

## Order CHARADRIIFORMES

A large, diverse assemblage of small to medium-large (12–75 cm long) limicoline, pratincoline, aquatic or terrestrial birds. Cosmopolitan from Arctic to Antarctic regions; in all sorts of maritime, freshwater and open terrestrial habitats (including deserts) with a few (woodcocks and snipes) even using dense forests. Once known as Limicolae or Laro-limicolae (e.g. Mayr & Amadon 1951); colloquially, the assemblage (excluding alcids, skuas, gulls, terns and skimmers) is often referred to as waders (especially in Britain) or shorebirds (especially in North America).

About 350 species in 19 families, though taxonomic treatments vary. Following families recognized (mostly based on recent reviews of Order [Sibley *et al.* 1988; Sibley & Ahlquist 1990; Sibley & Monroe 1990]):

Thinocoridae	seedsnipes; four species, S. America.
Pedionomidae	Plains-wanderer; monotypic, Aust.
Scolopacidae	sandpipers, snipes and allies; c. 85 species, cosmopolitan.
Rostratulidae	painted snipes; two species, s. America and Old World.
Jacanidae	jacanas; seven species, pantropical.
Chionididae	sheathbills; two species, Antarctica and subantarctic islands.
Burhinidae	thick-knees, stone-curlews; nine species, widespread in Old World and two in Neotropics.
Haematopodidae	oystercatchers; c. 11 species, worldwide in tropics and temperate regions.
Recurvirostridae	avocets and stilts; about seven species, worldwide in tropical and temperate regions.
Ibidiorhynchidae	Ibisbill; monotypic, central Asia.
Charadriidae	plovers and lapwings; c. 60 species, cosmopolitan.
Pluvianellidae	Magellanic Plover; monotypic, S. America.
Dromadidae	Crab Plover; monotypic, Arabian region.
Glareolidae	pratinoles, coursers, and Egyptian Plover; c. 15 species, widespread in Old World.
Stercorariidae	skuas and jaegers; about seven species, mostly in Arctic and Antarctic regions.
Rhynchopidae	skimmers; three species, pantropical.
Laridae	gulls; c. 47 species, cosmopolitan.
Sternidae	terns; c. 42 species, cosmopolitan.
Alcidae	auks; c. 20 species, Arctic and temperate regions of n. hemisphere.

Apparently monophyletic. Pteroclididae (sandgrouse) probably sister-group of Charadriiformes (e.g. Fjeldså 1976, 1977; Sibley & Ahlquist 1990; BWP), though whether best placed within Charadriiformes or in separate order is debated. Flamingoes (Phoenicopteridae) and divers (Gaviidae) have also been treated as Charadriiformes (Olson & Feduccia 1981; Fjeldså 1976, 1977) but DNA–DNA hybridization studies (Sibley & Ahlquist 1990) inconsistent with these theories. Affinities to other orders still controversial; DNA–DNA hybridization has suggested closest links are to large waterbirds, such as storks, herons and allies, Pelicaniformes, Procellariiformes, penguins, grebes, divers (Gaviidae) and also Falconiformes. All these were combined in huge order Ciconiiformes by Sibley & Ahlquist (1990).

Taxonomy and relationships reviewed in Sibley & Ahlquist (1990), Christian *et al.* (1992) and BWP (and references therein). Recent reviews have included: patterning of downy young (Jehl 1968; Fjeldså 1976, 1977), osteology (Strauch 1978; Mickevitch & Parenti 1980; Olson & Steadman 1981), DNA–DNA hybridization (Sibley *et al.* 1988, Sibley & Ahlquist 1990) and electrophoresis of tissue proteins (Christian *et al.* 1992). The studies of allozymes, DNA–DNA hybridization and the most recent osteological study of the entire order (Strauch 1978) have agreed in finding two or three well-knit, monophyletic assemblages within the Charadriiformes: scolopacids and allies (Thinocoridae, Pedionomidae, Scolopacidae, Rostratulidae, Jacanidae) and charadriids and allies (Chionididae, Burhinidae, Haematopodidae, Recurvirostridae, Ibidiorhynchidae, Charadriidae, Pluvianellidae, Dromadidae, Glareolidae, Stercorariidae, Rhynchopidae, Laridae, Sternidae, Alcidae); Strauch (1978) treated Alcidae as separate lineage, but skeletons may be so highly modified for foot-propelled diving that they do not reflect relations well (Sibley & Ahlquist 1990); gulls and allies have also been regarded as a separate lineage (Christian *et al.* 1992) or as allied to charadriids (e.g. Sibley & Ahlquist 1990). Further relationships within the Order discussed in introductions to families.

Because the Order comprises so many species and adaptations are so diverse, few characters shared by all species; those that are shared are mostly anatomical features of the skull, e.g. most or all have schizorhinal nostrils, schizognathous palates, well-developed vomer, lachrymals fused with ectethemoid and pre-frontal bones, well-developed supra-orbital grooves; see Olson & Steadman (1981) for more information on osteological characters. Wings usually have 11 primaries, with p10 longest and p11 minute; 15–24 secondaries; diastataxic except in *Scolopax minor*, as far as is known. Usually 12 tail-feathers. Necks usually rather long with 15–16 cervical vertebrae. Oil-gland bilobed and tufted. Syrinx, tracheo-bronchial; two carotids (type A-1 of Glenny 1955); caeca present. Legs usually rather long; hind toe small or lacking in most but all toes greatly elongated in Jacanidae. Feathers with small thin afterfeathers. Normally two moults annually: complete post-

breeding and partial pre-breeding; some jacanas and alcids have flightless periods when moulting remiges. Young, downy, usually with intricate cryptic patterns on upperparts of three chief types: pebbly, spotted and striped, matching characters of habitat (Fjeldså 1976, 1977): precocial, nidifugous usually, self-feeding or not depending greatly on parents.

Thirteen families recorded in HANZAB region, with 54 species breeding, 41 occurring as regular non-breeding migrants and c. 38 as accidentals or probable accidentals. Scolopacidae, Stercorariidae, Laridae and Sternidae will be dealt with in Volume 3 of HANZAB.

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## Family LARIDAE skuas, jaegers, gulls and terns

A large assemblage of small to very large charadriiform seabirds. We recognize four subfamilies within the Laridae following Mayr & Amadon (1951), AOU (1983).<sup>1</sup>

**Stercorariinae** Skuas and jaegers; about six species; cosmopolitan.

**Larinae** Gulls; c. 47 species; cosmopolitan.

**Sterninae** Terns; c. 42 species; cosmopolitan.

**Rynchopinae** Skimmers; three extralimital species, pan-tropical.

Taxonomic rank given to above groups varies greatly. Considered four families within suborder Lari (e.g. Campbell & Lack 1985; BWP), or four tribes within subfamily Larinae (e.g. Sibley *et al.* 1988; Sibley & Ahlquist 1990; Sibley & Monroe 1990). Others have divided Lari into three families (Stercorariidae, Laridae and Rynchopidae) with gulls and terns usually considered subfamilies within Laridae (e.g. Wetmore 1960; Judin 1965; Hackett 1989; Peters). Moynihan (1959) divided the group into two subfamilies, Stercorariinae, containing the skuas, and Larinae, containing gulls, terns and skimmers in three tribes. Study of skeletal and external morphology of suborder 'Lari' (our Laridae) was mostly unable to cluster gulls and terns satisfactorily and found group surprisingly uniform (Schnell 1970a,b). Despite lack of agreement on taxonomic ranking of above groups, monophyly of Laridae is not in doubt. Studies of biochemistry (Christian *et al.* 1992), DNA–DNA hybridization (Sibley & Ahlquist 1990), downy young (Fjeldså 1977) and skeletal morphology (Strauch 1978; Mickevich & Parenti 1980; Chu 1995) generally agree in finding close relation with Glareolidae (pratincoles) and Dromadidae (Crab Plover *Dromas ardeola*). DNA–DNA hybridization suggests Alcidae (auks) also closely related (Sibley & Ahlquist 1990), though this contradicted by studies of skeletal morphology (e.g. Strauch 1978; Chu 1995).

Body-form varies greatly, from small and slender in some gulls and terns, to robust and thickset in skuas, jaegers, some gulls and a few terns. Differences in size between sexes slight; males usually larger but females larger than males in Stercorariinae. Wings usually long, narrow and pointed, but broader and more rounded in some; 11 primaries; p10 longest, p11 minute; 17–24 secondaries. Tail has 12 rectrices; shape varies: in Stercorariinae, central rectrices project beyond rest of tail and greatly elongated in adult breeding plumages of *Stercorarius*; in most Sterninae and Rynchopinae, outer rectrices elongated and tail forked; in Larinae, usually square. Bill, varies, though usually rather short and stout, with prominent gonydeal angle; rather fine in some Larinae and Sterninae; tip pointed in Sterninae, decurved in strong hook in Stercorariinae. Bill highly modified for unique foraging methods in Rynchopinae (Zusi 1962). Lack cere, except in Stercorariinae. Nostrils schizorhinal and perforate, with no median septum. Legs, short and stout; attached near centre of body; tibiae partly bare; tarsi, short and typically scutellate in front. Four toes; hindtoe, short, raised, sometimes rudimentary or absent; front toes, fully webbed (webs somewhat incised in some). Claws, moderately long, strong, laterally compressed. Caeca ranges from large (Stercorariinae) to poorly developed (Rynchopinae, Sterninae). Supra-orbital salt-glands well developed.

Plumages mainly browns, black, white and greys. Colours of bare parts often striking and often showing marked variation with both season and age. Adults moult twice annually: (1) a post-breeding (pre-basic) moult to non-breeding plumage, which is complete (with apparent exception of *Larus sabini*); and (2) a pre-breeding (pre-alternate) moult to breeding plumage, which is almost always partial (but see *Larus pipixcan* and *L. sabini*); some terns also undergo one or two pre-supplemental moults of inner primaries. Primaries moult outwards.

Hatch in natal down, which is replaced by juvenile plumage; downy young precocial but more dependent on

<sup>1</sup> This treatment differs from the arrangement presented in the introduction to the Charadriiformes in Volume 2 of HANZAB (p. 648), where these four subfamilies were listed as families. Recent major studies in avian classification (particularly by Sibley and co-workers) and the publication of a revised species list of Aust. birds (Christidis & Boles 1994) since the preparation and publication of Volume 2, have brought much rearrangement. In this and subsequent volumes of HANZAB, taxonomy, nomenclature and arrangements of species follow Christidis & Boles (1994) (though they do not present subfamilial taxonomy). Their sequence of families of Charadriiformes occurring in HANZAB region is: Pedionomidae, Scolopacidae, Rostratulidae, Jacanidae, Chionidae, Burhinidae, Haematopodidae, Recurvirostridae, Charadriidae, Glareolidae and

Laridae. However, work on Volume 2 was too advanced to follow their sequence and taxonomy fully. The Scolopacidae are out of place in the arrangement of subfamilies in Volumes 2 and 3; other families follow the order of Christidis & Boles (1994).

### Plate 23

Oriental Pratincole *Glareola maldivarum* (page 366)

1 Adult breeding; 2 Adult non-breeding; 3 Juvenile;  
4, 5 Adult

Australian Pratincole *Stiltia isabella* (page 373)

6 Adult; 7 Downy young; 8 Juvenile;  
9 First immature non-breeding;  
10, 11 Adult

parental feeding than other Charadriiformes. Post-juvenile (first pre-basic) moult complete or partial, varying within and between families; moults of subadults complicated and vary between subfamilies (see subfamily accounts). Generally slow to mature, attaining adult plumage when 2–4 years old and first breeding at 2–4 years (smaller gulls and terns) to 4–9 years (many skuas and larger gulls and terns); some may breed in first year (e.g. *Sterna albifrons*).

Inhabit wide range of marine and freshwater habitats from Tropics to polar regions; many species strongly migratory, especially those breeding at high latitudes, e.g. South Polar Skua *Catharacta maccormicki* and Arctic Tern *Sterna paradisaea*, which migrate between polar regions. Most nest in terrestrial colonies near water (see subfamily accounts); some species highly pelagic in non-breeding season. Use wide range of foraging methods (see subfamilies; for discussion of feeding methods, see General Introduction).

See subfamily accounts for summaries of social organization and breeding.

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## Subfamily STERCORARIINAE skuas and jaegers

Medium to large (50–65 cm) predatory and scavenging seabirds. About six species in two genera: (1) *Catharacta* (skuas) comprises three or four species (but their taxonomy complex, see below), mostly of Subantarctic and Antarctic; two species occur HANZAB region; (2) *Stercorarius* (jaegers) comprise three species that breed in n. hemisphere and migrate to s. hemisphere for boreal winter; all three are non-breeding migrants to HANZAB region. Morphological and behavioural studies often agree in finding these genera to be distinct (Devillers 1978; Furness 1987; Christidis & Boles 1994), but Olson (1985) found no osteological basis for recognizing two genera, and recent preliminary study of mitochondrial DNA (Peter et al. 1994) found unexpected similarity between *S. pomarinus* and *C. skua*; further biochemical research needed. Relationship between skuas and other Laridae unclear; morphological studies generally suggest closest to Larinae (e.g. Strauch 1978; Furness 1987; Chu 1995) while studies of behaviour (Moynihan 1959) and DNA–DNA hybridization (Sibley & Ahlquist 1990) suggest they are equally related (sister-group) to all other Laridae. Major review of biology, morphology and taxonomy in Furness (1987).

