

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 DICRURIDAE fantails, drongos, monarch-flycatchers and boatbills

A large and highly diverse family of small to medium-sized passerines, often with short and rounded wings and long tails. The family comprises 160–170 species in 21 genera, distributed from Africa, across much of s. Asia, including the Indian subcontinent, to e. and se. Asia, including Japan, the Philippines and Wallacea, to A'asia and islands of w. Pacific Ocean as far E as Hawaii (Sibley & Monroe 1990; Monroe & Sibley 1993; Peters; DAB). Within HANZAB region there are 19 species generally recognized, in seven genera (Sibley & Monroe 1990; Monroe & Sibley 1993; Christidis & Boles 1994), but up to 22 species recognized in DAB. The taxonomy of the family has been the subject of considerable confusion. Here we recognize the following four subfamilies within the family Dicruridae (largely following DAB):

RHIPIDURINAE (FANTAILS): Comprises a single genus *Rhipidura*, with 37–42 species; five species in HANZAB region according to most authors (Sibley & Monroe 1990; Monroe & Sibley 1993; Christidis & Boles 1994), but seven species according to DAB.

DICRURINAE (DRONGOS): Comprises two genera: monotypic *Chaetorhynchus*, endemic to New Guinea; and *Dicrurus*, with 19–23 species, one of which occurs in HANZAB region. Characters present in this subfamily but absent from the others include an extended maxillary plate in the roof of the palate, thickened nasal bars, a large temporal fossa to the muscle of the mandible, and a long, double zygomatic process (DAB).

MONARCHINAE (MONARCH FLYCATCHERS): Four genera in HANZAB region: *Monarcha*, with 26–31 species, four of which occur in HANZAB region according to most authors (Sibley & Monroe 1990; Monroe & Sibley 1993; Christidis & Boles 1994; DAB); *Arses*, with three species according to most authors (four according to DAB), two (or three according to DAB) of which occur in HANZAB region; *Myiagra*, with 15–18 species, five in HANZAB region according to most authors, but six species according to DAB; and *Grallina*, with two species, and one in HANZAB region (see below for discussion on taxonomic position of this genus). The subfamily contains a further 42–44 species, in 13 genera, extralimitally (Sibley & Monroe 1990; Monroe & Sibley 1993).

MACHAERIRHYNCHINAE (BOATBILLS): *Machaerirhynchus*, with two species, one in HANZAB region. These have a number of structural characteristics rather divergent from other subfamilies, including fully perforate nasal and orbital septa, a much narrowed palatine shelf with long, subulate trans-palatine processes with slightly swollen ends, and much reduced ectethmoid wings with vestigial lachrymals on the latero-ventral face (DAB).

Early studies placed the monarch flycatchers and fantails in the superfamily Muscicapidae, which includes Old World flycatchers and thrushes among other passerine groups (Mayr & Amadon 1951; Vaurie 1953; Wetmore 1960; Aust. CL 1926). Later studies on syringeal morphology (Ames 1975) and egg-white proteins (Sibley 1970, 1976) showed that Australo-Papuan flycatchers are not closely related to members of the Old World family Muscicapidae. Beecher (1953), in his studies of passerine cranial osteology and myology, was the first to group monarch flycatchers and drongos together, along with whistlers (Pachycephalidae) and vireos (Vireonidae), in the family Monarchidae (see DAB for further discussion). Wolters (1975–82) considered drongos as a sister family to the monarchs and fantails. Based largely on syringeal morphology, electrophoretic patterns of egg-white proteins and juvenile plumage, Boles (1979) proposed that the Australo-Papuan flycatchers, monarchs, fantails, robins, whistlers and shrike-thrushes form a monophyletic group, centred in Aust. and New Guinea, and were not related to muscicapine flycatchers.

DNA–DNA hybridization studies (Sibley & Ahlquist 1985, 1990) led to our current understanding of the taxonomic position of Australo-Papuan monarchs and flycatchers. These studies, along with those of Christidis & Schodde (1991), indicate they nevertheless form part of the corvid (not the muscicapoid) assemblage and are probably most closely related to the Aegithinidae (ioras) and Malaconotidae (bush-shrikes and allies), and within the HANZAB region to the Pachycephalidae (whistlers). DNA–DNA hybridization studies (Sibley & Ahlquist 1985) also suggest a relationship between Australo-Papuan flycatchers and their allies, and several genera of African flycatchers and monarchs, including *Erythrocerus*, *Elminia*, *Trochocercus*, *Terpsiphone*, *Clytorhynchus* and other genera. However, osteological data (Olson 1989) suggests at least some of these African genera are not monarchs.

The taxonomic position of the magpie-larks *Grallina* has been the subject of much debate. Amadon (1950) considered *Grallina* related to the other Aust. mud-nesters, the Apostlebird *Struthidea cimerea* and White-winged Cough *Corcorax melanorhamphos*, and placed them in a family Grallinidae. Beecher (1953) assigned *Grallina* to the Artamidae (butcherbirds and woodswallows). McEvey (1976) suggested *Grallina* was a linking group between the other mud-nesters and Artamidae. More recent osteological (Olson 1989) and DNA–DNA hybridization data (Sibley & Ahlquist 1985) indicate that *Grallina* is allied to the Australo-Papuan flycatchers. Based on DNA–DNA hybridization data, Sibley & Ahlquist (1985) combined the monarchs, fantails, magpie-larks and drongos as a subfamily Dicrurinae within an expanded family Corvidae. The latter authors combine *Grallina* with *Monarcha* ($\Delta T_{50}H$ 2.9) and African genera of monarchs, and they place these as a tribe Monarchini within the subfamily.

Their data also supports the inclusion of the drongos *Dicrurus* and *Chaetorhynchus* with the *Monarcha* and *Grallina* ($\Delta T_{50}H$ 5.0), and accordingly they consider drongos as a tribe Dicrurini. The fantails are a sister group to the other monarchines ($\Delta T_{50}H$ 6.1) and are considered as the tribe Rhipidurini. In the present study we follow Christidis & Boles (1994) and DAB in elevating the subfamily Dicrurinae to family status, and consider the tribes of Sibley & Ahlquist (1993) as subfamilies (as above).

Within the HANZAB region, the smallest is Mangrove Grey Fantail *Rhipidura phasiana* (length c. 14.5 cm, weight c. 7 g) and the largest is Magpie-lark *Grallina cyanoleuca* (length c. 28 cm, weight c. 85 g). The Dicruridae are characterized by (Olson 1989; DAB): Single humeral fossa that is of pachycephaloid form, except in drongos and magpie-larks, which have weakly developed ventral tubercle tuberosity and depression above it. Palate with extensive ossification of the internasal septum. In some *Myiagra* and in *Grallina* (magpie-larks), nares virtually imperforate (amphirhinal). Vomer simple and shortly bifid with cartilaginous extensions. Ectethmoid plate thin with narrowed wing and no lachrymals (except boatbills *Machaerirhynchus*). Maxillo-palatine processes dorsoventrally flat. Palatine shelf varyingly narrow with attenuate but usually round-tipped trans-palatine processes. In the Rhipidurinae (fantails) and Dicrurinae (drongos), the interorbital septum is extensively ossified. Bill typically broad (not *Grallina*), with shortly hooked tips and notched maxillary tomia. Usually have dense, well-developed rectal bristles. Ten primaries, with p10 moderately developed; nine (Rhipidurinae), nine plus a vestigial s10 (Dicrurinae, most species of Monarchinae) or ten (*Grallina*) secondaries (including tertials). Usually 12 rectrices, but Pygmy Drongo *Chaetorhynchus papuensis* has ten. Tarsal scaling laminiplantar.

Plumage of adults usually contrasting patterns of rich greys, russets, whites and glossy blacks, often with iridescent sheens (DAB). Many species sexually dimorphic in adult plumage. Juveniles often like dull versions of adults, often with pale or brownish fringes to upperwing-coverts. Post-juvenile (first pre-basic) moult usually occurs soon after fledging and is usually partial, resulting in adult-like first immature (first basic) plumage. Adults undergo a single complete post-breeding (pre-basic) moult annually. Primaries moult outward, usually starting at p1. Most species have rather long tails, and short, well-rounded wings. Fantails and some monarchs often fan or flirt tail while foraging (possibly as foraging manoeuvre); *Myiagra* flycatchers and boatbills *Machaerirhynchus* vibrate tails when perched; in drongos, tails commonly forked and twisted at tips. Feet usually rather weak.

Throughout range, predominantly birds of forested habitats, but with a few exceptions, such as Torrent-lark *Grallina bruijnii* which is found along small, rocky and swift-flowing montane forest streams of New Guinea; Fork-tailed Drongo *Dicrurus adsimilis* which inhabits mainly open country, including savanna; and Willie Wagtail *Rhipidura leucophrys* which is also often found in open country, including grasslands and forest clearings. Many species (e.g. many fantails and drongos) associate with forest edge and ecotones between forests and open habitats, or with watercourses, lakes or swamps and riparian vegetation (Sibley & Monroe 1990; Maclean 1993; Cheke & Walsh 1996; Coates *et al.* 1997). In HANZAB region, mainly associated with sclerophyll forests and woodlands, predominantly eucalypt or acacia associations, and rainforests; less often in shrublands or heath, regrowth forest, and mangrove associations; in HANZAB region, Mangrove Grey Fantail and Broad-billed Flycatcher *Myiagra ruficollis* mainly confined to mangrove associations. Some species commonly in modified habitats, e.g. Willie Wagtail and Magpie-lark both common and familiar urban birds and often also found in farmland, parklands and gardens, commonly nesting in close association with human habitation. Association with forested habitats in Aust. results in distribution largely confined to wetter forested N, E, SE and SW. However, Willie Wagtail found throughout the continent, and Magpie-lark found throughout except for arid deserts of SA-WA-NT; Grey Fantail also extends into arid inland WA-NT. Recorded from lowlands to mountains; occur from coastal lowlands to alpine uplands in Aust.; common to 1500 m asl in NZ; in New Guinea and Wallacea recorded to 3600–3900 m asl (e.g. Dimorphic Fantail *R. brachyrhyncha*, Friendly Fantail *R. albolimbata*). Clearing of forests has reduced suitable habitat for some species (Pied Monarch *Arses kaupii*, Restless Flycatcher *M. inquieta*, Rufous Fantail *R. rufifrons* and Satin Flycatcher *M. cyanoleuca*). In contrast, Magpie-lark and Willie Wagtail have benefited from clearing and agricultural development (Coates 1990; Sibley & Monroe 1990; Maclean 1993; Coates *et al.* 1997; Urban *et al.* 1997; Heather & Robertson 2000; Aust. Atlas 1, 2; DAB; see species accounts).

