

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.
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	pratincoles, coursers, and Egyptian Plover; c. 15 species, widespread in Old World.
Stercorariidae	skuas and jaegers; about seven species, mostly in Arctic and Antarctic regions.
Rhynchopidae	skimmers; three species, pantropical.
Laridae	gulls; c. 47 species, cosmopolitan.
Sternidae	terns; c. 42 species, cosmopolitan.
Alcidae	auks; c. 20 species, Arctic and temperate regions of n. hemisphere.

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

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

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

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

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

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.
Mickey, 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.

Family CHARADRIIDAE plovers and lapwings

Small to medium-sized, mostly terrestrial, waders of open habitats. About 65 species, placed in varying number of genera. Evidently monophyletic by behaviour and structural characters. Distributed worldwide and separable into two distinct sub-families: Charadriinae (plovers) and Vanellinae (lapwings), both of which are represented in HANZAB region and are discussed in more detail below. Most closely related to Recurvirostridae, Haematopodidae and possibly Burhinidae (Sibley & Ahlquist 1990; Christian *et al.* 1992).

Bodies, compact. Size differences between sexes negligible; sometimes males and sometimes females slightly larger. Necks, short and thick; 15 cervical vertebrae. Wings, long and usually pointed but rounded in some lapwings; 11 primaries, p11 minute; 14–19 secondaries. Tails, short to medium-long, square or rounded; 12 feathers. Bill, short, somewhat swollen at tip and narrower centrally; no sensitive nerve-endings at tip and prey located by sight rather than touch. Nostrils, holorrhinal, impervious, slit-like. Head, rounded; forehead steep and broad. Legs, fairly short or medium in length; bare part of tibia short; tarsi, reticulated, rarely with some transverse scutes. Usually three, rather short toes, slightly webbed at base in some plovers; no hind toe in most plovers and in some lapwings; hallux, short and vestigial if retained. No crop. Caeca present. Eyes large. Supraorbital salt-glands, often large; size related to salinity of habitat and influences structure of skull and appearance of head. Plane of *foramen magnum* of occiput nearly horizontal.

Plumages generally boldly patterned in brown, olive-grey, black and white; markings often have cryptic disruptive effect. Bill, bicoloured in some species, especially plovers. Stance erect with head held high. Fast runners for good distances but often proceed in short bursts with halts, especially when feeding. Post-breeding moult complete; primaries outwards; pre-breeding moult varies considerably. Young, precocial, nidifugous and always feed themselves; down of pebbly-pattern type (Fjelds  1977).

See accounts of sub-families (below) for additional details.

REFERENCES

- Christian, P.D., *et al.* 1992. *Aust. J. Zool.* 40: 291–302.
 Fjelds , J. 1977. *Guide to the Young of European Precocial Birds*. Skarv Nature Pubs, Strandg rden, Tisvildeleje.
 Sibley, C.G. & J.E. Ahlquist. 1990. *Phylogeny and Classification of Birds*. Yale Univ. Press, New Haven.

Sub-family CHARADRIINAE plovers

Generally small birds, usually smaller than lapwings (Vanellinae). Apparently a monophyletic assemblage. About 40 species in five (Voous 1973; Strauch 1978; BWP) to 10 genera (Sibley & Ahlquist 1990; Sibley & Monroe 1990; Christian *et al.* 1992), with most species in two genera, *Pluvialis* and *Charadrius*, and varying number of genera composed of only one or a few species (e.g. *Anarhynchus*, *Phegornis*, *Thinornis*, *Elseyornis*). The affinities of *Phegornis* (Diademed Sandpiper-plover of South America) have not been resolved (Sibley & Monroe 1990). Recent studies of allozymes of Aust. plovers and lapwings (Christian *et al.* 1992) indicate that Red-kneed Dotterel *Erythrogonys cinctus* is a lapwing (Vanellinae; q.v.).

We recognize the following genera within the Charadriinae in HANZAB region:

Pluvialis. Two regular non-breeding migrants (*fulva*, *squatarola*), two doubtfully recorded (*dominica*, *apricaria*). We follow Connors *et al.* (1983, 1993) and treat *fulva* and *dominica* as full species.

