

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: Diomedeidae 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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Procellaria leucomelas Temminck, 1835, *Planches col.* 99: 587 — seas of Japan and Nagasaki Bay.

The generic name means 'beautiful swimmer' (καλός + νηκτρόν); the specific, light-and-dark or dusky, (λευκός + μέλας) in reference to its plumage.

OTHER ENGLISH NAMES White-fronted or White-faced Petrel or Shearwater.

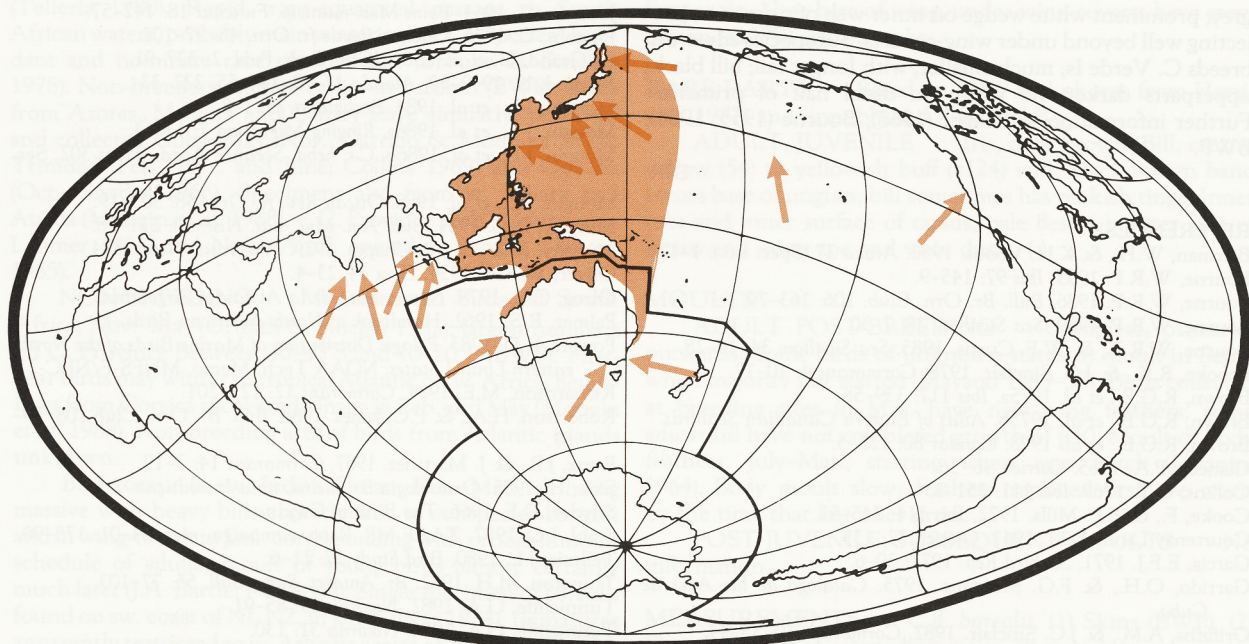
Streaked, though not so widely used in the literature as the two other qualifiers, seems to have gained ground recently and is preferred for simplicity and suitability.

MONOTYPIC

FIELD IDENTIFICATION Length 48 cm; wingspan 122 cm; weight 440–538 g. Very large shearwater, obviously larger than Wedge-tailed *Puffinus pacificus* and Buller's *P. bulleri* Shearwaters. Jizz distinctive: long slender bill, small head, flat crown, long slender neck and body tapering to long wedge-shaped tail; chest angular in profile; wings, very long and broad, large in comparison to body; carpal joints held well forward, outerwings angled back slightly and bowed down. Mostly white below, brownish above with diagnostic white face, finely streaked black. Sexes alike. No seasonal variation. Juveniles inseparable.

