

HYBRIDIZATION BETWEEN LITTLE TERN *Sterna albifrons* AND FAIRY TERN *Sterna nereis* IN BOTANY BAY, NEW SOUTH WALES

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The Little Tern *Sterna albifrons* and Fairy Tern *S. nereis* are largely allopatric breeders, but the incidence of breeding sympatry and hybridization appears to be increasing as the breeding range of the Fairy Tern expands northward. During the summer of 1996–97, a mixed pair comprising a female Little Tern and a male Fairy Tern nested on Towra Spit Island, Botany Bay. Species identification was confirmed by both plumage characteristics and morphometric measurements. The mixed pair successfully hatched two young from a clutch of three eggs. Hybridization may ultimately threaten the continued survival of one or both species.

INTRODUCTION

The Little Tern *Sterna albifrons* and Fairy Tern *S. nereis* are closely related species. These, together with the Least Tern *S. antillarum*, Saunder's Tern *S. saundersi*, Peruvian Tern *S. lorata*, Yellow-billed Tern *S. supercilialis* and perhaps the Damara Tern *S. balaenarum*, form a superspecies (Chandler and Wilds 1994; Olsen and Larsson 1995) — a set of species that were once races of a single species, but have diverged and retained largely separate distributions (Amadon 1966).

Until recently, the Little Tern and the Fairy Tern were thought to be allopatric breeders (Hitchcock 1959), each species occupying distinct breeding ranges. During the last few decades, however, an overlap of their breeding ranges has become apparent (Cox and Close 1977), and this area of breeding sympatry appears to be expanding. Within Australia, the Little Tern occurs from Shark Bay in the west, around northern Australia and down the east coast to Tasmania and across to the Gulf of St Vincent in South Australia (Blakers *et al.* 1984). Traditionally, breeding is believed to have been confined to the coast of the Gulf of Carpentaria and to eastern and south-eastern Australia. More recently, the species is known to have bred in South Australia (Eckert 1970; Glover 1973), in north-eastern Tasmania (Napier 1972) and at Broome in Western Australia (Collins and Jessop 1997). The Fairy Tern breeds on the coasts of Victoria, South Australia, Tasmania and Western Australia as far north as Admiralty Gulf (Blakers *et al.* 1984). Current evidence also suggests that the Fairy Tern is extending its breeding range northward into New South Wales. The causes underlying the range expansion of these species are unknown.

Until recently, the Fairy Tern was only a rare, non-breeding vagrant to New South Wales (Hoskin and Hindwood 1964; Hill *et al.* 1988). The first confirmed breeding of Fairy Terns in this State took place during the summer of 1994–95. Three pairs nested alongside two pairs of Little Terns on a small, sand island at the north-eastern end of Wallagoot Lake, approximately 12 kilometres north of Merimbula (Jones 1995). In 1995–96

five pairs of Fairy Terns nested with four or more pairs of Little Terns on a sand-spit at the northern side of Mogareka Inlet at the mouth of the Bega River (Smith 1997).

A colony of Little Terns regularly breeds in Botany Bay, New South Wales. This colony has been acutely affected by foreshore development, particularly the expansion of Kingsford Smith Airport (Straw and Priddel 1992). For many decades, breeding success at the colony was poor with few or no fledglings produced each year. Construction of an additional airport runway in 1993 removed the last remaining vestige of suitable nesting habitat near the traditional nesting site at the mouth of the Cooks River. In response to this development, the Little Tern colony in Botany Bay moved away from the airport environs to a newly-formed, sand island within the Towra Point Aquatic Reserve on the southern side of the Bay. The protection afforded by an island location, together with intensive management of the colony by the National Parks and Wildlife Service, has seen the colony flourish. Fledging success over the past five years has been high, allowing the colony to grow substantially (Priddel and Ross 1996). More than 50 pairs of Little Terns now breed in Botany Bay each year.

During the 1996–97 breeding season, a pair of birds sharing incubation duties at one particular nest in Botany Bay looked to have dissimilar plumage. One bird had the appearance of a Fairy Tern. Fairy Terns have been recorded in the Bay on only one occasion previously, in 1962 (Hoskin and Hindwood 1964). This paper presents direct evidence of the first recorded instance of hybridization between Little Terns and Fairy Terns in Botany Bay.

