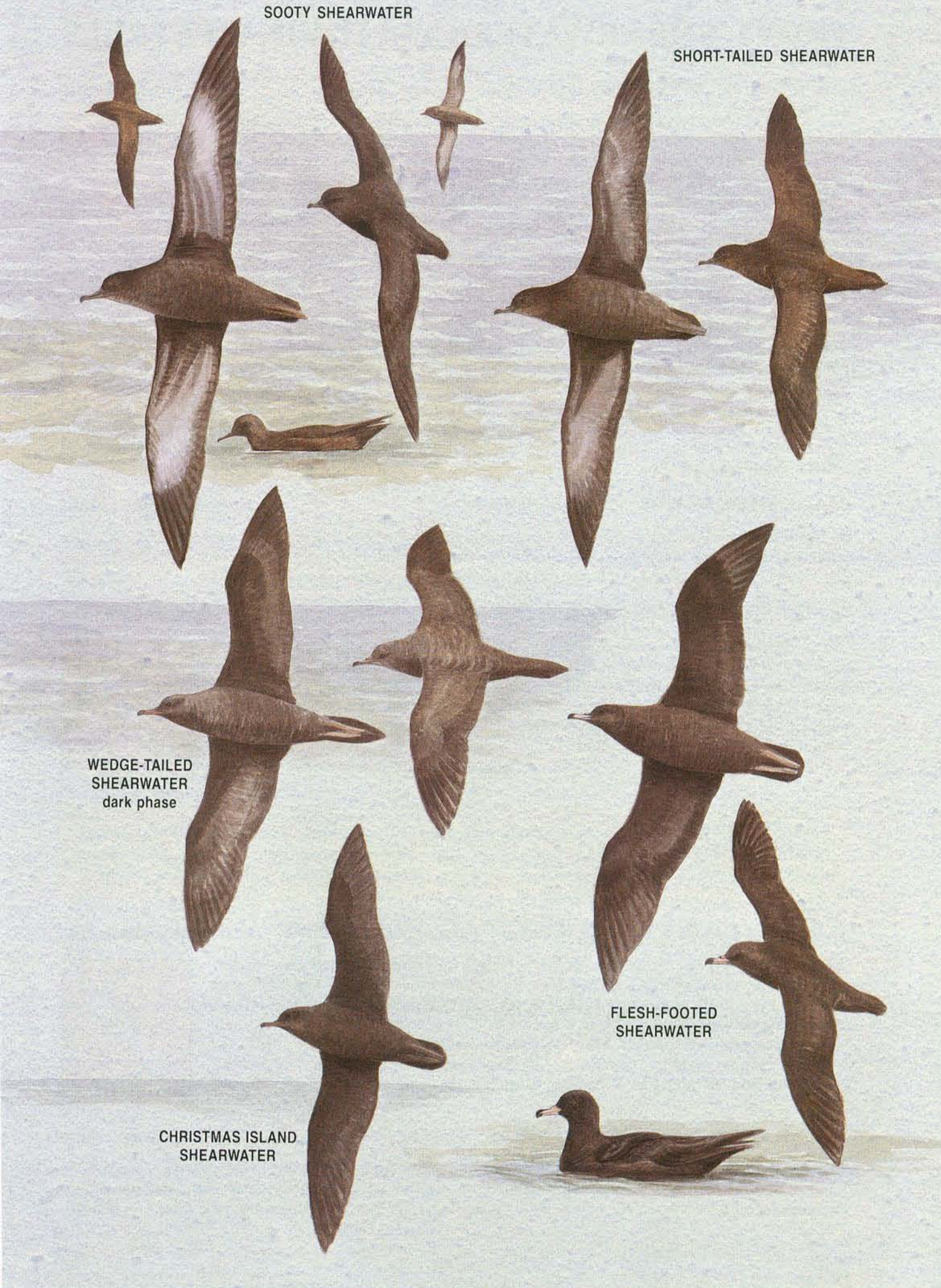
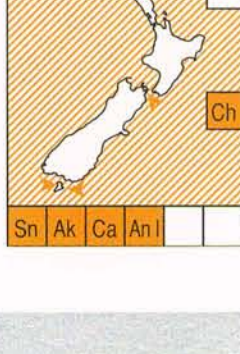


Medium to large seabirds with long slender bill and nostrils encased in a short flattened tube. Sexes and ages alike; most are dark above and mainly white below, but some are all dark. Many species form large feeding flocks. Usually fly close to the surface, often with a series of rapid wingbeats followed by a glide, but in windy conditions can wheel high on stiffly held wings. Clumsy on ground; legs and webbed feet set well back. Range from coastal to oceanic. Some species are highly migratory. Most species very vocal at breeding colonies at night. Lay 1 large white egg, usually deep in a burrow. Long incubation and fledging periods.

