

## Order PROCELLARIIFORMES

A rather distinct group of some 80–100 species of pelagic seabirds, ranging in size from huge to tiny and in habits from aerial (feeding in flight) to aquatic (pursuit-diving for food), but otherwise with similar biology. About three-quarters of the species occur or have been recorded in our region. They are found throughout the oceans and most come ashore voluntarily only to breed. They are distinguished by their hooked bills, covered in horny plates with raised tubular nostrils (hence the name Tubinares). Their olfactory systems are unusually well developed (Bang 1966) and they have a distinctly musky odour, which suggest that they may locate one another and their breeding places by smell; they are attracted to biogenic oils at sea, also no doubt by smell. Probably they are most closely related to penguins and more remotely to other shorebirds and waterbirds such as Charadriiformes and Pelecaniiformes. Their diversity and abundance in the s. hemisphere suggest that the group originated there, though some important groups occurred in the northern hemisphere by middle Tertiary (Brodkorb 1963; Olson 1975).

Structurally, the wings may be long in aerial species and shorter in divers of the genera *Puffinus* and *Pelecanoides*, with 11 primaries, the outermost minute, and 10–40 secondaries in the Oceanitinae and great albatrosses respectively. The tail varies in length, being forked in *Oceanodroma*, forked to pointed in other forms, usually with 12 rectrices but up to 16 in fulmars. The tarsi are light and cylindrical in aerial forms; strong and laterally compressed with legs set far back in aquatic ones. The front toes are webbed; hind toe small or absent. The proventriculus is long and glandular; the gizzard small and twisted; and the small intestine often spiral in *Pterodroma*, presumably to aid absorption of the unusual lipids in their food. Chicks are helpless and covered in down, with two coats except in some Oceanitinae. Some larger species have a darker immature plumage, and the female is often darker than the male in the great albatrosses. The male is usually larger than the female, though smaller in the Oceanitinae and some other small species. Otherwise there is little difference in appearance with sex or age, except that young birds may have more pronounced pale or dark edges to the feathers. Many have simple counter-shaded markings that often appear to have given rise to uniformly dark or, less often, to pale derivatives; some species in most groups are dimorphic or polymorphic. The more complex groups have often developed distinctive markings of the extremities.

Breed more or less colonially on offshore islands, coastal cliffs, or on hills and deserts inland, where they perform complex vocal and aerial displays. The nest is a simple scrape or cup in a burrow or natural hole, sometimes under vegetation. The s. albatrosses build large cone-shaped nests in the open; may be lined with any debris available in the area. Smaller species visit it only at night, though larger ones and those breeding on remote islands may come to nests in the open by day. Parents incubate for spells of several days in turn and generally leave the chick alone soon after it hatches, only returning at long intervals to feed it by regurgitation. In consequence the chick is vulnerable to introduced predators and some species are now greatly reduced and at least two are now extinct. Some species also periodically liable to have unsuccessful breeding seasons. Many young or even old birds may be wrecked ashore and die when they meet bad weather or suffer shortage of food on migration or in the winter. Though it has been claimed that they are also vulnerable to all sorts of pollution, the evidence is weak (Bourne 1976). There is at present anxiety about the effect of some fishing methods, such as long-lining, which may be endangering species such as the great albatrosses.

All species feed at sea on a variety of fish, cephalopods and small marine invertebrates, either socially or alone; larger species may scavenge all sorts of offal or prey on other birds. Most, except perhaps *Pelecanoides*, can digest the complex lipids formed by some marine animals (Clarke & Prince 1976), and may eject them to soil the plumage of their enemies with lethal results (Swennen 1974). Some species can digest wax (Obst 1986). Many now take wastes from whaling and fishing operations (Fisher 1952). All have long life-cycles in proportion to their size; they disperse on fledging and then prospect for nest-sites for 2–12 years in their youth. They usually lay a single large white egg annually; though a successful breeding cycle may be completed in less than a year in at least one tropical species, *Puffinus lherminieri*, it may take 2 years in larger southern ones. Before laying, the birds court for weeks or months, then go to sea for feeding. Incubation lasts 6–8 weeks, and fledging 2–9 months. Once the fat chick fledges it fends for itself, even in species that immediately make a long migration, sometimes to the opposite hemisphere.

