

## 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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## 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. Moults 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 <sup>1</sup> ) |
|--------------|---|---|
| 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 flavipes* Gmelin, 1789, *Syst. Nat.*, 1 (2): 659 — New York.

*Flavipes* combines the Latin *flavus*, yellow, and *pes*, foot.

MONOTYPIC

**FIELD IDENTIFICATION** Length 23–25 cm; wingspan 59–64 cm; weight 80 g. Medium-sized, rather slim, elegant wader, with longish neck, medium-length fine, straight or slightly upturned bill, and long yellow legs. Similar in size to Marsh Sandpiper *Tringa stagnatilis*, but slightly larger and bulkier, with shorter, stouter bill and longer wings. Like Wood Sandpiper *Tringa glareola*, but larger and slimmer, with slightly longer, thinner and darker bill; distinctly longer and brighter yellow legs (all of toes projecting beyond tip of tail in flight), and longer wings, which, at rest, extend beyond tip of tertials and tail, giving more attenuated rear-end. In all plumages, show obvious whitish fore-supercilium, clear white eye-ring, and square white patch on rump and uppertail-coverts. Sexes alike. Slight seasonal variation. Juvenile and immatures separable.

**Description Adult breeding** Head and neck, white, heavily streaked black, with contrasting white chin and throat, suggestion of darker loreal stripe, indistinct whitish fore-supercilium and prominent white eye-ring. Mantle, scapulars, tertials and most innerwing-coverts chequered black, grey and white, often with some plainer grey-brown non-breeding feathers admixed: breeding feathers black, with grey-brown tip and notches that become paler toward bases of feathers and often join to form pale bars on tertials and coverts; smaller coverts plainer dull grey-brown with white fringes. In flight from above, secondaries and inner primaries appear blackish-brown, grading to slightly darker black on outer primaries and primary coverts; remiges contrast slightly with paler, spotted, innerwing-coverts; and square white patch on rump and uppertail-coverts contrasts with blackish-brown back and closely barred dark-brown and white tail (barred grey-brown and black on central rectrices). Underbody, mostly white, with heavy black streaks on foreneck and breast, large triangular chevrons on sides of breast, and chevrons and bars on flanks and lateral undertail-coverts. Underwing-coverts, white, finely barred blackish or dark grey; contrasting with darker-grey remiges. Bill, black, with brownish or brownish-yellow tinge at extreme base. Iris, dark brown. Legs and feet, bright yellow to orange-yellow.

**Adult non-breeding** Much plainer and greyer above and less heavily marked below than adult breeding. Top and sides of head and neck, grey or brownish-grey, grading to white on chin and throat; white fore-supercilium and eye-ring, prominent, with darker loreal stripe; cap finely streaked white when fresh. Mantle, scapulars, tertials and innerwing-coverts, grey or brownish-grey, with alternating white and black spots or short bars on edges of some longer scapulars, tertials and innerwing-coverts, often forming complete bars on tertials and greater coverts. Rump, tail and upperwing, as breeding. Foreneck and breast, brownish grey; some show paler whitish central chest. Rest of underbody, white, with some grey barring on flanks and lateral undertail-coverts. Underwing as breeding. Legs, bright yellow; rest of bare parts, as breeding.

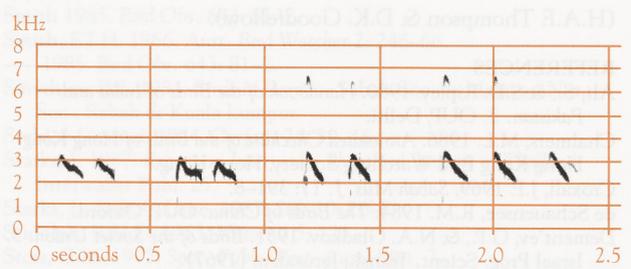
**Juvenile** Plumage similar to adult non-breeding, but: ground-colour of head and upperparts, darker, warmer dark-brown; cap speckled and streaked buff; rest of upperparts more evenly and profusely spotted with larger, more distinct buff spots that quickly fade to white (so no contrast between plain mantle and scapulars, and spotted tertials and wing-coverts seen in non-breeding); loreal stripe often darker and more distinct; foreneck and breast, brownish grey, with neat pattern of varying dark-brown streaking, and fine brownish-grey mottling and barring on flanks; rest of underparts, white. Base of bill duller, greyish; legs and feet slightly duller olive-yellow or straw-yellow at first, becoming bright yellow from about Oct. By Nov. plumage of head and upperparts, worn and darker blackish-brown, with pale spots partly abraded and sides of feathers beginning to be indented.

