

Gippsland Lakes Tern Monitoring 2019-20

BirdLife Australia
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This report was prepared by Deb Sullivan – BirdLife Australia.

Acknowledgement of Country

We acknowledge the Gunaikurnai people, traditional owners and custodians of the land and waters of the Gippsland Lakes region and pay our respects to their Elders both past and present.

Disclaimer

Every effort has been undertaken to ensure that the information presented within this publication is accurate. BirdLife Australia does not guarantee that the publication is without flaw of any kind and therefore disclaims all liability for any error, loss or other consequence that may arise from relying on any information in this publication.

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Introduction

The Department of Environment Land Water and Planning (the Department) has been the lead agency involved in the management and monitoring of both Fairy Tern and Little Terns (collectively known as small Terns) in the Gippsland Lakes for many years.

The Fairy tern (*Sterna nereis*) is listed as Vulnerable under the IUCN Red List of Threatened Species and under Environment Protection and Biodiversity Conservation Act 1999.

The Little Tern (*Sterna albifrons*) is listed as threatened (Flora and Fauna Guarantee Act 1988, VIC: Nov 2019 list. It is endangered in both NSW and SA. Listed as Least Concern (Global Status: IUCN Red List of Threatened Species: 2019.2 list. Listed as Least Concern (The Action Plan for Australian Birds 2010 - non-threatened)

In 2011, the total population of Fairy Terns within Australia was estimated to be between 3300-5700 breeding pairs (Garnett et al., 2011). The population is considered stable in Western Australia consisting of 3000-5000 pairs (Garnett et al., 2011). Rapid declines of Fairy Tern populations have occurred in eastern Australia: current estimates are 180-300 pairs in South Australia, 200-250 pairs in Tasmania, 6-70 pairs in Victoria and 12-40 pairs in New South Wales (Garnett et al., 2011).

The total population of both species have undergone significant declines and is expected to continue since known threats to the species show no signs of abating.(draft National Recovery Plan)

In recent years, a multi and inter-agency collaboration project sought to re-nourish and rehabilitate habitat (within the Gippsland Lakes) to protect and increase critical habitat for both species.

This more recent work on Crescent and Albifrons Island in 2015 continued to build on these conservation efforts previously undertaken in 1991 to protect habitat for small Terns. At Rigby Island the south eastern area was re profiled in 2017 also aimed at increasing habitat suitability for small Terns and other beach nesting species.

BirdLife Australia was engaged by the Department to record the breeding and fledgling success of Fairy and Little Tern across both the 2018-19 and 2019-2020 breeding season.

Funding for this project was provided through the Gippsland Lakes Coordinating Committee 'Love Our Lakes' initiative and overseen by the Natural Environment Program (NEP) Team within the Department.

The surveys in this document continue to record species abundance and diversity post habitat work whilst focusing on fledgling success of Fairy Tern (*Sternula nereis*) and Little Terns (*Sternula albifrons*) across the Gippsland Lakes. This document is designed to inform land managers and stakeholders of the population status and actions required to protect habitat for small Terns and other beach nesting bird species.

The monitoring undertaken in this project by BirdLife Australia is in accordance with the methodology outlined by the Department in the project specifications to record breeding success of small Tern species, as well as other beach nesting and migratory bird species.

Methodology

Surveys

Surveys were carried out weekly beginning in the first week of October 2019 until the last birds had departed the breeding area in March 2020. Where possible, all sites, with the exception of Lake Tyers, were surveyed on the same day and travelled the same route. Surveys were undertaken each Tuesday where weather conditions were suitable. Alternatively, when conditions were unsuitable the next most appropriate day was selected. The start date for surveying was determined by the first observations of small Terns arriving in the region. This was consistent with the methodology of the previous season surveys.

Survey Locations

Surveys were undertaken at the 6 key known breeding sites for small Terns. (Fig 1, Table 1)

Crescent Island – Horries Spit

Crescent Island – Pelican Patch

Albifrons Island (part of Crescent Island group)

Pelican Island

Rigby Island

Lake Tyers



Figure 1 – Site locations across Gippsland lakes – Crescent Island supports multiple locations.

Consistent with the 2018–19 season, 3 additional survey sites continued to be monitored where suitable habitat for small tern breeding was observed and/ or where small terns were seen utilizing the location.

These were –

Waddy Island beach

Barton Island

Flanagan Island East

Both Waddy Island and Barton Island also benefitted from habitat created through the sand island renourishment program on Crescent Island in 2015. See Fig 2, Table 1.

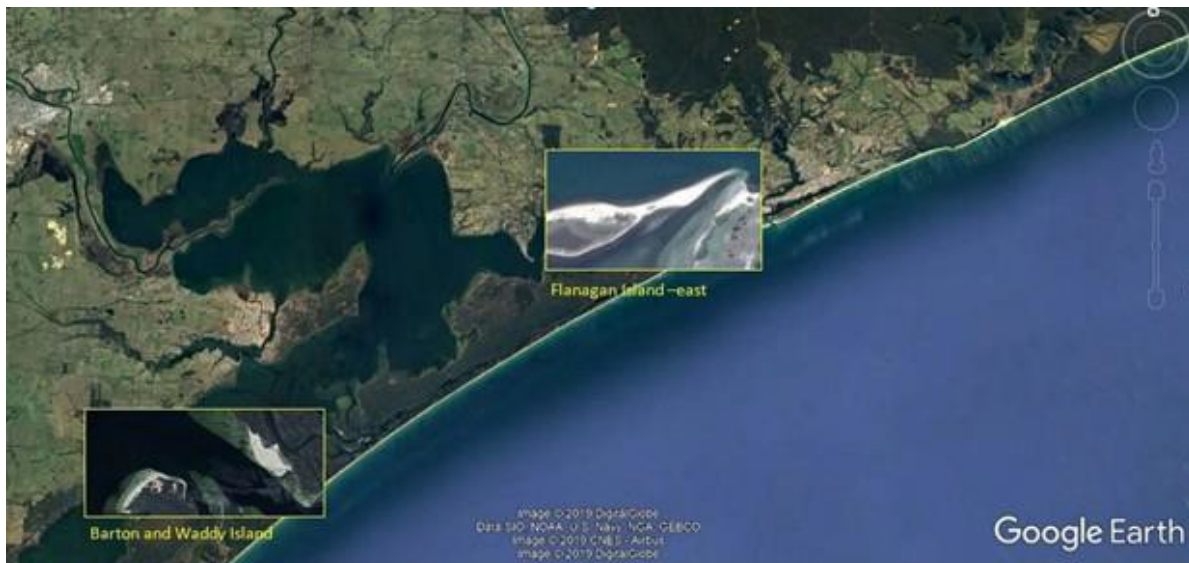


Figure 2 – Additional survey sites showing location of Barton, Waddy and Flanagan Island

Table 1 Site location details

Site Name	Latitude	Longitude
Crescent Island- Pelican Patch	-37.959116°	147.767647°
Lake Tyers	-37.851561°	148.096446°
Pelican Island	-37.896985°	147.880814°
Rigby Island	-37.887580°	147.965019°
Jones Bay- The Cut	-37.874647°	147.683107°
Crescent Island Horries Spit	-37.962279°	147.761780°
Albifrons Island	-37.959114°	147.770969°
Waddy Beach	-37.956028°	147.758770°
Barton Island	-37.956413°	147.750803°
Flannagan Island	-37.882654°	147.932642°

Survey methodology

Each site was counted for overall numbers, nesting, chicks and fledglings. Species differentiation was also recorded. To minimise colony disturbance, an egg count was not undertaken. Nesting was considered to be active when birds remained stationary at the same spot for long periods of time or returned directly to the same spot after any disturbances occurred. Each overall site count was taken 3 times using binoculars (10x42 magnification) and/or Nikon spotting scope. See Appendix 1 for survey forms. Photographic images taken during surveys were also used to support data collected in field. These were particularly valuable where multiple flight disturbances impacted the survey counts.

