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THE SUNBIRD

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NOTES ON THE BUSH-HEN BREEDING IN NEW SOUTH WALES

D.A. STEWART and A.J. STEWART

The Bush-hen *Gallinula olivacea* was first recorded in New South Wales at Grafton where it was found breeding in 1864 (Boles 1976). It was not subsequently recorded in the State until the 1960's, but since then has been found at a number of locations in the Tweed, Brunswick and Richmond River Valleys, extending south to Evans Head (Morris *et al.* 1981). It is listed as Rare and Vulnerable on Schedule 12 (Endangered Fauna, revised December 1992) of the New South Wales National Parks and Wildlife Act (1974). The only recently published record of the Bush-hen breeding in the State is from Ballina (Gosper 1986). Although a cryptic species, we consider that the Bush-hen is unlikely to be overlooked in an area because of its regular loud calling in spring and summer. There were no records of the Bush-hen south of 24°S during the period 1900-1964 when it was rediscovered near Brisbane (Morgan & Morgan 1968). It has been suggested that this species was absent from these areas during this period and returned to them when conditions were more favourable (Blakers *et al.* 1984).

Records of all bird species have been kept on a monthly basis at our property, Nemarotu, Wilsons Creek (28°34'S, 153°24'E), 9 km inland from Mullumbimby, since 1979. Wilsons Creek is a tributary of the Wilson River, itself a tributary of the Richmond River. We have recorded the Bush-hen in all months of the year at Nemarotu and have found it to be most vocal from October to December, prior to breeding. However, it can be heard calling occasionally at any time during the remainder of the year. During 1992, four breeding records were noted along Wilsons Creek. Three of these records were on our property and the March record was approximately 2 km downstream.

On 9 March a nest with six eggs was found in dense Blady Grass *Imperata cylindrica,* 0.7 m above the ground and 20 m from the creek bank. There was regrowth remnant rainforest interspersed with *Lantana camara* and dense

grass along the creek bank. The Blady Grass where the nest was situated was growing around a young Cocos Palm *Arecastrum romanzoffianum* in a palm plantation, and the surrounding area was occasionally slashed by tractor. The nest was placed in the grass so that it sat on top of the palm. It was open and shaped to the bird's body, with living and dead grass woven into the bottom. A few blades of living grass were pulled loosely over the top. Incubation coincided

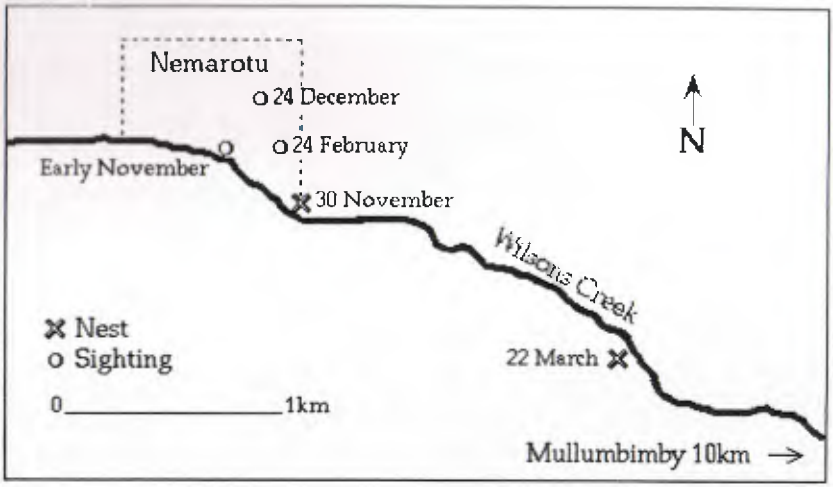

Fig. 1. Location of nests and sightings of Bush-hens with young.

with very heavy rain which caused the creek to flood. At this time we could not reach the nest. At other times, when we approached during the incubation period, the sitting bird slipped off the nest and flew a short distance across open ground, where formerly dense metre high Blady Grass had been mown. On the evening of 21 March the nest contained six eggs, but on 22 March, at 0905 h, five black downy chicks and one addled egg were present. We returned to the nest at 1050 h and found that it had been vacated by the chicks, which could be heard softly cheeping 20 m away in the undergrowth on the creek bank. Both parents were maintaining contact with the chicks from a few metres away with loud sharp clicking calls. The chicks made soft cheeping sounds.

