The IUCN Red List of Threatened Species Partnership Agreement

This Agreement is entered into between:

IUCN, International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN")

AND

Center for Biodiversity Outcomes, Arizona State University (hereinafter referred to as "ASU"),

BirdLife International,

Botanic Gardens Conservation International (hereinafter referred to as "BGCI"),

Conservation International (hereinafter referred to as "CI"),

NatureServe,

Royal Botanic Gardens, Kew (hereinafter referred to as "RBGK"),

Department of Animal and Human Biology, Sapienza University of Rome (hereinafter referred to as "SAPU"),

Texas A&M University (hereinafter referred to as "TAMU"), and

The Zoological Society of London (hereinafter referred to as "ZSL")

(with ASU, BirdLife International, BGCI, CI, NatureServe, RBGK, SAPU, TAMU and ZSL, and any other legal entity that may become a Party to this Agreement individually and collectively referred to as "Red List Partner" and "Red List Partners", respectively), all individually and collectively referred to as "Party" and "Parties", respectively.

I. Background

A. *The IUCN Red List of Threatened Species*™ (or the IUCN Red List) is the world's most widely recognized and authoritative compilation of data on the conservation status of species, and the extinction risks that they face. Since 1998, IUCN, representing the combined efforts of its Species Survival Commission

(SSC) and Global Species Programme (GSP), and the Red List Partners, have together developed The IUCN Red List into a global standard.

B. *The IUCN Red List of Threatened Species*™ is now recognized as one of the fundamental tools to support biodiversity assessments, conservation planning and priority setting, and for reporting on progress in fighting the extinction crisis. The Parties herein propose to continue expanding this species assessment work to ensure that *The IUCN Red List of Threatened Species*™ is deployed to maximum benefit by the wider conservation community, with the ultimate objectives of eliminating or significantly reducing the lack of information on biodiversity, and of promoting the achievement of effective conservation and sustainable forms of development.

C. Expanding and developing *The IUCN Red List of Threatened Species*™ requires close collaboration between the following entities:

1. IUCN, whose components share responsibilities as follows:
   a. The SSC, which acts as custodian of *The IUCN Red List of Threatened Species*™ and of The IUCN Red List Categories and Criteria, develops and maintains protocols and procedures for Red List assessments, and convenes a large volunteer network to contribute data and expertise;

   b. The IUCN Global Species Programme, which supports the SSC, manages data collection processes, convenes the Parties, and together with the SSC assists in the maintenance of standards and produces *The IUCN Red List of Threatened Species*™ and associated Red List products;

2. Certain IUCN Members, who are also Party to this Agreement as Red List Partners, and make substantive commitments to help advance and develop *The IUCN Red List of Threatened Species*™ in a variety of ways including serving as or hosting Red List authorities, coordinating major assessments and contributing to working groups and / or technical bodies; and

3. Other organizations that are not Members of IUCN, but are Party to this Agreement as Red List Partners, and make substantive commitments to help advance and develop *The IUCN Red List of Threatened Species*™ in a variety of ways, including serving as or hosting Red List Authorities, coordinating major assessments and contributing to working groups and / or technical bodies.

D. In 2002, IUCN and three Red List Partners (BirdLife International, Conservation International and NatureServe) entered into a formal agreement designed to enhance work to develop *The IUCN Red List of Threatened Species*™ ("Initial Agreement"). In 2010, the Initial Agreement was superseded and replaced by an Agreement concluded between IUCN and the initial Red List Partners, joined by five additional Red List Partners, namely Botanic Gardens Conservation International (BGCI), Royal Botanic Gardens, Kew (RGBK), Texas A&M University (TAMU), Department of Animal and Human Biology, Sapienza University of Rome (SAPU), Wildscreen, and Zoological Society of London (ZSL), hereafter the "Founding Red List Partners", and then later joined in 2012

by Microsoft Corporation ("Second Agreement"). This Agreement supersedes, replaces and builds on these earlier agreements, and constitutes the new formal basis for cooperation between IUCN and the Red List Partners signing this Agreement, to be known as the Red List Partnership.

E. The primary purpose of the Red List Partnership is to advance the development, maintenance, promotion and use of *The IUCN Red List of Threatened Species™*. The Red List Partnership also serves as an important means for the Parties to coordinate activities related to biodiversity assessment and analysis, and to share information, expertise and insights in ways that enable the Parties to achieve their own strategic goals for science-based biodiversity conservation.

F. It is understood that, for all intents and purposes of this Agreement, the term "Partnership" (including all its derivatives) is used solely with the meaning of "collaboration" and is not intended to create, nor shall it create, any rights or obligations (other than those of a contractual nature provided for hereunder) under the laws of partnership of any jurisdiction.

II. Goal and Objectives

A. The goal of *The IUCN Red List of Threatened Species™* is:

To provide information and analyses on the status, trends and threats to species in order to inform and catalyse action for biodiversity conservation.

B. To achieve this goal, *The IUCN Red List of Threatened Species™* aims to:

Establish a baseline from which to monitor the change in status of species; provide a global context for the establishment of conservation priorities at the local level; and monitor, on a continuing basis, the status of a representative selection of species (as biodiversity indicators) that cover all the major ecosystems of the world.

C. The Parties shall work together to achieve the goal of *The IUCN Red List of Threatened Species™*, as mandated from time to time by the IUCN World Conservation Congress, and in accordance with the terms of the Agreement.

III. Principles of Performance

All Parties agree to the following principles in the performance of this Agreement:

A. The normal means for governance and coordination of the work being implemented under this Agreement will be through the Red List Committee (herinafter "RLC"), constituted under the SSC Steering Committee and consisting of the RLC Chair, and representatives of the Red List Partners, the SSC, the IUCN Secretariat and others as set forth in the Terms of Reference of the RLC (annexed hereto as ***Annex 1***), and as may be amended from time to time by the RLC.

B. The strategic priorities for *The IUCN Red List of Threatened Species*™ will be agreed and established in The IUCN Red List Strategic Plan (annexed hereto as ***Annex 2***), as may be amended from time to time by the RLC but at least every four years. The IUCN Red List Strategic Plan will in turn serve as a component of the IUCN Programme of Work for the relevant IUCN quadrennium.

C. The procedures for undertaking Red List assessments will be clear and transparent and will follow the processes outlined in the "Rules of Procedure for IUCN Red List assessments" (annexed hereto as ***Annex 3***), as may be amended from time to time by the RLC, and endorsed by the SSC Steering Committee.

D. The listings of species will be based on correct use of the "IUCN Red List Categories and Criteria" (Version 3.1, annexed hereto as ***Annex 4***) and the current version of the "Guidelines for Using The IUCN Red List Categories and Criteria" (***Annex 5***), the latter as may be amended from time to time by the independent Red List Standards and Petitions Sub-committee (SPSC), established by the SSC Steering Committee (and whose Terms of Reference are annexed hereto as ***Annex 6***).

E. All status assessments of species will be correctly and adequately documented and supported by the best scientific information available, to the extent that this is reasonably possible within available resources and comply with the "Required and Recommended Supporting Information for IUCN Red List Assessments" (Annex 1 to the Rules of Procedure for IUCN Red List assessments) and the "Documentation standards and consistency checks for IUCN Red List assessments and species accounts" (***Annex 7***), the latter as may be amended from time to time by the Global Species Programme and endorsed by the RLC.

F. Listings and documentation of assessments will be open to challenge and correction, as may be necessary and appropriate, following the agreed "Procedure for Handling of Petitions against Current Listings on *The IUCN Red List of Threatened Species*™," (Annex 4 to the Rules of Procedure for IUCN Red List assessments). In accordance with its Terms of Reference, the SPSC shall have the authority to consider and resolve all disputes relating to the listing of species independently of the SSC Chair, the SSC Steering Committee or the RLC.

G. The Species Information Service ("SIS") is the accepted means to manage and make available *The IUCN Red List of Threatened Species*™ data.

H. *The IUCN Red List of Threatened Species*™ will exist as an electronic version on the World Wide Web (on "The IUCN Red List website") and, resources permitting, will be updated regularly. The IUCN Red List website and IUCN Red List data will be made available according to The IUCN Red List Terms and Conditions of Use (***Annex 8***), as may be amended from time to time by the RLC, except where (and to the extent that) restrictions have been placed by data providers in writing, or when Red List assessors or any Party to this Agreement considers that the release of sensitive data might jeopardise the conservation status of a species.

I. The IUCN Red List website will include a communication mechanism to allow users to provide information for consideration in updating *The IUCN Red List of Threatened Species™*.

J. The IUCN Red List logo and associated branding will be supported, protected and maintained in accordance with the principles, rules and guidelines governing the visual identity of the logo (*The IUCN Red List of Threatened Species™ Logo Guidelines*, annexed hereto as ***Annex 9***), as may be amended from time to time.

IV. Rights and Obligations of IUCN

A. The Red List Partners acknowledge and agree that IUCN has the right to be recognized as the owner of the Species Information Service (SIS) database in which *The IUCN Red List of Threatened Species™* data are stored and managed, of the IUCN Red List website, and of *The IUCN Red List of Threatened Species™* logo, and the custodian and producer of, and trademark holder, in *The IUCN Red List of Threatened Species™* (each of these terms being defined in the Glossary, annexed hereto as ***Annex 10***).

B. In this regard, IUCN shall have the following obligations during the term of this Agreement:

1. To administer and maintain the overall process for assuring the accuracy, quality and validity of *The IUCN Red List of Threatened Species™* data, including:

   a. The establishment and functioning of Red List Authorities and the formal appointment of Red List Authority Coordinators responsible for the assessment of specific *taxa* on *The IUCN Red List of Threatened Species™* ; and
   b. Ensuring that assessments of species are clear and transparent and follow the processes outlined in the "Rules of Procedure for IUCN Red List assessments" (***Annex 3***) and in accordance with proper application of The IUCN Red List Categories and Criteria (***Annex 10***);

2. To provide the secretariat services for the day-to-day running of *The IUCN Red List of Threatened Species™*, including the unit in charge of The IUCN Red List and maintaining the Species Information Service (SIS) and The IUCN Red List website;

3. To curate and maintain The IUCN Red List data, and make all such data, after review and consistency checking (as defined in ***Annex 3***), openly accessible on The IUCN Red List website in a timely manner (subject to the Terms and Conditions of Use set out in ***Annex 8***);

4. To maintain the Species Information Service (SIS) and The IUCN Red List website;

5. To coordinate the development and maintenance of training materials to facilitate understanding and application of the IUCN Red List Categories and Criteria, including the running of Red List Assessor and Red List trainer training workshops and the development of the Online IUCN Red List training course;

6. To provide secretariat services for the SPSC and RLC, as well as any working groups that may be established;

7. To provide advice on appropriate uses of *The IUCN Red List of Threatened Species*™ data, in accordance with the Guidelines for Appropriate Uses of Red List Data, annexed hereto as ***Annex 11,*** as may be amended from time to time by the RLC;

8. To compile The IUCN Red List Index, working with relevant Red List Partners as appropriate;

9. To convene and coordinate the Red List Partnership, and to coordinate the process for the admission of new Red List Partners, as provided for under Art. XIII;

10. To administer and maintain The IUCN Red List logo and the trademark and any associated trademarks and to legally challenge any misuse of the trademark;

11. To coordinate joint fund-raising efforts, on behalf of the Parties, in support of the achievement of The IUCN Red List Strategic Plan; and

12. To provide prominent recognition and acknowledgement of the contributions of the Red List Partners in all communications and publicity associated with the IUCN Red List.

V. Rights and Obligations of the Red List Partners

A. The Parties acknowledge and agree that Red List Partners have the right to:

1. Be acknowledged and recognized as Red List Partners, including on the IUCN Red List website and to be associated with any particular assessments they are responsible for producing, in any publicity associated with The IUCN Red List including updates to The IUCN Red List website, and in publications of *The IUCN Red List of Threatened Species*™ data;
2. Use The IUCN Red List logo, provided such use is in accordance with agreed protocols and the visual identity as specified in *The IUCN Red List of Threatened Species*™ Logo Guidelines (***Annex 9***);
3. Be invited to contribute to all major partnership activities including joint funding applications (in accordance with Art. VIII) and large-scale analyses and publications of *The IUCN Red List of Threatened Species*™ data; and
4. Be represented on the RLC by one representative, where this is in accordance with the provisions for the composition of the RLC as set out in ***Annex 1***.

B. Each Red List Partner shall have the following obligations during the term of this Agreement, subject to the provisions of Art. V.C.:

1. Making a long-term institutional commitment including:

   a. A substantial contribution towards achievement of The IUCN Red List Strategic Plan through leading or coordinating species-level assessment work (for example, large taxonomic or regional assessment projects), and/or acting as a Red List Authority; and
   b. The commitment of substantial financial or in-kind resources towards the performance of activities consistent with the Red List Partnership, equivalent to an amount of US$200,000 per calendar year or US$1,000,000 over five years, and subject to the provisions of Art. VIII.A.

2. Signing a bilateral Memorandum of Understanding (MoU) with IUCN outlining specific agreed activities and outputs in line with The IUCN Red List Strategic Plan and including financial costing of all proposed activities, with each MoU hereby incorporated by reference into this Agreement (attached hereto under ***Annex 12***). It is understood and agreed that these MoUs may be amended from time to time in accordance with amendments to The IUCN Red List Strategic Plan. In the case of any conflict or inconsistency between the language of the bilateral MoU and the language of this Agreement, the latter shall prevail;

3. Providing to IUCN, on an annual basis, a technical and financial progress report against activities and outputs outlined in the bilateral Memorandum of Understanding (MoU). These reports should match the reporting template agreed by the RLC (attached hereto under ***Annex 13***), and would be provided to IUCN one month before the annual meeting of the RLC;

4. Bearing the cost of their own attendance at annual in-person meetings of the RLC, noting that facilities shall also be made available to ensure that Red List Partners may attend all such meetings by virtual means where it is not possible to attend in-person;

5. Providing, as needed, contributions to any RLC Working Groups that may be established, and attending any meetings as may be required, which will be in person where possible or otherwise by virtual means, understanding that Red List Partners shall bear their own cost of such attendance;

6. Ensuring that all staff involved in assessment work have completed and passed the final course exam of the online IUCN Red List Training Course;

7. Respecting and abiding by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species*™, including the work of:

   a. The Red List Authorities carried out pursuant to their Terms of Reference (as set forth in ***Annex 3***); and

b. The SPSC – as referenced in Art. III.F above; and

8. Promoting and communicating *The IUCN Red List of Threatened Species*™, and the conservation messages emerging from it.

C. Recognizing that all these commitments are made in good faith, it being understood that the ability of each Red List Partner to implement its commitments will depend upon the availability of resources. However, continual or repeated failure of any Red List Partner to meet these commitments during the life of this Agreement may lead to enactment of Art. XIV.D. or Art. XIV.E.

D. Red List Partners are not obliged to make financial or in-kind contributions directly to IUCN in connection with this Agreement. Red List Partners may satisfy the obligations described in this Art. V. by securing third-party funding to support projects that contribute to the realization of the objectives of this Agreement as described in Art. V. as well as by providing any in-kind contributions towards such projects.

VI. Intellectual Property Rights

A. In their performance of this Agreement, all Parties will have the following obligations:

1. Abide by The IUCN Red List Terms and Conditions of Use (***Annex 8***) in accordance with Art. III.H;

2. To the extent permitted by applicable law, respect and preserve the intellectual property and other rights of data owners and suppliers, it being understood that, any Party who infringes third-party rights (as defined in the Glossary at ***Annex 10***) shall be individually and solely liable for any resulting damages; and

3. Take all reasonable steps necessary to preserve each Party's intellectual property rights in the data provided for inclusion into The IUCN Red List data or database.

B. It is recognized that each Party retains ownership of the intellectual property that already exists or it develops during the term of this Agreement and makes available for inclusion in the IUCN Red List Data, and retains the right to use this intellectual property outside of *The IUCN Red List Terms and Conditions of Use*.

C. Each Party agrees, to the extent permitted by applicable law, to grant to IUCN and the other Red List Partners an irrevocable, nonexclusive, non-transferable, royalty free license to use intellectual property contributed to The IUCN Red List data solely for purposes of this Agreement, provided such use is in keeping with Art. III.H. and it being understood that permission should be sought from the relevant Party prior to reposting and / or redistribution, each of these terms being defined in ***Annex 10***.

D. Notwithstanding Art. VI.C., Red List Partners agree to grant IUCN permission to license data for commercial use on their behalf via the Integrated Biodiversity Assessment Tool (IBAT), with the understanding that income thus generated will be reported to the RLC and that said income will be distributed in a manner agreed by the RLC, according to its Terms of Reference.

VII. Communication and Co-ordination

A. To facilitate communication and to co-ordinate the performance of this Agreement, each Red List Partner will designate in writing one specific individual to serve as its Primary Representative and one additional individual to serve as its Alternate Representative, who is authorized to act in the absence of the Primary Representative.

B. Any notice provided to a Red List Partner's Primary Representative shall be deemed to be notice to that Red List Partner. Each Red List Partner shall be responsible to keep the RLC Chair updated in writing as to the name and contact information of the Primary Representative and Alternative Representative.

C. The normal means for coordination of the work being implemented under this Agreement will be through the RLC.

D. In addition to the RLC, IUCN will establish mechanisms for all Parties to share relevant information and ideas, which may include, without limitation, the convening of meetings of the Red List Partnership to review the performance of the Agreement.

VIII. Resources and Fundraising

A. The Parties shall subscribe to the following principles in raising funds in support of the implementation of The IUCN Red List Strategic Plan, subject to the following obligations neither a) conflicting with or overriding the legal and charitable obligations of each Party nor b) affecting the ability of each Party to govern its own organisation, and determine its own fundraising activities and resource allocation. While it is recognized that each Red List Partner will need to independently meet the financial commitment established in Art. V.B.1.b., the principles below reflect the fact that the Red List Partnership will be more powerful when Parties work together in a coordinated and collaborative manner and the chance of fundraising success will be greater when multiple Parties collaborate on the development of significant proposals that demonstrate the spirit of the Red List Partnership. Serious emphasis will be given to large-scale joint approaches to donors to support the implementation of The IUCN Red List Strategic Plan.

1. All Parties will be responsible for and will undertake fundraising for activities contributing to the achievement of the goal of *The IUCN Red List of Threatened Species*™ and in support of the IUCN Red List Strategic Plan;

2. Where known, existing relationships that Parties might have with donors will be respected;
3. Parties will inform each other as early as possible about fundraising proposals for activities within the scope of this Agreement that include activities that would substantially overlap geographically or thematically with the work of other Parties;
4. Joint fundraising for activities in support of the implementation of The IUCN Red List Strategic Plan will be encouraged especially for large proposals (US$200,000 and over) to multilateral and bilateral agencies as well as approaches to foundations, banks and private sector operators;
5. A lead Party will be identified for such joint proposals acknowledging that the lead will depend on the topic and on the existing relations with the targeted donor;
6. Where possible, proposals will include contributions towards the costs of the Species Information Service and the IUCN Red List website; and
7. The Parties will agree on common approaches to the development of materials presenting *The IUCN Red List of Threatened Species*™ to ensure that a consistent approach is taken to prospective funders.

IX. Policies and Positions

A. *The IUCN Red List of Threatened Species*™ data will be made available only through the regular updates of The IUCN Red List website. Where Parties are involved in assessments, each Party is strongly discouraged from releasing its own draft data prior to publication on The IUCN Red List website, except in accordance with the "Policy on Use of Pre-Publication Red List Data" (included as Annex 6 in "Rules of Procedure for IUCN Red List assessments"). However, nothing in this Agreement shall prevent any Red List Partner from publishing its own data at any time, except that in the event of it being necessary for a Red List Partner to release data prior to publication on The IUCN Red List website, these data shall not be presented in a way that implies they have been formally approved by IUCN.

B. No Party shall utilize or publicly release for any purpose draft data provided by other Parties without the latter's advance written permission.

C. Red List Partners may write scientific or other publications based on these Red List data prior to their release on The IUCN Red List website, providing this is in accordance with the "Guiding principles concerning timing of publication of IUCN Red List assessments on The IUCN Red List website, relative to scientific publications and press releases" (annexed hereto as ***Annex 14***, as may be amended from time to time by the RLC), and providing that the data providers in question have given their consent for their data to be used for pre-publication in this way.

X. Acknowledgements and Logos of the Parties

A. Further to Art. V.A.1, the Parties agree that for all materials, reports or any other products based on the use or application of The IUCN Red List Categories and Criteria the participation of the Parties in each such product will be recognized in pre-agreed form according to the role played by the respective Parties, and consistent with the bilateral MOUs between IUCN and specified Red List Partners.

B. Boiler plate text will be developed and agreed to describe, for any product, the role played by IUCN and the Red List Partners. This acknowledgement shall be in addition to the recognition given to significant contributors to the product in question.

C. The name and logo of each of the Parties (whether registered or not as trademarks) are owned by that Party, and may not be used by the other Parties to this Agreement other than as expressly provided for hereunder, except with the prior written permission of their owner.

XI. Limitations to the Agreement

No Party to this Agreement has the authority to bind the others in any manner whatsoever, nor to take any positions, or create any commitments or obligations, whether legally binding or not, in the name or on behalf of any of the other Parties. Each Party shall retain its independence, and nothing in this Agreement shall confer any rights upon either another Party or any Committee established in relation to this Agreement, to exert any authority over a Party in determining how that Party governs and operates its organisation or resources.

XII. Modification of the Agreement

This Agreement may be modified only through a written amendment to this Agreement signed by all the Parties.

XIII. Admission criteria and additional Red List Partners

A. Any organization wishing to become a Red List Partner shall fulfil the following criteria:

1. Be a government agency, national non-governmental organization, and / or international non-governmental organization in the sense of the definition of IUCN Members set forth in article 4 and 5 of the IUCN Statutes and generally satisfy the criteria of admission as IUCN Members as set forth in article 7 of the IUCN Statutes, as may be amended from time to time;
2. Be science-based and able to demonstrate that its work is independent and free from any form of unacceptable bias and/or actual conflict of interest with regard to *The IUCN Red List of Threatened Species*™; and

3. Provide convincing demonstration of its support for, endorsement of, and intent to fulfil the principles of performance (Art. III) and commitments (Art. V.B.) set forth hereunder.

B. Any organization wishing to become an additional Red List Partner shall submit its request to IUCN addressing the criteria set forth in clause A. IUCN will assess the application against the admission criteria for inclusion and make recommendations to the organizations who are Red List Partners at the time of the request as to the suitability of the potential additional Red List Partner. The final decision on the admission of new Partners will be based on consensus among the existing Parties as far as possible, or, if not, by a two-thirds majority vote of the Parties.

C. Any organization fulfilling the criteria set forth in clause A above and signing "The IUCN Red List of Threatened Species Partnership Agreement" with IUCN shall be considered as Red List Partner and have the same rights and obligations as if it had signed this Agreement.

D. The admission of an additional Red List Partner shall not affect the term and conditions of this Agreement and in particular the "Initial Term" set forth in Art. XIV.A.

XIV. Term and Termination; Withdrawal by or Removal of Any Red List Partner from the Agreement

A. This Agreement shall become effective on 03 September 2016 and shall remain in force for a period of five (5) years (the "Initial Term").

B. IUCN may terminate this Agreement at any time, upon advance written notice of ninety (90) days to all Parties.

C. At any time during the Term, any Red List Partner may withdraw unilaterally from this Agreement and thus terminate its participation in the Red List Partnership by providing to IUCN ninety (90) days written notice of its intent to so withdraw. Termination by a Red List Partner of its participation in the Red List Partnership does not affect its accrued rights and obligations under this Agreement at the date of termination, but any further rights and obligations shall cease immediately upon termination.

D. Any Red List Partner can request IUCN to initiate a process for the review of the continuation of another Red List Partner within the Red List Partnership, should there be a concern that the behaviour or non-compliance of that Red List Partner is exposing the Red List Partnership or any Party to this Agreement to liability and/or risk (including reputational risk).

E. IUCN will assess if the allegations made by the requesting Red List Partner are sufficiently substantiated to initiate a process for review of the continuation of that Red List Partner within the Red List Partnership. In the event that any Red List Partner is suspected of failure to perform its obligations under this

Agreement and is so informed, the identified Red List Partner shall have the right to respond to such allegations within one month from notification by IUCN and to outline a proposal toward addressing the allegations of failure to perform its obligations and a plan to meet its obligations.

F. Should any Red List Partner fail, in the reasonable opinion of IUCN, to comply with the terms of or perform its obligations under this Agreement, IUCN, upon decision by its Director General, shall have the right to remove such a Red List Partner from the IUCN Red List Partnership by terminating The IUCN Red List of Threatened Species Partnership Agreement concluded with this Red List Partner upon ninety (90) days' advance written notice, which shall be copied to all the Red List Partners.

XV. Dispute Resolution

A. Should any dispute arise between the Parties concerning their respective rights, duties or liabilities under this Agreement, which the Parties are unable to resolve in an amicable fashion, such a dispute shall be settled exclusively and finally by arbitration under the UNCITRAL Arbitration Rules in effect at the time the dispute arose, and in accordance with the following provisions:

1. The number of arbitrators shall be three (3), unless the Parties involved agree to one (1) arbitrator;
2. The place of the arbitration shall be IUCN Headquarters, in Gland, Switzerland; and
3. The language to be used in the arbitral proceedings shall be English, with each of the Parties involved providing its own language interpretation services at its own expense.

B. The UNCITRAL Arbitration Rules may be requested in paper form to The United Nations Commission on International Trade Law (UNCITRAL), P.O. Box 500, A-1400, Vienna, Austria, or may be downloaded from the UN Internet website through the following link: http://www.jus.uio.no/lm/un.arbitration.rules.1976/

XVI. Miscellaneous

A. **Severability.** If any term or provision of this Agreement shall be held illegal, void, unenforceable under or otherwise in conflict with the laws of any competent jurisdiction, the validity of the remaining terms or provisions of the Agreement shall not be affected thereby and shall remain in full force and effect to the extent allowed by applicable law.

B. **No Waiver.** A waiver by any Party of any breach by any other Party of any term of this Agreement shall not be or deemed to be a waiver of any other preceding or subsequent breach of the same or any other term.

C. **Force Majeure.** The performance of this Agreement by any Party is subject to acts of God, war, government regulations, disaster, strikes, civil disorders,

curtailment of transportation facilities, and other emergencies making it illegal or impossible for any Party to perform its obligations.

D. **Entire Agreement.** It is understood and agreed that ***Annexes 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13*** and ***14,*** as they may be amended from time to time by the bodies administering them, are incorporated into and constitute an integral part of this Agreement. In case of any inconsistency or conflict between the language of this Agreement proper and that of any of the ***Annexes***, this Agreement proper shall prevail over any and all of ***Annexes 1-14***; and among the Annexes, ***Annex 4*** shall prevail over ***Annexes 1-3*** and ***5-14***. This Agreement contains the entire understanding between/among the Parties with respect to the subject matter hereof, and supersedes any and all prior and contemporaneous agreements and understandings between/among the Parties concerning said subject matter.

XVII. Execution

This Agreement has been executed by all the Parties in eleven (11) counterparts, each of which shall be deemed an original, and which together shall constitute one and the same instrument. The co-signature of the Chair of the SSC on behalf of IUCN, along with the primary signature of the Director General, is intended as an acknowledgment of the extensive role and work to which SSC is committed under this Agreement, it being understood that the ultimate decision-making authority under the Agreement on behalf of IUCN shall rest with its Director General.

Date: Aug. 3, 2016.

Director General
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 9-3-2016

University President
Arizona State University

Date: 3/9/2016

Chief Executive
BirdLife International

Date: 3 Sept 2016

Secretary General
Botanic Gardens Conservation International

Date: 3/09/2016

Executive Vice President
Conservation International

Date: 12/4/2017

Director of Science
Royal Botanic Gardens, Kew

Date: 11/28/2016

Interim CEO & Chief Information Officer
NatureServe

Date: 3/9/2016

Representative of the Director, Department of Biology and Biotechnologies
Sapienza University of Rome

Date: 2-28-17

Provost & Executive VP
Texas A&M University

Date: 1/11/16

Director General
Zoological Society of London

List of Annexes to The IUCN Red List of Threatened Species Partnership Agreement

Annex 1:	**Composition and Terms of Reference of the Red List Committee and its Working Groups (amended by RLC)**
Annex 2:	**The IUCN Red List Strategic Plan: 2017-2020 (amended by RLC)**
Annex 3:	**Rules of Procedure for IUCN Red List assessments (amended by RLC, and endorsed by SSC Steering Committee)**
Annex 4:	**IUCN Red List Categories and Criteria, version 3.1 (amended by IUCN Council)**
Annex 5:	**Guidelines for Using The IUCN Red List Categories and Criteria (amended by SPSC)**
Annex 6:	**Composition and Terms of Reference of the Red List Standards and Petitions Sub-Committee (amended by SSC Steering Committee)**
Annex 7:	**Documentation standards and consistency checks for IUCN Red List assessments and species accounts (amended by Global Species Programme, and endorsed by RLC)**
Annex 8:	**IUCN Red List Terms and Conditions of Use (amended by the RLC)**
Annex 9:	**The IUCN Red List of Threatened Species™ Logo Guidelines (amended by the GSP with RLC)**
Annex 10:	**Glossary to the IUCN Red List Partnership Agreement**
Annex 11:	**Guidelines for Appropriate Uses of Red List Data (amended by RLC)**
Annex 12:	**MoUs between IUCN and each Red List Partner (amended by IUCN and each respective Red List Partner)**
Annex 13:	**Technical and financial annual reporting template (amended by RLC)**
Annex 14:	**Guiding principles concerning timing of publication of IUCN Red List assessments on The IUCN Red List website, relative to scientific publications and press releases (amended by the RLC)**

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Annex 1: Composition and Terms of Reference of the IUCN Red List Committee and its Working Groups

The Red List Committee is the senior decision-making mechanism for *The IUCN Red List of Threatened Species*™. It serves to ensure co-ordination and smooth working of the Red List process, and in particular close and effective co-operation among the SSC, IUCN Global Species Programme and the Red List Partners. The responsibilities of the RLC are to:

1. Agree realistic priorities, within available resources, relating to expanding and maintaining The IUCN Red List, the biodiversity assessments and information systems that support it, and to elaborate these in the quadrennial The IUCN Red List Strategic Plan;
2. Keep The IUCN Red List Strategic Plan under review and adjust as needed;
3. Review annual progress reports received from Red List Partners and provide feedback on these reports;
4. Advise on, and assist with, fundraising in support of the agreed activities in The IUCN Red List Strategic Plan;
5. Review the need for appointment of Red List Authorities and vet the appointment of Red List Authority Coordinators;
6. Plan collaborative analytical work based on data in The IUCN Red List;
7. Set the standards of scientific quality for The IUCN Red List (the technical work underpinning this being carried out by RLC working groups and the SPSC);
8. Ensure adequate review and quality control of all synthetic products from the SSC relating to biodiversity assessments;
9. Maintain and promote adherence to "Rules of Procedure for IUCN Red List Assessments";
10. Maintain the "Guidelines for Appropriate Uses of Red List Data" and provide appropriate advice, as needed, on the use of Red List data in decision-making;
11. Maintain and enforce the "IUCN Red List Terms and Conditions of Use" and adjudicate on controversial requests for permission to waive these terms;
12. Agree the fair, equitable and appropriate distribution of income arising from the licensing of data for commercial or other purposes;
13. Consider and establish mechanisms for incentivizing and mobilizing support and resources for Red Listing work through, *inter alia*:
    a. Recognizing and engaging with institutions currently meeting all the admission criteria for full Red List Partners, but unable to meet the financial commitment level for full partnership; and
    b. Recognizing and engaging with the user community for institutions not currently meeting all the admission criteria for full Red List Partners, nor the strategic commitment, but interested in making a substantial financial or in-kind contribution; and
14. Provide regular updates and reports to the SSC Chair and the SSC Steering Committee.

The Red List Committee (RLC) is convened by and reports to the Chair of the IUCN Species Survival Commission (SSC), advised by the SSC Steering Committee. The Chair of the RLC is appointed by the Chair of the SSC. The RLC Chair is a member

of the SSC Steering Committee and will provide an annual report to the SSC Steering Committee on progress against the above terms of reference. Besides the RLC Chair, who will be independent and not vote, full membership of the RLC will consist of the following voting members:

- Up to five individuals representing the SSC (the "SSC members"), who shall be identified by the SSC Chair in consultation with the RLC Chair and the Chairs of the relevant SSC sub-committees;
- Up to five individuals representing the IUCN Secretariat (the "IUCN Secretariat members");
- A single representative from each Founding Red List Partner (as defined in Art. I.D. of the Red List Partnership Agreement, provided they remain a signatory to this Agreement); and
- A single representative each from no more than two (2) new Red List Partner organizations, elected from among these Partners, with each serving for a two-year term.

The Chair of the Standards and Petitions Sub-Committee (SPSC) and the Chairs of any RLC working groups that may be established by the RLC will be invited to sit on the RLC as non-voting members and to attend any meetings of the RLC. The RLC may also co-opt up to two individuals, not representing the interests of the Secretariat or the SSC or the Red List Partners, to sit on the RLC as non-voting members for a period agreed by the RLC.

As appropriate, other observers may be invited by the Chair of the RLC to participate in relevant agenda items at meetings of the RLC.

Decisions of the Red List Committee will ordinarily be taken by consensus. In exceptional cases where consensus cannot be reached, decisions will be by vote, where a simple majority of votes will be required in each and all of the following three categories: SSC members; IUCN Secretariat members; and Red List Partners. Any voting member can request that a decision on an issue be put to the vote.

Composition and Terms of Reference of the Red List Technical Working Group

The IUCN SSC Red List Technical Working Group reports to the Red List Committee and is responsible for ensuring consistency and developing improvements in: (a) the application of the IUCN Red List Categories and Criteria; (b) the documentation of Red List assessments, including through the design and coding of the IUCN Classification Schemes and creation of GIS data; (c) the design and implementation of Red List Indices; and (d) the use of the Species Information Service (SIS) to facilitate (a) to (c). In particular, the Red List Technical Working Group seeks to ensure that the SSC's major global and regional biodiversity assessment projects are implemented in a consistent manner. To do this, the Red List Technical Working Group will:

- Monitor the implementation of all the major biodiversity assessment projects, and other assessment work carried out by Red List Authorities, Red List Partners and the IUCN Global Species Programme;
- Identify major areas of possible inconsistency in the data generated by the different assessment projects, evaluate the nature and extent of the problems, and propose solutions;
- Identify issues that need to be covered and clarified in the Guidelines for Using the IUCN Red List Categories and Criteria (http://www.iucn.org/webfiles/doc/SSC/RedList/RedListGuidelines.pdf), and refer these issues and, wherever possible, real examples to the Standards and Petitions Sub-Committee;
- Provide comments and, wherever possible, examples to the Standards and Petitions Sub-Committee on the practical consequences of proposed revisions to Guidelines for Using the IUCN Red List Categories and Criteria;
- Propose developments and improvements to the documentation of Red List assessments, and develop/improve associated guidance, definitions etc;
- Monitor and develop when appropriate the structure, content, guidance and implementation of the Classification Schemes;
- Oversee the continuing development of The IUCN Red List Index, and advise on its use;
- Monitor the development of SIS and its use, make proposals for changes and improvements as needed, and review all requests for changes and modifications to SIS; and
- Provide feedback and guidance on the presentation of *The IUCN Red List of Threatened Species*™ data on The IUCN Red List website.

The Chair of the Red List Technical Working Group is appointed by the Chair of the Red List Committee, in consultation with the SSC Chair and serves as a full member of the Red List Committee. The membership of the Red List Technical Working Group is appointed by the Chair of the working group (guided by advice from the RLC) and shall comprise up to 16 individuals representing the SSC, IUCN Secretariat, and Red List Partners. The Red List Technical Working Group will meet as often as required, within available resources (*ad hoc*, specialized meetings may be held from time to tie to addressed particular issues). All formal decisions and recommendations of the Red List Technical Working Group will be referred to the Red List Committee for formal adoption. The Chair of the Red List Technical Working Group will provide an annual report to the Red List Committee on progress against the above terms of reference

Composition and Terms of Reference of the National Red List Working Group

The National Red List Alliance Coordinating Body oversees and coordinates the activities of the National Red List Alliance. The Coordinating Body simultaneously serves the role of the National Red List Working Group as the body that: reports to the IUCN Red List Committee; is responsible for overseeing the use and application of the IUCN Red List Categories and Criteria (particularly the Guidelines for Application of IUCN Red List Criteria at Regional Levels) at the national level; and builds linkages between the IUCN Red List of Threatened Species™ and species assessment processes at national levels by fostering and developing approaches and mechanisms to enhance the integration of national assessments with global assessments. Members of the National Red List Alliance Coordinating Body will:

1) Promote the application of the *Guidelines for Application of the IUCN Red List Criteria at Regional Levels* in a range of country contexts, and act as an advisory body for problems and issues relating to the implementation of these regional Guidelines;
2) Propose solutions to technical problems relating to the implementation of the regional guidelines, and make and send proposed revisions to the *Guidelines* to the IUCN Red List Committee for formal adoption, after review by the IUCN Standards and Petitions Sub-Committee;
3) Build linkages between IUCN SSC Red List Authorities responsible for the global IUCN Red List and the organizations responsible for national red lists;
4) Promote linkages between National Red List Alliance members and IUCN National Committees, in the countries where they are present.
5) Conduct a regional scoping exercise to identify a potential set of priority countries to help meet the targets in the 4-year National Red List Coordinating Body work-plan;
6) Help build national and/or regional capacity for national red listing
7) Develop a regional work-plan that supports the overall work-plan;
8) Report on the Key Performance Indicators, (measured as a percentage increase and absolute measure), within their region, developed by the Coordinating Body, including:
    a. Number of countries with an up-to-date Red List;
    b. Number of countries represented on the National Red List Alliance
    c. Number of ‘official’ formally trained trainers;
    d. Number of training workshops each year;
    e. Amount and source of funding allocated towards National Red Lists;
    f. Number of Red Lists uploaded into the National Red List database;
    g. Number of Action Plans uploaded into the National Red List database;
    h. Number of endemics uploaded to the Global Red List;
    i. Number of news feeds or blog entries uploaded onto the National Red List website;
    j. Number of Red List associated publications;
    k. Number of languages the website content and training material.
9) Co-host the nationalredlist.org website to store all species and ecosystem National Red Lists, species and ecosystem action plans, national level distribution maps, for their specific region, as available.
10) Collate and upload National Red Lists, distribution maps (Shape or KML files) and action plans for their region;
11) Translate the nationalredlist.org website content into the languages of their assigned regions, where possible;
12) Share experience, tools and contribute to the NRL website’s news and blogs on a regular basis; provide advice on the development of national-level databases for storing and managing Red List data;
13) Assist in raising funds for National Red Lists;
14) Contribute to raising awareness of the importance and potential use of National Red Lists;

15) Help coordinate or host in-country National Red List meetings as well as Alliance meetings;
16) Engage with the relevant political authorities nationally and at international meetings to promote National Red Lists;
17) Promote and guide the development of training initiatives for national Red List compilers (working in collaboration with the IUCN Species Programme and Red List Partners) and encourage the training of trainers in their region and foster synergies between species and ecosystem red lists;
18) Encourage countries with national red lists to also take account of those taxa listed as threatened on The IUCN Red List that occur in the country, particularly those that are endemic or near-endemic to the country, when setting priorities for conservation action.

Annex 2: The IUCN Red List Strategic Plan: 2017-2020

The IUCN Red List of Threatened Species™

Strategic Plan 2017 - 2020

The IUCN Red List of Threatened Species™

IUCN SSC Species Survival Commission

THE IUCN RED LIST OF THREATENED SPECIES: STRATEGIC PLAN 2017-2020

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THE IUCN RED LIST OF THREATENED SPECIES: STRATEGIC PLAN 2017-2020

January 2017

The IUCN Red List Partnership

Introduction

The concept of biodiversity can seem abstract and overly technical to the casual observer. Species, however, quickly populate the concept and provide a handle that the non-specialist can use to better understand the creatures with which we share the planet.

Encountering species quickly turns theory to reality and can be the basis on which people appreciate the wider scope of biodiversity. Whether it takes place in the wild, in the zoo or arboretum, a tangible encounter can create a meaningful relationship between humans and species; we can observe and touch them, feel affinity toward and be inspired by them, and we can care about their survival and well-being. The billions of dollars spent by birdwatchers, sports hunters and fishermen, gardeners, aquarium keepers, pet owners, and visitors to national parks bear testimony to our deep enjoyment of species. Even if we have little hope of ever seeing one, except perhaps on television (economists call this "existence value"), people derive pleasure from knowing that countless amazing species exist in the wild.

Furthermore, many people appreciate species as our source of food or medicine, providing us with survival and billions of dollars in profits. As reported in the assessment on The Economics of Ecosystems and Biodiversity (TEEB 2010), species play an important role in local, national, and international economies. But for many people, the issue of economics does not bring to bear on the value of species. Rather it is the ethical or religious belief that they deserve to be treated with respect and should continue to exist as part of the planet's ecosystems, from the abyssal seas to the majestic mountains and everywhere in between.

Biologists and ecologists, such as those contributing to the IUCN Red List, are constantly adding to our understanding and enjoyment of species. While well aware that species cannot be differentiated from the ecosystems in which they live, these scientists focus on particular aspects of individual taxa: their genetics, their role in ecosystems, their relationships with predators and prey, their behaviour, and their relations with humans. This research has been integral to the conservation of the thousands of species we love and depend upon.

IUCN has supported species conservation from its very beginnings. This approach was formalized through the establishment of the Species Survival Commission (SSC) in 1950. The first Red Data Book was published in 1963 under the leadership of Sir Peter Scott and highlighted the most high-profile species. Since then, the *IUCN Red List of Threatened Species™* (www.iucnredlist.org) has become the most authoritative and internationally accepted system for assessing species' extinction risk. The IUCN Red List is based on a simple yet robust set of quantitative categories and criteria, with the latest version dating from 2001.

The IUCN Red List is constantly being updated. At the time of writing, the IUCN Red List included assessments for ~82,000 species (version 2016.1). The IUCN Red List system assigns species to one of eight categories based on their risk of extinction. Species in the three categories of **Critically Endangered**, **Endangered** and **Vulnerable** are considered as '**threatened'**. **Data Deficient** species are those for which insufficient or inadequate information is available to make an informed assessment. Rates of Data Deficiency vary wildly among groups, from 1% of birds to nearly half of all cartilaginous fishes (sharks, rays and allies) and freshwater crabs.

To date, comprehensive species assessments have been completed for a number of taxonomic groups, including: all amphibians; mammals; birds; cartilaginous fishes; reef-building corals; freshwater crabs, crayfishes and caridean shrimps; mangroves; seagrasses; conifers; cacti; and cycads. Comprehensive assessments are ongoing for many other taxa, including all reptiles, fishes and a number of plant and invertebrate taxa, in order to remedy known biases in coverage, but even so the majority of described species remain Not Evaluated (including most plants and the vast majority of invertebrates and virtually all fungi and algae).

A complementary strategy, involving a sampled approach, has been developed to increase coverage of species groups which have to date been under-represented on the IUCN Red List, and for which

global, comprehensive assessments may be difficult or even unachievable due to knowledge, time and financial constraints. Assessments using the sampled methodology have been undertaken for the dragonflies and damselflies, reptiles, and bony fishes, and are currently underway for a number of other taxa.

Guidelines for applying the IUCN Red List Categories and Criteria at regional and national levels have been developed to help, in particular, those countries developing national Red Lists.

Every assessment on the IUCN Red List includes a list of the threats faced by the species. The most salient factors threatening species globally are: habitat loss and degradation; overexploitation; invasive species; pollution, and global climate change. The description of threats, status and trends in IUCN Red List assessments provides the basic information to catalyse action for each species.

The IUCN Red List: a key conservation tool

The IUCN Red List is a critically important tool for building support for species conservation. Virtually all countries have established protected areas, almost all are Parties to the Convention on Biological Diversity (CBD), all have laws in place to protect threatened species, and many have non-governmental conservation organizations dedicated to species. The IUCN Red List influences governments and international environmental instruments (CBD, CITES, IPBES, Ramsar, World Heritage, and many others), but it has no powers of enforcement, and depends on the quality of its science to convince the relevant agencies to adopt its results. The IUCN Red List remains inadequately funded, which limits the rate at which it can assess more species and the effort it can devote to promoting the conversion of the IUCN Red List findings into conservation action. It depends on the support of an outstanding network of volunteers, many of whom would be able to contribute more if they were better supported. It must also operate within the constraints of a world where nearly a billion people remain undernourished, calling for conservation actions that also address the needs of the rural poor who often live among the most threatened species, and are essential to their conservation. This Strategic Plan intends to address such weaknesses.

With sufficient funding, effective law enforcement, removal of the major threats, solid research, appropriate technology, and perseverance, no threatened species need ever become Extinct, and many could return to play their historical role as part of the complex natural ecosystems that have enriched planet Earth. The IUCN Red List of Threatened Species supports this effort as effectively as possible by providing reliable information on the status and trends of species, as well as the threats to them.

THE IUCN RED LIST OF THREATENED SPECIES: STRATEGIC PLAN 2017-2020

This Strategic Plan specifically addresses Resolution WCC-2012-Res-017 adopted at the 5th World Conservation Congress requesting "the IUCN Species Survival Commission and the Director General to … clarify agreed strategic priorities for the IUCN Red List to the year 2020, to make its timing consistent with the Aichi Targets of the Strategic Plan for Biodiversity 2011–2020..." This plan puts the goals of the IUCN Red List into action, as part of the IUCN Programme 2017-2020 (in which the IUCN Red List is stated as a priority knowledge product), and specifically as a component of the IUCN Species Strategic Plan 2017-2020. Note that this plan covers 2016, the final year of implementation of the 2013-2016 plan.

The IUCN Red List Strategic Plan includes the elements from the IUCN Programme that are relevant to the IUCN Red List and were drafted by the IUCN Red List Committee, which consists of representatives from the SSC, the Global Species Programme, and representatives of the Red List Partners. The primary purpose of the Red List Partnership is to advance the development, maintenance, promotion and use of *The IUCN Red List of Threatened Species™*. It serves as an important means for the Parties to coordinate activities related to biodiversity assessment and analysis, and to share information, expertise and insights in ways that enable the Parties to achieve their own strategic goals for science-based biodiversity conservation. The current Red List Partners include: BirdLife International, Botanic Gardens Conservation International, Conservation International, Royal Botanic Gardens Kew, Texas A&M University, Department of Animal and Human Biology, Sapienza University of Rome, and Zoological Society of London. Red List Partners assume direct responsibility for the delivery of many of the targets in the strategic plan.

The goal of the IUCN Red List of Threatened Species is: *To provide information and analyses on the status, trends and threats to species in order to inform and catalyse action for biodiversity conservation.*

This goal includes the "traditional" role of the IUCN Red List in identifying particular species at risk of extinction. While the role of the IUCN Red List in underpinning priority-setting processes for single species remains of critical importance, the goal has been expanded to encompass the use of data from the IUCN Red List for multi-species analyses in order to identify and monitor trends in species status and to catalyse appropriate conservation action.

To achieve this goal, the IUCN Red List has three main objectives:

1. To establish a baseline from which to monitor the change in status of species;
2. To provide a global context for the establishment of conservation priorities at the local level;
3. To monitor, on a continuing basis, the status of a representative selection of species (as biodiversity indicators) that cover all the major ecosystems of the world.

With these objectives in mind, the IUCN Red List Committee sets forth in this Strategic Plan ten key Results (each encompassing a suite of targets) as its measures of success by the year 2020:

1. IUCN Red List taxonomic and geographic coverage is expanded
2. More IUCN Red List Assessments are prepared at national and, where appropriate, at regional scales
3. The IUCN Red List Index is widely used as an effective biodiversity indicator
4. The IUCN Red List is a scientifically rigorous tool for conservation
5. IUCN Red Listing capacity built through expanded training programmes
6. The IUCN Red List is underpinned by cutting-edge information management technologies
7. The IUCN Red List is used effectively to inform policy and action
8. The IUCN Red List is widely communicated and recognized
9. The IUCN Red List is sufficiently and sustainably financed
10. Strategic oversight is provided to the IUCN Red List

Result 1. IUCN Red List taxonomic and geographic coverage is expanded

Studies of various taxa of plants, animals, fungi, and algae indicate that different taxa often have very different patterns of distribution, based on factors such as habitat requirements, evolutionary history, etc. Hence no taxonomic group can adequately serve as a surrogate for identifying threats, status, trends or conservation requirements in other taxonomic groups. For the IUCN Red List to inform and catalyse action for biodiversity conservation in general, it is therefore necessary to assess a wide range of species across all major taxonomic groups to establish a suitable baseline that covers all major ecosystems. Broader taxonomic coverage will make the IUCN Red List useful to a wider range of potential users of the information generated through the IUCN Red List process.

Setting targets for the taxonomic and geographic expansion of the IUCN Red List means reaching out to groups of biologists who are studying taxa that have not previously been included on the Red List, while simultaneously maintaining high quality assessments for the taxa that have already been treated. Selection of additional taxa will therefore to some extent depend on the availability of data, expertise and resources. These factors were borne in mind in setting the targets below. In addition, the following points were also considered:

- Taxonomic and geographic expansion must be mindful of the need to ensure that existing assessments are kept current, and that schedules for reassessments (to ensure achievement of Result 3) are met;
- The availability of a widely accepted taxonomic list for the taxonomic group concerned and some degree of taxonomic stability;
- Assessments of terrestrial vertebrates are incomplete;
- Assessments, through complete or sampled approaches, of taxa representative of particular ecosystems, especially freshwater, marine and arid lands, are grossly insufficient;
- Assessments of plants, fungi and invertebrates need to be substantially increased to represent the diversity of life adequately;
- Representation of species of economic importance and value to human livelihoods is insufficient;
- Many species, including flagship species, are in rapid decline, and the likelihood of their survival will be enhanced if their status is closely monitored.

Result 2. More IUCN Red List Assessments are prepared at national and, where appropriate, at regional scales

The ongoing development of national and regional Red Lists and the development of MDG and CBD targets requiring national measures of biodiversity change, indicates that these are providing important guidance to national and regional conservation efforts. National and regional assessments[1] also help build expertise within a given region, thereby building the critical mass of conservation interests that will be required to conserve biodiversity and meet the Aichi Targets, and the foundation from which to measure progress towards them. The preparation of Red List assessments at sub-global levels further enables far more information to be generated and fed into the global assessments. All countries need to prioritize national Red Listing in order to contribute to the monitoring of Millennium Development Goal 7, and also the Aichi Biodiversity Targets; indeed, IUCN members have agreed Resolution WCC-2012-5.018 to support the development and implementation of national and regional red lists. Consistent use of the IUCN Red List Criteria will enable comparisons between countries in terms of their biodiversity conservation performance.

Result 3. Selected species groups are periodically reassessed to allow the IUCN Red List Index to be widely used as an effective biodiversity indicator.

[1] See Annex 1

Indicators are essential for assessing progress towards targets addressing biodiversity loss, such as the Aichi Targets in the CBD Strategic Plan on Biodiversity, and the United Nations Millennium Development Goals. For tracking trends in the state of biodiversity, indicators focus at the level of genes, populations, species and ecosystems. IUCN developed the Red List Index (RLI) as a biodiversity indicator at the species level, with the index measuring trends in the extinction risk of sets of species. Initially tested on birds by BirdLife International, the approach has since been applied to amphibians, mammals and corals. The method and formula published initially has since been revised and improved. More recently, methods have been developed for producing an aggregated index across multiple taxa, and for calculating confidence intervals (primarily based on the uncertainty introduced by Data Deficient species). The first national RLIs (i.e. indices based on repeated assessments of extinction risk at the national scale) have also recently been published for Australia and Denmark. RLIs have been widely adopted at the policy level, being used to report against the CBD 2010 Biodiversity target, the UN Millennium Development Goals, by CITES, CMS (and its agreements: AEWA and ACAP), and for regional policy fora (e.g., SEBI in Europe). It has been well profiled in global assessments such as the Global Biodiversity Outlook-3 and Global Environment Outlook 5. Furthermore, the RLI has been identified as being relevant for reporting on half of the Aichi Targets for 2020.

However, the taxonomic breadth of the RLI needs to be expanded in order to make it more representative, existing indices for comprehensively assessed groups need to be updated, broader application at the national scale is needed, incorporation of the RLI into scenario models would be beneficial, and further technical developments would be desirable. Finally, continued promotion of the RLI is needed by demonstrating its utility to a wide range of potential interest groups.[2]

Result 4. The IUCN Red List is a scientifically rigorous tool for conservation

The credibility and scientific rigour of the IUCN Red List assessment is built upon two key facets: 1) the collation of a set of expert-reviewed data on the distribution, abundance, population trends, ecology, habitat preferences, and threats (and, where possible, utilization and conservation actions) for all currently recognized wild species; and 2) careful and qualified application of the IUCN Red List Categories and Criteria based on an interpretation of these data. The first of these requires that assessors compile and document this information, as articulated in the "Required and Recommended Supporting Information for IUCN Red List assessments" (which sit as an Annex to the Red List Authority Terms of Reference), and that expert review of the content of these data is sought as far as possible; the second involves consistent and correct application of the IUCN Red List Categories and Criteria by the assessor/s (which is facilitated in part by the *Guidelines for Using the IUCN Red List Categories*) and compliance with the stipulated review protocols (intended to ensure that proposed Red List categories and supported by the information presented, and that the criteria have been appropriately applied). By ensuring that all assessments on the IUCN Red List fully comply with the minimum supporting information requirements, and fostering as far as possible careful application of the IUCN Red List Categories and Criteria, IUCN hopes to ensure that assessments are transparent, defensible and repeatable, and thereby avoid criticisms to the contrary.

Result 5. IUCN Red Listing capacity built through expanded training programmes

Credibility of the IUCN Red List depends on assessors applying the IUCN Red List Categories and Criteria consistently and correctly, and this requires building capacity through training. Given the unequal distribution of biodiversity on the planet, there is particular need to increase Red Listing capacity in megadiverse developing tropical countries. Furthermore, given the aforementioned need to expand development of national and regional Red Lists that correctly apply the IUCN Red List Criteria following the regional guidelines, building Red List expertise at these spatial scales is of increasing priority. This capacity building effort will help generate high-quality information on species and thereby

[2] Note that initial Assessments carried out for the purpose of eventually calculating a Red List Index following a later reassessment are covered above under Result 1.

increase the scope (through the incorporation of Red List assessments of endemics undertaken at national / regional levels) and credibility of the IUCN Red List.

Result 6. The IUCN Red List is underpinned by cutting-edge information management technologies and the capacity to support them

As of 2016, the IUCN Red List manages assessment data for more than 85,000 species (with spatial data for two-thirds), and the Red List website receives more than 6 million visits (sessions) per year from about 4 million visitors. As the IUCN Red List continues to expand both taxonomically and in terms of content, world-class information technologies will be needed to support the actual management and storage of the underlying data, and it will be essential to maintain and build appropriate staffing capacity to oversee this information management. We also need to facilitate and promote public consumption of IUCN Red List data via improved and enhanced online search, download and analytical functionalities. In this regard, a particularly important advancement will be the need for the Species Information Service to integrate, under one umbrella, both spatial *and* tabular data (requiring GIS technologies to be mutually compatible with tabular ones). An impressive range of online information sources and technology companies produce a unique environment for the IUCN Red List to engage with and maximize its impact through strategic partnerships linked to its 10-year plan.

Result 7. The IUCN Red List is used effectively to inform policy and action

Already, IUCN Red List data and information are increasingly used to inform policy and action among governments, international agencies, and the private and public sector. Many conservation conventions (notably CITES, CBD, Ramsar, CMS, UNCLOS, World Heritage, and the various taxa-based conventions) are drawing on these data to help guide policies. Concepts developed through the use of the IUCN Red List are also guiding national policies in many countries and regions. Funding agencies, such as GEF, foundations, and international non-governmental organizations, are also using the IUCN Red List to determine policies on conservation investments. The challenge is to further enhance the IUCN Red List as a means of supporting policy and action for conservation, involving action promotion of the IUCN Red List in various policy fora. Species policy work will be linked to the policy work of other IUCN commissions and programs, and through the IUCN Red List Partnership and other IUCN Members. IUCN Red List information can help inform and guide corporate biodiversity responsibility, and can enable the incorporation of biodiversity into Environmental Impact Assessments and other processes (e.g., safeguard policies of finance lending institutions).

Result 8. The IUCN Red List is widely communicated and recognized

The IUCN Red List, reflecting a global effort involving the world's leading species experts and numerous conservation agencies, is already an established global identity. It is widely used by researchers and the mass media, but now needs to be packaged and promoted more effectively. Making the IUCN Red List a more recognized global brand will increase the visibility of the extinction crisis, build public support, and open new possibilities for making the IUCN Red List financially sustainable. Conservation of species ultimately depends on public support that drives political will. Different cultures often have different ways of thinking about species, judging from their folk tales, artistic approaches to nature, ways of treating wild animals, and other forms of behaviour. Information about species is often delivered to the public through mass media, visits to zoos, and trips to national parks. The messages provided through the IUCN Red List can help build broader public support, by highlighting the multiple values of species to human wellbeing, as well as promoting the ethical right of all species to survive. Achieving this result will require a broad coalition among conservation organizations, religious groups, the mass media, and many others. The information generated by the IUCN Red List and its applications will be designed to support such a coalition for stemming the extinction crisis.

Result 9. The IUCN Red List is sufficiently and sustainably financed

The anticipated growth of the IUCN Red List will necessitate considerable new investment to ensure that the technologies, resources and procedures underpinning it are sufficient to deliver this globally important knowledge product. Currently, the IUCN Red List is funded mainly through project grants and this approach provides neither the efficiency nor the sustainability needed to maintain the Red List or to attain the targets outlined in this plan. While contributions from IUCN and project donors will remain an important source of financial support, they must be augmented by other sources that can fund the core costs of running the Red List. In particular, it will be necessary to secure revenue from commercial users of the data.

Result 10. Strategic oversight is provided to the IUCN Red List

It is important that the delivery of the IUCN Red List achieves some very specific targets leading up to 2020 if it is to contribute maximally to the global community; this will only be achieved if the whole IUCN Red List process is subject to close strategic oversight. This oversight will be provided by the IUCN Red List Committee, which serves as the higher-level governance mechanism for the IUCN Red List.

Annex 1. The IUCN Red List Strategic Plan 2017-2020: Results, targets and sub-targets.

Explanatory notes: Under Target, comprehensive denotes all species in a given taxonomic group, non-comprehensive denotes a subset of species, and sampled denotes a random sample in accordance with the SRLI methodology. Under Sub-target, numbers in parentheses after Results 1-3 reflect the number of species to be assessed/reassessed. Resource level is generally indicated as Low (<US$10,000), Medium (US$10,000-100,000) and High (US$>100,000). Target date reflects a realistic date by which the target is expected to be achieved assuming appropriate funding. Responsible (reporting) denotes the SSC group or individual responsible for reporting purposes; responsible (ultimately) denotes the SSC group or individual responsible for auctioning the target/sub-target.

Annex 2. On regional assessments

Regional assessments are those that have assessed extinction risk at a subglobal scale by following the Guidelines for Application of IUCN Red List Criteria at Regional Levels. This involves applying the global categories and criteria at a subglobal scale and then potentially adjusting the category for each species by considering the connectivity to populations outside the scope of the assessment (and the status of such populations). This approach can be applied at the national scale ("National assessments"), subnational scale, multi-country scale (e.g., European Union), or at a biogeographical scale (e.g., Gulf of Mexico, Baltic Sea).

It is important to distinguish Regional assessments from Global assessments that are implemented within a particular region (although this distinction is often overlooked or misunderstood). The latter involves applying the IUCN Red List Categories and Criteria to species within a geopolitical or biogeographic unit. This is typically done as part of a wider effort to complete assessments for an entire taxonomic group (e.g., the Global Reptile Assessment, Global Marine Species Assessment, etc). For species endemic to the geopolitical or biogeographic unit, these are complete Global assessments. For species that also occur beyond the region, these assessments represent incomplete Global assessments, which become complete when information from beyond the region is added. Past experience has shown that funders are often willing to support red listing efforts for particular regions (whether geopolitical or biogeographic), and workshops bringing together relevant experts for a region can also be a cost-effective means of data-gathering.

While in theory, one could assess extinction risk at global, national, and one-or more regional scales for all species, the multiple different categories at which the same species could legitimately qualify at these different scales can be potentially confusing, and can distract and divert or dilute funding and conservation attention from agencies, organisations and individuals away from the species that are the highest global conservation priorities. It is therefore important to be clear about when it may be useful to carry out sub-global assessments in addition to global assessments. National assessments clearly have resonance and relevance given that conservation actions are often prioritised, funded, coordinated and implemented at a national scale. Regional assessments (ie those for a multi-country geopolitical or biogeographic unit) are strategically useful under specific circumstances as an addition to National and Global Assessments. In particular, they may be useful if there is an appropriate policy or implementation mechanism, adequate funding and capacity to address the priorities (for actions, places and taxa) generated by the assessment that are additional to those priorities from global assessments in the region, and if there is informed demand from the region and adequate funding to support the assessment process.

Examples of appropriate Regional assessments include those for the European Union (which has legal mechanisms for protecting taxa and funding conservation priorities at the EU-scale), the Mediterranean sea (for which the Barcelona Convention provides an equivalent policy mechanism), the Arabian Peninsula (which comprises a contiguous and coherent biogeographic region and political unit with existing mechanisms for region-wide political coordination and cooperation) or for the spatial area covered by a Regional Fisheries Management Organisation (for the particular fish species/taxa/stocks managed by it). Examples of inappropriate Regional assessments might include birds and mammals for a set of Caribbean islands or birds for a set of Pacific island states. In these cases there are existing Global assessments for the species, and in some case existing National assessments, but limited capacity and resources to tackle these existing conservation priorities, and no appropriate regional-scale policy mechanisms or other implementation mechanisms or funding sources to tackle any additional conservation priorities that would be produced by a Regional assessment.

Annex 3: Rules of Procedure for IUCN Red List assessments

Rules of Procedure for IUCN Red List assessments 2017-2020

Contents

A. The IUCN Red List Assessment Process

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Species Survival Commission (SSC), the IUCN Global Species Programme and the Red List Partnership. In order to maintain the credibility of the IUCN Red List, the process by which species can be included on the Red List has been formalized. In particular, this process includes the designation of Red List Authorities (RLAs) and Red List Authority Coordinators, under the auspices of the SSC, the responsibilities of which (and whom) are outlined in this document.

The IUCN Red List Unit (RLU) is the gatekeeper to the Red List. All assessments that are published on the Red List must be submitted to the RLU. There are three general routes by which assessments reach the RLU:

1. **Red List Authorities (RLA).** With some exceptions, IUCN SSC Specialist Groups typically are the recognized Red List Authorities for the species in their remit. The exceptions are those cases where a Red List Partner institution serves as the recognized Red List Authority (e.g., BirdLife International for all birds) or where a stand-alone Red List Authority is established (see below).

2. **IUCN Global Species Programme and Red List Partner projects**. These include the global biodiversity assessments (e.g., the Global Mammal Assessment, Global Marine Species Assessment), and regional biodiversity assessment projects (e.g., Mediterranean biodiversity assessments, regional freshwater biodiversity assessments) and assessments for the Sampled Red List Index (SRLI) run by the Zoological Society of London and the Royal Botanic Gardens Kew. Assessments submitted via this route must have been formally signed off by the RLA Coordinator of the relevant RLA, where one exists.

3. **External projects**. Red List assessments resulting from projects carried out by individuals, academia, and organizations often outside of the IUCN SSC network (this includes national Red List initiatives). Assessments submitted via this route must have been formally signed off by the RLA Coordinator of the relevant RLA, where one exists.

All three routes use the same basic process for preparing and submitting assessments for publication: raw data are gathered and provided by “Contributors”; “Assessors” use the data and the IUCN Red List Categories and Criteria to assess the taxon, and to document the assessment (as outlined in Annex 1); the assessment is reviewed by at least one “Reviewer”; accepted reviewed assessments are submitted to the RLU for final checks; accepted assessments are published on the IUCN Red List. But, the specific activities involved in the process may differ depending on the route used.

The steps involved in the IUCN Red List Process are presented schematically in Annex 2, and these steps are described in more detail in Annex 3.

The IUCN SSC Standards and Petitions Sub-Committee (SPSC) and the Red List Technical Working Group (RLTWG) also have the right to check assessments before publication for accurate and consistent application of the IUCN Red List Categories and Criteria and to check on consistency of approach across taxonomic groups.

B. Establishment and appointment of Red List Authorities

The Chair of the IUCN Species Survival Commission (SSC) is responsible for the establishment or appointment of Red List Authorities according to the types elaborated in section C below. This is done on the approval of the IUCN SSC

Steering Committee and in discussion with the IUCN Global Species Programme, the IUCN Red List Committee and, where applicable, the IUCN SSC Plant Conservation Sub-Committee (PCSC), the IUCN SSC Invertebrate Conservation Sub-Committee (ICSC), the IUCN SSC Freshwater Conservation Sub-Committee (FCSC) and the IUCN SSC Marine Conservation Sub-Committee (MCSC). Red List Authorities serve from the time of their appointment until the end of the current IUCN quadrennium (marked by the next meeting of the IUCN World Conservation Congress). Invariably, Red List Authorities are automatically re-established by the SSC Chair after Congress, but in some cases they may be discontinued, merged or split.

C. Types of Red List Authority

Red List Authorities are not individual people, but are groups of people appointed by the Chair of the SSC to carry out the activities described in these terms of reference for a particular (global or regional) taxonomic grouping of species. There are three types of Red List Authority:

1. As noted above, IUCN SSC Specialist Groups typically are the recognized Red List Authorities for the species in their remit (for example, the Cat Specialist Group is the Red List Authority for all species in the family Felidae). In some cases, Specialist Groups appoint subsets of individuals within the group to form an RLA group.
2. Stand-alone Red List Authorities are groups of individuals established only to do Red listing (e.g., the Brazil Plant RLA is responsible for Red List assessments for all Brazilian plants)
3. An institution serves as the Red List Authority (e.g., BirdLife International is the Bird RLA)

D. Red List Authority Roles and Responsibilities

The roles and responsibilities of the RLA include:

a) Establishing mechanisms for assessing and regularly re-assessing species within the RLA's remit and preparing Red List assessments following the IUCN Red List Categories and Criteria and the Guidelines for Using the IUCN Red List Categories and Criteria (the latter as may be amended from time to time), using the IUCN Species Information Service (SIS) as the means to compile and submit data;
b) Working with the staff of the IUCN Global Species Programme to participate in relevant IUCN SSC global and regional biodiversity assessment processes and, as part of this, "populating" the SIS with the most up-to-date information available on the species within their remit.
c) Serving as the taxonomic authority for species falling into the remit of the RLA (in other words, RLAs are responsible for determining and agreeing the nomenclature used on the IUCN Red List for the species in that group, noting that RLAs, in turn, are subject to IUCN's own guiding principles on taxonomy, which are currently in preparation and will become an annex to this document once completed).
d) The primary responsibility of RLAs is to undertake assessments at the global level. RLAs have jurisdictional responsibility for deciding the circumstances and conditions under which to undertake assessments of taxa at the regional and / or national level, noting that resource and other constraints dictate the conditions and circumstances under which such assessments take place. Even where RLAs do not undertake such assessments themselves, they may be required to review these assessments for possible inclusion on the IUCN Red List.

e) The primary responsibility of RLAs is to undertake assessments at the species level. RLAs have jurisdictional responsibility for deciding the circumstances and conditions under which to undertake assessments of taxa below the species level, noting that resource and other constraints dictate the conditions and circumstances under which such assessments take place. Even where RLAs do not undertake such assessments themselves, they may be required to review these assessments for possible inclusion on the IUCN Red List.

E. The Red List Authority Coordinator

For those Specialist Groups appointed as a Red List Authority, the SG Chair must recommend to the SSC Chair one person to act as the RLA Coordinator who is then formally appointed to this role by the SSC Chair. The RLA Coordinator will not normally be the same person as the SG Chair, and indeed this is strongly discouraged. For all other RLAs (stand-alone RLAs and institutional RLAs), the Coordinator is directly appointed by the Chair of SSC. The Chair of the SSC may at any time revoke the appointment of an RLA Coordinator. In addition to specific activities listed below, the general responsibilities of the RLA Coordinator include:

- Overseeing and coordinating Red List activities within the RLA;
- Serving as the contact person between the RLA and the various IUCN and SSC structures including the IUCN Global Species Programme staff, the IUCN Red List Committee (that oversees the Red List process), and the office of the Chair of the SSC.
- Ensuring that assessments feed through to the IUCN Red List Unit in a timely manner, and always at the earliest opportunity, and are not unnecessarily delayed for reasons not related to the assessment process;
- At the request of the SSC Chair, submitting a short annual report on activities undertaken in the course of the past year for inclusion in the Species Annual Report.

F. Red List Authority Coordinator Responsibilities

a. Assessment

Each RLA Coordinator is responsible for establishing mechanisms for assessing and re-assessing the species within the RLAs remit through:

1. Working closely with the IUCN Global Species Programme staff and any global or regional species assessment projects being implemented by IUCN and SSC (the IUCN Global Species Programme will keep RLAs updated on such projects, including the development of funding proposals for them);
2. Ensuring that members of the RLA are familiar with and up-to date with the IUCN Red List Categories and Criteria, and their application, and arranging for training of members as may be required / necessary;
3. Requiring Assessors to take full account of past and present literature (published and grey) and other reliable sources of information critical to the assessment of the taxon, including relevant national-level assessments, either relating directly to the taxon or providing relevant context (for example, information on threats, rates of habitat loss, etc, within the range of the taxon);
4. Requiring that Assessors not exhibit prejudice towards any published or unpublished materials that may be consulted or considered in the assessment process, but to consider all works on their merit;
5. Assisting Assessors to seek and locate the best available background data relating to the threats likely to affect the taxon;

6. Requiring Assessors to consult internally within the Red List Authority, with specialists in RLAs with overlapping jurisdictions, and externally with appropriate specialists and other interest groups;
7. Ensuring that for each assessment, the Assessors provide supporting information in line with the *Required and Recommended Supporting Information for IUCN Red List Assessments*, as set out in Annex 1 to this document;
8. Ensuring that Assessors adhere to the current version of the "Guidelines for Using the IUCN Red List Categories and Criteria", as may be updated from time to time;
9. Ensuring that Assessors adhere to the current version of the "Documentation Standards and Consistency Checks for IUCN Red List Assessments and Species Accounts", as may be updated from time to time;
10. Ensuring that all Assessors have completed and signed a Conflict of Interest declaration;
11. Resources permitting, ensuring that all species are reassessed at least once every ten years, or preferably (again, resources permitting) once every five years;

b. Review

Each RLA Coordinator is responsible for verifying Red List assessments through:

1. Ensuring that at least one named independent Reviewer (who was not directly involved with the assessment or an external party to the RLA) agrees with the status of each taxon based on the supporting documentation provided;
2. Ensuring that Reviewers have access to all of the supporting documentation provided;
3. Ensuring that Reviewers have access to all relevant documents and training materials on the IUCN Red List process and making themselves available for any consultations on this process;
4. Ensuring that Reviewers are familiar with the current version of the IUCN Red List Categories and Criteria, and their application, and adhere to the current version of the "Guidelines for Using the IUCN Red List Categories and Criteria", as may be amended from time to time;
5. Ensuring that Reviewers are provided with the latest version of the "Required and Recommended Supporting Information for IUCN Red List assessments";
6. Ensuring that, for any particular assessment, the Reviewers are not the same people as the Assessors or Contributors;
7. Ensuring that all Reviewers have completed and signed a Conflict of Interest declaration;
8. Acknowledging receipt of assessments sent to the RLA for review, and working together with assessment teams, including the Global Species Programme, to develop an acceptable schedule or time-table (where the default period, unless otherwise agreed, is three months) for reviewing assessments in a timely manner;
9. In the event that an RLA cannot perform the review, proposing an alternative solution for assessments to be reviewed, including the option to divest authority to the IUCN Red List Unit to identify an appropriate process to undertake the reviews;
10. Noting that failure to review external assessments within the prescribed time period or to reply within a timely manner to requests to review assessments, will result in responsibility automatically devolving to the Red List Unit to work with the assessors to identify an alternative strategy to have assessments reviewed;
11. Submitting all reviewed assessments including changes in categorization and/or changes in supporting documentation to the IUCN Red List Unit in the format

required using the Species Information Service and within schedules set for updates of the IUCN Red List.

c. Regional and National Red List processes

The RLA's primary responsibilities focus on assessments for publication on *The IUCN Red List of Threatened Species™* (i.e., global assessments and assessments for IUCN-led regional assessment processes, such as the European biodiversity assessments). Coordinators of regional and national Red List processes will sometimes approach the IUCN Global Species Programme, Red List Partners or RLAs directly for advice and assistance. Where it has been indicated that financial resources are available, appropriate RLA Coordinators may be approached by such parties to request RLA involvement in such projects.

Red List Authorities are not required (by IUCN) to participate in regional and national Red List assessment processes, but are encouraged to do so wherever time and financial resources make this possible, particularly in cases where high numbers of country endemic species are involved.

In such cases, the RLA Coordinator is responsible for:

1. Acknowledging receipt of the request to participate in a regional or national assessment project.
2. Circulating the request around RLA members with appropriate regional/national expertise as soon as possible after the initial contact has been made.
3. Providing a realistic estimate of time available for participating in the regional/national assessment project.
4. Providing a realistic estimate of financial costs required to cover involvement of RLA members in the regional/national assessment project.

d. Petitions Process

In the case of a petition against the listing of any taxon for which the RLA is responsible, the RLA Coordinator will:

1. Establish a process for handling the petition as set out in Annex 5 to this document;
2. Abide by any decisions of the arbitrating IUCN SSC Red List Standards and Petitions Sub-Committee.

G. Overlapping Red List Authority Jurisdictions

Given the structure, taxonomic scope and geographic coverage of the SSC Specialist Groups and Red List Authorities (RLAs), there is a degree of taxonomic overlap between some RLAs. For example, a species of tree could fall into the remit of both the Global Tree Specialist Group as well as the New Caledonia Plant RLA. The following protocol shall apply to the assessment of species in any and all such cases:

1) In principle, only one RLA is needed to sign off on a species assessment (see point 13 in Table 1 of Annex 1 for further details). However, where overlapping remits exist, it is incumbent upon any RLA who intends undertaking an assessment of a species to notify formally all and any other RLAs with overlapping jurisdictions at the earliest juncture and to invite them to participate either in the assessment or in the review. Participation could include contributing information or data, suggesting experts from within the network, or performing the roles of assessor or reviewer.

2) The relevant RLAs shall agree a process for timely assessment and review. This shall include agreement over which RLA shall ultimately preside over the assessment of the species or group of species in question. The default is for either i) the RLA with the most knowledge of the species, and/or ii) the RLA with the remit for the fewest species, to take the lead and overall responsibility to reduce the overall Red Listing burden on the other RLAs. In any case in which agreement cannot be reached between any RLAs concerning which RLA shall ultimately preside over the assessment of the species or group of species in question, then the RLU shall have the authority to intervene and to designate one or other RLA to have overall responsibility.
3) If an RLA Coordinator notifies the RLA Coordinator of another RLA with an overlapping remit concerning the intention to assess or review a particular species or group of species, it is the responsibility of the notified RLA to respond to the notifying RLA in a timely manner. No reply within 4 weeks of given notice will be taken as tacit approval for the notifying RLA to proceed with the assessment without the need to provide further notice to the notified RLA. Note that there is no obligation for the RLA being notified of an ongoing assessment by another RLA to engage if the notified RLA is satisfied that the notifying RLA can appropriately complete the work.
4) When an assessment for a species for which there is more than one RLA is submitted to the RLU, the relevant RLA shall be required to confirm to the RLU (by checking the appropriate field in the Species Information Service) that those RLAs with overlapping jurisdictions have been notified. It will be understood by all that by checking this box, the RLA is confirming that RLAs with overlapping jurisdictions have been given the opportunity to be involved in the assessment process.
5) In instances in which assessments are received by the RLU that have not been signed off by any RLA, the RLU will request the submitter to correspond directly with the RLA coordinators of the relevant groups. In the event of no response from the RLA coordinators within 4 weeks of notice, the RLU reserves the right to process the assessment as it sees fit.

It is understood by all that the overall aim is efficient and expedient assessment of species for the Red List, while ensuring rigour and transparency. In this regard, RLAs are expected to respond in a timely manner to requests for all inputs, and certainly within one month of said communication (unless a longer time-frame is agreed in writing), in the absence of which the assessment process will proceed without the contribution or inputs of said RLA.

H. Resources

A number of key documents provide essential reference and guidance for the Red List assessment process. All of these are available on the IUCN Red List and IUCN SSC websites (see Annex 4). These documents are supplemented by two overarching policies: one on pre-publication use of Red List data (Annex 6) and one on sensitive data (Annex 7).

I. Nomenclature

The use of the term “red-listed” is discouraged owing to ambiguity as to whether this includes Least Concern species or not, given that species assessed as Least Concern are included on the IUCN Red List. To refer to a set of species all of which have assessments on the IUCN Red List, the phrase “assessed for the IUCN Red List” can be used. To refer to threatened (i.e. Critically Endangered, Endangered and

Vulnerable) plus Extinct in the Wild and Near Threatened species collectively, the phrase “species of elevated conservation concern” may be used.

ANNEX 1

Required and Recommended Supporting Information for IUCN Red List Assessments

An IUCN Red List assessment includes the Red List Category and Criteria, and a range of supporting information (documentation). The purpose of providing supporting information with the assessment is:

1. To support and justify adequately each Red List assessment.
2. To allow basic analysis of the Red List status across species, including calculating the Red List Index.
3. To allow the Red List website (www.iucnredlist.org) to function properly (i.e., to allow users to search and find information on the website).

The more relevant supporting information is attached to an assessment, the more useful the assessment will be for all three of the above purposes. Within the Species Information Service (SIS) there are many data fields available to record a whole suite of information. Some of these data fields are essential to support the Red List assessment, and some are there to capture additional information for analyses and communication purposes.

IUCN has developed the following three tiers to identify the appropriate level of supporting information to include in a Red List assessment.

1. Required Supporting Information

Supporting information required for **ALL** Red List assessments before they can be accepted for publication on the IUCN Red List. There are two subsets of information for required supporting information:

- Required supporting information under all conditions; see Table 1.
- Required supporting information under specific conditions; see Table 2.

2. Recommended Supporting information

Recommended supporting information is not essential for a Red List assessment to be accepted for publication on the IUCN Red List but is strongly encouraged for all assessments for taxa prioritized in the IUCN Red List Strategic Plan 2012-2020 and IUCN Species Strategic Plan 2013-2016. See Table 3. IUCN Global Species Programme and Red List Partner-led assessments always strive to achieve assessments according to the Recommended level.

3. Discretionary (Optional) Supporting Information

Supporting information that is not essential for a Red List assessment to be accepted for publication on the IUCN Red List, but specific projects or Assessors may wish to record this for their own information or analysis purposes. Assessment project managers should clearly identify which of these additional fields to include in assessments and inform Assessors contributing to the project of this at the start of the project.

All fields in SIS that are not mentioned in Tables 1, 2 or 3 are considered discretionary (i.e., optional) fields.

Table 1: Required supporting information for all assessments submitted to the IUCN Red List (in all conditions). Any assessments that do not include all of the information listed in this table will be returned to Assessors.

Required Information	Purpose	Guidance Notes
1. Scientific name[1]	• To identify which taxon is being assessed • To support Red List website functionality	If the taxon is already in SIS, this information requires no additional effort from the Assessors. If the taxon is not yet recorded in SIS, Assessors must provide this information to the Red List Unit.
2. Higher taxonomy details (Kingdom, Phylum, Class, Order, Family)	• To identify which taxon is being assessed • To support Red List website functionality	If the taxon is already in SIS, this requires no additional effort from the Assessors. If the taxon is not yet recorded in SIS, Assessors must provide this information to the Red List Unit.
3. Taxonomic authorities for all specific and infra-specific names used, following the appropriate nomenclatural rules[2]	• To identify which taxon is being assessed	If the taxon is already in SIS, this information requires no additional effort from the Assessors. If the taxon is not yet recorded in SIS, Assessors must provide this information to the Red List Unit.
4. IUCN Red List Category and Criteria (including sub-criteria) met at the highest category of threat	• To identify the current status of the taxon • To support Red List website functionality • To allow basic analyses	The Red List Category and Criteria represent the most fundamental elements of a Red List assessment. Application of the categories and criteria must be in accordance with the *IUCN Red List Categories and Criteria. Version 3.1* and the current version of the *Guidelines for Using the IUCN Red List Categories and Criteria*.
5. A rationale for the Red List assessment	• To justify the Red List Category and Criteria selected	Include any inferences or uncertainty that relate to the interpretation of the data and information in relation to the criteria and their thresholds.

[1] Note that all taxa assessed must be validly published in accordance with the appropriate international nomenclatural codes and should be currently accepted names. Standard taxonomic checklists should be used wherever possible for names. The standard lists adopted by IUCN are periodically reviewed and listed on the Red List website: http://www.iucnredlist.org/info/info_sources_quality.html . For many groups no standards are available, or there may be a valid reason for adopting another treatment. In such cases, the taxonomic treatment followed should be indicated and if not one of the standards followed by IUCN, the reference should be cited in full and a reason for the deviation given

[2] [2]This should include the date of publication, except in the case of plant names. The abbreviations used for author names of plants should follow Brummitt and Powell (1992) and subsequent updates on the International Plant Names Index website (http://www.ipni.org/index.html)

Required Information	Purpose	Guidance Notes
6. Data for parameters triggering the Red List Criteria met at the highest Category level	• To underpin and justify the Red List Category and Criteria used	Enter these data either into the relevant coded/numerical fields or in the relevant narrative (text) fields in SIS. If data are entered into the data fields, this allows the Red List Criteria calculator to be used in SIS, which automatically checks for errors, omissions and inconsistencies, reducing the burden of manual checking by Assessors, RLA Coordinators and project coordinators. If data are included within the narrative (text) fields, the text must clearly indicate *all* of the relevant subcriteria parameters and qualifiers (observed, estimated, inferred, projected or suspected) used.
7. Countries of occurrence (for native and reintroduced taxa), including Presence and Origin coding	• To support Red List website functionality (especially country searches) • To allow basic analyses	SIS automatically records Presence = Extant and Origin = Native by default as countries are selected. A tool will be made available to determine countries of occurrence automatically from GIS maps. Countries of occurrence are not strictly required for vagrant and introduced ranges.

Required Information	Purpose	Guidance Notes
8. Geo-referenced distribution data for all taxa with a known distribution	• To support Red List website functionality • To allow basic analyses • Spatial distribution data are essential for supporting assessments under criteria B and D2 (and arguably also for demonstrating that these thresholds are not met)	Spatial distribution data are not required for taxa of unknown provenance (e.g. taxa assessed as Data Deficient because their range is not known). Spatial data may be geo-referenced polygons or point localities, and may be provided in any format, including as a paper map, text file of coordinates, pdf, graphics file or GIS shapefile. A GIS shapefile is preferred (but is not strictly required), given their value for conducting spatial analyses, visual displays on the Red List website, and future functionality on the Red List website that will allow spatial searches. Although additional distributional documentation is desirable for taxa qualifying under criterion B (e.g., 2x2 km grids showing occupancy), this is not Required. Note that any distributional data can be coded as sensitive to avoid this being distributed or displayed on the Red List website (see Annex 5).
9. Direction of current population trend (stable, increasing, decreasing, unknown)	• To support Red List website functionality • To allow basic analyses	
10. Coding for occurrence in freshwater (= inland waters), terrestrial, and marine ecosystems (i.e., “System” in SIS)	• To support Red List website functionality • To allow basic analyses	
11. Suitable habitats utilized (coded to lowest level in Habitats Classification Scheme)	• To support the assessment • To support Red List website functionality • To allow basic analyses	To speed up entering such coding in SIS, habitat importance is set to 'suitable' by default for any habitat selected.
12. Bibliography (cited in full; including unpublished data sources but not personal communications)	• To underpin the assessment and provide all sources of data and information used to support the Red List assessment	In SIS, references are recorded in the Reference Manager.

Required Information	Purpose	Guidance Notes
13. Names and contact details of the Assessor(s) and at least one Reviewer	• To demonstrate that the appropriate assessment and review process has been undertaken • To acknowledge those involved in the assessment. • To allow Assessors and Reviewers to be contacted easily in the case of the assessment content being questioned	Note that Contributor(s), Compiler(s), and Facilitator(s) may also be recorded but are not strictly required. However, recording them in the assessment does allow these people to be acknowledged on the Red List website. All contact details are stored within SIS; only names (e.g., surname and initials) are displayed on the Red List website. More than one Reviewer is encouraged for threatened species, commercially significant species or those species for which assessments may be contentious.

Table 2: Required supporting information for Red List assessments under specific conditions. The list of required supporting information (under specific conditions) is essential for all assessments that meet the conditions outlined below. Any assessments for taxa meeting these conditions that do not include all of the information listed below will be returned to Assessors.

