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# Breeding Sites of the Australian Pelican *Pelecanus conspicillatus* in Victoria

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## Summary

Published records and all available unpublished records of breeding by the Australian Pelican *Pelecanus conspicillatus* in Victoria have been critically assessed. Authentic records (i.e. those with details of nests, eggs and/or young) indicate that this species has bred at only eight locations since 1970 and at two additional locations before this. Two of these 10 locations (Lake Buloke and the Gippsland Lakes) had not been used before 1996, five have been used frequently, and the remainder have been used only intermittently. Although the breeding population of Pelicans fluctuates widely between years, the presence of the Pelican as a breeding waterbird in Victoria seems to be secure as it is able to utilise new sites when conditions become conducive to nesting. In Victoria, the sites used regularly are all on semi-permanent or permanent saline wetlands, typically on small islands in coastal lakes or embayments. Freshwater wetlands are sometimes used when islands and a reliable fish supply are present. There are only two locations (Mud Islands and Lake Corangamite) that have been used within the last 4 years for breeding, and there appears to have been a shift in breeding from French Island in Western Port to Mud Islands in Port Phillip Bay. Pelicans are vulnerable to disturbance at all Victorian breeding sites.

## Introduction

The Australian Pelican *Pelecanus conspicillatus* occurs widely in Australia in a range of coastal and inland habitats, and is a colonial nester on islands either offshore or in lakes and billabongs (Serventy *et al.* 1971). It has been recorded breeding at secluded sites in large open wetlands in all states and territories except the Northern Territory (Marchant & Higgins 1990) and on at least four Bass Strait Islands (Green 1969, 1993; Brothers *et al.* 2001), where breeding has been reported as far back as the late 1830s (Whinray 1978) and more recently (early 1990s) at Swan Island (Stomps 1995). In South Australia, Pelicans have been recorded breeding at 20 sites over the past 200 years (G. Johnston pers. comm.): nine inland sites where nesting tends to occur as isolated once-only large events (e.g. Lake Eyre: Waterman & Read 1992) and 11 coastal sites, which tend to be smaller, more permanent breeding sites that are active in most years. Six coastal breeding colonies are currently active in South Australia (Johnston pers. comm.). The largest breeding events in Australia have occurred at inland lakes, particularly Lake Eyre where in 1990 >100 000 Pelicans nested and 90 000 chicks fledged (Waterman & Read 1992) in the most successful Pelican breeding event ever recorded in Australia (Read & Badman 1999). No influx of immature Pelicans into South Australia was noted after this, in contrast with the 1974–75 Lake Eyre breeding event (Johnston pers. comm.), and there are no published accounts of where the immature Pelicans went after these two breeding events.

In contrast, in Victoria, Pelicans are currently classified as 'restricted colonially-

breeding waterbirds' (CNR 1995) because of the small number of breeding sites in this state. However, this species is not on the list of threatened vertebrates for Victoria (DSE 2003), although it is protected under the *Victorian Wildlife Act 1975*. A study (Project Pelican) to try to document the distribution and breeding of Pelicans in Australia was undertaken by the Bird Observers Club (BOCA, now Bird Observation and Conservation Australia) in the mid 1980s, but little information on Pelican breeding was published (McCulloch 1987).

This paper, therefore, aims to identify and verify the historical distribution of all Pelican breeding sites in Victoria. It also details two new breeding locations (Lake Buloke and Gippsland Lakes) and discusses changing patterns of breeding at two major locations (French Island and Mud Islands).

## Methods

The following sources were used to determine the distribution and breeding status of Pelicans in Victoria: atlases (Blakers *et al.* 1984; Emison *et al.* 1987; Barrett *et al.* 2003), databases (DSE 2005a,b), unpublished records from the Birds Australia (BA) Nest Record Scheme cards, and unpublished records of Friends of French Island and from individual bird observers and members of bird clubs and BOCA branches throughout Victoria and south-eastern Australia.

