

RESEARCH NOTE

Relocation of *Omphalotropis plicosa* (Pfeiffer, 1852), a Mauritian endemic landsnail believed extinct

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Mauritius, one of the three volcanic islands of the Mascarenes, is a 7.6 Myr-old oceanic island 900 km east of Madagascar. It covers 1,865 km², culminates at 828 m asl and was first colonized by humans in 1638, although it was discovered earlier (Cheke, 1987). The island's native terrestrial malacofauna started to be described in 1774 and now comprises 125 species, including 81 island endemics and another 32 species unique to the Mascarenes (Griffiths & Florens, 2006). Some 34% of this native fauna is considered extinct and until now none of the endemic Mauritian land snail species thought extinct have ever been relocated. Of the extinct native species, a third lived into the 19th century and appear to have finally succumbed mainly to massive habitat destruction that spared only 5% of the original native vegetation of the island (Safford, 1997), combined with the effects of alien predators (e.g. rats, *Rattus rattus* and *R. norvegicus*) and degradation of remnant habitats by invasive alien plants (e.g. Strawberry Guava, *Psidium cattleianum*). Two-thirds of the extinct species have, however, never been known alive and may have died out before the fauna began to be studied. Some extinctions, like those of the helicarioids *Ctenophylla aigretteianum* Griffiths, 2000, and *Pachystyla waynepagei* Griffiths, 2000, which are only known from a deposit dated at 15,000–5,000 years BP (Griffiths, 2000), may even predate human arrival. Most extinct species are known from more recent deposits, the only dated one being 2,500–1,000 years old (Griffiths, 2000). While Mauritius ranks eighth in the world in number of threatened molluscs (Hilton-Taylor, 2000), it has the second highest density of threatened species per km².

The Mauritian endemic assimineid *Omphalotropis plicosa* (Pfeiffer, 1852) is a small snail, with the shell reaching 7 1/4 mm in height by 5 mm in diameter. In 1921, the species was noted as rare (Germain, 1921), although none of the four cited localities appeared to have yielded live animals. A fifth locality, seemingly the only one where live animals were ever collected, was obtained from the manuscript of a collector particularly active in the latter half of the 19th century (Madge, 1939). It appears, therefore, that no live animal has been seen for over a century. The species is listed as extinct by the IUCN (IUCN, 2006).

Since 1976, some 500 sites have been surveyed over Mauritius, revealing *O. plicosa* shells in many locations, including two of the species' historical sites. While the known range of the species was extended (Fig. 1), only old empty shells were recovered, nearly always alongside several extinct species, making the finding of *O. plicosa* shells virtually synonymous with that of a snail-rich subfossil deposit. In August 2002 we located a first living population of *O. plicosa* within the Black River Gorges National Park, in southwest Mauritius (Fig. 1). The animals were found in a patch of wet native forest at latitude 20°23' 15" S and longitude 57°26' 45" E and 610 m asl, within and just outside a 3.5-ha conservation management area (CMA) where, since 1994, invasive alien plants, mainly *P. cattleianum*, had been weeded and a fence

erected to try to exclude introduced deer (*Cervus timorensis*) and feral pigs (*Sus scrofa*). The CMA is found within an 8-ha patch of well-preserved native forest (≥70% native plant cover) surrounded by more alien-degraded forests (Page & D'Argent, 1997). A two-person hours search in the leaf litter and on tree trunks and foliage up to 2 m above ground yielded 13 animals, all active on moist tree trunks between 0.9 and 1.6 m above ground (average 1.4 m). The other native *Omphalotropis* found were: one *O. rubens* (Quoy & Gaimard, 1832), a strictly arboreal species, one *O. antelmei* Madge, 1946 and two *O. variegata* (Morelet, 1866). The latter two species are predominantly leaf-litter dwellers. *Omphalotropis plicosa* was thus the commonest snail at the site and seems to be an arboreal species confined to tree trunks. We recorded only one alien gastropod, *Deroceras leae* (Muller, 1774), at the site. No *Euglandina rosea* (Férussac, 1821), the infamous introduced biocontrol agent present over most of Mauritius, were found, although it is known to occur in the region. *Omphalotropis plicosa* showed no preference for any of the native tree species, occurring on nine species from eight families. Tree trunk size did not seem important either as the snails occurred on trees from 0.5 to 20.7 cm diameter at breast height (average 7.8 cm). Two other sites of live *O. plicosa* were located in 2003 in nonweeded but well-preserved native forest. Sampling of trees over 100 m² at one of these weed-invaded forests yielded a roughly equal surface area of trunk of native species (49.99 m²) to that of *P. cattleianum* (50.76 m²) available over the first 2 m off the ground. Eighteen *O. plicosa* were found; native trunks had a higher density of the snail (1 per 4.2 m²) than *Psidium* trunks (1 per 8.5 m²), suggesting a preference for the former substrate.

