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The "Nonnac" Method of Netting Wild Birds

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A propulsive device called a "Nonnac" was used to capture 2 060 Galahs between 1971 and 1976 in the Western Australian Wheatbelt. Two nets each 36 m^2 were projected by Nonnacs over birds feeding at prebaited sites. The Nonnac itself, its manufacture, and the use of this technique for capturing Galahs are described in detail.

Birds which will feed close together in a flock at a restricted food supply can be caught by throwing a net over them. Traditionally bird-catchers have used a variety of drop and clap-nets to achieve this but such devices restrict the numbers of large birds that can be caught at any one time. Since there is often only one opportunity to fire over a flock at any one site (after which the birds are scared off) it is important to catch the optimum number of birds at the one time.

Wild geese are difficult to trap by conventional methods and so it is not surprising that it was waterfowl researchers who pioneered the mass netting of birds. In the late 1940's the Severn Wildfowl Trust was formed in Great Britain and to catch and ring large numbers of geese they developed a system of firing rockets to carry nets over birds feeding in areas that had been baited previously. The first catch of 32 wild geese was made on 18 February 1948 (Scott, 1948) and from 1952 onwards over 1 000 geese were caught each year, the largest single catch being 385 in 1953 (Anon, 1955). At almost the same time officers of the U.S. Fish & Wildlife Service perfected a different sort of propulsive device, which they called a "cannon", to achieve the same end, namely catching geese (Dill and Thornsberry, 1950).

In Australia the first cannons to be used were similar to those of Dill and Thornsberry and were fired over Magpie Geese *Anseranas semipalmata* in the Northern Territory (Frith and Davies, 1961). Other usage was listed recently by David Purchase (1980) Secretary of the Australian Bird-banding Scheme (these included Campion 1964 and Lane 1973).

In 1964 a study of Australian Shelduck *Tadorna tadornoides,* was started on Rottnest Island Western Australia (Riggert, 1977). Originally Dill and Thornsberry cannons were used to catch the ducks destined for banding ". . . however in 1966 a modified type of cannon . . . was substituted for the original design" (loc. cit. p.8). This device has been described in a rather obscure journal that I have not managed to read (Miller, 1957) and was further modified later (Marquardt, 1961); neither description is readily available. I understand (Minton, pers comm.) that a similar type of "cannon" was developed in Holland at much the same time, and named Nonnac (cannon spelt backwards), but this does not appear to have been described in print. Since this apparatus is strictly neither rocket nor cannon* we have used the name Nonnac in this paper.

In 1970, when we needed to catch and band large numbers of Galahs *Cacatua roseicapilla* in order to follow their movements we came across the further modified light-weight Nonnac (Riggert, pers. comm.) being used by the W.A. Fisheries and Fauna waterfowl team; we tried it and found it efficient, reliable and safe.

In the course of six years we managed to suit the technique to catching large numbers of cockatoos. Since this method of catching birds does not appear to have been published anywhere this paper describes the design detail, manufacture and operation of the Nonnac specifically as used by us to catch Galahs. Obviously we do not claim any orginality for the Nonnac design. This paper was written to satisfy the numerous requests for details that we have received.

Materials and Methods

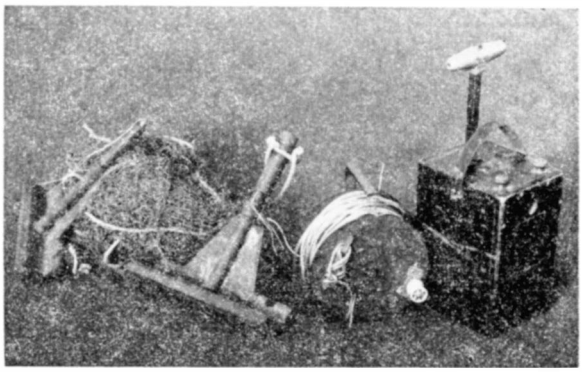
The Apparatus

As used to catch Galahs, the apparatus consisted of two nets set facing each other and thrown over the birds by simultaneous discharge from propellant devices known as "Nonnacs" (see Figure 1). The apparatus is described under three section — the Nonnac, the electrical system for firing, and the nets.

The Nonnac

In our experience the Nonnac is superior to both rockets and cannons because the charge and exposed wiring are shielded from moisture and damage (and other interference) by the covering barrel-cum-projectile. Also the appartus is compact, relatively lightweight, easy to manufacture and consequently quite inexpensive.