The most recent counts at Pelican breeding colonies include the number of nesting pairs as well as the numbers of recently vacated nests, eggs and/or (unfledged) young. Some of this information is unavailable for earlier counts. The graphs in this paper, from data since 1969, indicate the number of nests where this is known. A breeding location is defined as the geographic location in Victoria, breeding site as the specific site within a wetland where nests are placed, and breeding event refers to the total breeding i.e. total number of Pelican nests recorded during a breeding season. In this paper, an authentic breeding record is one that shows clear evidence on a BA Nest Record Scheme card of at least one of the following: a nest under construction, incubating adults, eggs and/or dependent young in the nest or flightless young present in a wetland.

## Distribution of Pelicans in Victoria

In Victoria, non-breeding Pelicans have been recorded wherever suitable habitat occurs, especially large, open wetlands that are free of aquatic vegetation (Marchant & Higgins 1990). They are common in coastal wetlands, and in irrigation and riverine areas in the north of the state (DSE 2000b), but not in the forested mountain areas of Gippsland or the lower-rainfall Mallee region in the north-west. Pelicans appear to prefer certain types of wetlands for breeding and foraging. Table 1 shows the occurrence of non-breeding Pelicans for each wetland category in Victoria since 1970. The data indicate that this species shows a preference for large wetlands near the coast, with Pelicans being reported especially from Permanent Open Freshwater, Semi-permanent Saline, Permanent Saline and Saltworks wetlands (Corrick & Norman 1980). An abundant and assured supply of fish for food is a prerequisite for successful breeding (Marchant & Higgins 1990).

## Breeding locations in Victoria

Since 1970 Pelicans have been recorded breeding at eight locations in Victoria, with an additional two locations (St Margaret Island in Corner Inlet and Lake Hindmarsh) used in the past but not for at least 40 years (Figure 1, Table 2). We have been unable to authenticate other locations listed by Marchant & Higgins (1990) and BA Nest Record Scheme data.

**Table 1**

**Occurrence of non-breeding Australian Pelicans on wetlands in Victoria since 1970. Source: DSE 2005b.**

| *Wetland category (Corrick & Norman 1980)* | *Code* | *No. of sightings* | *No. wetlands with Pelicans* | *No. of counts* | *No. of wetlands* | *Reporting rate (%)* |
|---|---|---|---|---|---|---|
| Freshwater Meadow | FM | 23 | 18 | 1186 | 790 | 2 |
| Shallow-freshwater Marsh | SFM | 98 | 54 | 1812 | 789 | 5 |
| Deep-freshwater Marsh | DFM | 535 | 98 | 2845 | 578 | 19 |
| Permanent Open Fresh Water | POFW | 1147 | 201 | 3897 | 752 | 29 |
| Semi-permanent Saline | SPS | 415 | 71 | 2056 | 394 | 20 |
| Permanent Saline | PS | 875 | 68 | 3193 | 127 | 27 |
| Sewage Lagoon | SL | 77 | 28 | 471 | 91 | 16 |
| Saltworks | SW | 28 | 3 | 51 | 3 | 55 |
| **Totals** | | **3198** | **541** | **15 511** | **3524** | |

