

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	seed-snipes; 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.
Jacaniidae	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, Jacaniidae) 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 Jacaniidae. 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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Order CHARADRIIFORMES

Family SCOLOPACIDAE sandpipers and allies

Small to large shorebirds (12–66 cm) with long bills and legs. Largest family of suborder Charadrii, with some 88 species in c. 24 genera; most species only breed in higher latitudes of Holarctic, but migrate long distances and occur almost worldwide in non-breeding period. In HANZAB area, 51 species in 18 genera: two breeding species, 27 regular non-breeding migrants, 19 accidentals and three doubtfully recorded. All are transequatorial migrants except for the two species of *Coenocorypha* that breed NZ, which are sedentary. The family is usually split into six subfamilies (e.g. Jehl 1968; BWP): Scolopacinae, Gallinagoninae, Tringinae, Arenariinae, Calidridinae and Phalaropodinae; we place the dowitchers *Limnodromus* in a separate subfamily, Limnodrominae (q.v. for details). All except Scolopacinae (woodcocks) represented in HANZAB region. Though they are convenient groupings, these subfamilies may not be wholly monophyletic (e.g. Strauch 1978; Dittman *et al.* 1989; Sibley & Ahlquist 1990; BWP); until phylogeny within the Family is understood, sequence of genera and species followed by different authors is likely to remain unsettled. Sequence and taxonomy used here follows Christidis & Boles (1994). Studies of allozymes (Christian *et al.* 1992), DNA hybridization (Sibley *et al.* 1988; Sibley & Ahlquist 1990), osteology (Strauch 1978) and patterns of downy young (Jehl 1968) generally agree in treating Scolopacidae as monophyletic, with distant links to Jacanidae, Rostratulidae, Thinocoridae and Pedionomidae.

Body-form diverse, from slender to stocky. Females slightly to considerably larger than males, though in a few species males are larger (Jehl & Murray 1986). Wings, long and pointed; p10 longest; 15–22 secondaries, including elongate tertials, which, with scapulars, cover back and rump when at rest. Tail, short; 12 feathers except in *Gallinago*, which have 14–28, and *Coenocorypha*, which have 14. Neck, long. Shape of bill varies considerably, though generally long and slender; usually straight to decurved, but recurved in a few Tringinae; tip of bill, fine or only slightly swollen (cf. Charadriidae) with sensory pits. Compared to Charadriidae, eyes small and head narrow. Unlike Charadriidae, have numerous fine pores in premaxillary bone to accommodate Herbst's corpuscles, which are assumed to be associated with more tactile, less visual, methods of foraging; some species have been shown to be capable of sensing buried prey, either through chemoreception (van Heezik *et al.* 1983) or mechanical detection of vibrations or self-induced pressure signals (Gerritsen *et al.* 1983; Gerritsen 1988; Piersma *et al.* 1994). Skeleton and musculature of jaw distinctive (Burton 1974). In most species, rynchokinesis of skull highly developed, enabling flexible upper mandible to be opened or retracted at tip only (to grasp prey while probing). Tarsi and tibiae, short to long, with transverse scales (except in *Numenius*). Four toes in all species except Sanderling *Calidris alba*; toes fairly long with lateral membrane (webbed in some); hindtoe, small and raised (except in Arenariinae). No crop. Caeca present. Apparently no other waders have spiral sperm cells (similar to those of Passeriformes).

Non-breeding plumage mostly dull and cryptic: mottled greys and browns above, and paler or white below, with or without streaks and spots. Breeding plumage generally much brighter (except in curlews, snipes and woodcocks), with more rufous or black. In HANZAB region, adults seen mainly during austral summer in non-breeding plumage, though breeding plumage can be seen on birds just before n. migration or on arrival after s. migration. Sexes usually similar. Bills, legs and feet variously, sometimes brightly, coloured. Adults generally have two moults per cycle: (1) a partial pre-breeding (pre-alternate) moult of most feathers of body, and, often, some tertials and upperwing-coverts; and (2) a complete post-breeding (pre-basic) moult; both usually performed in non-breeding areas or while staging on migration. Primaries moult outwards, usually after s. migration; some subspecies of Dunlin *Calidris alpina* (q.v.), Purple Sandpiper *C. maritima* and Rock Sandpiper *C. ptilocnemis* moult all primaries on or near breeding grounds before s. migration, a strategy rare in *Calidris*; Bristle-thighed Curlew *Numenius tahitiensis* moult remiges rapidly, inducing flightlessness in 50–70% of birds, apparently uniquely among Charadriiformes. Precocial young nidifugous; most feed themselves. Down varies greatly in structure and pattern; pattern mainly of spotted or striped type (Fjeldså 1977). Juvenile plumage usually distinctive; most like that of non-breeding adults, but often a little brighter, especially in Calidridinae. Moult-strategies of subadults complex and vary considerably with species, route of migration and age of first breeding. Adult plumage attained when 3–21 months old; most scolopacids of our region (except snipes) first attain adult plumage through partial first pre-alternate moult when c. 8–11 months old, or through complete second pre-basic moult when c. 12–16 months old (see discussion of Moults in General Introduction). Swift runners; wade expertly and some species swim habitually (Phalaropodinae). Stance often upright. Flight, fast and direct, often in tight flocks.

When breeding, most scolopacids (except some snipes and woodcocks) are birds of open habitats, including tundra. At other times, use a variety of habitats, including forests (woodcocks) and open sea (phalaropes), though most prefer shallow, fresh, brackish or intertidal wetlands. Greatest concentrations occur on intertidal mudflats,

especially estuaries. Feed mainly by touch, and the mandibular skeleton has distinctive features associated with tactile methods of foraging. When feeding, most probe into soft, moist substrata to catch invertebrates; some (e.g. Arenariinae) forage on rocky shores; surface-tension mechanism for feeding on plankton, recently described for Red-necked Phalaropes *Phalaropus lobatus* (Rubega & Obst 1993), may prove to be widespread among scolopacids with fine bills. Mixed-species foraging flocks common.

