Ruling of the IUCN Red List Standards and Petitions Working Group on Petition Against the 1998 Listing of Greenheart

26 February 2007

Taxon: Greenheart *Chlorocardium rodiei*

Petitioner: James Singh, Guyana Forestry Commission

RLA/SG: IUCN SSC Global Tree Specialist Group (acting as the Global Tree Red List Authority)

Red List: VU A1ad (1998)

Ruling: DD

The IUCN Red List Programme Office received the petition on 1 December 2005. Because the listing in question was based on an earlier version of the IUCN Red List Categories and Criteria, the Red List Authority (RLA) was asked to reassess the taxon within 6 months. The RLA failed to make this reassessment. The RLA was then given a further 4 months to provide a justification for the threatened status of the taxon in response to the petition. The RLA failed to provide a justification.

The Standards and Petitions Working Group (SPWG) of the IUCN-SSC Biodiversity Assessments Subcommittee received the justification of the petitioner on 9 November 2006. The SPWG did not receive a justification from the RLA or any further evidence from them relating to the listing, so deliberations on the existing listing could only be informed by very limited information available in the IUCN Red List.

The justification of the petitioner, although well over the specified page limit, contained very little information directly relevant to the listing it was arguing against. The lack of any information from the RLA and the shortage of relevant information from the petitioner made it very difficult for the SPWG to make an informed ruling. The available data were not sufficient to make an assessment, and result in the ruling that the appropriate category is Data Deficient (DD).

It is important to note that the DD ruling does not necessarily mean that there are not sufficient data to make a listing. Although the SPWG was unable to obtain sufficient data to make an assessment, it is very likely that a group of experts familiar with the species would be able to do this. In the course of its deliberations, SPWG was able to uncover much data (discussed below) and contacted very knowledgeable and helpful experts. Clearly, it should be possible for these experts to come to a consensus view on the estimates that are needed for a listing. Organizing and facilitating this process is the role of the RLA, which needs to be better engaged to support a listing.

SPWG takes the view that this appeal should have been resolved through earlier actions by the RLA to work with experts on the species and the criteria to agree on a listing. The involvement of SPWG at this stage, before any detailed discussions have taken place, has not been helpful in resolving the matter.

The rest of this document is a brief discussion of some of the technical issues that need to be addressed in the course of providing a listing for this species.

1. Reduction vs. Harvest

The listing of the taxon on the 2006 IUCN Red List provided the following justification (ARW 1998).

> An appeal against the listing of this species was submitted to the World Conservation Monitoring Centre by Dr. David Hammond in 1999. Dr. Hammond's submission provided corrections to the distribution of the species and some excellent additional documentation. The matter was referred to colleagues at TROPENBOS for comment as they have a programme in Guyana looking at this and other species. The conclusion after considering the case, which was also backed up by data from Dr. Hammond, was that the species merits a Vulnerable status as between 15.1 and 28.6% of the original population has been harvested to date. Harvesting as a commercial timber began in the late 1700s, but most of the harvesting has only taken place since the introduction of chainsaws, etc. in 1967. It is therefore reasonable to infer a 20% decline over the past three generations.

Thus, 20% reduction was inferred from an estimate that between 15.1 and 28.6% of the original population has been harvested until 1999. More recent calculations by D. Hammond (pers. comm.) suggest that about 38% of the original volume of harvestable trees has been harvested until the end of 2004. Due to uncertainty in the size of an average harvested tree, the proportion of the original tree population that is harvested has a large range (20% to 69%).

However, the proportion of original population harvested does not lead to a direct estimate of population reduction. Depending on recruitment, this proportion of original population harvested during a 150-year period may lead to a population reduction during that period of less than 20% (leading to an LC listing), more than 30% (leading to a VU listing), or even more.

Population reduction in this case can be calculated in several ways. Some of these approaches are discussed below.