**First immature non-breeding** Very similar to adult non-breeding, but usually distinguished by worn retained juvenile innerwing-coverts and tertials, which are darker, blackish brown with indented margins (particularly obvious on tertials), contrasting with fresh feathers, which are paler and greyer, with neat black-and-white spots on edges and, on tertials and inner greater coverts, black barring. Some moult outer primaries between Nov. and Apr., and can then also be distinguished by contrast between worn inner and fresher outer primaries (uniformly

fresh in adult); those that retain juvenile remiges differ from adult by having more worn primaries. **First immature breeding** Similar to adult breeding but distinguished by more worn primaries or contrast between worn inner, and fresher outer, primaries.

**Similar species** Combination of: size; slim, attenuated build; tips of folded wings extending well beyond tail at rest; straight dark bill; long yellow legs; grey plumage (except in juvenile) with spotted upperparts and pale fore-supercilium; square white patch on rump; and whistled flight call, distinguish from all other species of *Tringa*. **Wood Sandpiper** (especially juvenile) shares spotted upperparts, square white patch on rump and yellowish legs, but differs by: (1) slightly smaller size, with fuller body, shorter neck and wings, and, at rest, tips of folded primaries extend only short distance beyond tip of longest tertial and about level with tip of tail; (2) slightly shorter, thicker and paler bill, with greenish, yellowish-green or brownish basal half; (3) shorter, duller, green to greenish-yellow legs (though some overlap with youngest juvenile Yellowlegs); (4) supercilium usually prominent behind as well as in front of eye; (5) plumages generally browner, except in juvenile, which is similar in both species, though pale spotting above tends to be more buff in fresh-plumaged Wood but soon fades to whitish); (6) usual flight call a whistled *chiff-if* or *chiff-if-iff*, higher-pitched and louder than flight call of Yellowlegs. **Marsh Sandpiper** normally has duller greyish-green to yellowish-green legs, but some adults early in breeding season may have brighter, yellow or even orange-yellow legs; Marsh Sandpiper in all plumages has: (1) slightly smaller size, with slimmer body and neck; (2) shorter wings (wing-tips fall roughly level with tip of tail at rest); (3) longer, finer bill; (4) paler greyish upperparts (never with pale spotting, and often showing contrastingly darker blackish shoulder-patch); (5) paler, whitish lores and, usually, forehead, and longer, white supercilium extending well behind eye. In flight, Marsh Sandpiper is distinguished by bold, sharply pointed white wedge extending from uppertail-coverts to upper back. **Redshank** is larger and stockier, with shorter legs, and underparts more strongly and extensively marked with streaks and spots; in flight, has broad white trailing-edge to wing and white wedge up back. See also comments under **Wilson's Phalarope** *Phalaropus tricolor* and **Stilt Sandpiper** *Micropalama himantopus*. For distinctions from similar Greater Yellowlegs *T. melanoleuca*, see Hayman *et al.* (1986), Chandler (1989), Lewington *et al.* (1991) and Wilds (1982).

