

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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Puffinus creatopus Pink-footed Shearwater

Puffinus creatopus Coues, 1864, *Proc. Acad. nat. Sci. Philadelphia*: 131 — San Nicolas Island, California.

Specific name compounded from Greek κρέας (flesh, meat) and πούς (foot).

MONOTYPIC

FIELD IDENTIFICATION Length 48 cm; wingspan 109 cm. Large thickset shearwater with polymorphic plumage; always dark grey or grey-brown above, scaled paler on saddle and inner wing but varying in plumage below. Lightest birds show mainly white underbody with fine dark spotting and barring; underwing lining mainly white with varying blackish-brown mottling. Darkest birds darker on flanks, neck and sides of breast and more densely spotted and barred with dark on chin and throat (giving strongly dark-hooded appearance). Intermediates form most of population. Heavy dark-tipped pink bill, pink legs and feet and lumbering flight combined with structure give general resemblance to Flesh-footed Shearwater *Puffinus carneipes* but with pattern of plumage most like light morph of Wedge-tailed Shearwater *P. pacificus*. Sexes alike. No seasonal variation in plumage. Juveniles inseparable from adults.

DESCRIPTION **ADULT.** **Lightest birds.** Cap and hindneck, dark grey-brown, appearing slightly darker and more uniform than mantle or back. Rest of dorsum, dark grey-brown with strong greyish bloom obvious in fresh plumage, particularly on remiges and greater secondary coverts. Narrow whitish fringes to mantle, back and scapulars impart scaled aspect to dorsum. Greater secondary-coverts narrowly fringed white, forming thin pale tram-lines along upperwing. In some lights, fresh-plumaged birds show subtle dark M across upperwings. In worn plumage, grey bloom lost and whole upperparts become quite brown, with pale fringing reduced or faded, giving patchy appearance to saddle. Grey-brown of cap merges into white underbody via zone of dark speckling across cheeks which continues as irregular wavy barring down sides of neck, merging into more solid grey-brown on sides of upper breast. Rest of underbody from centre of chin to vent mainly white except for light barring along flanks (continuous with barring on sides of neck) and small dark-brown thigh-patch. Dark undersides of rectrices and grey-brown under tail-coverts (variably mottled with white) form dark rear-end to underbody. Undersides of remiges, glossy blackish brown, forming dark trailing-edge and large solid dark tip to underwing. Underwing lining, mainly white, with narrow blackish border along outerwing extending onto lesser and median primary coverts as series of bold dark streaks radiating inwards across white ground. Thin dark border continues along leading-edge of innerwing, behind which lining varyingly peppered and tipped with grey-brown, forming ill-defined dusky triangle (sometimes faintly pale-centered) in wing-pit, emphasized by broad dark tips of sub-humeral coverts. Rest of wing-lining, mainly white apart from subterminal dusky smudging to greater secondary coverts (increasing breadth of dark trailing-edge). Thus dusky wing-pit triangle and bold dark streaking on primary coverts combine with dark remiges to give underwing pattern strongly recalling that of Hutton's Shearwater *P. huttoni*. **Darkest birds.** Dorsum essentially identical to light birds but

with narrower, less conspicuous pale fringing to mantle, back and scapulars. Grey-brown of head and neck extends further onto sides of breast (giving strongly dark-hooded appearance) and more solidly and broadly down flanks, merging into extensive grey-brown under tail-coverts. White chin and centre of throat more densely speckled and barred with grey-brown. Narrow grey-brown barring on vent and belly imparts dirty white or grey-bellied aspect to underbody. Underwing lining much darker, with pattern of bold dark streaking across primary coverts retained but leading half of innerwing lining including wing-pit triangle more or less solid blackish brown as are tips of all greater coverts; only clear areas of white are those on exposed bases of greater coverts and on some inner median primary coverts, which appear as tapering diagonal whitish stripe down central underwing, recalling underwing pattern of Sooty Shearwater *P. griseus*. **All birds.** Bill, strong, long, with tubed nostrils conspicuously raised over basal third of upper mandible; pink to yellowish pink with conspicuous blackish tip (in close views, dusky culmen and darker sulcus stripe also apparent). Legs and feet, pink; outer toe and outer side of tarsus, brownish; tips of toes fall short of tail-tip in flight.