Tendency for failed breeders and non-breeders to begin moult before successful breeders. Five strategies of wing-moult in breeding adults: (1) In albatrosses, remiges replaced in staffelmauser interrupted while breeding; in nearly all other species, primaries moulted outwards; possibly simultaneously in some diving-petrels. (2) In most subantarctic and temperate species, moult begins soon after breeding and is completed shortly before next breeding season. (3) In most tropical species, moult aseasonal, between breeding attempts; resumption of breeding apparently depends on when moult completed. (4) In trans-equatorial migrants, wing-moult delayed until they reach non-breeding quarters, where it is completed; moult rapid but no satisfactory evidence for flightlessness. In

some species, body-moult also in winter quarters; in others, at breeding grounds. (5) In some species of high latitudes, rapid moult completed in summer when they breed; some begin moult long before breeding finished.

The history of the classification of the Order is very confused, as is seen by comparing Timmermann's (1965) discussion of their Mallophagan parasites with that by Klemm (1969) of their leg muscles and that by Harper (1978) of their proteins, but it is now widely agreed that the Order is best divided into four families: Diomedidae or large to huge aerial albatrosses; Procellariidae or medium-sized, mainly aerial but sometimes aquatic, petrels, shearwaters and prions; Hydrobatidae or small to tiny, aerial storm-petrels; and Pelecanoididae or small aquatic diving-petrels.

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## Family PROCELLARIIDAE fulmars, petrels, prions, shearwaters

The family Procellariidae represents the main radiation of medium-sized 'true petrels', characterized by having united nostrils with a median septum and the outer functional primary at least as long as the next. It tends to be dominant among the birds of the Southern Ocean, though in the n. hemisphere the Charadriiformes are more numerous. The giant-petrels *Macronectes* have also developed as large scavengers and predators, showing some convergence in appearance and behaviour with the Diomedidae. The Procellariidae may be divided into four main groups with some intermediate species, which makes it hard to draw distinctions between them.

(1) The fulmars *Macronectes*, *Fulmarus*, *Thalassoica*, *Daption* and *Pagodroma* consist of seven species of surface predators and filter-feeders of rather varying structure and appearance (Voous 1949) that breed in high latitudes but may migrate along cool currents into much lower ones. *Fulmarus* appears to have colonized the n. hemisphere in the Tertiary. Six of the seven species are essentially confined to our region.

(2) The gadfly-petrels *Pterodroma* are a large series of some 30 agile species; 16 breed in our region and another six occur rarely or rather rarely. Their short sturdy bills are adapted for seizing soft prey at the surface, and their twisted intestines, for digesting marine animals with an unusual biochemistry, which are also found throughout the warmer oceans (Imber 1985). They show complex markings of face and wings that must serve as interspecific recognition-marks (Murphy & Pennoyer 1952). Some species placed in this group have an intermediate structure and intergrade with all other groups distinguished here: *Pterodroma (Lugensa) brevirostris*, which moves S in winter, has distinctly big eyes like *Pagodroma*; *Halobaena caerulea* has a plumage similar to that of prions; *Bulweria* has some structural resemblance to shearwaters. At present it is difficult to determine their precise relationships.

(3) The prions *Pachyptila* are a specialized group of six (perhaps five) very numerous species, all in our region, that show a progressive adaptation of a small, agile, cryptically coloured, fulmarine form for filter-feeding on zooplankton. There has been dispute over their classification (Cox 1980; Harper 1980) but the arrangement discussed by Fleming (1941) seems best except that the Broad-billed Prion *P. vittata* appears to intergrade with Salvin's Prion *P. salvini* through *macgillivrayi* of Ile St Paul; so they may be better treated as subspecies of the same species.

(4) The shearwaters *Procellaria*, *Calonectris* and *Puffinus* include some 20 agile species with long bills adapted to catch prey more or less under water throughout the warmer seas (Kuroda 1954); 13 species breed in our region, some migrating into the n. hemisphere; six others are chance or perhaps regular visitors. From the fossil record (Brodkorb 1963; Olson 1975); they seem to have been particularly common in the great Tethys Ocean of the middle latitudes of the n. hemisphere in the Tertiary, so this development of aquatic habits may have occurred there without competition from penguins with a subsequent return S by the more successful forms.

