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The principal additions to current information that affect the arrangement of the family and higher groups in birds since the previous paper on this subject by the author was published (1951, pp. 1-22) have come in the fossil field and deal in part with the earliest known forms of the Jurassic and Cretaceous periods. While there has been much discussion of family limits among the Passeriformes, with considerable spread of opinion as to family limitations, in the main these have been expressions of individual viewpoint, without completely firm support in the new information offered. Valuable new data that are accumulating from many sources relative to this order, where they are completely decisive, in the main suggest better alignment of existing families through shift of genera from one group to another. The great majority of the many species still require detailed anatomical study.

Under the revision of the International Code of Zoological Nomenclature as adopted at the Fifteenth International Zoological Congress held in London in July 1958, now in press, a new rule provides that family names are to be based on strict priority in publication. There is no attempt to follow this requirement in the classification presented herewith since the final draft of the Code was not yet in print when the paper was under preparation. It is apparent, however, that acceptance of this new proviso, while intended to establish stability, in the beginning will bring many changes in current family and higher group designations in the class Aves.

The following notes that discuss the more important changes are added to material from the introductory section of the revision of 1951 where this remains pertinent. In the classification at the end of the text the fossil groups are enclosed in brackets to enable their ready recognition on the part of students familiar mainly with the family and other categories of living kinds.

Archaeornithes.—The recent careful study of the specimen of *Archaeopteryx* in the British Museum (Natural History) by Sir

Gavin de Beer has added greatly to knowledge of this bird through application of modern methods of examination. De Beer (1954, pp. 39-41) has outlined clearly the resemblances found in the two nearly complete specimens preserved in London and in Berlin and has shown that most of the differences between them that have been described either have been misinterpreted or do not rate the value that has been assigned to them. His conclusion is that "proposed generic and even specific distinction between them calls for very critical examination." In his final statement on this part of his study (l.c., pp. 50, 57) he unites both under the name "*Archaeopteryx lithographica* Meyer."

In brief review, formal recognition of the two specimens as representative of separate species came when Dames (1897, p. 829) named the one in Berlin *Archaeopteryx siemensii.* Petronievics (*in* Petronievics and Woodward, 1917, p. 5) considered that differences between the two were of sufficient weight to separate *siemensii* tentatively as the type of a new genus, *Archaeornis.* In a later study Petronievics (1921, p. 10), after further consideration, was definite in establishing the two in distinct genera and added that they might "vielleicht sogar zu zwei verschiedenen Familien gehören." In a more detailed account (1925, pp. 67-69) he placed the two in separate families, which he maintained later in a further review (1950, pp. 118-120).

The major points on which Petronievics based his two families have disappeared through the information supplied by de Beer. There remain, however, distinctions of size and relative proportion, the London specimen being about 10 percent larger in general dimension, with the foot about 25 percent greater. De Beer regards these size characters as individual, to be attributed either to age or to sex. Steiner (1938, p. 292), who also has considered the two identical, says that in his opinion the Berlin specimen was a young individual and a female, in contrast to the London example which he believes was a mature male.

While my personal study of this problem has been confined to views of the London fossil and the nearby cast from Berlin in the British Museum, additional comparisons of casts of the two in the U.S. National Museum, and examination of published figures, it appears to me that the foot of the Berlin bird not only is smaller but also has the toes of different proportion in relation to one another and to the tarsometatarsus. The wing elements in the two specimens appear quite similar, but the entire leg in the Berlin bird seems more slender. It is possible that these ancient birds, like some reptiles, continued to grow in size for a longer period than is true with modern species,

a factor, however, which must remain hypothetical. Steiner's supposition that the London specimen is male and the Berlin fossil female is equally speculative, since if sex is assumed, the reverse might be true. While the male is larger than the female in most living birds, this is not the universal rule, and as reptilian characteristics persist in these earliest known avian forms it must be remembered that in reptiles it is common for the female to be larger than the male. As a further contribution to available information there should be noted the analysis of the primary wing feathers by Savile (1957, pp. 99-101), which points out an apparent difference in wing formula between the London and the Berlin birds. This recent observation if accepted would indicate rather wide separation, but, on the other hand, if denied would serve to bolster the conclusions of de Beer.

A third specimen found in 1956 near the point where the first example was discovered shows mainly wing and leg bones and vertebrae, in addition to feather impressions. It has been described in detail by Heller (1959, pp. 1-25), who finds that it agrees in size and characters with the one in London, so that there are now two of the larger form known.

It is important to have a modern study, like that of de Beer, of the Berlin specimen, to add to the data assembled by Dames. As matters stand, the three known skeletons present an appearance of differences sufficient to mark them as two distinct species on the basis of criteria found in the osteology of living birds. These data, for the present, appear to warrant recognition of two genera, *Archaeopteryx* represented by two specimens and *Archaeornis* by one, which, however, should be united in one family, the Archaeopterygidae.

Ichthyornithes.—A recent study by Gregory (1952, pp. 73-88) has severed the long-standing association of *Hesperornis* and *Ichthyornis* in a superorder separated from all other birds known from the New World through the possession of teeth. In brief, Dr. Gregory has shown that the toothed lower jaw fragments allocated to the skeleton of *Ichthyornis dispar* Marsh, unduly large in proportion to the rest of the skull and the skeleton with which they have been associated, in reality are not avian but are those of a small mosasaur. Two other jaw fragments placed by Marsh with *Ichthyornis anceps* and *I. victor* are similar, so that all these specimens, which have the teeth in sockets, are identified as reptilian. This leaves *Hesperornis* as the only group of Cretaceous age in which teeth are known. To give a balanced treatment that will emphasize the important characters of the birds concerned it has seemed appropriate to establish a suborder Ichthyornithes for the Ichthyornithiformes, separated from all other birds

by the possession of biconcave vertebrae. I have given a somewhat more detailed discussion of this matter elsewhere (Wetmore, 1956, p. 2).

The penguins.—The question of the weight to be given the peculiarities of uniform pterylosis, extreme specialization of the wing as a flipper for submarine progression, and incomplete fusion in the metatarsal elements, as well as such other details as erect posture in standing and walking and the anatomical adjustments involved, found in the penguins, is one that has merited careful review. It seems reasonable after this examination to retain the Impennes as a superorder, at least until we have further evidence through fossils as to their line of evolution. It is necessary, however, to remove the fossil family Cladornithidae, since Simpson (1946, pp. 24-25) has found that the two genera *Cruschedula* and *Cladornis* placed in this family have no apparent relationship to the Sphenisciformes. These two, described by Ameghino from the Deseado formation of Patagonia, now placed in the Oligocene, are based on fragmentary, considerably flattened metatarsi. The descriptions and figures that have appeared thus far are not sufficiently definite to demonstrate characters of importance in classification. However, from what we now know these ancient birds cannot be considered as ancestral penguins of terrestrial habit, as has been supposed. The only suggestion that has come to me is that possibly they may belong in the order Pelecaniformes, in which I have placed the family tentatively in a suborder Cladornithes (see p. 25).

The Neognathae.—One important result of recent studies has been the allocation to the Neognathae of the orders formerly separated as the Palaeognathae. For years I have felt that recognition of the Palaeognathae, as a separate group apart from other birds, on the basis of a supposed peculiarity in the palate, stood on flimsy ground. The studies of McDowell (1948, pp. 520-549) demonstrate that the structure of the palaeognathous palate, in which the palatine and pterygoid bones are articulated by a squamous suture, is variable from order to order and that in fact the details of this union differ considerably in the several groups. For example, McDowell points out that in *Dromiceius* the palatine and pterygoid are not in contact, while in a number of families placed in the Neognathae, as in the Anatidae, to name only one, the two bones are in articulation. As there is no clear-cut separation, the former Palaeognathae must be combined with the Neognathae.

The supposed bird *Caenagnathus collinsi* described by R. M. Sternberg (1940, p. 81) from the Belly River series of beds of Upper Cretaceous age in Alberta has been carried tentatively in our avian

classification, though it has been my belief from the beginning that it was reptilian. It is known from a lower jaw, beautifully preserved, without appreciable deformation and practically complete except for part of the lower section of one ramus. The resemblance to birds is found in the lack of teeth, fused symphysis, and the considerable size of the mandibular foramen. While these are characters found in birds, there is nothing peculiar included since all are duplicated in some of the groups of the Reptilia. The fossil resembles Reptilia in the form of the articular surface, the forward position of the coronoid area, the conformation at the symphysis, especially on the upper surface, the upward curvature in that area, and in the general texture of the bone. In none of these is there exact duplication in Aves, except partially in the form of the symphyseal region. The whole appearance of the bone strongly suggests a species related to the Ornithomimidae among the therapod dinosaurs. In view of this the "Order Caenagnathiformes" is now omitted from the avian classification, since it is felt that its continued tentative inclusion may promote misunderstanding as to its status.

The family Eleutherornithidae is introduced for the fossil *Eleutherornis helveticus* Schaub, from the Eocene of Switzerland, described from a fairly well preserved pelvis. Apparently this is representative of an ancestral group from which the living ostriches may have come. Its greatest importance is found in its indication of relationship with carinate groups though of unquestioned ratite stock. It is thus important as definite indication that the struthious birds are descended from flying ancestors, not from some distinct cursorial line that always has been flightless, as some have contended.

