STARLING (Sturnus vulgaris) ROOSTS AND FLIGHTLINES NEAR WELLINGTON

By R. E. BROCKIE

ABSTRACT

Information on flightlines to and from roosts is summarised, and a map shows sites and areas served by roosts in the Wellington area. Four offshore islands in the area are used as roosts. In midwinter birds may spend 16 hours nightly in roosts. One roost has remained in use since at least 1913, and others have shifted or been used intermittently. The number of starlings flying to the major roosts in the region has fallen during the 1970s.

Occasional references to roosts of starlings are scattered through the New Zealand ornithological literature, usually as asides to other observations or in the Classified Summarised Notes of *Notornis*. This paper combines the Wellington records with my own and other more recent observations in an attempt to discover why the birds choose to roost where they do.

Since 1958 I have occasionally noted the direction and number of starlings flying to or from roosts at dusk or dawn, and I have visited roosts to count birds arriving at dusk. Flights to and from roosts can be distinguished from foraging flights which are usually short, slow, and rarely in a straight line. Roosting flights are fast, usually in a straight line, and cover a long distance. Some flightlines are clearly defined, as thousands of birds form skeins several kilometres long and all heading in one direction, but a trickle of single birds flying rapidly in the same direction can also reveal a flightline. A distinction has also been made between true overnight roosts and staging posts. Towards dusk, starlings individually, and sometimes in hundreds, gather in these staging posts but later fly to their overnight roost. This distinction is made by ornithologists but the general public, who sometimes report on the birds, do not always appreciate the difference.

Where flightlines and suburban roads coincide it is sometimes possible to measure the birds' speed from a car. For 1.5 km southwards along High Street between Avalon and Lower Hutt Public Hospital, and also through Karori, on windless evenings the birds maintained a steady 50 km/h. On clear evenings the birds flew higher; on overcast days and very windy days, they were closer to the ground.

GENERAL RESULTS

Flight times

Records of flight times in NZ Standard Time are summarised in Figure 1. All roosts in the Wellington area are used by some birds