A field notebook was kept for the duration of the project. Unusual observations and behaviours were noted throughout survey days.

A minimum of 3 observers were present for each survey. A primary and secondary skilled observer and a third supporting observer.

All locations with the exception of Lake Tyers were monitored from a boat anchored on or near shore at a safe distance from the colonies. Lake Tyers was monitored with spotting scopes and on foot at a distance of approx. 200 metres to not disturb the birds. All surveys were conducted in the early morning to take advantage of the best light angle on the colony; this was with the exception of Lake Tyers which suited afternoons due to the location of the colony.

Temporary corflute signs were installed at all sites prior to the arrival of the small Terns.

Results

The 2019/20 season recorded an unsuccessful breeding result for both species of small tern on the Gippsland Lakes. The results presented in this report are taken from 134 surveys undertaken across the 2019/20 breeding season for small Terns in the Gippsland Lakes.

Birds made several failed attempts at multiple locations with nil breeding success. Attempts to colonize sites for nesting occurred at five of the seven previously known breeding locations – Lake Tyers, Pelican Island, Flanagan Island, Rigby Island and Crescent Island.

All sites were unsuccessful in establishing a tern breeding colony. Reasons for colony failure are unclear, with the exception of Albifrons Island which was inundated by high water levels. Pelican Island was not colonized this season. A detailed description of events at each site are documented on page 10 of this report.

Across the Gippsland Lakes, the overall individual number of Fairy Terns dominated over Little Terns throughout the 2019/20 season. Some sites, such as Lake Tyers and Rigby Island appeared to be more favourable to Little Terns than Fairy Terns. See Figure 3.

This figure does not include numbers of birds categorized as unknown due to observational difficulties such as hindrance by weather conditions – birds continually facing away from observation point or due to repeated disturbance flights of unknown causes to accurately identify between species.

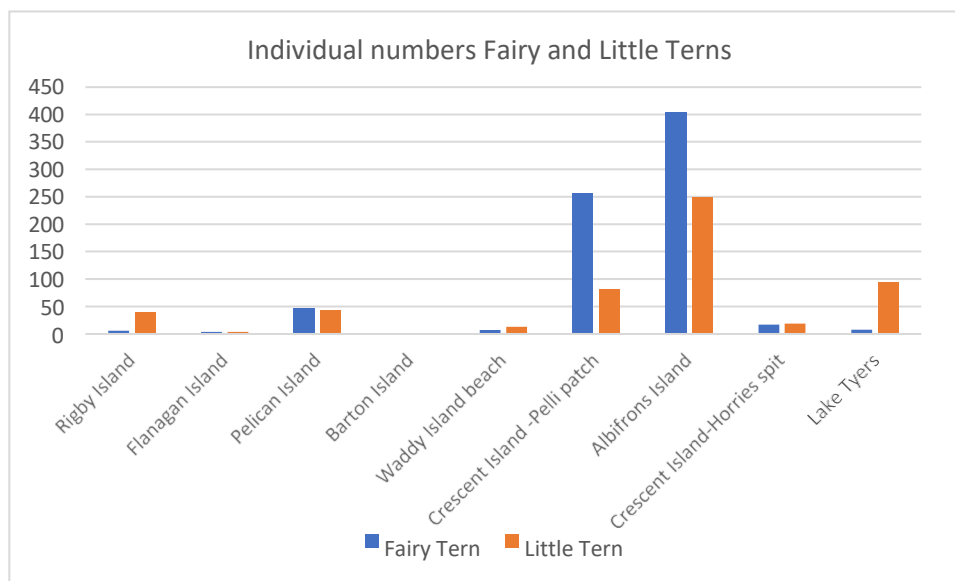


Figure 3: Total number of individuals of both Fairy and Little terns at each survey location.

In September, the first small terns of the season were observed scouting at Crescent Island (Pelican patch) and weekly monitoring surveys commenced thereafter. As with previous years, Crescent Island was the first location arriving birds were observed. Fairy Terns were the first of the two species to be recorded in the region.

An influx of both species was recorded in late October and over the next couple of weeks, the numbers increased and collectively reached their peak in November.

Figure 4 presents the average number of both Fairy and Little Terns sighted and represents birds in both breeding and non-breeding plumage.

Table 2 shows the number of Fairy and Little Terns observed on seven out of nine sites across the 16 weeks. It does not include birds observed at Lake Tyers where fewer site visits occurred or Barton Island where no small Terns were recorded. It is evident that numbers fluctuated between the 16-week surveys where all sites were surveyed consistently. Albifrons Island for example, had an average of 25 Fairy Terns and 15 Little Terns sighted across the season. This varied throughout the breeding cycle from as few as four Fairy Terns at the beginning of the breeding season, peaking at 64 mid cycle before crashing to zero when nesting failed. Numbers returned to their peak prior to departure at the end of the cycle. Similarly, Little Tern numbers fluctuated at the same location from as low as two to a maximum count of 54 also recorded mid breeding cycle but an average of 15. Numbers of Little Terns also returned to similar maximum numbers prior to departure.

This not only indicates post breeding movements within the region but emphasizes the importance of Albifrons Island as both breeding and staging area for both species' pre-departure

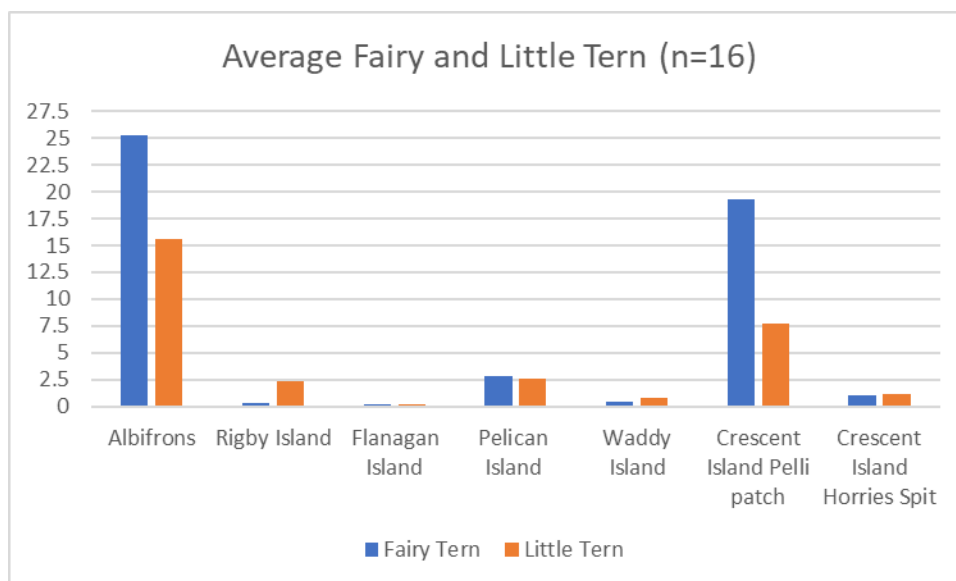


Figure 4 Average number of Fairy and Little Terns sighted across survey sites over 16 weeks.

