

Text and images extracted from

Marchant, S. & Higgins, P.J. (co-ordinating editors) 1990. Handbook of Australian, New Zealand & Antarctic Birds. Volume 1, Ratites to ducks; Part B, Australian pelican to ducks. Melbourne, Oxford University Press. Pages 953, 1071, 1095-1104; plate 80.

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## Order CICONIIFORMES

Medium-sized to huge, long-legged wading birds with well developed hallux or hind toe, and large bill. Variations in shape of bill used for recognition of sub-families. Despite long legs, walk rather than run and escape by flying. Five families of which three (Ardeidae, Ciconiidae, Threskiornithidae) represented in our region; others — Balaenicipitidae (Shoe-billed Stork) and Scopidae (Hammerhead) — monotypic and exclusively Ethiopian. Related to Phoenicopteriformes, which sometimes considered as belonging to same order, and, more distantly, to Anseriformes. Behavioural similarities suggest affinities also to Pelecaniformes (van Tets 1965; Meyerriecks 1966), but close relationship not supported by studies of egg-white proteins (Sibley & Ahlquist 1972). Suggested also, mainly on osteological and other anatomical characters, that Ardeidae should be placed in separate order from Ciconiidae and that Cathartidae (New World vultures) should be placed in same order as latter (Ligon 1967).

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## Family PLATALEIDAE ibises, spoonbills

Medium-sized to large wading and terrestrial birds. About 30 species in about 15 genera, divided into two sub-families: ibises (*Threskiornithinae*) and spoonbills (*Plataleinae*); five species in three genera breeding in our region. Body elongated, neck long. Male larger and with longer bill than female. Wings rather long and broad; 11 primaries; p8 and p9 longest, p11 minute. About 20 secondaries; diastataxic. Fly with strong wing-beats, often soaring; neck and legs extended. Tail short, square or slightly rounded; 12 feathers. Bill long: decurved in ibises, straight with flattened end in spoonbills; nostrils slit-like. Varying extent of bare skin on head and in *Threskiornis* on head and neck. Legs rather long, lower half of tibia bare; toes of medium length, with small webs basally, hind toe or hallux slightly elevated, middle toe pectinate only in *Plegadis*. Carriage of body upright, gait striding. Oil-gland, feathered. Feathers with aftershaft. Down on feather-tracts and apteria; no powder-down patches. Plumage, white, red, red-brown or black; dark colours often glossy. Sexes alike. In some species, notably *Threskiornis* and *Platalea*, breeding plumage differs from non-breeding by occurrence of ornamental feathers. Bare parts, especially of face, coloured black, brown, red or yellow; colour may intensify during pair-formation, such as red patches under wing in *Threskiornis molucca*. Two moults per cycle; pre-breeding moult may involve only small part of plumage. Moult of primaries in staffelmauser (outwards). Young semi-altricial, nidicolous. Two downs: white, grey or black; first sparse, growing from follicles of later contour-feathers and soon overgrown by dense second down, growing from follicles of later down. Juveniles, similar to adults, but often darker with bare areas of head smaller.

Cosmopolitan in tropical, subtropical and temperate areas. Marine intertidal and inland aquatic birds of warm and temperate continental climates, preferring standing or slow-flowing fresh water, marshes, floodlands and tidal flats. Ibises feed also in drier habitats. In our region species nomadic, with wide post-fledging and post-breeding dispersal. Move diurnally; usually roost in trees and bushes over water at night; fly in formation; often soar. Eat many sorts of invertebrates, especially insects and their larvae, molluscs and crustaceans, and small vertebrates, particularly fish, reptiles and amphibians. Feed mostly in shallow wet areas where typically probe in soft mud (ibises) or sweep bill from side to side in water (spoonbills). Some ibises feed much on insects in dry habitats, often probing in cracks in soil, and on insects flushed from pastures by irrigation; scavenge at garbage tips, poultry farms and in public parks. Gregarious when foraging and when roosting at night. Typically colonial breeders, pairs defending only nest-territory. Spoonbills may nest in small groups or singly. Monogamous pair-bond, of seasonal duration so far as known. Pair-formation appears to be as in other Ciconiiformes but not widely studied; displays include similar essential elements such as Twig-grasping and Stick-passing. Voice, mainly harsh, guttural, wheezing or grunting, with some bill-snapping sounds. Vocalization most apparent during pair-formation, nest-building and nest-occupation. Away from colony or roost, generally silent except when flocks alarmed. Nestlings more vocal than adults, with shriller sound. Comfort-behaviour similar to that of other waterbirds; stand in shallow water, often rapidly beating wings; crouch on nest or roost with wings outstretched and bare patches exposed in hot weather. Heat dissipated by gaping and gular fluttering, adults and unfledged young often stand with one wing lowered; eggs and nestlings sheltered by drooping wings of adult.

Annual, seasonal breeders in temperate parts of range, with local variation influenced by rainfall and flooding. Nest in trees or dense vegetation, almost invariably over water; occasionally stumps or small islands in marshes. Colonies of ibises and spoonbills often mixed, occasionally with cormorants. Nests large, interwoven from available vegetation, usually of sticks and rushes. Built largely by female with material brought by male. Eggs oval, white and smooth, except *Plegadis* (deep greenish-blue and slightly rough). Clutch-size 2-5 (1-5). One brood. Replacement clutches after loss. Eggs laid at intervals of 1-2 days. Incubation period 21-29 days. Incubation starts with first egg; hatching asynchronous. Both sexes incubate, changing over at least once in 24 hours. Single median brood patch. Eggshells discarded over side of nest. Young cared for by both sexes; nestlings brooded continuously when small. Fed mainly by partial regurgitation. May leave nest site at 2-3 weeks, often forming crèches but returning to nest to be fed. Nestling period 4-7 weeks, young becoming independent 1-4 weeks later. Age at maturity unknown, but breeding may occur in *Threskiornis* at 18 months-2 years.



## *Platalea regia* Royal Spoonbill

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*Platalea regia* Gould, 1838, *Syn. Birds Aust*, 4: append. 7 — eastern coast of New South Wales.

*Platalea* was the Latin name (Cicero) for the Spoonbill, here with the specific name of royal.

OTHER ENGLISH NAME Black-billed Spoonbill.

### MONOTYPIC

**FIELD IDENTIFICATION** Length 74–81 cm, of which body less than half; wingspan c. 120 cm; weight 1.5–1.8 kg. Large, immaculate white waterbird with black spatulate bill and black facial skin, legs and feet. Slightly smaller and shorter-billed than similar Yellow-billed Spoonbill. Pronounced nuchal crest during breeding season. Sexes alike; males slightly larger with slightly longer legs and bills. Sexes sometimes discernible in field at close range when pair together. Some seasonal plumage changes and distinctive changes in colour of bare parts. Immatures separable.

**DESCRIPTION** **ADULT MALE BREEDING.** Plumage, brilliant white except pale creamy-yellow wash in horizontal crescent across lower foreneck and upper breast (formed by elongate straw-like feathers). Striking nuchal crest (to 200 mm long) arises from crown; can be erected and spread during displays revealing salmon-pink skin beneath. Remiges tipped black in some birds. Strip of salmon-pink skin along leading-edge of underwing; very obvious when bird lifts wings. Bill, black with blue-grey transverse bars across upper mandible visible in close view. Iris, dark crimson. Facial skin, black contrasting with rich-yellow patch (usually oval) above eye on

bare skin within eye-socket; red patch on mid-forehead adjoining feathering of crown. Legs and feet, black. **ADULT FEMALE BREEDING.** Plumage like adult breeding male but crests often (not always) smaller; females also smaller, with shorter legs and bill. **ADULT NON-BREEDING.** Like breeding plumage but crests reduced, plumage often appears dirty and no bright-pink colour on underwing. **JUVENILE.** Smaller than adult with shorter smooth bill and without yellow patch of skin above eye; plumage like non-breeding adult but without crest and with black tips to primaries.

