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Additional case-studies from around the globe

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Establishing a second population of the flax snail in New Zealand

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Introduction

The flax snail *Placostylus ambagiosus* Suter, 1906 occurs at the end of the Aupouri Peninsula at the northernmost tip of New Zealand. Powell (1979) lists seventeen subspecies of *P.* ambagiosus of which ten are extant but present only in remnant populations. Some of these populations have fewer than 50 individuals. Fire and habitat destruction significantly contributed to their decline in the past, but nowadays the main threats are introduced predators - ship rats (*Rattus rattus*), Norway rats (*R. norvegicus*), mice (*Mus musculus*), pigs (*Sus scrofa*) and birds, especially song thrushes (*Turdus philomelos*). Introduced browsing mammals including feral pigs, cattle (*Bos taurus*), horses (*Equus caballus*), goats (*Capra hircus*) and brushtail possums (*Trichosurus vulpecula*) have also modified or destroyed snail habitat. Protection has included constructing fences around some colonies to protect them from browsers. However, controlling the predators of *Placostylus* snails represents the main challenge to their conservation. Protection of one population (*P. a. paraspiritus*) that survived on a small area of dry isolated vegetation surrounded by sand involved intermittent application of toxins to control rodents from 1982 onwards, supplementary plantings of some shrub species and, in 1990, an experimental translocation to two moister sites nearby.

Flax snails roosting under dry vegetation

Placostylus ambagiosus snails feed only on the yellowed leaves that fall from a variety of broadleaf shrubs and trees. They take two to 11 years to grow to the adult shell height of up to 78 mm depending on the habitat, then further increase in shell height ceases with the development of a thickened aperture lip. This lip protects the snail from predation by mice and most rats. *Placostylus a. paraspiritus* Powell, 1951 is listed as vulnerable B1+2abcde by

IUCN and as nationally endangered within New Zealand by Hitchmough *et al.* (2005). The colony is at the base of the Cape Maria van Diemen peninsula just south of Cape Reinga, Northland.

Goals

- Goal 1: To test whether new colonies of these snails can be established by wild-to-wild transfers. The aim was to test this as a potential conservation management tool in case of future need (Sherley & Parrish, 1989).
- Goal 2: To establish new populations of the snail in case of extinction of the extant colony (Sherley & Parrish, 1989).

Success Indicators

- Indicator 1: Survival of the snails that were released.
- Indicator 2: Confirmation that the snails have bred at the site.
- Indicator 3: The establishment of a self-sustaining population.

Project Summary

The existing colony is in an area of mostly introduced grasses with patches of native sedges and shrubs. It is on a small sandy headland surrounded by sand dunes on three sides with ocean on the other. The site is very vulnerable to erosion and elsewhere on the Cape Maria van Diemen peninsula there are large areas of bleached shells from former colonies. However, the colony was one of two containing hundreds and possibly thousands of snails and this allowed us to remove a small number to carry out these translocations. In 1989 bait stations for rodent control were re-activated at the parent colony and increased in number. These were restocked every three months. Bait stations were also established in the two areas selected for the releases nine months before the releases. These sites were 500 m south east of the parent colony and 100 m apart. The snails were transferred in May 1990, 25 adults and six sub-adults were released in the 'northern experimental' site and 25 adults and seven sub-adults in the 'southern experimental' site. Snails were released in groups of five or six beneath shrubs of favored food species. Each snail had a unique number engraved on the shell and the shell height was measured and recorded. The northern site consisted of shrubs surrounded by dense sedges and grasses in a moist valley whereas the southern site was drier and had more continuous and taller shrubbery.

The first monitoring occurred three months after the release. Searching was limited to areas of up to about 7 m around each release site and ten of the released adults were found alive at the northern site and nine at the southern site (see Table 1). The snails had moved away from the immediate release sites and some were found 6.5 m away. Later research conducted on translocating *P. ambagiosus* and *P. hongii* found adults would 'home' up to a distance of 80 m (the furthest we searched) whereas juveniles tended to remain where released. Juveniles (13 individuals) were first recorded 18 months after release and had shells 16-34 mm high. Hatchlings have shells about 6 mm high and we found that the snails grew at around 17 mm a year at the northern site, much faster than in the parent colony. The juvenile snails in the translocated colonies that had obtained a shell height of 34 mm had probably been laid soon after the transfer,

Searching for snails under shrubs at one of three sites near Cape Maria van Diemen, New Zealand

and had then grown relatively quickly. In captivity at 18°C, the eggs hatch after about 45 days, the snails take about two years to become sub-adults and the adults can also live up to 11 years (Stringer & Grant, 2007). Our data also suggest that at the parent colony, the snails took 6-11 years to develop into adults and that they may live for at least nine years as adults. It is possible that the first young occurred early at the translocation sites because gravid snails were released and because the adult snails seem to lay eggs when stressed as we have found subsequently. Adults will sometimes lay a few eggs while they are being transported.

