Corella, 2010, 34(1): 17-20

TRAPPING METHODS FOR TROPICAL WATERFOWL

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Received: 13 March 2009

Methods typically used to catch small- to large-sized waterbirds in tropical Australia are outlined. Detail is provided on a number of commonly used techniques, including licensing requirements, required levels of expertise, logistical support and general costs. Further, a case study of two capture methods (cannon-netting and cage-traps) used to secure waterbirds in Kakadu National Park, Northern Territory is provided. Following three years of experimentation, we found cage traps best suited our needs. This trapping method is described herein. It required little expertise, was relatively inexpensive and secured 73 Magpie Geese *Anseranas semipalmata* and 129 ducks (Plumed Whistling Duck *Dendrocygna eytoni* and Radjah Shelduck Tadorna radjah) in three consecutive operations. The more labour-intensive and expensive cannon-nets allowed us to secure 67 Magpie Geese and 103 ducks over the same time period.

INTRODUCTION

Wildlife capture is part of the work requirement and skill-base of many wildlife scientists and veterinarians. The capture, handling and sampling of wild-caught vertebrates is critical to scientific research and monitoring of target species, and is often undertaken in remote and hostile environments (for example Breed *et al.* 2006).

Across tropical northern Australia, numerous sub-coastal floodplains support large aggregations of waterbirds (Bayliss and Yeomas 1990; Finlayson *et al.* 2006). While many of these waterfowl are ecologically and culturally important to the region (Whitehead *et al.* 1990), the potential for these to transmit pathogens and parasites (see Tracey *et al.* 2004) has led to ongoing disease surveillance (AQIS 2006; Traill *et al.* 2009), which typically involves live-bird capture. Of course, waterbirds may be caught for a number of reasons other than surveillance, for example birds may be tagged or banded as part of research on survival or life history traits (Franklin *et al.* 2000). Nonetheless, capture is mostly done in remote areas, on a limited budget and within a defined time period. Expert ornithologists or field biologists may lead capture exercises, but at times biologists and particularly research students may need to adapt a method to their study question, area or species.

Little has been done to document methods used to capture waterbirds in tropical regions, and less discussion has been provided on the successes or failures of certain methods, or the costs incurred. Much of the work published on waterfowl capture has been relevant to temperate regions, especially North America (Davis *et al.* 1989; Ashley and North 2004).

Here we outline some of the trapping methods used to secure waterfowl in northern Australia. We provide an introduction to the more familiar traps used, and indicate expertise and costs involved with each. We also discuss in detail a cage-trap method developed in Kakadu National Park (KNP) during 2005–2007. We do not set out to suggest any one method is better than the other, but rather provide some background to the field biologist and share some of the lessons learned while working in Australia's Northern Territory.

TRAPPING METHODS

Clap-nets

Also known as clap-traps or clam-traps. These are either small, portable traps based on a double-spring mechanism, or fairly large nets sprung by large elastic ropes. The smaller traps are usually one metre in diameter and manufactured using a solid (usually wooden) base, natural coloured nylon netting, spread over two aluminium arcs, thereby forming a 'butterfly-wing' mechanism. The trigger is set when a bird depresses a plate at the base of the trap or can be operated manually by using a length of thin cord or fishing line. Powerful springs allow quick and secure closure.

Traps are typically set on the ground following monitoring of target species movement and habits. Light vegetation or soil can be used as camouflage and baits can be used to lure birds to the trap. The principal advantages of the small traps are that these are highly portable, cheap to manufacture or repair and generally effective for the capture of a few individual birds. This in turn is a disadvantage because not many birds can be caught in each trap, and the closure mechanism may injure birds.

Large clap-nets are up to three to five metres in diameter and triggered by powerful elastic ropes. Large waterbirds (up to 4 kg) can be successfully secured using this method. Unlike the smaller traps, large clap-nets are less mobile and more costly. The key advantage however is that more birds can be caught using this method.

