HABITAT SELECTION AND FEEDING PATTERNS OF BROWN TEAL (Anas castanea chlorotis) ON GREAT BARRIER ISLAND*

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A study of habitat selection and feeding behaviour of Brown Teal *(Anas castanea chlorotis)* was conducted on Great Barrier Island from 7 to 14 February 1973. In the Port Fitzroy area, teal fed almost exclusively in the tidal estuaries. Feeding was tide-regulated, and foods seemed to be invertebrates selected on a declining tide. During high tide, teal usually roosted in the shade of trees.

At several sites on the eastern part of the island, teal fed in slow-moving freshwater streams or brackish lagoons. In addition to dabbling and upending, teal dived regularly and efficiently. By a creek at Whangapoua Beach, most of 112 teal fed in the uplands either by probing in grass or by grabbing insect larvae from forbs. Teal also fed in the uplands at night.

Brown Teal are very adaptable in feeding sites and fill the niche of both aquatic dabbler and ground-feeder. They are most abundant in estuarine situations, and the survival of the species depends upon protection of suitable habitats. Intensive human use of estuaries on the mainland probably is responsible for the drastic decline of the species.

INTRODUCTION

The New Zealand Brown Teal *(Anas castanea chlorotis)* is among the rarer waterfowl of the world (Williams 1964; International Council for Bird Protection 1971). Once widespread in a variety of " swampy streams and ponds and tidal creeks shaded by trees " (Falla, Sibson & Turbott 1967), the major remaining population is on Great Barrier. Lesser numbers also occur on Little Barrier Island near Auckland, in estuaries on the Coromandel Peninsula and throughout Northland, Stewart Island, and the Invercargill district (McKenzie 1971; 1972).

Remarkably little seems to have been published on the species in recent times, but its restricted status is well recognized. Bell & Brathwaite (1964) conducted the most extensive survey on Great Barrier Island, and provided a summary of the general habits of the species there. A rearing programme has been conducted by the New Zealand Wildlife Service at the Mt Bruce Game Farm, and birds have been successfully introduced on Kapiti Island near Wellington.

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During the post-nesting period in February of 1973, I studied the feeding behaviour and food selection of Brown Teal. Because collection of birds was inadvisable, I concentrated on habitat use and patterns of feeding. The major objective was to describe the species' niche with the intent of finding ecological patterns that might aid in conserving the species. Field work was sponsored by National Science Foundation Grant GV 21491.

STUDY AREA AND METHODS

Although I spent about 4 days in search of Brown Teal in the Oban area (Half Moon Bay) on Stewart Island, I saw no birds there. Roy H. Traill, a resident naturalist who knows the bird well, had seen only one pair several years earlier, and had no recent reports. Although McKenzie (1972) noted Brown Teal at Lake George near Riverton, I found none there in late January.

Brown Teal were studied on Great Barrier Island where they are common, reasonably tame and appreciated and protected by the residents. I spent 8 days in the Port Fitzroy area, but also visited several other estuaries and beaches on the east side of the island.

Procedures involved recording of numbers, activities and distribution of Brown Teal in each habitat utilized. When possible, feeding sites were examined to determine availability of potential food items. When tide-related feeding became obvious, intensity of use was related to tide by periodic censuses and qualitative description of tide levels.

HABITAT

The northern part of Great Barrier Island is abrupt on the western side, but has extensive flatlands on the east. The Port Fitzroy area is dominated by woodland and scrub with small clearings near the settlement (Fig. 1). The only level areas are tidal flats of estuaries (Fig. 2) well inside the narrow bays. Three of four estuaries which held teal in the Port Fitzroy area (Table 1) were formed by small streams only 6 to 10 ft. wide and a few inches to a foot deep. All were rapidly moving streams with a high rate of fall until reaching a short flood plain above tidal level. Bottom substrates of the tidal bays graded from silt and sand to gravel of ½″ to 2″ diameter to rocks of 6″ to 10″ (Fig. 2).

On the east side of the island, streams also were responsible for the three major habitats seen, but they differed in that extensive sand beaches and pounding surf had formed barrier beaches of various degrees, creating either partly or fully closed lagoons. The result of this sand barrier at Whangapoua Beach was a slow-moving, pond-like stream edged with emergent sedges and grasses. This stream was undoubtedly enriched by cattle and sheep manure, and had pools deepened by cattle trampling.

