

Order CHARADRIIFORMES

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

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

Thinocoridae	seedsnipes; four species, S. America.
Pedionomidae	Plains-wanderer; monotypic, Aust.
Scolopacidae	sandpipers, snipes and allies; c. 85 species, cosmopolitan.
Rostratulidae	painted snipes; two species, s. America and Old World.
Jacanidae	jacanas; seven species, pantropical.
Chionididae	sheathbills; two species, Antarctica and subantarctic islands.
Burhinidae	thick-knees, stone-curlews; nine species, widespread in Old World and two in Neotropics.
Haematopodidae	oystercatchers; c. 11 species, worldwide in tropics and temperate regions.
Recurvirostridae	avocets and stilts; about seven species, worldwide in tropical and temperate regions.
Ibidiorhynchidae	Ibisbill; monotypic, central Asia.
Charadriidae	plovers and lapwings; c. 60 species, cosmopolitan.
Pluvianellidae	Magellanic Plover; monotypic, S. America.
Dromadidae	Crab Plover; monotypic, Arabian region.
Glareolidae	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. Fjeldsø 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; Fjeldsø 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; Fjeldsø 1976, 1977), osteology (Strauch 1978; Mickevitch & Parenti 1980; Olson & Steadman 1981), DNA–DNA hybridization (Sibley *et al.* 1988, Sibley & Ahlquist 1990) and electrophoresis of tissue proteins (Christian *et al.* 1992). The studies of allozymes, DNA–DNA hybridization and the most recent osteological study of the entire order (Strauch 1978) have agreed in finding two or three well-knit, monophyletic assemblages within the Charadriiformes: scolopacids and allies (Thinocoridae, Pedionomidae, Scolopacidae, Rostratulidae, Jacanidae) and charadriids and allies (Chionididae, Burhinidae, Haematopodidae, Recurvirostridae, Ibidiorhynchidae, Charadriidae, Pluvianellidae, Dromadidae, Glareolidae, Stercorariidae, Rhynchopidae, Laridae, Sternidae, Alcidae); Strauch (1978) treated Alcidae as separate lineage, but skeletons may be so highly modified for foot-propelled diving that they do not reflect relations well (Sibley & Ahlquist 1990); gulls and allies have also been regarded as a separate lineage (Christian *et al.* 1992) or as allied to charadriids (e.g. Sibley & Ahlquist 1990). Further relationships within the Order discussed in introductions to families.

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

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

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

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Family 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, holorhinal, 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.

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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 *Erythronyx 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; Fjeldsø 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. Grey 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.

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Charadrius melanops Vieillot, 1818, *Nouv. Dict. Hist. nat.* 27: 139 — 'Terres Australes' = New South Wales, *apud* Mathews.

This generic name is in honour of J.R. Elsey (1834–58), English surgeon, explorer and naturalist who was in Australia in 1855–56 and in the West Indies in 1857–58. *Melanops* is compounded of the Greek μέλας, μέλαν... (black) and ὤψ (face).

OTHER ENGLISH NAMES Guttersnipe, Sandpiper (in error).

NZ Black-fronted Dotterel.

MONOTYPIC

FIELD IDENTIFICATION Length 16–18 cm; wingspan 33–35 cm; weight 30–35 g. Small slim plover with rather horizontal stance; smaller and slimmer than Red-kneed Dotterel *Erythronyx cinctus* and Double-banded Plover *Charadrius bicinctus*. Wings, long and rather broad; tail, short. Prominent black eye-stripe bordered above by white supercilium, black bar on central forecrown joining black forehead, red eye-ring, Y-shaped black breast-band, and prominent dark scapulars, diagnostic. Sexes similar. No seasonal variation. Juvenile and immatures separable.

Adult Crown, mostly brown, finely streaked darker. Central forecrown, black, forming black bar that meets black forehead; broad black eye-stripe that joins forehead, extends from base of bill to hindneck; bordered above by prominent white supercilium from sides of forehead to nape, encircling crown; supercilium broadens in front of eye but does not connect across upper forehead. Lower hindneck, black. Mantle, back and lower scapulars, buff to light-brown, varying streaked darker, and becoming more variegated when worn; upper scapulars, purplish-

chestnut, forming dark patch. Rump and upper tail-coverts, dark brown with broad rufous fringes. Centre of tail, brownish-black with white tips that become broader towards sides of tail; outermost feathers mostly white. In flight, from above, broad white wing-bar on innerwing formed by tips of greater secondary coverts and bases of secondaries; rest of innerwing, dark-brown, with median coverts mottled white and pale grey-brown and forming pale panel that becomes browner with wear; outerwing, black-brown. Underparts, white except for black Y-shaped breast-band, which continues narrowly up sides of neck to black hindneck; chin and throat, white. Underwing: lining, white, with narrow dark leading-edge; remiges, black-brown. Bill, red with black tip. Orbital ring, bright red. Iris, black-brown. Legs and feet, cream to dull orange or pink. **Juvenile** Forehead and crown, brown mottled buff. Eye-stripe, dark brown, bordered above by buff supercilium extending to nape. Rest of upperparts and all scapulars, light brown, scaled buff and brown; no chestnut fringes to feathers of rump. Tail, as adult but central rectrices have orange-buff to

buff tips. Upperwing, much as adult but with rufous scaling and brown streaking on lesser and inner median secondary coverts; outer median secondary coverts, mostly white tipped rufous; white wing-bar as adult. Underparts, white; gradually develop shadowy breast-band, which becomes more definite as white tips of feathers wear. Bill, brown to grey-black. Orbital ring, absent or narrow and dull pink. Iris, black-brown; Legs, pink-brown. **Immature** Like adult but incomplete, somewhat mottled, breast-band; retained juvenile remiges and rectrices; and traces of retained juvenile plumage on forehead, giving mottled appearance, and on scapulars and median secondary coverts. Bill, duller red with more black on distal half; rest of bare parts like adult but somewhat duller.

Similar species Adult and immature unmistakable. Juvenile could be confused with juvenile and immature **Red-capped Plover** *Charadrius ruficapillus* (q.v.), which has upright stance, broad white side to upper tail-coverts, buffish head and neck, and no dark eye-stripe.

Solitary or in pairs, sometimes forming loose congregations in winter of up to 100 birds. Found on areas of mud or gravel usually near fresh water. Distinctive horizontal stance, with squat short-necked appearance and rapid run. Feed in walk- or run-stop-peck manner; probe to depth of about one-third of length of bill. In flight, deep flicking wing-beats with distinct pauses between beats; flight, low and undulating becoming more relaxed and less jerky over longer distances. Typical call sharp, high-pitched monosyllabic pip, given repeatedly in flight.

HABITAT Terrestrial freshwater wetlands; sometimes brackish, and, less often, saline wetlands.

Aust. Margins of terrestrial wetlands, particularly fresh shallow ones with muddy bottoms and margins (Sharland 1942; Smith 1964; Sonter 1975; Boekel 1980); swamps, lakes, pools, waterholes, dams and tanks, reservoirs, soaks and springs, billabongs, inundated claypans and paddocks, drainage channels, rivers, bores and sewage farms (Hindwood & Hoskin 1954; Hobbs 1961; Masters & Milhinch 1974; McGarvie & Templeton 1974; Sonter 1975; Maclean 1977; Emison & Porter 1978; Boekel 1980; Badman & May 1983; Gibson 1986; Gibson & Cole 1988; Badman 1989; Chafer 1989; Henle 1989). Also along dry gravel creek beds (Badman & May 1983) and gutters of unmade or little-used roads (Hindwood & Hoskin 1954). Occasionally brackish wetlands (Smith 1964, 1966; Ewart 1973; Gibson 1977; Badman 1979); sometimes recorded round waters of high salinity, especially in arid regions (Sonter 1975; Badman & May 1983; Storr 1985a; Gibson & Cole 1988; Badman 1989). Very rarely recorded in estuarine or littoral habitats (Smith 1964, 1966; Green & McGarvie 1971; McGarvie & Templeton 1974; Serventy & Whittell 1976; Bransbury 1985); recorded on rocky shoreline of Parramatta R. (Morris *et al.* 1990). On King I., recorded on sheltered shallow sloping shingle beaches with freshwater seepages (Schulz 1990; Schulz & Kristensen 1990). Rarely, on tidal mudflats (Haines 1969; Vic. Bird Rep. 1982) or intertidal pools (Storr 1987). Thought to favour small waterbodies in w. NSW, but occurs on both large and small wetlands (Maclean 1977; Gibson 1986). Often round receding floodwaters, characterized by large sheets of shallow turbid water, and surrounded by temporarily flooded creeks (Sharland 1942; Fjeldsø 1985; Badman 1989; Johnson 1990; Vic. Atlas).