Drop-nets

These typically comprise a three by five metre square-shaped net fitted to drop poles (2.5–3 m high). Sites are chosen

following surveillance of target species habits and preferred habitat, but birds may also be habituated to the net after feeding. This process can take 10–14 days. A remote-controlled trigger mechanism is set from an observation hide. The trigger simply releases the net and gravity pulls the weighted net to the ground and onto unsuspecting birds.

A key advantage of the drop-net is that no licence and little training is required for operation, and once purchased or manufactured, the trap is relatively easy to maintain. Portability of large poles can be difficult, and the method tends to be useful when biologists only require 10–30 birds in one capture.

Cannon-nets

Also known as rocket-nets. These comprise large (10 x 20 m) nets that are pulled over birds by weighted projectiles fired from secure cannons (Heath and Frederick 2003). Prior knowledge is required on the habits of the target species, and nets need to be set on gently undulating or level ground. Cannons are generally buried in the ground because of the impact of detonation. Nets are laid-out prior to the capture and carefully folded back to the cannon line. Ropes fitted to the net are secured to projectiles and these in turn are fitted to cannons. Experience is required to 'aim' the cannons correctly over the capture site. Detonation is done electronically by devices secured to black-powder cartridges within each respective cannon. Again, the nets are triggered remotely by personnel located in a well-concealed hide 50–80 metres from the net.

In Australia, strict operator license requirements necessitate the presence and leadership of certified personnel, especially where groups of people are required for net-layout and bird retrieval. License requirements are discussed later in the text. Nonetheless, it needs to be emphasised that field biologists either need to be trained in the use of cannon-nets, or may hire consultant ornithologists to operate the traps.

Nets and especially cannons are bulky and expensive to replace or purchase. Cannon-net operation can be done by two to three highly experienced personnel, but exercises typically involve five to ten people. This, as well as the size of the cannons and nets necessitates a large logistical operation. Birds may also be injured or killed by the projectiles, and will not return to the site if a mis-fire occurs.

A key advantage of cannons is their effectiveness in securing large numbers (up to 100) of waterbirds in one operation. Thus, when biologists literally need 'bang for their buck', a ten-day excursion can allow the capture of possibly hundreds of individual birds. Although bulky, the traps can be removed and re-set within a day, thereby allowing mobility in remote areas.

Cage-traps

These have been previously documented, but only in temperate systems (Ashley and North 2004). Cages allow the capture of multiple waterfowl without the stringent license requirements of a cannon-net. Cages can be of any size and shape and can be made from any number of materials. The key factor is that birds are lured into a cage and the biologists trigger a trap door at a chosen time.

Cage-traps should be large enough to allow adult persons room to manoeuvre, and built from material that is strong enough to resist attempts by birds to escape and at the same time, easy to work with and portable.

The technique is less dangerous (to birds and people) than cannon-netting and at the same time can catch a large amount of birds at one time, depending on the size of the trap. Additionally, cage-traps can be constructed using recycled material (e.g. old steel pickets, used wire-mesh).

Disadvantages are that at least five to ten days are required to habituate birds to the trap and much of the material needs to be stored. Below we discuss the design and results of a cage-trap used by us in Kakadu National Park.

CASE STUDY

Waterbird capture in tropical Australia

During the tropical dry season (May through November) 2005–2007, we trialled both cage-trap and cannon-net capture. We developed our own cage design, which we outline below and found this ultimately to be as effective as and cheaper than cannon-netting.

Our design incorporated approximately 15 steel pickets (2 m, galvanised) to construct the cage perimeter, with the opening facing a small wetland. Pickets were driven into the ground and three lines of wire (2.5 mm fencing strand, at base middle and top) were fitted through these. A central three-metre picket (doubled 2 m pickets) allowed wire strands to be run to the perimeter pickets allowing the roof to be built at a later stage. The trap perimeter was hexagonal in shape, and side length was approximately three metres with the maximal diameter approximately six metres. A mesh fence was fitted and secured to the wire lines. Rope or fish-netting could be used as a lighter alternative. The base of the cage, where the mesh met the ground was secured using 30-centimetre steel pegs (total of ~ 36) and heavy weights. Birds were baited and habituated over three to five days before the roof was fitted (again using wire mesh), and then baiting continued for another two to three days.