SIMILAR SPECIES Great care required to separate lightest morph from light morph of **Wedge-tailed Shearwater** *Puffinus pacificus*, particularly those with darkest underwings; Pink-footed appears slightly larger with bigger head and thicker neck set on heavier, more thickset body; wings look slightly broader and tend to be held straighter, less angled at carpals, so that tips appear more rounded and carpals not held so far forward. Clearest difference lies in much shorter and far less wedged tail of Pink-footed, never matching long, narrow, pointed (when closed) or strongly graduated wedge-shaped (when fanned) tail of Wedge-tailed. Bill of Pink-footed more robust, appearing thicker throughout length, with much greater contrast between well-defined black tip and pink base in good views (bill of Wedge-tailed never pink; greyish with less contrasting dark tip). More dark plumage on sides of breast and more extensive dusky spotting and barring on neck and sides of throat give darker, more strongly hooded appearance to head than in Wedge-tailed. Underwing also appears darker, with bolder and more extensive dusky streaking on primary coverts and generally more extensive dusky mottling over inner wing-lining, producing more solid dark wing-pit without clear pale centre of Wedge-tailed (Stallcup *et al.* 1988). Dusky smudging to greater secondary coverts and elsewhere on wing-lining adds to impression of broader, more diffuse dark border to underwing and dirty white wing-lining of Pink-footed. Flight of Pink-footed heavier, more lumbering than Wedge-tailed. Darkest morph of Pink-footed and most intermediates clearly darker about head, on flanks and on underwing than darkest light-morph Wedge-tailed. Also superficially resembles **Buller's Shearwater** *P. bulleri*. Wingspan and bulk noticeably greater

than Buller's, and Pink-footed always browner above without clear grey saddle and rump of Buller's, and Pink-footed never shows striking dorsal pattern or neat dark cap of Buller's; underwing of Buller's always lined clear white, with much thinner dusky border along trailing-edge and round extensively white wing-tip; flanks, vent and undertail always clear white in Buller's, whose all-dark bill plus size, structure and pattern of flight clearly distinguish it from Pink-footed. At distance, can be confused with **Streaked Shearwater** *Calonectris leucomelas*, which also has brownish dorsum, long pale bill and broad dark trailing-edge and tip to underwing but easily separated by conspicuous white face, less extensive dusky marks on inner underwing lining, never with dusky triangle in wing-pit, and clean white flanks, vent and under tail-coverts. Noticeably greater wingspan, skinnier-bodied jizz, longer and narrower tail and more slender greyish bill, with subterminal dark mark rather than black nail of Pink-footed, also differentiate the two. Conspicuously smaller than **Cory's Shearwater** *Calonectris diomedea*, with difference in size most obvious in lesser wingspan and shorter tail of Pink-footed.

Observed singly or in large flocks often with other shearwaters. Flight languid and unhurried, with long low glides to sea on gently drooped wings, broken by brief bursts of laboured flapping; flight faster and stronger in higher winds, bird arcing and banking higher. Flight-style identical to that of Flesh-footed Shearwater but more laboured and less manoeuvrable than Wedge-tailed Shearwater. Feed by surface-seizing and pursuit-plunging. No information on calls.

HABITAT Marine, pelagic. In subantarctic and subtropical e. Pacific Ocean; migrate N to seas off w. North America in non-breeding season. In breeding range, observed in seas of surface-temperature 14–19 °C; enter Chilean fiords where water is warm and highly saline (Brown *et al.* 1975). Few birds stay in South Pacific Ocean during non-breeding season, especially during years of *peste* (El Niño Southern Oscillation;

Ainley 1976). Off North America, occur over offshore and pelagic waters (Baltz & Morejohn 1977); numbers high when waters unusually warm, and low when coastal upwelling weak (Ainley 1976). Breed on forested hillsides and ridge-tops of islands up to 500 m asl (Murphy). Plunge-dive to take food from below surface; rarely submerge completely (Brown *et al.* 1978).

