

THE SUNBIRD

Volume 6 Number 2

June 1975

NOTES ON THE FEEDING OF WADERS ON HERON ISLAND

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ABSTRACT

Nine species of waders were recorded on Heron Island ($23^{\circ}26'S$, $151^{\circ}57'E$) in November 1974. Detailed information was collected on the diets and feeding methods of Pied Oystercatchers, Sooty Oystercatchers and Bar-tailed Godwits, under different weather conditions. Different wader species preferred different types of prey.

INTRODUCTION

The locations of the wintering grounds of the supposed many millions of waders which breed in eastern Siberia and migrate southwards in August and September are largely unknown. Thomas (1970) has marshalled data which suggest that no more than half a million reach southern Australia and another half million "winter" on the western and eastern coasts of Australia and in New Zealand. Domm and Recher (1973) have pointed out that the islands of the southern part of the Great Barrier Reef carry considerable populations of migratory Palaearctic waders during the northern winter. In their report on the birds of One Tree Island ($23^{\circ}31'S$, $152^{\circ}06'E$), Domm and Recher (loc. cit.) summarized the feeding locations of the more common wader species, and commented on the methods used by different species to find their prey. During a visit to nearby Heron Island from 4-20 November 1974, I made notes on the use of different habitats by shorebirds, and on their feeding methods, for comparison with the data from One Tree Island. A better understanding of the feeding requirements of waders will assist in their conservation.

Unlike One Tree Island, which is composed chiefly of coralline rubble, Heron Island is a well-vegetated sandy cay, offering to waders five, relatively distinct, feeding habitats; the reef crest, the reef flat (composed chiefly of dead coral on the northern side of the island, where most observations were made), intertidal coral sands, beach rock at about mid-tide level, and sand above high

water mark. Wistari Reef, which lies southwest of Heron Reef, separated from it by only a narrow channel, provides additional areas of reef crest and reef flat. Further details of the topography of Heron Island, in so far as they affect the avifauna, are given by Kikkawa (1970) in his summary of ornithological observations from the island.

NUMBERS OF BIRDS INVOLVED

Counts of waders and terns roosting on Heron Island at high tide were made on 5 days during my stay. Numbers counted varied slightly from day to day, but these fluctuations are probably not real, and result from human disturbance, particularly by people staying at the Resort.

A single Pied Oystercatcher and two Sooty Oystercatchers (*Haematopus ostralegus* and *H. fuliginosus*) were resident on the island, roosting on the beach, where they were joined by a single Red-capped Dotterel *Charadrius alexandrinus* on 8 November. The most common wader at high tide was the Mongolian Sand-dotterel *Charadrius mongolus*, of which up to 80 were present, accompanied by about 25 Eastern Golden Plovers *Pluvialis dominica*. These two species roosted chiefly at the western end of the island, near the helicopter landing pad, and were often joined by about 20 Turnstones *Arenaria interpres*. However, a few Golden Plovers roosted singly along the north shore, often under the *Casuarina* trees which fringe that side of the island. Grey-tailed Tattlers *Tringa brevipes* roosted on the upper branches of *Pisonia* trees close to the south shore, about 200 m east of the Marine Station. At least 40 were present, and probably more. (In spite of careful observation, no Wandering Tattlers *Tringa incana* could be detected amongst them.) Some of the tattlers showed noticeable gaps in mid-wing when they flew and so had presumably just begun to moult their primary feathers.

On 8 November, a single Terek Sandpiper *Xenus cinereus* was present on the southern shore. Up to 4 Bar-tailed Godwits *Limosa lapponica* were seen regularly; none of them had the white rump depicted in the Field Guide (Slater 1970), but rather a pale grey rump, quite unlike that of the western race of this species which winters in Europe and Africa. Although they were present on Hoskyn Island (23°48'S, 152°17'E) in the Bunker Group on 6 November, neither Whimbrel *Numenius phaeopus* nor Eastern Curlew *Numenius madagascariensis* were seen on Heron Island during my stay.

FEEDING LOCATIONS AND BEHAVIOUR

Although nearly 200 waders roosted on the island, few of them stayed to feed there. On One Tree Island, Domm and Recher (1973) found that most of the Mongolian Sand-dotterels, Eastern Golden Plovers and Grey-tailed Tattlers fed on the reef crest; most birds of these species which roosted on Heron Island went to the adjacent Wistari Reef to forage. The southeast corner of the reef crest of Wistari is exposed sooner, and covered later, by the tide than Heron Reef.

Waders flew to it directly from their roost sites as soon as it was exposed sufficiently for the first group of long-legged Reef Herons *Egretta sacra* to settle successfully. (The herons had also spent the high-tide period on Heron Island.)

On 14 November, the highest spring tide of the month, the waders' departure occurred about three hours after high tide, allowing them between six and seven hours in which to feed before they were forced off by the flooding tide. This feeding time appeared to be sufficient to satisfy their daily energy requirements, as they made no efforts to feed on the beach rock on the southern side of Heron Island on either side of high tide, even though potential prey (small gastropod snails) were abundant there. None of these three species of waders - Mongolian Sand-dotterel, Eastern Golden Plover, Grey-tailed Tattler - was encountered on the reef crest on the northern side of Heron Island, but two or three individuals of each species stayed on the shores of the island and fed on the intertidal sands.

The Mongolian Sand-dotterels and Eastern Golden Plovers fed in the typical plover manner - a short run followed by a pause, then a peck followed by another pause, etc. - and took small prey, including small gastropods, from the sand surface. The Grey-tailed Tattlers fed almost entirely from isolated lumps of dead coral which had been washed on to the sandy flats. They ran across the sand, without hesitation, from one piece of coral to the next, but would explore each piece at length, pecking and probing to extract small molluscs. *Nerita* species were readily available and presumably were taken. Only one tattler was seen to feed at the tide edge, where it was unsuccessful in obtaining small polychaete worms at low tide.

