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CAPTURING, MARKING AND RADIO-TRACKING A SMALL OWL, THE SOUTHERN BOOBOOK *Ninox novaeseelandiae* IN AUSTRALASIA

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This paper describes capture, marking and radio-tracking techniques for the Southern Boobook *Ninox novaeseelandiae* in Australasia. Techniques outlined include the use of taped calls and mist-nets, colour bands and reflective tape, handling and attachment of radio transmitters using harnesses.

INTRODUCTION

For many studies of birds, it is necessary to have a marked population so that individuals can be recognised. Bands are by far the most common means of marking birds (Calvo and Furness 1992). Coloured or numbered leg bands may be used to identify free-ranging wild birds, but for many owls such bands are often difficult to see, even at the best of times (Forsman *et al.* 1996). Thus, owls often require alternative methods for effective individual recognition. This not only requires effective marking techniques, but also suitable capture methods. This paper outlines methods for the capture, handling and marking of Southern Boobooks *Ninox novaeseelandiae* (known as Morepork in New Zealand), including the use of transmitters and coloured reflective markers.

The Boobook is one of several small (*ca.* 200–300 g) *Ninox*, represented throughout much of Australasia, the south-west Pacific islands and the Indonesian archipelago (Schodde and Mason 1980). Two members of the genus are listed as vulnerable and one as near-threatened (Collar *et al.* 1994) and very little is known about most members. The techniques described in this paper will be useful in investigating the ecology of these species for conservation purposes. Also, owls have often been overlooked in studies on the effects of pesticides and poisons, such as the use of rodenticides (Blus 1996). Moreover, predators such as owls tend to be good indicator species for ecosystem health and habitat change. The identification of effective capture and marking techniques can be of value in such studies of owls. Unless otherwise noted, results are from a study of Morepork on Mokoia Island, Lake Rotorua, New Zealand.

CAPTURING

Several capture methods have been trialled on small *Ninox*. Hand-nets were used on Boobooks, but were effective only on fledglings (Stephenson, pers. obs.). Adults were usually too cautious to allow hand-nets near them. Nooses on poles have been used to snare low-roosting small *Ninox* on Christmas Island (Hill and Lill 1998) where vegetation is dense. However, birds tend to flush in more open situations. This method was also used by Maori to catch Morepork in New Zealand (Best 1977). A bow-net set above a live mouse in a cage has been used successfully both on the ground and suspended from a tree (Bartos *et al.* 1989).

Mist-nets set up around a light in the bush within a Boobook's territory have been found to be successful (Robertson *et al.* 1983). The light attracts moths and other flying insects, which in turn attract Boobooks (a taped call may also be used to lure the birds closer). While the bird is hawking for insects it becomes entangled in the mist-nets. Nets can also be set around a regularly used low roost. They can be set to trap the owl returning to roost or set while the owl is absent and opened when it settles, in which case the owl is flushed into the nets.

As part of a study on the impact of a mouse eradication operation in New Zealand, we (Stephenson and Minot) captured Morepork in mist-nets, using playback of recorded calls to lure them to the site. This was in response to concern that Morepork may be affected by secondary poisoning during rodent eradication and control programmes. The nets were set in the early evening (average of 48 minutes before sunset), and also in the early morning (average of 1 hour 23 minutes before sunrise). Nets were set for an average of 1 hour 51 minutes in the evening (range = 7 minutes to 4 hours 30 minutes), and 1 hour 40 minutes in the morning (range = 12 minutes to 2 hours 15 minutes) before either a bird was caught or we gave up. Nets were often taken down if a bird was caught early in the netting session. They were usually set up in a line along a track, but could also be placed across gullies, and in a V-formation, with the nets at right angles to each other. Two mist-nets (60.5 mm mesh, four tier, 9 m nets), were set up on portable aluminium poles. Height above ground varied, but the nets were usually set with the bottom tier approximately 1 metre off the ground. Nets were always watched and were never left unattended whilst open. This was extremely important when it was still light, because small birds could be caught accidentally. Boobooks are very quick to arrive at the scene when passerine species are giving distress calls (Imboden 1975). Records were kept of moon phase, weather, cloud cover and time in relation to sunrise and sunset.