The genus Podiceps.—The differences of opinion that prevailed for years as to the application of the generic name *Colymbus* have been adjusted currently by an arrangement under which *Gavia* has been accepted for the loons and *Podiceps* for the grebes. There is, however, discussion still as to the proper spelling of the ordinal and familial names for which *Podiceps* is the base. The uncertainty arises from misunderstanding of the derivation of this generic term. The colloquial name applied to these diving birds in the English of the 16th to the 18th centuries (and later) was "arse foot," or "arsfoot," from the posterior position of the leg. The term is found in the early dictionaries of Johnson, was carried in the later editions of Todd and Walker, and is still found in a footnote in Webster's 1953 volume, with indication there that the word now is obsolete. Some early authors who wrote in Latin rendered this term appropriately as "Podicipes," as for example Willughby (1676, p. 258), and Ray (1713,

pp. 125, 190), where the horned grebe is listed as "Colymbus sive Podicipes minor." Catesby (1731, p. 91) wrote of the pied-billed grebe under the heading *"Prodicipes Minor* Rostro vario," but he corrected the spelling of the first word in the legend for the plate that faces the text, which is labeled "Podicipes &c." This account by Catesby was the sole basis on which Linnaeus (1758, p. 136) established his specific name for the pied-billed grebe. And it is here that present-day confusion has its beginning, since Linnaeus called the bird *"Colymbus Podiceps,"* and in citing the reference to Catesby wrote it "Podiceps minor, rostro vario." While he corrected Catesby's error in spelling he thus made another of his own, which remains in our current name *Podilymbus podiceps* (Linnaeus) for the pied-billed grebe. Following Linnaeus, John Latham (1787, p. 244) proposed the genus *Podiceps,* in which he included several species of grebes, with basis for the name on Linnaeus, as he makes reference to "Colymbus Lin." The error in spelling was recognized by several early authors, as in a note attributed to Oken (1839, p. 674) and one by Gloger (1854, p. 430). Correct usage for a family name based on *Podiceps* (=*Podicipes*) was indicated by Newton (1896, p. 381). That this history, well known up to 40 years or so ago, has been forgotten by many is shown by recent action of the International Commission on Zoological Nomenclature (1957, pp. 300-304) which it appears should have further review. The data supplied by the Committee to Dr. Grensted, as classical adviser, were misleading, as there was no indication for his information that "Podiceps" had been derived from "Podicipes."

As the terminal root in *Podiceps* is a contraction of the Latin pes, pedis, it would appear that the correct form for the family name is Podicipedidae (not Podicipidae or Podicipitidae), and for the order Podicipediformes (not Podicipitiformes or Podicipidiformes).

The Procellariiformes.—Family segregation in this order has been oversimplified in some recent discussions, probably through misunderstanding of the group characters, possibly also through somewhat confusing names that have been applied to familial and generic categories. Verheyen (1958, pp. 11-14) has placed the Pelecanoididae in an order with the Alcidae, as indicative that the auk group is allied rather closely to the Procellariiformes. The resemblances that he cites appear due to convergence, as the basic form of the diving petrels is definitely that of the shearwater-petrel group. Aside from this, the Diomedeidae and the Pelecanoididae have been accepted without apparent question, but the remaining species have been combined by some under a single family name. Lowe (1925, pp. 1436-1443) has shown that the genera

included in the Hydrobatidae have a simplified condition in the quadrato-tympanic region of the skull in which the opening of the upper tympanic recess is small, and is so located that it separates the squamosal and opisthotic facets. In addition, the posterior border of the sternum is truncated and entire, and basipterygoids are absent or are represented only by small spines. In the Procellariidae, on the other hand, the foramen of the upper tympanic recess is greatly enlarged and lies anterior to the two facets for the quadrate, which are joined by a bridge of bone; the posterior border of the sternum is notched; and basipterygoid processes are present. These constitute distinctive characters at the family level.

The Pelecaniformes.—In the arrangement of suborders in the order Pelecaniformes we encounter in marked degree the standard difficulty of logical placement in linear alignment of groups that really stand in three-dimensional relationship. Lanham (1947, pp. 65-70) has made a summary of the major anatomical characters of the group in which he points out the differences that set off the Phaëthontes and the Fregatae from the Pelecani. There is no question that the first two carry primitive characters, which may be presumed to be similar to those found in ancient ancestral stocks, since in these resemblances they are more like other types of birds, notably the Procellariiformes. From this style the families of the suborder Pelecani have become widely divergent. Although the tropicbirds and the frigate-birds both have retained a part of what may be regarded as a basic pattern, they are so distinct in other respects that it appears to be more reasonable to relate them individually as branches from a common stock rather than to combine the two on one line, separate from the Pelecani. The Phaëthontes possibly may have separated earlier than the Fregatae. Among interesting differences other than those of internal anatomy, it may be noted that the tropicbirds have the young covered with down at birth and that the adults possess series of air cells under the skin on the forepart of the body like those found in pelicans and boobies. The frigate-birds have young almost naked at hatching, and the emphysematous condition is mainly lacking. In view of this I prefer to continue to align these groups on either side of the Pelecani.

Though there is no question that the cormorants and snake-birds are closely allied, they differ in such degree that they should be retained in separate family status. The snake-birds are marked by a peculiar conformation of the cervical vertebrae through which the beak becomes a triggered spear in feeding. The bridge of Dönitz on the ninth vertebra is an important part of this arrangement. The stomach also is unusual in possessing a curious pyloric lobe, lined with a mat of hair-

like processes. And there is only one carotid artery while in cormorants there are two.

The description of *Osteodontornis orri* by Hildegarde Howard (1957a, pp. 1-23) from the Monterey formation in the Miocene of California adds a third species to the strange Odontopteryges, whose common character is found in the sharply pointed, dentate projections developed on the margins of upper and lower mandibles as continuous parts of the bony structure of the jaws. This suborder was placed tentatively (Wetmore, 1930, p. 3), following Lydekker (1891, pp. 57-58), in the Pelecaniformes, but this was not definite, as the characters of *Odontopteryx* have been interpreted by some as indicating closer alliance to the petrel–albatross group. In July 1956, at the British Museum (Natural History), through the kind attention of Dr. W. E. Swinton, I had the privilege of studying the type skull of *Odontopteryx toliapica* Owen, which came from the London clay of the lower Eocene, on the Isle of Sheppey, Kent, England. It was possible thus to ascertain certain details not clear from the published accounts. As a result of this study it is my opinion that the characters clearly indicate relationship with the Pelecaniformes.

Without repeating unnecessary detail, available in Lambrecht's great volume (1933, pp. 304-307), it was interesting to note the strongly marked craniofacial hinge at the base of the bill, like that of gannets and cormorants, and also the impressed line along the side of the premaxilla, and the definite closure of the external narial opening, as in the Sulidae. The distal articular end of the quadrate suggests that of *Phaëthon,* though somewhat more flattened, with the whole articular surface narrower, and the separate segments more nearly in line than in any living species of the various pelecaniform families. The lachrymal appears to have been slender and is firmly anchylosed on its upper margin to the frontal as in *Phalacrocorax.* The rounded cranium suggests that of pelicans, rather than the more flattened form of other families of the order. The sum of the characters indicates a bird of gannetlike diving habit that, when slippery aquatic prey was seized, could hold it firmly in the sharp dentations of the mouth.

Dr. Howard in her interesting study of *Osteodontornis* has elevated the group to the rank of an order, on the consideration that it "may represent an early connection with procellariiform–pelecaniform stock" (1957a, p. 22). It has seemed to me appropriate to emphasize the evident pelecaniform character by retaining the two families recognized in subordinal status in that group, since the resemblances that point toward the Procellariiformes appear to be much less definite and

possibly may be subject to other interpretation. It is desirable now to place the Odontopteryges at the beginning of the order because of their antiquity. The known history of the group, which begins in the early Eocene, indicates probable ancestry in Paleocene time. The pointed projections on the jaws, assumed to have been sheathed in the integument of the bill, were without question used in seizing prey. The disappearance during Miocene time of such a holding apparatus may indicate that the bony projections were not completely successful for their purpose, perhaps because of their hollow centers, as accidental breakage in them would not be restored. The fine serrations restricted entirely to the ramphotheca, found in the straight-billed species of the pelecaniform order (tropicbirds, gannets, boobies, and anhingas), may be regarded as a functional replacement.

The change in position made to the beginning of the order covers only the Odontopterygidae and the Pseudodontornithidae and leaves *Cladornis* and *Cruschedula* still unsettled as to relationship. As explained above (p. 4), Ameghino described both as forms of penguins, but Simpson says that they have no connection with this group. As the suborder Cladornithes, they are located in their former uncertain position at the end of the Pelecaniformes.

Suborder Ardeae.—The general resemblance of the boat-billed heron (*Cochlearius cochlearius*) to the night herons has been the occasion of differences in allocation of its rank in classification from that of a subgenus of *Nycticorax* to full family status. In a recent review of the Ardeidae, Bock (1956, pp. 31-35) has treated it as a separate genus in a "Tribe Nycticoracini" allied to *Nycticorax*. Superficially the boatbill is like a black-crowned night heron, but in detail there are outstanding differences. The enlarged bill is obvious, and there are four pairs of powder-down patches, instead of the three found in the other herons. In the skull, the bill has been changed from the spear point usual in herons to a broad scoop with the roof of the mouth smoothly arched. The lower jaw is widely bowed to fit this change, and the symphysis is greatly reduced in length. The palatines are so greatly broadened, and so inflated on the outer posterior margin, that they have little resemblance to the ordinary heron form. The quadrate has the orbital process shorter and thicker and the mandibular articulation narrowed; the lachrymal is small; the eye opening considerably enlarged to house the exceptionally large eye; and the external nasal opening considerably reduced. The palatal musculature is decidedly stronger than in the true herons.

In life boatbills act like night herons, as they roost and nest in groups and are mainly nocturnal. When hunting at night, I have

found them feeding in shallow waters, often in riffles where they scoop at their living prey, rather than spear at it as is the custom with the typical herons. The eyes, wood brown by day, at night reflect the jacklight with a faint orange sheen, which I have not observed in other herons. The eggs are pale, nearly white, and often are lightly speckled with brown, so that they resemble those of the tiger bittern, *Tigrisoma lineatum,* rather than those of the night herons, which are deep blue.

While there is no fossil record for the boatbill, I regard it as an ancient sideline from the typical herons that, judged from its present restricted range in the American Tropics, has not been too successful. It may seem attractive to unite *Cochlearius* with the true herons, but from long acquaintance I regard their characters, briefly outlined above, sufficient to maintain a separate family status.

In view of the fact that the structural characters of the Balaenicipitidae have been summarized clearly by Stresemann (1934, p. 809), it seems strange that the status of this family has been a matter of question. The single species shows affinity both with storks and with herons, in addition to outstanding peculiarities of its own. Miss Cottam (1957, pp. 51-71) has made a careful summary of the osteology from which she deduces a pelecaniform relationship, but this appears to be due to convergence rather than to actual relationship. The great enlargement of the skull has occasioned superficial resemblances to pelicans, but these, and others seen elsewhere in the skeleton, are subordinate to the general sum of all characters, which is ciconiiform.