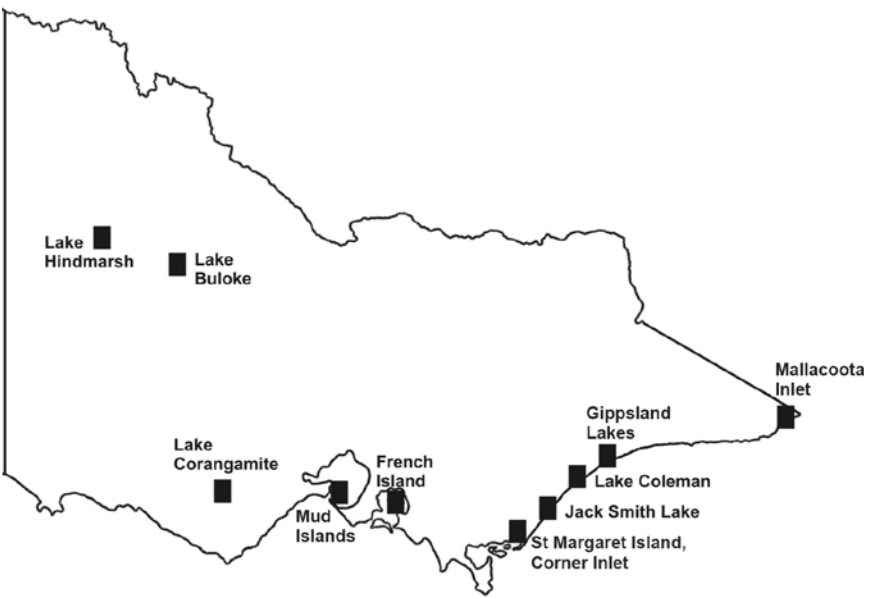


**Figure 1. Authenticated breeding locations of the Australian Pelican in Victoria.**

**Table 2**

**Authenticated breeding sites of Australian Pelicans in Victoria. See text, and Table 1 for wetland types. Source: DSE 2005a,b.**

| *Site* | *Land status* | *Site used since 2000?* | *Wetland type (Corrick category)* | *Years of use* |
|---|---|---|---|---|
| St Margaret Island, Corner Inlet | Coastal Park | No | PS | Prior to 1893 |
| Lake Corangamite | Lake Reserve | Yes | SPS | 1961 to 2006 |
| Lake Hindmarsh | Lake Reserve | No | POFW | 1967 |
| French Island | National Park | No | PS | 1970 to 2000 |
| Mud Islands | Marine National Park | Yes | PS | 1972 to 2006 |
| Mallacoota Inlet | Marine National Park | No | PS | ? to 1997 |
| Jack Smith Lake | State Game Reserve | No | SPS | 1987 to 1991 |
| Lake Coleman | State Game Reserve | Yes | POFW | 1993 to 2001 |
| Lake Buloke | Wildlife Management Co-operative Area | No | POFW | 1996 to 1997 |
| Gippsland Lakes | Coastal Park | Yes | PS | 1997 to 2003 |

The earliest recorded breeding by Pelicans in Victoria was in Western Port in 1844 (Haydon 1846). Although its precise location is not known, this was probably Pelican Island on the eastern side of Western Port. The first accurately known sites are at St Margaret Island in Corner Inlet (BA Nest Record Scheme) and Pelican Island in Western Port in the 1860s (Campbell 1900). Campbell recorded many Pelicans at all stages of the breeding cycle, including eggs, and he collected 40 young birds, which he forwarded to the Royal Botanic Gardens in Melbourne. Pelicans have not been reported breeding on Pelican Island since that time (BOCA Western Port unpubl. surveys).

With the exception of Lake Buloke, all Victorian breeding sites used since 1970 are on saline coastal wetlands or large fresh or brackish lakes within 50 km of the coast (Table 2). Until the 1996–97 summer, only two (inland) freshwater breeding locations (Lake Hindmarsh, Lake Coleman) had been used by Pelicans in Victoria. Breeding at Lake Hindmarsh, in north-western Victoria, in 1967 (750 pairs: Wheeler 1967) was the largest recorded breeding event for this species in Victoria. The only other inland breeding event known is an unconfirmed record from Bungil on Lake Hume east of Albury in 1995–96 (Bedggood 1959); the BA Nest Record Scheme card for this record did not provide clear evidence of a Pelican breeding colony or of Pelicans breeding at Lake Hume.

Since 1970, Pelicans have been recorded breeding at the following wetland locations in Victoria.

*Lake Corangamite, western Victoria*

The semi-permanent Lake Corangamite is the largest saline lake in Australia (Williams 1992). Pelican breeding last occurred here (2006: Figure 2a) on a sandy beach associated with rocky islets near the Wool Wool area on the eastern side of the lake (P. Du Guesclin pers. comm.). Breeding at the lake was first recorded