Most species are resident or sedentary, though some are migratory or partly migratory. In HANZAB region, many species (about half of those occurring) resident or sedentary, with some local movements or dispersion (e.g. Willie Wagtails, while largely sedentary, show some local movements to more open areas in winter). Remaining species partly or wholly migratory, with populations moving N for austral winter, mainly wintering in n. Aust., especially ne. Qld, and New Guinea, and returning to s. parts of range to breed (e.g. Leaden *Myiagra rubecula* and Satin Flycatchers, and Black-faced Monarch *Monarcha melanopsis*). However, patterns of movement can vary within some species, e.g. subspecies *allisteri* of Grey Fantail migrates from e. Aust. to WA and n. Aust., perhaps as far as New Guinea, and *preissi* moves from sw. WA, N and E in winter, while *keasti* of ne. Qld is resident or sedentary. A few species in e. Aust., particularly those occurring in se. highlands and tropical uplands, are partial altitudinal migrants, moving to lowlands, often near coasts, for autumn–winter; in NZ, Grey Fantail possibly also a partial altitudinal migrant. Readily cross water; in Aust., at least six (and probably eight) species regularly migrate across Torres Str., and Satin Flycatcher migrates across both Bass Str. and Torres Str. Extraliminally, drongos (Dicrurinae)

and boatbills (Machaerirhynchinae) generally resident or sedentary, except Crow-billed Drongo *D. annectans*, which winters in Greater Sundas after breeding in India and China, and Ashy Drongo *Dicrurus leucophaeus*, a resident and winter visitor to se. Asia, and altitudinal migrant to lowland India and Sri Lanka from Himalayan breeding grounds; several other show local movements. Fantails (Rhipidurinae) also largely sedentary or resident throughout se. Asia, Melanesia and Pacific region, but two species of Indian subcontinent show altitudinal movements. Monarch flycatchers (Monarchinae) mostly sedentary or resident, with a few migratory or partly migratory species, mainly *Terpsiphone* paradise-flycatchers extraliminally, e.g. Japanese Paradise-Flycatcher *T. atrocaudata* is migratory, breeding in Japan, Taiwan and extreme n. Philippines, and wintering in Sumatra, n. Borneo and Philippines; and African Paradise-Flycatcher *Terpsiphone viridis* partly migratory, with some populations moving towards Equator after breeding. For migratory species, birds usually occur singly or in pairs on passage, but some species observed in small flocks on passage, such as Rufous Fantail and Spangled Drongo (Britton 1980; Pratt *et al.* 1987; Coates 1990; Sibley & Monroe 1990; Maclean 1993; Coates *et al.* 1997; Robson 2000; see species accounts).

Mostly arboreal and aerial insectivores, and, with few exceptions, birds of middle and lower strata of forested habitats. However, *Grallina* predominantly ground foragers (Magpie-lark mainly in open, terrestrial habitats, and Torrent-lark in and along montane streams), and others also forage much on ground, such as Sooty Thicket-Fantail *Rhipidura threnothorax*. Mostly search for food from vantage perches, attacking by sally-striking in air or from foliage, branches or trunks of trees; some species sally-pounce to ground or sally-hover (e.g. Restless Flycatcher, Black-faced Monarch *Monarcha melanopsis*, fantails *Rhipidura* and paradise-flycatchers *Terpsiphone*), taking prey from foliage or flowers. Almost all species, especially monarchs and *Myiagra* flycatchers, also forage by flush-pursuit (though most Aust. literature does not distinguish between sallying and flush-pursuit). Some birds, especially fantails and *Elminia* flycatchers, intentionally use movements of tails and wings during foraging to flush prey (flush-pursuit) before chasing them. Some birds, such as paradise-flycatchers, follow other bird species along branches, gleaning prey that may be dislodged. In HANZAB region, two exceptions to typically flycatcher foraging: *Arses* commonly glean their food by spiralling up and round trunks of trees by foot (also typified, extraliminally, by *Erythrocerus* flycatchers, e.g. Chestnut-capped Flycatcher *E. mcallii*); and Magpie-lark, which forages primarily on ground (Coates 1990; Urban *et al.* 1997; Coates & Peckover 2001; see species accounts).

Social organization and behaviour poorly known for most species, but well known for a few in HANZAB region (Leaden Flycatcher, Grey Fantail, Willie Wagtail and Magpie-lark) and reasonably well known for some in Africa (e.g. African Paradise-Flycatcher). Usually solitary or in pairs, sometimes in small family groups. However, Grey Fantails and Willie Wagtails sometimes gather in loose congregations outside breeding season, and some species observed in small flocks on passage (see Movements summary above). Magpie-larks also sometimes form large flocks, of 100+, in winter. In most species, pair-bond monogamous and often long-term, pairs are territorial, and both sexes share parental care. At least two species in Africa, African Blue Flycatcher *Elminia longicauda* and Chestnut-capped Flycatcher, thought to be sometimes polygamous and have been recorded breeding co-operatively. In HANZAB region, co-operative breeding once recorded in Magpie-larks, and possibly once in Willie Wagtail. Most other species appear also to nest in simple pairs and share parental care between sexes; also appear to have distinctive, probably territorial, songs. Some species loosely colonial or at least show some clustering of nests (e.g. Satin Flycatcher, Spangled Drongo). Much aggression in defence of nest and young. Several species harass potential predators in fluttering, hovering flight, e.g. African Paradise-Flycatcher and Willie Wagtail. Often noisy (particularly drongos Dicrurinae) and conspicuous. Displays tend to be poorly known; and functions of several described displays are not known (such as some social displays in the monarch flycatchers, e.g. *Arses*). In HANZAB region, distraction displays recorded in Willie Wagtail, Rufous Fantail and Satin Flycatcher. In well-studied species, such as Willie Wagtail, young evicted from natal territory soon after independence, though young of migratory Rufous Fantail stay near natal territory until leaving on passage. Young of some species fully independent 4–7 weeks after fledging, but for most species period of dependence not known (Urban *et al.* 1997; DAB; see species accounts).

Dicrurids are noisy, particularly when breeding (DAB). Calls of the subfamily of monarch flycatchers (Monarchinae) are short and simple, the quality variously described as dry, grating, harsh, rasping, buzzing or scolding, with notes often rising in inflexion; the songs of *Myiagra* species have been described as a series of simple whistles, those of *Arses* species as slow rattled ringing trills, and those of *Monarcha* species as a musical jumble of loud mellow notes and fluting whistles; and *Grallina* (Magpie-lark and Torrent-lark) have loud and penetrating calls, often accompanied by conspicuous displays. Calls of the boatbills (Machaerirhynchinae) metallic or grating, and songs contain musical trills. Calls of fantails (Rhipidurinae) are simple chips, clucks and grating notes, and song is typically a weak, high-pitched but melodious phrase consisting of short clear whistles and climbing and tumbling series of shorter notes; a few species have louder and more forceful songs (e.g. Willie Wagtail). Within the drongos (Dicrurinae) vocalizations typically a mixture of harsh, scolding notes and pleasant musical whistles, and some species are good mimics (Campbell & Lack 1985; Beehler *et al.* 1986; see species accounts).

Breed solitarily. Seasonality varies geographically. In Aust. most species do not breed, or breed least often, in colder months (May–June) and a similar pattern, with birds breeding mostly in spring and summer, is followed in n. hemisphere. In tropical regions, birds may breed throughout year, e.g. in PNG, Willie Wagtail lays in all months,

while in Aust. eggs recorded only July–Feb. Usually nest in trees, shrubs or vines, on horizontal branches or in vertical or horizontal forks, though Frilled Monarch *Arses telescopthalmus* often builds between two parallel vertical hanging vines. Some species (e.g. Magpie-lark, Willie Wagtail, Grey Fantail) also build on and within assorted artificial structures. Usually show some evidence of site-fidelity, and some species show quite strong associations with other species, often others members of the family, e.g. Magpie-lark with Willie Wagtail. Build open nests: variously shallow, saucer, basket, basin or hammock-shaped in Yellow-breasted Boatbill *Machaerirhynchus flaviventer*, drongos *Dicrurus* and Frilled and Fantail *Monarcha axillaris* Monarchs, but cup-shaped in most other species; fantails often add tail to cup, making nest appear like a wine glass without a base. Nests usually made of plant material, sometimes with animal hair or spider web. In contrast, nests of Magpie-lark and Torrent-lark of New Guinea cup or bowl-shaped but often made of mud. Rarely, nests of Willie Wagtail also made of mud. Nests usually lined with soft or springy materials such as vine tendrils, hair, feathers, or soft plant material. Usually both sexes build, though on occasions workload may be shared unevenly, with female usually contributing more; in Yellow-breasted Boatbill, thought that males do all or most nest construction. Nest takes from <1 week to 6 weeks to build. Eggs vary in shape, but usually oval, elongate oval or swollen oval; also usually smooth and slightly lustrous. Ground-colour typically pale, from various shades of white (pure or creamy white, reddish, pinkish, yellowish, bluish or greenish white) to creamy brown or light buff, and, in Magpie-Lark, to rich buffy-red or reddish-buff; eggs of Ashy Drongos also quite dark. Eggs have various combinations of darker markings, sometimes mostly at, or forming a zone or band near, large end. Within the family, eggs of Grey and Mangrove Grey Fantails rather small (14–17 × 10–13 mm), ranging to large in Spangled Drongo and Magpie-lark (26–33 × 18–22); this range probably covers that of most extralimital species, though there is little data for many species (such as New Ireland Drongo *Dicrurus megarhynchus*). Clutch-size is one to four in most smaller species, but usually two or three in rest; apparently always two in Yellow-breasted Boatbill and Spectacled Monarch *Monarcha trivirgatus albiventris*; up to five in drongos (Ali & Ripley 1972a) and possibly six in Grey Fantail in NZ and Magpie-lark; Torrent-lark usually lays single egg, as does Silktail *Lamprolia victoriae* of Fiji. Laying interval usually c. 24 h, occasionally 48 h. Single- or multiple-brooded: in Aust., Willie Wagtails, Grey Fantails and Magpie-larks known to rear up to four or five broods in a season, Restless Flycatchers up to three, Satin and Leaden Flycatchers, Rufous and Northern Fantails two, and Yellow-breasted Boatbill, monarchs and Shining and Broad-billed Flycatchers only one. Both parents usually incubate, though sexes may not contribute equally, and in Spectacled Monarch, females incubate and are fed by males. Incubation period 12–19 days. Both parents feed nestlings; faecal sacs removed till late in nestling period; may perform distraction displays in defence of young. Both sexes also feed fledgelings, though broods sometimes divided; young usually fully independent 4–7 weeks after fledging. Fledging period usually 11–18 days in smaller species (fantails, flycatchers); 17–20 days in Spectacled Monarch; and 17–24 days in larger species (Spangled Drongo, Magpie-lark). In Aust., success varies: Willie Wagtail had most data in NRS (success data for 3091 eggs, in 1069 nests) and averaged 0.93 fledged young/nest; success in other species sometimes similar (e.g. Restless Flycatcher 0.97, Magpie-Lark 1.05), rarely higher (e.g. Spangled Drongo 1.25) and often substantially lower (e.g. Grey Fantail 0.46, Rufous Fantail 0.32, Leaden Flycatcher 0.24, Black-faced Monarch 0.10). Causes of failure include: extreme weather conditions, including heatwaves, drought, and cold, wet or windy weather; interference from people (some species desert nest readily); and cuckoos. Predators include Cats, rats *Rattus*, and other mammalian predators; rarely, lizards and snakes; and range of avian predators, including kookaburras *Dacelo*, crows and ravens *Corvus*, currawongs *Strepera* and butcherbirds *Cracticus* and various birds of prey (Ali & Ripley 1972a,b; Watling 1982; Coates 1990; Roberts 1992; see species accounts).

