

NOTES ON THE COMMON BIRDS OF GABO ISLAND, VICTORIA

PETER J. FULLAGAR¹, PETRUS C. HEYLIGERS and MICHAEL A. CROWLEY

M I Partners, PO Box 236, Moruya, New South Wales 2537

¹Corresponding author: E-mail: Peter@fullagar.com

Received: 7 December 2004

A total of 144 bird species has been recorded for Gabo Island and its adjacent waters; however, only 19 are confirmed or suspected as breeding on the island. Seabirds breeding on the island are the Little Penguin and the Short-tailed Shearwater, with about 16 500 and about 6 400 pairs, respectively. Other birds include the Caspian Tern, Swamp Harrier, Sooty Oystercatcher, Masked Lapwing, Brush Bronzewing, Horsfield's Bronze-cuckoo, Yellow-faced Honeyeater, New Holland Honeyeater, Tawny-crowned Honeyeater, Golden Whistler, Willie Wagtail, Welcome Swallow, Australian Pipit, Golden-headed Cisticola, Silveryeye, Common Blackbird and Common Starling. Notable absentees include rails, rosellas, Laughing Kookaburra, Eastern Yellow Robin, Grey Shrike-thrush, fairy wrens, White-browed Scrubwren, gerygone warblers, thornbills, wattlebirds, woodswallows, butcherbirds and currawongs. It is not clear why so many species apparently do not occur on the island as only a narrow passage separates it from the mainland, although a change in vegetation on the island over time is suspected.

INTRODUCTION

Gabo Island (37°34'S, 149°55'E; 126.5 ha) is situated between Cape Howe and Mallacoota Inlet at the north-eastern entrance to Bass Strait, only about 500 metres offshore from the wilderness section of Croajingolong National Park (Reilly 1977). Protruding as it does into the waters of Bass Strait, the island is well positioned for watching seabirds, not to mention migrating whales. Concentrations of krill and other plankton, formed as the result of opposing surface currents, attract large numbers of seabirds of various species.

The island harbours the largest breeding colony of Little Penguins *Eudyptula minor* in Victoria (Fullagar *et al.* 1995; Fullagar and Heyligers 1996) as well as several discrete Short-tailed Shearwater *Puffinus tenuirostris* colonies. It is also a stronghold for the Sooty Oystercatcher *Haematopus fuliginosus* that inhabit the generally sandy shoreline of East Gippsland. The island provides a mosaic of habitats, which is reflected in the variety of resident species and regular visitors, although their total number is rather low. Quite a few species, which one would expect to encounter in these habitats on the mainland, are absent from Gabo Island.

The aim of this paper is to present information about common species that inhabit Gabo Island. A compendium of the avifauna of the island and the surrounding waters of Bass Strait can be found in Fullagar *et al.* (2005).

NATURAL AND HUMAN HISTORY

The underlying geology of the island is red granite, which is exposed along the island's fringe and which provided the material for the construction of the lighthouse at the south-eastern tip. Santa Barbara Bay, the only somewhat sheltered cove in the north-west corner of the island, has a sandy beach while boulder beaches occur in some coves around the island and at the northern tip. Sand deposits overlying the granite have been shaped by wind into high dune ridges and intervening swales. Historic records show that a sandbar at the north of the island provided, at times, a connection to the mainland and was used by horse-drawn vehicles carrying material for the construction of the lighthouse.

In the centre of the island the dunes are covered by a low forest, dominated by Coast Banksia *Banksia integrifolia* and Coast Tea-tree *Leptospermum laevigatum* with Giant Honey-myrtle *Melaleuca armillaris*

in the intervening depressions (Fig. 1). A low vegetation of succulent plants such as Karkalla *Carpobrotus rossii*, Rounded Noon-flower *Disphyma crassifolium* and Bower Spinach *Tetragonia implexicoma*, and low bushy Seaberry Saltbush *Rhagodia candolleana* cover much of the rockier northern section. Gillham (1960, 1961) suggested that these succulent plants are an expression of increased soil nutrients resulting from the dense breeding population of seabirds in combination with strong, salt-laden winds. Much of the periphery of the rest of the island and the central parts of the northern section are dominated by introduced grasses, notably Kikuyu Grass *Pennisetum clandestinum* and Buffalo Grass *Stenotaphrum secundatum*, with scattered stands of African