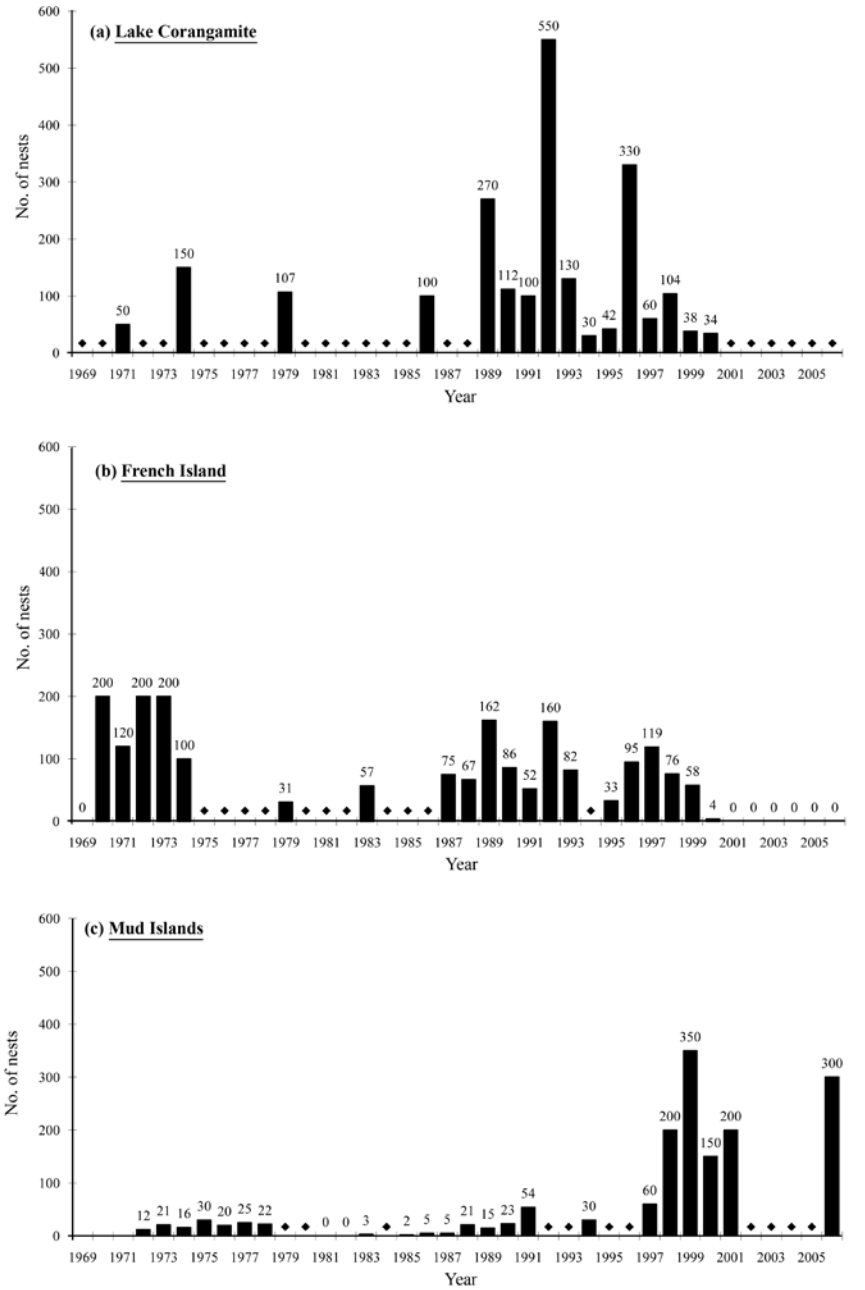


**Figure 2. Nest counts since 1969 of Australian Pelicans breeding at (a) Lake Corangamite, (b) Duck Splash, French Island, and (c) Mud Islands. ◆ = breeding reported but nests not counted, ■ = breeding recorded and nests counted, 0 = no breeding reported.**

in 1961 (Wheeler 1968), probably on Vaughan Island in the southern end of the lake, and Pelicans have bred at Vaughan Island in most years from then until 1976 (Simpson 1972; Du Guesclin pers. comm.). The colony moved from the original site at Vaughan Island to Wool Wool Rocks after the water-level dropped in 1976; since then, except for 1994, Vaughan Island has been connected to the shore (Du Guesclin pers. comm.). Until the Lake Buloke breeding event (see p. 25), Lake Corangamite was the only known Pelican breeding location in western Victoria except for the once-used Lake Hindmarsh. Evidence of predation of young Pelicans (presumably by Red Foxes *Vulpes vulpes*) was first recorded at Lake Corangamite in 2000, after which an electric fence was installed to prevent mammalian predator access.