DESCRIPTION ADULT. Forehead and forecrown, white streaked with dark brown (narrowly on forehead, heavily on forecrown), merging into dark brown of rear crown, nape and hindneck. Ear-coverts and cheeks, white conspicuously streaked dark brown. Pronounced white eye-ring. Mantle, back and scapulars, dark brown with narrow pale-brown or white fringes, giving scaled appearance to saddle

when close; saddle slightly paler, warmer brown than dark brown of head and neck. Rump, dark brown. Upper tail-coverts, dark brown with narrow pale-brown or white fringes, sometimes with white stripe either side forming prominent V-mark over base of dark-brown tail. Upperwing: inner wing-coverts, dark brown with narrow paler-brown fringes (matching saddle), contrasting with darker blackish secondaries and outerwing; in some lights, hint of diffuse diagonal dark bar across innerwing from carpal joint to base of trailing-edge combining with dark outerwing to give subtle M-mark. Underbody, white except for dark brown half-collar extending broadly from hindneck onto sides of neck and upper breast; sometimes front of collar extends to mid-line of fore-neck; underside of tail, blackish forming narrow dark rim round tip of tail. Underwing: remiges, blackish forming broad dark trailing-edge and large dark tip, sharply demarcated from mostly white lining. Outerwing lining, white except for thick dark leading-edge between carpal joint and base of outer pri-



mary (blackish-brown marginal coverts and heavy blackish streaking on lesser coverts), bold dark bar through middle of primary coverts (broad blackish brown streaks and tips of median coverts) and broad blackish-brown tips on outer greater primary coverts. Innerwing lining, white except for dusky diagonal bar from carpal joint to behind elbow (bold blackish-brown streaks on lesser coverts). Dark markings on wing lining often difficult to see in strong light. Bill, long and slender with tubed nostrils raised prominently above base of upper mandible; pale grey with narrow dusky subterminal band across base of nails. Iris, dark brown. Feet, flesh-pink, slightly darker on outer side of toes, especially on joints.