Boobooks are territorial all of the year (Stephenson, unpubl. data). However, their reactions to the broadcast calls were variable. Sometimes they reacted by landing in the canopy nearby, where they called back while sitting with body feathers erected, wings held slightly open and drooped at their sides. Olsen *et al.* (1989) noted the same behaviour in a subspecies of the New Zealand Morepork, the Norfolk Island Boobook Owl *Ninox novaeseelandiae undulata*, and it is well known in the Boobooks of mainland Australia and Tasmania (Olsen, pers. obs.). Sometimes birds arrived silently to investigate the calling and then disappeared, whereas at other times they were known to be present (they already had transmitters fitted) but appeared not to investigate or respond vocally.

One of the main problems we encountered was the owls flying over, rather than into, the mist-nets. Others have noted the same problem (Walker 1997; K. Brown, pers. comm.). The erection of higher nets, as was used on Norfolk Island (by Olsen, unpubl. data), is a possible solution, but takes time and requires climbing skill. Two techniques provided a partial solution to the problem. Firstly, playing the tape on one side of the net and then on the other sometimes lured the bird closer to the ground, especially where the landscape was uneven. This could also be done by setting up two speakers, one on either side of the mist-net, with a means of controlling the speaker from which the sound is played. Secondly, once lured into the area, birds were often highly responsive to a Boobook chick 'alarm' call. This call was recorded whilst handling a chick during the breeding season (September-February in New Zealand) and consisted of a high-pitched trilling. The chick alarm call worked well on most birds, including birds which had not raised chicks that year. It was also effective in June and July, outside the breeding season. Nonetheless, some birds were extremely difficult to catch, especially in June and July, when they seemed to be least responsive to the call. In conjunction with the use of taped calls, we also experimented with visual lures. A model Boobook was constructed from polystyrene and painted. However, the owls appeared to take no notice.

A total of 161 hours was spent mistnetting (25 hours in the morning and 136 hours in the evening) and from this we made 44 captures. Capture success was 0.36 birds per hour in the morning and 0.26 birds per hour in the evening.

We performed a discriminant function analysis on capture success or failure using the following variables: time the net was set up, average wind, average temperature, average rain, average cloud cover, time of sunrise, time of sunset, hours of light, time of moonrise, time of moonset, hours of moon, phase of the moon and whether the moon was up when the net was set. From this analysis no strong relationship was found and none of the variables was a good predictor of catching success. Thus weather and the other variables tested had little effect on capture success when mistnetting. Nevertheless, for the health and safety of the birds, the nets were never set up during rain.

Most Boobooks, once captured, are easily removed from the net. Care should be taken when handling the birds as their talons are extremely sharp. The legs and talons should be held securely at all times. Though their beaks are strong, they are not very sharp and so do not pose much threat. When correctly handled, most birds are calm and do not struggle. A cotton bag can be used for weighing the bird and is also useful for covering the bird's head to keep it calm. Assistance is essential when fitting a transmitter and makes capturing, handling and banding much easier.

MARKING

Boobooks have short, feathered legs and tend to perch with their legs obscured by body feathers. Because bands are difficult to see it is important to have other ways of identifying individuals.

We tried using a strip of coloured PVC approximately 25 × 10 mm fitted to the colour bands. This protruded out from the band in an attempt to make them more visible. However, most birds removed these soon after release.

The Boobook's short tarsi limit the number of bands which can be applied to one on each leg. To provide more colour combinations we glued coloured reflective tape on to the metal bands (see Olsen 1996). We also covered each colour band with reflective tape of a matching colour. This made the birds far easier to find and identify at night as the tape reflects light from a headlamp.

Other ways of marking the birds are possible. These, however, usually involve placing dyes (Calvo and Furness 1992) or iridescent nail polish (Olsen *et al.* 1989) on to the plumage. These methods therefore have a limited use, in that they only help identify the bird until it moults or removes the colour, and are difficult to see at night.

RADIO-TRACKING

Boobooks carrying a transmitter can be located relatively easily and regularly and identified unambiguously. Olsen and Bartos (1997) fitted a single-stage transmitter to the central tail feathers of an Australian Boobook following the method of Kenward (1978). This was used successfully to estimate home range size, but is not suitable for long-term use or on moulting birds. The single-stage transmitters we fitted to the New Zealand birds were supplied by Sirtrack Limited (Havelock North, New Zealand). These weighed approximately 6.5–7 grams, had a 180 millimetre whip antenna and were encased in epoxy resin with transverse lug holes for fitting the harness. They were powered by EP675E silver oxide cells and designed to last 10–12 months. Signal pulse rate was 40 pulses per minute, with an 18 millisecond pulse width. The transmitter (Fig. 1) was attached with a back-pack style harness made from nylon cord. This had a weak-link on the front that was designed to break should the bird become entangled (Karl and Clout 1987). A small piece of reflective tape was also placed on the end of the whip antenna to make the birds more visible at night, in the light of a headlamp.