Some 21 species globally threatened, many of which are endemic island forms, e.g. Flores Monarch *Monarcha sacerdotum* confined to w. Flores, and White-tipped Monarch *M. everetti* restricted to island of Tanahjampea, between Sulawesi and Flores, in Wallacea (White & Bruce 1986; Coates *et al.* 1997); five considered critically endangered, including Caerulean Paradise-Flycatcher *Eutrichomyias rowleyi* of n. Sulawesi, and Black-chinned Monarch *Monarcha boanensis* of s. Moluccas; six species endangered, ten vulnerable and 18 near threatened (Stattersfield & Capper 2000). Most are threatened by degradation or fragmentation of habitat, both through deforestation for agriculture or logging, or by recurrent cyclonic activity, which has allowed spread of invasive weeds. Populations of some island species, e.g. Elepaio *Chasiempis sandwichensis* and Tahiti Monarch *Pomarea nigra*, are threatened by predation by Black Rats *Rattus rattus* (Stattersfield & Capper 2000). In HANZAB region, Lord Howe Island Grey Fantail *Rhipidura fuliginosa cervina* extinct, owing to predation by Black Rats, and Norfolk Island Fantail *R.f. pelzelni* considered vulnerable; five other taxa considered near threatened (Garnett & Crowley 2000).

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Platyrynchos cyanoleucus Vieillot, 1818, *Nouv. Dict. Hist. Nat., Nouv. Éd., Paris* 27: 11 — Timor = Sydney, New South Wales.

The specific name refers to the blue-black head and upperparts and snowy-white underparts of the male (Greek κύανος, dark blue, and λευκός, white).

OTHER ENGLISH NAMES Shining Flycatcher, Satin Monarch, Satin or Shining Sparrow.

MONOTYPIC

FIELD IDENTIFICATION Length 17.5 cm (16.5–18); wingspan 23 cm (20–25); weight 17 g. Typical *Myiagra*, with upright posture and short erectile crest, and distinctive habit of quivering tail when perched. Very similar in shape and proportion to, but much larger than, Leaden Flycatcher *Myiagra rubecula*; also similar to Broad-billed Flycatcher *M. ruficollis* but with proportionately slightly shorter legs and slightly shorter and less strongly graduated tail (more square-cut at tip when spread) and, when viewed from below, bill appears triangular with straight sides (cf. strongly bowed outline of bill in Broad-billed). Sexes differ strongly in plumage in adults and some second immatures, but alike (and similar to females) in juveniles and first immatures, and roughly intermediate in appearance between adult male and female in some second immature males. Pattern of plumage very similar to that of Leaden Flycatcher. Adult male handsome, glossy blue-black on head, neck, breast and upperparts, and otherwise white below, with diagnostic blackish undertail and concave line of demarcation between breast and belly. Adult female, dark blue-grey above, with glossier cap and slightly browner wings and tail, and white below, with contrasting grey undertail and rich brownish-orange chin, throat and breast. No seasonal variation. Juvenile similar to adult female but browner and diffusely streaked whitish above, with prominent pale wing-bars; and chin, throat and breast paler, buff, and heavily barred dusky. First immature like adult female but with duller, less glossy head and neck, and retained juvenile secondary upper-wing-coverts. Some second immature males separable from adult male by having patchy glossy blue-black feathering with otherwise female-like brownish-orange chin, throat and breast. **Adult male** Head, neck, breast and upperparts, glossy blue-black, with contrasting black lores and slightly duller black-brown remiges. Belly with undertail-coverts, white, with white of belly extending farther up onto centre of breast than at sides, producing diagnostic concave line of demarcation between dark breast and white belly. Have diagnostic blackish undertail, contrasting strongly with white abdomen. Underwing mostly dark grey, merging to whitish on secondary coverts. Bill varies: dark blue-grey with black tip and tomia; or with mostly black or grey-black upper mandible, with dark

blue-grey restricted to basal third; viewed from directly below, bill appears triangular, with straight sides converging evenly from broad base to tip. Iris, black-brown. Legs and feet, dark grey or grey-black, with paler grey soles. **Adult female** Top of head, hindneck and sides of neck, glossy dark blue-grey, forming neat cap that contrasts noticeably with duller dark blue-grey of rest of upperbody, and with duller dark blue-grey or grey-black lores and ear-coverts, which usually combine to form suggestion of contrasting dark mask; in some, lores diffusely paler, greyish; narrow broken white eye-ring obvious round bottom half of eye but indistinct above. Dark lores and ear-coverts sharply demarcated from rich brownish-orange chin and throat, which often appear more intensely coloured in centre, and grade to slightly paler on chin; blue-grey of upper sides of neck protrudes as short narrow spur into brownish-orange lower sides of throat. Uppertail, dark brown (becoming browner with wear) with rectrices faintly edged greyer, and outermost pair finely though noticeably edged off-white. Folded wing, dark brown, with: smaller second-ary coverts, dark blue-grey, as upperbody; greater secondary coverts tinged greyish, with indistinct narrow light-brown fringes (soon wearing paler greyish); and tertials and second-aries have fine off-white edges, forming diffuse pale secondary panel; remiges and greater coverts become noticeably browner with wear, increasing contrast with blue-grey saddle, but retaining pale secondary panel. Underbody, white, with: brownish-orange of chin and throat extending onto breast and appearing sharply demarcated from white of belly in straight line across lower breast, roughly level with carpals; grey of flanks usually hidden by folded wing; and grey undertail noticeably paler and greyer than on male, but still contrasts noticeably with white abdomen; on closed undertail, note narrow off-white edge to outermost pair of rectrices (covering half width of outer web) with tips of rectrices closely bunched at tip of tail. Underwing similar to male except secondary coverts slightly duller, off-white or buff-white. Bare parts as male. **Juvenile** Broadly similar to adult female, from which differ by: Top and sides of head and neck, dark brown, with contrasting blackish loreal stripe; some have hint of, or prominent, diffuse pale grey-brown or pale-greyish patch running back from above eye, and

broadening and curving down onto ear-coverts. Upperbody and uppertail, dark brown, with narrow diffuse off-white streaking on mantle, back, scapulars and rump, and which extends faintly onto hindneck; streaking also tends to be broader and whiter on scapulars, where it aligns to form prominent broad pale scapular lines above folded wing. On folded wing, tertials and secondaries have much more prominent narrow light-brown edges, forming obvious light-brown (not whitish) secondary panel; median coverts have narrow off-white tips, forming prominent whitish wing-bar; and greater coverts have more prominent narrow light-brown fringes, merging to off-white at tips and forming obvious narrow buffish wing-bar. Chin, throat and upper breast much paler and duller, pink-buff, grading to cream on lower breast, with lower border of breast appearing more diffuse and grading into white of belly; chin and throat finely barred dark brown, grading into zone of broader and bolder barring on breast, then grading finer and petering out on white upper belly. On closed undertail, note pointed tips of rectrices (cf. square-ended in adult). Feathering of body also has softer, looser texture than in adult. Bill more uniform and darker than in adult female, dark grey or brownish, merging to more prominent pale area on basal half of lower mandible, obvious when seen from below; and have prominent pale gape. **First immature** Very similar to adult female but retain juvenile remiges, rectrices and greater primary and most greater secondary coverts on upperwing. Best distinguished (when not too worn) by combination of: (1) obvious narrow buffish wing-bar across tips of greater secondary coverts; (2) light-brown (not whitish) secondary panel; (3) duller, less glossy and contrasting cap; (4) much more pointed tips of rectrices (as visible on closed undertail); and (5) bare parts: blackish bill has prominent pale yellow-brown base to lower mandible; yellowish gape; and yellowish (not greyish) soles of feet. **Second immature** All females inseparable from adult male by having top of head and upperparts as adult male, but underbody like adult female, though with scattered blackish feathering within brownish-orange chin, throat and breast.

Similar species Often confused with **Leaden Flycatcher**, from which best distinguished by combination of following characters: **ADULT MALE**: (1) Much darker glossy blue-black head, neck, breast and upperparts (Leaden is paler dark blue-grey, with more contrasting blackish lores); (2) seen perched front-on, line of demarcation between blue-black breast and white belly appears gently concave, not convex as in Leaden; (3) much darker blackish undertail contrasts more strongly with white abdomen and appears much darker than dark brown-grey undertail of adult female (undertail of Leaden much paler, grey, and similar to that of female Leaden); (4) folded remiges and tertials are blackish with indistinct glossy blue-black edges, and appear concolorous with rest of upperparts (in fresh plumage, most Leadens have narrow white edges to remiges and tertials, forming fairly obvious diffuse whitish secondary panel on folded wing, though panel duller grey-white in some and lacking in others, and much less obvious in worn plumage); (5) if seen together, Satin noticeably larger; and (6) calls: very similar to Leaden, but with experience can be distinguished by their generally more strident quality (see Voice). **ADULT FEMALE**: (1) Noticeably darker blue-grey upperparts (Leaden is distinctly paler, more bluish grey above); (2) diagnostic glossy blue-black cap, giving obvious contrast with dark blue-grey mantle and rest of upperbody (lacking in Leaden, which has markedly paler, blue-grey and mat top of head and neck, merging into, and appearing barely any brighter than, rest of upperbody); (3) lores and ear-coverts tend to appear slightly darker, more grey-black than rest of head, often giving Satin effect of a contrasting dark mask (usually lacking in Leaden, on which lores and ear-coverts

typically appear more or less concolorous with top of head); and (4) size and call differences, as for adult male. **JUVENILES** of the two species are very similar, but their identity is usually established by attending parents. Characters for separation in field little studied, though Satin appears to have much warmer light-brown panel in secondaries (much paler, buff-white in Leaden). **FIRST IMMATURE** best separated by characters given for adult females. Patchy **SECOND IMMATURE MALES** readily distinguished from female-plumaged Leaden by their much darker glossy blue-black upperparts and patches of same colour within chin, throat and breast. Females, juveniles and immatures easily confused with **Broad-billed Flycatcher**; see that text for details. See also comments under **Restless Flycatcher** *Myiagra inquieta* and **Willie Wagtail** *Rhipidura leucophrys*.

Occur singly or in loose pairs and occasionally in small parties of three or four. Lively, active and noisy; usually seen high in canopy and subcanopy of taller forested habitats, where forage by making short dashing sallies from perch to capture insects in air, or dart from branch to branch to snatch insects from foliage, trunks or branches of trees or, rarely, ground. Almost continually on the move and never still: on alighting, sometimes wag tail rapidly from side to side, but more usually quiver tail rapidly up and down, raise crest and call loudly. Strong repeated upslurred piping, whistling *choo-ee*, *choo-ee* or *wu-chee*, *wu-chee* and associated clear, high-pitched *weir-to-weir-to-weir*, or *thurp*, *pewit pewit pewit*, characteristic; other calls include a guttural oft-repeated *zhurp* or *bzzurt*.

HABITAT Mainly inhabit eucalypt forests, particularly wet sclerophyll forest, and often in gullies or near watercourses or other wetlands (Officer 1969; Loyn 1985b; Mason 1985; Rich 1998; Chapman 2003; Aust. Atlas 1; Vic. Atlas; ACT Atlas). Also occur in eucalypt woodlands with open understorey and grassy ground-cover. Generally absent from rainforest (see below). In se. Aust., occur at elevations of up to 1400 m asl (Osborne & Green 1992; Vic. Atlas); in ACT, mainly occur between 800 m asl and treeline (ACT Atlas). Usually occur in moister and taller forests, at higher altitudes, than Leaden Flycatcher (Frith 1969; Chapman 2003; ACT Atlas).