**SIMILAR SPECIES** Large spatulate bill readily distinguishes spoonbills from all other waterbirds and easily seen unless bird sleeping. Similar only to **Yellow-billed Spoonbill** from which distinguished by black bill and facial skin (yellow and pale in Yellow-billed) and black legs and feet (yellow in Yellow-billed). Large nuchal crest of Royal Spoonbill also distinctive in breeding season and should help to distinguish Royal from Yellow-billed even in silhouette. When sleeping, black facial skin and yellow patches over eye may be visible.

Gregarious, in small flocks. Often fly in lines or chevrons



but parties tend to spread out when feeding. Walk slowly with upright posture and stiff-necked carriage. Habitually wade; feed by sweeping bill in smooth lateral arcs. Fly with neck and legs extended in flattened profile with bill held horizontally; wing-beats rapid, interspersed with glides. Roost communally. Usually silent away from nest; both sexes utter quiet grunts and groans at nest-site.

**HABITAT** Terrestrial wetlands, sheltered marine habitats and wet grasslands; permanent and ephemeral waters used where available in arid interior (Badman 1979). Structure of bill limits feeding to shallow water <0.4 m deep over substrate of sand, mud or clay (Vestjens 1975); birds often feed among aquatic or emergent vegetation or submerged logs that shelter prey (Vestjens 1975; Lowe 1982). Prefer large areas of water (Badman 1979; Pescott 1983). Within these limits, many habitats used; fresh or saline, permanent or ephemeral, open or vegetated. Favoured coastal habitats include estuaries and inlets, where forage on intertidal mudflats covered with seagrass (*Zostera*, *Heterozostera*); less common in open coastal lagoons, unvegetated salt pans, and saline swamps vegetated with mangroves, saltmarsh or rush (*Juncus*). Inland habitats little used in NZ, but in Aust., prefer freshwater wetlands, including swamps with semi-aquatic herbs or tall emergent vegetation (*Eleocharis*, *Typha*, *Phragmites*, *Scirpus*, *Eragrostis*), wet meadows, flooded pasture, rivers, billabongs and pools; in deeper lakes and swamps use shallow margins; also feed in open water or in inundated woodland (*Melaleuca*, *Casuarina*, *Eucalyptus*) (Goodrick 1970; Vestjens 1977; Corrick & Norman 1980; Robertson & Preece 1980; Corrick 1981; Gosper 1981; Corrick 1982; Lowe 1982; Fjelds  1985; Jaensch *et al.* 1988). Artificial wetlands used include sewage lagoons, salt fields and reservoirs.

**BREEDING** Probably throughout range in mainland Aust. and NZ and on small offshore islands in Otago, NZ. Nest over or near water, usually in trees, shrubs or reeds, but in NZ recorded on ground and among river debris (Holdaway 1980). Freshwater wetlands (lakes, swamps, watercourses, floodwaters) often used for breeding, but birds nest also in

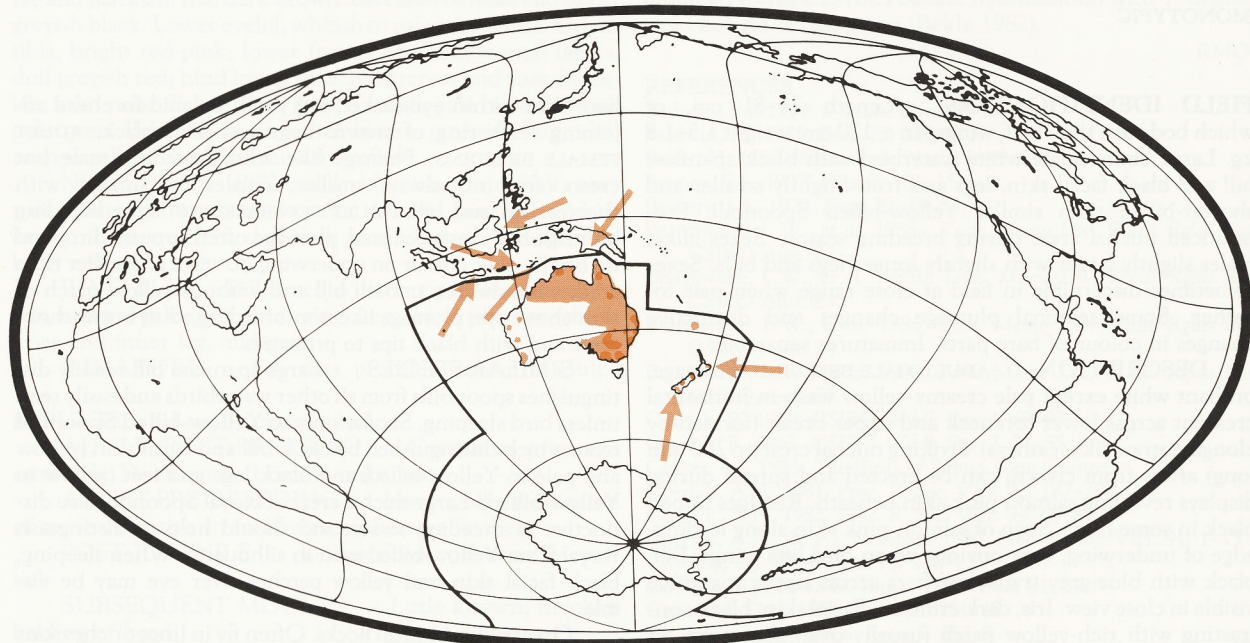
brackish or saline habitats (river deltas, salt lakes) (Bailey 1934; Garnett & Bredl 1985; Corrick & Norman 1980; Holdaway 1980; Pescott 1983).

Take food from on or above substrate (Lowe 1982). Fly up to many metres above ground, often soaring to great heights. Roost on ground, on banks or shores, or in trees, usually in or near water.