Charadrius. Four breeding species (*obscurus*, *ruficapillus*, *bicinctus*, *australis*), six non-breeding migrants (*hiaticula*, *dubius*, *mongolus*, *leschenaultii*, *asiaticus*, *veredus*), one accidental (*tricoloris*); one doubtfully recorded (*alexandrinus*). Inland Dotterel *C. australis* is a typical *Charadrius* plover (Maclean 1976; Christian *et al.* 1992 *contra* Jehl 1968); we follow NZCL in placing New Zealand Dotterel in *Charadrius*.

Thinornis. Two endemic species: *novaeseelandiae* and *rubricollis*.

Allozymes of *rubricollis* form a cluster (with *Elseyornis melanops*) well separated from those of typical *Charadrius*; placed in *Thinornis* on basis of similarities in morphology (Christian *et al.* 1992) and behaviour (Phillips 1980).

Elseyornis. Single species *melanops*, endemic to Aust. Allozymes, with those of *Thinornis rubricollis*, well separated from *Charadrius* (Christian *et al.* 1992).

Anarhynchus. Single species *frontalis*, endemic to NZ.

Thus, in HANZAB region, eight breeding species, eight non-breeding migrants, and four accidental or not acceptably recorded.

General features of the sub-family are outlined under Charadriidae. The plumages of *Pluvialis* are spangled in white or gold and black above, black below when breeding, and never with white band across nape; plumages of *Charadrius* and other genera in general plain brownish above and white below, boldly marked with black on face and head, at least when breeding;

usually with one or two black or chestnut bands across breast and often with white band across nape. Two moults per cycle: complete post-breeding moult, primaries outwards; and partial pre-breeding moult, which often brings in much brighter breeding plumage; supplemental plumage occurs in at least one species (Eurasian Golden Plover *Pluvialis apricaria*). Down of pebbled pattern (Jehl 1968; Fjeldså 1977, 1988; BWP). Juvenile plumage duller than adults in most species, with pale dorsal scalloping. Adult plumage attained at 1–2 years. Most probably first breed at 1–2 years, maturity perhaps delayed further in some migratory species (e.g. Gréy Plover *Pluvialis squatarola*).

Inhabit open places; when not breeding, many are typically birds of ocean beaches, coastal mudflats and estuaries; others use rivers and freshwater wetlands, often ephemeral; still others characteristic of dry habitats, including gibber plains, grasslands and steppes. Breeding may occur in any of these habitats, or in tundra or high-altitude moorlands. Most species probably migrate to some extent; about 15 species are long-distance transequatorial migrants. Diet consists of terrestrial and coastal invertebrates. When foraging, tend to spread out and feed separately over wide area, rather than feeding in flocks as do many scolopacids. In general, gregarious but less so than many scolopacids. Roost communally. Usually territorial when breeding; some species may defend feeding territories in wintering areas. Various mating systems recorded in different species: monogamy, polyandry (associated with sexual reversals), polygyny and polygamy. While breeding, generally rather aggressive, defending and advertising territories with displays on the ground and in the air, often with butterfly-like flights and song (long melodious trills). Courtship and mating behaviour often complex or stereotyped. Anti-predator strategies, injury-feigning and distraction displays generally elaborate and well developed. Most vocal during breeding season with variety of peeps, trills and mellow or liquid whistles.

Breed seasonally. Nest, a simple scrape on the ground, sparsely lined with plant stems, grasses and other objects; in open, often unvegetated places. Several scrapes may be prepared by male and one then selected by female. Eggs, oval, short oval or even somewhat pyriform; smooth, not glossy; ground-colour, buff, brown or grey, heavily blotched and spotted dark, well camouflaged. Clutch-size, 2–4, often consistently of one size in a species (e.g. two in *C. ruficapillus*). Laying at intervals of 24–60 h. Replacement laying, up to several times. Incubation by both sexes in monogamous species but share varies and is by male alone in Eurasian Dotterel *Eudromias morinellus*, the only plover in which female more brightly coloured than male. Incubation period, 24–31 days. Young hatched in natal down; precocial, nidifugous. Usually tended by both parents but feed themselves from hatching. Fledge in 3 (smaller species) to 5 (larger species) weeks.

