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Little Tern Breeding Colony on Artificial Site at Port Botany, New South Wales

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In 1979 I became aware of a colony of Little Tern *Sterna albifrons* breeding on the partly developed artificial site at Port Botany, New South Wales. The colony was studied in 1980-81, 1981-82 and 1982-83 to determine breeding success, to collect data relating to the artificial site, and to identify factors that threatened the colony. Runners were banded* to determine breeding success, and to identify Little Terns originating from the colony which may be retrapped or collected in the future at any location.

Morris (1979) summarised data on the breeding status of Little Terns in New South Wales up to 1978. This summary showed that from 1941 the Botany Bay, Little Tern colonies suffered continued disturbance and a decline in the number of nesting pairs from 50 in 1941-43 to two in 1978-79. In that breeding season Cook's River entrance was the only suitable breeding site recorded in the bay, sporadic nesting having occurred since 1963 on artificial sites provided by fill on the edges of the N-S runway extension of Sydney Kingsford Smith Airport.

History of Port Botany

Captain Watkin Tench, arriving with the First Fleet on 18 January, 1788, described Botany Bay as '. . . very open, and greatly exposed to to the fury of the S.E. winds, which, when they blow, cause a heavy and dangerous swell.' (Tench 1789). Botany Bay being too shallow at the entrance to allow anchorage in the deeper and less exposed S.W. arm, was not used as a port for over 150 years. In 1955 the refinery project at Kurnell meant the construction of a jetty and the dredging of a turning basin and approach channel for oil tankers.

In 1961 the Maritime Services Board (M.S.B.) of N.S.W. assumed responsibility for Botany Bay and began 18 years of research, dredging and reclamation to construct Stage 1 of Port Botany. This complex is sited on the N.E. shore of Botany Bay abutting Yarra Bay. The total area reclaimed is 260 ha of which 40 ha has been landscaped as parkland.

A V-shaped entrance channel about 1 700 m long was dredged, from 600 m inshore to the natural contour at 21.3 m outside the Heads. This directed most waves to the north side of the Bay and onto an armoured embankment protecting the Port site from the force of the waves. Thirteen million cubic metres of sand were removed in the dredging program and transferred to the reclamation area.

The Bulk Liquids Berth was opened on 23 April, 1979, and the container complex at Brotherson Dock was commissioned on 10 December, 1979 (Anon 1979).

* *Bands used were provided by the Australian Bird-banding Scheme, Division of Wildlife and Rangelands Research, CSIRO.*

History of Little Terns at Port Botany

In November 1979 a worker on the Container Terminals Australia site at Brotherson Dock reported Little Terns nesting on an area of sand in the centre of the construction site. Work was underway on a drainage trench directed towards the nesting area. The N.S.W. National Parks and Wildlife Service (N.P.W.S.) approached the M.S.B. and the construction contractor was consulted. It was agreed to rearrange the work program so that the nesting Little Terns would not be disturbed (Glascott 1979).

N.P.W.S. provided a simple fence for the site and notices reading 'Little Tern Nesting Area. This is an endangered species. Please keep clear,' were fixed to the fence. M.S.B. employees and construction workers expressed their interest and wardened the colony. A survey by N.P.W.S. reported 20 breeding pairs producing 12 runners from which six chicks fledged. Two runners were banded.

At the end of the 1979-80 breeding season the New South Wales Field Ornithologists Club (N.S.W.F.O.C.) wrote to the M.S.B. acknowledging the part the Board had played in giving temporary sanctuary to the breeding birds at Port Botany. The Club asked that where possible 'shell strewn beaches and similar undeveloped fill, be kept free of herbage where N.P.W.S. thinks there is a possibility of such sites serving as breeding areas.' (N.S.W.F.O.C. in litt.)

On 20 June, 1980, the Sydney Morning Herald reported that the Soil Conservation Service (S.C.S.) thought grass planting would control the problem of sand blowing from the artificial Port site [affected by Tench's notorious S.E. wind]. This had been a source of property damage to local residents and industrial workers. The N.S.W.F.O.C. (in litt.) immediately asked the N.P.W.S. to confer with the S.C.S. and the M.S.B. 'with the object of persuading them to co-operate with you in selecting a suitable shell strewn area to be kept free of artificial or natural grass growth' to allow Little Terns an opportunity to nest successfully the following season.

