

Fig. 1. Hatchling *Pelusios subniger parietalis* at 86 days.

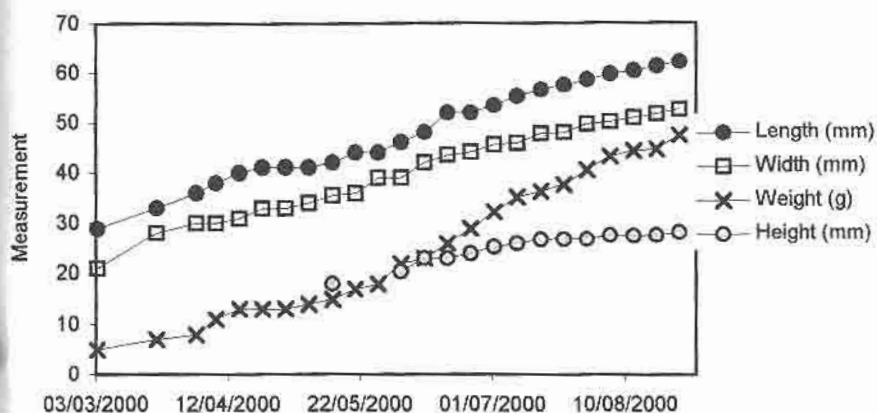


Fig. 2. Growth in *Pelusios subniger parietalis* hatchling

NOTES

Toxicity of 'specific' rodenticides and the risk to non-target taxa

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Alien predators are known to have had devastating impacts on some island snail populations, most obviously in the introductions of the carnivorous snail *Engelina rosea*

(Férussac, 1821). Predation by rodents has been blamed for declines in many island animal populations, including snails. The most serious impacts have been described from New Zealand and there considerable expertise has been developed in rodent eradication techniques using anti-coagulant baits, the currently favoured poison being Brodifacoum. There have been few published studies of the impacts of rodent control on invertebrate faunas but there are reports, at least anecdotally, of increases in mollusc populations following poisoning campaigns (D. Merton pers. comm.).

In 1999 proposals were made for the eradication of rats from 5 of the Seychelles islands using Brodifacoum. Most of these islands are small and are not believed to retain significant endemic faunas (although this has not been investigated). The exception is Fregate island which supports several endemic species including the Fregate enid snail *Pachnodus fregatensis* Van Mol & Coppo, 1980. The proposals included measures to protect non-target vertebrates, principally birds, but not invertebrates. The apparently unknown risks to invertebrates prompted an investigation of the effects of Brodifacoum on snails, insects and millipedes.

As was expected, all species would consume the bait and no adverse effects were apparent in any of the arthropods. In contrast, the snails suffered 100% mortality in the two species tested: *Achatina fulica* (Bowdich) and *Pachnodus silhouettanus* Van Mol & Coppo, 1980 (a common species used as a model for the threatened *P. fregatensis*). The fatal dosages vary according to the size of the snail, for the 15-20mm *P. silhouettanus* doses of only 0.01-0.2mg were sufficient to cause death within 72 hours.

Mauritian field data support these observations. In the Brise Fer forest some 24ha has been subject to rodent control by poisoning. A number of snail species have been seen feeding on poison baits and in treatment areas statistically significantly higher numbers of "fresh" dead *Pachystyla bicolor* and lower numbers of live adults have been found. Whether or not poisoning represents a significant threat to the affected populations depends on how this mortality compares with predation levels from mammals targeted by the poisoning. For the *P. bicolor* populations poisoning is a significantly greater mortality factor than predation, this site has the largest remaining *P. bicolor* population and is the only site for the critically endangered *Erepta styloдон*, shell of which have also been found at the poisoning site.

These studies demonstrate that molluscs can be affected by Brodifacoum poisoning. The authors believe that the impact of such rodent control measures should evaluate probable impacts on molluscs and other invertebrates before implementation. Whether such poisoning is a serious novel threat to the mollusc populations will depend upon the precise levels of predation by the targeted rodents and the level of poisoning risk. In the Fregate island case, *Pachnodus fregatensis* has not been affected by the high population of brown rats but will readily consume poison bait and poisoning mortalities are expected to be high. Far more serious is the threat to a streptaxid discovered in 1999. This is a radula-less carrion feeder which is likely to be attracted to the poisoned snails and to be killed by secondary poisoning. The significance of these findings is now becoming more widely appreciated; they have been taken into account during the implementation of the Fregate rat eradication (D. Merton & J. Nevill pers. comm.) and similar research is now being carried out as part of a review of Brodifacoum use in New Zealand (L. Booth pers. comm.).