Table 2 - Fairy and Little Terns observed at seven out of nine sites across the 16 weeks. It does not include birds observed at Lake Tyers where fewer site visits occurred, or Barton Island where no birds were detected. Figures in this table represent combined breeding and non-breeding plumages.

	Albifrons Island		Rigby Island		Flanagan Island		Pelican Island		Crescent Island-Horries Spit		Crescent Island-Pelican patch		Waddy Island		Totals	
	FT	LT	FT	LT	FT	LT	FT	LT	FT	LT	FT	LT	FT	LT	FT	LT
2/10/2019	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
10/10/2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15/10/2019	26	21	0	0	0	0	0	0	0	0	6	4	0	0	32	25
22/10/2019	0	0	0	0	4	0	9	4	0	0	36	13	0	0	49	17
29/10/2019	46	23	2	0	0	0	0	0	0	27	2	4	0	79	25	
6/11/2019	64	54	0	0	0	0	0	3	0	5	48	14	0	112	77	
19/11/2019	0	0	0	9	0	0	0	0	3	2	34	2	0	37	15	
25/11/2019	0	0	0	25	0	0	0	1	6	9	48	9	0	54	51	
8/12/2019	28	34	0	0	0	4	12	2	4	0	0	0	0	44	40	
17/12/2019	46	26	4	2	0	0	7	7	4	0	31	21	1	93	57	
23/12/2019	42	28	0	2	0	0	10	17	0	2	26	16	0	78	65	
14/01/2020	64	39	0	0	0	0	2	0	0	1	0	0	0	66	42	
22/01/2020	35	11	0	0	0	0	6	7	0	0	0	0	0	41	18	
28/01/2020	49	13	0	1	0	0	0	0	0	0	0	0	2	51	14	
25/02/2020	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	
3/03/2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

FT = Fairy Tern, LT = Little Tern

The highest single day count of Little and Fairy Terns collectively occurred on the 6th November when 254 individuals were recorded across all sites. Birds in both breeding and non-breeding plumage of both species are represented in this figure.

This figure does not consider additional birds who maybe away foraging from the monitoring sites. It is, however, representative of a time in the breeding cycle when birds are less likely to be widely dispersed, therefore assuming a reasonably accurate estimation. During this time pairs are bonding, vocalising and scrape making.

Previous estimations of individuals of combined species across a season are 350–400 and 300-350 birds present in 2018/19 and 2017/18 seasons, respectively.

Breeding attempts and observations at monitoring sites are detailed below –

Crescent Island and Albifrons Island

Like previous years the first arriving birds in the region were observed at the Crescent Island group. An influx of both species was recorded in late October– at Albifrons and Crescent Island (Pelican patch and Horries Spit) and steadily increased until they collectively reached their peak in early November. It is possible that some birds disturbed from Lake Tyers mud islands in late October added to the population at the Crescent Island group based on the rise and fall of numbers at those sites.

A series of low-pressure systems and high tides saw water levels inundate Albifrons Island washing away both small Tern and Pelicans attempting to nest at the site. See Appendix 2 for images. Erosion at 'Pelican Patch' on Crescent Island threatened to collapse the remaining established colony in the area. See Figure 5.

The highest nest count total was recorded on Crescent Island 'Pelican patch' between 19 – 25 November with 33 Fairy Terns and 3 pairs of Little Terns confirmed on nests.



Figure 5 - Erosion caused by high tide and low-pressure weather systems threatened nesting small terns on Crescent Island 'Pelican patch' and submerged Albifrons Island causing losses to both Pelican and small Terns nesting. Photo: D Sullivan

On the 25th November, the first and only sighting of chicks for the season was recorded. A pair of Fairy Tern chicks (< 3 days old) were observed with parent birds on Crescent Island - Pelican Patch. See Figure 6. It is possible other birds in the colony were brooding chicks of similar age but were not observed on the day. Terns are known to nest synchronously. This was the same site that was threatened by storms and high water just a few weeks earlier.

The following survey, however, was a very different story with the entire site abandoned with no evidence remaining of its existence other than nest scrapes in the sand. It is assumed all hatchlings and eggs were predated after the adults departed.

It is unclear what caused the abandonment of the site although large numbers of Silver Gulls (*Chroicocephalus novaehollandiae*), Pacific Gulls (*Larus pacificus*) and Australian Ravens (*Corvus coronoides*) were recorded in previous weeks.

Evidence of Hogg Deer (*Axis porcinus*) regularly trampling through the small Tern colony in search of food should not be excluded as a possible cause of abandonment. Deer species have also been documented eating birds' eggs (Mike Weston pers comms; Fairy Tern National draft recovery plan 2019). It is quite possible that *Sternula* eggs would also be an easy target for deer living on the island.

An area search of the abandoned site did not show any evidence of human disturbance interfering directly with the colony; therefore, it is assumed its desertion was caused by other factors.



Figure 6 On 25th November the only sighting of chicks for the season was at Crescent Island – Pelican patch. A week later this entire colony was abandoned. Photo: John Hutchison

Waddy Island

Waddy Island remained a loafing site for small numbers of birds throughout the breeding season with the exception of two pairs of Little terns who attempted to nest for a short time. Both pairs were observed over 2 weeks but quickly abandoned the site without the support of a colony.

Like previous years, the site once again failed to attract successful nesting despite what appears to be suitable habitat.

Barton Island

No small Tern activity was recorded at Barton Island, although feeding activity on the northern shores was occasionally seen.

Pelican Island

Birds of both species arrived at the Island in early December. A small number of Fairy Terns were witnessed fish wiping, mating and scrape making, nesting appeared imminent but never eventuated at the site.

It is assumed that the enormous vegetation growth has surpassed the preferred habitat requirements for both species at this site.

In general, terns tend to avoid vegetated areas and will abandon a traditional nesting site if it becomes too overgrown (Nic Dunlop pers comms) Clumps of vegetation, driftwood and other beach debris however provide shelter and shade for the chicks once they leave the nest.

What was important to note here was the returning birds to the island - suggesting site fidelity as confirmed by WA researchers (Claire Greenwell pers comms) and highlighting the need to maintain and manage the site for this species.

Undoubtedly the birds had returned to the island for breeding but found the ecological character of the site no longer favourable.

