



# ***Systematics and Taxonomy of Australian Birds***

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# Systematics and taxonomy of Australian birds

## PALAEOGNATHAE

### ■ ORDER STRUTHIONIFORMES

#### Family Struthionidae

The introduced *Struthio camelus* (Ostrich) occurs, or has occurred, in Australia. This was regarded as being represented by subspecies *australis* Gurney, 1868 from southern Africa (Condon 1975). Sequences of the mitochondrial control region indicate that this form is closest to the eastern African population *massaicus* Neumann, 1898 (Robinson and Matthee 1999). It is possible that Australian birds are now extinct as a wild population and thus the species should be transferred to the supplementary list.

No changes have been made from Christidis and Boles (1994).

<i>Struthio camelus</i>	Ostrich <sup>V/E?</sup>
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### ■ ORDER CASUARIIFORMES

#### Family Casuariidae

Christidis and Boles (1994) treated the Dromaiidae and Casuariidae as subfamilies within a single family, following the osteo-

logical studies by Patterson and Rich (1987). Livezey and Zusi (2007) retained these as separate families. One family is recognised here, with Casuariidae Kaup, 1847, having priority over Dromaiidae Huxley, 1868. This action is supported by DNA–DNA hybridisation (Sibley and Ahlquist 1981) and 12S RNA sequence (Cooper *et al.* 1992). The latter study showed that the divergence between the two is no greater than that between the species of kiwi *Apteryx*. Lee *et al.* (1997) and Cracraft *et al.* (2004) used the family name Dromiceidae [sic] for the emus. Dromaiidae Huxley, 1868, has priority over Dromiceidae Richmond, 1908 (Bock 1994) – note the correct formation of the latter. *Dromiceius* and *Dromaius* appeared in the same publication by Vieillot (1816); the former name has page priority (p. 54 versus p. 70), but was regarded by Serventy *et al.* (1965) to be a misprint and that it should be rejected as an incorrect original spelling.

Parker (1984) demonstrated that the dwarf emus of Kangaroo Island and King Island were morphologically distinct and should be regarded as separate species, taking the names *Dromaius baudinianus* S.A. Parker, 1984, and *D. ater* Vieillot, 1817, respectively. The taxonomic level at which the now extinct Tasmanian population (*diemenensis*) should be recognised has yet to be resolved (see

Patterson and Rich 1987); until the question is investigated further, this form has been retained in *D. novaehollandiae* (Emu)

<i>Casuarius casuarius</i>	Southern Cassowary
<i>Dromaius novaehollandiae</i>	Emu
<i>Dromaius ater</i>	King Island Emu <sup>E</sup>
<i>Dromaius baudinianus</i>	Kangaroo Island Emu <sup>E</sup>

## NEOGNATHAE

### Galloanseres

#### ■ ORDER GALLIFORMES

Australia has three native species each of megapodes and quail, but there are a number of other galliform species kept either in a domestic state or in aviaries that have become established in a feral state, or have the potential to do so.

Sibley *et al.* (1988), Sibley and Ahlquist (1990) and Sibley and Monroe (1990; see errata in Sibley and Monroe 1993) placed the megapodes (Megapodiidae) and the Neotropical currasows, guans and chachalacas (Cracidae) together in the order Craciformes as the sister clade to the remaining taxa (sometimes collectively called the typical galliforms or phasianoids). Subsequent authors have not adopted this division. The distinctiveness of the megapodes and cracids is evident, but subsequent authors, using morphological and molecular techniques, have found that these do not form a clade separate from the phasianoids. Instead, the Megapodiidae and Cracidae are successive sister groups to the phasianoids – an arrangement that has gained consensus among most workers (e.g. Cracraft 1973, 1981; Johnsgard 1986; Brom and Dekker 1992; Harshman 1994; del Hoyo 1994; Livezey and Zusi 2001; Mayr 2000; Dimcheff *et al.* 2000, 2002; Madge and McGowan 2002; Dyke and Gulas 2002; Dyke 2003; Dyke *et al.* 2003; Dickinson 2003; Cracraft *et al.* 2004; Pereira and Baker 2006; Crowe *et al.* 2006).

Within the phasianoids, there are several major divisions: guineafowl, New World

quail, Old World quail, turkeys, grouse, francolins, spurfowl, peafowl and several groups of partridges and pheasants. While these have been identified in most broad studies, there is less concordance about their inter-relationships and taxonomic rankings, with groups being variously treated as families, sub-families or tribes. For example, Johnsgard (1986, 1988), del Hoyo *et al.* (1994) and Madge and McGowan (2002) accepted five families and Dickinson (2003) accepted three.