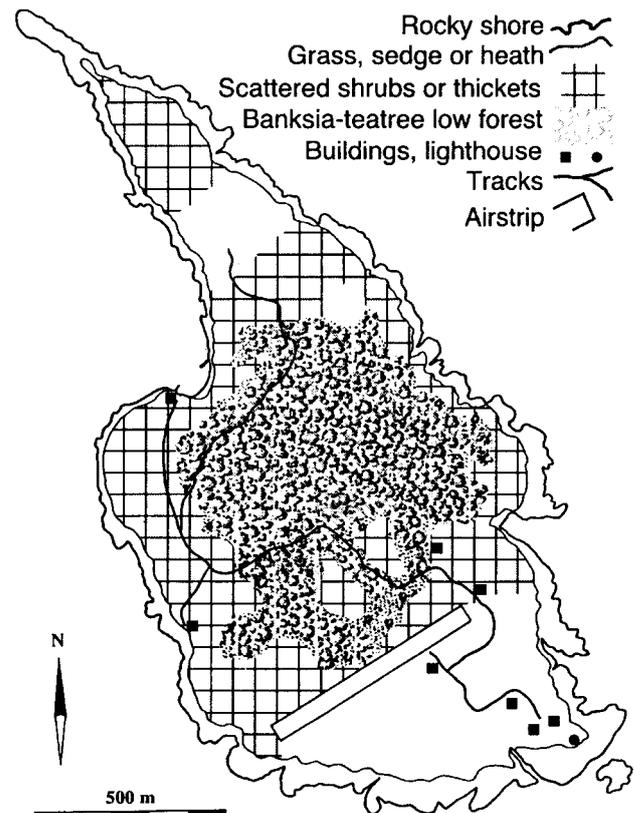


Figure 1. Generalized vegetation map, also showing buildings, tracks and airstrip. Santa Barbara Bay is the large bay off the north-west side of the island.

Boxthorn *Lycium ferocissimum*. The last species, together with blackberries *Rubus discolor* and, to a lesser extent, Common Dolichos *Dipogon lignosus* have invaded the forested areas and makes progress impossible in places. There is a small area of open freshwater pools near the centre of the island and a small water storage dam on the mid-west coast.

Gabo Island has a long history of human use (Twyford 1993; Twyford *et al.* 2000). From the 1850s to 1995 it was managed as a lighthouse reserve, at first by the Colonial Government of Victoria and then by the Commonwealth after federation. After automation of the light, jurisdiction returned to the State of Victoria. The island is now managed as a nature reserve. At some stage a granite quarry was in operation near Santa Barbara Bay. During World War II the Royal Australian Air Force had a radar lookout post set up in the centre of the island. Photographs taken at that time revealed low growth, possibly dominated by Spiny-headed Mat-rush *Lomandra longifolia*, covering much of the island. Higher dunes were almost bare of vegetation, and forested areas, if present at all, appeared to have been quite restricted. In the early 1970s, a grassed airstrip was constructed at the southern margin of the dunes, thus providing a new landscape element in a vegetation setting that had already become much woodier than 30 years earlier. There is a small herd of cattle on the island, which appears to be crucial in maintaining a certain ecological balance by keeping the introduced grasses in check and access routes open in the tangled undergrowth of the forest.

Early attempts to determine the population size of the Little Penguin and Short-tailed Shearwater colonies produced widely different estimates (Reilly 1977; Harris 1979; Harris and Norman 1981). In the 1990s we visited the island several times to more accurately assess population sizes based on methodologies we had successfully used on Montagu Island, New South Wales (Fullagar and Heyligers 1992, 1995, 1998). During these visits we also obtained data on other species, time permitting. When the Canberra Ornithologists' Group planned a field trip to Gabo Island in October 2000 we combined our resources and carried out an additional survey of the breeding populations.

METHODS

Breeding seabirds were surveyed between 1994 and 1996. The methodologies used to determine the size of the populations are described in detail by Fullagar *et al.* (1994, 1995) and Fullagar and Heyligers (1996). During the penguin survey in 1994, 12 transects were laid out 100 metres apart over the whole island and the data for every burrow within one metre of the centreline were recorded. Short-tailed Shearwaters were surveyed in 1996 in areas where colonies had been found during the 1994 penguin survey. Transects through the colonies were 25 metres apart where burrow density was high and 50 metres apart in areas where burrows were more dispersed. An additional method used to estimate the size of the penguin population relied on the mapping of landing sites and using the density of the deposits of 'white-wash' as an indicator of numbers of birds coming ashore. These numbers were obtained by counting the birds landing at dusk at a small but representative number of sites and multiplying the average number of birds per site with the total number of landing sites. Understandably, this method works best after a spell of relatively dry weather.

Breeding terrestrial birds were surveyed from 2–9 October 2000, with the members of the Canberra Ornithologists' Group assisting from 5–7 October. All observations were plotted on maps and for each species we made a judgement about the number of breeding territories represented by the sightings. The results are shown in Figure 2. Greatest confidence in the separation of adjacent territories occurred where birds were heard singing simultaneously. On the maps such observations are shown by a line joining the two singing-posts. Unfortunately, for most species it was too early in the season for nesting to be underway. Results from observations made during our fieldwork in October 1993, November–December 1994, November 1995, October 1996, December 1997, February 2000, early November 2000 and late October 2002 have been used to supplement observations made during the survey in October 2000.

