

SHORT NOTE

Sibley *et al.*'s (1988) classification of living birds applied to the New Zealand list

The method of DNA–DNA hybridization compares the whole genetic content of pairs of species by so-called ‘hybridizing’ the non-repeating DNA of each species. The degree of matching between the DNAs is taken as a measure of genetic distance between those species. Based on many comparisons between members of the same, and different, groups, Sibley *et al.* (1988) have constructed a phylogeny and classification of all living birds. They claim that this technique avoids the complexities of convergent and parallel evolution and convergent adaptation to environment that bedevil anatomical and morphological studies.

Possible consequences of the classification of living birds based on DNA–DNA hybridization data (Sibley *et al.* 1988) for the New Zealand checklist are presented here. The possible effects on the New Zealand passerine list of a classification of the Australo–Papuan passerines based on DNA–DNA hybridization data (Sibley & Ahlquist 1985) were discussed in a previous note (Holdaway 1988).

As with the passerine list, other information has been incorporated in the list presented below, and taxa not covered by Sibley *et al.*'s classification are included. In particular, new classifications of the shags and cormorants (Phalacrocoracidae) (Siegel-Causey 1988) and of the waterfowl (Livezey 1986, 1989) have been included to show the results of contemporary morphological studies beside the biochemically based main classification. Both these classifications were based on cladistic analyses of skeletal characters.

The list below is, unlike Sibley *et al.*'s classification, taken to genus level to show which New Zealand taxa belong where under the system. As with the passerine list, the present list is an attempt to apply the new information at a local level and to encourage work on avian systematics in New Zealand.

Sibley *et al.*'s classification maintains most of the familiar lower-order groupings of birds, particularly at the family level (except in the passerines, as discussed with the passerine list – Holdaway 1988), but it contains many novel arrangements of higher-level taxa. In effect, the Order has been ‘elevated’ in rank – or the Family ‘demoted’ – compared with current practice.

As Sibley *et al.* pointed out (p. 414), application of the Law of Priority results in some group names which may seem inappropriate: for example, the hawks and eagles (which are usually placed in an Order of their own) are included in an Order Ciconiiformes. This new group contains not only the traditional storks, herons, and ibises but also the gulls and waders, grebes, gannets, cormorants, petrels, pelicans, hawks, and New World vultures. This is a significant departure from current practice. Further, the Order is included, with the passerines, cranes, and pigeons, in a Superorder Passerimorphae. As the authors recognise, it is here and with the inclusive

group the Passerae, that the greatest incongruity of name and usage exists.

It is unsettling, perhaps, for groups with names based on the genus of sparrows to contain vultures, but to criticise the whole classification because of the semantics of group names would be to miss the point. For the first time, there is a useful working hypothesis on the interrelationships of the major groups of birds based on a coherent suite of published research. For an initial discussion of the merits of the scheme, see commentary by Mayr (1989) and replies by Sibley (1989) and Monroe (1989). The hypothesis can only benefit a field in which tradition has often outweighed science (Raikow 1985).

**THE GENERA OF BIRDS IN NEW ZEALAND,
INCLUDING THE KERMADEC ISLANDS, AND MACQUARIE ISLAND:
A LIST BASED ON THE CLASSIFICATION OF THE LIVING BIRDS
OF THE WORLD BY SIBLEY *et al.* (1988)**

General. Three groups in the New Zealand fauna which are not covered by Sibley *et al.*'s analysis have been included here. They are shown as *incertae sedis* (of uncertain position) within the group to which they are most likely to belong or are given subjective ranks in keeping with their distinctiveness. These groups are: the Dinornithi, Aptornithi, and Turnagridae. The genera of Acanthisittidae are as in Millener (1988, 1989, pers. comm.)

Conventions. ⁱ, introduced to New Zealand; ^e, extinct; ^r, relict distribution; ^{*}, another representative of genus in present fauna after natural colonisation or introduction, or as a straggler; ^v, vagrant; ^m, annual migrant to New Zealand.