On 30 November a nest with five eggs was located in a dense clump of Matt Rush *Lomandra longifolia* growing on top of a large rock (see Fig. 2) in water about one metre from the creek bank. The nest was similarly shaped and constructed to the

first nest found although it was completely open from above. At 0900 h the next day the five eggs were still present, but when checked at 1600 h there were three chicks and two eggs. Without delay, two of these chicks climbed out of the nest and hid in the grass on top of the rock. One was then seen to slide down the rock face and paddle quite strongly to the nearby bank. Almost immediately the other chick followed. While the chicks were paddling, the parents called constantly with loud clicking from a point on the bank where the chicks were able to scramble from the water. The third chick reached the bank half an hour later. While we were observing the chicks swimming, a fourth egg hatched. We then left the area as we did not wish to disturb the birds any further. On inspection the next morning, broken egg shell in the nest suggested that the fifth egg had also hatched and all chicks had left. Earlier in November a pair of Bush-hens with at least four downy chicks was briefly seen about 300 m further upstream from this second nest. This group was seen skulking in dense vegetation along the creek bank and attracted attention because of the loud clicking calls of the adults.

On 24 December another pair with at least three small downy chicks was seen in dense *Lantana* in regrowth rainforest. This sighting was about 450 m from the creek and at an elevation of about 80 m above the nest found on 30 November, but the age of the chicks indicated that this involved a different pair. Again the adults were heard calling before they were observed. A further sighting of a pair of Bush-hens with four well-grown, fully feathered young was made in weeds (mainly Tobacco Bush *Solanum mauritianum*) outside our house at 0830 h on 24 February 1993. This sighting, about 250 m from the nest found on 30 November 1992, probably involved the same pair observed with small downy chicks on 24 December.

Along Wilsons Creek, in the vicinity of the nest located on 30 November, there appear to be three resident pairs of Bush-hens within a distance of 1 km. Normally the birds are only heard calling when close to the creek, but during the breeding season, which coincides with the wetter months from December to March, they are often heard and occasionally seen up to 500 m away from the creek banks. Since 1979, when we moved to the area, local people have told us of finding nests or seeing Bush-hens with chicks. Some of these sightings have been up to 500 m from the creek. We have also played calls of Bush-hens to children at Wilsons Creek Primary School, and a number of children have recognised the piping *toc-toc-toc*..... call as having been heard in the area. D.R. Milledge (pers. comm.) has also reported Bush-hens regularly from similar habitat at Upper Coopers Creek, 4.5 km to the south, including one sighting of an adult with five downy young in March 1984.

Fig. 2. Nest situated in top of Matt Rush on rock surrounded by water.

These recent records indicate that the Bush-hen is probably widespread and moderately common as a breeding resident in the upper reaches of major tributaries of the Wilsons River.

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ACTIVE BREEDING BURROWS OF THE WEDGE-TAILED SHEARWATER AT NORTH STRADBROKE ISLAND

P.K.DYER and M.HINES

INTRODUCTION

Wedge-tailed Shearwaters *Puffinus pacificus* are medium sized migratory seabirds which return to their breeding sites, in either hemisphere, in spring. Found in both the Indian and Pacific Oceans, they are common summer migrants at Point Lookout, North Stradbroke Island, with 1000's seen nearby at sea (Smyth & Corben 1984). Of the two colour phases, the dark phase, which is completely grey-brown, makes up virtually all of the breeding population of islands off the eastern coast of Australia (Marchant & Higgins 1990).

The birds nest in a long meandering burrow up to 3m in length and sometimes over a metre in depth (Neil & Dyer 1992). These burrows can be sparsely or densely dispersed (Hill & Barnes 1989) with densities as high as 2/m2 on North West Island (P.K.D. personal observation). A single white ovoid egg is laid on a loose mat of nesting materials in a chamber at the end of the burrow tunnel. Incubation and feeding of the chick, once hatched, is shared by both adults. At the end of the spring/summer breeding season, the fledglings leave their breeding colonies some weeks after the adults have left to pursue pelagic activities in winter (Swanson & Merritt 1974, Floyd & Swanson 1983, Lindsey 1986).

Although no colony existed on the headlands near Dune Rocks at Point Lookout in the early 1970's (A. Smyth pers. comm.), a small colony of Wedge-tailed Shearwaters was first recorded there in 1983 (Hines 1983). In the 1990/91 season this young colony supported 248 burrows which had surface level signs of recent activity. The eight burrows found at Point Lookout Headland in November 1987 (B. Hines pers. comm.) may or may not be related to a colony reported to have been there in the early 1950's (J. Woodward pers. comm.). This paper discusses the breeding status of the young breeding colony of Wedge-tailed Shearwaters near Dune Rocks, which is being monitored.