NZ Mainly on river beds, especially shallow and braided rivers flowing through wide beds and banks of mixed grades of gravel or shingle (not large stones); often with former channels dammed by mobile shingle banks to form shallow, slow-moving or still backwaters with patches of fine wet silt or mud (Mackenzie

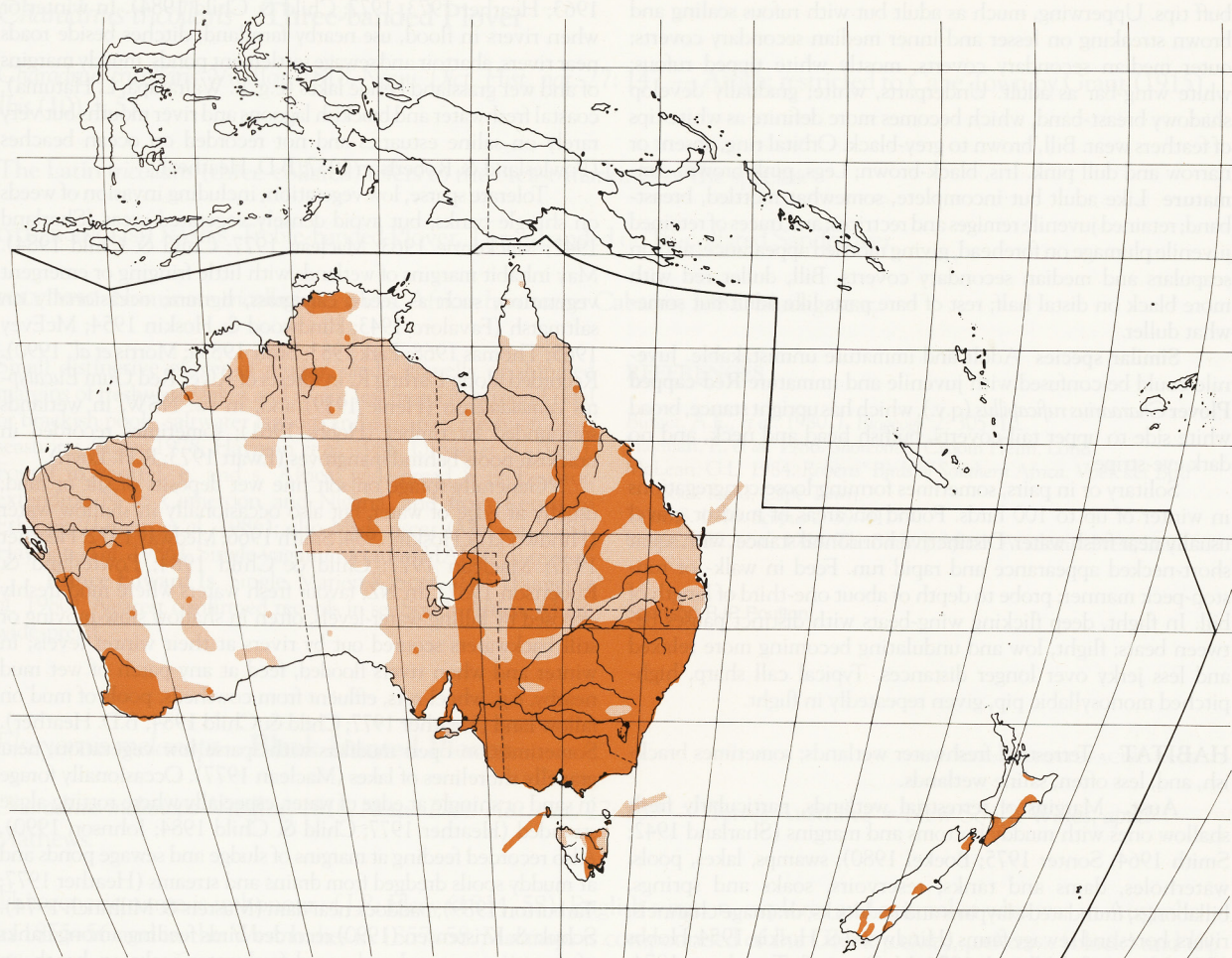
1963; Heather 1973, 1977; Child & Child 1984). In winter or when rivers in flood, use nearby farmland, ditches beside roads near rivers, abattoir and sewage settlement ponds, muddy margins of and wet grassland beside lakes (e.g. L. Wairarapa, L. Hatuma), coastal freshwater and brackish lagoons and river mouths but very rarely on saline estuaries and not recorded on ocean beaches (Powlesland & Robertson 1987; B.D. Heather).

Tolerate sparse, low vegetation, including invasion of weeds on shingle banks, but avoid densely vegetated areas (Sharland 1942; Mackenzie 1963; Maclean 1977; Child & Child 1984). May inhabit margins of wetlands with little fringing or emergent vegetation, such as reeds, canegrass, lignum; occasionally on saltmarsh (Favaloro 1943; Hindwood & Hoskin 1954; McEvey 1965; Thomas 1968; Park 1983; Storr 1985a; Morris *et al.* 1990). Recorded along Darling R. in forests of River Red Gum *Eucalyptus camaldulensis* (Henle 1989) and, in sw. NSW, in wetlands surrounded by timber (Hobbs 1961); sometimes recorded in brackish pools behind mangroves (Ewart 1973; R.H. Loyn).

Generally forage on soft fine wet deposits of silt or mud; usually at edge of water, but also occasionally in shallow water (Hindwood & Hoskin 1954; Smith 1966; Medway 1972; Heather 1977; Maclean 1977; Child & Child 1984; Powlesland & Robertson 1987). In NZ, favour fresh waters where mud freshly exposed by falling water-levels, often in shallow slow-moving or still backwaters scoured out by rivers at their winter levels; in winter and when rivers flooded, feed at any patch of wet mud nearby, e.g. wheel ruts, effluent from cowsheds, pools of mud on fallow land (Heather 1977; Child & Child 1984; B.D. Heather). Sometimes on open mudflats with sparse low vegetation, near gravelly shorelines of lakes (Maclean 1977). Occasionally forage in sand or shingle at edge of water, especially where rotting algae stranded (Heather 1977; Child & Child 1984; Johnson 1990). Also recorded feeding at margins of sludge and sewage ponds and at muddy spoils dredged from drains and streams (Heather 1977; Tarburton 1989); paddock near dam (Masters & Milhinch 1974). Schulz & Kristensen (1990) recorded birds feeding among banks of decaying seaweed and round freshwater soaks on beach on King I.

Roost along rivers, among saltmarsh, and on piles of dredged shells and mud beside ponds (Sibson 1972; Park 1983; Tarburton 1989). Shelter from strong winds behind gravel banks and walls (Heather 1977), and on hot days, may shelter in shade of bush (Maclean 1977). In Tas., may congregate round farm dams during dry weather (Patterson 1982). In NZ, after breeding, small groups may congregate on wet muddy and silty islands and backwaters in rivers, and in winter when rivers are high, groups of 10–100 gather in favoured places in breeding districts (B.D. Heather).

Usually breed on open stony ground. Often on banks of sand, gravel, pebbles or shingle, beside shallow creeks, rivers, lakes, lagoons, natural pans and farm dams; sometimes on river terraces; in NZ, almost exclusively on river beds (Sharland 1942; Heather 1973; Anon. 1974; McGarvie & Templeton 1974; Maclean 1977; Child & Child 1984). Also in gravel on verges of roads, or in middle of gravel roads (Green & McGarvie 1971; Anon. 1974; R.H. Loyn), but only occasionally so in NZ (Barlow 1989; B.D. Heather); gravelly semi-desert among sparse shrubs (Maclean 1977). Occasionally on baked mudflats or muddy islands in wetlands; in partly flooded River Red Gum forest (R.H. Loyn); in bare, ploughed or lightly grassed paddocks; in disused gravel pits and cultivated land next to river (Sharland 1942; Hindwood & Hoskin 1954; Green & McGarvie 1971; Masters & Milhinch 1974; Sonter 1975; B.D. Heather; W. & M. Twyde). Once recorded breeding on open sandy beach in estuary (McGarvie & Templeton 1974). Distance from water varies (Hindwood &



Hoskin 1954): in Aust., 4–300 m from water (Maclean 1977); one 500 m from nearest water (Masters & Milhinch 1974); in NZ, average distance from water 29 m (4–100; 25 nests) (B.D. Heather).

Construction of artificial wetlands (e.g. farm dams, sewage ponds) has increased available habitat. Also recorded in flooded paddocks (Storr & Johnstone 1988; Tarburton 1989), but does not favour them (Heather 1977); roadside ditches or puddles (McEvey 1965; Heather 1977; Storr 1987); flooded quarries (Vic. Atlas); pools in irrigation areas (Storr 1980); market gardens (Storr & Johnstone 1988). Recorded on concrete strips at edges of sewage oxidation ponds, and once recorded feeding on concrete causeway in flooded river (Johnson 1990; B.D. Heather). Recorded at shingle depressions caused by open-cut mining (Schulz & Kristensen 1990).

DISTRIBUTION AND POPULATION Widespread throughout A'asia (except New Guinea). Unacceptable claim of specimen taken near Madras, India, 1840 (Jerdon 1840).

