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The breeding seabirds of Shark Bay, Western Australia

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ABSTRACT

Surveys during May and September 1997 and collation of existing data reveal that 16 species of birds that depend on the ocean for food have been recorded breeding on 42 islands and islets in Shark Bay. Eleven of these are considered to be true seabirds: Wedge-tailed Shearwater, Australian Pelican, Pied Cormorant, Silver Gull, Pacific Gull, Caspian Tern, Crested Tern, Lesser Crested Tern, Roseate Tern, Bridled Tern and Fairy Tern. The other breeding species that depend on the ocean for their food and breed mainly on islands are Eastern Reef Egret, White-bellied Sea-Eagle, Osprey, Pied Oystercatcher and Sooty Oystercatcher. All the true seabirds have tropical or subtropical affinities except the Pacific Gull, which is a temperate species and is at the northern end of its range at Shark Bay. Shark Bay is at the southern edge of the breeding distribution of the Lesser Crested Tern. The other species have widespread distributions and are found along most of the Australian coastline. Pied Cormorants are particularly numerous at Shark Bay and the breeding colonies at Quoin Bluff South on Dirk Hartog Island, Freycinet Island and Pelican Island are the three largest reported in Western Australia. A significant Australian Pelican rookery occurs at Pelican Island. Seabirds breed on most of the smaller islands in Shark Bay, with a few species, such as White-bellied Sea-Eagles, Ospreys and Caspian Terns, breeding in low numbers on the larger islands (Faure, Dirk Hartog, Dorre, Bernier).

INTRODUCTION

The seabirds of Shark Bay are relatively poorly known. Burbidge, Johnstone and Fuller (1996), when reviewing the seabirds of Western Australia (WA), highlighted the Archipelago of the Recherche, Shark Bay islands and islands of the Kimberley coast, in that order, as the most poorly surveyed for seabird breeding.

Most islands in the Shark Bay World Heritage Property are nature reserves, vested in the National Parks and Nature Conservation Authority and managed by the Department of Conservation and Land Management (CALM), however, several of the smaller islets are vacant Crown land. Two of the larger islands, Dirk Hartog and Faure, are pastoral leases. The land tenure of all islands is provided in the Annotated List of Islands below.

ORNITHOLOGICAL HISTORY

Available records of breeding seabird species on islands were briefly summarized by Serventy, Serventy and Warham (1971). T. Carter visited Dirk Hartog Island in 1917 (Carter 1917, 1923), F.L. Whitlock collected eggs and recorded birds on Dirk Hartog Island in 1920 (Whitlock 1921); White 1921), A. Chenery (1928) and E. Ashby (1929) visited Dirk Hartog Island in September–October 1927, J. Gregory (1941) reported on breeding Pied Cormorants and Silver Gulls in May 1938, S. Fowler counted seabirds from the air in 1945 and 1946 (Fowler 1947), D.L. Serventy visited the area in October 1947 (Serventy 1972), G.F. Mees (in Ride *et al.* 1962) provided a comprehensive summary of the birds of Bernier and Dorre Islands from a visit in 1958, G.M. Storr visited several islands in 1965 (Serventy 1972), L.E. Sedgwick (1967, 1968) provided lists of birds from Dirk Hartog Island from a visit in 1967, D.L. Serventy (1972) published information on the colonies of Wedge-tailed Shearwaters of Shark Bay, highlighting the existence of unusual 'white-breasted phase' birds in the populations there and incorporating data collected by a visit by Western Australian Wildlife Authority members H. Hall, A.C. Robinson, N. Beeck, E. Dell and S. Davies on 21 and 22 August 1971, A.A. Burbidge and A.S. George (1978) and B.A. Wells and A.G. Wells (1974) provided some information on the seabirds of Dirk Hartog Island from visits in 1972 and 1973, S.J.J.F. Davies and G.S. Chapman (1975) summarized records from a Royal Australasian Ornithologists' Union Western Australian Group field excursion in 1972, I. Abbott (1977) reported on some birds of Bernier and Dirk Hartog Islands from visits in June and July 1976, M. Howard (1978) published observations on the birds of Bernier Island during a visit in September,

1977, and P.G. Cale (1992) published an annotated list of the birds of Dorre Island from a visit in October 1988. Storr (1985, 1990) provided overviews of the region's birds, including seabirds, but provided little information on abundance. The only previous survey of many of the smaller islands was by K.D. Morris in September 1989 (in the Department of Conservation and Land Management Seabird Breeding Islands Database (CALM SBID), Burbidge and Fuller 1996).

METHODS

We made two visits to almost all of the smaller Shark Bay islands, one in autumn and one in spring. The first visit was from 6 to 13 May 1997, and the second from 16 to 23 September 1997. We used CALM's 7 m research vessel *Caretta* to travel to and between the islands. If weather conditions permitted a landing, one or two persons traversed the whole island searching for evidence of seabird breeding. If a colonial species, such as Pied Cormorant or Crested Tern, was located, a complete nest count was carried out if the birds were on eggs or had very small chicks; if, however, the colony contained large young that might panic and scatter, we made an estimate of the number of breeding pairs from a safe distance. For Silver Gull colonies, where nests are scattered and often well hidden, complete counts were not always possible and we examined a sample of nests to obtain data on stage of breeding, and estimated the total number of breeding pairs. The number of occupied or recently-renovated Wedge-tailed Shearwater burrows was estimated, not counted, and our estimates may not be accurate. We also recorded non-breeding seabirds and other birds on each island.

In this paper we have used a wide definition of seabird. As well as including traditional seabird groups such as shearwaters, gulls and terns (see Ross *et al.* 1995), we have also included Eastern Reef Egret, oystercatchers, Osprey and White-bellied Sea-Eagle (see Burbidge and Fuller 1996).

Published data are included below, as are unpublished data from the CALM SBID and from a recent visit to some islands by R.E. Johnstone (Museum of Natural Science, WA Museum) and others.

ANNOTATED LIST OF ISLANDS

Islands are listed in alphabetical order.

Baudin Island

Location 26°30'55"S, 113°38'56"E. South-western part of Freycinet Sound.
Tenure Nature Reserve 26004.
Description High limestone island with limestone headlands and cliffs, sandy beaches, and varying depths of sand over the limestone. *Spinifex longifolius, Nitraria billardierei* and *Scaevola crassifolia* behind beaches, low heath on uplands, *Nitraria billardierei* shrublands on limestone talus slopes. Alford *et al.* (in prep.) recorded 92 plant species, including nine aliens. Mined for guano.
Breeding seabirds 1997
Silver Gull – May: about 15 pairs present, 6 nests located, ready for eggs or with eggs.
Caspian Tern – September: 2 birds, new scrape.
Previous seabird breeding records
Wedge-tailed Shearwater – 1 September 1965: *c.* 100 (Serventy 1972).
Osprey – old nest present 1997. September 1989: 1 nest (K.D. Morris in CALM SBID).
Silver Gull – September 1989: no data (K.D. Morris in CALM SBID).
Caspian Tern – September 1989: 1 nest (K.D. Morris in CALM SBID).
Crested Tern – September 1989: no data (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 16. September: *c.* 40.
Pied Oystercatcher – May: 1. September: 1.
Pacific Gull – May: 1. September: 1.
Other birds present 1997
Australian Kestrel – September: 1.
Welcome Swallow – May: common, old nest in cave. September: *c.* 10.
Grey Fantail – May: 1.
Rock Parrot – May: common. September: *c.* 30.
Richard's Pipit – May: common. September: 2.
Silvereye – September: *c.* 12.
Little Woodswallow – May: 6.
Little Crow – May: 1996 nest.
Serventy (1972) reports that G.M. Storr located *c.* 100 Wedge-tailed Shearwater burrows on the south-west face of the island in 1965, but noted that he did not find burrows of this species during a visit in October 1947. We saw no burrows. At the time of our visits a south-facing slope had recently been covered with wind-blown sea grass to a considerable depth and it is possible that this is the area referred to by Storr.

