

Order PASSERIFORMES

The largest and most diverse order of birds, commonly called passerines or perching birds, and comprising some 5712 species in 45 families (based on Sibley & Monroe 1990; Sibley & Ahlquist 1990), and well over half the world's known bird species. In the HANZAB region, Passeriformes represented by some 382 species in 39 families. Tiny to large: smallest passerine is Pygmy Tit *Psaltria exilis* of Java, with a total length c. 8 cm; largest is Greenland Raven *Corvus corax principalis*, with a total length c. 64 cm and weighing up to 1.7 kg. Superb Lyrebird *Menura novaehollandiae* of e. Aust. probably second largest in Order, with a total length (in adult male) of c. 103 cm, including tail of c. 70 cm, and weight up to c. 1.1 kg. Cosmopolitan except Antarctica and some oceanic islands; and occupying all terrestrial habitats.

Overall, Passeriformes are characterized by (based on Raikow 1982; Sibley & Ahlquist 1990; and DAB [=Schodde & Mason 1999]): Palate aegithongnathous (except Conopophagidae [gnateaters]). Intestinal caeca rudimentary. Single left carotid artery (except paired in *Pseudocalyptomena* and possibly other broadbills [Eurylaimidae]). Aftershaft reduced or absent. Neck short, with 14 cervical vertebrae in most, but 15 in Eurylaimidae (broadbills); atlas perforated; metasternum usually two-notched (rarely four-notched). Bicep slip absent. Expansor secundariorum often present (Berger 1956; Raikow 1982; *contra* Beddard 1898; Ridgeway 1901). Pelvic muscles AXY (AX in *Dicrurus* [drongos]). Ambiens absent. Iliofemoralis externus usually absent, but present in some groups as 'developmental anomaly' (Raikow 1982). Tensor propatagialis brevis tendon present. Hypocleideum present (except Menuridae [lyrebirds]). Wings eutaxic. Usually ten primaries, but p10 often reduced or absent; 11 primaries in Menuridae (lyrebirds), most Eurylaimidae (broadbills), most Furnariidae (ovenbirds), and some Passeri (oscines [see below]). Usually nine secondaries (ten in Menuridae [lyrebirds]). Usually 12 rectrices, but from six (*Stipiturus* [Maluridae]) to 16 (Menuridae). Lesser primary and secondary coverts usually reduced or absent (Zeidler 1966; Morlion 1985; Winkler & Jenni 1996), but a few well-developed lesser primary coverts are present in Superb Lyrebird (Morlion 1985). Uropygial preen glands naked. No basipterygoid process. Nasal glands minute. Foot anisodactyl. Hallux incumbent, large and directed backwards; toes 2, 3 and 4 directed forward; digital formula 2-3-4-5. Deep plantar tendons usually of type VII (lacking vinculum), but often type I in Eurylaimidae (broadbills). Spermatozoa bundled with coiled head and large acrosome.

The DNA-DNA hybridization studies of Sibley & Ahlquist (1985a, 1990) revealed much about the relationships within the Passeriformes and resulted in fundamental changes to the higher level taxonomy of passerines, not least to the taxonomy of the Australo-Papuan oscine passerines. Importantly, these studies showed that many elements of the Australo-Papuan avifauna (e.g. the A'asian wrens [Maluridae], robins [Petroicidae], babblers [Pomatostomidae], and so on), represent an endemic radiation of forms that bear an external resemblance to Eurasian families. Many of the findings of DNA-DNA hybridization studies regarding the Australo-Papuan oscines have since been broadly corroborated by studies using protein allozymes (e.g. Christidis 1991; Christidis & Schodde 1991) and microcomplement fixation (e.g. Baverstock *et al.* 1991, 1992), though there are also many points that remain uncertain and many familial relationships within the Passeriformes are unresolved (Christidis & Boles 1994). (For discussion of historical taxonomic arrangements preceding results of DNA-DNA hybridization studies, see BWP, and Sibley & Ahlquist [1985a,b, 1990]).

The Passeriformes divide into two main groups:

SUBORDER TYRANNI (SUBOSCINES): The distribution of the suboscines is centred in the American and Afro-asian Tropics, with a massive radiation in South America (Sibley & Ahlquist 1990; DAB). Suboscines characterized by mesomyodian syrinx, with or without a single pair of intrinsic syringeal muscles (van Tyne & Berger 1976; Campbell & Lack 1985; DAB). Suborder sometimes named Oligomyodi (e.g. Sibley & Ahlquist 1985a,b), Deutero-Oscines (e.g. Morony *et al.* 1975; Voous 1977), or Clamatores (Campbell & Lack 1985). Poorly represented in the HANZAB region: only TYRANNIDAE (tyrant-flycatchers), with two species, both accidental to South Georgia; ACANTHISITTIDAE (NZ wrens), with four species (one extinct) in three genera, endemic to NZ; and PITTIDAE (pittas), with four species in one genus in HANZAB region (three breeding, one accidental). Tyranni formerly included the Menuridae and Atrichornithidae (e.g. Wetmore 1960; Storer 1971), though subsequently shown that these two families should be included in Passeri (e.g. Sibley 1974; Sibley & Ahlquist 1985, 1990).

SUBORDER PASSERI (OSCINES OR SONGBIRDS): Cosmopolitan in distribution. Within the HANZAB region there are 36 families of Passeri. The Australo-Papuan Passeri can be subdivided into several supra-familial groups, but those recognized differ between authors (for further information, see Sibley & Ahlquist 1985, 1990; DAB). Oscines are

characterized by acromyodian syrinx, with three or four pairs of intrinsic syringeal muscles (van Tyne & Berger 1976; Campbell & Lack 1985; Sibley & Ahlquist 1990; DAB).

Suborder Passeri comprises the major element of the Aust. and NZ passerine avifauna. The families recorded in the HANZAB region, and the representatives in the region, are (following Christidis & Boles [1994] for Aust., with additional species for wider region added as appropriate):

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- MENURIDAE (lyrebirds): two species in one genus; endemic to Aust.;
- ATRICHORNITHIDAE (scrub-birds): two species in one genus; endemic to Aust.;
- CLIMACTERIDAE (A'asian treecreepers): six species in two genera breeding in Aust.;
- MALURIDAE (Australopapuan fairy-wrens, emu-wrens and grasswrens): 22 breeding species in three genera in Aust.;
- MELIPHAGIDAE (honeyeaters and Aust. chats): 76 species in 26 genera in Aust. and NZ, all breeding;
- PARDALOTIDAE (pardalotes, scrubwrens, thornbills and allies): 51 species (one extinct) in 15 genera in HANZAB region, all breeding;
- PETROICIDAE (A'asian robins): 23 species in eight genera in HANZAB region, all breeding;
- ORTHONYCHIDAE (logrunners): two breeding species in one genus in Aust.;
- POMATOSTOMIDAE (A'asian babblers): four breeding species in single genus in Aust.;
- CINCLOSOMATIDAE (whipbirds, wedgebills, quail-thrushes and jewel-babblers): eight breeding species in two genera in Aust.;
- NEOSITTIDAE (sitellas): single species breeding in Aust.;
- PACHYCEPHALIDAE (whistlers, shrike-thrushes and allies): 17 species in seven genera in HANZAB region, all breeding;
- DICRURIDAE (monarchs, flycatchers, fantails and drongos): 19 species in seven genera in HANZAB region, all breeding;
- CAMPEPHAGIDAE (cuckoo-shrikes, trillers and minivets): eight species (one extinct) in two genera in HANZAB region, all breeding;
- ORIOLIDAE (Old World orioles and figbirds): three species in two genera in Aust., all breeding;
- ARTAMIDAE (woodswallows, butcherbirds and currawongs): 14 species in four genera in HANZAB region, all breeding;
- PARADISAEIDAE (birds of paradise): five breeding species in two genera in Aust.;
- CORVIDAE (crows and jays): six breeding species in single genus in Aust. and NZ, including one introduced to NZ;
- CORCORACIDAE (Aust. mudnesters): two species in two monospecific genera, endemic to Aust.;
- CALLAEIDAE (NZ wattlebirds): three species (one extinct) in three monospecific genera, endemic to NZ;
- LANIIDAE (shrikes): two species in HANZAB region, one accidental to Prince Edward Is, the other accidental to Christmas I.;
- PTILONORHYNCHIDAE (bowerbirds): ten species in seven genera in Aust. (nine species) and NZ (one species), all breeding; Piopio of NZ probably extinct (Heather & Robertson 1997);
- ALAUDIDAE (larks): two breeding species in HANZAB region (including one successfully introduced to Aust. and NZ);
- MOTACILLIDAE (wagtails and pipits): eight species in two genera in HANZAB region, only two breeding (one on South Georgia), the rest non-breeding visitors or accidentals;
- PRUNELLIDAE (accentors): one species successfully introduced to NZ;
- PASSERIDAE (Old World sparrows and A'asian finches): 22 species in nine genera (including four successful introductions) in HANZAB region, all breeding;
- FRINGILLIDAE (Old World finches): seven species in four genera in HANZAB region, all introduced except one naturally occurring vagrant to South Georgia;
- EMBERIZIDAE (buntings, cardinals, tanagers and allies): two successfully introduced species, occurring NZ and Lord Howe I.;
- NECTARINIIDAE (sunbirds and spiderhunters): single breeding species in Aust.;
- DICAEDIDAE (flowerpeckers): single breeding species in Aust.;
- HIRUNDINIDAE (swallows and martins): eight species in four genera in HANZAB region, including four breeding species in Aust. and NZ, one non-breeding visitor and three accidentals;
- PYCNONOTIDAE (bulbuls): one successfully introduced species in Aust.;
- SYLVIIDAE (Old World warblers): 13 species in eight genera in HANZAB region, including ten breeding species (one extinct) in Aust. and NZ, and three accidental to region;
- ZOSTEROPIDAE (white-eyes): seven species (one extinct) in single genus in HANZAB region, all breeding;
- MUSCICAPIDAE (Old World flycatchers, thrushes and chats): eight species in six genera in HANZAB region, including five breeding species (two introduced), and four accidentals (including one on Prince Edward Is);
- STURNIDAE (starlings and mynas): five species in four genera, four breeding in HANZAB region (including two species successfully introduced, and one species now extinct), and one accidental.
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The Aust. oscines fall into two distinct clusters, each with at least three major supra-familial lineages (DAB): One cluster is the Passerida, comprising the Muscicapoida (including true thrushes and allies), Sylvioidea (true warblers and babblers, and swallows, and others), and Passeroidea (including larks, pipits, sunbirds, flowerpeckers and all finches and their allies). The other cluster is the Corvida, which is centred on the Australo-Papuan region (though its origins are not certain) and which also comprises three main lineages: Menuroidea (lyrebirds, scrub-birds, treecreepers and bowerbirds), Meliphagoidea (A'asian wrens, pardalotes, acanthizid warblers, and honeyeaters), and Corvoidea (A'asian robins, logrunners, A'asian babblers, whipbirds and quail-thrushes, sitellas, whistlers, fantails and monarchs, birds of paradise, butcherbirds and woodswallows, cuckoo-shrikes, Old World orioles, crows and mudnesters).

Throughout this volume, arrangement of families follows that of Christidis & Boles (1994) except that the Meliphagidae precedes the Pardalotidae. This change was made to ensure the Meliphagidae were dealt with in a single volume, rather than split between volumes, and because the switch meant no change to the positioning of Meliphagidae relative to the Pardalotidae (including Acanthizidae), one another's closest relatives, and because there is little overriding evidence of the exact taxonomic positioning of all families within the Meliphagoidea; Sibley & Monroe (1990) also placed the Meliphagidae between the Maluridae and Pardalotidae. However, DAB points out that based on structure of humeral fossa, positioning of Meliphagidae between the Maluridae and Pardalotidae is not correct.

DAB, however, varies from the familial arrangement of Christidis & Boles (1994) in several ways. The main differences are: (1) recognition of Pardalotidae and Acanthizidae as separate families (combined in Pardalotidae in Christidis & Boles); (2) minor rearrangement of the sequence of the families Paradisaeidae–Artamidae–Campephagidae–Oriolidae between the Dicuridae and Corvidae (cf. Dicuridae–Campephagidae–Oriolidae–Artamidae–Paradisaeidae–Corvidae in Christidis & Boles); (3) and use of the more traditional muscicapoid (flycatcher) – sylvioid (warbler) – passeroid (finch) sequence of Sibley *et al.* (1988), Sibley & Ahlquist (1990) and Sibley & Monroe (1990) and much contemporary literature of n. hemisphere, with families in the sequence Muscicapidae–Sturnidae–Hirundinidae–Pycnonotidae–Zosteropidae–Sylviidae–Alaudidae–Dicaeidae–Nectariniidae–Passeridae–Motacillidae–Estrildidae–Fringillidae and noting recognition of the Estrildidae as a separate family (cf. the reversed sequence of Christidis & Boles, as given above, and which submerges the Estrildidae within the Passeridae). For discussion of the reasons for these changes, see DAB (and discussion under these families in future volumes of HANZAB).

Arrangement of genera and species within families also follows Christidis & Boles (1994), which was in turn largely based on Schodde (1975) unless there were specific reasons for change. Lastly, with few exceptions, which are discussed in individual species accounts, taxonomy of subspecies follows DAB.

Passerines are extremely diverse in body form and plumage, and vary greatly in rates of maturation. Some attain adult plumage within months or weeks of fledging; others can take up to 9 years to attain adult plumage (e.g. Superb Lyrebird). Degree of sexual dimorphism also varies greatly: some monomorphic, others vary in either size, plumage or both. Common pattern of annual moult is a single complete post-breeding (pre-basic) moult, but some groups (e.g. Maluridae) or species (e.g. Banded Honeyeater *Certhionyx pectoralis*) also undergo a partial pre-breeding (pre-alternate) moult annually. Moult of primaries usually outward. Secondaries moult from innermost and outermost toward s5. Moult of tail usually centrifugal (outward from centre). Young altricial, nidicolous and dependent on adults for food; usually hatch with sparse to very sparse covering of down, mainly on dorsum; Menuridae (lyrebirds) have heavy natal down. Juvenile plumage usually duller than adult, and in many sexually dimorphic species, often similar to that of adult female.

There are few common features of food, feeding behaviour, social organization and behaviour, voice or breeding in such a large and diverse group of birds.

Volant; extinct Stephens Island Wren *Traversia lyalli* probably the only flightless passerine (Millener 1988). Movements vary greatly: some species long-distance migrants (e.g. Barn Swallow *Hirundo rustica*, Nightingale *Luscinia megarhynchos* and many Old World warblers, such as *Acrocephalus* and *Locustella*, breed in temperate Palaearctic and migrate to Africa or Indian subcontinent [BWP]; Acadian Flycatcher *Empidonax virescens* breeds North America and migrates to South America [Ridgely & Tudor 1994]), others sedentary in small territories (e.g. Cactus Wren *Campylorhynchus brunneicapillus* of sw. USA and Mexico [Ricklefs 1975; Ehrlich *et al.* 1988]). In HANZAB region, movements also vary widely: e.g. Yellow-faced Honeyeater *Lichenostomus chrysops* regular annual migrant in parts of e. Aust.; Rifleman *Acanthisitta chloris* of NZ sedentary in small territories. In Aust., movements often poorly known and unstudied; many species often said to be nomadic, with such claims often based on no or very poor knowledge of actual movements and based only on apparently irregular occurrence in an area (see General Introduction [Movements] for fuller discussion of this point).

Arboreal or terrestrial or both; some strictly arboreal (e.g. Hirundinidae), others strictly terrestrial (e.g. Menuridae, Pittidae); most combine both arboreal and terrestrial foraging to varying degrees, but usually with one predominating. Feed on almost all known food, from plant material to vertebrate animals, but most show some specialization for certain food, such as feeding on nectar (Nectariniidae), seeds (Passeridae), fruit (Zosteropidae), small vertebrates (Artamidae) and, commonly, insects (e.g. Maluridae, Pardalotidae, Petroicidae and others). Mostly feed by gleaning

and probing, including probing flowers for nectar; and other substrates for invertebrates; also feed by sallying, including various sallying techniques (sally-hovering, sally-striking and sally-pouncing), each suited for one group of prey, particularly moving animals.

In passerines, parental care in both sexes is well developed. However, a few species are parasitic, e.g. cowbirds *Molothrus* (Campbell & Lack 1985). Young are dependent on parents for food. Young beg by gaping, typically exposing brightly coloured inside of mouth, often with contrasting pale or dark spots; in non-passerines, bright gape present only in hoopoes (Upupidae), mousebirds (Coliiformes) and cuckoos (Cuculiformes) (BWP). See Boles & Longmore (1985) for descriptions of colours and markings inside the mouths of some Aust. passerines.

Anting is a highly specialized behaviour: ants are held in the bill and applied to the plumage, usually to the underside of the wing-tip (direct or active anting, or ant-application), or ants are allowed access to the plumage (indirect or passive anting, or ant-exposure), or both, e.g. anting recorded in Regent Honeyeaters *Xanthomyza phrygia* in HANZAB region, with bird then seen eating ant. Thought to be unique to Passeriformes (e.g. Simmons 1966; Campbell & Lack 1985; BWP). Suggested this may be comfort behaviour related to maintenance of feathers, by perhaps reducing ectoparasite load, removing stale or excess lipids, or adding supplementary essential oils (Campbell & Lack 1985); some secretions of ants are antibiotic, inhibiting growth of both fungi and bacteria, and the secondary acquisition of these antibiotic secretions would be an important advantage of anting (Ehrlick et al. 1986).

Other behavioural characters include head-scratching indirectly (or over the wing) in most families, with the foot brought up above the lowered wing. Head oiled indirectly, as seen in most taxa, but passerines also oil head by head-scratching, in which bird oils the bill directly, then transfers the oil first to one foot by scratching the bill, and then to the head by scratching the head with foot. To oil the undersurface of the wings, use bill or bill and head together, extending one wing at a time sideways and forward, carpus uppermost, and often alternating rapidly from one wing to the other. The stretching of one wing as a comfort movement seems common to all birds, but in passerines it is often accompanied by sideways fanning of tail. After both wings are stretched, passerines often give a two-leg stretch as they straighten the tarsal joints and lift the body. Heat is dissipated by gaping and panting (not by gular-fluttering, so far as known) (Campbell & Lack 1985; BWP). Bathing widespread, mainly by standing in shallow water, but some groups jump into and out of water repeatedly, or flight- or plunge-bathe, while others bathe only or mainly in rain or among wet foliage; for further details of bathing, see Campbell & Lack (1985). Passerines do not flap wings in the manner of non-passerines to dry, but perform various shaking movements, as well as preening (Campbell & Lack 1985). Dusting confined to only a few groups, but sunning, both for gaining heat (sun-basking) and other purposes (sun-exposure), is widespread, and of two distinct types: (1) lateral posture, in which sunning bird squats or sits down, usually on ground, and leans to one side exposing the flank or the 'sun-wing', which has been lowered and partly unfolded, and the fanned tail, which has been brought round to the same side; and (2) spread-eagle posture, in which bird squats or lies flat with both wings open and tail fanned (details in Campbell & Lack 1985; Simmons 1986).

There is a high incidence of co-operative breeding in Aust. and NZ, and it is especially common and well-studied in the Maluridae but is more widely recorded, including within the Acanthisittidae, Meliphagidae, Petroicidae, Pomatostomidae and Corcoracidae (see Dow 1978, 1980; Brown 1987; Ford 1989; Rowley & Russell 1997).

In vocal abilities, species of Passeriformes are more accomplished than those of any other order, but songs may be simple or highly complex, and repertoires small or large. Mimicry of calls of other species is practised by many species; c. 15% of Australian passerine species have been reported to mimic (Marshall 1950). The Superb Lyrebird and the Tui *Prosthemadera novaeseelandiae* have been classed among the best seven of the world's songsters (Hartshorne 1973). Oscines, or songbirds, have specialized forebrain song nuclei, and, through auditory feedback, learn their songs from those of adults, in much the same way as human young learn their spoken language from adults. In contrast, the songs of suboscines are relatively simple (like the non-learned call-notes of songbirds), repertoires are small, geographical variation is minimal, and development of song appears to take place without any imitative or feedback process. Some oscine species use vocal learning to generate large song repertoires and may vary them geographically, even locally. Other oscine species forgo these possibilities and have song repertoires more like those of suboscines; how the learning process maintains stereotypy of song over the range of such species is a mystery (Kroodsma 1996).

Apart from the five families discussed hereunder, syringeal structure of passeriform species of our area is similar, there being four pairs of intrinsic muscles. Pittidae have no intrinsic muscles (Ames 1971); calls are mostly loud strong whistles (Pizzey 1980). Acanthisittidae also have no intrinsic muscles, but the presence of a well-developed drum (fusion of posterior tracheal elements) suggests they may have once been present; vocal repertoire is not great (Ames 1971). Menuridae and Atrichornithidae have similar syringeal structures, with three pairs of intrinsic muscles; songs are highly developed, and there can be much mimicry (Ames 1971). Climacteridae, with four pairs of intrinsic muscles, exhibit gross asymmetry of the extrinsic muscles, unusual directions of muscle fibre in the intrinsic muscles, and an exceptionally robust sternotracheal muscle (Ames 1987); calls are brisk, sharp and piping (Pizzey 1980).

Extended tracheae are found in the genus *Manucodia* (Paradisaeidae), the calls of which are deep, loud or far-carrying (Frith 1994). In the only species occurring in our area, the Trumpet Manucode *M. keraudrenii*, the trachea forms a flat coil between the skin and the pectoral muscles, sometimes extending over the abdominal muscles as well,

and may be up to 828 mm in length, compared with body-length, from bill to pygostyle, of c. 150 mm (Ames 1971; Clench 1978).

