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DEVELOPMENT AND EVALUATION OF A TECHNIQUE FOR INDIVIDUALLY MARKING EGRETS

MAX MADDOCK

Faculty of Education, The University of Newcastle. NSW 2308
and Shortland Wetlands Centre, Box 130, Wallsend. NSW 2287

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A project studying the breeding biology, ecology and migration of egrets required a system of marking individual birds which could easily provide information on species, colony, season of banding and individual identification from observation made by non-expert field observers. Multiple Darvic or Celluloid leg bands proved slow and cumbersome to apply and observation of bands in the field was obscured when the birds stood in water, reeds or long grass. Bands often became obscured with caked mud and loss of bands created problems in identifying the birds. A system of patagial tagging has been developed which is simple and practical in the field and provides the required information from observations by non-experts in computer-compatible form. Pennant Flag Cloth or Fluorescent Banner Cloth have been found suitable for tag manufacture. The details of the tags and their application are described. Extensive observation of tagged nestlings, fostered birds raised in captivity, and adults in the field over four years reveal no evidence to date of physical problems to the birds. Tagged birds have been seen alive at distances of up to 2 160 km in Tasmania, Victoria and New Zealand. No evidence has been found that the breeding success of the tagged birds is different from the success of birds not carrying tags.

INTRODUCTION

Since 1981 a breeding colony of egrets, namely Great *Egretta alba*, Intermediate *E. intermedia*, Little *E. garzetta* and Cattle *Ardeola ibis*, has been established at what is now known as the Shortland Wetlands Centre, bordering Hexham Swamp, New South Wales, with over 2 000 nests in the 1987–88 breeding season.

A study of the breeding biology, ecology and migration of the egrets, which began when the colony was established, has been code-named Project Egret Watch since the establishment of the Shortland Wetlands Centre in 1985. In the 1983–84 season colour banding was instituted and registered with the Australian Bird and Bat Banding Scheme (ABBBS).

Deficiencies were identified in the use of colour bands and in the 1985–86 season a transition was made to patagial tagging. In the same season, the Cattle Egret breeding colony at Seaham Swamp Nature Reserve, 32 km as the egret flies to the north of the Shortland colony, was added to the project.

This paper outlines the evolution and evaluation of the system of marking individuals as it moved from colour banding to patagial tagging, and describes the currently used tagging technique.

Rationale

To achieve the aims of Project Egret Watch individual birds need to be recognizable at nest sites, other locations within the colony, feeding locations during the breeding season and at sites used between breeding seasons. The project required a system from which could be obtained by observation the colony where the bird was marked, the season in which the marking was done, the species and the identity of the individual bird. The observation had to be easily translated for computer storage.

Colour banding

The first system attempted was colour banding using Darvic or Celluloid colour bands. Of the colours available, eight which were easily distinguishable from each other were chosen and given computer code numbers. Each species was allocated a colour, the season of operation was allocated a colour according to the number code, and the colony where the banding was to be executed was given a colour, with provision for the use of other colours at other colonies if operations were eventually expanded. Three colours were used to identify the individual birds.

The following system was registered with the Australian Bird and Bat Banding Scheme:

left tibia:	upper band colony colour
	lower band species colour
left tarsus:	ABBBS metal band
right tibia:	season colour
right tarsus:	three colour bands for individual bird, to be read top to bottom.

Two Cattle Egrets were experimentally marked this way in the 1983–84 breeding season and over 200 egrets from the four species were marked in 1984–85.

Problems Encountered with Colour Banding

The application of seven bands per bird was found to be a slow and awkward operation, particularly because of the necessity to ensure that adjacent bands had the same spiral configuration. The bands were relatively easy to see on nestlings and fledglings when standing in the nest, or on branches. However, when the bird crouched in the nest or stood in long grass, reeds or water, the lower bands in particular were unobservable. The lower bands also frequently became covered with mud and unrecognizable. The mud may have also contributed to the loss of a number of bands, and birds were observed where bands had obviously been lost.

Patagial Tagging

As a result of these problems it was decided to change to a patagial tagging system, which had the advantage of being visible under most habitat conditions in which egrets operate.