During preparation for the survey we collated bird observations from other sources to obtain a comprehensive overview of the species seen on the island and over the surrounding sea. The reports of Penguin Study Group of the Victorian Ornithological Group proved to be a rich source of information (Penguin Study Group unpublished; Reilly unpublished; Reilly and Kerle 1978; Reilly *et al.* 1977; Thoday unpublished, 1982, 1983, 1984, 1985; Thoday *et al.* 1979; Willis 1973). Harris (1979) included a short list of birds other than seabirds occurring on the island

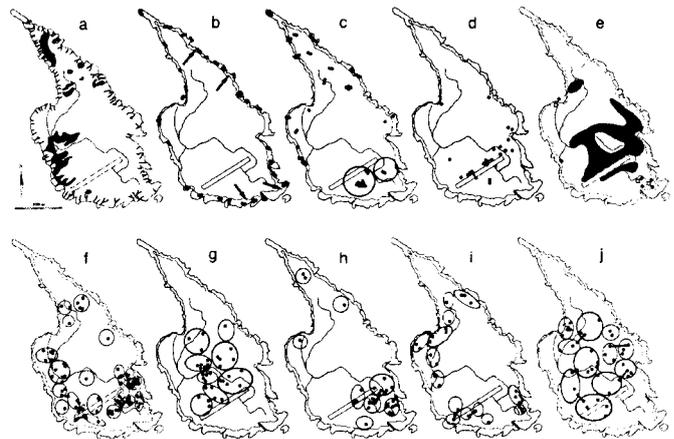


Figure 2. (a) Little Penguin landing sites in 2000 (lines) and distribution of Short-tailed Shearwater colonies in 1996 (areas in black), (b) Sooty Oystercatcher observations in 2000; arrows point to nest site locations confirmed in previous years. Maps (c) to (j) present only data obtained in 2000; observations connected by a line indicate simultaneous singing: (c) Masked Lapwing observations and approximate territories; (d) Horsfield's Bronze-Cuckoo sightings; (e) area used by New Holland Honeyeater and nest sites of Welcome Swallow (black squares) and Common Starling (open squares); observations and territories of (f) Tawny-crowned Honeyeater, (g) Golden Whistler, (h) Australian Pipit (N indicates nest site in the south-east corner of the island), (i) Golden-headed Cisticola and (j) Common Blackbird.

and K. Twyford (unpublished) collated a summary list of all records in June 1993. A copy of this list, which occasionally has been annotated with additional records, is held at the caretaker's residence on the island.

Because of the casual nature of our seabird observations we sought information on species that occur on the waters around Gabo Island. The most relevant data came from observations made by Barton (1978, 1979) during fishing operations in the waters off Gabo Island. A valuable source of more recent information was available in reports of pelagic trips from Eden, south-eastern New South Wales, September 1998–July 2000 (Eden Pelagics 2000).

Names of birds follow Christides and Boles (1994), except for the Australian Pipit, which follows Schodde and Mason (1999). Names for plants follow Walsh and Entwisle (1994, 1996, 1999).

RESULTS

A total of 144 species has been seen on Gabo Island or over the surrounding ocean (Fullagar *et al.* 2005). Of these, 19 species breed or are likely to breed on the island and another 25 or so are often seen. The other species are either infrequent visitors (*c.* 50 species), shorebirds (9 species) or seabirds (*c.* 40 species). Here we report on the species that breed or are suspected to breed on the island and some others often seen. The complete annotated list of 144 species can be found in Fullagar *et al.* (2005).

Chestnut Teal *Anas castanea*

This species was seen from time to time but no records of breeding were obtained. In October 2000, an adult pair was regularly seen on rock pools along the southern shoreline, but they did not behave in a way suggesting that they were breeding at the time.

Little Penguin *Eudyptula minor*

In 1975 it was estimated that between 20 000 and 50 000 Little Penguins were breeding on Gabo Island (Reilly 1977). After a survey based partly on transects and partly

on quadrats, the number of burrows was estimated to be between 5 000 and 10 000 (Harris 1979). In October 1993 we mapped 92 landing sites and estimated the number of penguins landing each night to be about 7 500 (Fullagar *et al.* 1994). Our impression was that laying had still to reach its peak and our estimate was that the breeding population could be between 15 000 and 20 000 pairs. A detailed survey in November 1994 established the number of breeding pairs to be between 15 000 and 18 000 (Fullagar *et al.* 1995).

In 1995, the breeding season did not seem to be as productive as in 1993 and in late October 1996 even fewer birds came ashore, with landing counts reduced to about one third of those in 1993. Most birds were incubating fresh eggs and only a few recently hatched young were found. In December 1997, few birds came ashore at dusk, implying that the breeding season was almost over. However, starving chicks were commonplace and dead chicks ranged from large downy individuals to almost fully feathered ones. In October 2000 many birds were incubating, but no chicks were noted. A survey of the shoreline revealed 98 landing sites (Fig. 2a). This is similar to the number of sites mapped in early October 1993 (Fullagar *et al.* 1994) and the number of birds coming ashore also appeared to be similar to that of 1993.