Migration the most striking feature of scolopacids. All but some Gallinagoninae, Scolopacinae and two aberrant Tringinae migrate (though some Tringinae partly resident in Europe), usually from breeding grounds in higher latitudes of n. hemisphere to lower latitudes of n. or s. hemispheres; many undertake extremely long migration steps, with non-stop flights of several thousand kilometres preceded by dramatic increase in weight. Scolopacids of HANZAB region breed mainly in e. Russia, Mongolia, n. China and Alaska; Latham's Snipe *Gallinago hardwickii* breeds Japan and in small numbers in e. Russia.

Migratory routes vary dramatically depending on the relationship between breeding and non-breeding ranges, and the ability to undertake long-distance non-stop flights. Some species migrate overland, some via coastal routes and others cross oceans; many species use a combination of these routes. Some species return to breeding grounds by the same route used in s. migration while others return by different routes, and make a loop migration (e.g. Curlew Sandpiper *Calidris ferruginea*). Timing of departure from breeding grounds often varies between sexes (e.g. Bar-tailed Godwit *Limosa lapponica*) and between ages; juveniles often leave at slightly different time (e.g. Bar-tailed Godwit *Limosa lapponica*) or migrate via a different route (e.g. Sharp-tailed Sandpiper *Calidris acuminata*). Most regular non-breeding migrants to Aust. migrate via East-Asian–Australasian Flyway; others to Aust. and, especially NZ, cross Pacific Ocean. Generally, in Aust. and NZ, s. migration Aug.–Nov. and n. migration, Feb.–May. Individuals of most species display a high degree of site-fidelity at breeding, non-breeding and even staging areas; others have little fidelity to breeding site and populations mix much (e.g. Curlew Sandpipers; P.S. Tomkovich). In HANZAB region, displays sometimes seen before migration, e.g. Red Knots in tight single-species flocks in nw. Aust. before migration (Lane & Jessop 1985). Pre-migratory flighting observed during Mar. in NZ (McKenzie 1967).

In non-breeding areas, most species undertake regular local movements between feeding and roosting sites or between different feeding sites. Most local movements are in response to tides, which affect exposure of feeding grounds (e.g. Hindwood & Hoskin 1954; Carter *et al.* 1976; Saunders & de Rebeira 1985; Smith 1985; Lane). Some roosting and feeding sites are close together, birds gradually dispersing from or returning to roosting sites as tides fall and rise (e.g. Robertson & Dennison 1979). At other sites, roosting and feeding sites farther apart, with birds even flying between islands or between islands and mainland (Saunders & de Rebeira 1985); in Capricorn Grp, Qld, Ruddy Turnstones and Grey-tailed Tattlers *Heteroscelus brevipes* fly at least 4 km from Tyron I., where roost at high tide, to North West Reef, where thought to feed (Prendergast *et al.* 1985); at Cairns, Qld, Whimbrels *Numenius phaeopus* move to mouth of Barron R. every evening (Amiet 1957) and can travel up to c. 20 km between roosting and feeding sites (McKenzie 1967; Garnett 1989). In poor weather, such as days of high winds or in storms, may move to sheltered areas other than normal roosting sites, such as near-coastal wetlands or pools in dunes (e.g. Crawford 1972; Forest 1982; Aust. Atlas). Some species dispersive, either locally or over longer distances (see accounts), sometimes in response to availability of food or availability of suitable wetland habitat. In NZ, Common Greenshanks *Tringa nebularia* tend to move round within harbours rather than returning to roosting site each day (Sibson 1965) and, in Tas., Common Greenshanks appear to move between coastal sites (Wall 1953); Curlew Sandpipers apparently move from Westport Bay, Vic., in Aug. when daily exposure of intertidal feeding grounds reduced (Loyn 1978; see also Hindwood & Hoskin 1954; Alcorn 1988).

Mainly feed and roost in single-species flocks. All species are strong fliers and those that form flocks often perform spectacular and complex aerial movements, which are performed with remarkable precision. Many species territorial during breeding season, but others lack specific territorial boundaries and are semi-colonial. Courtship displays, elaborate, including spectacular song-flights, often associated with formation of pairs. Distraction displays include repetitive display-flights, rodent-runs, and feigning injury.

Mating systems extraordinarily diverse, including monogamy (some species pair for life), polygyny (in some species, males display on leks, mating with females that visit their territories; in others, males maintain simultaneous pair-bonds with more than one female but provide no parental care) and polyandry (including double-clutching monogamy, where female lays two successive clutches, each of which is incubated by single adult; and classical polyandry, where female maintains pair-bonds with more than one male). Reasons for diversity of mating systems not clear but short breeding seasons and ability of single parent to incubate clutch and brood and raise chicks probably involved; possibly also related to phylogenetic history. For reviews of mating systems, see Ligon (1993) and Pitelka *et al.* (1974).

In CALIDRIDINAE, mating systems remarkably varied, including monogamy, polygyny, polyandry; most species monogamous (e.g. Pitelka *et al.* 1974). Role of sexes in parental care as diverse as mating systems. Apparently solely by female in the four polygynous species; roughly equally shared in some (e.g. Dunlin *C. alpina*), though female tends to leave chicks earlier; in others, male undertakes more of work and females leave before chick-rearing (or even

incubation) complete. Behaviour more complex in successive polyandrous species, with males raising first brood while females may lay and raise another clutch. In GALLINAGONINAE, mating systems poorly known but several species monogamous; Great Snipe *Gallinago media* promiscuous, mating at leks, and apparently unique among snipe in performing courtship display on ground; others have crepuscular or nocturnal display-flights accompanied by distinctive calls and non-vocal sounds (see Gallinagoninae). Mass flights of displaying snipes have been said to be aerial leks in several species, but confirmation needed (could be result of unsettled territorial boundaries early in breeding season) (Byrkjedal 1990). In TRINGINAE, most species monogamous but successive polyandry can occur in Spotted Redshank *Tringa erythropus* and Spotted Sandpiper *Actitis macularia*. Parental care shared about equally or females leave breeding grounds early while males undertake or finish rearing chicks. ARENARIINAE are monogamous; Ruddy Turnstone territorial and aggressive. LIMNODROMINAE, poorly known; apparently monogamous; territorial but *L. semipalmatus* nests in small colonies. Both sexes incubate; males undertake most of chick-rearing. In PHALAROPODINAE, many sex roles reversed when breeding; females almost unique among Scolopacidae in undertaking courtship behaviour, contesting access to mates in 'scramble displays' (Reynolds 1987; Colwell & Oring 1988a). Phalaropes usually monogamous, though polyandry recorded in all three species; incidence of polyandry may vary between populations but reasons not yet clear (e.g. Colwell & Oring 1988b). Males undertake virtually all incubation and raise chicks alone (see Colwell 1986; Colwell & Oring 1988a,b).