A recycled two by one metre farm gate was used as a trap door, which was hinged at the top and set using a 30-metre long (15 mm gauge) and natural-coloured rope fitted to the base of a timber block which propped it open. The trap was sprung out-of-view of the birds (here Magpie Geese *Anseranas semipalmata*) immediately following the feeding of the birds. We found this method reliable for the capture of over 60 birds in one event and without injury or fatality to any bird. The method unfortunately requires habituation and bulky material (although netting could be used in place of wire mesh, and plastic pickets in place of steel).

The first cage-capture secured 39 Magpie Geese, and a by-catch of five Plumed Whistling Ducks *Dendrocygna eytoni*, and four Radjah Shelducks *Tadorna radjah*. The technique was used again in 2006 and 2007 (total 34 Magpie Geese, 108 Plumed Whistling Ducks and 12 Radjah Shelducks). Of interest here is that whistling ducks entered the cage more eagerly than geese, and their numbers within the cage gave

TABLE 1

Summary of the techniques commonly used to capture wild-living waterfowl.

Method	Personnel required	Time required building / packing	Advantages	Disadvantages	License requirements (other than banding permit)
Clap-net	1 - 2	30 / 10 minutes	Portable, inexpensive	Few birds with small trap	Nil
Cannon or rocket-nets	3 - 10	180 / 90 minutes	Portable, high catch rate	Bulky, expensive to operate, bird injury and fatality can oocur.	Shot firers licence.
Cage-trap	2 - 5	180 / 30 minutes	Inexpensive, high catch rate, few volunteers	Bulky, bird habituation required	Nil
Drop-net	1 - 2	30 / 30 minutes	Portable	Bulky, limited catch rate	Nil

confidence to the geese. We estimate that each capture exercise, including labour, bait and material cost approximately $2500. On all but one occasion, just three people ran the entire operation, from building of trap, capture and de-construction.

We additionally hired consultants to carry out cannon-net capture during the three-year period for the same target species (Magpie Geese). The method required surveillance of appropriate capture sites and a large team (5–10 people). This further necessitated the hire of two to three four-wheel-drive vehicles and camping arrangements. The technique secured 67 Magpie Geese and 103 ducks (same species as above) from 2005–2007. We estimate that each cannon-net capture cost in the region of $5000 (includes vehicle hire, consult fees, fuel, food and sundries).

LICENSING, PERMITS AND ETHICS

Our work was based in the Northern Territory (NT) of Australia and we relate to our experiences there regarding operators licences and permits. Firstly, the capture and handling of wild birds needs to be approved by the relevant state or territory wildlife authority. In the NT, a *Permit to Take Wildlife* is required from the Parks and Wildlife Commission of the Northern Territory (http://nt.gov.au/nreta). A report needs to be mailed at the end of each year to the Parks authority, describing methods used, number of birds caught (including fatalities) and geographic locations.

Secondly, animal ethics clearance is mandatory. In the NT, animal ethics permits are administered by Charles Darwin University (http://cdu.edu.au). Proposals need to outline the need for capture and efforts taken to reduce animal injury or mortality. Finally, any capture, banding and release of birds requires licensing with the Australian Bird and Bat Banding Schemes and relevant State Authorities (http://environment.gov.au/biodiversity/science/abbbs). While working in KNP we also required a research permit from Parks Australia North (http://environment.gov.au/parks/kakadu).

Of note here is that operation of cannon-nets requires training and approval from the ABBBS (A Class authority with cannon-net endorsement). Some states may require biologists to obtain a firearm (shot-firers) licence for cannons.

DISCUSSION

We have outlined some of the more common methods used to catch waterfowl across tropical Australia (see Table 1). These can also be used to catch other (usually gregarious) avian species. Solitary birds may require more specialised techniques such as mist nets. We note that care needs to be taken to avoid further stress to the birds such as covering the trap cage with hessian cloth to provide shade. We also recommend that biologists use bait best-suited to the capture species, for example we found that crushed corn was adequate for Magpie Geese but this may not work for other birds.

