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# A TAXONOMIC RE-APPRAISAL OF THE PASSERIFORMES (AVES) BASED ON THE MORPHOLOGY OF THE PLANTAR SURFACE OF THE FOOT.

by

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Submitted to CNAA in partial fulfilment of the requirements for degree of Doctor of Philosophy.

Sponsoring establishment: City of London Polytechnic.

October 1988.

# A taxonomic re-appraisal of the Passeriformes (Aves), based on the morphology of the plantar surface of the foot.

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The taxonomy of the Order Passeriformes, at the family level and above, is still in considerable flux. An historical review of the taxonomy, including traditional studies, and more recent works (particularly DNA-DNA hybridization), is given.
The present study attempted to analyse little used characters, *i.e.* those on the plantar surface of the foot, of over five hundred species of bird. Large amounts of variation and homoplasy were found. Compatibility analysis (by a LeQuesne test computer program) was used to find cliques of compatible characters for families, and other groups of Passeriformes. The polarities of character state changes were hypothesized by outgroup comparison, with non-passerines from a number of orders. Some characters were found to be linked to the scansorial habit, others of reasonable use taxonomically, and yet others, not obviously adaptive, showed so much homoplasy as to be almost worthless taxonomically. Useful characters were then used to describe and define families, and in some cases other taxonomic groups. Attempts were made, with varying degrees of success, to allocate 'problem genera'. The same characters were used to construct cladograms, and then other informative characters (*i.e.* those which define subgroups within the cladogram, but show homoplasy) were added, to produce one or more trees of each group investigated. The results were compared to those of earlier studies, based on morphological, anatomical and biochemical characters. The degree of congruency varied considerably. It was particularly interesting to find that in some cases there was a reasonable fit with the results of DNA-DNA hybridization.

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## INTRODUCTION

Raikow (1982) demonstrated the monophyly of the class Aves, using feathers, fore-limb modifications, fore-limb musculature and the respiratory system as characters.

The largest order of the Aves, the Passeriformes, contains 5274 (approximately 58.5%) of the known extant species of birds (Bock and Farrand 1980). The order represents a recent radiation of mostly small, land-dwelling forms, feeding mostly upon small invertebrates, fruits, seeds and nectar. Except for feeding structures, they are anatomically quite uniform.

To establish monophyly of the passerines (Raikow *op.cit.*) concentrated on the characters of the hind limb. The passerine foot is adapted for perching, but in such a way as not to preclude terrestrial habits. The form of the foot is basically anisodactyl, which is the form found in the majority of the birds, in *Archaeopteryx* and in the theropod dinosaurs. Synapomorphies shared by all passerines include similar phalangeal formulae; large size of hallux and claw; no connection between the *flexor digitorum longus* and the *flexor hallucis* (except for a vinculum in the Eurylaimidae, but this is not a constant feature); derived (apparently) *pubo-ischio-femoralis* muscle which is distinctive for all passerines; absence of intrinsic muscles of digits II, III and IV, with the exception of a vestigial *exterior brevis digiti IV* (these muscles occur in non-avian tetrapods, and in non-passerine birds). In summary, the passerine hind-limb muscle system is quite simple compared to non-passerines. The extrinsic muscles, found in the shanks allow the forward toes and the hallux to be flexed separately, and the individual forward toes can also be flexed separately. There is also one muscle that flexes all the forward digits together, and only one extensor for the forward toes.

In the past, birds were mostly preserved in collections as study skins. Over 98% of the avian specimens, excluding nests and eggs, in the collection of the British Museum (Natural History) were skins (Blandamer and Burton 1979), at the time that they wrote. This was probably a reasonable reflection of the state of the major collections throughout the world. This resulted in avian systematics at the species level being one of the most advanced areas of taxonomy, but at the supergeneric level, much was little more than guesswork. External morphology was used extensively. Bill and associated characters of the skull tended to unite parallel and convergent groups. Post-cranial anatomy was comparatively neglected.

Sclater (1880) made the observation that the oscines (the largest sub-order of the Passeriformes) were no more varied than many families of other orders. This was re-iterated by Gadow (1891) and Lucas (1894). Furbringer (1888) recognised only two families of passerines. Since that time there have been a number of re-classifications, in which the number of accepted families have varied from forty-one to eighty-two, e.g. Stresemann (1934) forty-nine; Mayr and Amadon (1951) fifty; Wetmore (1960) seventy; Campbell and Lack (1985) eighty-two; Sibley *in* Campbell and Lack (1985) forty-one. The limits of the families, and the arrangement of the families in a hierachical classification in the last mentioned, are considerably different from any others. All but the last owe much of their features to history. Nitzsch (1840) utilised pterylography. Muller (1847) used features of the syrinx, and his findings may be considered the beginnings of modern classification. His major sub-divisions are still widely accepted. Cabanis and Heine (1850-63) synthesized the ideas of Keyserling and Blasius (1839), Nitsch (*op.cit.*) and Muller (*op.cit.*). The results are similar to the more traditional arrangements in use today. Gray (1869-71) listed the genera of passerines based mainly on external features, particularly the bill. Sharpe (1877-90) has been, and still is a very important influence, and changes (excluding Sibley, *e.g.* 1985; Sibley and his co-workers, many references) since Sclater (1880, 1881) have been relatively few. Stejneger (1885) based his classification on Sclater (*op.cit.*). Ridgway (1901-11) recognised the inadequacies of knowledge, and his criteria for New World passerine classification are still in use. He recorded discrepancies and difficulties. The classifications of Wetmore (*op.cit.*), Mayr and Amadon (*op.cit.*), Mayr and Greenway (1956), Amadon (1957), Delacour and Vaurie (1957) and Storer (1960) change the passerine families little.

Beecher (1953) published extensive data on jaw musculature of passerine families, proposing new and unexpected groupings. Tordoff (1954a, b) used palato-maxillaries on a less extensive group of passerines. However, Bock (1960) judged these characters to be of little or no value in showing relationships between families, or placing problem genera in correct families. Berger (1956) claimed that the *expansor secundariorum* muscle is of no use taxonomically, *contra* Garrod (1876). The scutellation of the tarsus, used by Ridgway (1907) was shown to be unreliable by Ames, Heimerdinger and Warter (1968), and Ridgway (*op. cit.*) had already recorded difficulties. Heimerdinger and Ames (1967) found suboscine sternal characters to be unreliable. Other characters used in recent decades include behaviour (Ficken and Ficken 1966; Andrew 1956 & 1961; Lorhl 1964; Nicolai 1964), bones and muscles of the hyoid apparatus (George 1962), number of primaries (Stresemann 1963), pterylography (Heimerdinger 1964), syrinx (Ames 1965, 1971), pneumatic fossa in the head of the humerus (Bock 1962) and other osteological characters (Pocock 1966), myology and serology (Stallcup 1954, 1961), spermatozoa (McFarlane 1963), blood groups (Norris 1963), chromosomes (Baldwin 1953, and Udagawa 1957), immunological and biochemical characters (Mainwardi, *e.g.* 1961), egg-white proteins (Sibley, *e.g.* 1970). Matson (1984) reviews works utilising electrophoresis since 1970. Harrison (1969,a) disagrees with the usefulness of one of the important characters used by Pocock (*op.cit.*), *viz.* the 'process D' on the carpometacarpus. Sibley (1970) considered that spermatozoa characters were of uncertain use, and that blood-group reactions had limited applicability. Ackermann (1967) claimed that numerical taxonomy was of doubtful value for systematic ornithology.

Wetmore (1960) recognised four sub-orders of passerines, *viz.* Eurylaimi, for the Eurylaimidae; Menurae for the Menuridae and Atrichornithidae; Tyranni for the remaining sub-oscines, including Xenicidae; Passeres for all the remaining families, i.e. the oscines.

Ames (1965), and Ames, Heimerdinger and Warter (1968) recognised four sub-orders, similar to Wetmore (*op. cit.*), except that the Philipittidae was removed from the Tyranni and placed in the Eurylaimi, and they considered that the Pittidae did not belong in this sub-order.

Sibley (1970) placed only the Eurylaimidae in the Eurylaimi; all New World sub-oscines, along with the Pittidae and Acanthisittidae were assigned to the Tyranni. The Menurae and Passeres remained as in Wetmore (*op.cit.*).

Sibley (1985) divided the Order Passeriformes into two sub-orders, the Passeres, for the traditionally accepted oscines, plus the Menuridae and Atrichornithidae, and Oligomyodi for the non-oscines, including the Xenicidae.

The very much more anatomically uniform Passeres or 'oscines' have, expectedly, given greater problems.

Wallace (1874) sub-divided the oscines using the number of primaries and development of the outer primary. Sclater (1880, 1881) found this arrangement unacceptable. Much debate followed on the outer wing feathers (particularly Stresemann *in litt.* to Sibley 1970). Averill (1925) demonstrated that these characters are adaptive and correlated with long distance migratory patterns. Stephan (1966) used the numbers of secondaries.

Shufeldt (1889a), using skeletal characters, produced interpretations which were generally unacceptable. Oates (1889) classified the passeres on the basis of juvenile plumage, which is known to be adaptive. Characters used by Sharpe (1891) resulted in convergent groups becoming allied. Heimerdinger (1964) and Ames, Heimerdinger and Warter (1968) state that pterylosis is remarkably constant and conservative in passerines. Ames (1965) concluded that the Passeres are a monophyletic unit with uniform syringeal structure. Beecher's (1953) findings on jaw musculature are generally not accepted, whereas Stallcup's (1961) serology results sometimes agree, and sometimes disagree, with other data. Some display characters used by Andrew (1961) show concordance, some do not. Disagreement with Pocock (1966) has been mentioned previously. Various behavioural characters (e.g. Simmons 1957, 1961; Ficken and Ficken 1966; Berger 1966; Cullen 1959) often lack concordance.

Sibley (1970) using egg-white protein found four main 'pattern types', which he named A,B,C and D. Type A included Sylviidae, Muscicapidae, Prunellidae, Mimidae, Motacillidae, Meliphagidae, Paridae, Certhiidae, Zosteropidae, Fringillidae, Emberizidae, Parulidae, Icteridae, Vireonidae, Alaudidae, Hirundinidae, Timaliidae, and possibly Grallinidae. Type A also included Pittidae, traditionally sub-oscine. *Passer* and *Vidua* also belong here, and not with their apparent relatives in Type B.

*Chamaea* and possibly *Aegithalos* and Troglodytidae may also belong to Type A. Some Meliphagidae, unexpectedly, showed Type B pattern. Type B pattern included Turdidae, Pycnonotidae, Dicruridae, Oriolidae, Nectariniidae, Ploceidae, Sturnidae, Cracticidae, Paradiseidae, and all non-oscines except *Pitta*. Also included in this group are *Lichmera*, *Certhionyx*, *Pardalotus*, *Acanthiza*, *Sericornis*, *Sitta*, *Climacteris*, *Panurus*, *Tichodroma*, *Phainopepla*, *Bombycilla* and *Dulus*, and probably *Laniarius*.

Type C pattern contained Corvidae, *Lanius*, *Campephaga*, *Chlorophoneus*, *Urolestes*, *Telophorus* and *Nilaus*.

Type D was reserved for Troglodytidae, which in some respects show similarities to *Parus*, *Certhia* and to non-oscines.

Using appendicular muscle characters, Raikow (1977,1978a) claimed that the Drepanididae were probably not monophyletic, and Bentz (1979) made a similar claim for the ploceid / estrildid complex. Raikow (1978a) claimed that New World nine-primaried oscines, excluding Vireonidae, do form a clade, as do the Atrichornithidae and Menuridae (Raikow 1978b). Feduccia (1975a,b & 1977), studying the stapes, proposed that sub-oscines and oscines together do not form a clade, but that the former are part of a clade with several coraciiform families. However, later, Feduccia (1979) stated that the derived state of the stapes evolved separately in the oscines and sub-oscines, and supported passeriform monophyly with sperm morphology.

Raikow (1978a), using appendicular myology, concluded that with the exception of the Vireonidae (including *Cyclarhis* and *Vireolanius*) the New World nine-primaried oscines form a monophyletic group, *viz.* Parulidae, Thraupidae, Fringillidae (including Cardinalinae and Emberizinae), Drepanididae and Icteridae. He included *Coereba* and *Conirostrum* in the Parulidae, but excluded *Peucedramus* which he thought might be a sylviid. *Zeledonia* was thought to be a parulid. He considered the Thraupidae to be possibly polyphyletic, and its border with Parulidae ill-defined. Coerebid tanagers fit Thraupidae, as do the aberrant *Rhodinocichla*, *Tersina* and *Catamblyrhynchus*. The Drepanididae are monophyletic.

Raikow (1978b) found *Menura* and *Atrichornis* to be closely related, and set well apart from all other passerines whose myology is known.

Raikow, Polumbo and Borecky (1980), using similar characters stated that they were uncertain of the monophyly of the Laniidae (*sens. lat.*), claiming it to be poorly defined. They formed four sub-families, the Malaconotinae (most primitive), Laniinae, Pityriasinae and Prionopinae (least primitive).

Raikow, Borecky and Berman (1979) found the *iliofemoralis externus* muscle, which is lost in passerines, to have been re-established in Ptilonorhynchidae, Callaeidae, *Epimarchus* (Paradisaeidae), Turnagridae and some Sturnidae. Presumably genes are present but are not normally expressed, or perhaps the muscle appears but usually atrophies in development. This character is of doubtful use taxonomically.

Lanyon (1984), using skull and syrinx morphologies shows that Kingbirds and their allies (Tyrannidae) are monophyletic, and sets up three new monotypic genera.

Ames (1975) examined the syringeal morphology of various oscines *viz.* Muscicapidae (*sens.lat.*), Prunellidae and Campephagidae. He found a syringeal muscle form, referred to as the 'turdine thumb', to be present in 30 out of 36 genera of Turdidae (exceptions being *Zeledonia, Modulatrix, Myadestes, Neocossyphus, Stizorhina* and *Phaeornis*) which include a wide range of ecological forms, and hence the structure is presumably not adaptive. It is found in all Muscicapinae except *Newtonia* and *Microeca*. It is absent in Platysteirinae, Monarchinae, Rhipidurininae, Pachycephalinae, Turnagridae, Campephagidae (except for *Chlamydochaera*), Prunellidae, Orthonychinae, Timaliinae, Panurinae, Picathartinae, Polioptilinae, Sylviinae, Malurinae and others examined.

Sibley and Ahlquist (1981a and 1984a) describe their technique for DNA-DNA hybridization, and have published many papers on their findings on the passerines, Piciformes and ratites.

In a number of papers Sibley and his co-workers tackle the whole of the passerines (Sibley and Ahlquist, many references; Sibley, Shodde and Ahlquist 1984; Sibley, Williams and Ahlquist 1982). Classifications and trees for the whole order are produced in Sibley and Ahlquist (1984a), and Sibley (1985) produced a classification which differed little from that of Sibley and Ahlquist (1984a). In this, the Order Passeriformes is divided into two suborders, the Oligomyodi and the Passeres. The first contains three infraorders, one for the Acanthisittidae, one for the Pittidae, Eurylaemidae and Philepittidae, and one for the New World taxa.

The second suborder contains two parvorders. One, the Corvi, which is claimed to have evolved in Australasia, diverging from the Muscicapae *ca.* 55-60 MYA (Sibley and Ahlquist 1985), includes three superfamilies, *viz.* Menuroidea (Menuridae, Ptilonorhynchidae, Climacteridae), Meliphagoidea (Maluridae, Meliphagidae, Acanthizidae) and Corvoidea (Eopsaltridae, Orthonychidae, Pomatostomidae, Corvidae, Laniidae, Callaeidae). The Corvidae is much expanded beyond its traditional limits to include *Cinclosoma*, Corcoracidae, Pachycephalidae, *Daphoenositta*, Paradisaeidae, Cracticidae, Oriolidae, Monarchinae, *Rhipidura*, Dicruridae, Malaconotinae, Prionopidae, *Artamus*, *Pityriasis*, *Peltops* and Vireonidae.

The second parvorder Muscicapae, claimed to have evolved in Africa or Asia, also contains three superfamilies, *viz.* Turdoidea (Bombycillidae, Cinclidae, Turdinae, Muscicapinae, Sturnini, Mimini), Sylvioidea (Sittidae, Certhiinae, Troglodytinae, Polioptilinae, Parinae, Remizinae, Aegithalidae, Hirundinidae, Regulidae, Pycnonotidae, Cisticolidae, Zosteropidae, Sylviidae), and Fringilloidea (Alaudidae, Nectariniidae, Ploceidae, Estrildidae, Fringillidae). The Timalidae are relegated to a tribe in the Sylviinae. The Fringillidae includes all the nine-primaried oscines. (This classification will be examined in much detail later.)

DNA-DNA hybridization is gaining acceptance as the most reliable method to date for phylogenetic analysis of the passerines. Part of its attraction is no doubt that it can provide tidy phylograms. Where these differ from those based on morphological or other characters , parallelism or convergence of the latter characters can be invoked to explain the incongruencies. Genera which have previously been too recalcitrant to place with any certainty have been fitted neatly into the scheme. Sibley and Ahlquist (1984a) assume a 'uniform average rate' of mutation (UAR) and fit a time scale to their dendrograms. Since they use only the non-duplicated part of the genome, which is presumably under much greater selective pressure than the rest, this should be considered suspect. This has also been refuted by others, in particular Britten (1986), who argues that the rate of DNA change in different phylogenetic groups can differ by upto a factor of five and is connected to generation length. Houde (1987a) not only argues against the assumption of a 'UAR', but also states that experimental error has not been eliminated, and insufficient data produced. DNA-DNA hybridisation is a distance method, and cannot discriminate between different components of distance which have the same effect on total distance. The ultimate answer may come from nucleotide sequencing. At the moment, it would perhaps be wise to consider DNA-DNA hybridization as another method to be used in conjunction with more traditional ones.

Mack *et al.* (1986) claim that mitochondrial DNA is more useful for studying closely related taxa than nuclear DNA.

Fragmentation patterns are produced by using restriction enzymes, and these are compared. Pain (1987) explains the use of mitochondrial DNA fragmentation in work on subspecies of *Branta canadensis*. It is stated that mitochondrial DNA accumulates mutations ten times faster that nuclear DNA, and since it all comes from the female (*i.e.* there is no mixing at fertilization) it is easier to trace genealogies.
An interesting point made by Raikow and Cracraft (1983) which would lead one to expect incongruencies between results from anatomy, morphology *etc.* and DNA is that similarity and phylogenetic relationship do not necessarily coincide; a crocodile more resembles a turtle, but is closer to a turtle dove, and a lungfish more resembles a goldfish, but is closer to a goldfinch.

The morphology of the plantar surface of the feet of birds was mentioned by Blaszyk (1935) and Ruggeberg (1960), but the first detailed investigation was by Lennerstedt (1973, 1974, 1975a, 1975b, 1975c) who decided that it was of limited taxonomic use. It was first applied to a taxonomic study by Mann, Burton and Lennerstedt (1978). Mann (1979) made a taxonomic study of the Timaliinae using a phenetic analysis of these characters, but the results were inconclusive. The present study grew out of this.

## AIMS AND OBJECTIVES

As can be seen from the 'Introduction', the taxonomy of the Order Passeriformes is still in considereble flux despite the resurgence of interest in the last two decades. Search for previously unused characters, re-examination of old characters and the quest for new methods of analysing the information gathered continues, and much debate results, some of it bordering on the acrimonious.

The results of Sibley and his co-workers (may refences) have sometimes been hailed as the last word, but very infrequently are the results of DNA-DNA hybridization corroborated, and there is much dispute over the validity of the technique and the interpretation of the results.

In this present study the author hoped to find useful characters which had not been utilised in earlier studies. The characters of the plantar surface of the foot were chosen because they are easily observable without extensive dissections, demonstrate considerable variation and had not been used before (except by the writer in a very limited way). They have the advantage that they can be scored, albeit not always with complete confidence, on study skins and on live birds, as well as on spirit specimens. The intention was to improve on the scoring method used earlier by Mann (1979). The whole of the order was to be examined, with representatives from all major subdivisions, and as many 'problem' genera as possible. The Timaliidae were examined very fully (upto five, occasionally more, specimens of each species, depending upon availability) as this had been the group studied by the writer earlier, with the purpose of finding the degree of intraspecific variation of the characters.

Having found suitable characters, studied a sufficiently large number of species to find as many combinations of character states as possible, the aim was to find a suitable method of analysis whereby phylogenetically more reliable characters could be selected and used in preference to those considered less reliable. Compatibility analysis by means of the LeQuesne test was chosen.

The next aim was to construct dendrograms of as many groups as possible within the Order Passeriformes, based on the family level in most cases. [An attempt to construct a phylogeny of the whole order, and of the suborders, with representatives of all families/groups was abandoned. Few characters appeared to be stable across the whole range of families so that there were hardly any characters which appeared to give any useful information. The relationships suggested from the results were totally incongruent with results of other workers, and groupings found to be well defined when tested separately often had their genera widely separated. A more critical look at this area is planned for the future.]

The final objective was to see if the relationships suggested by compatibility analysis of plantar characters show congruence with the results of earlier traditional taxonomic studies or with DNA-DNA hybridization.

# METHOD

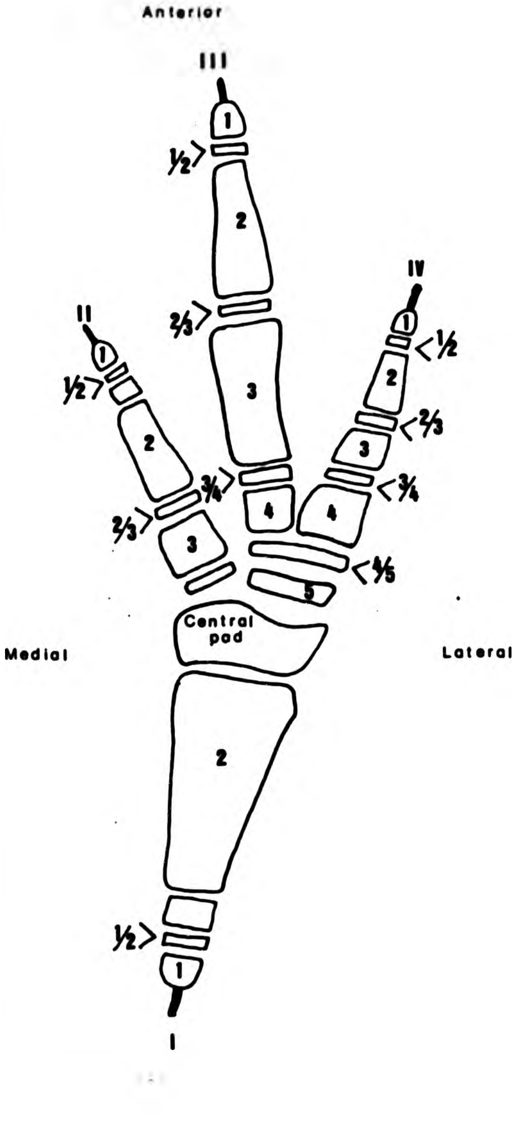
In this study, 692 specimens of 505 species of passerines, and one specimen each of 36 species of non-passerines from ten traditionally accepted orders, considered not too distant from the Order Passeriformes (see Appendix A), were examined. Specimens from as many passerine genera as possible in the time available, were examined, with no major taxon being omitted. All major subdivisions of the non-passerine orders examined were represented. The vast majority of the specimens used were those in the collection of the British Museum (Natural History), but smaller numbers of specimens from the South Australian Museum, Cambridge University Museum, National Museum, Kenya, Universiti Malaya and the writer's private collection were also examined.

The morphology of the plantar surface of the foot was examined with a low-powered stereo-microscope. The distribution of pads, folds and furrows on both feet were recorded using the terminology of Lennerstedt (1973) (Fig.1). The character states were recorded (see section entitled 'Character Analysis'). In many cases a simple dissection was carried out to ascertain the relationship between the superficial characters and the underlying bones. Spirit specimens were used where possible, but when these were unobtainable (less than 8% of the species examined) skins were used. These were not as satisfactory as spirit specimens as the soft parts tend to dry out, and their structure is not readily discernible, and moreover they cannot be dissected. For expediency, in the case of the non-passerines, drawings by Lennerstedt (1973) were used in eleven of the 36 species examined.

The foot of all passerine birds has four digits, except the three-toed *Paradoxornis paradoxus* which has lost the fourth. One points backward, the other three forward. They are numbered using Roman numerals, I being the backward-pointing digit, II the medial forward, III the middle forward and IV the lateral forward. Digit I has two phalanges, digit II has three, digit III has four and digit IV has five phalanges. The phalanges are numbered distally-proximally, so that III2 would be the second phalanx from the distal end of digit III. Fractional notation is used to indicate joints, *e.g.* IV2/3 is the joint between phalanx 2 and phalanx 3 on digit IV. The plantar surface is generally covered with papillae, divided into large areas termed 'pads' and narrower areas (from anterior to posterior) termed 'folds'. The gaps between these areas are termed 'furrows'. Folds tend to be associated with joints, as they enable bending. However, folds are also found on phalanges far from joints, and small pads are also frequently found at joints. (Pads at joints can be distinguished from folds because their greater width causes some degree of folding when the joint is bent.) The relationships of these structures to joints and phalanges were found by flexing the digits, examining the scutellation and making incisions on the sides of the digits to see the underlying bones. The left foot was examined, followed by the right, to discover any asymmetrical conditions. Figure 1 shows the plantar surface of a passerine bird, and demonstrates how the labelling is carried out. Where a pad or fold is raised very obviously in relation to its neighbours this is indicated on the diagrams with a black spot (none shown in Fig.1). Figures 19 to 174 include one or more examples from all major taxa of passerines examined.

The distribution of the pads, folds and furrows were scored as binary or multi-state characters. The latter were broken down into binary characters. Discrete character states were required for analytical procedures. In some cases little or no difficulty was encountered, but in others there were varying degrees of difficulty, and in some cases it was impossible to obtain discrete states in an intellectually honest form, and such characters were eliminated early in the analysis. Asymmetry (between left and right feet) and large degrees of intraspecific variation were also criteria for elimination of characters. The final set of characters used includes 50 two-state and 17 multi-state characters. The last were broken down to binary characters, giving a total of 102 binary characters.

The next process was to find the polarity of the character state changes. Bishop (1982) reviews methods used. He lists, and rejects, commonality, ontogeny, geographical distribution and stratigraphy. He gives only limited




PLANTAR SURFACE OF LEFT FOOT OF PASSERINE BIRD

FIG. 1

support to functional morphology.

Underwood (1982) reviews the process of arriving at valid characters and their changes of state. Quoting Sneath and Sokal (1973), he defines operational homology as that which admits to detailed examination at the descriptive level. He demonstrates that a transformation series can be arranged either logically, with the aggregated differences between adjacent pairs minised (phenetic parsimony), or biologically, whereby the aim is to juxtapose states which have the most similar genotypes (genetic parsimony). The former was normally followed through necessity in this study. The closest states would be those thst shared a genotype. These would be detected as asymmetries, and are combined as one state in this study. Underwood (*op.cit.*) rejects commonality, association of states, specialization (both morphological and ecological), geographic restriction, genetic structure and fossil record as means of assessing the polarity of character state changes, and accepts only outgroup comparison. He suggests that the outgroup be paraphyletic, and not a sister-group. It was believed to be paraphyletic in this study. He considers five possibilities. -

(a) there is only one state in the outgroup, and this matches one state in the ingroup. This is inferred to be primitive.

(b) the outgroup has several states, but only one matches a state in the ingroup. This is inferred to be primitive.

(c) the outgroup has several states, none matching any of the ingroup, but one is closest. This is inferred primitive.

(d) the outgroup has several states, and two or more match states in the ingroup. The one in the outgroup with the clear majority is inferred primitive.

(e) the phenetic gap between the outgroup and the ingroup is so great that no pair of states can be judged closer than any other. No inference can be made.

In this study all characters fell into (a), (b) and (d), except for a very few where the majority was very slender.

He goes on to discuss weighting, but this was irrelevant to this study, as it was found impossible to weight such characters as were used in this study.

He comments that with a changing environment we 'cannot expect modifications of isolating features to be so orderly and systematic as to allow precise analysis'. Characters used can hardly be expected to always be those that cause speciation. Moreover, there will have been anagenesis of lineages after dichotomy.

de Queiroz (1985) gives three methods of judging polarity:

(a) ontological - more general considered primitive;

(b) outgroup - less common considered derived;

(c) palaeontological - earlier considered primitive.

In this study an outgroup was established (the non-passerines mentioned above, and listed in Appendix A), and from this the polarity of the each character state change was established, with varying degrees of confidence.

In order to root a tree, the polarity of at least one character state change is required. The method of binary character coding follows Farris, Kluge and Eckardt (1970) by which any branching character-state tree can be represented relating states to one another. Only characters in which two , or more, states occur were analysed. The following examples are used to make the method clearer.

(a) Character 10:

The distal pad on the second phalanx of the second digit (II2) is either flush with the neighbouring pads (considered the primitive state, 0) or noticeably raised (considered the derived state, 1). This is a simple binary character. The example in Fig.1 would score '0'.

(b) Character 7

This concerns the presence or absence of folds or pads, or their fusion, on joint II 1/2 (between phalanx 1 and phalanx 2 on digit II). In order to accommodate five conditions, four binary characters are created. This is demonstrated more fully in 'Character Analysis'.

7.1: presence of separate pad and/or folds (0), or their absence (1).

7.2: other state (0), or fusion of pad or fold to II 1 (1).

7.3: other state (0), or fusion of pad or fold to II 2 (1).

7.4: no separate pad (0), or one pad (1).

The condition 'one or more separate folds' scores '0' in all four characters.

The example in Fig.1 scores as follows:

7.1 - 0

7.2 - 0

7.3 - 0

7.4 - 0

The set of binary characters forming the multi-state Character 7 form a branching tree (see 'Character Analysis').

By converting all multi-state characters to binary characters, a total of 102 binary characters was arrived at.
(All multi-state characters are analysed fully in the section 'Character Analysis'.)

Compatability analysis (LeQuesne 1969, 1972, 1982) was carried out, deleting characters by procedure number III (LeQuesne 1972) in the list of alternatives, by which characters are given a 'coefficient of character state randomness' based on the number of observed incompatibilities of a character expressed as a percentage of the number of incompatibilities expected on the null hypothesis of random distribution of their states. The characters are eliminated in order of coefficient of character state randomness, starting with the highest. The computer program for this analysis was devised by Gauld and Underwood (1986). This procedure leads to the establishment of a set of mutually compatible characters, a 'clique' as defined by Estabrook, Strauch and Fiala (1977). (An alternative method of identification of parallelism in discrete character sets, and arriving at a compatible clique, is explained by Guise *et al.*, 1982. This was not utilised in the present study.)

From this a cladogram (or 'phylogenetic dendrogram', Gauld and Underwood *op.cit.*) which by definition (*sensu* Hennig 1967) will have no parallels or reversals of character state transformation, may be constructed (Gauld and Underwood *op.cit.*). The terms 'character' and 'multi-state character complex' are used *sensu* Sneath and Sokal (1973) and Gauld and Underwood (*op.cit.*). The alternative states were scored as 0 and 1. Taking two characters, these are unconditionally incompatible if all possible combinations occur *i.e.* 0:0, 0:1, 1:0, 1:1, whether or not polarity (*i.e.* evolutionary direction) is assigned. The four combinations cannot be linked in a phylogenetic dendrogram without implying parallel evolution or reversal in one or more character. If the coding is polar, using 0 for primitive and 1 for the derived state, incompatibility occurs if no more than the following three combinations - 0:1, 1:0, 1:1 - occur. Inversion of the scores of one or more of the characters removes the incompatibility.

The largest clique (or cliques, if more than one maximum clique was found, or if a clique of one less than the maximum existed) was used to construct a cladogram. After this process other characters were used in the reverse order to which they were eliminated (*i.e.* those with the smallest coefficient of character state randomness first) to give greater definition. Re-arrangements of the taxa were carried out to find the most parsimonious dendrogram(s) without destroying the original cladistic (*sensu* Hennig *op.cit.*) arrangement. Figures 175 to 234 show dendrograms for passerine taxa investigated.

The following example (using Furnariidae) illustrates how the LeQuesne Test program is used.

Illustration of LeQuesne Incompatibility Test

Characters with all 0, all 1 or singleton 1 scores are removed, as these logically cannot be incompatible.

The program then computes the statistically expected number of incompatibilities for each character, adds up the number of observed incompatibilities and calculates the observed to expected ratio on the null hypothesis of random distribution of the observed 1 and 0 scores. It then removes the character with the highest ratio. It prints the grand total of incompatibilities observed, the number of incompatibilites expected, followed by the ratio. Finally, it prints the character deleted. *e.g.*the first line of the printout below, shows that the total of observed incompatibilities to be 97, the expected incompatibilities to be 98.33, and hence the ration to be 34.2; character 34.2 is then deleted.

The program then goes on to recalculate the these figures after the removal of this character. It continues to do this until the grand total of zero incompatibilites is arrived at. (Bottom line of this section of printout.)

Grand total - 775 886.14 0.87 Ch.deleted : 32

Grand total - 752 868.19 0.87 Ch.deleted : 47

Grand total - 732 850.43 0.86 Ch.deleted : 65

Grand total - 711 831.77 0.85 Ch.deleted : 18.4

| | | | |
|---|---|---|---|
| Grand total - 681 | 804.29 | 0.85 | Ch.deleted : 2 |
| Grand total - 637 | 764.56 | 0.83 | Ch.deleted : 4 |
| Grand total - 617 | 746.8 | 0.83 | Ch.deleted : 34.2 |
| Grand total - 577 | 708.38 | 0.81 | Ch.deleted : 28.2 |
| Grand total - 539 | 671.48 | 0.8 | Ch.deleted : 55 |
| Grand total - 503 | 635.22 | 0.79 | Ch.deleted : 14.2 |
| Grand total - 480 | 611.98 | 0.78 | Ch.deleted : 9 |
| Grand total - 448 | 579.21 | 0.77 | Ch.deleted : 36.1 |
| Grand total - 433 | 563.86 | 0.77 | Ch.deleted : 31 |
| Grand total - 402 | 532.35 | 0.76 | Ch.deleted : 35 |
| Grand total - 374 | 503.36 | 0.74 | Ch.deleted : 57.1 |
| Grand total - 346 | 473.36 | 0.73 | Ch.deleted : 50.4 |
| Grand total - 318 | 443.99 | 0.72 | Ch.deleted : 67 |
| Grand total - 289 | 412.65 | 0.7 | Ch.deleted : 15 |
| Grand total - 261 | 382.31 | 0.68 | Ch.deleted : 61 |

| | | | |
|---|---|---|---|
| Grand total - 238 | 356.32 | 0.67 | Ch.deleted : 51 |
| Grand total - 216 | 331.03 | 0.65 | Ch.deleted : 24 |
| Grand total - 196 | 308.51 | 0.64 | Ch.deleted : 7.4 |
| Grand total - 181 | 292.11 | 0.62 | Ch.deleted : 28.4 |
| Grand total - 169 | 277.5 | 0.61 | Ch.deleted : 28.6 |
| Grand total - 155 | 259.7 | 0.6 | Ch.deleted : 8 |
| Grand total - 138 | 238.4 | 0.58 | Ch.deleted : 25 |
| Grand total - 130 | 228.61 | 0.57 | Ch.deleted : 3 |
| Grand total - 112 | 206.48 | 0.54 | Ch.deleted : 14.1 |
| Grand total - 96 | 187.38 | 0.51 | Ch.deleted : 13 |
| Grand total - 83 | 169.3 | 0.49 | Ch.deleted : 49 |
| Grand total - 74 | 157.39 | 0.47 | Ch.deleted : 28.3 |
| Grand total - 63 | 140.75 | 0.45 | Ch.deleted : 45.1 |
| Grand total - 54 | 127.56 | 0.42 | Ch.deleted : 50.1 |
| Grand total - 47 | 117.16 | 0.4 | Ch.deleted : 12.1 |

| | | | | |
|---|---|---|---|---|
| Grand total - 43 | 111.3 | 0.39 | Ch.deleted : | 48 |
| Grand total - 36 | 101.28 | 0.36 | Ch.deleted : | 11 |
| Grand total - 28 | 88.79 | 0.32 | Ch.deleted : | 62 |
| Grand total - 21 | 76.57 | 0.27 | Ch.deleted : | 27 |
| Grand total - 18 | 70.95 | 0.25 | Ch.deleted : | 5 |
| Grand total - 13 | 59.9 | 0.22 | Ch.deleted : | 33 |
| Grand total - 9 | 48.83 | 0.18 | Ch.deleted : | 12.3 |
| Grand total - 7 | 42.73 | 0.16 | Ch.deleted : | 12.4 |
| Grand total - 5 | 35.42 | 0.14 | Ch.deleted : | 46 |
| Grand total - 3 | 27.68 | 0.11 | Ch.deleted : | 42 |
| Grand total - 1 | 20.37 | 5E-2 | Ch.deleted : | 21.3 |
| Grand total - 0 | 15.9 | 0 | | |

A table is then printed which shows for each of the remaining characters the observed incompatibilities (which should now be zero), the expected incompatibilities, and the ratio (which should be - or 0), and the number of polar incompatibilities. Polar incompatibilities are those which occur only because of the polarity of the character state change; if this is reversed the incompatibility disappears. The characters in this table are a compatible set or 'clique'.

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 20 | : 0 | 9.36 | 0 | - 3 | 21.1 | : 0 | 9.7 | 0 | - 3 |
| 21.2 | : 0 | 4.14 | 0 | - 0 | 22 | : 0 | 10.34 | 0 | - 2 |
| 26 | : 0 | 5.12 | 0 | - 0 | 37 | : 0 | 9.92 | 0 | - 3 |
| 38 | : 0 | 9.92 | 0 | - 3 | 50.3 | : 0 | 5.12 | 0 | - 5 |
| Grand total - 0 | | 31.81 | 0 | | | | | | |

TABLE 1

This set is not necessarily unique, but depends on the method used to eliminate the characters. Other sets of the same or similar size may exist. In order to attempt to find other cliques, the last six characters eliminated are replaced and the test run again. A matrix to show incompatibilites (shown below) can be printed. 'X' indicates an unconditional incompatibility between the two characters; ':' indicates a polar incompatibility (*i.e.* if the polarity of one of the characters is changed, they will be compatible.); '-' indicates a compatibility.

| | 12.3 | 12.4 | 20 | 21.1 | 21.2 | 21.3 | 22 | 26 | 33 | 37 | 38 | 42 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50.3 | : | : | : | - | - | - | : | - | : | : | : | : | : |
| 46 | - | - | - | : | - | - | - | - | X | X | X | - | |
| 42 | - | - | - | : | - | - | - | - | X | X | X | | |
| 38 | - | - | - | : | - | - | - | - | - | - | | | |
| 37 | - | - | - | : | - | - | - | - | - | | | | |
| 33 | - | - | - | X | - | X | - | - | | | | | |
| 26 | - | - | - | - | - | - | - | | | | | | |
| 22 | X | X | - | - | - | X | | | | | | | |
| 21.3 | - | - | - | | | | | | | | | | |
| 21.2 | - | - | - | | | | | | | | | | |
| 21.1 | X | X | : | | | | | | | | | | |
| 20 | - | - | | | | | | | | | | | |
| 12.4 | | | | | | | | | | | | | |

TABLE 2

Another table is produced showing compatibilities etc. now that these six characters have been restored. The table is examined and those characters with zero incompatibilities are noted - these will form part of the new clique. The character with the highest number of incompatibilities is found.

FURNARIIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12.3 | : 2 | 6.87 | 0.29 | - 1 | 12.4 | : 2 | 8.21 | 0.24 | - 1 |
| 20 | : 0 | 18.9 | 0 | - 3 | 21.1 | : 3 | 19.12 | 0.16 | - 5 |
| 21.2 | : 0 | 8.23 | 0 | - 0 | 21.3 | : 2 | 8.74 | 0.23 | - 1 |
| 22 | : 3 | 20.91 | 0.14 | - 2 | 26 | : 0 | 10.13 | 0 | - 0 |
| 33 | : 4 | 11.08 | 0.36 | - 2 | 37 | : 2 | 20.06 | 0.1 | - 3 |
| 38 | : 2 | 20.06 | 0.1 | - 3 | 42 | : 3 | 10.88 | 0.28 | - 3 |
| 46 | : 3 | 10.14 | 0.3 | - 3 | 50.3 | : 0 | 5.12 | 0 | - 5 |

Grand total - 13 59.9 0.22

Ranking ratios

20 50.3 21.2 26 38 37 22 21.1 21.3
12.4 42 12.3 46 33

TABLE 3

The computer is instructed to eliminate this, and those which score zero and recalculate. This procedure is repeated until a compatible clique is produced. A list of the characters from lowest to highest ratio is also printed out (ranking ratios). The clique, or cliques, can be used to construct a cladogram. The incompatibility matrix can be used to decide which character to eliminate if there are characters which the investigator prefers to keep in a clique which would otherwise be eliminated. It is also useful in deciding which characters should be re-polarised.

FURNARIIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12.3 | : 2 | 4.76 | 0.42 | - 1 | 12.4 | : 2 | 5.64 | 0.35 | - 0 |
| 21.1 | : 2 | 6.49 | 0.31 | - 4 | 21.3 | : 1 | 6.05 | 0.17 | - 0 |
| 22 | : 3 | 7.28 | 0.41 | - 0 | 37 | : 2 | 7.02 | 0.29 | - 1 |
| 38 | : 2 | 7.02 | 0.29 | - 1 | 42 | : 2 | 7.46 | 0.27 | - 1 |
| 46 | : 2 | 7.02 | 0.29 | - 1 | | | | | |

Grand total - 13 59.9 0.22

Ranking ratios

21.3 42 37 38 46 21.1 12.4 22 12.3

TABLE 4

FURNARIIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.3 : 1 | 4.06 | 0.25 | - 0 | 12.4 : 1 | 4.82 | 0.21 | - 0 |
| 21.1 : 2 | 5.51 | 0.36 | - 4 | 21.3 : 0 | 5.1 | 0 | - 0 |
| 37 : 2 | 6.07 | 0.33 | - 1 | 38 : 2 | 6.07 | 0.33 | - 1 |
| 42 : 2 | 6.48 | 0.31 | - 1 | 46 : 2 | 6.07 | 0.33 | - 1 |

Grand total - 6 22.09 0.27

Ranking ratios

21.3 12.4 12.3 42 26 37 38 21.1

TABLE 5

Incompatibilities: observed expected ratio - polar

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.3 : 0 | 3.31 | 0 | - 0 | 12.4 : 0 | 3.95 | 0 | - 0 |
| 37 : 2 | 5.1 | 0.39 | - 1 | 38 : 2 | 5.1 | 0.39 | - 1 |
| 42 : 2 | 5.48 | 0.36 | - 1 | 46 : 2 | 5.1 | 0.9 | - 1 |

Grand total - 4 16.58 0.24

Ranking ratios

12.3 12.4 42 38 46 37

TABLE 6

Incompatibilities: observed expected ratio - polar

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 38 : 2 | 4.2 | 0.48 | - 0 | 42 : 1 | 4.52 | 0.22 | - 0 |
| 46 : 1 | 4.2 | 0.24 | - 1 | | | | |

Grand total - 2 11.48 0.17

Ranking ratios

21.3 12.3 12.4 42 46 38

TABLE 7

Incompatibilities: observed expected ratio - polar

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 42 : 0 | 3.55 | 0 | - 0 | 46 : 0 | 3.29 | 0 | - 0 |

TABLE 8

Table 1 shows that two characters (21.2,26) are unconditionally compatible. The other six characters show polar incompatibilities. The last six characters eliminated are now replaced (since useful characters are often eliminated and do not appear in the final clique) and the set re-run, giving a Compatibility Matrix (Table 2) and Table of Incompatibilities (Table 3).

Characters 20,21.2,26 & 50.3 have no incompatibilities and go into the core set.

Character 33, having the highest number of incompatibilities, is removed, leaving the characters shown in Table 4.

Character 22 is now eliminated and the program run again to give Table 5.

Character 21.3 now joins the core and is removed. There are now five characters with two incompatibilities each. 21.1 has the highest observed to expected ratio and is therefore eliminated.

12.3 and 12.4 now join the core. Removal of 37 now leads to Table 7.

Removal of 38 now frees 42 and 46.

50.3 shows polar incompatibilities with other characters, but 12.3,12.4,20,21.2,21.3,26,42 and 46 are unconditionally compatible. These are used to construct dendrogram Alternative A (Fig.176).

37 and 38 are incompatible with 42 and 46, but are completely compatible with the rest of the clique. These

two pairs are exchanged to form a second clique of equal size (12.3,12.4,21.2,21.3,26,37 and 38) which is used to construct dendrogram Alternative B (Fig.177).

The initial clique formed (Table 1) is one character less than the last two cliques and is not utilised.

Since evolution has no *a priori* direction, it is not logical to assume that the most parsimonious alternative is the one most likely to be true. However, Wiley (1975) makes the point that 'The application of parsimony must be accepted not because nature is parsimonious, but because only parsimonious hypotheses can be defended by the investigator without resorting to authoritarianism or a priorism'. Mickevich (1978) claims that phylogenetic methods are consistantly more stable than phenetic. LeQuesne (1982) states "The fundamental philosophical question that separates compatibility and 'parsimony' methods is whether all characters are equal in their information content". Felsenstein (1981) states that the number of characters incompatible with a given phylogeny is a measure of departure from parsimony. This is interpreted as meaning that the two are not separate and mutually exclusive methods. The method used in the present study is compatibility analysis. However, characters other than those of a compatible clique are added once the main framework has been established from this clique. Adjustments are then made to the tree to achieve the most parsimonious arrangement without destroying the original framework.

A search was made for the correct name for the 'trees' produced in this study. Cracraft and Eldredge (1979) say that a cladogram is a branching diagram of the distribution of synapomorphies among taxa, whereas a phylogenetic tree (not necessarily branched) is an actual pattern of ancestry and descent. Eldredge and Cracraft (1980) state that a tree is a cladogram without synapomorphies, whereas a cladogram is a tree without ancestors and a phenogram shows all characters. Sibley and Ahlquist (many references) use 'phylogram' for their trees. Penny (1984) states that both cladograms and dendrograms are 'trees' in graph theory. Panchen (1982) reviews cladistic methods and demonstrates that cladograms show the order of the emergence of synapomorphies, and not speciation events. The trees produced in this study could by this definition be considered cladograms, with extra information added. However, where more than one synapomorphy arise at the same node, it cannot be assumed that they all arose simultaneously. Quoting Ashlock (1971) Panchen suggests the use of 'holophyly' for the Hennigian concept of monophyly. Monophyly could be used for holophyly plus paraphyly, and thus eliminate the conflict over the use of monophyly by the different schools.

In this study the terms tree and dendrogram are used interchangeably for the diagrams produced. Each node represents an accumulation of synapomorphic and other changes accompanying the dichotomy of a taxon.

The characters shown on the dendrograms (Figures 175 to 234) represent a change from primitive to derived state in that lineage, and exclude autapomorphies on the terminal branches except where these are homoplasic with character changes on the stems. Reversals (designated by 'r' to the right of the character number), absence of a character where a transformation of that character appears on a stem leading to that branch (designated by '$' after the character number) and intraspecific variations (indicated by 'V' after the character number) are also shown on the terminal branches. Uniquely derived characters in the group (synapomorphies), or characters found in all members (autapomorphies for the group) are marked '#'.

Species were grouped into families (or into groups of families where these are small) and analysed together. Dendrograms of these groupings were drawn up, and these were used to formulate descriptions of families (or other groupings) based on the morphology of the plantar surface of the foot (see 'Results').

Strauch (1984), having found a primary clique, compatible for the whole tree, then repolarises certain characters to find a secondary clique compatible with the primary characters on that branch. The same author (1985) used this method to produce a phylogeny of the Alcidae. The present writer was not entirely convinced of the usefulness of an operational procedure whereby different characters would be repolarised on different branches of the same tree, and on different trees, in order to obtain a spuriously better resolution. This method was not followed in this study.

## CHARACTER ANALYSIS

### CHARACTER 1 (I 1)

Three conditions recognised.

(a) no furrows not associated with I1/2.

(b) one furrow not associated with I1/2.

(c) two or more furrows not associated with I1/2.

Condition (a) is found in all of the outgroup except *Halcyon* where (b) occurs, and this is considered primitive. This was scored as two binary characters and the assumed derivation of (b) and (c) is shown below.

0 ———— 1.1 ———— 1

(a) ————————→ (b) ————————→ (c)

0 ———— 1.2 ———— 1

Fig. 2

Scoring is shown below.

| | .1 | .2 |
|---|---|---|
| (a) 0 furrows | 0 | 0 |
| (b) 1 furrow | 1 | 0 |
| (c) 2(+) furrows | 1 | 1 |

In the passerines (b) is found in *Certhia* and *Tichodroma*, whereas (c) is found in *Hyposítta* and some of the Dendrocolaptidae.

CHARACTER 2 (I 1/2)

Two conditions recognised, although others occurred which were discarded because of asymmetry.

(a) no pad.

(b) pad.

The first condition was found in all except four species in the outgroup, and therefore considered primitive. The derived state is widespread in the passerines , and the only state recorded in Menuridae, Atrichornithidae, Alaudidae, Cinclidae, Prunellidae, Daphaenosittidae and Icteridae.

CHARACTER 3 (I 2)

Two conditions which could be reliably scored were recognised.

(a) one or more distal folds or pads not associated with I1/2.

(b) none of the above.

Condition (b) was only found in a small number of the original outgroup, and therefore scored as derived. However, when the outgroup was exanded, it had a small majority. It was decided not to change the assumed polarity, as this could lead to confusion. The polarity must be considered dubious. The derived state is widespread in the passerines and the only state in eight families.

CHARACTER 4 ((I2)

Two conditions recognised.

(a) no, or one, medial or proximal furrow.

(b) two or more medial or proximal furrows.

Condition (b) was found in only two of the outgroup and considered derived. It is very uncommon in the passerines, being found in Dendrocolaptidae, Furnariidae, Rhynocryptidae, *Menura*, Alaudidae, *Certhia* and *Sitta*.

CHARACTER 5 (I 2)

There are two conditions.

(a) proximal pad not raised.

(b) proximal pad raised.

Condition (b) was found in only one of the outgroup (*Streptoprocne*) and considered the derived state. In the passerines it is very uncommon, found in Dendrocolaptidae, Furnariidae, Meliphagidae, Emberizidae, Grallinidae, and the only state in Certhiidae and Sittidae.

CHARACTER 6 (II 1)

Three conditions accepted.

(a) no furrows not associated with II1/2.

(b) one furrow not associated with II1/2.

(c) two or more furrows not associated with II1/2.

Only the first condition was found in the outgroup, and this was considered primitive and the other two derived. It was scored as two binary characters as shown below.

0 ——— 6.1 ——— 1

$(a) \longrightarrow (b) \longrightarrow (c)$

0 ——— 6.2 ——— 1

Fig. 3

Scoring is as follows.

| | .1 | .2 |
|---|---|---|
| (a) 0 furrows | 0 | 0 |
| (b) 1 furrow | 1 | 0 |
| (c) 2(+) furrows | 1 | 1 |

Conditions (b) and (c) are very rare in the passerines, the former being the sole condition in the Certhiidae, and the latter the sole condition in the Dendrocolaptidae and *Hypositta*.

<u>CHARACTER 7 (II 1/2)</u>

Five conditions could be reliably scored.

(a) one or more separate folds.

(b) a pad.

(c) no fold or pad, either separate or fused.

(d) II1/2 fused to II2.

(e) II1/2 fused to II1.

Condition (a) was the commonest in the outgroup, and considered primitive; (b) and (d) were found in a small number of species. The other conditions were not found. The scoring as four binary characters and the assumed path of derivation is shown below.

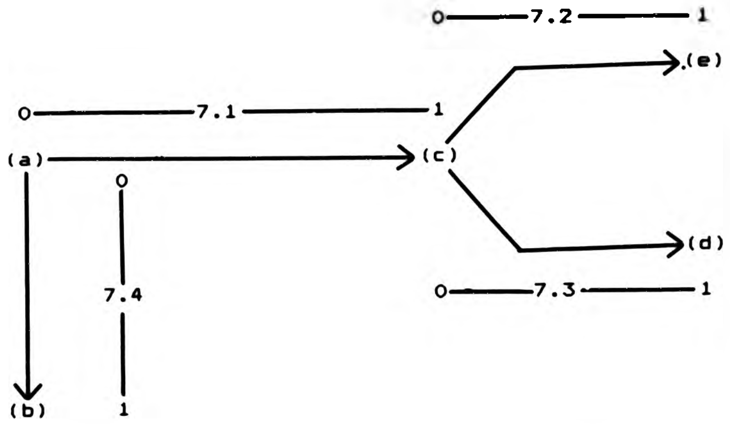



Fig. 4

Scoring is shown below.

| | .1 | .2 | .3 | .4 |
|---|---|---|---|---|
| (a) 1(+) folds | 0 | 0 | 0 | 0 |
| (b) pad | 0 | 0 | 0 | 1 |
| (c) no separate fold/pad | 1 | 0 | 0 | 0 |
| (d) fused to II 1 | 1 | 1 | 0 | 0 |
| (e) fused to II 2 | 1 | 0 | 1 | 0 |

Condition (a) is commonest in passerines. Condition (b) occurs sporadically in seventeen families; (c) is found in *Cinclus*, and some Turdidae, Orthonychinae and Maluridae; (d) is scattered through ten families and (e) only in *Certhia*.

CHARACTER 8 (II 2)

Two conditions finally recognised.

(a) no separate distal fold or pad.

(b) one or more separate distal folds or pads.

Eventually condition (b) was found in more than half of the outgroup, but was a minority in the original outgroup, and scored as derived. To avoid confusion the polarity has not been changed, and must therefore be considered suspect. The derived state is very common in the passerines, found in almost all groups examined, and the only state in thirty-two families and subfamilies.

CHARACTER 9 (II2)

Two conditions finally recognised.

(a) no medial furrow.

(b) one or more medial furrows.

The first condition occurs in just under half of the outgroup, is tentatively considered primitive. The derived state is common, being found in thirty-five families, and is the sole state in eleven.

CHARACTER 10 (II 2)

Two conditions exist.

(a) distal pad not raised.

(b) distal pad raised.

All members of the out group except *Streptoprocne* have condition (a) which is therefore considered primitive. The derived state is rare in the passerines, being found in Tyrannidae, Hirundinidae, Motacillidae,Orthonychinae, Aegithalidae and *Climacteris*.

CHARACTER 11 (II 2)

Two conditions are found.

(a) proximal pad not raised.

(b) proximal pad raised.

As with the above character, only *Streptoprocne* amongst the outgroup shows condition (b) which is therefore considered derived. The derived condition is found in fifty-three families and subfamilies of passerines, and is the sole state in twenty.

CHARACTER 12 (II 2/3)

Six conditions are recognised.

(a) fold or pad on II2/3 fused to II3.

(b) fold or pad on II2/3 fused to II2.

(c) no folds or pads, separate or fused.

(d) one separate fold.

(e) two or more separate folds.

(f) pad.

Condition (a) is found in eleven of the outgroup, and is considered primitive, but condition (b) occurs in ten members of the outgroup. The polarity should therefore be considered tentative. Condition (c) does not occur in the outgroup, condition (d) occurs six times, (e) once and (f) five times. The scoring of this as five binary characters and assumed derivation of these character states is shown below.

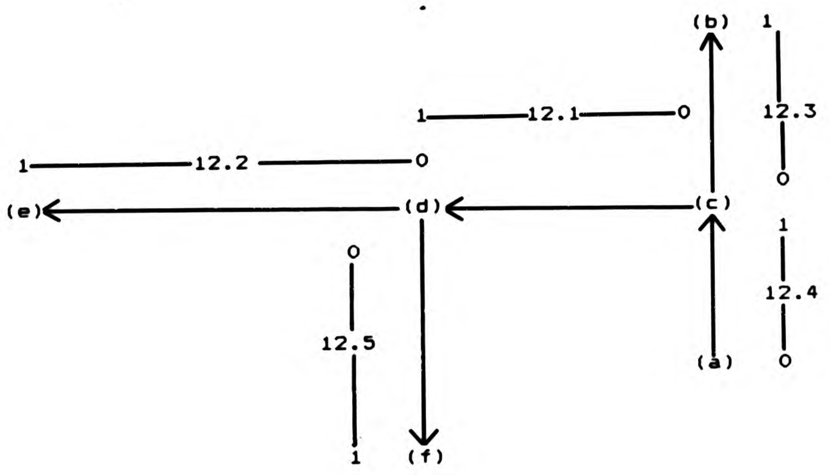



Fig. 5

Scoring is shown below.

| | .1 | .2 | .3 | .4 | .5 |
|---|---|---|---|---|---|
| (a) fused to II 3 | 0 | 0 | 0 | 0 | 0 |
| (b) fused to II 2(+) | 0 | 0 | 1 | 1 | 0 |
| (c) 0 folds/pads, separate or fused | 0 | 0 | 0 | 1 | 0 |
| (d) one separate fold | 1 | 0 | 0 | 1 | 0 |
| (e) two or more separate folds | 1 | 1 | 0 | 1 | 0 |
| (f) pad | 1 | 0 | 0 | 1 | 1 |

Conditions (a) and (d) are widespread in the passerines. Condition (b) is found in twelve families; (c) is rare, being found only in Conopophagidae and *Climacteris*; (e) occurs only in Mimidae and (f) is found sporadically in eight families.

CHARACTER 13 (II 2/3)

Two conditions recognised.

(a) pad or fold not raised.

(b) pad or fold raised.

Condition (a) is found throughout the outgroup and therefore considered primitive.The derived state is found in forty families of passerines, and is the sole state in all scansorials and eight other families.

CHARACTER 14 (II 3)

Three conditions could be scored.

(a) pad not divided, or divided once.

(b) pad divided twice.

(c) pad divided thrice.

Two of the outgroup have condition (c), twelve have condition (b) and the remaining twenty have condition (a), which is therefore considered primitive.It is scored as two binary characters. The assumed derivation of these conditions is shown below.

0 ———— 14.1 ———— 1

(a) ————→ (b) ————→ (c)

          0 ———— 14.2 ———— 1

Fig. 6

Scoring is shown below.

| | .1 | .2 |
|---|---|---|
| (a) 0/1 pad divisions | 0 | 0 |
| (b) 2 pad divisions | 1 | 0 |
| (c) 3(+) pad divisions | 1 | 1 |

Condition (a) is by far the commonest, (b) is found in a number of groups, whereas (c) is found only in nine families.

<u>CHARACTER 15 (II 3)</u>

Two conditions recognised.

(a) pad not raised.

(b) pad raised.

The first condition is found throughout the outgroup and therefore considered primitive. The derived state is found in fifty families of passerines, and is the sole state in all scansorials (except *Sitta*) and thirteen other families.

<u>CHARACTER 16 (II 3)</u>

Two conditions recognisable.

(a) no, or one, proximal furrow.

(b) two or more proximal furrows.

Condition (b) is only found in one of the outgroup (*Indicator*) and therefore considered derived. The derived state is rare in passerines, being found in Dendrocolaptidae, Alaudidae, *Hypositta*, Turdidae, *Prunella*, Timaliidae, Muscicapidae, Parulidae and Estrildidae.

CHARACTER 17 (III 1)

Three conditions could be reliably scored.

(a) no furrows on III1 not associated with III1/2.

(b) one furrow on III1 not associated with III1/2.

(c) two or more furrows on III1 not associated with III1/2.

Condition (b) occurs in only one of the outgrouo (*Halcyon*), whereas condition (c) was not found at all. Therefore condition (a) was considered primitive. It was scored as two binary characters. The assumed derivation of the conditions is shown below.

$$\begin{array}{ccccc} 0 & \text{——— 17.1 ———} & 1 & & \\ (a) & \longrightarrow & (b) & \longrightarrow & (c) \\ & & 0 & \text{——— 17.2 ———} & 1 \end{array}$$

Fig. 7

Scoring is shown below.

| | .1 | .2 |
|---|---|---|
| (a) 0 furrows | 0 | 0 |
| (b) 1 furrow | 1 | 0 |
| (c) 2(+) furrows | 1 | 1 |

Conditions (b) and (c) are very rare in the passerines, the former in some Dendrocolaptidae, in *Hypositta* and both members of Certhiidae, whereas the latter is found in the remaining Dendrocolaptidae. All these are scansorials.

CHARACTER 18 (III 1/2)

Five conditions recognised.

(a) one or more separate folds.

(b) no folds or pads.

(c) III1/2 fused to III1.

(d) III1/2 fused to III2.

(e) pad.

Condition (a) was found in the majority of the outgroup, and therefore considered primitive. Condition (c) was found in four, (d) in two, (e) in one, and (b) in none of the outgroup. It was scored as four binary characters as shown below.

