

## Seabird breeding schedules at the Pelsaert Group of islands, Houtman Abrolhos, Western Australia between 1993 and 1998

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**Abstract** – The timing of breeding of seabirds at the Pelsaert Group, Houtman Abrolhos, Western Australia was recorded between 1993 and 1998. Most seabirds bred between August and April, although the commencement of laying may in some species vary dramatically from one year to the next.

### INTRODUCTION

Many biologists visiting the Houtman Abrolhos, have reported on the breeding of seabirds here (Gibson 1908, Conigrave 1916, Alexander 1922, Sandland 1937, Serventy 1943, Tarr 1949, Ealey 1954, Warham 1956, Storr *et al.* 1986). More recent visits have concentrated on the sizes of breeding populations, particularly on Pelsaert Island (Fuller and Burbidge 1981, Burbidge and Fuller 1989, and Fuller *et al.* 1994). This paper aims to document the breeding seasons of seabirds at the Pelsaert Group, Houtman Abrolhos, as accurately as possible between September 1993 and January 1998. In this paper, the breeding season will be considered to include all activities from nest-site acquisition to the fledging of young. This information is essential when developing suitable management strategies for any increase in visits to the Houtman Abrolhos by different user groups. It also provides an insight into the effects of inter-annual variability in ocean currents and changes in food availability.

### METHODS

The Houtman Abrolhos is an archipelago of approximately 120 islands 60 km off the coast of Geraldton, Western Australia (Figure 1). The three major groups are the Pelsaert Group, to the south, the central Easter Group and the northern Wallabi Group. Further north, still, lies the solitary North Island.

The Pelsaert Group comprises 47 islands that lie within the lagoon formed by the rim of, Pelsaert Island on the east, and Half Moon Reef, a barrier reef, on the west. The islands are scattered to the north, amongst inner reefs, platforms and sandy shallows. Most records are for Pelsaert Island, which supports the most diverse number of breeding seabirds in the Houtman Abrolhos, with some additional information from other islands

within the Pelsaert Group. Pelsaert Island (28°56'S, 113°58.30'E) is the southernmost island of the Houtman Abrolhos, the third largest (120 ha) and the longest (12km). It is built on a foundation of coral reef limestone and is composed almost wholly of sedimentary rocks derived from beach-cast coral limestone and the skeletal remains of molluscs and corals (Collins *et al.* 1993).

Thirteen species of seabird breed regularly on Pelsaert Island. They include two species of noddy (Common Noddy *Anous stolidus* and Lesser Noddy *A. tenuirostris*), six terns (Caspian Tern *Sterna caspia*, Crested Tern *Sterna bergii*, Sooty Tern *S. fuscata*, Bridled Tern *S. anaethetus*, Roseate Tern *S. dougallii* and Fairy Tern *S. nereis*), two gulls (Pacific Gull *Larus pacificus* and Silver Gull *L. novaehollandiae*), two shearwaters (Wedge-tailed Shearwater *Puffinus pacificus* and Little Shearwater *P. assimilis*), and the White-faced Storm Petrel *Pelagodroma marina*. The Red-tailed Tropicbird *Phaethon rubricauda* occasionally breeds on Pelsaert Island. The Pied Cormorant *Phalacrocorax varius* also breeds on an adjacent island.

The Pelsaert Group was visited between 18 September 1993 and 5 January 1994, 8–12 May 1994, 20–26 June 1994, 3 September and 1 December 1994, 15–20 January 1995, 30 May and 4 June 1995, 3 September and 26 November 1995, 5–17 December 1995, 13–24 January 1996, 15–25 October 1996, 4–12 December 1996, 31 January and 6 February 1997, 19–23 March 1997, 19–29 April 1997, 19–28 May 1997, 11–19 October 1997, 31 October and 12 November 1997, 28 November and 7 December 1997 and 19–25 January 1998. Colonies of the Sooty Tern, Common Noddy, Lesser Noddy and Crested Tern on Pelsaert Island were visited every second day. Wedge-tailed Shearwater burrows were examined every four days. Other species were recorded during repeated visits to other islands in the Pelsaert Group.