CLASS Aves

Subclass Neornithes

Infraclass Eoaves

Parvclass Ratitae

Order Struthioniformes

Suborder Casuarii

Family Apterygidae [Kiwis]

Apteryx

Suborder Dinornithi¹

Family Dinornithidae [Moas]

^e*Dinornis*

Family Emeidae [Moas]

Subfamily Emeinae

^e*Emeus*

^e*Euryapteryx* (includes *Zelornis*)

Subfamily Anomalopteryginae

^e*Pachyornis*

^e*Megalapteryx*

^e*Anomalopteryx*

- Parvclass Galloanserae**
Superorder Gallomorphae
Order Galliformes
Parvorder Phasianida
Superfamily Phasianoidea
Family Phasianidae [Pheasants and quail]
^e*Coturnix*
ⁱ*Alectoris*
ⁱ*Perdix*
ⁱ*Synoicus*
^{ie}*Colinus*
ⁱ*Lophortyx* [now in *Callipepla*]
ⁱ*Phasianus*
ⁱ*Pavo*
Superorder Anserimorphae
Order Anseriformes ²
Infraorder Anserides
Family Dendrocygnidae [Whistling ducks]
^v*Dendrocygna*
Family Anatidae
Subfamily Oxyurinae [Stiff-tailed ducks]
^e*Oxyura*?
Subfamily Cygninae [Swans]
^e*Cygnus**
Subfamily Anatinae
Tribe Anserini [Geese]
^e*Cnemiornis*
ⁱ*Branta*
^{ie}*Cereopsis*
Tribe Anatini [Ducks and shelducks]
Tadorna
*Anas**
Hymenolaimus
Aythya
^v*Chenonetta*
^e*Mergus*
^e*Malacorhynchus**
^e*Biziura*
^e*Pachyanas*
^e*Euryanas*
Infraclass Neoaves
Parvclass Coraciae
Superorder Coraciimorphae
Order Coraciiformes
Suborder Coracii
Superfamily Coracioidea
Family Coraciidae [Typical rollers]
^v*Eurystomus*
Suborder Alcedini³
Infraorder Alcedinides
Parvorder Cerylida
Superfamily Dacelonoidea
Family Dacelonidae [Forest kingfishers]
Halcyon
ⁱ*Dacelo*

- Parvclass Passerae**
Superorder Cuculimorphae
Order Cuculiformes
Infraorder Cuculides
Parvorder Cuculida
Superfamily Cuculoidea
Family Cuculidae [Old World cuckoos]
^v*Cuculus*
Chrysococcyx
Eudynamys
^v*Scythrops*
- Superorder Psittacimorphae**
Order Psittaciformes
Family Psittacidae [Parrots]
Cyanoramphus
Nestor
Strigops
^{iv}*Cacatua*
ⁱ*Platycercus*
- Superorder Apodimorphae**
Order Apodiformes
Family Apodidae [Typical swifts]
^v*Hirundapus*
^v*Apus*
- Superorder Strigimorphae**
Order Strigiformes
Suborder Strigi
Parvorder Tytonida
Family Tytonidae [Barn owls]
^v*Tyto*
- Parvorder Strigida**
Family Strigidae [Typical owls]
Ninox
^e*Sceloglaux*
ⁱ*Athene*
- Suborder Aegotheli**
Family Aegothelidae [Owlet-nightjars]
^e*Aegotheles*⁴
- Superorder Passerimorphae**
Order Columbiformes
Family Columbidae [Pigeons and doves]
Hemiphaga
ⁱ*Columba*
ⁱ*Streptopelia*
- Order Gruiformes**
Suborder Gru
Infraorder Gruides
Parvorder Gruida
Superfamily Gruioidea
Family Gruidae [Cranes]
^v*Grus*

