

## 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]):

Thinororidae	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.
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 (Thinororidae, 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.

## REFERENCES

- Christian, P.D., *et al.* 1992. *Aust. J. Zool.* 40: 291–302.
- Fjeldså, J. 1976. *Vidensk. Medd. dansk. Natur. Foren.* 139: 179–243.
- 1977. *Guide to the Young of European Precocial Birds*. Scarv Nature Productions, Tisvildeleje.
- Glenny, F.H. 1955. *Proc. US natn. Mus.* 103 (3346): 525–621.
- Jehl, J.L., Jr. 1968. *Mem. San Diego Soc. nat. Hist.* 3.
- Mayr, E., & D. Amadon. 1951. *Am. Mus. Novit.* 1496.
- Mickevich, M.F., & L.R. Parenti. 1980. *Syst. Zool.* 29: 108–113.
- Olson, S.L., & A. Feduccia. 1981. *Smithson. Contrib. Zool.* 323: 1–24.
- , & D.W. Steadman. 1981. *Smithson. Contrib. Zool.* 337: 1–25.
- Sibley, C.G., & J.E. Ahlquist. 1990. *Phylogeny and Classification of Birds of the World*. Yale Univ. Press, New Haven.
- , & B.L. Monroe. 1990. *Distribution and Taxonomy of the Birds of the World*. Yale Univ. Press; New Haven.
- , *et al.* 1988. *Auk* 105: 409–423.
- Strauch, J.G., Jr. 1978. *Trans. zool. Soc. Lond.* 34: 263–345.

## 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.

## REFERENCES

- Alcorn, R. 1988. *Stilt* 12: 7–23.  
 Amiet, L. 1957. *Emu* 57: 236–54.  
 Burton, P.J.K. 1974. *Feeding and the Feeding Apparatus in Waders*. Br. Mus. Nat. Hist., Lond.  
 Byrkjedal, I. 1990. *Ornis scand.* 21: 239–47.  
 Carter, M.J., *et al.* 1976. *Aust. Bird Watcher* 6: 173–7.  
 Christian, P.D., *et al.* 1992. *Aust. J. Zool.* 40: 291–302.  
 Christidis, L., & W.E. Boles. 1994. *RAOU Monogr.* 2.  
 Colwell, M.A. 1986. *Auk* 103: 611–12.  
 —, & L.W. Oring. 1988a. *Behav. Ecol. Sociobiol.* 22: 165–73.  
 —, — 1988b. *Wilson Bull.* 100: 567–82.  
 Crawford, D.N. 1972. *Emu* 72: 131–48.  
 Dittman, D.L., *et al.* 1989. *Auk* 106: 324–6.  
 Fjeldså, J. 1977. *Guide to the Young of European Precocial Birds*. Skarv Nature Publs, Strandgården, Tisvildileje.  
 Forest, B.S. 1982. *Aust. Bird Watcher* 9: 159.  
 Garnett, S.T. 1989. *RAOU Rep.* 58.  
 Gerritsen, A.F.C. 1988. Unpubl. PhD thesis, Univ. Liedon.  
 —, *et al.* 1983. *Neth. J. Zool.* 33: 485–96.  
 Hindwood, K.A., & E.S. Hoskin. 1954. *Emu* 54: 217–55.  
 Jehl Jr, J.R. 1968. *Mem. San Diego Soc. Nat. Hist.* 3.  
 —, & B.G. Murray. 1986. *Current Orn.* 3: 1–86.  
 Johnsgard, P.A. 1981. *The Plovers, Sandpipers and Snipes of the World*. Univ. Nebraska Press, Lincoln.  
 Lane, B.A., & A. Jessop. 1985. *Stilt* 6: 2–16.  
 —, & D. Parish. 1991. *ICBP Tech. Publ.* 12: 291–312.  
 Ligon, J.D. 1993. *Current Orn.* 10: 1–46.  
 Loyn, R.H. 1978. *Emu* 78: 11–19.  
 McKenzie, H.R. 1967. *Notornis* 14: 154–7.  
 Piersma, T. 1994. *Close to the Edge: Energetic Bottlenecks and the Evolution of Migratory Pathways in Knots*. Uitgeverij Het Open Boek, Den Burg, Texel, Netherlands.  
 —, *et al.* 1994. Paper 3 In: Piersma 1994.  
 Pitelka, F.A., *et al.* 1974. *Am. Zool.* 14: 185–204.  
 Prendergast, H.D.V., *et al.* 1985. *Sunbird* 15: 80–3.  
 Reynolds, J.D. 1987. *Ibis* 129: 225–42.  
 Robertson, H.A., & M.D. Dennison. 1979. *Notornis* 26: 73–88.

Roselaar, C.S. 1979. *Watervogels* 4: 202–10.  
 Rubega, M.A., & B.S. Obst. 1993. *Auk* 110: 169–78.  
 Saunders, D., & P. de Rebeira. 1985. *The Birdlife of Rottnest Island*.  
 Authors, Perth.  
 Sibley, C.G., & J.E. Ahlquist. 1990. *Phylogeny and Classification of Birds*. Yale Univ. Press, New Haven.  
 —, et al. 1988. *Auk* 105: 409–23.  
 Sibson, R.B. 1965. *Notornis* 12: 44–6.

Smith, F.T.H. 1985. *Bird Obs.* 643: 81–2.  
 Starks, J. 1987. *Report on Shorebird Surveys in Thailand*. Interwader Publ. 25.  
 Strauch Jr, J.G. 1978. *Trans. zool. Soc. Lond.* 34: 263–345.  
 Underhill, L.G., et al. 1993. *Ibis* 135: 277–92.  
 van Heezik, Y.M., et al. 1983. *Neth. J. Sea Res.* 17: 47–56.  
 Wall, L.E. 1953. *Emu* 53: 80–6.

## Subfamily GALLINAGONINAE snipes

Small to medium-sized (17–33 cm) skulking, marsh-dwelling waders, with very long bills. About 18 species in three genera: (1) *Coenocorypha*, comprising two sedentary species of subantarctic NZ islands (NZCL), though specific recognition of some forms probably warranted (see those accounts); (2) *Limnocyptes*, single migratory species of Palaearctic; and (3) *Gallinago*, comprising c. 15 species, including three in HANZAB region (one regular non-breeding migrant and two accidentals); mostly migratory, breeding in Palaearctic, but with more sedentary species in Africa and South America. Genus *Gallinago* referred to as *Capella* in much early literature, and three South American species sometimes placed in separate genus *Chubbia*. Dowitchers often included in Gallinagoninae but treated in separate subfamily here (*Limnodrominae*, q.v.). Snipes sometimes combined with woodcocks in *Scolopacinae*, but kept separate here based on differences in downy young and dorsal vertebrae (Jehl 1968; BWP). Anatomy, downy young, internal feeding apparatus and studies of DNA hybridization suggest closest living relatives are *Scolopacinae* or *Calidridinae* (e.g. Jehl 1968; Burton 1974; Fjeldså 1977; Strauch 1978; Sibley & Ahlquist 1990) but conclusive biochemical and DNA studies needed.

Bill, long, usually straight but slightly decurved in some (especially *Coenocorypha*); tip, sensitive, with many Herbst's corpuscles; highly rhyndokinetic. Like woodcocks, have suborbital bar in skull, giving head rigid appearance, with eyes set higher and farther back than in most *Scolopacidae*; thus have very broad field of vision. Differ from woodcocks in having six unfused dorsal vertebrae (woodcocks have five unfused vertebrae and two fixed vertebrae in rigid *os notarium*) and larger pre-acetabular part of pelvis, giving horizontal crouching stance. Wings somewhat shorter and broader than in most *Scolopacidae*; fly strongly and most have explosive take-off and characteristic zigzagging flight when flushed. Tail, rather short; usually 14–28 rectrices in *Gallinago*, 12 in *Limnocyptes*, 14 in *Coenocorypha*. Outer rectrices usually stiff and strong; often also narrow. In most species they are splayed almost at right angles during display flights and their vibrations thought responsible for loud and species-specific drumming, whinnying or even fizzing noises that characterize such displays. However, mechanisms for production of such non-vocal sounds only known in a few species (Tuck 1972; Reddig 1978; Byrkjedal 1990; see account for Latham's Snipe *Gallinago hardwickii*). Non-vocal sounds of *Gallinago* snipe appear to differ structurally from those of Chatham Island Snipe *Coenocorypha pusilla* (q.v.). Legs and toes, moderately long; toes, unwebbed; hallux, short and raised.

Sexes similar, though females slightly larger and longer-billed (not *Limnocyptes* and *Coenocorypha*). Adult plumages, cryptic, intricately patterned in various shades of buff, brown and black; many species (especially *Gallinago*) have bold buff or rufous lines on scapulars and mantle, dark axillaries and underwing-coverts barred white, and large rufous patches on central rectrices. At least some species have partial pre-breeding moult, but none has seasonal changes in appearance of plumage. Juveniles very similar to adults, sometimes indistinguishable; moults of subadults poorly known and immatures not usually separable from adults after post-juvenile (first pre-basic) moult finished (e.g. Tuck 1972; Sæther et al. 1994; BWP; this volume). Downy young of most species, mainly dark chestnut-brown above and below; upperparts have black stripes overlain by small white powder-puffs, which are densely packed, short white barbules at tips of feathers. Unlike *Calidridinae*, powder-puffs do not tangle together, and are aligned in straight lines along back, rather than forming hour-glass pattern; number and density of powder-puffs varies much between species (Jehl 1968; Fjeldså 1977).

Typically birds of marshy habitats, with soft muddy soil and dense low vegetation, such as sedges and herbs; some species use dry moorlands and heathlands (including tundra) and several species use more forested habitats than any other waders other than woodcocks. Feed mostly on invertebrate prey, which is located by touch when probing; also pick invertebrates, seeds and other food from surface. Range from highly migratory (e.g. the three *Gallinago* species reaching Aust.) to sedentary (e.g. *Coenocorypha*).