Only singles recorded HANZAB region; elsewhere in non-breeding range, form large, loose feeding flocks of several dozen or even hundreds. Inhabit wide range of inland and coastal wetlands, including saltworks and sheltered estuaries. Wary, nervous, noisy and excitable, though sometimes tame and approachable; when alarmed, nervously bob head and tail as do other species of *Tringa*. Stances on ground like those of Wood Sandpiper, but walk and run more gracefully on longer legs. Forage on mud or wade in shallows with delicate, high-stepping walk; feed by picking and shallow probing; rarely dash after food. Flight more like that of smaller *Tringa*: easy languid action, with slow and elastic wing-beats; often seem slow but sometimes have fast flight, zigzagging and tumbling; in flight, toes extend beyond tip of tail and, compared with Marsh Sandpiper on wing, bill looks obviously shorter. Usual flight call is a whistled *tew-tew* or *yu-yu* (sonagram A), becoming louder when alarmed; like typical Contact-Alarm Call of Greenshank (P.J. Fullagar), though somewhat muted (see Greenshank; BWP); perched birds can emit very long, loud,



A Cornell LNS; British Columbia; Western Bird Songs, Peterson Field Guides, CD1, track 25

evenly spaced series of sharp *cww* notes in alarm, bobbing head and tail on each note.

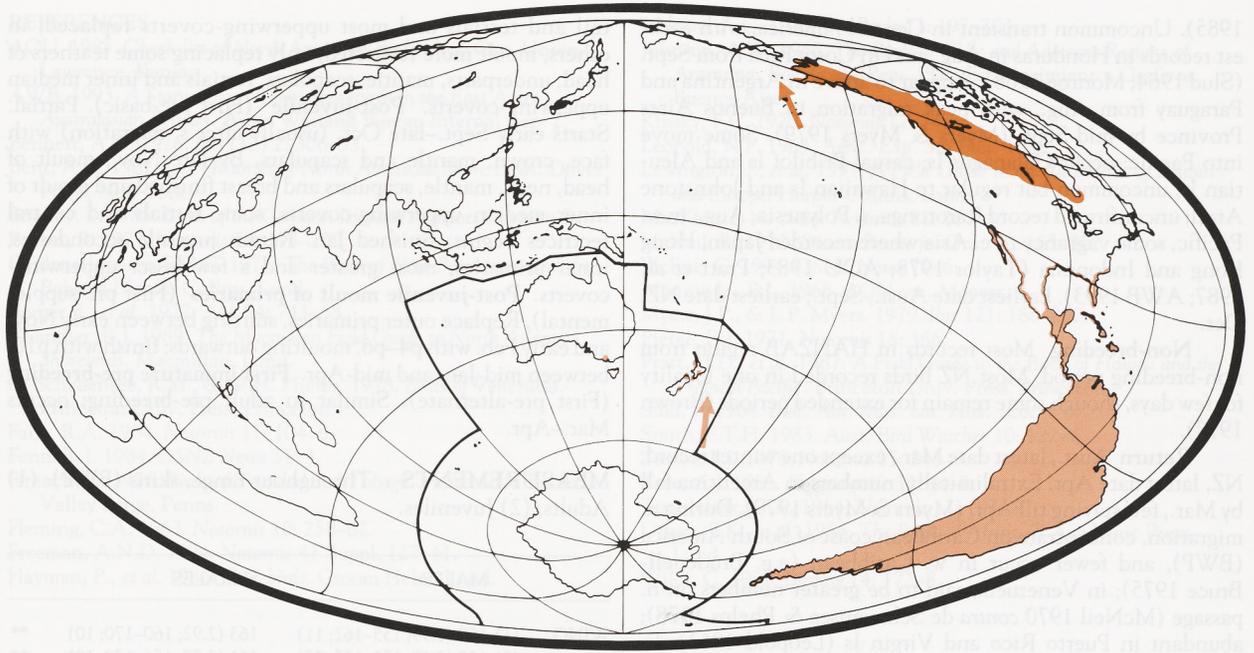
**HABITAT** During non-breeding season, coastal and inland wetlands usually with emergent vegetation, including grassy ponds and marshes, shores of shallow open lakes, lagoons and pools, coastal estuaries and mudflats, sheltered bays, inundated pastures, rivers and sewage ponds (Bent 1962; Burger *et al.* 1977; Myers & Myers 1979; BWP).