Suborder Ralli**Family Rallidae [Rails]***Dryolimnas* [= *Rallus*]⁵*Gallirallus*⁶*Porphyrio*⁷*Porzana*^e*Diaphorapteryx*^e*Fulica**^e*Capellirallus*^e*Gallinula****Suborder Aptornithi inc. sedis****Family Aptornithidae [Adzebills]***Aptornis*⁸**Order Ciconiiformes****Suborder Charadrii****Infraorder Charadriides****Parvorder Scolopacida****Superfamily Scolopacoidea****Family Scolopacidae [Sandpipers and snipe]****Subfamily Scolopacinae [Snipe]**^m*Gallinago*^r*Coenocorypha***Subfamily Tringinae [Sandpipers]**^m*Actitis*^m*Tringa* [incl. *Xenus*, *Heteroscelus*]^m*Numenius*^m*Limosa*^m*Limnodromus*^m*Philomachus*^m*Bartramia*^m*Arenaria*^m*Calidris*^m*Limicola*^m*Phalaropus***Parvorder Charadriida****Superfamily Charadriioidea****Family Charadriidae****Subfamily Recurvirostrinae****Tribe Haematopodini [Oystercatchers]***Haematopus***Tribe Recurvirostrini [Stilts and avocets]**^v*Recurvirostra**Himantopus***Subfamily Charadriinae [Plovers]***Lobibyx*^m*Pluvialis**Charadrius*^r'*Thinornis*''*Anarhynchus*'**Superfamily Laroidea****Family Glareolidae****Subfamily Glareolinae [Pratincoles]**^v*Glareola*

Family Laridae**Subfamily Larinae****Tribe Stercorariini [Skuas]***^mStercorarius**Catharacta***Tribe Larini [Gulls]***Larus***Tribe Sternini [Terns]***^vChlidonias**^vGelochelidon**Hydroprogne**Sterna**Anous**Gygis**Procelsterna***Suborder Ciconii****Infraorder Falconides****Parvorder Accipitrida****Family Accipitridae [Hawks and eagles]****Subfamily Accipitrinae***^eCircus⁹**^eHarpagornis**^eHaliaeetus?***Parvorder Falconida****Family Falconidae [Falcons]***Falco***Infraorder Ciconiides****Parvorder Podicipedida****Family Podicipedidae [Grebes]***Podiceps**Tachybaptus***Parvorder Phaethontida****Family Phaethontidae [Tropicbirds]***Phaethon***Parvorder Sulida****Superfamily Suloidea****Family Sulidae [Gannets and boobies]***Morus¹⁰**Sula***Family Anhingidae [Darters]***^vAnhinga***Superfamily Phalacrocoracoidea****Family Phalacrocoracidae [Shags and cormorants]***Phalacrocorax**Stictocarbo**Leucocarbo**Euleucocarbo**Nesocarbo**Microcarbo*

- Pärvorder Ciconiida**
Superfamily Ardeoidea
Family Ardeidae¹¹ [Hérons and bitterns]
Ardea
Egretta
Botaurus
^e*Ixobrychus*^{*}
Nycticorax
^m*Ardeola* [= *Bubulcus*]
- Superfamily Threskiornithoidea**
Family Threskiornithidae [Ibis and spoonbills]
^v*Plegadis*
^v*Threskiornis*
Platalea
- Superfamily Pelecanoidea**
Family Pelecanidae [Pelicans]
Subfamily Pelecaninae
^e*Pelecanus*^{*}
- Superfamily Procellarioidea**
Family Fregatidae [Frigatebirds]
^v*Fregata*
- Family Spheniscidae** [Penguins]
Aptenodytes
Eudyptes
Eudyptula
Megadyptes
Pygoscelis
^v*Spheniscus*
- Family Procellariidae** [Petrels]
Subfamily Hydrobatinae [Storm petrels]
^v*Oceanodroma*
^v*Oceanites*
Garrodia
Pelagodroma
Fregatta
- Subfamily Procellariinae** [Petrels]
Macronectes
Daption
^v*Fulmarus*
^v*Thalassoica*
^v*Lugensa*¹²
^v*Pseudobulweria*
Procellaria
Pterodroma
^v*Calonectris*
Puffinus
Pachyptila
^v*Halobaena*
Pelecanoides
- Subfamily Diomedeinae** [Albatrosses]
Diomedea
Phoebetria