2. Calculating Past Reduction

The most straightforward way of calculating past reduction would be to estimate past and current population sizes. The informal petition of 1999 mentioned above included an estimate of past population size and an estimate of the cumulative amount of harvest since the beginning of the commercial harvest of this species in the mid 19th century. If this calculation can be confirmed, it could be used in an assessment, which would also require an estimate of current population size. Although such an estimate is not currently available, it should be much easier to obtain an estimate of current population size than an estimate of the population size over 150 years ago.

The only region for which population reduction (rather than just harvest) is calculated is the Bartica Triangle (Steege *et al*. 2002), where the density of *Chlorocardium* trees declined by about 80% from 1924 to 1999 (based on the ratio of estimated densities in 1999 and 1924). This is a very substantial decline, but applies only to a very small part of the species range; the percentage of total population located in the Bartica Triangle 150 years ago was, very roughly, close to 5 or 6% (R. Zagt, pers. comm.). However, the methods used in this study can be applied to other parts of the range to estimate reductions based on historical and recent surveys. These estimates can then be combined to calculate the overall reduction, following the guidelines given in SPWG (2006).

3. Criterion A2 vs. Criterion A4

The generation length of the species is estimated to be around 300 years (Zagt 1997). Thus, the period since the start of commercial harvest represents only about half a generation of this species. There are some indications that the current levels of harvest may not be sustainable. For example, although the rotation period was recently increased to 60 years, Steege *et al*. (2002) estimate that it should be 100 years to achieve sustainable harvest. Thus, combining an estimate of past reduction with an estimate of future reduction for a listing under Criterion A4 may provide a better assessment of the taxon's status.

However, predicting future reduction presents several additional issues that must be addressed. Future reduction can be inferred from recent population trends, but this requires a higher temporal resolution than simply calculating the overall reduction since the 1850s. Depending on when, and in which parts of the species' range, additional surveys were done, it may be possible to infer future reduction based on an extrapolation of recent trends, modified by other relevant information that is available on harvest trends in different areas.

4. Future reduction based on population models

Another possible approach to projecting future reduction is to use population dynamics information. The population dynamics of Greenheart was well studied by Zagt (1997), who estimated stage-based transition matrices for exploited and unexploited (undisturbed) stands. The matrix for the undisturbed stand showed a slight decline (lambda=0.9978). The "exploited" stand, which was last harvested about 5 years prior to the study, showed a slight increase (lambda=1.0029). This may indicate density dependence, and there is also increased individual (diametrical) growth at increased light levels. Zagt (1997) concluded based on these that exploited stands may recover, but there are two caveats: the growth is very slow (and the difference between the growth rates of the two stands is small); and other co-occurring species respond more to increased light levels (Greenheart is more shade-tolerant).

In principle, it should be possible to use the stage matrices estimated by Zagt (1997), add the actual levels of harvest in the past, start from the estimated 1850 population, and simulate the population dynamics to estimate the past population reduction. If this approach leads to estimates similar to those based on surveys (as discussed above), then it would be possible to use the same models to predict future dynamics, by starting from the estimated current population, adding the current levels of harvest, assuming that they remain roughly constant into the future, and simulating the population dynamics to see what the population reduction is likely to be in the next 100 years. Combining this with past reduction would allow listing under Criterion A4.

However, estimating population reduction based on simulations of population dynamics is difficult because density dependence complicates the dynamics in two ways. First, density dependence implies that the stage matrix should change in exploited stands, as a function of time since harvest. But there are only two estimated matrices, and many transitions are different between them. In other words, there is not just one change (or a few simple changes), which might be combined with a linearity assumption to come up with a density dependence function. Second, density dependence acts within stands; it may not be correct to apply one simple density dependence function to the whole range. At any one time, the parts of the range that remain unexploited presumably are at an equilibrium, and there is increased growth in recently exploited stands. So, it may not be realistic to assume an "average" or overall density dependence function; it may be necessary to simulate subpopulations in smaller areas. If these difficulties can be overcome, future population reduction can be predicted based on the population dynamics of the species.

References

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