Samples of tags used for marking Sacred Ibis *Threskiornis aethiopica*, consisting of PVC coated polyurethane attached by pop rivetting (K. Lowe, pers. comm.) and samples of a much more lightweight, flexible, flag-cloth material which had been used on Queensland colonies of Cattle Egrets (D. Reimer, pers. comm.) were investigated. The latter were attached to the patagium with a single thick nylon thread pin (such as that used in lawn edge-cutting machines) and plastic washers, the ends of the pin expanded by applying heat (D. Reimer, pers. comm.). A letter-number code was put on the tag using cattle ear-tag marking pens. Examples of these tags, with coding clearly visible through a telescope from several hundred metres, had been observed on Queensland Cattle Egrets using the Shortland evening winter roost during 1985.

The material provided by Reimer was much more lightweight and flexible than the Lowe sample and was judged to provide a more suitable solution for tagging birds such as Little Egrets, which are significantly smaller than ibis.

Sources of material similar to the Reimer sample were sought in Newcastle, and a supply of Pennant and Flag Cloth was located at a local pennant-making firm, which was willing to sell offcuts of a size suitable for making several hundred tags. A range of distinctive colours was available.

Subsequently it has been possible to obtain adequate supplies on a regular basis from the manufacturer.

Tag Design and Attachment Technique

A small patch of colour on the upper part of the tag was used to signify the colony of origin and one contrasting colour constituted the bulk of the tag to signify the species.

A technique described by Stiehl (1983) for attaching plastic-coated nylon fabric ('Saflag') patagial tags to the Raven *Corvus corax* was considered. This involved piercing the patagium with a small-bore leather punch, folding the end of the tag over the leading edge of the wing aligning two reinforced eyelets with the hole and using a "pop rivet" and 3 mm "back-up plates". In our situation, folding the two-coloured part of the tag, fixing it on both sides of the leading edge of the wing, seemed to simply overcome the problem of attaching the two separate colour-parts of the tag.

Information on a further technique was obtained from Grant Pearson of the Western Australian Wildlife Research Centre (pers. comm. to G. Brown), which had been used on pelicans in Western Australia. This method involved the use of two flexible stainless steel wire pins protected by small stainless steel washers. One was pushed through the patagium, fixing a portion of the tag folded over the patagium in a similar fashion to the Stiehl (1983) technique. The other held the main body of the tag in position against the secondary feathers by attaching to the underflap of the tag. A simple knot in the wire was used to prevent the pin from pulling through the washer.

This technique was tested using two domestic homing pigeons, but using small plastic shirt buttons as washers, instead of the stainless steel type recommended by Pearson. Tags were fashioned from Flag Cloth, and one tag was attached to each wing of the pigeons using the modified Pearson system.

The birds were first released indoors and it was found that the tags severely hampered their attempts to fly. This was probably due to the large size of the underwing fold and relatively larger size of the tags in proportion to wing size than that used on the pelicans, which inhibited the function of the secondary flight feathers. When the underwing fold was reduced to a small tab and the attachment to the secondaries was removed, the birds were able to fly freely. The tags were left on for two weeks, during which time they were still able to fly freely. One was allowed to fly about 12 km from the Centre to its home loft, a journey achieved with success, and it was then decided to field-try the technique with egrets. The tags were left on one of the pigeons for long-term observation. Over a period of a year, one tag was lost, but there was no evidence of the two tags or the single tag remaining after the loss causing any problems to the pigeon.

The 1985–86 Field Trial

The modified Pearson technique was applied to all four egret species at Shortland at the beginning of the 1985–86 breeding season. Fine stainless steel surgical wire (26 gauge) was cut into approximately 20 mm lengths to produce the pins. Needle-nosed pliers were used to produce a knot in one end of the wire. However, the flexibility of the wire made it very difficult to push through the tag material and patagium and first surgical needles and finally a hole punch were used to puncture the patagium.

The unknotted end of the wire was threaded through one of the holes in a small, plastic shirt button (about 7–10 mm diameter), then pushed through the hole in the upper end of the tag and the hole in the patagium. The body of the tag was then folded over the leading edge of the patagium so that the protruding end of the steel pin passed through a hole in the tag, about 8 mm from the fold edge. A second shirt button was then slipped over the wire, a knot was tied in the wire to hold the button and tag-fold close to the wing, allowing a very small amount of space to allow for wing growth, and excess wire clipped off with side-cutters.