### REFERENCES

Burton, P.J.K. 1974. *Feeding and the Feeding Apparatus of Waders*. Br. Mus. Nat. Hist., Lond.  
 Byrkjedal, I. 1990. *Ornis scand.* 21: 239–47.  
 Fjeldså, J. 1977. *Guide to the Young of European Precocial Birds*. Skarv Nature Pubs, Strandgården, Tisvildileje.

Jehl Jr, J.R. 1968. *Mem. San Diego Soc. nat. Hist.* 3.  
 Reddig, E. 1978. *J. Orn.*, Lpz. 119: 357–87.  
 Sæther, S.A., et al. 1994. *Condor* 96: 959–72.  
 Sibley, C.G., & J.E. Ahlquist. 1990. *Phylogeny and Classification of Birds*. Yale Univ. Press, New Haven.  
 Tuck, L.M. 1972. *Can. Wildl. Serv. Monogr. Ser.* 5.

*Gallinago hardwickii* Latham's Snipe

COLOUR PLATE FACING PAGE 64

*Scolopax hardwickii* J.E. Gray, 1831, *Zool. Misc.*: 16 — Tasmania.

The generic name is derived from the Latin (*gallina*) for hen. The specific epithet is in honour of Charles Hardwick of Tasmania, who discovered the bird.

OTHER ENGLISH NAMES Japanese Snipe, New Holland Snipe.

## MONOTYPIC

**FIELD IDENTIFICATION** Length 29–33 cm; wingspan 50–54 cm; weight 150–230 g. Largest snipe in HANZAB region. Medium-sized, cryptically plumaged wader, with long straight bill, rather short broad pointed wings, long tail, and short legs. Very similar in size, shape and plumage to Swinhoe's *Gallinago megala* and Pin-tailed *G. stenura* Snipes: Latham's is slightly larger than Swinhoe's, with proportionately longer wings and tail than either, which give Latham's a more smoothly attenuated rear-end; on ground, long tail projects well beyond folded wing-tips, and folded primaries covered by or project only a few millimetres beyond tips of tertials; in flight, wing-tips appear more pointed than on Swinhoe's or Pin-tailed and, toes normally do not project beyond tip of tail. No single plumage feature considered diagnostic in field. Sexes similar. Little seasonal variation. Juvenile differs only slightly.

**Description Adult At rest** Crown, black-brown (rarely, flecked with brown) with narrow buff median stripe not usually reaching bill. Sides of head, pale buff, grading to white on chin, with fine dark-brown streaks on lower face and with bold narrow dark-brown cheek-stripe. Narrow blackish eye-stripe extends from bill to eye, and beneath eye; on most, continues as two short parallel dark stripes, one from rear of eye along upper border of ear-coverts, and the other from dark stripe beneath eye through central ear-coverts; double stripes vary but always fainter than lores. Broad, cream or white supercilium extends from bill to sides of nape; broad and bulging in front of eye (at least twice width of loreal stripe at base of bill) but much narrower and sometimes buff behind. Thin white eye-ring. Hindneck and sides of neck, light brown or buff, coarsely streaked black. Sides of upper mantle coarsely streaked cream and black; rest of mantle, upper back and inner scapulars, black, with some fine rufous-brown flecks; bold buff V on outer mantle and second buff V on inner scapulars; outer scapulars typically spread more loosely than inner scapulars, appearing paler, greyer with rufous-brown barring, broad buff fringes and black shaft-streak; no second scapular line. Tertials and inner greater coverts, grey-brown, buff or cinnamon, irregularly barred black. Lower back, rump and uppertail-coverts, light rufous-brown, finely barred darker and with white tips to distal coverts. Tail appears bright rufous, with narrow black subterminal band and broader white tip; some black may be seen beyond tail-coverts on central rectrices; black-and-white barred outer rectrices not visible. Lesser and median innerwing-coverts visible below scapulars, light brown, broadly tipped buff and crossed by thin, straight or chevron-shaped black bars and with characteristic paired buff spots at tip, which fade to creamy with wear. Throat, foreneck and upper breast, light brown or buff, with short dark streaks on throat and upper foreneck, grading to dark mottling over rest. Lower breast,

white, usually with varying dark barring, which can be broad and straight, or narrower and chevron-shaped (similar to Swinhoe's and Pin-tailed Snipes); in those with faint or no barring, gorget usually fairly sharply cut off from white of lower breast and belly; those with sparse barring show gradual transition to white belly; heavily barred birds have a sharp demarcation. Flanks typically white, boldly barred dark. Vent and undertail-coverts, light brown, barred dark. **In flight** Saddle shows bold pale lines on mantle and scapulars; blackish upperwing shows prominent pale buffy-brown panel on central innerwing-coverts, thin white tips to greater coverts, fine pale trailing-edge to secondaries and inner primaries (to p5–p7), and contrasting pale shaft on outer primary; lower back to uppertail-coverts, light brown or rufous-brown; in direct flight, tail usually tightly furled, appearing bright rufous, with thin black subterminal band and narrow cream tip; when landing, tail spread and messy black-and-white barring of outer rectrices can be seen. From below: axillaries and underwing, dark grey, finely barred white, with dark foreneck, flanks and breast contrasting with white belly. Plumage shows some wear and fading by Mar.; most obvious changes are: crown-stripe and mantle- and scapular-lines fade to cream or white; on upperwing, tips of central innerwing-coverts fade to cream, producing somewhat paler panel; and fine white trailing-edge of wing is lost; ground-colour of sides of head fades to cream or even white; ground-colour of throat to upper breast fades to paler buff, and contrasts less with white belly. Bill varies: pale brown to olive or olive-yellow at base, with blackish distal third and thin strip along culmen. Iris, blackish brown. Legs and feet, olive-grey to olive. **Juvenile** In fresh plumage, very similar to adult. Best distinguished by slight differences in pattern of upperwing: (1) broad buff fringes to median and lesser coverts form paler wing-panel and distinctly scaly pattern to coverts; (2) dark bars of coverts, narrower and strongly convex; (3) narrow white tips of secondaries and primaries slightly broader and clearer, forming more obvious pale trailing-edge, which extends to tip of outermost primary; pale tips of outer 3–5 primaries sometimes visible on folded wing at rest. Legs and feet may be more olive-yellow but much overlap. Indistinguishable after about early Nov.

**Similar species** Latham's, Swinhoe's and Pin-tailed Snipes overlap in size, structure, behaviour, habitat and plumages. Identification is not always possible and must be based on careful assessment of a range of characters, especially slight differences in size and structure. Typical differences of Latham's from Swinhoe's and Pin-tailed Snipes are: **At rest** (1) **SIZE:** Latham's is largest; Swinhoe's is intermediate but closer to Pin-tailed; Pin-tailed slightly but distinctly smaller; (2) **WING AND TAIL:** proportionately longer than Pin-tailed and

Swinhoe's, with tail projecting well beyond tips of folded wing, and folded primaries covered by or projecting only a few millimetres beyond tips of tertials, which all combine to give smoothly attenuated rear-end; in Pin-tailed, wings and tail shorter, with little or no projection of tail beyond tips of folded wing, and with marked step in outline between vent and undertail-coverts, which combine to give somewhat more truncated, less attenuated appearance; overall appearance of Pin-tailed rather squat, quite different from Latham's; in Swinhoe's, projection of tail similar to that of Latham's, but shorter wings and tail combine with step in outline between vent and undertail-coverts to give more truncated rear-end than Latham's and intermediate between appearance of Latham's and Pin-tailed; (3) BILL-LENGTH: much overlap in length; bill of Swinhoe's slightly shorter than that of Latham's; bill of Pin-tailed may be proportionately shorter than those of Latham's and Swinhoe's; (4) OUTER RECTRICES: in Pin-tailed Snipe, diagnostic outer rectrices sometimes seen in exceptional circumstances: outer 6–8 feathers, narrow, resembling row of tiny paintbrushes; in Latham's and Swinhoe's, outer rectrices much broader; (5) FACIAL STRIPES: in Latham's and Pin-tailed, double eye-stripe behind eye- and cheek-stripes typically weak and narrow; in Swinhoe's, eye-stripe usually bold and unbroken; (6) CROWN-STRIPES: in Latham's and Swinhoe's, lateral crown-stripes often uniformly dark, with little or no buff flecking, and joining more broadly over base of bill; in Pin-tailed, blackish lateral crown-stripes often have more brown flecking than on fresh Latham's and Swinhoe's, though flecks can be lost with wear, and join narrowly over bill as in Latham's; (7) LEGS AND FEET: olive-grey to olive in Latham's in HANZAB region; in Swinhoe's, legs and feet usually yellower, olive-yellow to yellowish olive; in Pin-tailed, legs similar to those of Swinhoe's but typically greener, from greyish green to brownish green, never matching yellowish colour of Swinhoe's, sometimes yellowish olive; legs of Pin-tailed thinner than those of Swinhoe's; (8) BARRING ON BREAST: if present, broad straight dark barring across lower breast of Latham's, diagnostic. **In flight** Similar in size, shape and proportions (including length of bill) to Swinhoe's Snipe; Pin-tailed appears slightly smaller, with tubbier appearance, proportionately smaller head, and shorter bill; (9) wings proportionately longer and more pointed; appear to have long bill and tail; (10) toes do not project beyond tip of tail, though very tips of toes may trail momentarily during take-off; in Swinhoe's, toes project beyond tip of tail; in Pin-tailed, almost entire length of toes project beyond tip of tail; (11) in Pin-tailed, diagnostic pin-like outer rectrices can occasionally be seen (e.g. when tail spread on landing); (12) typically appear to have pale chest (unlike some Swinhoe's), and slightly larger white patch on belly; patch of Swinhoe's and Pin-tailed similar but smaller than that of Latham's; (13) when flushed, generally utter one or more rasping *kek* notes; Swinhoe's usually silent, though may utter one or more dry, rasping notes on rising and occasionally during long flights; in Pin-tailed, normal flight call similar to Latham's but said to be more nasal. **OTHER DIFFERENCES** include: (14) mantle and scapular lines, rich buff, fading to paler cream or even white with wear by departure in about Mar.; at this time, Swinhoe's and Pin-tailed are in fresh plumage and show duller, buff lines; (15) on upperwing, shaft of outermost primary, contrasting, white; in Swinhoe's and Pin-tailed, shaft duller, brown (but can appear pale in some lights); (16) on arrival in Aust. in spring, age and colour of primaries of adults and first-year birds uniform; at this time adult Swinhoe's and Pin-tailed show contrast between fresh blackish-brown inner

primaries and duller, brown and worn outer primaries. Moulting of primaries starts (Latham's) or resumes (Swinhoe's and Pin-tailed) shortly after arrival (primaries of juvenile and first-immature Swinhoe's and Pin-tailed Snipe uniform while in Aust.); (17) tend to prefer wetter ground for feeding and roosting.