This request led to a meeting between officers of the M.S.B., S.C.S., N.P.W.S. and N.S.W.F.O.C. on 18 September 1980, when it was decided that the Little Tern nesting area known as site B, then the major site, would remain ungrassed during the 1980-81 breeding season. Officers from the S.C.S. thought it would be possible to leave patches of shell and grit unvegetated in future years without affecting the overall results of sand drift control by grassing.

A group of N.S.W.F.O.C. members was then organised to monitor the colony in 1980-81. Emphasis was placed on the need for collecting data relating to the breeding success of Little Terns nesting on artificial sites. The M.S.B. gave this group permission to enter the Port site. At the beginning of the next two breeding seasons this group again received permission to enter the Port site to study the breeding birds.

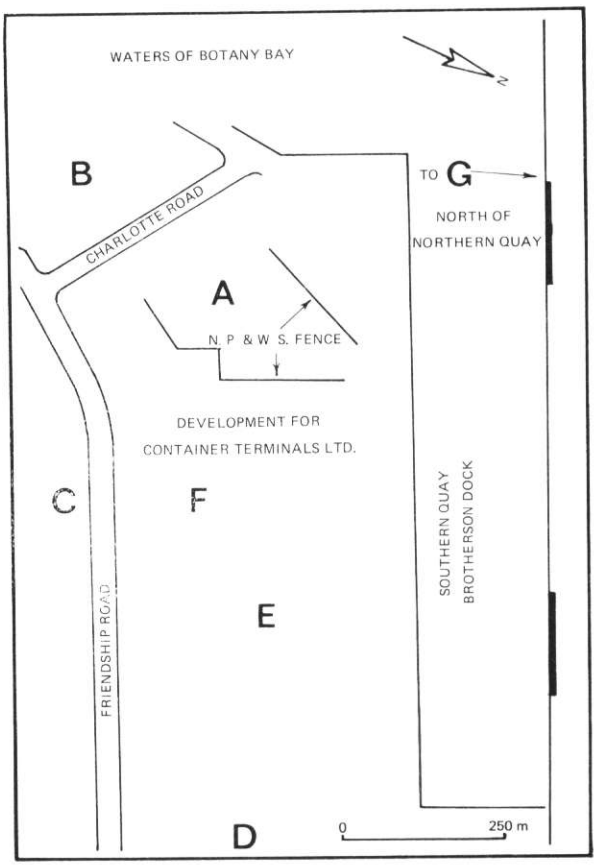
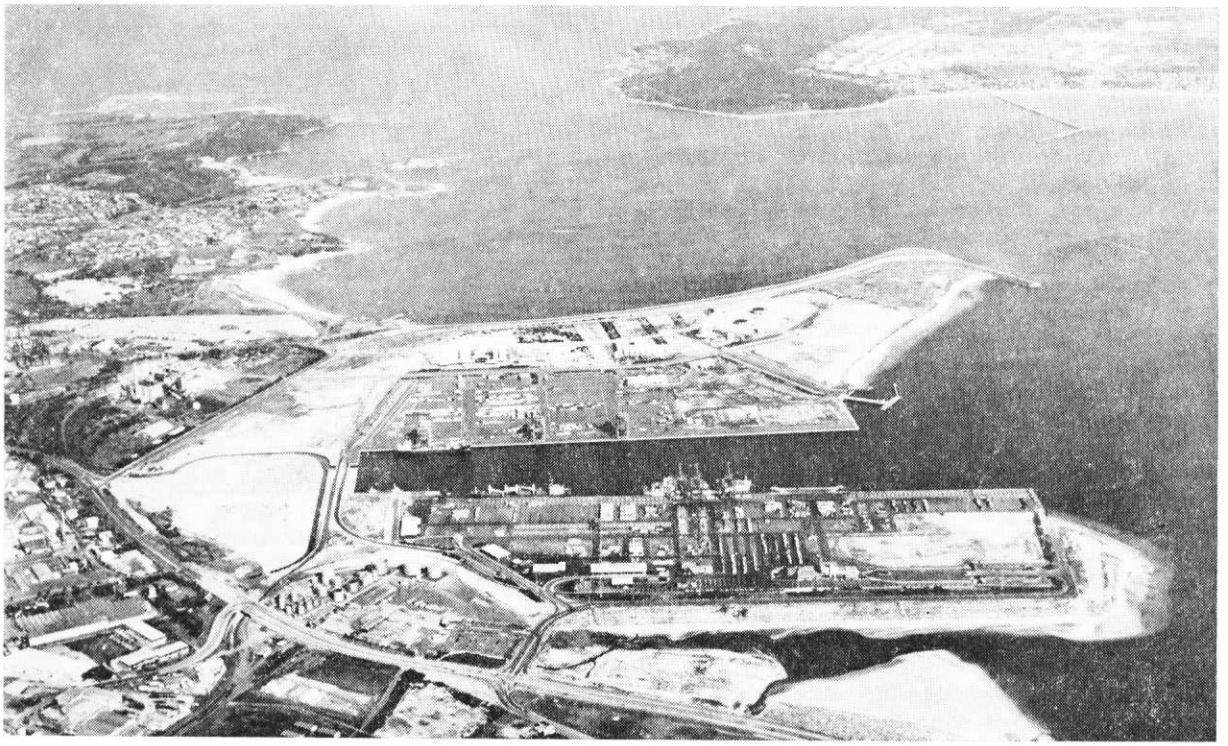