Required Information (under specific conditions)	Specific Condition	Purpose	Guidance Notes
1. Name of subpopulation	For subpopulation level assessment	• To identify what is being assessed below the species level	
2. Major Synonyms	For taxa with commonly used synonyms or that have been treated taxonomically differently in the past on the Red List	• To support Red List website functionality • To identify which taxon is being assessed	
3. Plant growth forms	For plants	• To support Red List website functionality. • To allow basic analyses	
4. Information on the reason for change in Red List Category of the taxon	For taxa being reassessed	• To distinguish up- or down-listings resulting from genuine improvement or deterioration, from those resulting from revised taxonomy, improved knowledge, etc	This should be coded regardless of whether a species qualifies in the same or for a different Red List Category .
5. Date last recorded (in the wild, if taxon survives in captivity) and details of surveys which have been conducted to search for the taxon	For Extinct and Extinct in the Wild taxa, and for Critically Endangered taxa tagged as Possibly Extinct or Possibly Extinct in the Wild,	• To justify use of the Extinct or Extinct in the Wild Category (to underpin assessments in which extinction is confirmed or thought highly likely) • To allow basic analyses	

Required Information (under specific conditions)	Specific Condition	Purpose	Guidance Notes
6. Possibly Extinct or Possibly Extinct in the Wild tag	For Critically Endangered taxa that are considered highly likely to be Extinct or Extinct in the Wild but for which confirmation is required	• To underpin assessments in which extinction is thought highly likely but which requires confirmation. • To allow basic analyses • To support Red List website functionality.	See section 11.2 in the current version of the *Guidelines for Using the IUCN Red List Categories and Criteria* for further information on this.
7. Documentation of available data, sources of uncertainty and justification for why the criteria cannot be applied; including, where appropriate, one or both of the Data Deficient tags *Unknown provenance* and *Uncertain taxonomic status explains lack of data*	For Data Deficient taxa	• To justify use of the Data Deficient Category	
8. Coding as Severely Fragmented, or the number of locations	Taxa listed as threatened using criteria B1a or B2a	• To justify the Red List Category and Criteria used	For definitions of severely fragmented and locations refer to the current version of the *Guidelines for Using the IUCN Red List Categories and Criteria*.
9. Generation length	For taxa listed as threatened under criteria A and C1	• To justify the Red List Category and Criteria used	For definition of generation length refer to the current version of the *Guidelines for Using the IUCN Red List Categories and Criteria*.
10. Time period over which 3-generation decline is measured around the present	For taxa listed as threatened under criterion A4	• To justify the Red List Category and Criteria used	Record this in SIS as the start year for the 3-generation time period.
11. The data, assumptions, structural equations, and Population Viability Analysis model if used	For taxa listed under Criterion E	• To justify the Red List Category and Criteria used	

Required Information (under specific conditions)	Specific Condition	Purpose	Guidance Notes
12. Coding and justification of the criteria that are nearly met or the reasons for the classification (e.g., dependence on ongoing conservation measures)	For taxa listed as Near Threatened	• To justify the Red List Category and Criteria used	
13. Taxonomic notes	• For taxa previously treated as a different taxonomic concept (e.g., “split” or “lumped”) on the IUCN Red List • For taxa for which there is widespread taxonomic ambiguity or uncertainty in the literature • For species that may represent a species complex • For taxa assessed as Data Deficient because of Taxonomic uncertainty	• To identify which taxon is being assessed • To allow comparison of taxa previously assessed on the Red List • To justify use of the Data Deficient Category	

Required Information (under specific conditions)	Specific Condition	Purpose	Guidance Notes
14. Major threats to the taxon (coded to lowest level in Threats Classification Scheme)	For taxa listed as Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, and Near Threatened	• To justify the Red List Category and Criteria used • To support Red List website functionality • To allow basic analyses	Only **major threats** to the species are required. Coding of timing and stresses not strictly required for the Red List assessment, but are recommended. Coding of scope and severity are discretionary (i.e., optional). If Assessors decide to also record minor threats, then ***Scope and Severity must be recorded for all threat records for the taxon*** (to allow major and minor threats to be clearly identified). Major threats are not required for Least Concern or Data Deficient taxa, but may be recorded if relevant (but with appropriate Timing, Scope and Severity codes)
15. Narrative text about the geographic range, population, habitat and ecology, and threats	For taxa listed as Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, and Data Deficient	• To justify the Red List Category and Criteria used	Required for supporting the assessment with contextual and explanatory information covering, among other things, the relevant data sources, uncertainties, subtleties and interpretations of data made by Assessors. Although general text would also be helpful for Least Concern taxa, this is not required.
16. Additional supporting information as detailed in section 2.6 of the *Documentation Standards and Consistency Checks for IUCN Red List Assessments and Species Accounts*	If the RAMAS® Red List software is used for an assessment	• To justify the Red List Category and Criteria assigned using RAMAS	

Table 3: Recommended Supporting Information. While the list of recommended supporting information is desirable, and strongly encouraged for all assessments for taxa prioritized in the IUCN Red List Strategic Plan 2012-2020 and IUCN Species Strategic Plan 2013-2016, it is not essential for other assessments being submitted to the IUCN Red List. Assessments that do not include any of the information listed below are still acceptable for submission to the Red List.

Recommended Supporting Information	Specific Condition	Purpose	Guidance Notes
1. GIS distribution map using IUCN's *Standard Polygon* and/or *Point Attributes*		• Useful to reduce the burden on the IUCN Red List Unit to create a GIS map • Facilitates spatial analyses • Allows visualization on the Red List website (and possible spatial queries)	Although provision of spatial distribution data is required in any form (see #8 in Table 1), a GIS map is recommended if possible.
2. Qualifiers (estimated, suspected, etc.) for direction of current population trend		• Useful for documenting uncertainty over the population trend code selected	
3. Occurrence in specified sub-country units for large countries and islands far from mainland countries		• Useful for searching by sub-country on the Red List website	If a GIS map has been prepared, a list can be pre-populated by GIS overlay.
4. Occurrence in terrestrial and freshwater biogeographic realms	For terrestrial and freshwater taxa	• Useful for searching on the Red List website, and for analyses	A GIS tool will soon be available to facilitate automatic coding of this from distribution maps. Note that currently there is no widely accepted equivalent system for the marine realm.
5. Elevation or depth limits		• Useful for supporting Assessments, describing the distribution, and particularly for considering impacts of climate change	
6. Coding of Stresses and Timing for Threats		• Useful for demonstrating the means by which threats impact taxa, and for distinguishing past, present and future threats	These are added to each threat after the relevant threats have been selected. Timing, Scope and Severity are drop down lists where only one option can be selected whereas for Stresses multiple options can be selected.

Recommended Supporting Information	Specific Condition	Purpose	Guidance Notes
7. Narrative text about the important conservation measures in place and needed	For taxa listed as Extinct in the Wild, Critically Endangered, Vulnerable, Near Threatened, and where appropriate, Data Deficient	• Useful to support and provide explanation and context for coding of conservation actions	
8. Coding of important conservation actions in place and needed	For taxa listed as Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near threatened, and where appropriate, Data Deficient	• Useful for providing a high-level indication of the most important actions in place and likely to be required, both for individual species and in multi-species analyses	These codes complement rather than pre-empt or replace more detailed Action Planning or Systematic Conservation Planning. Coding up conservation actions is not Required for Data Deficient taxa, but if possible these taxa should be coded where appropriate.
9. Narrative text on the utilization of the taxon	For utilized taxa	• Useful to support and provide explanation and context for coding of utilization	
10. Coding of the end use (purpose) and scale of utilization of the taxon	For utilized taxa	• Useful for providing a high-level indication of the most important ways in which species are utilized, both for individual species and in multi-species analyses	

ANNEX 2

Schematic Illustration of The Red List Process (see next page)

The Red List Process

From Raw Data to Red List

Red List Authority (RLA)

(SGs, stand-alone RLAs, Partner organizations)

Pre-Assessment (see step 1.1)

RLA members review data sources and compile data (in SIS or other agreed system) appropriate for Red List

Assessment (see step 2.1)

Carried out (in SIS or other agreed system) by one RLA member working alone; or a small group of members working together; or a large group of members in a workshop; or contributions from the whole membership through a workshop or email/internet forum

Assessments submitted directly to RLA

Assessment rejected by Reviewers

Review (see step 3.1)

RLA coordinator arranges review by at least one appropriate expert in Red List Assessments

RLA comments returned to Red List Unit

Global Species Programme & Partner Projects

(Includes Global Biodiversity Assessments and Regional Assessments; often involves RLAs & Partner organizations)

Pre-Assessment (see step 1.2)

Appropriate RLAs identified and timeline agreed for assessment review. Data source review and

Assessment (see step 2.2)

Draft assessments prepared in SIS through workshops, review, consistency checks, etc.

Assessment rejected by RLA

Review (see step 3.2)

Draft assessments in SIS referred to RLAs for assessment review.

Reviewed assessment accepted by RLA

Consistency Check (see step 4.2)

Project coordinators check criteria use, supporting documentation, consistency, proofreading and

Red List Unit

Unreviewed assessment referred to RLA (see **step 3.1**)

Problem detected

Problem detected

Submission (see steps 4.1, 4.2, 4.3)

All assessments from RLAs, Global Species Programme & Partner projects submitted via SIS. Red List Unit scans assessments submitted from above projects for obvious errors and checks consistency between projects.
Red List Unit checks criteria use, supporting documentation, consistency, proofreading and formatting for:

- Reviewed assessments from RLA.
- Unreviewed assessments from outside IUCN SSC network.

Problem detected by RLU / assessment rejected by RLA

Reviewed and checked assessments accepted for publication on Red List

Assessments submitted directly to Red List Unit

Publication (see step 5)

Assessments added to SIS database and appear on appropriate IUCN Red List web site update.

Assessment (see step 2.3)

Assessments from individuals working alone, academia, National Red List projects (endemic species), etc.

Pre-Assessment (see step 1.3)

Review of data sources and compilation of data appropriate for Red List assessment

External Assessors

(Assessors from outside the IUCN SSC networks and Global Species Programme activities)

Important Notes

1. This figure depicts a clear separation between the *Red List Authority* process on the left and the *Global Species Programme & Partner* projects on the right. In reality, those two processes are usually very closely interlinked and often one could not happen without the other. It is also often difficult to distinguish between the two. For example, Global Species Programme staff members initiate and raise the funds for assessment projects and provide the central coordination for running the projects. Red List Authority members are also closely involved in assessment projects, helping to gather the information required for the assessments, facilitating and participating in the assessment workshops, and checking the consolidated assessments once they are completed. In general, the bulk of the assessments that come into the Red List are as a result of the joint initiatives between the Global Species Programme and the RLAs.
2. The Red List Unit staff work very closely with the RLAs and are often requested to help facilitate assessment workshops arranged by the RLA or to provide Red List training to their members. Likewise, the Red List Unit staff may be used as facilitators/trainers in many of the global species assessment projects run by Global Species Programme staff or by Red List Partners. Hence there is usually direct involvement of Global Species Programme Staff in many of the steps outlined in the Red List Assessment process.

ANNEX 3

Details of the steps involved in the IUCN Red List process, including work involved in pre-assessment, assessment, review, submission to the IUCN Red List Unit (RLU), and publication on the IUCN Red List.

Step 1: Pre-assessment		
In all cases, the starting point is raw data. Data and information may be held in published papers, articles, books and reports, unpublished documents and reports, unpublished data, databases (including the IUCN Red List itself), GIS data, satellite imagery, etc. Prior to the assessment phase, raw data are gathered from across the entire global ranges for the taxa being assessed. Data must be recorded in a format compatible with the standards of the IUCN Red List Categories and Criteria and with appropriate supporting information (as specified in Annex 1). The IUCN Species Information Service (SIS) is the database used to hold all assessments published on the IUCN Red List. Global Assessment teams and Red List Authorities are required to use SIS to compile and manage Red List assessment information (see section E in these Terms of Reference). Red List Partners and other external organizations wanting to submit large numbers of assessments to the IUCN Red List are encouraged to use SIS. If that is not feasible, the data format and transfer mechanism needs to be discussed and agreed with the Red List Unit at the start of any such project, to ensure compatibility with SIS. Individuals who provide data through the pre-assessment phase are termed "Contributors".		
1.1 Red List Authorities (RLAs)	**1.2 Global Species Programme and Red List Partner projects**	**1.3 External projects**
Pre-assessment work may be done by one RLA member working alone; or a small group of RLA members working together; or through contributions from many/all RLA members and additional experts via a large workshop, e-mail correspondence, an internet-based discussion forum (e.g., discussion fora run by BirdLife International), or via the online SIS. The method used will depend on the number of species being assessed, the number of parties involved, the range of data sources being checked, and the amount of funding available for the project or ongoing updates. The RLA is responsible for deciding which approach to take for data compilation. • The RLA Coordinator prepares the list of taxa to be assessed and checks this against what is already in SIS. If taxonomy needs to be added to or modified in SIS, contact the RLU. • Available data sources are reviewed and current data are compiled in SIS. • Draft range maps are prepared.	**a)** Projects involving data compilation and assessment only: • Project staff members prepare the list of taxa to be assessed and check this against what is already in SIS. If taxonomy needs to be added to or modified in SIS, contact the RLU. • Data sources (from RLAs, other institutions, and literature) are reviewed and current data are compiled in SIS by project staff or expert consultants; • Draft range maps are prepared by project staff or expert consultants. **b)** Projects involving regional capacity-building: • Project staff members prepare the list of taxa to be assessed and check this against what is already in SIS. If taxonomy needs to be added to or modified in SIS, contact the RLU. • A Red List Assessor Training Workshop is held for project participants (experts from specific regions or with particular taxonomic expertise). • Project participants review	As for RLAs, the individual or organization involved is responsible for deciding how they will approach data compilation (see step 1.1).

	available data sources, compile current data in a database (e.g., SIS), and prepare draft range maps. Data collection and draft range maps may sometimes be initiated by project staff, then project participants add to this.	
Step 2: Assessment		
All assessments are based on data currently available for taxa across their entire global ranges compiled in step 1. In all cases, assessments must follow the IUCN Red List Categories and Criteria and the guidelines for applying these; both documents are available on the IUCN Red List and IUCN SSC websites). Each assessment must also include appropriate supporting information, as specified in Annex 1.		
2.1 Red List Authorities (RLA)	**2.2 Global Species Programme and Red List Partner projects**	**2.3 External projects**
Assessments, based on data and range maps compiled in step 1.1, may be carried out by one RLA member working alone; a small group of members working together; or by consensus agreement of a large group of members in a workshop, via e-mail, through an internet-based discussion forum (see step 1.1), or via the online SIS. External experts may also contribute to assessment. RLA members may also be involved in one or more of the Species Programme or Red List Partner projects (see step 2.2).	**a)** Projects involving data compilation and assessment only. If sufficient funds are in place, an assessment workshop can be held: *Assessment workshop*: • At a workshop, experts review data and draft range maps compiled in step 1.2 and provide additional information as necessary. • Project staff members adjust species accounts and maps accordingly. • Experts assess each taxon, often with the guidance of one or more facilitators. *No assessment workshop*: • Project staff and/or species-experts use data and range maps compiled in step 1.2 to prepare draft assessments. • Additional experts invited to comment on draft assessments via email or SIS. *Post workshop/draft assessment preparation*: • Project staff tidy up the species accounts and range maps and invite final comments by experts (via SIS or PDF species accounts posted on secure ftp site). • Experts check assessments, and staff members adjust information, assessments and maps where necessary. • Project staff members carry out checks on assessments to ensure IUCN Red List Categories and Criteria are being applied consistently and that all assessments are appropriately	As for the RLA (see step 2.1), the individual or organization involved is responsible for deciding how they will carry out the assessment. Individuals and organizations may also be involved in one or more of the Species Programme or Red List Partner projects (see step 2.2).

	documented.	
	b) Projects involving regional capacity-building: *Draft assessment preparation:* • Experts trained in step 1.2 prepare draft assessments based on the data and range maps compiled in step 1.2. *Assessment Review Workshop*: • At a workshop, experts review data and range maps compiled in step 1.2, and provide additional information as necessary. • Project staff members adjust species accounts and range maps accordingly. • Experts discuss draft assessments and project staff members adjust assessments if necessary. *Post-assessment review workshop:* • Project staff members tidy the species accounts and range maps and invite final comments by experts (via SIS or email and PDF species accounts posted on secure ftp site). • Experts check assessments and staff members adjust species accounts and maps accordingly. • Project staff members carry out checks on assessments to ensure IUCN Red List Categories and Criteria are being applied consistently and that all assessments are appropriately documented.	

Step 3: Review		
All assessments must go through a review process before they can be accepted for publication on the IUCN Red List. This involves at least one expert on the IUCN assessment process reviewing the assessment and agreeing that the data used have been interpreted correctly and consistently, and that uncertainty has been handled appropriately. In addition, for assessments that have not been carried out using the 'criteria calculator' option in SIS (which automatically assigns the criteria triggered from the underlying parameter estimates), the review process checks whether the IUCN Red List Categories and Criteria have been correctly applied and that the parameter estimates and supporting documentation are consistent with the Category and Criteria assigned.		
3.1 Red List Authorities (RLA)	**3.2 Global Species Programme and Red List Partner projects**	**3.3 External projects**

Each RLA has a Coordinator (formerly referred to as the Focal Point, or Chair in the case of stand-alone RLAs) who is responsible for ensuring that each assessment is reviewed by at least one person (but also see recommendations in Annex 1). • A Reviewer **cannot** also be an Assessor or Contributor for an assessment they are reviewing (but can play the role of a Facilitator). The review process may be carried out through: • The RLA Coordinator contacting appropriate RLA members who are experts on the IUCN assessment process; or • The RLA Coordinator contacting appropriate experts on the IUCN assessment process from outside the immediate RLA (e.g., Global Species Programme staff, or members of another taxonomic or geographic RLA); or • An Assessment Review Workshop involving a small group of RLA members or other experts on the IUCN assessment process; or • In an Assessment Workshop, an individual expert or small group of experts on the IUCN assessment process do independent reviews of assessments carried out by Assessors at the same workshop. For any assessment, review and assessment may not be entirely sequential, as guidance on appropriate interpretation of data and consistent approaches to handling uncertainty may be provided by Reviewers throughout the assessment process.	All global Red List assessments must be reviewed by at least one person (but also see recommendations in Annex 1). • All reviews must involve appropriate RLAs; the RLA may defer the review to the project coordinators. • Project coordinators are responsible for ensuring each assessment is reviewed appropriately. As in step 3.1, assessment and review may be carried out at the same workshop, where an individual or a small group prepares an assessment, and then review is carried out by independent experts on the IUCN assessment process who are also at the workshop. In cases where a new taxonomic group is being assessed, there may not yet be an appointed RLA for that group. In such cases project coordinators may act as Reviewers, provided they have not been involved with the individual assessments in question as either contributors or assessors.	Global assessments resulting from external projects **do not** need to be reviewed before reaching the RLU. RLU staff members will arrange the appropriate review (see step 4.3).

Reassessments

The process for reassessing taxa may differ from steps 1-3 above. Assuming that SIS is being used, the process will typically involve:

- Checking that the taxon to be assessed is the same taxonomic concept previously assessed; if not, appropriate taxonomic changes will need to be made in SIS and the new concept is then assessed for the first time as outlined above;
- Starting with a copy of the previously published assessment as a new draft assessment;
- Collating any new published or unpublished information available (either relevant to the species in question or relevant contextual information), and soliciting additional relevant data and information;
- Editing the data and text fields based on the new and updated information now available;
- Note that any PDF with additional supporting documentation attached to the previous published assessment needs to be reviewed and updated as required and attached to the new draft assessment.
- If new parameter estimates trigger higher, lower or different criteria thresholds, the Red List Category and Criteria are revised either manually or by use of the criteria calculator in SIS;
- The updated and revised information may then be reviewed by species experts (within or beyond the RLA);
- The revised assessments and accounts are reviewed by Red List assessment experts for appropriate and consistent interpretation of data and handling of uncertainty, before submission to the Red List Unit.

Step 4: Submission

All completed assessments are submitted to the IUCN Red List Unit.		
4.1 Red List Authorities (RLA)	**4.2 Global Species Programme and Red List Partner projects**	**4.3 External projects**
Assessments that are included within a global or regional assessment project are submitted by the RLA coordinator to the project coordinator (see step 4.2) who, in turn, submits completed assessments to the IUCN Red List Unit (RLU) on behalf of the RLA through SIS or via an agreed process. Assessments that **are not** included within a Global Species Programme or Red List Partner assessment project are submitted by the RLA coordinator directly to the RLU. • Additional supporting information, such as tables and figures, which need to be transformed into formatted attachments to the assessments (for an example, see the assessments for *Diceros bicornis* or *Ceratotherium simum*), also need to be submitted to the RLU. RLU staff members will then: • Acknowledge receipt of the assessments. • Conduct a random check of assessments to ensure the Red List Criteria have been applied appropriately. • Conduct a random check to ensure that the appropriate supporting information has been included (see Annex 1) • Transfer long sections of documentation, tables, graphs, etc. to PDF documents to be published alongside the appropriate species account with a direct link to these • Proof-read assessments and correct grammar and spelling where necessary • Contact the RLA Coordinator if any errors or omissions are detected or edits/changes required.	Project coordinators are responsible for: • Checking the Red List Criteria have been applied appropriately for each assessment; • Checking that the appropriate supporting information has been provided for each assessment; • Proof-reading, spell-checks and formatting checks for each assessment; • Checking assessments for overall consistency in application of the Red List Criteria; • Submission of completed assessments to the RLU via SIS including any additional supporting documentation, tables and/or figures. RLU staff members will then: • Carry out final checks (see step 4.1), but to a much lesser extent (since project staff should already have completed these checks). The RLU staff will focus on looking for overlooked errors, and problems in overall consistency between assessment projects. • Notify project coordinators of any errors or issues.	Unreviewed global assessments (including any additional supporting documentation, table and/or figures) resulting from external projects are submitted directly to the RLU via an agreed process. RLU staff will then: • Add the assessments to SIS (if they are not already in the system). • Check the assessments for quality (see step 4.1); • Return poor-quality assessments to those who submitted them with reasons why they are unacceptable for publication on the IUCN Red List. • Refer good-quality assessments to the appropriate RLA or other experts (in cases where no RLA has been appointed to cover the taxon) for review (see step 3.1). • Inform those who submitted the assessments of the outcome of the review, and return any assessments that were not accepted by the Reviewer(s).
Step 5: Publication		
All assessments that have been reviewed, submitted, checked and accepted are entered into SIS (if they are not already in the system) and are published in the appropriate update of the IUCN Red List website (dependent on the date of submission, the quality of the assessments, the number of assessments to be processed and the number of submissions received overall).		

ANNEX 4

IUCN Red List Assessment Resources

The following documents are essential reference and guidance documents required for the Red List assessment process. All of these are available on the IUCN Red List and IUCN SSC websites:

1. *IUCN Red List Categories and Criteria. Version 3.1*

This is the central rule-book for IUCN Red List assessments and must be followed for all assessments being submitted for publication on the IUCN Red List. It is available in the three official IUCN languages (English, French and Spanish) from the IUCN Red List website.

Full or partial translations of this document are available in some other languages and these are also available on the IUCN Red list website. IUCN cannot guarantee the accuracy of these unofficial translations, which have been carried out by a wide range of sources.

2. *Guidelines for Using the IUCN Red List Categories and Criteria*

This guidance document is prepared by the IUCN Standards and Petitions Sub-Committee of the IUCN Red list Committee and is available to download from the IUCN Red List website. The document provides guidelines to the application of version 3.1 of the IUCN Red List Categories and Criteria, including detailed explanations of the definitions of the many terms used in the Red List Criteria. This document is updated regularly. The IUCN Global Species Programme will inform the RLA network via email when updated versions of this document are available online.

3. *IUCN Documentation Standards and Consistency Checks for IUCN Red List Assessments and Species Accounts*

This guidance document is prepared by the IUCN Red List Unit and is available to download from the IUCN Red List website. This document provides guidance on:

- The required and recommended supporting information for IUCN Red List assessments;
- Details on what information should be recorded in text and data fields in SIS to support Red List assessments;
- General publication style and formatting guidelines (based on the IUCN style guidelines for publications);

This document is updated regularly. The IUCN Global Species Programme will inform the RLA network via email when updated versions are available online. A separate document providing guidelines on mapping is in preparation.

4. Guidance on the IUCN Red List Classification Schemes

To ensure uniformity when describing and recording the habitat a taxon occurs in, the threats to a taxon, what conservation actions are in place or are needed, and whether or not a taxon is utilized, a set of standard terms (referred to as Classification Schemes) have been developed. These schemes are used in SIS for recording these different parameters. Documents have been prepared on each of the schemes showing the structure of each, providing definitions of the terms, examples

and guidance notes on their use. These documents are available for download from the IUCN Red List website.

5. *Guidelines for Appropriate Use of Red List Data*

Although the IUCN Red List can be used in numerous ways, it is easy for those unfamiliar with the data to draw incorrect conclusions. These guidelines are provided to give advice on both appropriate and inappropriate uses of the IUCN Red List. They are available for download from the website. These guidelines currently include two important Annexes: 1. Guidelines for Reporting on Proportion Threatened; and 2. Guidelines on the Implementation of the "IUCN Policy Statement on Research Involving Species at Risk of Extinction", with special reference to Scientific Collecting of Threatened Species. Two additional Annexes are currently in preparation: one on the use of the Red List in making decisions relating to the harvesting of species, and another on the appropriate use of IUCN Red List data by business for informing environmental risks and opportunities in business.

6. Technical Support from the IUCN Red List Unit

The IUCN Red List Unit (RLU) is based in Cambridge, United Kingdom and is responsible for managing the IUCN Red List and for providing technical support to those involved in the Red List assessment process. The RLU can provide advice and guidance on a range of topics, including:

- IUCN Species Information Service (SIS). For requests for new SIS user accounts, access to SIS training tools, and advice on exporting and analysing data from SIS, contact the RLU.
- Red List Training. The RLU develops and maintains a range of Red List training materials and tools, including standard curricula for Red List Assessor and Red List Trainer training workshops, and online Red List Training courses. Contact the RLU for guidance on Red List training resources and opportunities, and advice on how to become a Red List Trainer.
- Contact the RLU for technical advice on applying the IUCN Red List Categories and Criteria (at both global and regional levels), where to find the various guidance documents and assessment tools, and how to use these.
- RAMAS Red List software. The RLU can provide some technical advice to anyone who has purchased this software, but as this is 3rd Party software, the RLU is unable to provide the software to anyone. The algorithm used by RAMAS Red List to obtain the Red List assessment is, however, incorporated into SIS.
- GIS software and tools for creating species range maps. The RLU is unable to provide GIS training, but Esri ArcGIS software licenses are freely available to eligible RLAs. A range of ArcGIS scripts and tools and other mapping resources useful for creating species range maps are also available. Contact the RLU for access to these tools and for any further guidance or advice on mapping.
- IUCN Red List website. For any questions or comments on the IUCN Red List website, contact the RLU.

Direct contact details for RLU staff can be found on the IUCN Species website, or the RLU can be contacted via the general RLU email address (redlist@iucn.org).

ANNEX 5

Procedure for Handling of Petitions against Current Listings on the *IUCN Red List of Threatened Species™*

Introduction

Status assessments presented in *The IUCN Red List of Threatened Species™* are open to challenge. Petitions may be made against current listings of species, subspecies or geographic subpopulations (hereinafter referred to as species). Petitions against historical listings (i.e., those that have since been updated with a new listing for the taxon in question) are not considered. Petitions may only be made on the basis of the IUCN Red List Categories and Criteria (version 3.1) and in reference to any supporting documentation accompanying the listing. It is not possible to change listings for political, emotional, economic, or other reasons not based on the Categories and Criteria.

Disagreements with Current Listings

Any party may contact the IUCN Red List Unit (RLU) at any time to express disagreement with any current listing. If this disagreement is based on scientific or technical grounds, the RLU will put this party in contact with the relevant Red List Authority (RLA) or Assessor (in the absence of an RLA) with intention of resolving the disagreement without entering a formal petition process. In the event of a disagreement concerning the listing of a species that is in the process of being reassessed, the RLA will seek to involve the party expressing disagreement in the reassessment process, with the objective of reaching consensus on the new listing.

The Formal Petitions Process

If the above process is not successful in resolving the disagreement, a formal petition may be submitted. The attached flow diagram presents a summary of the formal petitions process; the process is described in greater detail below.

A formal petition should be very brief, and just summarizing the points of disagreement, with explicit reference to the criteria under which the species is listed (2 pages maximum). The steps to follow for filing petitions are outlined below:

Petition Submission and Validation

1. Petitions can be submitted to the RLU at any time. The RLU will acknowledge receipt of the petition, and will inform the petitioner of the date on which the petition was received.
2. The RLU will consult with the IUCN SSC Standards and Petitions Sub-Committee (SPSC) to determine whether or not the petition has been filed on the basis of the IUCN Red List Categories and Criteria. If the petition has not been made on the basis of the IUCN Red List Categories and Criteria, it will be returned to the petitioner by the RLU with an explanation as to why the petition cannot be considered. This response will be sent to the petitioner within one month of the original receipt of the petition by the RLU.

Discussion Between Parties

3. If the petition is made on the basis of the IUCN Red List Categories and Criteria, it will be referred by the RLU to the RLA or particular Assessor/s (if there is no

RLA) responsible for the taxon assessment in question (the RLA or Assessor/s are hereafter just termed the RLA). Within one month of the original receipt of the petition, the RLU will request the RLA and the petitioner to discuss the petition with the objective of reaching an agreement between them. The RLA and the petitioner will be given four months to reach agreement from the date that the RLU refers the petition to them. In seeking to reach agreement, the RLA and the petitioner should determine whether or not they are using the same underlying data. They should clarify whether or not the disagreements are due to factual discrepancies, as opposed to differences of either interpretation or application of the IUCN Red List Categories and Criteria.

4. If the RLA agrees with the petition, or if the petitioner and the Red List Authority come to agreement, then any changes to the listing will be accepted. The change will appear in the following update of the IUCN Red List.
5. If the petitioner and the RLA are unable to agree within the time period set in no. 3 above, the petition will then enter the next stage in the process.

Justification Preparation and Submission

6. Within one week of the expiration of the time period set in no. 3 above, the RLU will notify both the petitioner and the RLA that each of them should submit justifications for their case to the SPSC via the RLU. The justifications should reach the RLU within four months from the date that the RLU issues this notification. These justifications should not be longer than 8 sides of A4 (excluding the list of references), 12-point print, and should provide the data to support their position. The justifications should include a synopsis of the failed negotiations, a brief statement of the reasons for the dispute, and a clarification of any factual discrepancies (e.g., different sources of data or information used). All data used in these justifications must either be referenced to publications that are available in the public domain, or else be made available to the SPSC. The data provided should be clearly linked to the use of the IUCN Red List Categories and Criteria. If the petitioner fails to submit a justification within the set time period and in the required format, the petition will be dropped, and the RLU will inform the SPSC of this. If the RLA fails to submit a justification within the set time period and in the required format, the petition will go forward. Requests for an extension to the deadline for submitting justifications will not normally be considered, unless there are exceptional circumstances. Any request for such an extension should be submitted to the RLU at least two weeks before the deadline, who will refer it to the Chair of the IUCN SSC Red List Committee. Generally, the maximum time limit to any requested delay is one month, with only one such request being considered from each party. However, in unusual circumstances, such as multiple petitions directed to the same RLA, a longer extension may be granted, at the discretion of the Chair.
7. The RLU will send the justifications of each party to the other within one week of the time period set in no. 6 above, or within one week of both justifications having been received. Both parties have three weeks in which to provide a 1-page addendum to their justifications, should they choose to do so. Any addendums received after the three-week period will not be considered. The parties may not make any changes to the original justifications.
8. At the end of this three-week period, whether or not an addendum is received, the RLU will send the justifications to all members of the SPSC for review and confidential comment. The SPSC may choose to circulate the justifications to other independent expert reviewers for confidential comments. The Chair of the SPSC should if at all possible receive these comments within two months of the

date of receipt of the justifications. If needed, the SPSC may seek clarification of particular issues from the RLA and the petitioner. In instances in which the RLA failed to submit a justification, the SPSC will make every effort to obtain a balanced set of confidential comments from reviewers.

Deliberation and Ruling

9. The SPSC will consider the justifications and the confidential reviews. It will make a ruling on each petition within four months from the time that the petitions were circulated to the SPSC members by the RLU. In the case of multiple petitions, a longer period may be granted, at the discretion of the Chair of the IUCN SSC Red List Committee. The SPSC will issue a notification that will include a full rationale and explanation of each ruling, but will not include a record of the deliberations that the SPSC made to reach its decision, and the names of any reviewers will be kept confidential. The SPSC will send this notification to the RLU.

Notification and Publication of Final Ruling

10. The RLU will send the SPSC's notification to the petitioner and to the RLA. Any changes will appear in the next update of *The IUCN Red List of Threatened Species™*. The notification of the ruling on any petition, and any resulting change in listing, will be placed on the IUCN SSC website.

Petitions Against Listings Based on an Old Version of the IUCN Red List Categories and Criteria

If a petition is made against a listing based on an old version of the IUCN Red List Categories and Criteria, and the petition is based on the Categories and Criteria, then the RLA in question will first be requested to update the listing so that it is based on the version of the Categories and Criteria currently in force. The RLA will be given six months to do this from the original receipt of the petition by the RLU. The RLA should consider the additional information provided by the petitioner. Once the RLA has updated the listing, the petitioner will be so informed and asked whether or not they wish to proceed with the petition against the new listing. If the RLA fails to meet this deadline for updating the listing, the petition will proceed according to the process outlined in paragraphs 5-9 above, and the final ruling of the SPSC will provide an updated listing for the taxon in question, using the version of the Categories and Criteria currently in force.

General Principles

Acknowledging Communications. During the formal petitions process, the petitioner, the RLA, the SPSC, and the RLU should acknowledge the receipt of all correspondence among them as soon as possible after arrival, so that any failure in delivery is detected as early as possible.

Confidentiality. While a petition is being considered, the associated documents (including justifications made by the petitioner and the RLA) are confidential documents that are not made available to third parties. The SPSC will circulate the justifications only to independent expert reviewers who agree to adhere to the confidentiality of the process and accept that their reviews will eventually be made public, but not attributed. Final rulings on petitions made by the SPSC will include

both justifications, and the reviews (without the names of the reviewers), in the documentation placed on the IUCN SSC website.

Repeated Petitions. In order to prevent continuing petitions on the same species, the SPSC will not accept a petition, subsequent to the first petition, if it is not based on new information.

Reassessment of Species Following a Petition. The first time that a species is reassessed following a petition, the reassessment will be reviewed by the SPSC.

Impartiality. The IUCN SSC Red List Committee and the RLU are responsible for ensuring that the process for handling petitions is adhered to, and that evaluations of petitions are carried out professionally and impartially. Prior to publishing the ruling on a petition, the Chair of the SPSC will send a brief report to the Chair of the IUCN SSC Red List Committee confirming that the above process was followed to reach the decision, or outlining any deviations from the process that had to be made. The IUCN SSC Red List Committee (excluding the SPSC), the SSC Steering Committee, the SSC Chair, and the IUCN Secretariat (including the staff of the IUCN Red List Unit), have no rights to intervene in the petitions process, or to involve themselves in the substance of any petition.

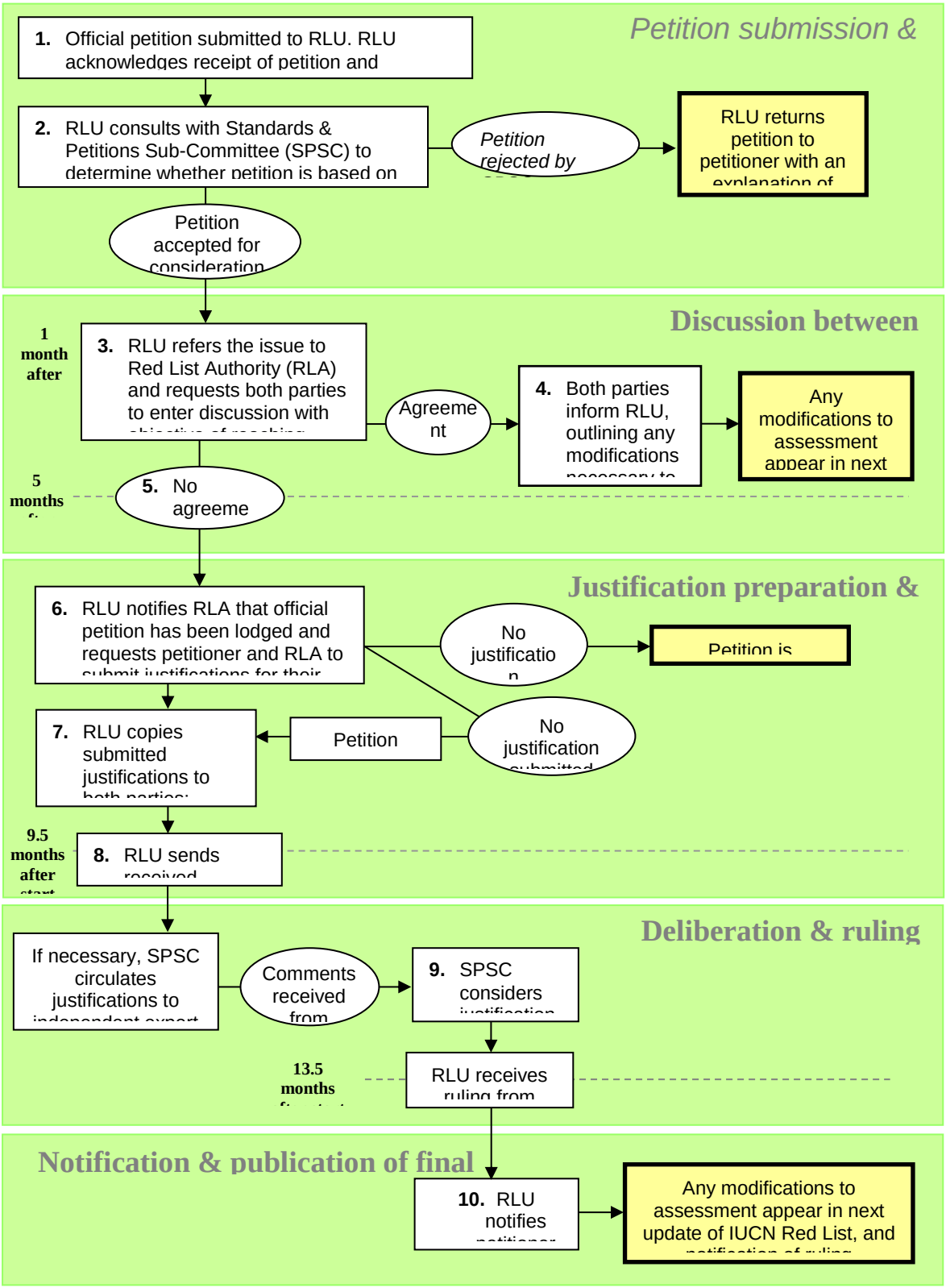
Special Cases

Deviations from the Process. Every effort will be made to avoid deviations from the process as laid out, above. However, any petitions requiring such deviations should be approved in advance by the Chair of the IUCN SSC Red List Committee.

Complaints about the Petitions Process. If there is an assertion that the above procedure has been violated, then a formal and documented complaint may be submitted to the SSC Chair.

Flow Diagram of Formal Red List Petitions Process

- All timelines noted in the diagram below are based on the deadlines outlined in the petitions process. The actual timeline for a petition will depend on response times and requests for deadline extensions. Please refer to the petitions process document for details.
- Figures noted within the diagram refer to the steps outlined in the petitions process document (see *The Formal Petitions Process*).



ANNEX 6

Policy on Use of Pre-Publication IUCN Red List Data

The use of pre-publication data is a potentially sensitive issue. Two key contextual points should first be noted. First, much of the species-related data generated by IUCN involves the participation of both SSC scientists and a number of (formal and informal) partner organizations. Second, IUCN as the driving force behind the Conservation Commons promotes open access (with a non-commercial restriction) for the data it holds.

IUCN recognizes that the rights of the data-providers must be respected, and this is indeed one of the principles of the Conservation Commons. In the past, there generally has been an unwritten understanding between IUCN and the data providers.

The general process that IUCN uses is to gather data through a formalized process, to undertake quality control, and to brand these data (i.e., acceptance of the data through publication on the IUCN Red List). Two additional steps sometimes undertaken are data analyses, and publication of products. The main issue is what happens between the data being checked by reviewers and being published on the Red List website – who gets to see and use data before they are made publicly accessible?

Data will always be gathered, with or without IUCN. For example, NatureServe collects data for its own purposes and as a by-product, guided by the Red List Partnership agreement, some of these data go onto the IUCN Red List. In the example of BirdLife International, a major (>20 year) data compilation process has been structured wholly to meet the needs of a process to assess the Red List status of the world's bird species. Sometimes, donors that pay for the costs of generating the data (e.g., through workshops), request permission to access data pre-publication for use in the donor's own planning.

A new policy was needed to clarify the following points:

1. What information/data should be made available, and to whom, prior to publication on the IUCN Red List and in what form?
2. How do we address the rights of SSC data providers in making data available pre-publication?

One major issue is the time lag between data being provided and the data appearing on the Red List. The longer this is, the more pressure there is for pre-publication data releases, especially as the need for information to inform conservation decision-making grows. Both the initial Global Amphibian Assessment and Global Mammal Assessment took several years between data being compiled and eventually being published on the IUCN Red List. More recent similar-sized projects have taken a different track, publishing data as the assessment process proceeds. BirdLife International, the Global Reptile Assessment, the Global Marine Species Assessment, and the Global Freshwater Biodiversity Assessment all post new data on the Red List website at each Red List update, and do not wait for these projects to be globally or even regionally complete. The amphibian assessment updates now proceed on this basis, and the Global Mammal Assessment moved to this model in 2008.

With this in mind, the IUCN Red List Committee has previously formalized a clear policy on the pre-publication use of data to help bring clarity to this issue:

General Rules

1. Requests for pre-publication data should be discouraged at the outset of projects, on the basis that these can delay completion of the project.
2. Data providers (including Red List Authorities) should be informed of IUCN's policy on pre-publication release of data prior to the provision of data to IUCN, so that the data providers in question have the option of insisting that there be no pre-publication release of data.
3. IUCN's policy on pre-publication release of data should be included as an Annex to the Red List Rules of Procedure.
4. Pre-consistency checked data will not be released to anyone (with exception of data providers and data managers directly involved in the project, who will have full access even to pre-consistency checked data, with caveats attached such as internal use only).
5. Any pre-publication data provided by IUCN to anyone must not be released to third parties.
6. Requests for data pre-publication should include an indication of how the data will be used.
7. Pre-publication data will be provided only if time and resources permit this.

The following table shows how pre-publication data could or could not be made available to different types of user. In this table, the data are divided into two categories: pre-consistency checked; and post consistency checked.

Type of User	Pre-consistency checked	Post-consistency checked	Data Access rights
Data Providers (individuals, institutions, Red List Authorities, etc.) and Reviewers	Yes	Yes	Full access to data.
Data Managers (mainly in Global Species Programme, sometimes in Red List Partners)	Yes	Yes	Full access to data for management purposes.
Project Partners (sometimes, but not always, Red List Partners)	No	Yes	Identified project partners have the right to: 1. Produce publications timed to be released synchronously or immediately prior to public release of the data on the IUCN Red List. 2. Use the data for internal conservation purposes (planning, fundraising, etc.)
Donors	No	Yes	Data will be provided (on request) only under specific conditions of contract/agreement. [Minimize these

			conditions]
Red List Partners (not directly involved in the project)	No	Yes	Only post-consistency checked data will be released (on request).
Other IUCN assessment projects (e.g., SRLI)	No	Yes	Data may be shared between IUCN projects (on request), if necessary.
Media	No	No (exception: immediately prior to a launch, with an embargo attached)	Only a summary of provisional results can be released (on request) for purposes of press releases, **provided it is made clear that the results are provisional**.
Third-party scientists (including students)	No	No	No pre-publication data will be released.
Third-party bodies – (commercial and non-commercial)	No	No	No pre-publication data will be released.

ANNEX 7

Sensitive Data Access Restrictions Policy for the IUCN Red List

1. Under normal circumstances, all data will be displayed on the web site.

For species that are sensitive to location data being displayed:

2. The burden of proof to justify the case for withholding data from the site lies with the IUCN SSC Red List Authority.

3. In general, the withholding of data policy should apply to Endangered (EN) and Critically Endangered (CR) species that:
(a) are listed under criteria C and D (but species assessed as CR under criteria A or B, but qualifying for EN under criteria C or D should also be highlighted);
(b) have high economic value;
(c) are threatened by trade; and
(d) have important sites that are generally not well known (i.e., an internet search engine such as Google cannot find these sites).

4. For species with sensitive sites (e.g., fish, migratory turtles, etc.), maps should be prepared at a minimum size appropriate to that species.

IUCN Red List
Categories and Criteria

Version 3.1

Second edition

Prepared by the IUCN Species Survival Commission

As approved by the
51st meeting of the IUCN Council
Gland, Switzerland

9 February 2000

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Preface

The first edition of the *IUCN Red List Categories and Criteria: Version 3.1* was published in 2001, after its formal adoption by the IUCN Council in February 2000. Since then it has been used as the standard for global Red List assessments published on the *IUCN Red List of Threatened Species*™. It is also used alongside the *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels* (IUCN 2003, 2012), by many countries around the world as a standard system for national Red List assessments.

Over the last decade, the IUCN Red List Categories and Criteria have been used to assess an increasingly diverse range of taxa occurring in a wide variety of habitats. In addition, ongoing technological advances continue to provide more scope for improving data analysis. Therefore it is necessary for the IUCN Red List to adapt to maintain and further develop its usefulness as a conservation tool. However, it is also essential that the central rules for assessing extinction risk for the IUCN Red List remain stable to be able to compare changes in Red List status over time.

This second edition of the *IUCN Red List Categories and Criteria: Version 3.1* retains the same assessment system presented in the 2001 publication. To allow for occasional changes in documentation requirements for assessments, information that was previously outlined in Annex 3 has been moved to a separate reference document: *Documentation Standards and Consistency Checks for IUCN Red List Assessments and Species Accounts*.

To ensure full understanding of IUCN Red List assessments, it is very important to refer to all of the following documents:

(1) *IUCN Red List Categories and Criteria: Version 3.1* (IUCN 2001 and later editions)
(2) The latest version of the *Guidelines for Using the IUCN Red List Categories and Criteria* (available from www.iucnredlist.org/documents/RedListGuidelines.pdf; check the IUCN Red List website for regular updates of this document)
(3) The latest version of the *Documentation Standards and Consistency Checks for IUCN Red List Assessments and Species Accounts* (available from www.iucnredlist.org/documents/RL_Standards_Consistency.pdf; check the IUCN Red List website for regular updates of this document)

For national and regional level assessments using the IUCN Red List Categories and Criteria, the *Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0* (IUCN 2012 and later versions) must also be used.

All of the above documents are freely available to download from the IUCN Red List website (www.iucnredlist.org). Note that documents (2) and (3) above are regularly updated, therefore it is important to check the website for the current versions.

Acknowledgements

IUCN gratefully acknowledges the dedication and efforts of the Red List Criteria Review Working Group (CRWG) in attending numerous workshops to discuss and debate the merits and demerits of the Red List Criteria. The members of the CRWG were: Resit Akçakaya, Jonathan Baillie, William Bond, Nigel Collar, Ulf Gärdenfors, Kevin Gaston, Craig Hilton-Taylor, Elodie Hudson, Bob Irvin, David Keith, Russell Lande, Charlotte Lusty, Nigel Leader-Williams, Georgina Mace, Michael Maunder, Larry Master, E.J. Milner-Gulland, Sanjay Molur, Howard Powles, André Punt, Jon Paul Rodríguez, Mary Seddon, Alison Stattersfield, Simon Stuart, John Wang, and Tetsukazu Yahara. Particular thanks must go to Dr Georgina Mace, who chaired the CRWG and who ably steered an extremely complex process through to a successful conclusion. The review process culminated in the adoption of this revised set of Red List Categories and Criteria by the IUCN Council.

The work of the CRWG and the hosting of the review workshops were made possible through generous financial support from the Canadian Wildlife Service; Federal Ministry for Economic Co-operation and Development, Germany (BMZ); Global Guardian Trust; New South Wales National Parks and Wildlife Service, Australia; New South Wales Scientific Committee, Australia; Ministry of the Environment, Finland; Ministry of the Environment, Sweden; Swedish Species Information Centre; and WWF Sweden. The review process was co-ordinated by the IUCN Red List Programme Officer funded by the UK Department for the Environment, Food and Rural Affairs (DEFRA); the Centre for Applied Biodiversity Science at Conservation International; and WWF UK.

IUCN is indebted to the hundreds of scientists who participated in the criteria review workshops or who submitted comments and suggestions during the review process. This combined input has resulted in a far more robust, user friendly and widely applicable system.

As a result of the review process, several new topics have become the focus of active research and publication in the academic community. As a greater clarity emerges on tricky and unresolved issues, these will be addressed in a comprehensive set of user guidelines. The intention is to keep this revised system stable to enable genuine changes in the status of species to be detected rather than to have such changes obscured by the constant medication of the criteria.

The ***IUCN Red List Categories and Criteria: Version 3.1*** are available in booklet form in the following language versions: English, French and Spanish from the IUCN Publications Services (www.iucn.org/knowledge/publications_doc/publications/).

They are also available to download from the IUCN Red List website in English, French and Spanish, at: www.iucnredlist.org/technical-documents/categories-and-criteria.

I. INTRODUCTION

1. The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk. However, while the Red List may focus attention on those taxa at the highest risk, it is not the sole means of setting priorities for conservation measures for their protection.

Extensive consultation and testing in the development of the system strongly suggest that it is robust across most organisms. However, it should be noted that although the system places species into the threatened categories with a high degree of consistency, the criteria do not take into account the life histories of every species. Hence, in certain individual cases, the risk of extinction may be under- or over-estimated.

2. Before 1994 the more subjective threatened species categories used in IUCN Red Data Books and Red Lists had been in place, with some modification, for almost 30 years. Although the need to revise the categories had long been recognized (Fitter and Fitter 1987), the current phase of development only began in 1989 following a request from the IUCN Species Survival Commission (SSC) Steering Committee to develop a more objective approach. The IUCN Council adopted the new Red List system in 1994.

The IUCN Red List Categories and Criteria have several specific aims:

- to provide a system that can be applied consistently by different people;
- to improve objectivity by providing users with clear guidance on how to evaluate different factors which affect the risk of extinction;
- to provide a system which will facilitate comparisons across widely different taxa;
- to give people using threatened species lists a better understanding of how individual species were classified.

3. Since their adoption by IUCN Council in 1994, the IUCN Red List Categories have become widely recognized internationally, and they are now used in a range of publications and listings produced by IUCN, as well as by numerous governmental and non-governmental organizations. Such broad and extensive use revealed the need for a number of

improvements, and SSC was mandated by the 1996 World Conservation Congress (WCC Res. 1.4) to conduct a review of the system (IUCN 1996). This document presents the revisions accepted by the IUCN Council.

The proposals presented in this document result from a continuing process of drafting, consultation and validation. The production of a large number of draft proposals has led to some confusion, especially as each draft has been used for classifying some set of species for conservation purposes. To clarify matters, and to open the way for modifications as and when they become necessary, a system for version numbering has been adopted as follows:

Version 1.0: Mace and Lande (1991)
The first paper discussing a new basis for the categories, and presenting numerical criteria especially relevant for large vertebrates.

Version 2.0: Mace *et al*. (1992)
A major revision of Version 1.0, including numerical criteria appropriate to all organisms and introducing the non-threatened categories.

Version 2.1: IUCN (1993)
Following an extensive consultation process within SSC, a number of changes were made to the details of the criteria, and fuller explanation of basic principles was included. A more explicit structure clarified the significance of the non-threatened categories.

Version 2.2: Mace and Stuart (1994)
Following further comments received and additional validation exercises, some minor changes to the criteria were made. In addition, the Susceptible category present in Versions 2.0 and 2.1 was subsumed into the Vulnerable category. A precautionary application of the system was emphasised.

Version 2.3: IUCN (1994)
IUCN Council adopted this version, which incorporated changes as a result of comments from IUCN members, in December 1994. The initial version of this document was published without the necessary bibliographic details, such as date of publication and ISBN number, but these were included in the subsequent reprints in

1998 and 1999. This version was used for the *1996 IUCN Red List of Threatened Animals* (Baillie and Groombridge 1996), *The World List of Threatened Trees* (Oldfield *et al.* 1998) and the *2000 IUCN Red List of Threatened Species* (Hilton-Taylor 2000)**.**

Version 3.0: IUCN/SSC Criteria Review Working Group (1999)
Following comments received, a series of workshops were convened to look at the IUCN Red List Criteria following which, changes were proposed affecting the criteria, the definitions of some key terms and the handling of uncertainty.

Version 3.1: IUCN (2001)
The IUCN Council adopted this latest version, which incorporated changes as a result of comments from the IUCN and SSC memberships and from a final meeting of the Criteria Review Working Group, in February 2000.

All new assessments from January 2001 should use the latest adopted version and cite the year of publication and version number.

4. In the rest of this document, the proposed system is outlined in several sections. Section II, the Preamble, presents basic information about the context and structure of the system, and the procedures that are to be followed in applying the criteria to species. Section III provides definitions of key terms used. Section IV presents the categories, while Section V details the quantitative criteria used for classification within the threatened categories. Annex 1 provides guidance on how to deal with uncertainty when applying the criteria; Annex 2 suggests a standard format for citing the Red List Categories and Criteria; and Annex 3 refers to the required and recommended supporting information for taxa to be included on IUCN's global Red List and where to find further guidance on these. It is important for the effective functioning of the system that all sections are read and understood to ensure that the definitions and rules are followed.

II. PREAMBLE

The information in this section is intended to direct and facilitate the use and interpretation of the categories (Critically Endangered, Endangered, etc.), criteria (A to E), and subcriteria (1, 2, etc.; a, b, etc.; i, ii, etc.).

1. Taxonomic level and scope of the categorization process

The criteria can be applied to any taxonomic unit at or below the species level. In the following information, definitions and criteria the term 'taxon' is used for convenience, and may represent species or lower taxonomic levels, including forms that are not yet formally described. There is sufficient range among the different criteria to enable the appropriate listing of taxa from the complete taxonomic spectrum, with the exception of micro-organisms. The criteria may also be applied within any specified geographical or political area, although in such cases special notice should be taken of point 14. In presenting the results of applying the criteria, the taxonomic unit and area under consideration should be specified in accordance with the documentation guidelines (see Annex 3). The categorization process should only be applied to wild populations inside their natural range, and to populations resulting from benign introductions. The latter are defined in the IUCN *Guidelines for Re-introductions* (IUCN 1998) as '...an attempt to establish a species, for the purpose of conservation, outside its recorded distribution, but within an appropriate habitat and eco-geographical area. This is a feasible conservation tool only when there is no remaining area left within a species' historic range'.

2. Nature of the categories

Extinction is a chance process. Thus, a listing in a higher extinction risk category implies a higher expectation of extinction, and over the time-frames specified more taxa listed in a higher category are expected to go extinct than those in a lower one (without effective conservation action). However, the persistence of some taxa in high-risk categories does not necessarily mean their initial assessment was inaccurate.

All taxa listed as Critically Endangered qualify for Vulnerable and Endangered, and all listed as Endangered qualify for Vulnerable. Together these categories are described as 'threatened'. The threatened categories form a part of the overall scheme. It will be possible to place all taxa into one of the categories (see Figure 1).

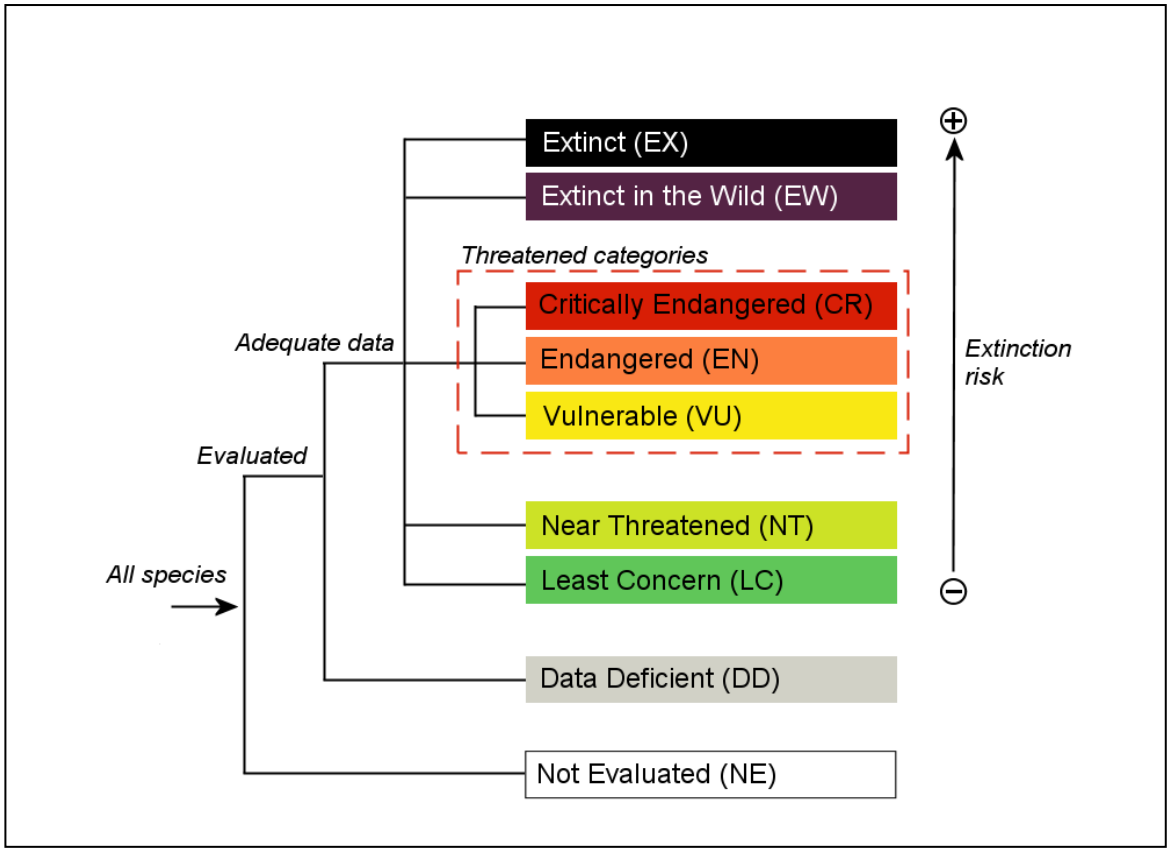

Figure 1. Structure of the categories

3. Role of the different criteria

For listing as Critically Endangered, Endangered or Vulnerable there is a range of quantitative criteria; meeting any one of these criteria qualifies a taxon for listing at that level of threat. Each taxon should be evaluated against all the criteria. Even though some criteria will be inappropriate for certain taxa (some taxa will never qualify under these however close to extinction they come), there should be criteria appropriate for assessing threat levels for any taxon. The relevant factor is whether *any one* criterion is met, not whether all are appropriate or all are met. Because it will never be clear in advance which criteria are appropriate for a particular taxon, each taxon should be evaluated against all the criteria, and *all* criteria met at the highest threat category must be listed.

4. Derivation of quantitative criteria

The different criteria (A-E) are derived from a wide review aimed at detecting risk factors across the broad range of organisms and the diverse life histories they exhibit. The quantitative values presented in the various criteria associated with threatened categories were developed through wide consultation, and they are set at what are generally judged to be

appropriate levels, even if no formal justification for these values exists. The levels for different criteria within categories were set independently but against a common standard. Broad consistency between them was sought.

5. Conservation actions in the listing process

The criteria for the threatened categories are to be applied to a taxon whatever the level of conservation action affecting it. It is important to emphasise here that a taxon may require conservation action even if it is not listed as threatened. Conservation actions which may benefit the taxon are included as part of the documentation requirements (see Annex 3).

6. Data quality and the importance of inference and projection

The criteria are clearly quantitative in nature. However, the absence of high-quality data should not deter attempts at applying the criteria, as methods involving estimation, inference and projection are emphasised as being acceptable throughout. Inference and projection may be based on extrapolation of current or potential threats into the future (including their rate of change), or of factors related to population abundance or distribution (including dependence on other taxa), so long as these can reasonably be supported. Suspected or inferred patterns in the recent past, present or near future can be based on any of a series of related factors, and these factors should be specified as part of the documentation.

Taxa at risk from threats posed by future events of low probability but with severe consequences (catastrophes) should be identified by the criteria (e.g. small distributions, few locations). Some threats need to be identified particularly early, and appropriate actions taken, because their effects are irreversible or nearly so (e.g. pathogens, invasive organisms, hybridization).

7. Problems of scale

Classification based on the sizes of geographic ranges or the patterns of habitat occupancy is complicated by problems of spatial scale. The finer the scale at which the distributions or habitats of taxa are mapped, the smaller the area will be that they are found to occupy, and the less likely it will be that range estimates (at least for 'area of occupancy': see Definitions, point 10) exceed the thresholds specified in the criteria. Mapping at finer scales reveals more areas in which the taxon is unrecorded. Conversely, coarse-scale mapping reveals fewer unoccupied areas, resulting in range estimates that are more likely to exceed the

thresholds for the threatened categories. The choice of scale at which range is estimated may thus, itself, influence the outcome of Red List assessments and could be a source of inconsistency and bias. It is impossible to provide any strict but general rules for mapping taxa or habitats; the most appropriate scale will depend on the taxon in question, and the origin and comprehensiveness of the distribution data.

8. Uncertainty

The data used to evaluate taxa against the criteria are often estimated with considerable uncertainty. Such uncertainty can arise from any one or all of the following three factors: natural variation, vagueness in the terms and definitions used, and measurement error. The way in which this uncertainty is handled can have a strong influence on the results of an evaluation. Details of methods recommended for handling uncertainty are included in Annex 1, and assessors are encouraged to read and follow these principles.

In general, when uncertainty leads to wide variation in the results of assessments, the range of possible outcomes should be specified. A single category must be chosen and the basis for the decision should be documented; it should be both precautionary and credible.

When data are very uncertain, the category of 'Data Deficient' may be assigned. However, in this case the assessor must provide documentation showing that this category has been assigned because data are inadequate to determine a threat category. It is important to recognize that taxa that are poorly known can often be assigned a threat category on the basis of background information concerning the deterioration of their habitat and/or other causal factors; therefore the liberal use of 'Data Deficient' is discouraged.

9. Implications of listing

Listing in the categories of Not Evaluated and Data Deficient indicates that no assessment of extinction risk has been made, though for different reasons. Until such time as an assessment is made, taxa listed in these categories should not be treated as if they were non-threatened. It may be appropriate (especially for Data Deficient forms) to give them the same degree of attention as threatened taxa, at least until their status can be assessed.

10. Documentation

All assessments should be documented. Threatened classifications should

state the criteria and subcriteria that were met. No assessment can be accepted for the IUCN Red List as valid unless at least one criterion is given. If more than one criterion or subcriterion is met, then each should be listed. If a re-evaluation indicates that the documented criterion is no longer met, this should not result in automatic reassignment to a lower category of threat (downlisting). Instead, the taxon should be re-evaluated against all the criteria to clarify its status. The factors responsible for qualifying the taxon against the criteria, especially where inference and projection are used, should be documented (see Annexes 2 and 3). The documentation requirements for other categories are also specified in Annex 3.

11. Threats and priorities

The category of threat is not necessarily sufficient to determine priorities for conservation action. The category of threat simply provides an assessment of the extinction risk under current circumstances, whereas a system for assessing priorities for action will include numerous other factors concerning conservation action such as costs, logistics, chances of success, and other biological characteristics of the subject.

12. Re-evaluation

Re-evaluation of taxa against the criteria should be carried out at appropriate intervals. This is especially important for taxa listed under Near Threatened, Data Deficient and for threatened taxa whose status is known or suspected to be deteriorating.

13. Transfer between categories

The following rules govern the movement of taxa between categories:

A. A taxon may be moved from a category of higher threat to a category of lower threat if none of the criteria of the higher category has been met for five years or more.

B. If the original classification is found to have been erroneous, the taxon may be transferred to the appropriate category or removed from the threatened categories altogether, without delay (but see Point 10 above).

C. Transfer from categories of lower to higher risk should be made without delay.

14. Use at regional level

The IUCN Red List Categories and Criteria were designed for global taxon assessments. However, many people are interested in applying them to subsets of global data, especially at regional, national or local

levels. To do this it is important to refer to guidelines prepared by the IUCN/SSC Regional Applications Working Group and the National Red List Working Group of the IUCN SSC Red List Committee (e.g. Gärdenfors *et al*. 2001; IUCN 2003, 2012). When applied at national or regional levels it must be recognized that a global category may not be the same as a national or regional category for a particular taxon. For example, taxa classified as Least Concern globally might be Critically Endangered within a particular region where numbers are very small or declining, perhaps only because they are at the margins of their global range. Conversely, taxa classified as Vulnerable on the basis of their global declines in numbers or range might be Least Concern within a particular region where their populations are stable. It is also important to note that taxa endemic to regions or nations will be assessed globally in any regional or national applications of the criteria, and in these cases great care must be taken to check that an assessment has not already been undertaken by a Red List Authority (RLA), and that the categorization is agreed with the relevant RLA (e.g. an SSC Specialist Group known to cover the taxon).

III. DEFINITIONS

1. Population and Population Size (Criteria A, C and D)

The term 'population' is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life forms, population size is measured as numbers of mature individuals only. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used.

2. Subpopulations (Criteria B and C)

Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).

3. Mature individuals (Criteria A, B, C and D)

The number of mature individuals is the number of individuals known, estimated or inferred to be capable of reproduction. When estimating this quantity, the following points should be borne in mind:

- Mature individuals that will never produce new recruits should not be counted (e.g. densities are too low for fertilization).
- In the case of populations with biased adult or breeding sex ratios, it is appropriate to use lower estimates for the number of mature individuals, which take this into account.
- Where the population size fluctuates, use a lower estimate. In most cases this will be much less than the mean.
- Reproducing units within a clone should be counted as individuals, except where such units are unable to survive alone (e.g. corals).
- In the case of taxa that naturally lose all or a subset of mature individuals at some point in their life cycle, the estimate should be made at the appropriate time, when mature individuals are available for breeding.
- Re-introduced individuals must have produced viable offspring before they are counted as mature individuals.

4. Generation (Criteria A, C and E)

Generation length is the average age of parents of the current cohort (i.e. newborn individuals in the population). Generation length therefore reflects the turnover rate of breeding individuals in a population. Generation length is greater than the age at first breeding and less than the

age of the oldest breeding individual, except in taxa that breed only once. Where generation length varies under threat, the more natural, i.e. pre-disturbance, generation length should be used.

5. Reduction (Criterion A)

A reduction is a decline in the number of mature individuals of at least the amount (%) stated under the criterion over the time period (years) specified, although the decline need not be continuing. A reduction should not be interpreted as part of a fluctuation unless there is good evidence for this. The downward phase of a fluctuation will not normally count as a reduction.

6. Continuing decline (Criteria B and C)

A continuing decline is a recent, current or projected future decline (which may be smooth, irregular or sporadic) which is liable to continue unless remedial measures are taken. Fluctuations will not normally count as continuing declines, but an observed decline should not be considered as a fluctuation unless there is evidence for this.

7. Extreme fluctuations (Criteria B and C)

Extreme fluctuations can be said to occur in a number of taxa when population size or distribution area varies widely, rapidly and frequently, typically with a variation greater than one order of magnitude (i.e. a tenfold increase or decrease).

8. Severely fragmented (Criterion B)

The phrase 'severely fragmented' refers to the situation in which increased extinction risk to the taxon results from the fact that most of its individuals are found in small and relatively isolated subpopulations (in certain circumstances this may be inferred from habitat information). These small subpopulations may go extinct, with a reduced probability of recolonization.

9. Extent of occurrence (Criteria A and B)

Extent of occurrence is defined as the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy (see Figure 2). This measure may exclude discontinuities or disjunctions within the overall distributions of taxa (e.g. large areas of obviously unsuitable habitat) (but see 'area of occupancy', point 10 below). Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal

angle exceeds 180 degrees and which contains all the sites of occurrence).

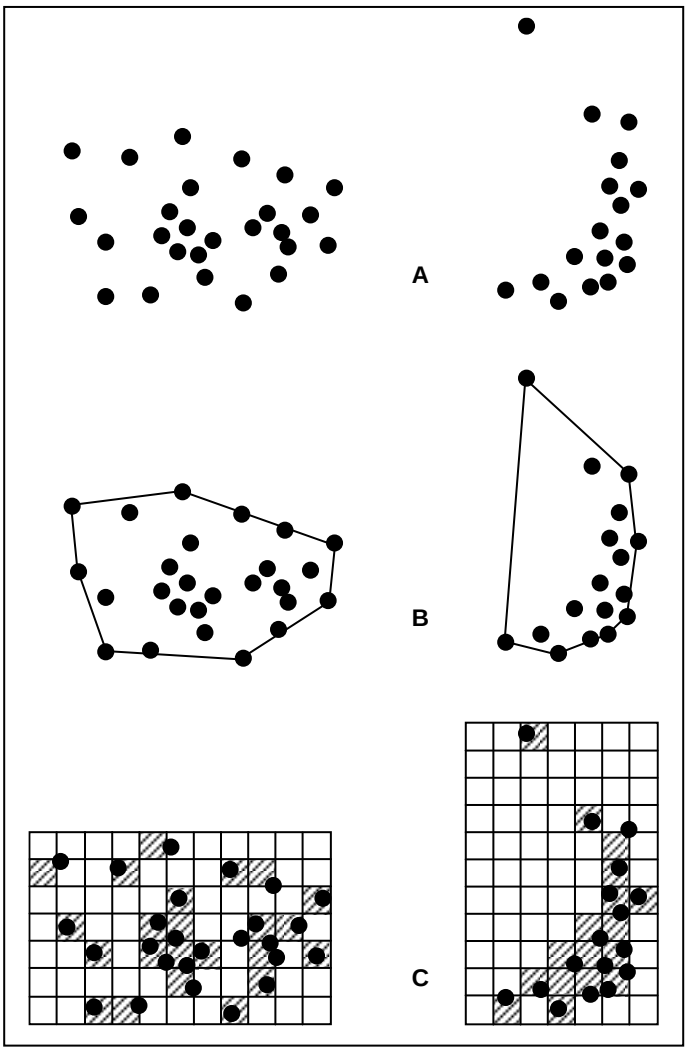

Figure 2. Two examples of the distinction between extent of occurrence and area of occupancy. (A) is the spatial distribution of known, inferred or projected sites of present occurrence. (B) shows one possible boundary to the extent of occurrence, which is the measured area within this boundary. (C) shows one measure of area of occupancy which can be achieved by the sum of the occupied grid squares.

10. Area of occupancy (Criteria A, B and D)

Area of occupancy is defined as the area within its 'extent of occurrence' (see point 9 above) which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases (e.g. irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of

threats and the available data (see point 7 in the Preamble). To avoid inconsistencies and bias in assessments caused by estimating area of occupancy at different scales, it may be necessary to standardize estimates by applying a scale-correction factor. It is difficult to give strict guidance on how standardization should be done because different types of taxa have different scale-area relationships.

11. Location (Criteria B and D)

The term 'location' defines a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat.

12. Quantitative analysis (Criterion E)

A quantitative analysis is defined here as any form of analysis which estimates the extinction probability of a taxon based on known life history, habitat requirements, threats and any specified management options. Population viability analysis (PVA) is one such technique. Quantitative analyses should make full use of all relevant available data. In a situation in which there is limited information, such data as are available can be used to provide an estimate of extinction risk (for instance, estimating the impact of stochastic events on habitat). In presenting the results of quantitative analyses, the assumptions (which must be appropriate and defensible), the data used and the uncertainty in the data or quantitative model must be documented.

IV. THE CATEGORIES [3]

A representation of the relationships between the categories is shown in Figure 1.

EXTINCT (EX)

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

EXTINCT IN THE WILD (EW)

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.

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[3] *Note: As in previous IUCN categories, the abbreviation of each category (in parenthesis) follows the English denominations when translated into other languages (see Annex 2).*

NEAR THREATENED (NT)

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)

A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

NOT EVALUATED (NE)

A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

V. THE CRITERIA FOR CRITICALLY ENDANGERED, ENDANGERED AND VULNERABLE

CRITICALLY ENDANGERED (CR)

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing an extremely high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥90% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
   (a) direct observation
   (b) an index of abundance appropriate to the taxon
   (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
   (d) actual or potential levels of exploitation
   (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of ≥80% over the last 10 years or three generations, whichever is the longer**,** where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible**,** based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of ≥80%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of ≥80% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the

future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 100 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at only a single location.

   b. Continuing decline, observed, inferred or projected, in any of the following:
      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat
      (iv) number of locations or subpopulations
      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:
      (i) extent of occurrence
      (ii) area of occupancy
      (iii) number of locations or subpopulations
      (iv) number of mature individuals.

2. Area of occupancy estimated to be less than 10 km^2, and estimate indicating at least two of a-c:

   a. Severely fragmented or known to exist at only a single location.

   b. Continuing decline, observed, inferred or projected, in any of the following:
      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat
      (iv) number of locations or subpopulations
      (v) number of mature individuals.

c. Extreme fluctuations in any of the following:
   (i) extent of occurrence
   (ii) area of occupancy
   (iii) number of locations or subpopulations
   (iv) number of mature individuals.

C. Population size estimated to number fewer than 250 mature individuals and either:

1. An estimated continuing decline of at least 25% within three years or one generation, whichever is longer, (up to a maximum of 100 years in the future) OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

   a. Population structure in the form of one of the following:
      (i) no subpopulation estimated to contain more than 50 mature individuals, OR
      (ii) at least 90% of mature individuals in one subpopulation.

   b. Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 50 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 50% within 10 years or three generations, whichever is the longer (up to a maximum of 100 years).

ENDANGERED (EN)

A taxon is Endangered when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a very high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥70% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and

specifying) any of the following:

(a) direct observation
(b) an index of abundance appropriate to the taxon
(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
(d) actual or potential levels of exploitation
(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of ≥50% over the last 10 years or three generations, whichever is the longer**,** where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of ≥50%, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of ≥50% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, AND where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 5,000 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at no more than five locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:
      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat

(iv) number of locations or subpopulations
(v) number of mature individuals.

c. Extreme fluctuations in any of the following:
(i) extent of occurrence
(ii) area of occupancy
(iii) number of locations or subpopulations
(iv) number of mature individuals.

2. Area of occupancy estimated to be less than 500 km^2, and estimates indicating at least two of a-c:

a. Severely fragmented or known to exist at no more than five locations.

b. Continuing decline, observed, inferred or projected, in any of the following:
(i) extent of occurrence
(ii) area of occupancy
(iii) area, extent and/or quality of habitat
(iv) number of locations or subpopulations
(v) number of mature individuals.

b. Extreme fluctuations in any of the following:
(i) extent of occurrence
(ii) area of occupancy
(iii) number of locations or subpopulations
(iv) number of mature individuals.

C. Population size estimated to number fewer than 2,500 mature individuals and either:

1. An estimated continuing decline of at least 20% within five years or two generations, whichever is longer, (up to a maximum of 100 years in the future) OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

a. Population structure in the form of one of the following:
(i) no subpopulation estimated to contain more than 250 mature individuals, OR

(ii) at least 95% of mature individuals in one subpopulation.

b. Extreme fluctuations in number of mature individuals.

D. Population size estimated to number fewer than 250 mature individuals.

E. Quantitative analysis showing the probability of extinction in the wild is at least 20% within 20 years or five generations, whichever is the longer (up to a maximum of 100 years).

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the following criteria (A to E), and it is therefore considered to be facing a high risk of extinction in the wild:

A. Reduction in population size based on any of the following:

1. An observed, estimated, inferred or suspected population size reduction of ≥50% over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
   (a) direct observation
   (b) an index of abundance appropriate to the taxon
   (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
   (d) actual or potential levels of exploitation
   (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

2. An observed, estimated, inferred or suspected population size reduction of ≥30% over the last 10 years or three generations, whichever is the longer**,** where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

3. A population size reduction of ≥30% projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.

4. An observed, estimated, inferred, projected or suspected population size reduction of ≥30% over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, AND where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy) OR both:

1. Extent of occurrence estimated to be less than 20,000 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at no more than 10 locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:
      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat
      (iv) number of locations or subpopulations
      (v) number of mature individuals.

   c. Extreme fluctuations in any of the following:
      (i) extent of occurrence
      (ii) area of occupancy
      (iii) number of locations or subpopulations
      (iv) number of mature individuals.

2. Area of occupancy estimated to be less than 2,000 km^2, and estimates indicating at least two of a-c:

   a. Severely fragmented or known to exist at no more than 10 locations.

   b. Continuing decline, observed, inferred or projected, in any of the following:
      (i) extent of occurrence
      (ii) area of occupancy
      (iii) area, extent and/or quality of habitat

(iv) number of locations or subpopulations
(v) number of mature individuals.

c. Extreme fluctuations in any of the following:
(i) extent of occurrence
(ii) area of occupancy
(iii) number of locations or subpopulations
(iv) number of mature individuals.

C. Population size estimated to number fewer than 10,000 mature individuals and either:

1. An estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, (up to a maximum of 100 years in the future) OR

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

a. Population structure in the form of one of the following:
(i) no subpopulation estimated to contain more than 1,000 mature individuals, OR
(ii) all mature individuals in one subpopulation.

b. Extreme fluctuations in number of mature individuals.

D. Population very small or restricted in the form of either of the following:

1. Population size estimated to number fewer than 1,000 mature individuals.

2. Population with a very restricted area of occupancy (typically less than 20 km^2) or number of locations (typically five or fewer) such that it is prone to the effects of human activities or stochastic events within a very short time period in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period.

E. Quantitative analysis showing the probability of extinction in the wild is at least 10% within 100 years.

Annex 1: Uncertainty

The Red List Criteria should be applied to a taxon based on the available evidence concerning its numbers, trend and distribution. In cases where there are evident threats to a taxon through, for example, deterioration of its only known habitat, a threatened listing may be justified, even though there may be little direct information on the biological status of the taxon itself. In all these instances there are uncertainties associated with the available information and how it was obtained. These uncertainties may be categorized as natural variability, semantic uncertainty and measurement error (Akçakaya *et al*. 2000). This section provides guidance on how to recognize and deal with these uncertainties when using the criteria. More information is available in the *Guidelines for Using the IUCN Red List Categories and Criteria* (downloadable from www.iucnredlist.org/documents/RedListGuidelines.pdf; check the IUCN Red List website for regular updates of this document).

Natural variability results from the fact that species' life histories and the environments in which they live change over time and space. The effect of this variation on the criteria is limited, because each parameter refers to a specific time or spatial scale. Semantic uncertainty arises from vagueness in the definition of terms or lack of consistency in different assessors' usage of them. Despite attempts to make the definitions of the terms used in the criteria exact, in some cases this is not possible without the loss of generality. Measurement error is often the largest source of uncertainty; it arises from the lack of precise information about the parameters used in the criteria. This may be due to inaccuracies in estimating the values or a lack of knowledge. Measurement error may be reduced or eliminated by acquiring additional data. For further details, see Akçakaya *et al*. (2000) and Burgman *et al*. (1999).

One of the simplest ways to represent uncertainty is to specify a best estimate and a range of plausible values. The best estimate itself might be a range, but in any case the best estimate should always be included in the range of plausible values. When data are very uncertain, the range for the best estimate might be the range of plausible values. There are various methods that can be used to establish the plausible range. It may be based on confidence intervals, the opinion of a single expert, or the consensus opinion of a group of experts. Whichever method is used should be stated and justified in the documentation.

When interpreting and using uncertain data, attitudes toward risk and uncertainty may play an important role. Attitudes have two components. First, assessors need to consider whether they will include the full range of plausible values in assessments, or whether they will exclude extreme values from consideration (known as dispute tolerance). An assessor with a low dispute tolerance would include all values, thereby increasing the uncertainty, whereas an assessor with a high dispute tolerance would exclude extremes, reducing the uncertainty. Second, assessors need to consider whether they have a precautionary or evidentiary attitude to risk (known as risk tolerance). A precautionary attitude will classify a taxon as threatened unless it is certain that it is not threatened, whereas an evidentiary attitude will classify a taxon as threatened only when there is strong evidence to support a threatened classification. Assessors should resist an evidentiary attitude and adopt a precautionary but realistic attitude to uncertainty when applying the criteria, for example, by using plausible lower bounds, rather than best estimates, in determining population size, especially if it is fluctuating. All attitudes should be explicitly documented.

An assessment using a point estimate (i.e. single numerical value) will lead to a single Red List Category. However, when a plausible range for each parameter is used to evaluate the criteria, a range of categories may be obtained, reflecting the uncertainties in the data. A single category, based on a specific attitude to uncertainty, should always be listed along with the criteria met, while the range of plausible categories should be indicated in the documentation (see Annex 3).

Where data are so uncertain that any category is plausible, the category of 'Data Deficient' should be assigned. However, it is important to recognize that this category indicates that the data are inadequate to determine the degree of threat faced by a taxon, not necessarily that the taxon is poorly known or indeed not threatened. Although Data Deficient is not a threatened category, it indicates a need to obtain more information on a taxon to determine the appropriate listing; moreover, it requires documentation with whatever available information exists.

Annex 2: Citation of the IUCN Red List Categories and Criteria

In order to promote the use of a standard format for citing the Red List Categories and Criteria the following forms of citation are recommended:

1. The Red List Category may be written out in full or abbreviated as follows (when translated into other languages, the abbreviations should follow the English denominations):

Extinct, EX	Near Threatened, NT
Extinct in the Wild, EW	Least Concern, LC
Critically Endangered, CR	Data Deficient, DD
Endangered, EN	Not Evaluated, NE
Vulnerable, VU	

2. Under Section V (the criteria for Critically Endangered, Endangered and Vulnerable) there is a hierarchical alphanumeric numbering system of criteria and subcriteria. These criteria and subcriteria (all three levels) form an integral part of the Red List assessment and all those that result in the assignment of a threatened category must be specified after the category. Under the criteria A to C, and D under Vulnerable, the first level of the hierarchy is indicated by the use of numbers (1-4) and if more than one is met, they are separated by means of the '+' symbol. The second level is indicated by the use of the lower-case alphabet characters (a-e). These are listed without any punctuation. A third level of the hierarchy under criteria B and C involves the use of lower case roman numerals (i-v). These are placed in parentheses (with no space between the preceding alphabet character and start of the parenthesis) and separated by the use of commas if more than one is listed. Where more than one criterion is met, they should be separated by semicolons. The following are examples of such usage:

EX	CR D
EN B1ac(i,ii,iii)	VU C2a(ii)
CR A2c+3c; B1ab(iii)	EN B2b(iii)c(ii)
EN B2ab(i,ii,iii)	VU B1ab(iii)+2ab(iii)
EN A1c; B1ab(iii); C2a(i)	VU A2c+3c
EN B1ab(i)c(ii,v)+2ab(i)c(ii,v)	CR C1+2a(ii)
CR A1cd	VU D1+2
EN A2c; D	VU D2

EN A2abc+3bc+4abc; B1b(iii,iv,v)c(ii,iii,iv)+2b(iii,iv,v)c(ii,iii,iv)

Annex 3: Required and Recommended Supporting Information for IUCN Red List Assessments

All assessments published on the IUCN Red List are freely available for public use. To ensure assessments are fully justified and to allow Red List assessment data to be analysed, thus making the IUCN Red List a powerful tool for conservation and policy decisions, a set of supporting information is required to accompany every assessment submitted for publication on the *IUCN Red List of Threatened Species*™.

The reference document *Documentation Standards and Consistency Checks for IUCN Red List Assessments and Species Accounts* is available to download from the Red List website (www.iucnredlist.org) and provides guidance on the following:

- Required supporting information for all IUCN Red List assessments.
- Required supporting information under specific conditions (e.g. taxa assessed under specific Red List Categories or Criteria, plant assessments, reassessed taxa, etc.).
- Recommended supporting information, if sufficient time and data are available.
- Tools available for preparing and submitting assessments for the IUCN Red List, including the IUCN Species Information Service (SIS) and RAMAS® Red List (Akçakaya and Ferson 2001).
- General formatting and style guidelines for documenting IUCN Red List assessments.

Note that the *Documentation Standards and Consistency Checks for IUCN Red List Assessments and Species Accounts* will be updated on a regular basis. Users should check the IUCN Red List website for the most current version of this reference document.

Annex 4: Summary of the IUCN Red List Criteria

See pages 28-29 for a summary of the five criteria (A-E) used to evaluate if a taxon belongs in an IUCN Red List threatened category (Critically Endangered, Endangered or Vulnerable).

SUMMARY OF THE FIVE CRITERIA (A-E) USED TO EVALUATE IF A TAXON BELONGS IN AN IUCN RED LIST THREATENED CATEGORY (CRITICALLY ENDANGERED, ENDANGERED OR VULNERABLE).[1]

A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered	Endangered	Vulnerable
A1	**≥ 90%**	**≥ 70%**	**≥ 50%**
A2, A3 &A4	**≥ 80%**	**≥ 50%**	**≥ 30%**

A1	Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND have ceased.	based on any of the following: (a) direct observation [*except A3*] (b) an index of abundance appropriate to the taxon (c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality (d) actual or potential levels of exploitation (e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites
A2	Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.	
A3	Population reduction projected, inferred or suspected to be met in the future (up to a maximum of 100 years). *[(a) cannot be used for A3]*	
A4	An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.	

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)

	Critically Endangered	Endangered	Vulnerable
B1. Extent of occurrence (EOO)	< 100 km²	< 5 000 km²	< 20 000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2 000 km²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented **OR** Number of locations	= 1	≤ 5	≤ 10

(b) Continuing decline observed, estimated, inferred or projected in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals

(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals

C. Small population size and decline

	Critically Endangered	Endangered	Vulnerable
Number of mature individuals	< 250	< 2 500	< 10 000
AND at least one of C1 or C2:			
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)

	longer)		
C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions:			
(a) **(i)** Number of mature individuals in each subpopulation:	≤ 50	≤ 250	≤ 1,000
(ii) % of mature individuals in one subpopulation =	90-100 %	95-100%	100%
(b) Extreme fluctuations in the number of mature individuals			
D. Very small or restricted population			
	Critically Endangered	**Endangered**	**Vulnerable**
D. Number of mature individuals	< 50	< 250	< 1 000
D2. *Only applies to the VU category* Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	-	-	**D2.** typically: AOO < 20 km² or number of locations ≤ 5
E. Quantitative Analysis			
	Critically Endangered	**Endangered**	**Vulnerable**
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

1 Use of this summary sheet requires full understanding of the IUCN Red List Categories and Criteria and Guidelines for Using the IUCN Red List Categories and Criteria. Please refer to both documents for explanations of terms and concepts used here.