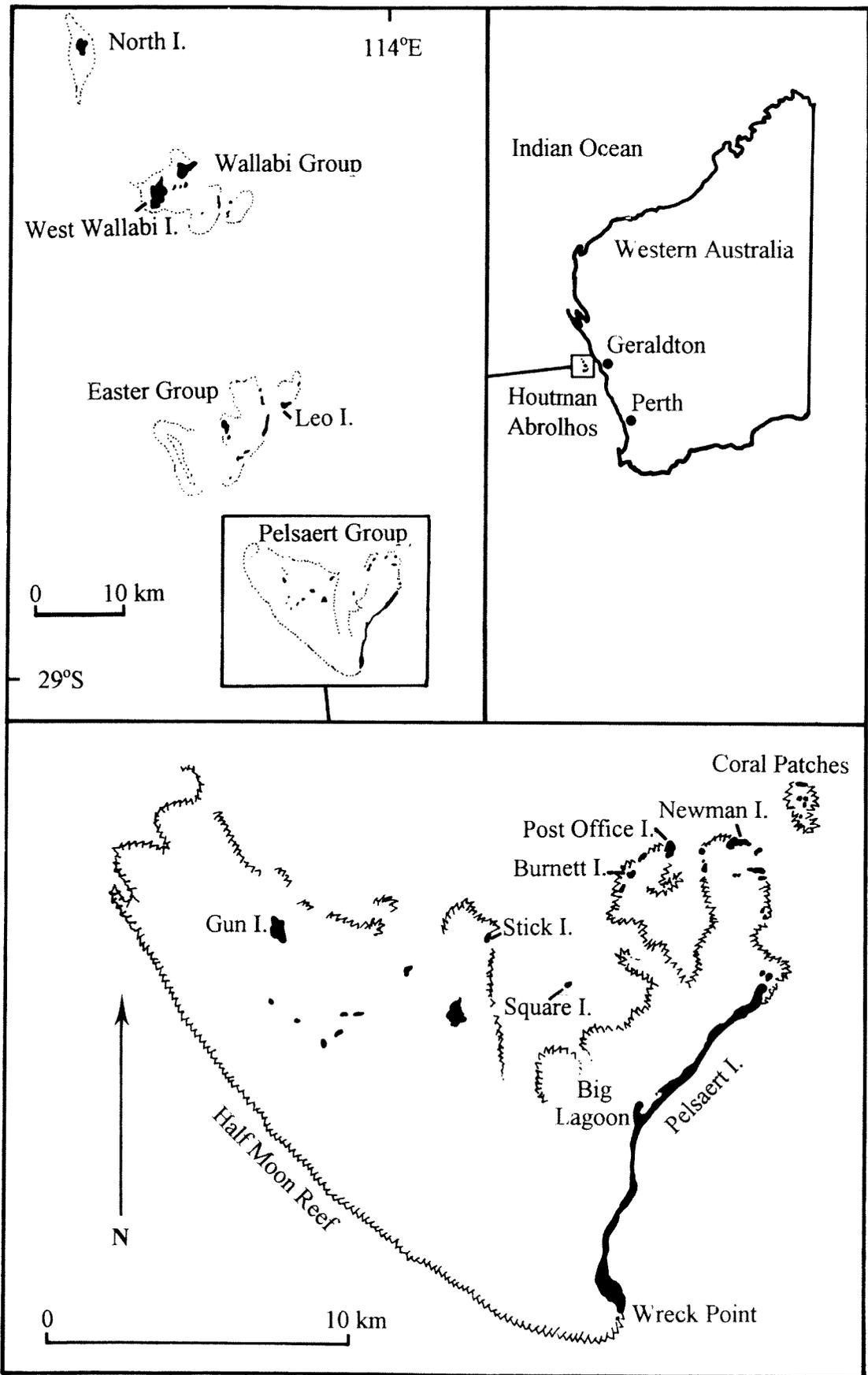


Figure 1 Locality map showing the position of the Houtman Abrolhos in relation to Western Australia, and the position of the three major island groups and locations referred to in the text.