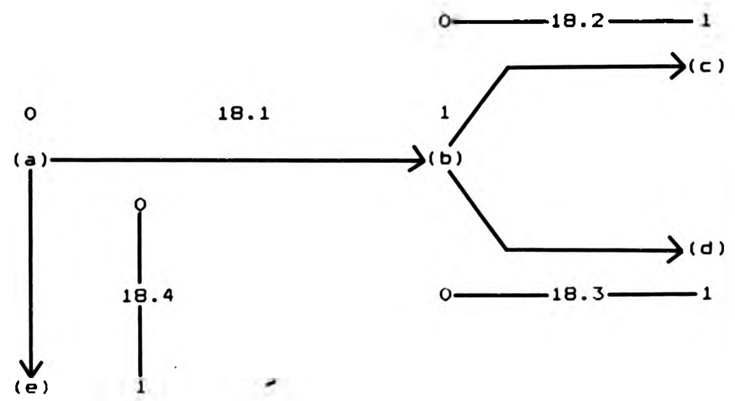



Fig. 8

Scoring is shown below.

| | .1 | .2 | .3 | .4 |
|---|---|---|---|---|
| (a) 1(+) separate folds | 0 | 0 | 0 | 0 |
| (b) 0 folds or pads | 1 | 0 | 0 | 0 |
| (c) fused to III 1 | 1 | 1 | 0 | 0 |
| (d) fused to III 2 | 1 | 0 | 1 | 0 |
| (e) pad | 0 | 0 | 0 | 1 |

Condition (a) is commonest in the passerines. Condition (b) is only found in some Turdidae; (c) only occurs in Dendrocolaptidae, Formicariidae, Orthonychinae and Maluridae; (d) occurs in nine families and (e) only in Dendrocolaptidae, Furnariidae and Formicariidae.

CHARACTER 19 (III 2)

Two conditions recognised.

(a) distal pad not raised.

(b) distal pad raised.

The first condition is found in all of the outgroup except *Streptoprocne*, and therefore considered primitive. The derived state is rare in passerines, being found in Formicariidae, Pycnonotidae, Orthonychinae, Aegithalidae and Grallinidae.

CHARACTER 20 (III 2)

Two conditions recognised.

(a) medial/proximal pad not raised.

(b) medial/proximal pad raised.

The first condition is found throughout the outgroup except in *Streptopelia*, and is judged primitive. The derived state is found in forty-six families and subfamilies of the passerines, and is the sole state in seventeen. It occurs in all scansorials with the exception of Climacteris and some of the Dendrocolaptidae.

CHARACTER 21

The original analysis based on the bulk of the specimens examined found five conditions which were coded as four binary characters. However, examination of further species after the analysis had been carried out resulted in additional states being found which could only be represented as 'hybrid' codes, resulting in incompatibility between some of the binary components.

(a) no folds or pads.
(b) one or more separate folds.
(c) III2/3 fused to III2.
(d) III2/3 fused to III3.
(e) pad.
(f) combination of (c) & (d) - results in incompatibility between 21.2 21.3.
(g) combination of (b) & (c) - results in incompatibility between 21.1 21.2.
(h) combination of (b) & (c) - results in incompatibility between 21.1 21.3.

To code all possible alternative routes to these hybrid states would require six additional binary characters.

Conditions (a), (g) and (h) were found in none of the outgroup. Condition (c) was found in 11 of the outgroup, (b) in nine, (f) in six, (d) and (e) in four each.

It was broken down to four binary character as shown below. The polarity of some of the character state changes must be considered highly tentative.

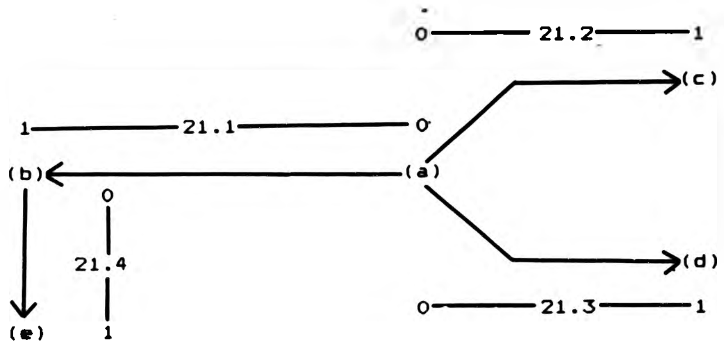



Fig. 9

Scoring is shown below.

| | .1 | .2 | .3 | .4 |
|---|---|---|---|---|
| (a) 0 separate folds/pads | 0 | 0 | 0 | 0 |
| (b) 1(+) separate folds | 1 | 0 | 0 | 0 |
| (c) fused to III 2 | 0 | 1 | 0 | 0 |
| (d) fused to III 3 | 0 | 0 | 1 | 0 |
| (e) pad | 1 | 0 | 0 | 1 |
| (f) (c) + (d) | 0 | 1 | 1 | 0 |
| (g) (b) + (c) | 1 | 1 | 0 | 0 |
| (h) (b) + (d) | 1 | 0 | 1 | 0 |

Condition (f) is not found in the passerines; (a) only in *Alaemon* (Alaudidae) and *Melampitta* (Orthonychinae); (h) only in *Pitta*, *Panurus* (Paradoxornithidae) and *Cacicus* (Icteridae); (g) is found only in *Phoenicurus* (Turdidae). Condition (b) is commonest, being found in sixty-five groups, and is the sole condition in forty-six. Condition (c) is found in fifteen families, (d) in sixteen and (e) in six.

CHARACTER 22 (III 2/3)

Two conditions recognised.

(a) fold or pad not raised.

(b) fold or pad raised.

Condition (a) is found in all but two of the outgroup and therefore considered primitive.

In the passerines the derived state is found in twenty families, being the sole state in seven. It is found in most, but not all, of the scansorials, and all of Alaudidae.

CHARACTER 23 (III 3)

Two conditions could be scored with accuracy, and with no asymmetry.

(a) no, or one, distal furrow.

(b) two or more distal furrows.

Condition (a) is found in all of the outgroup, and so considered primitive.

The derived state is rare in the passerines, being found in only seven families.

CHARACTER 24 (III 3)

Two conditions recognised.

(a) distal pad not raised.

(b) distal pad raised.

The former is found throughout the outgroup, and therefore considered primitive.

The derived state is found in forty-five groups of passerines, being the sole state in twelve. It is also found in almost all scansorials.

CHARACTER 25 (III 3)

Two conditions recognised.

(a) proximal pad not raised.

(b) proximal pad raised.

The former is found throughout the outgroup (except *Streptoprocne*) and so considered primitive. The derived state is found in twenty-eight families in the passerines, being the sole state in seven.

CHARACTER 26 (III 3/4)

Two conditions recognised.

(a) III3/4 not fused to III4.

(b) III3/4 fused to III4.

The former is found in twenty-two of the thirty-four in the outgroup, and considered primitive. The derived state is found in twenty-seven families of passerines, being the sole state in six.

CHARACTER 27 (III 3/4)

Two conditions recognised.

(a) fold or pad not raised.

(b) fold or pad raised.

The former is found in all members of the outgroup (except *Streptoprocne*) and considered primitive. The derived state is found in eighteen families of passerines, being the only state in two.

CHARACTER 56 (III 3/4)

Two conditions recognised.

(a) III3/4 not fused to II2/3.

(b) III3/4 fused to II2/3.

The latter is found in only seven of the outgroup and considered derived. The derived state is rare in passerines, being found only in some Dendrocolaptidae and Timaliidae, and in *Salpornis*.

CHARACTER 28 (III 4)

The complexity of this character resulted in a number of different character state trees being constructed. The one that seemed most suitable at the time the major part of the data was being processed, and the dendrograms being constructed is that shown in Fig.10 below. This required the introduction of a fictitious state (X) which logically cannot be scored. Seven conditions were finally recognised.

(a) no folds or pads.

(b) one fold, no pad(s).

(c) two folds, no pad(s).

(d) one or more pads, no folds.

(e) pad, and proximal fold.

(f) pad, and distal fold.

(g) pad, proximal fold and distal fold.

The majority of the outgroup showed condition (d), four showed (e) and one (a).

Having a hypothetical state (X) puts extra distance between several states. Examination of further taxa after the main analysis had been carried out suggested that 28.4 should be repolarised (based on outgroup comparison) and that (X) should be replaced by (g). State (g) is a hybrid state resposible for internal incompatibilities between 28.2, 28.3, 28.4 and 28.5.

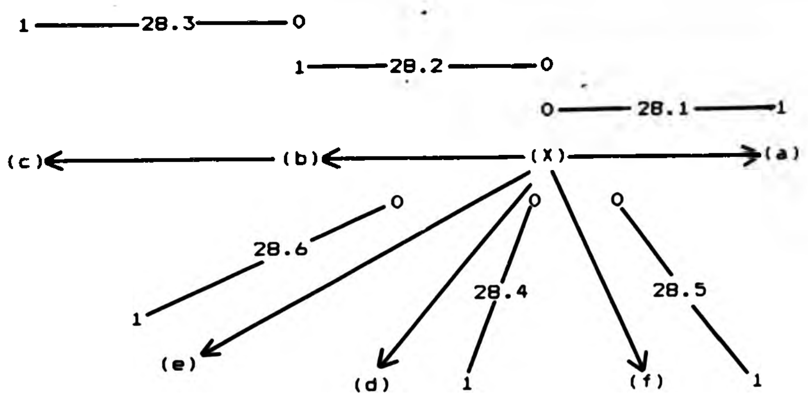



Fig. 10

The scoring was as follows.

| | .1 | .2 | .3 | .4 | .5 | .6 |
|---|---|---|---|---|---|---|
| (a) 0 folds/pads | 1 | 0 | 0 | 0 | 0 | 0 |
| (b) 1(+) separate folds | 0 | 1 | 0 | 0 | 1 | 1 |
| (c) 2(+) separate folds | 0 | 1 | 1 | 0 | 0 | 0 |
| (d) 1(+) pad | 0 | 0 | 0 | 1 | 0 | 0 |
| (e) pad + proximal fold | 0 | 0 | 0 | 1 | 0 | 1 |
| (f) pad + distal fold | 0 | 0 | 0 | 1 | 1 | 0 |
| (g) (e) + (f) | 0 | 1 | 1 | 1 | 1 | 1 |

Condition (a) is found in ten families of passerines; (b) in forty-eight, and the only condition in twelve; (c) in thirty-eight, and the only condition in five; (d) in eighteen, and the only condition in one; (e) in twenty-three, and the only condition in one; (f) is the commonest condition, found in fifty-eight groups, and the sole condition in seventeen; (g) occurs in fourteen groups. However, at a later date, it was decided that replacing (X) with (g) on the character state tree, and re-polarising

Character 28.4 would be more appropriate. This would affect all the binary components except 28.1. Therefore little confidence should be placed in this multistate character as it is presently scored.

CHARACTER 65 (III 4)

Two conditions recognised.

(a) fold or pad not raised.

(b) fold or pad raised.

The former is found in all of the outgroup and considered primitive. The derived state is found in only nine families of passerines.

CHARACTER 66 (III 4)

Two conditions recognised.

(a) pad(s) or fold(s) on III4 not fused to II2/3.

(b) pad(s) or fold(s) on III4 fused to II2/3.

The former condition is found in all but four of the outgroup and considered primitive. The derived state is very rare in the passerines, occurring only in some of the Dendrocolaptidae.

CHARACTER 67 (III4)

Two conditions recognised.

(a) pad(s) or fold(s) on III4 not fused to II3.

(b) pad(s) or fold(s) on III4 fused to II3.

The former is considered primitive as it is found in twenty-two of the outgroup.The derived state is extremely common in passerines, being found in sixty-eight groups, and the only state in fifty-three.

CHARACTER 29 (IV 1)

Three conditions recognised.

(a) no furrows not associated with IV1/2.

(b) one furrow not associated with IV1/2.

(c) two or more furrows not associated with IV1/2.

All the outgroup showed condition (a) which was therefore considered primitive. The character was treated as two binary characters, and the assumed derivation of the other states is shown below.

```
0 ————29.1———— 1

(a) ——————————→ (b) ——————————→ (c)

                0 ————29.2———— 1
```

Fig. 11

Scoring is shown below.

| | .1 | .2 |
|---|---|---|
| (a) 0 furrows | 0 | 0 |
| (b) 1 furrow | 1 | 0 |
| (c) 2(+) furrows | 1 | 1 |

Condition (a) is found in almost all passerines. Condition (b) is found in some Dendrocolaptidae, in *Hypositta* and Certhiidae; (c) is found in some Dendrocolaptidae.

CHARACTER 30 (IV 1/2)

Four conditions recognised.

(a) one or more separate folds or pads.

(b) no fold(s) or pad.

(c) IV1/2 fused to IV1.

(d) IV1/2 fused to IV2.

Condition (a) was found in twenty-six of the outgroup and considered primitive. Condition (b) was not found at all; condition (c) in five, and (d) in three. The character was treated as three binary characters.

The assumed derivation of the states is shown below.

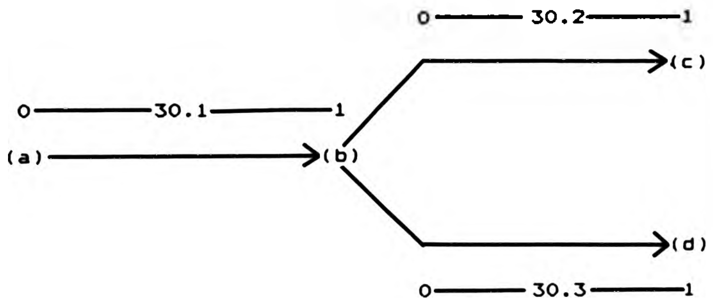



Fig. 12

Scoring is shown below.

| | .1 | .2 | .3 |
|---|---|---|---|
| (a) 1(+) separate fold or pad | 0 | 0 | 0 |
| (b) no separate folds or pads | 1 | 0 | 0 |
| (c) fused to IV 1 | 1 | 1 | 0 |
| (d) fused to IV 2 | 1 | 0 | 1 |

This implies that a lost fold reappeared fused to either IV 1 or IV 2 to accommodate states states (c) and (d). An alternative tree could be constructed in which (b), (c) and

(d) arise from (a) as a trichotomy. This would involve re-scoring, whereby (c) becomes 0 1 0 and (d) 0 0 1. In the passerines condition (a) is by far the commonest, being found in all groups except Pittidae, Prunellidae, Cinclidae and Artamidae. Condition (b) is found only in Sylviidae; condition (c) is found only in Dendrocolaptidae, Turdidae, Orthonychinae and Maluridae; (d) is found in thirteen groups.

CHARACTER 57 (IV 2)

Three conditions could be confidently recognised.

(a) no proximal furrows.

(b) one proximal furrow.

(c) two or more proximal furrows.

The first condition is found in all except two of the outgroup (which showed the second condition) and was considered primitive. The assumed derivation of the other states is shown below. It was treated as two binary characters.

```
0 ---------57.1--------- 1

(a) ------------------> (b) ------------------> (c)

                         0 ---------57.2--------- 1
```

Fig. 13

Condition (a) is commonest in the passerines. Condition (b) is found in nineteen groups of passerines, including most of the scansorials; condition (c) is found in most Dendrocolaptidae and *Cinclorhamphus mathewsi* only.

Scoring is shown below.

| | .1 | .2 |
|---|---|---|
| (a) no proximal furrows | 0 | 0 |
| (b) 1 proximal furrow | 1 | 0 |
| (c) 2(+) proximal furrows | 1 | 1 |

<u>CHARACTER 34 (IV 2/3)</u>

Four conditions could be scored.

(a) a separate fold, or fused to IV2.

(b) two or more folds.

(c) fused to IV3.

(d) pad.

Conditions (a) and (c) each occurred in thirteen of the outgroup. In the first outgroup (a) was in a majority, and therefore considered primitive. Polarity of the character state change in 34.2 is therefore dubious.

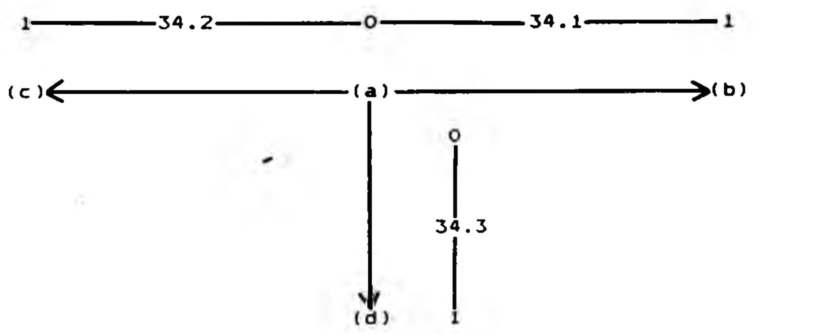



Fig. 14

Condition (a) is the commonest in passerines. Condition (b) is only found in *Panurus* (Paradoxornithidae) and *Philentoma* (Monarchidae); (c) is found in thirty-seven groups, and is the sole condition in six; (d) is found in only seven groups.

It was split into three binary characters scored as shown below.

| | .1 | .2 | .3 |
|---|---|---|---|
| (a) a separate fold or fused to IV 2 | 0 | 0 | 0 |
| (b) 2(+) folds | 1 | 0 | 0 |
| (c) fused to IV 3 | 0 | 1 | 0 |
| (d) pad | 0 | 0 | 1 |

<u>CHARACTER 35 (IV 2/3)</u>

Two condition are found.

(a) fold or pad not raised.

(b) fold or pad raised.

Condition is found in all of the outgroup except *Streptoprocne* and therefore considered primitive. The derived state is found in twenty families of passerines, including most scsnsorials, and is the sole state in four.

<u>CHARACTER 59 (IV 2/3)</u>

Two conditions are recognised.

(a) IV2/3 not fused to III2/3.

(b) IV2/3 fused to III2/3.

The first is found in all of the outgroup except *Halcyon* and considered to be primitive. The derived state is not found in any of the passerines examined, and therefore does not appear in the analysis.

<u>CHARACTER 60 (IV 2/3)</u>

Two conditions recognised.

(a) IV2/3 not fused to III3.

(b) IV2/3 fused to III3.

The first is found throughout the outgroup and considered primitive. In the passerines it is very rare , being found only in Eurylaemidae and *Bleda* (Pycnonotidae).

<u>CHARACTER 36 (IV 3)</u>

Three conditions could be recognised with no asymmetry.

(a) no pad divisions.

(b) one pad division.

(c) two or more pad divisions.

The first is found in twenty-four of the outgroup and considered primitive; condition (b) in eight and (c) in two. It was treated as two binary characters.

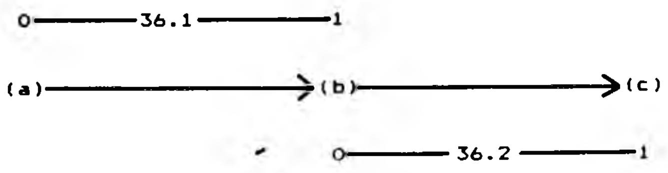



Fig. 15

Condition (a) is by far the commonest in passerines; (b) occurs in eleven groups, whereas (c) only occurs in four.

Scoring is shown below.

| | .1 | .2 |
|---|---|---|
| (a) no pad divisions | 0 | 0 |
| (b) 1 pad division | 1 | 0 |
| (c) 2(+) pad divisions | 1 | 1 |

CHARACTER 37 (IV 3)

Two conditions are found.

(a) distal pad not raised.

(b) distal pad raised.

The former occurs in all of the outgroup except *Streptoprocne* and considered primitive. The derived state is found in thirty-one groups of passerines, and is the sole state in five.

CHARACTER 38 (IV 3)

Two conditions occur.

(a) proximal pad not raised.

(b) proximal pad raised.

The former occurs in all of the outgroup except *Streptoprocne* and considered primitive. The derived state is found in thirty-six groups of passerines, and is the sole state in seven.

CHARACTER 39 (IV 3)

Two conditions exist.

(a) IV3 not fused to III2/3.

(b) IV3 fused to III2/3.

The former occurs in all of the outgroup except *Ceryle* and considered primitive. The derived state is not found in any of the passerines examined, and is therefore not used in the analysis.

CHARACTER 40 (IV 3)

Two conditions recognised.

(a) IV3 not fused to III3.

(b) IV3 fused to III3.

The former is found in all but six of the outgroup and considered primitive. The derived state is very uncommon in passerines, being found in only nine families.

CHARACTER 41 (IV 3/4)

Four conditions could be confidently recognised where there is no asymmetry.

(a) no fold or pad, or one fold, or fused to IV4.

(b) fused to IV3.

(c) pad.

(d) two or more separate folds.

The first occurs in nineteen of the outgroup and considered primitive. Condition (b) occurs in eleven, (c) in three and (d) in one. It was treated as three binary characters as shown below.

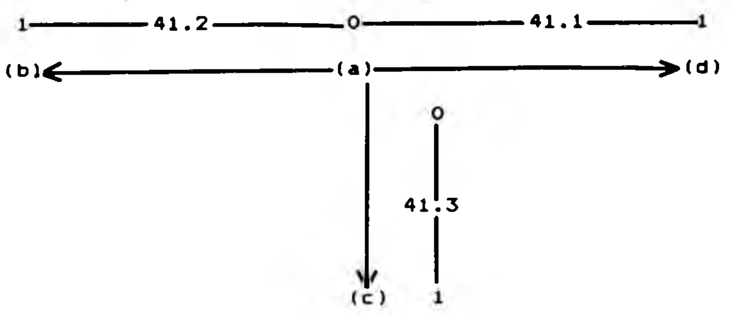



Fig. 16

The first condition occurs in the vaste majority of passerines, condition (b) in twelve families, (c) in five families and (d) only in *Panurus* (Paradoxornithidae). Scoring is shown below.

| | .1 | .2 | .3 |
|---|---|---|---|
| (a) no folds/pads, or one fold, or fused to IV 4 | 0 | 0 | 0 |
| (b) fused to IV 3 | 0 | 1 | 0 |
| (c) pad | 0 | 0 | 1 |
| (d) 2(+) separate folds/pads | 1 | 0 | 0 |

CHARACTER 42 (IV 3/4)

Two conditions occur.

(a) fold or pad not raised.

(b) fold or pad raised.

All the outgroup (except *Streptoprocne*) have (a) which is assumed to be primitive. The derived state is found in twenty-four families, and is the sole state in four.

CHARACTER 43 (IV 3/4)

Two conditions occur.

(a) IV3/4 not fused to III3.

(b) IV3/4 fused to III3.

The former is found in twenty-seven of the outgroup and considered primitive. The derived state is found in only nine passerine families, and is the sole state in three.

CHARACTER 44 (IV 3/4)

Two conditions occur.

(a) IV3/4 not fused to III3/4.

(b) IV3/4 fused to III3/4.

The former occurs in all but two of the outgroup and considered primitive. The derived state is found in fifteen families of passerines, and is the sole state in three.

CHARACTER 45 (IV 4)

Three conditions could be accurately scored with no asymmetries.

(a) no pad division.

(b) one pad division.

(c) two or more pad divisions.

Twenty-three of the outgroup had condition (a) which was therefore considered primitive. Condition (b) occurs in ten and (c) in one only. The first is the commonest in passerines, (b) occurs in fifteen groups, and is the sole condition in two, whereas (c) only occurs in Dendrocolaptidae and Cracticidae. It was treated as two binary characters as shown below.

0 ——— 45.1 ——— 1

(a) ———→ (b) ———→ (c)

0 ——— 45.2 ——— 1

Fig. 17

Scoring is shown below.

| | .1 | .2 |
|---|---|---|
| (a) 0 pad divisions | 0 | 0 |
| (b) 1 pad division | 1 | 0 |
| (c) 2(+) pad divisions | 1 | 1 |

CHARACTER 46 (IV 4)

Two conditions occur.

(a) pad not raised.

(b) pad raised.

Only the former is found in the outgroup and considered primitive. The derived state is common in passerines, occurring in thirty-seven groups, and is the sole state in seven, including all scansorials except *Rhabdornis*.

CHARACTER 47 (IV 4)

Two conditions recognised.

(a) IV4 not fused to III3.

(b) IV4 fused to III3.

The first occurs in twenty-nine of the outgroup and considered primitive. The derived state is very uncommon in passerines, being the sole state in three families, and also found in five others.

CHARACTER 48 (IV 4)

Two conditions found.

(a) IV4 not fused to III3/4.

(b) IV4 fused to III3/4.

The former is found in all but seven of the outgroup and considered primitive. The derived state is found in twenty-eight groups of passerines, and the only state in seven.

CHARACTER 49 ((IV 4)

Two conditions exist.

(a) IV4 not fused to III4.

(b) IV4 fused to III4.

The former occurs in all except eight of the outgroup and assumed to be primitive. In the passerines the derived state is found in thirty-three groups, and is the sole state in nine.

CHARACTER 50 (IV 4/5)

Five conditions could be scored with confidence.

(a) fused to IV5.

(b) no folds or pads.

(c) fused to IV4.

(d) one or more separate folds.

(e) pad.

Condition (a) is found in eleven of the outgroup, (b) in none, (c) in fourteen, (d) and (e) in three each, and one has nothing at this position (therefore scoring 7's). It was treated as four binary characters as shown below.

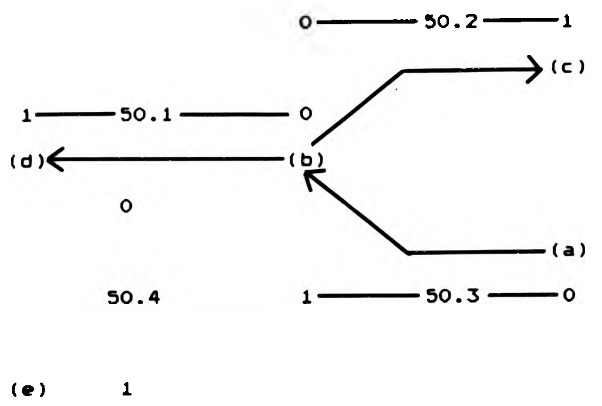



Fig. 18

Condition (a) is found in seventeen groups of passerines, (b) only in six, (c) in thirty-five, and is the sole condition in thirteen, (d) in nineteen and the sole condition in six, and (e) in forty-two groups, and the only condition in sixteen.

Scoring is shown below.

| | .1 | .2 | .3 | .4 |
|---|---|---|---|---|
| (a) fused to IV 5 | 0 | 0 | 0 | 0 |
| (b) no separate folds/pads | 0 | 0 | 1 | 0 |
| (c) fused to IV 4 | 0 | 1 | 1 | 0 |
| (d) 1(+) separate folds | 1 | 0 | 1 | 0 |
| (e) pad | 1 | 0 | 1 | 1 |

In the original outgroup (a) was the majority condition and assumed to be primitive, but its place was taken by (c) in the expanded outgroup. To avoid confusion it was decided not change the polarities of 50.2 and 50.3. Also, as more taxa were examined, three further conditions became obvious:

State (f) - combination of (c) and (d) - results in incompatibility between 50.1 and 50.2.

State (g) - combination of (c) and (e) - results in incompatibility between 50.1, 50.2 and 50.4.

State (h) - combination of (a), (c) and (e) - results in incompatibility between 50.1, 50.2 and 50.4.

Six extra binary characters would be necessary to code for all possible routes to these new states.

CHARACTER 51 ((IV 4/5)

Two conditions exist.

(a) fold or pad not raised.

(b) fold or pad raised.

The former is found throughout the outgroup (except for *Caprimulgus* which has nothing) and considered primitive. The derived state is found in twenty-three groups of passerines, being the only state in three.

CHARACTER 52 (IV 4/5)

Two conditions recognised.

(a) IV4/5 not fused to III3.

(b) IV4/5 fused to III3.

The former is found in all except two of the outgroup and considered primitive. The derived state occurs in twelve families of passerine, being the only state in one.

CHARACTER 53 (IV 4/5)

Two conditions recognised.

(a) IV4/5 not fused to III3/4.

(b) IV4/5 fused to III3/4.

The first is found in all but two of the outgroup and considered primitive. The derived state is found in twenty-five groups of passerines, and is the sole state in four.

CHARACTER 54 (IV 4/5)

Two conditions recognised.

(a) IV4/5 not fused to III4.

(b) IV4/5 fused to III4.

The former is found in twenty-two of the outgroup and therefore considered primitive. The derived state is very common in passerines, occurring in fifty-two groups and is the sole state in twenty-four.

CHARACTER 55 (IV 5)

Two conditions could be scored without any asymmetry.

(a) one or more pads or folds.

(b) no pads or folds.

The former occurs in twenty-nine of the outgroup and therefore considered primitive. The derived state occurs in eighteen passerine groups, and is the sole state in four.

CHARACTER 61 (IV 5)

Two conditions could be scored with confidence.

(a) one or more pads, but no folds.

(b) state other than above. The former is found in twenty-four of the outgroup and hence considered primitive. The derived state is very common in passerines, occurring in sixty-one groups, and is the sole condition in twenty-six.

CHARACTER 62 (IV 5)

Strictly, this should be combined with Character 61 to form a multistate character, but to avoid confusion it was decided to leave it separate.

Two conditions could be scored with confidence.

(a) one or more folds but no pads.

(b) condition other than above.

The latter was found in twenty-seven of the outgroup and considered primitive. The derived state is very common in passerines, being found in fifty-nine groups and in twenty-three as the sole state.

CHARACTER 63 (IV 5)

Two conditions occur.

(a) IV5 not fused to III4.

(b) IV5 fused to III4.

Condition (a) is found in seventeen of the outgroup, (b) in twelve and nothing in five. The former is tentatively considered primitive. The derived state is very common in passerines, occurring in sixty-six groups, and in thirty-nine is the sole state.

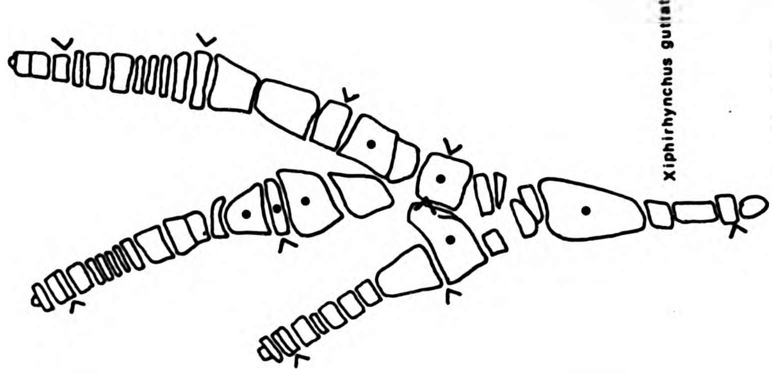
CHARACTER 64 (IV 5)

Two conditions occur.

(a) IV5 not fused to III3/4.

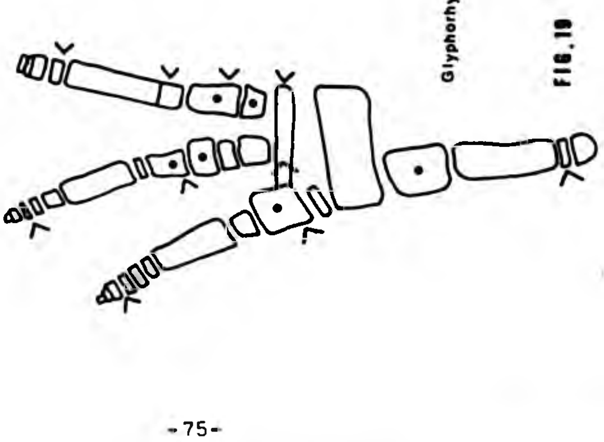
(b) IV5 fused to III3/4.

The former occurs in all but six of the outgroup and considered primitive. The derived state is rare in passerines, being found in only six families.



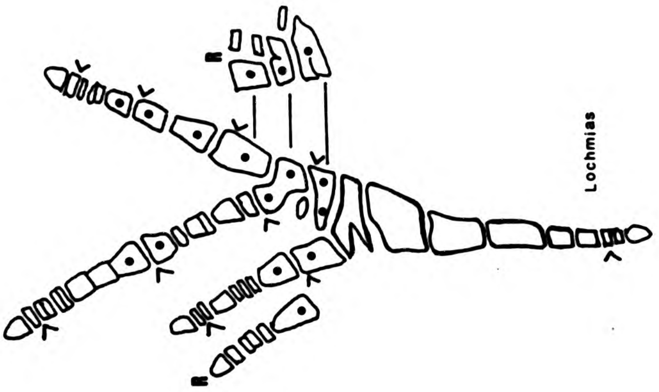
Xiphirhynchus guttatus

FIG. 20



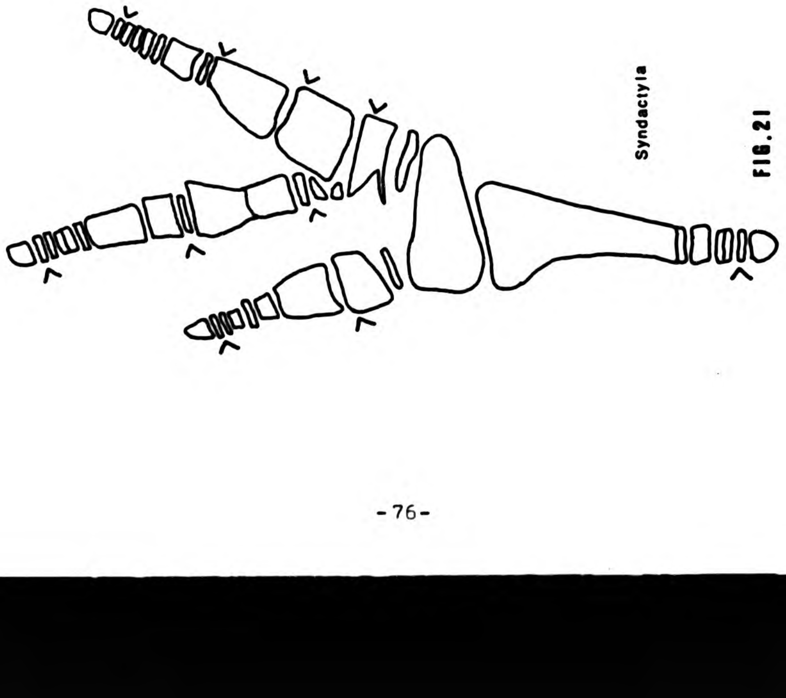
Glyphorhynchus

FIG. 19



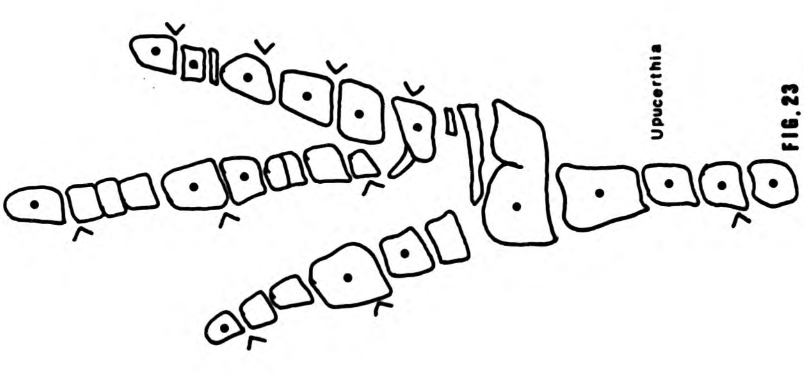

Lochmias

FIG.22



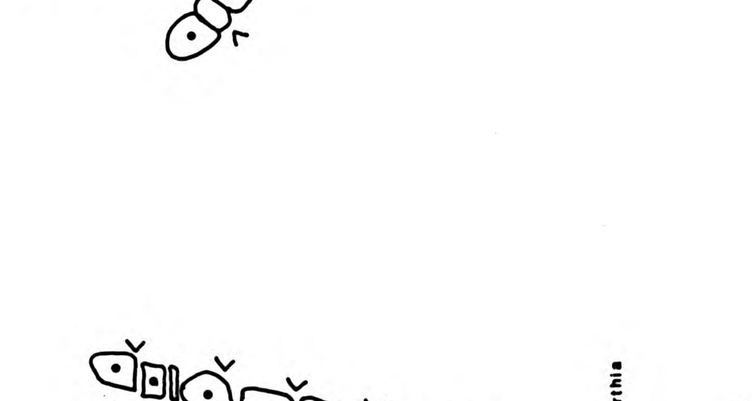
Syndactyla

FIG.21



Upucerthia

FIG.23



Geositta

FIG.24

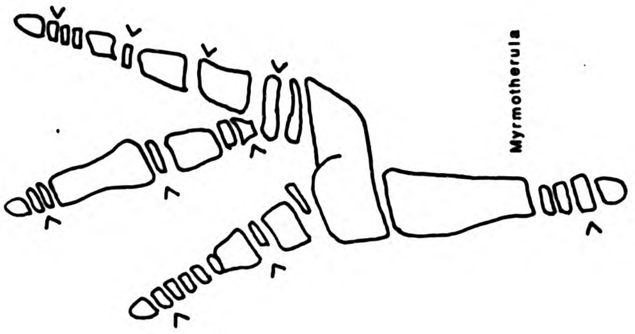


FIG.26 Myrmotherula

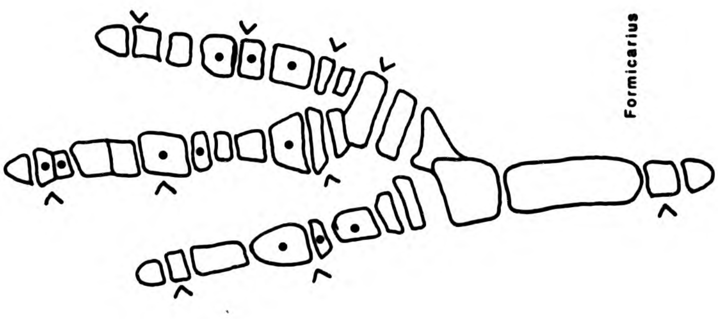
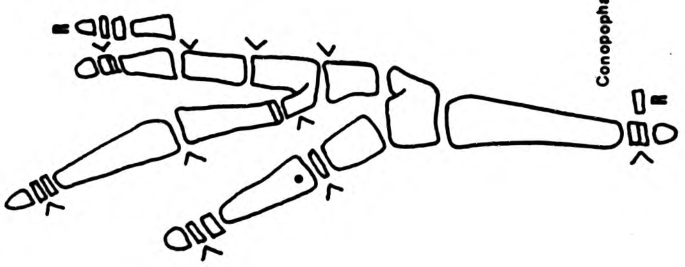
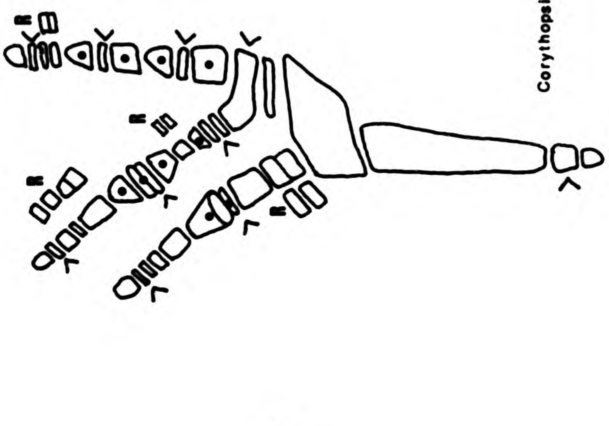


FIG.25 Formicarius



Conopophaga

FIG.28

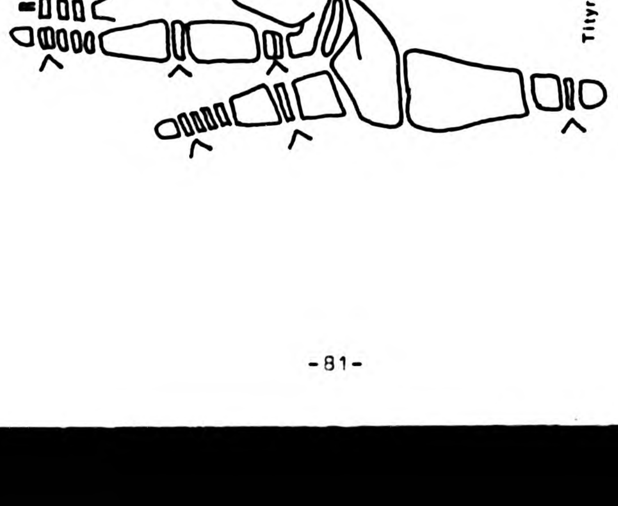


Corythopsis

FIG.27

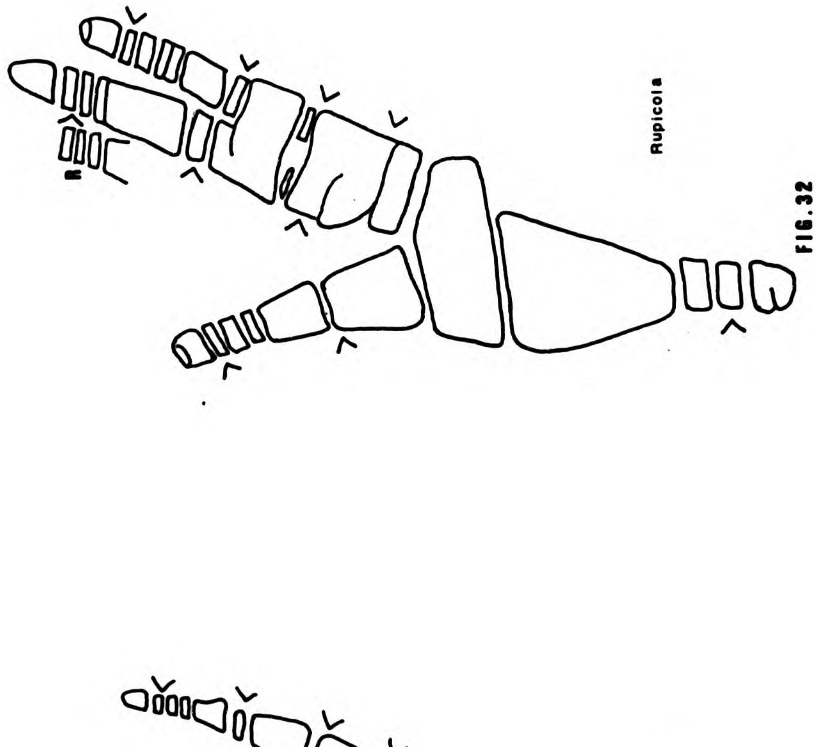

FIG.29


FIG.30



Tityra

FIG.31



Rupicola

FIG.32

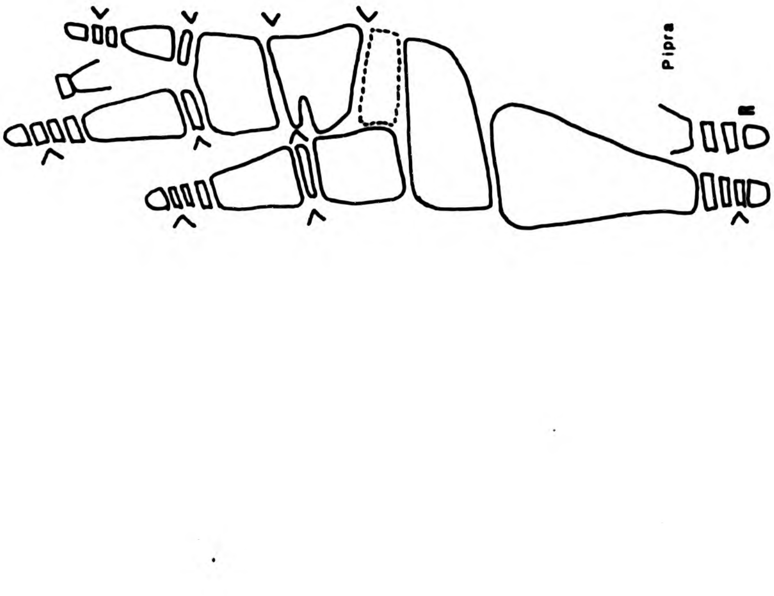



FIG. 34

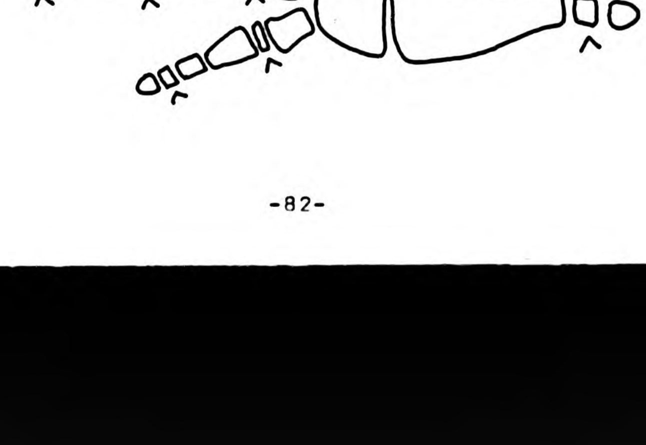



FIG. 33

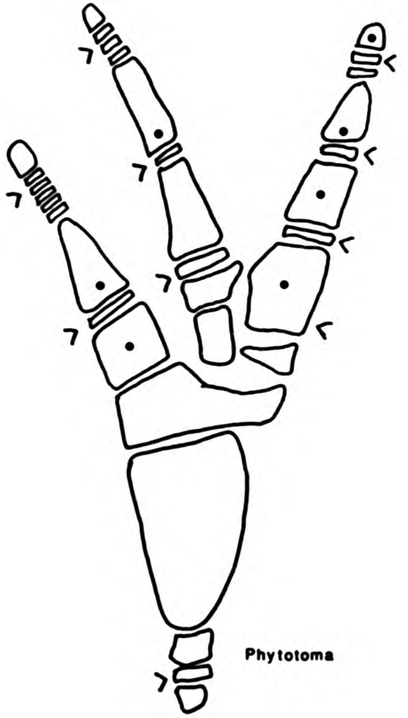



FIG.35


FIG.36

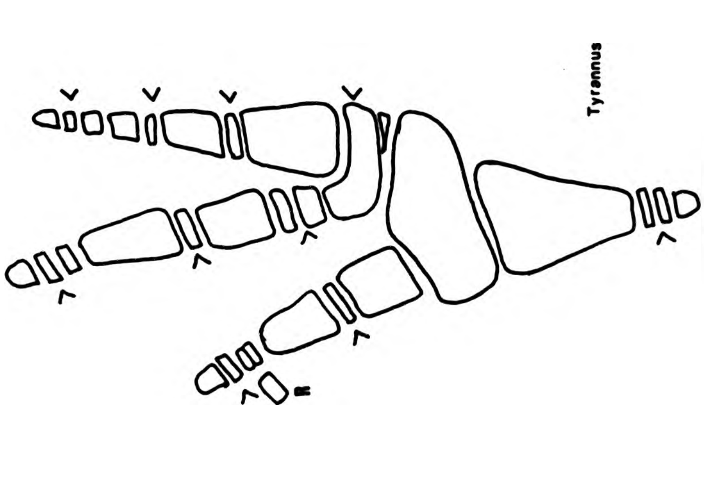



FIG.37

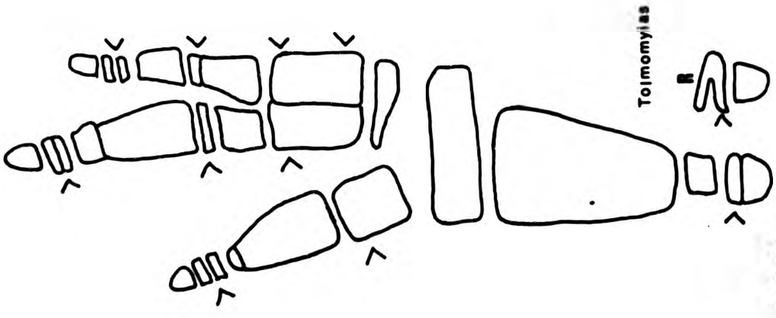



FIG.38

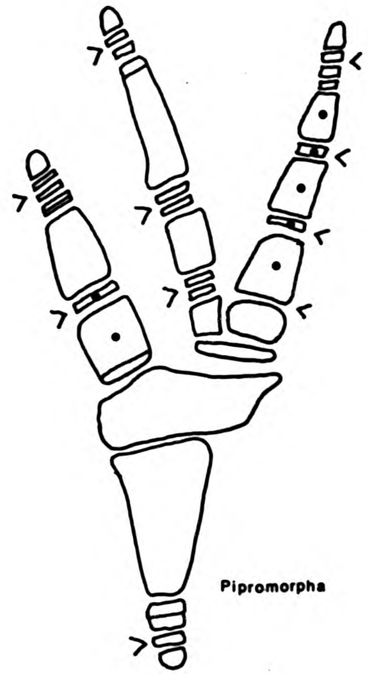
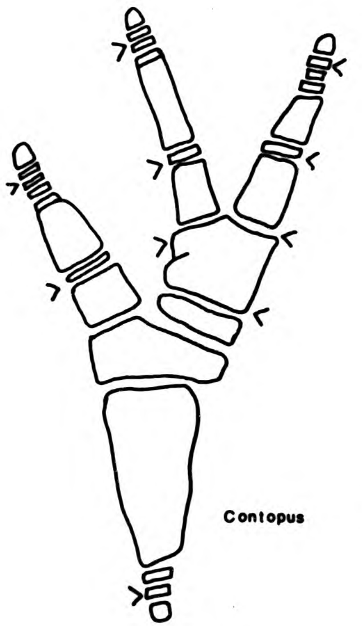


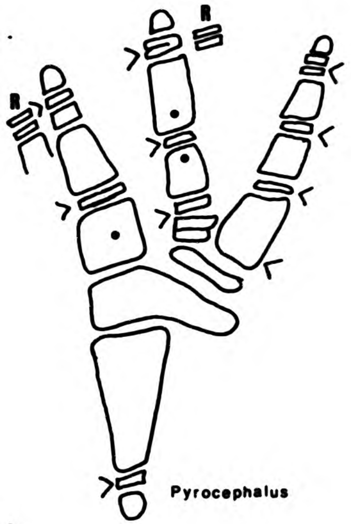

FIG.39


FIG.40



Contopus

FIG.41




Pyrocephalus

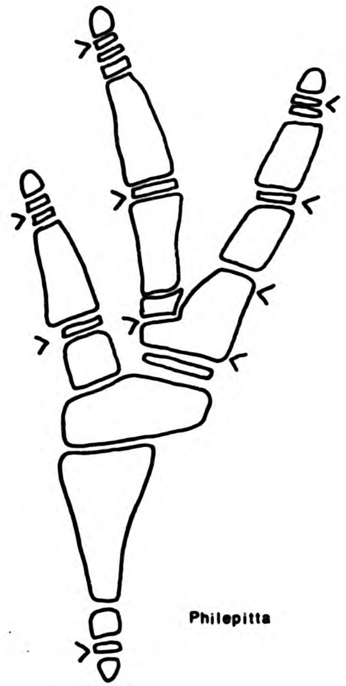
FIG.42


FIG.43


FIG.44

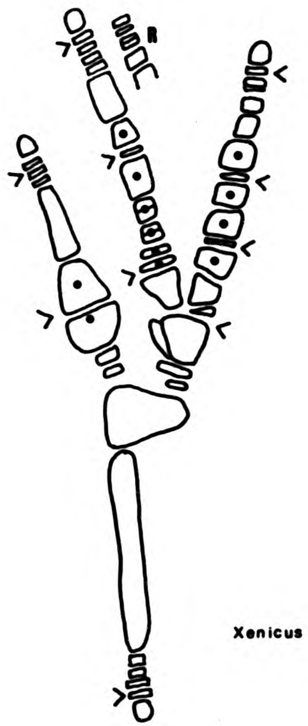
Pitta

FIG.45



Philepitta

FIG.46




Xenicus

FIG. 47

Acanthisitta

FIG. 48

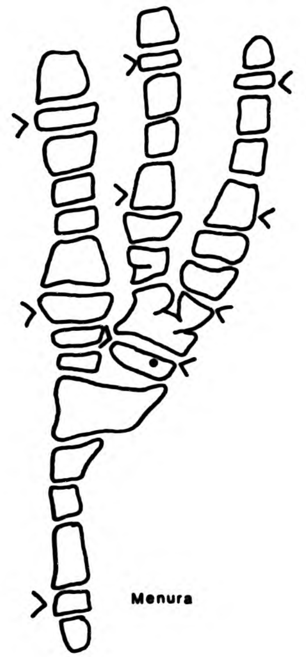
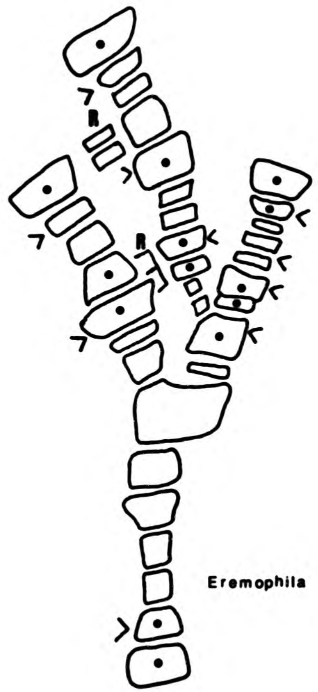


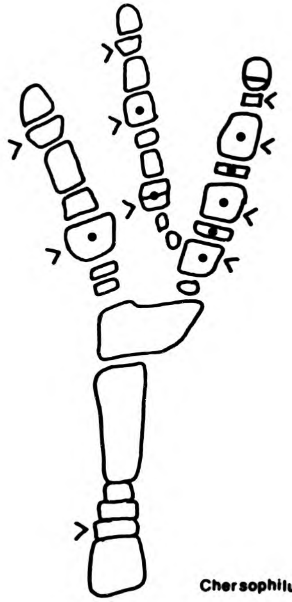

FIG. 49


FIG. 50



Eremophila

FIG.51



Chersophilus

FIG.52


Cecropis

FIG.53

Riparia

FIG.54

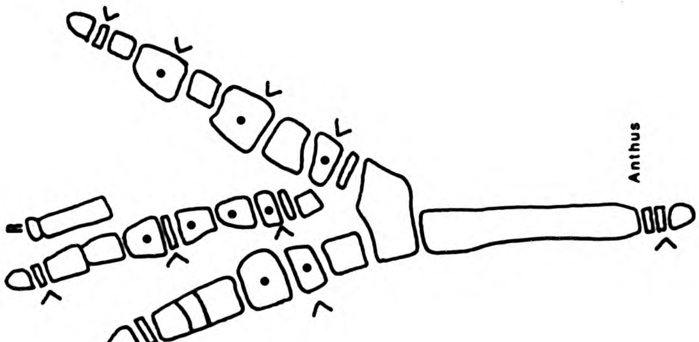



FIG.55

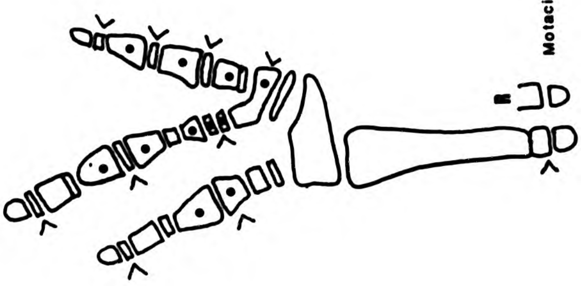
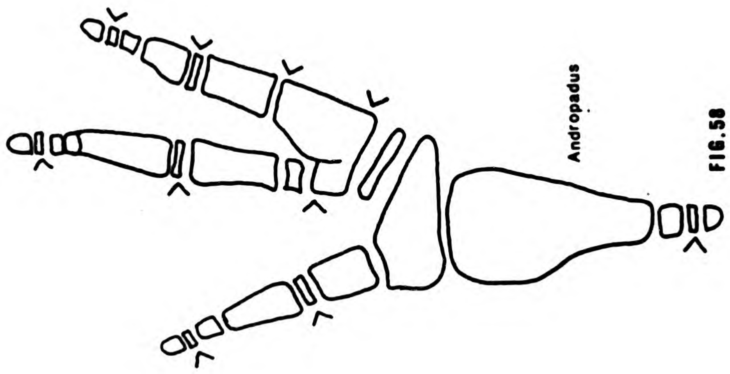
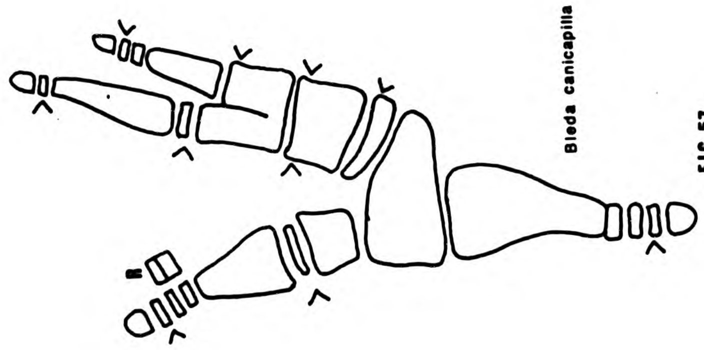



FIG.56



Andropadus

FIG.58



Bleda canicapilla

FIG.57

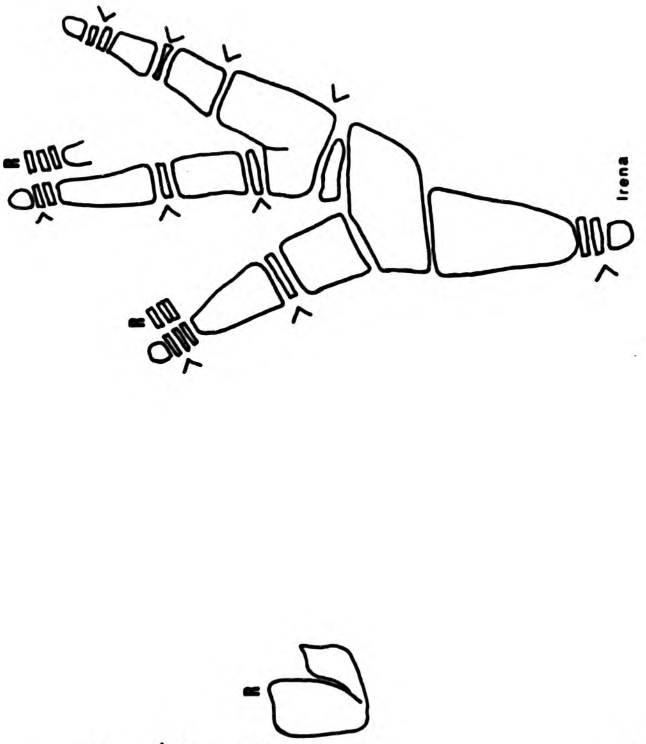



FIG.60

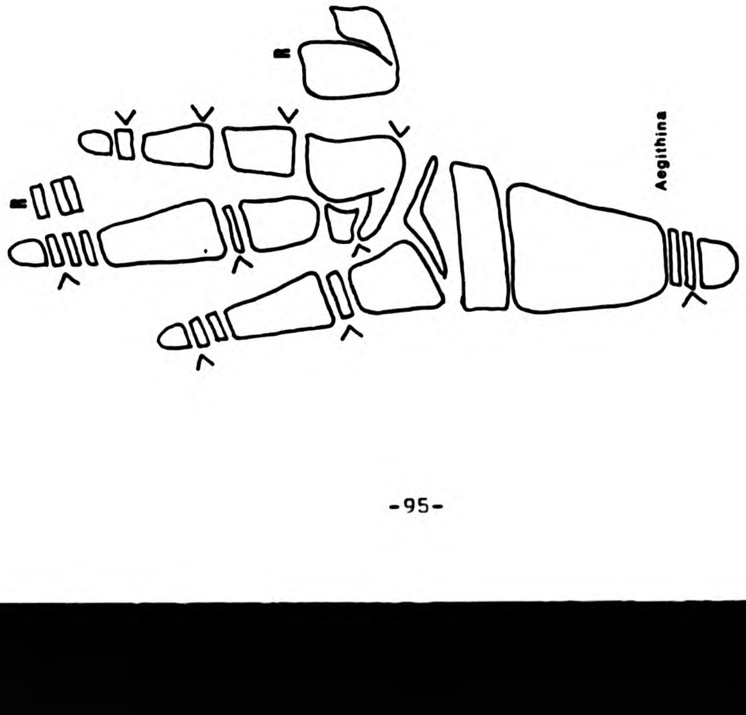
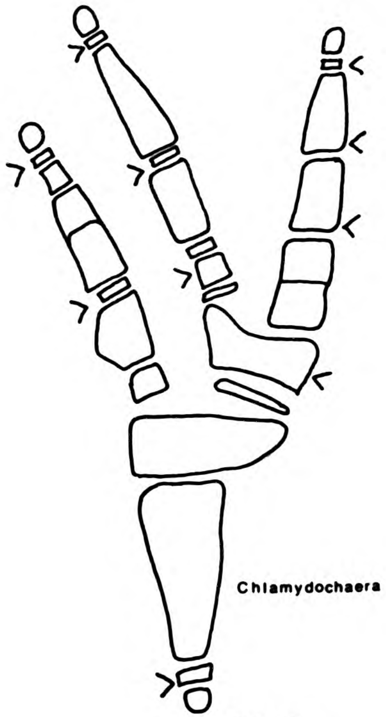



