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## Order GRUIFORMES

Diverse assemblage of small to very large wading and terrestrial birds. Morphologically diverse, with few unifying characters within the Order. Anatomical details are summarized by Sibley & Ahlquist (1990). Possibly polyphyletic, though DNA comparisons indicate that the Order is monophyletic, composed of highly divergent groups that are more closely related to one another than to members of any other order (Sibley & Ahlquist 1990). The boundaries of the Order and relationships with other Orders and between families in this Order are uncertain (Sibley 1960; Sibley & Ahlquist 1972, 1990; Cracraft 1973; G.F. van Tets).

Peters, Wetmore (1960) and Storer (1971) recognized 12 families: Eurypygidae (monotypic Sun-bittern of tropical America); Otididae (bustards); Gruidae (cranes); Heliornithidae (finfoots of tropical Old and New World; three monotypic species); Aramididae (monotypic Limpkin of tropical and subtropical America); Psophiidae (trumpeters of tropical America; three species in single genus); Cariamidae (seriemas of central S. America; two monotypic genera); Rhynochetidae (monotypic Kagu of New Caledonia); Rallidae (crakes and rails); Mesitornithidae (mesites of Madagascar; three species in two genera); Pedionomidae (monotypic Plains-wanderer of Aust.); and Turnicidae (button-quails).

The Plains-wanderer is now recognized as being a charadriiform on evidence of morphology (Olson & Steadman 1981) and DNA-DNA hybridization (Sibley *et al.* 1988). Sibley *et al.* (1988) and Sibley & Ahlquist (1990) placed the Turnicidae in a separate Order, the Turniciformes *incertae sedis* (which we follow here; q.v.) and included Aramididae within the Heliornithidae but otherwise retained a similar arrangement of families. The Mesitornithidae, Rhynochetidae and Otididae have also been regarded as separate Orders.

Only Gruidae, Rallidae and Otididae occur in our region; other families are not considered further here.

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## Family RALLIDAE rails, crakes and gallinules

A group of small to medium-sized (12–65 cm long), generally slender, terrestrial birds, usually of wetlands, often very secretive and skulking. Almost cosmopolitan, not occurring in polar regions and waterless deserts. In our region, 17 breeding species in 11 genera, five accidentals (one doubtful) and three extinct. Relation to other Gruiformes not fully resolved; skeletal morphology suggests close alliance to Psophiidae (trumpeters) and Heliornithidae (sungrebes) (Cracraft 1973); Aramididae, Eurypygididae and Cariamididae of S. America, and Rhynochetidae of New Caledonia and the extinct Aptornithidae of NZ also closely related; some or all of these families could be included as sub-families in Rallidae (G.F. van Tets). DNA–DNA hybridization evidence shows Rallidae form a distinct cluster separate from cranes and their allies (Sibley & Ahlquist 1990). Olson (1973b) recognized two sub-families: the monotypic Himantornithinae and the Rallinae, with Himantornithinae intermediate between Rallinae and Psophiidae. The Jacanidae (Charadriiformes; q.v.) may be derived as aquatic specialists from *Gallinula*-like stock and more appropriately placed within the Rallidae (G.F. van Tets).

Arrangements within the Rallidae have varied: Peters recognized 52 genera; Thomson (1964), 45; Olson (1973b), 35; Ripley (1977) 17; BWP, 32–39; Campbell & Lack (1985), 18; and Sibley & Ahlquist (1990) 34 (142 species). Rallidae vary anatomically in relation to diet and habitat. Olson (1973b) suggested they evolved from terrestrial to aquatic but admits evolution may have occurred several times. For practical purposes, broad division often made into (1) rails, crakes and wood-rails, most of which are terrestrial (in HANZAB region: *Rallina*, *Gallirallus*, *Dryolimnas*, *Porzana*, *Eulabeornis*, *Crex*); and (2) coots and gallinules (including swamphens, native-hens and waterhens), which tend to be more aquatic (in HANZAB region: *Amauromis*, *Gallinula*, *Porphyrio*, *Fulica*, *Gallicrex*). The affinities of the genera and, in brackets, the number of volant and flightless species recorded in HANZAB region given below. *Rallina* (2, 0): one species occurring Aust. and New Guinea and another vagrant to Aust.; close relatives are *Canirallus* and *Sarothrura* of Africa, *Mentocrex* of Madagascar and *Rallacula* of New Guinea (Olson 1973b). *Gallirallus* (1, 4): widespread in Indo-Pacific region; one or more species of volant *Gallirallus* are thought to be ancestral to several insular species in the sw. Pacific, including *lafresnayanus* of New Caledonia and *sylvestris* of Lord Howe I. (Olson 1973b; Fullagar & Disney 1981; Schodde & de Naurois 1982; Diamond 1991). *Dryolimnas* (1, 0): one species (*pectoralis*) occurring Aust. and Auckland Is; closely related to *Gallirallus* and *Rallus*; *pectoralis* often placed in *Rallus*. *Amauromis* (1, 0): one species occurring Aust., New Guinea, Philippines and Moluccas. *Porzana* (5, 0): worldwide, with four species native to our region and one vagrant; we follow Mees (1982) by including *Poliolimnas* in *Porzana*; Olson (1973b) thought *Porzana* may have evolved from *Amauromis*. *Eulabeornis* (1, 0) endemic to n. Aust. and Aru Is, and according to Olson (1973b), an allopatric close relative of *Habroptila* (1, 1) of Wallacea and New Guinea. *Crex* (1, 0) breeds in Eurasia and migrates S, mainly to Africa; vagrant to Aust. and, doubtfully, to NZ. *Gallicrex* (1, 0): vagrant from se. Asia to Christmas I. (Ind.); may also have derived from *Amauromis*. *Gallinula* (2, 1) worldwide distribution, with three species in our area; also an *Amauromis* derivative; sub-genus *Tribonyx* is endemic to Aust. with a fossil record going back to Pliocene (Olson 1975); differ from *Gallinula* in broad bill, long tail and short toes. *Porphyrio* (2, 2) appears to be a *Gallinula* derivative, with sub-genus *Porphyryula* intermediate in shape and plumage between *Gallinula* and nominate *Porphyrio* of Africa, Asia and Aust.; the sub-genus *Notornis* of Lord Howe I. and NZ consists of obvious derivatives of the nominate, but are terrestrial with an exceptionally deep bill and short toes. *Fulica* (1, 0): worldwide distribution, with one species in our region, and two flightless extinct species in NZ; probably derived from *Gallinula*-like stock (Olson 1973b).

Bodies, short, often laterally compressed for ease of movement in dense vegetation. Neck, short or moderately long; 14–15 cervical vertebrae. Males, often slightly larger than females. Wings, short, broad, rounded; in volant species, flight appears low, weak and generally not sustained though some species capable of long-distance movements, occurring on or colonizing oceanic islands (e.g. Purple Gallinule *Porphyrio martinica*, Watercock *Gallicrex cinerea* in HANZAB region). Some island species are flightless, yet many others migrate or disperse over long distances. In HANZAB region, all species have 11 primaries (p11 minute) and 10–12 secondaries; in Family, 10–20 secondaries, smaller species have ten and some flightless species have fewer primaries (BWP); diastataxic. Short sharp curved claw on alula. Tail, short, square to rounded, soft; often raised or flicked up to signal colours of under tail-coverts; normally 12 (6–16) rectrices. Bill varies: often rather slender, straight and slightly longer than head, and in some species, slightly decurved; or quite short and laterally compressed (crakes, most gallinules, coots); or massive and laterally compressed (some species of *Porphyrio*). Gallinules and coots have smooth, plate-like horny frontal shield (continuous with ramphotheca) on forehead. Nostrils usually in large depression (not in *Porphyrio*), pervious and perforate in some species. Sense of smell said to be well developed (Ripley 1977). Legs, well developed, usually strong, long to quite short, often laterally compressed. Toes, long and slender but may be rather short and heavy; hind toe, large, slightly raised. In most gallinules (not native-hens *Gallinula*, Takahe *Porphyrio mantelli* and White Gallinule *P. alba*) and some crakes, toes greatly elongated and legs modified for walking on floating vegetation; in coots, toes have enlarged lateral lobes to aid swimming, and pelvis and legs modified for diving. All species can swim; dive easily and can sink, using wings under water if necessary. Many species climb easily among thick vegetation; downy young of some (and

possibly adults) use wing-claw to assist climbing. Oil-gland bi-lobed, feathered in most species. Caeca, long. Syrinx, simple; tracho-bronchial. Feathers, fairly loose and soft, frayed and even hair-like in some; small after-feather usual.