The transmitters were fitted by passing both ends of the top loop (which goes around the neck) through the top lug of the transmitter. This loop was then passed over the head of the bird, but not yet tied. The ends of the other loop of the harness were then passed around the body posterior to the wings and through the bottom lug of the transmitter, which was sitting roughly over the back. The top loop was then tightened and a temporary knot tied. The loop passing under the wings was then tightened, and another temporary knot tied. If the transmitter was sitting correctly, the knots

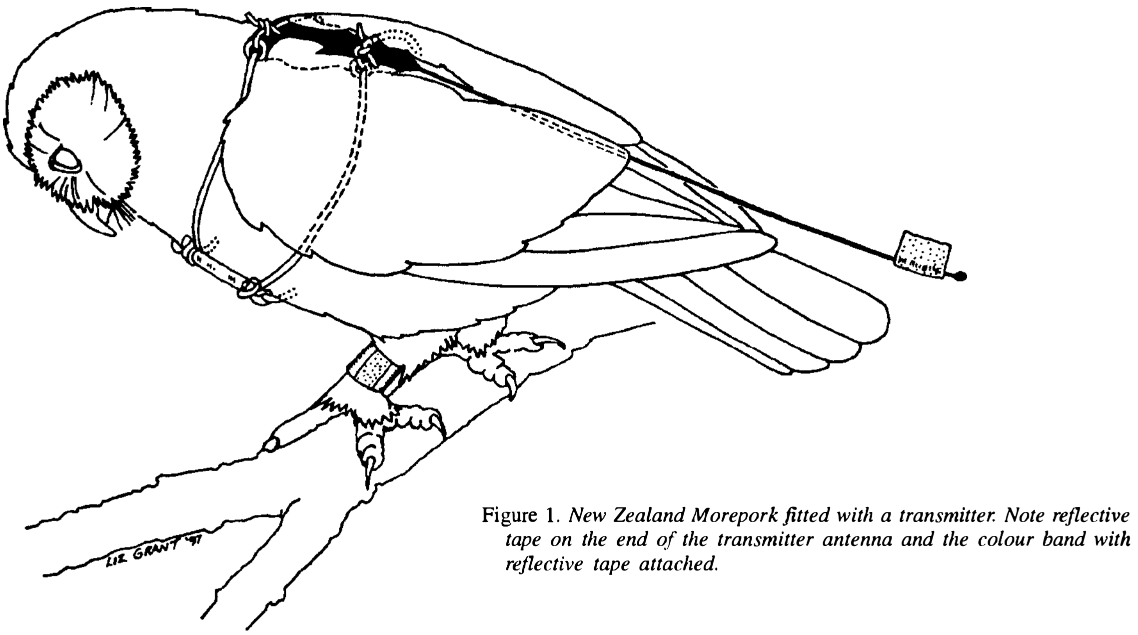

Figure 1. *New Zealand Morepork fitted with a transmitter. Note reflective tape on the end of the transmitter antenna and the colour band with reflective tape attached.*

were tied tightly on top of the transmitter (as in Fig. 1). The knot was then strengthened with super glue and the ends trimmed and melted to prevent fraying which would weaken the knot. The harness was just loose enough so that a finger (about 1 centimetre in diameter) would fit under the weak-link on the breast of the bird. The transmitter sat flat on the bird's back, on top of the spine, between the wings.

Some problems seem to be caused by individual variation in the behaviour of the birds. For example, one bird caught its beak in the neck loop of the harness. While this may have been caused by incorrect fitting, it was probably also because of abnormal persistence in tugging on the harness following release. This bird was captured and refitted with a transmitter the next day and no further problems occurred.

The time from capture to release was approximately 40 minutes. This included time to fit bands and a transmitter, and to take a blood sample. Fitting the transmitter was the longest part of the operation. Once the birds were released they usually flew up to a perch and tugged on their harness until they flew out of sight. Birds were occasionally seen to tug on their harnesses the following day. Tugging, however, was not observed after birds had been fitted with the transmitter for several days. The transmitters were not usually visible the day following fitting, having nestled down among the bird's feathers.

