

## 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 *Porphyryla* 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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*Gallinula ventralis* Black-tailed Native-hen

COLOUR PLATE FACING PAGE 624

*Gallinula ventralis* Gould, 1837, *Proc. zool. Soc. Lond.* (1838): 85 — Swan River, Western Australia.*Ventralis* is late or modern Latin for 'of the belly', 'bellied' or 'connected with the belly' but the allusion is obscure.

OTHER ENGLISH NAMES Black-tailed Waterhen, Gallinule, Swamphen, Waterhen, Native Bantam.

## MONOTYPIC

**FIELD IDENTIFICATION** Length: 30–38 cm; wingspan: 55–66 cm; weight: c. 400 g. Large dark fleet-footed rail with thickest appearance and erect narrow black tail; close in size and general shape to Dusky Moorhen *Gallinula tenebrosa*, but with more upright stance. Sexes similar; female slightly smaller. No seasonal variation. Juvenile separable.

**Description** **Adult male** Sides of head, and throat, slate-grey; indistinct blackish band round base of bill. Rest of upperparts and upperwing, olive-brown with black tail, slightly darker remiges and primary coverts, and thin white leading-edge to outerwing. Foreneck and breast, slate-grey with bluish tinge, washed olive-brown on sides of upper breast; flanks, belly, thighs, vent and under tail-coverts, blackish; long feathers of fore-flanks, grey-black with large white spots at ends, forming patch of pale spots or streaks prominent against black of belly and flanks. Axillaries, olive-brown, sometimes tipped white. Underwing, dark grey-brown with distinct white stripes across coverts. Bill and frontal shield, light green, shading to pale green at tip; base of lower mandible, orange-red. Iris, bright yellow. Legs and feet, coral-pink. **Adult female** Very similar to male but generally duller and paler with narrower or no dark band round base of bill, and smaller spots on flanks. **Juvenile** Similar to adult female; differs by: spots on flanks smaller and less conspicuous; lores, chin, face and throat, off-white; paler ventrally with sharper contrast between blackish vent and under tail-coverts and rest of underparts; when worn, breast and belly, paler; thighs and hind-flanks fade to grey-brown. Bill, greenish yellow with dusky tip; iris, blackish; tarsus and toes, brownish pink. Attain adult colours before post-juvenile moult.

**Similar species** Generally unmistakable through combination of large size, bantam-like shape, vertically fanned tail, nimble gait and preference for foraging in drier habitats, usually in groups. All ages of **Dusky Moorhen** distinguished by conspicuous white lateral under tail-coverts; slimmer build; finer bill, which is never mostly green; somewhat pointed tail and wing-points not extending beyond tertials; more aquatic habits. Vagrants could be confused with **Tasmanian Native-hen** *Gallinula mortierii* (q.v.).

Gregarious; seen singly, though more usually in pairs, parties or large groups (occasionally numbering thousands) in almost any open dry area close to water and cover and in scrubby or timbered areas. Gait on land a high-stepping walk, like a moorhen, but more upright, with tail held erect and folded like that of bantam-hen; run fast and nimbly to cover when disturbed. Wade, and swim readily with buoyant carriage and tail erect; seldom wade. When hard pressed, fly strongly with rapid shallow wing-beats on long narrow rounded wings, feet trailing; take off and land with short run. Will perch in trees. Usually silent, but single sharp call sometimes given in alarm; also rapid harsh metallic cackle.

**HABITAT** Opportunistic; permanent or ephemeral terrestrial wetlands in low rainfall areas. Though favour fresh or brackish

water, often on shallow and more saline drying ephemeral wetlands. Wetlands include shallow lakes, swamps, pools, floodplains and flats of rivers and creeks, and inundated depressions; often characterized by dense clumps of lignum, canegrass, bluebush or saltbush, and may be sparsely wooded. During irruptions (and at other times), may use many habitats, including artificial wetlands such as dams, margins of reservoirs, soaks round bores, sewage ponds; farmland consisting of pasture, crops or fallow. May occur in urban areas in streets, gardens, golf courses and round human habitation; also unfamiliar habitats such as arid country, sandhills, undulating hills and valleys, coastal flats, and among samphire and coastal shrubs (W.E. Matheson). Rarely in dry *Banksia* woodland, mangroves or tidal pools (Church 1925; Anon. 1973; Rich 1973). May occur far from water.