The genus *Catharacta* comprises six closely related forms (all but one of which breeds in s. hemisphere), and boundaries between species and subspecies difficult to define: *skua* breeds North Atlantic; *lonnbergi*, circumpolar, breeding subantarctic islands and Antarctic Pen.; *hamiltoni* breeds Tristan Grp and Gough I., South Atlantic Ocean,

and it is probably this form that occurs Iles Amsterdam and St Paul, Indian Ocean; *antarctica* breeds Falkland Is and Patagonia; *chilensis* breeds coastal Chile and Patagonia; and *maccormicki* is circumpolar on Antarctic Continent, continental islands and South Shetland Is. Both *maccormicki* and *chilensis* usually treated as separate monotypic species. Other four usually treated as one or two species, but treatment complicated by nomenclatural priorities: the three s. circumpolar taxa *antarctica*, *lonnbergi*, and *hamiltoni* almost always treated as subspecies of a single species, and North Atlantic *skua* treated as separate species or fourth subspecies with s. taxa. If all four treated as one species, *skua* has nomenclatural priority (thus *C. skua* with four subspecies); if treated as two species, *C. skua* monotypic, and *C. antarctica* has three subspecies. (The specific name used for s. hemisphere

### Plate 24

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| Great Skua <i>Catharacta skua</i><br>(page 388)  | Pomarine Jaeger <i>Stercorarius pomarinus</i> (page 438)             |
| 1 Adult on breeding grounds, austral summer; 2 Downy young; 3 Juvenile   | 8 Adult female breeding, light morph; 9 Juvenile, intermediate phase |
| South Polar Skua <i>Catharacta maccormicki</i><br>(page 412)   | Arctic Jaeger <i>Stercorarius parasiticus</i> (page 448)             |
| 4 Adult pale morph, in worn plumage at breeding grounds, austral summer; 5 Adult dark morph, in fresh plumage at breeding grounds, austral summer; 6 Downy young; 7 Juvenile | 10 Adult breeding, light morph; 11 Juvenile, intermediate phase      |
|  | Long-tailed Jaeger <i>Stercorarius longicaudus</i> (page 459)        |
|  | 12 Adult breeding, light morph; 13 Juvenile, intermediate phase      |

forms has little biological implication beyond whether *skua* has differentiated sufficiently to be considered a species; *Catharacta* clearly radiated in s. hemisphere and *skua* is a recent offshoot from a s. ancestor [Furness 1987; cf. Brooke 1978].) Here we treat *skua*, *antarctica*, *lonnbergi* and *hamiltoni* as subspecies of *C. skua* and recognize *maccormicki* and *chilensis* as separate species (following Devillers 1977, 1978; Furness 1987; Christidis & Boles 1994; BWP; NZCL). Forms of *Catharacta* mostly allopatric; some hybridization occurs in all areas of contact between breeding forms. For fuller discussion of hybridization, variation and taxonomy in *Catharacta*, see Great (Subantarctic) Skua: Geographical Variation.

Body, robust and thickset, especially in *Catharacta*. Females larger than males: females 11–17% heavier during breeding season, and wings 1–4% longer, but differences slight or absent in other linear measurements. Wings, long; narrow and pointed, with angled carpal joint in *Stercorarius*; broader, straighter and blunter in *Catharacta*; 11 primaries; p11 minute; 17–20 secondaries. Tail, short, slightly wedge-shaped to rounded in *Catharacta*; 12 rectrices; central pair (t1) project slightly in *Catharacta* and most plumages of *Stercorarius*; greatly elongated in adult breeding plumages of *Stercorarius*, forming long tail-streamers (the shapes of which are diagnostic of species); tail-streamers often broken off (or intentionally bitten off) during breeding season. Bill, short, heavy and powerful, with strongly hooked tip to upper mandible and prominent gonydeal angle; superficially gull-like, but rhamphotheca complex, with four distinct sheaths on upper mandible: (1) sheath of lateral edge; (2) strongly curved distal sheath (unguis), smoother and more rounded than tip of bill of gulls; and (3) pair of separate, soft, thin dorsal plates covering nostrils, forming distinct cere (absent in all other Laridae). Head, rounded; neck, thick and strong. Coracoids do not overlap. Sternum has one notch on each side. Legs, short, superficially gull-like, but with very short bare part on tibia. Tarsi, short; scutellate in *Stercorarius*; with single row of scutes at front and reticulate scaling elsewhere in *Catharacta*; scales hard (soft and fleshy in other Laridae). Four toes; hindtoe, short, raised; front toes, fully webbed. Claws, moderately long, strong, laterally compressed, strongly hooked and sharp; combination of strongly hooked claws and fully webbed toes unique among birds. Oil-gland feathered. Caeca present, large, much longer than in Larinae. Supra-orbital salt-glands, well developed. Down occurs on both pterygiae and apteria.

Sexes similar in plumage. Bare parts not brightly coloured, unlike Rynchopinae and many Larinae and Sterninae. Iris, black-brown. Bill, dull brown to black. Legs, blue-grey to black. In most *Catharacta*, plumages dark brown, with varying red and yellow tints; great individual variation in plumages within populations (though variation associated with wear, age and season poorly understood). South Polar Skua *C. maccormicki* and all *Stercorarius* polymorphic, with dark morphs (very rare in Long-tailed Jaeger *S. longicaudus*) and varying light morphs (including so-called intermediate morph, which often recognized for convenience); ratios of morphs vary geographically in some species. White bases of primaries form conspicuous patches in wing of all species, but less conspicuous in *Stercorarius*. Light morph *Stercorarius* have white in underbody of adults and subadults. Similarity of plumages between species and great individual variation complicates field identification. Adults moult twice annually: a complete post-breeding (pre-basic) moult and a partial pre-breeding (pre-alternate) moult; both occur mainly while migrating or in non-breeding areas. Young hatch with long soft woolly down, mostly uniform greyish-brown but slightly paler on belly, tips of wing-pads and around and in front of eyes; chicks of *C. maccormicki* very pale all over. Although precocial, chicks dependent on parents for some time. Bill, legs and feet of juveniles paler than in adult and area of black increases with age in *Stercorarius*. Juveniles strongly barred below in *Stercorarius* (unique among Laridae) but not *Catharacta*, one of main reasons for generic separation (Brooke 1978; Furness 1987). Juvenile plumages of *Stercorarius* polyphasic; coloration of juvenile plumage not necessarily related to colour of immature or adult plumage (hence use of phase in accounts, q.v.). Immatures of *Stercorarius* recognized by barred underwing-coverts; gradually attain adult plumage through a series of immature plumages; length of central rectrices increases with age until adult plumage attained. Transition to adult plumage also gradual in *Catharacta*, but immatures difficult to age and subadult moults poorly known. Minimum age of first breeding probably 4–8 years old in *Catharacta* (Furness 1987); c. 4 years old in *Stercorarius*; in Arctic Jaeger *S. parasiticus*, average age of first breeding appears to vary with morph (see Arctic Jaeger: Plumages).

*Catharacta* breeds s. hemisphere, except for outlying population (*C.s. skua*) breeding in North Atlantic. *Stercorarius* circumpolar breeders in high latitudes of n. hemisphere. Migratory, but non-breeding range of all species poorly known. Marine in non-breeding season, in pelagic or (less often) coastal waters. *Stercorarius* migrate S in boreal winter to poorly known wintering areas in Pacific, Indian and Atlantic Oceans. Migrations of *Catharacta* more varied and poorly known, but at least South Polar Skua long-distance trans-equatorial migrants, and almost all leave breeding colonies in non-breeding periods; some Great (Subantarctic) Skua stay near breeding islands in non-breeding periods.

Opportunistic predators, scavengers and, notably, kleptoparasites, though importance of kleptoparasitism varies greatly between species. Feed on land and at sea, taking a variety of carrion, small mammals, eggs and young of seabirds, burrowing petrels, land birds and fish, crustaceans, molluscs, offal and garbage. At times, approach or follow boats, feeding on offals or scraps thrown overboard or stealing food from other seabirds. Pomarine Jaeger and some populations of Long-tailed Jaeger depend almost exclusively on lemmings during breeding season. At sea, food

taken mostly by dipping, surface-diving, pattering and aerial pursuit; also piracy. On land, use a variety of methods, including direct attacks, stealing and scavenging. Feeding behaviour of South Polar Skua influenced by presence of Great (Subantarctic) Skua in areas where both species breed (see South Polar Skua: Food). Some individuals defend feeding territories or type-A territories.

Behaviour well studied. Established pairs normally monogamous, with pairs re-forming at start of each breeding season on traditional territories. However, Pomarine Jaegers do not retain same mates or territories but roam nomadically and breed opportunistically and Great (Subantarctic) Skuas in some locations, including HANZAB region, breed in trios as well as pairs (e.g. Bonner 1964; Burton 1968a,b; Young 1978; Hemmings 1989). Trios usually consist of two males and a female (Hemmings 1989). Trios not recorded for South Polar Skua. Nests well-spaced and territories vigorously defended. Clubs a feature of large colonies, generally where non-breeding birds gather to rest together or to practice displays and behaviours. Most jaegers and skuas have same patterns of displays, though only jaegers use a distraction display as well as diving at intruders near nest. During most activities, *Catharacta* typically display white patches in wings by stretching wings vertically. Jaegers and skuas have fewer displays than gulls, and displays generally aggressive, with fewer appeasing postures than gulls. Fight often. Main types of aggressive behaviours involve Upright (equivalent to Upright of gulls), Oblique, Bent, and Long Call Complex. Most conspicuous display, Long Call Complex, combines Oblique and Bent displays with Wing-raising and Long Call; involved in territorial advertisement and in agonistic and sexual encounters. Long Call Complex differs between taxa of skua. Tail-raising important display between prospective mates; performed on ground within territory and displays central rectrices (which are diagnostic of age and species in jaegers). In established pairs, Scoop-making or Scraping may begin only a couple of days after a pair reforms. Young precocial and, if undisturbed, semi-nidifugous; fed by both parents, food being given in bill or regurgitated onto ground. Dependent on food from parents for long period. When food short, usually only one chick fledged by each successful pair; second-hatched chick, younger by 1–2 days, often killed by sibling. Chicks of all species show cryptic behaviour when predators present. Adults show alarm by calling or attacking, sometimes swooping and striking intruder. Only Arctic Jaeger has full distraction-lure display, though Pomarine and Long-tailed Jaegers less often use an incomplete distraction-lure type display. No such displays by *Catharacta* species. Often bathe in fresh water, though will bathe communally in seawater where no freshwater sites. Interspecific hybridization occurs between *Catharacta* species (see above, accounts, and Great Skua: Geographical Variation).

Breed seasonally. *Stercorarius* in high latitudes of n. hemisphere in boreal summer; *Catharacta* in austral summer (except outlying population *C. skua skua* breeding North Atlantic in boreal summer). In *Catharacta*, season broadly Sept.–Feb. but onset of laying varies with latitude, Sept.–Nov. in mid-latitudes, later in Antarctic (Young 1977). S. hemisphere *Catharacta* nest in or round penguin colonies; in sheltered snow-free areas on flat or sloping ground, in valleys, on small hills, moraines, cliff edges; *Stercorarius* on tundra and, in Arctic Jaeger, in moorland. Nest, a scrape or scoop in gravel, soil or vegetation, sometimes with rim; lined or unlined; nests sometimes more substantial. Colour of eggs vary from light grey, pale green or greenish blue to olive-brown or dark stone, with irregular blotches of light or dark brown, yellow-brown or purple. Usually two eggs per clutch, occasionally only one. Eggs laid at intervals of 2–8 days in *Catharacta*. Both sexes incubate, either beginning with first egg (e.g. South Polar Skua) or when clutch complete (Great Skua). Incubation period, 24–34 days, mostly 28–30 days. Hatching asynchronous. Young, semi-precocial. Both sexes feed and brood young. Chicks may leave nest within 24 h but chicks of South Polar Skua may stay in nest for up to 27 days. Parent regurgitates food onto ground then picks up pieces, which chick takes; older chicks catch food as it is being regurgitated or take food from ground. Age of first flight, 49–65 days. Young fed by parents after fledging though start feeding themselves at c. 7 weeks. May remain in parents' territory for 3–4 weeks after fledging.

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*Stercorarius parasiticus* Arctic Jaeger

COLOUR PLATES FACING PAGES 385, 417 &amp; 488

*Larus parasiticus* Linnaeus, 1758, *Syst. Nat.*, ed. 10 (1): 136 — within the Tropic of Cancer of Europe, America and Asia; restricted to coast of Sweden.

Specific name is directly from the Latin *parasitus*, parasite.

OTHER ENGLISH NAMES Arctic Skua; Parasitic Skua or Jaeger.

## MONOTYPIC

**FIELD IDENTIFICATION** Length 46–67 cm (including tail-streamers that project up to 10.5 cm in breeding adult); wingspan 97–115 cm; weight: male 420 g, female 510 g. Medium-sized jaeger, with slender bill, small head, deep rounded belly, long narrow wings, medium-length tail, elegant appearance, and fast rather falcon-like flight. Size, shape and proportions intermediate between Pomarine *Stercorarius pomarinus* and Long-tailed *S. longicaudus* Jaegers; smaller, more slender and elegant than Pomarine; generally larger and bulkier than Long-tailed Jaeger. Adults dimorphic, with light and dark morphs. All have outermost 3–8 primary-shafts pale, and obvious pale primary-patch on underwing. Juveniles distinguished from other juvenile jaegers by short pointed central tail-projections. Sexes alike. Marked seasonal variation. Juveniles separable; polyphasic. Immatures separable; polymorphic.