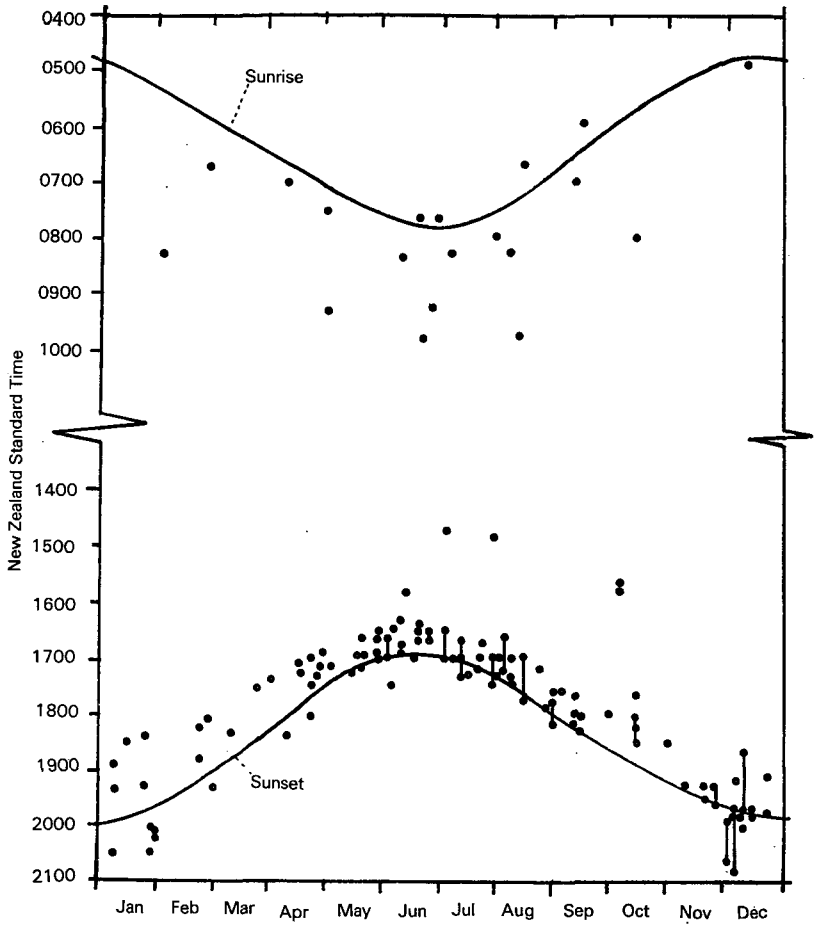


FIGURE 1 — Starling roosting flight times in Wellington district, 1958-82. The morning records show times of departure from roosts; the evening records show times of flights or arrivals at roosts. Line fitted by eye.

throughout the year. When counts of arriving birds have been made at roosts, most arrive close to official sunset. On most evenings the birds are strung out over half an hour before sunset, but if the afternoon is overcast and unusually dark, birds may start flying to roosts as early as two and a half hours before sunset. Other birds were seen leaving Makara at the relatively early time of 1705 hours on 25 December.

With the approach of winter, birds spend longer in their nightly roost. In June the birds must spend a 16-hour night at the roost, compared with a 9-hour night in December. As birds spend so much of their time in the roost, the siting must be of great importance.

Birds usually leave roosts in the morning in small groups or individually and often stop to forage between flights. As a result, flights away from the roost are harder to identify.

Eclipse of sun

On 5 February 1981 four-fifths of the sun were eclipsed by the moon. On that occasion the roosting trees on Gear Island were watched between 0830 and 1030 hours to see if starlings were misled into roosting by the approaching gloom. But no starlings showed up. (Nor did the partial eclipse appear to affect the behaviour of House Sparrows, Chaffinches, Goldfinches, White-backed Magpies, Black-backed Gulls, or Rock Pigeons foraging on the scene.)

Flightlines

When all the separate observations on flights and roosts are mapped, well-defined patterns emerge (Fig. 2). In flying to their roosts birds follow coasts, low-lying areas and valley floors. They avoid hills and cross at the lowest saddle, the route apparently being chosen to save the expenditure of energy. Engineers, impelled by the same need, have often designed roads which follow the same routes, and so the birds can be followed to the saddle on the Wainuiomata Hill road, the Karori-Makara road, Northland Road, and the cutting between Constable Street and Kilbirnie, where regular flights pass through these bottlenecks at dusk.

THE WELLINGTON ROOSTS

Tokomapuna Island (1 km SE of Kapiti Island)

This roost has been in use since 1913, if not longer (Thomson 1922). Andersen (1919) noted thousands of starlings regularly flying to roost there in 1917. Kirk & Wodzicki (1943) reported 20 000-30 000 starlings flying south across the Waikanae estuary, presumably on their way towards Kapiti Island, in April 1942. Wilkinson (1927) stated that they roost in taupata and boxthorn in countless numbers, some flocks from the mainland stretching nearly three miles across the channel. "No matter how hard the wind is blowing or how violent the storm, so long as they can see Tokomapuna, nothing prevents them flying to the roosting place." In foggy weather, however, the birds may miscalculate. "One morning about eight o'clock, we saw thousands sitting on every available perch near our home on Kapiti Island. . . . A dense fog hung over the channel blocking out the mainland and the birds were really lost." Wilkinson also reported two large flocks lost in fog on Kapiti on 16 March, some of which crashed into reeds bordering a swamp.

On 22 February 1982 I watched starlings gathering at Paraparaumu Beach before they flew towards Kapiti Island. The birds grouped above the coast nearest the island (between house numbers 60 and 100 Marine Parade), individuals or small flocks of up to 200 birds flying in from the south and southeast at an estimated height of 50-80 metres. They then began wheeling and banking directly above the shoreline, uniting with other groups to form large flocks. The birds gained height with their evolutions until many were at the limit of observation, even with binoculars. Some flocks then began their flights into the setting sun and towards Tokomapuna Island between 1820 and 1840 hours NZST. Since 1970, I have seen starlings flying from Paekakariki towards Paraparaumu at dusk, presumably en route to Tokomapuna.

