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A VARIATION ON THE 'NOOSED FISH' METHOD AND ITS SUITABILITY FOR TRAPPING THE WHITE-BELLIED SEA-EAGLE *Haliaeetus leucogaster*

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We present a modification of the noosed fish method for trapping the White-Bellied Sea-Eagle *Haliaeetus leucogaster*. This technique provides a safe and inexpensive trapping method that may be applied in a water or land setting remote from the nest site. This versatility has great relevance where investigator disturbance may be an issue. Field evidence suggests the design may be readily adapted to suit other lake or coastally based Australian raptor species.

INTRODUCTION

Birds of prey by their very nature are difficult to capture and it often requires extraordinary trap design and ingenuity on behalf of the researcher to catch them. Where the bird is required in the hand to take measurements, blood samples for genetic analysis, or to mount a transmitter in mark-recapture work, catching is necessary. Many raptors within Australia are relatively unaffected by a variety of nest site sampling techniques (Olsen 1995). However, the White-Bellied Sea-Eagle *Haliaeetus leucogaster* has a history of sensitivity to nest site disturbance (Mooney and Brothers 1986; Marchant and Higgins 1993; Dennis and Lashmar 1996). Whilst adults are more readily located within known territories, disturbance susceptibility precludes the trapping of adults or young at the nest for fear of unnaturally increasing chick mortality as a result of nest or territory desertion by adults. Accordingly, trapping of this species should be confined to roosting and hunting territories in favour of leaving nesting areas undisturbed.

Noosed trap design has been used extensively in North America and the sheer volume of raptor research in the Northern Hemisphere has ensured the availability of trap design information to these workers. Unfortunately, this information has often appeared in specialized journals that are difficult to access in Australia.

The noosed fish method was first used to trap Bald Eagles in Alaska (Robards 1967). The technique described in this paper is a modification of the noose system of Frenzel and Anthony described in Bloom (1987), and utilizes a 4-noose system in lieu of the original 2-noose design. A floating fish snare has also been described by Cain and Hodges (1989), and a manually operated single noosed system has been used in Northern Australia to selectively capture White-Bellied Sea-Eagles (Hertog 1987). Our design is suitable to both boat and land-based set-ups, and allows catching of adult and immature White-Bellied Sea- Eagles away from the nest.

MATERIALS AND METHODS

Trap construction and use

Entrails were removed from the baitfish and the body cavity packed with sufficient cork or polystyrene to float the fish. It was important to ensure the passage from the body cavity to the mouth remained relatively clear to allow smooth movement of the noose lines. Any snagging was found to decrease trap success. Four monofilament lines (40–60 lb), each approximately 1metre long, were prepared with a small overhand knot tied in the end. Each line was then fed through its respective knot to form a self-regulating/tightening noose (Fig. 1a). Great care was taken to keep the knots small (2–3 mm), so they did not interfere with the positioning and action of the noose. The "free" end of the lines were then passed through the body cavity of the fish, lying on top of the packing and emerging from the mouth.

Prior to setting the final noose sizes, the body cavity was cinched together using a needle and cotton at points 1, 2 and 3 (Fig. 1) with a single reef knot at each point. At point 1 we sewed over the monofilament line, and points 2 and 3 under, so the nooses could work unencumbered. Nooses were set, two slightly forward covering the head to the midpoint of the fish, and two to the tail area. The nooses were overlapping and approximately 10–16 centimetres in diameter depending on the size of the bait fish (Fig. 1). Each noose was held in place by a single overhand stitch (points 4, 5, 6 and 7 in Fig. 1) using a needle and cotton. It was sometimes necessary to place additional stitches to stabilize an individual noose. Stitches were placed through the skin only (i.e. not through underlying tissue) to ensure the noose broke away easily when struck by the bird, allowing it to tighten quickly and produce limited damage to the bait fish in the event of an unsuccessful strike. Care was taken to ensure the nooses sat straight and flat so when the fish was floated they remained parallel and flush with the surface of the water. Finally, lines emerging from the mouth were grouped and tied in a single overhand knot.