This process proved cumbersome and slow because of the necessarily small length of the pin. The slightest excess pressure tended to bend the pin in the middle. It was impossible to remove excess wire without leaving a tiny sharp protuberance. Wilma Barden (pers. comm.) raised the question of whether a thread material could be substituted for the steel, and David Maddock (pers. comm.) recommended the use of a double length of fine nylon fishing line as a substitute, using a surgical knot to tie off the two ends above the top button. This modification proved immediately successful and was instituted for the rest of the season.

Just over 200 egrets were tagged during the 1985–86 season, out of which approximately 40 birds were tagged using the stainless steel wire. The system using fishing line was used with success during the 1986–87, 1987–88 and 1988–89 breeding seasons on more than 500 egrets.

The Refined Technique

Materials

The tags are made from either Pennant Flag Cloth or fluorescent Banner Cloth, an adequate substitute, obtainable from pennant making or canvas firms.

Tag Design and Construction

The stages of construction are illustrated in Figure 1 (a–e).

(1) The species colour cloth is cut into rectangles about 80–85 mm by 75 mm and the rectangles cut into two trapezoid pieces (Fig. 1a), using a guillotine. Each trapezoid piece is then trimmed with scissors to the shape shown (Fig. 1b). The colony colour is similarly cut to produce trapezoid pieces from a rectangle about 45 mm × 30 mm. The colony colour is then placed over the species colour and fixed with a copper staple, flattened with pliers after application to eliminate any projections of metal. The staple projections point out, away from the bird's body (Fig. 1c).

(2) The tag is then trimmed with sharp scissors to produce the shape shown and the attachment flap is folded over so that about ⅔ of the flap is behind the main body of the tag (Fig. 1d). A fine-bore hole punch is then used to punch a hole through the fold so that two holes which can be aligned are produced (Fig. 1e).

Coding

A cattle eartag marking pen is used to code black numerals onto the tag. Code number 1 is put on the blue (Shortland) patch, representing the computer number for Shortland, and corresponding to the locode registered with the Australian Bird and Bat Banding Schemes. The number 9 (locode 09), representing the Seaham colony, is coded onto pink Seaham patches. Colour and locode number represent the site of the colony.

On the tag body itself a number representing the season of operation (3=1985–86 season, 5=1987–88 season) is placed towards the top, and a number representing the individual bird is added to the lower part. There is adequate room for a three digit code (see Figs 3 to 5).

The unique identifying number for each individual is thus made up with the colony number, the season number and the individual number. Currently, numbers are being allocated consecutively from season to season, for quick

