

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 externa Juan Fernandez Petrel

COLOUR PLATE FACING PAGE 488

Oestrelata externa Salvin, 1875, *Ibis* (Ser. 3) 5: 373 — islands of Mas Afuera and Juan Fernandez.

Named *externa* (or outside) after the former name (Mas Afuera) for Isla Alejandro Selkirk, *mas afuera* simply being the Spanish for 'farther out'.

MONOTYPIC Sometimes regarded as conspecific with *P. cervicalis* (Salvin, 1891) (e.g. Peters).

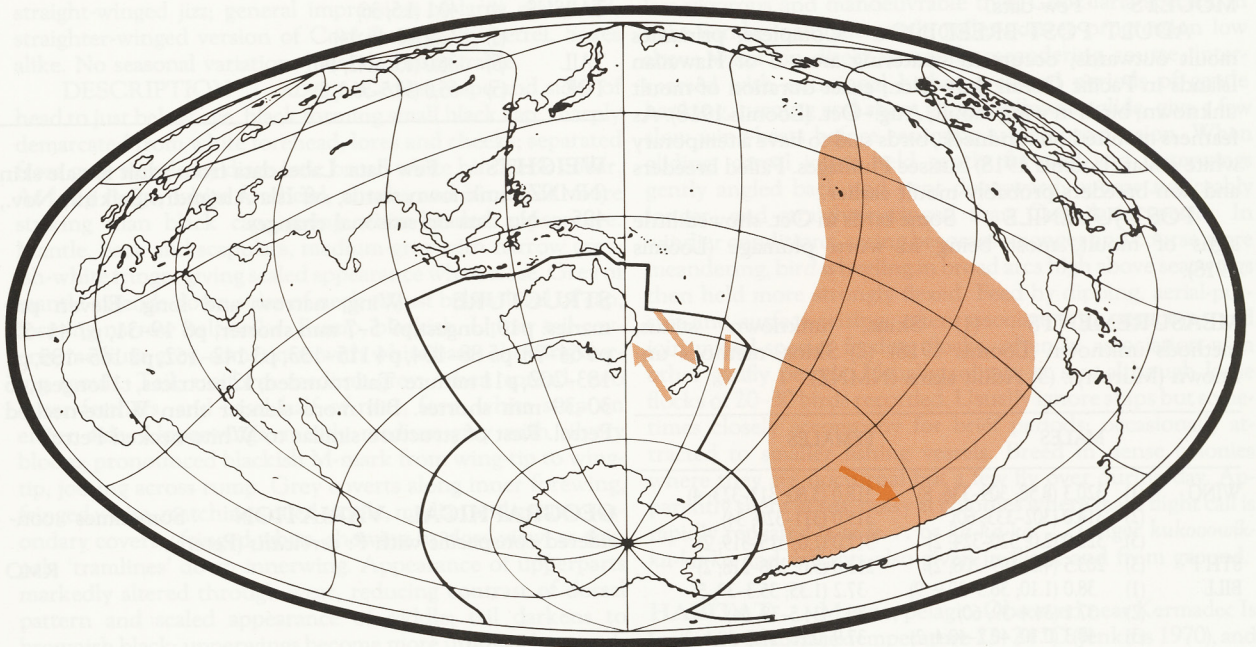
FIELD IDENTIFICATION Length 43 cm; wingspan 97 cm; weight c. 500 g. Large dark-capped grey and white gadfly petrel; closely resembles White-necked Petrel *Pterodroma cervicalis* in size and shape. General impression of large elongate straighter-winged version of Cookilaria gadfly petrel. Underwing pattern diagnostic. Sexes alike. No seasonal variation. Juvenile inseparable.