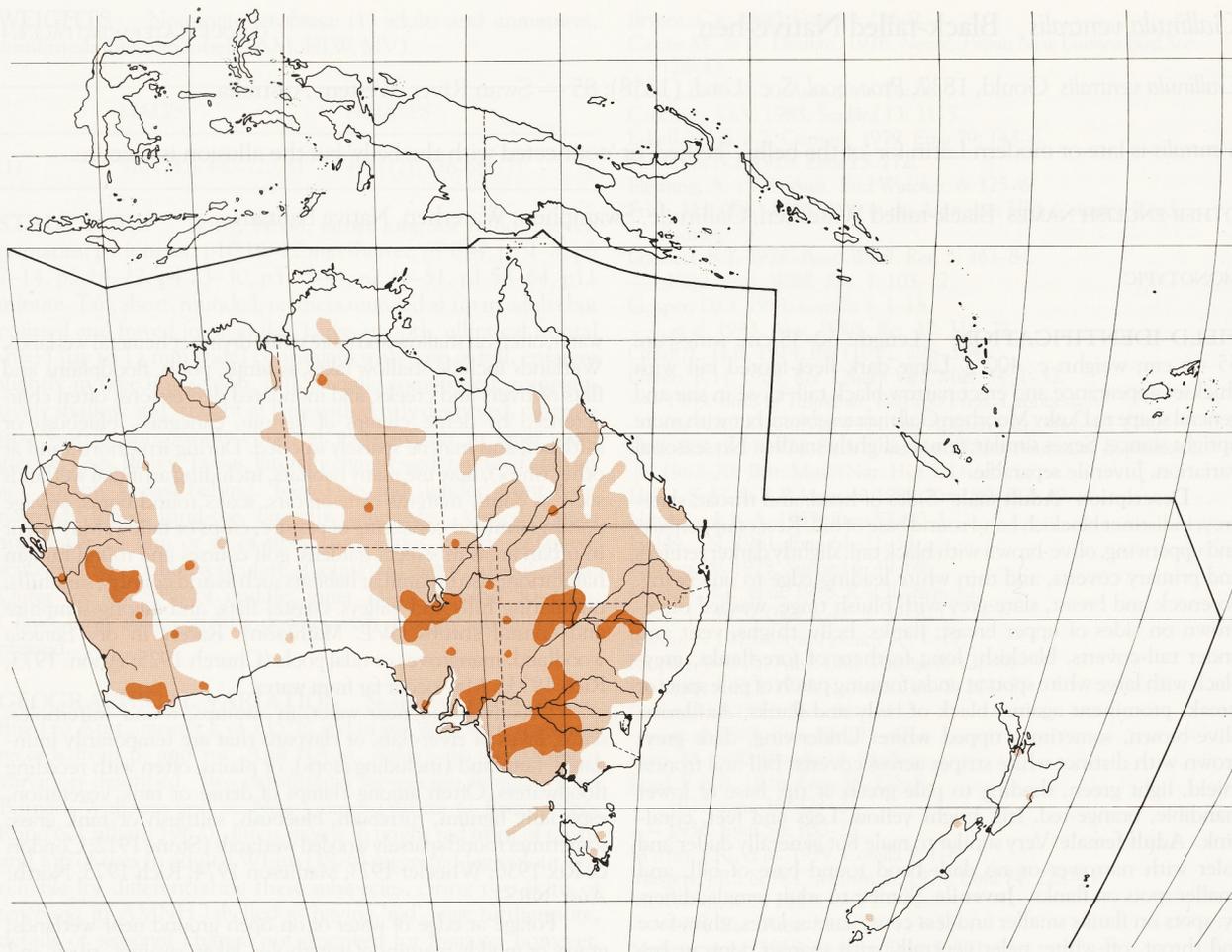
Usually breed near water, in swamps, round waterholes, dams, lakes or river-flats, or claypans that are temporarily inundated, farmland (including crops), or plains, often with receding floodwaters. Often among clumps of dense or rank vegetation, especially lignum, nitrebush, bluebush, saltbush or rank grass; sometimes round sparsely wooded wetlands (Stone 1912; Condon & Rix 1936; Wheeler 1973; Matheson 1974; Rich 1975; North; Aust. NRS).

Forage at edge of water or on open ground near wetlands: grassy or muddy margins of waterholes, lakes, swamps, rivers and creeks; also green or dry pastures or crops, in 'scrub', often far from surface water; sand dunes. Round human habitation, may forage in fowl-yards and piggeries (Berney 1907; Mellor 1923; Wheeler 1973; Matheson 1974; Wilson 1974; North).

Often use artificial habitats, especially during irruptions, including short-grassed areas such as golf courses, racecourses, parks, pasture and crops; also streets in urban areas; artificial wetlands; sometimes in fowl-yards. Widely thought to damage crops during irruptions.

**DISTRIBUTION AND POPULATION** Widespread throughout mainland Aust.; vagrant to Tas. and NZ.

**Aust. Qld** Absent C. York Pen. Generally widespread S of 20°S and W of Great Dividing Ra.; a few scattered records in coastal and subcoastal regions (Aust. Atlas). Recorded in Gulf Country in 1909 (MacGillivray 1914) but not again till 500 seen round Karumba, Apr. 1985 (Qld Bird Rep. 1985). **NSW** Widespread W of Great Dividing Ra.; recorded on Tablelands at Orange, Apr. 1978 (NSW Bird Rep. 1978) and Canberra, Jan.–May 1969 (Dow 1988); vagrant E of Great Dividing Ra.: recorded at Maryland, Sept.–Nov. 1979 (Aust. Atlas); Grafton, Dec. 1978 (NSW Bird Rep. 1978); Oakville, 22 Mar. 1980; Skeyville, 29 Mar. 1980 (Aust. Atlas). **Vic.** Mainly N of Great Dividing Ra. in Wimmera, Mallee and Northern regions; scattered records S of Great Dividing Ra. in w. and central regions (Vic. Atlas). Single Gippsland record: Ensay, May–Dec. 1977 (Aust. Atlas). **Tas.** Vagrant. Three confirmed records: single (specimen), Epping, 19 June 1916 (Green 1963); three, King I., Mar.–July 1985 (Tas. Bird