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Annex 5: Guidelines for Using The IUCN Red List Categories and Criteria

Guidelines for Using the IUCN Red List
Categories and Criteria

Version 12
(February 2016)

Prepared by the Standards and Petitions Subcommittee of the IUCN Species Survival Commission.

Citation: IUCN Standards and Petitions Subcommittee. 2016. Guidelines for Using the IUCN Red List Categories and Criteria. Version 12. Prepared by the Standards and Petitions Subcommittee. Downloadable from http://www.iucnredlist.org/documents/RedListGuidelines.pdf.

Contents

Introduction

The IUCN Red List Categories and Criteria were first published in 1994 following six years of research and broad consultation (IUCN 1994). The 1994 IUCN Categories and Criteria were developed to improve objectivity and transparency in assessing the conservation status of species, and therefore to improve consistency and understanding among users. The 1994 categories and criteria were applied to a large number of species in compiling the 1996 Red List of Threatened Animals. The assessment of many species for the 1996 Red List drew attention to certain areas of difficulty, which led IUCN to initiate a review of the 1994 categories and criteria, which was undertaken during 1998 to 1999. This review was completed and the IUCN Red List Categories and Criteria (version 3.1) are now published (IUCN 2001, 2012b).

This document provides guidelines to the application of version 3.1 of the categories and criteria, and in so doing addresses many of the issues raised in the process of reviewing the 1994 categories and criteria. This document explains how the criteria should be applied to determine whether a taxon belongs in a category of threat, and gives examples from different taxonomic groups to illustrate the application of the criteria. These guidelines also provide detailed explanations of the definitions of the many terms used in the criteria. The guidelines should be used in conjunction with the official IUCN Red List Categories and Criteria booklet (IUCN 2001, 2012b).

We expect to review and update these guidelines periodically, and input from all users of the IUCN Red List Categories and Criteria are welcome. We especially welcome IUCN Specialist Groups and Red List Authorities to submit examples that are illustrative of these guidelines. We expect that the changes to these guidelines will be mostly additions of detail and not changes in substance. In addition, we do not expect the IUCN Red List Criteria to be revised in the near future, because a stable system is necessary to allow comparisons over time.

An Outline of the Red List Categories and Criteria

Taxonomic level and scope of the categorization process

Taxonomic scale of categorization

The criteria may be applied to any taxonomic unit at or below the species level. In these guidelines, the terms '*taxon*' and 'taxa' are used to represent species or lower taxonomic levels, including forms that are not yet fully described. There is sufficient range among the different criteria to enable appropriate listing of taxa from the complete taxonomic spectrum, with the exception of micro-organisms. In presenting the results of applying criteria, the taxonomic unit used (species, subspecies, etc.) should be specified. It should be noted that taxa below the rank of variety (e.g., forma, morph, cultivar), are NOT included on the IUCN Red List, with the exception of assessments of subpopulations. Before assessments of taxa below the species level (subspecies, variety or subpopulation) can be included on the IUCN Red List, an assessment of the full species is also required.

Subpopulations: If a subpopulation assessed under the criteria is not isolated (i.e., if it may be exchanging individuals with other subpopulations), its assessments must follow the regional guidelines (IUCN 2003, 2012a). In addition, it must be a biological subpopulation (i.e., not defined by political or national boundaries). Although the regional guidelines can in principle be applied at any geographical scale, application within very small geographical areas is strongly discouraged. The smaller the subpopulation as a proportion of the global population of the species, the more often the subpopulation will exchange individuals with other subpopulations. Therefore the assessment of extinction risk based on the criteria would become more unreliable (IUCN 2003, 2012a). See also *Geographical scale of categorization* below.

Newly described species: The inclusion of newly described species on the IUCN Red List is addressed on a case-by-case basis. The designated IUCN Red List Authority and/or IUCN Global Species Programme staff (including staff from partner institutions working on Global Species Assessment projects) will consult with relevant experts to ascertain how widely accepted these are.

Undescribed species: The listing of undescribed species on the IUCN Red List is discouraged, but in exceptional circumstances these may be included. There must be a clear conservation benefit to justify the inclusion of such listings, or in the case of projects to completely assess a taxonomic group, undescribed species that are listed as Least Concern (LC) or Data Deficient (DD) may only be included if there is clear evidence that work is underway to describe the species concerned and that the new species will be widely accepted. The new species description should be published within four years of an undescribed species being included on the IUCN Red List; if it is not published or is not in press after that time, the assessment will be removed. For an undescribed species to be included on the IUCN Red List the following conditions must be met:

- There must be general agreement that the undescribed form is a clearly circumscribed species
- There must be a clear indication that work is underway to describe the species (e.g., a draft manuscript in preparation or a paper with the new description already submitted for publication)
- Clear distribution information must be provided
- Listing the undescribed species will potentially aid in its conservation
- Specimen reference numbers (voucher collection details) must be provided to enable the species to be traced without confusion
- The museum, herbarium or other institution holding the collection/s and the individual/s responsible for the proposal must be identified
- Undescribed species sometimes have a local common name, if so this should be provided, but if not a recognizable common name should be coined, so that it can be used to clearly indicate the identity of this taxon without any implication about scientific validity.

Undescribed species are presented on the IUCN Red List by using the generic name and the abbreviation sp. or sp. nov., sometimes followed by a provisional name in inverted commas (e.g., *Philautus* sp. nov. 'Kalpatta'). Voucher collection details

(collector's name, specimen number and institution where housed) must be provided so that they can be cited under the Taxonomic Notes section of the species' account on the Red List web site. Instances may arise where there are valid reasons for voucher collection details to be withheld. If this is clearly indicated and justified by the assessor(s) concerned, the voucher information will be suppressed from the public version of the species account. However, in such cases the voucher information must still be supplied in order for the assessment to be accepted, and this information will be held in confidence.

Undescribed species assessed as Least Concern (LC) or Data Deficient (DD) are not included on the IUCN Red List as there is little conservation benefit to such listings.

Undescribed infraspecific taxa are not included on the IUCN Red List.

In summary, assessments of the following taxa may be included on the IUCN Red List

- Species
- Subspecies
- Varieties (only for plants)
- Subpopulations (provided certain conditions as described above are met)
- Undescribed species (provided certain conditions as described above are met, and they are not listed as LC or DD)

Assessments of the following taxa may NOT be included on the IUCN Red List

- Taxa assessed locally, nationally or regionally are not considered for inclusion on the IUCN Red List unless they are global or subpopulation assessments (see "*Subpopulation*" above, and section 2.1.2)
- Hybrids (except for apomictic plant hybrids which are treated as 'species')
- Infraspecific ranks such as formas, morphs, subvarieties, varieties of subspecies, cultivars, etc.
- Domesticated taxa (in the case where a taxon comprises both domesticated and wild individuals, only the wild population may be assessed and included; feral animals derived from a domesticated source should not be included)
- Taxa known to have gone Extinct before 1500 AD
- Undescribed species assessed as Data Deficient or Least Concern (except in the case of complete global assessments for a taxonomic group, see above)
- Undescribed infraspecific taxa
- Assessments of higher taxa (i.e., above the species level).

Geographical scale of categorization

The IUCN criteria are designed for global taxon assessments. However many people are interested in applying them to subsets of global data, especially at regional, national or local levels. To do this it is important to refer to guidelines prepared by the IUCN SSC Regional Applications Working Group (e.g., Gardenfors *et al.* 2001; IUCN 2003, 2012a; Miller *et al*. 2007). When applied at national or regional levels it must be recognized that a global category may not be the same as a national or regional category for a particular taxon. For example, taxa classified as Least

Concern globally might be Critically Endangered within a particular region where numbers are very small or declining, perhaps only because they are at the margins of their global range. Conversely, taxa classified as Vulnerable on the basis of their global declines in numbers or range might, within a particular region where their populations are stable, not even nearly meet the criteria for Vulnerable, i.e. be Least Concern. Although this appears illogical, it is a result of the structure of the criteria. When such a situation occurs, interactions among sub-units should be carefully considered when planning conservation actions.

Although the criteria (along with regional guidelines; IUCN 2012a) may be applied at any geographical scale, application within very restricted geographical areas is strongly discouraged (IUCN 2012a). In a small region, a wide-ranging taxon will frequently exchange individuals with neighbouring regions, leading to unreliable assessments (IUCN 2012a).

It is also important to note that in any regional or national applications of the criteria, an assessment of taxa endemic to that region or nation will be a global assessment; in these cases great care must be taken to check that a global assessment has not already been undertaken by an IUCN SSC Red List Authority (RLA), and that the final categorization is agreed with the relevant RLA; see the regional guidelines for more details (IUCN 2003, 2012a).

Introduced taxa and subpopulations

In addition to wild subpopulations (see section 2.1.4) inside the natural range of a taxon, the categorization process should also be applied to wild subpopulations resulting from introductions outside the natural range, if all of the following conditions are met:

(a) The known or likely intent of the introduction was to reduce the extinction risk of the taxon being introduced. In cases where the intent is unclear, the assessors should weigh the available evidence to determine the most likely intent.
(b) The introduced subpopulation is geographically close to the natural range of the taxon. What is considered to be geographically close enough should be determined by the assessor, considering factors such as the area of the natural range, the nature of the landscape separating the natural and the introduced range, and whether the taxon could have dispersed to the introduced range without the effects of human impacts such as habitat loss and fragmentation. For example, an introduced subpopulation in a continent distant from the natural range would not qualify. On the other hand, most introduced subpopulations within the same ecoregion as the natural range would qualify.
(c) The introduced subpopulation has produced viable offspring.
(d) At least five years have passed since the introduction.

In cases where such introduced subpopulations are included in the assessment, assessors must state and justify their inclusion in the assessment supporting documentation.

In some cases, taxa have successfully expanded their natural ranges into urban or semi-urban areas, e.g., primates, foxes and some birds. In these instances urban areas

should be considered as part of the natural range, as the taxa have not been introduced.

In addition to taxa within their natural range and subpopulations resulting from introductions outside the taxon's natural range that conform to the conditions above (also referred to as "benign introductions"), the criteria should also be applied to self-sustaining translocated or re-introduced subpopulations (within the taxon's natural range), regardless of the original goal of such translocations or re-introductions. In such cases, the listing should indicate whether all or part of the assessed population has been introduced.

Managed subpopulations

The IUCN Red List assessment should only be applied to wild populations. There is a continuum of management intensities, from captive populations in zoos, aquaria and botanical gardens to populations not benefiting from any conservation measure. Clearly, captive populations are not considered "wild" and would be excluded from a Red List assessment (i.e., data from such populations are not considered in determining the species' status, except for EW). On the other hand, subpopulations of many species are dependent on conservation measures (such as protected areas) that are largely directed at mitigating human impacts. Such subpopulations are generally considered "wild", and the data from such subpopulations are used in Red List assessments. In between these are subpopulations that are managed at moderate levels of intensity (Redford *et al.* 2011). For these subpopulations, the definition of "wild" may be based on the intensity of management, and the expected viability of the subpopulation without the management.

Subpopulations dependent on direct intervention are not considered wild, if they would go extinct within 10 years without "intensive" management such as

- Providing most of the food needs of most individuals in the subpopulation;
- Regularly supplementing the population from captive stock to prevent imminent extinction;
- Breeding manipulations, such as cross-fostering and down-brooding (i.e., removing extra chicks from large broods and giving to foster parents);
- Providing ongoing intensive veterinary care to most individuals.

Managed subpopulations are considered wild if the management is for counter-acting the effects of human threats, such as

- Protected areas;
- Anti-poaching patrols;
- Providing artificial shelters (e.g., nest boxes for birds, roosting sites for bats);
- Providing preventative treatments against disease outbreaks;
- Preventing natural vegetation succession in order to maintain the species' habitat;
- Translocating individuals between existing subpopulations (also see section 2.1.3);
- Control measures against non-native competitors or predators, including the establishment of exclusion fences, such as those used to keep out invasive predators;

- Control measures against native competitors or predators if such species have increased because of human activities (e.g., removing cowbird which have increased because of habitat fragmentation);
- Occasionally supplementing the population from captive stock to increase genetic variability.

This delineation of "wild" from "not wild" roughly corresponds to the difference between "lightly managed species" and "intensively managed species" as defined by Redford et al. (2011).

Nature of the categories

There are nine clearly defined categories into which every taxon in the world (excluding micro-organisms) can be classified (Figure 2.1). Complete definitions of the categories are given in Box 2.1. The first two categories in Figure 2.1 are relatively self-explanatory. **Extinct** means that there is no reasonable doubt that the last individual has died. **Extinct in the Wild** means that the taxon is extinct in its natural habitat (see Introduced taxa above). The following three categories, **Critically Endangered, Endangered** and **Vulnerable**, are assigned to taxa on the basis of quantitative criteria that are designed to reflect varying degrees of threat of extinction; taxa in any of these three categories are collectively referred to as ‘threatened’. These criteria will be discussed further in the next section. The category **Near Threatened** is applied to taxa that do not qualify as threatened now, but may be close to qualifying as threatened, and to taxa that do not currently meet the criteria for a threatened category, but are likely to do so if ongoing conservation actions abate or cease.

The category **Least Concern** is applied to taxa that do not qualify (and are not close to qualifying) as threatened or Near Threatened. It is important to emphasize that "least concern" simply means that, in terms of extinction risk, these species are of lesser concern than species in other threat categories. It does not imply that these species are of no conservation concern.

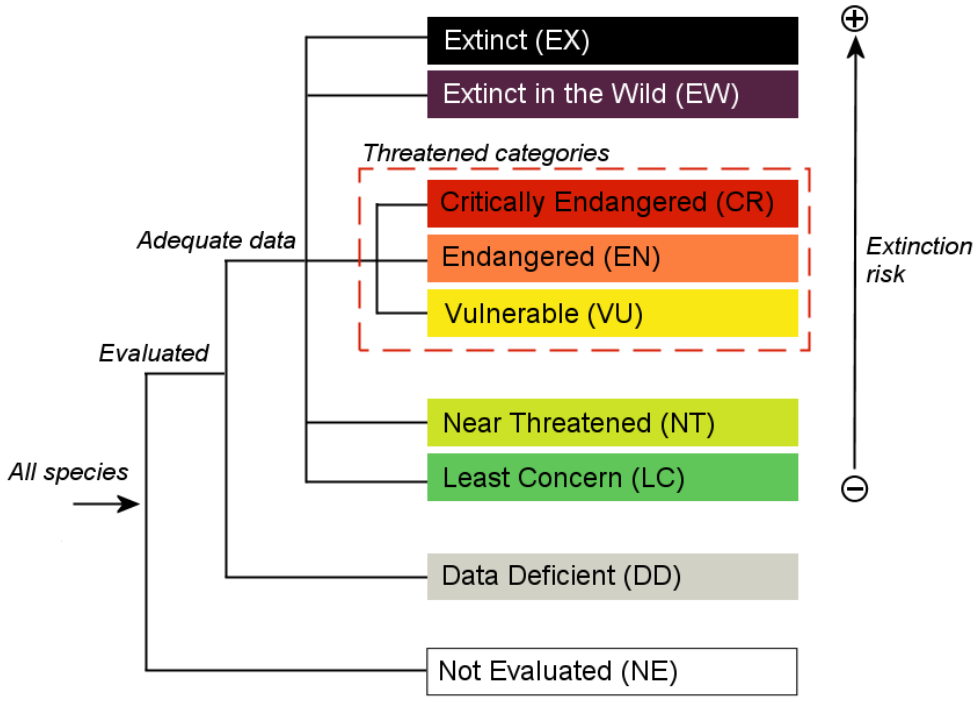

Figure 2.1. Structure of the IUCN Red List Categories

Box 2.1. **The IUCN Red List Categories**

EXTINCT (EX)
A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycles and life form.

EXTINCT IN THE WILD (EW)
A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

CRITICALLY ENDANGERED (CR)
A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.

ENDANGERED (EN)
A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.

VULNERABLE (VU)
A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

NEAR THREATENED (NT)
A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

LEAST CONCERN (LC)
A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

DATA DEFICIENT (DD)
A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, if a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

NOT EVALUATED (NE)
A taxon is Not Evaluated when it is has not yet been evaluated against the criteria.

The remaining two categories do not reflect the threat status of taxa. The category **Data Deficient** highlights taxa for which sufficient information is lacking to make a

sound status assessment. The inclination to assess taxa as Data Deficient may be very strong; it should be emphasized that assessors must use all data available in full when making a Red List assessment. Precise information on scarce taxa is usually lacking, and although the criteria are highly quantitative and defined, one can use projections, assumptions and inferences (as long as they are explicitly stated and clearly justified) in order to place a taxon in the appropriate category. Since Data Deficient is not a category of threat, taxa placed in this category may not be so obviously targets for conservation action, although their needs might be very great. Assessors should use whatever information is available and relevant to make assessments and place taxa into the Data Deficient category only when there is really no alternative. Guidance on handling uncertainty is especially relevant in the case of poorly known taxa (see section 3.2). The category **Not Evaluated** applies to taxa that have not yet been evaluated against the Red List Criteria.

The term "red-listed" is not defined in IUCN (2001), and is not used in this document owing to ambiguity as to whether this includes Least Concern species or not, given that species assessed as Least Concern are included on the IUCN Red List. To refer to species that have assessments on the IUCN Red List, the phrase "assessed for the IUCN Red List" can be used. To refer to species that are Extinct in the Wild, threatened and Near Threatened (i.e. EW, CR, EN, VU, NT), the phrase "species of elevated conservation concern" may be used.

Transfer between categories

The following rules govern the movement of taxa between categories:

A. A taxon may be moved from a category of higher threat to a category of lower threat if and when none of the criteria of the higher category has been met for five years or more (i.e., if the taxon has qualified for a lower threat category for at least five years, regardless of when the previous assessment was published). Thus, the 5-year period commences when the data show that the taxon no longer meets the criteria for the category in which it is currently listed; this is not necessarily the date of the previous assessment. If it is not possible to identify the year in which the taxon qualified for the lower threat category, then the current assessment year is used as the start of the 5-year period. However, if the taxon is being moved from EW as a result of the establishment of a re-introduced population, this period must be five years or until viable offspring are produced, whichever is the longer.

B. If the original classification is found to have been erroneous, the taxon may be transferred to the appropriate category or removed from the threatened categories altogether, without delay. However, in this case, the taxon should be re-evaluated against all the criteria to clarify its status.

C. Transfer from categories of lower to higher risk should be made without delay.

D. The reason for a transfer between categories must be documented as one of the following:

Genuine (recent). The change in category is the result of a genuine status change that has taken place since the previous assessment. For example, the change is due to an increase in the rate of decline, a decrease in population or range size or habitat, or declines in these for the first time (owing to increasing/new threats) and therefore new thresholds are met relating to the IUCN Red List Criteria.

Genuine (since first assessment). This applies to taxa assessed at least three times, and is used to assign genuine category changes to the appropriate time period in order to calculate the Red List Index. The change in category is the result of a genuine status change that took place prior to the last assessment, but since the first assessment and that has only just been detected owing to new information or new documentation. If this new information had been available earlier, the new category would have been assigned during the previous assessment(s). When this code is used, the appropriate time period (between previous assessments) in which the status change occurred needs to be indicated. [See example below]

Criteria revision. The change in category is the result of the revision of the IUCN Red List Criteria (e.g., 1994 v. 2001 versions). These largely relate to criteria A2, A3, A4, D2 and the removal of the 'Conservation Dependent' category.

New information. The change in category is the result of better knowledge about the taxon, e.g. owing to new or newly synthesized information about the status of the taxon (e.g., better estimates for population size, range size or rate of decline).

Taxonomy. The new category is different from the previous owing to a taxonomic change adopted during the period since the previous assessment. Such changes include: *newly split* (the taxon is newly elevated to species level), *newly described* (the taxon is newly described as a species), *newly lumped* (the taxon is recognized following lumping of two previously recognized taxa) and *no longer valid/recognized* (either the taxon is no longer valid e.g. because it is now considered to be a hybrid or variant, form or subspecies of another species, or the previously recognized taxon differs from a currently recognized one as a result of a split or lump).

Mistake. The previous category was applied in error because the assessor(s) misunderstood the IUCN Red List Criteria.

Incorrect data. The previous category was applied in error because incorrect data were used (e.g., the data referred to a different taxon).

Other. The change in category is the result of other reasons not easily covered by the above, and/or requires further explanation. Examples include change in assessor's attitude to risk and uncertainty (as defined in section 3.2.3) and changes in this guidelines document.

Determining the appropriate reason for change often requires careful consideration. Many category changes result from a combination of improved knowledge and some element of genuine deterioration or improvement in status. In such cases, "genuine" should only be assigned if the amount of genuine change (e.g., population size change, decline rate change, range size change, etc.) is sufficient on its own to cross

the relevant Red List Category threshold. Genuine and non-genuine reasons for change should never be coded at the same time.

> e.g. Species A previously qualified as Endangered (D) with a population estimated to be 150 individuals; it is reassessed as Vulnerable (D1) because its population is now estimated to number 400 individuals; the new estimate is partly a result of the discovery of a new stable subpopulation numbering 50 individuals, and partly because the previously known subpopulation increased from 150 to 350 individuals. The genuine increase is sufficient to have taken the total population over the threshold for Vulnerable, so the category change is coded as Genuine (recent), and Knowledge should not be coded in this case.

> e.g. Species B previously qualified as Endangered (D) with a population estimated to be 150 individuals; it is reassessed as Vulnerable (D1) because its population is now estimated to number 400 individuals; the new estimate is partly a result of the discovery of a new stable subpopulation numbering 200 individuals, and partly because the previously known subpopulation increased from 150 to 200 individuals. The genuine increase in this case is insufficient to have taken the total population over the threshold for Vulnerable, (it should have qualified as Vulnerable in the previous assessment also) so the category change is coded as Knowledge, and Genuine should not be coded in this case.

In cases where a category change results from a combination of taxonomic splitting and genuine change, the change should be coded as Genuine (recent).

> e.g. Species C previously qualified as Vulnerable(D1) with a total population estimated to number 600 individuals. It is then split into species D (540 individuals and stable) and species E (now only 40 individuals, having declined from 60 individuals in the previous assessment). This category change for species E (previously 'Not Recognized' but now Critically Endangered C1) should be coded as Genuine (recent). [Species D would be classified as Vulnerable (D), with "Taxonomy (newly split)"as its reason for change.]

All Genuine (recent) or Genuine (since first assessment) category changes should be supported with appropriate notes to justify why the change is coded as genuine.

> e.g. Mauritius Kestrel *Falco punctatus* was downlisted from CR in 1988 to EN in 1994; this was coded as Genuine (recent) with the note: "Population increased from eight pairs in 1987–1988 to 56–68 pairs in 1994 as a result of a ban on hunting".

> e.g. Montserrat Oriole *Icterus oberi* was uplisted from NT in 1994 to CR in 2000; this was coded as Genuine (recent) with the note: "In the early 1990s, this species occurred throughout the three main forested hill ranges on the island, but volcanic eruptions in 1995-1997 destroyed two-thirds of remaining habitat. Recent evidence suggests that the decline may now have halted, and the population is estimated at c.100-400 pairs".

> e.g. Ethiopian Bush-crow *Zavattariornis stresemanni* was uplisted from Vulnerable to Endangered in 2005. This category change was coded as Genuine (since first assessment), with the genuine change assigned to the 1994–2000 period, and the note "Encounter rates declined 80% between 1989 and 2003. Assuming declines began in 1989, the cumulative decline would have exceeded 50% over 10 years for the first time during the period 1994-2000".

Nature of the criteria

There are five quantitative criteria which are used to determine whether a taxon is threatened or not, and if threatened, which category of threat it belongs in (Critically Endangered, Endangered or Vulnerable) (Table 2.1). These criteria are based around the biological indicators of populations that are threatened with extinction, such as rapid population decline or very small population size. Most of the criteria also include subcriteria that must be used to justify more specifically the listing of a taxon

under a particular category. For example, a taxon listed as "Vulnerable C2a(ii)" has been placed in the Vulnerable category because its population is fewer than 10,000 mature individuals (criterion C) and the population is undergoing a continuing decline and all its mature individuals are in one subpopulation (subcriterion a(ii) of criterion C2).

Table 2.1. Summary of the five criteria (A-E) used to evaluate if a taxon belongs in a threatened category (Critically Endangered, Endangered or Vulnerable).

A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered	**Endangered**	**Vulnerable**
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3 & A4	≥ 80%	≥ 50%	≥ 30%

A1 Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND have ceased.

A2 Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction projected, inferred or suspected to be met in the future (up to a maximum of 100 years) *[(a) cannot be used for A3]*.

A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

based on any of the following:

(a) direct observation *[except A3]*

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality

(d) actual or potential levels of exploitation

(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)			
	Critically Endangered	**Endangered**	**Vulnerable**
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented **OR** Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** area, extent and/or quality of habitat; **(iv)** number of locations or subpopulations; **(v)** number of mature individuals			
(c) Extreme fluctuations in any of: **(i)** extent of occurrence; **(ii)** area of occupancy; **(iii)** number of locations or subpopulations; **(iv)** number of mature individuals			

C. Small population size and decline			
	Critically Endangered	**Endangered**	**Vulnerable**
Number of mature individuals	< 250	< 2,500	< 10,000
AND at least one of C1 or C2			
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2. An observed, estimated, projected or inferred continuing decline AND at least 1 of the following 3 conditions:			
(a) **(i)** Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(ii) % of mature individuals in one subpopulation =	90–100%	95–100%	100%
(b) Extreme fluctuations in the number of mature individuals			

D. Very small or restricted population			
	Critically Endangered	**Endangered**	**Vulnerable**
D. Number of mature individuals	< 50	< 250	**D1.** < 1,000
D2. *Only applies to the VU category* Restricted area of occupancy or number of locations with a plausible future threat that could drive the taxon to CR or EX in a very short time.	-	-	**D2.** typically: AOO < 20 km² or number of locations ≤ 5

E. Quantitative Analysis			
	Critically Endangered	**Endangered**	**Vulnerable**
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

1 Use of this summary sheet requires full understanding of the *IUCN Red List Categories and Criteria* and *Guidelines for Using the IUCN Red List Categories and Criteria*. Please refer to both documents for explanations of terms and concepts used here.

The five criteria are:

A. Declining population (past, present and/or projected)
B. Geographic range size, and fragmentation, decline or fluctuations
C. Small population size and fragmentation, decline, or fluctuations
D. Very small population or very restricted distribution
E. Quantitative analysis of extinction risk (e.g., Population Viability Analysis)

To list a particular taxon in any of the categories of threat, only one of the criteria, A, B, C, D, or E needs to be met. However, a taxon should be assessed against as many criteria as available data permit, and the listing should be annotated by as many criteria as are applicable for a specific category of threat. For example, Critically Endangered: A2cd; B1ab(iv,v); C2a(i). Only the criteria for the highest category of threat that the taxon qualifies for should be listed. For example, if a taxon qualifies for criteria A, B, and C in the Vulnerable and Endangered category and only criterion A in the Critically Endangered category, then only the criterion A met in the Critically Endangered category should be listed (the highest category of threat). Additional criteria that the taxon qualifies for at lower threat categories may be included in the documentation

Although the criteria for each of the categories of threat are based on quantitative thresholds, the system remains relatively flexible to ensure that taxa for which there is very little information can also be assessed. This has been achieved by incorporating inference, suspicion and projection into the assessment process. Therefore, the person conducting an assessment is expected to use the best available information in combination with inference and projection to test a taxon against the criteria. However, if inference, suspicion and projection are used, the assumptions made must be documented. If there is any reasonable concern that a taxon is threatened with extinction in the near future, it should qualify for the criteria of one of the categories of threat.

The different criteria (A-E) are derived from a wide review aimed at detecting risk factors across the broad range of organisms and the diverse life histories they exhibit. The criteria are aimed at detecting symptoms of endangerment rather than causes. Consequently the criteria are applicable to any threatening process that results in symptoms such as past and future population decline, small population sizes, and small geographic distributions. A taxon may be classified as threatened even if a threatening process cannot be identified. Regardless of the nature of threats, assessments must follow IUCN (2001, 2012b) and these guidelines to ensure valid application of the criteria. However, different threats, especially new threats or poorly understood processes such as global climate change may require further guidance in the application of definitions and criteria. Section 12 provides guidance specific to different threats.

The quantitative values presented in the various criteria associated with threatened categories were developed through wide consultation, and they are set at what are generally judged to be appropriate levels. Broad consistency between them was sought. The process and the technical background to the IUCN Red List system, and

the fundamental biological processes underlying population decline and extinction that the criteria are based on, are described by Mace *et al*. (2008).

Some studies suggest that when taxa are evaluated under all five criteria, there is a tendency for them to be listed under criteria A to D rather than under E. There are several possible reasons for this. First, a reliable assessment under criterion E generally requires more data and analysis, and in practice the process may often be incomplete. Second, even if each criterion on average corresponds to an identical risk of extinction, the probability that a specific species meets at least one of four criteria will be higher than the probability that it meets one criterion. Third, the thresholds in criteria A to D may be more precautionary. This would be justified because they are based on partial information and are often used in data-poor situations, whereas criterion E can (and should) incorporate all factors that influence population dynamics. In data-poor situations, where data permit only one or two of criteria A-D to be assessed, it would be very easy to 'miss' taxa that should be listed (Keith *et al*. 2000); in other words, the listing errors will be wider under A-D, so their thresholds should be more precautionary. Even so, it should be noted that while some studies suggest that criteria A-D are more precautionary than criterion E (e.g., Gardenfors 2000), other studies indicate that criteria A-D may not be very precautionary, particularly when data are limited (e.g., Keith *et al*. 2004).

Conservation priorities and actions

The category of threat is not necessarily sufficient to determine priorities for conservation action. The category of threat simply provides an assessment of the extinction risk under current circumstances, whereas a system for assessing priorities for action will include numerous other factors concerning conservation action such as costs, logistics, chances of success, and other biological characteristics (Mace and Lande 1991). The Red List should therefore not be interpreted as a means of priority setting (IUCN 2001, 2012b). The difference between measuring threats and assessing conservation priorities needs to be appreciated. However, assessment of taxa using Red List Criteria represents a critical first step in setting priorities for conservation action.

Many taxa assessed under the IUCN Red List Criteria will already be subject to some level of conservation action. The criteria for the threatened categories are to be applied to a taxon whatever the level of conservation action affecting it, and any conservation measures must be included with the assessment documentation. It is important to emphasize here that a taxon may require conservation action even if it is not listed as threatened, and that effectively conserved threatened taxa may, as their status improves over time, cease to qualify for listing.

Documentation

All assessments should be documented. Threatened classifications should state the criteria and subcriteria that are met. For example, in a taxon listed as Endangered A2cd, the criterion A2 indicates that the taxon has declined by more than 50% in the last 10 years or three generations (whichever is longer) and the subcriteria indicate that the decline in mature individuals has been caused by a decline in the quality of

habitat as well as actual levels of exploitation. Clearly listing the subcriteria provides the reasoning for placing a taxon in a specific category, and if necessary, the reasoning can be re-examined. It also enables people to understand the primary threats facing a taxon and may aid in conservation planning. No assessment can be accepted for the IUCN Red List as valid unless at least one criterion and any qualifying subcriteria are given. If more than one criterion or subcriterion is met, then each should be listed. If a re-evaluation indicates that the documented criterion is no longer met, this should not result in automatic reassignment to a lower category of threat (downlisting). Instead, the taxon should be re-evaluated against all the criteria to clarify its status. The factors responsible for qualifying the taxon against the criteria, especially where inference and projection are used, should be documented. All data used in a listing must be either referenced to a publication that is available in the public domain, or else be made available. Full documentation requirements are given in Annex 3 of the IUCN Red List Categories and Criteria (Version 3.1) (IUCN 2012b).

Data Quality

Data availability, inference, suspicion and projection

The IUCN Red List Criteria are intended to be applied to taxa at a global scale. However, it is very rare for detailed and relevant data to be available across the entire range of a taxon. For this reason, the Red List Criteria are designed to incorporate the use of inference, suspicion and projection, to allow taxa to be assessed in the absence of complete data. Although the criteria are quantitative in nature, the absence of high-quality data should not deter attempts at applying the criteria. In addition to the quality and completeness of the data (or lack of), there may be uncertainty in the data itself, which needs to be considered in a Red List assessment. Data uncertainty is discussed separately in section 3.2.

The IUCN criteria use the terms Observed, Estimated, Projected, Inferred, and Suspected to refer to the nature of the evidence (including aspects of data quality) for specific criteria. For example, criterion A allows inferred or suspected reduction, whereas criterion C1 allows only estimated declines and criterion C2 specifies "observed, projected, or inferred" declines. These terms are defined as follows:

Observed: information that is directly based on well-documented observations of all known individuals in the population.

Estimated: information that is based on calculations that may include statistical assumptions about sampling, or biological assumptions about the relationship between an observed variable (e.g., an index of abundance) to the variable of interest (e.g., number of mature individuals). These assumptions should be stated and justified in the documentation. Estimation may also involve interpolation in time to calculate the variable of interest for a particular time step (e.g., a 10-year reduction based on observations or estimations of population size 5 and 15 years ago). For examples, see discussion under criterion A.

Projected: same as "estimated", but the variable of interest is extrapolated in time towards the future, or in space. Projected variables require a discussion of the

method of extrapolation (e.g., justification of the statistical assumptions or the population model used) as well as the extrapolation of current or potential threats into the future, including their rates of change.

Inferred: information that is based on indirect evidence, on variables that are indirectly related to the variable of interest, but in the same general type of units (different types include number of individuals or area or number of subpopulations). Examples include population reduction (A2d) inferred from a change in catch statistics, continuing decline in number of mature individuals (C2) inferred from trade estimates, or continuing decline in area of occupancy (B1b(ii,iii), B2b(ii,iii)) inferred from rate of habitat loss. Inferred values rely on more assumptions than estimated values. For example, inferring reduction from catch statistics not only requires statistical assumptions (e.g., random sampling) and biological assumptions (about the relationship of the harvested section of the population to the total population), but also assumptions about trends in effort, efficiency, and spatial and temporal distribution of the harvest in relation to the population. Inference may also involve extrapolating an observed or estimated quantity from known subpopulations to calculate the same quantity for other subpopulations. Whether there are enough data to make such an inference will depend on how large the known subpopulations are as a proportion of the whole population, and the applicability of the threats and trends observed in the known subpopulations to the rest of the taxon. The method of extrapolating to unknown subpopulations depends on the criteria and on the type of data available for the known subpopulations. Further guidelines are given under specific criteria (e.g., see section 4.5 for extrapolating population reduction for criterion A assessments).

Suspected: information that is based on circumstantial evidence, or on variables in different types of units, for example, % population reduction based on decline in habitat quality (A2c) or on incidence of a disease (A2e). For example, evidence of qualitative habitat loss can be used to ***infer*** that there is a qualitative (continuing) decline, whereas evidence of the amount of habitat loss can be used to ***suspect*** a population reduction at a particular rate. In general, a suspected population reduction can be based on any factor related to population abundance or distribution, including the effects of (or dependence on) other taxa, so long as the relevance of these factors can be reasonably supported.

Uncertainty

The data used to evaluate taxa against the criteria are often obtained with considerable uncertainty. Uncertainty in the data should not be confused with a lack of data for certain parts of a species' range or a lack of data for certain parameters. This problem is dealt with in section 3.1 (Data availability, inference, suspicion and projection). Data uncertainty can arise from any one or all of the following three factors: natural variability, vagueness in the terms and definitions used in the criteria (semantic uncertainty), and measurement error (Akçakaya *et al.* 2000). The way in which uncertainty is handled can have a major influence on the results of an evaluation. Details of methods recommended for handling uncertainty are given below.

Types of uncertainty

Natural variability results from the fact that species' life histories and the environments in which they live change over time and space. The effect of this variation on the criteria is limited, because each parameter refers to a specific time or spatial scale. However, natural variability can be problematic, e.g. there is spatial variation in age-at-maturity for marine turtles, and a single estimate for these taxa needs to be calculated to best represent the naturally occurring range of values. Semantic uncertainty arises from vagueness in the definition of terms in the criteria or lack of consistency in different assessors' usage of them. Despite attempts to make the definitions of the terms used in the criteria exact, in some cases this is not possible without the loss of generality. Measurement error is often the largest source of uncertainty; it arises from the lack of precise information about the quantities used in the criteria. This may be due to inaccuracies in estimating values or a lack of knowledge. Measurement error may be reduced or eliminated by acquiring additional data (Akçakaya *et al*. 2000; Burgman *et al.* 1999). Another source of measurement error is 'estimation error', i.e. sampling the wrong data or the consequences of estimating a quantity (e.g., natural mortality) based on a weak estimation method. This source of measurement error is not necessarily reduced by acquiring additional data.

Representing uncertainty

Uncertainty may be represented by specifying a best estimate and a range of plausible values for a particular quantity. The best estimate can itself be a range, but in any case the best estimate should always be included in the range of plausible values. The plausible range may be established using various methods, for example based on confidence intervals, the opinion of a single expert, or the consensus view of a group of experts. The method used should be stated and justified in the assessment documentation.

Dispute tolerance and risk tolerance

When interpreting and using uncertain data, attitudes toward risk and uncertainty are important. First, assessors need to consider whether they will include the full range of plausible values in assessments, or whether they will exclude extreme values from consideration (known as dispute tolerance). Uncertainty in the data is reduced when an assessor has a high dispute tolerance, and thus excludes extreme values from the assessment. On the one hand, it may sometimes be desirable to exclude the extreme values if these are unrealistic (e.g., the result of opinions that reflect biases rather than underlying data uncertainty). On the other hand, it is important that assessments accurately represent the range of uncertainty. We recommend that dispute tolerance (representing attitude towards uncertainty) is set to a low value, in most cases as low as 0.0 (including the whole range of uncertainty).

Second, assessors need to consider whether they have a precautionary or evidentiary attitude to risk (known as risk tolerance). A precautionary attitude (i.e., low risk tolerance) will classify a taxon as threatened unless it is highly unlikely that it is not threatened, whereas an evidentiary attitude will classify a taxon as threatened only when there is strong evidence to support a threatened classification. A method

developed for incorporating attitudes towards risk and uncertainty (Akçakaya *et al.* 2000) has been implemented in SIS as well as in RAMAS Red List (Akçakaya and Root 2007). Because these systems are used by a variety of institutions (e.g., for national assessments), it is not appropriate to set the values for attitude settings to specific constants. This is because the attitude settings are subjective, and reflect the assessors' values. However, for global listings in the IUCN Red List, it is appropriate to use a single risk tolerance value for all assessments, so that assessments are consistent across taxa. In particular, for the IUCN Red List, the risk tolerance value should not depend on factors such as ecological, evolutionary, economic, societal importance of the species; its chances of recovery; cost of measures to save it, etc. (such factors can be used in prioritization of conservation actions, but not for red-listing). This institutional setting for the IUCN Red List should reflect the reasons for this use (determination of global threat status), the overall objective of maintaining consistency of the IUCN Red List, and IUCN's values. IUCN (2001) specifies that "… when uncertainty leads to wide variation in the results of assessments, the range of possible outcomes should be specified. A single category must be chosen and the basis for the decision should be documented; it should be both precautionary and credible" and assessors "should resist an evidentiary attitude and adopt a precautionary but realistic attitude to uncertainty when applying the criteria". A precautionary but realistic attitude would require a slightly lower than mid-value for the risk tolerance parameter, perhaps a value in the range from 0.40 to 0.49.

Dealing with uncertainty

It is recommended that assessors should adopt a precautionary but realistic attitude, and to resist an evidentiary attitude to uncertainty when applying the criteria (i.e., have low risk tolerance). This may be achieved by using plausible lower bounds, rather than best estimates, in determining the quantities used in the criteria. It is recommended that 'worst case scenario' reasoning be avoided as this may lead to unrealistically precautionary listings. All attitudes should be explicitly documented. In situations where the spread of plausible values (after excluding extreme or unlikely values) qualifies a taxon for two or more categories of threat, the precautionary approach would recommend that the taxon be listed under the higher (more threatened) category.

In some rare cases, uncertainties may result in two non-consecutive plausible threat categories. This may happen, for example, when extent of occurrence (EOO) or area of occupancy (AOO) is smaller than the EN threshold and one subcriterion is definitively met, but it is uncertain whether a second subcriterion is also met. Depending on this, the category can be either EN or NT. In such cases, the category could be specified as the range EN–NT in the documentation (giving the reasons why), and the assessors must choose the most plausible of the categories, of which VU could be one. This choice depends on the level of precaution (see section 3.2.3) and should be justified.

Specific guidelines for dealing with uncertainty in assessing taxa with widely distributed or multiple subpopulations against criterion A are given in section 4.5. This section offers clear guidance on using uncertain estimates, uncertainty about the pattern of population decline and using data with different abundance units.

Documenting uncertainty and interpreting listings

The level of uncertainty associated with a particular taxon's assessment is not apparent from the listing itself, potentially complicating and de-valuing interpretation of listings. When a plausible range for each quantity is used to evaluate the criteria, a range of categories may be obtained, reflecting the uncertainties in the data. However, only a single category, based on a specific attitude to uncertainty, will be listed along with the relevant criteria on the IUCN Red List. It is important to note that the range of possible categories should also be indicated, along with the assessors' attitudes to uncertainty, in the documentation accompanying the assessment. The inclusion of information on uncertainty in the documentation, allows users of the Red List access to important information that will assist in the interpretation of listings, and inform debates over particular issues or listings.

Uncertainty and the application of the categories Data Deficient and Near Threatened

The level of uncertainty in the data used for assessments may or may not affect the application of the categories Data Deficient and Near Threatened. Guidance on the application of these categories is given in section 10.

Definitions of Terms Used in the Criteria and their Calculation

The terms used in the IUCN Red List Categories and Criteria must be clearly understood to ensure that taxa are correctly assessed. The following terms are defined in the *IUCN Red List Categories and Criteria (version 3.1)* on pages 10-13 (IUCN 2001, 2012b). These definitions are reproduced here, with additional guidelines to assist in their interpretation and calculation.

Population and population size (criteria A, C and D)

"The term 'population' is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of individuals of the taxon. For functional reasons, primarily owing to differences between life forms, population size is measured as numbers of mature individuals only. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used." (IUCN 2001, 2012b)

The definition above means that a "population" (sensu IUCN 2001, 2012b) includes all individuals (mature and other life stages) that are assigned to the taxon throughout its distribution. "Population" and "Population size" are, however, not synonymous. There are two important aspects of the definition of population size. First, population size is measured only in terms of mature individuals. Thus, the interpretation of this definition depends critically on an understanding of the definition of 'mature individuals', which is given and discussed below in section 4.3. Second, population size is defined as the total number of mature individuals in all areas. Even if some of the taxon exists in subpopulations that might be seen as distinct populations in a

general biological sense, for the purposes of the criteria, the total number of mature individuals in all areas (or all subpopulations) is used to measure the "population size" of the taxon.

Subpopulations (criteria B and C)

"Subpopulations are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less)." (IUCN 2001, 2012b)

The significance of subpopulations in the criteria relates to the additional risks faced by taxa where the population is either subdivided into many small spatial units or where most individuals are concentrated into one such unit. Operational methods for determining the number of subpopulations may vary according to the taxon; in the case of tree species, for example, a subpopulation can be defined as a spatially distinct segment of the population that experiences insignificant or reproductively unsuccessful migration (of seed or pollen) from other subpopulations.

Although subpopulations typically have little demographic or genetic exchange, this may or may not amount to their complete isolation in this regard. In other words, subpopulations need not be completely isolated. Even highly mobile species may have multiple subpopulations, as high mobility is not always a guarantee of genetic or demographic connectivity. For example, even if a species migrates thousands of kilometers annually, if it has very high fidelity to both natal and breeding sites, there could be few dispersers among subpopulations within the breeding range, making it necessary to recognize multiple subpopulations.

Mature individuals (criteria A, B, C and D)

"The number of mature individuals is the number of individuals known, estimated or inferred to be capable of reproduction. When estimating this quantity the following points should be borne in mind:

- Mature individuals that will never produce new recruits should not be counted (e.g., densities are too low for fertilization).
- In the case of populations with biased adult or breeding sex ratios, it is appropriate to use lower estimates for the number of mature individuals, which take this into account.
- Where the population size fluctuates, use a lower estimate. In most cases this will be much less than the mean.
- Reproducing units within a clone should be counted as individuals, except where such units are unable to survive alone (e.g., corals).
- In the case of taxa that naturally lose all or a subset of mature breeding individuals at some point in their life cycle, the estimate should be made at the appropriate time, when mature individuals are available for breeding.
- Re-introduced individuals must have produced viable offspring before they are counted as mature individuals." (IUCN 2001, 2012b)

Notes on defining mature individuals

This definition of mature individuals differs slightly from that given in version 2.3 of the Red List Categories and Criteria (IUCN 1994). Some groups have found the more recent definition of mature individuals to be less conservative and less precise, leading to a potential down-listing of some taxa (e.g., obligate co-operative breeders), even though their extinction risk has not changed. It must be stressed that the intention of the definition of mature individuals is to allow the estimate of the number of mature individuals to take account of all the factors that may make a taxon more vulnerable than might otherwise be expected. The list of points given with the definition is not exhaustive and should not restrict an assessor's interpretation of mature individuals, provided they are estimating the number of individuals known, estimated or inferred to be capable of reproduction. The ability of an assessor to estimate or infer which individuals are capable of reproduction is paramount and highly contingent on the particular features of the taxon or group. Juveniles, senescent individuals, suppressed individuals and individuals in subpopulations whose densities are too low for fertilization to occur will never produce new recruits, and therefore should not be counted as mature individuals. On the other hand, in many taxa there is a pool of non-reproductive (e.g., suppressed) individuals that will quickly become reproductive if a mature individual dies. These individuals can be considered to be capable of reproduction. For example, in social bees and ants there is often just one or a few actually reproducing females ("queens") at a time, but new such queens can be promoted from larvae under development or from reproductively suppressed workers, if a functional queen were to die. As possible template for the number of 'mature individuals' in such societies could be the number of queens * 10 (an expression for the number of potential queens that could realistically be produced) * 2 (the male counterpart). In general, the judgement will be best made by assessors with insight into the species' biology.

Note that effective population size (N_e) cannot be used as an estimate of the number of mature individuals. One reason is that reproductively suppressed individuals do not contribute to the calculation of N_e, but, as explained above, they may be counted as mature individuals.

In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values of mature individuals for the host taxon might be used. This number may be much less than the total number of mature individuals of the host taxon, because generally other factors restrict the dependant taxon from utilizing all host individuals.

The number of mature individuals can be estimated using the equation $d * A * p$, where d is an estimate of population density, A is an estimate of area, and p is an estimate of the proportion of individuals that are mature. However, this approach often leads to gross overestimates of number of mature individuals. Therefore, great care should be taken when using this formula to ensure that: (a) the area is appropriately selected and d is an estimate of the average over the entire A (for example, the estimate will be positively biased if A is set to EOO and d is based on samples from areas of highest density), and (b) p should be selected based on knowledge of the taxon (or related taxa) rather than being set to a default value (such

as 0.5) because the proportion of mature individuals in a population differs markedly among taxa. Bounds on the estimate of number of mature individuals can be obtained by placing bounds on each of *d*, *A*, and *p*. The value from this approach will be an *estimate* if the values for *d*, *A* and *p* are all estimates, but should be considered to be an *inference* if one or more of these values are based on inference.

Clonal colonial organisms, such as most corals, algae, bryophytes, fungi and some vascular plants

As opposed to a unitary organism, such as a vertebrate, an insect and many vascular plants, the growth and development of a clonal (modular) colonial organism is an iterative process in which "modules" are added step by step to the existing structure. In principle, the growth of a modular organism never ends and it has no final shape, size or age. A modular organism (the genet) can sometimes exist in a form of many parts (ramets), which can become more or less isolated from each other. Consequently, what constitutes a 'mature individual' in a colonial or modular organism is not always clear. Still, it is important to define 'mature individual' for such organisms, since 'mature individual' is used under criteria C and D to capture the effects of threats and demographic stochasticity to a small population. In defining 'mature individual' for colonial organisms, it is important to identify entities that are comparable in demographic stochasticity and extinction proneness to a population of discrete individuals of animals. For some taxa (e.g., reef-forming corals), it may also help to consider what entity typically lives, is injured, and dies as a unit.

As a general rule, the ramet, i.e., the smallest entity capable of both independent survival and (sexual or asexual) reproduction should be considered a 'mature individual'. Reproducing units within a clone should be counted as individuals, except where such units are unable to survive alone (IUCN 2012b). For instance, in those cases where the organism appears in well-distinguishable units, each such unit would be counted as one mature individual. Examples may be a bryophyte tuft (e.g., of *Ulota*) or a discrete cushion (e.g., *Brachythecium*), a lichen thallus (e.g., *Alectoria*) or foliose patch (e.g., *Parmelia*), or a coral discrete entity (e.g., a brain coral *Diploria* or sun coral *Tubastrea*).

If the delimitation of ramets is not obvious, but the species lives in or on a discrete and relatively small substrate unit limited by a certain resource, e.g. a piece of cow dung, a leaf or a dead tree branch, each unit colonized by the species should be counted as a single mature individual. In many other cases, like reef-forming corals, cliff-growing lichens and ground-growing fungi, the organism grows in large, more or less continuous entities that could be divided into smaller pieces without obviously harming the organism. In principle, the smallest such entity (ramet) that an organism could be divided into without causing its death or preventing reproduction, should be counted as one mature individual. Obviously, what such an entity would be is often not known. Therefore, in such cases, it may be necessary to adopt a pragmatic approach to defining 'mature individuals'. Examples of possible interpretations of the definition of a mature individual are:

- For diffuse, wholly visible organisms in continuous habitats (e.g., reef-forming corals, algal mats) assessors may assume an average area occupied by a mature individual and estimate the number of mature individuals from the area covered

by the taxon. The area covered by the taxon should be estimated at a scale (grid size; e.g. 1 m^2) that is as close as practicable to the area assumed to be occupied by a single mature individual. (However, note that AOO must still be estimated using the 2-km scale.)

- For diffuse organisms, not wholly visible, in continuous habitats (e.g., subterranean mycelial fungi) assessors may assume that each recorded presence separated by a minimum distance represents an assumed number of individuals. For example, each visible fungal fruiting body may be assumed to represent ten mature individuals, so long as they are separated by at least 10 metres. This kind of assumption is necessary because the size or area of a fungal mycelium is rarely known.
- For diffuse organisms that occur in discrete habitat patches (e.g., fungi living more or less concealed in dead wood), each patch (trunk or log colonized by the species) could – if no better information exists – be counted as 1–10 mature individuals, depending on the size of the tree.

In any case, it is recommended that authors of Red List assessments specify the way they have used 'mature individual'.

Fishes

In many taxa of marine fish, reproductive potential is commonly closely related to body size. Since exploitation usually reduces the mean age and size of individuals, assessing declines in numbers of mature individuals may under-estimate the severity of the decline. When evaluating population decline, this factor should be kept in mind. One possible method is to estimate decline in the biomass of mature individuals rather than the number of such individuals when applying criterion A, where biomass is 'an index of abundance appropriate to the taxon'.

Sex-changing organisms

Many marine taxa have the capacity to change sex as they grow. In such taxa, the sex ratio may be highly biased towards the smaller sex. The criteria acknowledge that the number of mature individuals can take biased sex ratios into account, by using a lower estimate for the number of mature individuals. For sex-changing organisms it is also appropriate to consider changes in sex ratio as an indicator of population perturbation, which may be of additional conservation concern because the larger sex (already less numerous) is often subject to higher harvest mortality. In these cases, the number of mature individuals may be estimated by doubling the average number of individuals of the larger (or less numerous) sex.

Trees

Individual trees that flower without producing viable seeds do not qualify as mature individuals. For example, *Baillonella toxisperma* first flowers at 50-70 years and does not fruit until roughly 20 years later. Conversely, *Sequoiadendron giganteum* may produce seed at less than 20 years of age and continue to do so for 3,000 years. However, not all trees between these ages may be mature individuals if the population includes some reproductively suppressed individuals. If little is known about age at

fruiting, mature individuals should be counted as those of a typical reproductive size; e.g. estimates for canopy taxa should exclude sub-canopy individuals. Vegetative clones, apomictic taxa and self-fertilizing taxa may qualify as mature individuals, so long as they produce viable offspring and their survival is independent of other clones.

Where it is impossible to calculate the number of mature individuals, but information is available on the total population size, it may be possible to infer the number of mature individuals from the total population size.

Generation (criteria A, C1 and E)

"Generation length is the average age of parents of the current cohort (i.e., newborn individuals in the population). Generation length therefore reflects the turnover rate of breeding individuals in a population. Generation length is greater than the age at first breeding and less than the age of the oldest breeding individual, except in taxa that breed only once. Where generation length varies under threat, such as the exploitation of fishes, the more natural, i.e. pre-disturbance, generation length should be used." (IUCN 2001, 2012b)

In general, time-based measures in the criteria are scaled for the different rates at which taxa survive and reproduce, and generation length is used to provide this scaling. The current definition of generation length has been widely misunderstood, and there are difficulties when dealing with very long-lived taxa, with taxa having age-related variation in fecundity and mortality, with variation in generation length under harvesting, with environmental changes and variation between the sexes. Some of the different acceptable methods for estimating generation length are included here.

It is also appropriate to extrapolate information such as a generation length from closely related well-known taxa and to apply it to lesser-known and potentially threatened taxa.

Formally, there are several definitions of generation length, including the one given above; mean age at which a cohort of newborns produce offspring; age at which 50% total reproductive output is achieved; mean age of parents in a population at the stable age distribution; and time required for the population to increase by the replacement rate. All of these definitions of generation length require age- and sex-specific information on survival and fecundity, and are best calculated from a life table (e.g., option 1 below). Depending on the taxon concerned, other methods may provide a good approximation (e.g., options 2 and 3). Care should be taken to avoid estimates that may bias the generation length estimate in a non-precautionary way, usually by under-estimating it. Generation length may be estimated in a number of ways:

1. the average age of parents in the population, based on the equation

$$G = \sum x l_x m_x \Big/ \sum l_x m_x$$

   where the summations are from age (x) 0 to the last age of reproduction; m_x is (proportional to) the fecundity at age x; and l_x is survivorship up to age x (i.e., $l_x = S_0 \cdot S_1 \cdots S_{x-1}$ where S is annual survival rate, and $l_0 = 1$ by definition).

This formula is implemented in an associated spreadsheet file (see below). To use this formula, follow the instructions in the file, noting the exact definitions of the parameters required.

2. 1/adult mortality + age of first reproduction. This approximation is useful if annual mortality after the age of first reproduction is well known, and if mortality and fecundity do not change with age after the age of first reproduction (i.e., there is no senescence). Many species exhibit senescence, with mortality increasing and fecundity decreasing with age; for these species, this formula will overestimate generation length (in such cases, use the spreadsheet mentioned above). For age of first reproduction, use the age at which individuals first produce offspring in the wild (which may be later than when they are biologically capable of breeding), averaged over all individuals or all females. If first reproduction (production of offspring) typically occurs by 12 months, use 0, not 1; if it occurs between 12 and 24 months, use 1, etc.
3. age of first reproduction + [z * (length of the reproductive period)], where z is a number between 0 and 1; z is usually <0.5, depending on survivorship and the relative fecundity of young vs. old individuals in the population. For example, for mammals, two studies estimated z= 0.29 and z=0.284 (Pacifici *et al.* 2013; Keith *et al.* 2015). For age of first reproduction, see (2) above. This approximation is useful when ages of first and last reproduction are the only available data, but finding the correct value of z may be tricky. In general, for a given length of reproductive period, z is lower for higher mortality during reproductive years and it is higher for relative fecundity skewed towards older age classes. To see how generation length is affected by deviation from these assumptions, you can use the spreadsheet mentioned above. Note that the length of the reproductive period depends on longevity in the wild, which is not a well-defined demographic parameter because its estimate often depends very sensitively on sample size.
4. for partially clonal taxa, generation length should be averaged over asexually and sexually reproducing individuals in the population, weighted according to their relative frequency.
5. for plants with seed banks, use juvenile period + either the half-life of seeds in the seed bank or the median time to germination, whichever is known more precisely. Seed bank half-lives commonly range between <1 and 10 years. If using the spreadsheet for such species, enter seed bank as one or several separate age classes, depending on the mean residence time in the seed bank.

Options 2 and 3 are still appropriate if the interbirth interval is more than one year; a more precise calculation can be made in this case by using the spreadsheet (see above), and for each age class averaging fecundity over all individuals (or females) in that age class (regardless of whether they actually reproduced at that age). The turnover rate mentioned in the definition is not directly related to the interbirth interval; it reflects the average time it takes one group of breeding individuals to be replaced by its progeny.

The formula given in option 1 is implemented in the workbook (spreadsheet) file **Generation_Length_Workbook.xls**, which is available in http://www.iucnredlist.org/technical-documents/red-

list-documents (in the section titled "Red List Assessment Tools"). This workbook is also useful for exploring the effects of various assumptions in options 2 and 3 on the calculated generation length.

It is not necessary to calculate an average or typical generation length if some subpopulations of the taxon differ in terms of generation length. Instead, use each subpopulation's generation length to calculate the reduction over the appropriate number of generations, and then calculate the overall population reduction (for criterion A) or overall estimated continuing decline (for criterion C1) using a weighted average of the reductions calculated for each subpopulation, where the weight is the size of the subpopulation 3 generations ago (see detailed explanation and examples in section 4.5.3).

The reason IUCN (2001, 2012b) requires using "pre-disturbance" generation length for exploited populations is to avoid a shifting baseline effect. This would arise because using current, shorter generation length (under disturbance, such as harvest) may result in a lower threat category (because a shorter period is used to calculate the reduction), which may lead to further harvest. Thus, using generation length under harvest would represent a case of shifting baseline based on a change caused by human impacts. Harvest mortality shifts the age structure and the survival rates, and in some cases (e.g., some terrestrial mammals) harvest of older individuals allows younger individuals, whose reproduction had been suppressed by the older individuals, to reproduce. In addition, in many cases, the reduction in generation length is a demographic response (rather than a genetic response) resulting from overexploitation; this may result in reduced bet-hedging (risk-spreading) capacity and a lower, more variable population growth rate, which then increases the probability of extinction. Even in cases where the response has a genetic basis, it represents an artificial selection that would still lead to the shifting baseline described above.

Reduction (criterion A)

“A reduction is a decline in the number of mature individuals of at least the amount (%) stated under the criterion over the time period (years) specified, although the decline need not be continuing. A reduction should not be interpreted as part of a fluctuation unless there is good evidence for this. The downward phase of a fluctuation will not normally count as a reduction.” (IUCN 2001, 2012b)

In the subsections below, various approaches to calculating population reduction are discussed, including statistical methods (4.5.1) and population models (4.5.2). Main issues involved in calculating population reduction using statistical methods include the patterns of decline, and the methods of extrapolation based on these patterns. Finally, methods for combining information from multiple regions or subpopulations to calculate the reduction for the taxon are discussed (4.5.3). The methods discussed in these sections also apply to calculating estimated continuing decline (4.6), except that the time period for calculating estimated continuing decline depends on the category (e.g., for CR, the longer of 1 generation or 3 years).

Many of the calculations discussed in the sections below are implemented in the workbook (spreadsheet) file **CriterionA_Workbook.xls**, which is available in http://www.iucnredlist.org/technical-documents/red-list-documents (in the section titled "Red List Assessment Tools"). Make sure to check all the tabs in the file.

Calculating population reduction using statistical methods

Statistical models can be used to extrapolate population trends so that a reduction of three generations can be calculated. The model to be fitted should be based on the pattern of decline (which may be exponential, linear, accelerated, or a more complex pattern), which may be inferred from the type of threat. The assumed pattern of decline can make an important difference. Assessors should indicate the basis on which they have decided the form of the decline function. The best information about the processes that contribute to changes in population size should be used to decide what form of decline function to apply over the three-generation period. Specifically, if a model is fitted, the assumptions of the model must be justified by characteristics of life history, habitat biology, pattern of exploitation or other threatening processes, etc. For example:

(1) If a taxon is threatened by exploitation, and the hunting mortality (proportion of individuals taken) does not change as the population size declines, then the population is likely to be declining exponentially, and this model should be fitted.
(2) A linear model is appropriate when the number of individuals removed from the population on an annual basis (rather than their proportion to the total population) remains the same as the population changes. For example, if a taxon is threatened with habitat loss, and a similar sized area of habitat is lost every year, this could lead to a linear decline in the number of individuals.
(3) A model with an accelerating decline rate is appropriate if the threat processes have increased in severity over time and these are affecting the population in an increasingly severe manner.
(4) No model need be fitted in cases where there are only two estimates of population size (at the start and end of the time period specified in the criteria) – the reduction can be calculated from these two points.

The population data from which a reduction can be calculated are likely to be variable, and it may not be obvious how a reduction should best be calculated. Depending on the shape of the data, a linear or exponential model may be fitted (see Section 4.5.2), and the start and end points of the fitted line used to calculate the reduction. Fitting a model in this way helps to eliminate some of the variability in the data that may be attributable to natural fluctuations, which should not be included. Fitting a time series longer than three generations or 10 years (as applicable) may give a more representative estimate of the long-term population reduction, especially if populations fluctuate widely, or oscillate with periods longer than the generation time. However, regardless of the length of the time series fitted, the reduction should be calculated for the most recent three generations or 10 years (as applicable). Figure 4.1 shows an example where the three generation period is from 1920 to 2000, but data are available from 1900. The relationship between the number of mature individuals

and time is based on all the data (dashed line) but the reduction is calculated over years 1920 to 2000.

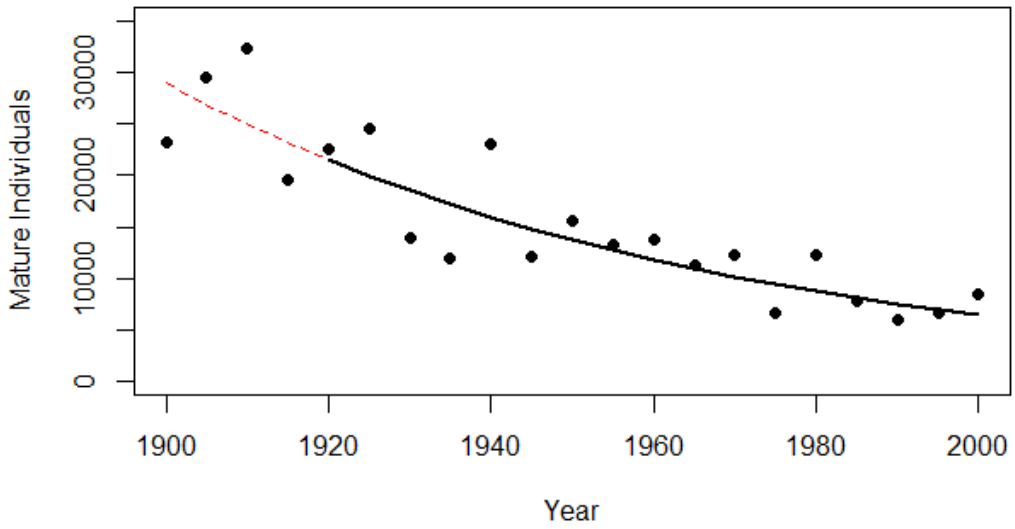

Figure 4.1. Example of using data for more than three generations (1900 to 2000) to estimate a reduction over the period 1920 to 2000.

Here, we briefly discuss various assumptions, and where they might be applicable. Consider a species with a 20-year generation time, and suppose population size was estimated as 20,000 in 1961 and 14,000 in 1981 (these are shown as square markers in the graphs below). We need to extrapolate back in time to 1941 and forward to 2001.

The simplest assumptions are those that involve no change in early or late years. For example, if it is assumed that decline did not start until the early 1960s, the reduction can be based on the initial population of 20,000. If it can be assumed that the decline stopped before 1981, then 14,000 can be used as the current population size (Figure 4.2a), resulting in a 30% reduction (1–(14000/20000)). However, it is necessary to make an assumption about the pattern of decline if some decline is suspected to have occurred outside this period. The documentation should include a rationale for the assumed pattern of decline.

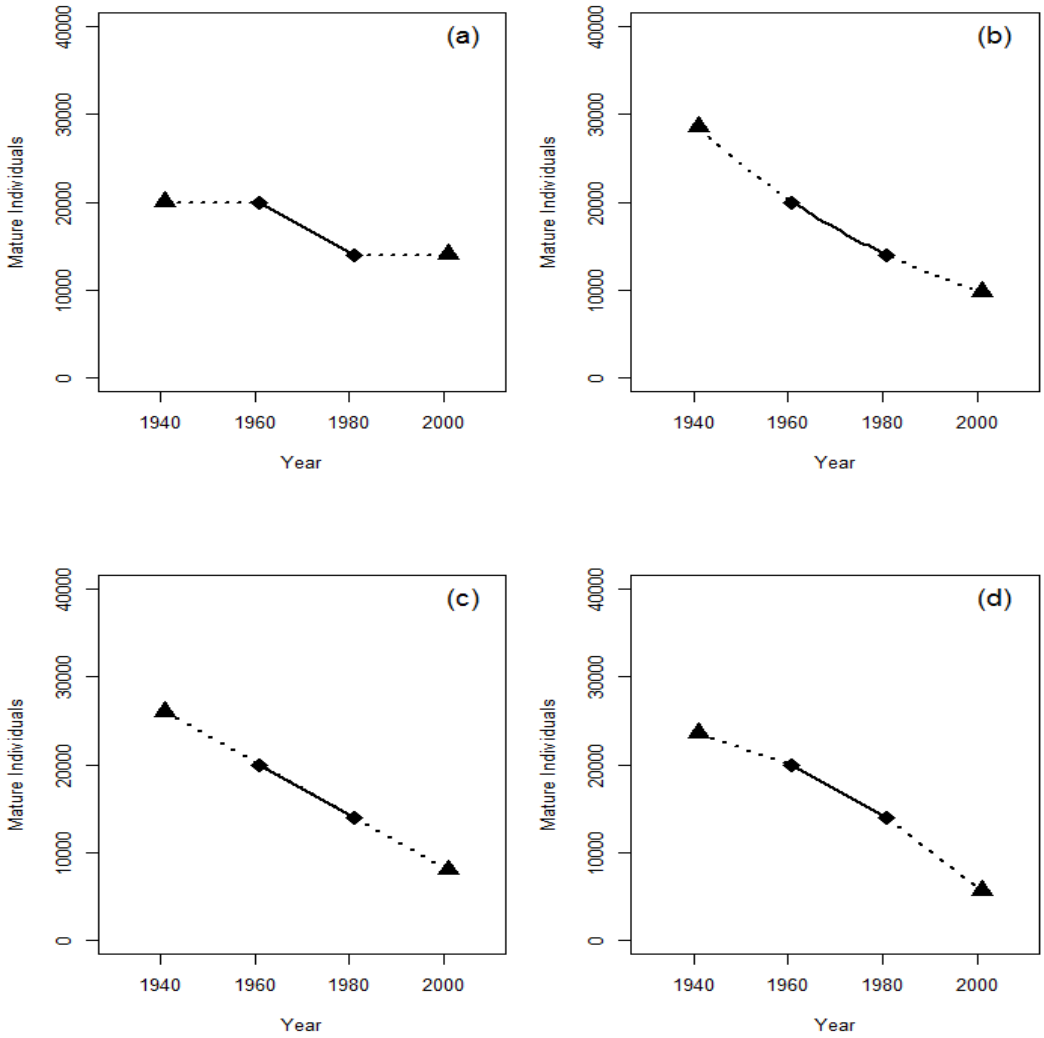

Figure 4.2. Examples of estimating population reduction, for an assessment made in 2001 of a species with a generation length of 20 years. Population size was estimated as 20,000 in 1961 and 14,000 in 1981; extrapolations were made because reduction is to be calculated over the last three generations, from 1941 to 2001. Calculations assume: (a) no change from 1941 to 1961 and from 1981 to 2001, (b) exponential change between 1941 and 2001, (c) linear decline between 1941 and 2001, and (d) accelerated decline from 1941 to 2001.

Exponential decline

Exponential decline can be assumed in cases where the proportional rate of decline of the population is believed to be constant. For example, an exponential decline can be assumed if the taxon is threatened by exploitation, and the hunting mortality (proportion of individuals taken) does not change as the population size declines. For the case where there are estimates of population size, the reduction is calculated using the equations:

$$\text{Reduction} = 1 - (\text{Observed Change})^{(3\text{Generation} / \text{Observed Period})}$$

Where "Observed Change" is the ratio of the second population size to the first population size (in this case $N(1981)/N(1961)$), and "Observed Period" is the number

of years between the first and last observation years. For example, in Fig. 4.5b, the Observed Change is 14,000/20,000 and the Observed Period is 20 years. Thus, the 60-year reduction in 65.7% [$=1-(14{,}000/20{,}000)^{(60/20)}$]. The annual rate of change is calculated as:

$$\text{Annual Change} = (\text{Observed Change})^{(1/\text{Observed Period})}$$

For this case, the annual rate of change is 0.9823, which suggests about 1.8% annual rate of decline. This population size three generations ago can be estimated as 28,571 [=20,000/0.9823^20], and the current population as 9,800 [=14,000*0.9823^20] (Figure 4.2b). The worksheet "Exponential decline" in the spreadsheet **CriterionA_Workbook.xls** mentioned above can be used to calculate reductions.

Linear decline

In some cases, the number of individuals removed from the population (rather than their proportion to the total population) may remain constant. For example, if a species is threatened with habitat loss, and a similar sized area of habitat is lost every year, this could lead to a linear decline in the number of individuals. Note that this means that the rate of decline is increasing every year, because the same amount of habitat is lost out of a decreasing amount of remaining habitat. So, we cannot calculate a single rate of decline (as a percentage or proportion of population size), as we did in the exponential case. Instead, we can calculate annual reduction in units of the number of individuals:

$$\text{Annual Reduction in N} = (\text{First N} - \text{Second N})/(\text{Observed Period})$$

where "First N" is the population size observed at the start of the observed period, and "Second N" is the population size observed at the end. For the example, the annual reduction is 300 individuals ((20000-14000)/20). Now, we need to calculate the population sizes at the start and end of the 3-generation period. To do this, we first calculate:

$$\text{Abundance1} = \text{First N} + \text{Annual Reduction} * \text{Period1}$$
$$\text{Abundance2} = \text{Second N} - \text{Annual Reduction} * \text{Period2}$$

where Abundance1 is the calculated population size at the start of the 3-generation period and Abundance2 is the calculated population size at the end of the 3-generation period. Abundance1 and Abundance2 are calculated from the calculated annual reduction in mature numbers, the two population sizes and the number of years between when the population sizes were obtained. Period1 is the difference in the number of years between the start of the 3-generation period and the year for which the first population size observation is available (1941 and 1961 for the example) and Period2 is the difference in the number of years between the end of the 3-generation period and the year for which the second population size observation is available (1981 and 2001 for the example). Finally, we calculate the 3-generation proportional (percentage) reduction as follows:

$$\text{Reduction} = (\text{Abundance1} - \text{Abundance2}) / \text{Abundance1}$$

For the example, the annual reduction is 300 individuals per year so the number of individuals in 1941 and 2001 would be 26,000 [20,000+300*20] and 8,000 [20,000–300*20] respectively (triangle markers in Figure 4.2c), giving a 3-generation reduction of about 69.2%. In this case, the rate of decline is only 23% for the 1st

generation, but increases to 43% for the 3rd generation. The worksheet "Linear decline" in the spreadsheet **CriterionA_Workbook.xls** mentioned above can be used to calculate reductions.

Accelerated decline

Although a linear decline in the number of individuals means that the rate of decline is increasing, this increase can be even faster, leading to an accelerated decline in the number of individuals. This may happen when the exploitation level increases, for example when the number of individuals killed is larger every year because of increasing human population, or improving harvest efficiency.

To extrapolate under an assumption of accelerated decline, it is necessary to know or guess how the rate of decline has changed. For instance, in the above example, the observed 1-generation decline (from 1961 to 1981) is 30%. One assumption might be that the rate of decline doubled in each generation, from 15% in the 1st generation to 30% in the 2nd and 60% in the 3rd. This assumption would lead to population size estimates of 23,529 for 1941 (20,000/(1–0.15)) and 5,600 for 2001 (14,000*(1–0.6)), giving a 3-generation reduction of about 76% (Figure 4.2d). Of course, different assumptions about how the rates of decline may have changed in the past will give different results.

The same approach can be used to make the calculation based on an assumption of decelerating decline.

Complex patterns of decline

It is possible to assume different patterns of decline for different periods. For example, decline can be assumed to be zero until the first observation, and then exponential. This would give a population of 20,000 for 1941 and 9,800 for 2001, giving a three-generation reduction of about 51%.

The examples in Figure 4.2 were based on two values for the number of individuals. When multiple estimates of population size are available the data need to be smoothed, using for example regression (Figure 4.1). When applying regression, it is important to check that the fitted line goes through the data well. For example, Fig. 4.3 shows a case where a linear model is not an adequate fit to the data. In this case a reduction could be calculated as the ratio of the average population size for the last 8 years (10,329) to that for the years before overexploitation occurred (19,885). The reduction would be 48% (1–(10,329/19,885)).

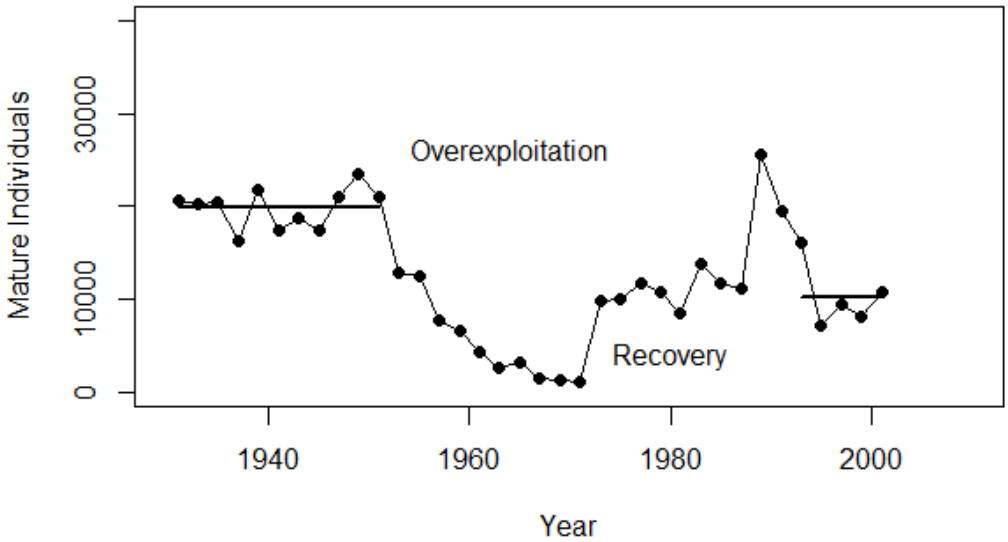

Figure 4.3. An example of calculating reduction for a population that is initially stable but then subject to overexploitation followed by recovery. Reduction is based on the average population sizes of the last few years and the years before overexploitation occurred.

Calculating reductions by the ratio of the average population size at the start of the 3-generation period to the average population size at the end of the 3-generation period is appropriate when there is evidence for change in trend (e.g. due to changes in threatening processes). In contrast, regression (linear or exponential) should be used to calculate reductions if there is no such evidence or the population size estimates are very imprecise.

Finally, when there is no basis for deciding among various patterns of decline, the rate of decline can be specified as an uncertain number, based on the declines predicted by the different patterns. For example, in the set of four examples in Figure 4.2 above, the rate of decline can be expressed as the interval 66%-69%, if both exponential and linear patterns of decline are considered plausible, or as the interval 30%-76%, if all four possibilities discussed are considered plausible.

Calculating population reduction using population models

Past and future population reduction can be calculated using population models, provided that: (i) the model meets the requirements outlined in section 9 ("Guidelines for Applying Criterion E"), (ii) the effects of future levels of threat are included in the population model, represented as changes in model parameters, and (iii) the model outputs are not inconsistent with expected changes in current or recent rates of decline. When using a population model to project a reduction under criterion A3, the median or mean of the projections for a range of plausible scenarios should be used to calculate a best estimate of the magnitude of the projected reduction. Assessments may be based on the best estimate, lower or upper bound but, for reasons of transparency, assessors must justify the rationale for their choice if a value other than the best estimate is used. The projected variability may be used to quantify uncertainty. For example, upper and lower quartiles of the projected magnitude of the future reduction (i.e., reductions with 25% and 75% probability) may be considered to represent a plausible range of projected reduction, and used to incorporate uncertainty

in the assessment, as described in sections 3.2 and 4.5.3. The bounds on the plausible range should incorporate model uncertainty as well as measurement error; or a justification of the model structure, and why it is the most appropriate in the face of model uncertainty, should be provided.

Taxa with widely distributed or multiple subpopulations

This section addresses the issues related to the presentation and use of information from subpopulations (or from parts of the range) of a widely distributed taxon, in assessing the taxon against criterion A. For such taxa, it is recommended that the available data on past reduction be presented in a table that lists all known subpopulations (or parts of the range), and gives at least two of the following three values for each subpopulation:

the estimated population size at a point in time close to three generations ago[4], and the year of this estimate,
the most recent estimated population size and its year,
suspected or inferred reduction (in %) over the last three generations.

If there are estimates of abundance for years other than those reported in (1) or (2), these should also be reported in separate columns of the same table. Any qualitative information about past trends for each subpopulation should be summarized in a separate column, as well as quantities calculated based on the presented data (see examples below).

There are three important requirements:

(a) The values should be based on estimates or indices of the number of mature individuals. If the values are based on indices, a note should be included that explains how the index values are expected to relate to the number of mature individuals, and what assumptions are necessary for this relationship to hold.
(b) The subpopulations should be non-overlapping. This does not mean that there is no or infrequent dispersal among subpopulations. The point of this requirement is to avoid double-counting as much as possible.
(c) Together, the subpopulations should include all of the taxon. If this is not possible, a "subpopulation" named *Remainder* should include an estimate of the total number of mature individuals not included in the listed subpopulations. This estimate, like others, can be uncertain (see below).

If these requirements cannot be met, the taxon cannot be assessed under criterion A.

In this section, we refer to subpopulations, but the discussion applies to any type of non-overlapping subunits of the taxon, such as parts of the taxon's range. In the next subsection on *Estimating overall reduction*, we discuss the basic methods of using such a data table for assessing a taxon under criterion A. In many cases, there will be uncertainty, because the population sizes are not known precisely, are in different units for different subpopulations, or are available only from one or few subpopulations. These cases will be discussed later, in a subsection on *Dealing with uncertainty*.

[4] The criteria are defined in terms of the maximum of 10 years or three generations. However, for clarity of presentation, reference is only made in this section to "three generations".

Estimating overall reduction

To assess a taxon against criterion A, it is necessary to estimate the overall reduction over the last three generations. All available data should be used to calculate a reduction as an average over all subpopulations, weighted by the estimated size of each subpopulation three generations ago. Inferences regarding reductions should not be based on information for any single subpopulation (whether it is the fastest declining, most stable, largest or smallest)[5].

The recommended methods for estimating reduction are explained below by a series of examples. All examples are for a taxon with a generation length of 20 years, assessed in 2001 (i.e., for these examples, the "present" is 2001 and "three generations ago" is 1941). All examples of this section are based on data with the same units for all subpopulations; the issue of different units is discussed in the next subsection (*Dealing with uncertainty*).

The worksheet "Multiple populations" in the spreadsheet **CriterionA_Workbook.xls** (mentioned at the start of section 4.5) can be used to calculate reductions using data from multiple populations.

Example 1: Estimates are available for past (3 generations ago) and current population sizes.

Subpopulation	**Past**	**Present**
Pacific Ocean	10,000 (1941)	5,000 (2001)
Atlantic Ocean	8,000 (1941)	9,000 (2001)
Indian Ocean	12,000 (1941)	2,000 (2001)
Overall	30,000 (1941)	16,000 (2001)

In this (simplest) case, all past population sizes are added up (30,000) and all present population sizes are added up (16,000), giving an overall reduction of 46.7% [(30-16)/30]. Note that the changes in individual subpopulations are 50% reduction, 12.5% increase and 83.3% reduction. An average of these numbers, weighted by the initial population sizes, gives the same answer [(-0.5*10+0.125*8-0.833*12)/30].

Example 2: Estimates are available for various past population sizes.

Subpopulation	**Past**	**Present**	**Notes**
Pacific Ocean	10,000 (1930s)	7,000 (1995)	most of the decline in the last 20 yr
Atlantic Ocean	8,000 (1975)		believed to have been stable
Indian Ocean	10,000 (1961)	4,000 (1981)	

In this case, the "past" and "present" population estimates are not from the same year for all subpopulations. Thus, it is necessary to calculate reduction for each subpopulation in the same time period. For example it is necessary to project the population from the "past" census (in the 1930s) to 1941 (three generations ago) as well as from the most recent census (in 1995) to the present.

[5] However, see "*Dealing with uncertainty*" below for a discussion of exceptions to this rule.

These calculations depend on the pattern of decline (see section 4.5.1). Any information about past trends can be valuable in making such projections (as in the "Notes" in the example). For instance, given that most of the decline in the "Pacific Ocean" subpopulation has occurred in recent years, the estimate in the 1930s can be assumed to also represent the population in 1941 (three generations ago). However, in this case, it is necessary to make a projection from the most recent estimate (in 1995) to 2001. If the estimated decline from 10,000 to 7,000 occurred in 20 years, then assuming a constant rate of decline during this period, annual rate of decline can be calculated as 1.77% [$1-(7{,}000/10{,}000)^{(1/20)}$], giving a projected reduction of about 10.1% in the six years from the last census (in 1995) to 2001, and a projected 2001 population of 6,290 (=$7{,}000*(7{,}000/10{,}000)^{(6/20)}$). This means a three-generation reduction of 37% (10,000 to 6,290).

When there is no evidence that the rate of decline is changing, exponential decline can be assumed. For example, for the "Indian Ocean" subpopulation, the 20-year reduction from 1961 to 1981 is 60% per generation; corresponding to 4.48% per year [$-0.0448=(4{,}000/10{,}000)^{(1/20)}-1$]. Thus, three-generation decline can be estimated as 93.6% [$-0.936=(4{,}000/10{,}000)^{(60/20)}-1$].

The "Atlantic Ocean" subpopulation has been stable, so a reduction of 0% is assumed. Combining the three estimates, the weighted average of reduction for the taxon is estimated as 63% [(-0.37*10+0*8-0.936*25)/43].

When such calculations are used in estimating the overall reduction, the calculated reductions and calculated subpopulation sizes should be given in different columns of the table than those that are used for the data (see completed table below).

Subpop.	**Past**	**Present**	**Notes**	**Population 3 gen. ago (est.)**	**Current population (est.)**	**Estimated 3-generation reduction**
Pacific Ocean	10,000 (1930s)	7,000 (1995)	Most of the decline in the last 20yr	10,000	6,290	37.1%
Atlantic Ocean	8,000 (1975)		Believed to have been stable	8,000	8,000	0%
Indian Ocean	10,000 (1961)	4,000 (1981)		25,000	1,600	93.6%
Overall				43,000	15,890	63.0%

Example 3: Estimates are available for various past population sizes for some subpopulations only.

Subpopulation	**Past**	**Present**	**Reduction**	**Notes**
Pacific Ocean	unknown	5,000 (1990)	50%	suspected reduction over 3 generations
Atlantic Ocean	8,000 (1955)	9,000 (1998)		
Indian Ocean	unknown	2,000 (1980)	70%	inferred reduction over 3 generations

In this case, for some regions, there is no information about the past subpopulation size, but there is a suspected or inferred reduction. In this case, such suspected or inferred values must be averaged, weighted by the population size three generations ago. Since this number is not known, it must be projected using the present estimates and the inferred or suspected reduction amount, using the methods discussed under

Example 2. Assuming exponential decline or growth, the table is completed as follows.

Subpop.	**Past**	**Present**	**Reduction**	**Population 3 gen. ago (est.)**	**Current population (est.)**	**3-generation change**
Pacific Ocean	?	5,000 (1990)	50% (suspected)	8,807[a]	4,403[a]	50% suspected reduction
Atlantic Ocean	8,000 (1955)	9,000 (1998)		7,699[b]	9,074[b]	17.9% estimated increase
Indian Ocean	?	2,000 (1980)	70% (inferred)	4,374[c]	1,312[c]	70% inferred reduction
Overall				20,880	14,789	29.2% reduction

[a] Annual proportional population change is 0.9885 [$=(1-0.5)^{(1/60)}$], which is a 1.15% decrease per year. Population change from 1941 until the census in 1990 is 0.5678 [$=0.9885^{(1990-1941)}$]. Thus, population size in 1941 is 8,807 (5,000/0.5678). Population change from the census in 1990 to 2001 is 0.8807 [$=0.9885^{(2001-1990)}$]. Thus, population size in 2001 is 4,403 (5,000*0.8807).
[b] Population change from 1955 to 1998 is 1.125 (=9,000/8,000; 12.5% increase). Thus, annual change is 1.00274, or 0.27% increase per year [$=1.125^{1/(1998-1955)}$]. Population size in 1941 is 7,699 [$=8{,}000/1.00274^{(1955-1941)}$]. Population size in 2001 is 9,074 [$=9{,}000*1.00274^{(2001-1998)}$].
[c] Annual population change is 0.9801 [$=(1-0.7)^{(1/60)}$]. Population change from 1941 until the census in 1980 is 0.4572 [$=0.9801^{(1980-1941)}$]. Thus, population size in 1941 is 4,374 (2,000/0.4572). Population change from the census in 1980 to 2001 is 0.6561 [$=0.9801^{(2001-1980)}$]. Thus, population size in 2001 is 1,312 (2,000*0.6561).

Example 4: Multiple estimates are available for various past population sizes.