FIG.59

Coracina

FIG.61



Chlamydochaera

FIG.62

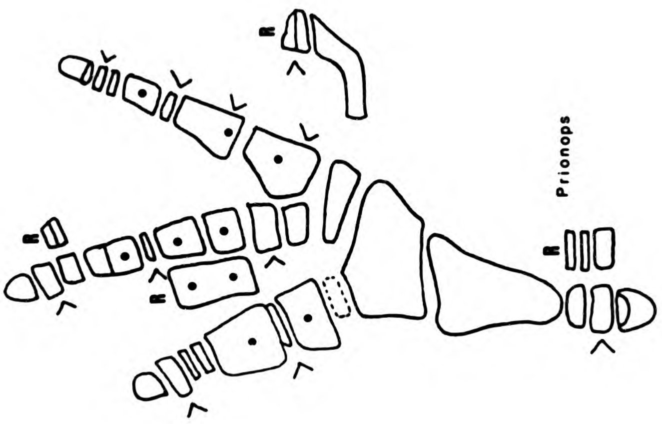



FIG.64

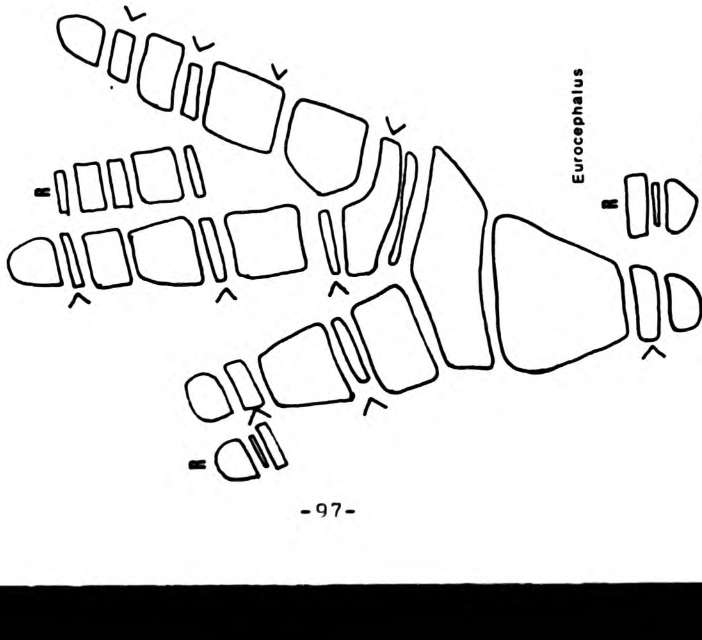



FIG.63

FIG.66

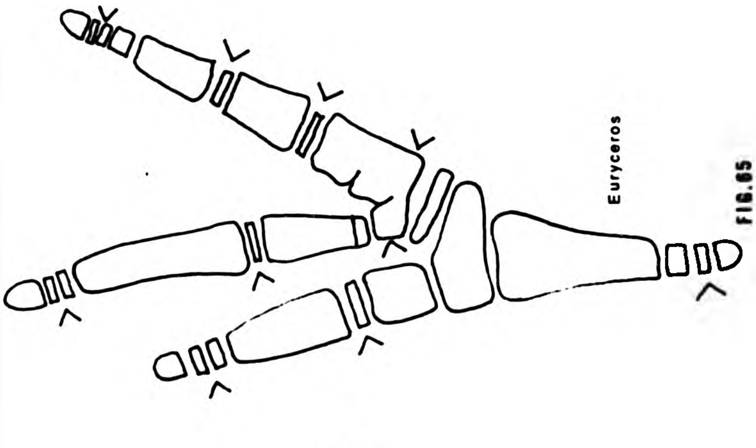
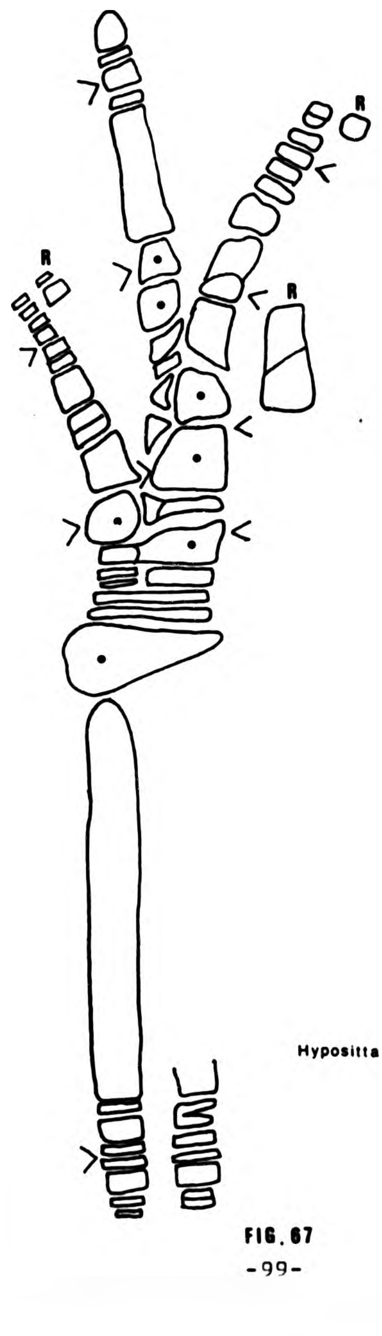
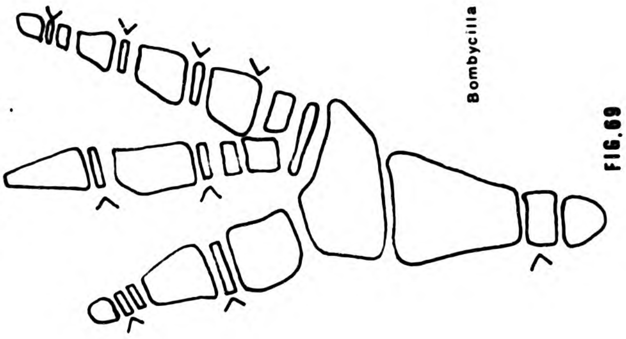


FIG.65



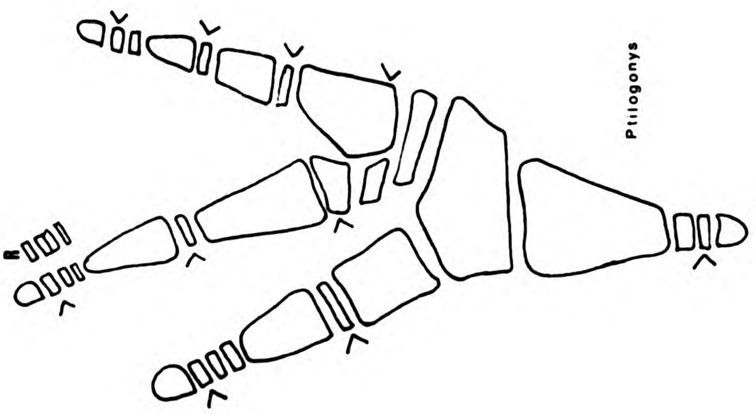

Hypositta

FIG. 67



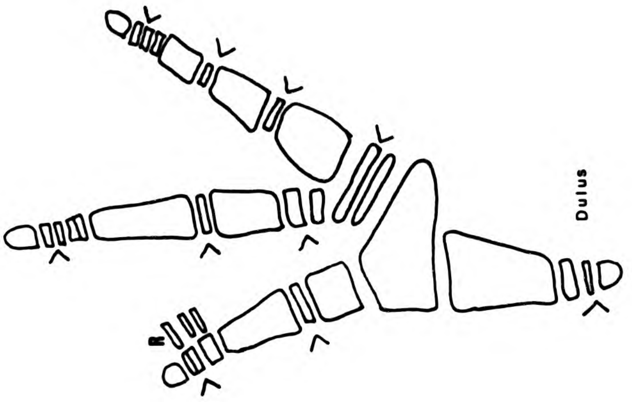
Bombycilla

FIG. 69



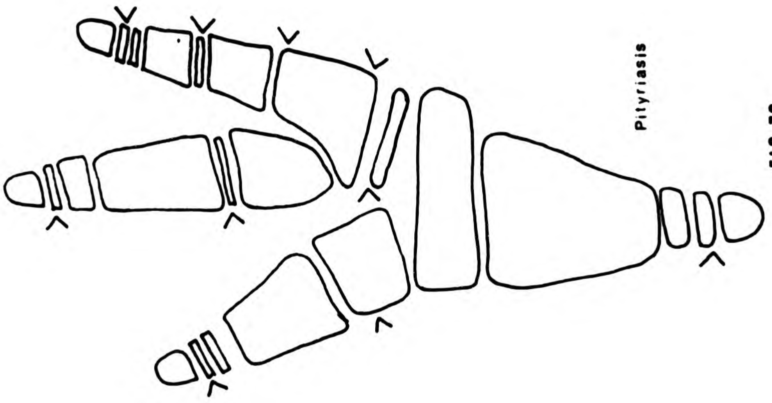

Ptilogonys

FIG. 68




Dulus

FIG. 71



Pityriasis

FIG. 70

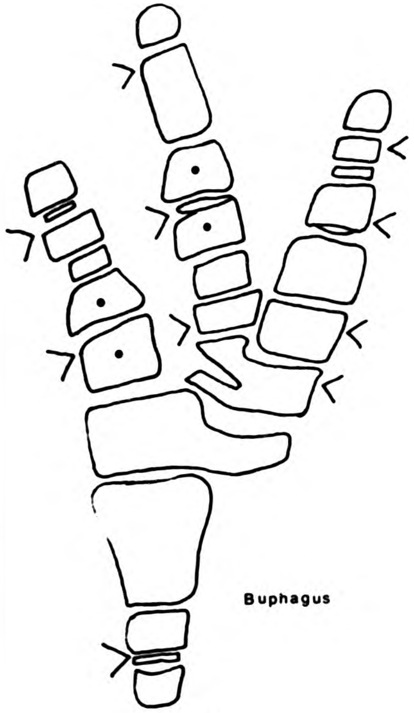



FIG.72

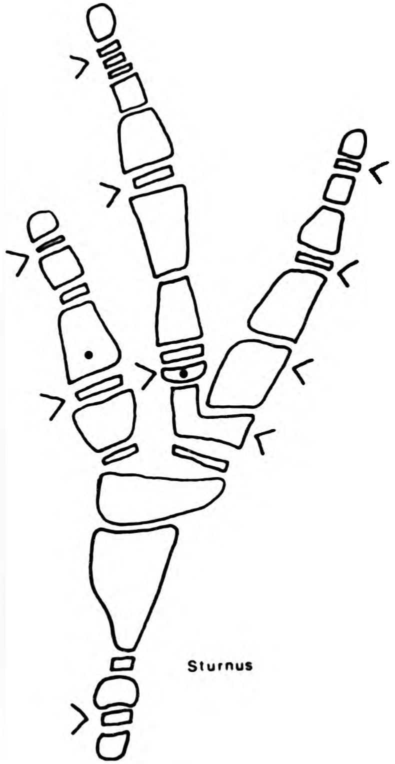
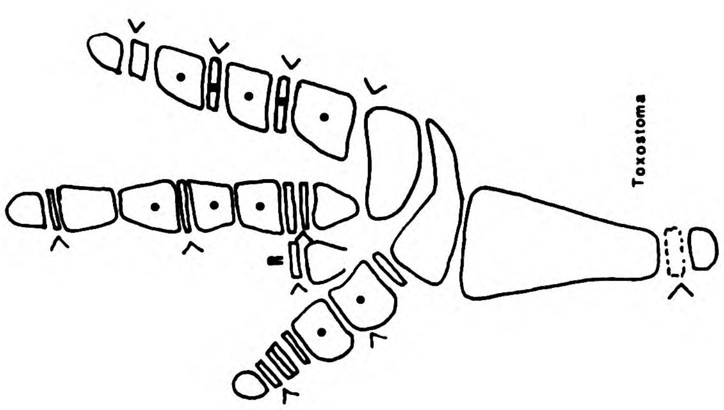
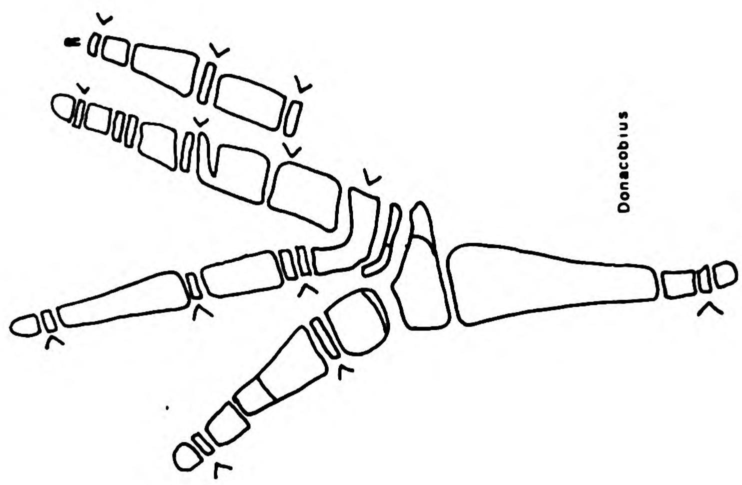



FIG.73



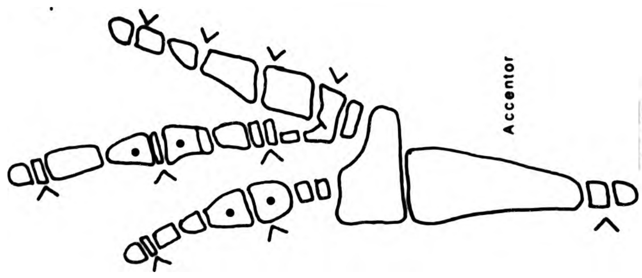
Toxostoma

FIG.74



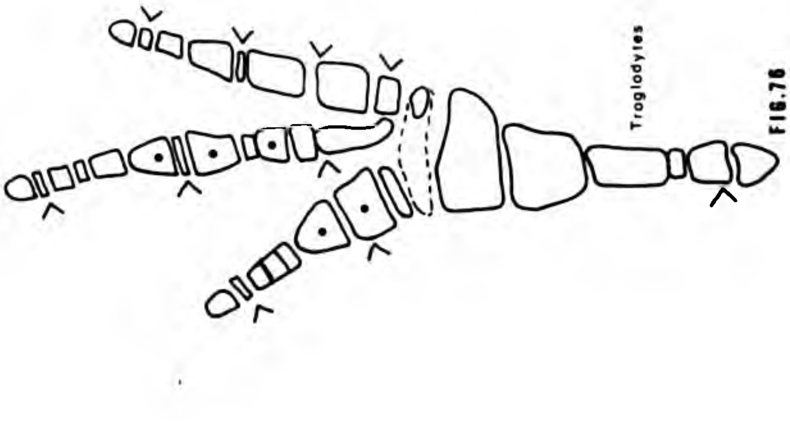
Donacobius

FIG.75



Accentor

FIG.77



Troglodytes

FIG.78

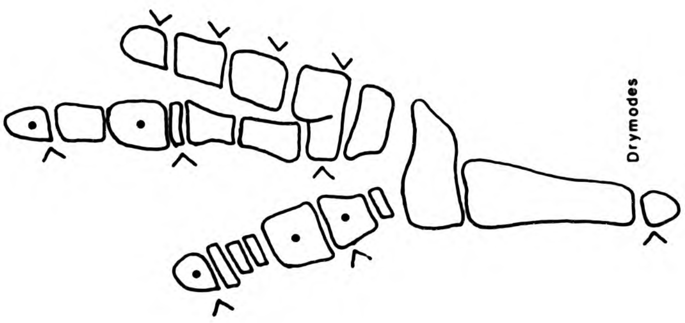



FIG.79

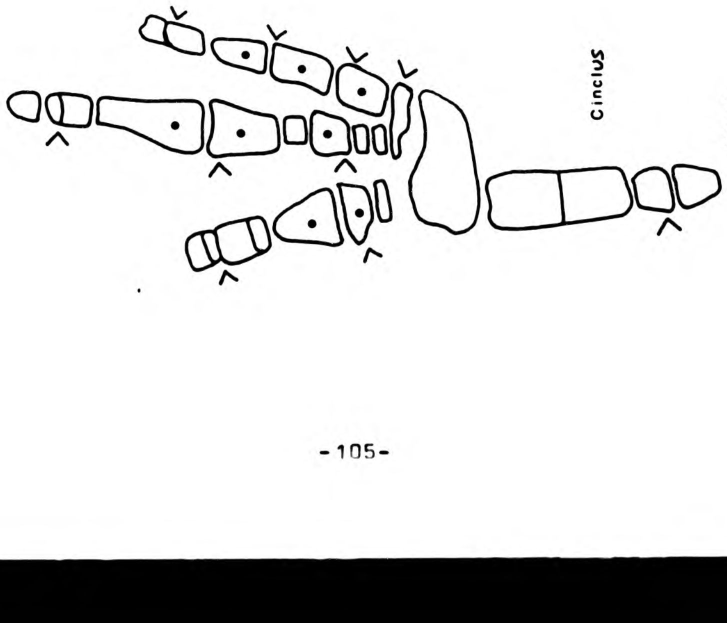
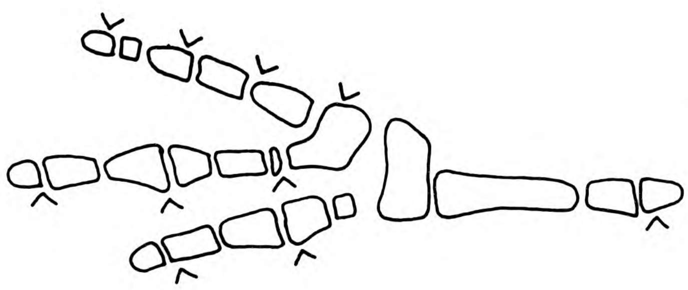
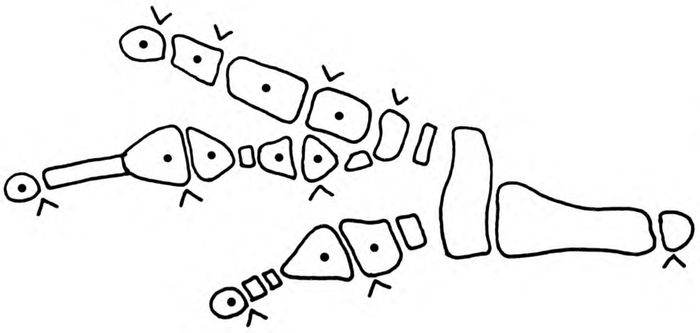



FIG.78



Chaetops

FIG. 81



Oenanthe

FIG. 80

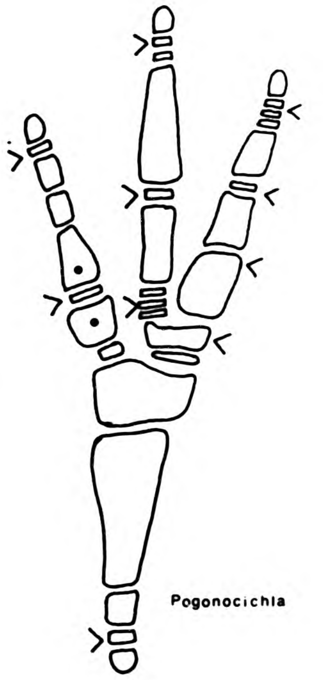



FIG.82


FIG.83

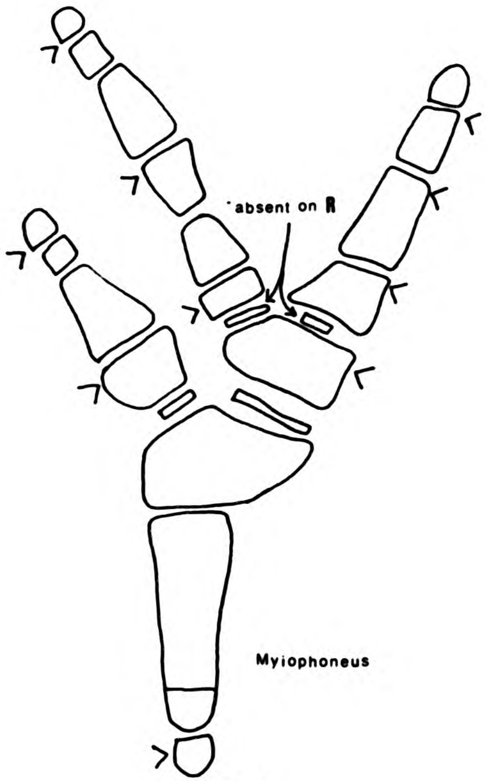



FIG.84

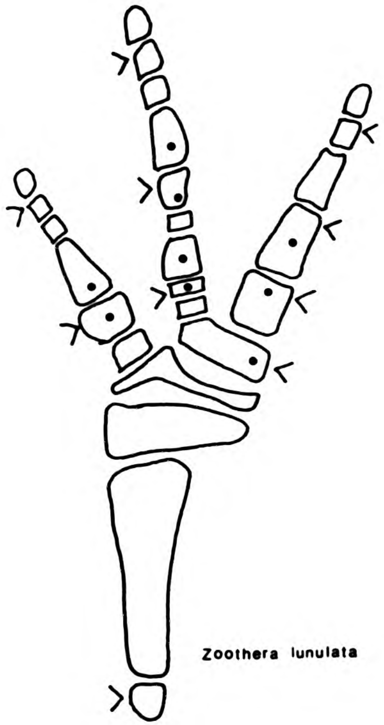
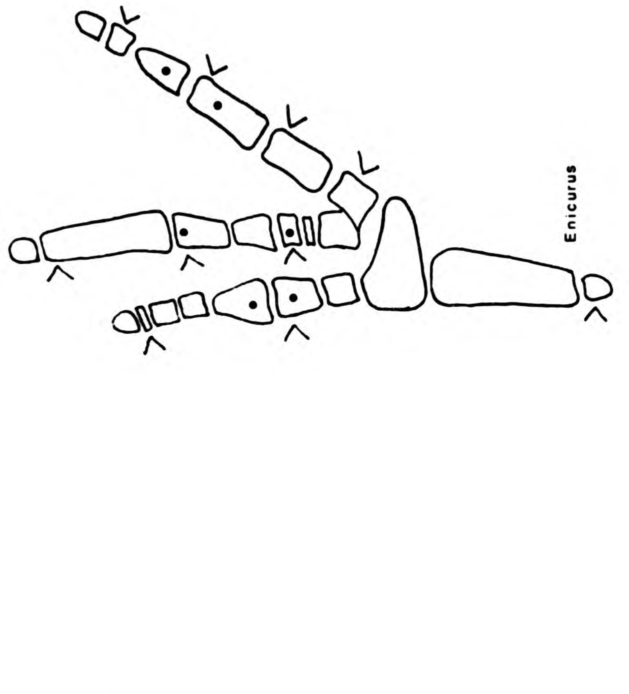
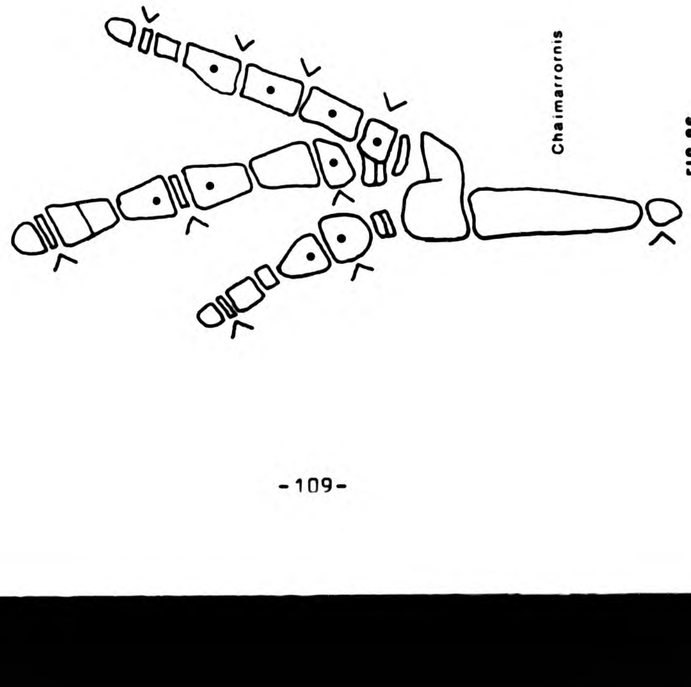



FIG.85



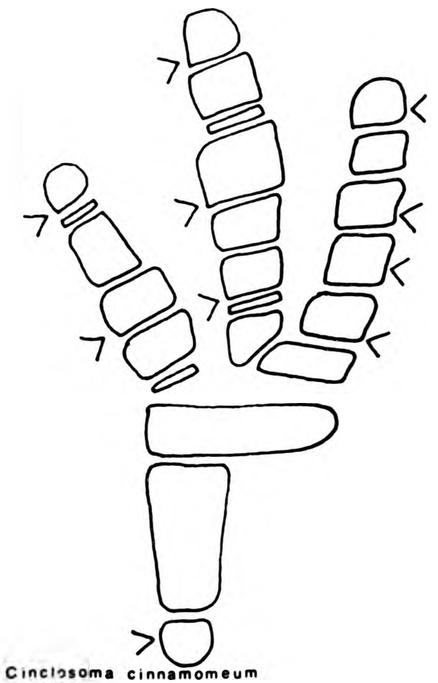
Enicurus

FIG.87



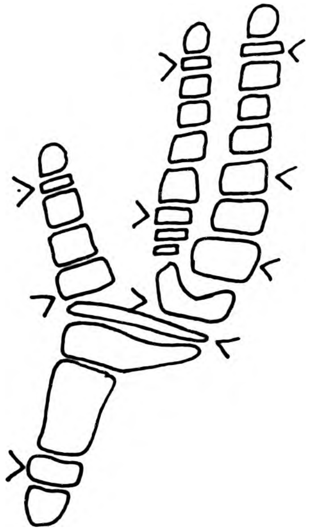
Chaimarrornis

FIG.86



Cinclosoma cinnamomeum

FIG.88



Orthonyx

FIG.89

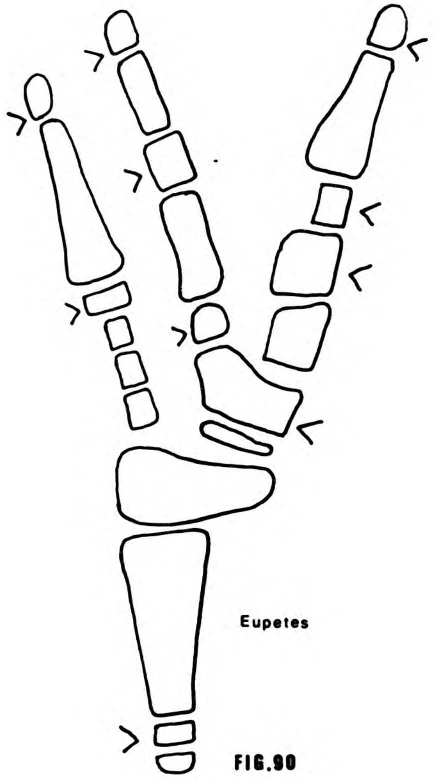



FIG.90

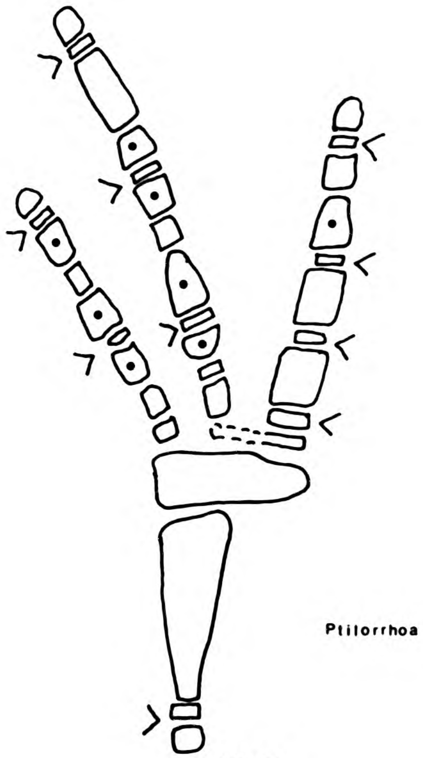
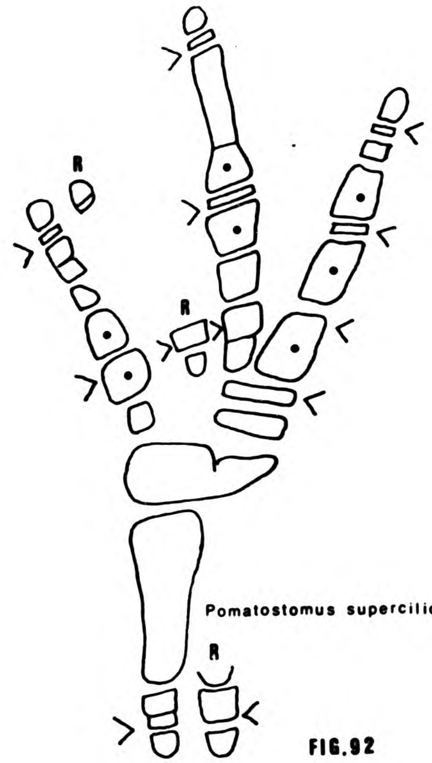
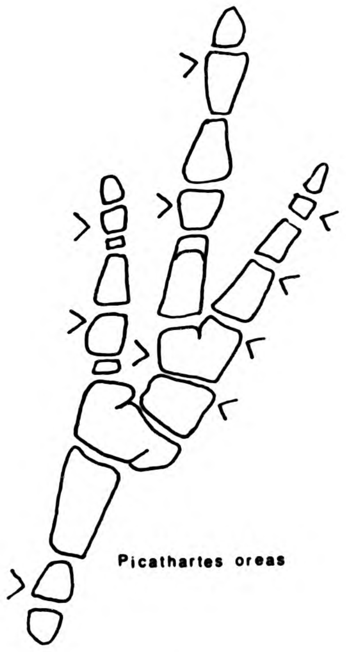



FIG.91




Pomatostomus superciliosus

FIG.92



Picathartes oreas

FIG.93

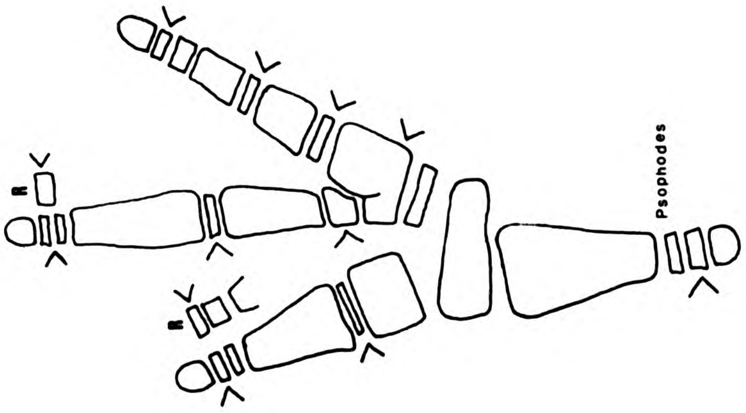



FIG.94

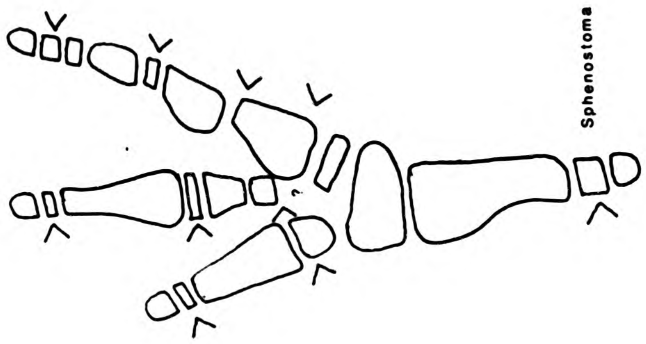



FIG.95

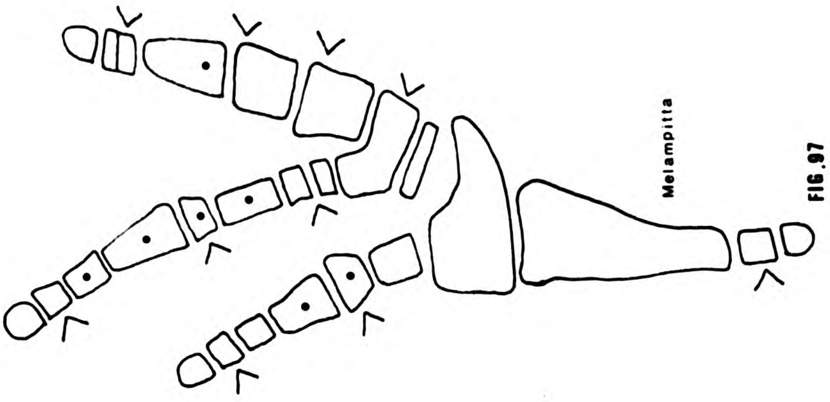



FIG.97

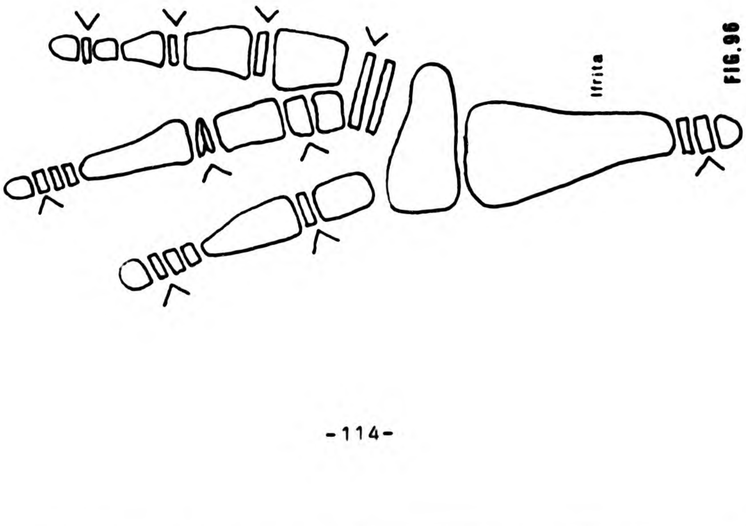
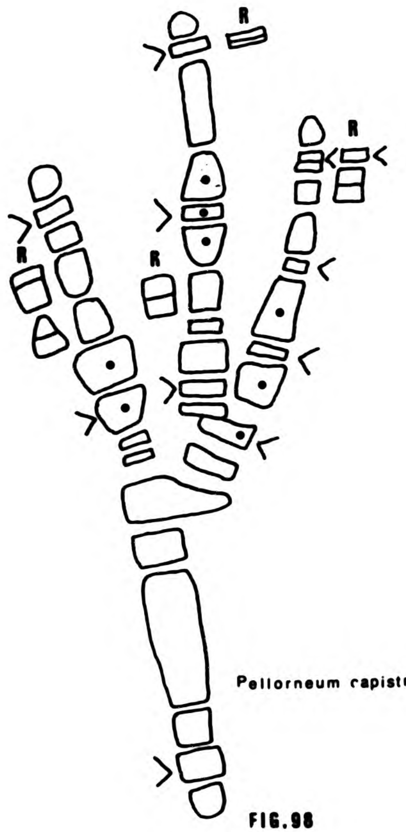
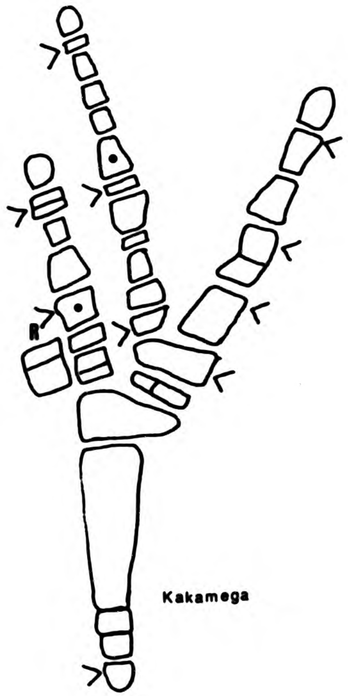



FIG.96



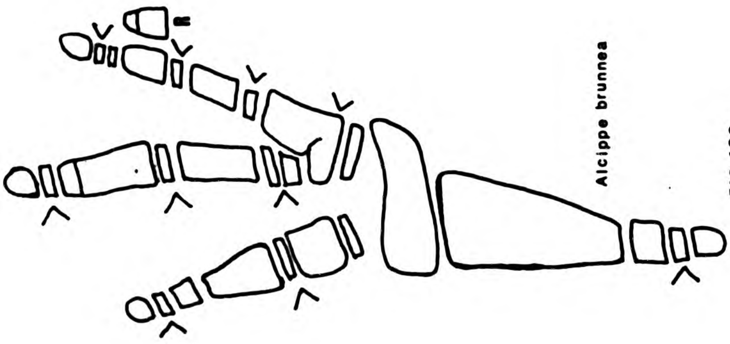

Pellorneum capistratum

FIG.98



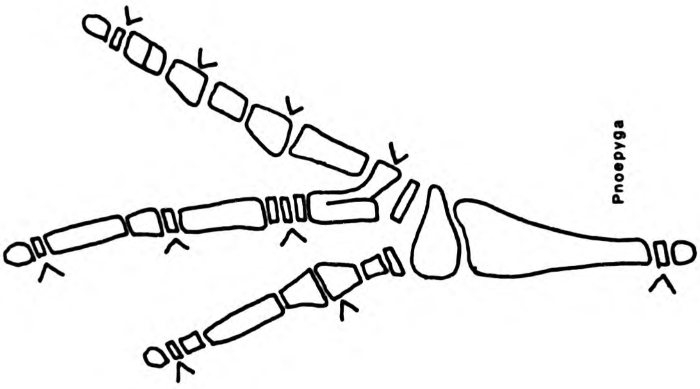

Kakamega

FIG.99



Alcippe brunnea

FIG.100



Pnoepyga

FIG.101

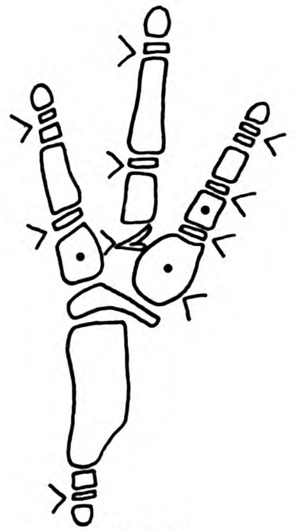
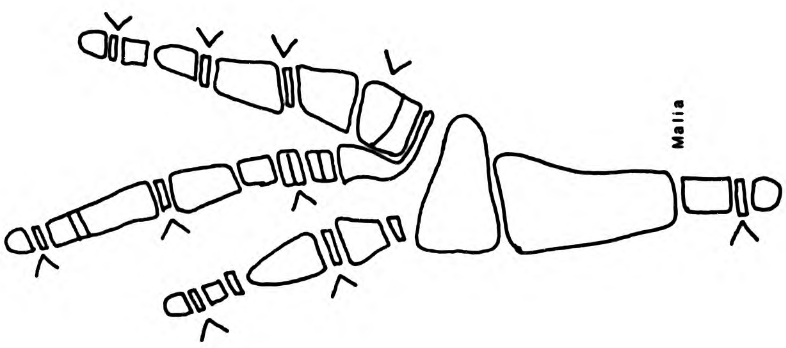


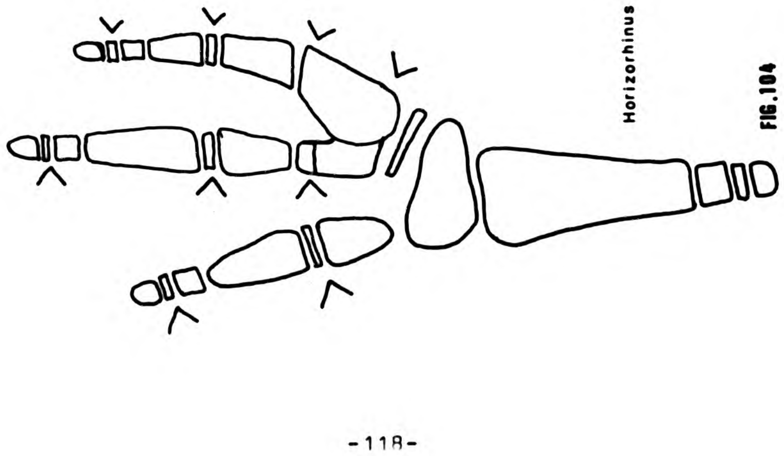

FIG.102


FIG.103



Malia

FIG.105



Horizorhinus

FIG.104

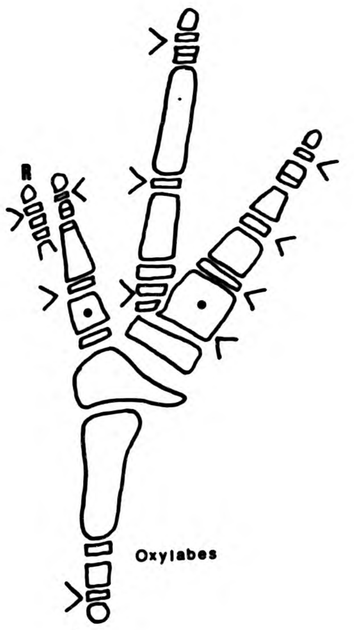
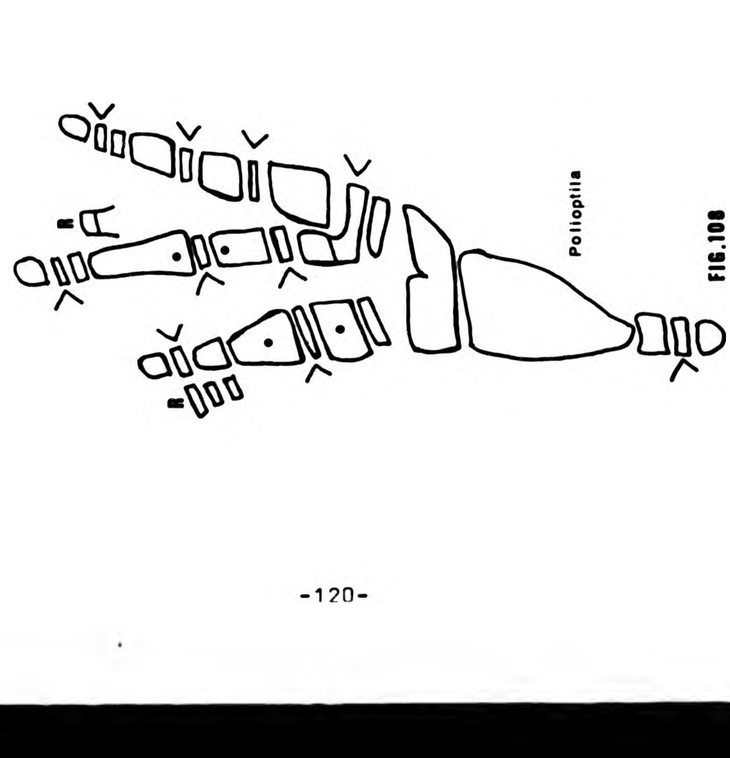



FIG.106


FIG.107

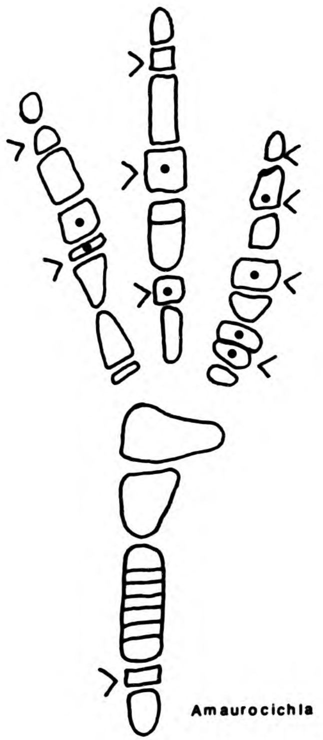


Polioptila

FIG.108

Ramphocaenus

FIG.109

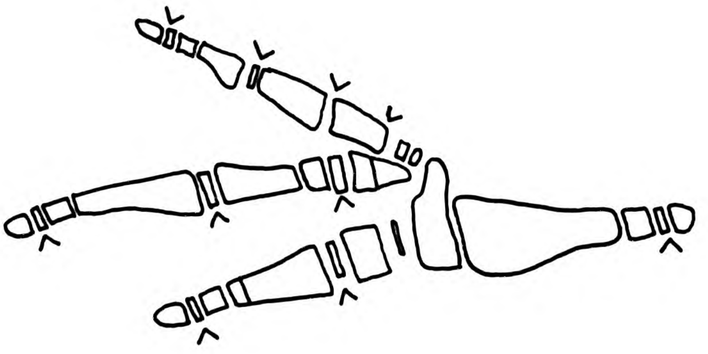


Amaurocichla

FIG.110

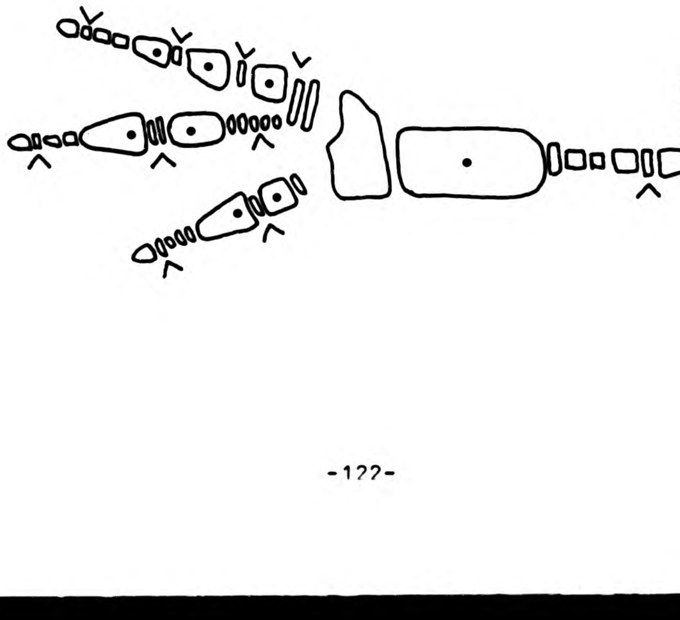
Orthotomus

FIG.111



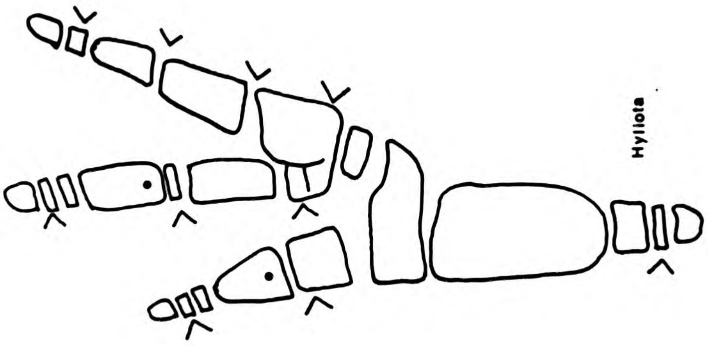
Cisticola

FIG. 113



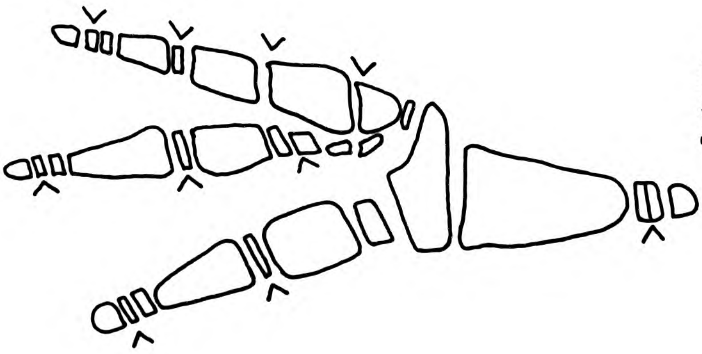
Regulus

FIG. 112



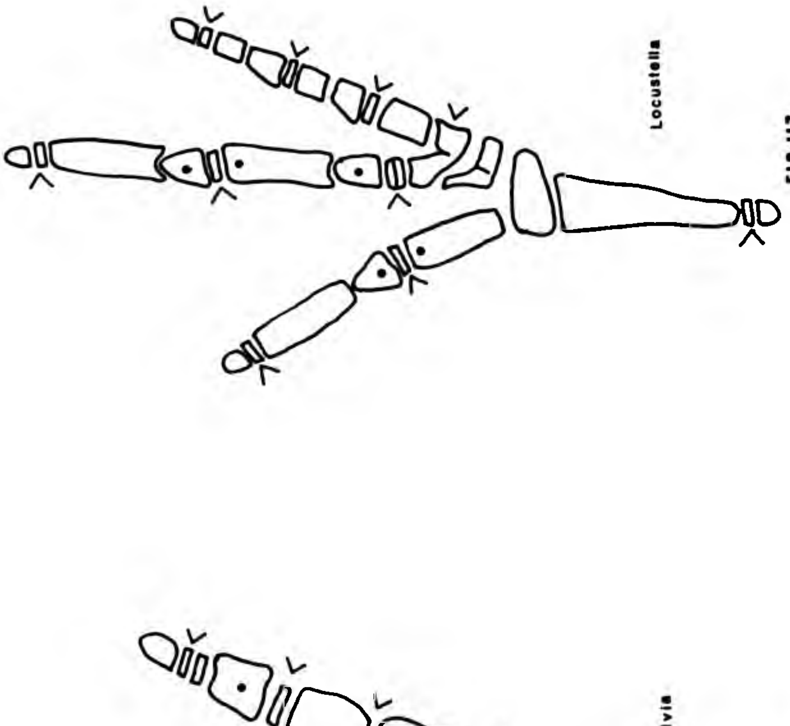
Hyliota

FIG. 115



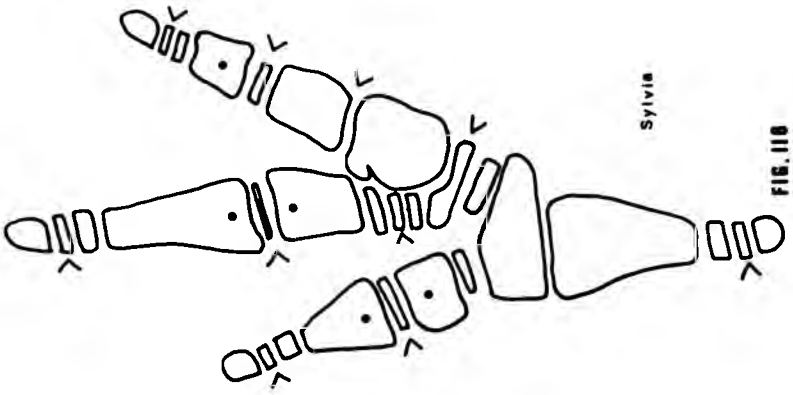
Parisoma

FIG. 114



Locustella

FIG.117



Sylvia

FIG.118

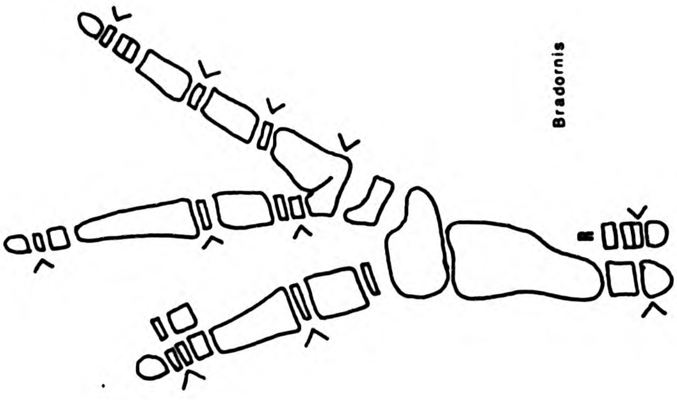


FIG.119 Bradornis

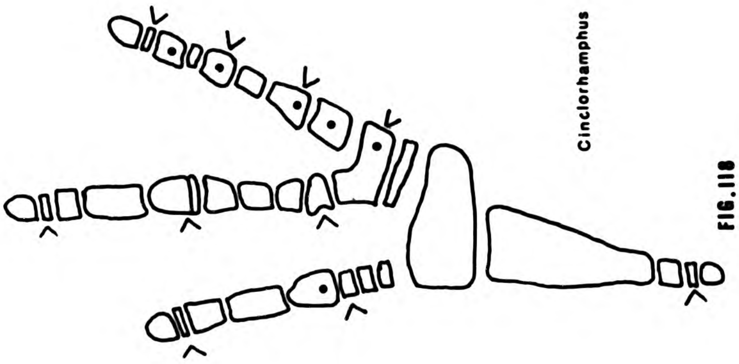
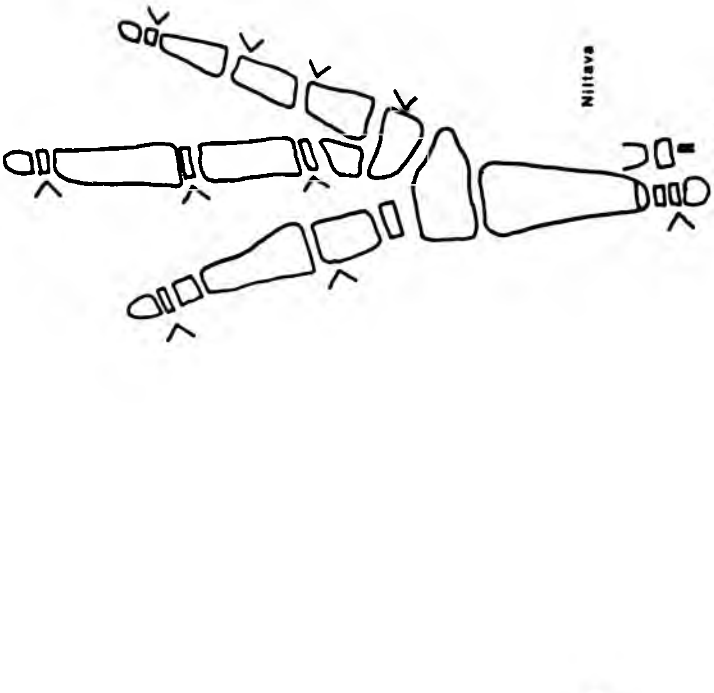
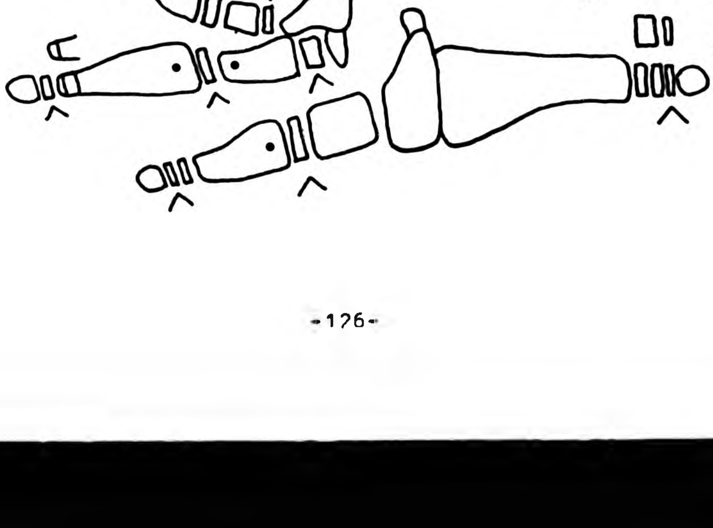


FIG.118 Cinclorhamphus



Nitava

FIG.121



Newtonia

FIG.120

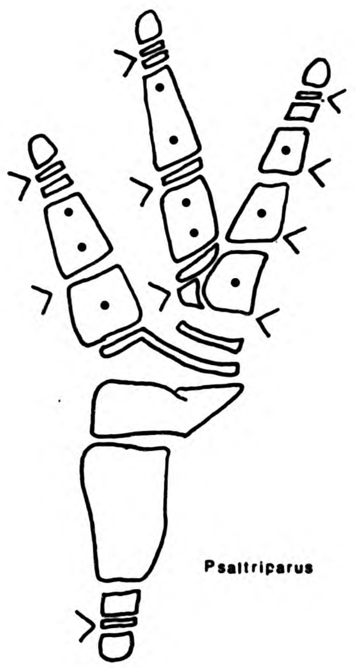
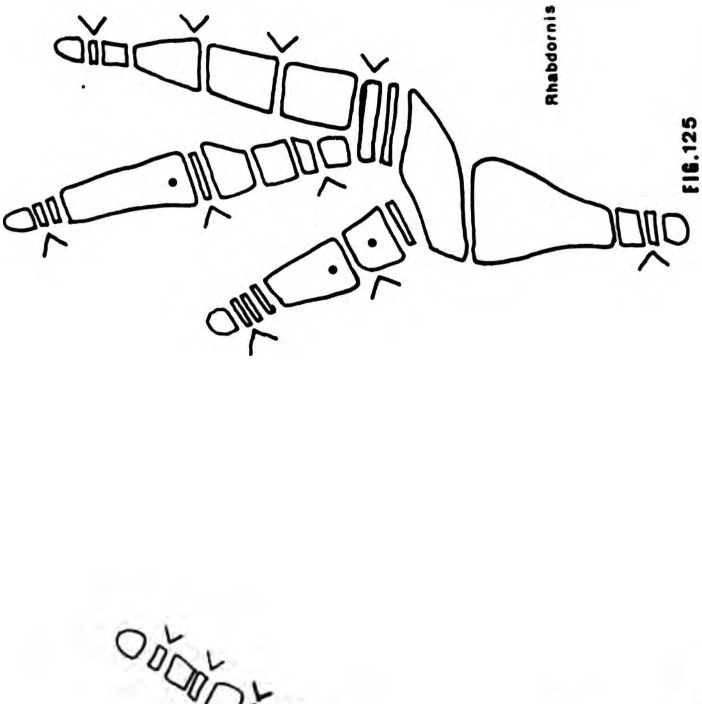