In A'asia, recorded in coastal lagoons, harbours, shallow lakes, saltworks and sewage farms; fresh to hypersaline. Mainly feed on mudflats, in shallow water up to belly; also recorded feeding in saltponds and among small fringing halophytic plants; and among small pebbles at edge of estuarine streams. Recorded roosting at edge of lake and in field with other waders (MacKenzie 1964; Tunnicliffe 1964; Pierce 1971; Brown 1977; Smith 1983; CSN 21, 36).

**DISTRIBUTION** Breed North America, from w. central Alaska, S of Arctic Circle, across much of Canada, from Yukon Territory and n. and central British Columbia, E to w. Quebec, and S to central Manitoba and Ontario. Non-breeding range mostly South America, S to Chile and Argentina, occasionally S to Tierra del Fuego; some occur s. USA and central America. Uncommon but regular visitor to British Isles and w. Europe. In s. hemisphere, accidental to s. Africa, Falkland Is and Polynesia; straggler to A'asia (Bennett 1926; Bent 1962; Johnson 1965; Taylor 1978; Tree 1981; Smith 1983; Urban *et al.* 1986; BWP).

**Aust.** Two acceptable records: single, Reedy L.—Moolap, Vic., 9 Jan.—20 Mar. 1983 (Smith 1983; Vic. Bird Rep. 1983); single, Werribee Sewage Farm, 9–12 Apr. 1995 (RAC). Unverified claims: single, Lytton, Qld, 2–7 Sept. 1984 (Qld Bird Rep. 1984); single, N of Coongie Ls, SA, 14 June 1988; single ICI (St Kilda) Saltworks, SA, 4–7 Feb. 1990; Reedy L. and Hospital Swamp, Geelong, Vic., Feb. 1995; single, Tolderol Pt, SA, Feb. 1995.

**NZ** All singles: Ahuriri Lagoon, Napier, 3–5 Nov. 1963 (MacKenzie 1964), 14–25 Apr. 1973 (CSN 21), Feb. 1983 (Fennell 1984), Dec. 1993 (McRae 1994); L. Ellesmere, 20–25 Jan. 1964 (Tunnicliffe 1964); Washdyke Lagoon, Timaru, 1 Feb. 1971 (Pierce 1971); L. Wainono, 13 Feb., 26 Mar. 1972 (CSN 19), Nov. 1987 (CSN 36); Karaka, Oct.—Dec. 1973, 9 Mar. 1974 (Brown 1977; CSN 21); Farewell Spit, 9–10 Mar. 1974 (Brown 1977; CSN 21), Jan. 1977 (CSN 24); L. Pukepuke, Manawatu, 18 Mar.—19 Apr. 1974 (CSN 21); Boggy Pond, Wairarapa, 16–19 Jan. 1983 (CSN 31); Mangere SP, Auckland, 30 Oct. 1987–23, Feb. 1988 (CSN 36). A yellowlegs at Porirua, 11–17 Nov. 1962, at first identified as a Greater Yellowlegs *T. melanoleuca* (Fleming 1963), may have been *T.*



*flavipes* (Falla 1964; Kinsky 1970; NZCL).

**Chatham Is** Single, Te Whanga Lagoon, Chatham I., 14 Nov. 1985 (Freeman 1994; NZCL).

**MOVEMENTS** Migratory; breed North America and move S to non-breeding areas (AOU 1983; BWP).

**Departure** Move through British Columbia, July–Sept.; leave prairie provinces of Canada, Aug.–Sept. (see Bent 1962). Many move S through interior of North America, and large

numbers move SE across Canada into Gulf of St Lawrence and Maritime Provinces, then along Atlantic coast. Peak passage in USA, mid-July to mid-Sept.; numbers decrease rapidly in Oct.; first waves (July–Aug.) are adults, later ones mainly juveniles. Suggested that some cross Atlantic from North America to Lesser Antilles and ne. South America; regular Bermuda, July–Sept. (see Bent 1962; BWP). Considered common transient in Caribbean, Aug.–Nov. (Brudenell-Bruce 1975; Ffrench 1976; de Schauensee & Phelps 1978; Bradley