In contrast to the three previously mentioned bird species, the Turnstones remained on Heron Island throughout the tidal cycle, and fed chiefly on the tide edge, where they investigated material deposited along the strand line. They were seen to take goose-barnacles *Lepas* spp. and small gastropods, which had often been carried in by the tide on broken cuttle-bones or seaweeds. Turnstones fed at the tide-line chiefly for the first two or three hours of the falling tide. Thereafter they fed mainly on the reef flat at the northwest corner of the island, where coral rubble (from the excavation of Heron Island harbour) had become exposed by the tide. This area was also the favoured feeding site of the Sooty Oystercatchers. They also explored the beach rock on both the north and south shores of the island, and occasionally searched for food through coral boulders partly covered by sand. They preyed on the gastropod *Nerita polita* which they opened by hammering it into a crack; they also tried to take *Nerita albicilla*, which occurs at lower tidal levels, but were unable to smash its thicker shell. In contrast, the Pied Oystercatcher fed almost always on the intertidal sands, where its preferred prey was the bivalve *Atactodea striata* which lives a few centimetres below the surface of the sand. The Pied Oystercatcher preferred to feed on wet sand within about one metre of the tide edge, but in order to feed towards the time of

high tide, it often had to wade in the water (to reach tidal levels sufficiently low for the bivalve to occur).

Both species of Oystercatcher were absent from the shore at around the time of low tide on calm days, and were believed to have gone to the reef crest, on the north side of Heron Reef. (A Sooty Oystercatcher flew back to the shore from the reef crest 3½ hours before high water on 14 November). However, during a period of several days of strong easterly winds, the reef crest was continually battered by waves, and both species of Oystercatcher remained on the shore throughout the low tide period. On these days, the Pied Oystercatcher was seen to take red polychaete worms, about 5 cm long, from the sand at the tide edge. These were identified later by Dr. Pat Hutchings as of the genus *Nerinides* (family Spionidae). The size range of bivalves taken by the Pied Oystercatcher corresponded to that available. However, the small shells (up to about 2 cm in length) were swallowed whole, whereas the larger shells were opened by severing the adductor muscle, which holds the two shells together, and "chiselling out" the animal inside. Further details of the feeding behaviour of the two Oystercatcher species are being published elsewhere.

Bar-tailed Godwits fed chiefly on wet intertidal sand on the north-east side of the island. While the tide was receding they fed also at the water's edge or in shallow water, but at all times they avoided dry patches of sand. When they encountered dry sand they would run across it without stopping to search for possible prey. On the wet sand they took polychaete worms, apparently the same species as those taken by the Pied Oystercatcher.

Female Bar-tailed Godwits are noticeably bigger than males, with bills about 30% longer. Hence the two sexes can be separated in the field, and compared whilst feeding in the same area. I was able to watch one male and three females simultaneously on Heron Island. No difference could be found in the rates at which they searched the area; both sexes covered between 110 and 130 paces each minute, a faster rate than found in Godwits feeding on muddy sandflats in Britain. Often they pecked at the sand surface without interrupting their forward progress, but to catch prey they inserted their bill to its full length (up to 10 cm) into the sand, and often pivoted round the hole before attempting to pull out the worm they had caught. At low tide, the male godwit probed consistently about 14 times each minute. Half of these attempts were successful, i.e. he secured about seven worms a minute. By contrast, females probed at only half the rate of the male - between six and seven times each minute - but, surprisingly, were no more successful, so that they secured, on average, only about three worms each minute. No differences were apparent in the size or identity of the prey taken by the two sexes, so the feeding performances of females were definitely inferior to that of the male on the wet sand. Possibly they were more successful in another feeding location, but I have no information on this. If not, they must have fed for a much longer period to satisfy

their daily requirements.

A single female Bar-tailed Godwit and two Grey-tailed Tattlers were found feeding regularly above the high tide line, in the sand which had been disturbed by turtles during egg-laying. The birds did not feed around all the turtle pits, but only around those on the northern and eastern ends of Heron Island, under or near *Casuarina* trees. Most observations were made of the godwit, which behaved as though it was searching for worms on wet sand. It maintained the same searching rate - about 120 paces/minute - but obtained its prey without having to insert its bill into the sand to more than half its length (about 5 cm). Among food items taken, only insect larvae and pupae could be recognised. A search of the disturbed soil revealed one lepidopteran larva, and it is known that the larvae of several moths attack the leaves and roots of *Casuarina* trees, e.g. those of *Carposina neurophorella*, *Munychryia* spp. and *Perna* spp. Possibly these formed the diet of the waders, and had been made available by the digging activities of the turtles.

DISCUSSION

My observations show, yet again, the tendency for different bird species to feed in different locations and on different foods. A feature of particular interest shown by individual shorebirds is their ability to feed on very different food organisms at different times of year and in widely different geographical areas. This plasticity of feeding behaviour is well illustrated by the Bar-tailed Godwit, which feeds on Arctic tundra during the breeding season, and on mudflats, silica and coral sandflats, and even on coral rubble (Dommm and Recher 1973) during the non-breeding season. One individual had also learnt to exploit a disturbed sandy habitat above the high-tide line, although the majority of godwits feed in the intertidal zone in the non-breeding season.

This adaptability may also explain, in part, why the varieties of shorebird species found on Heron and One Tree Islands were so similar, in spite of marked differences in the habitats offered to them on the two islands. The three species which made extensive use of the intertidal and beach sands, which are restricted to Heron Island, fed instead on the reef crest (Turnstone and Pied Oystercatcher) or reef flat (Bar-tailed Godwit) on One Tree Island. At least for the oystercatcher and godwit, this meant that they made use of habitats on One Tree Island in which they were unable to use their full repertoires of feeding behaviour. Presumably they could not have afforded to do this if the times available for feeding, when the respective habitats were exposed by the tide, had been less than those required to obtain their daily needs from the optimal habitats. Since daily energy requirements of all bird species are less in warmer tropical than in cooler temperate environments, the feeding times required will also be less (other things e.g. habitat and prey availability, being equal). Hence one might expect to find birds exploiting "sub-optimal" habitats more often in the tropics, as appears true of shorebirds on the islands of the Capricorn group.

Little information was gathered on the importance of the reef crest as a feeding site for waders on Heron Island. It is hoped that the observations summarized above may persuade others to extend the studies of feeding by waders on the islands of the Barrier Reef.

ACKNOWLEDGEMENTS

I am most grateful to the Nuffield Foundation for the award of a Travelling Fellowship which enabled me to visit Heron Island; to Dr Klaus Rhode, Director of the Marine Biological Station on the Island, for help in identification of the molluscs and for several useful discussions; to Dr Pat Hutchings of the Australian Museum, Sydney, for identification of the polychaete worms taken by the oystercatcher and godwits; to Mr Peter Christy of Monash University for information on lepidoptera attacking *Casuarina* trees; and to Dr Douglas Dorward, also of Monash University, for reading the first draft of this manuscript.