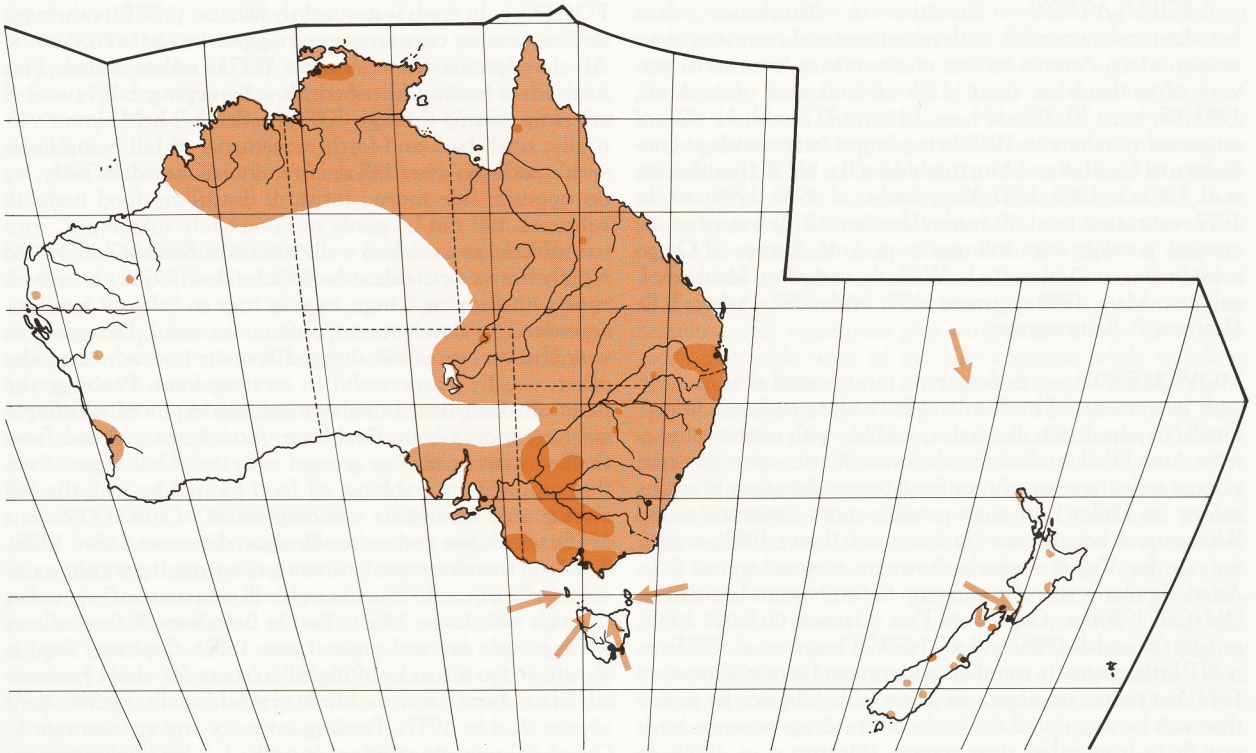
Intolerant of disturbance, particularly at breeding colonies. Construction of sewage lagoons, salt fields and reservoirs has provided additional feeding habitat, but many natural freshwater wetlands used for feeding and nesting have been destroyed or modified by drainage, clearing, increased salinity, burning, increased inundation and invasion by introduced plants (Riggert 1966; Goodrick 1970; Corrick & Norman 1980; Corrick 1981, 1982; Jaensch *et al.* 1988; Morton *et al.* 1989). Freshwater wetlands on floodplains of NT threatened by saline intrusion when buffalo break down levees (Schulz 1989).

**DISTRIBUTION AND POPULATION** Occur throughout e. and n. Aust. and NZ; straggle to Indonesia, New Guinea and some sw. Pacific islands.

**AUST.** Generally common throughout e. mainland and N of 20°S; rare SW of line roughly from Broome, WA, to head of Spencer Gulf, SA; rare Tas. (Aust. Atlas). Small numbers regularly recorded Torres Str. (Draffan *et al.* 1983). **Qld**, **NSW**, **Vic.**, **se. SA**, throughout all areas but perhaps more numerous on and near coast than inland. **Tas.** Rare visitor; King I.: singles, C. Wickham, June 1965, and Pass R., July 1966 (McGarvie 1966); single, Adelaide Bay, Flinders I., 2 Dec. 1985 (Tas. Bird Rep. 1985); singles, Stanley, and Forth, 31 Aug. 1957 (Wall 1977); St Helens: two, Aug.–Nov. 1975, single, July–Sept. 1985, single 10 Oct. 1985 (Tas. Bird Reps 1975, 1985); single, Swansea, Sept. 1959 (Wall 1977); Little Swanport: 9 Nov. 1957; Mar.–Apr. 1958 (Wall 1977); single, Triabunna, 15 Aug. 1985–27 Feb 1986 (Tas. Bird Rep. 1986); single, Marion Beach–Marchwiell Marsh, 1983 (Tas. Bird Rep. 1983); two, Brown's R., May, Oct. 1957 (Sharland 1957). **SA.** Westernmost records Streaky Bay (Aust. Atlas). **WA.** Rare,







except in Kimberley Division. Atlas records S of 20°S: Newman, 21 Feb. 1979; Carnarvon, Aug. 1978; Wooleen Stn, 7 Oct. 1978; L. Chandala, 24 Oct. 1981; L. Forrestdale, 4 July 1981; Bengier Swamp, Nov. 1977; Collie R., July–Sept. 1979.

**NZ** Breed at three or four localities on SI; in non-breeding period disperse along coasts; few inland records. Rare straggler before 1940s; breeding at Okarito since 1950 (Oliver; NZCL). **NI.** Small numbers recorded from Northland to Wairarapa; regular in winter at Westshore, Hawke's Bay, and especially in Manawatu R. estuary. **SI.** Recorded in all regions, most often in Nelson district at Farewell Spit, Motueka and Waimea Inlet; in Marlborough, at Vernon Lagoons; on w. coast from Karamea to L. Moeraki; on e. coast from Banks Pen. to L. Waiholo, Otago Pen.; and in e. Southland (Fortrose, Waituna Lagoon) (B.D. Heather; NZ Atlas; CSN).

**NORFOLK I.** Vagrant, four records of single birds: 1892 (Bassett-Hull 1910); 1963 (Wakelin 1968); 1971, 1976 (Moore 1981).

**LORD HOWE I.** Vagrant; singles: collected, Sept. 1891 (Hindwood 1940); found dead, 6 June 1975 (NSW Bird Rep. 1975).

**BREEDING.** Aust.: Perhaps widely throughout range in suitable places, when conditions favourable. Known localities as follows (from Aust. Atlas or Aust. NRS, except as noted):

#### Qld

- Bynoe R.: 1985, 50 nests
- Coleman R.: 1981, large colony
- Flinders R. Estuary: 1985, 80+ nests
- Mouths of Kendall and Holroyd Rs: 1989 (A. Taplin)
- L. Dynevor: 1977–81
- Mt Tamborine: 1979, 6 nests

#### NSW

- Murwillumbah: 1980
- Barham: 1981.
- Burril L., Ulladulla: 1980
- L. Cowal: 1984, 24 nests
- Moira: 1983, 30 nests
- Pillingarwarrina Bore: 1978

#### Vic.

- Rhyll Swamp: 1979 (Lowe 1981)
- French I.: 1979 (Lowe 1981)
- Heifer Swamp: 1980, 20 nests
- Inverloch: 1980
- L. Tutchewop: 1980
- Mystic Park: 1986, 5 nests
- Sale: 1978
- Werribee: 1978

#### SA

- Bool Lagoon: 1980–81

#### NT

- Humpty Doo: 1977, 4 nests
- Kapalga: 1979.

**NZ** Originally, only at Okarito but new colonies established since 1978.

#### Marlborough

- Vernon Lagoons: since 1978; 1982, 42 birds (Holdaway 1980; NZ Atlas); 1986, 9 nests, 19 birds; 1988, 5 nests, 44 birds (W.F. Cash).

#### Otago

- Maukieke I., Moeraki: established 1983–84, 7 nests; 1987–90, c. 30 nests (P. Schweigman)
- Green I., Dunedin: since 1988, 4 nests (P. Schweigman)

#### Westland

- Okarito: 1978, 52 birds; 1983, 26 birds (NZ Atlas); 1983–90, 6–9 nests (C. Woolmore; G. Aburn).



**POPULATION** Sensitive to disturbance when breeding and vulnerable to development and recreational activities. **AUST.** Annual indices of abundance from aerial surveys of wetlands in about 12% of land area of e. Aust., 1983–88, were 70, 282, 104, —, 181 and 727; with 41–80% of estimated numbers in 1988 being found in wetlands at confluence of Lachlan and Murrumbidgee Rs, NSW (Braithwaite *et al.* 1985a,b, 1986, 1987; Kingsford *et al.* 1988, 1989). **NZ.** In 1977, estimated total 49 birds (Heather 1978) but since increased, possibly with influxes from Aust. Survey of Otago coast (between Oamaru to L. Waiholo, including Maukikie I. colony), Mar. 1990 counted 157 birds (NZ Atlas; B.D. Heather; P. Schweigman).

