

A SURVEY OF BREEDING OSPREYS *Pandion haliaetus* IN NORTH-EASTERN COASTAL NEW SOUTH WALES 1980 TO 1982

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Ospreys were surveyed on 560 km of coast in northern New South Wales during 1980 to 1982. Fifteen nests were found with fourteen pairs attempting to breed (one nest per 37 km of coastline). At least thirteen young fledged, four from three pairs in 1980 and eight from five pairs in 1981 (1.6 young per successful nest). The diet was mainly fish, but included cuttlefish, crustaceans, a reptile and a mammal. The breeding cycle (nest building to fledging) occupied the months June to October. Nests were placed in tall dead trees, usually within one kilometre of a major water body, in eucalypt open forest/woodland, swamp forest and grassland (pastures). Details of breeding activity, nests, clutch size, sexual dimorphism, diet and threats to breeding success are presented.

INTRODUCTION

The Osprey is a cosmopolitan species found breeding along most of the Australian coastline, with the exception of central and southern New South Wales, Victoria and Tasmania, though there are infrequent sightings from these areas. Before 1980, only six nest sites in New South Wales were known to the author from personal observation and the published and unpublished records of other observers. This prompted concern for the species' survival in this state, which culminated in surveys (co-ordinated by the New South Wales National Parks and Wildlife Service) during 1980 and 1981. These surveys were carried out in an attempt to determine the size of the breeding population in the state and to gather general ecological and biological information on the species. Further field investigations were carried out during July and August 1982 to follow up unconfirmed reports of nesting Ospreys. This paper reports on the results of these surveys. The area covered by the surveys is shown in Fig. 1.

METHODS

A literature survey was made to determine the

known distribution of the species from published records and to ascertain which of these records referred to breeding birds. Letters seeking further details of observations were sent to the New South Wales Field Ornithologists Club, the Atlas of Australian Birds (RAOU) and individual ornithologists, including those residing within the known range of the Osprey. Some media coverage was given to the surveys in newspapers and local television.

Reports of 'Ospreys' nesting were checked in the field to confirm correct identification and to collect basic data on nest location and siting, behaviour of adult birds, and apparent or potential threats to breeding success. Between one and five visits (average 2.2) were made to each nest site during the period 1 June, 1980 to 23 October, 1980 and between 1 and 11 visits (average 4) during the period 21 March, 1981 to 31 October, 1981. Field investigations were carried out during July and August 1982 at seven locations to follow up unconfirmed reports of nesting Ospreys.

Whenever possible details of the plumage of all Ospreys observed were noted.

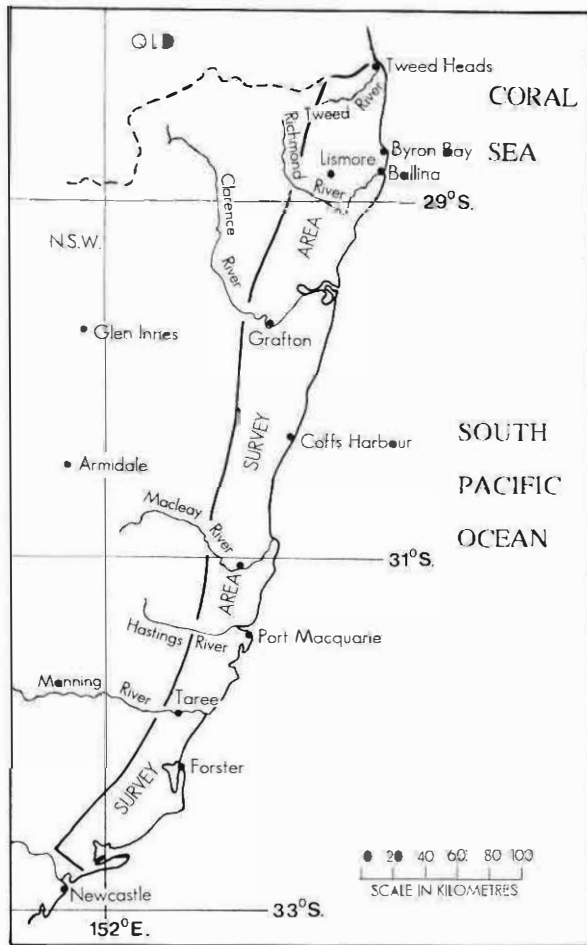


Figure 1. Map of north-eastern New South Wales showing study area.