**Description Adult breeding LIGHT MORPH:** Crown, nape and round eye, dull black to black-brown, forming dark cap, grading to paler grey on sides of forehead and to off-white at base of upper mandible; malar area, grey to off-white. Rest of head and neck, white with varying yellow wash on hindneck and sides of neck and head, fading to creamy or white with wear. Rest of upperparts, dark grey-brown to black-brown; off-white shafts of outermost 3–8 primaries form triangular flash on wing appearing as semicircular patch when wing spread. Underbody, white, with partial or complete dark-grey breast-band (reduced in palest birds to small patch at sides of upper breast) and dark-grey flanks, vent and undertail-coverts. Those with complete breast-band tend to have more grey on flanks and vent and smaller pale hindneck-collar; grey of breast extends to throat or chin in some. Underwing: axillaries and most coverts, dark grey, contrasting slightly with paler, glossy dark-grey greater coverts and remiges; up to basal half of primaries, silvery, grey or white, forming pale patches that appear to flash in flight. Undertail, silvery white, with dark distal third; central tail-feathers, long and pointed, projecting well beyond rest of tail (projection about equal to length of rest of tail). Bill, black, tinged brown or olive on base of upper mandible, which may give slight two-tone effect in bright light. Iris, dark brown. Legs and feet, black. **DARK MORPH:** Like light morph but: uniform dark grey-brown or dark brown, with slightly contrasting blackish upper primary coverts, remiges, rectrices and cap, and varying yellow-brown collar on hindneck and sides of head; pale patch on underwing tends to be duller, silvery or grey, and less prominent; paler birds may have trace of darker breast-band. Some have uniformly dark head and underbody or are all sooty black except for pale primary-shafts and bases to remiges and rectrices. **Adult non-breeding LIGHT MORPH:** Differ from adult breeding by: Dark cap appears paler, dark brown or grey-brown, and less sharply demarcated. Rest of head and neck, white or indistinctly mottled brown, form-

ing pale collar separating cap from breast-band. In some, pale areas of head and neck more heavily spotted and barred brown, so that dark cap appears to merge with broad dark breast-band, giving appearance of dark hood with diffuse narrow whitish or buffy collar on sides of neck. Upperparts, dark, with narrow pale-buff or white scaling on mantle and back and bold or incomplete black-and-white barring on uppertail-coverts, which form pale area above dark tail at distance. Underbody, white, with usually prominent breast-band, heavily spotted and barred darker (faint or absent in some), varying narrow dark barring along flanks, and usually strong dark barring on undertail-coverts; belly usually white but barred dark in some. Tail-projections as adult breeding or missing. **DARK MORPH:** As adult breeding except: no yellow on head and neck; upperparts often narrowly scaled dark rufous-brown; and vent and undertail-coverts more broadly barred with dark rufous-brown. Some paler birds (or darker intermediates) have varying, yellow-buff hindneck, dark grey-brown underbody faintly barred or grizzled white behind darker breast-band, and bolder white barring on undertail-coverts; a few also have bolder dark barring on buff belly. **Juvenile** Much variation in colour and pattern of plumage. Divisible into three colour phases. Light and intermediate phases characterized by warm plumage tones, always with rusty tinge and paler hindneck of varying prominence; darkest birds almost uniformly black. **INTERMEDIATE (BARRED) PHASE:** Commonest phase. Head and neck, rufous-brown, streaked darker, with dusky patch in front of eye, and paler rufous-brown to orange-brown hindneck; on many, diffuse pale area at base of upper mandible. Underbody, rufous-brown, with diffuse narrow dark-brown barring, grading to broad, bold and wavy dark barring on vent and undertail-coverts, with dark-barred breast-band on some, contrasting slightly with paler belly. Upperparts and innerwing-coverts,

## Plate 27

Pomarine Jaeger *Stercorarius pomarinus* (page 438)  
1, 2 Juvenile, intermediate phase; 3 Juvenile, light phase, in early stage of moult to first immature non-breeding, first austral summer-autumn; 4 Third immature non-breeding, light morph

Arctic Jaeger *Stercorarius parasiticus* (page 448)  
5, 6 Juvenile, intermediate phase; 7 Second immature breeding, light morph; 8 Third immature breeding, light morph

Long-tailed Jaeger *Stercorarius longicaudus* (page 459)  
9, 10 Juvenile, intermediate phase;  
11 Second immature non-breeding, light morph

blackish brown, with, when fresh, narrow rufous-brown barring on saddle and thin transverse pale lines along innerwing; many appear to have slightly paler rufous leading-edge to innerwing in flight. On most birds, uppertail-coverts, blackish-brown, with wavy rufous-brown barring (not normally forming pale patch above tail); some have pale barring, always in combination with pale head or hindneck. Upperwing, blackish-brown, with pale tips to primaries when fresh (clearly visible at rest and sometimes in flight), and pale shafts of outermost 3–8 primaries, forming diffuse pale patch as in adult; some also have distinct narrow white crescent across bases of primaries, heightening prominence of patch. Underwing: axillaries and coverts, boldly barred black-brown and rufous-brown; some have less pale barring, making coverts appear uniform at distance, while a few have uniformly dark coverts; remiges, dark with clear-cut white patch covering up to basal half of primaries; in some, greater primary coverts have pale bases and dark tips, which, with pale bases of primaries, create double pale patch (like that of juvenile Pomarine Jaeger, though never so clear-cut and prominent). Tail, blackish brown, grading to whitish basal half below (normally concealed by undertail-coverts); central tail-feathers diagnostically pointed, projecting only short distance beyond rest of tail. Darker intermediates generally darker and browner, with less rufous in plumage, less prominent pale fringes above, and less prominent pale barring on uppertail-coverts; always have rusty collar on hindneck. A few have off-white head and belly, with little dark streaking and barring, and large pale bases to underside of primaries (as light-phase juvenile), appearing somewhat similar to intermediate- or light-phase juvenile Long-tailed Jaeger. A rare barred variant reported by BWP (q.v.), not mentioned by other authors. **LIGHT PHASE:** Similar to intermediate phase but generally paler. Differ mainly by: (1) head and neck, paler orange-buff or yellow-buff, contrasting more with saddle; (2) fringing on upperparts and innerwing-coverts, broader, buff, so appear paler above (especially on forewing-coverts) with paler leading-edge to innerwing; (3) wavy barring on uppertail-coverts, paler orange-buff, contrasting with dark tail but uniform with rest of upperparts; (4) palest birds have combination of narrow white crescent across bases of primaries and striking white basal half to tail when spread; (5) underbody, paler orange-buff overlaid with finer dark barring or mottling, with some white barring on breast or belly (retain breast-band and dark-barred undertail-coverts); (6) underwing-coverts, slightly paler, strongly barred black, orange-buff and white. **DARK PHASE:** Similar to darkest intermediate morphs, but darker and more uniform, sooty brown or blackish brown, with faint or no pale collar; narrow rufous-brown barring on upperparts and underbody varies but usually on vent and tail-coverts, saddle and inner upperwing-coverts, and along flanks (barring fine and indistinct on some); pale barring on axillaries and underwing-coverts narrower and less prominent. A few very dark birds uniform black except for

pale primary-shafts and pale patch on underside of primaries (as intermediate morph). Bare parts similar in all morphs. Bill, bi-coloured: tip, black, with paler blue-grey to brown-grey basal two-thirds. Iris, dark brown. Legs and base of feet, pale blue-grey; rest of foot, black. **First immature (non-breeding and breeding)** General appearance a mixture of juvenile and adult non-breeding plumages, with no rufous tones in plumage. Differ from juvenile by: **LIGHT AND INTERMEDIATE MORPHS:** Head and neck, darker, with paler creamy hindneck-collar; saddle and inner upperwing-coverts, more uniform, black-brown or grey-black, with narrow buff scaling; uppertail-coverts strongly barred black-and-white, as adult non-breeding; underbody, paler, often with white belly with dark breast-band, narrowly barred flanks and more boldly barred undertail-coverts. Either no central tail-projections or with short, tapered spikes. Dark tip of bill, larger, and pale base more grey or yellow; legs and feet as juvenile or with some black spotting on tarsi. **DARK MORPH:** Like juvenile except for new pointed central tail-feathers. Best aged during first austral summer–autumn by juvenile appearance coupled with active moult of remiges and rectrices. **Second immature non-breeding** **LIGHT AND INTERMEDIATE MORPHS:** Similar to adult non-breeding but underwing heavily barred, and some have heavy dark barring on underbody. Bare parts much as first immature. **DARK MORPH:** Similar to adult non-breeding but underwing heavily barred. Bare parts as light morph. **Second immature breeding** **LIGHT MORPH:** Similar to adult non-breeding but dark cap and breast-band intermediate between non-breeding and breeding and underwing heavily barred; central tail-feathers shorter than those of adult breeding. Bill similar to that of adult but still bi-coloured in some. Legs slightly darker than first immature, with more black on tarsi. **DARK MORPH:** Much as second immature non-breeding but upperparts often a mixture of old and new feathers (of uniform age in adult). Tail-projections and bare parts as light morph. **Third immature non-breeding** **LIGHT MORPH:** Similar to second immature non-breeding but more like adult, with axillaries and underwing-coverts less heavily barred and mostly dark like adult; typically, axillaries a mixture of plain and finely pale-barred or edged feathers; most of pale barring concentrated in pale band on central innerwing-coverts and subhumeral, with some fine pale mottling along leading-edge of innerwing. Bare parts similar to adult, except legs and feet, black, with small pale patches on tarsi. **DARK MORPH:** As adult non-breeding, differing by partly barred underwing-coverts as light morph; bare parts as light morph. **Third immature breeding** **LIGHT MORPH:** Very similar to adult breeding but pale areas of head and neck often streaked darker, and yellow wash on same areas duller. Typically, upperparts retain some non-breeding feathers. Best aged by adult-like appearance coupled with partly barred underwing as third immature non-breeding; tail-projections slightly shorter than adult. Bare parts as third immature non-breeding but legs and feet, black, with only traces of pale on tarsi. **DARK MORPH:** Similar to adult breeding; best aged by partly barred underwing-coverts, shorter tail-projections and traces of pale on tarsi as light morph. **Fourth immature (non-breeding and breeding)** Very similar to adult and generally not separable. Birds with a few white marks on tail-coverts or underwing-coverts, a few dark bars on underbody, and a few pale patches on tarsi possibly fourth or fifth immature breeding.

**Similar species** Mainly confused with **Pomarine Jaeger**, with much overlap in plumages and few specific identifying characters. If seen, projecting central rectrices, diagnostic: in adult breeding plumage, Pomarine differs by long twisted

## Plate 28

Pacific Gull *Larus pacificus* (nominative *pacificus* unless stated)  
(page 471)

- 1 Adult breeding; 2 Adult non-breeding; 3 Adult, subspecies *georgii*, Shark Bay, WA; 4 Juvenile; 5 First immature non-breeding; 6 First immature breeding; 7 Second immature non-breeding; 8 Second immature breeding;
- 9 Third immature non-breeding; 10 Third immature breeding



projections, which are broadly rounded at tip, forming diagnostic spoon-shaped projections; in adult non-breeding plumage projections shorter and hardly twisted, though still distinctively broad and rounded. Other than tail-projections, identification must be based on size and structure. Pomarine is bigger and bulkier, with larger head and thicker, heavier bill; importantly, wings broader at base; tail shorter and fuller; neck thicker; and chest deeper and more prominent, appearing barrel-chested or even giving impression of hanging belly often emphasized by prominent dark breast-band (Arctic normally appears slimmer, with different body-shape characterized by smaller almost triangular head, flatter chest, and characteristically deep rounded belly). Differences in flight and behaviour also helpful: Pomarine has slower, steadier, more purposeful flight, with more laboured (less falcon-like) wing-beats, recalling Great (Subantarctic) Skua or large gull; tend to chase larger birds and, unlike Arctic, may even force them into sea. Other features: **ADULT BREEDING, LIGHT MORPH:** Pomarine differs by: (1) larger and solid black cap, extending to base of lower mandible, and lower on face (onto ear-coverts and malar area) (Arctic has diagnostic pale patch on forehead and typically paler and greyer malar area); (2) yellow wash on nape, hindneck and sides of head often brighter; (3) upperparts darker, generally blackish-brown; (4) except in some males, breast-band darker black-brown and heavily spotted and barred darker; (5) flanks, vent and undertail-coverts, darker blackish-brown with (at least on females) barring on flanks and, often, a dark patch extending from vent onto centre of lower belly (generally paler, dark grey-brown on Arctic, never with barred flanks and with vent squarely demarcated from white belly or with less dark extending towards belly); (6) bill more bi-coloured, with paler brownish, brownish-orange or yellowish base contrasting more strongly with black tip. **ADULT NON-BREEDING AND IMMATURES, LIGHT MORPH:** Pomarine very similar to Arctic; best separated by foregoing differences in size and structure, shape of projecting central rectrices, and colour of bill coupled with flight and behaviour. **ADULT AND IMMATURES, DARK MORPH:** Pomarine very similar to Arctic; best distinguished as adult non-breeding and immatures light morph. **JUVENILES, INTERMEDIATE AND LIGHT PHASES:** Pomarine differs by: (1) general coloration 'colder', greyish buff to grey-brown or dark grey-brown, generally without strong rufous tones typical of many Arctics; (2) head and neck rather uniform and dark, with darker (not pale) area round base of bill and faint dark spotting or barring throughout, not streaked; hindneck faintly paler and greyer, never contrasting strongly with rest of head (cf. typically prominent contrasting rusty hindneck-collar of Arctic); (3) uppertail-coverts more evenly and boldly barred dark-and-pale, forming pale patch contrasting with darker upperparts on all but darkest birds; pale patch always appears paler than hindneck (normally the reverse in Arctic, on which obvious pale patch occurs only in combination with pale hindneck-collar); (4) undertail-coverts generally more boldly and evenly barred dark-and-pale; (5) pale fringes on upperparts and inner upperwing-coverts generally narrower, so that folded wing often appears quite dark, contrasting with paler breast, and lacks pale rusty leading-edge on innerwing; (6) lack or have only fine pale tips to primaries (cf. obvious pale tips of all but darkest Arctics); no narrow pale crescent across bases of primaries on upperwing nor striking pale basal half to uppertail; (7) most have prominent double pale patch on underwing, which is perhaps best distinction (normally lacking on Arctics but, when present, less clear-cut and conspicuous); also, buff barring on underwing-coverts contrasts

with darker underbody (rufous barring of most Arctics matches general colour of underbody); (8) central rectrices, short and rounded, hardly projecting beyond rest (cf. clearly pointed projections of Arctic); (9) pale base of bill contrasts more strongly with dark tip and stands out more at distance (up to 500 m; on Arctic, only to c. 150 m). **JUVENILE, DARK MORPH:** best distinguished by points (7)–(9) above, combined with differences in size, structure, flight and behaviour.