Figure 1. *Location of nesting sites A to G of Little Terns within Port Botany, 1980-83.*



• *Brotherson Dock in Port Botany showing sandy areas colonised by Little Terns.*

Photo courtesy Maritime Services Board of N.S.W.

Breeding Sites

In 1979-80 six breeding areas were occupied. These were designated A to F (Fig. 1). Site A was the major nesting area that year. It was flat, unvegetated except for occasional low tufts of Searocket *Cakile edentula,* and did not border Botany Bay. After site A was developed for Port facilities at the end of the 1979-80 breeding season, site B and new site G were the major nesting areas.

Site B bordered the bay and was of considerable area with high artificial dunes ringing an extensive basin of shelly and, in part, stony sand that served as the main nesting area in 1980-81. Runners sheltered in grass on a high dune away from the water. When an industrial lot adjacent to this dune was developed during the 1981-82 season ,noise disturbance occured, and sand was added to the dune from the industrial lot. In that season nest sites were selected on the dunes along the beach, which was not the case the previous season. This gave brooding birds a view of the water. In this position they were exposed to disturbance by people from the beach, and probably to predation by rats nesting at the edge of the beach dune just above the high tide mark. In 1982-83 this site, having been seeded, was overgrown by Marram Grass *Ammophila arenaria* and Hairy Spinifex *Spinifex hirsutus.* In some places gully erosion by S.E. wind had exposed a hard surface that was unsuitable for nest sites. The circling dunes had been slightly reduced in height by the wind removing sand. No nests were recorded on this site that season.

Site C, east of B, was located between two industrial developments. The nesting area here was restricted by grass and weed growth and by wattle species, all of which provided suitable shelter for runners. This site had no view of the water; it was flat and sheltered by the high armoured wall.

Sites D, E and F lay between site A and Bumborah Road. By 1980-81, E and F had been asphalted. Site D, although very extensive, had no border with Botany Bay and was not colonised to any extent. Vegetation and a generally rough surface made it unsuitable for nesting on a large scale. It was considered sites B and G were also preferred to site D because they were closer to the water.

A further area north of the Port development, which adjoined an artificial beach, was designated G. This area, dubbed 'The Green Hill' by the survey team, was identified by S.C.S. as Lot 40. Part of this area was stabilised with Hairy Spinifex and Marram Grass, the balance being a high stockpile of sand which made up a dune. This stockpile was not part of the S.C.S. vegetation program. Instead it had been sprayed with Curasol R, a temporary surface stabiliser, on 25 August, 1980 and 21 October, 1980 to form a crusty skin. A vegetable dye, Colanyl Green, was added to show the area had been stabilised and to discourage traffic by people and vehicles (S.C.S. in litt.). As this skin broke down, areas of exposed sand were available as nest sites. An inlet from Botany Bay separated this site from Brotherson Dock.