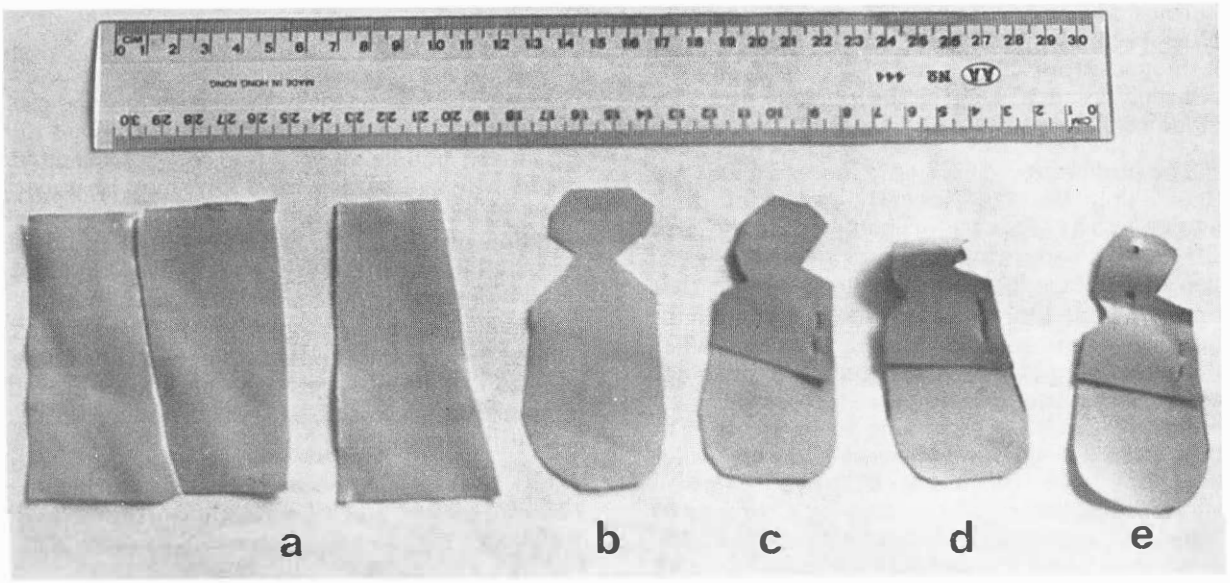

Figure 1. *Stages of construction of patagial tags for use on egrets.*

identification from field observation. For example any pink and yellow tag with a number between 129 and 181 is a Seaham Cattle Egret tagged in 1987-88 until the end of February. When 999 birds have been tagged, the individual numbers will revert to start with 1 again, needing the other codes added to provide uniqueness. This system allows the same computer file which was used for the colour banding to be used for data storage. A variable designated "band code" is used to distinguish whether a bird has been given an ABBBS band only, colour bands or patagial tags.

Attachment

The stages in the attachment of the tags are illustrated in Fig. 2 a–h.

(1) An assistant holds the bird with its breast facing the bander, extending one wing to present the under part of the patagium to the bander. A leather hole-punch is used to put a small hole in the patagium between the leading edge of the wing and the tendon, about two-thirds of the way towards the bend of the wing where the underwing coverts overlap the secondaries (Fig. 2a). This is most easily achieved when the nestling is about 3–4 weeks old, before the coverts grow across the patagium. In older nestlings and adults it is more difficult to find the tendon because of the growth of the coverts.

(2) A small two-holed plastic shirt button (7–10 mm diameter) is threaded with fishing line (4–5 kg breaking strain) to leave two free ends about 60–70 mm long. The two free ends are then threaded through the hole in the attachment lobe of the tag from the upper side, and through the hole in the patagium from the underside of the wing (Fig. 2b).

(3) The free ends of fishing line are put through the hole in the main body of the tag from the underside, the tag is folded over the leading edge of the wing so that the main body of the tag lies over the upper coverts and secondaries, and a second shirt button threaded onto the fishing line, one free end through each hole (Figs 2c, 2d).

(4) The free ends of the line are then tied using a surgical knot. For nestlings, these are pulled sufficiently tight to hold the tag firmly in place, but leaving leeway for wing growth to occur.

The Surgical Knot

The free ends of the line are held together with one hand, surgical forceps in the other.

(1) The closed blades of the forceps are placed *between* the two protruding free ends of the fishing line (Fig. 2e) and wound to produce three loops of line around the blades (Fig. 2f).

(2) The forceps are opened to grasp the other free end (Fig. 2f), which is then pulled through the loop, and the triple knot so formed pulled firmly so that the button is held down onto the tag surface (Fig. 2g).

(3) The forceps are again placed between the free ends, two loops are formed, and the forceps used to grasp the unlooped, free end (Fig. 2h).

(4) The free end is pulled through to form a double knot and tightened.

(5) Three more double knots are formed in the same way and then the surplus ends of fishing line are cut off with side cutters.

When the bander has practised and is fully fluent with the technique, a tag can be attached and the bird released within 3–4 minutes.

Observations on Tag Losses and Bird Mortality

Twice-daily checks have been maintained on 185 tagged Cattle Egrets at Seaham over the four seasons in which tagging has been carried out. The colony occupies a small area, with virtually all nests able to be kept under close observation. The follow-up for the 400 egrets processed at Shortland has been less rigorous because of the wide scattering and density of the trees. At Seaham, two birds tagged in the first season with the stainless steel technique lost one tag and one lost both within a few days. Subsequently, single tag losses have been recorded for three birds while they were still in the colony. Four deaths have been recorded, and two cases of a tagged sibling being attacked when returned to the nest have been observed. In one of these cases, the sibling survived for nine subsequent days. In the other, the bird was ejected from the nest, was rescued by the staff of the Centre, raised in captivity and released.