Plumage, generally sombre browns, chestnut, black, or greys; iridescent purplish-blue and green in *Porphyrio*. Barring on flanks common. Vent and under tail-coverts may contrast with rest of plumage. Upperparts, spotted, barred, streaked, or plain. Bare parts often brightly coloured and forehead shield conspicuous. Sexes usually similar or nearly so (except in *Sarothrura* and *Gallixrex*). Pre-breeding moults restricted or absent, with no seasonal changes in appearance (except in *Gallixrex*) but colours of bare parts change in some species, coinciding with moults. Post-breeding moult, complete. Remiges may be moulted irregularly, or simultaneously, with consequent flightless period. Post-juvenile moult partial; can be followed by partial pre-alternate moult or by complete second pre-basic. Young, downy, and unlike other precocial birds, black (sometimes iridescent) or dark brown, which may be an adaptation for hiding in dense vegetation; evidently a derived condition (Olson 1973b). In some species, downy young have brightly coloured bills or skin on head or both, which may function for signalling (Fjeldså 1977). Downy young of *Gallinula*, *Porphyrio* and *Fulica* also have white or yellow terminal bristles on down. Post-natal development slower than in some other precocial birds, such as Galliformes and Turniciformes, with initial emphasis on development of legs and feet and not wings; flight-feathers develop last. Juveniles generally similar to but duller than adults.

Numerous flightless forms; incidence of flightlessness perhaps greater than in any other group except ratites and penguins. Flightlessness has evolved many times within the Rallidae, often and repeatedly on islands without predators and probably independently each time; appears to evolve rapidly and so probably of little phylogenetic significance above the level of species (Olson 1973a). Selection reduces flight-muscle and pectoral girdle, possibly through neoteny (Olson 1973a); usually corresponding increase in development of leg muscles. Frequency of flightlessness suggests that rails are predisposed to it; they are certainly pre-adapted for coping with some of the restrictions it imposes: many volant species are behaviourally flightless, e.g. avoiding predators by running away; many are temporarily flightless during wing-moult (a feature shared with several other groups containing flightless forms), when secretive and elusive; and post-natal development of flight is slow. In many species, populations of insular flightless species exterminated by introduced predators (e.g. Chatham Island Rail *Gallirallus modestus*, Dieffenbach's Rail *Gallirallus dieffenbachi*). Subfossils from our region have been reviewed (Olson 1977) and include flightless and often large species of coot, waterhen, rail and wood-rail and the distinctive snipe-rail *Capellirallus*. For discussion of biogeography of *Gallirallus* see Olson (1973b), Fullagar *et al.* (1982), Schodde & de Naurois (1982), and Diamond (1991).

Most inhabit all sorts of terrestrial, estuarine and littoral wetlands, from sea-level to mountain highlands. Some genera found in lowland and montane forests; others in wet grasslands; still others, e.g. Takahe *Porphyrio mantelli*, *Crex*, tussock grasslands, hay-fields and similar places, not necessarily with wet areas. Some species migratory; many dispersive; others apparently sedentary. Patterns of movements in HANZAB region generally not known, perhaps because they appear to take place at night and perhaps because the birds are so secretive and silent when not breeding that absences may be more supposed than real. Gallinules and coots appear to be more sedentary than crakes and rails, though at least the Black-tailed Native-hen *Gallinula ventralis* is notably irruptive, in response to floods and droughts of inland Aust.

Omnivorous, or in some species mostly vegetarian. Species with long thin bills probe for invertebrates in soft ground and litter. Eat all sorts of plants and submerged vegetation, insects, molluscs, crustaceans, eggs and young of other birds, small fish and carrion. Some gallinules graze, e.g. Tasmanian Native-hen *Gallinula mortierii* and coots. Only *Fulica* dives for food; they and *Gallinula* will up-end. Often wash food in water.

Mostly solitary or in small groups, though densities can be very high in some wetlands; *Gallinula* (e.g. Black-tailed Native-hen *Gallinula ventralis*) and *Fulica* form large flocks, especially in winter; after onset of inland droughts, irruptions may involve thousands of birds. Roost solitarily except in species that flock; generally at night on ground in cover; occasionally in bushes and trees. Some species nocturnal or crepuscular. Most species nest solitarily; some strongly territorial, advertising territories with loud persistent calling and chasing of intruders. Dense vegetation and apparently secretive habits make it hard to study social organization and behaviour in most species. Agonistic and sexual behaviour often conspicuous with wing-spreading, tail-flicking, fighting with use of bill and feet and other ritualized features of display. Pair-bond usually monogamous and only for one season but may be sustained. Polygyny known in captivity and suspected in wild, e.g. in *C. crex*; polyandry occurs in Tasmanian Native-hen *Gallinula mortierii* and possibly Weka *Gallirallus australis*. Co-operative breeding in some gallinules, e.g. Dusky Moorhen *Gallinula tenebrosa*. Pair-formation and courtship little known except in some gallinules and coots, in which a variety of chasing, bowing, nibbling, mock-preening and feeding, and courtship feeding takes place; no elaborate ceremonies at time of nest-relief. Copulation and other activities take place out of water or on specially built platforms. Most species very vocal, with screams, trills, whistles, booms, rattles, trumpets, grunts or barks; can be ventriloquial; mostly silent when not breeding but social species have loud rallying cries. Stand at rest (sometimes on one leg) in hunched posture with head sunk on shoulders, or lie down; sleep with head on back and bill among feathers. Bathe in shallow water, alternately ducking head in water and flipping water over back or by beating half-open wings in water; coots may bathe while swimming. Leave water to oil and preen after bathing. Sun themselves after preening. Allopeening common. Scratch head directly. Some species (e.g. *Porphyrio porphyrio*, *P. alba*, *P. mantelli*) recorded manipulating and grasping food in foot or holding down large items with feet.

Breed seasonally and protractedly. Nest fairly deep and cup-shaped; in some rails, domed; in wetlands, often with ramps up to nests. In thick vegetation, often near or on surface of water but some species nest high in trees; use old nests of other birds or nest on ground far from water; materials from any available plants; built by both sexes. Horned Coot *F. cornuta* of S. America builds islands of small stones. Some build nests that float or are attached to aquatic vegetation; nests on water may be built up rapidly if water-level rises. Non-functional nests often found in gallinules and *Gallinula*, which also build nursery nests after young hatch. Eggs, blunt oval; smooth and fairly glossy; dull white to tan ground-colour, blotched and spotted red-brown to black; unspotted in *Rallina*. Clutch-size, 5–10 (1–18) but dump-laying or laying by more than one female in same nest may complicate estimation of size of clutch laid by an individual. Usually one or two broods and replacement layings up to three times. Lay at intervals of 24 or 48 h. Incubation usually by both sexes but in some by female alone or with only small share by male. Incubation period, 14–24 days per egg; start of incubation varies from first to last egg and so hatching synchronic or asynchronic. Egg-shells left in nest or removed. Generally have two large lateral and one small median brood-patches. Young hatch in down, precocial, nidifugous; at first fed bill to bill, becoming self-feeding within few days or not until 8 weeks old. Normally tended by both parents and, in a few species, offspring of previous broods may help to feed young, e.g. *Gallinula*, occasionally *Porphyrio*. Fledging period, 30–60 days (20–70) and then independent except in co-operative breeders. First breeding usually when 1 year old or less.

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*Porzana pusilla* **Baillon's Crake**

COLOUR PLATE FACING PAGE 553

*Rallus pusilla* Pallas, 1776, *Reise versch. Prov. russ. Reichs*, 3: 700 — Dauria, Siberia.*Porzana* is the local (Venetian) Italian name (*sporzana*, *porzana*) for the smaller crakes; the Latin *pusillus* means 'very small', 'paltry'.

OTHER ENGLISH NAMES Lesser Spotted, Pallas's, Tiny, Little, Little Water and Marsh Crake.

