CONTROL OF BIRDLIFE AT AUSTRALIAN AIRFIELDS

The presence of birdlife at airports has been a constant source of danger—particularly since the introduction of jet aircraft.

A series of papers on gulls and other birds inhabiting airfields was prepared by CSIRO wildlife Research Officers and appeared in the "CSIRO Wildlife Research", Vol. 14, No. 2 in December 1969.

Space does not permit a full reprint of these articles which are published below in a condensed form. The authors' summaries (shown in italics) are however, reprinted in full. Paper 3 will be published in the next issue of S.W.A.N.S.

PAPER 1—SILVER GULLS AT SYDNEY AIRPORT

Summary by G. F. van Tets

The diurnal movement patterns of silver gulls, Larus novaehollandiae, were found to be related to localised sources of food and shelter. Peak movements occurred at dawn and dusk when the gulls flew between roosting and feeding areas. Peak movements also occurred before and after low tide when gulls flew to and from the beach where they fed on intertidal animals. The gull showed a marked tendency to fly over water rather than over land.

Changes in the availability and location of food and shelter were followed by corresponding changes in the movement patterns.

INTRODUCTION

A study of various aspects of the aircraft-bird collision problem in Australia was started during 1963-64. In the first half of 1964, diurnal movement patterns of the silver gull, *Larus novaehollandiae* Stephens, were recorded at Sydney Aairport, Mascot, N.S.W., in an attempt to understand why the airport area was attractive to gulls.

This paper reports and discusses the effect of some man-made and natural environmental changes on the movement patterns during the first half of 1964.

STUDY AREA

The study area (Fig. 1), consisting of the airfield and adjacent open areas, was formerly part of the tidal estuary of Cook's River. This area was bordered on the north, east and west by the built-up urban and industrial areas of Rockdale, Marrickville, Mascot and Botany. To the south lay the sandy beaches of Botany Bay.

Most of the airfield and other fully reclaimed areas were covered by grass which was mowed regularly. When rain fell, large amounts of water ran off paved runways, taxi-ways, aprons, and roads. Since the area was only a few feet above sea level at high tide, this water was held temporarily in shallow drainage ponds (S) which drained at low tide through flat valves into Alexandra Canal, Cook's River, and Botany Bay. When the grass-covered area became waterlogged by heavy rain some of the soil fauna, which included mice, insects and worms, were forced to the surface and exposed to predation by gulls and other birds.

The main methods being used for reclamation were tipping of garbage, piping of sand dredged from Botany Bay and Cook's River, and dumping of fly-ash.

The tipping of garbage provided food for large numbers of gulls and when dredging was in progress gulls gathered at the dumping site and fed on animals that were sucked up with the sand.

To prevent fly-ash (a fine grey powder produced from coal-burning) being blown around it was tipped under a sprinkling system. This process produced wide expanses of level silt covered by shallow water. The fly-ash settling ponds (F) and the shallow drainage ponds (S) were used by gulls for roosting at night. Near the lagoon at the former mouth of Cook's River were two deep-water ponds (D) where gulls bathed but did not roost.

At low tide gulls fed on intertidal animals along Botany Beach, while the general public fed gulls along the Rockdale and Mascot beaches.

Gulls also fed occasionally on live fish in Cook's River and Alexandra Canal and on scraps from fish cleaned by owners of small craft in the lagoon and Cook's River.

METHODS

At fortnightly intervals from February to July, 1964, gulls flying up and down the river across line AB and flying north and south over the airfield across line AC were counted to provide a measure of the flow of gulls per hour.

RESULTS—

(a) *Movements at Dawn and Dusk*

Before the middle of May 1964, gulls would roost at night in large numbers in the shallow drainage and fly-ash settling ponds situated north of the lines AB and AC. In May these ponds were drained or wires were strung at 6 ft intervals over undrainable portions and fly-ash sluicing was discontinued. Before the changes most gulls tended to fly north up the river at dusk and south down the river at dawn.

After the changes the gulls flew up the river at sunset and, on finding their roosts either dry or wired, departed south across the airfield towards Botany Bay. At dawn they retraced the previous evening's flight pattern by flying north across the airfield and then turning south down the river.

(b) *Movements before and after Low Tide*

Except for before and after low tide, the movement of gulls during the day was very slight compared to that at dawn and dusk. The timing and extent of beach exposed by low tide depend in part on the phase of the moon, and differ from day to day. From February to May 1964, there was a peak in the net flow of gulls moving south across the airfield 87 minutes before low tide and a peak in the net flow of gulls moving north up the river 151 minutes after low tide. The one-hour difference between the timing of the before and after low tide movement peaks is presumably due to the gulls taking time to digest their food and lighten their load before flying elsewhere.

DISCUSSION

This study concerned an aspect of group behaviour in the silver gull—indicating how the majority of gulls were utilizing the environs of Sydney Airport.