Bernier Island

Location 24°51'S, 113°08'E. With Dorre Island, Bernier Island forms the north-western margin of Shark Bay west of Carnarvon.
Tenure Nature Reserve A24869.
Description A large island of 4267 ha. For a description see Ride *et al.* (1962).
Breeding seabirds 1997 We did not visit this island.
Previous seabird breeding records
Osprey – September 1977: 2 nests (Howard 1977). August 1987: 1 nest (K.D. Morris in CALM SBID).
White-bellied Sea-Eagle – September 1977: 1 nest (Howard 1977).
Pied Oystercatcher – September 1977: 1 nest (Howard 1977).
Pacific Gull – no data (Serventy *et al.* 1971). August 1987: 2 nests (K.D. Morris in CALM SBID).
Silver Gull – June 1976: 1 nest (Abbott 1977).

Brown Inlet (unnamed island)

Location 26°27'22"S, 113°29'24"E. In Brown Inlet, west of Carrarang Homestead.
Tenure Vacant Crown land.
Description Small limestone island, slightly domed and lightly vegetated.
Breeding seabirds 1997
Caspian Tern – September: 1 nest with 2 small chicks.
Silver Gull – September: *c.* 55 birds present, 3 old nests, 3 runners.
Eastern Reef Egret – September: single nest under dense *Nitraria,* with 3 eggs.
Osprey – nest with 2 eggs.
Previous seabird breeding records Nil.
Other seabirds present 1997
Pied Cormorant – September: 8.
Other birds present 1997 Nil.

Charlie Island

Location 26°22'04"S, 113°34'08"E. Freycinet Sound near Carrarang Peninsula.
Tenure Nature Reserve A33828.
Description Limestone plateau with low shrubland of *Nitraria billardierei.* Not mined for guano.
Breeding seabirds 1997
Silver Gull – May: 15 birds present, 2 nests located with eggs. September: 25 birds present, 1 runner, 3 old nests.
Caspian Tern – September: pair with nest with 1 egg.
Previous seabird breeding records
Osprey – May 1997: old nest. September 1989: 1 nest (K.D. Morris in CALM SBID).
Pacific Gull – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Caspian Tern – September 1989: 1 nest (K.D. Morris in CALM SBID).
Bridled Tern – no data (Storr 1985).
Other seabirds present 1997
Pied Cormorant – May: 25. September: 160.
Osprey – May: 1. September: 1.
Crested Tern – May: 3.
Other birds present 1997
Common Sandpiper – September: 1.
Ruddy Turnstone – September: 2.
Welcome Swallow – May: 2.

Charlie (islet to south-west)

Location 26°23'02"S, 113°31'51"E. Freycinet Sound near Carrarang Peninsula.
Tenure Vacant Crown land.
Description Flat rock with low vegetation.
Breeding seabirds 1997
Silver Gull – September: dead chick, 2 old nests.
Previous seabird breeding records
Pied Cormorant – September 1989: 30 nests (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – September: 35.
Silver Gull – September: 8.
Other birds present 1997
Ruddy Turnstone – September: 2.
Welcome Swallow – September: 2.
Comments Not visited in May.

Depuch Loop (unnamed islet)

Location 26°31'11"S, 113°35'40"E. Northern end of Depuch Loop on eastern side, north-west of Top Boorabuggatta Well.
Tenure Vacant Crown land.
Description Low rocky islet.
Breeding seabirds 1997
Osprey – September: nest with 2 chicks, 1 egg.
Pied Cormorant – September: 8 empty recently used nests, 1 with large chick.
Silver Gull – September: several old nests, 1 dead runner.
Pied Oystercatcher – September: nest with 2 eggs.
Previous seabird breeding records Nil.
Other birds present 1997
Welcome Swallow – September: 3.
Comments Not visited in May.

Dirk Hartog Island

Location 25°50'S, 113°03'E. A large island of about 62 000 ha which forms the western margin of Denham Sound.
Tenure Pastoral lease.
Description See Burbidge and George (1978).
Breeding seabirds 1997
Pied Cormorant – September: *c.* 600 nests with partially fledged chicks and flying young at Quoin Bluff South. (Colony had not commenced nesting in May.)
Osprey – September: 3 active nests on east coast between Sunday Island and Louisa Bay.
White-bellied Sea-Eagle – September: nest with single large chick at Quoin Bluff South above Pied Cormorant colony.
Previous seabird breeding records
Pied Cormorant – August 1920: 'Two large breeding colonies exist on Dirk Hartog Island – *viz.*, at Quoin Bluff and at another headland to the north, generally known as 'Shag Mia ... I estimated the number of nests (at Quoin Bluff) at over 2500' (Whitlock 1921, p. 175) and 'breeding in a great colony on Quoin Bluff. ... Thousands of young, in various stages of growth were noted. Date, 19th August, 1920' (White 1921, p. 189, reporting Whitlock's visit). September 1927: 'nesting in great numbers on the Quoin Bluff ... young fully fledged (I was there in the third week of September)' (Chenery 1928, p. 225, see also Ashby 1929). No data (Serventy *et al.* 1971; K.D. Morris in CALM SBID). September 1972: *c.* 2500 nests (Burbidge and George 1978). August-September 1973: 'large colony at Quoin Bluff containing an estimated 3000 plus birds'

(Wells and Wells 1974, p. 20). December 1976: numerous old nests (P.J. Fuller and A.A. Burbidge in CALM SBID). All these records, except for Whitlock's 1921 visit, are from Quoin Bluff South. In September we searched the coast northwards from Quoin Bluff to near Sandy Point but found no other colony. The Pied Cormorant colony at Quoin Bluff South, like many other colonies of this species, is located in different areas in different years. In September 1997 the colony was on the north side of the bluff; however, old nests were visible on the south side.
Osprey – September 1972: 'several' nests (Burbidge and George 1978). August-September 1973: 4 nests (Wells and Wells 1974).
White-bellied Sea-Eagle – September 1972: 1 nest (Burbidge and George 1978). August 1973: 1 nest (Wells and Wells 1974). December 1976: 1 nest (P.J. Fuller and A.A. Burbidge in CALM SBID). All these records are from Quoin Bluff South.
Pied Oystercatcher – August 1973: 1 nest (Wells and Wells 1974).
Silver Gull – 'A colony breeds amongst a host of Pied Cormorants at the Quoin Bluff' (Whitlock 1921). No data (Serventy *et al.* 1971; K.D. Morris in CALM SBID). August 1973: no data (Wells and Wells 1974).
Caspian Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID). September 1972: 1 nest at Cape Ransonnet (Burbidge and George 1978).
Fairy Tern – 1920: 'about a week later (after 24 September) several eggs were sent to me from Dirk Hartog; they had been taken from the beach within a mile of the homestead' (Whitlock 1921, p. 173); no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Bridled Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Other seabirds present 1997 Not recorded, as only a small part of the coast was searched.
Other birds present 1997 Not recorded: we landed only at Quoin Bluff South in May and September. For comprehensive lists of birds see Carter (1917, 1923), Whitlock (1921), Sedgwick (1967, 1968), Davies and Chapman (1975), Burbidge and George (1978) and Wells and Wells (1974).

Dorre Island

Location 25°03'S, 113°06'E. With Bernier Island, Dorre Island forms the north-western margin of Shark Bay to the west of Carnarvon.
Tenure Nature Reserve A24869.
Description A large Island of 5163 ha. For a description see Ride *et al.* (1962).
Breeding seabirds 1997 We did not visit this island.
Previous seabird breeding records
Pied Cormorant – August 1977: no data (R.I.T. Prince in CALM SBID); no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Eastern Reef Egret – August 1978: no data (R.I.T. Prince in CALM SBID).
Osprey – October 1975: no data (R.I.T. Prince in CALM SBID). August 1977: no data (R.I.T. Prince in CALM SBID). October 1988: 2 nests (Cale 1992); no data (K.D. Morris in CALM SBID).
White-bellied Sea-Eagle – December 1973 and August 1978: no data (R.I.T. Prince in CALM SBID); no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Pied Oystercatcher – October 1988: 1 nest (Cale 1992).
Pacific Gull – October 1975: (R.I.T. Prince in CALM SBID). October 1988: 1 nest (Cale 1992); no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Silver Gull – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Caspian Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Crested Tern – no data (Storr 1985).
Fairy Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).