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Family SYLVIIDAE Old World warblers, Old World babblers and allies

A very large and morphologically highly diverse family of very small to medium-sized passerines. The family, as defined here (see below), comprises c. 680 species in c. 119 genera, distributed throughout Africa, the Middle East, Eurasia, including the Indian subcontinent, Japan, Indonesia and the Philippines, Papuan Region, A'asia and islands of the w. Pacific Ocean; one species, Arctic Warbler *Phylloscopus borealis*, breeds in far nw. N. America and this and Dusky Warbler *P. fuscatus* occur as non-breeding vagrants to w. N. America (Sibley & Monroe 1990; Monroe & Sibley 1993; AOU 1998; Peters; DAB). The taxonomy of the family is highly complex and unsettled. Taxonomic history is discussed in detail in Sibley & Ahlquist (1990), and there are varying opinions concerning its composition. Sharpe (1879) was among the earliest workers to suggest affinities with true thrushes, and he included Old World warblers as a subfamily Sylviinae within the Turdidae. This was later followed by Hartert (1910), who placed Old World warblers, Old World flycatchers, monarch flycatchers, Old World babblers and true thrushes in one huge family, Muscicapidae. Later authors (Mayr & Amadon 1951; Mayr & Greenway 1956) included Hartert's groups, as well as some species and genera now known to be part of Australo-Papuan centred Meliphagoidea and Corvoidea superfamilies, into the family Muscicapidae. Beecher (1953) treated bulbuls, cisticolas, fairy-wrens, Old World flycatchers and Old World warblers as subfamilies or tribes in Sylviidae. Later, Old World babblers and laughing-thrushes were combined, along with true thrushes, Old World warblers and some Australo-Papuan corvoid genera, in the family Muscicapidae, and the rest of the Old World warblers placed in the family Sylviidae (Peters: see introduction to Vol. 11 for discussion of that treatment). Molecular studies (see below) have now shown these various taxonomic arrangements to be largely incorrect from an evolutionary standpoint (this was pre-empted by Peters). Sibley (1970) found close affinities between Old World warblers and Old World babblers based on electrophoresis of egg-white proteins, but that they were not closely related to true thrushes and Old World flycatchers (see introduction to Family Muscicapidae in this volume for further discussion). Sibley & Monroe (1990) and Monroe & Sibley (1993) used DNA-DNA hybridization data (Sibley *et al.* 1988; Sibley & Ahlquist 1990) to split the Old World warblers (superfamily Sylvioidea) into three families: Regulidae (kinglets and goldcrests *Regulus*), from the Americas and Eurasia; Cisticolidae (cisticolas and African warblers); and Sylviidae, which includes the subfamilies listed below. Some authors include kinglets and goldcrests (*Regulus*) within the Sylviidae (Baker 1997; Peters).

Here, we follow the treatment of Sibley & Monroe (1990) and Monroe & Sibley (1993) except that we include the cisticolas as a subfamily within the Sylviidae (pending further revisions [see below]). The following subfamilies are recognized:

ACROCEPHALINAE: Comprising 223 species, in 36 genera; major genera include *Acrocephalus*, *Cettia*, *Bradypterus*, *Locustella*, *Hippolais*, *Eremomela*, *Phylloscopus*. Four species, in two genera (*Acrocephalus*, *Phylloscopus*), recorded in HANZAB region (see below).

CISTICOLINAE (cisticolas, prinias and allies): Comprising 120 species, in 17 genera. Two species of *Cisticola* recorded in HANZAB region (see below).

MEGALURINAE (grassbirds and allies): Comprising 22 species in ten genera, distributed in Africa, Asia, Papuan Region and A'asia. Seven species, in four genera (*Megalurus*, *Bowdleria*, *Eremiornis*, *Cincloramphus*), in HANZAB region (see below).

GARRULACINAE (laughing-thrushes and allies): Comprising 54 species, in two genera, distributed across s. and se. Asia. Not recorded HANZAB region.

SYLVIINAE (Old World babblers, *Sylvia* warblers and allies): Comprising 261 species, in 54 genera, falling into three distinct tribes: (1) Timaliini (Old World babblers, parrotbills and allies), with 236 species in 51 genera, distributed across Africa, Middle East and Asia, with no species in HANZAB region; (2) Chamaeini (Wrentit *Chamaea fasciata*), consisting of a single monotypic genus, occurring in w. USA and nw. Baja California; and (3) Sylviini (*Sylvia* warblers), with 24 species in one genus, occurring in Europe, Middle East, Africa and Asia, though with only one species in se. Asia (Lesser Whitethroat *S. curruca*, which vagrant in Thailand [Robson 2000]). No species recorded naturally in HANZAB region (but three species introduced unsuccessfully; see below).

Recent studies of mitochondrial DNA-sequences (Leisler *et al.* 1997; Helbig & Seibold 1999) and a combination of nuclear and mitochondrial DNA-sequences (Alström *et al.* In press) have shed further light on the evolutionary relationships between many of the taxa mentioned above. These studies all confirm the close relationship between *Acrocephalus*, *Chloropeta* and *Hippolais*; and Leisler *et al.* (1997) indicate that cisticolas lie between reed-warblers and *Phylloscopus* warblers (cf. Sibley & Ahlquist [1990] who place them outside the Old World warblers). The work of Alström *et al.* (In press) provides further insight into the phylogeny of the superfamily Sylvioidea and their data indicate the following: (1) a number of subfamilies, such as Acrocephalinae, Cisticolinae and Megalurinae, may be elevated to family status; (2) *Phylloscopus* is not monophyletic, and, along with *Seicercus*,

form the family Phylloscopidae; and (3) confirm the close relationship between Old World babblers, *Sylvia* warblers and laughing-thrushes, as well as white-eyes *Zosterops*, which together they place in the family Timaliidae. However, in this work we follow Christidis & Boles (1994) and DAB in maintaining *Acrocephalus*, *Cisticola*, *Megalurus* and *Phylloscopus* in Sylviidae, and white-eyes in Zosteropidae, but recognizing that this will almost certainly change.

Overall, 13 species, in seven genera, acceptably recorded within HANZAB region: two species of grassbirds *Megalurus* (Tawny *M. timoriensis* and Little *M. gramineus* Grassbirds); two species of fernbirds *Bowdleria* (Fernbird *B. punctata* and extinct Chatham Island Fernbird *B. rufescens*); monotypic *Eremiornis* (Spinifexbird *E. carteri*); two species of songlarks *Cincloramphus* (Rufous *C. mathewsi* and Brown *C. cruralis* Songlarks); two species of cisticolas *Cisticola* (Zitting *C. juncidis* and Golden-headed *C. exilis* Cisticolas); two species of reed-warblers *Acrocephalus* (Australian *A. australis* and Oriental *A. orientalis* Reed-Warblers, latter non-breeding migrant to Aust.); and two species of *Phylloscopus* (Arctic Warbler accidental to Aust., and Willow Warbler *P. trochilus* accidental to Prince Edward Is; see species accounts). In addition, Gray's Grasshopper Warbler *Locustella fasciolata* unacceptably reported for Aust. (see species account); and a further three species of Sylviinae (Sylvini) unsuccessfully introduced to Aust. and NZ: (1) RED-BILLED LEIOTHRIX *Leiothrix lutea*: Probably released in WA before 1912 but did not become established; (2) WHITETHROAT *Sylvia communis*: Two birds released Auckland, NI, in 1868 but not seen after release; attempted import in 1874 failed when birds died on passage to NZ; and (3) BLACKCAP *S. atricapilla*: Five birds released Auckland, NI, in 1872, but no further information (Thomson 1922; Long 1981).

The following discusses species in the subfamilies Acrocephalinae and Megalurinae, the tribe Sylviini within the subfamily Sylviinae and the Cisticolinae (see above). We do not discuss further laughing-thrushes and allies (subfamily Garrulacinae), and Old World babblers (tribe Timaliini) or Wrenit (tribe Chamaeini) in the Sylviinae; nor do we discuss further Regulidae, which some authors include in Sylviidae (see above). See Fry *et al.* (2000) for general discussion on Old World babblers, and Sibley & Ahlquist (1982) for discussion of Wrenit.

The family (excluding Garrulacinae, Old World Babblers, Wrenit and Regulidae) has the following characteristics (summarized largely from Baker [1997], Urban *et al.* [1997], BWP and DAB). Size varies from tiny (e.g. Tiny *Cisticola* *Cisticola nanus*: total length c. 9 cm, weight c. 5 g) or very small (e.g. Pallas's Leaf-Warbler *Phylloscopus proregulus*: total length 9 cm, weight c. 6 g), to medium-sized (e.g. Brown Songlark: total length 23 cm, weight 70 g [males]). Wings vary from short and rounded at tips in some (e.g. *Megalurus*, *Cisticola*) to rather long and pointed at tips (e.g. some *Phylloscopus*, *Sylvia*). Ten primaries; p10 usually rather short or very short. Nine secondaries, including three tertials. Tail varies from very short and slightly rounded at tip (e.g. *Tesia*, *Sylvietta*) to long with rather square tip (e.g. *Sylvia*, *Hippolais*) or very long and graduated at tip (e.g. *Megalurus*, *Locustella*, *Prinia*); most species have 12 rectrices, but some (e.g. *Tesia*, *Seicercus*, *Malcorus*, *Prinia*, *Abroscopus*) have only ten; number of rectrices can vary within genus and even species (e.g. Cinnamon Bracken-Warbler *Bradypterus cinnamomeus* which have 10 or 12). Some species (e.g. *Sylvietta*, Spinifexbird) have elongated tail-coverts. Bill usually rather short, straight and slender, but fairly long and more robust in some (e.g. *Acrocephalus*, *Hippolais*), rather long and more decurved in others (e.g. *Orthotomus*) or occasionally rather broad and slightly flattened (e.g. *Seicercus*); some even have small hook at tip of bill (e.g. longbills *Macrosphenus*). Bill said to lack tomial notch near tip of maxilla, but this present in some species (e.g. Brown Songlark). Nostrils rounded and operculate. Rictal and nasal bristles present; usually very short or vestigial, but more prominent in some species (e.g. *Acrocephalus*). Tongue slender with blade-like tip in some species (Beecher 1953); in some species (e.g. *Sylvia*, *Phylloscopus*) adapted for taking nectar or insects from flowers. Legs and feet usually rather short and weak, but longer and stronger in some (e.g. *Tesia*, *Locustella*, *Acrocephalus*). Some (e.g. *Acrocephalus*) have rather long hindtoe and hindclaw. Tarsal scaling laminiplantar in most species but said to be holothecal in some (BWP). Skull rather narrow. Ectethmoid plate usually truncate, but winged in cisticolas; species in the grassbird assemblage (Megalurinae) have thin ectethmoid plate. Ectethmoid foramen usually a single slit. Lachrymal fused. Tips to maxillo-palatine processes usually thickened and furrowed, but often differ in shape (e.g. clavate and flattened in grassbirds; subulate in cisticolas). Tip of vomer usually shortly acute (flat-tipped in cisticolas). Temporal fossae narrow and flanked by well-developed post-orbital and zygomatic processes. Humerus has two pneumatic fossae, but second fossa only weakly developed (Bock 1962).

Following plumage and moult characteristics shared by the family (summarized from Baker [1997], Urban *et al.* [1997], BWP and DAB). Colour and markings of plumage vary greatly; most species have rather dull and sombre plumage comprising brown, grey, olive, dull-green or yellow tones, but others, especially African and Asian genera (e.g. *Seicercus*, *Apalis*, *Abroscopus*, *Orthotomus*, *Sylvietta*), have brighter plumage, with rich yellows, greens and rufous; *Hyltiota* have dark-bluish or purplish upperparts. Markings also vary considerably; many (e.g. *Acrocephalus*, *Prinia*, *Cettia*, *Phylloscopus*, *Bradypterus*, *Megalurus*) have white or yellow supercilia; some also have other facial markings such as crown-stripes and dark eye-stripes (e.g. *Phylloscopus*, some *Acrocephalus*), blackish or rufous caps, facial masks or hoods (some *Apalis*, *Orthotomus*, *Eremomela*, *Bathmocercus*) or moustachial stripes (some *Sylvia*, *Phylloscopus*, *Apalis*). Some have distinct white tips or outer edges to tail (e.g. *Sylvia*, *Acrocephalus*, *Prinia*, *Cisticola*). Some species (e.g. *Megalurus*, *Cisticola*) have blackish streaking on head and body. Sexes usually similar, but some

(e.g. *Cisticola*, *Apalis*, *Sylvia*, *Hyltiota*) show obvious plumage-dimorphism. In adults, males tend to be slightly larger than females. Juveniles usually duller than adult, and unspotted. Nestlings usually naked, but some (e.g. *cisticolas*) develop fine, sparse down. Nestlings usually have 2–3 black spots on tongue; nestlings of songlarks also have black markings on tip of one or both mandibles, and nestling Brown Songlark also has much black on palate (Maclean & Vernon 1976). Fledge in juvenile plumage. Moulting strategies vary considerably, even within species. Most species undergo a partial post-juvenile (first pre-basic) moult to adult-like first immature (first basic) plumage, usually starting when 1–2 months old; this usually does not involve remiges, greater primary coverts or rectrices. Some (e.g. some *Acrocephalus*, *Sylvia* and *cisticolas*) undergo a complete or nearly complete post-juvenile moult; in some species (e.g. Zitting *Cisticola* in n. hemisphere), birds that hatch early undergo a complete post-juvenile moult to adult plumage, but late-hatched birds undergo a partial post-juvenile moult to first immature plumage. Moulting strategies often complex and vary considerably between species, and often related to migratory movements and date of hatching. Most species undergo a complete adult post-breeding (pre-basic) moult on or near breeding grounds each year, but some species, particularly long-distance migrants (e.g. some *Phylloscopus* and *Acrocephalus*), start complete post-breeding (pre-basic) moult on or near breeding grounds, then suspend moult for s. migration and finish moult on wintering grounds. Many species also undergo a partial pre-breeding (pre-alternate) moult, usually not involving remiges, greater primary coverts, alula and rectrices. A few species (e.g. Aquatic Warbler *Acrocephalus paludicola*) undergo only a partial post-breeding (pre-basic) moult, suspending moult of remiges during s. migration, and not finishing moult of remiges till complete pre-breeding (pre-alternate) moult on wintering grounds. Some species (e.g. some *Acrocephalus*, *Hippolais* and *Locustella*) undergo a partial post-breeding moult that includes outer primaries on breeding grounds, suspend moult for s. migration, then perform a complete pre-breeding (pre-alternate) moult in wintering grounds; these birds therefore moult outer primaries twice each year. Primaries moult outward, usually starting at p1, but sometimes starting with outer primaries in those species undergoing partial post-breeding moult; a few species (e.g. Savi's Warbler *Locustella luscinioides*) undergo outward and inward moult of primaries, starting at about p4. Secondaries usually moult inward, but sequence can vary individually; usually starting when moult of primaries about halfway through. Moult of tail centrifugal. Moult of tail and body usually start about same time as primaries.

Found in wide variety of habitats, but often in dense low vegetation, and many species closely associated with water in both aquatic and riparian associations, including swamps, marshlands, freshwater meadows and the like. Commonly in grasslands, sedgeland or rushlands, including pasture or cropland; also often in dense understorey of woodlands and forests, including riparian or gallery associations; and in more open habitats, such as sparse or arid shrublands. Some species strongly associated with open woodlands or forests, particularly where bordering open country or clearings (e.g. Rufous Songlark in Aust.) (de Schauensee 1984; Urban *et al.* 1997; Grimmett *et al.* 1999; Robson 2000; Shirihai *et al.* 2001; see species accounts).

Range from sedentary or resident to migratory, with proportion of migratory species increasing with increasing latitude. Most n. Eurasian breeding species migratory (e.g. *Hippolais* warblers), while African and s. Asian breeding species tend to be sedentary or resident with minor local or altitudinal movements (e.g. *Bradypterus* warblers, prinias). Reed-warblers *Acrocephalus* and grasshopper-warblers *Locustella* highly migratory, though some African breeding reed-warblers are resident (e.g. Lesser Swamp-Warbler *A. gracilirostris*), and Clamorous Reed-Warbler *A. stentoreus* is resident in e. Mediterranean, Indonesia and New Guinea, but partly migratory in central Asia and the Middle East; *Phylloscopus* and *Sylvia* warblers tend to be migratory (e.g. Pallas's Leaf-Warbler, Garden Warbler *S. borin*), or partly migratory (e.g. Chinese Leaf-Warbler *P. sichuanensis*, Sardinian Warbler *S. melanocephala*), with some altitudinal migrants (e.g. Smoky Warbler *P. fulgiventis*), and breeding residents in Africa (e.g. Laura's Woodland-Warbler *P. laurae*); tesian *Tesia* are local altitudinal migrants (e.g. Chestnut-headed *Tesia T. castaneocoronata*); and grassbirds *Megalurus* and *Graminicola*, *cisticolas Cisticola*, prinias *Prinia* and tailorbirds *Orthotomus* largely sedentary or resident (e.g. Golden-headed *Cisticola*, Graceful Warbler *P. gracilis*, Common Tailorbird *O. sutorius*), with a few species known to undertake local movements; Zitting *Cisticola*, especially juveniles, dispersive and occasionally irruptive in parts of range, and cross Mediterranean from Europe to n. Morocco. Interpretation of movement patterns of some species complicated by marked seasonal changes in conspicuousness (e.g. Little and Tawny Grassbirds) (de Schauensee 1984; Urban *et al.* 1997; Grimmett *et al.* 1999; Robson 2000; Shirihai *et al.* 2001; BWP; see species accounts).

Primarily insectivorous. Mainly take invertebrates, predominantly insects, though many species also eat small fruits and seeds, and some take nectar or other vegetable matter; some occasionally eat small vertebrates (e.g. small frogs, lizards, fish fry). Mainly arboreal, foraging in trees and shrubs, though many species also feed to varying degree on ground, and some also take food from surface of water or just below surface. Most prey gleaned from vegetation (usually foliage but also twigs and branches), usually while perching, or occasionally while hanging upside-down or hovering. Some species also take flying prey from air, usually by sally-striking, sometimes by leaping between branches or, rarely, by snatching prey while perched. Some probe flowers for nectar, insects or parts of flowers; and morphology of bill, tongue and oral cavity of some species adapted for this purpose. Usually search through vegetation by hopping or making short flights between branches, sometimes inspecting substrates slowly or

meticulously. When foraging on ground, walk, hop or run, and pause to glean or probe from ground or to glean from low vegetation, or sometimes leap to pounce on active prey. Usually forage solitarily during non-breeding season, though some may join mixed-species foraging flocks (Urban *et al.* 1997; BWP).

Most species typically seen singly or in pairs throughout year, but some more usually in small groups (e.g. eremomelas *Eremomela*). Some join mixed-species flocks in non-breeding season. Most species monogamous, but some polygynous. Co-operative breeding occurs in eremomelas *Eremomela*. In most species, incubation by female only. In many species, both parents feed nestlings and fledgelings, and helpers also feed young in co-operatively breeding species; in some species, only female feeds young. Most species nest solitarily and are territorial. Usually roost solitarily when not breeding. Social behaviour of most species not well known. Many species skulk within vegetation, making observation difficult, and vocalizations often the only indication of their presence (e.g. reed-warblers *Acrocephalus*, bush-warblers *Cettia* and *Bradypterus* and tailorbirds *Orthotomus*). Some species of open habitats more conspicuous (e.g. eremomelas *Eremomela* and crombecs *Sylvietta*). Most scratch head indirectly, but Eurasian Reed-Warbler *Acrocephalus scirpaceus* uses direct method. Usually bathe by standing in shallow water, but also bathe in wet foliage. Apparent dust-bathing reported in a few species. In many species, males perform aerial flight-displays, often accompanied by songs or noise of wings (Smythies 1981; Skutch 1987; Coates 1990; Urban *et al.* 1997; BWP).

Vocalizations vary greatly; for example, some produce insect-like buzzing (e.g. Zitting Cisticola), some almost mechanical sounds (e.g. River Warbler *Locustella fluviatilis*), and others produce sweet liquid notes (e.g. Marsh Warbler *Acrocephalus palustris*). Many species have well-developed songs that are often loud and far-carrying. Usually sing most often in breeding season, and song thought to be used both in mate attraction and territorial defence. Some species rather quiet in non-breeding season (Smythies 1981; Urban *et al.* 1997; BWP; see species accounts).

Most species solitary and monogamous, but some polygynous; most *Eremomela* breed co-operatively (see above). Most species nest close to ground (or surface of water) in dense, low vegetation (e.g. in tussocks of grass, clumps of reeds or sedges, or among brambles), or low down in shrubs or trees; *Phylloscopus* habitually nest on ground, or in holes or crevices. Structure of nests varies greatly; generally either cup-shaped or domed with side entrance, but sometimes partly domed (e.g. Moustached Warbler *Acrocephalus melanopogon*, Cricket Warbler *Spiloptila clamans*, Yellow-breasted Apalis *Apalis flavida*), purse or bag-shaped (e.g. *Schistolais*, *Sylvietta*, *Phyllolais*, some *Apalis* species), or occasionally pear or bottle-shaped (e.g. some cisticolas, White-tailed Warbler *Poliolais lopesi*). Nests typically made of grass, leaves and plant stems, and sometimes other material, such as plant down, moss, lichen, roots, bark or twigs; material sometimes bound together with spider web; and nests usually lined with fine grass, hair, feathers, plant down, rootlets or other fine fibres. Nests built by both sexes, or sometimes by female only; helpers may assist in *Eremomela*. Eggs varyingly oval to sub-elliptical; smooth; usually glossy, sometimes slightly glossy or lustreless. Ground-colour often pale, varying from white or shades of white (e.g. dull white, or pinkish, greenish, bluish or greyish white) to shades of buff, pink, green, blue or grey, or occasionally red, brown or olive. Eggs usually spotted or blotched with shades of brown, grey, red, black, green, mauve or purple; markings sometimes more concentrated at, or form ring or cap round large end. Eggs also occasionally unmarked. Clutch-size usually 2–4 in tropics and 3–4 to 5–6 in more temperate regions, but some variation. Eggs laid on consecutive days. Incubation by both sexes, though often mainly by female, or by female only; helpers may assist in *Eremomela*. Incubation period usually between 11–12 and 16–17 days in most species, but varies from <10 to >20 days. Nestlings usually fed and brooded by both sexes, though brooding often mainly by female and, in some species, brooding and occasionally feeding by female only; helpers may assist parents with feeding, and possibly brooding, in some species (e.g. eremomelas, Banded Prinia *Prinia bairdii*). Fledging period between 10–11 and 16–17 days in most species. In some species, young fledge before capable of flight. Fledgelings usually fed by both parents; brood-division can occur in some species, and fledgelings may also be fed by helpers in *Eremomela*. Young usually dependent on adults for 1–3 weeks after fledging, occasionally longer (up to 1 month or more). Many species rear 2–3 broods per season (Urban *et al.* 1997; BWP).