Order Passeriformes**Suborder Tyranni (Suboscines)****Infraorder Acanthisittides****Family Acanthisittidae [New Zealand wrens]***Acanthisitta**Xenicus*^e*Traversia*^e*Pachyplichas*^en. gen.**Suborder Passeri (Oscines)****Parvorder Corvida****Superfamily Meliphagoidea****Family Meliphagidae [Honeyeaters]***Notiomystis**Anthornis**Prothemadera*^v*Anthochaera***Superfamily Corvoidea****Family Eopsaltriidae [Australian robins]***Petroica***Family Corvidae****Subfamily Pachycephalinae****Tribe Mohouini [Yellowheads]***Mohoua* [incl. *Finschia*]**Subfamily Corvinae****Tribe Corvini [Crows and jays]**^e*Corvus***Tribe Artamini [Currawongs, wood swallows]**ⁱ*Gymnorhina*^v*Artamus***Tribe Oreolini [Orioles, cuckooshrikes]**^v*Coracina*^v*Lalage***Subfamily Dicurinae****Tribe Rhipidurini [Fantails]***Rhipidura***Tribe Monarchini [Monarchs]**^v*Myiagra***Family Callaeatidae *inc. sedis* [Wattlebirds]***Callaeas**Philesturnus*^e*Heteralocha***Family Turnagridae *inc. sedis* [Piopios]***Turnagra***Parvorder Passerida****Superfamily Muscicapoidea****Family Muscicapidae****Subfamily Turdinae [Thrushes]**ⁱ*Turdus***Family Sturnidae****Tribe Sturnini [Starlings]**ⁱ*Sturnus*ⁱ*Acridotheres*

- Superfamily Sylvioidea**
Family Hirundinidae [Swallows, martins]
Subfamily Hirundininae
^v*Cecropia* [formerly *Hylochelidon*]
Hirundo
Family Pycnonotidae [Bulbuls]
^{ie}*Pycnonotus*
Family Zosteropidae [Silvereyes]
Zosterops
Family Sylviidae
Subfamily Megalurinae [Grass warblers]
Megalurus [= *Bowdleria*]
- Superfamily Passeroidea**
Family Alaudidae [Larks]
ⁱ*Alauda*
Family Passeridae
Subfamily Passerinae [Old World sparrows]
ⁱ*Passer*
Subfamily Motacillinae [Pipits, wagtails]
Anthus
Subfamily Prunellinae [Accentors, dunnocks]
ⁱ*Prunella*
Family Fringillidae
Subfamily Fringillinae
Tribe Fringillini [Chaffinches]
ⁱ*Fringilla*
Tribe Carduelini [Old World finches]
ⁱ*Carduelis*
Subfamily Emberizinae
Tribe Emberizini [Buntings]
ⁱ*Emberiza*

- ¹ I have accepted two families for the moas, Dinornithidae and Emeidae, in contrast to the arrangement in Kinsky (1970). The morphological differences between the groups are as great as has been used to support family status in other groups. Advances in cloning DNA from very small samples may one day allow even these extinct groups to be compared with extant taxa.
- ² The full classification by Livezey (1986) based on morphological characters is given below for comparison; *Cnemiornis* and *Euryanas* are placed in the main list in orthodox positions.
- ³ It is unfortunate that this ending is the same as for a Tribe.
- ⁴ Olson, Balouet, & Fisher (1987) treat *Megaegotheles* Scarlett, 1968 as a junior subjective synonym of *Aegotheles* Vigors and Horsfield, 1826, based on an examination of all the other species in *Aegotheles*. The New Zealand species therefore becomes *Aegotheles novaezealandiae* (Scarlett, 1968). *Aegotheles savesi*, known from a single skin and subfossil bones from New Caledonia (Olson et al. 1987), resembles *A. novaezealandiae* in having an elongated tarsometatarsus and reduced wing elements (Balouet & Olson 1989).
- ⁵ According to Olson (1973).