Mana Island (3 km west of Titahi Bay)

This roost is among boxthorn and macrocarpa trees near the jetty on the eastern side of the island. Birds have been seen converging on the island at dusk from Paremata Inlet, Karehana Bay and Plimmerton and from a point west of the tall radio-transmitting aerials. In June 1971, M. J. Meads (pers. comm. 1982) estimated over a million birds flew in to the island to roost in boxthorn at a point above the jetty. On 30 November 1977, M. G. Efford and H. Moller (pers. comm. 1982) counted 2691 starlings arriving between 1935 and 2100 hours. On the following night they counted 1327 birds between 1935 and 2115 hours. I have seen only two birds heading from the mainland at dusk towards the island. After perching on television aerials on the rocky headland at the extreme north of Titahi Bay the birds flew singly to a great height before heading towards the island at 1845 hours on 12 February 1982.

Gear "Island" (Petone)

This is not a true island, being joined to the mainland along its entire western side. Most of the birds roost in rows of tall dense *Pinus radiata* on the Shandon Golf Course, which occupies most of the island. T. Caithness (pers. comm. 1982) reports that very large numbers of starlings have roosted in these trees since at least 1957, the birds sometimes alighting to cover the fairways "like a black blanket" towards dusk. T. Caithness and the groundsman independently noted that fewer starlings roost on the golf course these days than during the 1960s and 1970s. The groundsman remarked that in the mid-1970s, shopkeepers at the eastern end of Jackson Street, Petone, became so alarmed at the vast numbers of starlings darkening the evening sky that they sought his help in reducing their numbers. In the event he did nothing but he estimates that their numbers fell to between a half or a third of their former level in the late 1970s. During the winter of 1982 I counted 7000-8000 starlings flying into this roost, mostly from the north. Flightlines suggest that the roost attracts birds from the upper Hutt Valley, Silverstream, Naenae, Wainui-

omata city, Belmont (Flux & Flux 1981), Korokoro, and the Hutt motorway southwards as far as Ngauranga Gorge. A major flightline observed since 1975 runs down the centre of the Hutt Valley, following High Street between Taita and the Lower Hutt Public Hospital. During the autumn of 1982 a temporary roost developed in silver poplars standing in the grounds of Petone West Primary School and attracted 1000-2500 starlings, but the birds abandoned the roost when the leaves fell.

More interesting is a row of dense old macrocarpas at the eastern end of Marine Parade, Petone, and at the mouth of the Hutt River. These trees act as a gathering and dispersal point for roosting starlings. In the winter of 1982 about 4000 starlings gathered in these trees at dusk. Usually about 2000 of these flew to the Shandon Golf Course for the night but small groups of 20-30 birds and, on 3 August 1982, a large flock (A. J. White, pers. comm.) left the macrocarpas to fly towards Somes Island. On three occasions in the winter of 1982 I saw other groups of 30-50 birds headed directly south down the harbour into fierce southerly winds in the direction of Ward Island. The rest of the birds remained in the macrocarpas overnight.

Ward Island

Dr R. A. Falla (pers. comm. 1971) recalled seeing starlings leaving Eastbourne and Days Bay at dusk to fly southwest towards Ward Island during the 1960s. I saw three pairs flying very high from Eastbourne towards this island in 1971 but despite several attempts to confirm the observation saw nothing until 24 August 1982 when 945 birds in seven flocks flew directly into a strong northwester towards Ward Island from a point on the coast about 500 m beyond the southern end of the public road. Flightlines from Moores Valley, Wainuiomata, the Catchpole Valley and the mouth of the Orongorongo River apparently converge on the coast at this point. Ward Island lacks tall trees, but this is no impediment to starlings, which often roost on scrub-covered or even bare small islands and rocks.

Linden

A grove of macrocarpa trees in a shallow gully on the eastern side of the Porirua-Johnsonville motorway half way between Porirua and Linden is the site of this roost. Birds have been seen flying towards this roost since 1970 from the suburbs of Tawa, Linden, Cannons Creek, Porirua City, and Elsdon, and from Titahi Bay south of Te Pene Street. Birds from Belmont Hill also probably roost here in summer (Flux & Flux 1981). At sunset on 12 February 1982 these trees contained 3000-5000 birds.