Within the components of this large family we discuss here, many species globally threatened. Two species extinct in wild, including Chatham Island Fernbird of HANZAB region (see species account); the other, Aldabra Warbler *Nesillas aldabrana*, was confined to the Seychelles and only discovered in 1967 (and last recorded in 1983). Three species considered critically endangered: Taita Apalis *Apalis fuscigularis* of Kenya, Long-billed Tailorbird *A. moreaui* of Tanzania and Mozambique, and Millerbird *Acrocephalus familiaris* of Hawaii. A further eleven species are endangered, and 26 considered vulnerable (Stattersfield & Capper 2000; BirdLife International Species Factsheets, available at <http://www.birdlife.org/datazone/species/index.html> [accessed Sept. 2005]).

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Acrocephalus australis **Australian Reed-Warbler**

COLOUR PLATE FACING PAGE 1561

Calomoherpe australis Gould, 1838, **In** Lewin, *Nat. Hist. Birds New South Wales*: index to synonyms to pl. 18 — Parramatta, New South Wales.

The generic name refers to the peaked crown of many reed-warblers (Greek ακρος, topmost, and κεφαλή, the head). The specific name refers to the type-locality (Latin *australis*, southern).

OTHER ENGLISH NAMES Long-billed, Southern or Western Reed-Warbler or Great Reed-Warbler; Reed-Warbler, Reed-lark or Reed-bird; Swamp Tit or Water Sparrow; Nightingale.

POLYTYPIC Nominate *australis* (Gould, 1838), breeding throughout se. Aust., including Tas. and Furneaux Grp, W to Eyre Pen. and w. L. Eyre Basin and N at least to central Qld and possibly coastal ne. Qld and se. Gulf of Carpentaria; winter N to subcoastal Kimberley Div., WA, Top End, NT, and Gulf of Carpentaria and C. York. Pen., Qld, and possibly s. New Guinea; *gouldi* Dubois, 1901, coastal and subcoastal w. Aust, from s. coast of WA, between Esperance and C. Lewin, N to w. and central Pilbara and possibly subcoastal Kimberley Div., WA, and sw. Arnhem Land, NT, though subspecific identity of n. WA and n. NT breeding populations not clear (see Geographical Variation); sw. populations possibly also winter n. WA and n. NT. Previously considered a

subspecies of Clamorous Reed-Warbler *A. stentoreus* (Christidis & Boles 1994; Peters; BWP); here we recognize *A. australis* as a full species (see Geographical Variation below for justification). Extralimital breeding populations in New Guinea, Bismarck Arch. and Solomon Is may be a third subspecies, *sumbae* Hartert 1924, but their taxonomic affinities are not known (see Geographical Variation); here we treat *sumbae* as a subspecies of Clamorous Reed-Warbler *A. stentoreus*.

FIELD IDENTIFICATION Length 16 cm (15–18); wingspan 20 cm (19–21); weight 20 g. Sleek, medium-small and cryptic reed-dwelling bird, usually detected by loud warbling Song. Rather long and slender, with: long, slender and slightly decurved bill with slight hook at tip; rather narrow head with flat crown, but with short erectile and bluntly triangular crest, which is raised in alarm or when singing; fairly short wings with rounded tips to primaries, which extend well past tips of tertials but fall well short of tips of uppertail-coverts; long and broad tail with broadly rounded tip; and long, strong legs and feet with short feathered tibia. Almost identical to Oriental Reed-Warbler *Acrocephalus orientalis* in size, shape and structure but Oriental slightly larger, with longer thicker bill and subtly different Song; unlike related extralimital Clamorous Reed-Warbler *A. stentoreus*, little difference between Oriental and Australian in primary-formula, primary-projection and tail-formula (these characters useful only in the hand; see Recognition for detail). Slightly larger and more robust than equally cryptic Little Grassbird *Megahurus gramineus*; about same size but slightly more thickset than Tawny Grassbird *M. timoriensis*. In flight, which normally brief, appear long and slender, with broad rounded wings and long tail. Sexes alike. Plumage rather drab and largely brown, but appearance varies with wear. In fresh plumage, mostly russet-brown above, with rufous uppertail-coverts, and facial pattern of short and diffuse supercilium, only slightly paler than rest of face, and weak dark eye-stripe; and dull rufous-brown below (paler than upperparts), isolating white throat-patch. In worn plumage, upperparts have grey or olive tinge, and rump and uppertail-coverts appear washed out; supercilium, whitish, and dark eye-stripe, blackish, both well defined; and underparts much paler, almost whitish, merging into white of throat. Juveniles very like adults, differing only subtly by yellowish-brown uppertail-coverts and underparts; narrower and more pointed rectrices; and comparative freshness of plumage compared with adults. Immature almost identical to adult, and most doubtfully distinguishable in field. Two subspecies in Aust., which differ only subtly in plumage and size: compared with *australis* of e. and n. Aust., *gouldi* of w. and nw. Aust. slightly larger (difference barely noticeable in field but must be kept in mind when comparing with Oriental Reed-Warbler); darker above and, in fresh plumage, underbody more extensively and darker dull-rufous; and bill slightly longer and deeper, tending to be slightly straighter and less decurved and also slightly stouter (recalling bill of Oriental Reed-Warbler). **Adult FRESH PLUMAGE** (late summer to autumn): Top of head, russet-brown, slightly paler and greyer on hindneck, with indistinct, diffuse, paler brown supercilium extending across upper lores (from just short of bill), over eye to about midway over ear-coverts, and merging into brown of top of head, though appearance of supercilium can vary slightly with light and posture: sometimes appears almost obsolete, while in strong light may look almost whitish and better defined, but never as pale as throat and still rather indistinct. Feathers of crown slightly elongated, and can be raised to form short, bluntly triangular crest when singing or alarmed. Centre of lores as top of head, and slightly darker than supercilium, forming indistinct and diffuse dark-brown eye-stripe that continues narrowly behind eye and through upper ear-coverts; appearance of eye-stripe also varies with light and posture, from strong and well defined, appearing almost blackish, to diffuse and brownish and contrasting little

with side of face. Partial narrow creamy eye-ring forms diffuse pale arcs above and below eye, merging into supercilium above, contrasting more below, and broken in front and rear by eye-stripe. Ear-coverts, brown diffusely streaked with paler brown. Malar area, chin and throat, cream-white, forming large pale throat-patch. Sides of neck slightly paler than hind-neck and grade into coloration of sides of breast. Mantle, back and scapulars, russet-brown; and rump and uppertail-coverts, warm brown grading to rufous-brown on uppertail-coverts (*gouldi* have richer rufous-brown rump and uppertail-coverts). Uppertail, dark brown with rufous-brown edging to feathers and light-brown to pinkish-buff tip. Folded wing appears mostly dark brown, with: blackish primary coverts and alula; rufous-brown fringes to greater secondary coverts form diffuse, indistinct and narrow wing-bar, contrasting with darker brown primaries and secondaries, which are narrowly edged russet-brown or pale rufous-brown; and tertials, dark-brown with russet-brown fringes. Breast and flanks, dull rufous-brown, slightly paler in centre of breast, and contrasting with much paler throat; sides of breast sometimes mottled cream and, rarely, have very faint and diffuse greyish streaking (but never distinct dark streaking); in nominate *australis*, underbody grades to pale buff or cream in centre of belly and vent, and dull rufous-brown on undertail-coverts; in subspecies *gouldi*, underbody more extensively, and darker, dull rufous, with only very centre of belly and vent paler, pale rufous. Undertail, blackish brown with narrow light-brown to pinkish-buff tip. Underwing: coverts, buff with slight rufous tinge; remiges, dark grey-brown with cinnamon outer edges, forming diffuse but broad dark trailing edge to wing. Bill: upper mandible mostly black except for flesh-pink cutting edge; lower mandible mostly flesh-pink with blackish subterminal marking and sometimes tip; inside of mouth (often seen when bird sings), deep orange or pinkish orange. Iris, grey-brown; orbital ring, grey-black. Legs, dark slate-grey to almost black. **WORN PLUMAGE** (late winter to midsummer): Much paler overall than fresh plumage and with better defined facial markings; differences from fresh plumage: (1) **FACIAL PATTERN**: Much better marked than in fresh plumage, with: much paler, more contrasting, cream to dull-white (not pale-brown) supercilium, which starts a little closer to base of bill and contrasts more with dark top of head; and with stronger and better marked fine, almost blackish eye-stripe, which extends fairly strongly from base of bill, through eye and through upper rear ear-coverts; cheeks much as in fresh plumage but tend to be a little more greyish brown. Malar area, chin and throat much as fresh plumage (see Underbody below). (2) **UPPERBODY**: Paler overall, with colder, more grey or olive tone and washed-out light-brown or pale rufous-brown rump and uppertail-coverts. (3) **UPPERTAIL**: Ground-colour slightly paler, with pale-buff edges to feathers and cream or whitish tip. (4) **UPPERWING**: Like upperbody, paler with colder, more grey or olive tone: marginal and median secondary coverts and fringes of greater secondary coverts, paler, greyish olive-brown; and ground-colour of primary coverts, alula and remiges slightly paler, and fringes or edges to same paler, particularly fringes to tertials. (5) **UNDERBODY**: Malar area, chin and throat, white, much as in fresh plumage; unlike fresh plumage, merge with much paler, creamy centre of breast, belly and vent (i.e. not forming isolated throat-patch); sides of breast and flanks washed-out buff or grey-brown, often mottled dull white;

undertail-coverts, pale buff or cream. No difference in colour of underbody between subspecies in worn plumage. (6) *UNDERTAIL* as fresh plumage but tip tends to be paler, off-white. (7) *UNDERWING* much like fresh plumage, but coverts slightly paler. Bare parts as in fresh plumage. **Juvenile** Probably in this plumage for short time. Very like fresh-plumaged adult of respective subspecies, differing by: (1) rump and uppertail-coverts more yellowish brown, not rufous-brown, and contrasting more with rest of upperparts; (2) underparts as in fresh adults but with slight yellowish tinge; and (3) rectrices narrower with more pointed tips. For juveniles that fledge in late spring to early summer (as is typical), plumage is much fresher, with ill-defined facial pattern and darker upperparts and underparts, compared with worn plumage of adults at same time of year. However, juveniles that fledge later in year, in late summer to autumn, may show little difference in wear from those adults that have finished post-breeding moult to fresh plumage), and then probably much harder to distinguish. **Immature** Identical to fresh-plumaged adult of respective subspecies except retain juvenile rectrices, which are narrower and more pointed than in adult and may occasionally be visible with excellent views.

Similar species Very similar to **Oriental Reed-Warbler**, which is rare vagrant to n. and e. Aust., and the only other reed-warbler recorded in HANZAB region, though Oriental may prove to be more common than currently known; for differences see that species account. Should not be confused with grassbirds; for differences from **Little** and **Tawny Grassbirds**, see those accounts.

Usually occur singly or in pairs. Large numbers and high densities may occur in reed beds, though birds are dispersed, not in flocks. Cryptic. Usually first detected by loud ringing Song, which given constantly from deep within reed beds, but often very difficult to see because habitat dense, spend much time within reeds, and usually shy and skulking. Often only seen briefly flitting between reed beds or across gaps within reeds, though if quietly approached, especially from water, close views can be obtained at times, and birds can be quite confiding. Often perch horizontally across reeds, occasionally at tops of reeds. Hop up reeds, and flick wings and tail a little while moving through vegetation; sometimes forage on mud or flattened vegetation at bases of reeds, where hop and shuffle about, often with tail cocked. Flights usually short, quick and jerky, but very direct; also flutter and flit quickly through reeds and between reed beds; rarely seen flying great distances. Respond well to imitations of vocalizations, and also to harsh pishing noises. When singing, puff throat, raise short crest, and inside of mouth often visible. As well as loud Song (see above, and Voice) also often give harsh scolding note.

HABITAT Typically in dense, low, aquatic or riparian vegetation, mainly reeds, rushes, sedges and other vegetation with similar vertical structure, in and round nearly any type of fresh, brackish or saline wetlands, including creeks, rivers, billabongs, estuaries, ponds, swamps, lagoons, lakes and clay-pans, and modified or artificial wetlands, such as dams, bores and bore drains, irrigated farmland, sewage ponds, and rural and urban ponds and lakes in parks, gardens and on golf courses, though generally less common in modified wetlands. Can occur in very isolated wetlands, e.g. abundant in reed beds in Glen Helen Gorge, MacDonnell Ras, NT (D.I. Rogers). Sometimes in other riparian or aquatic vegetation, such as shrubs and trees, mainly when foraging and when with young; and occasionally well away from water (Le Souëf & Macpherson 1920; Sutton 1927, 1931; Hobbs 1961; McEvey 1965; Costello 1981; Gosper 1981; Morris *et al.* 1981, 1990; Schrader 1981; Passmore 1982; Brown & Brown 1986; Vervest 1988; Henle 1989; Lenz 1989b; Dawson *et al.* 1991; Johnstone *et al.* 2000; Read *et al.* 2000; Stewart & Gynther

2003; Hall; Serventy & Whittell; Storr 16, 26, 27, 28, 35; NSW Bird Rep. 1982; see Food, see below). In classification of waterbird communities of se. Aust., formed strong association with Pacific Black Duck *Anas superciliosa* and Purple Swamphen *Porphyrio porphyrio*, the three usually coexisting on small, deep ponds and tanks typically in undulating open coastal terrain with abundant Giant Blue Waterlily *Nymphaea gigantea* and some tall sedges or cumbungi (Fjeldså 1985). In Vic., occur throughout lowlands and foothills and only rarely in highlands; most common in wetlands and irrigation areas of Mid- and Upper Murray Valley (Vic. Atlas). Suggested that dry habitats suitable for foraging, close to wetland breeding sites, important sources of food; e.g. pasture and crops adjacent to nest-sites in *Typha* reed beds near Manjimup, WA (Brown & Brown 1986; Lenz 1989b).

Primarily inhabit dense RUSHLAND, SEDGELAND AND GRASSLAND and similar vegetation in and round wide variety of natural and artificial WETLANDS (as above), including combinations of these formations, or successions of such vegetation, and sometimes with scattered shrubs or trees (as below); and dominated by rushes, reeds and sedges, up to 3 m tall, such as cumbungi *Typha* (including Bulrush *T. orientalis* and Narrow-leaf Cumbungi *T. domingensis*), *Phragmites*, *Juncus*, *Baumea* (including Jointed Twig-rush *B. articulata*), *Cyperus* (including Stiff Flat-sedge *C. vaginatus*, and spike-rush *Eleocharis*; and grasses such as *Pennisetum*, Para Grass *Brachiaria mutica* and canegrass *Eragrostis*; and similar types of vegetation, such as mat-rush *Lomandra* (e.g. Legge 1902; Howe 1910; Rix 1943; Bedgood 1970, 1972, 1973, 1980; Kitchener *et al.* 1975; Morris 1975; Fleming 1976; Gibson 1977; Cooper 1978; Gosper 1981; Sedgwick & McNee 1984; Fjeldså 1985; Newby & Newby 1989; Bamford *et al.* 1990; Morris *et al.* 1990; Gynther 1994; Baxter 1995; Britton & Britton 2000; Read *et al.* 2000; Hooper 2001; Eikenaar *et al.* 2003; Stewart & Gynther 2003; Hall; Serventy & Whittell; Storr 16, 26, 27, 28; R. Johnson; see above, and below), e.g. freshwater lagoon partly vegetated with Sea Rush *Juncus kraussii*, Tall Spike-rush *Eleocharis sphacelata* and Leafy Flat-sedge *Cyperus lucidus* (Smith & Chafer 1987); and lagoons and lakes with Giant Rush *Juncus ingens*, Spiny Rush *J. acutus* and Narrow-leaf Cumbungi (McEvey 1965); and in beds of Shore Club-rush *Schoenoplectus litoralis* and Bulrush fringing pond on golf course (Courtney-Haines 1975). Also sometimes use riparian or aquatic SHRUBLANDS or WOODLANDS, or patches and thickets of SHRUBS AND TREES, in or round wetlands or interspersed through above habitats, often when foraging, when sometimes occur high in trees, and especially when raising young (see Food). However, also reported nesting in shrubs and thickets away from water in drought year (see Lenz 1989b). Dominant shrubs and trees include Lignum (sometimes in association with canegrass and *Juncus*), bluebush *Maireana* (especially during local flooding), bottlebrush *Callistemon*, grevilleas, acacias, tea-trees, casuarinas, bamboo *Bambusa*, *Pandanus*, paperbarks and eucalypts, and introduced species, such as willows *Salix*, *Cotoneaster*, *Wisteria* and Lantana, or mixed stands of native and exotic species (Campbell 1903; Sandland & Orton 1922; Sutton 1931; Hobbs 1961; Eckert 1972, 1973; Morris *et al.* 1981; Schrader 1981; Sedgwick & McNee 1984; Henle 1989; Lenz 1989b; Hall; Storr 11, 21, 35; Vic. Atlas; R. Johnson; see Food); on Kangaroo I., SA, mostly found in paperbarks round brackish tea-tree lagoons (Baxter 1995). In se. Qld, seen to move from dense *Typha* reed beds to forage in scattered or woodland eucalypts, including Forest Red Gum and Narrow-leaved Ironbark, and Swamp Oak, and in understorey acacias (Gynther 1994; see Food); seen up to 6 km from reeds (Courtney-Haines 1991); recorded in riparian Weeping Bottlebrush *Callistemon viminalis* with an understorey of tall grasses, Spiny-headed Mat-rush *Lomandra longifolia* and Common Reed *Phragmites*

australis (R. Johnson); in *Pandanus* along flowing creek with reed beds (Hall); and in ne. Kimberley Div., breed in small stands of Narrow-leaf Cumbungi in dam fringed by paperbarks and dense stands of River Pandanus *Pandanus aquaticus* (Coate *et al.* 2001). Also occasionally use riparian shrubs and trees when water-levels of wetlands raised, e.g. in dense flooded *Melaleuca* thickets at edge of lake (Anon. 1983), and in flooded heath and inundated banksia thickets (Jaensch 1984). Sometimes occupy patches or thickets of shrubs and trees well away from water, e.g. in Canberra, 150–500 m distant, and in Ballarat, Vic., c. 750 m (Lenz 1989b). Listed, without further explanation, as occurring often, and breeding, in dry sclerophyll forest (Ford & Paton 1975), though species probably using preferred habitat within or adjacent to such forests (e.g. see Gynther 1994 above). Occasionally in MANGROVES (Storr 7, 19), both freshwater and estuarine (Hall). As well as modified or artificial wetlands (as above), occasionally in dense non-riparian vegetation in MODIFIED ENVIRONMENTS, though usually with water nearby, such as: irrigated farmland; tall irrigated cereal crops, including *Sorghum*, Corn and millet *Panicum*; and in windbreaks of exotic plants, including Sudan Grass *Sorghum vulgare*, Pampas Grass *Cortaderia selloana* and bamboo (McKeown 1923; Hobbs 1961; Eckert 1972, 1973; Storr 21; Vic. Atlas); occasionally in sugar-cane crops (Campbell & Barnard 1917; Storr 19; R. Johnson); and in shrubs and trees, such as Weeping Bottlebrush, paperbark, *Oleander*, Cocos Palms *Syagrus romanzoffiana* and Golden Cane Palms *Chrysalidocarpus lucubensis*, and clumping grasses, such as bamboo and Pampas Grass, in parks and gardens (Bryant 1934; Lenz 1989b; R. Johnson). Once, during wet year, recorded breeding in Patterson's Curse *Echium lycopsis* beside road, which probably in water (Rich 1975); and said to be regularly in short roadside vegetation in Top End, NT, during wet season (Goodfellow 2001).

DISTRIBUTION AND POPULATION Widespread in well-watered parts of Aust., S of 20°S, in E and well-watered parts of WA; occur at scattered sites in N, and largely absent from many arid or inland areas. Unconfirmed report from NZ. Resident breeding populations possibly occur in Wallacea (Sumba, Buru, Timor), New Guinea and Solomon Is (White & Bruce 1986; Coates 1990; Sibley & Monroe 1990; Baker 1997; Coates *et al.* 1997; BWP), but these usually considered as subspecies of Clamorous Reed-Warbler; for discussion of taxonomy, see Geographical Variation.