TABLE 1

NUMBERS OF BROWN TEAL SEEN ON GREAT BARRIER ISLAND, February 7-14, 1973

Location	Water Type	Max. No.	Date
Port Fitzroy Settlement	Estuary & tidal flat	29	7-14 Feb 1973
Port Fitzroy Forestry Camp	Estuary & tidal flat	5	7&13 Feb 1973
Karaka Bay	Estuary & tidal flat	10	8 Feb 1973
Whangapoua Beach	Freshwater stream	112	9 Feb 1973
Kaitoke Beach	North stream	39	10 Feb 1973
	South stream	3	10 Feb 1973
Harataonga Bay	Brackish ponds	46	10 Feb 1973
TOTAL TEAL OBSERVED		244	

FIGURE 1 — View of Port Fitzroy. Trees along shore provide roosting sites during the day. Teal moved to roost or into grassy uplands at night.

At Harataonga Bay, a barrier beach had walled off an oxbow pond complex at the terminus of a sizable stream. This water is brackish, however, because of infiltration of sea water at high tide; emergent sedges and grasses survive mostly along the edge of the stream. Two large, slow-moving streams at Kaitoke Beach also are influenced by a barrier beach and perhaps by tide levels. The northern stream has extensive silt-sand shores, which were favoured feeding sites by Brown Teal.

FIGURE 2 — Brown Teal feeding or loafing on tidal flat at the head of Port Fitzroy.

FEEDING BEHAVIOUR

Marine situations:

In three tidal flats where streams emptied into the sea, Brown Teal fed exclusively by dabbling in very shallow water. Many walked along the water's edge and dabbled with neck outstretched on silt flats, or in silt between rocks (Fig. 3). Others swam in shallow water dabbling with the bill or entire head under water. Occasionally, teal walked and dabbled in the stream where it spread over gravel at low tide. It was obvious that small food items were taken, but no plant material was evident. Invertebrates present were hermit crabs, clams, amphipods, isopods and caddis-like larvae in cases.

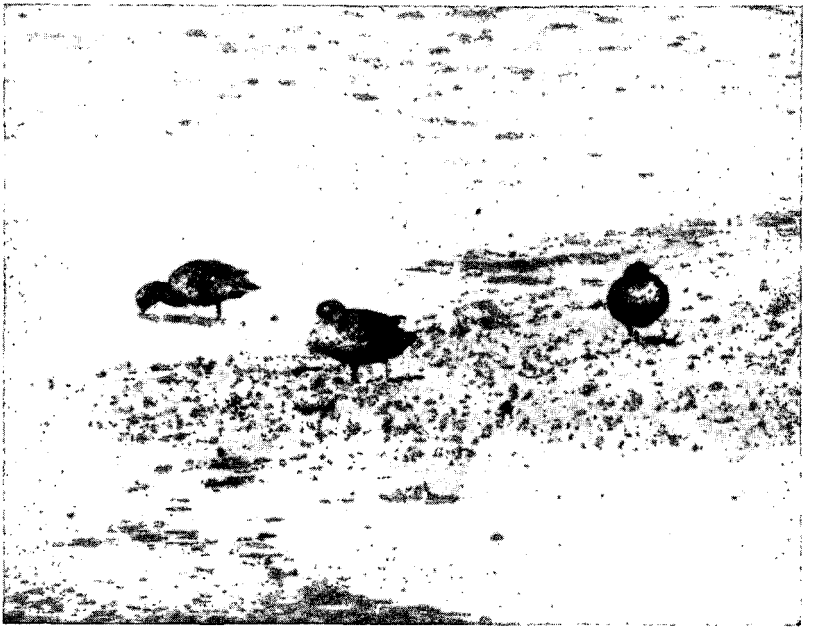

FIGURE 3 — Typical feeding and loafing postures in Port Fitzroy.

The Port Fitzroy population consistently numbered 23 to 29 birds during observations from 7 to 14 Feb 1973. Feeding seemed tide-regulated but during my period of study, tidal regimes changed little; low tides occurred shortly before sunrise and just before sunset. A general relationship is evident between numbers of ducks present and low tide levels (Fig. 4), but the relative nature of the tide measurements preclude statistical correlations.

