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PAIR FORMATION AND RELATED BEHAVIOUR

IN THE WHITE-CAPPED NODDY

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ABSTRACT

The behaviour of the white-capped noddy is described and compared to the closely related black noddy. Pair formation is traced from single courting birds to incubating pairs. Low intraspecific aggression is shown and this reflects on the instability of pair bonds formed. Nest site is seen as an intergral part of the pair bond and a major influence on its stability.

Intensity values are defined and used to elucidate patterns within interactions.

INTRODUCTION

The white-capped noddy *Anous minutus* is common in southern waters of the Great Barrier Reef (Serventy *et al.* 1971) and although a number of colonies are readily accessible, little has been published on their biology or behaviour. In this paper, I describe the behaviour of noddies from pair formation up until the time of egg laying.

Cullen and Ashmole (1963) gave a detailed description of the behaviour of the black noddy *A. tenuirostris* which they consider to be conspecific with *A. minutus*. Several important differences were found between the behaviour of the black noddy and white-capped noddy and in this study the two are regarded as separate species.

STUDY AREA AND METHODS

Observations were made at Heron Island (23°31'S, 152°06'E) in the Capricorn Group at irregular intervals between mid-September and late November 1976. A description of Heron Island is given by Kikkawa (1970). Most observations were made in an area on the south-west corner of the colony close to the beach.

Over 300 separate interactions were noted. An additional 68 interactions were described directly onto a tape recorder for analysis of display rates and intensity. General observations on other behaviour, such as aerial displays, nesting

activity and copulation were added. From this information a comparison with the behaviour of the black noddy were made and the sequence of pair formation described.

Displays were recognised using the descriptions of Cullen and Ashmole (1963) and their terminology is used where applicable. Interactions were recorded beginning with an approach of the bird and ending when activity ceased. The various activities in each interaction were noted. Specific control sites and their associated birds were followed throughout.

No colour banding was done but some individual birds could be followed through a given sequence of interactions that occurred in a small area.

As observations progressed it became apparent that some measure of the intensity of interactions would be valuable in elucidating patterns within the interaction. Different displays often occur in a regular sequence and a relationship between the intensity (in displays per second) and a particular display was established.

In the 68 interactions recorded on tape, displays were noted and timed as they occurred. From this, intensity was calculated to characterise the whole interaction. No distinction was made between the different displays while counting their occurrence because counts were predominantly of nods. Each down turning of the head in nodding or each pull back of the head in bridling was recorded as one display. Only the displays of the most active bird in a display exchange were counted for the rate calculation.

Using these intensity values each of the 68 interactions could be placed in one of four numerical categories depending on the intensity (displays per second) calculated for the interaction. The categories are, 1) 0-0.4; 2) 0.4-0.8; 3) 0.8-1.2; 4) >1.2 displays per second. Displays occurring in the interactions were therefore placed into one of these categories. Histograms were drawn summarising the frequency of each display in each of the categories.

Although the sample size was small for some displays, the distribution of displays over the range of intensity, plus field notes were sufficient to assess the relationship of some important displays and their intensity.

RESULTS

DESCRIPTION OF DISPLAYS

Most activity appeared to be centred around the times at which the birds were leaving for or returning from their feeding grounds. At night, birds in established pairs courted in their territories. There was little nocturnal movement about the colony and no evidence that the birds hunted at night.

The various displays of the white-capped noddy show a marked

similarity in both form and function to the corresponding displays of the black noddy described by Cullen and Ashmole (1963). The following notes are only to point out differences which became obvious when comparisons were made. Two new displays are described, the "feeding flock" display and the "bridle-click". A distinct posture not noted for the black noddy is also described, i.e. the head-breast posture.

AERIAL DISPLAYS

Two distinct aerial displays were observed. The first involved the formation of a loose "feeding flock" by birds returning to the colony in the afternoon. The second was a more stereotyped paired flight similar to that described for the black noddy by Cullen and Ashmole (1963).

The "feeding flock" occurred over the reef flats close to shore. The birds followed the normal feeding pattern, i.e. flying low over the water until they came to the leading edge, (which was up-wind) where they rose and glided to the rear of the flock and began the low flight again. There was a constant exchange of calls between birds in the flock. I assumed that birds involved in this social display were unpaired because the number of participants decreased markedly as the breeding season progressed.

Paired flights, in most cases, arose from high intensity (if not overtly hostile) exchanges between courting birds, and from "feeding flock" displays. When "ground displays" (Cullen and Ashmole 1963) resulted in a paired flight, the display was often initiated by one bird simply taking off and the other following. A more stereotyped beginning also occurred. One bird flew out and in front of the other. This was repeated a number of times without any attempt to approach the other bird after landing.

INTRODUCTORY DISPLAYS

A. Nodding

Most interactions began with nodding after or during an approach. Frequently this elicited a response from the bird to which the display was directed. The downward movement of the head exposed the prominent white cap and it is possible that this cap provided a stimulus. Consequently, birds could remain beside each other without interacting until they turned and faced each other.

B. Approaches

Within the colony any given bird was normally surrounded by a large number of others, many within its visual field. Thus for an interaction to occur between two birds, the approaching bird must attract the attention of the other. This was normally done by a walking approach or landing nearby.

The effect of these two approaches differed. The landing approach appeared to be a stronger stimulus, because it resulted in the sudden appearance of another bird (often quite near) that was potentially, a threat. The walking approach was a more controlled process; the beginning was usually observed by the resident bird and it could be stopped or even reversed. Figure 1, summarising the resultant intensities of these approaches, indicates this apparent difference.

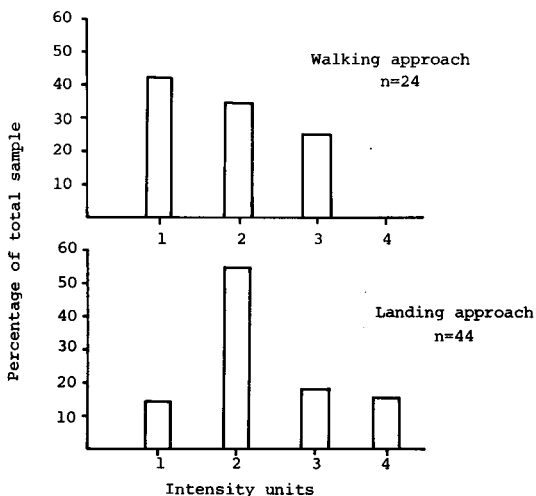


FIGURE 1. Showing intensities resulting from different approaches.