STUDY AREA AND METHODS

Part of the largest sand dune island chain in the world, which lies between 27°S and 28°S and protects Moreton Bay and the southeast coast of Queensland, North Stradbroke Island consists almost entirely of quartz and mineralised sands. The small rocky outcrops at Point Lookout, where the

Wedge-tailed Shearwater colony is situated, and some sandstone at Dunwich are exceptional geomorphic features on this island.

The climate is subtropical with rainfall averaging 1566mm and falling mainly between November and May (Bureau of Meteorology), during the Wedge-tailed Shearwaters' breeding season. Human settlement is concentrated at three locations, one of which is Point Lookout. Because there is no bridge to the mainland, the rate of development is slower than would otherwise be expected (Durbidge & Covacevich 1981). The island is accessible by boat and vehicular ferry.

Few details about the Wedge-tailed Shearwater's breeding habits at Point Lookout are known, so burrows were counted each season (M.H.) from 1985/86 to 1992/93, and the contents of burrows and burrow lengths within a 200m2 study area were ascertained in the 1989/90 and 1990/91 seasons (P.K.D.) by means of a burrowscope (Dyer & Hill 1991). Located at Point Lookout, in the area known as Dune Rocks Headland, the colony itself is divided into southern and northern sections by natural boundaries. These consist of cliffs and sand dunes which have soft sand that prevents surface digging. The study area where contents of burrows were examined is located in the northern section of the colony.

RESULTS

The number of active burrows found for consecutive seasons from 1985/86 to 1992/93 ranges from 85 to 248 (Table 1). Incubation rates were similar, with 24% (n = 61) and 22% (n = 62) of burrows in the study area accommodating incubating birds in the 1989/90 and 1990/91 seasons, respectively. This represents relatively few breeders when compared with other colonies such as those in the Capricorn Group, on the Great Barrier Reef, where incubation rates were greater than 40% (Dyer & Hill 1992).

The success rate to fledging stage at Point Lookout was virtually nonexistent, with only one live chick found in the study area in March 1991. This chick was still covered in down so the likelihood of it reaching maturity was far from certain. There were no chicks in March 1992.

Burrow lining, invariably consisting of the available material within the immediate vicinity of burrows, was restricted to nesting chambers. The most common lining was grass, with 85% of lined burrows having a rough mat of grass or a combination of grass and leaves. Leaves and twigs were used in the remaining

TABLE 1. The number of burrows found at the Dune Rocks Head land site, Point Lookout, for breeding seasons from 1985/1986 to 1992/1993.

DATE OF COUNT	SOUTH SECTION	NORTH SECTION	TOTAL
03:01:1986	129	78	207
01:01:1989	108	71	179
30:12:1989	116	81	197
01:01:1991	147	101	248
30:12:1991	82	86	168
28:12:1992	50	35	85

lined burrows. There was a strong relationship between nest chamber lining and incubation (1989/90: $X2 = 20.50$, df = 1, $P < 0.001$; 1990/91: $X2 = 14.11$, df = 1, $P < 0.001$) with 92% of incubation burrows lined in both seasons.

Burrow lengths were similar in the 1989/90 and 1990/91 seasons ($t = 0.039$, df = 115, $P = 0.969$), with a mean burrow length of 1.1m, ranging from 0.1m to 2.5m. At the Capricorn Group islands in 1990/91, mean burrow lengths were shorter, being 0.9m, 0.7m and 0.7m, for Heron Island ($t = 3.063$, df = 357, $P < 0.002$), Erskine Island ($t = 4.411$, df = 86, $P < 0.001$), and North West Islands ($t = 5.547$, df = 622, $P < 0.001$), respectively (Dyer 1992).

DISCUSSION

Earlier estimates of the number of breeding pairs of Wedge-tailed Shearwaters have been based on counts of burrows showing signs of activity, assuming that burrows with entrances displaying signs of use supported a breeding pair. The variation in incubation rates (per burrow) found between North Stradbroke Island (23%) and other islands such as Mutton Bird Island (> 70%) (Floyd & Swanson 1983) and islands in the Capricorn Group (> 40%) (Dyer & Hill 1992), has important implications for the application of incubation rates that are not site specific. The age, location and viability of particular colonies also need to be considered. Particular species can vary in behaviour according to time, location and environmental conditions (Nelson 1980). The Wedge-tailed Shearwater, for instance, returns to Mutton Bird Island (33°18'S, 153°09'E) in the first week of August, but to Point Lookout (27°25'S, 153°32'E) nearer the third week of August, and to Heron Island (23°26'S, 151°57'E) early in October (Swanson & Merritt 1974, Dyer 1992).