Field experience and a good knowledge of the habits of target species will allow success with any of the above-mentioned techniques, and users are recommended to consider time, logistics and financial constraints. We recommend field biologists try alternate techniques and settle on what best works for their situation.

ACKNOWLEDGEMENTS

We thank John Curran, Katie Dyke, Don Franklin, Chris Hassell, Jonathan Lee, Dave Lindner, Tida Nou, Patsy Ragla, Emma Watkins and Peter Whitehead for their advice and assistance in the field. Authorisation permits are as follows: Animal ethics permit number A05009 Charles Darwin University; ABBBS authority number 1456; Kakadu research permit number RK625. All fieldwork was funded through an Australian Research Council grant DP0558350.

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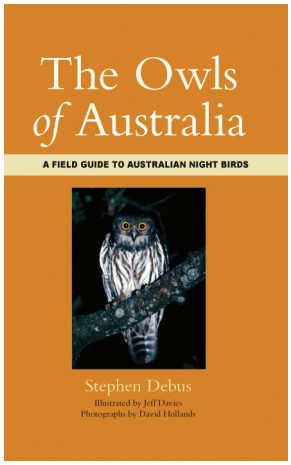
BOOK REVIEWS



The Owls of Australia
A Field Guide to Australian Night Birds

Stephen Debus 2009.
Envirobook. Paperback, 112 pp, colour photographs and plates.
ISBN 9780858812222.
RRP $22.95

Stephen Debus is well qualified to write a book on Australian owls. His MSc thesis was on threatened forest owls and raptors, he is an author of many papers on owls, and he was a major contributor to the entries on *Ninox* and *Tyto* in the Handbook of Australian, New Zealand and Antarctic Birds (HANZAB). Stephen's experience as an editor – currently of *Boobook* (journal of the Australian Raptor Association) and Australian Field Ornithology – is reflected in the informative, clear and concise text of this book.

The book has six chapters. The first is an introduction to owls, how Australian owls fit into the world fauna and the species recognised in Australia. This chapter also covers general owl identification techniques, food and hunting, behaviour, breeding biology, handling and studying owls and finally, threats to their existence and the conservation needs of the group.

There follows a very interesting short chapter by David Johnston and Walter Boles on the global fossil record of owls.

The next two chapters cover the two owl genera found in Australia – Hawk Owls *(Ninox)* and Barn Owls *(Tyto)*. The fourth chapter is on frogmouths; whilst these birds are not owls, they are also nocturnal birds and the general public often thinks of them as owls. Within these three chapters the topics discussed in general terms in Chapter One are expanded in the accounts for each of the 13 owls and frogmouths found in Australia.

The final chapter – Threats, Conservation and the Future – covers a range of issues that affect the survival and well being of owls, such as pesticides, persecution, pest management, research, education and rehabilitation.

The book incorporates information from HANZAB but brings it up to date by including the latest research findings. The colour plates of owls and frogmouths from the Handbook and a selection of David Hollands' photographs enhance the value of the book. The bibliography includes significant books and papers on owls and frogmouths published subsequent to the publication of Volume 4 of HANZAB.

This is an excellent field guide for Australian owls and frogmouths. I particularly liked the use of the very fine Jeff Davies artwork from HANZAB because it allows them to be used in the field, a role unsuited to HANZAB. These illustrations are complemented by the usual high standard photography of David Hollands. The compact size of the book enables it to fit into a large pocket or a small shoulder bag.

The book doesn't cover all nocturnal birds; nightjars and owlet-nightjars are not included nor the owl sub-species found on islands. The author's experience as an editor of many journals is highlighted by his ability to extract information from HANZAB and more recent research and succinctly present it in a very readable and interesting narrative. Hopefully the book will arouse the interest of those unfamiliar with owls and enthuse students to research this group of fascinating birds.

This book is highly recommended to all omithologists whether amateur or professional; the extensive bibliography alone is a very valuable resource.

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