Figure 2 shows the detail and dimensions of the Nonnac; it consists of a central pillar of 25 mm diameter steel (an old car-axle is adequate) which is drilled out centrally to provide a cavity 51 mm deep by 12.2 mm diameter to accept a 11.9 mm (.410" gauge) "long" cartridge. Figure 3 shows how the projectile fits over this pillar and consists of 127 mm of steel tube (34 mm O.D; 27 mm I.D.) welded shut at one end and with two rings (a chain link cut in half) welded on opposite sides to which are attached trace ropes fastened to the net. This projectile fits loosely over the pillar and is held 6 mm above the base of the cartridge by a collar cut from the same diameter tube and welded to the pillar. This collar protects the fuse head and wiring from being squashed by the projectile. The outside of the pillar is grooved vertically to form a trench in which the leads from the fuse head can run.



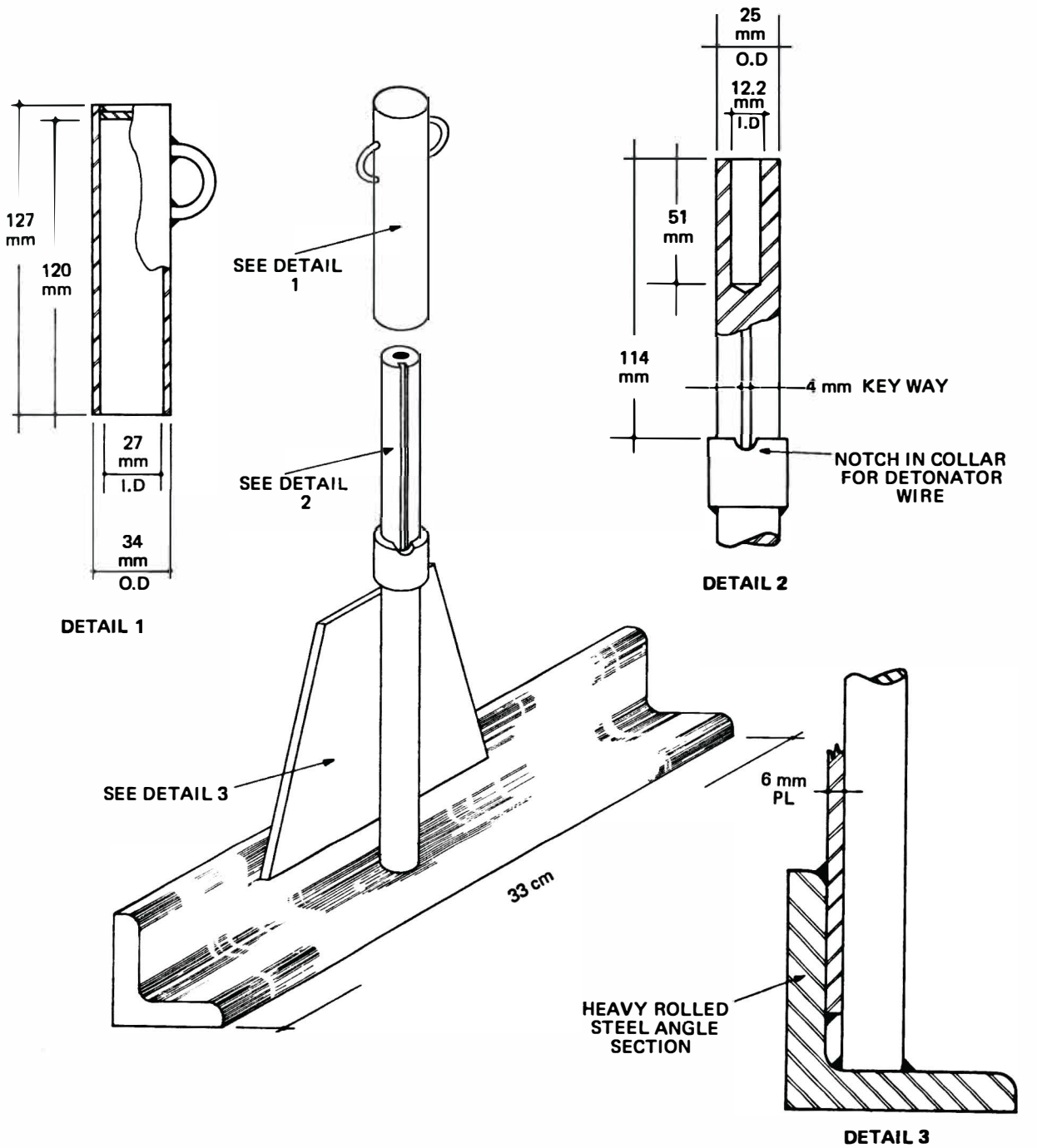
• Figure 1. *Nonnac equipment showing two Nonnacs, a net, a cable reel and a blasting machine.*