General features of the family are: body, ovate, or elongate in shearwaters; wings, long and narrow, 11 primaries, p10 longest, p11 minute; 20-29 secondaries, short, diastataxic; tail, short, 12 feathers; bill, heavy (*Macronectes*), slender (shearwaters), broad (prions) or stubby (gadfly-petrels), hooked, formed of several horny plates; nostrils in dorsal tube of varying length; legs set far back, laterally flattened but round in gadfly-petrels; three toes, webbed, hind toe vestigial, raised. Oil-gland feathered. Peculiar musky odour. Sexes similar, male usually larger than female. Plumage, black or grey above, white below, or all dark; light and dark morphs in some species. Juveniles and immatures usually like adults.

Cosmopolitan throughout the oceans, essentially pelagic; more abundant in cool or cold waters rich in plankton and mostly away from ice. Swim well but usually aerial except when feeding or resting. Fly with alternate swooping and flapping action close to the surface but often arcing high in some gadfly-petrels. Gait on land, a shuffling crouch, being unable to walk properly with feet set so far back; generally avoid open areas on land, being thus vulnerable to predators. Nest colonially; for the most part in burrows and cavities in all sorts of terrain, sometimes far from the sea and in mountainous areas but some species, e.g. *Macronectes*, nest on open ground. Hole-nesters usually nocturnal at colonies, when often extremely vocal, though generally silent at sea. Migratory and dispersive. Some species divide the year between s. and n. hemisphere, often migrating in large flocks that may settle on the sea in huge dense rafts. Feed mostly on fish, cephalopods and crustaceans obtained by flight-feeding, plunge-diving, surface feeding, surface-diving and underwater pursuit; hydroplaning (Murphy) is a characteristic method used particularly by prions.

Probably all defend small nesting territories to which they return regularly while undisturbed; certainly so in some hole- and burrow-nesting forms. Agonistic and sexual behaviour of nocturnal, hole-nesting species very poorly known but generally seem to have little specialization for visual displays. Tactile actions such as allopreening and billing used but olfactory and vocal communication is probably important. Breeding is usually seasonal, generally with synchronized laying, often after a pre-laying exodus but some may not nest annually; some have shorter

cycles or nest continually. For the most part, little attempt to make substantial nests. Eggs, ovate, mat, white. Clutch-size, invariably one; single-brooded; no replacement laying. Incubation by both sexes in alternate spells of 1-11 days. Single median brood-patch. Incubation period, 45-55 days. Eggshells probably always trampled in nest. Young, semi-altricial, nidicolous; hatched in down. Rarely left alone in nest for first 1-2 weeks. Cared for and fed by incomplete regurgitation by both parents. Nestling period generally shorter in cliff- and ledge-nesting species than in hole-nesters. Young attain greatest weight, often well above that of adult, some days before fledging, by which time weight has been reduced to about the same as an adult, but no clear evidence that young are totally deserted for last few days in nest. Adults and young of most species liable to eject stomach-oil in defence. Young independent at fledging. Maturity reached at minimum of 3-4 years, in some 6-12 years.

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*Pterodroma axillaris* Chatham Petrel

*Oestrelata axillaris* Salvin, 1893, in *Bull. Br. Orn. Club* 1: 33 — Chatham Islands.

The Latin *axilla* means 'armpit'; here specifically in adjectival form, referring to diagnostic pattern of underwing.

## MONOTYPIC

**FIELD IDENTIFICATION** Length 30 cm; wingspan 63–71 cm; weight c. 200 g. Small, rather compact gadfly petrel of Cookilaria group. Closely resembles Black-winged Petrel *P. nigripennis* in size and shape, with short stubby bill, small head, slender body, longish, gently wedge-shaped tail (usually tightly folded and appearing pointed) and narrow, finely pointed wings. Head pattern also closely resembles that of Black-winged. Underwing pattern diagnostic. Extremely rare; known only from Chatham Is and adjacent seas. Sexes alike; no seasonal variation. Juvenile undescribed.