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WEDGE-TAILED EAGLE ATTACKS EMU CHICK

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On 8 August 1974 at Rockwood, Chinchilla, Queensland (26°44'S, 150°38'E) we observed one young Wedge-tailed Eagle *Aquila audax* flying 3 m to 15 m above a flock of about seven Emus *Dromaius novaehollandiae* and diving repeatedly at them to within less than 1 m. The eagle did not appear to be attempting to strike the adult Emus. Some Emus approached the eagle and jabbed toward it with their bills although

failing to actually strike it. The attacks began after we had chased the Emu group from a large, grassy paddock to the forest edge. At one point the Wedge-tailed Eagle perched on a dead limb about 7 m directly above the Emu flock and appeared to be watching them closely. A few minutes after the attacks commenced all but one of the adult group of Emus had disappeared into the trees and dense grass. The one remaining adult Emu continued to be harassed by the eagle and jabbed vigorously at it during its closest approaches. At this time we could see that the lone adult Emu was accompanying and protecting at least two Emu chicks in striped plumage and about 30 cm high. The adult and two chicks slowly made their way into the forest. The eagle followed overhead and once followed a short distance on the ground. In the forest, the eagle dived once more unsuccessfully. Our observations suggest that it was attempting to capture an Emu chick. The eagle, possibly frightened off by our approach, left the scene without capturing a chick. The total duration of the attacks was about 7 minutes.

We know of no published descriptions of attacks by Wedge-tailed Eagles on Emu chicks. M.G. Brooker (pers.comm.) has written to us that "Emu chicks were found in a small proportion of eagle prey remains during our study of this species in Western Australia." Joseph R. Murphy kindly made available to us the following unpublished observations, which he made in company with M.R. Ridpath and D. Hart on 13 September 1974, 40 km northwest of Rawlinna, Western Australia. "I saw a Wedge-tailed Eagle fly up from a low acacia tree near the road, leaving something draped in a tree. We all assumed this to be a rabbit, but on closer approach found that it was an Emu chick of about six weeks of age. The carcass was still intact indicating that the eagle had just begun feeding prior to our arrival. ... M. Ridpath expressed keen interest in this incident, as it was the first time in seven years of study at this locality that the CSIRO team had found direct evidence of eagle predation on Emus." According to S.J.J.F. Davies (pers.comm.) Wedge-tailed Eagles are known to harry grown Emus, especially ones that have been drugged or are on the verge of starvation, at which time they are reported to hunt in pairs. Davies also heard unpublished accounts of Wedge-tailed Eagles attacking Emu chicks. The Wedge-tailed Eagle appears from this information to be at least of some significance as a predator of Emus.

ACKNOWLEDGEMENTS

We thank M.G. Brooker, S.J.J.F. Davies and J.R. Murphy for information and comments.

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NOTES ON THE BIRDS OF GROOTE EYLANDT, N.T.

PETER HASELGROVE

INTRODUCTION

I had opportunities to observe the birds on Groote Eylandt whilst I was employed there from December 1971 to February 1972 and from February 1973 to June 1974. My notes are by no means complete, because of the restricted area visited, however the information is of interest as only two other papers appear to have been published on Groote Eylandt birds. These cover visits by W.M. McLennan in May-June 1921 (Campbell, 1922) and by the American-Australian Scientific Expedition in May 1948 (Deignan, 1964).

GROOTE EYLANDT

Groote Eylandt ($14^{\circ}\text{S}, 137^{\circ}\text{E}$) is located off the west coast of the Gulf of Carpentaria (Fig.1). There are four settlements on the island: the mining township of Alyangula, a prawning treatment works and supply station at Deception Bay, and two mission settlements at Umbakumba and Angurugu. The Groote Eylandt Mining Company holds mining leases on the western side of the island where manganese ore is strip mined.

The climate is monsoonal, with the wet season lasting from November to March. Average annual rainfall is approximately 1200 mm, with almost all rain falling during the wet season. The wet season of 1972-73 was unusual in that nearly twice the average annual rainfall was recorded and it lasted into May, with cyclones occurring in the Gulf of Carpentaria during April and May. Consequently, the following dry season was not typical: it was hotter and wetter than usual.

The island is low lying with a low quartzitic sandstone ridge running in a north-south direction. To the west of this range the country is flat, while to the east the terrain is broken and hilly. The north-east and south coastal area are covered by extensive sand-hills, and there are freshwater and saltwater lakes. There are numerous rocky islets to the north.

The beaches on the eastern coast are sandy and broken with rocky headlands to the south. The west coast is shallower and there are extensive tracts of mangroves and mudflats.

There are six main habitat types: monsoonal forest, tropical open forest, dry sclerophyll forest on the sandstone range, swampy areas along creeks, mangrove forest and the open seashore.

The open forest, covering the flatter country to the west of the

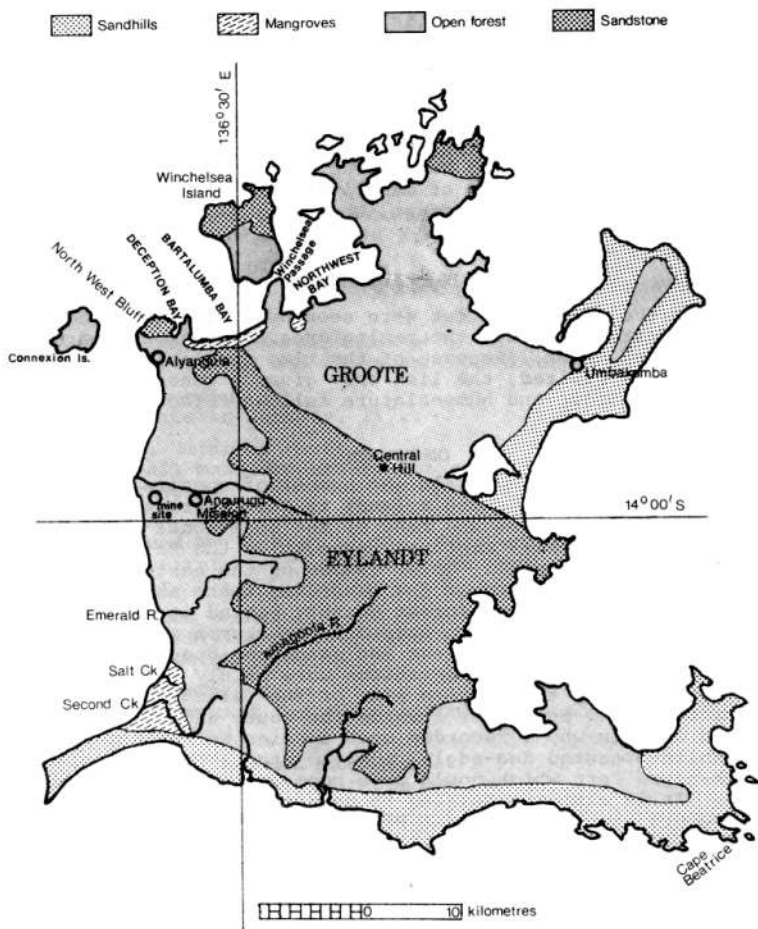


Figure 1. Grooteylandt, showing the main vegetation zones.