Most of our use for this apparatus has been on hard, dry ground so that we have relied mainly on the weight of the Nonnac itself to restrain recoil movement. Nevertheless we usually dug a trench into which the base plate sat firmly, to be on the safe side and also help camouflage the set up. The base plate was a 33 cm length of railway line "fish plate" welded to the pillar of the Nonnac and strengthened on each side by a piece of 6 mm steel plate. A piece of heavy rolled steel angle would serve equally well.

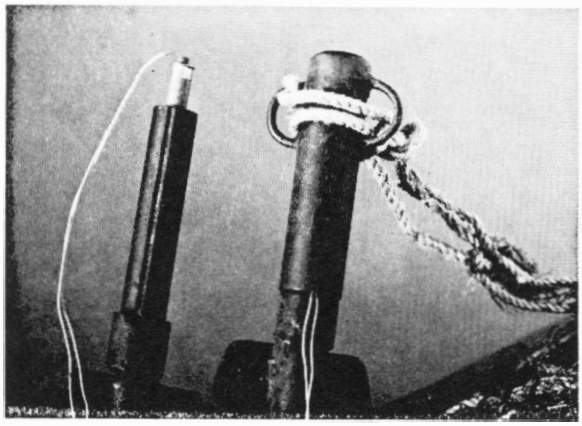
On soft ground the heavy base plate might be replaced by a spike to be driven into the ground; this would certainly save weight, but in the Western Australian summer the ground is too hard.

We used ".410", long" shotgun cartridge cases which were obtained empty and unprimed; the bases of the cartridges were drilled to accept Testex fuse heads which come complete with a rubber plug and 30 cm leads (Figure 3). The rubber plug was pressed into the hole in the base of the cartridge by hand, leaving the fuse head inside and the leads trailing out. (If the plug was twisted too much during insertion an open circuit could result and spoil the subsequent firing).

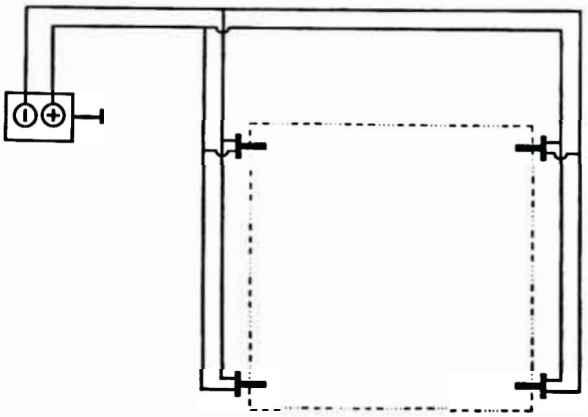
* To clarify the terminology relating to the different methods of propelling nets over birds:— rockets are both propellant and projectile in one, and, on ignition both leave the launching site together. Cannons are smooth-bore guns which hold a charge and a projectile (as used by Dill and Thornsberry): when the charge is ignited and explodes the projectile is forced up and out of the barrel. The Nonnac is neither rocket nor cannon for although the basic charge for cannon and Nonnac may be similar, with the Nonnac the barrel becomes the projectile which is attached to the net.



• Figure 2. *The detail and dimensions of a Nonnac.*



• Figure 3. *A loaded Nonnac showing how the charge and leads are well protected.*



• Figure 4. *Wiring diagram.*

The cartridge was next filled to within 1 cm of the top with black powder (FFF grade). This resulted in a charge of approximately 3.3 g of powder which was covered with a wad of cotton wool and the ends of the cardboard cartridge were crimped over. All the above items were obtained from ICI Explosives Division.

Wiring

(*i*) *Circuit.*

The most suitable cable proved to be figure eight 240 v electric lighting flex coated with clear PVC. This was inconspicuous and enabled breaks in the wire to be easily seen.

We used four Nonnacs, two to each net as shown in Figure 6, and these were connected in parallel (see Figure 4) which meant that if one failed to fire the others still did so which, with the opposed nets, resulted in an acceptable catch on most occasions. If set in series one defect in the circuit means none of the charges fire; British netters prefer such a circuit (Minton, pers. comm.).