NOD-PARP DISPLAY:

In this display the normal nodding movement occurred and except during the upward movement of the head, a "parp" call is emitted. Normally a nod-parp is given only once but exceptional situations resulted in it being given several times.

The nod-parp is clearly associated with high intensity situations but there is little indication as to whether it is hostile or "meeting" (Cullen and Ashmole 1963). It usually occurred after a vigorous exchange of nodding and preceded both bridling or hostile behaviour. Established pairs, when approached by another bird, sometimes turned to each other, nodded until a nod-parp was given then one turned towards the new bird and gave an overtly hostile display. In meeting, bridling often followed a nod-parp in a normal approach interaction sequence between two birds.

This display was further examined by noting its behavioural context. Six situations were recognised.

1. Hostile: clearly hostile displays or attaching moves.
2. Flight: one bird flies away.
3. Within the pair structure:
 - a. courting: in high intensity courting.
 - b. within pairs: nod-parp within pair on being approached by a third bird.
4. Separation: interaction stops or one walks a short distance away.
5. Continuation: the interaction continues.
6. Meeting: birds close and/or one bridling as other approaches.

Using the criteria of Cullen and Ashmole (1963) to characterize the situations, the nod-parp occurs equally in hostile and meeting situations. However, if the situations are more closely defined into grades ranging from clearly hostile to clearly meeting, as above, the display appears to occur without being clearly hostile (Table 1).

TABLE 1

Behavioural context of nod-parp display (n = 56 separate occurrences)

Context	Percentage of total sample number	Motivation as characterised by Cullen and Ashmole (1963)
1. Hostile	9)
2. Flight	7)
3. Within pair) Hostile
a. courting	2) (43%)
b. within pairs	11)
4. Separation	14)
5. Continuing	27)
6. Meeting	30) Meeting (57%)

The nod-parp is therefore indicative of a high intensity situation without being clearly hostile or meeting in motivation. It apparently appeases a build-up in intensity with a display that is functionally "neutral" in character.

FOOT-LOOK:

This behaviour is similar in form to that described for the black noddy. In the white-capped noddy, it may function as a control in the build-up intensity that results in most exchanges of displays. The performing bird casts its eyes down and away from the other bird and therefore removes the source of the stimulus in the interaction. Generally this elicits a similar response from the other bird, thus their relative positions are maintained while the intensity of the situation is slowly decreased, averting the hostility that often results at high intensity.

The possible function of this display is further examined in the analysis of intensity.

HEAD-SHAKES:

Causal factors for this display were difficult to elucidate. Head-shakes rarely occurred in high intensity situations (Figure 2) and seemed to be a response to a lack of a

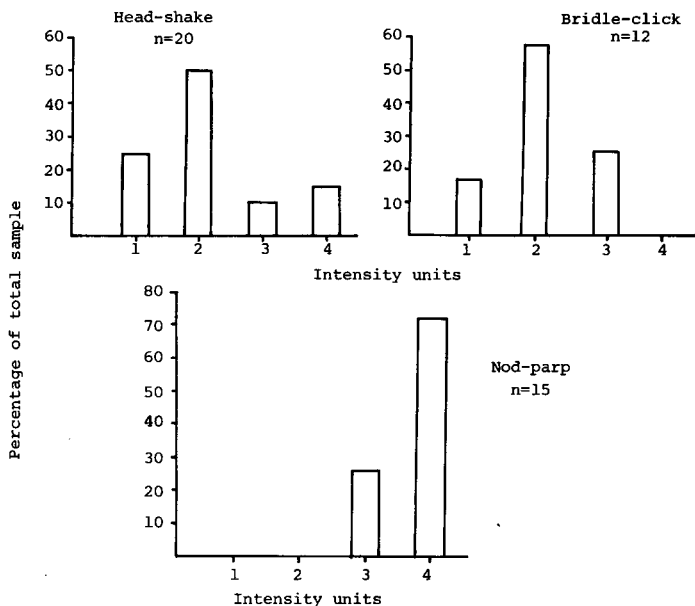


FIGURE 3. Showing intensity-display distribution

recognisable stimulus in a situation that "required" some activity. A common example of its occurrence was when a bird landed near a bird on a nest without approaching or interacting. The resident bird usually head-shook and nodded a number of times until some response from the "incoming" bird was obtained. During nest building a building bird on a nest-site was often seen to head-shake while waiting for its mate to return with nest-material.

This display is also often seen in association with the foot-like display the latter display providing a "pause" in the exchanges that results in a head-shake. Thus it appears to be characteristic of a moderately intense situation where there is no definable stimulus.

BRIDLING:

Two forms of bridling were distinguished, one accompanied by a "rattle" sound, the other silent or with a distinct "click" of a closing bill. Both of these closely follow the description given by Cullen and Ashmole (1963) for the black noddy, but neither was observed in situations clearly indicating a "hostile bridling display" as described for the black noddy. At the time of observations, I did not know the subtle physical differences given as definitive for the hostile and meeting forms of bridling. A few observations were made where bridling occurred in obviously hostile interactions. On two of these occasions, there was a single bird at a site courting intensely with a number of other birds. The bird bridled and attacked any bird that landed near it. Presumably the "incoming" bird was attracted by bridling. Fighting occurred in one of these situations thus at least one of the "incoming" birds may have been attempting to occupy the site. In another observation, a bird on a nest bridled to a bird which had landed nearby, when it did not respond, the "sitting" bird pecked at it.

The bridle-click display is distinguished in this study from the bridle-rattle because it always preceded the bridle-rattle in any interaction where there was a gradual build-up in intensity. Thus the bridle-click is interpreted as a more moderate form of bridling.

Field observations on both forms of bridling agree with the generally accepted view that bridling has a similar function to the "choking" of gulls. That is, it attracts females to a male on his territory while at the same time announces his territorial claim to rival males (Tinbergen 1953). Usually the approach of one bird (presumably female) is accepted by the bridling of the other bird.

COURTSHIP FEEDING:

This activity was common between both courting pairs and established pairs at nest sites. It often accompanied the change over ceremony at the nest site when one mate returned and relieved the incubating bird. This change-over ceremony

probably serves to reduce aggression between mates and thus would diminish in both frequency and duration as the birds became familiar with each other (K. Hulsman pers. comm.).