Aust. **Qld** N of 20°S, mainly recorded at scattered coastal or near-coastal sites, from Gregory Downs N to islands in Torres Str., and thence SE to Salisbury Plain, near Bowen; occasionally at a few scattered sites farther inland, e.g. Toomba Stn and Gregory Ra. (Draffan *et al.* 1983; Britton & Britton 2000; Aust. Atlas 1, 2; Storr 19). Widespread S of 20°S, mostly E of line from site near Nelia (between Julia Ck and Richmond) SE to Culgoa NP, and at progressively more scattered sites farther W, especially near watercourses and other wetlands, e.g. along Diamantina R. (Ford & Parker 1974; Horton 1975; Finlayson 1980; Schrader 1981; Stewart & Gynther 2003; Aust. Atlas 1, 2; Storr 19). **NSW** Widespread in all regions but most sparsely scattered in Upper and Lower Western Regions (Morris *et al.* 1981; Cooper & McAllan 1995; Chafer *et al.* 1999; Aust. Atlas 1, 2; NSW Bird Reps). **Vic.** Widespread, especially along upper and middle reaches of Murray R. and its tributaries; but largely absent from mountainous areas of North-East and Gippsland Districts, and also in parts of Mallee away from Murray R. (Vic. Atlas). **Tas.** Recorded at a few sparsely scattered sites, mostly in E. Very occasionally recorded in W and NW, at Pieman R., Marrawah and Wynyard (Aust. Atlas 2; Tas. Bird Reps 13, 24). Farther E, many records round Tamar R., from Asbestos Ra. NP downstream to Launceston, and at a few

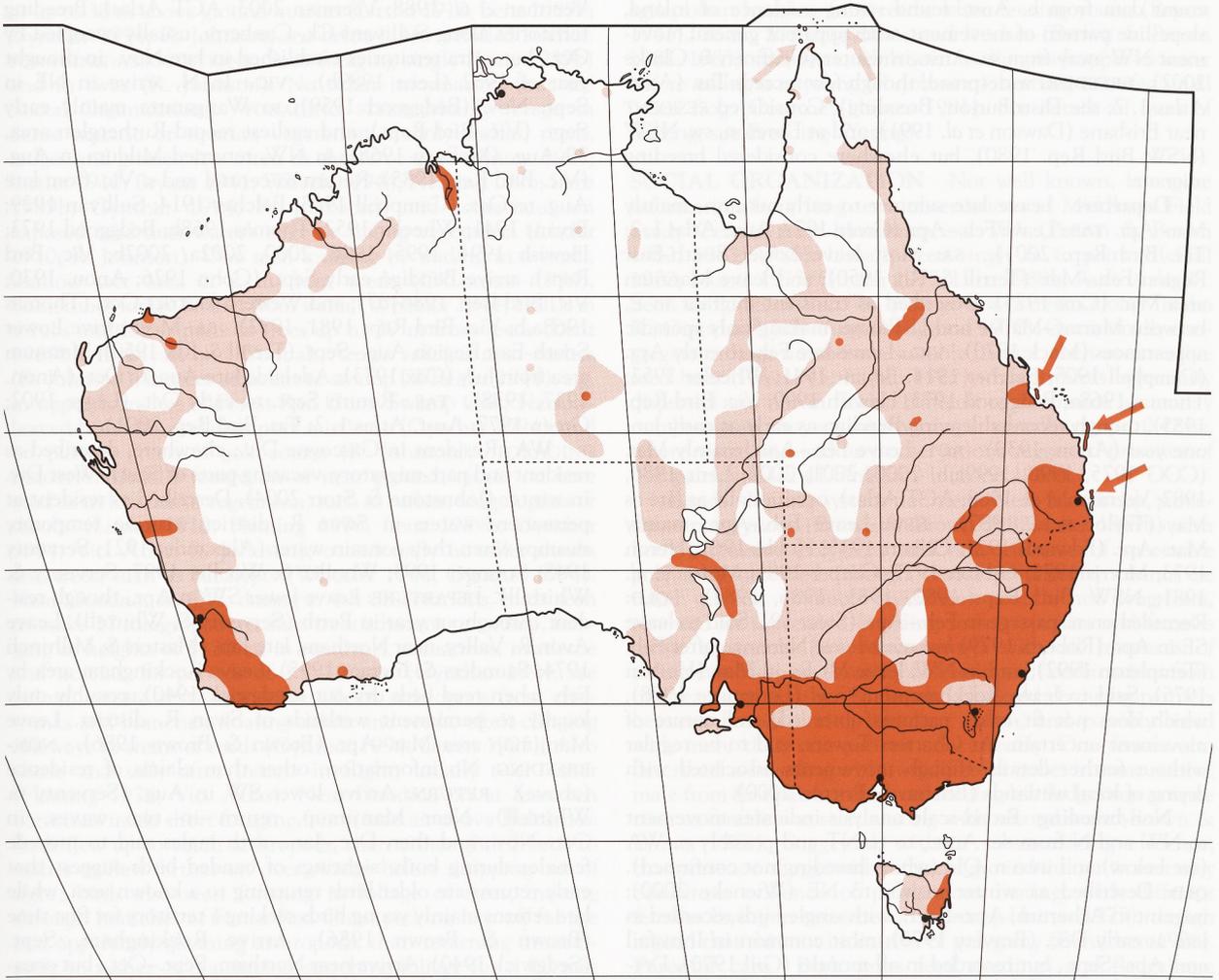
scattered inland sites, from Deloraine S to Brumbys Ck, and E to Cressy. Recorded at sparsely scattered sites along e. coast, from Upper Scamander S to Margate, and inland at sites along Derwent R., upstream to Meadowbank Dam, near Ouse; and also at other inland sites, such as Craighourne Dam and Tunbridge (Aust. Atlas 1, 2; Tas. Bird Reps). No recent published records from islands in Bass Str., though historical report from Furneaux Grp (Le Souëf 1902). **SA** Widespread in E, though only recorded at scattered sites in L. Eyre Drainage Basin. Mainly occur W to line from Kelly Hill CP on sw. Kangaroo I., through Moonta (on Yorke Pen.) and Kingoonya, to Dalhousie Springs. Very occasionally recorded farther W, on Eyre Pen. from Port Lincoln NW to Streaky Bay, and farther W, at Cook (Eckert 1972, 1973; Cox & Pedler 1977; Badman 1979; Stove 1994; Baxter 1995; Aust. Atlas 1, 2; SA Bird Reps). **WA** Very occasionally recorded along s. coast, e.g. Eyre Bird Observatory, and sites between Duke of Orleans Bay and Culham Inlet, near Hopetoun; and once recorded farther inland at Kalgoorlie. More widespread farther W, especially W of line from Bremer Bay, through Meckering (near Northam), Thundelarra Stn and Lyons R. (between Edithina Pool and Mt Augustus), to Carawine Gorge, Oakover R., though very sparsely scattered in w. Pilbara Region (Jaensch *et al.* 1988; Newby & Newby 1989; Jaensch & Vervest 1990; Anon. 1992; Johnstone *et al.* 2000; Johnstone & Storr 2004; Aust. Atlas 1, 2; Storr 16, 21, 26, 27, 35). Very occasionally recorded in nw. Great Sandy Desert, round Sandfire, Anna Plains, McLarty Hills and Dragon Tree Soak (Storr 1981; Start & Fuller 1983; Anon. 1996; Aust. Atlas 1, 2). Also recorded at scattered sites in Kimberley Div., from near Broome E to L. Gladstone, and from Liveringa (Looma) and Geikie Gorge NP, N to Munja Swamp, Walcott Inlet, as well as farther E, from Wyndham W to Drysdale R. NP and S to L. Argyle (Johnstone *et al.* 1977; Jaensch & Vervest 1990; Aumann 1991; Buchanan 1994; Collins 1995; Johnstone & Storr 2004; Storr 11; Aust. Atlas 1, 2). **NT** Sparsely scattered. In Top End, recorded at a few sites from round Darwin E to Kakadu NP, and occasionally farther E, in Arnhem Land (e.g. near Maningrida). Elsewhere in Top End, recorded at Victoria R. Downs, at various sites along Roper R., Sir Edward Pellew Grp and adjacent mainland, site near Elliott, and on Barkly Tableland, round Walhollow Stn and Brunette Downs Stn. More widespread farther S, where recorded from L. Surprise S to Indracowra Stn and SE to Andado Stn (Rix 1970; Crawford 1972; Schodde 1976; Roberts 1980; McKean 1983; Goodfellow 2001; Storr 7; Aust. Atlas 1, 2).

NZ **SI** Single unconfirmed report from St Annes Lagoon, near Cheviot, 14–28 Nov. 2004 (Allen 2004).

Breeding Widespread in se. Aust., mainly from coastal areas inland to w. or n. slopes of Great Divide and adjacent plains, mostly S of line from Nanango, se. Qld, SW to Mildura, nw. Vic., with records in SA mainly extending W to Wirrabara on Adelaide Plain; also widespread in sw. WA. Recorded at scattered sites elsewhere throughout much of range, with no confirmed records N of 20°S in Qld, though report of 'small numbers ... breeding' in Atherton Region (Wet Tropics) (Wieneke 2000; Aust. Atlas 1, 2; NRS).

Change in range, population Range said to have recently expanded in central Aust. to include Alice Springs, where said to have been first recorded in Dec. 1976 (Klapste 1978; Roberts 1980), though historical record from Finke R., just S of Alice Springs, in 1920s (Whitlock 1924). Said to have 'invaded' plains round Richmond, Qld, after establishment of artesian bores by early 20th century (Berney 1905). Populations on Wilsons Prom., Vic., said to have declined since early 20th century, as recorded much less often by 1970s (Cooper 1975).

Populations **RECORDED DENSITIES:** All WA (from Jaensch *et al.* 1988): 0.14 birds/ha, Alfred Cove NR; 0.41



birds/ha, Benger Swamp NR; 0.05 birds/ha, Chittering L. NR; 0.32 birds/ha, Forrestdale L. NR; 0.06 birds/ha, Grasmere L. NR; 0.03 birds/ha, Thomsons L. NR; 0.02 birds/ha, Towerinning L. NR; 0.32 birds/ha, Malling Swamp NR; 0.39 birds/ha, Wannamal L. NR; 0.05 birds/ha, Beetalyinna Pool NR; 0.02 birds/ha, Coomelberrup L. NR; 0.01 birds/ha, Coyrecup NR; 0.01 birds/ha, Harver Estuary NR; 0.05 birds/ha, Jandabup L. NR; 0.03 birds/ha, Kulunilup L. NR; 0.02 birds/ha, Mettler L. NR; 0.45 birds/ha, Milyu NR; 0.01 birds/ha, Mogumber Swamp NR; 0.02 birds/ha, Nine Mile L. NR; 0.07 birds/ha, Pleasant View L. NR; 0.56 birds/ha, Shark L. NR; 0.16 birds/ha, Yarnup Lagoon NR.

THREATS AND HUMAN INTERACTIONS Agriculture has enabled Reed-Warblers to spread and invade newly formed reed beds (Aust. Atlas 1), e.g. in Richmond District, n. Qld, the advent of artesian bore streams with cumbungi saw them invade areas where previously unknown (Berney 1905). However, coastal habitats lost with reclamation of swamps and other developments (e.g. Gibson 1977). Occasionally killed by vehicles (Vestjens 1973; Brown *et al.* 1986). Very occasionally collide with lighthouses (Stokes 1983); and once thought to have collided with overhead wires (Sedgwick 1988). Historically, nests often destroyed and eggs taken by children (Bryant 1941).

MOVEMENTS Partly migratory, but full range of movements not clear, especially for sw. and n. Aust. Largely migratory in

se. Aust., leaving breeding sites and moving N and NW in late summer to autumn, and returning to SE in late winter to early spring, though some remain in winter (Morris *et al.* 1981; Griffioen & Clarke 2002; Aust. Atlas 1, 2; Vic. Atlas; ACT Atlas; see below). Though sometimes considered non-breeding winter visitor to n. Aust., breeding recorded Kimberley Div., WA, and Top End, NT, but breeding not confirmed in Qld N of 20°S or in Torres Str. (Draffan *et al.* 1983; Goodfellow 2001; Storr 11; Aust. Atlas 1, 2; see Distribution and Population, see below). WA populations considered mainly sedentary, but some movements suggested by appearance on waterless islands and at desert oases, and birds probably vacate drier and colder parts of range in winter; patterns of movements in s. WA not clear; breeding widespread, and varying considered resident, or with some seasonal movements (e.g. Masters & Milhinch 1974; Johnstone & Storr 2004; see below). Show marked seasonal changes in conspicuousness: obvious during breeding season, when birds vociferous, but difficult to detect during non-breeding periods, perhaps exaggerating impressions of seasonal movements in some areas (e.g. Frith 1969; Dedman *et al.* 1998; Paton & Pedler 1999; Aust. Atlas 1; see Social Behaviour, Voice). **NATURE OF PASSAGE:** In sw. WA, males apparently return before females (see WA [Return] below).

SE. Aust. Largely migratory (partial migrant), leaving breeding sites Feb.–Apr. and returning Aug.–Sept., though some remain in winter (Cooper 1978; Morris *et al.* 1981, 1990; Aust. Atlas 1; see below). Broad-scale analysis of bird atlas and

count data from e. Aust. found strong evidence of inland, slope-line pattern of movement, with apparent general movement NW away from se. Aust. in winter (Griffioen & Clarke 2002). **BREEDING** widespread, though few records Tas. (Aust. Atlas 1, 2; see Distribution, Breeding). Considered *RESIDENT* near Brisbane (Dawson *et al.* 1991); and at Dareton, sw. NSW (NSW Bird Rep. 1980), but elsewhere considered breeding migrant.

Departure Leave late summer to early autumn, mainly Mar.–Apr. **TAS.**: Leave Feb.–Apr. (Green 1977; Aust. Atlas 1, 2; Tas. Bird Rep. 2001). **SA**: Most leave Lower South-East Region Feb.–Mar. (Terrill & Rix 1950); and leave Mannum area Mar. (Cox 1973). Described as transient migrant in E, between Murray–Mallee and L. Frome, making only sporadic appearances (Mack 1970). **VIC.**: Leave late Feb. to early Apr. (Campbell 1905; Belcher 1914; Bryant 1941; Wheeler 1952; Thomas 1968a; Bedggood 1973; Hewish 1999; Vic. Bird Rep. 1985), though recorded leaving Bendigo as early as early Jan. one year (Anon. 1930). **ACT**: Leave Feb.–Apr., mainly Mar. (COG 1975, 1990, 1999a,b, 2000, 2001, 2002; Lenz 1980, 1982; Veerman *et al.* 1988; ACT Atlas), occasionally as late as May (Taylor *et al.* 1987). **NSW**: Leave Feb.–Apr., mainly Mar.–Apr. (Edwards 1921; Gilbert 1935; Hobbs 1961; Heron 1973; Morris 1975; Gibson 1977; Gosper 1981; Morris *et al.* 1981; NSW Bird Reps 1980, 1985, 1986, 1987). **QLD**: Recorded on n. passage in Feb.–Apr. (Storr 19). Said to leave SE in Apr. (Roberts 1979) but most leave Nanango after Feb. (Templeton 1992); and in NW, leave Mt Isa in Mar. (Horton 1975). Said to leave Rockhampton Nov. (Longmore 1978), which does not fit other patterns observed, and nature of movement uncertain. At Charters Towers, said to be regular without further details, though movements associated with drying of local wetlands (Britton & Britton 2000).

Non-breeding Broad-scale analysis indicates movement to NW and N from se. Aust., to n. NT and possibly n. WA (see below) and into n. Qld (where breeding not confirmed). **QLD**: Described as winter visitor to NE (Wieneke 2000); migrant to Atherton, Apr.–Sept., with single birds recorded as late as early Dec. (Bravery 1970); most common in Innisfail area Apr.–Sept., but recorded in all months (Gill 1970). Dry-season visitor to islands of s. and w. Torres Str. (Draffan *et al.* 1983). **WA AND NT**: See discussion below.

Small numbers winter throughout se. Aust., at least N to se. Qld (Russell 1921; Morse 1922; Terrill & Rix 1950; McEvey 1965; Taylor 1967; Bedggood 1970, 1972, 1973, 1980; Morris 1975; Fleming 1976; Gibson 1977; Whatmough 1978; Gosper 1981; Templeton 1992; Vic. Bird Reps 1983, 1984, 1986–87), but very rarely in Tas. (Tas. Bird Rep. 1997). Also described as rare non-breeding visitor to L. Frome district, SA, Apr.–July in years of good rainfall (McGillp 1923).

Return Arrive SE from late Aug. (see below); s. passage recorded Qld in late Aug.–Oct. (Storr 19). **QLD**: In NW, arrive Mt Isa in Sept. (Horton 1975). Arrived Pine I., Percy Is (E of Mackay), and stayed for 1 week from 24 Sept. 1960, probably on passage (Makin 1961). Arrive Rockhampton July–Sept. (Longmore 1978), possibly on passage (see Departure, above). Arrived Blenheim Stn, SE, in Nov. (Perkins 1973), but generally arrive SE in Sept. (Perkins 1973; Roberts 1979; Templeton 1992). **NSW**: Arrive most of e. half of State, and Central-west Plain Region and Riverina Region, Aug.–Sept., usually from late Aug. (Gilbert 1935; Bryant 1941; Hobbs 1961; Heron 1973; Morris 1975; Gibson 1977; Gosper 1981; Morris *et al.* 1981; NSW Bird Reps 1977, 1980, 1981, 1982, 1985, 1986, 1987, 1988, 1994, 1999). Arrive lower South Coast Region late Aug. to Oct. (Edwards 1921; Whiter 1991, 1993, 1994, 1996; Whiter & Andrew 1997, 1998). **ACT**: Return to Canberra area from late Aug., mostly Sept. (Wilson 1970; COG 1975, 1990, 1999a, 2000, 2001, 2002; Clark 1976; Lenz 1980, 1981, 1982; Taylor 1987;

Veerman *et al.* 1988; Veerman 2003; ACT Atlas). Breeding territories along Sullivans Ck, Canberra, usually occupied by Oct., but extra territories established in late Nov., in drought year of 1982 (Lenz 1989b). **VIC.**: In N, arrive in NE in Sept.–Nov. (Bedggood 1959); to Wangaratta mainly early Sept. (Vic. Bird Reps); and earliest record Rutherglen area, 29 Aug. (McEvey 1965); in NW, returned Mildura in Aug. (Vic. Bird Rep. 1985). Return to central and s. Vic. from late Aug. to Oct. (Campbell 1903; Belcher 1914; Sullivan 1929; Bryant 1941; Wheeler 1952; Thomas 1968b; Bedggood 1973; Hewish 1994, 1995, 1996, 2000, 2002a, 2002b; Vic. Bird Reps); arrive Bendigo early Sept. (Cohn 1926; Anon. 1930; Vic. Bird Rep. 1986–87); and Western District Oct. (Thomas 1968a,b; Vic. Bird Reps 1981, 1982). **SA**: Most arrive Lower South-East Region Aug.–Sept. (Terrill & Rix 1950); Mannum area from July (Cox 1973); Adelaide late Aug. to Oct. (Anon. 1937, 1938). **TAS.**: Return Sept. to early Oct. (Legge 1902; Green 1977; Aust. Atlas 1, 2; Tas. Bird Rep. 2001).

WA Resident in Gascoyne Div.; elsewhere, described as resident and part-migratory, vacating parts of South-West Div. in winter (Johnstone & Storr 2004). Described as resident at permanent waters in Swan R. district, visiting temporary swamps when they contain water (Alexander 1921; Serventy 1948; Stranger 1993; Wooller & Wooller 1997; Serventy & Whittell). **DEPARTURE**: Leave lower SW in Apr., though resident throughout year in Perth (Serventy & Whittell). Leave Avon R. Valley, near Northam, late Jan. (Masters & Milhinch 1974; Saunders & Ingram 1995). Leave Rockingham area by Feb. when reed beds dry out (Sedgwick 1940), possibly only locally to permanent wetlands of Swan R. district. Leave Manjimup area Mar.–Apr. (Brown & Brown 1986). **NON-BREEDING**: No information, other than claims of residence (above). **RETURN**: Arrive lower SW in Aug. (Serventy & Whittell). Near Manjimup, return in two waves, in Oct.–Nov., and then Dec.–Jan., with males said to precede females during both; sightings of banded birds suggest that early returns are older birds returning to a known area, while late returns mainly young birds seeking a territory for first time (Brown & Brown 1986). Arrive Rockingham, Sept. (Sedgwick 1940). Arrive near Northam, Sept.–Oct., but occasionally absent (Masters & Milhinch 1974; Saunders & Ingram 1995).

N. WA and n. NT Very poorly known. Considered resident in Kimberley Div. and Pilbara Div. (Storr 11). Not known if birds from s. Aust., either SW or SE, winter in Kimberley. **NT**: Possibly largely a non-breeding visitor from se. Aust., but few data. Considered scarce non-breeding migrant to lower McArthur R. area, Apr.–Oct. (Schodde 1976); and winter visitor to Top End, present Darwin June–Jan. (Crawford 1972; Storr 7). However, also described as scarce resident to Top End, and recorded breeding on Daly R. and elsewhere (Goodfellow 2001; Storr 7; see Distribution).

Banding Of 5788 banded in Aust., 1953 to June 2003, 774 recoveries (13.4%), of 418 birds: 725 (93.7%) <10 km from banding place; 48 (6.2%) 10–49 km; and one (0.1%) >100 km (ABBBS). Near Manjimup, s. WA, of 579 banded to 30 June 1985, 174 (30%) retrapped (probably at banding site) (Brown & Brown 1986). **LONG-DISTANCE RECOVERY**: Coleraine, Vic., to near Ingham, Qld: 2118 km, 14°, 54 months^D, Nov., +1 (ABBBS). **LONGEVITY**: Adult banded at Somers, Vic., 8 Oct. 1995, recaptured dead near banding place over 7 years after banding (ABBBS).