It was useful to place a stabilizing cotton line from the final overhand knot back to the soft skin of the lower mandible (behind the lip) to counteract wave or wind action that could gradually tighten the nooses. In the event of a strike, this tore easily away. The fish was then joined directly to the secondary line (e.g. nylon 'builders line'). The secondary line was attached to a standard diving belt weight (~1.5 kg) via a 50 centimetre length of shockcord. A longer length of 3–5 millimetre nylon cord (prussick line or similar) was also tied between the weight and secondary line to restrict the shockcord from reaching maximum extension. It was useful to have a number of weights with secondary lines of varying lengths for different water depths.

Once a target bird was located, the noosed fish and weight were 'dropped' carefully from the boat (preferably on the opposite side of

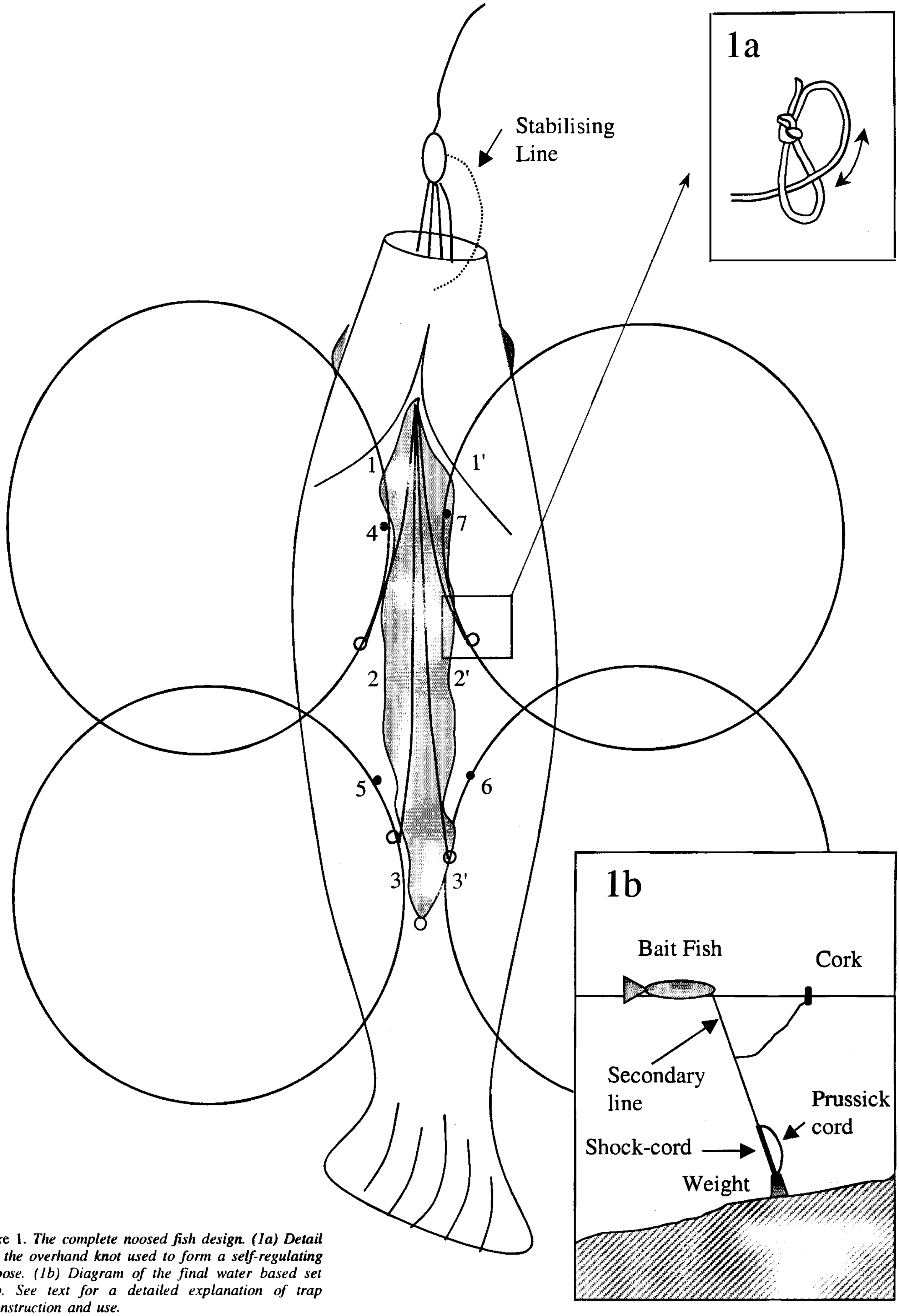

Figure 1. *The complete noosed fish design. (1a) Detail of the overhand knot used to form a self-regulating noose. (1b) Diagram of the final water based set up. See text for a detailed explanation of trap construction and use.*