Gulls tend to forage near water, and this habit was reflected in the preference they showed for flying over the river when the airfield was dry. The river may have been a guide to food at the Marrickville tip and shelter on the airfield ponds. By congregating at localised sources of food and shelter they presumably improved their utilisation of the environment, and there may also have been safety in numbers. Changes in the location and availability of food and shelter were followed by corresponding changes in the movement patterns of the gulls. Hence, by changing quantity, quality, and location of resources, gulls may be discouraged from frequenting areas where they are considered a pest and encouraged to go where they might be an asset.

PAPER 2—BIRD HABITAT AT SYDNEY AIRPORT

By G. F. van Tets

SUMMARY

From January 1964 to June 1968 counts were made of the birds seen during the middle of the day at Sydney Airport. Numbers and varieties of birds declined after the following measures were taken: exposure of household refuse near the airport was stopped; airfield drainage was improved; frequency of mowing the airfield was increased; and the airfield was treated with insecticide. There was also a corresponding decrease in reports of bird strikes, and of bird strike damage to aircraft. The numbers of five bird species of about equal size which were killed by aircraft during this period were found to be positively related to the cube roots of their average numbers on the airfield. The implication of this relationship is that bird control measures may be able to produce significant reductions in the incidences of bird strikes only if bird numbers on the airfield are reduced by at least 80%.

INTRODUCTION

A study of the environmental behaviour of birds frequenting Australian airfields was started during 1963-64 (see previous paper) with the hope that this knowledge would suggest means whereby bird numbers could be lowered and thus reduce the risk of strike damage to aircraft. From 1964 to 1968 Sydney Airport was being altered and extended. This paper reports and discusses the changes that took place in the abundance and species composition of the birds in relation to the changes in their environment.

STUDY AREA

The area within which birds were counted is shown in figure I. The area changed in habitat composition and quality, initially because of the attempts to make the area less attractive to birds and later because of extension of the north-south runway and construction of a new terminal which was still in progress at the end of this study. As a result of the drainage and wiring carried out in May 1964 the gulls did not roost on the airfield until November 1965. Then a succession of ponds was created owing to the reclamation of the new terminal area with mud from Cook's River and sand from Botany Bay. Furthermore, the fly-ash was found to be too unstable to support buildings and had to be removed by excavation. Some of these excavations filled with water and attracted gulls. A few still existed in June 1968 at the end of this study. Pond 6 was too deep for gulls to roost in until it was partly filled with fly-ash in October 1965; then it was attractive to gulls for the rest of the study period. Pond 7 was also too deep for gulls to roost in. It was very attractive to water birds until it became entirely covered by water hyacinth, *Eichhornis crassipes,* in February 1966. A few land birds and a couple of swamphens, *Porphyrio porphyrio* were the only birds that remained on the pond.

Throughout the study period many gulls and waders, Charadrii, congregated in bay 8, formerly the mouth of Cook's River until it was diverted to extend the airfield. Beaches 9, 10, and 11 were relatively steep and there gulls were mainly fed by the public. During the first half of 1967 signs were erected along these beaches asking the public not to feed birds. Gulls were also fed by construction workers from 1965 to 1968.

The dashed lines on Figure 1 indicate the full extension of the shoreline into Botany Bay in 1967. A concrete seawall was built at beach 10 and a rock wall around the runway extension. In November 1965, sand adrift from the runway extension formed an island around a portion of an old breakwater protecting the former mouth of Cook's River. This island became very attractive to gulls, waders, terns, and cormorants. The island and the runway extension sheltered a small harbour in front of beach 11.

Beach 12 had a wide intertidal zone which became more extensive in front of bay 8 during the course of the study. Bay 8 and beach 12 are well known to Sydney bird-watchers for the large numbers and varieties of birds they attract. At low tide the intertidal sand banks form an attractive feeding area for thousands of gulls.

Small craft are moored in areas 8, 13, and 14, and some gulls and cormorants perch on the boats. Gulls were fed by fishermen in areas 8-15.

At area 15 there was a large intertidal sand bank where hundreds of gulls congregated at even moderately low tides, while at high tide gulls rested during the day on the banks of Cook's River. From February 1967 to June 1968 a new channel was dug for Alexandra Canal through the Marrickville tip (dashed lines on Fig. 1). Some of the excavated material was dumped in the west side of pond 5. This area became attractive to hundreds of gulls, especially at point 16 where gulls fed on organic matter floating on the water pumped out of the excavation. The material dumped in pond 5 depressed the remainder of the pond, which then filled with shallow water and again became attractive to roosting gulls.

During wet weather, large numbers of gulls invaded grass-covered portions of airfields to feed on earthworms, grubs, and even mice which were flooded out of their burrows. When the long grass is eventually cut or burned large numbers of birds may come to feed on exposed insects and seeds. In 1964 drainage was gradually improved and the frequency of mowing was increased in order to keep the grass short.

Potential prey for gulls and other insectivorous birds was kept to a minimum even further by regular applications of insecticides. The first

application was in October 1964. No dead birds were found on the airfield after the spraying. The tips and other open areas around the airfield were sprayed with insecticides before and during the course of this study in order to combat Argentine ants, *Iridomyrmex humilis*.