NZ Marsh Crake.

This species ranges widely through the Old World and has traditionally been called **Baillon's** after Louis Antoine François Baillon, 1778–1855, who collected the type specimen of *Rallus Bailloni*, Viellot, 1819, a junior name of *R. pusilla intermedia* Hermann, 1804. **Marsh**, though traditional in Aust. and NZ, is not definitive.POLYTYPIC Nominate *pusilla* and several other subspecies extralimital in Europe, Africa, Madagascar, Asia to New Guinea; *palustris* Gould, 1842, e. New Guinea, Aust. and Tas.; *affinis* (J.E. Gray, 1846), NZ and Chatham Is.**FIELD IDENTIFICATION** Length: 15–18 cm; wingspan 23–25 cm; weight: 30 g. Smallest rail in HANZAB area; noticeably smaller and slimmer than Australian *Porzana fluminea* or Spotted *P. tabuensis* Crakes. Combination of small size, rich cinnamon-brown upperparts contrasting with pale-grey underbody and boldly barred flanks and under tail-coverts, diagnostic. Sexes similar; some males distinguishable on plumage. No seasonal variation. Juvenile separable.**Description** **Adult male** Crown, nape, hindneck and centre of forehead, rich cinnamon-brown, indistinctly streaked blackish, more boldly when worn. Supercilium, face and foreneck, light grey, some with varying pale area on chin or throat or both; many have cinnamon-brown on lores and ear-coverts and a few show distinct narrow cinnamon-brown eye-stripe from bill to rear ear-coverts. Rest of upperbody, rich cinnamon-brown, streaked black and heavily spotted and streaked white on mantle, back, scapulars and tertials; rump and upper tail-coverts seldom spotted white, and tail unmarked; white markings bordered and sometimes speckled with black. Inner wing-coverts, mostly rich cinnamon-brown with white tips to median and greater-coverts (bordered black as rest of upperparts); dark-brown primary coverts and remiges; outermost primary has white leading-edge, sometimes visible in flight. Sides of neck, breast and fore-flanks, rich cinnamon-brown. Belly, white. Rest of flanks, thighs, vent and under tail-coverts barred black-and-white. Underwing, light grey, coverts broadly tipped white. Bill usually green with dark-grey culmen and tip; in darkest, dark-grey tinged olive on sides and more yellow at base. Iris, bright red. Legs and feet, olive-yellow to olive. **Adult female** As male, except upperparts slightly duller brown, with more olive tinge; at least trace of eye-stripe, and majority show well-marked cinnamon-brown eye-stripe; pale patch on chin and throat varies as in male but always present. **Juvenile** Upperparts as adult, but supercilium, face and sides of neck, light to buffish brown or light grey to whitish, and paler than adult. Chin and upper throat, white. Sides of throat and foreneck, uniform buffish-brown as face, grading to white centrally; or these areas and breast, white, heavily mottled dark brown. Belly and centre of lower breast, white. Rest of flanks and thighs unevenly barred grey-black and white; under tail-coverts barred black-and-white as adult. Bare parts, brown at first; adult colours attained before post-juvenile moult begins.**Similar species** **Australian Crake** (q.v.).

Singly or in pairs in aquatic vegetation in wetlands. Secretive but not shy, though nervous; periodically dash for cover for no obvious reason, though soon re-emerge; less difficult to flush than other crakes. Pass easily between reeds, run on aquatic vegetation that grows on or just below water surface, and climb in vegetation. Prefer to forage on floating vegetation, sometimes in open. Gait on land or floating vegetation a slow stalking walk and sudden crouching run, with tail held erect and constantly flicked; when disturbed on floating vegetation, scuttle madly as plants sink gradually beneath weight; sometimes run or rest on branches of waterside trees; swim readily and dive. Flight over short distances weak and fluttering on short rounded wings, with legs dangling; on longer flights, stronger, with feet trailing and wings beaten much more rapidly than Australian Crake. Voice a harsh krek-krek or ratchet-like creak, like fingernail being drawn against tooth of comb. Generally less vocal than other small crakes.

**HABITAT** Vegetated, permanent to ephemeral terrestrial and coastal wetlands; waters usually fresh or brackish; also saline: marshes, swamps, peat bogs, billabongs, swampy creeks and rivers, lakes and reservoirs, temporarily inundated depressions and marshy artificial wetlands, all of which may be subject to fluctuating water-levels. Wetlands usually have dense vegetation, often with abundant floating plants, but also occur in open waters with clumped vegetation (Barlow & Sutton 1975; Mason & Wolfe 1975; Ogle & Cheyne 1981; Moore 1983); in NZ, small stands of emergent vegetation may be used seasonally (Kaufmann 1987). Occasionally on saltmarsh, especially in NZ; in Nelson and Marlborough Sounds, only found in saltmarsh (Elliott 1989), and all records at Waimea Inlet are of birds on mudflats, round tidal creeks or in saltmarsh (Owen & Sell 1985; CSN); also recorded in swampy ponds round sand dunes (Kaufmann 1987; CSN 19). In sw. WA, most often found in brackish wetlands (1–3 ppt mean Sept. salinity); few records in acidic wetlands (Goodsell 1990; R.P. Jaensch). May prefer wetlands subject to fluctuating water-levels (Bryant 1942; Moore 1983). Occur on floating vegetation in deep water (R.P. Jaensch).

Breed in clumps and tussocks on edge of wetlands (Bryant &amp; Amos 1949; Hobbs 1967; Kaufmann 1987; Aust. NRS); in floating vegetation, including ribbon weed (Bright &amp; Taysom 1932;

Bryant 1942); and short sedge, well out in swamp (R.P. Jaensch). Forage on mud in and next to reeds and other fringing vegetation. Also feed while wading in either clear water or water covered with *Azolla* and other floating vegetation to a depth of c. 3 cm (Barlow & Sutton 1975; Mason & Wolfe 1975; Moore 1983). Roost or loaf on floating vegetation or perched just above water, on branches of trees or on stumps (Bryant 1942; Mason & Wolfe 1975; Vic. Bird Rep. 1981). Once recorded roosting on ledge of city building (Tas. Bird Rep. 12).

Reclamation of wetlands has decreased available habitat (Owen & Sell 1985). Occasionally recorded in artificial habitats, including wetlands such as ricefields (NSW Bird Rep. 1989), reservoirs and farm dams (NSW Bird Reps 1976, 1977, 1983), sewage ponds and saltworks (Watson 1955; Doughty 1977; NSW Bird Reps., Vic. Bird Rep 1985), bore-overflows (J.M. Peter; J.R. Starks) and drains (Vic. Bird Rep. 1972); in grassed or vegetated areas including parks, gardens, golf courses and airfields (NSW Bird Reps 1980, 1972; CSN 19, 24). Sometimes collide with artificial structures such as lighthouses, bridges and buildings (Stokes 1983; CSN).

**DISTRIBUTION AND POPULATION** Through n. Africa from n. Mauritania to Egypt; s. Africa, S of Uganda and Angola; Madagascar; scattered in w. Europe from Iberian Pen., N to Holland and E to Greece; widespread from w. Ukraine and Russia, N to upper Ob R., through Mongolia to ne. and e. China; Korea and Japan; Persian Gulf; from lower Himalayas, throughout Indian subcontinent, E to Burma, Indochina, Malay Pen. and Wallacea, Aust. and NZ.