Subpopulation	**Past-1**	**Past-2**	**Past-3**	**Present**
Pacific Ocean	10,000 (1935)	10,200 (1956)	8,000 (1977)	5,000 (1994)
Atlantic Ocean	8,000 (1955)			9,000 (1998)
Indian Ocean	13,000 (1946)	9,000 (1953)	5,000 (1965)	3,500 (1980)

In this case, as in example 2, the “past” and “present” population size estimates are not from the same year for all subpopulations. However, there are estimates for additional years, which provide information for making projections. For example, for the "Pacific Ocean" subpopulation, the annual rate of change has changed from a 0.09% increase in the first period (1935 to 1956) to a 1.15% decrease in the second and a 2.73% decrease in the third period, suggesting an accelerated decline. One option is to assume that the final rate of decline will apply from 1994 to 2001 as well. Another option is to perform a non-linear regression. For example, a 2nd degree polynomial regression on the natural logarithms of the four population estimates predicts population size as $exp(-1328+1.373t -0.0003524t^2)$, where t is year from 1935 to 2001. This equation gives a 1941 population of 10,389 and a 2001 population of 3,942, which correspond to a 62% reduction. The "Indian Ocean" subpopulation shows a different pattern; the annual rate of decline decelerates from 5.12% in the first period to 4.78% in the second and 2.35% in the third period. The same regression method predicts population size as $exp(2881-2.887t+0.0007255t^2)$, giving a 1941 subpopulation of 18,481 and a 2001 subpopulation of 3,538, which correspond to a 80.9% decline (thus, the regression has predicted a slight increase from 1980 to 2001). The completed table is below.

Subpop.	Past-1	Past-2	Past-3	Present (closest to 2001)	Population 3 gen. ago (1941; est.)	Current population (2001; est.)	Estimated 3-generation change
Pacific Ocean	10,000 (1935)	10,200 (1956)	8,000 (1977)	5,000 (1994)	10,389	3,942	62.1% reduction
Atlantic Ocean	8,000 (1955)			9,000 (1998)	7,699	9,074	17.9% increase
Indian Ocean	13,000 (1946)	9,000 (1953)	5,000 (1965)	3,500 (1980)	18,481	3,538	80.9% reduction
Overall					36,569	16,554	54.7% reduction

Dealing with uncertainty

In many cases, data from some or even most of the subpopulations (or regions) will be unavailable or uncertain. Even for taxa with very uncertain data, we recommend that the available data be organized in the same way as described above. Sections 4.5.1 discusses how to calculate population sizes for the present and 3 generations ago.

Using uncertain estimates

Uncertain values can be entered as plausible and realistic ranges (intervals). In specifying uncertainty, it is important to separate natural (temporal or spatial) variability from uncertainty due to lack of information. Because criterion A refers to a specific period, temporal variability should not contribute to uncertainty. In other words, the uncertainty you specify should not include year-to-year variation. Criterion A refers to the overall reduction of the taxon, so spatial variability should not contribute to uncertainty. For example, if the reduction in different subpopulations ranges from 10% to 80%, this range ([10,80]%) should not be used to represent uncertainty. Instead, the estimated reduction in different subpopulations should be averaged as described above.

This leaves uncertainty due to lack of information, which can be specified by entering each estimate as an interval, as in the following table.

Subpopulation	**Past**	**Present**
Pacific Ocean	8,000 - 10,000 (1941)	4,000 - 6,000 (2001)
Atlantic Ocean	7,000 - 8,000 (1941)	8,000 - 10,000 (2001)
Indian Ocean	10,000 - 15,000 (1941)	1,500 - 2,500 (2001)

In this case, a simple approach is to calculate the minimum and maximum estimates for the reduction in each subpopulation using the lower and upper estimates[6]. For example, for the "Pacific Ocean" subpopulation, the minimum reduction can be estimated as a reduction from 8,000 to 6,000 (25%) and the maximum reduction can be estimated as 60% (from 10,000 to 4,000). If "best" estimates for past and present population sizes are also available, they can be used to estimate the best estimate for reduction. Otherwise, the best estimate for reduction can be estimated as 44% (9,000 to 5,000), using the midpoints of the intervals for the past and the present population sizes.

[6] This is the method used in RAMAS Red List to calculate reduction based on abundances, when you click the "Calculate" button in the Value editor window for past or future reduction.

If similar uncertainty exists for all subpopulations (as in this example), a simple approach is to add all lower and all upper bounds of estimates. In this case, the total population size would be 25,000-33,000 in the past and 13,500-18,500 in the present. Using the same approach as outlined above, the best estimate of reduction can be calculated as 45% (29,000 to 16,000), with plausible range of reductions from 26% (from 25,000 to 18,500) to 59% (from 33,000 to 13,500).

An alternative method is to use a probabilistic (Monte Carlo) approach. If the uncertainty of past and present population sizes are given as probability distributions, and the correlation between these distributions are known, then the probability distribution for the reduction can be calculated by randomly selecting a pair of past and present population sizes (using the given distributions), calculating the reduction based on this pair, and repeating this with hundreds of randomly selected pairs.

Using data with different units

The examples discussed above assumed that the population data were in the same units (number of mature individuals). In some cases, data from different populations may be in different units (such as CPUE or other indices). In such cases, it is recommend that a separate table be prepared for each data type. If the past and current population sizes are in the same units for any subpopulation, they can be used to calculate (perhaps with extrapolation as discussed above) the reduction for that subpopulation. Such a calculation assumes that the index is linearly related to the number of mature individuals. The assessment should discuss the validity of this assumption, and make the necessary transformation (of the index to one that linearly relates to the number of mature individuals) before reduction is calculated (also see requirement (a) at the start of this section).

It is also important that an effort be made to combine the tables by converting all units to a common one. This is because it is necessary to know the relative sizes of the subpopulations in order to combine the reduction estimates, unless the subpopulations are known to be similar sizes or have declined by similar percentages. If the percent reduction is similar (within one or two percentage points) for different subpopulations, their relative sizes will not play an important role, and a simple (arithmetic) average can be used instead of a weighted average. If population sizes were known to be similar three generations ago (e.g., the smallest subpopulation was not any smaller than, say, 90% of the largest), again a simple average can be used.

If population sizes and reduction amounts differ among subpopulations, then reductions (in percent) based on different units can be combined only if the relative sizes of the subpopulations can be estimated. However, this need not be a very precise calculation. Ranges (intervals) can be used to calculate uncertain results. For example, suppose that the estimates of reduction in two subpopulations are 60% and 80%, and that precise estimates of relative population sizes are not available (because these reduction estimates are based on different indices). In this case, crude estimates of relative sizes can be used. If the relative size of the first subpopulation is estimated to be between 0.40 and 0.70 of the total population, then the overall reduction can be calculated as follows. The high estimate would be (60%*0.4)+ (80%*0.6), or 72%.

The low estimate would be (60%*0.7)+(80%*0.3), or 66%. Thus, the overall reduction can be expressed as the interval 66%-72%.

Using data from a few subpopulations

In some cases, reliable data exist from only one or few subpopulations. In such cases, the available data can be used under the following conditions.

1. If the subpopulation for which a reduction estimate is available was by far the largest subpopulation three generations ago, then this estimate can be used for the whole taxon. This process can also be formalized using the methods outlined above. For example, suppose that the largest subpopulation has declined by 60%, and that it had represented 90 to 99% of the mature individuals in the taxon three generations ago. If there is no information on the rest of the subpopulations (representing 1-10% of mature individuals), these subpopulations can be assumed to have declined by 0 to 100% (although, of course, this range does not include all the possibilities, as it excludes the possibility that the other subpopulations have increased). With these assumptions, the low estimate would be 54% (if the rest of the subpopulations had 10% of the individuals, and declined by 0%), and the high estimate would be 64% (if the rest of the subpopulations had 10% of the individuals, and declined by 100%). Thus, the overall reduction can be expressed as the interval 54%-64%, which includes the estimate (60%) based on the largest subpopulation, but also incorporates the uncertainty due to lack of knowledge from other subpopulations.

2. If it can be assumed that all (or all the large) subpopulations are declining at the same rate, then the reduction estimated for a subset of the subpopulations can be used for the whole taxon. In this case, it is important to document any evidence that indicates that the rates are the same, and discuss and rule out various factors that may lead to different rates of reduction in different subpopulations.

Continuing decline (criteria B and C)

"A continuing decline is a recent, current or projected future decline (which may be smooth, irregular or sporadic) which is liable to continue unless remedial measures are taken. Fluctuations will not normally count as continuing declines, but an observed decline should not be considered as a fluctuation unless there is evidence for this." (IUCN 2001, 2012b)

Continuing declines are used in two different ways in the criteria. Continuing declines at any rate can be used to qualify taxa under criteria B or C2. This is because taxa under consideration for criteria B and C are already characterized by restricted ranges or small population size. *Estimated continuing decline* (under criterion C1) has quantitative thresholds, and requires a quantitative estimate, which can be calculated using the same methods as for population reduction (see section 4.5). The concept of continuing decline at any rate is not applicable under criterion C1 (or under criterion A).

Under criteria B1b, B2b, and C2, continuing declines can be observed, estimated, inferred or projected. Although not explicitly mentioned in criteria B or C2, estimated

continuing declines are permissible. Under criterion C1, continuing declines can only be observed, estimated or projected. A continuing decline under criteria B or C can be projected, thus, it does not have to have started yet. However, such projected declines must be justified and there must be high degree of certainty that they will take place (i.e., merely 'plausible' future declines are not allowed).

Rates of continuing decline over long generation times (in the same way as reductions) may be estimated from data over shorter time frames. For example, evaluating a taxon under criterion C1 for the Vulnerable category requires estimating a continuing decline for three generations or 10 years, whichever is longer (up to a maximum of 100 years). When extrapolating data from shorter time frames, assumptions about the rate of decline remaining constant, increasing or decreasing, relative to the observed interval must be justified with reference to threatening processes, life history or other relevant factors.

Note that a continuing decline is not possible without a population reduction (which, however, may not be large enough to meet any thresholds under criterion A), but a reduction is possible without a continuing decline: if a reduction has ‘ceased’ under criterion A, there cannot be a continuing decline. However, continuing declines need not be continuous; they can be sporadic, occurring at unpredictable intervals, but they must be likely to continue into the future. Relatively rare events can be considered to contribute to a continuing decline if they happened at least once within the last three generations or 10 years (whichever is longer), and it is likely that they may happen again in the next three generations or 10 years (whichever is longer), and the population is not expected to recover between the events.

A potentially confusing aspect of the criteria is that “estimated continuing decline” under criterion C1 is conceptually very similar to “moving window reduction” under criterion A4. The differences are (i) criterion A4 is always evaluated for three generations/10 years, whereas criterion C1 is evaluated for one, two or three generations, depending on the category, (ii) the thresholds are lower under criterion C1 (e.g., for VU, 10% under criterion C1 and 30% under criterion A4), (iii) criterion C1 also requires small population size, and (iv) under criterion C1, the decline must be observed or estimated, whereas under criterion A4, the reduction can be observed, estimated, inferred, projected or suspected.

If habitat is declining but abundance is not, this may be because (i) there is a delay in the population's response to lower carrying capacity, perhaps because the population is below the carrying capacity for other reasons (such as harvest), (ii) habitat is declining in areas not currently occupied by the taxon, or (iii) habitat is not correctly identified. In the case of (i), the population will eventually be impacted; in the case of (ii) the loss of recolonization options may eventually impact the population. In both cases, criteria B1b(iii) or B2b(iii) may be invoked even if the population is not undergoing a continuing decline. Incorrect habitat identification (case iii) often requires a more precise definition of "habitat." When determining continuing decline in area, extent and/or quality of habitat (criteria B1b(iii) and B2b(iii)), assessors should define "habitat" in the strict sense, i.e., as the area, characterized by its abiotic and biotic properties, that is habitable by a particular species. In particular, they should avoid using generic classifications such as "forest" that indicate a biotope, a

vegetation type, or a land cover type, rather than a species-specific identification of habitat.

Note that continuing decline is different from "current population trend", which is a required field in IUCN Red List assessments, but not used when applying the criteria. There is not a simple correspondence between these two terms. The current population trend may be stable or increasing, with a continuing decline projected in the future. If the current population trend is declining, then there is continuing decline, but only if the trend is liable to continue into the future and it is not the declining phase of a fluctuation.

Extreme fluctuations (criteria B and C2)

"Extreme fluctuations can be said to occur in a number of taxa where population size or distribution area varies widely, rapidly and frequently, typically with a variation greater than one order of magnitude (i.e., a tenfold increase or decrease)." (IUCN 2001, 2012b)

Extreme fluctuations are included in criteria B and C in recognition of the positive relationship between extinction risk and variance in the rate of population growth (Burgman *et al*. 1993). Populations that undergo extreme fluctuations are likely to have highly variable growth rates, and are therefore likely to be exposed to higher extinction risks than populations with lower levels of variability.

Population fluctuations may vary in magnitude and frequency (Figure 4.4). For the 'extreme fluctuations' subcriterion to be invoked, populations would normally need to fluctuate by at least 10-fold (i.e., an order of magnitude difference between population minima and maxima). Fluctuations may occur over any time span, depending on their underlying causes. Short-term fluctuations that occur over seasonal or annual cycles will generally be easier to detect than those that occur over longer time spans, such as those driven by rare events or climatic cycles such as El Niño. Fluctuations may occur regularly or sporadically (i.e., with variable intervals between successive population minima or successive population maxima).

The effect of extreme fluctuations on the extinction risk will depend on both the degree of isolation and the degree of synchrony of the fluctuations between subpopulations.

If there is regular or occasional dispersal (of even a small number of individuals, seeds, spores, etc) between all (or nearly all) of the subpopulations, then the degree of fluctuations should be measured over the entire population. In this case, the subcriterion would be met only when the overall degree of fluctuation (in the total population size) is larger than one order of magnitude. If the fluctuations of different subpopulations are independent and asynchronous, they would cancel each other to some extent when fluctuations of the total population size are considered.

If, on the other hand, the subpopulations are totally isolated, the degree of synchrony between the populations is not as important and it is sufficient that a majority of subpopulations each show extreme fluctuation to meet the subcriterion. In this case, if

most of the subpopulations show fluctuations of an order of magnitude, then the criterion would be met (regardless of the degree of the fluctuations in total population size).

Between these two extremes, if dispersal is only between some of the subpopulations, then the total population size over these connected subpopulations should be considered when assessing fluctuations; each set of connected subpopulations should be considered separately.

Population fluctuations may be difficult to distinguish from directional population changes, such as continuing declines, reductions or increases. Figure 4.4 shows examples where fluctuations occur independent of, and in combination with, directional changes. A reduction should not be interpreted as part of a fluctuation unless there is good evidence for this. Fluctuations must be inferred only where there is reasonable certainty that a population change will be followed by a change in the reverse direction within a generation or two. In contrast, directional changes will not necessarily be followed by a change in the reverse direction.

There are two main ways that extreme fluctuations may be diagnosed: (i) by interpreting population trajectories based on an index of abundance appropriate for the taxon; and (ii) by using life history characteristics or habitat biology of the taxon.

i) Population trajectories must show a recurring pattern of increases and decreases (Figure 4.4). Normally, several successive increases and decreases would need to be observed to demonstrate the reversible nature of population changes, unless an interpretation of the data was supported by an understanding of the underlying cause of the fluctuation (see ii). Successive maxima or minima may be separated by intervals of relatively stable population size.

ii) Some organisms have life histories prone to boom/bust dynamics. Examples include fish that live in intermittent streams, granivorous small mammals of arid climates, and plants that respond to stand-replacing disturbances. In these cases there is dependence on a particular resource that fluctuates in availability, or a response to a disturbance regime that involves predictable episodes of mortality and recruitment. An understanding of such relationships for any given taxon may be gained from studies of functionally similar taxa, and inference of extreme fluctuations need not require direct observation of successive increases and decreases.

In all cases, assessors must be reasonably certain that fluctuations in the number of mature individuals represent changes in the total population, rather than simply a flux of individuals between different life stages. For example, in some freshwater invertebrates of intermittent water bodies, the number of mature individuals increases after inundation which stimulates emergence from larval stages. Mature individuals reproduce while conditions remain suitable, but die out as the water body dries, leaving behind immature life stages (e.g., eggs) until the next inundation occurs. Similarly, fires may stimulate mass recruitment from large persistent seed banks when there were few mature individuals before the event. As in the previous example,

mature plants may die out during the interval between fires, leaving a store of immature individuals (seeds) until they are stimulated to germinate by the next fire. Such cases do not fall within the definition of extreme fluctuations unless the dormant life stages are exhaustible by a single event or cannot persist without mature individuals. Plant taxa that were killed by fire and had an exhaustible canopy-stored seed bank (serotinous obligate seeders), for example, would therefore be prone to extreme fluctuations because the decline in the number of mature individuals represents a decline in the total number.

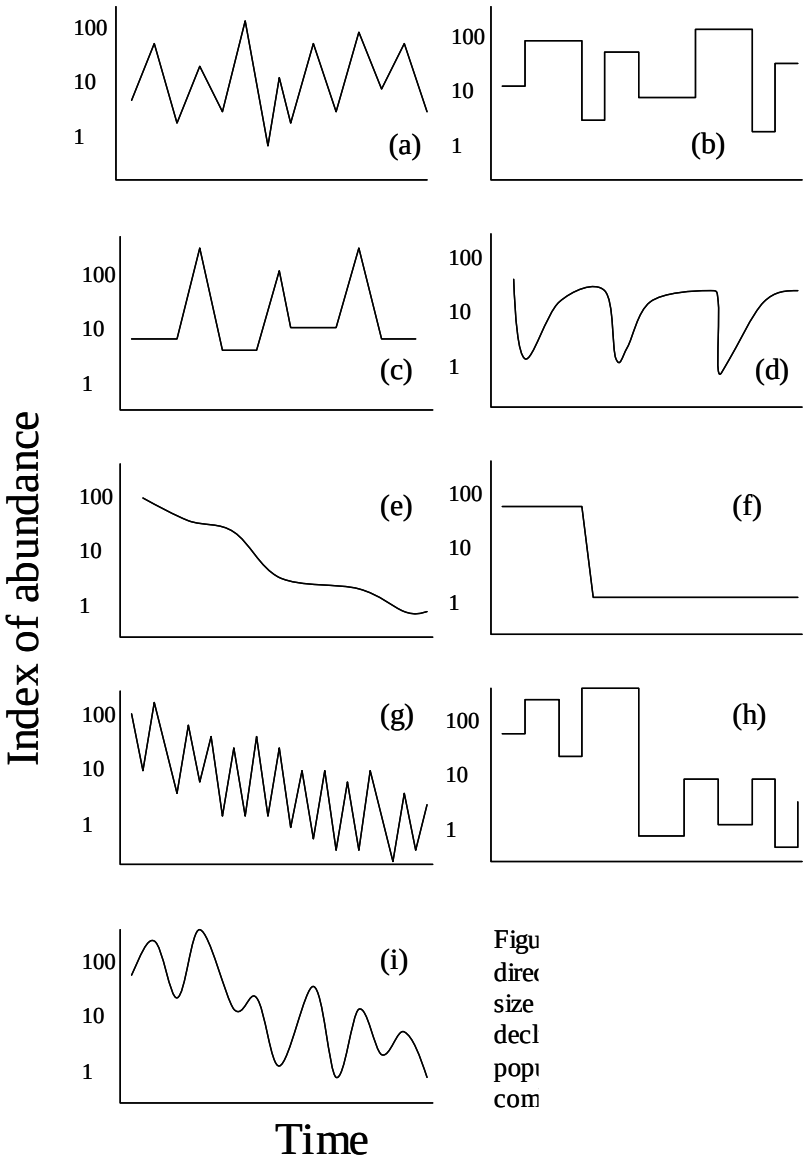

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Figure 4.4. Fluctuations without directional change in population size (a-d), population reductions or declines without fluctuations (e, f), population reductions in combination with fluctuations (g-i).

Severely fragmented (criterion B)

"The phrase 'severely fragmented' refers to the situation in which increased extinction risks to the taxon results from the fact that most of its individuals are found in small

and relatively isolated subpopulations (in certain circumstances this may be inferred from habitat information). These small subpopulations may go extinct, with a reduced probability of recolonization." (IUCN 2001, 2012b)

Fragmentation must be assessed at a scale that is appropriate to biological isolation in the taxon under consideration. In general, taxa with highly mobile adult life stages or with a large production of small mobile diaspores are considered more widely dispersed, and hence not so vulnerable to isolation through fragmentation of their habitats. Thus, the same degree of habitat fragmentation may not lead to the same degree of population fragmentation for species with different levels of mobility. Taxa that produce only small numbers of diaspores (or none at all), or only large ones, are less efficient at long distance dispersal and therefore more easily isolated. If natural habitats have been fragmented (e.g., old growth forests and rich fens), this can be used as direct evidence for fragmentation for taxa with poor dispersal ability.

The following criterion can be used to decide whether there is severe fragmentation in cases where data are available on (i) the distribution of area of occupancy (i.e., detailed maps of occupied habitat), (ii) some aspect of the dispersal ability of the taxon (e.g., average dispersal distance), and (iii) average population density in occupied habitat (e.g., information on territory size, home range size, etc.), then the: A taxon can be considered to be severely fragmented if most (>50%) of its total area of occupancy is in habitat patches that are (1) smaller than would be required to support a viable population, and (2) separated from other habitat patches by a large distance.

For (1), the area for a viable population should be based on rudimentary estimates of population density, and on the ecology of the taxon. For example, for many vertebrates, subpopulations of fewer than 100 individuals may be considered too small to be viable. For (2), the degree of isolation of patches should be based on dispersal distance of the taxon. For example, subpopulations that are isolated by distances several times greater than the (long-term) average dispersal distance of the taxon may be considered isolated. On the other hand, separation of subpopulations by non-habitat areas (e.g., islands in an archipelago) does not necessarily mean isolation, if the taxon can disperse between the subpopulations.

Note that the existence (or even a large number) of small and isolated patches is not sufficient to consider the taxon severely fragmented. For meeting this criterion, more than half of the individuals (or, more than half of the occupied habitat area) must be in small and isolated patches.

For many taxa, the information on population density and dispersal distance can be based on other similar taxa. Biologically informed values can be set by the assessors for large taxonomic groups (families or even orders) or for other groupings of taxa based on their biology. For example in bryophytes, information on the effects of isolation of subpopulations is often lacking. For bryophytes, it is recommended that in most circumstances, a minimum distance greater than 50 km between subpopulations of taxa without spore dispersal can indicate severe fragmentation, and a distance of between 100 km and 1,000 km for taxa with spores (Hallingbäck *et al.* 2000).

The definition of severe fragmentation is based on the distribution of subpopulations. This is often confused with the concept of "location" (see section 4.11), but is independent of it. A taxon may be severely fragmented, yet all the isolated subpopulations may be threatened by the same major factor (single location), or each subpopulation may be threatened by a different factor (many locations).

Extent of occurrence (criteria A and B)

Extent of occurrence is defined as "the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy" (IUCN 2001, 2012b).

Extent of occurrence (EOO) is a parameter that measures the spatial spread of the areas currently occupied by the taxon. The intent behind this parameter is to measure the degree to which risks from threatening factors are spread spatially across the taxon's geographical distribution. The theoretical basis for using EOO as a measure of risk spreading is the observation that many environmental variables and processes are spatially correlated, meaning that locations that are close to each other experience more similar (more correlated) conditions over time than locations that are far away from each other. These processes include both human threats (such as diseases, invasive species, oil spills, non-native predators, habitat loss to development, etc.) and natural processes (fluctuations in environmental variables such as droughts, heat waves, cold snaps, hurricanes and other weather events, as well as other disturbance events such as fires, floods, and volcanism). Higher correlation leads to higher overall extinction risk, so that, all other things being equal, a set of populations spread in a small area have higher extinction risk overall than a set of populations spread over a larger area.

EOO is not intended to be an estimate of the amount of occupied or potential habitat, or a general measure of the taxon's range. Other, more restrictive definitions of "range" may be more appropriate for other purposes, such as for planning conservation actions. Valid use of the criteria requires that EOO is estimated in a way that is consistent with the thresholds set therein.

In thinking about the differences between EOO and AOO (area of occupancy; discussed in section 4.10), it may be helpful to compare species that have similar values for one of these spatial parameters and different values for the other. All else being equal, larger EOOs usually result in a higher degree of risk spreading (and hence a lower overall risk of extinction for the taxon) than smaller EOOs, depending on the relevant threats to the taxa. For example, a taxon with occurrences distributed over a large area is highly unlikely to be adversely affected across its entire range by a single fire because the spatial scale of a single occurrence of this threat is narrower than the spatial distribution of the taxon. Conversely, a narrowly distributed endemic taxon, with the same AOO as the taxon above, may be severely affected by a fire across its entire EOO because the spatial scale of the threat is larger than, or as large as, the EOO of the taxon.

In the case of migratory species, EOO should be based on the minimum of the breeding or non-breeding (wintering) areas, but not both, because such species are dependent on both areas, and the bulk of the population is found in only one of these areas at any time.

If EOO is less than AOO, EOO should be changed to make it equal to AOO to ensure consistency with the definition of AOO as an area within EOO.

"Extent of occurrence can often be measured by a minimum convex polygon (the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence)" (IUCN 2001, 2012b). The IUCN Red List Categories and Criteria state that EOO may exclude "discontinuities or disjunctions within the overall distribution of the taxa". However, for assessments of criterion B, exclusion of areas forming discontinuities or disjunctions from estimates of EOO is strongly discouraged. Exclusions are not recommended for criterion B, because disjunctions and outlying occurrences accurately reflect the extent to which a large range size reduces the chance that the entire population of the taxon will be affected by a single threatening process. The risks are spread by the existence of outlying or disjunct occurrences irrespective of whether the EOO encompasses significant areas of unsuitable habitat. Inappropriate exclusions of discontinuities or disjunctions within the overall distribution of a taxon will underestimate EOO for the purpose of assessing criterion B and consequently will underestimate the degree to which risk is spread spatially for the taxon.

When there are such discontinuities or disjunctions in a species distribution, the minimum convex polygon (also called the convex hull) yields a boundary with a very coarse level of resolution on its outer surface, resulting in a substantial overestimate of the range, particularly for irregularly shaped ranges (Ostro *et al.* 1999). The consequences of this bias vary, depending on whether the estimate of EOO is to be used for assessing the spatial thresholds in criterion B or whether it is to be used for estimating or inferring reductions (criterion A) or continuing declines (criteria B and C). The use of convex hulls is unlikely to bias the assessment of EOO thresholds under criterion B, because disjunctions and outlying occurrences often do contribute to the spatial spread of risk (see above). This is also true for "doughnut distributions" (e.g. aquatic species confined to the margins of a lake) and elongated distributions (e.g., coastal species). In the case of species with linear elongated distributions, minimum convex polygon may lead to an overestimate of extinction risk. Nevertheless, given the paucity of practical methods applicable to all spatial distributions, and the need to estimate EOO consistently across taxa, minimum convex polygon remains a pragmatic measure of the spatial spread of risk.

However, the bias associated with estimates based on convex hulls, and their sensitivity to sampling effort, makes them less suitable as a method for comparing two or more temporal estimates of EOO for assessing reductions or continuing declines. If outliers are detected at one time and not another, this could result in erroneous inferences about reductions or increases. Therefore, a method such as the α-hull (a generalization of a convex hull) is recommended for assessing reductions of continuing declines in EOO because it substantially reduces the biases that may result

from the spatial arrangement of habitat (Burgman and Fox 2003). The α-hull provides a more repeatable description of the external shape of a species' range by breaking it into several discrete patches when it spans uninhabited regions. For α-hulls the estimate of area and trend in area also converges on the correct value as sample size increases, unless other errors are large. This does not necessarily hold for convex hulls. Kernel estimators may be used for the same purpose but their application is more complex.

To estimate an α-hull, the first step is to make a Delauney triangulation of the mapped points of occurrence (Figure 4.5). The triangulation is created by drawing lines joining the points, constrained so that no lines intersect between points. The outer surface of the Delauney triangulation is identical to the convex hull.

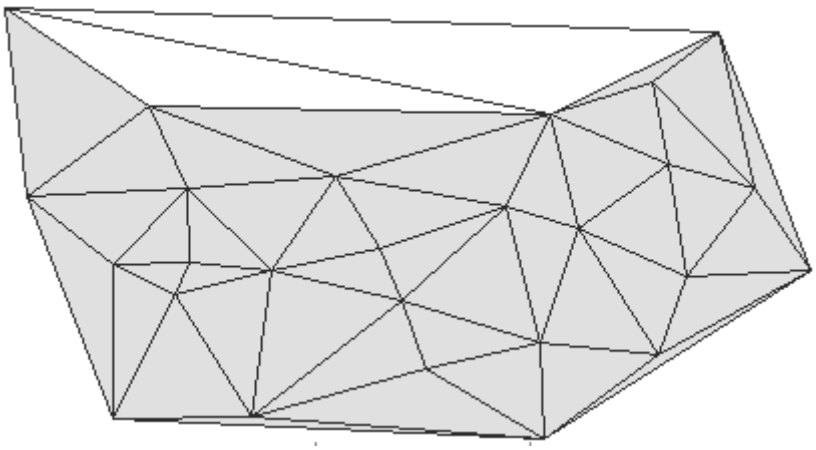


Figure 4.5. Illustration of α-hull. The lines show the Delauney triangulation (the intersection points of the lines are the taxon's occurrence locations). The sum of the areas of darker triangles is EOO based on the α-hull. The two lighter coloured triangles that are part of the convex hull are excluded from the α-hull.

The second step is to measure the lengths of all of the lines, and calculate the average line length. The third step is to delete all lines that are longer than a multiple (α) of the average line length. (This product of α and the average line length represents a "discontinuity distance".) The value of α can be chosen with a required level of resolution in mind. The smaller the value of α, the finer the resolution of the hull. Experience has shown that an α value of 2 is a good starting point for some species (however, the value to use for specific cases of assessing reductions in EOO should be based on a compromise between minimizing the potential bias associated with incomplete sampling of outlying occurrences and minimizing the departure from a convex hull). This process results in the deletion of lines joining points that are relatively distant, and may subdivide the total range into more than one polygon. The final step is to calculate the extent of occurrence by summing the areas of all remaining triangles. When this exercise is repeated to estimate EOO from a second temporal sample of points (and hence assess change in EOO), the same discontinuity distance between points should be used as a threshold for deleting lines (rather than the same value of α). This will reduce bias due to variation in sampling effort between

the two surveys and the bias due to changing average line length with more or fewer occurrences.

Extent of occurrence and area of occupancy are measures of the current distribution, i.e. they should not include areas where the species no longer exists. On the other hand, these measures should not only include the actually known sites, but also inferred or projected sites (see section 4.10.7). For instance, sites can be inferred from presence of known appropriate habitat, but where the species has not yet been searched for. In doing so, it will be important to judge to what extent the taxon has been looked for. Incorporating inferred sites results in a range of plausible values, which may give a range of plausible Red List Categories (see sections 3.1 on *Data availability, inference and projection*, and 3.2 on *Uncertainty*).

Area of occupancy (criteria A, B and D)

"Area of occupancy is defined as the area within its 'extent of occurrence' (see 0 above), which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats. In some cases, (e.g., irreplaceable colonial nesting sites, crucial feeding sites for migratory taxa) the area of occupancy is the smallest area essential at any stage to the survival of existing populations of a taxon. The size of the area of occupancy will be a function of the scale at which it is measured, and should be at a scale appropriate to relevant biological aspects of the taxon, the nature of threats and the available data (see below). To avoid inconsistencies and bias in assessments caused by estimating area of occupancy at different scales, it may be necessary to standardize estimates by applying a scale-correction factor. It is difficult to give strict guidance on how standardization should be done because different types of taxa have different scale-area relationships." (IUCN 2001, 2012b)

Area of occupancy (AOO) is a parameter that represents the area of suitable habitat currently occupied by the taxon. As any area measure, AOO requires a particular scale. In this case, the scale is determined by the thresholds in the criteria, i.e. valid use of the criteria requires that AOO is estimated at scales that relate to the thresholds in the criteria. These scales (see "Problems of scale" below) are intended to result in comparable threat status across taxa; other scales may be more appropriate for other uses. For example, much finer scales are appropriate for planning conservation action for plants, and larger scales may be appropriate for global gap analysis for large mobile species. However, such scales may not be appropriate for use with the criteria.

Area of occupancy is included in the criteria for two main reasons. The first is to identify species with restricted spatial distribution and, thus usually with restricted habitat. These species are often habitat specialists. Species with a restricted habitat are considered to have an increased risk of extinction. Secondly, in many cases, AOO can be a useful proxy for population size, because there is generally a positive correlation between AOO and population size. The veracity of this relationship for any one species depends on variation in its population density.

Suppose two species have the same EOO, but different values for AOO, perhaps because one has more specialized habitat requirements. For example, two species may be distributed across the same desert (hence EOO is the same), but one is wide ranging throughout (large AOO) while the other is restricted to oases (small AOO). The species with the smaller AOO may have a higher risk of extinction because threats to its restricted habitat (e.g., degradation of oases) are likely to reduce its habitat more rapidly to an area that cannot support a viable population. The species with the smaller AOO is also likely to have a smaller population size than the one with a larger AOO, and hence is likely to have higher extinction risks for that reason.

Problems of scale

Classifications based on the area of occupancy (AOO) may be complicated by problems of spatial scale. There is a logical conflict between having fixed range thresholds and the necessity of measuring range at different scales for different taxa. "The finer the scale at which the distributions or habitats of taxa are mapped, the smaller the area will be that they are found to occupy, and the less likely it will be that range estimates … exceed the thresholds specified in the criteria. Mapping at finer spatial scales reveals more areas in which the taxon is unrecorded. Conversely, coarse-scale mapping reveals fewer unoccupied areas, resulting in range estimates that are more likely to exceed the thresholds for the threatened categories. The choice of scale at which AOO is estimated may thus, itself, influence the outcome of Red List assessments and could be a source of inconsistency and bias." (IUCN 2001, 2012b)

Some estimates of AOO may require standardization to an appropriate reference scale to reduce such bias. Below, we first discuss a simple method of estimating AOO, then we make recommendations about the appropriate reference scale, and finally we describe a method of standardization for cases where the available data are not at the reference scale.

Methods for estimating AOO

There are several ways of estimating AOO, but for the purpose of these guidelines we assume estimates have been obtained by counting the number of occupied cells in a uniform grid that covers the entire range of a taxon (see Figure 2 in IUCN 2001, 2012b), and then tallying the total area of all occupied cells:

$$\text{AOO} = \text{no. occupied cells} \times \text{area of an individual cell} \qquad \text{(equation 4.1)}$$

The 'scale' of AOO estimates can then be represented by the area of an individual cell in the grid (or alternatively the length of a cell, but here we use area). There are other ways of representing AOO, for example, by mapping and calculating the area of polygons that contain all occupied habitat. The scale of such estimates may be represented by the area of the smallest mapped polygon (or the length of the shortest polygon segment), but these alternatives are not recommended.

If different grid locations (starting points of the grid) result in different AOO estimates, the minimum estimate should be used.

The appropriate scale

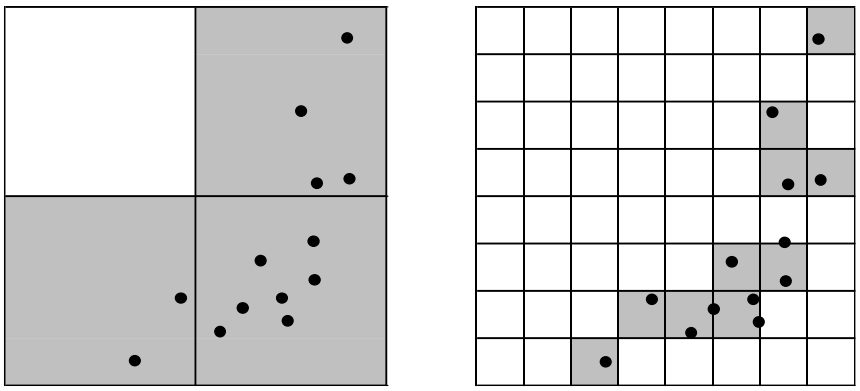
It is impossible to provide any strict but general rules for mapping taxa or habitats; the most appropriate scale will depend on the taxon in question, and the origin and comprehensiveness of the distribution data. However, we believe that in many cases a grid size of 2 km (a cell area of 4 km^2) is an appropriate scale. Scales of 3.2 km grid size or coarser (larger) are inappropriate because they do not allow any taxa to be listed as Critically Endangered (where the threshold AOO under criterion B is 10 km^2). Scales of 1 km grid size or smaller tend to list more taxa at higher threat categories than these categories imply. For most cases, we recommend a scale of 4 km^2 cells as the reference scale. If an estimate was made at a different scale, especially if data at different scales were used in assessing species in the same taxonomic group, this may result in inconsistencies and bias. In any case, the scale for AOO should not be based on EOO (or other measures of range area), because AOO and EOO measure different factors affecting extinction risk (see above).

If AOO can be calculated at the reference scale of 4 km^2 cells, you can skip sections 0 and 0. If AOO cannot be calculated at the reference scale (e.g., because it has already been calculated at another scale and original maps are not available), then the methods described in the following two sections may be helpful.

Scale-area relationships

We recommended reducing the biases caused by use of range estimates made at different scales by standardizing estimates to a reference scale that is appropriate to the thresholds in the criteria. This and the following section discuss the scale-area relationship that forms the background for these standardization methods, and describe such a method with examples. The method of standardization depends on how AOO is estimated. In the following discussion, we assume that AOO was estimated using the grid method summarized above.

The standardization or correction method we will discuss below relies on the relationship of scale to area, in other words, how the estimated AOO changes as the scale or resolution changes. Estimates of AOO may be calculated at different scales by starting with mapped locations at the finest spatial resolution available, and successively doubling the dimensions of grid cells. The relationship between the area occupied and the scale at which it was estimated may be represented on a graph known as an area-area curve (e.g., Figure 4.6). The slopes of these curves may vary between theoretical bounds, depending on the extent of grid saturation. A maximum slope = 1 is achieved when there is only one occupied fine-scale grid cell in the landscape (fully unsaturated distribution). A minimum slope = 0 is achieved when all fine-scale grid cells are occupied (fully saturated distribution).



grid length	grid area	AOO
1	1	10
2	4	24
4	16	48
8	64	64
16	256	256
32	1,024	1,024

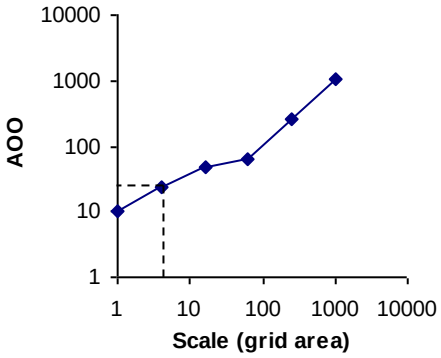


Figure 4.6. Illustration of scale-dependence when calculating area of occupancy. At a fine scale (map on right) AOO = 10 x 1 = 10 units^2. At a coarse scale (map on left) AOO = 3 x 16 = 48 units^2. AOO may be calculated at various scales by successively doubling grid dimensions from estimates at the finest available scale (see Table). These may be displayed on an area-area curve (above).

Scale correction factors

Estimates of AOO may be standardized by applying a scale-correction factor. Scale-area relationships (e.g., Figure. 4.6) provide important guidance for such standardization. It is not possible to give a single scale-correction factor that is suitable for all cases because different taxa have different scale-area relationships. Furthermore, a suitable correction factor needs to take into account a reference scale (e.g., 2 km grid size) that is appropriate to the area of occupancy thresholds in criterion B. The example below shows how estimates of AOO made at fine and coarse scales may be scaled up and down, respectively, to the reference scale to obtain an estimate that may be assessed against the AOO thresholds in criterion B.

Example: Scaling Up

Assume that estimates of AOO are available at 1 km grid resolution shown in Figure 4.6 (right) and that it is necessary to obtain an estimate at the reference scale represented by a 2 km grid. This may be done cartographically by simply doubling the original grid dimensions, counting the number of occupied cells and applying equation 4.1. When the reference scale is not a geometric multiple of the scale of the original estimate, it is necessary to calculate an area-area curve, as shown in Figure 4.6, and interpolate an estimate of AOO at the reference scale. This can be done

mathematically by calculating a scale correction factor (C) from the slope of the area-area curve as follows (in all equations below, "log" means logarithm to base 10):

$$C = \log(AOO_2/AOO_1) / \log(Ag_2/Ag_1) \qquad \text{(equation 4.2)}$$

where AOO_1 is the estimated area occupied from grids of area Ag_1, a size close to, but smaller than the reference scale, and AOO_2 is the estimated area occupied from grids of area Ag_2, a size close to, but larger than the reference scale. An estimate of AOO_R at the reference scale, Ag_R, may thus be calculated by rearranging equation 2 as follows:

$$AOO_R = AOO_1 * 10^{C*\log(Ag_R / Ag_1)}, \text{ or } AOO_R = AOO_2 * 10^{C*\log(Ag_R / Ag_2)}$$

(equation 4.3)

In the example shown in Figure 4.6, estimates of AOO from 1x1 km and 4x4 km grids may be used to verify the estimate AOO at the reference scale of 2x2 km as follows:

C = log(48/10) / log(16/1) = 0.566, and using equation 4.3 with this value of C, the AOO estimate at the larger scale (AOO_2=48), and the grid sizes at the larger and reference scales (Ag_R=4; Ag_2=16), the AOO estimate at the reference scale is calculated as:

$$AOO = 48 * 10^{0.566*\log(4/16)} = 22 \text{ km}^2$$

Note that this estimate differs slightly from the true value obtained from grid counting and equation 1 (24 km^2) because the slope of the area-area curve is not exactly constant between the measurement scales of 1x1 km and 4x4 km.

Example: Scaling Down

Scaling down estimates of AOO is more difficult than scaling up because there is no quantitative information about grid occupancy at scales finer than the reference scale. Scaling therefore requires extrapolation, rather than interpolation of the area-area curve. Kunin (1998) and He and Gaston (2000) suggest mathematical methods for this. A simple approach is to apply equation 4.3 using an approximated value of C.

An approximation of C may be derived by calculating it at coarser scales, as suggested by Kunin (1998). For example, to estimate AOO at 2x2 km when the finest resolution of available data is at 4x4 km, we could calculate C from estimates at 4x4 km and 8x8 km as follows.

C = log(64/48) / log(64/16) = 0.208

However, this approach assumes that the slope of the area-area curve is constant, which is unlikely to hold for many taxa across a moderate range of scales. In this case, AOO at 2x2 km is overestimated because C was underestimated.

$$AOO = 48 * 10^{0.208*\log(4/16)} = 36 \text{ km}^2.$$

While mathematical extrapolation may give some guidance in estimating C, there may be qualitative information about the dispersal ability, habitat specificity and landscape patterns that could also provide guidance. Table 4.1 gives some guidance on how these factors may influence the values of C within the range of scales between 2x2 km and 10x10 km grid sizes.

Table 4.1. Characteristics of organisms and their habitat that influence the slope of the scale-area relationship, and hence the scale-correction factor, C, within the range of spatial scales represented by 2x2 km and 10x10 km grid cells.

Biological characteristic	Influence on C	
	small (approaching 0)	large (approaching 1)
Dispersal ability	Wide	localized or sessile
Habitat specificity	Broad	Narrow
Habitat availability	Extensive	Limited

For example, if the organism under consideration was a wide-ranging animal without specialized habitat requirements in an extensive and relatively uniform landscape (e.g., a species of camel in desert), its distribution at fine scale would be relatively saturated and the value of C would be close to zero. In contrast, organisms that are either sessile or wide ranging but have specialized habitat requirements that only exist in small patches within the landscape (e.g., migratory sea birds that only breed on certain types of cliffs on certain types of islands) would have very unsaturated distributions represented by values of C close to one. Qualitative biological knowledge about organisms and mathematical relationships derived from coarse-scale data may thus both be useful for estimating a value of C that may be applied in equation 4.3 to estimate AOO at the reference scale.

Finally, it is important to note that if unscaled estimates of AOO at scales larger than the reference value are used directly to assess a taxon against thresholds in criterion B, then the assessment is assuming that the distribution is fully saturated at the reference scale (i.e., assumes C = 0). In other words, the occupied coarse-scale grids are assumed to contain no unsuitable or unoccupied habitat that could be detected in grids of the reference size (see Figure 4.7).

"Linear" habitat

There is a concern that grids do not have much ecological meaning for taxa living in "linear" habitat such as in rivers or along coastlines. Although this concern is valid, for the purpose of assessing taxa against criterion B, it is important to have a measurement system that is consistent with the thresholds, and that leads to comparable listings. If AOO estimates were based on estimates of length x breadth of habitat, there may be very few taxa that exceed the VU threshold for criterion B (especially when the habitats concerned are streams or beaches a few metres wide). In addition, there is the problem of defining what a "linear" habitat is, and measuring the length of a jagged line. Thus, we recommend that the methods described above for estimating AOO should be used for taxa in all types of habitat distribution, including taxa with linear ranges living in rivers or along coastlines.

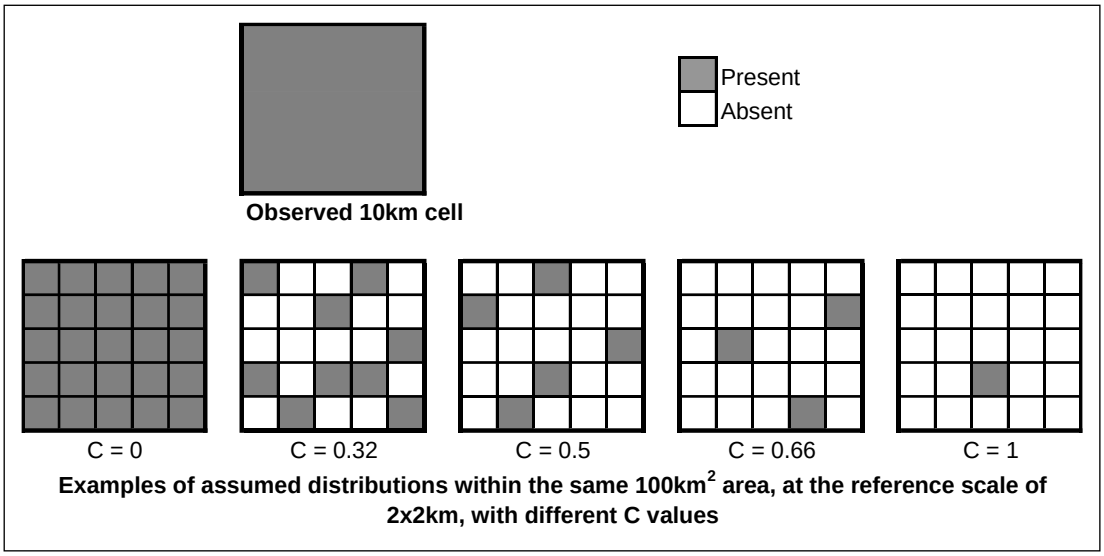


Figure 4.7. Demonstration of the consequences of different assumed C values. The available map is at 10x10 km resolution, so a presence observed at this scale corresponds to 25 cells at the reference scale of 2x2 km. Assuming C=0 (i.e., using the unscaled estimate directly as AOO) assumes that all of these 25 cells are occupied. At the other extreme, a value of C=1 assumes that only one 2x2 km cell is occupied.

AOO and EOO based on habitat maps and models

Both AOO and EOO may be estimated based on "…known, inferred or projected sites of present occurrences…" (IUCN 2001). In this case, 'known' refers to confirmed extant records of the taxon; 'inferred' refers to the use of information about habitat characteristics, dispersal capability, rates and effects of habitat destruction and other relevant factors, based on known sites, to deduce a very high likelihood of presence at other sites; and 'projected' refers to spatially predicted sites on the basis of habitat maps or models, subject to the three conditions outlined below.

Habitat maps show the distribution of potential habitat for a species. They may be derived from interpretation of remote imagery and/or analyses of spatial environmental data using simple combinations of GIS data layers, or by more formal statistical habitat models (e.g., generalized linear and additive models, decision trees, Bayesian models, regression trees, etc.). These habitat models are also referred to as ecological niche models, species distribution models, bioclimatic models and habitat suitability models. Habitat maps can provide a basis for estimating AOO and EOO and, if maps are available for different points in time, rates of change can be estimated. They cannot be used directly to estimate a taxon's AOO or EOO because they often map an area that is larger than the occupied habitat (i.e., they also map areas of potential habitat that may presently be unoccupied). However, they may be a useful means of estimating AOO or EOO indirectly, provided the three following conditions are met.

i) Maps must be justified as accurate representations of the habitat requirements of the species and validated by a means that is independent of the data used to construct them.

ii) The mapped area of *potential* habitat must be interpreted to produce an estimate of the area of *occupied* habitat.

iii) The estimated area of occupied habitat derived from the map must be scaled to the grid size that is appropriate for AOO of the species.

Habitat maps can vary widely in quality and accuracy (condition i). A map may not be an accurate representation of habitat if key variables are omitted from the underlying model. For example, a map would over-estimate the habitat of a forest-dependent montane species if it identified all forest areas as potential habitat, irrespective of altitude. The spatial resolution of habitat resources also affects how well maps can represent habitat. For example, specialized nest sites for birds, such as a particular configuration of undergrowth or trees with hollows of a particular size, do not lend themselves to mapping or modelling at coarse scales. Any application of habitat maps to Red List assessments should therefore be subject to an appraisal of mapping limitations, which should lead to an understanding of whether the maps over-estimate or under-estimate the area of potential habitat. A critical evaluation of condition (i) should include both biological and statistical considerations. For example, the selection of predictor variables should be based on knowledge of the biology of the species and not simply fitted statistically from a pool of candidate variables that are conveniently available. Statistically, appropriate methods of model evaluation should be employed (e.g. cross validation). See section 12.1.12.

Habitat maps may accurately reflect the potential habitat, but only a fraction of potential habitat may be occupied (condition ii). Conversely, depending on survey effort, the set of 'known' occurrences may underestimate the area of occupied habitat. Low habitat occupancy may result because other factors are limiting – such as availability of prey, impacts of predators, competitors or disturbance, dispersal limitations, etc. In such cases, the area of mapped habitat could be substantially larger than AOO or EOO, and will therefore need to be adjusted (using an estimate of the proportion of habitat occupied) to produce a valid estimate. This may be done by random sampling of suitable habitat grid cells, which would require multiple iterations to obtain a stable mean value of AOO. To determine what portions of predicted potential habitat should be identified as 'projected' sites that may be used to estimate AOO and EOO, assessors should consider which sites are very likely to be occupied based on: predicted habitat suitability values; ecologically relevant characteristics of the locality; the taxon's dispersal capability; potential dispersal barriers; physiological and behavioural characteristics of the taxon; proximity to confirmed records; survey intensity; the effect of predators, competitors or pathogens in reducing the occupied fraction of available habitat; and other relevant factors.

Habitat maps are produced at a resolution determined by the input data layers (satellite images, digital elevation models, climate surfaces, etc.). Often these will be at finer scales than those required to estimate AOO (condition iii), and consequently scaling up will be required (see section 4.10.5).

In those cases where AOO is less than the area of potential habitat, the population may be declining within the habitat, but the habitat may show no indication of change. Hence this method could be both inaccurate and non-precautionary for estimating reductions in population change.

However, if a decline in mapped habitat area is observed (and the map is a reasonable representation of potential habitat – condition i), then the population is likely to be declining at least at that rate. This is a robust generalisation because even the loss of

unoccupied habitat can reduce population viability. Thus, if estimates of AOO are not available, then the observed decline in mapped habitat area can be used to invoke "continuing decline" in criteria B and C, and the rate of such decline can be used as a basis for calculating a lower bound for population reduction under criterion A.

Location (criteria B and D)

“The term ‘location’ defines a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat.” (IUCN 2001, 2012b)

Justification for the number of locations used in Red List assessments should include reference to the most serious plausible threat(s). For example, where the most serious plausible threat is habitat loss, a location is an area where a single development project can eliminate or severely reduce the population. Where the most serious plausible threat is volcanic eruption, hurricane, tsunami, frequent flood or fire, locations may be defined by the previous or predicted extent of lava flows, storm paths, inundation, fire paths, etc. Where the most serious plausible threat is collection or harvest, then locations may be defined based on the size of jurisdictions (within which similar regulations apply) or on the level of access (e.g., ease with which collectors may reach different areas), as well as on the factors that determine how the levels of exploitation change (e.g., if collection intensity in two separate areas changes in response to the same market trends in demand, these may be counted as a single location).

If two or more subpopulations occur within an area that may be threatened by one such event, they must be counted as a single location. Conversely, if a single subpopulation covers an area larger than may be affected by any single event, it must be counted as more than one location.

Where the most serious plausible threat does not affect all of the taxon’s distribution, other threats can be used to define and count locations in those areas not affected by the most serious plausible threat.

If there are two or more serious plausible threats, the number of locations should be based on the threat that results in the smallest number of locations.

When parts of the distribution are not affected by any threat, the following options will be appropriate under different circumstances: (a) number of locations is not used (i.e., the subcriteria that refer to the number of locations consequently are not met), especially if the unaffected area is more than half the taxon’s range; (b) number of locations in the unaffected areas is set to the number of subpopulations in those areas, especially if there are several subpopulations; (c) the number of locations is based on the smallest size of locations in the currently affected areas; (d) the number of locations is based on the most likely threat that may affect the currently-unaffected

areas in the future. In any case, the basis of the number of locations should be documented.

In the absence of any plausible threat for the taxon, the term "location" cannot be used and the subcriteria that refer to the number of locations will not be met.

Quantitative analysis (criterion E)

"A quantitative analysis is defined here as any form of analysis which estimates the extinction probability of a taxon based on known life history, habitat requirements, threats and any specified management options. Population viability analysis (PVA) is one such technique. Quantitative analyses should make full use of all relevant available data. In a situation in which there is limited information, such data as are available can be used to provide an estimate of extinction risk (for instance, estimating the impact of stochastic events on habitat). In presenting the results of quantitative analyses, the assumptions (which must be appropriate and defensible), the data used and the uncertainty in the data or quantitative model must be documented." (IUCN 2001, 2012b)

Quantitative analyses are used for assessing taxa under criterion E. Guidelines for applying criterion E are discussed in section 9. It is important to note that the risk-based thresholds of criterion E should not be used to infer an extinction risk for a taxon assessed as VU, EN and CR under any of the criteria A to D.

Guidelines for Applying Criterion A

The A criterion is designed to highlight taxa that have undergone a significant reduction in the near past, or are projected to experience a significant reduction in the near future. Methods of calculating reductions are explained in section 4.5.

The rationale for criterion A is that, all other things being equal, the probability of extinction is greater when the decline rate is high (Mace et al. 2008). The obvious mechanism is that if declines are not stopped, the population will go extinct, regardless of current population size. Even if a population is not currently declining, prior declines indicate risk of extinction. One reason is that if a population responded to a threat with a large decline, a similar decline can happen in the future in response to a similar threat. Further declines do not have to be immediate (criterion A does not require continuing decline). Another reason is that having declined to densities far below those at which it existed or evolved with, the species may be vulnerable to new threats or other changes in its environment, even if the population is not currently declining (see section 5.4 for examples).

Criterion A is based only on population reduction. The reason the IUCN criteria (except for E) consider symptoms of endangerment (such as decline, small population, restricted distribution, fragmentation, etc.) singly or a few in combination, instead of altogether, is that in the vast majority of cases reliable data on all of them do not exist for the same species. For example, although decline rates can be estimated based on an index of abundance (e.g., CPUE) and are relatively common, unbiased estimates of population size are rare, esp. for abundant species. Another reason criterion A

considers only reduction is that, when a population is declining with a substantial rate, extinction risk is more sensitive to the rate of decline than to the population size (Lande *et al.* 2003). Finally, there are many examples of abundant species that have become extinct or nearly extinct. Such species could have been identified as threatened only by a criterion based only on declines (Stanton 2014). So, from both practical and theoretical points of view, it is necessary to have a criterion based only on rate of decline, in addition to one (criterion C) that is based on both population size and rate of decline.

The criterion is split into the criteria A1, A2, A3 and A4.

- Criterion A1 deals with reductions in the past 10 years or three generations (whichever is longer) and is applicable to taxa in which the causes of reduction are clearly reversible AND understood AND ceased (see discussion below), based on (and specifying) any of (a) to (e), as discussed above.
- Criterion A2 also deals with reductions in the past 10 years or three generations (whichever is longer) but for taxa where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.
- Criterion A3 deals with population reductions projected or suspected to be met in the future 10 years or three generations (whichever is longer, but up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
- Criterion A4 deals with reductions observed, estimated, inferred, projected or suspected over any 10 year or three generation time period (up to a maximum of 100 years into the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

Under criterion A, a specific quantitative threshold indicating the population reduction must be met to qualify for one of the categories of threat. Under criterion A1, these thresholds are 90% (CR), 70% (EN) and 50% (VU). Under criteria A2, A3 and A4, these thresholds are 80% (CR), 50% (EN) and 30% (VU). These different rates reflect the understanding that taxa in which the causes of reduction are clearly reversible AND understood AND ceased are less at risk from extinction than those where the causes of reduction may not have ceased OR may not be understood OR may not be reversible. In order to use A1, three conditions must be met. (1) The reduction must be reversible. For example, the population size must not be so low that factors such as Allee effects make it impossible or unlikely to recover. It is the condition that must be reversible, not the cause of the deteriorated state. For example, loss of habitat may be irreversible even if the action that caused the loss has ceased. In contrast, a reduction in a forest-dependent species caused by logging could be considered reversible if changed management practices are leading to recovery of this species. (2) The causes of the reduction (the threatening factors) must be identified and their actions must be understood. Thus, it is not sufficient to simply list the threatening factors; it is also necessary to understand the scale and mechanism of their action (e.g., the magnitude and spatial distribution of overfishing, or the relationship between pollution and the population reduction). (3) The threatening factors must have ceased (e.g., overfishing has stopped). Examples of taxa that might qualify

under criterion A1 are fish species that have suffered declines under exploitation but where the cause of reduction (e.g., over-exploitation) has ceased. This criterion may also be applicable to situations where the population is still being exploited, at lower levels of exploitation that do not cause additional population reductions. If any of the three conditions (reversible and understood and ceased) are not met in a substantial portion of the taxon's population (10% or more), then A2 should be used instead of A1.

The basis of reductions

Listing a taxon under criterion A requires specifying whether the reduction is based on (a) direct observation (A1, A2 and A4 only), (b) an index of abundance appropriate to the taxon, (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat, (d) actual or potential levels of exploitation, and/or (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

The difference between direct observation (a) and index of abundance (b), as well as the value of distinguishing between them, lies in the assumptions to be met to provide valid estimates of population size. While “direct observation” requires only statistical assumptions (e.g., random sampling), indices of abundance require assumptions related to the biology of the species. For example, for a marine turtle species, use of “nesting females” to examine population change assumes that the proportion of mature individuals that breeds each year, and the number of visits to breeding sites per female per year are reasonably constant (or at least vary randomly) among years. If these assumptions are true, then “nesting females” is an appropriate index of mature individuals.

Direct observation (a) is the most relevant measure and, all things being equal, should be preferred. However, other measures may be used if they result in more reliable or more consistent (i.e., covering the three-generation period more comprehensively) estimates of population size through time. For example, for species that are difficult to detect, direct counts may entail large sampling errors and be biased (i.e., systematically under or overestimate the change in population size). Alternatively, an index based on easily detectable traces (e.g., tracks, droppings, etc.) or resources that the taxon depends on exclusively may provide more reliable estimates of population reduction. Similarly, for a species that is censused very infrequently, or responds to habitat loss with a time lag, habitat change may be a more comprehensive estimate of reduction than direct observation (see section 5.8 on the relationship between habitat change and population change).

All applicable bases for reduction should be listed. Even if the reduction is calculated based on the best available data, for example, from direct observation, if others (such as decline in area of occupancy) are also observed, estimated, inferred or suspected, these should also be specified.

The IUCN criteria use the terms "observed", "estimated", "projected", "inferred", and "suspected" to detail the nature of the evidence (including aspects of data quality) used for specific criteria. It is important to note that, for a given data source, not all combinations can form the basis for use of criterion A (Table 5.1). Examples below

detail the types of data that might be used to calculate population reduction for criterion A.

Table 5.1. The relationship between the nature of evidence (data qualifiers) and the basis of reduction for criterion A.

	Basis of reduction:				
	a	**b**	**c**	**D**	**e**
Nature of evidence	direct observation	index of abundance (e.g. CPUE)	AOO, EOO, habitat quality	actual or potential exploitation (e.g. landings, road kill)	introduced taxa, hybridization, pathogens, pollutants, competitors, parasites
observed (all counted - census)	A1, A2, A4	n.a.	n.a.	n.a.	n.a.
estimated (statistical assumptions)	A1, A2, A4	A1, A2, A4	n.a.	n.a.	n.a.
projected (extrapolated into future)	A4	A3, A4	n.a.	n.a.	n.a.
inferred (estimated from indirect evidence on variables of same type)	n.a.	A1, A2, A3, A4	n.a.	A1, A2, A3, A4	A1, A2, A3, A4
suspected (estimated from indirect evidence on variables of different type)	n.a.	n.a.	A1, A2, A3, A4	A1, A2, A3, A4	A1, A2, A3, A4

n.a. : not applicable

A population reduction can be *observed* if the data used to deduce the decline are from a census in which a direct count of all known individuals of a population is made. This can be used in criteria A1 or A2. For criterion A4, where the time frame for assessing reductions spans both the past and present, only the portion of a reduction in the past can be *observed*. The portion of the population trend in the future must be under another qualifier (e.g. *projected*).

A population reduction can be *estimated* from census data, as above, or from an index of abundance (e.g. Catch Per Unit Effort, density, number of nesting females; abundance based on mark-recapture data). Indices of abundance rely on statistical assumptions (e.g. about how the sampling scheme implemented relates to the number of mature individuals) and/or assumptions related to the biology of the species, i.e. how the index relates to the variable being estimated to calculate a population reduction (mature individuals).

A population reduction can be *projected* if it is extrapolated from census data or an index of abundance, either from the present into the future (criterion A3), or from past and present into the future (criterion A4). For example, a decline may be estimated for a population over two generations, and projected for a further generation into the future (criterion A4).

A population reduction can be *inferred* if it is calculated from indirect evidence of variables of the same general type. For example, population reduction in number of

mature individuals calculated from a decline in catch data from fisheries, hunting data, or road kill (criterion A2d) could all be classed as *inferred*. Inference may also involve extrapolating an observed or estimated reduction from a known subpopulation to calculate an inferred reduction for another subpopulation of the same species. For example, an observed decline in population size from a forest fragment could be inferred to be the same for a subpopulation in a similar sized fragment that has not been censused, but which is perceived to be under the same threats. Inference may also be made from decline in EOO, or based on a reduction in habitat quality or extent. In this case we might expect the number of mature individuals of a habitat specialist species to have a closer association to the reduction in habitat extent than a non-habitat specialist.

A population reduction can be *suspected* if, based on circumstantial evidence, the relationship can be made based on a factor related to population abundance or distribution. The relevance of the factor as a proxy for number of mature individuals must be reasonably supported. Records of traditional ecological knowledge or anecdotal data may, for example, be used to calculate a suspected reduction over a given time period, if a population used to be seen regularly, but is now rarely observed.

The use of time caps in criterion A

Generation length is used in criterion A as a way of scaling the time frame over which reductions are measured with the life history of the taxon. Short-lived, faster-reproducing taxa have to suffer higher annual mortality rates than long-lived, slower-reproducing taxa to meet the same quantitative threshold (e.g., 80% reduction) over a set time period (e.g., 10 years). To put it another way, long-lived taxa might be unlikely ever to meet quantitative decline thresholds over a fixed time period, yet could be facing many years of population decline per recruitment opportunity. The three-generation time period is used to scale the decline rate threshold for the species' life history. This important scalar allows criterion A to be applied to a wide range of taxa. A minimum time cap of 10 years is specified because, although some taxa will have three-generation periods of less than 10 years, 10 years is the shortest time period of relevance to conservation planning and action. A maximum time cap has been introduced for assessments based on projections into the future, as it is felt that the distant future cannot be predicted with enough certainty to justify its use as a way of assessing whether a taxon is threatened. A maximum time cap is not applied to assessments based on past reductions, as it is felt that for long-lived taxa, it is important to use data for three generations, if it is available.

How to apply criterion A4

In order to decide whether a taxon can be listed under criterion A4, a "moving-window" reduction must be calculated. It is not possible to determine whether criterion A4 is applicable only by looking at the qualitative pattern of the decline, or by calculating only past or only future reductions.

To calculate a "moving window" reduction, first create a time series of past population sizes and future projections. Then, calculate 3-generation reduction for all

time frames that include at least one past year and at least one future year. The length of all those time frames (windows) must be 3-generations or 10 years (whichever is longer), but cannot extend more than 100 years into the future. Finally, find the maximum of these reductions, which is the number to use in criterion A4. Whether a taxon is listed under criterion A4 or not, of course, depends on whether it qualifies under any of the other criteria.

In cases where reliable past data are available only for time periods of less than three generations, and/or reliable future predictions can only be made for less than three generations into the future, the 3-generation window to use in criterion A4 can be set as the time period for which reliable data and predictions are available.

In general, if a taxon is listed under criteria A2 and A3, it will also be listed under criterion A4. However, this is not always the case, and the category of threat determined using a "moving window" can exceed that calculated from past and future declines. Therefore, species should always be evaluated against criterion A4 as well as criteria A2 and A3. For a simple example of the use of criteria A2, A3 and A4, see the worksheet "A1-A4" in the spreadsheet **CriterionA_Workbook.xls** mentioned in section 4.5.

Reduction followed by short-term stabilization or increase: The 'ski-jump' effect

Some widespread, long-lived taxa show very large long-term declines as well as recent increases, and their population sizes are well above the thresholds for critical population size and distribution (under criteria B to D). This pattern has been termed the 'ski-jump' effect and affects any long-lived taxa that have declined in the past and are now stable or increasing. The question often asked is whether the long term historical declines or the more recent increases should take precedence in the assessment of threat in such taxa. However, the question is misleading; the IUCN criteria do not allow precedence among the criteria, or emphasizing one criterion over another. The correct interpretation is to assess the taxon against all the criteria. The point of criterion A is that long-term trends may indicate an underlying cause whereas recent trends may be temporary.

When applying criterion A to taxa showing these patterns, a few points should be remembered. (1) If the causes of reduction are clearly reversible AND understood AND ceased then the higher thresholds of criterion A1 (90% for CR, 70% for EN and 50% for VU) apply, which may lead to a down-listing of the taxon that would reflect the fact that it is currently stable or increasing. (2) Uncertainty in the data (particularly long-term historical data) if properly incorporated into the assessment may affect the outcome of the listing (see section 3.2). (3) If a continuing conservation or management programme is in place that benefits the status of a taxon, the cessation of which would result in it qualifying for a threatened category within five years, then the taxon may qualify to be listed as NT (see section 10.1), unless it qualifies for a threatened category under any criteria. An example of this management or conservation dependence would be a case where a population is severely depleted and a management programme prevents further declines or rebuilds the population. If it is projected, inferred or suspected that the cessation of the programme would lead to

population declines, such that the taxon would qualify for a threatened category under criteria A3 or A4 within 10 years, then it can be listed as conservation dependent under the NT category, with description of the management programme in place. (4) If it is projected, inferred or suspected that populations will decline to the thresholds under criterion A, the taxon can be listed under criteria A3 or A4.

Historical reduction followed by long-term stabilization: Severely depleted populations

Some taxa (particularly marine taxa) show persistence at very low fractions of their unexploited equilibrium or carrying capacity. The current size of a population relative to historical levels can be calculated by estimating the reduction from the earliest year for which data are available to the current year (see Section 4.5 for methods for estimating reductions). Such estimates, or other information, may show that a population is severely depleted relative to its unexploited equilibrium or carrying capacity. In some cases, taxa may be severely depleted, but show no detectable declines, so they may not qualify under criteria A1 or A2 because their declines occurred more than three generations ago, and they may be too widespread and abundant to qualify under any other criteria, reflecting the fact that they do not have a high extinction risk at present. Nevertheless, they may be more cause for concern because they are more susceptible to unforeseen catastrophic events and marine taxa may be harvested as bycatch in other fisheries. Such taxa are not currently being assessed as threatened under the criteria A1 and A2, although they may still qualify under criteria A3, A4, B, C, D or E.

Taxa in this situation may be assessed under criteria A3 or A4 based on projected or suspected population declines in the future, provided there is sufficient evidence for the threats faced by the taxon or the likely decline rate of the taxon to warrant such a listing. These range from biological or ecological factors (e.g. depensation or sex ratio effect thresholds especially in species adapted to high population density), to threat and detection factors (e.g. increased economic value increasing with rarity, technological innovation, or sudden removal of management measures). Such assessments against criteria A3 or A4 should be undertaken where the status of the species depends on conservation or management measures that are projected, suspected or inferred to become less effective over three generation lengths. Specific examples from marine taxa include: Queen Conch (*Strombus gigas*) and abalone (*Haliotis* spp.), which have minimum density requirements for reproduction (e.g., Hobday *et al.* 2001; Stoner *et al.* 2012); Gag (*Mycteroperca microlepis*), which may experience sperm limitation under heavy female sex ratio skew (Coleman *et al.* 1996); Nassau Grouper (*Epinephelus striatus*), which experienced a sudden collapse due to hyperstability or possible depensation (Sadovy and Domeier 2005); Totoaba Croaker (*Totoaba macdonaldi*), which underwent intense exploitation after a sudden increase in the value of the swim bladder (Sadovy and Cheung 2003); and Nassau Grouper in the Bahamas, which underwent a temporary removal of protection due to an economic downturn (Lam 2009).

The category Near Threatened could also be used if a taxon nearly qualifies as Vulnerable under criteria A3 or A4. It must be remembered however that the IUCN Red List Criteria are designed to identify taxa that exhibit symptoms of

endangerment, and not simply depletion or conservation priority. The problem of assessing these taxa is also related to the scaling issues discussed under the definition of area of occupancy (section 4.10), which affects the application of criterion B. If an appropriate taxon-specific scaling factor is used, severely depleted marine taxa may qualify as threatened under criterion B.

Fisheries

Fisheries management and extinction risk

Taxa that are the targets of fisheries may show a decline in population size due to intentional management action. Under the Red List Criteria, such taxa could be assigned a threatened status under criterion A (declining population). Concern has been expressed that such a listing might not reflect extinction risk, especially if the decline is a consequence of a management plan designed to achieve a goal such as the maximisation of sustainable yield from a fishery.

It is important to note that criterion A measures declines over the last three generations, not from the original, unexploited stock. Thus, a well-managed stock should trigger the IUCN Criterion A thresholds only during the first three generations after the commencement of exploitation. Indeed, a species that is sustainably fished to achieve, for example, maximum sustainable yield (which could be at a biomass that is ~90% of the original biomass for a shark through to ~30% of the original biomass for a highly productive tuna) should have a current decline rate of zero. In addition, fisheries that are being managed sustainably are assessed against the higher thresholds of criterion A1 (50% over 3 generations for VU), making it less likely that they will be classified as threatened.

There should not be a large number of fish stocks for which there would be a 50% reduction in population size over the most recent three generations due to commencement of regulated exploitation. This is because there are few stocks that were close to their unexploited state three generations ago. Rather, most major fisheries started more than three generations ago (Sethi *et al.* 2010). Even for these few stocks, a reduction of 50% should last only a few years (perhaps up to one generation) until the population approaches the target level and the decline rate decreases. If declines continued, there would be reason for concern; in this case a new assessment, against all five criteria, may indicate that the taxon is still threatened.

Technical aspects of using criterion A for fisheries

Percentage reductions in the number of mature individuals can be estimated in a number of ways, including ‘an index of abundance appropriate to the taxon’. In the case of exploited fishes, catch per unit effort (CPUE) may be used. This measure should be used with caution because changes in CPUE may underestimate population declines. This may occur, for example, if the population aggregates even at small sizes so that catches remain high with the same level of effort, even if the size of the population is declining. It may also occur if increases in fishing efficiency are not fully taken into account. It is therefore preferable to assess exploited fish taxa using the results of fishery-independent survey techniques.

Assessments of taxa under criterion A1 need to justify that the threat (e.g., overexploitation) has ceased and the taxon is being managed sustainably. This can be based on the ratio of the average level of fishing mortality (F) to the fishing mortality corresponding to maximum sustainable yield (MSY), i.e., $F/F_{MSY} < 1$, for the greater of one generation or five years. Other methods could be used to justify the use of criterion A1 instead of A2. However, care needs to be taken to consider the chance that unsustainably managed species are incorrectly judged to be sustainable.

Long-lived taxa

The generation length of some species (e.g., some trees) can exceed 100 years. It is difficult to estimate population declines from a point in time before which the species populations or even the species itself may have been recorded. It is important to emphasize the point that the most significant declines, which are useful to record and which may be possible to reverse, are probably those that have been caused over the last 100 years.

Relationship between loss of habitat and population reduction

Under criterion A, a reduction in population size may be based on a decline in area of occupancy, extent of occurrence and/or quality of habitat. The assumptions made about the relationship between habitat loss and population reduction have an important effect on the outcome of an assessment. In particular, the simplest assumption, that the relationship is linear, is not often true and may lead to over- or under-listing. For example, a bird species may not be reduced by 50% if 50% of its habitat is lost (perhaps because it will colonize new habitats). Or, reduction may happen mostly in lower-density areas, leading to a faster decline in range than in population size. Conversely, if reductions occur predominantly in high-density areas, population reduction will be faster than can be deducted from range contraction (decrease in EOO) (Rodríguez 2002). Similarly, a coral reef fish may be reduced by more than 50% if 50% of its habitat is lost through fishing with explosives (perhaps because spawning areas have been destroyed).

The sensible use of inference and projection is encouraged when estimating population reductions from changes in habitat. For example, if a forest species' extent of occurrence has been 70% clear cut in the last five years it might be justified to infer a 50% decline in the population over the past ten years. The species would therefore qualify as Endangered A2c**.**

In all cases, an understanding of the taxon and its relationship to its habitat, and the threats facing the habitat is central to making the most appropriate assumptions about habitat loss and subsequent population reduction. All assumptions about this relationship, and the information used should be included with the assessment documentation.

Available population data may contradict habitat data (e.g., habitat seems to be declining in quality, but population numbers are stable). This can occur because: (1) one set of data is uncertain, biased, or dated, or (2) the population has a lagged response to loss of habitat (likely if generation time is long). In the first case, the

assessors must use their judgement to decide which data are more certain. If it is decided that the abundance data are adequate to determine trends, the taxon should be listed under criterion A2. The implications of a possible lagged response in abundance to loss of habitat should, however, be considered when evaluating the taxon under criterion A3. For example, if population reduction in the last three generations is 30% based on abundance data, which are adequate to determine trends, then the species should be listed as VU A2, even if habitat loss in the same period was 60%. However, if a lagged response in abundance to loss of habitat is likely (i.e., the impact of habitat loss at present may lead to a future reduction in the number of mature individuals), then the population may be expected to decline further in the future (even if habitat loss has stopped), so an EN A3 or EN A4 listing should be considered as well, if the 60% loss of habitat is inferred to lead to 50% or more reduction in the number of mature individuals.

Guidelines for Applying Criterion B

Criterion B has been designed to identify populations with restricted distributions that are also severely fragmented, undergoing a form of continuing decline, and/or exhibiting extreme fluctuations (in the present or near future). It is important to pay particular attention to criterion B, as it is the most commonly misused criterion. To qualify for criterion B, the general distributional threshold must first be met for one of the categories of threat, either in terms of extent of occurrence (EOO) or area of occupancy (AOO). The taxon must then meet at least TWO of the three options listed for criterion B. The options are (a) severely fragmented or known to exist in no more than x locations, (b) continuing decline, or (c) extreme fluctuation (Table 2.1). Therefore, if a taxon has met the distributional requirement for the Endangered category and option (c) extreme fluctuation, but none of the other options, it would not qualify as Endangered (or Vulnerable) under criterion B. To qualify, it would also have to meet either (a) or (b). An example of the proper use of criterion B is Endangered: B1ab(v). This means that the taxon is judged to have an extent of occurrence of less than 5,000 km^2, the population is severely fragmented or known to exist at no more than five locations, and there is a continuing decline in the number of mature individuals.

Subcriterion (a) requires severe fragmentation and/or limited number of locations. The numbering in the criteria does not allow distinguishing between these two conditions. We recommend that assessors make this distinction by explicitly specifying in their documentation: (1) whether the taxon is severely fragmented, and (2) the number of locations.

Some of the problems encountered when applying criterion B are dealt with elsewhere in this document, i.e. definitions of "subpopulations" (section 4.2), "location" (section 4.11), "continuing decline" (section 4.6), "extreme fluctuations" (section 4.7), "severely fragmented" (section 4.8), "extent of occurrence" (section 4.9) and "area of occupancy" (section 4.10).

Guidelines for Applying Criterion C

Criterion C has been designed to identify taxa with small populations that are currently declining or may decline in the near future. For criterion C, the small population threshold must be met as well as one of the two subcriteria that describe decline. For example, to qualify for Endangered under criterion C, the population must be estimated to number less than 2,500 mature individuals, and to either (1) have an estimated continuing decline of at least 20% within five years or two generations (whichever is longer, up to a maximum of 100 years) or (2) have a continuing decline in the number of mature individuals and either (a) a restricted population structure or (b) extreme fluctuations in the number of mature individuals (see Table 2.1 for details).

Few taxa have data on both population size and decline rates at the necessary resolution to apply subcriterion C1. There is also some overlap between criteria A and C1, the difference being that criterion C applies only to small populations, the time frame over which the decline is measured is shorter (except for the Vulnerable category) and the decline rate thresholds are lower, because the populations are already small.

Criterion C2a has two subcriteria (i and ii), focusing on seemingly opposite conditions. These subcriteria take into account the fact that the distribution of a taxon's total population into either many subpopulations, or a single (or very few) subpopulation(s) could both lead to higher extinction risk, for different reasons. On the one hand, a taxon that is divided into many subpopulations may be severely fragmented (as defined in section 4.8), with many of the subpopulations having a small population size and a very high probability of extinction. On the other hand, a single subpopulation is like putting all eggs in one basket: a single subpopulation cannot recover from a local extinction by recolonization, or from a catastrophic decline by the rescue effect. Which of these is more important depends on subpopulation sizes and other factors. Criterion C2a covers both of these situations: (i) is for the first case, where even the largest subpopulation is quite small, and (ii) is for the second case, where almost all or all individuals are in the same subpopulation. A species that meets the general conditions for criterion C2a (i.e., has a small, declining population) is likely to be affected by one of these two conditions if they occur.

It may seem that such a species may not have increased risk of extinction, if it also has a wide range. However, this would be true only if the different parts of the range fluctuated and declined independently of each other. But if this were the case, then these different "parts" would likely not be connected (otherwise they would be in synchrony), so they should not be considered a single subpopulation. Thus, in order to apply criterion C2a correctly, it is important to identify subpopulations correctly (see section 4.2).

Some of the problems encountered when applying criterion C are dealt with elsewhere in this document, i.e. definitions of "subpopulations" (section 4.2), "mature

individuals" (section 4.3), "continuing decline" (section 4.6), calculation of declines (section 4.5), and "extreme fluctuations" (section 4.7).

Guidelines for Applying Criterion D

This criterion identifies very small or restricted populations. A taxon qualifies for criterion D if the population of mature individuals (see section 4.3) is smaller than the threshold set for each of the categories of threat. Under the Vulnerable category there are two options, D1 and D2. A taxon qualifies for Vulnerable D1 if the population size is estimated to number fewer than 1,000 mature individuals (defined in section 4.3). A taxon qualifies for Vulnerable D2 if the area of occupancy is very restricted (typically less than 20 km^2) or exists at typically five or fewer locations, and if there is a plausible natural or anthropogenic threat. This criterion is provided for taxa that may not be decreasing, but are characterized by an acute restriction in their number of mature individuals, area of occupancy or in their number of locations thereby rendering them particularly susceptible to a plausible threat.

The subcriterion D2 under Vulnerable was intended to be used for taxa with very small distributions. However, the thresholds for area of occupancy and the number of locations, although given as indicators (i.e., typically less than 20 km^2 or typically five or fewer locations), are frequently interpreted literally, which is not appropriate. Some people have argued that the subcriterion is too inclusive and results in massive over-listing, while others argue that it is too exclusive (e.g., many marine species) and so leads to under-listing. It must be emphasized that the restricted area of occupancy under criterion D2 is defined such that the population is prone to the effects of human activities or stochastic events in an uncertain future, and is thus capable of becoming Critically Endangered or even Extinct in a very short time period (e.g., within one or two generations after the threatening event occurs). The numerical thresholds are given more by way of example and are not intended to be interpreted as strict thresholds.

The focus of subcriterion D2 is not the area or the location count (for which many taxa could qualify), but the risk that the taxon could suddenly become Critically Endangered or Extinct (i.e., if the plausible threat is realized, then the species will within a very short time qualify for listing in one of these categories under, for example, criterion A or B). So, simply meeting the suggested (or any other) threshold for AOO or number of locations is not sufficient. It is necessary that this restriction makes the species capable of becoming CR or EX within a very short time, because of the effects of human activities or stochastic events. There must be a substantial possibility of these activities or events actually occurring. Thus, unlikely events (e.g., eruption of an inactive volcano), non-specific events that were not observed in similar species (e.g., an unspecified disease epidemic), events unlikely to cause extinction (e.g., because the species has survived many hurricanes, or is likely to adapt to global warming, etc.), or events unlikely to take place rapidly enough to result in a CR or EX listing in a very short time would not qualify for listing under criterion D2. The stochastic events or human activities that lead to this listing must be specified in the justification for listing (see example below). If the taxon is highly restricted, and

there are plausible threats that can cause the species to become VU or EN in a short time, then the taxon should be considered for listing as NT.

Taxa known only from the type locality

If a taxon is only known from its type locality and there is no information on its current status or possible threats, the taxon should be listed as DD. If there are no plausible threats, and the area is relatively well known, Least Concern is appropriate, unless criteria A, B or C is met. If people have searched for the taxon, both at the type locality and at a reasonable number of other potential localities, and no more than 50 mature individuals are estimated, then the taxon would be listed as Critically Endangered D (an appropriate time interval for the taxon must be used). If any significant or plausible threats can be identified, then a full assessment will be necessary to determine the most appropriate classification (e.g., Critically Endangered under criteria B or C, or Vulnerable under criterion D2).

Example of applying criterion D

The New Caledonian Lorikeet *Charmosyna diadema* is a very rare bird described from two female specimens collected in 1859 and an observation in 1913 on New Caledonia. The species was thought to be extinct in 1978, however, islanders reported that it may still exist, and in 1980 two birds were reported by an experienced bushman. It is thought that this unobtrusive and easily overlooked species may survive in the cloud forest of Mount Humboldt and the Massif of Koualoué. Obviously very little is known about this species, but it is safe to estimate, given the limited sightings many years ago and the likelihood that bird watchers would have seen it, that the population contains less than 50 mature individuals. Therefore the New Caledonian Lorikeet is listed as Critically Endangered: D.

Example of applying criterion D2

Chatham Island Snipe *Coenocorypha pusilla* is confined to only four predator-free islands in the Chatham Islands, New Zealand, where it is common and considered stable. The historical range of this species was reduced as the result of the introduction of predators such as cats, rats *Rattus* spp. and Weka *Gallirallus australis*. Birds attempting to colonize neighbouring Pitt Island are killed by cats and *G. australis*. The accidental introduction of alien species to the predator-free islands could easily cause local extinction. Thus, the number of locations is estimated as four (because it is unlikely that such introductions would occur on more than one island at any given time), and the species is classified as VU under criterion D2.

Guidelines for Applying Criterion E

To qualify under the E criterion a quantitative analysis such as a Population Viability Analysis (PVA) must be conducted to determine a species' probability of extinction over a given time period. For example, Critically Endangered E, would mean that the taxon has at least a 50% probability of going extinct in the wild in the next 10 years or three generations (whichever is longer).

What is extinction?

Extinction is defined as population size reaching zero. Population size, for the purpose of defining extinction, is the number of all individuals of the taxon (not only mature individuals). In some cases, extinction can be defined as population size reaching a number larger than zero. For example, if only females are modelled, it is prudent to define extinction as one female (instead of zero) remaining in the population. More generally, an extinction threshold greater than zero is justified if factors that were not incorporated into the analysis due to a lack of information (for example, Allee effects, sex structure, genetics, or social interactions) make the predictions of the analysis at low population sizes unreliable.

For criterion E, extinction risk must be calculated for up to three time periods:

- 10 years or three generations, whichever is longer (up to a maximum of 100 years)
- 20 years or five generations, whichever is longer (up to a maximum of 100 years)
- 100 years

For a taxon with a generation length of 34 years or longer, only one assessment (for 100 years) is needed. For a taxon with a generation length of 20 to 33 years, two assessments (for three generations and 100 years) are needed. For a taxon with a generation length less than 20 years, all three assessments are needed.

Which method can be used?

One of the commonly used techniques of quantitative analysis is population viability analysis (PVA), which is a collection of methods for evaluating the threats faced by populations of species, their risks of extinction or decline, and their chances for recovery, based on species-specific data and models. For an introduction to PVA, see Boyce (1992), Burgman *et al*. (1993), Akçakaya and Sjögren-Gulve (2000). Types of models used in a PVA will be discussed below.

In some cases, criterion E can be used without a full PVA, using instead a quantitative analysis that does not necessarily include demographic information. For example, if a species is restricted to a small area, it may be possible to estimate the probability of the destruction of its entire remaining habitat. Such estimations may be based on past weather records, or other information about trends and locations of past habitat loss. It is important to remember, however, that such estimates can only be considered as lower bounds on the risk of extinction as it would have been estimated using a PVA. This is because a PVA incorporates such stochastic effects on habitat as well as other factors such as demographic variability, and other threats such as direct exploitation. Whatever the method used, the analysis must be numerical (i.e., a qualitative assessment such as “high probability of extinction” is not sufficient).

Which method is appropriate depends on the availability of data and the ecology of the taxon. The model structure should be detailed enough to use all the relevant data, but no more detailed. Assessments that use all the available and relevant data are more reliable than those that ignore part of the relevant information. However,

including more detail than can be justified by the quality of the available data may result in increased uncertainty.