RESULTS

Nest sites

The 1980 survey resulted in four new active nests being located, bringing the total to ten nest sites known in the state. Three additional nests were located during the 1981 study; however, three nests observed in 1980 were not occupied that year. Field investigations during July and August 1982 added two new nest sites. The other five sites investigated were found to contain nests of either the White-bellied Sea-Eagle *Haliaeetus leucogaster* or Whistling Kite *Haliastur sphenurus*, or no nest at all was found.

All nests were located north of 32°30'S, and were within ten kilometres of the coast, though a nest located subsequent to the survey was located just south of 33°00'S. Fifteen nests were located along 560 km of coastline giving a density of one nest per 37 km. The nearest nests were 3.3 km apart.

Breeding activity

The exact duration of breeding activity could not be determined because visits to most nests were infrequent. However, at one site in the Clarence Valley, where more frequent observations were possible, adult Ospreys were present in the nesting area from late March. A female bird in the Tweed Valley was seen to add a small stick to its nest on 27 June, 1980. Mating was observed on 18 June, 1980 and 29 September, 1981, the latter while a nestling was present. Eggs were recorded on 13 and 19 August, 1981, and the earliest date that nestlings were observed was 19 August, 1981. Juveniles were on or near to nests during the period 2 to 29 October.

Nests

All nests were large structures built of sticks and placed at varying heights (estimated 12-40 m above ground) in dead or partly dead trees (Table 1). Of three nests closely examined, one was lined with *Melaleuca* bark (90% of lining), palm fibre and six pieces of kelp; another had mostly *Melaleuca* bark with some kelp; and the third had woodchips, bark from Blackbutt *Eucalyptus pilularis*, *Melaleuca* bark, and dried grasses. Nest trees were situated within one kilometre of a major waterway (river, estuary or ocean), or were on elevated land up to 10 to 15 m above sea level. They were in eucalypt open forest or woodland, in swamp forest, and on land cleared of its natural vegetation. This cleared land included pasture grassland, an active sand quarry and former mineral sands mining areas (Table 1).

Clutch size and breeding success

Clutches of three eggs were recorded in the three nests that were closely examined. Although exact details of breeding success could not be ascertained because of infrequent visits, at least

TABLE 1

Details of nest sites.

Nest	Habitat	Type of Tree	Estimated Nest Height (m from ground)
1	Disturbed eucalypt woodland adjacent to mangroves	Dead eucalypt	18-21
2	Swamp forest of <i>Melaleuca quinquenervia</i>	Dead ? eucalypt	20
3	Disturbed eucalypt open forest	Dead eucalypt	15-18
4	Swamp forest of <i>M. quinquenervia</i>	Dead <i>M. quinquenervia</i>	15
5	Clearing in eucalypt open forest	Dead eucalypt	20
6	Open forest	Dead eucalypt	27
7	Revegetating mineral sands mining area	Dead ? eucalypt	21-24
8	Edge of housing subdivision adjacent to mangroves (? former swamp forest)	Dead ? eucalypt	not estimated
9	Swamp forest of <i>M. quinquenervia</i>	Partly dead <i>M. quinquenervia</i>	not estimated
10	Cleared eucalypt open forest adjacent to housing subdivision	Dead <i>Eucalyptus robusta</i> or <i>E. resinifera</i>	40
11	Clearing in eucalypt open forest	Dead eucalypt	29
12	Cleared eucalypt open forest (sand quarry) on edge of river	Dead <i>Eucalyptus pilularis</i> (tree died during occupation)	15-18
13	Cleared paddock (pastureland) surrounded by eucalypt open forest	Dead eucalypt	not estimated
14	Cleared paddock (pastureland) adjacent to eucalypt open forest	Dead ? eucalypt	22+
15	Open paddock (pastureland) with scattered trees	Dead ? eucalypt	10-12

five young were successfully fledged from three nests during 1980 and at least nine from five nests during 1981. A mean of 1.6 young were fledged per successful nest.

Defence of nest

Only one instance of nest defence against a potential natural predator was recorded. An adult female Osprey chased off two Torresian Crows *Corvus orru* from the vicinity of a nest near the Clarence River on 13 July 1980. Nests were not strongly defended against human intervention; however, when one nest tree was climbed, both adults circled overhead, called continually, and made a few swoops at the climber. The male swooped very close at one stage, but at no time did physical contact seem likely. This is in contrast to other large raptors, such as the Wedge-tailed Eagle *Aquila audax*, which do not defend the nest at all (Cupper and Cupper 1981).