Occur singly or in small loose groups; occasionally, gather in larger groups of several dozen. Occur in a variety of freshwater wetlands on or near coast, generally with dense cover. Mainly crepuscular; extremely shy, wary and skulking. Stance varies: horizontal when feeding; more upright when resting or moving about undisturbed; upright with head raised when alarmed. Feed busily by thrusting bill deep into mud with rapid, vertical sewing-machine action. When disturbed, erupt from cover in fast, constantly twisting or zigzagging flight, uttering explosive *kek* on leaving cover, which often causes others nearby to flush; tower to some height and fly more than 100 m, often circling widely and uttering alarm calls before diving steeply, quickly checking descent close to ground with a few wing-beats and dropping tail-down into cover. However, escape-flight and behaviour varies: some fly heavily on direct course over shorter distance, keeping lower and with little zigzagging before dropping into cover; occasionally, do not call. Sometimes crouch when disturbed. If land in open, run quickly to cover.

**HABITAT** In Aust., occur in wide variety of permanent and ephemeral wetlands (Naarding 1981). Prefer open freshwater wetlands with cover nearby, especially fresh meadows, seasonal and semi-permanent fresh swamps and open fresh waters (Frith *et al.* 1977; Naarding 1983); also recorded in bogs, swamps, waterholes, billabongs, lagoons, lakes, edges of creek and rivers, river-pools, floodplains; also some artificial wetlands and marshes behind coastal sand dunes (Recher 1975; Naarding 1981, 1983). Occupy any vegetation round wetlands, including tussock grasslands, sedges, lignum, reeds and rushes, button-grass, alpine, subalpine and coastal heath, tea-tree scrub, woodlands and sclerophyll forests (Chapman 1969; Frith 1970; Longmore 1973; McGarvie & Templeton 1974; Frith *et al.* 1977; Naarding 1983). During migration, occasionally in saline or brackish habitats, such as saltmarsh, mangrove creeks, sandy bays, shingle beaches and tidal rivers (Frith *et al.* 1977; Wood 1985; Morris *et al.* 1990; Tas. Bird Rep. 20); round Port Phillip Bay, Vic., regularly recorded in saltmarsh and recorded at saltworks (Naarding 1983; Lane & Jessop 1985). Once observed in mallee leaf-litter near small dam (M.A. Cameron). In NZ, mainly in coastal wetlands, including near-coastal lagoons; recorded in reeds or rushes at edges of sewage pond; at freshwater bog with artificial tarns and canals; backwaters of small stream (Brathwaite 1955; Miskelly *et al.* 1985; Baker *et al.* 1986; CSN 20).

Feed on soft mud or in shallow water, at edges of wetlands, either in open or on bare mud between vegetation (McGarvie & Templeton 1974; Frith *et al.* 1977; Lane 1978; Naarding 1981, 1982, 1983; Morris *et al.* 1990). Roost during day, on ground in vegetation near feeding areas; usually beside or under clumps of vegetation; occasionally in dense copses of tea-trees, or on forest floor, up to 100 m into forest; in agricultural areas, sometimes in unvegetated drainage ditches or bare furrows of ploughed paddocks; rarely, in rocky outcrops or boulders. May roost on feeding grounds or even in shallow water if no suitable shelter nearby (Frith *et al.* 1977; Lane 1978; Naarding 1982, 1983). Once seen resting on a log, and another observed sunning on large waterlily leaf (Hindwood

& Hoskin 1954). After being flushed, usually land in dense undergrowth; once seen to land c. 3 m up on branch of a eucalypt in open forest (Lane 1978).

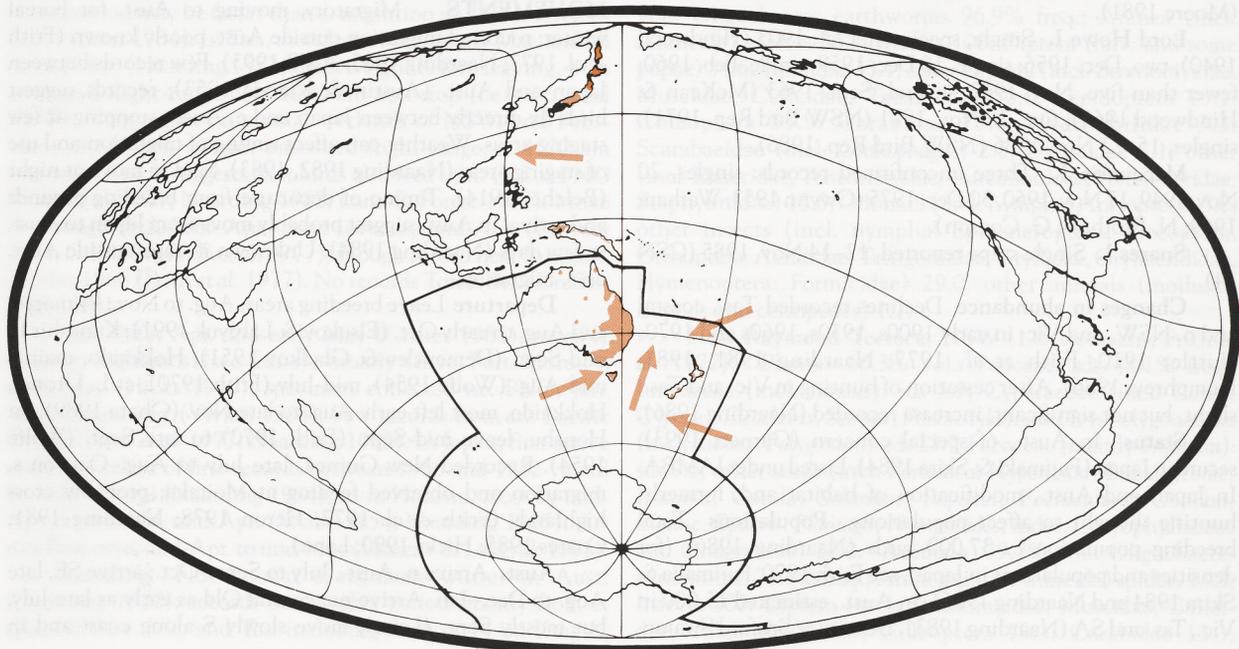
Readily use modified or artificial habitats, including pasture, ricecrops, ploughed paddocks and orchards; also sewage farms, drainage ditches and irrigation channels, farm dams, swamps cleared of vegetation (McGarvie & Templeton 1974; Milledge 1975; Frith *et al.* 1977; Lane 1978; Fielding 1979; Naarding 1982, 1983; Czechura 1983; Lane & Jessop 1985; Baker *et al.* 1986). Adversely affected by drainage of wetlands (Frith *et al.* 1977; Naarding 1981, 1983, 1985). Further, modification of wetlands or creation of artificial wetlands (e.g. farm dams, hydro-electric impoundments) usually decreases amount of suitable habitat (Naarding 1981). Disturbed by people and grazing cattle (Naarding 1983), though sometimes recorded in wetlands prone to disturbance, e.g. near industrial complexes, next to roads, railways, airfields, and within school grounds (Gill 1970; Naarding 1982, 1983; M.A. Weston).