Aust. Most widespread wader in Aust., with Aust. Atlas records in 70% of all 1°-blocks (Aust. Atlas). **Qld** Widespread in all districts except N of 14°S, where only two Aust. Atlas records. **NSW, Vic.** Widespread; recorded in all but one 1°-block. **Tas.** Widespread in n., central and se. regions; occasionally recorded in W (Tas. Bird Reps; Aust. Atlas). Recorded King I., but not Flinders I. **SA** Widespread E of line from Streaky Bay to Mitchell

Nob (Jaensch & Jaensch 1987; SA Bird Reps 1977–81; Aust. Atlas). Occasionally in e. Nullarbor (Klau 1988). **WA** Few scattered records in Western Deserts region; widespread elsewhere. **NT** Widespread throughout, but recorded only rarely between s. Barkly Highway and n. Simpson Desert; s. Simpson Desert; and between s. Tanami Desert and Petermann Ras (Gibson 1986; Gibson & Cole 1988; Aust. Atlas). Absent from Cobourg Pen. (Frith & Calaby 1974; Storr 1977; Thompson & Goodfellow in prep.; Aust. Atlas). **Breeding** Scattered throughout range. In e. Aust., mainly E of line from Townsville, SW along Diamantina R. to L. Eyre, and S to w. Eyre Pen. In WA, mainly W of 120°E. Elsewhere, scattered records in Goldfields and Kimberley regions, WA, the Top End, s. NT, the Gulf Country and round Cairns (Aust. NRS; Aust. Atlas).

NZ Information from CSN *passim* and B.D. Heather unless stated. **NI** Established in E and S. Scattered records N of 39°S, including Aupouri Pen. (CSN 37–39), Ruakaka (CSN 28), near Manukau Harbour, Awhitu Pen., Firth of Thames (Sibson 1972; CSN 19,28,29,39), L. Waikare (Sibson 1972), Ruapuke Beach (S. Rowe), Ls Rotorua and Rotomahana (Palliser 1975; CSN 30), and Wairoa district (mainly at Whakaki Lagoon) (CSN 38,39); regular in small numbers in Bay of Plenty, mainly at Kaituna Cut, Matata Lagoon, and estuary of Rangitaiki R. (CSN 38,39). **HAWKE'S BAY:** breed Mohaka, Esk, Maraetotara, Tutaekuri, Ngaruroro, Tukutuki, Waipawa, Manawatu Rs; post-breeding congregations:

Ahuriri Estuary, Waitangi, Ls Hurimoana, Rotokare, Poukawa and Hatuma, and Wanstead Lagoon. **WAIRARAPA:** breed Ruamahanga, Huangarua, Turanganui Rs, river deltas of L. Wairarapa, Pahaoa, Awhea, Opouawe, Mangatainoka, Mataikona and Kaiwhata Rs; post-breeding congregations also Masterton and Waingawa settlement ponds. **WELLINGTON:** occasionally at estuary of Waikanae R. (Fleming 1972). **MANAWATU:** breed Manawatu, Rangitikei and Oroua Rs; post-breeding congregations: lagoons of Ohau and Turakina R. estuaries, Feilding Sewage Plant and Longburn Abattoir, Pukepuke and Omanuka Lagoons. **WANGANUI:** post-breeding congregations: Turakina, Whangaeahu Rs, occasionally W to mouth of Waitotara R. **TARANAKI:** singles: Bell Block (Medway 1972), near Hawera, Pihama, and Pungareere Stream (M. Davis). **SI** Small numbers established in E and S. **MARLBOROUGH:** breed Wairau and Awatere Rs; post-breeding congregations: Ls Elterwater and Grassmere. **CANTERBURY:** breed Waipara, Ashburton, Orari and Opihi Rs; post-breeding congregations on coast, e.g. Ls Ellesmere and Wainono, Spider and Washdyke Lagoons. **OTAGO:** breed Taieri and Manuhierika Rs; occasionally on coast, e.g. Hawkesbury Lagoon and estuary of Kaikorai R. **SOUTHLAND:** breed Aparima, Oreti, Mararoa and possibly Maitara and Whitestone Rs; post-breeding congregations elsewhere, mainly mouth of Waimatuku R. **WEST COAST, NELSON:** Karangarua R., 1984; N of Karamea, 1988; occasionally Nelson Haven.

Range has expanded recently. **Aust.** Now widespread Tas., where considered rare as recently as 1968 (Frith 1969; Aust. Atlas). Numbers on King I. thought to have increased (McGarvie & Templeton 1974). **NZ** Colonized NZ from Aust.; colonization appears to have begun in Hawke's Bay in late 1950s, populations increased there during 1960s, then spread S to Wairarapa and Manawatu and across Cook Str. to Marlborough and South Canterbury in late 1960s. First record: Ahuriri Lagoon, Napier, 1954 (Brathwaite 1955). Additional records in mid-1950s: single, near Palmerston North, Aug. 1955 (Andrew 1956); single, Leithfield Beach, n. Canterbury, Apr. 1956 (Scarlett 1957); five, L. Hurimoana, near Napier, winter 1956. First breeding recorded near Napier in 1961–62 (Mackenzie 1962) and counts of more than 100 birds in three rivers in Hawke's Bay in Oct. 1962, indicated that birds had been breeding there for several years (Mackenzie 1963). Several widely separated records of 1–2 birds from 1960s: Houhora, Far North, in 1970; near Auckland in 1970; Waikato, in mid-1960s; Wairarapa: Ruamahanga R., 1966–68, Huangarua R., 1969, L. Wairarapa, 1970; Wairau R., Marlborough, 1969; near Oamaru, 1963; Taieri R., Otago, 1984; Southland: Aparima R., 1981, Oreti R., 1986, Mararoa, 1985 (possibly earlier) (McVinnie 1963; Stidolph 1971; Grant 1972; Pierce 1971; Sibson 1972; Smuts-Kennedy & Drew 1972; Andrew 1975; Child 1982; Barlow 1989; CSN 19, 21, 23, 32). Increases in populations noted in many regions: on three main Hawke's Bay rivers, 109 in 1962, 686 in 1986 (W. Twytle); on main rivers of Manawatu, 67 in Nov. 1974, 199 in Nov. 1978 (Andrew 1975; CSN 26); on main Wairarapa rivers, 78 in Nov.–Dec. 1972, 239 in Jan. 1989 (Heather 1973; CSN 37); on Orari and Opihi Rs, 15 in 1973, 55 in 1987 (R.J. Pierce; C.F.J. O'Donnell; CSN); on Ashburton R., 1–4 in 1981–84, 58 in 1990 (D. Geddes; C.F.J. O'Donnell).

No immediate or serious threats to continued survival (Lane 1987). **Aust.** Total population c. 17,000 (D. Watkins). Sites of significance and maximum or average counts from summer and winter surveys round Aust., 1981–85, were: Charters Towers region, Qld, 360; far nw. lakes, NSW, 200; Lower Darling R., NSW, 150; w. coast Eyre Pen., SA, 140; lakes in Horsham area, Vic., 120; far sw. lakes, Qld, 120 (Lane 1987). On King I., 27

recorded on c. 200 km of coastline (Schulz & Kristensen 1990). Recorded in 48 of 197 nature reserves surveyed in sw. WA, 1981–85 (Jaensch *et al.* 1988). Totals for summer and winter counts, 1986–89, in Aust., summarized in Table 1 (Hewish 1986, 1987a,b, 1988, 1989a,b, 1990a,b). **NZ** Total population in 1992, c. 1600 (B.D. Heather): in NI, c. 1350 (Hawke's Bay, 800; Wairarapa, 300; Manawatu, 250); in SI, c. 280 (Marlborough, 30; Canterbury, 150; Otago, 50; Southland, 50). In NI, populations probably stable with little or no breeding habitat in n., w. and central NI; populations increasing in e. and s. SI where much potential habitat not yet occupied.

Table 1

	NUMBER OF BIRDS	NUMBER OF SITES
summer 1986	59	23
winter 1986	144	23
summer 1987	85	22
winter 1987	296	23
summer 1988	70	23
winter 1988	101	23
summer 1989	48	22
winter 1989	199	21

MOVEMENTS Poorly known in Aust.; unpublished study in s. NI (OSNZ). Mainly sedentary; many remain on or near breeding site. Most birds remain within 1–2 km of breeding area, though some may move considerable distances without apparent pattern. In Aust., lack of marked seasonal changes in numbers suggests no large-scale movements (Lane 1987); however, congregations (50–250) occur at some sites in most states (see State Bird Reps *passim*). In NZ, in winter, congregate at favoured sites away from rivers, especially Apr.–July; noted since mid-1970s; for sites where congregations occur regularly, see Distribution. Winter congregations not yet a feature in SI; birds generally remain on or near rivers (D. Geddes; B.D. Heather). Some dispersal with ones and twos turning up at scattered localities round NZ. May move daily to and from special food source, e.g. at Longburn, Manawatu, most birds moved to sludge ponds before sunrise and again in mid-afternoon, returning to river after sunset, spending middle of day at or beside river, even when in flood (Tarburton 1989).