DESCRIPTION ADULT. Forehead and most of lores, white, forming large square patch sharply demarcated from dark cap (slate-grey crown and slightly darker blackish patch under eye); cap contrasts with medium-grey hindneck and saddle. In strong light, crown appears much paler, greyer, with little or no contrast with hindneck (but contrasting more with blackish eye-patch). Small dark cap emphasizes small-headed, rather flat-crowned jizz. Medium-grey of hindneck extends onto sides of neck, below level of cap, as short broad grey patch or narrow square-ended half-collar, separated from cap by upward extension of white from cheeks. Mantle, back and all but longest scapulars, medium-grey, with narrow paler fringes giving scaled appearance when close. Rump and central upper tail-coverts, blackish; lateral and distal upper tail-coverts, slate grey; concealed white bases of these feathers sometimes exposed, forming scattered pronounced white patches or white horseshoe over base of tail. Tail, slate grey; when spread, white on inner webs of outermost pair of rectrices show as narrow white strip either side. Upperwings, mostly medium grey with silvery bloom; pronounced blackish open M-mark from wing-tip to wing-tip, joining across rump. Grey coverts along inner forewing have white fringes, matching scaled saddle; median and greater secondary coverts also with white fringes, showing as thin pale 'tramlines' down innerwing in close view. Appearance of upperparts markedly altered through wear, resulting in general darkening and reduction in contrast of dorsal pattern and scaled appearance; many develop narrow pale-grey collar bordering dark cap, joining upward extension of white from cheeks and contrasting faintly with rest of hindneck (visible only when close); rest of hindneck and saddle, greyish brown; upper tail-coverts, rump and tail, brownish black, contrasting strongly with paler greyish-brown saddle; upperwings, more uniform brownish black (M-mark barely apparent), contrasting with greyish-brown saddle; some grey tone always retained along innermost forewing, as extension of greyish brown saddle. Underbody, white except for short grey patch or half-collar; dark tips of rectrices show as thin dark rim round tip of tail, contrasting with white under tail-coverts. Pattern of underwing diagnostic: mainly white with narrow sharply defined blackish trailing-edge that continues narrowly round wing-tip to base of outermost primary; trailing-edge broadest across tips of outer primaries (forming small dark tip, covering distal third or less of wing-tip); underwing lining, wholly white except for varying black mark at carpal; either small black patch or short

narrow diagonal bar tapering inward across coverts. Underwing appears wholly white at distance. Bill, black; long and rather prominent, with strongly hooked nail and short nostril tubes raised prominently over basal quarter. Tarsi and basal third of feet, pinkish flesh; rest of feet, black.

SIMILAR SPECIES **White-necked Petrel** closely similar in size, shape and flight; distinguished by wholly white hindneck forming diagnostic broad white collar separating black cap from grey of mantle and back, often visible at considerable distance (worn-plumaged Juan Fernandez may have narrow paler-grey collar but most of hindneck uniform medium-grey). For distinctions from **Barau's Petrel** *q.v.* **Stejneger's Petrel** *P. longirostris* has rather similar small black cap, large white forehead, white intrusion behind dark eye-patch, and grey hindneck but different underwing pattern: thin, often interrupted, black band along anterior border of primary coverts; always has diagonal carpal bar, much longer than on Juan Fernandez. **Gould's Petrel** *P. leucoptera* superficially similar but distinguished by different pattern on head: white on forehead confined to narrow white band above bill and black cap larger, more uniform, extending to mantle and in broad lobe over ear-coverts and sides of neck (forming distinctive helmet). Stejneger's and Gould's much smaller than Juan Fernandez, with more compact appearance: wings appear shorter, more angular (carpal joints held well forward); tail appears shorter; bill, shorter, smaller, more delicate; flight more dashing and manoeuvrable, with tighter bounding and swooping progression and faster crisper wing-beats. **Buller's Shearwater** *Puffinus bulleri* superficially similar but has markedly different jizz and flight: long slender bill; broader more angular wings, carpal joints held well forward; more strongly wedge-shaped tail; does not arc powerfully in flight; in light winds, flight slower and more leisurely, with regular alternation of slow measured wing-beats and long glides low above surface; in strong winds, has less powerful arcing progression on more direct course. Also differs in dark forehead, whiter underwing without carpal bar and black anterior border to primary coverts.

Markedly pelagic but occasionally range into shelf-break waters; avoid land except when breeding. Flight as White-necked and Barau's Petrels (*q.v.*); at all times graceful and effortless, appearing slower, less vigorous and manoeuvrable than Cookilaria species. Feed by surface-seizing, aerial-pursuit, dipping and pattering; frequently associate with cetaceans and join feeding flocks of other seabirds, often in association with other *Pterodroma* species. Usually solitary or in small, loose groups at sea; sometimes form large feeding flocks (up to 200 individuals) near breeding island. Usually ignore ships but sometimes accompany briefly; occasionally attracted to small fishing boats. Breed in mixed colonies with Stejneger's Petrel on upland tree fern-covered slopes. Strictly nocturnal at colonies. Apparently silent at sea but noisy at



colonies where flight call, prolonged sighing whistle, sometimes followed by harsh bark or *wowk*; flying and grounded birds also give booming *boo-boo-boo*; grounded birds utter a chattering call, occasionally also given from within burrow.