Rep. 15); single, Gould's Lagoon, 15 km NW of Hobart, 12 Mar.–23 Apr. 1988 (Patterson 1989). Unconfirmed record of 'large flock' on Tamar I. in c. 1893 (Green 1963). **SA** Mainly in interior; small populations in S augmented by irruptions (Matheson 1974). Recorded all regions W of 134°E (Aust. Atlas). Also at Marla Bore, May 1979 and Jan. 1985 (Aust. Atlas; P.J. Higgins), and in NW near Amata, Billa Kalina Stn and Kingoonya (Jaensch & Jaensch 1987; SA Bird Reps 1977–81). **WA** Widespread in SW (erratic occurrences), Gascoyne and Pilbara regions, from Esperance, N to Dampier, and E to 122°E (Storr 1985a; Aust. Atlas). Uncommon visitor to s. and e. Kimberley Division (Storr 1980; Johnstone *et al.* 1981; Johnstone 1983; Aust. Atlas). Few sporadic records from Western Deserts region, from Great Sandy Desert, S to Nullarbor Plain (McCull 1929; Brooker *et al.* 1979; Start & Fuller 1983; Storr 1985b, 1986; Dymond 1988; Aust. Atlas). **NT** Widespread but sporadic S of 19°S, including Simpson Desert (Gibson & Cole 1988); few, sparse records N to Adelaide R. (Thompson 1977; Aust. Atlas).

**NZ** Vagrant. Four confirmed records: single (specimen), Colac Bay, Southland, June 1923 (Stidolph 1925; Oliver); single, Tukituki R., Hawke's Bay, May 1957 to mid-1958 (Braithwaite 1963); single, Kongahu Swamp, Karamea, Aug.–Nov. 1984 (CSN 33; *contra* NZCL, which, in error, lists record in 1985); single, Opuatia Swamp, Waikato, 16 May 1986 (CSN 34). Oliver states 'other specimens without data in museums' (in NZ).

**Breeding** Most records in Murray–Darling and L. Eyre drainage basins (Aust. NRS; Aust. Atlas). Other records include

se. SA; Yorke and Eyre Pens; sw. WA; round Kalgoorlie; Gascoyne region; round L. Carnegie; Victoria R. Downs; round Alice Springs (Boekel 1980; Aust. NRS; Aust. Atlas). Colonial breeding reported 35 km E of Thargomindah, 1971–72 (Roberts 1975); near Ultima, five nests, Nov. 1974 (Aust. NRS); Mystic Park, 18 nests, Oct. 1973 (Aust. NRS).

**Population** Annual indices of relative abundance from aerial surveys (transect counts) covering wetlands in c. 12% of land area in e. Aust., 1983–89, were 12,788; 25,424; 3728; 6529; 5370; 2222; 2560 respectively; important areas from these surveys were (1) lakes, swamps and floodplains of Paroo R. and Cuttaburra channels in nw. NSW (1983, 61–80% of total numbers counted); (2) billabongs and floodplain of Darling R., nw. NSW (1984, 61–80% of total numbers counted); (3) Menindee L. system of shallow-water impoundments, on the Darling R., sw. NSW (1985, 61–80% of total numbers counted); (4) wetlands on floodplains at confluence of Lachlan and Murrumbidgee Rs (1986, 81–100% of total numbers counted) (Braithwaite *et al.* 1985a, 1985b, 1986, 1987; Kingsford *et al.* 1988, 1989, 1990). Up to 140 recorded on Coomelberrup L. NR (92 ha), 130 on Wannamal L. NR (81 ha) and 107 on Chandala Swamp NR (134 ha) between 1981 and 1985 (Jaensch *et al.* 1988). However, may occur in tens of thousands at some wetlands of unknown area during irruptions (Ford 1906; Cox & Pedler 1977; NSW Bird Rep. 1972). During irruptions, cause damage to crops and vegetable gardens by trampling and eating plants (Carter 1904; Ford 1906; Berney 1907; Boehm 1953; Matheson 1974; Campbell); may pollute water supplies

(Ford 1906). May feed with poultry (Nicholls 1905; Berney 1907; Anon. 1986), sometimes congregating in hundreds waiting for chickens to be fed (Berney 1907).