Most scolopacids breed first at 2 years old, though some species can breed in their first year and maturity may be delayed for more than 2 years in some large long-distance migrants. Usually nest on ground, often concealed in herbage. The scrape, often made during a scraping ceremony by the male in the presence of female, is often lined, usually after laying the first egg and more lining is added during incubation. Unusually, Solitary *Tringa solitaria*, Green *Tringa ochropus* and some Wood *Tringa glareola* Sandpipers recorded nesting in trees, usually in nests of other birds (see BWP). Usually four eggs per clutch, in some cases two or three. Eggs usually pyriform, with dark-brown and black markings, over paler ground-colour; all are cryptically coloured. Incubation normally starts with laying of last egg and chicks hatch almost simultaneously. Both sexes usually share incubation, though one bird often takes greater share. Downy young leave nest within 1 day of hatching and generally accompanied by brooding adult till able to fly. Social organization, social behaviour and breeding not discussed further in subfamily accounts.

In East-Asian–Australasian Flyway, hunting and destruction of wetland habitats major threats to shorebirds; this Flyway said to be probably the most threatened migration system in world (Lane & Parish 1991). Outside Aust. and NZ, hunting widespread, mainly for food, but little information available on impact on populations (Lane & Parish 1991). For example, in Thailand and n. Vietnam, both Great Knot and Red-necked Stint on passage or overwintering are eaten, and captive birds are kept to act as decoys to catch other waders; band-recoveries of Red-necked Stints in n. Vietnam have come from birds taken for food (Starks 1987; J.R. Starks). Many wetlands destroyed by reclamation for agriculture, aquaculture, salt-production, and urban or industrial development, including wetland habitats in Aust. and NZ (Lane & Parish 1991). Aust. is signatory to the Ramsar Convention and to bilateral treaties with Japan (JAMBA) and China (CAMBA) to protect migratory birds.

In many n. hemisphere breeding areas, breeding success cyclical and thought to be linked to population cycles of lemmings, which in turn influence levels of predation of breeding birds (Underhill *et al.* 1993). For example, in breeding areas of Curlew Sandpipers, decreased populations of lemmings *Lemmus sibiricus* and *Dicrostonyx torquatus*, the regular prey of Arctic Foxes *Alopex lagopus*, results in increased predation of eggs and young of Curlew Sandpipers (Roselaar 1979). Reproductive success in n. hemisphere in preceding breeding season reflected in numbers and proportion of juveniles and immatures in populations in non-breeding areas, such as Aust. and NZ.

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28 Gallinagoninae

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Subfamily TRINGINAE godwits, curlews, 'shanks' and allies

Diverse and widespread assemblage of shorebirds, varying markedly in size and shape; include small species (*Actitis*, 19 cm) and largest waders (*Numenius*, up to 66 cm in *madagascariensis*). Mostly migratory, breeding from low Arctic to Temperate regions of n. hemisphere. About 30 species, in three tribes (see Table 1) (Jehl 1968; Zusi & Jehl 1970); Prosobiniini restricted to islands of Pacific Ocean. In HANZAB region, 22 species in seven genera recorded: 13 regular non-breeding migrants, seven accidentals, and two doubtfully recorded.

Table 1

TRIBE	GENUS	NUMBER OF SPECIES (NUMBER RECORDED HANZAB REGION ¹)
Numenini	<i>Limosa</i> (godwits)	4 (2NB, 1A)
	<i>Numenius</i> (curlews and whimbrels)	8 (3NB, 1A, 1D)
	<i>Bartramia</i>	1 (1A)
Tringini	<i>Tringa</i> ('shanks')	10 (4NB, 4A, 1D)
	<i>Xenus</i>	1 (1NB)
	<i>Actitis</i>	2 (1NB)
	<i>Heteroscelus</i> (tattlers)	2 (2NB)
	<i>Catoptrophorus</i>	1 (0)
Prosobiniini	<i>Prosobonia</i>	2, including 1 recently extinct (0)

1 NB = regular non-breeding migrant; A = accidental; D = unacceptably claimed.

Monophyly of Subfamily not established. Phalaropes and dowitchers sometimes included, though treated separately here (see Phalaropodinae and Limnodrominae). Other unresolved taxonomic problems include: (1) various features of anatomy, biochemistry and mallophagan parasites (Timmerman 1957; Ahlquist 1974; Strauch 1978) suggest relationship of *Limosa* and *Xenus* to dowitchers; (2) anatomical studies suggest that curlews, godwits and some allies might be better placed in separate subfamily (Lowe 1931; Kozlova 1962) (Numeninae not Limosinae; Jehl 1968), which agrees with phylogenies constructed from allozyme data (Christian *et al.* 1992); (3) affinities of *Prosobonia* are not clear; anatomy supports inclusion in Tringinae (Jehl 1968; Zusi & Jehl 1970) but some features of muscles of jaw and tongue resemble Calidridinae (Burton 1974); there are no studies of downy young, biochemistry or DNA of *Prosobonia*; (4) there is little agreement about whether *Actitis*, *Heteroscelus* and *Xenus* (recognized here after Christidis & Boles 1994) should be included in *Tringa*.