HABITAT Marine, pelagic; in subtropical and tropical waters of se. Pacific Ocean (Ainley & Boekelheide 1983); spend non-breeding season in n. Pacific, widespread in central and e. tropical and central subtropical waters (see Distribution). In tropical e. Pacific, associated with s. edge of North Equatorial Current at 10°N, over upwelling associated with current divergence (Pitman 1986). Breed on Juan Fernandez Is; on slopes, ridges and volcanic craters in fern forest (*Dicksonia externa*) or grassland, from 600–1100 m (Johnson 1965; Brooke 1987). Fly high over sea (Harrison 1983).

DISTRIBUTION AND POPULATION Confined to Pacific Ocean, breeding only on Isla Alejandro Selkirk, Juan Fernandez Grp, where estimated 1 000 000 pairs (Brooke 1987). Vagrant to Aust. and NZ. Abundant round Juan Fernandez Grp during breeding season, S to Subtropical Convergence and to 50°S (Harper 1987). Migrate to central Pacific, mainly between equator and 20°N (King 1970; Pitman 1986).

AUST. One captured and photographed, Cessnock, NSW, Oct. 1988 (J. Martindale). Record off Wollongong, 10 Aug. 1985 (NSW Bird Rep. 1985) not published with supporting details and cannot be accepted. Earlier report of single, sighted off Gabo I., 4 Feb. 1985 (Vic. Bird Rep. 1985) withdrawn by observer (D.W. Eades).

NZ One, Ngahinapouri, 22 Oct. 1971 (Reed 1972, 1976) and two, South East I., Chatham Is (Guest & Bell 1989).

MOVEMENTS Trans-equatorial migrant to North Pacific from breeding grounds on Isla Alejandro Selkirk off s. South America where present Oct.–June (Harrison 1983; Harper 1987; Jehl 1973). Most sightings of non-breeding birds 2–18°N from 98°W to at least 157°W (Pitman 1986). Birds

recorded NZ and e. Aust. presumably vagrants dispersing farther W than usual.

PLUMAGES Similar to White-necked Petrel; differences only described below.

ADULT Age of first breeding unknown. **HEAD AND NECK.** Crown to hindneck, dark brown (121), fringed grey (84); concealed bases of feathers, white; sometimes exposed on anterior hindneck during moult. Reports (e.g. King 1967) that moulting individuals (in winter quarters, c. June–Oct.) develop temporary white cervical collar (recalling broad white hindneck collar of White-necked Petrel) apparently based on museum specimens (Loomis 1918) and remain uncorroborated by field observation. Dark eye-patch (running from posterior lores, under eye and onto anterior ear-coverts); white fringes on forehead similar to White-necked Petrel. **UPPERPARTS.** M-mark less prominent, lacking sharp contrast with other feathers as in White-necked Petrel. **TAIL,** white; rachis tipped dark brown or black on all rectrices (Loomis 1918). **UNDERWING.** Primaries, pale black-brown (119) with white inner margins of inner webs, extending for three-quarters of length as sharp wedge; outer margin of web, edged dark-brown (121). All coverts, white except some marginal primary coverts dark brown (219), narrowly tipped white or mottled white on inner webs. Marginal coverts from carpal joint, for one-quarter length of radius-ulna bone, dark-brown (219) narrowly fringed light-grey (85). Lesser coverts similar, but extending for half length of radius-ulna bone. Median coverts similar to lesser coverts, but tipped white. Rest of coverts, white. Dark coverts sometimes form diagonal bar across underwing, from carpal joint to about half the length of radius-ulna and extending along marginal primary coverts to base of p10.

DOWNY YOUNG Covered in slaty grey down (NZRD); more detailed description required; unknown if two stages of down exist.

JUVENILE Similar to adult.

BARE PARTS Similar to White-necked Petrel (*q.v.*).

MOULTS Few data.

ADULT POST-BREEDING Complete; primaries moult outwards; occurs in wintering area, S of Hawaiian Islands in Pacific Ocean, July–Oct.; exact duration of moult unknown; birds in wing moult, Aug.–Oct. (Loomis 1918). As feathers moulted on hindneck, birds said to have a temporary white collar (Loomis 1918) but see Plumages. Failed breeders and non-breeders probably moult earlier.

POST-JUVENILE Some birds in Oct. showed little signs of moult, most being in worn plumage (Loomis 1918).

MEASUREMENTS (1) Skins, unknown status; methods unknown (Loomis 1918). (2) Skins; methods unknown (Murphy). (3) Adult skins (NMNZ).

