

A Long-term Breeding Trio of Pied Oystercatchers *Haematopus longirostris*

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Summary

A polygynous breeding association of the Pied Oystercatcher *Haematopus longirostris* was studied over 10 breeding seasons, 1994–2003, on the North Coast of New South Wales. Nest and clutch characteristics, breeding behaviour, parental care and territory defence were monitored. Clutches were sometimes laid in separate nests and sometimes in a common nest, apparently at random, with the latter the more frequent option. Laying was highly synchronised. Parental care, feeding, territory protection and predator defence were all shared between the two females and the male. Aspects where our results add to previous knowledge are discussed.

Introduction

The normal mating system in the genus *Haematopus* is strict monogamy (Marchant & Higgins 1993; Hockey 1996). A few instances of unusual breeding associations, including bigamy, have been published since 1913. In the United Kingdom the Eurasian Oystercatcher *H. ostralegus* has formed trios of one male and two breeding females, laying separate (Rowan 1913; Harris 1967; Briggs 1984) or combined (Barnes 1950; Ticehurst 1950; Nevin & Ticehurst 1951) clutches. In the Netherlands a study over 14 years found that polygyny was extremely rare (Heg & van Treuren 1998). Two pairs attending a common nest has been reported in the American Oystercatcher *H. palliatus* (Chapman 1982) as also has probable polygyny, based on clutch-sizes rather than behavioural observations of birds (Lauro *et al.* 1992). A nest shared by two pairs of Black Oystercatchers *H. bachmani* has been reported in Alaska (Webster 1941), and a trio of this species with separate clutches 1.2 km apart was observed by Morse (2005). The only record of likely polygynous breeding in the Southern Hemisphere is of the Variable Oystercatcher *H. unicolor* of New Zealand: one instance of 'chicks raised by a threesome' (Keeley 1989). The present paper documents breeding events undertaken by a trio of the Pied Oystercatcher *H. longirostris* of Australia, nesting in the same territory over more than 10 consecutive seasons.

Study area and methods

Study site and territory characteristics

The breeding site was in northern New South Wales, ~ 14 km south of the Richmond River mouth (28°33'S, 153°19'E), commonly known as South Ballina Beach. The breeding habitat is sandy, open ocean beach backed by bare or lightly grassed low sloping dunes and steeper higher dunes to ~ 10 m elevation, vegetated with Coastal Wattle *Acacia sophorae* and introduced Bitou Bush *Chrysanthemoides monillifera*. A semi-permanent freshwater swamp is situated immediately behind the dunes. The territory studied comprised ~ 1 km of beachfront and adjoining dunes, and bordered other Pied Oystercatcher territories to the

north and south. The trio was part of a fairly static population of 14 to 18 breeding pairs, spread over about 17 km of beach. Islands in the swamp were also occasionally used for breeding by the trio and by two adjacent pairs. The breeding pairs were unevenly spaced in distribution along the beach, generally with territories ranging from 0.4 to 1.4 km of beachfront. Pairs rarely nested in closer proximity than 200 m.

Methods

Irregular observations before this study indicated that during and since the 1992 breeding season there were always three adult Oystercatchers in the territory studied. Regular monitoring of the trio by BT commenced in the 1994 breeding season as part of a breeding study of the South Ballina Pied Oystercatcher population. In the 2000 season the population monitoring became part of a New South Wales National Parks & Wildlife Service (NSW NPWS) fox threat-abatement program, but close monitoring of the trio continued independently.

Breeding pairs and the trio were monitored every 3 days, but daily when laying or hatching was imminent or in progress and sometimes longer apart than 3 days pre- and post-breeding. The following information was recorded: laying and clutch-completion dates, clutch-sizes, distance between clutches, distance of clutches from the high-water mark and estimated elevation, hatching, chick survival until confirmed lost, and fledging dates. Responses to trespassing neighbouring breeding pairs and other conspecific intruders, potential predators and scavengers were also recorded.