**IRRUPTIONS** Highly irruptive; may arrive suddenly, with many appearing in a short time; more than 10,000 arrived at Manara within 14 h (Schrader 1974). Determined by climatic conditions, but stimulus may vary. Matheson (1974) stated that irruptions result from exodus from interior, when wet periods of high breeding activity are followed by dry conditions. However, some influxes are recorded after floods. Irruptive movements may be non-directional, with far-flung regions experiencing an influx simultaneously, e.g. in 1972–73, influxes recorded in e. and s. SA, n. Vic., sw. WA and sw. Qld. Records on islands and vagrant occurrences may coincide with influxes: records on King I. coincide with 1985 influx into s. Vic. (Tas. Bird Rep. 15; Vic. Bird Rep. 1985); all NZ records (1923, 1957, 1984, 1986) roughly coincide with irruptions in Vic. and s. NSW. First recorded irruption occurred in May 1833 in Swan R. district (Alexander 1921; Campbell); at least 57 irruptions recorded since then; on average, one every 2.7 years. **Qld** Irruptions recorded in Gulf Country, 1909 (MacGillivray 1914); Karumba, Apr. 1985 (Qld Bird Rep. 1985); Richmond, 1905 (Berney 1907); Longreach, Dec. 1905 to Apr. 1906 (Ford 1906); Mackenzie and Dawson Rs, autumn 1854 (McDonald & Colston 1966; Campbell); round Thargomindah, 1971–72, 1974 (Roberts 1975); Upper Barcoo R., Oct. 1922 (Alexander 1923). **NSW** Irruptions recorded at Mungindi, Mar.–Apr. 1975, Sept.–Oct. 1977 (Costello 1981); Riverina and SW: 1955–56, 1972–1982, 1984, 1985–86 (Hobbs 1956, 1961; Rich 1975; NSW Bird Reps 1982, 1984–86); Western region: 1909, c. 1918, Nov. 1971 to May 1972, 1974 Spring 1977, Aug.–Sept. 1984, 1985 to early 1986 (MacGillivray 1910, 1914; Hobbs 1973; Schrader 1974; Schmidt 1978; Henle 1989; NSW Bird Reps 1971, 1972, 1984, 1985); Moree district, Nov. 1933 (Bryant 1934). **Vic.** Irruptions recorded in s. districts: 1917, 1982, 1985, (Le Souëf 1919; Humphreys 1986; Vic. Bird Reps 1982, 1985); sw. and w. districts: May 1951, Aug. 1973 (Glover 1952; Hirth 1976); Mallee and n. Vic.: 1909, 1917, 1922, 1956, 1972, 1984 (Stone 1912; White 1918; Leach 1929; Lowe 1963; Rich 1973; Anon. 1976; Vic. Bird Rep. 1984). **SA** Irruptions recorded in NE: 1844, 1895, 1901, 1918, 1930, 1969, 1972–73, 1975, 1977–78, 1985 (Lyons 1902; McGilp 1923b, 1931; Simpson 1932; Cleland 1937a,b; Mack 1970; Eckert 1973; Cox & Pedler 1977; Badman 1979; Carpenter 1985; SA Bird Reps 1977–81); in S, including SE to Murray-Mallee and Eyre Pen.: 1840, 1843, 1917, 1919, 1920, 1922, 1951, 1952, late 1967 to early 1968, 1969, 1971–73, 1975 (Morgan 1918, 1919; Anon. 1920; Mellor 1923; Boehm 1928; Cleland 1937a; Condon 1952; Storr *et al.* 1952; Matheson 1974, 1978; Campbell; SA Bird Reps 1967–68, 1968–69, 1971–72, 1977–81). **WA** Irruptions recorded in mid-e. and se. interior and Eucla Division: 1892, 1896, 1984, 1985 (Storr 1985b, 1986, 1987; Dymond 1988); SW: 1833, 1835, 1842, 1853, 1865, 1872, 1886, 1905, 1908, 1919, 1926–27, 1933–35, 1936, 1940–41, 1948, 1952–53, 1955–56, 1963–65, 1971–73, 1975, 1982, 1985–86 (Alexander 1919, 1921; Carter 1923; Serventy 1929, 1948, 1953; Masters & Milhinch 1974; Serventy & Whittell 1976; Anon. 1985a, 1986; Storr 1988; Campbell); Goldfields, Gascoyne and Pilbara regions: 1858, 1886, 1897, 1922, 1923, 1952, 1971, 1972, 1978, 1982, 1984, (Carter 1904; Whittell 1946; Serventy & Whittell 1976; Fletcher 1980; Howard 1983; Anon. 1985b; WA Bird Rep. 1982). **NT** Irruption recorded round Alice Springs, Dec. 1978–Jan. 1979 (Roberts 1981). N. record at Adelaide R. in 1975 (Thompson 1977) coincides with irruptions in SA and sw. WA.

**MOVEMENTS** Dispersive and highly irruptive (see Irruptions). May make regular seasonal movements: reporting rate N of 26°S increases (5.3%) in wet summer season, compared with dry winter season (1977–81; Aust. Atlas); in Vic., reporting rates increase in spring and summer and decrease in winter (Vic. Atlas). Regular visitor in irregular numbers to Swan R. district (Serventy 1948). In some areas present at most times of year (Matheson 1974), e.g. Mannum region of SA (Cox 1971), some swamps in sw. NSW (Hobbs 1961) and Milloo district, Vic. (Christian 1909).

During irruptions possibly disperse in all directions (Matheson 1974) but in Qld may move to coast (Storr 1973). Irruptions more frequent 50–100 years ago (Chisholm 1964; Matheson 1974); sometimes characterized by sudden appearance and disappearance (Stone 1912; Green 1963; Serventy & Whittell 1976); thousands disappeared from Moolawatana Bore on night of 18–19 Sept. 1918 and thousands arrived c. 96 km away on 18 Sept. 1918, after thunderstorm on 17 Sept. 1918 (McGilp 1923b). In nw. NSW c. 10,000 birds moved into area within 12–14 h of rainfall (Schrader 1974). Near Blanchetown, SA, flock arrived at pond formed by rain during previous day (Matheson 1974); elsewhere in SA birds known to arrive at wetlands partially filled by rain (Badman 1979). Irruptions probably associated with favourable breeding conditions in N allowing build-up of numbers, followed by harsh conditions, drought and decreasing food supplies, causing birds to leave interior (Matheson 1974, 1978; Jaensch 1984). Possibly move in response to cloud banks, which may explain why birds moved back to ne. SA in 1975 despite plentiful food in S (Matheson 1978). Movements often linked to rainfall or conditions related to rainfall. Claimed to appear before rain actually falls (Christian 1909; Mack 1970); more often appear after rain has fallen (MacGillivray 1910; McGilp 1923b; Simpson 1932; Serventy 1953; Anon. 1972; Hobbs 1973; Wheeler 1973; Serventy & Whittell 1976; Storr 1977; Fletcher 1980; Johnstone *et al.* 1981; North) and after cyclonic disturbances (Howard 1983). Suspected of moving to flooded areas (Carter 1904; Bryant 1934; Hobbs 1956, 1961; Serventy & Whittell 1976; Badman 1979; Campbell; North) and areas with lush green growth (Pearse 1938; North). May move away from district after period of hot weather (Anon. 1973) and may move away from drying areas (Glover 1952; Matheson 1974; Cox & Pedler 1977; Henle 1989), from drought-stricken areas (Alexander 1919; Le Souëf 1919; Mellor 1923; Serventy 1953; Storr 1973), sometimes even before drought intense (Rich 1973). However, known to move into regions affected by droughts (Berney 1907; Wheeler 1973). Possibly move back to normal range after rainfall (Anon. 1973) though after irruptions in some districts (e.g. Northam, WA) may remain during winter (Masters & Milhinch 1974; Vic. Bird Rep. 1985). Localized breeding along drain in dry period in 1971–72 changed to widely dispersed flocks in flood conditions (Roberts 1975).

