

# Marine Ecosystems

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## Assessment of the status of the Flesh-footed Shearwater in South Australia: population status, subspecies status and foraging ecology



Simon D Goldsworthy, Jennifer Lavers,  
Mark Carey and Andrew D Lowther

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Final Report to Nature Foundation SA

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## **1 EXECUTIVE SUMMARY**

South Australia has the smallest and a vulnerable flesh-footed shearwater population in Australia, which is restricted to two to four islands in southern Spencer Gulf. Previous estimates of abundance in South Australia suggested the species may only number in the 100s. Given the recent declines observed in other populations, there is a need to undertake a comprehensive assessment of the status of the species in South Australia. This study undertook overnight surveys on three islands in Thorny Passage, southern Spencer Gulf. It confirmed the breeding of flesh-footed shearwaters on Smith and Lewis Islands, with the former island estimated to contain ~3,000 pairs, and the latter ~300 pairs (where they breed sympatrically with short-tailed shearwaters). Neither species was detected breeding on the northern parts of Hopkins Island. DNA samples were taken from ten flesh-footed shearwaters on Smith Island and eight on Lewis Island, and will be used to gain a greater understanding of their genetic relationships to populations in Western Australia and eastern Australia as part of another project, and the potential sub-specific status of the population. It is planned to deploy Global Location Sensing (GLS) tags on a sample of flesh-footed and short-tailed shearwaters in 2013, and these are expected to provide useful information on the foraging distribution and migratory routes of these populations. All these data will provide a better understanding of the vulnerability of flesh-footed shearwaters to bycatch in domestic and high-seas long-line fisheries.

## 2 INTRODUCTION

In Australasia, the flesh-footed shearwater (FFS; *Puffinus carneipes*) breeds in colonies on offshore islands. It has three main breeding areas: the south-west Pacific Ocean that includes Lord Howe Island and northern New Zealand; along the coast of Western Australia (WA) from Cape Leeuwin to the Recherche Archipelago; and in South Australia (SA) where breeding may be restricted to two to four islands in southern Spencer Gulf. Based on genetic subpopulation structure in other shearwater species, it is possible that each of these regional populations represent genetically distinct subpopulations or subspecies.

All FFS populations for which trend data are available show a consistent pattern of decline over the last three decades. At Lord Howe Island, the population declined by more than 60% between 1978 and 2009 (Lavers and Reid, unpublished data). In northern New Zealand there has been at least an 80% decline between 1984 and 2010 (Baker *et al.* 2010), with recent surveys indicating that the species has abandoned breeding on at least four historically used islands (Baker *et al.* 2010). The size of the FFS population in WA was estimated at 300,000 pairs in 1982 (Burbidge *et al.* 1996), however most colonies have not been surveyed since then.

South Australia has the smallest of all the FFS populations, with the only confirmed breeding sites being Smith (150 pairs) and Lewis Island (no survey data) in Thorny Passage, southern Spencer Gulf (Copley 1996) (Figure 1). There is also unconfirmed breeding on nearby Williams and Hopkins Islands. The only survey on Smith Island was conducted more than 15 years ago (Copley 1996).

The most likely cause for the declines in FFS populations is from bycatch in pelagic long-line fisheries (Baker and Wise 2005). Information from eastern Australia suggests that bycatch from the expanding tuna fishing industry may be significant, with 1,800–4,500 individuals being killed annually ((Baker and Wise 2005). Fishing effort off WA has increased in recent years with unknown effects on this species. Ingestion of plastic is also a major cause for concern (Hutton *et al.* 2008).

Tracking studies using small archival light-recording tags (Global Location Sensing or GLS tags) offer considerable potential for tracking animal movements, and have been used to determine the foraging ground and migration routes of many pelagic seabirds (Carey *et al.* 2009, Powell 2009, Thalmann *et al.* 2010). GLS tags attached to breeding FFS from the Lord Howe Island population indicated they forage in waters mainly to the west of the Island between October to May, but then migrate north to waters surrounding Japan during the austral winter (Thalmann *et al.* 2010, Rayner *et al.* 2011). In contrast, FFS in the WA population migrate to waters in the Bay of Bengal in the northern Indian Ocean. Whether SA populations of FFS migrate to the north-west Pacific or the northern Indian Ocean wintering ground is unknown. Furthermore, the distribution of foraging effort during the chick rearing period is also unknown, although it is presumably south of Australia. Such information is important to gain an understanding of the likely interactions with local and high-seas fisheries.