Arctic often confused with **Long-tailed Jaeger**, which, in adult breeding plumage, readily distinguished by diagnostic very long fine projecting ribbon-like central rectrices, which quiver in flight; streamers often longer than distance from tip of rest of tail to trailing-edge of wing (about same length or shorter in Arctic). When tail-projections missing (normally in HANZAB area), can be distinguished by differences in size, structure, flight and behaviour. Most Long-tailed distinctly smaller (though some overlap with smallest Arctic), slimmer, more elegant and tern-like, with: smaller head, slightly shorter and heavier bill, more prominent chest and flatter belly, longer narrower wings, and longer rump and tail, giving more attenuated rear-end. Normal flight more buoyant and tern-like; tend to have more continuously flapping flight, though often dip to surface like terns. Generally less aggressive and falcon-like than Arctic, and more dependent on surface feeding than piracy. **ADULT BREEDING:** Long-tailed best distinguished by: (1) neat solid black cap without pale patch on forehead or paler malar area; (2) much paler and greyer upperparts, with contrasting black trailing-edge to secondaries and only two (occasionally three) pale outer primary-shafts, forming pale strip along leading-edge of outerwing (on Arctic, little or no contrast between secondaries and rest of upperwing and normally 3–4, up to eight, pale primary-shafts forming pale patch on outerwing); (3) on underbody, dark grey extends farther forward to lower belly and sometimes to lower breast, contrasting with white chin to upper breast; and never have grey breast-band or patches at sides of breast; (4) underwing, dark grey except for pale shaft of outermost primary; (5) legs mostly pale grey-blue with contrasting black feet. **ADULT NON-BREEDING, LIGHT MORPH:** Long-tailed distinguished by same differences in upperparts, primary-shafts, underwing and colour of legs as adult breeding; also differ by (1) generally more strongly barred uppertail-coverts, forming more prominent pale patch above tail; (2) generally finer central tail-projections, some diagnostically tipped white or tapering to very fine, wire-like tips. **IMMATURES:** Best distinguished by size, structure, flight and behaviour, though many second immatures and older birds already paler and more grey-brown above than any Arctic. **JUVENILE, INTERMEDIATE AND LIGHT PHASE:** Long-tailed differs by: (1) plumage, colder and greyer, never with rufous tinge; (2) head and neck generally colder and greyer, with paler grey to yellow-grey hindneck; pale birds often appear strikingly white-headed (rarely so in Arctic); (3) on most, marked contrast between colder brownish or grey-brown forewing-coverts and blackish primary coverts and remiges; and generally broader and more contrasting scaling, especially on saddle; (4) only one or two contrasting pale primary-shafts on upperwing, and only narrow pale strip along leading-edge (4–8 pale shafts and definite patch on Arctic); (5) underbody, colder and greyer or mostly white (last rare on Arctic), typically with more uniform grey breast-band and obvious contrast between breast-band and paler belly; (6) tail-coverts more evenly and boldly barred dark and pale; (7) bolder black-and-white barring on axillaries and underwing-coverts, contrasting more with underbody when underbody dark (cf. warmer rufous-and-dark

barring matching general colour of underbody on Arctic); (8) central tail-projections often longer and clearly blunt-tipped (short and pointed on Arctic); (9) bill has larger dark tip, extending farther along cutting edges of mandibles. **JUVENILE, DARK PHASE:** Long-tailed best separated by differences in pattern of bill, number of pale primary-shafts, size, structure, flight and behaviour.

In non-breeding periods, seen singly, in pairs or small groups; occasionally in larger numbers when feeding round trawlers or when loafing in loose groups in favoured areas in large bays and harbours. In HANZAB region, prefer inshore waters, often entering bays and harbours. In some areas, patrol mudflats along open shores of large bays to harry feeding shorebirds, gulls and terns and will even briefly fly over land. Occasionally seen offshore in outer shelf and shelf-break waters; only infrequently in pelagic waters, mainly during migration. Normal flight less laboured than that of Pomarine Jaeger, with frequent changes between active rather falcon-like wing-beats and gliding; in strong winds, alternate shearwater-like gliding on fixed wings with bouts of gliding and flapping with wings flexed. Piratical flight impressive, with marked burst of acceleration, sustained speed and graceful aerobatics, bird suddenly stalling, somersaulting, or turning back on previous flight-path; relentlessly pursue other seabirds, such as terns and smaller gulls till they disgorge food, usually catching food in mid-air. Gait, rather waddling walk or run, with head held up and tail touching ground. On sea, resemble small gull but sit higher, with tips of wing and tail raised well above surface of water. Normally silent at sea.

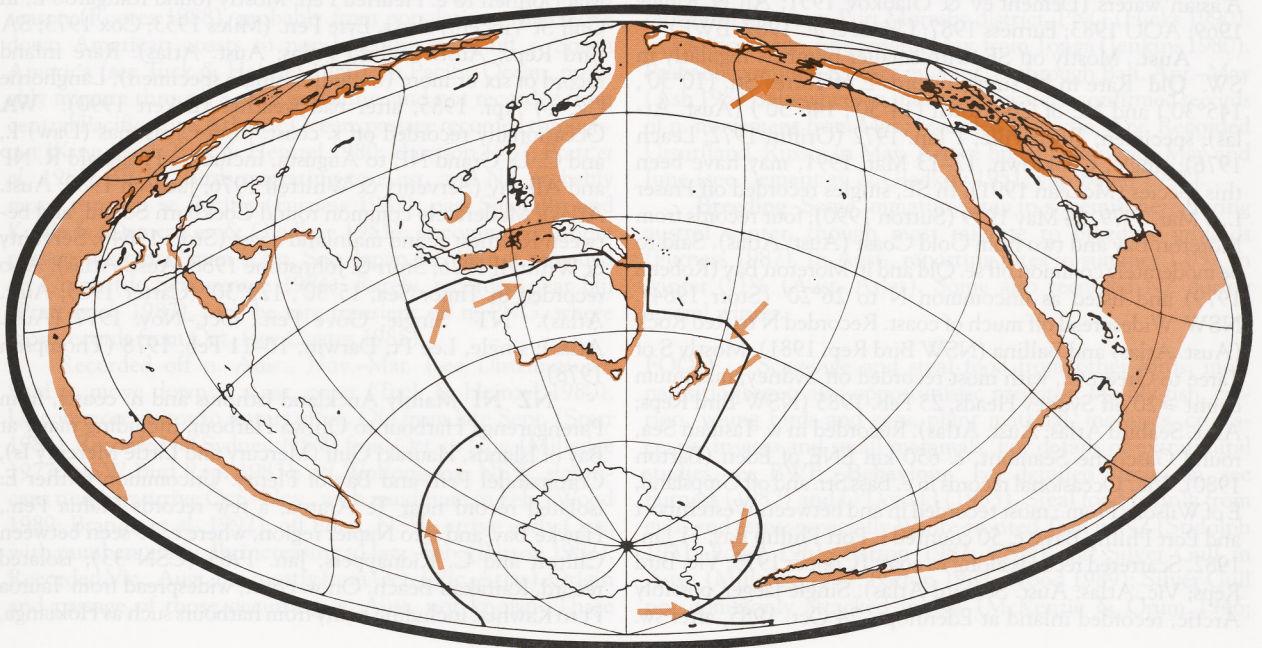
**HABITAT** Poorly known in HANZAB region. In non-breeding periods, subtropical and subantarctic seas (Brown *et al.* 1975; Aust. Seabird Atlas). Arrival in Nov. in w. Tasman Sea coincides with rise in temperature of water and the strongest flow of E. Aust. Current (Barton 1979); in e. Cook Str. region, associated with warm D'Urville Current rather than cooler Southland Current (Bartle 1974). Off NSW, recorded in waters with sea-surface temperatures of c. 20.3–23 °C (Fisher 1963; Barton 1980). Off Argentina, recorded at sea-surface temperatures of 12.7–20.7 °C (Cook & Mills 1972).

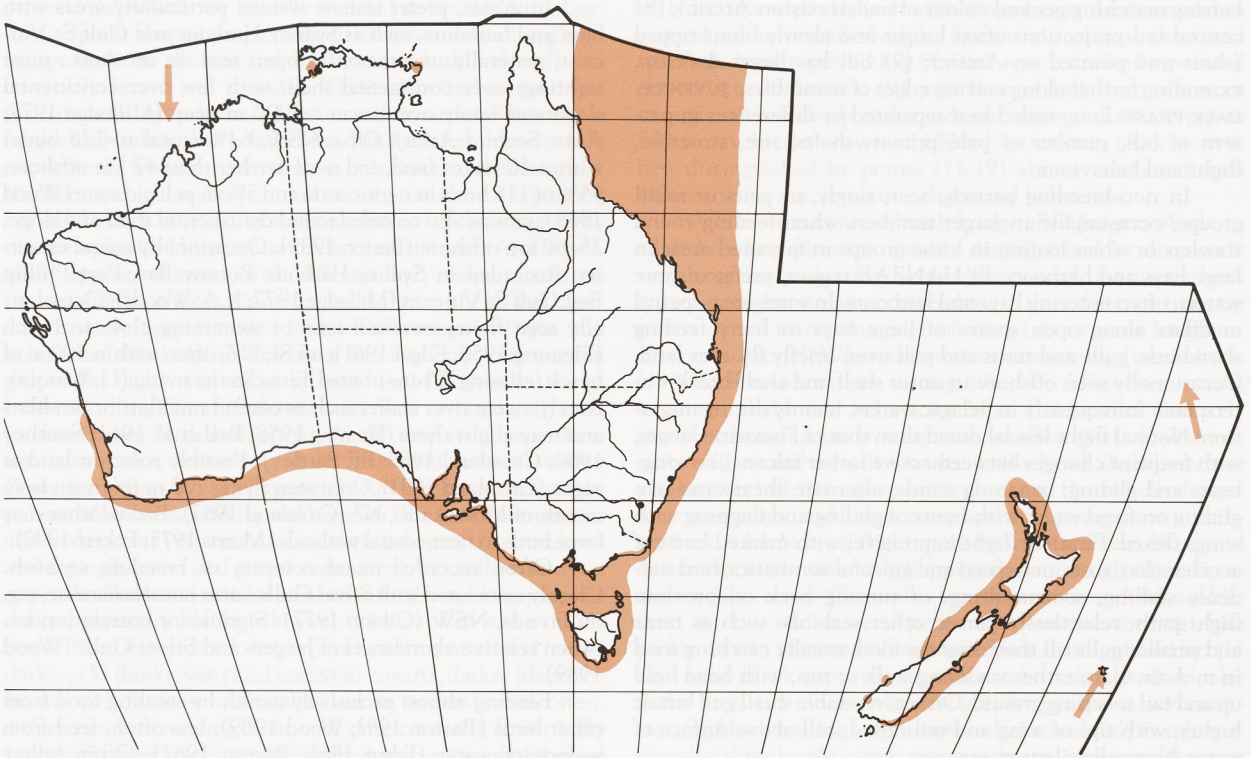
In A'asia, prefer inshore waters, particularly areas with bays and harbours, such as Sydney Harbour and Gulf St Vincent; generally uncommon in open seas. In se. Aust., most sightings over continental shelf, with few over continental slope and rarely over ocean >2000 m deep (Milledge 1977; Aust. Seabird Atlas). Off s. NSW, 64% (total n=126 birds) within 10 km of land, and none farther than 47 km offshore; 95% of 118 birds in neritic zone and 5% in pelagic zone (Wood 1989); groups also recorded round continental shelf and slope, 25–60 km offshore (Barton 1982). Occasionally round estuaries. Recorded in Sydney Harbour, Botany Bay, Port Phillip Bay, Gulf St Vincent (Milledge 1977; K.A. Woods). Occasionally seen flying over surf-zone or swimming close to beach (Fleming 1958; Edgar 1961); off SI, NZ, often within 500 m of beach, chasing White-fronted Terns *Sterna striata* (G. Watola). Rarely, occur over shores such as coastal mudflats or sandflats and may alight there (Fleming 1958; Bell *et al.* 1961; Southey 1980; Crossland 1987; P.F. Battley). Possibly roost on land at night (Crossland 1993). Once seen flying 200 m upstream from mouth of Motueka R., NZ (Crossland 1987). Bad weather may force birds to near-coastal wetlands (Morris 1975; Eckert 1990).

Often recorded round colonies of breeding seabirds. Closely associated with Silver Gulls *Larus novaehollandiae*, e.g. on Five Is, NSW (Gibson 1977). Significant correlation between relative abundances of Jaegers and Silver Gulls (Wood 1989).