Sibley *et al.* (1988) identified three major lineages in the typical Galliformes: Numididae (guineafowls), Odontophoridae (New World quails) and Phasianidae (grouse, pheasants, partridges, turkeys, Old World quails). Helm-Bychowski and Wilson (1986) analysed 161 restriction sites in the nuclear DNA of *Gallus*, *Alectoris*, *Meleagris*, *Phasianus*, *Pavo* and *Numida* and concluded that of these genera, *Numida* was the most divergent lineage and most appropriately placed in its own family. Turbott (1990) and AOU (1998), however, retained the guineafowl as a subfamily in the Phasianidae. Recognition of the Odontophoridae at family level is well supported by osteology (Holman 1964; Mourer-Chaviré 1992), biochemistry (Gutiérrez *et al.* 1983), mitochondrial and nuclear DNA (e.g. Kornegay *et al.* 1993; Kimball *et al.* 1999; Cracraft *et al.* 2004; Pereira and Baker 2006; Crowe *et al.* 2006), and has been generally accepted in recent publications (e.g. del Hoyo 1994; AOU 1998; Madge and McGowan 2002; Dickinson 2003). Armstrong *et al.* (2001), employing the mitochondrial cytochrome-*b* gene, found the Numididae in a more derived position than the Odontophoridae, whereas the nuclear marker avian ovomucoid intron G produced the reverse result.

Phylogenetic relationships within the Galliformes were studied in depth by Crowe *et al.* (2006) using 4452 base pairs from both mitochondrial and nuclear genes and 102 morphological and behavioural characters. The first phasianoid family to diverge was the Numididae, with the Odontophoridae, as the sister group to all remaining forms, which were placed in the Phasianidae.

Kimball *et al.* (1999) confirmed that the New World quail (Odontophoridae) and guineafowl (Numididae) warranted recognition at family level, and were successive outgroups to the traditional Galliformes, which collectively segregate as the Phasianidae. Using mainly morphological characters, augmented by some behavioural traits, Dyke *et al.* (2002), concluded that the guineafowl were the first family to diverge within the phasianoid lineage, but as a succession of paraphyletic taxa, rather than a monophyletic unit. Whereas these authors included four guineafowl taxa, Kimball *et al.* (1999) had one, and so could not test for this arrangement. Dyke *et al.* (2002) considered the Old World and New World quail and several partridge genera to form a rather derived clade.

*Meleagris* was previously frequently segregated in its own family (Meleagrididae); (see also Livezey and Zusi 2007). Studies using a variety of morphological (Schnell and Wood 1976) and molecular characters (Sibley and Ahlquist 1990; Helm-Bychowski and Wilson 1986; Randi *et al.* 1991; Kornegay *et al.* 1993; Kimball *et al.* 1999; Pereira and Baker 2006), however, reveal a close relationship between *Meleagris* and the traditional Phasianidae. Turkeys were placed as the sister taxon to the Holarctic grouse (also sometimes given family rank as Tetraonidae) by Kimball *et al.* (1999) and Dimcheff *et al.* (2002), although there is not consistent agreement among other authors regarding the relationships of these groups to each other or to other members of this family. Pereira and Baker (2006) and Crowe *et al.* (2006) recovered the novel pairing of turkeys with *Perdix perdix* (Grey Partridge).

The higher divisions of the Galliformes used in the list and their sequence are those of Crowe *et al.* (2006).

### Family Megapodiidae

Clark (1964a, b), using overall similarity of various morphological and proportional characters, discerned a division between the scrubfowl (*Megapodius* [including *Eulipoa*], *Macrocephalon*) and the other taxa (*Alectura*,

*Aepyodius*, *Talegalla* and *Leipoa*). Brom and Dekker (1992), basing their study on many of the same characters, but employing cladistic methodology, could not confirm this arrangement. They associated the two brush-turkeys (*Alectura*, *Aepyodius*), while *Talegalla* and *Leipoa* formed a trichotomy with *Megapodius–Eulipoa–Macrocephalon*. Mey (1997) examined the taxonomy of megapode feather lice to assess that of their host taxa, concluding there was a split between *Megapodius–Eulipoa* and *Alectura–Aepyodius*. The positions of *Macrocephalon*, *Talegalla* and *Leipoa* were less certain, but appeared aligned with the latter genera. Birks and Edwards (2002), using nuclear and mitochondrial DNA, confirmed a dichotomy between the scrubfowl and the other genera. *Alectura* and *Aepyodius* were sister taxa, but the relative positions of *Talegalla* and *Leipoa* within the latter group were not fully resolved. The sequence used here is derived from the phylogeny of Birks and Edwards (2002).

