Unsuccessful transfer of captive-bred *Placostylus* land snails to a cage at Te Paki Farm Park, North Auckland

DOC SCIENCE INTERNAL SERIES 97

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Published by
Department of Conservation
PO Box 10-420
Wellington, New Zealand

DOC Science Internal Series is a published record of scientific research carried out, or advice given, by Department of Conservation staff, or external contractors funded by DOC. It comprises progress reports and short communications that are generally peer-reviewed within DOC, but not always externally refereed. Fully refereed contract reports funded from the Conservation Services Levy (CSL) are also included.

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ISSN 1175–6519

ISBN 0–478–22377–3

In the interest of forest conservation, DOC Science Publishing supports paperless electronic publishing. When printing, recycled paper is used wherever possible.

This report was prepared for publication by DOC Science Publishing, Science & Research Unit; editing and layout by Jaap Jasperse. Publication was approved by the Manager, Science & Research Unit, Science Technology and Information Services, Department of Conservation, Wellington.

CONTENTS

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ABSTRACT

Seven laboratory-reared *Placostylus ambagiosus paraspiritus* were transferred to an outside cage where they were protected from mammalian predators as the first step to determine if they can survive being transferred to the wild. The 1.8 m × 1.8 m cage was situated in Te Paki Farm Park, 13 km from where these snails occur naturally. The snails survived for less than one year but the shells of the three juvenile snails were up to 4% longer than their original lengths of 49–60 mm. The cause of mortality was not determined, but was possibly starvation or dehydration.

Keywords: Snail mortality, translocation, *Placostylus ambagiosus,* Pulmonata, Bulimulidae, endangered landsnail.

Stringer, I.A.N; Grant, E.A. 2003: Unsuccessful transfer of captive-bred *Placostylus* land snails to a cage at Te Paki Farm Park, North Auckland. *DOC Science Internal Series 97*. Department of Conservation, Wellington. 10 p.

1. Introduction

The flax snail, *Placostylus ambagiosus* Powell, is a threatened species that is fully protected (Wildlife Act 1953, 1980 Amendment). It is a large, slow-moving, slow-developing and long-lived land snail that occurs at the end of the Aupouri Peninsula and on adjacent Motuopao Island, at the northernmost end of the North Island, New Zealand. It feeds exclusively on leaves recently fallen from broadleaf trees and shrubs. The distribution of these snails has been severely reduced by habitat destruction by humans and livestock, and by predation from introduced pigs (*Sus scrofa*) and rodents (*Rattus rattus, Rattus norvegicus, Mus musculus*) (Powell 1938; Gardner & Bartlett 1980; Millener 1981; Goulstone et al. 1993; Parrish et al. 1995). There are now perhaps several thousand individuals of one subspecies and another 9 subspecies are represented by widely scattered colonies consisting of < 100 to several 100 snails. All subspecies are ranked Nationally Critical or Nationally Endangered by Hitchmough (2002). Most colonies and even some entire subspecies are at risk from disasters such as fire. Parrish et al. (1995) recommended new colonies of populations that are threatened could be established within the areas that the snails once occupied to reduce the risk of subspecies becoming extinct. Captive-bred flax snails could also be used to supplement a colony if it were severely reduced (Parrish et al. 1995). The transfer of animals between captivity and the wild, between different captive rearing facilities, or from different places in the wild is now termed a translocation by the Department of Conservation (Townsend 2003).

The Wildlife Service, Department of Internal Affairs, kept between 6 and 16 adult snails of each of the subspecies *P. a. keenorum, P. a. pandora, P. a. whareana,* and *P. a. watti,* in separate outdoor cages (approximately 1 m × 1 m × 1 m) at the Kerikeri Fish and Wildlife Station. The snails were collected in May 1983 and all bred successfully in captivity so that 17–62 snails of each subspecies were released on different rat-free islands in the Cavalli and Simmonds Island Groups, Northland, in August 1984 and October 1985 respectively (Wildlife Service file 33/5/70). However, no records were kept of how the snails were housed or fed, and what mortality occurred. *Placostylus a. whareana* Powell had successfully reproduced, and one adult snail of *P. a. pandora* Powell with eggs were found when the Cavalli Islands were visited in May 1986 (Wildlife Service file 33/5/70) but there was no sign of any snails or shells of any subspecies on these islands on 6 May 1988 (Department of Conservation file 33/5/37).