HEAD-BREAST POSTURE:

The relative position of the two birds in courtship feeding can be identified as a separate element of interactions not involving food being passed by regurgitation. It was most obvious during nest building when a bird who was collecting nest-material gave a leaf to its mate. This was done by stretching over the lowered head of the other bird, so that the actual exchange was carried out with the "low" mate between the collecting bird and the leaf. Of interest, is the role of the sexes in nest building. Collecting nest-materials appears to be solely the activity of the male; the female builds the nest.

COPULATION:

This was seldomly seen during the day, occurring mostly at night or at first light before dawn. By restricting copulation to these hours, when there is little movement within the colony away from sites, the occurrence of rape or mating outside the pair structure is rare. This contrasts with the brown noddy *A. stolidus* in which rape is common (Moynihan 1961). Precopulatory behaviour was not noted but during the days prior to copulation, nesting activity was common and intense.

GAPING AND CHIN-UP RATTLE:

As in the black noddy, the chin-up rattle seems to be a clearly aggressive display. Gaping shows a fairly different pattern to that described for the black noddy. It was rarely seen in the hostile form where it is directed "face on to another bird, while advancing, or simply as a maintained position for some time" (Cullen and Ashmole 1963). Landing gape as described by Cullen and Ashmole (1963) was also very common.

ANALYSIS OF INTENSITY:

When the 68 taped interactions were broken up into their behavioural components, the sample size was too small to allow any statistical analysis. However, frequency distribution patterns of the various displays and situations over the four intensity categories were calculated and are presented in Figures 1 to 3. Only those components with a sample size greater than ten are shown. The values for the resultant situations and approaches, were gauged from the intensity of the preceding or following interaction.

Using the distribution of displays over the range of intensity, and field notes, qualitative intensity values for some important displays are given (Table 2). This gives some measure of intensity as it changes during an interaction. Where reasonable motivation is given as either hostile (H) or meeting (M).

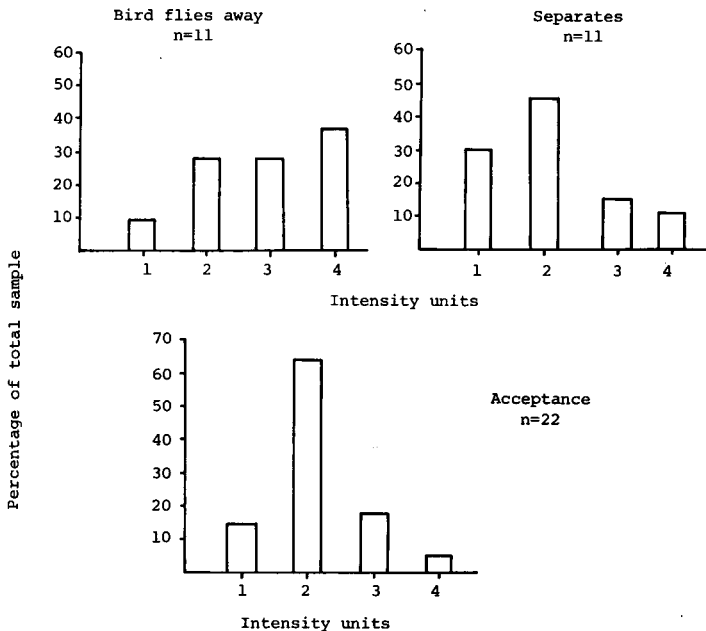


FIGURE 3. Showing intensities preceding various results.

Nodding and foot-looking occurred in most interactions but because of their apparent role in manipulating intensity they are omitted. Chin-up rattle is seen as a moderate to high intensity display in the field. It is clearly hostile, although less so than pecking or supplanting moves. The two approaches are separated mainly on the basis of field observations; the landing approach was often used to initiate interactions with a quiescent mate (see Reinforcing phase in Pair Formation). In these situations one of a pair will fly from branch to branch, landing near its mate, often resulting in interactions that lead to courtship behaviour. This often follows attempts by the active mate to initiate an exchange of displays with a walking approach and/or introductory displays.

Using Table 2 the change in intensity from before and after a foot-look is measured. The results of 53 separate occurrences of this display are given in Table 3. The foot-look often preceded a decrease in intensity, and only rarely did a rise in intensity occur. The resulting motivation of each

TABLE 2

Intensity value of some displays and situations
(H= hostile, M= meeting)

Value	Display or situation
1	Walking approach
2	Bridling (M); Landing approach, Separation (H), Acceptance (M)
3	Nod-parp; Chin-up rattle (H)
4	Pecking (H); Supplanting Move (H) Courtship Feeding (M)

TABLE 3

Situation following foot-look display

Change in intensity	Motivation following display			Total percentage
	Meeting	Hostile	Unknown	
Decrease	21%	8%	28%	57
Increase	13	2	2	17
No change	2	13	11	26

situation is not significant but the low percentage of hostile situations implies that foot-looks may avert the expression of hostility.

Role of Intensity

Intensity appears to function as a distinct element that can be manipulated in interactions by the birds. High intensity situations often resulted in hostility between birds when one or both birds were unfamiliar with the situation they were in. Thus courting birds actively avoid an unchecked increase in intensity with foot-looks and slow approaches. This aspect of intensity also seems to play an important role in recognition. If the incoming bird is unfamiliar with the site, it may not be able to match the high intensity displays given by the resident, thus resulting in hostility being expressed.

When an incoming bird has some attachment to the site, it is able to interact at a high intensity with the resident which is ostensibly an intruder on the "incoming" bird's site. If the incoming bird matches the displays of the resident, it can approach close to the resident.

Within established pairs, the rise in intensity results in courtship activity rather than hostility. This implies that such activities as bridling, and courtship feeding, are the result of redirected hostility. Stimulation leading to the rise in intensity and subsequent courtship behaviour was common in the reinforcing phase (see Pair formation).

PAIR FORMATION

The pair structure develops from groups of single birds in ground displays and subsequent aerial displays. In the earlier stages, a definite site is established probably by the male, and this site later becomes critical in the maintenance of a given association between two birds. Males and females are morphologically alike, therefore the early pairing process involves the problem of recognition of sex and mate. It is suggested that familiarity with the site offers a possible solution to this problem. As the "bird-site" complex develops, nests are built leading to the stage where one bird remains sitting on the nest while the other feeds. This occurs prior to egg laying.

Observations ceased before any eggs hatched. The pair formation is described below as a succession of five stages:

1. Single birds

The "feeding flock" display is the social phase of courtship (Palmer 1941). There is a transition from this social phase to the individual phase (Palmer 1941) which is when some of the first signs of pair structure can be observed. The paired aerial flights offer the first sign of individual courtship. These are important in the early phase of courtship by allowing interactions without any confines in space as happens in the trees. Aerial displays give the birds complete freedom in varying the distance and relative position of one bird to the other.