The bridle cable attaching to the two sets of Nonnacs plus one hundred metres of further cable takes a lot of winding up and if this is not done carefully kinks occur and sooner or later the wire breaks and the circuit fails. Revolving cable reels enable the circuit to be laid out quickly and without kinks and are also convenient for storing the cable when not in use (see Figure 1). Commercially available reels for garden hoses are adequate.

(*ii*) *Current.*

Many different power sources will discharge the Nonnacs but we found that the most dependable was the device known as a Blasting Machine (ICI Model 30). This machine generates its own power when the handle is depressed (see Figure 1). It can be locked with a key, in the "off" position and requires the positive action of raising the handle and pushing it down before discharging a current so that accidental firings are most unlikely to occur.

We have tried various battery devices but at one time or another they proved unreliable, whereas the Blasting Machine never let us down. However, they are not cheap — about $190 in 1979.

Nets

Nets used for catching birds may vary in many ways: the size of the mesh; their overall dimensions; and their shape colour and weight.

(*i*) *Mesh size.*

When a net is thrown over wild birds it is necessary for them not only to be covered by the net but become enmeshed in it otherwise the birds will roam around until they reach the edges and escape or find a neighbour and start a fight. Therefore, the mesh should not be too small. At the other extreme the largest mesh that stops the birds passing through and escaping is *too* large since the wings and legs of the bird pass through the mesh and become entangled as well as the head and neck; this usually results in the

net needing to be cut before the bird can be extracted. The ideal mesh size is that which allows the bird's head to pass through but not the wing; this dimension will vary from species to species but for Galahs and Little Corellas* *Cacatua sanguinea,* nets of 5 cm mesh (stretched diagonal measurement from knot to knot) work well whilst for White-tailed Black Cockatoos, *Calyptorhynchus baudinii*†, Red-tailed Black-Cockatoos, *C. magnificus*† and Sulphur-crested Cockatoos, *Cacatua galerita*‡ 6 cm mesh was necessary.

Commercial fish nets are readily available and so we used these. They were made from 9-ply nylon thread and were quite strong enough to hold cockatoos.

(ii) Dimensions of net.

The overall size of the net to be thrown depends on how many birds can be processed before signs of distress (in the birds) becomes evident. Obviously climatic extremes limit the number that can be handled but so also do the objectives of the researcher. The time taken to disentangle, band, tag, measure, record moult, take blood samples etc. all mount up and as a rule of thumb two hours processing of birds is long enough to keep them from feeding and drinking under the stressful conditions of captivity. Once the number of birds that can be safely processed has been determined, the upper dimensions of the net decide themselves; twice the area occupied by the optimal number of birds when feeding allows a sufficient margin for the fringe birds to escape and leave enough behind to become enmeshed. We found that nets 36 m^2 (6 m x 6 m) of 5 cm mesh were adequate for catching Galahs, and were easily thrown by two Nonnacs. We also found that this area was quite large enough to sweep clear of snags and to bait the birds on.

(iii) Shape.

We used square nets of 6 m side which were slung on grey polypropylene side-ropes (4 mm diameter) so as to leave a bag in the middle. This was done by slinging 225 meshes on the 6 m of the side rope. Two lead-ropes (0.5 m long) of similar polypropylene connected the leading edge of the net to the projectiles.

(iv) Colour.

Nets are available in different colours; we chose a golden-olive coloured material and found this inconspicous and satisfactory.

(v) Weight.

Our 6 m x 6 m net with side and lead ropes weighed 1.8 kg.

The Method

Catching area

A well prepared catching area is essential for a successful firing. First, the area chosen needs to be fairly flat, otherwise birds tend to escape under the edges of the net before it can be held down. Secondly the ground must be clean of all debris likely to tangle the net, particularly near the base line. One small wiry rootlet, a broken off weed-stem or a tuft of grass can ruin a firing by holding back a large part of the net and causing it to swerve away from the catching area. If it is impractical to clean the area, the nets may be set on top of a narrow strip of hessian or plastic, but cleaning of nets fired over a dirty area is tedious.

Galahs will feed quite close to each other (Figure 5) and so the area occupied by 27 feeding birds was quite easily covered by our 36 m^2 nets. We baited one side of the cleared area with wheat to concentrate the birds under the spread of the nets (see Figure 6).

With only a limited number of expensive nets and Nonnacs available, we could not leave these

● Figure 5. *Galahs feed close together — there are 27 birds in the picture, a good target.*

* G. T. Smith (pers. comm.).
† D. A. Saunders (pers. comm.).
‡ J. A. Ingram (pers. comm.).