Phoenicopteri.—The position of the modern flamingos, which show characters that point on one hand to the Ciconiiformes and on the other to the Anseriformes, has been a matter of some variance in allocation. Mayr and Amadon (1951, pp. 7, 33), with only brief discussion, have set them up as a distinct order, but general opinion has carried them as a suborder allied to the herons, storks, and their relatives. The latter course remains justified when the fossil genera *Palaelodus* and *Elornis* of the upper Eocene to Miocene of western Europe are considered (Wetmore, 1956, p. 3). This group of flamingo relatives was identified in North America when Alden Miller (1944, p. 86) described *Megapaloelodus connectens* from the lower Miocene of South Dakota, a species to which remains from the upper Miocene of California also are referred (Loye Miller, 1950, pp. 69-73; 1952; pp. 296-298). The group may be recognized as the family Palaelodidae, on the generic name *Palaelodus* Milne-Edwards (1863, pp. 157, 158). (There has been confusion relative to the proper spelling, since Milne-

Edwards in his important later work [1868, p. 58] used the form *Paloelodus*.)

Howard (1955, pp. 3-23) has described a still different form of the flamingo group as *Telmabates antiquus* from the lower Eocene (Casamayor formation) of Chubut in Patagonia. While this species resembles the Palaelodidae in shortness and other details of form in the leg, it may prove to be representative of a separate family on characters found in the vertebrae and wing, as suggested in the original description. It is regarded for the present as of subfamily status in the Palaelodidae.

Suborder Cathartae.—The superfamily Neocathartoidea, and family Neocathartidae, for the curious vulture *Neocathartes grallator* (Wetmore), discovered in the Upper Eocene fossil beds of Wyoming, introduced a new element in our known avifauna in the form of a small-winged, strong-legged vulture that evidently was terrestrial with limited powers of flight. It had about the same relation to the other American vultures that the secretarybird has to the hawks and falcons. Its inclusion also requires a separate superfamily, the Cathartoidea, for the previously known cathartine families.

Galliformes.—The Numididae, which have been placed by some as a subfamily of the Phasianidae, differ in completely lacking the tuberosity or plate on the inner side of the second metacarpal that is so prominent in pheasants and grouse. It should be recorded, however, that Hudson, Lanzilloti, and Edwards (1959, p. 64) note that *Numida* shows no peculiarities in the leg musculature when compared with the Phasianidae. The Tetraonidae, in contrast with the Phasianidae, have the pelvis relatively much broader and different in proportion, and the tarsus relatively shorter in relation to the length of the tibiotarsus. With these differences in mind it seems reasonable to retain the three groups in family status, at least until more detailed knowledge of their anatomy as a whole warrants change.

Gruiformes.—In the Turnices the two genera of bustardquails, *Turnix* and *Ortyxelus,* have no hind toe, the wing is eutaxic, only the left carotid is present, and the eggs are rounded oval. The plain-wanderer of Australia, *Pedionomus,* has a small hind toe, the wing is diastataxic, right and left carotids are found, and the large eggs are pyriform. It seems desirable to continue these as separate families, rather than as subfamilies of one group, an arrangement that Stresemann (1933, p. 760) has accepted.

It has long been known that *Mesites* Geoffroy for the curious roatelos of Madagascar is antedated by the same name used by Schönherr for a group of beetles. It has been in error, however, to replace

this with *Mesoenas* Reichenbach 1862, since the conflict had been noted seven years earlier by Prince Bonaparte who gave the group the name *Mesitornis* (Bonaparte, 1855, p. 484). The suborder becomes Mesitornithides and the family Mesitornithidae.

In the course of study of the fossil *Andrewsornis abbotti* from the Oligocene of Patagonia, Bryan Patterson (1941, pp. 50-53) has reviewed related groups to the end that he has added the family Psilopteridae for the South American fossil genera *Psilopterus* and *Smiliornis*. Further, he has placed *Phororhacos* and its allies as a superfamily Phororhacoidea under the suborder Cariamae. His further observations on these matters are to appear later in a more comprehensive paper.

The family Cunampaiidae, for the fossil *Cunampaia simplex,* named by Rusconi (1946, p. 1) from the Oligocene of western Argentina, while placed in the Cariamae, still remains of uncertain status.

The allocation of the phororhacid group to its new position and its demotion from subordinal status requires recognition of a superfamily Cariamoidea for the living Cariamidae and the fossil group Hermosiornithidae. The common name for the Cariamidae in most English writings has been "Cariama," being the form instituted by Marcgrave in 1648 in his Historiae rerum naturalium Brasiliae, when he rendered the Tupí name "çariama" as cariama. This was copied by subsequent authors, including Linnaeus in his twelfth edition, and so came finally into English usage, beginning with Ray's translation of Willughby's Ornithologiae in 1678. Seriema, a modification of the Indian word çariama, is used in Brazil, and with that spelling has come into the Engish language, where it should replace the other form.

Charadriiformes.—Differences of treatment at present are found mainly in the superfamily Charadrioidea and the suborder Lari, in which the groups have been regarded by some as of family value and by others have been allocated to the rank of subfamilies. The various studies that have been made have not been complete from a taxonomic point of view except for part of the species, and the conclusions derived from the data available appear in the main more philosophical than concrete. The picture therefore still remains confused.

In view of the diverse specializations that are apparent, and the obvious long evolutionary history, it appears better to me to continue to acknowledge the main segregations as families, at least until the subjects involved have been more thoroughly investigated. A family, Rhegminornithidae, covers the fossil *Rhegminornis calobates* Wetmore, described from the lower Miocene of Florida. This was as

large as a medium-sized curlew, of peculiar form as regards the foot, the only part of the skeleton known, which shows certain characters that seem to point toward the jaçanas, though the bird is to be placed in the Charadrioidea.

It should be noted that the family affinity of the turnstones and the surfbird, long considered members of the plover family, is not certain as some studies (Lowe, 1931, pp. 747-750) place them in the Scolopacidae. (See also Bock, 1958, pp. 85-86.)

In the Lari the terns and the gulls are regarded as one family, though there are some reasons that make further examination of this treatment desirable. The Stercorariidae possess a 2-notched sternum, large caeca, a cere, and a complex rhamphotheca. In the Laridae ambiens and biceps slip are present, the sternum is 4-notched, there is no cere, and the rhamphotheca is simple in form.

In further discussion of proposals relative to this group it is pertinent to observe that a logical scheme of classification should attempt to outline relationships in living and fossil species through examination of all available data, considerations in which modern studies of behavior find increasingly useful part. There are pitfalls and hidden traps, however, when attempt is made to establish affiliation through any single method of approach, as inevitably inconsistencies appear. I fully agree with Martin Moynihan (1959, pp. 22-23, 35-38) that the skimmers (*Rynchops*) represent an early separation in the ancestry of the gull-like birds and find it pertinent that this is shown in their behavior pattern. At the same time these birds present outstanding peculiarities that should be considered in assigning them appropriate status in relation to their relatives. The bill, compressed to knifelike form, with great elongation of the ramphotheca of the lower jaw, is unique, and the method of feeding, where the lower mandible cuts the water surface with the bird in flight, is equally strange. The structural modifications in the form of the skull from that found in skuas, gulls, and terns also are too extensive to be ignored. The elongated blade of the lower mandible anterior to the symphysis of the rami is intriguing but less important than the profound changes elsewhere. The palatine bones are greatly expanded, the orbital process of the quadrate is reduced to a short, pointed spine, the impression for the nasal gland is much reduced, the frontal area is inflated and produced posteriorly, with compression of the lachrymal, and consequent reduction in size of the cavity for the eye, to enumerate the most outstanding differences in the osteology. Externally, the pupil of the eye is a vertical slit similar to that of a cat, and thus unlike that of any other group of birds (Wetmore, 1919,

p. 195). Other peculiarities have been described in the musculature. The sum of these characters justifies treatment of the Rynchopidae as a distinct family in their suborder.

The fossil humerus, type of *Mancalla californiensis* Lucas, that was the first intimation of a flightless auk on the west coast, while unique for many years, now has been supplemented by abundant material from which an additional, smaller species, *Mancalla diegense* (L. H. Miller), is recognized. It has been possible also to construct a composite skeleton of the larger one that is sufficiently complete to give a clear picture of its form and characters. The evident peculiarities of the genus *Mancalla* are found in the wing, as elsewhere the skeleton resembles that of other alcids, except for differences of a generic and specific nature. In comparison of the wing with that of the great auk, now extinct, that formerly ranged the coasts of the North Atlantic, the humerus of *Mancalla* is generally similar, the forearm appears proportionately shorter, and the hand more elongated. Ulna, radius, metacarpal, and phalanges so far as present are more slender. The head of the humerus in *Mancalla* differs decidedly in the relative angles of different elements, and also in the conformation of the distal articular surface. The general indication in the west-coast bird is of a proportionately longer wing, with the slighter bones to be expected in a form of lesser bulk. Loye Miller (1946, pp. 34-36) and Loye Miller and Howard (1949, pp. 222, 225) have likened the specialization seen in the wing to that found in penguins and explain any similarity to the great auk, *Pinguinis impennis,* as due to convergence. On this basis they have separated *Mancalla* from the other auks in the family Mancallidae. While I followed this, with some reservation, in the last revision of the fossil list (Wetmore, 1956, pp. 3, 80-81), a further review of the subject raises definite doubt, since, except for some specialization in the wing, *Mancalla,* as said above, is like other alcids. The change in the wing is no greater than that of *Pinguinis,* though the divergence is in a different direction. It would seem sufficient to place *Mancalla* in a well-marked subfamily, rather than in a separate family.

Finally, the proposals of several authors to separate the auks in a distinct order appear to require further study.

Strigiformes.—Old World ornithologists in the main regard the owls as belonging to a single family, but while all are deceivingly similar in general aspect, Ridgway (1914, p. 598) years ago summarized the considerable structural characters that separate the Tytonidae and the Strigidae. It is necessary here only to point out the more outstanding differences of the barn owls in lack of the manu-

brium, the different form of the posterior margin of the sternum, which is entire or 2-notched, the straight outline of the palatines, and in the ventral pteryla where the outer branch joins posteriorly to the main tract. The Strigidae possess a manubrium, the sternum is 4-notched, the palatines are greatly expanded posteriorly, and the posterior end of the ventral pteryla does not join the main tract at the posterior end.