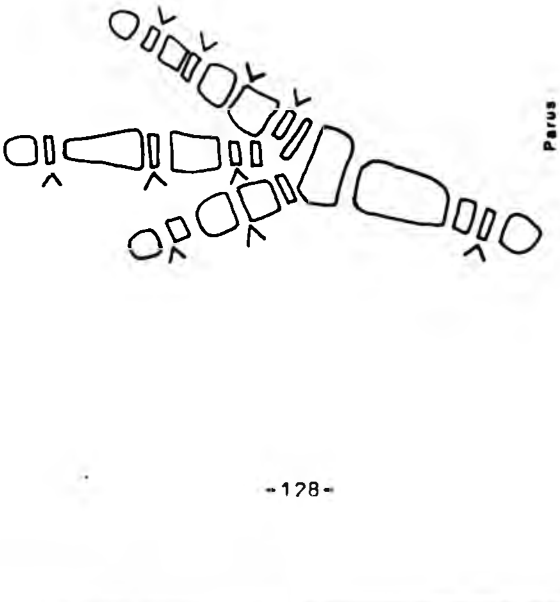

FIG.122


FIG.123



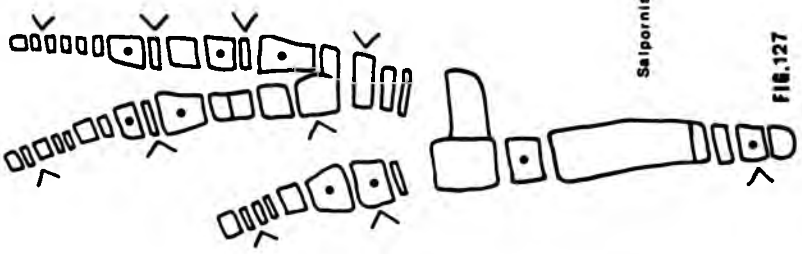
Rhabdornis

FIG.125



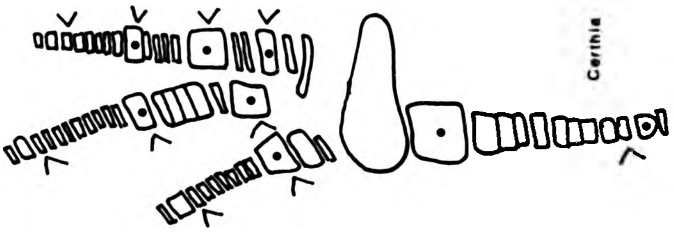
Parus

FIG.124



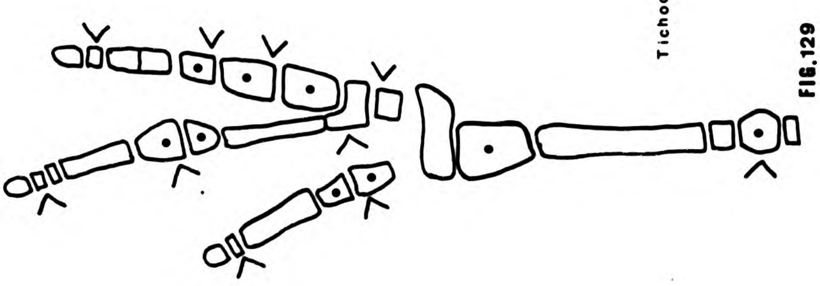
Salpornis

FIG.127



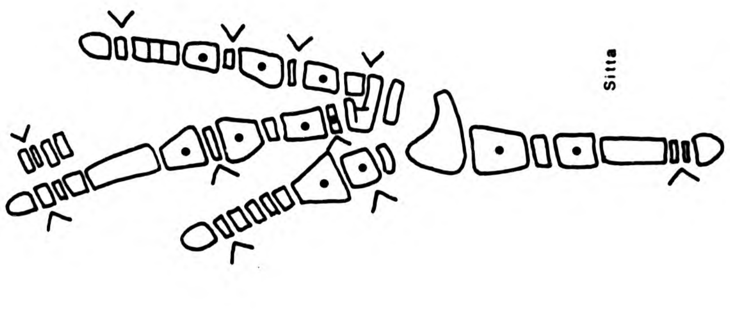
Certhia

FIG.126



Tichodroma

FIG. 129



Sitta

FIG. 128


FIG.130

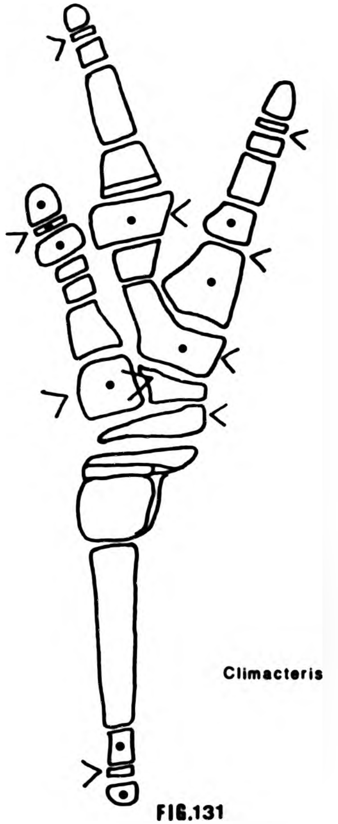
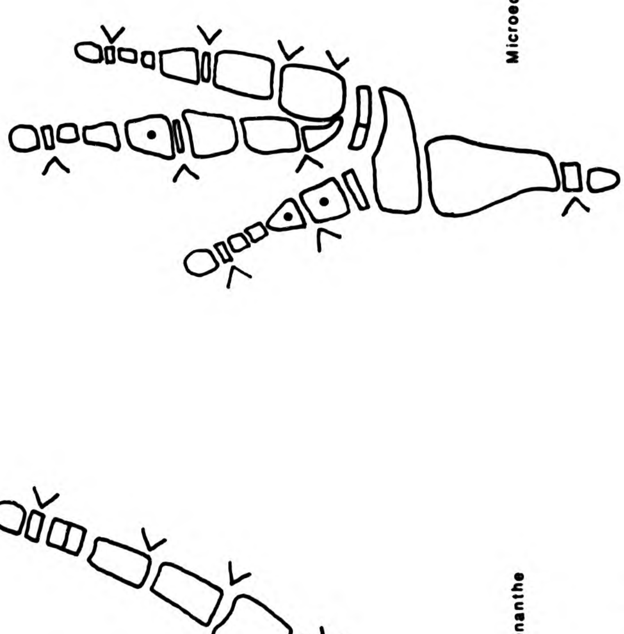
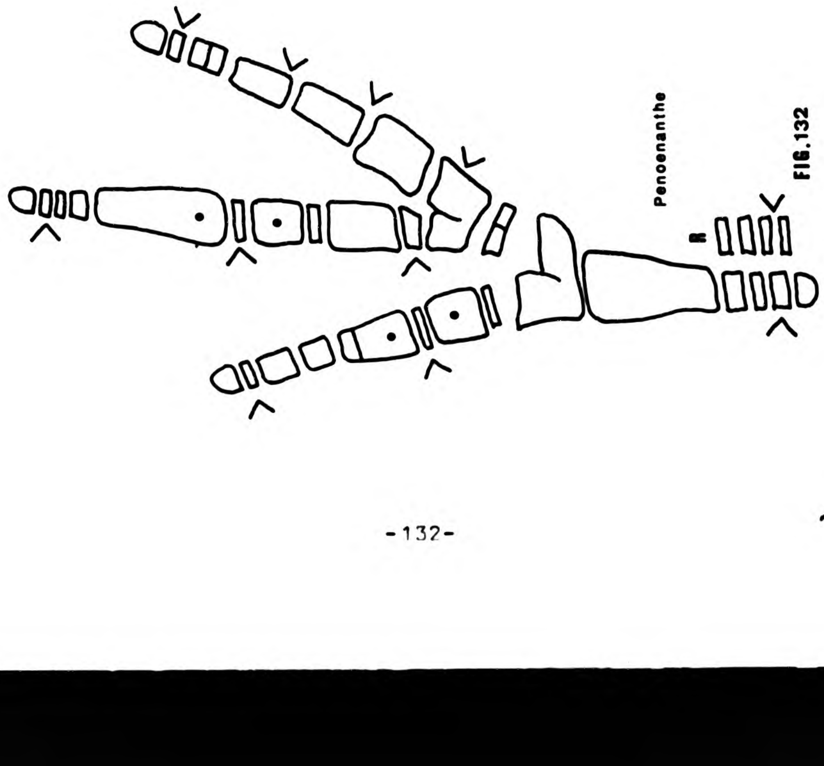



FIG.131



Microeca

FIG.133




Penoenanthe

FIG.132


FIG.135

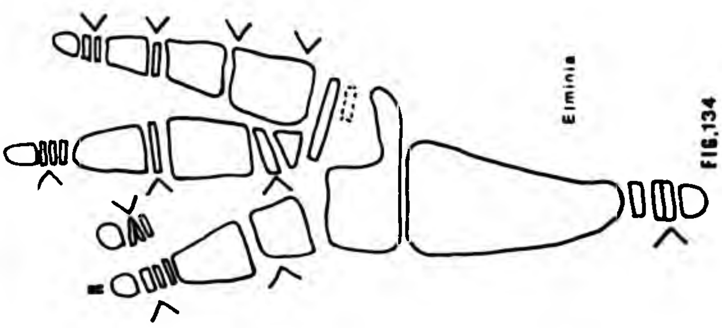



FIG.134

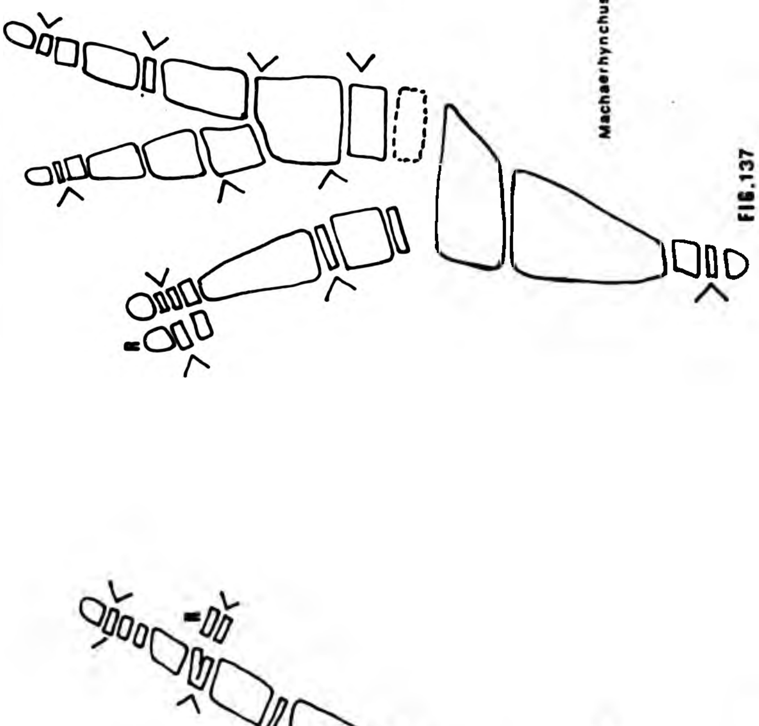


FIG.137 Machaerhynchus

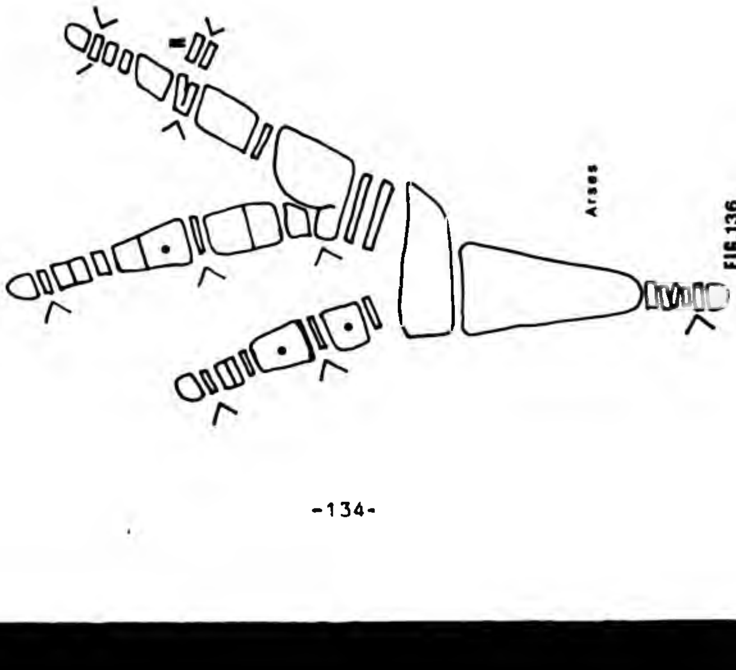
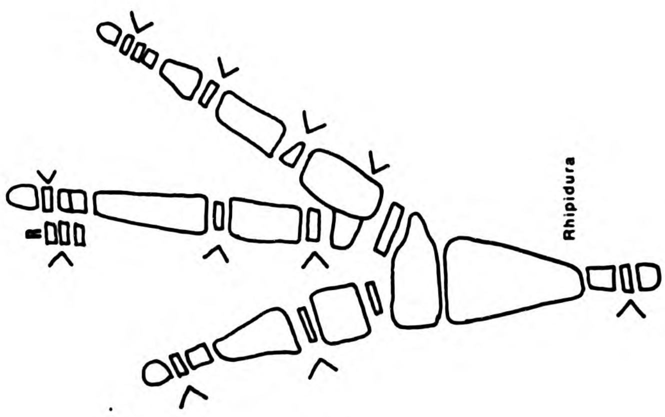
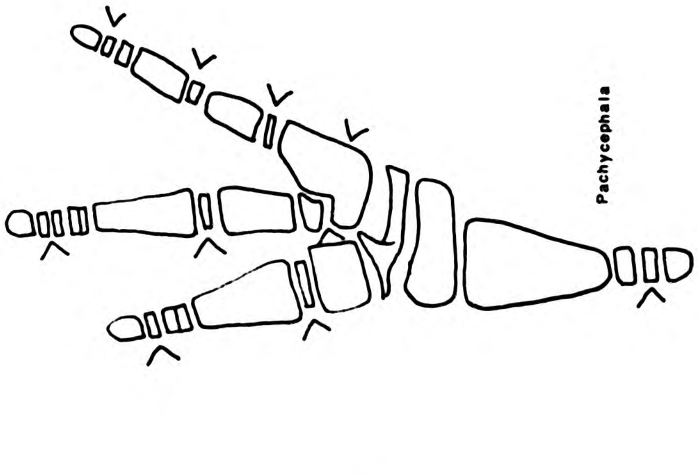


FIG.136 Arses



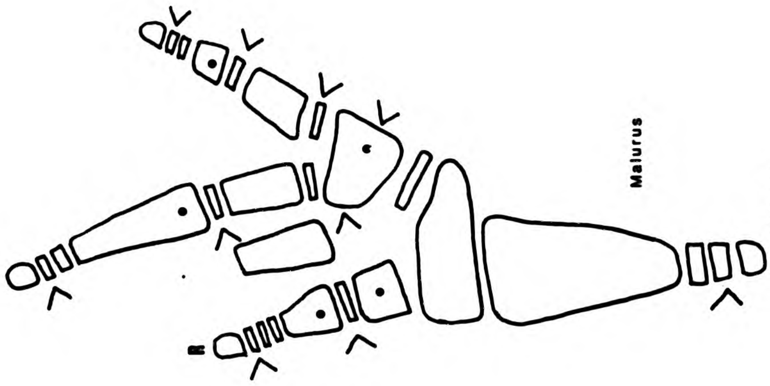
Rhipidura

FIG.139



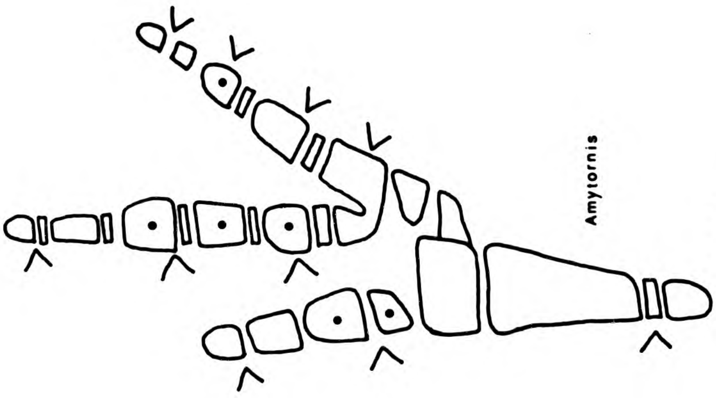
Pachycephala

FIG.138



Malurus

FIG.141



Amytornis

FIG.140


FIG.142

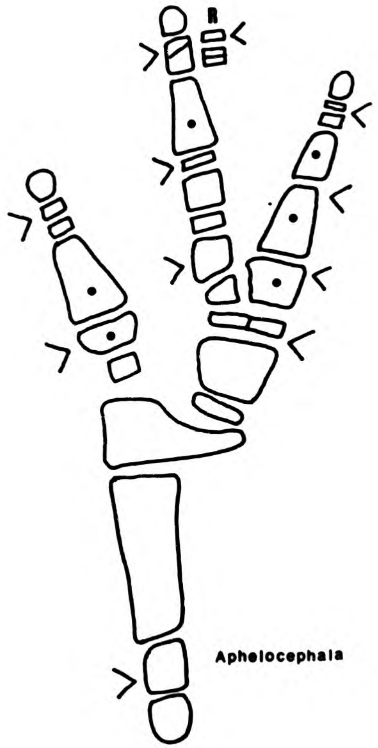
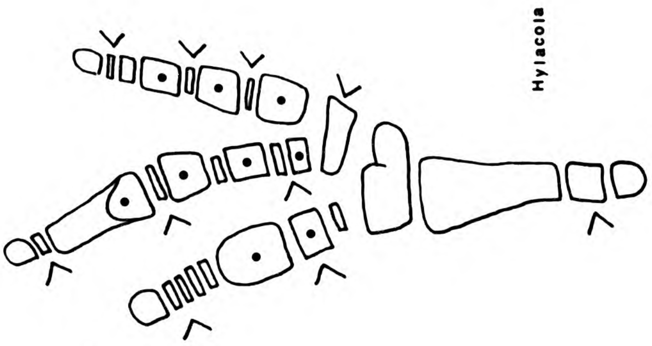
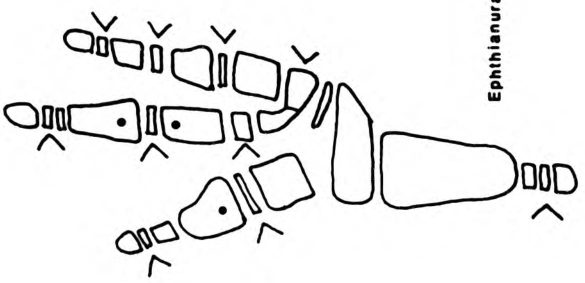



FIG.143



Hylacola

FIG.145



Ephthianura

FIG.144

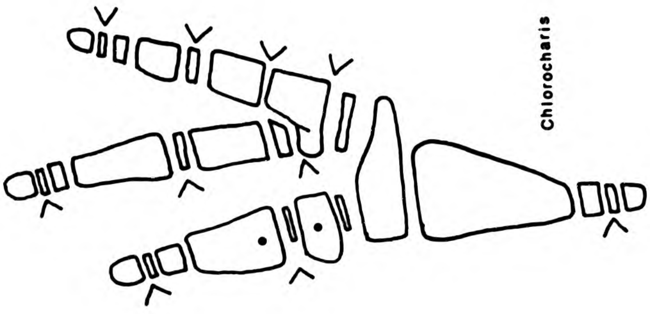


FIG.147 Chlorocharis

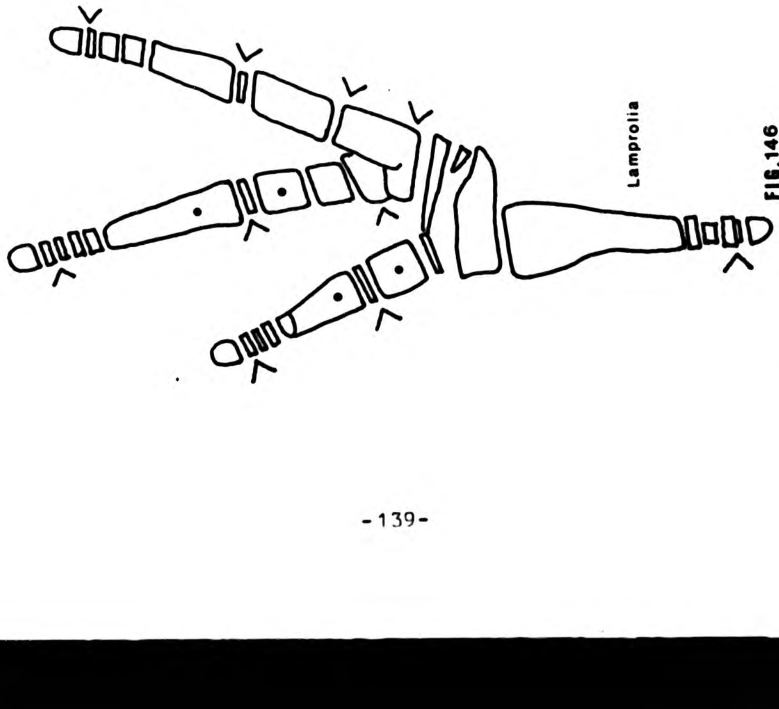


FIG.146 Lamprolia

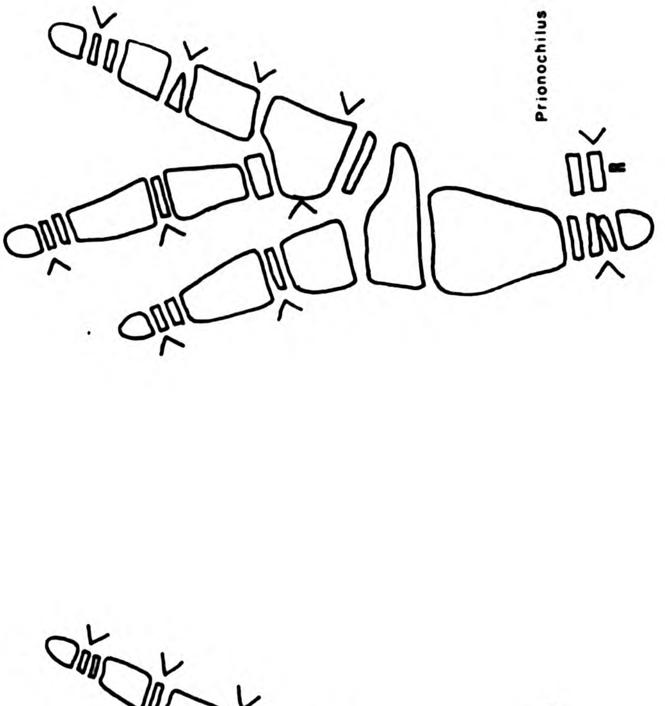



FIG.149

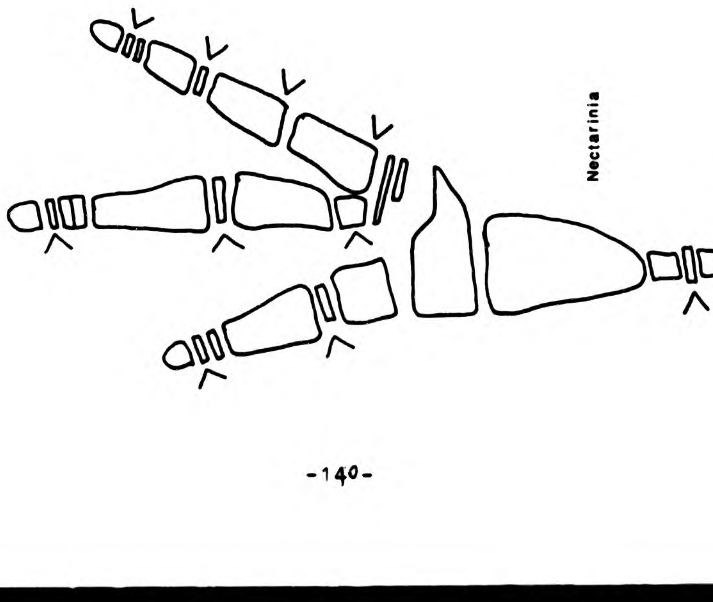
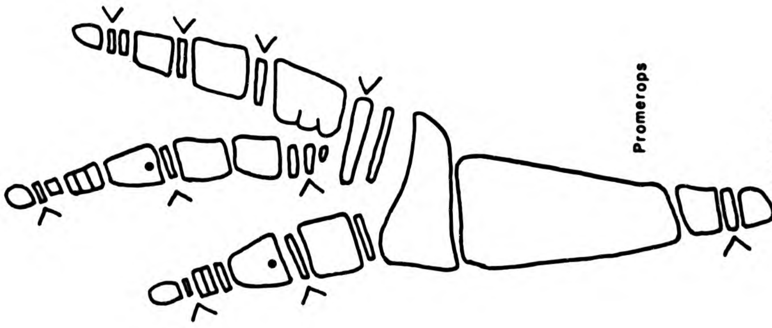
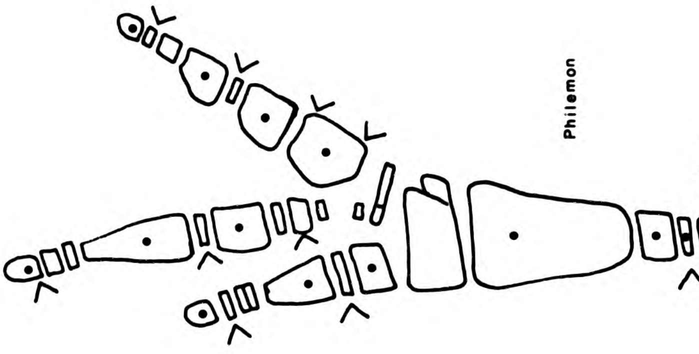



FIG.148



Promerops

FIG.150



Philemon

FIG.151

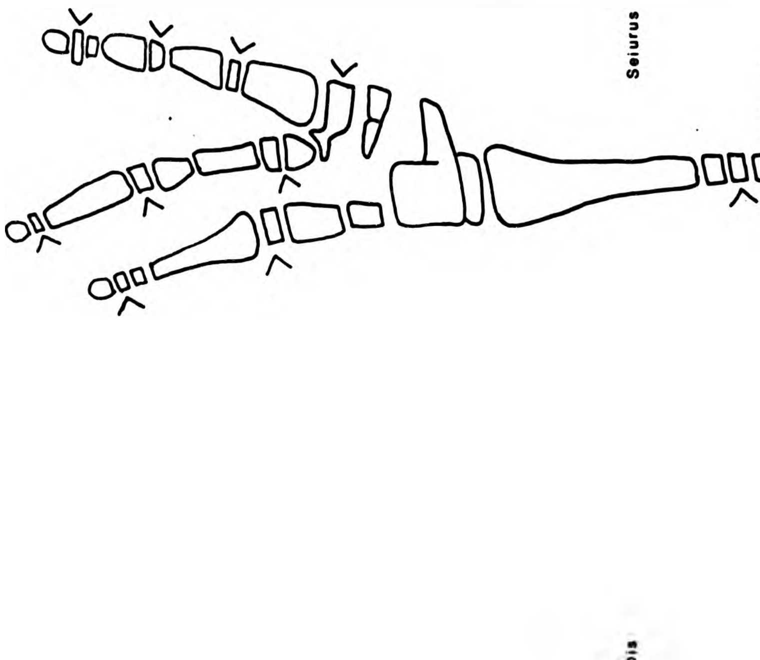


FIG.153 Seiurus

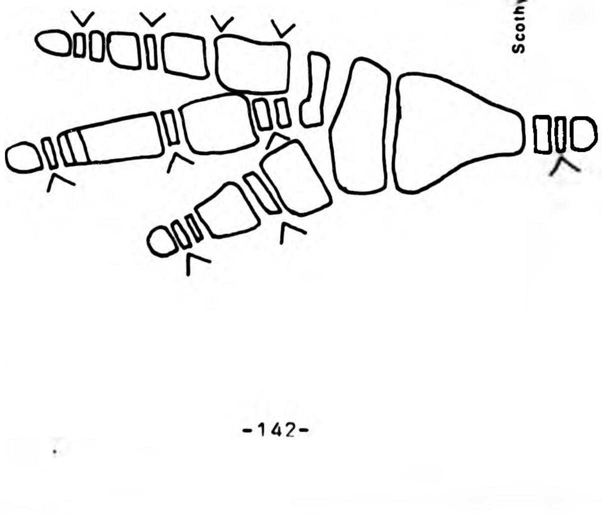
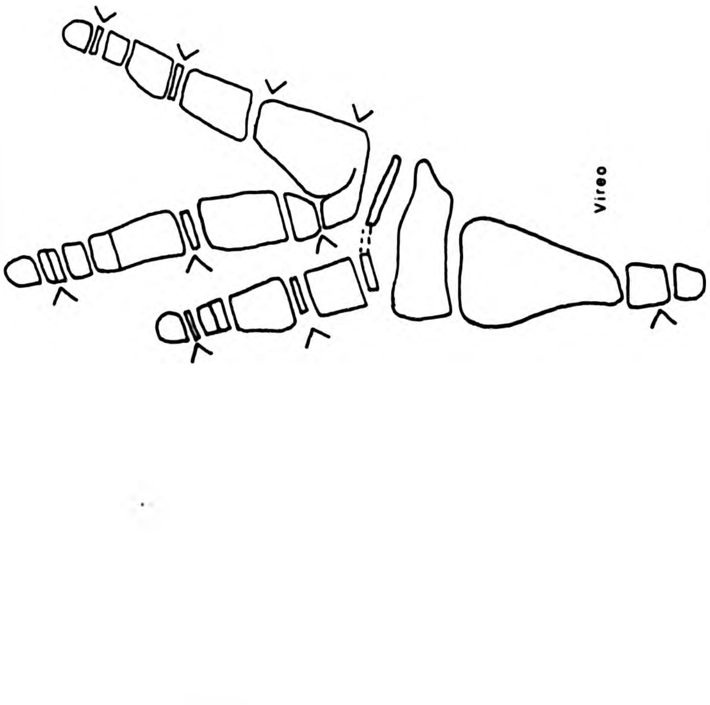
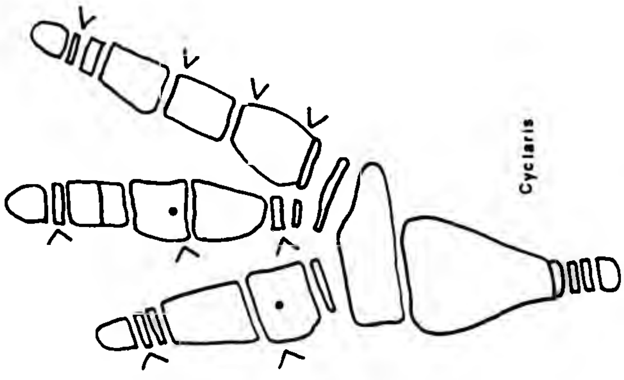


FIG.152 Scothylpis



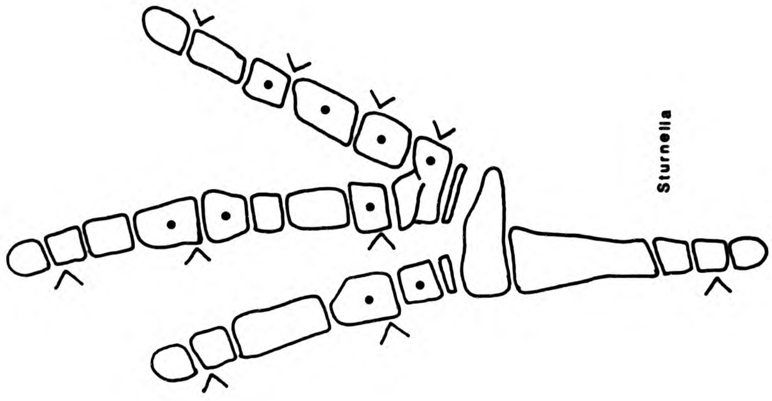
Vireo

FIG.155



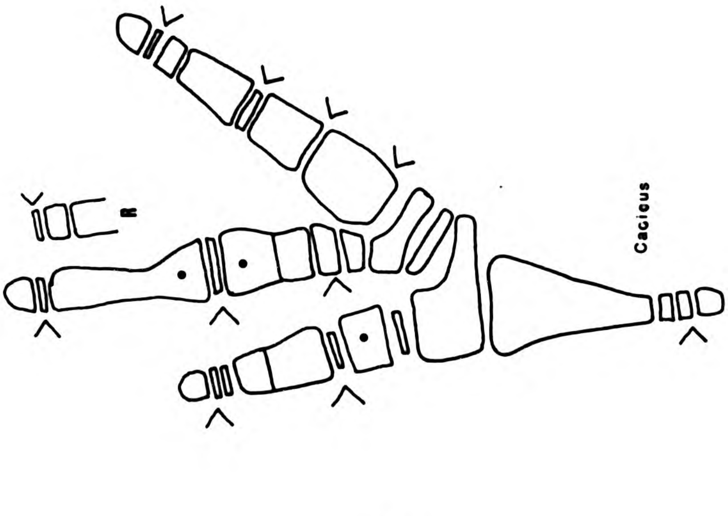
Cyclaris

FIG.154



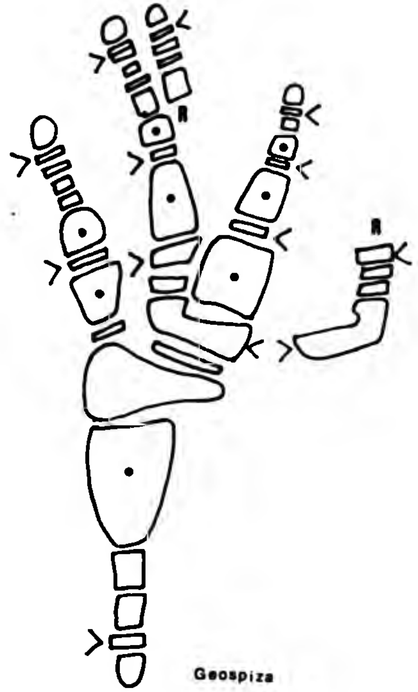
Sturnella

FIG.157



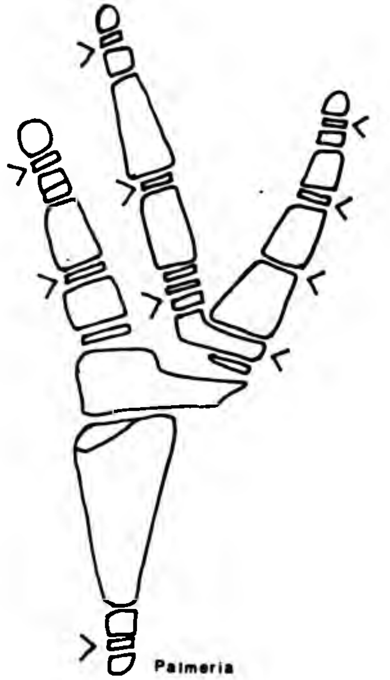
Cacicus

FIG.156



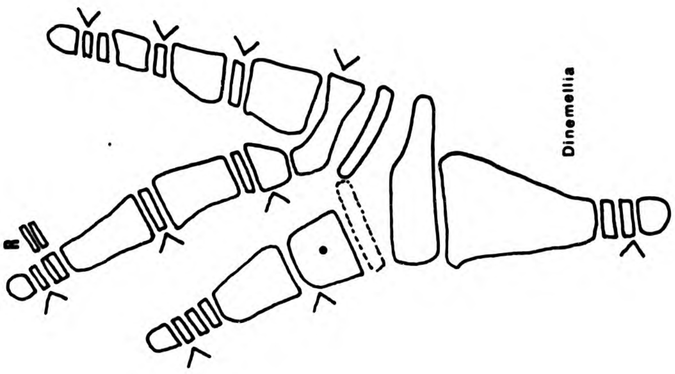

Geospiza

FIG.158



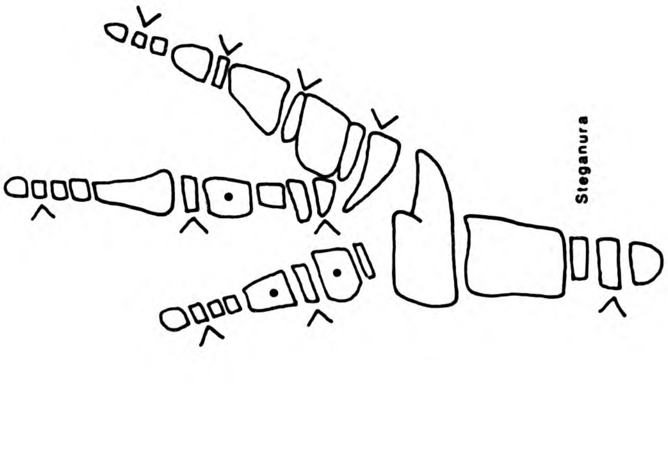
Palmeria

FIG.159



Dinemellia

FIG.161



Steganura

FIG.160

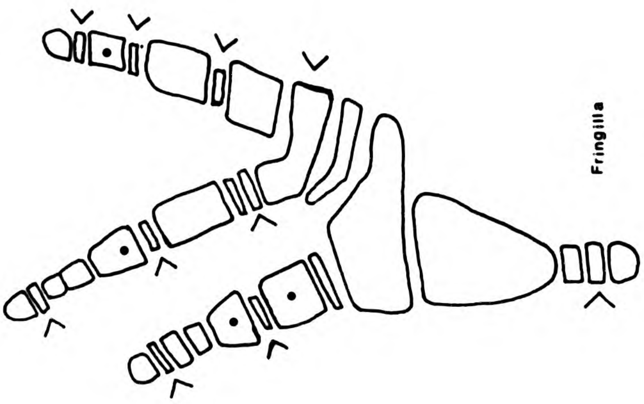



FIG.163

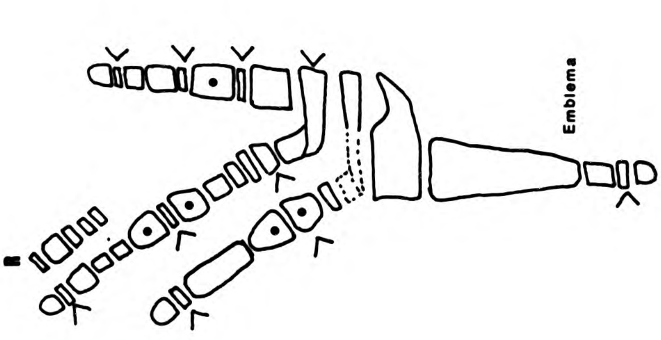
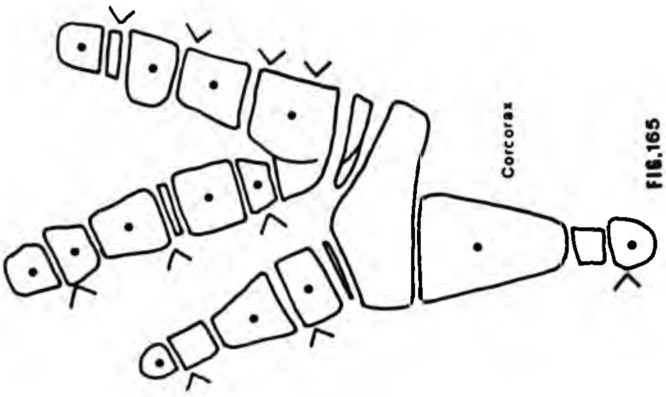
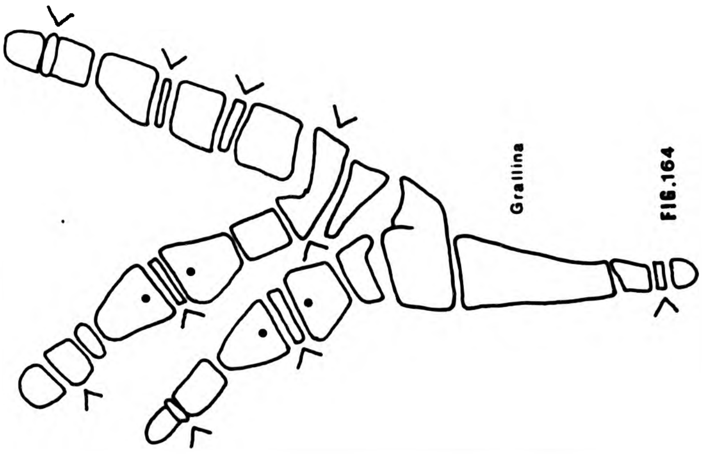



FIG.162



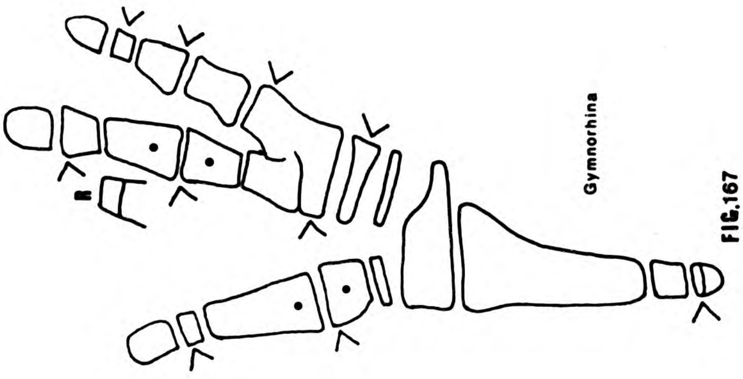
Corcorax

FIG.165



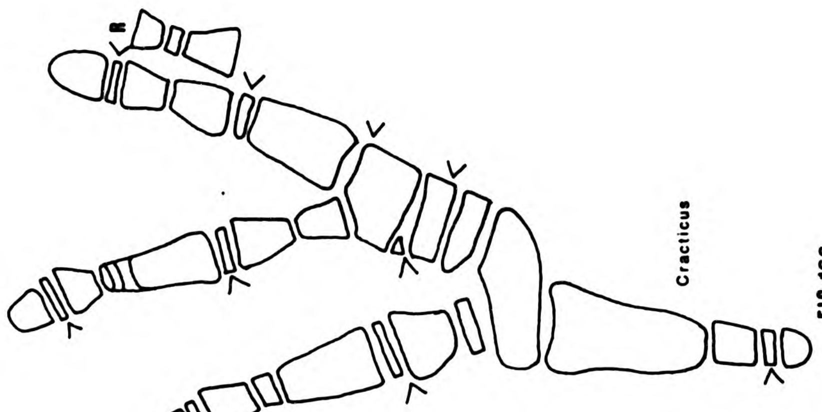
Grallina

FIG.164




Gymnorhina

FIG.167




Cracticus

FIG.166

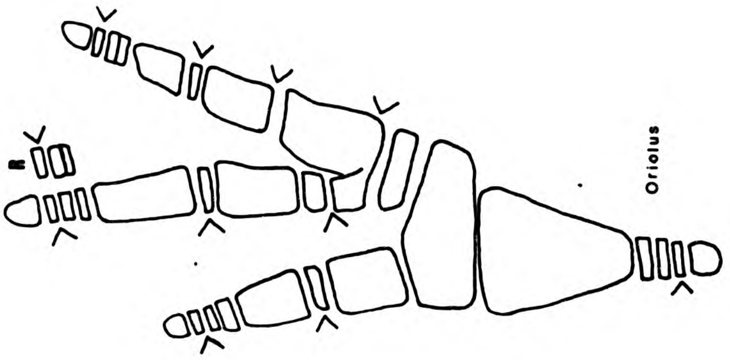


FIG.169

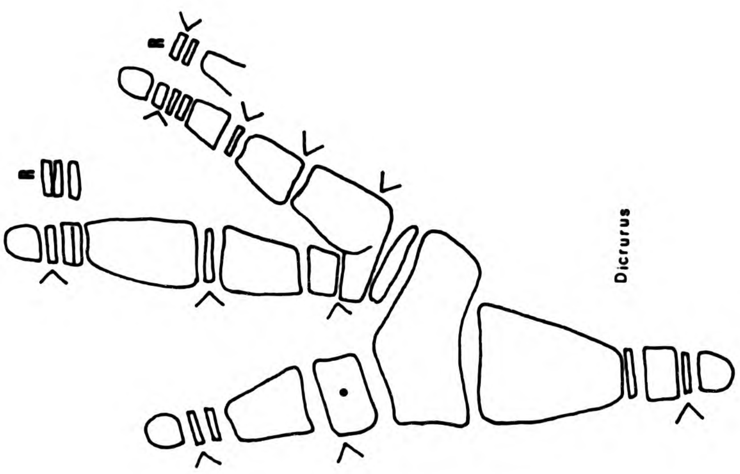
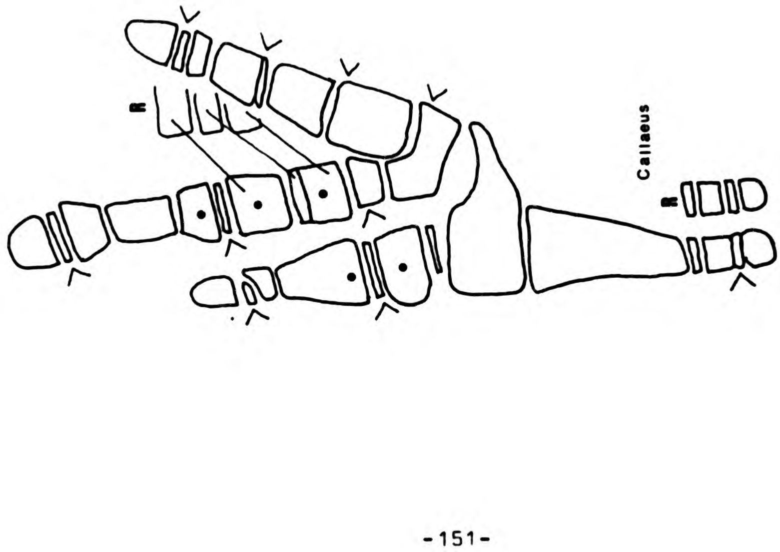
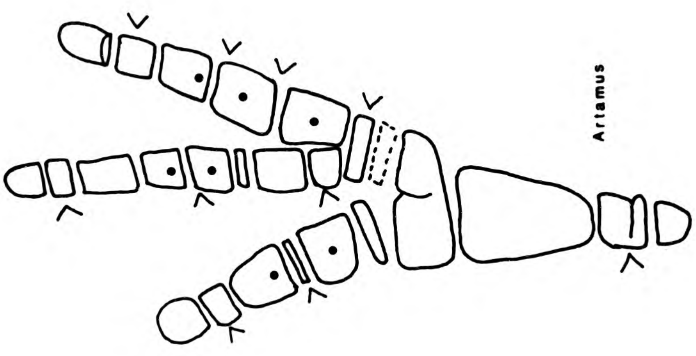


FIG.168




Callaeus

FIG.170



Artamus

FIG.171

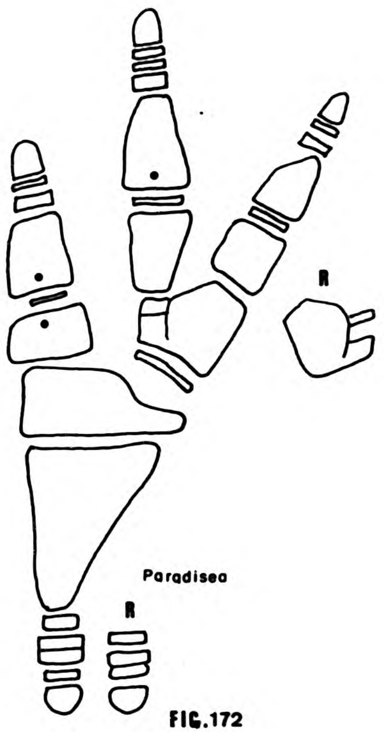



FIG.172

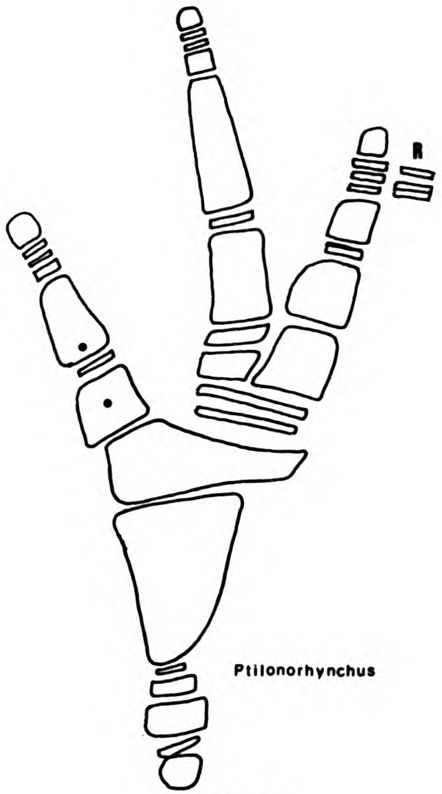



FIG.173

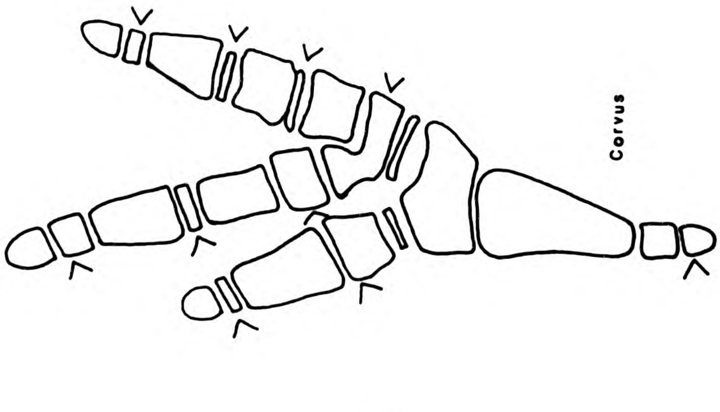



FIG. 174

# RESULTS

Code numbers for the characters are given in brackets. Only derived states are shown. Autapomorphies mentioned are derived states found throughout the taxon. (The dubious scoring of Characters 28 and 50 should be borne in mind.)

## SUB-ORDER OLIGOMYODI

### Family Dendrocolaptidae

Species examined: *Dendrocincla ?fuliginosa*, *D. homochroa*, *Campylorhamphus trochilirostris*, *Dendrocolaptes platyrostris*, *Lepidocolaptes affinis*, *L. angustirostris*, *Glyphorhynchus spirurus*, *Deconychura longicauda*, *Xiphirhynchus guttatus*, *X. picus*, *X. flavigaster* and *Sittasomus griseicapillus* (Figs.19-20).

Autapomorphies:

(a) two or more furrows on II 1 (6.1/6.2);

(b) one or more separate distal folds or pads on II 2 (8);

(c) pad or fold on II 2/3 raised (13);

(d) pad on II 3 raised (15);

(e) one or more furrows on III 1 (17.1);

(f) fold or pad on III 2/3 raised (22);

(g) distal pad on III 3 raised (24);

(h) pad on IV 4 raised (46).

All except *Glyphorhynchus* have one or more separate medial furrows on II 2 (9).

All except *Campylorhamphus* have the proximal pad on I 2 raised (5).
All except *Xiphirhynchus guttatus* have fold or pad on IV 3/4 raised (42).

Synapomorphies:

(a) two or more furrows on I 1 (1.1/1.2);

(b) pad on I 1/2 (2);

(c) one or more medial furrows on II 2 (9);

(d) pad on III 1/2 (18.4);

(e) one or more separate folds or pads on III 2/3 (21.1);

(f) III 3/4 fused to III 4 (26);

(g) fold or pad on III 3/4 raised (27);

(h) one or more folds on III 4 (28.2);

(i) pad and two or more proximal folds on III 4 (28.3/28.6);

(j) fold or pad on III 4 raised (65);

(k) fusion of IV 3/4 to III 3 (43);

(l) fusion of IV 5 to III 4 (63).

*Glyphorhynchus* is the least derived, *Sittasomus*, followed by *Deconychura*, the most derived (Fig.175).
This family is a well-defined taxon with many autapomorphies and synapomorphies (Fig.175). The two species of *Dendrocincla*, and similarly the two *Lepidocolaptes*, come out as adjacent taxa. Two species of *Xiphorhynchus* are also sister taxa, and a third is paired with *Campylorhamphus*, the former two pairs forming sister groups to each other. This would suggest that the characters used in this study show reasonable congruence

with those used by earlier taxonomists. Being scansorials they have numerous adaptive features not found in their assumed close relatives.

Family Furnariidae

Species examined: *Geositta cunicularia*, *Furnarius leucopus*, *Syndactyla rufosuperciliata*, *Phacellodomus ruber*, *Pseudoseiura lophotes*, *Upucerthia dumetaria*, *Cinclodes fuscus*, *Aphrastura spinicauda*, *Leptasthenura platensis*, *Synallaxis albescens*, *Certhiaxis cinnamomea*, *Spartonoica maluroides*, *Phleocryptes melanops*, *Anumbius annumbi*, *Lochmias nematura*, *Pseudocolaptes lawrencii*, *Philydor lichtensteini*, *Sclerurus caudacutus*, *Xenops rutilans*, *Pygarrhichas albogularis* and *Asthenes* (*Thripophaga*)*modesta*. (Fig.21-24).

All except *Cinclodes* have IV 4/5 fused to III 4 (54).
All except *Upucerthia* and *Asthenes* have one or more separate folds or pads on IV 4/5 (50.1/50.3).
Two trees can be constructed (Figs.176-7).
Synapomorphies:
(a) II 2/3 fused to II 2 (12.3) - alternatives A and B;
(b) II 2/3 has a separate fold or pad, or fused to II 2 (12.4) - alternatives A and B;
(c) medial / proximal pad on III 2 raised (20) - alternatives A and B;
(d) III 2/3 fused to III 2 (21.2) - alternatives A and B;
(e) III 2/3 fused to III 3 (21.3) - alternatives A and B;
(f) III 3/4 fused to III 4 (26) - alternatives A and B;

(g) distal pads on IV 3 raised (37) - alternative B;

(h) proximal pads on IV 3 raised (38) - alternative B;

(i) fold or pad on IV 3/4 raised (42) - alternative A;

(j) pad on IV 4 raised (46) - alternative A.

A rather ill-defined group with no autapomorphies suggesting that perhaps this is not a natural taxon. With only a difference of two synapomorphies between them, the two trees are very similar (Figs. 176-7). *Asthenes* and *Upucerthia* are the most derived, *Phylidor*, *Syndactyla*, *Leptosphenura*, *Certhiaxis* and *Phleocryptes* are the least. By moving the position of Characters 11 and 13 to the next main stem to the left, *Leptosphenura* and *Phleocryptes* become a pair, with *Certhiaxis* as a sister taxon.

<u>Family Formicariidae</u>

Species examined: *Gymnocichla nudiceps*, *Taraba major*, *Thamnophilus punctata*, *Myrmotherula fulviventris*, *Formicarius analis* and *Grallaria perspicillatus* (Figs.25-26,29).

<u>Family Conopophagidae</u>

Species examined: *Corythopsis torquata* and *Conopohaga lineata* (Figs.27-28).

<u>Family Rhinocryptidae</u>

Species examined: *Pteroptochus megapodius* (Fig.30).

Autapomorphies:

(a) III 4 not fused to II 3 (67);

(b) IV 4/5 fused to III 4 (54).

Two trees can be constructed, one with just Formicariidae (alternative A), and one with all three families (alternative B).

Synapomorphies:

(a) pad on I 1/2 (2) - alternative A;

(b) no distal fold or pad on I 2 (3) - alternatives A and B;

(c) pad on II 1/2 (7.4) - alternative A;

(d) proximal pad on II 2 raised (11) - alternatives A and B;

(e) one or more separate folds or pads on II 2/3 (12.1) - alternatives A & B;

(f) II 2/3 fused to II 2 (12.3) - alternative B;

(g) pad or fold on II 2/3 raised (13) - alternatives A and B;

(h) II 3 divided into 2 or more pads (14.1) - alternatives A and B;

(i) II 3 divided into 3 or more pads (14.2) - alternative B;

(j) pad on II 3 raised (15) - alternative A;

(k) distal pad on III 2 raised (19) - alternative A;

(l) medial/proximal pad on III 2 raised (20) - alternatives A and B;

(m) one or more separate folds or pads on III 2/3 (21.1) - alternative A;

(n) fold or pad on III 2/3 raised (22) - alternatives A and B;

(o) distal pad on III 3 raised (24) - alternatives A and B.

(p) proximal pad on III 3 raised (25) - alternatives A and B;

(q) proximal pad on IV 2 raised (33) - alternative B;

(r) distal pad on IV 3 raised (37) - alternative B;

(s) proximal pad on IV 3 raised (38) - alternative B;

(t) pad on IV 4/5 (50.4) - alternative B.

Formicariidae is defined by three autapomorphies, with *Formicarius* and *Grallaria* forming a highly derived group quite separate from *Gymnocichla*, *Myrmotherula*, *Thamnophilus* and *Taraba* (Fig.178). When a tree of all three families is constructed (Fig.179) the four least derived formicariids remain as a group, whereas *Corythopsis* and *Formicarius* are paired, with *Pteroptochus* as a sister group to these; *Grallaria* becomes a sister-group to these three, with *Conopophaga* a sister to all four. These findings suggest that perhaps Formicariidae is not a natural taxon, or perhaps should be expanded to includes these other two families.

<u>Family Pipridae</u>

Species examined: *Pipra pipra*, *Chiroxiphia pareola*, *Manacus manacus* and *Ilicura militaris* (Figs.33-34).

Family Cotingidae

Species examined: *Gymnoderus foetidus*, *Pachyrhamphus viridis*, *Querula purpurata*, *Perissocephalus tricolor*, *Tityra cayana*, *Procnias nudicollis* and *Rupicola rupicola* (Figs.31-32).

Family Phytotomidae

Species examined: *Phytotoma rutila* (Fig.35).

Taking all three families together

Autapomorphies:

(a) one or more separate distal folds or pads at II 2 (8);

(b) one or more separate folds or pads at III 2/3 (21.1).

All except *Pachyrhamphus* have IV 4/5 fused to IV 4 (50.2).

All except *Manacus* have III 4 not fused to II 3 (67).

All Cotingidae and Pipridae have IV 5 fused to III 4 (63).

Synapomorphies:

(a) III 3/4 fused to III 4 (26);

(b) III 4 has a pad and at least one proximal fold (28.2/28.6);

(c) IV 3/4 fused to III 3/4 (44);

(d) IV 4 fused to III 3/4 (48);

(e) IV 4/5 fused to III 3/4 (53);

(f) only one or more folds on IV5 (61/62);

(g) IV 5 fused to III 4 (63).

Taking the families separately

Family Pipridae

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 3/4 fused to III 4 (26);

(d) one or more separate distal folds or pads on IV 2 (31);

(e) IV 4/5 fused to IV 4 (50.2);

(f) IV 4/5 fused to III 3/4 (53);

(g) IV 5 fused to III 4 (63).

All except *Chiroxiphia* have a separate fold or pad on II 2/3 (12.1/12.4).

All except *Manacus* have

(a) III 4 not fused to II 3 (67);

(b) IV 3 fused to III 3 (40);

All except *Iliacura* have

(a) IV 4 fused to III 3/4 (48);

(b) IV 4 fused to III 4 (49);

(c) IV 4/5 with a separate fold or pad, or fused to IV 4 (50.3);

(d) IV 4/5 fused to III 4 (54).

Synapomorphies:

(a) III 3/4 fused to IV 3/4 (44);

(b) IV 4 fused to III 3/4 (48);

(c) IV 4 fused to III 4 (49);

(d) IV 4/5 with a separate fold or pad, or fused to IV 4 (50.3);

(e) IV 4/5 fused to III 4 (54).

This seems a well-defined group, although only four species were examined. *Iliacura* is the least derived (Fig.180).

Family Cotingidae

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) IV 5 fused to III 4 (63).

All except *Pachyrhamphus* have IV 4/5 fused to IV 4 (50.2).

Synapomorphies:

(a) a separate fold or pad on II 2/3 (12.1/12.4);

(b) a pad and one or more proximal folds on III 4 (28.2/28.6);

(c) IV 4 fused to III 4 (49);

(d) one or more folds only on IV 5 (61/62).

This family is not as well-defined as Pipridae, although more species were examined so the two are not strictly comparable. *Rupicola* and *Gymnoderus* are the least derived, and form a sister group to the others (Fig.181).

If a tree is drawn of all three families, three sister groups are formed. One consists of the piprids with *Rupicola*, another of *Gymnoderus* and *Procnias*, and the third of the remaining cotingids. *Phytotoma* is the sister group to all the others.

Family Tyrannidae

Species examined: *Xolmis irupero*, *Sayornis phoebe*, *Colonia colonia*, *Pyrocephalus rubinus*, *Machaetornis rixosus*, *Syristes sibilator*, *Myiozetetes*, *Contopus* sp., *Myiarchus magnirostris*, *Attila spadiceus*, *Empidonax virescens*, *Myiobius barbatus*, *Tolmomyias sulphurescens*, *Phylloscartes ventralis*, *Colopteryx galeatus*, *Serpophaga subcristata*, *Elaenia* sp., *Pipromorpha oleagina*, *Pitangus sulphuratus*, *Tyrannus dominicensis*, *Muscivora tyrannus*, *Satrapus icterophrys*, *Muscisaxicola* sp., *Fluvicola pica*, *Rhynchocychus olivaceus*, *Platyrhinchus mystaceus*, *Oncostoma olivaceum* and *Mionectes olivaceus* (Figs.37-42).

All except *Attila* have III 4 not fused to II 3 (67).
All except *Xolmis* and *Myiobius* have a separate fold or pad on IV 4/5, or fused to IV 4 (50.3).

Three dendrograms can be constructed.

Synapomorphies:

(a) a pad at II 1/2 (7.4) - alternatives A, B and C;

(b) pad on II 3 raised (15) - alternatives A and B;

(c) medial/proximal pad on III 2 raised (20) - alternatives A, B and C;

(d) distal pad on III 3 raised (24) - alternatives A, B and C;

(e) III 3/4 fused to III 4 (26) - alternatives A and C;

(f) two or more folds on III 4 (28.3) - alternatives A and B;

(g) III 3/4 fused to IV 3/4 (44) - alternatives A and C;

(h) IV 4 fused to III 3/4 (48) - alternatives A and C;

(i) IV 4 fused to III 4 (49) - alternatives A and C;

(j) IV 4/5 fused to III 3/4 (53) - alternative B;

(k) no pads or folds on IV 5 (55) - alternative B;

(l) IV 5 fused to III 4 (63) - alternative B;

(m) IV 5 fused to III 3/4 (64) - alternatives A, B and C.

A large, diverse group with no autapomorphies for the family. Of the three alternative dendrograms, A has ten, B nine and C eight synapomorphies (Figs.182-184). Examining the synapomorphies more thoroughly, it is found that Character 15 has a high randomness ratio (1.01). Character 28.3 is of rather dubious value (see 'Character Analysis'). Characters 7.4, 20, 24 and 64 are common. Characters 26, 44, 48 and 49 have somewhat higher randomness ratios (0.75 to 0.84) than Characters 53, 55 and 63 (0.39 to 0.67). The latter group is found in Alternative B, the former in Alternatives A and C. For this reason Alternative B is perhaps preferable. *Pyrocephalus* and *Empidonax* remain paired in all alternatives, with *Pipromorpha* as a sister taxon in alternatives A and B. *Tolmomyias* and *Rhynchocychus* are paired in all, with *Elaenia* close, and *Contopus* also in alternatives A and C. *Syristes* and *Mionectes* are paired, with *Colopteryx* as a sister group, in all alternatives. *Myiobius* and *Phylloscartes* are close in all, and *Attila* is close to these in the first two alternatives. *Machetornis* and *Platyrhynchus* are paired in all. *Sayornis*, *Myiozetetes* and *Fluvicola* are close in all, and with *Contopus* in alternative B. *Xolmis* and *Tyrannus* are paired in A and C; in B the former is the sister taxon to a group which includes *Tyrannus*. *Pitangus* and *Oncostoma* are sister taxa in A and B, with *Serpophaga* as a sister taxon in C. *Syristes*, *Mionectes*, *Colopteryx*, *Myiobius*, *Phylloscartes* and *Attila* are all close in A and B.