BREEDING SEASON: SE. AUST.: Mainly recorded in wet sclerophyll forests dominated by eucalypts, usually with tall shrubby understorey of tall acacias (such as Blackwood), tea-trees and tree-ferns (Sharland 1958; Lamm *et al.* 1963; Ridpath & Moreau 1966; Disney & Stokes 1976; ACT Atlas), including forests dominated by Brown Barrel, Mountain Gum, Mountain Grey Gum, Narrow-leaved Peppermint, Messmate or Manna Gum, or occasionally Mountain Ash (Driscoll 1977; Loyn 1985a, 1993; Mac Nally 1997; Vic. Atlas; G.A. Carpenter). Also occur in moist and wet sclerophyll Black Sallee woodlands at higher altitudes in Vic. (Vic. Atlas). Sometimes also occur in dry sclerophyll forests and woodlands, also usually dominated by eucalypts and usually with open understorey (Emison & Porter 1978; Morris *et al.* 1981; Smith 1984), such as forests and woodlands dominated by Blakely's Red Gum, Mugga, Yellow Box, White Box, Manna Gum, or stringybarks, including Red Stringybark and Broad-leaved Stringybark (Ford & Bell 1981; Mason 1985; Loyn 1993; Traill *et al.* 1996; Rich 1998). In Tas. recorded occasionally in dry sclerophyll forest with a shrubby understorey and sparse ground-cover; dominant eucalypts include Messmate, Alpine Ash, Mountain Gum and White Peppermint *Eucalyptus pulchella*. Generally absent from nearby logged areas of dry sclerophyll forest (Taylor *et al.* 1977; Dickinson *et al.* 1986; Taylor & Haseler 1995). In far se. SA, where few records, breeds in open forest of Manna Gum and Brown Stringybark with understorey of Blackwood and Bracken, and only recorded in other habitats as a non-breeding visitor (Reid & Cox 1978; G.A. Carpenter). Occasionally recorded in thickets of paperbarks (Newman *et al.* 1984);

dense coastal scrub, or low forest, and heathland (Officer 1969; Smith 1984; NSW Bird Rep. 1982). In se. Tas. recorded in dense riparian vegetation dominated by acacia with an understorey of smaller shrubs and sedges (Dickinson *et al.* 1986). Rarely occur in rainforests of se. Aust. (Smith 1984; Aust. Atlas 1), but occasionally recorded in cool-temperate rainforest in Tas. (Anon. 1977). **NE. QLD:** In Paluma Ra. a few birds appear to remain in the dense rainforest where breeding has been recorded by three pairs (Chapman 2003). **SE. QLD:** Breeding status of species in this region now doubted (Chapman 2003; H.A. Nix); female recorded in Nov. in open woodland dominated by eucalypt and *Angophora* (Noyce 1997); uncommon summer visitor to coastal thickets and open forest (Roberts 1979).

NON-BREEDING AND ON PASSAGE: Occur in most wooded habitats including parks and gardens (Boles). In se. Qld, autumn and spring passage migrants recorded in woodlands with dominants including White Gum *Eucalyptus alba*, Bimble Box, Queensland Grey Ironbark *E. drepanophylla*, tea-tree and Brigalow (Longmore 1978); single bird recorded in Brigalow shrubland was probably on passage (Leach & Hines 1987); occasionally wintering birds recorded in well-vegetated Brisbane suburb <1 km from open eucalypt forest (Catterall *et al.* 1991). In ne. Qld, wintering birds recorded at edges of tropical rainforest and in gallery rainforest mixed with riparian species and colonizing species from adjacent disturbed areas (Johnson & Mighell 1999), also in rainforest dominated by Banyan *Ficus virens* (Wheeler 1967); in Paluma Ra. passage migrants recorded mainly in Sarsaparilla *Alphitonia petriei* along roads in rainforest or in Paluma township (Griffin 1995); birds may occasionally winter in or pass through mangroves and paperbark swamps from Innisfail northward (Storr 1973; Wieneke 1992; Chapman 2003; Storr 19). In ACT, birds on passage may be seen in a variety of lowland habitats including suburban parks and gardens, woodland and savanna (ACT Atlas) and wet sclerophyll forest (Lamm *et al.* 1963). In Vic., birds on passage sometimes occur in riparian River Red Gum associations and gardens (Vic. Atlas); and in uplands of E. Gippsland, birds recorded in pasture with scattered eucalypts and in open forest and woodland, surveyed on dates between early Feb. and mid-Mar., probably on passage (Emison & Porter 1978); also in lowland and damp sclerophyll forest (Loyn 1993), and a range of forest types (Loyn 1980). In SA, mostly recorded in eucalypt mallee dense shrubland or woodland or mixed eucalypt–Moonah *Melaleuca lanceolata* mallee shrubland with understorey of heathy shrubs (Carpenter 1985; Guy 1991; Baxter 1998); e.g. summer vagrant on Kangaroo I. in dense mallee shrubland of Soap Mallee *Eucalyptus diversifolia*, Kingscote Mallee *E. rugosa*, Crimson Mallee *E. lansdowneana*, Giant Mallee and Moonah with an understorey of shrubs and ground-cover dominated by lilies and irises, e.g. Morning Flag *Orthrosanthus multiflorus* and Black-anther Flax Lily *Dianella revoluta* (Baxter 1998). In Tas., migratory visitor once recorded in an orchard (Fielding 1979).

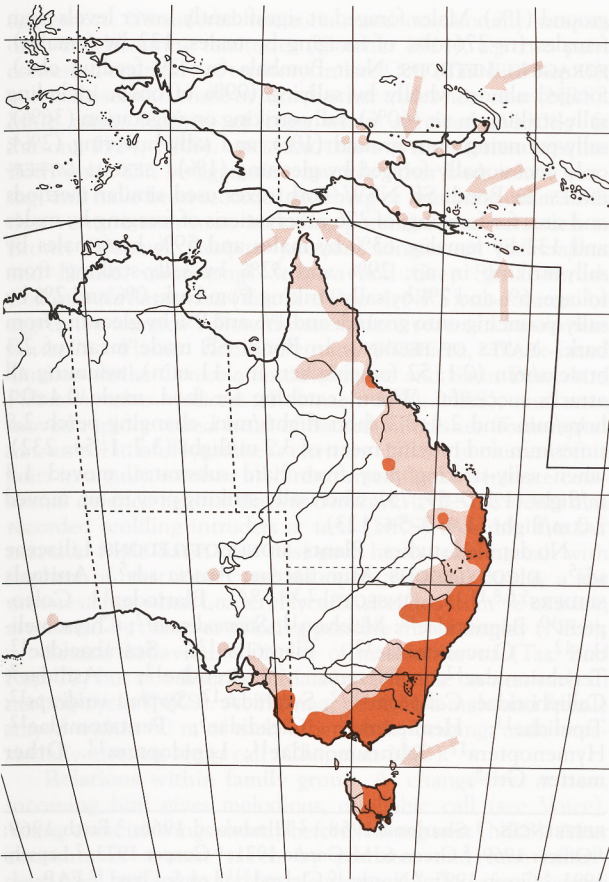
DISTRIBUTION AND POPULATION Recorded at many scattered sites in New Guinea and on offshore islands, including Bismarck, D'Entrecasteaux and Louisiade Archs (Coates 1990). Widespread in e. Aust.; vagrant to NZ.

Aust. Qld Widespread but scattered in E, mainly on passage or during non-breeding periods (see below; see also Movements), though a few claims of breeding in NE, central-E, and in SE (see Breeding, below). Recorded on passage on a few islands in w. Torres Str., and patchily recorded on C. York Pen., from C. York S to line from Aurukun to Coen. More widespread farther S, though still scattered, from Musgrave Stn S to c. 24°S, mostly in coastal areas but also on Great Divide, and occasionally farther W, e.g. in area between Cape R., W of L. Dalrymple, and site near Rolleston; and near

Croydon (Aust. Atlas 1, 2). Unconfirmed report, either of this species or Leaden Flycatcher, much farther W, at Camerons Tank, Idalia NP (Sharp & Sewell 1995). Widespread in South-East Region, in area from Fraser I. W to Goombi and S to NSW border (Aust. Atlas 1, 2). **NSW** Widespread on and E of Great Divide, though sparsely scattered on w. slopes, with very occasional records farther W on w. plains, especially in North-West Plain Region; occur W to line joining site SE of Mungindi, Gulargambone, L. Cowal, Temora and Rand (Morris *et al.* 1981; Cooper & McAllan 1995; Aust. Atlas 1, 2; NSW Bird Reps) with recent record farther W in Riverina, 40 km E of Deniliquin, 14 Oct. 1995 (NSW Bird Rep. 1995). **Vic.** Widespread in S and E, in area S of line joining Numurkah, Maldon, n. Grampians, Balmoral and Nelson, though, within this range, sparsely scattered on w. plains. Farther N, very occasionally recorded at a few scattered sites in Little Desert (Aust. Atlas 1, 2; Vic. Atlas). **Tas.** Regular breeding visitor. Occur on islands in Bass Str., e.g. Albatross I. (Brothers & Davis 1985), King I. (Green 1971; Thomas 1979; Aust. Atlas 1, 2) and Furneaux Grp (Green 1969; Thomas 1979; Newman *et al.* 1984; Aust. Atlas 1). On Tas. mainland, widespread in E, mostly W to line joining Ulverstone and South Cape (Thomas 1979; Aust. Atlas 1, 2; Tas. Bird Reps), though recorded farther W along n. coast and in NW (Aust. Atlas 1, 2; Tas. Bird Reps); very occasionally recorded at scattered sites near w. coast, e.g. Temma, Strahan and Port Davey (Rounsevell 1980; White 1985; Aust. Atlas 1; Tas. Bird Reps). **SA** Occasionally recorded. Most records in Lower South-East, occasionally as far N as Naracoorte (Reid & Cox 1978; Glover 1983b; Aust. Atlas 1, 2; SA Bird Reps). Six records at scattered sites in area from Langhorne Ck, W to e. Kangaroo I. and N to Sandy Ck CP (all singles unless stated): Langhorne Ck, 29 Mar. 1964 (Condon 1965); Horsnell Gully NP, 17 Jan. 1970 (Anon. 1970); Sandy Ck CP, June 1983 (Glover 1983b); two, C. Willoughby, Kangaroo I., 12 Apr. 1991 (Carpenter 1991); Eagle on the Hill CP, 20 Mar. 1993 (Rich 1998); and Vivonne Bay, Kangaroo I., 12 Jan. 1998 (Baxter 1998). Also recorded farther afield: 13 km E of Kimba, Eyre Pen., 16 Dec. 1984 (Carpenter 1985); in n. Mt Lofty Ras, near Burra, 29 Nov. 2000 (Aust. Atlas 2); and, in North-East Region, at Marree, 18 Feb. 1983 (Eckert 1987) and Billa Kalina Bore, 18–19 Mar. 1983 (Glover 1983a). Several unconfirmed reports of females or immatures, probably of this species, from widely scattered sites, near Naracoorte, in Mt Lofty Ras, Arkaroola, Purni Bore and Victory Well in Everard Ras (Attiwill 1976; Glover 1976; Shurcliff 1977; Reid & Cox 1978; Badman 1979; Glover 1983b; SA Bird Rep. 1966–67). **WA** Vagrant. Single specimen, Twilight Cove, 12 Apr. 1973 (Brooker 1974). **NT** No properly authenticated records (Chapman 2003). Unconfirmed or doubtful reports from Butterfly Gorge, S of Darwin (Goodfellow 2001) and Kakadu NP, including Anbangbang Billabong, Aug. 1991 (Andrew & Eades 1991; Goodfellow 2001; Boles) and not acceptable currently (see Chapman 2003).

NZ Vagrant. **NI** Single, Gisborne, 12 June 1963 (Blackburn 1963). **SI** Single (dead), Motueka, Dec. 1988 (Heather & Robertson 1997); single, Okarito, Mar. 1992 (CSN 41).

