ESSAY 5.1. SEYCHELLES AMPHIBIANS

Due to their permeable skin few amphibians are able to tolerate dry or salty conditions, a characteristic that has prevented most species from colonising oceanic islands. The most diverse oceanic amphibian fauna is found in the Seychelles, an archipelago of about 115 granitic and coralline islands in the Indian Ocean, some 1,600km east of mainland Africa, and northeast of the island of Madagascar (Figure 1). Eleven native amphibian species have been recorded from the Seychelles islands, comprising both recent colonists and ancient endemics. Recent colonization by one species, the Mascarene Grass Frog Ptychadena mascareniensis (LC), is probably the result of human introduction (Vences et al. 2004) in the 1800s, whilst the endemic Seychelles Treefrog Tachymeniscus seychellenensis (LC) is believed to be descended from a natural colonist from Madagascar (Venets et al. 2003). The remaining species are all ancient endemics that have probably existed on the island since their isolation from the Indian landmass some 65 million years ago. These species comprise the endemic frog family Sooglossidae and seven species of burrowing caecilians (Order Gymnophiona).

Sooglossids are an exceptional family in several respects. Four species are currently recognized in two genera, although recent morphological and molecular data suggests that a further three species remain to be described and that the genera need to be redefined. They are all small frogs, with Gardiner’s Sooglossus gardineri (VU) among several species up for contention as the smallest frog (with adults being as small as 6mm in length). All sooglossids are found in the damp forests of the two highest islands, Mahé and Silhouette. These habitats have only seasonal or fast-flowing streams, and the sooglossids have abandoned the normal frog life cycle in favour of terrestrial development. The Seychelles Frog Sooglossus seychellenensis (VU) lays its eggs on land and the female carries the tadpoles until they develop into frogs. Sooglossus gardineri is even more specialized, with the male guarding terrestrial eggs that hatch into 35mm long frogs; the entire tadpole stage is passed within the egg. Thomas’s Seychelles Frog Nesomantis thomasseti (VU) has recently been discovered to have a very similar breeding strategy, but nothing is known of the reproductive behaviour of the Seychelles Palm Frog S. pipilodryas (VU). This latter species is the most recently described of the Seychelles amphibians, having been discovered in 2000 (Gerlach and Vences 2002). It lives in the sinks of endemic palms where it lays protected from discovery by the dense spines of the palm leaves. It is the only arboreal sooglossid, the other species all being associated with crevices in boulder fields or the leaf-litter and root-mat of the forest floor.

The caecilian fauna of the Seychelles islands comprises six species in three endemic genera. Not surprisingly, and as with caecilians in general (see Essay 1.3), these are the least well known of all Seychelles amphibians. Their burrowing habits make them difficult to locate and study. For most species, their distributions are reasonably well defined and there are some observations of breeding habits. Different species appear to show the full range of reproductive strategies, form aquatic larvae, thorough to terrestrial larvae and direct development. The limited ecological data available indicate that Grandisnoana alternans (LC) is a widespread species occurring in all habitats and Hypogeophis rostratus (LC) is a similar generalist, although more associated with lowland habitats. In contrast, Ptychadena cooperi (VU) and some of the small Grandisnoana species appear to be specialists of the high forest.

Recent research into this group is attempting to develop monitoring methods and to identify aspects of their ecology that are of importance to their conservation.

ESSAY 5.2. THE ENDEMIC AND THREATENED AMPHIBIANS OF MADAGASCAR

Separated from mainland Africa by a distance of some 300km, the biodiversity of Madagascar has experienced a distinct evolutionary trajectory that has resulted in a very high degree of endemism in both its fauna and flora. Among the vertebrates, the amphibians of this large island (around 580,000km² – the fourth in the world for size) are currently represented by more than 230 frog species1, a number that is still preliminary and tentative, since many more remain to be discovered or are awaiting description (see Essay 1.1) (Figure 1). Remarkably, out of the entire amphibian fauna, only two species, the adaptable and widely distributed Ptychadena mascareniensis, which is present also in mainland Africa, and Hyplobatrachus nigroviridis, introduced to Madagascar from southern Asia, are not considered to be endemic. Interestingly, recent molecular studies have shown that the P. mascareniensis populations from Madagascar are already sufficiently differentiated from those from mainland Africa, and likely represent a different species (Vences et al. 2003, 2004).

Half of Seychelles amphibians are threatened due to their naturally restricted ranges and deteriorating habitats (five species are categorised as Least Concern, 5 Vulnerable and one Endangered). The sooglossid frogs and the caecilian Ptychadena cooperi have particularly restricted ranges, being associated only with the damper rain-forests. Habitat deterioration is a significant threat to the caecilian Grandisnoana draves (EN), which has a restricted range and occurs in habitats that are suffering from ongoing invasion by alien plant species. In addition, there is some suggestion that changes in rainfall patterns may have impacts on some species, which may result from mid-year declines in rainfall restricting the activity and distribution of the rain-forest specialists (Gerlach 2000). Losses of several areas of marsh habitats have probably caused population declines in some species, such as another caecilian Grandisnoana alternans (Gerlach 2000).