*Megapodius reinwardt* (Orange-footed Scrubfowl) is generally regarded as a separate species from *M. freycinet* (Dusky Megapode; e.g. Schodde 1977; White and Bruce 1986; Sibley and Monroe 1990; Marchant and Higgins 1993; del Hoyo *et al.* 1994; Jones *et al.* 1995; Dickinson 2003). Nevertheless, the taxonomic status of most of the forms within the *Megapodius freycinet* superspecies complex are poorly understood and further detailed work is required

<i>Alectura lathamii</i>	Australian Brush-turkey
<i>Leipoa ocellata</i>	Malleefowl
<i>Megapodius reinwardt</i>	Orange-footed Scrubfowl

### Family Numididae

Populations of *Numida meleagris* (Helmeted Guineafowl) in Australia were not considered by Marchant and Higgins (1993) to be self sustaining and viable, on which basis Christidis and Boles (1994) placed it on the supplementary list. Britton and Britton (2000) and Wieneke and James (2006)

provided evidence that there are low numbers at several locations in northern Queensland where this species has persisted and bred. It has been transferred to the main list.

<i>Numida meleagris</i>
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Helmeted Guineafowl <sup>1</sup>
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### Family Odontophoridae

This family is represented in Australia by the introduced *Callipepla californica* (California Quail). This was previously placed in *Lophortyx* (e.g. Condon 1975), but this genus is now included in *Callipepla* (Holman 1964; Ohmart 1967; Johnsgard 1970, 1973, 1988; AOU 1998; Sibley and Monroe 1990; Christidis and Boles 1994; Madge and McGowan 2002; Dickinson 2003).

<i>Callipepla californica</i>
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California Quail <sup>1</sup>
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### Family Phasianidae

This family is represented in Australia by three native and several feral species. Of the feral species, Christidis and Boles (1994) listed *Phasianus colchicus* (Common Pheasant), *Gallus gallus* (Red Junglefowl), *Pavo cristatus* (Indian Peafowl) and *Meleagris gallopavo* (Wild Turkey). The first three have small persisting populations, mostly on offshore islands, and populations of Wild Turkeys on Bass Strait Islands are now accepted as being feral (see Marchant and Higgins 1993), but were not included in Condon (1975). *Pavo cristatus* is also feral on Kangaroo Island (Baxter 1995). The population of *Gallus varius* (Green Junglefowl) on Cocos (Keeling) Islands was considered not to be self-sustaining and viable (Marchant and Higgins 1993), so the species was included on the supplementary list. It has since been shown that this species survives on West Island, Cocos (Keeling) Islands, where it is common and breeds (Carter 1994b; Johnstone and Darnell 2004b; Hopton 2006; Hadden 2006). Populations of *Alectoris chukar* (Chukar Partridge) in New South Wales were regarded by Marchant and Higgins (1993) as

being extinct (no observers are known to have investigated this population, however).

Most studies place turkeys in a basal, or near basal, position relative to the remaining genera. The remaining taxa are sometimes separated into two subfamilies or tribes – one of the partridges, quail and francolins, the other of the pheasants. There are several recognised lineages within the pheasants: gallopheasants (represented in Australia by *Coturnix*, *Phasianus* and *Alectoris*), tragopans and allies (unrepresented), peafowl (*Pavo*) and junglefowl (*Gallus*).

Kimball *et al.* (1999), Armstrong *et al.* (2001) and Dyke *et al.* (2003) showed that neither the partridges nor the pheasants, as conventionally circumscribed, form monophyletic units relative to each other (see also Fumihito *et al.* 1995 and Bush and Strobeck 2003). There was poor resolution of the positions of many genera, and no formal recommendations were made about how to treat these various divisions within the family taxonomically.

Crowe *et al.* (2006) divided the Phasianidae into six subfamilies, falling into two main clades. The first comprised the Aborophilinae – an assemblage of mono- or dispecific African and Asian genera (*Xenoperdix*, *Rollulus* and *Aborophila*) and the Coturnicinae. The latter included the Old World quail (*Coturnix* and *Excalfactoria*), Madagascan Partridge (*Margaroperdix madagascarensis*), spurfowl (*Pternistes*), partridges (*Alectoris*) and others. The other phasianid clade contained two subclades. One comprised the Pavoninae, with peafowl (*Pavo*) and relatives, and the Gallinae – junglefowl (*Gallus*), bamboo-partridges (*Bambusicola*) and several genera of francolins. The second subgroup included the Meleagridinae, uniting *Meleagris* and Grey Partridge (*Perdix perdix*), as sister group to the Tetraoninae (grouse) and these, in turn, forming a clade with the Phasianinae – the pheasants, including *Phasianus*, *Chrysolophus* and *Lophura*.