SOOTY SHEARWATER (Titi, Muttonbird) *Puffinus griseus* Abundant native

44 cm, 800 g. Sooty-brown upperparts, slightly greyer underparts with *silvery-grey flash on underwings*. Wings long and narrow, tail short and rounded. Bill long and slender (42 x 13 mm), dark grey; feet dark lilac with brown markings on the outer side. Main call a series of hoarse moans: 'oo-oo-ah', getting louder and faster each time. **Habitat:** Breeds mainly around NZ, on islands and mainland headlands from Three Kings to Campbell Is, but also southern Australia, Macquarie I and southern S America. Main NZ colonies are at The Snares, islands off Stewart Island and in Foveaux Strait, and Chatham Is. NZ birds migrate to N Pacific, many becoming beach-wrecked in Apr–May and Oct–Dec. **Breeding:** Nov–May. [Sp 22]



SHEARWATERS, FULMARS, PRIONS and PETRELS Procellariidae

The Procellariidae is the largest and most diverse family of seabirds, with about 72 species. In the New Zealand region, 49 species have been recorded, including 11 endemic species and 23 other breeding species.

The Procellariidae includes a wide variety of seabirds from the giant petrels to the diving petrels. All have distinctive external nostrils encased in a tube on the top or sides of the bill. They have 11 primaries. The 11th (outermost) is minute, but the 10th is at least as long as the 9th, giving the wing a pointed tip. All seabirds have webbed feet with three forward-pointing toes of about the same length.

Most species nest in burrows or crevices, normally clumped into colonies. Birds return

to their colony months before egg-laying to claim their nest sites (usually the same site is used year after year) and to court. After copulation, females leave the colony for one to six weeks on a 'pre-laying exodus' to form the egg. Males also leave but often make occasional visits to the nest site.

All species lay one white egg, which is very large relative to the female's size. The few instances of two eggs in a nest are from two females using the same site. A long incubation period is typically split up into several incubation stints lasting from several days to several weeks between changeovers. Occasionally the changeovers do not coincide and the egg is left unattended for several days; however, eggs have hatched successfully after

being chilled for six days. Incubation stints shorten as incubation proceeds, and when the egg hatches the downy chick is brooded and guarded for only a few days in hole-nesting species, but for several weeks in surface-nesting species, until it is able to maintain body temperature.

Throughout its development, the chick is fed large meals at irregular intervals. It gains weight rapidly, becoming much heavier than its parents, but this declines towards adult weight before it fledges. Chicks usually spend some time on the surface exercising their wings before they eventually leave the colony. Once they have flown, they are completely independent of their parents. Young birds usually return to their home colony at 2–7 years old, and spend several years visiting the colony, especially when breeders are incubating or feeding chicks, before attempting to breed. The Procellariidae are typically long-lived, with several species known to live over 25 years.

Most species now breed only on offshore and outlying islands because mainland colonies have been ravaged by introduced mammalian predators. They generally return to their colonies at night, and once on land they are clumsy and unable to take flight rapidly; their only defence is by biting or by spitting stomach oil. The nestling is particularly vulnerable to predators because it is often left unattended for long periods while the parents feed at sea and it emerges from the nest at night to exercise its wings in the week or two before it can fly.

The Procellariidae feed on a wide variety of sea life, ranging from some of the prions, which sieve zooplankton on comb-like lamellae along the edge of their bills, to the giant petrels, which scavenge on dead marine mammals and occasionally kill small seabirds. Most species feed within a few metres of the sea surface, but some shearwaters dive to at least 20 m. These seabirds have well-developed nasal glands for extracting salt from their blood and exuding it out of the prominent nostrils.