Females larger than males, especially in Numenini. Great diversity in structure of bill: in Numenini, long and highly rhynchokinetic, decurved to straight or slightly upturned; in most Tringini, shorter and straighter, and only moderately rhynchokinetic in many; difference in bills associated with variety of methods of feeding. Differ from Calidridinae in cranial structure (Lowe 1915) and musculature of jaw (Burton 1974). Body-form diverse; typically have narrow, deeply keeled sternum (associated with powerful flight) and upright stance associated with oblique plane of *foramen magnum* of occiput. Twelve rectrices. Tarsus, long, not greatly compressed; in Tringini, scutellate in front and usually behind; in Numenini, reticulate behind and scutellate or reticulate in front. Hallux, small and raised; small to minute webs between bases of anterior toes; most species can swim.

Most species undergo marked seasonal change in appearance of plumage; *Numenius*, *Bartramia* and *Prosobonia* do not. Sexes usually alike in breeding plumage, except in *Limosa*, in which males brighter. In general, plumages typical of Scolopacidae and sequences of moult resemble those of Calidridinae. Down of precocial young, soft and ramose; at least three patterns (Jehl 1968; Fjeldså 1977; BWP): (1) In most Numenini, down buff to cinnamon, with partially exposed grey bases, marked above by discontinuous dark-brown blotches and bands; in mid-dorsal region bands and blotches arranged in elongate (*Limosa*) or compact (*Numenius*) diamond-shape. (2) In most Tringini, pattern includes three prominent dark bands along length of back, as well as prominent dark blotches on wing-pad, thigh, lower leg and crown and cap; underparts off-white. (3) In *Heteroscelus*, *Actitis* and *Xenus*, dorsal pattern, pebbly, superficially like that of Charadriidae but with bold black mid-dorsal line; underparts off-white. *Bartramia* has unusual stiff down with densely mottled pattern like adult; downy young of *Prosobonia* apparently undescribed.

Inhabit wide range of wetland habitats, including intertidal mudflats, reefs and atolls, damp grasslands and (especially in Tringini) shallow, brackish or freshwater pools; except in high Arctic, Tringinae at almost all sites

where waders congregate. Feeding behaviours diverse; feed at night and during day, using sight and touch; in general, visual foraging more important than in Calidridinae. Probe for prey or pick small invertebrates from surface of water or mud; *Limosa* and some *Numenius* specialized to probe mud deeply for large invertebrate prey; Tringini recorded using 'mowing' action, though few observations in HANZAB region.

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Scolopax tahitiensis Gmelin, 1789, *Syst. Nat.*, ed. 13 (1): 656 — Tahiti. Based on Otaheite Curlew of Latham, 1781–1801, *Gen. Syn. Birds* 3 (1): 122–3.

Specifically named after the type-locality.

The English name refers to the diagnostic, narrow, elongated shafts that extend beyond tip of webs on the feathers of the thighs.

MONOTYPIC

FIELD IDENTIFICATION Length 40–44 cm; weight 380–600 g. Medium-sized curlew; similar in size, shape and proportions to Whimbrel *Numenius phaeopus* but slightly smaller, with thicker blunter bill, and slightly shorter and heavier legs and feet. General pattern of plumage, including strongly striped head, similar to that of Whimbrel. In flight, distinguished by bright cinnamon rump and uppertail, and deep cinnamon underwing-coverts. Sexes alike. No seasonal variation. Juvenile separable when close.

Description Adult Head strongly patterned: buff median crown-stripe and long broad buff supercilium contrast with broad dark-brown lateral crown-stripe and narrow dark-brown eye-stripe; cheeks and ear-coverts, buff, usually finely streaked dark brown; chin and throat, white. Hindneck and sides of neck, buff with narrow dark-brown streaking; in some, sides of neck almost plain buff. Mantle, scapulars, tertials and central innerwing-coverts, dark brown, with large cinnamon-buff spots. Back and upper rump, dark brown. Lower rump and uppertail-coverts, bright cinnamon, showing in flight as conspicuous squarish patch at base of tail. Tail, bright cinnamon, broadly barred dark brown and with buff tip; central feathers usually paler buff. Upperwing: secondary coverts, dark brown, broadly fringed and spotted cinnamon-buff except along leading-edge; primary coverts, darker, blackish brown with narrow white tips; remiges, dark brown, with pale lateral spotting on secondaries and inner primaries, and thin diffuse pale tips to all but outer 2–3 primaries. Underbody, from foreneck to vent, dull buff, sometimes tinged cinnamon, with heavy dark-brown streaks on foreneck, breast and flanks and sparse dark-brown bars on fore-flanks; undertail-coverts, pale creamy-cinnamon. Axillaries and underwing-coverts, deep cinnamon, with dense dark-brown barring; underside of remiges, white, heavily barred grey-black. In worn plumage, buff of head, neck and underparts may fade to off-white; cinnamon-buff markings on upperparts and wing-coverts fade to off-white and may be much reduced, leaving edges of feathers deeply notched, with only remnants of pale lateral spots. Bill varies (see Bare Parts); black (possible breeding) to black at tip with pink base to lower mandible and sides of upper mandible (possibly non-breeding). Iris, dark brown. Legs and feet, bluish grey. Elongated shafts to feathers of thighs form unique shiny bristles, which are occasionally visible in field in close view.

Like adult, but with neater appearance and larger, more obvious buffish-cinnamon spotting on upperparts and innerwing-coverts; on upperwing, show broader white tips to primary coverts, and bold white tips to inner eight primaries show in flight as neater, more obvious pale trailing-edge to wing; underbody, more buff, with much less streaking (breast virtually unstreaked in some).

Similar species Distinctive. At rest, distinguished from Whimbrel by strong buff tone to plumage, especially larger more prominent and brighter cinnamon-buff markings on upperparts and innerwing-coverts; strong buff tone (often with cinnamon tinge) to underbody, with less heavy streaking on foreneck and breast and less heavily marked flanks; and rich cinnamon-buff tail, with fewer, more widely spaced dark bars. Bristle-like shafts of feathers of thighs, diagnostic. In flight, distinguished from Whimbrel and all other large waders by conspicuous and diagnostic bright cinnamon-buff rump-patch and tawny uppertail, and deep cinnamon axillaries and underwing-coverts (though subspecies *hudsonicus* of Whimbrel has similar, though paler buff, ground-colour to axillaries and underwing-coverts). Calls also very different from those of Whimbrel (see below).