Birds may move at night (McGilp 1923b; North). Occurrence on islands of Bass Str. (Tas. Bird Rep. 1985), Tas. (Green 1963; Patterson 1989) and NZ (Brathwaite 1963; Oliver; CSN 33,34) shows birds able to fly for long distances.

**FOOD** Seeds, plant material and insects. **Behaviour** Diurnal; feed in water and on ground. Glean from ground and surface of water. Feed gregariously or in pairs, alternately running and stopping in order to disturb insects. Submerge head and shoulders in water (Christian 1909).

**Adult** Four crops, NSW; (Vestjens 1977): Plants: plant material 100% freq.; Polygonaceae: *Polygonum* sds 100. Ani-

mals: Insects: Coleoptera: Carabidae 50; Chrysomelidae 25; Hymenoptera: Formicidae 25. Grit 100.

**Other records** **Plants** Vegetable matter (Gould; North; Mathews; Barker & Vestjens); young vegetable plants (Berney 1907); young cereal crops (Boehm 1953); fresh green growth of annuals; fodder crops (Matheson 1974); grain (Nicholls 1905; Gould; North); aquatic plants (Cayley 1966); sds (Gould); Poaceae (Nicholls 1905; Cayley 1966; Mathews): young shoots (Mellor 1923; Matheson 1974; Serventy & Whittell 1976); short lengths of aquatic grass (Green 1963); *Triticum aestivum* young plants, sds; *Hordeum vulgare* young plants, sds; *Avena sativa* young plants (Matheson 1974); *Zea mays* crops (Carter 1904); Fabaceae: *Medicago sativa* crops; *Pisum sativum* young plants (Matheson 1974); Asteraceae: thistles (Nicholls 1905; Mathews); Rosaceae: drying apricots *Prunus armeniaca* (Matheson 1974). **Animals** Molluscs; Insects (Gould): ads and larv. (Matheson 1974); Orthoptera: Gryllacrididae (Christian 1909); Tettigoniidae (Pearse 1938); Acrididae/Tettigoniidae: grasshoppers (Christian 1909; Boehm 1953); Coleoptera: Scarabaeidae: larv. (Matheson 1974); Lepidoptera; Hymenoptera: Formicidae (Christian 1909). Quartz gravel and mud (Green 1963)

**Young, Intake** No information.

**SOCIAL ORGANIZATION** No detailed information. Usually gregarious, also solitary; breed opportunistically at any time of year. Gather in very large numbers when conditions suitable (see Distribution, Irruptions); during irruptions, recorded feeding in large flocks of up to 20,000 birds (Anon. 1965). Reported gathering in hundreds waiting for domestic fowls to be fed (Berney 1907).

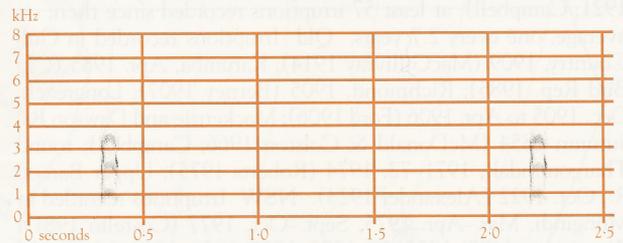
**Bonds** Unknown. **Parental care** Both adults appear to accompany and feed young (Campbell). **Breeding dispersion** Breed as isolated pairs or in colonies of five nests (Aust. NRS) to 500+ birds (Roberts 1975); in inland NSW, nests c. 7–10 m apart (Ridpath 1972a). **Territories** One pair, feeding young <10 days old, recorded defending area of swamp from non-breeding conspecifics; observed portion of swamp seemed to have a non-breeding area occupied by a large flock, and a breeding area occupied by adults with small young; no aggressive encounters observed between pairs (S.T. Garnett). **Roosting** Nocturnal; in long grass and dense vegetation. During day, groups sleep and rest round roots of trees (Nicholls 1924).

**SOCIAL BEHAVIOUR** No detailed studies. Easy to observe from cover (Christian 1909). Behaviour not typical of gallinules, possibly because nomadic; aggressive behaviour not developed; small acoustic repertoire compared with Tasmanian Native-hen. Christian (1909) observed unusual behaviour in large feeding flock; occasionally a bird ran in circles, flapping wings, then left both wings outstretched, and with neck stretched forward, continued running; stopped abruptly near another bird, and generally this latter bird continued performance.