Paired flights subsequently lead to ground displays. In the trees, the male's courting behaviour probably attracts other single females. Localised areas of single birds were noticed where the same number of birds can be seen regularly. Often, although not always, these were approaching and displaying with one or two central birds. These central birds were probably males (Cullen and Ashmole 1963; Moynihan 1961). The spread of nesting territories would also localise the areas available for single birds.

2. Courting birds

Cues used by birds to recognise the sex of another could not be distinguished. Any bird regurgitating food in courtship feeding was classified as a male. Although sexing birds by behaviour is often used by observers, it is far from being infallible because of the ambivalence of the birds' sex roles. Cullen (1960) found this occurred in arctic terns *Sterna paradisaea*, and some evidence of a change in usual sex roles was found in this study.

Once a loose pair becomes evident, the male attracts the female by bridling. Observations showed, that in 21 approaches in which birds could be sexed, the female approached the male on 16 occasions. At this point other females may be attracted and up to 4 females could be involved in interactions with one male. In more limited courting (with only two birds) both male and female were observed to attract and approach. In these situations, sexual roles are probably interchangeable perhaps because previous activity allows each to recognise the other. In the early phases birds which remain in sight of each other without any significant lapse in time, or interference, seem to recognise each other.

Bridling by the male is directed at females who have gained his attention. This bridling probably also functions to repel other males who were not noticed because they were not directly involved.

In this way the normal sequence of exchange begins. With an approach, low intensity introductory displays are given by both birds (in most cases, these are nodding displays), building up in intensity until some threshold where either overt hostility or acceptance is shown. After the initial approach and acceptance, birds that recognise each other can quickly overcome the need for lengthy, low intensity nodding. Nodding in these situations appears to function as a means of building up intensity so that motivations can be clearly expressed. When a number of birds are approaching a male, lack of recognition often results in the male being hostile to all who approach including any individual whom he may have already accepted. Acceptance behaviour, here, is advantageous to the relevant female because it apparently instils an "affinity" for the site and as an indirect consequence for the resident male. The female recognises the male because he remains on the site. Thus any previously accepted female is more capable of interacting at higher intensities than other females and therefore more likely to be accepted again.

An unusual situation was observed on one occasion when a pair were separated during a high intensity exchange. Each landed near "strange" birds on other sites and both immediately approached and successfully elicited the corresponding courtship feeding response from the "strange" birds. Presumably the intensity of the interaction prior to separation was enough to counter any low intensity threats

from the residents.

3. Reinforcing phase

As a pair begins to define itself from a group of single birds, a process of reinforcing the site attachment becomes important. This involves mutual stimulation with either low intensity exchanges such as nodding or approaches leading to courtship behaviour. This courtship behaviour includes nest building, allopreening and courtship feeding. On one occasion, a female remained at the site where she had received two courtship feedings for three days after the cessation of any further courting behaviour.

Nesting activity is common and varies with courting activity. Often several nests are built which subsequently break up due to lack of maintenance. Up to 1½ weeks can lapse between significant nesting activity. Eventually, sometimes after two or three "courting" nests, the final nest is built in a concentrated effort without any of the courting between each piece of nest-material that characterised the earlier nesting attempts. This nest becomes inadvertently cemented with excreta as activity becomes regular and confined to the nest-site. The temporary nests do not appear to be part of the behaviour of the black noddy on Ascension Island, perhaps because of the lack of nest-material.

At this phase it appears that recognition is still a problem and "strange" birds may be accepted by one of a pair. The continual courting however allows the birds to interact at high intensity on the site, thus making it difficult for any "strange" bird to successfully gain acceptance. The presence of a nest probably has signal value for an incoming bird, again favouring the owners of the site.

This role of site attachment in recognition and pair formation is common in other larids (Tinbergen 1956).

Errors do occur if the "strange" incoming bird has just come from a high intensity situation, as shown in the example given earlier. Therefore pairs up to and including the sitting phase can be disrupted.

As in the black noddy, pairing occurs before the final selection of the nest-site, but shifts in location are generally within a localised area and lead to increased courting. Both birds in the pair appear to select the site by placing nest material at the chosen site. When fighting occurred it generally involved two pairs claiming the same site.

4. Sitting phase

This phase is characterised by the presence of one bird (presumably the female) remaining on the nest during the days immediately prior to laying. The transition to this phase is gradual, the bird remaining behind in the morning for increasing periods of time before joining its mate on the

feeding grounds. The exact function of this phase is not known. However regular patterns of visiting are probably established at this stage before incubation begins. The end of this phase is when the egg is laid.

5. Incubation phase

The male gradually takes some of the incubating duties from the female. The recognition of the mate is probably still strongly based on site recognition and attachment to the site. However, there is evidence that some recognition of the mate's vocalisations also plays a part. In established pairs, the incoming mate normally calls prior to landing. In these cases the resident bird bridles immediately and little or no introductory displays are given.

DISCUSSION

Observations in this study indicate there is less aggression in interactions of the white-capped noddy than in the closely related black noddy (Cullen and Ashmole 1963). The apparent lack of hostile bridling and the infrequent use of the hostile form of gaping imply a less aggressive nature. The defended individual distance around nests and individual birds was rarely greater than the pecking reach and this is indicative of low aggression (Hinde 1956). A possible reason for this difference in aggression could be the availability of suitable nest-sites. In other larid species in which each sex is morphologically similar and both male and female defend sites, competition for sites increases the level of aggression normally expressed (Nelson (1972). The black noddy on Ascension Island competes for sites (Ashmole 1962) and thus is influenced by this effect.

A. Competition for sites could occur in the white-capped noddy colony, where sites protected from the wind are limited (Braithwaite 1973), and/or where optimum social sites are limited (Nelson 1972). Sites which are protected from the wind would be favoured because the nests of this species are shallow resulting in heavy loss of eggs and young in windy conditions (K. Hulsman pers. comm.). This will adversely affect breeding success and lead to instability in the pair structure (Coulson 1972). In this species a suitable social position is perhaps more important than simply a physically suitable site. From observations made during this study, sites near to experienced and successful pairs would be advantageous because of the stimulation to court that would result. This idea developed further in the discussion below.