Family Oxyruncidae

Species examined: *Oxyruncus cristatus* (Fig.36).

This species was examined late and was not included in the LeQuesne test. It shows resemblances to Tyrannidae.

Family Eurylaimidae

Species examined: *Cymbirhynchus macrorhynchus*, *Calyptomena viridis*, *Smithornis capensis*, *Psarisomus dalhousiae* and *Eurylaimus javanicus*. (Figs.43-44).

Family Philepittidae

Species examined: *Neodrepanis coruscans* and *Philepitta castanea* (Fig.46).

Family Pittidae

Species examined: *Pitta reichenowi* (Fig.45).

Taking the three families together

All except *Pitta* have

(a) one separate fold or pad on II 2/3 (12.1/12.4);

(b) IV 4/5 fused to III 4 (54).

All except *Eurylaimus* have one or more separate folds or pads on III 2/3 (21.1).

All except *Calyptomena* have IV 4 fused to III 4 (49).

All except *Psarisomus* have IV 5 fused to III 4 (63).

Synapomorphies:

(a) one or more separate folds or pads on II 2/3 (12.1/12.4);

(b) IV 4/5 fused to III 4 (54).

Taking the families separately

Family Eurylaimidae

Autapomorphies:

(a) one separate fold or pad on II 2/3 (12.1/12.4);

(b) IV 4 fused to III 3/4 (48);

(c) IV 4/5 fused to III 4 (54).

All except *Psarisomus* have IV 5 fused to III 4 (63).

All except *Calyptomena* have

(a) one or more separate distal folds or pads on II 2 (8);

(b) III 3/4 fused to III 4 (26);

(c) one or more separate distal folds or pads on IV 2 (31);

(d) IV fused to III 4 (49).

All except *Eurylaimus* have

(a) one or more separate folds or pads on III 2/3 (21.1);

(b) IV 3 fused to III 3 (40);

(c) IV 4 fused to III 3/4 (48).

All except *Smithornis* have IV 4 fused to III 3 (47).

Synapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) III 3/4 fused to III 4 (26);

(c) III 4 not fused to II 3 (67);

(d) one or more separate folds or pads on IV 2 (31);

(e) IV 4 fused to III 4 (49);

(f) IV 4/5 fused to IV 4 (50.2);

(g) IV 4/5 fused to III 3 (52);

(h) IV 4/5 fused to III 3/4 (53).

Family Philepittidae

Autapomorphies:

(a) one separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) pad and one or more proximal folds on III 4 (28.2/28.6);

(d) III 4 not fused to II 3 (67);

(e) IV 4 fused to III 4 (49);

(f) IV 4/5 fused to IV 4 (50.2/50.3);

(g) IV 4/5 fused to III 4 (54);

(h) not pads alone on IV 5 (61);

(i) folds only on IV 5 (62);

(j) IV 5 fused to III 4 (63).

Family Acanthisittidae (Xenicidae)

Species examined: *Xenicus longipes* and *Acanthisitta chloris* (Figs.47-48).

Autapomorphies:

(a) proximal pad on II 2 raised (11);

(b) fold or pad on ii 2/3 raised (13);

(c) medial or proximal pad on III 2 raised (20);

(d) one or more separate folds or pads on III 2/3 (21.1);

(e) distal pad on III 3 raised (24);

(f) proximal pad on III 3 raised (25);

(g) pad and one or more proximal folds on III 4 (28.2/28.6);

(h) III 4 not fused to II 3 (67);

(i) one or more separate distal folds or pads on IV 2 (31);

(j) separate fold or pad on IV 4/5, or fused to IV 4 (50.3);

(k) not pads only on IV 5 (61);

(l) IV 5 fused to III 4 (63).

Taking all Old-World suboscines together -

There is no derived state shared by all.

Synapomorphies:

(a) proximal pad on II 2 raised (11);

(b) one or more separate folds or pads on II 2/3 (12.1/12.4);

(c) fold or pad on II 2/3 raised (13);

(d) medial/proximal pad on III 2 raised (20);

(e) distal pad on III 3 raised (24);

(f) proximal pad on III 3 raised (25);

(h) IV 4/5 fused to III 3 (52);

(i) IV 4/5 fused to III 3/4 (53).

Eurylaimidae form a clade, with *Calyptomena* least derived and justifying its subfamilial status (Fig.185). The family has four autapomorphies, but the subfamily Eurylaeminae has a further four. *Neodrepanis* and *Philepitta* form a clade (Philepittidae) and are the sister group to Eurylaemidae. Acanthisittidae appears as a sister group to Pittidae, and these together form a sister group, defined by four autapomorphies (11,13,20,24), to all the former. *Pitta* is highly derived, but many of its characters are autapomorphous to the genus when considered with other Old-World suboscines. The Acanthisittidae could be considered a sister group to the Menuroidea, but share only one derived character with this superfamily (Fig.186).

SUB-ORDER OSCINES

Superfamily Menuroidea

Species examined: *Menura novaehollandiae*, *Atrichornis clamosus* and *A. rufescens* (Figs.49-50).

Autapomorphies:

(a) pad at I 1/2 (2);

(b) one or more medial furrows on II 2 (9);

(c) separate fold or pad on II 2/3 (12.1/12.4);

(d) one or more separate folds or pads at IV 4/5 (50.1/50.3).

Both species of *Atrichornis* also have

(a) one or more separate folds at III 2/3 (21.1);

(b) pads and one or more distal folds at III 4 (28.2/28.5).

(c) III 4 not fused to II 3 (67).

These are therefore synapomorphies in the Menuroidea. The Menuroidea would appear to form a well-defined clade with six autapomorphies. The Atrichornithidae, with four autapomorphies, forms a sister group to Menuridae (Fig.186).

Family Alaudidae

Species examined: *Alaemon alaudipes*, *Eremophila alpestris*, *Eremopteryx signata*, *Melanocorypha leucoptera*, *Chersophilus duponti*, and *Alauda arvensis* (Figs.51-52).

Autapomorphies:

(a) a pad at I 1/2 (2);

(b) pad or fold at II 2/3 raised (13);

(c) pad or fold at III 2/3 raised (22);

(d) pad or fold at III 3/4 raised (27);

(e) no fusion between II 3 and III 4 (67);

(f) pad or fold at IV 3/4 raised (42);

(g) folds at IV 5 (61).

All except *Chersophilus* have either a separate fold or pad at II 2/3, or it is fused to II 2 (12.4).
All except *Alaemon* have folds at III 4 (28.2).
All except *Eremophila* have the fold or pad at IV 2/3 raised (35).

Synapomorphies:

(a) no separate distal fold or pad on I 2 (3);

(b) medial / proximal pad on III 2 raised (20);

(c) III 2/3 fused to III 2 (21.2);

(d) IV 2/3 fused to IV 3 (34.2);

(e) fold or pad on IV 2/3 raised (35);

(f) one or more proximal divisions on IV3 (36.1);

(g) distal pad on IV 3 raised (37);

(h) proximal pad on IV 3 raised (38);

(i) IV 3/4 fused to IV 3 (41.2);

(h) IV 4/5 fused to IV 4 (50.2).

A highly derived family, with seven autapomorphies, and ten synapomorphies within the family (Fig.187). *Chersophilus* and *Eremopteryx* are the most derived, *Eremophila* the least. A terrestial way of life is doubtless responsible for many adaptations to the plantar surface of the foot, including the number of raised pads and folds.

Family Hirundinidae

Species examined: *Stelgidopteryx ruficollis*, *Cecropis senegalensis*, *Delichon urbica*, *Riparia riparia* and *Hirundo rustica* (Figs.53-54).

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) proximal pad on II 2 raised (11);

(c) pad on II 3 raised (15);

(d) III 4 not fused to II 3 (67);

(e) one or more separate distal folds or pads on IV 2 (31).

All except *Cecropis* have

(a) separate fold or pad on II 2/3 (12.1/12.4);

(b) separate fold or pad on III 2/3 (21.1);

(c) pad on IV 4 raised (46);

(d) separate fold on IV 4/5, or fused to IV 4 (50.3);

(e) not pads only on IV 5 (61).

Synapomorphies:

All characters listed for species except *Cecropis*. Also pad(s) with one or more proximal folds on III 4 (28.2/28.6) and one or more separate folds or pads on IV 4/5 (50.1).

A well-defined taxon, with five autapomorphies. *Cecropis* is well separated from *Hirundo*, with which it is normally merged, by seven synapomorphies (Fig.188).

Family Motacillidae

Species examined: *Motacilla alba*, *Macronyx croceus*, *Anthus novaeseelandiae* and *Dendronanthus indicus* (Figs.55-56).

Autapomorphies:

(a) proximal pad on II 2 raised (11);

(b) medial/proximal pad on III 2 raised (20);

(c) one or more separate folds or pads on III 2/3 (21.1);

(d) proximal pad on III 3 raised (25);

(e) III 4 not fused to II 3 (67);

(f) proximal pad on IV 2 raised (33);

(g) proximal pad on IV 3 raised (38);

(h) one or more separate folds or pads on IV 4/5 (50.1/50.3);

(i) one or more folds only on IV 5 (61/62).

Synapomorphies:

(a) separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more proximal furrows on IV 2 (57.1);

(c) fold or pad on IV 2/3 raised (35);

(d) one or more divisions of the pad on IV 3 (36.1);

(e) IV 3/4 fused to IV 3 (41.2);

(f) fold or pad on IV 3/4 raised (42).

A highly derived and well-defined family with eleven autapomorphies, although only four genera were examined.

*Anthus* is the most derived, *Motacilla* the least (Fig.189). It would appear to be well adapted to a terrestial life, but only shares two autapomorphies with Alaudidae.

Family Pycnonotidae

Species examined: **Pycnonotus jocosus*, *P.simplex*, **P.plumosus*, **Andropadus curvirostris*, **Phyllastrephus debilis*, *P.terrestris*, *Bleda eximia*, *B.syndactyla*, **B.canicapilla* and **Bernieria zosterops* (Figs.57-58).

* = used in LeQuesne tests.

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) separate fold or pad on II 2/3 (12.1/12.4);

(c) one or more separate folds or pads on III 2/3 (21.1);

(d) III 4 not fused to II 3 (67);

(e) IV 4 fused III 4 (49), except one specimen of *Bernieria*;

(e) IV 4/5 fused to III 3 (50.3);

(f) IV 4/5 fused to III 4 (54).

Synapomorphies:

(a) pad and proximal fold(s) on III 4 (28.2/28.6);

(b) one or more separate folds or pads on IV 2 (31);

(c) IV 4/5 fused to IV 4 (50.2);

(d) folds only on IV 5 (61/62);

(e) IV 5 fused to III 4 (63).

A well-defined taxon with eight autapomorphies. *Bleda*, a ground living genus (pers.obs.) is quite distinct, the remaining genera being separated by a further seven autapomorphies. This possibly merits subfamily status.

Family Aegithinidae

Species examined: *Chloropsis sonnerati*, *Aegithina tiphia* and *Irena puella* (Figs.59-60).

Autapomorphies:

(a) no distal folds or pads on I 2 (3);

(b) separate fold or pad on II 2/3 (12.1/12.4);

(c) one or more separate folds or pads on III 2/3 (21.1);

(d) IV 4 fused to III 4 (49);

(e) IV 4/5 fused to IV 4 and not to IV 5 (50.2/50.3);

(f) IV 4/5 fused to III 4 (54);

(g) fold(s) only on IV 5 (61/62);

(h) IV 5 fused to III 4 (63).

Synapomorphies:

(a) III 3/4 fused to III 4 (26);

(b) pad and proximal fold(s) on III 4 (28.2/28.6);

(c) IV 2/3 fused to IV 3 (34.2);

(d) IV 3/4 fused to III 3/4 (44);

(e) IV 4 fused to III 3/4 (48);

(f) IV 4/5 fused to III 3/4 (53).

This family shares six derived characters with the previous family, and is probably very close. *Irena* is somewhat distinct from its sister group which contains the other two genera, and possibly merits subfamilial rank (Fig.191). Alternatively, this family could be sunk in the Pycnonotidae.

Family Campephagidae

Species examined: *Coracina lineata* and *Pericrocotus speciosus*. *Chlamydochaera jeffreyi*, traditionally placed in this family, is included under Turdidae. (Figs.61-62).

Autapomorphies:

(a) no folds or pads on I 2 (3);

(b) separate fold or pad on II 2/3 (12.1/12.4);

(c) one or more separate folds or pads on III 2/3 (21.1);

(d) pad and one or more proximal folds on III 4 (28.2/28.6);

(e) II 3 not fused to III 4 (67);

(f) IV 4/5 fused to IV 4 but not to IV 5 (50.2/50.3);

(g) only folds on IV 5 (61/62);

(h) IV 5 fused to III 4 (63).

If *Chlamydochaera* is considered, the same characters are shared by all three, except 50.2/50.3 and 62. These become synapomorphies for *Coracina* and *Pericrocotus*, which form the sister group to *Chlamydochaera* (Fig.192). The latter genus does not appear too dissimilar from the other two, but it can also fit well into the Turdidae, thus agreeing with Ames (1975) and Ahlquist *et al.* (1984).

Family Laniidae

Species examined: Subfamily Prionopinae - *Eurocephalus anguitimens* and *Prionops plumata*.

Subfamily Malaconotinae - *Laniarius barbarus* and *Telophorus multicolor*.

Subfamily Laniinae - *Corvinella corvina* and *Lanius tigrinus*.

Subfamily Pityriasinae - *Pityriasis gymnocephala*. (Figs.63-64,70).

Autapomorphies:

(a) one or more separate folds or pads on III 2/3 (21.1);

(b) III 4 not fused to II 3 (67);

(c) IV 4/5 not fused to IV 5 (50.3);

(d) IV 5 fused to III 4 (63).

Synapomorphies:

(a) no separate distal folds or pads on I 2 (3);

(b) III 3 has distal pad raised (24);

(c) pad and proximal fold(s) on III 4 (28.6);

(d) IV 4/5 fused to III 4 (54);

(e) not only pads on IV 5 (61);

(f) folds only on IV 5 (62).

The family is defined by four autapomorphies. *Laniarius* and *Prionops* form a sister group to the rest, which includes *Pityriasis*. *Eurocephalus* and *Lanius* form a sister group to *Telophorus*, and these three a sister group to *Corvinella*. *Pityriasis* is a sister taxon to these (Fig.193). This calls into question the traditional classification into subfamilies. *Pityriasis* may well not belong in this family (Ahlquist *et al.* 1984).

Family Vangidae

Species examined: *Calicalicus madagascariensis*, *Schetba rufa*, *Vanga curvirostra*, *Xenopirostris xenopirostris*, *Falculea palliata*, *Leptopterus madagascarinus*, *Euryceros prevostii* and *Hypositta corallirostris* (Figs.65-67).

Autapomorphies:

(a) one or more separate distal folds or pads on IV 2 (31);

(b) IV 4/5 not fused to IV 4 (50.3);

(c) IV 5 fused to III 4 (63).

All except *Hypositta* have

(a) two or more separate folds or pads on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) IV 4/5 fused to IV 4 (50.2).

Synapomorphies:

(a) no distal folds or pads on I 2 (3) - alternative A and B;

(b) one or more separate distal folds or pads on II 2 (8) - alternative A;

(c) separate fold or pad on II 2/3 (12.1/12.4) - alternative B;

(d) one or more separate folds or pads on III 2/3 (21.1) - alternative B;

(e) III 4 not fused to II 3 (67) - alternative B;

(f) IV 3 fused to III 3 (40) - alternative A;

(g) IV 3/4 fused to III 3 (43) - alternative A;

(h) IV 4 fused to III 3 (47) - alternative A;

(i) IV 4/5 fused to IV 4 (50.2) - alternative B.

This family is defined by three autapomorphies. However if the highly derived scansorial *Hypositta* is removed, in one arrangement (alternative B) four more autapomorphies are found. The two alternative arrangements are quite different. In 'A' *Hypositta* and *Vanga* are sister genera, and have the greatest number of synapomorphies. In 'B' *Hypositta* has four fewer synapomorphies than any other, and *Vanga* has one or two less than the others. In both arrangements *Calicalis* and *Schetba* form a pair, as do *Leptopterus* and *Xenopirostris*, with *Euryceros* not too distant (Fig.195). The polarity of Character 50.2 should be reversed (see 'Character Analysis') and it then becomes an autapomorphy for *Hypositta* only. Therefore the two alternatives have an equal number of synapomorphies. The randomness ratios of the characters found only in 'A' are greater than those only found in 'B' (0.94,1.07,0.85,0.85 *versus* 0,0,0,1.07) and on this reason the latter is to be preferred. This family is confined to the island of Madagascar and is superficially very diverse. If it were not for their distribution it is unlikely that they would be placed in one family, particularly *Hypositta*.

Family Bombycillidae

Species examined: Subfamily Ptilogonatinae - *Ptilogonys caudatus*, *Phainopepla nitens* and *Bombycilla garrulus*.

Subfamily Hypocoliinae - *Hypocolius ampelinus*. (Figs.68-69).

Autapomorphies:

(a) separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) IV 4/5 fused to IV 4 (50.2/50.3);

(e) IV 5 fused to III 4 (63).

Synapomorphies:

(a) pad on I 1/2 (2);

(b) no distal folds or pads on I 2 (3);

(c) pad and proximal folds on III 4 (28.2/28.6);

(d) not only pads on IV 5 (61).

Family Dulidae

Species examined: *Dulus dominicus* (Fig.71).

Shares the following derived character states with Bombycillidae.

(a) a separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) IV 4/5 fused to IV 4 (50.2);

If included in a dendrogram with Bombycillidae, it appears as a sister group to *Bombycilla* and *Hypocolius*, whereas *Ptilogonys* and *Phaenopepla* form a sister group to these three. The same synapomorphies are found. The two families together are defined by six autapomorphies (Fig.194). The findings here suggest that *Dulus* and *Bombycilla* be transferred to the Hypocolinae, while Ptilogonatinae remains for the other two genera.

<u>Family Troglodytidae</u>

Species examined: *Troglodytes troglodytes* and *Thryothorus ludovicianus* (Fig.76).

Autapomorphies:

(a) one or more medial furrows on II 2 (9);
(b) proximal pad on II 2 raised (11);
(c) pad or fold on II 2/3 raised (13);
(d) pad on II 3 raised (15);
(e) medial/proximal pad on III 2 raised (20);
(f) one or more separate folds or pads on III 2/3 (21.1);
(g) distal pad on III 3 raised (24);
(h) III 4 not fused to II 3 (67);
(i) one or more separate folds or pads on IV 2 (31);
(j) separate pad on IV 4/5 (50.1/50.3/50.4).

This would appear to be a highly derived family, the members of which have the ability to cling to many surfaces, and so could be expected to show numerous adaptations (Fig.197).

Family Prunellidae

Species examined: *Prunella modularis* (Fig.77).

(*n.b.* In the figure the outdated generic name *Accentor* is used in error.)

Family Cinclidae

Species examined: *Cinclus sp.* (Fig.78).

These last two families are small, each containing only one genus. Both are highly derived, the former no doubt having many adaptations for its unique (in passerines) life style, which involves much walking and swimming under water. The latter's apparent specialisations are less easily explained. It is fairly terrestial in its habits, but no more so than many species (*e.g.* certain timaliids) that do not have these derived character states.

Family Sturnidae

Species examined: Subfamily Sturninae - *Gracula religiosa* and *Sturnus vulgaris*.

Subfamily Buphaginae - *Buphagus africanus*. (Figs.72-73).

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) pad and one or more proximal folds on III 4 (28.2/28.6);

(c) III 4 not fused to II 3 (67);

(d) one or more separate folds or pads on IV 2 (31);

(e) IV 4/5 fused to III 4 (54);

(f) IV 5 fused to III 4 (63).

Synapomorphies:

(a) separate fold on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) separate pad on IV 4/5 (50.1/50.3/50.4);

(d) folds only on IV 5 (62).

Family Mimidae

Species examined: *Donacobius atricapillus* and *Toxostoma ludovicianus* (Figs.74-75).

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) one or more separate fold or pad on IV 2 (31);

(e) IV 4/5 fused to III 4 (54);

(f) IV 5 fused to III 4 (63).

The three species of sturnids examined share seven derived characters. *Buphagus* is well separated (by a further seven characters) which is to be expected from its unique foraging method of clambering on the bodies of large ungulates. Its subfamilial rank is probably well-merited (Fig.198). The sturnids share five derived characters with mimids (Fig.196), and one more if *Buphagus* is excluded. Merging this family into Sturnidae (Sibley and Ahlquist 1980,1984b) would seem merited.

Taking Troglodytidae, Prunellidae, Cinclidae, Sturnidae and Mimidae together:

Autapomorphies:

(a) III 4 not fused to II 3 (67);

(b) one or more separate folds or pads on IV 2 (31).

Synapomorphies:

(a) one or more separate medial furrows on II 2 (9);

(b) proximal pad on II 2 raised (11);

(c) pad or fold on II 2/3 raised (13);

(d) medial/proximal pad on III 2 raised (20);

(e) distal pad on III 3 raised (24);

(f) two or more folds on III 4 (28.3);

(g) proximal pad on IV 2 raised (33);

(h) IV 2/3 fused to IV 3 (34.2);

(i) fold or pad on IV 2/3 raised (35);

(j) distal pad on IV 3 raised (37);

(k) proximal pad on IV 3 raised (38);

(l) fold or pad on IV 3/4 raised (42);

(m) pad on IV 4 raised (46).

The traditional groupings are somewhat broken up (Fig.200).

Taking the above group without Sturnidae:

All have the same autapomorphies. The same synapomorphies are found, except that Character 20 is excluded, and Character 21.1 ( one or more separate folds or pads on III 2/3) is included. Once again the arrangement does not agree with traditional groupings (Fig.199).

<u>Family Turdidae</u>

Species examined: *#Neocossyphus rufus, N. poensis, #Cossypha cyanocampter, Turdus olivaceus, T. pilaris, T. ericetorum, T. litsipsirupa, T. albicollis, T. libonyanus, T. nudigenis, T. migratorius, T. merula, T. boulboul, T. plumbeus, T. fuscator, T. viscivorus, #T. falklandi, T. leucomelas, T. obscurus, T. serranus, T. unicolor, T. ruficollis, T. abyssinicus, T. torenatis, T. chrysolaus, T. fumigatus, T. rufiventris, T. iliacus, T. poliocephala, #Brachypteryx leucophrys, #Phoenicurus ochrurus, #Alethe diademata, A. fulleborni, #Oenanthe oenanthe, #Cinclidium frontalis, #Modulatrix orostruthus, M. stictigula, #Myadestes unicolor, #Stizorhina fraseri, S. finschii, #Zoothera ( dauma ) lunulata, Z. sibirica, Z. citrinus, Z.mollissima, #Grandala coelicolor, #Sialia mexicana, #Erithacus rubecula, #Monticola cinclorhynchus, #Chaetops fraenatus, #Entomodestes coracinus, #Thamnolaea semirufa, #Pogonocichla stellata, #Erythropygia galactotes, #Cichladusa aquatica, #Copsychus saularis, #Myrmecocichla arnotti, #Rhyacornis fuliginosus, #Saxicoloides fulicata, #Pseudocossyphus sharpei, #Enicurus sharpei, #Saxicola*

*torquata*, **Cercomela familiaris*, **Chaimarrornis leucocephalus*, **Myiophoneus caeruleus*, **Nesocichla eremita*, **Hylocichla mustelina*, **Catharus ustulatus*, *C. guttatus*, *C.minimus*, **Platycichla flavipes* and **Chlamydochaera jeffreyi*. It should be noted that *Drymodes*, traditionally considered a member of this family, has been excluded, whereas *Chlamydochaera*, traditionally placed in Campephagidae has been included here (Figs.79-87).
* = used in LeQuesne tests.

All except *Zoothera (dauma) lunulata* have III 4 not fused to II 3 (67). However, in its congeners *sibirica*, *citrinus* and *mollissima* it is also not fused.
All except *Modulatrix orostruthus* and *Oenanthe* have IV 4/5 fused to III 4 (54). In *M. stictigula* it is fused.
All except *Oenanthe* have IV 5 fused to III 4 (63).

Two trees can be constructed.

Synapomorphies:
(a) fold or pad on II 1/2 fused to II 2 (7.3) - alternatives A and B;
(b) medial / proximal pad on III 2 raised (20) - alternatives A and B;
(c) distal pad on III 3 raised (24) - alternatives A and B;
(d) proximal pad on IV 3 raised (38) - alternatives A and B;
(e) fold or pad on IV 3/4 raised (42) - alternative A;
(f) pad on IV 4 raised (46) - alternatives A and B;

(g) fold or pad on IV 4/5 raised (51) - alternative B.

A large group with not a single autapomorphy. There are few synapomorphies (five in each of the alternatives) (Fig.201-202). The alternative arrangements affect only a small number of genera. There is a difference of only one synapomorphy between the two alternatives. Character 51 has a slightly lower randomness ratio than 42 (0.81 to 0.86), and one *versus* two polar incompatibilities. Otherwise there is no reason to prefer one alternative to the other. *Chlamydochaera* can easily be accommodated into the arrangement, in agreement with Ames (1975) and Ahlquist *et al.* (1984). Possibly the 'amorphous' appearance is to be expected when a large group is examined using characters where there is a great degree of homoplasy.

<u>Subfamily Orthonychinae</u>

Species examined: *Orthonyx temminckii*, *Psophodes olivaceus*, *Cinclosoma cinnamomeum*, *C.castanotum*, *Sphenostoma cristatum*, *Ptilorrhoa castanota*, *Eupetes macroscelis*, *Melampitta gigantea* and *Ifrita kowaldi*.
*inc.sedis:* *Pomatostomus ruficeps*, *P.superciliosus*, *P.temporalis*, *Crateroscelis nigrorufa*, *Picathartes oreus* and *P.gymnocephalus* (Figs.88-97).

All have a separate fold or pad on IV 4/5, or it is fused to IV 4 (50.3).
All except *Orthonyx* has III 4 not fused to II 3 (67).

All except *Orthonyx* and *Eupetes* have IV 5 fused to III 4 (63).

Synapomorphies:

(a) no separate fold or pad on II 1/2 (7.1);

(b) II 1/2 fused to II 1 (7.2);

(c) II 1/2 fused to II 2 (7.3);

(d) proximal pad on II 2 raised (11);

(e) fold or pad on II 2/3 raised (13);

(f) pad on II 3 raised (15);

(g) III 1/2 fused to III 1 (18.2);

(h) medial or proximal pad on III 2 raised (20);

(i) III 2/3 fused to III 3 (21.3);

(j) distal pad on III 3 specialized (24);

(k) III 3/4 fused to III 4 (26);

(l) IV 1/2 fused to IV 1 (30.2);

(m) proximal pad on IV 2 specialized (33);

(n) IV 3/4 fused to III 3/4 (44);

(o) IV 4 fused to III 3/4 (48);

(p) IV 4 fused to III 4 (49);

(q) IV 4/5 fused to III 3 (52).

A mixed bag, containing a number of highly derived genera, which would appear not to be a natural grouping (Fig.205). The West African *Picathartes* appears as a sister group to the highly derived Australo-New Guinea *Orthonyx*. The Australo-New Guinea *Cinclosoma* would appear to be close to the Malesian *Eupetes*, but the latter is quite distinct from the New Guinea *Ptilorrhoa* (*contra* Sibley and Ahlquist

1984a, who merge the two). Only skins were available of this last genus, but the differences were so marked that a close relationship with *Eupetes* would seem out of the question. However, this study does support these authors insofar as *Eupetes-Cinclosoma-Sphenostoma* form a clade, but *Psophodes* and *Ptilorrhoa* are distant. The Australo-New Guinean *Pomatostomus* is quite distinct, but could be close to *Melampitta* or *Ptilorrhoa*. *Ifrita* also shows some overall resemblance to *Pomatostomus*.

Family Timaliidae

Species examined: **Pellorneum capistratum*, **P. ruficeps*, **Trichastoma albipectus*, *T. bicolor*, *T. fulvescens*, **T. malaccense*, *T. puveli*, *T. pyrrhoptera*, *T. rostratum*, *T. tickelli*, **Malacopteron affine*, *M. albogulare*, *M. cinereum*, *M. magnirostre*, **M. magnum*, **Ptyrticus turdinus*, **Pomatorhinus hypoleucos*, *P. ochraceiceps*, *P. ruficollis*, *P. schisticeps*, **Ptilocichla falcata*, **Kenopia striata*, *Napothera atrigularis*, *N. brevicaudata*, *N. epilepidota*, **N. macrodactyla*, **Pnoepyga pusilla*, **Garritornis isidori*, **Xiphyrhynchus superciliaris*, **Jabouillea danjou*, **Rimator malacoptilus*, **Spelaeornis caudata*, **Sphenocichla humei*, **Neomixix flaviviridis*, **N. tennela*, **Stachyris chrysaea*, *S. erythroptera*, *S. maculata*, *S. nigriceps*, *S. nigricollis*, *S. poliocephala*, *S. ruficeps*, *S. striolata*, *S. thoracica*, **Dumetia hyperythra*, *Macronous gularis*, **M. ptilosus*, **Timalia pileata*, **Rhopocichla atriceps*, *Tudoides caudatus*, *T. jardinei*, **T. leucopygius*, *T. melanops*, **T. plebeja*, *T. squamiceps*, *T. rubiginosus*, *T. striatus*, **Garrulax affinis*, *G. canorus*, *G. chinensis*, *G. davidi*, *G. erythrocephalus*, *G. leucolophus*, *G. lugubris*, *G. maesi*, *G. merulinus*, *G. milnei*, *G. mitrata*, *G. sannio*, *G. subunicolor*, *G. striatus*, **Leiothrix argentarius*, *L. lutea*, **Cutia nipalensis*, **Pteruthius melanotis*, *P. rufiventer*, **Gamsorhynchus rufulus*, **Minla cyanaouroptera*, *M. ignotincta*, *M. strigula*, **Alcippe brunnea*, *A. brunneicauda*, *A. castaneiceps*, *A. chrysotii*, *A.morrisonia*, *A. nipalensis*, *A. peracensis*, *A. poioicephala*, *A. ruficapilla*, *A. rufogularis*, *A. cinereiceps*, **Heterophasia annectans*, *H. capistrata*, *H. melanoleuca*, *H. picaoides*, **Yuhina castaniceps*, *Y. flavicollis*, *Y. gularis*, *Y. nigrimenta*, *Y. xantholeuca*, **Babax waddeli*, **Liocichla steerii*, **Myzornis pyrrhoa*, **Actinodura egertoni*, **Lioptilus nigricapillus*, **Kupeornis gilberti*, **Paraphasma galinieri*, **Phyllanthus atripennis*, **Crocias albonotatus* and **Kakamega poliothorax* (Figs.98-101).

* = used in LeQuesne tests.

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) separate fold or pad on IV 4/5, or fused to IV 4 (50.3).

All except *Heterophasia annectans*, and some specimens of *Pteruthius melanotis* and *Macronous gularis*, have IV 4/5 fused to III 4 (54).

Two trees can be constructed (Fig.203-204). (*n.b.* On Alternative A, Part 2 *Stachyris* is misspelt.)

Synapomorphies:

(a) II 1/2 fused to II 2 (7.1/7.3) - alternative B;

(b) pad on II 3 raised (15) - alternative A;

(c) fold or pad on III 2/3 raised (22) - alternatives A & B;

(d) two or more distal furrows at III 3 (23) - alternatives A & B;

(e) III 3/4 fused to III 4 (26) - alternative B;

(f) proximal pad on IV 2 raised (33) - alternatives A & B;

(g) distal pad on IV 3 raised (37) - alternative A;

(h) proximal pad on IV 3 raised (38) - alternative A;

(i) pad on IV raised (46) - alternative A;

(j) separate pad on IV 4/5 (50.1/50.4) - alternative B;

(k) no pads or folds on IV 5 (55) - alternatives A & B.

A large number of species and specimens were examined. The family is defined by four autapomorphies, and the vast majority share a further derived character state. Some genera show marked differences in overall appearance of the plantar surface, but much of this appears to be the result of homoplasy. This results in little robustness when comparing the relationships shown in the two alternative trees. *Kakamega*, *Pellorneum* and *Pnoepyga* seem very distinct from the other genera in overall appearance, and this may be connected with fondness for walking on the ground. However, other terrestrial genera, e.g. *Turdoides* and

*Garrulax*, do not show this. Removing 50.1/50.4 gives 'A' one more synapomorphy and a lower mean randomness ratio for the synapomorphies (1.07 *versus* 1.13). Therefore 'A' should be preferred. The characters used in this study would not seem to be particularly useful for finding intergeneric relationships within this family.

*inc.sed.* *Horizorhinus dohrni*, *Oxylabes madagascariensis*, *Mystacornis crossleyi* and *Malia grata* (Figs.104-107). These were run with Polioptilinae in the LeQuesne test.

<u>Sub-family Polioptilinae</u>

Species examined: **Ramphocaenus melanurus*, **Polioptila caerulea*, *P.dumicola* a· *P.plumbea* (Figs.108-109).

* = used in LeQuesne tests.

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) one or more separate folds or pads on III 2/3 (21/.1);

(c) one or more separate distal folds or pads on IV 2 (31);

(d) one or more separate folds or pads on IV 4/5 (50.1/50.3);

(e) IV 4/5 fused to III 4 (54);

(f) IV 5 fused to III 3/4 (63).

When run with Timaliidae *inc.sed.* two alternative trees can be constructed (Fig.208).

All except *Rhamphocaenus* have one or more separate folds or pads on II 2/3 (12.1/12.4) and III 4 not fused to II 3 (67).

All except *Malia* have IV 4/5 not fused to IV 5 (50.2).

All except *Malia*, and one specimen each of *Oxylabes* and *Mystacornis*, have IV 4/5 fused to III 4 (54).

Synapomorphies:

(a) one or more separate folds or pads on II 2/3 (12.1/12.4) - alternatives A & B;

(b) pad on II 3 raised (15) - alternative A;

(c) pad and one, or more, proximal folds on III 4 (28.2/28.6) - alternatives A & B;

(d) III 4 not fused to II 3 (67) - alternatives A & B;

(e) pad on IV raised (46) - alternative A;

(f) IV 4 fused to III 4 (49) - alternative B;

(g) IV 4/5 fused to IV 4 (50.2) - alternative B;

(h) folds only on IV 5 (61/62) alternatives A & B.

When the whole group is run together, Polioptilinae is split. *Oxylabes* is possibly close to *Horizorhinus*, and the latter is probably rightly placed in the Timaliidae. *Malia* is more distinct, and *Mystacornis* even more. Character 50.2 should be repolarised (see Character Analysis ) and would no longer be a synapomorphy for Alternative B, which will now have one less than A. For this reason Alternative A is preferred. Although *Oxylabes* and *Mystacornis* are Malagasy genera, their affinities would appear not to be with the vangids.

Family Paradoxornithidae

Species examined: *Chamaea fasciata*, *Chrysomma sinense*, *Moupinia altirostris*, *Paradoxornis heudei*, *P.webbiana*, *Conostoma oemodium* and *Panurus biarmicus* (Figs.102-103).

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) IV 4/5 not fused to IV 5 (50.3).

All except one specimen of *Panurus* have IV 4/5 fused to IV 4 (50.2) and IV 5 fused to III 4 (63).

All except *Chamaea fasciata* have

(a) a separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on IV 2 (31);

(c) IV 5 fused to III 4 (63) - *Chamaea* lacks pads or folds on IV 5.

Synapomorphies:

(a) a separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more folds on III 4 (28.2);

(c) two, or more, folds, but no pads, on III4 (28.3/28.4);

(d) one or more separate folds or pads on IV 2 (31);

(e) folds only on IV 5 (61/62);

(f) IV 5 fused to III 4 (63).

This family is defined by four autapomorphies. *Chamaea* forms a sister group to the others, which share four further autapomorphies (Fig.206). The two species of *Paradoxornis* examined (*heudei* and *webbiana*) are well separated. Since these two are rather different in bill shape and plumage, perhaps they should not be considered congeneric. This family can be accommodated within Timaliidae, as is frequently suggested (*e.g.* Campbell and Lack 1985).

Family Sylviidae

Species examined: *Eminia lepida*, *Sylvia hortensis*, *Cisticola lateralis*, *Melocichla mentalis*, *Prinia flaviventris*, *Acrocephalus palustris*, *Hippolais languida*, *Macrosphenus concolor*, *Locustella lanceolata*, *Megalurus galactotes*, *Eremiornis carteri*, *Parisoma plumbeum*, *Hyliota flavigaster*, *Hylia prasina*, *Phylloscopus laurae*, *Seicercus poliogenys*, *Regulus regulus*, *Conopoderas caffra*, *Dromaeocercus seebohmi*, **Amaurocichla bocagei* and *Orthotomus ruficeps* (Fig.110-118).

*Cinclorhamphus cruralis* and **C.mathewsi* were previosly included in Maluridae (or some other Australian group). They fit well except that they lack one or more separate folds or pads on III 2/3 (21.1).

* = not used in LeQuesne tests.

Autapomorphies:

(a) one or more folds or pads on III 2/3 (21.1);

(b) fold or pad on III 4 not fused to II 3 (67).

All except *Hyliota* have one separate fold or pad on II 2/3 (12.1/12.4).

Synapomorphies:

(a) pad on II 3 raised (15);

(b) distal pad on III 3 raised (24);

(c) proximal pad on III 3 raised (25);

(d) pad on IV 4 fused to III 3/4 (48);

(e) pad on IV 4 fused to III 4 (49);

(f) one or more separate folds or pads on IV 4/5 (50.1/50.3);

(g) IV 4/5 fused to IV 4 (50.2);

(h) IV 4/5 fused to III 3/4 (53).

A rather ill-defined group with only two autapomorphies. *Locustella* and *Megalurus*, and *Orthotomus* and *Hyliota* have the greatest number of synapomorphies (Fig.209). *Amaurocichla* shows a number of unusual features, and may possibly have scansorial or extreme terrestrial habits. It does not have the derived state of Character 21.1, and therefore perhaps does not belong in this family. However, only the type specimen (skin) was available for examination, and this is very old, hence many features of the plantar surface were obscured. This species was examined late, and was not run in a LeQuesne test. The arrangement arrived at shows little congruence with any other classification and quite possibly this is not a monophyletic grouping.

Family Paridae

Species examined: *Parus major* (Fig.124).

Family Remizidae

Species examined: *Anthoscopus caroli* and *Auriparus flaviceps* (Fig.122).

Family Aegithalidae

Species examined: *Psaltriparus minimus* and *Aegithalos* caudatus (Fig.123).

Autapomorphies:

(a) separate fold or pad at III 2/3 (21.1);

(b) either a separate fold or pad at IV 4/5, or it is fused to IV 4 (50.3).

All except *Auriparus* have

(a) folds at III 4 (28.2);

(b) folds only at IV 5 (61/62);

(c) IV 5 fused to III 4 (63).

Both Remizidae also have

(a) a pad on IV 4/5 (50.1/50.4);

(b) IV 4/5 fused to III 4 (54);

(c) only folds on IV 5 (62).

Synapomorphies:

(a) proximal pad at II 2 raised (11);

(b) pad or fold at II 2/3 raised (13);

(c) pad at II 3 raised (15);

(d) distal pad at III 3 raised (24);

(e) medial / proximal pad at III 3 raised (25);

(f) two or more folds at III 4 (28.2/28.3);

(g) IV 2/3 fused to IV 3 (34.2);

(h) folds only at IV 5 (61/62);

(i) IV 5 fused to III 4 (63).

When the three families are run together the family groupings are lost (Figs.210-212). This could be interpreted as homoplasy rendering the exercise rather futile, or, there is no support for the division of this group into three families on these characters.

SCANSORIAL FAMILIES

This grouping excludes the suboscine Neotropical Dendrocolaptidae and the vangid *Hypositta*, although the latter is considered in the formation of one dendrogram.

Family Sittidae

Species examined: Subfamily Sittinae - *Sitta canadensis* (Fig.128).

Subfamily Tichodrominae - *Tichodroma muraria* (Fig.129).

Family Neosittidae

Species examined: *Neositta chrysoptera* (Fig.130).

Family Certhiidae

Species examined: *Certhia familiaris* and *Salpornis spilonotus* (Fig.126-127).

Family Rhabdornithidae

Species examined: *Rhabdornis mystacalis* (Fig.125).

Family Climacteridae

Species examined: *Climacteris melanura* (Fig.131).

Taking all families together, all have
(a) proximal pad on II 2 raised (11);
(b) pad or fold on II 2/3 raised (13).
All except *Climacteris* have the medial/proximal pad on III 2 raised (20) and III 4 not fused to II 3 (67).
All except *Rhabdornis* have
(a) one or more separate medial furrows on II 2 (9);
(b) proximal pad on IV 2 raised (33);
(c) pad on IV 4 raised (46).
All except *Neositta* and *Rhabdornis* have
(a) one or more proximal furrows on IV 2 (57.1);
(b) proximal pad on IV 3 raised (38).
All except *Tichodroma* (and *Climacteris* because it has no discernable features on IV 5) have
(a) folds only IV 5 (61/62);
(b) IV 5 fused to III 4 (63).
All except *Sitta* have the pad on II 3 raised (15).
All except *Tichodroma* have
(a) one or more distal folds or pads on II 2 (8);

(b) IV 4/5 not fused to IV 5 (50.3).

All except *Climacteris* and *Tichodroma* have one or more folds on III 4 (28.2).

All except *Neositta* and *Tichodroma* have one or more separate folds or pads on IV 4/5 (50.1).One tree can be drawn for Certhiidae, Sittidae and Rhabdornithidae (alternative A), and one to include, Climacteridae, Neosittidae and *Hypositta* also (alternative B) (Fig.213).

All those in Alternative A have

(a) proximal pad on II 2 raised (11);

(b) pad or fold on II 2/3 raised (13);

(c) medial/proximal pad on III 2 raised (20;

(d) III 4 not fused to II 3 (67).

All those in Alternative B share character 13.

Synapomorphies:

(a) one or more furrows on I 1 not associated with I 1/2 (1.1) - alternative A;

(b) proximal pad on I 2 raised (5) - alternative A;

(c) one or more furrows on II 1 not associated with II 1/2 (6.1) - alternative B;

(d) one or more separate medial furrows on II 2 (9) - alternatives A & B;

(e) one or more furrows on III 1 not associated with II 1/2 (17.1) - alternative B;

(f) III 2/3 fused to III 2 (21.2) - alternatives A & B;

(g) fold or pad on II 2/3 raised (22) - alternative A;

(h) no pads on III 4 (28.4) - alternative B;

(i) one or more furrows on IV 1 not associated with IV 1/2 (29.1) - alternative B;

(j) proximal pad on IV 2 raised (33) - alternative A;

(k) one or more proximal furrows on IV 2 (57.1) - alternatives A & B;

(l) fold or pad on IV 2/3 raised (35) - alternative A;

(m) one or more divisions of pad on IV 3 (36.1) - alternative B;

(n) proximal pad on IV 3 raised (38) - alternatives A & B;

(o) IV 3/4 fused to IV 3 (41.2) - alternative A;

(p) fold or pad on IV 3/4 raised (42) - alternative A;

(q) one or more divisions of pad on IV 4 (45.1) - alternative A;

(r) pad on IV raised (46) - alternatives A & B;

(s) pad on IV 4/5 (50.4) - alternatives A & B.

Considering Sittidae, Certhiidae and Rhabdornithidae together they are characterised by four autapomorphies. If the last family is excluded they are characterised by a further seven autapomorphies. When the above group is run with *Neositta*, *Climacteris* and *Hypositta*, there is only one autapomorphy; with the removal of *Rhabdornis* there are two more. *Certhia* and *Salpornis* are close in both arrangements, but otherwise there is little robustness. *Rhabdornis* is almost certainly not a scansorial, or is one that has recently taken up this mode of life. S.A.Parker (*in litt.*) believes it is not a scansorial. *Certhia* and *Salpornis* deserve placement in the same family, whereas *Tichodroma* and *Sitta* would appear to merit separation into two families, as in Campbell and Lack (1985), but not as in most classifications (*e.g.* Sibley 1985). If *Rhabdornis* is excluded, it would appear that the scansorial habit has evolved five of six times in the oscines. This has resulted in much homoplasy, although the overall appearance of the plantar surface is quite different in each of the taxa examined, suggesting that they are not at all close.

Family Muscicapidae

Species examined: **Rhinomyias ruficauda*, **Niltava grandis*, *N.hodgsoni*, **Newtonia ?amphichroa*, **Bradornis pallidus*, **Fraseria cinerascens*, **Muscicapa latirostris*, *M.thalassina* and **Ficedula mugimaki* (Figs.119-121).

* = used in LeQuesne test.

Autapomorphies:

(a) one or separate folds or pads at III 2/3 (21.1);

(b) III 4 not fused to II 3 (67);

(c) fusion of IV 4/5 to III 4 (54).

All except *Niltava* have

(a) separate fold or pad at II 2/3 (12.1/12.4);

(b) one or more separate distal folds or pads at IV 2 (31).

All except *Newtonia* have

(a) one or more separate distal folds or pads on II 2 (8);

(b) IV 5 fused to III 4 (63).

Synapomorphies:

(a) proximal pad on II 2 raised (11);

(b) a separate fold or pad on II 2/3 (12.1/12.4);

(c) medial or proximal pad on III 2 raised (20);

(d) distal pad on III 3 raised (24);

(e) pad and one or more proximal folds on III 4 (28.2/28.6);

(f) one or more separate distal folds or pads on IV 2 (31);

(g) not pads only on IV 5 (61).

A small group was examined, but only three autapomorphies found (Fig.207). However, without *Niltava* a further three autapomorphies define the remainder. There are overall resemblances between some members of this group and Turdidae, thus supporting Ames (1975).

Family Eopsaltriidae

Species examined: *Microeca leucophaea*, *Eopsaltria georgiana*, *Petroica cucullata*, *Penoenanthe pulverulenta* and *Poecilodryas superciliosus* (Fig.132-133).

Autapomorphies:

(a) one or more separate distal folds or pads at II 2 (8);

(b) III 4 not fused to II 3 (67);

(c) one or more separate distal folds or pads at IV 2 (31);

(d) not only pads at IV 5 (61).

All except *Microeca* have

(a) one separate fold or pad at II 2/3 (12.1/12.4);

(b) one or more separate folds or pads at III 2/3 (21.1).

Synapomorphies:

Characters above which are found in all species except *Microeca*.

Also IV 2/3 fused to IV 3 (34.2).

This family is defined by four autapomorphies, with *Microeca* as a sister taxon to the remaining five genera, which are defined by a further three autapomorphies (Fig.219). Probably not at all close to the Muscicapidae with which it has been merged (*e.g.* Morony *et al.*1975).

Family Monarchidae

Species examined: *Batis minor*, *Platysteira cyanea*, *Bias musicus*, *Pseudobias wardi*, *Myiagra azureocapilla*, *Terpsiphone rufocinerea*, *Hypothymis azurea*, *Seisura inquieta*, *Monarcha verticalis*, *Elminia longicauda*, *Mayrornis lessoni*, *Trochocercus nitens*, *Clitorhynchus hamleni*, *Erythrocercus mccalli*, *Machaerhynchus nigripectus*, *Philentoma pyrrhoptera* and *Arses lorealis* (Figs.134-137).

All have III 4 not fused to II 3 (67).

All except *Machaerhynchus* have a separate fold or pad on III 2/3 (21.1) and IV 4/5 fused to IV 4 (50.2).

All except *Machaerhynchus* and *Erythrocercus* have IV 5 fused to III 4 (63).

Synapomorphies:

(a) one or more separate folds or pads on III 2/3 (21.1);

(b) folds on III 4 (28.2);

(c) pad(s) and proximal fold(s) on III 4 (28.6);

(d) IV 4/5 fused to IV 4 (50.2);

(e) not just pads on IV 5 (61).

This group is characterised by only one autapomorphy, and is possibly not a monophyletic grouping (Fig.218), or if it is, there is considerable homoplasy. *Rhipidura* (Fig.139) can be fitted into the dendrogram as one of the most derived taxa. *Machaerhynchus* is the least derived. Three members of the Afro-tropical subfamily Platysteirinae cluster, but the fourth member (*Bias*) is separated by three synapomorphies. The remaining Afro-tropical members are interspersed amongst the Oriental and Australasian genera. Boles (1979) includes *Rhipidura* in the Monarchinae, but excludes *Hypothymus*, *Terpsiphone* and the African 'monarchs'.

Subfamily Rhipidurinae

Species examined: *Rhipidura spilodera* (Fig.139).

This genus fits Monarchidae (see above) and Pachycephalinae (see below) without the loss of any synapomorphies.

Subfamily Pachycephalinae

Species examined: *Falcunculus frontatus*, *Oreoica gutturalis*, *Pachycephala pectoralis*, *Colluricincla* *megarhyncha* and *Pitohui kirhocephalus* (Fig.138). *Rhipidura* was also considered here.

All (including *Rhipidura*) have

(a) separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) IV 4 fused to III 4 (49);

(d) IV 4/5 fused to IV 4 (50.2);

(e) IV 4/5 fused to III 4 (54);

(f) IV 5 fused to III 4 (63).

All except *Pachycephala* have one or more folds on III 4 (28.2).

All except Falcunculus have IV 4/5 not fused to IV 5 (50.3).

Two alternative trees can be constructed.

Synapomorphies:

(a) one or more separate distal folds or pads on II 2 (8) - alternative A;

(b) one or more folds on III 4 (28.2) - alternative B;

(c) pad plus one or more proximal folds on III 4 (28.6) - alternatives A & B;

(d) folds only on IV 5 (61/62) - alternatives A & B.

This group is well defined by seven autapomorphies (Fig.220). *Colluricincla* and *Pitohui* form a pair in both alternatives, with *Rhipidura* as sister group. *Falcunculus* or *Pachycephala* can be seen as the least derived. The two alternative synapomorphies are of dubious polarity. There is no reason to prefer one alternative to the other. Boles (*op.cit.*) adds the Eopsaltiidae to this group to form the Pachycephalinae, a sister group to the Monarchinae in the family Pachycephalidae.

Family Maluridae

Species examined: Subfamily Malurinae - *Malurus coronatus*, *Stipiturus malachurus* and *Amytornis striatus*.

Subfamily Acanthizinae - *Gerygone levigaster*, *Smicrornis brevirostris*, *Aphelocephala nigricincta*, *Acanthiza chrysorrhoa*, *Sericornis maculatus*, *Calamanthus fuliginosus*, *Hylacola cauta* and *Pyrrholaemus brunneus*.

Subfamily Ephthianurinae - *Ephthianura tricolor*.

*inc. sed.* - *Lamprolia victoria*, *Cinclorhamphus cruralis* and **C.mathewsi* (Figs.118,140-146)

(The last two are also considered in Sylviidae.)

* = not used in LeQuesne test.

All except *Lamprolia* have III 4 not fused to II 3 (67).

All except *Amytornis* and *Cinclorhamphus* have one or more separate folds or pads on III 2/3 (21.1).

All except *Sericornis* have IV 4/5 fused to III 4 (54).

All except *Amytornis* and *Pyrrholaemus* have one or more separate distal folds or pads on II 2 (8).

All except *Hylacola*, *Stipiturus* and *Pyrrholaemus* have one or more folds on III 4 (28.2).

All Malurinae have

(a) proximal pad on II 2 raised (11);

(b) pad on II 3 raised (15);

(c) medial/proximal pad on III 2 raised (20);

(d) III 4 not fused to II 3 (67);

(e) proximal pad on IV 2 raised (33);

(f) IV 4 fused to III 4 (49);

(g) IV 4/5 fused to III 4 (54).

All Acanthizinae have one or more separate folds or pads on III 2/3 (21.1).

Synapomorphies:

Malurinae and Acanthizinae together - pad on IV 4 raised (46).

Malurinae alone -

(a) one separate fold or pad on II 2/3 or fused to II 2 (12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) one or more separate distal folds or pads on IV 2 (31);

(d) IV 4 fused to III 4 (49).

Acanthizinae alone -

(a) pad on I 1/2 (2);

(b) proximal pad on II 2 raised (11);

(c) proximal pad on IV 2 raised (33);

(d) distal pad on IV 3 raised (37);

(e) proximal pad on IV 3 raised (38).

Taking them all together, four alternative trees can be constructed (alternatives A & B, and two alternative positions for *Cinclorhamphus* and *Amytornis* on each main alternative), giving the following synapomorphies (Fig.217)

(a) III 2/3 fused to III 2 (21.2) - all alternatives;

(b) two or more proximal furrows on IV 2 (57.2) - all alternatives;

(c) pad on IV 3 divided one or more times (36.1) - all alternatives;

(d) distal and proximal pads on IV 3 raised (37/38) - alternatives A & C;

(e) IV 3/4 fused to IV 3 (41.2) - all alternatives;

(f) IV 4/5 fused to IV 4 (50.2) - all alternatives;

(g) separate pad on IV 4/5 (50.4) - alternatives B & D.

Alternatives A and C are to be preferred because they have two synapomorphies more than B and D (if 50.4 is rejected). There are no autapomorphies for the group. *Cinclorhamphus*, now generally considered a sylviid (*e.g.* Morony *et al.* 1975), pairs with *Amytornis* in all cases. *Hylacola* and *Aphelocephala* may be close, although they are only united by synapomorphies in two alternatives. *Ephthianura* and *Acanthiza* may be close but they are not united by synapomorphies. *Malurus*, *Lamprolia* and *Gerygone* form a clade, with *Smicrornis* as a sister group. This grouping is robust. [*n.b.* There is a mistake in the diagram

(Fig.217) whereby *Smicrornis* should join the stem leading to *Malurus*, *Lamprolia* and *Gerygone*.] This family is possibly not monophyletic, or the true relationships are masked by the large amount of homoplasy. The Malurinae are well defined, with seven autapomorphies, but only three genera were examined. They are dispersed when run with the rest of the family. The Acanthizinae, however, have only one autapomorphy.

<u>NECTARIVORE FAMILIES</u>

<u>Family Dicaedae</u>

Species examined: *Prionochilus thoracicus* and *Paramythia montium* (Fig.149).

Autapomorphies:

(a) separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) one or more proximal folds plus a pad on III 4 (28.2/28.6);

(d) III 4 not fused to II 3 (67);

(e) IV 4 fused to III 4 (49);

(f) IV 4/5 fused to IV 4 (50.2/50.3);

(g) IV 4/5 fused to III 4 (54);

(h) one or more folds only on IV 5 (61/62);

(i) IV 5 fused to III 3 (63).

(Fig.216).

<u>Family Nectariniidae</u>

Species examined: *Nectarinia notata* (Fig.148).

Family Zosteropidae

Species examined: *Chlorocharis emiliae* (Fig.147).

Family Meliphagidae

Species examined: *Certhionyx niger, Meliphaga penicillato, Philemon novaeguinea* and *Entomyzon cyanotis* (Fig.151).

Autapomorphies:

(a) one or more separate distal folds or pads on II 2/3 (8);

(a) a separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) IV 4/5 fused to IV 4 (50.2/50.3).

Synapomorphies:

(a) proximal pad on I 2 raised (5);

(b) one or more separate distal folds or pads on II 2 (8);

(c) proximal pad on II 2 raised (11);

(d) proximal pad on II 3 raised (15);

(e) medial proximal pad on III 2 raised (20);

(f) distal pad on III 3 raised (24);

(g) proximal pad on III 3 raised (25);

(h) two ore more folds on II 4 (28.2/28.3);

(i) proximal pad on IV 2 raised (33);

(j) distal pad on IV 3 raised (37);

(k) proximal pad on IV 3 raised (38);

(l) fold or pad on IV 3/4 raised (42);

(m) pad on IV 4 raised (46);

(n) IV 4/5 fused to IV 4 (50.2);

(o) fold or pad on IV 4/5 raised (51).

(Fig.215).

*inc. sed.: Promerops caffer* (Fig.150).

Taking all nectarivore families together -

Autapomorphies:

(a) a separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) IV 4/5 has a separate fold or pad or it is fused to IV 4 (50.3).

Synapomorphies:

(a) proximal pad on I 2 raised (5);

(b) proximal pad on II 2 raised (11);

(c) medial/proximal pad on III 2 raised (20);

(d) distal pad on III 3 raised (24);

(e) proximal pad on III 3 raised (25);

(f) two or more distal folds on III 4 (28.2/28.3);

(g) proximal pad on IV 2 raised (33);

(h) distal pad on IV 3 raised (37);

(i) proximal pad on IV 3 raised (38);

(j) fold or pad on IV 3/4 raised (42);

(k) pad on IV 4 raised (46);

(l) IV 4/5 fused to IV 4 (50.2);

(m) fold or pad on IV 4/5 raised (51).

When all are run together the traditional familial groupings break down. This would suggest much homoplasy. However, the whole group is characterised by five autapomorphies. The Meliphagidae, which are almost entirely Australasian, are defined by seven autapomorphies. *Philemon* and *Entomyzon*, are very close, and *Promerops*, the South African outlier, is a sister taxon to them, and would seem well placed in this family. *Nectarinia* would seem to be the least derived of all the nectarivores.

<u>NINE-PRIMARIED OSCINES</u>

<u>Family Emberizidae</u>

Species examined: Subfamily Emberizinae- *Emberiza citrinella and Geospiza magnirostris* (Fig.158).

Subfamily Cardinalinae- *Cardinalis cardinalis*.

Subfamily Thraupinae- *Tangara chlorotica*.

Autapomorphies:

(a) a separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) separate pad on IV 4/5 (50.1/50.3/50.4);

(e) folds only on IV 5 (61/62).

Two dendrograms can be constructed.

Synapomorphies:

(a) no distal folds or pads on I 2 not associated with I 1/2 (3) - alternative B;

(b) one or more separate distal folds or pads on II 2 (8) - alternatives A & B;

(c) one or more separate medial furrows on II 2 (9) - alternative A;

(d) proximal pad on II 2 raised (11) - alternatives A & B;

(e) pad on II 3 raised (15) - alternatives A & B;

(f) medial or proximal pad on III 2 raised (20) - alternative A;

(g) one or more separate folds or pads on IV 2 (31) - alternative B.

The four genera examined come from three generally accepted subfamilies (sometimes considered families), but they would appear to be very close, with *Tangara* forming a sister group to the others. It is characterised by nine autapomorphies (Fig.222).
(*n.b.* In Alternative B character 54 appears on the main stem in place of 28.6, and *Tangara* has 28.6 in place of 54; spelling of *Tangara* is incorrect.) Characters 9 and 20 in Alternative A have much lower randomness ratios than Characters 3 and 31 of Alternative B (0.84 and 0.68 *versus* 1.12 and 1.16) indicating the former alternative to be preferable.

<u>Family Parulidae</u>

Species examined: *Mniotilta varia*, *Zeledonia coronata*, *Coereba flaveola*, *Icteria virens*, *Seiurus noveboracensis* and *Stothylpis sp.* (Figs.152-153).

Autapomorphies:

(a) a separate fold or pad on II 2/3 (12.1/12.4);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) III 4 not fused to II 3 (67);

(d) separate fold or pad on IV 4/5 or fused to IV 4 (50.3).

Synapomorphies:

(a) II 3 divided into two or more pads (14.1);

(b) pad on IV 4/5 (50.4).

*Zeledonia* and *Seiurus* form a pair and are the most derived, thus the former would seem well placed in this family. *Mniotilta* is a sister taxon, and *Icteria* a sister to these three. *Stothylpis* and *Coereba* in turn form a sister group to the aforementioned (Fig.221). The family is defined by five autapomorphies.

Family Drepanididae

Species examined: Subfamily Drepanidinae - *Palmeria dolei* (Fig.159).

Subfamily Psittirostrinae - *Loxops coccinea*.

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) separate fold or pad on II 2/3 (12.1/12.4);

(c) one or more separate folds or pads on III 2/3 (21.1);

(d) one or more folds on III 4 (28.2);

(e) III 4 not fused to II 3 (67);

(f) one or more separate distal folds or pads on IV 2 (31);

(g) pad on IV 4/5 (50.1/50.3/50.4);

(h) IV 4/5 fused to III 4 (54);

(i) folds only on IV 5 (61/62).

(Fig.223).

Family Vireonidae

Species examined: *Cyclarhis guyensis* and *Vireo flavifrons* (Figs.154-155).