sandstone range and part of the north of the island (see Fig.1), is dominated by Darwin Stringybark *Eucalyptus tetradonta* and Woollybutt *E.miniata*, with small stands of Cypress-pine *Callitris* sp. where the soil is sandy. The understorey is low, with occasional stands of *Acacia* spp. The open forest extends onto the sandstone complex with the addition of the eucalypts *E. ferruginea* and *E. papuana*, and a thicker understorey. Swampy areas usually occur along small shallow creeks and behind the sandhills with *Eucalyptus*, *Tristania*, *Pandanus*, *Melaleuca* and *Banksia* spp. dominating over low grasses and reeds. There are several areas of monsoonal forest in the open forest, and semi-monsoonal forest behind some areas of sandhills along the western shore. Extensive tracts of mangroves cover the shore in Bartalumba Bay, Winchelsea Passage, Northwest Bay and between Emerald River and Second Creek.

BIRDS OF THE AREA

The birds in the following list were seen near Alyangula and North West Bluff, Bartalumba Bay, the mining area, and between Emerald River and Second Creek. Because of the time available and the restricted areas visited, the list only gives a general indication of status. The order and nomenclature follows CSIRO (1969).

DISCUSSION

The list of 91 species increases the number of species from the 105 previously recorded for Groote Eylandt to 130. Earlier records were made during the dry season and many of the additional species I have recorded represent summer migrants, especially the Palaearctic waders. McLennan (Campbell, 1922) camped on the eastern side of Bartalumba Bay and observed in the mangroves there as well as in the broken sandstone ridge-open forest country behind it, whilst the American-Australian Expedition camped at Umbakumba and made observations in sandhills, open forest and sandstone-open forest country towards Central Hill. My observations were mainly made in the open forest country along the western side of the island and the mangroves, mud flats and river estuaries towards the south end of the island. This could explain why I recorded such species as Darter, Pelican, Jabiru, White-breasted Sea-eagle, Sooty Oystercatcher, Caspian Tern and Black-naped Tern which could have come across from the nearby mainland. It is also interesting to note that the other observers did not record the Torres Strait Pigeon, while I only saw it at the south-eastern end of the island, flying to and from the mainland.

I did not see 39 previously recorded species: these are listed after the list of observed species. This may be because the previous observers visited more varied habitats, particularly the area visited by McLennan south-east of Bartalumba Bay, and the rainforest and sandhill habitats visited by the American-Australian Expedition.

The mining and prawning industries have so far had very limited impact on the Groote Eylandt environment and would probably have had

negligible effect on the bird life, except possibly to produce additional wader habitat around the tailings dams.

LIST OF BIRDS OBSERVED 1971-1974

- *Australian Pelican, *Pelecanus conspicillatus*
A flock of 16 in August 1973 on a small shallow lagoon behind Second Creek.
- *Darter, *Anhinga rufa*
Common along Emerald River, usually sitting on dead trees.
Uncommon in the smaller creeks.
- *Little Pied Cormorant, *Phalacrocorax melanoleucus*
Seen several times on Emerald River, uncommon.
- *Frigate-bird, *Fregata* sp.
During windy weather February to May 1973, and once in August 1973.
- White-faced Heron, *Ardea novaehollandiae*
Occasionally around mud-flats and open beaches.
- *Pied Heron, *Ardea picata*
Near mine site in January, 1972.
- Mangrove Heron, *Butorides striatus*
Common in all mangrove areas, either on the mudflats or along the estuaries.
- Reef Heron, *Egretta sacra*
Common around North West Bluff. Only white phase birds were seen on my first visit, and only the grey phase during my second visit.
- *Jabiru, *Xenorhynchus asiaticus*
Occasionally flying over the mouth of the Emerald River during the dry season of 1973.
- Burdekin Duck, *Tadorna radjah*
A pair were present for about a month in September 1973 on the creek at Alyangula.
- *Green Pygmy Goose, *Nettapus pulchellus*
A pair at Amagoola Pools in January, 1972.
- *Red-backed Sea Eagle, *Haliastur indus*
Common along the western coast at Alyangula, Emerald River, Second and Salt Creeks. Nested in December 1973 on a tall tower on the loading jetty at Alyangula.
- Whistling Eagle, *Haliastur sphenurus*
The most common bird of prey on the island. Seen over Alyangula and along the road connecting the town and the mine site where animals were occasionally killed by traffic.
- *Wedge-tailed Eagle, *Aquila audax*
One bird on two occasions near the Angurugu Mission.

- *White-breasted Sea Eagle, *Haliaeetus leucogaster*
Common along the coast, particularly around the mouth of the Emerald River and around small islands to the north.
- Osprey, *Pandion haliaetus*
Occasionally along the coast between Alyangula and Emerald River, and common around the small rocky islands to the north.
- Little Falcon, *Falco longipennis*
Stooping among the trees at Alyangula in the early mornings.
- Brown Hawk, *Falco berigora*
Occasionally in the open forest.
- Scrub Fowl, *Megapodius freycinet*
In the sandhills behind mangroves at Salt Creek, January 1972.
- Brown Quail, *Synoicus ypsilophorus*
Small groups near long grass at Emerald River.
- Brolga, *Grus rubicunda*
Two flocks of four birds seen on separate occasions at the mouth of the Emerald River during the dry season 1973.
- Pied Oystercatcher, *Haematopus ostralegus*
Not common, in pairs February - April 1973 on the beaches or around the mouth of the Emerald River.
- *Sooty Oystercatcher, *Haematopus fuliginosus*
Twice seen on the rocks around North West Bluff, January - February 1972.
- Masked Plover, *Vanellus miles*
A group of six birds was usually present on or near the township oval. These birds were not seen elsewhere.
- Red-capped Dotterel, *Charadrius alexandrinus*
Not common, but occasionally on the beaches near Emerald River.
- *Little Whimbrel, *Numenius minutus*
Flock of 10 on Alyangula Oval, January - February, 1972.
- Eastern Curlew, *Numenius madagascariensis*
Not common, only on the mud/sand flats around the mouth of Emerald River and Salt Creek during the wet season.
- *Greenshank, *Tringa nebularia*
Occasionally on the beaches in summer but more often around the tailings dams near the mine.
- *Common Sandpiper, *Tringa hypoleucos*
Individuals along the beach at Alyangula, the rocks around North West Bluff, and around the mine tailings dams.
- *Grey-tailed Tattler, *Tringa brevipes*
Not common, among the rocks around North West Bluff, identified by the two-note call.
- *Sharp-tailed Sandpiper, *Calidris acuminata*
Small flocks near the mouth of Emerald River. Not common.