METHODS

Once every 2-4 weeks, usually every third Wednesday, starting about 11 a.m. and finishing about 3 p.m. from January 1964 to June 1968, the numbers of all species of birds seen by an observer walking once around the airfield were recorded. The route was kept as constant as construction and airfield alterations would permit, and the area searched remained essentially the same (Fig. 1). The numbers of birds seen were only an index of those present. During the middle of the day birds tend to be less active and, consequently, less visible. Such birds as would have been concealed by some local patches of thick vegetation, and therefore not recorded, would have been mainly species not likely to venture into the flight path of aircraft.

Most birds are readily recognized as to species, but some species, especially in their non-breeding plumages, cannot be distinguished with confidence. Therefore, when doubt exists, uncommon species have been included in the common species which they resemble. Thus counts of little stint, *Erolia ruficollis*, may have included long-toed stint, *E. subminuta;* counts of sharp-tailed sandpiper, *E. acuminata,* may have included pectoral sandpiper, *E. melanotos;* counts of bar-tailed godwit, *Limosa lapponica,* may have included black-tailed godwit, *L. Limosa*; and counts of marsh tern, *Chlidonias hybrida,* may have included white-winged black tern, *C. leucoptera,* and white-fronted tern, *Sterna striata.* In bad light some female chestnut teal, *Anas castanea,* may have been confused with grey teal, *A. gibberifrons.*

An indirect measure of airfield densities of birds was the number of birds struck by aircraft. Bird strikes, with and without damage to the aircraft, have been reported to the Department of Civil Aviation by pilots and traffic controllers since 1958.

Since 1964, birds picked up on the runways after being struck by aircraft have been forwarded to the C.S.I.R.O. Division of Wildlife Research at Canberra, for identification and an examination of crop and stomach contents.

A limitation of the bird strike data is that not all strikes are detected and reported. It was assumed, however, that the strikes reported and the birds forwarded formed a representative sample and indication of the kinds and relative numbers of birds struck.

RESULTS

The study showed that there was not only a decrease in the numbers of gulls and other birds after the first half of 1964 but also a net decrease in the number of species of birds at Sydney Airport. This drop was maintained during the subsequent four years. The period from January to June was chosen for comparison for each of the years because the first half of 1964 was the only period studied that gave any indication of conditions prior to most environmental changes. During this period most species were present in maximum numbers. Most birds left the area to breed elsewhere during the latter half of the year. The decrease in silver gulls, starlings, pigeons, ravens, Indian mynas, spur-winged plovers, banded plovers and pipits may be attributed to reduction in availability of food on the mowed portions of the airfield and to the closure of the two tips adjacent to the airfield.

A slightly higher number of gulls existed in 1967 and 1968; partly attributable to the excavation of a new channel for Alexandra Canal

through the Marrickville tip and to the increased availability of lunch scraps at the construction sites.

The runway extension, by increasing the intertidal area and by shielding this area from polluted water may have provided more food for gulls, terns and waders. This may help to explain the increase in numbers of crested terns, marsh terns, sharp-tailed sandpipers, double-banded dotterels, and bartailed godwits.

The newly created shallow water areas in pond 6 attracted the royal spoonbills, yellow-billed spoonbills, little egrets, white-headed stilts, red-kneed dotterels and black-fronted dotterels; these birds were not seen in 1964.

The decrease in chestnut teal, grey teal, dusky moorhen, coot, hardhead and black swan may be explained by the drainage of ponds 1, 4 and 5 and by water hyacinths covering pond 7.

After 1964 there was also a decrease in the number of bird strikes. However, in 1967-68 strikes increased probably due to the temporary attractiveness to birds of the new terminal construction site.

DISCUSSION

Since birds were recognised as a serious hazard to aircraft, attempts to reduce their numbers have mainly consisted of a variety of bird-scaring and killing techniques. These techniques have given only short-lived relief.

The abundance of birds on the airfield is partly a function of its attractiveness to birds in relation to surrounding areas and, furthermore, a function of environmental conditions far beyond the control of the airport authorities. Consequently the only bird control measure open to airport authorities is to manage the airfield environment in the manner least attractive to birds.

The study revealed that the alterations in habitat did substantially lower bird numbers and the incidence of aircraft striking birds. There were also indications of how the numbers might be reduced further by switching garbage disposal methods to incineration or to tipping at night; filling of shallow pools or, if this is unavoidable, by maintaining a permanent depth of at least three feet and a complete cover of water hyacinths and, keeping airfield grass short, well-drained and treated with insecticide. Before any major alterations are undertaken at airfields, wildlife biologists should be consulted because bird problems are easier and cheaper to avoid in the design stages than by remedial action afterwards.

CONCLUSION

Because the incidence of aircraft striking birds appears to be a function of the cube root of the density of birds, reductions in bird densities at airfields will only result in detectable and significant reductions in bird strike damage when the bird densities are reduced by at least 80 per cent.

Fig. 1.