Thus there is possibly competition for sites within the colony however at the present time this is apparently not greatly influencing the level of intraspecific aggression. The white-capped noddy also has considerable space in which to interact and can therefore moderate interactions by varying the distance between birds. The black noddy however, is usually confined to a small ledge which would intensify

activity and therefore hostility would more commonly occur (Braithwaite 1973). The displays of the white-capped noddy are very similar to the corresponding displays of the black noddy, the main differences are probably a function of the difference in intraspecific aggression. The hostile bridling of the black noddy is perhaps the result of elements of this enhanced aggression, being expressed in what is essentially a meeting display to a bird of the opposite sex. These aggressive components are enough for the display to become a hostile stimulus to the bird at which it is directed.

Recognition of sex by noddies is probably through differences in behaviour. If the male bridges on the site, a female attracted by this behaviour will approach exhibiting submissive behaviour. An incoming male however, will approach more aggressively.

Another behavioural difference between the two species is the incorporation of nesting behaviour as an integral part of pair formation. This is presumably a consequence of the adaptation to nesting in trees and the use of leaves in building nests in the white capped noddy.

The measure of intensity used here does not depend on the duration of activity as used by Recher and Recher (1969) and Nelson (1972). The measure is only valid in isolated approach interactions where the beginning and end of activity can be clearly defined. These interactions need to be separated from previous interactions by a suitable interval of time. In the early phases of pair formation, the pair bond is dependant on recognition of mate. This recognition appears to rely on an affinity for a given site. The point at which a resident, on being approached, redirects the resultant "tension" from aggressive behaviour to meeting behaviour is probably when an incoming bird is more aggressive to the resident than vice-versa. This would result when the incoming mate is confronted with a bird on its site, while the resident only sees a bird nearby, and both have an equal affinity for the site. Courtship on the site will synchronise the affinity of both to the site. Factors such as small territory, colonial living and low intraspecific aggression all tend to make this a tenuous basis for recognition and therefore pair stability.

The permanence of the sites in the trees provides well established pairs with a focal point over many breeding seasons. Thus the pair structure may be permanent. Maintenance of a bond structure once it is established, is essential for its continued existence. The low intraspecific aggression of the white-capped noddy suggests that the presence of a mate nearby would provide little stimulus, leading to a decline in courtship activity. The impression from field observations is that the pairs often suffer disruption because insufficient courting has led to low affinity for the site and a low level of aggression being expressed to intruders. Thus bonds are paradoxically disadvantaged by low intraspecific aggression.

Stimulation to court would occur if pairs nearby are active at a similar stage in their breeding (Coulson 1972). Thus the strength of the pair bond depends to some extent on the relative position of a given pair to other courting birds. An important stimulus in this process is probably the constant "purring" that accompanies the nocturnal courtship activity.

Once past the initial pairing, the absence of single birds courting nearby would be an advantage by eliminating the chance of single birds coming from high intensity situations and gaining the acceptance of one of a pair on another site. Thus factors influencing the stability of the pair include the level of individual recognition, breeding success and position in the social order of the colony. In the central area of the colony the above conditions for a successful pair appear to be best met. There are large protective trees and a few single birds courting. The pairs in this area appear to have formed early in the season and thus these are perhaps pairs reformed from former breeding seasons. It could therefore be expected that pairs will be most stable here and breeding more successful than pairs nesting near or at the periphery of the colony.

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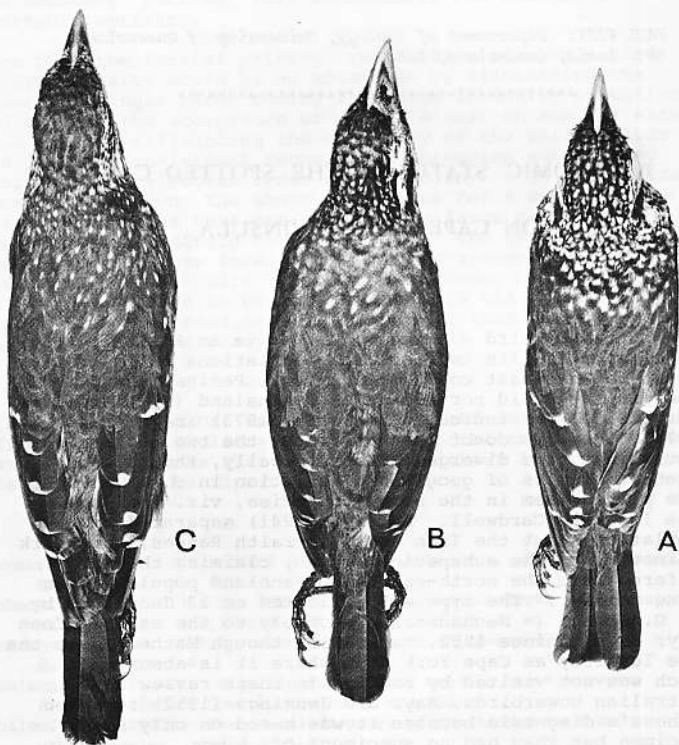
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TAXONOMIC STATUS OF THE SPOTTED CATBIRD ON CAPE YORK PENINSULA

JULIAN FORD

The spotted catbird *Ailuroedus melanotis* is an Australo-Papuan species with two isolated populations in Australia, one in the mid-east coast of Cape York Peninsula and the other in the humid north-east of Queensland (Gilliard 1969, Storr 1973). As indicated by Storr (1973) and Kikkawa (1976), there is doubt whether or not the two Australian populations have diverged subspecifically, though most recent reviewers of geographic variation in *A. melanotis* have placed them in the same subspecies, viz. *maculosus*, type locality Cardwell. Mathews (1941) separated the population about the Iron and McIlwraith Ranges, Cape York Peninsula, as the subspecies *joanae*, claiming that it differed from the north-eastern Queensland population in being smaller. The type was collected on 23 June 1938 by Dr. G. Scott, (= Neuhauser) presumably to the east of Coen (Mayr and Jennings 1952, Mack 1953) though Mathews gave the type locality as Cape York from where it is absent and which was not visited by Scott. In their review of Australian bowerbirds, Mayr and Jennings (1952) rejected Mathews's diagnosis because it was based on only one specimen but they had no specimens of *joanae*.