If the only available data are presence-absence information from a number of locations, occupancy models can be used (see Sjögren-Gulve and Hanski 2000). If census information from a number of years is available, then a scalar (unstructured) dynamic model can be used (see Dennis *et al*. 1991; Burgman *et al*. 1993). If data are available for various age classes or stages (e.g., juvenile and adult), then a structured model can be used (see Akçakaya 2000). If detailed data are available at the individual level (for example, pedigree data), then an individual-based model can be used (see Lacy 2000). If data on the spatial distribution are available, a metapopulation model or other spatially explicit model should be considered (note that scalar, structured and individual-based models can all be spatially structured).

The second important consideration in selecting a model is the ecology of the species. The model structure and assumptions should be realistic with respect to the ecology of the species. The documentation should list all the assumptions (even the most obvious ones) related to model structure, parameters and uncertainties. In cases where the available data and the ecology of the species allow more than one type of model, comparative modelling (e.g., Kindvall 2000; Brook *et al*. 2000) and other types of validation (McCarthy *et al*. 2001) may strengthen the conclusions.

Are there sufficient data?

The types of data that can be used in an assessment include spatial distributions of suitable habitat, local populations or individuals, patterns of occupancy and extinction in habitat patches, presence-absence data, habitat relationships, abundance estimates from surveys and censuses, vital rate (fecundity and survival) estimates from censuses and mark-recapture studies, as well as temporal variation and spatial covariation in these parameters. Not all of these types of data are required for any one model. For more information about data needs of particular types of PVA models, see the references mentioned above.

When there is not sufficient data, or when the available information is too uncertain, it is risky to make a criterion E assessment with any method, including PVA. In order to decide whether the available data are sufficient to make a criterion E assessment, we suggest the following procedure. First, select a model structure based on the discussion in the previous section. Then, estimate the model parameters (see below), incorporating the uncertainties in the data. A simple way to do this is to make a best estimate for each parameter, as well as an "optimistic" and a "pessimistic" estimate. The more uncertain a parameter is, the wider the difference will be between the "optimistic" and the "pessimistic" estimates. Use these estimates to create a range of models, which should give a range of extinction risk estimates. The range of these estimates indicates whether the results are useful (and, hence, whether there is enough data). See also "Incorporating uncertainty" (section 9.5) below.

Remember that criterion E does not require very specific predictions. Even very uncertain results may be useful. For example, if the minimum estimate for the risk of extinction in 100 years is 10%, then the taxon is at least Vulnerable, regardless of the

most pessimistic predictions. The criteria also allow incorporating uncertainty in the form of a range of categories presented in the documentation, while a single category should always be specified in the Red List (see Annex 1 of IUCN 2001, 2012b). So, for example, if the generation length is 10 years, and the extinction risk is 20-60% in 100 years, 10-30% in 50 years, and 5-10% in 30 years, the taxon could be classified as (VU-EN) in the documentation, while either has to be chosen for the Red List.

Model components and parameters

It is very important that model parameters are estimated without bias. However, it is difficult to provide detailed guidelines on parameter estimation because the components and parameters of a model depend on its structure. Thus, although we provide some general guidelines and specific examples in this section, these are not comprehensive.

Density dependence

Density dependence is the relationship between demographic parameters (such as survival, fecundity, population growth rate, etc.) and the size or density of the local population. The relationship can be negative (also called compensation), with demographic parameters decreasing as density increases, or it may be positive (also called depensation), with demographic parameters decreasing as density decreases. The former type of density dependence may result, for instance, from overcrowding and interspecific competition, and the latter may result from Allee effects, social structure, and inbreeding depression. Both types of density dependence have important effects on extinction risks, so models should address both. In other words, whether the model includes or excludes these types of density dependence, the choice should be justified.

Compensation is especially important to include in cases where habitat loss is a threat. Depensation can be incorporated by setting an extinction threshold greater than zero (see above).

Because density dependence affects demographic parameters such as survival and fecundity, estimates of these rates should include description of the population sizes or densities during the time period when the data for these estimates were obtained.

Temporal variability

Because the criteria are in terms of probabilities, it is essential that all relevant forms of variability are included in the assessment. Thus, the following types of variability should be considered: environmental fluctuations (in the form of random changes in one or more model parameters), demographic stochasticity, expected future trends in the average values of model parameters (e.g., as a result of deteriorating habitat), genetic stochasticity, random changes in the sex ratio, and low-probability, high-impact events (disturbances or catastrophes).

In modelling environmental fluctuations, the estimates of the variances of model parameters should include only temporal variation; variation due to demographic stochasticity, measurement error, spatial variation, etc. should be subtracted. For

example, if survival rates are based on census data, binomial variance representing demographic stochasticity can be subtracted from total observed variance (Akçakaya 2002); if the survival rates are based on a mark-recapture analysis, methods described by Gould and Nichols (1998) and White *et al*. (2002), or in the help file of Program MARK (http://warnercnr.colostate.edu/~gwhite/mark/ mark.htm) can be used to remove demographic/sampling variance.

If catastrophes are included in the model, only data from non-catastrophe years should be used when estimating the mean and variance of the model variable (such as survival, fecundity, or carrying capacity) that the catastrophe affects.

When probabilistic results are based on simulations, the number of replications or iterations determines the precision of these results. In most cases, the randomly sampled model parameters are statistically representative if the number of replications is in the 1,000 to 10,000 range.

Spatial variability

If different subpopulations of the taxon are spatially separated or have different demographic rates, these should be incorporated by making the model spatially explicit. Modelling such a taxon with a single-population model may underestimate the extinction probability. When multiple populations are included in the model, the correlation among the different populations is an important factor; ignoring it (i.e., assuming all populations to be independent) may underestimate the extinction probability.

Incorporating uncertainty

We suggest that all parameters be specified as ranges that reflect uncertainties in the data (lack of knowledge or measurement errors). In addition, uncertainties in the structure of the model can be incorporated by building multiple models (e.g., with different types of density dependence). There are various methods of propagating such uncertainties in calculations and simulations (Ferson *et al*. 1998). One of the simplest methods is to build best-case and worst-case models (e.g., Akçakaya and Raphael 1998). A best-case (or optimistic) model includes a combination of the lower bounds of parameters that have a negative effect on viability (such as variation in survival rate), and upper bounds of those that have a positive effect (such as average survival rate). A worst-case or pessimistic model includes the reverse bounds. The results from these two models can be used as upper and lower bounds on the estimate of extinction risk, which in turn can be used to specify a range of threat categories (see Annex 1 of IUCN 2001, 2012b).

Documentation requirements

Any Red List assessment that relies on criterion E should include a document that describes the quantitative methods used, as well as all the data files that were used in the analysis. The document and accompanying information should include enough detail to allow a reviewer to reconstruct the methods used and the results obtained.

The documentation should include a list of assumptions of the analysis, and provide explanations and justifications for these assumptions. All data used in estimation should be either referenced to a publication that is available in the public domain, or else be included with the listing documentation. The uncertainties in the data should be documented.

Methods used in estimating model parameters and in incorporating uncertainties should be described in detail. Time units used for different model parameters and components should be consistent; the periods over which parameters are estimated should be specified.

Guidelines for Applying the Categories DD, NT and NE

When to use the category Near Threatened

To qualify for the Near Threatened category, the taxon should be close to qualifying for the Vulnerable category. The estimates of population size or habitat should be close to the Vulnerable thresholds, especially when there is a high degree of uncertainty, or possibly meet some of the subcriteria. This may be combined with biological susceptibility and threat. The category Near Threatened is not specified by its own criteria, but instead by the proximity of a species to the criteria for the category Vulnerable. For taxa listed as Near Threatened on the IUCN Red List, assessors are asked to indicate as part of the justification, which criteria were nearly met. For example, NT listing would be justified in the following cases (in each case, any criteria not specifically mentioned are not met and are not nearly met):

- Population has declined by an estimated 20-25% in the last three generations.
- The taxon meets the area requirements under criterion B for threatened (EOO <20,000 km^2 and/or AOO <2,000 km^2) and is declining, but the population is not severely fragmented, occurs at twelve locations, and there are no extreme fluctuations.
- The taxon meets the area requirements under criterion B for threatened (EOO <20,000 km^2 and/or AOO <2,000 km^2) and is severely fragmented, but the population is not declining, occurs at more than 10 locations, and there are no extreme fluctuations.
- The taxon is declining and occurs at ten locations, but has an EOO of 30,000 km^2 and/or an AOO of 3,000 km^2, which are uncertain estimates.
- The taxon is declining and severely fragmented, but has an EOO of 30,000 km^2 and/or an AOO of 3,000 km^2, which are uncertain estimates.
- The taxon is declining and severely fragmented, but has an EOO of 22,000 km^2 and/or an AOO of 3,000 km^2, which are highly certain estimates.
- Population has declined by an estimated 10% in the last three generations, and is continuing to decline, and has about 15,000 mature individuals.
- The taxon exists in a single subpopulation of about 15,000 individuals and is declining.
- The population has about 1,500 mature individuals.
- The best estimate of population size is 2,000 mature individuals, but this estimate is very uncertain, and as low as 1,000 mature individuals cannot be ruled out.

- The taxon exists at three sites, occupying an area of 12 km^2; the population is being harvested but is not declining; there are no current threats, but there are plausible events that may cause the species to decline, but these are unlikely to make the species Extinct or Critically Endangered in a short time.
- Population has declined by 40% in the last three generations, but the decline has stopped, and the causes of the decline have been understood.

The following are examples of species that should not be listed as NT (or any of the categories of threat), unless other criteria apply:

- Population has declined by an estimated 10% in the last three generations, and there are more than 20,000 mature individuals.
- Population has declined by an estimated 30% as part of fluctuations.
- The taxon meets the area requirements under criterion B for CR (EOO <100 km^2 and/or AOO <10 km^2), but is not declining, not severely fragmented, there are no extreme fluctuations, and there are no obvious threats.
- The taxon is long-lived and slow growing, but does not meet any criteria A-E.
- The population has more than 2,000 mature individuals.
- The taxon exists at three sites, occupying an area of 30 km^2; the population is not declining; there are no current threats, and the species is very unlikely to become Extinct or Critically Endangered in a short time.

A taxon may also qualify for the Near Threatened category if it is the focus of a continuing taxon-specific or habitat-specific conservation or management programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years. A targeted taxon-specific or habitat-specific conservation or management programme is one that:

- has conservation as its goal, or one of its goals, or has a goal that is consistent with, and not in conflict with, conservation;
- identifies the target taxon, or a group of species to which the target belongs, or a habitat type on which the taxon depends;
- is actively implemented and effective in abating the identified threats that may result in uplisting of the taxon to a threatened category if implementation of the programme ceases; and
- has documentation that is publically available.

In these cases, the listing justification must explicitly state that the taxon is listed as NT because it is conservation-dependent. The conservation or management programmes that focus on the taxon must be cited or described as part of the documentation requirements (see IUCN 2001, 2012b; Annex 3).

Not Evaluated and Data Deficient

Listing in the categories of Not Evaluated (NE) and Data Deficient (DD) indicates that no estimation of extinction risk has been made, though for different reasons. NE indicates that no attempt to evaluate the current status of the taxon has been made. DD indicates that the taxon was evaluated using available data, which were found to

be insufficient to place the taxon into a category. Taxa listed in these categories should not be treated as if they were not threatened.

When to use Data Deficient

If a taxon is known, but there is no direct or indirect information about its current status or possible threats, then it is obviously Data Deficient (DD). A Data Deficient listing does not imply that a taxon is not threatened.

The issue becomes more complex when there is very little information known about a taxon, but the available information indicates that the taxon may be threatened. The question then becomes how far is it acceptable to take inference and projection? This is discussed in greater detail in sections 3.1 and 3.2 (Data availability, inference and projection, and uncertainty).

When data are very uncertain, the category of Data Deficient may be assigned. However, in this case the assessor must provide documentation showing that this category has been assigned because data are inadequate to determine a threat category. If the data are so uncertain that both CR and LC are plausible categories, the taxon can be listed as DD. If plausible categories range from NT to threatened categories, DD is not the appropriate category; in this case, see section 3.2 about guidance to select the most plausible category while documenting the uncertainty. It is important to recognize that taxa that are poorly known can often be assigned a threat category on the basis of background information concerning the deterioration of their habitat and/or other causal factors; therefore the liberal use of Data Deficient is discouraged.

Data Deficient species may be flagged with one or both of the following tags, although most DD species would not need either:

1. **Unknown provenance**. The taxon is known only from one or more specimens with no or extremely uncertain locality information, so that it is not possible to make any further inference about its status.

   Examples:
   Bogata Sunangel *Heliangelus zusii* is a hummingbird known from a single trade-skin purchased in 1909 in Bogotá, and speculated to have been collected on the East Andes or possibly the Central Andes of Colombia, within a few hundred kilometres of the capital. However, some "Bogotá" specimens came from as far away as Ecuador. Since no other specimen is known, it is assumed to be (or have been) a relict species of restricted range.

   Rheocles pellegrini is a freshwater fish known only from the type collection made in 1930 one day west of Andapa which is somewhere along the northeast coast of Madagascar. This species has not been collected again since the 1930s, largely because its exact type locality is not known. There are therefore no data available upon which to base statements about the quality of its habitat or the size of its population, but it is assumed to be (or have been) a relict species of restricted range.

   Anthurium parambae is a hemi-epiphytic aroid plant endemic to Ecuador. It is known only from the type collection made in an unknown locale by L. Sodiro a century ago. The

lack of information prevents any evaluation of the species' conservation status and this is further compounded by taxonomic problems with many species of *Anthurium* that were described by Sodiro.

2. **Taxonomic uncertainty explains lack of information**. The paucity of data may be a consequence of taxonomic uncertainty, i.e. the lack of information on distribution, status, ecology and threats is because there are very few specimens and/or records, and this may be because the taxon represents aberrant individuals, hybrids, rare colour morphs, or subspecies of other species. This explanation is as or more likely than the possibility that the taxon is genuinely rare, threatened or has been inadequately searched for. It is important to note that this tag should not be used for taxa that simply have uncertainty around their taxonomy. Such taxa should not be classified as Data Deficient simply because of this uncertainty: they should either be regarded as good species and assessed against the Red List Criteria, or not assessed for the Red List. The process of determining the list of taxa to be assessed should be separated from the process of assessing extinction risk (see section 2.1 on taxonomy).

   Examples

   Blüntschli's Vanga *Hypositta perdita* was named relatively recently on the basis of two specimens collected in 1931 in southeast Madagascar. The specimens are juveniles, and Goodman *et al*. (1997) speculated that they may refer to juvenile Nuthatch Vanga *H. corallirostris*, although the far longer tarsi and shorter toes make this unlikely. Nevertheless, the lack of any further information on distribution, population size, trends, ecology and threats, mean that the IUCN Red List Criteria cannot be applied, and the species is consequently classified as Data Deficient.

   Blue-wattled Bulbul *Pycnonotus nieuwenhuisii* is known from one specimen collected in northeast Kalimantan in 1900 and another from Sumatra in 1937, plus reports in 1992 in Brunei. It has been speculated to be of hybrid origin, or a rare morph, although it is possible that it may be a genuinely rare habitat specialist that is occasionally forced to search other areas for food. With no further information, this uncertainty makes Data Deficient the most appropriate category.

   Monteiro's Bush-shrike *Malaconotus monteiri* has previously been considered a subspecies of Grey-headed Bush-shrike *M. blanchoti* or a colour morph of Fiery-breasted Bushshrike *M. cruentus*, but specific status has been proposed owing to differences in habitat, despite the similarity of specimens to *blanchoti*. The form *perspicillatus* was described from Mt Cameroon but has not been recorded subsequently although there is a record of *monteiri* from Mt Kupe, Cameroon. A specimen apparently similar to *perspicillatus* was collected in western Kenya but was subsequently lost, and there has been no further evidence of such birds in western Kenya. Although surveys in 2005 brought more records of *monteiri* from Angola, further study is needed to clarify the taxonomic status of this taxon. With such unclear and fragmentary information on its distribution and status, it is not possible to apply the Red List Criteria.

   For further discussion and examples, see Butchart and Bird (2009).

Where a species name is widely accepted as containing multiple taxa that may deserve species-level recognition (a 'species complex') AND there is insufficient information (direct or indirect) to apply the Red List Categories and Criteria, the 'species

complex' should be listed as Data Deficient. If the complexity and uncertainty of the taxonomic status plausibly explains the lack of information, then the assessment should be tagged as 'Taxonomic uncertainty explains lack of information'.

When not to use Data Deficient

Data Deficient classification implies that the taxon has been assessed against all criteria. All DD assessments require documentation of available data, sources of uncertainty and justification for why each of the five criteria cannot be applied (and, if applicable, the tags discussed in the previous section). If all of the five criteria have not been considered, DD cannot be used (the taxon must be categorized as NE).

In many cases, uncertainty in the data precludes placing the taxon in one of the other categories (LC to EX). However, not being able to place the taxon into a single category is, by itself, not a sufficient reason for a DD assessment. As discussed above, if the data are so uncertain that both CR and LC are plausible categories, the taxon can be listed as DD. If, however, plausible categories range from NT to threatened categories, DD is not the appropriate category. In this case, the assessor must select the most plausible category. If it is not possible to identify the most plausible category, the assessor must select one of the categories, based on their level of risk tolerance. For example, if LC, NT, and VU are considered to be equally plausible categories, the taxon may be categorised as NT. In all cases, the justification text must specify all categories that were considered plausible, as well as the degree of risk tolerance (see section 3.2.2). If assessors cannot decide on the level of risk tolerance, the mid category should be selected. It is important to note that, if uncertainty is specified at the parameter level (using the Red List Criteria Calculator in SIS), then the range of plausible categories and the most plausible category would be automatically selected, in accordance with the specified level of risk tolerance. See also section 3.2 about guidance to select the most plausible category while documenting the uncertainty; section 3.1 on data availability, inference and projection, and section 5.7 on inferring population reduction based on habitat loss.

In some cases, the data uncertainty has a spatial component; for example, there may be some data from one part of the range, but none or little from the other parts. In such cases, the assessors should try to avoid a DD listing by considering different plausible assumptions about how representative the threats are from known areas, and use these assumptions to form uncertainty intervals for the parameters used (such as mature individuals, locations, subpopulations, etc.).

In other cases, the uncertainty may have a temporal component: the information may be more uncertain in the more distant past and/or about the more distant future. In such cases, the assessors should try to avoid a DD listing by using criterion A4 to minimize uncertainty. Considering a 3-generation window that includes both the more recent past and the more near future would focus the assessment to a period where data uncertainties are smaller.

Guidelines for Applying the Extinct Categories and Tag

The extinct categories (EX and EW)

The category of Extinct is used when 'there is no reasonable doubt that the last individual has died'. However, extinction—the disappearance of the last individual of a species—is very difficult to detect. Listing of a species as Extinct requires that exhaustive surveys have been undertaken in all known or likely habitat throughout its historic range, at appropriate times (diurnal, seasonal, annual) and over a timeframe appropriate to its life cycle and life form. Listing as Extinct has significant conservation implications, because protective measures and conservation funding are usually not targeted at species believed to be extinct. Therefore, a species should not be listed in the Extinct (EX) or Extinct in the Wild (EW) categories if there is any reasonable possibility that they may still be extant, in order to avoid the 'Romeo Error' (Collar 1998), where any protective measures and funding are removed from threatened species in the mistaken belief that they are already extinct. This term was first applied to the case of Cebu Flowerpecker *Dicaeum quadricolor*, which was rediscovered in 1992 after 86 years without a record (Dutson *et al*. 1993), having been written off as extinct at least 40 years earlier on the presumption that none of its forest habitat remained on the island of Cebu (Magsalay *et al*. 1995). An evidentiary approach to classifying extinctions is appropriate in order to encourage continuing conservation efforts until there is no reasonable doubt that the last individual of a species has died. However, if assessments of EX or EW are too evidentiary, then extinction rates based on the Red List are likely to be under-estimated. To avoid this bias, it is necessary to include possibly extinct species in estimates of numbers of extinct taxa and extinction rates.

Extinct in the Wild is defined as existing only in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. "Cultivation" and "captivity" are not necessarily restricted to confinement. To be consistent with the definition of a "wild" subpopulation (see section 2.1.4 on managed subpopulations), EW should also be used if none of the subpopulations are wild. Thus, if the only surviving subpopulations of a taxon are not confined, but are nonetheless subject to intensive, individual-level management interventions as discussed in section 2.1.4, that taxon should be listed as EW.

'Possibly Extinct' tag for Critically Endangered taxa

Although an evidentiary approach to classifying extinctions is appropriate, this approach biases analyses of recent extinctions when based only on those species classified as Extinct or Extinct in the Wild (when individuals survive only in captivity). For example, the number of recent extinctions documented on the IUCN Red List is likely to be a significant underestimate, even for well-known taxa such as birds. The tag of 'Possibly Extinct' has therefore been developed to identify those Critically Endangered species that are likely already Extinct, but for which confirmation is required. Taxa tagged as Possibly Extinct would then be included within bounded estimates of the number of recent extinctions to indicate plausible uncertainty in contemporary rates of extinction.

Identifying Possibly Extinct species

Critically Endangered (Possibly Extinct) taxa are those that are, on the balance of evidence, likely to be extinct, but for which there is a small chance that they may be extant. Hence they should not be listed as Extinct until adequate surveys have failed to record the species and local or unconfirmed reports have been investigated and discounted. 'Possibly Extinct in the Wild' correspondingly applies to such species known to survive in captivity.

Note that 'Possibly Extinct' is a tag, and **not** a new Red List Category.

Different standards of evidence are required from assessors when deciding to assign a taxon to the Extinct or Critically Endangered (Possibly Extinct) categories. Assignment to the Extinct category requires evidence beyond reasonable doubt that the last individual of the taxon has died. Assignment of the 'Possibly Extinct' tag requires that on the balance of evidence, the taxon is likely to be extinct, but there is a small chance that it may be extant. Relevant types of evidence supporting a listing of extinction include (Butchart *et al.* 2006):

- For species with recent last records, the decline has been well documented.
- Severe threatening processes are known to have occurred (e.g., extensive habitat loss, the spread of alien invasive predators, intensive hunting, etc.).
- The species possesses attributes known to predispose taxa to extinction, e.g. flightlessness (for birds)
- Recent surveys have been apparently adequate and appropriate to the species' detectability, but have failed to detect the species.

Such evidence should be balanced against the following considerations (Butchart *et al.* 2006):

- Recent field work has been inadequate (any surveys have been insufficiently intensive/extensive, or inappropriately timed; or the species' range is inaccessible, remote, unsafe or inadequately known).
- The species is difficult to detect (it is cryptic, inconspicuous, nocturnal, nomadic, silent or its vocalisations are unknown, identification is difficult, or the species occurs at low densities).
- There have been reasonably convincing recent local reports or unconfirmed sightings.
- Suitable habitat (free of introduced predators and pathogens if relevant) remains within the species' known range, and/or allospecies or congeners may survive despite similar threatening processes.

Similar considerations apply when assigning a taxon to either the Extinct in the Wild or Critically Endangered (Possibly Extinct in the Wild) categories.

Guidelines for interpretation of the standards of evidence supportive of Extinct and Critically Endangered (Possibly Extinct) classifications and Extinct in the Wild and Critically Endangered (Possibly Extinct in the Wild) classifications are under development.

The documentation for each taxon assessed as Extinct, Extinct in the Wild, Critically Endangered (Possibly Extinct) and Critically Endangered (Possibly Extinct in the Wild) should explicitly justify the application of the Extinct categories and 'Possibly Extinct' tag. The documentation must summarize the lines of evidence for and against extinction, describe surveys carried out to search for the species and specify the date and relevant details of the last confirmed record.

The status of all taxa assigned 'Possibly Extinct' tags must be reviewed at five-year intervals. For further discussion of the application of the Possibly Extinct tag, see Butchart *et al*. (2006).

There is sometimes difficulty in deciding the correct approach to assessing species that are very rare, and which might be Extinct, but for which there are limited data. An example might be an amphibian species which can no longer be found in areas where it once occurred, and which appears to have undergone a drastic decline (for example, in an area from where chytrid fungus has been reported). Such a species can have no known extant subpopulations, but information is lacking to declare it Extinct, even though extinction is a real possibility. Such species should be listed as Critically Endangered (with the Possibly Extinct tag if, on the balance of the evidence, extinction is more likely than survival), but choosing the correct criteria for doing this requires some care. If the species disappeared from known sites within the last ten years or three generations (whichever is longer), then listing under criterion A2 is the preferable option. If the species is known from a single location with EOO less than 100 km^2 or AOO less than 10 km^2, then listing as CR B1ab(i,ii,v) or B2ab(i,ii,v) are possibilities. However, there are many instances of species for which extinction is a real possibility, but for which the declines or disappearances took place more than 10 years or three generations ago (whichever is relevant), and for which the EOO and AOO are too large for listing as CR, and/or at least two subcriteria for CR B are not met. In such instances, the species should be listed as CR C2a(i), CR C2a(ii), and/or CR D, whichever seems more plausible. Such an assessment therefore infers a population size of fewer than 250 mature individuals (for C2) or 50 mature individuals (for D). Even though it is impossible to know whether or not such an inference is correct, it is a reasonable one for a species that could be Extinct.

Examples of Critically Endangered (Possibly Extinct) species

Nukupu'u *Hemignathus lucidus* is a bird endemic to the Hawaiian Islands where it has not been recorded since 1995–1996 despite extensive survey effort in a large proportion of its historic range (Pratt *et al*. 2001). It is in all likelihood extinct as a result of habitat loss and degradation combined with introduced diseases such as avian malaria spread by introduced mosquitoes. However, given the last record was within the last decade, the species is tagged as Possibly Extinct until further surveys confirm that no individuals remain.

Guadalupe Storm-petrel *Oceanodroma macrodactyla* is a bird endemic to the Mexican island of Guadalupe. It has not been recorded since 1912 despite several searches, following a severe decline owing to predation by introduced cats and habitat degradation by introduced goats (BirdLife International 2004). Only the difficulty of detecting storm-petrels at their breeding colonies at night (when the birds are active) and the continued survival of other storm-petrels on the island point to the possibility that some individuals survive. It is therefore classified as Possibly Extinct until further surveys confirm that the no individuals remain.

Spix's Macaw *Cyanopsitta spixii* is a parrot endemic to Brazil. It underwent a severe decline owing to unsustainable and intensive exploitation for the cagebird trade (Juniper 2003), and the last known individual disappeared in 2000. Searches have not led to the discovery of any other populations, although it is conceivable, if unlikely, that further individuals survive.

Oloma'o *Myadestes lanaiensis* is a bird endemic to the Hawaiian Islands. It was last recorded in 1980, with an unconfirmed report in 1988. There have been no subsequent records despite further surveys in most of the historical range. It is likely to have been driven extinct by disease spread by introduced mosquitoes, and as a result of habitat destruction (Reynolds and Snetsinger 2001). However, the remote Oloku'i Plateau has not been surveyed recently and could still harbour some birds.

Atelopus planispina is a species of Harlequin Toad endemic to the eastern slopes of the Ecuadorian Andes, from Volcan Reventador to the south, to Cordillera de Cutucu. The population has declined dramatically (more than 80%) in the last three generations probably due to the impacts of the disease chytridiomycosis, which has affected many other montane species of *Atelopus*. The last record of the species was in July 1985 (an amplectant pair) despite repeated visits to known (El Reventador) or inferred localities (within its extent of occurrence) (Bustamante 2002).

Hispaniolan Crestless Toad *Bufo fluviaticus* is a toad with a very restricted range (two known localities) in northwestern Dominican Republic. It was found in xeric habitats with broadleaf gallery forest, typically in close proximity to streams. It is not known whether animals stay close to streams or spread out into xeric habitats. The species is threatened by habitat destruction from agriculture and cattle grazing. The Hispaniolan Crestless Toad has not been encountered by any herpetologist in the three decades since it was first discovered, including by experts who have collected extensively on the island. Because toads often breed (and are seen) sporadically, additional efforts should be made to locate this species before it is considered extinct. No specimens have been collected since the type series. A scientist looked for it in 2003 and did not find it (M. Hernandez, pers. comm.).

Ethiopian Amphibious Rat *Nilopegamys plumbeus* is known only from one specimen trapped near the source of the Little Abbai River in northwestern Ethiopia. It is a water-adapted, insectivorous rodent and is therefore likely to occur at low densities. The species occurs in an area where the habitat has been destroyed through overgrazing by livestock. The habitat was already severely degraded when the type specimen was collected in the 1920s and L. Lavrenchenko (pers. comm.) confirms that the type locality area today is pure pastureland. The population status is unknown, possibly extinct. L. Lavrenchenko (pers. comm.) has attempted to recollect this species on two occasions, D. Schlitter (pers. comm.) has also tried, but without any success.

Pondicherry Shark *Carcharhinus hemiodon* is a very rare Indo-West Pacific shark species known from about 20 specimens in museums, obtained from widely separated sites. It occurs inshore on continental and insular shelves. All of the sites where it is known from are subject to large, expanding and unregulated artisanal and commercial 'catch all' fisheries. The population of this species is thought to have been severely depleted as a result of this exploitation. The species was last recorded in 1979 (in India), and it has not been reported since, despite detailed market surveys in much of its range in recent years (in Borneo, Philippines and Indonesia). Given that it has not be observed in over 20 years, that most known specimens were captured before 1900, and that its previously known habitat and extent of occurrence faces expanding unregulated fisheries, this species is listed as Critically Endangered (Possibly Extinct). Future survey work should attempt to locate the species.

Guidelines for Threatening Processes

As discussed in an earlier section (2.3), the criteria aim to detect symptoms of endangerment rather than causes (see also Mace *et al*. 2008). Consequently, they are applicable to any threatening process that results in symptoms such as population decline, small population sizes, and small geographic distributions. A taxon may be classified as threatened even if a threatening process cannot be identified. Regardless of the nature of threats, assessments must follow IUCN (2001, 2012b) and these guidelines to ensure valid application of the criteria. However, different threats, especially new or poorly understood processes such as global climate change may require further guidance in the application of definitions and criteria.

The purpose of this section is to provide such specific guidance. In this version, we focus on global climate change; future versions will provide further guidance on how the criteria may be interpreted to assess taxa affected by other threats. It is important to note that the guidance in this section is not an alternative to previous sections.

One aspect of a Red List assessment involves listing the major threats in the required documentation, as described in IUCN (2001, 2012b; Annex 3), using a standard classification scheme available at www.iucnredlist.org/technical-documents/classification-schemes. The guidance given here does not relate to this process; instead the focus is on the application of the Red List Categories and Criteria.

Global climate change

There has been concern that the Red List criteria may not be adequate for assessing species threatened with climate change. This is because many species that are projected to undergo substantial range contractions in the future have short generation lengths. Consequently, there are concerns that the assessment time frames are too short for the inferred population declines to trigger the relevant IUCN Red List criteria, which consider declines over a 3-generation period (see section 12.1.1). However, recent studies show that the IUCN Red List criteria can identify species vulnerable to extinction due to climate change. In a study involving North American reptiles and amphibians, Pearson *et al.* (2014) showed that extinction risk due to climate change can be predicted by information available now, such as current occupied area and population size, much of which is used in the IUCN Red List criteria.

Stanton *et al.* (2015) defined "warning time" as the time between when a species is first identified as threatened and when it goes extinct, assuming no conservation action. Using the same species and climate projections as Pearson *et al.* (2014), they showed that IUCN Red List criteria can identify species that would go extinct because of climate change without conservation action, and can do so with decades of warning time. In an independent study, Keith *et al.* (2014) reached the same conclusion for a short-lived Australian amphibian. Although these studies show the ability of the IUCN Red List criteria to identify species vulnerable to extinction because of climate change, they also show that warning times may be short in data-poor situations, and if conservation action is started only when a species is listed at the highest IUCN threat category (Critically Endangered). Therefore, there is a need to develop further

guidance for using the IUCN Red List system, especially in data-poor situations and for timely policy responses to exploit the maximum warning time available for species on extinction trajectories in response to changes in climate. As new research increases understanding of the impacts of climate change on species, the results will be used to improve these guidelines. Below, guidance is provided on a number of relevant issues, based on research available in 2015.

Time horizons

An important issue in the application of the criteria to species impacted by climate change concerns the time horizons over which the assessments are made.

The time horizons used in the criteria serve several purposes. First, the generation time is used as a surrogate for turnover rates within populations and as a biologically relevant scaling factor that corrects for the variation in rates at which different taxa survive and reproduce. Second, the time horizon is set to a minimum of 10 years because measuring changes over shorter time periods is difficult and does not reflect time scales for human interventions. Third, the time horizon is set to a maximum of 100 years into the future, because of the uncertainties in predicting population sizes for a long time from the present day (Mace *et al*. 2008).

The global climate is projected to continue to change for several centuries (IPCC 2013; Chapter 12). The effects on biological systems will certainly continue for a long time. Thus, for many species, especially short-lived ones, Red List assessments are based on time horizons much shorter than the long periods over which we now expect the world's climate and its effect on species will change. This by itself may not make climate change fundamentally different: other threats, such as habitat loss may also continue for a long time.

However, the nature of change in biological systems caused by climate change is thought to be different than changes caused by other threats. Thuiller *et al*. (2005), for example, argued that, "the recognized time scales for assigning species IUCN Red List Categories are not suited to evaluating the consequences of slow-acting but persistent threats," suggesting that the projected climate change impacts are thought to be of a more deterministic nature than other threats. In addition, some amount of climate change-related impact is irreversible (already committed) because of the lag between greenhouse gas emissions and climate change (and subsequent biological change).

While stochastic events (catastrophic fires, ENSO events, etc.) that contribute to the variability and hence the risk of extinction of populations clearly operate at different time scales than climate change, there are other processes that also are slow-acting and persistent. For example, it is debatable whether threats such as habitat loss and fragmentation are any less persistent or any more uncertain than climate change. Although climate change may be persistent, the predictions are also very uncertain. For example, IPCC (2013) makes most of its predictions only until 2100 because general climate models tend to produce very different outputs towards the end of the 21st century.

The criteria recognize that some threats may be irreversible (as explicitly noted in criterion A). For example, in many cases, habitat loss brought about by urban sprawl is not reversible. Various threats may involve time lags similar to that of climate change. For example, human populations have a momentum, and thus there is often a lag between a change in the human population growth rate and resulting changes in human pressures on natural systems.

Thus, the assessment of species with short generation times is not fundamentally different under climate change and under other threats. Although short-lived species may not be listed under criterion A initially, if they are affected by climate change they will be listed (likely under criteria B or C) as their ranges and populations change as a response to climate change. They can also be listed under criterion E (see below).

In summary, many of the issues related to time horizons are not specific to global climate change. Although future versions of this document may provide further guidance on this issue, for the time being, the horizons for each of the criteria should continue to be applied as they are currently specified, regardless of the nature of the threatening factor, including global climate change.

Suggested steps for applying the criteria under climate change

There are a number of challenges in applying the criteria to species impacted by global climate change, which have resulted in several misapplications of the criteria. A common mistake is making arbitrary changes to thresholds or time horizons specified in the IUCN criteria (see Akçakaya *et al.* 2006 for examples and details). An important characteristic of the Red List is that threat categories are comparable across taxonomic groups. For this important standard to be maintained, it is essential that the thresholds and time periods used in the criteria are not altered (see section 12.1.1).

To assess species that might be impacted by climate change, the following steps are recommended (Figure 12.1), as available data and information about the species permit.

1. Assessors are encouraged to think systematically through the potential mechanisms of the impact of climate change on the species (see section 12.1.3 below). The identification of likely mechanisms of impact will help with defining key variables used in red list assessments in the context of climate change. This diagnostic process may be aided by development of diagrammatic models.

2. Assessors should identify and estimate or infer the values of all the parameters in the Red List criteria relevant to the mechanisms of taxon change under climate change identified in Step 1. These parameters include “very restricted distribution” and “plausibility and immediacy of threat” (section 12.1.4), "number of locations" (12.1.5), "severely fragmented populations" (12.1.6), “continuing decline” (12.1.7), "extreme fluctuations" (12.1.8), and “population

reductions" (12.1.9). Inferences about such variables can lead to listing under criteria A, B, D2 or C2 (Fig. 12.1)

3. To incorporate future climate impacts on species more explicitly, assessors are encouraged to make inferences about the magnitude of future population reduction (criteria A3 and A4) and whether continuing decline (criteria B and C2) will occur due to climate change (see section 12.1.8). Such inferences can be aided by developing models of (a) bioclimatic habitat or (b) population dynamics (see sections 12.1.9, 12.1.10, and 12.1.12). The identification of likely mechanisms of impact will also help with developing such models. The output of such models can lead to listings under criteria A, C1 or E (Fig. 12.1)

4. Finally, the results of the bioclimatic models can be used to determine the spatial structure of stochastic population models, which are then used to estimate probability of extinction for assessment under criterion E (discussed in detail in section 12.1.11). This allows assessors to explicitly incorporate effects of future habitat shifts and habitat fragmentation, future increases in climate variability (hence in extreme fluctuations), and dispersal limitations and barriers. The output of such models can lead to listings under criteria A or E (Fig. 12.1). However, this approach requires substantial amounts of demographic information that may not be available for most species.

Assessors should first complete Steps 1 and 2, and then complete as many of the remaining steps as the available data and expertise allow. In the following sections, we discuss mechanisms of impact of climate change, applications of various definitions and criteria, and use of different types of models for estimating population reductions and continuing declines. Although we discuss particular criteria in this section, this does not mean that these are the only applicable ones. As with any other threat, the taxon should be assessed against all the criteria as available data permit.

Mechanisms

Climate change can affect populations via many mechanisms; and thinking about how this will occur for given taxa can clarify the parameters and criteria relevant for a Red List assessment. Relevant parameters for assessments under climate change include "very restricted distribution", "plausibility & immediacy of threat", "number of locations", "severe fragmentation", "continuing decline", "extreme fluctuations", and "population reductions". The relevant criteria for future effects of climate change include A3, A4, B1, B2, C1, C2, D2 (VU), and E (Fig. 12.1).

The effects of climate change on taxa are analysed quantitatively through two main groups of symptoms: changes in the taxon's distribution and changes in the demography of the taxon which is then included in population models. While range changes have been the most studied symptom of species decline due to climate change (Pearson *et al.* 2002), changes in demography can also lead to reductions in population abundance even when species distributions are projected to increase under climate change. This is because births, deaths, emigration and immigration drive population dynamics and these are demographic factors not necessarily directly linked

to habitat and range size (Thuiller *et al.* 2014). Demographic factors that could be affected by climate change include vital rates (e.g. survival, growth, fecundity, and dispersal), species interactions, phenology, population responses to disturbance, and deposition and production of calcareous structures and tissues (e.g. in corals) (Foden *et al.* 2013). Hence, when considering population declines driven by climate change, it is important to consider the main mechanisms by which this is likely to occur as this will highlight the most appropriate criteria for assessment under this threat.

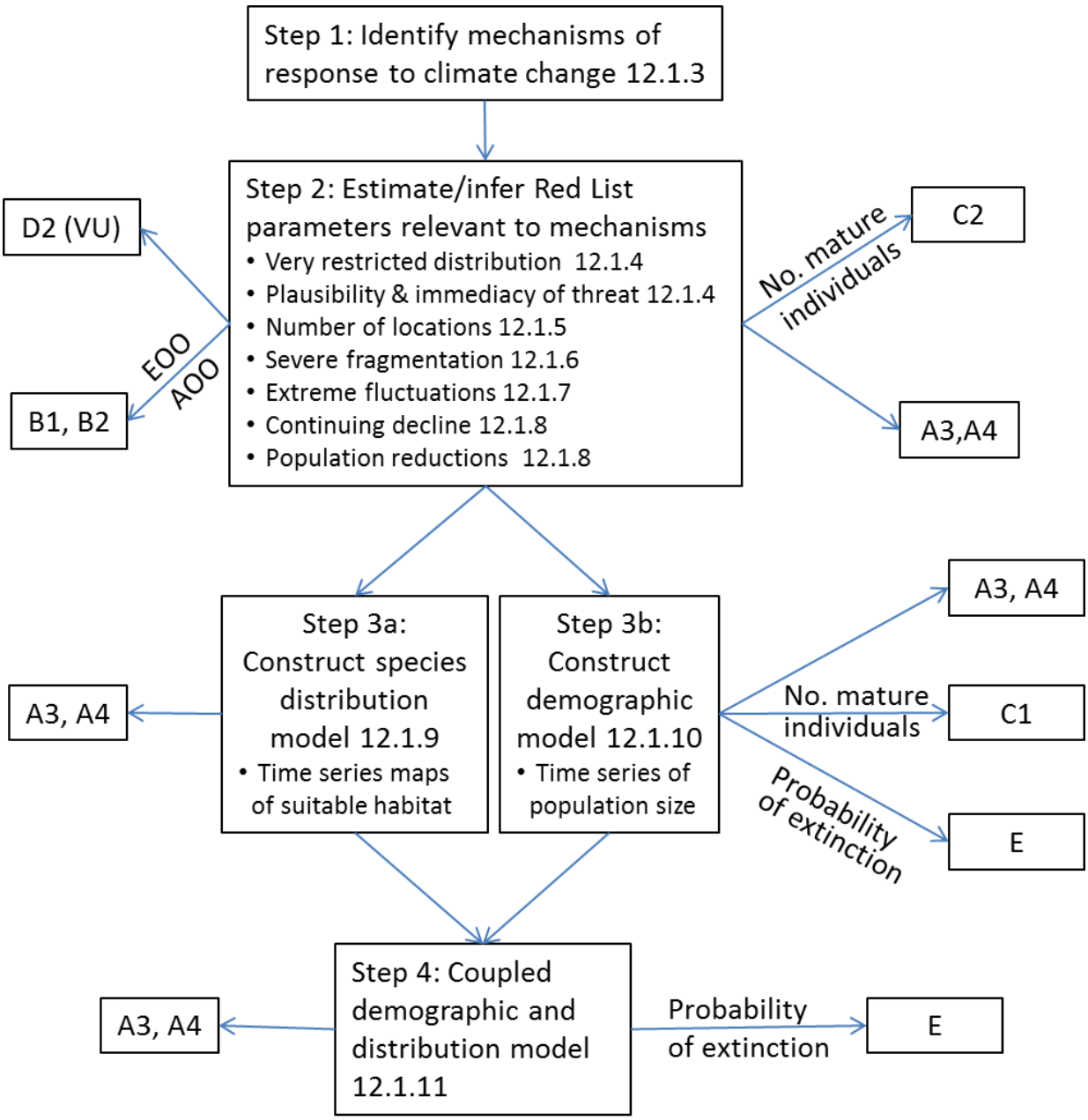


Figure 12.1. Protocol for assessing extinction risks under climate change using the IUCN Red List Criteria for Threatened Species (IUCN 2001). Letters and numbers in marginal boxes refer to respective Red List criteria. Numbers within central boxes refer to relevant sections of text in these Guidelines. Any assessment must address all plausible threats (not just climate change), and should also evaluate eligibility for listing under criteria A1, A2 and D1 (not shown).

Changes in habitat can occur under climate change because climate is a predictor of habitat suitability for many taxa. Changes in precipitation and temperature across space can shift, fragment, contract or increase species ranges leading to changes in EOO and AOO and the degree of fragmentation. The ability of a population to track shifts or increases in suitable habitat will depend on its dispersal capabilities (Foden *et al.* 2013). However, changes in climatic variables can also expose organisms to conditions outside their range of physical tolerance resulting in reduced survival and fecundity, leading to reductions in population size (Deutsch *et al.* 2008). In the case of corals, increased ocean temperatures or changes in pH can reduce or prevent development of calcareous tissues, thus reducing survival and growth rates. Increased temperatures can change predator-prey relationships, or food webs, by altering organisms' behaviour such as movement and exposure times, with potential ramifications to both the predator and prey or consumer and resource (Gilman *et al.* 2010). Phenology, or the timing of life-cycle processes, can shift by climate change such that a mismatch occurs between, say, the timing of flowering and the presence of pollinators (Memmott *et al.* 2007). And changes in the intensity and frequency of environmental events, such as fire, drought, or floods can reduce populations that have evolved under a different regime (Dale *et al*. 2001). For example, obligate seeding plants that rely on seedbanks for post-fire seed regeneration will undergo population declines if fire frequency is increased, because fewer seeds will be added to seedbanks between successive fires.

Very restricted distribution and plausibility and immediacy of threat (VU D2)

Taxa that have very restricted distributions and become susceptible under climate change to a threat that is plausible and liable to cause the entire population to rapidly become Critically Endangered or even Extinct in the Wild will be eligible for listing as Vulnerable under criterion D2. However, classification under criterion D2 is only permissible if the effects of climate change are such that the taxon is capable of becoming Critically Endangered or Extinct in a very short time period after the effects of the threat become apparent.

Application of this criterion requires only knowledge of the species' distribution and an understanding of the severity and immediacy of impacts of a plausible threat. For example, a sessile terrestrial organism that is susceptible to salt would qualify for listing as VU D2 if it had a very restricted distribution in a coastal location that is projected to become more exposed to salt water or saltspray as a consequence of projected rises in sea-level and/or increased frequency of coastal storms. More detailed examples are given below.

Example 1. A species that currently does not meet the area thresholds under criterion B may be classified as VU D2 if bioclimate models (see section 12.1.12) predict that a range reduction could correspond to a population reduction of 80% or more (and other information indicates that there are few locations; see above). In this case, the start of the decline may not occur soon, but the decline is plausible, and once it begins it is expected to cause a population reduction in a very short period of time (e.g., within one to two generations or 10 years) so that the species will be classified as CR A3c, so it now meets VU D2.

Example 2. A species of coral currently has restricted area of occupancy (less than 20 km^2) but does not satisfy the criteria for classification under criterion B. Climate change models predict increases in ocean temperatures, greater than the typical seasonal variation, across the entire range of the species. This temperature increase is expected to cause coral bleaching such that the area of occupancy will be reduced to less than 10 km^2 within 10 years of the start of bleaching. It is highly uncertain when the temperature increase or the onset of the bleaching will occur, but there is a reasonable chance that it will occur in the future. Once the bleaching starts, the species will meet CR B2ab within a short time, so it now meets VU D2.

Example 3. A small mammal with an AOO >500 km^2 occurs in a single location (see example of Species 3 in section 12.1.5) where it is dependent on snow cover (for insulation and predator avoidance during the winter). Climate change is expected to increase the probability of a series of years with no or inadequate snow cover. If this occurs, the species is expected to decline by 80% or more within 1-2 generations due to mortality from exposure and predation. Although having a number of years with no snow cover is a stochastic process and cannot be exactly predicted, in this case the climate models indicate that it is a plausible event. The species meets VU D2 because this plausible event, once it occurs, will cause the species to be listed as CR.

Example 4. A species has AOO <20 km^2, but is not declining or under any specific threat or experiencing extreme fluctuations. It is expected that future climate change will affect this species, but the effects are expected to cause gradual and slow decline, which will not trigger any criteria for CR or cause extinction within three generations. Thus, this species does not meet VU D2.

Example 5. A fish species known only from a single oceanic archipelago, where it occurs from 1 to 30 m depth. It lives in small recesses on slopes and walls of rocky reefs. In this region, localized declines, including the complete loss of at least one other endemic fish species, have occurred after strong El Niño-Southern Oscillation (ENSO) events that result in shallow waters that are too warm and nutrient poor for extended periods of time. The frequency and duration of ENSO events in this region appears to be increasing. Given the restricted distribution of the species and its specialized shallow water habitat, oceanographic environmental changes, such as those associated with future ENSO events, may cause the extinction of this species in a short period of time (as has happened for a similar species). Thus, it meets VU D2.

Definition of "Location" under climate change (B1, B2, D2)

Using the number of locations in Red List assessments requires the most serious plausible threat(s) to be identified (see section 12.1.3). In some cases, the most serious plausible threat will be climate change, but it may not be correct to assume that species threatened by climate change occupy a single location. In general, it is not possible to identify climate change as the main threat (for purposes of defining locations) without knowing something about how the effects of climate change are likely to be played out through the proximate causes or direct threats. For most species susceptible to climate change, the climate change itself (e.g., increasing temperatures or changes in precipitation) is not the direct threat. Rather, the process

through which climate change is expected to affect species involves a large variety of threats or proximate causes—such as changes in fire frequency, hydrology, species interactions, habitat suitability, diseases—that affect the species vital rates (these proximate causes can be inferred using knowledge of species ecology and predicted changes in relevant climatic variables). Thus, even when the ultimate cause of endangerment is climate change, the locations occupied by a species should be defined (and counted) in terms of these direct threats. Climate change should only be used to define the number of locations when it is the direct threat (e.g., where survival rates are reduced by thermal stress and are likely to be the principal direct cause of population declines or when suitable habitat is reduced due to changes in temperature and precipitation).

In some cases, climate change may threaten different parts of a species' range through different proximate factors, or not affect some parts at all (for example, part of the range may be expanding). In such cases, the most serious plausible threats should be used to define locations in different parts of the species range in accordance with section 4.11 (options a–d).

Examples of estimating the number of locations for species susceptible to climate change:

Species 1 is restricted to a single climatic zone affected by severe storms that cause episodes of high mortality. The frequency of severe storms in the region is projected to increase by at least 20% over the next 100 years. A single severe storm is unlikely to affect the entire range of the species, but two severe storms could cover the entire range. The species is correctly estimated to occur at two locations based on severe storms as the proximate threat (the minimum number of independent storms that could affect its entire range). It would be incorrect to interpret the species as occupying a single location based on the single climatic zone occupied in which severe storm frequency is projected to increase.

Species 2 is restricted to three coastal freshwater wetlands potentially affected by saltwater incursion associated with sea level rise. Two of the wetlands occur on the same floodplain, one at a low-lying site 0.5 metres above sea level, and another perched on the upper floodplain five metres above sea level. The third wetland also occurs at five metres above sea level, but in another region where there is a very large inter-tidal range. Sea level is projected to rise, on average by 1.0 metre by year 2100. The low-lying wetland will certainly be affected by sea level rise. The nearby perched wetland is very unlikely to be affected by sea level rise. The third wetland could be affected by saltwater incursion during extreme spring tides under projected future climate, but this is uncertain. Incursion by saltwater is the most serious plausible threat at the low-lying (first) site and the distant (third) site with the high inter-tidal range. These two sites could be interpreted as a single location if they are both threatened by the same regional sea-level rise. However, if sea level rise could lead to different outcomes at the two sites they could be interpreted as two separate locations. For example, the same amount of sea level rise may inundate the first wetland but only sporadically affect the third wetland, causing different types of impacts at the two wetlands (total habitat loss in one and temporary population reduction in the other). If the independence of threat outcomes at the two wetlands is uncertain, then a

bounded estimate of [1-2] locations is appropriate (see section 3). The second wetland is very unlikely to be affected by sea level rise, and hence the most serious plausible threat for this wetland is not sea level rise. If this site is subject to other threats, the most serious plausible one will govern how many locations are represented at that site. For example, if the entire wetland is threatened by polluted runoff, then it should be counted as a single location and the total number of locations for the species is [2-3]. Alternatively, if the second wetland is not threatened, then the number of subpopulations at that site could be used as a proxy or the number of locations may not be applicable to the assessment of the species (i.e., the subcriteria for number of locations cannot be met, see section 4.11).

Species 3 is restricted to the highest altitudes of two mountain ranges separated by a plain of 100 km. The two mountain ranges have a seasonal cover of winter snow that extends above a similar threshold altitude (1,800 m above sea level), although the summits of their mountains are at different elevations. Seasonal snow cover affects breeding success by providing insulation during cold winters. The extent of snow cover is projected to decline stochastically over the next 30 years. The most serious plausible threat is the risk of a year in which there will be very low or no winter snow cover, which causes an episode of very high mortality in the species population. The chance of this occurring in the same year on both mountain ranges is about 30%, based on correlation of minimum snow extent over previous years. Despite their geographic separation, the two mountain ranges are interpreted as a single location for the species because they may be affected by the same 'low-snow cover' event.

Severe fragmentation (B1, B2, C1 and C2)

If a taxon is not currently severely fragmented (see section 4.8), this cannot be used to meet the severe fragmentation subcriteria (e.g., criterion B1a) even if there is evidence to infer that it may become so under future climates. However, projected future fragmentation can be used to infer continuing decline, if certain conditions are met. Continuing decline is recent, current or projected future decline (see section 4.6). Severe fragmentation can for some species lead to local extinctions of subpopulations inhabiting the smallest habitat fragments. If the population density and the projected distribution of fragments justify a prediction of increasing rate of local extinctions in the near future, this may be used to infer continuing future decline in population size.

The same conditions may also allow inferring population decline or reduction under criterion A3 (or C1), but this requires a quantitative prediction. Suppose that a bioclimatic model (see section 12.1.12) predicts that EOO of a taxon will decline by 20% in the next three generations due to climate change. Assuming that the population reduction will be at least as large as the EOO reduction (but see section 12.1.8), this can be used to infer a 20% population reduction, but would not by itself meet the VU threshold for A3. However, suppose that a population dynamic model predicts that populations smaller than a certain size have 50% risk of extinction. If the bioclimatic model also predicts that 40% of the population will be in fragments that support populations of this size or smaller, then we can infer that the population will undergo a further 20% reduction due to increased local extinction of smaller populations. Combined with the 20% reduction due to range contraction, this result can be used to infer a total of 40% population reduction, listing the species as VU A3.

Extreme fluctuations (B1, B2, C1 and C2)

One of the predictions of many climate models is an increase in the frequency of extreme weather events (such as droughts, heat waves, etc.). This may increase population fluctuations to extreme levels (see section 4.7). If a taxon is not currently experiencing extreme fluctuations, but is predicted to do so in the future as a result of climate change, this prediction cannot be used to meet the extreme fluctuation subcriteria (e.g., B1c). However, a projected future increase in population fluctuations can be used to infer continuing decline, if certain conditions are met. Continuing decline is recent, current or projected future decline (see section 4.6). Extreme fluctuations can for some species lead to an increase in rate of local extinctions of subpopulations (especially if combined with severe fragmentation; see above). If the population sizes and the projected increase in fluctuations justify a prediction of increasing rate of local extinctions in the near future, this may be used to infer continuing future decline in population size.

A prediction of future extreme fluctuations can also contribute to a VU D2 listing if projected local extinctions could cause it to meet the criteria for CR in a very short period of time (see above).

Inferring population reduction and continuing decline (A3, A4, B1, B2, C2)

Criteria A3 and A4 may be applied if a population reduction of a given magnitude may be inferred from relevant evidence. Unless there are quantitative models enabling projections of suitable habitat or population size under future climates, the evidence base will be indirect or circumstantial (section 3.1). For example, if there is evidence of a strong relationship between temperature and survival or temperature and breeding success, and there are projections of future temperatures that suggest that they will rise rapidly enough to reduce the number of mature individuals by at least 30% within the next 10 years or 3 generations, whichever is longer, then this information may be used to apply criterion A3. Similar inferences may be used to infer the direction of trends in the number of mature individuals, which may be used to infer continuing declines under criteria B1, B2 and C2.

Inferring reductions from bioclimatic models (A3, A4)

Bioclimate envelope models (or bioclimate models) are often used to predict changes in a taxon's range as defined by climatic variables. Such models are also known as species distribution models (SDM) or ecological niche models (ENM) that use climatic variables as predictor variables (see section 12.1.12 for detailed guidance on developing these models). The results of bioclimate envelope models will be a series of habitat suitability maps. In order to infer population reduction (for use in criteria A3 or A4) from these maps, it is necessary to calculate the expected population size from the current map and from the map for the time step that corresponds to three generations in the future. If climate data are not available for the year that corresponds to three generations in the future, it should be created by interpolation from the available layers.

Even if the current population size of the taxon is known, the same method of estimation should be used for both the "current" and the "future" maps. This is because the quantity of interest is the proportional change in population size, and using the same methods removes some of the effects of the assumptions involved in making this conversion from habitat suitability (HS) to population size.

The relationship between population reduction and habitat loss may not be linear (see section 5.8). However, in the absence of more specific information, it is an allowable assumption. With this assumption, the conversion from habitat suitability to population size will involve summing all the HS values in each map, and calculating the proportional change in three generations. One important correction to this calculation is to use a threshold value of HS, to exclude from calculation of proportional reduction any areas that are unlikely to support a population because of low suitability. Another correction that should be made is to exclude patches that are too small to support a viable subpopulation (because of demographic stochasticity or Allee effects), or too isolated to be colonized by dispersers from occupied patches. Note that these corrections require species-specific information, and must be made separately for each taxon.

For species with limited dispersal ability, it is important to examine the overlap between successive habitat maps, projected at 1-generation intervals. The degree of overlap between each successive pair of habitat maps determines the relationship between habitat loss and population reduction. If there is little overlap, population reduction is likely to be larger than the projected habitat loss.

Other types of correlative analyses of population size or density as a function of environmental factors can also be used to infer population reductions. For example, the 2015 assessment of the Polar Bear (*Ursus maritimus*) used statistical relationships between sea ice and population size, combined with projected future decrease in sea ice, to calculate the range of plausible future 3-generation population reduction amounts (Wiig *et al.* 2015).

Projected change in habitat can also be used to infer continuing decline in habitat quality (e.g., criterion B1b(iii)).

Inferring reductions from demographic change

As noted in section 12.1.3, climate change may lead to population reductions or continuing declines through a range of demographic mechanisms. Understanding these can help to project the direction and rate of population response. The tools that are used to inform these projections will depend on the mechanism of response. In this section we briefly review the principle mechanisms, alert assessors to appropriate means of inference and suggest suitable tools to inform projection.

Some mechanisms are based on a direct ecophysiological relationship between a climate variable and one or more vital rates of the population. For example, in some taxa quantified relationships exist between fecundity and particular temperature variables for which projections can be derived from the outputs of Global Circulation Models (e.g. Kearney and Porter 2009). Other vital rates including survival, growth

and dispersal may be affected. A range of plausible scenarios can be constructed from uncertainty in both the species response and the climate projection to estimate plausible bounds of population reduction. This method of projection will usually involve some assumptions about rates of adaptation to new environmental conditions (Hoffmann and Sgrò 2011). In some cases, there may be sufficient data to use demographic models for this purpose.

Some mechanisms involve a relationship between calcification rates and ocean acidity for organisms with calcified body parts (e.g. corals, molluscs) (Orr *et al.* 2005). Hence projections of ocean acidification (with characterisation of uncertainty in trends) should permit inferences about the continuing declines (criteria B and C) and projections of population reduction over required time frames (criterion A). Again, this should be based on defensible assumptions about rates of adaptation and should generate bounded estimates to represent the uncertainty in the projections.

A wide range of taxa have life history processes and vital rates that respond to regimes of fire, flood or storms, and hence may undergo population reductions depending on how disturbance regimes respond to climate change. It is possible to generate projections for indices of change in the frequency, intensity and season of such disturbance events from Global Circulation Models (Milly *et al.* 2002; Clarke *et al.* 2012; Zhao *et al.* 2015). Such projections, in combination with models of the species responses to the disturbance should support inferences about continuing declines and bounded estimates of population reduction over required time frames. Changes in the frequency of heat waves and other extreme weather events could be treated in a similar manner where they are key drivers of declines.

A fourth mechanism of response to climate change involves changes to species interactions. These are challenging to predict, but it may often be plausible to project the direction of change, as a basis for inferring continuing declines, if the mechanisms are reasonably well understood. Examples include population changes of a target species inferred from projected increases in the area of spatial overlap between the habitat of the target taxon with those of its competitors, predators or disease vectors. Another example involves continuing declines inferred from phenological decoupling of mutualistic or facilitation interactions, or conversely phenological changes that result in increased exposure to competitors, predators or diseases.

Quantitative estimates of population reduction may be derived for many of these estimates using stochastic population models (e.g. Akçakaya *et al.* 2004). The parameterisation of these models may be adjusted to reflect projected trends in vital rates under a range of future climate scenarios based on regionally skilled Global Circulation Models (see section 12.1.12 for Guidance on the selection of these). All applications of such models should justify the parameter settings and selection of scenarios used in projection. Recent developments allow the coupling of stochastic demographic models to species distribution models projected to produce a time series of habitat suitability maps under future climate scenarios (Keith *et al.* 2008). Alternative modelling approaches are developing to achieve similar goals (e.g. Cabral *et al.* 2013). These not only allow projections of future population reductions for assessment of criteria A3 and A4, but may produce estimates of extinction risk over required time frames for assessment under criterion E (see section 12.1.11).

Estimating extinction risk quantitatively with coupled habitat and population models (E)

Because of its time horizon for VU of 100 years (regardless of generation time), criterion E can be used to list species with short generation times that are predicted to be threatened by climate change. However, the difficulties with using criterion E (see section 9) are increased when climate change is the main threat, because of the need to take into account multiple types of stochastic and deterministic changes in the taxon's environment, demography and habitat that are caused or exacerbated by climate change.

When adequate data are available for developing both bioclimate models (see section 12.1.12) and population models (see section 9), new approaches that link outputs of global circulation models (GCMs, or climate models) to species habitat models and metapopulation models can be used to estimate risks of extinction (Keith *et al*. 2008; Anderson *et al*. 2009; Brook *et al*. 2009; Cabral *et al.* 2013). Preliminary findings from these studies showed that extinction risks under climate change are subject to complex dependencies between species life history, distribution patterns and landscape processes (Keith *et al*. 2008).

It is very important not to ignore other threats, which may interact with, or supersede, climate change impacts when predicting species vulnerability to climate change. Approaches that focus on climate change alone may therefore lead to underestimation of extinction risks (Brook *et al*. 2009).

Using bioclimate models

Some of the guidance in the preceding sections refers to variables that may be calculated from outputs of bioclimate envelope models (or, bioclimate models). Such models are also known as species distribution models (SDM) or ecological niche models (ENM) that use climatic variables as predictor variables. This section will summarize methodological guidance in the use of these models for the purposes of Red List assessments. It is important to note that the use of these models is not necessary for all assessments of species threatened with climate change. Future versions of this document may include guidelines for other types of predictive modelling (such as eco-physiological models) that may be useful for Red List assessments.

Bioclimate envelope models have been widely applied to explore potential impacts of climate change on species distributions (for reviews of this field see: Guisan and Zimmerman 2000; Guisan and Thuiller 2005; Heikkinen *et al*. 2006; Franklin 2010; Peterson et al. 2011; for a practical introduction see Pearson 2007). These models commonly utilize associations between environmental variables and known species' occurrence records to identify climatic conditions within which populations can be maintained. The spatial distribution that is suitable for the species in the future can then be estimated under future climate scenarios. Advantages and disadvantages of this modelling approach have been widely debated in the literature, and multiple uncertainties make it essential that the model outputs are carefully interpreted

(Pearson and Dawson 2003; Hampe 2004; Araújo and Guisan 2006; Thuiller *et al*. 2008).

Bioclimate envelope models may provide useful information for red listing by identifying species that are more or less likely to experience contractions in the area of suitable climate space in the future and by estimating the degree to which potential distributions in the future might overlap with current observed distributions. The guidelines here are intended as a list of methodological issues that must be carefully considered in applications of these models for red listing under climate change. It is important that methodologies are well justified within the context of any particular study, and with respect to the biology of the taxon being assessed. Assessments that rely on bioclimate models will be reviewed by the Standards and Petitions Subcommittee (SPSC), so sufficient detail must be provided to allow the SPSC to determine if the model follows these guidelines.

Results of bioclimatic envelope models can be used in various ways to help with species assessments under the Red List Categories and Criteria. These uses include inferring population reduction under criterion A3 and continuing decline (see section 12.1.9), linking bioclimate and demographic models for criteria E (section 12.1.11), inferring continuing decline from projected increases in fragmentation (see section 12.1.6), and projecting plausible threats for use in criterion D2 (see section 12.1.4). Although the interpretation of the results from these models for Red List assessments relies on a number of assumptions, they do allow a tentative solution to the problem of incorporating the long-term impacts of climate change. A number of alternative modelling approaches are being developed to explore the relationship between climate change and species endangerment (see section 12.1.11), which will allow more comprehensive guidelines for assessing the risk of extinction due to climate change.

Quality of species occurrence data

Bioclimate envelope models rely on observed occurrence records for characterizing species limits of tolerance to climate predictors so it is essential that these data are of good quality. Confidence in the accuracy of georeferencing and species identifications of occurrence records should be high. It is important that georeferencing of occurrence records is accurate to a degree that is relevant to the resolution of the environmental variables (e.g., accuracy should be within a few tens of metres if the resolution of analysis is 1 km^2). Ideally, occurrence records should be associated with vouchered specimens and/or should have been identified by experts in the taxonomic group of interest. Data extracted from distributed databases (e.g., GBIF, HerpNET) should be carefully checked for accuracy, coverage and sampling intensity prior to use.

Selection of environmental predictor variables

Predictor variables need to be carefully selected. It is important to select variables that are expected to exert direct influence on the distributions of species (e.g., minimum temperature of the coldest month, maximum temperature of the warmest month, spring precipitation) through known eco-physiological mechanisms, and avoid indirect variables (e.g., altitude, topographic heterogeneity) (e.g., Guisan and Zimermann 2000). Often, there are several candidate variables for modelling the

distributions of species, but they tend to be correlated amongst each other. When this is the case, it is often advisable to investigate the correlation amongst them and select a reduced number of uncorrelated variables (to avoid problems of co-linearity; Araújo and Guisan 2006). One possible approach is to use Principal Components Analysis (PCA) to identify a reduced number of significant axes and then select a sub-set of ecologically meaningful variables that are associated with each one of the significant axis. Note that the number of predictor variables should not exceed the number of species occurrence records that are used. As a general rule, no more than one predictor variable for every five observations should be used. Some methods (e.g., Maxent, Phillips *et al*. 2006; Boosted Regression Trees, Elith *et al*. 2008) select a parsimonious number of variables automatically in which case the above rule would not apply. One reason to aim for parsimony in variable selection is to avoid overfitting of the models, thus increasing generality.

Land-use masks

In addition to the climatic predictor variables, current and future land-use also constrains the distribution of species. This is especially crucial for species whose bioclimatic envelope is predicted to shift through human-dominated landscapes. Assessments that rely on climate data alone are prone to over-predict areas of suitable habitat because climate may be suitable, but land cover may be unsuitable (Pearson *et al*. 2004). A land use map can be used as a mask to exclude such unsuitable areas from current and projected habitat. However, if land-use and climatic variables are likely to interact, then the land-use variables should be included in the model together with the climatic variables, rather than used as a mask (Stanton *et al.* 2012).

Choosing an appropriate spatial resolution

Bioclimatic models have been fitted with data of varying resolutions, for instance ranging from 1 ha cells in Switzerland (Randin *et al*. 2009), to 2 degree latitude-longitude cells at a global level. There is commonly a trade-off between the geographical extent of the study area and the resolution of the data: studies across large areas are likely to use data at coarser resolutions than studies across smaller regions. Similarly, it is often necessary to use data at finer resolution when modelling the bioclimate envelope of restricted range species, whereas wide-ranging species may be effectively modelled using data at coarser resolutions. Also, when modelling species across regions with low spatial heterogeneity (e.g., flat terrain), coarser resolution data are less of a problem than when models are used across areas of high heterogeneity (e.g., rugged terrain). It is important to bear in mind, however, that analyses at coarse resolutions may not account for microclimates that may be important for species persistence (Pearson *et al*. 2006; Trivedi *et al*. 2008; Randin *et al*. 2009).

Model selection

A large number of bioclimatic modelling techniques exist, and it has been shown that agreements between predicted and observed distributions are often greater with models allowing complex response curves (e.g., Elith *et al*. 2006). There is an ongoing debate as to whether more complex models are more adequate for modelling species ranges under climate change (Araújo and Rahbek 2006), so it is difficult at

this point to provide unequivocal guidelines with respect to the choice of the modelling techniques. However, it is important that assessments of species range changes are based on established methodologies that have been used and verified by several independent research groups.

Assessing the robustness of model projections

Studies have shown that projections from alternative models can be so variable as to compromise assessment of whether species potential distributions should contract or expand for any given climate scenario (e.g., Araújo *et al*. 2005; Araújo *et al*. 2006; Pearson *et al*. 2006). Assessments of the temporal trends in the sizes of species potential distributions should, therefore, include an assessment of the robustness of the projections by comparing results of a range of bioclimatic modelling techniques. We suggest that at least three modelling techniques should be compared and be as independent as possible with regards to how they link the response and the predictor variables (e.g., GAM and GLM are conceptually similar and tend to produce similar results). Various strategies may be employed in cases when models forecast inconsistent trends. One such strategy is to investigate the cause of the discrepancies. Typically, this would involve investigation of the species response curves obtained with each one of the methods, evaluating if there is any clear error, and then selecting the projections by the method producing more reasonable results. This approach is useful for species with well-known ecologies where expert judgements can be made and contrasted with the model outputs. The downside of the approach is that it involves subjective judgement that may yield non-repeatable results. An alternative strategy is to run ensembles of forecasts using a number of established approaches and then combine the individual model projections through consensus methodologies (for a review see Araújo and New 2007). The disadvantage here is that potentially significant ecological knowledge is not being used.

Background/pseudo-absence in the species distribution data

Species distribution data may be either presence-only (i.e., records of localities where the species has been observed) or presence/absence (i.e., records of presence and absence of the species at sampled localities). Alternative modelling approaches have been developed to deal with each of these cases. Some approaches that use presence-only data also utilize ‘background’ (e.g., Maxent, Phillips *et al*. 2006) or ‘pseudo-absence’ (e.g., Elith *et al*. 2006) data. In these cases, model results are sensitive to the extent of the study region from which background or pseudo-absence samples are taken. It is therefore important to select an appropriate study region. In general, background and pseudo-absence records should not be selected from areas where the species is absent due to non-climatic factors, such as dispersal limitation or inter-species competition (because such records provide a false-negative signal that will lead to poorer characterization of the species’ climatic requirements; Anderson and Raza 2010). Where possible, selection of the extent of the study region should therefore take into account factors including the dispersal capacity of the species and distributions of competitors.

Capturing entire species ranges and avoiding model extrapolation

It is necessary to include occurrence records from throughout the species range in order to avoid artificially truncating response curves when modelling the species' niche (Elith and Graham 2009; Thuiller *et al*. 2004). For example, models based on data from only one country within a multi-national species range will generally be unacceptable. It is possible that response curves could be adequately characterized using part of the range provided that excluded localities do not represent parts of the niche that are represented by other occurrence records, but such cases must be well justified. Caution must also be exercised when extrapolating model results under future climate scenarios (i.e., extrapolating in environmental space beyond the range of data used to build the model; Pearson *et al*. 2006). Extrapolation should be avoided where possible (e.g., Pearson *et al*. 2002), or else the behaviour of the model (i.e., the shape of response curves when extrapolating) should be known and well justified.

Model testing

Testing model performance is an important step in any modelling exercise. Multiple tests have been employed to assess the performance bioclimate envelope models (e.g., AUC, Kappa, TSS; Fielding and Bell 1997), but it is important to note that testing of bioclimate models remains problematic for at least three reasons. First, models aim to predict the distribution of potentially suitable climates, yet data against which this can be tested are not available (use of species absence records is unsatisfactory because predictions of 'presence' in areas that are climatically suitable but unoccupied for non-climatic reasons will be classified as model 'errors') (Peterson *et al*. 2011). Second, performance of the models is usually inflated because studies use data for training the models that are not independent from the data used for testing them (Araújo *et al*. 2005). Finally, projections are made for events that have not yet occurred, so any attempts to test the models must focus on examination of the internal consistency of the models rather than their predictive accuracy (Araújo and Guisan 2006). So, although standard testing methodologies are an important part of model building, it should be noted that the predictive skill of the bioclimatic models under climate change remains untested.

Using appropriate metrics of species range changes

Bioclimate models may be useful to assess trends in the availability of suitable climate conditions for species. There are two possible measures that are likely to be useful. One is based on combining probabilities or suitability indices from the models, and the second is based on measuring the potential area occupied by the species after transforming probabilities (or suitabilities) into estimates of presence and absence. To make such a transformation, it is necessary to use thresholds (see, for example, Liu *et al*. 2005). For instance, use of the lowest presence threshold (e.g., Pearson *et al*. 2007) may be justified in cases with few occurrence records, but balancing sensitivity and specificity may be more appropriate when a larger number of presence/absence records are available. Sensitivity of conclusions to the selection of alternative methods for defining thresholds should be examined. However, it should be noted that the measures of change in climate suitability that are relevant to red listing are relative measures (of proportional change in time) and these are, in principle, robust to alternative methods for defining thresholds. The absolute areas (of range or potential

habitat) should not be used as part of assessments of species extinction risk under climate change because estimates of change from bioclimate models are very sensitive to the thresholds used. Note that thresholds may also be used when converting habitat suitability to population size (see section 12.1.9).

Future emission scenarios

Climate models are based upon socio-economic scenarios. Each of these scenarios makes different assumptions about future greenhouse gas emissions, land-use and other driving forces. Assumptions about future technological and economic developments are built into families of 'storylines', each of which describing alternative pathways for the future because there is no theoretical basis for long-term socio-economic forecasting. The IPCC Fifth Assessment Report (AR5) projected changes in the climate system using a set of scenarios called Representative Concentration Pathways (RCPs). In order to account for uncertainty in predictions of future climate change, studies should explore a range of plausible scenarios of climate change (e.g., the RCP8.5 and RCP4.5 scenarios in IPCC 2013), and the broader the range of scenarios considered the better. The set of scenarios selected should be justified. Furthermore, as emission scenarios are revised in future, the relevant red list assessments based on them should be revised.

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Appendix: Summary of Changes to the Guidelines

Changes in version 12 (2016)

Section 2.1.2: Text on applying the criteria in very small geographic areas.

Section 2.2: Use of the term "red-listed".

Section 2.2.1: Clarifying the 5-year rule for transfer between categories.

Section 4.2: Clarifying subdivision.

Section 4.3.1: Text on suppressed individuals.

Section 4.3.2: Edits related to clonal colonial organisms.

Section 4.4: Additional explanation of the "pre-disturbance" generation time.

Section 4.5: Major restructuring and new text on calculating reductions. Also, the spreadsheet file CriterionA_Workbook.xls is updated with additional tabs demonstrating basic calculations.

Section 4.5.3: This new section includes most of former section 5.8; the rest of former section 5.8 is merged with 4.5.1.

Section 4.8: Clarification of habitat vs. population fragmentation.

Section 4.9: Additional explanation of the risk-spreading function of EOO.

Section 5: Additional explanation of the rationale of criterion A.

Section 5.1: New section on the basis of reductions, including a new table.

Section 5.2: This is the former section 5.1 (use of time caps).

Section 5.3: This is the former section 5.2 (how to apply A4).

Section 5.4: This is the former section 5.3 (the ski-jump effect), with a more descriptive title, and expanded text (point (3) at the end).

Section 5.5: This is the former section 5.4 (severely depleted populations), with a more descriptive title, and additional text and examples.

Section 5.6: This is the former section 5.5 (fisheries), now divided into two subsections, with additional text discussing issues related to fisheries management.

Section 5.7: This is the former section 5.6 (was titled “Trees”).

Section 5.8: This is the former section 5.7 (loss of habitat and reduction).

Former section 5.8 is merged with parts of section 4.5 (see above).

Section 10.1: Definition of a "targeted taxon-specific or habitat-specific conservation or management programme".

Section 10.4: New section on when it is not appropriate to use DD.

Section 12.1: Major restructuring; substantial new text and a new figure. Note that many of the subsection numbers within section 12.1 have been changed.

This appendix is expanded to cover all previous versions.

Changes in version 11 (February 2014)

Section 2.1.3: Substantial changes related to introduced taxa and subpopulations.

Section 2.1.4: New section on managed subpopulations.

Section 3.2.3: New guidance on setting the dispute tolerance and the risk tolerance values.

Section 4.4: New paragraph on using pre-disturbance generation length.

Section 4.9: Additional explanation on using minimum convex polygon for EOO.

Section 4.10.7: Expanded discussion on using habitat maps and models for EOO and AOO.

Section 11.1: New paragraph on using EW when none of the subpopulations are wild.

Changes in version 10.1 (September 2013)

Section 11.2.1: New paragraph added.

Minor corrections in sections 4.3, 4.5, and 13.

Changes in version 10 (February 2013)

Section 2: Table 2.1 and Figure 2.1 updated; minor changes to the last paragraph of section 2.1.2; clarification of LC and NT categories and minor corrections in sections 2.2 and 2.3.

Section 4.1: Clarification of the definitions of population and population size.

Section 4.2: Clarifying the relation between a species' mobility and the delineation of its subpopulations.

Section 4.6: The relation between continuing decline and "current population trend."

Section 4.11: The number of locations when there are two or more serious plausible threats.

Section 7: New paragraphs (third and fourth) clarifying the subcriteria i and ii of C2a.

Section 8: Minor change to the 2nd paragraph, clarifying "very short time period" in D2.

Changes in version 9.0 (September 2011)

Section 4.4: The guidelines for calculating generation length are revised substantially.

Section 4.5.1: Added text: "If populations fluctuate widely, or oscillate with periods longer than generation time, fitting a time series longer than three generations may give a more representative estimate of the long-term population reduction. However, regardless of the length of the time series fitted, the reduction should be calculated for the most recent three generations. The model to be fitted should be based on the pattern of decline, which may be inferred from the type of threat."

Section 4.6: Two new paragraphs (3rd and last), and addition to the 5th paragraph ("Note that …").

Section 5.5: Sentence modified: "If declines continued, there would be reason for concern; in this case a new assessment, against all 5 criteria, may indicate that the taxon is still threatened."

Section 10.1: A new example added to the list of examples where an NT listing would be justified.

Section 10.3: Substantial revision to the 2nd DD tag, which is now named "Taxonomic uncertainty explains lack of information."

This appendix added.

Changes in version 8.1 (August 2010)

Minor corrections, incl. to Table 2.1

Changes in version 8.0 (March 2010)

Section 2.3: Minor change to refer to the new section 12

Section 4.10.5: Several minor changes, mostly to equations to make them more clear.

Figure 4.4: New figure

Section 5: New paragraphs (third and fourth) to clarify subcriteria a and b.

Section 5: New sentence: "If any of the three conditions (reversible and understood and ceased) are not met in a substantial portion of the taxon's population (10% or more), then A2 should be used instead of A1."

Section 8: Changes in the first and third paragraph to clarify, and to give an example for "a very short time" (within one or two generations).

Section 12: New section on Threatening Processes, including guidelines for applying the criteria to species impacted by global climate change.

Changes in version 7.0 (August 2008)

Section 2.1.1: Expanded guidance on taxonomic scales, including newly described and undescribed species, and subpopulations.

Section 2.2.1: Detailed definition of the reasons for transfer between categories.

Section 4: Additional guidance on calculating the number of mature individuals, generation time, future reduction, EOO, and number of locations.

Section 10.3. Data deficient flags.

Section 11. New section on the extinct categories and the PE tag.

Changes in version 6.2 (Dec 2006)

Section 2.3: Changes to paragraph on comparison of criteria A-D vs E.

Section 8: Minor changes to section on taxa known only from the type locality

Changes in version 6.1 (Aug 2006)

Minor changes, including version number on page 1.

Changes in version 6.0 (July 2006)

Section 4.3.2: Mature individual for colonial or modular organisms

Section 4.9: Clarification on EOO, including risk-spreading; discouraging exclusion of discontinuities or disjunctions except in extreme circumstances, but encouraging it for calculating change in EOO; EOO of migratory species.

Section 4.10: Further explanation of why a specific scale is necessary for AOO; new section on *AOO based on habitat maps and models*

Section 4.11: Guidance on number of locations with different threats in different areas

Section 5: How to apply criterion A4; discussion of population data contradicting habitat data; description of the workbook file (CriteraA.XLS) accompanying the guidelines.

Section 6: Guidelines for applying Criterion B (numbering for subcriterion a)

Section 8. New guidelines and an example for applying Criterion D2

Section 10: Examples for when to use and when not to use NT and DD.

Changes in version 5.0 (April 2005)

Expanded sections on extreme fluctuations and severely fragmented; NT based on conservation dependence

Changes in version 4.0 (March 2004)

New section on *Transfer between categories*.

Clarifications on continuing decline vs. reduction; criterion A basis; A1 vs. A2; A4.

Changes in version 3.0 (May 2003)

Additions to clarify issues related taxa below the rank of variety, introduced taxa, generation length for clonal plants, specifying criteria for NT; new examples and references, and numerous minor edits.

Changes in version 2.0 (Jan 2003)

First version that covered all criteria and definitions (48 pages).

Changes in version 1.1 (Dec 2001)

Minor additions such as clarifying that "non-overlapping" is not "isolated" (10 pages).

Version 1.0 (June 2001)

This first version was titled "*Guidelines for Assessing Taxa with Widely Distributed or Multiple Populations Against Criterion A*" and became section 5.8 in version 2.

Annex 6: Composition and Terms of Reference of the Standards and Petitions Sub-Committee

The IUCN SSC Standards and Petitions Sub-Committee reports to the SSC Steering Committee and is responsible for ensuring the quality and standard of *The IUCN Red List of Threatened Species*™, focusing on the correct use of the IUCN Red List Categories and Criteria. As a guiding principle, the Standards and Petitions Sub-Committee seeks to ensure that the original intent of the IUCN Red List Categories and Criteria is not compromised. To do this, the Standards and Petitions Sub-Committee will:

- Develop and recommend the standards that Red List Authorities, Red List Partners and the IUCN Global Species Programme should use for justifying the use of the IUCN Red List Categories and Criteria;
- Develop and keep updated the Guidelines for Using the IUCN Red List Categories and Criteria;
- Advise on the interpretation of the IUCN Red List Categories and Criteria;
- Advise on the use and adoption of any methods for using incomplete datasets on species and how to extrapolate from these datasets to apply Red List Criteria;
- Review and advise on Red List training materials and approaches;
- Review any proposed changes to the *Guidelines for Application of IUCN Red List Criteria at Regional Levels* put forward by the National Red List Working Group;
- Review all assessments made using only Criterion E, especially if Population Viability Analysis is used;
- Periodically review assessments made by Red List Authorities, Red List Partners and the IUCN Global Species Programme and comment on specific assessments forwarded by the IUCN Global Species Programme;
- Respond to requests for scientific advice and guidance from the Red List Technical Working Group, the IUCN Global Species Programme and from Red List Partners; and
- At the request of the Red List Committee, lead and coordinate the process of undertaking any revisions to the IUCN Red List Categories and Criteria, should these be required in the future.

Proposed changes to the Guidelines for Using the IUCN Red List Categories and Criteria will be reviewed by the Red List Committee and by the Red List Technical Working Group. Proposed changes to the IUCN Red List Categories and Criteria will be subject to a consultation process established by the Red List Committee, and will be reviewed by the Red List Committee and by the Red List Technical Working Group, prior to submission to IUCN Council for adoption.

In the event of any petitions against IUCN Red List assessments the Standards and Petitions Sub-Committee will:

- Oversee the formal process for handling disputes over the application of the criteria and the resulting listings, as outlined in Annex 5a;
- Take final decisions on petitions, ensuring that these are based on sound scientific evidence, seeking appropriate specialist advice when necessary;

- Present decisions and documentation to the Chair of SSC;
- Issue written decisions on petitions to be forwarded to both parties, for publication on the IUCN SSC web site.

When making decisions on petitions, the Standards and Petitions Sub-Committee acts as the final judge, and does not refer the matter to either the Red List Committee or SSC Steering Committee for a final decision. However, prior to publishing the result of a decision, the Chair of the Standards and Petitions Sub-Committee will send a brief report to the SSC Chair confirming that the above process was followed to reach the decision, or outlining any deviations from the process that had to be made. The SSC Steering Committee is responsible for ensuring that petitions are handled professionally and impartially. In the event of the SSC Steering Committee being concerned about the process followed during a particular petition, it will request the Standards and Petitions Sub-Committee to review this process and make improvements. Under no circumstances should the Red List Committee or SSC Steering Committee involve itself in the substance of any petition.

The Chair of the Standards and Petitions Sub-Committee is appointed by the SSC Chair, and serves as a non-voting member of the Red List Committee. The membership of the Standards and Petitions Committee is appointed by the Chair of the Sub-committee (guided by advice, where appropriate, from the RLC and its subsidiary bodies and the SSC Chair to ensure an unbiased membership), and shall comprise up to eight (8) individuals. The Standards and Petitions Sub-Committee will meet as often as required, within available resources. The Chair of the SPSC will provide an annual report to the SSC Steering Committee and to the RLC on progress against the above terms of reference.

Annex 7: Documentation standards and consistency checks for IUCN Red List assessments and species accounts

DOCUMENTATION STANDARDS AND CONSISTENCY CHECKS FOR IUCN RED LIST ASSESSMENTS AND SPECIES ACCOUNTS

Version 2 (September 2013)

A working document prepared by the IUCN Red List Unit, Cambridge, UK

Citation: IUCN. 2013. Documentation standards and consistency checks for IUCN Red List assessments and species accounts. Version 2. Adopted by the IUCN Red List Committee and IUCN SSC Steering Committee. Downloadable from: http://www.iucnredlist.org/documents/RL_Standards_Consistency.pdf

Table of Contents

Introduction

Please note that this is a working document which is subject to modification and addition; all future versions will be given a new version number. If you are unsure whether you are working from the most recent version, please check the IUCN Red List website or contact the IUCN Red List Unit (RLU).

This document provides detailed instructions for documenting species accounts held in the IUCN Species Information Service (SIS) to support assessments for inclusion on *The IUCN Red List of Threatened Species*™ (hereafter referred to as the IUCN Red List). The information presented here builds on the required and recommended supporting information for IUCN Red List assessments, and follows the IUCN SSC Style Guidelines (with some minor deviations), and the format of SIS. **It is important to follow the instructions and standards set out in this document closely to maintain consistency and high standards within the IUCN Red List.**

In addition to instructions for supporting information, this document includes a list of the standard checks that need to be carried out BEFORE assessments are submitted for publication in the IUCN Red List (note that SIS will soon include an automated integrity checker which will perform many of the basic checks; once that functionality is made available these Guidelines will be updated to reflect the changes).

For assessments being submitted from a major assessment project (e.g., comprehensive assessments of major taxonomic groups, assessments of endemic species from regional projects) or assessments submitted by Red List Authorities, **it is the responsibility of Project Manager or relevant Red List Authority Coordinator to ensure that all assessments have been checked (for supporting information and consistency) before submitting them for publication on the IUCN Red List.**

The RLU will carry out further consistency checks on submitted assessments, focusing particularly on threatened and Near Threatened taxa, to check that the IUCN Red List Criteria have been applied appropriately and consistently across species. The RLU cannot carry out thorough supporting information checks for ALL submitted assessments; hence any indication that standards have not been adequately followed will result in assessments being returned for correction and resubmission later.