By 1982-83 all sites, with the exception of site G, had been developed or stabilised by plantings of Marram Grass, Hairy Spinifex and cereal crops, and there was some weed growth. Site G was suitable for nesting because the surface compound had broken down to a large extent, exposing a considerable area of sand of varying shell content that was taken up for nesting sites. Runners sheltered in the plantings of Marram Grass between the breeding area and the adjoining road (Fig. 2).

The breeding areas consisted of dredged sand. This material contained stones as well as shell and shell grit but none of these was evenly distributed over the sites. One nest was located in pure sand, the area of which varied from day to day according to the direction and force of the wind.

The sites were protected to a varying extent because of the location within the Port complex. Sites B and G, with access to the beach, were intruded upon by people walking to the water to fish and by children wandering from family parties arriving at the beach by boat. Site B was most vulnerable to this and was also occasionally used for trail bike riding. One banded runner was found dead in a trail bike track. Site G was enclosed by a S.C.S. fence of wooden posts and steel droppers with dog proof wire. In 1981-82 this fence was down in some sections allowing children, joggers and their dogs to enter. At the beginning of 1982-83 the fence was repaired by S.C.S. and signs used to protect the colony in 1979-80 were re-erected by N.P.W.S. at this fence. There was no evidence of vandalism on the site that season.

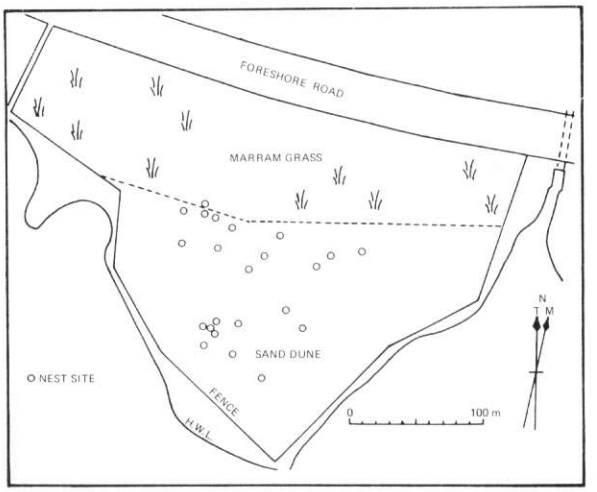


Figure 2. *Details of Site G, two nest sites not located. Nest sites are shown as open circles.*

Methods

Survey

The survey of the breeding sites began about mid-October to determine the arrival date of Little Terns in breeding plumage. Because of very hot conditions, observations were usually made from 07:00 hours daylight saving time and continued for about four hours, occasionally longer. Visits were made at weekly intervals. While hatching was at its peak, it would have been advisable to be on the site at hatching date, or the next day, to assess the hatching rate. After this time chicks moved to adjacent vegetation for cover. Personal circumstances made this possible only in 1982-83 when at least one observer was able to attend up to four times a week while chicks were hatching. This allowed a higher proportion of chicks to be located and banded before they reached the shelter of the Marram Grass than was possible previously.

There were normally two or three people in the observing team. The number of visits to the sites were 17 (1980-81); 18 (1981-82) and 23 (1982-83).

The nests were located by watching the behaviour of adult birds from the edge of the breeding site. The nests were then marked with a stake placed three metres from the nest in line with a master stake on a point that could be seen from any part of the site. On some sites prominent features in the industrial landscape were used instead of a master stake. Stakes were numbered, allowing quick checking and recording of nest content.

Because of the very large area of the sites early in the survey, garden stakes were used in the first year as these could be located without undue delay. This reduced the time observers spent on the sites during which nesting birds were disturbed. These stakes were removed from site B by an unknown person at the end of the 1980-81 season. To reduce the appeal of stakes to pilferers, half garden stakes were used in the next year. While the stakes at site B remained undisturbed that year, stakes were taken from G site.