**MOVEMENTS** Sedentary at most coastal sites in Aust. with movements of birds inland fluctuating with conditions. Small NZ population dispersive, possibly with winter influxes from Aust. Well-studied population at Westernport Bay considered sedentary, largely confined to mudflats near breeding colony on Philip I., though possibly more dispersed round Westernport late summer–early autumn (Lowe 1982); reporting rate for Vic. as a whole shows no seasonal trends (Vic. Atlas). Similarly, size of population fairly constant Innisfail, n. Qld (Gill 1970), w. Cape York Pen. (Garnett & Bredl 1985), se. Qld (Woodall 1985) and ne. NSW (Gosper *et al.* 1983). In n. NT little change in numbers occurs near Darwin (Crawford 1972) but more congregate on swamps in Alligator Rs region than can be accounted for by local breeding; so some birds may fly in from other river systems (Morton *et al.* 1989). In inland NSW, movements more extensive: absent from L. Cowal, NSW, May–Oct. (Vestjens 1975) and only small numbers present sw. NSW, May–July (Hobbs 1961). Also dry season (Apr.–Dec.) visitor to islands in Torres Str. (Draffan *et al.* 1983) and flocks of 50–200 seen flying N towards NG in Apr., S in Dec. (Vigden 1921; S.T. Garnett). Immatures certainly travel long distances with most distant recovery over 1400 km (Lowe 1984). In NZ, birds breeding Okarito and Marlborough disperse to wintering areas at Farewell Spit, Motueka and Waimea Inlet in n. SI and to Manawatu R. estuary and Westshore in NI, with small numbers occurring at other estuaries and some inland lakes. Birds breeding Otago appear to disperse to coasts of Canterbury, Otago and Southland (Robertson & Preece 1980; Owen & Sell 1985; B.D. Heather). Also recorded Lord Howe I. (Hindwood 1940).

**BANDING** Returns from Dowd's Morass (ABBBS) summarized Fig. 1.

Other records (all ABBBS):  
 29S147E 12 P U 36 380 123  
 32S142E 01 P U 7 686 162  
 35S143E 12 P U 7 711 075  
 35S143E 12 P U 7 1472 033  
 37S140E 11 P U 1 277 048

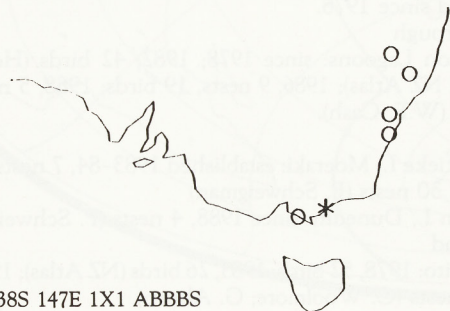


Fig. 1. 38S 147E 1X1 ABBBS

**FOOD** In fresh water mainly fish, on tidal flats shrimps; also takes other crustaceans and aquatic insects. **BEHAVIOUR.** All descriptions from Vestjens (1975) unless stated. Five methods of feeding described: **Slow Sweeping:** bill, open 2–4 cm at tip, swung through 100° arc with bill held almost vertically, small back-and-forth movements of bill being made within each arc; when bill at extremity on one side of body, leg on opposite side moved forward, disturbing food items in substrate. Bill can be partly or completely submerged, with part of head and neck as well. **Intensive Search:** bill moved rapidly from side to side as bird wades slowly, quickly or even runs with flapping wings; usually tries to relocate food encountered by slow sweeping; often successful. **Dragging:** in very shallow water bill dragged first on one side then the other; usually unsuccessful in locating food. **Probing:** the bases of waterplants or submerged logs explored with rapid stabbing movements. **Grabbing:** food items grabbed from shallow water, plants or ground with tip of bill. Apart from that captured by grabbing, all food located by feel, the bill closing only on objects touching inside of spoon (Vestjens 1975), which has numerous vibration detectors (Lowe 1978). The food therefore usually floating or swimming within water column (Vestjens 1975), although will pass stems of vegetation through bill (Lowe 1982). Tactile detection of food allows feeding both day and night (Lowe 1982). Captured food is transferred to throat by lifting bill to about 60° above horizontal. Have been seen to break crayfish shells against hard objects (Hobbs 1957). Feeding intensity and success rate L. Cowal (20 min observations/month, 3–7 birds/observation; Vestjens 1975) 56.4 sweeps/min (25–74), 6.4 food items/min (2–18); Westernport (60 observations; Lowe 1982) 3.5 items/min. Juveniles (2–6 items/min, four birds, 20 min observations) much less successful than adults (5–12 items/min, five birds; Vestjens 1975). Feed singly or in flocks >100. Sometimes follows Sacred Ibis for up to 5 min, but without any observable increase in feeding success (Lowe 1982). Differ from Yellow-billed Spoonbill *P. flavipes* by feeding more rapidly with shorter broader bill that has more papillae in spoon, therefore can capture and hold larger faster prey.

**ADULT** At L. Cowal (20 stomachs; Vestjens 1975) fish 42.0% vol. (*Retropinna semoni* tr./bird, max. 1, *Carassius auratus* mean 3, 32, *Gambusia affinis* 24, 194, *Perca fluviatilis* tr., 1, *Philypnodon* tr., 2), insects 33 (odonatans: Anisoptera nymphs 1, 18, bugs Corixidae 21, 134, Notonectidae 9, 162, beetles Dytiscidae 1, 4, Hydrophilidae tr., 7, water beetle larv. 1, 5), crustaceans 25 (shrimps Atyidae tr., 3, *Macrobrachium* tr., 2, freshwater crayfish *Cherax destructor* 1, 4), molluscs <1 (*Lymnaea*, *Bullinus* tr., 3), plants <1 (*Medicago* seed 18, 116).

At Westernport (ten stomachs; Lowe 1982) crustaceans shrimps *Macrobrachium intermedium* (66.2% wt., 5.6–90.1, 100% freq., mean 104.3 individuals/bird, max. 218), other crustaceans 4.6, 2.9, 1.0–9.3, 100 (amphipods *Cymadusa* tr., 2, isopods *Cerceis acuticaudata* tr., 1, shrimps *Alpheus euphrosyne* 2.8, 10, *Pontophilus intermedium* 4.1, 11, *Chlorotocella leptorhynchus* tr., 4, crabs *Brachynotus bispinosus* tr., 1, *Macrophthalmus latifrons* tr., 1), fish 23.9, 23.5, 1.0–80.3, 111 (Gobiidae, mostly *Arenigobius bifrenatus*, 2.6, 24, Clinidae 1.2, 3), cephalopods 5.3, 1.7, 0–53.0, 10; Sepiolidae tr., 3).

**Other records:** shellfish (Mathews 1910); freshwater crayfish *Eustacus armatus* (Hobbs 1957); insects incl. plague locusts (Boekel 1980), bugs Notonectidae, *Agraptocorixa* (van Tets *et al.* 1977), beetles (Mathews 1909, 1910) incl. *Homeodytes scutellaris*, Curculionidae (van Tets *et al.* 1977); tadpoles



(Mathews 1910); plants *Marsilea* (van Tets *et al.* 1977).

**NESTLING** Apparently similar to adults: at Westport (three chicks, 182 items; Lowe 1982) *Alpheus ephrosyne* 13% no., 67% freq., *Macrobrachium intermedium* 53, 67, *Pontophilus intermedius* 3, 67, Dytiscidae 12, 100, Gobiidae 14, 33.