Until more is known about breeding rates, estimates based on information which is not site specific should probably be based on information for like sized and aged colonies with similar environments. Inferences from results found at Point Lookout would best be restricted to similarly exposed and relatively new colonies. It is obvious, then, that the outcome of applying any single model to adjust earlier estimates, regardless of location or author, or of applying uniform incubation rates that are not site specific, would be meaningless. There is a need for comparative longitudinal studies of long lived burrowing species such as the Wedge-tailed Shearwater.

Since relatively constant incubation rates of approximately 23% were found in both seasons, estimates based on burrow counts for previous seasons at Point Lookout appear to be feasible. The low incubation rate and absence of success to fledging stage raise doubts about the viability of the colony. Not all colonies survive. A knowledge of basic demographic parameters is necessary to predict the probability of the viability of a colony being established from a minimum base population (MacArthur & Wilson 1967). The present study has shown that the colony at Point Lookout may not have the minimum base population required for establishing a stable colony.

Low incubation rates may be a natural phenomenon associated with a young or transient colony. The colony could represent an excess of birds from elsewhere, or birds making brief stopovers during feeding forages from other areas. North Stradbroke Island is within the feeding range of other breeding colonies found to the north and south. A bird banded as an adult at North Solitary Island (29°55'S, 153°23'E) has been recovered at the study site. An expanded banding programme at both colonies could clarify this aspect.

Many birds die of natural causes, but, unlike the islands of the Capricorn Group where there are few predators, Wedge-tailed Shearwaters at North Stradbroke Island are exposed to both natural and introduced predators. Cats and dogs, and more recently, foxes, have been a major threat. The sudden drop in the burrow count in 1991/92, and a further reduction in the 1992/93 season (Table 1), were associated with devastation by foxes which killed 300 birds in a single night in December 1991 (R.Lambert pers. comm.).

Numerous Carpet Snakes *Morelia spilotes variegata* have been reported in the area. When found they are caught and transported 8-9km to the island rubbish tip where they are released (R.Lambert pers. comm.). Monitor Lizards *Varanus varius* are also common (Covacevich & Ingram 1975). Since evidence of predators was seen on three of the seven visits made to inspect

burrow contents, predation is probably high and is plausibly considered the main contributor to low breeding success rates.

If the colony is so highly exposed to natural and introduced predators, there may be little point in attempting to conserve it. On the other hand, although the Wedge-tailed Shearwater population on North Stradbroke Island is very small compared with other colonies, it may have important relevance to Wedge-tailed Shearwater research and conservation in general. It presents the rare opportunity to establish a monitoring system for a young, conveniently located colony near a major city. It is unusual to be able to establish the age of a colony so closely. No birds occupied the site in the early 1970's so this site affords an opportunity to identify stages in the development of a colony.

In this respect, some answers regarding degree of protection need to be considered. Indisputably, the colony should be protected from cats, dogs and foxes. In response to uncontrolled dogs attacking the 'mutton bird colony' (*Redland Times* 16/12/87) the local shire council requires dogs on Deadman's and Frenchman's beaches to be on leashes, but uncontrolled dogs still visit these beaches regularly. Because of the close proximity to residential areas, local cooperation and regulated control of pets are imperative.

Perhaps foxes pose an insurmountable problem for the management of the whole island's wildlife. Because of the inaccessibility of much of the island, the feasibility of a fox eradication programme is debatable. Vigilance on the part of volunteers is essential, but the main problem is that the first observed evidence of a fox can be the decimation of many birds. There is some irony in the fact that increasing development, which exposes the colony to sightseers, cats and dogs, may assist the colony by inhibiting access for foxes. On the other hand people may attract foxes by providing sustenance in the form of exposed scraps and waste. It is hoped that an active feral predator control programme, due to commence in 1993 by the Queensland National Parks and Wildlife Service, will provide a substantial degree of protection.

With a University of Queensland Research Centre based on North Stradbroke Island, the colony is conveniently located to support both research and institutional and public education. But the wisdom of such exposure is disputable. The colony at present is known only to a few ornithologists and naturalists. An informed public is more likely to cooperate in conservation processes, but, if the colony's whereabouts becomes common knowledge, it is in danger of being severely disturbed by vandals or, unwittingly, by sightseers. This could create a detrimental impact on the colony and on the

surrounding vegetation, which appears to be retreating westwards leaving sand hills exposed.

