CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Twenty-fourth meeting of the Animals Committee
Geneva, (Switzerland), 20-24 April 2009

Review of Significant Trade in specimens of Appendix-II species

OVERVIEW OF THE SPECIES-BASED REVIEW OF SIGNIFICANT TRADE

1. This document has been prepared by the Secretariat.

2. Resolution Conf. 12.8 (Rev. CoP13) on *Review of Significant Trade in specimens of Appendix-II species* directs the Secretariat, for the purpose of monitoring and facilitating the implementation of that Resolution and the relevant paragraphs of Article IV, "to report at each meeting of the Animals or Plants Committee on the implementation by the range States concerned of the recommendations made by the Committee". The Secretariat, in consultation with the Chair of the Animals Committee, has to determine whether recommendations made under the Review of Significant Trade have been implemented by the range States and to report to the Standing Committee, which decides on appropriate action. The present document therefore contains information on recent decisions of the Standing Committee in the context of the Review of Significant Trade, and gives brief updates on ongoing reviews.

Species selected before 2000

3. Paragraph v) of Resolution Conf. 12.8 (Rev. CoP13) states that:

> *the Standing Committee, in consultation with the Secretariat and the Chairman of the Animals or Plants Committee, shall review recommendations to suspend trade that have been in place for longer than two years and, if appropriate, take measures to address the situation.*

4. In accordance with this paragraph, the Secretariat commissioned a study to review such recommendations to suspend trade established prior to September 2003. On the basis of this report, the Secretariat discussed these cases with the Chair of the Animals Committee and submitted recommendations to the Standing Committee in Annex 1 (Rev. 1) of document SC57 Doc. 29.2.

5. The Standing Committee has recommended that Parties not accept imports of specimens of a number of species from certain States, until recommendations of the Animals Committee are implemented by those States. A list of such recommendations currently in force, together with their date of application, can be found in Notification to the Parties No. 2009/003 of 3 February 2009.

6. At its 57th meeting (SC57, Geneva, July 2008), the Standing Committee adopted recommendations made by the Secretariat and the Chair of the Animals Committee with the exception of *Agapornis fischeri* and *Malacochersus tornieri* from the United Republic of Tanzania. The Standing Committee also requested that the Animals Committee re-evaluate its recommendations concerning the export of certain species of Malagasy chameleons and day geckos [see Annex 1 (Rev. 1) of document SC57 Doc. 29.2].

Agapornis fischeri

7. On 28 December 2007, the Secretariat received a letter and report from the Management Authority of the United Republic of Tanzania requesting the withdrawal of the recommendation to suspend trade in *Agapornis fischeri* from that country.

8. This matter was raised at SC57. The Standing Committee supported the concerns of the Animals Committee that its recommendations for *Agapornis fischeri* had not been complied with. The existing Standing Committee recommendation to Parties not to accept imports of this species from the United Republic of Tanzania therefore remains in place.

Malacochersus tornieri

9. At SC57, reservations were expressed about withdrawing the Committee's recommendation for *Malacochersus tornieri* from the United Republic of Tanzania. The Standing Committee considered that claims for breeding in captivity could not be relied upon and noted that export quotas had been exceeded. The existing Standing Committee recommendation to Parties not to accept imports of this species from the United Republic of Tanzania therefore remains in place.

Malagasy chameleons

10. *Chamaeleo* spp. [except *C. lateralis, C. oustaleti, C. pardalis* and *C. verrucosus* (now *Furcifer lateralis, F. oustaleti, F. pardalis* and *F. verrucosus* respectively) and *Phelsuma* spp. (except *P. laticauda*, *P. lineata*, *P. madagascariensis* and *P. quadriocellata*) were included in the Review of Significant Trade in 1994.

11. The Animals Committee recommended that Madagascar regularly submit copies of all export permits issued to the Secretariat and within 12 months:

    a) suspend exports of all but four *Chamaeleo* spp., pending science-based harvest quotas;

    b) provide the biological basis for determining that exports of specimens of these species would not be detrimental;

    c) cease to issue export permits that did not indicate the species involved;

    d) implement a system to verify the identification of specimens before they were exported; and

    e) undertake scientifically-based field assessments of the species before allowing exports to resume.

12. At SC57 the Committee requested the Animals Committee to re-evaluate its recommendations concerning the export of specimens of these species on a species-by-species basis.

13. The Standing Committee recommendations to Parties not to accept imports of specimens of these species from Madagascar should be withdrawn in cases where the Animals Committee considers that the provisions of Article IV, paragraphs 2 (a) and 3 of the Convention are being complied with.

14. In order to assist the Animals Committee in the resolution of this situation, the Secretariat commissioned a study (see the Annex* to the present document) which summarizes available information on a species-by-species basis and gives a preliminary assessment of whether the species may be traded internationally in accordance with Article IV.

Species selected following the 11th meeting of the Conference of the Parties (CoP11; Gigiri, 2000)

15. Table 1 shows the species that the Animals Committee selected for its Review of Significant Trade following CoP11. The Animals Committee has now largely completed its task in relation to the review of these species. The main remaining actions need to be undertaken by the Secretariat, in consultation with the Chair of the Animals Committee, and the Standing Committee.

Table 1: Species selected by the Animals Committee for Review of Significant Trade following CoP11

Taxa	**Document with detailed taxa report**	**Status of the Review of Significant Trade – action required**
Testudines selected pursuant to Decision 11.93		
Cuora amboinensis	AC18 Doc. 7.1	Viet Nam. Ongoing – action to be taken by the Secretariat with AC Chair
Cuora galbinifrons	AC18 Doc. 7.1	Lao People's Democratic Republic, Viet Nam. Ongoing – action to be taken by the Secretariat with AC Chair
Lissemys punctata	AC18 Doc. 7.1	Bangladesh. Ongoing – action to be taken by the Secretariat with AC Chair

Species selected following the 12th meeting of the Conference of the Parties (CoP12, Santiago, 2002)

Table 2: Species selected by the Animals Committee for the Review of Significant Trade following CoP12

Taxa	**Document with detailed taxa report**	**Status of the Review of Significant Trade – action required**
Falconiformes		
Falco cherrug	AC20 Doc. 8.1	Completed at SC54 (see paragraphs 16-19 of the present document)
Psittaciformes		
Poicephalus senegalus	AC22 Doc. 10.2	Completed at SC57 (see paragraphs 20-23 of the present document)
Psittacus erithacus	AC22 Doc. 10.2	Completed at SC57 (see paragraphs 24-26 of the present document)
Passeriformes		
Gracula religiosa	AC22 Doc. 10.2	Completed at SC57 (see paragraphs 27-30 of the present document)
Sauria		
Phelsuma comorensis	AC22 Doc. 10.2	Completed at SC57 (see paragraph 31 of the present document)

* *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat or the United Nations Environment Programme concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

Sauria		
Phelsuma v-nigra	AC22 Doc. 10.2	Completed at SC57 (see paragraph 31 of the present document)
Uromastyx dispar	AC22 Doc. 10.2	Completed at SC57 (see paragraph 32 of the present document)
Uromastyx geyri	AC22 Doc. 10.2	Completed at SC57 (see paragraph 33 of the present document)
Mollusca		
Hippopus hippopus	AC22 Doc. 10.2	Completed at SC57 (see paragraphs 34-36 of the present document)
Tridacna crocea	AC22 Doc. 10.2	Completed at SC57 (see paragraphs 34-36 of the present document)
Tridacna derasa	AC22 Doc. 10.2	Completed at SC57 (see paragraphs 34-36 of the present document)
Tridacna gigas	AC22 Doc. 10.2	Completed at SC57 (see paragraphs 34-36 of the present document)
Tridacna maxima	AC22 Doc. 10.2	Completed at SC57 (see paragraphs 34-36 of the present document)
Tridacna squamosa	AC22 Doc. 10.2	Completed at SC57 (see paragraphs 34-36 of the present document)

Falco cherrug

16. At its 21st meeting (AC21, Geneva, May 2005) the Animals Committee categorized *Falco cherrug* as 'of urgent concern' in nine range States, including Mongolia, and 'of possible concern' in a further 26 range States. In consultation with the Secretariat, it formulated recommendations directed to the range States concerned with deadlines for their implementation. The Secretariat provided an update of the implementation of these recommendations at the 54th and 55th meetings of the Standing Committee [SC54, Geneva, October 2006 (see document SC54 Doc. 42), and SC55 (The Hague, June 2007 (see document SC55 Doc. 17)].

17. In response to the recommendations addressed to it, Mongolia, a range State of a population 'of urgent concern', advised the Secretariat on 6 September 2005 that no further export permits would be issued until the problem of *Falco cherrug* was resolved by the Animals Committee through the Secretariat. The Secretariat conveyed this information to all Parties in Notification No. 2006/061 of 14 November 2006.

18. Subsequently, this information proved not to be correct and, in fact, exports continued. At SC57, the Standing Committee recommended that all Parties suspend trade in *Falco cherrug* with Mongolia, if that Party had not complied with the recommendations in full to the satisfaction of the Secretariat and Chair of the Animals Committee by 31 December 2008.

19. The Management Authority of Mongolia wrote to the Secretariat on 22 October and 1 December 2008 about this matter. Having reviewed the available information, the Secretariat and the Chair of the Animals Committee are not satisfied that the recommendations have been implemented. The recommendation to suspend trade in *Falco cherrug* with Mongolia therefore remains in place.

Poicephalus senegalus

20. At its 22nd meeting (AC22, Lima, July 2006), the Animals Committee categorized populations of *Poicephalus senegalus* from Guinea, Liberia, Mali and Senegal as 'of possible concern'.

21. In consultation with the Secretariat, the Animals Committee formulated recommendations with deadlines for their implementation, and the Secretariat transmitted them to the range States concerned in November and December 2006.

22. Based on the responses received, and in consultation with the Animals Committee Chair, the Secretariat has made a determination regarding compliance with the Animals Committee recommendations by the range States concerned.

23. At SC57, the Standing Committee adopted the following recommendations [see the Annex to document SC57 Doc. 29.1 (Rev. 2)] regarding *Poicephalus senegalus*:

    For Guinea (GN) and Liberia (LR): Until the recommendations of the Animals Committee have been complied with, the Secretariat should indicate in its list of annual export quotas that the export quota for wild live specimens of *Poicephalus senegalus* from GN and LR is zero.

    For Mali (ML): The Secretariat should engage further with ML to determine the basis for the proposed export quota and obtain a copy of the study mentioned by ML and report at SC58.

    For Senegal: Maintain current export quota until compliance with the recommendations with a deadline of November 2008 is demonstrated.

Psittacus erithacus

24. At AC22, the Animals Committee categorized *Psittacus erithacus* as 'of urgent concern' in Cameroon, Côte d'Ivoire, Guinea, Liberia and Sierra Leone, and 'of possible concern' in the Congo, the Democratic Republic of the Congo and Equatorial Guinea. In consultation with the Secretariat it formulated recommendations which the Secretariat transmitted to the Parties concerned on 7 November 2006.

25. In the light of a report from the Secretariat on the implementation of the recommendations contained in document SC55 Doc. 17, the Standing Committee decided by postal procedure after SC55 that:

    a) the Secretariat should indicate in its list of export quotas for 2008 that the export quota for wild live specimens of *Psittacus erithacus* from Cameroon, Côte d'Ivoire, Guinea, Liberia and Sierra Leone is zero; and

    b) Cameroon, Côte d'Ivoire, Guinea, Liberia and Sierra Leone should implement all the recommendations of the Animals Committee concerning *P. erithacus* within the agreed time-frame.

26. At SC57, the Secretariat repeated the recommendations of the Animals Committee and provided an update on actions since SC55 [see the Annex to document SC57 Doc.29.1 (Rev.2)]. The Standing Committee adopted the following recommendations:

    For Cameroon, Côte d'Ivoire, Guinea, Liberia and Sierra Leone: Until the recommendations of the Animals Committee are complied with, the Secretariat should maintain a zero export quota for wild live specimens of *Psittacus erithacus* in its list of annual export quotas as agreed by the Committee after SC55.

    For the Congo and the Democratic Republic of the Congo: Until the recommendations of the Animals Committee have been complied with, the Secretariat should continue to indicate in its list of annual export quotas that the export quota for wild live specimens of *Psittacus erithacus* from the Congo is 4,000 and 5,000 from the Democratic Republic of the Congo.