Breeding All reports in Qld currently considered doubtful (Aust. Atlas 2), or at least those of se. and central Qld (Chapman 2003; G.S. Chapman), which had previously been accepted in Aust. Atlas 1. Reports of breeding in Qld include: a few N of 25°S, at Abattoir Swamp, near Mt Molloy, Nov. 2000 (Aust. Atlas 2), in Paluma Ra., Dec. 1984 (Chapman 2003), at Jourama Falls, near Ingham, Dec. 1997 (NRS), and at Wallaman Falls, near Ingham, Nov. 1991 (Chapman 2003); in central-e. Qld, at Rubyvale, between Sept. 1977 and Feb. 1978 (Aust. Atlas 1); and in SE, from near Childers to Qld–NSW border (nine records in Aust. Atlas 1). Breeding widespread throughout most of range from ne. NSW, inland to



Warrumbungle NP, S and SW to Mt Burr and Tantanoola in se. SA, and throughout e. half of Tas. (Aust. Atlas 1; NRS).

Populations RECORDED DENSITIES: 0.08 birds/ha, near Armidale, NSW (Ford & Bell 1981); 1.25 birds/ha, near Bathurst, NSW (Disney & Stokes 1976); 0.43–0.66 birds/ha, Bondi SE, near Bombala, NSW (Recher & Holmes 1985); 0.2–0.5 birds/ha, Bombala, NSW (Aust. Atlas 1); maximum of 0.23 birds/ha, Olinda SE, Vic. (Mac Nally 1997); 0.25 birds/ha, near Campbell Town, Tas. (Recher *et al.* 1971); 0.01–0.18 birds/ha, near Woodsdale, Tas. (Taylor *et al.* 1997); and 0.2–0.4 birds/ha, Maria I., Tas. (Aust. Atlas 1).

Change in range, populations Said to have become increasingly common in Tas. in late 1940s and early 1950s, with records in areas where not previously recorded (Sharland 1952).

THREATS AND HUMAN INTERACTIONS Populations reduced by clearing and logging of forests in se. Aust. (Aust. Atlas 1): occur mainly in mature forests, and largely absent from regrowth forests (Loyn 1980; Loyn 1985a; Taylor *et al.* 1997; see Habitat); in Gippsland mostly in mature forest or edge of gullies, not recorded in regrowth forest, including regrowth aged 70 yrs (Loyn 1980); in Mountain Ash forest mainly in stands 50–100 years old, or older where canopy remains continuous, rarely in retained trees or harvested areas (Loyn 1985a); in dry sclerophyll forest near Woodsdale, se. Tas., appeared not to have recolonized regrowth up to 12 yrs old (Taylor *et al.* 1997).

MOVEMENTS Migratory, with strong evidence for e.-coastal pattern of movement (Griffioen & Clarke 2002; also see below); breed se. mainland Aust. and Tas. in spring–summer then migrate N in autumn, wintering in n. Aust., s. New Guinea and Bismarck Arch.; return to se. Aust. in spring.

Almost entirely absent from se. mainland Aust. and Tas. in winter; reporting rates 7.8% and 13.6% respectively, in summer, and 0.3% and 0.3% in winter (Aust. Atlas 1; see below). Appear to migrate along Great Divide (Gilbert 1935; Hindwood & McGill 1958; Officer 1969) with some coastal movement in NSW (Serventy 1944; Hoskin 1991). However, some individuals deviate widely, at least on n. migration (see Departure below). **NATURE OF PASSAGE:** Described as inconspicuous when on passage, possibly because birds move singly, in pairs or small loose groups through tree-tops; possibly also move at night (Aust. Atlas 1). Vagrant near Gisborne, NZ, probably ship-assisted (Blackburn 1963).

Breeding Breed spring–summer in se. Aust., between se. Qld and far-se. SA and in Tas., with some breeding in ne. Qld (see Distribution, and below). Some site-fidelity suggested (but birds not banded and nature of individual behaviour not certain): in Emerald and Gembrook districts, Vic., birds return to same area each year to breed (Twaits 1998a), and elsewhere in Dandenong Ras, pair bred in same tree for three consecutive years (Howe 1928), though not known if same birds involved.

Some non-breeding birds remain s. New Guinea and Bismarck Arch. through summer (Coates 1990).

Departure Leave se. Aust. from Feb. to Apr., apparently slightly earlier in s. parts of breeding range than in N. However, recorded on n. passage in Torres Str. as early as Feb. (see below). **TAS.:** Leave Feb.–Mar. (Sharland & Crane 1922; Campbell 1938; Dove 1939; Green 1977). **VIC.:** Mainly leave Feb.–Mar. (Howe 1928; Officer 1958; Hore-Lacy 1964; Bedgood 1972, 1980; Cooper 1974, 1975a,b; Loyn 1980, 1985a,b; Conole 1981; Burbidge 1982; Thomas & Wheeler 1983; Anon. 1989, 1992; Schulz 1991; Traill *et al.* 1996; Twaits 1998a,b), a few remaining Apr. (Vic. Atlas; Aust. Atlas 2). Birds seen on n. passage at Wilsons Prom. (Cooper 1974, 1975a,b) assumed to be from Tas. **ACT:** Leave autumn, mainly Mar., with a few in Apr.–May (ACT Atlas); probably leave Brindabella Ra. mid-Feb. (Lamm & Wilson 1966). **NSW:** Leave Feb.–Mar. (Austin 1907; Gilbert 1935; Frith 1969; Heron 1973; Morris 1975; Gibson 1977; Gall & Longmore 1978; Morris *et al.* 1981; Jordan 1984, 1987, 1988; Smith 1984; Recher & Holmes 1985; Ford *et al.* 1986; Leishman 1994; Egan *et al.* 1997; Morris 2001; NSW Bird Reps). Most records in Sydney region are of birds on passage, with n. movement Feb.–Apr.; earliest record 2 Feb. (Serventy 1944; Hindwood & McGill 1958; Hoskin 1991; NSW Bird Reps). After breeding, some move towards coast on n. migration, Feb.–Apr. (Hoskin 1991). **SE. QLD:** Leave in Apr. (Lord 1933; Longmore 1978; Roberts 1979; Templeton 1992; Durrant & MacRae 1994; Bielewicz & Bielewicz 1996), but recorded on n. passage Feb. to early May (Storr 1973; Storr 19), e.g. on passage in Lamington NP, Mar.–Apr. (Nielsen 1991). **CENTRAL AND N. QLD:** Recorded on passage on Magnetic I. in May (Wieneke 1988). Passage migrant in small numbers in Torres Str., mostly on islands in W (Draffan *et al.* 1983), including Waraber I., mid-Feb. to early Mar. (Drake 1979).

During n. migration, some deviate widely from normal route, e.g. many vagrants in SA (outside far SE) in late summer–autumn or winter; single record in s. WA, at Twilight Cove, Apr.; and recorded NZ in Dec., Mar. and June (see Distribution).

Non-breeding Some winter in n. Qld, round Innisfail and farther N (Gill 1970; Palliser 1985; Wieneke 1992; Storr 19). On Atherton Tableland, said to be present Feb.–Nov., though movements described as erratic (Bravery 1970), *contra* claim that present throughout year (Bourke & Austin 1947). Several records during winter in ne. Vic. (Campbell 1902). However, largely absent from se. Aust.; of 1300 records in Aust. Atlas 2 from NSW, Vic., Tas. and SA, only five (0.38%) in winter (Aust. Atlas 2).

Mostly winter in s. New Guinea and Bismarck Arch., Mar.–Oct. (Keast 1958; Rand & Gilliard 1967; Beehler *et al.* 1986; Coates 1990; Aust. Atlas 1). Possibly mainly transitory in area from Fly R. to Port Moresby, where recorded only between Mar. and mid-Apr., and Aug.–Oct.; winter on n. side of central range, late Mar. and May–July (Coates 1990). **Return** Move S from late Aug. to Nov., arriving earlier in n. parts of breeding range than in SE. **QLD:** Return or s. passage recorded late Aug. to Nov., with most moving along coast (Storr 1973; Wieneke 1988; Nielsen 1991; Griffin 1995; Storr 19). At Paluma, ne. Qld, arrive annually around late Sept. to early Oct. and seen for about 2 weeks, with a few remaining and at least occasionally breeding (Chapman 2003). Mostly arrive se. Qld in Sept. (Lord 1933; Longmore 1978; Roberts 1979; Templeton 1992; Durrant & MacRae 1994; Bielewicz & Bielewicz 1996). **NSW:** Arrive or recorded on passage Sept.–Oct. (Austin 1907; Gilbert 1935; Frith 1969; Heron 1973; Morris 1975; Gibson 1977; Gall & Longmore 1978; Morris *et al.* 1981; Jordan 1984, 1987, 1988; Smith 1984; Recher & Holmes 1985; Ford *et al.* 1986; Leishman 1994; Egan *et al.* 1997; NSW Bird Reps); arrive Wollombi 10–20 Oct. (NSW Bird Reps 1977, 1978), Warrumbungle NP 10 Oct. (NSW Bird Rep. 1975, 1977), Sydney Region 15 Oct.–1 Nov. (NSW Bird Reps 1975, 1976, 1980, 1993). Most records in Sydney region are of birds on passage, with s. passage mostly between 26 Sept. and 30 Nov. (Serventy 1944; Hoskin 1991; NSW Bird Reps). **ACT:** Arrive Oct., most appearing more or less simultaneously (Lamm & Wilson 1966; Frith 1969; ACT Atlas). **VIC.:** Arrive Oct.–Nov. (Howe 1928; Officer 1958; Hore-Lacy 1964; Bedgood 1972, 1980; Cooper 1974, 1975a,b; Loyn 1980, 1985a,b; Conole 1981; Burbidge 1982; Thomas & Wheeler 1983; Anon. 1989, 1992; Schulz 1991; Traill *et al.* 1996; Twaits 1998a,b; Vic. Atlas). Migrate across Bass Str.; recorded on s. passage at Wilsons Prom. (Cooper 1974, 1975a,b); and on King I. in summer (Green & McGarvie 1971). **TAS.:** Arrive about Oct. (Sharland & Crane 1922; Sharland 1924, 1958; Dove 1928, 1939; Campbell 1938; Hinsby 1954; Green & Mollison 1961; Ridpath & Moreau 1966; Napier 1969; Cooper 1975a,b; Green 1977; 1995; Ratkowsky & Ratkowsky 1978; Fielding 1979; Hird 1995). On Black Pyramid, off nw. Tas., appeared to be on passage, in semi-exhausted state, in Nov. (Green & Macdonald 1963).

Banding Of 173 banded in Aust. and New Guinea, 1953–2001, six recoveries (3.5%). One recovery, July 1984–Aug. 2001, <10 km from banding site (ABBBS). (Individual studies involving small numbers: Leishman [1994], and Tidemann *et al.* [1988].)