**Agonistic behaviour** Birds with chicks seen to chase away non-breeding birds that came into breeding territory (S.T. Garnett). No intraspecific aggression recorded among captive birds (Ridpath 1972a). Recorded injuring domestic chicken (Nicholls 1905). Flew low to escape attack by Tasmanian Native-hen (Patterson 1989). **Alarm** When disturbed, flick spread tail rapidly and often; observed in downy young. Run, sometimes zigzagging towards cover or, if pressed, fly or take to water (Nicholls 1905; Chaffer 1940; Hobbs 1973; Schrader 1974; North). Hide by tussocks, tall reeds, even by railway sleepers (Anon. 1973; Schrader 1974). **Sexual behaviour** No information. **Relations within family group** Chicks observed running and swimming

with one or two adults (Aust. NRS). Chicks in vegetation fed by adults (Aust. NRS). **Anti-predator responses of young** When in open, threatened chicks crouch in depressions; when discovered, run or swim; at nest, run and climb to cover; recorded crouching in hoofprints of cattle (Boekel 1980; North; Aust. NRS). **Parental anti-predator strategies** Behave cryptically on nest; turn head away from predator, bury bill in feathers; hide eyes and bill. When terrestrial predators nearby, incubating adult flies from nest; lone adult creeps from nest; brooding adult and chicks leave nest together (Aust. NRS).

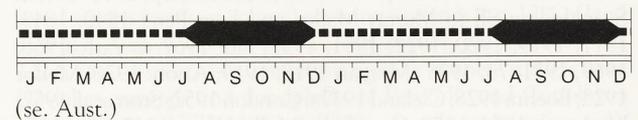
**VOICE** Virtually unknown. Sharp *kak* (sonagram A), harsh cackling (Slater 1970); rapid harsh metallic *yapyapyapyap* (Pizzey 1980). Fairly quiet when feeding; occasionally utter peculiar sharp cry (Christian 1909); no calls from 'considerable flock' (Alexander 1923). No difference in calls between sexes; syrinx of female, apart from being slightly smaller, similar to that of male; syrinx less developed than that of Tasmanian Native-hen, which is much more vocal (Ridpath 1972a).



A. F. James; Nhill, Vic. Nov., 1981; P36

**BREEDING** Poorly known. No major studies. Information from general references; 55 records in Aust. NRS up to May 1992. Breed opportunistically, may arrive in an area in large numbers within 1 week of heavy rain and breed in large numbers (North).

**Season** Usually Aug.–Dec. in e. and s. Aust. but influenced by rainfall, especially after drought, when may breed in any month (Campbell; North; Aust. NRS). In sw. WA, breed June–Nov. (Masters & Milhinch 1974; Halse & Jaensch 1989); in sw. NSW, breed after great influx of birds, breeding continuously through winter and summer (Hobbs 1961). Time of laying correlated with peak of rainfall plus 2 or 3 months (Halse & Jaensch 1989); start nesting as water dries up after flooding (Aust. NRS).



(se. Aust.)

**Site** In swamps of redgum, cane grass, lignum or occasionally polygonum, in rank grass beside flooded creek, long grass on banks of reservoir, flooded paddock, farm dam, on small islet in lake (Howe 1910; McGilp 1923a; Aust. NRS); in lignum bushes, cane grass, clump of rushes, nitre bush, bluebush, well hidden among tangle of grasses and herbage, on branches of fallen tree, top of stump or in growth from stump, on debris on top of log in water, in forked butt of tree, shallow depression in ground (Chaffer 1940; North; Aust. NRS). Recorded nesting inside wooden box in tree (Morse 1922), under wire fence enclosure at foot of Peppercorn Tree *Schinus molle* (North). Black-winged Stilt *Himantopus himantopus*, Red-kneed Dotterel *Erythrogonys cinctus*, Australian Crake *Porzana fluminea* and White-fronted Chat *Ephthianura albifrons* may nest in colony of Native-hens (Aust.

NRS). MEASUREMENTS: height of nest (m): 0.3 (0.2; 0–0.8; 39) (Aust. NRS).

**Nest, Materials** Cup-shaped nest of lignum stalks and leaves, reed stems, twigs, leaves, cane grass, grass, long strips of bark (Chaffer 1940; Aust. NRS); lined with grass, leaves, swamp weed, feathers (Howe 1910; Aust. NRS); often partly hooded with woven stems over nest, sometimes with approach-ramp of broken reeds. MEASUREMENTS (cm): diameter, 23; depth, 10 (n=1) (Condon & Rix 1936). Nests, 7–10 m apart in w. NSW (Ridpath 1972b).

**Eggs** Oval, somewhat compressed towards smaller end; coarse, close-grained, more or less lustrous; vary from dull light-green to pale sage-green, pale greenish-blue or dark green, blotched with rounded markings of chestnut and purplish brown and minutely spotted all over with same colours or sparsely and evenly spotted or dotted fine purplish-brown intermingled with fainter underlying markings of same colour or dull violet-grey, sometimes with a few short purplish-brown hair-lines, particularly at larger end (Chaffer 1940; Campbell; North). MEASUREMENTS: 45.0 (1.01; 43.7–47.5; 20) x 31.8 (0.84; 29.7–33.3) (North). **Clutch-size** Usually 5–7 (McGilp 1923a; Aust. NRS); average 5.9 (4–12; 13) (Aust. NRS); larger clutches possibly from two females laying in same nest (S.T. Garnett). **Laying** Probably synchronic in large colonies where large numbers of birds arrive in an area and start breeding; in one 'colony' of five nests, four had clutches, fifth not known (Aust. NRS). One nest found with eight eggs being incubated and three eggs buried in base of nest, which suggests re-use of old nest, possibly after failure of earlier clutch (Aust. NRS).