Feeding almost exclusively aerial, by stealing food from other birds (Barton 1982; Wood 1989); less often, feed from surface of water (Edgar 1961; Barton 1982). Often follow ships, feeding on discarded refuse; also attracted to sewage outfall (Hindwood 1955).

**DISTRIBUTION** Breeding circumpolar in n. hemisphere. In North America, in w. and n. Alaska and n. Canada; from Aleutian Is, Alaskan Pen. and Kodiak I., N to Pt Barrow, then E through central Mackenzie, s. Keewatin and w. and sw. Hudson Bay, to n. Quebec and Newfoundland; occur N to Canadian Arctic Is. In Palaearctic, in w. and e. Greenland, Iceland, Spitsbergen, islands of North Atlantic and Arctic Ocean, and n. Scotland; Baltic coasts of se. Sweden and sw.





Finland, w. and n. coastal Norway, E through n. Russia to Chukotskiy Pen., then S to Kamchatka Pen. and n. coasts of Sea of Okhotsk. In w. and n. Russia, not farther S than Arctic Circle in s. Kolskiy Pen. and s. Obskaya Gulf; N to Novaya Zemlya and s. Taymyr Pen. During non-breeding period, occur off Pacific and Atlantic coasts of South America, S to s. Chile and Argentina; round Africa, mainly off Angola, Namibia and w. South Africa, but a few records scattered on Atlantic coast, N to w. Libya; uncommonly recorded, Red Sea, Gulf of Aden and Persian Gulf. Once recorded Pakistan. Occur widely in A'sian waters (Dement'ev & Gladkov 1951; Ali & Ripley 1969; AOU 1983; Furness 1987; Urban *et al.* 1987; BWP).

**Aust.** Mostly off SE, with smaller numbers regularly in SW. **Qld** Rare in N: single records E of Torres Str. (10°30', 145°30') and NE of Cooktown (14°30', 146°30') (Aust. Atlas); specimen, Townsville, 1 Jan. 1972 (Griffin 1972; Leach 1976); single, Cooktown, 12–13 Mar. 1991, may have been this species (McLean 1991). In SE, singles recorded off Fraser I., 5 Mar. 1979, 24 May 1979 (Sutton 1990); four records from Moreton Bay and two from Gold Coast (Aust. Atlas). Said to be moderately common off se. Qld and in Moreton Bay (Roberts 1979) and listed as uncommon N to 26°20' (Storr 1984). **NSW** Widespread off much of coast. Recorded N to Red Rock (Aust. Atlas) and Ballina (NSW Bird Rep. 1981). Mostly S of Taree to Green C., with most recorded off Sydney; maximum count  $\geq 20$  off Sydney Heads, 23 Feb. 1985 (NSW Bird Reps; Aust. Seabird Atlas; Aust. Atlas). Recorded in w. Tasman Sea, round Gascoyne Seamont, c. 650 km ENE of Eden (Barton 1980). **Vic.** Occasional records in e. Bass Str. and off Gippsland, E of Wilsons Prom.; most recorded in and between Westernport and Port Phillip Bays; c. 50 counted s. Port Phillip Bay, 31 Jan. 1982. Scattered records along w. coast (Cooper 1975; Vic. Bird Reps; Vic. Atlas; Aust. Seabird Atlas). Single jaeger, possibly Arctic, recorded inland at Edenhope, 24 Oct. 1985, after sw.

gales (Vic. Bird Rep. 1985). **Tas.** Recorded central Bass Str., and inshore waters off n., e. and s. coasts, from Albatross I., near Hunter I., E to C. Portland, including Devonport (>100, 6 Jan. 1973) and S to Storm Bay, Bruny I. and D'Entrecasteaux Channel (Tas. Bird Reps; Aust. Seabird Atlas; Aust. Atlas). On sw. and w. coasts, singles recorded South West Cape, 22–23 Jan. 1980 (Aust. Atlas); Nye Bay, 2 Jan. 1981 (White 1985); and beachcast, Ocean Beach, Dec. 1978 (Tas. Bird Rep. 8). Also recorded Georges Rocks in sw. Bass Str. (Napier & Singline 1979). **SA** Recorded in SE, from E of Port MacDonnell to e. Fleurieu Pen. Mostly round Kangaroo I., in Gulf St Vincent; also s. Eyre Pen. (Miles 1953; Cox 1973; SA Bird Reps; Aust. Seabird Atlas; Aust. Atlas). Rare inland record of six or more (including single specimen), Langhorne Ck, 14 Apr. 1985, after bad weather (Eckert 1990). **WA** Occasionally recorded off s. coast, from Christmas (Daw) I., and C. Le Grand NP, to Augusta, including Fitzgerald R. NP and Albany (Serventy & Whittell 1976; Jaensch 1989; Aust. Atlas). Moderately common round Cockburn Sound, and between Rottneest I. and mainland coast (Storr 1964b; Serventy & Whittell 1976; Storr & Johnstone 1988; Aust. Atlas). Also recorded in Timor Sea, 15°30', 122°30' (Carter 1983; Aust. Atlas). **NT** Single, Gove Pen., Oct.–Nov. 1977 (Aust. Atlas); single, Lee Pt, Darwin, 10–11 Feb. 1978 (Thompson 1978).

**NZ NI** Mainly Auckland Isthmus and n. coasts, from Parengarenga Harbour to Ohiwa Harbour, including many at Bay of Islands, Hauraki Gulf (Mercury and Little Mercury Is), Coromandel Pen. and Bay of Plenty. Uncommon farther E: isolated record near Te Araroa; a few records Mahia Pen., Hawke Bay, and S to Napier region, where c. 30 seen between Clifton and C. Kidnappers, Jan. 1985 (CSN 33); isolated record, Kairakau Beach. On w. coast, widespread from Tauroa Pt to Kawhia, including many from harbours such as Hokianga,

Kaipara (including c. 50, Dec. 1955; NZCL), Manukau, Raglan and Kawhia Harbours. Isolated records in Taranaki, at New Plymouth and near Opunake. Widespread sw. coast, from mouth of Wanganui R. to Wellington and Turakirae Head (NZ Atlas; CSN). Regular Cook Str. (Bell *et al.* 1961; Bartle 1974). **SI** Recorded Golden Bay, Tasman Bay and Marlborough Sounds; occasionally Clifford Bay. Widespread on e. coast, especially Pegasus Bay and Banks Pen., S to Taumutu, and between C. Wanbrow and Tautuku Bay. In Foveaux Str., recorded Fortrose, Toetoes Harbour and Oreti. Along w. coast, many records between mouth of Buller R. and Bruce Bay. Isolated records Jackson Bay and Dusky Sound. No records Stewart I. (Bell *et al.* 1961; Bartle 1974; CSN; NZ Atlas).

**Christmas I.** Single, specimen, 5 Jan. 1983. A jaeger found mid-1979, either Arctic or Long-tailed (Stokes *et al.* 1987).

**Kermadec Is** Single, 23 Nov. 1964 (Edgar *et al.* 1965). Seven recorded SE of Kermadec Is, at 34°11'S, 177°07'E, E of Kermadec Trench (Jenkins 1979).

**Chatham Is** Probably regular summer visitor in small numbers (Imber 1994); two records in Nilsson *et al.* (1994).

**S. Orkney Is** Signy I., single, specimen, c. 19–26 Jan. 1951 (Sladen 1952); single, 4 Dec. 1980 (Rootes 1988). Single, 16–22 Jan. 1966 (Beck 1968), may have been this species.

**Prince Edward Is** Two, Marion I., 10 Feb. 1979 (Sinclair 1981).

**Antarctica** Vagrant; unknown number at c. 61°S, 92°W, early Jan. 1973 (Watson 1975).

**MOVEMENTS** Migratory. Breed Arctic, moving S for boreal winter to non-breeding areas in Pacific, Indian and Atlantic Oceans, as far as 60°S (Tuck & Heinzel 1980; BWP). Mainly migrate close to continental coasts, but also overland and mid-ocean (in Atlantic Ocean) (King 1967; Furness 1987; BWP). Loose flock, possibly on migration, seen flying 15–45 m above sea at 37–46 km/h (Jenkins 1979).

**Departure** Failed breeders and immatures start leaving, July; successful breeders, mainly Aug.–Sept.; remain at some breeding areas till Oct.; leave s. breeding areas earlier than n. areas (Dement'ev & Gladkov 1951; Harrison 1983; Furness 1987). Vagrants to South Orkney Is, during non-breeding season (Rootes 1988), probably from populations that move down American coasts to non-breeding areas off s. South America (see Tuck & Heinzel 1980). In Pacific Ocean, probably migrate through e. and w. Pacific, and not recorded from central Pacific. In n. Atlantic Ocean, passage recorded throughout (King 1967; Tuck & Heinzel 1980; Harrison 1987; Pratt *et al.* 1987; BWP). Birds migrating to Aust. and NZ probably move through w. Pacific (Furness 1987); pass Sakhalin and Kurile Is (Dement'ev & Gladkov 1951); uncommon offshore passage migrant, Japan (Orn. Soc. Japan 1974); not recorded off China (de Schauensee 1984). Rarely, recorded near Fiji (Pratt *et al.* 1987). May be rare transient off n. PNG, where most records from Oct. (see Coates 1985).

Recorded off n. Aust., Nov.–Mar. (see Distribution). Said to move down e. Aust. coast (Tuck & Heinzel 1980). Uncommon visitor to waters off se. Qld from late Sept. (Storr 1984). Recorded off Sydney, NSW, from Oct. or Nov. (Milledge 1977; NSW Bird Rep. 1983); off Wollongong, NSW, significant numbers arrive Oct.–Nov., with maximum in Feb. (Wood 1989; Brandis *et al.* 1992); off Eden, NSW, arrive early Oct., with numbers gradually increasing to Jan.–Feb. (Barton 1982). Recorded Vic., Aug., but mostly from Oct. (Vic. Atlas). Origin and passage of those occurring w. Aust. not known. Three

routes have been proposed: (1) move W across Southern Ocean from se. Aust.; (2) move from w. Pacific Ocean, through se. Asian seas (recorded Indonesia and Thailand) to w. Aust.; (3) birds breeding n. Russia migrate overland to Persian Gulf and coasts of Arabia, may then move E across Indian Ocean to w. Aust. (Tuck & Heinzel 1980; Smythies 1981; Furness 1987; see van Balen 1991; Lekagul & Round 1991). Common between Fremantle and Rottnest I., sw. WA, where first appear late Sept.; said to be most numerous from late Dec. (Storr 1964a). In Indian Ocean, vagrants recorded Christmas I., Jan. (Stokes *et al.* 1987), and Prince Edward Is, Feb. (Sinclair 1981). Suggested that migrate to NZ across Coral Sea (Tuck & Heinzel 1980; Furness 1987); recorded Society Is (du Pont 1976), mid-Tasman Sea (Norris 1965; Barton 1980), and SE of Kermadec Is (seven, 1 Nov. 1979) (Jenkins 1979). Most common Jaeger to SI and NI, NZ, mostly Nov. (CSN); also recorded Aug. (Falla *et al.* 1981; Oliver); maximum numbers at some NZ sites in Feb. (e.g. Foxton Beach; CSN 22).

**Non-breeding** Mainly along s. coasts of South Africa, South America and A'asia (Furness 1987). Off Eden, NSW, possibly sedentary during summer (Barton 1982). May move locally in response to apparent sources of food, such as presence of foraging terns (e.g. at Mercury Bay, NZ; CSN 22); in NZ, sometimes seen moving out to sea with large numbers of White-fronted Terns (Jenkins 1969). May move upstream or to sheltered bays or coastal lakes during bad weather (McGill 1945; Morris 1975; Eckert 1990). At Eden, NSW, apparently move from inshore waters where found in late summer, to continental shelf and slope, where groups recorded in late Apr., before return N (Barton 1982). Small parties also noted in NZ before n. migration (CSN 24).

**Return** Generally Mar.–May (Furness 1987). Mostly leave NZ by Apr., though said to be not uncommon, May (CSN; Oliver). Most numerous off sw. Aust. before mid-Mar.; said to leave end Apr. or early May (Storr 1964a). Late records include: May, Vic. (Vic. Atlas); mid-Apr., Sydney Harbour, NSW (NSW Bird Rep. 1983); early May, Botany Bay (NSW Bird Rep. 1989); last seen off Coffs Harbour, NSW, early June 1976 (NSW Bird Rep. 1976). Not recorded off Wollongong, NSW, after May (Wood 1989). Uncommon visitor to se. Qld till early Apr. (Storr 1984). Extraliminally, only one occurrence in Apr., from Port Moresby district, PNG (Hicks 1990). In Pacific Ocean, one record, May, from Tonga (Jenkins 1980). Probably common passage migrant, N through Bali, Apr.–May (Ash 1984); elsewhere in Indonesian waters, confirmed records of n. movement from Mar.; recorded Malaysia, Apr. Recorded Ussuriland, Russia in May. Arrive breeding grounds May and June (see Dement'ev & Gladkov 1951; van Balen 1991).

**Breeding** Some immatures stay in s. hemisphere during austral winter, though most migrate to breeding grounds (Furness 1987). In Aust., reporting rates in summer 1.0%, in winter 0.1% (Aust. Atlas). Some also recorded NZ during austral winter.