The incubation routine of the trio, parental care and territory defence were monitored by AH during the 2003 breeding season, using a telescope from sites deemed to be sufficiently distant not to interfere with the incubation routine, generally ~ 200 m away. Monitoring periods to record the involvement of all three adult Oystercatchers in incubation, care and defence were of 20–90 minutes' duration. Two nests were monitored, each containing a clutch of four eggs and thus apparently containing eggs laid by both females (see Discussion). Members of the trio were sexed in the field based on noticeable differences in bill length.

Results

Breeding history

The breeding history of the trio for the first six seasons, 1994–99, is shown in Table 1 as a representative sample. Breeding continued more or less similarly until 2003, for a total of 39 trio-breeding events. Synchronous clutches laid in either a common nest or in separate nests were defined as one trio-breeding event. The three birds were last observed together on 9 January 2004, foraging with two young, which both fledged the following day. In the following breeding seasons, 2004 and 2005, a pair bred in the territory, possibly the male and one of the females from the trio.

The majority of the 48 Pied Oystercatcher nests observed during this study (1994–2003) were situated in the low dune (54%). Others were on sand filllets accreting against an erosion cut caused by storm or king tides (30%), on the beach at or below the high-tide mark (7%), or on the high dune (7%). Only one nest was on an island in the swamp. Of the 39 breeding events recorded for the trio, 30 were in a common nest and nine in separate nests; in the latter case, the distance between the separate nests varied from 5 to 250 m.

Laying and incubation

The highest number of clutches laid by the trio in one season was seven (in 1996; see Table 1). In separate nests the number of eggs laid ranged from one to three, with a mean of 2.0 (\pm Standard Deviation 0.58) eggs. Communal nests

Table 1. Breeding history 1994–99 of Pied Oystercatcher trio at South Ballina, NSW.
* indicates a breeding event with synchronised clutches laid in separate nests.

| <i>Season</i> | <i>Breeding event no.</i> | <i>Clutch-size</i> | <i>Date clutch completed</i> | <i>Date eggs lost</i> | <i>Likely fate</i> |
|---------------|---------------------------|--------------------|------------------------------|-----------------------|-----------------------------|
| 1994 | 941 * | 2 | 06.09.94 | 08.09.94 | Tide washout |
| | 941 * | 2 | 10.09.94 | 17.09.94 | Destroyed by campers |
| | 942 | 3 | 13.10.94 | 22.10.94 | Unknown |
| | 943 | 1 | 05.11.94 | 08.11.94 | Unknown |
| | 944 | 1 | 19.11.94 | 23.11.94 | Unknown |
| 1995 | 951 | 4 | 31.08.95 | 06.09.95 | Fox predation |
| | 952 | 3 | 21.09.95 | 25.09.95 | Unknown |
| | 953 | 2 | 08.10.95 | 11.10.95 | Dune collapse |
| | 954 | 3 | 26.10.95 | 30.10.95 | Unknown |
| | 955 | 3 | 14.11.95 | 18.11.95 | Tide washout |
| 1996 | 961 | 4 | 11.08.96 | 21.08.96 | Fox predation |
| | 962 | 4 | 31.08.96 | 06.09.96 | Fox predation |
| | 963 | 2 | 18.09.96 | 21.09.96 | Unknown |
| | 964 | 3 | 03.10.96 | 07.10.96 | Fox predation |
| | 965 | 2 | 20.10.96 | 23.10.96 | Unknown |
| | 966 | 3 | 02.11.96 | 04.11.96 | Unknown |
| | 967 | 1 | 15.11.96 | 20.11.96 | Dune collapse |
| 1997 | 971 | 3 | 30.08.97 | | Hatched 3, fledged 1 |
| 1998 | 981 * | 2 | 10.08.98 | 23.08.98 | Unknown |
| | 981 * | 2 | 14.08.98 | 22.08.98 | Fox predation |
| | 982 * | 2 | 03.09.98 | 08.09.98 | Abandoned |
| | 982 * | 2 | 04.09.98 | | Hatched 2, fledged 2 |
| 1999 | 991 | 2 | 21.08.99 | 24.08.99 | Unknown |
| | 992 | 4 | 09.09.99 | 20.09.99 | Bird predation |
| | 993 * | 3 | 02.10.99 | | Hatched 3, fledged 0 |
| | 993 * | 1 | 04.10.99 | 20.10.99 | Unknown |
| Total | 26 clutches | 64 eggs | 56 eggs lost | | 8 hatched, 3 fledged |