## RESULTS

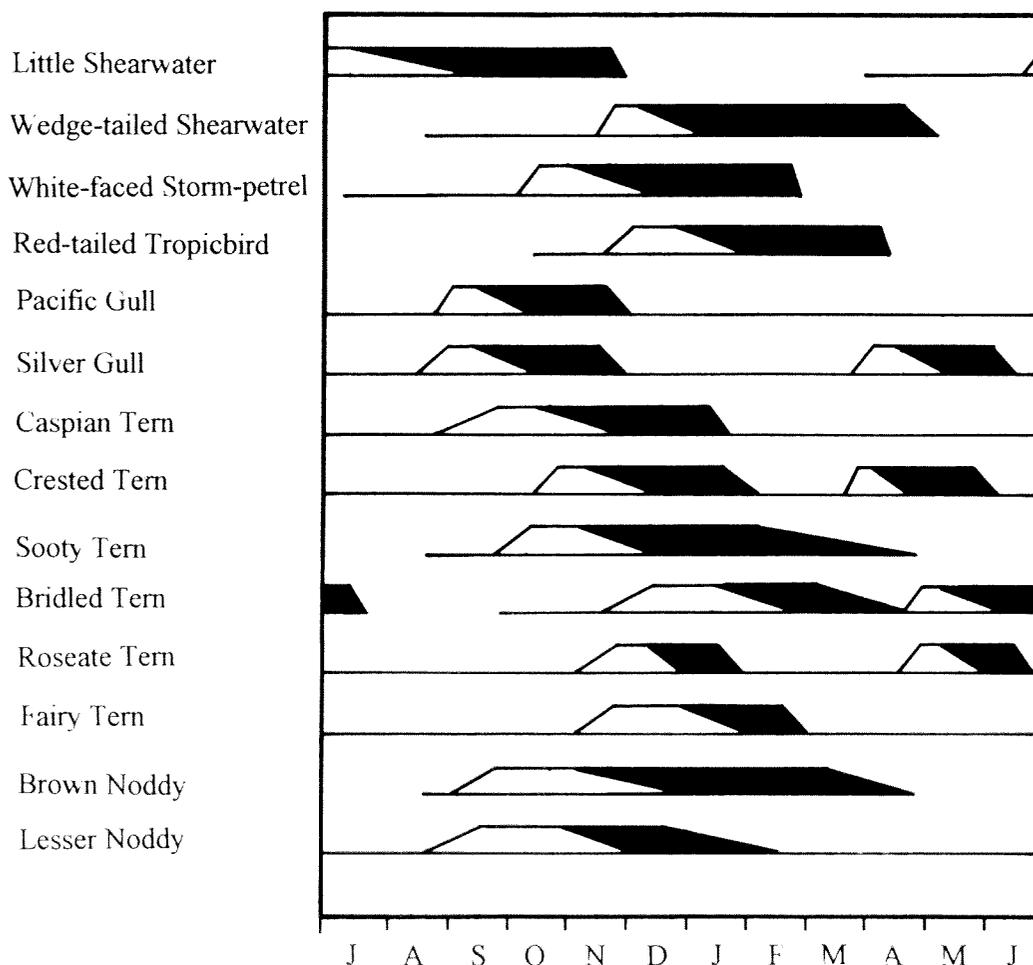
The following accounts summarise the breeding chronology of each seabird recorded breeding between September 1993 and April 1997. Figure 2 shows the periods of arrival, incubation, nestlings and departure for seabirds in the Pelsaert Group.

## Wedge-tailed Shearwater

The first report relating to seabirds at the Houtman Abrolhos was from the log of Adriaen van der Graff, the second mate of the Dutch ship *Zeeuyk*, wrecked at the Pelsaert Group in July 1727. He recorded the arrival of the first Wedge-tailed Shearwaters on Gun Island, where the survivors were camped, on the evening of 20 August 1727 (O'Loughlin 1969). Over 250 years later, visits to the Houtman Abrolhos in late August found no evidence of breeding (O'Loughlin 1966, Tarr 1949). Birds return in the second half of August to excavate burrows (Storr *et al.* 1986). Visits in the past confirm the commencement of laying in mid-November and the pre-laying exodus. Gibson

(1908) reported that laying commenced sometime between 12–19 November 1907, Sandland (1937) found fresh eggs on 16 November 1936 after witnessing the end of the pre-laying exodus, Alexander (1922) recorded fresh eggs during his visit in November 1913 and the Storr-Johnstone Data Base (Western Australian Museum) records egg laying on 13 November.

Wedge-tailed Shearwaters were already visiting their rookeries by night in early September. They were observed in large numbers in the seas adjacent to the Houtman Abrolhos during a survey aboard the *R. V. Franklin* on 15 August 1996. Wedge-tailed Shearwaters continue to visit the island at night until early November of each year when most breeding adults vacate the island during their pre-laying exodus, as elsewhere (Garkaklis *et al.* in press). The first breeding adults returned to Pelsaert Island on the evening of 16 November 1994 to commence laying. Most eggs were laid by early December of each year and chicks were hatching on 15 January 1995. Large,



**Figure 2** Breeding chronology of seabirds of the Pelsaert Group, Houtman Abrolhos, Western Australia. The figure summarises trends observed since 1993 and from data compiled from Warham (1956), Tarr (1949) and Surman (1994b). The presence of eggs is shown by the hollow bar, the presence of chicks by the solid bar, and the presence of adults without chicks by a line.

downy young with some development of the primaries were found on 22 March 1997. By 21 April 1997 most nestlings were well grown, with about 20% body down, nearly fully grown primaries, beaks and tarsi. The first young fledged on 22 April 1997.