Short-tailed Shearwater *Puffinus tenuirostris*

In the mid 1970s, the shearwater colonies were restricted to about six distinct areas (Reilly 1977; Harris 1979). Our survey in 1996 revealed ten discrete colonies with a combined area of 11.7 hectares (Fig. 2a) and a total of about 14 200 burrows. On Montagu Island, New South Wales, we have found on average 45 per cent of burrows are occupied by successful breeding birds (Fullagar *et al.* 2004). If valid for Gabo Island this would indicate that about 6 400 breeding pairs were present (Fullagar and Heyligers 1996).

Spectacular numbers came ashore after dusk on 25 November 1995, with birds everywhere on the colonies and much calling. This followed two evenings with little activity or calling. Eggs were found on the ground on 24 and 25 November. In October 2000 excavation was conspicuous and many birds arrived at dusk.

In October 1993, a constant stream of birds passed west, especially on 5 October with an estimated 900 birds per minute for most of the day. In October 2000, birds again streamed past the island and very large rafts were seen feeding on concentrations of krill far out in Bass Strait. Our estimates varied from 5 000 birds on 7 October to more than 100 000 during the next day. On several occasions a White-bellied Sea-Eagle *Haliaeetus leucogaster* flew over from the mainland to snatch a shearwater from the flocks feeding out at sea.

White-faced Heron *Egretta novaehollandiae*

This species was seen on almost all visits with a maximum of four seen in January 1982.

Whistling Kite *Haliastur sphenurus*

Whistling Kites were seen on most visits but never more than two birds on each occasion.

White-bellied Sea-Eagle *Haliaeetus leucogaster*

Both adult and immature birds were seen on almost all visits in number varying between one and five.

Swamp Harrier *Circus approximans*

Birds of both sexes have been seen on almost all visits, in number varying between one and five. In late November 1994, three nests were found, an old nest, one with four eggs and another with three eggs and a recently hatched chick. One male, two females and four fledged young were seen in late November 1995 and at least two males and two females were present during October and November 1996. During October 2000, harriers were conspicuous and seen every day. No nests were found, but our counts indicate the presence of two males and three females. This species is known to be polygamous and hence two breeding groups were present. Birds have been seen commuting between the island and the nearby swamp in Croajingolong National Park.

Brown Falcon *Falco berigora*

Brown Falcons were seen on many visits with a maximum of two birds on any one occasion.

Nankeen Kestrel *Falco cenchroides*

Nankeen Kestrels were often present, but rarely more than one bird recorded at any one time.

Sooty Oystercatcher *Haematopus fuliginosus*

Fifteen to 20 birds were present in October 1993 and three breeding sites were detected by limpet shell concentrations. A nest scrape was present at one of these and at another it held two eggs. In November 1994, on the site east of the lighthouse, one well-grown downy chick was being fed near a nest containing an unhatched egg. Up to three adult birds were seen in this territory, but only two were active with the chick.

In late November 1995, 17 birds were present. The pair on the site east of the lighthouse had one well-grown, but fluffy chick and two additional adults were also seen in this territory. Another nest with two eggs was found west of the lighthouse. The maximum count in October and November 1996 was 16 birds; no active nests were found. On 12 December 1997, in the territory east of the lighthouse, there were four adults and a nest containing two eggs. Two anxious pairs at the north-west side of island probably indicated the presence of nests or young.

In February 2000, 17 birds were present, distributed over eight sites; one pair had an attendant juvenile. Between 3 and 5 October, in a systematic search of the shoreline, we counted 26 individuals occupying a minimum of 11 discrete locations (Fig. 2b). At the southern end, near the lighthouse, four birds were seen in each of adjacent territories. No nests were found. Often birds were observed sitting as pairs and therefore we concluded that egg laying had probably not yet started. We also thought that many of the birds seen along the upper eastern shore might in fact not have been occupying breeding sites. In October 2002, 18 adults and one juvenile were seen, occupying nine discrete sites. A nest with one egg was found at the south-east corner of the island on 28 October and had still one egg on 31 October.

Although up to 26 adults have been reported at any one time, from our observations over the years we only know for certain of four breeding sites as shown by arrows on the map (Fig. 2b). We therefore have to assume that a good number of the birds seen are either immature individuals or casual visitors.