Plumages

The main plumage difference between adult male and female Ospreys appears to be the width of the brown breast band. In breeding males, it is usually very narrow and indistinct. In two of seven pairs observed, the breast band of the male was broad, but in at least one it was noticeably narrower than that of the female. Juveniles of both sexes have very broad breast bands, as well as brownish-white hind crowns and napes, and pale spotting on the back and wings.

A small downy nestling, estimated to be about two weeks of age, measured about 185 mm in length. The skin of the head and wings was blue. The feet and legs were grey, the iris yellow-brown, and the bill dark grey-black, being paler at the base. The body, including the wings, was covered in grey-buff down, and there were rusty pin feathers on the nape and hind crown.

Diet

Thirty-seven observations were made of Ospreys carrying or feeding on prey items, all but one involving fish. The other prey item was a Bearded Dragon *Amphibolurus barbatus* observed being taken by an adult Osprey in recently cleared land near a nest site south of Coffs Harbour (I. Eckford, pers. comm.) on 28 September, 1981. Twenty-one records (58% of all records) referred to unidentified fish, nine (25%) were mullet, four (11.1%) Whiting *Sillago* sp. and two (5.6%) Silver Bream *Acanthopagrus australis*. Many of the unidentified fish were thought to be mullet. In addition, the remains of a fish (probably a Red Rock Cod *Scorpaena cardinalis*), a Blue Swimmer Crab, the carapace of a crayfish, and numerous internal shells of cuttlefish were found in occupied nests. The skull of a Long-nosed Bandicoot *Perameles nasuta* was found at the base of a nest tree near Tweed Heads on 2 July, 1981.

When feeding on fish, Ospreys gripped their prey securely in their talons while perched on a branch of a dead tree or occasionally on a log or public sign on a beach. The fish, having been carried in a head-forward position, was usually held on the perch similarly, allowing the Osprey easy access to the head region of the fish. The head was usually the first section to be torn apart, beginning with the opercular bones, which were usually discarded, presumably to avoid internal damage, as these bones are usually quite hard and sharp. The fish were often still alive when the opercular bones were removed. Other bones were apparently swallowed, though at times undigested caudal (tail) fins were located under nest trees. One male partly ate large fish before giving them to a nestling, while small fish were given whole to the young. On one occasion the same male placed two small fish in the nest simultaneously, one being carried in each foot.

Threats to breeding Ospreys

Two addled eggs were collected from a nest near the Clarence River and their empty shells sent to Penny Olsen (C.S.I.R.O. Division of Wildlife and Rangelands Research) for pesticide analysis. They were found to be not significantly thinner than eggs collected before the introduction of DDT into Australia.

Other known threats to breeding Ospreys include shooting and egg collecting.

DISCUSSION

Breeding season

The breeding season of the Osprey in Australia has been variously given as September to October, August to November and September to November in the south of the range; April to July, July to September and May to September in the north; and July to August in southern Queensland (Beruldsen 1980; Reader's Digest 1986; Cupper and Cupper 1981). Morris *et al.* (1981) give May to September as the period of egg laying in New South Wales. Observations during this survey suggest that Ospreys in north-eastern New South Wales arrive in the nest area during late March. Nest construction and repair occur during June, and mating and egg laying occur during July and August. Eggs hatch during August or September following a 33-35 day incubation period (Cupper and Cupper 1981; Price-Jones 1983). Fledging, which takes about 50 days, usually occurs during October.

Nests

Throughout the Australian and overseas range of the Osprey nest placement varies from trees, cliff-faces or rocky pinnacles, to the ground or rocks, the last usually on offshore islands. Man-made structures, such as transmission towers, are also used as nest sites (Beruldsen 1980; Reader's Digest 1986; Cupper and Cupper 1981). All nests studied during this survey were placed in tall dead or partly dead trees. A nest located after the survey was constructed on a pile of discarded oyster stakes on an abandoned vehicular ferry. Ospreys have not been recorded breeding on any offshore island in New South Wales despite visits by ornithologists to most, if not all. The size of a nest would make it difficult to overlook and it seems extremely unlikely that any exist.

Other authors have noted that Ospreys line their nests with dry vegetation, especially seaweed, sometimes with grasses or palm leaves (Beruldsen 1980; Cayley 1987; Cupper and Cupper 1981; Morris 1976; Reader's Digest 1986). Of three nests examined during this

survey, two were lined with *Melaleuca* bark and some kelp; one also contained some palm fibre. The third nest contained woodchips, bark from Blackbutt trees, *Melaleuca* bark, and dried grass. It appears that the nest lining varies depending upon locally available materials. The third nest mentioned above was sited close to a bush saw-mill, hence the woodchips.