The shearwaters (*Calonectris*, *Puffinus*) include about 15 medium to large species with long slender bills and flat nasal tubes. They

are usually brown to black above and white or brown below. Some have large sternums and dive well for fish and squid, using their wings for propulsion, while others have small sternums and feed on, or close to, the surface.

The four species of diving petrel (*Pelecanoides*) are small, stocky black and white seabirds with short wings adapted for propulsion under water. They have a fast, direct, whirring flight and readily dive for small krill and copepods.

The four species of *Procellaria* are large stocky seabirds with large, heavily hooked pale bills with dark markings and prominent nostrils. They feed mainly at night on bioluminescent squid but also now take offal discarded from fishing boats.

The three species of *Pseudobulweria* are medium-sized seabirds with exceptionally large feet and a notch on the cutting edge of the upper bill caused by the latericorns having blunt ends.

The fulmarine petrels (*Lugensa*, *Pagodroma*, *Daption*, *Thalassoica*, *Fulmarus* and *Macronectes*) are a diverse group of 8 species, all of which have robust bills with prominent joined nasal tubes, rising from the base.

The six species of prion (*Pachyptila*) are small seabirds pale blue above and white below with a prominent M-shaped mark across the upperwings and a dark-tipped tail. Comb-like lamellae on the inside of the bill are used to filter zooplankton.

The single *Halobaena* species looks like the prions but has a white-tipped tail and the upper bill has small tooth-like serrations at the base.

The gadfly petrels (*Pterodroma*) consist of 29 species of highly agile seabirds with long wings and short, laterally compressed black bills with a strongly hooked nail. They feed mainly on squid and small fish.

Reading: Harrison, P. 1987. *Seabirds of the World: a photographic guide*. London: Christopher Helm. Harrison, P. 1988. *Seabirds: an identification guide*. London: Christopher Helm. Imber, M.J. 1985. *Ibis* 127: 197–229. Murphy, R.C. 1936. *Oceanic Birds of South America*. New York: MacMillan. Serventy, D.L. et al. 1971. *The Handbook of Australian Seabirds*. Sydney: Reed. Warham, J. 1990. *The Petrels: their ecology and breeding systems*. London: Academic Press.

22. SOOTY SHEARWATER *Puffinus griseus* Plate 8

Other names: Titi, Muttonbird

Size: 44 cm, 800 g

Distribution: Circumpolar, breeding in the subantarctic and temperate zones on islands off the coast of Chile and around Cape Horn; on Kidney Island, Falklands; on Tristan da Cunha; on islands off Tasmania and New South Wales; Macquarie Island; and in New Zealand on many islands and some headlands on the mainland, from the Three Kings Islands to Campbell Island and the Chatham Islands. The main colonies in the New Zealand region are on islands off Stewart Island (especially Codfish and Big South Cape), The Snares, Auckland, Campbell and Chatham Islands. Subfossil and midden evidence and historical records suggest that Sooty Shearwaters

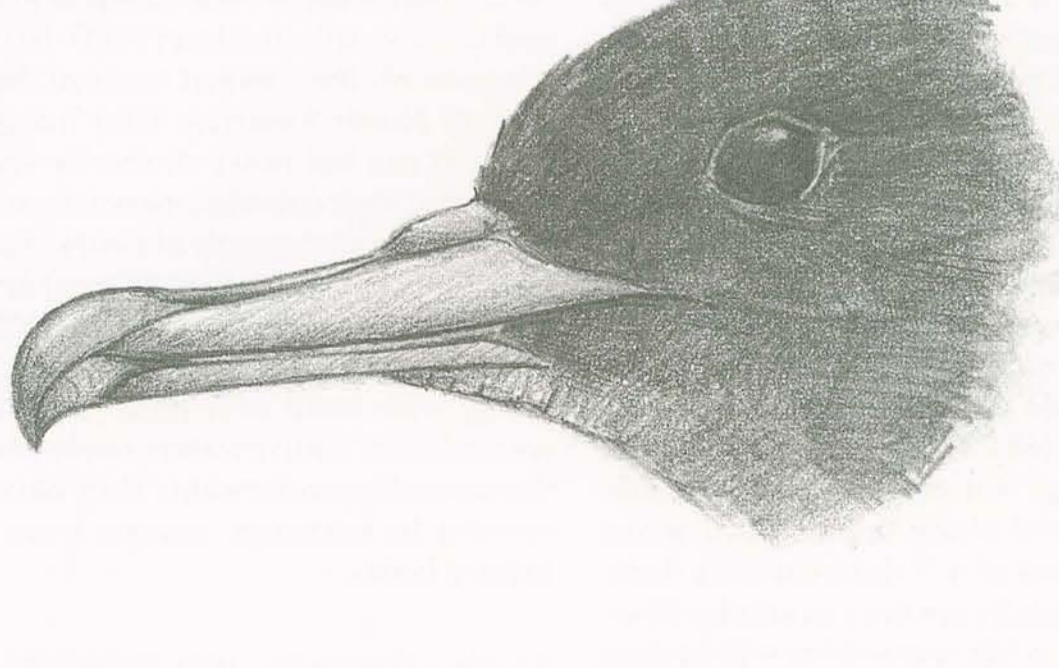
formerly bred in large colonies on the mainland, but only small colonies persist on Banks Peninsula, on Cape Wanbrow (Oamaru), on the Otago coast and on isolated headlands along the west coast of the South Island.