**INTAKE** Take c. 1900 prey/day (Howard & Lowe 1984).

**SOCIAL ORGANIZATION** Based on observations at L. Cowal, NSW (Kahl 1988); additional notes from K.W. Lowe at Rhyll Swamp, Phillip I., and Kerang, Vic. Found singly or in groups of up to 50 throughout year, often in association with Yellow-billed Spoonbills and other ibises, herons and cormorants.

**BONDS** Monogamous; pair-bond probably lasts one season; new pairs apparently formed at beginning of breeding season. Sex ratio, ages at pair-formation and first breeding unknown.

**BREEDING DISPERSION** Colonial or semi-colonial. 2–50 nests within sight of each other; single nests up to 50 m apart to clusters of two or three nests within 2 m of each other; 1–5 nests within 5–10 m of each other. Nesting territory extends for only 1–2 m round nest; established at beginning of breeding season; only nesting activities carried out in territory. Non-territorial at feeding areas, though fights do erupt if birds crowd each other too much. Range widely to feed; overlapping with conspecifics.

**ROOSTING** Outside breeding season, in trees near feeding areas (e.g. mangroves) or at breeding sites (K.W. Lowe); also on sandspits among roosting waders and gulls in NZ. During breeding season, off-duty parents often roost and rest on elevated perch near nests; typical sites on lignum, in trees or in water. Roost anytime when not feeding; often feed at night. Rest and loaf in water near feeding area, often in groups. When loafing or sleeping, spoonbills stand, usually on one leg, in **Hunched Posture**, neck retracted, head withdrawn nearly to level of upper back, bill pointed down and resting on chest; or frequently head rotated c. 165° with bill and front portion of face tucked beneath mid-back and scapular feathers; most of time head turned to side opposite single standing leg and often face toward more exposed or vulnerable side of nest.

**SOCIAL BEHAVIOUR** Based on observation at L. Cowal (Kahl 1988) and in Vic. (K.W. Lowe). Before flying, give **Flight-intention Display** in which extend neck forward, hold head up and forward with bill raised between horizontal and 30–45° below horizontal; rock backwards and forwards between this and erect stance; crest compressed, mainly laterally, but still hangs out in back; may gape (10–30 mm at tip) and sporadically give flight-intention calls uttered at intervals of 1–10 s (see Voice); open wings and launch into air with upward jump. At high intensity, often looks to side, may repeatedly lift one foot and, sometimes, flicks one wing. Often given over many minutes before take-off and sometimes abruptly stops without resulting in flight; may adopt posture in conjunction with Alarm Display if disturbed. **Autopreening**. When preening remiges, feathers generally held in broad portion of spoon and stripped down length of feather with lateral movement of bill; gentle nibbling of contour feathers in tip of bill. Spend long periods preening feathers of back, wings and breast; often rub bare skin of face and base of bill on preen gland, then wipe it on feathers. Rolling head-rubs, rubbing

back and sides of head on back and bend of wing with rolling head motion, common, especially during tense social situations, such as pair-formation and may have signal function. **Scratching**. Scratch feathers of head and neck with tip of middle toe; erect crest; once seen scratching head with foot while gliding. **Shaking**, especially after bout of preening or scratching, extend neck forward horizontally, hold wings loosely away from side and shake up and down several times, then shake head and neck several times with rotational movement round longitudinal axis; often several snaps of bill, accompanied by slight upward toss of head follow; near end of shake erect crest briefly. Most often give both shakes in above sequence, but sometimes give wing-shake alone. Several rapid, side-to-side wags of tail also common while standing, often after stretching, and often after sitting, when settling on eggs to incubate. **Stretching**. Stretch leg and wing of same side, first raising leg until foot nearly touches feathers of belly, then extending leg and wing out from midline, down and to rear. Over-the-back and double-wing stretch less common; rotate body forwards and downwards, past horizontal, extend neck and hold head low, cock tail and lifts both wings over back and opens wrist; more often seen in large nestlings than adults. **Yawning**. Lift bill, partially erect crest and gape mandibles 100–200 mm at tip for 1–2 s simultaneously giving slight upward toss of head so that upper mandible near or slightly above horizontal; sometimes a few snaps (rarely audible) of bill follow, accompanied by slight toss of head; some birds yawn up to once every 5 s for as many as 19 times in a few minutes.

**AGONISTIC BEHAVIOUR** More often seen in male than female; occasionally seen when feeding, brief intraspecific threats with crest raised and bill gaped briefly at opponent; not known if antagonistic at roosts; most obvious in male establishing or maintaining territory. Male attacks by flying, or occasionally walking along branch, at perched intruders with **Supplanting**; vigorous attack, directed against either sex; often start display up to 10 m away. **Supplanting**. Extends neck, raises head until gaped-bill 10–30° above horizontal and crest erect; tilts body backwards and flaps against direction of flight, so reducing airspeed, makes loud noise with wings and appears ready to land on victim. Intruder usually flees and attacker lands in vacated spot with gaped bill and head below body axis; then often performs Display Preen (Front or Rear). Courting female, attempting to approach established male, submissive and tries to be accepted by **Appeasement Display**; male aggressive. **APPEASEMENT DISPLAY**. Female turns head away from male, bends forward with body axis nearly horizontal and head low; remains submissive and does not defend herself if attacked. After **Supplanting**, if neither bird retreats, Sparring may occur; no injuries sustained as blows rarely land and bills too soft; eventually one bird forces other to fly off to perch. **Sparring**. Attacker turns toward opponent, erects crest, gapes bill and reaches forward with neck extended and head in line with body; makes jabbing or biting movements at opponent (most often of same sex), wings often flapped for balance and snapping of mandibles sometimes audible at end of grab; opponent dodges blow and directs similar bite at attacker who, in turn, dodges blow; sometimes takes place between neighbouring pairs, generally males joust with males and females with females. In response to potential predators near nest, birds give **Nest-covering Display**: with all feathers of crest, head, neck, back and wing coverts raised (making bird appear much larger) and closed bill pointed down just in front of vertical, bends legs slightly,



droops wings away from sides and turns head or entire body toward threatening object, usually uttering grunting growl and at high intensity sometimes hisses (see Voice). May remain thus for several minutes if threat remains; seen in response to Australian Ravens *Corvus coronoides*, Rufous Night Herons *Nycticorax caledonicus*, Dusky Moorhens *Gallinula tenebrosa*, Eurasian Coots *Fulica atra*, Galahs *Cacatua roseicapilla* and Willie Wagtails *Rhipidura leucophrys* and once to conspecific near nest. Low intensity forms of display sometimes given by incubating birds, without standing up, and by birds standing on one leg with bill tucked. Herons and egrets antagonistic towards Royal Spoonbills that come near them while feeding (Vestjens 1975). However, Royal Spoonbills threaten Yellow-billed Spoonbills on feeding grounds (Vestjens 1975).