Apodiformes.—Lucas (1889, pp. 8-13; 1895, pp. 155-157) long ago demonstrated the differences between the true swifts and the crested swifts, though his work seems latterly to have been overlooked, in view of the recent inclusion of the two in one group, as by Stresemann and by Mayr and Amadon. The skull in the Hemiprocnidae is quite distinct in the general form of the cranium and in the development of the nasals, vomer, and palatines. The hypotarsus has a tendinal foramen (like that found in hummingbirds), and the plantar tendons have the flexor longus hallucis connected with the branch of the flexor perforans digitorum, which extends to the fourth digit. Coupled with this there may be noted the curious nest, which, fastened to the side of a branch, is barely large enough to contain one egg, and the further fact that these birds perch regularly on branches and twigs in trees.

As *Apus* Scopoli, published in 1777, is recognized now in place of *Micropus* Meyer and Wolf, 1810, for the type genus of the swifts, the terms in the classification change to order Apodiformes, suborder Apodi, and family Apodidae, which replace the former terms Micropodiformes, Micropodi, and Micropodidae, respectively.

Coraciiformes.—The proposal of Mayr and Amadon (1951, p. 35) to include the rollers in one family, the Coraciidae, with three subfamilies, goes back to the arrangement of Dresser in his monograph of the group (1893, pp. xviii, 85, 101). Sclater (1865, pp. 682-688), however, many years ago, pointed out the pelvic powder-down tracts, the small manubrium, and other peculiarities of *Leptosoma,* and set it apart in a distinct family. The anatomy of the syrinx and feet was further elaborated by Forbes (1880, pp. 464-475). The family Leptosomatidae therefore should be recognized.

The groundrollers, *Brachypteracias, Atelornis,* and *Uratelornis,* usually have been included as a subfamily of the Leptosomatidae, but Stresemann (1934, p. 829) places them in a separate family, the Brachypteraciidae. There seems to be reason for this in their general appearance, though their anatomy is not well known. *Brachypteracias,* in its skeleton, differs from *Coracias* and *Eurystomus* in the much greater depth of the outer notch on the posterior border of the sternum, in the much broader and stronger pelvis, the heavier femur,

and the greater curvature of the shaft and reduction of the crista superior of the humerus. I have not seen the skull. The habit of life is markedly different. Although anatomical material of the other genera is not presently available, it seems reasonable to accept Stresemann's proposal. These peculiar birds certainly are not closely allied to *Leptosoma.*

Lack of information on the anatomy of the woodhoopoes must be the reason for recent nonrecognition of the Phoeniculidae as a family separate from the Upupidae, since the two are quite distinct and have been so recognized for many years. The external differences are readily apparent. In the skeleton in *Phoeniculus* (of which I have seen several examples) the posterior part of the nasal area is ossified, there being only a small, narrow, elongated nasal opening; the ectethmoid is much reduced; the anterior end of the pterygoid is broadly expanded; the sphenoidal rostrum is swollen at the anterior end, where the expanded ends of the pterygoids join it; the quadrates are decidedly larger; the keel of the sternum is greatly reduced, being only half as high as in *Upupa;* the furculum is broader; the pelvis is narrowed, and considerably enlongated posterior to the acetabulum, with the ischio-pubic fenestra greatly enlarged; and the tarsus is heavier and broader, with two definite fenestra below the head. There are other minor details. In all of the above the characters of *Upupa* are directly opposite. The two groups appear to me to be sharply set off as distinct families.

Passeriformes.—This order, with more living species than all the others combined, and far fewer fossil forms known, presents many difficult problems in logical arrangement. The major groups are clear, whether we rank them as suborders or superfamilies being a matter of opinion. But the limits and status of numerous families contained in these larger categories are uncertain since the internal anatomy is known for so few kinds that details of difference are poorly understood. Superficial resemblances, on the other hand, are so obvious in many cases that they cause confusion. Under the circumstances it continues to seem appropriate to me to accept the family grouping that has been current for many years, except in those cases where acceptable studies clearly indicate change. Supposition in these matters has led to various proposals for changes, some part of which undoubtedly will prove correct. It is equally probable that a part, possibly the considerably larger part, may prove to be unfounded when details are more clearly known. If change is accepted under these circumstances it may prove unwarranted, necessitating further shift, perhaps a return to the original status. Since this can only prove

confusing I prefer the conservative course. In the remarks that follow I shall discuss only a few matters on which I have more or less concrete ideas.

In the superfamily Furnarioidea, von Ihering (1915, pp. 145-153) united the Furnariidae and the Dendrocolaptidae, since he was unable to separate two groups on the basis of the form of the posterior border of the nasal opening. The variation that he showed seems valid, but there are numbers of other points of supposed difference in the osteology and other structural details, so that his suggestion is far from established. Pycraft (1906, pp. 133-159), though seemingly uncertain in the beginning, finally retained the two families. It may prove that some genera are wrongfully allocated at present between the two groups, so that their shift, when we have sufficient information, will clear our understanding.

In the Tyrannoidea, the family Oxyruncidae is known through external characters that seem to warrant separation. If the sharpbills have other affinities it is doubtful that these are within the family Tyrannidae, where some have placed them.

In the family Cracticidae, recognized by Australian ornithologists, the skull, according to Pycraft (1907, pp. 355-365), mainly from examination of *Gymnorhina,* has the zygomatic process of the squamosal bifurcate, the postorbital process large, the orbitosphenoid ossified, the interorbital septum with a single opening, the prefrontals unusually large, and the form of the palate peculiar. In his phylogenetic tree Pycraft places the group on a common stem with the Artamidae, and not far from the Paradisaeidae. His account is difficult to summarize in concrete form.

The family Grallinidae is likewise recognized officially by Australian ornithologists for *Grallina cyanoleuca,* the magpie-lark. The principal study of the osteology is that of Shufeldt (1923, pp. 16-19, pl. 6) but his account is mainly descriptive and without definite conclusion. Amadon (1950, pp. 123-127) has placed *Corcorax* and *Struthidea* here tentatively, though this seems subject to further proof.

Stonor (1937, pp. 475-490) has outlined excellent reasons for recognition of the Ptilonorhynchidae, finding that they differ from Paradisaeidae, with which they have been united, in having an apterium in the center of the dorsal feather tract, the tip of the vomer convex, larger, more developed maxillo-palatines, the margin of the palatines angular, smaller ectethmoid, much larger lachrymal, and slender, greatly elongated orbital ramus of the quadrate. The genera *Loria* and *Loboparadisea,* usually included here, he transfers to the Paradisaeidae. His conclusion is that "the Ptilonorhynchidae constitute

a singularly complete and isolated family of the acromyodian passerine birds and show no special relationship to any other, being sharply marked off by the structure of the skull, the colour-pattern, and the bower-building habit." (It should be noted that the names on Stonor's figs. 6 and 8 have been transposed, fig. 6 being *Semioptera wallacei,* and fig. 8 *Amblyornis subalaris,* not the reverse as printed on pp. 481 and 483.)

Oberholser (1917, pp. 537-539) has set up a distinct family Irenidae for the fairy bluebirds (*Irena*), and Delacour (1946b, p. 3) a family Aegithinidae for the leafbirds, which would cover *Irena, Aegithina,* and *Chloropsis.*

The proper allocation of the genus *Chamaea* for the wrentits, at present accepted by the A. O. U. Committee on Classification and Nomenclature as a separate family, the Chamaeidae, is one of considerable uncertainty. Delacour (1946a, pp. 18, 25, 35) has suggested that the group be located in the family Timaliidae in a special subfamily in which he includes also such diverse genera as *Chrysomma* (*Moupinia*), *Panurus, Conostoma,* and *Paradoxornis* (combining under this name *Suthora, Psittiparus, Neosuthora,* and *Cholornis*). This is an obviously heterogeneous assemblance, in which *Chamaea* has slight resemblances to the first only. From *Moupinia poecilotis* (placed in *Chrysomma* by Delacour) the wrentit differs definitely in weaker, less arched bill and in differently proportioned feet. It has no close similarity to any of the others that are mentioned. Although the relationships of *Chamaea* are obviously uncertain, it is retained as a family pending other information.

In consultation with Herbert Deignan, expert in matters that relate to the birds of eastern Asia, the Campephagidae have been placed near the Pycnonotidae, an arrangement that agrees with that adopted by Charles Vaurie in his recent volume on the palearctic region (1959, p. 181), and the Paradoxornithidae are brought nearer the Timeliidae.

The fossil family Palaeoscinidae, proposed by Hildegarde Howard (1957b, p. 15) for the species *Palaeoscinis turdirostris,* has been inserted provisionally near the Pycnonotidae. The specimen on which this name is based is a skeleton found in Santa Barbara County, Calif., compressed in a slab of Miocene limestone of the Monterey formation. The type, in which most of the bones are outlined, is one of those attractive silhouette impressions that delight the eye but that often pose difficulties in classification through lack of clear-cut characters on which to judge relationship. In the present instance Dr. Howard has concluded that "affinities of the Palaeoscinidae lie with the Pycnonotidae, Bombycillidae, Corvidae and Cinclidae" of the suborder

Passeres. Affinity with the Bombycillidae may be queried, as the fossil differs from *Bombycilla* in the proportions found in the hind limb, where both metatarsus and femur are longer in comparison with the tibiotarsus, and the toes appear longer, as well as of different proportion. The corvid affiliation also seems uncertain because of the slender form of *Palaeoscinis,* since the skeleton of the crows and their relatives is strong and robust.

Separation of the two genera of leafbirds, *Aegithina* and *Chloropsis,* in a family distinct from the Pycnonotidae is justified on the basis of characters found in the skull. The entire palatal structure is slighter than in *Pycnonotus* and allied genera, with the central plate of the palatine reduced in area, and the transpalatine produced posteriorly. The sphenoidal rostrum is slender, as is the orbital process of the quadrate. In *Pycnonotus* the palatine is broad, the transpalatine process distally is only slightly angular without posterior projection, and both the rostrum and the orbital process of the quadrate are strong and heavy. Herbert Deignan informs me that the group, recognized by several authors, seems to have been first separated by Cabanis (1847, p. 326), who designated it as the subfamily "Phyllornithinae" based on *Phyllornis* Temminck, 1829. This generic term is antedated by *Chloropsis* Jardine and Selby, 1826, so the family name based on this genus will be Chloropseidae, rather than Aegithinidae which dates from G. R. Gray in 1869 (p. 312).