- ⁶ Including *Cabalus*, *Nesolimnas*, and *Rallus philippensis* (Olson 1973, 1977).
- ⁷ Including *Notornis* (Olson 1973, 1977).
- ⁸ Olson (1985) points out that the name *Apterornis* Owen has one week's priority over *Aptornis* Owen. *Aptornis* has been used by every author since then (even by Owen himself), so a case for conserving *Aptornis* could be presented to the International Commission. *Apterornis* may have been a misspelling corrected by the first reviser (Owen himself), without comment.
- ⁹ The fossil hawks first noted by Forbes in the 1890s were named *Circus eylesi* by Scarlett in 1953. R. J. Scarlett (pers. comm.) has since suggested that the species belongs in *Accipiter* but the change has yet to be formally published. Morphological characters, however, support its retention in *Circus* (pers. obs.)
- ¹⁰ *Morus* is maintained for the gannets on osteological grounds as shown, for example, in Olson (1985) and van Tets et al. (1988).
- ¹¹ Horn (1980) reported the Black Bittern (*Dupetor flavicollis*) from subfossil deposits at Poukawa. This is now thought to be a misidentification of the New Zealand Little Bittern (Horn, pers. comm.)
- ¹² *Lugensa* and *Pseudobulweria* as in Imber (1985).

Note added in press: Since the MS was submitted, the third edition (1990) of the New Zealand checklist has been published (E. G. Turbott, Convener). This edition recognises two families of moa, the Dinornithidae and Emeidae, as in the original draft of the present note; the subfamilial arrangement here follows that in the 1990 checklist. The 1990 checklist also uses *Porphyrio* for *Notornis*, but retains, for example, *Rallus* for the Banded Rails, and *Bowdleria* for *Megalurus*.

Arrangement of the waterfowl according to Livezey (1986, 1989)

Suborder Anseres

Family Cnemiornithidae [New Zealand geese]

Cnemiornis

Family Anatidae

Subfamily Dendrocygnae [Tree ducks]

Dendrocygna

Subfamily Anserinae [Geese and swans]

Tribe Anserini [Geese]

Cereopsis

Branta

Tribe Cygnini

Cygnus

Olor

Subfamily Euryanatinae [New Zealand forest duck]

Euryanas

Subfamily Tadorninae

Tribe Tadornini [Shelducks]

Subtribe Tadorneae

Tadorna

Subtribe Malacorhyncheae [Pink-eared ducks]

Malacorhynchus

Subtribe Merganettae [Torrent ducks]

Hymenolaimus

- Subfamily Anatinae
 [Tribe] 'Anatini' *inc. sedis* [Dabbling ducks]
Anas
Chenonetta
 Tribe Aythyini [Scaup]
Aythya
 Tribe Mergini [Mergansers]
Mergus
 Tribe Oxyurini [Stiff-tailed ducks]
Oxyura
Biziura
Incertae sedis
Pachyanas

How the 'Sibley' system differs from the classification used in the current Checklist (Kinsky 1970)

1. The upland gamebirds and waterfowl are grouped with the ratites (including kiwis) in the Infraclass Eoaves, which is separated from the Infraclass Neoaves, which includes all other living birds.
2. Within the Neoaves, the kingfishers and rollers are separated from all other birds, in their own Parvclass, the Coraciae: in the present New Zealand list, they are of equal rank to taxa such as the parrots or the passerines.
3. The Parvclass Passerae contains all groups of birds on the New Zealand list which are not ratites, gamebirds, waterfowl, or kingfishers and their allies. The other two Parvclasses are the Picae (woodpeckers, barbets, and toucans) and the Coliae (mousebirds), neither of which occur in New Zealand.
4. The cuckoos have a Superorder of their own, as have the parrots, and the swifts. Owls and owlet-nightjars are placed as separate suborders within a single Order, one of two in a fourth Superorder. These four Superorders are equal in rank to the fifth, the Passerimorphae, which contains four Orders containing birds as diverse as pigeons, rails terns, hawks, and riflemen. This section of the classification is sure to be contentious because, for example, it implies that honeyeaters (*Meliphagidae*) share a more recent common ancestor with the petrels (*Procellariinae*) than with cuckoos, as is implied by the present arrangement.
5. The grebes are placed next to the tropicbirds, shags, and gannets, and the frigatebirds have been shifted to near the petrels and penguins. The waterbirds, traditionally perceived as 'primitive', are placed as some of the most advanced (= highly derived) groups in this classification.
6. Differences between the two systems for the passerines have been discussed elsewhere (Holdaway 1988).