**SEXUAL BEHAVIOUR** Before pairs form, unmated birds of both sexes congregate in **Bachelor Parties**, usually in tall trees within sight of potential nesting areas, where first perform displays typical of behaviour at nest; males repeatedly attack, usually by Supplanting, and drive away others of both sexes; females seldom defend themselves or attack, and mainly stand round periphery of group; subadults may join in and on rare occasions newly paired bird leaves mate to do so. Bachelor Parties common for several days at start of breeding while most birds unpaired, may last for many minutes; afterwards many males return to already established nest-sites nearby. On one occasion, presumed male observed flying from place to place with stick in bill — perhaps male advertising display. Bachelor Parties possibly form where potential mates first meet but pair-formation not apparent until birds at nest-site. As Bachelor Parties become less prevalent, male generally establishes nest-site, begins to construct rudimentary nest platform and waits there; may spend many hours standing or apparently asleep on or near nest-site. Initially male drives away either sex; female approaching and trying to step on nest, if attacked, will retreat, wait, perhaps perform Display Flight and try to approach again; eventually, in most cases, persistent female accepted and pair stands together on platform. Copulation or attack by male may follow and not until male leaves to collect nest material, c. 5–8 days after establishment of nest-site, can birds be considered paired. During courtship and pair-formation, **Display Flights** commonly performed by unpaired female near courting group and occasionally by male or both members of partially formed pair; often used by birds flying to Bachelor Party: flies low over colony, for usually 20–60 s, with exaggerated wing-noise; flight-path often circular or in figure-eight with radius of 50–100 m; bird then lands near where it started. No calls made. If performed by pair, take off a few seconds apart, fly same route and usually land near each other. Early in season, especially during courtship and pair-formation, display series lasting 5–6 s of Display Shake followed by Display Preen (Front) or, less commonly, Display Preen (Rear) maybe seen; often given in hostile situations where fighting imminent but not yet broken out; a series in one member of pair often stimulates displays in mate. **Display Shake**: standing erect, with wings held loosely away from sides, shakes wings alternately or together, up and down a few times with noisy rattle; often raises crest at end of shake. **Display Preen (Front)**: remaining erect following Display Shake, holds one wing slightly away from side, bends neck forward, reaches inside wing from front and appears to strip down a primary rhythmically with tip of bill, though does not actually close bill on feathers. Sometimes repeats display, usually on op-

posite side, or follows with Display Preen (Rear); occasionally merely flicks wings open 4–5 cm after Display Shake, which may be incomplete form of Display Preen (Front). Often performed in unison, or in succession, by both members of new pair. **Display Preen (Rear)**: leaning forward with body axis nearly horizontal, opens elbow of one wing away from side; rotates head to rear and reaches over partially spread wing and down behind it; then appears to preen feathers under and behind wing with stiff deliberate movements but hardly touches them; feathers of crest erect and, in high-intensity displays, feathers of back and wing-coverts also raised; yellowish salmon-coloured skin on underside of wings shows especially if lighted from rear. Sometimes given separately from series. Often appear to sleep during social interactions; **Display Sleeping**, where head rotated and bill and front part of face buried in feathers of upper back leaving bright yellow facial spot just above eye exposed and giving impression that bird is awake, considered ritualized display (Kahl 1988); appears to be performed more during pair-formation period than at other times. Head Quiver, a very slight movement which occurs more often and at faster rates when in presence of actual or potential mate than when alone, possibly also



Plate 79

Straw-necked Ibis *Threskiornis spinicollis*

1. Adult
2. Immature
3. Downy young
4. Adult

Australian White Ibis *Threskiornis molucca*

5. Adult
6. Immature
7. Downy young
8. Adult
9. Juvenile
10. Juvenile



ritualized display. **Head Quiver:** usually standing erect, although may be given by incubating or brooding birds, and nearly immobile; head quickly twitches several times, with bill tip following lateral arc of 15–30 mm, typically every 2–15 s; crest shakes noticeably; sometimes similar movement follows in mate. Courtship feeding not observed. In **Greeting Display**, pair, with crests strongly erect, gape upward with bills between 45° below horizontal and vertically upward, then repeatedly raise and lower heads and necks (at c. 1/s) uttering series of calls at rate of c. 1–2/s (see Voice). Most often given in unison by pair on nest throughout breeding at nest-relief or when one member returns after foraging or stick-gathering. Adult on nest often recognizes approaching mate in flight and may initiate Greeting while mate still several seconds away; arriving bird may begin with crest erect, gaping and vocalizations, while still airborne. Early in season, often followed by Display Shake and Display Preen (Front or Rear); later commonly followed by mutual Head-shaking; sometimes, similar display may be given by lone bird after hostile encounter. Early in season, while standing side by side on nest, one or both birds perform Head-shaking, often after Greeting given; superficially appears like nest building but nest material not

manipulated. **Head-shaking:** bends forward until head level with body and closed bill pointed vertically down; shakes head (2–3 times/s) while lowering head until bill nearly touches substrate; male sometimes crosses neck over female. A few weeks after pair-formation, display becomes less frequent, then stops. **Stick-shaking** similar to Head-shaking but bill open and bird grasps nesting material, shaking its head rapidly (3–5 times/s); sitting bird may remain sitting while performing. Lower-intensity display than Head-shaking and may be given by solitary birds; may be followed by bouts of preening or allopreening. Generally simultaneous allopreening though, sometimes, female preens more often and longer; commonly preen mate's head or upper neck feathers. **COPULATION** frequent during pair-formation and laying. During copulation, female bends forward with body axis about horizontal and holds wings slightly away from body at rear; male steps slowly onto female's back, hooks feet over her shoulders, flaps wings slowly for balance and lowers body for cloacal contact; male shakes head alongside female's head and neck as cloacal contact made; while mounted, male's crest erect; copulation lasts c. 8–10 s. Has not been determined if male grasps female's bill or whether calling occurs.

**RELATIONS WITHIN FAMILY GROUP** **Begging Display:** chick faces parent, raises head, holds bill up and usually drops on tarsi, although older nestlings sometimes remain standing; rhythmically bobs head and neck up and down (at 1–2/s), usually 30° and 60° above horizontal; opens bill c. 5–20 mm at tip and utters begging call repeatedly, usually in synchrony with upsweep of head movements at every second or third bob. Most pronounced after return of adult to nest after feeding trip; at high intensity, small young may peck at side or bottom of spoon of parent's bill, often at spot at bottom of spoon that differs in colour from rest of bill; larger young, at junction of mandibles; intensity wanes after several feedings. Parent's buccal cavity can only supply food for one young at a time, usually most vigorously displaying chick; others may cease begging while chosen young fed and resume when that feeding finished. Small young fed by parent taking young's head into its bill where young ingests material regurgitated into adult's buccal cavity; larger young can put head in parent's buccal cavity unassisted; bright-pink lining of parent's throat may direct nestling. When >7–8 days old, nestling sometimes points bill upward, nearly to vertical and rapidly nibbles in air 3–4 times/s after begging. When distressed (eg. hot, cold, fearful or during vigorous allopreening by parent), nestlings give distress call, opening bills c. 50–75 mm at tip, wider than in Begging Display (c. 10–20 mm). **Alarm Posture:** usually on or near nest, adult stands very erect with body c. 30° in front of vertical, neck extended upward and bill lifted to 30–45° below horizontal; all feathers compressed giving body slim, and back of head, flat appearance; ready to fly, repeatedly lifts its weight from one foot, gapes bill 20–50 mm at tip about every 1–30 seconds (increases with intensity) and gives weak growling grunts or Flight-intention Calls (see Voice) at irregular intervals, while peering intently at disturbing object; at high intensity, may quickly flick one wing at a time. Held for a few, or many, seconds and sometimes intergrades with Flight-intention; may take flight after one or both of these displays; causes small nestlings to crouch motionless and silent on floor of nest and large nestlings to hide in surrounding vegetation; also alerts nearby adult birds. When this stops, nestlings resume normal activities. Often preen nestlings, especially on head, back and wings; occasionally, nestlings briefly allopreen parent on