    For Equatorial Guinea: The Standing Committee should recommend that all Parties suspend trade in all specimens of *Psittacus erithacus* from Equatorial Guinea until that country demonstrates compliance with Article IV, paragraphs 2 (a) and 3, for this species, and provides full and detailed information to the Secretariat regarding compliance with the recommendations of the Animals Committee.

Gracula religiosa

27. At AC22, the Animals Committee categorized the Malaysian population of *Gracula religiosa* as 'of possible concern'.

28. In consultation with the Secretariat, the Animals Committee formulated recommendations with deadlines for their implementation, and the Secretariat transmitted them to Malaysia in November and December 2006.

29. In December 2007, Malaysia advised the Secretariat that it had established a voluntary zero export quota for peninsular Malaysia only with effect from 1 January 2007 and that it would be seeking funding to work on the non-detriment finding for the species. With respect to peninsular Malaysia, Malaysia has therefore complied with the initial recommendation of the Animals Committee.

30. At SC57 the Committee recommended that Malaysia [see Annex 1 of document SC57 Doc. 29.1 (Rev. 2)] maintain its current zero export quota for peninsular Malaysia until compliance with the recommendations with a deadline of November 2007 is demonstrated. The Secretariat therefore indicated in its list of annual export quotas for 2008 that the export quota for wild live specimens of *Gracula religiosa* from peninsular Malaysia was zero.

Phelsuma v-nigra and *Phelsuma comorensis*

31. Comoros has not complied with the initial recommendations of the Animals Committee. At SC57, the Standing Committee therefore recommended that all Parties suspend trade in all specimens of *Phelsuma v-nigra* and *Phelsuma comorensis* from Comoros until that country demonstrates compliance with Article IV, paragraphs 2 (a) and 3, for this species, and provides full and detailed information to the Secretariat regarding compliance with the recommendations of the Animals Committee.

Uromastyx dispar

32. Mali has not complied with the initial recommendations of the Animals Committee. No clarification concerning the captive breeding of *U. dispar* or other *Uromastyx* species in Mali has been received. At SC57, the Standing Committee therefore recommended that all Parties suspend trade in all specimens of *Uromastyx dispar* from Mali until that country demonstrates compliance with Article IV, paragraphs 2 (a) and 3, for this species, and provides full and detailed information to the Secretariat regarding compliance with the recommendations of the Animals Committee.

Uromastyx geyri

33. Mali has considerably reduced its export quota for this species but no other recommendations of the Animals Committee have been complied with. Niger has halted trade in this species but none of the recommendations of the Animals Committee has been complied with. At SC57, the Standing Committee therefore recommended that the Secretariat should not accept any increase in the annual export quota from Mali and Niger for *Uromastyx geyri* until the recommendations of the Animals Committee have been complied with.

Tridacnidae

34. At AC22, the Animals Committee categorized a number of species in the family Tridacnidae as 'of urgent concern' or 'of possible concern'.

Hippopus hippopus
Possible concern: Fiji, France (New Caledonia), Tonga and Vanuatu.

Tridacna crocea
Urgent concern: Viet Nam.
Possible concern: Fiji, France (New Caledonia), Tonga and Vanuatu.

Tridacna derasa
Urgent concern: Tonga.
Possible concern: Fiji, Palau and Vanuatu.

Tridacna gigas
Urgent concern: Vanuatu and Viet Nam.

Possible concern: the Federated States of Micronesia, Fiji, the Marshall Islands, Palau, Papua New Guinea and Tonga.

Tridacna maxima
Urgent concern: Tonga.
Possible concern: the Federated States of Micronesia, Fiji, France (New Caledonia), Madagascar, the Marshall Islands, Mozambique, Vanuatu and Viet Nam.

Tridacna squamosa
Urgent concern: Viet Nam.
Possible concern: Fiji, France (New Caledonia), the Marshall Islands and Tonga.

35. In consultation with the Secretariat, the Committee formulated recommendations with deadlines for their implementation. The Secretariat transmitted them to the range States concerned on 18 December 2006. Based on the responses received, and in consultation with the AC Chair, the Secretariat has made a determination regarding compliance with the AC recommendations by the range States concerned and presented them to the Standing Committee.

36. At SC57, the Standing Committee adopted the following recommendations [see the Annex to document SC57 Doc. 29.1 (Rev. 2)]:

For Fiji, the Standing Committee recommend that the Secretariat should include Fiji's zero export quota for commercial trade of *Hippopus hippopus, Tridacna crocea, T. derasa, T. gigas, T. maxima* and *T. squamosa* on the CITES website.

For France (New Caledonia), the Standing Committee recommend that the Secretariat should include France's zero export quota for commercial trade of *Hippopus hippopus, Tridacna crocea, T. maxima* and *T. squamosa* on the CITES website.

For Madagascar, Marshall Islands, Federated States of Micronesia, Tonga and Viet Nam, the Standing Committee agreed to extend the deadline for compliance with the recommendations until 31 December 2008. These countries complied with the recommendations to the satisfaction of the Secretariat and the Chair of the Animals Committee.

For Mozambique, the Standing Committee recommended that the Secretariat include Mozambique's zero export quota for commercial trade of *Tridacna maxima* (and *T. squamosa*) on the CITES website.

For Palau, Papua New Guinea and Vanuatu, the Standing Committee noted that they had complied with the recommendations to the satisfaction of the Secretariat and the Chair of the Animals Committee and that no further action was required.

Species selected following the 13th meeting of the Conference of the Parties (CoP13, Bangkok, 2004)

Table 3: Species selected by the Animals Committee for the Review of Significant Trade following CoP13

Taxa	**Document with detailed taxa report**	**Status of the Review of Significant Trade – action required**
Testudines		
Testudo graeca [population of Lebanon]	AC23 Doc. 8.4	Completed at AC23 (see AC23 summary record)
Amphibia		
Mantella spp.	AC23 Doc. 8.4	Ongoing for *M. crocea*, *M. expectata*, *M. milotympanum* and *M. viridis*– action to be taken by the AC (see document AC24 Doc. 7.3)

37. The Committee is invited to note this document and to review the information provided in its Annex in order to re-evaluate its recommendations concerning the Malagasy chameleons and day geckos.

Malagasy species of chameleon in the genera *Calumma* and *Furcifer* and of day-gecko in the genus *Phelsuma* included in Appendix II and currently covered by Notification 833 (January 1995)

Introduction

Madagascar has a very diverse fauna, with an extremely high proportion of endemic species. It is particularly rich in reptiles and amphibians. Among the former are a number of species of day gecko in the genus *Phelsuma* and of chameleons. Until the mid-1990s, Madagascar's chameleons were placed in two genera, *Brookesia* and *Chamaeleo*. Since the mid-1990s, the Malagasy chameleons formerly included in *Chamaeleo* have been placed in two genera: *Calumma* and *Furcifer.*

In 1994 nine species of *Phelsuma* of which seven were Malagasy and nine chameleons (then included in *Chamaeleo*) of which five were Malagasy were included in the Review of Significant Trade. As a result of the review the Animals Committee, in Notification 784 (1994), recommended that Parties not accept export documents of *Phelsuma* and *Chamaeleo* that did not accurately indicate the species being traded. It also made a series of recommendations to ensure that exports of Appendix-II listed species were in accordance with Article IV. These recommendations were not acted on at the time.

In Notification 833 (Jan 1995), the Standing Committee informed Parties of this and recommended that Parties not accept imports of specimens of *Phelsuma* spp. and *Chamaeleo* spp. (except *P. laticauda, P. lineata, P. madagascariensis, P. quadriocellata, Chamaeleo* (now *Furcifer*) *lateralis, C. (F.) oustaleti, C. (F.) pardalis* and *C. (F.) verrucosus)* until the primary recommendations of the Animals Committee had been acted upon.

In 1999 Parties were informed in Notification 51 that Madagascar had put in place an experimental programme for the management and exploitation of its populations of reptiles and amphibians. Under this programme, only the four species of day gecko and four species of chameleon listed above were to be exported commercially, with annual quotas of 2000 specimens of each. The experimental programme was short-lived, but these quotas have been maintained to the present day (with the exception of 2002 when Madagascar imposed a year-long moratorium on the commercial export of all wildlife species).

In 2001, the Animals Committee at its 17th meeting decided to carry out the first country-based Review of Significant Trade. Madagascar was chosen as the country for the review, because of continuing concerns regarding the implementation of Article IV for a range of exported species. This review resulted in the development of an action plan for the reform of Madagascar's wildlife export trade. This was adopted in Madagascar in 2003 and has been in the process of implementation since then. In 2008, the joint meeting of the Animals and Plants Committees (AC23/PC17) decided that, in view of the progress made in the implementation of the action plan, the country-based review of significant trade could be formally considered at an end.

Despite the successful conclusion of the country-based review, the 1995 recommendation of the Standing Committee has not been withdrawn, so that there is still in effect a suspension on commercial exports of all *Calumma, Furcifer* and *Phelsuma* spp. from Madagascar other than the four *Furcifer* and *Phelsuma* listed above.

This report has been prepared to assist in the resolution of this anomalous situation. It provides a summary of available information on the relevant species and a preliminary assessment, based on that information and on expert opinion, of whether the species may be appropriate for commercial export in accordance with Article IV and provided that adequate controls are in place. It suggests tentative classification of each species in one of four categories: species for which available information suggests that no collection of wild specimens for commercial export should be allowed at present; species for which there is insufficient information available at present to determine whether collection of wild specimens for commercial export should be allowed; species for which information indicates that limited collection of wild specimens for commercial export could be allowed; species for which information indicates that moderate collection of wild specimens for commercial export should be allowed.

Taxonomy

Madagascar's reptiles are the subject of ongoing taxonomic research. A number of new species, particularly of *Calumma* and *Phelsuma* have been described in recent years, and more may be expected to be described in the future. In addition, the nomenclature of currently recognised species is subject to revision. This report follows CITES taxonomy as used in the UNEP-WCMC CITES database but also includes summary information for a number of species described since the last modification of the CITES list (made at CoP13 in April 2007) and which it is anticipated will be recognised under the next revision. It also follows recently accepted practice in recognising the generic name *Calumma* as neuter in Latin, with consequent emendations of some specific epithets.

Chameleons

Calumma was formerly included in the much larger genus *Chamaeleo*. CITES taxonomy recognises 24 species in Madagascar (one other species, *Calumma tigris,* occurs in the Seychelles). An additional six species have recently been described and may be expected to be recognised under CITES taxonomy when this is next revised. They are therefore included in the present review.

Furcifer was also formerly included in *Chamaeleo*. CITES taxonomy recognises 18 species in Madagascar (two others, *F. cephalolepis* and *F. pollen*, occur on the Comoro Islands). Four of the Malagasy species (*F. lateralis, F. oustaleti, F. pardalis* and *F. verrucosus*) are currently exported under a quota system and are not considered further here.

Species in the two genera range in size from 12 cm or so in the case of *Calumma boettgeri* to well over 60 cm in *C. parsonii* and *Furcifer oustaleti*. The genus *Furcifer* is found throughout Madagascar, while *Calumma*, although also widespread, is absent from the drier and more seasonal areas of the south and west. *Furcifer* species are usually found in more open habitats than *Calumma* species, which tend to be associated with humid forests. Most species are more or less arboreal. Some are largely canopy dwellers while others are generally found in low bushes or scrub. All lay their eggs in the ground. They feed on a range of invertebrates and, in the case of larger species, small vertebrates.

Known ranges of the species vary greatly, with some (eg *Calumma parsonii* and *Furcifer oustaletii*) being extremely widespread and others, such as *F. belalandaensis,* having apparently highly restricted ranges. No Malagasy species of *Calumma* have been assessed for inclusion in the IUCN Red List. Three species of Malagasy *Furcifer* (*F. campani, F. labordi* and *F. minor*) were assessed in 1996 as Vulnerable although these are regarded as in need of re-assessment.