#### Little Shearwater

Adults return to breeding islands in April, commence laying in June and young usually fledge in November (Storr *et al.* 1986). Gibson (1908) found fully grown young in November. Few breeding attempts by Little Shearwaters were recorded, mainly due their scarcity and winter breeding time. On 3 October 1995 I found four burrows amongst low sand dunes at the northern end of Pelsaert Island; two contained a single, large downy nestling, a third contained a pair of adults and the fourth was empty. On 25 April 1997, tracks of Little Shearwaters were found around burrows on Stick Island and Pelsaert Island, although no burrows had been excavated.

#### White-faced Storm Petrel

White-faced Storm Petrels return to the Houtman Abrolhos from wintering grounds in the north-western Indian Ocean between April and September (Storr *et al.* 1986, Surman 1994a, Marchant and Higgins 1990). All twenty burrows of this species checked on 29 September 1994 at Stick Island were unoccupied, but there were fresh tracks throughout the colony. Storr (1966) found empty burrows on West Wallabi Island during a visit in April 1959 at a time when the young had already fledged and well before adults return for the next breeding season.

#### Red-tailed Tropicbird

Breeding by Red-tailed Tropicbirds has been irregular, the last recorded attempt being a single nest in December 1988 (Fuller *et al.* 1994). Red-tailed Tropicbirds are regular visitors during spring and summer to Pelsaert Island. Two adults were at the southern end of Pelsaert Island on 9 October 1993, three on 21 October 1996, seven and five adults engaged in display flights on 7 and 9 December 1996 respectively, three adults were present on 3 and 5 February 1997, a single adult was observed on 17 October 1997, five on 1 December and six on 5 December 1997. Only a single nest was recorded on Pelsaert Island with one egg laid some time between 12 December 1996 and 31 January 1997. On 19 March 1997 the nest was deserted with the remains of the egg still present and the body of one of the adults nearby.

#### Pacific Gull

Pacific Gulls breed between August and October

(Storr *et al.* 1986) with many records of large runners or fledglings during visits in November (Alexander 1922, Gibson 1908, Garstone 1978, Warham 1956, Burbidge and Fuller 1989). During the 1991/92 summer, eggs were laid from mid-August and young fledged from late November (Surman 1994b).

Pacific Gulls are resident at the Houtman Abrolhos throughout the year. Most nests contained two eggs during each year of this study (clutch size 1(10), 2 (28)), estimated to have been laid as early as 17 August in some years, with hatching taking place from 16 September until late-October. Of ten nests monitored regularly during 1995, 16 of the 17 eggs hatched and one was addled.

#### Silver Gull

Silver Gulls are resident in the Houtman Abrolhos all year, and breed during autumn and spring (Storr *et al.* 1986). Breeding during autumn coincides with the breeding of Roseate, Crested and Fairy Terns and the presence of rock lobster fisherman, who provide an increased food source through discarded bait and food scraps. Spring breeding appears to coincide with breeding by Lesser Noddies, Common Noddies and Sooty Terns. Spring populations of Silver Gulls are smaller and breed at different locations from autumn populations, even though their natural food source is more abundant at this time. Spring-breeding Silver Gulls commence laying from late August, hatch during late September and fledge in November and December. Autumn-breeders lay in late March-early April and fledge young by late June.

#### Caspian Tern

Caspian Terns are solitary nesters throughout the Houtman Abrolhos, except for colonies of up to 80 nests on West Wallabi Island (Wallabi Group, Storr *et al.* 1986), 40 nests on Leo Island (Easter Group, Fuller *et al.* 1994) and a smaller but more recent colony of six pairs at Big Lagoon on Pelsaert Island. Most earlier accounts agree with the observations below, although O'Loughlin (1969) found eggs in January 1968 at a time when most young would have fledged. Caspian Terns usually lay two eggs (clutch size 1(7), 2(20)) during spring. Eggs are laid between 20 August and 30 September with most laid in the first half of September. Chicks hatched between late September and mid-October and fledged from late October. At seven nests, each containing two eggs, followed until hatching in 1995, ten eggs (71%) hatched, two were addled and two met an unknown fate.