METHODS

Intensive monitoring of the Botany Bay colony has been undertaken since its translocation to Towra Spit Island in 1992 (Priddel and Ross 1996). Part of this monitoring entails trapping and banding breeding birds. Adults are captured in small circular clap-traps placed over the nest. Nestlings are captured by hand while still in the nest, within the first three days of hatching. Careful trial and evaluation of these procedures have shown that, when used cautiously, they can be practised without undue risk to the birds or their eggs.

Captured adults and nestlings are routinely measured and then banded with individually numbered metal leg-bands supplied by the Australian Bird and Bat Banding Scheme (ABBBS). Adults are also fitted with three coloured plastic leg-flags (a circular band with a rigid extension protruding outward from the leg). More than 300 Little Terns have been banded in Botany Bay since 1992.

To confirm the species identification of the mixed pair nesting in Botany Bay, both birds were trapped using the method described above. The birds were also examined for plumage differences, measured, banded, and photographed. The eggs were monitored throughout the period of incubation, and the chicks examined and banded shortly after hatching.

RESULTS

Close examination of the two birds confirmed that this was a mixed pair comprising a Fairy Tern and a Little Tern (Fig. 1). The diagnostic features for distinguishing the two species comprise: plumage coloration of the head, back and wings, particularly the two outermost primaries; coloration of the bill and legs; and a difference in body weight (Hitchcock 1967; Higgins and Davies 1996). One member of the pair, identified as a Little Tern, had a black crown, nape and lores, and a white forehead that tapered back over each eye. The bill was yellow with a black tip, and the legs were orange-yellow. The outermost primaries in the folded wing were dark grey to black, and contrasted with the paler, inner primaries. The back and wings were pale grey, and contrasted with the white rump and tail. The other partner of the pair, identified as a Fairy Tern, was slightly larger and stockier than its mate. The crown and

nape were black, but the lores and forehead were white. The white of the forehead did not extend back over the eye as in the Little Tern. It is possible for Little Terns, when moulting their breeding plumage, to show a loral pattern superficially like that of Fairy Terns (Higgins and Davies 1996). However, other plumage characteristics clearly distinguished this individual as a Fairy Tern. The bill and legs were distinctly orange. The primaries were pale grey with a narrow black line visible along the leading edge of the outermost primary. The back and wings were a little paler than those of the Little Tern, and contrasted less with the white rump and tail.

The mixed pair produced and incubated a clutch of three eggs that were indistinguishable in size or pigmentation from Little Tern eggs. Three is the typical clutch size for Little Terns, particularly in Botany Bay (Priddel and Ross 1996), which is greater than the normal two egg clutch of Fairy Terns (Higgins and Davies 1996). This, together with the size and appearance of the eggs, suggested that the Little Tern was probably the female of the pair and, by default, the Fairy Tern the male. This inference was supported by the relative time each bird spent incubating eggs. Although incubation duties were shared, the Little Tern was more frequently seen on the nest than was the Fairy Tern. Females of both species typically undertake most of the incubation duties (Higgins and Davies 1996).

Morphometric measurements of the mixed pair (Table 1) were analysed to determine whether they supported the