In 1982-83 Vic Tyler devised a method of locating nests by using a set of semi-circular scales from which observers could read bearings of nest sites. These indicators were attached to permanent footings, and could be folded for removal at the end of each survey.

The technique developed by Vic Tyler allowed him to survey and map site G (Fig. 2). He calculated its area to be six hectares, of which the dune made up a large part. He measured the summit of the dune as being 13.1 m above high water level on 3 January 1983.

It was not practical to measure the area of the other nesting sites but it was estimated that the areas of sites B and D were 16 ha each.

As the nesting rate of the terns outstripped the development of the 'tern indicator scales', dowelling stakes of sandy colour and about 0.3 m long were used to mark the nests. This proved satisfactory for the comparatively small site G, and although two stakes were missing at the end of the survey, it was considered that these had fallen and been covered by wind blown sand rather than removed.

In assessing fledgling numbers, the maximum number of birds in view at one time was recorded. The plumage of birds recorded as fledglings included the upper back and crown mottled ashy-brown, with a slightly darker brown band extending from the eye around the nape and outer tail feathers shorter than for adults.

The results were tabulated with comments after each visit to the sites; these are presented in Tables 1 and 2.

TABLE 1

Summary of results of nesting of Little Terns at Port Botany 1980-1983

Breeding season	1980-81	1981-82	1982-83
Number of clutches	29	40	25
Clutch size: 1	1	4	2
2	13	28	11
3	14	8	12
5	1		
Mean clutch size	2.46+.58*	2.10+.55	2.40+.65
Number of eggs	74	84	57
Number of runners	30	30	28
Hatching success rate	41%	36%	49%
Number of infertile eggs	8	3	5
Number of fledglings	12	1	1
Fledging success rate	40%	3%	4%
Runners per clutch	1.0	0.75	1.2
Fledglings per clutch	0.41	0.025	0.040

*Five egg clutch disregarded.

TABLE 2

Results of survey of Little Tern colonies at Port Botany 1980-1983

Date	Site B				Site C				Site D				Site G				Total			
	N	E	R	F	N	E	R	F	N	E	R	F	N	E	R	F	N	E	R	F
1980-81																				
3.11.80																				
11.11.80	2	4															2	4		
15.11.80	3	8															3	8		
23.11.80	7	16			2	5							1	3			10	24		
29.11.80	4	11	2														4	11	2	
6.12.80	3	8	3												2		3	8	5	
14.12.80	1	7	4				1										1	7	5	
21.12.80	4	9	7	2			2						2	3			6	12	9	2
28.12.80			4	2															4	2
4. 1.81			1	11				1							3				4	12
10. 1.81			1																1	
17. 1.81																				
Total	24	63	22	11	2	5	3	1					3	6	5		29	74	30	12
1981-82																				
4.11.81	2	4															2	4		
8.11.81																				
15.11.81	2	3															2	3		
21.11.81	3	6							1	3							4	9		
28.11.81	6	16							1	3			1	3			8	22		
5.12.81	3	6															3	6		
13.12.81	4	6	6														4	6	6	
20.12.81	1	3	6								1						1	3	7	
28.12.81	1	2	1														1	2	1	
2. 1.82	1	2	2										2	3			3	5	2	
9. 1.82													2	4			2	4		
17. 1.82													4	8	1		4	8	1	
23. 1.82													6	12	11		6	12	11	
30. 1.82															1				1	
7. 2.82															1				1	
14. 2.82																1				1
27. 2.82																1				1
Total	23	48	15	0					2	6	1	0	15	30	14	1	40	84	30	1
1982-83																				
7.11.82													1	3			1	3		
13.11.82																				
20.11.82													6	15			6	15		
27.11.82													3	8	1		3	8	1	
4.12.82													3	6			3	6		
10.12.82													2	6	8		2	6	8	
15.12.82													2	3	4		2	3	4	
18.12.82													4	8	2		4	8	2	
22.12.82													1	2	6		1	2	6	
27.12.82															1				1	
28.12.82													3	6			3	6		
3. 1.83															1				1	
4. 1.83															2				2	
5. 1.83															2				2	
6. 1.83															1				1	
8. 1.83																1				1
15. 1.83																1				1
17. 1.83																1				1
Total													25	57	28	1	25	57	28	1