Banding In NZ, of 72 birds colour-banded since 1988, only one has been found to move more than 1–2 km from breeding site: bird banded Masterton moved 40 km to L. Wairarapa, and was back at original site 1 week later. Of 34 banded on Wairarapa rivers in 1970s, one was seen briefly in Nelson, 200 km across Cook Str., in 1977. Bird banded 31 Dec. 1974 as breeding adult, recaptured 29 Dec. 1979, at least 5 years old.

FOOD Molluscs, crustaceans and insects; occasionally seeds.

Behaviour Diurnal. Feed in typical walk- or run-stop-peck behaviour of *Charadrius* plovers; also tap and peck, probe into mud to depth of about one-third length of bill, and glean; often move back and forth over same stretch of wet mud (Heather 1977; Tarburton 1989; B.D. Heather). In Manawatu, NZ, feeding method used (tap and peck or simple pecking) depended on hardness of substrate: on hard substrate, tap and peck; on soft substrate, simple peck (walk and peck or run and peck); on intermediate substrates, both methods used about equally and birds moving from one type of substrate to another changed their method of feeding accordingly; tapping action on hard substrate disturbs prey (flies); on soft substrate tapping did not disturb prey, but prey were more visible, so disturbance unnecessary (Tarburton 1989). In Hawke's Bay, NZ, averaged 1.65 runs/s (0.88; 202 s observa-

tions) and 2.04 pecks/s (1.10; 0.81–3.25; 202 s observations) with average of 1.22 pecks/run (0.12; 202 s observations) (Phillips 1980). In Manawatu, NZ, on river (hard surfaces), river (all surfaces), and sludge ponds (all surfaces) respectively: peck-rates of 18.3 simple pecks/min (8.8; 31 min obs.), 36.0 (17.4; 1046) and 51.0 (14.9; 197) and 26.8 tap-and-pecks/min (7.3; 22), 32.4 (7.6; 8), and 29.6 (6.1; 116). On sludge ponds, success rate of pecking (91%, $n=2934$ pecks) was significantly ($P<0.001$) more successful than tap and peck (86%, $n=1873$ tap and pecks); on the river, no significant differences between peck (83%, $n=1182$ pecks) and tap and peck (85%, $n=259$) (Tarburton 1989). Recorded foot-trembling to disturb prey in sandy and muddy substrates (Heather 1977; Tarburton 1989; Schulz & Kristensen 1990; W. & M. Twytle). Beat large prey and swallow whole (Maclean 1977), though not recorded NZ (B.D. Heather).

Adult No detailed studies (observations unless stated).

Plants Seeds (stomachs, Cleland); Fabaceae: sds (stomachs, Vestjens 1977; Barker & Vestjens); *Trifolium dubium* sds (stomachs, Barker & Vestjens). **Animals** Annelids: oligochaetes: earthworms (Heather 1977). Molluscs (stomachs, Barker & Vestjens; North): gastropods: freshwater snail (stomachs, Vestjens 1977; Tarburton 1989; Barker & Vestjens). Crustaceans (stomachs, Hall 1974): ostracods (stomachs, Barker & Vestjens); isopods: wood slaters. Arachnids: mites (Tarburton 1989). Insects (stomachs, McLennan 1917; McKeown 1934; Hall 1974; North): larv. (stomachs, Cleland); Collembola (2.5 mm, Tarburton 1989); Odonata: Anisoptera: large dragonfly (Maclean 1977); Dermaptera: (stomachs, Barker & Vestjens); Hemiptera (stomachs, Barker & Vestjens): Corixidae: imm. (stomachs, McKeown 1934); Orthoptera: Acrididae (stomachs, Barker & Vestjens); Gryllidae: crickets (Johnson 1990); Lepidoptera: larv. (Vestjens 1977; stomachs, Cleland); Psychodidae (5 mm, Tarburton 1989); Diptera (Schulz & Kristensen 1990; stomachs, Cleland): larv. (stomachs, Vestjens 1977); Ephydriidae (3–4 mm); Tipulidae (Tarburton 1989); Chironomidae: larv. (stomachs, McKeown 1934; Barker & Vestjens); *Chironomus* ads; bloodworms (Tarburton 1989); Muscidae: larv. (stomachs, McKeown 1934; Barker & Vestjens); Coleoptera (McKeown 1934; Vestjens 1977; stomachs, Cleland; Barker & Vestjens): water-beetles (stomachs, Barnard 1914; Vestjens 1977): larv. (stomachs, McKeown 1934; Vestjens 1977); Carabidae (stomachs, Vestjens 1977): *Sarothrocrepis*; *Ectroma* (stomachs, McKeown 1934); Dytiscidae (stomachs, Barker & Vestjens); Hydrophilidae: larv. (stomachs, McKeown 1934); Tenebrionidae (Tarburton 1989); Chrysomelidae (stomachs, Barker & Vestjens); Curculionidae (stomachs, Vestjens 1977); Hymenoptera: Formicidae (Vestjens 1977; stomachs, Cleland); *Iridomyrmex* (stomachs, Barker & Vestjens). Sand (stomachs, Cleland; McKeown 1934); small pebbles and mud (stomachs, McKeown 1934); grit (stomachs, Vestjens 1977).

Young, Intake No data.

SOCIAL ORGANIZATION No major studies; better known in NZ than Aust.; NZ material based on contribution by B.D. Heather; some information for inland Aust. (Maclean 1977). Generally not gregarious. In Aust., usually solitary or in twos (e.g. Berney 1907; Alexander 1916; Maclean 1977; Storr 1985a,b, 1986), often family groups (e.g. Jones 1938; Smith 1966; Maclean 1977), occasionally small loose flocks up to c. 30 (e.g. Berney 1907; Boehm 1964; Hobbs 1955, 1961; Storr 1987, 1988), rarely larger flocks of up to c. 200 (Storr 1980; Badman & May 1983; State Bird Reps); autumn–winter flocking recorded (e.g. Hobbs 1961; Smith 1966; Vic. Bird Rep. 1982), but not so apparent as in NZ (Schulz & Kristensen 1990). In NZ, generally seen in twos, seldom solitary. During breeding season, breeding pairs remain in

breeding habitat along river; activity of non-breeding birds on rivers unknown. After breeding, most remain at or near breeding areas in twos (not necessarily mated pairs) or small parties of up to ten; during autumn–winter, some move to other habitat nearby and form small loose groups of up to 175 on a few favoured lake margins, especially in NI; occasionally small parties or twos, even singles, may appear well away from breeding districts. No association with other species, though breeding and feeding habitat may be shared amicably with: in Aust., Red-kneed Dotterels (Maclean 1977); in NZ, Black-winged Stilts *Himantopus himantopus* and Double-banded Plovers (B.D. Heather). May be some aggression if pair nests near other species, e.g. Red-capped Plovers c. 30 m away (Jones 1938).

Bonds Monogamous; studies of colour-banded birds show pair-bond, at least sometimes, for more than one breeding season (M.C. Child; B.D. Heather). One record of apparent change of mate: when chicks did not survive, one adult obtained new partner while former partner stayed near newly formed pair (T.C. Dennison). No information on age of first pairing, sex-ratio, or stage of cycle when pairing starts or ends. **Parental care** Both parents share nest-building, incubation, and tending unfledged young (Maclean 1977; B.D. Heather). If second clutch laid, non-incubating parent attends chicks in territory for up to several days after incubation of second clutch begins (Child & Child 1984); first brood remains until second clutch hatched (B.D. Heather). Fledged juveniles seem to remain in or near natal territories, sometimes in small mixed groups of up to 4–6 juveniles gathering at favoured feeding places. Time of separation of parents and juveniles not known (B.D. Heather); once, juveniles stayed with parents until at least 57 days after hatching (Child & Child 1984).

Breeding dispersion Solitary nesting. In NZ, pairs appear strongly attached to site, and if forced to leave over winter, return to site to breed (B.D. Heather). Similar tendency noted in Aust. (Sharland 1942). In NZ, distance between nests, and therefore size of territory, seems to depend on availability of food, e.g. in 3.5 km of Ruamahanga R., Wairarapa, number of breeding pairs varied from six to two pairs in successive years, according to number of muddy backwaters (B.D. Heather); similar density on Manuhirikia R., Central Otago (Child & Child 1984). In Aust., three pairs equally divided 700 m long x 50 m wide billabong into equal territories c. 235 m long; pairs used both sides of water's edge (Hobbs 1987). **Territories** All-purpose; includes suitable nesting and feeding areas (Child & Child 1984); unless disturbed, young fledge in territory (B.D. Heather); defence apparently confined to breeding period, though further study needed. No evidence of feeding territories in non-breeding period, though, if possible, birds spread out and keep apart to feed and rest (B.D. Heather).