Double Island

Location 26°24'58"S, 113°37'00"E. Western Freycinet Sound off Carrarang Peninsula.
Tenure: Nature Reserve 26004.
Description: Two limestone plateaux with talus slopes. *Nitraria billardierei* shrubland on slopes and grasses and herbs on plateaux. Probably mined for guano.
Breeding seabirds 1997
Wedge-tailed Shearwater – September: *c.* 160 freshly-excavated nesting burrows.
Previous seabird breeding records
Wedge-tailed Shearwater – October 1947: a 'few' burrows (Serventy 1972). April 1971: *c.* 50 burrows (Serventy 1972). September 1989: 11–100 nests (K.D. Morris in CALM SBID).
Pied Cormorant – old nests present in September 1997; no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
White-bellied Sea-Eagle – no data (K.D. Morris in CALM SBID).
Bridled Tern – no data (Storr 1985; K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 12. September: 15–20.
Silver Gull – September: 10.
Caspian Tern – September: 2.
Crested Tern – September: 2.
Bridled Tern – September: 4.
Other birds present 1997
Welcome Swallow – May: 2.
Little Crow – May: 1.
Comments We did not land in May.

Eagle Island

Location 26°05'41"S, 113°34'31"E. Freycinet Reach, off Eagle Bluff, Peron Peninsula.
Tenure Vacant Crown land.
Description Limestone dome, with low cliffs and a low dune on the south-eastern end, vegetated with a *Nitraria billardierei* shrubland and herbs. Alford *et al.* (in prep.) recorded seven plant species, including three aliens.

Breeding seabirds 1997
Silver Gull – May: *c.* 140 birds present, 32 nests located, ready for eggs or with eggs. September: *c.* 180 birds present, 2 nests with eggs, 4 runners, many old nests.
Caspian Tern – September: nest with 2 eggs.
Previous seabird breeding records
Osprey – September 1989: 1 nest (K.D. Morris in CALM SBID).
Pied Oystercatcher – no data (K.D. Morris in CALM SBID).
Silver Gull – September 1989: 11–100 nests (K.D. Morris in CALM SBID).
Caspian Tern – September 1989: 1 nest (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 16. September: 240.
Osprey – May: 1.
Other birds present 1997
Rock Parrot – May: 4.
Welcome Swallow – May: 7. September: 10–15.

Eagle Island (islet to south)

Location About 100 m south of Eagle Island.
Tenure Vacant Crown land.
Description Shrubland of *Nitraria billardierei*. Alford *et al.* (in prep.) noted several other species; however, they did not land on the islet.
Breeding seabirds 1997 Nil.
Previous seabird breeding records Nil.
Other seabirds present 1997
Pied Cormorant – May: 15. September: 40.
Silver Gull – May: 2. September: 15.
Other birds present 1997 Nil.

Egg Island

Location 25°54'35"S, 113°09'21"E. In Tetradon Loop, south of Quoin Bluff South, off east coast of Dirk Hartog Island. Also known as Tetradon Island.
Tenure Nature Reserve 26004.
Description Dome-shaped, rock-based with extensive guano and sand, mostly unvegetated, with a few shrubs of *Nitraria billardierei* on north-east corner. Mined for guano.
Breeding seabirds 1997
Silver Gull – May: *c.* 160 birds present, 47 nests located, ready for eggs or with eggs. September: *c.* 180 to 200 birds present, 2 nests with eggs, 3 runners.
Breeding seabirds 1998 (Johnstone[1], personal communication)
Silver Gull – 15 August: *c.* 200 birds present, 32 nests with eggs located, 6 runners.
Previous seabird breeding records
Silver Gull – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Caspian Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Crested Tern – many broken eggs found in May 1997, probably bred in spring or summer of 1996.
Bridled Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 150. September: 200–220.
Australian Pelican – May: 6.
Pied Oystercatcher – September: 1.
Pacific Gull – May: 1.
Other birds present 1997 Nil.

Faure Island

Location 25°52'S, 113°54'E. Disappointment Reach, north of Petit Point, east-south-east of Monkey Mia.
Tenure Pastoral lease.
Description A large island of 5148 ha, leased for pastoral purposes.
Breeding seabirds 1997 We did not visit this island.
Previous seabird breeding records
Caspian Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).

Freycinet Island

Location 26°24"S, 113°37'E. Western Freycinet Sound off Carrarang Peninsula.
Tenure Nature Reserve 26004.
Description High limestone plateau with talus slopes and a peak at the northern end. Slopes vegetated with *Nitraria billardierei* shrubland, many shrubs showing damage owing to nesting and roosting cormorants. Plateau with herbfields. Mined for guano. Alford *et al.* (in prep.) recorded 34 plant species, six of them aliens.
Breeding seabirds 1997
Wedge-tailed Shearwater – September: *c.* 200 freshly excavated nesting burrows, some nests occupied in daytime.
Pied Cormorant – May: *c.* 1500 nests on western slope towards north end of island, 40 per cent with 1 or 2 eggs and 60 per cent under construction or ready for eggs. Old breeding colony at southern end of island. September: *c.* 1000 birds present, breeding completed.
Silver Gull – May: *c.* 250 birds present, 37 nests located, ready for eggs or with eggs. Estimated total of 80 to 90 nests.
Previous seabird breeding records
Wedge-tailed Shearwater – October 1947: *c.* 50 burrows on western side (Serventy 1972). October 1965: *c.* 500 burrows on southern and western slopes (Serventy 1972). April 1971: *c.* 250 burrows (Serventy *et al.* 1971). September 1989: 100–500 nests (K.D. Morris in CALM SBID).
Pied Cormorant – no data (Serventy *et al.* 1971). September 1989: 500–1000 nests (K.D. Morris in CALM SBID).
Eastern Reef Egret – September 1989: 1 nest (K.D. Morris in CALM SBID).

[1] R.E. Johnstone, Museum of Natural Science, Western Australian Museum, Francis St, Perth WA 6000

Silver Gull – September 1989: 2 nests (K.D. Morris in CALM SBID).
Caspian Tern – September 1989: 1 nest (K.D. Morris in CALM SBID).
Bridled Tern – no data (Serventy *et al.* 1971). September 1989: no data (K.D. Morris in CALM SBID).
Other seabirds present 1997
White-bellied Sea-Eagle – September: 2.
Pied Oystercatcher – September: 2.
Caspian Tern – September: 2.
Other birds present 1997
Australian Kestrel – September: 1.
Banded Land-rail – September: 1 runner.
Common Sandpiper – September: 1.
Ruddy Turnstone – September: 4.
Rock Parrot – May: 10. September: *c.* 35.
Welcome Swallow – May: 8–10. September: common.
Richard's Pipit – September: 2.

Friday Island

Location 26°06'10"S, 113°24'10"E. In Freycinet Reach, off western side of Heirisson Prong and south of causeway to Slope Island.
Tenure Nature Reserve A33829.
Description Limestone plateau with talus slope to north and a small beach on the southern side, *Nitraria billardierei* shrubland on talus, low shrubs and herbs behind beach and no vegetation on plateau. Mined for guano.
Breeding seabirds 1997
Wedge-tailed Shearwater – September: *c.* 65 freshly excavated burrows.
Pied Cormorant – September: 88 nests with young almost ready to fly.
Silver Gull – September: *c.* 120 birds present, 2 nests with eggs, 4 runners, breeding mostly finished.
Previous seabird breeding records
Wedge-tailed Shearwater – September 1965: *c.* 50 nests (Serventy 1972). September 1972: no data (N. Beeck in CALM SBID).
Pied Cormorant – September 1989: 100–500 nests (K.D. Morris in CALM SBID).
Silver Gull – September 1989: 11–100 nests (K.D. Morris in CALM SBID).
Caspian Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Bridled Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Other seabirds present 1997
Eastern Reef Egret – September: 2.
Other birds present 1997
Rock Parrot – September: *c.* 10.
Ruddy Turnstone – September: 4.
Red-necked Stint – September: 2.
Comments Not visited in May owing to adverse weather conditions.