1985). Uncommon transient in Central America, with earliest records in Honduras in Aug., and in Costa Rica from Sept. (Slud 1964; Monroe 1968). Appear to arrive in Argentina and Paraguay from Aug., with peak migration in Buenos Aires Province by mid-Sept. (Myers & Myers 1979). Some move into Pacific: occur Galapagos Is; casual Pribilof Is and Aleutian Is; uncommon but regular to Hawaiian Is and Johnstone Atoll; unconfirmed record Rarotonga, s. Polynesia, Aug.; in w. Pacific, some vagrancy to e. Asia where recorded Japan, Hong Kong and Indonesia (Taylor 1978; AOU 1983; Pratt *et al.* 1987; AWB 1993). Earliest date Aust., Sept.; earliest date NZ, Oct.

**Non-breeding** Most records in HANZAB region from non-breeding period. Most NZ birds recorded in one locality for few days, though some remain for extended periods (Brown 1977).

**Return** Aust., latest date Mar., except one winter record; NZ, latest date Apr. Extralimitally, numbers in Argentina fall by Mar., few staying till Apr. (Myers & Myers 1979). During n. migration, concentrate on Caribbean coast of South America (BWP), and fewer occur in w. Caribbean (e.g. Brudenell-Bruce 1975); in Venezuela, said to be greater numbers on n. passage (McNeil 1970 *contra* de Schauensee & Phelps 1978); abundant in Puerto Rico and Virgin Is (Leopold 1963). In Costa Rica, occur well into Apr. (Slud 1964); and in Honduras, latest date May (Monroe 1968). In USA, most move through interior, with fewer following Atlantic coast (cf. s. migration). Arrive s. USA from late Mar. and reach s. breeding grounds in early May; passage virtually complete by end May (see BWP).

**Breeding** At least some recorded S of breeding range in boreal summer; as far S as Argentina (AOU 1983; BWP). Single record in HANZAB region: SA, June.

**PLUMAGES** Prepared by A.M. Dunn. Too few specimens in Aust. or NZ to prepare complete text; see BWP for full details. Undergo partial post-juvenile (first pre-basic) moult to immature non-breeding plumage, usually after s. migration. Immatures undergo pre-supplemental moult of outer primaries. Undergo partial first pre-breeding (pre-alternate) moult before n. migration, attaining breeding plumage similar to that of adults. Thereafter, moult twice annually: a complete post-breeding (pre-basic) moult after s. migration; and a partial pre-breeding (pre-alternate) moult before return to breeding areas. Some may try to breed in first year but most first breed in second year.

**MOULTS** Mainly from BWP with some additional information from Jackson (1918) and Bent (1962). **Adult post-breeding** (Second and subsequent pre-basic). Complete; primaries outward. Begins in breeding areas just before s. migration, with some feathers of head, sides of breast, or upperparts. Moult suspended during migration and started again soon after arrival in non-breeding areas with replacement of most feathers of head, body and wing-coverts. Begin moult of primaries and central rectrices in non-breeding areas, between mid-July and early Oct.; finished between late Oct. and late Jan. Back to uppertail-coverts, greater and lesser coverts, secondaries and outer tail, replaced during later stages of primary-moult. **Adult pre-breeding** (Second and subsequent pre-alternate). Partial; extent varies. Begins late Jan.–Feb., and completed Apr.–May. Most replace head, neck, all underparts, much of mantle, scapulars and tertials, central rectrices, many median and some lesser upperwing-coverts. In some, all upperparts,