**Aust.** Mainly in e., se. and sw. mainland. **Qld** Sporadic N of 20°S, irregularly reported on islands of Torres Str., Proserpine and Mt Isa (Horton 1975; Draffan *et al.* 1983; Stokes 1983; Ingram *et al.* 1986; Aust. Atlas; Aust. NRS; Qld Bird Reps). In s. and central regions, scattered mainly S of 24°S, and W to Tambo and Eulo (Aust. Atlas; J.M. Peter). **NSW** Widespread in all regions, in E generally W to 148°E, and in S, N to 32°S (Aust. Atlas; NSW Bird Reps); few records in Upper and Lower Western regions (Aust. Atlas; NSW Bird Reps 1974, 1981). **Vic.** Widespread in suitable habitats; mainly S of 37°S; sparsely spread in

Wimmera, and n. and ne. regions (Vic. Atlas). **Tas.** Rarely reported (Aust. Atlas); single, unconfirmed breeding record on King I. (Campbell). Possibly more frequently observed in the past (Littler 1910; Bryant 1942). **SA** Several records in L. Eyre drainage basin (Cox & Pedler 1977; Aust. Atlas); mainly in S from Mt Gambier, N to c. 34°S; also s. Eyre Pen. (Cox 1973; Aust. Atlas; SA Bird Rep. 1970–71). **WA** Recorded at Eyre Bird Observatory: single, Sept. 1981; single, Sept.–Oct. 1985 (Congreve 1982; Dymond 1988). In SW, from Shark L. NR to Crackers Swamp (Jaensch *et al.* 1988; Aust. NRS). Also Murchison R. district (Sedgwick 1949; Aust. Atlas) and Maitland R., Pilbara region (Aust. Atlas). Widespread in Kimberley Division from Leemington Outstation, S to Dragon Tree Soak, and E to L. Argyle (Storr 1980; Aust. Atlas). **NT** First records: 15–20, Kapalga, July 1974 (Mason & Wolfe 1975); about five, Holmes Jungle, Sept. 1974, Sept. 1984; two, Fogg Dam, Aug. 1987; Cobourg Pen. (Mason & Wolfe 1975; Thompson & Goodfellow in prep.); single, Alice Springs, 17 Dec. 1978 (Roberts 1988).

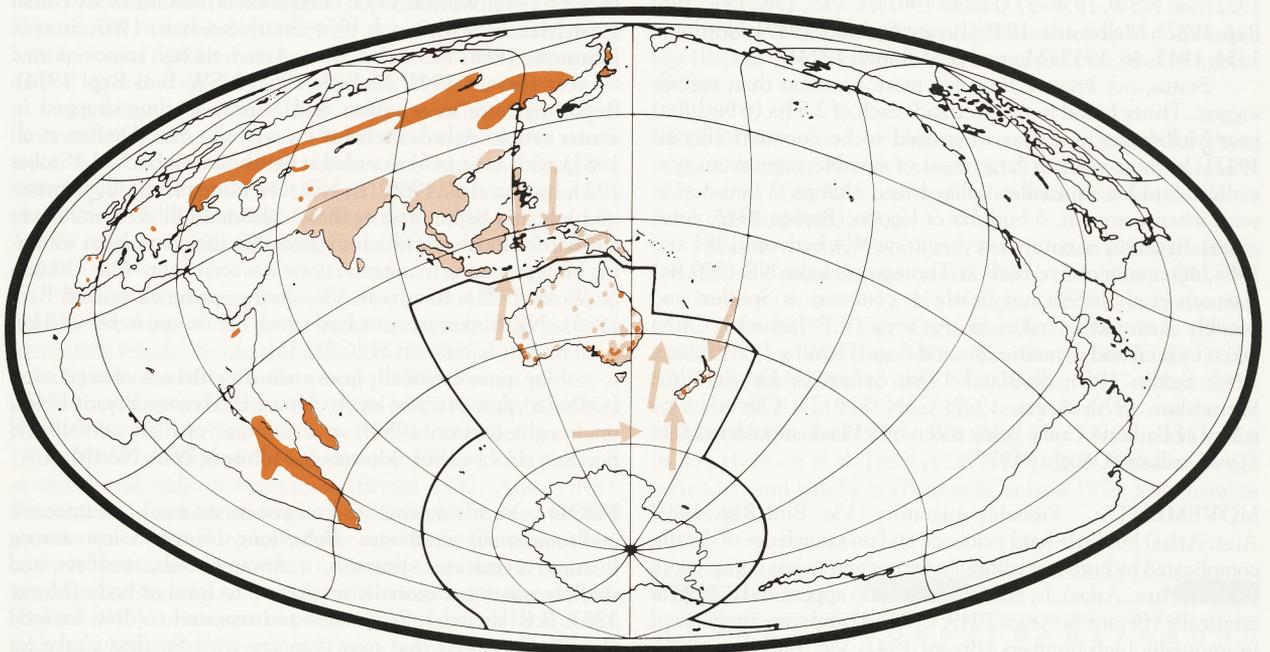
**NZ** Probably widespread throughout NI and SI, though not often reported; scattered records, including Stewart I. (Elliott 1989; Oliver; NZ Atlas; CSN). Once recorded Little Barrier I. (Oliver 1922).

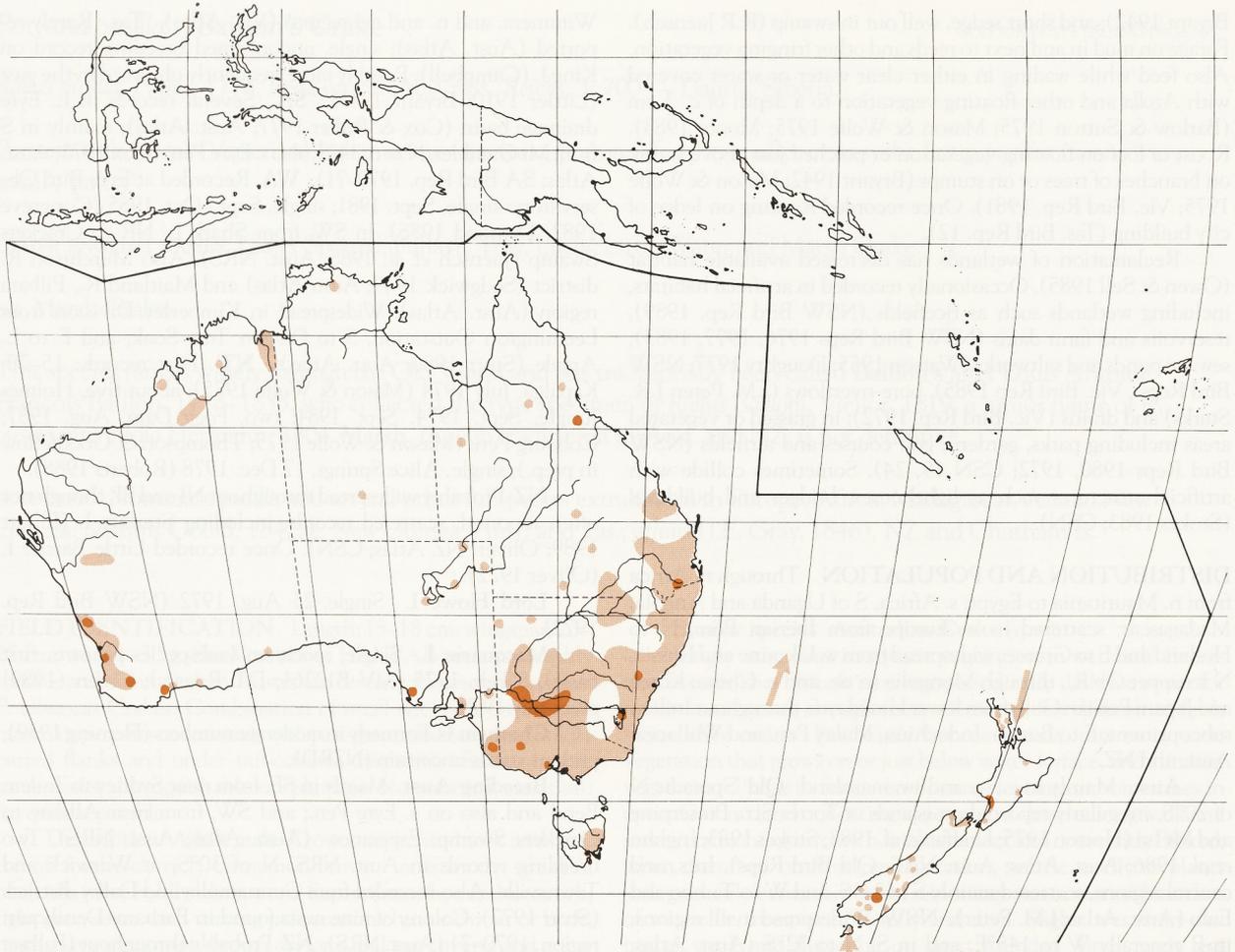
**Lord Howe I.** Single, 25 Aug. 1972 (NSW Bird Rep. 1972).