- *Red-necked Stint, *Calidris ruficollis*
Not common, near the mouth of the Emerald River and along the western beaches.
- Southern Stone-curlew, *Burhinus magnirostris*
Two birds in open forest south of Bartalumba Bay, and others heard at night near Alyangula and Emerald River.
- Beach Stone-curlew, *Esacus magnirostris*
Individuals along the beach at Alyangula and around North West Bluff. Present all year but most numerous March - June 1973.
- Australian Pratincole, *Stiltia isabella*
One small flock near the mine site in August 1973. They were very common late March - June 1974, particularly around the tailings dams at the mine site.
- Silver Gull, *Larus novaehollandiae*
Common all around the coastline.
- *Caspian Tern, *Hydroprogne caspia*
Individuals seen three times in the Emerald River - Salt Creek area towards the end of the 1973 dry season.
- *Black-naped Tern, *Sterna sumatrana*
Common off the beach at Alyangula August - October 1973. Did not move very far down the coast but appeared to prefer open sea around rocky coasts with deep water.
- Crested Tern, *Sterna bergii*
Common all around the coast.
- Lesser Crested Tern, *Sterna bengalensis*
Uncommon. Only seen to the north of the island around Bartalumba, Northwest Bays and Winchelsea Island.
- *Torres Strait Pigeon, *Ducula spilorrhoa*
Uncommon, but seen in mangroves and flying in from the direction of the mainland in the evenings at Emerald River, Salt and Second Creeks. Appeared to roost in the mangroves.
- Bar-shouldered Dove, *Geopelia humeralis*
Common wherever there was open ground and especially around Alyangula where the habitat was more varied.
- Peaceful Dove, *Geopelia striata*
In the same areas as the Bar-shouldered Dove.
- Green-winged Pigeon, *Chalcophaps indica*
Occasionally in the thicker scrub behind the sandhills.
- Common Bronzewing, *Phaps chalcoptera*
Probably the most common pigeon, throughout the open forest.
- Rainbow Lorikeet, *Trichoglossus haematodus*
Present all the year but became very common when the *Banksia* were flowering in the swampy areas at the beginning of the dry season.

Red-tailed Black Cockatoo, *Calyptorhynchus banksi*

Only during the wet season, not common, and single birds were feeding on *Banksia* bushes behind the sandhills on two occasions.

Sulphur-crested Cockatoo, *Cacatua galerita*

Common in open areas, especially near the Angurugu River.

Little Corella, *Cacatua sanguinea*

More common than the Sulphur-crested Cockatoo and could be found feeding in open forest well away from clearings.

Red-winged Parrot, *Aprosmictus erythropterus*

Common throughout the open forest and could be seen in smaller trees behind the beach and rocks around North West Bluff.

*Oriental Cuckoo, *Cuculus saturatus*

Positive identification once in swampy area during the wet season 1973 - 1974. Probably quite common.

*Koel, *Eudynamys scolopacea*

Common in the open forest during the wet season.

Channel-billed Cuckoo, *Scythrops novaehollandiae*

Not common, only occasionally during the wet season.

Pheasant Coucal, *Centropus phasianinus*

Throughout the year, but much more common during the wet season.

Boobook Owl, *Ninox novaeseelandiae*

Heard at night in open forest, seen several times around Alyangula.

Tawny Frogmouth, *Podargus strigoides*

Probably fairly common as it was frequently around town, and at the port loading areas, feeding on insects on the ground under flood lights.

*Fork-tailed Swift, *Apus pacificus*

Present during the wet seasons preceding storms. Were often hawking around conveyor gantries at the concentration plant.

Azure Kingfisher, *Alcyon azurea*

On the estuarine reaches of Emerald River and Salt Creek.

Little Kingfisher, *Alcyon pusilla*

Rare, in mangroves along Emerald River, Salt and Second Creeks.

Blue-winged Kookaburra, *Dacelo leachi*

Common in wooded areas extending to the beach around North West Bluff.

Forest Kingfisher, *Halcyon macleayi*

Not common, but throughout the open forest areas and along wooded creeks.

Rainbow Bee-eater, *Merops ornatus*

Present all the year but only in very small numbers during the dry season.

*Dollar-bird, *Eurystomus orientalis*

Arrived in November 1973 and departed March - April 1974.
Arrival date was not known for the previous wet season but
the departure date was approximately the same. Never common.

Tree-martin, *Petrochelidon nigricans*

Present throughout the year in the open forest areas but not
common.

Black-faced Cuckoo-shrike, *Coracina novaehollandiae*

Very common throughout the year, especially in the open
forest habitats.

Papuan Cuckoo-shrike, *Coracina papuensis*

Common throughout the year, although numbers appeared to
decrease during the dry season.

Grey-crowned Babbler, *Pomatostomus temporalis*

Not common, appeared to be restricted to the border of sand-
stone outcrops and open forest where *Callitris* sp. were present.

Red-backed Wren, *Malurus melanocephalus*

Common in thick grass in open forest.

*White-throated Warbler, *Gerygone olivacea*

Present throughout the year, but seemed most common during
the dry season.

Northern Fantail, *Rhipidura rufiventris*

Not common, but present throughout the open forest.

Leaden Flycatcher, *Myiagra rubecula*

Not common, a summer migrant seen several times in February 1972
at Alyangula, and several times at Emerald River February -
March 1973.

Rufous Whistler, *Pachycephala rufiventris*

Very common in the open forest, calling for several hours
most mornings during the dry season.

Brown Shrike-thrush, *Colluricincla brunnea*

Common in the open forest.

Mistletoe Bird, *Dicaeum hirundinaceum*

Present all the year in the open forest, but more common
during the dry season.

Black-headed Pardalote, *Pardalotus melanocephalus*

Common in the open forest down to the beach. Were nesting in
the sandy banks of a creek where it crossed the beach near
North West Bluff.