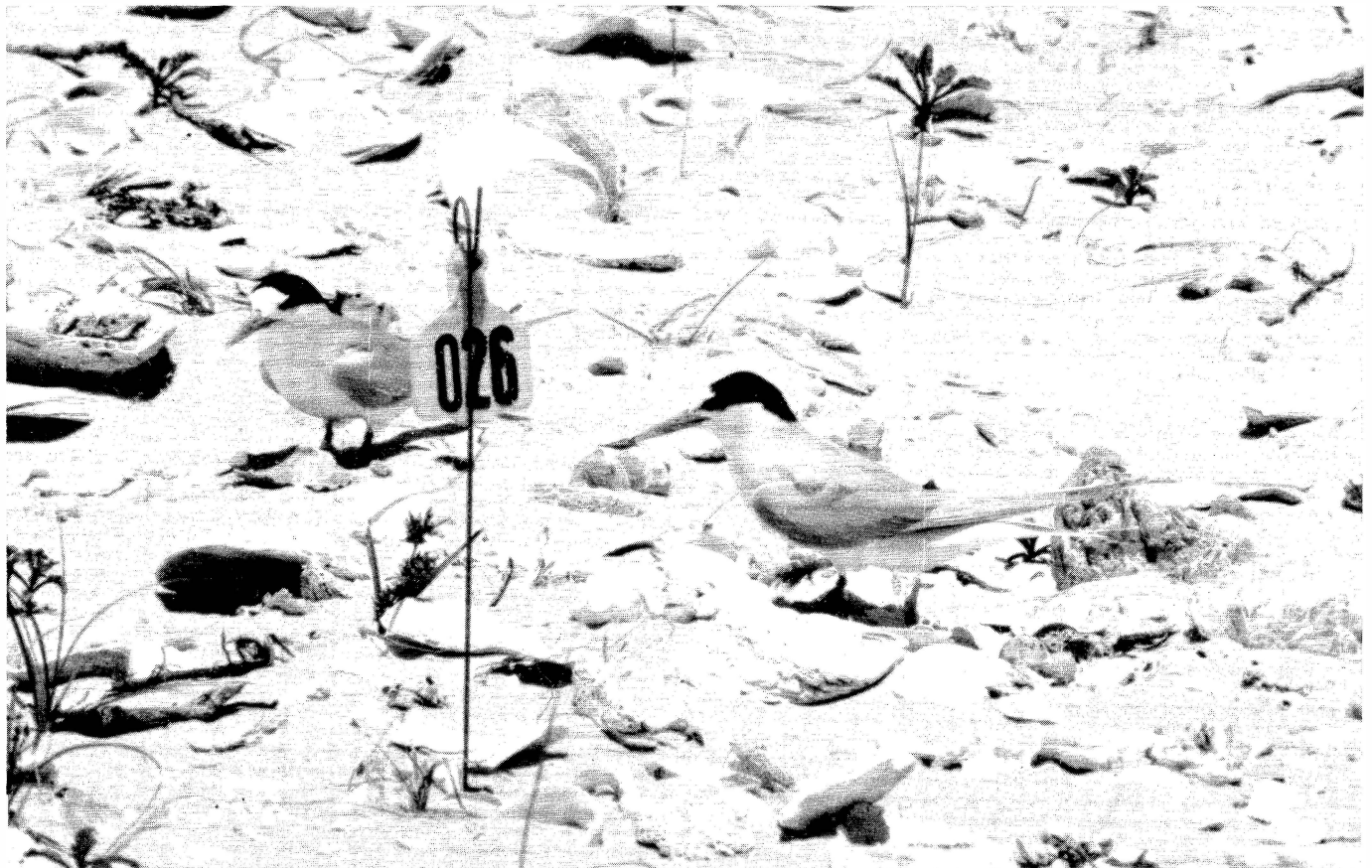


Figure 1. Fairy Tern *Sterna nereis* (left) and Little Tern *S. albigula* (right) nesting together as a pair at Botany Bay, New South Wales.

findings based on plumage characteristics and nesting activity. The measurements were compared with data recorded for Little Terns at Botany Bay, and with reference data for each of the two species (data taken from Higgins and Davies 1996). The reference data indicated that it was possible to differentiate between species on the basis of body weight and tarsal length. Although measurements of wing length and tail length were also taken, these parameters are not sufficiently disparate to differentiate the two species, particularly for individuals whose sex is uncertain (see data in Higgins and Davies 1996). Moreover, wing and tail length are not particularly reliable measures as they are dependent on the condition of the plumage, and as such can be subject to considerable variation.

The body weight of the bird identified from plumage characteristics as a Fairy Tern (66.5 g) was well outside the range of weights recorded for Little Terns, both within Botany Bay and elsewhere (Table 1). It was, however, within the reference range of body weights recorded for female Fairy Terns (Table 1) and just outside the range of weights recorded for male Fairy Terns. This bird had a tarsal length of 16.8 mm, within the range of both Little Terns and Fairy Terns (Table 1). The partner of the mixed pair, identified from plumage characteristics as a Little Tern, had a body weight and tarsal length that were both typical of Little Terns (Table 1).

Both birds were released unharmed after being marked with coloured plastic leg-flags and numbered metal leg-bands supplied by the ABBBS. (Fairy Tern: left leg, dark green over dark blue; right leg white over metal 041-36201; Little Tern: left leg, red over red; right leg white over metal 041-36181.)

Two eggs hatched from the hybrid clutch of three. The third egg contained no visible sign of development and was probably infertile. The two nestlings were banded with numbered, metal bands (numbers: 041-36242, 041-36243). Like all Little Tern nestlings, the tarsi of the hybrid nestlings were too short to accommodate coloured flags in addition to the metal band. Although a single flag would fit on the other leg, this particular scheme was already in use elsewhere and could not be duplicated without jeopardizing other studies. There was no discernible difference in colouration between the hybrid nestlings and Little Tern nestlings. Without any means to distinguish the

hybrids from other chicks and fledglings present in the colony, it was not possible to ascertain whether the hybrid young fledged successfully.