REFERENCES

- Christian, P.D., et al. 1992. *Aust. J. Zool.* 40: 225–33.
 Connors, P.G., et al. 1983. *Auk* 100: 607–20.
 — 1993. *Auk* 110: 9–20.
 Fjeldså, J. 1977. *Guide to the Young of European Precocial Birds*. Skarv Nature Publs, Strandgården, Tisvildileje.
 — 1988. *Proc. Int. orn. Congr.* XIX: 1476–85.
 Jehl, J.R. Jr 1968. *Mem. San Diego Soc. nat. Hist.* 3.
 Maclean, G.L. 1976. *Emu* 76: 207–15.
 Phillips, R.E. 1980. *Emu* 80: 177–97.
 Sibley, C.G., & J.E. Ahlquist. 1990. *Phylogeny and Taxonomy of Birds*. Yale Univ. Press, New Haven.
 —, & B.L. Monroe. 1990. *Distribution and Taxonomy of Birds of the World*. Yale Univ. Press, New Haven.
 Strauch, J.G. 1978. *Trans. Zool. Soc. Lond.* 34: 263–345.
 Voous, K.H. 1973. *Ibis* 115: 612–38.

Pluvialis dominica **American Golden Plover**

Charadrius dominicus P.L.S. Müller, 1776, Linne's *Vollst. Natur. Syst. Suppl.*: 116 — Hispaniola, West Indies.

Dominica is after the type-locality, Santo Domingo, as Hispaniola was once called.

OTHER ENGLISH NAMES Golden Plover; Lesser, Pacific or Eastern Golden Plover.

Now that *fulva* and *dominica* are recognized as separate species, **American Golden Plover** has apparently been adopted in British literature (e.g. *Br. Birds*) and is the name used in N. America; we follow it.

MONOTYPIC

Medium-sized plover, almost identical to Pacific Golden Plover *Pluvialis fulva* in size, shape, plumage and jizz; field identification of *fulva* and *dominica* very difficult, see Pacific Golden Plover. Breed in Arctic and subarctic tundra, mainly in uplands, of N. America, from Baffin I., Canada, W to nw. Alaska; winters in S. America in s. Brazil, Uruguay, Paraguay and Argentina, and

occasionally Peru and Chile; straggler to Tierra del Fuego (Johnson 1965; Connors 1983). The distribution of American and Pacific Golden Plovers overlaps in Alaska and there is no evidence that birds interbreed in zone of overlap (Connors 1983).

Aust. No acceptable records. A golden plover that had been banded (US Dept Int. Fish. Wildl. Serv. number 863–

99641) on 24 Aug. 1966 in the Pribilof Is, Alaska, as at least 1 year old, was killed by a hawk on 27 May 1970 at Urunga, mid-n. coast NSW (Wyndham 1977). This was before *fulva* was recognized as a full species and no information was given as to how it was identified when banded or when it was killed, though the record was published as *dominica*. Other sight-records and claims of occurrence are all unacceptable: two, Ballina, NSW, date unknown (G. Holmes); single, French I., Vic., 28 Feb. 1976 (Doughty & Carter 1977); several records, Nowra, NSW, 1976–81; single, Merbein, Vic., 30 Sept. 1987 (Hobbs 1988); single, Comerong I., NSW, 3 Oct. 1989 (Chafer & Brandis 1990). Hayman *et al.* (1986) without evidence state the species probably occurs in Qld. For further discussion of Aust. records, see James (in prep.).

NZ Single record: Karikari Pen., Northland, 27 Jan. 1991; accepted by NZ RBC (Guest 1992). Other claims: two, probable,

Farewell Spit, 19 Nov. 1981 (B.D. Heather); single, Pollen I., Waitemata Harbour, 30 Jan. 1989 (OSNZ Rare Birds Committee).

REFERENCES

- Chafer, C.J., & C. Brandis. 1990. *Aust. Birds* 24: 1–3.
Connors, P.G. 1983. *Auk* 100: 607–20.
Doughty, C., & M.J. Carter. 1977. *Aust. Bird Watcher* 7: 23–4.
Guest, R. 1992. *Notornis* 39: 319–21.
Hayman, P., *et al.* 1986. *Shorebirds*. Croom Helm, Lond.
Hobbs, J. 1988. *NSW Field Orn. Club. Newsl.* 105: 4.
James, D.J. In prep. *Aust. Bird Watcher*.
Johnson, A.W. 1965. *The Birds of Chile and Adjacent Regions or Argentina, Bolivia and Peru*. Platt Establecimientos Graficos S.A., Buenos Aires.
Wyndham, E. 1977. *Emu* 77: 39.