FOOD Arthropods, mainly insects and spiders; also molluscs and occasionally seeds. **Behaviour** Little information. Forage mainly in dense aquatic or riparian vegetation, making observations difficult (Anon. 1907; Littler 1910; Fleming 1976; Lenz 1989b; Gynther 1994; R. Johnson; see Habitat); forage in vegetation, on bare ground or mud within or next to reeds,

or up to 30 m above ground in trees (Littler 1910; Lenz 1989b; Gynther 1994; R. Johnson; see below). No detailed studies. **FORAGING ASSOCIATIONS:** Seen foraging singly (Lenz 1989b) and in twos (R. Johnson). No other information (but see Social Organization). **FORAGING SITES:** Mainly forage in dense aquatic or riparian vegetation, mainly rushes, reeds, sedges and grasses, less often in shrubs or trees (Anon. 1907; Littler 1910; Bryant 1941; Wheeler 1944; Fleming 1976; Lenz 1989b; Gynther 1994; R. Johnson), and sometimes on exposed mud near water's edge or among vegetation (Littler 1910; R. Johnson). One seen foraging by wading in a small, shallow wet area c. 2 m from reeds (O'Connor 1994). Sometimes forage farther from water (Wheeler 1944; Hall): in shrubs and lower parts of trees up to 30 m from reeds (Lenz 1989b); in Myall and Coobah *Acacia salicina* near rushes (R. Johnson); in trees adjacent to swamp (Wheeler 1944), e.g. in upper branches of Forest Red Gum, Swamp Oak, Narrow-leaved Ironbark, and clumps of mistletoe (Gynther 1994); and on putting green of golf course (R. Johnson). **FORAGING HEIGHTS:** Usually forage on or near ground, either on bare mud or in low dense vegetation, such as rushes, sedges, grass or shrubs (Littler 1910; Fleming 1976; Lenz 1989b; Gynther 1994; Vic. Atlas; R. Johnson); occasionally in taller shrubs and trees, such as eucalypts (Wheeler 1944; Gynther 1994). Near Goodna, se. Qld, during c. 4-h observations, birds seen to make 17 foraging forays into trees adjacent to swamp, foraging at heights of 7–30 m, in eucalypts, casuarinas, mistletoe and acacias, for periods of 1.5–10 min (Gynther 1994; see below). **FORAGING METHODS:** Glean arthropods from tree-trunks and branches, floating debris and reeds, often clinging sideways to stems of reeds (Gynther 1994; Green 1995). Also chase and sally after insects in flight, usually over water (Fleming 1976; Vic. Atlas). Near Goodna, on at least ten occasions made short foraging forays into air above Bulrushes: birds flew up to catch arthropods, then either glided back to rushes or flew farther on over swamp before dropping out of sight; birds also seen foraging in foliage of trees, moving through branches of Forest Red Gum, picking lerp off foliage and apparently gleaning arthropods, then returning immediately to rushes or continuing searching foliage for c. 10 min while holding prey in bill (Gynther 1994). At Mona Vale, e. NSW, seen hopping around, with tail cocked, lunging at insects disturbed by water spray on putting green of golf course (R. Johnson). Near Rockingham, sw. WA, one seen foraging 'like a wader' in shallow water, appearing to use feet to splash water or to stamp on mud, as though to disturb prey (O'Connor 1994).

No detailed studies. **Plants** DICOTYLEDONS: Asteraceae sds¹⁸; Vitaceae: *Vitis vinifera* fru.²². **Animals** MOLLUSCS^{1,7,18}. SPIDERS^{10,12,21}. INSECTS^{1,4,5,7,8,9,11,12,13,14,16,18,19,20,23}: Coleoptera^{2,8,10,16,17,18,21}; Chrysomelidae¹⁰; Cryptocephalus¹⁸; Ditropodius¹⁸; Paropsis²¹; Coccinellidae²¹; Curculionidae: weevils^{10,21}; Hydrophilidae: *Berosus australiae*²¹; Staphylinidae²¹; Elateridae²¹; Diptera: flies^{10,18,21}; Calliphoridae: blowfly larv.¹⁵; Hemiptera^{10,21}; Cicadidae²; Lygaeidae^{3,18}; Pentatomidae¹⁰; Hymenoptera: Formicidae: ants^{10,21}; Psyllidae lerp¹²; Lepidoptera¹⁸: moths^{6,21}; Odonata: damselflies^{10,14,21}; dragonflies^{14,21}; Orthoptera: grasshoppers^{21,23}; Acrididae^{10,21}. AMPHIBIANS: Frogs⁸.

REFERENCES: ¹ Littler 1910; ² Jarvis 1929; ³ McKeown 1936; ⁴ Wheeler 1944; ⁵ Sharland 1958; Courtney-Haines 6 1968, 7 1975, 8 1991; 9 Fleming 1976; 10 Vestjens 1977; 11 Lenz 1989b; 12 Gynther 1994; 13 Green 1995; 14 Wooller & Wooller 1997; 15 Welbergen *et al.* 2001; 16 Gould; 17 North; 18 Lea & Gray; 19 Hall; 20 Aust. Atlas 1; 21 FAB; 22 SA Bird Rep. 1967–68; 23 R. Johnson.

Young Nestlings and fledgelings fed by both parents (see Breeding), carrying food in bills (Milligan 1903), and very

agile, often hanging from reeds, when feeding young (Bryant 1941). Young fed dragonflies and leeches (Brown & Brown 1982, 1983) and, once, adult seen to dip grasshopper in water before taking it to young (R. Johnson); nestling once fed small green frog (Courtney-Haines 1991). For details of rates of feeding, see Breeding (Young).

SOCIAL ORGANIZATION Not well known, but some information from long-term observations at Middlesex Field Study Centre, near Manjimup, sw. WA (Brown & Brown 1982, 1983, 1986). Usually seen singly or in pairs (McGill 1970; Morris 1975; Gibson 1977; Lenz 1989b; Aust. Atlas 1). Seen in flocks of 5–20 on passage downstream along Tambo R., Gippsland, July–Aug. (Bedggood 1970). Occasionally congregate in large numbers in suitable habitat, such as extensive reed beds (Rix 1945; Hobbs 1961), though birds apparently dispersed and not in flocks. Difficult to determine accurately numbers in an area, e.g. mist-netting at a small swamp c. 0.42 ha, where visual and auditory observations suggested presence of 4–6 pairs, yielded 41 birds in 2 h (Lane 1968).

Bonds Mating system not clear. Near Manjimup, sometimes polygynous (Brown & Brown 1982; Lenz 1989b) with both successive polygamy and one instance of successive polyandry observed (though casual promiscuity cannot be ruled out on available evidence). Bonds not long-term, renewed in successive breeding seasons (males and females arrive separately [see Movements]) with all instances of colour-banded pairs showing different pair combinations from one season to another. Males also observed changing partners between broods during breeding season, and possibly breed with more than one partner concurrently. One female also described as breeding with two different males in same season, male from first pairing observed feeding his fledgelings at same time as female was seen nesting with second male (Brown & Brown 1982). Suggested, without substantiating evidence, that presence of eggs with different ground-colour in nest may constitute evidence of polygamous mating, with different females laying in same nest (Courtney-Haines 1975), though argued that this not indicative of polygamy (Beruldsen 1976). **Parental care** Both sexes feed nestlings and fledgelings; brooding by female only (see Breeding). In one family near Manjimup, four fledgelings still being fed by both parents 19 days after fledging, and whole family gone from area 4 days later (Brown & Brown 1983).

Breeding dispersion Described as nesting in groups (Bryant 1941). On rivers in Gippsland, often c. 12 nests in a stand of reeds 20–30 m long (Bedggood 1970), but this pattern probably reflects dispersion of suitable habitat rather than colonial breeding. In Canberra, 30+ breeding territories on one creek in university grounds (Lenz 1989b), but length of creek and dispersion not stated. **Territories, Home-ranges** Defend territories during breeding season (Lenz 1989b). Near Manjimup, both sexes defended immediate nest area, and flight-paths to and from nests avoided neighbouring defended areas; during nestling period, females foraged close to nest, while males ranged wider, entering adjacent paddocks and blackberries (Brown & Brown 1982). In Canberra, territories normally established along creek by early Oct.; in drought year, additional territories established in thickets of shrubs, 150–500 m from water, in late Nov., and were held for 18 days to 2 months. Birds move more widely, foraging beyond rushlands in which they nest, when feeding nestlings: in Canberra, territorial birds along creek foraged in shrubs and trees up to 30 m or more, from reeds in which they nested, but only during nestling period (Lenz 1989b); at Campbelltown, sw. Sydney, foraging restricted to stands of *Typha* till nestling stage, when adults foraged over wider area (Leishman 1994); and in se. Qld, birds forage away from reeds and carry food back to reeds (Gynther 1994; see Food). Near Manjimup, individuals return

to same dams each year, but not to same nesting sites (Brown & Brown 1986; see Social Behaviour).

Roosting Parents and fledgelings seen roosting together in willows *Salix* and other riparian vegetation (Bryant 1941). No other information.

SOCIAL BEHAVIOUR Not well known. Some information from long-term study, with colour-banded birds, at Middlesex Field Study Centre, near Manjimup, sw. WA, including descriptions of behaviour at nestling and fledgling stages (Brown & Brown 1982, 1983, 1986; also see Social Organization). Usually first detected by loud, ringing Song, given constantly from deep within reed beds during breeding season. Cryptic, and difficult to observe behaviour because habitat dense and difficult to access, and birds usually skulk deep within reeds (e.g. Legge 1902; Frith 1969; Cooper 1978; Brown & Brown 1986; Courtney-Haines 1991; Gynther 1994; Hall; see Habitat); if quietly approached, especially from water, birds can be confiding, but habitat still prevents prolonged observation of behaviour (K. Bartram; P.J. Higgins). Conspicuousness varies markedly with levels of singing through year: highly vocal during breeding season, rather quiet in non-breeding periods (though largely vacate se. Aust. during this time) (Ashby 1930; Bryant 1941; Fleming 1976; Courtney-Haines 1991; see Voice). Also sometimes forage away from dense vegetation, possibly more so during breeding after hatching (see Food), and said also sometimes to sing from or perch at tops of reeds or from trees (Cooper 1978; Goodfellow 2001; Hall). When singing, raise short, triangular crest and puff out feathers of throat, and body appears to vibrate (Bryant 1941; McGill 1970).

Agonistic behaviour Breeding territories defended by sustained singing during breeding season, through daylight hours and well into night (Bryant 1941; Fleming 1976; Lenz 1989b; see Voice). In Canberra, in drought year, apparent competition for nesting sites: after typical territorial establishment along creek by early Oct., additional territories established and birds nested in late Nov. in thickets of shrubs 150–500 m from water, which apparently suboptimal habitat (Lenz 1989b; see Social Organization). Near Manjimup, older experienced birds return to breed Oct.–Nov., and male Song and most aggressive encounters concentrated at certain areas within reed beds, where first nests of season built; second wave of arrivals in Dec.–Jan. apparently comprises younger birds and older displaced birds seeking a breeding territory, and these forced to settle in other areas which presumably suboptimal (Brown & Brown 1986). Also described as not apparently territorial, seldom making any attempt to chase away interlopers (Bryant 1941). Described as extremely aggressive towards 'intruders' when nest contains nestlings (Courtney-Haines 1991), but not clear whether 'intruders' are conspecifics or potential predators. **Alarm** Call in alarm (see Voice) when observer, cat or potential predator nearby (Dove 1908a; Carter 1924; Hall). Raise short crest when alarmed (Courtney-Haines 1991). Nesting birds said to utter warning calls when approached while foraging (Lenz 1989b). **Interspecific interactions** Once, two birds drawn to edge of reed bed by calling of mixed-species association of Brown *Acanthiza pusilla* and Yellow-rumped *A. chrysomha* Thornbills, Silvereyes *Zosterops lateralis* and Little Grassbirds (Sedgwick 1949). One seen to attack a Superb Fairy-wren *Malurus cyaneus* singing in a clump of reeds (Sutton 1931).

Sexual behaviour While female incubates, male usually perches nearby and sings (Bryant 1941). No other information.

Relations within family group When feeding nestlings, adults seen hanging from stems above nest and stretching out to drop food into mouths of nestlings (Bryant 1941). Suggested that parents may wet plumage to cool nestlings on hot days but confirmation needed: at one nest, parent seen to

have damp breast-feathers, top of nest was saturated with water and nestlings were covered in large drops of water. At same nest, adult also seen dipping grasshopper into water before taking it to young (Chisholm 1971). Near Manjimup, one brood of four increasingly active from Day 9 after hatching, one pushing up to stand on top of its siblings, preen and stretch wings before resuming position, and similar activity, mainly from two nestlings, continued on Day 10, with much leg-stretching while standing on edge of nest at intervals throughout day, and a few hops from nest. Sorties increased in frequency and extent on Day 11, till two nestlings left nest permanently and perched on old nest of Eurasian Coot *Fulica atra*, uttering persistent Begging Calls; these two were fed by male, while female fed remaining nestlings. Third nestling fledged on Day 12, encouraged from nest by non-feeding visits and Cheezing Calls of female. Division of feeding duties continued on Day 12, male feeding first two fledgelings and female feeding third and remaining nestling, though feeding visits to nest apparently stopped after third nestling fledged; last nestling fledged next day (Brown & Brown 1983). **Parental anti-predator strategies** Described as extremely aggressive towards 'intruders' when nest contains nestlings (Courtney-Haines 1991).

VOICE Not well known and no detailed studies. Often described as one of the best or most melodious singers in Aust. (e.g. Berney 1905; Bryant 1941; North), and often compared to Common Nightingale *Luscinia megarhynchos* (e.g. Dove 1908b; Whitlock 1939); Song also said to be canary-like (Campbell; Mathews). More often heard than seen, and vocalizations, especially rich, varied Song, often only indication of presence. Often sing from within cover of dense vegetation (Legge 1902; White 1913; Alexander 1921; Hall 1924; Whitlock 1924; McGill 1970; Lenz 1989b; Gynther 1994; Campbell; Mathews; Serventy & Whittell). **ANNUAL PATTERN:** Song uttered over long periods during breeding season (McGill 1970; Morcombe 2000; see below); usually rather quiet in non-breeding season (see below) but also probably vacate some areas in winter (see Movements). Timing of singing appears to vary slightly across range, mainly spring–summer in S, though also other months inland. **NSW–ACT:** At Leeton, sing July–Aug., once in June (NSW Bird Reps 1986, 1988, 1989, 1990, 1991). In Canberra, Song first heard in late Sept. or early Oct., continues till Dec. (Lenz 1989a,b). At Talbragar R., heard in summer (Austin 1907). **VIC.:** In s. and central Vic., usually sing Aug.–Jan., but sometimes short bursts of Song heard Feb. (Anon. 1930; Bryant 1941; Wheeler 1952; Watson 1955; Fleming 1976; Campbell; Vic. Bird Rep. 1985). In some locations in S, still present but silent late Feb. to July (Russell 1921; Fleming 1976). At Seaford, one once heard singing in July (Vic. Bird Rep. 1984). At locations in N, Song sometimes heard Apr.–May (Wheeler 1952), and occasional birds heard calling on sunny days in winter (Bedgood 1973). **TAS.:** First heard singing Sept.–Oct. (Legge 1902; Dove 1908a; Tas. Bird Reps 8, 22), and vocalizations (not stated if Song) heard till late Jan. (Tas. Bird Reps 3, 9, 18, 19, 20). **SA:** In SE, heard singing Aug. to early Jan. (Sutton 1923, 1927, 1938a,b; Morgan 1925, 1927, 1932, 1933; Ashby 1930; Chenery 1933; Symon 1939) with Song heard almost continuously from mid-Dec. to early Jan. (Ashby 1930) and vocalizations (not stated if Song) heard till Feb. (Ashby 1930; Jarman 1935). On Murray R., present but not singing Apr. (Morgan 1917). In Adelaide, rarely call in autumn–winter (Paton & Pedler 1999). At L. Frome, once heard in July (Cleland 1942). On Finke R., heard singing in Oct. (Whitlock 1924). **WA:** Round Perth, song heard all months (Serventy & Marshall 1957; Curry 1981) but highest density of singing birds recorded Aug.–Sept. (Curry 1981), and quieter over winter than at other times of year (Wooller

& Wooller 1997). Once, at Karratha, in central-W, one sang short Subsong in May; in n. WA, silent in May at Derby, and at L. Gladstone, in full Song in July (Hall). **DIURNAL PATTERN:** Song often heard almost continuously throughout day, and often also sing quite late into night (Legge 1902; Berney 1905, 1938; Dove 1908b; White 1913; Carter 1924; Ashby 1930; Bryant 1941; Boehm 1950; Bell 1961; Lane 1966; Gould; Campbell; North). Said to sing most at night on warm evenings after hot day, or on moonlit nights (Dove 1908b; McGill 1970; North) but sometimes utter a few bouts of Song on dark or starlit nights (Mathews). Sitting bird sometimes calls from nest (Bryant 1941). Said to keep silent when sky overcast (Carter 1924; Mathews). Song said to sound seemingly better in crisp, dry air (Berney 1905). Song output also affected by food availability (Berg *et al.* 2005). **SIMILAR SPECIES:** Song higher in pitch and not as guttural as that of Oriental Reed-Warbler. Will respond to playback of recordings of Oriental Reed-Warbler (McKean 1983; see also Field Identification). Phrases of Song similar to Song of Brown Honeyeater *Lichmera indistincta*, but more powerful (Serventy & Whittell) and individual Songs more prolonged (P.J. Higgins).

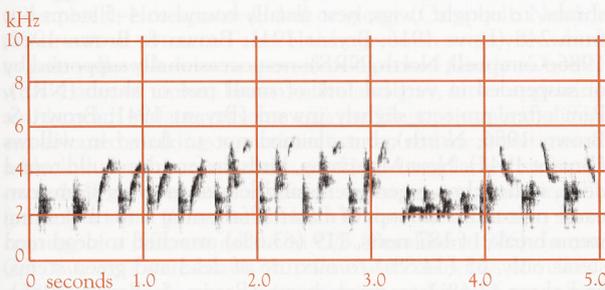
Adult SONG: Clear, loud, persistent and melodious, variously described as exceptionally sweet, beautiful, rich, splendid, musical and cheerful (D'Ombra 1906; Alexander 1921; Ashby 1930; Berney 1938; Whitlock 1939; Wheeler 1952; McGill 1970; Gould; Campbell; North). Can be clearly heard from at least 100 m (Hartshorne 1953). Song consists of varied sequences of several repeated phrases, variously rendered as *twitchee-twitchee-twitchee quarty-quarty-quarty* (McGill 1970; Courtney-Haines 1975; North; Serventy & Whittell; Aust. RD); *chutch chutch chutch dzee-dzee-dzee quarty-quarty-quarty* (Pizzey 1980); *cheewip-cheewip quitt-quitt-quitt kwitchee-kwitchee kwarty-kwarty-warty* (Morcombe 2000); and *choo-choo wheea-wheea-whee* (D'Ombra 1906); see Sonagram A. Phrases described as rich, variable and liquid, some metallic and guttural, others sweet (Dove 1908b; Pizzey 1980; Morcombe 2000; North; Mathews). Song also described as more chirpy than musical, with superior tonal quality, adequate phonetic contrast, excellent coherence and considerable variety (Hartshorne 1953). Song used in territorial defence (see Social Behaviour). **ALARM CALL:** Utter abrupt *t!* (Pizzey 1980); sharp *chat-chat* (Carter 1924; Mathews); abrupt *tchuck*

(Morcombe 2000); short grating alarm notes (Hall); harsh, somewhat guttural call-note, not unlike that of Crescent Honeyeater *Phylidonyris pyrrhoptera* (Dove 1908a; Mathews), all probably describe Alarm Calls. Other possible alarm, warning or threat calls include: *kretch kretch* (Morcombe 2000), scolding *squarrk* (Morcombe 2000), or dry, scolding rattle (Pizzey 1980). Harsh calls in Sonagram B probably Alarm Calls. **Other calls** Most common call said to be loud, sharp *chut* (Aust. RD); frequently uttered harsh *chack* calls (Gynther 1994) probably same call, and both possibly another rendering of an Alarm Call (see above). When encouraging nestlings to fledge, female gave a *cheezing* call (Brown & Brown 1983). Foraging individuals uttered single soft notes (Gynther 1994). Other calls include notes rendered as *priit-priit-priit* (Courtney-Haines 1975) and, in WA, notes resembling gurgling sound of Spiny-cheeked Honeyeater *Acanthagenys rufogularis* (North).

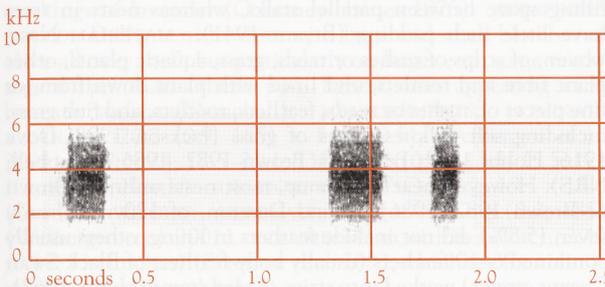
Young BEGGING CALLS: Those of nestlings described as animated *peeps*; of fledgelings, insistent *cheezing* and *churring* (Brown & Brown 1983). Young can be located by sound of Begging Calls (Lenz 1989a). **ALARM CALL:** One fledgeling gave 'frightened squeak' when it slipped from perch (Brown & Brown 1983).