At Shortland, one Cattle Egret was observed to have lost a tag on the 17th day after processing. Over the four seasons, 17 deaths have been

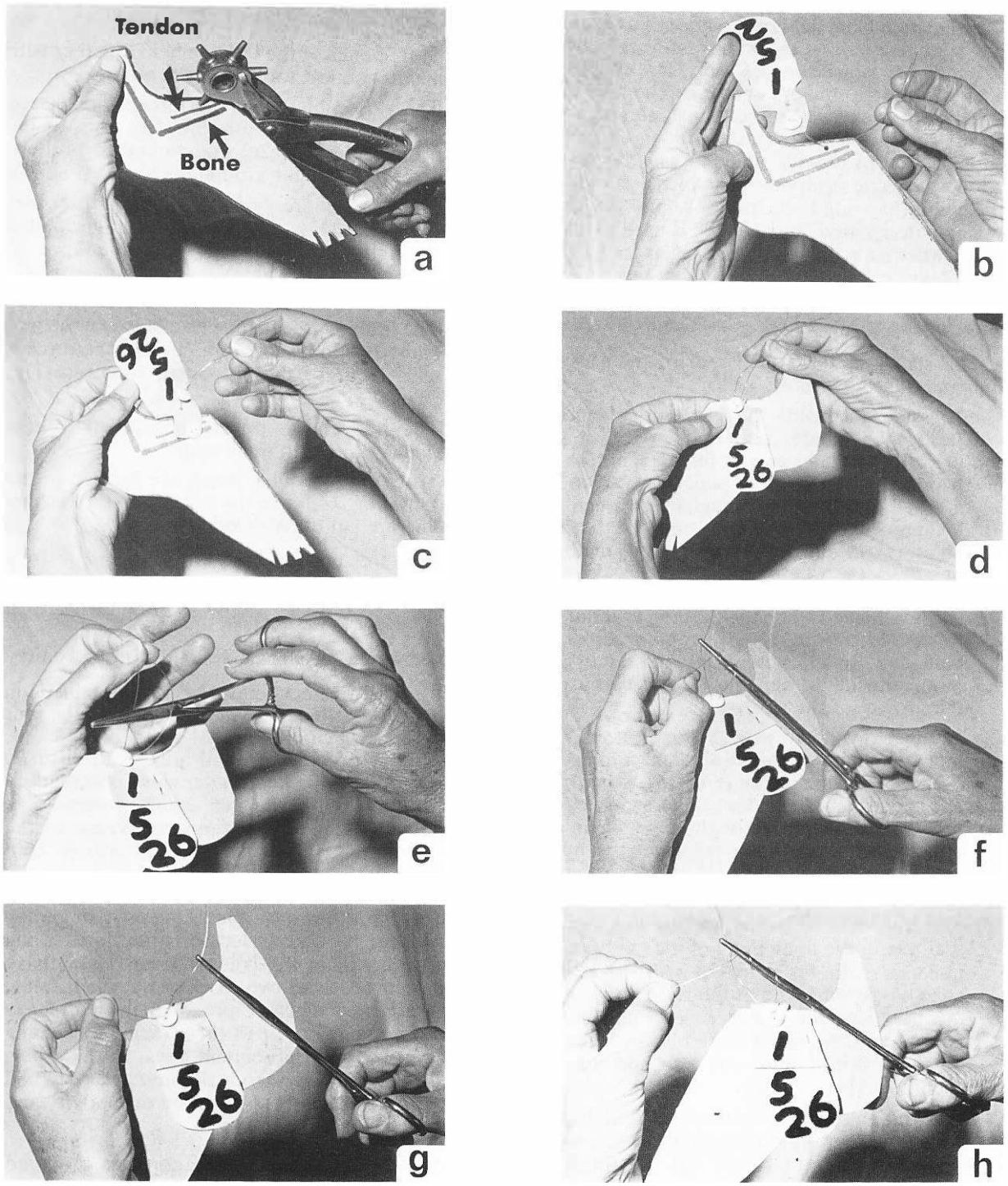

Figure 2. *Methods of attachment of patagial tags on egrets, and the securing of the tags with the surgical knot.*