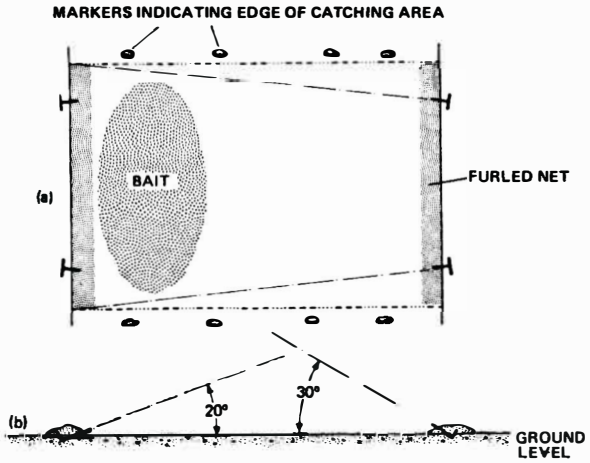
at all sites which were baited prior to netting. We therefore, substituted a rolled length of hessian for the nets and bottles or pieces of pipe for the Nonnacs, to accustom the birds to strange objects near their food. Galahs like to perch in a tree before dropping down to feed, and our best results were obtained by siting the catching area under a staging perch such as a dead tree. We even laid such dead trees carefully behind the base line of the nets, both to break the straight outline of the net and to provide a perch close to the grain. Galahs were very suspicious and birds that had been involved in previous firings quickly learned to recognise the trap situation and would hover and screech above it. Such activity made other birds nervous and was not conducive to successful netting.

We also tried to net at water troughs but not many birds were caught at such sites because Galahs drink quickly, a few at a time and do not stay long.

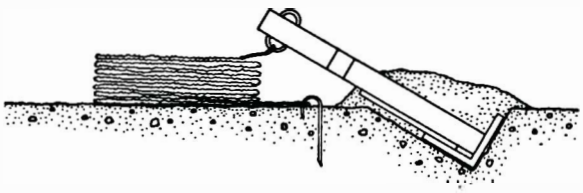
Setting Nets

We found that better catches were obtained by firing two nets at one another (see Figure 6 (a) and (b)). Galahs were very quick off the mark, and using a single net, we found that the instant for which the net hung at full stretch was sufficient for many birds to fly out from underneath.

For 36 m² nets we allowed approximately 50% overlap but this was not critical. On a very restricted site almost 100% overlap was possible.



• Figure 6. *Layout of catching area. (a) Plan (b) Section showing elevation of Nonnacs.*



• Figure 7. *Detail of Nonnac and net placement.*

To achieve this overlap the Nonnacs carrying one of the nets (that closest to the bait) were aimed lower than the other pair (see Figure 6b). The one drawback of this system was that the projectile of the low angled net tended to make holes in the opposite net, resulting in frequent repairing of nets. The less overlap allowed, the less likelihood of this damage.*

Nets were fastened securely to the ground at the baseline by pegs with bent over tops that were hammered right into the ground otherwise wind could have blown a set net over the top of a peg and aborted the throw. The net was evenly furled at the base line, a job that is more easily accomplished by two people. Particular care here must be taken not to allow any small twigs, rootlets or other foreign matter to become caught in the net as it is folded.

The Nonnac bases were dug into the ground using a mattock so that only the barrels projected over the top of the furled nets (Figure 7). The angle of the Nonnac must be adjusted carefully to the estimated trajectory of the projectiles, i.e. one net needs to fire higher than the other and each projectile should be aimed slightly inside the projected corner of the net (see Figure 6 (a) and (b)). If it was aimed outside the corner, the leading edge of the net tautened in mid-air resulting in a rebound action that pulled in the leading corners towards the middle. With wider nets, this effect is not so important.

Where the ground permitted we buried the firing cables out of view, particularly the one that ran past the end of the firing area between the two nets. Not only did this avoid the cables being chewed (a frequent source of trouble, particularly with black-cockatoos) but some Galahs

* David Purchase has suggested that if the low angled net were wider than the higher net such collisions would be avoided.

were obviously scared by the cable when it was left visible, and would walk around it.

Testing

Probably the most important single pre-requisite to successful firing is to do a test fire using bare fuse heads attached to the priming leads before attaching them to the primed Nonnacs. The fuse heads make a faint "zap" when they fire, barely audible 50 m away; this leaves no doubt as to the state of the wiring, a fairly frequent cause of failure. Electrical meters can be used to test the circuit but they will not show if one of the fuses is short circuited unless the whole circuit is tested section by section and this is very time consuming (the U.K. netters prefer to use meters (Minton, pers. comm.)).