Rare vagrant to HANZAB region. Usually seen singly or in small groups on oceanic islands, on exposed reefs, undisturbed sandy shorelines, dry sandy ground away from shore, and among seabird colonies; only occasionally reported from continental shores in non-breeding areas. Feed by probing in mud or reef crevices; break open molluscs and crabs by dashing them on rocks with left-to-right swing of bill. In seabird colonies, feed mainly by stealing eggs, which are broken by spearing them with bill or by dropping them onto hard surface. When roosting, often perch in trees or on roofs of houses. Most common call, and that most likely to be heard in HANZAB region, is long three-part whistle: *chi-u-wit* (sonagram A); very different from that of Whimbrel and reminiscent of calls of Grey Plover *Pluvialis squatarola*; other calls include short rippling whistle *whe-whe-whe*; and ringing *whee-wheoo*.

HABITAT During non-breeding period, mainly inland and on coasts of oceanic islands and only rarely on continental shores. On coasts, prefer beaches with sandbars, tidal mudflats or exposed reefs; inland, occur in open grasslands and other areas of dry ground, and may occur at tops of mountains (AOU 1983; Pratt *et al.* 1987; Hayman *et al.* 1986). On Pacific islands, recorded feeding on exposed reefs, among colonies of seabirds, and in dry grassy areas away from coast. Often roost in trees or on roofs of buildings (Hayman *et al.* 1986).

In HANZAB region, recorded on edges of lakes and in marshland; dried corpse found high on rocks on N. Meyer I. (Veitch 1974).

DISTRIBUTION Breeding range not well known; possibly w. Alaska, in area between mouth of Yukon R. and Seward Pen. Recorded on passage on Pribilof and Aleutian Is and main Hawaiian islands. Winter on islands in Pacific: from nw. Hawaii (Midway I. to French Frigate Shoals), SE to Pitcairn and Ducie Is, Marquesas, Tuamotu and Society Grps, and SW to Polynesia and e. Micronesia, including Samoa, Tonga, Fiji and Marshall Is; New Caledonia, casual to w. Micronesia including Mariana and Caroline Is and Yap. Vagrant to s. Alaska, British Columbia and Washington, Japan, Bonin I. and Kermadec Is (Bent 1962; AOU 1983; Hayman *et al.* 1986; Pratt *et al.* 1987).

Aust. Unverified claim of single bird, Cairns, Qld, 20–28 Nov. 1990 (Qld Bird Rep. 1990), not yet vetted or accepted by RAC.

Norfolk I. Unverified claim of single, 20 Jan. 1968 (Hermes 1985; Moore 1985), not yet vetted or accepted by RAC.

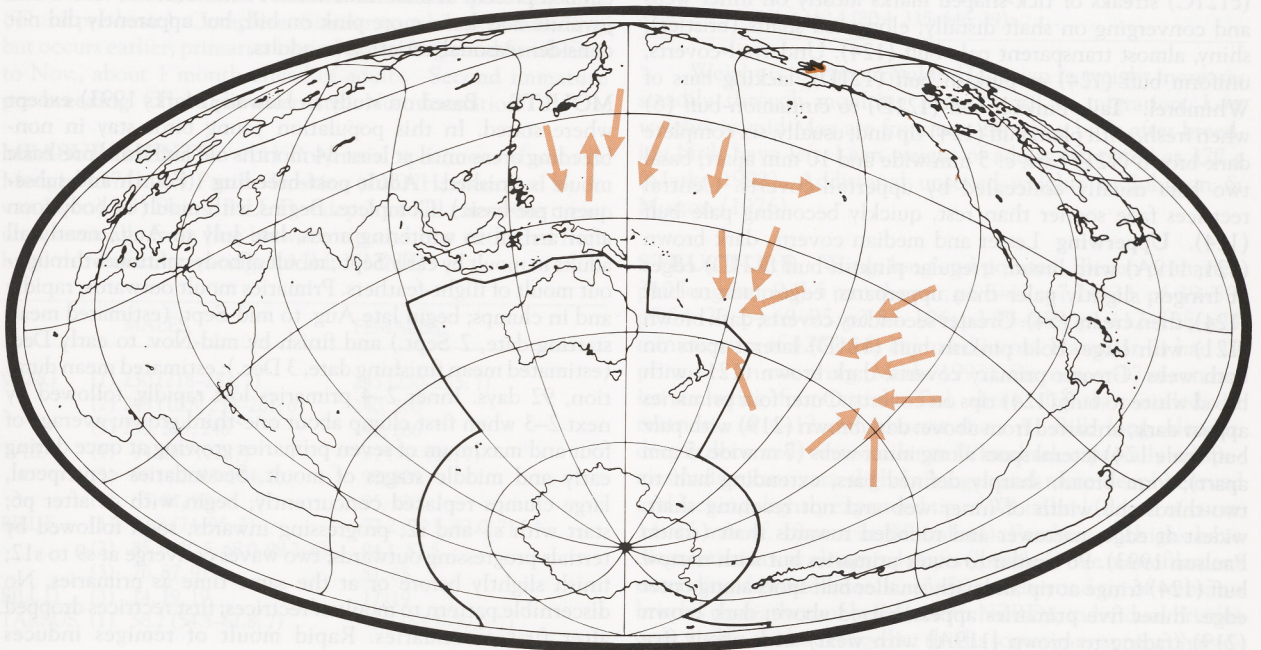
Kermadec Is Single, Macauley I., Aug. 1966; single, specimen, N. Meyer I., 9 Sept. 1972; single, Raoul I., 25–30 Sept. 1972 (Veitch 1974).

MOVEMENTS Migratory; breed w. Alaska and migrate directly S, from late Aug., to islands of tropical Pacific for austral summer (Farrand 1983; Pratt *et al.* 1987; Gill & Redmond 1992; Vilina *et al.* 1992). Vagrant S of normal non-

breeding range to Kermadec Is where all records Aug. and Sept., during period of s. migration. Extralimittally, start n. migration, May (Vilina *et al.* 1992).