Somes Island

Thomson (1922) reported that immense flocks of starlings resorted to the island before World War I but " since it became a place for interned German prisoners the birds have largely abandoned it,

on account of the number of people about." During the late 1940s Dr P. R. Wilson (pers. comm. 1982) saw very large flocks flying across Petone beach towards the island at dusk and in 1957-58 I saw small flocks of a few hundred birds from York, Mahina and Lowry Bays flying from the oil wharf at Point Howard towards Somes Island on most nights for several months. Large numbers gathered nightly on a tall advertising sign at the Ford car factory in 1958 before flying to Somes Island in their thousands. Dr R. A. Fordham (pers. comm. 1982), who studied Black-backed Gulls on Somes Island between 1962 and 1966, regularly saw tens of thousands of starlings arriving to roost — some also roosting on the smaller Leper Island at its northern tip. The birds roosted in pines and macrocarpas above the jetty. The present keeper on the island (R. W. Benfield, *in litt.* 1982) reports that few birds have flown to roost on the island since 1966. Several of the larger trees on the island have now gone but enough remain to provide good sites for overnight roosts. In 1982 a few dozen starlings lived on the island itself (J. E. C. Flux, pers. comm. 1982) and small groups of birds were seen flying from the macrocarpas at the mouth of the Hutt River towards Somes Island at dusk, but the crowded flightlines of the 1950s and 1960s are a thing of the past.

Wellington City

The situation here is complicated because the birds often shift roosts.

Lambton Quay September 1941: Dr K. A. Wodzicki reported several hundred birds roosting every night in a lone pine tree in the grounds of Government Buildings. This tree has long since been cut down.

Southern end of Courtenay Place 1948-49: I recall seeing hundreds of starlings roosting overnight in pohutukawas, felled during the 1950s.

Wesley Church, Taranaki Street: Several hundred starlings sometimes roosted in two pohutukawas in front of the church, at least from 1975 to 1980.

Near Zoological Gardens, Newtown 1957-58: I made four records of flocks converging on this area from the central city, Brooklyn and Riddiford Street, but none has been seen flying in that direction for the last 20 years.

Oriental Bay 1963-79: There was a roost in windshorn pines on the steep hillside between Grass Street and Hay Street. As far as I can ascertain, all flightlines in the city area led to this large roost between 1963 and 1978. Thousands of birds wheeled spectacularly about this roost at dusk, until 1979 or 1980 when the birds quit this site.

Pigeon Park (bounded by Manners Street and Dixon Street) 1970-82: Flocks of 1000-2000 birds shared Norfolk pines and pohutu-

kawas here with several hundred sparrows. So fouled and defoliated did the trees become that one was felled in 1980 and the other is now in poor condition. The Pigeon Park roost undoubtedly shelters many birds which once roosted at Oriental Bay, flocks being seen flying past the old site to roost in Pigeon Park. On 8 December 1981, 2823 Starlings and 145 House Sparrows flew to roost in these trees between 1840 and 2115 hours. In 1982 large numbers of starlings flew past this roost on their way to the Post Office Square.

Wellington Railway Station: Tall pohutukawas on the west side of the station have sheltered increasing numbers of starlings overnight through the 1970s to the present day. Sometimes the trees serve as a staging post, all birds flying to the central city area at dusk. In December 1981 the trees sheltered about 30 birds, but they were empty after dark in January-February 1982.

Post Office Square: Five tall gum trees at the corner of Jervois Quay and Hunter Street have been used as a roost since at least 1978. I counted 1044 starlings flying into these trees on 3 December 1981 between 2002 hours and 2010 hours. The roost was used through the winter of 1982, and many birds were drawn there from the roosts in Pigeon Park and Victoria Street.

Corner of Victoria and Mercer Streets: A small garden on this corner contains dense ash and ornamental elm trees. On 2 February 1982, 2446 starlings and scores of sparrows flew in between 1915 and 1955 hours, but they abandoned this roost in the autumn when the trees lost their leaves.