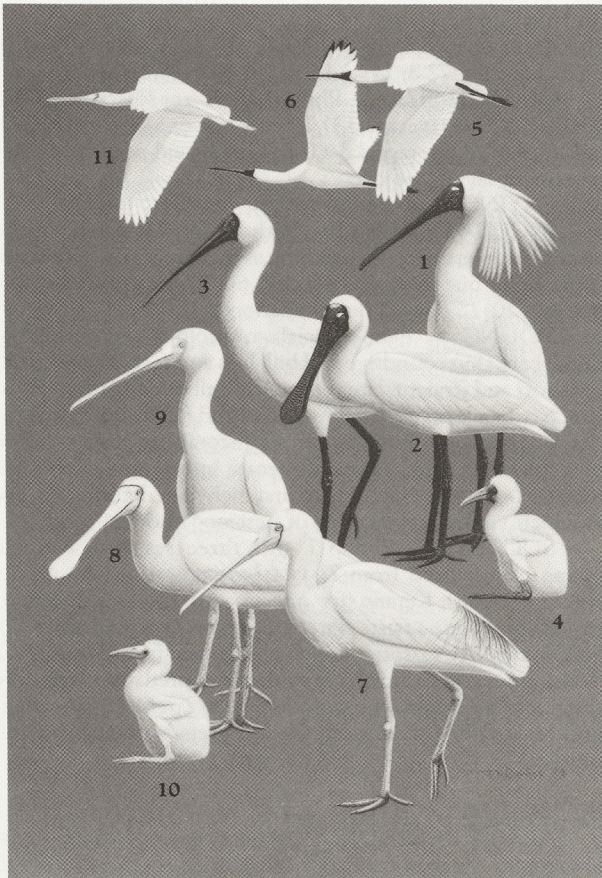


Plate 80

Royal Spoonbill *Platalea regia*

1. Adult breeding
2. Adult non-breeding
3. Juvenile
4. Downy young
5. Adult
6. Juvenile

Yellow-billed Spoonbill *Platalea flavipes*

7. Adult breeding
8. Adult non-breeding
9. Juvenile
10. Downy young
11. Adult breeding



abdomen or neck. Young often fed by parents for several weeks after fledging; often forage with one or both parent after fledging. Family group seems to break up after several weeks.

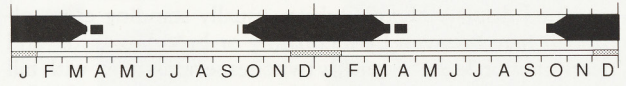
**VOICE** No detailed studies but reasonably well known from studies of behaviour at L. Cowal, NSW (Kahl 1988), on which account based. Generally quiet outside breeding season; calling mainly during breeding season and mostly at nest-site. Utter soft grunts, groans and hisses with little variety. At start of breeding season, males form noisy bachelor parties near potential nesting areas (Kahl 1988); bachelor parties last for several minutes and commonly occur for several days at start of breeding season; females also present in these parties but mostly stand round edge of group. These parties are part of pair-formation. No sexual or individual differences reported. Non-vocal sounds include Bill-snapping and exaggerated, loud wing *woofing*. No information on geographical variation.

**ADULT** No sexual differences reported. **Grunt.** Repeated low soft growling grunts given in different circumstances: (1) when threatened or alarmed (Alarm Call), utter repeated weak growling *grunt* of about 0.5 s duration; audible only over short distances. Given as part of Alarm Posture as short-range display to alert nearby birds, including chicks, to danger. (2) When about to take flight (Flight-intention Call), utter repeated soft grunts at intervals of 1–10 s, interval between grunts decreasing as intensity of display and urge to fly increases; may continue for several minutes until bird takes flight or stays at nest. Call very similar to Alarm Call. (3) Greeting Call: a repeated soft honking groaning *huh-huh-huh-huh* uttered 1–2 times/s by both members of pair. Given at nest throughout breeding season; may be given by arriving bird when several metres from nest; (4) usually gives 4–5 low-pitched growling grunts, each about 0.25 s duration, during Nest-covering Display; also hiss loudly during Nest-covering; Nest-covering is also a response to threats. **NON-VOCAL SOUNDS:** **Bill-snapping.** Give several, nearly inaudible, bill-snaps during Shaking and Sparring. **Wing-woofing.** Loud exaggerated *woofing* noise produced by action of wings when Supplanting.

**YOUNG** Small young beg with repeated weak high-pitched *chittering* or trilling *chirr*; about 0.5 s duration. Call of older young lower-pitched warbling trill. **Distress Call.** Rapidly repeated (1–2/s) high-pitched mono- or disyllabic staccato hiccupping sound *tchat tchat tchat tchat* or *tchak tchak tchak*; very different from Distress Call of Yellow-billed Spoonbill chicks.

**BREEDING** Detailed studies by K.W. Lowe (Phillip I. and Kerang, Vic.) and M.P. Kahl (L. Cowal, NSW). Breed in simple pairs, colonially, with egrets, herons, ibises, other spoonbills; in NZ, also among Kelp Gulls *Larus dominicanus* (Marlborough) and Stewart Shags *Phalacrocorax chalconotus* (Otago).

**SEASON** Phillip I.: laying, early Oct.–late Nov. Kerang, mid-Dec.–mid-Jan.; last young, mid-Jan. to mid-Mar. L. Cowal, NSW, Nov.–May (Vestjens 1977); first nests late Oct. (Kahl 1988) but eggs still seen in late Jan. Thus, usual season in se. Aust., probably Oct.–Mar. but (July) Aug.–Nov. claimed without authentication (Beruldsen 1980) and Mar. (eggs; North) to May in n. Aust. Probably varies according to state of flooding or drought inland. In NZ, birds arrive Aug.–early Sept., lay Nov. (P. Schweigman)



(se. Aust.)

**SITE** Loose colonies of 2–50 nests (Kahl 1988). In crowns of trees and on horizontal side-branches (*Eucalyptus*, *Melaleuca*, *Avicennia*); in reeds, rushes, lignum (Vestjens 1977). Usually over water 0.5–1.5 m deep; when over water, in trees 1–15+ m high; in reeds 0.5–1.5 m high. In NZ, in low boxthorn *Lycium ferocissimum* and taupata *Coprosma repens* on small offshore islands (P. Schweigman). Site selected by male (M.P. Kahl). Re-used from year to year, which suggests site fidelity.

**NEST, MATERIALS** Solid substantial bowl of sticks and small twigs interwoven, lined with leaves and waterweeds. Material collected from ground in area of colony. At Marlborough colony, on ground. Role of sexes in building not known. No measurements.

**EGGS** Oval to elongate oval; sometimes slightly pointed at smaller end; chalky, coarse-grained, finely pitted, not glossy; dull chalky-white with yellowish-brown, reddish-brown, chocolate and dark-brown blotches, sometimes only on larger end.

**MEASUREMENTS:** 66.6 (61.7–69.3; 8) x 43.4 (41.7–43.9) (North); 65.8 (2.5; 61.7–72.3; 24) x 43.3 (1.4; 40.6–45.2) (MV).

**CLUTCH-SIZE** Phillip I. (for three seasons): 1xC/2, 33xC/3, 5xC/4 (average 3.1); Kerang (for one season): 1xC/2, 6xC/3, 4xC/4 (average 3.3 ± 0.7). One brood per season. Replacement laying, no data.

**LAYING** No information.

**INCUBATION** By both sexes, starting before clutch complete because hatching asynchronous. By both sexes (M.P. Kahl) but share and routine not known. **INCUBATION PERIOD:** 20–25 days (3 determinations).

**YOUNG** Semi-altricial, nidicolous. At hatching, blind; bare skin round eye and bill, legs and feet, orange-pink; bill short and straight, later becoming bulbous and then spatulate. No details on growth. Attended and fed by both parents; share of sexes not known. Fed by incomplete regurgitation; one chick at a time. Young defaecate in nest and over edge. **NESTLING PERIOD.** Hatching to first flight not determined; age at which young clamber out of nest not known.