Discussion

The classification proposed by Sibley *et al.* (1988) has the merit of being based on potentially testable, repeatable work. This contrasts with the 'Wetmore order', and the 'Basel' and other sequences, which date back to Gadow (Monroe 1989). The real bases of these sequences are opinions and hence the classifications are not testable.

Raikow (1985) concluded that a classification based on a single method has the advantage of not being ambiguous: a cladistic classification, based solely on a hypothesis of genealogy, "tells us with certainty what an author has decided about the pattern of genealogical descent uniting the species included". This contrasts with the traditional or 'eclectic' technique, where an unknown mixture of similarity and proposed genealogy is embodied in the classification. The results of DNA – DNA hybridization studies resemble the cladistic approach in being based entirely on an hypothesized pattern of descent. Phenetic similarity often only obscures the genealogy, where two groups have converged structurally and occupy similar ecological niches.

Sibley *et al.* (1988), Mayr (1989), Sibley (1989), and Monroe (1989) have emphasised that the new classification is not the last word in avian systematics. It should be used as the basis for further research, and not set in concrete or discarded completely. Some features of the classification are sure to be wrong, but the advantages of having the system as the base for research hypotheses are enormous.

New information and classifications can lead to new insights in ecology and behavioural studies. Brown (1987, p. 34) pointed out that the distribution of cooperative breeding in passerines is random with respect to the Wetmore order of families: "The taxonomic representation of communally breeding is bewildering. No really clear patterns emerge because communal breeding species are found in many orders and families. Communal breeding is clearly not a trait whose phylogeny can be usefully analyzed along phylogenetic lines, with the possible exception of certain genera (*Aphelocoma* jays) and subfamilies (*Crotophaginae*, anis)." Russell (1989), however, drew attention to the concentration of communally breeding species in the Corvida.

In morphology, too, the new classification has already shown that characters once dismissed as random are taxonomically useful. Bock (1962) noted that the variation in the tricipital fossa of the passerine humerus was random with respect to the Wetmore order of families. Sibley *et al.* (1989) and Monroe (1989) have pointed out that there is more than 90% congruence between the distribution of the character states of the fossa and the Corvida/Passerida division proposed in the DNA – DNA classification.

The new classification highlights many possible case studies for New Zealand workers. For example, Sibley & Ahlquist (1987) suggested that *Finschia* and *Mohoua* should be merged and that they form part of the pachycephaline radiation. There is scope for work on groups such as the rails, parrots, plovers, petrels, penguins, and shags, quite apart from the passerines. Must anatomical studies of New Zealand birds always be done elsewhere? A shortage of comparative material has often been a problem in the past, but exchange of specimens and travel to overseas collections have never been easier. The revision of *Pterodroma* (Imber 1985) is an example of what can be achieved. New Zealand, with its large list of petrels, shags, and penguins is an ideal site for research on the relationships of these groups. I hope that presenting the classification in a local context will encourage work on the New Zealand fauna.