Please keep this document to hand for reference while entering information into species accounts in SIS. If there is something you need to know which is not covered here, please contact the IUCN Red List Unit (Craig Hilton-Taylor (craig.hilton-taylor@iucn.org) or Caroline Pollock (caroline.pollock@iucn.org)).

Guidance on using SIS

The intention of this document is to provide guidance on documenting assessments for the IUCN Red List. For guidance on how to use SIS, a self-teach tool has been developed (Microsoft PowerPoint show) which users can download and refer to as needed. The SIS self-teach tool can be downloaded from the IUCN Red List website (http://www.iucnredlist.org/technical-documents/red-list-training/species-information-service) or from the SIS home page (after logging in to SIS, scroll down through the *SIS Updates* panel in the bottom right hand corner). The SIS self-teach tool will be updated as

1. Required and Recommended Supporting Information for IUCN Red List Assessments

An IUCN Red List assessment includes the Red List Category and Criteria, and a range of supporting information (documentation). The purpose of providing supporting information with the assessment is:

1. To support and justify adequately each Red List assessment.
2. To allow basic analysis of the Red List status across species, including calculating the Red List Index.
3. To allow the Red List website (www.iucnredlist.org) to function properly (i.e., to allow users to search and find information on the website).

The inclusion of relevant information in an assessment increases the utility of that assessment for all three of the above purposes. Within the Species Information Service (SIS) there are many data fields available to record a whole suite of information. Some of these data fields are essential to support the Red List assessment, and some are there to capture additional information for analyses and communication purposes.

IUCN has developed three tiers to identify the appropriate level of supporting information to include in a Red List assessment:

1. Required Supporting Information

Supporting information required for **ALL** Red List assessments before they can be accepted for publication on the IUCN Red List. There are two subsets of information for required supporting information:

- Required supporting information under all conditions; see Table 1.
- Required supporting information under specific conditions; see Table 2.

2. Recommended Supporting information

Recommended supporting information is not essential for a Red List assessment to be accepted for publication on the IUCN Red List but is strongly encouraged for all assessments for taxa prioritized in the IUCN Red List Strategic Plan 2012-2020 and the IUCN Species Strategic Plan 2013-2016; see Table 3. IUCN Global Species Programme and Red List Partner-led assessments always strive to achieve assessments according to the recommended level.

3. Discretionary (Optional) Supporting Information

Supporting information that is not essential for a Red List assessment to be accepted for publication on the IUCN Red List, but specific projects or Assessors may wish to record this for their own information or analysis purposes. Assessment project managers should clearly identify which of these additional fields they want

to include in assessments and inform Assessors contributing to the project about this at the start of the project.

All fields in SIS that are not mentioned in Tables 1, 2 or 3 are considered to be discretionary (i.e. optional) fields.

Table 1: Required supporting information for all assessments submitted to the IUCN Red List (in all conditions). Any assessments that do not include all of the information listed in this table will be returned to Assessors.

Required Information	Purpose	Guidance Notes
1. Scientific name	• To identify which taxon is being assessed • To support Red List website functionality	If the taxon is already in SIS, this information requires no additional effort from the Assessors. If the taxon is not yet recorded in SIS, Assessors must provide this information to the Red List Unit. See sections 2.1 and 4.2.
2. Higher taxonomy details (Kingdom, Phylum, Class, Order, Family)	• To identify which taxon is being assessed • To support Red List website functionality	If the taxon details are already in SIS, this requires no additional effort from the Assessors. If the taxon details are not yet recorded in SIS, Assessors must provide this information to the Red List Unit. See sections 2.1 and 4.1.
3. Taxonomic authorities for all specific and infra-specific names used, following the appropriate nomenclatural rules	• To identify which taxon is being assessed	If the taxon authority details are already entered in SIS, this information requires no additional effort from the Assessors. If the taxon authority details are not yet recorded in SIS, Assessors must provide this information to the Red List Unit. See sections 2.1 and 4.3.
4. IUCN Red List Category and Criteria (including subcriteria) met at the highest category of threat.	• To identify the current status of the taxon • To support Red List website functionality • To allow basic analyses	The Red List Category and Criteria represent the most fundamental elements of a Red List assessment. Use of the categories and criteria must be in accordance with the *IUCN Red List Categories and Criteria. Version 3.1* and the current version of the *Guidelines for Using the IUCN Red List Categories and Criteria*. Both documents are available to download from the IUCN Red List website (http://www.iucnredlist.org/technical-documents/red-list-documents). See section 2.5.1.
5. A rationale for the Red List assessment.	• To justify the Red List Category and Criteria selected.	Include any inferences or uncertainty that relate to the interpretation of the data and information in relation to the criteria and their thresholds. See sections 2.2.8 and 3.

Required Information	Purpose	Guidance Notes
6. Data for parameters triggering the Red List Criteria met at the highest Category level.	• To underpin and justify the Red List Category and Criteria used.	Enter these data either into the relevant coded/numerical fields or in the relevant narrative (text) fields in SIS. If data are entered into the data fields, this allows the Red List Criteria calculator to be used in SIS, which automatically checks for errors, omissions and inconsistencies, reducing the burden of manual checking by Assessors, RLA Coordinators and project coordinators. If data are included within the narrative (text) fields, the text must clearly indicate *all* of the relevant sub-criteria parameters and qualifiers (observed, estimated, inferred, projected or suspected) used. See sections 2.2 and 2.3.2.
7. Countries of occurrence (for native and reintroduced taxa), including Presence and Origin coding.	• To support Red List website functionality (especially country searches) • To allow basic analyses	SIS automatically records Presence = Extant and Origin = Native by default as countries are selected. A tool will be developed to determine countries of occurrence from GIS maps and to auto-populate SIS with this information, but some manual checking and correcting will still be required. Countries of occurrence are not strictly required for vagrant and introduced ranges. Subcountries may also be recorded, but these are not strictly required (see Table 3). See section 2.4.7.

Required Information	Purpose	Guidance Notes
8. Geo-referenced distribution data for all taxa with a known distribution	• To support Red List website functionality • To allow basic analyses • Spatial distribution data are essential for supporting assessments under criteria B and D2 (and arguably also for demonstrating that the thresholds for these criteria are not met)	Spatial distribution data are not required for taxa of unknown provenance (e.g. taxa assessed as Data Deficient because their range is not known). Spatial data may be geo-referenced polygons or point localities, and may be provided in any format, including as a paper map, text file of coordinates, pdf, graphics file or GIS shapefile. A GIS shapefile is preferred (but is not strictly required), given their value for conducting spatial analyses, visual displays on the Red List website, and future functionality on the Red List website that will allow spatial searches. Although additional distributional documentation is desirable for taxa qualifying under criterion B (e.g. 2x2 km grids showing occupancy), this is not Required. Note that any distributional data can be coded as sensitive to avoid this being distributed or displayed on the Red List website. See section 2.7.
9. Direction of current population trend (stable, increasing, decreasing, unknown)	• To support Red List website functionality • To allow basic analyses	See section 2.3.1.
10. Coding for occurrence in freshwater (= inland waters), terrestrial, and marine ecosystems (i.e., "System" in SIS)	• To support Red List website functionality • To allow basic analyses	See section 2.3.1.
11. Suitable habitats utilized (coded to lowest level in Habitats Classification Scheme).	• To support the assessment • To support Red List website functionality • To allow basic analyses	To speed up entering such coding in SIS, habitat suitability is set to 'suitable' by default for any habitat selected. See section 2.4.1.

Required Information	Purpose	Guidance Notes
12. Bibliography (cited in full; including unpublished data sources but not personal communications)	• To underpin the assessment and provide all sources of data and information used to support the Red List assessment	References are stored centrally in SIS and are managed and attached to assessments via the Reference functions. See sections 2.8 and 3.11 for guidance on formatting references for the bibliography.
13. Names and contact details of the Assessor(s) and at least one Reviewer	• To demonstrate that the appropriate assessment and review process has been undertaken • To acknowledge those involved in the assessment. • To allow Assessors and Reviewers to be contacted easily in the case of the assessment content being questioned • To support Red List website functionality	Note that Contributor(s), Compiler(s), and Facilitator(s) may also be recorded but are not strictly required. However, recording them in the assessment does allow these people to be acknowledged on the Red List website. All contact details are stored within SIS; only names (e.g. surname and initials) are displayed on the Red List website. More than one Reviewer is encouraged for commercially significant species, or those species for which assessments may be contentious. See section 2.5.3.

Table 2: Required supporting information for Red List assessments under specific conditions. The list of required supporting information (under specific conditions) is essential for all assessments that meet the conditions outlined below. Any assessments for taxa meeting these conditions that do not include all of the information listed below will be returned to Assessors.

Required Information **(under specific conditions)**	**Specific Condition**	**Purpose**	**Guidance Notes**
1. Name of subpopulation	For subpopulation level assessments	• To identify what is being assessed below the species level.	See section 2.1.
2. Major Synonyms	For taxa with commonly used alternative names or that have been treated under different names in the past on the Red List	• To support Red List website functionality • To identify which taxon is being assessed	Incorrect spellings of scientific names on the Red List are included as synonyms when the spellings are corrected. See sections 2.1 and 4.4.
3. Plant growth forms	For plants	• To support Red List website functionality • To allow basic analyses	See section 2.3.1.
4. Information on the reason for change in Red List Category of the taxon	For all taxa being reassessed	• To distinguish up- or down-listings resulting from genuine improvement or deterioration, from those resulting from revised taxonomy, improved knowledge, etc.	This should be coded irrespective of whether a taxon qualifies in the same or for a different Red List Category. See section 2.5.6.
5. Date last recorded (in the wild, if taxon survives in captivity) and details of surveys which have been conducted to search for the taxon	For Extinct and Extinct in the Wild taxa, and for Critically Endangered taxa tagged as Possibly Extinct or Possibly Extinct in the Wild.	• To justify use of the categories Extinct or Extinct in the Wild, (to underpin assessments in which extinction is confirmed or thought highly likely) • To allow basic analyses	

Required Information **(under specific conditions)**	**Specific Condition**	**Purpose**	**Guidance Notes**
6. Possibly Extinct or Possibly Extinct in the Wild tag	For Critically Endangered taxa that considered highly likely to be Extinct or Extinct in the Wild but for which confirmation is required	• To underpin assessments in which extinction is thought highly likely but which requires confirmation • To allow basic analyses • To support Red List website functionality	See section 11.2 in the current version of the *Guidelines for Using the IUCN Red List Categories and Criteria* for more information on this.
7. Documentation of available data, sources of uncertainty and justification for why the criteria cannot be applied; including, where appropriate, one or both of the Data Deficient tags *Unknown provenance* and *Uncertain taxonomic status explains lack of data*	For Data Deficient taxa	• To justify use of the Data Deficient Category	
8. Coding as Severely Fragmented, or the number of locations	Taxa listed as threatened using criteria B1a or B2a	• To justify the Red List Category and Criteria used	For definitions of severely fragmented and locations refer to the current version of the *Guidelines for Using the IUCN Red List Categories and Criteria*.
9. Generation length	For taxa listed as threatened under criteria A and C1	• To justify the Red List Category and Criteria used	For definition of generation length refer to the current version of the *Guidelines for Using the IUCN Red List Categories and Criteria*.
10. Time period over which 3-generation decline is measured around the present.	For taxa listed as threatened under criterion A4	• To justify the Red List Category and Criteria used	Record this as the start year for the 3-generation time period.

Required Information **(under specific conditions)**	**Specific Condition**	**Purpose**	**Guidance Notes**
11. The data, assumptions, structural equations, and Population Viability Analysis model if used.	For taxa listed under Criterion E	• To justify the Red List Category and Criteria used.	
12. Coding and justification of the criteria that are nearly met or the reasons for the classification (e.g., dependence on ongoing conservation measures)	For taxa listed as Near Threatened	• To justify the Red List Category and Criteria used	Include this information in the rationale for the assessment. A system for coding up criteria met or nearly met will be developed for SIS in future.
13. Taxonomic notes	• For taxa previously treated as a different taxonomic concept (e.g., "split" or "lumped") on the Red List. • For taxa for which there is widespread taxonomic ambiguity or uncertainty in the literature. • For species that may represent a species complex • For taxa assessed as Data Deficient because of Taxonomic uncertainty.	• To clarify which taxon concept is being assessed. • To allow comparison of taxa previously assessed on the Red List. • To justify use of the Data Deficient Category.	See sections 2.2.1 and 3.

Required Information **(under specific conditions)**	**Specific Condition**	**Purpose**	**Guidance Notes**
14. Major threats to the taxon (coded to lowest level in Threats Classification Scheme)	For taxa listed as Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, and Near Threatened	• To justify the Red List Category and Criteria used • To support Red List website functionality • To allow basic analyses	Only **major threats** to the species are required. Coding of timing and stresses is not strictly required for the Red List assessment, but is recommended. Coding of scope and severity are discretionary (i.e., optional). If Assessors decide to also record minor threats, then ***Scope and Severity must be recorded for all threat records for the taxon*** (to allow major and minor threats to be clearly identified). Major threats are not required for Least Concern or Data Deficient taxa, but may be recorded if relevant (but with appropriate Timing, Scope and Severity codes). See section 2.4.2.
15. Narrative text about the geographic range, population, habitat and ecology, and threats	For taxa listed as Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, and Data Deficient	• To justify the Red List Category and Criteria used	Required for supporting the assessment with contextual and explanatory information covering, among other things, the relevant data sources, uncertainties, subtleties and interpretations of data made by Assessors. Although general text would also be helpful for Least Concern taxa, this is not required. See sections 2.2 and 3.

Required Information **(under specific conditions)**	**Specific Condition**	**Purpose**	**Guidance Notes**
16. Additional supporting information as detailed in section 2.6 of the *Documentation Standards and Consistency Checks for IUCN Red List Assessments and Species Accounts*	If the RAMAS® Red List software is used for the assessment	• To justify the Red List Category and Criteria used	See section 2.6.

Table 3: Recommended Supporting Information. While the list of recommended supporting information is desirable, and strongly encouraged for all assessments for taxa prioritized in the IUCN Red List Strategic Plan 2012-2020 and IUCN Species Strategic Plan 2013-2016, it is not essential for other assessments being submitted to the IUCN Red List. Assessments that do not include any of the information listed below are still acceptable for submission to the IUCN Red List.

Recommended Supporting Information	Specific Condition	Purpose	Guidance Notes
1. GIS distribution map using IUCN's *Standard Polygon* and/or *Point Attributes*		• Facilitates spatial analyses • Allows visualisation on the Red List website (and possible spatial queries)	Although provision of spatial distribution data is required in any form (see # in Table 1), a GIS map is recommended if possible. See section 2.7.
2. Qualifiers (estimated, suspected, etc.) for direction of current population trend		• Useful for documenting uncertainty over the population trend code selected	
3. Occurrence in specified sub-country units for large countries and islands far from mainland countries		• Useful for searching by sub-country units on the Red List website	If a GIS map has been prepared, a list can be pre-populated by GIS overlay. See section 2.4.7.
4. Occurrence in terrestrial and freshwater biogeographic realms	For terrestrial and freshwater taxa	• Useful for searching on the Red List website, and for analyses	A GIS tool will be developed to facilitate automatic coding of this from distribution maps. No that currently there is no widely accepted equivalent system for the marine realm See section 2.3.1.
5. Elevation or depth limits		• Useful for supporting Assessments, describing the distribution, and particularly for considering impacts of climate change	See section 2.3.1.
6. Coding of Stresses and Timing for Threats		• Useful for demonstrating the means by which threats impact taxa, and for distinguishing past, present and future threats	These are added to each threat after the relevant threats have been selected. Timing, Scope and Severity are drop-down lists where only one option can be selected, whereas for Stresses multiple options ca be selected. See sections 2.4.2 and 2.4.3

Recommended Supporting Information	Specific Condition	Purpose	Guidance Notes
7. Narrative text about the important conservation measures in place and needed.	For taxa listed as Extinct in the Wild, Critically Endangered, Vulnerable, Near Threatened, and where appropriate, Data Deficient	• Useful to support and provide explanation and context for coding of conservation actions	See section 2.2.7.
8. Coding of important conservation actions in place and needed	For taxa listed as Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened, and where appropriate, Data Deficient.	• Useful for providing a high-level indication of the most important actions in place and likely to be required, both for individual species and in multi-species analyses	These codes complement rather than pre-empting or replacing more detailed Action Planning or Systematic Conservation Planning. Coding up conservation actions is not Required for Data Deficien taxa, but if possible these taxa should be coded where appropriate. See section 2.4.4.
9. Narrative text on the utilization of the taxon	For utilized taxa	• Useful to support and provide explanation and context for coding of utilization	See section 2.2.5.
10. Coding of the end use (purpose) and scale of utilization of the taxon	For utilized taxa	• Useful for providing a high-level indication of the most important ways in which species are utilized, both for individual species and in multi-species analyses	See section 2.4.6.

2. Supporting Information for IUCN Red List Assessments stored in SIS

All assessments entering the IUCN Red List must include supporting information. This section provides guidance on what to record in the species account text and data fields within SIS for required and recommended supporting information (see section 1 for the full lists of required and recommended supporting information). For guidance on writing styles, formats, etc. please refer to section 3 and section 4 this document.

Box 1. An important note about copying and pasting text from Microsoft Word and PDF documents
Before entering any text into an assessment account in SIS, it is important to know that certain Microsoft programmes contain hidden non-standard HTML codes that can seriously affect how text is displayed on the internet. This can also severely increase the file size on the web page and affect the site's functionality. For example, you may copy the following text from an MS Word document:
...landing statistics are generally unavailable as all species of batoids are recorded as "unidentified rays and skates".
and paste this into SIS, where it looks correct. However, once transferred to the Red List website, this text may be displayed as:
...landing statistics are generally unavailable as all species of batoids are recorded as ?unidentified rays and skates?.
This highlights the importance of avoiding copying and pasting directly from MS Word or PDF documents wherever possible. If text must be copied from external sources into SIS, we recommend that you first save the text as a text (.txt) file—you can use Notepad for this. This will remove all format tags and styles (i.e., it removes all hidden codes), then the text can safely be copied from the .txt file into SIS and reformatted within the system, if necessary.

2.1. Taxonomy

Taxonomic information is required supporting information. Higher taxonomy, scientific name, and taxonomic authority are required for all Red List assessments (Table 1), and major synonyms are required for taxa with commonly used alternative names and taxa that have been treated under different names in past IUCN Red Lists (Table 2).

For taxonomy in SIS, Assessors are only permitted to edit synonyms. Adding new taxonomy to the system or editing existing taxonomy is managed by the IUCN Red List Unit. If new taxonomy needs to be added to SIS, the following information needs to be provided to the Red List Unit:

- Kingdom, phylum, class, order, family, genus and species (also subspecies, if this is the level being assessed) following the appropriate standard taxonomic references (section 4). Note that the IUCN Red List does not record taxonomy to the level of suborders, subfamilies and subgenera.

- Taxonomic authority, in the appropriate format (section 4.3).
- Taxonomic source. This is the reference for the taxonomic concept being followed. For example, *Amphibian Species of the World* is the taxonomic source for amphibians (e.g., Frost 2013). Where there is a deviation from a standard checklist, it is particularly important to record the taxonomic source used. Where there is no standard checklist available, the taxonomic source may be the published reference for the taxon's original description, or (if the taxon has been revised since its description) reference to the publication where the taxonomic concept was most recently revised.

All taxa assessed for the IUCN Red List must be validly published in accordance with the appropriate international nomenclatural codes and should be currently accepted names. Standard taxonomic checklists should be used wherever possible for scientific names. The standard lists adopted by IUCN are periodically reviewed and listed on the IUCN Red List website (http://www.iucnredlist.org/technical-documents/information-sources-and-quality#standards). For many groups, no standards are available, or there may be a valid reason for adopting another treatment. In such cases, the taxonomic treatment should be clearly indicated and, if this is not one of the standards followed by IUCN the reference must be cited in full and a reason for the deviation given.

For animals, the taxonomic authority should include the year of publication; plant names do not include the publication year. Abbreviations used for plant author names should follow Brummit and Powel (1992) and subsequent updates on the International Plant Names Index website (http://www.ipni.org/index.html).

Box 2. Red List assessments and changing taxonomic concepts
When a species is being reassessed for the IUCN Red List, it is extremely important to consider what taxonomic concept was used for the previous assessment (i.e., have there been any taxonomic revisions resulting in the species being split into several species with smaller ranges and population sizes, or being merged with other species to form a new concept with a much larger range and population size?)
If the taxonomic concept has changed since the previous assessment, but the old species name has been retained, then the previous Red List assessment will not be comparable to a new assessment. See section 4.5 for guidance on this issue.

Once the taxonomy has been entered into SIS, major synonyms (if any) must also be recorded. This includes synonyms arising through recent taxonomic changes. More detailed guidance about taxonomy and nomenclature is given in section 4.

Subpopulation Names

For subpopulation level assessments, an appropriate subpopulation name is required (Table 2). Subpopulation names usually refer to the name of the geographic area, sea or river where the subpopulation occurs. The word "subpopulation" is also included. For example:

Carcharhinus amboinensis Southwest Indian Ocean subpopulation

Neamblysomus julianae Bronberg Ridge subpopulation

Subpopulations can only be edited or added to SIS by the IUCN Red List Unit.

Common Names

Within SIS, in the *General Information* section for the taxon, fields are available to record common names in most languages. Prior to September 2012, known common names (in English, French and Spanish), were required with a Red List assessment. While common names are very useful, particularly for communication purposes, this information is now discretionary (optional) and can be recorded if the Assessor wishes to do so, or if a specific project requests that this information be recorded. Please refer to section 3.3 for guidance on preferred formatting for common names for a Red List assessment.

2.2. Summary Information Text

For Red List assessments, narrative text about geographic range, population, habitat and ecology, and threats is required supporting information for all taxa except those that are Least Concern (Table 2). While this information is also useful for Least Concern taxa, it is not essential; Assessors (or assessment Project Managers) can decide for themselves whether or not to record this for Least Concern species.

Taxonomic notes are also required for taxa that were previously assessed under a different scientific name, or until recently were treated as a different taxonomic concept (box 2 and section 4.5), and taxa with taxonomic uncertainties or widespread ambiguities (Table 2).

General text about important conservation actions is recommended supporting information for all taxa except those listed as Least Concern (Table 3). Similarly, general text on use and trade of all taxa that are utilized is recommended, but is not strictly required for the assessment (Table 3).

Assessors may decide to also include data for parameters triggering the Red List Criteria within the narrative text instead of (or in addition to) recording these in the data fields in SIS (Table 1). It is advisable to record actual estimated values (e.g., 1,500 km², or 100-240 km²) in the text instead of repeating the thresholds from the IUCN Red List Categories and Criteria; by doing this Assessors will clearly demonstrate that the taxon falls within certain criteria thresholds. This also helps Assessors for future reassessments to identify where parameter estimates have changed since the previous assessment.

The summary documentation text in each of the sections noted below should be succinct but informative, and should be based on the most recent information available for the taxon. Please try to avoid one-word answers; when read together (i.e., in the species account published on the Red List website) the different sections should merge to tell a story summarizing what the taxon is, its current Red List status, where it occurs, what threats are affecting it, and what actions are being done or need to be implemented to prevent it from moving closer to extinction. In each case, if

there is no information available on the taxon at all, please state this and explain why this is the case.

Box 3. Important note about the Data Entry Module (DEM)
The Data Entry Module (DEM) is now obsolete and should no longer be used for compiling IUCN Red List assessments. The DEM is not fully compatible with the online SIS and if assessments are uploaded from the DEM into SIS, there will still be a lot of work required to manually translate DEM information into the appropriate codes used in SIS. Effectively, by using the DEM you will double the time it takes to complete a Red List assessment.
If you are still relying on the DEM to store and submit your assessments, please contact the IUCN Red List Unit to arrange for access to SIS to allow you to continue to assess taxa.

2.2.1 Taxonomic Notes

Taxonomic notes are required supporting information for taxa that have undergone recent taxonomic changes or where there are any taxonomic doubts or debates about the validity or identity of the taxon (Table 2). In SIS, these notes are recorded in the *Taxonomic Notes* field (in the *General Information* section for the taxon). This section **should not** be used to simply copy and paste collection label notes into. See the Box 2, and section 4.5 for more information on taxonomic changes.

Example:

	Preferred style	**Try to avoid**
Taxonomic Notes:	*Alethe diademata* (following Dowsett and Forbes-Watson 1993) previously included populations from Upper Guinea and Lower Guinea. However, only individuals from Upper Guinea are now recognized as *A. diademata*, while the Lower Guinea population is accepted as the separate species, *A. castanea*.	Not the same taxonomic concept used for previous assessments.

Adding Taxonomic Notes to SIS

In SIS, the *Taxonomic Notes* field is attached to the **Taxonomic information** instead of to the assessment itself. This allows Assessors to edit taxonomic notes at any time (e.g., if taxonomic revisions are underway, but a reassessment is not yet underway). However, these notes are only displayed on the IUCN Red List website when a new assessment (or reassessment) is published. If an Assessor wishes updated taxonomic notes to be attached to a currently published assessment, it is important that they contact the Red List Unit to arrange for this to happen.

For any references cited in the taxonomic notes, these should be directly attached to the *Taxonomic Notes* field, and **not** to the Taxonomic Sources section or directly to the assessment (unless these references are also cited within the reference itself).

2.2.2. Geographic Range

A summary of currently available information on geographic range is required supporting information for all taxa that are not assessed as Least Concern (Table 2). For taxa that are particularly sensitive to collecting or hunting, it is prudent to avoid

providing information that allows people to see exactly where the species can be found, but a less precise summary should be provided.

For taxa listed under criteria B, all distribution data and qualifiers related to the thresholds met must be recorded (Table 1). These may be recorded in the separate data fields in SIS (section 2.3.2), or they may be included within the *Geographic Range Information* text field. If the information is being recorded within the text field, ensure that the text clearly indicates all of the relevant subcriteria parameters, and all qualifiers (observed, estimated, inferred, projected, or suspected) used to justify the assessment.

For instance, if criteria B1ab(i,ii,iii)+2ab(i,ii,iii) are used in the assessment and the data are being captured within the text, ensure that all of the following is included in the geographic range text field:

1) Estimated extent of occurrence (EOO) in km², with an indication of how this was estimated.
2) Estimated area of occupancy (AOO) in km², with an indication of how this was estimated.
3) Estimated number of locations (if number of locations is the basis of using criteria B1a+2a) with reference to major threats and how these affect the taxon to justify this estimate.
3) Justification of why the taxon is severely fragmented (if severe fragmentation is the basis of using criteria B1a+2a).
4) Justification for stating that there is continuing decline in EOO, AOO, and area, extent and/or quality of habitat (including indication of the appropriate qualifiers used: observed, estimated, projected, or inferred).

Examples:

	Preferred style	**Try to avoid**
Distribution: *(where specific data and qualifiers are recorded in separate data fields in SIS)*	This species is known only from the Serra (or Maciço) de Baturité, in the State of Ceará, in northeastern Brazil.	Brazil.
Distribution: *(where specific data and parameters are included in the narrative text)*	This species is known only from the Serra (or Maciço) de Baturité, in the State of Ceará, in northeastern Brazil. The species' extent of occurrence (EOO) is estimated at 2,500 km² (based on total area within a minimum convex polygon around all known occurrences), but the area occupied within this EOO is estimated at 550 km² (based on a 2x2 km² grid overlay on the range map; see Smith *et al*. 2011). There are four areas within the range where concentrations of this species tend to occur (see figure 3 in Smith *et al*. 2011). The main threat (habitat loss) appears to affect each of these areas relatively independently; therefore the species is estimated to occur in only four	Brazil. EOO <5,000 km². AOO <500 km². 4 locations.

	locations.

2.2.3. Population

A summary of the currently available population information is required supporting information for all taxa that are not assessed as Least Concern (Table 2). In SIS, this is recorded in the *Population Information* text field. The summary should include currently available information on the global population size and trends. Information about the population structure (e.g., number, sizes, and trends of subpopulations, and trends in particular regions within the taxon's range) is also useful, particularly if criterion C2 is used for the assessment. .

If there is no quantitative information on population sizes or trends, it is helpful to record whether the species is common, abundant, rare, etc. If there really is no information at all about the population, please note this and indicate why this is case (e.g., no surveys have been carried out because the area isn't safe to work in, no research has been undertaken for the species, etc.).

For taxa listed under criteria A or C, all population data and qualifiers related to the thresholds met must be recorded (Table 1). These may be recorded in the separate data fields in SIS (section 2.3.2), or they may be included within the *Population Information* text field. If these are recorded within the text field, ensure that the text clearly indicates all of the relevant subcriteria parameters, and all qualifiers used to justify the assessment.

For instance, if criteria A2ac; C2a(i) are used in the assessment and the data are being captured within the text, ensure that all of the following information is included:

1) Rate of population reduction over the past ten years or three generations (note that for criteria A and C1, generation length must also be recorded – Table 2 and section 2.3.2).
2) Qualifier for the stated reduction (i.e., observed, estimated, inferred or suspected reduction)
3) Information supporting the use of direct observation and decline in AOO, EOO and/or quality of habitat as the basis for the reduction.
4) Estimated current population size, with an indication of how this was estimated.
5) Justification for continuing decline in population size, and the qualifier for this (i.e., is continuing decline observed, estimated, projected, or inferred?)
6) Estimated size of the largest subpopulation.

Examples:

	Preferred style	**Try to avoid**
Population: *(where specific data and qualifiers are recorded in separate data fields in SIS)*	Until 2002, this frog was very common within its small range; often it was found at numerous localities. Between 2002 and 2011 the same sites were surveyed 34 times; not a single individual was found until in July 2012, when three	Rare.

	individuals were recorded. It is suspected that the population is genuinely declining, but more research is needed to investigate the possibility of natural population fluctuations occurring.	
Population: *(where specific data and parameters are included only in the narrative text)*	Until 2002, this frog was very common within its small range; often it was found at numerous localities. Between 2002 and 2011 the same sites were surveyed 34 times; not a single individual was found until in July 2012, when three individuals were recorded. More research is needed to investigate the possibility of natural population fluctuations occurring for this species, but based on existing information is suspected that the population has genuinely declined by at least 90% over the last ten years. If this species still remains in the wild, it is likely that the population is still declining. Based on current evidence, the population size is suspected to be less than 50; the species may even already be extinct.	This is a rare species. The population has declined by >90% since 2002.

2.2.4. Habitats and Ecology

A summary of the taxon's suitable habitats and ecological requirements is required supporting information for all taxa that are not assessed as Least Concern (Table 2). In SIS, this is recorded in the *Habitats & ecology information* field. This summary should include information on the essential habitats and ecological conditions required by the taxon. This does not need to be extensive; for example, it is not necessary to know the details of all behavioural traits, etc. unless these are relevant to the taxon's risk of extinction (e.g., it has a particular life cycle, growth pattern or behaviour that makes it susceptible to specific threats).

Example:

	Preferred style	**Try to avoid**
Habitats & Ecology:	Most specimens have been found in reasonably well-preserved closed forests in dry or moist leaf-litter on the ground, in bromeliads, and in stream margins. However, the species can also survive in shaded coffee plantations. It is a diurnal species that breeds by direct development, and it is likely that the eggs are deposited in wet spots on the ground.	Forest streams.

2.2.5. Use and Trade

Prior to September 2012, Assessors were required to record text for use and trade of the taxon. This is no longer strictly required for assessments to be published on the IUCN Red List. However, this is very useful information therefore it is recommended that this be recorded for those taxa that are utilized (Table 3), including taxa that are legally or illegally hunted or collected.

In SIS, this information is recorded in the *General notes regarding trade and use of the species* text field. This text should summarize the information currently available for any utilization and/or trade of the taxon (including legal and illegal hunting and collection, and for local, national and international trade).

Example:

	Preferred style	**Try to avoid**
Use & Trade:	Although this species is legally protected in all of its range countries, illegal collection continues in many parts of its range. Hunters particularly target young individuals for the international pet trade.	Illegal collection.

2.2.6. Threats

A summary of the main threats currently affecting or likely to affect the taxon is required supporting information for all taxa that are not assessed as Least Concern|(Table 2). In SIS, this is recorded in the *Threats Information* text field. Try to indicate whether these threats are historic, current (and whether they are likely to continue into the future), or if these are threats that are highly likely to occur in the near future (include a justification of why this is the case).

Often this text is used to inform the codes recorded in the Threats and Stresses Classification Schemes; therefore it is helpful to document as much detail about the threats as possible, including the main causes of the threat, the scale of the threat (is it affecting the entire global population or does it occur in only specific parts of the taxon's range), and the stress each threat places on the species. For example, if deforestation is the main threat affecting the species, explain what is driving the deforestation (e.g., large scale hardwood timber extraction for national and international trade, ongoing forest clearance for expansion of coffee plantations, etc.) and how this is affecting the species being assessed (e.g., removal of mature individuals and seeds from the wild population, removing suitable habitat, altering the habitat to the extent that suitable breeding sites are becoming increasingly scarce, etc.)

Example:

	Preferred style	**Try to avoid**

Threats:	The major threat affecting this species is extensive habitat loss across its range caused by logging, mainly for the timber trade, and to convert forest areas to agricultural land (large-scale plantations) and, urban expansion and tourist area development. The region's very good soils and favourable climate encourages agricultural expansion; the species cannot survive in the banana plantations that are rapidly taking over the area.	Forest loss.

2.2.7. Conservation Actions

Prior to September 2012, Assessors were required to include a summary of conservation and actions in place and needed for the taxon. This is no longer strictly required for assessments to be published on the IUCN Red List, but it is recommended that this be recorded wherever possible for extant, taxa that are not assessed as Least Concern (Table 3).

In SIS, this text is recorded in the *Conservation Actions Information* field. The text should include conservation actions currently in place, and realistically achievable actions needed to mitigate the current causes of declines (if any). Research actions (in place and needed) can also be recorded in this section.

Example:

	Preferred style	**Try to avoid**
Conservation:	The species is not known from any protected areas, but clearly there is a need for improved habitat protection at sites where it is known to occur. Further survey work is required to determine whether or not this species is experiencing a genuine decline, or is undergoing natural population fluctuations.	None in place.

2.2.8. Assessment Rationale

All assessments published on the IUCN Red List require a rationale—sometimes also referred to as the "justification" (Table 1). The rationale justifies the IUCN Red List Category and Criteria selected for the taxon.

In SIS, this is recorded in the *Rationale for the Red List Assessment* field. The rationale should not simply quote the Red List Criteria thresholds that are met (the criteria code already indicates these); instead it should use the key issues highlighted in the other documentation sections to summarize the reasons why the taxon qualifies for the assigned category. Include in the rationale any inferences or uncertainty that relate to the interpretation of the available data and information in relation to the criteria and their thresholds.

When including estimates for data related to the IUCN Red List thresholds within the rationale (e.g., extent of occurrence (EOO), area of occupancy (AOO), number of locations, population size, etc.) try to use the actual estimates instead of just stating the thresholds from the criteria. For example, use "estimated extent of occurrence (EOO) is 15,000 km²" rather than "EOO <20,000 km²".

Example:

	Preferred style	**Try to avoid**
Assessment rationale:	This is a range-restricted species, known from 6-8 locations in the Maciço de Baturité, northeastern Brazil. Its extent of occurrence (EOO) is around 2,500 km², and area of occupancy (AOO) is 550 km². Its forest habitat is declining due to logging and rapid expansion of agriculture and human settlements. These threats are likely to continue as the area is favourable for agriculture and there is no current protection for this frog's habitat. The species is listed as Vulnerable.	Vulnerable because EOO <20,000 km², AOO <2,000 km², occurs in <10 locations, and habitat is declining.

2.3. Data fields

Along with text fields to record narrative text to support the Red List assessment, SIS has a wide range of data fields. Some of these must be completed before an assessment can be published on the IUCN Red List (i.e., they are required supporting information; Table 1 and Table 2); some are not required but are recommended supporting information (Table 3); and others are available in SIS to be completed if Assessors or assessment Project Managers want this information recorded in the assessment (i.e., they are discretionary (optional) fields).

2.3.1. Data fields for additional information

The following fields in SIS are used to record additional information that allows the Red List website to function properly or allows data to be analysed and used for communication purposes.

a) Current Population Trend

Current population trend is required supporting information for all IUCN Red List assessments (Table 1). The options for this are: Increasing, Decreasing, Stable, Unknown. It is also recommended that the qualifier be recorded for this information (observed, estimated, inferred, suspected) (Table 3).

"Current" population trend refers to trends over a period of *ca*. three years around the present. The population narrative text should include clear justification for the current population trend recorded in this field. If quantitative data are available, analysis of these data needs to be interpreted carefully, taking account of uncertainty and variability in the dataset over the short time frame.

Although current population trend is not strictly necessary to support the Red List assessment, this is valuable information for analyses of overall patterns of trends, for communication purposes.

b) System

Coding for occurrence of the taxon in freshwater (i.e., inland waters), terrestrial, and marine ecosystems is required for all Red List assessments (Table 1). In SIS, this is recorded in the *System* section, where all three options are available with a checkbox alongside.

For taxa occurring in brackish inland waters, select "Freshwater (inland waters)".

For estuarine taxa, the system recorded will depend on where in the estuary the taxon occurs. If it occurs high up in the estuary (i.e., not at or near the coast), select "Freshwater (inland waters)". If it occurs at the mouth of the estuary only, select "Marine". If it occurs widely throughout the estuary, or if this information is not known, select both "Freshwater (inland waters)" and "Marine".

Note that more detailed habitat description and coding can be recorded in the narrative text and in the Habitats Classification Scheme.

This information is valuable for analyses, communications purposes, presenting Red List data to various policy fora, calculating the Red List Index, and for searching on the Red List website.

c) Plant Growth Form

For all plant assessments, the plant growth form (e.g., annual, cycad, epiphyte, fern, shrub, tree, etc.) is required information (Table 2).

This information is required to facilitate searches on the Red List website (e.g., for all threatened trees), and to allow analyses of this information. Definitions for the terms used for Plant Growth Forms can be found in the Classification Schemes page on the IUCN Red List website (http://www.iucnredlist.org/technical-documents/classification-schemes).

d) Biogeographic Realms

Recording the Biogeographic Realms in which the taxon occurs (figure 1) is not required for the Red List assessment, but it is recommended supporting information for terrestrial and freshwater taxa (Table 3). In SIS, these are recorded in the *Biogeographic Realm* section (a series of tick boxes). For marine taxa, currently there is no widely accepted equivalent of biogeographic realms.

A GIS tool will be developed to facilitate automatic coding of this from distribution maps.

Recording biogeographic realms is useful for searching on the IUCN Red List website, and for analysing these data.

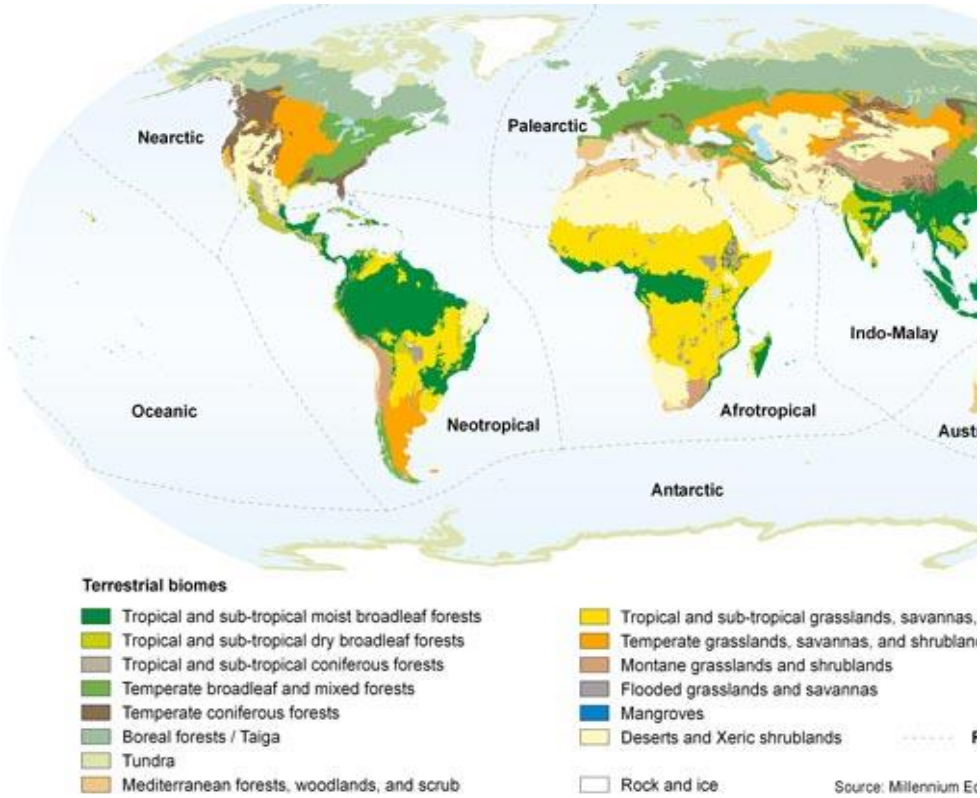


Figure 1. The biogeographical realms (large spatial regions within which ecosystems share a broadly similar evolutionary history). Although the biomes shown in this figure do not completely match the Habitat Classification Scheme used for the Red List, there are some broad similarities, so they can be used as a rough guide.

e) Elevation or Depth Limits

Recording elevation or depth limits is not required, but is recommended supporting information (Table 3) because this is very useful for supporting assessments, describing the distribution, and in particular, for considering the impacts of climate change on the species. In SIS, the elevation and depth limits fields can be found in the *Distribution* section.

SIS also includes data fields to record *Depth Zones* for aquatic species (shallow photic (0-50 m), deep photic (51-200 m), Bathyl (201-4,000 m), etc.). These are discretionary (optional) fields, which SIS users can use if they wish (e.g., to be able to analyse the status of marine species occurring in these zones).

2.3.2 Data fields for the Red List Criteria calculator in SIS

SIS includes an expert system (the Red List Criteria calculator) which compares data fields holding parameters related to the IUCN Red List Criteria against the criteria thresholds and automatically assigns a Red List assessment for that taxon. Assessors should keep in mind that if they wish to use the Red List Criteria calculator in SIS, then the data must be entered into the appropriate fields.

Recording all parameters and qualifiers that support the assessment (i.e., parameters for all criteria and sub-criteria met at the highest Red List Category) is required supporting information (Table 1). This may be recorded in the data fields in SIS for the Red List Criteria calculator, or they may be included within the narrative text.

The Red List Criteria calculator data fields are attached to each of the various documentation sections. For example, the *Distribution* section includes fields for recording area of occupancy (AOO), extent of occurrence (EOO), number of locations, etc., all of which are used to determine whether the criterion B thresholds are met.

SIS also includes a ***Criteria Factor View***, which displays all of the data fields used by the Red List Criteria calculator; often it is easier to use that view to ensure all of the appropriate data fields have been completed for the calculator to work properly.

In each case, the measurement units are displayed alongside the data field; SIS will not allow units, or any other text or punctuation (e.g., commas, full stops) to be entered into the data fields. In many cases, you will not have a single figure for a particular parameter, but will know that true figure is within a specific range or is greater than or less than a specific figure. You can still enter this information into SIS.

For example:

Data to be entered	Format to use in SIS
500 km²	500
10,000	10000
< 2,000	0-2000 or 1-2000
> 10,000	10000-1000000
Somewhere between 3 and 9	3-9
Between 500 and 10,000, but best estimate is 650	500-10000, 650
Certainly between 200 and 5,000, but most likely somewhere between 1,000 and 3,000	200-5000, 1000-3000

2.4. Classification Schemes

All of the currently adopted Classification Schemes are included in SIS. The current Classification Schemes are listed below.

2.4.1. Habitats Classification Scheme (*Habitats and Ecology* section in SIS).

Coding for **suitable habitats** is required supporting information for all Red List assessments (Table 1). To speed up the process of entering habitat codes for a taxon, SIS automatically records suitability = suitable as default when a habitat code is selected. Assessors should record this to the lowest level in the Habitats Classification

Scheme and should also record whether the habitat is important to the taxon or not (e.g., can the taxon survive in alternative habitats if that one is lost).

Note that recording marginal and possible habitats is discretionary (optional). If Assessors choose to record these habitats, they must also change the degree of suitability for each of these habitats from the default setting of "suitable" (to "marginal" or "possible").

Examples and guidance for using the Habitats Classification Scheme are available on the IUCN Red List website (http://www.iucnredlist.org/technical-documents/classification-schemes).

2.4.2. Threats Classification Scheme (*Threats* section in SIS).

Coding for **major threats** is required supporting information for all taxa except those assessed as Data Deficient or Least Concern (Table 2). Assessors should record this to the lowest level in the Threats Classification Scheme.

Coding of timing (and stresses (see point c. below) for each major threat is not strictly required, but is recommended supporting information (Table 3). Coding of scope and severity of the threat is discretionary (optional).

Note that only major threats are required. If Assessors decide to also record minor threats (e.g., threats affecting only a very small proportion of the global population), then it is essential that both scope and severity be recorded for all threat codes recorded. This will allow major and minor threats to be clearly identified within the codes selected for the taxon.

Examples and guidance for using the Threats Classification Scheme are available on the IUCN Red List website (http://www.iucnredlist.org/technical-documents/classification-schemes).

2.4.3. Stresses Classification Scheme (*Threats* section in SIS – attached to each threat code selected in the Threats Classification Scheme)

Although recording **stresses** for each threat selected from the Threats Classification Scheme is not required, this is recommended supporting information (Table 3). This information is very useful for demonstrating the means by which the threats are impacting taxa.

In SIS, the Stresses Classification Scheme can be accessed via each threat code selected from the Threats Classification Scheme. Multiple stresses may be selected for each threat code.

Examples and guidance for using the Stresses Classification Scheme are available on the IUCN Red List website (http://www.iucnredlist.org/technical-documents/classification-schemes).

2.4.4. Conservation Actions Classification Schemes (*Conservation Actions In Place* and *Conservation Actions Needed* sections in SIS).

Coding of important conservation actions in place and needed is not required, but is recommended supporting information for all taxa that are not assessed as Extinct or

Least Concern (Table 3); for Data Deficient taxa, it is recommended that conservation actions are coded where appropriate.

These codes provide a high-level indication of conservation actions currently in place and recommended actions to implement in order to prevent the taxon moving nearer to extinction.

Conservation Actions In Place

In SIS, conservation actions in place are recorded through a series of standard questions: Is there an action recovery plan in place for the taxon? Does it occur in at least one protected area? Is it included in international legislation? etc.)

Conservation Actions Needed

The purpose of recording conservation actions needed is to complement more detailed Action Planning or Systematic Conservation Planning that may be in place or being developed. These codes are not intended to pre-empt or replace detailed Action Plans.

When selecting conservation actions needed, Assessors are advised to treat these as a set of realistic key actions that can be achieved within the next five years, rather than as a wish list of everything that could be potentially help the taxon.

Examples and guidance for using the Conservation Actions Classification Schemes are available on the IUCN Red List website (http://www.iucnredlist.org/technical-documents/classification-schemes).

2.4.5. Research Actions Classification Scheme (*Research Actions Needed* section in SIS)

Prior to September 2012, Assessors were required to record research actions needed for the taxon. This is now discretionary (optional) supporting information.

Examples and guidance for using the Research Actions Classification Scheme are available on the IUCN Red List website (http://www.iucnredlist.org/technical-documents/classification-schemes).

2.4.6. Use and Trade Classification Scheme (*Use and Trade* section in SIS).

Coding of the end use (purpose) and scale of utilization of the taxon is not required, but is recommended supporting information for all taxa that are utilized (Table 3).

The main purpose of recording use and trade information is to allow these data to be analysed: this information is useful for informing international, regional and national trade regulations (e.g,. CITES).

In addition to the use and trade text field (section 2.2.5), SIS includes a Use and Trade Classification Scheme that allows you to code utilized taxa for:

- Purpose of any use (e.g., for food, medicine, pet trade, research, etc.).
- Source of harvested individuals (e.g., from wild or captive populations).
- Form removed (e.g., whole individuals or parts of individuals: eggs, seeds, fruit, etc.)

- Level of trade (subnational, national or international)
- Harvest level (in terms of volumne, weight or number of individuals)
- Whether harvesting for this use is a possible threat to the species.

The use and trade section is under revision in SIS; this section of the Guidelines will be updated when the revised format is released.

2.4.7. Countries of Occurrence Classification Scheme (*Countries of Occurrence* section in SIS).

Country occurrence coding (including presence and origin) for countries where the taxon is native or has been reintroduced is required supporting information for all Red List assessments (Table 1).

To help speed up the process of adding these to species accounts, SIS automatically records presence = Extant and origin = Native for each country added. While this saves time for data entry, it is important to check the final country list and to modify any presence and origin codes if necessary (e.g., for countries where the species is now extinct or where the species has been reintroduced).

A tool will be developed to automatically populate country occurrence codes in SIS from GIS maps. This will be particularly useful for coding country occurrence for very widespread, Least Concern taxa.

Coding of occurrence in countries where the taxon is vagrant or introduced is not strictly required; SIS provides Assessors with the opportunity to record these countries if they wish.

Sub-country Occurrence

Prior to September 2012, it was required that sub-country units be recorded at least for threatened species. This is no longer strictly required for Red List assessments, however, it is recommended supporting information (Table 3).

Sub-country occurrence is useful information for searching the website and analysing significant sub-country data (e.g., to analyse data for threatened species occurring in Hawaii). It is therefore recommended that sub-country units for large countries and islands far from mainland countries be recorded if possible.

SIS also includes Classification Schemes for recording **FAO Area Occurrence**, **Large Marine Ecosystem (LME) Occurrence**, **Ecosystem Services**, and **Livelihoods.** All of these are discretionary (optional) supporting information, with fields available in SIS for Assessors to use if they wish.

2.5. Assessment Information

The following information must be recorded in the *Red List Assessment* section in SIS.

2.5.1. Red List Category and Criteria (*Red List Status* section in SIS)

SIS has an expert system (Red List Criteria calculator –section 2.3.2) which calculates the appropriate Red List status based on information recorded in the data fields. However, Assessors can also enter the assessment manually. Whichever method is used, Assessors must ensure that the appropriate Red List Category, Criteria, and sub-criteria met at the highest category of threat are recorded (Table 1).

Application of the categories and criteria must be in accordance with the *IUCN Red List Categories and Crieria. Version 3.1* and the current version of the *Guidelines for Using the IUCN Red List Categories and Criteria*. Both documents are available on the IUCN Red List website (http://www.iucnredlist.org/technical-documents/categories-and-criteria).

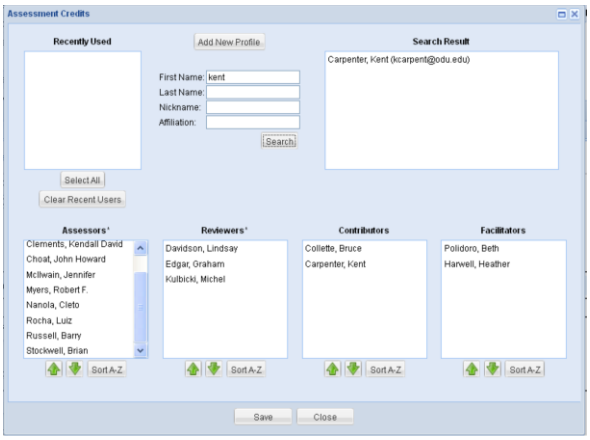
2.5.2. Assessment Date (*Assessment Information* section in SIS)

The assessment date is the final date when all Assessors involved in the assessment agree on the appropriate Red List status for the taxon. This date field should not be completed until all Assessors have approved of the final assessment.

For all dates in SIS, the format **yyyy-mm-dd** is used as standard. There is also a calendar attached to each date field, which can be used to select the appropriate date.

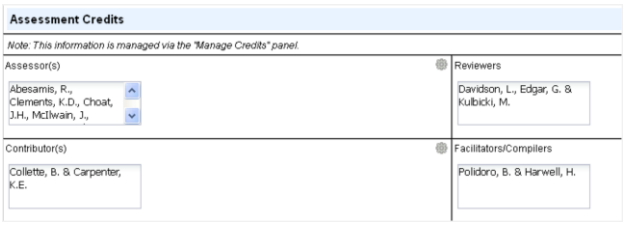
2.5.3. Assessors, Reviewers, Contributors, Facilitators and Compilers (*Assessment Information* section in SIS)

In SIS, the full names and email addresses of Assessors, Reviewers, Contributors, and Facilitators/Compilers are stored and this information used to generate names in the appropriate format for the IUCN Red List assessment. Contact details remain stored within SIS, while in the published assessment names are displayed with the surname first followed by initials (e.g., Freyhof, J. & Kottelat, M.)



2a

Figure 2: In SIS, names and email addresses of all people involved in the assessment are stored in full (2a) and are automatically displayed in the assessment in the appropriate format (2b)



2b

Assessors

All IUCN Red List assessments require at least one Assessor (Table 1).

Assessors are species experts who also have good knowledge of the IUCN Red List Categories and Criteria. The Assessor's role in the assessment process is to use all appropriate data currently available for a taxon, and the IUCN Red List Categories and Criteria, to assess the taxon appropriately, and to ensure that the assessment has the appropriate supporting information.

In general, Assessors are named people, but sometimes organizations are responsible for producing assessments based on data contributed to them (e.g., BirdLife International, NatureServe).

When a taxon is being reassessed, in SIS all of the data from the previous published assessment can be copied to a new assessment to be edited. The names of all Assessors involved in the previous assessment are also carried across to the new assessment and can either be retained as Assessors (with new Assessor names added, if appropriate); or, if the assessment is being modified substantially, the previous Assessors can be moved the ***Contributors*** field to acknowledge their contribution information used in the reassessment.

See Box 4 below for a summary of the relationship of Assessors with the other roles for an assessment.

For further guidance on the IUCN Red List assessment process and the role of Assessors, see the *Rules of Procedure: IUCN Red List assessment process 2013-2016* (https://cmsdata.iucn.org/downloads/rules_of_procedure_for_red_list_2013_2016_final.pdf).

Reviewers

All IUCN Red List assessments require at least one Reviewer (Table 1). For taxa assessed as threatened, commercially significant taxa, and assessments that may be contentious, it is encouraged that the assessment is reviewed by more than one Reviewer. Note that Assessors cannot also be Reviewers for taxa they have assessed; however it is acceptable for a Reviewer to have been Assessor for a previous published assessment for the same taxon.

Reviewers are people with good knowledge of the IUCN Red List Categories and Criteria. Ideally, Reviewers should also have good knowledge of the taxon being assessed, but sometimes (e.g., through lack of available species experts) this is not possible. The Reviewer's role is to read the information presented in the assessment and confirm whether the information has been interpreted appropriately and the IUCN Red List Criteria have been applied correctly.

See Box 4 below for a summary of the relationship of Reviewers with the other roles for an assessment.

For further guidance on the IUCN Red List assessment process and the role of Assessors, see the *Rules of Procedure: IUCN Red List assessment process 2013-2016* (https://cmsdata.iucn.org/downloads/rules_of_procedure_for_red_list_2013_2016_final.pdf).

Contributors

For some taxa, species experts or owners of databases containing species data may provide information specifically for use in the species account, but they are not directly involved in the actual assessment itself. These people are ***Contributors***.

Reviewers may also have contributed information for the assessment, without being directly involved in the assessment itself. Therefore a Reviewer may also be named as a Contributor.

SIS provides a field to record Contributors' names. This information is discretionary (optional), but recording Contributor names in SIS allows these people to be acknowledged in the published assessment.

In SIS, when a taxon is being reassessed all data from the previous published assessment can be copied to a new assessment to be edited. All names recorded in the Contributors field in the previous assessment are also copied across to the Contributors field in new assessment.

See Box 4 below for a summary of the relationship of Contributors with the other roles for an assessment.

Facilitators/Compilers

Taxa being assessed through a global assessment project often have IUCN staff, Red List Partner staff, consultants, or volunteers to reviewing published literature and entering relevant information into SIS in preparation the assessment. These are data ***Compilers***.

For large assessment projects, experts are often brought together for an assessment workshop where small groups of experts will discuss the compiled information for a list of taxa and carry out assessments. Each working group within an assessment workshop will have a ***Facilitator*** who is responsible for recording comments from the experts, helping to keep discussions relevant to the Red List assessment, and guiding the assessment process to ensure all taxa assigned to the group are assessed to the best quality possible in the time available during the workshop.

Compilers and Facilitators are also involved in tidying and checking assessments after the assessment workshop to ensure quality and consistency.

SIS provides a field to record Facilitators and Compilers. This information is discretionary (optional), but recording Facilitator and Compiler names in SIS allows these people to be acknowledged in the published assessment.

In SIS, when a taxon is being reassessed all data from the previous published assessment can be copied to a new assessment to be edited. All names recorded in the Facilitators/Compilers field in the previous assessment are also copied across to the new assessment.

See Box 4 for a summary of the relationship of Facilitators and Compilers with the other roles in an assessment.

Box 4. Relationship between Assessors, Contributors, Facilitators/Compilers and Reviewers
Y = Yes. The same person can perform both roles for the same assessment (e.g., an Assessor may also be a Compiler)
N = No. The same person cannot perform both roles for the same assessment (e.g., an Assessor cannot also be a Reviewer)

	Assessor	***Contributor***	***Facilitator/Compiler***	***Reviewer***
Assessor		N	Y (*for Compiler only*)	N
Contributor	N		Y	N
Facilitator/Compiler	Y (*for Compiler only*)	Y		Y (*for Facilitator only*)
Reviewer	N	N	Y (*for Facilitator only*)	

2.5.4. Review Process Information (*Assessment Information* section in SIS)

The review process fields should be completed by assessment Reviewers or Project Managers. When the review process has been completed, the *Reviewed* check box must be ticked and the date and outcome of the review (passed, rejected, returned for improvements) must be recorded. The date of review should be recorded as soon as all Reviewers involved agree on the outcome of the review process.

2.5.5. Rationale (*Assessment Rational* section in SIS)

A rationale is required information for all IUCN Red List assessments (Table 1 and section 2.2.8.)

2.5.6. Reasons for Change (*Reasons for Change* section in SIS)

For all taxa being reassessed, recording the 'Reason for Change' in Red List Category since the previous assessment is required supporting information (Table 2).

The 'Reason for Change' section should be completed for **ALL** reassessed taxa. The purpose of this section is to record whether the status has changed since the previous assessment (i.e., has it moved into a different category, or is there no change in category), and the main reason for any changes (i.e., is it a genuine or a non-genuine change).

For genuine category changes, Assessors must record whether the change happened since the previous assessment (a genuine "recent change"), or it happened before the previous assessment but after the taxon was first assessed (a genuine change "since first assessment").

Red List Index

Red List Index (RLI) calculations use data for genuine status changes only. However, it is important that the reason for change noted in SIS is used in combination with back-casting to check whether any previously published assessments need to be adjusted for the RLI (i.e. genuine changes and data for current versus previous published assessments should not be used blindly).

More detailed guidance on back-casting assessments for RLI calculations will be developed.

2.6. RAMAS® Red List

If an assessment has been made using RAMAS® Red List, Assessors are required to supply the RAMAS datafile for the assessment (Table 2).

Red List assessments may be made using the software package RAMAS® Red List (version 2.0 or later; Akçakaya and Ferson 2001). This program assigns taxa to IUCN Red List Categories according to the rules of the *IUCN Red List Categories and Criteria. Version 3.1* and has the advantage of being able to explicitly handle uncertainty in the data. The software captures much (but not all) of the minimum supporting information required for IUCN Red List assessments, but in some cases the information will be reported differently. The following points should be noted:

- If RAMAS® Red List is used to obtain a listing, this should be stated.
- Uncertain values should be entered into the program as a best estimate and a plausible range, or as an interval (see the RAMAS® Red List manual or help files for further details).
- The settings for attitude towards risk and uncertainty (i.e. dispute tolerance, risk tolerance and burden of proof) are all pre-set at a mid-point. If any of these settings are changed this should be documented and fully justified, especially if a less precautionary position is adopted.
- Depending on the uncertainties, the resulting classification can be a single category and/or a range of plausible categories. In such instances, the following approach should be adopted (the program will usually indicate this automatically in the Results window):
    - If the range of plausible categories extends across two or more of the threatened categories (e.g. Critically Endangered to Vulnerable) and no preferred category is indicated, the precautionary approach is to take the highest category shown, i.e. CR in the above example. In such cases, the range of plausible categories should be documented under the rationale including a note that a precautionary approach was followed in order to distinguish it from the situation in the next point. The following notation has been suggested e.g. CR* (CR-VU).
    - If a range of plausible categories is given and a preferred category is indicated, the rationale should indicate the range of plausible categories met e.g. EN (CR-VU).
- The program specifies the criteria that contributed to the listing (see Status

window). However, when data are uncertain, the listing criteria are approximate, and in some cases may not be determined at all. In such cases, the assessors should use the Text results to determine or verify the criteria and sub-criteria met. Listing criteria derived in this way must be clearly indicated in the rationale (refer to the RAMAS® Red List Help menu for further guidance on this issue).

- If the preferred category is indicated as Least Concern, but the plausible range extends into the threatened categories, a listing of 'Near Threatened' (NT) should be used. The criteria, which triggered the extension into the threatened range, should be recorded under the rationale.
- Any assessments made using this software must be submitted with the RAMAS® Red List input files (i.e. the *.RED files).

New global assessments or reassessments of taxa currently on the IUCN Red List, may be submitted to the IUCN Red List Unit for publication (subject to review) in a future edition of the *IUCN Red List of Threatened Species*™. Submissions from within the IUCN SSC network should be made using the Species Information Service (SIS) database. Other submissions may be submitted electronically; these should preferably be as files produced using RAMAS® Red List or in a format agreed with the IUCN Red List Unit prior to submission.

2.7. Distribution Map

A distribution map is required supporting information for all IUCN Red List assessments (Table 1). The map should aim to provide the current known distribution of the taxon within its native range. The limits of distribution are determined using known occurrences of the taxon, and knowledge of its habitat preferences, remaining suitable habitat, elevation limits, etc.

A GIS shapefile (for geo-referenced polygons or point localities) is the preferable format for spatial data, given their value for spatial data analyses, visual displays, and future functionality of the Red List website. However, a paper map, text file coordinates, pdf document, or a graphics file are also acceptable if a GIS shapefile cannot be created.

For GIS shapefiles, a set of standard data attributes must be recorded to describe the taxon's distribution (see Annex 1 for the list of attributes, and codes for presence, origin and seasonality data).

A detailed guidance document is being developed to provide guidance on IUCN mapping standards for creating distribution maps to support Red List assessments. Guidance on IUCN mapping standards is also available through the online IUCN Red List Training course (https://www.conservationtraining.org/mod/page/view.php?id=3756).

2.8. Bibliography

A comprehensive list of the all data sources used, cited in full, is required supporting information for all IUCN Red List assessments (Table 1). In SIS, the assessment bibliography can be accessed from any screen in the species account (in the toolbar click on *Tools*, then *Manage References*). References may also be attached to specific fields (click on the cogwheel icon attached to the field and select *References*).

See section 3.11 for guidance on formatting citations and bibliographic references in SIS.

3. General Formatting and Style Guidelines

This section gives detailed information and guidelines on the general styles and formats that should be used to maintain consistency in the IUCN Red List.

3.1. Language

Although IUCN officially uses three languages (English, French and Spanish), currently the IUCN Red List is available only in English therefore all documentation appearing in the species accounts in SIS must be written in English.

UK English has been adopted for spelling and grammar standards in the Red List (although there are some exceptions), and hence the documentation in SIS should use the same standard. If in doubt, please use the Oxford English Dictionary as a general reference. A few examples of the more common conflicting spellings are given below:

Preferred spelling for the IUCN Red List	Try to avoid
grey	gray
colour	color
favourite	favorite
centre	center
programme	program
metre	meter
kilometre	kilometer
organization	organisation
colonize	colonise
recognize	recognise

Exception: For common names, North American spellings are acceptable, but common names using UK spellings should also be added for these taxa to ensure that Red List users from different countries will find the species they are looking for. For example, *Carcharhinus amblyrhynchos* has both ‘Gray Reef Shark’ and ‘Grey Reef Shark’ recorded as common names.

3.2. General writing style

IUCN Red List users come from a very wide range of backgrounds; from taxonomists to journalists, biologists to policy makers, postgraduates to high school students. Not all users understand taxonomy or the meaning of specific biological terms or the technical terms we commonly use in the Red List, however generally all users are interested to learn what is threatened, where and why.

When writing species accounts in SIS, the purpose of the text is twofold: 1) to provide information that supports the Red List assessment for that species; and 2) to provide some background information about the species, which helps Red List users to visualize that organism, where it occurs, what its needs are, what threats are affecting it, and what can be done about the situation.

People will carry on reading, and will learn more about and sympathize with the species if they can quickly and easily understand the summary documentation. This does not mean that the writing should be overly simplified; using correct grammar, restricting the use of highly technical terms, avoiding extensive use of unexplained acronyms and long lists of technical data, and thinking about the overall message you are trying to get across will help to form a more elegant account that people will read and learn from.

Avoid unnecessary words or using multiple words that mean the same thing. For example:

Preferred style	**Try to avoid**
Often this dragonfly is found close to fast-flowing streams.	Often this dragonfly is found in close proximity to fast-flowing streams.
The region's very good soils and favourable climate encourages agricultural expansion; the species cannot survive in the banana plantations that are rapidly taking over the area.	The very good soils and favourable climate of the region are encouraging agricultural expansion, and the species is unable to survive in the banana plantations that are rapidly taking over the area.

Attachments for Species Accounts

If more detailed or technical information is essential (e.g., results of multiple surveys to support the overall population decline rate given in the summary documentation), this should be attached to the assessment in SIS. Attachments should be Word, jpegs, or Excel files (**NOT** pdf docments). The IUCN Red List Unit will transfer these to pdf documents suitable for publication on the IUCN Red List website.

3.3. Scientific and common names

It is not essential to include the scientific or common name in the text. Indeed, the preference may be to avoid this, particularly in groups where the taxonomy is likely to change because this can result in a lot of editing if the scientific name has been cited repeatedly. Also, common names can be a bit random and taxa may be known by different common names in different areas of their range. However, if no scientific or common name is used in the text, please try to refer back to the taxon in some other way; for example, use phrases such as "This diurnal lizard …" or "This arboreal frog …"

Refer to the following guidelines if scientific and common names are being used within the documentation text:

1. If the taxon has several common names, try to select one name only to use throughout the text (the one selected as the primary name).
2. If a common name exists, this can be used in place of the scientific name throughout the text. On the IUCN Red List website, the documentation text is displayed in the following order:

   (1) Taxonomic notes; (2) Rationale; (3) Distribution; (4) Population; (5) Habitat & Ecology; (6) Threats; (7) Conservation Actions.

   Scientific names will, of course, be used in the taxonomic notes section. Elsewhere, it may be necessary to use the scientific name once only in the rationale, and thereafter use the common name without losing a logical flow to the species account.

   In the first instance, use the common name first followed by the scientific name within brackets and in italics. For example:

Preferred style	**Try to avoid**
Shortnose Sturgeon (*Acipenser brevirostrum*)	Shortnose Sturgeon, *Acipenser brevirostrum* *Acipenser brevirostrum* (Shortnose Sturgeon) Shortnose Sturgeon (Acipenser brevirostrum)

3. Whether being included in the species account text or being entered into the *Common Names* field in SIS, common names should be capitalized. For example:

Preferred style	**Try to avoid**
American Pika	American pika
Rufous-necked Hornbill	Rufous-Necked Hornbill rufous-necked hornbill

4. If the taxon has a common name, the scientific name should be mentioned once only and thereafter only the common name should be used. For example:

Preferred style	**Try to avoid**
The Corsican Hare (*Lepus corsicanus*) is legally protected in continental Italy because of its conservation status. However, problematic discrimination in the field between the Corsican Hare and the European Hare (*Lepus europaeus*),	*Lepus corsicanus* is legally protected in continental Italy because of its conservation status. However, the problematic discrimination in the field between the *Lepus corsicanus* and *Lepus europaeus*, which is a game species,

which is a game species, produces remarkable problems for effective protection. Since the Corsican Hare was recognized as a true species (in 1998), hare hunting has been banned in Sicily.	produces remarkable problems for effective protection. Since *Lepus corsicanus* was recognized as a true species (in 1998), hare hunting has been banned in Sicily.

Exception: For some taxa, common names do not exist or are not universally recognised. In these cases, the first mention of the scientific name should be in full and thereafter the genus should be abbreviated to the first initial only. For example:

Preferred style	**Try to avoid**
Calocedrus rupestris is rare in most provinces although it may be locally common in some areas. Population size is less than 2,500 mature individuals. Seedlings of *C. rupestris* are rare and hence recruitment is poor.	*Calocedrus rupestris* is rare in most provinces although it may be locally common in some areas. Population size is less than 2,500 mature individuals. Seedlings of *Calocedrus rupestris* are rare and hence recruitment is poor.

5. When referring to a group of species with the same generic scientific name, the abbreviation "spp." may be used (e.g., "*Varanus* spp." refers to more than one species of *Varanus*). The abbreviation "sp." refers to only one species (e.g., "*Varanus* sp." refers only one, unspecified species of *Varanus*).
6. When citing a taxonomic level higher than the genus, (i.e. family, order, class, division or phylum) no italicization is needed, but the term should be capitalized. For example:

Preferred style	**Try to avoid**
This species formerly was included in the Parathelphusidae, but it has recently been reassigned to the Gecarcinucidae.	This species formerly was included in the PARATHELPHUSIDAE, but it has recently been reassigned to the GECARCINUCIDAE. This species formerly was included in the *Parathelphusidae*, but it has recently been reassigned to the *Gecarcinucidae*.

3.4. Numbers and Dates

3.4.1. Numbers

1. Write numbers between one and nine in full. For example:

Preferred style	**Try to avoid**

Although regular surveys have been carried out in all known suitable habitats around the island, this seahorse has been found at only three sites on the south coast and six on the west coast.	Although regular surveys have been carried out in all known suitable habitats around the island, this seahorse has been found at only 3 sites on the south coast and 6 on the west coast.

2. For numbers above nine, write these numerically. For example:

Preferred style	**Try to avoid**
After 105 sightings recorded in 1998, repeated annual surveys since have recorded decreasing numbers, with only 32 sightings recorded during the most recent survey in 2007.	After 105 sightings recorded in 1998, repeated annual surveys since have recorded decreasing numbers, with only thirty two sightings recorded during the most recent survey in 2007.

3. When starting a sentence with a number (even if it is greater than nine), write the number in full. For example:

Preferred style	**Try to avoid**
Fifteen grouse were spotted outside the reserve.	15 grouse were spotted outside the reserve.

4. For numbers with four or more numerals, use commas to separate the hundreds. For example:

Preferred style	**Try to avoid**
This fish usually occurs at depths of more than 2,000 m.	This fish usually occurs at depths of more than 2000 m. This fish usually occurs at depths of more than 2.000 m.

5. For numbers of 1,000,000 or more, write the main numeral followed by the qualifier ‘million’ or ‘billion’, etc. (e.g., 2.4 million, 80–100 million, 27 billion, etc.).

3.4.2. Dates

1. When writing a date out in full, use the structure dd/month/yyyy. For example:

Preferred style	**Try to avoid**
11 January 2005	January 11, 2005 11th January 2005

2. When referring to a particular century the preference is:

Preferred style	Try to avoid
19th century	nineteenth century 19th Century
1980s	1980's 1980 s

3.5. Brackets, dashes, hyphens, etc.

3.5.1. Brackets

Curved brackets, also called parentheses, enclose information which is a supplement to the rest of a sentence. Try to avoid using too many brackets as they can interrupt the flow of a sentence or paragraph.

3.5.2. Dashes

1. **En dashes** (–) are primarily for showing duration or range as in 9:00–5:00 or 112–600 m or 15–31 March. A single en dash can also act like a colon or a comma, marking off a few words from the first part of the sentence. For example:

   "The fate of the Tasmanian Tiger was finally sealed – a stark lesson for humanity".

2. **Em dashes** (—) act like brackets and can be used to set apart clauses in a sentence. For example:

   "Dam construction—for hydropower and water management—is also a threat to the European Eel."

3.5.3. Hyphens

Hyphens are used for hyphenating words (e.g., reef-forming corals), separating characters (e.g., in a phone number, as in 123-555-0123), or as a minus sign (e.g., 4-3=1).

It is difficult to give a general rule for when to use or not to use a hyphen. ***If anyone can provide us with a general rule that works, please do so***.

3.5.4. Colons

Use a colon to indicate that what follows it is an explanation or elaboration of what precedes it. That is, having introduced some topic in more general terms, you can use a colon and go on to explain that same topic in more specific terms. For example:

"The Clanwilliam Rock Catfish occurs in nine tributaries of the Olifants River: Oudste, Thee, Noordhoeks, Boontjies, Boskloof, Heks, Rondegat, Jan Dissels, and Dwars."

"Although 12 sites within the range were surveyed, the species was found at only one site: Willapa Bay."

3.5.5. Semi-colons

1. Use a semi-colon to join complete sentences together into a single sentence, where the sentences are too closely related to be separated by a full stop. For example:

   "Atlantic Sturgeon was an important item of commerce to early American and Canadian colonists; large quantities of sturgeon meat, roe, oil and isinglass were exported to Europe in the late 17th and 18th centuries."

2. A semi-colon can also be used where a series of elements are long or complex and involve other punctuation marks such as commas. For example:

   "Stabile *et al*. (1996) identified five regional or river-specific stocks: Lake Ponchartrain and Pearl River; Pascagoula River; Escambia and Yellow rivers; Choctawhatchee River; and Apalachicola, Ochlockonee, and Suwannee rivers."

3.5.6. Commas

1. Use commas to separate items in a list. For example:

   "The main threats affecting the population are deforestation, agriculture and hunting";

2. In a series consisting of four or more elements, use commas to separate all the elements, including the final one. For example:

   "This shark feeds mainly on bony fishes including tunas, barracuda, white marlin, dolphinfish, lancetfish, oarfish, threadfish, and swordfish."

3. Use commas to enclose additional information within a sentence. For example:

   "This species, together with the Silky Shark (*Carcharhinus falciformis*) and Blue Shark (*Prionace glauca*), has often been described as one of the most abundant oceanic shark species in the world."

4. Use a comma after an introductory or opening phrase. For example:

   "In general, snakes will only attack humans when riled."

5. Use commas, for example, around "for example". See the previous sentence as an example.

3.6. Abbreviations and common Latin terms

1. Try to avoid using the abbreviations ‘e.g.’ and ‘i.e.’ within the body of a text; instead use “for example”, “including”, “that is”, “in other words”, or “that means”. For example:

Preferred style	**Try to avoid**
The Sicilian Fir (*Abies nebrodensis*) was used extensively as a building material in the 19th century and it can be seen in many local structures, for example, in the doors and roof-beams of local churches.	The Sicilian Fir (*Abies nebrodensis*) was used extensively as a building material in the 19th century and it can be seen in many local structures, e.g., in the doors and roof-beams of local churches.

2. If ‘e.g.’ or ‘i.e.’ are used, note the position of the two full stops in both of these abbreviations (e.g. and i.e.), use a comma to separate the abbreviation and the attached statement, and enclose the whole statement within brackets. For example:

Preferred style	**Try to avoid**
The Sicilian Fir (*Abies nebrodensis*) was used extensively as a building material in the 19th century and it can be seen in many local structures (e.g., in the doors and roof-beams of local churches).	The Sicilian Fir (*Abies nebrodensis*) was used extensively as a building material in the 19th century and it can be seen in many local structures, e.g. in the doors and roof-beams of local churches.

3. There is a general rule for deciding whether or not to use a full stop after an abbreviation: if the abbreviation stops before the end of the word then use a full stop, but if the abbreviation ends with the final letter of the full word then do not use a full stop. For example, both ‘*c*.’ and ‘*ca*’ are commonly used abbreviations for *circa*). Recommended formats for some common terms and abbreviations are given below.

Meaning	Preferred style	Try to avoid
and the rest (Latin: *et cetera*)	etc.	*etc.* etc
and others (Latin: *et alia*)	*et al.*	et al. *et al*
approximately (Latin *circa*)	*c.* *ca*	c *c* ca *ca.*
in its original place (Latin: *in situ*)	*in situ*	in situ *in situ*.
Outside of its original place (Latin *ex situ*)	*ex situ*	ex situ *ex situ.*
compare (Roman: confer)	cf.	*cf.* cf
this purpose (Latin: *ad hoc*)	*ad hoc*	ad hoc *ad hoc*.
by itself (Latin: *per se*)	*per se*	per se
personal communication	pers. comm.	pers comm pers com.
personal observation	pers. obs.	pers obs
in or from a letter	in litt.	in lit
Professor	Prof.	Prof
Doctor	Dr	Dr.
above sea level	Asl	a.s.l.
editor	ed.	ed

editors	Eds	eds.

3.7. Symbols and measurement units

1. With the exception of their use at the start of a sentence, percentages should be written as a number. For example:

   "It is estimated that the population has declined by 80–85% over the last 10 years" or "Forty percent of the lakeside habitat has been converted to tourist developments since 2002."

2. The preferred standard for writing measurements is to leave one space between the number and the symbol (e.g., 3 m, 15-20 km, 1,200 ft).

   Exception: do not use a space before the percentage symbol (i.e., use 20% and not 20 %).

3. Use the appropriate symbols and abbreviations. For example:

Preferred style	Try to avoid
km²	sqkm km2
5°N	5 degrees N
15°C	15 degrees Celsius
25%	25 percent

4. SIS includes the options of superscript (e.g., for 'km²') and subscript (e.g., for 'N_{max}'). In the Mozilla Firefox web browser, a useful add-on tool (ABCtajpu) is available that allows special characters and symbols to be entered into text. To install this tool, do a Google search for "ABCtajpu" to find the ABCtajpu Firefox add-ons page and follow the instructions therein.

   For the Google Chrome web browser, use the utf-8 characters extension for special characters and symbols (available from the Chrome web store: https://chrome.google.com/webstore/detail/utf-8/fcemphgmjnjpmmdhcedhjiegickfbiia?hl=en).

   It is also useful to know the html codes for particular symbols that you may need to use in species accounts. The following list provides some of the more common standard abbreviations and symbols that you may need (along with the appropriate html code for symbols that do not appear on your keyboard):

	Abbreviation / Symbol	Html code (use Alt + code)		Abbreviation / Symbol	Html code (use Alt + code – using numeric keypad)
metre	m		Degrees	°	0176
kilometre	km		Squared	²	0178
tonnes	t		Cubed	³	0179
feet	ft		one quarter	¼	0188
kilogrammes	kg		one half	½	0189
centimetres	cm		three quarters	¾	0190
litre	l		division sign	÷	0247
millilitre	ml		plus-or-minus sign	±	0177
gramme	g		multiplication sign	×	0215
year	yr		en dash	–	0406
years	yrs		em dash	—	0407
percent	%		trademark sign	™	0153
greater than	>		copyright sign	©	0169
less than	<				

3.8. IUCN and IUCN Red List terminology

1. Refer to “IUCN” or and not “the IUCN”.
2. When referring to IUCN SSC Specialist Groups, avoid using the abbreviation SG. Instead, use the full name of the group, at least in the first instance. For example:

   “Members of the IUCN SSC Crocodile Specialist Group have carried out annual surveys of the population since 2001.” or “Members of the IUCN SSC Crocodile Specialist Group (CSG) have carried out annual surveys of the population since 2001. The results of these surveys, combined with other data

gathered by CSG members, indicate substantial declines within the last five years".

3. If the IUCN Red List is referred to more than once in text, use "The IUCN Red List of Threatened Species" first, and thereafter refer to "The IUCN Red List".
4. The official Red List URL is www.iucnredlist.org (**not** www.redlist.org).
5. Refer to the "IUCN Red List Categories and Criteria" and not the "IUCN Red List categories and criteria".
6. The IUCN Red List Categories are official terms, therefore when these are cited they must be capitalized. For example:

Correct	**Incorrect**
Extinct	extinct
Extinct in the Wild	extinct in the wild Extinct in the wild
Critically Endangered	critically endangered Critically endangered
Endangered	endangered
Vulnerable	vulnerable
Near Threatened	near threatened Near threatened Nearly Threatened
Least Concern	least concern Least concern Least Concerned
Data Deficient	data deficient Data deficient
Not Evaluated	not evaluated Not evaluated

7. All of the Red List Categories have official abbreviations (EX, EW, CR, EN, VU, NT, LC, DD, NE). Note that the correct abbreviation for Critically Endangered is 'CR' **and not** 'CE'.

8. When referring to taxa that are assessed as CR, EN or VU, you may refer to them as being “threatened” (but not “Threatened”, because this term does not refer to one specific category).

3.9. Geographical information

1. The IUCN Red List (and hence SIS) uses the International Organization for Standardization (ISO) 3166 codes for country names and code elements. Some examples of appropriate country name citations are given below:

Preference	Try to avoid
Viet Nam	Vietnam
Lao PDR	Laos
Cote d'Ivoire	Ivory Coast
Myanmar	Burma
Kazakhstan	Kazakstan
Democratic Republic of Congo Or DRC	Zaire

2. Use capital letters for geographical names, but lower case when referring to parts of a country or region. For example, use Northern Ireland, Western Australia and East Africa for these geographical areas; but use "east Japan", "northwest Norway", and "western Europe" for these areas.
3. When writing directions, do not capitalize these. For example, use "north" and not "North".
4. When compass points are abbreviated, use upper case for these. For example:

Preferred style	Try to avoid
N	N
SE	S-E
ENE	E-NE

5. Use a capital letter when referring to a cultural rather than a geographical entity. For example, use "Western culture", "Eastern medicine", "North-South divide".
6. Capitalize the names of specific national parks, but use "national parks" when writing about them in general. For example:

   "This species is found in four national parks, but the majority of the population occurs in the Peak District National Park."
7. Similarly, capitalize the names of specific geographic features, but use lower case when referring to these in general. For example:

   "There are four major oceans on the planet: the Pacific Ocean, Atlantic Ocean, Arctic Ocean, and Indian Ocean. The Antarctic Ocean (or Southern Ocean) is here included within the Indian Ocean."

3.10. Acronyms

Please remember that not all Red List users know what our acronyms and abbreviations for technical terms and organizations mean. If these must be used, write their meaning out in full in the first instance with the shortened version in brackets immediately afterwards; thereafter, use the acronym or abbreviation (this does contradict the general rule of using as few words as possible, however it will clarify the text). For example:

Preferred style	Try to avoid
This species breeds within one, well-managed national park, and it is listed in Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and in the Convention on Migratory Species (CMS). It is also the focus of several research projects run by two international non-government organizations: Conservation International (CI) and BirdLife International (BI).	This species breeds within one, well-managed NP, and it is listed in Appendix 1 of CITES, and in CMS. It is also the focus of several research projects run by two international NGOs: CI and BI.
The extent of occurrence (EOO) is estimated to be much greater than the threshold for criterion B, but the area of occupancy (AOO) is within the threshold for Endangered. Combining known occurrences with areas of suitable habitat where the species is likely to occur gives an estimated AOO of 300 km².	The EOO is estimated to be much greater than the threshold for criterion B, but the AOO is within the threshold for Endangered. Combining known occurrences with areas of suitable habitat where the species is likely to occur gives an estimated AOO of 300 km².

3.11. References

3.11.1. Citing references within text

1. Information sources can be cited in two ways within a body of text: if the author's name is an integral part of the sentence, include the publication date in brackets after the author's name; or, if the source is not included within the information itself, include the author's name and publication date together within brackets. For example:

Preferred style	Try to avoid
Flannery (1995) reports the Sulawesi Fruit Bat as common near villages on the Sula Islands.	Flannery, 1995, reports the Sulawesi Fruit Bat as common near villages on the Sula Islands.

The Sulawesi Fruit Bat is common near villages on the Sula Islands (Flannery 1995).	The Sulawesi Fruit Bat is common near villages on the Sula Islands; Flannery (1995). The Sulawesi Fruit Bat is common near villages on the Sula Islands (Flannery (1995)).

2. Do not use a comma to separate author names and publication dates. For example:

Preferred style	**Try to avoid**
The Sulawesi Fruit Bat is common near villages on the Sula Islands (Flannery 1995).	The Sulawesi Fruit Bat is common near villages on the Sula Islands (Flannery, 1995).

3. If a publication has two authors, use ‘and’ instead of an ampersand to link them. For example:

Preferred style	**Try to avoid**
This species occurs in central to southern Chile and Argentina (Musser and Carleton 2005).	This species occurs in central to southern Chile and Argentina (Musser & Carleton 2005)

4. If more than one source is cited for the same information, use a comma to separate these. For example:

Preferred style	**Try to avoid**
Brumback's Night Monkey is a lowland species, with a range extending east from the Cordillera Oriental in Colombia, between the Ríos Arauca and Guaviare (Hershkovitz 1983, Defler 2003).	Brumback's Night Monkey is a lowland species, with a range extending east from the Cordillera Oriental in Colombia, between the Ríos Arauca and Guaviare (Hershkovitz 1983; Defler 2003).

Exception: If part of the string includes more than one publication for the same author, use a comma to separate these, and a semi-colon to separate the other citations. For example:

Correct	**Incorrect**
Brumback's Night Monkey is a lowland species, with a range extending east from	Brumback's Night Monkey is a lowland species, with a range extending east from

the Cordillera Oriental in Colombia, between the Ríos Arauca and Guaviare (Hershkovitz 1983; Defler 2003, 2004a,b).	the Cordillera Oriental in Colombia, between the Ríos Arauca and Guaviare (Hershkovitz 1983; Defler 2003; 2004a&b).
	Brumback's Night Monkey is a lowland species, with a range extending east from the Cordillera Oriental in Colombia, between the Ríos Arauca and Guaviare (Hershkovitz 1983, Defler 2003, Defler 2004a; Defler 2004b).