PLUMAGES Prepared by D.J. James. Poorly known. Sexes similar. Sequences of plumages not known fully, especially for immatures. Juveniles arrive at wintering grounds from late Aug. Complete post-juvenile moult to first immature non-breeding begins Oct.–Nov.; thereafter, immatures not reliably distinguished from adults on plumage (though they remain on wintering grounds for two seasons and moult earlier than adults). Adults undergo complete post-breeding and partial pre-breeding moults annually, producing alternating non-breeding and breeding plumages with little or no change in appearance; wear produces marked changes and individual variation great. No subspecies. Account based on eight skins (AIM, NMNZ) and photos (Allen & Killingstad 1949; Armstrong 1983; Farrand 1983; Gill *et al.* 1988; Hawaii Audubon Society 1967, 1984; Marks *et al.* 1990; McCaffery & Gill 1992; Myers *et al.* 1985; Paulson 1993; Thibault & Rives 1988; NZRD; Japan Bird Club 1983).

Adult (Definitive basic and alternate). **Head and neck** Pattern similar to that of Whimbrel. Narrow buff (124) median crown-stripe streaked brown (121A–21), extending from base of bill on forehead to rear of crown, but not to nape; bordered by broad dark-brown (121) to rich-brown (121A) lateral crown-stripes from forehead to nape; these join across nape, and form U-shape; feathers on forehead have thin buff (124) fringes. Broad, buff (124) supercilium, with short, fine dark-brown (121A–21) streaks. Lores, dark brown (121) with small buff (124) streaks, forming thin, bold, dark loreal stripe that extends behind eye onto ear-coverts. Rest of ear-coverts, cream (54) to buff (124) with short dark-brown (121A–21) streaks; intensity of streaking varies greatly: possibly more prominent in breeding and fresh plumages, but appears to vary individually. Chin and throat, off-white to cream (54). Front and sides of neck, pinkish buff (121D) (fading to buff [124] then cream [54] with wear) with bold rich to dark brown



(223B–121) shaft-streaks, the streaking more prominent than on ear-coverts and becoming denser toward body. Hindneck, brown (c23), streaked with narrow cinnamon-buff (pale 6) edges; some birds appear less streaked on neck than others. Very similar to Whimbrel except for generally stronger buff coloration and tapering shaft-streaks (broad at base and narrow at tip) on foreneck. **Upperparts** Dark brown, boldly spotted buff; individuals vary much and buff colours fade to cream with wear. Mantle and scapulars, dark brown (119A) with pinkish-buff (121D) corners (quite large, irregular spots) to feathers; some variation in buff colour within and between feathers; corners fade to cream and reduced by wear and are sometimes worn away completely. Subscapulars, dark brown (119A) with two to three large pinkish-buff (121D) spots on each web reaching three-quarters in to shaft. Back, dark brown (119A) with varying sized, pinkish-buff (121D) tips, edges or spots. Rump, dark brown (119A) with cinnamon-buff (c6) edges or fringes to feathers forming untidy streaking. Uppertail-coverts, cinnamon-buff (6) when fresh, fading to cream (92) or off-white with wear; some feathers have varying brown (c121B) bars, chevrons or streaks, or all three, on webs, but these usually concealed or at least inconspicuous, so uppertail-coverts appear as broad, clean buff patch. **Underparts** Breast, pale buff (pale 124) (sometimes with pinkish tinge [pale 121D] and fading to off-white with wear) with short, irregular wedge-shaped brown (121B) streaks in centre of feathers, which form faint to prominent gorget ending abruptly above lower breast (though cut-off usually not conspicuous because streaking sparse); streaking may be heavier in breeding plumage. Feathers on sides of breast, warm buff (124), fading to cream with wear, and with narrow brown (121B) shaft-streaks and partly exposed brown (121B) bases. Flanks, buff (124), irregularly barred with brown (121B) chevrons, mostly on inner webs; barring mostly concealed by closed wing, and usually have less barring than does Whimbrel. Axillaries, boldly and evenly barred pinkish buff (121D) and dark brown (119A). Lower breast, belly and vent, cream (54) to off-white; gorget streaks does not extend as far down breast as it does on Whimbrel. Thighs, pale buff (pale 124) with irregular, brown (c121C) streaks or tick-shaped marks mostly on inner webs and converging on shaft distally; elongated shafts (bristles), shiny, almost transparent pale buff (124). Undertail-coverts, uniform buff (124) or pinkish buff (121D), lacking bars of Whimbrel. **Tail** Pinkish buff (121D) to cinnamon-buff (6) when fresh, with plain buff (124) tip and, usually, six complete dark-brown (121) bars, c. 5 mm wide and 10 mm apart; basal two bars usually concealed by uppertail-coverts. Central rectrices fade sooner than rest, quickly becoming pale buff (124). **Upperwing** Lesser and median coverts, dark brown (121, 119A) with broad, irregular pinkish-buff (121D) edges or fringes, slightly paler than upperparts; edges fade to buff (124), then cream (54). Greater secondary coverts, dark brown (121) with large, bold pinkish buff (121D) lateral spots on both webs. Greater primary coverts, dark brown (121) with broad white to buff (124) tips on coverts. Outer four primaries appear dark, unbarred from above: dark brown (219) with pale buff (pale 124) lateral spots along inner webs (7 m wide, 5 mm apart); form broad, sharply defined bars, extending half to two-thirds the width of inner web and not reaching shaft, widest at edge, narrower and rounded towards shaft (*contra* Paulson 1993). P6 similar to outer primaries but with narrow buff (124) fringe at tip and with smaller buff spots along outer edge. Inner five primaries appear barred above: dark brown (219) (fading to brown [119A] with wear) with about five