Clutch size and breeding success

The usual clutch size of the Osprey has been stated as two or three, rarely four (Beruldsen 1980; Cupper and Cupper 1981; Reader's Digest 1986); the limited data from this survey agree with this. Cupper and Cupper (1981) examined seven nests, four of which had three eggs and three of which had two. The three nests examined during this survey had clutches of three.

When a clutch size of three occurs, it is apparently common for one egg to fail to hatch (Cupper and Cupper 1981; P. Olsen, pers. comm.). The maximum number of offspring in this survey was two. At one nest with a clutch of three, only one egg hatched successfully. Two added eggs discussed elsewhere were collected from this nest.

Breeding success could not be determined precisely; however, from the limited data it seems likely that sites with little or no disturbance regularly produce two young to the flying stage. Sites with regular disturbances may produce only one, or even no young. A mean of 1.6 young were fledged from the eight breeding attempts for which the outcome is known. Holsworth (1965) recorded a mean of 1.4 young from nine breeding attempts, but when the one unsuccessful attempt is eliminated from the analysis, it gives a mean of 1.6 from eight breeding attempts. These data on successful breeding attempts therefore agree.

Sexual dimorphism

Reader's Digest (1986) describes the female Osprey as similar to male, but having the crown and breast band more heavily marked with brown forming a necklace. Observations during this survey support this, though some variation in the width and colour of the breast band was noted

in both sexes. Sexing was usually possible by noting the size difference between the male and female of a pair, the female being the larger.

Diet

The diet of the Osprey in Australia is considered to consist exclusively of fish, or with the occasional sea snake (Reader's Digest 1986; Blakers *et al.* 1984; Cupper and Cupper 1981). Although most food records during this survey involved fish, other animals were recorded (see Results). The survey records of cuttlefish, crustaceans, a reptile and a mammal antedate those of Smith (1985), who claimed that his observations were the first of birds and crustacea in the diet of Ospreys from the southern hemisphere. Mullet, probably Bully Mullet *Mugil cephalus* and Flat-tailed Mullet *Liza argentea*, were the fish most frequently observed in the diet of the local Ospreys; Silver Bream and Whiting were also eaten. Leatherjackets featured prominently in fish remains examined under an active nest south of Newcastle subsequent to this survey (in 1985). Smith (1985) recorded eight families of fish, one family of seabird and a crustacean in prey remains from Osprey roosts on the Great Barrier Reef. Triggerfish (Balistidae) and surgeonfish (Acanthuridae) were the most frequently recorded fish. Seabirds have also been recorded in the diet of Ospreys in Torres Strait and at Rottnest Island. Mammals and a lizard were also recorded at the latter site and a lizard was observed being eaten in South Australia (Langford 1986; Mooney 1987; Saunders and de Rebeira 1985).

Threats to breeding Ospreys

Ospreys traditionally return to the same nest each year, providing that it is still present (pers. obs., Cupper and Cupper 1981). The removal of nest trees, which are almost always tall and dead, and therefore considered dangerous where close to habitation, is the main threat to their breeding success. This is compounded in areas of rapid development, such as the Coffs Harbour district, where the available nest sites are declining as a result of urban development. Removal of a nest tree has been documented in the press. Nevertheless, the number of potential nest trees available appears to be sufficient at present, as an artificial

nest platform erected south of Coffs Harbour has not yet been used for nesting. There may, however, be other reasons why the platform has not been utilized for breeding.

Examination of the two addled eggs collected from the Clarence River area found them to be not significantly thinner than eggs collected prior to the introduction of DDT to Australia. However, as the contents of the eggs were discarded by the author, the possibility of other pesticides affecting egg fertility cannot be discounted. P. Olsen (pers. comm.) has suggested that the female may have accidentally pricked the eggs with her talons. The loss of eggs from accidental damage by adult birds could be expected to increase with an increase of human disturbance near nests. Despite this, there is recent evidence to suggest that pesticide levels in some Ospreys on the New South Wales north coast are dangerously high.

Egg collecting may affect breeding success, but because this practice is illegal, its exact extent is not known. An apparent slight increase in Osprey numbers on the north coast in recent years may reflect a decline in illegal egg collecting as a result of law enforcement activities. There is also a greater number of 'Osprey watchers' in this area as a result of these surveys, and the subsequent publicity may have deterred some egg collecting activities.

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