FOOD Arthropods, mainly insects; seeds reported occasionally. **Behaviour** Poorly known. Primarily arboreal but very occasionally forage on ground; forage high in trees, in canopy and subcanopy, flitting from one perch to another, constantly quivering tail, and usually taking prey by sallying for prey in air or picking prey from foliage and branches of trees (Hindwood 1966; Ridpath & Moreau 1966; Frith 1969; Officer 1969; Loyn 1980, 1985a; Green 1995; Taylor *et al.* 1997; Baxter 1998; North; see below). **DETAILED STUDIES:** Near Bombala, in se. NSW and ne. Vic., Dec. 1976–Jan. 1981 (Recher & Holmes 1985; Recher *et al.* 1985), including analysis of sexual differences in Bondi SF (Recher & Holmes 2000 [which see for analysis of differences between plots within study area]) and rates of feeding (Holmes & Recher 1986). **FORAGING HEIGHTS, SITES:** Near Bombala, foraged mainly in canopy and subcanopy; mean height of foraging 9.5 m (4.5; 429 obs. of foraging): 1% on ground; 13% in shrubs, 0.2–4 m above ground; 49% in subcanopy, 4–10 m above ground; and 37% in canopy, >10 m above ground. At same site (n=429 obs.), substrates from which food obtained were: air (61%), foliage (32%), bark of tree-trunks and branches (6%), and

ground (1%). Males foraged at significantly lower levels than females (n=276 obs. of foraging by males, 132 by females). **FORAGING METHODS:** Near Bombala (n=429 feeding obs.), foraged almost wholly by sallying (99% of obs.), including sally-striking in air (60%), sally-striking on vegetation (36%), sally-pouncing onto ground (1%), and sally-hovering (2%); only occasionally foraged by gleaning (1%). **SEXUAL DIFFERENCES:** In Bondi SF, NSW, both sexes used similar methods and sites for foraging; of 276 observations of foraging by males and 132 by females: 63% by males and 59% by females by sally-striking in air; 29% and 32% by sally-striking from foliage; 6% and 7% by sally-striking from bark; 0% and 2% by sally-pouncing onto ground; and 1% and 0% by gleaning from bark. **RATES OF FEEDING:** In Bondi SF, made mean of 2.3 attacks/min (0.1; 52 foraging acts in 111 min), assuming all attacks successful. When searching for food, made 0.4±0.1 hops/min and 2.4±0.2 short flights/min, changing perch 2.8 times/min and moving mean of 3.2 m/flight (3.7; 1–5+; 232); when sally-striking prey from hard substrates, moved 1.3 m/flight (1.1; 0–5+; 75); when sally-striking prey in air, moved 2.0 m/flight (1.4; 0–5+; 123).

No detailed studies. **Plants** MONOCOTYLEDONS: Liliaceae sds⁵. DICOTYLEDONS: Mimosaceae: *Acacia* sds⁵. **Animals** SPIDERS^{5,6,8,11,12}. INSECTS^{1,2,3,4,6,9,11}: Blattodea¹²; Coleoptera¹⁰; Buprestidae¹²; *Melobasis*¹¹; *Stigmoderma*¹²; Chrysomelidae¹²; Curculionidae¹²; Elateridae¹²; Scarabaeidae¹²; Tenebrionidae¹²; Diptera: Acroceridae¹²; Asilidae⁷; Calliphoridae: *Calliphora*^{11,12}; Syrphidae¹²; *Syrphus viridiceps*¹²; Tipulidae¹¹; Hemiptera¹²: Cicadidae⁵; Pentatomidae¹²; Hymenoptera¹²: Ichneumonidae¹¹; Lepidoptera¹². **Other matter** Grit⁵.

REFERENCES: ¹ Sharland 1958; ² Hindwood 1966; ³ Frith 1969; ⁴ Officer 1969; ⁵ Green & McGarvie 1971; ⁶ Cooper 1973; ⁷ Lepschy 1993; ⁸ Green 1995; ⁹ North; ¹⁰ Cleland; ¹¹ Lea & Gray; ¹² FAB.

SOCIAL ORGANIZATION Not well known. Usually occur singly or in pairs (e.g. Batey 1907; Green & McGarvie 1971; McGarvie & Templeton 1974; Morris 1975; Longmore 1978; Leach & Hines 1987; Smith & Chafer 1987; Griffin 1995; Thoday 1995; North); sometimes reported in groups of three or four (Newman *et al.* 1984; NSW Bird Reps). One report of ten males (NSW Bird Rep. 1973).

Bonds Nest as simple pairs, in discrete territories (Fletcher 1924), though groups of nests may occur in small clusters (see Breeding dispersion). **Parental care** Both sexes brood and feed nestlings (North; NRS) and feed fledgelings (NRS).

Breeding dispersion Said that each pair occupies discrete territory (Fletcher 1924). Nests at least sometimes clustered, possibly in loose colonies (Frith 1969; Shields & Recher 1984; NRS), e.g. in se. NSW, nest in small colonies of 2–5 nests spaced 20–50 m apart (Aust. Atlas 1); in se. Tas., five active nests found in gully, two of which were 25 m apart (NRS); and once, nine nests found within radius of c. 400 m at junction of two creeks in Tas. (Campbell); two other nests c. 20 m apart (NRS), and another two 40 m apart (NRS). Three nests within 'a few acres' (Cooper 1973). Sometimes recorded nesting singly (NRS). Once young have fledged, family sometimes moves to drier habitat away from natal territory (Aust. Atlas 1; NRS).

Roosting No information.

SOCIAL BEHAVIOUR Not well known. Loud calls conspicuous (Shields & Recher 1984). Tail often quivered (McClymont 1906; Le Souef 1923; Gould; North); and male raises crest when singing (North). Once recorded bathing in creek by immersing breast a few times, before returning to nest (Hinsby 1954).

Agonistic behaviour Little information on intraspecific

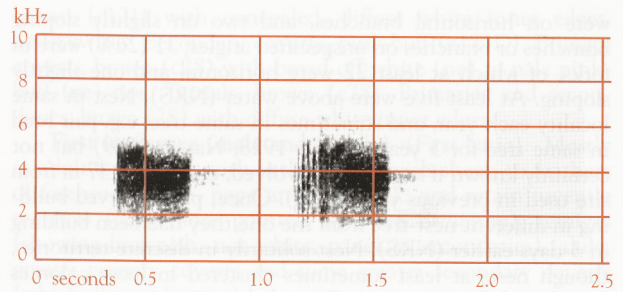
aggression. Considered territorial, and occasionally trespass onto neighbouring territories (Fletcher 1924), e.g. two pairs contested boundary of territory, in late Oct. (Tas. Bird Rep. 3); and male seen to chase or attack other males near nest (NRS). Male raises feathers of crest when annoyed (McGilp & Parsons 1924; NRS). **INTERACTIONS WITH OTHER SPECIES:** Both sexes can be aggressive towards other birds when nesting, and have been recorded mobbing or attacking other birds that venture near nest, including potential predators such as Brown Goshawk *Accipiter fasciatus*, kingfishers *Todiramphus* and *Dacelo*, currawongs *Strepera* and Grey Shrike-thrush *Colluricincla harmonica* (Tas. Bird Rep. 4; NRS); also seen to be aggressive towards Yellow-throated Honeyeater *Lichenostomus flavicollis*, Flame Robin *Petroica phoenicea*, Black-faced Cuckoo-shrike *Coracina novaehollandiae* and Satin Bowerbird *Ptilonorhynchus violaceus* (Robinson 1993; NRS); and once moved rapidly round head of Sacred Kingfisher *Todiramphus sanctus* till it left Flycatcher's territory (NRS). In cluster of five pairs in a gully, some or all birds formed flock to initiate communal defence against Brown Goshawk (NRS). Parents also recorded scolding intruders at nest (NRS). Possible **THREAT DISPLAY:** Male Satin near nest gave harsh cackling call with feathers of crest raised and bill open; repeated display a few minutes later when Leaden Flycatcher called from 50 m away; attributed by observer as being possible threat display (NRS).

Sexual behaviour Display of male observed (Tas. Bird Rep. 20) but not described. Male feeds female on nest early in nesting cycle (NRS). At Paluma, ne. Qld, a male and female stayed within 50 m of each other while foraging, male occasionally uttering *rzzzzt* call (Chapman 2003).

Relations within family group At change-over at nest, incoming bird gives melodious, disyllabic call (see Voice). Young exercise wings shortly before leaving nest (NRS). After contents of a nest taken by predator and nest mostly destroyed, both male and female were seen taking food to nest; c. 30 min later, male continued to bring food to nest, but female had started rebuilding; nest abandoned next day (NRS). **Parental anti-predator strategies** Male sits tightly on nest when observer nearby, and may be touched sometimes (NRS). See Agonistic behaviour for responses to other species near nests. **DISTRACTION DISPLAY:** Once, a male fluttered along ground after it was disturbed from nest by approach of observer (North).

VOICE Little information. Quite noisy, with both sexes conspicuous by their loud calls and songs (Fletcher 1924; Sharland 1958; Shields & Recher 1984). One observer recognized three calls: one said to be a contact call, and the others to express 'exuberance of spirits' (Fletcher 1924). Male sings during construction of nest, and Song continued till after Nov. (Fletcher 1924). Sometimes call from nest (Howe 1928); and last calls at night sometimes indicate location (Fletcher 1924). Calls of Leaden and Satin considered very similar, with much individual variation in both species, and separable only with practice (Chapman 2003); Song said to be clearer, deeper and louder than that of Leaden Flycatcher (Frith 1969; North; Mathews).

Adult SONG: Described as repeated loud piping whistle *chuee, wu-chee, too-weet, tweet* or *chee-ee* (Littler 1910; Frith 1969; Officer 1969; Pizzey 1980; Chapman 2003; Gould; North); sometimes associated with clear, high-pitched *weir-to-weir-to-weir* or *thurp, pewit pewit* (Pizzey 1980). Described as an advertising call (Chapman 2003). **ZHURP:** Guttural *zhurp* or *bzzurt*, often repeated (Pizzey 1980); *rzzzzt* (Chapman 2003); and described as loud and frog-like (Officer 1969). Two calls shown in sonagram A, in which amplitude modulation evident (T. Howard). **Other calls** Change-over at nest accompanied by melodious, disyllabic call from incoming bird; described by another observer as 'songcall' by male and more



A F.W. van Gessel; Deloraine, Tas., Dec. 1988; P50

subdued call by female (NRS). Birds with young scolded intruder near nest (NRS). Harsh cackling call, given by male with possible Threat Display directed at Leaden Flycatcher, resembled imitation of Yellow-faced Honeyeater *Lichenostomus chrysops*, degenerating into rapid cackle like that of Nankeen Kestrel *Falco cenchroides* (NRS).

Young No information.

BREEDING Reasonably well known, though no detailed studies; 124 records in NRS to Dec. 2003; contents of nests difficult to record because of height of nests, with only seven records of nests with eggs; records of eggs, below, include nests where eggs sighted or where adults considered to be incubating following nest-building or before nestlings recorded. All breeding records for se. Qld considered doubtful (Chapman 2003) and not considered further here. Nest solitary in discrete territories, though nests at least sometimes clustered in loose colonies (see Social Organization).

Season In se. Aust., eggs recorded Nov.–Jan. and nestlings recorded Nov.–Feb. (see below). NSW: Eggs, Nov.–Jan. (Gilbert 1935; Morris *et al.* 1981; NRS [n=20]). VIC.: Eggs, Nov.–Feb. [n=14]; nestlings, Dec. and Jan. (NRS [n=14]). Breeding otherwise recorded Nov.–Mar. (Cooper 1973; Vic. Atlas; Vic. Bird Rep. 1982), with 84% of 49 records of breeding, Nov.–Jan. (Vic. Atlas). Breeding recorded in Churchill NP, Nov. (Cooper 1973), and in Strathbogie Ra., Dec.–Feb. (Bedgood 1972). TAS.: Eggs, Nov.–Jan. (Littler 1910; Dove 1927; Hinsby 1954; North; Tas. Bird Reps 4, 23; NRS [n=5]). Nestlings, Dec. and Jan. (NRS [n=6]); said that most nests contain well-grown young by 20 Dec. (Napier 1969). SA: One pair building, early Dec.; another nest with large young, late Dec. (Reid & Cox 1978; Carpenter 1986). No other information.