On-ground management works have commenced at Pelican Island to reduce vegetation cover at the site before birds return for the new season.

Flanagan Island

A single pair of Little Terns were observed attempting to settle on the east of Flanagan Island but was quickly abandoned. The likelihood of nesting success for a single pair is very low without the numbers of a colony for protection from predators but as in previous years the site has regularly attracted birds making nest attempts. This Island was recently placed under covenant by Trust for Nature.

Rigby Island

A small number of Little Tern pairs attempted a loose colony on Rigby Island SE dune. The birds were observed fish wiping and scrape making but never formally settled at the site. Disturbance was a contributing and most likely factor of the site failure.

Disturbance caused by human activities was regularly observed despite signs and will likely remain an ongoing management issue at this location due to its proximity to Lakes Entrance. Both dog and cat evidence were regularly observed at the island. Similarly, footprints of Rakali (*Hydromys chrysogaster*) were regularly seen. Rakali are known to prey on birds eggs and may be another factor limiting the success small terns in the birds are in our nature

region.

Lake Tyers

Lake Tyers once again looked promising as birds moved onto the Mud Islands. At highest count it supported a combined species total of 70 individuals. Birds were observed scrape making and fish wiping but failed to maintain colony structure due to regular disturbance resulting in abandonment. On several occasions' dogs off leash, bike riders, walkers, Samba deer (*Cervus unicolor*) and even an All-Terrain Vehicle were observed moving through or within close proximity to the colony causing mass disturbance.

A second attempt to colonise the area came in mid-December when 11 pairs of Little Terns colonised the Mud Islands close to the water's edge. Like other sites this was also quickly abandoned with the most likely cause being human disturbance.

Marlo

A small number of birds were observed at Marlo Inlet in early to mid-December attempting to colonise a site for nesting. Whilst scrape making was observed no confirmed nesting was recorded.

Post breeding

Post breeding surveys were also carried out across the Gippsland Lakes. At Jones Bay, Pelican Island and Victoria Lagoon, all sites recorded congregating non-breeding and transitional plumaged birds. This pattern of behaviour at these sites has been repeated over a number of years and appears to be the final staging grounds before departure

Migratory species

In addition to small Tern monitoring, other bird species observed at each site were recorded, as well as any breeding activity. Refer to Appendix 3 for the full list of all species recorded.

13 of the 37 migratory shorebird species that visit Australia were recorded across the survey sites (see Table 3). This was slightly less than the recorded number last season. Three of these species, Eastern Curlew (*Numenius madagascariensis*) Curlew Sandpiper (*Calidris ferruginea*), and Great Knot (*Calidris tenuirostris*) are listed under EPBC Act as *Critically Endangered*. The Red Knot (*Calidris canutus*) and Lesser Sand Plover (*Charadrius mongolus*) are listed as *Endangered* and the Bar Tailed Godwit (*Limosa lapponica*) as *Vulnerable*. All six of these listed species were observed across the project period.

Of interest was the sighting of yet another *Endangered* Red Knot (*Calidris canutus*) with a research flag. The Red Knot (*Calidris canutus*) was observed on 15th October at Waddy Island flagged with a black over white combination. According to the Australian Wader Study Group records, the bird was banded in Chongming Dao, near Shanghai, in eastern China. It is the most prolific banding project in China, using black / white as their combination. It is not possible to tell where the breeding grounds of this bird are. By the time birds reach the Shanghai region the direction of origin is a guess compared to the concentrations further north in Kamchatka, where the latter birds breed in eastern Russia (and possibly Chukotka where last years flagged bird was from). The bird was photographed by project assistant John Hutchison and reported to AWSG.

This instance once again highlights the value of photography as a supporting data tool when undertaking surveys. See Figure 7.



Figure 7. An *endangered* Red Knot (*Calidris canutus*) still in partial breeding colour showing the flag combination used in Chongming Dao, near Shanghai, in eastern China.

Photographed at Waddy Island, Gippsland Lakes by John Hutchison

Table 3 – Migratory shorebird species recorded across project sites

Species No	Species	Status	Rigby Island	Flanagan Island	Pelican Island	Barton Island	Waddy Island beach	Crescent Island -Pelli patch	Albifrons Island	Crescent Island-Horries spit	Little Island	Lake Tyers	Total
136	Grey Plover				1								1
137	Pacific Golden Plover												
140	Double-banded Plover								1	3			4
139	Lesser Sand Plover	End							1				1
141	Greater Sand Plover												
150	Whimbrel									1		1	2
893	Eurasian Curlew												
149	Far Eastern Curlew	Crit End	1										1
153	Bar-tailed Godwit	Vul		1	91	2	27	18	323	84		31	577
129	Ruddy Turnstone							3				1	4
165	Great Knot	Crit End							9	1			10
164	Red Knot	End			12			15	326	21		14	388
163	Sharp-tailed Sandpiper								1				1
161	Curlew Sandpiper	Crit End							3	2			5
162	Red-necked Stint				24		46	137	841	293		455	1796
166	Sanderling								1	2		1	4
168	Latham's Snipe												
155	Grey-tailed Tattler												
156	Wandering Tattler												
158	Common Greenshank												
154	Wood Sandpiper												
159	Marsh Sandpiper												

Similar to previous years, Red Neck Stint were the most abundant and frequently recorded migratory species across all sites. An increased number of Bar-tailed Godwits observed throughout the monitoring season had the second highest reporting rate followed by the endangered Red Knot.

Other beach nesting species that were observed nesting across monitoring sites included Australian Pied Oystercatcher, Hooded Plover, Masked Lapwing and Red-capped Plover. Pied Oystercatchers exhibited the most breeding activity overall. While the number of nest attempts was promising the results were poor. All species hatched chicks but few made it to fledgling age.

Discussion

2019-20 saw a larger number of birds from both species in non-breeding plumage throughout the breeding season than those of previous years. This may well have been the inclusion of birds from northern populations such as Japan whose breeding cycle varies from those arriving in south eastern areas to breed. A small number of first year birds were also present.

An increase in non-breeding and transitional plumages could clearly be seen as breeding attempts failed and birds lost breeding condition. A strong indication that the reproductive cycle is no longer active and no more nesting attempts will occur in the season. See Figures 8-10.