Recently I was able to examine the two specimens of *joanae* collected by Mr. D.P. Vernon at Rocky Scrub, upper Nesbit River (♂) and near Iron Range (♀) during the Archbold Expedition of 1948 to Cape York Peninsula (Mack 1953) and thus to compare them with series of *maculosus* and *A. crassirostris*. The two specimens differ from *maculosus* in several minor ways on the ventral surface and in a pronounced way on the dorsum (Figure 1). These differences are set out in Table 1. In *joanae* the spots are ochraceous buff and reddish brown on the crown, buffy white and cinnamon on the neck and upper back and margined all round with black whereas in *maculosus* the spots are dull whitish grey and slightly greenish margined less sharply with greenish or

FIGURE 1: Dorsal views of (A) *joanae*, (B) *maculosus* and (C) *crassirostris*

greyish black on the crown and dull whitish grey or slightly buffy green with green or dusky green margins on the neck and upper back. The dorsal spotting in *joanae* is fairly sharply demarcated from the green of the mantle whereas in *maculosus* it grades into the green of the back. Both forms have blackish ear-coverts and pale buff-white or off-white post-ocular areas. Their wing measurements indicate that they are fairly similar in size: *joanae* ♂ 146, ♀ 133; *maculosus* ♂ 139-159, ♀ 137-152 mm. The wing length of 133 mm given by Mathews for the type of *joanae* suggests it was actually a female or an immature rather than an adult male.

TABLE 1

Differences between *Ailuroedus melanotis maculosus*
and *A. m. joanae*

Character	<i>A.m. maculosus</i>	<i>A.m. joanae</i>
Spotting on tips of wings and coverts	small or absent	large
Chin and base of lower mandible	black	dusky
Throat feathers	more dusky on tips	less dusky on tips
Breast feathers	more greenish tipped and centres paler	darker tipped and buffier centres
Flanks	greenish	yellowish
Crown and nape	spots dull and their margins diffuse and light	spots bright and their margins sharp and dark
Upper back and neck	dull spotting merging gradually with green of back	bold spotting, sharply separated from green of back
Distribution	humid north-eastern Queensland from Cooktown south to the Herbert River	humid mid-east coast of Cape York Peninsula from the Claudie south to the Rocky River

From the description of nominate *melanotis*, the form in southern central New Guinea and the Aru Islands, given by Rand and Gilliard (1967) and Gilliard (1969), it can be concluded that *joanae* is acceptable as the subspecific name for the population on Cape York Peninsula despite Mathews's incorrect diagnosis. *Melanotis* is pale ochraceous buff on the abdomen whereas *joanae* is yellowish but otherwise they seem to be more similar to one another than either is to *maculosus*.

Schodde (1975) followed Gilliard (1969) in treating *A. crassirostris* and *A. melanotis* as specifically distinct. However, Mayr and Jennings (1952) argued that their basic similarity, the agreement of their habits, and their basic difference from *A. buccoides* of New Guinea, the only other

species of the genus, were compelling reasons for considering them as conspecific. *A. crassirostris* and *A. melanotis* inhabit mainly montane rainforest whereas *A. buccoides* is essentially an inhabitant of lowland rainforest. The basic differences between *melanotis* and *crassirostris* are the pronounced reduction in dorsal spotting and the absence of black ear-coverts in the latter but whether these would operate as a reproductive isolating mechanism is speculative because they are allopatric. Perhaps information on their potential interaction could be gained from a detailed comparative study of their habits and calls. Gilliard (1969) also believed that the coloration of their eggs differed but apparently the coloration of some clutches of eggs of *maculosus* are cream like those of *crassirostris*. Interestingly, the morphological sequence of *joanae*, *maculosus* and *crassirostris*, as depicted in Figure 1, indicates that the difference between *maculosus* and *crassirostris* is only slightly greater than that between *maculosus* and *joanae*, and that *maculosus* represents a phenetic connexion.

I am grateful to Mr. D.P. Vernon of the Queensland Museum for allowing Dr. G.M. Storr of the Western Australian Museum to borrow specimens of *A. melanotis maculosus*, *A. m. joanae* and *A. crassirostris* for me.

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THE NEST AND EGGS OF THE WHITE PIGMY GOOSE

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INTRODUCTION

Museum and private egg collections contain very few specimens from the white pygmy goose, *Nettapus coromandelianus*, and consequently there is little data available on their nests or eggs. There is also a paucity of published information on the nest and nesting behaviour of the species. In this report I summarise the available information and describe recent observations on a nest and eggs of this species found in south-east Queensland. Comments on the species status are also made.

PREVIOUS NESTING RECORDS

The Australian Museum, Sydney, has a single egg and an unregistered clutch of twelve eggs from the white pygmy goose. Data for the single egg only records the species name.

Data for the clutch of twelve eggs is more informative and part of it reads- "taken ...near Workon, Condamine River, Queensland, on October 21st 1901. The nest was within a hollow of a dead tree in a lagoon, 40 miles from Youlba Railway Station. The sitting bird was flushed from the nest, ... a hollow tree leaning over the lagoon.... I saw five pairs on the lagoon. I found the nest while driving some horses across the lagoon, the splashing flushed the bird, as I did not see her come out of the hole, I rode away and waited under a tree, presently she flew up and went down the hollow, which was only about a foot deep. I climbed the tree the next day, when there were only two eggs, I kept my eye on the place and got the full clutch. About Christmas time I saw three clutches of young birds with their mothers".

The National Museum of Victoria, Melbourne, has a clutch of three eggs and two single eggs. Data on the single eggs only records the species name and the collecting locality, one of which simply reads "Queensland". Information on the clutch reads - "Three eggs, taken by H. Lau, at the Darling Downs, Queensland on the 7th November, 1897". Measurements of the three eggs are shown in Table 1.

Campbell (1900) makes the following comment about the species - "one of the birds had a nest in a spout of a gum-tree about seventy feet (21 m) from the ground, in my (James C. Wilcox - the source of Campbell's information) garden at South Grafton, and, from what I remember, there were seven or eight young ones which she carried out in her bill after they were hatched. The spout almost overhangs a small creek. I recollect a young one falling out of the nest into the water, but it swam away unconcerned. I know of other nests in trees about our swamps".

A decade later, North (1913-1914) records a clutch of sixteen eggs taken from a hole in a tree. The species is mentioned only in two short paragraphs added after, but under the heading of,

Nettopus (Nettapus) pulchellus.

Little other information was published on the species nest until Ey (1951) described a possible nesting site located near Ayr, Queensland. The nest was in "a hollow about 15 feet (4.5 m) up in a gum and about 20 yards (18 m) from the edge of the swamp".

Lavery (1963) collected a brood of three downy young females, approximately three weeks old on Poulathanga Station, Charters Towers on 30 March 1962.