contained one to four eggs, with a mean clutch-size of 2.8 ± 0.80 eggs. Laying of both separate and combined clutches was highly synchronised, defined here as being laid within the time it would have taken for one female to lay the same number of eggs at 2-day intervals. Of the 39 breeding events, there was only one instance of asynchronous laying, where the second of two separate clutches (of two eggs each, nests 300 m apart), was completed 14 days after the first one.

During 2003, incubation times of each bird of the trio were measured on six occasions. Survey durations ranged from 20 minutes to 1.5 h (total time 6.0 h), during which time all three individuals were involved, although duties were not equally shared (Figure 1). The two females collectively incubated for 70% of the survey time and the male for the remaining 20% of time that eggs were attended

(eggs were unattended because of disturbance for 10% of total survey time). On three occasions the male did not incubate at all. Incubation changeovers ranged from none to four times during a survey period. Occasionally when both off-duty birds came to the nest at the same time, the relieving bird was replaced by the other after only a few minutes of incubation.

The base colour of the eggs varied from light olive to light brown in combined clutches as well as in separate clutches.

Parental care and defence

During the observation periods, parental care and feeding were shared between the three adults. All brought food to the chicks and fed them. Both females also brought food to the one that was waiting with the chicks, which then fed it to the chicks. The females also brought food to the male which then fed it to the chicks. No female–female aggression was observed. All three adults were observed partitioning food, allowing each chick to receive small quantities; no sibling bias was observed. On average, 67% of food items collectively obtained were fed to the chicks. The Pipi *Donax deltoides* was the only prey species observed given to the young.

The male spent more time (11% of the observation time) than the females collectively (6%) defending the nest or territory. All three adults also spent some time standing guard close by the nests. Both females combined spent more time (17% of the observation time) on this duty than the male did (4%). Conspecific intruders into the territory were vigorously attacked and expelled by the three Oystercatchers either together, in pairs or singly. Potential predator—Whistling Kites *Haliastur sphenurus*, Brahminy Kites *H. indus* and White-bellied Sea-Eagles *Haliaeetus leucogaster*—were mobbed by the trio in unison. The male and one female repeatedly dived at a domestic dog.

Discussion

The paucity of references to breeding systems other than monogamy in such a well-studied genus indicates that what has been loosely termed communal breeding or bigamy is a rare and therefore probably unimportant aberration in oystercatchers. The possible reasons for, and the consequences of, polygynous breeding behaviour were analysed by Heg & van Treuren (1998). The purpose of the present report is to document a long-term such breeding association of the Pied Oystercatcher. Monitoring of shared incubation, feeding and territory defence was deemed sufficient to verify that all three adults were involved in these duties but, because of the short monitoring periods, it is not possible to draw meaningful conclusions on division of those duties.

Bigamy in the Eurasian Oystercatcher is occasional and opportunistic (Cramp & Simmons 1983), yet repeated breeding by trios has been reported in consecutive seasons (Barnes 1950; Nevin & Ticehurst 1951; Briggs 1984). A trio of Black Oystercatchers bred in two consecutive seasons (Morse 2005), and the population studied by Lauro *et al.* (1992) could have included undetected repeated breeding by trios. The trio studied by us appeared to have robust social bonds that were evident through collaborative incubation, shared parental care and lack of any aggression between females. This breeding association, spanning more than a decade, was clearly not opportunistic. Prolonged polygyny by the same individuals may be more common than is generally assumed in oystercatchers and possibly