	MALES	FEMALES
WING	(1) 320.3 (8.58; 309–336; 8) (2) 314.0 (302–333; 60) (3) 322.0 (2.0; 320–324; 2)	318.0 (3.80; 313–323; 4) 315.0 (311–320; 34) 317.0 (2.0; 315–319; 2)
8TH P	(3) 203.5 (4.5; 199–208; 2)	213.0 (5.0; 208–218; 2)
BILL	(1) 38.0 (1.10; 36.5–39.9; 9) (2) 37.1 (34.4–39; 60) (3) 40.3 (0.10; 40.2–40.4; 2)	37.2 (1.35; 35.3–39; 5) 36.2 (34.5–38; 34) 37.9 (0.20; 37.7–38.1; 2) *
TARSUS	(1) 35.9 (1.37; 33.1–37.6; 10) (2) 38.9 (36.8–39.9; 60) (3) 39.2 (0.10; 39.1–39.3; 2)	35.4 (1.26; 33.4–37; 5) 38.6 (37.2–40.2; 34) 38.9
TAIL	(1) 141.4 (5.44; 133–150; 10) (2) 137.0 (127.8–143.1; 60) (3) 132.0 (11.00; 121–143; 2)	135.4 (2.33; 132–138; 5) * 133.1 (124.6–138.4; 34) 140.5 (0.50; 140–141; 2)
TOE	(1) 52.0 (2.11; 49–55.9; 10) (2) 50.1 (47.2–53.2; 60) (3) 50.2 (4.10; 46.1–54.3; 2)	50.5 (1.88; 47.7–53.0; 5) 50.0 (46.6–52.8; 34) 54.8 (0.20; 54.6–55; 2)

Unsexed birds: (4) Isla Alejandro Selkirk, adult breeders; methods unknown (Brooke 1987). (5) unsexed skins (NMNZ); methods unknown (Falla 1976).

	UNSEXED
WING	(4) 319.0 (6.6; 36)
BILL	(4) 38.2 (1.14; 36) (5) 36.4 (37.7–41.1; 5)

TARSUS	(4) 40.1 (1.5; 36) (5) 42.0 (40–46; 14)
TAIL	(5) 136.0 (132–142; 14)
TOE	(5) 55.0 (53.5–56.3; 5)

WEIGHTS Few data. Label data from adult female skin (NMNZ), unknown status, off Isla Alejandro Selkirk, Nov., 495 g. No data on seasonal changes.

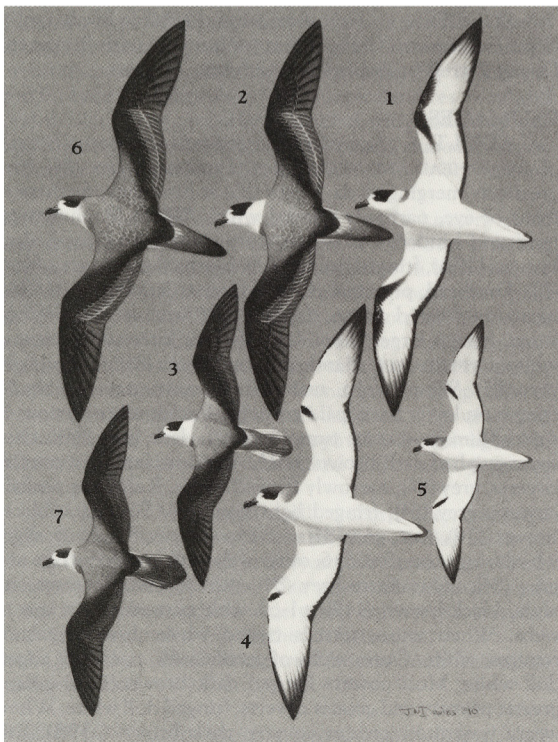
STRUCTURE Wing, narrow and long. Eleven primaries: p10 longest, p9 5–7 mm shorter, p8 19–31, p7 41–52, p6 64–78, p5 88–104, p4 115–133, p3 142–162, p2 165–185, p1 183–202, p11 minute. Tail rounded; 12 rectrices, t1 longest, t6 30–39 mm shorter. Bill more slender than White-necked Petrel. Rest of structure similar to White-necked Petrel.

GEOGRAPHICAL VARIATION Sometimes considered conspecific with *P. cervicalis* (Peters).

RMO

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White-necked Petrel *Pterodroma cervicalis*

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

Juan Fernandez Petrel *Pterodroma externa*

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

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