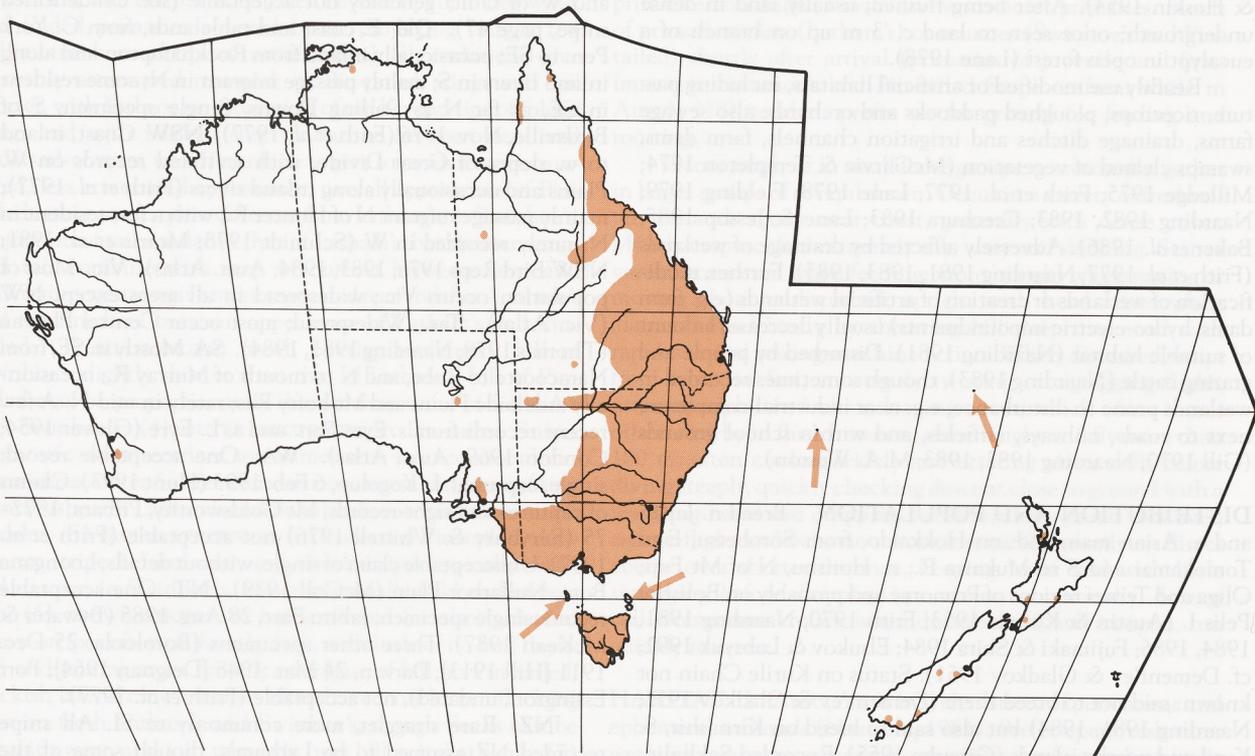
**DISTRIBUTION AND POPULATION** Breed n. Japan and e. Asian mainland: on Hokkaido, from Sorobetsu, E to Tomokamai and S to Mukawa R.; n. Honshu, N of Mt Fuji; Oliga and Ternei regions of Primorye and probably on Bolishoi Pelis I. (Austin & Kuroda 1953; Frith 1970; Naarding 1981, 1984, 1986; Fujimaki & Skira 1984; Elsukov & Labzyuk 1991; cf. Dement'ev & Gladkov 1951). Status on Kurile Chain not known: said not to breed there (Dement'ev & Gladkov 1951; Naarding 1981, 1984) but also said to breed on Kirnashir, S. Kuril and nearby islands (Gizenko 1955). Recorded Sakhalin, but not breeding (Naarding 1984). Non-breeding records on s. Japanese islands of Shikoku, Kyushu and Izu; single record Taiwan (Austin & Kuroda 1953). Recorded doubtfully from Philippines (Naarding 1984) and Marshall Is (Amerson 1969). Specimens supposedly taken from India are likely to be incorrect localities (Frith *et al.* 1977). Recorded on passage in New Guinea, from e. Irian Jaya E to Milne Bay (Frith *et al.* 1977; Naarding 1981).

**Aust.** Non-breeding visitor to SE; passage migrant in N. Sight records in n. and central Aust. (e.g. Gulf of Carpentaria,

and W of Gulf) generally not acceptable (see Unidentified snipe, page 47). **Qld** E. coast and tablelands, from C. York Pen. to SE; occasionally inland from Rockhampton and along inland rivers in S; mainly passage migrant in N; some resident in SE, as far N as Darling Downs. Single specimen, S of Birdsville, Nov. 1976 (Frith *et al.* 1977). **NSW** Coast, inland to w. slopes of Great Divide, with scattered records on W. Plains and occasionally along inland rivers (Frith *et al.* 1977); mainly passage migrant N of Hunter R., with a few resident in N; rarely recorded in W (Schmidt 1978; Morris *et al.* 1981; NSW Bird Reps 1976, 1983, 1984; Aust. Atlas). **Vic.** Most of population occurs Vic.; widespread in all areas except NW (Vic. Atlas). **Tas.** Widespread; most occur Central Plateau (Thomas 1979; Naarding 1981, 1984). **SA** Mostly in SE, from Naracoorte to Robe, and N to mouth of Murray R.; occasionally Adelaide Plains and Mt Lofty Ras; rarely in mid-N. A few recent records from s. Eyre Pen. and s. L. Eyre (Glover 1954; Condon 1969; Aust. Atlas). **WA** One acceptable record: single, captured, L. Kogolup, 6 Feb. 1993 (Hunt 1993). Claims of captures and sight-records, Mt Goldsworthy, Pilbara, 1972–75 (Serventy & Whittell 1976) not acceptable (Frith *et al.* 1977). Unacceptable claim of single, without details, Loongana Bore, Nullarbor Plain (McColl 1929). **NT** One acceptable record: single specimen, Jabiru East, 28 Aug. 1985 (Bywater & McKean 1987). Three other specimens (Borolooloa, 25 Dec. 1911 [Hill 1913]; Darwin, 24 Mar. 1948 [Deignan 1964]; Port Essington, undated), not acceptable (Frith *et al.* 1977).

**NZ** Rare straggler, more commonly to SI. All snipe recorded NZ assumed to be Latham's, though some of the records below have few details. (Singles unless stated). **NI** First record: specimen, Arch Hill, W. Auckland, 26 Mar. 1898 (Stidolph 1927); Mangere, 13 Oct. 1985 (Baker *et al.* 1986; accepted RBC); Ahuriri Lagoon, Napier, 13 Apr. 1952 (Brathwaite 1955); specimen, Castlecliff, Wanganui, 6 Oct. 1914 (Oliver); Waitohu Stream, Otaki, Nov. 1972 (CSN 20); L. Wairarapa: 10 Jan. 1993, 21 Jan. 1993 (two birds), 31 Jan., 6 Feb. 1993 (three birds) (CSN 41; H.A. Robertson; P. Reese; B.D. Heather; G.A. Taylor). **SI** Coopers Lagoon, L. Ellesmere: Jan. 1973 (two), 21 Dec. 1987 (CSN 20, 36); L. Tekapo, 31 Dec.





1983 to 1 Jan. 1984, 1988 (R.J. Pierce; NZCL); Taieri Beach and Lake, Otago, Jan. 1941, Jan. 1942; summer 1968–69 (Edgar *et al.* 1969; CSN 1); L. George, Colac Bay, Southland: 19 Dec. 1984 to 21 Mar. 1985 (five sightings of singles and one sighting of two birds), 22 Mar. 1985 (two), 25 Dec. 1985, 12 Jan. 1986, 12 Jan. 1987 (two), 27 Nov. 1987 (Miskelly *et al.* 1985; CSN 34, 35, 37); Waituna Lagoon, 13 Mar. 1991 (R. Sutton).

**Norfolk I.** Two, Mar. 1969 (Disney & Smithers 1972); a few, Nov. 1976 (Hermes *et al.* 1986); 2–3, 6–16 Nov. 1980 (Moore 1981).

**Lord Howe I.** Single, specimen, Oct. 1903 (Hindwood 1940); two, Dec. 1956; single, 10 Dec. 1959; single, Feb. 1960; fewer than five, Nov. 1962; several, Sept. 1963 (McKean & Hindwood 1965); five, 28 Nov. 1971 (NSW Bird Rep. 1971); singles, 15–22 Nov. 1986 (NSW Bird Rep. 1986).

**Macquarie I.** Three unconfirmed records: singles, 20 Nov. 1949, 17 Nov. 1960, 30 Dec. 1975 (Gwynn 1953; Warham 1969; N. Brothers; G. Copson).

**Snares I.** Single snipe reported, 12–14 Nov. 1985 (CSN 34).

**Changes in abundance** Declines recorded Tas., coastal and n. NSW, and Vic. in early 1900s, 1930s, 1960s and 1970s (Littler 1910; Frith *et al.* 1977; Naarding 1981, 1983; Humphreys 1986). After cessation of hunting in Vic. and Tas., slight, but not significant, increase recorded (Naarding 1986).

**Status** In Aust., of special concern (Garnett 1993); secure in Japan (Fujimaki & Skira 1984). Listed under JAMBA. In Japan and Aust., modification of habitat and, formerly, hunting thought to affect populations. **Populations** Total breeding population c. 37,000 birds (Naarding 1986) (for densities and populations in Japan, see Frith 1970, Fujimaki & Skira 1984 and Naarding 1986). In Aust., estimated 15,000 in Vic., Tas. and SA (Naarding 1983). Density at Seaford Swamp,

Vic., Feb. 1983, 50/ha (Naarding 1983); on n. migration, 32 recorded in 1 ha in Atherton Shire (Bravery 1970).

Formerly hunted in all e. States; hunting banned in NSW since 1976; in Vic. since 1984; in Tas. since 1983; also banned Qld; formerly up to 10,000 killed annually, with c. 6000 in Vic. and 1000 in Tas. (Naarding 1981, 1983, 1986). No hunting in Japan since 1974 (Naarding 1983); formerly c. 2000 shot each year (Frith 1970; Naarding 1981). May be disturbed by cattle (Naarding 1983).

**MOVEMENTS** Migratory, moving to Aust. for boreal winter; routes of migration outside Aust. poorly known (Frith *et al.* 1977; Naarding 1985; AWB 1993). Few records between Japan and Aust. (Austin & Kuroda 1953); records suggest birds fly directly between Japan and e. Aust., stopping at few staging areas. Weather can affect timing of migration and use of staging areas (Naarding 1982, 1983). Said to move at night (Belcher 1914). Timing of departure from breeding grounds and arrival in Aust. suggest probably move from Japan to Aust. in few days (Naarding 1984). Unknown if stage outside Aust. on s. migration.

**Departure** Leave breeding areas, Aug. to Nov.: Primorye, end Aug. to early Oct. (Elsukov & Labzyuk 1991); Kunashir I., mid-Sept. (Dement'ev & Gladkov 1951); Hokkaido, mainly mid-Aug. (Wolfe 1954), mid-July (Frith 1970); at L. Utonai, Hokkaido, most left early Aug. to late Nov. (Ohata 1989); on Honshu, leave mid-Sept. (Frith 1970) to late Sept. (Wolfe 1954). Recorded New Guinea, late July to Aug.–Oct. on s. migration and observed feeding at Moitaka; probably cross highlands (Frith *et al.* 1977; Heron 1978; Naarding 1981; Coates 1985; Hicks 1990; Lane).