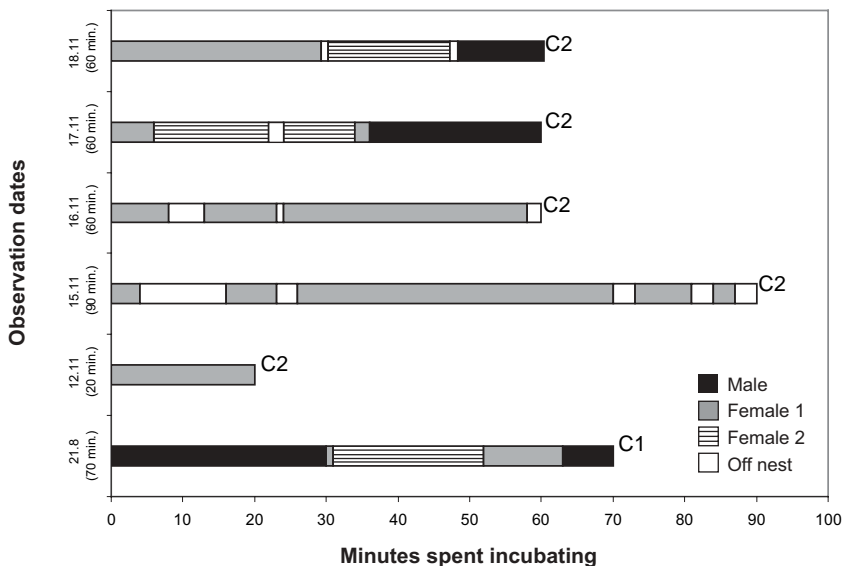


Figure 1. Incubation by a trio of Pied Oystercatchers at two nests at South Ballina, NSW, on six observation days [date (day, month) and duration (minutes) as specified] during 2003: incubation periods undertaken by each adult. C1 = first clutch (four eggs, completed 20.08.03), C2 = second clutch (four eggs, completed 11.11.03). Females were not individually identified; Female 1 is the female incubating at the start of monitoring, Female 2 is the other female, off nest = nest unattended.

undetected because of some species and populations not receiving much study effort. Nonetheless, we suggest that polygynous breeding in the Pied Oystercatcher is rare: of the 41 breeding associations monitored on the far North Coast of New South Wales by AH over three breeding seasons (2003–05) only the one in this study was not monogamous (A. Harrison unpublished data).

Without direct observation it is not possible to conclude with certainty that both females laid eggs in communal nests even though both contributed to incubation. However, the last two eggs in clutch 954 were laid within 26 hours, the last three eggs in clutch 992 were laid within 48 hours, and similar laying intervals were recorded throughout the study period, indicating laying by both females. Clutches of three are uncommon in the Pied Oystercatcher and clutches of four rare (Marchant & Higgins 1993). The high proportion of such clutch-sizes in the present study also indicates the contribution by both females. We also note that, compared with previous studies of the species in Tasmania (Newman 1992), the intervals between replacement clutches appear very short. We therefore suggest that laying by both females in shared nests does seem likely.

Eggs in combined clutches of the Black (Lauro *et al.* 1992) and Eurasian (Barnes 1950; Leach 1980) Oystercatchers were of different base colour, suggesting that base colour in those species can assist in identifying eggs laid by different females. We found, however, that the base colour of the Pied Oystercatcher trio's eggs did not follow any pattern and was equally variable in the eggs of the monogamous pairs in the population. In the Pied Oystercatcher at least, variation

of the egg base colour seems not to be a good indication of different parentage.

For the first three monitored seasons (1994–96), breeding was unsuccessful, with many eggs lost to predation; only one chick hatched and subsequently fledged from 16 pairs of Pied Oystercatchers. Fox control specifically to protect the Oystercatcher breeding population in and around the study area was introduced by NSW NPWS in the 1997 season and continued throughout the study period, with varied success (Wellman *et al.* 2000). An improvement in breeding success was evident, however, after the introduction of this control program (see Table 1 for breeding success of the trio). We found no apparent difference in breeding success between the monogamous population and the trio.

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