Field surveys of a number of species have been carried out in recent years, most notably by Brady and Griffiths (1999) who assessed the status of a number of both *Calumma* and *Furcifer* species, but also by Karsten *et al*. (2008), who estimated population densities of three sympatric *Furcifer* species in south-west Madagascar and Andreone *et al.* (2005) who surveyed *F. pardalis* (currently exported under quota and not addressed further here) on Nosy Be island in north-west Madagascar. This survey, carried out in 2000-2001, estimated a total population on the 22,500-ha island of some 450,000 adult *Furcifer pardalis* (95% confidence limits of 22,000-940,000), giving an average density of 20 individuals per hectare over the whole island, the vast majority of which is mixed agricultural land.

For five *Calumma* species, Brady and Griffiths (1999) combined population density estimates based on field surveys with estimates of the extent of remaining suitable habitat within the range of each species to estimate probable total population sizes. Wide variations in observed population densities at sample sites (from fewer than one individual to 130 individuals per hectare) led in each case to global population estimates showing a very wide variance, but it is notable that in all five cases the minimum estimated population size (95% confidence limits) exceeded one million individuals, with midpoint estimates ranging from 8 million to, in the case of *C. nasuta,* just under 90 million.

Life history parameters vary considerably from species to species. In almost all cases details of reproduction are based on specimens in captivity. All species are egg-laying, although the size of individual clutches varies from four or five to 50 or more in the case of some of the larger species such as *Calumma parsonii*. Some species lay multiple clutches in a single breeding season, others apparently

only one. Reported incubation periods – almost always taken from eggs artificially incubated either in Madagascar or elsewhere – are variable, even within species, but can often be very protracted, extended to nine months or more; in the latter case the incubation period includes a diapause phase to coincide with the cool, dry winter months when embryonic development is supenced.

Maturity in many species is reached in under a year, although some larger species may not normally breed until their second year or possibly even later. One species, *Furcifer labordi*, has recently been shown to have a remarkable life-history pattern in at least part of its range, in that the adults are believed to hatch, breed and die all within one 4-5 month period, this being the shortest known lifespan of any tetrapod (*Karsten et al,* 2008). Very rapid maturation after hatching (3-4 months) has been reported in other *Furcifer* species including *F. campani* and *F. willsii* (Le Berre, 1995), and the pattern of a short adult lifespan may be more widespread in this genus and others although longevity data for wild populations of other species are largely lacking. Many species are short-lived in captivity, and some are reported to be difficult to establish at all (see below). This is generally put down to poor or unsuitable husbandry, but may reflect a naturally short lifespan.

Use and trade

As noted above, chameleons have been and continue to be in demand as exotic pets, with considerable international trade over the past few decades, amounting to several tens of thousands of individuals annually. As well as Madagascar, notable numbers of wild caught specimens have been exported from countries in West and East Africa. In recent years, the most heavily traded species has been *Chamaeleo senegalensis* from West Africa, with large numbers of *Chamaeleo calyptratus* (native to Saudi Arabia and Yemen) reported as captive-bred in non-range States also in international trade.

Wild-caught chameleons are well known for being generally difficult to establish in captivity, often carrying high parasite loads and being sensitive to stress. Even those that survive an initial acclimatisation often do not live for very long (possibly, as discussed above, a natural phenomenon). Captive-bred specimens of Malagasy species such as *F. pardalis* (and of non-Malagasy *Chamaeleo calyptratus*) are reputed to be generally much more amenable in captivity.

As with day-geckos, there is a specialist hobbyist market for chameleons as well as a more general exotic pet market. However, because of the challenges in keeping many species, this market is likely to be smaller than that for day-geckos. Demand for species that do not have special characteristics is likely to be limited. For example it was reported in the early 2000s that exporters in Madagascar had difficulty placing their quotas of *F. verrucosus,* indicating that total demand for that species at the time was less than 2000 specimens a year (the annual export quota from Madagascar).

Chameleons are not exploited domestically in Madagascar. They are typically regarded with some fear and may occasionally be killed as a result, but this is not known to have any significant impact on populations.

Phelsuma

CITES taxonomy currently recognises 39 species of *Phelsuma*, of which 24 have been recorded in Madagascar (one, *P. cepediana,* only as escapes and almost certainly with no established wild population). Three new species have recently been described (*P. kely, P. ravenala* and *P. vanheygeni*) and are likely to be accepted in the next revision of CITES taxonomy. In addition, the species *P. madagascariensis* (currently exported with an annual quota of 2000 and not addressed in this report) has recently been divided into three separate species: *P. madagascariensis* (*sensu stricto*), *P. grandis* and *P. kochi*. Of the Malagasy species considered here, all except *P. abbotti* and *P. dubia* are endemic.

As their common name suggests, day-geckos are diurnal lizards. They range in length from ca 6 to 30 cm and are mostly arboreal, with one or two rock-dwelling (*P. barbouri* and *P. malamakibo*). Some, such as *P. abbotti, P. dubia* and *P. modesta* adapt themselves very well to human presence and can be abundant in and around dwellings. Many are very attractively coloured, often predominantly green with blue, red or yellow markings. They primarily feed on invertebrates, but also take nectar, pollen, plant exudates and sometimes ripe fruits of various kinds.

Status and distribution

As a genus, *Phelsuma*, is extremely widely distributed in Madagascar, although largely absent from completely deforested areas in the central highlands. Species vary considerably in the extent of their ranges and in the apparent specificity of their habitat requirements.

Nine species of *Phelsuma* have been assessed under the IUCN Red List programme of which four occur in Madagascar. One of these (*Phelsuma standingi,* designated as Vulnerable) was assessed in 1995 and is regarded as in need of re-assessment. *Phelsuma antanosy* was designated Critically Endangered in 2006 because of its extremely small and shrinking range. The two other, non-endemic, species (*P. laticauda* not considered here, and *P. abbotti*) were designated as of Least Concern because of their adaptability, wide ranges and evident abundance in the wild.

No quantitative population density or abundance estimates have been located any of the species within Madagascar. However, Gerlach (2008) surveyed reptiles on various Seychelles Islands and estimated population densities of three native species of *Phelsuma* (*P. astriata* and *P. sundbergi*, neither of which occurs in Madagascar, and *P. abbotti* which does). He found highly variable densities related often to the amount of tree cover. Maximum densities (of *P. astriata*) were found in coconut groves, where 625 individuals per ha (62,500 per km^2) were estimated in one case. It is clear that at least some species such as *P. lineata* can reach comparable densities locally in Madagascar (pers. obs).

Observations in captivity indicate that *Phelsuma* spp. are generally seasonal in their breeding, with the length of the breeding season varying from species to species. Females lay multiple clutches, usually of two eggs but sometimes of a single egg, at intervals of between two and four weeks through the season. Average annual productivity in captivity is 10-20 eggs. Incubation period varies and is temperature dependent, but appears normally in the range 35-50 days. Most species reach sexual maturity at 8-9 months but some of the larger species, such as *P. standingi*, may be one or two years old before they first breed. Maximum recorded longevity in captivity varies from species to species, ranging from seven or eight years to as much as twenty.

Use and trade

As noted above, day geckos are popular as exotic pets. International trade in the genus has amounted to a few tens of thousands of individuals a year since the late 1980s. Most exports have been from Madagascar, with the Comoros and the United Republic of Tanzania also exporting reasonable numbers. Overall trade levels have declined (generally to fewer than 20,000 per year) since the imposition of export quotas for the four exported species from Madagascar in 1999. The general market appears to be satisfied with a small number of species that are attractive and easy to keep, such as *P. madagascariensis, P. dubia* and *P. lineata*. The genus also attracts the interest of dedicated hobbysists. These are relatively few in number, but they certainly create demand for the less well known and rarer species.

Virtually all the species are currently bred or have been bred in captivity, some evidently only in very small numbers. Some species have become naturalised abroad, for example *P. madagascariensis* in Florida, but in general it seems that there is insufficient captive breeding overseas to satisfy markets so that there is still demand for specimens from countries of origin.

There is no known collection for local use in Madagascar.

Species summaries and tentative recommendations

Category 1: species for which available information suggests that no collection of wild specimens for commercial export should be allowed at present;

Category 2: species for which there is insufficient information available at present to determine whether collection of wild specimens for commercial export should be allowed;

Category 3: species for which information indicates that limited collection of wild specimens for commercial export could be allowed;

Category 4: species for which information indicates that moderate collection of wild specimens for commercial export could be allowed.

Table 1 *Calumma* (formerly *Chamaeleo*) species in Madagascar

Species	Proposed category	Observations
*amber**	**C1**	A species hitherto confused with *C. brevicorne* known only from within Montagne d'Ambre National Park; collection for commercial export could only be authorised were viable populations to be discovered outside the protected area.
andringitraense	**C3**	Relatively widespread in montane areas in the south.
boettgeri	**C4**	A widespread and common species in the north.
brevicorne	**C4**	Widespread, with adult population estimated in1999 at 660,000 – 56 million; clutch size of 5-16. Recent taxonomic changes have somewhat reduced known range of species (with concomitant impact on global population estimate), but species as currently recognised still widespread and common.
capuroni	**C1**	Known only from high altitudes in Andohehela Strict Nature Reserve.
cucullatum	**C2/C3**	A reasonably widespread species that may be at least locally common.
*crypticum**	**C4**	A widespread species hitherto confused with other *Calumma* species.
fallax	**C3**	Relatively widespread and believed to be not uncommon.
furcifer	**C2**	Limited range; no information on population status.
gallus	**C3**	Widely though possibly patchily distributed and locally common.
gastrotaenia	**C4**	Widespread, common and adapts well to secondary habitats.
glawi	**C3**	Limited range in eastern central Madagascar; locally common.
globifer	**C4**	Estimated 8300 km^2 habitat within range; adult population estimated at 675,000 – 8.5 million; annual productivity of 30-50 eggs.
guibei	**C1**	Known only from within the Tsaratanana Strict Nature Reserve.
guillaumeti	**C3**	Widespread in the north.
*hafahafa**	**C1**	A very limited known range in relict forest in the west.
hilleniusi	**C2**	Known from two mountain massifs in central and southern Madagascar. Little information on current status.
*jejy**	**C1**	Known only from the summit of Mt Marojejy in Marojejy National Park.
linotum	**C2**	A dubious species known from a few specimens from in the north.
malthe	**C4**	Widespread and locally abundant.
marojeziense	**C3**	Relatively widespread in the north and evidently locally common.
nasutum	**C4**	Very widespread and at leats locally abundant with adult population estimated at 670,000 – 100 million.
oshaughnessyi	**C4**	Widely distributed, with adult population estimated at 3 million to 25 million.
parsonii	**C3/C4**	Widespread, with adult population estimated at 1.2 million – 11.2 million; annual productivity of 30-60 eggs. However, generally low local population densities, long incubation period and (probable) relatively delayed maturity indicate susceptibility to local over-exploitation indicating a small quota.
*peltierorum**	**C2**	Known from two montane areas in the north.
peyrierasi	**C1**	Known from only one site in a protected area, and reportedly rare.
tsaratananense	**C1**	Known only from a single site within a strict nature reserve.
*tsycorne **	**C2**	Known from mid-altitude rainforest in two mountain ranges in the south-east.
vatosoa	**C2**	A little known species from the north.
vencesi	**C3**	Reasonably widespread in the north and at least locally common .

* Species recently described by Raxworthy and Nussbaum (2006).

Table 2: *Furcifer* (formerly *Chamaeleo*) species in Madagascar (except *F. lateralis, F. oustaleti, F. pardalis* and *F. verrucosus*)

Species	Proposed category	Observations
angeli	**C2**	Reasonably extensive range but reportedly not common.
antimena	**C3**	Reportedly common within its range.
balteatus	**C2**	Relatively limited range and reported not to be common.
belalandaensis	**C1**	Highly localized and extremely rare if not extinct.
bifidus	**C2/C3**	Widespread in the east but relatively rarely recorded in surveys.
campani	**C3**	Relatively wide ranging in highlands in southern central Madagascar and reported to be at least locally common.
labordi	**C2**	Population appears abundant enough to sustain at least a limited harvest for export, but only wild population studied has lifespan once hatched of 4-5 months only, and would therefore appear to be of little or no interest to importers.
minor	**C3/C4**	An adaptable and at least locally abundant species.
[*monoceras*	**C1**	Known only from the type specimen and now widely accepted to be a synonym of *F. rhinoceratus*]
nicosiai	**C1**	Entire known population confined to a single protected area.
petteri	**C3**	Reasonably widespread in the north and at least locally common.
rhinoceratus	**C3**	Reasonably extensive range in the north-west and at least locally common.
tuzeatae	**C2**	Recorded from two highly disjunct locations one in the south-west, the other in the north-west. Evidently rare or overlooked.
willsii	**C3**	Widespread and occurs in secondary habitats.