The degree of protection afforded the colony will depend on the type of conservation and research advocated. If it is decided that conservation is imperative, and that research should have a biological or educational emphasis, then artificial support of the colony, incorporating artificial nesting structures and the addition of native beachplants to eroded areas (Byrd & Boynton 1979), may be warranted. Alternatively, an emphasis on ecological studies would suggest minimal interference, perhaps even monitoring the demise of the colony so as to establish causal relationships for reference and future management of other young colonies. In this case it would probably be unwise to interfere with natural predation. Monitoring this type of predation could expose reasons for the lack of colonies on similar islands.

Implications and generalisations from the above study would seem premature. Prior to this study and a more comprehensive concurrent study in the Capricorn Group islands (Dyer 1992), research into Wedge-tailed Shearwater breeding activities, in Queensland, was somewhat superficial. Cooperative planning for and management of the Point Lookout colony, with input from local residents, scientists, and National Parks and Wildlife personnel, is suggested.

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NOTES ON THE BRUSH BRONZEWING *PHAPS ELEGANS* AND SOUTHERN EMU-WREN *STIPITURUS MALACHURUS* IN COOLOOLA NATIONAL PARK

DAVID McFARLAND

INTRODUCTION

Both the Brush Bronzewing *Phaps elegans* and Southern Emu-wren *Stipiturus malachurus* have had relatively recent rediscoveries in Cooloola National Park (Corben 1973, Ingram 1972) after long periods without reports from south-east Queensland (bronzewing - Chisholm 1924, emu-wren - Gould 1865, Cayley 1949). Since these last records very little additional information has been published concerning the species in the Great Sandy Region (Roberts & Ingram 1976, McFarland 1988a). Cooloola and nearby Fraser Island represent the northerly extremes for the Southern Emu-wren and Brush Bronzewing, respectively (Blakers *et al.* 1984). In this paper some notes are presented on the breeding activity of bronzewings and the distribution of emu-wrens in Cooloola National Park.

STUDY AREA AND METHODS

During a study of the Ground Parrot *Pezoporus wallicus* in Queensland (1986-1988), 118 heathland sites were visited between Caloundra (28°48'S, 153°08'E) and Woodgate (25°07'S, 152°34'E), and included sites on Fraser Island. Vegetation at these locations was low graminoid heathland with some sedgelands and swamps. For detailed descriptions of the areas see McFarland (1988a, 1988b). Most work was done in Cooloola National Park (26°05'S, 153°02'E), with intensive study (monthly transects) of several sites that differed in fire age (range 0-10.5 years post fire). The methods used in these heathlands are described in McFarland (1988a).

RESULTS AND DISCUSSION

Brush Bronzewing

Bronzewing nests (n = 6) were only found at Cooloola. (Birds were seen in heathlands on Fraser Island and in sites near Boonooroo (25°38'S, 152°52'E), Tinnanbar (25°46'S, 152°58'E) Bell's Creek (26°51'S, 153°07'E) and on the Noosa north shore (26°18'S, 153°03'E). It is likely that breeding occurs in all areas.) All nests were in dry heathland and on the ground under either *Banksia oblongifolia* (n = 5) or *B. robur* (n = 1)

shrubs of <50cm height. The nests contained either 2 eggs (n = 4) or 2 chicks (n = 2). Eggs were laid in September (n = 2) and October (n = 10). These results are similar to those recorded by Chisholm (1924) and Frith (1982) except for the more restricted and earlier breeding season (cf. October - January, Frith 1982). This may simply be a variation typical of species with a wide latitudinal distribution, e.g. Ground Parrots (McFarland 1988c).

Despite regular searching, no nests were found in heathlands unburnt for less than 2 years or more than 10.5 years (3-4 years post fire = 3 nests, 5-6 years = 2 nests, 7-8 years = 1 nest). This suggests that burning on a cycle of less than every three years could adversely affect the species, and that breeding activity may decline in older subtropical heathlands.

Southern Emu-wren

During the study a maximum of 20 emu-wrens were located in the period October-November 1987. The birds were in three well separated heathland blocks covering sites 4, 5, 6, 7, 8, 9, 10 (Fig. 1), and included birds seen in areas of the sites not covered by regular transects. There was also an unconfirmed report of Southern Emu-wrens at a heathland near Rainbow Beach (site 13, R. Blick pers. comm.). The birds were recorded in seven pairs and two trios, the latter being adults with dependent young. Emu-wrens occurred in heathlands unburnt for 1.5 to 9.0 years, with the highest density in sites that had not been burnt for 6-8 years (0.20 - 0.25 birds/ha).