#### Crested Tern

At the Houtman Abrolhos Crested Terns, like

Silver Gulls, Roseate Terns and Fairy Terns, may breed during autumn or spring/summer. Dunlop (1985) found that individual Crested Terns in the Fremantle area of Western Australia tended to breed at the same time each year, making autumn and spring/summer populations distinct. It is uncertain if this applies to Houtman Abrolhos Crested Terns. Other studies have reported eggs as early as late August (O'Loughlin 1966) and September (Storr 1966) at the Wallabi Group and, on Pelsaert Island, Garstone (1978) found small chicks during late October, suggesting that laying commenced two weeks earlier on Pelsaert Island during 1977 than reported here for 1993–1997. Autumn-nesting begins during late March.

A group of 80 Crested Terns, each with single eggs, commenced laying on 24 March 1997 on Stick Island. Spring/summer breeding by smaller colonies of up to 250 pairs begins around 15 October at various localities on Pelsaert Island. In 1991, 1995 and 1996 each of these smaller colonies failed completely. A larger colony at an established nesting area where up to 1500 pairs may breed (Fuller *et al.* 1994) laid highly regularly and synchronously, commencing on 16 October 1993, 18 October 1994, 22 October 1995 and 23 October 1996. This colony relocated approximately 400m west of the original site and laying commenced between 30 October and 1 November 1997. Laying continued until mid to late-November and by mid-December some eggs were still being incubated at the same time as mobile young up to three weeks old dispersed along the rocky shore. Some later breeders were still raising large young by early February.

#### **Bridled Tern**

Few visitors have recorded laying by Bridled Terns. No eggs were present during Garstone's (1978) visit in October nor Alexander's (1922) in November, or Sandland's (1937) visit in early November 1936. Fresh eggs were observed by Fuller and Burbidge (1981) on 27 November 1980. Storr *et al.* (1986) sites R.E. Johnstone's observations of 17 August 1980 of juveniles on Newman Island that would have come from eggs laid in late June.

Bridled Terns first return to their nesting grounds at night before returning during daylight to secure nest sites. The first birds were observed during the evenings of 7 October 1993 and 1994, and on 2 October 1995. Bridled Terns were already present by day on 15 October 1996 and 1997. Laying commenced on 22 November and continued well into January, although one egg was just hatching on 22 March 1997 on Newman Island. Chicks usually fledged between mid-March and mid-April. A further check for a new wave of nesting by Bridled Terns on Newman Island on 27 April 1997 revealed 12 freshly laid eggs. Any

young from these eggs would not have fledged until mid-July, well after most Western Australian Bridled Terns had departed in May for wintering grounds in the Sulawesi Sea (Dunlop and Johnstone 1994). This population of Bridled Terns is currently being investigated to determine if it is resident or consists of summer breeders relaying after a failed initial attempt or comprises recruits nesting for the first time.

#### **Sooty Tern**

This is the most numerous seabird breeding in the Pelsaert Group. Sooty Terns are highly synchronous breeders (Feare 1976), with only a few early eggs each year before the main laying period. Although some earlier accounts (Sandland 1937, Tarr 1949) indicate that Sooty Terns usually lay in October, as found from 1993–1995, other visitors (Garstone 1978) reported laying commencing as late as 26 October, similar to 1996/97. Similarly, both Burbidge and Fuller (1989) and Warham (1956) also found during visits in 1981 and 1954 respectively that laying commenced in late October and Storr *et al.* (1986) reported laying dates of October–November.

Numbers had built up at the southern end of Pelsaert Island by the time of my first visit each year in early September. Laying commenced on 25–27 September each year between 1993 and 1995, with most eggs laid during early October, but did not commence until 24 October during 1996 and 3 December 1997. Hatching began in late October and by mid-January large nestlings and free-flying young were present, some already participating in foraging excursions. The last birds departed Pelsaert Island in late April 1997 although most birds had already left on their northward migration by mid-March of each year. No young were recorded from the 1997/1998 breeding season.