Firing

We usually used 100 m of cable depending on the cover available. It was not easy to judge when birds were best positioned in the catching area and the closer the vantage point the better. However, we have used up to 200 m of cable on occasions and under such conditions it was helpful to place a few markers such as small stones, etc., to delineate the edges of the catching area between the nets. Ideally we waited for all the birds to have their heads down facing in towards the nets before firing.

After Firing

Different species reacted in different ways to being caught under a net. Sulphur-crested Cockatoos, Australian Ravens, *Corvus coronoides,* Little Crows, *C. bennetti* Australian Magpie-larks, *Grallina cynaoleuca* and Pied Butcherbirds *Cracticus nigrogularis* all lay quietly when netted but Galahs shrieked and struggled violently. They also bit one another, themselves, the net, the catcher and whatever else was handy. This made the extraction of Galahs from the net a slower process than was the case with, say crows. To stop Galahs escaping and from biting one another, short pieces of heavy timber were placed on top of the net between the birds. Ideally, if sufficient manpower was available, birds were removed from nets and placed in holding bags or cages to await attention. However with simple tagging we found that it was better to process the birds as they were removed from the net, because the weather was often hot and the birds suffered less that way. Netting birds in extremely hot or wet weather was avoided because the struggling bird under the net either became exhausted in the heat or soaking wet. Whenever practical, birds trapped together as a flock or group, were released together, rather than one by one. Piecemeal release of flock birds after handling could cause the flock to fragment.

Catches

Table 1 shows the catches of Galahs that we achieved between 1971 and 1976. In the first year we were obviously feeling our way and more than half of the catches were of 15 birds or less; thereafter we aimed at netting 15-35 birds, a number we could process quickly before the heat of the day built up. Our "record" was 82 birds but this took nearly five hours to process even though several passing farmers took pity on us and helped (until they were bitten!).

TABLE 1

Number of Galahs caught per netting attempt — Manmanning 1971-1976.

	Number of birds in catch					Total		
Year	<6	6-15	16-25	26-35	>35	Firings	Birds	Av. Birds/ Firing
1971	12	14	9	2	1	38	495	13.0
1972	0	3	5	0	1	9	169	18.8
1973	1	3	7	2	0	13	232	17.8
1974	0	4	7	2	8	21	611	29.1
1975	1	2	2	3	0	8	152	19.0
1976	1	0	7	4	2	14	401	28.6
	15	26	37	13	12	103	2 060	20.0

Discussion

Since we developed Nonnac-netting to catch cockatoos, cannon-netting has become more widespread in the United Kingdom and has been widely used for catching gulls on rubbish tips and waders, particularly at roost, besides the waterfowl for which it was originated. The Wader study Group and in particular the Wash Wader Ringing Group were largely responsible for this increase in the use of the technique and together with the Ringing and Migration Committee of the British Trust for Ornithology they have written a Cannon-netting Code of Practice (Lessells, C. M., McMeeking, J.M. and Minton, C.T.D., 1978) which provides a lot of useful information* and should be read by all would-be netters. However, geese, waders and gulls pose quite different problems to those raised by netting cockatoos with their very powerful bills and sharp claws capable of damaging themselves, the equipment and operator with equal ease. Because of these differences some of our recommendations in this paper differ from those in the Code.

One of the leaders of the British Wader Study Group, Clive Minton arrived in Melbourne in 1978 and before long wader banding studies at Werribee were including cannon-netting in their programme. In June 1979 the Victorian Wader Study Group was inaugurated in Melbourne as part of the Victorian Ornithological Research Group. The success of this group is evident from recent reports (Minton 1979, 1980).

Netting birds using either cannon or Nonnacs is therefore here to stay in Australia. As with many other aspects of catching and marking birds, each State may be expected to have different regulations. Anyone contemplating using nets propelled by explosive devices should therefore contact their Regional Organiser (under the Australian Bird-banding Scheme) and make sure that the relevant State Authorities allow the use of this technique — rather than be disappointed (or worse!) after investing in costly equipment.

The method of netting birds described in this paper has resulted in regular catches of large numbers of cockatoos. If necessary, still larger numbers could be caught by using more Nonnacs — the limitation is really one of manpower to process the birds that are netted.

* Available from B.T.O. Beech House, Tring, Herts. U.K.; price 50 pence.

Acknowledgements

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