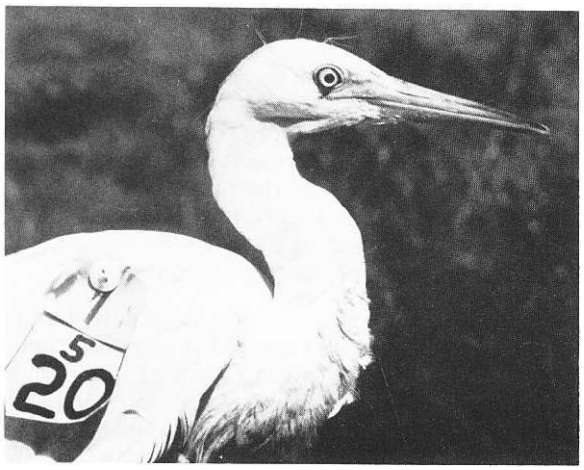

Figure 3. *Little Egret No. 20, Shortland Season 5.*

recorded. Two ejections occurred in 1987–88 and both these birds were rescued, rehabilitated in captivity and subsequently released.

None of the deaths or ejections recorded can be directly attributed to the process of tagging, the circumstances being consistent with those observed for non-tagged birds. Twelve of the deaths occurred at Shortland during the 1986–87 severe drought season, when many nests were noted with young birds under stress, and several dead untagged birds were being found each day on the floor of the colony. It is highly probable that the drought was an important factor in the mortality rate, as tagged birds did not seem to be over-represented in the number of dead birds found.

Figure 4. *Cattle Egret No. 107, Seaham Season 4.*

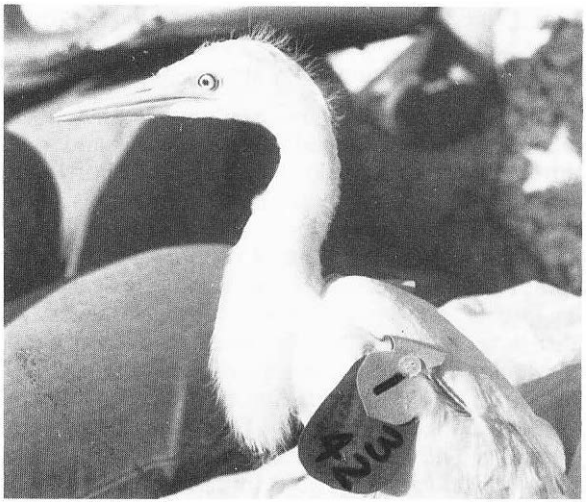

Figure 5. *Intermediate Egret No. 42, Shortland Season 3.*

Observations on Success of Technique

Tag Sightings between Breeding Seasons

The majority of all four species of egrets depart the Hunter region for elsewhere at the end of the breeding season, while a few overwinter. There were consistent sightings of tagged Cattle Egrets during the three winters up to the beginning of the 1988–89 breeding season, but sightings were few for Little and Intermediate Egrets and no Great Egrets have been located. Regular sightings of Cattle Egrets in the area around the breeding colonies have allowed monitoring of the durability and legibility of tags over time and their effect on the behaviour of the birds, while sightings of birds elsewhere have enabled assessment of the capacity of the tags to withstand long flights.

One Shortland Cattle Egret was observed throughout the winters of 1986 and 1987, and another throughout 1987 and 1988. One Seaham Cattle Egret was seen regularly from the date of tagging in February 1987, until April 1987 and again from August 1987 through to October 1989, totalling more than 250 sightings. Another Seaham Cattle Egret has been observed consistently from July 1988 to October 1989.

One 1985–86 Little Egret lived around Shortland for five months before being found shot in

June 1986, while sightings were recorded for three Intermediate Egrets (one 1986–87 bird and one 1987–88 bird) during early spring 1988.

Successful long-distance movements have been recorded for six tagged Cattle Egrets and one Little Egret. A Little Egret from Shortland, recognizable by its blue and orange tags, was located at Curdie Vale, near Warrnambool in Victoria, in May 1987, but no coding details were obtained by the observer and hence the season of tagging is not known. Cattle Egrets tagged at Shortland in January 1986 were recovered dead at Macksville, near Coffs Harbour, in June (270 km north), and sighted live at Kulnura (59 km south) and at Huonville, Tasmania (1 200 km south). The Tasmanian flight had been accomplished within two months.

A Cattle Egret tagged at Shortland in January 1987 was sighted live in the Lake Ellesmere district, near Christchurch, New Zealand, in May 1987, April 1988, May 1988, and was subsequently found dead in the same district in August 1988. Although no sightings of the bird were reported in the Hunter in the summer of 1987–88, these may represent each-way Tasman Sea crossings of 2 160 km for each leg. Cattle Egrets are known to reach New Zealand in autumn and disappear again in spring (Heather 1978, 1982).