Abreviations used in column headings:

N=Nests —new nests since previous visit
E=Eggs —new eggs since previous visit
R=Runners —new runners since previous visit
F=Fledglings —total number of fledglings seen during visit

Analysis of shell sizes

The sizes of the shells and stones at five nest sites were analysed in 1981-82 to see if a particular substrate was prefered. The following method was used:

i. A one metre square aluminium frame was used to define sample areas in which shells were counted. A square grid was made in this frame by stretching string across every 10 cm. The squares thus delineated ensured that individual shells were not counted more than once.

ii. Shell sizes were determined by using a 10 cm square plastic template subsectioned into one centimetre squares.

iii. The shells in each sample area were counted and sorted into the following size ranges:

(a) >9-25 cm^2
(b) >4- 9 cm^2
(c) 1- 4 cm^2

iv. In some sampling areas there were stones on the surface, and these are included in the table.

v. Shells or stones wholly or partially resting on the sand surface were counted and measured.

The results of these analyses is shown in Table 3.

Results

On the basis of numbers of chicks reaching fledging stage, the 1980-81 nesting season was the most successful. There was an initial disparity in number of eggs laid between years but different hatching rates resulted in nearly identical numbers of runners. The fledging success rate in 1980-81 was ten times that of the other two years when only one chick fledged each season. Mean clutch size for all seasons was 2.29 ± .60. That of 1981-82 was significantly smaller than those of the other two years (z-test, $P < .05$).

It should be mentioned that in 1980-81 a clutch of five eggs was found on site B. This clutch did not hatch and was deemed infertile. It was collected for The Australian Museum. Some discussion arose among members of the survey team as to whether these eggs may have originally belonged to two clutches, and having been moved together by an intruder, were then not brooded either because the location had changed or because the set of eggs was too large. Because of the doubts surounding this clutch it was not included when the mean clutch size for 1980-81 was calculated.

The total number of clutches in 1981-82 was considerably larger than in the other seasons. Although no adult Little Terns were banded until the end of the 1982-83 season, there was some evidence for second wave nesting in 1981-82 when the sudden disappearance of eggs, runners and adults from site B between 2-9 January was followed by a new wave of nesting on site G, where only one nest had previously been recorded that season. (Table 2). Mean clutch size on site B was 2.09 and on site G, from 9 January onwards, it was 1.93.

In 1982-83. Rep-capped Plovers *Charadrius ruficapillus* were nesting on site G, where two nests each with two eggs were located at the

TABLE 3

Numbers and sizes of shells per m^2. Numbers of stones given in brackets.

Sample	>9-25 cm^2	>4-9 cm^2	1-4 cm^2
1	7 (5)	27 (21)	298 (129)
2	7 (2)	32 (24)	337 (144)
3	7 (6)	37 (26)	535 (181)
4	16	33	832 (12)
5	5	33 (2)	919 (0)
Mean± Standard Error	8.4 ±4.3	32.4 ±3.6	584.2 ±282.4

Samples 1-3 (Site B) had high stone content.
Samples 4-5 (Site G) were very shelly.
Shells greater than 25 cm^2 were not found in any of the samples.
Shells less than one cm^2 were very numerous, particularly as grit, and were not counted.

edge of the Marram Grass near Little Tern nests. Two chicks and one adult Red-capped Plover were banded.

Predators

Possible predators observed were Silver Gull *Larus novaehollandiae,* Pied Oystercatcher *Haematopus longirostris,* Australian Ravens *Corvus coronoides,* Australian Kestrels *Falco cenchroides.* Tracks of lizards, dogs, cats and rats were identified.

The dunes on sites B and G were used at different times by thousands of Silver Gulls as a roost. There was no evidence of egg loss by gull predation, nor were they seen to take newly hatched chicks, although they possibly did so.

Pied Oystercatchers were nesting on site B all three seasons but there was no evidence that they preyed on chicks of Little Terns. Australian Ravens were infrequently recorded. One was disturbed at a new nest which had contained an egg. Raven tracks surrounded the nest.