**Macquarie I.** Single, specimen (subspecies *palustris*, first basic), 8 Feb. 1975 (MV B12261; D.I. Rogers); Green (1989) gives July 1975.

**Chatham Is** Formerly in moderate numbers (Fleming 1939); present status uncertain (NZRD).

**Breeding Aust.** Mainly in SE, from near Sydney to Taillem Bend and also on s. Eyre Pen.; and SW, from near Albany to Crackers Swamp; Esperance (Aust. Atlas; Aust. NRS). Two breeding records in Aust. NRS, N of 30°S, at Warwick and Townsville. Also recorded from Cunnamulla and Dalby districts (Storr 1977). Colony of nine nests found in Barham–Deniliquin region, 1970–71 (Aust. NRS). **NZ** Probably throughout (Falla *et al.* 1981); recorded Pukepuke Lagoon (86 ha), two nests, Oct., Dec. 1982 (Kaufmann & Lavers 1987); Athol, Southland, single nest, Nov. 1974 (Barlow & Sutton 1975).





Large numbers sometimes recorded after good rains: Armidale region, 1971 (Gosper 1973); Moree district, about 1922 (Morse 1922); sw. NSW, 1956–57 (Hobbs 1961); s. Vic., 1982 (Vic. Bird Rep. 1982); Melbourne, 1948 (Bryant & Amos 1949); Northam, 1934, 1945–46, 1955 (Masters & Milhinch 1974).

Status, not known. Probably more common than records suggest. Thirty found in two wetlands each of 2.5 ha (6 birds/ha) near Melbourne in a year when said to be common (Bryant 1942). In most years in large areas of suitable vegetation, normally 1 bird/ha; in smaller isolated reed clumps, 2 birds/ha; in years when common, 6 birds/ha of lagoon (Bryant 1942; Aust. Atlas). In survey of nature reserves in sw. WA between 1981 and 1988, maximum of five birds at Thompson's Lake NR (509 ha) (Jaensch *et al.* 1988); not nearly as common as Spotless and possibly Australian Crakes in this area (R.P. Jaensch). Often taken by feral and domestic cats and dogs (Fleming 1939; Bryant 1942; Sefton 1958; Sharland 1958; Sefton & Devitt 1962; Westerskov 1970; Anon. 1977; CSN 5–8, 23; Oliver). One record of Baillon's Crake being eaten by a Black-shouldered Kite *Elanus axillaris* (Doughty 1977).

**MOVEMENTS** Probably migratory (Vic. Bird Rep. 1985; Aust. Atlas) but little hard evidence and no knowledge of details; complicated by birds not calling in winter and so less conspicuous (Oliver; Aust. Atlas). In NZ and Aust., also appear and disappear erratically (Bryant & Amos 1949; CSN 19) and sometimes occur in unusually high numbers (Bryant 1942; Vic. Bird Reps 1982,

1986–87; NSW Bird Rep. 1984).

**Aust.** Generally disappear from s. part of range, Apr.–Sept. (Bryant 1942; Watson 1955; Hindwood & McGill 1958; Lamm 1964; Masters & Milhinch 1974; Smith & Chafer 1987; Storr & Johnstone 1988; Vic. Atlas; Aust. Atlas), though some reported all year (Bryant 1942; McEvey 1965; NSW Bird Rep. 1974). Reporting rates in se. Aust. and Murray–Darling dropped in winter (Aust. Atlas). Probably cross Torres Str. (Draffan *et al.* 1983), with a few (<6) recorded at lighthouse on Booby I. (Stokes 1983; Ingram *et al.* 1986). In NT, seen quite plentifully between mid-July and Sept.; most of those collected July were immature and carried much fat, which suggests that they have been wintering birds preparing to migrate; none was seen Sept.–Mar. (Mason & Wolfe 1975). Return n. Vic. during spring (Vic. Bird Rep. 1985). **NZ** Unknown; one bird struck lighthouse in Feb., 18 km from nearest habitat on SI (CSN 35).

May move erratically from areas after dieback of vegetation (CSN 28), drop of water-levels (Moore 1983 *contra* Bryant 1942), or drought (Sefton 1958), or into areas of high rainfall and flooding (Hobbs 1961; Masters & Milhinch 1974; North).

**FOOD** Mostly aquatic insects, also seeds, snails, crustaceans, and some small vertebrates. **Behaviour** Diurnal. Glean among floating vegetation, saltmarsh, freshwater reeds, mudflats, and shallow water, occasionally wading up to level of body (Moore 1983; R.P. Jaensch). Swim well and reported to dive for food (BWP). Suggested that may compete with Spotless Crake for

food (Ripley 1977), but forage in different areas (R.P. Jaensch) and confirmation needed.

**Adult** No detailed studies. Plants: seeds (Moore 1983; Lea & Gray; Oliver); Cyperaceae: *Carex* (Barker & Vestjens). Animals: molluscs (Oliver): very small shells (Lea & Gray); freshwater shells (North; Barker & Vestjens). Crustaceans: copepods (Barker & Vestjens). Insects (Moore 1983; Lea & Gray; Oliver; WAM): larv. (Vestjens 1972); Odonata: *Xanthocnemis* ad. (Moore 1983); Hemiptera: belastomatids (Barker & Vestjens); Coleoptera (Lea & Gray): Hydrophilidae (North; Barker & Vestjens); Diptera: Drosophilidae (CSN 22). Small bones (Lea & Gray); sand (North); stones (WAM).

**Young, Intake** No data.

**SOCIAL ORGANIZATION** Very little known; some detail on n. hemisphere subspecies in BWP, but considered to be least known of all Rallidae. Usually solitary, in pairs, or family groups (Lamm 1964; Cayley 1972; Tronson & Tronson 1989; R. Lavers).

**Bonds** Probably monogamous; duration unknown. On returning to breeding grounds birds appear to concentrate, then disperse, possibly moving to nest-sites as soon as paired (Bryant 1942). **Parental care** In NZ, both parents incubate (Kaufmann & Lavers 1987), but in Aust. claimed that male rarely approaches nest (Bryant 1942). Both parents feed young (Aust. NRS).

**Breeding dispersion** Solitary pairs. No information on breeding density (see Distribution and Population).

**Roosting** Usually feed during day; may be active at night (Moore 1983; North). Observed roosting on platform-like vegetation with White-browed Crakes *Porzana cinereus* and Buff-banded Rails *Gallirallus philippensis* (Mason & Wolfe 1975). Often rest and preen on vantage points, e.g. branches, stumps above water (Bryant 1942). Male seen resting beside incubating female (Kaufmann & Lavers 1987). Immatures sometimes roost on floating platforms of grass (Mason & Wolfe 1975).

**SOCIAL BEHAVIOUR** Very little known; some information for NZ in Kaufmann & Lavers (1987); extralimital information in BWP. Shy, secretive (Lamm 1964); will forage in open, remaining near dense vegetation (P.J. Higgins); reported nesting near human habitation (D'Ombra 1905). Preen chest with bill, scratch neck with foot, and fluff feathers vigorously (Moore 1983). **STRETCH:** extend leg and wing on one side (Moore 1983).

**Agonistic behaviour** Loud calling possibly territorial in function (Kaufmann & Lavers 1987). **Alarm** Adult first stands erect, then takes to cover; sometimes flies and runs along low branches; dives (Bryant 1942; Moore 1983; North); occasionally gives Alarm Call (Hobbs 1967). Often flick tail, as in other rails. Timid; seem to avoid Spotless Crake (Howard 1962; Moore 1983).

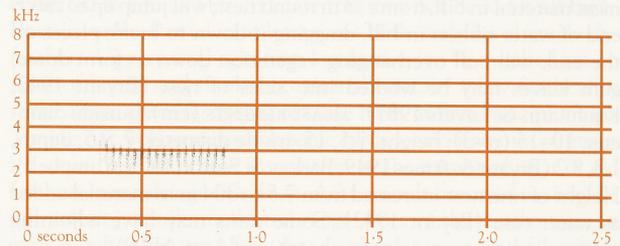
**Sexual behaviour** Before change-over, male rests, occasionally breaking off pieces of sedge and presenting them to incubating female (Kaufmann & Lavers 1987).