Southern Emu-wrens were only recorded at Cooloola. Given the birds' secretive nature and seemingly low densities it is possible that the species is more widely distributed in the extensive heathlands of the park (Fig. 1). Alternatively, those birds found may be a remnant population whose continued existence requires habitat management, particularly with respect to fire regimes. Emu-wrens have been reported from the Beerburrum area to the south (Blakers *et al.* 1984), and seemingly suitable habitat was found at a number of localities outside the national park. However, the increased fragmentation and generally high fire frequency of these heathlands may have eliminated Emu-wren populations and prevent recolonisation.

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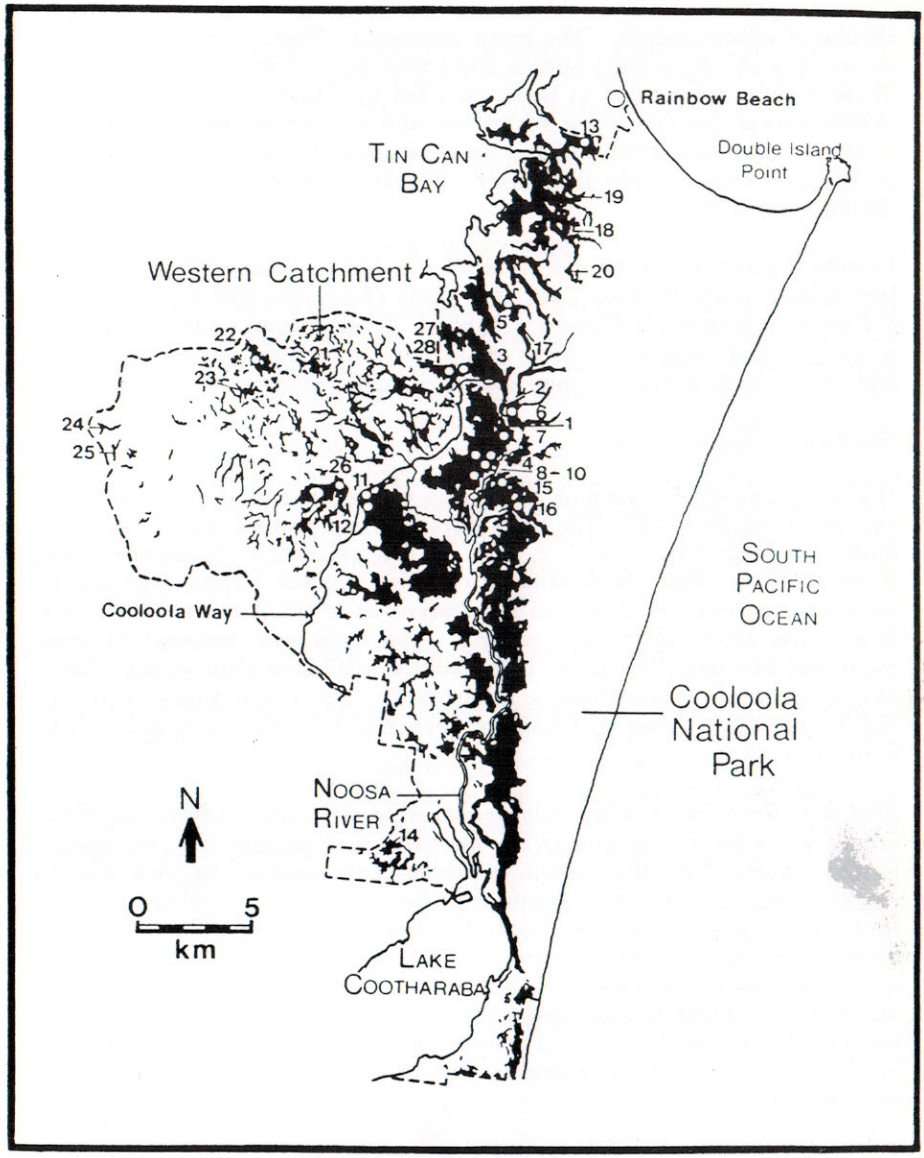

Fig. 1. The distribution of heathlands (black areas) in Cooloola National Park and the locations (1 - 28) of all sites visited in the park.