Kangaroo Island

Location 26°19'10"S, 113°29'59"E. Boat Haven Loop.
Tenure Vacant Crown land.
Description Low plateau with herbfield on shallow soils and a low dune with *Nitraria billardierei* shrubland, surrounded by low cliffs with *Nitraria billardierei* shrubland. Alford *et al.* (in prep.) recorded 11 plant species, including five aliens. Mined for guano.
Breeding seabirds 1997
Osprey – September: nest with 2 chicks and addled egg.
Pied Oystercatcher – September: pair with 1 runner.
Pacific Gull – September: 2 new nests.
Silver Gull – May: 6 birds present, 1 nest located with single egg. September: 160 birds present, nest with 2 eggs.
Previous seabird breeding records
Osprey – September 1989: 1 nest (K.D. Morris in CALM SBID).
Pacific Gull – September 1989: 4 nests (K.D. Morris in CALM SBID).
Silver Gull – September 1989: 11–100 nests (K.D. Morris in CALM SBID).
Caspian Tern – September 1989: 1 nest (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 11.
Eastern Reef Egret – September: 2.
Osprey – May: 1.
Pacific Gull – May: 2.
Other birds present 1997
Welcome Swallow – May: 5.

Kangaroo Island (islet to south)

Location 26°20'29"S, 113°30'52"E. Boat Haven Loop.
Tenure Vacant Crown land.
Description Low dome-shaped islet with *Nitraria billardierei* shrubs near edge and herbs or bare sand elsewhere.
Breeding seabirds 1997
Pied Cormorant – May: 63 nests, 37 with eggs and 26 under construction or ready for eggs. September: 10 nests with eggs, 13 nests with unfledged young.
Osprey – September: nest with 1 egg.
Silver Gull – May: 12 birds present, 4 nests located, ready for eggs or with eggs. September: 10–12 birds present, 3 dead chicks and several runners.
Caspian Tern – September: nest with 1 egg.
Previous seabird breeding records Nil.
Other seabirds present 1997
Osprey – May: 1.
Pied Oystercatcher – September: 2.
Other birds present 1997
Rock Parrot – May: 5. September: *c.* 8, nest with chicks under loose limestone slab.
Welcome Swallow – September: *c.* 5.

Koks Island

Location 24°45'03"S, 113°09'34"E. Off northern tip of Bernier Island.
Tenure Nature Reserve A33901.
Description Limestone plateau with surrounding cliffs.
Breeding seabirds 1997 We did not visit this island.
Previous seabird breeding records
Crested Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Roseate Tern – no data (K.D. Morris in CALM SBID).
Fairy Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).

Lefebre Island

Location 26°13'51"S, 113°30'26"E. Freycinet Sound, north of Carrarang Peninsula and east of Edel Land.
Tenure Vacant Crown land.
Description A rocky island with scanty vegetation.
Breeding seabirds 1997 May: Nil. September: Nil.
Previous seabird breeding records
Wedge-tailed Shearwater – no data (Storr 1985).
Pied Cormorant – no data (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 80. September: 250–300.
Ruddy Turnstone – September: 2.
Silver Gull – May: 15. September: 20.
Rock Parrot – September: 10.
Other birds present 1997 Nil.

Mary Anne Island

Location 26°29'07"S, 113°41'00"E. Southern Freycinet Sound.
Tenure Nature Reserve 26004.
Description Limestone plateau and talus slopes, *Nitraria billardierei* shrubland on slopes, plateau with grasses and herbs. Mined for guano. Alford *et al.* (in prep.) recorded 16 plant species, including four aliens.
Breeding seabirds 1997
Pied Oystercatcher – September: nest with 1 egg.
Pacific Gull – September: pair with newly constructed nest.
Silver Gull – May: about 90 present, 21 nests located, ready for eggs or with eggs. September: 25 to 30 birds present, 1 nest with 2 eggs plus dead runners.
Roseate Tern – May: 138 nests: 20 new scrapes, 83 with 1 egg, 35 with 2 eggs.
Previous seabird breeding records
Pied Cormorant – no data (Serventy *et al.* 1971).
Osprey – September 1989: 1 nest (K.D. Morris in CALM SBID).
Pied Oystercatcher – September 1989: 2 nests (K.D. Morris in CALM SBID).
Pacific Gull – September 1989: 1 nest (K.D. Morris in CALM SBID).
Silver Gull – September 1989: 9 nests (K.D. Morris in CALM SBID).
Caspian Tern – September 1989: 1 nest (K.D. Morris in CALM SBID).
Crested Tern – no data (Serventy *et al.* 1971).
Bridled Tern – no data (Storr 1985).
Other seabirds present 1997
Pied Cormorant – May: 35. September: *c.* 50.
Caspian Tern – September: 2.
Other birds present 1997
Ruddy Turnstone – September: 20.
Welcome Swallow – September: *c.* 5.

Meade Island

Location 26°00'06"S, 113°11'58"E. About 75 m off east coast of Dirk Hartog Island, adjacent to homestead.
Tenure Vacant Crown land.
Description Low limestone island with small pockets of sand. *Nitraria billardierei* shrubland with halophytes.
Breeding seabirds 1997
Osprey – September: nest with chicks.
Silver Gull – May: *c.* 40 birds present, 3 nests located, 1 with addled egg and 2 new nests. September: *c.* 50 birds present, 4 nests with eggs, 3 runners, breeding almost completed.
Breeding seabirds 1998 (Johnstone, personal communication)
Osprey – 3 August, 15 August: nest with 3 eggs.
Silver Gull – 3 August: 2 nests with eggs, 2 runners. 15 August: 3 nests with eggs.
Crested Tern – 3 August: *c.* 45 runners, *c.* 60 recently fledged birds. 15 August: 50–60 feathered runners, *c.* 50 recently-fledged young.
Lesser Crested Tern – 3 August: 10–15 runners, 1 broken egg. 15 August: 2–3 runners, 6 recently-fledged young.
Previous seabird breeding records
Silver Gull – no data (K.D. Morris in CALM SBID); May 1978: 9 nests (P.J. Fuller and A.A. Burbidge in CALM SBID); February 1985: no data (A.A. Burbidge in CALM SBID).
Crested Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID); September 1972: 1 chick (Burbidge and George 1978).
Roseate Tern – no data (K.D. Morris in CALM SBID). December 1976: 200–300 nests (Burbidge and George 1978).
Fairy Tern – no data (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 15. September: 25.
Australian Pelican – September: 4.
Osprey – May: 1.
Pied Oystercatcher – September: 2.
Crested Tern – September: 6.
Other birds present 1997
Rock Parrot – May: 2.
Comments May: A recently-dead Feral Cat (*Felis catus*) found on island. Feral cats are abundant on the adjacent Dirk Hartog Island.

North Guana Island

Location 26°32'00"S, 113°41'26"E. Southern Freycinet Sound, west of Salutation Island and north of Baba Head.

Tenure Nature Reserve 26004.
Description Limestone plateau and talus slopes. Slopes vegetated with *Nitraria billardierei* shrubland, grassland on plateau. Alford *et al.* (in prep.) recorded 17 plant species, including three aliens. Plateau mined for guano.
Breeding seabirds 1997
Osprey – September: nest with 1 egg.
Pacific Gull – September: 2 new nests.
Silver Gull – May: 50 birds present, 11 nests located, ready for eggs or with eggs. September: 15 to 20 birds present, old nests seen plus dead runners.
Previous seabird breeding records
Osprey – September 1989: 2 nests (K.D. Morris in CALM SBID).
Bridled Tern – September 1989: 15 nests (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 8. September: 15.
Osprey – May: 3.
Pied Oystercatcher – September: 1.
Roseate tern – September: 4.
Fairy Tern – September: 6.
Other birds present 1997
Rock Parrot – May: common. September: *c.* 35.
Welcome Swallow – May: 5. September: *c.* 6.
Richard's Pipit – September: 2.

North Guano, islet to west

Location Freycinet Sound, about 150 m west of North Guano Island.
Tenure Vacant Crown land.
Description Rugged limestone rock with *Nitraria billardierei* shrubland. 'Little Guano Rock' of Alford *et al.* (in prep.), who recorded eight plant species.
Breeding seabirds 1997
Roseate Tern – May: 92 nests all with eggs.
Previous seabird breeding records Nil.
Other seabirds present 1997
Pied Cormorant – September: 25.
Silver Gull – September: 2.
Crested Tern – September: 2.
Other birds present 1997 Nil.