Maintaining *Synoicus* and *Excalfactoria* as distinct from *Coturnix* had once been the usual treatment (e.g. Peters 1934), but this

was replaced by the now common practice of uniting all as *Coturnix* (e.g. Condon 1975, Johnsgard 1988; Sibley and Monroe 1990; Marchant and Higgins 1993; Christidis and Boles 1994; Madge and McGowan 2002; Dickinson 2003). Although this grouping is not universally accepted (e.g. Turbott 1990, who retained *Synoicus* for *ypsilophorus*), it is followed here. It was considered that differences in the number of rectrices or ornate plumage of the adult males – the bases on which these genera were recognised previously – were inadequate criteria for separation. Crowe *et al.* (2006) consistently recovered a clade in which *Excalfactoria* had a sister relationship with the pair of *Coturnix* and *Margaroperdix*. There has not been any previous suggestion that *Margaroperdix* and *Coturnix* are congeneric. If these are each kept at generic level, then so too must be *Excalfactoria*. This is done here, with the King Quail becoming *Excalfactoria chinensis*.

Condon (1975) maintained *Coturnix pectoralis* (Stubble Quail) as a distinct species from *C. novaezelandiae* (New Zealand Quail); RAOU (1978b) subsequently merged these without explanation, as did Turbott (1990) and Johnstone and Storr (1998). If such action were accepted, *novaezelandiae* Quoy and Gaimard, 1830, has priority over *pectoralis* Gould, 1837. These forms are morphologically quite distinctive (James 1993a) and are kept separate here – a practice that conforms to the most frequent current usage (e.g. Sibley and Monroe 1990; Madge and McGowan 2002; Dickinson 2003).

The taxonomy of the *Coturnix australis*–*ypsilophora* complex is poorly resolved. Condon (1975) separated both at specific level – his distributions indicating sympatry on the south-eastern mainland, but such overlap has not been confirmed. Furthermore, James (1993a) has shown that, apart from size, the variation between *ypsilophora* (Tasmania) and *australis* (mainland) is little greater than the variation within some mainland populations. They are best combined as moderately marked subspecies (see also Sibley and Monroe 1990), and this is now the conven-

tional treatment; *ypsilophora* Bosc, 1792, has priority over *australis*, Latham, 1802. *Coturnix* is feminine (ICZN 1987), thus the specific epithet should be *ypsilophora*.

*Excalfactoria chinensis* is the sister species of *E. adansonii* (African Blue Quail) of Sub-Saharan Africa. Some of the populations of *Excalfactoria chinensis* in Victoria may result from introduced birds (Marchant and Higgins 1993).

Here the genera of Phasianidae follow the classification of Crowe *et al.* (2006).

<i>Coturnix pectoralis</i>	Stubble Quail
<i>Coturnix ypsilophora</i>	Brown Quail
<i>Excalfactoria chinensis</i>	King Quail
<i>Alectoris chukar</i>	Chukar Partridge <sup>5</sup>
<i>Pavo cristatus</i>	Indian Peafowl <sup>l</sup>
<i>Gallus gallus</i>	Red Junglefowl <sup>l</sup>
<i>Gallus varius</i>	Green Junglefowl <sup>CK/1</sup>
<i>Phasianus colchicus</i>	Common Pheasant <sup>l</sup>
<i>Meleagris gallopavo</i>	Wild Turkey <sup>l</sup>

## ■ ORDER ANSERIFORMES

The Anseriformes have been shown to comprise three distinct lineages (Livezey 1986, 1997b; Sibley and Ahlquist 1990): Anhimidae (screamers, South America), Anseranatidae (*Anseranas semipalmata*; Magpie Goose) and Anatidae (remaining species). Sibley and Ahlquist (1990) aligned *Anseranas* with the Anhimidae, whereas Livezey (1986) aligned it more closely with the typical waterfowl. These and other authors (e.g. Woolfenden 1961; Olson and Feduccia 1980a), nevertheless, agreed that *Anseranas* should be recognised at family level, Anseranatidae, as was done in Christidis and Boles (1994) and most subsequent classifications (e.g. Dickinson 2003; Kear 2005; *contra* Carbaneras 1992a).

### Family Anseranatidae

This family comprises only the single living species, *Anseranas semipalmata* (Magpie Goose).

<i>Anseranas semipalmata</i>	Magpie Goose
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