**Relations within family group** Chicks remain in nest at least 24 h; young swim, and climb (Aust. NRS). Both parents feed chicks; observed feeding chicks with food obtained in water (Aust. NRS). **Anti-predator responses of young** Leave nest, run or swim, and hide in vegetation (Bryant 1942; Aust. NRS). **Parental anti-predator strategies** Incubating bird leaves nest and retreats, quietly returning later. After eggs hatch, adult less willing to leave and more determined to defend nest; attack finger of intruders threatening nest; charge with wings uplifted, and pecks (Bryant 1942). **DISTRACTION DISPLAY:** adult ran with head down, body hunched, tail depressed, and one or both wings slightly open

and drooped; ran from nest to cover, but repeatedly left shelter to run about in water, splashing conspicuously; occasionally called before leaving cover; similar to distraction display of Spotless Crake (Hobbs 1967; Kaufmann & Lavers 1987). Adult returns to nest after disturbance with creeping action, using available cover (Barlow & Sutton 1975); approach to nest can involve hops, short swims (Kaufmann 1987).

**VOICE** The little information in HANZAB area broadly consistent with account in BWP, which is based on more information and includes sonagram. A ratchet-like call and various shorter calls, made mainly at night (Frith 1969); said to be generally silent by day (NZRD). Ratchet-like call made only by male (BWP). Individual differences and regional variation, not known. Silent in comparison with Spotless Crake (Moore 1983) and Australian and White-browed Crakes (R.P. Jaensch). **Non-vocal sounds** Splashing of water as bird runs during distraction display, in contrast to usual quiet motion (Hobbs 1967).

**Adult** (1) **RATCHET CALL** (sonagram A): loud; many short notes, reminiscent of fingernail being drawn rapidly along teeth of a comb (Kaufmann & Lavers 1987). Various described as purring, whirring or trilling (Fletcher 1913; Bryant 1942; Falla *et al.* 1981; Frith 1969). A territorial call, given only by male (BWP). (2) **KREK-KREK CALL** (Bryant 1942): given in alarm (Hobbs 1967). **Other calls** Grunts (Fletcher 1913); clicking calls during distraction display (Hobbs 1967); soft whining and sharp querulous cry when harassed (Bryant 1942); high-pitched call in flight (Frith 1969).

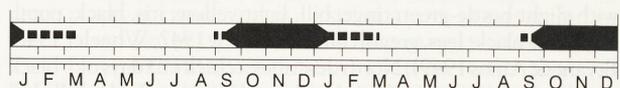


A NZ Wildl. Service; L. Alexandrina, NZ, Nov. 1979; P36

**Young** Squeaks and tapping from chick still in unbroken egg (Bryant 1942); cry from chick as it fell over stick (Fletcher 1913).

**BREEDING** No major studies; 19 records in Aust. NRS. Breed in pairs, solitarily. Few nests found in NZ; in Aust., mainly in S; only record N of 30°S is fledgeling with adult at Townsville, 21 Feb. (Qld Bird Rep. 1990).

**Season** Laying, Sept.–Jan.; Feb. in unusually wet seasons (North), one record of eggs in mid-Mar. (Aust. NRS). **Qld** Oct. in s. interior (Storr 1984). **NSW** Eggs, Dec. and Jan., also mid-Mar. (Aust. NRS). **Vic.** Eggs, mid-Oct. to late Dec. (Bryant 1942; Wheeler 1948; Aust. NRS). **Tas.** Oct. to Jan. (Littler 1910). **SA** Eggs, early Sept. to early Nov. (Sutton 1927; Reese 1932; Condon & Rix 1936); breeding, early Nov. to mid-Jan. at Naracoorte (Attiwill 1972). **WA** Eggs, Sept.–Nov., small young in Jan. (Jaensch *et al.* 1988; Aust. NRS). **NZ** Nests with eggs, early Oct. and late Nov. (Barlow & Sutton 1975; Kaufmann & Lavers 1987).



**Site** In thick vegetation in shallow water, usually within 20 m of edge of swamps, flooded lake beds, drainage channels bordering rice fields, in samphire in s. Aust. (Sutton 1927; Bryant 1942; Aust. NRS; North); one clutch in WA observed in small, low shrub, in open, with some fine sedge <0.3 m (R.P. Jaensch); in grass tussock, canegrass *Eragrostis australasica*, beardgrass *Polypogon*, rushes *Juncus*, reeds *Typha*, in dead thistle or lucerne bush in recently flooded lake bed (Sutton 1927; Bryant 1942; Bryant & Amos 1949; Aust. NRS; North); one nest floating on aquatic vegetation (Aust. NRS). Often have two small entrances through vegetation leading to nest (Campbell). Height of nest above water (cm): 16 (16; 4–60; 12); depth below top of vegetation: 48 (41; 0–140; 9) (Aust. NRS).

**Nest, Materials** Shallow cup or platform with or without hood (Wheeler 1948; Bryant & Amos 1949; Aust. NRS); hood may be constructed when little cover available above nest, e.g. in recently flooded lake (Aust. NRS), in samphire bush (Condon & Rix 1936), or when vegetation parted and arranged to allow easy viewing (Bryant 1942); nests flimsy in comparison to those of other crakes (R.P. Jaensch). Nest constructed out of dry rushes, grass or water-weed, e.g. water ribbon *Triglochin procera*, lined with smaller and softer portions of same material (Barlow & Sutton 1975; Aust. NRS; Campbell). Material cut or broken into short 1.5–2 cm lengths (Kaufmann & Lavers 1987), c. 30 cm lengths or shorter for base (Bryant 1942); loosely crossed or wound round to form nest. Material added during incubation, when nest exposed for viewing or when water-levels rise; material placed on top of eggs, then adult pushed and rolled eggs up to top again. Gather most material in bill, from c. 3 m round nest; will jump up to catch end of water ribbon in bill, dragging it down to break pieces off the end; will pull overhanging vegetation down to form dome; gum leaves may be worked into sides of nest (Bryant 1942; Kaufmann & Lavers 1987). MEASUREMENTS (cm): outside diameter, 10–15 (n=3); height, 7.5, 15; inside diameter, 7, 9.5; depth, 1.3, 3.2 (Bryant & Amos 1949; Barlow & Sutton 1975; Campbell). Height of one nest increased from 7.5 to 30 cm as material added as water rose (Bryant 1942). Some nests may have adjoining platform where young sit after hatching (Aust. NRS).

**Eggs** Vary from swollen and elongate oval to thick and lengthened ellipse; close-grained, smooth, lustrous; pale brown tinged olive to dark olive-brown, either unmarked or with numerous short flecks or streaks of slightly darker shade of ground-colour (North). MEASUREMENTS: Aust.: 27.6 (1.09; 25.4–29.2; 16) x 19.9 (0.75; 18.8–21.6) (North); NZ: 27.8 (0.89; 26.5–28.6; 6) x 19.6 (0.43; 18.9–20.1) (Kaufmann & Lavers 1987).

**Clutch-size** Few critical determinations; average 5.9: C/5 x 3, C/6 x 3, C/7 x 2 (Bryant 1942; Wheeler 1948; Aust. NRS); records of five or six eggs in nests most common, four or seven eggs less so.

**Laying** Eggs laid at intervals of 24 h (Wheeler 1948; Bryant & Amos 1949). No other information.

**Incubation** Both sexes incubate; begins when clutch complete (Bryant 1942). From two clutches of six eggs and one clutch of five eggs, all but two eggs of clutch hatched synchronously, remaining eggs usually hatch within 24 h (Bryant 1942; Wheeler 1948; Aust. NRS). INCUBATION PERIOD: minimum period, 16–18 days (Bryant 1942; Wheeler 1948; Aust. NRS). Brooding adult disposed of egg-shells by shaking them in bill and knocking them against edge of nest, then eating most fragments (Bryant 1942).