The fairy bluebirds, genus *Irena,* often have been placed with the leafbirds but have no close connection with that group. The main external peculiarity of *Irena* is found in the smooth, enamel-like tipping found in adult males on the feathers of the central dorsal area from the center of the crown back over hindneck, back, rump, and upper tail coverts, and on the elongated under tail coverts. As this is a secondary sexual character, not present in females, it has no value at the family level. In the osteology, the skull differs from *Chloropsis* and *Aegithina* in the completely open external narial opening, the ossification of the vertical plate between the nares, the more inflated lachrymal, and the more elongate maxillo-palatines. In the sternum the depth of the notch on either side of the posterior margin relatively is decidedly less, and in the pelvis the antitrochanter has the dorsal margin much produced laterally. The general resemblance in these matters is to species of the genus *Oriolus.* It may be observed further that the feathers of breast and back in the aberrant species *Oriolus traillii* and *O. mellianus* have smooth exposed ends that suggest the condition found in male *Irena.* In view of these resemblances, and in lack of important differences, it seems sufficient to include the fairy

bluebirds in the family Oriolidae, as the subfamily Ireninae, which incidentally dates from G. R. Gray (1869, p. 288) and not from the name Irenidae set up later by Oberholser (1917, pp. 537-539).

Suggestions for the union of the Bombycillidae, Ptilogonatidae, and the Dulidae in one family are not substantiated by examination of the skeleton. *Dulus,* the palmchat, is widely different from the other two, a structural distinction that is further emphasized by its curious communal nesting habits. The first two seem more closely related but are separated clearly by characters found in the ectethmoid region of the skull, and in the manubrium, to mention only two points that are easily apparent. Delacour and Amadon (1949, pp. 427-429) consider *Hypocolius* closely allied to *Ptilogonys.*

While Zimmer (1942, p. 10) believed that the family Vireolaniidae should be included in the Vireonidae, separate family rank in my opinion is definitely justified. In addition to characters assigned by Pycraft (1907, pp. 378-379) for the shrike-vireos I have found that in the pterylosis the dorsal tract on the lower back is divided, the arms being broad at the ends, and separated from the narrowed line that continues onto the caudal area. This is completely different from the usual rhomboid in the vireos, and may indicate that the family eventually should be removed from the vicinity of the Vireonidae.

The family characters of the peppershrikes, likewise outlined by Pycraft in the reference given above, are easily apparent on examination of the skeleton.

The family Callaeidae has been separated by Stonor (1942, pp. 1-18) on the weakened keel of the sternum, the great development of the lower limb coupled with reduced powers of flight, and the presence of a mouth wattle, for three peculiar genera, *Callaeus, Heterolocha,* and *Philesturnus* of New Zealand.

Continuing discussion relative to the group of families to be placed in elevated position at the end of the list has led to publication of several useful studies and interesting statements. Beecher (1953, pp. 270-333) from examination of the musculature of the jaw, aided by other anatomical features, has proposed two major divisions of the suborder of the song birds, within which he has diagramed radiating lines of family and subfamily relationship. While he shows a variety of connections that in many cases vary widely from ideas current at present, he places the crow group in the assemblage with simpler muscle development in the area of the jaw, in contrast to those of higher status with a more complicated arrangement.

Tordoff (1954a, 1954b) in a study of the skull, particularly the palatal structure, of species allied to the Fringillidae, has proposed the

union of part of the honeycreepers and the wood warblers in one family, the tanagers, with part of the coerebine assemblage with some of the fringillids in the Fringillidae, and removal of the cardueline finches to the Ploceidae, placing that family at the end of his list. His detailed studies afford much valuable information. I agree with him that shifting of certain genera to families in which they are not classified at present will lead to better alignment, but I am not prepared from present information to completely dismember the Coerebidae without further study. *Coereba,* for example, has a stomach peculiar in its small size; *Diglossa* differs in the form of the bill, in which the gonys is extended posteriorly behind the level of the nostril, so that it differs from all other oscinine species, to cite only two easily seen characters.

Mayr and Greenway (1956, pp. 2-5, 8-9) discuss problems of sequence in some detail and cite the approval of a committee appointed at the International Ornithological Congress held in Basel in 1954 to allocation of the Corvidae at the higher end of the list, as has been long customary among most ornithologists of Europe. In further consideration of these matters, I published a note on the humerus of the Corvidae (Wetmore, 1957, pp. 207-209), which called attention particularly to the proximal end of the bone, where the pneumatic fossa in *Corvus,* for example, has a form not only generally similar to that of the New World flycatchers and their allies, which are recognized as low down in the linear classification, but also to the woodpeckers, the Coraciiformes, and the trogons. There is transition from this simpler form to the style found in such groups as the Icteridae, Thraupidae, and Fringillidae, where the fossa is enlarged, and is more complex, as it is partly divided by a bladelike process projecting from the internal tuberosity. (In the paper cited I neglected to refer to an earlier study by James T. Ashley [1941] on the humerus of the Corvidae, which outlined the same differences, and on which Ashley considered the crow group to have more primitive status.)

Amadon (1957) recently has outlined the three major groups of oscinine families, with the conclusion that the one most highly advanced includes the 9-primaried New World groups, while the section containing the crows is placed low at the beginning. There is general agreement with this in the classification outlined by Delacour and Vaurie (1957).

Storer (1959) in a clearly stated summary of these recent contributions, in which he includes a more recent statement by Mayr (1958), writes that in a classification for a text on the biology of birds now in preparation he has placed the 9-primaried groups in the highest place,

and indicates that this is the procedure that is gaining in acceptance in parts of the world other than America.

The former family Melithreptidae becomes the family Meliphagidae, since the name of the type genus is now accepted as *Meliphaga* Lewin, 1808.

In a similar way the family Compsothlypidae for the wood warblers becomes the family Parulidae, since the former *Compsothlypis* Cabanis, 1851, is replaced by the older *Parula* Bonaparte, described in 1838.

The order of arrangement in the Passeriformes as said above is in part necessarily arbitrary, through the easily perceptible and often-remarked fact that we are required to list the groups in linear order in a two-dimensional alignment when actually they stand in three-dimensional relationship to one another. A further element that may be regarded almost as a fourth dimension is found in some of the extinct groups known only as fossils that have no close relatives alive today. The sequence in the following pages is the one that best represents my present understanding, based on personal studies over a period of more than 50 years. I continue to place the Fringillidae at the end of the list, because of my feeling that this group is the modern expression of a main core or stem that through the earlier Tertiary periods has given rise to more specialized assemblages that we now recognize as distinct families. Further specialization is apparent in some parts of the existing fringilline assemblage that, if undisturbed, may lead to further differentiation, should these variants be able to persist for the necessary millenniums in our rapidly changing world. Adjacent to the Fringillidae I place the other groups that obviously are closely allied to them. Attempts to arrange the avian families with the Corvidae and their allies in the terminal position, because of supposed more advanced development of the brain, appear to me quite uncertain, particularly in view of our decidedly limited information in this field. Should this idea be coupled with belief in superior mental reactions in the corvine assemblage, I would consider this more an anthropomorphic interpretation than one supported by scientific fact.

In the formation of group names the suffixes -idae and -inae for families and subfamilies are accepted rather universally so that they do not require examination. In view of the limited number of species covered in ornithology I see no point in the introduction of tribes as another category between the subfamily and the genus. This may be useful to entomologists with their tens of thousands of species but seems unnecessary and cumbersome with birds. In some of the more comprehensive avian genera there are groups of species more closely

allied to one another than to their fellows, but the taxonomist may discuss these at need as groups without imposing another burden on a classification that now is highly divided. For the group names above the family level, I believe it preferable to use suffixes that allow immediate identification of the rank, coupled with a stem that, like the family name, is based on a current generic term. Where ordinal and subordinal names are both formed as Latin plurals there is possibility of confusion.

SYSTEMATIC LIST

Fossil groups in brackets

Class Aves, Birds.
[Subclass Archaeornithes, Ancestral Birds (fossil).]
[Order Archaeopterygiformes, Archaeopteryx, Archaeornis (fossil).]
[Family Archaeopterygidae, *Archaeopteryx, Archaeornis* (fossil).]
Subclass Neornithes, True Birds.
[Superorder Odontognathae, New World Toothed Birds (fossil).]
[Order Hesperornithiformes, Hesperornithes (fossil).]
[Family Hesperornithidae, *Hesperornis* (fossil).]
[Enaliornithidae,[1] *Enaliornis* (fossil).]
[Baptornithidae, *Baptornis* (fossil).]
[Superorder *Ichthyornithes*, Ichthyornis and Allies (fossil).]
[Order Ichthyornithiformes, Ichthyornithes (fossil).]
[Family Ichthyornithidae, *Ichthyornis* (fossil).]
[Apatornithidae, *Apatornis* (fossil).]
Superorder Impennes, Penguins.
Order Sphenisciformes, Penguins.
Family Spheniscidae, Penguins.
Superorder Neognathae, Typical Birds.
Order Struthioniformes, Ostriches.
[Family Eleutherornithidae, *Eleutherornis* (fossil).]
Struthionidae, Ostriches.
Order Rheiformes, Rheas.
Family Rheidae, Rheas.
Order Casuariiformes, Cassowaries, Emus.
Family Casuariidae, Cassowaries.
Dromiceidae, Emus.
[Dromornithidae, *Dromornis* (fossil).]

[1] Position provisional.