Yellow Silvereye, *Zosterops lutea*

Common in the lower scrub behind the beaches and on the beaches.
The numbers appeared to fluctuate through the year.

Brown Honeyeater, *Lichmera indistincta*

Very common in the lower trees along the beaches and in and
near the mangrove areas.

- Red-headed Honeyeater, *Myzomela erythrocephala*
Several times in the mangroves along Salt Creek at the beginning of the 1974 dry season.
- White-gaped Honeyeater, *Meliphaga unicolor*
Not common, but small parties working along creeks and around the edges of swampy areas.
- White-throated Honeyeater, *Melithreptus albogularis*
Most common honeyeater of the open forest.
- Silver-crowned Friarbird, *Philemon argenticeps*
Common in Alyangula and the open forest.
- Banded Finch, *Peophila bichenovii*
Common in small flocks around Alyangula and in open areas in the open forests.
- Yellow Figbird, *Sphecotheres flaviventris*
Several flocks of up to a dozen birds near North West Bluff during the 1972 - 73 wet season.
- Spangled Drongo, *Dicrurus bracteatus*
Summer migrant, common in all habitats.
- Magpie Lark, *Grallina cyanoleuca*
Appeared at the beginning of the dry season in flocks of up to 14 and remained in decreasing numbers throughout the dry season.
- White-breasted Wood-swallow, *Artamus leucorhynchus*
Appeared approximately half-way through the 1973 dry season and remained until October - November. Was not seen in 1974.
- Little Wood-swallow, *Artamus minor*
One bird August 1973 in lower woodland behind the mangroves at Second Creek.
- Pied Butcherbird, *Cracticus nigrogularis*
Common in the open forest throughout the year.
- Black-backed Magpie, *Gymnorhina tibicen*
Common throughout the open forest areas.
- Great Bower-bird, *Chlamydera nuchalis*
Common in most habitats throughout the year.
- Australian Crow, *Corvus orru*
Common throughout.

* Indicates species not previously recorded.

ADDITIONAL SPECIES NOT SEEN BY THE AUTHOR

Royal Spoonbill	2	Gull-billed Tern	2
Brown Goshawk	2	Little Tern	2
Spotted Harrier	2	Red-crowned Pigeon	1,2
Nankeen Kestrel	2	Brush Cuckoo	1,2
Chestnut-backed Quail	2	Fan-tailed Cuckoo	2
Chestnut Rail	1	Horsfield Bronze Cuckoo	1

Little Bronze Cuckoo	2	Lemon-breasted Flycatcher	1,2
Barn Owl	2	Rufous Fantail	1,2
Spotted Nightjar	2	Broad-billed Flycatcher	1,2
Red-backed Kingfisher	2	Shining Flycatcher	1,2
Sacred Kingfisher	1,2	Restless Flycatcher	2
Mangrove Kingfisher	1	Mangrove Golden Whistler	1
Rainbow Pitta	1	Brown Whistler	1,2
Australian Pipit	2	Little Shrike-thrush	2
White-winged Triller	1,2	Rufous-banded Honeyeater	2
Varied Triller	1,2	Rufous-throated Honeyeater	2
Golden-headed Fantail-warbler	1	Zebra Finch	1
Tawny Grassbird	1	Chestnut-breasted Finch	1
Large-billed Warbler	1	Olive-backed Oriole	1,2
Green-backed Warbler	1,2		

1 - indicates observed by McLennan (Campbell, 1922).

2 - indicates observed by Deignan (Deignan, 1964).

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THE SKIMMING BEHAVIOUR OF TERNS

KES HULSMAN

Skimming by terns has been described by Buckley and Hailman (1970), Simmons (1970), Buckley and Buckley (1972) and Hulsmann (1974). This article proposes possible functions of skimming and related behaviour observed while I was on One Tree Island (23°31'S, 152°06'E) from 1 September to 28 February 1975.

The Crested Tern *Sterna bergii*, Lesser Crested Tern *S. bengalensis*, Roseate Tern *S. dougalli*, Bridled Tern *S. anaetheta*, Black-naped Tern *S. sumatrana*, Little Tern *S. albifrons*, and the White-capped Noddy *Anous minutus*

scooped up water to drink in a similar way to skimmers *Rynchops* spp. foraging (Simmons, 1970). All these species except the White-capped Noddy skimmed after swallowing fish, probably to wash the fish down. Crested, Lesser Crested, Roseate and Black-naped Terns skimmed while carrying fish, especially birds bringing food to their mates or chicks. When feeding of dependents is delayed the fish become dry and sticky. The terns skimmed, or actually landed on the water, to wet the fish making them easier to swallow. June Chilvers and I fed an injured Crested Tern for two months. Initially we fed the tern with live and dead fish by hand and found that it would not eat dry sticky fish. Therefore we dipped the fish in water before feeding them to the tern. Later we placed fish in a bowl of water and let the tern take the fish in its own time. If the tern dropped a fish, it left the fish lying on the ground and took another one from the bowl. When the bowl was empty the tern pecked at the fish lying on the ground but rarely picked it up. We found that if we then wet the fish, the tern would eat it. However Buckley and Buckley (1972) proposed another function for skimming by Royal Terns *S. maxima maxima* while carrying crabs or fish. They suggested a tern skimmed, in this situation, to soothe or clean its bill after being nipped by crab's claws or irritated by fish.

Simmons (1970) described "aerial bathing" by the Ascension Island Frigatebird *Fregata aquila* and the Noddy *A. stolidus*. Serventy and White (1950) described similar behaviour by Roseate Terns, and suggested that wetting of the feathers probably had some relation to brooding requirements. Crested, Bridled, Roseate and Black-naped Terns were seen to skid on their feet and breasts along the surface of the water, like landing ducks, rise and then shake themselves. Occasionally, Crested, Roseate and Black-naped Terns landed on the water and ducked their heads before taking off. These types of behaviour probably cool the terns.

On a hot day whilst observing incubating Crested Terns I noticed a particular individual often left its egg for 15 to 30 seconds. Unlike the other terns this one was not panting. Next time this individual left its nest I watched it fly to a pond 20 m away where it skimmed and landed on the water for a few seconds before returning to its nest. When this tern began to pant slightly it went to the pond, skimmed, skidded or both, and then returned to its nest. Every three minutes for the three hours I observed this bird it left its nest and went to the pond. This tern cooled itself in these ways and possibly regulated the incubation or brood temperature as Serventy and White (1950) suggested.