We began rearing *Placostylus ambagiosus paraspiritus* Powell in the laboratory at a constant temperature of 16–18°C and in high humidity in 1992, and by 1999 we had over 40 captive-bred snails (see Stringer & Grant (1992) for the rearing method). These captive snails originated from three juveniles and nine adults collected from the parent colony near Cape Maria van Diemen on 6 May 1991 and 21 October 1992 (Stringer & Grant 1994). Here we report the results of releasing some of these laboratory-bred snails into a large cage near the Field Centre at Te Paki Farm Park. The aim was to determine if laboratory-bred snails could survive the change of environment to an outdoor cage, as the

first step towards being released into the wild. The cage provided protection against mammalian predators and allowed the snails to be easily found again. We did not use replicate cages because there were no alternate sites where they could be looked after.

2. Methods

Seven captive-bred *Placostylus ambagiosus paraspiritus* snails were placed inside a cage next to the Te Paki Field Centre on 25 October 1999, and subsequently found again in June 2000. The snails were bred in the laboratory at a constant temperature of 16–18°C and in high humidity following the method of Stringer & Grant (1992). They originated from three juveniles and nine adults collected from the parent colony near Cape Maria van Diemen on 6 May 1991 and 21 October 1992 (Stringer & Grant 1994). The snails were recorded as adult, sub-adult or juvenile according to whether there was a thickened lip around the aperture of the shell, or if this lip was just developing, or if the shell lacked a lip, respectively. These terms are used in an operational sense following Johnson & Black (1991) because reproductive maturity can begin before the lip develops in other pulmonates with determinate growth (e.g. Williamson 1976; Solem & Christensen 1984; Staikou & Lazaridou-Dimitriadou 1990; Lazaridou-Dimitriadou 1995). The maximum length of each snail shell was also measured to 0.01 mm with callipers. Identification numbers were engraved on the shells by carefully grinding through the periostracum with an engraver ('Arlec' from Dick Smith Electronics). These numbers were positioned near the aperture lip of large shells, or near the junction between whorls on juvenile shells where the number would not get overgrown by subsequent shell growth.

The cage was constructed in November 1998 and was sited in an area of lawn next to the Te Paki Field Centre where overhanging trees largely shaded it. Here it was at least 1 km from the nearest suitable natural habitat for these snails. The cage was 1.8 m × 1.8 m × 2 m high, and consisted of a wooden frame (H4 tannalised) covered with fine knitted nylon shade cloth with a triangular mesh about 1 mm × 2 mm. The four corner frame posts and the shade cloth were dug into the ground 200–300 mm to provide lateral stability and to deter mammals from burrowing in. Diagonal bracing provided rigidity and access was gained through a closely fitting door consisting of a braced wooden frame with shade cloth stretched over it. Small plants of hangehange (*Geniostoma rupestre*), karaka (*Corynocarpus laevigatus*), *Coprosma lucida,* and *Morelotia affinis* were planted in the cage. These were then left, except for weeding and watering, until they had grown to occupy much of the available space. The snails were introduced on 25 October 1999 together with a generous supply of freshly fallen yellow karaka leaves. The cage was watered periodically by sprinkling from the outside with a garden hose.

3. Results

All seven *P. a. paraspiritus* snails that were placed in the cage were found dead by Conservancy staff in June 2000. None of the empty shells showed any signs of rodent damage. The sub-adult snails and three juvenile snails, however, had all clearly grown a small amount before they died (Table 1).