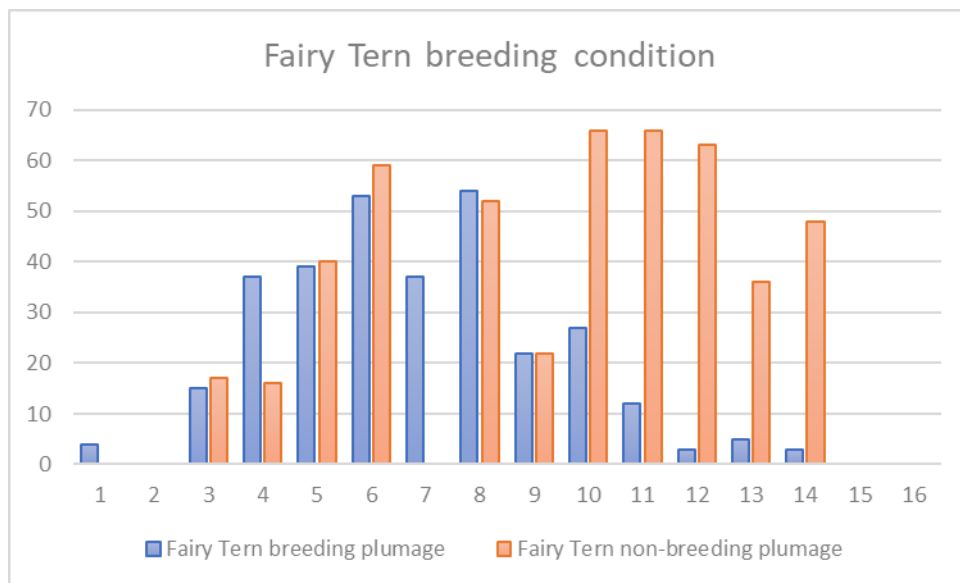


Figure 8. Shows the transition of Fairy Tern plumage from breeding to non-breeding condition across the 16-week period. This transition was quickly apparent after breeding attempts failed for the season.

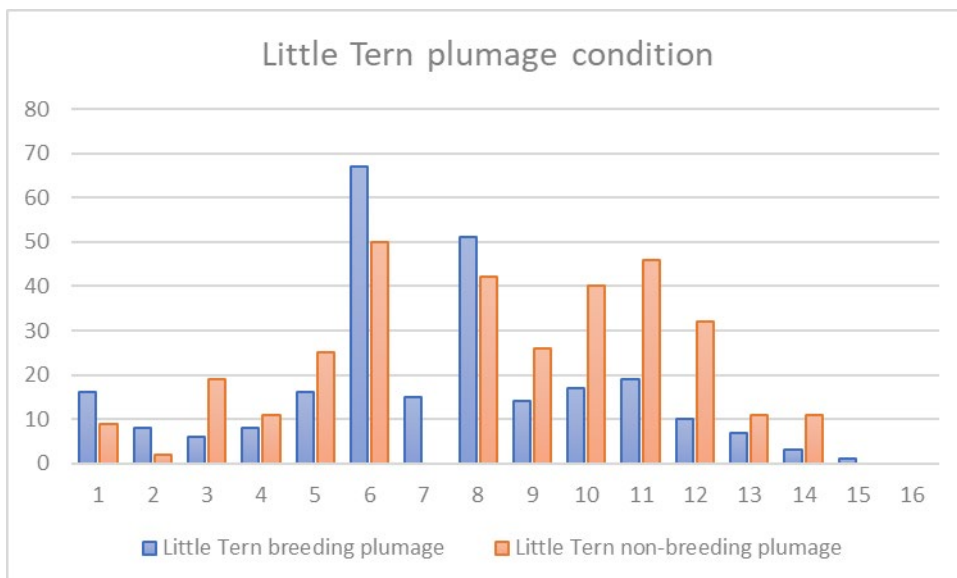


Figure 9 Similarly Little Terns transition to non-breeding plumage after breeding attempts fail



Figure 10. A typical mixed flock of Terns regularly observed throughout the monitoring season. These birds, mostly non-breeding or in transitional plumage, were observed on Albifrons Island and include Little Tern (*Sternula albifrons*), Fairy Tern (*Sternula nereis*), Common Tern (*Sterna hirundo*) and Crested Tern (*Thalasseus bergii*).

In addition to on-ground monitoring BirdLife project staff were invited to a number of external key stakeholder and research team meetings to assess the situation for Fairy Terns at a local, State and National level.

In August 2019, researchers, from across the country including East Gippsland gathered to workshop the first National Recovery Plan for the Australian Fairy Tern facilitated by Biodiversity Conservation Division staff from Department of the Environment and Energy, Australian Government. The goal of the workshop was to identify key breeding regions, threats to Australian Fairy Tern, prioritise threat matrix and discuss high priority actions to be included in the draft National Recovery Plan for the Australian Fairy Tern. Data and key findings from the Gippsland Lakes were presented with the resulting outcome highlighting the Gippsland Lakes as one of 4 key breeding sites for Fairy Terns in Victoria (S.Garnett, FFG Victorian Assessment 2020). If accepted, the National Recovery Plan will become a valuable document to guide land managers and researchers in future decisions for Fairy Tern management.

This was followed up by a post breeding season Fairy Tern Steering Committee meeting in April 2020 with members from Victoria, South Australia, and Western Australia present. Once again data and key findings from the Gippsland Lakes were presented. The following paragraph summarises the 2019-20 breeding season outcomes for Victoria.

In Victoria the only known breeding success for 2019-20 season was recorded at Phillip Island where 47 chicks fledged from 61 nests (P. Dann, PINP, pers comms), attempts were made at Corner Inlet and French Island but failed to produce any fledglings. Mud Island in Port Phillip Bay failed to attract any birds across the season (G. McGuire, A. Adams pers comms).

Temporary corflute signs were also installed across known breeding sites prior to the birds arriving. See Figure 11



Figure 11. A Fairy Tern presents a fish to a potential mate in front of a temporary sign at Crescent Island. Photo: Deb Sullivan

These temporary signs designed in collaboration with the BirdLife Australia Beach Nesting Birds Program to be recognisable across all significant sites in Victoria for multiple beach nesting bird species. Unlike the 2018-19 season there was no evidence of signs being vandalised. The scope of this project does not include an evaluation of community response to signs installed.

Nesting success is also relative to suitable food in the system and should be considered when understanding why the colonies failed. Adults may not have been able to provide enough food to feed their chicks forcing abandonment or breeding suppression as seen in some other species. Foraging birds may have been away for longer periods in search of food leaving incubating birds to defend nests, and leaving young chicks exposed to predators for longer periods. In 2018-19 a lack of bait fish was anecdotally reported most likely due to the limited inflows across catchments caused by the ongoing drought. The up-coming season faces lingering blue green algae and poor water quality due to heavy sediment runoff from the devastating summer bushfires which may also have an impact on fish stocks. See Figure 12. There is no baseline data or regular monitoring in the region other than anecdotal information suggesting fish stocks have already begun to show signs of impact (D.Love;Friends of Beware Reef. Pers comms)



Figure 8. Water quality has been severely compromised by runoff from bushfire grounds in the catchment. These samples both from 21st February 2020 show water quality in the Mitchell River (left) and Tambo River (right). The impact on fish stocks is unknown. Photo – Deb Sullivan

Threats

The biggest threats that face small Terns are human disturbance, avian predators, mammalian predators, loss of habitat and water inundation (National Recovery Plan for Fairy Tern, 2019). Identifying the sources of nest failure and tracking threats at breeding sites through the breeding season, would also enable us to formulate targeted threat mitigation actions for sites to improve future success.

The severity of avian predation could not be assessed across this season as weekly visits to sites for very short periods will not produce enough observations to allow severity of avian predation to be measured/assessed.