the boat to the eagle; as suggested in Bloom (1987)). Where actual water depth was unknown at the time of setting, it was useful to place the weight and tie a knot in the secondary line at water level. The fish may then be quickly tied to this loop circumventing repeated attempts at shortening and lengthening the secondary line to get the appropriate length. A cork was attached to the secondary line via a 1–2 metre trace, to facilitate the retrieval of the weight when picking up the bird and also in the event that the bird took the fish without being caught.

Depending on their degree of exposure to human activity and specifically boat-based fishing, it was sometimes possible to get within 100 metres of a bird prior to setting a trap. In some instances birds left a perch to circle overhead whilst a trap was being prepared and were subsequently trapped within 20 metres of the boat. However, it was more usual to move the boat up to 500 metres away from the set trap.

RESULTS AND DISCUSSION

Ninety-five per cent of all birds (N = 93) that approached a set trap attempted to strike and capture the bait. From a total of 87 individual bird strikes, 37 per cent of birds were snared by the trap. A total of 32 birds were caught over approximately 40 trap days, with 9 individuals freeing themselves from the trap prior to collection thereby reducing total capture success to 26 per cent. Whilst low, it is comparable with rates reported by Cain and Hodges (1989) for Bald Eagle research.

This system provides a relatively inexpensive and safe trap mechanism. In our combined work there have been no instances of injury to sea eagles. Due to their large wing span, birds float easily on the surface of the water prior to collection, and as the weight system sits on the bottom substrate, the flotation of the bird is unaffected. However, care should be taken in placing traps where the bottom can not be seen, or where it is suspected to drop away to much greater depths. If a bird hits the fish outside the noosed area and takes the fish, the nooses are readily ripped through the body cavity of the fish, and remain attached to the weight system for later retrieval. It is often possible to re-use these nooses. However, freshly constructed traps are associated with greater trap success. It is possible to pre-prepare traps which are then secured in plastic wrap and frozen. These should be thawed prior to reaching a site so the nooses 'sit' well. The combined action of the shock-cord and drag afforded by the water add suspension to an otherwise rigid system. Given that birds hit the trap at the base of an approach glide, this ensures the bird's forward movement is interrupted 'gently', rather than with a sudden jerk, therefore reducing injury risk.

Monofilament line greater than 60 lb appears too rigid for nooses to remain tight and may loosen, allowing the bird to escape prior to being picked up. Noose size is also a variable factor and may require change depending on the bait type chosen. As a guide however, the minimum combined noose diameter should exceed the span of the outstretched claw of the raptor. Traps must be monitored at all times, and in some instances may require guarding from other predatory or opportunistic bird and fish species. In land-based trapping, where water drag is lost, it is necessary to tie the buried or camouflaged weight system to a fixed object or an additional set of weights. As the combined dry weight of the trap is only around 2.5 kilograms, it is possible that a bird may pick up the entire system and travel some distance, which depending on the terrain, may hold inherent dangers for both bird and trapper. To date, greatest trap success has been achieved using a firm fleshed baitfish with a straight body silhouette; the advantage being that it presents a relatively large target surface to the raptor, and can withstand repeated attacks, saving much time and effort in resetting traps.

The extent to which the trap may be used to capture individual birds selectively is unclear. Certainly, both birds from a territory have competed for a bait, however, the only method available to the trapper to deter any one bird is to scare it during its approach flight. Trap shyness in most instances does not seem to be a problem, and many of the birds sampled made multiple attacks during the same trap day, or tolerated multiple captures during independent trapping days. Where trap effectiveness is reduced due to weather or water conditions, and trap shyness may be a real consequence of failure, it is best to return on a separate trap day.

Finally, preliminary field evidence suggests the trap may be readily adapted to catching the Brahminy Kite *Haliastur indus*, Whistling Kite *H. sphenurus*, Osprey *Pandion haliaetus* and Black Kite *Milvus migrans*.

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