Roosting Little known. Tarburton (1989) found birds fed for 86% of day in winter, 38% during incubation, and 69% when tending chicks; spent 3–10% of diurnal hours resting or keeping watch. Off-duty bird may rest in shade of nearby bush on hot days (Maclean 1977). In NZ, at one site in winter heard calling 1 h before sunrise as they flew from roosting sites to feeding areas; appeared to feed until almost 1 h after sunset, when left feeding areas in one or two flocks (Tarburton 1989).

SOCIAL BEHAVIOUR No major studies; some work in inland Aust. (Maclean 1977) and NZ (Phillips 1980); with additional information for NZ from B.D. Heather. For comparison with behaviour of other plovers, see Phillips (1980). Cryptic when on shingle, often spending long periods motionless (Phillips 1980). **NORMAL POSTURE**: head, back and tail in line and only 15–20° above horizontal, head withdrawn so that bird appears neckless

(Phillips 1980). Scratch head indirectly (Maclean 1977). **Flock behaviour** Outside breeding season members of group tend to behave independently; seems to be grouping of convenience, birds generally avoiding each other while feeding but fairly aggressive when crowded together; birds tend to gather rather than move as a cohesive flock; when disturbed, members generally take flight and move elsewhere independently (B.D. Heather), but some flush as flock (Boehm 1964).

Agonistic behaviour Observed on breeding territories and in winter feeding flocks, especially if birds congregated in small area; most chases on ground but some become brief chases in air (B.D. Heather). During breeding season, aggressive interactions on ground often involve pairs, Threat Calls, and birds often make picking movements at shingle. Interactions consist of CHASES: fast runs where one pair seems to chase another bird or pair; running alternates with motionless silent pauses, for as long as several minutes, before another bout begins. Chasing bird runs and pauses in normal horizontal hunched posture but, if more intense, holds head higher than back and drawn back so that eye-stripe remains horizontal; scarlet eye-ring conspicuous; fleeing bird tends to sleek plumage, pursuer fluffs feathers of belly and scapulars, and black feathers of head and breast, making black marking stand out against white of breast, and dark scapular bar becomes extension of black breast-band; viewed from front, bird has square outline, quite different from aggressive postures of many other plovers (Phillips 1980). In breeding areas PARALLEL RUNNING observed: two or three birds sprint across shingle, side by side, interspersing running with bouts of 'frozen' posture and Threat Calls; eventually disperse quietly to feed; function unknown (B.D. Heather). Short advertising BUTTERFLY FLIGHTS: bird, assumed to be male, flying in wide circles (c. 100 m wide) over territory with stiff shallow wing-beats and uttering continuous rolling Threat Call; head held higher than back, bill horizontal, and neck withdrawn, and flight different from normal flight; observed at start of nesting; function unknown (also see Sexual Behaviour) (Maclean 1977; Phillips 1980; B.D. Heather). Once, after hostile encounter, two birds flew in Butterfly Flight near one another, dived spectacularly, then resumed circling only a few metres above ground before rejoining two on ground and again engaging in aggressive chases; may have been territorial interaction. Males also recorded in flying CHASES, uttering buzzing Threat Calls, in territorial boundary disputes (Phillips 1980). **Attack** In one form, which may be seen any time of year and often preceded by Threat Calls, bird sprints at opponent with plumage tightly compressed, back horizontal and head lowered (B.D. Heather); similar threat posture with white feathers of flanks conspicuously fluffed out to side also described (Maclean 1977). Opponent may turn aside, flee, or spring into air while attacker sprints beneath; attack may be followed by leap-frog flutter over opponent or both may stand facing each other with heads and tails down and feathers of mantle and scapulars raised, or stand in erect stiff-legged posture, sometimes with wings slightly drooped. In group confrontations, 2–5 birds, adults and immatures, face inwards or slightly sideways and give loud Threat Calls followed by long period when remain still and silent (B.D. Heather). Nesting pair seen fighting with neighbouring pair of Red-capped Plovers (Jones 1938). **Alarm** Seen to face away in crouch with tail spread and depressed, standing still or rocking slightly from side to side; birds often observed quickly raising, then slowly lowering, tail (Phillips 1980). At low intensity, bob head; at higher intensity, body bobbed also (Maclean 1977); bobbing also recorded by others (e.g. Chandler 1920; Phillips 1980). Give Alarm Calls (Maclean 1977; B.D. Heather). Head-bobbing used, even by newly hatched chicks, but less often than by many other plovers. Do not give extreme

upright posture adopted by some plovers. When disturbed by people, may crouch silently among stones with back to observer, peering back over shoulder (B.D. Heather). When approached, fly or run (Alexander 1916; B.D. Heather), calling often, and landing with fluttering wings, then running short distance before stopping (Lane 1987). Sometimes swim when disturbed (Hobbs 1955; Sedgwick 1958a); when attacked by Collared Sparrowhawk *Accipiter cirrhocephalus*, seen to dive into water and stay submerged (Bettington 1922). When Swamp Harrier *Circus approximans* flew overhead, Black-winged Stilts and Masked Lapwings *Vanellus miles* flew up and a Black-fronted Plover crouched and stretched flat on ground; the Plover was first to resume feeding (W. Twydle).

Sexual behaviour **Courtship** Butterfly Flight (see Agonistic Behaviour) probably also functions as advertising display and in courtship. Observations by Phillips (1980) probably relate to sexual behaviour: once, pairs were chasing one another in boundary conflict when one bird ran and crouched and picked up small pieces of rock or debris and flicked it over its shoulder with a sideways jerk (probably Side-throwing); another bird ran to it; as second bird approached, first bird faced it, tilted forward and flashed wings, then turned away, picking up material and tossing it again; the other bird crouched in front of second bird. Another time, after conspecific had disturbed feeding pair, one bird of pair began scraping, then partner approached it; scraper stood making picking movements while second bird crouched in scrape, often bobbing head; original scraper began to pick up and toss material, then returned to scrape and crouched while other stood with body horizontal; standing bird walked round nest, and approached scraper head on; scraper tipped forward with head withdrawn, bill horizontal, tail high, and wings flashed open briefly; displaying bird then stood and slowly turned 180° with tail high; approaching bird entered scrape under raised tail of other. Another time, one of feeding pair flew a few metres and began to pick or nod head while crouching; second bird approached with feathers of breast fluffed; first met it with humeri extended and wrists flexed, breast down, and tail high; then first bird stood in horizontal posture at right angles to second, which crouched in scrape; both did much picking up material and tossing it; first bird then entered scrape under raised tail of second bird, which stood with tail high and breast lowered before walking away. Another time, two birds alighted and one began to scrape with tail high and wing-tips crossed; second approached and first walked toward it; second then tipped breast down and tail up, as if intending to pick; then, very briefly, they stood head to head, both tipped forward. Ross (1926) also noted pair at scrape, bowing to each other in possible sexual display. **Greeting** During change-over at nest, sitting bird usually just slips off at approach of partner, and does not take flight till c. 10 m away (M.C. Child); once, sitting bird briefly refused to leave eggs, and stood half-crouched over them with head lowered, churring at mate (Hadden 1973). **Copulation** Preliminary activities vary: male runs to female (Child & Child 1984; B.D. Heather), and male observed flying in low and running to female (Phillips 1980). Male may or may not goose-step beside female before mounting; once, beside scrape, male used forward tilting posture toward female before mounting (possibly part of scrape ceremony). Threat Call sometimes heard during behaviour preceding copulation (Maclean 1977; Phillips 1980; Child & Child 1984; B.D. Heather); however, copulations usually silent (Child & Child 1984; B.D. Heather), but Maclean (1977) recorded hearing soft chizzling between birds during mounting. Female adopts horizontal soliciting posture before mounting (Maclean 1977; Phillips 1980; Child & Child 1984). Average duration of mount 7 s (2; 6) (Phillips 1980). After copulation, male dismounts

simply to side or rear (B.D. Heather). Male may stand hunched momentarily, while female stands with head held a little higher, and sometimes with feathers of breast slightly fluffed; male may stretch wings or bob; one or both may preen, or may move to feed fairly quickly (Phillips 1980; Child & Child 1984; B.D. Heather).