**Aust.** Arrive n. Aust., July to Sept.–Oct.; arrive SE, late Aug. to Dec.–Jan. Arrive ne. coastal Qld as early as late July, but mostly Sept. (Lane); move slowly S along coast and in

near-coastal regions (Frith *et al.* 1977; Storr 1984): pass Innisfail mainly Sept. and Oct. (1957–74) (Gill 1970; Frith *et al.* 1977); arrive Tinaroo Dam, early Aug. (Bravery 1964); pass Maryborough, early Aug. to late Sept.–Oct. (Frith *et al.* 1977); near Rockhampton and Qld–NSW border may move S and W along inland rivers (Frith *et al.* 1977). In NSW, pass Richmond R. district, early Aug. and Sept. (Frith *et al.* 1977), though single record, late July, near Tweed R. (Keast 1944); move through inland NSW, Oct. and Nov. (Lane). Arrive Vic. as early as late Aug., maximum numbers not till Dec.–Jan. (Naarding 1983; Lane). Arrive Tas., from early Aug., mostly end Sept. to early Oct.; date of arrival varies, possibly with conditions on mainland. During main arrival, flocks of up to 200 seen, but disperse within days across State (Naarding 1981, 1982, 1983). Arrive SA, Oct. and early Nov. (Naarding 1983). Irregular visitor to Lord Howe and Norfolk Is; rare straggler to NZ and possible vagrant Macquarie I. Said to arrive in s. Vic. with full moon nearest end Aug. (Belcher 1914); also said to arrive and depart Tas. on moonlit night (Littler 1910).

**Non-breeding** SE. Aust., mostly S of Richmond R., NSW; few, if any, remain in ne. Aust. through summer (Lane). All NZ records during austral summer. Single extralimital record PNG (Hicks 1990). Dispersive in Aust.; probably in response to rainfall and availability of food. Such movements probably explain far inland records (e.g. near Birdsville; Frith *et al.* 1977). Some dispersion seasonal. In Tas., birds move from drying wetlands on nw. coast, Oct.–Nov., to wet areas in high country or in SW; when these areas become unsuitable birds leave Tas. (Naarding 1982). In Vic., move from high country when upstream habitat dries (before Dec.) to more permanent wetlands nearer coast (Naarding 1983) where concentrations of up to 100 occur in some drying swamps (Vic. Atlas). In NSW, leave high country and feed at suitable feeding grounds on coastal plains, Feb. and Mar. (Frith *et al.* 1977). Regular counts in s. Aust. indicate much mobility (Naarding 1983, 1984). In NZ, birds observed at one locality for some time. Said to flock before migration in SA and Qld (Bravery 1964, 1970; Cox 1978).

**Return Aust.** Most leave SE by end Feb. (Frith *et al.* 1977; Naarding 1983); move N along coast of NSW and Qld. N. migration may be faster than s. migration and birds often in flocks (Storr 1984). In Tas., most have left by early Mar. and all by late Mar. (Naarding 1982); gain weight before leaving, with estimated flight-range of c. 1000 km non-stop (i.e. to coastal NSW). Congregate on coastal wetlands of NSW, end Feb.–Mar., where gain weight; estimated flight-range, c. 4600 km non-stop, which suggests that birds also feed in n. Qld or PNG (Frith *et al.* 1977; Naarding 1982; Lane & Forest 1984). Move N through Qld, Feb.–Apr.; most leave by mid-Apr. (Bravery 1964; Gill 1970; Frith *et al.* 1977), though record near Innisfail, 25 May 1966 (Frith *et al.* 1977). No records Torres Str. (Draffan *et al.* 1983).

Pass PNG, Apr. and early May (Coates 1985), possibly crossing highlands (see Lane); usually leave Port Moresby, early May (Hicks 1990); specimen collected ne. PNG, Jan. 'when migrating' (Vivian 1904). Few records from sw. Pacific Ocean (Frith *et al.* 1977; Naarding 1982). In Japan, first arrive early Apr.; date of first records between 1966 and 1982 varied by only 12 days (Naarding 1984); in n. Honshu, most by mid-Apr.; Hokkaido, mid-Apr. (Wolfe 1954; Naarding 1985). Arrive Primorye, mid-Apr. to mid-May (Elsukov & Labzyuk 1991).

**Breeding** Not known if regularly winter in Aust. (Naarding 1982); records during this period mainly from e. Qld, NSW, e. Vic. and Tas. including flock of 14 on King I.,

Bass Str. (Naarding 1981). Single record PNG (Hicks 1990).

**Banding** International recoveries: of five banded in Japan, June–Aug., three recovered s. Vic. in following Nov.; one recovered near Melbourne and one recovered Atherton Tableland, Qld, 2 years after banding. One banded Aust., Dec. 1967, recovered Japan, June 1968 (Driscoll 1993). Two records of movement interstate and only one other record of movement >12 km. Of 14 recaptures ≤12 km from banding site, ten at same site in same season, four at same site 1 or 2 years later (Driscoll 1993).

32S151E	12	1+	U	5	8397	354	ABBS
33S151E	12	1+	U	5	8397	354	ABBS
32S151E	12	1+	U	5	8364	354	ABBS
33S151E	12	1+	U	5	8364	354	ABBS
33S150E	02	1+	U	10	914	231	ABBS
33S150E	01	1+	U	23	793	227	ABBS
33S150E	03	1+	U	22	646	250	ABBS
42N144E	06	1+	U	30	9152	180	BMRC
43N145E	08	2+	U	2	9061	179	BMRC
38N141E	08	2+	U	3	8472	178	BMRC
38N141E	08	2+	U	2	8464	176	BMRC
39N141E	07	U	U	25	6334	175	BMRC

**FOOD** Omnivorous; seeds and other plant material, earthworms, spiders and insects; occasionally molluscs, isopods and centipedes. **Behaviour** Crepuscular. Probe soft ground with sensitive, flexible tip of bill. Action compared to repetitive movements of sewing-machine. Diet varies between localities and months. Fibrous plant material considered to be ingested incidentally (Frith *et al.* 1977).

**Adult Cooma–Jindabyne, NSW** (359 stomachs; Frith *et al.* 1977): **Plants** 43.7% vol.: plant fibres 100% freq.; Poaceae: sds 7.2; Juncaceae: sds 25.6 (incl. *Juncus*); Cyperaceae (incl. *Carex*, *Cyperus*, *Eleocharis*, *Scirpus*, *Fimbristylis*): 41.5; Polygonaceae (incl. *Polygonum*, *Rumex*): sds 3.3; Boraginaceae (incl. *Myosotis*): sds 11.7; Fabaceae: sds 10.6; Ranunculaceae (incl. *Ranunculus*): sds 23.1; other seeds (incl. *Portulaca*, *Hypericum*, *Branchycome*, *Isotoma*, *Cotula*, *Solanum*, *Papaver*, *Foeniculum*, *Conium*, *Elatine*, *Epacris*, *Plantago*, *Nymphoides*, indet. Caryophyllaceae and Onagraceae) 22.8. **Animals** 56.3% vol.: Oligochaetes earthworms 96.9% freq.; Aranea (incl. Araneida) spiders 36.2; Insects 100: Diptera (larv. and some pupae) 54.6: Tipulidae 33.1; other Diptera (incl. Stratiomyidae, Muscidae, Culicidae, Tabanidae) 30.6; Lepidoptera 13.1; Coleoptera 35.9: Carabidae 15.0; Hydrophilidae 3.3; Scarabaeidae (incl. *Onthophagus*) 2.5; Dytiscidae 3.1; other (incl. Elateridae, Tenebrionidae, Curculionidae, Heteroceridae; Staphylinidae) 15.0; Odonata (incl. nymphal Anisoptera) 5.0; other insects (incl. nymphal Ephemeroptera, Plecoptera, Orthoptera: Acrididae, Tettigoniidae, Gryllidae, Gryllacrididae, Hymenoptera: Formicidae) 29.0; other animals (molluscs, isopods and centipedes) 1.7.

Near **Raymond Terrace, NSW** (135 stomachs; Frith *et al.* 1977): **Plants** 60.3% vol.: Poaceae: sds 48.1% freq.; Juncaceae (incl. *Juncus*): sds 5.9; Cyperaceae (incl. *Carex*, *Cyperus*, *Eleocharis*, *Scirpus*, *Fimbristylis*): sds 27.4; Polygonaceae (incl. *Rumex*, *Polygonum*): sds 23.7; Fabaceae (mainly *Trifolium*): sds 9.6; other seeds (incl. *Portulaca*, *Hypericum*, *Branchycome*, *Isotoma*, *Cotula*, *Solanum*, *Papaver*, *Foeniculum*, *Conium*, *Elatine*, *Epacris*, *Plantago*, *Nymphoides*, indet. Caryophyllaceae and Onagraceae) 20.0. **Animals** 39.7% vol.: Oligochaetes earthworms 77.8% freq.; Aranea (incl. Araneida) spiders 13.3; Insects 100: Diptera (incl. Stratiomyidae, Muscidae, Culicidae, Tabanidae) 16.3; Coleoptera 79.3: Carabidae 13.3;

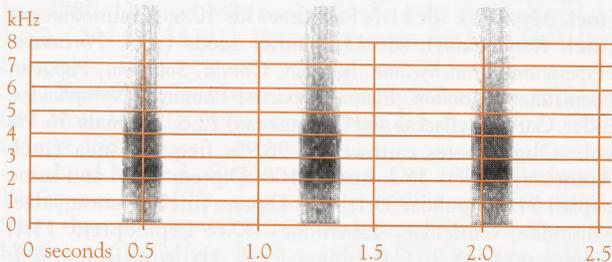
Hydrophilidae 34.8; Dytiscidae 21.5; other (incl. Elatridae, Tenebrionidae, Curculionidae, Heteroceridae; Staphylinidae) 27.4; Dermaptera 14.8; Odonata (incl. nymphal Anisoptera) 3.7; other insects (incl. nymphal Ephemeroptera, Plecoptera, Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllacrididae, Hymenoptera: Formicidae) 24.4.