**DESCRIPTION ADULT.** In fresh plumage, forehead whitish, merging into grey of crown; combines with white lores and narrow white fore-supercilium to form pale face, conspicuous in head-on views; forehead darkens and becomes greyer with wear, matching crown. Crown, nape and hindneck, uniform light grey, merging without contrast into light-grey mantle and back. Large black patch under eye, contrasting strongly with grey cap and sharply demarcated from white of cheeks, which extends upward behind eye-patch onto posterior ear-coverts, separating eye-patch from extensive grey collar tapering from hindneck toward mid-line of foreneck. Mantle, back, anterior scapulars, upper tail-coverts and uppertail, uniform light grey; latter narrowly tipped dusky when fresh; becoming blacker and more contrasting with wear. In fresh plumage, light-grey upperwings show pronounced black open M across entire span, linked by triangular black rump-patch. Outer part of M formed by blackish outer primaries and adjacent coverts, contrasting with grey-toned inner ones; inner part, by diagonal blackish bar tapering across inner wing-coverts from carpal to longest scapulars, contrasting with light-grey coverts along whole of inner forewing and with grey-toned secondaries and all but innermost few greater and median secondary coverts. Appearance of upperwing substantially altered through wear: progressive loss of bloom to grey-toned areas (except along innermost forewing) results in general darkening of upperwing and reduction in clarity of M; when fully worn, upperwings appear much darker and more uniform brownish-black (M barely apparent) contrasting strongly with light grey of mantle, back and innermost forewing. Underbody, white except for pronounced, nearly complete grey collar; grey at base of collar extends to basal leading edge of underwing, forming small pre-axillary notch. Dark tips of rectrices show as narrow dark rim round tip of tail, contrasting with white under tail-coverts. Underwing, white centrally, broadly margined and narrowly tipped with black. Inner webs of primaries white over basal two-thirds, forming clear white wedge extending well into wing-tip and sharply demarcated from narrow black border round latter. Blackish secondaries form thick dark trailing-edge to innerwing. Wing-lining marked with thick solid black band along anterior border of primary coverts, from base of outermost primary to carpal; band extends diagonally inward

from carpal joint across lining to merge with diagnostic black wing-pit, formed by black subhumeral, subhumeral coverts and axillaries. Innerwing thus marked with bold diagonal stripe continuous from carpal joint to body, a pattern unique among *Pterodroma*. Black diagonal stripe isolates narrow white triangle along inner forewing; triangle abuts wing-base in front of black axillaries and tapers outward towards carpal joint, becoming increasingly mottled with black distally. Wing-lining behind diagonal stripe clear white except for scattering of small black spots in some individuals. Bill, black; short and stubby, with tubed nostrils raised prominently over basal third of upper mandible. Outer toes and distal two-thirds of other toes and webs, black; rest of feet and legs, fleshy pink.

**SIMILAR SPECIES** Unmistakable if diagnostic underwing pattern clearly seen, though otherwise very similar to **Black-winged Petrel**: thick black diagonal stripe, extending inward from carpal joint to merge with diagnostic black wing-pit, forms pattern unique among Cookilaria (and all *Pterodroma*) petrels; all other Cookilaria and larger *Pterodroma* spp that have black diagonal carpal bar across white innerwing show clear-white wing-pit, preventing carpal bar from reaching body. For further differences from Black-winged Petrel, see that account.

Extremely rare and little-known. Restricted to South Pacific Ocean, breeding only on Rangitira I. (formerly South East I.) in Chatham Is, E of NZ; population numbers between 200 and 400 individuals. Only one report away from breeding site. Flight and feeding behaviour undescribed but probably similar to Black-winged Petrel. Avoid land except when breeding. Solitary or loosely colonial breeder, nesting at low altitude on forested, bracken- and grass-covered slopes of Rangitira I. Strictly nocturnal at breeding site. Main flight-call is loud incisive *chee-chee-chee* similar to that of Black-winged Petrel.

**HABITAT** Marine, pelagic; thought to inhabit seas surrounding only breeding station (Chatham Is), but habitat not known.

Breed on Rangitira I., Chatham Is, burrowing in low-altitude coastal slopes and flats; in deep soft loam under low forest, bracken, *Muehlenbeckia* vines or rank grass. Nest among Broad-billed Prions *Pachyptila vittata* and Common Diving-Petrels *Pelecanoides urinatrix*, which may compete for burrows (King 1979).