As a result of river diversions, major salinity changes have occurred in Lake Corangamite since 1980. The salinity has increased from ~35 g/L to >50 g/L, and the water-level has dropped by ~2 m (Williams 1992, 1995). The drop in water-level has resulted in many islands now becoming peninsulas, and the change in salinity has altered the lake biota. Numbers of food items available for birds (e.g. Brine Shrimps *Parartemia zietziana* and small aquatic snails *Coxiella striata*) have been drastically reduced, and there are no longer any fish in the lake (Williams 1995). The decrease in invertebrates and loss of fish have adversely affected the diversity and abundance of birds associated with the lake (Williams 1995; DSE Wetlands Database unpubl. data), and the absence of fish may have contributed to the cessation of Pelican breeding since 2006.

*French Island, Western Port*

There is evidence that Pelicans bred at French Island before 1970 (D. Bowery pers. comm. in Simpson 1972). During the last 40 years, four sites on or adjacent to the island have been used: the Duck Splash, Pelican Island, Red Bill Creek and near Palmers Point (Loyn 1975). Gooch (2006) published an aerial photograph (dated, probably incorrectly, 1971) of ~80 Pelicans nesting at Red Bill Creek on the island's north-west. No precise dates are known for breeding here, but breeding is thought to have occurred earlier (1963: Quinn & Lacey 1999) although it was abandoned within a few years.

There are two breeding sites at the Duck Splash, ~750 m apart, in the widest part of the saltmarsh on the northern coast of French Island. Breeding here was first observed in the 1970s (Loyn 1975), and has been recorded in most years since (Figure 2b). The Duck Splash is within the French Island National Park, and has been formerly identified as a site of zoological significance because of the presence of Pelicans (Andrew *et al.* 1984). The sites are remote from human access and well protected by tidal creeks, dense Grey Mangroves *Avicennia marina* and prolific Shrubby Glasswort *Sclerostegia arbuscula*. There are no Foxes on French Island.

Pelicans have not bred on French Island since 2000 (Figure 2b). There has been a drought in this area since 2003, but this does not seem to have affected the quality of the breeding site because the saltmarsh at the Duck Splash fills regularly every year from the king tides. It is possible that Pelicans that once bred on French Island have now moved to Mud Islands (see below).

*Mud Islands, Port Phillip Bay*

Pelicans were first recorded breeding on this group of three small islands at

the southern end of Port Phillip Bay in 1972 (Menkhorst *et al.* 1983, 1988), but bone remains and guano indicate extensive breeding in the past (Menkhorst *et al.* 1988) and possibly as early as the 1800s (Gilham & Thomson 1961). Breeding has occurred on Mud Islands each year since 1983 (Figure 2c), at four sites: Boatswain Island (two sites), Eastern Island and Northern Island (Friends of Mud Islands 2000).

The islands are visited by tourists, bird observers and fishermen (P. Menkhorst pers. comm.), and may not be secure in the long term as human access increases. Pelicans have changed nest-sites on the islands in most years since 1983 (Menkhorst pers. comm.).

*Mallacoota Inlet, East Gippsland*

Pelican nesting occurred on a low island in the north-eastern corner of Mallacoota Inlet, a permanent saline wetland. Breeding was last reported in September 1997 (DSE 2005b; A. Murray pers. comm.). It may have occurred at the Inlet as early as 1978 (Marchant & Higgins 1990), but the Nest Record Scheme card for this site then has no verifiable details.

*Jack Smith Lake, Gippsland*

Pelicans first nested in 1987 on a small island in this semi-permanent saline lake, and nesting has occurred each year until 1991 (DCE 1991). This locality has been dry for most years since then, and no further breeding of Pelicans has been recorded (D. Fraser pers. comm.).

*Lake Coleman, Gippsland Lakes*

Most of Lake Coleman is classified as Permanent Open Fresh Water (Table 2), but Pelicans nested in the slightly more saline section of this wetland complex in the summer of 1993–4, and have been recorded breeding there until early 2001 (B. Moss pers. comm.).