**Other records** Plants: Poaceae: grass fibre (Wolfe 1954); *Panicum* sds (FAB); Oligochaetes worms (Hindwood & Hoskin 1954); earthworms (Mathews 1909); Insects (Wolfe 1954): aquatic insects (Gould); Orthoptera: Acrididae (FAB); Coleoptera (Sutton 1927): water beetles (Mathews 1909); Carabidae (Wolfe 1954); Lepidoptera: caterpillar (Sutton 1927; FAB). Sand (Gould; Wolfe 1954).

**Young** Plant fibres and sand (Wolfe 1954).

**VOICE** Only call normally given in HANZAB region a hoarse rasping Alarm Call. Usually heard before being seen. When breeding, give many more calls; also distinctive aerial displays, using modified outer tail-feathers to produce a non-vocal 'drumming' or 'bleating'. For descriptions of calls and drumming when breeding, see Tuck (1972), Naarding (1984, 1985), Nakamura & Shigemori (1990 [including sonagrams]) and Carr-Lewty (1943).

**Adult ALARM CALL** (Naarding 1981): Sharp, repeated *kek*, *krak*, *kark*, *krark* or *squaack*; probably best described as a central vowel varying between 'e' as in 'bet', and 'a' as in 'bark', preceded and followed by the same 'k' or 'kr' sound; usually given on take-off and in flight; often first sign of presence of Snipe. Naarding (1982), found 94% of birds (n=599) call when flushed. Also heard at night, as birds approach feeding area. Call in sonagram A, a harsh and complex atonal sound, with most energy concentrated round two peaks of amplitude, varying slightly between calls, but usually at c. 2.3 and 4 kHz (P.J. Fullagar).



A R. Buckingham; Ballarat, Vic., Nov. 1980; P36

**PLUMAGES** Prepared by D.I. Rogers. Early stages of juvenile body-moult poorly known: on arrival in Aust., retain some body-feathers and all remiges and rectrices, which are replaced in complete moult by first austral autumn (then indistinguishable from adults). Adults begin and complete pre-basic moult in Aust.; a pre-alternate moult occurs between departure from s. Aust. and breeding areas but details of timing not known.

**Adult** (Second-basic and subsequent plumages.) **Head and neck** Forehead and crown, black-brown (119), bisected by light-brown (123A) median crown-stripe, which fades to cream (92) with wear. In fresh plumage, black sides of crown sometimes narrowly flecked brown (223B) (tips of outer webs of feathers at side of crown). Broad pale supercilium, at least twice width of eye-stripe even at base of bill, runs from fore-

head to hindcrown. Face, buff (124, c223D), fading to cream (c92) or even off-white with wear and grading to white on chin. Small dark-brown (121) shaft-streaks on ear-coverts and malar region form faint streaking, which is coarser towards rear. Narrow, dark to blackish-brown (121–119) eye-stripe from base of bill (where upper margin is level with nostrils and lower margin about level with gape) to eye, gradually narrowing towards eye and becoming fainter beneath eye; in many, mark continues behind eye, splitting into two varying parallel stripes (always short and fainter than stripe on lores); upper stripe meets rear margin of eye and lower meets small dark patch below eyelid; stripes separated by mottled brown plumage (as hindneck) so contrast little. A dark-brown (121) stripe runs across lower face from malar area to ear-coverts. Hindneck, light brown (c39) coarsely streaked by black-brown (119) shaft-streaks and partly concealed dark-brown (119A) bases to feathers. Throat and foreneck similar but narrower dark-brown (119A–119B) shaft-streaks contribute to slightly paler appearance, especially when plumage is worn and ground-colour fades to buff (124). **Upperparts** Mantle, back and inner scapulars, mostly black-brown (119), appearing slightly paler when plumage is worn and dark-brown (119A) bases to feathers slightly exposed. At rest, striking V on mantle, formed by broad buff (223D–c124) outer edges and narrow buff tips to outer (longest) feathers of mantle and upper back; V fades to cream (c92) or even off-white when worn. A less distinct buff V on scapulars formed by broad buff (223D–c124) fringes to outer scapulars, which are often broken on each feather by narrow black-brown (119) shaft-streaks. When plumage ruffled, V on mantle and particularly on scapulars become less distinct and area can appear to be flecked with buff, especially in some that also have narrow light-brown (39–223D) tips to feathers of centre of mantle and inner scapulars. Subscapulars and longest scapulars, black-brown (119), grading to dark brown (119A) at base (larger area of dark brown on subscapulars) with broad buff (223D–c124) fringes and strong brown (c123) convex barring on basal two-thirds of each feather; buff fringes often broken by black-brown (119) shaft-streaks and fade to cream or even white when worn. Rump and lower back usually concealed by scapulars and tertials; brown (c123, slightly more rufous when fresh and greyer when worn) with fine chevron-shaped dark-brown (121) barring. Uppertail-coverts similar but with white tips. **Underparts** Upper breast, light brown (c39) or buff (c124) (especially when worn), mottled darker by partly exposed dark-brown (119A–119B) bases to feathers. Lower breast varies: like upper breast, or white with varying, crooked dark-brown (119A–119B) barring (sometimes faint), or, in some, white. Demarcation between buffish ground-colour of upper breast and clean white of belly or lower breast of some, usually sharp but varies with degree of markings on lower breast. Flanks, thighs, vent and undertail-coverts, pale brown (c39) to white, with strong dark-brown (121–119A) barring (sometimes chevron-shaped); ground-colour usually palest on flanks and thighs. Axillaries, neatly barred blackish brown (c119–c121) and white. **Tail** T1–t4, broad and straight; basal two-thirds always concealed, black-brown (119) with varying faint brown (c119B) barring and concealed pale rufous (c139) patches on inner webs of t2–t4; exposed distal third, rufous (c36), grading to pale rufous (c139) on t4, with narrow (c. 2 mm) convex black-brown (119) subterminal bands and white tips 1–4 mm wide; traces of black-brown flecking on rufous areas can form second narrow dark bar, especially on t3 and t4. T5 to t8 or t9, narrower and seldom exposed except during display-flights on breeding

grounds (see Structure); irregularly barred dark brown (119–119A) and white, with white tips and dark subterminal bars continuous with corresponding markings on t4, but becoming broader on outer feathers; other pale bars vary, though always whiter and more distinct towards outer feathers and tip; towards t5 and bases, pale bars grade to pale brown (c223D). **Upperwing** Primaries and secondaries, dark brown (121) to blackish brown (119); secondaries and inner 5–7 primaries have narrow (<1 mm wide) white tips when fresh; p1–p3 can have faint buff (c124) freckling; p10 has pale-brown (c119D) or paler rachis, grading to whitish distal third (at times entire shaft whitish). Alula, primary coverts and most greater secondary coverts similar, but white tips at least 1 mm wide and seldom lost with wear; inner greater secondary coverts have buff (39–124) blotches on outer edges that broaden to form bold buff (39–124) and dark-brown barring across innermost feathers. Marginal coverts, dark brown (c121) to blackish brown (119), narrowly scaled by light-brown (c119C) outer edges. Median and lesser coverts form contrasting innerwing panel of mottled brown and buff; feathers, dark brown (119A–121) with broad and irregular light-brown (39) central bar and broad buff (124) tips, which fade to cream (c92) when worn and are often divided by dark-brown (121) shaft-streaks (Fig. 1). Tertiary coverts and most tertials, boldly barred black-brown (119) and cinnamon-brown (39) to buff (124); bars shaped irregularly and vary much between individuals. Outer tertials have grey-brown (greyish 119C), not buff, barring on inner webs; outermost (s11) tertial, mostly dark brown with indistinct grey-brown (greyish 119C) barring or mottling. **Underwing** Primaries and secondaries, glossy brownish grey (c79–c83) with narrow white tips when fresh (as upperwing). Greater secondary and primary coverts, median secondary coverts and subhumeral similar but with bold white bars on distal half, each about half the width of the dark bars. Other coverts, evenly barred black-brown (119) and white.

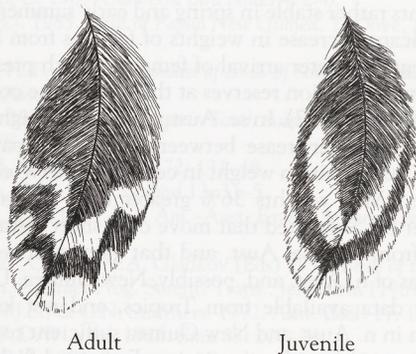


Figure 1 Median secondary coverts

**Juvenile** No skins in fresh plumage available; following based on photographs of juvenile in hand (Y. Fujimaki) and remnant juvenile plumage on immature skins. Differences from adults: **Head and neck** Face, especially at base of bill, rear of supercilium and ear-coverts, has slight cinnamon (c139) tinge; probably because plumage uniformly fresh rather than real difference in colour. Streaking of throat and foreneck generally paler (c119B) and looks finer because feathers slightly smaller. **Upperparts** Barring of lower back and upper rump slightly greyer (c83) and finer. Pale fringes of scapulars and feathers of mantle perhaps paler buff. General appearance of upperparts probably similar to first immatures (q.v.) but no

details available. **Underparts** Barring on lower breast generally finer and more chevron-shaped. **Tail** White tips of t1–t4 have slight cinnamon tinge (at least when fresh), especially on central feathers. **Upperwing** White tips of primaries and secondaries broader (c. 2 mm wide) and more clean-cut, extending out to tip of p10 when plumage fresh. Innerwing-panel (median and lesser secondary coverts) generally paler, with distinct buff scaling rather than fine buff mottling; feathers have broader buff (124–92) fringes (not appearing as divided buff spots at tip of each feather); submarginal lines narrower, slightly paler (121), and convex (unlike horizontal or chevron-shaped submarginal lines of adults); central wedge of these coverts, brown (119B) bordered by darker-brown (c121) line (Fig. 1). Tertiary coverts similar to median coverts, with broader submarginal lines and smaller area of rufous-brown; lack barring of adult (Fig. 1). **Underwing** As adult except white tips to primaries broader and cleaner.