North Kangaroo Island

Location 26°17'58"S, 113°30'12"E. Boat Haven Loop.
Tenure Vacant Crown land.
Description Small plateau with *Calandrinia polyandra* herbfield, surrounding low cliffs vegetated with *Nitraria billardierei* shrubs. Alford *et al.* (in prep.) recorded 15 plant species including three aliens. In our September visit most of the island was covered with the introduced Ice Plant (*Mesembryanthemum crystallinum*). Alford *et al.* (in prep.) reported that the island had been mined for guano, but we saw no sign of this.
Breeding seabirds 1997
Fairy Tern – September: 6 nests with eggs.
Previous seabird breeding records Nil.
Other seabirds present 1997
Pied Cormorant – May: 6. September: 5.
Eastern Reef Egret – September: 1.
Osprey – May: 1.
Pied Oystercatcher – September: 1.
Silver Gull – September: 6.
Caspian Tern – September: 2.
Other birds present 1997
Rock Parrot – May: 4. September: 6.
Welcome Swallow – September: *c.* 10.
Richard's Pipit – May: 2.
Comments We did not land in May.

Pelican Island

Location 25°51'13"S, 114°00'49"E. Disappointment Reach, east of Faure Island.
Tenure Nature Reserve 26004.
Description Sand cay on large limestone reef, covered with closed shrubland of *Nitraria billardierei*, some of which shows damage from cormorant colonies. Narrow beaches surround the island.
Breeding seabirds 1997
Pied Cormorant – May: *c.* 1150 nests towards northern tip of island, most were new nests ready for eggs or with up to 4 eggs; about 150 nests towards southern end of colony with large young. Old colonies evident (old nests) in regenerating *Nitraria* towards southern end of island. No birds breeding in September.
Australian Pelican – May: 92 nests on western edge of island towards northern end, all with 1 or 2 eggs. September: 6 three-quarter grown young in crèche, 30–40 adults at island.
Pied Oystercatcher – September: 4 nests with eggs.
Silver Gull – May: about 350 birds present, 42 nests located, ready for eggs or with eggs.
Previous seabird breeding records
Lane and Pearson[2] (personal communication) recorded the following data during a study of pelican biology during the 1970s.
Australian Pelican – 19 May 1974: *c.* 60 pairs on eggs. 10 July 1975*: *c.* 70 pairs on nests. 4 September 1975: *c.* 30 flightless young (out of nest). 20 March 1976*: no nesting. 1 August 1976*: *c.* 20 pairs nesting. 7 October 1976*: no nesting. 4 February 1977*: no nesting. 1 April 1977*: no nesting. 8 August 1977*: a crèche of flightless young, estimated 30–35 birds. 1 March 1978: no nesting. 12 September 1978: *c.* 40 large chicks in crèche, 1 nest with single egg. [* denotes aerial survey.] Lane and Pearson also recorded the following data on other seabirds.
Pied Cormorant – 19 May 1974: several thousand. 10 July 1974: nesting, no estimate made. 1 April 1977: several thousand nesting. 12 September 1978: several thousand nests.
Pied Oystercatcher – 4 September 1975: 'numerous' pairs on eggs.
Pacific Gull – 12 September 1978: 2 nests with eggs.
Caspian Tern – 12 September 1978: 40 nests containing eggs, eggs and chicks, and chicks.

[2] J.A.K.Lane, CALMScience Division, Busselton.
G.B.Pearson, CALMScience Division, Woodvale.

Other seabirds present 1997
Eastern Reef Egret – May: 1. September: 2 (probably breeding – bird flushed twice from dense vegetation).
White-bellied Sea-Eagle – September: 2.
Pied Oystercatcher – May: 45.
Silver Gull – September: 5.
Other birds present 1997
Grey-tailed Tattler – May: 1.
Bar-tailed Godwit – May: 2. September: 12.
Curlew Sandpiper – September: 4.
Red-necked Stint – September: several on reef.
Wedge-tailed Eagle – September: 1.
White-bellied Woodswallow – September: 7.
Notes Pelican Island is an important Australian Pelican and Pied Cormorant breeding site. Available data show that pelicans nest and lay in late autumn and that most young have left the island by October. The Pied Cormorant colony is one of three large colonies in Shark Bay, the others being at Quoin Bluff South on Dirk Hartog Island and on Freycinet Island. The 1978 record of a colony of Caspian Terns is the only record of colonial nesting of this species in Shark Bay.

Ransonnet Rock

Location 26°09'50"S, 113°12'52"E. In South Passage, off Cape Ransonnet, Dirk Hartog Island.
Tenure Vacant Crown land.
Description Small, unvegetated rock.
Breeding seabirds 1997 May: Nil.
Previous seabird breeding records Nil.
Other seabirds present 1997 May: Nil.
Other birds present 1997 May: Nil.
Comments Not visited in September.

Salutation Island

Location 26°32'S, 113°46'E. Southern Freycinet Sound.
Tenure Nature Reserve 26004.
Description Rocky limestone headlands with sandy beaches, inland areas mainly sand. Inland areas vegetated with low open shrubland of *Acacia rostellifera* over low shrubs, grasses and herbs. Alford *et al.* (in prep.) recorded 109 plant species, 14 of them aliens.
Breeding seabirds 1997
Osprey – September: nest ready for eggs.
Pied Oystercatcher – September: 4 nests with 1 or 2 eggs.
Pacific Gull – September: 3 nests ready for eggs.
Caspian Tern – September: 5 nests all with a single egg.
Previous seabird breeding records
Pied Cormorant – September 1989: 100 nests (K.D. Morris in CALM SBID).
Osprey – August–September 1972: 1 nest with chick (Davies and Chapman 1975).
Pied Oystercatcher – September 1989: 1 nest (K.D. Morris in CALM SBID).
Pacific Gull – August–September 1972: 9 nests with eggs (Davies and Chapman 1975). September 1989: 2 nests (K.D. Morris in CALM SBID).
Silver Gull – September 1989: 11–50 nests (K.D. Morris in CALM SBID).
Caspian Tern – September 1989: 1 nest (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 10. September: *c.* 90.
Pied Oystercatcher – May: 2.
Pacific Gull – May: 4.
Silver Gull – September: *c.* 25.
Crested Tern – September: 12.
Other birds present 1997
Wedge-tailed Eagle – September: 1.
White-faced Heron – May: 1.
Greenshank – September: 4.
Grey-tailed Tattler – September: 2.
Common Sandpiper – September: 1.
Red-necked Stint – September: 4.
Australian Kestrel – September: 2.
Rock Parrot – September: 6.
Welcome Swallow – May and September: common.
Quail, probably Brown Quail – May: 4. September: 12.
Richard's Pipit – May: common. September: 4.
Willie Wagtail – May: 1.
Singing Honeyeater – September: 3.
Comments Tracks and stick nests of Wopilkara (Greater Stick-nest Rat) *Leporillus conditor* abundant and four animals seen in daylight during the September visit. This species has been introduced as part of the implementation of a recovery plan.

Salutation Island (islet to south)

Location About 100 m off the south-east corner of Salutation Island.
Tenure Nature Reserve 26004.
Description Flat topped rock with sparse vegetation.
Breeding seabirds 1997
Silver Gull – September: 40 birds present, 3 runners.
Previous seabird breeding records
Pied Cormorant – September 1989: 20–50 old nests (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – September: 80.
Other birds present 1997 Nil.
Comments Not visited in May.

Slope Island

Location 26°05'47"S, 113°24'53"E. Freycinet Reach to east of Heirisson Prong.
Tenure Mining lease.
Description Connected to mainland by causeway in late 1966 or early 1967. Most of the island has been destroyed or severely degraded by the construction of a salt-loading facility. Some remnant *Nitraria billardierei* shrubland on talus slopes. Alford *et al.* (in prep.) recorded four plant species, including one alien.
Breeding seabirds 1997 Nil.
Previous seabird breeding records
Wedge-tailed Shearwater – 1943: no data (Serventy 1972). 28 August 1965: 150–200 breeding pairs (Serventy 1972). April 1971: *c.* 150 pairs (Serventy 1972). February 1980: no data (K. Marshall in CALM SBID).

Bridled Tern – 1917: 'Mr Carter obtained an egg on Slope Island' (Whitlock 1921). February 1980: no data (K. Marshall in CALM SBID).
Other seabirds present 1997
Pied Cormorant – September: 120.
Osprey – September: nest on jetty, with 2 birds in attendance.
Silver Gull – September: 50–60.
Other birds present 1997 Nil.
Comments Not visited in May. We searched for Wedge-tailed Shearwater burrows in September, but located none, although workers at the site told us that some birds still visited the area at night. Rabbits abundant in location where burrows formerly occurred.