Between September and mid-May, breeding and pre-breeding birds disperse widely throughout New Zealand seas, mainly over continental-shelf and deeper waters off southern New Zealand, and some may move south to the pack ice. Most adults depart on migration to the North Pacific between late March and early May, moving along the east coast of the South and North Islands. Fledglings leave their colonies from mid-April to late May and follow a similar route.

The migration path is directly north over a broad front to subarctic waters between Japan and the west coast of North America, which they reach in April–May. Some then drift northwards to reach the Gulf of Alaska in June. Breeding birds return directly south

muttonbirds is not certain, but because the huge colonies on The Snares, Auckland Islands and the Chatham are protected, the overall population is secure.

Breeding: Birds return to their colonies in September and court and clean out their



in August and arrive back in New Zealand waters in September, but non-breeders return a month or two later. Sooty Shearwaters are often found dead on the New Zealand coast during the northward migration of fledglings in May, and again in November–December when pre-breeders return to New Zealand waters.

Population: 20 million+ birds; the largest colony is at The Snares, where c. 2.75 million pairs breed.

Conservation: Protected native, except that a large traditional take of muttonbirds (the fattest chicks) is permitted on some islands in Foveaux Strait and around Stewart Island. Sooty Shearwaters have undoubtedly declined since 1840, with the demise of many mainland and some island colonies being due to the spread of introduced predators and the conversion of forest for logging, over-harvesting of muttonbirds, and drift-netting in the North Pacific. The impact of the annual legal take by Maori of an estimated 250,000

burrows through October. After a pre-laying exodus of c. 3 weeks in early November, most eggs are laid in late November and early December. They lay 1 white egg (77 x 48 mm, 93 g) in a burrow 0.5–3 m long, or occasionally in a crevice, under bushes or huts. Both sexes incubate. Eggs hatch from mid-January after c. 53 days. Chicks are initially covered in smoky blue-grey down and are left unattended within days of hatching. Chicks reach their maximum weight, of 1000–1800 g, at c. 7 weeks old, but then lose weight to fledge at c. 750 g at 86–97–106 days old in late April to mid-May. Young return to their natal colony at 3–4 years old but do not start breeding for several years. The oldest bird recorded in New Zealand lived over 25 years.

Behaviour: Breed in large dense colonies, interspersed with other seabirds. At sea, Sooty Shearwaters are gregarious, with large flocks of up to 500,000 birds recorded feeding, on migration or in the seas near breeding colonies. They are generally silent at sea but

noisy in the air and on the ground at their colonies when they return in the two hours after dusk, and are even noisier as they depart just before dawn. The main call is a series of hoarse moans: 'oo-oo-ah', getting louder and faster each time.

Feeding: Diet is small fish, squid, krill and other small crustaceans, taken mainly by

plunging and then swimming metres under the surface.

Reading: Ainley, D.G. & Boekelheide, R.J. 1983. *Studies in Avian Biol* 8: 2–23. Richdale, L.E. 1963. *Proc Zool Soc (Lond)* 141: 1–117. Speare, L.B. & Ainley, D.G. 1999. *Condor* 101: 205–218. Warham, J. & Wilson, G.J. 1982. *Notornis* 29: 23–30. Warham, J. et al. 1982. *Notornis* 29: 269–292.