BREEDING Fairly well known. Detailed studies over many seasons at Middlesex Field Study Centre, near Manjimup, sw. WA (Brown & Brown 1982, 1983, 1986); of 120 nests over one season round Dareton, sw. NSW (Hobbs 1962); and of 36 breeding territories over one season (1978–79) in ACT (Lenz 1989a); study of sex of offspring and parental feeding investment at two sites near Melbourne, Aug. 1997–Jan. 1998 (Berg 1998); study of egg-discrimination by parents at two sites near Melbourne, Sept. 1997–Jan. 1998 (Welbergen *et al.* 2001), results of which are mostly excluded here (see source for data on effects of experimental nest parasitism); and study of effect of supplementary feeding on incubation and hatching asynchrony over two seasons near Melbourne (Eikenaar *et al.* 2003), for which we present only data from control nests (see source for data from experimental nests with supplementary food); and a total of 1052 records in NRS to Dec. 2003 (including 746 submitted by R. & M. Brown from sw. WA). Mating system not properly known, but sometimes polygynous (Brown & Brown 1982; see Social Organization).

Season Throughout range, eggs recorded early Sept. to mid-Feb.; of 900 clutches in NRS: 11 (10.4%) in Sept., 94 (1.2%) in Oct., 234 (26.0%) in Nov., 326 (36.2%) in Dec., 218 (24.2%) in Jan., and 17 (1.9%) in Feb. **N. Aust.** Very poorly known. **N. WA:** Unspecified breeding recorded Aug.–Oct., Dec.–Jan. and Apr. (Gould; Aust. Atlas 1, 2; see below). In Pilbara Region, breed Oct. and possibly Nov. (Storr 16). In Kimberley Div., breed autumn, but no details (Slater 1959); and one nest with eggs, early Sept. (Coate *et al.* 2001). **NT:** From Daly R., one clutch, early Feb. (North); said to breed in Jan. (Storr 7) or wet season (Goodfellow 2001). Unspecified breeding recorded once in Nov. and once in Jan. (Aust. Atlas 2). **N. QLD:** No confirmed breeding N of 20°S (see Distribution). Round Richmond (20°44'S), eggs and young, Nov.–Dec. (Berney 1905); breed Charters Towers (20°05'S) but timing not stated (Britton & Britton 2000). Unspecified breeding recorded Rockhampton, Jan. (23°23'S) (Aust. Atlas 2). **S. Aust.** Eggs, early Sept. to mid-Feb.; nestlings, late Sept. to early Mar. **s. QLD:** Eggs, late Sept. to mid-Feb. (NRS; n=38 clutches): two (5.3%) in Sept., 12 (31.6%) in Oct., eight (21.1%) in Nov., three (7.9%) in Dec., 11 (28.9%) in Jan., and two (5.3%) in Feb. Nestlings, early Oct. to early Feb. (NRS [n=36]). Fledgelings, late Oct. to early Feb. (NRS [n=19]). Unspecified breeding recorded Aug.–Feb. (Leach & Hines 1987; Bielewicz & Bielewicz 1996; Aust. Atlas 1, 2). **NSW–ACT:** Eggs, mid-Sept. to early Feb.



A F.W. van Gessel; Kununurra, WA, Dec. 1983; P73



B F.W. van Gessel; Fogg Dam, NT, July 1984; P73

(Courtney-Haines 1975; Hobbs 1980; Morris *et al.* 1981; North; NRS); of 91 clutches in NRS: four (4.4%) in Sept., nine (9.9%) in Oct., 27 (29.7%) in Nov., 32 (35.2%) in Dec., 18 (19.8%) in Jan., and one (1.1%) in Feb. Nestlings, late Sept. to early Feb. (Hobbs 1980; North; NRS [$n=67$]). Fledgelings, mid-Oct. to early Mar. (Lenz 1989a; NRS [$n=26$]). One observation of adults feeding young in early Apr., but not stated if nestlings or fledgelings (NSW Bird Rep. 1984). In ACT, of ten territories in which two successive clutches were laid, young (mostly fledgelings) from first clutches were recorded early Nov. to late Dec., and from second clutches, early Jan. to late Feb. (Lenz 1989a). Unspecified breeding recorded Sept.–Apr. (Hobbs 1961, 1980; Gosper 1981; Aust. Atlas 1, 2). VIC.: Eggs, mid-Sept. to early Feb. (Bryant 1941; Wheeler 1948; NRS); of 49 clutches in NRS: one (2.0%) in Sept., 11 (22.4%) in Oct., 13 (26.5%) in Nov., 17 (34.7%) in Dec., and seven (14.3%) in Jan. Nestlings, early Oct. to early Mar. (Bryant 1941; NRS [$n=47$]). Fledgelings, late Sept. to mid-Jan. (NRS [$n=14$]). Unspecified breeding, Sept.–late Feb. (Bryant 1941; Bedgood 1973; Aust. Atlas 1, 2; Vic. Atlas) with two records in Mar. and single record in July (Vic. Atlas; Aust. Atlas 2). TAS.: Few records (and none in NRS). One report of unspecified breeding in Dec. (Tas. Bird Rep. 8); and Littler (1910) stated breeding, Sept.–Jan., but not known if this is for Tas. birds or a general statement. SA: Eggs, Oct.–Jan. (Sutton 1931; Brummitt 1934; Attiwill 1972; NRS [$n=6$]). Nestlings, Oct.–Nov. and Jan. (NRS [$n=9$]); also two nests with nestlings recorded between 29 Nov. and 7 Dec. (Sutton 1931). Unspecified breeding recorded Sept.–Mar. (Laffer 1914; Brummitt 1935; Whatmough 1978; Paton & Pedler 1999; Read *et al.* 2000; Aust. Atlas 1, 2; SA Bird Rep. 1982–99). s. WA: Eggs, early Sept. to early Feb. (Orton & Sandland 1913; Brown & Brown 1983; NRS); of 716 clutches in NRS: four (0.6%) in Sept., 62 (8.7%) in Oct., 183 (25.6%) in Nov., 273 (38.1%) in Dec., 180 (25.1%) in Jan., and 14 (2.0%) in Feb. Nestlings, late Sept. to mid-Feb. (Orton & Sandland 1913; Brown & Brown 1983; NRS); of 557 records in NRS, most (72%) early Dec. to late Jan. Fledgelings, late Oct. to late Feb. (Brown & Brown 1983; NRS); of 314 records in NRS, most (74%) early Dec. to late Jan. Unspecified breeding, Sept.–Feb., mostly Oct.–Jan. (Robinson 1955; Masters & Milhinch 1974; Davies 1979; Halse & Jaensch 1989; Aust. Atlas 1, 2; Storr 28, 35). Near Manjimup, breeding occurs in two waves as birds arrive: first wave in Oct.–Nov., second in Dec.–Jan., latter coinciding with second broods of first-wave nesters (Brown & Brown 1986).

Site Typically in dense, low, aquatic or riparian vegetation, in and round nearly any type of fresh, brackish or saline wetlands (see Habitat). Usually among rushes and reeds, including *Phragmites*, *Baumea* and *Scirpus*, less often sedges or grasses, such as *Lepidosperma*, and *Cyperus*, sword-grass *Gahnia* and canegrass *Eragrostis*; also sometimes in other riparian or aquatic vegetation, such as shrubs, herbs or trees; and very occasionally away from water. Often nest in cumbungi *Typha* (often Narrow-leaf Cumbungi *T. domingensis*); also in clumps of bamboo *Bambusa* or pampas grass *Cortaderia*; and in shrubs and herbs, including Lignum, *Polygonum* and dock *Rumex* (all Polygonaceae), paperbarks, tea-tree, Nitre Bush *Nitraria schoberi*, and Spearbush *Pandorea doratoxylon*; also in introduced species such as Patterson's Curse *Echium lycopsis*, Ball Mustard *Neslia paniculata*, African Hemp *Sparmannia africana*, and Purple-top Verbena *Verbena bonariensis*; occasionally low in trees, mainly willows *Salix*, but also in elm and mulberry. Typically over water but occasionally some distance from water, e.g. in two successive years, nest built in clump of pampas grass in school grounds c. 750 m from lake with large population of Reed-Warblers (Dove 1908b, 1916; Jackson 1908; Stone 1912; Orton & Sandland 1913; Sandland & Orton 1922; Bryant 1934; Hood 1935; Rix 1943; Chisholm

1951; Courtney-Haines 1975; Rich 1975; Hobbs 1980; Lenz 1989b; Stranger 1999; Coate *et al.* 2001; Campbell; North; NRS; see below; also see Habitat). Of sample of 200 nests from throughout range in NRS (includes 100 nests from e. Aust. and 100 from sw. WA, with latter including 97 records from R.J. & M.N. Brown): 158 (79.0%) in cumbungi; 14 (7.0%) in *Phragmites*; 12 (6.0%) in willows; two (1.0%) in each of Ball Mustard, canegrass, dock, *Juncus*, Nitre Bush and *Polygonum*; and singles (0.5%) in *Baumea*, *Cyperus*, lignum, Purple-top Verbena and sword-grass. In sample from e. Aust.: 60 (60.0%) in cumbungi; 14 (14.0%) in *Phragmites*; 12 in willows; two (2.0%) in each of Ball Mustard, canegrass, dock, *Juncus*, Nitre Bush and *Polygonum*; and singles (1.0%) in *Cyperus*, lignum and Purple-top Verbena. In sample from sw. WA: 98 (98.0%) in cumbungi, and singles (1.0%) in *Baumea* and sword-grass (NRS). Near Manjimup, prefer reeds free from other aquatic vegetation and debris, and growing in open water of depth 0.3–1.8 m (mostly 0.6–1.2 m); in one clump of reeds at edge of dam, most nests were in denser growth at either end, rather than more open growth in centre (Brown & Brown 1982, 1986). In Canberra, in drought year, after typical territorial establishment along creek, late arrivals nested in late Nov. 150–500 m from water in apparently suboptimal habitat in thickets of shrubs including tea-trees, grevilleas, *Cotoneaster* or mixed stands of native and exotic shrubs, such as conifers and *Wisteria* (Lenz 1989b; see also Social Organization and Behaviour). Suggested that some pairs nest in willows *Salix* in absence of reeds (Campbell); and at Heidelberg, Vic., pairs increasingly nested in trees rather than reeds, possibly a response to boys taking eggs from nests in reeds (Bryant 1941). In sw. WA, said to abandon nests when wetlands dry out (Lenz 1989b). Near Manjimup, nest-sites used for single season only, but new nest sometimes built on top of, or very close to, old nest. General nesting areas may be used for several years; of 124 birds that returned to same dams to breed: 81 (65.3%) returned once, 34 (27.4%) twice, seven (5.6%) three times and two (1.6%) four times (Brown & Brown 1986). MEASUREMENTS (m): HEIGHT OF NEST ABOVE WATER: All sites, 0.8 (0.30; 0.1–2.5; 1025); in willows, 1.13 (0.34; 0.36–1.5; 12) (NRS). HEIGHT OF NEST-PLANT: All sites, 2.02 (0.45; 0.7–4.0; 593) (NRS).

Nest, Materials Nest deep and cup-shaped, suspended by rim to crisscrossing or touching stems of rushes or reeds, or, in shrubs, to upright twigs; nest usually bound to 4–5 stems but from 2–8 (Dove 1916; Bryant 1941; Brown & Brown 1982, 1986; Campbell; North; NRS); nest occasionally supported by or suspended in vertical fork of small tree or shrub (NRS). Rim often projects slightly inward (Bryant 1941; Brown & Brown 1986; North), but claimed not to do so in willows (Bryant 1941). Near Manjimup, birds preferred to build round dead, rather than green, stems and leaves; growing stems can cause nest to tilt as loops of material fastening it to thickening stems break; of 187 nests, 119 (63.6%) attached to dead reed stems only, 65 (34.8%) to mixture of dead and green stems, and three (1.6%) to green stems (Brown & Brown 1986). Nests in reeds often have material extending down from nest, filling space between parallel stalks, whereas nests in trees have little such padding (Bryant 1941). MATERIAL: Nests woven, of strips of rushes or reeds, grass, aquatic plants, other plant fibre and rootlets; and lined with plant down from, or fine pieces of, rushes or reeds, feathers, rootlets, and fine grass, including soft inflorescences of grass (Jackson 1908; Dove 1916; Hobbs 1962; Brown & Brown 1982, 1986; Campbell; NRS). However, near Manjimup, most nests unlined (Brown & Brown 1982, 1986). Round Dareton, of 120 nests, only seven (5.8%) did not include feathers in lining; others usually contained 6–10 feathers (usually body-feathers of Black Swan *Cygnus atratus*) worked into strips of reed stems (Hobbs 1962). One nest included several pieces of soft string (North); and

nesters near a rail shed included cotton waste, with one almost entirely this (Dove 1916). One nest made of small reed stems, pond slime and mud, and nest had dried to a cardboard-like firmness (Chisholm 1951). **CONSTRUCTION:** Material collected from nearby, and nest often made of surrounding vegetation, e.g. nests in rushes made mostly of material from rushes, and nests in canegrass mostly of canegrass stems (Jackson 1908; NRS); seen to collect water-weed from logs and stones near nest (Jackson 1908) and, round Dareton, to collect and carry billfuls of floating water-weed to nest (Hobbs 1962). Near Manjimup, usually collected wet strips of *Typha* leaves, but if strips dry when gathered, birds took them to water before building with them; wet strips woven round reed stems and leaves, and wet inflorescence material also incorporated, giving nest untidy appearance; nest remains wet during building. Some nests had a few black feathers woven into sides or rim, but most were unlined. When dry, nest free to move on supporting stems and leaves. Some late nesters use pond weed *Potamogeton* for nests, but this shrinks rapidly and such nests often failed (Brown & Brown 1982, 1986). Round Dareton, base of nest usually composed of reed fluff, sometimes with damp weed mixed in; when available, damp weed also worked into external walls, often by twisting it round material that attaches nest to reed stem supports; water-weed hardened and contracted as it dried, binding it and consolidating other material. Nests containing weed were firm in construction, with cardboard-like consistency (Hobbs 1962). Also said to wind water-weed round nest, giving a smooth, moulded appearance (Jackson 1908). Nests become flattened during nestling stage and can end up little more than a platform (Brown & Brown 1986). Both sexes build, but female does more (Brown & Brown 1982, 1983, 1986). Build new nests for replacement or second clutches, sometimes on top of, or very close to, old nests (Brown & Brown 1982, 1986; NRS). One female built new nest within 4 days of loss of a brood (Brown & Brown 1982). **MEASUREMENTS (cm):** For unknown number or unspecified nests: external diameter (at rim) 7.6–8.9, external depth 8.3–10.2, internal diameter (at rim) 4.3–4.4, internal depth 5.1, (Campbell); corresponding measurements from North: 6.4, 10.2, 4.4, 5.1; and from Brown & Brown (1986): 4.0–5.0, –, –, 5.0–8.0. One nest had external depth 22.9 (Bryant 1941); nest in bamboo was 14 deep (North).

Eggs Oval to compressed oval (North) or swollen oval (Campbell); close-grained; dull or glossy (Campbell; North). **NOMINATE AUSTRALIS:** Faint bluish, greenish or greyish white to pale yellowish-brown, spotted or blotched faintly to boldly with shades of umber, brown, olive and grey, latter appearing as if beneath surface; on some eggs markings penumbral; different coloured markings sometimes overlap and are sometimes of a blackish-brown or inky hue; markings irregularly distributed over shell or sometimes confined to larger end, occasionally forming a zone (Campbell; North). Not uncommon to have one egg of a different colour in C/3 (Beruldsen 1976); in one C/3, two eggs were brownish yellow with markings of yellow-ochre, brown and umber, and underlying markings of grey; third was greyish white with similar surface markings but underlying markings of lavender (Courtney-Haines 1975). **SUBSPECIES GOULDI:** Dull greenish-white with large and small blotches of olive all over shell, but particularly on larger end; some markings darker than others, with lighter ones appearing as if beneath surface (Campbell). **MEASUREMENTS:** **NOMINATE AUSTRALIS:** 20.2 (0.9; 185) × 14.6 (0.5) (Welbergen *et al.* 2001); 19.7 (1.24; 17.5–21.1; 13) × 14.3 (0.69; 13.5–15.5; 12) (Campbell; North). **SUBSPECIES GOULDI:** One egg, 19.1 × 16.0 (Gould). **WEIGHT:** **NOMINATE AUSTRALIS:** 2.2 g (0.2; 185) (Welbergen *et al.* 2001). **VOLUME:** Mean within a clutch, 2.40 (0.17; 51 clutches) (Eikenaar *et al.* 2003, which see for volume asymmetry within clutches).

Clutch-size Usually three, sometimes two or four, rarely

one, slightly larger in sw. WA (Sandland & Orton 1922; Masters & Milhinch 1974; Campbell; North; NRS; see below). Throughout range, 3.10 (0.50; 529): C/1 × 2, C/2 × 37, C/3 × 395, C/4 × 95 (NRS); 2.6 (0.7; 213) (Eikenaar *et al.* 2003); 2.8 (0.4; 95) (Welbergen *et al.* 2001). **SE. AUST.** (nominate; QLD, NSW, VIC., SA): 2.89 (0.50; 55): C/1 × 1, C/2 × 7, C/3 × 44, C/4 × 3 (NRS); near Melbourne, 2.86 (0.35; 51) (Eikenaar *et al.* 2003). **s. WA (gouldi):** 3.13 (0.51; 474): C/1 × 1, C/2 × 30, C/3 × 351, C/4 × 92 (NRS); not necessarily complete clutches, 3.27 (0.58; 60): C/2 × 4, C/3 × 36, C/4 × 20 (Storr 28, 35).

Laying Eggs usually laid on consecutive days; third egg of one clutch laid >30 h after second (NRS). Eggs laid 2–4 days after completion of nest (NRS). Can be double-brooded (Brown & Brown 1982; Lenz 1989a; NRS); once, laying of second clutch, in new nest, began c. 14 days after young of first brood fledged; and another second clutch, in new nest, began c. 8 days after first young fledged (NRS). Near Melbourne, pairs made up to three nesting attempts in a season, though usually only one fledged successfully (Berg 1998). Will re-lay after failure; one new clutch laid within 13 days of loss of first clutch (NRS). One female laid three clutches in a season: first successful; second failed shortly after hatching; and third, with a different male, successful (Brown & Brown 1982).

Incubation Said to begin after (Welbergen *et al.* 2001) or before (NRS) completion of clutch, usually resulting in asynchronous hatching, with last egg hatching 1 day after others (NRS). Of 14 clutches near Manjimup, all eggs of clutch hatched on same day in four (Brown & Brown 1982); once, last of C/4 hatched 2 days after other three (Brown & Brown 1983). Near Melbourne, of 11 clutches for which data available, all eggs hatched within 1 day (Eikenaar *et al.* 2003, which see for asynchrony estimates based on nestling measurements). By female only (Welbergen *et al.* 2001). Rarely, male feeds female on nest; near Melbourne, incubating females fed twice in c. 30-h observation. Near Melbourne, mean duration of daytime incubation bouts 3.98 min (1.30; 12) with recesses of 3.85 min (1.18; 12) and 8.15 recesses/h (1.94; 12). Females spent c. 51% of day incubating (n=10). Mean start of nocturnal incubation was 18:35 (± 38 min); and end 05:37 (± 22 min) with mean duration 9.24 h (0.83; 12). Daytime incubation attendance was positively correlated with availability of food (Eikenaar *et al.* 2003). Incubation attendance was negatively affected by humidity (Eikenaar *et al.* 2003). **INCUBATION PERIOD:** From completion of clutch, 12.7 days (0.96; 65): 11 days × 4, 12 days × 22, 13 days × 32, 14 days × 4, 15 days × 1, 16 days × 2 (NRS). From laying of first egg, 15–16 days (Brown & Brown 1982).

Young Altricial, nidicolous. Blind and naked at hatching (Dove 1916; NRS). **Growth** Near Melbourne, male nestlings tended to grow faster than females, and were significantly heavier just before fledging (8 days old). **WEIGHT (g):** Near Melbourne, mean weight of male and female nestlings respectively (estimated from graph; N not given): at 1 day old, c. 2.2 and c. 2.5; 2 days old, c. 4.2, c. 4.0; 3 days old, c. 5.0, c. 5.1; 4 days old, c. 7.6, c. 6.4; 5 days old, c. 9.3, c. 10.4; 6 days old, c. 12.2, c. 10.7; 7 days old, c. 15.6, c. 13.2; 8 days old, 15.0±5.4, 14.0±1.4; 9 days old, c. 16.9, c. 14.6; 10 days old, –, c. 15.6; 11 days old, c. 15.1, c. 14.7 (Berg 1998). In WA, weight of nestlings at 8 days old, 18.0 (15.0–20.5; 38) (Brown & Brown 1986). **Parental care, Role of sexes** Both sexes feed young; female stays in reeds within breeding territory while male forages farther afield (Bryant 1941; Brown & Brown 1982; Lenz 1989b); food for nestlings collected up to 240 m from nest (Berg 1998). At two sites near Melbourne (Berg 1998), mean rate of feeding by males 5.1 feeds/h (3.2; 0–10.6; 117), varying with amount of time spent guarding nest; mean rate by females 6.0 feeds/h (5.5; 0–27.6; 138), varying with time spent brooding; and 27.6 feeds/h recorded from a nest at which only

female fed nestlings. No significant difference in parental feeding rate between broods of different size. In broods of mixed sex, male parent fed male nestlings significantly more than female nestlings; most female parents showed no bias towards either sex. At seven nests: of 81 feeds by adult males to nestlings of known sex, 54 (66.7%) to male and 27 (33.3%) to female nestlings; of 65 feeds by adult females to nestlings of known sex, 37 (56.9%) to male and 28 (43.1%) to female nestlings. Adult males fed all male nestlings in a brood more than all female nestlings in a brood in all but one nest; females biased their feeding towards male nestlings in one nest, and towards female nestlings in two nests. Feeding frequency of male parents to each male and to each female offspring was significantly different; there was no such difference in feeding rates of female parents. Preferential feeding of male nestlings by paternal males was not a result of different food demands of male nestlings, or to differences in nestling body-mass; male nestlings were fed more often even when smaller than female siblings (Berg 1998). At one nest containing three nestlings 10 days old and one nestling 8 days old, parents averaged 18.5 feeding visits/h between them in morning; after two young fledged, female fed remaining nestlings and male fed fledgelings (Brown & Brown 1983). Only female broods, including overnight (Brown & Brown 1986; Berg 1998). Both sexes remove faecal sacs (Brown & Brown 1982).