In 1998 we began an experiment to test the effect of intensive rodent control at the two sites targeting mice, as rats were rare in that habitat. New 25 m x 25 m grids of bait stations and rodent tracking tunnels were established that covered areas of 125 m x 125 m centered on the release sites. The experiment was intended as a reciprocal one whereby toxins (bromodiolene wax baits) were laid only at the northern site for two years and then only at the southern site for two years. However, we decided to extend the period of poisoning at the northern site because large juveniles and sub-adults were present after two years of rodent

Table 1. Numbers of live *Placostylus ambagiosus paraspiritus* snails found at two sites after an experimental translocation. Numbers in brackets are recaptures of live marked snails that survived from the original release.

	1990	1992	1993	1994	1995	1996	1998	1999	2000	2001	2002	2003	2004
Northern Site													
Adult	(10)	(1)	(2)	0	13 (2)	(1)	6 (1)	6	5	13	33	18	10
Juv	0	12	1	15 - 20	40	0	20	50	63	57	84	61	62
Total	10	13	3	15 - 20	53	1	26	56	68	70	117	79	72
Southern Site													
Adult	(9)	(5)	(1)	0	-	3 (1)	3 (1)	2 (1)	2	2	0	0	0
Juv	0	1	0	Eggs	-	2	5	2	3	2	5	4	1
Total	9	6	1	0	-	5	8	4	5	4	5	4	1

control and extending the period would ensure the recruitment of adult snails. The advantage of this is that the shells of adult *Placostylus* snails have a thickened aperture lip which protects the snails from being preyed on by ship rats and mice (Norway rats can bite through the thickened lips). However, managers of the area (Department of Conservation) banned the toxin between 2000 and 2002 when poisoning was due to commence at the southern site, so this was delayed until 2002. All monitoring at these two sites was done by systematically searching for the snails within large grids (100 m^2 at the northern site, 100 m^2 or 75 m^2 at the southern site) every year from 1999 until 2004. Prior to 1999 all monitoring was unsystematic.

Snails increased in the northern site during the poisoning, reaching 117 snails in 2002 when poisoning ceased. The numbers subsequently declined to similar levels as those recorded in 2001 (Table 1). In contrast, at the southern site, only 4 -5 snails were found each year between 1999 and 2002, and similar numbers were recorded after rodent control commenced there in 2002 except in the last year when only one snail was present. However, in the last three years only juveniles were found and it appears that there was insufficient time for the snails to benefit from the poisoning. Possible reasons for this were that the habitat was suboptimal and that the initial numbers of adult present (in 2002) were so low that few juveniles were produced and none matured in the time available to contribute to further population recovery.

Major difficulties faced

- The revocation of permission to use the toxin (bromodiolene) from 2000 to 2002 was while the effects of its accumulation in animals were investigated. This delayed poisoning of the southern site and subsequently reduced the period when rodents were controlled at this site.
- Changes in personnel responsible for the various poisoning regimes over the years. This affected the period before 1998 when rodent control was intermittent.
- The dispersal of the adults that were released away from release sites. This may have reduced the density of adult snails at the southern site to a level that reduced their ability to recover there

Major lessons learned

- Adult *Placostylus ambagiosus* snails can survive and reproduce after a wild-to-wild translocation into suitable habitat.
- Appropriate predator control is required during establishment and until snails reach adulthood (develop a thickened shell aperture lip which prevents predation by most rodents).

Success of project

Highly Successful	Successful	**Partially Successful**	Failure
		√	

Reason(s) for success/failure:

- One translocated population (northern) flourished with predator control in the better habitat.
- The other site (southern) failed possibly because the habitat was more open and probably drier, and therefore less suitable and the predator control regime was insufficient. Had predator control been more intensive before the numbers of adults present became reduced to very low levels, it too may have successfully established.

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