bold, sharply defined buff (124) to cream (54) spots on outer webs (5–7 mm wide, 7–8 mm apart), about two-thirds width of web; similar spots on inner web shorter (half width of web) less well defined and paler, buff-grey; broad buff (124) tips grade to cream (54) distally. Secondaries, grey-brown (c91) with indistinct buff-grey spots on both webs, less boldly barred than inner primaries. Tertiaries, dark brown (121, 119A) with bold cinnamon-brown spots, which are larger than equivalent spots on Whimbrel, but prone to wear and sometimes lost. **Underwing** Primaries, appear buff (124) with bold grey-brown (28) barring and trailing-edge. Secondaries appear duller, buff-grey, with bold grey-brown (91–28) barring (brown broader than buff); buff (124) tip to inner web forms narrow pale trailing-edge. Greater primary coverts, grey-brown (28) with buff (124) tips and lateral spots. Greater secondary coverts and subhumeral, dark brown (121) boldly barred cinnamon-buff (6). Lesser and median coverts, dark brown (121) spotted cinnamon-brown (6). In flight, wing-lining appears dark brown closely barred pink-buff to cinnamon-buff (c. 60% brown, 40% buff) with remiges and greater coverts duller brown and more boldly barred. Underwing very similar to that of subspecies *hudsonicus* of Whimbrel, which actually shows more buff on wing-lining (c. 40% brown, 60% buff) and stronger pink tinge to bars on primaries.

Juvenile, Immatures See Ageing.

BARE PARTS Based on photos as listed above. Information on coloration of bill needs confirmation. **Adult non-breeding** (From photos on wintering grounds). Bill, bi-coloured, with blackish tip and extensive brown-pink (219D) or dull-pink (5) base; pink extends over basal two-thirds of lower mandible and sides of upper mandible; culmen, dark to base of bill. Females may have more pink on bill (Paulson 1993). Iris, dark brown or blackish. Legs, light blue-grey (c88) or greyish blue. **Adult breeding** All photos of birds on tundra that have been examined have bills black or with only a small area of pink at base of lower mandible. Legs may be slightly darker than in non-breeding. **Juvenile, Immature** Apparently like adult non-breeding, but little reliable data; dark wedge at base of culmen present at least sometimes. Paulson (1993) stated that juvenile may have more pink on bill, but apparently did not consider seasonal variation in adults.

MOULTS Based on study in Hawaii (Marks 1993) except where stated. In this population young birds stay in non-breeding areas until at least 34 months old and third pre-basic moult is finished. **Adult post-breeding** (Fourth and subsequent pre-basic). Complete. Begins with moult of body soon after arrival in wintering areas, late July to Aug.; nearly all adults in moult by early Sept.; moult of body continues throughout moult of flight-feathers. Primaries moult outwards, rapidly and in clumps; begin late Aug. to mid-Sept. (estimated mean starting date, 2 Sept.) and finish by mid-Nov. to early Dec. (estimated mean finishing date, 3 Dec.); estimated mean duration, 92 days. Inner 2–4 primaries lost rapidly, followed by next 2–3 when first clump about one-third grown; average of four and maximum of seven primaries growing at once during early and middle stages of moult. Secondaries centripetal, large clumps replaced concurrently; begin with or after p6; start with s1 and s2, progressing inwards, soon followed by tertiaries progressing outwards; two waves converge at s9 to s12; finish slightly before or at the same time as primaries. No discernible pattern to moult of rectrices; first rectrices dropped after first secondaries. Rapid moult of remiges induces

flightlessness in 50–70% of birds from early Sept. to late Nov.; flightlessness probably lasts 2 weeks; occurs during moulting of either 4–7 inner primaries or combination of 3–5 outer primaries and blocks of secondaries; reported from Niue I. (sw. Pacific) and Hawaii (Kinsky & Yaldwin 1981; Marks *et al.* 1990; Marks 1993); this phenomenon apparently unique among Charadriiformes. **Adult pre-breeding** (Fourth and subsequent pre-alternate). Partial moult of head and body, sometimes some rectrices, and perhaps lesser secondary coverts; exact timing unknown, about Jan. to Apr. Sometimes moult all wing-coverts and tertials (photos in Allen & Killingstad 1949; Gill *et al.* 1988; McCaffery & Gill 1992). **Post-juvenile** (First pre-basic). Complete, protracted; primaries outwards. Begins with moult of body after arrival in non-breeding grounds between late Sept. and late Oct.; not known when finished, before Feb. Primaries begin between about early Mar. and mid-May and finish between July and Oct., with much variation between years. Secondaries replaced between June and Sept. Rectrices vary greatly, some beginning early Oct., others not until Jan. or later. Unlike older birds, remiges not shed in blocks and moult does not cause flightlessness. **Immature pre-breeding** (First pre-alternate). No information. Moult may not occur or, if it does, birds moult only a few feathers and moult overlaps with post-breeding moults. Post-juvenile moult of primaries and secondaries might be better treated as first pre-supplemental, by analogy with other species of migratory wader, and because moult interrupted between end of body-moult and start of moult of primaries (in subsequent moults, body and remiges moult concurrently). **Immature post-breeding** (Second pre-basic). Overlaps much with post-juvenile moult of remiges. Complete or nearly complete. Most begin moult of primaries in July or Aug., replacing still fresh first-basic primaries. At this stage, post-juvenile moult is not always complete; in most, outer primaries are juvenile, and birds have three generations of primaries and two moult-fronts. Sometimes all first-basic primaries replaced but more often varying number of outer primaries retained. Moult of secondaries begins about half-way through moult of primaries; not known if all are replaced. **Immature pre-breeding** (Second pre-alternate). No information. **Second immature post-breeding** (Third pre-basic). Complete. Similar to adult post-breeding, but occurs earlier; primaries begin July to Aug., and finish Oct. to Nov., about 1 month ahead of adults. **Second immature pre-breeding** (Third pre-alternate). No information.

MEASUREMENTS (1) Polynesia, specimens (Lacan & Mougins 1974). (2) Pacific Is, skins (BMNH; measured by A. van Loon). (3) Skins; BILL D = depth of bill curvature measured vertically from line between tip and line extended from basal third of culmen-ridge (AIM, NMNZ).