Frith (1968) in his monograph on Australian waterfowl relates very little information on the eggs and nesting site of the species and details relating to the thirty eggs from the four clutches mentioned has been misplaced (H.J. Frith, pers. comm.).

PRESENT OBSERVATION

Following the report of a pair of white pygmy geese with young at Dyers Lagoon near Laidley in south east Queensland in January 1976, I conducted a search in the area for the species in January 1977. All accessible lagoons in an area bounded by Ipswich, Gatton, Laidley and Coominya were visited on 18 and 24 January 1977. Observations were made difficult on the first day by a strong and hot wind. The water surface was continually rippling and the sun's glare was considerable. Conditions on the second day were ideal with no wind and light cloud cover.

On 18 January 1977 at One Mile Lagoon, west of Lowood, I sighted a female white pygmy goose in flight. I watched her fly around a circuit of approximately half a kilometer. The white wing markings were prominent as the bird circled. At the end of the circuit she flew into a tree hollow about 20 m from where I stood. The bird approached the hollow at apparently little less than normal flying speed, braking only momentarily before reaching the hollow. The feet were lowered and appeared to touch the lower edge of the hollow as the bird "tumbled" inside.

The tree was a small (18 m high) dead red gum, (*Eucalyptus camaldulensis*) with a few dead branches. It was one of a scattered group of four dead and one living red gums which stood on a well grassed triangular spit. The nest tree was less than 20 m from the water's edge in one direction and 50 m from water on the other two sides. Cattle use the tree as a "rubbing post", and consequently the grass around the base had been heavily tramped, and the ground was almost bare.

While I was pulling a ladder into position to inspect the nest, the bird flew from the hollow and landed nearby in the lagoon. It had previously not responded to hammering on the tree with a steel pipe. It swam amongst water lillies and joined a previously unobserved male of the species. They showed no obvious signs of being disturbed by my presence at their nest.

The entrance to the nest was a circular knot hole, 11 cm in diameter, facing upwards at an angle of approximately 45°. It

was 7 m from the ground and led directly into the hollow trunk of the tree which had an internal diameter of 23 cm. Some down had been caught in crevices on the outside of the knot hole and was discernable from the ground. The depth from the lower edge of the entrance to the nest was 90 cm. The nest was a bowl of approximately 13 cm diameter and 8 cm deep thinly lined with down and several small feathers which were subsequently identified as those from the white pygmy goose.

The hollow had been previously used by Indian mynahs, *Acridotheres tristis* and the bottom of the hollow contained a considerable quantity of dry grasses, weed stalks, leaves and a few feathers. The nest bowl was moulded into this material and contained eight eggs which were in an advanced state of incubation. The eggs were a dirty cream colour, smooth and lustrous. When one egg was cleaned a smooth, finely grained, ivory coloured surface was revealed. The measurements of the eight eggs are given in Table 1.

TABLE 1

Dimensions of white pygmy geese eggs from Queensland

	size in mm	Locality
1.	48.3 x 34.3	Darling Downs, Qld.
2.	45.2 x 34.8	Darling Downs, Qld.
3.	47.5 x 33.5	Darling Downs, Qld.
1.	47 x 34	Lowood, Qld.
2.	47 x 35	Lowood, Qld.
3.	45 x 35	Lowood, Qld.
4.	46 x 35	Lowood, Qld.
5.	49 x 35	Lowood, Qld.
6.	45 x 35	Lowood, Qld.
7.	45 x 34	Lowood, Qld.
8.	45 x 34	Lowood, Qld.

On 24 January 1977 the female could not be flushed from the nest. The male was swimming in a nearby area of the lagoon which had a dense cover of water-lillies, surrounding open water.

No other white pygmy-geese were seen during the two days of survey.

DISCUSSION

All available evidence indicates that for a nest site the white pygmy goose selects an elevated hollow in a dead tree which is located in or close to water. My observations in south east Queensland suggest that the species has a preference for the water to be deep with a growth of water lillies.

The suggestion that the species will nest in long grass on the

edge of swamps (Lavery 1966) needs substantiating. The closely related green pygmy goose, *Nettapus pulchellus* is thought to nest in grass as very small young have been seen on water with no suitable nesting trees in or near the water (Frith 1968). Campbell (1900) recorded the white pygmy goose carrying young and I suspect that both species carry their young from the nest to water. Lavery has also pointed out that white-quilled pygmy geese are particularly ungainly on land and I therefore suggest that it is unlikely that the young would be capable of travelling any distance on land.

From known records and unpublished sightings of broods and goslings (H.J. Lavery and D. Seton, pers. comm.), the normal clutch size appears to be six to nine eggs.

Most breeding records for the species are within 150 km of the coast, the one exception being the record from Warkon, Condamine River, Queensland. Frith (1968) comments that the breeding season seems to be timed to occur when the swamps are full after the wet season, and breeding habitat, ultimately provided by rainfall, is abundant. Thus in the southern end of its 'previous' range in northern coastal N.S.W., breeding occurred in spring after the winter rains. In south-east Queensland, breeding occurs in November/December after the "thunderstorm season" fills the lagoons. The young at Laidley would have hatched from eggs laid about late December 1975 while the eggs at Lowood would have been laid in the last week of December 1976 or the first week of January 1977. This followed the only substantial rain that the district had received from the 1975 "thunderstorm season". This rain was still not sufficient to cause much of a change to the level of the lagoon which was regarded as being unusually low. There was little noticeable breeding activity of other water birds on the lagoon.

In the northern parts of its range, breeding occurs in February/March, once the swamps are full after the wet season (Frith 1968). Lavery, Seton and Bravery (1968) record clutches being commenced in December and February in north-eastern Australia.

Water heights also seem to play an important part in providing a suitable habitat for the species. It has already been pointed out that the species appears to have a preference for deep water which also supports areas of water lily growth. There have been few, if any, records of white pygmy geese in streams or swamps which have shallow or running water or that are completely covered by aquatic plants. Many water bodies in the species' range are now choked with water hyacinth (*Eichornia crassipes*) or have been drained as part of flood mitigation programmes. This is particularly evident in the lower Clarence River area in northern N.S.W., where the species is now rarely seen. Some of the earliest records of the white pygmy goose (Barnard 1925; Chisholm 1944), indicate that the species was never very plentiful and sightings were once so few that the bird was even thought to be extinct (Jones 1946). With the increasing loss of suitable habitat it may well be that Jones' thoughts will become reality.