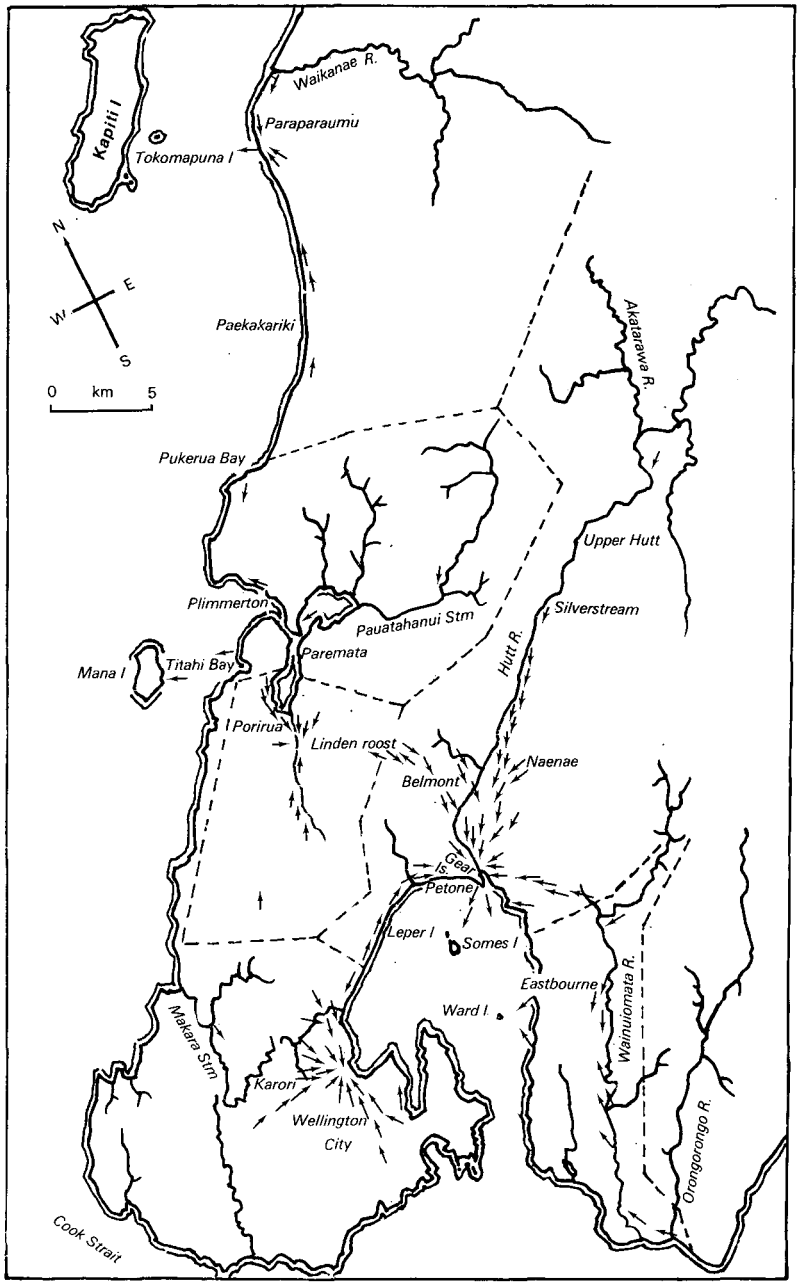
Outside the Wellington Club, The Terrace: In November 1981 the Wellington City Council sought the advice of DSIR on removing roosting starlings from the large pohutukawa standing in front of this building. On Dr M. R. Rudge's advice, some hundreds of starlings and scores of sparrows were driven out of this tree by the Fire Service playing hoses on the tree after dark. These birds flew towards the central city. This attempt to dislodge the birds was successful, and the birds have remained clear of the tree up to the time of writing (March 1983).

Temporary roosts have been reported in a tall gum tree in Inverlochie Place, Te Aro (A. Beauchamp, pers. comm. 1982).

DISCUSSION

Figure 2 summarises recent (1970-1982) observations of the direction of movement of roosting starlings in the Wellington district. Each arrow represents a separate observation of groups of starlings seen flying towards roosts at dusk.