DISTRIBUTION Vagrant to Aust. and NZ. Occurs in e. Pacific Ocean. Breeds on Mocha, MasAtierra and Santa Clara Is, Juan Fernandez Grp, Chile. Non-breeding season spent at sea off w. North America, generally N of 10°N: from Mexico to British Columbia (Murphy; Pitman 1986; Palmer 1962). Occasionally reaches Gulf of Alaska and s. Bering Sea (AOU). Stragglers recorded Hawaii, Kiribati.

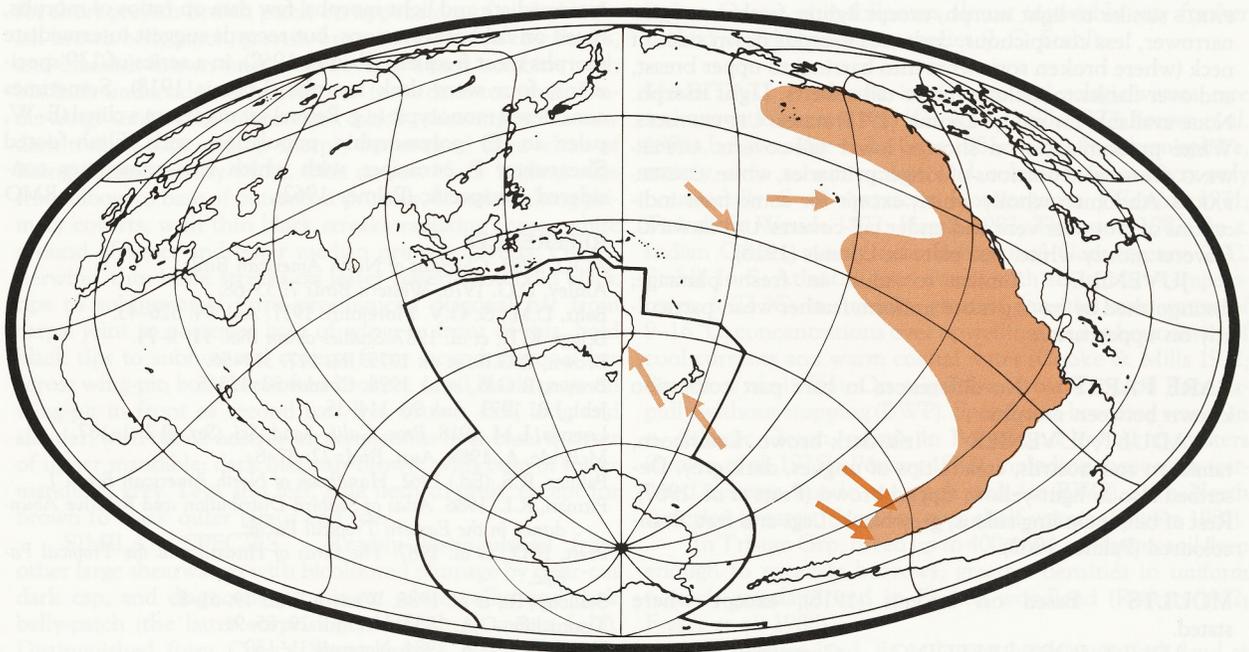
AUST. One, sighted 21 km E of Wollongong, NSW, Mar. 1986 (McBride 1989).

NZ About four, sighted off Canterbury Bight, SI, June 1979 (initially misidentified as Cory's Shearwater; Tunncliffe 1982, 1984).

MOVEMENTS Trans-equatorial migrant from breeding islands off w. coast South America to n. South Pacific and e. North Pacific Oceans (Ainley 1976; Murphy), leaving Mar.–Apr., returning Nov.–Dec. with a few remaining off s. Chile in winter (Jehl 1973). Common off California Apr.–Nov., most frequent Aug.–early Oct., particularly during years of *peste* off Peru (Ainley 1976; Briggs *et al.* 1987).