During daylight high tides, Brown Teal were rarely visible on the usual feeding areas (Figs 5 & 6). Departure from the area both in morning (Fig. 5) and in evening (Fig. 6) usually occurred after the tide started to rise. As the tide declined about 1/5 to 1/4 in early afternoon, birds moved toward the feeding areas (Fig. 6) by swimming from sheltered shorelines. On some days, teal flew from some distance out in the bay and landed near the feeding sites, swimming the remainder of the way. By the time the tide level was 1/3 down, the entire population had moved to the feeding area (Fig. 6). Also by this time, a few birds already were loafing at the water's edge. The percentage of the population that loafed remained fairly constant, however, suggesting that this pattern resulted from alternate feeding and resting periods.

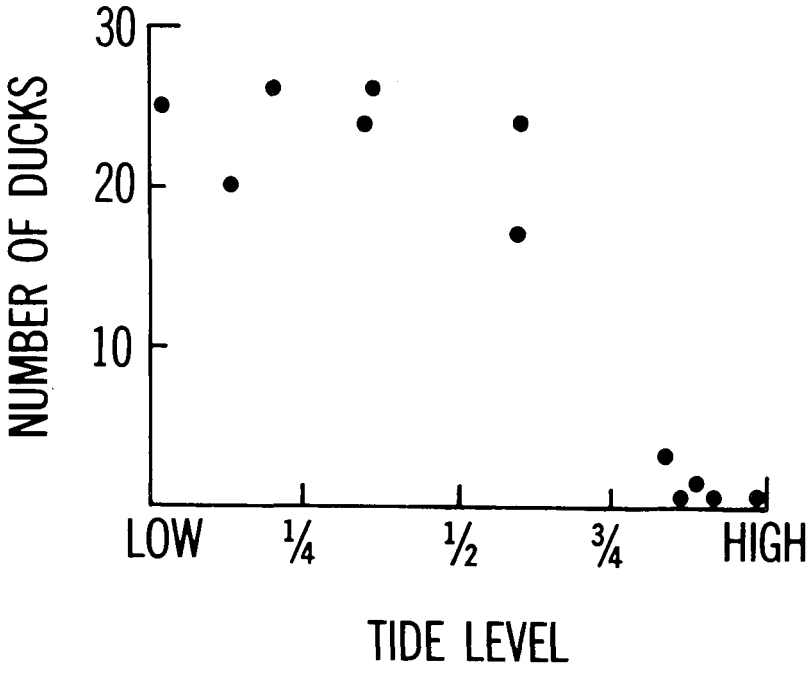

FIGURE 4 — Relationship between numbers of birds on the Port Fitzroy tidal flat and the general tide level, 11 February 1973.

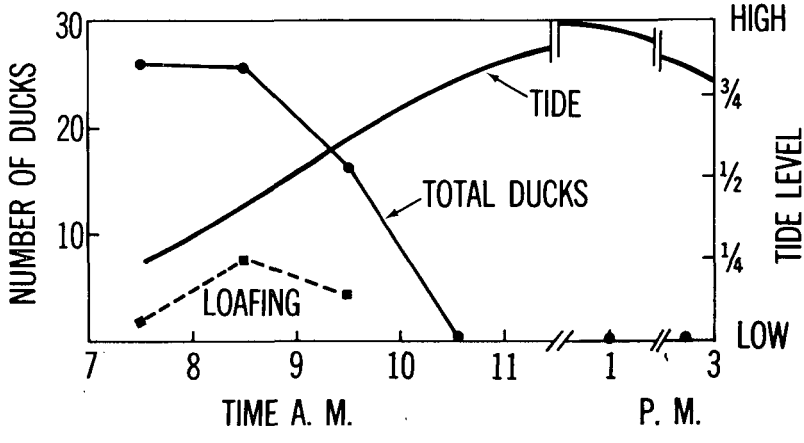

FIGURE 5 — A comparison of numbers of ducks loafing of the total observed as related to tidal levels early in the day, Port Fitzroy, 11 February 1973. All nonloafing birds were actively feeding.