**SUCCESS** Phillip I. (for three seasons): a single young bird fledged from 21 of 53 nests started (0.4 chicks reared per pair); Kerang (for one season); five young fledged from three of nine nests started (0.55 chicks reared per pair). At Okarito (five seasons), five chicks fledged from 37 nests (C. Woolmore & G. Aburn). No evidence of predation; probably some loss of chicks by starvation; in NZ, chicks die of exposure or falling from nest; Great Egrets evict chicks from nests.

## PLUMAGES

**ADULT BREEDING** Almost entirely white. **HEAD AND NECK.** Skin on front of head (extending from forehead and forecrown, behind eye to chin and upper throat), bare. At hindcrown, long (124–146 mm) loose pointed nuptial plumes; barbs soon detached with wear; nuptial plumes erectile. **UPPERPARTS.** White. **UNDERPARTS.** White; on lower fore-neck and upper breast, feathers slightly lanceolate and cream (54); as breeding season progresses, cream (54) colour fades; colour probably due to skin exudate.

**ADULT NON-BREEDING** Similar to adult breed-



ing, but lacks nuptial plumes; no cream (54) colour on lower foreneck and upper breast.

**NESTLING** Protoptile, sparse and white with silky tips. Mesoptile, short and dense, cream-white. Forehead, lores, malar area and chin, bare.

**JUVENILE** Similar to adult non-breeding. Differs in having tail slightly forked. Also, outer web of p10 and tip of inner web dark brown (119A); p9-7 with varying tips of dark brown (119A). Rachis of remiges, black-brown (119). Outermost greater primary covert, dark brown (119A); next innermost edged dark brown (119A) on outer web; feather with dark brown (119A) distal shaft streak. Outermost alula feather, edged dark brown (119A) on outer web; next innermost, similar but edging slight. Rachis of all alula feathers, black brown (119). Rachis of greater under primary coverts, basally brown (119B); webs tipped dark brown (119A).

**IMMATURE** Similar to juvenile. Differs in having varying but fewer, black-brown (119) rachis on remiges. Also, fewer outer primaries have dark brown (119A) tips.

**BARE PARTS** Based on photos in Pringle (1985) and NZRD.

**ADULT BREEDING** Iris, red-brown (32). Upper eyelid and small patch above eyes, yellow (153), joined; yellow not extending below eyes *contra* NZRD. Facial skin, interramal space, chin, mid-throat and most of forecrown, grey-black (82) except for patch of varyingly coloured, usually crimson (8), sometimes rose (9), skin in front of feathers. Bill, black (89). Between irregular transverse ridges across dorsal surface of culmen, grey (87). Legs and feet, black (89).

**ADULT NON-BREEDING** Similar to adult breeding but crests reduced and no bright-pink colour on underwing.

**NESTLING** Iris, dark brown (219). Bare skin on lores and eye-ring, dark grey (83); forecrown, light grey (85). Bill, pale pink (7) with brown-grey (80) shade; darkens near fledging. Legs and feet, pale pink at hatching; later, dark grey (83).

**JUVENILE** Iris, dark brown (219A). Bill, legs and feet, grey-black (82). Lacks crimson patch on crown and yellow upper eyelid and patch above eye.

**MOULTS** Mostly undescribed. Based on skins from se. Aust. (MV).

**ADULT POST-BREEDING** Complete; primaries moult outwards. Occurs about Dec.-Jan.

**ADULT PRE-BREEDING** Partial. Involves development of nuptial plumes; probably also some feathers on underparts.

**POST-JUVENILE** Complete; duration, timing and sequence unknown.

**SUBSEQUENT MOULTS** No data.

**MEASUREMENTS** Few data. (1) Westernport, Vic., live adults; BILL = exposed culmen (K.W. Lowe). (2) Location and methods unknown (Vestjens 1975). (3) Ne. Qld and Vic. (respectively), adult female skins (MV, SAM).

SPOON W	(1)	55.8 (1.19; 54.4-57.8; 6)	50.6 (1.82; 49.2-53.1; 4)
	(2)	55 (54-57; 3)	51 (48-54; 9)
TARSUS	(1)	122.5 (4.93; 116-128; 6)	108.5 (8.39; 100-120; 4)
	(3)		115.8, 113.3
TAIL	(3)		104, 117
TOE	(3)		90.6, 89.2

Males have longer bills than females.

**WEIGHTS** Westernport, Vic., males 1886 (158; 1650-2070; 6); females 1575 (171; 1400-1800; 4) (K.W. Lowe).

**STRUCTURE** Wing, long and slightly pointed. Eleven primaries: p9 longest, p10 13-18 mm shorter, p8 1-6, p7 10, p6 31-52, p5 55-69, p4 80-83, p3 96, p2 108-109, p1 119, p11 reduced, concealed by primary coverts. Inner webs of p10-8 and outer p9-7 emarginated. Tail short, square in adults, slightly forked in juveniles; 12 broad rectrices, t1 longest, t6 6 mm shorter. Bill, long flat spoon-shaped: maximum 18 mm wide at middle, 49-58 mm at widest portion of rounded tip; tip of upper mandible very flat; outer margin slightly decurved, more so at tip. On inner side of decurved tip, narrow rigid lamellae. Outer sides of tomia, with some rows of blunted knobs basally. Dorsal surface of basal and central portions of culmen and basal sides of lower mandible corrugated in adult, smooth in juvenile (see Vestjens 1975). Narrow, elliptical nostrils basally in groove of culmen. Lower half of tibia, bare. Legs and feet, slender. Outer toe c. 88% of middle, inner c. 76%, hind c. 44%. Outer, middle, and inner toes basally connected by webs.

**RECOGNITION** Confusion possible between nestling Yellow-billed and Royal Spoonbills; see Recognition for Yellow-billed Spoonbill.

**GEOGRAPHICAL VARIATION** Forms superspecies with *P. leucorodia* of Europe, *P. minor* of e. Asia and *P. alba* of Africa; differ in extent of bare skin on head, colour of bare parts and size (Amadon & Woolfenden 1952).

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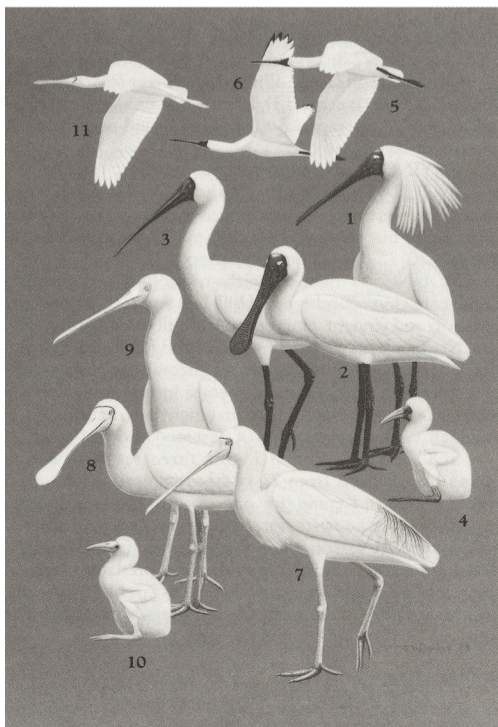
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	MALES	FEMALES
WING	(1) 371 (15.0; 347-385; 6)	365, 380, 350
8TH P	(3)	221, 216
BILL	(1) 212.3 (6.56; 205-220; 6)	177.8 (13.3; 158-187; 4)
	(2) 180 (176-187; 3)	164 (136-189; 9)



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**Volume 1 (Part B), Plate 80**

Royal Spoonbill *Plegadis regia*

1. Adult breeding
2. Adult non-breeding
3. Juvenile
4. Downy young
5. Adult
6. Juvenile

Yellow-billed Spoonbill *Plegadis flavipes*

7. Adult breeding
8. Adult non-breeding
9. Juvenile
10. Downy young
11. Adult breeding

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