A first-year Shortland Cattle Egret tagged in January 1988 was sighted near Sale, Victoria, in October 1988 and at the Seaham breeding colony (32 km north of Shortland) in December 1988. These sightings represent a southward movement of 740 km, with a 770 km return flight.

Sightings During Breeding Seasons

Sightings of tagged birds at the breeding colonies in each of the three nesting seasons since patagial tagging commenced in 1986–87 has enabled assessment of the longevity of the tags, their legibility, their effect on breeding behaviour and breeding success, and the survival rate of tagged birds.

Four Cattle Egrets tagged as nestlings in January 1986 are known to have returned in the 1986–87 breeding season. These four, as well as two others of the same cohort not recorded in 1986–87, returned as two-year old birds in 1987–88 in company with 26 first-year birds tagged in the previous season.

In the 1988–89 season, four of the Cattle Egrets tagged in the 1985–86 season returned as three-year old birds. One of these had been tagged using stainless steel wire for attachment. Eighteen from the 1986–87 tagging programme returned as two-year old birds, representing 70 percent of those which had returned the previous season. Of the 107 Cattle Egrets tagged in 1987–88, 20 birds (19 percent) returned in the 1988–89 season. Of this latter group, only one had lost one tag.

In the 1988–89 season, one tagged first-year Intermediate Egret was located in the Shortland colony, the first record of a return of other than a Cattle Egret to the breeding colony. Eighteen Intermediate Egrets were tagged in 1987–88.

Nesting Success of Tagged Birds

Observations of nesting tagged birds have produced no evidence that birds tagged by the technique described in this paper are less successful than untagged birds. Of six nests for which outcomes are known in 1987–88, one nest failed, three nests successfully fledged two chicks and two produced two chicks. Results for 1988–89 had not been completed at the time of writing, but of six nests in which young were fledged, one nest had one chick, one had two, three had three and one nest, four chicks.

If the 1988–89 results are combined with the results of the five successful nests in 1987–88, a total of 28 chicks for 11 successful nests is obtained. The mean number of chicks is 2.5 (S.D.=0.5). Mean breeding success number of chicks fledged per successful nest from 138 successful nests at Shortland for two seasons (1982–83, 1984–85) was 2.6 (S.D.=0.7) (Maddock 1986).

A further nine nests of tagged birds, including two pairs, had been located with young in the 1988–89 season, at the time of preparation of this paper. The young were too small to be taken into account in estimating breeding success.

Fostered and Rehabilitated Birds

From 1986–87 to 1987–88, a number of nestlings ejected from nests by sibling aggression have been rescued, fostered in captivity until rehabilitated, tagged and released. After release, they have tended to remain in the vicinity of the release point for up to several weeks, returning

each day for food, enabling close observation of their reaction to the tags. Behaviour followed the same pattern as that for tagged nestlings kept under observation in the colonies. A few picked at the tags for an hour or so after attachment but others ignored them. All ultimately accepted them and included them in the feather-preening routine.

Effect of Tags on Flight

There is no evidence for either fostered birds or nestlings in the colony that the tags impeded learning to fly; the birds carried out the normal practice wing-flapping as they developed, then flew short distances of a few metres, before extending their range to locations up to a kilometre away. Birds observed in the field on a regular basis over winter and at the colony during the breeding season were able to fly freely, even those which had lost one tag.

Loss of Tags

One fostered bird lost a tag before release. Examination in the hand revealed a small tear in the leading edge of the patagium where the tag had been attached. The tag had been apparently caught in an obstruction and pulled away from the patagium. The bird behaved normally and flew without impediment. Fledglings in the colonies, both tagged and untagged, often scramble through branches using legs, wings and beak for assistance, and this probably accounts for the tag losses in the wild birds. A single tag creates observation problems as the side carrying the tag must face the observer before it can be seen.

Reading Tags in the Field

Under optimum conditions (bird fully side on, little wind and good light), tags can be easily seen from about 300 m and the coding read up to 15 m distance using the naked eye. Using 10×50 binoculars, the coding can be read from 80–90 m, and using a telescope with 15×45 zoom lens from about 300 m. The telescope also enables tag numbers to be read at about 100 m or so, even in very poor light, such as close to dusk.