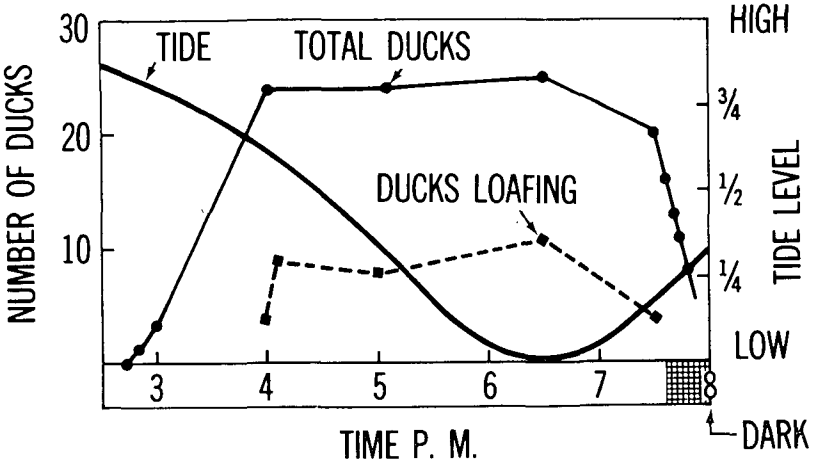

FIGURE 6 — A comparison of numbers of ducks loafing to the total observed as related to tidal level and sunset, Port Fitzroy.

Teal obviously moved to the feeding flats as the tide declined less than 1/4 (Fig. 6), whereas they left the area in the morning when the tide had risen to 1/3 to 1/2 of full (Fig. 5). Presumably, the need for food or the availability of food organisms prompted a move earlier on a falling tide, whereas teal left more casually after feeding during the morning low tide.

Freshwater and brackish ponds and lagoons:

In deeper, slow moving or stationary water, Brown Teal fed by skilful dives, by upending, or by dabbling in emergent grasses and sedges along the edge of ponds or streams. In only one instance was depth of diving established as about 2 ft by the presence of cattle standing in the stream pool. Invertebrate organisms seen in freshwater or brackish areas were: fairy shrimp, snails, isopods, water boatman and fish.

Terrestrial feeding:

It is well known that teal come on shore at night to feed (Falla, Sibson & Turbott 1967), but nothing is known of their foods. After their evening feeding at marine sites, teal moved toward, but did not all remain at their usual daytime roosting sites. Instead, some moved upland into grassy fields. I was unable to study their behaviour at such times because they usually were disturbed by a flashlight, but some individuals did probe in the grass. At least three residents reported that Brown Teal frequently were encountered in the grass outdoors at night. Two persons reported that teal came to gardens regularly, and one thought they fed on snails there.

Less well known is that Brown Teal also may feed in the uplands during full sunlight. At the Mabey Farm at Whangapoua Beach, most of the 112 Brown Teal seen initially were loafing on shore or in the stream pool under the shade of a large tree. Some of these ducks moved out in the stream to dabble and dive. Eventually, small groups of 5 to 20 birds moved upland in mid-afternoon and probed vigorously in the grass (Fig. 7). I was unable to find anything but flies and small butterflies in the grass, but teal fed in this fashion for over ½ hour, making it clear that suitable food was present. One flock of 20 was feeding with two domestic chickens on the lawn of the Mabey home while people walked within 30 yards of them.

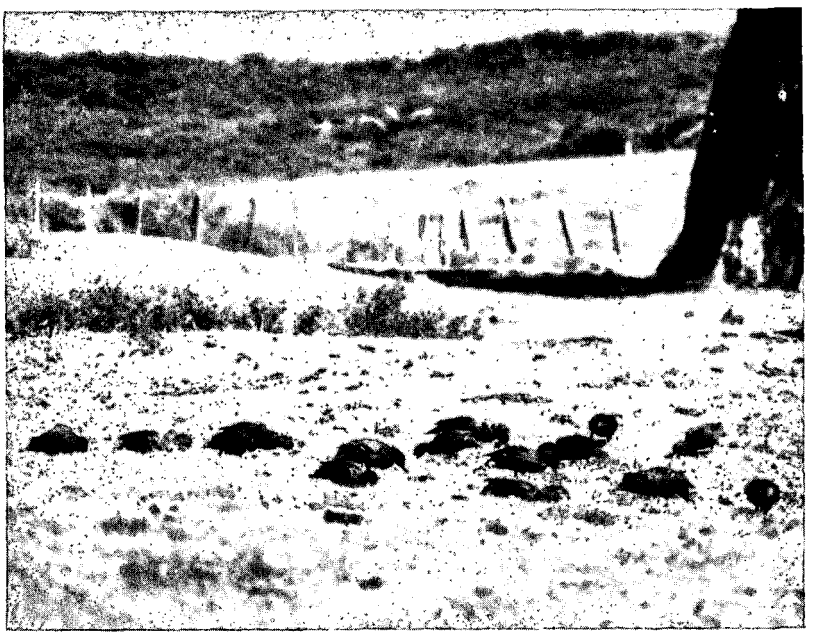

FIGURE 7 — Flock of Brown Teal feeding in grass during mid-afternoon. F. Mabey Farm, Whangapoua Beach, 9 February, 1973.