Australian Kestrels were rarely recorded on site B, but in 1982-83 frequent observations of them at site G culminated in the discovery of a kestrel on the ground with a freshly killed Little Tern runner almost at flying stage. The next day a kestrel was trapped, banded and relocated at Kellyville. On an earlier occasion a kestrel flying from site G holding a small object was fiercely mobbed by Little Terns. Although the object in the kestrels talon could not be positively identified it appeared to be a Little Tern runner.

There were numerous rat tracks in the wet sand along the shore at sites B and G. Grey feathers were noted at the entrances to rat burrows on the edge of the beach dune at site B.

Site conditions

Vegetated areas were an essential component of the breeding sites. This was demonstrated in 1980-81 when two chicks banded near a nest in the basin of site B were found later the same day on an eroded part of a high dune about 150 m from the banding place. The vegetation on the crest of this dune was used as a creche that season.

A notable feature on all sites was natural growth of Searocket which occurred as isolated clumps on the sites. These offered shelter to very young chicks before they reached the denser vegetation bordering the breeding area.

On both sites B and G, flat sheltered areas were selected for nests before exposed areas on on the top of dunes were taken up.

None of the nest sites was at risk from high tides. Strong winds from the N.E. and S.E. sometimes blasted sand across the sites, and this was a problem particularly for nests on the top of the dunes. An egg in pure sand on the G stockpile was completely buried at one visit, but shortly after was found uncovered. It was not known whether adults or the wind exposed the egg which hatched successfully. Chicks on dunes, adopting cryptic poses, raised themselves up at intervals to avoid burial by wind-blown sand.

Analysis of shell sizes at nest sites

The number of nest sites sampled for shell content was small in relation to the total number of nests. It was not practical to analyse a larger number of samples because of the long and tedious process of handcounting shells.

An appraisal of the nest scrapes on site G on 1982-83 showed wide variation in the number of shells and stones present. One egg was laid in pure sand. Nests were also found in saucers of sand completely surrounded by the crusty green surface stabiliser. The birds seemed to adapt well to exploiting site G as a nesting area.

The proportions of different sized shells and stones in the substrate (Table 3) did not appear to greatly influence the tern's choice of nest sites.

Discussion

The high hatching success rate recorded in 1982-83 may have been a reflection of the number of visits made by observers to the site in anticipation of eggs having recently hatched; at this time chicks were often found still in the scrapes. Some runners were probably lost to predation on the breeding area before they could be counted.

After reaching the shelter of edging vegetation runners were less likely to be attacked by gulls than by kestrels, a more efficient hunter.

The lack of kestrel perching places adjacent to site B may have accounted for the fledglings' success in 1980-81; in addition, the creche was located away from the rat burrows along the beach front dune that season.

The loss of eggs and runners from site B in 1981-82 and the abandonment of the site, may have been caused by rats, gulls, or human intrusion relating to use of the beach or trail-bike riding.

The number of runners reported might be smaller than the number of eggs that hatched, it is quite likely that some runners reached shelter before they could be recorded. Although it is possible that fledglings were overlooked, this is considered unlikely.

The absence of juvenile Little Terns practising flight and dives, and roosting on the beaches, indicated a high death rate of runners. Although humans intruded onto the sites in the first two years, this did not happen in 1982-83. The Australian Kestrel must be regarded as a highly efficient predator that year, having surveillance of site G from perches on the light stanchions in Brotherson Dock.

Kestrels visiting site G approached from the Botany area where they may have exploited the roofs of factories as nesting sites. McCulloch (1982) commented that natural predators of Little Terns in Australia are not well documented, but a specimen of a male juvenile Little Tern, number AM 0.40393 in the Australian Museum collection, is recorded as 'Killed by Nankeen Kestrel', (found by C. Campion Sydney Airport, 31 Dec. 1962.

A detrimental effect of the gulls' presence was harrying of adult Little Terns bringing fish to dependent young. The feeding rate of runners would be reduced by this behaviour, and in the case of broods of two or three chicks, some loss of young might result from starvation.