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BIRDS OF WEIPA, CAPE YORK PENINSULA

J. KIKKAWA

SUMMARY

Ninety-two species of birds have been recorded from Weipa and its environs. A brief survey of birds in the mangrove and small patches of rainforest in February 1975 produced no species from the southern region of the Gulf of Carpentaria but recorded some distinct rainforest bird species which had been known previously only from the east coast of Cape York Peninsula.

INTRODUCTION

The distribution of land birds within Cape York Peninsula is related to the size and complexity of the rainforest habitats in which endemic species occur. As one proceeds northwards the rainforest patches become smaller and less complex. Also the altitudinal sequence disappears in the north because the dividing range becomes low. At McIlwraith Range (13°45'S) the highest peak reaches 823 m and the rainforest is extensive on the eastern slopes where the tableland fauna is represented by the Lewin Honeyeater *Meliphaga lewinii* above 500 m. Further north no tableland species is known. At Iron Range (12°45'S) rainforest is restricted to the coastal lowland of the Pascoe-Claudie Basin and does not extend to the dividing range, whereas at Cape York (10°45'S) the extensive rainforest of Lockerbie Scrub covers the range which, however, rises to only about 150 m in altitude. Thus along the east coast of the Peninsula species diversity decreases from south to north. South of the Peninsula a total of 236 species of land birds has been

recorded from the Cairns-Atherton Tableland area ($17^{\circ}15'S$), but it is reduced to 179 species in the Cooktown-Laura area ($15^{\circ}30'S$) (Storr, 1954; Hopkins, 1972; Gill, pers.comm.). Further north, the Lloyd's Bay-Iron Range area ($12^{\circ}45'S$) has 152 species (MacGillivray, 1917-18; Sharland, unpublished; Kikkawa, unpublished) and Cape York ($10^{\circ}45'S$) has 117 (Barnard, 1911; MacGillivray, 1914; Officer, 1967; Kikkawa, unpublished).

In the central and western parts of the Peninsula, where open woodland, heath and swamps predominate, land birds are not diverse as in the rainforest habitats of the east coast. Because of the low species diversity and absence of endemic species, central and western parts of the Peninsula have been largely neglected by ornithologists even though habitat there is much more typical of Cape York Peninsula. The few published accounts of birds in the central Peninsula indicate that the species diversity for land birds west of the dividing range is reduced, and in the Coen area ($13^{\circ}55'S$) including the western side of McIlwraith Range there are 134 species of land birds (White, 1922; Mack, 1953). On the west coast Domrow's (1967) list for the Mitchell River Mission area ($15^{\circ}30'S$) contains only 91 species of land birds. There is no published list of birds from the west coast north of the Mitchell River.

This article lists birds recorded at Weipa, 280 km north of the Mitchell River and 220 km south of Cape York. Weipa lies on the west coast of the Peninsula at about the same latitude as Iron Range on the east coast. The Peninsula at this latitude is about 160 km wide and the dividing range lies close to the east coast rising to a maximum altitude of 545 m at Mt. Tozer. The annual rainfall at Weipa is about 1650 mm and most of the rain falls during the monsoon season from December to March. Extensive areas of bauxite nodules around Weipa support open forest of eucalypts. *Melaleuca* swamps and heath are very poorly represented, but mangroves occur in a belt along Albatross Bay, Embley and Mission Rivers. There are some new habitats developing for birds in the regularly watered gardens of residential areas, and in the areas revegetated after mining. Although it is not generally known, rainforest patches occur in this region.

Geoff Monteith, Glen Ingram, Robert Raven and I visited Weipa from 5 to 8 February 1975 to examine the rainforest areas in the wet season as part of a project supported by the Australian Biological Resources Study. Mr J. Leggate of COMALCO helped us with the field transport and Mr R. O'Reilly, a resident of Weipa, subsequently supplied useful information on the seasonal pattern of additional species. I am grateful to them for their help and for allowing me to include their findings in this article.

We examined rainforest adjacent to the beach at the tip of Weipa Peninsula (Hibbard Point) ($12^{\circ}40'S, 141^{\circ}50'E$), at Andoom ($12^{\circ}29'S, 141^{\circ}47'E$) where two small patches (about 2ha and 1ha in area, respectively) are surrounded by open forest of *Eucalyptus tetradonta*, and along Mission

River at 12°35'S, 141°55'E. We also paid special attention to the mangrove habitat, looking for the southern and western species.

There are 70 species of land birds recorded so far from Weipa, the fauna being much less diverse than at the Mitchell River. Many woodland species and mangrove birds of the southern Gulf region were absent, and very few waders were sighted during the period of our visit. However, some interesting records of rainforest birds were obtained. The last wet season was unusually dry and very little rain had fallen before February. Mr O'Reilly reported nesting of the Red-backed Sea Eagle, Osprey, Azure Kingfisher and Lesser Lewin Honey-eater at the end of April.

SPECIES LIST

In the following list the species added by Mr O'Reilly, confirmed by descriptions and photographs, are marked with an asterisk.

- Emu, *Dromaius novaehollandiae*
 *Australian Pelican, *Pelecanus conspicillatus*
 *Darter, *Anhinga rufa*
 Pied Cormorant, *Phalacrocorax varius*
 Lesser Frigate-bird *Fregata ariel*. More than 2000 appeared overland south of Evans Landing during a cyclone in the Gulf.
 *White-faced Heron, *Ardea novaehollandiae*
 White Egret, *Egretta alba*
 Little Egret, *Egretta garzetta*
 *Nankeen Night-heron, *Nycticorax caledonicus*
 *Jabiru, *Xenorhynchus asiaticus*
 White Ibis, *Threskiornis molucca*
 Straw-necked Ibis, *Threskiornis spinicollis*
 Burdekin Duck, *Tadorna radjah*
 *Black Duck, *Anas superciliosa*
 Red-backed Sea Eagle, *Haliaeetus leucogaster*
 Whistling Eagle, *Haliaeetus sphenurus*
 *Grey Goshawk, *Accipiter novaehollandiae*
 *Wedge-tailed Eagle, *Aquila audax*
 White-breasted Sea Eagle, *Haliaeetus leucogaster*
 *Osprey, *Pandion haliaetus*
 Nankeen Kestrel, *Falco cenchroides*
 *Brown Hawk, *Falco berigora*
 Scrub Fowl, *Megapodius freycinet*. Restricted to rainforest.
 *Brolga, *Grus rubicunda*
 *Bustard, *Eupodotis australis*
 Pied Oystercatcher, *Haematopus ostralegus*
 Masked Plover, *Vanellus miles*
 Whimbrel, *Numenius phaeopus*
 Greenshank, *Tringa nebularia*
 Common Sandpiper, *Tringa hypoleucos*
 *Southern Stone-curlew, *Burhinus magnirostris*
 Beach Stone-curlew, *Esacus magnirostris*
 Little Tern, *Sterna albifrons*