At least seven other Brown Teal fed by examining the tops of legumes 15″ to 24″ tall (Fig. 8). The teal occasionally jumped up with outstretched neck to grab at the tops of these plants. Examination of some of these plants showed unidentified caterpillars about ¾″ to 1″ long.

FIGURE 8 — Two teal search for insect larva on legumes. F. Mabey Farm, Whangapoua Beach, 9 February 1973.

Collection of actively feeding birds would be essential to document the implied food utilization noted here. I saw no evidence of use of aquatic plants, but Brown Teal show great adaptability to aquatic and terrestrial invertebrates. In this way, Brown Teal, not only fill the usual niche of dabbling ducks, but also fill the ground-feeding niche normally filled by quail or pheasants.

ROOSTING BEHAVIOUR

Light-controlled rhythmicity of roosting movements by ducks is well known in several North American species (Hein & Haugen 1966). Brown Teal feeding on tidal flats at Port Fitzroy moved to roost sites by swimming, or occasionally by flying, as tide levels increased either during the day or at dusk.

During the day, teal loafed on trunks of overhanging trees, often 10 or 15 ft above the water. Others sat on gravel shoals or rocks, but some teal may have been in the uplands and were not found. Most teal moved more than 50 yards from the major feeding zone at the head of Fitzroy Bay. Teal did not move up the creek, possibly because it was too shallow to swim easily. By the aggressive behaviour of birds on loafing sites toward encroaching birds, it is probable that roosting sites are defended. Moreover, two birds were prevalent and may have represented mated pairs.

About ½ to ¾ hour before darkness, ducks swam to open water and then toward favoured roosting sites along the shore. Some individuals flew several hundred yards down the bay. Figures 5 & 6 suggest that birds departed from the feeding area at lower tide levels at dusk (Fig. 6) than during daylight hours (Fig. 5), although feeding conditions were still optimal. Unfortunately, these are only suggestions because the methodology and the tidal regimes studied did not produce the most clear-cut results. Further study would be essential to clarify this point. Whether birds returned to feed at night is unknown, but some teal did move past roosting sites and into uplands where they presumably fed.

POTENTIAL PREDATORS

Brown Teal are beautifully camouflaged in the dark, reddish-brown or black rocks of tidal areas, and immobile or loafing ducks are difficult to discern. Local residents indicated that ducklings are taken by eels in freshwater situations and by Harriers *(Circus approximans)*. On only one occasion was a Harrier seen circling near flocks of Brown Teal in the uplands. There was alertness by the teal, but no panic. Earlier, some teal had flown from the uplands to the pond, and although the Harrier may have been responsible, no direct attacks or investigating swoops were seen.

HABITAT PROTECTION AND CONSERVATION OF THE SPECIES

The drastic decline of Brown Teal in New Zealand probably is a result of habitat loss as Williams (1964) suggested. Although the species seemingly used a variety of wetlands over an extensive area of New Zealand (McKenzie 1971), it is obvious that the species has adapted to estuarine habitats on both the North and South Islands. It is these areas where the species is most abundant, and industrial and residential development of such estuarine areas is prevalent in New Zealand as in the rest of the world. The resulting disturbance and pollution could affect breeding success and the suitability of feeding areas for the Brown Teal. As with several other rare New Zealand birds, offshore islands now are the major refuge of the Brown Teal, but even on the mainland, a protected few estuaries still harbour healthy populations.

The programme by the New Zealand Wildlife Service to rear and release Brown Teal should be continued. Its success will be influenced, however, by the availability of suitable habitats protected from siltation, pollution and disturbance. The population on Great Barrier undoubtedly is the largest and presently most secure. But increased sewage and agricultural development could modify the estuarine lagoons, the quantity of food resources available and breeding success of local populations. Impoundment of streams to create permanent water basins might be highly detrimental to the production

of food organisms that teal use. Both habitats and teal populations should be monitored regularly to prevent loss of this last major population of Brown Teal.

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