Fledging to independence FLEDGING PERIOD: 11.5 days (0.97; 10): 11 days × 7, 12 days × 2, 14 days × 1 (NRS); 10 days (n=3) (Hobbs 1971). Young sometimes return to nest after fledging, often, but not always, to escape predators (Brown & Brown 1983, 1986; Eikenaar *et al.* 2003), which makes accurate determination of period difficult (Eikenaar *et al.* 2003). Young can leave nest from 9 days old (Brown & Brown 1986). At one nest, two young left and returned to nest 10 days after hatching, before leaving permanently in afternoon of following day, at 11 days old; a third nestling fledged at 12 days and did not return; the fourth nestling fledged but returned to nest at 10 days, then left permanently the following morning; the entire brood fledged over period <48 h (Brown & Brown 1983). Young unable to fly at fledging; clamber out of nest, climbing and clinging to reeds, and are sometimes led away from reeds into nearby trees or other cover (Bryant 1941; Hobbs 1971; Brown & Brown 1983). **Parental care** Fledgelings fed by both parents after leaving nest (Brown & Brown 1982; Lenz 1989b; NRS). At one nest, when two of four nestlings fledged, female fed remaining nestlings while male fed fledgelings, which perched 2 m away on old nest of Eurasian Coots; after remaining nestlings fledged, both parents fed fledgelings, and were still feeding them 17 days after first two left nest (Brown & Brown 1983; see also Social Behaviour).

Success Where clutch-size, hatching and fledging success known: from 1078 eggs in 359 nests, 681 (63.2%) hatched, and 502 (46.6%) young fledged, equal to 1.39 young fledged/nest; 73.7% of eggs that hatched produced fledgelings. For 500 nests where clutch-size and hatching success (but not always outcome) known: from 1519 eggs, 1093 (72.0%) hatched. Of 622 nests of known outcome, 270 (43.4%) were successful, and 352 failed (NRS). Near Melbourne, mean hatching success was 86% (0.20; n=41 clutches) at nests free from predation (Eikenaar *et al.* 2003). **CAUSES OF FAILURE:** Nestlings taken by snakes and rats (Berg 1998); rats may also take eggs, with rat faeces and eggshell fragments found round one nest that failed during incubation (NRS). Eggs formerly taken and nests destroyed by boys (Bryant 1941; NRS; see also Site). Will abandon nests and nesting area if reed-beds dry out (Lenz 1989b). Near Manjimup, mean annual frequency of desertion of clutches 6.2% (Brown *et al.* 1990). Round Dareton, exceptionally heavy rain coinciding with irrigation flooding caused rapid rises in water-level and destruction of many, possibly all, 120 nests under observation (Hobbs 1962).

At L. Gol Gol, sw. NSW, Southern Bell Frogs *Litoria raniformis* took refuge in reeds, and in Reed-Warbler nests, after water-levels in lake and channels fell, in some nests preventing incubation of eggs or feeding and brooding of nestlings (Hobbs 1980). Nestling starvation was not observed at two sites near Melbourne (Berg 1998). **CUCKOOS:** Occasionally parasitized by Pallid *Cuculus pallidus* and Fan-tailed *Cacomantis flabelliformis* Cuckoos, and Horsfield's *Chrysococcyx basalis* and Shining *C. lucidus* Bronze-Cuckoos (Chandler 1910; White 1915; Bryant 1941; Brooker & Brooker 1989; Storr 28, 35; HANZAB 4), but no records of parasitism by cuckoos near Manjimup (Brown & Brown 1987) or at two sites near Melbourne (Welbergen *et al.* 2001). However, despite low incidence of parasitism, ability to distinguish foreign eggs from own clutch has been shown experimentally in wild populations (for details see Welbergen *et al.* 2001), though discrimination may vary geographically: Vic. populations respond strongly to introduction of foreign eggs (Welbergen *et al.* 2001), but discriminatory behaviour not observed near Manjimup (Brown & Brown 1987; Brown *et al.* 1990). No ectoparasites found on nestlings near Melbourne (Berg 1998).

PLUMAGES Prepared by J.S. Matthew and A.M. Dunn. Naked at hatching (NRS). Fledge in juvenile plumage. Undergo partial post-juvenile (first pre-basic) moult to adult-like first immature (first basic) plumage. Acquire adult plumage in complete first immature post-breeding (second pre-basic) moult, probably when c. 1 year old. Thereafter, a complete post-breeding (pre-basic) moult each cycle produces successive adult (basic) plumages with no change in appearance. Sexes similar. Christidis & Boles (1994) combined Aust. populations with Clamorous Reed-Warbler *A. stentoreus*, but here they are considered as a full species, Australian Reed-Warbler *A. australis*, following recent morphological and molecular studies (see Geographical Variation for further discussion). At least two subspecies occur in Aust. *A. australis* and *A. gouldi*; nominate *australis* described below based on examination of skins of 16 adults, two first immatures and two juveniles (HLW, MV, SAM), all collected from se. Aust. in spring-summer.

Adult (Definitive basic). Appearance varies considerably with wear. In s. Aust., plumage fresh from autumn to early winter, and worn by late spring to early summer. **HEAD AND NECK:** Forehead, crown, nape and hindneck, russet-brown (c33) when fresh, fading to olive-brown (c28) or dark greyish-brown (c91) with wear, slightly greyer on hindneck. Sides of neck grade from dark brown (c119A) dorsally to light brown (c223D) ventrally. Lores and ear-coverts just behind eye, dark brown (c121) with narrow light-brown (c223D) tips to feathers, forming an indistinct dark eye-stripe that appears darker with wear. Supercilium and rest of ear-coverts, light brown (223D) when fresh; supercilium fades to cream (c92) with wear. Eye-ring, light brown (c39) when fresh, fading to cream (c92) with wear. Malar area, chin and throat, off-white (ne). Whole of head becomes paler with wear. Up to four rather short (5–7 mm) black (89) bristles above gape. **UPPERPARTS:** Mantle, back and scapulars, warm russet-brown (c33) when fresh, fading to colder olive-brown (c28) or greyish brown (c91) with wear. Rump and uppertail-coverts slightly paler brown (121C) with longest uppertail-coverts, deep russet-brown (33); fade to light brown (c26) or yellowish brown (ne) with wear. **UNDERPARTS:** In fresh plumage, sides of breast and flanks, light brown (223D) or buff (124), on most birds extending as buff wash across upper breast; grades to creamy white (ne) on centre of lower breast (and upper breast in some birds), belly and vent. In worn plumage, sides of breast and flanks, buff (c124) or greyish brown (ne), grading to white or off-white (ne) on centre of breast, belly and vent. Thighs, light brown (c123A) when fresh, fading to light brown

(c223D) with wear. Undertail-coverts, light brown (223D) or buff (124) when fresh, becoming pale buff (123D) or cream (c54) with wear. **UPPERTAIL:** When fresh, rectrices, dark brown (c121) with narrow, diffuse light-brown (c223D) or pinkish-buff (ne) fringes to tips and inner webs, narrowest at tip of t1 and broader (up to 2.5 mm) at tips of t4–t6, and with narrow, diffuse light-brown (c223C) edge to outer webs. When worn, rectrices slightly paler, dark brown (c119A), fringes narrower at tips, more diffuse and paler, off-white (ne) or cream (92), and outer edges narrower, more diffuse and paler, pink-buff (c121). **UNDERTAIL:** When fresh, rectrices, dark brownish-grey (ne) with white shafts and narrow, diffuse light-brown (c223D) fringes to tips and inner webs. When worn, ground-colour of rectrices paler, brownish grey (c79), fringes paler at tips, off-white (ne), and outer edges paler, pink-buff (c121). **UPPERWING:** When fresh, all secondary coverts, dark brown (121) with narrow, diffuse russet-brown (33) fringes, becoming paler (light brown [c223C]) with wear; fringe confined to outer webs and tips on greater secondary coverts and, in fresh plumage, combine to form diffuse, narrow and indistinct russet-brown (33) wing-bar. Most marginal and median and primary coverts, dark brown (121); those on leading edge of wing with buff (c124) or cream (54) outer webs, which combine to form narrow pale strip along leading edge of wing adjacent to alula. Greater primary coverts and alula, dark brown (121) with narrow russet-brown (33) fringes to outer webs and tips, fringes becoming paler with wear. Tertiaries, dark brown (c121) with narrow light-brown (c223D), russet-brown (121C) or yellow-brown (123B) fringes to tips and outer webs, fringes paler and narrower with wear. Secondaries, dark brown (c121) with lighter brown (121C) or yellow-brown (123B) outer edges and cream (54) fringes to tips and inner webs, narrow at tips; outer edges become paler with wear. Primaries similar to secondaries but slightly paler, dark brown (c119A); and p6–10 have cream (92) inner edges, but these do not extend to tips. **UNDERWING:** Coverts, buff (124) or light yellow-brown (123C), grading to off-white (ne) at bases. Remiges, brownish grey (c79) with cream (54) inner edges and narrow cream (54) fringes at tips of secondaries and inner primaries.

Nestling Not known if down acquired.

Juvenile Very similar to adult, from which differs by: **HEAD AND NECK:** Feathers of hindneck softer and more loosely textured. **UPPERPARTS:** Rump and uppertail-coverts slightly paler, yellowish brown (c123C), contrasting more with rest of upperparts than in adult; feathers also softer and more loosely textured. **UNDERPARTS:** Similar to adult in fresh plumage. **TAIL:** Rectrices narrower and more acute at tips.

First immature (First basic). Little information. As adult, but two skins examined retained all juvenile rectrices (which narrower and more acute at tips than in adults) and possibly all juvenile remiges (these with synchronous growth-bars, but note that moult of outer primaries can be synchronous). Not known if any juvenile upperwing-coverts retained, but likely that greater primary coverts are.

BARE PARTS Based on photos (*Bird Obs.* 758 (1995): 1; unpubl.: R.P. Allen; R. Drummond; and standard sources), and other sources as cited. Aust. subspecies combined. **Adult** Bill: upper mandible, grey-black (82); lower mandible and tomtia, pinkish brown (219D) on basal half grading to greyish (c84) towards tip; bill also described as black with pinkish-cream base to lower mandible (Rogers *et al.* 1986). Gape, pinkish brown (219D); also described as pale pink or orange (K.G., A. & D.I. Rogers) or pinkish orange (Rogers *et al.* 1986). Mouth, orange-red to orange-yellow though ages not stated (Hall); palate also described as orange, sometimes with pinkish tinge (Rogers *et al.* 1986). Iris, dark brown (119A) or black-brown (219); also brownish olive (Rogers *et al.* 1986), light brown or grey-brown (Mees 1961). Orbital ring, dark

grey (83). Legs and feet, grey-black (82); also dull blue-grey (Hall). Soles described as buff (Hall) or white (K.G., A. & D.I. Rogers). **Nestling** Bill similar to adult but with pale-yellow (157) tomtia. Palate, yellow (c55). Gape, pale yellow (157), swollen. Two small black (89) spots at base of tongue (Boles & Longmore 1985). No other information. **Juvenile** From Rogers *et al.* (1990) unless stated. Bill: upper mandible, dark grey with yellowish tip; lower mandible, pink. Mouth described as yellow (D.I. Rogers). Gape, cream, puffy. Iris, dark grey. Feet and legs, light grey, lighter grey on soles. Some, but not all, juveniles have dark spots on tongue (Brown & Brown 1986). **First immature** Probably as adult, but Rogers *et al.* (1986) gave following differences from adult (see above): Bill, dull black with whitish base to lower mandible; palate, pale yellow; and gape, creamy white. Brown & Brown (1986) banded several nestlings with dark spots on tongue, and recaptured several of these up to 1 year later, when most had dark to faint spots on tongue.

MOULTS Based on examination of skins of 26 adult, two first immature and two juvenile *australis*, and 15 adult and two first immature *gouldi* (AM, HLW, MV, SAM); live birds captured at Derby, nw. WA (n=7, probably adults, subspecies not known) and Vic. (n=97 adults, 30 first immatures and two juveniles) (K.G., A. & D.I. Rogers); and other information as cited. **Adult post-breeding** (Probably third and subsequent pre-basic). Complete. Poorly understood, as surprising lack of records of birds with active moult; probably because of combination of: (1) rapid moult; (2) birds become more cryptic while moulting remiges; (3) birds, at least from s. part of range, migrate away from breeding areas before undergoing moult of remiges (D.I. Rogers). Primaries outward, probably usually starting at p1. Up to five primaries grow at once. Inner primaries said to moult simultaneously (Rogers *et al.* 1990), e.g. one had following unconventional primary moult of 1³2¹0⁶; outer primaries also replaced nearly simultaneously, e.g. two birds captured at Derby in Apr. had inner 5–6 primaries new, and rest nearly fully grown. Some birds show unconventional primary moult, e.g. one from Derby in Apr. had primary moult of S³1S¹4¹1¹; this bird possibly suspended moult of primaries or had moult occurring at two nodes. Timing of moult of primaries not understood. s. AUST. (NSW, Vic., SA and sw. WA): Almost no records of active moult of primaries; one captured in Vic. in early Feb. 1981 had PMS 5, one *gouldi* from sw. WA in late Mar. had PMS 43, and another in May had PMS 40. Most birds from s. part of range had worn primaries in spring (28 of 29), summer (84 of 86) and autumn (3 of 6), the exceptions being birds with all primaries new in Mar. (1 of 3), May (1 of 1) and Oct. (1 of 4). At two sites in s. Vic., birds arrived in spring with slightly worn primaries, and apparently departed in autumn with very worn primaries (Rogers *et al.* 1986, 1990). Further N, e.g. in n. NSW, moult of primaries can occur at breeding sites in autumn (B. Reed). NW. AUST. (Kimberley Div. S to Pilbara Region, WA; skins and live birds combined): Active moult of primaries recorded in: Feb. (1 of 1; PMS 13; Pilbara Region), Apr. (4 of 6; mean PMS 38.7 [12.52; 20–46]; all from Derby), and Sept. (1 of 2; PMS 26; Pilbara Region); other two in Apr. had all primaries new; all three in Jan., one of one in Aug., and other in Sept., had all primaries worn. No moult in five collected from w. Pilbara Region, WA, in July (Mees 1961). Rogers *et al.* (1990) stated that moult finished by May, but locations not specified. These limited data suggest considerable variation in location where moult of primaries occurs. Difficulties in ageing birds may complicate analysis of moult data; some birds mentioned here may be first immatures which probably have worn primaries at a time when adults have fresh primaries or active moult of primaries. Different migration strategies between individuals or populations may also confuse matters; it is likely that birds

returning from n. Aust. and arriving in s. Aust. in early spring have slightly worn primaries, having undergone moult in n. Aust. in autumn–winter; birds that winter in s. Aust. may have finished moult of primaries in early autumn and have more worn primaries in early spring. More data needed for correctly aged birds from various locations and from all months of year. Moult of tail centrifugal in some birds, e.g. one in Feb. with t1 in pin and t2–t6 worn; others said to moult rectrices simultaneously, based on known adults (retraps) with synchronous growth-bar to tail (Rogers *et al.* 1990). Active moult of tail recorded in s. Aust. in five (skins and live birds combined) from Dec.–Apr., these birds not yet started moult of primaries; of five captured at Derby, nw. WA, in Apr., three with active moult of tail (these with active moult of primaries) and two with all rectrices new (these finished moult of primaries); two from Pilbara region with active moult of tail, one starting in Feb. (with PMS 43) and one with simultaneous moult of rectrices in Sept. (with PMS 26). As with primaries, timing of moult of tail probably varies. Moult of body apparently starts before start of moult of primaries; Rogers *et al.* (1990) stated that moult starts on forehead and crown in mid-Dec. in Vic. **Adult pre-breeding** (Pre-alternate). Not known if this species undergoes partial pre-alternate moult as in Oriental Reed-Warbler (q.v.). In Clamorous Reed-Warbler, subspecies *brunnescens* from Middle East does not undergo pre-alternate moult, but in subspecies *lentecaptus* from Borneo and Lesser Sundas, Indonesia, some birds undergo partial moult, involving feathers of head and body, in Feb.–Mar., and this subspecies undergoes complete post-breeding moult Aug.–Nov. (BWP). Taxonomic relationship of these two subspecies of Oriental with Aust. populations not resolved, so their moult-strategies not necessarily applicable to Aust. As timing of post-breeding moult poorly understood for Aust. populations, timing of pre-alternate moult, if it occurs at all, also not known. **Post-juvenile** (First pre-basic). Little known. Apparently partial, based on examination of first immatures (this study). Rogers *et al.* (1986) stated that immatures captured in spring have very worn primaries, suggesting these are retained juvenile. All 30 first immatures captured in Vic. Dec.–Mar. (K.G., A. & D.I. Rogers) with all primaries new, at a time when adults have worn primaries, indicating juvenile primaries retained. Skins of three first immatures, collected Oct.–Feb., had all juvenile rectrices retained. In *A. stentoreus*, post-juvenile moult said to be partial, involving feathers of head and body (BWP). **First immature post-breeding** (Second pre-basic). No information.

MEASUREMENTS **NOMINATE AUSTRALIS:** (1–3) Qld, NSW, SA and Vic. (ANWC, HLW, MV, SAM): (1) Adults; (2) First immatures; (3) Juveniles. (4–5) Vic., live birds, sexed on cloaca and brood-patch during breeding season (Rogers *et al.* 1986): (4) Adults; (5) Immatures; note that source has measurements of sexes transposed (Rogers *et al.* 1990). Bill D and Bill N measured at anterior edge of nostrils.

	MALES	FEMALES	
WING	(1) 72.6 (2.06; 68–76; 22)	68.5 (2.68; 64–73; 12)	**
	(2) 74, 74	–	
	(3) 68, 69	–	
	(4) 75.0 (1.38; 65)	71.1 (1.38; 81)	**
	(5) 73.2 (1.50; 30)	69.3 (1.42; 27)	
TAIL	(1) 63.7 (2.80; 59–69; 21)	58.5 (3.90; 51–63; 12)	**
	(2) 65, 65	–	
	(3) 57, 58	–	
BILL S	(1) 20.2 (0.90; 17.6–21.4; 21)	19.8 (1.08; 17.3–20.9; 11)	ns
	(2) 20.9, 21.4	–	
	(3) 18.9, 19.3	–	
BILL N	(1) 11.1 (0.39; 10.3–11.6; 15)	–	
BILL D	(1) 4.1 (0.21; 3.8–4.6; 13)	–	
THL	(4) 38.3 (0.83; 63)	37.3 (0.83; 63)	

	(5) 38.1 (0.31; 29)	36.0 (0.31; 26)	**
TARSUS	(1) 24.5 (1.06; 22.8–26.8; 20)	23.7 (0.84; 22.5–24.8; 10)	ns
	(2) 23.3, 23.5	–	
	(3) 23.9, 24.9	–	

NOMINATE AUSTRALIS: Unsexed: (6) Seaford Swamp and Corranderrk Bushland, Vic., live (unpubl. BATH data).

	ADULTS	JUVENILES AND IMMATURES	
WING	(6) 72.8 (2.31; 68–78; 154)	71.4 (2.42; 65–77; 58)	**
TAIL	(6) 64.4 (2.94; 57–70; 39)	61.9 (5.05; 56–68; 7)	ns
BILL F	(6) 15.6 (1.27; 12.7–19.0; 94)	14.6 (1.15; 12.0–17.0; 51)	**
THL	(6) 37.8 (0.96; 35.0–40.7; 132)	37.2 (1.12; 35.0–39.5; 55)	**

SUBSPECIES GOULDI: (7) SW. WA, N to Pilbara Region, adults, skins (ANWC, HLW, MV, SAM, WAM); skins from WAM measured by R. Schodde & I.J. Mason.

	MALES	FEMALES	
WING	(7) 74.9 (2.34; 71–79; 16)	71.2 (2.93; 68–76; 6)	**
TAIL	(7) 65.8 (3.19; 60–71; 16)	62.7 (2.50; 59–66; 6)	*
BILL S	(7) 22.0 (0.51; 21.5–22.8; 10)	22.0 (0.74; 21.3–23.3; 6)	ns
BILL N	(7) 12.8 (0.30; 12.3–13.0; 5)	–	
BILL D	(7) 4.4 (0.23; 4.1–4.6; 5)	4.3 (0.22; 4.0–4.6; 5)	ns
TARSUS	(7) 25.2 (1.71; 21.2–26.7; 10)	24.4 (0.45; 23.7–24.8; 6)	ns

SUBSPECIES NOT KNOWN: (8) Kimberley Div., WA, skins, ages not given (Johnstone & Storr 2004).

	MALES	FEMALES	
WING	(8) 70.7 (64–76; 4)	66, 68, 69	
TAIL	(8) 61.2 (54–67; 4)	57, 60, 61	
BILL S	(8) 21.7 (21–22; 4)	20, 20, 22	
TARSUS	(8) 25.7 (24–28; 4)	23, 25, 26	

SUBSPECIES NOT KNOWN: Unsexed: (9) Derby, WA, live, captured Apr. (unpubl. BATH data).