We fitted transmitters to birds 27 times. Of these, four transmitters came off when the weak-link broke. We do not know if this resulted from entanglement or because the birds broke the link. We recaptured seven owls and removed their transmitters, but were unable to recover eight transmitters. Three birds died during the brodifacoum poisoning operation to eradicate mice from the study site (Stephenson and Minot, in press). The most likely cause of death was secondary poisoning. Two other birds also died, of unknown causes, some time after the poison operation and their transmitters were recovered from their bodies. A further two birds (juveniles) were killed, possibly by predation, and their transmitters were recovered. Only one owl was found dead because of problems with the transmitter and harness. That individual had killed an incubating Common Starling *Sturnus vulgaris* on a nest in the hollow trunk in the top of a broken tree fern. The aerial of its transmitter became jammed in a split in the tree fern containing the nest hole and the weak-link did not break. All transmitters lasted the full length of their battery life and none failed.

The combination of colour bands and transmitters was particularly effective. Even without transmitters, colour bands (with reflective tape) allowed identification of birds at night. With patience, banded birds could be identified at their roosts, by waiting for them to scratch themselves with their feet, or when stretching. However, these silent-flying, nocturnal birds are extremely hard to find and observe, during the day or night. The additional use of transmitters (with reflective tape on the antenna) was found to be invaluable. It meant that birds could easily be located on a daily basis and followed at night. Females fitted with transmitters also revealed the location of nesting sites. These techniques will therefore be important when investigating the ecology of *Ninox* owls and other small owls. However, careful fitting of both bands and transmitters is necessary as both devices could cause serious injury.

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REFERENCES

Bartos, R., Olsen, P. and Olsen, J. (1989). The Bartos trap: a new raptor trap. *Raptor Res.* **23:** 117–120.

Best, E. (1977). 'Forest lore of the Maori.' (E. C. Keating, Government Printer: Wellington.)

Blus, L. J. (1996). Effects of pesticides on owls in North America. *Raptor Res.* **30:** 198–206.

Calvo, B. and Furness, R. W. (1992). A review of the use and the effects of marks and devices on birds. *Ringing and Migration* **13:** 129–151.

Collar, N. J., Crosby, M. J. and Stattersfield, A. J. (1994). 'Birds to watch 2: The world list of threatened birds.' (BirdLife International: Cambridge.)

Forsman, E. D., Franklin, A. B., Oliver, F. M. and Ward, J. P. (1996). A color band for Spotted Owls. *Field Ornithol.* **67:** 507–510.

Hill, F. A. R. and Lill, A. (1998). Density and total population estimates for the threatened Christmas Island Hawk-Owl *Ninox natalis. Emu* **98:** 209–220.

Imboden, C. (1975). A brief radio-telemetry study on Moreporks. *Notornis* **22:** 221–230.

Karl, B. J. and Clout, M. N. (1987). An improved radio transmitter harness with a weak link to prevent snagging. *Field Ornithol.* **58:** 73–77.

Kenward, R. E. (1978). Radio transmitters tail-mounted on hawks. *Ornis Scandinavica* **9:** 220–223.

Olsen, P. (1996). Re-establishment of an endangered subspecies: the Norfolk Island Boobook Owl *Ninox novaeseelandiae undulata. Bird Cons. Internat.* **6:** 63–80.

Olsen, P. and Bartos, R. (1997). Home range of a Southern Boobook *Ninox novaeseelandiae* near Canberra, ACT. In 'Australian Raptor Studies II.' (Eds Czechura G. and Debus S.) Pp. 86–91. (Birds Australia Monograph 3.)

Olsen, P. D., Mooney, N. J. and Olsen, J. (1989). Status and conservation of the Norfolk Island Boobook *Ninox novaeseelandiae undulata*. In 'Raptors in the Modern World.' (Eds Meyburg B.-U. and Chancellor R. D.) Pp. 415–422. (World Working Group on Birds of Prey and Owls: Berlin, London and Paris.)

Robertson, H. A., Whitaker, A. H. and Fitzgerald, B. M. (1983). Morphometrics of forest birds in the Orongorongo Valley, Wellington, New Zealand. *NZ J. Zoo.* **10:** 87–98.

Schodde, R. and Mason, I. J. (1980). 'Nocturnal birds of Australia.' (Lansdowne Editions: Melbourne.)

Stephenson, B. M. and Minot E. O. (in press). Fates of Morepork during a pest control operation on Mokoia Island. *NZ J. Ecol.*

Walker, K. (1997). Effect of aerial distribution of 1080 for possum control on Weka, Great Spotted Kiwi, Morepork and Fernbird. *Ecol. Manag.* **5:** 29–37.