Table 3: *Phelsuma* species in Madagascar (except *P. laticauda, P. lineata, P. madagascariensis (s.l.)* and *P. quadriocellata*)

Species	Proposed category	Observations
abbotti	**C4**	IUCN Red List category Least Concern (assessed 2006); non-endemic, widespread and abundant.
antanosy	**C1**	IUCN Red List category Criticially Endangered (assessed 2007); highly restricted range with declining habitat.
barbouri	**C3**	Relatively restricted range, but locally common and habitat not under threat.
berghofi	**C2**	Recently described and known from only limited area; occurs in the common Traveller's Palm *Ravenala madagascariensis* and may be more widespread than currently known.
breviceps	**C3**	Relatively restricted range in the south-west.
[cepediana	**C1/C4**	Non-native, and probably not established as wild population. Either no restriction, or no export should be allowed to prevent possible confusion or mis-identification.]
dubia	**C4**	Non-endemic, widespread and abundant.
flavigularis	**C2**	Known from only a limited area; occurs in the common Traveller's Palm *Ravenala madagascariensis* and may be more widespread than currently known.
guttata	**C4**	Widespread and at least locally common.
hielscheri	**C2/C3**	A recently described species known from two disjunct areas in south-west Madagascar and very likely to be more widely distributed than currently known. Likely to be able to sustain some collection for export.
*kely**	**C2**	A very small recently described species known only from its type locality.
klemmeri	**C3**	Relatively restricted distribution in the north-west but known to be more widespread than previously thought and found in secondary habitat (bamboo).
malamakibo	**C1**	A recently described species known only from upland areas in Andohahela Strict Nature Reserve.

Species	Proposed category	Observations
masohoala	**C2**	A little known species from the north-east.
modesta	**C4**	A widespread species not known to be under any threat.
mutabilis	**C4**	A widespread adaptable and locally abundant species.
pronki	**C1**	Known from a very limited range and apparently uncommon within that range.
pusilla	**C4**	A widespread and common species known to adapt to secondary habitats.
*ravenala**	**C2**	A recently described species known only from its type locality.
seippi	**C3**	Relatively restricted distribution in the north-west but known to be more widespread than previously thought and found in secondary habitat (bamboo).
serraticauda	**C2/C3**	Known only from a limited area.
standingi	**C3**	Reasonably broad distribution in the south-west.
*vanheygeni**	**C2**	A recently described species known from a limited area of the north-west.

* recently described species not currently included in the CITES checklist.

Species accounts

1. Accounts for *Calumma* species in Madagascar

Calumma amber

A medium-sized species, previously confused with *C. brevicorne*, growing to ca 25 cm in total length.

Distribution The species is currently only known from Montagne d'Ambre National Park in northern Madagascar where it appears to be restricted to mid-elevation humid forest at altitudes of 900-1300 m (Glaw and Vences, 2007).

Population Evidently not uncommon within its limited range – in 1992 (when it was believed to *C. brevicorne*) a density of some 25 individuals per hectare was estimated in Montagne d'Ambre National Park (IUCN /SSC TSG *et al.*. 1993).

Life history Little information although presumably similar to *C. brevicorne*. Gravid females with at least a dozen eggs have been recorded in Montagne d'Ambre National Park(IUCN /SSC TSG *et al.*. 1993).

Tentative conclusions Although the species may be reasonably abundant within its limited range, and theoretically capable of withstanding a very limited offtake for commercial export, as far as is known the entire range of the species lies within a protected area where collection for commercial purposes is forbidden. No export quota should therefore be allocated unless a viable population is discovered outside a protected area.

Calumma andringitraense

A relatively small chameleon growing to 15 cm, very similar to and formerly included in *C. gastrotaenia*.

Distribution Occurs in montane areas in southern Madagascar. Formerly believed endemic to the Andringitra Massif, it has recently also been recorded in the Kalambatritra Massif by Andreone and Randrianirina (2007). These authors believe that records ascribed to *C. gastrotaenia* from the Anosy mountains (Chaînes Anosyennes) to the south of this should be ascribed to this species.

Population No quantitative information. Raxworthy (2008) and Vences (2008) both consider that the species is abundant enough to support collection for a small export quota.

Life history No specific information although presumably similar to *C. gastrotaenia*.

Tentative conclusions The species is evidently relatively widespread in southern Madagascar. Species of the *C. gastrotaenia* complex are generally at least locally abundant. This species seems very likely to be able to support collection for at least a small export quota.

Calumma boettgeri

A small chameleon up to 13 cm in length, similar to *C. nasuta*.

Distribution Widely distributed at low and mid-altitude (up to at least 1300 m) in northern Madagascar (Raxworthy et al, Glaw and Vences, 2007, IUCN/SSC TSG *et ai.*, 1993). Occurs in both modified and undisturbed forests (IUCN/SSC TSG *et al.,* 1993, Andreone, *et al.*, 2003).

Population At least locally abundant, for example in secondary forest on Nosy Be and at mid-altitude in Montagne d'Ambre National Park (IUCN/SSC TSG *et al.*, 1993).

Life history Clutches of 4-5 eggs laid after a gestation period of some 45 days and hatching after some 3 months incubation (IUCN/SSC TSG *et al.,* 1993, Schenke and Heinecke, 2002).

Tentative conclusions A widespread and at least locally species that would appear capable of supporting a moderate export quota.

Calumma brevicorne

A medium to large sized species, reaching up to 37 cm, similar to and clearly related to *C. cucullata* and *C. malthe*.

Distribution *C. brevicorne* is widely distributed in the rainforests of eastern Madagascar from the southern part of the Chaines Anosyennes in the far south to the southeastern limits of the Tsaratarana Massif in the north, and at altitudes of between 810 and 1000 m (Raxworthy *et al.*, 2006). Records at higher altitudes and from the Montagne d'Ambre in the far north are now assigned to newly described species including *C. amber* (qv). The species appears to be more often recorded in disturbed forest and open habitats, including roadside scrub and village gardens, than in the interior of mature rainforest. Brady and Griffiths (1999) estimated some 30,000 km^2 of available habitat within its range, although this is undoubtedly an overestimate as some parts of what was formerly considered its range are now known to be occupied instead by other, similar species (Raxworthy *et al.,* 2006).

Population The species has often been described as one of the most abundant rainforest chameleons in Madagsacar (although this may be a reflection of the fact that its apparent preference for more disturbed habitats is likely to make it more often encountered than species with a preference for mature forest, especially high-canopy species). On the basis of field surveys, Brady and Griffiths (1999) found highly variable population densities, ranging from 40 to 3400 individuals per km^2. The extrapolated these to an overall population of between 1.2 and 102 million individuals, of which between 660,000 and 56 million were adults, although because its range has been overestimated (see above), this too this is probably an overestimate.

Life history Clutch size of captive animals reportedly varies from 5 to 16 eggs with incubation under artificial conditions at 22.5°C taking 5 months and sexual maturity reached 8 months after hatching. Gravid females containing at least 12 eggs having been recorded in the wild, and one wild female has been observed laying a clutch of 13 eggs (Brady and Griffiths, 1999).

Tentative conclusions With an large or very large adult population and good reproductive potential, the species is clearly capable overall of sustaining at least a moderate harvest for export.

Calumma capuroni

A medium-sized chameleon, growing to just over 20 cm in total length.

Distribution Known only from Andohehela National Park at the southern end of the Chaînes Anosyennes in extreme southern Madagascar, where recorded at 1900-1950 m altitude (Brygoo, 1978; Glaw and Vences, 2007).

Population No information.

Life history No information.

Tentative conclusions As far as known at present, the species has a highly restricted distribution all of which is within a single national park where collection for commercial export is forbidden. A zero export quota therefore seems appropriate.

Calumma cucullatum

A medium-sized to large chameleon, up to 38 cm in total length.

Distribution Recorded from mid altitude and lowland forest in eastern Madagascar from Moramanga, due east of Antananarivo to Andapa in the north (IUCN/SSC TSG *et al.,* 1993; Glaw and Vences, 2007). Most records are from lowland forest (below ca 500 m) although Andreone *et al.* (2000) recorded it at ca 1000 m in Ambolokopatrika forest west of the Marojejy Massif. However, the species appeared to be localised in this area, as it was only recorded at one site in a relatively extensive survey (Andreone *et al*, 2005).

Population The species has not been frequently reported recently. However, Andreone *et al.* (2005) recorded it on transects at three out of five survey sites in the Masoala Peninsula. They also found it to be evidently common at one site in Ambolopatrika forest. Raxworthy (2008) believes that more information should be obtain on the status of the species before a commercial quota is set.

Life history No information.

Tentative conclusions The species is reasonably widespread and appears to be at least locally common. However, it has been relatively rarely recorded in recent years. From observatoIt may be capable of sustaining collection for a small export quota.

Calumma crypticum

A medium-sized chameleon, reaching around 20 cm in length, previously confused with *C. brevicorne.*

Distribution Widely distributed from the Chaines Anoysennes in the far south to the Tsaratanana Massif in the north, extending across the High Plateau region, at altitudes of between 1050 and 1870 m (Raxworthy *et al.* , 2006).

Population No quantitative information, but Raxworthy (2008) and Vences (2008) both believe it to be common enough to sustain a moderate export quota.

Life history No information, although likely to be similar to *C. brevicorne*. Both Raxworthy (2008) and Vences (2008) believe the species to be abundant enough to sustain a moderate export quota.

Tentative conclusions Although only recently described, the species is known to be very widespread and is believed likely to be able to withstand collection for moderate levels of export.

Calumma fallax

A small chameleon, up to 11 cm in total length, similar to *C. nasuta*.

Distribution Relatively widespread at mid-altitude in east and south-east Madagascar (Glaw and Vences, 2007).

Population No quantitative information, although Raxworthy (2008) believed the species to be abundant enough to support a small export quota.

Life history No information.

Tentative conclusions Although there is relatively little information on its status, the species is known to be widespread and is believed abundant enough to sustain harvest for a small export quota.

Calumma furcifer

A small chameleon, up to 15 cm in total length, related to *C. gastrotaenia*.

Distribution Recorded from a relatively small area of eastern Madagascar in the region of Toamasina (Glaw and Vences, 2007).

Population No quantitative information. Reported as 'rather rare' by Glaw and Vences (2007).

Life history No information.

Tentative conclusions There is insufficient information to determine whether the species could sustain collection for commercial export or not.

Calumma gallus

A small chameleon, to around 12 cm in total length.

Distribution Widely distributed in eastern Madagascar from Andapa in the north to the far south (Glaw and Vences, 2007).

Population The species appears to be patchily distributed but is evidently at least locally common. Brady and Griffiths (1999) recorded densities of 7 and 27 individuals per hectare at Mantadia.

Life history No information.

Tentative conclusions The species is widely, although possibly patchily, distributed and at least locally common. It should be capable of sustaining harvest for a small export quota.

Calumma gastrotaenia

A small chameleon, to around 15 cm in total length. The species formerly included a number of populations that have in recent years been recognised as separate species (*C. andringitraensis, C. guillaumeti, C. marojezensis*)

Distribution As currently recognised, the species occupies a relatively extensive range in central and eastern Madagascar at altitudes up to 1100 m. The species appears adaptable, and has been reported in shrubby vegetation along roadsides and in regrowth forest as well as in mature humid forest (Andreone *et al.,* 2001).

Population Described as common (IUCN/SSC TSG *et al.,* 1993). Brady and Griffiths (1999) found it to be abundant at two of their survey sites (Andranomay and Mantadia), with some very high densities recorded (max of 130 individuals per hectare). In both areas the species was the most abundant chameleon observed in both heavily disturbed and undisturbed forest.

Life history No specific information.

Tentative conclusions The species is widely distributed and at least locally abundant, and seems very likely to be able to support collection for a moderate export quota.

Calumma glawi

A relatively small chameleon, to around 15 cm in total length, described in 1997 and similar to *C. gastrotaenia*.