	ADULTS	IMMATURE	
WING	(9) 75, 75, 81	77	
TAIL	(9) 68.4 (1.82; 66–71; 5)	64	
THL	(9) 41.4 (1.15; 39.7–43.1; 6)	41	
TARSUS	(9) 26.6 (0.93; 26.0–27.5; 6)	25.7	

WEIGHTS **NOMINATE AUSTRALIS:** (1) Vic., adults, from museum labels (MV). **SUBSPECIES GOULDI:** (2) SW. WA, N to Pilbara Region, adults (Hall).

	MALES	FEMALES	
(1)	19.8 (0.96; 19–21; 4)	–	
(2)	19.3 (3.18; 15.1–21.7; 5)	18.7	

Unsexed: **NOMINATE AUSTRALIS:** (3) Seaford Swamp and Corranderrk Bushland, Vic., adults, live (unpubl. BATH data; see also Rogers *et al.* [1986]). **SUBSPECIES NOT KNOWN:** (4) Derby, live (unpubl. BATH data).

	ADULTS	JUVENILES AND IMMATURES	
(3)	17.7 (1.71; 13.8–22.8; 142)	16.5 (2.04; 11.9–20.0; 56)	**
(4)	21.8 (2.47; 18.0–25.3; 6)	23.2	

STRUCTURE Aust. subspecies combined. Wing fairly short, slightly rounded at tip. Ten primaries: p8 longest and forming wing-tip; p7 = p8 in 13 of 22 skins measured; p10 42–51 mm shorter than p8, p9 1–4, p7 0–1, p6 0.5–3, p5 2–6, p4 5–9, p3 7–11, p2 8–15, p1 10–17. Slight emargination to outer webs of p7 and p8, less so on p7, rarely on p6; p9 emarginated on inner web, forming notch that falls 10–19 mm short of tip of feather; notch on p9 usually falls between tip of

p1 and secondaries when wing folded; p8 with very indistinct notch or lacking notch on inner web. Tip of p9 usually falls between tips of p5 and p6 or equal with p5, sometimes equal with p6; rarely, tip of p9 falls between tips of p4 and p5 or equal with tip of p7. Nine secondaries, including three tertials; tip of longest tertial falls between tips of p1 and secondaries on folded wing. Primary projection (distance which longest primary projects beyond tip of longest tertial) 12–22 mm. Tip of p10 falls 1–5 mm shorter than tip of longest greater primary covert. Tail fairly long with slightly rounded tip when folded; 12 rectrices; t6 7–10 mm shorter than t1. Bill fairly long, rather slender with pointed tip, about same length as head; upper mandible slightly decurved; slight gonydeal angle. Tarsus long, slender and laterally compressed; scaling lamini-plantar. Tibia fully feathered. Middle toe with claw 19.5 mm (1.44; 17.0–21.0; 6); outer toe 76–83% of middle, inner 68–83%, hindtoe 85–105%.

AGEING Juveniles distinguishable from adult by subtle differences in plumage and bare parts (q.v.). First immatures difficult to distinguish from adults. Rogers *et al.* (1986) noted that immatures have very worn primaries in spring following fledging (when just under 1 year old), but found presence of synchronous growth-bars in tail to be of little use for ageing as this also observed in some adults (as some adults moult rectrices simultaneously [see Moults]). Examination of skins in present study revealed four birds (two *australis* and two *gouldi*) with adult-like plumage, but with all rectrices narrower and more acute at tips than in adults; these thought to be first immatures with retained juvenile rectrices. Juveniles said to have paler grey tarsi with smooth scaling (cf. adults with darker tarsi and rougher scaling), this obvious on birds in the hand (B. Reed).

SEXING No differences in plumage. Adult males on average larger than adult females (Rogers *et al.* 1990; see Measurements). Brown & Brown (1986) captured 112 *gouldi* near Manjimup, sw. WA, in Sept.–Apr., 1975–85, and sexed these by presence (female) or absence (male) of brood-patch and by behaviour at nests. They found length of wing to be useful sexing criterion for birds aged 1–5 years (ages known from banding data): birds with Wing ≤ 75 mm are female (9.3% chance of incorrect sexing) and ≥ 76 are male (12% chance of incorrect sexing), with 89.3% of birds sexable; birds with Wing ≤ 73 mm are female, and ≤ 78 mm are male (100% reliability; 61% of birds sexed). Brown & Brown (1986) also considered wingspan to be useful sexing criterion: birds with wingspan 222–237 mm are females, and those with wingspan

238–253 males; however, wingspan is difficult to measure on live birds and its use should be avoided. Rogers *et al.* (1986) also used length of wing as sexing criterion for *australis* captured in Vic. (sexed by examination of brood-patch and cloaca): (1) adults with Wing ≤ 71 mm are female, and ≥ 75 mm are male (48.6% of birds sexed correctly, 0.2% sexed incorrectly and 51.2% unsexed); and (2) immatures with Wing ≤ 69 mm are female, and ≥ 73 mm are male (48.4% of birds sexed correctly, 0.4% sexed incorrectly, 51.2% unsexed). Note that Rogers *et al.* (1986) accidentally transposed data for sexes, and this noted in later publication (Rogers *et al.* 1990).

RECOGNITION In HANZAB region, readily confused with very similar Oriental Reed-Warbler. Oriental best distinguished by presence of dark streaking on lower throat and upper breast, and Song (see Field Identification of Oriental Reed-Warbler for details). Birds in HANZAB region with active moult of primaries very unlikely to be Oriental, which are only likely to replace accidentally dropped primaries, in which case only one or two feathers likely to be moulting (cf. conventional outward moult with up to five primaries growing at once in *australis* [see Moults in this account and account for Oriental Reed-Warbler]). Table 1 summarizes morphometric data of potential use for distinguishing the two species in the hand; identification should be based on combination of criteria presented (see also Fig. 1). Potential confusion with other large *Acrocephalus* warblers from e. and se. Asia (e.g. Clamorous *A. stentoreus*, Great *A. arundinaceus* Reed-Warblers, Thick-billed Warbler *A. aedon* and Blyth's Reed-Warbler *A. dumetorum*) not discussed here as these not known to occur in HANZAB region (for recognition of large *Acrocephalus* outside HANZAB region, see Svensson [1992]; Shirihai [1995] and BWP).

GEOGRAPHICAL VARIATION Not fully resolved, and species limits contentious. Here we consider Aust. breeding populations as a full species, Australian Reed-Warbler *A. australis*, based on morphological and molecular studies (see below). Christidis & Boles (1994) combined Aust. populations with Clamorous Reed-Warbler *A. stentoreus*, a view shared by several earlier authors (Hartert 1924; Salomonsen 1929; Stresemann 1940; Mayr 1948; Stresemann & Arnold 1949; Peters; BWP). However, some authors consider Aust. populations to be a distinct species, Australian Reed-Warbler *A. australis* (Hartert 1909; McKean 1983; Coates 1990; Sibley & Monroe 1990; Shirihai *et al.* 1995; Coates *et al.* 1997; Parkin *et al.* 2004; DAB). Comparison of morphological characters

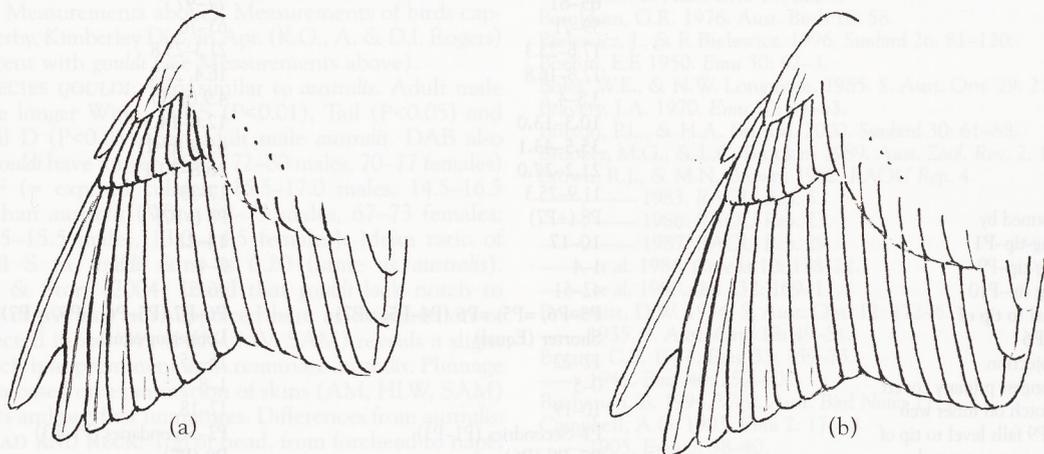


Figure 1 Wing structure of (a) Australian Reed-Warbler, nominate *australis* and (b) Oriental Reed-Warbler

using cluster analysis (Leisler *et al.* 1997) found *australis* to be most similar to Clamorous Reed-Warbler *A.s. stentoreus* (from Egypt) and subspecies *A.s. brunnescens* (from Arabia, coastal ne. Africa and Caucasus); same study also found Oriental Reed-Warbler *A. orientalis* (from e. Asia) to be morphologically closest to Great Reed-Warbler *A. arundinaceus* (from Eurasia). However, genetic studies support view that Aust. populations represent a distinct species. Analysis of 1068 base-pairs of mitochondrial cytochrome *b* gene (Leisler *et al.* 1997) confirm the distinctiveness of *A. australis* and indicate its closest relative is the Pitcairn Reed-Warbler *A. vaughani* from s. Polynesia (differing by 4.1% nucleotide divergence); same study also indicates *A. australis* is part of large monophyletic group from the Palearctic–A'asian region, which includes *A. arundinaceus*, *A. stentoreus brunnescens*, *A. orientalis* and *A. vaughani*. Leisler *et al.* (1997) also found that *A. australis* is genetically closer to *A. stentoreus* (5.2% nucleotide divergence) and *A. orientalis* (5.3–5.4%) than to *A. arundinaceus* (6.8%). Another study analysed either 400 base-pairs or 1041 base-pairs of mitochondrial cytochrome *b* gene (Helbig & Seibold 1999) from 18 species of *Acrocephalus*; that study found: (1) Aust. populations (sampled from sw. WA) differ more from *A. arundinaceus* (6.2%) than *A. orientalis* (4.9% nucleotide divergence) or *A. stentoreus* from Philippines (4.5%) or Middle East (4.4%); (2) *A. arundinaceus* is slightly more closely related to *A. stentoreus* (4.8–5.3%) than *A. orientalis* (5.9%), despite close morphological similarity with *orientalis*; and (3) strong molecular support for recognition of each of *australis*, *orientalis*, *arundinaceus* and *stentoreus* as a full species.

Taxonomic status of resident populations in New Guinea, Bismarck Arch., Solomon Is and Lesser Sundas not understood (Anon. 1977; White & Bruce 1986; Coates 1990; DAB). Some authors consider resident populations in s. Moluccas (Buru), s. Lesser Sundas (Sumba, Timor), New Guinea, Bismarck Arch., Solomon Is and far n. Qld and Torres Str. as subspecies *sumbae* of Clamorous Reed-Warbler, sometimes using the synonyms *cervinis* or *toxopei* for these populations (Mayr 1948; Baker 1997; Peters; BWP). Others consider New Guinean and Solomon Is populations as subspecies *sumbae* of Australian

Reed-Warbler *A. australis* (Finch 1980; Hadden 1981, 2004; Coates 1990; Johnstone & Storr 2004). DAB did not resolve the affinities of New Guinean populations, but stated that these have: (1) p8 shorter than p7 (unlike Aust. birds which have p8 slightly longer or equal with p7); (2) p5, and sometimes p4 or p3, longer than p9 (Aust. birds always have p3 and p4 shorter than p9, and p5 slightly shorter or equal to p9); see also Coates (1990) who stated p9 shorter than p5; (3) shorter and more rounded wings than Aust. birds. DAB raised the possibility that New Guinean, and perhaps Lesser Sunda, populations are part of a third undescribed *Acrocephalus* species. It is also possible that New Guinean populations are augmented in autumn–winter by non-breeding migrants from Aust., but no empirical evidence for this. Mayr (1948) gave the following measurements for adult males: S. NEW GUINEA: Wing 68.4 (67–70); Tail 61.0 (61–66); ratio of length of Tail:Wing 89.8% (88–91.5); and Bill S 21.0 (20.1–22.1). C. YORK PEN. AND GULF OF CARPENTARIA, NE. QLD: Wing 71.5 (68.5–73); Tail 62.8 (60–64.5); Tail:Wing 87.1% (85.5–88.3); and Bill S 20.8 (20.1–21.9) (also see Mayr [1948] for measurements from Sumba, New Britain and Solomon Is).

Breeding populations of reed-warblers in Java, Borneo and Philippines are usually considered *A. stentoreus* (White & Bruce 1986; Baker 1997; Peters; BWP), but Coates *et al.* (1997) suggested they may be *A. australis*. Following measurements taken from skins (n=4; RMNH; measured by D.I. Rogers) collected in Java (usually considered as *A.s. siebersi*; see below): Wing (74–75); Tail (66–70); Bill S (20.7–22.4); Bill N (13.5–13.9); Tarsus (26.3–27.5); wing-tip to p1 (9–10); tip of p9 falls equal with tip of p4 (n=2), between p3–p4 (n=1) or between p4–p5 (n=1); length of t1–t6 (12–14); all of these skins have dark streaking on throat (much as in *A. orientalis*). These birds therefore differ from Aust. birds (see Table 1 above for comparison) by: presence of throat streaking; length of Bill N; relatively short p9; and distance between t1–t6; they also differ from *A. orientalis* by their short wing-length, relative length of p9 and rather short bill. These limited results support the view that *A. australis* differs from at least some Indonesian populations of reed-warblers. Genetic analysis needed to further

Table 1. Summary of measurements and wing-structures (live birds and skins combined; sexes and ages combined; mm unless stated) of Australian Reed-Warbler (nominative *australis* and *gouldi* combined; BARC [Sub. 247]; this study) and Oriental Reed-Warbler (Svensson 1992; Shirihai 1995; Johnstone & Storr 2004; BARC [Sub. 247]; BWP; this study). Data in parentheses indicate less commonly recorded measures; those shown in bold are probably the most useful identification criteria.

	AUSTRALIAN	ORIENTAL
Wing	65–81	77–97
Tail	59–71	63–76
Bill S	17.6–23.3	21.3–25.8
Bill F	12.8–16.8	16.4, 20.2
Bill D	3.8–4.7	4.9 (n=1)
Bill N	10.3–13.0	12.6–14.3
THL	35.5–43.1	45.9 (n=1)
Tarsus	21.2–27.0	26.8–30.1
Weight (g)	11.9–25.3	17–33
Wing-tip formed by	P8 (+P7)	P8 (+P7)
Length wing-tip–P1	10–17	14–22
Length wing-tip–P9	1–4	0–4
Length wing tip–P10	42–51	46–53
Tip P9 equal to tip of P9 Versus P6	P5–P6, =P5, =P6 (P4–P5, =P7)	P6–P7 (P5–P6, =P5, =P7)
Primary-projection	Shorter (Equal)	Longer or equal
P10 to tip ongest primary covert	12–22	15–25
Tip P9 to notch on inner web	0–5	1–8
Notch on P9 falls level to tip of	10–19	12–18
Emargination on outer web	P1–Secondaries (P1–P3)	P2–Secondaries (P1–P3)
Length T1–T6	P7–P8 (P6)	P8 (P7)
	7–10	9–13

resolve species limits, particularly breeding populations in New Guinea, Bismarck Arch., Solomon Is and Wallacea.

Views concerning subspecies differ. Two subspecies of *A. australis* generally recognized (DAB), but see below for further discussion. Earlier authors considered Aust. populations as *A. stentoreus*, comprising two subspecies in Aust. and usually nine (Peters; BWP) or ten (Baker 1997) subspecies extraliminally. The following extralimital subspecies of *A. stentoreus* are recognized (Peters): nominate *stentoreus* resident in Suez and along Nile, Egypt, and in Jordan Valley; *brunnescens* breeding from coasts of s. Red Sea and Gulf of Aden, Afghanistan, Iran, N to Aral Sea and Transcaspia, Pakistan and nw. India, and wintering through India, Sri Lanka and nw. Thailand; *meridionalis* resident in Sri Lanka; *amya* breeding in Assam, ne. India, Burma and s. China; *harterti* from Philippines; *siebersi* from Java; *lentecaptus* from w. Lesser Sundas (Lombok, Sumbawa) and se. Borneo; *celebensis* from s. Sulawesi; and possibly *sumbae* from s. Lesser Sundas, New Guinea, Bismarck Arch. and Solomon Is (see above for discussion of these populations). Subspecies from Philippines, Indonesia, New Guinea and Aust. are smaller and have shorter bill than those from ne. Africa, central Asia and Indian subcontinent (BWP).

Within Aust. (excluding n. Qld and Torres Str.), two subspecies currently recognized: nominate *australis* breeding in e. Aust. (s. Qld, NSW, Vic., Tas. and Furneaux Grp, e. SA), wintering as far N as n. Qld and Torres Str., n. NT and, possibly, Kimberley Div., n. WA; and subspecies *gouldi* breeding in sw. and central-w. WA, and possibly also Kimberley Div., with s. populations possibly wintering as far N as Kimberley Div. and n. NT (DAB). However, wintering ranges of subspecies poorly understood and specimens needed from n. Aust. in late autumn to winter to resolve the issue. Mayr (1948) suggested populations from ne. Qld are intermediate between *australis* and New Guinean birds; this supported by DAB, which found that specimens (n=14) from ne. Qld and Torres Str. have rather pointed wings and resemble *australis* or have wing-structure intermediate between *australis* and New Guinean birds. White & Bruce (1986) suggested that populations in ne. Qld are clinal variants of *australis*, being slightly smaller than birds in s. Aust. Mayr (1948) also recognized a third subspecies, *carterae*, in Kimberley Div., WA, with longer bill than *gouldi*; subsequent authors (Mees 1961; DAB) found bill-length of birds from Kimberley Div. did not differ from *gouldi* farther S in WA, and therefore did not recognize *carterae* as a valid subspecies. Johnstone & Storr (2004) stated that there is a resident pale-plumaged population in Kimberley Div., but taxonomic status of this population not resolved; their small sample of skins from this region have short wings and tail compared with *australis* or *gouldi*, but long bill and tarsus as in *gouldi* (see Measurements above). Measurements of birds captured at Derby, Kimberley Div., in Apr. (K.G., A. & D.I. Rogers) are consistent with *gouldi* (see Measurements above).

SUBSPECIES GOULDI: Very similar to *australis*. Adult male *gouldi* have longer Wing, Bill S ($P<0.01$), Tail ($P<0.05$) and greater Bill D ($P<0.05$) than adult male *australis*. DAB also indicates *gouldi* have longer Wing (72–80 males, 70–77 females) and Bill F (= exposed culmen: 15.5–17.0 males, 14.5–16.5 females) than *australis* (Wing 69–75 males, 67–73 females; Bill F 13.5–15.5 males, 13.0–14.5 females). Mean ratio of Bill D/Bill S in *gouldi* skins is 0.20 (same as *australis*). Johnstone & Storr (2004) stated that *gouldi* lack notch to inner web of p9; this not supported here as examination of skins collected in sw. WA (HLW, MV, SAM) reveals a slight notch which is as prominent as in nominate *australis*. Plumage description based on examination of skins (AM, HLW, SAM) of 16 adults and two first immatures. Differences from *australis*: **Adult HEAD AND NECK:** Top of head, from forehead to nape, dark olive-brown (c129), becoming grey-brown (c91) on hindneck. **UPPERPARTS:** In fresh or worn plumage, mantle,

back and scapulars, deeper and 'rustier' brown (c33, c37) than *australis* in similar state of wear; contrasts with darker olive-brown top of head (cf. *australis*, which shows little or no contrast with top of head). Rump and uppertail-coverts, rufous-brown (dull 136) when fresh, warm brown (c37) or deep cinnamon-brown (123A) when worn (*australis* slightly lighter brown or yellowish brown when worn). **UNDERPARTS:** In fresh or worn plumage, tend to have richer yellow-brown (123B) or cinnamon-brown (39) flanks, sides of breast and thighs, in some birds extending across upper breast; contrasting fairly strongly with cream-white (ne) centre of breast, belly and vent. Undertail-coverts, buff (124). **TAIL:** Outer edges to rectrices, richer brown (121C) or rufous-brown (dull 136). In worn plumage, fringes to tips of rectrices, buff (c124) (cf. creamy or whitish in *australis*). **UPPERWING:** Fringes to tertials, coverts and alula tend to be richer brown (same colour as *australis* but deeper) when fresh or worn (cf. *australis* which lighter brown when worn).

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Australian Reed-Warbler *Acrocephalus australis* (page 1605)

NOMINATE AUSTRALIS: 1 Adult (fresh plumage); 2 Adult (worn plumage); 3 Juvenile; 4 Adult
 SUBSPECIES GOULDI: 5 Adult

Oriental Reed-Warbler *Acrocephalus orientalis* (page 1623)

6 Adult

Zitting Cisticola *Cisticola juncidis* (page 1700)

SUBSPECIES LEANYERI: 7 Adult male breeding; 8 Adult female breeding; 9 Juvenile; 10 Adult male breeding; 11 Adult female breeding
 SUBSPECIES LAVERYI: 12 Adult male breeding

Golden-headed Cisticola *Cisticola exilis* (page 1712)

SUBSPECIES ALEXANDRAE: 13 Adult male breeding; 14 Adult male non-breeding

SUBSPECIES DIMINUTA: 15 Adult male breeding

NOMINATE EXILIS: 16 Adult male breeding; 17 Adult male non-breeding; 18 Adult female breeding; 19 Juvenile; 20 Adult male breeding;
 21 Adult male non-breeding