Masked Lapwing *Vanellus miles*

Our observations between 1993 and 1997 have shown that four or five territories are regularly occupied during the breeding season; one or two on the northern peninsula, one near the wharf and two south of the airstrip. In 1995, a nest on the airstrip had four eggs and these hatched soon after 1 November. There were many sightings during October 2000 but the level of aggressive behaviour suggested that there were only two pairs breeding in adjacent territories south of the airstrip (Fig. 2c). Birds seen elsewhere were often seen sitting on the rocky shore. However, on 2 November at the north end of the island, two adults and one recently hatched chick were observed. In October 2002 only a few birds were present, possibly only two pairs, with territories near the residences and on the airstrip.

Caspian Tern *Sterna caspia*

Two birds were seen at the north-west side of the island on 5 October 1993, two at the northern end on 24 November 1994 and one near the wharf on 9 and 11 December 1997. In October 2000 two adult birds in prime breeding plumage were consistently foraging around the northern end but no nesting activity was detected.

Brush Bronzewing *Phaps elegans*

Despite a report of 50 birds in December 1975 (Reilly *et al.* 1977), there are few reliable estimates of numbers from subsequent years. In late November 1995 these pigeons were more numerous than at the same time in the previous year, with 20 or more birds seen. In October 2000 a total of seven sightings were recorded but this pertained to the presence of only three individuals as calling was only heard from one locality. On previous visits birds have been seen more often and calling has indicated the presence of possibly several breeding pairs.

Rainbow Lorrikeet *Trichoglossus haematodus*

In October 2000 more than 100 were attracted by the profuse flowering of Coast Banksia and Coast Tea-tree and were almost certainly commuting daily from the mainland.

Horsfield's Bronze-Cuckoo *Chrysococcyx basalis*

One bird was seen in December 1975 (Reilly *et al.* 1977), two or three individuals were seen in October 1993, two in November 1994 and one in November 1995. In October 2000 there were 24 sightings. Birds were conspicuous by virtue of their call from exposed perches, with interactive calling recorded on one occasion. Although sightings were widely scattered, most observations were made along the airstrip and out towards the east coast (Fig. 2d). Interestingly, this coincides with the area most densely occupied by Tawny-crowned and New Holland Honeyeaters.

Yellow-faced Honeyeater *Lichenostomus chrysops*

This species is listed in most reports, sometimes as common or numerous. In December 1975 it was reported as 'nesting' (Reilly *et al.* 1977) and in January 1982 as 'breeding' (Thoday 1982). In October 2000 birds were widespread throughout the scrub and low forest areas, but no nests were found. Song was constantly heard and there could have been more than 100 birds present on the island. It was not possible to determine resident territories.

New Holland Honeyeater *Phylidonyris novaehollandiae*

This species is often mentioned in observation reports, sometimes as common or numerous. In October 1996 it was vocal and birds were feeding young. In October 2000, birds were common in areas with flowering Coast Banksia, especially where it occurred in more open-structured vegetation. No nests were found, but birds were conspicuous and frequently calling. In total, there must have been between 50 and 100 birds present on the island. Figure 2e shows the general area where the New Holland Honeyeater occurs.

Tawny-crowned Honeyeater *Phylidonyris melanops*

This species is usually seen and heard in heath on rocky substrate and in scattered low shrubs over a mixed herbaceous groundcover. Two nests were found on 7 October 1993; one with two recently fledged young nearby and two adults performing a distraction display, and one with an adult that was flushed from two eggs. This adult also performed a distraction display. This nest was built in low Coast Banksia smothered in Kikuyu Grass. On 24 November 1994, at the east end of the airstrip, one adult was flushed from a nest 30 centimetres above the ground in mat-rush and blackberry tangles. It contained two eggs and the birds were still incubating on 5 December. During late October 1996 birds were often singing, but in October 2000 the general level of singing was rather subdued, although a few song flights were seen. No nests were found, but from 67 sightings and nine cases of interactive singing, we deduced a minimum of 21 territories (Fig. 2f). In October 2002 results were similar to those in 2000.

Golden Whistler *Pachycephala pectoralis*

All territories of this species were associated with taller, dense scrub of Coast Tea-tree and Giant Honey-myrtle. In October 1993 two males were heard in countersong near the vegetable garden; no other birds were seen or heard, but during the penguin survey in 1994 we estimated that between ten and 20 pairs were present. In October 1995 birds were singing at dawn and dusk, but in smaller numbers than the year before. Territory mapping in October 1996 failed because few singing males were present. During the survey in October 2000 no nests were found, but there were 25 sightings. Males were frequently singing at the same general location and four cases of interactive singing were reported (Fig. 2g).

Willie Wagtail *Rhipidura leucophrys*

On 7 October 1993 two birds were seen near the lightstation. This was the first record for Gabo Island. During our visits in the following years only single birds

were seen, each time at a different location. In October 2000 a single bird was repeatedly seen along the eastern fringe of the banksia and teatree low forest, but on 9 October we saw two birds there behaving as though they were nesting. However, no nest could be found.