When the cage was checked again in November 2000 it was completely intact and there were no holes in the shade cloth. A dense growth of pasture grasses had formed an open sward 10–30 mm high over the entire floor of the cage. Most of the leaves that had fallen from the food plants were resting on the top of the grass and few had reached the ground. No ants or other likely predators were found inside the cage.

TABLE 1. LENGTHS OF LABORATORY-REARED *PLACOSTYLUS AMBAGIOSUS PARASPIRITUS* WHEN PLACED IN A CAGE AT TE PAKI (25 OCTOBER 1999), AND WHEN RECOVERED DEAD (JUNE 2000).

	MAX. LENGTH (mm)		DEVELOPMENTAL STAGE	
SNAIL NO.	1999	2000	1999	2000
1	58.99	59.00	Adult	Adult
2	60.14	60.10	Adult	Adult
3	59.95	59.90	Adult	Adult
4	59.88	59.90	Sub-adult	Sub-adult
5	48.82	50.64	Juvenile	Juvenile
6	53.96	56.21	Juvenile	Juvenile
7	59.10	59.26	Juvenile	Sub-adult

4. Discussion

We do not know what caused the caged snails to die. It is unlikely that they had died of dehydration because this subspecies occurs naturally in dry sand-dune vegetation where it survives long droughts. In addition, all the bushes planted within the cage were alive and had grown, suggesting that they had not experienced a long dry period. However, the snails in the cage were reared from eggs in a constant high humidity in the laboratory (Stringer & Grant 1994) so they may have been susceptible to short dry periods. Starvation seems more likely because the grass and sedges present in the cage had grown and may have kept most of the leaves that fell from the food plants above the reach of the snails. We do not know if these snails will climb vegetation for food in such circumstances, although they certainly do move well above the ground in dense kikuyu grass (*Pennisetum clandestinum*) at Cape Maria van Diemen (Ian Stringer, unpubl. obs.).

We recommend that a second attempt be made to determine if laboratory-bred snails can be successfully translocated into the wild. However, the lack of any clear cause of death for the snails in the cage suggests that releasing them into a cage first should not be repeated and, instead, we recommend that the snails are introduced directly into the field. Such an experiment should follow the guidelines for translocations as set out by Townsend (2003). These include minimising the risk of introducing pathogens into the existing colonies that the snails may have acquired in captivity, so we recommend that the captive-bred snails be used to start a new colony. However, in this instance none of the 23 snails that remained in the laboratory died during the year when snails were in the cage at the Te Paki Field Centre.

Two new colonies of this subspecies of snail have already been established by translocating 25 adult snails together with six or seven large juveniles directly from the parent colony (Sherley 1990) so this is clearly a sufficient number to start a new colony. We suspect that even fewer snails could be used, although this may presumably increase the chance of reducing the genetic diversity in a new colony. Both juvenile and adult snails are also likely to move away from their release site but juvenile snails do not show the site fidelity that adult snails do, so juveniles are less likely to attempt to find their original locations (Stringer, Parrish & Sherley, unpubl. data). We suspect that adult snails may be likely to attempt to return if the new colony is close to the parent colony. However, juvenile snails are very susceptible to predation by rodents, particularly rats (*Rattus* spp.): these will need to be controlled at the new colony until adult snails are common. Adults can survive for many years if pigs are not present (Sherley et al. 1998; Stringer, Parrish & Sherley, unpubl. data).

The advantage of using captive-bred snails when starting a new colony, or when supplementing an existing colony, is that they can be reared to large juveniles within about 2–3 years at 16–18°C (Stringer & Grant 1994) whereas they may take 4–9 or more years to reach adult size in the field (Sherley et al. 1998; Stringer, Parrish & Sherley, unpublished data). Captive rearing involves 1–2 h per week collecting and cleaning leaves, and occasionally cleaning aquaria; this is likely to be less expense than controlling rodents in the field over a much longer period.