PLUMAGES Polymorphic; birds show complete gradation from light to dark morphs; intermediates most common, vary in plumage of underparts (Palmer 1962). More concise descriptions of light and dark morphs needed.

ADULT Intermediate morph. Age of first breeding unknown. **HEAD AND NECK.** Feathers of crown and hind-neck, dark-brown (119A) to black-brown (119), fringed slightly paler; concealed bases of feathers, light grey-brown (119D). Lores, dark-brown (119A), narrowly tipped white.



Short white filoplumes on nape, malar region and ear-coverts. Sides of head and neck, dark-brown (119A); feathers on lower malar region and on outer margins of foreneck, white, with subterminal pale dark-brown (119A) webs, tipped white; on lower foreneck, these feathers form an incomplete collar; pattern of feathers gives barred appearance. Chin and rest of foreneck, white. **UPPERPARTS.** Feathers of mantle, black-brown (119) with open pennaceous dark-brown (119A) subterminal fringes; narrowly tipped white; concealed bases of feathers, light grey-brown (119D). When worn, white tips on mantle largely lost. Back, rump and upper tail-coverts, black-brown (119), with open pennaceous dark-brown (119A) fringes; scapulars similar to mantle, but white tips narrower. **TAIL,** black-brown (119). **UPPERWING.** Most coverts, including alula, dark-brown (119A) to black-brown (119), with open pennaceous dark-brown (119A) fringes; greater coverts tipped white; when worn, white tips lost. Rest of upperwing, black-brown (119); when worn, tips dark-brown (119A). Inner webs of remiges, dark brown (119A), white basally and mottled white at demarcation. Assumed to differ from adult light morph by having darker inner web (see below). **UNDERPARTS,** mostly white. Outer margins of breast, pale dark-brown (119A) with broad subterminal brown-grey (80) fringes, tipped white. Flanks, white with mottled pale dark-brown (119A) webs; vent and lower abdominal feathers have pair of narrow subterminal pale dark-brown (119A) bars. Thighs and under tail-coverts, dark-brown (221); fringes on under tail-coverts slightly paler. Axillaries, dark-brown (221), tipped white; basal inner web, white; smaller axillaries, mottled white. **UNDERWING.** Greater primary coverts and greater coverts, white, with pale dark-brown (121) subterminal mottling on webs. Median primary coverts, white on outer webs, with irregular broad subterminal dark-brown (221) patch on inner webs; dark-brown (221) patch extends onto outer webs on rest of median coverts. All lesser coverts, white with narrow dark-brown (221) shaft-streaks. Marginal coverts, dark-brown (121), narrowly tipped white. **Dark morph.** None available for study; see description and plate in Loomis (1918) and Field Identification. Palmer (1962) states: **UPPERPARTS** and **UNDERPARTS** similar to light morph, except lighter feather margins narrower, less conspicuous; dark area extends down sides of neck (where broken somewhat into barring) to upper breast, and over flanks to include under tail-coverts. **Light morph.** None available for study; Loomis (1918) states: **UPPERPARTS.** White predominates on shorter lower tail-coverts. **UPPERWING.** Concealed portions of longer primaries, white. **UNDERPARTS.** Abdomen wholly white, except for some faint indications of grey near vent and under tail-coverts. **UNDERWING.** Coverts mostly white. See plate in Loomis (1918).

JUVENILE Similar to adult in fresh plumage; distinguished by having more uniform feather wear, particularly on upperparts.

BARE PARTS No differences in bare part coloration known between morphs.

ADULT, JUVENILE Iris, dark brown. Latericorn, ramicorn and nostrils, cream; tips of unguis, dark grey. Described also as light-yellow, tipped brown (Pratt *et al.* 1987). Rest of bill, including sulcus, grey-black. Legs and feet, flesh-coloured (Palmer 1962).

MOULTS Based on Loomis (1918), except where stated.