Autapomorphies:

(a) no folds or pads on I 2 (3);

(b) one or more folds on III 4 (28.2);

(c) III 4 not fused to II 3 (67);

(d) one or more separate distal folds or pads on IV 2 (31);

(e) pad on IV 4/5 fused to IV 4 (50.1/50.2/50.3);

(f) folds only on IV 5 (61/62);

(g) IV 5 fused to III 4 (63).

(Fig.226).

Family Icteridae

Species examined: *Cacicus haemorrhous* and *Sturnella neglecta* (Figs.156-157).

Autapomorphies:

(a) pad on I 2 (2);

(b) pad on II 3 raised (15);

(c) medial/proximal pad on III 2 raised (20);

(d) distal pad on III 3 raised (24);

(e) pad and one, or more, proximal folds on III 4 (28.2/28.6);

(f) III 4 not fused to II 3 (67);

(g) IV 4/5 not fused to IV 5 (50.3);

(h) IV 4/5 fused to II 4 (54);

(i) folds only on IV 5 (61/62);

(k) IV 5 fused to III 4 (63).

(Fig.225).

<u>Family Fringillidae</u>

Species examined: *Fringilla coelebs* and *Pinicola enucleator* (Fig.163).

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) proximal pad on II 2 raised (11);

(c) separate fold or pad on II 2/3 (12.1/12.4);

(d) pad on II 3 raised (15);

(e) medial/proximal pad on III 2 raised (20);

(f) one or more separate folds or pads on III 2/3 (21.1);

(g) III 4 not fused to II 3 (67);

(h) proximal pad on IV 2 raised (32);

(i) distal pad on IV 2 raised (33);

(j) separate pad on IV 4/5 (50.1/50.3/50.4);

(j) IV 5 fused to III 4 (63).

(Fig.224).

Taking Emberizidae, Parulidae, Drepanididae, Vireonidae, Icteridae and Fringillidae together -

Autapomorphies:

(a) III 4 not fused to II 3 (67);

(b) separate fold or pad on IV 4/5, or it is fused to IV 4 (50.3).

All except *Sturnella* and *Cyclaris* have one or more separate folds or pads on III 2/3 (21.1).
All except *Sturnella* and *Stothylpis* have one or more separate folds or pads on IV 4/5 (50.1).

A dendrogram can be constructed (by fusion of the dendrograms of the separate families) in which the traditional family groupings partly disappear (Fig.227; *n.b.* spelling of *Tangara* is incorrect.). There are two synapomorpies, *viz.* two or more proximal folds on II 3 (16) and the distal pad on IV 2 raised (32). When all the families are run together in the LeQuesne test the traditional groupings are completely lost. Emberizidae, Drepanididae and Fringillidae would appear to be close, with Parulidae a little more distant. Vireonidae is further still, followed by Icteridae.

WEAVER ASSEMBLAGE

Family Estrildidae

Species examined: *Spermophaga haematina*, *Emblema picta*, *Lonchura fringilloides* and *Pholidornis rushiae* (Fig.162).

Autapomorphies:

(a) one or more separate folds or pads on III 2/3 (21.1);

(b) III 4 not fused to II 3 (67);

(c) IV 4/5 not fused to IV 5 (50.3).

Synapomorphies:

(a) pad on II 3 raised (15);

(b) distal pad on III 3 raised (24);

(c) pad on IV 4/5 (50.1/50.4);

(d) IV 4/5 fused to III 4 (54).

The four genera examined are from four groups, the first three sometimes given tribal status, the last *inc.sed.* (Morony *et al.* 1975). They have four autapomorphies. *Pholidornis*, the least derived, is rather aberrant and unwaxbill-like in general appearance (pers.obs.). The remaining are characterised by three further autapomorphies (Fig.228).

Family Ploceidae

Species examined: Subfamily Bubalornithinae - *Dinemellia dinemelli.*

Subfamily Passerinae - *Passer griseus.*

Subfamily Ploceinae - *Ploceus cucullatus.*

Subfamily Viduinae - *Steganura paradisea*

(Figs.160-161).

Autapomorphies:

(a) one or more separate distal folds or pads on II 2 (8);

(b) one or more separate folds or pads on III 2/3 (21.1);

(c) one or more folds on III 4 (28.2);

(d) III 4 not fused to II 3 (67);

(e) separate pad on IV 4/5 (50.1/50.3/50.4).

Synapomorphies:

(a) fold or pad on II 2/3 raised (13);

(b) pad on II 3 raised (15);

(c) medial/proximal pad on III 2 raised (20).

The four genera are from four generally accepted subfamilies, and are defined by seven autapomorphies. They would all appear to be close, with *Dinemellia* and *Passer* forming a pair (Fig.229).

A dendrogram can be constructed taking both families.

Autapomorphies:

(a) one or more separate folds or pads on III 2/3 (21.1);

(b) III 4 not fused to II 2 (67);

(c) IV 4/5 not fused to IV 5 (50.3).

Synapomorphies:

(a) pad on IV 4/5 (50.1/50.4);

(b) IV 4/5 fused to III 4 (54).

Together they are characterised by three autapomorphies. The ploceids remain a group, but no autapomorphies characterise them (Fig.230). Three estrildids join this group as two sister groups, and the whole grouping is then characterised by three autapomorphies. *Pholidornis* remains an outlier. If the two families were merged, this genus would require subfamilial status. Bentz (1979) studying these two families could find no autapomorphy, but claimed that certain characters supported monophyly. He found the estrildids the most derived and constituted a family which included the Viduinae, but claimed that the three subfamilies of ploceids were paraphyletic.

CORVID ASSEMBLAGE

Family Grallinidae

Species examined: *Corcorax melanorhamphos*, *Struthidea cinerea* and *Grallina cyanoleuca* (Fig.164-165).

Family Cracticidae

Species examined: *Gymnorhina tibicen*, *Strepera graculina* and *Cracticus torquatus* (Fig.166-167).

Family Dicruridae

Species examined: *Dicrurus hottentottus* (Fig.168).

Family Oriolidae

Species examined: *Oriolus sagittatus* (Fig.169).

Family Callaeidae

Species examined: *Callaeus cinerea* (Fig.170).

Family Artamidae

Species examined: *Artamus melanops* (Fig.171).

Family Paradisaeidae

Species examined: *Paradisaea raggiana* (Fig.172).

Family Ptilonorhynchidae

Species examined: *Ptilonorhynchus violaceus* (Fig.173).

Family Corvidae

Species examined: *Cyanocitta cristata*, *Corvus monedula* and *Zavattariornis stresemanni* (Fig.174).

Taking the Oriolidae, Dicruridae, Callaeidae, Grallinidae, Artamidae, Cracticidae, Ptilonorhynchidae, Paradisaeidae and Corvidae together -

All have IV 4/5 fused to III 4 (54).

All except *Callaeus* have IV 5 fused to III 4 (63). This genus has no discernable external features on IV 5.

All except one specimen *Cyanocitta* have III 4 not fused to II 3 (67).

All except *Paradisea* have IV 4/5 not fused to IV 5 (50.3).

Synapomorphies:

(a) fold or pad on III 3/4 raised (27);

(b) fold or pad on IV 2/3 raised (35);

(c) distal pad on IV 3 raised (37);

(d) proximal pad on IV 3 raised (38);

(e) fold or pad on IV 3/4 raised (42);

(f) pad on IV 4 raised (46);

(g) fold or pad on IV 4/5 raised (51);

(h) IV 4/5 fused to III 3/4 (53);

(i) folds only on IV 5 (62);

(j) IV 5 fused to III 4 (63).

(Fig.234).

Taking the families separately -

Family Grallinidae

Autapomorphies:

(a) one or more separate folds or pads on III 2/3 (21.1);

(b) III 4 not fused to II 2 (67);

(c) IV 4 fused to III 4 (49);

(d) IV 4/5 fused to IV 4 and not IV 5 (50.2/50.3);

(e) IV 4/5 fused to III 4 (54);

(f) IV 5 fused to III 4 (63).

Synapomorphies:

(a) pad on I 1/2 (2);

(b) no separate folds or pads on I 2 (3);

(c) fold or pad on II 1/2 fused to II 2 (7.1/7.3);

(d) one or more separate distal folds or pads on II 2 (8);

(e) III 3 has a pad plus one proximal fold (28.2/28.6);

(f) IV 2/3 fused to IV 3 (34.2);

(g) only folds on IV 5 (61/62).

Seven autapomorphies define this family, but *Corcorax* and *Struthidea* are separated from *Grallina* by a further ten (Fig.232).

Family Cracticidae

Autapomorphies:

(a) III 4 not fused to II 3 (67);

(b) IV 3/4 fused to III 3 (43);

(c) IV 4 fused to III 3 (47);

(d) IV 4 fused to III 3/4 (48);

(e) pad on IV 4/5 not fused to IV 5 (50.3/50.4);

(f) IV 4/5 fused to III 4 (54);

(g) IV 5 fused to III 4 (63).

Defined by eight autapomorphies, with *Strepera* and *Cracticus* being separated by six more from *Gymnorhina* (Fig.233).

Family Corvidae

Autapomorphies:

(a) one or more separate fold or pads on III 2/3 (21.1);

(b) a pad and one or more proximal folds on III 4 (28.2/28.6);

(c) IV 4/5 not fused to IV 5 (50.3);

(d) IV 4/5 fused to III 4 (54);

(e) folds only on IV 5 (61/62);

(f) IV 5 fused to III 4 (63).

Synapomorphies:

(a) pad on I 1/2 (2);

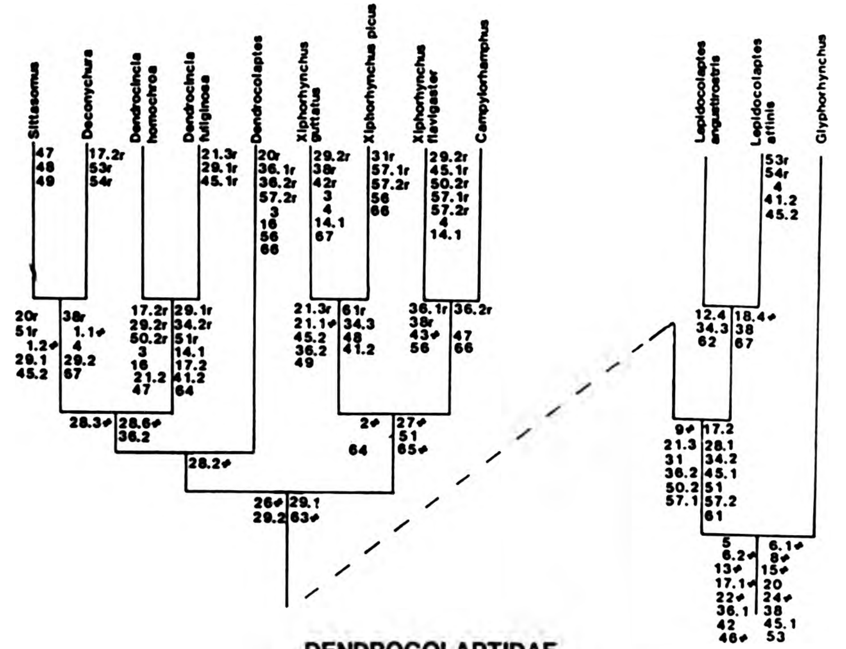
(b) no separate distal fold or pad on I 2 (3);

(c) pad on II 3 raised (15);

(d) pad on IV 4/5 (50.1/50.4).

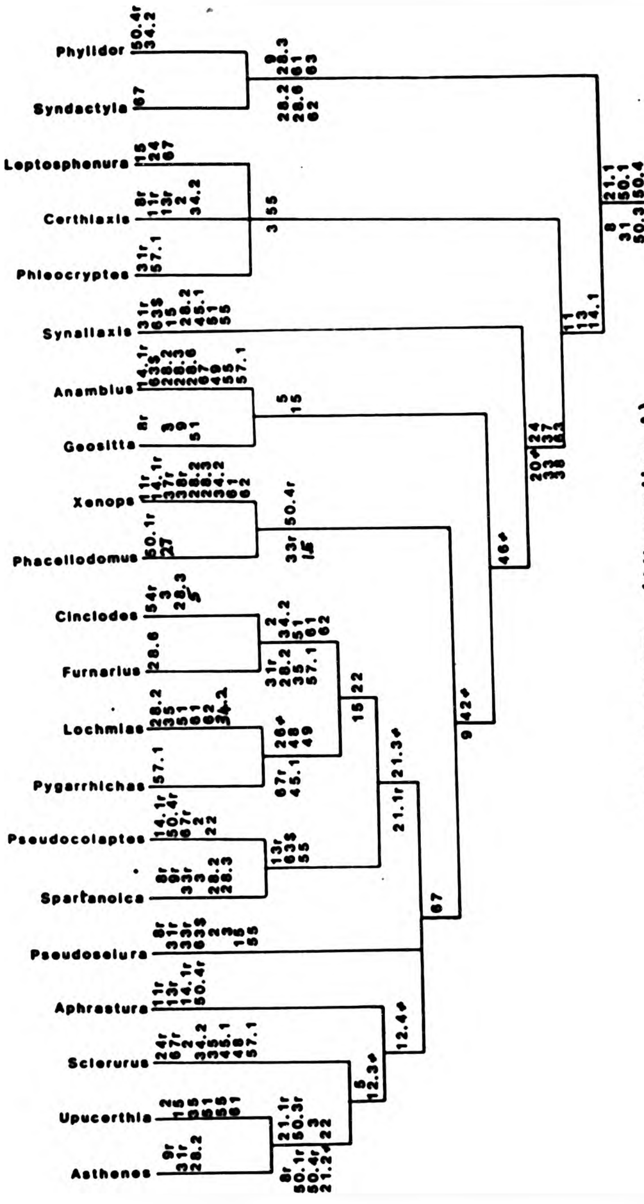
The family is defined by eight autapomorphies, with *Zavattoriornis* and *Corvus* separated by five more from *Cyanocitta* (Fig.231).

When the whole assemblage is run together, *Strepera* and *Corcorax* remain paired, otherwise family groupings are somewhat dispersed, or intrafamily arrangements altered as with *Zavattariornis* and *Cyanocitta*. *Artamus* becomes the sister group to *Corcorax-Strepera*, being supported by five autapomorphies. *Gymnorhina* is more distinct, forming a sister group to these, and *Struthidea* a sister group to these four. No synapomorphies are involved in the adding of these two taxa to the arrangement. *Corvus* pairs with *Ptilonorhynchus*, and *Dicrurus* becomes a sister to these two. This latter arrangement inspires little confidence, as very few characters are involved, and none are synapomorphies. *Grallina* pairs with *Paradisea*, and *Cracticus* is the sister group. However, only one synapomorphy defines this triplet. *Oriolus* forms a sister group to these but no autapomorphies define the grouping. *Callaeus*, a New Zealand outlier, is a sister taxon to all the others of this assemblage (Fig.234).



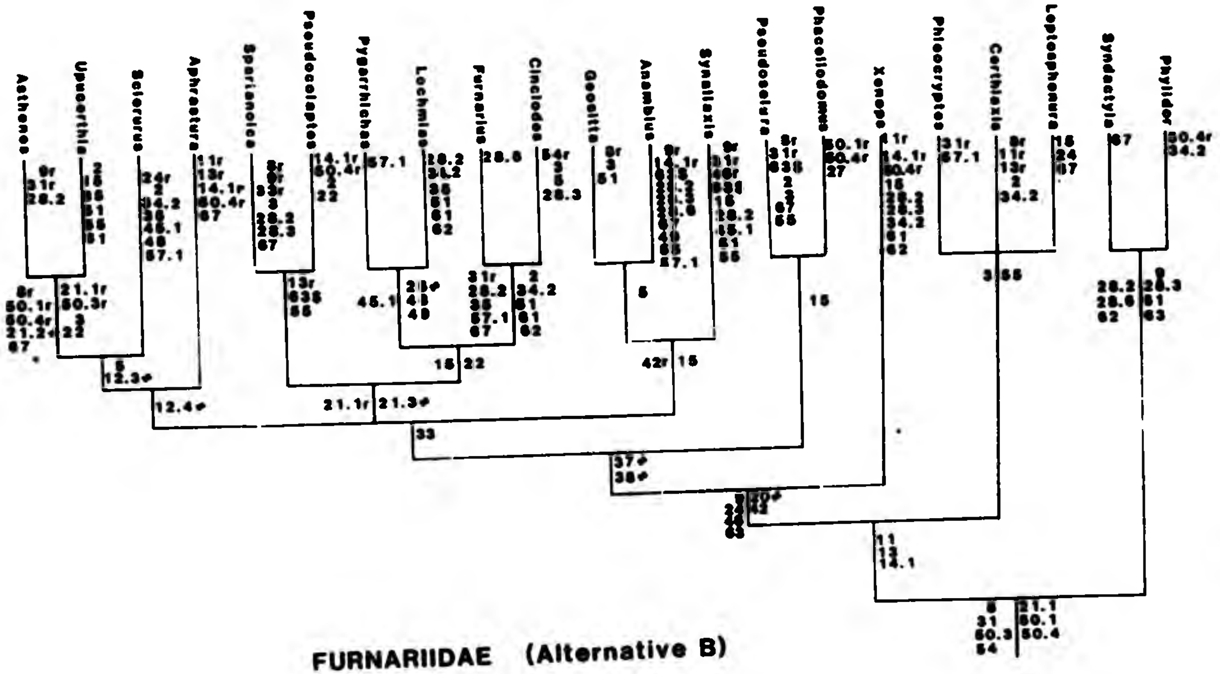

**DENDROCOLAPTIDAE**

FIG. 175



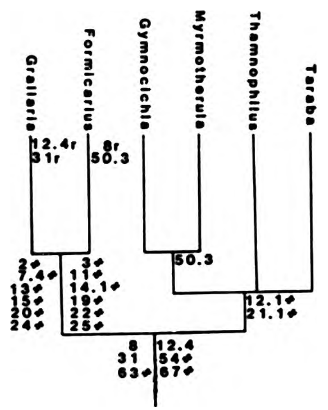

FURNARIIDAE (Alternative A)

FIG. 176



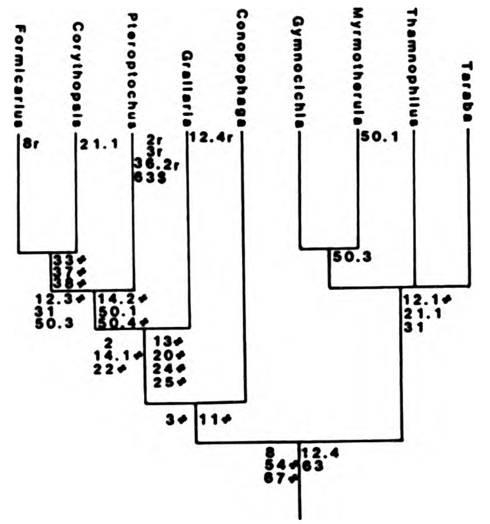

FURNARIIDAE (Alternative B)

FIG. 177



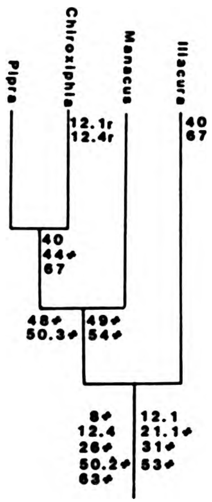

FORMICARIIDAE

FIG. 178



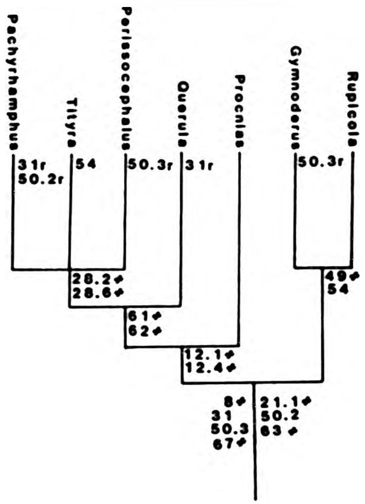

FORMICARIIDAE, CONOPOPHAGIDAE & RHINOCRYPTIDAE

FIG. 179



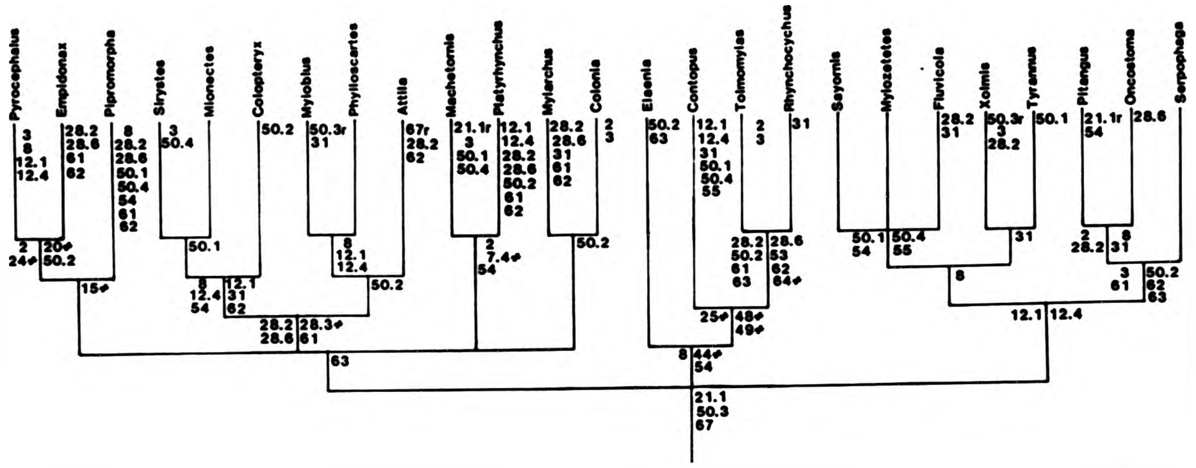

PIPRIDAE

FIG.180



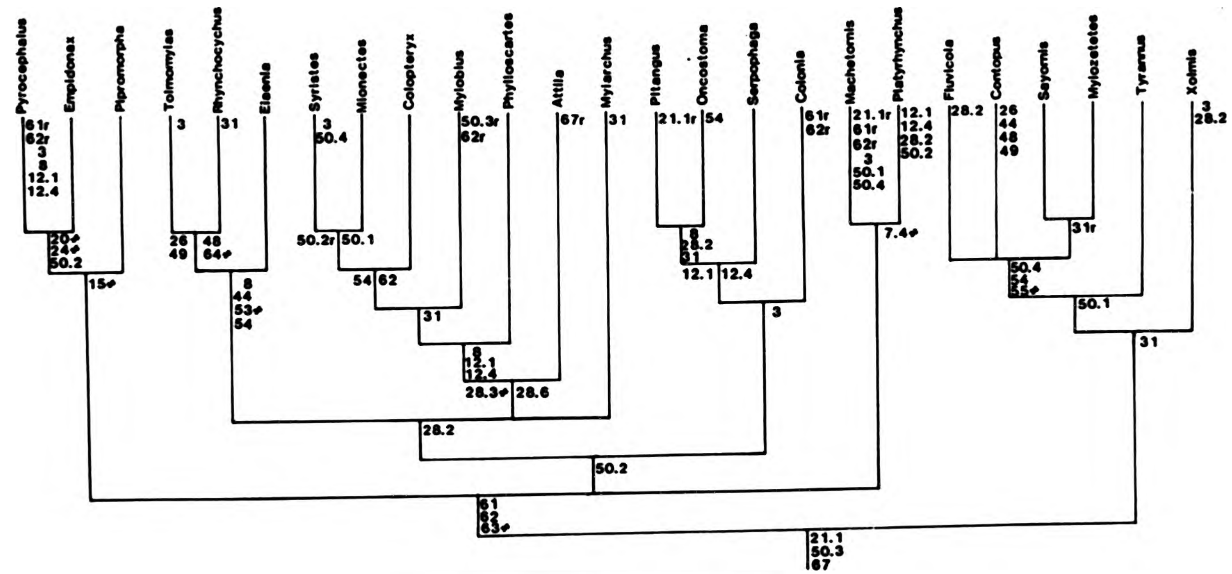

COTINGIDAE

FIG.181



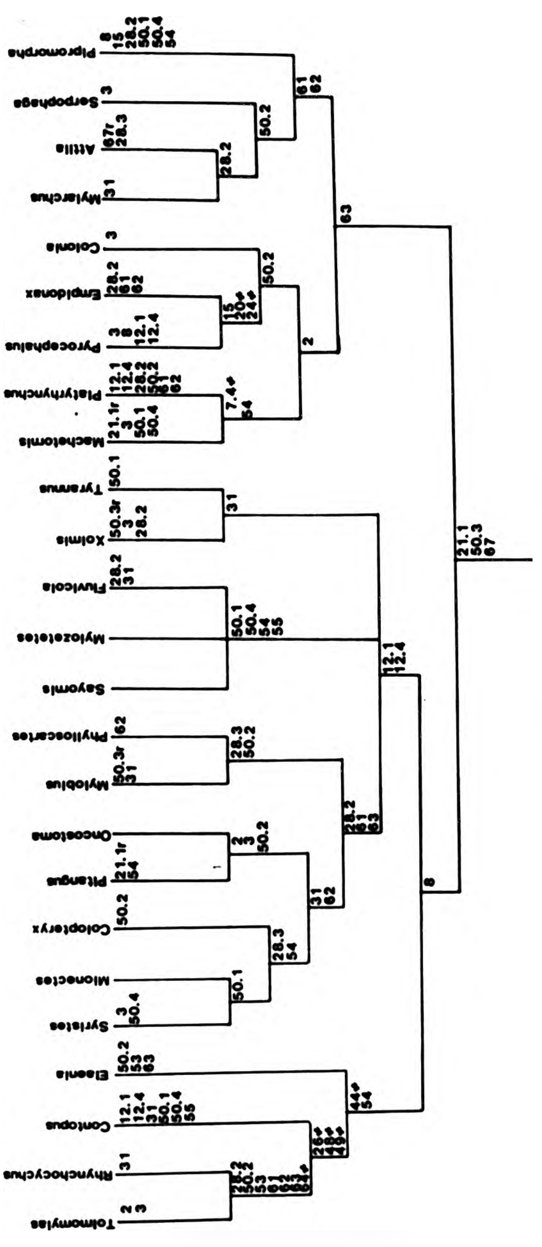

**TYRANNIDAE (Alternative A)**

FIG. 182



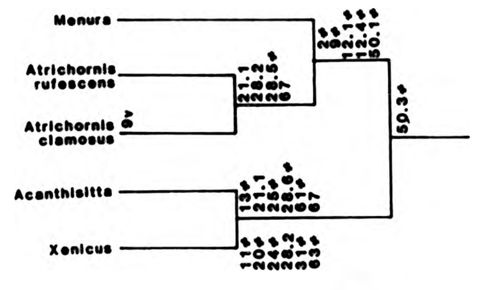

**TYRANNIDAE (Alternative B)**

FIG. 183



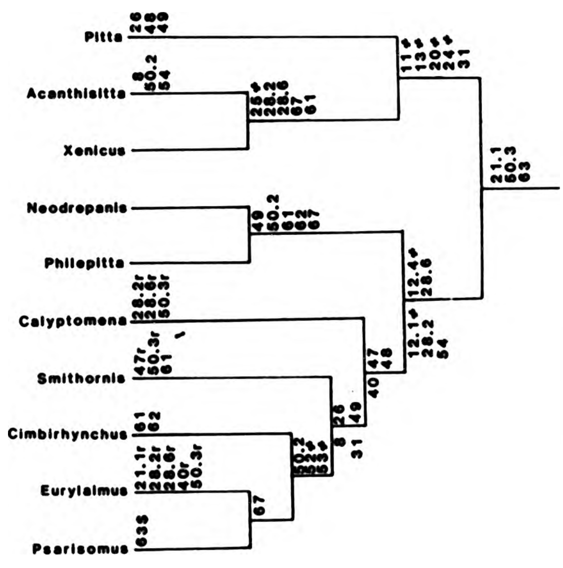

TYRANNIDAE (Alternative C)

FIG. 184



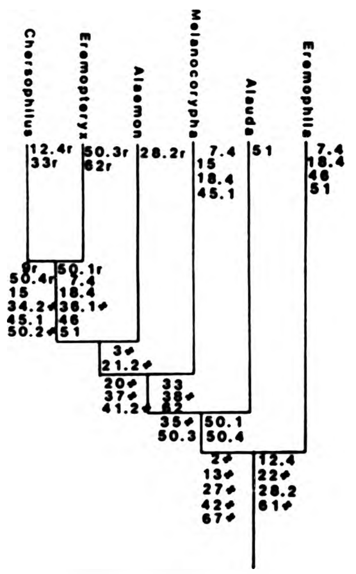

MENURAE & ACANTHISITTIDAE

FIG.186



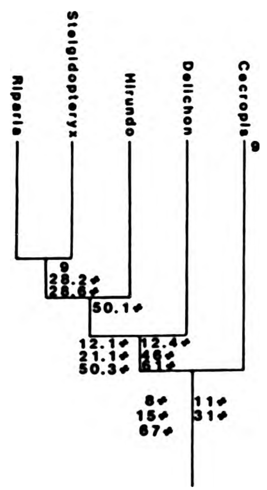

OLD-WORLD SUBOSCINES

FIG.185



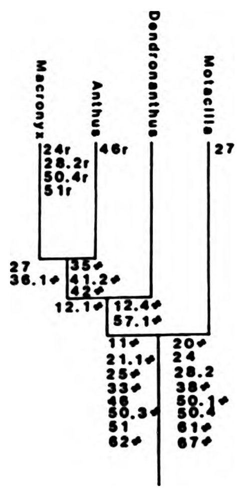

**ALAUDIDAE**

FIG.187



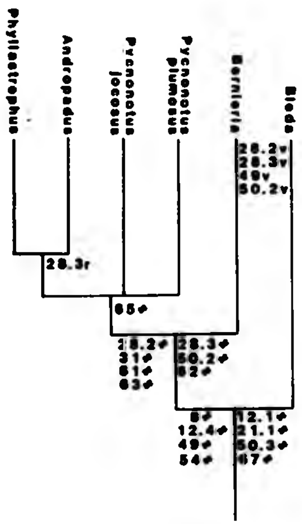

**HIRUNDINIDAE**

FIG. 188



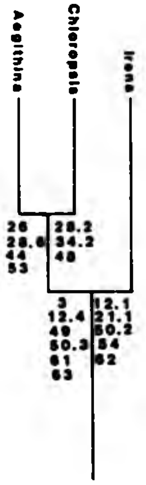

**MOTACILLIDAE**

FIG.189



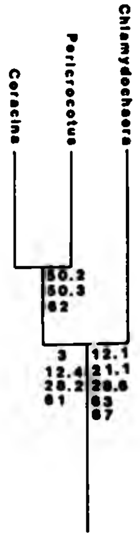

PYCNONOTIDAE

FIG.190



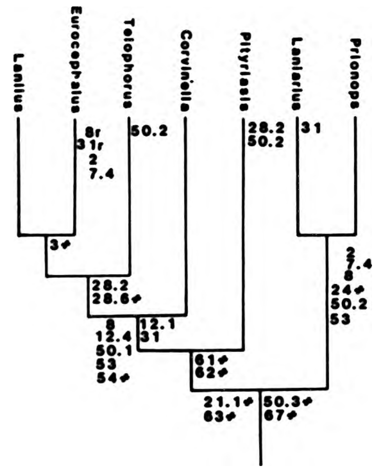

AEGITHINIDAE

FIG.191



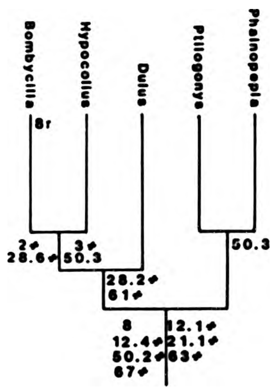

CAMPEPHAGIDAE

FIG.192



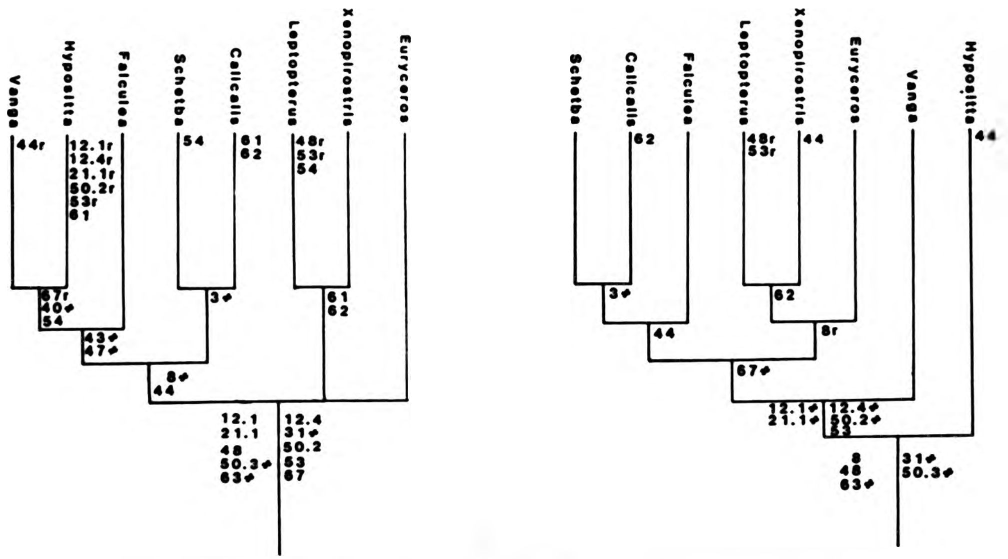

LANIIDAE

FIG.193



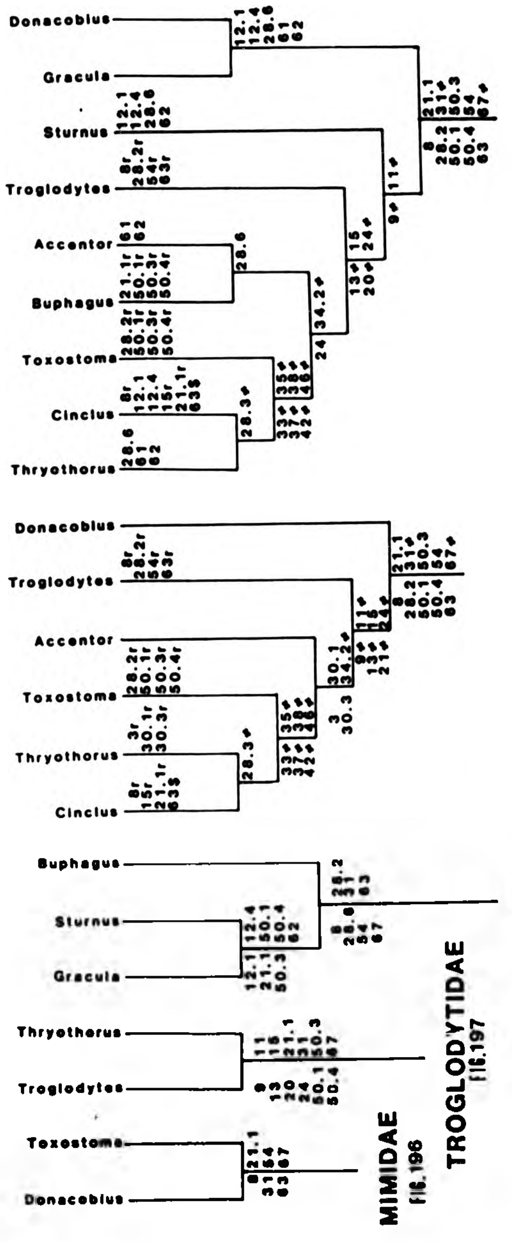

BOMBYCILLIDAE & DULIDAE

FIG.194




(Alternative A) VANGIDAE (Alternative B)

FIG.195



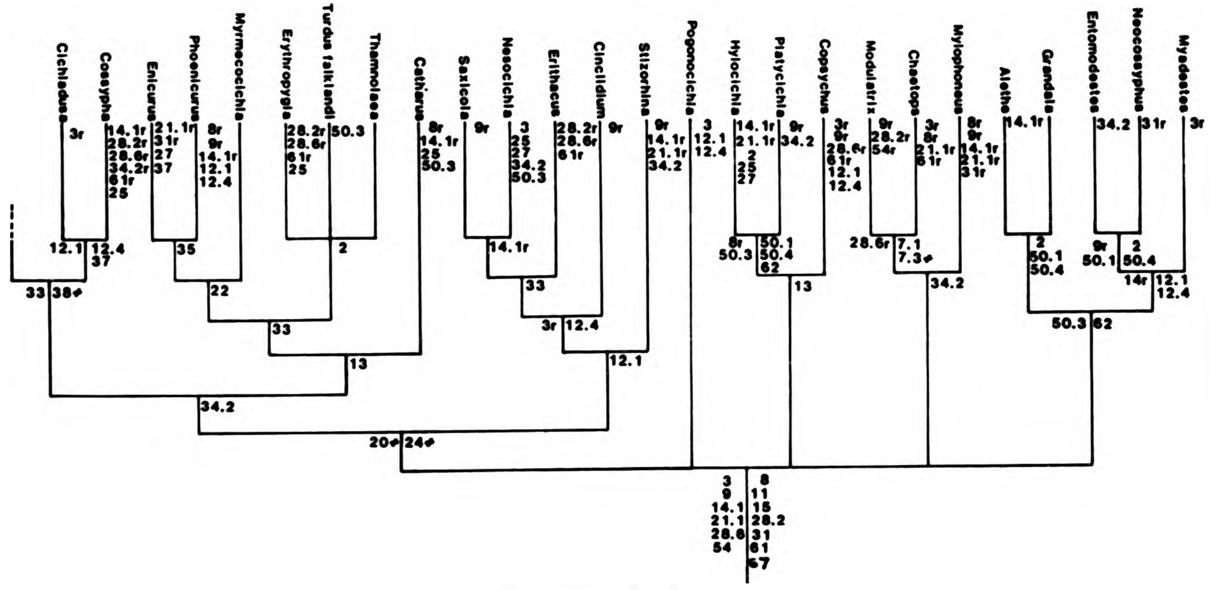

MIMIDAE FIG.196

TROGLODYTIDAE FIG.197

STURNIDAE FIG.198

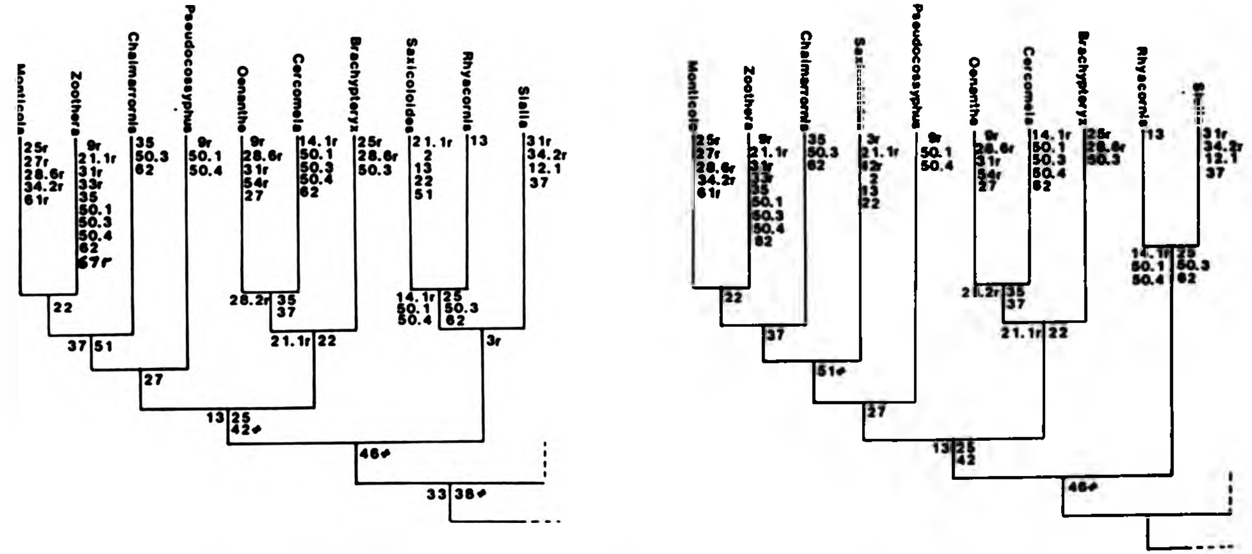
CINCLIDAE ETC FIG.199

STURNIDAE ETC FIG.200




**TURDIDAE (Core)**

FIG. 201

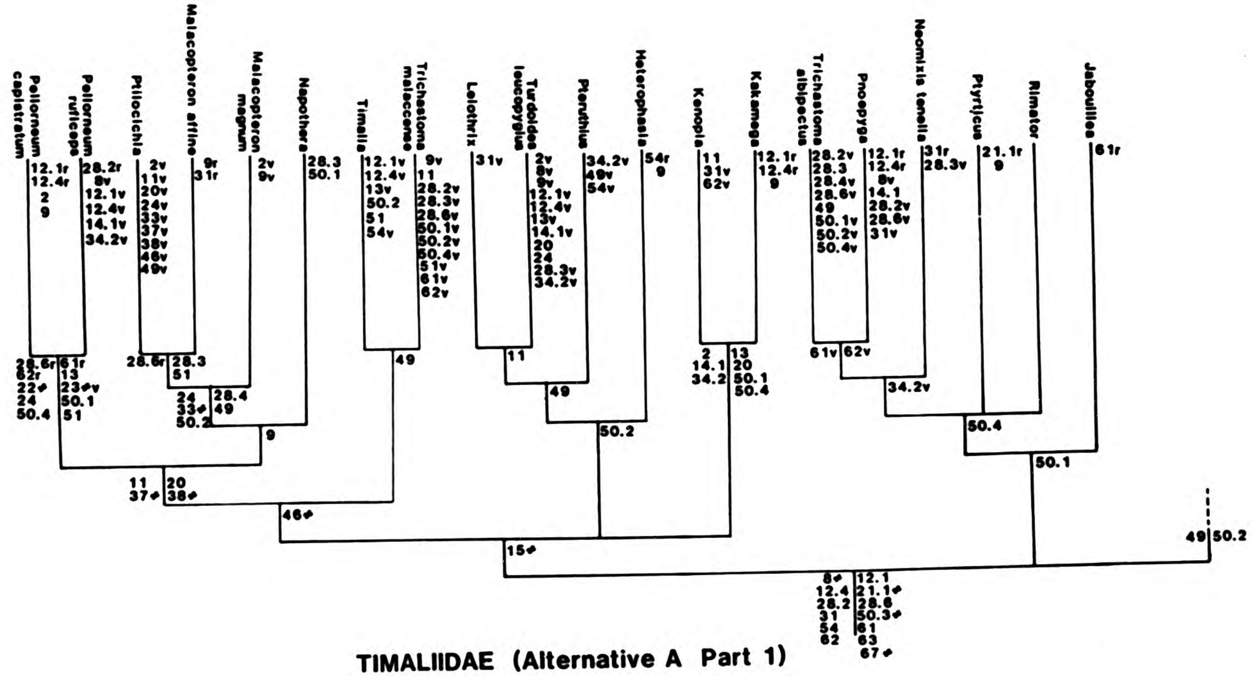



(Alternative A)

TURDIDAE

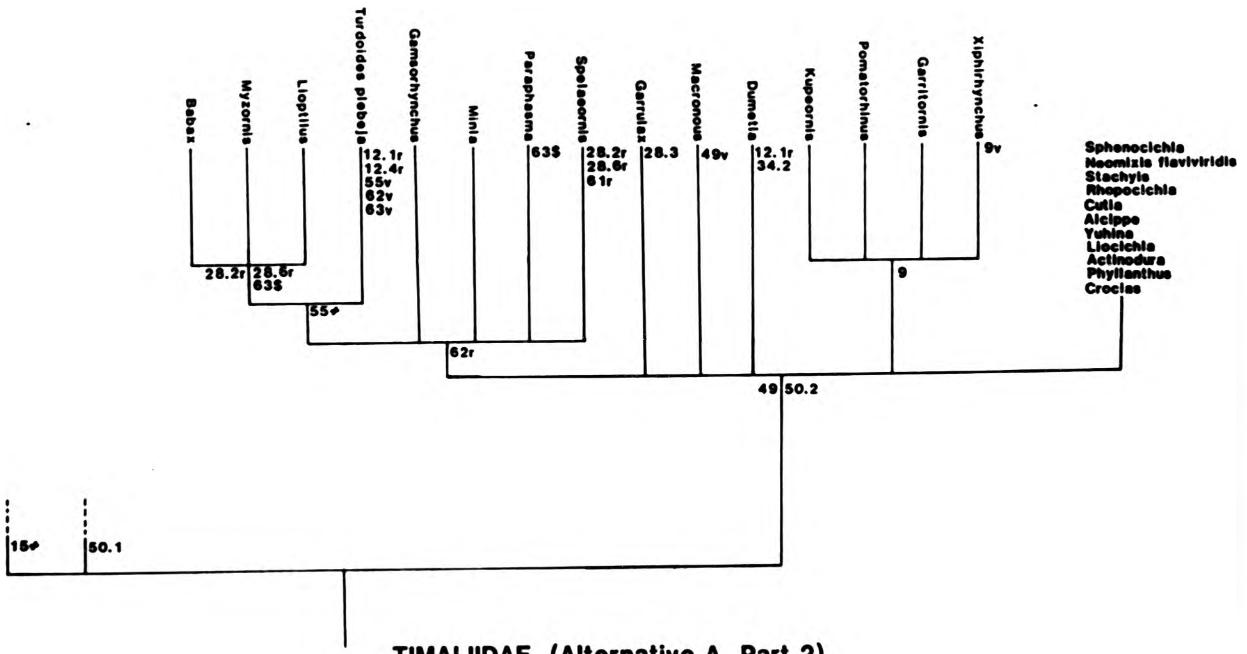
(Alternative B)

FIG.202



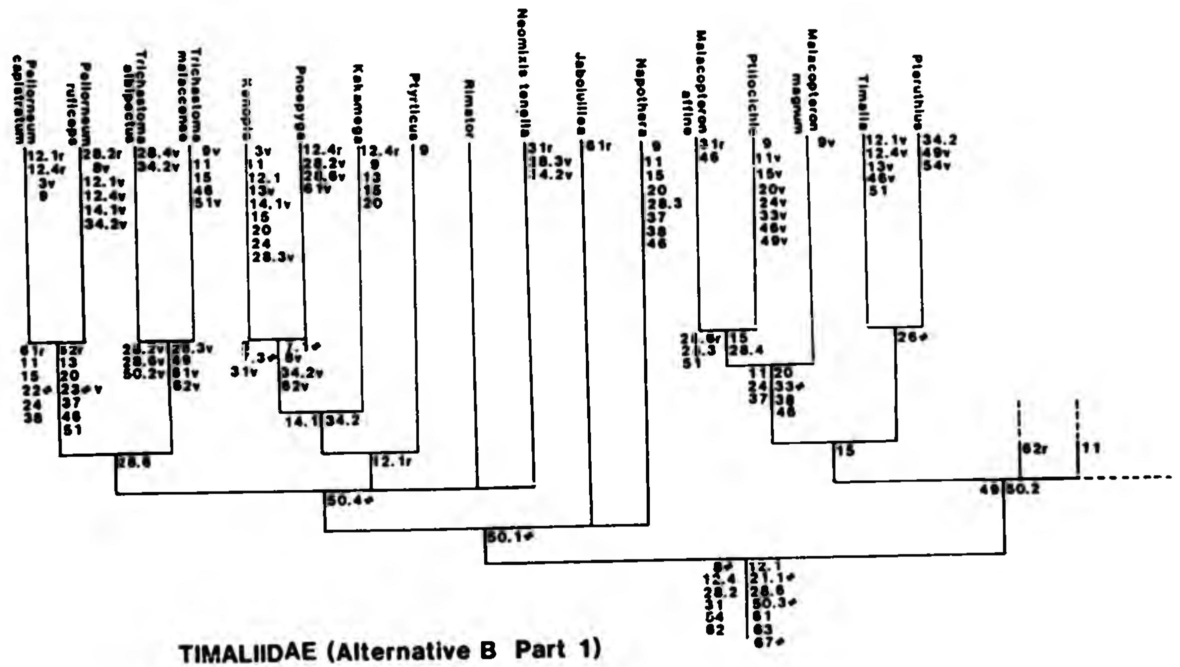

**TIMALIIDAE (Alternative A Part 1)**

FIG.203(a)



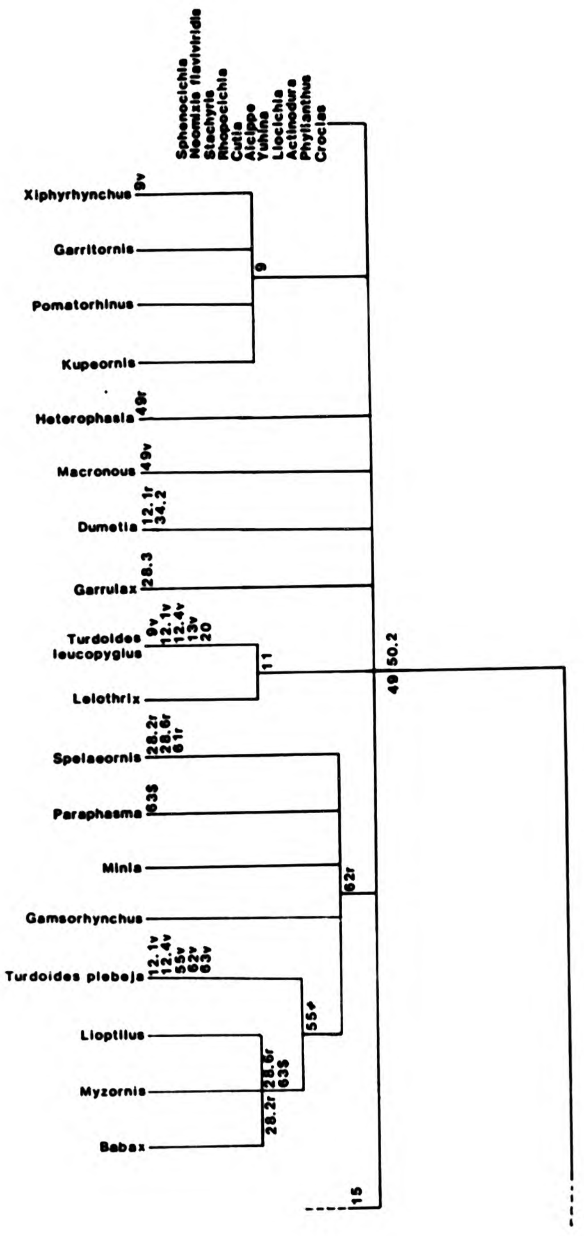

TIMALIIDAE (Alternative A Part 2)

FIG. 203(b)



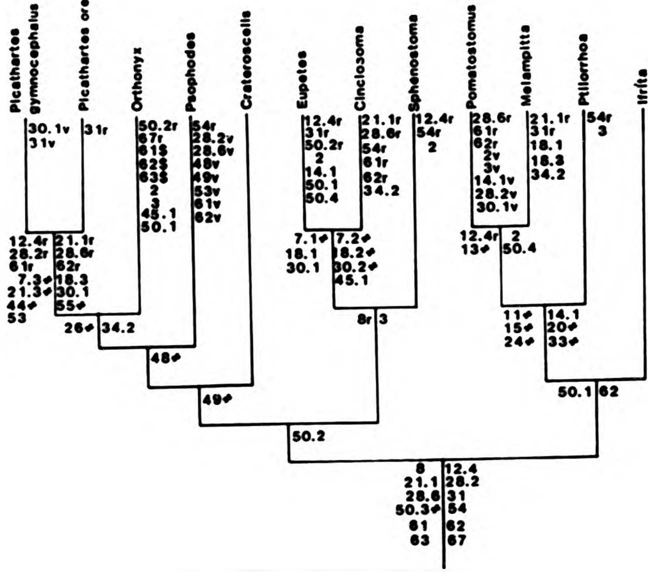

TIMALIIDAE (Alternative B Part 1)

FIG. 204(a)



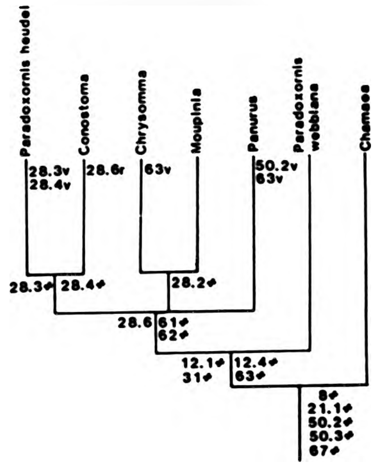

TIMALIIDAE (Alternative B Part 2)

fig.204(b)



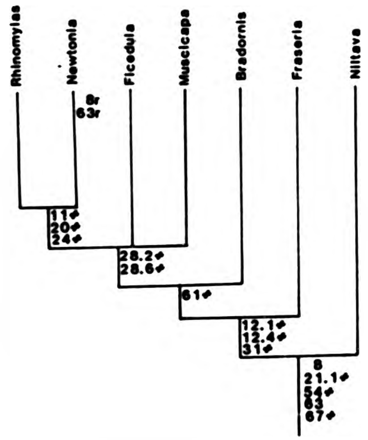

ORTHONYCHINAE

FIG.205



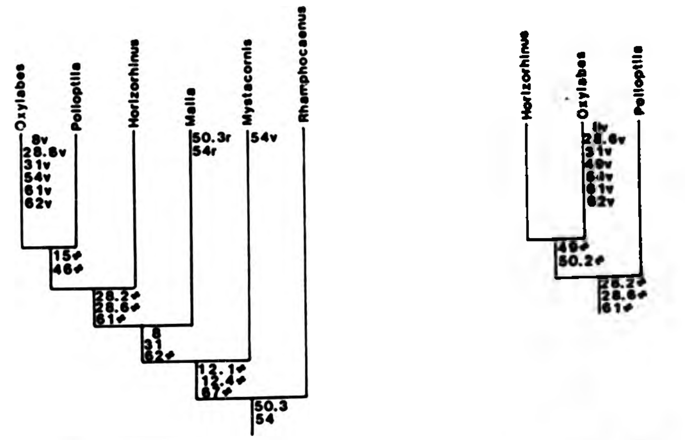

PARADOXORNITHIDAE

FIG.206




MUSCICAPIDAE

FIG.207

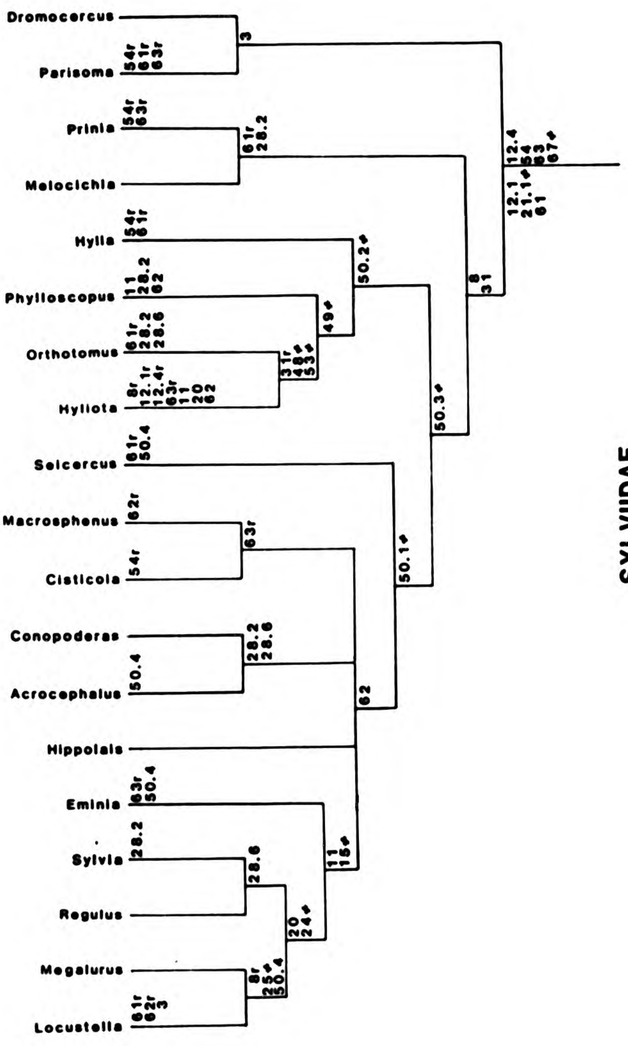



(Alternative A)

(Alternative B)

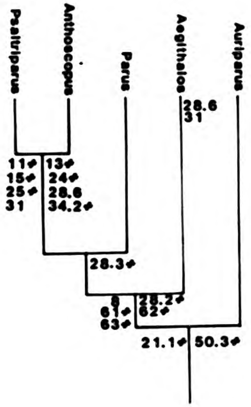
POLIOPTILINAE ETC

FIG.208



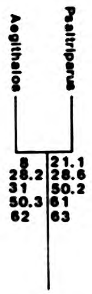

SYLVIIDAE

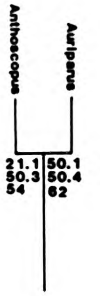
FIG.209




PARIDAE ETC.