DISCUSSION

Plumage and morphometric data were consistent with the birds being a mixed pair comprising a Little Tern female and a Fairy Tern male. Hybridization between Fairy and Little Terns has been reported previously. In 1975, at Price Saltfields on the shore of Gulf St Vincent, South Australia, one Little Tern mated with a Fairy Tern and another mated with an unconfirmed hybrid (Cox and Close 1977). There is also a report of a Fairy Tern and a Little Tern nesting together on a sand-spit at the mouth of Tilba Lake, New South Wales in December 1980 (Lindsey 1981). In 1997–98, the small breeding colony of Little Terns at Wallagoot Lake included two mixed pairs of Little Terns and Fairy Terns, both of which nested (B. Jones, pers. comm.). As the 1998–99 breeding season begins, the Little Tern colony at Wallagoot Lake currently contains one mixed pair engaged in pre-nesting courtship behaviour.

It appears that mixed pairs of Little Terns and Fairy Terns can breed successfully, producing hybrids that are themselves fertile. Individuals with breeding plumage intermediate between both species have been observed in South Australia (Cox and Close 1977) and Victoria (Sharland 1938; Cox and Close 1977; Vincent 1983). One of these apparent hybrids nested with a Fairy Tern at Price Saltfields, South Australia, where the pair successfully hatched a single chick from a clutch of two eggs (Cox and Close 1977).

The apparent past rarity of interbreeding between Little Terns and Fairy Terns is understandable given the previously small overlap in breeding range. Both species, however, appear to be expanding their breeding range, and the incidence of interbreeding appears to be increasing. The northward progression of the Fairy Tern into New South Wales has brought the two species into much closer contact. Twenty-five Fairy Terns in breeding plumage together with five or more flying young were seen at Wallagoot Lake during January 1998 (J. Leonard, pers. comm.). Interbreeding at this locale already appears to be a regular occurrence.

TABLE 1

Comparison of morphometric measurements of the mixed pair nesting at Botany Bay with reference data for Fairy Terns *Sterna nereis* and Little Terns *S. albifrons*. ^A Reference data taken from Higgins and Davies (1996).

Species Individual/group	Weight			Tarsus			Wing (mm)	Tail (mm)
	range (g)	mean (g)	<i>n</i>	range (mm)	mean (mm)	<i>n</i>		
Little Tern <i>Sterna albifrons</i>								
Individual of mixed pair		53.5			17.7		184.0	100.0
Botany Bay population	44.0–59.0	53.4	87	15.0–21.5	17.6	83	181.8	94.0
Males ^A	35.0–60.0	51.2	8	15.5–18.4	17.3	17	187.2	101.9
Females ^A	39.0–60.0	51.9	6	16.3–18.0	17.2	19	183.8	90.5
Fairy Tern <i>S. nereis</i>								
Individual of mixed pair		66.5			16.8		190.0	110.0
Males ^A	68.0–80.0	72.2	6	15.0–19.2	16.7	25	186.8	91.0
Females ^A	64.0–80.0	72.4	11	15.7–16.8	16.3	16	182.4	82.0

As the area of breeding overlap of Little Terns and Fairy Terns continues to increase, so too will the opportunity for interbreeding. As the hybrid young appear to be fertile, there is a risk that the genetic distinctiveness of the two species will be compromised through hybridization. Several potential outcomes, however, are possible. If the current spate of interbreeding is caused by a lack of mates of the same species, interbreeding may continue to occur only at the leading edge of the advancing ranges, with sympatry becoming established behind (Cox and Close 1977). If the hybrids exhibit a high site-fidelity, interbreeding may eventually create a zone of hybridization within the area of breeding overlap. The worst case scenario will arise if hybrid genetic material is transferred widely across the range of one or other species. This process will lead to the genetic integrity of the species being severely compromised. Genetic mixing may eventually threaten the continued survival of one or both species, in much the same way that it now threatens the survival of the Black-eared Miner *Manorina melanotis*. Now extremely rare, this species is being hybridized out of existence through genetic swamping by the common and widespread congeneric Yellow-throated Miner *M. flavigula* as clearing of its mallee habitat allows contact between the species (Schodde 1981).

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