5. Acknowledgements

We thank Jens Jorgensen (Massey University) for constructing the cage at Te Paki Farm Park, Aileena Sucich for maintaining plants inside the cage, and Lisa Sinclair, Richard Parrish and Rachel Standish for constructive criticism of the manuscript. This work was supported by Department of Conservation Science Investigation No. 2386, and by Massey University.

6. References

Gardner R.O.; Bartlett, J.K. 1980: Forest flora of the North Cape region. *Tane 26*: 223–234.

Goulstone, J.F.; Mayhill, P.C.; Parrish, G.R. 1993: An illustrated guide to the land Mollusca of the Te Paki Ecological Region, Northland, New Zealand. *Tane 34*: 1–32.

Hitchmough, R. (comp.) 2002: New Zealand Threat Classification System lists—2002. *Threatened species occasional publication 23*, 210 p. Department of Conservation, Wellington.

Johnson, M.S.; Black, R. 1991: Growth, survivorship, and population size in the land snail *Rhagada convicta* Cox, 1870 (Pulmonata: Camaenidae) from a semiarid environment in Western Australia. *Journal of molluscan studies 57*: 367–374.

Lazaridou-Dimitriadou, M. 1995: The life cycle, demographic analysis, growth and secondary production of the snail *Helicella* (*Xerothracia*) *pappi* (Schutt, 1962) (Gastropoda Pulmonata) in E. Macedonia (Greece). *Malacologia 37*: 1–11.

Millener, P.R. 1981: The quaternary avifauna of the North Island, New Zealand. Unpublished PhD thesis, University of Auckland, New Zealand. 897 p.

Parrish, R.; Sherley, G.; Aviss, M. 1995: Giant land snail recovery plan *Placostylus* spp., *Paryphanta* sp. Department of Conservation, Wellington. 39 p.

Powell, A.W.B. 1938: The Paryphantidae of New Zealand. No. IV. and the genus *Placostylus* in New Zealand. Records of the *Auckland Museum and Institute 2*: 133–150.

Sherley, G. 1990: Transferral of *Placostylus ambagiosus paraspiritus* from Cape Maria van Diemen 16 and 17 May with comments on the condition of the colony. Unpublished report, Department of Conservation, Wellington. 7 p.

Sherley, G.H.; Stringer, I.A.N.; Parrish, G.R.; Flux, I. 1998: Demography of two landsnail populations (*Placostylus ambagiosus*, Pulmonata: Bulimulidae) in relation to predator control in the far north of New Zealand. *Biological conservation 84*: 83–88.

Solem, A.; Christensen, C.C. 1984: Camaenid land snail reproductive cycle and growth patterns in semiarid areas of North-Western Australia. *Australian journal of zoology 32*: 471–491.

Staikou, A.; Lazaridou-Dimitriadou, M. 1990: Aspects of the life cycle, population dynamics, growth and secondary production of the snail *Monacha cartusiana* (Müller, 1774) (Gastropoda Pulmonata) in Greece. *Malacologia 31*: 353–362.

Stringer, I.A.N.; Grant, E.A. 1992: Report on an attempt to rear *Placostylus* in the laboratory. Unpublished progress report, Department of Conservation, Wanganui. 22 p.

Stringer, I.A.N.; Grant, E.A. 1994: Report number 4 on an attempt to rear *Placostylus* in the laboratory. Unpublished progress report, Department of Conservation, Wanganui. 29 p.

Townsend, A. (co-ordinator) 2003: Standard operating procedure for the translocation of New Zealand's indigenous flora and fauna. Department of Conservation, Wellington. Publication No. QD NH1042. 47 p.

Wildlife Act 1953: 7th Schedule, Sections 2, 7B. Government Printer, Wellington.

Williamson, P. 1976: Size-weight relationship and field growth rates of the land snail *Cepaea nemoralis* L. *Journal of animal ecology 45*: 875–885.