**Immatures** (Probably first basic, though moult sequences of first-year birds not well known.) Very similar to adults; distinguished in first austral spring and early summer by retained juvenile plumage; by autumn, cannot be distinguished except possibly by slightly fresher primaries. **Head and neck** During spring, rather bleached retained juvenile plumage can make face and hindneck look slightly paler than adult. Rather finely streaked juvenile feathers may be retained on lower throat and foreneck. **Upperparts** As adult; all juvenile feathers of rump can be replaced by Nov. **Underparts** White area of belly larger than that of adults, extending farther onto flanks and lower breast. As with adults, general aspect of breast varies individually and with posture, but retained juvenile plumage usually makes cut-off with white belly look less sharply defined and less strongly barred than in adult. **Tail** Juvenile tail retained for some time, but by Nov. white tips of t1–t4 often bleached and without cinnamon tinge. **Upperwing** Juvenile primaries and secondaries (except p9–p10) retain white tips until moulted. Some juvenile median and lesser secondary coverts can be retained as late as Jan. **Underwing** As adult, except for white tips to retained juvenile primaries and secondaries.

**Aberrant plumages** Two partial albinos have been collected in Vic. (MV); one of these in active pre-basic moult, replacing wholly white plumage with muted and pale version of adult plumage.

**BARE PARTS** From photos (Pringle 1987; Brazil 1994; NZRD; unpubl.: H.M. Gibbs, VWSG, Y. Fujimaki).

**Adult, Juvenile** Bill mostly pale brown (c219D) to olive-grey (85–42) or olive (c150), grading to olive-yellow (52) on mandibular rami and base of upper mandible; distal third and narrow strip along culmen, blackish (82–c119) to dark brown. Basal two-thirds of bill may vary seasonally; adults at breeding grounds (photos) show pinkish-brown (c221D) or dirty-pink (4) ground-colour, with orange-pink (6) tinge to mandibular rami. Iris, black-brown (119). Legs and feet, olive-grey (85–43) to olive (c150–46); tend to be most grey on toe-joints, most olive on tarsus. Colour of legs may vary seasonally; the few photographs available from breeding grounds show strong olive-yellow (52) tinge to legs. Claws, blackish (82–84).

## MOULTS

**Adult post-breeding** (Pre-basic moults from second austral summer). Complete; unique among migratory *Gallinago* in doing virtually all moult (including all remiges) in non-breeding areas. Sequences described by Frith *et al.* (1977); primaries

moult outwards and quickly, usually growing four feathers on each wing concurrently during early stages of moult, with some growing up to 5–6 at one time. In samples, 239 in active moult and only five birds had interrupted (assumed to be suspended) moult of primaries (Frith *et al.* 1977); interrupted moult not a regular part of the sequence of moult, unlike Swinhoe's and Pin-tailed Snipes. Primary-moult usually begins in Sept., soon after arrival in Aust., and most (perhaps all) have completed moult by mid-Jan. (when begin to gain weight before migration) (Frith *et al.* 1977; Lane & Forest 1984). Timing not clear because first-year birds difficult to separate from older birds, particularly in later stages of moult; suggestion that females moult later than males (Frith *et al.* 1977) accordingly unconfirmed. Concurrent growth of many primaries suggests that duration of individual moult may be less than the 4–5 months in which active moult of primaries observed in population. Moult of secondaries (excluding tertials), centripetal; waves begin at s1 and s10, usually at about the same time as moult of primaries begins; most secondaries moult when PMS exceeds c. 25, when s3 to s5–s7 are shed almost simultaneously. Moult of tertials, irregular, usually starting with s12–s13 and beginning before moult of secondaries. Tail irregular; sequence not fully known but moult occurs late in moult of primaries and appears to be more gradual than in other species of *Gallinago*. Moult of body occurs Sept.–Feb., most intensely from Nov. to Jan. **Adult pre-breeding** Partial; freshness of plumage of adults photographed at nest suggests that a body-moult must occur. Little is known of extent and timing of this moult; does not occur in s. Aust., so presumably undertaken while staging on n. migration or on arrival at breeding grounds. **Post-juvenile** (First pre-basic?). Sequences of moult in first year not fully understood. All birds complete a moult (including remiges) in first austral summer, with primaries beginning Oct. or Nov. (later than in adults). Moult complete by mid-Jan. to Feb., but problems in ageing birds after Dec. make it difficult to establish duration. Some moult of body-feathers occurs before arrival in Aust. (for areas of retained juvenile feathering, see Plumages). Not known if this part of protracted and complete post-juvenile moult; there may be a restricted post-juvenile (and even first pre-breeding) moult soon after fledging, with the first moult of primaries being second pre-basic (a sequence described for *G. gallinago*; Tuck 1972).

**MEASUREMENTS** (1) Aust., adult, skins (ANWC, HLW, MV). (2–3) NSW, ages combined; T9 = length of outer rectrix from point of insertion to tip (Frith *et al.* 1977): (2) Skins; (3) Freshly dead.

	MALES	FEMALES	
WING	(1) 157.4 (3.17; 154–163; 9) (2) 155.6 (4.58; 146–168; 115) (3) 161.7 (6.02; 137–175; 245)	161.5 (3.96; 152–169; 14) 157.3 (3.93; 150–165; 103) 162.6 (5.64; 142–178; 231)	** ** ns
TAIL	(1) 66.1 (3.04; 62–71; 10) (2) 65.2 (2.86; 60–72; 115)	64.5 (3.11; 60–70; 15) 64.4 (3.00; 58–72; 103)	ns **
T9	(2) 77.0 (4.92; 59–70; 71)	80.0 (5.78; 54–80; 58)	**
BILL	(1) 67.7 (2.04; 65.3–70.9; 10) (2) 67.7 (2.71; 62.3–75.5; 115) (3) 69.0 (3.85; 63.0–80.0; 245)	70.7 (2.78; 66.9–75.6; 14) 70.8 (2.52; 64.4–79.0; 03) 72.8 (2.94; 61.0–79.0; 231)	* ** **
TARSUS	(2) 34.6 (1.32; 32.0–37.2; 115) (3) 36.6 (1.19; 33.0–39.0; 245)	35.5 (1.31; 32.4–38.0; 103) 37.9 (1.43; 30.0–41.0; 231)	** **
TOE C	(1) 39.5 (1.46; 37.0–40.9; 6)	40.0, 41.2	

(4) Vic., live birds, ages combined (Lane & Forest 1984).

## UNSEXED

THL (5) 103.9 (3.60; 64)

**WEIGHTS** (1) Cooma–Jindabyne highlands, s. NSW, age not known (Frith *et al.* 1977). (2) Hunter R., central n. NSW; age not known (Frith *et al.* 1977). Data from rather coarsely scaled graph and only accurate to c. 0.5 mm.

	MALES	FEMALES	
Sept.	(1) 145.5 (24.5; 131–190; 52)	161.8 (20.0; 143–184; 33)	**
Oct.	(1) 145.1 (20.0; 129–170; 31) (2) 143.9 (16.1; 137–163; 15)	153.5 (24.5; 120–182; 48) 149.6 (20.4; 130–166; 12)	** ns
Nov.	(1) 144.5 (22.4; 129–182; 36) (2) 148.6 (20.4; 138–161; 22)	158.8 (18.4; 143–178; 41) 160.2 (24.3; 149–175; 16)	** **
Dec.	(1) 145.5 (16.3; 130–159; 33) (2) 144.7 (22.4; 116–160; 14)	160.4 (11.4; 145–170; 25) 155.9 (18.0; 139–166; 16)	** **
Jan.	(1) 148.0 (22.4; 116–160; 14)	159.2 (18.6; 134–184; 30)	**
Feb.	(1) 150.2 (30.6; 142–178; 7) (2) 160.0 (34.9; 139–190; 5)	164.7 (18.6; 154–180; 7) 168.2 (22.7; 158–190; 8)	** ns
Mar.	(2) 232.4 (38.8; 202–274; 12)	226.5 (65.3; 178–277; 12)	ns

(3) Vic. (two sites near Melbourne), age not known (Lane & Forest 1984). A few more weights in Milledge (1975), Lane (1978) and Mees (1982); no substantial data available from s. migration or breeding grounds.

## UNSEXED

Sept.–Nov.	(3) 157.1 (8.71; 144–176; 14)
29 Dec.–9 Jan.	(3) 162.7 (7.71; 146–173; 9)
17 Jan.	(3) 170.8 (13.15; 151–197; 9)
29–30 Jan.	(3) 169.9 (13.04; 147–203; 23)
17–19 Feb.	(3) 169.7 (10.92; 152–193; 40)

Weights rather stable in spring and early summer, except for a significant decrease in weights of females from Sept. to Oct.; attributed to later arrival of females, which presumably retained some migration reserves at the start of the collection period (Frith *et al.* 1977). In se. Aust., gain little weight before migration; average increase between Jan. and departure in Feb. only c. 20 g. Gain in weight in central-n. NSW considerably greater (Mar. weights 36% greater than any available from farther S). Suggested that move only short distances on migration from from se. Aust. and that gain most weight in staging areas of n. Aust. and, possibly, New Guinea. Unfortunately, few data available from Tropics, and not known if weight gain in n. Aust. and New Guinea sufficient to migrate to breeding grounds without stopping. Estimated flight-range from central n. NSW at time of departure in Mar. (see above), 4900 km (Lane & Forest 1984).