Relations within family group Adult on nest often restless; at other times dozes with eyes closed and utters very quiet chittery noises (Child & Child 1984). In Aust., off-duty bird feeds at nearby water or rests nearby (Maclean 1977); in NZ, usually well away from nest, and often unaware of disturbances (B.D. Heather). In hot weather, relieving parent may wet feathers of belly before flying or running to nest; may shade eggs or young by standing over them, sometimes with wings spread (Bright 1935; Bryant 1941; Hadden 1973; Maclean 1977). In hot weather, also appeared to place drops of water on eggs (Thomson 1917) and eggs often left for hours (Chandler 1920). Observed crouching over eggs (Child & Child 1984). After hatching, chicks soon move to nearby wet mud to feed; may remain with parents for several weeks if undisturbed (B.D. Heather). One parent stays within 2–3 m of young while other is away feeding; parents tend chicks fairly equally (Tarburton 1989). **Anti-predator behaviour of young** Non-flying young scatter and crouch, whether on shingle, in shallow water, or under low vegetation; often bob head when alarmed, even when just hatched (B.D. Heather); young react to Alarm Calls of parents (Leach 1928); young and adult recorded calling to each other (Cohn 1923); noted swimming to escape when only 10 h old (Sedgwick 1958b). **Parental anti-predator strategies** Always leave nest silently, except when flushed (B.D. Heather). Distraction Displays: unobtrusive; performed with little or no noise (Maclean 1977; B.D. Heather); include FALSE FEEDING (B.D. Heather), FALSE BROODING (B.D. Heather); sometimes running from nest (e.g. Hall 1902; Campbell 1908) with rear of body tilted up and turned slightly sideways (B.D. Heather). Away from nest, may stand silently with back to intruder, swaying rear of body slowly from side to side or, more often, depressing tail and fanning it slowly open and shut while partly opening each wing alternately; tail-movements reveal chestnut tail-coverts, white outer tail-feathers and white tail-tip; observed before and during incubation (B.D. Heather); similar rocking motion described by Phillips (1980). Intense INJURY-FEIGNING (Fig. 1a,b) not common: with back to threat and tail depressed and fanned, crouches or staggers, and lies on one side then other, with opposite wing extended and flapping slowly; silent (Maclean 1977) or accompanied by wailing cries (B.D. Heather); similar behaviour also recorded by others (e.g. Ising 1932; Bryant 1941; Mueller 1975). On approach of intruder, sitting bird flies from nest, staying close to shingle, or runs to edge of water, where it FALSE

FEEDS. Some stay on nest in flattened posture, and if pressed, explode into air with twittering Alarm Call and flurry of wings (B.D. Heather). When train approached sitting bird that was nesting in railway yard, bird sometimes stood on nest, ruffled feathers and opened bill, occasionally lifting wings, before running away (Ising 1932). Until intruder has left, generally both birds stay away, or one stands or crouches at distance with back to intruder; may give distraction display, gradually moving away from nest area; on open mud it may crouch with head lowered to conceal nuchal bands and with back-feathers partially raised. In late incubation or when with young, may stand or run at a distance, uttering Alarm Calls and bobbing head; or may fly past intruders to pitch at distance and then run away (B.D. Heather). At night, during hatching, one adult allowed itself to be handled by observer (Child & Child 1984). Once, one bird, thought to be male, seen driving other bird back to eggs (Bryant 1941).

VOICE Not well known and no detailed studies; some information from studies in inland NSW by Maclean (1977) and in NZ by Phillips (1980) and B.D. Heather; information supplied by B.D. Heather. Calls are sharp notes, twitters, churring and buzzing rattles. Contact and Alarm Calls given throughout year and are heard during day and at night; Threat Call can be heard all year but most often during breeding season (Maclean 1977; B.D. Heather). Contact *pit* calls higher-pitched and more metallic than those of Double-banded Plover and uttered more repeatedly in flight (B.D. Heather). Calls often heard at night (White 1921; McKeown 1923; Maclean 1977; B.D. Heather). Geographical variation, and differences between sexes, not known.

Adult CONTACT CALL: repeated *tip-tip-tip...* or *pit-pit-pit...*, notes given at intervals of 1–2 s; also rendered as sharp *chip* (Phillips 1980) or *plink* (Tarburton 1989); with Alarm Call, most commonly heard calls; given on ground and in flight; at night and during day (Maclean 1977; B.D. Heather). In winter feeding-flocks in NZ, sometimes make soft *chip* calls, with general effect of continuous quiet chattering (B.D. Heather). Repeated chipping calls reported during agonistic encounters (Child & Child 1984). **ALARM CALL:** similar to Contact Call (B.D. Heather): simple series of sharp rather high-pitched *pip-pip* notes (Maclean 1977); normal Alarm Call a loud *peet*. Extended to sharp shrill twittering call when flushed from nest or from concealed feeding place (B.D. Heather). **THREAT and COURTSHIP CALL:** buzzy *tweet-tweet-tre-tre-tre-chip-chip-chip* (Phillips 1980), vigorous rippling *ree-ree-ree-ree...*, *dree-dree-dree...* or *chi-chi-chi-chi* given at rate of 4–5 syllables/s (B.D. Heather), or buzzing rattle (termed chizzling; Maclean 1977). Call 'like a fly in a matchbox', given when young handled (Cohn

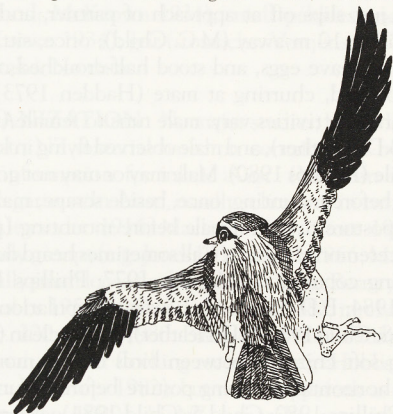


Figure 1a Injury-feigning

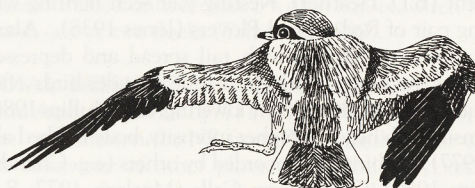
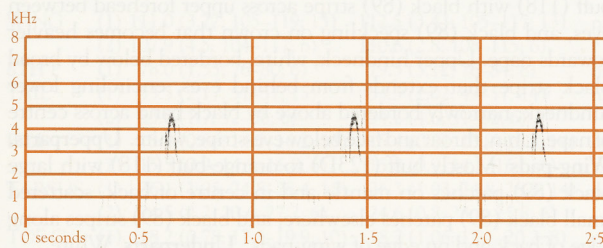


Figure 1b Injury-feigning

1923) and *ch-u-u-r-r-r* (Tarburton 1989), probably this call. Uttered in flight or on ground during territorial boundary disputes and other agonistic encounters, Butterfly Flights, in group confrontations and, in non-breeding season, in disputes when feeding and when joining feeding group (Maclean 1977; Phillips 1980; B.D. Heather). Commonly given as bird approaches mate on territory (in air or on ground) and sometimes given by mate in reply (B.D. Heather). During breeding period, continuous rolling languid churring *rrr-reep* (sonagram A) given by male in Butterfly Flight over territory, rarely on ground (B.D. Heather). Also heard before copulation (B.D. Heather) and said to be given softly by both birds before and during copulation (see Social Behaviour). Churring given by incubating bird refusing relief at nest (Hadden 1973). **Other calls** Utter very quiet *chittery* noises while incubating eggs (Child & Child 1984). Also reported to utter *chink-oo-chink*, *churr-choo-ch* and *cler-it* (Tarburton 1989), though circumstances and function not described.

Young Before hatching, chicks *peep* in eggs (Child & Child 1984). Buzzing call, similar to that of adult, given by young thought to be 1 day old (Cohn 1923).



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BREEDING No major studies in Aust.; study in NZ (Child & Child 1984; OSNZ); information from NZ supplied by B.D. Heather, which includes data from NZ NRS and OSNZ; 263 records in Aust. NRS to Oct. 1992. Breed in simple pairs, solitarily.

Season In Aust., broadly Sept.–Feb. throughout but may start earlier and extend later if conditions suitable, e.g. after rain in late summer or early autumn in e. Aust. (North). In NZ, broadly Aug.–Mar., peak for incubation, Sept.–Dec. In n. Qld: laying, Aug.–Nov. and Apr. (Lavery *et al.* 1968); NT: eggs, Aug., Sept. and May; young, July and Sept. (Aust. NRS); s. WA: breed, July–Jan., peaks in Sept., Oct. and Jan., possible because multiple broods (Halse & Jaensch 1989); NSW: laying, Aug.–Jan., sometimes Feb., Mar. and Apr. in warmer weather (Hindwood & Hoskin 1954; Aust. NRS); Vic.: eggs, Sept.–Feb. (Aust. NRS); Tas.: eggs, Sept.–Feb.; SA: usually Oct.–Dec. (McGilp 1923); eggs, Aug.–Jan. (Aust. NRS).