Australian Pipit *Anthus australis*

Pipits occur over widely scattered locations, but always in open grassy areas. Occurrences are concentrated on and southeast of the airstrip, but also include other open areas along the fringes of the island. In October 1993 we saw four or five pairs, one pair with a young. In late November 1995 a freshly fledged chick was seen at the lightstation. In October–November 1996 up to ten birds were seen at the airstrip, with another ten scattered over their other favoured habitat. In October 2000, 29 pipits were seen although they were hard to detect and little song was heard. We concluded that there probably were eight territories (Fig. 2h). On one of these the indications were that a bird was incubating. A nest with two eggs was found on another territory on 10 October.

Welcome Swallow *Hirundo neoxena*

Welcome Swallows are common on the island and use man-made structures for nesting sites. For instance, in October 2000 when there were at least 14 active nests, these were attached to the lightstation houses and sheds, the gazebo, the pump shed and the wharf (Fig. 2e). Birds were incubating at five sites (one nest with a clutch of four eggs, another one with a clutch of three) and at four nests construction was still in progress. Observations from previous years give an indication of the variability between seasons. Five nests were found in October 1993, one with three half-grown young, one recently lined and three not examined. On 26 November 1994 a recently fledged chick was seen with an adult. In late November 1995 we saw between 20 and 30 birds and examined five nests: two in the pump shed, one with three dead chicks and one, newly lined, but unfeathered nearby, two (unused) at the lighthouse buildings, while on 27 October five chicks flew from a nest at the signalman's quarters. No nests with eggs or chicks were found in October–November 1996, but several freshly built and lined nests were present. On 12 December 1997 three chicks fledged from a nest below the assistant keeper's house.

Little Grassbird *Megalurus gramineus*

This species was recorded up to 1982 with breeding confirmed. No further observations were recorded until one bird was heard and seen near the monument on 28 October and two birds were heard and seen at the airstrip on 29 October 2002.

Golden-headed Cisticola *Cisticola exilis*

The preferred habitats of this species are open grassy areas often mixed with Knobby Club-rush *Isolepis nodosa* and scattered low shrubs. Such areas occur along the margins of the airstrip, south of the jetty and near the cemetery (Fig. 2i). It is often difficult to form an impression of how many birds are present due to their secretive

behaviour. In October 1993 there probably were fewer than ten pairs, but in October 2000 we made 27 sightings and watched two cases of interactive singing. However, few birds were seen in song flight or heard calling in a sustained manner. We found no nests, but estimated that there could be 15 occupied territories. On 23 November 1995 two recently fledged young were seen with an adult.

Silvereeye *Zosterops lateralis*

This species is very common and has been recorded throughout the year, but there is no information on possible replacement of breeding birds by migrants from Tasmania during winter. During the survey in October 2000, birds were heard and seen in virtually all woody vegetation, whether in small patches or in more continuous stands. Numbers must have exceeded 100 individuals and all birds appeared to conform to the common east coast subspecies.

Common Blackbird *Turdus merula*

Blackbirds were already recorded as 'very common' in December 1975 (Reilly *et al.* 1977), while in February 1980 ten birds were seen. Our observations in November 1994 indicated that there were eight territories, while in October 1996 there could have been thirteen. In October 2000 we recorded 38 sightings and four cases of interactive singing. Twelve territories were deduced based on singing males, but no nests were found (Fig. 2j). Most territories occur in taller, dense scrub of Coast Teatree and Giant Honey-myrtle, as with the Golden Whistler, but occasionally territories are also established in lower, more open scrub.

Common Starling *Sturnus vulgaris*

Between 20 and 30 birds were recorded in October 1993 and, apart from the nests under the roofs of the lightstation buildings, one nest with three eggs was located in the life-buoy box at the wharf and another one in a stump of Coast Banksia. In late October 1996, more than 60 starlings were seen with broods everywhere in the buildings. In October 2000, starlings were feeding young in nests under the corrugated asbestos roofs of the lighthouse buildings and in the shed at the wharf (Fig. 2e). At least five nests were involved and a maximum count of 17 birds was made in the vicinity of the lighthouse buildings.

DISCUSSION

Reliability of our data on territories

For song birds the territory mapping technique depends on a number of assumptions; first, that males are consistently in song for part of the day, second, that the presence of singing males indicates the presence of a breeding pair, and third, that male song is taking place in an established breeding territory. Consequently song by adjacent males is taken to indicate birds from different territories. Although this method has been used extensively in Western Europe there are few examples of its application in Australia (Loyn 1980, 1985).

The level of song on Gabo Island during our survey in 2000 was not intense because our timing turned out to be

early in the breeding season. Also, it would have been ideal to confirm territories by finding the active nests (Marchant 1992), but few nests were found. Consequently, delineation of territories was less precise than we could have wished for and hence the maps present only our best estimates of territory locations.