A problem in reading the tags in the field is caused by the lack of a second attachment point, causing fluttering in strong wind. Under certain conditions a tag may also point upwards, instead of hanging over the wing, so that only the under side is visible. Under the final coding scheme adopted, the tag number can be read through the back of the tag.

At first, the address and phone number of the Hunter Wetlands Trust were printed on the under side of the tag. This obscured the number from being read through the tag and also created interference with reading the numbers on the correct side at the longer distances.

A similar problem, although not so great, was created when the code numbers were put on the underside in an attempt to facilitate reading upward pointing tags. This interfered with reading the tags from either side. The best conditions had numbers coded on one side only.

The outer side of the yellow Flag Cloth and Banner Cloth is subject to severe fading. Colour retention is reasonable in the first year, but by two years the Flag Cloth had faded to a dirty khaki. Yellow also adopts a greenish hue in diffuse sunlight among green foliage, and over time, the address on the back of a tag also tends to impart a greenish colour. Blue, pink and red have retained good colour over three years.

The black numbers have also been found to be variably faded but still readable after three years. The maker of the cattle ear tag marker pens warns against fading if inadequate ink is used.

DISCUSSION

The egrets start to disperse from the colonies soon after fledging. For most of the Cattle Egrets in the two colonies this involves a movement towards Victoria, Tasmania and New Zealand, where resightings are dependent on the number of observers available at wintering sites. Only six birds have been located outside of the Hunter region since wing tagging commenced but frequent sightings and resightings have been made locally during the breeding season and of resident birds staying over winter. The return of 70 percent of two-year old birds to the breeding colony is regarded as very satisfactory.

That there is only one record each for Great and Little Egrets is not surprising, as less than 20 for each species were processed over two seasons (1985–86, 1986–87) and none were done in 1987–88. Great Egrets nest at the top of tall melaleucas

at Shortland, making it extremely difficult to obtain chicks, and only a small number of Little Egrets have nested each season. However, 116 Intermediate Egrets were tagged over three seasons, but few sightings have been recorded. A first-year bird in breeding colour and plumes was seen in Hexham swamp during the 1987–88 season but was not seen in the breeding colony, and another first-year bird in full plumage was observed in the colony area in the 1988–89 season, but no nest was found.

The reason for the discrepancy between the rate of sighting Cattle and Intermediate Egrets is something of a mystery as yet. One possible explanation is that there is a major difference between breeding season movements. Cattle Egrets have a well established route down the eastern seaboard, where Project Egret Watch has about 100 registered observers and chances of a marked bird being sighted are relatively high. If Intermediate Egrets take a different route where possible observers are few, the chances of a sighting are relatively more remote. Hancock and Kushlan (1984) indicated that little is known of their movements. These egrets have been rarely seen in Tasmania, with some indication of winter migration to Papua New Guinea. However, this does not explain the paucity of return of birds to the breeding colony, which may be related to age at first breeding. That the two first-year birds sighted had breeding plumage suggests that like Cattle Egrets, Intermediates are capable of breeding as first-year birds. As the number of Intermediate Egrets processed increases and the observer network extended to other areas, it is hoped that further recoveries will be obtained. A report on these recoveries will be prepared when sufficient data have been collected.

Banding sessions in Project Egret Watch have been deliberately restricted to about three hours in late afternoon in order to minimize colony disturbance and exposure of eggs and chicks to hot summer sun, and the number of sessions has been limited to minimize frequency of disturbance. Usually two banders operate, with a team of helpers to catch and ferry chicks from and to the nest, and the maximum number of birds processed in any session has been 40. Under these restrictions, the number of birds that can be processed using the technique is thus somewhat limited. However, the system has proved successful in applying a tag which lasts at least three years and provides the required information effectively, and the number of tagged birds returning to the colonies has enabled effective breeding biology studies to be conducted. To process more birds without additional colony disturbance would require a system using a simple, direct applicator and suitably designed tags, such as those used for car tagging cattle.

An important feature of the system is that valuable information can be obtained from non-expert observers who do not have to be able to identify the different species in the field. Reporting of the two colours enables species and location of banding site to be identified. If, in addition, the season number only is sighted, the age of the bird can also be determined.

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