Site On ground, usually close to water but sometimes up to 500 m away, in shingly or stony areas or stone-strewn sand. Nest in same area year after year (Sharland 1942; B.D. Heather). Second and replacement clutches usually laid near first site, up to 500 m away, but sometimes in same site (Hobbs 1987; B.D. Heather). **Aust.** In creeks, on shore of lakes, swamps, dams, on open sandy beach, semi-desert areas, quarries, borrow pits, roadsides, gravel on railway tracks, levelled dump of building rubble, on raised areas such as gravel heap, dam wall, even in accumulated sand in guttering of roof of shed; also in ploughed paddocks, bare paddocks or with short grass, area of couch-grass, canegrass swamp, burnt corner of orchard; sometimes placed next to horse dung, piece of bark, blackened stump, tall thistle, branch of tree, large rock, under tree or small bush (Campbell 1908; Chandler 1920; McGilp 1923; Leach 1928; Ising 1932; Jones 1938; Bryant 1941; Sharland 1942; Hindwood & Hoskin 1954;

Masters & Milhinch 1974; McGarvie & Templeton 1974; Maclean 1977; Aust. NRS); one nest on slightly raised platform of small rocks which had apparently been carried to site (Campbell 1909). One nest c. 9 m from nest of Red-capped Plover (Jones 1938). **NZ** Shingle ridge, less often shingle slope or terrace, close to feeding wetland; good view along river but not necessarily all-round view; closeness of vegetation apparently not important; average distance of nests from rivers, 29 m (4–100; 25). One pair regularly nested in sparse saltmarsh; once recorded in field of asparagus and newly planted vineyard next to river. Occasionally within or next to colonies of Black-winged Stilts (Child 1982).

Nest, Materials Depression in ground, unlined or lined with pebbles, pellets of dry mud, dry leaves, bark, short grass stalks, clover seed-pods, sticks, sheep and rabbit dung (Aust. NRS); sometimes a scrape formed of small pieces of hard mud and stone fragments (Hindwood & Hoskin 1954). May be ringed by small stones or short sticks c. 13 mm long, sometimes put in place 3 days before hatching (Leach 1928). Lined with short dry twigs, grass, leaves, bark, clover seed-pods, samphire stems, pellets of dry mud, pebbles, and droppings of sheep, cattle and rabbits (McGilp 1923; Aust. NRS; OSNZ). Of 46 nests in NZ: nine were unlined, 19 were lined with fine pebbles, 12 with wood chips, dry grass and leaves, and six with particles of mud and silt, fragments of shell, or dung (OSNZ). Bird shuffled to make depression; one pair nested in human footprint (Aust. NRS). **MEASUREMENTS:** c. 10 cm diameter (Child & Child 1984); diameter of two nests, 10 and 12 cm; depth of one nest, 3 cm (Ising 1932; Aust. NRS).

Eggs Oval to pyriform; close-grained, smooth, lustreless; ground-colour, grey, pale whitish or yellowish (Maclean 1977); cream to light creamy-white, more or less obscured by numerous small irregularly shaped angular markings, spots and fine wavy lines of dark brown to black, and fewer intermingled fainter underlying markings of dull bluish- or inky-grey. On some, markings faint and closely interlaced uniformly over shell, almost obscuring ground-colour; others larger and deposited thickly toward larger end, where they form well-defined cap or zone (North). **MEASUREMENTS:** Aust.: 27.6 (1.03; 26.4–30.2; 47) x 21.2 (0.76; 19.3–22.7) (Aust. NRS); NZ: 29 (27–33; 41) x 21 (20–22) (NZ NRS; B.D. Heather; includes data of Child & Child 1984); 27.8 (26.9–29.4; 11) x 21.3 (19.7–22.2) (NMNZ, measured by F.C. Kinsky).

Clutch-size Usually 2–3 eggs per clutch. Aust.: average, 2.2 (1–4; 109); C/1 x 2, C/2 x 41, C/3 x 65, C/4 x 1 (Aust. NRS); NZ: 2.7 (1–3; 54); C/1 x 4, C/2 x 8, C/3 x 42.

Laying At intervals of 48 h (Courtney & Marchant 1971; Hobbs 1987; Aust. NRS; M.C. Child). In one clutch of three: third egg laid at least 7 days after second (Jones 1938). One clutch of six eggs recorded, appearance suggested two clutches of three eggs (Aust. NRS). Will lay two clutches per season (Sharland 1942); re-lay up to twice after failure (Hobbs 1987). Second clutches laid c. 21, 37 and up to 46 days after first clutch hatched; a replacement clutch laid 5–9 days after failure (Hobbs 1987; M.C. Child).

Incubation Both sexes incubate (Ising 1932; Bryant 1941). Stints of incubation: in Aust., 10–60 min; may leave eggs uncovered for hours during warm weather (Chandler 1920; Maclean 1977); in NZ, usually 1–1.5 h; at one nest during hatching, stints were 23, 34, 67, 30 and 11 min (M.C. Child). **INCUBATION PERIOD:** often 25 days but from 22 to 26 days (Courtney & Marchant 1971; Hadden 1973; Child & Child 1984; Hobbs 1987; Aust. NRS); 27 days from laying of first egg to hatching (n=2), 26 days since laying of second egg (Aust. NRS). Young heard cheeping up to 3 days before hatching; pip 1 day before hatching; hatching may be synchronic, within 3 h, or spread over 20–25 h (Hobbs

1987; Aust. NRS; M.C. Child; B.D. Heather). Egg-shell removed as soon as each chick hatches (B.D. Heather). At one nest, egg-shells removed and dropped in river 25 m downstream; at another nest, egg-shell found in clump of sedges 56 m away (Child & Child 1984).

Young Precocial, nidifugous. At hatching: buff above speckled and blotched black, with white collar, and black along sides of back and leading-edge of wing-pads; underparts, white; bill, dark grey; legs, light flesh (Campbell 1909; Maclean 1977; B.D. Heather). Remain in nest until all eggs hatch (Hobbs 1987); able to run within a few hours of hatching (Bryant 1941).

Parental care, Role of sexes Young brooded in nest for all or part of first day (Hadden 1973); brooding intervals averaged 32 min during 4 h of observation (Child & Child 1984). Adult will shade eggs and young on hot days (Bright 1935). Adults perform distraction displays (see Social Behaviour). Young crouch and freeze if danger approaches (Chandler 1920; Leach 1928). **Growth** A chick aged 14 days weighed 16 g (W. & M. Twyde); two chicks aged 30 days weighed 22 and 23 g (D. Geddes). No other information.

Fledging to maturity For one pair: parents continued to associate closely with offspring for several days after they began incubating second clutch; young of second brood remained with parents until at least 57 days after hatching (Child & Child 1984). In another observation, young of first brood remained with parents until second clutch hatched, c. 6.5–7 weeks (B.D. Heather). **FLEDGING PERIOD:** for two nests, 27 and 40 days (Child & Child 1984); a chick first seen to fly at 23 days (M.C. Child), two others flying at 30 days (D. Geddes).

Success From Aust. NRS: from 119 eggs, 72 (61%) hatched. In Central Otago, NZ, fledging success varied from 67% in good season to 32% in poor season (Child & Child 1984). Eggs and young taken by feral cats and foxes; nests may fail after human disturbance; nests trampled by stock or run over by vehicles (Vestjens 1973; Maclean 1977; Child & Child 1984; Aust. NRS). Eggs washed away by floods (McGarvie & Templeton 1974; Aust. NRS; B.D. Heather). In NZ, flooding in rivers almost certainly affects timing of breeding; in seasons of repeated flooding, most nests found are destroyed by high river levels and few juveniles seen (B.D. Heather; OSNZ).

PLUMAGES Prepared by A.M. Dunn. Hatch in natal down. Begin pre-juvenile moult at unknown age. Partial post-juvenile moult to immature plumage probably begins soon after fledging. Thereafter, complete second pre-basic moult produces adult plumage; probably first attained when 1 year old. Sexes similar.

Adult Second-basic and all subsequent plumages. **Head and neck** Forehead, lores and central forecrown, black (89); join broad black (89) eye-stripe, which extends from lores to encircle hindneck. White supercilium extends from side of forehead to encircle nape, above black eye-stripe. Crown, brown (28) with dark-brown (121) shafts. **Upperparts** Feathers of mantle and back, dark brown (119A) with buff (123D) to orange-buff (118) fringes that quickly fade or wear. Upper scapulars, maroon (31); lower scapulars, longer, dark brown (119A). Feathers of rump and upper tail-coverts, dark brown (119A) with broad orange-rufous (c132C) fringes. **Underparts** White except for large Y-shaped black breast-band that extends from sides of breast up sides of neck to join black hindneck. **Tail** T1 and t2, black-brown (119) with thin white tips; t3 and t4, black-brown (119) with broad white tips; t5 and t6, mostly white with black-brown (119) restricted to patch on inner web. **Upperwing** Prominent white wing-bar extends across bases of secondaries and tips of greater

secondary coverts. Marginal coverts, mostly dark brown (121) but white outside carpal joint. Lesser secondary coverts, black-brown (121). Median secondary coverts have light grey-brown (119C) outer web, white inner web, and black-brown (119) shaft-streak. Greater secondary coverts, mostly dark brown (c119A) with broad white tips. Secondaries, dark brown (219) with large white bases. Alula and primary coverts, black-brown (119). Primaries, mostly black-brown; p1–p6 have concealed white patches near base of inner web. **Underwing** Marginal and lesser primary and secondary coverts, dark brown (c119A) with white tips forming dark leading-edge to lining, broken outside carpal joint. Median and greater coverts, white. Inner secondaries, mostly white with brown (28) patch near tip of outer web that becomes broader on outer feathers; outer secondaries, mostly brown (28) with large white patch on base of inner web. Primaries, mostly black-brown (19); p1–p6 have white patch near base of inner web, broadest on inner feathers.