Endangered; grazing by sheep and cattle has reduced forest and scrub cover on breeding island and increased vulnerability of Petrels to predation by Great Skuas *Catharacta skua*. Sheep and cattle removed in 1955 and vegetation regenerating (King 1979).

**DISTRIBUTION AND POPULATION** Extremely



rare; breeding restricted to Rangitira (formerly South East I., Chatham Is, NZ). Burrows widely scattered with probably fewer than 100 burrows used annually (M.J. Imber). Pelagic distribution unknown; may disperse to North Pacific Ocean (as close relatives do) in non-breeding period (M.J. Imber). Only one recent report away from breeding colonies, at 45°07'S, 176°30'W, c. 120 km SE Chatham Is, 28 Nov. 1970 (Rogers 1980). Reported only once from mainland NZ, at Wairarapa, last century (Buller 1905).

Previously occurred on Chatham I. and Mangere I. (as shown by subfossil bones and listed among foods taken by Moriori people). Status, rare and endangered; total population estimated c. 200–400 birds (M.J. Imber). Extirpated on Chatham I. and Mangere I. where previously exploited by man for food; introduced cats, pigs, rats and dogs possibly contributed to disappearance.

**MOVEMENTS** Unknown away from breeding colonies, except one sighting within 200 km (Rogers 1980).

**DEPARTURE** Breeding adults and chicks leave May–early June; failed and non-breeders having left Apr.

**RETURN** Probably late Nov. or early Dec. (M.J. Imber).

**FOOD** Virtually unknown and never seen feeding. Cephalopods (1 Neoteuthidae, 1 Cranchiidae) recorded in one sample regurgitated at nest; fish (1 Photichthyidae) in another (M.J. Imber).

**SOCIAL ORGANIZATION** Not known; no studies. Usually solitary; outside breeding season, probably not gregarious but no data. No information on bonds though two pairs known to have bred in same burrows in successive years. Solitary nester; probably defending territory round nest-site. When breeding, roosts in burrows, either during day or for full-day period when incubating; possibly roosts at sea when not attending nest and during non-breeding periods; may rest on calm seas (M.J. Imber).

**SOCIAL BEHAVIOUR** Not known and no detailed studies. Displays difficult to observe because few nests found and birds nocturnal; displays may be aerial. Two observations of **FIGHTING** with Broad-billed Prions, probably in competition for burrow; fights noisy (heard several metres away) and blood drawn. Calls probably associated with courtship displays. Building, incubation and chick-raising shared by sexes. No further information. (M.J. Imber).

**VOICE** No detailed studies and poorly known; some observations by M.J. Imber. Call much in flight over breeding colonies; not heard to call from ground or in burrows; no observations of birds at sea. Utter a few sharp but rather quiet calls; similar to calls of Black-winged and Mottled *Pterodroma inexpectata* Petrels. Calls heard between Dec. and Mar.; indicates they probably function in mate selection, advertisement and pair-formation, as typically found in courtship calls of other petrels. Begin calling in full darkness, rate of calling decreasing in early morning and stopping before first light. No information on sexual or individual differences (but see below).

**ADULT** Main aerial call a sharp *chee*, repeated rapidly 2–4 times, thus *chee-chee-chee-chee*. . .; may be by female. Sometimes followed or answered by *coooo* or *wikooo*, which may be given by males. Also utter *wek-wek-wek*. . . call but much less often and less widely over colony; this may also be call given by males. No further information.

**YOUNG** No calls reported but no doubt call when begging for food.

**BREEDING** Information supplied by M.J. Imber. Very poorly known; less than 30 nesting burrows have ever been identified. These have been scattered in colonies of Broad-billed Prions, Common Diving-Petrels and White-faced Storm-Petrels *Pelagodroma marina*; only on Rangitira I., Chatham Is, under forest and scrub.

**SEASON** Late Nov. to early June. Birds arrive by first week of Dec.; probable pre-laying exodus of c. 3 weeks

before laying from late Dec. to mid-Jan. Departure Apr. to early June.

**SITE** Burrows have been found on flat areas to moderate slopes in lowland temperate forest and scrub, among bracken, grasses and in *Muehlenbeckia* vine-thickets; on n. and e. parts of island below 200 m asl. Burrows indistinguishable from those of Prions and Diving-Petrels but larger than those of Storm-Petrels. In deep crumbly loam under forest, easily damaged when walking through area. Compete with Prions and Diving-Petrels for use of burrows but probably used traditionally unless displaced by competitors. Burrows about 0.4–2.0 m long and 10 x 7 cm in diameter.