**FOOD** Scavenge and steal food from other birds; most parasitic jaeger; also opportunistic predator. Mainly fish, carrion, young birds and eggs, plant material, molluscs, crustaceans, insects and small mammals. For details of extralimital studies, see BWP. **Behaviour** For detailed discussion, see Furness (1987) and O'Donald (1983). Steal food mainly from gulls and terns; especially White-fronted Tern in NZ (Stidolph 1931; Edgar 1961; Barton 1982; CSN) and Silver Gull in Aust. (Milledge 1977; Barton 1982; Wood 1989); Silver Gull not commonly attacked in NZ (McKenzie & Orum 1946;

Hawkins 1980; CSN). Choose a bird, alone or in a flock, pursuing and staying close to it until it disgorges or drops food (Dove 1918; Wood 1989). Once, used feet and bill to strike Caspian Tern *Sterna caspia* from behind, dislodging Tern's feathers; at times both birds almost vertical; Tern forced to ground, but attack resumed only when it flew again (P.F. Battley). Groups of four (Edgar 1961) or up to eight (Bassett-Hull 1916) can co-operate to attack a single tern. May strike from above (Southey 1980). Catch dropped food before it hits water (Iredale 1940; Storr 1964a). Also steal from Fluttering Shearwaters *Puffinus gavia* (Barton 1982; CSN 34), White-faced Storm-Petrels *Pelagodroma marina* (CSN 39), White-tailed Tropicbirds *Phaethon lepturus* (Lewis 1988), Australasian Gannet *Morus serrator* (Barton 1982), Black-winged Stilts *Himantopus himantopus*, Masked Lapwings *Vanellus miles* (Southey 1980), Red Knots *Calidris canutus*, Kelp Gulls *Larus dominicanus* (Cunningham & Moors 1985; CSN 29), Black-billed Gulls *Larus bulleri* (Crossland 1987), Caspian Tern (McKenzie & Orum 1946), Crested Terns *Sterna bergii* (Bassett-Hull 1911; Dove 1918; Storr 1964a; Milledge 1977; Barton 1982), and Bridled Terns *Sterna anaethetus* (Storr 1964a). Pursue and force small passerines into water (e.g. Silvereyes *Zosterops lateralis*) (Sibson 1956; Lewis 1987); also appear to take wind-blown locusts *Chortoicetes terminifera* (White 1917). May take offal from surface of water (Barton 1982). Occasionally seen fishing among large schools of fish (Edgar 1961). Also observed picking prey from surface of water (Ainley & Boekelheide 1983). Readily attracted to boats with food (CSN 41).

**Adult** No detailed studies. In SA (two stomachs; White 1916): Molluscs: gastropods: Trochidae: *Thalotia conica* (both stomachs); Crustaceans: crabs (both). In Gulf St Vincent, SA (four stomachs; White 1917): Molluscs: cephalopods: squid 2 freq.; Insects: Orthoptera: Acrididae: *Chortoicetes terminifera* 3; Fish 4. **Other records** Insects: Coleoptera: Dytiscidae (FAB); Fish (Dove 1918; Hindwood 1924; Stidolph 1931; Iredale 1940; Edgar 1961; Storr 1964a; FAB); Birds: small passerines (Sibson 1956; Lewis 1987). Eel bait (McKenzie & Orum 1946); offal (Barton 1982); refuse (Hindwood 1924; Leach 1928; Fisher 1963).

**Intake** Gulf St Vincent, SA, 29 *Chortoicetes terminifera* and parts of small fish found in one stomach; 36 cephalopod beaks and many fish remains in another (White 1917).

**VOICE** Only information from HANZAB region is from Barton (1982): high-pitched *weet, weet*, given by birds feeding on offal, only when with conspecifics; when feeding, quieter than Pomarine Jaeger; silent when pursuing other species. For detailed accounts of calls at breeding grounds, see Perdeck (1963) and BWP.

**PLUMAGES** Prepared by R.P. Scofield. Fledge and migrate S in varying juvenile plumage; three colour phases described: dark, light and intermediate (or barred); colour of juvenile plumage not related to colour of immature or adult plumages. Immature plumages polymorphic, with dark, intermediate (or barred or dark light-morph) and light morphs described; all recognized by barred underwing-coverts. First attain immature non-breeding (first basic) plumage in complete post-juvenile (first pre-basic) moult after s. migration. Undergo partial first pre-breeding (pre-alternate) moult to first immature breeding plumage late in first austral summer. Thereafter, moult twice

annually in series of immature post-breeding (pre-basic) and pre-breeding (pre-alternate) moults, with gradual transition to adult plumage. Adult plumages, dimorphic: a varying light morph and a rather uniform dark morph (e.g. BWP); some authors recognize a third intermediate (or barred) morph (e.g. Harrison 1983; photos in Pringle 1987: 462, 464–5), considered here (*apud* BWP) as dark light-morphs. However, no evidence that dark light-morph adult breeding more heavily barred in non-breeding plumage than other light morphs. First attain definitive adult non-breeding plumage in pre-basic moult at beginning of fourth austral summer; attain definitive adult breeding plumage in pre-alternate moult, usually at end of fifth austral summer. Thereafter, moult twice annually. Average age of first breeding differs significantly ( $P < 0.01$ ) between morphs: in light morph, 3.9 years ( $n=14$ ); in dark morph ( $n=11$ ) and so-called intermediate morph (dark light-morph) ( $n=27$ ), average 4.6 years (O'Donald & Davis 1975). No subspecies. Descriptions below based on specimens from A'asia or, where not available, birds from rim of North Pacific Ocean (e. Siberia and n. North America).

**Adult breeding** (Definitive alternate). **LIGHT MORPH:** **Head and neck** Forehead, brown (119B) with varying amounts of off-white next to bill, grading to black-brown (119) on crown, lores and cheeks below eye; malar area, dark brown (119A). Hindneck, grey-brown (79) with orange-buff (153) shaft-streaks to some feathers. Narrow buff (124) half-collar on nape (sometimes orange-buff [153] when fresh). Chin and throat, off-white; in darkest birds, chin and throat can be washed brownish grey. Rest of head and neck varies, from mostly off-white with buff (124) or cream (54) wash, to mostly brownish grey (c79). All except darkest birds have prominent orange-buff (153) shaft-streaks to some ear-coverts and feathers on sides of neck; with wear these feathers become strongly pointed. **Upperparts** Dark-brown (119A). **Tail** Rectrices, dark brown (119A) with black-brown (119) tips and white or off-white on basal one-sixth of webs; central rectrices elongated. Upper sides of shafts, dark at tip, grading to off-white or light grey-brown (119D) at base; underside of shafts, light grey-brown (119D) at tip, grading to white at base. **Underparts** Mostly white or off-white, with varying dark patches. Sides of breast and upper breast usually washed light brownish-grey (c79), forming dark band of varying width and darkness. Axillaries, brown (119B). Flanks, rear of belly, vent and undertail-coverts marked with dark brownish-grey (c79); those with darker and larger breast-bands usually have larger dark patches on flanks, rear of belly, sides of neck and ear-coverts. **Upperwing** Most coverts, dark brown (119A). Remiges and greater coverts, black (89) when fresh, fading to black-brown (119) with wear; bases to all primaries, white, extending slightly beyond greater coverts on outer five primaries. Shafts of outer 2–3 primaries, mostly off-white with brown (119B) tips; other shafts paler than webs, usually a mixture of light grey-brown (119D) or pale brown (223C) on tips, grading to off-white towards base. **Underwing** Coverts and subhumeral, brown (119B). Remiges, dark brown (119A) grading to light grey-brown (c119D) toward bases, with off-white basal webs; outer primaries have silvery sheen. Shafts to primaries and most secondaries, off-white or light grey-brown (119D), but covered by outer webs of adjacent feathers on all but outer three primaries. **DARK MORPH:** Like light morph, but differs by: **Head and neck** Crown and forehead, mostly black-brown (119) with varying amount of off-white next to bill. Rest of head, dark-brown (119A) with some yellow-brown (123C) shaft-streaks on ear-coverts. **Underparts** Brown (119B).

**Upperparts, Tail** As light morph, except little or no pale at bases of primaries. Exceptionally dark birds may be entirely black-brown (119) with only slightly paler brown (119B) feathering next to bill, and off-white shafts to outer primaries (photo in Harrison 1987).

**Adult non-breeding** (Definitive basic). **LIGHT MORPH:**

**Head and neck** Crown, lores, malar area and cheeks below eye, dark brown (219), varying marked with narrow off-white tips and broad off-white edges to feathers of hind-crown. Forehead, dark brown (219) with varying number of off-white or pinkish-buff (121D) feathers next to bill. Nape, chin and throat, white or off-white, forming complete collar; nape varying marked by brown (119B) bases to feathers and scattered brown streaks. Feathers of breast vary: off-white with brown (119B) streaks or spots; or off-white with one or more brown subterminal bars and light pinkish-buff (219D) wash; or brown with off-white restricted to base. **Upperparts** Mainly dark brown (219). Mantle, brown (119B) with pink-buff (121D) subterminal bars or tips, which are usually divided by brown shaft-streaks. Some birds have scattered small white spots on edges and tips of other feathers of upperparts, which are quickly lost with wear (these pale markings may indicate young adults). Lateral uppertail-coverts, white, with brown (119B) spots, complete and incomplete brown (119B) bars and brown (119B) tips; central 2–4 uppertail-coverts usually uniformly brown (119B). **Tail** As adult breeding but central rectrices often heavily worn, broken, missing, or growing. **Underparts** Vary. Mostly white or off-white. Breast, usually white, marked with indistinct brown (119B) tips to feathers. Axillaries, brown (119B). Flanks, vent, undertail-coverts and patch on thighs, either: strongly or weakly barred, with two or more brown bars; or mainly brown (119B) with pinkish-buff (121D) streaks and tips to some feathers of vent, undertail-coverts and lower flanks. Belly, usually white, though on a few, varying washed light grey-brown (119C). **Wing** As adult breeding. **DARK MORPH:** As adult breeding dark morph but: no yellow-brown (123C) shaft-streaks to feathers of neck; and upperwing-coverts and most feathers of upperparts have narrow rufous-brown (240) edges; edges fade to buff (124) on uppertail-coverts, vent and undertail-coverts and can be retained till pre-breeding moult begins.

**Juvenile** Varies greatly. Many orange-buff (c118) feathers fade to off-white before being replaced in post-juvenile moult. **LIGHT PHASE: Head and neck** Forehead, crown, lores and ear-coverts, orange-buff (c118) or light rufous (c39) with dark-brown (219) shaft-streaks and bases to feathers. Chin and throat, off-white, with varying buff (124) or light-rufous (c39) wash, and some brown (119B) subterminal spots and shafts. Feathers of nape, orange-buff (c118) with brown (119B) shaft-streaks and bases. **Upperparts** Mantle and rump, brown (119B) with pair of orange-buff (c118) spots on distal edges of each feather and broad orange-buff tips to feathers. Back, dark-brown (219) with broad orange-buff tips to feathers. Uppertail-coverts, off-white, with broad dark-brown (219) bars; many bars have small rosethorns extending along shaft toward tip and orange-buff (c118) wash, especially next to bars. **Underparts** Feathers of breast, orange-buff (c118) and off-white, with two brown (119B) bars. Axillaries, white, with 3–4 brown (119B) bars, the innermost often incomplete. Feathers of flanks, white, with three brown bars and varying orange-buff wash, especially on anterior flanks and patch on thigh. Belly and vent, mostly off-white, with varying brown (119B) barring, becoming indistinct on lower belly and vent. Undertail-coverts, off-white, with 3–4 dark-brown (219) bars, small

rosethorns extending along shaft toward tip, and orange-buff (c118) wash. **Tail** Mostly dark brown (219) with white bases to rectrices; white covers basal two-fifths of central rectrices, decreasing to one-fifth on outer rectrices (t6). Tips of t2–t6, straight with slight point; central rectrices, elongated and strongly pointed (cf. Long-tailed Jaeger), extending beyond rest of tail by 12–22 mm. Shafts of undertail, off-white.

**Upperwing** Marginal coverts, orange-buff, with dark-brown (219) central wedges. Primary coverts, black-brown (119) with narrow buff (124) edges. Secondary, tertial and subhumeral coverts, dark brown (219) with broad orange-buff (c118) tips or paired terminal spots; greater coverts often have buff (124) outer edge (not meeting buff tip). Basal half of primaries, white, showing beyond primary coverts and forming narrow white border to coverts; rest of primaries, black-brown (119) with buff tips when fresh; slightly pointed when worn. Shafts of p6 and p7, off-white at bases becoming brown (119B) at tips; shafts of p8–p10 entirely off-white. Secondaries, black-brown (119); palest birds have orange-buff (c118) tips. Humerals and tertials have broad orange-buff (c118) tips and some orange-buff spots along edges. **Underwing** Marginal coverts, orange-buff (c118) with brown (119B) central wedges. Rest of coverts strongly barred brown (119B) and off-white or buff (124); coverts have pairs of small pale spots at tips. Outermost rows of greater coverts have wide pale subterminal bars that align to form one or more wing-bars. Subhumeral and their coverts, distinctive, off-white or buff (124) with 3–4 narrow brown (119B) bars, the innermost often incomplete. Remiges, dark brown (119A) with large white bases and outer webs to primaries; white at bases extends beyond overlying coverts, forming pale crescent. Shafts of remiges, white or off-white, with pink-brown (219D) wash at tip. **INTERMEDIATE PHASE:** As light phase, except: **Head and neck** Crown, black-brown (119) with brown (119B) edges to feathers. Posterior lores, malar area and central ear-coverts, dark brown (119A); feathers of crown and ear-coverts have off-white tips when fresh. Rest of head and neck, brown (119B) with light grey-brown (119C) edges to feathers. **DARK PHASE:** Mostly black-brown (119) with pale edges to varying number of feathers. Feathers of nape, sides of head, mantle, rump and belly, and marginal upperwing-coverts narrowly edged light rufous-brown (139). Vent and tail-coverts have light rufous-brown (139) or buff (124) tips or, sometimes, barring. Underwing-coverts have light rufous-brown (139) tips and terminal spots (usually two pairs of spots on lesser and median coverts and one pair on greater coverts). Tail, uniform black-brown (119). Remiges have no pale bases, or pale area reduced and does not extend beyond coverts on upperwing or underwing; only shafts of outer three primaries entirely off-white; shafts of inner primaries, dark brown (119) or pink-brown (219D) centrally, with dark-brown (119A) or black-brown (119) tips. Darkest birds entirely black-brown (119) except for primary-shafts; separable from very dark adult dark morphs only by colour of bare parts and short central rectrices.