Slope Island (island to north)

Location 26°03'28"S, 113°23'51"E. Freycinet Reach, about 4 km north of Slope Island salt loading facility.
Tenure Vacant Crown land.
Description Domed rocky islet with sparse vegetation. Mined for guano.
Breeding seabirds 1997
Wedge-tailed Shearwater – September: 68 freshly excavated burrows.
Silver Gull – May: 160 birds present, 38 nests located, ready for eggs or with eggs. September: *c.* 250 birds present, 3 nests with eggs, 4 runners.
Caspian Tern – September: nest with 2 small chicks.
Crested Tern – May: 410 nests, 34 scrapes, 376 with 1 egg.
Previous seabird breeding records Nil.
Other seabirds present 1997
Pied Cormorant – May: 24. September: *c.* 450.
Australian Pelican – September: 5.
Eastern Reef Egret – September: 1.
Pied Oystercatcher – May: 2.
Other birds present 1997
Ruddy Turnstone – May: 24. September: 14.

Smith Islands (north)

Location 26°35'00"S, 113°43'25"E. Southern Freycinet Sound.
Tenure Vacant Crown land.
Description Bare limestone.
Breeding seabirds 1997 None recorded
Previous seabird breeding records Nil.
Other seabirds present 1997
Pied Cormorant – September: 13.
Silver Gull – September: 4.
Other birds present 1997 Nil.
Comments Strong winds prevented landing in May.

Smith Islands (south)

Location 26°35'00"S, 113°43'25"E. Southern Freycinet Sound.
Tenure Vacant Crown land.
Description Bare limestone.
Breeding seabirds 1997
Eastern Reef Egret – September: nest with 2 eggs.
Osprey – September: nest with chick.
Silver Gull – September: 8–10 birds present, nest with addled egg, plus 2 runners.
Previous seabird breeding records
Osprey – September 1989: 1 nest (K.D. Morris in CALM SBID).
Pied Cormorant – September 1989: 5 nests (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – September: 15.
Other birds present 1997 Nil.
Comments: Strong winds prevented landing in May.

Smith Rocks

Location 26°05'41"S, 113°24'04"E. Freycinet Reach, off east coast of Heirisson Prong, to south of salt loading causeway.
Tenure Vacant Crown land.
Description Unvegetated rock.
Breeding seabirds 1997 Nil.
Previous seabird breeding records Nil.
Other seabirds present 1997 Nil.
Other birds present 1997 Nil.

South Guano Island

Location 26°32'46"S, 113°41'25"E. Southern Freycinet Sound, west of Salutation Island and north of Baba Head.
Tenure Nature Reserve 26004.
Description 3.717 ha. Limestone plateau with surrounding rugged talus slopes. Tall shrubland of *Nitraria billardierei* on talus, herbfields on plateau. Alford *et al.* (in prep.) recorded 22 plant species, including three aliens. Plateau mined for guano.
Breeding seabirds 1997
Wedge-tailed Shearwater – *c.* 80 freshly excavated burrows on western slopes.
Silver Gull – May: 100 birds present, 12 nests located, ready for eggs or with eggs. September: 35–40 birds present, 2 runners.
Previous seabird breeding records
Wedge-tailed Shearwater – September 1989: 6 nests (K.D. Morris in CALM SBID).
Osprey – old nest present in 1997.
Other seabirds present 1997
Pied Cormorant – May: 25. September: 45.
Eastern Reef Egret – September: 1.
Other birds present 1997
Rock Parrot – May: 6. September: 35.
Australian Kestrel – September: 1.
Welcome Swallow – May: 5.
Richard's Pipit – September: 2.

Three Bays Island

Location 26°33'16"S, 113°38'47"E. South-western Freycinet Sound.
Tenure Nature Reserve 26004.

Description Limestone headlands with low sandy areas and beaches between. Sandy areas have *Spinifex longifolius* and bands of *Nitraria billardierei*. Headlands with low heath of *Atriplex cinerea* and *Sarcostemma viminale*. Alford *et al.* (in prep.) recorded 80 plant species, including 12 aliens. Mined for guano.
Breeding seabirds 1997
Osprey – September: nest with 3 large young.
Pied Oystercatcher – September: pair seen whose behaviour indicated nesting, but nest not located.
Silver Gull – May: 9 nests located, ready for eggs or with eggs, *c.* 40 nests probable. September: breeding finished, several flying juveniles.
Caspian Tern – September: nest with 1 egg.
Crested Tern – May: 4 nests each with single egg on north-west slope of eastern headland. Seven pairs present.
Previous seabird breeding records
Osprey – we saw a nest judged to have been used in 1996. September 1989: 1 nest (K.D. Morris in CALM SBID).
Caspian Tern – September 1989: 2 nests (K.D. Morris in CALM SBID).
Pacific Gull – September 1989: 1 nest (K.D. Morris in CALM SBID).
Silver Gull – September 1989: no data (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 30. September: *c.* 70.
Osprey – May: 2.
Pacific Gull – September: 2.
Silver Gull – September: *c.* 75.
Crested Tern – September: 33.
Other birds present 1997
Australian Kestrel – September: 1.
Rock Parrot – May: common. September: 6.
Welcome Swallow – May: 6. September: numerous.
Richard's Pipit – September: 2.
Silvereye – September: *c.* 10.
Comments Tracks of a small mammal, presumably *Mus domesticus*, seen behind northern beach. This species was trapped on Three Bays Island in 1989 (Morris[3], personal communication)

Sunday Island

Location 26°07'33"S, 113°14'07"E. Blind Strait, near Dirk Hartog Island.
Tenure Nature Reserve 26004.
Description Low limestone plateau surrounded by cliffs.
Breeding seabirds 1997
Osprey – September; nest with single egg.
Silver Gull – May: *c.* 140 birds present, 15 nests located, ready for eggs or with eggs. September: *c.* 40 birds present, 2 nests with eggs, several runners.
Crested Tern – May: 14 nests, 2 scrapes and 12 with 1 egg. September: 1 three-quarter fledged chick with broken wing.
Breeding seabirds 1998 (Johnstone, personal communication):
Silver Gull – 15 August: 200–300 birds present, 7 nests with eggs, 2 runners.
Bridled Tern – 15 August: old egg under *Nitraria billardierei* shrub.
Previous seabird breeding records
Osprey – no data (K.D. Morris in CALM SBID).
Pacific Gull – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Caspian Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Crested Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Bridled Tern – no data (Serventy *et al.* 1971; K.D. Morris in CALM SBID).
Other seabirds present 1997
Eastern Reef Egret – September: 2.
Osprey – May: 2.
Other birds present 1997 Nil.

White Island

Location 26°26'39"S, 113°45'42"E. Central Freycinet Sound.
Tenure Nature Reserve 26004.
Description Limestone, steep sides, flat top, scattered *Nitraria billardieri* on slopes, plateau unvegetated, mined for guano. Alford *et al.* (in prep.) recorded 15 plant species, five of them aliens.
Breeding seabirds 1997
Osprey – September: newly lined nest.
Silver Gull – May: 250 birds present, 24 nests located, ready for eggs or with eggs. Colony of about 100 pairs probable. September: 190–200 birds present, runners and flying juveniles.
Caspian Tern – September: nest with 2 eggs.
Previous seabird breeding records
White-bellied Sea-Eagle – no data (Storr 1985).
Osprey – In May 1997 we saw a nest judged to have been used in 1996.
Other seabirds present 1997
Pied Cormorant – May: 250. September: 220.
Bridled Tern – September: *c.* 70 pairs.
Other birds present 1997
Welcome Swallow – May: 5. September: 6.

Wilds Islands

Location 26°27'07"S, 113°36'55"E. Freycinet Sound, north of Giraud Point.
Tenure Nature Reserve 26004.
Description A group of three islands. The largest comprises a plateau with talus slopes, joined by a tombolo to a rugged rock, and the other two are unvegetated rocks. The plateau has been mined for guano and is vegetated with grasses and herbs, the slopes with a shrubland of *Nitraria billardierei*. Alford *et al.* (in prep.) recorded 13 plant species on the plateau and slopes, including five aliens, and nine plant species including three aliens on the vegetated rock.