Site Usually high, in fork of outer branches of trees, mainly eucalypts, including saplings (Fletcher 1924; Dove 1927; Gilbert 1935; Hinsby 1954; Reid & Cox 1978; North). From 81 records in NRS: 96% were in eucalypts, including Tasmanian Blue Gum *Eucalyptus globulus*, Manna Gum, Broad-leaved Peppermint *E. dives*, Mountain Grey Gum, Narrow-leaved Peppermint, Messmate, Mountain Gum, Snow Gum, Broad-leaved Stringybark, Sydney Peppermint, Yellow Box and Blue Mountains Ash *E. oreades*; two (2.5%) in acacias (one in Blackwood); and one (1.2%) in unidentified tree. One nest in Coast Banksia (Cooper 1973); one nest in poplar *Populus* (Dove 1928). Nest often placed on dead horizontal branches, often in forks (Littler 1910; Fletcher 1924; Dove 1927, 1928; Lord 1933; Gilbert 1935; Hinsby 1954; Reid & Cox 1978; Campbell; North). Of 120 descriptions of nest-site in NRS: 56 (46%) nests were on dead branches, of which at least four were in a horizontal fork, and included two that were on a dead branch below a live branch and one on a dead branch below another dead branch; another two nests were on a branch directly under another branch, making only five nests in total that were known to be directly under another branch (4% [cf. >50% in Leaden Flycatcher]); c. 30 (25%)

were on horizontal branches, and two on slightly sloping branches or branches on unspecified angles; 31 (26%) were in forks, of which at least 22 were horizontal and one slightly sloping. At least five were above water (NRS). Nest in same locality each year, and sometimes in same tree, e.g. pair bred in same tree for 3 years (Howe 1928; Napier 1969) but not certainly known if same pairs involved; one nest c. 37 m from site used in previous year (NRS). Once, pair observed building in different nest-tree from the one they had been building in 3 days earlier (NRS). Nest solitary in discrete territories, though nests at least sometimes clustered in loose colonies (see Social Organization). Recorded nesting in same tree as nesting Crimson Rosella *Platycercus elegans* and Rufous Whistler *Pachycephala rufiventris* (NRS). Once nested c. 15 m from Leaden Flycatcher (Cooper 1973); once recorded nesting near pair of Flame Robins, but not in same tree (Dove 1927); once, several pairs nested near nest of Brown Goshawks that contained nestlings, but Flycatchers mobbed adult Goshawks (Tas. Bird Rep. 4); also recorded near Sacred Kingfisher, Eastern Yellow Robin *Eopsaltria australis*, Grey Fantail *Rhipidura fuliginosa* and Crimson Rosella (NRS), including one record, in se. Aust., of Satin Flycatcher and Eastern Yellow Robin working on same nest (Nix & Nix 1999). MEASUREMENTS (m): Height of nest, 12.1 (5.15; 1.5–27.0; 111) (NRS); 9.8 (5.12; 3.1–18.3; 11) (Dove 1927, 1928; Howe 1933; Gilbert 1935; Hinsby 1954; Cooper 1973; Campbell; North). Height of nest-plant, 22.4 (9.22; 8.0–55.0; 43) (NRS).

Nest, Materials Small, neat cup; 'perfectly' round (Dove 1927, 1928); resembles knot on branch (Fletcher 1924; North) or appears to be part of branch itself (Hinsby 1954). Form of nest appears to depend on nature of site: on level branch, large with high walls, while those in forks are shallower (Campbell). Made of bark, bound together with spider web, with a few pieces of lichen attached, and lined with fine material such as bark, grass, rootlets, plant fibres, flowers and hair (Dove 1927, 1928; Frith 1969; Campbell; North). From 35 nests in NRS: 26 (74.3%) contained spider web; 21 (60%) bark (including strips of paperbark and stringybark); seven (20%) grass; four (11.4%) 'down'; three (8.6%) lichen; three (8.6%) rootlets; two (5.7%) twigs; and single records (2.9%) of mud and fibres; one was lined with grass (NRS). Covering of spider web is woven vertically, from branch to rim of nest (Hinsby 1954). Both sexes build (Fletcher 1924; Hinsby 1954; NRS). Twice, building took >5 days (Fletcher 1924; Hinsby 1954). Once, building stopped after 11:00 with a little more work in late afternoon; initially, web was placed around two sides of fork, then bottom of nest was worked on, but sides of nest were not distinguishable till 5 days later (Fletcher 1924). Once, gathered material from eucalypt >250 m away (Hinsby 1954). During incubation, relieving bird sometimes brings nest-material and adds it to nest before settling (NRS). MEASUREMENTS (cm): External diameter 7.6; internal diameter 5.4; internal depth 3.5 (North).

Eggs Oval (North) or short oval (Littler 1910; Campbell). Close-grained, smooth, and glossy (Campbell; North). Dull white, pearly white, cream, very faint bluish white or greenish white, spotted or blotched (occasionally irregularly marked) with brown, amber, purplish grey or pale purplish-brown (sometimes with tiny purplish-black centres), and underlying spots of dull purplish-grey, all in well-defined zone or belt at large end and with only a few spots scattered over rest of shell (Littler 1910; Campbell; North). Like small eggs of Restless Flycatcher (Campbell). MEASUREMENTS: 19.6 (0.25; 19.3–20.1; 8) × 14.9 (0.19; 14.7–15.2) (Campbell; North); a smaller clutch 18.5 × 14.5, 19.0 × 14.5 (Littler 1910); average for these clutches combined 19.4 (0.43; 18.5–20.1; 10) × 14.8 (0.23; 14.5–15.2).

Clutch-size One to three, usually three (Gilbert 1935; North; NRS). In Vic. and Tas., C/2 × 1, C/3 × 2 (NRS). One

nest contained four eggs, but clutch not definitely determined; one nest with one egg abandoned, probably before laying completed (NRS).

Laying Eggs laid within a day or two of completion of nest (NRS). Claimed to be double-brooded (Howe 1928), but no evidence provided. No other information.

Incubation By both sexes (Ross 1926; Cooper 1973; North; NRS); stints often short, with frequent change-overs (Littler 1910; Ross 1926), e.g. six change-overs in 20 min; at another nest, stints of incubation 10–25 min (NRS). Male recorded feeding female on nest (NRS). INCUBATION PERIOD: Claimed, without supporting evidence, to be c. 17 days (Aust. RD). If eggs laid on consecutive days, maximum period from completion of clutch, for one egg, 16 days (NRS).

Young Altricial, nidicolous. Naked at hatching; one nestling was naked except for white down over eyes (NRS); large nestlings had whitish-grey throat and breast (Reid & Cox 1978). Both parents brood and feed nestlings (Reid & Cox 1978; NRS); once, over short period of observation at a nest probably containing young chicks, adults changed over every 2 min (NRS). One pair said to regurgitate food for nestlings (NRS). Appear to perform distraction display (North). Once, female seen to remove faecal sac (NRS).

Fledging to independence Female observed feeding recently fledged young (Hinsby 1954). FLEDGING PERIOD: Claimed, without supporting evidence, to be c. 18 days (Aust. RD); two young, based on incubation period (above) of 16 days, estimated to have fledged at maximum 15 days old (NRS).

Success Where number of eggs and outcome known, of nine eggs in four nests, two (22.22%) hatched and two (22.22%) young fledged, equal to 0.50 fledged young/nest; from 14 eggs in seven nests, five (35.7%) hatched; where outcome known, of 39 nests, 20 fledged at least one young and 19 failed. Causes of failure include loss of eggs following heavy rain; nests blown from tree; and abandonment of nest (NRS). CUCKOOS: Parasitized by Pallid *Cuculus pallidus* and Brush *Cacomantis variolosus* Cuckoos, and occasionally by Horsfield's *Brookerooccyx basalis* and Shining *C. lucidus* Bronze-Cuckoos (Brooker & Brooker 1989; HANZAB 4).

PLUMAGES Prepared by A.M. Dunn. Fledge in juvenile plumage. Begin partial post-juvenile (first pre-basic) moult to immature (first basic) plumage shortly after fledging. Females probably attain adult plumage in complete first immature post-breeding (second pre-basic) moult at end of first year or early in second. Not known when males attain adult plumage but at least some do not attain adult male plumage till third year. After attaining adult plumage, a complete post-breeding (pre-basic) moult each cycle produces successive adult plumages without change in appearance. Sexes differ in adult plumage. No subspecies. Descriptions based on examination of skins of 34 adult males, 18 adult females, six juveniles, eight first immatures and two second immature males (AM, ANWC, HLW, MV, SAM).

Adult male (Definitive basic). HEAD AND NECK, UPPER-PARTS: Entirely black (89) with strong bluish or greenish sheen to all feathers except on lores. UNDERPARTS: Breast, black (89) with strong bluish or greenish sheen, as upperparts. Anterior flanks, grey (84). Rest of underparts, white, with concealed grey-black (82) bases to feathers. UPPERTAIL: Rectrices, black-brown (119) with black (89) outer edges with strong bluish or greenish sheen. UNDERTAIL: Dark brown (c121) with off-white (ne) to light-brown (c223D) shafts to feathers. UPPERWING: All marginal and median coverts, black (89) with strong bluish or greenish sheen. Greater secondary coverts, black-brown (119) with broad black (89) fringes with strong bluish or greenish sheen. Alula and greater primary coverts, black-brown (119) with narrow black (89) outer

edges with strong bluish or greenish sheen. Tertiaries, black-brown (119) with strong black (89) suffusion, mostly to outer webs, and which also has strong bluish or greenish sheen. Primaries and secondaries, black-brown (119) with narrow black (89) outer edges, with strong bluish or greenish sheen, and concealed narrow white inner edges. **UNDERWING:** All secondary coverts, white. Median and marginal primary coverts, black-brown (119) with white fringes at tips. Greater primary coverts, brown (c28) with white fringes at tips. Tertiaries, dark brown (c121). Primaries and secondaries, dark brown (c121) with narrow white inner edges.

Adult female (Second and subsequent basic). **HEAD AND NECK:** Forehead, crown, nape, hindneck and sides of neck, dark grey (c83) with strong bluish sheen to feathers. Loes and ear-coverts, grey (84) to grey-black (82). Eye-ring, off-white (ne). Chin and throat, light orange-brown (ne). **UPPERPARTS:** Dark grey (c83). **UNDERPARTS:** Breast, light orange-brown (ne) as throat. Anterior flanks, grey (84). Rest of underparts, white, with concealed grey-black (82) bases to feathers. **UPPERTAIL:** T1–t4, dark brown (121) with dark-grey (c83) suffusion to outer webs. T5 and t6, dark brown (c121) with narrow off-white (ne) fringes to outer webs and at tips. **UNDERTAIL:** Rectrices, dark brown (c121) with off-white (ne) shafts. **UPPERWING:** Marginal and median secondary coverts, dark grey (83). Greater secondary coverts, dark grey (c83) with diffuse light-brown (c26) outer edges. Alula and all primary coverts, dark grey (c83). Tertiaries, dark brown (c121). Secondaries, dark brown (121) with fine off-white (ne) outer edges and concealed narrow white inner edges. Primaries, dark brown (121) with concealed white edge to bases of inner webs. **UNDERWING:** Secondary coverts, off-white (ne), often with slight buff (c124) wash. Marginal and median primary coverts, dark brown (121) with pink-buff (121D) to orange-brown (ne) fringes. Greater primary coverts, brown (c28) with off-white (ne) to pink-buff (c121D) fringes to tips. Tertiaries, dark brown (c121). Primaries and secondaries, dark brown (c121) with narrow white inner edges.