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INLAND BREEDING OF THE TORRESIAN IMPERIAL-PIGEON ON CAPE YORK PENINSULA

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INTRODUCTION

On the mainland of Queensland, the Torresian Imperial-Pigeon *Ducula spilorrhoa* has usually been reported breeding in mangroves (cf. Storr 1953, 1984; King 1990). Inland, breeding has been reported from "isolated scrubs" and "open timber away from the river" near Laura (Storr 1953). The numbers of individuals breeding at such mainland sites have been stated to be much lower than those on offshore islands (Storr 1984). Crome & Shields (1992) noted that many birds breed on the mainland of Cape York Peninsula and the Northern Territory, although they gave no evidence for this proposition. In November 1992 we visited the Cape York Peninsula and made several observations indicating that this species may breed in large numbers away from mangroves on the Queensand mainland.

OBSERVATIONS

Late on the afternoon of 6 November 1992 a Torresian Imperial-Pigeon was seen in gallery forest at the Morehead River crossing, some 65 km from the coast [for vegetation descriptions of Cape York rainforests see Laverack & Godwin (1987)]. At dusk on 7 November several flocks of up to 20 birds were seen flying over the canopy of the notophyll vine forest of upper Peach Creek in the McIlwraith Range. This locality is 20 km from the coast and 525 m above sea level. Flocks were noted in the same area the following morning.

On the morning of 9 November we were at the middle reaches of Peach Creek at the western base of the McIlwraith Range, 30 km from the east coast and 195 m above sea level. One of the first birds in the dawn chorus was the Torresian Imperial-Pigeon. Flocks of up to ten birds were seen within one hour of daylight flying along the band of notophyll vine forest/ gallery forest beside the creek. Approximately one kilometre of the length of the creek was walked during this time.

That night we camped at the Archer River Roadhouse near the Peninsula Development Road crossing of the Archer River, 70 km west of the coast. On the morning of 10 November one of the first birds heard calling was again the Torresian Imperial-Pigeon. In the first hour after daybreak up to ten small groups of pigeons numbering from one to ten individuals were observed along the river. These flocks were seen both feeding in, and flying along, the gallery forest corridor. Again about one kilometre of river bed was

walked.

On returning to the campsite, a nest of a Torresian Imperial-Pigeon was discovered in an Ironwood *Erythrophleum chlorostachys* some 200 m from the river in open woodland. The nest was approximately 11 m above the ground in the canopy of the tree. It was a loose stick structure with a central depression. A pigeon sat on it for the half-hour of our observations. During this time another pigeon visited the nest and added a stick to it. The nest tree is not a vine forest species; rather it is usually found in open savannah woodland across northern Australia (Williams 1988, Brock 1988). It is a species which is totally poisonous to mammals.

Subsequently we were informed that thousands of Torresian Imperial-Pigeons inhabit the gallery forests at Archer Bend each summer (M. Delaney pers. comm.). Archer Bend is the site of the largest gallery forests on Cape York Peninsula (Laverack & Godwin 1987).

DISCUSSION

The birds seen on upper Peach Creek could conceivably have come from colonies offshore. Large numbers of pigeons travel between their breeding islands and the mainland every day, leaving at dawn and returning at dusk (Frith 1982, Crome & Shields 1992). King (1990) found that the three largest known breeding colonies in Queensland are on Night, Hay and Hannah Islands, which are adjacent to this section of coast. However, all of our other observations were from sites more than 30 km from the coast and were made either near dawn or late in the afternoon. It is unlikely that these birds had flown to or from a breeding island in the time available.

If these observations are any guide, Torresian Imperial-Pigeons would be expected to breed in or near the gallery forest of all the major streams of Cape York Peninsula, at least as far south as Coen where they have also been reported breeding (Storr 1984). Given that they have bred at Laura and Kings Plains (Storr 1953), and have been seen at the Hann River crossing, they may breed on most of the rivers south to Cooktown. From the numbers that we saw at middle Peach Creek and the Archer River crossing, and taking into account sites such as Archer Bend, many thousands of pairs could be involved.

On the mainland of Cape York the pigeon may not usually breed in a colony, being scattered along riverine gallery forests and in suitable patches of vine forest. Such a situation also appears to occur with the Torresian Imperial-Pigeons of the Kimberley region (Dell 1978, Johnstone 1981). As the nest found at the Archer River crossing was not in a vine forest species, the

number of potential breeding sites is actually greater than the distribution of vine forest might suggest. This could make detection of nest sites difficult and result in underestimations of the numbers involved. It is not known whether more birds nest on islands or on the mainland. However the observations presented here show that breeding on the mainland may occur in a significant proportion of the total population.