Distribution The species is known from the Ranomafana area in eastern central Madagascar at altitudes of 900-1100 m, where it occurs in sympatry with *C. gastrotaenia* (Brady and Griffiths, 1999; Glaw and Vences, 2007). Its currently known range is relatively limited, although it may be more widespread than is currently known.

Population Brady and Griffiths (1999) found it to be relatively abundant (densities of up to 30 individuals per hectare) in lightly logged forest at Ranomafana and to be present, though at much lower densities (averaging 1-2 individuals per hectare) in intensively logged forest in the region.

Life history No specific information.

Tentative conclusions Although having an apparently limited range, the species is known to be at least locally abundant and is likely to be able to support a limited harvest for export.

Calumma globifer

Calumma globifer is a medium to large chameleon, reaching around 37 cm in total length and very similar to *C. oshaughnessyi*.

Distribution *C. globifer* occurs in the eastern rainforests in the northern central part of Madagascar, from the Betsileo region to the Marojejy Massif, where it has been recorded at altitudes of between 1000 and 2550 m above sea level. Records from the Montagne d'Ambre in the far north are believed to be the result of mis-identification. Brady and Griffiths (1999) estimated just under 8300 km^2 of suitable habitat within the range of the species.

Population On the basis of field surveys, Brady and Griffiths (1999) estimated population densities ranging from 160 to just over 2000 individuals per km^2, giving an overall population of 1.3 to 17 million individuals, of which between 675,000 and 8.7 million were adults.

Life history Captive females reportedly produce a single clutch of eggs annually, of 30 to 50 eggs. Incubation in captivity at 21°C took 8 months, with sexual maturity reached 8 months after hatching (Brady and Griffiths, 1999).

Tentative conclusions With an estimated adult population of between 675,000 and 8.7 million (ca 340,000 – 4.35 million females assuming balanced sex ratios in the wild), and a reproductive capacity of 30-50 eggs per breeding female per year, the species is clearly capable overall of sustaining at least a moderate harvest for export.

Calumma guibei

A small and virtually unknown chameleon, reaching around 9 cm in total length.

Distribution Known only from forest at 1800 m in Tsaratanana Strict Nature Reserve in northern Madagascar (Glaw and Vences, 2007).

Population No information.

Life history No information.

Tentative conclusions The species is hardly known, and the only specimens come from within a single strict nature reserve where collection for commercial purposes is forbidden. A zero export quota therefore seems appropriate.

Calumma guillaumeti

A relatively small chameleon, up to 13 cm in total length formerly included in *C. gastrotaenia*.

Distribution As currently understood, the species occurs in montane forests in northern Madagascar at altitudes of between 1200 and 1700 m, notably in the massifs of Marojejy, Tsaratanana and Anjanaharibe-Sud (Andreone *et al.,* 2001).

Population The species appears to be frequently encountered and not uncommon within its range (Andreone *et al.*, 2001). Raxworthy (2008) believes it to be capable of sustaining a small exort quota.

Life history No information.

Tentative conclusions The species is evidently relatively widespread in northern Madagascar, and appears to be at least locally common within its range. It is likely to be able to support at least limited collection for export.

Calumma hafahafa

A recently described medium-sized chameleon, reaching around 23 cm in length and resembling *C. brevicorne*.

Distribution The species is currently known only from the Bemanevika Lakes region of western Madagascar in Mahajanga Province, where it has been recorded in relict humid forest between 1580 and 1650 m elevation. Forests here were reported in 2006 as apparently gradually declining in extent and fragmenting as a result of burning of pastures for cattle grazing (Raxworthy *et al.,* 2006). However, the area was also reportedly one of low population density.

Population No information.

Life history No information.

Tentative conclusions With an apparently very limited range not included in any protected area and with habitat reportedly declining in extent it seems unlikely that this species would be suitable for collection for commercial export, unless it were found to be considerably more widespread than currently known.

Calumma hilleniusi

A medium sized chameleon growing to around 22 cm, though normally only to 15 cm, similar to though smaller than *C. brevicorne*.

Distribution Known from high altitudes in the Ankaratra and Andringitra Massifs in central and southern Madagascar (Andreone *et al.*, 2001; Glaw and Vences, 2007). In the Ankaratra Massif recorded from gallery forest and tall shrubs between 1800 and 2000 m (Vences *et al.*, 2003).

Population No information.

Life history In captivity clutches of 6-8 eggs are laid after a gestation of around 40 days. Incubation period has been variously quoted as 90 days (Henkel and Heineke, nd) and between 9 and 12 months (Pollak and Pietschmann, 2002).

Tentative conclusions There appears to be insufficient information to determine whether the species can sustain a harvest for commercial export.

Calumma jejy

C. jejy is a recently described medium-sized species reaching around 20 cm in total length and similar to *C. brevicorne*.

Distribution Known only from the summit area of Marojejy Mountain, between 1800 and 2130 m. The vegetation in the area is montane heathland and montane dominated by bamboo with many rocky outcrops (Raxworthy *et al.,* 2006).

Population No information. Its known area of occurrence is very limited, so that it is highly probable that the global population is not large.

Life history No information on breeding. Most individuals have been recorded on the ground, on rocks or in grass indicating a largely terrestrial habit extremely unusual in Malagasy chameleons other than *Brookesia* (Raxworthy *et al.,* 2006).

Tentative conclusions Assuming the species to be confined to the Marojejy Massif, it is likely to have a small global population lying within a protected area (Marojejy National Park) where collection for commercial purposes is forbidden. Only in the event of a viable population being discovered outside a protected area should a commercial export quota be contemplated. The summit of the Marjojejy Massif is not easily accessible and the species is unlikely to enter commercial trade.

Calumma linotum

A dubious species, known from a male holotype that may be an aberrant *C. boettgeri*, and four females from the Col d'Ambatodradama in northern Madagascar (Glaw and Vences, 2007).

Tentative conclusions There is insufficient information to determine whether this species, if it exists, could sustain collection for export.

Calumma malthe

A fairly large chameleon, reaching 30 cm or more in length, similar to but largely sympatric with *C. brevicorne*.

Distribution A widespread species in eastern and northern Madagascar, from Mantadia north at least to the southern part of the Tsaratanana Massif (Brady and Griffiths, 1999; IUCN/SSC TSG *et al.*, 1993; Raxworthy *et al.* 2006).

Population At least locally abundant. Brady and Griffiths (1999) recorded densities of up to 31 individuals per hectare at Mantadia. They found the species to be on average more abundant in disturbed than in undisturbed sites.

Life history No information.

Tentative conclusions The species is widespread and at least locally abundant, and can evidently survive well in disturbed habitats. It would seem likely to be able to support at least a moderate harvest for export.

Calumma marojeziense

A small chameleon, to 15 cm in total length, formerly considered a subspecies of *C. gastrotaenia*.

Distribution Recorded at low to medium altitudes in northern Madagascar, where apparently widespread, having been recorded in the Majorejy region, the Masoala peninsula, and at Andranivola (Andreone *et al,*, 2001).

Population As *C. gastrotaenia* the species has been recorded as evidently at locally common in northern Madagascar, for example on the Masoala peninsula where Andreone *et al.* (2005) found it to be the most abundant chameleon, recording it at all survey sites.

Life history No information.

Tentative conclusions The species appears widespread in northern Madagascar and is evidently at least locally common. It would appear capable of sustaining harvest for at least a small export quota.

Calumma nasutum

A small-bodied chameleon (up to 11 cm body length), largely brown in colour, with a single, soft nasal appendage. International demand is likely to be largely confined to specialist collectors.

Distribution The species is widely distributed in the eastern rainforest region, from the area around Fort Dauphin (Talagnaro) in the extreme south to Nosy Be in the north and has been recorded at altitudes from 0 to 1300 m above sea level. Records from Montagne d'Ambre in the extreme north are believed to represent introductions (Brady and Griffiths, 1999). The species occurs in mature rainforest and also in regrowth forest and various forest edge habitats, including roadsides, railway verges, shrubby vegetation and heathland (Brady and Griffiths, 1999). The total area of suitable habitat within its range was estimated by Brady and Griffiths (1999) at around 60,000 km^2.

Population Population density based on field surveys was found to be highly variable, ranging from around 20 to nearly 3000 per km^2. Total population estimate was therefore similarly variable, ranging from 1.2 million to nearly 178 million (95% confidence limits), with 670,000 to 116 million adults.

Life history Clutch size in captivity is 2-4 eggs. Gravid females and hatchlings have been recorded throughout the summer months in field surveys, with a marked increase in the number of hatchlings at the end of the summer. In captivity, gestation lasts 45 days with incubation normally around 90 days, although periods of as short as 60 days have been reported (Pollak, 2002).

Tentative conclusions With a wild adult population estimated at between 670,000 and over 100 million, and almost certainly numbering in the tens of millions, this species is clearly capable overall of sustaining at least a moderate harvest for export.

Calumma oshaughnessyi

A medium to large species, reaching up to 40 cm in length.

Distribution The species is very widely distributed in the eastern rainforests, having been recorded from the Anosy Mountains (Chaînes Anosyennes) in the south to the Montagne d'Ambre in the far north at altitudes from 600 to 1400 m above sea level. Brady and Griffiths (1999) estimated some 27,500 km^2 of suitable habitat within its range.

Population On the basis of field surveys, Brady and Griffiths (1999) calculated densities of between 230 and just under 2000 individuals per square kilometre. From this they extrapolated a possible national population of 6.3 to 53 million, with 3 to 25 million adults (95% confidence intervals).

Life history Clutch size and incubation period are unknown.

Tentative conclusions With an estimated adult population of between 3 and 25 million (1.5 – 12.5 million females assuming balanced sex ratios in the wild), even if the species has unusually low reproductive

capacity for a *Calumma* (and there is no reason to think this), it is clearly capable overall of sustaining at least a moderate harvest for export.

Calumma parsoni

A large chameleon, capable of reaching some 60 cm in total length.

Distribution The species is widely distributed in the eastern rainforests and Sambirano region in the north-west. It is generally associated with relatively undisturbed rainforest, although it may also apparently be encountered in small fragments of secondary forest and mature stands of agricultural trees (Brady and Griffiths, 1999). It has been recorded at altitudes from 0 to 1300 m above sea level. In 1999 Brady and Griffiths estimated just under 40,000 km^2 of suitable habitat within the range.

Population On the basis of field surveys, Brady and Griffiths (1999) calculated densities of between 100 and just under 1000 individuals per square kilometre. From this they extrapolated a possible national population of 3.9 to 37.5 million, with 1.2 to 11.2 million adults (95% confidence intervals).

Life history Captive females have been recorded as laying one clutch per year of between 30 and 60 eggs. Incubation period under artificial conditions varies from 13 to 24 months. Sexual maturity has been reported at 1.5 years, although Brady and Griffiths(1999) note that anecdotal evidence indicates that in captivity maturity may not be reached until 3 to 5 years after hatching, longer than that reported for other Malagasy chameleons.

Tentative conclusions With an estimated adult population of between 1.2 and 11.2 million (600,000 – 5.5 million females assuming balanced sex ratios in the wild), and a reproductive capacity of 30-60 eggs per breeding female per year, the species is clearly capable overall of sustaining at least a moderate harvest for export.

Calumma peltierorum

A recently described medium-sized chameleon reaching around 22 cm in length resembling *C. brevicorne*.

Distribution Known only from two montane areas in northern Madagascar: the Massif of Tsaratanana and Anjanaharibe-Sud, where recorded in montane rainforest at altitudes between 1700 and 2580 m (Raxworthy *et al.*, 2006).

Population No information.

Life history No information.

Tentative conclusions The species evidently has a limited global range and its overall population is unlikely to be large. It is, however known from two separate areas and may be more widespread than currently known. More information on the status of the species is clearly needed before any export quota could be recommended.

Calumma peyrierasi

A small (to 11 cm) and very little known chameleon.

Distribution Known only from high altitudes (above 1650 m) in the Marojejy Massif in northern Madagascar. Habitat in this area is largely ericoid thicket (Glaw and Vences, 2007).

Population Unknown, although apparently rare (Andreone *et al,*, 2001).

Life history No information.

Tentative conclusions This species appears to be endemic to a small area and is reportedly rare. As far as is known its range lies within a national park, where collection for commercial purposes is forbidden; a zero export quota would therefore appear appropriate.