Composition of the avifauna

There are quite a few bird species that one might have expected to occur on, or at least to be visitors to, Gabo Island. These include rails, rosellas, Laughing Kookaburra, Eastern Yellow Robin, Grey Shrike-thrush, fairy wrens, White-browed Scrubwren, gerygone warblers, thornbills, wattlebirds, woodswallows, butcherbirds and currawongs. Two species regularly recorded in the past have disappeared from the island. The records suggest that the Skylark was last present in 1995 and the Bassian Thrush in 1993. However, the Little Grassbird, of which a nest was found in 1975 and which was last reported in 1982, was seen again in 2002.

Several factors could be at play in preventing the establishment of species on Gabo Island. The occasional presence of a connecting sandbar might have encouraged access from the nearby coastline. However, it is clear from photographic evidence that the vegetation structure on the Island has dramatically altered over time. For example, unpublished photographs of the central part show that in the 1940s areas that are now covered by scrub and low forest were then dominated by open tussock vegetation. Likewise, there have been well-documented changes in the vegetation structure on Bowen Island in Jervis Bay New South Wales (Fortiscue 1991). On Bowen woody vegetation, especially Coast Banksia, has rapidly recolonized the extensive pastures following cessation of grazing. This happened within the span of 30 years. We may presume that the original vegetation on Gabo Island would have deteriorated following the construction of lighthouse facilities in the mid 19th century, in the same way that it did on Montagu Island New South Wales (Heyligers and Adams 2004). It is most likely that this would have led to a depauperate landbird fauna on Gabo, much as is the case on Montagu, where only nine breeding species now occur (Fullagar *et al.* 1993).

Unfortunately there are no studies on the birds of the nearby coastal dune and swamp vegetation or of the nearby forests. Available data (e.g. Barrett *et al.* 2003) are too coarse to be useful for this purpose. Consequently it is difficult to speculate why some species of songbird have become established as breeding birds on Gabo Island and others have not.

ACKNOWLEDGMENTS

We thank the following members of the Canberra Ornithologists' Group: Alistair Bestow, Jenny Bounds, Charles Buer, John Gouldie, and Joan and Trevor Lipscombe, for their enthusiastic participation in the breeding bird survey. Parks Victoria staff based at the Mallacoota office has played an invaluable role in our studies on Gabo Island right from the first visit. We thank them for their assistance and cooperation. Peter Fullagar and Petrus Heyligers are Honorary Research Fellows with CSIRO Sustainable Ecosystems and thank this organisation for their support. We are indebted to the editor and reviewers for their constructive comments.