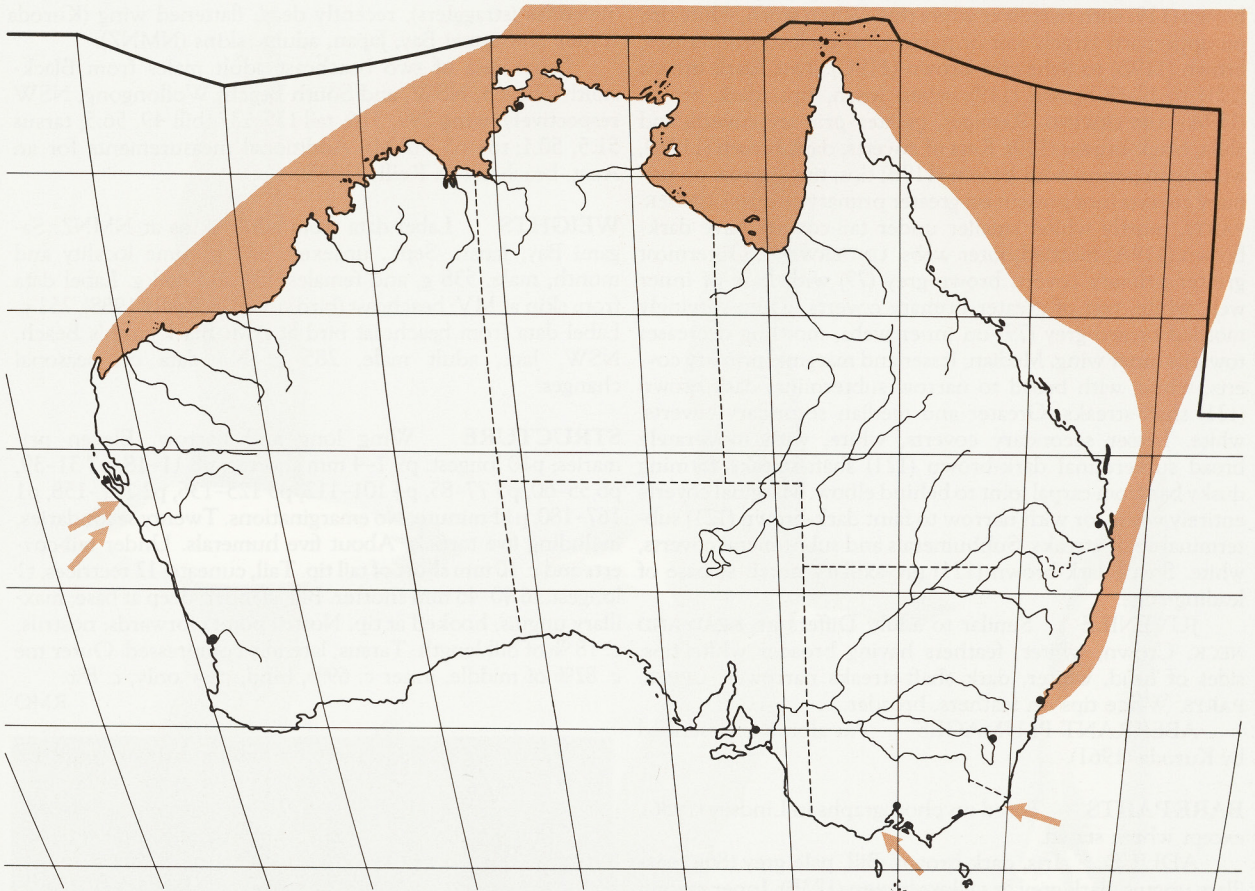
SIMILAR SPECIES Distinctive large shearwater; pattern of white forehead, forehead and face with dark brown streaking, diagnostic and conspicuous at considerable distance (all other shearwaters have dark forehead without streaking on head); white eye-ring also unique among shearwaters. **Light-phase Wedge-tailed Shearwater**, has similar all-dark remiges, brownish upperparts, and flight (but may glide less and wing-beats may appear less powerful); obviously smaller with shorter darker bill and shorter neck; wings, more slender, tending to be held slightly more angled; tail, more markedly wedge-shaped; no white on face or streaking on head; no white V on upper tail-coverts. **Buller's Shearwater**, obviously smaller with shorter, dark (not pale) bill and shorter neck; wings tend to be held slightly more angled; upperparts, light grey with striking dark M-mark across upperwings and no white V on upper tail-coverts; forehead and sides of head, all dark, without streaking; underwing with narrower grey (not black) trailing-edge that continues narrowly round wing-tip, leaving most of primaries white; underwing lining, clean white. **Cory's Shearwater**, slightly larger, stockier with larger head and thicker neck; bill, thicker, yellow; head, uniform grey without white face or streaks; underwing whiter: less dark streaking on primary coverts (only on lesser coverts), no dark bar across median primary coverts or dark tips to greater primary coverts. **Pink-footed Shearwater** superficially similar but smaller, stockier, with larger head, shorter neck, shorter tail and narrower

wings; bill, thicker, pink; forehead and sides of head, all dark, without streaking; upperparts, uniform greyish brown; no white V on upper tail-coverts; flanks mottled brownish; under tail-coverts, dark brown, not white; dusky triangle in wing-pit. **Great Shearwater** has dark bill; white collar contrasting with black cap; upperparts, more neatly scaled, though shares white tips to upper tail-coverts; dark patch on belly; dark under tail-coverts; and dark bars across wing-pit.

Pelagic; tropical and subtropical waters. Occur at shelf-break and common over shelf waters but not usually in sheltered habitats such as reef waters and bays, except during gales. Occasionally seen from land. Fly gracefully and slowly, almost albatross-like; often close to surface, in lazy arcs interspersed with leisurely flapping. Arc more and flap less in strong winds. Viewed head-on, wings bowed down. When sitting on sea, neck extended so that head held high and erect, emphasizing slender neck (Carter 1983a). Follow fishing boats but not large ships. Feed by surface-seizing. Occur singly, frequently in small groups or occasionally, in n. Aust. seas, in large flocks mixing with other shearwaters, storm petrels, terns and boobies (Carter 1983a). Rest in rafts on sea.

HABITAT Marine, pelagic; in waters of nw. Pacific Ocean; move S to tropical w. Pacific in non-breeding season, when widespread and locally common in New Guinea and n. Aust. waters. Occur over pelagic waters and inshore waters; in n. Aust., usually > 18 km from mainland coast (Carter 1983a) but elsewhere sometimes close inshore. In breeding range, usually within 180 km of land; gather along current rips (Saotome 1969). Take food from on or below sea surface, not submerging completely (Kuroda 1954).