ADULT POST-BREEDING Complete; primaries

moult outwards; up to six inner primaries growing at one time. Inner primaries moulting at same time as greater and lesser wing-coverts, as well as body-moult of head and lower tail-coverts. Tail-moult also at this time; central rectrix and t3 replaced, others later (skins at NMNZ). Order of replacement, inferred from specimens as: primaries, wing-coverts, tail and secondaries. Moult occurs May–Nov. in n. hemisphere (e.g. off California); birds moulting as early as Feb. most likely non-breeders or failed breeders. Birds in worn plumage in Apr. represent breeders. Some traces of body-moult in breeders during later stages of breeding; type of body-moult not specified (Palmer 1962). For full details of moult observed in specimens, with month, see Loomis (1918).

POST-JUVENILE Undescribed.

MEASUREMENTS (1) Adults; methods unknown (Murphy).

		MALES	FEMALES
WING	(1)	331.0 (321–342; 22)	330.0 (322–340; 16)
TAIL	(1)	111.7 (106.8–116.5; 22)	112.3 (107–118.5; 16)
BILL	(1)	42.9 (40.3–46.5; 22)	41.3 (39.9–43.2; 16)
TARSUS	(1)	54.4 (52.5–56.3; 22)	54.0 (50.4–56.3; 16)
TOE	(1)	67.7 (62.9–70.3; 22)	67.0 (64.3–72; 16)

(2) Adults, sexes combined; methods unknown (Palmer 1962).

WING	(2)	330.0 (318–337; 18)
TAIL	(2)	116.0 (114–122; 18)
BILL	(2)	42.4 (41–46; 18)
TARSUS	(2)	54.3 (53–56; 18)

Additional measurements in Loomis (1918).

WEIGHTS No data.

STRUCTURE Similar to Flesh-footed Shearwater (*q.v.*).

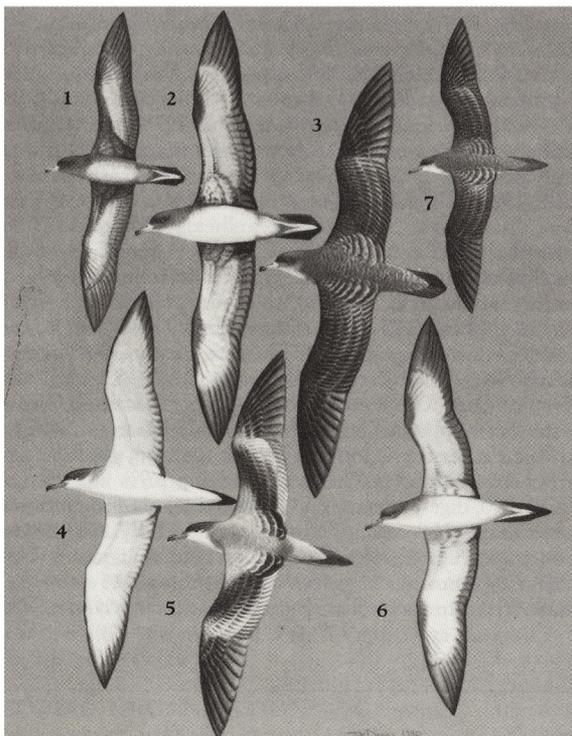
GEOGRAPHICAL VARIATION Polymorphic; dark, intermediate and light morphs; few data on ratios of morphs, based on field observations, but records suggest intermediate morphs most frequent (Palmer 1962); in a series of 139 specimens, four were dark morphs (Loomis 1918). Sometimes considered monotypic (e.g. Peters), or may form a clinal (E–W, paler in E) polymorphic population with Flesh-footed Shearwater *P. carneipes*, with which it is sometimes considered conspecific (Palmer 1962). RMO

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Pink-footed Shearwater *Puffinus creatopus*

- 1. Adult, dark morph, ventral
- 2. Adult, light morph, ventral
- 3. Adult, dorsal

Buller's Shearwater *Puffinus bulleri*

- 4. Adult, ventral
- 5. Adult, dorsal

Wedge-tailed Shearwater *Puffinus pacificus*

- 6. Adult, light morph, ventral
- 7. Adult, light morph, dorsal

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