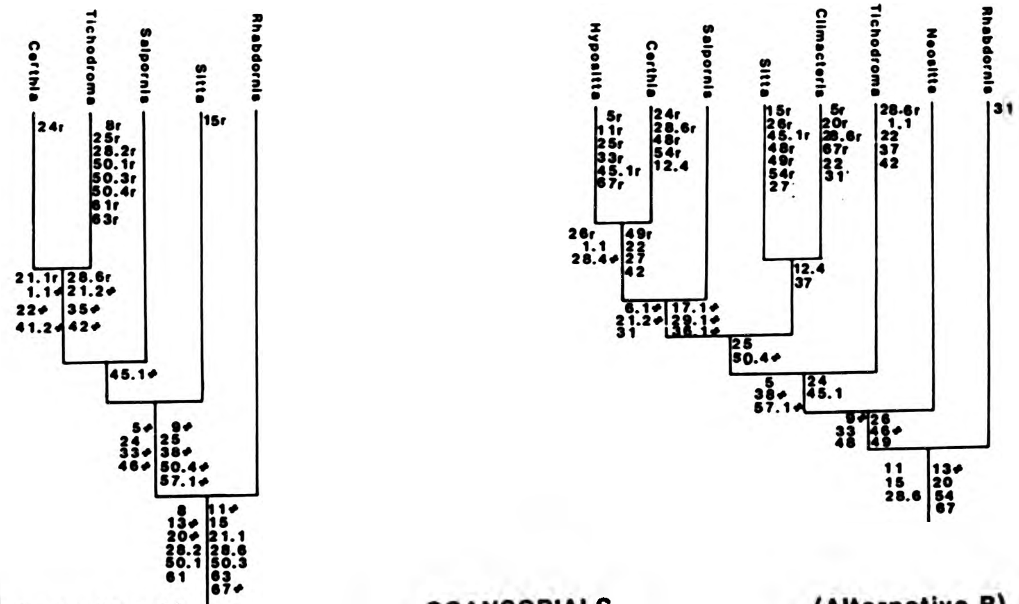
FIG.210




AEGITHALIDAE REMIZIDAE

FIG.211 FIG.212

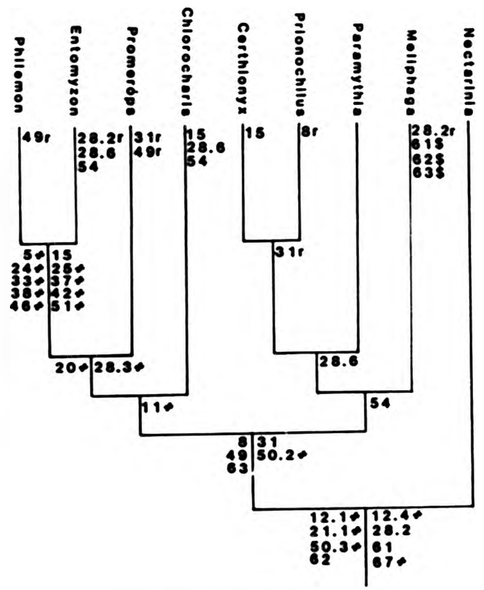



(Alternative A)

SCANSORIALS

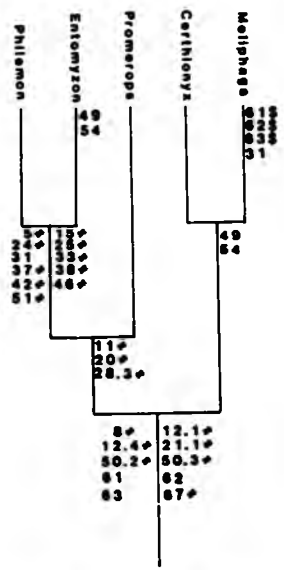
(Alternative B)

FIG.213



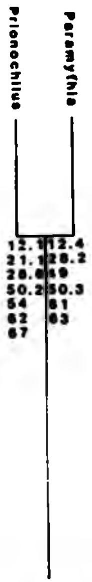

NECTARIVORES

FIG.214



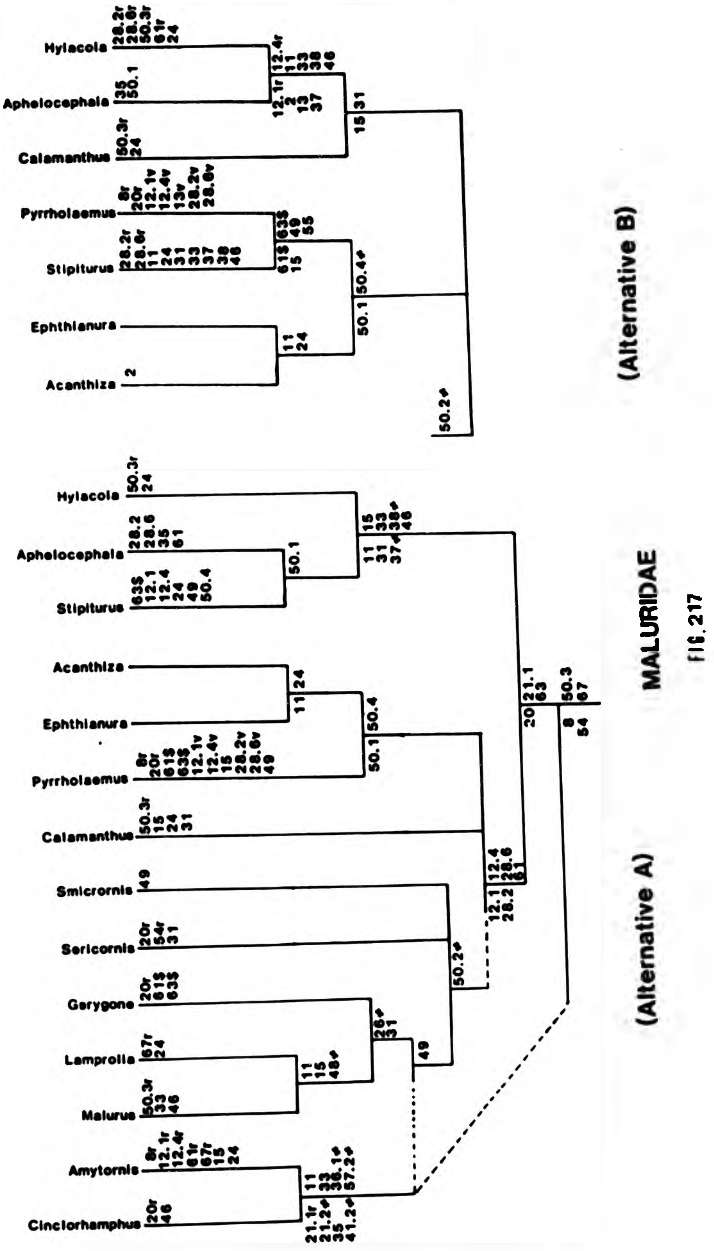

MELIPHAGIDAE

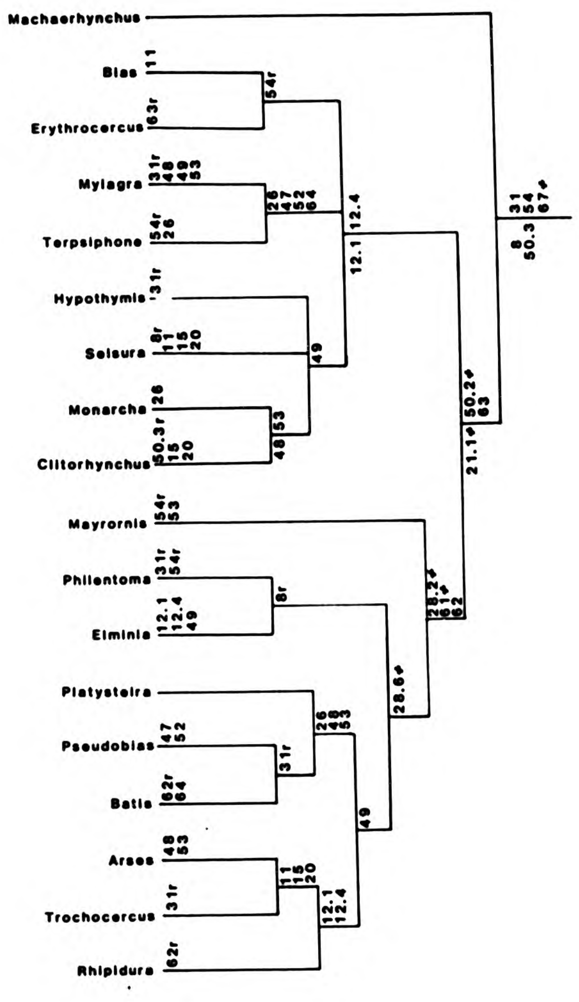
FIG.215




DICAEIDAE

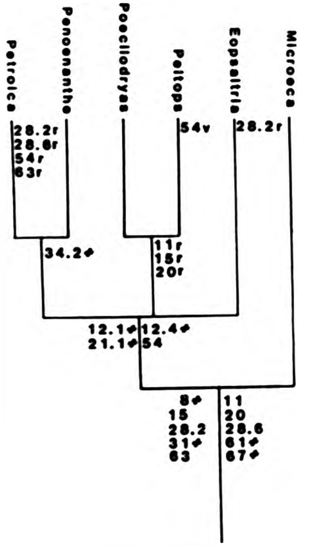
FIG.216


MALURIDAE
FIG. 217
(Alternative A)
(Alternative B)
Hylacola
Aphelocephala
Stipiturus
Acanthiza
Ephthianura
Pyrrholaemus
Calamanthus
Smicrornis
Sericornis
Gerygone
Lamprolia
Malurus
Amytornis
Cinclorhamphus



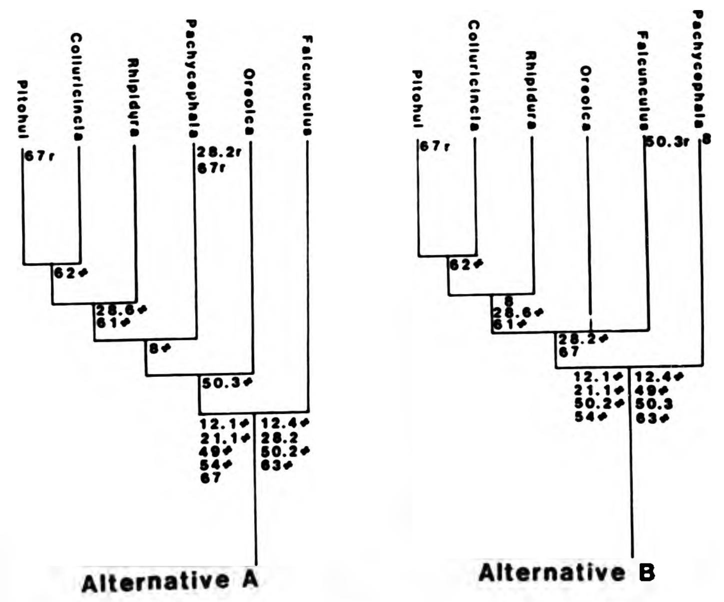

MONARCHIDAE

FIG.218



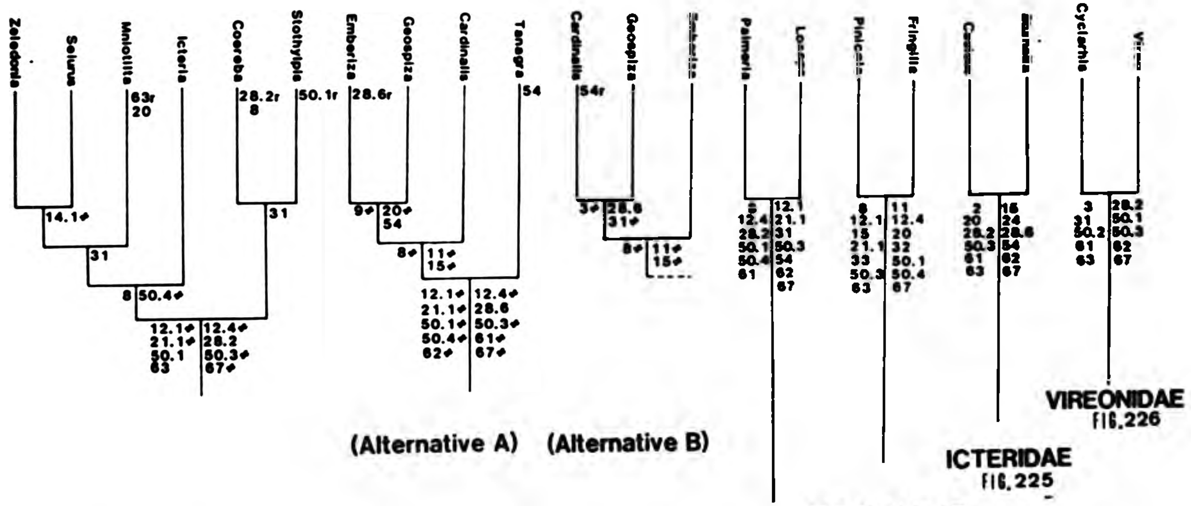

**EOPSALTRIIDAE**

FIG. 219




**PACHYCEPHALINAE**

FIG. 220




VIREONIDAE FIG. 226

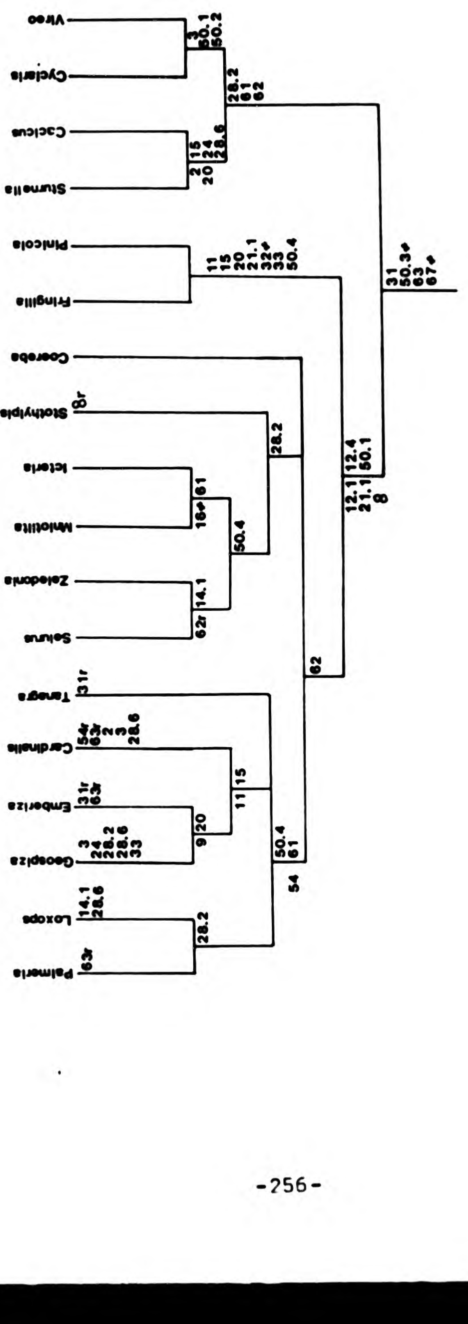
ICTERIDAE FIG. 225

FRINGILLIDAE FIG. 224

PARULIDAE FIG. 221

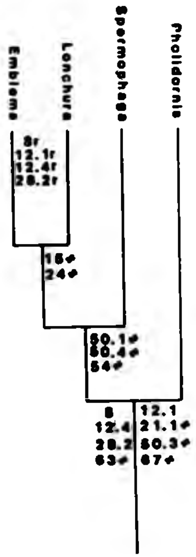
EMBERIZIDAE FIG. 222

DREPANIDIDAE FIG. 223



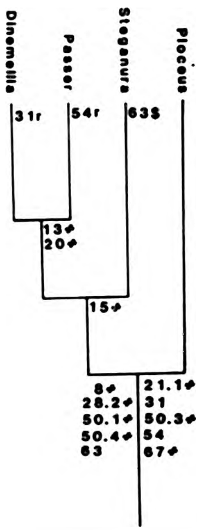

NINE-PRIMARIED OSCINES

FIG.227



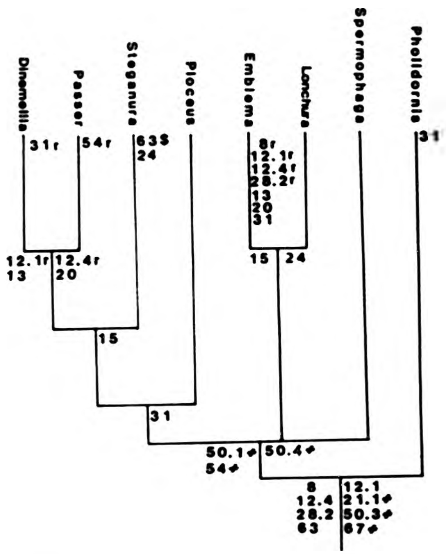

ESTRILDIDAE

FIG.228



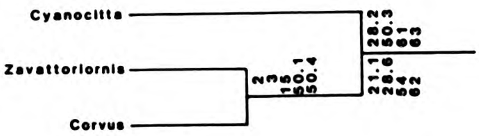

PLOCEIDAE

FIG.229



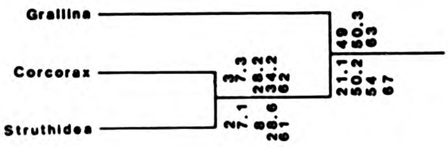

ESTRILDIDAE & PLOCEIDAE

FIG.230



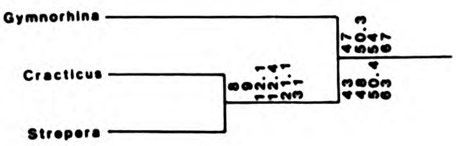

**CORVIDAE**

FIG.231



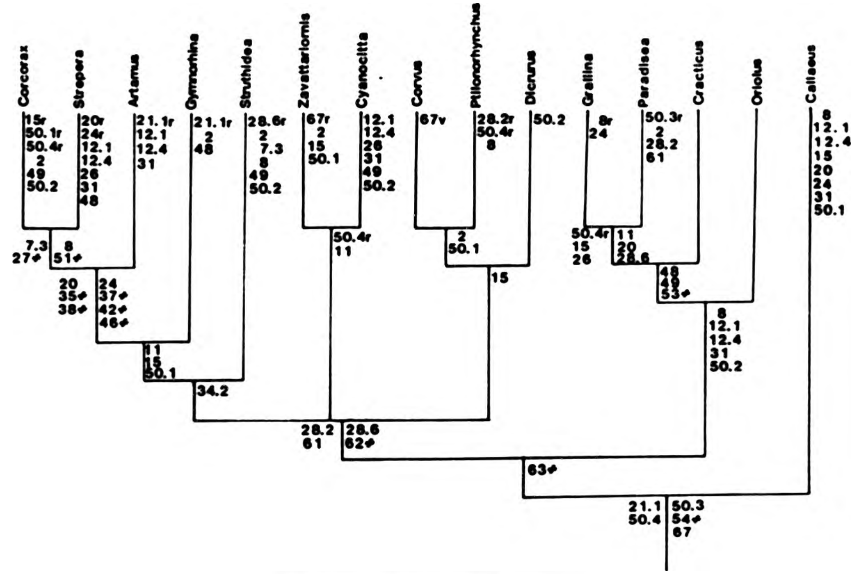

**GRALLINIDAE**

FIG.232




**CRACTICIDAE**

FIG.233




CORVID ASSEMBLAGE

FIG.234

## DISCUSSION AND CONCLUSIONS

Raikow (1987) states that passerine monophyly is corroborated by sperm structure, palate and hind limb anatomy. This point is accepted and will not be discussed further.

In order to avoid excessive confusion, the proposed classification of the Order Passeriformes (Sibley 1985) is given below for reference. (The families included in each group are bracketted.)

Suborder Oligomyodi (=Suboscines)

Infraorder Acanthisittides (Acanthisittidae)

Infraorder Eurylaimides (Eurylaemidae, Pittidae, Philepittidae)

Infraorder Tyrannides

Parvorder Tyranni (Tyrannidae, Mionectidae)

Parvorder Furnarii

Superfamily Furnarioidea (Furnariidae)

Superfamily Formicarioidea (Formicariidae, Rhinocryptidae, Conopophagidae)

Parvorder Thamnophili (Thamnophilidae)

Suborder Passeres (=Oscines)

Parvorder Corvi

Superfamily Menuroidea (Climacteridae, Menuridae, Ptilonorhynchidae)

Superfamily Meliphagoidea (Maluridae, Meliphagidae, Acanthizidae)

Superfamily Corvoidea (Eopsaltriidae, Orthonychidae, Pomatostomidae, Corvidae, Laniidae, Callaeidae)

Parvorder Muscicapae

Superfamily Turdoidea (Bombycillidae, Cinclidae, Turdidae, Sturnidae)

Superfamily Sylvioidea (Sittidae, Troglodytidae, Paridae, Aegithalidae, Hirundinidae, Regulidae, Pycnonotidae, Cisticolidae, Zosteropidae, Sylviidae)

Superfamily Fringilloidea (Alaudidae, Nectariniidae, Ploceidae, Fringillidae)

## SUB-ORDER OLIGOMYODI

Sibley and Ahlquist (1984c & 1985b) erect three infraorders - Acanthisittides, Eurylaimi (Pittidae, Eurylaimidae and ?Philepittidae) and Tyrannides (New World Suboscines).

The last they divide into three parvorders. Parvorder Furnarii contains Furnaroidea containing only Furnariidae (Furnariinae and Dendrocolaptinae), and Formicaroidea (Formicariidae, Rhinocryptidae and Conopophagidae. Parvorder Thamnophili contains only Thamnophilidae.

(a) New World Suboscines:

The Family Dendrocolaptidae is a well defined taxon, but with considerable variation, greater than in any other family studied. Due to the extreme adaptation to the scansorial habit, the features of the plantar surface are of little use in finding close relatives for this family. They show numerous features in common with other scansorials in the suborder Passeres.

The Family Furnariidae is an ill-defined group, which from this study gives the impression of perhaps being polyphyletic, *contra* Sibley and Ahlquist (1984c & 1985b).

In these works they erect Superfamily Formicaroidea, containing Formicariidae, Conopophagidae and Rhinocryptidae.

In the Family Formicariidae they keep only *Formicarius*, *Chamaeza*, *Grallaria* and *Pittasoma* (others traditionally placed in this family are removed to Thamnophilidae, Parvorder Thamnophili, *e.g.* *Thamnophilus*, *Taraba*, *Dysithamnus, Pygiptila, Myrmotherula etc.*) The findings of this study completely support this innovation, with *Formicarius* and *Grallaria* separated from the other genera, and defined by twelve autapomorphies. The Thamnophili are defined by only two.

They include only *Conopophaga* in the Family Conopophagidae. *Corythopsis* is placed in the Tyrannoidea. There is no support for this in this study, which would place *Corythopsis* in Formicariidae, close to *Formicarius*. *Conopophaga* would be a sister taxon to this expanded Formicariidae.

Family Rhinocryptidae includes *Pteroptochus etc.* and is placed close to Conophagidae. This does not conflict with the findings of the present study except that a closer relationship is suggested, placing *Pteroptochus* in Formicariidae.

Raikow (1987) found Rhinocryptidae, Formicariidae, Furnariidae and Dendrocolaptidae monophyletic on syringeal features; Ames (1971) and Sibley and Ahlquist (1985b) confirm.

The latter workers place the remaining New World suboscines in Parvorder Tyranni, Superfamily Tyrannoidea.

Sibley and Ahlquist (1984c & 1985b) place Family Pipridae as a subfamily of Tyrannidae, and include *Pipra, Manacus, Chiroxiphia.* The closeness of these last three genera is supported by this study, but *Iliacura* is not too distant.

Family Cotingidae is also placed as subfamily of Tyrannidae and include *Phytotoma* (Phytotomidae), *Pipreola, Oxyruncus* (Oxyruncidae), *Lipaugus, Rupicola, Procnias, Amphelion,* *Cephalopterus*. The present findings could support *Phytotoma*'s claims to inclusion, or it could belong in Pipridae, except that it does not have the derived state of character 63. *Rupicola* is not found to be particularly distinct. Lanyon (1985) places *Phytotoma* close to certain cotingids, incluing *Rupicola* and others not examined in this study.

McKitrick (1985a) found no characters supporting the monophyly of the Family Tyrannidae, but certain syringeal features support the monophyly of a slightly larger group. Two dendrograms are produced by McKitrick (*op.cit.*), and they contain four groups:

(A) *Oxyruncus*, *Iodopleura* (cotingid), *Corythopsis* (conopophagid), *Elaemia*, *Sayornis*, *Miarchus*, *Todirostrum*, *Mionectes* and all other tyrannids not in group (B).

(B) *Terenotricus*, *Myiobius*, *Pyrrhomyias*, *Onychorhynchus*, *Tolmomyias*, *Todirostrum*, *Zimmerius* (tyrannids); *Piprites*, *Sapayoa*, *Tyranneutes*, *Neopipo*, *Neopelma* (piprids).

(C) *Schiffornis* - (piprid), *Pachyrhamphus* and *Tityra* (cotingids).

(D) *Chiroxiphia*, *Pipra*, *Manacus* (piprids); *Lipaugus*, *Ampelioides*, *Procnias* (cotingids). *Pipreola* (cotingid) and *Phytotoma* are more distant.

Two arrangements are suggested: (A) + (B) sister to (C) + (D), or (B) + (C) sister to (A), and these three a sister to (D).

The same author (1985b) claims there is no clear phylogenetic pattern for kingbirds and allies.

Sibley and Ahlquist (1984c & 1985b) place *Myiarchus*, *Sayornis*, *Elaenia* in Tyranninae, but *Todirostrum*, *Leptopogon*, *Pipromorpha*, *Mionectes* in Mionectidae, with *Corythopsis*. Few of these innovations are supported, partly because of the non-coincidence of the taxa studied in this work and those by others. Certainly *Syristes*, placed in Tyrannidae by Sibley and Ahlquist (amongst others) comes out close to *Mionectes* in this study, i.e. a taxon which Sibley and Ahlquist (1984c & 1985b) place in another family (Thamnophilidae).

Family Oxyruncidae is included in Cotinginae by Sibley and Ahlquist (1984c & 1985b). Lanyon (1985) using various data, including DNA-DNA hybridization, puts it close to *Tityra*, *Pachyramphus* and *Pipra*, with *Rupicola*, *Phytotoma*, *Pipreola* and *Querula* rather more distant, *Cotinga* and *Gymnoderus* even more distant. This species was examined late and was not included in the LeQuesne test. It shows resemblances to Tyrannidae, but would appear closest to *Tityra* and *Pachyramphus* (cotingids), thus supporting the workers quoted above. Raikow (1987) claims that Tyrannidae, Cotingidae, Pipridae, Phytotomidae, Oxyruncidae are tentatively monophyletic, and cites Ames (1971) and Sibley and Ahlquist (1985b) for corroboration.

(b) Old World Suboscines:

Olson (1971) thought subordinal rank was not appropriate for Family Eurylaimidae, and placed it with Philepittidae, Cotingidae and Pipridae in Tyrannoidea despite the unique character in Eurylaemidae of a vinculum between the plantar tendons, as this is weak and sometimes absent in *Calyptomena* and *Smithornis*.

*Neodrepanis* was placed in Family Philepittidae on all characters studied including the syrinx (Amadon 1951) despite the considerable superficial dissimilarities to the other member of the family, *Philepitta*. This study supports the closeness of the two genera in this family.

The Family Pittidae is a highly derived family, which shares four autapomorphies of the plantar surface with the Acanthisittidae.

Sibley *et al.* (1982) show that by using syrinx, muscles, skeleton and other characters the Family Acanthisittidae (Xenicidae) was shuffled about and placed close to Tyrannidae, Pipridae, Pittidae, Philepittidae, and Furnariidae amongst others ( Furbringer 1888, Pycraft 1905, Stresemann 1934, and others in Sibley *et al.* 1982). On protein evidence Sibley (1970) thought it might be closest to oscines, and this was supported by Feduccia (1974,1975a and b) because of the primitive stapes. However Sibley *et al.* (1982) conclude that it is suboscine, with no close relatives. Raikow (1987) claims the family shares a syringeal muscle character with the oscines. He states that intraspecific variation in hind limb morphology to be greater than interspecific, but believes that other characters corroborate monophyly of Old World suboscines- derived stapes, primitive syrinx and syndactyly. The present study found syndactyly to be <u>absent</u> in Philepittidae and Acanthisittidae, and to occur sporadically in New World suboscines and in numerous unrelated families of oscines. Sibley *et al.* (1982) consider Eurylaimidae and Pittidae as sister groups (they did not study Philepittidae), and this is supported by Ames (1971) and Raikow (1987). Raikow supports monophyly of Eurylaimidae, but shows that *Calyptomena* is very distinct (as in this study). The findings of this study do not support monophyly of the Old World suboscines, but if that hypothesis is accepted, this study supports the distinctness of *Calyptomena* within the Eurylaimidae, and the juxtaposition of this family and Philepittidae. The Acanthisittidae would certainly appear to be closer to *Pitta* than to the Menuroidea.

SUB-ORDER OSCINES

The results of this study demonstrate that the Superfamily Menuroidea (*i.e. Menura* and *Atrichornis*) is a well defined clade. Sibley (1974) claimed *Menura* to be close to Paradisaeidae and Ptilonorhynchidae on protein analysis and syringeal structure.

Sibley and Ahlquist (1983) claimed *Climacteris* to be close to Ptilonorhynchidae and *Menura*, *contra* Ames (1987) who says that the syrinx of *Climacteris* is very distinct from other passerines. No LeQuesne test was run of these groups together, but a phenetic comparison revealed that *Climacteris* shared nine characters with *Menura* (and in addition they both lacked the same four characters), and nine with *Ptilonorhynchus*, but only four with *Atrichornis*. *Menura* shared only six with *Atrichornis*, and seven with

*Ptilonorhynchus*. These last two share nine. This was somewhat surprising, since both *Climacteris* and *Menura* appear to have considerable specialization of the plantar surface, the former scansorial, the latter terrestrial. These findings certainly do not disagree with those of Sibley and Ahlquist (1983).

Due to the seemingly great degree of specialisation of the plantar surface in the Family Alaudidae it is difficult to relate this family to any other. A terrestial way of life is doubtless responsible for many adaptations to the plantar surface of the foot, including the number of raised pads and folds. Sibley and Ahlquist (1985c) place this in Fringilloidea with Nectarinidae, Ploceidae and Fringillidae. No valid comment can be made on this move from this study.

Sibley and Ahlquist (1985c) place the Family Hirundinidae in Superfamily Sylvioidea. Three autapomorphies for this family (8,31 and 67) are also found in most of the sylvioids and therefore tentative support can be given for this move. *Cecropis* is well separated from *Hirundo* on plantar morphology and nest structure which is quite different in the two taxa. The latter usually building supported cup-shaped nests, whereas the former builds retort-shaped mud nests, normally unsuported, but in certain species somewhat degenerate (pers.obs.). However, Phillips (1973) claims *Petrochelidon* is not separable from *Hirundo*, as the nest structure of the former is variable.

Sibley and Ahlquist (1985c) place the Family Motacillidae as a subfamily in Ploceidae with Prunellinae, Estrildinae *etc*. These authors earlier (1981c) review its placement close to Alaudidae, Hirundinidae, Turdidae, Prunellidae, nine-primaried oscines etc. (*e.g.* Sclater 1880, Sharpe 1891, Mayr and Amadon 1951, Wetmore 1960). The family shares a lot of derived characters with *Prunella*, and a certain number with Estrildidae and Ploceidae thus supporting this relationship.

*Bernieria*, a Malagasy genus, previously problematical and often classified in Timaliidae *incertae sedis*, is separated by only one character that is autapomorphous for the rest of the Pycnonotidae, and would therefore appear to be well placed in this family. The distinct plantar morphology of the terrestrial *Bleda*, possibly warranting subfamily status within this family, is mentioned in 'Results'. Sibley and Ahlquist (1985c) place this family in Superfamily Sylvioidea. It shares a number of derived states with Timaliidae, Sylviidae and Polioptilinae, and thus would appear close.

These authors place the Family Aegithinidae as *incertae sedis* in the Corvidae. It shares a number of derived states with the corvid assemblage, but on balance would appear to be much closer to the pycnonotids, perhaps even of the same family.

Sibley and Ahlquist (1985c) place the Family Campephagidae in the Tribe Oriolini of the Corvinae. The present study does not support this, because although it has some characters in common with *Oriolus*, it is not obviosly close. The ambivalent position of *Chlamydochaera* (either in its traditional place in Campephagidae, or in Turdidae) is considered in 'Results'. Phenetically its plantar surface suggests the latter.

The Family Laniidae has long caused controversy, both over its limits, and its subdivisions. Beecher (1953) claims that Malaconotinae and Laniinae (constituting the Family Laniidae) are close, and evolved from Monarchinae; that Vanginae and Prionopinae (Prionopidae) derive separately from Monarchinae; that Pityriasinae, Cracticinae, Artaminae and Grallinae (Cracticidae) are another group deriving from the Monarchinae. Raikow *et al.* (1980) studying appendicular myology, find Malaconotinae the most primitive, followed by *Corvinella* - *Lanius*, then *Pityriasis* and then *Eurocephalus* - *Prionops*. Sibley and Ahlquist (1985c) make Malaconotinae (Malaconotini + Prionopini -see under Vangidae) a subfamily along with Monarchinae and four others in Corvidae. *Pityriasis* is transferred to the Cracticidae. Laniidae is a sister family to Corvidae and contains *Eurocephalus*, *Corvinella* and *Lanius*. This study supports the closeness of *Eurocephalus*, *Corvinella* and *Lanius*, but *Telophorus* (traditionally a malaconotine) would also belong to this clade, and probably *Pityriasis*. *Prionops* and *Laniarius* (a malaconotine) belong to another clade. That *Pityriasis* is a cracticid could not be claimed with confidence.

The Family Vangidae is confined to Madagascar, and contains a number of seemingly disparate forms as a result of a radiation comparable to that of Geospizinae or Drepanididae. Beecher (1953) claims they evolved with Prionopinae (Prionopidae) from Monarchinae. Sibley and

Ahlquist (1985c) place *Leptopterus* with *Prionops*, *Batis*, *Platysteira*, *Philentoma* and *Tephrodornis* in Prionopini. The present study does not support the relationship of *Leptopterus* and *Prionops*, but there are a number of characters in common between vangids and certain monarchs (*sens.lat.*) including *Batis*, *Platysteira* and *Philentoma*. *Tephrodornis* was not examined.

The results from Family Bombycillidae and Family Dulidae support Arvey (1951) who merged these two families and Ptilogonatidae. Sibley (1973b) placed *Myadestes* (and perhaps *Entomodestes*) in Ptilogonatidae. Sibley and Ahlquist (1984a) move the last two genera to Turdidae, and place the Bombycillidae (Bombycillini, Dulini and Ptilonogatini) close to Turdidae and Sturnidae. Arguements for two subfamilies, the Hypocolinae and Ptilogonatinae are found in 'Results'.

The Family Troglodytidae is expanded by Sibley and Ahlquist (1985c) who place Certhiinae and Polioptilinae in this family, and place it in Sylvioidea. These authors (1984a) add *Auriparus* to Polioptilinae. *Polioptila* could belong on plantar characters, but *Ramphocaenus* is very distinct. The certhiids are so highly adapted that no meaningful judgement can be made. The findings of this study do not oppose the placing of Troglodytidae in the Sylvioidea.

The Family Prunellidae is given subfamilial status in Ploceidae, with Motacillidae *etc.* by Sibley and Ahlquist (1985c). Earlier these authors (1981b) review its historical placement allied to buntings, Paridae, Sylviidae, Turdidae, and 'close to fringillids'. Usually it was given its own family. Its apparent closeness to Motacillidae has been remarked upon under that family.

The Family Cinclidae is allied by Sibley and Ahlquist (1985c) with Bombycillidae, Turdidae and Sturnidae, and placed in Turdoidea. This study shows it to be closest to *Toxostoma* (Mimidae) and *Thryothorus* (Troglodytidae).

The Family Sturnidae and Family Mimidae become tribes within the Sturnidae according to Sibley and Ahlquist ( 1980,1984b and 1985c). The present study supports this merger, but finds *Buphagus* particularly distinct, with its presumed adaptations to walking on ungulates.

When Troglodytidae, Prunellidae, Cinclidae and Mimidae are run together (with, or without, Sturnidae) the traditional groupings are somewhat broken up. Beecher (1953) puts these groups close (except Troglodytidae), with Turdidae and Hirundinidae.

The Family Turdidae has not a single autapomorphy, unless *Zoothera lunulata, Oenanthe* and *Modulatrix orostruthus* are ignored. Goodwin (1956) claims that *Pseudocossyphus* is closer to *Monticola* than to *Cossypha*, and Harrison (1976) states that *Drymodes brunneipygia* is not turdine on syringeal musculature. These two findings are supported by the present study. Irwin and Clancey (1974) place *Cossypha, Xenocopsychus* and *Pogonocichla* in one group, and *Alethe, Dryocichloides, Sheppardia, Stiphrornis* and *Swynnertonia* in another on plumage pattern. There is no support for this from the present study. Benson and Irwin (1975) placed *'Phyllastrephus' orostruthus* in *Modulatrix*. Irwin and

Clancey (1986) erected a new genus, *Arcanator*, for *orostruthus*, pointing out the considerable differences in plumage and bill shape between this and *stictigula*. Since spirit specimens of these two species were not available, skins had to be used. The overall appearance of the plantar surface shows that they are very close, but *Kakamega poliothorax* (a timaliid) is possibly closer to *stictigula* than the latter is to *orostruthus*. Olson (1987) states that *Amalocichla* has a non-turdine syrinx and humerus and may be closest to *Crateroscelis* of Acanthizinae. The former genus was not studied, and no comment can be made. He also states that *Drymodes* has a corvine humerus (*sensu* Sibley and Ahlquist 1984a). Sibley and Ahlquist (1982b) review the historical placement of *Drymodes* as a timaliine (*e.g.* Sharpe 1903), in Cinclosomatidae (*e.g.* Mathews 1927), and as a turdid (e.g. Ripley 1952), and place it in the Eopsaltriidae. Sibley and Ahlquist (1985c) remove Erithacini, and place it with Muscicapini in Muscicapinae, a sister to Turdinae. There is no support for this from this study.

The problems of the almost certainly polyphyletic Subfamily Orthonychinae are mentioned in 'Results'. *Melampitta* of New Guinea could be a turdid, although Sibley and Ahlquist (1987b) claim that the other member of this genus is a paradisaeid. On plumage grounds *Ifrita* , also of New Guinea, has been claimed to be close to *Niltava* (Muscicapidae) by Desfaye (1967). Harrison (1967) however, claimed it to be closest to *Todopsis*, and to a lesser extent *Malurus* (both Maluridae) and *Eupetes* (presumably *sens.lat.*, which includes *Ptilorrhoa*), all of which he places in Timaliidae. This present study does not support any of these suggestions, although *Todopsis* was not examined. The Australian *Sphenostoma* and *Psophodes*, often now merged (*e.g.* Campbell and Lack 1985) would appear to be distinct. Another New Guinea genus, *Crateroscelis*, is now generally placed in Acanthizidae (*e.g.* Campbell and Lack, *op.cit.*) and probably belongs there. The W.African *Picathartes* is probably not close to any others in the group. It has been placed in the Corvidae (Sclater 1930), Sturnidae (Lowe 1938) and Timaliidae (*e.g.* Delacour and Amadon 1951, Sibley 1973), close to either *Turdoides* or *Garrulax*. Serle (1952) noted resemblances to *Eupetes* , and this was supported by Olson (1979) specifically regarding *E.macrocercus*, and not other species separated as *Ptilorrhoa*. The findings here support none of these ideas. The genus appears to have a highly derived plantar surface, which possibly has some connection with its fondness for clinging to vertical saplings somewhat after the manner of *Panurus* clinging to reeds (A.D.Forbes-Watson, pers.comm.).

Rather tenous suggestions for the 'Orthonychinae' from this study are -

(a) *Ifrita* is possibly closer to the *Pomatostomus* clade than anything else.

(b) *Melampitta* is perhaps a turdid, although it could be close to *Pomatostomus* - *Ptilorrhoa*.

(c) *Sphenostoma* and *Psophodes* warrant generic separation.

(d) *Eupetes* and *Ptilorrhoa* are certainly not congeners, the first being closest to *Cinclosoma*, the second to *Melampitta* and *Pomatostomus*.

(e) *Crateroscelis* possibly belongs to the Acanthizidae, close to *Smicrornis*.

(f) *Picathartes* may not be related to this group, or is closest to *Orthonyx*.

(g) *Eupetes* and *Cinclosoma* form a clade.

(h) *Pomatostomus* is certainly not a timaliid, but probably closest to *Melampitta* and *Ptilorrhoa*.

There is no support for the division of Family Timaliidae into tribes following Delacour (1946). The possible misplacement of *Kakamega* in this family is discussed under Turdidae above. Few attempts have been made to reclassify this group since Delacour (1946,1950). Mann *et al.* (1978) discussed the anomalous *Kakamega*. Mann (1979) attempted to reclassify the family but produced no firm conclusions.

Ripley and Beehler (1985) split Tribe Pellorneini into five groups on eight characters using nearest-neighbour clustering techniques.

(A) *Trichastoma* - *rostratum, celebense, bicolor* + ?*Leonardina woodi*.

(B) *Malacocincla* - *abbotti, sepiaria, malaccensis, cinereiceps* + ?*perspicillata*.

(C) *Pellorneum* - *tickelli, albiventris, palustre, ruficeps, fuscocapillum* (+*capistratum, pyrrhogenus*)

(D) *Malacopteron* - *magnirostre, affine, cinereum, magnum*.

(E) *Illadopsis* - *cleaveri, albipectus, rufipennis, puveli, rufescens, fulvescens, pyrroptera* - to which they add *Alcippe abyssinica*, and claim *Kakamega poliothorax* to be close to *pyrrhoptera*.

*Ptyrticus turdinus* is placed *incertae sedis*.

Although they quote Mann *et al*. (1978), they do not utilise the characters shown there which would demonstrate the great difference between *Kakamega* and any member of *Trichastoma* (*sens.lat.*). *Trichastoma tickelli* was examined in the present study, and does appear to have rather long, slender digits, but does not show the peculiarities of *Pellorneum capistratum* or *ruficeps*. *Alcippe abyssinica* bears no resemblence in behaviour, vocalisations or 'general facies' to *Illadopsis* (pers.obs.). The morphology of the plantar surface of *Alcippe* and *Trichastoma* is too similar to be used to make any meaningful judgements on their relationships. *Ptyrticus* is quite unlike any other babbler, except possibly *Kakamega*, but only skins were available for examination. Harrison (1986) places *Heterophasia annectans* in *Minla*; *Yuhina zantholeuca* in *Stachyris*; *Y.castaniceps* in *Staphida*; *Minla cyanouroptera* in *Leiothrix* or in monotypic *Siva*. The results of the present study do not lend themselves to making any valid comments on these moves, as the plantar surfaces of all are rather similar.

Rand and Traylor (1953) suggest that the Subfamily Polioptilinae is not a natural group, and that *Ramphocaenus* and *Microbates* (and possibly *Psilorhamphus*) are much more like *Macrosphenus* (Sylviidae) than *Polioptila*. This study certainly finds the first genus quite distinct from the last, and the two are well separated when placed in a dendrogram with Timaliidae *incertae sedis* (*i.e. Malia*, *Horizorhinus*, *Mystacornis* and *Oxylabes*). *Macrosphenus* is an Afrotropical genus, whereas the others are all New World. Sibley and Ahlquist (1984a) place Polioptilinae as a subfamily in Troglodytidae, Sylvioidea.

The Family Paradoxornithidae contains the only passerine with three digits (*Paradoxornis paradoxus*). Beecher (1953), using jaw musculature, allies them with motacillids and alaudids , as well as timaliids. Sibley and Ahlquist (1982e) claim that *Chamaea* is equidistant from Old World sylviids and timaliids, which are together monophyletic. They place this family with the timaliids in Tribe Timaliini. This study certainly agrees with their closeness to the timaliids.

Beecher (1953) splits the Family Sylviidae into Sylviinae and Cisticolinae, each giving rise to separate lineages. Sibley and Ahlquist (1985c) divide the family into three families Sylviidae (Sylviinae - Sylviini + Timaliini; Megalurinae; Phylloscopinae), Cisticolidae and Regulidae. Some of the genera shown in their phylograms were used in the present study. The groupings of the two works show considerable incongruence, although as remarked in 'Results', it is thought that this group may well not be a natural one.

Families Paridae and Remizidae are merged by Sibley and Ahlquist (1985c), having previously (1984c) transferred *Auriparus* to Polioptilinae. These changes are supported by the present study. They place Paridae and Aegithalidae in Sylvioidea. This study would also merge Aegithalidae with Paridae.

Certain characters appear to be associated with the scansorial mode of life, and are presumably highly adaptive and of less use taxonomically than others which are not so. These are the derived states of Characters 1, 4 (also apparently associated with a terrestrial habit), 5 (although not exclusively scansorial), 6, 17, 29 and 46. The derived state of the latter is found in all scansorials except *Rhabdornis* which seemingly has been wrongly attributed with this habit (see below). This must be born in mind when weighing alternatives.

The scansorial families have been discussed at length in 'Results'. The Dendrocolaptidae have also been considered under 'Oligomyodi' and *Hypositta* belongs to Vangidae. The members of this group are so specialised (regarding the plantar surface) for the scansorial habit that few meaningful judgements can be made about their relationships. Since it appears that the scansorial habit has evolved five or six different times in the oscines, there is considerable homoplasy when the group is taken as a whole.

The Family Sittidae is divided into Sittinae and Tichodrominae (*i.e.* no departure from tradition) by Sibley and Ahlquist (1985c) and placed in Sylvioidea. The present study would argue against the close relationships of these two subfamilies.

The Family Daphoenosittidae (containing only *Daphoenositta* = *Neositta*) has been placed in Sittidae (Sharpe 1903), Timaliidae (Beecher 1953), Salpornidae (Delacour and Vaurie 1957), in Certhiidae, with all creepers (Berndt and Meise 1960), and finally given full family status (Rand and

Gilliard 1967). Parker (1982) suggests that it is descended from the Pachycephalidae (robin-whistler-monarch group). Sibley and Ahlquist (1982c,h and 1984c) place it as a tribe in Pachycephalinae, Corvidae. The results of this study only confirm that it is not related to other scansorials.

The Family Certhiidae is placed as a subfamily in Troglodytidae by Sibley and Ahlquist (1984a). This study shows that *Certhia* and *Salpornis* are close, but no comments can be made on relationships at higher levels. The scansorial habit is dubiously attributable to the endemic Filipino family, Rhabdornithidae, as discussed in 'Results'. It could possibly be a member of the Timaliidae.

Harrison (1969) and Parker (1982) both claimed that the Family Climacteridae evolved from Meliphagidae, and their scansorial habit was recent and not well developed. Sibley *et al.* (1984) claim that *Climacteris* is closest to *Menura*. Ames (1987) found the syrinx of *Climacteris* very different from all other oscines, and not close to *Menura* or *Meliphaga*. In this study it was found that *Climacteris* shares four characters with Menuroidea, and ten characters with *Menura* (four more than the latter shares with *Atrichornis*). Also, *Climacteris* and *Menura* have characters 61 to 64 inclusive missing. It would appear that *Menura* is closer to *Climacteris* than to *Atrichornis*, at least as far as plantar characters are concerned. This is most unexpected as *Menura* is highly terrestrial.

Within the Family Muscicapidae, *Niltava* is quite distant from *Muscicapa*, justifying the separation of the two into distinct genera. However, *Newtonia*, found by Ames (1975) to be aberrant, fits the group well. There is no real support for Sibley and Ahlquist (1985c) in placing this family as a sister tribe to Erithacini in Muscicapinae, Turdidae, although there are overall similarities between the muscicapids and turdids.

The Family Eopsaltriidae is reasonably well defined, particularly if *Microeca* is not considered. Boles (1979) placed this family in Pachycephalinae. Sibley and Ahlquist (1985c) place it as a family in Corvoidea. These workers (1982b) review the various taxonomic treatements of *Drymodes* (*e.g.* in Timaliidae, Sharpe 1903; in Cinclosomatidae, Mathews 1927; in Turdidae, Ripley 1952) and place it in Eopsaltriidae close to *Poecilodryas* and *Eopsaltria*. This study would place it in Orthonychinae (*sens.lat.*) close to *Eupetes* and *Cinclosoma*.

It would appear that the Family Monarchidae, as generally accepted (*e.g.* Morony *et al.* 1975), is polyphyletic. Running such a group through the LeQuesne test together could be expected to give such a clique as would produce anomalous groupings. Boles (1979) includes *Rhipidura* in the Monarchinae, but excludes *Hypothymus*, *Terpsiphone* and the African 'monarchs'. He places Monarchinae in Pachycephalidae. Sibley and Ahlquist (1984a) accept *Terpsiphone* and *Trochocercus* as monarchs, as well as *Grallina*, and place the group as a subfamily of Corvidae. In a later paper (1985c) they transfer *Batis*, *Platysteira* and *Philentoma* to Prionopini, and *Lamprolia* to the monarchs. If a LeQuesne test is run on the monarchs *sensu* Sibley and Ahlquist (with *Bias* and *Pseudobias* also removed as they are generally considered to belong to Platysteirinae, e.g. Morony *et al.* 1975) the dendrogram arrived at is somewhat different to that found for the original Monarchidae (Fig.218), and there is no autapomorphy for the whole group. In the new arrangement *Myiagra, Terpsiphone* and *Machaerhynchus* form a clade (the first two are close in the earlier dendrogram). *Grallina, Lamprolia, Trochocercus, Arses, Clitorhynchus* and *Seisura* form another clade (the last two are close in the earlier arrangement, as are *Trochocercus* and *Arses*, indicating some robustness). Another arrangement juxtaposes *Lamprolia, Trochocercus, Elminia* and *Mayornis.* The last three are not particularly close in the original arrangement (Fig.218). Perhaps this group, particularly with the removal of the Platysteirinae, is more natural. The findings of the present study do not lend much support for, nor do they disagree with these innovations.

Boles (1975) places *Chelidorhynx* in Subfamily Rhipidurinae and suggests that *Sphenostoma* could be related. The former was not studied in this work, but there is no disagreement with the latter suggestion. Sibley and Ahlquist (1984a) place this group as a tribe of Monarchinae. The present study would support this, but would equally support its membership of Pachycephalinae.

Boles (1979) adds the Eopsaltiidae to this group to form the Pachycephalinae, a sister group to the Monarchinae in the family Pachycephalidae. He adds *Finschia, Mohoua* and *Eugerygone* to Subfamily Pachycephalinae, following Keast (1977a and b). Sibley and Ahlquist (1987c) confirm the first two, and place this group as a subfamily of Corvidae. They add *Daphoenositta* as a tribe (1982c,h and 1984c) as mentioned above. The results of this study suggest that this is a monophyletic group (although no comment can be made about this last addition), equidistant from Monarchidae and Eopsaltriidae.

Sibley and Ahlquist (1982a and 1983) split the Acanthizidae from the Family Maluridae, and transfer *Lamprolia* to Monarchinae and *Ephthianura* to Meliphagidae. The findings of this study support this split, with the Maluridae well defined by seven autapomorphies. When the Acanthizidae (*sensu* Sibley and Ahlquist) is put through the LeQuesne test, cliques are produced that allow for three possible arrangements. *Aphelocephala*, *Hylacola* and *Acanthiza* are close in all (as are the first two in the original dendrogram, Fig.217). *Gerygone* and *Pyrrholaemus* are close in two arrangements, and *Smicrornis* may also be close to the former. The details disagree with Sibley and Ahlquist (1984c). No comments can be made about higher level relationships.

When the nectarivore families are put through the LeQuesne test together a clique is produced in which traditional relationships are lost. One interpretaion is that the larger grouping is polyphyletic. Sibley and Ahlquist (1985c) place *Promerops* as a subfamily of Nectariniidae, whereas the findings of this study suggest it belongs in the Meliphagidae. In the same paper they place Zosteropidae as a family of Sylvioidea. In an earlier paper (1984a) they give both Family Dicaedae and Family Nectariniidae tribal status within the Nectariniinae. These moves are neither supported or contested by the findings of the present study.

Sibley and Ahlquist (1984a and 1985c) exclude Vireonidae from the 'nine-primaried oscines' and reduce the group to one family, the Fringillidae. This they subdivide into Emberizinae (Emberizini, Parulini, Cardinalini, Icterini, Thraupini) and Fringillinae (Fringillini, Carduelini, Drepanidini). Thraupini includes *Tersina* (Sibley 1973), whilst Parulini includes *Icteria* (Sibley and Ahlquist 1982d) and *Zeledonia* (Sibley and Ahlquist 1982g). The present study would support these inclusions, and the closeness of this group, except for Icterini which appears quite distant from the others. However, it should be pointed out that one of the genera examined in this group is *Sturnella* which appears to have a number of adaptations to terrestrial life.

Avise *et al.* (1980b) found one emberizid (*Calcarius*) to be more distant genetically than a fringillid (*Carpodacus*) to others of the Emberizidae, and supported this with behavioural characters. Neither of these was examined in this study.

The Family Vireonidae will be considered next. Beecher (1953) places Vireoninae, a descendent of Monarchinae, as the ancestral group to all other nine-primaried oscines. Raikow (1978a) finds that after the removal of Vireonidae the assemblage is close, with Parulidae the most primitive, Drepanididae, Carduelinae and Fringillinae the most derived. Avise *et al.* (1980c) claim that *Vireo* comes from the stem group that gives rise to *Catharus* and later Parulidae. Avise *et al.* (1982) found that genetic distances within *Vireo* to be very great when compared with other oscines, suggesting that it is a very old genus, and further suggest that it is a descendent of the stem group that gave rise to other nine-primaried oscines. Raikow (1978a) however disagrees. Sibley and Ahlquist (1982f) review the taxonomic history of the family, showing that is usually allied to the nine-primaried oscinrs or Laniidae, only occasionally with other groups. They (1985c) place it as a subfamily *incertae sedis* in Corvidae. The present study shows it to be quite separate from the nine-primaried oscines, except perhaps Icteridae, but no further comment can be made.

Vernon and Dean (1975) disagree with the Family Estrildidae being the correct place for *Pholidornis*, and similarly Sittidae, Nectariniidae and Ploceidae. They suggest that it belongs in Remizidae. This study certainly finds it to be quite distant from other estrildids and ploceids, but no suggestion can be made about its relationships. Christidis (1987), studying estrildids by protein electrophoresis, found *Emblema* and *Lonchura* widely separated, thus disagreeing with the present study. However, since there were no other genera in common between the two studies, no further comment can be made. This worker found *Passer* more distant from the estrildids, and this is supported by the present study. Sibley and Ahlquist (1985c) place the estrildids as a subfamily of the Ploceidae, with Motacillinae and Prunellinae. The results of this study do not disagree.

Studying the Family Ploceidae, Bock & Morony (1978) found a character (preglossale of tongue) to be unique to *Passer, Montifringilla* and *Petronia*, and on this they separated them into Passeridae, distinct from Ploceidae and Estrildidae. Bentz (1979) studying these two families could find no autapomorphy, but claimed that certain characters supported monophyly. He found the estrildids the most derived and constituted a family which included the Viduinae, but claimed that the three subfamilies of ploceids were paraphyletic. Cracraft (1981) erects three superfamilies - Passeroidea, Ploceoidea and Estrildoidea (Estrildidae and Bubalornithidae). Sibley and Ahlquist (1985c) split the ploceids into two subfamilies, Ploceinae and Passerinae within Ploceidae. The present study does not support or deny any of these moves.

The remaining families are treated together as the 'corvid assemblage'. Sibley and Ahlquist (1984a and 1985a) remove the type of the Family Grallinidae and place it in Monarchini. This study found that ten autapomorphies separate *Corcorax* and *Struthidea* from *Grallina*, and thus gives some support to this innovation. The residual family group would then become the Corcoracidae (Corcoracinae, Corvidae, Sibley 1985).

The Family Cracticidae becomes the Tribe Cracticini of the Corvinae (Sibley and Ahlquist 1985c). It is expanded to include *Artamus* and *Pityriasis*. In an earlier paper (1984c) they place *Peltops* in this group and quote T.R.Howell (pers.comm.) who states that the skull is cracticine, and not muscicapine or monarchine. No valid comments can be made on this.

The Family Dicruridae is treated as a tribe of Monarchinae (Sibley and Ahlquist 1984a). This move is compatible with the present findings, and *Dicrurus* could be close to *Elminia*, or *Trochocercus-Arses.*

The Family Oriolidae becomes a tribe of Corvinae, and includes the Campephagidae. The findings of this study do not strongly disagree.

The Family Callaeidae retains its status in Sibley (1985) and is placed in Corvoidea.

The Family Paradisaeidae becomes a tribe in Corvinae (Sibley and Ahlquist 1985c). No useful comments can be made on these moves.

The Family Ptilonorhynchidae is included in Menuroidea (see above).

One of the greatest controversies in ornithological taxonomy in the last decade has resulted from the proliferation of papers based on DNA-DNA hybridization, the majority of which emanate from Sibley and his co-workers (Sibley, Sibley and Ahlquist etc., numerous references from 1980 onwards). The present worker's doubts about this technique are expressed in the 'Introduction'. Sibley and Ahlquist (1983) claim that reciprocal experiments using different radioactive tracer DNA in quite diverse groups give very close results. They use this as evidence of the ability of the technique to measure accurately large reciprocal distances. They claim that this also supports a uniform average rate of nucleotide substitution (UAR), which they use to put a time scale on their phylograms, whereby each dichotomy becomes an event timed from present. They also applied this technique to hominoids (Sibley and Ahlquist 1984d). Templeton (1985) demonstrates that the conclusions of this last work are without statistical significance owing to internal inconsistancies in their data set. Britten (1986) claims that the rate of DNA change in different phylogenetic groups varies by up to a factor of ten. It is slowest in higher primates and some birds, and fastest in rodents, sea urchins and *Drosophila*. He suggests that generation length and selection for reduction in mutation rate are the factors responsible. Ruvolo and Smith (1986) support Sibley's method and findings, and state that stochastic errors are not important if the whole of the single copy DNA is used. Cracraft (1987) has a number of criticisms of Sibley and his co-workers. Firstly he claims that labelled taxa do not appear as unlabelled taxa in other studies. Hence there is a complete matrix at the species level for only a small number of species, and that distances are generated for trees by non-quantitative comparisons. They produce completely resolved phylogenies in the absence of any data, but claim that interrelationships cannot be determined if taxa are not labelled. Cracraft also attacks the idea of a 'uniform average rate' of genomic substitution in birds. He further states that cladistic analysis of nucleotide and amino acid sequences reveals moderate to high levels of homoplasy, and therefore DNA distance will not reflect the recency of common ancestry with complete fidelity. Raikow (1987) makes the point that DNA-DNA hybridization is an estimate of genetic distance. There are no characters in the traditional sense, and no direct relationship between such distances and any particular class of morphological characters. His conclusion is that if DNA studies and morphology generate similar phylogenies, the probable explanation is that they are not coupled, but are independantly tracing a third, common, pattern which is presumably the true historical genealogy. If the results are divergent, then errors must lie in one or both methods. Sheldon (1987) studying DNA-DNA hybridization in herons and ibises claims to have discovered different rates of DNA evolution in different lineages. In reply to Cracraft (1987), Sibley *et al.* (1987) state that the average genomic rate (AGR) of nucleotide substitution is similar for passerines, non-passerines and hominods, but there is a slowdown in those with delayed maturity - 'neutral theory of molecular evolution' (Kimura 1983). They claim that a complete matrix of all species being labelled is not necessary for a tree; one species in each subgroup is required to be labelled and compared with other genera. Discrepancies in reciprocal results are put down to experimental error. They predict that nucleotide sequencing will yield similar results, but will be much more time consuming. These authors argue that Cracraft's claims that it is a phenetic method, and as such cannot distinguish between homology and analogy, or between synapomorphy and symplesiomorphy, are objections which are false or misleading. All genes, inluding silent ones, are compared - 'Genes are not affected by convergent evolution, adaptive limits, developmental channelling, evolutionary propensity, structural constraints or orthogenesis'. Only autapomorphous changes are measured - there are no synapomorphies or symplesiomorphies. Homoplasy is not a hazard as it is for nuclear sequencing, where nucleotides are used as characters, and parsimony is involed. DNA, they state, measures 'net divergence'.

Their claim that only one member of a subgroup needs to be labelled and compared to other genera would be valid only if the level of confidence in the subgroup's naturalness is very high.

Few studies have been reported in which there are direct comparisons between the findings of traditional methods and those of DNA-DNA hybridization for the same group, or groups, of taxa. One exception to this is Prum (1988) reporting on Capitonidae and Ramphastidae (Piciformes). He compares cladistic analysis based on morphology and anatomy with DNA-DNA hybridization phylogenies of Sibley and Ahlquist (1985c and 1986). He found very high congruence between his most parsimonious cladogram and the phylogram produced in the second paper.

Houde (1987a,b) attacks Sibley and his co-workers (various references) on their re-interpretation of findings at different times from the same data set, and also their dates of divergence of many families. He claims that their invoking differential vagility to explain discrepancies is wrong, and that it is evolutionary rates which are important. He states that taxonomic levels indicated by genetic differences may be so different from those indicated by morphology as to obscure diversity. Both molecular and traditional analyses are subject to uncertainties at higher taxonomic levels. A further complaint is that much may be lost if all DNA is not used. Ahlquist *et al.* (1987) in reply to Houde claim to have been aware since 1984 that rates of molecular evolution differ. Such variation alone does not introduce ambiguity into phylogenetic reconstructions. DNA-DNA hybridization data is phenetic, but it is genomic and not phenotypic, and measures the median sequence divergence between two genomes, and is therefore not comparable to phenetic methods of analysing characters, where genetic content is unknown, and convergence occurs. They claim congruence with other data, particularly in New World suboscines, *e.g.* traditional findings of Heimerdinger and Ames (1967), Ames *et al.* (1968) and Ames (1971). With Old World suboscines the findings differ from tradition, but are congruent with Raikow (1986,1987). Congeners and confamiliers tend to agree with tradition, and most controversy is at and above family level. The ability to use morphology should decrease with time as differences accumulate. There are no direct comparisons between DNA sequencing and DNA-DNA hybridization for birds, but there are for hominoids, and these support each other. They claim that they do in fact classify organisms, and not DNA, but if sequencing is used there is a risk of classifying gene phylogenies, and not organism phylogenies.

Although the present writer has expressed reservations about the work of Sibley and his co-workers (see 'Introduction'), a certain degree of congruence is not infrequently found, and in many other cases the findings neither agree nor disagree.

The characters of this study, in common with most others studied in the past, show considerable homoplasy. The fact that the characters were superficial and simple, with presumably simple genetic mechanisms, could easily result in reversal and parallelism. Selection must be important on the characters of a functional organ such as a foot, but adaptation at the detailed level could not be expected to approximate closely in two phyletic lines which are adapted for similar habits from diverse starting conditions. This was well-illustrated when comparing two scansorial groups (*e.g.* Dendrocolaptidae and Climacteridae) or two terrestrial groups (*e.g.* Alaudidae and Motacillidae). Although certain character states could be associated with the scansorial habit, no such suite could be identified for terrestrial birds. However, working on the assumption that not all previous studies could be completely wrong, it was interesting to find congruency with other traditional studies, and DNA-DNA hybridization, in some groups, but non-congruency with one or both in others. Only in the last fifteen years or so has it been normal practice to distinguish between plesiomorphous and apomorphous states of characters. Classifications based on characters where this distinction was not made can be expected to be at variance with those where the distinction was made. The value, albeit limited, of the characters in this study would seem to be at levels below the family. Relationships within a family, or the assignment of a species to a family or genus may be suggested or confirmed by these characters. A subjective impression was gained that the degree of homoplasy was directly related to the number of taxa in a dendrogram. The 'Character Index' for each dendrogram was calculated by dividing the number of informative characters by the number of transformations required (tabulated in Appendix D). This appeared not to be the case (Correlation Coefficient <-0.01). Perhaps if the scoring of the characters were to be refined further, and characters found to produce only 'noise' in all groups were to be permanently removed, a more useful suite of characters would be found.

## ACKNOWLEDGEMENTS

Gratitude is expressed to Dr.P.J.K.Burton, Mr.P.R.Colston, Mr.G.C.Cowles, Mr.I.C.J.Galbraith, Dr.D.W.Snow, and other staff of the Sub-department of Ornithology, British Museum (Natural History) for their considerable help and kindnesses over the years.