- Torres Strait Pigeon, *Ducula spilorrhoa*
 Bar-shouldered Dove, *Geopelia humeralis*. Very common and enters
 rainforest.
- *Crested Pigeon, *Ocyphaps lophotes*
 Rainbow Lorikeet, *Trichoglossus haematodus*
 Palm Cockatoo, *Probosciger aterrimus*. Not uncommon.
- *Red-tailed Black Cockatoo, *Calyptorhynchus banksi*
 Sulphur-crested Cockatoo, *Cacatua galerita*
 Red-winged Parrot, *Aprosmictus erythropterus*. Very common and enters
 rainforest.
- *Pale-headed Rosella, *Platycercus adscitus*
- *Koel, *Eudynamis scolopacea*
- *Channel-billed Cuckoo, *Scythrops novaehollandiae*
 Pheasant Coucal, *Centropus phasianinus*
 Boobook Owl, *Ninox novaeseelandiae*
 Papuan Frogmouth, *Podargus papuensis*. Restricted to rainforest.
- *Owlet Nightjar, *Aegotheles cristatus*
 White-tailed Nightjar, *Caprimulgus macrurus*
 Fork-tailed Swift, *Apus pacificus*
- *Azure Kingfisher, *Alcyon azurea*
 Laughing Kookaburra, *Dacelo gigas*
 Blue-winged Kookaburra, *Dacelo leachi*
 Forest Kingfisher, *Halcyon macleayi*
 Yellow-billed Kingfisher, *Syma torotoro*. Restricted to rainforest.
 Rainbow Bee-eater, *Merops ornatus*. The number increases in winter.
 Dollar-bird, *Eurystomus orientalis*. Fledged young in early February.
- *Black-faced Cuckoo-shrike, *Coracina novaehollandiae*
 Little Cuckoo-shrike, *Coracina robusta*
 Varied Triller, *Lalage leucomela*. Very common in mangroves and
 rainforest, young in February.
 Lovely Wren, *Malurus amabilis*. Restricted to rainforest and edges.
 Black-throated Warbler, *Gerygone palpebrosa*. Restricted to rainforest
 and mangroves.
 Little Scrub-wren, *Sericornis beccarii*. In rainforest at Andoom.
- Leaden Flycatcher, *Myiagra rubecula*
 Frill-necked Flycatcher, *Arses lorealis*. In rainforest at Andoom.
 Rufous Whistler, *Pachycephala rufiventris*
 Grey Whistler, *Pachycephala simplex*. In rainforest at Andoom.
 Rufous Shrike-thrush, *Colluricincla megarrhyncha*
- *Black Tree-creeper, *Climacteris melanota*
 Mistletoe Bird, *Dicaeum hirundinaceum*
 Yellow-breasted Sunbird, *Nectarinia jugularis*. In gardens.
 Dusky Honeyeater, *Myzomela obscura*
 Red-headed Honeyeater, *Myzomela erythrocephala*
 Graceful Honeyeater, *Meliphaga gracilis*. Mostly in mangroves and
 rainforest.
 Lesser Lewin Honeyeater, *Meliphaga notata*. Restricted to rainforest.
- *Yellow Honeyeater, *Meliphaga flava*. In gardens.
 Tawny-breasted Honeyeater, *Meliphaga flaviventer*. Restricted to
 rainforest.
 White-throated Honeyeater, *Melithreptus albogularis*
 Blue-faced Honeyeater, *Entomyzon cyanotis*. In gardens.

- Helmeted Friar-bird, *Philemon novaeguineae*
 Red-browed Finch, *Aegintha temporalis*
 *Chestnut-breasted Finch, *Lonchura castaneothorax*
 Yellow Oriole, *Oriolus flavocinctus*
 Yellow Figbird, *Sphecotheres flaviventris*
 Spangled Drongo, *Dicrurus bracteatus*
 *Magpie-lark, *Grallina cyanoleuca*. Winter visitor.
 *White-breasted Wood-swallow, *Artamus leucorhynchus*. Winter visitor.
 Black Butcher-bird, *Cracticus quoyi*. In mangroves and rainforest.
 Black-backed Butcher-bird, *Cracticus mentalis*
 Great Bower-bird, *Chlamydera nuchalis*
 Magnificent Rifle-bird, *Ptiloris magnificus*. Restricted to rainforest.
 Australian Crow, *Corvus orru*.

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A BARN OWL, A SOOTY ALBATROSS, AND A DOVE PRION FROM ONE TREE ISLAND

JUNE CHILVERS

On 16 August 1974 I saw a strange fawn-coloured bird rise from the bushes behind our dwelling on One Tree Island (23°31'S, 152°06'E). I was away from the island for the next five days, but on my return I found a dead White-capped Noddy *Anous minutus* without its head lying outside our dwelling. That night only one White-capped Noddy roosted in a *Messerschmidia argenta* tree behind the dwelling, where previously a dozen of them used to roost. Next day a walk around the island produced three dead noddies without heads and a dead Reef Heron *Egretta sacra* under a tree on the western side of the island. Beside the heron was a freshly dead Barn Owl *Tyto alba* lying face down with wings outstretched. Kees Hulsman and I found thirteen more dead noddies with heads missing. Although no observation of predation by the owl was made it was apparent that the Barn Owl had been attacking roosting White-capped Noddies on the island. With the death of the owl the killing of noddies stopped. The Barn Owl has been recorded from Fairfax Island (Booth, 1970) but not from One Tree Island (Domm and Recher, 1973).

On 1 July, the body of a Sooty Albatross *Pheobetria fusca* was found by Ted Chilvers and myself on a rubble bank on the reef of the island. It was in good condition, permitting its identification. The beak of this bird is now deposited with the Queensland Museum. On the same day a prion was found dead on the beach. Its condition was poor, but the specimen was sent to CSIRO Division of Wildlife Research where it was identified as the Dove Prion *Pachyptila desolata* and its skeleton is preserved (G.F. van Tets, pers. comm.). These two birds were probably blown north after strong winds which lashed the New South Wales coast during May and June. Neither species has been recorded previously this far north (Serventy *et al.*, 1971).

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