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QUEENSLAND RECORDS OF SOOTY ALBATROSS,

LIGHT-MANTLED ALBATROSS, AND WHITE-HEADED PETREL

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The light-mantled albatross (*Phoebastria palpebrata*) appears to be "scarce in Australian seas, being known only from eight records in the Great Australian Bight in May, from two beach-washed specimens collected near Portland, Victoria in July 1950, and July 1956, and two others stated to be of this species, from Stradbroke Island, Queensland". (Serventy *et al.* 1971). Storr (1973) similarly lists unidentified *Phoebastria* on the basis of the above-mentioned specimens. Slater (1970) does not include Queensland in his distribution map for *P. palpebrata*.

The specimens referred to by Serventy *et al.* and Storr were found beach-washed on North Stradbroke Island (27°S, 153°E) by

Hines (1962) on 31 July and 27 September 1959. The head and feet of both birds were deposited in the Queensland Museum (QM 015391 and QM 015392). These birds were initially identified as light-mantled albatross and it is my belief that they definitely belong to this species.

Serventy *et al.* (1971) give the culmen range of *P. palpebrata* as 98-117 mm. and that of the closely-related sooty albatross (*Phoebetria fusca*) as 110-116 mm. The culmen of QM 015391 is 107 mm., and that of QM 015392 is 98 mm.; both being outside the range of the culmen of the sooty albatross. Murphy (1936) notes that a deeply concave culminicorm is diagnostic of *P. palpebrata* compared to the much straighter *P. fusca* culmen. The culmens of both these specimens were very noticeably concave in shape.

In the adults of the two *Phoebetria* species, the colouration on the bill readily identifies them. The light-mantled albatross has a yellow stripe along the side of the lower mandible while the sooty albatross has a blue to violet stripe. Juveniles of both species, however, may have all dark bills and the above-mentioned specimens were in fact dark-billed juveniles.

On 22 July 1973, Chris Corben and I found a juvenile *Phoebetria* albatross beach-washed south of Pt. Lookout on North Stradbroke Island. Its head and feet were deposited in the Queensland Museum (QM 014413) and the bird was initially believed to be a light-mantled albatross (Roberts 1973). The culmen of this specimen is very straight when compared to the *P. palpebrata* specimens and is 114 mm. in length, falling well within the range of both species. Cox (1976) notes that juvenile *P. fusca* has a brownish mantle and that of *P. palpebrata* has an ashy-grey mantle mottled darker. In adult plumage, *P. fusca* has wholly sooty-brown upper parts and *P. palpebrata* has dark wings and a light ashy-grey mantle. On the basis of the straight culmen and dark mantle on the bird when found, it is believed that this specimen is a sooty albatross. This is the second specimen to be recorded from Queensland.

Serventy *et al.* (1971) indicate that the sooty albatross is "probably a fairly regular visitor to waters around southern Australia across the Bight to New South Wales (rarely) but records based on specimens are scarce".

Chilvers (1975) records a sooty albatross found on 1 July 1974, on One-Tree Island. The skull was donated to the Queensland Museum (QM 016038). Because of the missing bill plates, it is difficult to determine the shape of the culmen which is approximately 112 mm. in length. However, Chilvers states that the bird was in good condition when found and confirmed its identity as *P. fusca*.

There is one other record of *Phoebetria* albatross from Queensland. The wing, skeleton and skull are in the Queensland Museum (QM 013828). No other details of the bird, found on Cooloola beach in south-east Queensland (26°S, 153°E), are provided. The plates of the bill (culmen 110 mm approximately) of this specimen

are also missing. It is my opinion that identification of the bird is not possible at this stage.

From this data it can be concluded that there are two Queensland records each of the sooty albatross and light-mantled albatross and one of an unidentified *Phoebetria* from the state.

On 4 June 1974, Chris Corben, Anita Smyth and I found a beach-washed white-headed petrel (*Pterodroma lessoni*) on North Stradbroke Island. This bird, which was in an advanced state of decay, was also donated to the Queensland Museum (QM 015661). Details are as follows:

Head and neck greyish-white with black patch around eye; back dove-grey; upper wing brownish black; under wing pale grey with darker trailing edge and very pale coverts; tail white speckled grey; legs fleshy-white; toes black; middle toe-and-claw 61 mm., tarsus 42 mm., culmen 36 mm., tail 135 mm., wing 298 mm.

The white-headed petrel is a "fairly frequent visitor to southern Australian waters" (Slater 1970), but has not previously been recorded from Queensland (Serventy *et al.* 1971; Slater 1970; Storr 1973).

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LETTER-WINGED KITES ON STRADBROKE ISLAND, QUEENSLAND

GREG ROBERTS

On 10 May 1977, I was bird watching with Allan Beard and Lucy Hawrysko ten kilometers south of Point Lookout on North Stradbroke Island, south-east Queensland. While travelling along the sand-dune which separates Eighteen-Mile Swamp from the ocean beach, four small, pale hawks were seen from a distance, perched together on a telegraph pole. At first sight they were thought to be black-shouldered kites (*Elanus notatus*). When the pole was approached to within about 20 m, the kites, which had not flown, appeared to have extraordinarily large eyes. Three of the birds flushed after we moved closer, revealing an under wing with a broad black line near the trailing edge forming a broken 'M'-shape. A suspicion that we had been observing letter-winged kites (*Elanus scriptus*) was confirmed. The fourth kite proved to be extremely tame and ignored all our exhortations to make it fly. In the meantime its three companions had landed together on the next telegraph pole 50 m away. We watched the birds for a period of approximately one hour.

Rabig (1970) and Cameron (1974) have drawn attention to the eye-size of this species, which I agree is much larger than that of *E. notatus* and is diagnostic of *E. scriptus*. The eyes are orange-red with black orbital rings and their size give the bird an almost owl-like appearance. In addition I believe that letter-winged kites are sligher in build and, when perched, appear less colourful and striking than *E. notatus*.

The Eighteen-Mile Swamp area supports large numbers of swamp rats, (*Rattus lutreolus*), and the grassland melomys, (*Melomys littoralis*). It is presumed that these rats would provide a suitable food source for the kites. It is not known for how long the kites were in the vicinity as subsequent visits were not possible.

Storr (1973) notes that letter-winged kites occur in Queensland over the "greater part of the state but ordinarily western, Gulf drainages and Lake Eyre drainages". The kite is an "accidental or rare drought refugee in east (Townsville, Dalby, Upper Lockyer and Upper Condamine)". To my knowledge there are no previous records of this species from coastal Queensland south of the Townsville area.

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