**Young** Precocial, nidifugous. Hatch in sooty-black down with slight bottle-green tinge; bill, light yellow; iris, black; pupil, dark blue-black; legs, greyish brown (Bryant 1942; Wheeler 1948; Bryant & Amos 1949). North describes a chick c. 3 days old: black down, with indication of pale buff barred black on flanks; bill, dull

yellow with base of upper mandible and basal half of lower mandible black; iris, black; legs and feet, dark greyish-olive. At about 3 weeks, young still have traces of down; sides of face, neck and underparts, pale buff (North). Remain in nest for at least 24 h after hatching (Aust. NRS). No information on growth, development. **Parental care, Role of sexes** Both adults guard young. Defend nest during incubation by lunging and pecking at intruder or performing rodent-run distraction display or injury-feigning by wing-drooping or fanning (Hobbs 1967; Kaufmann & Lavers 1987). At approach of danger, young may drop into water and swim away or hide under rim of nest (Bryant 1942; Aust. NRS).

**Success** From 24 eggs laid, 12 hatched (n=4) (Aust. NRS); five newly hatched young dead after heavy storms (Bryant 1942); nest with eggs deserted probably because swamp dried out (Bryant & Amos 1949). No other information.

**PLUMAGES** Prepared by D.I. Rogers. Subspecies *palustris*.

**Adult male** Age attained unknown, but in first year. **Head and neck** Crown, hindneck and centre of forehead, light cinnamon-brown (olive 121C), indistinctly streaked or dotted black-brown (119). Feathers, black-brown (119) with concealed greyish-white bases and broad light cinnamon-brown (olive 121C) fringes. When worn, fringes narrow at tip and can be lost, leaving light cinnamon-brown edges and streaked appearance. Sides of hindneck, cinnamon-brown (123A). Face, foreneck and most of throat, light grey (85), with varying pale patch centred round chin. Palest birds have chin and upper and central throat, white, contrasting with light-grey foreneck and breast; darkest birds have no contrast; intermediates occur, with chin and upper throat paler than face and rest of throat, or with white only on chin. Up to 15% of adult males have rufous-brown (c37) eye-stripes forming narrow line from lores to ear-coverts; about half have a few rufous-brown feathers in this area, which form no coherent pattern; and in rest, eye-stripe absent. **Upperparts** Cinnamon-brown streaked black, with small but boldly contrasting white spots or streaks. Feathers, black-brown (119) with broad cinnamon-brown (yellowish 121C) fringes. Most feathers have irregular white spots near edges, usually largest on inner web of back feathers and outer edge of scapulars. Spots are bordered, and sometimes speckled, black (89), dark borders emphasizing spots. Rump and upper tail-coverts seldom spotted white. **Underparts** Breast, light (85) to pale grey (86), tending to be whiter in centre. Belly, white, in some faintly barred dark brownish-grey (79). Flanks, thighs and under tail-coverts neatly barred grey-black (82) and white. Dark bars of a few birds have brown (33) tinge near shaft and base. **Tail** Feathers, black-brown (119) with cinnamon-brown (123A) fringes. Tail usually held closed, with only t1 visible. **Upperwing** Primaries, dark brown (light greyish 121) with bold white outer edge to p10. Other primaries sometimes have narrow rufous-brown (c123A) fringes, apparently developed with wear; inner primaries occasionally have small white spots at tips. Primary coverts, alula and secondaries, dark grey-brown; secondaries sometimes have small white spots at tips. Other coverts, cinnamon-brown (yellowish 121C) with largely concealed grey-brown bases; median and greater secondary coverts have varying number of white spots bordered blackish (82–83), often restricted to innermost feathers. Tertiaries, as scapulars; inner tertiaries tend to have less white spotting. **Underwing** Light grey (85); all coverts have narrow white shafts and broad white tips.

**Adult male breeding** Eighteen skins (reliably sexed) collected in s. Aust. between late July and mid-Apr. had larger pale patch on chin in late summer and early autumn than other times (Spearman Rank Correlation,  $P < 0.01$ ); none had signs of severe wear on chin and throat, possibly because there is a paler-chinned

breeding plumage, akin to pale-throated breeding plumage described for *intermedia* in BWP. However, birds with intermediate colour of throat were not in moult in that area, so a breeding plumage in *palustris* is unconfirmed.

**Adult female** Differences from male: all have some trace of rufous-brown (c37) eye-stripe; in 65%, eye-stripe forms continuous line from lores to back of ear-coverts, 2–3 mm wide. Variation in extent of pale patch on chin is almost as great as in males; all specimens have it, and there is no evidence for seasonal variation. Areas that are cinnamon-brown on upperparts and upperwing in males are brown (123) in females, with stronger olive and less yellow tinge; difference is subtle but consistent.

**Downy young** Down, short, thick and black (89), tending to be most sparse on crown. Small chicks have a slight bottle-green gloss to crown, upperparts and flanks. Fine white tips to down of crown and upperparts have been photographed (e.g. NPIAW 1985) but are not seen in skins and have not been reported in other subspecies (Fjeldså 1977).

**Juvenile Head and neck** Crown, nape and hindneck as adult. Ear-coverts and sides of face, light brown (c123A) with light-grey (85) to white bases, which are entirely concealed in some young birds, often exposed in older birds. Chin and upper throat, white. Sides of hindneck, buffish brown (c123A) to brown (37), with concealed broad white band in centre of feathers and dark-grey (83) bases. Sides of throat vary, but feathers of all have white bases, which are exposed with wear. In some, perhaps generally in females, tips of feathers are light brown (223D–39), occasionally barred dark brown (c121), and sides of throat appear light brown. In some (perhaps usually males) feathers are barred white and dark; dark bars range from olive-brown (28) near base to dark grey-brown (121) at tip; in some, dark bars are dark grey (83) except for dark-brown (121) tips and broad olive-brown (28) subterminal bands. In such birds, sides of breast look heavily mottled dark brown and white, with an olive-brown tinge. Centre of lower throat and foreneck, white; feathers of some fresh birds having varying dark-brown (121) or olive-brown (28) tips. **Upperparts** Similar to adults but of little use in sexing because broad fringes of feathers of both sexes fade paler (approaching colour of adult males) with time. White markings tend to have no dark flecking within. **Underparts** Upper breast as lower throat, with tendency for dark markings on side to be bolder. Belly and centre of lower breast, white. Flanks untidily barred grey-black (82) and white, blackish bars often grading to brown (123A) outer edge; occasionally blackish bars have brown centres. **Tail, Wings** Similar to adults, but primaries tend to be more pointed.

**BARE PARTS** Subspecies *palustris* and *affinis*. Based on photographs (NPIAW 1985; Moon 1988; NZRD; Aust. RD; NZ DOC Slide Library; unpubl.: J.N. Davies), Westerskov (1970) and labels, except where stated.

**Adult** Bill, usually green (60, c260) with dark-grey (83) or dark olive-grey culmen and tip; in palest, green extends onto base of culmen; tip may be brownish grey (79) and centre of culmen light olive-grey (c86); in darkest, bill mostly dark grey (c83 or 79) with olive wash to sides and olive to base, more yellow (51) at base. Iris, red-brown (132A) to red (12); iris, light hazel (–) or orange-red (–) with grey inner ring also reported; references on label to orange-red (–) eyes. Narrow eye-ring varies from yellow (57) to orange-buff (118) in nesting birds. Legs and feet, olive-yellow (52) to olive (51), with darker soles; recently dead adult in New Guinea highlands (D. Hadden) had dull pinkish-orange (c94) joints to toes. Dark olive-brown legs recorded on some museum labels may have been affected by post-mortem discoloration. Claws, light brown (119D); pale horn-brown (Westerskov 1970).

**Downy young** Bill, mostly yellowish white (92) with black (89) gape; at least some *palustris* have black (89) patch on proximal fifth of lower mandible and extreme base of upper mandible. In recently hatched chicks: down sparse on hindcrown and nape, exposing patch of pink (108D) to pinkish-red (c10) skin; sparsely covered patch above each eye (–) and skin, blue (Fjeldså 1977). Orbital ring, grey (84), possibly black in some. Iris, black-brown (119) to dark greyish-brown (c121); blue-black also recorded (Bryant on museum label, MV) but later found blue-black restricted to pupil (Bryant & Amos 1949). Feet and legs, mostly dark grey (82–83); scutes on front of tarsus and top of middle toe have dark pink (c4) proximal edges; greyish brown (–) also reported (Bryant 1942). Claws, light brown. No information on bare parts of large downy young in our region; in Europe, legs, dirty flesh-colour (Fjeldså 1977). **Juvenile** Bill and legs, brown (–); iris, initially brown (–) or dark brown (–); adult colour attained before post-juvenile moult begins.