LITERATURE CITED

- BALOUET, J.C.; OLSON, S.L. 1989. Fossil birds from late Quaternary deposits in New Caledonia. *Smiths. Contr. Zool.* 469: 1-38.
- BOCK, W.J. 1962. The pneumatic fossa of the humerus in the passerines. *Auk* 79: 425-443.
- BROWN, J.L. 1987. *Helping and communal breeding in birds: ecology and evolution*. Princeton, N.J.; Princeton University Press.
- HOLDAWAY, R.N. 1988. The New Zealand passerine list: what if Sibley & Ahlquist are right? *Notornis* 35: 63-70.
- HORN, P.L. 1980. Probable occurrence of the Black Bittern, *Dupetor flavicollis* (Linnaeus), in New Zealand. *Notornis* 27: 401-403.
- IMBER, M.J. 1985. Origins, phylogeny and taxonomy of the gadfly petrels *Pterodroma* spp. *Ibis* 127: 197-229.
- KINSKY, F.C. (Convener) 1970. Annotated checklist of the birds of New Zealand. Wellington: Reed & Ornithological Society of NZ.
- KINSKY, F.C. (Convener) 1980. Amendments and additions to the 1970 Annotated Checklist of the Birds of New Zealand. *Notornis* 27 (Supplement): 1-23.
- LIVEZEY, B.C. 1986. A phylogenetic analysis of recent anseriform genera using morphological characters. *Auk* 103: 737-754.
- LIVEZEY, B.C. 1989. Phylogenetic relationships of several subfossil Anseriforms of New Zealand. *Occ. Papers Mus. Nat. Hist. Uni. Kansas* 128: 1-25.
- MAYR, E. 1989. [Commentary] A new classification of the living birds of the World. *Auk* 106: 508-512.
- MILLENER, P.R. 1988. Contributions to New Zealand's Late Quaternary avifauna. 1: *Pachyplichas*, a new genus of wren (Aves: Acanthisittidae), with two new species. *J. Roy. Soc. NZ* 18: 383-406.
- MILLENER, P.R. 1989. The only flightless passerine; the Stephens Island wren (*Traversia lyalli*: Acanthisittidae). *Notornis* 36: 280-284.
- MONROE, B.L. 1989. [Commentary] Response to E. Mayr. *Auk* 106: 515-516.
- OLSON, S.L. 1973. A classification of the Rallidae. *Wilson Bull.* 85: 381-416.
- OLSON, S.L. 1977. A synopsis of the fossil Rallidae. Pages 339-373 in Ripley, S.D. *Rails of the World: a Monograph of the Family Rallidae*. Boston: David R Godine.
- OLSON, S.L. 1985. The fossil record of birds. Pages 79-238 in FARNER, D.S.; KING, J.R.; PARKES, K.C. (eds). *Avian Biology*, vol. VIII. London: Academic Press.
- OLSON, S.L.; BALOUET, J.C.; FISHER, C.T. 1987 [1989]. The owl-nightjar of New Caledonia, *Aegotheles savei*, with comments on the systematics of the Aegothelidae. *Le Gerfaut* 77: 341-352.
- RAIKOW, R.J. 1985. Problems in avian classification. Pages 187-212 in Johnston, R.F. (ed). *Current Ornithology*, vol 2. New York and London: Plenum press.
- RUSSELL, E.M. 1989. Co-operative breeding - a Gondwanan perspective. *Emu* 89: 61-62.
- SCARLETT, R.J. 1953. A sub-fossil hawk from New Zealand. *Rec. Cant. Mus.* 6: 245-252.
- SIBLEY, C.G. 1989. [Commentary] Response to E. Mayr. *Auk* 106: 512-515.
- SIBLEY, C.G.; AHLQUIST, J.E. 1985. The phylogeny and classification of the Australo-Papuan passerine birds. *Emu* 85: 1-14.
- SIBLEY, C.G.; AHLQUIST, J.E. 1987. The relationships of four species of New Zealand passerine birds. *Emu* 87: 63-66.
- SIBLEY, C.G.; AHLQUIST, J.E.; Monroe, B.L. 1988. A classification of the living birds of the world based on DNA-DNA hybridization studies. *Auk* 105: 409-423.
- SIEGEL-Causey, D. 1988. Phylogeny of the Phalacrocoracidae. *Condor* 90: 885-905.
- van TETS, G.F.; MEREDITH, C.W.; FULLAGAR, P.J.; DAVIDSON, P.M. 1988. Osteological differences between *Sula* and *Morus*, and a description of an extinct new species of *Sula* from Lord Howe and Norfolk Islands, Tasman Sea. *Notornis* 35: 35-57.

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