Downy young Based on photos (Pringle 1987; unpubl.: B.D. Heather, P.N. Maher) and descriptions from Maclean (1977) and B.D. Heather. **Head and neck** Forehead and crown, orange-buff (118) with black (89) stripe across upper forehead between eyes, and black (89) speckling on crown that becomes heavier towards nape. Upper hindneck, white, bordered below by broad black stripe that extends from behind eyes, encircling lower hindneck; narrowly bordered above by black band across centre of nape. Chin, throat and face below eye-stripe, white. **Upperparts, Wing-pads** Mostly buff (123D) to orange-buff (118) with large black (89) patches on mantle and in centre of back, scattered small black (89) patches elsewhere, and black (89) stripes along edge of back and on edge of wing-pads. **Underparts** White.

Juvenile Differences from adult. **Head and neck** Less boldly patterned than adult. Feathers of forehead and crown, dark brown (22) with buff (123D) fringes; no black centre to forecrown. Supercilium, buff (123D). Eye-stripe, dark-brown (21). Chin and throat, white. **Upperparts** Feathers of mantle, back, and rump and upper tail-coverts, brown (28) with buff (123D) to orange-buff (118) fringes and dark-brown (121) subterminal fringes, so without distinctive maroon stripe of adults. Upper scapulars, brown (28) basally with buff (123D) tips and thin dark-brown (121) bars; longer lower scapulars, mostly brown (28) with thin rufous (40) fringes and thin dark-brown (121) subterminal fringes. **Underparts** Mostly white; feathers where breast-band develops have grey-brown (91) bases, concealed when fresh, slightly exposed when plumage worn, especially on sides of upper breast. **Tail** T1–t3 have orange-buff (118) tips, which fade to buff (123D). **Upperwing** Lesser secondary coverts, dark brown (21) with fine rufous (40) tips. Inner median secondary coverts, light grey-brown (119D) with broad rufous (40) tips and dark-brown (21) subterminal fringe and shaft-streak; outer median secondary coverts, white with brownish-grey (79) base to outer web and rufous (40) wash to tip.

First immature Like adult but breast-band not fully developed and traces of juvenile plumage retained, particularly on forehead, scapulars and median secondary coverts. Juvenile remiges and rectrices retained and may show considerable wear.

BARE PARTS Based on photos (Pringle 1987, unpubl.: B.D. Heather, P.N. Maher) and museum labels (HLW, MV). **Adult** Bill, red (14) with black (89) distal third. Orbital ring, red (14). Iris, black-brown (89). Legs, dull pink (5) to cream (54). **Downy young** Bill, dark grey (83) with small white egg-tooth. Iris, black (89). Legs, dull pink (c5). **Juvenile** Bill, black (89). Orbital ring, salmon (c6). Iris, black (89). Legs, pink-brown (c221D). **First immature** Label data. Bill, dull red with black distal half. Orbital

ring, dull red. Iris, black (89). Legs, dull pink (c5). Probably attain adult coloration of bill and orbital ring in first year.

MOULTS Based on skins of 26 adults (HLW, MV), unless otherwise stated. **Adult post-breeding** Second and subsequent pre-basic; complete. Primaries moult outward. Active moult of primaries between Oct. and Mar. Live adults, Feb., had median primary moult-score of 30 (n=7) (Barter 1991). Timing of body-moult not known; in skins, some feathers moulting all times of year. **Post-juvenile** First pre-basic; partial. Probably begin moult soon after fledging, with moulting immatures seen between Nov. and July (NZRD). Most feathers of body moulted; forehead, scapulars and median secondary coverts moulted last.

MEASUREMENTS (1) Aust., adults, skins (HLW, MV). (2) NZ, adults, skins; methods unknown (NMNZ; measured by F.C. Kinsky).

	MALES	FEMALES	
WING	(1) 111.0 (3.72; 105–119; 13) (2) 107.9 (4.5; 104–117; 6)	112.5 (3.43; 105–117; 13) 110.6 (2.8; 108–115; 6)	ns
8TH P	(1) 78.0 (1.55; 76–80; 6)	79.5 (3.12; 76–84; 8)	ns
TAIL	(1) 53.5 (2.17; 51–57; 15) (2) 53.8 (1.7; 52–56; 6)	53.3 (2.02; 49–57; 14) 54.2 (4.6; 51–62; 6)	ns
BILL	(1) 15.4 (0.66; 14.0–16.2; 15) (2) 15.5 (0.9; 14.5–16.8; 6)	15.4 (0.82; 13.9–16.5; 14) 15.8 (0.9; 14.1–16.6; 6)	ns
TARSUS	(1) 26.1 (1.05; 24.8–28.4; 15) (2) 24.5 (2.2; 20.6–27.2; 6)	26.3 (1.03; 24.8–28.2; 14) 24.6 (0.8; 23.4–25.8; 6)	ns
TOE C	(1) 18.2 (0.78; 17.3–19.9; 10) (2) 17.3 (1.1; 16.1–18.8; 6)	18.2 (1.06; 17.1–20.2; 8) 18.2 (1.4; 17.1–20.9; 6)	ns

(3) NZ, adults, live; methods unknown (M.L. Barlow, M.C. Child, M.D. Dennison, B.D. Heather, H.A. Robertson, W. Twydlle). (4–5) Vic., live (Barter 1991): (4) adults; (5) juveniles (first-years).

	UNSEXED
WING	(3) 109 (3.61; 101–115; 55) (4) 114.6 (2.65; 38) (5) 113.8 (2.42; 11)
TAIL	(3) 52 (3.6; 41–57; 35)
BILL	(3) 15.7 (0.79; 14.0–18.5; 48) (4) 16.1 (0.83; 21) (5) 15.9 (0.68; 4)
BILL W	(3) 5.73 (0.58; 4.8–6.9; 23)
BILL D	(3) 6.14 (0.47; 5.0–6.7; 22)
THL	(3) 37 (2.1; 34–44; 32) (4) 37.6 (1.12; 34) (5) 37.7 (0.72; 12)
TARSUS	(3) 25.1 (1.61; 21.8–29.2; 55) (4) 25.8 (1.44; 6)
TOE C	(3) 18.3 (0.87; 16.7–19.9; 13)

In samples from Vic., WING, BILL and THL were not significantly different between adults and juveniles; wing-lengths of adults were significantly shorter when p10 was worn than when p10 was fresh: 113.8 (2.64; 16) and 115.7 (2.54; 17) respectively (Barter 1991).

WEIGHTS In Aust., unsexed adults, live: 32.3 (3.44; 34): summer, 30.3 (2.72; 16); winter, 33.8 (2.58; 17); weights in summer significantly lighter than in winter; live, unsexed, juveniles and immatures combined, 32.0 (2.30; 12) (Barter 1991).

Adult male, 35 g (MV). In NZ, unsexed adults, live: 33 (3.1; 27–42; 40) (M.L. Barlow, M.C. Child, M.D. Dennison, B.D. Heather, H.A. Robertson, D. Sim, W. Twydlle).

STRUCTURE Wing, long, broad and pointed. Eleven primaries; p10 longest; p9 1–2 mm shorter, p8 1–3, p7 8–11, p6 16–20, p5 23–29, p4 31–35, p3 37–44, p2 42–50, p1 48–54; p11 minute. Fourteen secondaries, including three tertials; tips of longest tertials fall between p6 and p9 on folded wing. Tail, square; 12 rectrices. Bill, short, slender and pointed, half length of head; nasal groove, shallow and two-thirds length of bill; nostril, small and slit-like. Tarsus, smooth, laterally compressed; scales, reticulate but almost fused. Outer toe 74–85% of middle, inner 67–70%; no hind toe; toes, unwebbed.

RECOGNITION Downy young differ from all other wader chicks in HANZAB region in combination of buff forehead, neat black frontal band across forecrown, white underparts, and white band on hindneck broadly bordered black behind.

GEOGRAPHICAL VARIATION None. Often included in *Charadrius*; here treated in monotypic genus *Elseya* following Christian *et al.* (1992). Sibley & Monroe, in error, reported that allozymes indicated closely related to lapwings (Vanellinae).

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Volume 2, Plate 67

Hooded Plover *Thinornis rubricollis* (page 902)

1 Adult; 2 Downy young; 3 Juvenile in fresh plumage with down remaining on head; 4 Juvenile in worn plumage; 5, 6 Adult

Red-kneed Dotterel *Erythronyx cinctus* (page 928)

7, 8 Adult; 9 Downy young; 10 Juvenile in fresh plumage; 11 Immature in post-juvenile moult; 12, 13 Adult

Black-fronted Plover *Elseya melanops* (page 892)

14, 15 Adult; 16 Downy young; 17 Juvenile; 18, 19 Adult