Globally, the FFS is recognised as one of the most poorly studied seabird species, with data on survival rates and breeding success lacking for almost all locations (Powell 2009, Baker *et al.* 2010). As a result, the International Union for the Conservation of Nature (IUCN) declined to list this species in 2004 due to lack of sufficient survey and demographic data. Since then, the FFS has been nominated for listing under the Agreement for the Conservation of Albatross and Petrels (ACAP; Cooper and Baker 2008), and in June 2011 the Australian FFS population was nominated for uplisting to Vulnerable under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). Flesh-footed shearwater is listed as *Vulnerable* in New South Wales (Threatened Species Conservation Act 1995), and *Rare* in South Australia (National Parks and Wildlife Act 1972).

The objectives of this study were to:

1. Conduct surveys of the distribution and burrow numbers of FFS at Smith and Lewis Islands; assess the presence of FFS on Hopkins and Williams Islands and, if present there, conduct surveys of burrow distribution and number.
2. Collect FFS feather samples from South Australian breeding islands to assess a) genetic structure in relation to other FFS populations, b) trophic position (using stable isotopes), and c) trace metal contamination levels.

3. Deploy GLS tags onto an FFS for a 12-month period to determine the distribution of local foraging grounds during the breeding season (October to May), and their migration routes and winter foraging areas.

Note, support from Nature Foundation SA for this project was for logistic costs to access field sites so that surveys and sample collection could be undertaken. Only results of the surveys are presented here; the genetic and trophic sample analyses are being funded through other external projects.



**Figure 1.** The location of Lewis, Smith, Hopkins and Williams Islands, Thorny Passage, southern Spencer Gulf, South Australia.

### 3 METHODS

1. Distribution and abundance surveys: ground surveys were undertaken on Lewis, Smith, Hopkins and Williams Islands between 19 - 21 of November 2011 to identify the locations and area on each island where FFS burrows occur. Active burrows were recognised by the presence of footprints and disturbed sand at the entrances. The number of active burrows were counted to provide an estimate of the number of breeding pairs.

2. Genetic, isotope and trace metal sampling: a sample of adult birds (eight on Lewis Island and ten on Smith Island) were captured on flight runways as they arrived in the evening or departed in the early morning. A feather was removed from each bird to obtain DNA, isotope ( $^{13}\text{C}$ ,  $^{15}\text{N}$ ) and trace metal samples.

### 4 RESULTS AND DISCUSSION

Survey results:

Overnight surveys were undertaken on Smith Island (19 November 2011), Hopkins Island (20 November 2011) and Lewis Island (21 November 2011) (Figure 1). Islands were accessed by helicopter. Logistic constraints (helicopter charter) prevented the survey of Williams Island. Surveys of burrows and runways confirmed the breeding of FFS on Smith and Lewis Islands, with an estimated ~3,000 and ~300 pairs, respectively. On Lewis Island, FFS were observed to nest sympatrically with short-tailed shearwaters (*P. tenuirostris*). Neither species was detected breeding on the northern parts of Hopkins Island. The middle and southern parts of the island were not surveyed.

Sample collection:

A feather sample for DNA and isotope analyses was taken from ten FFS on Smith Island and eight on Lewis Island, and will be used to gain a greater understanding of their genetic relationships to populations in Western Australia and eastern Australia (and potential sub-specific status) as part of another project.

GLS tagging:

The proposed GLS tagging to be undertaken over the 2011/12 breeding season was not possible. GLS tags from the British Antarctic Survey (BAS) were temporarily out of production. An alternate tag was sourced from Star-Odi, but during production the manufacturers identified a problem with their batteries that made the units unsuitable for use. In March 2013, 50 BAS GLS tags (now manufactured by Biotrack) were deployed on FFS on Lewis Island. It is intended that most of these will be recovered from birds in the 2013/14 breeding season. These should provide insights on the foraging distribution and migratory routes of these populations, and a better understanding of FFS vulnerability to bycatch in domestic and high-seas long-line fisheries.

It is proposed to undertake more quantitative baseline surveys of the distribution and abundance of FFS on the islands in the Thorny Passage during the 2013/14 breeding season. This will include detailed burrow transects and surveys to estimate density and abundance within colonies, from which future changes can be assessed.

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