Human disturbance was recorded at all breeding sites despite signage in place. The Gippsland Lakes have a high recreational threat base. See Figure 13. It is unclear if human disturbance was the single cause or a contributing factor to the abandonment of colonies.

Understanding disturbance factors, aside from human activity and behavioural cues that result in a flight initiation response is a subject that continues to be explored by many researchers. Future monitoring could include additional methodology to assess these behaviours and visual cues.



Figure 13 Rigby Island is a popular location for summer beachgoers. Dogs are regularly seen disembarking from boats at this site despite signs. The yellow arrow denotes known Tern and Hooded plover nesting area. Photo Deb Sullivan.

A number of sites had evidence of dogs including Rigby Island – where dogs were released
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from boats to roam free, and Lake Tyers where 'dogs on leads' signs are regularly ignored by dog walkers and unleashed dogs frequent the beaches. This remains a significant threat to beach nesting bird species.

A Hooded Plover chick less than a few days old was found victim to a dog attack not far from the Tern colony at Lake Tyers. The flightless chicks' desperate attempts to out manoeuvre the dog can clearly be seen by prints in the sand. See Figure 10. Off lead dogs pose a real risk of causing abandonment to colonies and further chick mortality.



Figure 10 - An endangered Hooded Plover chick found deceased after an off-lead dog pursued and killed the chick at Lake Tyers Beach 2020. The colony of small Terns was nearby. Photo: Gary and Judy Smith.

Strong low-pressure frontal systems with strong winds and high tides also impacted the breeding colonies with submersion of some sites. Notably was Albifrons Island which was submerged on 2 occasions washing away nesting attempts by both small terns and Pelicans. Terns can re-nest in a given season therefore it is possible that nesting birds originally washed out at Albifrons Island attempted to re-nest at the same site.

It is highly recommended that this be considered for continued renourishment as inundation remains a key threatening process for these species. The commitment to a second breeding attempt on the island as well as its importance as a staging ground assures the value of the site to the birds.

Lingering blue green algae and poor water quality due to heavy sediment runoff and chemicals from the devastating summer bushfires which may also have an impact on fish stocks in the coming years

Mammalian predators also rank highly in the threat matrix for small Terns. In addition to invasive predators, native mammals and rodents can also contribute to failure of a breeding site. There is no known data assessing the impact of Rakali on small tern colonies, but extensive monitoring has proven introduced Brown (*Rattus norvegicus*) and Black Rats (*Rattus rattus*) have significant impact (National recovery plan, 2019; J. Reside pers comms).

Lake Tyers and Gippsland Lakes support widespread populations of Rakali *Hydromys chrysogaster* or native water rat (G. Williams and M. Serena, 2014). These carnivorous native rodents are known to prey on small birds, and birds' eggs alongside their aquatic diet (CSIRO, 2015). They are also known to return to successful hunting grounds to forage repeatedly (CSIRO, 2015). This type of activity could easily decimate a tern colony. Evidence of high Rakali activity at Rigby Island may also have contributed to this site being vacated by small Terns. Potentially reoccurring over multiple years and contributing to the failure of this site alongside ecological character changes and human disturbance. The addition of remote cameras to the project will provide scope to assess nest fate

Another major threat to the Terns was the presence of fox (*Vulpes vulpes*) and cat (*Felis catus*) at Rigby Island. Similar to Crescent Island suite, Hogg Deer (*Axis porcinus*) are also present on the island and threaten nesting success for all beach nesting bird species. Nests and eggs are highly vulnerable to being trampled and destroyed before hatching. Evidence of deer activity was observed regularly tramping through nesting colonies in particular at Crescent Island.



A Little Tern pair exchanging a fish as part of courtship behaviour

Recommendations

Monitoring

It is recommended that the methodology as described on page 5 and in the Departments project schedule be continued in future breeding seasons to maintain consistency of data.

In addition, identifying where possible plumage moult between juvenile and first year birds as an indicator of recruitment success. This will require the aid of photography.

Cautionary signs to alert the public of breeding site significance should be installed prior to nesting commencing. Signs should also discourage entry into breeding areas.

The use of remote cameras will assist with quantifying avian; mammalian and invasive species impacts at known breeding sites. Seasonal monitoring would benefit from the addition of remote cameras installed on site to compliment on ground observations. This will assist in documenting and understanding the level of predation caused by avian predators on a colony as well as an insight to any other threats and/or disturbances that may contribute to colony failure. Animal ethics protocols will need to be followed to avoid disturbing the colony.

Use photography to identify fish species caught/fed to chicks etc

In addition, a description of the site composition (percentage cover) of the vegetation and shell grit present.

A snapshot threat assessment encompassing a 100 m radius around an abandoned nesting colony including tracks/prints to help determine nest fate and abandonment

Assessing habitat characters and Tern response to vegetation management on Pelican Island will provide a valuable case study in addition to this report.

Quadrants should be set after the completion of on ground works and prior to the bird's arrival. These will be designed to assess site viability and Tern response. Contents of each quadrant, including any vegetation, beach wrack, shell grit, driftwood, or flotsam and jetsam will be calculated as well as number of nests should the birds colonise the site for breeding

Threat Management

It is critical that the management of invasive species such as fox, cats and deer be continued across all breeding sites. Control of pest species at significant sites should be targeted prior to nesting commencing.

Any additional site management such as vegetation control should also be completed before the scouting birds arrive. If Pelican Island is to remain a viable site for future nesting it is critical that vegetation be removed and managed at the breeding site.

Control of Hogg and Sambar deer at critical nesting locations. Trampling of nests, disturbance and consuming vegetation increasing erosion is a regular occurrence at Gippsland Lakes breeding sites.

Albifrons Island and Crescent Island be considered for future re-nourishment to increase birds are in our nature

sand profile

Continue Sea spurge (*Euphorbia paralias*) weed control across all known breeding sites.

Consistent water quality sampling and toxicant levels in fish and waterbirds should be assessed for contamination levels following bushfires of 2019-20.

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Conclusion

Unfortunately, the 2019/20 breeding season for small terns across the Gippsland Lakes did not realise any success. Despite multiple attempts at colonising the usual known breeding sites - Crescent Island, Lake Tyers, Pelican Island and Rigby Island, there was no successful breeding events. This was a disappointing follow up to the previous year 2018/19 where Gippsland Lakes returned the ONLY successful breeding event in Victoria.

The only nest event that appeared promising was Crescent Island where a nest count total was recorded between 19– 25 November with 33 Fairy Terns and 3 pairs of Little Terns confirmed on nests. For reasons unclear, the site was abandoned shortly after hatching.

As predicted the density of vegetation on Pelican Island proved too much for the small Terns rendering the site unusable for nesting. The birds did, however, search the western site looking for suitability, indicating it is still very much a site of significance if the vegetation is controlled. Vegetation removal and management is **critical** if this site is to become viable again in the future.

Protecting breeding habitat in the Gippsland Lakes for small Terns is considered a high priority for the species and should be considered an important priority for land managers. It is one of few breeding areas and considered to be a stronghold for the species (S. Garnett pers comms).