**MOULTS Adult post-breeding** Complete. Primaries and secondaries assumed to be simultaneous as in subspecies *intermedia* (BWP) but no specimens in wing-moult collected in Aust. Tail may be simultaneous too; one specimen in simultaneous tail-moult (Perth, Jan.) had lost no upper tail-coverts, which suggests moult was not accidental. Specimens have been collected in s. Aust. in all months from July to Apr., but body-moult only recorded Oct.–Jan.; moult begins in underparts. Wear of primaries indicates that at least some adults moult flight-feathers in Jan. or Feb. before n. migration, but worn primaries on birds collected as late as Mar. indicate this may not be so for all birds. **Post-juvenile** Partial in at least some birds, only involving body-feathers. Upperparts begin first; last feathers to be moulted are on sides of breast and flanks; occasionally retain a few feathers in these areas, allowing ageing of some birds in first-basic plumage. Timing not well understood; some birds retain juvenile plumage for some time and there is variation in the extent of wear of old feathers in moulting birds. In se. Aust., moult occurred in six of 11 full-grown juveniles collected Aug.–Apr.; of these, two were in early moult in Jan. and Feb., two were in late post-juvenile moult in Apr. and one was in late post-juvenile moult in Aug.; none appeared to have moulted wing. However four first-year birds ranging from juvenile to first basic collected in n. NT in July had new to slightly worn primaries, not as worn as would be expected in birds that had migrated from s. Aust. Either a post-juvenile wing-moult had occurred after migration, or they were not s. migrants (*contra* Mason & Wolfe 1975).

**MEASUREMENTS** Subspecies *palustris*: (1) adult, skins (AM, ANWC, HLW, MV, SAM, WAM). (2–3) Subspecies *affinis*: (2) adults, skins (CM, NMNZ); (3) adults, freshly dead (NMNZ). Additional data for *affinis* given by BWP and Kaufmann & Lavers (1987).

	MALES	FEMALES	
WING	(1) 82.3 (3.85; 76–93; 16)	81.1 (2.22; 77–85; 12)	ns
	(2) 84.3 (1.9; 82–88; 14)	84.9 (1.83; 82–88; 13)	ns
	(3) 83.4 (3.55; 78–89; 8)	82.2 (5.25; 69–87; 9)	ns
8TH P	(1) 58.8 (2.51; 55–64; 16)	59.2 (2.30; 55–63; 12)	ns
TAIL	(1) 43.1 (3.01; 35–47; 15)	42.7 (3.20; 36–47; 9)	ns
	(3) 45.6 (5.31; 34–50; 8)	45.7 (3.46; 39–50; 9)	ns
BILL	(1) 15.5 (0.69; 14.2–16.6; 16)	14.8 (0.51; 13.9–15.5; 10)	**
	(2) 18.0 (0.75; 16.0–18.8; 13)	17.1 (0.88; 15.8–18.8; 13)	*
	(3) 17.8 (1.15; 15.9–19.4; 8)	17.2 (1.72; 15.0–21.3; 9)	ns
TARSUS	(1) 25.3 (1.18; 23.4–27.6; 16)	24.9 (0.80; 22.8–26.0; 12)	ns

	(2)	27.5 (1.04; 25.5–29.2; 13)	26.2 (2.25; 20.0–28.6; 12)	ns
	(3)	27.6 (1.82; 25.3–30.9; 8)	27.5 (2.07; 24.8–32.4; 9)	ns
TOE C	(1)	34.5 (1.17; 32.8–36.4; 10)	34.0 (1.49; 31.9–35.9; 6)	ns
	(3)	35.7 (2.07; 32.3–38.6; 8)	34.9 (3.01; 31.7–42.4; 9)	ns

Subspecies *palustris*: (4) Juvenile, skins (AM, ANWC, HLW, MV, NTM, WAM).

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UNSEXED

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WING	(4)	80.6 (2.43; 75–85; 12)
8TH P	(4)	58.3 (2.01; 55–60; 12)
TAIL	(4)	43.9 (1.92; 41–46; 10)
BILL	(4)	14.9 (0.65; 13.6–16.0; 12)
TARSUS	(4)	25.1 (0.76; 24.3–27.1; 12)
TOE C	(4)	35.3 (1.74; 32.9–38.0; 8)

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**WEIGHTS** Subspecies *palustris*: few data; adults (including first basic) throughout year: 29.2 (6.68; 14–42; 15) (ABBBS; AM, ANWC, MV, WAM), including three males from S. Alligator R., NT, thought to be in first-basic plumage and which had much fat (Mason & Wolfe 1975) weighing 35, 31.5 and 30 g; no data on condition of body for the three lightest birds, but two were vagrants (first-basic female from Macquarie I, Feb., weighing 23.8 g; adult female from 14 km W of Eyre Bird Observatory, Sept., weighing 17 g), which suggests that great range of weights is associated with reserves used in migration. Juveniles with full-grown wings: 28.2 (6.63; 20.0–38.7; 7) (ANWC, MV).

Subspecies *affinis*: adults throughout year, mostly fat or with some fat: males 36.2 (4.32; 31–41; 5), females 35.7 (3.35; 32–43; 7) (NMNZ). Some rather light birds not included above: male with no fat, Sept., 22.9 g; females of 25.5, 22.4 and 20 g; fat female with broken egg in oviduct, 55.3 g (NMNZ). Unsexed adults, Pukepuke Lagoon, 41.7 (40.0–46.0; 8) (Kaufmann & Lavers 1987).

**STRUCTURE** Wing, short and broad. Ten primaries; p8 longest, p10 11–15 shorter, p9 0–3, p7 1–3, p6 3–6, p5 6–10, p4 10–13, p3 14–19, p2 18–23, p1 21–27; no emarginations. Twelve secondaries, including five tertials; longest tertials extend to between p3 and p7 on folded wing. Tail, short and pointed; appears larger in the field because often held cocked with tail-coverts; 10–12 soft pointed feathers; t1 to outer tail-feather 14–20 mm. Body, laterally compressed. Bill, slightly shorter than head, deeper than broad at base; mostly straight with culmen sloping gradually to slightly decurved tip. Nostrils, slit-like. Small swelling at base of culmen of some adults may be associated with breeding condition, as reported for subspecies *intermedia* (BWP). Skull can be fully pneumatized in first basic, but apparently not all adults attain full ossification. Tarsus, laterally compressed, scutellate; toes, long and slender with narrow, sharply pointed claws; outer toe c. 87% of middle, inner c. 82%, hind c. 45%.

**RECOGNITION** Small downy young unmistakable in HANZAB region by stubby, wheat-coloured bill with only small area of black at base; large downy young distinguished from all but Australian Crake by short bill and emerging juvenile plumage with barring on sides of breast.

**GEOGRAPHICAL VARIATION** Distinct; subspecies separated on size and colour, especially shade of grey on underparts. Subspecies *affinis* of NZ slightly larger than *palustris*, with longer bill (see Measurements). Breast, throat and face, grey (light 84), darker than Aust. birds; lores, dark greyish-brown (121) to black-

brown (119). Subspecies *mayri* of New Guinea (not accepted by all authorities) said to be smaller (Ripley 1977), but only four specimens have been measured and show no significant difference from *palustris*. Variation in Wallacea not fully understood; subspecies *mira* described from e. Borneo with white throat and very pale grey foreneck (Ripley 1977); there are breeding populations on Sulawesi and possibly elsewhere but it is likely that many birds in the area are migrant *pusilla* (White & Bruce 1986). Three subspecies in Old World (*intermedia*, *obscura*, *pusilla*); for differences from *palustris* see BWP.

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Baillon's Crake *Porzana pusilla* (page 544)

1 Adult male, subspecies *palustris*; 2 Adult male, subspecies *affinis*; 3 Adult female, subspecies *palustris*; 4 Downy young; 5 Juvenile; 6 Adult

Australian Crake *Porzana fluminea* (page 551)

7 Adult male; 8 Adult female; 9 Downy young; 10 Juvenile; 11 Immature; 12 Adult