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SHORT NOTE

Breeding of the Antarctic Tern (*Sterna vittata bethunei*) on Macquarie Island

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The Macquarie Island population of the Antarctic tern (*Sterna vittata*) is sometimes considered a separate subspecies (*S. v. macquariensis*) (Falla 1937; del Hoyo *et al*. 1996). However, other authors have questioned the validity of this subspecies and synonymised this population with the New Zealand subspecies (*S. v. bethunei*) (e.g., Higgins & Davies 1996). Macquarie Island (54º30′S, 158º55′E) supports the only breeding population of *S. v. bethunei* in Australia. It was estimated at 40 ± 4 pairs in 1979 (Rounsevell & Brothers 1984), resulting in it being listed as endangered (Garnett & Crowley 2000). Here, we describe nesting sites based on incidental observations collected during three breeding seasons on two extended visits to the island: 9 November 2000 - 12 October 2001 and 26 October 2002 - 6 December 2003. Additionally, an estimate of breeding population size is provided based on a full island census conducted on 27 November - 4 December 2003. This census covered the main egg-laying period of the New Zealand Antarctic tern (Sagar 1978; Sadleir *et al*. 1986; Sagar *et al*. 2003).

Single nests and colonies were located by scanning offshore rock stacks and other coastal situations with Leica 10x42 binoculars, concentrating observations at sites where individuals displayed agitated or territorial behaviour, or following birds carrying food. Sea cliffs were surveyed by sitting at vantage points scanning for attendant birds and individuals carrying prey.

Eighteen nesting sites were recorded over the three breeding seasons, ranging in size from one to 12 nesting pairs. Ten of these sites comprised a single nest while another seven comprised less than four nests in those seasons when occupied or surveyed. The largest colony, supporting a maximum of 12 nests in December 2000, was situated on a small rock stack in the northern part of Sandell Bay (54º39′59″S, 158º49′28″E) on the west coast of the island.

Five (28%) breeding sites were used in all three seasons, including the North Sandell Bay site. At this site the maximum number of breeding pairs varied between 12 in December 2000 and four in late November 2003. Three sites were only used in a single breeding season and two in two seasons. Eight sites were not visited in all three nesting seasons and the regularity of site usage could not be ascertained.

The majority of nest sites (94%, n = 17) were located on offshore rock stacks that were isolated from the main shoreline at low tide by permanently-flooded 8-100m wide channels. The only nesting record on the main island was of a single nest on a stack on mid-Sandell Bay beach (54º40′39″S, 158º49′41″E) in December 2000. Unlike on New Zealand subantarctic islands no nests were detected on steep slopes or cliff faces overlooking the sea (Sagar *et al*. 2003).

All breeding sites were located in positions not frequented by fur seals (*Arctocephalus* spp.) or the southern elephant seal (*Mirounga leonina*), and were approximately 4-14 m above high tide level. Nests were situated on ledges or in depressions amongst prostrate vegetation dominated by cushion plant *Colobanthus muscoides* (Caryophyllaceae), *Cotula plumosa* (Asteraceae) or the low grass *Puccinellia macquariensis* (Poaceae) (n = 58, all breeding seasons combined), in scrapes amongst shell fragments from kelp gull (*Larus dominicanus*) regurgitations (n = 6) or in slight depressions on flat areas of bare rock (n = 3). All 15 colonies on the west coast were situated on the eastern side of rock stacks, protected from the prevailing winds, while on the east coast all nests at three sites were located on the western sides of stacks, protected from easterly swells.

Observed nest failures were attributed to flooding and predation. Storm waves washed over the North Sandell Bay stack in early December 2000 resulting in the loss of all eggs from 10 active nests and, similarly, washed away three nests in the same location in mid-October 2003.

At an abandoned nest on the stack on mid-Sandell Bay beach eggshell fragments and numerous black rat (*Rattus rattus*) scats suggested that the nest failed as a result of predation. This site was not re-used in following breeding seasons. No incidences of subantarctic skua

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(*Catharacta skua*) or kelp gull predation were observed at the North Sandell Bay colony; any skuas or gulls flying in close proximity to this colony were mobbed by up to six terns.

Twenty-four breeding pairs were recorded on the island in late November - early December 2003. This census corresponded to the second egg-laying peak on Snares Island (Sagar 1978; Sagar *et al*. 2003). Since Antarctic terns have an extended breeding season on New Zealand subantarctic islands, with egg-laying extending to the end of December and sometimes to March (Bailey & Sorensen 1962; Sadleir *et al*. 1986; Sagar *et al*. 2003), this census may have excluded some late nesting pairs.

The predominance of nests on offshore stacks contrasts to nesting situations on New Zealand subantarctic islands where cliff faces and steep slopes are commonly used (Sagar *et al*. 2003). Use of offshore stacks has been suggested to be in response to predation by feral cats (*Felis catus*) (eradicated in 2000) and black rat (Rounsevell & Brothers 1984; Garnett & Crowley 2000). On Tristan da Cunha the introduction of the black rat resulted in a shift of breeding colonies from sandy beaches to cliff ledges (Elliott 1957) while, on Campbell Island, the brown rat (*Rattus norvegicus*) caused nest failures (Sadleir *et al*. 1986). Since the feral cat's eradication there has been no shift of colonies back onto Macquarie Island and the fate of the Sandell Bay beach stack nest suggests successful recolonisation is unlikely in the presence of the black rat.

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