5. Where several references occur with the same primary author, but different subsequent authors, and same year of publication, cluster the references by primary author; arrange the cluster alphabetically by secondary, tertiary, etc., author; add ‘a’, ‘b’, ‘c’, ‘d’, etc. after the publication year; and cite the references as ‘primary author name *et al*. 2005a, primary author name *et al*. 2005b’. For example, the following publications:

   Bennett, A., Hugill, B. and Knee, A. 1990. How to cite references. *Bibliography Bible*. 12(1): 5-10.

   Bennett, A., Hugill, B., Stevens, B. and Knee, A. 1990. How to cite more references. *Bibliography Bible*. 12(2): 20-23.

   Bennett, A., Stevens, B., Knee, A. and Hugill, B. 1990. Even more reference citations. *Bibliography Bible*. 12(3): 17-19.

   Bennett, A., Stevens, B., Hugill, B. and Knee, A. 1990. Advanced citations for complicated references. *Bibliography Bible*. 13(1): 3-7.

   Bennett, A., Knee, A. and Stevens, B. 1990. Who needs all these references anyway? *Bibliography Bible*. 13(2): 14-105.

   Would be arranged as:

   Bennett, Hugill and Knee 1990a

   Bennett, Hugill, Stevens and Knee 1990b

   Bennett, Knee and Stevens 1990c

   Bennett, Stevens, Hugill and Knee 1990d

   Bennett, Stevens, Knee and Hugill 1990e

   And these would be cited in a body of text as:

"It is important to be consistent when citing information sources within a body of text (Bennett *et al*. 1990a, Bennett *et al*. 1990b, Bennett *et al*. 1990c, Bennett *et al*. 1990d, Bennett *et al*. 1990e)."

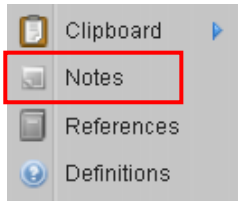
6. If a publication has more than two authors, cite only the first author then use '*et al*.'. For example:

Preferred style	**Try to avoid**
The identification of spawning sites in Lough Leane and their protection from declining water quality and development works is a priority to ensure the future survival of the species (Doherty *et al*. 2004).	The identification of spawning sites in Lough Leane and their protection from declining water quality and development works is a priority to ensure the future survival of the species (Doherty, O'Maoileidigh and McCarthy 2004).

7. If the information source is a personal communication or a personal observation include the initial(s) of the person who communicated the information BEFORE the surname, followed by the appropriate abbreviation (no comma), then the year the information was received. For example:

Preferred style	Try to avoid
The Macedonian Shad's previously occurred in Lake Koronia, but in 1995 the lake dried up killing all the fish present there (G. Barbieri pers. comm. 2006).	The Macedonian Shad's previously occurred in Lake Koronia, but in 1995 the lake dried up killing all the fish present there (Barbieri, pers. comm.).
	The Macedonian Shad's previously occurred in Lake Koronia, but in 1995 the lake dried up killing all the fish present there (Barbieri, Pers. Comm., 2006).

NOTE: For all pers. comm., pers. obs., and in litt. citations, there should be a record of where the original statement came from (e.g., if in an email or a letter, an electronic or hard copy of this should be held somewhere and the details noted). Every field in SIS has a notes field attached to it where these details can be recorded. The notes field can be opened by clicking on the cogwheel icon attached to any and selecting *Notes*:



For example, the citation 'M. Kottelat pers. comm. 2008' may have the following note attached "M. Kottelat pers. comm. 2008: email dated 12th June 2008 from Maurice Kottelat to Kevin Smith (IUCN Freshwater Biodiversity Assessment Unit).

3.11.2. References in a bibliographic list

In SIS, information such as authors, publication year, title, journal name, book titles, etc. must be entered into separate fields; SIS can then automatically generate the reference citation in the appropriate format based on the reference type and the information in these fields.

In general, **DO NOT** add commas, full stops, semi-colons, etc. at the end of authors, titles, etc. in the SIS reference fields; these will be added automatically when the citation is generated. However, it is important to enter the information into the fields in the appropriate format otherwise the final citation will not follow the correct standard.

1. **Author Names**.

a. For all author names, use the format ‘Smith, A.B.’ (note that initials are separated by a full stop and no space).
b. Separate co-author names using a comma.
c. Use ‘and’ between the penultimate and last co-author names, with no comma before ‘and’.
d. In general, where author names include text such as “de”, include this at the front of the surname.
e. Where and author name has “junior” attached to it, add this as a abbreviation (Jr) at the end of the name.

For example:

Preferred style	**Try to avoid**
Cochran, D.M. and Goin, C.J.	Cochran, D.M. & C.J. Goin Cochran, D. M. and Goin, C. J.
de Gaulle, C.	Gaulle, de C. Gaulle, C. de
Smith, K., Jr. and Jones, P.A.	Smith, Jr. K., and Jones, P.A. Smith, K. Junior and Jones, P.A.
Carnaval, A.C.O.Q., Puschendorf, R., Peixoto, O.L., Verdade, V.K. and Rodrigues, M.T.	Carnaval, A.C.O.Q., R., Puschendorf, O.L., Peixoto, V.K. Verdade and M.T. Rodrigues Carnaval, A.C.O.Q., Puschendorf, R., Peixoto, O.L., Verdade, V.K., & Rodrigues, M.T.

2. **Publication year**.

   Enter the publication year **without** adding any punctuation after it. SIS will automatically add a full stop after the year when it creates the citation. For example:

Preferred style	**Try to avoid**
1990	1990. 1990,

3. **Titles**.

   In SIS, book titles are automatically italicised so there is no need to do this manually; for all reference types the just enter the title into the *Title* field. However, if Latin terms (e.g., scientific names) are included in the title, these

need to be in italicised. Use html codes for this. Do not include any full stops at the end of the title. For example:

Preferred style	**Try to avoid**
Alburnus vistonicus, a new species from eastern Greece, with remarks on Chalcaburnus chalcoides macedonicus from Lake Volvi	Alburnus vistonicus, a new species from eastern Greece, with remarks on Chalcaburnus chalcoides macedonicus from Lake Volvi. Alburnus vistonicus, a new species from eastern Greece, with remarks on Chalcaburnus chalcoides macedonicus from Lake Volvi

4. **Editors**.
    a. For editors names, the initials appear before the surname.
    b. Do not use a full stop or a comma after the editors names.
    c. SIS automatically adds the associated text for this (i.e., there is no need to add 'In:' or '(eds)' in the *Editor* field).

For example:

Preferred style	**Try to avoid**
C.D. Barker	Barker, C.D. (ed.)
C.D. Barker and A.B. Smith	In: C.D. Barker and Smith, A.B. (eds),

5. **Journal Titles**.
    a. In references, journal titles appear in italics. However, SIS automatically handles this formatting, so there is no need to add codes for italics in the *Journal* field.
    b. Avoid using abbreviations for journals, because 1) it can be difficult to maintain consistency and check that the correct abbreviations are used; and 2) it can be difficult to understand what these mean for some of the less well-known journals.

For example:

Preferred style	**Try to avoid**
Oryx	Oryx
Annales de la Faculté des Sciences du Yaoundé	Ann. Fac. Sci. Yaoundé
Bulletin of Marine Science	Bull. Mar. Sci. Bull.Mar.Sci.
Chelonian Conservation and Biology	Chelonian Conservation & Biology

Herpetological Review	Herp. Review
	Herp Rev

6. **Journal volume, issue and page numbers**.

   SIS formats these automatically, so there is no need to enter brackets, colons, spaces, etc. Simply type the appropriate information into the *Volume*, *Issue* and *Pages* fields.

4. Systematics

This section provides a mixture of commonly accepted rules for nomenclature, and specific rules for entering and citing this information in SIS.

While the IUCN Red List is not intended as a comprehensive taxonomic authority of the world's species, it is important for those responsible for entering assessment information into SIS to know and understand some of the basic rules of taxonomy and nomenclature.

Taxonomy is the process of identifying, naming and classifying organisms according to apparent common characteristics. While this sounds quite straight forward in theory, in practice different taxonomists studying the same groups of organisms often have different approaches to this process. The result is that the same organism can be classified under different taxonomic concepts; what one taxonomist sees as one species may well be seen as several different species by another taxonomist. **The issue of developing taxonomic standards for the Red List is still under discussion.**

Nomenclature is the process of naming organisms and the system of names used. Just as different taxonomists may use different taxonomic concepts, they may also have different opinions on the taxonomic names allocated to an organism (e.g., different taxonomists may place an organism in different taxonomic families). To maintain consistency and stability in the IUCN Red List, certain standard references for nomenclature have been adopted (e.g., for mammals the general reference source is Wilson and Reeder (2005)), although sometimes the IUCN Red List will deviate from the standard reference on the advice of a Specialist Group. In such cases, supporting documentation and published references must be provided to explain why the standard reference is not being followed.

For a summary of the current reference sources used, see the page *Information Sources and Quality* on the IUCN Red List website (www.iucnredlist.org).

Editing Taxonomy in SIS
Taxonomic information in SIS is managed by the IUCN Red List Unit. If you have a list of taxa to assess that are not already in SIS, or if you see existing taxonomy in SIS that needs to be modified, please contact the IUCN Red List Unit directly (contact Craig Hilton-Taylor (craig.hilton-taylor@iucn.org) or Caroline Pollock (caroline.pollock@iucn.org)).
The information below is provided to help you to understand how the Red List Unit manages taxonomy in SIS and to provide guidance on what taxonomic information assessors and project managers should provide in the event that new taxonomy or taxonomic changes are required within SIS.

Rules for entering and citing taxonomic information in SIS

The IUCN Red List (and hence, SIS) follows the standard rules for writing scientific names of organisms. Although there are general rules that apply to all organisms, it is important to note that some details are different for plants and animals. All entries for animal taxa on the Red List follow the rules as defined by the *International Code for Zoological Nomenclature* (ICZN 1999 – see http://www.iczn.org/iczn/index.jsp). All entries for plant taxa on the Red List follow the *International Code of Nomenclature*

for algae, fungi, and plants (Melbourne Code) (ICN 2012 – see http://www.iapt-taxon.org/nomen/main.php).

4.1. Higher Taxonomic Levels

SIS already includes an extensive list of names for the taxonomic levels kingdom, phylum, class, order, and family, however this list of names is not comprehensive. In many cases the appropriate higher taxonomy can simply be selected from the list of names in SIS, but it may sometimes be necessary to enter a new name or modify the status of an existing name. In these cases, the following basic rules should be followed:

1. Try to use the general taxonomic standards and nomenclature checklists for taxonomic names being added to SIS (see the page *Information Sources and Quality* on the IUCN Red List website (www.iucnredlist.org)).
2. If the standard taxonomic reference is not using the most up-to-date taxonomy (e.g., taxonomic revisions have been recently published and are generally accepted by the taxonomic community for that group, but the taxonomic reference source has not yet been updated to reflect this), please provide documentation to support the deviation from the standard reference source (i.e., provide the publication reference(s) (or, ideally, a copy of the publication) and a short explanation of why this taxonomy is being used and not the taxonomy shown in the standard reference source).
3. In the taxonomic backbone of SIS, the higher level names (for kingdom, phylum, class, order, family) are currently entered in CAPITAL letters. For example, CANIDAE is used instead of Canidae. But, if a higher level taxonomic term is used within a text field, it should be treated as a proper noun with the first letter capitalized (see section 3.3).
4. Please provide the taxonomic authority for the higher-level names, if this is known or can easily be found.
5. After the new name has been saved in SIS, add the common term for this scientific name if this is known; for example, the family CANIDAE has all of the common names Dogs, Foxes, Jackals and Wolves attached to it. These common terms are used in the search function on the Red List website to help non-taxonomists to easily find what they are looking for without using taxonomic terms.

4.2. Genus, Species and Subspecies Names

SIS already includes an extensive list of genus and species names. However, as with the higher taxonomic levels, this list is not comprehensive, and also taxonomic

changes and new terms will regularly need to be incorporated into SIS. So, while in many cases the appropriate genus can simply be selected from the list of names in the system, it will sometimes be necessary to add a new name to the system. When genus names are added to SIS, please ensure that:

1. The general taxonomic standards and nomenclature checklists are used for any taxonomic names being added to SIS (see the page *Information Sources and Quality* on the IUCN Red List website (www.iucnredlist.org)).
2. If the standard taxonomic reference is not using the most up-to-date taxonomy (e.g., taxonomic revisions have been recently published and are generally accepted by the taxonomic community for that group, but the taxonomic reference source has not yet been updated to reflect this), please provide documentation to support the deviation from the standard reference source (i.e., provide the publication reference(s) (or, ideally, a copy of the publication) and a short explanation of why this taxonomy is being used and not the taxonomy shown in the standard reference source).
3. Enter the taxonomic authority for the genus name, if this is known or can easily be found.
4. After the new name has been saved in SIS, add the common term for this genus, if this is known; these common names are used in the search function on the Red List website to help non-taxonomists to find what they are looking for without using taxonomic terms.
5. When being used in a body of text, all genus, species and subspecies names are italicized (see section 3.3).

5.Genus names are always Capitalized, while species and subspecies names are written in lower case. For example:

Correct	**Incorrect**
Acipenser baerii	*acipenser baerii* *Acipenser Baerii*
Acipenser baerii baerii	*Acipenser Baerii baerii* *Acipenser Baerii Baerii*

4.3. Taxonomic Authorities

The taxonomic authority is the name of the person (or people) who described the species. There are very specific rules governing how taxonomic authorities are written, and these rules are different for animals and plants. A very brief summary of the general rules are given below.

4.3.1. Animals

For animal names, the following rules apply:

1. The authority is written as the name(s) of the author(s) who published the **original description** of the taxon, followed by the year the original description was published.
2. For the IUCN Red List, the following standard format for taxonomic authorities has been adopted:
   - A comma is used to separate the author name and the publication year.
   - There is no full stop used after the name (unless the name is being used at the end of a sentence).

   For example:

Correct	**Incorrect**
	Lowe 1843.
Lowe, 1843	Lowe (1843)
	Lowe [1843]

3. The name of the author follows the name of the taxon without any intervening punctuation mark (but see point 5 below for an important exception).

   For example:

Correct	Incorrect
Seriola gracilis Lowe, 1843	*Seriola gracilis*, Lowe 1843 *Seriola gracilis* (Lowe, 1843) **(but see point 5 below)** *Seriola gracilis* Lowe (1843)

4. For subspecies, only one authority name appears: for nominate subspecies (i.e., the subspecies name matches the species name), the authority for the species' description is used; for other subspecies, the authority is the name and year for the description of that subspecies.

   For example:

Correct	Incorrect
Acipenser baerii baerii Brandt, 1869	*Acipenser baerii* Brandt, 1869 *baerii*
Acipenser baerii baicalensis Nikolskii, 1896	*Acipenser baerii* Brandt, 1869 *baicalensis* Nikolskii, 1896

5. Where there are co-authors involved in the description, use an ampersand (&) to separate the two author names. For example:

Correct	Incorrect
Raja bathyphila Holt & Byrne, 1908	*Raja bathyphila* Holt and Byrne, 1908 *Raja bathyphila* Holt, Byrne (1908)

6. If the species has been moved to a different genus since its original description, the original authority is kept with the new taxonomic name, but the authority is placed within brackets; **authorities within brackets have the specific meaning that at the time of its description the taxon was placed under a different genus than the one in which it currently appears**.

   For example, in 1989, Séret published the description of a new species of skate, which he named *Raja crosnieri*. In 1998, McEachran and Dunn moved the species to the newly recognized genus *Dipturus*, making the new name for this fish *Dipturus crosnieri*. The full citation of the new species name is:

Correct	Incorrect
Dipturus crosnieri (Séret, 1989)	*Dipturus crosnieri* Séret, 1989
	Dipturus crosnieri (Séret, 1989) McEachran & Dunn, 1998
	Dipturus crosnieri McEachran & Dunn, 1998
	Dipturus crosnieri (McEachran & Dunn, 1998)

4.3.2. Plants

For plant names, the following general rules apply:

1. The original author(s) who originally described the species are cited **without the year of publication**.

Correct	Incorrect
Abies beshanzuensis M.H.Wu	*Abies beshanzuensis* M.N. Wu, 1960

2. It is very common to see initials included with plant authorities and for them to be written in an abbreviated form. The main references used to decipher these abbreviations are Brummitt and Powell (1992) and the International Plant Names Index (IPNI – see http://www.ipni.org/). For example:

Correct	Incorrect
Abies beshanzuensis M.H.Wu	*Abies beshanzuensis* Wu
	Abies beshanzuensis Ming Nsiang Wu

3. If the taxon has been moved to a different genus, or if a subspecies or variety has been raised to species-level since its original description was published, the original authority should be placed within brackets. However, in contrast to the rules for animals, for plants the author(s) responsible for the altered name are added outside of the brackets.

   For example, the Sicilian Fir was originally described as a variety of *Abies pectinata* by Lojac. The taxon was later raised to species level by Giovanni Ettore Mattei who placed the species in the genus *Abies*. The correct citation for the current species name is:

   Abies nebrodensis (Lojac.) Mattei

4. For plant subspecies and varieties, the authors of both the species-level and subspecies- / variety-level descriptions are cited.

For example, when Lojac. first described *nebrodensis* it was a variety of the species *Abies pectinata* which had been described (and remained unchanged since) by Gilib. At the time, the correct citation for this plant variety was:

Abies pectinata Gilib. var. *nebrodensis* Lojac.

4.4. Synonyms

The IUCN Red List is not intended to be a comprehensive taxonomic authority of the world's species. Therefore there is no need to enter a comprehensive list of synonyms since the description of the species.

The following general rules should be followed when entering synonyms into SIS:

1. Add all synonyms that are still in regular usage.
2. Do not include old and obscure names (but, see point 3 below).
3. When a taxon has been moved to a different genus since its original description, the original published name is called the 'basionym' in plants and 'original combination' in animals. Currently, it is not compulsory to record the original name in the list of synonyms, but this is very useful to ensure the authority names are correctly cited.
4. Ensure the genus, species names (and subspecies and variety names, if applicable) and taxonomic authority for each synonym is provided, following the same rules outlined above.

4.5. Taxonomic changes: splitting and merging taxa

When a species concept has been revised, resulting in a species being split into several new species concepts or merged with other species to form a single species, the Red List Unit has to edit the taxa affected by the revision within SIS. **It is very important to consider changes in taxonomic concepts when carrying out Red List assessments** because previously published assessments attached to the species' name may no longer refer to the same taxonomic concept.

Consider the following example:

Prior to 2008, the Reticulated Swellshark (*Cephaloscyllium fasciatum* Chan, 1966) included two subpopulations: one off the coastlines of Vietnam and China, and one off northwestern Australia. The species (based on available information from both subpopulations) was assessed as Data Deficient in 2003.

In 2008, White and Ebert revised the taxonomy for *Cephaloscyllium fasciatum*, splitting the species concept into two separate species:

- *Cephaloscyllium fasciatum* Chan, 1966 refers only those individuals in the western Pacific around Viet Nam and China.
- *Cephaloscyllium hiscosellum* White & Ebert, 2008 refers to individuals occurring in the eastern Indian Ocean off northwestern Australia.

In 2010, both species were assessed: *Cephaloscyllium fasciatum* as Data Deficient, and *Cephaloscyllium hiscosellum* as Least Concern.

Although the species name *Cephaloscyllium fasciatum* has DD assessments for both 2003 and 2010, these assessments refer to very different taxonomic concepts: in 2003, data from a much larger population and range was considered than for the 2010 assessment. Therefore, the two assessments are not directly comparable and the 2003 assessment should not appear as a historic assessment for the *Cephaloscyllium fasciatum*.

Such taxonomic splits are handled through the following steps:

1. The appropriate Red List Authority (e.g., in the above example, the Shark RLA) or assessment project manager contacts the Red List Unit to inform them of the taxonomic revision needed in SIS, providing all supporting documentation to fully explain the situation (e.g., sending a copy of the publication is useful as there may be other taxonomic revisions included in the paper that also need to be considered in SIS).
2. The name of the old taxonomic concept (e.g., in the above example, the entry for *Cephaloscyllium fasciatum* with the 2003 DD assessment attached) is changed to *Genus species_old* (e.g., in the above example, *Cephaloscyllium fasciatum* was changed to *Cephaloscyllium fasciatum_old*).
3. The taxonomic status for the old taxonomic concept is changed to "discarded" in SIS. This prevents the modified name and the old assessment from being published on the Red List website at the next Red List update, but retains the taxon and the assessment in SIS (i.e., the old assessment is not lost).
4. New entries are created for the new species concept and the new species that have split from the old concept (e.g., in the above example, new entries were created for *Cephaloscyllium fasciatum* and *Cephaloscyllium hiscosellum*).
5. The assessors complete assessments for the new species (e.g., members of the IUCN SSC Shark Specialist Group prepared new assessments for *Cephaloscyllium fasciatum* and *Cephaloscyllium hiscosellum* within SIS and submitted these for publication on the Red List).

Note: If a new assessment is not completed for the new taxonomic concept in time for the next Red List update, that taxon name will drop out of the published Red List, because the old concept is no longer recognised and has been changed to "Discarded" in SIS (see point 3 below). If this is a concern for the assessors then the following alternative arrangement can be made:

The name of the old taxonomic concept (e.g., in the above example, the entry for *Cephaloscyllium fasciatum* with the 2003 DD assessment attached) can be retained as it is. A new taxonomic concept can then be created in SIS named *Genus species_new* (e.g., in the above example, *Cephaloscyllium fasciatum_new*) allowing the assessors to prepare an assessment for the new concept ready to submit for a later Red List update. After submission, the Red List Unit will modify the names and taxonomic

status appropriately to allow the old assessment to be replaced by the new assessment without the name being lost from the Red List.

Please ensure you explain which option you prefer when you contact the Red List Unit to explain taxonomic changes needed in SIS.

If, in the above example, the taxonomic change was happening in reverse (i.e., if *Cephaloscyllium fasciatum* and *Cephaloscyllium hiscosellum* were being merged together to form a new taxonomic concept for *Cephaloscyllium fasciatum* that included all individuals from both species), a similar process would occur. Please contact the Red List Unit if such a taxonomic change is needed in SIS.

5. Pre-submission Checks

This section gives a summary of the general supporting information checks and consistency checks that must be carried out before assessments are submitted for inclusion in the IUCN Red List.

The final step before assessments are submitted for publication on the IUCN Red List is to check that all of the assessments include the required supporting information, in the standard format and that the assessment accounts are clear, informative, and the data and information presented match the final IUCN Red List assessment. For example, if the taxon is assessed as CR B1ab(iii) and the extent of occurrence is stated as 200 km² in the text but 95 km² in the data field, then there is a contradiction that needs to be resolved before the assessment is submitted.

5.1. Supporting Information Checks

Before submitting assessments, refer to Table 1, Table 2 and Table 3 to check that all of the appropriate information is included. A summary of the general supporting information checks for each assessment are listed below:

Taxonomy

- Taxonomy from kingdom to species (and subspecies, if applicable) follows appropriate standard reference. Any deviations (e.g., the Shark Specialist Group following Compagno rather than Eschmeyer for current shark taxonomy) should be explained in the taxonomic notes section (see section 2.1 and section 2.2.1).
- The taxonomic authority is recorded and is in the correct format (see section 2.1 and section 4.3).
- Any recent synonyms have been recorded, in the appropriate format (see section 2.1 and section 4.4)

Common names

If common names have been recorded, check that:

- The appropriate format has been used for common names (see section 3.3)
- The primary common name is highlighted in SIS.

Summary text

- Narrative text has been entered for:
    - Taxonomic notes (if necessary; see Table 2 and section 2.2.1)
    - Geographic range (required for all non-LC taxa; see Table 2 and section 2.2.2)
    - Population (required for all non-LC taxa; see Table 2 and section 2.2.3)
    - Habitats & Ecology (required for all non-LC taxa; see Table 2 and section 2.2.4)
    - Threats (required for all non-LC taxa; see Table 2 and section 2.2.6)

  - Red List Assessment Rationale (required for all assessments; see Table 1 and section 2.2.8)
- If appropriate, narrative text has been entered for:
  - Use & Trade (recommended for utilized taxa; see Table 3 and section 2.2.5)
  - Conservation Actions (recommended for non-EX and non-LC taxa; see Table 3 and section 2.2.7)
- For all narratives, the text is clear and understandable.
- Spelling has been checked.
- Appropriate formats are used for reference citations, etc. (see section 3)
- Italics have been added in the appropriate places (*et al*., species names, etc.)

Data fields

- All data fields completed (including qualifiers) for parameters triggering IUCN Red List Criteria met at the highest Red List Category level (see Table 1, section 2.3.2, and the *Criteria Factor View* in SIS), including:
  - Generation Length (for criteria A and C1)
  - Rate of reduction (for criteria A and C1)
  - Time period over which reduction is measured (for criteria A and C1)
  - Basis for rate of reduction (for criterion A)
  - Causes of reduction understood, reversible and/or ceased (for criterion A)
  - Extent of occurrence – EOO (for criterion B1)
  - Area of occupancy – AOO (for criterion B2)
  - Number of locations (for criteria B1a and B2a)
  - Severe fragmentation (for criteria B1a and B2a)
  - Continuing decline in EOO, AOO, habitat area/extent/quality, number of locations/subpopulations (for criteria B1b and B2b)
  - Continuing decline in population size (for criteria B1b, B2b, and C)
  - Extreme fluctuation in EOO, AOO, and number of locations/subpopulations (for criteria B1c and B2c)
  - Extreme fluctuation in population size (for criteria B1c, B2c and C2)
  - Population size (for criteria C and D, and VU D1)
  - Size of largest subpopulation (for criterion C2)
  - Highly restricted range or small number of locations and plausible threat (for VU D2)
  - Probability of extinction in the wild (for criterion E)
- Qualifiers (observed, estimated, projected, inferred, suspected) are recorded for each data field, where applicable.
- Data fields for additional information and for website functionality (see Table 1 and section 2.3.1), including:

- Current population trend (required for all assessments; see Table 1 and section 2.3.1)
- System (required for all assessments; see Table 1 and section 2.3.1)
- Biogeographic realms, if applicable (recommended for terrestrial and freshwater taxa; see Table 3 and section 2.3.1)
- Plant growth form (required for all plant taxa; see Table 2 and section 2.3.1)
- Elevation or depth limits, if applicable (recommended supporting information; see Table 3 and section 2.3.1)

Occurrence information

- Countries of occurrence, with Presence and Origin coding, all countries within the taxon's native and reintroduced range (see Table 1 and section 2.4.7).
- If applicable, sub-country occurrence units within large countries and islands far from the mainland (recommended supporting information; see Table 3 and section 2.4.7).

Classification Schemes

- Habitat Classification Scheme codes recorded for suitable habitats (required for all assessments; see Table 1 and section 2..4.1).
- Threats Classification Scheme codes recorded for major threats (required for all non-DD and non-LC taxa; see Table 2 and section 2.4.2).
- Conservation Actions In Place Classification Scheme codes recorded, if applicable (recommended for all non-EX and non-LC taxa; Table 3 and section 2.4.4).
- Conservation Actions Needed Classification Scheme codes recorded, if applicable (recommended for all non-EX and non-LC taxa; Table 3 and section 2.4.4).
- Utilization Classification Scheme codes recorded, if applicable (recommended for all utilized taxa; Table 3 and section 2.4.6).

Distribution Map

Ensure that a distribution map has been prepared (Table 1, section 2.7, and Annex 1)

- If it is possible to prepare GIS shapefiles, then this is the preferred format.
- Record all of the required data attributes (Annex 1).

Red List Assessment Information

- Red List Category and Criteria, including all relevant subcriteria (see Table 1 and section 2.5.1)
- Assessment date (see section 2.5.2).
- Name(s) of Assessor(s) names (see Table 1 and section 2.5.3).
- Name(s) of Reviewer(s) (see Table 1 and section 2.5.3).
- Review process information (see section 2.5.4).
- All EX, EW, CR(PE) and CR(PEW) taxa have date last recorded attached (see Table 2).
- The fields *Possibly Extinct* or *Possibly Extinct in the Wild* have been completed for all taxa being assessed as CR(PE) or CR(PEW) (see Table 2).

- All DD taxa have appropriate documentation and DD reason completed (see Table 2)
- All reassessed taxa have a reason for change recorded (see Table 2 and section 2.5.6).
- Rationale is included and is understandable and fully supports the assessment (see Table 1 and section 2.2.8).

Bibliography

- All references cited in the text appear in the bibliography (see Table 1 and section 2.8).
- References in the bibliography follow the appropriate format (see section 3.11).

Common Errors

An automatic system is being developed in SIS (the ***Integrity Checker***), which will allow SIS users to quickly check for many of the errors listed below. Meanwhile, please carry out at least the following checks (you can probably think of others in addition to this list):

- The Red List Criteria and supporting information are appropriate for the selected category.
    - Criteria apply only to CR, EN and VU; for NT taxa, record criteria met and nearly met in the rationale.
    - Criteria D1 and D2 are used for Vulnerable only; for CR and EN, criterion D is used.
    - If criteria A or C1 are used, ensure the generation length has been stated and that the appropriate time period has been used. Also check that the reasoning behind the estimated rate of decline is appropriately documented.
    - If criterion A1 is used, check the assessment carefully; A1 is specific to causes of population decline being understood and have stopped and the effects are reversible.
    - If criteria B1 or B2 are used, check that EOO or AOO estimates are given.
    - If criteria B1a or B2a are used, check that the assessment is clear about whether severe fragmentation or number of locations have been used for the assessment. Also check that the number of locations has been estimated appropriately (based on the most serious threat rather than simply on collection sites).
    - If VU D2 is used, check that there is a plausible threat to the species rather than having a restricted range and no threats at all.
    - If criterion E is used, ensure the quantitative model (with the assumptions used in this) is available for inspection.
- Check for contradictions between information in the summary documentation and the data fields (e.g., text says population has declined by 32% but data field records decline of at least 50%).
- Check that EX and EW taxa are also recorded as ‘Presence = extinct’ in **all** of their country and subcountry (and FAO and LME areas, if applicable) occurrence records.
- For all reassessed taxa, check that the reason for change recorded is a comparison between the current assessment and the last published assessment. If the taxon changed status BEFORE the previous assessment but after the first assessment, ensure this is properly recorded.

- Where a reason for change has been recorded, check that there IS at least one previous published assessment for that taxon.
- Ensure that the reason for change makes sense; for example, if a taxon moves from EX to CR the reason for change should be ‘New information’ and not ‘Genuine change’.

5.2. Consistency Checks

Before a large number of assessments are submitted for publication on the IUCN Red List, it is also important to check the assessments for consistency in how the IUCN Red List Categories and Criteria have been applied to different taxa, particularly taxa occurring in the same area and facing the same threats.

Different Assessors may apply the IUCN Red List Criteria slightly differently because of differences in attitudes. When faced with uncertain data, some Assessors will be more precautionary in their interpretation of the data, tending to list taxa in higher threat categories, while others are more evidentiary and tend to seek out further evidence before listing a taxon in a higher threat category.

In large assessment projects involving lots of taxa, often it is necessary to carry out many assessment workshops, sometimes over several years. These workshops may involve different Assessors and Facilitators, all having different attitudes towards uncertainty.

Sometimes, by the end of a long project or even a long workshop, the same person can even apply the Red List Criteria slightly differently from how they applied the criteria at the start of the process (e.g., throughout the project they may have gained a better understanding of the IUCN Red List Criteria, or tiredness can take its toll during a long workshop and result in an Assessor or Facilitator misinterpreting information or being heavily influenced by peer pressure).

For these reasons, large assessment projects must include a consistency check period where project staff will check for errors in how the Red List Criteria have been applied before submitting assessments to the RLU. This gives them a chance to address these issues before final submission. During this process, some taxa may have their assessments adjusted accordingly, with the agreement of the Assessors and Reviewers.

After submission, the RLU carries out further consistency checks as a last-stop effort to catch any errors, inconsistencies and to fix these before the assessments are finally published on the IUCN Red List website.

Annex 1: Attributes for Spatial Data

For the distribution map, there is a list of spatial data attributes which must be recorded. These attributes help describe the taxon's distribution. The tables below list the standard attributes for spatial data (Table 1); the codes used to indicate presence, origin and seasonality (Tables 2a, b and c); and how these codes are used to create legends for the distribution map (Table 3).

Table 1: Attributes to record for spatial data.

Field	ESRI Field Type	Description
ID_NO	Integer	Internal Record ID (must match the corresponding field in SIS)
BINOMIAL	String	Scientific name (must match the corresponding field in SIS)
BASIN_ID (freshwater species only)	Integer	River catchment ID number. This must match the corresponding BASIN_ID or HYDRO_ID in the hydroshed/catchment layer.
PRESENCE	ShortInt	Is/was the species in this area (codes listed in Table 2a)
ORIGIN	ShortInt	Why/how the species is in this area (codes listed in Table 2b)
SEASONAL	ShortInt	What is the seasonal presence of the species in the area (codes listed in Table 2c)
COMPILER	String	Name of the individual/s or institution responsible for generating the polygon, if not IUCN.
YEAR	ShortInt	Year in which the polygon was mapped, compiled, or modified
CITATION	String	Individual/s or institution responsible for providing the data

Table 2a: Codes used to record the taxon's presence.

Code	Presence	Definition
1	Extant	The species is known or thought very likely to occur presently in the area, usually encompassing current or recent localities where suitable habitat at appropriate altitudes remains.
2	Probably Extant	The species' presence is considered probable, either based on extrapolations of known records, or realistic inferences (e.g., based on distribution of suitable habitat at appropriate altitudes and proximity to areas where it is known or thought very likely to remain Extant). 'Probably Extant' ranges often extend beyond areas where the species is Extant, or may fall between them.
3	Possibly Extant	The species may possibly occur, based on the distribution of suitable habitat at appropriate altitudes, but where there are no known records. 'Possibly Extant' ranges often extend beyond areas where the species is Extant (see definition of "Extant" above) or Probably Extant (see definition of "Probably Extant" above), or may fall between them.
4	Possibly Extinct	The species was formerly known or thought very likely to occur in the area, but it is most likely now extirpated from the area because habitat loss/other threats are thought likely to have extirpated the species and/or owing to a lack of records in the last 30 years.
5	Extinct	The species was formerly known or thought very likely to occur in the area, but there have been no records in the last 30 years and it is almost certain that the species no longer occurs, and/or habitat loss/other threats have almost certainly extirpated the species.
6	Presence Uncertain	The species was formerly known or thought very likely to occur in the area but it is no longer known whether it still occurs (usually because there have been no recent surveys).

Table 2b: Codes used to record the taxon's origin.

Code	Origin	Definition
1	Native	The species is/was native to the area
2	Reintroduced	The species is/was reintroduced through either direct or indirect human activity.
3	Introduced	The species is/was introduced outside of its historical distribution range through either direct or indirect human activity
4	Vagrant	The species is/was recorded once or sporadically, but it is known not to be native to the area.

5	Origin Uncertain	The species' provenance in an area is not known (it may be native, reintroduced or introduced)

Table 2c: Codes used to record the taxon's seasonality.

Code	Seasonality	Definition
1	Resident	The species is/was known or thought very likely to be resident throughout the year
2	Breeding Season	The species is/was known or thought very likely to occur regularly during the breeding season and to breed.
3	Non-breeding Season	The species is/was known or thought very likely to occur regularly during the non-breeding season. In the Eurasian and North American contexts, this encompasses 'winter'.
4	Passage	The species is/was known or thought very likely to occur regularly during a relatively short period(s) of the year on migration between breeding and non-breeding ranges.
5	Seasonal Occurrence Uncertain	The species is/was present, but it is not known if it is present during part or all of the year.

Table 3: Different combinations of presence, origin and seasonality codes are used to create legends for the final distribution map. The legends are listed in the table below (refer to Tables 2a, 2b and 2c for an explanation of the presence, origin and seasonality codes).

Legend	Presence	Origin	Seasonality
Extant (resident)	1	1	1
Extant (breeding)	1	1	2
Extant (non breeding)	1	1	3
Probably Extant (resident)	2	1	1
Probably Extant (breeding)	2	1	2
Probably Extant (non breeding)	2	1	3
Reintroduced	1 or 2	2	1 or 2 or 3
Introduced	1 or 2	3	1 or 2 or 3
Possibly Extinct	4	1 or 2 or 5	1 or 2 or 3 or 4 or 5
Extinct	5	1 or 2 or 5	1 or 2 or 3 or 4 or 5

Origin Uncertain	1 or 2	5	1 or 2 or 3

Annex 8: IUCN Red List Terms and Conditions of Use

The IUCN Red List Terms and Conditions of Use (version 2.1)

Use of this site constitutes your acceptance of these Terms and Conditions which take effect on the date from which you first use the site.

1. General

This User Agreement sets forth the terms and conditions of a license for you to use The IUCN Red List of Threatened Species™ website (hereafter referred to as "The IUCN Red List") and the data contained within it ("IUCN Red List Data"). For the purposes of this Agreement, IUCN Red List Data comprise all tabular, and all spatial and associated attribute, data contained within The IUCN Red List. By accessing and/or using The IUCN Red List, you have read, consent and agree to comply with all of the Terms and Conditions of this User Agreement. The rights and obligations concerning use of The IUCN Red List in accordance with this User Agreement are personal to you or to members of your household and are not transferable to any other person or entity. From time to time, these terms and conditions of use of The IUCN Red List may be modified. Accordingly, please continue to review the terms and conditions whenever accessing or using The IUCN Red List, since any use by you after any such changes, modifications, or additions shall be governed by this User Agreement.

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places no restrictions on use of the IUCN Red List Categories associated with each named taxonomic entity.

4. No reposting and/or redistribution

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using IUCN Red List Data must be sent, free of charge, to IUCN using the contact details below in section 16.

7. Acknowledgements and citation

The recipient of the data will provide full acknowledgement and citation (which includes reference to the version of the IUCN Red List Data used) in any materials or publications derived in part or in whole from the data; relevant citation (including version) details are provided with each dataset. For any publications making significant use of the data, IUCN and its partners welcome the opportunity for collaboration, and possible co-authorship, and to comment prior to publication. Expressions of interest can be sent directly to IUCN using the contact details below in section 16.

8. IUCN Red List updates

Unless required to do so for specific analyses, you should not use any version of the IUCN Red List Data after it has been superseded by a subsequent version. It is your responsibility to check if an update of The IUCN Red List is available.

9. Feedback and revised information

In order to keep the IUCN Red List Data up to date, IUCN, the Species Survival Commission and IUCN Red List Partner organizations would welcome feedback on the quality, reliability and accuracy of the data. Such contributions should be free of restrictions, and IUCN commits to provide appropriate acknowledgement and credit for any such contributions. The objective is to improve the IUCN Red List Data for the benefit of the global conservation community. For information on providing data to IUCN for updating the IUCN Red List Data, please contact IUCN directly using the contact details below in section 16.

10. Disclaimer on frontiers and national boundaries

The designation of geographical entities on The IUCN Red List do not imply the expression of, or represent, any opinion by IUCN, the Species Survival Commission, or its Partners concerning the legal status of any country, territory or area, or concerning the delimitation of its frontiers or boundaries.

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12. Indemnification

You agree to defend, indemnify and hold IUCN and their affiliates harmless from any and all damages, liabilities, costs and expenses, including attorneys' fees, related to any violation of this Agreement by you or any authorized users of your account.

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This User Agreement shall be governed by general principles of law, to the exclusion of any single national system of law. Any dispute, controversy or claim arising under or pursuant to this User Agreement shall be settled by mutual agreement. If the Parties are unable to reach agreement on any question in dispute, either party shall have the right to request arbitration in accordance with the Arbitration Rules of the United Nations Commission on International Trade Law. The Parties agree to be bound by any arbitration ruling rendered in accordance with the above, as the final adjudication of any such dispute. Nothing contained in or related to this User

Agreement shall be deemed a waiver, express or implied, of the privileges and immunities of IUCN.

15. Miscellaneous

The provisions of this User Agreement shall inure to the benefit of IUCN and its third-party content providers and licensors. No waiver by any party hereto of any of the provisions hereof or of any breach or other default hereunder shall be deemed to be a waiver of any preceding or subsequent breach or default.

16. Contact information

If you have any questions about any of these terms or how they may apply to your intended use of The IUCN Red List and the IUCN Red List Data, please contact the IUCN Global Species Programme Red List unit at:

IUCN Red List Unit
IUCN UK Office, 219c Huntingdon Road
Cambridge CB3 0DL, United Kingdom
Tel: +44 (0)1223 277966
Fax: +44 (0)1223 277845
E-mail: redlist@iucn.org

Annex 9: The IUCN Red List of Threatened Species™ Logo Guidelines

THE IUCN RED LIST OF THREATENED SPECIES LOGO, SCALE AND BUTTON USER GUIDELINES (the "Code of Use") version 2.0

RED LIST LOGO

The shape of the three icons and the proportions between the icons and the words RED LIST cannot be changed. The RED LIST logo colours must be used, Pantone 485 for the three icons and black for the words RED LIST (always in English). The font of the RED LIST script is "Helvetica Neue" 85 Heavy. The use of this logo must be always authorized by the Head, Species Programme who will consult with the SSC Chair.

For the English version of the logo, use the IUCN Red List logo (also referred to as the "logo") together with the trademark **"The IUCN Red List of Threatened Species™"**;

For the French version of the logo, use the IUCN Red List logo together with the trademark **"La liste rouge de l'UICN des espèces menacées™"**; and

For the Spanish version of the logo, use the IUCN Red List logo together with **"La lista roja de la UICN de especies amenazadas™"**.

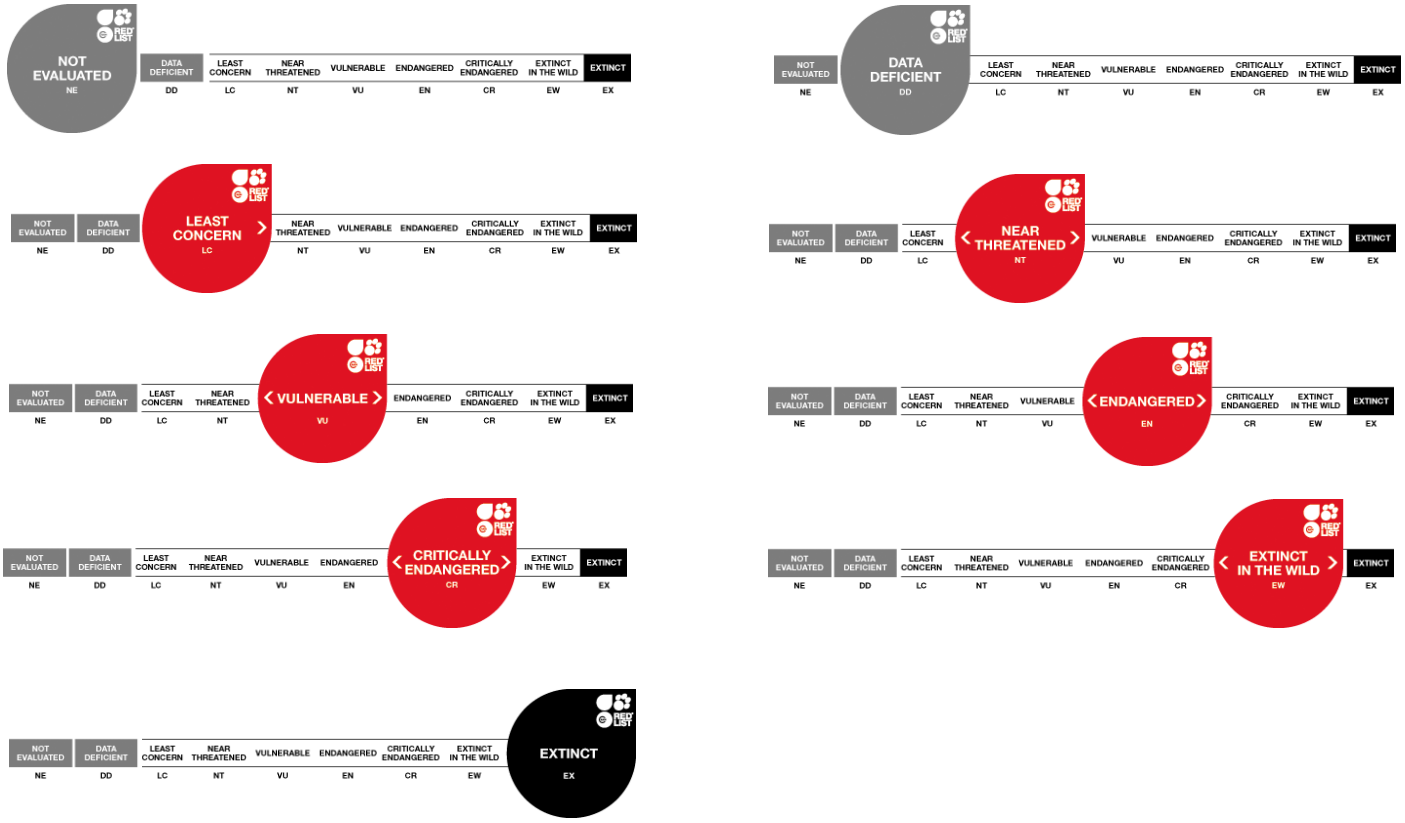
RED LIST SCALE AND BUTTONS

The proportion of the scale and button cannot be changed. Red List logo colours must be used, Pantone 485 for all buttons except “NOT EVALUATED” and “DATA DEFICIENT”, which are to be in 60% black. The scale uses black and 60% black. The font is Helvetica Neue 75 bold.

The Red List scale and individual buttons can only be used in relation to IUCN Red List of Threatened Species threat categories.

The use of the scales and buttons must always be authorized by the Head, Species Programme who will consult with the SSC Chair.

IUCN Red List Scale and buttons



THE CODE OF USE

The Code of Use for The IUCN Red List of Threatened Species™ defines the rules governing the use of the IUCN Red List logo *i.e.* the stylised 3 icons which together with the name Red List comprise the logo, and the use of the IUCN Red List long and short scale and buttons.

The IUCN Global Species Programme has the authority to grant use of the IUCN Red List logo, scales and buttons, to all offices, Commissions, members, partners and Committees of IUCN and the Species Survival Commission and to any third parties having an economic or non-financial relationship with IUCN.

This authorization must always be granted *in writing*, prior to use, and may contain specific terms for such use taking priority if in contradiction with this Code of Use.

The Head, Global Species Programme is the position within IUCN which exercises this authority, and it therefore has the final responsibility for enforcing this Code of Use throughout the world together with IUCN Global Communications. In exercising this authority s/he will consult with the SSC Chair and with the IUCN Red List Committee.

The following may be authorized by the Head, Species Programme to use the IUCN Red List logo, scales and buttons, subject to the provisions of this Code of Use:

1. IUCN Headquarters, Regional and National Offices
2. IUCN Commissions in particular the Species Survival Commission (SSC)
3. IUCN SSC Specialist Groups and individual SSC members
4. IUCN Members
5. IUCN Red List Partners
6. Institutions and Associations involved in Species Conservation
7. Sponsors
8. Private Donors
9. Licensees

All other entities or individuals not listed above shall, with rare exception, be authorized to use the IUCN Red List logo or scales and buttons, under any circumstance.

1. IUCN HEADQUARTERS, REGIONAL AND NATIONAL OFFICES

Whenever the IUCN Headquarters, Regional or National Offices intend to use The IUCN Red List logo, scales and buttons, a request shall be made in writing for authorization to the Head, Global Species Programme before any intended use.

IUCN Headquarters, Regional and National Offices are responsible for monitoring correct use of the IUCN Red List logo, scales and buttons, under their authority and for notifying any improper use to the Head, Global Species Programme.

2. IUCN COMMISSIONS (in particular the Species Survival Commission (SSC))

Whenever an IUCN Commission intends to use the IUCN Red List logo, scales and buttons, it shall make a written request for authorization to the Head, Global Species Programme prior to intended use. Authorization to individual members of an IUCN commission is only granted in special circumstances.

3. IUCN SSC SPECIALIST GROUPS AND IUCN SSC MEMBERS

Whenever an IUCN SSC Specialist Group, Task Force, Stand-alone Red List Authority or Sub-committee intends to use the IUCN Red List logo, scales and buttons, it shall make a prior written request for authorization to the Head, Global Species Programme. In the case of an individual SSC member seeking approval, the request must proceed via the appointed Chair of the Specialist Group, Task Force or Sub-Committee.

4. IUCN MEMBERS

Whenever an IUCN member intends to use the IUCN Red List logo, scales and buttons, it shall make a written request for authorization to the Head, Global Species Programme prior to intended use.

5. IUCN RED LIST PARTNERS

The IUCN Red List Partners may use the IUCN Red List logo, scales and buttons, with the name of its regional or national associations, or without any name at all, without prior authorization from the Head, Global Species Programme, in accordance with the provisions of Art. V.2. of the Red List Partnership Agreement. However, IUCN Red List Partners are required to

notify the Head, Global Species Programme, of any use of the IUCN Red List trademark symbol, logo, scales and buttons, on any product each time it is used.

6. INSTITUTIONS AND ASSOCATIONS INVOLVED IN SPECIES CONSERVATION

Any Institution or Association involved in working on species conservation (including but not limited to zoos, aquariums and botanical gardens), whether IUCN members or not, do not receive the right to use the IUCN Red List logo. The exceptional granting of use of the IUCN Red List logo, scales and buttons, must always be authorized by the Head, Global Species Programme, only after having signed a licensing agreement with the IUCN Global Species Programme.

7. COMPANIES SPONSORING IUCN RED LIST AT IUCN HEADQUARTERS, REGIONAL OR NATIONAL LEVEL

The possible granting of use of the IUCN Red List logo, scales and buttons to sponsors (for a significant event or for general support of IUCN Headquarters, Regional or National Offices) must always be authorized by the Head, Species Programme, subject to precise prior notification by IUCN Headquarters, Regional or National offices regarding the use the business intends to make of the logo, scales and buttons. A company is authorized to use the IUCN Red List logo, scale and buttons, with its own name only after having signed a licensing agreement with the IUCN Species Programme. The precise scope and terms of allowed use must be defined in advance in the licensing agreement. No acquired rights will be acknowledged by IUCN.

A business may state its support (*e.g.* in advertisements) for the IUCN Red List, but, without written agreement of the Head, Species Programme, it may not use the IUCN Red List logo, scales or buttons under any circumstance.

In particular, each time that IUCN Headquarters, Regional or National Offices agree with a sponsor to launch a significant promotional campaign or significant initiative, and if the licensing agreement involves substantial support from the business sponsor, public use of the logo, scales and buttons, (even if accompanied by the national name) must be agreed and authorized in advance by the Head, Species Programme.

8. INDIVIDUAL PRIVATE DONORS

Private donors may publicly state their support to the IUCN Red List, subject to the terms fixed by the Head, Global Species Programme, provided that the

general conditions in this Code of Use are respected. In each case the donor must specify the beneficiary and, without the authorization of the Head, Global Species Programme, may not use the IUCN Red List logo, scales or buttons, regardless of their wording.

9. LICENSEES

The possible granting of use of the IUCN Red List logo, scales or buttons on any company's goods and services must always be authorized by the Head, Global Species Programme, only after having signed a licensing agreement with the IUCN Global Species Programme and committing to payment of the agreed license fee as indicated in the agreement. No acquired rights arising from previous use will be acknowledged by IUCN.

10. THIRD PARTIES

No authorized person or entity is allowed to assign its rights or grant sub-rights to any third party.

11. LOSS OF RIGHT TO USE THE LOGO

The Head, Global Species Programme, in consultation with the SSC Chair and the IUCN Red List Committee, has the power to revoke the right to use the IUCN Red List logo, scale or buttons, of any party previously granted the right to use the logo, scale or buttons, under the provisions of this Code of Use.

The Head, Global Species Programme revokes authorization to use the IUCN Red List logo, scales and buttons, in the following cases:

a. Any individual or association will have its right to use the logo, scales and buttons, revoked if it does not specifically comply with this Code of Use.

b. Any entity either belonging to IUCN or external to it will have its right to use the logo, scales and buttons revoked if it uses the IUCN Red List logo, scales and buttons, to promote activities and ventures which have no connection with the IUCN Red List.

c. Any entity either belonging to IUCN or external to it will have its right to use the IUCN Red List logo, scales and buttons, revoked if it uses the IUCN Red List logo, scales and buttons, to promote species lists which have not been compiled in strict accordance with the current issue of the IUCN Red List Categories and Criteria.

d. Any entity either belonging to IUCN or external to it will have its right to use the logo, scales and buttons, revoked if it uses the IUCN Red List logo, scales and buttons, to categorize a species if it has not been submitted and accepted for inclusion in the IUCN Red List of Threatened Species.

e. Any entity either belonging to IUCN or external to it, will have its right to use the logo, scales and buttons revoked if it uses the IUCN Red List logo, scales and buttons in the event of authorization being refused.

If the Head, Global Species Programme revokes authorization to use the logo, scales and buttons it must provide written notification (by recorded delivery letter, fax or email). In any case, the decision of the Head, Global Species Programme is final.

For all enquiries regarding the authorization, and the use of the IUCN Red List logo, scales and buttons, please send an email to redlist@iucn.org.

Annex 10: Glossary to the IUCN Red List Partnership Agreement

IUCN Global Species Programme (GSP): The programme in the IUCN Secretariat (whose name may be amended from time to time by the IUCN Director General) that supports the activities of the IUCN Species Survival Commission (SSC) and its constituent Specialist Groups, and maintains and manages The IUCN Red List of Threatened Species ™, including implementing global species conservation initiatives to assess the status of species for the IUCN Red List. The IUCN Red List Unit is part of the Global Species Programme.

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Reposting: Publishing the IUCN Red List Data in a largely unmodified form, in whole or in part, alone or combined with other data, by any means including (but not limited to) electronic formats such a website or internet posting. If the data reposted are also made available for download, then the act of downloading falls under Redistribution.

Red List Authority: a group of experts appointed by the Chair of the IUCN Species Survival Commission to carry out the pre-assessment, assessment and review functions (as outlined in Annex 3 of the Agreement) for a defined group of species.

Red List Authority Coordinator: the primary person, appointed by the Chair of the IUCN Species Survival Commission, responsible for providing leadership of the Red List Authority and for establishing mechanisms for assessing and re-assessing the species within the RLAs remit.

Red List Committee: the governance body of The IUCN Red List, comprising representatives of the IUCN Secretariat, the SSC and the Red List Partners, and charged with providing oversight of the implementation of The IUCN Red List Strategic Plan, making strategic decisions and taking actions to enhance the implementation of The IUCN Red List.

Red List Partner: Any organization, who has been accepted by IUCN as Red List Partner and has signed "The IUCN Red List of Threatened Species Partnership Agreement" with IUCN

Species Information Service (SIS) database: The database primarily developed and owned by IUCN and containing The IUCN Red List Data.

The IUCN Red List of Threatened Species™ **or The IUCN Red List:** a registered trademark of IUCN comprising the Species Information Service database, the *IUCN Red List of Threatened Species* Data and the *IUCN Red List of Threatened Species* Website..

The IUCN Red List of Threatened Species™ **data (IUCN Red List data):** The species data compiled by the IUCN Global Species Programme and SSC and/or provided to IUCN by the Red List Partners and other third-parties, subject to any conditions of use as may be agreed by IUCN and the Red List Partners, which are compiled and contained in the Species Information Service database.

The IUCN Red List of Threatened Species™ **logo:** the logo associated with the *IUCN Red List of Threatened Species™* and for which the copyright is held by IUCN.

The IUCN Red List of Threatened Species™ **website (IUCN Red List website):** The platform on the World Wide Web through which the *IUCN Red List of Threatened Species™* Data are made electronically available, underpinned by the Species Information Service Database.

The IUCN Red List Index **(RLI):** an indicator of the aggregate rate at which all species in a given taxonomic group are moving towards extinction. Derivation requires extracting only those changes in IUCN Red List category between assessments that are caused by genuine increases or decreases in extinction risk, while those caused by changing knowledge or revised taxonomy are discounted.

The IUCN Red List Strategic Plan**:** The four-year plan agreed by the Red List Committee that establishes the priorities for the Red List Partners, the Secretariat and the SSC, and which forms the Red List subset of the broader IUCN Species Strategic Plan.

Third-party rights: Any rights, including without limitation copyright and other intellectual property or proprietary rights, that any party other than the Parties to this Agreement has or may have in the species data comprising the The IUCN Red List data.

Annex 11: Guidelines for Appropriate Uses of Red List Data

GUIDELINES FOR APPROPRIATE USES OF IUCN RED LIST DATA

Incorporating, as Annexes, the 1) Guidelines for Reporting on Proportion Threatened (ver. 1.1); 2) Guidelines on Scientific Collecting of Threatened Species (ver. 1.0); and 3) Guidelines for the Appropriate Use of the IUCN Red List by Business (ver. 1.0)

Version 3.0 (October 2016)

Citation: IUCN. 2016. Guidelines for appropriate uses of IUCN Red List Data. Incorporating, as Annexes, the Guidelines for Reporting on Proportion Threatened, Guidelines on Scientific Collecting of Threatened Species, and Guidelines for the Appropriate Use of the IUCN Red List by Business. Version 3. Adopted by the IUCN Red List Committee.

GUIDELINES FOR APPROPRIATE USES OF RED LIST DATA

The IUCN Red List of Threatened Species™ is the world's most comprehensive data resource on the status of species, containing information and status assessments on over 80,000 species of animals, plants and fungi. As well as measuring the extinction risk faced by each species, the IUCN Red List includes detailed species-specific information on distribution, threats, conservation measures, and other relevant factors. The IUCN Red List of Threatened Species™ is increasingly used by scientists, governments, NGOs, businesses, and civil society for a wide variety of purposes.

These Guidelines are designed to encourage and facilitate the use of IUCN Red List data and information to tackle a broad range of important conservation issues. These Guidelines give a brief introduction to *The IUCN Red List of Threatened Species*™ (hereafter called the IUCN Red List), the Red List Categories and Criteria, and the Red List Assessment process, followed by some key facts that all Red List users need to know to maximally take advantage of this resource. More detailed information on the IUCN Red List is available, and references are provided at the end of this document. Finally, these Guidelines include a table giving examples of the wide variety of uses to which IUCN Red List data and information can be utilized, and outlining a few common errors and pitfalls to avoid.

The IUCN Red List of Threatened Species™

The IUCN Red List is jointly developed and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission and the IUCN Red List Partnership. The Red List partners are Arizona State University, BirdLife International, Botanic Gardens Conservation International, Conservation International, NatureServe, Royal Botanic Gardens Kew, Sapienza University of Rome, Texas A&M University, and Zoological Society of London. The IUCN Red List is a searchable online database (www.iucnredlist.org), and users can register to freely download data provided this is for non-commercial use only and in accordance with the IUCN Red List Terms and Conditions of Use.

The IUCN Red List Assessment Process

The IUCN Red List draws on contributions from a network of thousands of scientific experts around the world both within the IUCN community and beyond -- including universities, museums, and NGOs. It uses a scientific process based upon objective criteria. Assessments are impartial, independent, and not politically driven. This

approach allows for a robust and rigorous peer review process of all incoming data. Only after the data have been through a transparent and thorough process of peer review, are they added to the database. Assessments are periodically updated to ensure current information is available for users. The IUCN Red List is therefore a synthesis of the best available species knowledge from the top experts.

The IUCN Red List Categories and Criteria

The IUCN Red List Categories and Criteria are the world's most widely used system for gauging the extinction risk faced by species. Each species assessed is assigned to one of eight different Categories (Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable, Near Threatened and Data Deficient), based on a series of quantitative Criteria (http://www.iucnredlist.org/info/categories_criteria2001). Species classified as Vulnerable, Endangered and Critically Endangered are regarded as 'threatened'. The IUCN Red List Criteria were developed following extensive consultation and testing with experts familiar with all kinds of different species from all over the world, and it can be used to assess any species (apart from microorganisms).

The IUCN Red List of Threatened Species™ – the key facts:

1. The IUCN Red List is much more than just a list – the Red List database includes information on population size and trends, distribution, ecology and habitat preferences, utilization, threats, and conservation measures in place and needed. For an increasingly large number of species on the IUCN Red List, spatial distribution maps (in digital format) are freely available.

2. The IUCN Red List includes more than threatened species and not all threatened species have been assessed; the IUCN Red List provides the threat status of the assessed species and therefore includes information on both threatened and non-threatened species.

3. The sample of species on the IUCN Red List are representative of the state of biodiversity, though not all species have been assessed:
   a. Between 1.4 – 1.8 million species have been described, yet the estimates of the total number of species on earth range from 2 – 100 million. We are far from knowing the true status of the entire earth's biodiversity.
   b. There are 82,845 species assessed for inclusion on IUCN Red List version 2016.1.

c. This total includes, among others, all known birds, amphibians, mammals, reef-building corals, freshwater crustaceans, sharks and rays, mangroves, seagrasses, cacti, conifers and cycads.
d. Only a relatively small proportion of plants, invertebrates, and freshwater and marine species have been assessed to date.

4. IUCN Red List Categories are broad – one Vulnerable species isn't necessarily identical in status to another Vulnerable species. A species can decline (or improve) in status without necessarily changing its Red List Category.

5. Even if species assessments are done using the best available knowledge at the time, species may undergo non-genuine changes in categories across assessment periods for several reasons, including change in taxonomy and the availability of improved knowledge. – Thus, a change in extinction risk between any two assessment periods does not necessarily mean the extinction risk of the species has genuinely changed.

6. The status of a species may be different at the global level and at the local level. In certain situations, a species may be listed as threatened on a national Red List even though it is considered Least Concern at the global level on the IUCN Red List.

7. The Red List Criteria were developed for large-scale assessments; they can be applied to broad-scale regional assessments, but by itself may not be appropriate at very small scales (for more information see the Red List Guidelines (http://www.iucnredlist.org/documents/RedListGuidelines.pdf and Regional Red List Guidelines http://www.iucnredlist.org/documents/reg_guidelines_en.pdf).

8. The IUCN Red List of Threatened Species™ is not, on its own, a system for setting conservation priorities. Red List assessments simply measure the relative extinction risk faced by species, subspecies, or subpopulations. To set conservation priorities, additional information must be taken into account.

9. Many Red List assessments include spatial distribution maps. However, these maps generally show current known limits of distribution of a species, accounting for all known, inferred or projected sites of occurrence, including conservation translocations outside native habitat, within historical range. Within these ranges, species may be variably present or absent. Hence, for the purpose of site-based analyses, more detailed information on confirmed presence, such as Key Biodiversity Areas, should be consulted.

10. Red List assessments and criteria for each species reflect the best data available. However, it must be noted that there is a time lag between the collection of data and inclusion of the status of a species on the Red List. Therefore the information on the Red List refers to the time at which supporting data were gathered and not at the time it was published on the Red List.

The IUCN Red List of Threatened Species™ – appropriate and inappropriate uses

The following table gives an indication of the wide variety of uses to which the IUCN Red List (and data contained therein) can be utilized. Some examples of inappropriate applications are also given so that users of these data do not expend unnecessary resources on analyses that may prove to be counterproductive in the conservation arena – these examples should be taken as indicative rather than exhaustive.

Types of Use	Appropriate Uses	Inappropriate Uses
Policy and Legislation		
International/national/sub-national legislation and policy.	Informing the development of: • National/regional/sub-national threatened species lists • National Biodiversity Strategies and Action Plans. Using the IUCN Red List Index to determine genuine changes in species status over time.	Automatically linking a legislative response to the inclusion of a species in a particular Red List Category e.g., enacting national law banning all trade of any species that is listed as threatened. Well-regulated trade can contribute positively to the conservation of some threatened species, and may be essential for human livelihoods. For information on IUCN's guidelines on scientific collecting of threatened species see Annex 2.
International agreements.	Guiding or informing decisions in international conventions, including: • Convention on Biological Diversity (CBD) • Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) • Ramsar Convention on Wetlands • Convention on the Conservation of Migratory Species of Wild Animals (CMS), including the various CMS Regional Agreements • Fisheries agreements	Automatically including threatened species on lists without considering the underlying cause of the threat and other relevant factors e.g., including a threatened species on a CITES Appendix when it is not threatened by international trade and does not resemble any species that is threatened by international trade.
Development Planning and Environmental Review		
Regional and national resource management and	Guiding the management of natural resources at scales	Relying solely on the global Red List status for

development.	ranging from local to national development policies and legislation (e.g., in the areas of land-use planning, certification, transport, energy, river-basin management, poverty reduction strategies).	local planning (e.g., developing a harvest plan for a local plant population based solely on the global Red List status).
Site-level planning and Environmental Impact Assessment.	Guiding the site level evaluation, the Red List is a key input for an EIA. Evaluating the possible effects of large-scale, infrastructure development initiatives or assessing project impacts at site level.	Relying solely on Red List information without incorporating site level information e.g. assuming a site can be developed because, according to Red List maps, no threatened species appear to be present. The IUCN Red List can provide broad context, but cannot replace targeted site level investigations.

Conservation Planning		
Informing conservation action for individual species.	Using Red List data (including information on habitat requirements, threats that need to be addressed, conservation actions that are recommended, etc.) to identify species that require specific conservation action, and to help determine the conservation measures that are needed.	Relying solely on the Red List Category without incorporating supporting information and/or additional relevant data sources.
Geographic priority setting: site-level, landscape/seascape level; and global level.	Determining site-scale conservation priorities, such as Important Bird Areas, Important Plant Areas, Key Biodiversity Areas, and Alliance for Zero Extinction Sites, which can be used to inform protected areas gap analyses. Informing the conservation of wide-ranging species, and species threatened by broad-scale ecological processes, such as water quality.	Misinterpreting range map information presented on the IUCN Red List. It is important to be aware that IUCN Red List maps show species distribution on a broad scale – at the site level they provide a good indication of which species may be present, but this information needs to be verified through site surveys.

	Informing the identification of global priorities, e.g., Endemic Bird Areas, biodiversity hotspots, etc. Setting geographical priorities for conservation funding, e.g. Global Environment Facility System for Transparent Allocation of Resources (STAR) for country allocations.	It is always important to remember that not all species have been assessed.

Monitoring and Evaluation		
Evaluating the state of biodiversity and monitoring changes in the state of biodiversity. Measuring the effectiveness and impact of conservation activities.	Answering important questions regarding the state of biodiversity, including: the overall status of biodiversity; the varying status of biodiversity between regions, countries and sub-national areas; the rate at which biodiversity is being lost; where biodiversity is being lost most rapidly; and the main drivers of decline and loss of biodiversity. A useful tool for tracking changes in species status over time is the IUCN Red List Index.	Assuming that the IUCN Red List provides a comprehensive picture of all the species that are threatened. So far, only some groups of species have been comprehensively assessed. It is important to recognize that species may change in Red List Category just because better information has become available; a category change does not necessarily mean that the species' status has changed.
Documenting extinction.	Determining extinction rates across globally and comprehensively assessed species groups.	Assuming that the number of Extinct and Extinct in the Wild species on the IUCN Red List represents a comprehensive global list of extinctions. Many extinctions go undocumented, and many species may have gone extinct before they could be formally described. Also, many extinctions took place

		before 1500 AD, the date from which extinctions are recorded on the IUCN Red List.

Scientific Research		
Informing species-specific survey work and ecological studies.	Using data gaps identified in the assessment process (e.g., Data Deficient (DD) species or known data gaps for threatened species) to guide research and funding opportunities.	
Informing survey work and research into threatening processes across multiple species.	Using Red List data to highlight general overarching threatening processes, including emerging threats.	

Education, Communication and Awareness-raising		
Education.	Informing academic work (e.g., school home-work assignments, undergraduate essays and dissertations, etc.).	
Media.	Promoting knowledge of the state of biodiversity, species-conservation issues, species at risk, etc.	
Fund-raising.	Providing a solid factual basis for funding proposals to engage in meaningful conservation work.	

Sources for additional information:

- IUCN Red List Categories and Criteria
- RLI documents
- Red List Guidelines
- Regional Red List Guidelines

Annex 1

Guidelines for Reporting on Proportion Threatened (Version 1.1) [7]

The uncertainty introduced by Data Deficient species

The true levels of threat we report for the taxa we assess are imperfectly known, because in most groups many species are categorized as Data Deficient (DD), meaning that there is insufficient information currently available to assess their risk of extinction. The uncertainty over the degree of threat to DD species introduces uncertainty to estimates of the proportion of species threatened in the group as a whole. One might expect a high proportion of DD species to be Least Concern (LC) in reality, given that if threats can be inferred from contextual information, this information should be used in assessments (often leading to a non-LC non-DD listing). On the other hand, given that many DD species are likely to have small ranges they might be expected to have an elevated risk of extinction.

Examining the fate of species formerly classified as DD and subsequently re-categorized in a category of threat provides some insight. Among birds, for example, 37 of 58 (64%) DD species that have been re-evaluated over time have been classified as LC or Near Threatened (NT), three (5%) were re-categorized as Endangered (EN), eight (14%) as Vulnerable (VU), with 10 (17%) no longer recognized due to taxonomic revision (Butchart and Bird 2010). Using all the available information on known records, contextual information on habitat condition and plausible threats, and inferences from congeners, Butchart and Bird (2010) posited that of the 63 current DD bird species, three (5%) are likely to prove to be hybrids, subspecies or taxonomically invalid, nine (14%) may be threatened, and 51 (81%) not threatened (NT or LC). In other words, in birds, DD species appear to very roughly have the same fraction of threatened species as data sufficient (i.e., non-DD) species.

However, it is not immediately evident whether this trend will hold in other taxa, particularly in groups with high discovery rates from regions experiencing high threat. Unfortunately, there is currently limited information available to assess this trend in other taxa. However, a reassessment of South African DD amphibians resulted in the

[7] These guidelines apply to taxa that have been completely assessed, or assessed by means of a random sampling approach (Baillie *et al*. 2008). It is not appropriate to report on proportion of species threatened in groups that have not been completely or randomly assessed.

reclassification of seven (of a total of eight) species classified as DD in 2004 into other categories: 4 (57%) were assessed as LC, 1 (14%) as NT and 2 (29%) as VU, again roughly the same fraction of threatened species as data sufficient species.

As a result of the uncertainty that Data Deficient species introduce to estimates of proportions of species threatened, we have generally reported three values (not always publicly, but certainly in publications), as follows:

- Lower bound: percentage of threatened species among all species assessed, including Extinct and Extinct in the Wild, i.e., number of threatened species divided by the total number of species assessed [(CR+EN+VU) / Assessed]. This corresponds to the assumption that none of the Data Deficient species is threatened. This may be an intuitive measure for some, but more than likely underestimates risk of extinction.

- Mid-point: percentage of threatened species among those for which threat status could be determined, i.e., number of threatened species divided by the number of data sufficient species[8] [(CR+EN+VU) / (Assessed-DD)]. This corresponds to the assumption that Data Deficient species have the same fraction of threatened species as data sufficient species. This represents a best estimate, and demonstrates that the true value lies somewhere between the upper and lower bound.

- Upper bound: percentage of threatened or Data Deficient species among those assessed, i.e., number of threatened species plus Data Deficient species, divided by the total number of species assessed [(CR+EN+VU+DD) / Assessed]. This corresponds to the assumption that all of the Data Deficient species are threatened. This is the most pessimistic estimate of extinction risk.

So, for example, based on groups that have been completely assessed, degree of uncertainty regarding the true level of threat is greatest in cartilaginous fishes (range=17-64%; mid-point=33%) and freshwater brachyurans (range=16-65%; mid-point=31%) and least in birds (range=12-13%; mid-point=12%).

Reporting proportion threatened

[8] Where “data sufficient” species equates to all non-DD species.

For academic purposes, we recommend reporting the lower bound, mid-point, and upper bound estimates, with the emphasis (e.g., in the abstract or conclusions) placed on the mid-point value as the main result, provided that this distinction is made clear and qualified (e.g., Schipper *et al*. 2008; Hoffmann *et al*. 2010[9]). Note further that Extinct (EX) species should now be excluded from all calculations of proportion of species threatened (but NOT Extinct in the Wild, which can be downlisted). In other words, revised formulas for calculating the lower, mid- and upper bounds are:

Lower bound: (CR+EN+VU) / (assessed – EX)

Mid-point: (CR+EN+VU) / (assessed – EX – DD)

Upper bound: (CR+EN+VU+DD) / (assessed – EX)

For communication purposes, it is appropriate to report the mid-point figure ("*xx% of extant species for which sufficient data are available are threatened"*) as the best estimate of extinction risk. Its underlying assumption that DD species are equally threatened as data sufficient species appears to be roughly borne out by available evidence from reassessed taxa, although this requires further investigation and may not necessarily hold true. It is essential to specify, in 'notes to editors', the mid-point figure, with the lower and upper bound figures as a range; for example, "*xx% of extant species are threatened, although the precise figure is uncertain and could lie between xx% (if all DD species are not threatened) and xx% (if all DD species are threatened)".* Reporting proportions as fractions (e.g., one in three or one-quarter) is acceptable, provided that fractions are calculated according to the preceding guidance and using the same proposed language (e.g., *two in five extant amphibians for which sufficient data are available are threatened*).

Emphasis always should be on reporting the proportion "threatened", but it may be appropriate to report the proportion of "species of elevated conservation concern" where this is defined as (EW+CR+EN+VU+NT) / (assessed – DD). Use of the terminology "elevated risk of extinction" should be avoided.

[9] Both of these papers contain detailed explanations in their Supplementary Online Material regarding the practice of citing a mid-point estimate framed by a lower and upper bound. Either may, therefore, be used by way of explanation to academic editors of manuscripts who may be unfamiliar with the practice.

Guidelines on reporting extinctions

In addition to reporting the proportion of species in a clade or taxonomic group threatened with extinction, it may also be appropriate to report the number of species documented as being formally Extinct and Extinct in the Wild. For example, "*in addition, xx species are known to have become Extinct since 1500, while yy survive only in captivity and are classified as Extinct in the Wild*". However, according to the IUCN Guidelines for Using the IUCN Red List Categories and Criteria, "*an evidentiary approach to classifying extinctions is appropriate in order to encourage continuing conservation efforts until there is no reasonable doubt that the last individual of a species has died. However, if assessments of EX or EW are too evidentiary, then extinction rates based on the Red List are likely to be under-estimated. To avoid this bias, it is necessary to include 'possibly extinct' species in estimates of numbers of extinct taxa…*" Critically Endangered species tagged as Possibly Extinct (or Possibly Extinct in the Wild) are those considered likely to be extinct, but for which there remains some reasonable doubt that the last individual (in the wild) has died (Butchart *et al*. 2006). For this reason, we strongly encourage reporting both the confirmed documented number of extinctions as well as the number of species flagged as Possibly Extinct or Possibly Extinct in the Wild (for example, " *in addition, xx species are known (y species) or considered likely (z species) to have become Extinct since 1500, while yy are known or considered likely to survive only in captivity.*

A note on use of the term Red Listed

The use of the term "red-listed" is discouraged owing to ambiguity as to whether this includes Least Concern species or not, given that species assessed as Least Concern are included on the IUCN Red List. To refer to a set of species all of which have assessments on the IUCN Red List, the phrase "assessed for the IUCN Red List" can be used. To refer to threatened (i.e. Critically Endangered, Endangered and Vulnerable) plus Extinct in the Wild and Near Threatened species collectively, the phrase "species of elevated conservation concern" may be used

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Annex 2

Guidelines on the Implementation of the "IUCN Policy Statement on Research Involving Species at Risk of Extinction"[10], with special reference to Scientific Collecting of Threatened Species (Version 1.0)

The IUCN Policy Statement on Research Involving Species at Risk of Extinction[11] *was approved at the 27th Meeting of IUCN Council, June 1989, and encourages basic and applied research on threatened species that contributes to the likelihood of their survival.*

The current guidelines were called for in Resolution 3.013 "The Uses of the IUCN Red List of Threatened Species" of the 3rd World Conservation Congress in Bangkok in 2004, and Resolution 4.015 "Guidelines regarding research and scientific collecting of threatened species" of the 4th World Conservation Congress in Barcelona in 2008. These motions were tabled in response to an awareness that a) some governments are prohibiting the scientific collection of species included in the IUCN Red List and which may, in turn, be detrimental to the conservation of those particular species; and b) that many scientists are increasingly reluctant to provide data to the Red List process, due to the risk that the listing of a species in one of the threat categories will, in some cases, lead to government restrictions on scientific collecting or a requirement for expensive research permits. The current guidelines are, therefore, intended to better guide the development and implementation of legislation in response to the listing of a species by IUCN in a threatened category. They are also intended to promote responsible collecting of threatened species by researchers. These guidelines do not address the specific issue of taking live individuals (both whole organisms and 'living tissues') from the wild for maintenance in ex-situ collections[12]*.*

The guidelines focus solely on scientific collecting of threatened species (recognizing that such collecting is seldom the cause of the species becoming threatened in the first instance), and are not intended to represent comprehensive IUCN guidelines on the complex topic of collecting in general. These guidelines are developed mindful of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, *adopted by the Conference of the Parties to the Convention on Biological*

[10] http://intranet.iucn.org/webfiles/doc/SSC/SSCwebsite/Policy_statements/IUCN_Policy_Statement_on_Research_Involving_Species_at_Risk_of_Extinction.pdf
[11] http://intranet.iucn.org/webfiles/doc/SSC/SSCwebsite/Policy_statements/IUCN_Policy_Statement_on_Research_Involving_Species_at_Risk_of_Extinction.pdf
[12] A process is currently underway to revise the current IUCN Technical guidelines on the management of ex situ populations for conservation (http://intranet.iucn.org/webfiles/doc/SSC/SSCwebsite/Policy_statements/IUCN_Technical_Guidelines_on_the_Management_of_Ex_situ_populations_for_Conservation.pdf)

Diversity at its tenth meeting on 29 October 2010 in Nagoya, Japan[13]. All scientific collecting should take place in accordance with the provisions of the Nagoya Protocol.

[13] http://www.cbd.int/abs/

The IUCN Species Survival Commission recommends that:

1. **Research and threatened species.** In the spirit of the *IUCN Policy Statement on Research Involving Species at Risk of Extinction* (IUCN, 1989), governments and research institutions should encourage and facilitate research on globally threatened species by competent scientists to enhance understanding of the natural history and conservation needs of these species. Successful conservation programmes focusing on globally threatened species will normally need to be fully integrated with dedicated research programmes on these species, ideally led by scientists from the country or countries where the species occurs. In some cases, such research may require the collection of scientific specimens.

2. **Legislative procedures.** Blanket prohibitions on research and the collection (including lethal collection) of scientific specimens of globally threatened species can hinder conservation efforts, and it is recommended that governments should avoid imposing them unless essential. Although careful review of any scientific research application is important, complex or time-consuming procedures for issuing research, collecting and (in the case of specimens moving across international borders) export / import[14] permits may discourage the implementation of such research. Permit-issuing agencies should attach high priority to the timely review of applications related to threatened species. Where appropriate, SSC encourages involving the national conservation community in an advisory role for permit decisions. Conversely, scientists should be aware that many permit-issuing agencies have very limited capacity and resources, and so applicants should understand the process for issuing permits and apply in a timely manner.

3. **Non-lethal collecting.** Much modern research involves analysis of material collected non-lethally from animals, plants and fungi, including body fluids, faeces, hair, feathers, scales, seeds, roots, and leaves. Governments are encouraged to minimize the administrative burden involved in the issuing of permits for non-lethal samples of species that IUCN has listed as threatened.

4. **Responsible collecting.** Scientists working on globally threatened species should act responsibly to ensure that their research is either directed towards enhancing the conservation status of the species that they are studying, or providing important information that will assist in the conservation of the species. They should ensure that:

[14] Including export, re-export, import and introduction from the sea

(a) the material they need is not already available in museum or other institutional collections;

(b) they do not collect more than the minimum number of specimens necessary for the accomplishment of their research;

(c) they use non-lethal sampling methods instead of lethal collecting when the research objectives allow this, and employ preferential collection of post-reproductive individuals (or the life stage with the least reproductive value) when lethal collection is essential for enhancing the survival prospects of the species;

(d) they place all specimens collected in institutions where they can be preserved in perpetuity and be made available to other scientists, thus limiting the need for further collections; and

(e) they submit copies of reports and publications based on their research in a timely manner to permit-issuing agencies.

Several professional societies produce and regularly update guidelines regarding the use and treatment of wild species in research[15], including scientific collecting, and scientists should consult and comply with these guidelines (and, obviously, any collecting must be in full accordance with the laws and regulations of the country, state, or province where the collecting is being conducted).

5. **Small populations.** In the case of species listed as Vulnerable under criterion D1 (less than 1,000 mature individuals and stable), or Endangered under criterion C (less than 2,500 mature individuals and declining), scientists should provide evidence to permit-issuing agencies that the number of specimens that they wish to collect lethally is very unlikely to increase the risk of extinction of the species in question, and that the research proposed is essential for assisting in the conservation of the species.

6. **Very small populations.** In the case of species listed as Critically Endangered under criteria C or D, and as Endangered under criterion D (in all these cases there are less than 250 mature individuals), the lethal collection of scientific specimens (i.e. collections that involve killing of wild individuals within the population) should not

[15] For example, the "Guidelines of the American Society of Mammalogists for the use of wild mammals in research" (http://www.mammalsociety.org/uploads/Sikes%20et%20al%202011.pdf), the "Guidelines for use of live amphibians and reptiles in field and laboratory research" (http://www.asih.org/files/hacc-final.pdf) of the American Society of Ichthyologists and Herpetologists, and the Marine Mammal Society's "Guidelines for the treatment of marine mammals in field research" (http://onlinelibrary.wiley.com/doi/10.1111/j.1748-7692.2008.00279.x/pdf)

normally take place, and should only be permitted when it is clear that the research proposed is demonstrably essential for enhancing the survival prospects of the species.

7. **Considerations for species with small populations**. In issuing permits for the lethal scientific collection of species listed as Vulnerable under criterion D1, or as Endangered and / or Critically Endangered under criteria C or D, permit-issuing agencies should take into account the cumulative effects of scientific collecting within a generation of the species in question. If a permit has been granted for the lethal collection of scientific material from a threatened species, the results from that study should preferably be considered before issuing further collection permits for that species.

8. **CITES**. Finally, in instances where scientific collecting of threatened species involves the movement of specimens across international borders, IUCN State members and others are encouraged to make full use of the provisions agreed by CITES Parties to regulate and, where appropriate, facilitate the movement of specimens used in scientific research[16].

[16] Most cross-border movements of CITES-listed specimens will be for purposes which are not primarily commercial in nature. The purpose codes 'G' - Botanical gardens or 'S' – Scientific are likely to be used on CITES permits. Therefore, provided that the specimens have been legally acquired and that the Scientific Authority of the State of export has advised that their export will not be detrimental to the survival of the species, even Appendix I listed species can be imported and exported for scientific purposes. In addition, in the case of the non-commercial loan, donation or exchange of herbarium specimens, other preserved, dried or embedded museum specimens, and live plant material, the text of CITES provides a specific exemption from the CITES standard permitting requirements. Such specimens must be transferred between scientists or scientific institutions registered by a CITES Management Authority of their State and carry a label issued or approved by that Management Authority to be able to benefit from this exemption. The CITES Parties have adopted a resolution on this issue [Resolution Conf. 11.15 (Rev. CoP12)], which encourages scientific research on wild fauna and flora, where it may be of use in conserving species that are threatened with extinction or that may become so, but considers that museum needs for research specimens can also have an adverse impact on small populations of rare animals and plants. The Resolution also contains some standards for scientific institutions which may qualify for registration.

In other Resolutions, CITES Parties have also recommended that, even where entry into trade might otherwise have been considered detrimental to the survival of the species in the wild, international trade in salvaged specimens of Appendix-I and Appendix-II plants be permitted where all of the following conditions are met:

i) such trade would clearly enhance the survival of the species, albeit not in the wild;
ii) import is for the purposes of care and propagation of the species; and
iii) import is by bona fide botanic garden or scientific institution.

Furthermore, the CITES Parties have agreed on the expedited processing of permits and certificates for trade in certain biological samples, where such trade will have a negligible impact, or none, on the conservation of the species concerned, and, the purpose of the transaction is, inter alia, in the interest of the conservation of the species concerned or other species listed in the Appendices. Full details of this provision can be found in Section XII and Annex 4 of Resolution Conf. 12.3 (Rev. CoP13) on Permits and certificates.

Annex 3

Guidelines for the Appropriate Use of the IUCN Red List by Business (Version 1.0)

This guidance summarises how the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (hereafter, the IUCN Red List; www.iucnredlist.org) can help inform business decision-making. It is aimed at environmental managers, consultants, NGOs and regulatory bodies working in all sectors of industry and in finance. The guidance outlines key applications of Red List information, including impact assessment and mitigation planning, and how common pitfalls can be avoided.

I. What is the IUCN Red List?

The primary purpose of the IUCN Red List is to catalogue and highlight species that face global extinction risk. However, despite its name, the IUCN Red List of Threatened Species doesn't only include threatened species, but also information on non-threatened species. Currently, the Red List provides assessments of extinction risk for over 80,000 individual species. A Red List assessment uses objective criteria to place each species into one of eight IUCN Red List Categories. The Red List criteria use information such as global population size, rate of population decline, area of geographic distribution, and distribution fragmentation (IUCN 2012).

The Red List Categories (Figure 1) are:

Extinct – no known individuals remaining;

Extinct in the Wild – known only to survive in captivity, or as a naturalized population outside its historic range;

Critically Endangered (CR) – extremely high risk of extinction in the wild

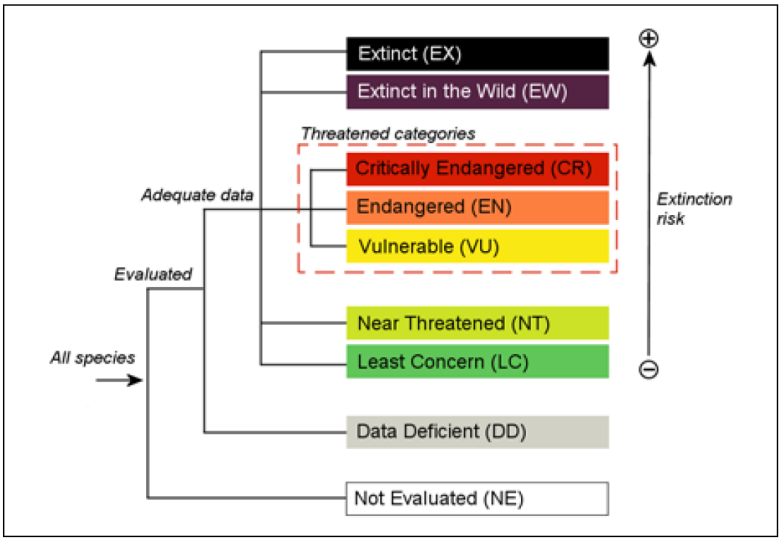
Endangered (EN) – high risk of extinction in the wild

Vulnerable (VU) – medium risk of extinction in the wild;

Near Threatened (NT) – likely to become threatened in the near future;

Least Concern (LC) – lowest risk (but note that many such species may still be declining);

Data Deficient (DD) – not enough data to make an assessment of its risk of extinction.