Calumma tsaratananense

A chameleon known only from the female type specimen which was 11 cm in total length.

Distribution Known only from the Tsaratanana Massif in northern Madagascar at 2500 m altitude (Glaw and Vences, 2007). At this height habitat comprises sclerophyllous forest merging into ericoid heathland (Crowley, nd).

Population No information.

Life history No information.

Tentative conclusions The species is known only from the type specimens and is likely to be rare. Its entire known range is within the Tsaratanana Strict Nature Reserve, where no collection for commercial purposes is allowed. A zero export quota therefore seems appropriate.

Calumma tsycorne

A recently described medium-sized chameleon, reaching around 25 cm in total length, resembling *C. brevicorne.*

Distribution Known from two mountain areas in south-east Madagascar, the Kalambatritra Massif and the Chaines Anosyennes, were recorded in mid-altitude rainforest at altitudes between 1110 and 1250 m (Raxworthy *et al.*, 2006).

Population No information.

Life history No information.

Tentative conclusions The species has a relatively limited known range; part of this is in the Andohahela National Park where no collection for commercial export would be permitted while part is in the Kalambatritra special reserve, where commercial collection may possibly be permitted (depending on the precise terms of the ordinance that established the area). However, more information on the status of the species is needed before any export quota could be recommended.

Calumma vatosoa

A relatively recently described (2001) fairly small, brightly coloured chameleon, measuring ca 13 cm, similar to *C. gastrotaenia*.

Distribution Currently only recorded from its type locality, the summit area of the Tsararano mountain chain in northern Madagascar south of the Marojejy Massif. The species was recorded at an altitude of 665 m in an area of mixed rainforest and ericoid heathland (Andreone *et al.*, 2001).

Population No information.

Life history No information.

Tentative conclusions This species remains virtually unknown, but may have a limited distribution. It would appear that further information is required before any quota for commercial export could be set.

Calumma vencesi

A relatively recently described (2001), fairly small chameleon reaching some 15 cm in total length, similar to *C. gastrotaenia.*

Distribution Recorded from forest areas to the south and south-west of the Marojejy Massif in northern Madagascar (specifically Ambolokopatrika, Besariaka and Tsararano forests) and thought likely to occupy an altitudinal range of 600-1000 m (Andreone *et al*, 2001).

Population Described as 'rather abundant' in those areas where it was found (Andreaone *et al.*, 2001).

Life history No specific information, although likely to be similar to *C. gastrotaenia*.

Tentative conclusions The species evidently has a reasonably wide distribution in northern Madagascar and is reportedly common in areas where it was found. It seems likely that it is capable of supporting limited collection for at least a small commercial export quota.

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2. Accounts for *Furcifer* species in Madagascar (except *F. lateralis, F. oustaleti, F. pardalis* and *F. verrucosus*)

Furcifer angeli

A relatively large chameleon, reaching at least 33 cm in length, possibly more.

Distribution Occurs in the dry forests of north-western Madagascar, from the Tsingy de Namoroka at least as far north as Anjiamangirana (Glaw and Vences, 2006). Recorded in both degraded and undegraded forests but not in more heavily modified or open habitats (Raselimanana and Rakotomalala 2003). Its overall known range covers several thousand square kilometres but only a portion of this is forested.

Population No detailed information, although reported to be generally less commonly encountered in Ankarafantsika Nature Reserve than other chameleon species (Ramamanjato and Rabibisoa, 2002).

Life history No information.

Tentative conclusions The species has a relatively extensive range and it is likely that it could sustain a limited harvest for export. However, there are indications that it is not common and it would be advisable to obtain more information on its wild status before establishing any quota.

Furcifer antimena

A relatively large chameleon, reaching some 34 cm in length, related to *F. rhinoceratus*.

Distribution Occurs in south-west Madagascar between the Onilahy and Mangoky Rivers at altitudes of from 0 to 300 m above sea level (Brady and Griffiths, 1999; Glaw and Vences, 2007). Brady and Griffiths (1999) estimated its range at around 4200 km^2. It has been recorded in both degraded and undegraded areas.

Population Reported to be commonly encountered during the summer months (Brady and Griffiths, 1999; IUCN/SSC TSG *et al.*, 1993). A density of just under 20 individuals per hectare was recorded in a study near Toliara (Andriamandimbiarisoa, 2007).

Life history Captive females can reportedly produce 2-3 clutches of 8-23 eggs each year. Incubation at 25°C takes 7-8 months and sexual maturity can be reached 6 months after hatching (Le Berre, 1995).

Tentative conclusions Although not widely distributed, the species appears to be common within its range and has a high reproductive potential. It would appear to be capable of supporting collection for at least a small export quota.

Furcifer balteatus

A large chameleon, reaching around 44 cm in maximum length.

Distribution The species appears to have a limited distribution around Ranomafana National Park in south-central eastern Madagascar, where it is thought to occur at altitudes of from ca 200-900 m. Brady and Griffiths (1999) estimated the extent of the range to be just under 3000 km^2. Within this area the species is primarily associated with scrubland, orchards and other relatively open or modified habitats, rather than with continuous stands of mature forest. Such modified habitats were estimated to cover around 2000 km^2 within the range of the species, although it is not known what proportion of this is actually occupied by it. IUCN/SSC TSG *et al.* (1993) note an unconfirmed report that the species has been recorded at Brickaville, some 400 km north of the currently known range. If this were confirmed it would greatly extend the distribution of the species.

Population No quantitative data are available, although Brady and Griffiths (1999) indicate that it was regarded by collectors as not common.

Life history No information.

Tentative conclusions The fact that the species can evidently adapt to secondary habitats indicates that it is likely to be able to support some collection for at least a small export quota. However, given its apparently limited range and the absence of any quantitative population data, it may be advisable to defer the establishment of a quota until more information is available.

Furcifer belalandaensis

A relatively large chameleon very similar to and previously included in *F. antimena*.

Distribution Known only from the region of Belalanda village near Toliara in south-west Madagascar, where it has been recorded in degraded gallery forest (Glaw and Vences, 2007). The species was not recorded during extensive surveys of other forest habitats in the region and is thought likely therefore to be restricted to gallery forest (Andriamandimbiarisoa 2007).

Population The species was last recorded in 1995 and has not been found recently during surveys of the region (Andriamandimbiarisoa 2007). If it is still extant its population is likely to be very low.

Life history No information.

Tentative conclusions The species is evidently extremely localised and very rare if not extinct. A zero export quota is clearly appropriate.

Furcifer bifidus

Distribution Occurs in eastern Madagascar from the Mangoro River in eastern-central Madagascar as far north as the Marojejy Massif. Reported to be a lowland species, generally recorded below 450 m altitude (Glaw and Vences, 2007).

Population No information. Andreone *et al.* (2005) reported it at only one of five survey sites in the Masoala peninsula. Similarly, Rakotondravony (2006) found the species in only one of 12 forests surveyed in the Loky-Manambato complex near Daraina. It is likely, however, that the species, like other members of its group such as *F. minor* and *F. willsii* (q.v.) is more prevalent in open areas or secondary forest which have been generally less well surveyed.

Life history No information.

Tentative conclusions The species is relatively widespread and if its biology is similar to that of other closely related species such as *F. minor* and *F. willsii*, it is likely to be capable of supporting collection for at least a small export quota. However, it is not often recorded in surveys, and it may be advisable to gather further information on its status before an export quota is set.

Furcifer campani

A small chameleon, growing to around 13 cm.

Distribution The species occurs at high altitudes (1850-2300 m) in mountain regions in the southern part of the central plateau, from the Ankaratra Massif in the north to the Andringitra Massif in the south. It occurs chiefly on open grassland and heathland and on the edges of forest patches (Brady and Griffiths, 1999, Glaw and Vences, 2007). Brady and Griffiths (1999) estimated a range of some 23,000 km^2, almost all of which was grassland and other forms of open vegetation.

Population Brady and Griffiths (1999) note that collectors report the species to be very abundant during the summer months. IUCN/SSC TSG *et al.* (1993) note earlier reports that state it was not uncommon on the Ankaratra Massif.

Life history Le Berre (1995) reports clutches of 8 – 12 eggs with females in captivity laying 2 to 3 clutches each year and an incubation period of 9 months. Sexual maturity can reportedly be reached in as little as 3 months after hatching.

Tentative conclusions The species has a relatively extensive range, is reportedly not rare and appears to have a reasonably high reproductive rate. It would appear capable of supporting collection for at least a small export quota.

Furcifer labordi

A medium-sized chameleon, reaching ca 27 cm in total length, similar to *F. rhinoceratus* and *F. antimena*.

Distribution The species is restricted to west and south-west Madagascar where it is found in lowland areas (20-100 m asl) with spiny desert vegetation from south of Toliara north to the region of Morondava.

Population Population densities of 30 individuals per hectare have been reported from a study site near Toliara (Andriamandimbiarisoa, 2007).

Life history The population near Toliara display a life history pattern that is, as far as known, unique in tetrapods. Synchronous hatching occurs in November, at the start of the rainy season, followed by rapid growth to maturity, mating in January, production of eggs and then senescence and death by April (Karsten *et al.*, 2008). Limited data indicate a clutch size of 8-11 eggs (Karsten *et al.*, 2008, Pollak, 2002). It is not clear if all populations of this species follow the same life history pattern.

Tentative conclusions The species is relatively widespread and apparently at least locally common, during the summer months. If all populations display the same annual life-cycle as the population studied near Toliara, it is not clear that there will be any interest in the importation of wild-collected adults, as these will only survive a few weeks at most. More information is required from other populations to determine whether this will be the case.

Furcifer minor

A medium-sized chameleon, reaching some 27 cm in total length similar to *F. petteri* and *F. willsii.*

Distribution Restricted to southern central Madagascar from the region of Fianarantsoa south to Betafo. A single record from the west coast is believed likely to be in error. Its altitudinal range is believed to be roughly 1000-1650 m. Brady and Griffiths (1999) calculated its range as roughly 26000 km^2, although it was not known what proportion of this was actually occupied by the species. The species can evidently adapt very well to modified habitats such as coffee and cocoa plantations (Anderson, 2002; Pollak, 2002; Glaw and Vences, 2007). Anderson (2002) on the basis of observations in 2001-2002 reported it to be widespread and evidently common in highly disturbed areas with little natural tree cover in the region of Itremo (1340 m altitude) and noted that it was also said to be abundant in degraded vegetation along a main road near Ambositra (Anderson, 2002).

Population Reported to be at least locally common in disturbed or modified habitats (see above) (Anderson, 2002).

Life history Information from captive animals indicates a clutch size of 4-16 eggs with a female capable of producing up to three clutches in a year. Sexual maturity is typically reached in about 5 months (Pollak, 2002).

Tentative conclusions The species can evidently adapt well to modified habitats and is reported to be locally common. It would appear to be capable of sustaining offtake for at least a small and probably a moderate export quota.

Furcifer nicosiai

A large chameleon very similar to both *F. oustaleti* and *F. verrucosus* (both of which are currently exported commercially under quota).

Distribution Currently known only from within the Tsingy de Bemaraha National Park in western Madagascar, where found associated with relatively intact dry, deciduous forest (Jesu *et al.,* 1999; Randrianantoandro *et* al., 2008). Records tentatively ascribed to this species from the Menabe region are believed to be of an as yet undescribed species (Raselimanana, 2008).

Population Randrianantoandro *et al.* (2008) found it to be not uncommon in the Tsingy de Bemaraha National Park.

Life history No information but presumably similar to that of *F. oustaleti* and *F. verrucosus*.

Tentative conclusions The entire known population at present is confined to a protected area where collection for commercial export is forbidden. A zero export quota would therefore be appropriate, at least until a viable population outside a protected area is discovered.

Furcifer petteri

A small chameleon, up to 17 cm in total length, very similar to and formerly considered conspecific with *F. willsii*.

Distribution Reported from north and north-west Madagascar, from the Montagne des Français in the far north as far south as the Tsingy de Bemaraha (although it has recently been suggested that the population in the latter represents a different species (Jenkins *in litt,* 2009). It has been reported from intact humid forest, degraded forest and well-vegetated gardens (Glaw and Vences, 2007).