**Immatures** Three morphs described. Generally, all distinguished from adults by: (1) buff (124) barring on feathers of upperparts; (2) central rectrices shorter, and not extending so far beyond rest of tail; (3) pale patches on tarsi; (4) barring on underparts; and (5) mixture of two or more ages of feathers on upperparts and wing-coverts.

**First immature (non-breeding and breeding)** (First basic, First alternate). **LIGHT MORPH:** Based on BWP, Olsen (1992: drawing p. 45, photos p. 91, nos 41, 42) and Walter (1962: photo p. 177). As light-morph adult non-breeding

except: (1) upperparts, dark brown (219) with narrow light rufous-brown (139) tips to most feathers; (2) underwing-coverts like those of juvenile but less strongly barred, especially primary and greater coverts (which are mostly off-white or light rufous-brown [139] with two indistinct brown [119B] bars and some submarginal streaks); (3) rectrices project only 30–46 cm. First immature breeding superficially similar, with mixture of new and old feathers on upperparts; in palest, head and underparts can be mostly white. **INTERMEDIATE MORPH:** Based on BWP, Pringle (1987: 466, lower photo), and one specimen (MV R10103). Like intermediate-phase juvenile but: (1) underparts more heavily barred with off-white, especially tail-coverts (which can appear mostly white); and (2) upperparts and wings as light-morph first immature non-breeding. **DARK MORPH:** Based on one specimen (MV 1451) and Olsen (1992: photo p. 92, no. 45). Like dark-phase juvenile but with narrower, light rufous-brown (139) tips to feathers of upperparts, and buff (124) edges to some feathers of nape. In first immature breeding: (1) upperparts a mixture of fresh dark-brown (119A) feathers, like adult breeding dark morph, and worn dark-brown (219) immature non-breeding feathers, some still with narrow light rufous-brown (139) edges; (2) central rectrices elongated, projecting >30 cm beyond rest of tail. Underwing patterned as juvenile but pale areas less distinct and absent on some outer greater coverts. Dark-phase juveniles that become light-morph adults may develop large off-white patches on vent, rear of belly and chin, and have broadly barred dark-brown (219) and light rufous-brown (139) undertail-coverts. Exceptionally, may be entirely dark and separable from dark adult dark morph only by pale tarsi and feet, and short, less elongated central rectrices.

**Second immature (non-breeding and breeding)** (Second basic, Second alternate). **LIGHT MORPH:** Based on BWP, Olsen (1989: photos p. 158; 1992: photos p. 91, no. 39 upper). Like light-morph adult non-breeding except: head like that of adult breeding; cap, dark-brown (119A); feathers of nape and rear ear-coverts, yellow (118) with brown shaft-streaks. Breeding differs from non-breeding only in having upperparts a mixture of fresh dark-brown (119A) adult breeding feathers and worn dark-brown (219) immature non-breeding feathers; some may retain light rufous-brown (139) subterminal bars to some feathers. Underwing as in first immature non-breeding. **INTERMEDIATE MORPH:** Said to be inseparable from light-morph adult from late in first austral winter (BWP). However, some may retain large amounts of barring throughout immaturity; one specimen (MV R10104), aged as second or third non-breeding by timing of moult and pattern of underwing, was heavily barred below; and two specimens (MV R10108, MV 45342), aged as fourth or fifth immature non-breeding on length of projection of central rectrices and mixture of old and new plumages in upperparts, were heavily barred on underwing (like juvenile). **DARK MORPH:** Based on photos in Olsen (1992: pp 92–93, nos 44, 45, 50). Said to be mostly like dark-morph adult from austral summer of second to third calendar year. However, some birds in second and third calendar years (aged by lengths of central rectrices and photos in Olsen [1992]), have underwing-coverts similar to first immature plumages. Also, a photo said to be of a bird in its fourth calendar year (third immature breeding), appears to have central rectrices shorter than in adult, and pale bases to greater underwing-coverts and outer rectrices. Third immature non-breeding and subsequent immature plumages may retain pale edges to some feathers of upperparts for one or two generations of feathers, and most will have a mixture of old and new

feathers instead of uniformly new plumage, as in adults.

**Subsequent immature plumages** **INTERMEDIATE AND DARK MORPHS:** See Second immature.

**Third immature non-breeding** (Third basic). **LIGHT MORPH:** Based on BWP; no photos or specimens available. Like adult non-breeding, except underwing a mixture of brown adult-type coverts, and immature feathers with off-white or buff edges and bars: median coverts usually have either broad pale edges or are mostly pale with incomplete dark bars, streaks or subterminal spots; these contrast with surrounding mostly dark feathers to form light underwing-bar; subhumeral coverts and subhumeral feathers usually strongly barred off-white and brown (119B).

**Third immature breeding** (Third alternate). **LIGHT MORPH:** Based on Olsen (1989: photos p. 159; 1992: p. 92, nos 43, 48). Generally like light-morph adult breeding; underwing like third immature non-breeding but subhumeral and their coverts usually dark brown (119A) with off-white or buff (124) edges and terminal spots.

**Fourth immature non-breeding** (Fourth basic). **LIGHT MORPH:** Based on unpublished photos of live bird in hand (D.W. Eades) and one specimen (QM 26554). Most probably inseparable from light-morph adult non-breeding, though some retain one or more older generations of feathers on upperwing, scapulars and uppertail-coverts. These retained tracts may be exceptionally worn. Exceptionally, some may retain some barred underwing-coverts.

**Fourth immature breeding** (Fourth alternate). **LIGHT MORPH:** Based on Olsen (1992) and BWP. Normally not separable from light-morph adult breeding but may retain some dark barring on underparts or some pale barring on uppertail-coverts. Exceptionally, some may retain some barred underwing-coverts.

**BARE PARTS** Based on museum labels (six skins), photos (Melville 1985; Pringle 1987; *Br. Birds passim*), and BWP. **Adult** Bill, black (89) with supra-nasary saddle and base of bill, dark olive-brown (129), brownish grey (79) or pearl grey (81). Iris, dark brown (119A). Tarsus and foot, black (89). **Juvenile** Bill, grey (84) or blue-grey (c88) with black (89) tip. Iris, dark brown (119A) or black-brown (119). Tibia, black (89), blue-grey (c88) or mixture of black and blue-grey. Tarsus, blue-grey (c88). Foot, bi-coloured; distal half of toes and webs, black (89); basal half, pale blue-grey (c88) or pink-white (c108D). **Immatures** Bill and iris, as adult. Tibia, black (89). Tarsus becomes increasingly black (89) with age, spreading from joints toward centre; area of black may differ between tarsi. In second calendar year, 10–70% of surface of tarsus, blue-grey (c88); in third, 0–50%; in fourth, 0–20%; in fifth, 0–10%; all black when older (BWP). However, one dark-morph immature (possibly second year) (MV 1451) has only small pale areas, on tarsal-phalangeal joints. Another, aged as fourth immature non-breeding (QM 26554) has right tarsus mostly pale (c. 60% of area) with dark line running down rear of tarsus; left tarsus only pale toward bottom of front (c. 40% pale). Web and toes rapidly darken to black (89).

**MOULTS** Based on c. 40 museum skins (AM, AIM, ANWC, MV, SAM, QM, WAM), Melville (1985), Stresemann & Stresemann (1966) and BWP.

**Adult post-breeding** (Fifth and subsequent pre-basic). Complete; primaries outwards. Moult of body occurs mainly in

non-breeding areas; in failed breeders, apparently July–Aug.; in breeding birds, late Aug. to late Sept. Usual sequence: crown, neck, mantle, breast, flanks, tail-coverts, rest of head, belly, vent, scapulars, back and rump; finished by Nov. Moulting of wing begins Nov., finished by end of Apr. Normally moult tail in sequence t1–t2–t6–t5–t3–t4. **Adult pre-breeding** (Fifth and subsequent pre-alternate). Partial; mid-Mar. to Apr. Moulting head and body, except for most scapulars and centre of back and rump; do not moult wing-coverts or remiges. Begins as post-breeding moult of outer primaries is finishing (about Apr.); generally completed before n. migration. Sequence and completeness of moult of tail not properly known. **Post-juvenile** (First pre-basic). Complete. Body, Nov.–Apr. Moulting of wing begins much later than in adults but often moult inner three remiges simultaneously, so moult sometimes completed by June. Moulting of tail begins late Feb. to Mar.; t1 always moulted first, sequence then usually t2–t6–t5–t3–t4; finished July. **First immature pre-breeding** (First pre-alternate). Does not always occur. Partial; June–July; remiges and rectrices moulted during post-juvenile moult sometimes still growing. Moulting some feathers of breast, head, mantle and tail-coverts. **First, second and third immature post-breeding** (Second, third and fourth pre-basic). Not always complete. Body, June to Aug.–Oct. All remiges, late Oct.–Nov. to Apr. Normally begins 1–2 months before adult post-breeding moult, though timing becomes closer to that of adult each year. Moulting of tail, complex; central rectrices may be retained. **Second, third and fourth pre-breeding** (Second, third and fourth pre-alternate). Partial. Moulting increasing amounts of body each year. Breed only after undergoing a complete pre-breeding moult. Dark morphs may take longer to reach adult cycle of moults than light morphs.

**MEASUREMENTS** (1) A'asia, ages combined, skins; for definitions of T6, T1–T6, M–U, Gonys and SNS, see Pomarine Jaeger (AM, ANWC, MV, NMNZ [from Melville 1985], QM, SAM, WAM). (2) South America, adults, skins; methods not known (Murphy [AMNH]).

	MALE	FEMALE	
WING	(1) 323.1 (6.66; 315–330; 18) (2) 320.0 (301–340; 16)	319 (14.59; 298–345; 18) 323.7 (317–341; 14)	ns
TAIL	(1) 169.9 (28.07; 130–207; 16) (2) 188.9 (164.5–235.0; 16)	171.3 (26.02; 138–175; 15) 199.7 (176–226; 14)	ns
T6	(1) 125.4 (23.04; 101–204; 16)	127.5 (26.96; 102–152; 15)	ns
T1–T6	(1) 56.7 (24.6; 25–100; 14)	49.7 (22.46; 26–58; 11)	
BILL	(1) 29.7 (1.91; 26.5–33.0; 20) (2) 31.2 (28.0–35.0; 16)	29.7 (1.6; 28.0–32.5; 20) 31.8 (29.0–34.5; 14)	ns
THL	(1) 71.7	70.0	
M–U	(1) 15.4 (0.51; 14.4–16.1; 6)	–	
GONYS	(1) 7.7 (0.76; 7.0–9.2; 16)	7.5 (0.71; 6.3–8.3; 11)	ns
SNS	(1) 15.0 (1.38; 12.7–17.5; 16)	15.0 (1.66; 14.6–17.7; 11)	ns
TARSUS	(1) 44.7 (2.27; 39.2–48.0; 20) (2) 41.9 (39.5–45.5; 16)	44.4 (1.78; 39.5–49.3; 20) 42.1 (39.0–45.0; 14)	ns
TOE	(1) 42.3 (2.62; 35.8–45.7; 13) (2) 34.8 (33.0–37.0; 16)	42.2 (1.64; 41.0–45.0; 17) 35.9 (32.0–38.0; 14)	ns

In some European populations, females have significantly longer wings and bills (P,0.05) (BWP); no differences in small samples from s. hemisphere (above).

(3–5) A'asia, skins; methods and samples as (1), sexes combined: (3) Adults that have not begun post-breeding moult of remiges; (4) Adults that have begun or completed post-breeding moult of remiges; (5) Immatures; (6) Juveniles.