Several Mauritian endemic snail species have suffered dramatic range reduction similar to that of *O. plicosa*. For example, old shells of the helicarioid *Erepta stylodon* (Pfeiffer, 1842) are known from dozens of localities from sea level to high peaks, but live animals are now known from only one site of about 10 ha. These range contractions seem linked to habitat destruction and degradation by invasive alien species. By the time *O. plicosa* was described in 1852, 86% of the island's native forest had been cleared (Vaughan & Wiehe, 1937). When superposed on recent maps of native forest quality (Page & D'Argent, 1997), only three *O. plicosa* sites occurred in areas supporting well preserved forest (≥70% native plant cover), and these were also the only sites where the snails were found alive. The other sites, which yielded old empty shells typically deeply buried in subfossil deposits, occurred as follows: four in forests with 20–50% native cover, 11 in forests with ≤20% native cover and two with no forest left. This distribution pattern strongly suggest that *O. plicosa* is intolerant of both deforestation and forest degradation by alien plants, unlike some of its congeners such as *O. variegata* (Morelet, 1866) and *O. moebii* Martens 1880, which survive well in native forests, gardens, plantations or in pure exotic vegetation. Predation by alien animals seems largely unrelated to the decline of *O. plicosa*, since its small size tends to protect it from tenrecs (*Tenrec ecaudatus*) or rats, and its arboreal habit

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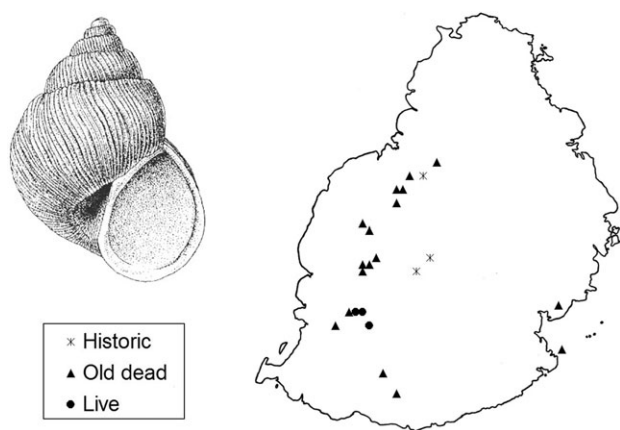


Figure 1. Records of *Omphalotropis plicosa* on Mauritius indicating surviving populations (Live), sites where only old empty shells were found (Old dead) and sites where no shells were found recently but records exist in the literature (Historic). Each symbol covers 1 km². Figure of shell reproduced with permission from Griffiths & Florens (2006).

keeps it largely out of reach of the toad *Bufo gutturalis* although it has recently been recorded in stomachs of this predator (Chuttoo, 2006). The only alien species that could be a significant threat is *E. rosea*, but although the latter occurs in all sites where dead *O. plicosa* were found, similar-sized *Omphalotropis* often co-exist with *E. rosea*. The decline of *O. plicosa* thus seems mainly linked to massive deforestation and habitat transformation by invasive alien plants.

The conservation management applied at the site where *O. plicosa* was first relocated, particularly the sudden removal of all alien weeds, appears detrimental to most native snails, at least within the first few years (Florens, Daby & Jones, 1998). However, a native group of predominantly tree trunk-dwelling snails, the *Nesopupa* spp., did not seem to suffer from weed removal (Florens, 1996). For trunk-dwellers, removal of alien weeds, which consists mainly of *P. cattleianum*, does not represent substantial habitat loss as these snails tend to avoid that tree, apparently because its trunk supports few epiphytes due to frequent bark shedding. This contrasts with most native tree species that typically support a diverse epiphyte flora. *Omphalotropis plicosa*, being apparently the only predominantly trunk dwelling-arboreal species of its genus in Mauritius, may thus be suffering particularly severely from the gradual replacement of native trees by alien weeds such as *P. cattleianum*. Restoration of native forest through alien plant weeding appears essential to conserve *O. plicosa*.

Since *O. plicosa* is known from three areas in tiny patches of only the best preserved native forest, most of which are continuing to degrade under alien plant invasion, we propose to change

the conservation status of the snail from Extinct (IUCN, 2006) to Critically Threatened CR B1ab(iii), B2ab(iii) using the IUCN red list criteria (IUCN, 2001).

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