Under Ramsar site obligations, the critical processes (CPS's) identified at the time of listing are intermittently assessed against Limits of Acceptable Change (LAC's). Of the twenty-six critical CPS for the Gippsland Lakes Ramsar Site, 3 are related to bird populations:

1. waterbird abundance and diversity
2. waterbird breeding; Colonial waterbirds
3. Threatened Species; Fairy and Little Tern, Australasian Bittern

Future monitoring of breeding success of birds within the area is critical to informing future LAC assessment.

Maintaining habitat should include existing sites and potential locations where habitat could be increased to support the species.

A better understanding of the Victorian population of both species would also be beneficial for future management. A collaborative census of the small tern numbers across States would be beneficial to understanding their current population. The ability to share knowledge and data with other agencies across sites and States is critical to the better understanding these species.

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Appendices

Appendix 1 - Site survey data template

FAIRY and LITTLE TERN SITE MONITORING FORM

Please ensure site visits with zero Fairy Terns are also submitted

Observer name/s:				
Site name, location:				
Latitude/Longitude of location (can be determined by Google maps):				
Date:		Start and end time:		
Temperature:	Cloud cover (0-100%):		Wind direction:	
Wind strength:	Calm:	Light:	Moderate:	Strong:

Overall count A:

B:

C:

(both species can be counted as an indication of numbers in case of disturbances)

Number adults:		Number juveniles:		Bands?	
Other bird species:					
Management evident:	<input type="checkbox"/> Beach access signs	<input type="checkbox"/> Nest site signs	<input type="checkbox"/> Fence	Other:	
Habitat of colony	<input type="checkbox"/> Rocks	<input type="checkbox"/> Beach/sand	<input type="checkbox"/> Shell-grit	<input type="checkbox"/> Fringing vegetation	
	<input type="checkbox"/> Seagrass	Other:			
Adult Behaviour	<input type="checkbox"/> Foraging	<input type="checkbox"/> Calling	<input type="checkbox"/> Aerial displays	<input type="checkbox"/> Courtship feeding	
	<input type="checkbox"/> Courtship: males walking in circles around females	<input type="checkbox"/> Nest scrape building	<input type="checkbox"/> Copulating	<input type="checkbox"/> Incubating	
	<input type="checkbox"/> Brooding chick	<input type="checkbox"/> Defecating while flying	<input type="checkbox"/> Dive-bombing	<input type="checkbox"/> Chick feeding	
	<input type="checkbox"/> Flying	<input type="checkbox"/> Resting	Other:		

Quick Threat Assessment of site

Threat Type	Number observed:	Footprints (% cover of beach):
Walkers/Joggers		
People sunbaking / sitting		
Surfers / Swimmers		
People fishing		
Dog walkers		
Dogs on leash (# dogs)		
Dogs off leash (# dogs)		
Horses		
Encroaching vegetation (distance to nest)		
Vehicles		
Ravens		
Gulls		
Raptor:		
Other:		

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Appendix 2

Water inundation of Albifrons Island



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Appendix 3 –

Individual totals for all species recorded at each site

SpNo	Common Name	Rigby Island	Flanagan Island	Pelican Island	Barton Island	Waddy Island beach	Crescent Island - Pell patch	Albifrons Island	Crescent Island - Horries spit	Lake Tyers	Total
217	Musk Duck										
213	Pink-eared Duck										
203	Black Swan	15	89		442	216	172	270	102	42	1348
207	Australian Shelduck			2						2	4
212	Australasian Shoveler										
208	Pacific Black Duck										
211	Grey Teal									70	70
210	Chestnut Teal	17	8		34	27	130	14	225	43	498
61	Australasian Grebe										
62	Hoary-headed Grebe										
60	Great Crested Grebe				1						1
59	Eurasian Coot										
182	Yellow-billed Spoonbill									2	2
181	Royal Spoonbill	3	4	1			1			11	20
180	Straw-necked Ibis										
179	Australian White Ibis	5		1							6
977	Cattle Egret										
189	White-necked Heron										
187	Great Egret	1			1					2	4
188	White-faced Heron	2								1	3
185	Little Egret	4								2	6
106	Australian Pelican	704	140	110	48		75	86	137	30	1330
100	Little Pied Cormorant	3	210	191	210	7	52	308	45		1026
96	Great Cormorant	2528	43		40	25		109	10		2755
97	Little Black Cormorant	13	358	84	179		12	16	8		670
98	Black-faced Cormorant	1			1		99	482			583
99	Great Pied Cormorant		36	1	71		84	118			310
101	Australasian Darter										
130	Australian Pied Oystercatc	69	22	68	16	21	69	53	55	32	405
131	Sooty Oystercatcher	3									3
148	Red-necked Avocet							2			2
146	Pied Stilt			2							2
136	Grey Plover			1							1
137	Pacific Golden Plover		2								2
143	Red-capped Plover			30		20	25	21	53	32	181
140	Double-banded Plover							1	3		4
139	Lesser Sand Plover							1			1
141	Greater Sand Plover										
138	Hooded Plover	16	16	25	26	20	24	16		5	148
144	Black-fronted Dotterel										
135	Banded Lapwing										
133	Masked Lapwing	16	20	21	8	9	20	7	13	11	125
132	Red-kneed Dotterel										
150	Whimbrel								1	1	2
893	Eurasian Curlew										
149	Far Eastern Curlew	1									1
153	Bar-tailed Godwit		1	91	2	27	18	323	84	31	577
129	Ruddy Turnstone						3			1	4
165	Great Knot							9	1		10
164	Red Knot			12			15	326	21	14	388
163	Sharp-tailed Sandpiper							1		5	6

161	Curlew Sandpiper									3	2		5	
162	Red-necked Stint						24		46	137	841	293	1341	
166	Sanderling										1	2	1	4
125	Silver Gull	453	293	13	93	1	109	553	6	36	1557			
126	Pacific Gull	41	7	3	4			10	26	2	3			96
117	Little Tern													
118	Fairy Tern													
112	Caspian Tern	3	8	18				3		19	3	8		62
110	Whiskered Tern								2					2
114	White-fronted Tern													
953	Common Tern	1							19	456				476
115	Greater Crested Tern	539	36	8				1	90	1115		311		2100
224	Wedge-tailed Eagle													
219	Swamp Harrier													
221	Brown Goshawk													
226	White-bellied Sea-Eagle		2	1										3
228	Whistling Kite													
240	Nankeen Kestrel													
235	Australian Hobby													
239	Brown Falcon													
237	Peregrine Falcon													
868	Forest Raven						1					2		3
930	Australian Raven													
168	Latham's Snipe													
155	Grey-tailed Tattler													
156	Wandering Tattler													
158	Common Greenshank													
154	Wood Sandpiper													
159	Marsh Sandpiper													
125	Silver Gull													
126	Pacific Gull													
117	Little Tern													
118	Fairy Tern													
111	Common Gull-billed Tern													
8794	Australian Gull-billed Tern													
112	Caspian Tern													
110	Whiskered Tern													
114	White-fronted Tern													
953	Common Tern													
115	Greater Crested Tern													
241	Osprey													
232	Black-shouldered Kite													
224	Wedge-tailed Eagle													
225	Little Eagle													
219	Swamp Harrier													
221	Brown Goshawk													
226	White-bellied Sea-Eagle													
228	Whistling Kite													
240	Nankeen Kestrel													
235	Australian Hobby													
239	Brown Falcon													
237	Peregrine Falcon													
868	Forest Raven													
930	Australian Raven													
		4438	1295	708	1176	423	1166	5177	1068	696	16147			

Date:

Appendix 4

Small Tern results at each site.