[3] K.D. Morris, CALMScience Division, CALM, PO Box 51, Wanneroo, WA 6065

Breeding seabirds 1997
Silver Gull – May: 90 birds present, 26 nests located, ready for eggs or with eggs. September: 70 birds present, several flying young.
Previous seabird breeding records
Pied Cormorant – no data (Serventy *et al.* 1971).
September 1989: 100–500 nests (K.D. Morris in CALM SBID).
Silver Gull – September 1989: no data (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – May: 42.
Other birds present 1997
Rock Parrot – May: 5.

Wilds (islet to south)

Location 26°29'15"S, 113°36'43"E. Freycinet Sound near entrance to Depuch Loop.
Tenure Vacant Crown land.
Description Scattered *Nitraria billardierei* around edges, central parts bare. Alford *et al.* (in prep.) refer to this island as Depuch Island 'North'. Mined for guano.
Breeding seabirds 1997
Silver Gull – May: 30 birds present, 3 nests located, all with eggs.
Crested Tern – May: 13 nests all with 1 egg.
Previous seabird breeding records Nil.
Other seabirds present 1997
Osprey – May: 1.
Pacific Gull – May: 2.
Other birds present 1997
Ruddy Turnstone – May: 3.

Wilds (islet to south-west)

Location 26°29'16"S, 113°34'28"E. Depuch Loop, adjacent to Carrarang Peninsula.
Tenure Vacant Crown land.
Description Limestone boulders and guano; scattered herbs and grasses with some *Nitraria billardierei* shrubs. Alford *et al.* (in prep.) refer to this island as Depuch Island 'South'.
Breeding seabirds 1997
Silver Gull – May: *c.* 45 birds present, 5 nests located with eggs.
Previous seabird breeding records Nil.
Other seabirds present 1997
Pied Cormorant – May: 18. September: 50.
Pacific Gull – May: 3. September: 2.
Silver Gull – September: 2.
Other birds present 1997
Australian Kestrel – September: 1.
Rock Parrot – May: 30–35.
Welcome Swallow – May: 7.

Wilds (islets to west, North Islet)

Location 26°26'42"S, 113°34'15"E. Freycinet Sound, near entrance to Depuch Loop, adjacent to eastern side of Carrarang Peninsula.
Tenure Vacant Crown land.
Description Bare rock.
Breeding seabirds 1997 Nil.
Previous seabird breeding records
Silver Gull – September 1989: 20 nests (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – September: 25.
Silver Gull – September: 2.
Other birds present Nil.

Wilds (islets to west, South Islet)

Location 26°27'10"S, 113°34'28"E. Freycinet Sound, near entrance to Depuch Loop, adjacent to eastern side of Carrarang Peninsula.
Tenure Vacant Crown land.
Description Low domed rock with grassy plateau and some *Nitraria*. Mined for guano.
Breeding seabirds 1997
Eastern Reef Egret – September: 1 nest with 2 eggs under Osprey nest.
Osprey – September: 1 nest with 1 egg and 2 small chicks.
Silver Gull – September: breeding finished, 3 dead runners.
Caspian Tern – September: 1 nest with 1 egg.
Previous seabird breeding records
Pied Cormorant – September 1989: 50 nests (K.D. Morris in CALM SBID).
Silver Gull – September 1989: 50–100 nests (K.D. Morris in CALM SBID).
Other seabirds present 1997
Pied Cormorant – September: 15.
Pacific Gull – September: 2.
Other birds present
Rock Parrot – September: 15–20.

ANNOTATED LIST OF BREEDING SEABIRDS

Wedge-tailed Shearwater (*Puffinus pacificus*) recorded breeding on Baudin, Charlie, Double, Freycinet, Friday, Lefebre, Slope, Slope (island to N) and South Guano Islands. The largest colony we recorded, of *c.* 200 burrows, was on Freycinet Island. A widespread species breeding from near Perth around the northern coasts of Australia. Shark Bay colonies are much smaller than those in the Houtman Abrolhos (Fuller, Burbidge and Owens 1994) and on some islands off the Pilbara coast. The colony on Slope Island appears now to be effectively destroyed, owing to the construction of the salt loading port. Construction destroyed some, but not all, habitat; however, the causeway to the mainland allowed access to feral animals and this resulted in the Red Fox (*Vulpes vulpes*) predating adults and young, and the European Rabbit (*Oryctolagus cuniculus*) interfering with breeding burrows. Serventy (1972) reported that Shark Bay birds show a variation in plumage unknown elsewhere in WA (a proportion (*c.* 20 per cent) of the birds, instead of being

uniformly dark-plumaged, has white under-parts. This condition was first reported only in the Slope Island colony; however, work in 1965 and 1971 showed that it occurred in other Shark Bay islands as well. Serventy (1972) estimated a total of about 600 breeding pairs in Shark Bay, very similar to our 1997 estimate of 580 (Table 1); however, estimates of numbers of breeding pairs made from estimates of number of active burrows may be inaccurate.

Australian Pelican (*Pelecanus conspicillatus*) recorded breeding on Pelican Island. This is the only Shark Bay colony. In WA, other colonies are found some distance away – in the south-west (Oyster Harbour, Peel Inlet, Mandurah, Penguin Island) and off the Pilbara (Little Rocky Islet being the closest to Shark Bay) and Kimberley coasts. It also occasionally breeds in inland freshwater lakes in the Pilbara and Kimberley.

Pied Cormorant (*Phalacrocorax varius*) recorded breeding on Charlie (islet 2 km SW), Depuch Loop (unnamed islet), Dirk Hartog, Dorre, Double, Freycinet, Friday, Lefebre, Mary Anne, Pelican, Salutation, Salutation (islet to south-west), Smith (South), White and Wilds Islands and Wilds (islets to west, South Islet). Reported breeding on Faure and North Guano Islands and on light beacons 13 and 25 km west of Denham (Gregory 1941; Storr 1985); may breed on additional smaller islands. Shark Bay is a major stronghold for this species with large colonies on Dirk Hartog, Freycinet and Pelican Islands. Fowler (1947) reported numbers of Pied Cormorants seen from the air in October 1945 and July 1946, noting that 'The number of cormorants observed during the first flight was the largest I have seen within a comparable area in Australia' (p. 69). Fowler reported 15 000 to 20 000 birds off the east coast of Dirk Hartog Island between Cape Levillain and Egg Island during the 1945 flight.

Eastern Reef Egret (*Egretta sacra*) recorded breeding on Brown Inlet (unnamed island), Dorre, Freycinet, Salutation, Smith (South) and Wilds (islets to west, south islet) Islands. This widespread species may breed on almost any rock island in Shark Bay.

Osprey (*Pandion haliaetus*) recorded breeding on Baudin, Bernier, Charlie, Depuch Loop (unnamed islet), Dirk Hartog, Dorre, Eagle, Kangaroo, Mary Anne, Meade, North Guano, Salutation, Smith (South), Sunday, Three Bays, White, Wilds Islands, and Wilds (islets to west, south islet). A common species in Shark Bay which may breed on almost any island or islet in the area.

White-bellied Sea-Eagle (*Haliaeetus leucogaster*) recorded breeding on Bernier, Dirk Hartog, Dorre, Double and White Islands. A widespread but not particularly common species. May breed on other Shark Bay islands from time to time.

Pied Oystercatcher (*Haematopus longirostris*) recorded breeding on Bernier, Depuch Loop (unnamed islet), Dirk Hartog, Dorre, Eagle, Mary Anne, Pelican, Salutation and Three Bays Islands. May breed on any island with sandy beaches.

Sooty Oystercatcher (*Haematopus fuliginosus*) recorded breeding on Dorre Island. An uncommon species in Shark Bay.

Silver Gull (*Larus novaehollandiae*) recorded breeding on Baudin, Bernier, Charlie, Charlie (islet to south-west), Depuch Loop (unnamed islet), Dirk Hartog, Dorre, Eagle, Egg, Freycinet, Friday, Kangaroo, Mary Anne, Meade, North Guano, Pelican, Salutation, Salutation (islet to south-west), Slope, island to north, Smith (South), South Guano, Sunday, Three Bays, White, Wilds, Wilds (islet to south), Wilds (islet to south west), Wilds (islets to west, north islet), and Wilds (islets to west, south islet). Very common in Shark Bay. This species is increasing in abundance near centres of human population.