Red List assessments include a rationale summarising the assessment, the Red List Category, and supporting data (which may be quite extensive in some cases, less so in others) on species' population size and trend, distribution, habitat preferences, threats and conservation actions in place or needed.

The Red List draws on a global expert network (>10,000 experts) for information, assessment, and review. This includes the IUCN Species Survival Commission and a suite of Red List Partner organisations, co-ordinated by the Red List Unit in the IUCN Secretariat. The individuals or organizations involved in this process are named in the assessment documentation. The Red List website is updated several times per year, with both new assessments as well as with updates to some existing assessments.

The Red List is thus much more than a list of species and threat status. It is an important mechanism for compiling, synthesising, disseminating and updating species-related data.

The Red List is one of a suite of inter-related biodiversity knowledge products that are compiled by a broad range of partners and collaborators, and delivered through IUCN. These also include the Red List of Ecosystems, Protected Planet (powered by the World Database on Protected Areas) and Key Biodiversity Areas (see Appendix I).

II. Accessing the IUCN Red List

The full set of Red List data including species distribution maps can be accessed for commercial use through the Integrated Biodiversity Assessment Tool (IBAT - https://www.ibatforbusiness.org/). Note that full acknowledgement and citation (including reference to the version of the IUCN Red List Data used) should be provided; relevant citation details are provided with each dataset.

In addition to the global IUCN Red List, many national and regional Red Lists exist. IUCN has developed guidelines for undertaking species assessments at a sub-global scale. However, national and regional Red List processes are not overseen by IUCN, may or may not follow the IUCN guidelines or even the IUCN Categories and Criteria, and may or may not include or require the same minimum documentation standards as those on the global IUCN Red List. Many national/regional Red Lists are available on the website of the National Red List working group (http://www.nationalredlist.org/) or on the Red List website (http://www.iucnredlist.org/about/links#National_Regional_Red_Lists). See Section V for caveats in using information from national/regional Red Lists.

III. Using the IUCN Red List

The IUCN Red List is a key dataset for informing business decisions and reporting, related to biodiversity management.

The Red List can be used to provide information on potential risks and opportunities including:

- **Project-level decision-making** and priority setting (for projects that may impact biodiversity) including screening for potential presence of threatened species, impact avoidance design, baseline survey design, application of the mitigation hierarchy, biodiversity action plan development, offset design and implementation, and monitoring and evaluation.

- **Assessment and reporting** along supply-chains or at business level, including Natural Capital Accounting (e.g. the Natural Capital Protocol (Natural Capital Coalition 2016)).

- **Alignment with environmental standards and safeguards** including government Environmental and Social Impact Assessment (ESIA) policies and financial performance standards (e.g. the International Finance Corporation's Performance Standard 6 (PS6)).

III.1 Project-level decision-making

Red List data can be used to help identify, manage, and reduce the negative impacts of development projects across a range of sectors (e.g. agriculture, infrastructure, extractives, and energy) on biodiversity and ecosystem services. These data can be used in the implementation of the mitigation hierarchy to anticipate and avoid, minimize, rehabilitate or restore, and offset impacts (Figure 1).

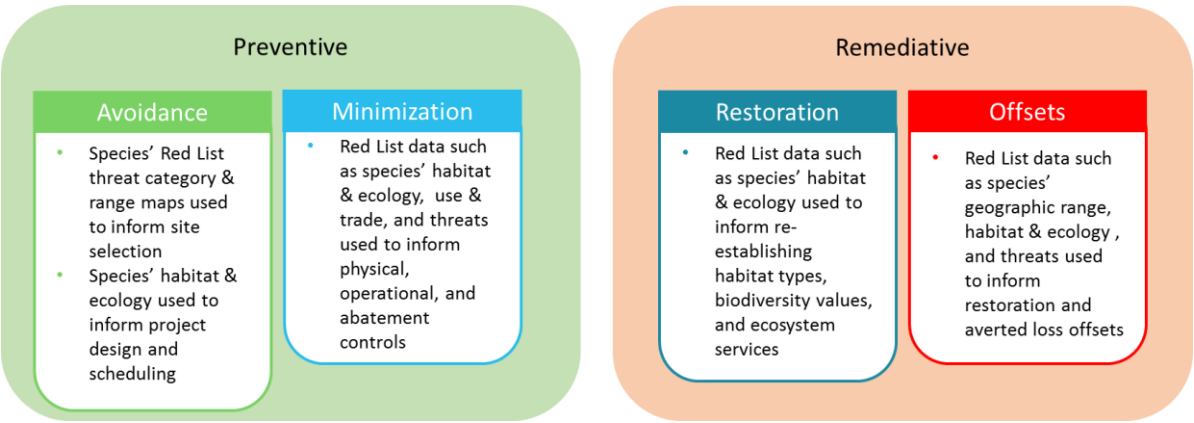


Figure 1. Schematic diagram showing how IUCN Red List data can be used in the implementation of the mitigation hierarchy.

Red List data help inform key stages in project decision-making (Figure 2). These include:

Screening and scoping risk: Before investment in exploration permits or development of projects, companies often screen potential project sites for biodiversity risk, alongside other factors such as social or security risk. The Red List species' range maps and assessment information are valuable for early assessment and identification of potential biodiversity risk, at a stage where up-front avoidance, such

as alternative project siting, is still possible. For example, in IFC's PS6, the presence of Endangered or Critically Endangered species may qualify an area as 'Critical Habitat', with specific stipulations for the project. Critical Habitat screening for a project site could use IUCN Red List species range maps to identify if Endangered or Critically Endangered species were likely to be present. Red List information on range size and migratory status can be used to assess qualification under other PS6 criteria. Another example is that the presence of threatened species and ecosystems may qualify an area as High Conservation Value (HCV).

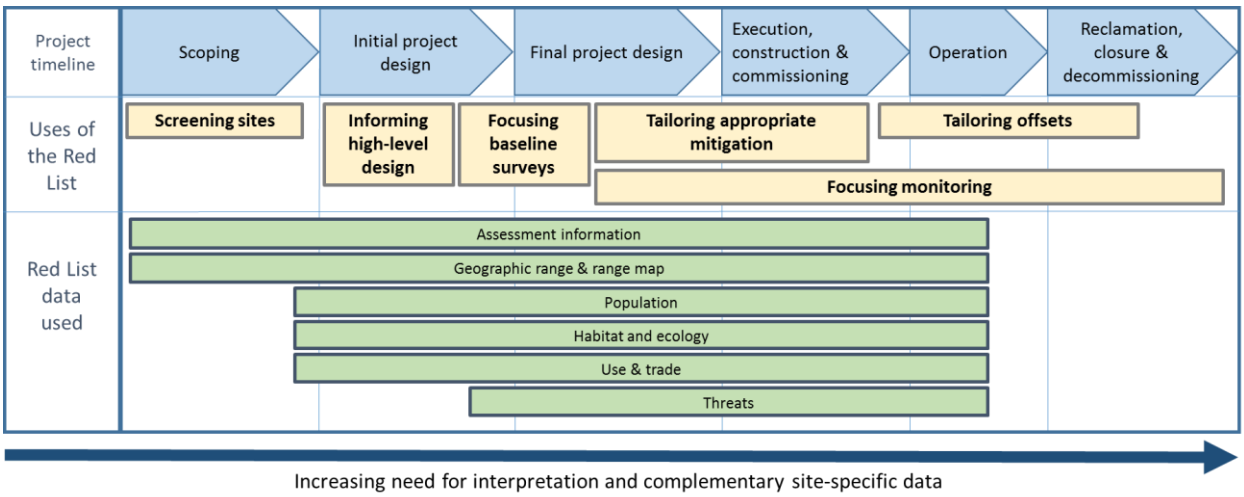


Figure 2. Generalised schematic of the use of the IUCN Red List by industry for project decision-making (may vary per sector). As design and implementation progress, there is likely to be increasing need for site-specific data to be collected and for additional analysis and interpretation of Red List information.

Prioritising and guiding baseline surveys and monitoring: Once a project concept is chosen and investment funding becomes available, an environmental and social impact assessment is required. At this point companies will frequently contract extensive baseline surveys to fill gaps in knowledge identified during initial screening and scoping. The Red List is an invaluable tool for prioritising where biodiversity survey effort will be most effective. Priorities for survey could be

- To refine knowledge of the distribution of threatened or restricted-range species known to be in a project area

- To assess the actual status of species that the Red List indicates might be present

- To improve understanding of the status of species that are classed as Data Deficient (this is not always seen as a task for business but important for a realistic understanding potential risk)

Focusing surveys in this way can reduce costs, optimise filling of data gaps, and address biodiversity risks more effectively.

Screening/scoping and *baseline surveys* inform *initial project design,* which offers the biggest opportunities for avoidance of impacts on priority species identified using the Red List. For example, this might allow re-routing of planned roads or re-siting of processing plants that would otherwise impact on highly threatened species.

Impact analysis and assessment, mitigation planning: Through screening, initial project design and baseline surveys, the Red List can help identify priorities for detailed impact assessment and mitigation planning. Red List information helps to highlight existing threats and how these might be exacerbated by project impacts: e.g., unsustainable harvesting of bushmeat species could be worsened by an influx of work-seekers.

Red List information on ecology and behaviour may also point to how potential impacts can be mitigated (e.g., avoiding seismic activity seasonally when a sensitive

cetacean species migrates through the project area) or where further assessment of species' sensitivities is needed (e.g., migratory freshwater fish in the context of hydropower dams).

The Red List is a key information source for such assessments, but supplementary information is frequently needed. For instance, to assess against the quantitative thresholds used in PS6 and similar safeguard frameworks, the relatively broad-brush Red List range maps available for most species may need to be refined through modelling and mapping the extent of suitable habitat, using land cover data, and perhaps even refined further through consultation with taxon experts, to give more realistic estimates of the percentages of range covered by the project study area.

Identifying potential offsets: Information on the wider distribution and status of species helps selection of potential offset sites, and in producing standardised metrics such as Units of Global Distribution (based on proportion of global population or range) (Temple et al. 2012). Information on threats and recommended conservation actions coming from the Red List may also inform management interventions and priorities for monitoring.

III.2 Business-level decision-making

Driven by investor and public concerns, businesses are increasingly adopting 'non-financial reporting' to provide a fuller picture of business performance and impacts alongside financial accounts. The Red List, as one of a handful of global standards for biodiversity assessment, features strongly in non-financial reporting frameworks, including The Global Reporting Initiative (GRI 2013). Although the Red List is included in these frameworks, it may be more useful to consider reporting on how businesses are impacting on species positively or negatively (for example, species accounting (UNEP-WCMC 2016)) rather than just the overlap with Red Listed species. More broadly, non-financial assessment is increasingly focused on the concept of 'natural capital'. Natural capital assessment and accounting has many potential applications, but a key interest for many businesses is understanding and managing risks in supply chains. Methods and metrics for natural capital assessments are still evolving and the Red List is likely to figure centrally in the biodiversity part of these assessments (Bolt *et al.* 2016). Added to this the Red List Index is listed in the official indicator framework for the 17 Sustainable Development Goals (SDGs). There is on-going discussion around corporate accountability in the context of private sector contributions to solving sustainable development challenges.

III.3 Environmental standards and safeguards

Environmental standards and safeguards aim to prevent and mitigate undue harm to the environment at the earliest possible planning stages. The growing application of such safeguards reflects rapidly increasing national and international awareness of the need for effective environmental sustainability. The Red List is a key data source for the application of these standards and safeguards (UNEP-WCMC 2011; Table 1)[17].

[17] UNEP-WCMC (2011) found that the Red List Categories were used in over half of 36 standards assessed. Juffe-Bignoli (2014) also provides numerous examples of how the Red List is used in standards & safeguards.

Table 1. Examples of the use of IUCN Red List data within sustainability frameworks across different business sectors

Standard/safeguard	**Red List data use**
Agriculture	
Roundtable on Sustainable Palm Oil's (RSPO) Principles and Criteria for the Production of Sustainable Palm Oil (2013)	Used to support determination of the biodiversity value of a forest and requires forest managers to pay particular attention to threatened species (Principle 5.2)[18]
Forestry	
International Tropical Timber Organisation's (ITTO)/IUCN Guidelines for the Conservation and Sustainable Use of Biodiversity in Tropical Timber Production Forests (2009)	Used to support determination of appropriate management action, based on the presence of threatened species (Principle 2, guidelines 3 and 4)
Forest Stewardship Council (FSC) Forest Management Standards	Used to determine the type of High Conservation Value (HCV) Forests as part of early assessment
International Finance Institutions	
The International Finance Corporation's (IFC) Performance Standard 6 (PS6) on the Biodiversity Conservation and Sustainable Management of Living Natural Resources (2012)[19]	Used to support determination of the biodiversity value of an area, with stringent requirements for operating in areas that contain significant numbers of threatened species to ensure projects do not lead to a net reduction in their population (paragraphs 16-19);

[18] Threatened species refers to species listed as one of the three threatened categories: 'Critically Endangered' (CR), 'Endangered' (EN) and 'Vulnerable' (VU) on the IUCN Red List. In many cases, the Red List will also be used to assess species that have a restricted range, are endemic to a region or country, are migratory or form congregations.

[19] Equator Principles Financial Institutions also voluntary apply PS6.

	Encourages consultation with IUCN species experts to evaluate unlisted species based on Red List criteria (Guidance Note 69 & 78).
European Bank for Reconstruction and Development's Performance Requirement 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (2014)	Draws from IFC PS6 guidelines for determining the biodiversity value and implications of operating in an area, based, in part, on the presence of threatened species (paragraphs 14-18).
European Investment Bank's Statement of Environmental and Social Principles and Standards (2009)	Identifies the biodiversity value of an area based, in part, on the presence of threatened species. The bank does not fund project's operating in these areas where there are negative impacts (paragraph 71).
The World Bank's Environmental & Social Safeguards (ESS) (2016)	The revised 2016 ESS aligns closely with IFC PS6 requirements for biodiversity.
Asian Development Bank's Safeguard Policy (2009)	Used to determine the biodiversity value of an area. Projects must not lead to a net reduction to the threatened species for which it was designated (paragraph 28).
Inter-American Development Bank's Environment and Safeguards Compliance Policy (2006)	Used to determine the biodiversity value of an area based, in part, by the presence of habitats crucial for threatened and near-threatened species. The Bank will not support operations that significantly convert or degrade such habitats (clause B9 4.23).

IV. Dynamism in the IUCN Red List

The Red List is subject to change. On an on-going basis, new assessments are added, increasing taxonomic and geographic coverage. New or updated information (including spatial information) is also added to existing assessments. To keep the Red List current, the aim is that every species will be re-assessed at least once each 10 years after which assessments technically are flagged as out of date. However, some species are assessed more frequently.

The threat category assigned to a species may change for several reasons:

- Changing knowledge, as new information becomes available on a species that previously was not available, thereby changing understanding of a species' conservation status

- Changing taxonomy (e.g. taxonomic review may split a species into two or more new species, or lump two or more species together)

- Changing threats: the actual conservation status of a species may deteriorate or improve. This could be because of general or site-specific threats, or because of effective conservation action.

Business decisions that are informed by the Red List may clearly be sensitive to such changes. Where knowledge of a species is poor, or the assessment does not take into account recent new threats, further targeted survey or research work may often be a sound project investment. This can help improve certainty about a species' status. Quite often, poorly-known species turn out to be more widespread and abundant than previously thought, reducing the risks that a project needs to manage.

A number of measures are in place to reduce volatility in the Red List through changing knowledge and taxonomy. These include:

- Rigorous peer and expert review

- Adoption of standard taxonomic references, and critical evaluation of proposed changes

- Training for Red List assessors

At the same time, the Red List remains sensitive to genuine change in species' status through the contributions and expertise contained in its vast support network comprising over 130 Specialist Groups and Red List Authorities, 10,000 members of the IUCN Species Survival Commission, and the Red List Partnership.

V. Steering clear of pitfalls

Valuable as it is, the Red List has limitations and needs careful interpretation. It is advisable to seek expert guidance, e.g. from specialist consultants, when using the Red List to inform decisions.

There are a number of caveats to bear in mind (this is not an exhaustive list):

- **Many species are yet to be assessed**: there are perhaps as many as 1.9 million described species, and only ~82,000 have been assessed as of 2016. The fact that a species does not appear on the Red List does not mean it may not be threatened with extinction. Red List coverage is best for vertebrates, for temperate regions and for terrestrial species; coverage is still relatively poor, but improving, for freshwater species in Latin America and many parts of Asia, and generally for plants and invertebrates. How up-to-date and comprehensive the information is also varies considerably across species and across taxonomic groups. The Red List aims to include assessments for a more representative set of 160,000 species by 2020.

- **Risk of extinction is only one aspect of conservation priority.** Species may be important to key stakeholders for many other reasons, including because they are seen as flagships or charismatic or because they provide key ecosystem services. Red List species accounts do not always reference these values. Increasingly the assessments do include information on use and trade, and sometimes on ecosystem services provided, although the latter is not consistently documented.

- The criteria should always be used in conjunction with the categories. The criteria are expressed in the syntax after the category (E.g. VU B1ab (iii)). These **criteria can provide important contextual understanding**, especially to understanding why a widespread, long-lived species with relatively large populations might be listed in the same category of threat as a more narrowly distributed species with a small population size.

- **The IUCN Red List global dataset covers global threat status. National or regional conservation status may be as important to many stakeholders**, and national and regional Red Lists can provide detailed and very useful information. However, unlike global Red List assessments, national or regional Red Lists may not be rigorously reviewed, and some may use non-standard criteria. On the other hand, some national Red Lists may be of even higher quality and be more up-to-date than the global Red List assessments. Therefore, the reliability of national or regional Red Lists should be carefully evaluated before use (e.g. their use of peer-review, expert consultation, and application of IUCN criteria)

- **Red List assessments may be scale-dependent.** For example, a species that is listed as Least Concern globally could be assessed as Vulnerable in a particular country or region. Because of the nature of some Red List criteria (e.g. relating to rapid population decline), the reverse is also sometimes true: a species could be listed in a lower threat category nationally/regionally, but listed as threatened globally. Assuming the IUCN Categories and Criteria have been correctly applied, it is usually advisable (and precautionary) to refer to the highest-level threat categorisation.

- **Overlap of a species' range map with the project area does not mean the species definitely occurs in that area.** IUCN Red List maps generally reflect current known limits of distribution of a species, accounting for all known, inferred or projected sites of occurrence. Sometimes, they reflect the detailed pattern of local presence (area of occupancy: AOO). Unfortunately, the distinction between the two is not always clear. The quality and age of range maps also varies considerably between assessments.

- Conversely, **non-overlap of a species' range map with the project area does not mean that the species is definitely absent.** Range extensions are not unlikely for poorly-known species where suitable habitat is present.

VI. Strengthening the IUCN Red List

There is an increasing business demand for comprehensive, reliable and up-to-date biodiversity information to support risk management and sustainability reporting. The Red List provides such information, but itself depends on the extensive sharing of data and expertise. Many data collected by industry during baseline surveys and impact assessments are relevant to the Red List and could contribute greatly to strengthening it. However, such data are often not accessible (because of confidentiality or competition concerns), discoverable (because they are not in public

repositories, or have limited documentation) or inter-operable (because they are already aggregated, or do not follow common standards).

More open sharing of data can help avoid major cost inefficiencies for business (e.g. the duplication of survey effort or over-estimation of risk). Every record of a threatened or Data Deficient species available to IUCN Red List authorities improves understanding of the species' true status (and more records most often result in a downgrading of the species' threat status, and lowered company risk). Data availability can help governments and lenders to understand cumulative impacts, conduct strategic impact assessments, and improve spatial planning.

Effective data sharing typically involves submission of species records (at minimum spatial location and date) and relevant meta-data to recognised national or international biodiversity databanks (e.g. the Global Biodiversity Information Facility). Through sharing relevant data, businesses that use the Red List have a great opportunity to strengthen the resource on which they depend, and to improve the information base for effective assessment, management and monitoring of biodiversity. To share such data, the appropriate person to contact is the Red List Authority Coordinator in each taxonomic group. A full directory may be found here: http://cms.iucn.org/theme/species/about/ssc-specialist-groups-and-red-list-authorities-directory

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VIII. Acknowledgements

IUCN, SSC and the Red List Partners would like to acknowledge the contribution of The Biodiversity Consultancy in the development of this guidance document.

Appendix I. The IUCN Red List and other global biodiversity knowledge products delivered through IUCN and Partners

Knowledge Product	Notes	Business applications
1 IUCN Red List of Threatened Species	The presence of threatened species is a criterion for identification of Key Biodiversity Areas (#4), which may be strong candidates for formal Protected Area designation (#5)	Outlined in this report.
2 IUCN Red List of Threatened Ecosystems	IUCN has co-ordinated a consultative process to develop criteria for assessing the threat status of ecosystems. These are now being applied to create a global Red List of ecosystems by 2025	Threatened ecosystems feature alongside threatened species in many environmental safeguards, but have not been assessed via a standard framework until recently. The extent of threatened ecosystems and the ranges of threatened species may often overlap, but with incomplete congruence. The two datasets thus provide complementary information.
3 Key Biodiversity Areas	IUCN has co-ordinated a consultative process to develop criteria for defining Key Biodiversity Areas, sites of global significance for the persistence of biodiversity. These criteria draw on the Red Lists of species and ecosystems, among other information. Many KBAs have already been identified using earlier, non-unified criteria, including over 12,000 Important Bird and Biodiversity Areas and nearly 600 Alliance for Zero Extinction sites. Expansion of KBA identification to fill geographic and taxonomic gaps is underway.	KBAs are likely to be of significant concern to stakeholders, and feature in many environmental safeguards (e.g. as Internationally Recognised Areas in IFC PS6). Global KBA data are managed by the Key Biodiversity Areas Partnership through the Key Biodiversity Areas Database and available for commercial use through the IBAT.
4 Protected Planet (powered by the World Database of Protected Areas)	PAs may be set up to protect threatened species, but also for other conservation objectives. IUCN's World Commission on Protected Areas (PAs) recognise six	Protected Areas (and particularly those in Categories I, II and III) are likely to be of significant concern to stakeholders, and feature in many environmental

	categories of Protected Areas, based on their conservation aims and governance. However, not all countries use the IUCN categories and so all PAs in the database need to be considered in any analyses undertaken. If not protected already, Key Biodiversity Areas are often strong candidates for Protected Area status.	safeguards. Global Protected Area data are managed by UNEP-WCMC through the World Database on Protected Areas (WDPA) and available for commercial use through the IBAT.

Annex 12: MoUs between IUCN and each Red List Partner

Memorandum of Understanding between IUCN and BirdLife International

This Memorandum of Understanding is entered into between:

IUCN – The International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN"),

and

BirdLife International

IUCN and BirdLife International are collectively referred to as the "Parties".

Background

BirdLife International has been carrying out Red List assessments in collaboration with IUCN and its Species Survival Commission (SSC) since the 1980s. This has resulted in a series of regional Red Data Books (for Africa in 1985, Americas in 1992 and Asia in 2001) and global Red Lists for birds (in 1988, 1994, 2000, 2004, 2008, 2012 and 2016). BirdLife has been closely involved in the development of the IUCN Red List, including the development of new quantitative criteria in the early 1990s, the development of a coordinated programme since the late 1990s, leading the development of the Red List Index and promotion of its policy application since 2003, publication of research on the criteria, methods of evaluation and application of the Red List, as well as leading and contributing to improvements and innovations in documentation standards, classification schemes and other technical aspects. BirdLife has been the Red List Authority (RLA) for birds on the IUCN Red List since the first appointment of RLAs, and works closely with the bird Specialist Groups and other experts and organizations to reassess all bird species regularly.

Purpose

The Parties agree that the *IUCN Red List of Threatened Species™* (hereinafter referred to as IUCN Red List), which is the world's most authoritative compilation of data on the conservation status of species, should form the basis for their collaboration on biodiversity assessments. The IUCN Red List is now recognized as one of the fundamental tools to support conservation planning, management, monitoring, and decision making, with growing value for, among others: 1) aiding in the identification of globally important sites for biodiversity; 2) helping to track progress towards major global biodiversity-related targets; 3) influencing globally flexible conservation spending; and 4) demonstrating the importance and value of biodiversity to society. The Parties propose to continue and expand their Red List species assessment work in support of The IUCN Red List Strategic Plan to ensure that the IUCN Red List plays a key role in reducing the current rate of extinction of species.

Rights and Obligations of IUCN

The full rights and obligations of IUCN are detailed in Art. IV of The IUCN Red List of Threatened Species Partnership Agreement. IUCN is the owner of the Red List brand, and the custodian and producer of *The IUCN Red List of Threatened Species™*. IUCN administers and maintains the overall process for assuring the accuracy, quality and validity of the data in the IUCN Red List, including through the expert-review process to ensure the proper application of the IUCN Red List Categories and Criteria, and through maintaining an independent scientific process for resolving listing disputes. IUCN places all Red List data, after review and consistency checking, in the public domain, except where restrictions have been placed by data providers in writing or for conservation reasons. IUCN is responsible for maintaining the IUCN Red List Unit which manages the IUCN Red List process, for developing and supporting the Species Information Service (SIS), which is the software that underpins the IUCN Red List and the biodiversity assessments, and for communicating, in collaboration with Red List Partners, the key findings of the IUCN Red List to the wider world.

Building on a Letter of Agreement between IUCN and BirdLife International signed in 2010 regarding the technical development and future use of SIS (see below), IUCN has the right to: (a) all SIS source code (i.e. code necessary to run the software, excluding any data held within SIS) developed under contract for BirdLife (e.g. to enhance the functionality available to other SIS users); (b) make the SIS source code (including for BirdLife-developed functionality) open source through any means, and to distribute it to other institutions. IUCN has the responsibility to engage fully with BirdLife (through relevant bodies under the Red List Committee) before any developments and enhancements are made that may change the functionality and availability of the system to BirdLife. IUCN has the responsibility to engage BirdLife on matters relating to the Red List Index (given BirdLife's leadership in developing and promoting this), and to acknowledge BirdLife in this respect as appropriate.

Rights and Obligations of BirdLife International

The full rights and obligations of Red List Partners are detailed in Art. V of The IUCN Red List of Threatened Species Partnership Agreement. BirdLife International is a major supporter of the IUCN Red List and of the underlying biodiversity assessments. BirdLife International agrees to make a substantial contribution towards achieving The IUCN Red List Strategic Plan, including leading species-level assessment work for birds and committing an amount exceeding $200,000 per calendar year through an in-kind contribution. BirdLife International commits to provide an annual technical and financial progress report against activities and outputs outlined in this MOU, to attend annual meetings of the Red List Committee and to bear the costs thereof (understanding that this may count towards its annual financial commitment), to contribute as appropriate to any technical working groups that may be established, and to respect and abide by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species*™. BirdLife International has the right to be acknowledged and recognized as a Red List Partner, as the stand-alone RLA for birds, and as the Assessor and Author for all bird Red List assessments, including on the IUCN Red List website, and to use the Red List logo, provided such use is in accordance with the visual identity, to contribute to all major partnership activities including joint funding applications and large-scale analyses and publications, to be engaged and acknowledged as appropriate on matters relating to the Red List Index, and to be represented on the Red List Committee by one representative.

Building on a Letter of Agreement between IUCN and BirdLife International signed in 2010 regarding the technical development and future use of SIS, BirdLife has the right to: (a) contract separately for the development of specific modules and enhancements within the system (without any requirement that other users of SIS should have access to or populate these fields); (b) extract all bird data from SIS at any time; and (c) all source code developed in SIS should BirdLife or IUCN wish to terminate BirdLife's status as a Red List Partner and/or should BirdLife wish to remove the bird assessments from the IUCN Red List. BirdLife has the responsibility to: (a) engage fully with IUCN on the specification of any potential modules and enhancements they make to the system before development begins; (b) provide IUCN with all source code for any modules and enhancements they make to the system; and (c) provide scientific and technical input to support IUCN's development of the system. BirdLife has the right for its logo to be displayed on all bird assessments on the IUCN Red List website.

Scope of Work

Under this MOU, BirdLife International will support the delivery of The IUCN Red List Strategic Plan through the following costed activities over the five (5)-year duration of the Agreement:

Activity	Estimated approximate value (in-kind/actual)
Coordinate and lead the reassessments of all bird species in support of Result 3.14.1 and 3.14.4	US$178,000-318,000 (annual)
Development and communication of the Red List Index and promotion of its policy application in support of,	US$12,000 (annual)

Result 7.4	
Attend RLC meetings & contribute intersessionally in support of Result 10.4	US$5,000 (annual)
Contribute to the Red List Technical Working Group and Red List Informatics WG in support of Result 10.5	US$5,000 (annual)

The total level of BirdLife International's annual contribution to these activities, both in cash and in-kind, is estimated at between US$200,000 and US$340,000 per annum (based on the approximate costing provided with the activities above).

BirdLife International's Chief Scientist, Stuart Butchart, will provide overall coordination and supervision of the work carried out under this MOU, and will be responsible for all financial and technical reporting.

This MOU will be conterminous with the IUCN Red List of Threatened Species Partnership Agreement and will terminate upon termination of the Partnership Agreement or upon withdrawal from the Partnership Agreement.

Date: 24 Oct 2017

Director General
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 11/11/16

Chief Executive
BirdLife International

Annex 12: MoUs between IUCN and each Red List Partner

Memorandum of Understanding between IUCN and the Center for Biodiversity Outcomes at Arizona State University

This Memorandum of Understanding is entered into between:

IUCN – The International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN"),

and

The Arizona Board of Regents for and on behalf of Arizona State University (hereinafter referred to as "ASU") and its Center for Biodiversity Outcomes (hereinafter referred to as "CBO")

IUCN and ASU are collectively referred to as the "Parties".

Background

The Center for Biodiversity Outcomes (CBO) is a shared academic center between the Julie Ann Wrigley Global Institute of Sustainability (GIOS), which maintains an IUCN membership, and the School of Life Sciences at Arizona State University. Numerous CBO faculty affiliates are associated with IUCN, and most notably with several species specialist groups within the Species Survival Commission (SSC), including the Amphibian Specialist Group, the Lagomorph Specialist Group, the Tuna & Billfishes Specialist Group, and the Marine Fishes Red List Authority. In addition, CBO maintains strong institutional partnerships with the Arizona Center for Nature Conservation (also known as the Phoenix Zoo) which hosts the SSC Small Carnivore Specialist Group and Conservation Breeding Specialist Group, and the Desert Botanical Garden, which hosts the SSC Cactus & Succulent Plant Specialist Group.

Since CBO's inception in 2014, CBO faculty affiliates have strived to incorporate a number of Red List activities (including species assessments, assessor trainings, student research projects, etc.) into CBO core initiatives and the center's strategic plan. From 2014-2016, CBO faculty affiliates have worked to complete new Red List assessments for more than 1,800 species, primarily comprised of marine fishes, for publication on the IUCN Red List of Threatened Species, and have worked to create updated re-assessments for more than 200 mammals. Through this process, more than 20 undergraduate and graduate students have been trained in IUCN Red List assessment methodology and SIS data entry protocols. Over the past two years, CBO has also completed the first ever comprehensive list of Sonoran Desert plants (>4,500 species), and is planning to fully support a Sonoran Desert Plant Red List Initiative. Through this scope of work already completed (valued at more than $560,000 over 2 years) and CBO's expanding network of partnerships with SSC Specialist Groups, CBO wishes to establish itself as a core Red List Partner to contribute new and updated Red List assessments for a variety of taxa, likely dominated by marine species and Sonoran Desert plants over the next 5 years, and to serve as a formal satellite Red List Training Center that can provide training, assessment and facilitation services for a wide variety of Species Specialist Groups and Red List initiatives.

Purpose

The Parties agree that the *IUCN Red List of Threatened Species*™ (hereinafter referred to as IUCN Red List), which is the world's most authoritative compilation of data on the conservation status of species, should form the basis for their collaboration on biodiversity assessments. The IUCN Red List is now recognized as one of the fundamental tools to

support conservation planning, management, monitoring, and decision making, with growing value for, among others: 1) aiding in the identification of globally important sites for biodiversity; 2) helping to track progress towards major global biodiversity-related targets; 3) influencing globally flexible conservation spending; and 4) demonstrating the importance and value of biodiversity to society. The Parties propose to continue and expand their Red List species assessment work in support of The IUCN Red List Strategic Plan to ensure that the IUCN Red List plays a key role in reducing the current rate of extinction of species.

Rights and Obligations of IUCN

The full rights and obligations of IUCN are detailed in Art. IV of The IUCN Red List of Threatened Species Partnership Agreement. IUCN is the owner of the Red List brand, and the custodian and producer of *The IUCN Red List of Threatened Species™*. IUCN administers and maintains the overall process for assuring the accuracy, quality and validity of the data in the IUCN Red List, including through the expert-review process to ensure the proper application of the IUCN Red List Categories and Criteria, and through maintaining an independent scientific process for resolving listing disputes. IUCN places all Red List data, after review and consistency checking, in the public domain, except where restrictions have been placed by data providers in writing or for conservation reasons. IUCN is responsible for maintaining the IUCN Red List Unit which manages the IUCN Red List process, for developing and supporting the Species Information Service (SIS), which is the software that underpins the IUCN Red List and the biodiversity assessments, and for communicating, in collaboration with Red List Partners, the key findings of the IUCN Red List to the wider world.

Rights and Obligations of CBO

The full rights and obligations of Red List Partners are detailed in Art. V of The IUCN Red List of Threatened Species Partnership Agreement. CBO is a major supporter of the IUCN Red List and of the underlying biodiversity assessments. CBO agrees to make a substantial contribution towards achieving The IUCN Red List Strategic Plan, including leading, coordinating or supporting species-level assessment work for a variety of taxa, but primarily marine species and Sonoran Desert plants, and committing an amount estimated at US$234,000 per calendar year through an in-kind contribution. CBO commits to provide an annual technical and financial progress report against activities and outputs outlined in this MOU, to attend annual meetings of the Red List Committee and to bear the costs thereof (understanding that this may count towards its annual financial commitment), to contribute to any technical working groups that may be established, and to respect and abide by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species™*. CBO has the right to be acknowledged and recognized as a Red List Partner, including on the IUCN Red List website, to use the Red List logo, provided such use is in accordance with the visual identity, to contribute to all major partnership activities including joint funding applications and large-scale analyses and publications, and to be represented on the Red List Committee by one representative.

Scope of Work

Under this Memorandum of Understanding (MOU), CBO will support the support the delivery of The IUCN Red List Strategic Plan through the following costed activities over the five (5)-year duration of the IUCN Red List of Threatened Species Partnership Agreement:

Activity	Estimated approximate value (in-kind/actual)
Co-leading complete global comprehensive assessments for at least 2,200 marine fishes in support of Result 1.3.5	US$100,000 (annual)
First global non-comprehensive	US$60,000 (annual)

assessments of Sonoran Desert Endemic Plants in support of Result 1.9	
First comprehensive reassessments of Tunas and Billfishes in support of Result 3.4.5	US$70,000 (one-off)
First comprehensive reassessments of Seagrasses in support of Result 3.4.3	US$50,000 (one-off)
First comprehensive reassessments of Reef-Building Corals in support of Result 3.12	US$100,000 (one-off)
Establishment of a satellite Red List Training Center to support training of trainers, assessments, and other Red List Initiatives, primarily in North and South America in support of Result 5.6 and 5.7	US$20,000 (annual)
Participation in the RLC in support of Result 10.4	US$5,000 (annual)
Participation in the Red List Technical Working Group in support of Result 10.5	US$5,000 (annual)

The total level of CBO's annual contribution to these activities, both in cash and in-kind, is estimated at US$234,000 per annum (based on the approximate costing provided with the activities above).

CBO's Beth Polidoro will provide overall coordination and supervision of the work carried out under this MOU, and will be responsible for all financial and technical reporting.

This MOU is not intended to, and does not create any rights, benefits or legal obligations (substantive or procedural), enforceable at law or in equity, by one Party, its officers, employees or agents against the other Party, its officers, employees or agents. Each Party is an independent contractor and is independent of the other Party.

This MOU will be conterminous with the IUCN Red List of Threatened Species Partnership Agreement and will terminate upon termination of the Partnership Agreement or upon ASU's withdrawal from the Partnership Agreement.

Date: Sept. 3, 2016.

Director General
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 9-3-16

University President
Arizona State University

Memorandum of Understanding between IUCN and Botanic Gardens Conservation International

This Memorandum of Understanding is entered into between:

IUCN – The International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN"),

and

Botanic Gardens Conservation International (hereinafter referred to as "BGCI")

IUCN and BGCI are collectively referred to as the "Parties".

Background

There are an estimated 2500 botanic gardens and arboreta in the world attracting 500 million visitors each year. Collectively, it is estimated that botanic gardens conserve at least one third of the world's plant species in their living collections. Established in 1987, Botanic Gardens Conservation International (BGCI) is the pivotal centre of this network. Its members include the largest, most renowned gardens on the planet – Kew, New York, Missouri, Singapore, Sydney and Shanghai – but they also include many smaller gardens situated in the world's plant diversity hotspots. All of these member gardens share a commitment to making sure that no plant species becomes extinct and a combined workforce of many thousands of horticulturalists and scientists working towards that end. BGCI provides support to its members in many different ways: as an advocate for the botanic garden community, promoting the role of botanic gardens in plant conservation policy, practice and education; by connecting people, co-ordinating efforts and bringing people together to exchange ideas; as a knowledge hub, providing training, learning resources and professional support; and as a funder, providing funds and technical support to efforts aimed at saving plants.

BGCI has been a member of the IUCN Red List Partnership since 2010, and BGCI's Red List programme works with partners to assess the conservation status of the world's plant species. By assembling and disseminating comprehensive information on plant species and their status in the wild, we help to inform and prioritise conservation efforts. BGCI provides the Secretariat for the IUCN/SSC Global Tree Specialist Group (GTSG) and has provided Red List data for tree species since 2005. In the last decade, BGCI has raised the funds to assess and publish eleven regionally or taxonomically focused Red Lists encompassing over 4,000 conservation assessments of trees. Currently, BGCI is working with the GTSG towards the Global Tree Assessment (https://www.bgci.org/plant-conservation/globaltreeassessment/) to provide conservation assessments of all the world's tree species by 2020. The Global Tree Assessment will identify those tree species that are at greatest risk of extinction, and provide prioritization information to ensure that conservation efforts are directed at the right species so that no tree species becomes extinct.

BGCI is also a primary user of Red List information in monitoring and supporting *ex situ* collections of threatened plant species around the world, as well as developing on the ground conservation work for the species most at risk, via the Global Trees Campaign.

The mission statement of BGCI is: *To mobilise botanic gardens and engage partners in securing plant diversity for the well-being of people and the planet".*

Purpose

The Parties agree that the *IUCN Red List of Threatened Species*™ (hereinafter referred to as IUCN Red List), which is the world's most authoritative compilation of data on the conservation status of species, should form the basis for their collaboration on biodiversity assessments. The IUCN Red List is now recognized as one of the fundamental tools to support conservation planning, management, monitoring, and decision making, with growing value for, among others: 1) aiding in the identification of globally important sites for biodiversity; 2) helping to track progress towards major global

biodiversity-related targets; 3) influencing globally flexible conservation spending; and 4) demonstrating the importance and value of biodiversity to society. The Parties propose to continue and expand their Red List species assessment work in support of The IUCN Red List Strategic Plan to ensure that the IUCN Red List plays a key role in reducing the current rate of extinction of species.

Rights and Obligations of IUCN

The full rights and obligations of IUCN are detailed in Art. IV of The IUCN Red List of Threatened Species Partnership Agreement. IUCN is the owner of the Red List brand, and the custodian and producer of *The IUCN Red List of Threatened Species™*. IUCN administers and maintains the overall process for assuring the accuracy, quality and validity of the data in the IUCN Red List, including through the expert-review process to ensure the proper application of the IUCN Red List Categories and Criteria, and through maintaining an independent scientific process for resolving listing disputes. IUCN places all Red List data, after review and consistency checking, in the public domain, except where restrictions have been placed by data providers in writing or for conservation reasons. IUCN is responsible for maintaining the IUCN Red List Unit which manages the IUCN Red List process, for developing and supporting the Species Information Service (SIS), which is the software that underpins the IUCN Red List and the biodiversity assessments, and for communicating, in collaboration with Red List Partners, the key findings of the IUCN Red List to the wider world.

Rights and Obligations of BGCI

The full rights and obligations of Red List Partners are detailed in Art. V of The IUCN Red List of Threatened Species Partnership Agreement. BGCI is a major supporter of the IUCN Red List and of the underlying biodiversity assessments. BGCI agrees to make a substantial contribution towards achieving The IUCN Red List Strategic Plan, including leading, coordinating or supporting species-level assessment work for the Global Tree Assessment (US$4 million over 5 years) and committing an amount estimated at US$71,000 per calendar year through an in-kind contribution. BGCI commits to provide an annual technical and financial progress report against activities and outputs outlined in this MOU, to attend annual meetings of the Red List Committee and to bear the costs thereof (understanding that this may count towards its annual financial commitment), to contribute to any technical working groups that may be established, and to respect and abide by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species*™. BGCI has the right to be acknowledged and recognized as a Red List Partner, including on the IUCN Red List website, to use the Red List logo, provided such use is in accordance with the visual identity, to contribute to all major partnership activities including joint funding applications and large-scale analyses and publications, and to be represented on the Red List Committee by one representative.

Scope of Work

Under this MOU, BGCI will support the delivery of The IUCN Red List Strategic Plan through the following costed activities over the five (5)-year duration of the IUCN Red List of Threatened Species Partnership Agreement:

Activity	Estimated approximate value (in-kind/actual)
Leading the global tree assessment in support of Result 1.9.21	US$154,000 (annual) (actual); US$61,400 (annual) (in kind)
Leading the European assessment of trees and selected shrubs, in support of Result 2.10.5	US$25,000 (annual) (actual)
Supporting the expansion of IUCN Red List identity in member botanic gardens in support of Result 8.4.6	US$4,000 (annual) (in kind)
Attendance at the annual meeting of the Red List Committee and associated governance activities, in support of Result 10.4	US$5,000 (annual) (in-kind)

Contributing to the activities of the Red List Technical Working Group, in support of Result 10.5	US$4,000 (annual) (in-kind)

The total level of BGCI's annual contribution to these activities, both in cash and in-kind, is estimated at US$253,400 per annum (based on the approximate costing provided with the activities above).

BGCI's Red List Manager, Malin Rivers, will provide overall coordination and supervision of the work carried out under this MOU, and will be responsible for all financial and technical reporting.

This MOU will be conterminous with the IUCN Red List of Threatened Species Partnership Agreement and will terminate upon termination of the Partnership Agreement or upon ASU's withdrawal from the Partnership Agreement.

Date: Sept. 3, 2016.

Director General
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 Sept 2016

Secretary General
Botanic Gardens Conservation International

Annex 12: MoUs between IUCN and each Red List Partner

Memorandum of Understanding between IUCN and Conservation International

This Memorandum of Understanding is entered into between:

IUCN – The International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN"),

and

Conservation International

IUCN and Conservation International are collectively referred to as the "Parties".

Background

Conservation International and the Species Survival Commission (SSC) of IUCN established the IUCN-SSC/CI-CABS Biodiversity Assessment Unit (BAU) in 2001, based in the offices of CI. Since inception, the BAU, working in close association with the IUCN Global Species Programme and other partners, has conducted: the first-ever assessment of the world's 6,000 amphibians (the Global Amphibian Assessment or GAA); a major revision of the conservation status of the world's mammals (Global Mammal Assessment, or GMA); initiated a comprehensive assessment of some 20,000 selected marine species (the Global Marine Species Assessment, or GMSA) and some 9,000 reptiles (the Global Reptile Assessment, or GRA). Additional contributions have been made to enhance understanding of the conservation status of over 1,000 freshwater species of the tropical Andes, and BAU continues to work closely with the Moore Center for Science (MCS) in developing conservation assessments for Crop Wild Relatives and pollinator species. CI has also played a fundamental role in supporting uptake of IUCN Red List data in wider decision making policy, including on the inclusion of IUCN Red List data into the Global Environment Facility's System for Transparent Allocation of Resources, and as a criterion for the identification of critical habitat in the International Finance Corporations' highly influential Performance Standard 6.

Purpose

The Parties agree that the *IUCN Red List of Threatened Species*™ (hereinafter referred to as IUCN Red List), which is the world's most authoritative compilation of data on the conservation status of species, should form the basis for their collaboration on biodiversity assessments. The IUCN Red List is now recognized as one of the fundamental tools to support conservation planning, management, monitoring, and decision making, with growing value for, among others: 1) aiding in the identification of globally important sites for biodiversity; 2) helping to track progress towards major global biodiversity-related targets; 3) influencing globally flexible conservation spending; and 4) demonstrating the importance and value of biodiversity to society. The Parties propose to continue and expand their Red List species assessment work in support of The IUCN Red List Strategic Plan to ensure that the IUCN Red List plays a key role in reducing the current rate of extinction of species.

Rights and Obligations of IUCN

The full rights and obligations of IUCN are detailed in Art. IV of The IUCN Red List of Threatened Species Partnership Agreement. IUCN is the owner of the Red List brand, and the custodian and producer of *The IUCN Red List of Threatened Species*™. IUCN administers and maintains the overall process for assuring the accuracy, quality and validity of the data in the IUCN Red List, including through the expert-review process to ensure the proper application of the IUCN Red List Categories and Criteria, and through maintaining an

independent scientific process for resolving listing disputes. IUCN places all Red List data, after review and consistency checking, in the public domain, except where restrictions have been placed by data providers in writing or for conservation reasons. IUCN is responsible for maintaining the IUCN Red List Unit which manages the IUCN Red List process, for developing and supporting the Species Information Service (SIS), which is the software that underpins the IUCN Red List and the biodiversity assessments, and for communicating, in collaboration with Red List Partners, the key findings of the IUCN Red List to the wider world.

Rights and Obligations of Conservation International

The full rights and obligations of Red List Partners are detailed in Art. V of The IUCN Red List of Threatened Species Partnership Agreement. Conservation International is a major supporter of the IUCN Red List and of the underlying biodiversity assessments. Conservation International agrees to make a substantial contribution towards achieving the IUCN Red List Strategic Plan, including leading, coordinating or supporting species-level assessment work forcrop wild relatives, reptiles, freshwater species in the Western Hemisphere and primates, and committing an amount estimated at US$235,400 per calendar year through an in-kind contribution. Conservation International commits to provide an annual technical and financial progress report against activities and outputs outlined in this MOU, to attend annual meetings of the Red List Committee and to bear the costs thereof (understanding that this may count towards its annual financial commitment), to contribute to any technical working groups that may be established, and to respect and abide by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species*™. Conservation International has the right to be acknowledged and recognized as a Red List Partner, including on the IUCN Red List website, to use the Red List logo, provided such use is in accordance with the visual identity, to contribute to all major partnership activities including joint funding applications and large-scale analyses and publications, and to be represented on the Red List Committee by one representative.

Scope of Work

Under this MOU, Conservation International will support the delivery of the IUCN Red List Strategic Plan through the following costed activities over the five (5)-year duration of the IUCN Red List of Threatened Species Partnership Agreement:

Activity	Estimated approximate value (in-kind/actual)
Lead the assessments of freshwater species in the Western Hemisphere in support of Result 1.1	US$38,850 annual (actual; to support the BAU)
Lead the assessments of reptiles in support of Result 1.5	US$33,850 annual (actual; to support the BAU)
Contribute to assessments of crop wild relatives in support of Result 1.9.6	US$38,850 annual (actual; to support the BAU)
Coordinate the reassessments of primate species in support of Result 3.14.2	US$87,250 (annual) (in kind)
Inclusion of CI staff time (and representation on IBAT board) for helping drive the continued development of IBAT – with a particular focus on Extractive Industries in support of Results 7.1.3 and 7.1.4	US$10,000 (annual) (in kind)
Engage with CEESP to help ensure	US$10,000 (annual) (in kind)

that the emerging 'IUCN Human Dependency on Nature' and 'Natural Resource Governance' Frameworks are developed, taking into consideration potential and actual linkages with the Red List, in support of Result 8.5.4	
Engagement in Red List Committee activities (e.g. attendance at Red List Committee meeting, internal coordination, etc) in support of Result 10.4	US$16,600 (annual) (in kind)

The total level of Conservation International's annual contribution to these activities, both in cash and in-kind, is estimated at US$235,400 per annum (based on the approximate costing provided with the activities above).

CI's Managing Director of the Moore Center for Science, Daniela Raik, will provide overall coordination and supervision of the work carried out under this MOU, and will be responsible for all financial and technical reporting.

This MOU will be conterminous with the IUCN Red List of Threatened Species Partnership Agreement and will terminate upon termination of the Partnership Agreement or upon ASU's withdrawal from the Partnership Agreement.

Date: Sept. 3, 2016.

Director General
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3/09/2016

Executive Vice President
Conservation International

Annex 12: MoUs between IUCN and each Red List Partner

Memorandum of Understanding between IUCN and NatureServe

This Memorandum of Understanding is entered into between:

IUCN – The International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN"),

and

NatureServe

IUCN and NatureServe are collectively referred to as the "Parties".

Background

NatureServe has a long history of involvement with the IUCN Species Survival Commission (hereinafter referred to as SSC), and the *IUCN Red List of Threatened Species*™ and the assessment of the conservation status of numerous Western Hemisphere plant, animal, and lichen groups. NatureServe's internal assessments of the status of over 40,000 North American species often provide the basis for subsequent IUCN Red List assessments of these species. Specific collaborations include: i) The first-ever assessment of the world's 6,000 amphibians (the Global Amphibian Assessment) and subsequent updates, including funding and coordination of re-assessment workshops in Costa Rica (2007, 2010), Colombia (2016), and Ecuador (2016); ii) a major revision of the conservation status of the world's mammals (the Global Mammal Assessment), including the provision of several thousand range maps; iii) the first-ever assessment of the world's reptiles (the Global Reptile Assessment), including funding and coordination for ten regional assessment workshops in Latin America and the Caribbean and subsequent data compilation (2007-2016); iv) contributions to the Global Freshwater Biodiversity Assessment (specifically, assessment of freshwater mussels, aquatic snails, and fishes of North America); v) contributions to the Global Cactus Assessment (including funding a workshop for Caribbean species, and participation and provision of data for a workshop on North American species); vi) contributions to orchid assessments (co-funding and data provision to Orchid Specialist Group); vii) service on IUCN SSC Specialist Groups and Red List Authorities (including coordinating the North American Plant Red List Authority and participation in the Amphibian Specialist Group and Mollusc Specialist Group); and viii) provision of technical advice during the development of the Species Information Service (SIS).

NatureServe has contributed as a partner to the IUCN Red List since the establishment of the Biodiversity Assessment Subcommittee (hosting one of the subcommittee's meetings) and all subsequent Red List Partnerships. Since its founding, NatureServe has contributed an estimated $2M to support Red List efforts.

Purpose

The Parties agree that the *IUCN Red List of Threatened Species*™ (hereinafter referred to as IUCN Red List), which is the world's most authoritative compilation of data on the conservation status of species, should form the basis for their collaboration on biodiversity assessments. The IUCN Red List is now recognized as one of the fundamental tools to support conservation planning, management, monitoring, and decision making, with growing value for, among others: 1) aiding in the identification of globally important sites for biodiversity; 2) helping to track progress towards major global biodiversity-related targets; 3) influencing globally flexible conservation spending; and 4) demonstrating the importance and value of biodiversity to society. The Parties propose to continue and expand their Red List species assessment work in support of The IUCN Red List Strategic Plan to ensure that the IUCN Red List plays a key role in reducing the current rate of extinction of species.

Rights and Obligations of IUCN
The full rights and obligations of IUCN are detailed in Art. IV of The IUCN Red List of Threatened Species Partnership Agreement. IUCN is the owner of the Red List brand, and the custodian and producer of *The IUCN Red List of Threatened Species™*. IUCN administers and maintains the overall process for assuring the accuracy, quality and validity of the data in the IUCN Red List, including through the expert-review process to ensure the proper application of the IUCN Red List Categories and Criteria, and through maintaining an independent scientific process for resolving listing disputes. IUCN places all Red List data, after review and consistency checking, in the public domain, except where restrictions have been placed by data providers in writing or for conservation reasons. IUCN is responsible for maintaining the IUCN Red List Unit which manages the IUCN Red List process, for developing and supporting the Species Information Service (SIS), which is the software that underpins the IUCN Red List and the biodiversity assessments, and for communicating, in collaboration with Red List Partners, the key findings of the IUCN Red List to the wider world.

Rights and Obligations of NatureServe
The full rights and obligations of Red List Partners are detailed in Art. V of The IUCN Red List of Threatened Species Partnership Agreement. NatureServe is a major supporter of the IUCN Red List and of the underlying biodiversity assessments. NatureServe agrees to make a substantial contribution towards achieving The IUCN Red List Strategic Plan, including leading, coordinating or supporting species-level assessment work for reptiles and plants and other groups as opportunities arise, and committing an amount estimated at $205,000 per calendar year through an in-kind contribution. NatureServe commits to provide an annual technical and financial progress report against activities and outputs outlined in this MOU, to attend annual meetings of the Red List Committee and to bear the costs thereof (understanding that this may count towards its annual financial commitment), to contribute to any technical working groups that may be established, and to respect and abide by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species™*. NatureServe has the right to be acknowledged and recognized as a Red List Partner, including on the IUCN Red List website, to use the Red List logo, provided such use is in accordance with the visual identity, to contribute to all major partnership activities including joint funding applications and large-scale analyses and publications, and to be represented on the Red List Committee by one representative.

Scope of Work
Under this MOU, NatureServe will support the delivery of The IUCN Red List Strategic Plan through the following costed activities over the five (5)-year duration of the IUCN Red List of Threatened Species Partnership Agreement:

Activity	Estimated approximate value (in-kind/actual)
Reptile Red List Assessments in support of Result 1.5	US$150,000 (one-off)
North American plant assessments in support of Result 1.9.8	US$20,000 (annual)
Amphibian Red List reassessments in support of Result 3.14.3	US$30,000 (one-off)
Status assessments of selected plants, animals and lichens* using NatureServe methodology, the results of which are provided as input to Red List assessments in support of various targets under Results 1 and 3	US$95,000 (annual)
Visualization of Red List Index trends over time in the Biodiversity Indicators Dashboard in support of Result 7.4.10	US$45,000 (annual)

Participation in Red List Committee meetings and internal communication in support of Result 10.4	US$5,000 (annual)
Participation in the Red List Technical Working Group and Red List Informatics Working Group in support of Result 10.5	US$5,000 (annual)
Total	US$1,030,000 (over five years)

*Including vascular and nonvascular plants, insects (bees, Lepidoptera, some beetles, aquatic groups like mayflies, dragonflies, damselflies, stoneflies, caddisflies), freshwater inverts (molluscs, crayfishes, shrimps), all vertebrate groups except marine fishes

The total level of NatureServe's annual contribution to these activities, both in cash and in-kind, is estimated at $206,000 per annum (based on the approximate costing provided with the activities above).

NatureServe's Director of Species Science, Bruce Young, will provide overall coordination and supervision of the work carried out under this MOU, and will be responsible for all financial and technical reporting.

This MOU will be conterminous with the IUCN Red List of Threatened Species Partnership Agreement and will terminate upon termination of the Partnership Agreement or upon ASU's withdrawal from the Partnership Agreement.

Date: Sept. 3, 2016.

Director General
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 28 November 2016

Interim CEO & Chief Information Officer
NatureServe

Annex 12: MoUs between IUCN and each Red List Partner

Memorandum of Understanding between IUCN and Board of Trustees of the Royal Botanic Gardens, Kew

This Memorandum of Understanding is entered into between:

IUCN – The International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN"),

and

Royal Botanic Gardens Kew

IUCN and Royal Botanic Gardens Kew are collectively referred to as the "Parties".

Background

The Royal Botanic Gardens Kew has been a member of the Red List Partnership since 2010, but has been active in red listing plants for very much longer. More than 17 staff at Kew are active in red listing plant species from geographic regions they work in and/or taxonomic groups they work on. In 2005 Kew introduced a requirement for all new species descriptions published in Kew Bulletin to also include a red list assessment. Kew staff are involved at many levels in the IUCN Species Survival Commission, providing the chair for Orchid and Palm Specialist Groups, providing technical expertise as members of specialist working groups of IUCN including the Red List Technical Working Group and Red List Informatics Working Group membership of the Red List Committee. Several Kew staff are accredited Red List Assessors and many review Assessments. Kew also hosts the Red List Authority (RLA) for palms, orchids and, until recently, conifers. Several staff have successfully undertaken the Red List Trainers programme run by the IUCN Red List Unit and now run red list training in their own right. Kew contributed to the development of the Sampled Red List Index and, is working on a Sampled Red List Index for Plants. The SRLI team produced for the first time, a global assessment of the conservation status of the world's plants estimating that 1 in 5 vascular plants are threatened with extinction. Kew's SRLI team are a Key Indicator Partner for Aichi Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained

Purpose

The Parties agree that the *IUCN Red List of Threatened Species™* (hereinafter referred to as IUCN Red List), which is the world's most authoritative compilation of data on the conservation status of species, should form the basis for their collaboration on biodiversity assessments. The IUCN Red List is now recognized as one of the fundamental tools to support conservation planning, management, monitoring, and decision making, with growing value for, among others: 1) aiding in the identification of globally important sites for biodiversity; 2) helping to track progress towards major global biodiversity-related targets; 3) influencing globally flexible conservation spending; and 4) demonstrating the importance and value of biodiversity to society. The Parties propose to continue and expand their Red List species assessment work in support of The IUCN Red List Strategic Plan to ensure that the IUCN Red List plays a key role in reducing the current rate of extinction of species.

Rights and Obligations of IUCN

The full rights and obligations of IUCN are detailed in Art. IV of The IUCN Red List of Threatened Species Partnership Agreement. IUCN is the owner of the Red List brand, and the custodian and producer of *The IUCN Red List of Threatened Species™*. IUCN administers and maintains the overall process for assuring the accuracy, quality and validity of the data in the IUCN Red List, including through the expert-review process to ensure the proper application of the IUCN Red List Categories and Criteria, and through maintaining an independent scientific process for resolving listing disputes.

IUCN places all Red List data, after review and consistency checking, in the public domain, except where restrictions have been placed by data providers in writing or for conservation reasons. IUCN is responsible for maintaining the IUCN Red List Unit which manages the IUCN Red List process, for developing and supporting the Species Information Service (SIS), which is the software that underpins the IUCN Red List and the biodiversity assessments, and for communicating, in collaboration with Red List Partners, the key findings of the IUCN Red List to the wider world.

Rights and Obligations of Royal Botanic Gardens Kew

The full rights and obligations of Red List Partners are detailed in Art. V of The IUCN Red List of Threatened Species Partnership Agreement. Royal Botanic Gardens Kew is a major supporter of the IUCN Red List and of the underlying biodiversity assessments. Royal Botanic Gardens Kew agrees to make a substantial contribution towards achieving The IUCN Red List Strategic Plan, including leading, coordinating or supporting species-level assessment work for the SRLI Plant groups and economically important genera such as *Coffea* and committing at least $US200,000 per calendar year through an in-kind contribution. Royal Botanic Gardens Kew commits to provide an annual technical and financial progress report against fundraising and project related activities and outputs outlined in this MOU, to attend annual meetings of the Red List Committee and to bear the costs thereof (understanding that this may count towards its annual financial commitment), to contribute to any technical working groups that may be established, and to respect and abide by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species*™. Royal Botanic Gardens Kew has the right to be acknowledged and recognized as a Red List Partner, including on the IUCN Red List website, to use the Red List logo, provided such use is in accordance with the visual identity, to contribute to all major partnership activities including joint funding applications and large-scale analyses and publications, and to be represented on the Red List Committee by one representative. Nothing in this MOU shall create an obligation upon Royal Botanic Gardens Kew to disclose or report how it allocates its core funding.

Scope of Work

Under this MOU, Royal Botanic Gardens Kew will support the support the delivery of The IUCN Red List Strategic Plan through the following costed fundraising and project related activities over the five (5)-year duration of the IUCN Red List of Threatened Species Partnership Agreement:

Activity	Estimated approximate value (in-kind/actual)
Leading the assessment of all *Coffea* spp in support of Result 1.4.3	US$20,000 (annual)
Leading the assessment of global sampled plant assessments in support of Result 1.3	US$150,000 (annual)
Undertaking retrospective assessments of all eudicots, legumes and monocots, in support of Result 3.10	US$30,000 (annual)
Participation in the Red List Committee in support of Result 10.4	US$5,000 (annual)
Contribution to the Red List Techical Working Group and Red List Informatic WK in support of Result 10.5	US$5,000 (annual)

The total level of Royal Botanic Gardens Kew's annual contribution to these activities, both in cash and in-kind, is estimated at >US$210,000 per annum (based on the approximate costing provided with the activities above).

The Royal Botanic Gardens Kew's Head of Conservation Science, Dr Colin Clubbe, will provide overall coordination and supervision of the work carried out under this MOU, and will be responsible for all financial and technical reporting.

This MOU will be conterminous with the IUCN Red List of Threatened Species Partnership Agreement and will terminate upon termination of the Partnership Agreement or upon ASU's withdrawal from the Partnership Agreement.

Date: Sept. 3, 2016

Director General
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 12/4/2017

Director of Science, Royal Botanic Gardens Kew

Annex 12: MoUs between IUCN and each Red List Partner

Memorandum of Understanding between IUCN and the Department of Biology and Biotechnologies, Sapienza University of Rome

This Memorandum of Understanding is entered into between:

IUCN – The International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN"),

and

Department of Biology and Biotechnologies, Sapienza University of Rome (hereinafter referred to as "SUR")

IUCN and SUR are collectively referred to as the "Parties".

Background

SUR has been involved with the development of the IUCN Red List for over 20 years, participating to the strategic, governing, and technical bodies of the Red List and supporting the establishment of the Red List as an authoritative source of information on species extinction risk in the scientific and academic world. In the past decade, SUR has been instrumental in the development of what has now become the Species Information Service, the information technology backbone for the storage and management of Red List data.Since 2011, SUR is a member of the Red List Partnership, whereby it coordinates the reassessment process of all mammals globally for the IUCN Red List. Further, through its contribution to global assessments on biodiversity and ecosystem services (including GBO4 and IPBES assessments), SUR promotes the use of IUCN Knowledge Products beyond the Red List for the development of international policies on biodiversity. SUR has recently helped shaping the new IUCN KBA standard and oversees the National Red List process in Italy, where it has helped mainstreaming the Red List methodology for national assessments. Finally, SUR is a leading actor in the development of EU policies on large carnivores, hosting the Large Carnivore Initiative for Europe (LCIE).

Purpose

The Parties agree that the *IUCN Red List of Threatened Species™* (hereinafter referred to as IUCN Red List), which is the world's most authoritative compilation of data on the conservation status of species, should form the basis for their collaboration on biodiversity assessments. The IUCN Red List is now recognized as one of the fundamental tools to support conservation planning, management, monitoring, and decision making, with growing value for, among others: 1) aiding in the identification of globally important sites for biodiversity; 2) helping to track progress towards major global biodiversity-related targets; 3) influencing globally flexible conservation spending; and 4) demonstrating the importance and value of biodiversity to society. The Parties propose to continue and expand their Red List species assessment work in support of The IUCN Red List Strategic Plan to ensure that the IUCN Red List plays a key role in reducing the current rate of extinction of species.

Rights and Obligations of IUCN

The full rights and obligations of IUCN are detailed in Art. IV of The IUCN Red List of Threatened Species Partnership Agreement. IUCN is the owner of the Red List brand, and the custodian and producer of *The IUCN Red List of Threatened Species™*. IUCN administers and maintains the overall process for assuring the accuracy, quality and validity of the data in the IUCN Red List, including through the expert-review process to ensure the proper application of the IUCN Red List Categories and Criteria, and through maintaining an independent scientific process for resolving listing disputes. IUCN places all Red List data, after review and consistency checking, in the public domain, except where restrictions have been placed by data providers in writing or for conservation reasons. IUCN is responsible for maintaining the IUCN Red List Unit which manages the IUCN Red List process, for developing and supporting the Species Information Service (SIS), which is the software that underpins the IUCN Red List and the biodiversity assessments, and for

communicating, in collaboration with Red List Partners, the key findings of the IUCN Red List to the wider world.

Rights and Obligations of SUR

The full rights and obligations of Red List Partners are detailed in Art. V of The IUCN Red List of Threatened Species Partnership Agreement. SUR is a major supporter of the IUCN Red List and of the underlying biodiversity assessments. SUR agrees to make a substantial contribution towards achieving The IUCN Red List Strategic Plan, including leading, coordinating or supporting species-level assessment work for mammals and committing an amount estimated at US$200,000 per calendar year through an in-kind contribution. SUR commits to provide an annual technical and financial progress report against activities and outputs outlined in this MOU, to attend annual meetings of the Red List Committee and to bear the costs thereof (understanding that this may count towards its annual financial commitment), to contribute to any technical working groups that may be established, and to respect and abide by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species*™. SUR has the right to be acknowledged and recognized as a Red List Partner, including on the IUCN Red List website, to use the Red List logo, provided such use is in accordance with the visual identity, to contribute to all major partnership activities including joint funding applications and large-scale analyses and publications, and to be represented on the Red List Committee by one representative.

Scope of Work

Under this MOU, SUR will support the support the delivery of The IUCN Red List Strategic Plan through the following costed activities over the five (5)-year duration of the IUCN Red List of Threatened Species Partnership Agreement:

Activity	Estimated approximate value (in-kind/actual)
Red List Assessments for Italian endemic species uploaded into the global Red List in support of Result 2.7.	US$25,000 (annual)
Partial data collection and consistency check for the reassessment of European mammals in support of Result 3.7.2	US$40,000 (one-off)
Partial data collection and consistency check for the reassessment of Mediterranean mammals in support of Result 3.8.3 (First regional reassessments (Mediterranean) - mammals)	US$40,000 (one-off)
Coordinating and leading the reassessment of mammals in support of Result 3.14.4.	US$75,000 (annual)
Update the mammal habitat suitability models for eventual inclusion in IBAT in support of Result 7.1	US$ 50,000 (one-off)
Participation to the IPBES Global Assessment Report on Biodiversity and Ecosystem Services in support of Result 7.4.5	US$ 20,000 (annual)
Research and production of peer reviewed publications based on IUCN Red List data, often in collaboration with other Red List partners, in support of Result 8.1.4.	US$ 40,000 (annual)
Participation in the Red List Committee in support of Result	US$ 6,000 (annual)

10.4	
Participation in the Red List Technical Working Group and Red List Informations Working Group in support of Result 10.5	US$9,000 (annual)

The total level of SUR annual contribution to these activities, both in cash and in-kind, is estimated at at least US$201,000 per annum (based on the approximate costing provided with the activities above).

Dr. Carlo Rondinini in SUR will provide overall coordination and supervision of the work carried out under this MOU, and will be responsible for all financial and technical reporting.

This MOU will be conterminous with the IUCN Red List of Threatened Species Partnership Agreement and will terminate upon termination of the Partnership Agreement or upon ASU's withdrawal from the Partnership Agreement.

Date: Sept. 3, 2016.

Director General
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3/9/2016

Representative of the Director, Department of Biology and Biotechnologies
Sapienza University of Rome

Annex 12: MOUs between IUCN and each Red List Partner

Memorandum of Understanding between IUCN and Texas A&M University

This Agreement is entered into between:

IUCN – The International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN"),

and

Texas A&M University

IUCN and Texas A&M University are collectively referred to as the Parties.

Background

Texas A&M University has been engaged in aspects of IUCN related research and assessment since 2005, while Thomas Lacher was at the Center for Applied Biodiversity Science at Conservation International. He participated in particular in the Global Mammal Assessment workshops for Latin America, including Vitoria, Brazil (2005), Porto Alegre, Brazil (2006), and Honduras (2007). During this period, he also gave numerous invited presentations discussing the value of the IUCN and the importance of the Global Assessments at national and international conferences, and led a paper in *Conservation Letters* on the value of these. He was a co-author on two major papers in *Science* based upon the Red List Assessments. Based upon this long-term interaction, the university was invited by IUCN to become a Red List Partner and agreed to join the Red List Partnership in late Fall of 2010 as one of the charter partners. In 2011, Dr. Lacher became a member of the newly reformed IUCN Small Mammal Specialist Group, and in 2012 became Co-Chair of the group. As part of the current reassessment of the conservation status of the world's mammals, the SMSG is responsible for the assessment of approximately half of all of the world's mammals, a significant task. He has been active in participating in many aspects of the management of the Red List, attending the SSC Chairs meetings in Abu Dhabi in 2012 and 2016; attending the World Parks Congress in 2003 and 2014; and attending the World Conservation Congress in 2008 (where he helped to staff the Global Mammal Assessment booth), 2012, and now in the Fall of 2016. As part of the requirements of Red List Partnership he also sits on the IUCN Red List Committee and has never missed a meeting. He has trained dozens of students, both undergraduate and graduate, in the Red List Assessment process and they are actively contributing to the Global Mammal Reassessment and former Texas A&M MS student Kelsey Neam is now a Coordinator for the IUCN Global Amphibian Assessment. He has also engaged other Texas A&M faculty in participation in IUCN freshwater fish and reptile assessments. He is currently working with IUCN and Global Wildlife Conservation in Austin Texas on several potential donors interested in funding the IUCN process and specifically the engagement of Texas A&M in global conservation efforts.

Purpose

The Parties agree that the *IUCN Red List of Threatened Species*™ (hereinafter referred to as IUCN Red List), which is the world's most authoritative compilation of data on the conservation status of species, should form the basis for their collaboration on biodiversity assessments. The IUCN Red List is now recognized as one of the fundamental tools to support conservation planning, management, monitoring, and decision making, with growing value for, among others: 1) aiding in the identification of globally important sites for biodiversity; 2) helping to track progress towards major global biodiversity-related targets; 3) influencing globally flexible conservation spending; and 4) demonstrating the importance and value of biodiversity to society. The Parties propose to continue and expand their Red List species assessment work

in support of The IUCN Red List Strategic Plan to ensure that lack of information on biodiversity does not remain an obstacle to reducing the current rate of extinction of species.

Rights and Obligations of IUCN

The full rights and obligations of IUCN are detailed in Art. IV of The IUCN Red List of Threatened Species Partnership Agreement. IUCN is the owner of the Red List brand, and the custodian and producer of *The IUCN Red List of Threatened Species™*. IUCN administers and maintains the overall process for assuring the accuracy, quality and validity of the data in the IUCN Red List, including through the expert-review process to ensure the proper application of the IUCN Red List Categories and Criteria, and through maintaining an independent scientific process for resolving listing disputes. IUCN places all Red List data, after review and consistency checking, in the public domain, except where restrictions have been placed by data providers in writing or for conservation reasons. IUCN is responsible for maintaining the IUCN Red List Unit which manages the IUCN Red List process, for developing and supporting the Species Information Service (SIS), which is the software that underpins the IUCN Red List and the biodiversity assessments, and for communicating, in collaboration with Red List Partners, the key findings of the IUCN Red List to the wider world.

Rights and Obligations of Texas A&M University

The full rights and obligations of Red List Partners are detailed in Art. V of The IUCN Red List of Threatened Species Partnership Agreement. Texas A&M University is a major supporter of the IUCN Red List and of the underlying biodiversity assessments. Texas A&M University agrees to make a substantial contribution towards achieving The IUCN Red List Strategic Plan, including leading, coordinating or supporting species-level assessment work for the IUCN Small Mammal Specialist Group (approximately 2,800 species), developing collaborations to support the Global Amphibian and Global Reptile Assessments, and committing an amount estimated at $200,000 per calendar year through cash and in-kind contributions. Texas A&M University commits to provide an annual technical and financial progress report against activities and outputs outlined in this MoU, to attend annual meetings of the Red List Committee and to bear the costs thereof (understanding that this may count towards its annual financial commitment), to contribute to any technical working groups that may be established, and to respect and abide by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species*™. Texas A&M University has the right to be acknowledged and recognized as a Red List Partner, including on the IUCN Red List website, to use the Red List logo, provided such use is in accordance with the visual identity, to contribute to all major partnership activities including joint funding applications and large-scale analyses and publications, and to be presented on the Red List Committee by one representative.

Scope of Work

Under this Memorandum of Understanding (MOU), Texas A&M University will support the delivery of The IUCN Red List Strategic Plan through the following costed activities over the five (5)-year duration of the Agreement:

Activity	Estimated approximate value (in-kind/actual)
Supporting first-time assessments of reptiles and amphibians in support of Result 1.5 and 3.14.3	US$25,000 (in kind or actual, tbd)
Co-leading the reassessments of small mammals in support of Result 3.14.2 (This includes graduate student support of small mammal Red Listing activities, undergraduate internships focused on Red Listing, UG research activities, and staff time, related to direct responsibility for approximately 1,400	US$170,000 annual (in kind)

species and collaboration on an additional 1,400 species with SMSG Co-Chair in Bath.)	
Representing Texas A&M on the Red List Committee (Lacher or alternate) in support of Result 10.4	US$5,000 annual. Lacher travel, cash and in kind
Total	US$200,000

The total level of Texas A&M University's annual contribution to these activities, both in cash and in-kind, is estimated at US$200,000 per annum (based on the approximate costing provided with the activities above).

Thomas E. Lacher, Jr. in Texas A&M University will provide overall coordination and supervision of the work carried out under this MOU, and will be responsible for all financial and technical reporting.

Date: 24 Oct. 2017

Director General, IUCN – International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission, IUCN, The International Union for Conservation of Nature and Natural Resources

Date: 2-28-17

Karan L. Watson, Ph.D., P.E., Provost and Executive Vice President, Texas A&M University

Annex 12: MoUs between IUCN and each Red List Partner

Memorandum of Understanding between IUCN and the Zoological Society of London

This Memorandum of Understanding is entered into between:

IUCN – The International Union for Conservation of Nature and Natural Resources (hereinafter referred to as "IUCN"),

and

The Zoological Society of London (hereinafter referred to as "ZSL")

IUCN and the Zoological Society of London (ZSL) are collectively referred to as the "Parties".

Background

The Species Survival Commission (SSC) of IUCN and ZSL have been collaborating on projects related to the development and implementation of the IUCN Red List since the late 1980s. Since the inception of these collaborations, ZSL, working in close association with the IUCN Species Programme and other partners, played a leading role in the development of the IUCN Red List Categories and Criteria and subsequent redevelopments; helped in developing the IUCN Red List Index and developed and implemented the sampled approach to Red Listing; led on major Red List publications such as the 2004 IUCN Red List of Threatened Species: A Global Species Assessment; initiated a comprehensive assessment of 2,000 species across lesser known invertebrate groups and 13,000 assessments of representative samples of lesser known vertebrates, invertebrates and plants; played a key role in the major revision of the conservation status of the world's mammals; implemented the first online database of a range of National Red List assessments; established the National Red List Alliance and provided the Chair of the National Red List Working Group; and raised more than £1m in funding to support these projects since 2006. In addition a large number of ZSL staff make major contributions to the SSC network, either participating in or leading Specialist Groups. ZSL has also played a major convening role for IUCN, hosting many seminal meetings such as the first meeting of the Red List Committee Meeting; the first Red List for Ecosystems Meeting, the first National Red List Working Group meeting, the first IUCN Sampled Red list index meeting, and many others.

Purpose

The Parties agree that the *IUCN Red List of Threatened Species™* (hereinafter referred to as IUCN Red List), which is the world's most authoritative compilation of data on the conservation status of species, should form the basis for their collaboration on biodiversity assessments. The IUCN Red List is now recognized as one of the fundamental tools to support conservation planning, management, monitoring, and decision making, with growing value for, among others: 1) aiding in the identification of globally important sites for biodiversity; 2) helping to track progress towards major global biodiversity-related targets; 3) influencing globally flexible conservation spending; and 4) demonstrating the importance and value of biodiversity to society. The Parties propose to continue and expand their Red List species assessment work in support of The IUCN Red List Strategic Plan to ensure that lack of information on biodiversity does not remain an obstacle to reducing the current rate of extinction of species.

Rights and Obligations of IUCN

The full rights and obligations of IUCN are detailed in Art. IV of The IUCN Red List of Threatened Species Partnership Agreement. IUCN is the owner of the Red List brand, and the custodian and producer of *The IUCN Red List of Threatened Species™*. IUCN administers and maintains the overall process for assuring the accuracy, quality and validity of the data in the IUCN Red List, including through the expert-review process to ensure the proper application of the IUCN Red List Categories

and Criteria, and through maintaining an independent scientific process for resolving listing disputes. IUCN places all Red List data, after review and consistency checking, in the public domain, except where restrictions have been placed by data providers in writing or for conservation reasons. IUCN is responsible for maintaining the IUCN Red List Unit which manages the IUCN Red List process, for developing and supporting the Species Information Service (SIS), which is the software that underpins the IUCN Red List and the biodiversity assessments, and for communicating, in collaboration with Red List Partners, the key findings of the IUCN Red List to the wider world.

Rights and Obligations of ZSL

The full rights and obligations of Red List Partners are detailed in Art. V of The IUCN Red List of Threatened Species Partnership Agreement. ZSL is a major supporter of the IUCN Red List and of the underlying biodiversity assessments. ZSL agrees to make a substantial contribution towards achieving The IUCN Red List Strategic Plan, including leading, coordinating or supporting species-level assessment work, coordination of the activities of the National Red List Working group and committing an amount estimated at US$223,000 per calendar year through an in-kind contribution. ZSL commits to provide an annual technical and financial progress report against activities and outputs outlined in this MOU, to attend annual meetings of the Red List Committee and to bear the costs thereof (understanding that this may count towards its annual financial commitment), to contribute to any technical working groups that may be established, and to respect and abide by the independent scientific process for assessing species for *The IUCN Red List of Threatened Species*™. ZSL has the right to be acknowledged and recognized as a Red List Partner, including on the IUCN Red List website, to use the Red List logo, provided such use is in accordance with the visual identity, to contribute to all major partnership activities including joint funding applications and large-scale analyses and publications, and to be represented on the Red List Committee by one representative.

Scope of Work

Under this MOU, ZSL will support the delivery of The IUCN Red List Strategic Plan through the following costed activities over the five (5)-year duration of the IUCN Red List of Threatened Species Partnership Agreement:

Activity	Estimated approximate value (in-kind/actual) over 5 years
Leading sampled assessments for dung beetles, butterflies and cephalopods in support of Result 1.11.	US$75,000
Chair the National Red List Working Group and promote the development of National Red Lists in priority countries, including maintaining the National Red List database and website, in support of Results 2.1 – 2.9	US$128,000
Leading sampled re-assessments of reptiles, in support of Result 3.11	US$10,000
Participation in the Red List Committee in support of Result 10.4.	US$5,000
Participation in the Red List Technical Working Group in support of Result 10.5	US$5,000

The total level of ZSL's annual contribution to these activities, both in cash and in-kind, is estimated at $223,000 per annum (based on the approximate costing provided with the activities above).

ZSL's Director of Conservation Programmes, Professor Jonathan Baillie, will provide overall coordination and supervision of the work carried out under this MOU, and will be responsible for all financial and technical reporting.

This MOU will be conterminous with the IUCN Red List of Threatened Species Partnership Agreement and will terminate upon termination of the Partnership Agreement or upon ASU's withdrawal from the Partnership Agreement.

Date: Sept. 3, 2016.

Director General
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 3 September 2016

Chair, Species Survival Commission
IUCN, International Union for Conservation of Nature and Natural Resources

Date: 1/11/16

Director General
Zoological Society of London

Annex 13: Technical and financial annual reporting template

Red List Partner	
Reporting year	

Technical Report

Summary of year's activities undertaken as contribution towards achievement of The IUCN Red List Strategic Plan and MoU

Summary of targets on track

Summary of targets not on track (and reasons for delay)

Planned activities for coming calendar year

Other comments

Financial Report

Activity[1]		*Estimated cost*	*In-kind / actual*
Result #	Activity		
3.x.x	Reassessing mammals	US$150,000	1 FTE
			US$90,000 (workshop costs)
5.x.x	Reviewing classification schemes	US$3,000	1 FTE @ 5 days
10.x.x	Attendance at RLTWG meeting	US$2,000	1 FTE @ 3 days
10.x.x	Attendance at RLC meeting	US$6,000	1 FTE @ 3 days
			US$2,000 (travel and accommodation)
	Total estimated cost[2]		

[1] Reflecting activities outlined in the individual Partner's MoU). New activities not mentioned in the MoU should also be listed hereIn order to meet the Red List Partner criteria, annual total estimated cost should average to $200,000

Annex 14: Guiding principles concerning timing of publication of IUCN Red List assessments on The IUCN Red List website, relative to scientific publications and press releases

Background

While the IUCN Red List Unit strives to ensure that assessments are published on the Red List website in a timely manner and as efficiently as possible, the publication of assessments may sometimes be delayed for any one of a number of reasons, including the need for internal consistency checks, capacity in the RLU, technology constraints or other. However, in recent years, there have been a few instances involving a delay in posting IUCN Red List data online to provide project leaders / assessors and others time to analyse and publish results of the assessments in a peer-reviewed journal. The delay is caused by a perception that (i) publication of species assessments on the IUCN Red List website could jeopardize scientific publication in high-profile scientific journal, and that (ii) once data are made available, then others might be able to publish the results first before those who have invested a lot of time gathering and synthesizing the data.

However, there are good cases where the results of global or regional assessments have been published without anyone using these data for a scientific paper. In some instances, papers by the assessors were published years after the data have been available on the Red List website (e.g., Sadovy de Mitcheson *et al*. 2013[20]). In addition, experience has shown that there can be significant delays in the publication of scientific papers and waiting for their publication could, in turn, result in significant delays in providing much needed updated information to the conservation community and policy makers. Lastly, agreements with donors often include the publication of species assessments of the IUCN Red List website as a key deliverable and on completion of the project.

At the 18th meeting of the Red List Committee, members of the Committee *"unanimously agreed that we should not be withholding data from publication given that the primary purpose of assessment work is ensuring these data are made available to inform conservation."* Members further *"recognized and strongly encouraged the production of scientific papers and analyses using Red List data by Partners, but strongly recommended and urged that RL data should be published at the earliest opportunity, and should not be unnecessarily delayed (e.g., due to trying to publish in an academic journal)".*

[20] Sadovy de Mitcheson, Y. *et al*. 2013. Fishing groupers towards extinction: a global assessment of threats and extinction risks in a billion dollar fishery. *Fish and Fisheries* 14(2): 119-136.

It was agreed that the Terms of Reference for Red List Authority coordinators would be revised to include wording that encourages Specialist Group members to always strive towards expediting the publication of data. This was actioned prior to the start of the 2013-2016 IUCN Quadrennium, and all RLA coordinators have signed and agreed to this in principle.

Finally, the Red List Committee requested the drafting of a formal policy statement on timing of publication of Red List assessments on the IUCN Red List website, relative to scientific publications and press releases. The current document serves as a response to that decision, specifically to clarify the conditions under which the IUCN Red List Unit would intentionally delay, if at all, publication of assessments onto the Red List for any reason.

The principles

1. The conservation imperative: The primary purpose of assessment work is ensuring that species assessments are made available online, on the IUCN Red List website (and also on Red List Partner websites as relevant) to inform conservation. Making such data available to the conservation community to guide conservation action is a collective priority. For this primary reason, IUCN and its Red List Partners will always strive to publish Red List data on the IUCN Red List website at the earliest opportunity and work to ensure that publication is not unnecessarily delayed.
2. The value of scientific publishing: IUCN recognizes the value of scientific publications and strongly encourages the production of scientific papers and analyses using Red List data by Red List Partner institutions, Commission members, and species experts involved in the assessment process. However, the conservation imperative over-rides the value of scientific publication.
3. Assessments and peer-reviewed publications: Where a peer-reviewed paper is planned to summarize the results of the assessment, IUCN will not intentionally[21] delay publication of the same assessments onto the IUCN Red List by more than six months following submission. Once the six-month period has lapsed, assessments will be processed and published at the next opportunity.
4. Assessments and publicity: Publishing assessments on the IUCN Red List does not necessitate publicizing the results in the media. Media outreach and press releases can be delayed until a peer-reviewed paper is ready. In other words, peer-reviewed papers can delay publicity, but not delay publication on the IUCN Red List. IUCN recognizes that a disadvantage of this approach is inadvertently delaying urgent conservation action that could otherwise have

[21] Assessments can be delayed for many reasons relating to the need to run back-ground checks and so on. The provision here assumes that assessments have passed internal checks and are essentially ready for publication.

been triggered by more rapid and widespread communication. At the same time, publication in a peer-reviewed journal could also serve to bolster credibility of the communications (although the added credibility conferred by journal publication over and above publication on the Red List, especially once DOIs are associated with individual Red List assessments, is debatable). Given this tension, unless a peer-reviewed paper is in press (or there is evidence that a paper has a high likelihood of being accepted[22]), IUCN will not delay publicity of the assessment results beyond the date of publication on the Red List.

Implementation

Principles 3 and 4 above are contingent upon any assessors or project coordinators not unduly delaying the submission of data to the IUCN Red List Unit for publication in order to circumvent the publishing and publicity time-window.

The above policy will be reflected in the Terms of Reference of Chairs of IUCN SSC Specialist Groups and stand-alone Red List Authorities as well as Red List Authority Coordinators at the start of the next quadrennium.

Line managers within IUCN and across Red List Partners will instruct their staff members to expedite the publication of data.

[22] Evidence in support of this would include where authors are dealing with reviewer comments