The forests of the Tararua and Rimutaka Ranges act as barriers to the Wellington starlings, and within the district lesser hills separate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Silverstream
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Titahi Bay
Paremata
Hutt R.
Porirua
Linden roost
Belmont
Naenae
Gear Is.
Petone
Leper I
Somes I
Eastbourne
Ward I
Makara Stm
Karori
Wellington City
Wainuiomata R.
Orongorongo R.
Cook Strait

areas served by different roosts. The Belmont hills separate Linden and Gear Island roosting birds, although the division is not complete because the birds fly west to roost for part of the year at Linden and southeast to roost on Gear Island in the winter (Flux & Flux 1981). Ngauranga Gorge marks the dividing line between the Wellington City birds and those roosting on Gear Island. The birds of Titahi Bay fly either to Mana Island or to the Linden roost, depending apparently on which of the two roosts is in sight of their feeding ground. Birds feeding in the northern end of Wainuiomata Valley fly to Gear Island; those from Moores Valley southwards fly to Ward Island.

These Wellington observations generally confirm findings made elsewhere in New Zealand and overseas (Marples 1934, Imber 1956, Yom-Tov *et al.* 1977, Clergeau 1981). Most birds arrive at their roosts in greatest numbers within half an hour of sunset. Their flightlines usually follow valleys and avoid hills. Some roosts are used for decades; others do not last a season. The roosts are all at low altitude and in winter are sited in evergreen trees.

Four new observations stand out:

1. Birds flying to roost in the early afternoon. I can find no references in the ornithological literature on starlings flying to roost one or two hours before sunset. Wellington's frequent high winds probably contribute to this early roosting because Imber (1956) found that adverse weather in the form of low temperatures, rain, snow, or high winds encourages earlier roosting in the United States.
2. Birds flying along coasts towards roosts. Birds regularly fly along the coasts surrounding Wellington Harbour, at Plimmerton, and along the Paekakariki, Paraparaumu and Waikanae beaches, which make excellent guidelines in most weathers.
3. Starlings gathering on the coast and wheeling upwards before flying to island roosts. On calm days these birds probably exploited thermal air currents, or in windy weather topographical up-currents, to gain height; but they also flew to a great height before flying into fierce cold head-winds in Wellington Harbour.
4. The starling population in Wellington apparently declined during the 1970s. Three observers, quite unprompted, told me about the decline in roosting starlings on the Shandon Golf Course in Petone. Between July 1969 and August 1971 and again between

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FIGURE 2 — Observations on flightlines and roosts, and inferred boundaries between roosting areas in the Wellington district, 1981-82. Each arrow represents a field observation of groups of starlings flying at or just before sunset or their time of arrival at a roost. The dotted lines, which represent boundaries of areas served by different roosts, are inferred from the pattern of evening flights.

November 1981 and October 1982, I counted all birds seen and heard on a 2.4-km transect through the Wellington Botanic Gardens. The average number of starlings seen fell from 48 to 19 birds per transect during the intervening 10 years.

Two questions stand out from the Wellington observations. With apparently adequate and satisfactory roosts on the mainland, why do starlings risk their lives in flying across the sea to Tokomapuna, Mana, Somes, and Ward Islands? And why did starlings abandon their roost on Somes Island during World War I and again in the 1960s?

A common feature of Tokomapuna, Mana, Somes and Ward Islands is that they are free of any species of rat. Other islands near Wellington — Kapiti, Motungarara, Tahoramaurea and Taputeranga — have *Rattus norvegicus,* and Kapiti Island has *R. exulans* as well (Daniel 1969), but these islands are not used as starling roosts, even though they are well within flying range of the birds and have adequate cover. Somes Island is of special interest because it was used by large numbers of starlings as a roost through the 1950s but was almost abandoned by them soon after 1966. The date of this abandonment cannot be accurately fixed, but it followed the accidental introduction of *Rattus rattus* to the island in 1964 or 1965 (R. H. Taylor, pers. comm.) 1982). In the selection of island roosts by starlings the limited data presented here suggest that the principle of mutual exclusion may be at work, starlings choosing to roost on rat-free islands and avoiding those islands with rats. Another paper is planned which will survey New Zealand starling roosts outside the Wellington district and further pursue the connection between these birds and potential predators.

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