**Incubation** Probably begins before clutch complete as hatching asynchronous but probably all within 24–48 h (Aust. NRS). No other information. **INCUBATION PERIOD:** 19–20 days (Aust. NRS). **Young** Precocial, nidifugous. At hatching, down, black with greenish tinge (Serventy & Whittell 1976; North; Aust. NRS). Remain in nest after hatching but not known for how long. **Parental care, Role of sexes** One adult accompanying a chick (Aust. NRS). No other information. **Success** From 30 eggs laid, seven hatched (Aust. NRS), but figure probably too low as hatching success difficult to measure because young seldom seen after leaving nest.

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

**Adult male** Second basic and subsequent plumages; not known if there are pre-alternate moults but no seasonal variation in appearance. **Head and neck** Forehead, lores and chin, black-brown (119) forming indistinct dark band round base of bill. Crown, nape and hindneck, olive-brown (28) to dark olive-brown (129), grading to dark grey (83) or grey-black (82) chin and throat. **Upperparts** Uniform olive (c30–c48); feathers have dark-brown (21) centres, which can be exposed on longest scapulars. **Underparts** Breast, dark grey (83) or dark leaden-grey (c87), grading to blackish (c82) vent and under tail-coverts. When very fresh, indistinct grey-black (82) tips to feathers of breast can make this area look blackish too. Thighs and hind-flanks, dark grey-brown (121) with concealed light-brown (119C) bases. Long feathers on sides of belly, which cover hind-flanks in some postures, grey-black (82) with large, elongate white spot near tip of each feather. Axillaries, olive-brown (c28), sometimes with white tips. **Tail** Black (89) to black-brown (119); central feathers have dark-olive (c48) bases to edges. **Upperwing** Tertiaries and all secondary coverts, olive (c30–c48) with dark-brown (119A) centres that are varyingly exposed on greater and outer median coverts and less exposed on inner median coverts. Primary coverts and alula, dark brown (121) to blackish brown (119) (inner webs generally darker) with olive-brown (c28) outer webs. Prima-

ries and secondaries, dark brown (121) to blackish brown (119); most have narrow brownish-olive (c28) outer edge grading to olive-grey (42) on p6–p9 but p10 has broad white outer edge. **Underwing** Remiges, dark grey (83), appearing light grey (85) in some lights; all greater coverts and median secondary coverts, similar but with broad white tips meeting to form distinct stripes across underwing. All other coverts, dark brown (119B–119A) with broad white tips (narrowest towards leading-edge) and black-brown (119) subterminal bands.

**Adult female** Second basic and subsequent plumages. Differences from adult male: **Head and neck** Blackish-brown band of feathering round base of bill narrower than in males, sometimes absent. Crown to hindneck, olive-brown, generally lighter and greyer than in males. Throat and foreneck, dark grey (83) to grey (c84), generally lighter than in male. **Upperparts** Olive (pale 48) to grey-olive (43); slightly paler and greyer than in males. **Underparts** Breast, leaden grey (87) to grey (c84), paler and faintly bluer than in male; breast-colour often extends over much of belly. White flank-spots usually slightly smaller than in male. **Upperwing** Tertiaries and all secondary coverts slightly lighter and greyer than in male.

**Downy young** Small chicks evenly covered by short black (89) down, which can show faint greenish or silvery sheen in sunlight. Down of body fades to black-brown (119) before it is shed.

**Juvenile** Differences from adult. **Head and neck** Feathers smaller and narrower than in adult. When fresh, very similar to adult female. When worn, white bases to feathers of lores and chin exposed; top of head, paler olive-brown (pale 28) or olive-grey (c43) than adult female, grading to pale grey (c86) or off-white on face and throat. **Upperparts** As adult female. **Underparts** At first, similar to adult female but feathers smaller and narrower; ground-colour of breast slightly paler and greyer and extends over whole belly so that blackish vent and under tail-coverts contrast sharply. Flank-spots much smaller, narrower and less conspicuous; feathers have white shaft-streaks that broaden into two or three small spots near tip of feathers; distal spots have dark-brown (121) borders. When worn, breast and belly look much paler because fringes of feathers fade to grey-brown (119C); feathers can develop narrow white tips. Thighs and hind-flanks fade to wholly grey-brown (119C). **Tail** As adult but feathers narrower and softer. **Wings** Similar to adult female; remiges, narrower but distinction unreliable when worn.

**Immature** First basic; closely similar to adults. Some individuals separable on shape of primaries and some retain a few juvenile feathers on flanks (where smaller, narrower juvenile flank-spots are conspicuous), midline of underparts (where remnant juvenile feathers are paler and usually white-tipped) and tail.