*Lake Buloke, near Donald in north-western Victoria*

Lake Buloke is located 5.5 km north of Donald. It forms the terminal basin of the Avon–Richardson River system in the Wimmera River Basin (Department of Water Resources 1989). Under the Corrick & Norman (1980) wetland classification scheme, Lake Buloke is classified as a Permanent Open Freshwater Wetland. When full, it is ~8150 ha in area and has three parts: a main basin of 5100 ha, an overflow floodplain north and east of this (2800 ha), and Little Lake Buloke (250 ha) in the south-west. The Pelican breeding site is on a low island in the main basin. Breeding by Pelicans was first noted in early 1997 (AHC pers. obs.), although nesting probably commenced in late 1996 (see p. 26). Pelicans again bred in late 1997, but this time they nested in the south-western portion of the main basin (M. Rohde pers. comm.). Pelicans have not been recorded nesting at this location again, even though the species is a regular visitor to this wetland when Lake Buloke holds water (DSE 2005b). Lake Buloke has been dry since 1997.

When Lake Buloke filled in the summer of 1996–97 a suitable island formed in the overflow (although the Pelican breeding site was in a small area between the

main lake and the overflow) area of the wetland, and simultaneously introduced European Carp *Cyprinus carpio* occurred in vast numbers (R. Price pers. comm.). Thus 1996–97 may have been the first year when both a reliable food supply and a suitable (isolated) breeding site occurred together here.

In March 1997 ~1000 Pelicans (adults and young) were observed in the northern section of Lake Buloke (Price pers. comm.). Many young birds were just able to fly, and there were ~30 still in nests. The presence of fledglings indicated that the Pelicans must have commenced breeding in late 1996, although this had gone unrecorded.

In November 1997 Pelicans again bred. Because of the much lower water-level than in 1996, however, no suitable islands formed in the northern end. The site utilised this time was dam banks at the south-western end, where an estimated 250 nests were recorded, and all stages of breeding were observed from eggs through to feathered young (Rohde pers. comm.). Rohde (pers. comm.) also reported high nestling mortality because of predation by Silver Gulls *Chroicocephalus novaehollandiae,* presumably when the Pelican chicks were very young.

*Gippsland Lakes, south-east of Bairnsdale*

This breeding site is situated on a low island in the Bunga Arm section of these permanent saline lakes. Pelican nesting was first noted in 1997 (DSE 2005b). The site is reasonably remote from human disturbance although not secure from fishermen or other visitors using boats. Nesting Pelicans bred on a small, isolated, low-lying island, and a peak count of at least 100 nests was recorded in 2001 (B. Moss pers. comm.)

It is not clear what environmental factors stimulated the use of this island for breeding when there were already several other islands, seemingly with similar geography, nearby. Local observers had not previously noticed Pelicans nesting in the Gippsland Lakes Coastal Park (Moss pers. comm.). Of the 31 waterbird species recorded for the Lake King area of the Gippsland Lakes (DSE 2005b), only Black Swans *Cygnus atratus*, Pelicans and two species of duck (Chestnut Teal *Anas castanea* and Pacific Black Duck *A. superciliosa*) have been recorded breeding here.

**Threats**

Human disturbance is known to be a major cause of breeding failure of Pelicans in Australia (Marchant & Higgins 1990). Fluctuating water-levels, and access by stock and dogs are other threats to breeding colonies (Frith 1969; Serventy *et al.* 1971; Marchant & Higgins 1990; Brothers *et al.* 2001).

Within the last 4 years, breeding locations for Pelicans in Victoria have been Mud Islands and Lake Corangamite. All other sites that have been used by Pelicans (but are not currently used) have been affected by changes to wetland water-levels and access by predators.

At Lake Corangamite in 1961 there was widespread nest desertion and loss of young Pelicans as a result of the impact of shooting Black Swans near the Pelican breeding site (Wheeler 1967). Access from the shore by Foxes, cattle and people to Vaughan Island after the lake-level dropped (1976) is believed to have contributed to the failure of Pelicans to breed there since then (AHC pers. obs.; Du Guesclin

pers. comm.). The colony subsequently moved to Wool Wool Rocks on the eastern side of the lake and bred until 2006 (Du Guesclin pers. comm.).

At Lake Hindmarsh in November 1967, people accompanied by dogs visited the Pelican breeding colony and photographed children holding Pelican chicks (Wheeler 1967), which led to nest abandonment, death of young birds and loss of eggs, and no breeding has occurred subsequently at Lake Hindmarsh.