	MALES	FEMALES
WING	(1) 230 (218–253; 7) (2) 245 (10.8; 233–261; 6) (3) 238, 239, 246	245 (230–255; 7) 240, 260 240, 266
TAIL	(1) 94 (86–102; 7) (2) 98 (4.7; 93–104; 6) (3) 85, 91, 97	97 (90–101; 7) 97, 105 95, 100
BILL F	(1) 82.8 (74–95; 7) (2) 85.5 (10.5; 68.0–99.2; 6) (3) 76, 87, 91	77.2 (70.5–82.0; 7) 94.1, 87.5 81, 85
BILL D	(3) 14, 19, 19	17, 19
TARSUS	(1) 58.2 (54.5–61.8; 7)	56.5 (53.2–59.0; 7)

	(2) 53.6 (3.0; 50.4–58.6; 6)	52.3, 53.6
	(3) 54.5, 55.5, 58.0	57.8, 61.2
TOE C	(1) 45.1 (42.8–47.0; 7)	47.4 (43.5–50.0; 7)
	(2) 47.6 (4.0; 42.0–52.5; 6)	47.4, 46.7
TOE	(3) 36.5	36.5

Hayman *et al.* (1986) state, and (1) and (3) above suggest, that females have longer wing and tail and shorter bill. However (2) above suggests that bill of females is longer (as in all other species of *Numenius*; Hayman *et al.* 1986; BWP); sexing of some specimens may be unreliable. Some additional measurements in Johnsgard (1981), Hayman *et al.* (1986) and Prater *et al.* (1977). Sexed birds from Kinsky & Yaldwin (1981) remeasured and included in (3).

WEIGHTS (1) Polynesia, specimens (Lacan & Mougins 1974). (2) Localities unknown, specimens (Johnsgard 1981 [US Natn Mus.]). (3) Pitcairn and Niue Is, freshly killed (Kinsky & Yaldwin 1981).

	MALE	FEMALE
(1)	460 (380–605; 7)	485 (405–660; 7)
(2)	378 (254–400; 10)	489 (372–618; 10)
(3)	345, 397	

(4) NW. Hawaiian Is, live; Apr. = early to mid-Apr.; Apr.–May = late Apr. and early May; May = mid- to late May (Marks 1993).

UNSEXED		
July	(4) 439.8 (39.3; 368–485; 9)	
Aug.	(4) 449.9 (57.6; 343–558; 33)	
Sept.	(4) 482.9 (39.8; 398–557; 66)	
Oct.	(4) 490.2 (49.1; 393–584; 44)	
Nov.	(4) 506.2 (48.7; 410–622; 21)	
Feb.	(4) 594.1 (69.0; 501–684; 9)	
Apr.	(4) 583.9 (69.5; 434–690; 14)	
Apr.–May	(4) 656.3 (77.4; 419–796; 70)	
May	(4) 430.4 (80.4; 335–546; 39)	

Weight is low on arrival in Hawaiian Is; weight increases steadily through moulting period until n. migration. Low weights in mid-May are from non-breeding birds after breeding birds have left. Lean weight of adults estimated at 377 g (Marks 1993). Additional unsexed weights in Johnson & Morton (1976).

STRUCTURE Wing, long and pointed. Eleven primaries; p10 longest; p9 1–5 mm shorter, p8 8–17, p7 24–23, p6 39–50, p5 54–70, p4 69–95, p3 85–106, p2 99–119, p1 112–138; p11 minute; two of 420 birds captured in nw. Hawaiian Is had 12 primaries on one wing (Marks 1993). Sixteen or 17 secondaries including four tertials. Tail, short, slightly rounded; 12 rectrices, t6 4–12 mm shorter than t1. Bill, long, slender, deeply decurved; very similar to Whimbrel, especially subspecies *hudsonicus*; very slightly longer and more deeply curved and lacking slightly expanded tip of Whimbrel (depth of curve 14–23 mm cf. 10 mm in Whimbrel). Feathers of thighs have diagnostic narrow elongated shafts ('bristles') like monofilament extending down to knee, c. 25–50 mm beyond tip of webs; no bristles on feathers of belly (*contra* NZRD); individual bristles only visible at close range but thighs sometimes appear charac-

teristically shaggy. Tarsus, similar to that of Whimbrel, but proportionately slightly shorter and thicker; more rounded with less angular corners; scales, scutellate on front, reticulate elsewhere. Toes similar to those of Whimbrel; outer toe 85–90% of middle, inner 75–78%, hind 27–34%.

AGEING Insufficient juvenile and immature material examined to determine criteria for ageing. Juvenile like adult, but in fresh plumage, coverts more neatly patterned and arranged, and patterns of upperparts, upperwing-coverts and tertials slightly brighter and with larger buff spots (Hayman *et al.* 1986; Paulson 1993); scapulars and, especially, secondary coverts may have more buff spotting (cf. edging in adults). By Oct., marking of upperparts very worn and buff tinges lost except from tail and uppertail-coverts (Paulson 1993). Inner eight primaries have bold white tips (Prater *et al.* 1977; Hayman *et al.* 1986); it has been suggested that (greater) primary coverts have broader pale tips but these also rather broad in fresh adults (skins; see photo in Marks *et al.* 1990). Marks (1993) aged juveniles in tropical Pacific till mid-Oct. on general freshness of plumage and incompletely grown bills. Immatures moulting from first to second basic should be identifiable by pattern of moult of primaries and presence of three generations of primaries (Marks 1993; see Moults) but more information needed.

GEOGRAPHICAL VARIATION None known. Considered to form species-pair with Whimbrel (Larson 1957) or species-group with Whimbrel *N. phaeopus* and Slender-billed Curlew *N. tenuirostris* (Mayr & Short 1970; Johnsgard 1981). Populations of *N. phaeopus* and *N. tahitiensis* show stepped cline of some plumage characters (especially streaking on underparts and overall buff and cinnamon tinges) with *N. tahitiensis* most closely resembling *N. p. hudsonicus* of Canadian Arctic (skins).

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Volume 3, Plate 6

Bristle-thighed Curlew *Numenius tahitiensis* (page 112)
1 Adult; 2 Juvenile; 3, 4 Adult

Whimbrel *Numenius phaeopus* (page 103)
5 Adult; 6 Juvenile; 7, 8 Adult

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