Population Glaw and Vences (2007) note that it can be locally abundant. Regarded as uncommon in the Montange des Français (D'Cruze *et al.*, 2007) but evidently common in the Loky-Manambato complex near Daraina (Rakotondravony, 2006) and at lower altitudes in Montagne d'Ambre National Park (Cattau, 2004).

Life history In captivity incubation takes ca 240 days at 22°C.

Tentative conclusions The species is evidently at least locally common within its reasonably extensive range and would appear able to sustain harvest for at least a small export quota.

Furcifer rhinoceratus

A medium-sized chameleon reaching around 27 cm in total length, similar to *F. antimena* and *F. labordi*.

Distribution Reasonably widespread in north-west Madagascar in the region of Mahajanga including the Soalala Peninsula and the Ankarafantsika National Park. Occurs in relatively open areas of low or secondary vegetation, including scrub along roads and paths, but also in forest (Glaw and Vences, 2007; Pronk, 2002).

Population Reported to be locally common (Pronk, 2002).

Life history In captivity in Madagascar, clutches of 4-11 eggs were laid in November and hatched after an incubation of just over 290 days at 28.5°C (Pronk, 2002).

Tentative conclusions The species has a reasonably wide range and is at least locally common and would appear capable of sustaining a harvest for a small export quota.

Furcifer tuzetae

A medium sized to large chameleon, reaching around 40 cm in total length.

Distribution Until recently known only from its type-locality in south-west Madagascar near Andrenalamivola (Brygoo *et al.,* 1972, Glaw and Vences, 2007). However, it has recently been reported from two localities in the far north-west, including the Sahamalaza Biosphere Reserve. The discovery of populations at two opposite ends of Madagascar imply either a highly disjunct distribution, or a very widespread one.

Population No information.

Life history No information.

Tentative conclusions The species has until recently been considered very localised. It now appears to be more widespread than hitherto thought, and may be able to sustain some harvest for export. However, the fact that it has evidently been overlooked elsewhere indicates that it may not be common. Further information is needed before any export quota can be established.

Furcifer willsii

A medium-sized chameleon, reaching some 24 cm in total length very similar to *F. petteri*, which was formerly considered a subspecies.

Distribution Widely distributed in eastern and parts of northern Madagascar, from the region of Ikongo south of Fianarantsoa in the south to at least as far north as the Ambolokopatrika forest west of the Marojejy Massif in northern Madagascar (Andreone *et al.* 2000). Altitudinal range of ca 600-1300 m asl. (Glaw and Vences, 2007). Records formerly ascribed to this species from extreme northern Madagascar are now considered to be *F. petteri* . Brady and Griffiths (1999) estimated its range at over 90,000 km^2. They reported that at Ranomafana and Mantadia (Analamazaotra/Andasibe) they only ever encountered the species in degraded or very degraded habitats, including regrowth forest and roadside scrub, and not in mature forest, although they do note other reports of the species being encountered, albeit rarely, in the latter.

Population No quantitative data. The species is evidently uncommon in mature forest (eg at Analamazaotra/Andasibe and in Ambolokopatrika forest in the northern part of its range) but appears to be more commonly encountered in degraded habitats.

Life history No specific information.

Tentative conclusions Although few population data are available, the species has a very extensive range and is known to adapt to secondary or degraded habitats. It seems very likely that it will be capable of supporting collection for at least a small export quota.

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3. Accounts for *Phelsuma* species in Madagascar (except *P. laticauda, P. lineata, P. madagascariensis (s.l.)* and *P. quadriocellata*)

Phelsuma abbotti

A medium-sized species, reaching around 14.5 cm in length.

Distribution Non-endemic, also occurring in the Seychelles (Aldabra Atoll and Assumption Island). In Madagascar the species occurs relatively widely in lowland coastal areas of the west from Antsiranana in the far north south to the region of Soalala in the west. It is also found on the offshore islands of Nosy Be, Nosy Komba and Nosy Mamoko. (Glaw and Vences, 2007). Within its ranges it is reported to be normally found on the trunks of relatively large trees both within and outside mature forests, including mangroves; in urban areas such as Antsiranana and the southern part of Nosy Be it can be found in houses and gardens (Andreone *et al.*, 2003; Glaw and Vences, 2007). Regarded as generally a very adaptable species (IUCN Red List, 2008).

Population Classified as Least Concern in the IUCN Red List. IUCN/SSC TSG *et al.* (1993) reported population densities in the wild to be variable; it was at least locally common. Gerlach (2008) estimated the population on Aldabra at ca 270,000 individuals and that on Assumption at ca 3000.

Life history Sexual maturity is reached in ca 7 months (Berghof, nd).

Tentative conclusions The species is widespread and adaptable and seems capable of supporting harvest for at least a moderate level of export.

Phelsuma antanosy

A small species, reaching some 10 cm in total length.

Distribution Endemic. The species is known from only two forest areas, approximately 80 km apart in southeastern Madagascar. At one (Sainte Luce), the species has been recorded in five fragments totalling 560 ha; at the other (Ambatotsirongorongo Forest), it occurs in three fragments totalling approximately 235 ha. Individuals are found on *Dypsis* palms such as Sainte Luce Dypsis *Dypsis saintelucei* and sometimes *Ravenala madagascariensis*. The species is thought to have specific habitat requirements for egg-laying and usually uses a single species of *Pandanus* that is found at both localities where it occurs. The species also used to occur in the west of the 597 ha Petriky Forest (its type locality) but has not been recorded there since 1994 despite regular searches. The extirpation at this site was caused by the removal of its *Pandanus* habitat for agriculture (Jenkins *et al.*, 2007).

Population No population figures are available. The species was classified by IUCN in 2007 as Critically Endangered (B2ab(ii,iii,iv)) on the basis of its very small and highly fragmented range (less than 9 km^2) and a continuing decline in the area of habitat and number of sub-population (Jenkins *et al.*, 2007).

Life history No information.

Tentative conclusions The extremely small and evidently declining range of the species indicate that no collection for commercial export should be allowed at present. However as at least part of the population (that at Sainet Luce) is included within an area covered by a community resource use agreement, it is conceivable that strictly controlled and limited harvest might be allowed some time in the future, when further information on the species is available and a suitable control system has been put in place.

Phelsuma barbouri

A medium-sized day-gecko, reaching around 13 cm in length.

Distribution Endemic. *a* high altitude species, known from the two major mountain massifs (Andringitra and Ankaratra) in the southern half of the central plateau of Madagascar. It is reported as occurring above the tree-line, at altitudes of 2100-2600 m, where it lives on rocky outcrops and boulders in ericoid thicket vegetation ((IUCN/SSC TSG et al., 1993, Van Heygen, 2008).

Population Glaw and Vences (2007) describe it as common in rocky habitats in both the Ankaratra and Andringitra mountains. Both Raxworthy (2008) and Vences (2008) consider it abundant enough to sustain harvest for at least a small and possibly a moderate level of export.

Life history In captivity females produce clutches of two eggs at roughly monthly intervals for as much as ten months of the year (Forsberg, nd). The species may nest communally in the wild, with deposits of up to 50 eggs in one site having been reported (Bloxam, 1993). Longevity is at least five years in captivity (Slavens and Slavens, 1995-2003).

Tentative conclusions The species is reported to be common within its range and is believed able to support collection for at least a small, and possibly a moderate export quota.

Phelsuma berghofi

A medium-sized day-gecko, reaching around 13 cm in total length.

Distribution Currently only known from a small area in south-eastern Madagascar, in the vicinity of Somisiky, a few kilometres from the coast. Adults have only been recorded in the crowns of the Traveller's Palm *Ravenala madagascariensis* at heights of some 3-5 m above the ground; juveniles have been recorded in lower-growing *Ravenala*. In the wild the species is reportedly shy and difficult to observe (Berghof, nd).

Population No information.

Life history In captivity females may lay pairs of eggs as frequently as every 14 days, attached to a suitable plant. The incubation period is around 35 days. (Berghof, nd).

Tentative conclusions There is insufficient information available at present to determine whether this species could sustain harvest for commercial export.

Phelsuma breviceps

A small day-gecko, normally reaching a maximum length of 10 cm.

Distribution Endemic. Occurs in south-west Madagascar, with records along a stretch of coastline south of Toliara, running for some 150 km, from Anakao south to Itampolo; recorded also around Ampanihy, some 50 km inland of Itampolo (Glaw and Vences, 2007; Van Heygen, nd). The area is semi-desert. Within its habitat the species is particularly associated with the widespread spiny, arborescent succulent *Euphorbia stenoclada* (Van Heygen nd, Buse, 2008).

Population No information although regarded by both Raxworthy (2008) and Vences (2008) as abundant enough to sustain harvest for a small export quota.

Life history Paired eggs are laid by the female directly onto the branches of plants, usually *Euphorbia stenoclada*. One captive-breeder reports 3-5 clutches per female per season. Incubation in captivity has been reported at around 6 weeks at 28-30°C (Nagorny, nd.) or around 60 days at 25-30°C (Bruse, nd).

Tentative conclusions The species has a relatively limited range, but is considered abundant enough to sustain harvest for a small export quota.

Phelsuma cepediana

A medium-sized day gecko, reaching a maximum length of around 15 cm.

Distribution Non-native. The species occurs naturally in Mauritius, where it is the most widespread day gecko, and also exists as a recently introduced population on Rodrigues. In Madagascar there are records from the east coast near Ambanja and Ivoloina north of Toamasina. These are believed to be the result of accidental or deliberate introduction (there is a long-standing zoo at Ivoloina which was probably the original source). It is not clear if there is a resident population in Masdagascar at present (Glaw and Vences, 2007).

Population No information for Madagascar. In its native Mauritius the species is reportedly highly adaptable and common in a wide range of habitats (Van Heygen, nd).

Life history Incubation in captivity takes ca 45 days (Van Heygen, nd).

Tentative conclusions The species is not native in Madagascar, and is widespread and abundant within its natural range in Mauritius. Being a non-threatened non-native, there would appear be no reason to restrict export of this species from Madagascar. However Vences (2008) believes that in order to minimise possible confusion or mis-identification of exports no quota for this species should be established in Madagascar.

Phelsuma dubia

A medium-sized day gecko, reaching just over 15 cm in total length.

Distribution Non-endemic; occurs in Comoros, Kenya, Madagascar, Mayotte, Mozambique, United Republic of Tanzania (UNEP-WCMC Species Database, 2009). In Madagascar the species is found along the west coast from the Soalala Peninsula south of Mahajanga north to Antsiranana in the extreme north (Glaw and Vences, 2007). It is reported to be highly adaptable and found in a wide range of habitats including secondary vegetation, houses and gardens (Glaw and Vences, 2007).

Population No quantitative data, but clearly abundant in many parts of its range (Glaw and Vences, 2007; Raxworthy, 2008; Vences, 2008).

Life history In captivity breeding normally takes place for around seven or eight months of the year, with females producing up to 7 clutches of two eggs each, at roughly monthly intervals. Incubation takes 40-45 days and individuals are sexually mature, though not full-grown, at around 8 months (Lerner, nd.).

Tentative conclusions This widespread, adaptable and evidently abundant species is very likely to be able to sustain harvest for at least a moderate level of export.

Phelsuma flavigularis

A medium-sized day gecko, reaching 16 cm in length.

Distribution Endemic. The species is known only from a limited area around Périnet (Andasibe) in eastern-central Madagascar, at altitudes of between 900 and 1100 m (Glaw and Vences, 2007). It has been mainly observed living on Traveller's Palm *Ravenala madagascariensis* (Bruse, nd).

Population No information.

Life history In captivity females have been recorded as laying between 3 and 6 two-egg clutches each season. Incubation takes 35-45 days at 28°-30°C (Berghof, nd). Rearing of young is reportedly problematic.

Tentative conclusions The species has a limited range and there is little information on its wild status. It would be advisable to obtain more information before determining whether the species was capable of sustaining harvest for commercial export.

Phelsuma guttata

A small to medium-sized day gecko, reaching 13 cm in length.