**BARE PARTS** From photos (NPIAW 1985; Aust. RD; unpubl.: J.N. Davies) and museum labels.

**Adult, Immature** Bill and frontal shield, light green (161, 61, 58), sometimes grading to duller green (–) or pale bluish-grey (c86) at tip of lower mandible; basal half to basal two-thirds of lower mandible, orange-red (c15) to red (14). Iris, usually orange-yellow (18), sometimes yellow (–). Tarsus and toes, pinkish red (c13); claws, grey-black (82). No seasonal change known but there has been no detailed study throughout a breeding attempt. **Downy young** When newly hatched: bill, black (89) with large white egg-tooth; basal third of upper mandible (behind nostrils), dark pink (c108C); base of mandibular rami perhaps also pink; narrow white or pale grey (c86) saddle with black border occurs half-way along upper mandible; iris, blackish (–); tarsus and toes,

grey-black (c82). No information for large downy young. **Juvenile** At first, bill, greenish yellow (–) with dusky (–) tip that is largest on lower mandible; iris, black-brown (c119); tarsus and toes, dirty pink (c3) with brown (c119B) centres to scutes. Adult colours attained before post-juvenile moult.

**MOULTS** From about ten subadult and 45 adult skins (ANWC, HLW, MV, SAM) and records in Hall (1974).

**Adult post-breeding** Pre-basic; complete. No records available of adults in moulting remiges; presumably they are cryptic during a simultaneous moult of remiges. Wear of fully grown primaries in skins indicates most moult remiges in late summer or autumn. Of ten individuals collected Sept. and Oct., most had worn wings but three collected 21 Sept. and 8 and 15 Oct. had completed moult. A few individuals still have worn plumage in May. Too few data on moult of body to rule out possibility of pre-alternate moult. **Post-juvenile** Partial, not including remiges, which are retained through first winter and replaced in second pre-basic at about the same time as adult post-breeding. Some retain a few feathers in tail or underparts. Date of active post-juvenile body-moult probably depends on date of hatching; has been recorded Jan.–Apr. but fresh juveniles without moult have also been collected as late as May and July.

**MEASUREMENTS** (1) Aust., adult, skins; BILL G taken from tip to junction of upper tomium with feathering (ANWC, HLW, MV, SAM). (2) Aust., fully grown juvenile, skins (ANWC, MV, SAM).

	MALES	FEMALES	
WING	(1) 218.3 (6.48; 205–231; 18) (2) 213.8 (7.08; 205–226; 5)	210.2 (6.83; 200–223; 15) 207	**
STH P	(1) 150.5 (5.40; 139–159; 18) (2) 147.6 (4.18; 141–153; 5)	145.1 (7.18; 131–160; 16) –	*
TAIL	(1) 82.7 (3.50; 76–88; 18) (2) 79.3 (4.23; 71–84; 6)	80.1 (4.49; 72–87; 15) 71, 70	ns
BILL	(1) 33.0 (2.37; 30.2–39.0; 18) (2) 31.0 (2.75; 28.1–34.6; 6)	29.2 (1.23; 27.3–31.6; 15) 28.0, 31.7	**
BILL G	(1) 25.4 (1.59; 20.3–28.1; 18) (2) 24.7 (2.20; 21.5–27.6; 6)	24.1 (1.54; 21.3–28.9; 15) 22.7, 25.2	*
TARSUS	(1) 61.7 (1.81; 59–66; 15) (2) 58.0 (2.77; 52.2–61.1; 6)	56.5 (3.63; 50.3–62.4; 14) 55.3, 58.5	**
TOE C	(1) 57.6 (0.67; 56.5–58.5; 5)	56.4 (3.85; 51.7–62.4; 4)	ns

**WEIGHTS** Adult males: 410 (82.8; 250–530; 8) (ANWC, MV, SAM; Hall 1974); adult females: 364 (33.9; 322–405; 5) (ANWC, MV); immature males: 520, 320; juvenile males: 347, 302 (ANWC, MV, SAM). Considerable range of weights possibly related to reserves acquired for long-distance movements but available data shows no obvious seasonal trend.

**STRUCTURE** Wing, short and rounded. Ten primaries; p9 longest, p10 7–15 shorter, p8 0–3, p7 3–10, p6 8–23, p5 16–36, p4 26–49, p3 36–50, p2 47–71, p1 61–83. No emarginations. Twelve secondaries, including four tertials. Tail, rather short; square when folded but usually raised in strongly arched position (like posture often seen in Domestic Chicken), so sides of tail readily visible; 14–18 feathers. Bill, short and straight; at base, depth c. 40% of length, width c. 60%. Tarsus, scutellate. Toes, rather short for a rallid (about length of tarsus); outer toe c. 80% of middle, inner c. 78%, hind c. 35%.

**RECOGNITION** Colour of bill of downy young not like that

of adults (*contra* Mathews & Iredale 1921 and many secondary sources thereafter). Downy young could be confused with those of Tasmanian Native-hen; Black-tailed has narrow pale white saddle in centre of upper mandible (saddle lavender [c77] in Tasmanian) and slightly more slender feet (based on two photos and one skin); not known if these characters useful in separating larger chicks but most large chicks would have emergent juvenile plumage, showing differing patterns of flanks. Native-hen chicks differ from all other Aust. rallid chicks by large pink base to upper mandible, large white egg-tooth, and small pale central saddle on bill.

**GEOGRAPHICAL VARIATION** None in Aust. (Hall 1974). Hybridization with Eurasian Coot *Fulica atra* recorded in captivity (Dunn 1990).

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Black-tailed Native-hen *Gallinula ventralis* (page 609)  
1 Adult male; 2 Adult female; 3 Downy young; 4 Juvenile; 5 Adult

Tasmanian Native-hen *Gallinula mortierii* (page 615)  
6 Adult; 7 Downy young; 8 Juvenile