[Order Aepyornithiformes, Elephantbirds (fossil and subfossil).]
[Family Aepyornithidae, *Aepyornis* (fossil and subfossil).]
[Order Dinornithiformes, Moas (fossil and subfossil).]
[Family Dinornithidae, *Dinornis* (fossil and subfossil).]
[Anomalopterygidae, *Anomalopteryx, Emeus,* and Allies (fossil and subfossil).]
Order Apterygiformes, Kiwis.
Family Apterygidae, Kiwis.
Order Tinamiformes, Tinamous.
Family Tinamidae, Tinamous.
Order Gaviiformes, Loons.
Family Gaviidae, Loons.
Order Podicipediformes, Grebes.
Family Podicipedidae, Grebes.
Order Procellariiformes, Albatrosses, Shearwaters, Petrels, and Allies.
Family Diomedeidae, Albatrosses.
Procellariidae, Shearwaters, Fulmars.
Hydrobatidae, Storm Petrels.
Pelecanoididae, Diving Petrels.
Order Pelecaniformes, Tropicbirds, Pelicans, Frigate-birds, and Allies.
[Suborder Odontopteryges, Odontopteryx, and Allies (fossil).]
[Family Odontopterygidae, *Odontopteryx* (fossil).]
[Pseudodontornithidae, *Pseudodontornis, Osteodontornis* (fossil).]
Suborder Phaëthontes, Tropicbirds.
Family Phaëthontidae, Tropicbirds.
Suborder Pelecani, Pelicans, Boobies, Cormorants, Snakebirds.
Superfamily Pelecanoidea, Pelicans and Allies.
Family Pelecanidae, Pelicans.
[Cyphornithidae, *Cyphornis, Palaeochenöides* (fossil).]
Superfamily Suloidea, Boobies, Cormorants, and Allies.
Family [Pelagornithidae, *Pelagornis* (fossil).]
Sulidae, Boobies, Gannets.

[Elopterygidae, *Elopteryx, Eostega, Actiornis* (fossil).]
Phalacrocoracidae, Cormorants.
Anhingidae, Snake-birds.
Suborder Fregatae, Frigate-birds.
Family Fregatidae, Frigate-birds.
[Suborder Cladornithes, Cladornis and Cruschedula (fossil).]
[Family Cladornithidae, *Cladornis, Cruschedula* (fossil).]
Order Ciconiiformes, Herons, Storks, and Allies.
Suborder Ardeae, Herons, Bitterns.
Family Ardeidae, Herons, Bitterns.
Cochleariidae, Boatbilled Herons.
Suborder Balaenicipites, Whale-headed Storks.
Family Balaenicipitidae, Whale-headed Storks.
Suborder Ciconiae, Storks, Ibises, Spoonbills.
Superfamily Scopoidea, Hammerheads.
Family Scopidae, Hammerheads.
Superfamily Ciconioidea, Storks.
Family Ciconiidae, Storks, Jabirus.
Superfamily Threskiornithoidea, Ibises.
Family Threskiornithidae, Ibises, Spoonbills.
Suborder Phoenicopteri, Flamingos.
[Family Agnopteridae, *Agnopterus* (fossil).]
[Scaniornithidae, *Scaniornis, Parascaniornis* (fossil).]
Phoenicopteridae, Flamingos.
[Palaelodidae, *Palaelodus, Megapaloelodus, Telmabates* (fossil).]
Order Anseriformes, Screamers, Ducks, Geese, Swans.
Suborder Anhimae, Screamers.
Family Anhimidae, Screamers.
Suborder Anseres, Ducks, Geese, Swans.
[Family Paranyrocidae, *Paranyroca* (fossil).]
Anatidae, Ducks, Geese, Swans.
Order Falconiformes, Vultures, Hawks, Falcons.
Suborder Cathartae, New World Vultures.
[Superfamily Neocathartoidea, Neocathartes (fossil).]
[Family Neocathartidae, *Neocathartes* (fossil).]

Superfamily Cathartoidea, New World Vultures.
Family Cathartidae, New World Vultures.
[Teratornithidae, *Teratornis, Cathartornis* (fossil).]
Suborder Falcones, Secretarybirds, Hawks, Falcons.
Superfamily Sagittarioidea, Secretarybirds.
Family Sagittariidae, Secretarybirds.
Superfamily Falconoidea, Hawks, Falcons, and Allies.
Family Accipitridae, Hawks, Old World Vultures, Harriers.
Pandionidae, Ospreys.
Falconidae, Falcons, Caracaras.
Order Galliformes, Megapodes, Curassows, Pheasants, Hoatzins.
Suborder Galli, Megapodes, Curassows, Grouse, Pheasants.
Superfamily Cracoidea, Megapodes, Curassows.
Family Megapodiidae, Megapodes.
[Gallinuloididae, *Gallinuloides* (fossil).]
Cracidae, Curassows, Guans, Chachalacas.
Superfamily Phasianoidea, Grouse, Pheasants, Turkeys.
Family Tetraonidae, Grouse.
Phasianidae, Quails, Pheasants, Peacocks.
Numididae, Guineafowl.
Meleagrididae, Turkeys.
Suborder Opisthocomi, Hoatzins.
Family Opisthocomidae, Hoatzins.
Order Gruiformes, Cranes, Rails, and Allies.
Suborder Mesitornithides, Roatelos, Monias.
Family Mesitornithidae, Roatelos, *Monias.*
Suborder Turnices, Bustardquails, Hemipodes.
Family Turnicidae, Bustardquails.
Pedionomidae, Plainwanderers.
Suborder Grues, Cranes, Limpkins, Trumpeters, Rails.
Superfamily Gruoidea, Cranes, Limpkins, Trumpeters.
[Family Geranoididae, *Geranoides* (fossil).]
[Eogruidae, *Eogrus* (fossil).]
Gruidae, Cranes.
Aramidae, Limpkins.
Psophiidae, Trumpeters.

Superfamily Ralloidea, Rails.
[Family Orthocnemidae,[2] *Orthocnemus, Elaphrocnemus* (fossil).]
Rallidae, Rails, Coots, Gallinules.
Suborder Heliornithes, Sungrebes.
Family Heliornithidae, Sungrebes.
Suborder Rhynocheti, Kagus.
Family Rhynochetidae, Kagus.
Suborder Eurypygae, Sunbitterns.
Family Eurypygidae, Sunbitterns.
Suborder Cariamae, Seriemas and Allies.
[Superfamily Phororhacoidea, Phororhacos and Allies (fossil).]
[Family Phororhacidae, *Phororhacos* and Allies (fossil).]
[Psilopteridae, *Psilopterus* and Allies (fossil).]
[Brontornithidae, *Brontornis, Liornis,* and Allies (fossil).]
[Opisthodactylidae, *Opisthodactylus* (fossil).]
[Cunampaiidae, *Cunampaia* (fossil).]
Superfamily Cariamoidea, Seriemas and Allies.
[Family Bathornithidae, *Bathornis* (fossil).]
[Hermosiornithidae, *Hermosiornis, Procariama* (fossil).]
Cariamidae, Seriemas.
Suborder Otides, Bustards.
Family Otididae, Bustards.
[Order Diatrymiformes, Diatryma, Omorhamphus, and Allies (fossil).]
[Family Diatrymidae, *Diatryma* (fossil).]
[Gastornithidae, *Gastornis, Remiornis* (fossil).]
Order Charadriiformes, Shore Birds, Gulls, Auks.
Suborder Charadrii, Shore Birds.
Superfamily Jacanoidea, Jaçanas.
Family Jacanidae, Jaçanas.
Superfamily Charadrioidea, Plovers, Sandpipers, and Allies.

[2] Position provisional.

[Family Rhegminornithidae, *Rhegminornis* (fossil).]
Rostratulidae, Painted Snipe.
Haematopodidae, Oystercatchers.
Charadriidae, Plovers, Turnstones, Surfbirds.
Scolopacidae, Snipe, Woodcock, Sandpipers.
Recurvirostridae, Avocets, Stilts.
[Presbyornithidae, *Presbyornis* (fossil).]
Phalaropodidae, Phalaropes.
Superfamily Dromadoidea, Crabplovers.
Family Dromadidae, Crabplovers.
Superfamily Burhinoidea, Thick-knees.
Family Burhinidae, Thick-knees.
Superfamily Glareoloidea, Pratincoles, Coursers.
Family Glareolidae, Pratincoles, Coursers.
Superfamily Thinocoroidea, Seedsnipe.
Family Thinocoridae, Seedsnipe.
Superfamily Chionidoidea, Sheathbills.
Family Chionididae, Sheathbills.
Suborder Lari, Gulls, Terns, Skimmers.
Family Stercorariidae, Skuas, Jaegers.
Laridae, Gulls, Terns.
Rynchopidae, Skimmers.
Suborder Alcae, Auks.
Family Alcidae, Auks, Auklets, Murres.
Order Columbiformes, Sandgrouse, Pigeons, Doves.
Suborder Pterocletes, Sandgrouse.
Family Pteroclidae, Sandgrouse.
Suborder Columbae, Pigeons, Doves.
Family Raphidae, Dodos, Solitaires.
Columbidae, Pigeons, Doves.
Order Psittaciformes, Lories, Parrots, Macaws.
Family Psittacidae, Lories, Parrots, Macaws.
Order Cuculiformes, Plantain-eaters, Cuckoos.
Suborder Musophagi, Plantain-eaters.
Family Musophagidae, Plantain-eaters, Touracos.
Suborder Cuculi, Cuckoos, Roadrunners, Anis.
Family Cuculidae, Cuckoos, Roadrunners, Anis.
Order Strigiformes, Owls.
[Family Protostrigidae, *Protostrix* (fossil).]
Tytonidae, Barn Owls.
Strigidae, Typical Owls.

Order Caprimulgiformes, Oilbirds, Goatsuckers.
Suborder Steatornithes, Oilbirds.
Family Steatornithidae, Oilbirds.
Suborder Caprimulgi, Frogmouths, Goatsuckers.
Family Podargidae, Frogmouths.
Nyctibiidae, Potoos.
Aegothelidae, Owlet-frogmouths.
Caprimulgidae, Goatsuckers.
Order Apodiformes, Swifts, Hummingbirds.
Suborder Apodi, Swifts.
[Family Aegialornithidae,[3] *Aegialornis* (fossil).]
Apodidae, Swifts.
Hemiprocnidae, Crested Swifts.
Suborder Trochili, Hummingbirds.
Family Trochilidae, Hummingbirds.
Order Coliiformes, Colies.
Family Coliidae, Colies.
Order Trogoniformes, Trogons.
Family Trogonidae, Trogons.
Order Coraciiformes, Kingfishers, Bee-eaters, Rollers, Hornbills.
Suborder Alcedines, Kingfishers, Todies, Motmots.
Superfamily Alcedinoidea, Kingfishers.
Family Alcedinidae, Kingfishers.
Superfamily Todoidea, Todies.
Family Todidae, Todies.
Superfamily Momotoidea, Motmots.
Family Momotidae, Motmots.
Suborder Meropes, Bee-eaters.
Family Meropidae, Bee-eaters.
Suborder Coracii, Rollers, Hoopoes.
Family Coraciidae, Rollers.
Brachypteraciidae, Groundrollers.
Leptosomatidae, Cuckoo-rollers.
Upupidae, Hoopoes.
Phoeniculidae, Woodhoopoes.
Suborder Bucerotes, Hornbills.
Family Bucerotidae, Hornbills.