There have been a number of successful conservation programmes in Seychelles, concentrating mainly on birds. Critically endangered species have been rescued from extinction by limited habitat management, but mostly by inter-island transfers. These programmes have been borne to the benefit of species such as the Seychelles Magpie-robin Cypriolius seychellensis and the Seychelles White-eye Zosterops modesta. Such options are not available for the amphibians due to their close dependence on their high forest or marsh land habitats. Consequently, preservation of their habitat is essential; most species are present in protected areas, although habitat management is still required to control the spread of invasive plant species. The island with the highest diversity of amphibians (Silhouette) is currently unprotected and designation of this island as a national park would significantly enhance amphibian conservation in Seychelles.

To date, there has been no evidence of any sudden amphibian decline in Seychelles, although the potential impact of an invasion by chytridiomycosis would be considerable. Monitoring programmes are in place for the frogs, and are being developed for the caecilians. Updates on research and conservation progress can be found at http://members.aol.com/jgerlach/herps.htm.

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References

As a general trait, Mantellidae, Guibemantis, Spinomantis, Gephyromantis, and Michevantis show peculiar reproductive features, such as the absence of amplexus and high mating frequency around the town of Maroantsetra, where most known populations occur. There is also evidence that the populations have apparently declined in numbers, and the species appears to have vanished from sites at which it was formerly known to occur (Chian et al. 2006).

Fortunately, field surveys conducted during the last 15 years have revealed no known extinctions of Malagasy amphibians resulting from habitat loss, disease or other agents (Andreone et al. 2005b). A further 21 species were classed as Endangered according to the IUCN Red List Categories and Criteria, namely: Mantella aurea, M. cowani, M. expectata, M. miz משווה, M. viridis, Scaphiophryne gottlebei, Mantella expectata (Mantellidae, Mantellinae) from Isalo National Park, and international pet-trade: conservation strategies for the threatened amphibians Madagascar: Conclusions from the Global Amphibian Assessment. (2003) Proceedings of the Royal Society of the USA 102:1617-1622.

References


16. Mattioli, F., Andreone, F. 2005. Matas with large aggregations. The genus Rhombophryne, several of these sites, such as the Antsiranana Massif and Fiorenna, remain unprotected. In general, the two areas with the majority of threatened species are the northern Tsaratanana-Manjoey Massa highlands and the southeastern Avaratra Mountains (Andreone et al. 2006b).

17. Following the remarkable declaration by Madagascar president Marc Ravalomanana to protect the existing coverage of the island’s protected network (see Figure 2), amphibians are now being targeted for this purpose. For example, one of the nine Critically Endangered amphibians, six are not recorded from any protected area (Andreone et al. 2005b, 2006b). Amphibians also represent an excellent candidate to become a symbol for the conservation strategies in Madagascar. Indeed, it is clear that, as with lemurs, the frogs of Madagascar have the potential to become an important tool for the conservation of wildlife in Madagascar. This aspect, as well as long-term conservation planning, was the focus of a workshop (A Conservation Strategy for the Amphibians of Madagascar) held in Antananarivo in September 2006 specifically dedicated to the amphibians of Madagascar, and attended by more than 80 scientists and conservation practitioners.

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Threatened Amphibians of the World

In addition to the threat of habitat loss, some species (e.g. those belonging to Mantella, Scaphiophryne and Dyscophus) have been highly sought after for the international pet trade due to their biological peculiarities and remarkable resemblance to amphibians of the cophyline family (Andreone et al. 2006b; Mattioli et al. 2006a). There is still a paucity of reliable data on the impact of trade on wild populations, although in some cases it is evident that collecting represents a confounding threat when the habitat is already compromised and the populations are small. This is the case, for example, for the rare harlequin mantella, Mantella cowani, which was collected in high numbers and survived in a very degraded environment on the high plateau of Madagascar (Andreone and Randrianarisoa 2003; Chian et al. 2006). Fortunately, concerning overharvesting for commercial trade, amphibians in the genus Mantellids as well as the species Scaphiophryne gottlebei are now included on CITES Appendix II. Other species are also of conservation concern, such as the Tomato Frog, Dyscophus antongilii, the only native species included on CITES Appendix I. Although its distribution area is wider than formerly believed (Andreone et al. 2006a), the habitat degradation around the town of Maroantsetra, where most known populations occur, is still high. There is also evidence that the populations have apparently declined in numbers, and the species appears to have vanished from sites at which it was formerly known to occur (Chian et al. 2006).

Figure 1. Richness map of amphibian species in Madagascar, with dark red colours corresponding to areas of higher richness. Colour scale based on 10 quartile classes. Maximum richness equal 99 species.

Figure 2. Forest cover map for Madagascar, and existing protected areas in black. Red corresponds to forest clearance between 1990 and 2000, shown to clearance between 1975 and 1990, and green to forest cover in 2000.

Figure 3. Richness map of threatened amphibian species in Madagascar, with dark red colours corresponding to areas of higher richness. Colour scale based on five quartile classes. Maximum richness equal nine species.