	UNSEXED
WING	(3) 326.1 (10.89; 305–342; 13) (4) 316.5 (9.90; 296–335; 24) (5) 327.1 (11.57; 306–345; 9) (6) 310.1 (8.25; 298–324; 8)
TAIL	(3) 194.2 (20.16; 139–222; 13) (4) 155.3 (27.07; 120–204; 20) (5) 160.4 (15.91; 125–181; 8) (6) 139.7 (10.03; 124–152; 6)
T1–T6	(3) 83.5 (15.62; 38–100; 13) (4) 51.0 (21.19; 20–100; 13) (5) 49.4 (8.55; 32–57; 7) (6) 28.5 (6.5; 19–35; 4)
T6	(3) 110.6 (9.08; 99–125; 13) (4) 126.3 (36.53; 100–204; 20) (5) 117.1 (11.83; 91–129; 8) (6) 120.7 (21.57; 90–152; 6)
BILL	(3) 29.3 (1.48; 26.3–32.0; 13) (4) 30.1 (2.80; 26.2–41.2; 26) (5) 30.2 (1.56; 28.0–33.0; 9) (6) 29.9 (1.45; 27.9–32.5; 8)
M–U	(3) 15.3 (0.53; 14.7–16.0; 5) (4) 15.4 (0.67; 14.4–16.1; 4) (5) 14.1, 16.2, 16.2 (6) 15.2, 15.5
GONYS	(3) 7.4 (0.79; 6.4–9.2; 13) (4) 7.4 (0.66; 6.7–8.8; 16) (5) 7.6 (0.62; 6.5–8.3; 8) (6) 6.8 (0.67; 6.3–7.9; 4)
SNS	(3) 14.5 (1.39; 12.4–17.0; 13) (4) 14.9 (1.33; 12.5–17.7; 17) (5) 16.0 (1.18; 14.2–17.5; 8) (6) 15.3 (0.78; 14.4–16.4; 4)
TARSUS	(3) 44.9 (1.41; 42.3–46.9; 13) (4) 44.6 (2.75; 39.0–49.3; 27) (5) 44.8 (1.00; 43.3–46.8; 9) (6) 44.6 (1.15; 43.1–47.1; 8)
TOE	(3) 41.7 (2.17; 39.4–45.7; 9) (4) 42.6 (2.14; 35.8–45.5; 23) (5) 42.6 (2.13; 39.2–44.6; 6) (6) 42.9 (1.24; 41.0–45.0; 7)

Wing and all measures of tail significantly (P<0.01) longer in adult breeding than adult non-breeding; T1 of immatures significantly (P<0.01) shorter than that of adults; t1 of juveniles significantly shorter (P<0.01) than that of immatures.

Ratio of length of supra-nasal saddle to length of maxillary unguis: in juveniles, 0.24, 0.25, 0.26; in immatures, 0.26 (0.018; 0.23–0.28; 7); and in adults, 0.23 (0.018; 0.20–0.28; 29); ratio in immatures significantly (P<0.01) greater than in adults.

**WEIGHTS** A'asia, label data on skins (AM, ANWC, MV, QM, SAM, WAM): adult males: 450, 414, 400, 384; adult female 410; unsexed adult: 414; beachcast, starved: adults: 260, 292, 194, 168, 146; immature: 243.

In n. Alaska, adults, breeding: males 421 (51.7; 301–540; 20); females 508 (80.9; 346–644; 11); females significantly heavier (P<0.01). For discussion of sexual dimorphism, see Furness (1989).

**STRUCTURE** Wing, long, pointed and narrow; width at carpal joints 137 mm or c. 45% of length of wing. Eleven primaries; extralimitally: in adult: p10 longest, p9 6–16 mm shorter, p8 19–32, p7 35–55, p1 165–182; in juvenile: p1 150–



**Table 1.** Ratio of length of bill to length of maxillary unguis; age in calendar years; data for Long-tailed Jaeger from A'asian skins (AM, MV, SAM, QM); data for Arctic Jaeger from Europe (BWP).

Age	Long-tailed Jaeger	Arctic Jaeger	Pomarine Jaeger
JUVENILE	2.04 (0.12; 1.83–2.20; 36)	2.23 (0.14; 2.03–2.50; 33)	2.06, 1.99, 2.05
2–3	–	2.19 (0.06; 2.12–2.28; 6)	–
2–4	1.98 (0.09; 1.80–2.10; 28)	–	1.94, 2.11, 2.07 <sup>A</sup>
4–5	–	2.13 (0.08; 1.95–2.21; 14)	–
ADULT	1.89 (0.08; 1.70–2.02; 93)	2.06 (0.07; 1.98–2.15; 34)	1.95, 1.85, 2.03

<sup>A</sup> Immatures of all ages; for comparison, immatures combined for Arctic Jaeger: 2.15 (0.07; 1.95–2.28; 20).

165 mm shorter than p10; p11 minute and hidden by lesser upper primary coverts (BWP; lengths of other primaries not given); no Aust. data because specimens in moult. Seventeen secondaries, including four tertials. Tail, slightly wedge-shaped, with t2 5–10 mm longer than t6. T1: slightly elongated and pointed in juvenile; strongly elongated in adult; t1 of immatures intermediate between juvenile and adult. In adult breeding, tips of feathers of neck and sides of head pointed because edges wear leaving shafts exposed. Bill, long and slender. Tarsus and toes, short and broad, scutellate. Front three toes fully webbed. Nails, sharp, decurved; outer toe c. 86% of middle; inner c. 73%; hind c. 23%.

**RECOGNITION** ALL AGES: Arctic always distinguished by: pale feathers on forehead next to bill (none on Long-tailed and Pomarine); length and shape of central rectrices (see below); ratio of length of bill to length of maxillary unguis significantly less ( $P < 0.01$ ) than in Long-tailed at all ages (though ratio decreases with age) (see Table 1); and number of pale primary-shafts (see below). **ADULTS:** Arctic differs from Long-tailed and Pomarine by: four completely pale primary-shafts with pale bases to most other primaries (in Pomarine, 5–6 off-white shafts; in Long-tailed, 2–3); elongated central rectrices shorter than those of Long-tailed at all ages; central rectrices never twisted as in Pomarine. **JUVENILES:** Arctic differs by: rufous markings on head; pale nose-band; central rectrices pointed (rounded in Pomarine and Long-tailed); 3–5 completely pale primary-shafts and 2–3 partially pale shafts (Pomarine often has 6–8 mostly pale shafts and Long-tailed never has more than three [Olsen 1992]); tips of primaries pale when fresh; buff edges to tips of tertials (in Pomarine, separate spots on each web or single spot on outer web); greater upperwing-coverts have buff (124) line on edge of outer web not joining buff-fringed tip (in Pomarine buff [124] restricted to tip); indistinct barring on uppertail- and undertail-coverts (distinct parallel bars across all feathers in Pomarine and Long-tailed). Tips of primaries, pointed (in intermediate morphs only; BWP *contra* Walter 1962). Juvenile Pomarine also has white crescent on underwing-coverts, formed by white bases

**Table 2.** Extension of central rectrix (t1–t6); age in calendar years; sexes and localities combined (BWP).

Age	Long-tailed Jaeger	Arctic Jaeger	
1	23 (4.7; 18–32; 39)	17 (3.6; 12–22; 34)	*
2	56 (21.3; 36–82; 4)	40 (8.5; 30–46; 3)	ns
3	88 (26.3; 60–134; 10)	51 (12.4; 35–63; 8)	*
4–5	130 (42.3; 65–213; 22)	61 (15.1; 40–80; 24)	**
6+	179 (25.5; 135–256; 84)	82 (9.91; 60–105; 62)	**

to greater primary coverts (not in Arctic or Long-tailed). Juvenile Long-tailed has large white triangle on underwing and white crescent on upperwing formed by pale bases to primaries. **IMMATURES:** Arctic differs by: (1) number of pale primary-shafts; shape of bill; and the central rectrices shorter than those of Long-tailed (see Table 2), and differ in shape and length from those of Pomarine. Immature Long-tailed Jaeger usually also have buff (124) tips to rectrices, especially in non-breeding plumages.

**AGEING** Juveniles differ from immatures by: short, pointed central rectrices that hardly project beyond the tail (12–22 mm); (2) pale base to bill, and pale tarsi, tibia and most of foot; (3) all but the darkest have strong rufous tinge to sides of head, broad rufous-brown (139) fringes to feathers of upperparts, and much buff (124) barring on all underwing-coverts. Immatures differ from all morphs of adults by: (1) buff (124) barring on feathers of upperparts; (2) projection of central rectrices (t1) shorter (30–80 mm cf. 60–105 mm); (3) pale patches on tarsi; (4) off-white barring on underwings; (5) two or more ages of feathers on upperparts and wing-coverts; (6) early start and finish of moult of primaries; (7) timing and completeness of moult of tail.

**GEOGRAPHICAL VARIATION** No subspecies recognized. Length of wing and weight differ significantly between populations; smaller birds occur Eurasia and larger birds in North America and Greenland; variation may be clinal (see BWP). Proportion of dark morphs in populations varies considerably.

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Volume 3, Plate 24

Great Skua *Catharacta skua* (page 388)

1 Adult on breeding grounds, austral summer; 2 Downy young; 3 Juvenile

South Polar Skua *Catharacta macconnicki* (page 412)

4 Adult pale morph, in worn plumage at breeding grounds, austral summer; 5 Adult dark morph, in fresh plumage at breeding grounds, austral summer; 6 Downy young; 7 Juvenile

Pomarine Jaeger *Stercorarius pomarinus* (page 438)

8 Adult female breeding, light morph; 9 Juvenile, intermediate phase

Arctic Jaeger *Stercorarius parasiticus* (page 448)

10 Adult breeding, light morph; 11 Juvenile, intermediate phase

Long-tailed Jaeger *Stercorarius longicaudus* (page 459)

12 Adult breeding, light morph; 13 Juvenile, intermediate phase

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Pomarine Jaeger *Stercorarius pomarinus* (page 438)

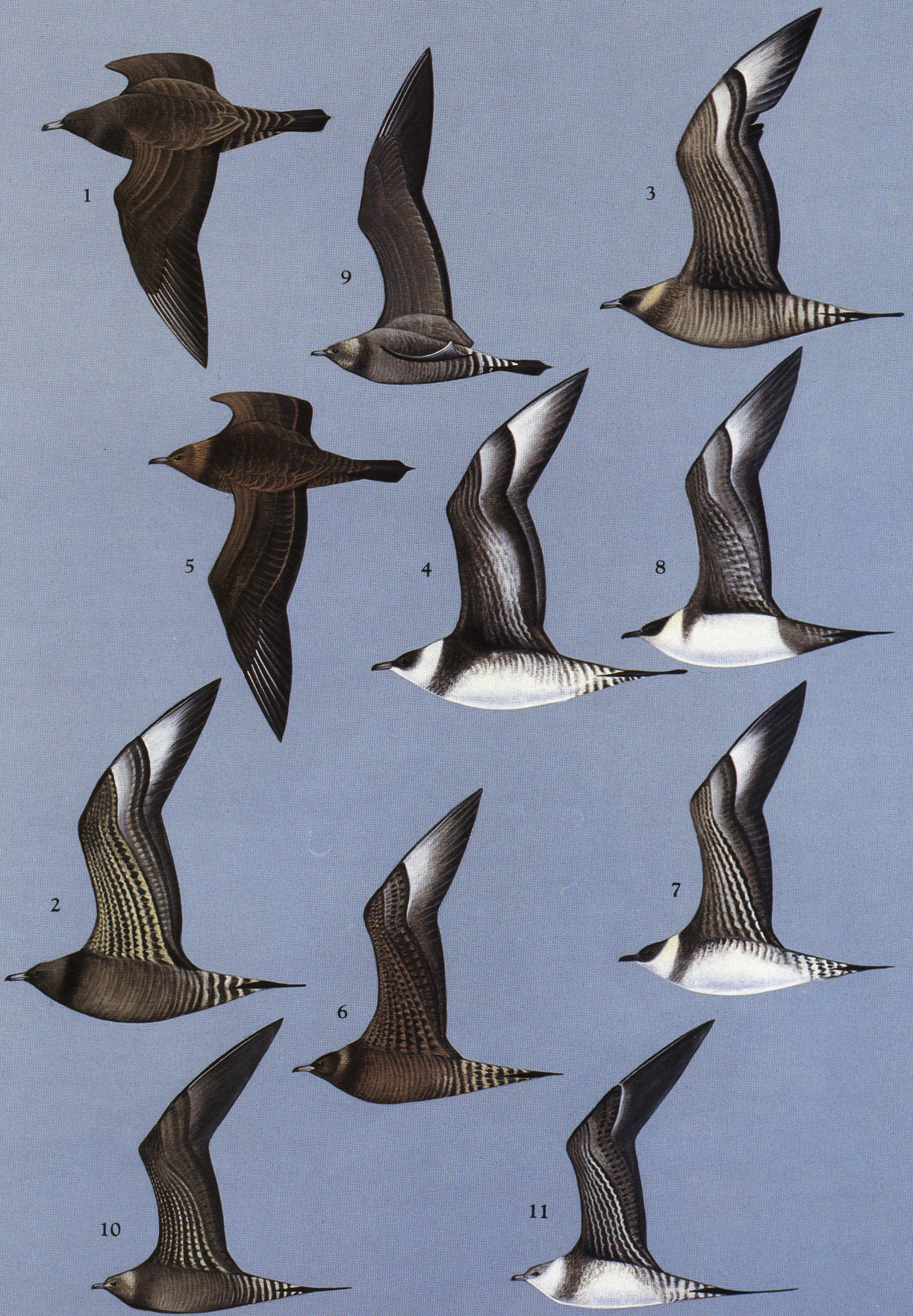
1, 2 Adult male breeding, light morph; 3, 4 Adult non-breeding, light morph; 5, 6 Adult breeding, dark morph

Arctic Jaeger *Stercorarius parasiticus* (page 448)

7, 8 Adult breeding, light morph; 9, 10 Adult non-breeding, light morph; 11, 12 Adult breeding, dark morph

Long-tailed Jaeger *Stercorarius longicaudus* (page 459)

13, 14 Adult breeding, light morph; 15, 16 Adult non-breeding, light morph



BRETT JARRETT

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Pomarine Jaeger *Stercorarius pomarinus* (page 438)

1, 2 Juvenile, intermediate phase; 3, 4 Juvenile, light phase, in early stage of moult to first immature non-breeding, first austral summer-autumn; 4 Third immature non-breeding, light morph

Arctic Jaeger *Stercorarius parasiticus* (page 448)

5, 6 Juvenile, intermediate phase; 7 Second immature breeding, light morph; 8 Third immature breeding, light morph

Long-tailed Jaeger *Stercorarius longicaudus* (page 459)

9, 10 Juvenile, intermediate phase; 11 Second immature non-breeding, light morph