**STRUCTURE** Wing, pointed, long, and rather broad for a wader. Eleven primaries; p10 longest, p9 0–3 mm shorter, p8 5–8, p7 13–19, p6 22–27, p5 32–37, p4 41–45, p3 49–53, p2 58–61, p1 68–69; p11 very narrow, only c. 1 cm long, concealed by primary coverts. No emarginations. Fourteen secondaries, including four tertials; tips of longest tertials about level with tip of p8 on folded wing, but may conceal all primaries, especially in late stages of moult. Tail, fan-shaped but usually held tightly closed, then appearing narrow and rather pointed; usually projects 2–4 cm beyond primaries when wing folded. Eighteen rectrices, with t5–t8 c. 50% width of t1–t4

and t9 narrower still; t1 c. 7–20 mm longer than t9. Vibration of splayed outer rectrices in display-flight causes distinctive pulsating hum (see Voice). Bill, straight, slender and very long (about twice length of head); upper mandible slightly bulbous at tip and projects 3–4 mm beyond tip of lower mandible; distal third of bill mostly pliable (though hard at extreme tip); can be lifted and curved upwards without opening rest of bill; base of bill slightly laterally compressed with small slit-like nostrils set in shallow nasal groove running two-thirds length of bill. Eyes set far back on skull compared to other waders. Tarsus fairly short and slightly laterally compressed; scutellate in front and behind. Outer toe 83% length of middle, inner 73%, hind 35%. Claws, rather long, narrow and curved.

**RECOGNITION** Plumages similar to those of other *Gallinago* snipe in our region; in the hand, Latham's can be identified reliably by larger size (especially longer wings and tail) and structure of tail. See Recognition of Pin-tailed Snipe for full discussion.

**GEOGRAPHICAL VARIATION** None.

#### REFERENCES

- Amerson, A.B. 1969. *Atoll Res. Bull.* 127: 1–348.  
 AWB. 1993. *A Status Overview of the East Asian–Australasian Flyway*. Asian Wetland Bureau. Internal Rep. 2.  
 Austin, O.L., & N. Kuroda. 1953. *Bull. Mus. Comp. Zool.* 109: 277–612.  
 Baker, D.G., et al. 1986. *Notornis* 33: 149–50.  
 Belcher, C.F. 1914. *Birds of the District of Geelong*. Griffiths, Geelong.  
 Brazil, M.A. 1994. *Dutch Birding* 16: 45–54.  
 Brathwaite, D.H. 1955. *Notornis* 6: 145–50.  
 Bravery, J.A. 1964. *Emu* 64: 61–4.  
 — 1970. *Emu* 70: 49–63.  
 Bywater, J., & J.L. McKean. 1987. *Aust. Bird Watcher* 12: 65.  
 Carr-Lewty, R.A. 1943. *Br. Birds* 36: 230–4.  
 Chapman, G. 1969. *Canberra Bird Notes* 4: 2–6.  
 Coates, B.J. 1985. *Birds of Papua New Guinea*. 1. Dove, Alderley, Qld.  
 Condon, H.T. 1969. *A Handlist of Birds of South Australia*. S. Aust. Orn. Assoc., Adelaide.  
 Cox, J.B. 1978. *Japanese Snipe in South Australia*. Unpubl. Rep. SA NPWS.  
 Crawford, D.N. 1972. *Emu* 72: 131–48.  
 Czechura, G.V. 1983. *Sunbird* 13: 31–5.  
 Deignan, H.G. 1964. *Rec. Am.–Aust. Exped. Arnhem Land* 4: 345–426.  
 Dement'ev, G.P., & N.A. Gladkov (Eds) 1951. *Birds of the Soviet Union*. 3. Israel Prog. Scient. Trans., Jerusalem (1969).  
 Disney, H.J.S., & C.N. Smithers. 1972. *Aust. Zool.* 17: 1–11.  
 Draffan, R.D.W., et al. 1983. *Emu* 83: 207–34.  
 Driscoll, P.V. 1993. *Summary of Banding Data and Literature Review for Five Species of Migratory Bird*. Rep. to ANPWS.  
 Edgar, A.T., et al. 1969. *Notornis* 16: 285–7.  
 Elsuikov, S.V., & V.I. Labzyuk. 1991. *Newsl. Orn. Far East* 16: 1–3.  
 Fielding, P. 1979. *Tasm. Nat.* 56: 7–8.  
 Frith, H.J. 1970. *Tech. Memo. Div. Wildl. Res. CSIRO, Aust.* 6.  
 —, et al. 1977. *Aust. J. Ecol.* 2: 341–68.  
 Fujimaki, Y., & I.J. Skira. 1984. *Emu* 84: 49–51.  
 Garnett, S.T. 1993. *RAOU Rep.* 82.  
 Gill, H.B. 1970. *Emu* 70: 105–16.  
 Gizenko, A.I. 1955. *Birds of the Sakhalin Region*.  
 Glover, B. 1954. *Emu* 54: 51–7.  
 Gwynn, A.M. 1953. *Emu* 53: 150–2.  
 Hermes, N., et al. 1986. *Notornis* 33: 141–9.  
 Heron, S.J. 1978. *PNG Bird Soc. Newsl.* 149–50: 8–15.  
 Hicks, R.K. 1990. *Muruk* 4: 91–104.  
 Hill, G.F. 1913. *Emu* 12: 238–62.  
 Hindwood, K.A. 1940. *Emu* 40: 1–86.  
 —, & E.S. Hoskin. 1954. *Emu* 54: 217–55.  
 Humphreys, J.S. 1986. *Aust. Bird Watcher* 11: 153–66.  
 Hunt, J. 1993. *West. Aust. Bird Notes* 65: 1–2.  
 Keast, J.A. 1944. *Emu* 43: 177–87.  
 Lane, B.A., & A. Jessop. 1985. *National Wader Count, Summer 1985 – Report to Participants*. Unpubl. Rep. RAOU.  
 —, & B.S. Forest. 1984. *Vict. Wader Stud. Grp. Bull.* 8: 2–11.  
 Lane, S.G. 1978. *Corella* 2: 49–51.  
 Legge, R.W. 1932. *Emu* 31: 308.  
 Littler, F.M. 1910. *A Handbook of the Birds of Tasmania and its Dependencies*. Author, Launceston.  
 Longmore, W. 1973. *Birds* 8: 33–5.  
 Mathews, G.M. 1909. *Emu* 9: 53–65.  
 McColl, W.S. 1929. *Emu* 29: 91–100.  
 McGarvie, A.M., & M.T. Templeton. 1974. *Emu* 74: 91–6.  
 McKean, J.L., & K.A. Hindwood. 1965. *Emu* 64: 79–98.  
 Mees, G.F. 1982. *Zool. Verh.* 191: 1–188.  
 Milledge, D.R. 1975. *Aust. Bird Bander* 13: 12–13.  
 Miskelly, C.M., et al. 1985. *Notornis* 32: 327–8.  
 Moore, J.L. 1981. *Notornis* 28: 50–6.  
 Morris, A.K., et al. 1981. *Handlist of Birds in New South Wales*. NSW Field Orn. Club, Sydney.  
 —, et al. 1990. *Aust. Birds* 23: 44–64.  
 Naarding, J.A. 1981. *Tech. Rep. Tas. NPWS Wildl. Div.* 81/2.  
 — 1982. *Tech. Rep. Tas. NPWS Wildl. Div.* 82/1.  
 — 1983. *Tech. Rep. Tas. NPWS Wildl. Div.* 83/1.  
 — 1984. *Tech. Rep. Tas. NPWS Wildl. Div.* 84/1.  
 — 1985. *Tech. Rep. Tas. NPWS Wildl. Div.* 85/2.  
 — 1986. *RAOU Rep.* 24.  
 Nakamura, H., & K. Shigemori. 1990. *J. Yamashina Inst. Orn.* 22: 85–113.  
 Ohata, K. 1989. *Strix* 8: 139–44.  
 Pringle, J.D. 1987. *Shorebirds of Australia*. Angus & Robertson, Sydney.  
 Recher, H.F. 1975. *Emu* 75: 213–25.  
 Schmidt, B.L. 1978. *Aust. Birds* 12: 61–86.  
 Serventy, D.L., & H.M. Whittell. 1976. *Birds of Western Australia*. Univ. West. Aust. Press, Perth.  
 Stidolph, R.H.D. 1927. *Emu* 26: 212–19.  
 Storr, G.M. 1984. *Rec. West. Aust. Mus. Suppl.* 19.  
 Sutton, J. 1927. *S. Aust. Orn.* 9: 5–29.  
 Thomas, D. 1979. *Tasmanian Bird Atlas*. Univ. Tas., Hobart.  
 Tucke, L.M. 1972. *The Snipes: A Study of the Genus Capella*. Canadian Wildl. Ser. Monogr. 5.  
 Vivian, R.A. 1904. *Emu* 4: 52–7.  
 Warham, J. 1969. *Notornis* 16: 190–7.  
 Wolfe, C.L.R. 1954. *Emu* 54: 198–203.  
 Wood, K. 1985. *Aust. Birds* 19: 17–38.  
 Zwarts, L., et al. 1990. *Ardea* 78: 339–64.



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Volume 3, Plate 1

Latham's Snipe *Gallinago hardwickii* (page 29)  
 1 Adult; 2 Juvenile; 3 First immature non-breeding; 4, 5 Adult; 6 Tail

Pin-tailed Snipe *Gallinago stenura* (page 38)  
 7-10 Adult; 11 Tail

Swinhoe's Snipe *Gallinago megala* (page 42)  
 12 Adult; 13 First immature non-breeding; 14, 15 Adult; 16 Tail