**NEST, MATERIALS** Shallow or deep bowl near end of burrow; made mostly of dead leaves with some twigs. No further information.

**EGGS** Oval; white. Measurements of only four eggs that have ever been found: 52.2 (50.5–53.7) x 38.5 (37.5–40.1); one weighed 47 g.

**CLUTCH-SIZE** One.

**LAYING** No data on synchronization but the four known eggs were laid in last 10 days of Dec. and first 10 days of Jan. No replacement laying.

**INCUBATION** By both sexes in alternate long shifts, probably of 10–15 days. No further information.

**NESTLING** Semi-altricial, nidicolous. Hatched with dark grey down. No further data on feeding, parental care or growth.

**SUCCESS** No information. Probable predation by skuas *Catharacta*. Competition for burrows with Prions and Diving-Petrels probably leads to failure of nests.

## PLUMAGES

**ADULT** Age of first breeding unknown. In fresh plumage: **HEAD AND NECK.** Crown and nape grey (84), progressively merging to dark-grey (83) at hindneck; feathers in front of eye, narrowly fringed white. White filoplumes on nape and hindcrown. When worn, crown and nape, dark brown (119A), fringed grey (84). Sub-orbital patch, grey-black (82). Forehead, proximal chin and lores, dark-brown (119A), narrowly fringed white; fringes narrower at chin. When worn, fringes largely lost. Rest of chin, lores and foreneck, white. **UPPERPARTS.** Mantle and back, grey (84), fringed light grey (85). When worn, mantle has brown-grey (79) shade; fringes on lower back, pale-grey (86). Rachis more obvious in worn plumage. Lower rump-feathers, dark grey (83); when worn, washed dark-brown (119A). Proximal lateral upper tail-coverts, grey (84), narrowly fringed white. Rest of upper tail-coverts, grey (84), fringed light grey (85). Scapulars, black-brown (119). **TAIL,** grey (84) with brown-grey (80) shade; slight white fringes on t5 and t6; outer web of t6 mottled white and grey (84); t5, uniform grey (84). **UPPERWING.** Remiges and alula, black-brown (119); p1-p3 with narrow white tips to webs. When worn, tertials tipped white. Inner webs of remiges, white. Outer webs of secondaries, narrowly edged dull white. Most coverts fringed dark brown (121), except greater primary and greater coverts, fringed dull white. When worn, innermost greater coverts, dark brown (119A). Primaries extend 7–18 mm beyond tip of tail. **UNDERPARTS,** almost entirely white. On upper breast, feathers form an incomplete half-collar; feathers grey (84), connecting with hindneck, and narrowly fringed pale-grey (86) or white. When worn, retains pale-grey (86), narrow fringes in shoulder area. Thighs vary: feathers either entirely white, with white rachis, or with light-grey (85) mottled patches on webs, or tipped grey

(84) with strong brown-grey (79) shade; rachis coloration also varies, corresponding with web colour. Long under tail-coverts, end c. 1 mm short of tip of tail. Four long axillaries; dark-brown (219), fringed white; longest axillaries have dark-brown (119A) rachis and white basal webs. **UNDERWING.** On primaries, a moderately sharp wedge-shaped white mark on inner web, extending from base, to three-quarters of length of feathers. Most marginal coverts, dark-brown (219), narrowly fringed light grey (85); those closest to body, have white basal webs and narrowly fringed white. Greater and median primary coverts, white; outermost varying marked dark-brown (219) on outer webs. Outermost greater and median coverts, white, varying marked dark-brown (219) on inner webs; innermost greater coverts, dark-brown (219) in inner webs, white on outer. Innermost median coverts, dark-brown (219), narrowly tipped white. Lesser coverts, dark-brown (219). In general, areas of dark-brown (219), form diagnostic diagonal bar across underwing, from axillaries, to carpal joint, and extending along marginal and lesser coverts.