#### **Common Noddy**

Common Noddies return to the Houtman Abrolhos in August. On 3 September 1994 and 1995 Common Noddies were already defending sites, building nests, and some had fresh eggs. Laying commenced during late August or early September during most years of this study, but did not begin until early November in 1996 or until late November 1997, despite adults having returned to the area in August. Young hatched from October onwards in some years and most had fledged by January. During the 1996/97 season, some fledglings were still roosting on Pelsaert Island during the day on 25 April 1997.

#### **Lesser Noddy**

Lesser Noddies are resident at the Houtman Abrolhos. Previous visits recorded laying between

mid-August and late December (Storr *et al.* 1986). During the 1991–1994 breeding seasons laying began in late August, with most eggs laid in September and October. However, laying was delayed until mid-October during 1995 and until early-November in 1996 and 1997. The laying period is typically protracted, extending for more than 100 days when laying commenced in late August (Surman and Wooller 1995). Young were present from early October and fledged from mid-November onwards.

#### Fairy Tern

Fairy Terns occur at the Houtman Abrolhos throughout the year, although numbers may decline during winter (Storr *et al.* 1986). Laying commenced on 24 November in 1991 (Surman 1994b), early November (Gibson 1908, Alexander 1922) or late October in other years (Garstone 1978). Storr *et al.* (1986) lists breeding from late October to mid-February. The earliest attempts at breeding during this study occurred on 5 November 1995 when seven nests were observed on Burnett Island. On 4 February 1997 some nests contained eggs and young nestlings on Pelsaert Island.

#### Roseate Tern

Roseate Terns breed during summer and autumn at the Houtman Abrolhos, although it is unclear whether the two breeding groups belong to distinct populations. Spring/summer breeders commence laying in early November. A dozen birds were on eggs on an islet to the north of Robinson Island and 30 more were in attendance on 5 November 1995. A colony (500 nests) of Roseate Terns nested at Wreck Point, Pelsaert Island, in 1991, 1993, 1994, 1995 and 1997. Laying had commenced at this site by 7 November 1995 with a further 250 adults in breeding plumage defending sites; by 15 November 1995 it was estimated to contain 350–500 nests.

Laying commenced at the same time on adjacent Square Island from 1993 to 1997. On 16 November 1995, approximately 200 birds nested on Square Island. On 29 November 1994 this colony contained one or two egg clutches, while, at the same time, a smaller colony at the Coral Patches had clutches of 1–3 eggs, and nestlings 1–7 days old. During 1996, Roseate Terns bred at a site 2 km north of Wreck Point, with approximately 1000 nests by 10 December 1996, mostly single egg clutches. By 2 February 1997, the colony had been abandoned leaving the remains of well-developed eggs and bodies of nestlings less than 5 days old.

Autumn-breeding populations of Roseate Terns began displaying at potential nesting sites by mid-March. Nest-sites in autumn tended to differ from those used in summer. Breeding was recorded on Post Office Island in April 1995, 1996 and 1997,

with laying starting on 25 April 1997; by 20 May 1997 chicks were hatching. A colony of 80 nests on Newman Island, with approximately 350 adults in attendance was first noticed on 19 April 1997 (B. Suckling pers. comm.) but was unsuccessful.

#### DISCUSSION

Most seabirds at the Houtman Abrolhos breed during spring/summer. Some Roseate Terns, Crested Terns, Bridled Terns and Silver Gulls breed during autumn as well as spring/summer; it is unclear whether these represent distinct breeding populations. Spring breeding coincides with longer daylight, less frequent passage of cold fronts, lower rainfall and prevailing southerly winds (Surman 1997). Earlier observations also found that spring/summer was the busiest breeding time for seabirds at the Houtman Abrolhos (Storr *et al.* 1986, Fuller *et al.* 1994).

All species are probably annual breeders, commencing their next breeding attempt around the same time each year. However, variation in the mean annual laying date of the Lesser and Common Noddy of as much as two months appears linked to variability in the flow of the Leeuwin Current (Surman 1997).

Other years in which Lesser Noddies and Common Noddies appear to have laid later (i.e. November), were recorded by Warham in 1954, and O'Loughlin in 1968. Both species appeared to respond more dramatically than other species to variation in oceanographic conditions, perhaps because their large colony size made changes more obvious. However, other seabird species were not studied as intensively and may have been affected in less obvious ways.

Regular monitoring of seabird breeding seasons would make it possible to understand which factors, if any, influence breeding times from one year to the next and how best to ensure that seabirds are protected during their most vulnerable stages of breeding from disturbance to their nesting sites on land, or to exploitation of marine sources of food.

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