The visit to Cape York was during the driest season for ten years and in some parts since 1960 (Bureau of Meteorology, pers. comm.). The only places where we saw flowing water were at the Hann River crossing and the middle Peach Creek site. There were pools of water at the Morehead River and upper Peach Creek. However, according to the locals there had been no surface water at the Archer River nest site since September. This suggests that neither lack of surface water, nor rain water, inhibits breeding in this species. There are no reported observations of the pigeon drinking fresh water on the ground (Frith 1982). The only obvious source of moisture for the pigeons of central Cape York appears to be the fruit they eat.

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BIRDS MOBBING POSSUMS

PETER F. WOODALL

Mobbing describes the "collective and noisy demonstration against a predator by birds of one or several species ... typically shown when small passerines surround a perched owl in daytime" (Campbell & Lack 1985). There are a number of published accounts of mobbing by Australian birds (Dow 1975, Ambrose 1984) but I have found none describing mobbing directed at possums (Phalangeroidea).

An adult Common Ringtail Possum *Pseudocheirus peregrinus* was seen sitting high in an Umbrella Tree *Schefflera actinophylla* at the St Lucia campus of The University of Queensland, Brisbane, on 11 February 1993 at 1630 h. It was being mobbed by a group of about seven Noisy Miners *Manorina melanocephala* and three Pied Butcherbirds *Cracticus nigrogularis*, all alarm-calling noisily. The following morning a similar-sized Common Ringtail Possum, presumably the same individual, was found dead near the foot of the tree without any obvious external injuries. On 3 March 1993 at 1730 h, I watched an adult Common Brushtail Possum *Trichosurus vulpecula* sitting at the top of an electricity pole in East Brisbane. It was being mobbed by a noisy group of about five Noisy Miners, three Blue-faced Honeyeaters *Entomyzon cyanotis*, four Australian Magpie-larks *Grallina cyanoleuca* and three Australian Magpies *Gymnorhina tibicen*.

Both species of possum are primarily nocturnal and, like owls, would not be normally encountered by diurnal birds. Whether the mobbing in any way contributed to the death of the Common Ringtail Possum is uncertain. Its unusual appearance in daylight might have been linked with sickness. Francis *et al.* (1989) listed 20 species of animals (10 reptiles, 2 birds, 8 mammals) mobbed by the Florida Scrub Jay *Aphelocoma c. coerulescens* and noted that nocturnal predators, occasionally encountered during the day, were mobbed most often.

The Common Brushtail Possum feeds on a wide variety of plant food, and also meat (How 1983), and is believed responsible for destroying many birds' nests in search of eggs and young (Troughton 1943, Brown *et al.* 1993). The Common Ringtail Possum is a more specialist herbivore feeding on leaves, flowers and fruits and not even taking insects (McKay 1983). Thus, the Common Brushtail Possum can be considered a potential predator, particularly to nesting birds, whereas the Common Ringtail Possum is an innocuous relative, which, nevertheless, elicited a similar mobbing response from various birds. This seems similar to the observation of Adelie Penguins *Pygoscelis adeliae* mobbing a Ross Seal *Ommatophoca*

rossi, which is not a known predator of penguins, although the Leopard Seal *Hydrurga leptonyx* is a feared penguin predator (Barker & Hand 1981).

Noisy Miners were the major participants, in terms of both numbers and activity, in both of my observations. They are well known for their aggressive interactions with other species. Dow (1975) states that all predatory birds, mammals and reptiles are mobbed by Noisy Miners using their intraspecific threat display, and some miners dive at the mobbed animal, occasionally hitting it. Non-predators, such as Crested Pigeons *Ocyphaps lophotes* and Tawny Frogmouths *Podargus strigoides*, are also frequently mobbed by Noisy Miners (Dow 1975). The other birds observed mobbing possums are also conspicuous and aggressive species.

A range of functions have been suggested for mobbing, including silencing offspring, reducing individual danger, creating confusion, causing the predator to move on, alerting others, and cultural transmission of predator identity (Curio 1978). Curio *et al.* (1978) were able to demonstrate experimentally that European Blackbirds *Turdus merula* could teach the identity of a 'predator' through a sequence of at least six birds. One of the Pied Butcherbirds and two of the Australian Magpies were immature and, while they remained on the periphery of the mobbing flock, they were clearly exposed to the other birds' reactions to these 'predators'.

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