[3] Position provisional.

Order Piciformes, Jacamars, Barbets, Toucans, Woodpeckers.
Suborder Galbulae, Jacamars, Barbets, Toucans.
Superfamily Galbuloidea, Jacamars, Puffbirds.
Family Galbulidae, Jacamars.
Bucconidae, Puffbirds.
Superfamily Capitonoidea, Barbets, Honeyguides.
Family Capitonidae, Barbets.
Indicatoridae, Honeyguides.
Superfamily Ramphastoidea, Toucans.
Family Ramphastidae, Toucans.
Suborder Pici, Woodpeckers.
Family Picidae, Woodpeckers, Piculets.
Order Passeriformes, Perching Birds.
Suborder Eurylaimi, Broadbills.
Family Eurylaimidae, Broadbills.
Suborder Tyranni, Ovenbirds, Tyrant Flycatchers, and Allies
Superfamily Furnarioidea, Ovenbirds, Woodhewers, and Allies.
Family Dendrocolaptidae, Woodhewers.
Furnariidae, Ovenbirds.
Formicariidae, Ant-thrushes.
Conopophagidae, Antpipits.
Rhinocryptidae, Tapaculos.
Superfamily Tyrannoidea, Tyrant Flycatchers, Pittas, and Allies.
Family Cotingidae, Cotingas.
Pipridae, Manakins.
Tyrannidae, Tyrant Flycatchers.
Oxyruncidae, Sharpbills.
Phytotomidae, Plantcutters.
Pittidae, Pittas.
Acanthisittidae, New Zealand Wrens.
Philepittidae, Asities, False Sunbirds.
Suborder Menurae, Lyrebirds.
Family Menuridae, Lyrebirds.
Atrichornithidae, Scrubbirds.
Suborder Passeres, Songbirds.
Family Alaudidae, Larks.
[Palaeospizidae, *Palaeospiza* (fossil).]
Hirundinidae, Swallows.
Dicruridae, Drongos.

Oriolidae, Old World Orioles.
Corvidae, Crows, Magpies, Jays.
Cracticidae, Bell Magpies, Australian Butcher-birds.
Grallinidae, Magpie-larks.
Ptilonorhynchidae, Bowerbirds.
Paradisaeidae, Birds of Paradise.
Paridae, Titmice.
Sittidae, Nuthatches.
Hypositticlae, Coralbilled Nuthatches.
Certhiidae, Creepers.
Paradoxornithidae, Parrotbills, Suthoras.
Chamaeidae, Wrentits.
Timaliidae, Babblers.
Campephagidae, Cuckoo-shrikes.
Pycnonotidae, Bulbuls.
[Palaeoscinidae,[4] *Palaeoscinis* (fossil).]
Chloropseidae, Leafbirds.
Cinclidae, Dippers.
Troglodytidae, Wrens.
Mimidae, Thrashers, Mockingbirds.
Turdidae, Thrushes.
Zeledoniidae, Wrenthrushes.
Sylviidae, Old World Warblers.
Regulidae, Kinglets.
Muscicapidae, Old World Flycatchers.
Prunellidae, Accentors.
Motacillidae, Wagtails, Pipits.
Bombycillidae, Waxwings.
Ptilogonatidae, Silky Flycatchers.
Dulidae, Palmchats.
Artamidae, Woodswallows.
Vangidae, Vanga Shrikes.
Laniidae, Shrikes.
Prionopidae, Woodshrikes.
Cyclarhidae, Peppershrikes.
Vireolaniidae, Shrike-vireos.
Callaeidae, Wattled Crows, Huias, Saddlebacks.
Sturnidae, Starlings.
Meliphagidae, Honey-eaters.

[4] Allocation to this position is tentative.

Nectariniidae, Sunbirds.
Dicaeidae, Flowerpeckers.
Zosteropidae, White-eyes.
Vireonidae, Vireos.
Coerebidae, Honeycreepers.
Drepanididae, Hawaiian Honeycreepers.
Parulidae, Wood Warblers.
Ploceidae, Weaverbirds.
Icteridae, Blackbirds, Troupials.
Tersinidae, Swallowtanagers.
Thraupidae, Tanagers.
Catamblyrhynchidae, Plushcapped Finches.
Fringillidae, Grosbeaks, Finches, Buntings.

December 31, 1959.

LITERATURE CITED

Amadon, Dean.
1950. Australian mud builders. Emu, vol. 50, pt. 2, Oct., pp. 123-127.
1957. Remarks on the classification of the perching birds [order Passeriformes]. Proc. Zool. Soc. Calcutta, Mookerjee Mem. Vol., May 1, pp. 259-268.

Ashley, James F.
1941. A study of the structure of the humerus in the Corvidae. Condor, vol. 43, No. 4, July 15, pp. 184-195, figs. 50-56.

Beecher, William J.
1953. A phylogeny of the Oscines. Auk, vol. 70, No. 3, July, pp. 270-333, 18 figs.

Bock, Walter J.
1956. A generic review of the family Ardeidae (Aves). Amer. Mus. Nov., No. 1779, July 27, pp. 1-49.
1958. A generic review of the plovers (Charadriinae, Aves). Bull. Mus. Comp. Zool., vol. 118, No. 2, March, pp. 27-97, 6 figs.

Bonaparte, Prince.
1855. (Remarks, in proceedings of Académie des Sciences de Paris.) Rev. et Mag. Zool., ser. 2, vol. 7, Oct., pp. 482-485.

Cabanis, J.
1847. Ornithologische Notizen. II. Arch. Naturg., vol. 1, pp. 308-352.

Catesby, Mark.
1731. The natural history of Carolina, Florida and the Bahama Islands: Containing the figures of birds, beasts, fishes, serpents, insects and plants: Particularly the forest-trees, shrubs, and other plants, not hitherto described, or very incorrectly figured by authors. Vol. 1, pp. i-xii, 1-100, 100 pls. London.

Cottam, Patricia A.
1957. The pelecaniform characters of the skeleton of the shoe-bill stork, *Balaeniceps rex*. Bull. Brit. Mus. (Nat. Hist.), Zool., vol. 5, No. 3, July, pp. 1-71, 1 pl., 4 figs.

DAMES, W.
1897. Über Brustbein, Schulter- und Beckengürtel der Archaeopteryx. Sitzb. preuss. Akad. Wiss. Berlin, vol. 38, Aug. 9, pp. 818-834.

DE BEER, SIR GAVIN.
1954. *Archaeopteryx lithographica*, a study based upon the British Museum specimen. Pp. i-xii, 1-68, 16 pls., 9 text figs. British Museum (Natural History), London.

DELACOUR, JEAN.
1946a. Les timeliines. Ois. Rev. Franç. Orn., n.s., vol. 16, pp. 7-36.
1946b. Notes on the taxonomy of the birds of Malaysia. Zoologica, vol. 31, pt. 1, Apr. 29, pp. 1-8.

DELACOUR, JEAN, and AMADON, DEAN.
1949. The relationships of *Hypocolius*. Ibis, vol. 91, No. 3, July, pp. 427-429, pls. 19-20.

DELACOUR, JEAN, and VAURIE, CHARLES.
1957. A classification of the Oscines (Aves). Los Angeles County Mus. Contr. Sci., No. 16, Oct. 31, pp. 1-6.

DRESSER, HENRY EELES.
1893. A monograph of the Coraciidae, or family of the rollers. Pp. i-xx, 1-111, 27 pls. London.

FORBES, WILLIAM ALEXANDER.
1880. On the anatomy of *Leptosoma discolor*. Proc. Zool. Soc. London, 1880, pp. 464-475, 5 figs.

GLOGER, CONSTANTIN LAMBERT.
1854. *In* J. Reinhardt, Bemerkungen zur Ornithologie Grönlands. Journ. für Orn., vol. 2, No. 11, Sept., pp. 423-443.

GRAY, G. R.
1869. Hand-list of genera and species of birds, distinguishing those contained in the British Museum. Part I. Pp. i-xx, 1-404. London.

GREGORY, JOSEPH T.
1952. The jaws of the Cretaceous toothed birds, *Ichthyornis* and *Hesperornis*. Condor, vol. 54, No. 2, Mar. 26, pp. 73-88, 9 figs.

HELLER, FLORIAN.
1959. Ein dritter *Archaeopteryx*-Fund aus den Solnhofener Plattenkalken von Langenaltheim/Mfr. Mit einem Beitrag von Klaus Fesefeldt. Erlanger Geol. Abh., vol. 31, June 10, pp. 1-25, 15 pls., 2 figs.

HOWARD, HILDEGARDE.
1955. A new wading bird from the Eocene of Patagonia. Amer. Mus. Nov., No. 1710, Mar. 11, pp. 1-25, 8 figs.
1957a. A gigantic "toothed" marine bird from the Miocene of California. Santa Barbara Mus. Nat. Hist., Dept. Geol. Bull. No. 1, Feb. 1, pp. 1-23, 8 figs.
1957b. A new species of passerine bird from the Miocene of California. Los Angeles County Mus. Contr. Sci., No. 9, June 28, pp. 1-16, 2 figs.

HUDSON, GEORGE; LANZILLOTI, PATRICIA J.; and EDWARDS, GLENN D.
1959. Muscles of the pelvic limb in galliform birds. Amer. Midl. Nat., vol. 61, pp. 1-67, 20 figs.

IHERING, HERMAN VON.
1915. The classification of the family Dendrocolaptidae. Auk, vol. 32, No. 2, Apr., pp. 145-153, pls. 11-12.

International Commission on Zoological Nomenclature.
1957. Opinions and declarations, vol. 13, pt. 22, Direction 75, June 21, pp. 291-308.

