“Extinction” of *Rhachistia aldabrae* contested.

Working Paper: posted by Clive Hambler (2022)

Photo: *Rhachistia aldabrae* (Clive Hambler)

Notes:

This manuscript was submitted to a journal in 2007 but was rejected.

It is co-authored by C.W.D. Gibson, who died in 2008. This manuscript has not been changed since his death so that his contribution can be preserved accurately and acknowledged.

The species was 'rediscovered' in 2014.

"Extinction" of *Rhachistia aldabrae* contested.

We contest Gerlach's (2007) declaration that the snail *Rhachistia aldabrae* is extinct. Recent surveys are not exhaustive. The species uses a range of habitats, including some mangrove (C. Hambler, personal observation). The land area of Aldabra is over 150 km^2, and the mangrove some 20 km^2. The vast majority of the habitat is virtually inaccessible and has never been visited. Fryer (1911) reported the species "hard to find" in the wet season.

Gerlach's review of observations and collections is incomplete. C. Hambler observed live *R. aldabrae* a few times in each of 1981, 1983 and 1988, without searching; he considered it widespread but sparse. There was no conspicuous change in abundance or size from 1981 to 1988, but a small arboreal animal with unknown activity biases and low density would be very hard to monitor, even with specific surveys.

We contest that records and collections indicate former "high levels of abundance", as Gerlach proposes, since past sampling intent and intensity are unclear and subjective descriptions of density may differ between observers. Low encounter rates in the 1980s suggest many months of survey would be required to be confident of a decline since 1981. Any rapid decline was apparently before 1981.

There is no statistical support for the proposed extinction. Gerlach uses Solow's (1993) classical statistical method (*not* the Bayesian method). Solow stresses this assumes relatively constant recording effort, or constant chance of incidental encounter, between observations. We suggest a common limitation of such methods is that sampling effort may be hard to quantify, as for Aldabra. In this case the assumption is violated through changes in observer number, skill, intent, location and season.

Between 1967 and 1977 a Royal Society expedition to Aldabra undertook some 50 person-years of research, including several biologists with an interest in invertebrates (Stoddart 1979); activity has since declined steeply. Solow's method is extremely sensitive to declines in recent effort, yet Gerlach gives few details of "more systematic", "extensive" and "exhaustive" surveys for the snail since 1997.

Sensitivity analysis using Solow's method reveals that if a specimen collected (by C. Hambler near Couroupa) in 1988 was included, the "probability of survival" in 2006 would be 0.23. If observations in 1981, 1983 and 1988 are included, this would be 0.20, which is not significant. A striking feature of such models is that the more unreported observations there are before the latest observation, the lower the predicted probability of survival, whilst any unreported observation after 2000 would greatly increase the probability.

Solow's assumption that population size is not variable until immediately before extinction is violated if the species declined slowly, and /or is sensitive to climatic trends. The species' activity and observability may also vary with climate, illustrating a further limitation of such methods.

We suggest short-term climate change is unlikely to be a threat to an endemic species of a raised tropical island, particularly if it has a long sub-fossil record. *R. aldabrae* has apparently existed in the region for over 125,000 years, despite substantial changes in Aldabra's habitat and land area (Taylor *et al.* 1979). The species survived very low rainfall around the 1950s (Stoddart & Walsh 1979), including years drier than any since 1968. Rainfall data for Aldabra are fragmented and will require expert analysis. Gerlach's data and analyses require correction: 1981 had c. 970 mm (not 1702), and 2006 was the wettest on record (1787 mm). Fuller

data (including 1984-1993) show generally dry periods between both 1980 - 1991, and 1999 - 2004.

Other potential threats must be considered. Very substantial local vegetation changes occurred between 1981 - 1983, and between 1983 - 1988, in part attributed to goats, tortoises and rainfall (Newing *et al.* 1984; Bourn *et al*. 1999). Rats (*Rattus rattus*) are widespread on Aldabra; these threaten some snails (*e.g*. NSW N. P. W. S. 2001).

It is unwise to declare this species extinct after a gap in (known) records of ten years. Declarations of extinction should be cautious (Butchart *et al.* 2006; Roberts & Kitchener 2006). We predict "rediscovery" when resources permit.

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