DISTRIBUTION Breed n. hemisphere in nw. Pacific Ocean on islands off Korea, China and Japan during s. winter; move into tropical w. Pacific in s. summer. Main wintering area believed to be equatorial seas N of New Guinea where at times abundant (King 1967). Found in some numbers off s. coast of Papua New Guinea (Carter 1983a). Occasionally to Sri



Lanka and Maldives, Indian Ocean; vagrant e. Pacific (King 1967; Harrison 1983). No records NZ.

AUST. Records from all states except Tas. and SA. Almost unknown in Aust. waters until 1970s when interest in pelagic seabirds increased, and studies made in area of Aust. distribution of Streaked; now considered to be fairly common in n. Aust. seas, from Timor to Torres Str., and regular, if uncommon, in e. Aust., at least between Brisbane, Qld and Wollongong, NSW (Carter 1983a; Corben 1987). **Qld.** First record, three beachcast, North Stradbroke I., 15 Mar. 1974; collected Raine I., 12 Dec., 1979; several records North Stradbroke I., Jan.-Mar. 1982-83; common Torres Str.; usually in low numbers, off North Stradbroke I., Dec.-Mar., probably regular summer visitor; one seen 9 Aug. 1986, off North Stradbroke I. (Vernon & Martin 1975; Carter 1983a; Qld Bird Reps 1983-86). **NSW.** Uncommon but regularly recorded off coast, S to Wollongong; usually between late Dec. and Apr. except for one record of single bird off Ballina, 10 Sept. 1984; usually single birds though 30+ seen off Sydney, 27 Mar. 1982 (Carter 1983a; NSW Bird Reps 1982-85). **Vic.** One collected, 5 Mar. 1978; one seen, 17 Mar. 1978 near Gabo I.; one beachcast Fairhaven, Aireys Inlet, 18 Feb. 1987 (Barton 1978; Reilly 1988). **WA.** Two seen, 8 Nov. 1979, Timor Sea. Many seen c. 50 nautical miles off coast N of Broome, Nov.-Dec. 1980; 30 seen, 53 km from Geraldton, 10 May 1981; three seen, Roebuck Bay, Broome, 19 Sept. 1984; several dozen seen 50 km S Steep Pt, Zuytdorp Cliffs, mid-Mar. 1988; 50-100 seen, 50 km N of North I., 4 Apr. 1988 (McKean 1980; Johnstone 1982; Carter 1983b; WA Bird Reps 1984, 1988).

NT. Quite common Arafura Sea during summer (Shuntov 1972; Carter 1983b).

MOVEMENTS Migrant from breeding grounds in Japan and Korean Pen. to seas between s. Japan and n. Aust. Most birds banded Japan recovered Philippines (McClure 1974) but have been detected in large numbers off ne. PNG in Jan. and Feb. (N.G. Cheshire), and n. Aust. where apparently present Oct.-Mar. (Shuntov 1972; Vernon & Martin 1975; Gibson 1975; Carter 1983a; Smyth & Corben 1984; Aust. Atlas) with some birds occasionally reaching s. Aust. waters down both e. and w. coasts (Barton 1978, 1984; Reilly 1988) though generally keeps offshore (Carter 1983a).

PLUMAGES

ADULT Age of first breeding unknown. In fresh plumage: **HEAD AND NECK.** Feathers of crown, black-brown (119), narrowly tipped white; white tips broader at forehead and forecrown; concealed bases, white. Lores and malar region, white with narrow dark-brown (119A) shaft-streaks, extending down sides of neck; shaft-streaks give head streaked appearance. Rest of sides of neck, nape and hind-neck, dark brown (119A) to black-brown (119). Chin, throat and foreneck, white; occasionally faint dark-brown (119A) shaft-streaks on throat. **UPPERPARTS.** Mantle, back, rump and upper tail-coverts, dark brown (221 to 119A), with subterminal brown (119B) and open pennaceous tips, broadly tipped white; concealed bases, white, sometimes exposed on mantle. Scapulars, similar to mantle, but dark brown (221) to black-