**DOWNY YOUNG** Undescribed.

**JUVENILE** Undescribed, but probably similar to adult in fresh plumage.

**BARE PARTS** Based on photo in NZRD and label data from skins.

**ADULT** Iris, dark brown (219). Bill, grey black (82). Skins at NMNZ: outer toe and webs, black; centre and inner toe and inner web, to first joint, flesh coloured, rest, black.

**DOWNY YOUNG, JUVENILE** Undescribed.

**MOULTS** Few data.

**ADULT POST-BREEDING** Label data on skin at NMNZ: no body-moult in Feb. Moult most likely complete and undoubtedly occurs in winter, from June–Nov.

**POST-JUVENILE** Undescribed.

**MEASUREMENTS** Adult skins (NMNZ).

	MALES	FEMALES
WING	211.0 (8.98; 200–222; 3)	216.5 (2.95; 212–220; 4)
8TH P	138.0 (3.55; 135–143; 3)	137.2 (3.11; 132–140; 4)
BILL	24.6 (0.91; 23.4–25.6; 3)	24.6 (1.10; 23.2–26.0; 4)
TARSUS	30.3 (2.17; 27.3–32.1; 3)	30.4 (0.79; 29.5–31.4; 4)
TAIL	93.3 (2.62; 91–97; 3)	93.7 (2.68; 91–98; 4)
TOE	40.6 (0.65; 39.9–41.5; 3)	38.9 (0.46; 38.1–39.3; 4) *

Oliver (techniques unknown), gives measurements: bill 23.4–25, wing 214–232, tail 92–106, tarsus 28.3–31 and toe 36–40. Additional measurements in Murphy (1929).

**WEIGHTS** Few data. Chatham Is: label data from adult skins, collected Jan. (NMNZ); female, very fat: 197.3; female: 165. Two males, very fat: 231.5, 207.6. No data on seasonal changes.

**STRUCTURE** Wing, long and slender. Eleven primaries; p10 longest, p9 1–5mm shorter, p8 8–13, p7 20–27, p6 33–43, p5 49–61, p4 69–82, p3 89–104, p2 107–120, p1 120–133, p11 minute. Primaries tapering; no emarginations. Twenty secondaries, 3 of tertial form. Twelve rectrices, t1 longest, t6 13–20 mm shorter. Bill, slender; maxillary unguis, hooked at tip. Nostril tubes, rounded and point forwards; c.

25% of bill-length. Outer toe and middle toes about equal; inner c. 86% of middle, hind, claw only c. 11%.

**GEOGRAPHICAL VARIATION** None. Forms superspecies with *P. nigripennis* (Peters). The similarities with *nigripennis* discussed in Falla (1941) and Bourne (1982).

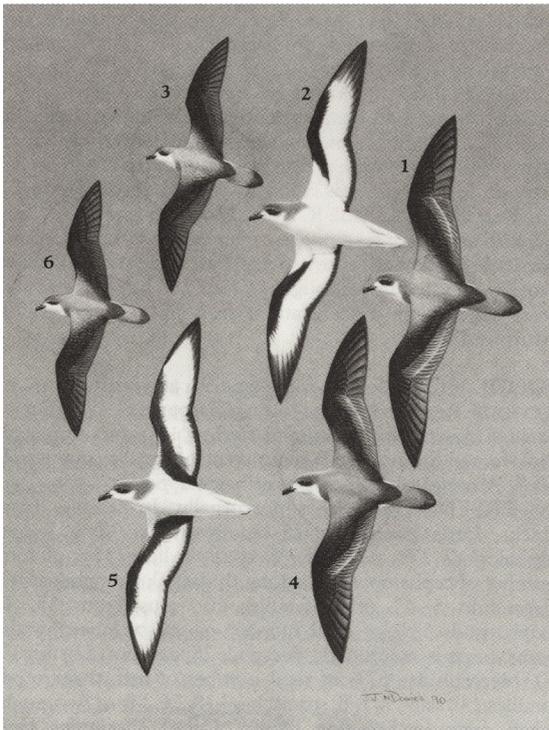
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Black-winged Petrel *Pterodroma nigripennis*

- 1. Adult, dorsal, fresh
- 2. Adult, ventral, fresh
- 3. Adult, dorsal, worn

Chatham Petrel *Pterodroma axillaris*

- 4. Adult, dorsal, fresh
- 5. Adult, ventral, fresh
- 6. Adult, dorsal, worn

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