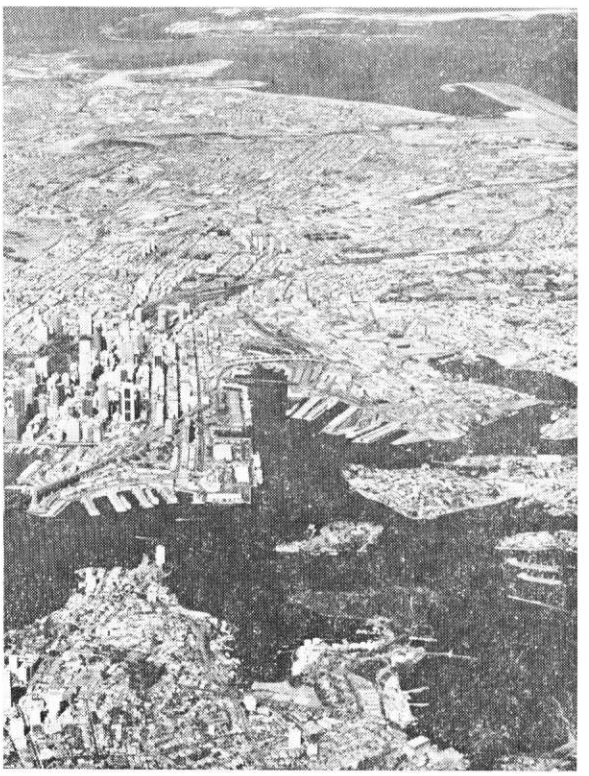
Rats were suspected predators of Little Tern runners sheltering in dune vegetation.

In 1980-81 a number of chicks were blinded by 'sticky eyes'. Black ants were embedded in the eyes in some cases. Adults called to and fed these offspring which would not have survived after the parents' instinct to feed waned. In 1982-83 a chick about three days old was found in very windy conditions on the crest of the G dune. A small amount of sand had accumulated as a ball in the corner of each eye. This was removed with a paper tissue, but left untreated may have led to blindness when immobilised chicks would be subject to ant infestation. Chicks with sticky eyes were not banded nor were newly hatched chicks still wet from the egg.

Conclusion

The photographs accompanying this paper emphasise the visual impact of large areas of sand in an urban complex.

The temporary provision of such sand at Port Botany showed that Little Terns are attracted in numbers to traditional breeding places even after many years' disturbance (Morris 1979). It is possible that the Port reclamation had been



• *Sydney Harbour commercial wharfage; Port Botany and Sydney Airport in background. Emphasises visual impact of sandy areas in urban landscape.*

Photo courtesy Maritime Services Board of N.S.W.

used for nesting before it was first recorded in 1979-80.

In the absence of current data from the South Coast, a comparison of the results of the Port Botany survey with those of G. Clancy (pers. comm.) on Little Tern colonies on the N.S.W. coast north of Forster, indicates that between 1979 and 1983 Port Botany was a major breeding site for Little Tern in N.S.W.

The results indicate that the extremely low number of fledglings was mainly due to mortality of runners rather than to infertile eggs, nest desertion or predation on eggs.

While human intrusion onto the breeding site was excluded as a factor contributing to poor breeding success in 1982-83, the results reinforce the concern voiced by Vincent (1983) over the future of the Little Tern as a breeding species.

Suggested management

In Botany Bay Little Tern colonies require areas of sand of at least six hectares, containing shell and grit, edged by grass or low shrubs. Nesting areas should be free of cover, except for occasional low bushes to give shelter to very young runners.

Sites should be fenced and wardened to stop human intrusion. Control of Silver Gulls is not considered practical in Botany Bay, and perhaps is unnecessary, but trapping for feral animals and Australian Kestrels, just before the site is occupied and throughout the breeding season, would improve fledging rates.

If a substantial fence of wire strands and netting is used, notices are not essential; they appear to complement a single strand wire fence in protecting a nesting area. While it can be argued that notices attract egg collectors and other vandals to the site, they also create goodwill. There were interested questions about the colony from some beach users and from some people walking past the site to the beach with dogs on leads. A balanced view is that the use of notices is acceptable, especially if wardens or rangers are often seen at the site.

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