Pacific Gull (*Larus pacificus*) recorded breeding on Bernier, Charlie, Dorre, Kangaroo, Mary Anne, North Guano, Pelican, Salutation, Sunday and Three Bays Islands and on Wilds (islet to south). Probably breeds on other islands. The Pacific Gull is at its northern breeding limit on the west coast at Shark Bay. An unusually large number of breeding pairs (9) recorded on Kangaroo Island.

Caspian Tern (*Sterna caspia*) recorded breeding on Baudin, Charlie, Dirk Hartog, Dorre, Eagle, Egg, Faure, Freycinet, Friday, Kangaroo, Mary Anne, Pelican, Salutation, Slope (island to north), Sunday, Three Bays, White Island and Wilds (islets to west, south islet). Will breed on most islands. Usually a single pair will defend an area around its nest site; however, the species is occasionally colonial, as has been recorded on Pelican Island.

Crested Tern (*Sterna bergii*) recorded breeding on Baudin, Dorre, Egg, Friday, Koks, Mary Anne, Meade, Slope (island to north), Sunday, Three Bays and White Islands. A colonial breeder, often breeding in the same place for several years, then shifting to a new site.

Lesser Crested Tern (*Sterna bengalensis*) recorded breeding on Meade Island (Johnstone, personal communication). The southernmost breeding record for this species in WA.

Roseate Tern (*Sterna dougallii*) recorded breeding on Koks, Mary Anne and Meade Islands, and on North Guano (islet to west). Reasonably common in Shark Bay, but in lower numbers than at the Houtman Abrolhos (Fuller *et al.* 1994) and along the Pilbara coast (CALM SBID). A colonial breeder, but not faithful to breeding site.

Fairy Tern (*Sterna nereis*) recorded breeding on Dirk Hartog, Dorre, Koks, Meade and North Kangaroo Islands. An uncommon species in WA, where it breeds on islands and on beaches on the mainland. A colonial breeder, but not faithful to breeding site.

Bridled Tern (*Sterna anaethetus*) recorded breeding on Charlie, Dirk Hartog, Double, Egg, Freycinet, Friday, Mary Anne, North Guano, Slope, Sunday and White Islands. Returns to the same breeding islands year after year. An abundant species along the Western Australian coast south to near Perth.

DISCUSSION

Our surveys in May and September 1997 located colonies of most species previously known to breed in Shark Bay, located many new colonies and provided estimates of the

minimum total number of breeding pairs for some species (Table 1). An early summer visit would have added data, especially on terns. Bridled Terns, for example, had not started nesting in September. A summer survey of all islands would have been difficult in a small boat because of the strong southerly winds that prevail in Shark Bay from October to April. A helicopter survey was planned, but could not be arranged because of the unavailability in the area of a float-equipped helicopter.

Sixteen species of 'seabirds' have been recorded breeding on 42 islands and islets in Shark Bay. Eleven of the birds are considered to be true seabirds: Wedge-tailed Shearwater, Australian Pelican, Pied Cormorant, Silver Gull, Pacific Gull, Caspian Tern, Crested Tern, Lesser Crested Tern, Roseate Tern, Bridled Tern and Fairy Tern. The other breeding species that depend on the ocean for their food and breed mainly on islands are Eastern Reef Egret, Osprey, White-bellied Sea-Eagle, Pied Oystercatcher and Sooty Oystercatcher. All the true seabirds have tropical or subtropical affinities except the Pacific Gull, which is a temperate species and is at the northern end of its range at Shark Bay. Shark Bay is at the southern edge of the breeding distribution of the Lesser Crested Tern. The other species have widespread distributions and are found along most of the Australian coastline.

Table 1 provides a summary of the breeding data we collected in 1997. Some of the estimates of minimum number of breeding pairs are clearly under-estimates, as our visits did not coincide with peaks of breeding. At the Houtman Abrolhos, Roseate Terns breed in both early summer and autumn, with numbers breeding in summer being much higher (Fuller *et al.* 1994). We recorded autumn breeding at Shark Bay but would have missed any summer breeding. Crested Terns also probably have their peak of breeding in the early summer, again something we would have missed. Caspian Terns have a long breeding season along the Western Australian coast and we probably missed some winter and summer breeding. Visits to the larger islands (Dirk Hartog, Faure, Bernier and Dorre) would have added records, particularly of White-bellied Sea-Eagles, Ospreys and oystercatchers. Counts for Wedge-tailed Shearwater, Pied Cormorant and Australian Pelican are probably near complete.

With only a few hundred breeding pairs, Wedge-tailed Shearwaters are not common in Shark Bay, but the existence of 'white-breasted phase' birds, reported by Serventy (1972) needs further investigation.

Pied Cormorants are particularly numerous at Shark Bay (Table 1). The breeding colonies at Quoin Bluff South on Dirk Hartog Island, Freycinet Island and Pelican Island are the three largest reported in WA (CALM SBID). The large numbers of this species reflect both the large area of protected water within the embayments and the relative abundance of suitable food fish.

The western subspecies of the Pacific Gull, *Larus pacificus georgii*, is found from Shark Bay to Lancelin on the west coast and, on the south coast, from Cape Leeuwin westwards into South Australia. It is a comparatively rare bird, numbering in the thousands (Burbidge *et al.* 1996).

Seabirds breed on most of the smaller islands in Shark Bay, with a few species, such as Caspian Terns, Ospreys and White-bellied Sea-Eagles breeding in low numbers on the larger islands (Faure, Dirk Hartog, Dorre, Bernier).

In summary, Shark Bay is an important seabird breeding area, with numerous small islands providing excellent nesting sites for species such as the Eastern Reef Egret, Osprey, Pacific Gull, Silver Gull, Caspian Tern, Crested Tern, Roseate Tern, Fairy Tern and Bridled Tern. As well, it has the three largest rookeries of Pied Cormorant in WA, has a major Australian Pelican rookery and is the southernmost recorded breeding site for the Lesser Crested Tern in WA.

Table 1. Summary of breeding seabirds recorded in Shark Bay, May and September 1997.

SPECIES	ESTIMATED MINUMUM TOTAL NUMBER OF BREEDING PAIRS	MINIMUM NUMBER OF BREEDING ISLANDS/ISLETS
Wedge-tailed Shearwater, *Puffinus pacificus*	580	5
Pied Cormorant, *Phalacrocorax varius*	3430	7
Australian Pelican, *Pelicanus conspicillatus*	95	1
Osprey, *Pandion haliaetus*	20	16
White-bellied Sea-Eagle, *Haliaeetus leucogaster*	1	1
Pied Oystercatcher, *Haematopus longirostris*	14	7
Pacific Gull, *Larus pacificus*	16	7
Silver Gull, *Larus novaehollandiae*	1000	26
Caspian tern, *Sterna caspia*	11	11
Crested Tern, *Sterna bergii*	441	5
Roseate Tern, *Sterna dougallii*	230	2
Fairy Tern, *Sterna nereis*	3	1

SEABIRD CONSERVATION AND MANAGEMENT

While most of the islands on which seabirds breed are currently reserved for nature conservation, some remain vacant Crown land and should be reserved to aid the protection of the colonies that occur there. Islands that are in need of reservation as nature reserves are: unnamed islet in Brown Inlet west of Carrarang homestead, islet to south-west of Charlie Island, islet in northern end of Depuch Loop, Eagle Island and adjacent islet, Kangaroo Island, islet to south of Kangaroo Island, Lefebre Island, Meade Island, islet to west of North Guano Island, North Kangaroo Island, island to north of Slope Island, Smith Islands and islets near Wilds Islands.

Most of the smaller islands are currently infrequently visited and little management is required. However, many fishers anchor in the lee of these islands and at times land briefly on them. A readily available pamphlet, distributed through CALM offices and fishing tackle outlets, should be made available summarizing the nature conservation values of the islands and outlining procedures to be followed by visitors to prevent disturbance and damage to the seabird colonies. Signs advising of their status as nature reserves have been erected on some islands; these require regular checking and maintenance.

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