**Changing breeding patterns on French Island and Mud Islands**

In recent years there have been major changes in Pelican breeding patterns on French Island and Mud Islands, with breeding declining on the former and increasing on the latter (Figures 2b,c). It appears that Pelicans typically commence breeding at a mainland site only after a wetland has been filled for at least 12 months, which allows for the establishment of a food supply to support the colony as well as providing safe nesting sites, which are presumably a prerequisite for breeding (Serventy *et al.* 1971).

On French Island, in the last 40 years Pelicans have bred only at the Duck Splash, and here nest numbers fluctuated each season until late 2000 (Figure 2b). Monitoring generally took place in either October or November, but sometimes in both these months or at other times of year. In most of the years when two inspections were made in spring (1988, 1989, 1990, 1996 and 1997), it was found that breeding took place twice in the same season; Pelicans bred at one site at the Duck Splash in October and at another in November. In 1971, 1986, 1990 and 1998, additional breeding was observed in the summer or autumn. It is not clear why breeding sometimes occurred twice in the one season except that conditions must have been suitable. However, in 2000 there were only a few nests (four: Figure 2b), and since then no Pelicans have bred on French Island.

On Mud Islands, Pelicans breed throughout the year, in contrast with the late-spring breeding pattern on French Island. Since 1998 Mud Islands have experienced a marked increase in Pelican breeding, with an approximate doubling since 2000 in number of pairs to 300 in 2006 (Figure 2c). There is no obvious reason for the decline at French Island and the simultaneous increase at Mud Islands, although one can speculate on possible factors that may lead to these changes in nest-sites. Mud Islands constitute a very dynamic ecosystem, with continual changes in size and configuration and in the vegetation, and it is possible that their habitat has become more attractive to Pelicans in recent years. It is possible that drought has also been a factor, although pools in the French Island saltmarsh are filled by high tides and are thus unaffected by rainfall. The present long dry period in the Melbourne region began in 1977, and the Pelican nesting shift occurred ~1998–99. Availability of suitable food must also be a key factor, and Port Phillip Bay may be more favourable (e.g. because of more food available from fishermen or at boat ramps) at present than Western Port.

The use of new breeding sites by Pelicans emphasises the opportunistic nature of breeding by this species, especially in Victoria. It is not known whether the events at French Island and Mud Islands are related nor if any French Island Pelicans have later bred at Mud Islands. Recent breeding by the species in Victoria has been limited (Figure 3).

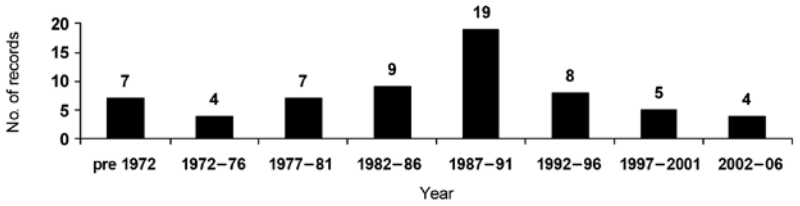


**Figure 3. Breeding events of Australian Pelicans in Victoria. Source: DSE 2005a,b.**

## Conclusions

Pelicans are opportunistic breeders, and have utilised at least eight Victorian inland and coastal locations for breeding since 1970. Their breeding status in this state appears to be in decline, with the numbers of both breeding birds and sites being used less now than previously. When conditions for breeding (including food supply and nest security) are suitable, however, new locations (such as Lake Buloke and the Gippsland Lakes) are used, although these generally have not become regular sites. Current data show that the species utilises both saline and freshwater wetlands for breeding, although the use of remote sites in large open wetlands means that some breeding events may go unrecorded.

The remarkable decline in breeding by Pelicans on French Island, Western Port, since 1999 and the simultaneous increase at Mud Islands, Port Phillip Bay, point to the importance of carrying out population studies to determine Pelican numbers and movements at breeding sites. In addition, the conditions for successful breeding should be investigated more fully (e.g. by banding birds, as has been done for the Pelicans in the Coorong, South Australia: Chapman 1963) to better understand the role of this species (and other waterbirds) in wetland ecosystems.

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