brown (119) with narrower white tips. When worn, white tips on upperparts largely lost or narrow; when lost, feather tips, brown (119B) to light grey-brown (119C). TAIL, dark brown (221) to black-brown (119); when worn, tips, dark brown (119A). UPPERWING. Remiges, greater primary coverts and alula, black-brown (119). Rest of coverts, dark brown (119A), with open pennaceous brown (119B) tips; tips narrow on primary coverts (not present on greater primary coverts). UNDERPARTS, mostly white; smaller under tail-coverts have dark-brown (119A) mottled outer webs. UNDERWING. Outermost greater primary covert, brown-grey (79) with base of inner web, white; rest of greater primary coverts, white varyingly mottled brown-grey (79) on inner webs; mottling decreases towards inner wing. Median, lesser and marginal primary coverts, white, with broad to narrow subterminal dark-brown (121) shaft-streaks. Greater and median secondary coverts, white. Lesser secondary coverts, white, with moderately broad subterminal dark-brown (121) shaft-streaks forming dusky bar from carpal joint to behind elbow. Marginal coverts entirely white, or with narrow to faint dark-brown (121) subterminal shaft-streaks. Subhumeral and subhumeral coverts, white. Small dark-brown (121) pre-axillary notch at base of leading-edge.

JUVENILE Similar to adult. Differs in: HEAD AND NECK. Crown, whiter, feathers having broader white tips; sides of head, whiter, dark shaft-streaks narrower. UPPERPARTS. White tips on feathers, broader.

ABERRANT PLUMAGES An albino is described by Kuroda (1961).

BARE PARTS Based on photographs in Lindsey (1986), except where stated.

ADULT Iris, dark brown. Bill, pale grey (86); maxillary unguis, dark grey or yellow-brown (123B). Inner margin of tarsus, toes (except outer) and webs, pink (3). Outer margin of outer tarsus and toe, dirty pink (4). Label data from skin of beachcast adult (MV), noted in Reilly (1988): on upper mandible, culmicorn and nostrils, dark grey-brown; lighter latericorn; maxillary unguis, dark grey with horn tip; lower mandible, dull greyish-brown; sulcus, black; base of ramicorn, horn; joint of ramicorn and mandibular unguis, dark brown; tip of mandibular unguis, horn. Legs, pale flesh-pink. Feet, dull lemon-yellow. Claws, ivory-white with grey tips.

JUVENILE No data.

MOULTS Undescribed; pattern of moult presumably similar to other *Calonectris*.

MEASUREMENTS (1) Sangajima I., Japan, breeding adults, recently dead; flattened wing (Kuroda 1966). (2) Japan,

juveniles (stragglers), recently dead; flattened wing (Kuroda 1966). (3) Sagami Bay, Japan, adults, skins (NMNZ).

Label data of two beachcast adult males from Blacksmith's Beach, NSW, and South Beach, Wollongong, NSW respectively: wing 299, 316; tail 135, 137; bill 49, 56.5; tarsus 51.5, 50.1; toe 63.7 (AM). Additional measurements for an Aust. beachcast in Reilly (1988).

WEIGHTS Label data from adult skins at NMNZ: Sagami Bay, Japan, Sept., unsexed, 440 g; same locality and month, male, 538 g, and females 484 and 468 g. Label data from skin at MV: beachcast (bird noted in Reilly 1988), 251 g. Label data from beachcast bird at AM: Blacksmith's Beach, NSW, Jan., adult male, 285 g. No data on seasonal changes.

STRUCTURE Wing long and narrow. Eleven primaries; p10 longest, p9 1-4 mm shorter, p8 11-18, p7 31-39, p6 55-60, p5 77-85, p4 101-112, p3 125-136, p2 147-158, p1 167-180, p11 minute. No emarginations. Twenty secondaries, including five tertials. About five humerals. Under tail-coverts end c. 10 mm short of tail tip. Tail, cuneate; 12 rectrices, t1 longest, t6 40-46 mm shorter. Bill, slender; deep at base; maxillary unguis, hooked at tip. Nostril points forwards; nostrils, c. 18% of bill length. Tarsus, laterally compressed. Outer toe c. 82% of middle, inner c. 69%, hind, claw only, c. 8%.