Distribution Endemic. The species has a relatively wide distribution in eastern and north-eastern Madagascar, mainly in coastal areas at low altitudes, although also recorded in the Marojejy Massif, and at up to 750 m altitude in and around the Réserve Spéciale d'Ambatovaky (IUCN SSC TSG *et al.* 1993). Occurs on the offshore islands of Nosy Boraha (Ile Ste Marie) and Nosy Mangabe. It has been recorded both within mature forest and on forest edges. It is apparently frequently recorded on Traveller's Palm *Ravenala madagascariensis* (IUCN SSC TSG *et al.,* 1993; Glaw and Vences, 2007).

Population Apparently at least locally common (e.g. around the Réserve Spéciale d'Ambatovaky (IUCN SSC TSG *et al.* 1993) and Lake Ampitabe south of Toamasina (Schönecker *et al*., 2004)) and believed by Raxworthy (2008) and Vences (2008) to be capable of sustaining harvest for at least a small and possibly a moderate export quota.

Life history In captivity clutches hatch after an incubation period of 55-60 days (Berghof, nd).

Tentative conclusions Widespread and at least locally common and believed capable of sustaining harvest for at least a small and possibly a moderate export quota.

Phelsuma hielscheri

A recently described (2001) medium-sized day gecko, reaching around 17 cm in total length.

Distribution Endemic. Recorded in two disjunct areas of western Madagascar: the region of Morondava on the west coast, where it is known from its type locality some 15 km south-west of Morondava, and the Kirindy Forest inland from Morondava; and Isalo National Park ca 250 km south-east of this Rösler *et al,* 2001, Raxworthy et al, 2007).

Population No information. Vences (2008) believes it to be sufficiently abundant to be able to sustain collection for a small export quota.

Life history No information.

Tentative conclusions This recently described species is likely to be more widespread than currently known and is likely to be able to sustain collection for at least a small export quota. However, in view of the paucity of information on its wild status it may be advisable to obtain more information before establishing any quota.

Phelsuma kely

A recently described (2004) day-gecko, the smallest known species in the genus, reaching a maximum length of 7 cm.

Distribution Currently known only from the type-locality, Lake Ampitabe (altitude 10 m asl) some 65 km south of Toamasina in eastern Madagascar, where recorded in secondary forest, generally on *Dracaena* plants with narrow trunks (ca 2 cm diameter) (Schönecker *et al*., 2004). The species is grey, black and white in colour and does not resemble other *Phelsuma* spp. – captive animals were originally thought to be of the genus *Lygodactylus* (Schönecker *et al*., 2004). It is likely to have been overlooked and may be more widespread than currently thought.

Population Schönecker *et al*. (2004) noted that it seemed less abundant at Lake Ampitabe than the other day-geckos recorded there (*P. guttata* and *P. quadriocellata*).

Life history The species has bred in captivity in Madagascar. Incubation of clutches took 58-60 days at 28°C (Schönecker *et al*., 2004).

Tentative conclusions The species is known only from its type locality and may not be particularly abundant. It would be advisable to obtain more information on its status before setting any export quota.

Phelsuma klemmeri

A small day-gecko, reaching a maximum length of just under 10 cm.

Distribution Endemic. The species occurs in north-west Madagascar, where it is reportedly widespread on the Ampasindava peninsula, occurring in stands of medium-sized bamboo, either within mature forest or in secondary vegetation (Van Heygen, 2004). The extent of available habitat appears to have increased as a result of human activities, as bamboo stands are characteristic of disturbed areas (Van Heygen, 2004).

Population No population data are available, although the species appears to be relatively common in suitable habitat (Van Heygen, 2004).

Life history In captivity, males reach maturity at around 6 months and females can produce their first clutches at around 8 months. Females generally only breeds for around six months in each year, producing a clutch of two eggs, or occasionally a single egg, every three or four weeks, or around six clutches in total each year. Incubation period is variable and evidently temperature dependent; one breeder reports an average of ca 44 days at ca 30°C (Farah, nd).

Tentative conclusions The species appears to be at least locally common within its relatively small range and is likely to be able to sustain collection for at least a small export quota.

Phelsuma malamakibo

A recently described (2001), medium-sized day gecko

Distribution Endemic. Currently known only from the Anosy mountain chain (Chaînes Anosyennes) in south-east Madagascar, specifically at altitudes between 810 and 1940 m in the Andohahela Strict Nature Reserve. It lives on rocks. At lower elevations it is found on rocky outcrops within rainforest and in open areas along rivers and streams. At higher elevations, it is widely distributed on rocky substrate in montane grassland and heathland (Nussbaum *et al.,* 2000).

Population No quantitative data, although the species appears relatively common at higher elevations (Nussbaum *et al*., 2000).

Life history In the wild eggs are attached to rocks and nesting sites may apparently be used by a number of different females (Nussbaum *et al*., 2000).

Tentative conclusions There is insufficient information to determine whether the species might be able to tolerate collection for commercial export. In any event, currently known populations of the species are confined to a protected area where commercial collection is not allowed. No export should therefore be allowed unless it can be demonstrated that the species occurs outside Andohahela Strict Nature Reserve.

Phelsuma masohoala

A small day-gecko, reaching around 10 cm in total length.

Distribution Only known from littoral forest at Cap Est on the Masoala peninsula in north-east Madagascar (Raxworthy and Nussbaum, 1994). The species was believed likely to be endemic to littoral forest on the eastern side of the Masohoala peninsula. Much of this forest type in the region had been cleared.

Population No information. Only one specimen was located at the time of its collection, despite intensive searches. Raxworthy and Nussbaum (1994) speculated that it might normally occur in the upper canopy of littoral forest and therefore be overlooked.

Life-history No information.

Tentative conclusions There is insufficient information to determine whether this species could sustain collection for a commercial export quota or not.

Phelsuma modesta

A small species up to 13 cm in total length. Most forms of this species were formerly considered to be the no longer valid species *P. leiogaster*.

Distribution Endemic. The species is recorded from three disjunct areas in western and south-east Madagascar: the Soalala Peninsula south of Mahajanga in the west; the area around Toliara in the south-west and the region of Talognaro in the south-east. In these areas it is often found associated with human habitations (Glaw and Vences, 2007).

Population Described as abundant in and around Toliara and common in the Tolagnaro area (Glaw and Vences, 2007).

Life history Incubation takes 40-45 days at 28°C (Krause, nd).

Tentative conclusions A widespread, evidently adaptable and at least locally abundant species that can evidently withstand harvest for at least a moderate export quota.

Phelsuma pronki

A small day-gecko, reaching under 12 cm in total length.

Distribution Endemic. The species is currently known only from a small patch of mid-altitude forest some 30 km west of Moromanga in eastern central Madagascar and from a single specimen reportedly collected some 120 km to the east of this (Glaw and Vences, 2006, Berghof, nd). It is apparently a forest-canopy dwelling species (Berghof, nd).

Population Relatively intensive searches at the site near Moromanga have only produced a small number of specimens, implying that the species is uncommon (Glaw and Vences, 2006, Berghof, nd). However, the fact that it occurs in the forest canopy means that it will be easy to overlook, and it may be more widespread and commoner than appears.

Life history The species has reportedly been bred in captivity (in Madagascar) although details are lacking.

Tentative conclusions As currently known, the species has a very limited distribution and appears to be uncommon within it indicating that no collection for commercial export should be allowed at present. Were the species shown to be more widespread and abundant that currently known, this could be reviewed in future.

Phelsuma pusilla

A small species, up to 9 cm in total length originally included in *P. lineata*.

Distribution Widespread in eastern Madagascar at low altitudes from Mananjary at least as far north as Maroantsetra; also Nosy Boraha (Ile St Marie) and Nosy Mangabe (Glaw and Vences, 2006).

Population Reported to be common, found in and around human habitations and in open habitats such as sugar plantations (Glaw and Vences, 2006).

Life-history No information.

Tentative conclusions The species is widespread, common and evidently adaptable to modified habitats. It would appear capable of sustaining collection for a moderate export quota.

Phelsuma ravenala

A recently described (2007) day-gecko similar to *P. dubia*, around 12 cm in length.

Distribution Currently known with certainty only from the region of Mananjary on the east coast of Madagascar. All specimens were seen on the trunks or frond stems of Traveller's Palms *Ravenala madagascariensis* exceeding 6 m in total height growing in plantations, grassland or gardens in or around the town (altitude 0-20 m elevation). The geckos were not seen on other plant species and is thought possibly to be a *Ravenala* specialist, as *P. berghofi* (qv) is . The species is thought likely to occur along the east coast at low altitudes at least as far as and including Nosy Boraha (Ile Ste Marie) (Raxworthy *et al.*, 2007).

Population Evidently locally common, with up to five individuals seen on a single tree (Raxworthy *et al.*, 2007). The host plant is very common in anthropogenic habitats in lowland Madagascar.

Life history No information.

Tentative conclusions The species appears locally common, and occurs in heavily modified habitats. It is likely that it could support collection for at least a small export quota. However, it is currently known only from its type locality and it would be advisable to obtain further information on its distribution before setting an export quota.

Phelsuma seippi

A small day gecko, reaching a maximum length of around 12 cm

Distribution Endemic. Occurs in north-west Madagascar, where it has been recorded on the Ampasindava Peninsula and the offshore islands of Nosy Be and Nosy Komba. On the Ampasindava peninsula, where the species appears to be widespread, it has been mainly recorded in stands of medium-sized bamboo and on *Ravenala madagascariensis* (Van Heygen, 2004). The extent of available habitat appears to have increased as a result of human activities, as bamboo stands are characteristic of disturbed areas (Van Heygen, 2004).

Population Van Heygen (2004) found the species to be at least locally abundant on bamboo on the Ampasindava Peninsula. It appears to be more abundant here than on Nosy Be, from where it was first described.

Life history Eggs are laid in pairs on the ground. In captivity females can produce clutches every 23-27 days and incubation (at 28°C) takes 49-56 days (Bruse, nd).

Tentative conclusions The species is reportedly at least locally abundant and would appear able to support collection for a small export quota.

Phelsuma serraticauda

A medium-sized day-gecko reaching some 15 cm in total length.

Distribution Known only from the region around Ivoloina north of Toamasina on the east coast of Madagascar. Recorded here particularly in the crowns of coconut palms and sometimes banana plants (Glaw and Vences, 2006).

Population Apparently not uncommon within its limited range. Vences (2008) regards it as abundant enough to sutain collection for a small export quota.

Life history No information.

Tentative conclusions The species may be abundant enough to sustain collection for a small export quota, but in view of its apparently very limited range, it may be advisable to obtain further information on its status before establishing a quota.

Phelsuma standingi

The largest Malagasy day-gecko, along with *P. madagascariensis,* reaching up to 28 cm in length.

Distribution South-west Madagascar, chiefly between the Onilahy and Mangoky Rivers. Reported to be relatively widespread in the area, and to be chiefly found on large acacia *Acacia* spp. and tamarind *Tamarindus indica* trees (Glaw and Vences, 2007; Hallmann, nd).

Population No quantitative information, although considered by Vences (2008) to be abundant enough to sustain collection for a small export quota.

Life-history In captivity up to six clutches of two eggs each may be laid in a breeding season. Incubation takes 60-65 days at 25°-27°C. Young are reported normally to reach maturity in their second year (Hallmann, nd).

Tentative conclusions The species is reasonably widespread in south-west Madagascar and believed abudant enough to support collection for a small export quota.

Phelsuma vanheygeni

A recently described very small day-gecko, to around 8 cm in total length.

Distribution Currently only known from the Ampasindava peninsula in north-west Madagascar where, like *P. klemmeri* and *P. seippi,* it occurs in bamboo groves. In 2004 the species was found in three of the five sights surveyed on the peninsula (Van Heygen, 2004). It typically inhabits medium-sized bamboos, with a stem diameter of ca 5 cm. Van Heygen (2004) notes that bamboo has increased in extent on the peninsula as a result of human actions.

Population No quantitative information, although believed not rare on the Ampasindava peninsula (Van Heygen, 2004). When disturbed individuals retreat immediately to the leafy parts of bamboos where they are well disguised and easily overlooked, so that they may be commoner than first appears (Van Heygen, 2004).

Life-history In captivity eggs hatch after an incubation period of 25 days at ca 27°C (Ven Heygen, 2004).

Tentative conclusions The species appears to be relatively common within its apparently limited distribution and is likely to be able to sustain collection for a small export quota. However, it still remains relatively little known and it may be advisable to obtain additional information on its wild status before any quota is set.

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