Nestling Have sparse tufts of pale-grey (c86) or white down (photos: Trounson & Trounson 1994; Flegg & Madge 1995; Aust. RD).

Juvenile Appears browner than adults of either sex, with diffusely streaked upperparts and rather mottled breast. **HEAD AND NECK:** Forehead, crown, nape, hindneck, sides of neck and ear-coverts, black-brown (c119); feathers of hindneck have faint off-white (ne) shaft-streaks. Loes, black-brown (119). Chin and throat, pink-buff (121D) with fine, faint dark-brown (121) fringes to tips of feathers. Some birds have diffuse pale-greyish (c86) or light greyish-brown (c119D) patch running from above eye to above and down over ear-coverts. **UPPERPARTS:** Mantle, back, scapulars and rump, black-brown (c119) with diffuse off-white (ne) shaft-streaks to feathers, and which often broader and whiter on scapulars. Uppertail-coverts, black-brown (c119). **UNDERPARTS:** Feathers of breast, pink-buff (121D) to cream (c54) with narrow and diffuse dark-brown (121) fringes, resulting in rather mottled appearance. Feathers of upper flanks, white, with dark-brown (121) tips. Belly, vent, undertail-coverts, thighs and lower flanks, white. All feathers have fluffy, down-like texture and concealed grey-black (82) bases. **TAIL:** As adult female, but rectrices more pointed at tips. **UPPERWING:** Marginal and median secondary coverts, brown (28) with narrow off-white (ne) to light grey-brown (c119D) fringes at tips. Greater secondary coverts, brown (28) with warmer light-brown (123A) outer edges and narrow off-white (ne) fringes at tips. Alula and all primary coverts, brown (28). Tertiaries, dark brown (c121) with narrow light-brown (123A) outer edge that grades into off-white (ne) fringe at tips. Secondaries, dark brown (c121) with narrow light-brown (123A) outer edges, and concealed diffuse white inner edges. Primaries, dark

brown (c121) with concealed, diffuse white inner edges. **UNDERWING:** Secondary coverts, pink-buff (c121D). Primary coverts, brown (c28) with broad off-white (ne) to pale pink-buff (ne) tips. Tertiaries, brown (c28). Primaries and secondaries, brown (28) with diffuse white inner edges.

First immature (male and female) (First basic). Mostly as adult female but with little or no bluish sheen to feathers of forehead, crown, nape and hindneck; and retain juvenile rectrices (with more pointed tips; see Structure), remiges (showing brownish, not white, panel in secondaries), alula, greater primary coverts and some greater secondary coverts (which show paler tips).

Second immature male (Second basic). At least some males have very patchy appearance to breast. Top of head, upperparts, wing and tail as adult male. Underparts mostly as adult female but with patches of black (89) on chin, throat and breast, giving patchy or mottled appearance: chin, throat and breast a mixture of plain orange-brown (ne) feathers, plain black (89) feathers, and orange-brown (ne) feathers with black (89) suffusion. Not known whether all males go through this patchy appearance or whether some are as adult male at this age.

BARE PARTS Based on photos (unpubl.: J.S. Matthew; D.I. Rogers; and standard sources) and museum labels. **Adult male** Bill: upper mandible, black (89) or grey-black (82); lower mandible, dark blue-grey (c78) with black (89) or grey-black (82) tip. Inside of mouth, creamy flesh, yellowish or flesh-pink (SAM). Iris, black-brown (119). Orbital ring, black (89). Legs and feet, dark grey or grey-black (82). Soles, grey (SAM). **Adult female** As adult male. **Nestling** When unfeathered: bill, grey (84) grading to off-white (ne) at cutting edges; gape, off-white and puffy (ne); inside of mouth, orange (17); bare dorsal skin, dark grey (83); bare ventral skin, pink (c3). **Juvenile** Upper mandible, dusky; lower mandible, sepia (ANWC); or bill wholly dark grey (AM). Iris, dark brown or grey-brown (AM, ANWC). Legs and feet, leaden or grey (AM, ANWC). **First immature** Bill, blackish with pale brown-yellow base to lower mandible (SAM); also described as having pale base to lower mandible (Rich 1998), or being wholly black (Rogers *et al.* 1990). Gape, yellow (Rogers *et al.* 1990; Rich 1998). Inside of mouth, orange-yellow (SAM) or yellow-green (Rogers *et al.* 1990). Iris, deep blackish-brown (SAM) or dark brown (Rogers *et al.* 1990). Orbital ring, blackish (SAM). Legs and feet, slaty grey (SAM) or dirty grey; soles, yellow (Rogers *et al.* 1990).

MOULTS Based on examination of skins of 34 adults and nine juveniles and immatures (ANWC, HLW, MV, SAM). **Adult post-breeding** (Third or fourth and subsequent pre-basic). Very few data. Apparently complete. Timing not known. No skins collected Apr.–Sept.; of 34 collected Oct.–Mar., none had active moult. Lack of moulting specimens in available collections indicates may moult after migration, in non-breeding areas, but confirmation needed. **Post-juvenile** (First pre-basic). Partial; involves most of body except alula, greater primary coverts, remiges, rectrices and some greater secondary coverts. Appears to begin shortly after fledging; one in Dec. had started moulting body before juvenile tail was fully grown. Two others recorded with active moult of body in both upperparts and underparts; one in Feb. and another in Mar. **First immature post-breeding** (Second pre-basic). Few data. One female in Jan. was just starting with slight moult of feathers of head and upperparts. **Second immature post-breeding** (Third pre-basic). No information.

MEASUREMENTS (1–2) Qld, NSW, Vic., Tas. and SA, skins (ANWC, HLW, MV, SAM): (1) Adults; (2) Juveniles and immatures. (3) Throughout range, adults, skins (Keast

1958). (4) Throughout range, all ages except juveniles, live (Baker *et al.* 1997).

	MALES	FEMALES	
WING	(1) 89.6 (2.69; 85–96; 27)	86.3 (2.40; 80–89; 18)	**
	(2) 87.0 (2.00; 84–88; 4)	84.6 (2.70; 82–88; 5)	ns
	(3) 89 (85–94; 19)	–	
	(4) –	83, 87, 98	
TAIL	(1) 78.3 (2.73; 73–84; 27)	76.5 (2.89; 70–80; 18)	*
	(2) 79.2 (1.71; 77–81; 4)	75.6 (3.21; 72–80; 5)	ns
	(4) –	78, 80	
	(1) 19.0 (0.58; 18.0–20.0; 24)	18.7 (0.61; 17.8–19.7; 18)	ns
BILL S	(2) 19.6 (0.13; 19.5–19.8; 4)	18.6 (0.43; 18.1–19.1; 5)	**
	(1) 7.3 (0.30; 6.5–7.7; 27)	7.5 (0.27; 7.0–7.9; 18)	*
BILL W	(2) 7.3 (0.64; 6.4–7.8; 4)	7.4 (0.40; 6.9–7.9; 5)	ns
	(4) –	37, 37	
THL	(1) 15.4 (0.46; 14.5–16.3; 26)	15.4 (0.46; 14.5–16.3; 17)	ns
	(2) 15.6 (0.31; 15.3–16.0; 4)	15.3 (0.50; 14.8–16.1; 5)	ns

One live adult male from Vic. had Wing 93 mm, Tail 83 mm and THL 37.4 mm (Rogers *et al.* 1990). One live unsexed immature from Vic. had Wing 82 mm, Tail 77 mm and THL 36.0 mm (Rogers *et al.* 1990).

WEIGHTS (1–2) Qld, NSW, Vic., Tas. and SA, from museum labels (AM, ANWC, MV, SAM): (1) Adults; (2) Juveniles and first immatures.

	MALES	FEMALES	
(1)	17.8 (2.49; 12.0–23.0; 14)	17.0 (1.85; 14.0–19.0; 9)	ns
(2)	16.0, 16.6, 18.0	15.7 (2.97; 11.4–20.0; 8)	

Two females from unknown location weighed 17 and 18 g (Baker *et al.* 1997).

STRUCTURE Wing rather broad and rounded. Ten primaries: p7 longest (p6, p8 sometimes =); p10 39–43 mm shorter, p9 13–14, p8 0–2, p6 0–2, p5 2–4, p4 7–10, p3 11–15, p2 15–18, p1 17–20. P5–p8 slightly emarginated on outer webs; no emarginations on inner webs. Nine secondaries, including three tertials; tips of longest tertials fall short of tips of secondaries on folded wing. Tail long with a square tip; 12 rectrices; tips of rectrices more pointed in juvenile. Bill short, straight and broad at base with slight dorso-ventral compression; about half length of head. Tarsus short, slender and laterally compressed; scaling laminiplatar. Tibia fully feathered. Middle toe with claw 13.4 mm (0.31; 13.0–13.7; 6); outer toe 82–89% of middle, inner 70–77%, hindtoe 80–91%.

RECOGNITION Females and immatures very similar to those of Leaden Flycatcher and both sexes of Broad-billed Flycatcher. Most should be easily separated in the hand on size. Satin much larger than other two in length of wing and tail. Females have Wing \geq 80 mm and Tail \geq 70 mm compared with Wing \leq 81 mm and Tail \leq 73 mm for female Leaden Flycatcher and Wing \leq 75 mm and Tail \leq 73 mm for both sexes of Broad-billed Flycatcher. Plumage also differs slightly from the other two: top of head and upperparts of females much darker than those of either female Leaden Flycatcher or both sexes of Broad-billed Flycatcher, and also usually slightly darker and richer in colour of throat and breast than female Leaden Flycatcher (Reid & Cox 1978; Boles 1980; this study). Extent of orange-brown on breast not a reliable indicator of identity (Reid & Cox 1978). Pale eye-ring of females also often appears more noticeable than on female Leaden Flycatchers (Reid & Cox 1978). See comments in Field Identification for further details of distinguishing species in the field.

GEOGRAPHICAL VARIATION No subspecies. No variation in plumage. Some slight variation in length of bill

within Aust.: those breeding on Aust. mainland appear to have slightly longer bill than those breeding in Tas. (DAB); Bill S not significantly different between skins collected from mainland (n=24, sexes combined) during breeding season (Oct.–Feb.) and those collected from Tas. (n=13) across same period (this study). Differentiation between se. Aust. mainland and Tas. populations possible but unsubstantiated (DAB; cf. Keast 1958; Peters).

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N. DAY, 2001.

Volume 7 (Part A), Plate 3

Broad-billed Flycatcher *Myiagra ruficollis* (page 82)
 SUBSPECIES MIMIKAE: 1 Adult male; 2 Adult female; 3 Juvenile; 4 First immature

Leaden Flycatcher *Myiagra rubecula* (page 88)
 NOMINATE RUBECULA: 5 Adult male; 6 Adult female; 7 Juvenile; 8 First immature
 SUBSPECIES YORKI: 9 Adult male
 SUBSPECIES OKYRI: 10 Adult female

Satin Flycatcher *Myiagra cyanoleuca* (page 104)
 11 Adult male; 12 Adult female; 13 Juvenile; 14 First immature