	27/09/2018	29/10/2018	11/11/2018	13/11/2018	22/11/2018	27/11/2018	5/12/2018	11/12/2018	18/12/2018	27/12/2018	2/01/2019	8/01/2019	15/01/2019	22/01/2019	29/01/2019	5/02/2019	19/02/2019
Rigby Island																	
Combined overall site total observations		2	5		24	2	4		2								
Little Tern		2	5		11	2	4		2								
Little Tern non Breeding					1												
Little Tern nesting					6	0	0										
Little Tern chick																	
Little Tern fledgling																	
Fairy Tern					5												
Fairy Tern non Breeding																	
Fairy Tern nesting					1												
Fairy Tern chick																	
Fairy Tern fledgling																	
Unidentified sp ID																	

	29/10/2018	4/11/2018	13/11/2018	22/11/2018	27/11/2018	5/12/2018	11/12/2018	18/12/2018	27/12/2018	2/01/2019	8/01/2019	15/01/2019	22/01/2019	29/01/2019	5/02/2019	19/02/2019	19/02/2019
Flanagan Island																	
Combined overall site total observations				1	26	1	1		1	2	1	1	1	4			
Little Tern				1	15	1			1	2	1	1	1	4			
Little Tern non Breeding					2												
Little Tern nesting					4		1										
Little Tern chick																	
Little Tern fledgling																	
Fairy Tern					6												
Fairy Tern non Breeding																	
Fairy Tern nesting																	

Fairy Tern chick																			
Fairy Tern fledgling																			
Unidentified sp ID																			

	9/10/2018	16/10/2018	29/10/2018	6/11/2018	13/11/2018	22/11/2018	27/11/2018	5/12/2018	11/12/2018	18/12/2018	27/12/2018	2/01/2019	8/01/2019	15/01/2019	22/01/2019	29/01/2019	5/02/2019	19/02/2019	
Pelican Island																			
Combined overall site total observations	2	4	8		4	3	10	12	39	69	92	70	12	14	26	87		41	
Little Tern	1		3	2	4	3	9	11	31	29	41	27	32	50	4	16		23	
Little Tern non breeding								1	2	20	12	1	25	16	2	18		4	
Little Tern nesting										4	25	31	39	34					
Little Tern chick														11				10	
Little Tern fledgling												2		2	5	15			
Fairy Tern	1		5	4			1		6	13	2	1	5	13	2	2		2	
Fairy Tern non breeding													1	8	3	2			
Fairy Tern nesting										1	7	8	8	5					
Fairy Tern chick														2				2	
Fairy Tern fledgling														3	4	3			
Unidentified sp ID		4								2	5		13		6	56			

	9/10/2018	12/10/2018	16/10/2018	29/10/2018	6/11/2018	13/11/2018	27/11/2018	5/12/2018	11/12/2018	18/12/2018	27/12/2018	2/01/2019	8/01/2019	15/01/2019	22/01/2019	29/01/2019	5/02/2019	19/02/2019	
Crescent Pelican patch																			
Combined overall site total observations	13	30	18	15	5	2					25		4		1				
Little Tern				2	3	2					17				1				
Little Tern non breeding		4									5								
Little Tern nesting											3								
Little Tern chick																			
Little Tern fledgling																			
Fairy Tern	13	25	16	12	2														
Fairy Tern non	1																		

breeding																		
Fairy Tern nesting		1																
Fairy Tern chick																		
Fairy Tern fledgling																		
Unidentified sp ID			2	1									4					

Crescent Island Horries Spit	9/10/2018	12/10/2018	16/10/2018	29/10/2018	6/11/2018	13/11/2018	27/11/2018	5/12/2018	11/12/2018	18/12/2018	27/12/2018	2/01/2019	8/01/2019	15/01/2019	22/01/2019	29/01/2019	5/02/2019	19/02/2019
Combined overall site total observations	2	6		5		2		0			6							
Little Tern				3		2					6					3		
Little Tern non breeding																4		
Little Tern nesting																		
Little Tern chick																		
Little Tern fledgling																4		
Fairy Tern	2	5		2														
Fairy Tern non breeding		1															1	
Fairy Tern nesting																		
Fairy Tern chick																		
Fairy Tern fledgling																		
Unidentified sp ID																		

	9/10/2018	12/10/2018	16/10/2018	6/11/2018	13/11/2018	27/11/2018	5/12/2018	11/12/2018	18/12/2018	27/12/2018	2/01/2019	8/01/2019	15/01/2019	22/01/2019	29/01/2019	5/02/2019	19/02/2019
Albifrons Island																	
Combined overall site total observations	21	33	8	78	6	0	13		9			4			72		
Little Tern				6	5				1						10	6	
Little Tern non breeding				50	1		3					4			50	12	
Little Tern nesting																	
Little Tern chick																	
Little Tern fledgling																	
Fairy Tern	20	33	7	9			2								1		
Fairy Tern non breeding	1		1	11											4		
Fairy Tern nesting																	
Fairy Tern chick																	
Fairy Tern fledgling																	
Unidentified sp ID				2			7		8					12	3		

	9/10/2018	12/10/2018	16/10/2018	29/10/2018	6/11/2018	13/11/2018	27/11/2018	5/12/2018	11/12/2018	18/12/2018	27/12/2018	2/01/2019	8/01/2019	15/01/2019	22/01/2019	29/01/2019	5/02/2019	19/02/2019
Waddy Island																		
Combined overall site total observations					2	7	2	1		2	2			2	2			
Little Tern					2	4	2				2			2	2			
Little Tern non breeding						1												
Little Tern nesting						2		1		2								
Little Tern chick																		
Little Tern fledgling																		
Fairy Tern																		
Fairy Tern non breeding																		
Fairy Tern nesting																		
Fairy Tern chick																		
Fairy Tern fledgling																		
Unidentified sp ID																		

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	27/09/2018	27/10/2018	2/11/2018	15/11/2018									10/01/2019	24/01/2019	1/02/2019	15/02/2019			
Lake Tyers																			
Combined overall site total observations			3	17									20 7	77					
Little Tern			3										57	45					
Little Tern non breeding													35						
Little Tern nesting																			
Little Tern chick														3					
Little Tern fledgling													50	23					
Fairy Tern													23	12					
Fairy Tern non breeding													22						
Fairy Tern nesting																			
Fairy Tern chick														2					
Fairy Tern fledgling													20	7					
Unidentified sp ID				17									57	20			30		

BirdLife Australia
Suite 2-05
60 Leicester Street
Carlton VIC 3053

T 03 9347 0757
F 03 9347 9323

info@birdlife.org.au
birdlife.org.au

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