Lambrecht, Kálmán.
1933. Handbuch der Palaeornithologie. Pp. i-xix, 1-1024, 4 pls., 209 text figs. Berlin.

Lanham, Urless N.
1947. Notes on the phylogeny of the Pelecaniformes. Auk, vol. 64, No. 1, Jan., pp. 65-70.

Latham, John.
1787. General synopsis of birds, Supplement, vol. 1, pp. i-iv, 1-298 (with 8 pages of additions, and index), 13 pls.

Linnaeus, C.
1758. Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Ed. 10, vol. 1, pp. 1-824.

Lowe, Percy R.
1925. On the classification of the Tubinares or Petrels. Proc. Zool. Soc. London (Jan. 14, 1926), pp. 1436-1443, 2 figs.
1931. An anatomical review of the "waders" (*Telmatomorphae*), with special reference to the families, sub-families, and genera within the suborders *Limicolae, Grui-Limicolae* and *Lari-Limicolae*. Ibis, Oct., pp. 712-771, figs. 19-30.

Lucas, Frederic A.
1889. The main divisions of the swifts. Auk, vol. 6, No. 1, Jan., pp. 8-13, 1 fig.
1895. Additional characters of the Macropterygidae. Auk, vol. 12, No. 2, Apr., pp. 155-157, 1 fig.

Lydekker, Richard.
1891. Catalogue of the fossil birds in the British Museum (Natural History). Pp. i-xxviii, 1-368, 75 figs. London.

Mayr, Ernst.
1958. The sequence of the songbird families. Condor, vol. 60, No. 3, May 29, pp. 194-195.

Mayr, Ernst, and Amadon, Dean.
1951. A classification of recent birds. Amer. Mus. Nov., No. 1496, Apr. 2, pp. 1-42.

Mayr, Ernst, and Greenway, James C., Jr.
1956. Sequence of passerine families (Aves). Mus. Comp. Zool. Breviora, No. 58, June 29, pp. 1-11.

McDowell, Sam.
1948. The bony palate of birds. Part I. The Palaeognathae. Auk, vol. 65, No. 4, Oct., pp. 520-549, 6 figs.

Miller, Alden H.
1944. An avifauna from the lower Miocene of South Dakota. Univ. California Publ., Bull. Dept. Geol. Sci., vol. 27, No. 4, June 22, pp. 85-100, 8 figs.

Miller, Loye.
1946. The Lucas auk appears again. Condor, vol. 48, No. 1, Feb. 4, pp. 32-36, fig. 3.

1950. A Miocene flamingo from California. Condor, vol. 52, No. 2, Mar. 15, pp. 69-73, fig. 16.

1952. The avifauna from the Barstow Miocene of California. Condor, vol. 54, No. 5, Sept. 22, pp. 296-301, 2 figs.

MILLER, LOYE, and HOWARD, HILDEGARDE.

1949. The flightless Pliocene bird *Mancalla*. Carnegie Inst. Washington, Publ. 584, June 22, pp. 202-228, 6 pls.

MILNE-EDWARDS, ALPHONSE.

1863. Mémoire sur la distribution géologique des oiseaux fossiles et description de quelques espèces nouvelles. Ann. Sci. Nat., ser. 4, vol. 20, pp. 133-176, pl. 4.

1868-1871. Recherches anatomiques et paléontologiques pour servir a l'histoire des oiseaux fossiles de la France. Vol. 2, pp. 1-632. Paris.

MOYNIHAN, MARTIN.

1959. A revision of the family Laridae (Aves). Amer. Mus. Nov., No. 1928, Mar. 5, pp. 1-42.

NEWTON, ALFRED.

1896. A dictionary of birds. Pp. i-xii, 1-1088, 700 figs. in text. London.

OBERHOLSER, HARRY C.

1917. Diagnosis of a new pycnonotine family of Passeriformes. Journ. Washington Acad. Sci., vol. 7, Oct. 19, pp. 537-541.

[OKEN, LORENZ.]

1839. *In* Isis von Oken, vol. 33, pt. 9, p. 673.

PATTERSON, BRYAN.

1941. A new phororhacid bird from the Deseado formation of Patagonia. Field Mus. Nat. Hist., Geol. Ser., vol. 8, No. 8, Oct. 31, pp. 49-54.

PETRONIEVICS, BRANISLAV.

1921. Ueber das Becken, den Schultergürtel und einige andere Teile der Londoner *Archaeopteryx*. Pp. 1-31, 2 pls. Genf.

1925. Ueber die Berliner *Archaeornis*. Beitrag zur Osteologie der Archaeornithes. Ann. Géol. Pén. Balkanique, vol. 8, fasc. 1, pp. 37-84, 6 pls. (Issued also as a separate, repaged, with addition of a table of contents.)

1950. Les deux oiseaux fossiles les plus anciens (*Archaeopteryx* et *Archaeornis*). Ann. Géol. Pén. Balkanique, vol. 18, pp. 105-127, 25 figs. (On pp. 89-103 the paper is presented in Bulgar.)

PETRONIEVICS, BRANISLAV, and WOODWARD, ARTHUR SMITH.

1917. On the pectoral and pelvic arches of the British Museum specimen of *Archaeopteryx*. Proc. Zool. Soc. London, 1917, No. 1, Apr. 20, pp. 1-6, pl. 1.

PYCRAFT, W. P.

1906. Contributions to the osteology of birds. Part VIII. The "Tracheophone" Passeres, with remarks on families allied thereto. Proc. Zool. Soc. London, 1906, pp. 133-159, figs. 49-52.

1907. Contributions to the osteology of birds. Part IX. Tyranni; Hirundines; Muscicapae, Lanii, and Gymnorhines. Proc. Zool. Soc. London, 1907, pp. 355-379, figs. 101-104.

RAY, JOHN.

1713. Synopsis methodica avium. Pp. 1-198, index, 2 pls. London.

RIDGWAY, ROBERT.
1914. The birds of North and Middle America. U.S. Nat. Mus. Bull. 50, pt. 6, Apr. 8, pp. i-xx, 1-882, 35 pls.

RUSCONI, CARLOS.
1946. Ave y reptil Oligocenos de Mendoza. Bol. Pal. Buenos Aires, No. 21, May 2, pp. 1-3, 2 figs.

SAVILE, DOUGLAS BARTON OSBORNE.
1957. The primaries of *Archaeopteryx*. Auk, vol. 74, No. 1, Jan., pp. 99-101.

SCLATER, PHILIP LUTLEY.
1865. On the structure of *Leptosoma discolor*. Proc. Zool. Soc. London, 1865, pp. 682-688, 8 figs.

SHUFELDT, ROBERT W.
1923. Comparative osteology of the Australian mud-builders. Emu, vol. 23, pt. 1, July, pp. 4-19, pls. 4-6.

SIMPSON, GEORGE GAYLORD.
1946. Fossil penguins. Bull. Amer. Mus. Nat. Hist., vol. 87, art. 1, Aug. 8, pp. 1-99, 33 figs.

STERNBERG, R. M.
1940. A toothless bird from the Cretaceous of Alberta. Journ. Pal., vol. 14, No. 1, Jan., pp. 81-85, 6 figs.

STEINER, HANS.
1938. Der "Archaeopteryx"—Schwanz der Vogelembryonen. Vierteljahrsch. Naturf. Ges. Zürich, vol. 83, Beibl. 30, Festschr. Karl Hescheler, Nov. 3, pp. 279-300, 5 text figs., 1 pl.

STONOR, C. R.
1937. On the systematic position of the Ptilonorhynchidae. Proc. Zool Soc. London, vol. 107, ser. B, pt. 3, Sept., pp. 475-490.
1942. Anatomical notes on the New Zealand wattled crow (*Callaeas*), with especial reference to its powers of flight. Ibis, ser. 14, vol. 6, No. 1, Jan., pp. 1-18, 10 figs., tables 1-3.

STORER, R. W.
1959. The arrangement of songbird families. Condor, vol. 61, No. 2, Mar. 31, pp. 152-153.

STRESEMANN, ERWIN.
1927-1934. Aves, *in* Kükenthal und Krumbach, Handbuch der Zoologie, vol. 7, pt. 2, sect. 8, pp. i-xii, 1-899, 944 figs.

TORDOFF, HARRISON B.
1954a. A systematic study of the avian family Fringillidae based on the structure of the skull. Univ. Michigan Mus. Zool. Misc. Publ. No. 81, Apr. 26, pp. 1-42, 77 figs.
1954b. Relationships in the New World nine-primaried Oscines. Auk, vol. 71, No. 3, July, pp. 273-284, 2 figs.

VAURIE, CHARLES.
1959. The birds of the Palearctic fauna, a systematic reference: Order Passeriformes. Pp. i-xii, 1-762. London.

VERHEYEN, RENÉ.
1958. Contribution à la systematique des Alciformes. Bull. Inst. Roy. Sci. Nat. Belgique, vol. 34, No. 45, Dec., pp. 11-14.

WETMORE, ALEXANDER.

1919. A note on the eye of the black skimmer (*Rynchops nigra*). Proc. Biol. Soc. Washington, vol. 32, Dec. 31, p. 195.

1930. A systematic classification for the birds of the world. Proc. U. S. Nat. Mus., vol. 76, art. 24, Jan. 8, pp. 1-8.

1951. A revised classification for the birds of the world. Smithsonian Misc. Coll., vol. 117, No. 4, Nov. 1, pp. 1-22.

1956. A check-list of the fossil and prehistoric birds of North America and the West Indies. Smithsonian Misc. Coll., vol. 131, No. 5, Jan. 25, pp. 1-105.

1957. The classification of the oscine Passeriformes. Condor, vol. 59, No. 3, May 24, pp. 207-209, 1 fig.

WILLUGHBY, FRANCIS.

1676. Ornithologiae, libri tres in quibus aves omnes hactenus cognitae in methodum naturis suis convenientem redactae accurate describuntur, descriptionis iconibus elegantissimis & vivarum avium simillimis, aeri incisis illustrantur. Pp. 1-307 (with introduction and index), 77 pls. London.

ZIMMER, JOHN T.

1942. Studies of Peruvian birds. No. 41. The genera *Hylophilus, Smaragdolanius,* and *Cyclarhis.* Amer. Mus. Nov., No. 1160, Jan. 30, pp. 1-16.