REFERENCES

- Barrett, G., Silcocks, A., Barry, S., Cunninham, R. and Poulter, R. (2003). 'The New Atlas of Australian Birds'. (RAOU: Hawthorn East.)
- Barton, D. (1978). Birds seen at sea off southern NSW and eastern Victoria. *Aust. Seabird Group News* 10: 14–19.
- Barton, D. (1979). Albatrosses in the western Tasman Sea. *Emu* 79: 31–35.
- Christides, L. and Boles, W. E. (1994). 'The taxonomy and Species of Birds of Australia and its Territories'. *RAOU Monograph 2* (RAOU: Melbourne.)
- Eden Pelagics (2000). Eden Pelagic Trip Reports: Tony Palliser's Pelagic Home Page (www.users.bigpond.net.au/palliser/) (covers reports from 15 day-trips between 20 September 1998 and 30 July 2000). Now available at <http://web.archive.org/web/20010407123942/users.bigpond.net.au/palliser/rpt-indx.html>
- Fortescue, M. (1991). 'Breeding biology and management of the Little Penguin, *Eudytila minor* (Forster 1781), on Bowen Island, Jervis Bay'. M. App. Sci. thesis, University of Canberra, ACT. (unpubl.)
- Fullagar, P. J. and Heyligers, P. C. (1992). 'Montagu Island penguin census November 1992'. *M I Partners Report No. 1*. (M I Partners: Moruya.)
- Fullagar, P. J. and Heyligers, P. C. (1995). 'The second Montagu Island penguin survey November 1994'. *M I Partners Report No. 3*. (M I Partners: Moruya.)
- Fullagar, P. J. and Heyligers, P. C. (1996). 'Gabo Island shearwater surveys 1995 and 1996'. *M I Partners Report No. 5*. (M I Partners: Moruya.)
- Fullagar, P. J. and Heyligers, P. C. (1998). 'Montagu Island shearwater population survey March 1997'. *M I Partners Report No. 7*. (M I Partners: Moruya.)
- Fullagar, P. J., Heyligers, P. C., Crowley, M. A., van Tets, G. F. and Davey, C. C. (1993). The breeding birds of Montagu Island, NSW. *Nature in Eurobodalla* 7: 57–64.
- Fullagar, P. J., Heyligers, P. C., van Tets, G. F. and Crowley, M. A. (1994). 'A reconnaissance of Gabo Island to assess the feasibility of a Little Penguin breeding population survey'. *M I Partners Report No. 2*. (M I Partners: Moruya.)
- Fullagar, P. J., Heyligers, P. C., Crowley, M. A. and Klomp, N. I. (1995). 'Gabo Island penguin survey November 1994'. *M I Partners Report No. 4*. (M I Partners: Moruya.)
- Fullagar, P. J., Heyligers, P. C. and Crowley, M. A. (2005). 'The birds of Gabo Island'. *M I Partners Report No. 11*. (M I Partners: Moruya.)
- Fullagar, P. J., Perkins, H. D. and Heyligers, P. C. (2004). 45th annual assessment of shearwater breeding success on Montagu Island 26–29 March 2004. *Nature in Eurobodalla* 18: 57–63.
- Gillham, M. E. (1960). Destruction of indigenous heath vegetation in Victorian seabird colonies. *Aust. J. Bot.* 8: 277–317.
- Gillham, M. E. (1961). Plants and seabirds of granite islands in south-east Victoria. *Proceedings of the Royal Society of Victoria (new series)* 73: 21–35.
- Harris, M. P. (1979). 'The seabirds of the Victorian islands'. A report to the Minister for Conservation, Victorian State Government. *ITE Project 588*. (Institute of Terrestrial Ecology — Natural Environment Research Council.)
- Harris, M. P. and Norman, F. I. (1981). Distribution and status of coastal seabirds in Victoria. *Memoirs of the National Museum of Victoria* 42: 89–106.
- Heyligers, P. C. and Adams, L. G. (2004). Flora and vegetation of Montagu Island — past and present. *Cunninghamia* 8: 285–305.
- Loyn, R. H. (1980). Bird populations in a mixed eucalypt forest used for production of wood in Gippsland, Victoria. *Emu* 80: 145–156.
- Loyn, R. H. (1985). Bird populations in successional forests of Mountain Ash *Eucalyptus regnans* in central Victoria. *Emu* 85: 213–230.
- Marchant, S. (1992). 'A Bird Observatory at Moruya, NSW 1975–84'. Occasional Publication No 1. (Eurobodalla Natural History Society: Moruya.)
- Reilly, P. N. (1977). Seabird Islands No. 45: Gabo Island, Victoria. *Corella* 1: 51–53.
- Reilly, P. N. and Kerle, J. A. (1978). A report of a visit to Gabo Island, Victoria from 19 to 26 January 1978. *VORG Notes* 14/1: 3–12.
- Reilly, P., Thoday, R. G. and Trusler, P. W. (1977). A report of a visit to Gabo Island, Victoria from 5 to 15 December 1975. *VORG Notes* 13/2: 14–19.
- Schodde, R. and Mason I. J. (1999). 'The directory of Australian birds — passerines'. (CSIRO: Collingwood, Vic.)
- Thoday, R. (1982). Gabo Island. January 11–16, 1982. *VORG Notes* 18/1: 16–22.
- Thoday, R. (1983). Gabo Island. January 5–12, 1983. *VORG Notes* 19/1: 27–32.
- Thoday, R. (1984). PSG on Gabo Island, 3–10 January 1984. *VORG Notes* 20/1: 18–20.
- Thoday, R. (1985). Gabo Island. 13–19 January 1985. *VORG Notes* 21/1: 27.
- Thoday, R., Britton, D., Lovett, G., Gordon, M. and Caron, M. (1979). Gabo Island report 18–25 January 1979. *VORG Notes* 15/1: 18–22.
- Twyford, K. L. (1993). 'Investigations into the effects of introduced plants and animals on the nature conservation values of Gabo Island: project outline'. (Dept. of Conservation & Natural Resources, Orbost Region: Orbost.)
- Twyford, K. L., Humphrey, P. G., Nunn, R. P. and Willoughby, L. (2000). Eradication of feral cats (*Felis catus*) from Gabo Island, south-east Victoria. *Ecol. Man. Restor.* 1: 42–49.
- Walsh, N. G. and Entwistle, T. J. (Eds.) (1994). 'Flora of Victoria Vol. 2: Ferns and allied plants, conifers and monocotyledons'. (Inkata Press: Melbourne.)
- Walsh, N. G. and Entwistle, T. J. (Eds.) (1996). 'Flora of Victoria Vol. 3: Dicotyledons, Winteraceae to Myrtaceae'. (Inkata Press: Melbourne.)
- Walsh, N. G. and Entwistle, T. J. (Eds.) (1999). 'Flora of Victoria Vol. 4: Dicotyledons, Cornaceae to Asteraceae'. (Inkata Press: Melbourne.)
- Willis, J. J. (1973). Report on the effect of burrowing birds on the proposed airstrip on Gabo Island, Victoria. *VORG Notes* 9/10: 7–12.