RMO

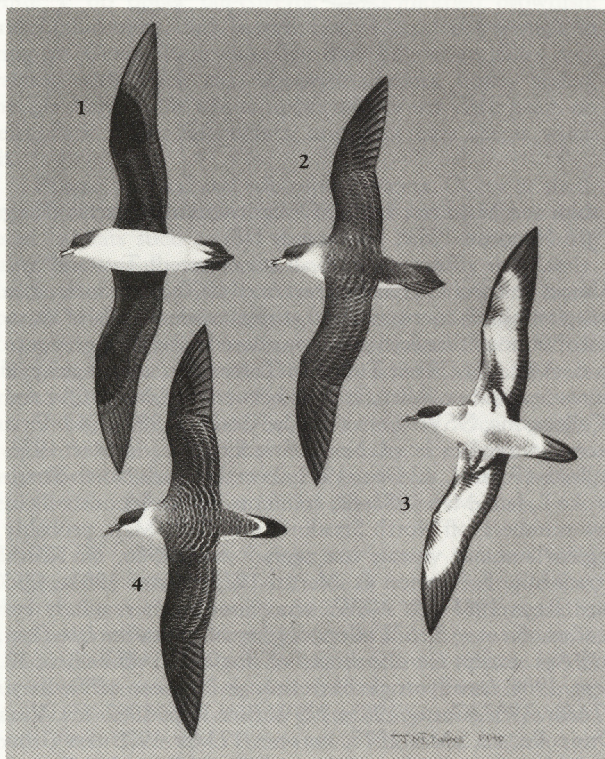


Plate 43

Grey Petrel *Procellaria cinerea*

1. Adult, ventral

2. Adult, dorsal

Great Shearwater *Puffinus gravis*

3. Adult, ventral

4. Adult, dorsal

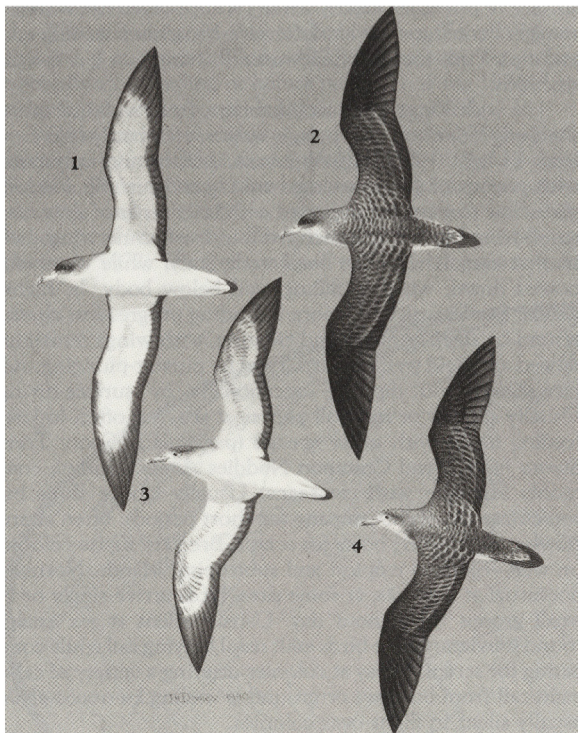
	MALES	FEMALES
WING	(1) 330.0 (317-337; 15)	320.0 (312-329; 14)
	(2) 318.0 (310-327; 8)	302.8 (288-318; 5)
	(3) 317.0	313.0, 311.0
8TH P	(3) 198.0	193.0, 197.0
TAIL	(3) 137.0	132.0, 132.0
BILL	(1) 52.7 (51-55; 15)	48.0 (46-51; 14)
	(2) 48.7 (45.5-51; 8)	47.1 (45-50.5; 5)
	(3) 51.0	50.2, 42.8
TARSUS	(3) 51.4	48.0, 49.5
TOE	(3) 67.4	63.9, 64.3

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Cory's Shearwater *Calonectris diomedea* Subspecies *borealis*

- 1. Adult, ventral
- 2. Adult, dorsal

Streaked Shearwater *Calonectris leucomelas*

- 3. Adult, ventral
- 4. Adult, dorsal

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