tail and tertials and most upperwing-coverts replaced; in others, moult more restricted, only replacing some feathers of head, underparts, mantle, scapulars, tertials and inner median upperwing-coverts. **Post-juvenile** (First pre-basic). Partial. Starts early Sept.–late Oct. (usually after s. migration) with face, crown, mantle and scapulars. By late Nov., moult of head, neck, mantle, scapulars and breast finished and moult of inner median upperwing-coverts, some tertials and central rectrices begins; finished Jan. Retain juvenile secondaries, inner primaries, most greater and a few lesser upperwing-coverts. **Post-juvenile moult of primaries** (First pre-supplemental). Replace outer primaries, starting between early Nov. and early Feb. with p4–p6, moulting outwards; finish with p10, between mid-Jan. and mid-Apr. **First immature pre-breeding** (First pre-alternate). Similar to adult pre-breeding; occurs Mar.–Apr.

**MEASUREMENTS** Throughout range, skins (BWP): (1) Adults; (2) Juveniles.

|        | MALES                       | FEMALES                 |    |
|--------|-----------------------------|-------------------------|----|
| WING   | (1) 159 (1.99; 155–162; 11) | 163 (2.92; 160–170; 10) | ** |
|        | (2) 158 (3.69; 153–165; 23) | 161 (3.77; 156–170; 19) | ** |
| TAIL   | (1) 59.7 (1.98; 57–64; 18)  | 59.8 (2.04; 57–63; 13)  | ns |
| BILL   | (1) 36.0 (1.38; 34–38; 33)  | 36.5 (1.53; 35–39; 29)  | ns |
| TARSUS | (1) 50.9 (2.10; 47–56; 33)  | 52.0 (2.31; 49–57; 28)  | *  |
| TOE C  | (1) 32.6 (1.10; 30–35; 32)  | 32.7 (1.32; 30–36; 29)  | ns |

Length of wing and tarsus differs significantly between sexes. Length of wing and tail of juveniles generally 1–2 mm shorter than that of adults (difference not significant).

**WEIGHTS** Adults (BWP): (1) Mostly Alaska; (2) Lesser Antilles and Surinam.

|                        | MALES                     | FEMALES                |
|------------------------|---------------------------|------------------------|
| late May to early July | (1) 80.0 (66–94; 15)      | 83.7 (77–100; 7)       |
| Aug. to Sept.          | (2) 78.9 (8.11; 68–88; 4) | 94.0 (6.50; 84–102; 5) |
| Nov. to Jan.           | (2) 81.8 (8.54; 68–94; 7) | 74, 87, 96             |
| Feb. to Mar.           | (2) 78.4 (11.7; 64–98; 8) | 79.0 (9.30; 70–89; 7)  |

(3) Lesser Antilles, n. South America and Panama, ages combined (BWP).

|                 | UNSEXED                     |
|-----------------|-----------------------------|
| Jan.–Feb.       | (3) 73.7 (8.44; 58–92; 39)  |
| Mar.–Apr.       | (3) 78.9 (60–114; 66)       |
| May.–early June | (3) 86.4 (9.08; 78–106; 8)  |
| late July       | (3) 68.1 (11.9; 54–82; 5)   |
| Aug.            | (3) 84.2 (8.76; 70–98; 13)  |
| Sept.           | (3) 74.5 (14.4; 48–108; 19) |
| Oct.            | (3) 72.3 (10.3; 58–89; 15)  |
| Nov.–Dec.       | (3) 77.5 (8.20; 63–96; 45)  |

**AGEING** On arrival in non-breeding areas, juveniles have fresh primaries, whereas primaries of adults worn or moulting. For ageing of immatures, see Field Identification.

**GEOGRAPHICAL VARIATION** None.

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Volume 3, Plate 9 [caption error corrected from original]

Lesser Yellowlegs *Tringa flavipes* (page 153)  
 1 Adult breeding; 2 Adult non-breeding; 3 Juvenile; 4, 5 Adult

Marsh Sandpiper *Tringa stagnatilis* (page 136)  
 6 Adult breeding; 7 Adult non-breeding; 8 Juvenile; 9, 10 Adult

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