Dr.B.Giles and other members of the Biology Department, City of London Polytechnic, kindly gave help with computing facilities. For assistance with some computing problems the writer is grateful to Mr.J.Banks, Mr.I.M.Pixton and Mr.D.P.Schmieder, and with graphics to Mr.B.M.Hanson.

The late Mr.C.W.Benson, Mr.S.A.Parker and Dr.D.R.Wells provided some elusive specimens.

A considerable amount of helpful discussion was held over the years with ornithologist friends who are too numerous to mention. I hope omission of their names will not cause offence.

Above all, my most sincere thanks must go to Dr.G.Underwood, who with friendship, kindness, understanding and patience continued to encourage me, and to be of immense help, during the long gestation period of this project.

## REFERENCES


Ackermann, A. 1967. Quantitative Untersuchungen an kornerfressenden Singvogeln. *J. fur Orn.* 108:430-473.

Ahlquist, J.E., Bledsoe, A.H., Sheldon F.H., and Sibley, C.G. 1987. DNA Hybridisation and Avian Systematics. *Auk.* 104(3):556-563.

Ahlquist, J.E., Sheldon, F.H. and Sibley, C.G. 1984. The relationships of the Bornean Bristlehead (*Pityriasis gymnocephala*) and the Black-collared Thrush (*Chlamydochaera jeffreyi*). *J. fur Orn.* 125:129-140.

Amadon, D. 1957. Remarks on the classification of perching birds (Order Passeriformes). *Zool. Soc. , Calcutta, Proc. , Mookerjee Memorial Vol.* 259-268.

Ames, P.L. 1965.The morphology of the syrinx in passerine birds: Its application to the taxonomy of the order Passeriformes. Ph.D.Thesis, Yale University, unpubl.

Ames, P.L. 1971. Morphology of the syrinx in passerine birds. *Bull. Peabody Museum nat. Hist.* No. 37.

Ames, P.L. 1975. The application of syringeal morphology to the classification of the Old World Insect Eaters. *Bonn.zool.Beitr.*26: 107-134.

Ames, P.L., Heimerdinger, M.A. and Warter, S.L. 1968. The anatomy and systematic position of the antpipits *Conophaga* and *Corythopsis*. *Postilla* 114:1-32.

Andrew, R.J. 1956. Intention movements of flight in certain passerines, and their use in systematics. *Behaviour* 10:179-204.

Andrew, R.J. 1961. The displays given by passerines in courtship and reproductive fighting: a review. *Ibis* 103a:315-348.

Arvey, M.D. 1951. Phylogeny of the waxwings and allied birds. *Univ. of Kansas, Mus. Nat. Hist.* Publ.3:437-530.

Ashlock, P.D. 1971. Monophyly and associated terms. *Syst.Zool.* 20:63-69.

Averill, C.K. 1925. The outer primary in relation to migration in the ten-primaried oscines. *Auk* 42:353-358.

Avise, J.C., Aquadro, C.F. and Patton, J.C. 1982. Evolutionary genetics of birds. V. Genetic distances within Mimidae (mimic thrushes) and Vireonidae (vireos). *Biochem.Genet.*20: 95-100.

Avise, J.C., Patton, J.C. & Aquadro, C.F. 1980(a). Evolutionary genetics of birds. I. Relationships among North American thrushes and allies. *Auk* 97:135-147.

Avise, J.C., Patton, J.C. & Aquadro, C.F. 1980(b). Evolutionary genetics of birds II. Conservative protein evolution in North American Sparrows and relatives. *Syst.Zool.* 29:323-334.

Avise, J.C., Patton, J.C. & Aquadro, C.F. 1980(c). Evolutionary genetics of birds. *J.Hered.* 71:303-310.

Baldwin, P.H. 1953. The chromosomes of the red-wing and the yellow-headed blackbird (Family Icteridae). *Colo.-Wyo. Acad. Sci., J.* 4(5):60.

Beecher, W.J. 1953. A phylogeny of the Oscines. *Auk* 70:270-333.

Benson, C.W. and Irwin, M.P. Stuart 1975. The systematic position of *Phyllastrephus orostruthus* and *P. xanthophrys*, two species incorrectly placed in the family Pycnonotidae (Aves). *Arnoldia Rhod.* 7 (17):1-10.

Bentz, G.D. 1979. The appendicular myology and phylogenetic relationships of the Ploceidae and Estrildidae (Aves: Passeriformes). *Bull. Carnegie Mus. Nat. Hist.* No. 15:1-25.

Berger, A.J. 1956. The expansor secundariorum muscle, with special reference to passerine birds. *J. Morph.* 99:137-168.

Berger, A.K. 1966. Head-scratching behaviour of some hand-raised birds. *Wilson Bull.* 78:769.

Berndt, R. and Meise, W. (Eds.) 1960. Naturgeschichte der Vogel. vol.2:540-544. Stuttgart:Franckh'sche Verlag.

Bishop, M.J. 1982. Criteria for the determination of the direction of character state changes. *Zool. Jour. Linn. Soc.* 74(3):197-206.

Blandamer, J.S. and Burton, P.J.K. 1979. Anatomical specimens of birds in the collections of the British Museum (Natural History). *Bull. Br. Mus. Nat. Hist. (Zool.)* 34(4):125-180.

Blaszyk, P. 1935. Untersuchungen uber die Stammeogeschichte der Vogel-schuppen und Federn und uber die Abhangigkeit ihrer Ausbildung am Vogelfuss von der Funktion. *Morph. Jb.* 75:483-587.

Bledsoe, A.H. 1987 Estimation of Phylogeny from Molecule Distance Data: The Issue of Variable Rates. *Auk* 104(3):563-565.

Bock, W.J. 1960. The palatine process of the premaxilla in the Passeres. *Mus. Comp. Zool. Bull.* 122:361-488.

Bock, W.J. 1962. The pneumatic fossa of the humerus in the Passeres. *Auk* 79:425-443.

Bock, W.J. and Farrand, J. Jr. 1980. The number of species and genera of Recent birds: a contribution to comparative systematics. *Amer. Mus. Novit.* 2703:1-29.

Bock, W.J. & Morony, J.J.Jnr. 1978. Relationships of the passerine finches (Passeriformes: Passeridae). *Bonner Zool. Beitr.* 29:122-147.

Boles, W.E.1979. The relationships of the Autralo-Papuan Flycatchers. *Emu* 79:107-110.

Britten, R.J. 1986. Rates of DNA sequence evolution differ between taxonomic groups. *Science* 231:1393-1398.

Brownell, E. 1983. DNA-DNA hybridization studies of muroid rodents: symmetry and rates of molecular evolution. *Evolution* 37:1034-1051.

Cabanis, J.L. and Heine, F. 1850-1863. Museum Heineanum. Halberstadt.

Campbell, B. and Lack, E. (Eds.). 1985. A Dictionary of Birds. Poyser.

Christidis, L. 1987. Biochemical Systematics within Palaeotropic Finches (Aves:Estrildidae). *Auk* 104(3):380-392.

Clarke, G.A. 1972. Passerine foot-scutes. *Auk* 89:549-558.

Cracraft, J. 1974. Phylogenetic models and classifications. *Syst. Zool.* 23 (1):71-90.

Cracraft, J. 1981. Toward a phylogenetic classification of the recent birds of the world (Class Aves). *Auk* 98(4):681-714.

Cracraft, J. 1987. DNA hybridization and avian phylogenetics. Pp. 47-96 *in* Evolutionary biology, vol.21 (M.K.Hecht, B.Wallace, & G.T.Prance, Eds.). New York, Plenum Press.

Cracraft, J. and Eldredge, N. (Eds.) 1979. Phylogenetic analysis and paleontology. New York, Columbia Univ. Press.

Cullen, J.M. 1959. Behaviour as a help in taxonomy. *Systematics Assoc. Publ.* 3:131-140.

de Queiriz, K. 1985. The ontogenetic method for determining character polarity and its relevance to phylogenetic systematics. Syst. Zool. 34(3):280-299.

Delacour, J. 1946. Les timaliines. *Oiseau Rev. Franc. Orn.* 16:7-36.

Delacour, J. 1950. Les timaliines. Additions et modifications. *Oiseau Rev. Franc. Orn.* 20:186-191.

Delacour, J. and Amadon, D. 1951. The systematic position of *Picathartes*. *Ibis* 93:60-62.

Delacour, J. and Vaurie, C. 1957. A classification of the oscines (Aves). *Los Angeles County Mus., Contrib. Sci.* 16:1-6.

Desfayes, M. 1967. What is *Ifrita*? *Bull. Br. Orn. Cl.* 87:37-38.

Eldredge, N. and Cracraft, J. 1980. Phylogenetic patterns and the evolutionary process. New York, Columbia Univ. Press.

Estabrook, G.F., Strauch, J.G. & Fiala, K.L. 1977. An application of compatibility analysis to Blackith's data on orthopteroid insects. *Syst.Zool.* 26:269-276.

Farris, J.S., Kluge,A.g. & Eckardt, M.J. 1970. A numerical approach to phylogenetic systematics. *Syst. Zool.* 19:172-189.

Feduccia, A. 1974. Morphology of the bony stapes in New and Old World suboscines: new evidence for a common ancestry. *Auk* 91:427-429.

Feduccia, A. 1975(a). Morphology of the bony stapes (columella) in the Passeriformes and related groups: evolutionary implications. *Univ. Kans. Mus. Nat. Hist. Misc. Publ.* 63:1-34.

Feduccia, A. 1975(b). Morphology of the bony stapes in the Menuridae and Acanthisittidae: evidence for oscine affinities. *Wilson Bull.* 87:418-420.

Feduccia, A. 1977. A model for the evolution of perching birds. *Syst. Zool.* 26:19-31.

Feduccia, A. 1979. Comments on the phylogeny of perching birds. *Proc. Biol. Soc. Washington* 92(4):689-696.

Felsenstein, J.A. 1981. A likelihood approach to character weighting and what it tells us about parsimony and compatibility. *Biol. Jour. Linn. Soc.* 16(3):183-196.

Ficken, R.W. and Ficken, M.S. 1966. A review of some aspects of avian field ethology. *Auk* 83:637-661.

Friday, A.E. 1982. Parsimony, simplicity and what actually happened. *Zool. Jour. Linn. Soc.* 74(3):329-335.

Furbringer, M. 1888. Untersuchungen zur Morphologie und

Systematik der Vogel. Von Holkema, Amsterdam. 2 vol.

Gadow, H. 1891. Further remarks on the relationships of the Drepanididae, pp.251-257. *In* S.B.Wilson and A.H.Evans (Eds.). Aves Hawaiiensis: the birds of the Sandwich Islands. R.H.Porter, London.

Garrod, A.H. 1876. On some anatomical characters which bear upon the major divisions of the passerine birds. Pt.I. *Proc. Zool. Soc. Lond.*:506-519.

Gauld, I. and Underwood, G. 1986. Some applications of the LeQuesne compatibility test. *Biol. Jour. Linn. Soc.* 29(3):191-222.

George, W.G. 1962. The classification of the olive warbler, *Peucedramus taeniatus*. *Amer. Mus. Novitates* 2103:1-41.

George, W.G. and Casler, C.L. 1972. Sub-alular apterium in birds. *Auk* 89:245-262.

Glenny, Fred H. 1955. Modifications of pattern in the aortic arch system of birds and their phylogenetic significance. *Proc. United States Nat.Mus.* No.3346.

Goodwin, D. 1956. Note on the genus *Pseudocossyphus* Sharpe. *Bull. Br. Orn. Cl.*76 (8):143-144.

Gray, G.R. 1869-1871. Hand-list of genera and species of birds. Trustees, British Museum, London. 3 vols.

Griffiths, G.C.D. 1973. Some fundamental problems in biological classification. *Syst. Zool.* 22:338-343.

Grimes, L.G. 1974. Duetting in *Hypergerus atriceps* and its taxonomic relationship to *Eminia lepida*. *Bull. Br. Orn. Cl.* 94 (3):89-96.

Guise, A., Peacock, D. and Gleaves, T. 1982. A method for identification of parallelism in discrete character sets. *Zool. Jour. Linn. Soc.* 74(3): 293-303.

Harrison, C.J.O. 1967. The apparrent affinities of *Ifrita*. *Bull. Br. Orn. Cl.* 87:97-100.

Harrison, C.J.O. 1969(a). Additional information on the carpometacarpal process as a taxonomic character. *Bull. Br. Orn. Cl.* 89:27-29.

Harrison, C.J.O. 1969(b). The possible affinities of the Australian treecreepers of the genus *Climacteris*. *Emu* 69:161-168.

Harrison, C.J.O. 1976. The syrinx of the southern Scrub-robin *Drymodes brunneipygia (sic)*. *Emu* 76:154.

Harrison, C.J.O. 1986. A re-assessment of the affinities of some small Oriental babblers, Timaliidae. *Forktail* 1:81-83.

Harrison, C.J.O. and Parker, S.A. 1965. The behavioural affinities of the blue wrens of the genus *Malurus*. *Emu* 65:103-113.

Heimerdinger, M.A. 1964. A study of morphological variation in the dorsal and ventral pterylae of Passeriformes. Ph.D. Thesis, Yale University, unpubl.

Heimerdinger, M.A. and Ames, P.L. 1967. Variation in the sternal notches of suboscine passeriform birds. *Postilla* 105:1-44.

Henley, C., Feduccia, A. and Costello, D.P. 1978. Oscine spermatozoa: a light and electron-microscopy study. *Condor* 80:41-48.

Hennig, W. 1967. Phylogenetic Systematics. Univ. of Illinois Press.

Houde, P. 1987(a). Critical evaluation of DNA hybridization studies in avian systematics. *Auk* 104(1): 17-32.

Houde, P. 1987(b). Response to A.H.Bledsoe and J.E.Ahlquist *et al. Auk* 104(3):566-568.

Irwin, M.P.S. and Clancey, P.A. 1974. A re-appraisal of the generic relationships of some African forest-dwelling Robins (Aves: Turdidae) *Arnoldia Rhod.* 6(34):1-19.

Irwin, M.P.S. and Clancey, P.A. 1986. A new generic status for the Dappled Mountain Robin. *Bull. Br. Orn. Cl.*106 (3):111-115.

Keast, A. 1976. Adaptive morphology and biogeography relative to the evolution and classification of the Australian and Pacific island warblers. *Proc. 16th. Int. Orn. Congress*:519-529.

Keast, A. 1977(a). The relationships of *Finschia* and *Mohoua* (Family Muscicapidae) *Notornis* 24:50-52.

Keast, A. 1977(b). The relationships of the New Guinea Red-backed 'Warbler' *Eugerygone rubra*. *Emu* 77:228-229.

Keyserling, A.G. von and Blasius, J.H. 1839. Uber ein zoologische Kennzeichnen der Ordnung der Sperlingsarten-oder Singvogel.*Wiegnem Archiv. fur Naturgesch.* Pt. 1:332-334.

Kimura, M. 1983. The neutral theory of molecular evolution. England: Cambridge University Press.

Koop, B.F., Goodman, P., Xu, P., Chan, K. and Slighton, J.L. 1986. Primate n-globin DNA sequences and Man's place amongst the great apes. *Nature* 319:234-238.

Lanyon, W.E. 1984. A Phylogeny of the Kingbirds and Their Allies. *Amer. Mus. Nov.* 2797.

Lanyon, W.E. 1985. Molecular perspective on higher-level relationships in the Tyrannoidea (Aves). *Syst. Zool.* 34:404-418.

Lanyon, W.E. and Fitzpatrick, J.W. 1983. Behaviour, Morphology and Systematics of *Sirystes sibilator* (Tyrannidae). *Auk* 100(1):98-104.

Lennerstedt, I. 1973. Pads, furrows and papillae in the foot of birds. Thesis, Lund.

Lennerstedt, I. 1974. Pads and papillae on the feet of nine passerine species. *Ornis. scand.* 5:103-111.

Lennerstedt, I. 1975(a). Pattern of pads and folds in the foot of European Oscines. (Aves, Passeriformes). *Zool. Scr.* 4:101-109.

Lennerstedt, I. 1975(b). Seasonal variation in the foot papillae of wood pigeon, pheasant and house sparrow. *Comp. Biochem. Physiol.* 51A:511-520.

Lennerstedt, I. 1975(c). A functional study of papillae and pads in the foot of passerines, parrots and owls. *Zool. Scr.*4:111-123.

LeQuesne, W.J. 1969. A method of selection of characters in numerical taxonomy. *Syst. Zool.* 18:201-205.

LeQuesne, W.J. 1972. Further studies based on the uniquely derived character concept. *Syst. Zool.* 21(3):281-288.

LeQuesne, W.J. 1982. Compatibility analysis and its applications. *Zool. Jour. Linn. Soc.* 74(3):267-275.

Lohrl, H. 1964. Verhaltensmerkmale der Gattungen *Parus* (Meisen), *Aegithalos* (Schwarzmeisen), *Sitta* (Kleiber), *Tichodroma* (Mauerlaufer) und *Certhia* (Baumlaufer) *J. fur Orn.* 105:153-181.

Lowe, P.R. 1938. Some anatomical and other notes on the systematic position of the genus *Picathartes*, together with some remarks on the families Sturnidae and Eulabetidae. *Ibis* 80:254-269.

Lucas, F.A. 1894. Notes on the anatomy and affinities of the Coerebidae and other American birds. *Proc. U.S. Nat. Mus.* 17:299-312.

McFarlane, R.W. 1963. The taxonomic significance of avian sperm. *Intern. Orn. Congr. ( Ithaca, New York ), Proc. XIII:* 91-102.

McKitrick, M.C. 1985(a). Monophyly of the Tyrannidae (Aves): comparison of morphology and DNA. *Syst. Zool.* 34:35-45.

McKitrick, M.C. 1985(b). Pelvic myology of the kingbirds and their allies (Aves: Tyrannidae). *Ann. Carnegie Museum* 54:275-317.

McNeil, J. 1982. Phylogenetic reconstruction and phenetic taxonomy. *Zool. Jour. Linn. Soc.* 74(3):337-344.

Mack, A.L., Gill, F.B., Colburn, R. and Spolsky, C. 1986. Mitochondrial DNA: A source of genetic markers for studies of similar passerine bird species. *Auk* 103(4):676-681.

Mainardi, D. 1961. Distanze immunologiche tra alcune famiglie di passeriform. *Ist. Lombardo, Rend. Sci.* B 95:117-122.

Mann, C.F. 1979 The use of the plantar surface of the foot in the taxonomy of the Timaliinae ( Aves, Passeriformes, Muscicapidae ). M.Sc. Thesis, London, PCL/CLP.

Mann, C.F., Burton, P.J.K. and Lennerstedt, I. 1978. A re-appraisal of the systematic position of *Trichastoma poliothorax* (Timaliinae, Muscicapidae). *Bull. Br. Orn. Cl.* 98(4):131-140.

Mathews, G.M. 1927. *Systema avium Australasianarum.* London:B.O.U.

Matson, R.H. 1984. Applications of electrophoretic data in avian systematics. *Auk* 101(4):717-729.

Mayr, E. 1955. Comments on some recent studies of song bird phylogeny. *Wilson Bull.*67:33-44.

Mayr, E. and Amadon, D. 1951. A classification of recent birds. *Amer. Mus. Nov.* 1496:1-42.

Mayr, E. and Greenway, J.C. Jr. 1956. Sequence of passerine families (Aves). *Breviora* 58:1-11.

Mickevich, M.F. 1978. Taxonomic Congruence. *Syst. Zool.* 27:143-158.

Morony, J.J., Bock, W.J. & Farrand, J. 1975. Reference list of birds of the world. New York: American Museum of Natural History.

Muller, J. 1847. Uber die bisher unbekannten typischen Verscheidenheiten der Stimmorgane der Passerinen. *Abh. preuss. Akad. Wiss.*:321-392, 405-406.

Nelson, G.J. 1973. Classification as an expression of phylogenetic relationships. *Syst. Zool.* 22:344-359.

Nicolai, J. 1964. Der Brutparasitismus der Viduinae als ethologisches Problem. *Z. fur Tierpsych.* 21:129-204.

Nitzsch, C.L. 1840. System de Pterylography. Eduard Anton, Halle.

Norris, R.A. 1963. A preliminary study of avian blood groups, with special reference to the Passeriformes. *Tall Timbers Res. Station, Bull.* 4:1-71.

Oates, E.W. 1889. The Fauna of British India. Vol. I. Taylor and Francis, London.

Olson, S.L. 1971. Taxonomic comments on the Eurylaimidae. *Ibis* 113(4):507-516.

Olson, S.L. 1979. *Picathartes* - another West African forest relict with probable Asian affinities. *Bull. Br. Orn. Cl.* 99 (3):112-113.

Olson, S.L. 1982. A critique of Cracraft's classification of birds. *Auk* 99(4):733-739.

Olson, S.L. 1983. Evidence for a polyphyletic origin of the Piciformes. *Auk* 100(1):126-133.

Olson, S.L. 1987 The relationships of the New Guinea Ground-Robins *Amalocichla*. *Emu* 87:247-248.

Pain, S. 1987. Biologists on the trail of Mother Goose. *New Scientist*. March 19: 26.

Panchen, A.L. 1982. The use of parsimony in testing phylogenetic hypotheses. *Zool. Jour. Linn. Soc.* 74(3):197-206.

Parker, S.A. 1973. The tongues of *Ephthianura* and *Ashbyia*. *Emu* 73:19-20.

Parker, S.A. 1982. The relationships of the Australo-Papuan Treecreepers and Sitellas. *South Australian Ornithologist*. 28:197-200.

Penny, D. 1982. Graph theory, evolutionary trees and classification. *Zool. Jour. Linn. Soc*. 74(3):277-292.

Phillips, A.R. 1973. On the supposed genus *Petrochelidon*.

*Bull. Br. Orn. Cl.* 93 (1):20.

Pocock, T.N. 1966. Contributions to the osteology of African birds. *Pan African Orn. Con. Proc.* 2: 83-94. *Ostrich Suppl.* 6.

Prum, R.O. 1988. Phylogenetic interrelationships of the barbets (Aves: Capitonidae) and toucans (Aves: Ramphastidae) based on morphology with comparisons to DNA-DNA hybridization. *Zool. Jour. Linn. Soc.* 92:313:343.

Pycraft, W.P. 1905. Some points on the anatomy of *Acanthidositta chloris*, with some remarks on the systematic position of the genera *Acanthidositta* and *Xenicus*. *Ibis* 47:603-621.

Raikow, R.J. 1977. The origin and evolution of the Hawaiian Honeycreepers (Drepanididae). The Living Bird, 15th Annual:95-118.

Raikow, R.J. 1978 (a). Appendicular myology and relationships of the New World Nine-primaried Oscines (Aves: Passeriformes). *Bull. Carnegie Mus. of Nat. Hist.*7:1-43.

Raikow, R.J. 1978 (b). The appendicular myology and its taxonomic significance in the Passerine Suborder Menurae. *American Zoologist* 18(3):377.

Raikow, R.J. 1979. Evolution of the hind limb musculature in Passerine birds. *American Zoologist* 19 (3):278.

Raikow, R.J. 1980. Abstract, *2nd. Intern. Cong. Syst. Evol. Biol.* p 317.

Raikow, R.J. 1981. Relationships between toe arrangements and deep plantar tendons in birds. *American Zoologist* 21(4): 706.

Raikow, R.J. 1982. Monophyly of the Passeriformes: test of a phylogenetic hypothesis. *Auk* 99:431-445.

Raikow, R.J. 1986. Phylogenetic relationships of the Old World suboscines. Abstr.No. 447. *19th Intern. Ornithol. Congr.*

Raikow, R.J. 1987. Hindlimb myology and evolution of the Old World suboscine birds (Acanthisittidae, Pittidae, Philepittidae, Eurylaemidae). *Ornithol. Monogr.* No.41.

Raikow, R.J., Borecky, S.R. and Berman, S.L. 1979. The evolutionary re-establishment of a lost ancestral muscle in the Bowerbird assemblage. *Condor* 81:203-206.

Raikow, R.J. and Cracraft, J. 1983. Monophyly of the Piciformes: a reply to Olson. *Auk* 100 (1):134-138.

Raikow, R.J., Polumbo, P.J. and Borecky, S.R. 1980. Appendicular myology and relationships of the Shrikes (Aves: Passeriformes: Laniidae). *Annals of Carnegie Museum* 49:131-152.

Rand, A.L. 1959. Tarsal scutellation of song birds as a taxonomic character. *Wilson Bull.* 71:274-277.

Rand, A.L. & Gilliard, E.T. 1967. Handbook of New Guinea Birds. Garden City, New York: Natural History Press.

Rand, A.L. & Traylor, M.A. 1953. The systematic position of the genera *Ramphocaenus* and *Microbates*. *Auk* 70:334-337.

Ridgway, R. 1901-1911. The birds of North and Middle America. Pt. 1-5, *U.S. Nat. Mus., Bull.* 50.

Ripley, S.D. 1952. The Thrushes. *Postilla* 13:1-48.

Ripley, S.D. 1962. Brief comments on the thrushes. *Postilla* 63:1-5.

Ripley, S.D. and Beehler, B.M. 1985. A revision of the babbler genus *Trichastoma* and its allies (Aves: Timaliinae). *Ibis* 127(4):495-509.

Ruggeberg, T. 1960. Zur funktionellen Anatomie der hinteren Extremitat einiger mitteleuropaischer Singvogelarten. *Z. wiss. Zool.* 164:1-106.

Ruvolo, M. & Smith, T.F. 1986. Phylogeny and DNA-DNA hybridization. *Mol. Biol. Evol.* 3:285-289.

Sclater, P.L. 1880. Remarks on the present state of the *systema avium. Ibis* 22:340-350, 399-411.

Sclater, P.L. 1881. Remarks on the present state of the *systema avium. Nuttal Orn. Club, Bull.* 6:28-37,73-84.

Sclater, W.L. 1930. *Systema avium aethiopicarum.* London: British Ornithologists' Union.

Serle, W. 1952. The affinities of the genus *Picathartes* Lesson. *Bull. Brit. Orn. Cl.*72:2-6.

Schaeffer, B., Hecht, M.K. & Eldridge, N. 1972. Phylogeny and Palaeontology. *Evol. Biol.* 6:31-46.

Sharpe, R.B. 1877-1890. Catalogue of birds in the British Museum. Vol.3, 4, 7 and 13. Trustees, British Museum, London.

Sharpe, R.B. 1891. A review of recent attempts to classify birds. *II Int. Orn. Congr. (Budapest), Proc.*

Sharpe, R.B. 1903. A hand-list of the genera and species of birds, vol.4. London: Taylor & Francis.

Sheldon, F.H. 1987(a). Phylogeny of herons estimated from

DNA-DNA hybridization data. *Auk* 104:97-108.

Sheldon, F.H. 1987(b). Rates of single-copy DNA evolution in herons. *Mol. Biol. Evol.* 4:56-69.

Shufeldt, R.W. 1889. Contributions to the comparative osteology of the families of North American Passeres. *J. Morph.* 3:81-114.

Sibley, C.G. 1968. The relationships of the "wren-thrush" *Zeledonia coronata* Ridgeway. *Postilla* (Peabody Mus.Nat.Hist., Yale Univ.) 125:1-12.

Sibley, C.G. 1970. A comparative study of the egg-white proteins of passerine birds. *Peabody Mus. Nat. Hist. Bull.*32:1-131.

Sibley, C.G. 1973(a). The relationships of *Picathartes*. *Bull. Br. Orn. Cl.* 93 (1):23-25.

Sibley, C.G.1973(b). The relationships of the Silky Flycatchers. *Auk* 90:394-410.

Sibley, C.G. 1973(c). Relationships of swallow-tanager *Tersina viridis*. *Bull. Br. Orn. Cl.* 93 (2):75-79.

Sibley, C.G. 1974. The relationships of the lyrebirds. *Emu* 74:65-79.

Sibley, C.G. 1976. Protein evidence of the relationships of some Australian passerine birds. *Proc. 16th Int. Orn. Congress:* 557-570.

Sibley, C.G. 1985. *In* Campbell, B. and Lack, E. ( Eds. ). A Dictionary of Birds. Poyser.

Sibley, C.G. and Ahlquist, J.E. 1980. The Relationships of the " Primitive Insect Eaters " (Aves: Passeriformes ) as indicated by DNA x DNA

Hybridization. *Proc.XVII Int. Orn. Cong. 1978:* 1215-1220.

Sibley, C.G. and Ahlquist, J.E. 1981(a). The phylogeny and relationships of the ratite birds as indicated by DNA-DNA hybridization. *In* Scudder G.G.E. and Reveal J.L. (Eds.). *Evolution Today, Proceedings of the Second International Congress of Systematics and Evolutionary Biology.* 301-335.

Sibley, C.G. and Ahlquist J.E. 1981(b). The relationships of the Accentors (*Prunella*) as indicated by DNA-DNA hybridization. *J. fur Orn.* 122 (4):369-378.

Sibley, C.G. and Ahlquist J.E. 1981(c). The relationships of the Wagtails and Pipits (Motacillidae) as indicated by DNA-DNA hybridization. *L'Oiseau et R.F.O.* 5(3):189-199.

Sibley, C.G. and Ahlquist, J.E. 1982(a). The relationships of the Australo-Papuan Fairy-wrens as indicated by DNA-DNA hybridization. *Emu* 82 (suppl.):251-255.

Sibley, C.G. and Ahlquist, J.E. 1982(b). The relationships of the Australo-Papuan Scrub-Robins *Drymodes* as indicated by DNA-DNA hybridization. *Emu* 82(2):101-105.

Sibley, C.G. and Ahlquist, J.E. 1982(c). The relationships of the Australo-Papuan Sittelas *Daphoenositta* as indicated by DNA-DNA hybridization. *Emu* 82(3):173-176.

Sibley, C.G. and Ahlquist, J.E. 1982(d). The relationships of the Yellow-breasted Chat (*Icteria virens*) and the alleged slowdown in the rate of macromolecular evolution in birds. *Postilla* 187.

Sibley, C.G. and Ahlquist, J.E. 1982(e). The relationships of the Wrentit as indicated by DNA-DNA hybridization. *Condor* 84:40-44.

Sibley, C.G. and Ahlquist, J.E. 1982(f). The relationship of the Vireos (Vireoninae) as indicated by DNA-DNA hybridization. *Wilson Bull.* 94(2):114-128.

Sibley, C.G. and Ahlquist, J.E. 1982(g). The relationships of the Hawaiian Honeycreepers ( Drepaninini ) as indicated by DNA-DNA hybridization. *Auk* 99:130-140.

Sibley, C.G. and Ahlquist, J.E. 1982(h). The relationships of the Australasian Whistlers *Pachycephala* as indicated by DNA-DNA hybridization. *Emu* 82(4):199-202.

Sibley, C.G. and Ahlquist, J.E. 1983. Phylogeny and classification based on the data of DNA-DNA hybridization. *Current Ornithology* 1:245-292.Johnston R.F. (Ed.). Plenum Press, New York.

Sibley, C.G. and Ahlquist, J.E. 1984(a). The phylogeny and classification of the passerine birds, based on comparisons of the genetic material, DNA. *Proc. 18th. Int. Orn. Cong.* Nauka Publ. Moscow.

Sibley, C.G. and Ahlquist, J.E. 1984(b). The relationships of the Starlings (Sturnidae: Sturnini) and the Mockingbirds (Sturnidae: Mimini). *Auk* 101(2):230-243.

Sibley, C.G. and Ahlquist, J.E. 1984(c). The relationships of the Papuan genus *Peltops*. *Emu* 84(3):181-183.

Sibley, C.G. & Ahlquist, J.E. 1984(d). The phylogeny of the hominoid primates, as indicated by DNA-DNA hybridization. *J. Mol. Evol.* 20:2-15.

Sibley, C.G. and Ahlquist, J.E. 1985(a). The phylogeny and classification of the Australo-Papuan passerines. *Emu* 85(1):1-14.

Sibley, C.G. and Ahlquist, J.E. 1985(b). Phylogeny and classification of New World suboscine passerine birds (Passeriformes: Oligomyodi: Tyrannides). Pp.396-428 *in* Neotropical ornithology (P.A.Buckley, M.S.Foster, R.S. Ridgely, & F.G.Buckley, Eds.). *Ornithol.Monogr.* No. 36.

Sibley, C.G. and Ahlquist, J.E. 1985(c). The relationships of some groups of African birds, based on comparisons of the genetic material, DNA. Pp. 115-161 *in* *Proc.Intern.Symp. on African Vertebrates* (K.L.Schuchmann, Ed.) Bonn.Zool.Forschungsinst. and Mus. A. Koenig.

Sibley, C.G. & Ahlquist, J.E. 1986. Reconstruction of bird phylogeny by comparing DNA's. *Scientific American* 254(2):82-92.

Sibley, C.G. & Ahlquist, J.E. 1987(a). The relationships of four species of New Zealand passerine birds. *Emu* 87(1):63-66.

Sibley, C.G. & Ahlquist, J.E. 1987(b). The Lesser Melampitta is a Bird of Paradise. *Emu* 87(1):66-68.

Sibley, C.G., Ahlquist, J. E. & Sheldon, F.H. 1987. DNA hybridization and avian phylogenetics: reply to Cracraft. Pp. 97-125 *in* Vol. 21, *Evol Biol.* (M.Hecht, B.Wallace, and G.Prance, Eds.). New York, Plenum Press.

Sibley, C.G., Lanyon, S.M. & Ahlquist, J.E. 1984. The relationships of the sharpbill (*Oxyruncus cristalis*). *Condor* 86:48-52.

Sibley, C.G., Schodde, R. and Ahlquist, J.E. 1984. The relationships of the Australo-Papuan Treecreepers (Climacteridae) as indicated by DNA-DNA hybridization. *Emu* 84(4):236-241.

Sibley, C.G., Williams, G.R. and Ahlquist, J.E. 1982. The relationships of the New Zealand Wrens (Acanthisittidae) as indicated by DNA-DNA hybridization. *Notornis* 29(2):113-130.

Simmons, K.E.L. 1957. The taxonomic significance of head-scratching in birds. *Ibis* 99:178-181.

Simmons, K.E.L. 1961. Problems of head-scratching in birds. *Ibis* 103a:37-49.

Simmons, K.E.L. 1963. Some behaviour characters of the babblers (Timaliidae). *Avic. Mag.* 69:183-193.

Simpson, G.G. 1944. Tempo and Mode in Evolution. Columbia University Press, New York.

Sneath, P.H.A. & Sokal,R.R. 1973. Numerical Taxonomy. San Francisco:Freeman.

Stallcup, W.B. 1954. Myology and serology of the avian family Fringillidae. *Publ. Mus. Nat. Hist. Univ. Kansas* 8(2):157-211.

Stallcup, W.B. 1961. Relationships of some families of the suborder Passeres (songbirds) as indicated by comparisons of tissue proteins. *J. Grad. Res. Center, Southern Methodist Univ.* 29(1):43-65.

Stejneger, L. 1885. *In* Kingsley, J.S. ( Ed. ). The standard natural history. Vol. 4. S.E. Casino, Boston.

Stephan, B. 1966. Die Zahl der Armschwingen bei den Passeriformes. *J. fur Orn.* 106:446-458.

Storer, R.W. 1960. The classification of birds, pp. 57-93. *in* Marshall, A.J. (Ed.). Biology and comparative physiology of birds. Academic Press, New York.

Strauch, J.G. Jr. 1984. Use of homoplastic characters in compatibility analysis. *Syst. Zool.* 33(2):167-177.

Strauch, J.G. Jr. 1985. The phylogeny of the Alcidae. *Auk* 102 (3):520-539.

Stresemann, E. 1934. Aves. *In* Kukenthal, W. and Krumbach, T. (Eds.) Handbuch de Zoologie. Vol. 7, Pt. 2. Walter de Gruyter, Berlin.

Stresemann, E. 1959. The status of avian systematics and its unsolved problems. *Auk* 76:269-280.

Stresemann, E. 1963. Variation in the number of primaries. *Condor* 65:449-459.

Swierczewski, E.V. and Raikow, R.J. 1981. Hind limb morphology, phylogeny, and classification of the Piciformes. *Auk* 98:466-480.

Templeton, A.R. 1985. The phylogeny of the hominoid primates: a statistical analysis of the DNA-DNA hybridisation data. *Mol. Biol. Evol.* 2:420-433.

Tordoff, H.B. 1954(a). A systematic study of the avian family Fringillidae based on the structure of the skull. *Misc. Publ. Mus. Zool. Mich.* 81:1-42.

Tordoff, H.B. 1954(b). Relationships of the New World nine-primaried oscines. *Auk* 71:273-284.

Traylor, M.A. 1977. *Bull. Mus. Comp. Zool.* 148:129-184.

Udagawa, T. 1957. Karyogram studies in birds. IX. The chromosomes of five species of thrushes (Turdidae). *J. Fac. Sci. Hokkaido Univ., Ser. VI, Zool.* 13:338-343.

Underwood, G. 1982. Parallel evolution in the context of character analysis. *Zool. Jour. Linn. Soc.* 74(3):197-206.

Vernon, C.J. and Dean, W.R.J. 1975. On the systematic position of *Pholidornis rushiae. Bull. Br. Orn. Cl.* 95(1):20.

Wallace, A.R. 1874. On the arrangement of the families constituting the Order Passeres. *Ibis* 22:406-416.

Wetmore, A. 1960. A classification for the birds of the world. *Smith. Misc. Coll.* 139 (11):1-37.

Wiley, E.O. 1975. Karl Popper, systematics and classification. A reply to Walter Bock and other evolutionary taxonomists. *Syst Zool.* 24:233-243.

## APPENDIX A

Species examined in this study. (* denotes skin only.)

PASSERIFORMES

| NUMBER | SPECIES | No. |
|---|---|---|
| 630101 | Cymbirhynchus macrorhynchos | 1 |
| 630201 | Calyptomena viridis | 1 |
| 630301 | Smithornis capensis | 1 |
| 630401 | Psarisomas dalhousiae | 1 |
| 630501 | Eurylaimus javanicus | 1 |
| 640101 | Dendrocincla ?fuliginosa | 1 |
| 640102 | D.homochroa | 1 |
| 640201 | Campylorhamphus trochilirostris | 1 |
| 640301 | Dendrocolaptes platyrostris | 1 |
| 640401 | Lepidocolaptes affinis | 1 |
| 640402 | L.angustirostris | 1 |
| 640501 | Glyphorhynchus spirurus | 1 |
| 640601 | Deconychura longicauda | 1 |
| 640701 | Xiphorhynchus guttatus | 1 |
| 640702 | X.picus | 1 |
| 640703 | X.flavigaster | 1 |
| 640801 | Sittasomus griseicapillus | 1 |
| 650101 | Geositta canicularia | 1 |
| 650201 | Furnarius leucopus | 1 |
| 650301 | Syndactyla rufosuperciliata | 1 |
| 650401 | Cinclodes fuscus | 1 |
| 651101 | Phacellodomus ruber | 1 |
| 651201 | Phleocryptes melanops | 1 |
| 651301 | Certhiaxis cinnamomea | 1 |
| 651401 | Upucerthia ruficauda | 1 |
| 651501 | Leptosphenura platensis | 1 |
| 651601 | Synallaxis albescens | 1 |
| 651701 | Spartanoica maluroides | 1 |
| 651801 | Anambius annumbi | 1 |
| 652101 | Pseudoseiura lophotes | 1 |
| 652201 | Pygarrhichas albogularis | 1 |
| 652301 | Sclerurus caudacutus | 1 |
| 652401 | Asthenes (Thripophaga) modesta | 1 |
| 652501 | Phylidor lichtensteini | 1 |
| 652601 | Lochmias nematura | 1 |
| 652701 | Pseudocolaptes lawrencii | 1 |
| 652801 | Xenops rutilans | 1 |
| 652901 | Aphrastura spinicauda | 1 |
| 660101 | Gymnocichla nudiceps | 1 |
| 660201 | Grallaria perspicillatus | 1 |
| 660301 | Thamnophilus punctata | 1 |
| 660401 | Myrmotherula fulviventris | 1 |
| 660501 | Formicarius analis | 1 |
| 660601 | Taraba major | 1 |
| 670101 | Corythopis torquata | 1 |
| 670201 | Conopophaga lineata | 1 |
| 680101 | Pteroptochus megapodius | 1 |
| 690101 | Gymnoderus foetidus | 1 |
| 690201 | Pachyramphus viridis | 1 |
| 690301 | Querula purpurata | 1 |

| | | |
|---|---|---|
| 690401 | Perissocephalus tricolor | 1 |
| 690501 | Tityra cayana | 1 |
| 690601 | Procnias nudicollis | 1 |
| 693101 | Rupicola rupicola | 1 |
| 700101 | Pipra pipra | 1 |
| 700201 | Chiroxiphia pareola | 1 |
| 700301 | Manacus manacus | 1 |
| 700401 | Iliacura militaris | 1 |
| 710101 | Xolmis irupero | 1 |
| 710201 | Sayornis phoebe | 1 |
| 710301 | Colonia colonia | 1 |
| 710401 | Pyrocephalus rubinus | 1 |
| 710501 | Machetornis rixosus | 1 |
| 710601 | Sirystes sibilator | 1 |
| 710701 | Myiozetetes cayanensis | 1 |
| 710801 | Pitangus sulphuratus | 1 |
| 710901 | Tyrannus dominicensis | 1 |
| 711001 | Muscivora tyrannus | 1 |
| 711101 | Satrapus icterophrys | 1 |
| 711201 | Muscisaxicola sp. | 1 |
| 711301 | Fluvicola pica | 1 |
| 714101 | Contopus sp. | 1 |
| 714201 | Myiarchus magnirostris | 1 |
| 714301 | Attila spadiceus | 1 |
| 714401 | Empidonax virescens | 1 |
| 714501 | Myiobius barbatus | 1 |
| 716101 | Tolmomyias sulphurescens | 1 |
| 716201 | Rhynchocychus olivaceus | 1 |
| 716301 | Platyrhynchus mystaceus | 1 |
| 717101 | Phylloscartes ventralis | 1 |
| 717201 | Colopteryx galeatus | 1 |
| 717301 | Oncostoma olivaceum | 1 |
| 718101 | Serpophaga subcristata | 1 |
| 719101 | Elaenia sp. | 1 |
| 719201 | Pipromorpha oleaginea | 1 |
| 719301 | Mionectes olivaceus | 1 |
| 720101 | Oxyruncus cristatus | 1* |
| 730101 | Phytotoma rutila | 1 |
| 740101 | Pitta reichenowi | 1 |
| 750101 | Xenicus longipes | 1 |
| 750201 | Acanthisitta chloris | 1 |
| 760101 | Philepitta castanea | 1 |
| 760501 | Neodrepanis coruscans | 1 |
| 770101 | Menura novaehollandiae | 1 |
| 780901 | Atrichornis clamosus | 1* |
| 780902 | A.rufescens | 2* |
| 210101 | Alaemon alaudipes | 1 |
| 210201 | Eremophila alpestris | 1 |
| 210301 | Eremopteryx signata | 1 |
| 210401 | Melanocorypha leucoptera | 1 |
| 210501 | Chersophilus duponti | 1 |
| 210601 | Alauda arvensis | 1 |
| 220101 | Stelgidopteryx ruficollis | 1 |
| 220202 | Cecropsis senegalensis | 1 |
| 220301 | Delichon urbica | 1 |
| 220401 | Hirundo rustica | 1 |
| 220501 | Riparia riparia | 1 |
| 230101 | Motacilla alba | 1 |

| | | |
|---|---|---|
| 230201 | Macronyx croceus | 1 |
| 230301 | Anthus novaeseelandiae | 1 |
| 230401 | Dendronanthus indicus | 1 |
| 350101 | Coracina lineatus | 1 |
| 350201 | Pericrocotus speciosus | 1 |
| 200101 | Pycnonotus jocosus | 1 |
| 200102 | P. simplex | 1 |
| 200103 | P.plumosus | 1 |
| 200201 | Andropadus curvirostris | 1 |
| 200301 | Phyllastrephus debilis | 1 |
| 200302 | P. terrestris | 1 |
| 200401 | Bleda eximia | 1 |
| 200402 | B. syndactyla | 1 |
| 200403 | B. canicapilla | 1 |
| 070601 | Bernieria zosterops | 3 |
| 240101 | Aegithina tiphia | 1 |
| 240201 | Chloropsis sonnerati | 1 |
| 240301 | Irena puella | 1 |
| 250101 | Eurocephalus anguitimens | 1 |
| 250201 | Prionops plumata | 1 |
| 250301 | Laniarius barbarus | 1 |
| 250401 | Telophorus multicolor | 1 |
| 251001 | Corvinella corvina | 1 |
| 251101 | Lanius tigrinus | 1 |
| 251201 | Pityriasis gymnocephala | 1 |
| 430101 | Vanga curvirostris | 1 |
| 430201 | Leptopterus madagascariensis | 1 |
| 430301 | Xenopirostris xenopirostris | 1 |
| 430401 | Hypositta coralirostris | 1 |
| 430501 | Schetba rufa | 1 |
| 430601 | Calicalis madagascariensis | 1 |
| 430701 | Euryceros prevostii | 1 |
| 430801 | Falculea palliata | 1 |
| 360101 | Ptilogonys caudatus | 1 |
| 360201 | Phainopepla nitens | 1 |
| 360301 | Bombycilla garrulus | 1 |
| 360401 | Hypocolius ampelinus | 1 |
| 300101 | Dulus dominicus | 1 |
| 310101 | Cinclus sp. | 1 |
| 320101 | Troglodytes troglodytes | 1 |
| 320201 | Thryothorus ludovicianus | 1 |
| 330101 | Donacobius atricapillus | 1 |
| 330201 | Toxostoma redivivum | 1 |
| 340101 | Accentor modularis | 1 |
| 100101 | Neocossyphus rufus | 1 |
| 100102 | N. poensis | 1 |
| 100201 | Cossypha cyanocampter | 1 |
| 100301 | Turdus olivaceus | 1 |
| 100302 | T. pilaris | 1 |
| 100303 | T. ericetorum | 1 |
| 100304 | T. litsipsirupa | 1* |
| 100305 | T. albicollis | 1 |
| 100306 | T. libonyanus | 1 |
| 100307 | T. nudigenis | 1 |
| 100308 | T. migratorius | 1 |
| 100309 | T. merula | 2 |
| 100310 | T. boulboul | 1 |
| 100311 | T. plumbeus | 1 |

| | | |
|---|---|---|
| 100312 | T. fuscator | 1 |
| 100313 | T. viscivorus | 1 |
| 100314 | T. falklandi | 1 |
| 100315 | T. leucomelas | 1 |
| 100316 | T. obscurus | 1 |
| 100317 | T. serranus | 1 |
| 100318 | T. unicolor | 1 |
| 100319 | T. ruficollis atrogularis | 1 |
| 100320 | T. abyssinicus | 1 |
| 100321 | T. torenatis | 1 |
| 100322 | T. chrysolaus | 1 |
| 100323 | T. fumigatus | 1 |
| 100324 | T. rufiventris | 1 |
| 100325 | T. iliacus | 1 |
| 100326 | T. poliocephalus | 2 |
| 100401 | Brachypteryx leucophrys | 1 |
| 100501 | Phoenicurus ochrurus | 1 |
| 100601 | Alethe diademata | 3 |
| 100602 | A. fulleborni | 1* |
| 100701 | Oenanthe oenanthe | 1 |
| 100801 | Cinclidium frontalis | 1 |
| 100901 | Drymodes brunneopygia | 1 |
| 101001 | Modulatrix orostruthus | 1* |
| 101002 | M. stictigula | 2* |
| 101101 | Myadestes unicolor | 1 |
| 101201 | Stizorhina fraseri | 1 |
| 101202 | S. finschii | 1 |
| 101301 | Zoothera (dauma) lunulata | 1 |
| 101302 | Z. sibirica | 1 |
| 101303 | Z. citrinus | 1 |
| 101304 | Z. mollissima | 1 |
| 101401 | Grandala coelicolor | 1 |
| 101501 | Sialia mexicana | 1 |
| 101601 | Erithacus rubecula | 1 |
| 101701 | Monticola cinclorhynchus | 1 |
| 101801 | Chaetops fraenatus | 1* |
| 101901 | Entomodestes coracinus | 1* |
| 102001 | Thamnolaea semirufa | 1 |
| 102101 | Pogonocichla stellata | 1 |
| 102201 | Erythropygia galactotes | 1 |
| 102301 | Cichladusa aquatica | 1 |
| 102401 | Copsychus saularis | 1 |
| 102501 | Myrmecocichla arnotti | 1 |
| 102601 | Rhyacornis fuliginosus | 1 |
| 102701 | Saxicoloides fulicata | 1 |
| 102801 | Pseudocossyphus sharpei | 1 |
| 102901 | Enicuris schistaceus | 1 |
| 103001 | Saxicola torquata | 1 |
| 103101 | Cercomela familiaris | 1 |
| 103201 | Chaimarrornis leucocephalus | 1 |
| 103301 | Myiophoneus caeruleus | 1 |
| 103401 | Nesocichla eremita | 1 |
| 103501 | Hylocichla mustelina | 1 |
| 103601 | Catharus ustulatus | 1 |
| 103602 | C. guttatus | 1 |
| 103603 | C. minimus | 1 |
| 103701 | Platycichla flavipes | 1 |
| 350301 | Chlamydochaera jefferyi | 1* |

| | | |
|---|---|---|
| 010301 | Kakamega poliothorax | 1 |
| 090101 | Orthonyx temminckii | 1 |
| 090201 | Psophodes olivaceus | 2 |
| 090301 | Cinclosoma cinnamomeum | 2 |
| 090302 | C. castanotum | 1* |
| 090501 | Sphenostoma cristatum | 1* |
| 090601 | Ptilorrhoa castanota | 1* |
| 090701 | Eupetes macrocercus | 1 |
| 090801 | Melampitta gigantea | 1* |
| 090901 | Ifrita kowaldi | 1* |
| 091001 | Crateroscelis nigrorufa | 1* |
| 010101 | Pellorneum capistratum | 3 |
| 010102 | P. ruficeps | 5 |
| 010103 | P. ?sp. | 1 |
| 010201 | Trichastoma albipectus | 3 |
| 010202 | T. bicolor | 1 |
| 010203 | T. fulvescens | 1 |
| 010204 | T. malaccense | 5 |
| 010205 | T. puveli | 1 |
| 010206 | T. pyrrhoptera | 1 |
| 010207 | T. rostratum | 5 |
| 010208 | T. tickelli | 5 |
| 010401 | Malacopteron affine | 1 |
| 010402 | M. albogulare | 5 |
| 010403 | M. cinereum | 5 |
| 010404 | M. magnirostre | 2 |
| 010405 | M. magnum | 5 |
| 010601 | Ptyrticus turdinus | 1* |
| 020101 | Pomatorhinus hypoleucos | 3 |
| 020102 | P. ochraceiceps | 4 |
| 020103 | P. ruficollis | 4 |
| 020104 | P. schisticeps | 2 |
| 020201 | Pomatostomus ruficeps | 1 |
| 020202 | P. superciliosus | 4 |
| 020203 | P. temporalis | 8 |
| 020301 | Ptilocichla falcata | 1 |
| 020401 | Kenopia striata | 1 |
| 020501 | Napothera atrigularis | 5 |
| 020502 | N. brevicaudata | 2 |
| 020503 | N. epilepidota | 1 |
| 020504 | N. macrodactyla | 2 |
| 020601 | Pnoepyga pusilla | 3 |
| 020701 | Garritornis isidori | 1* |
| 020801 | Xiphyrhynchus superciliaris | 1* |
| 020901 | Jaboiuilea danjou | 1* |
| 021001 | Rimator malacoptilus | 1* |
| 021101 | Spelaeornis caudata | 1* |
| 021201 | Sphenocichla humei | 1* |
| 030101 | Neomixis flaviviridis | 1 |
| 030102 | N. tenella | 2 |
| 030201 | Stachyris chrysaea | 5 |
| 030202 | S. erythroptera | 5 |
| 030203 | S. maculata | 5 |
| 030204 | S. nigriceps | 5 |
| 030205 | S. nigricollis | 2 |
| 030206 | S. poliocephala | 5 |
| 030207 | S. ruficeps | 1 |
| 030208 | S. striolata | 1 |

| | | |
|---|---|---|
| 030209 | S. thoracica | 1* |
| 030301 | Dumetia hyperythra | 1 |
| 030401 | Macronous gularis | 5 |
| 030402 | M. ptilosus | 5 |
| 030501 | Timalia pileata | 3 |
| 030601 | Rhopocichla atriceps | 1* |
| 040101 | Turdoides caudatus | 2 |
| 040102 | T. jardinei | 1 |
| 040103 | T. leucopygius | 3 |
| 040104 | T. melanops | 2 |
| 040105 | T. plebeja | 2 |
| 040106 | T. squamiceps | 1 |
| 040107 | T. rubiginosus | 1 |
| 040108 | T. striatus | 1 |
| 040201 | Garrulax affinis | 1 |
| 040202 | G. canorus | 3 |
| 040203 | G. chinensis | 4 |
| 040204 | G. davidi | 1 |
| 040205 | G. erythrocephalus | 1 |
| 040206 | G. leucolophus | 5 |
| 040207 | G. lugubris | 2 |
| 040208 | G. maesi | 1 |
| 040209 | G. merulinus | 1 |
| 040210 | G. milnei | 1 |
| 040211 | G. mitrata | 2 |
| 040212 | G. sannio | 1 |
| 040213 | G. subunicolor | 1 |
| 040214 | G. striatus | 1 |
| 040301 | Leiothrix argentarius | 5 |
| 040302 | L. lutea | 5 |
| 040401 | Cutia nipalensis | 1 |
| 040501 | Pteruthius melanotis | 3 |
| 040502 | P. rufiventer | 1 |
| 040601 | Gamsorhynchus rufulus | 1 |
| 040701 | Minla cyanaouroptera | 5 |
| 040702 | M. ignotincta | 1 |
| 040703 | M. strigula | 4 |
| 040801 | Alcippe brunnea | 1 |
| 040802 | A. brunneicauda | 1 |
| 040803 | A. castaneiceps | 4 |
| 040804 | A. chrysotii | 3 |
| 040805 | A. morrisonia | 2 |
| 040806 | A. nipalensis | 5 |
| 040807 | A. peracensis | 3 |
| 040808 | A. poioicephala | 3 |
| 040809 | A. ruficapilla | 1 |
| 040810 | A. rufogularis | 1 |
| 040811 | A. cinereiceps | 2 |
| 040901 | Heterophasia annectans | 1 |
| 040902 | H. capistrata | 5 |
| 040903 | H. melanoleuca | 3 |
| 040904 | H. picaoides | 2 |
| 041001 | Yuhina castaniceps | 2 |
| 041002 | Y. flavicollis | 6 |
| 041003 | Y. gularis | 2 |
| 041004 | Y. nigrimenta | 2 |
| 041005 | Y. xantholeuca | 1 |
| 041101 | Babax waddelli | 1* |

| | | |
|---|---|---|
| 041201 | Liocichla steerii | 1* |
| 041301 | Myzornis pyrrhoa | 1* |
| 041401 | Actinodura egertoni | 1* |
| 041501 | Lioptilus nigricapillus | 1* |
| 041502 | Kupeornis gilberti | 1* |
| 041601 | Paraphasma galinieri | 1* |
| 041701 | Phyllanthus atripennis | 1* |
| 041801 | Crocias albonotatus | 1* |
| 070101 | Horizorhinus dohrni | 1* |
| 070201 | Oxylabes madagascariensis | 4 |
| 070301 | Mystacornis crossleyi | 2 |
| 070401 | Malia grata | 1* |
| 060101 | Chrysomma sinensis | 2 |
| 060201 | Chamaea fasciata | 1 |
| 060301 | Paradoxornis heudei | 4 |
| 060302 | P. webbiana | 2 |
| 060401 | Panurus biarmicus | 4 |
| 060501 | Moupinia altirostris | 1* |
| 060601 | Conostoma oemodium | 1* |
| 050101 | Picathartes gymnocephalus | 4 |
| 050102 | P. oreus | 4 |
| 080101 | Ramphocaenus melanurus | 2 |
| 080201 | Polioptila caerulea | 1 |
| 080202 | P. dumicola | 2 |
| 080203 | P. plumbea | 1 |
| 110101 | Eminia lepida | 1 |
| 110201 | Sylvia hortensis | 1 |
| 110301 | Cisticola lateralis | 1 |
| 110401 | Melocichla mentalis | 1 |
| 110501 | Prinia flaviventris | 1 |
| 110601 | Acrocephalus palustris | 1 |
| 110701 | Hippolais languida | 1 |
| 110801 | Macrosphenus concolor | 1 |
| 110901 | Locustella lanceolata | 1 |
| 111001 | Megalurus galactotes | 1 |
| 111101 | Eremiornis carteri | 1 |
| 111201 | Parisoma plumbeum | 1 |
| 111301 | Hyliota flavigaster | 1 |
| 111401 | Hylia prasina | 1 |
| 111501 | Phylloscopus laurae | 1 |
| 111601 | Seicercus poliogenys | 1 |
| 111701 | Regulus regulus | 1 |
| 111801 | Conopoderas caffra | 1 |
| 111901 | Orthotomus ruficeps | 1 |
| 112001 | Dromocercus seebohmi | 1 |
| 112101 | Amaurocichla bocagei | 1* |
| 170101 | Malurus coronatus | 1 |
| 170201 | Aphelocephale nigricincta | 1 |
| 170301 | Acanthiza chrysorrhoa | 1 |
| 170401 | Cinclorhamphus cruralis | 1 |
| 170402 | C. mathewsi | 1 |
| 170501 | Lamprolia victoriae | 1 |
| 170601 | Stipiturus malachurus | 2 |
| 170701 | Amytornis striatus | 1 |
| 170801 | Gerygone levigaster | 1 |
| 170901 | Smicrornis brevirostris | 1 |
| 171001 | Ephthianura tricolor | 1 |
| 171101 | Pyrrholaemus brunneus | 1 |

| | | |
|---|---|---|
| 171201 | Calamanthus fuliginosus | 1 |
| 171301 | Sericornis maculatus | 1 |
| 171401 | Hylacola cauta | 1 |
| 120101 | Rhinomyias ruficauda | 1 |
| 120201 | Niltava grandis | 1 |
| 120202 | N. hodgsoni | 1 |
| 120301 | Microeca leucophaea | 1 |
| 120401 | Eopsaltria georgiana | 1 |
| 120501 | Petroica cucullata | 1 |
| 120601 | Peltops montanus | 2 |
| 120701 | Newtonia ?amphichroa | 1* |
| 120801 | Bradornis pallidus | 1 |
| 120901 | Penoenanthe pulverulenta | 1 |
| 121001 | Philentoma pyrrhoptera | 1 |
| 121101 | Poecilodryas superciliosus | 1 |
| 121201 | Fraseria cinerascens | 1 |
| 121301 | Muscicapa latirostris | 1 |
| 121302 | M. thalassina | 1 |
| 121401 | Ficedula mugimaki | 1 |
| 130101 | Batis minor | 1 |
| 130201 | Platysteira cyanea | 1 |
| 130301 | Bias musicus | 1 |
| 130401 | Pseudobias wardi | 1 |
| 140101 | Myiagra azureocapilla | 1 |
| 140201 | Terpsiphone rufocinerea | 1 |
| 140301 | Hypothymis azurea | 1 |
| 140401 | Seisura inquieta | 1 |
| 140501 | Monarcha verticalis | 1 |
| 140601 | Elminia longicauda | 1 |
| 140701 | Mayrornis lessoni | 1 |
| 140801 | Trochocercus nitens | 1 |
| 140901 | Clitorhynchus hamleni | 1 |
| 141001 | Erythrocercus mccalli | 1 |
| 141101 | Machaerhynchus nigripectus | 1 |
| 141201 | Arses lorealis | 1 |
| 150101 | Rhipidura spilodera | 1 |
| 160101 | Pachycephala pectoralis | 1 |
| 160201 | Pitohui kirhocephalus | 1 |
| 160301 | Colluricincla megarhynchus | 1 |
| 160401 | Falcunculus frontatus | 1 |
| 160501 | Oreoica gutturalis | 1 |
| 260101 | Psaltriparus minimus | 1 |
| 260201 | Aegithalos caudatus | 1 |
| 270101 | Anthoscopus caroli | 1 |
| 270201 | Auriparus flaviceps | 1 |
| 280101 | Parus major | 1 |
| 390101 | Tichodroma muraria | 1 |
| 390201 | Sitta canadensis | 1 |
| 390301 | Neositta chrysoptera | 1 |
| 380101 | Salpornis spilonota | 1 |
| 380201 | Certhia familiaris | 1 |
| 410101 | Rhabdornis mysticalis | 1 |
| 420101 | Climacteris melanura | 1 |
| 290101 | Prionochilus thoracicus | 1 |
| 290201 | Paramythia montium | 1 |
| 440101 | Nectarinia notata | 1 |
| 450101 | Chloroharis emiliae | 1 |
| 400101 | Certhionyx niger | 1 |

| | | |
|---|---|---|
| 400201 | Meliphaga penicillato | 1 |
| 400301 | Promerops caffer | 1 |
| 400401 | Philemon novaeguinea | 1 |
| 400501 | Entomyzon cyanotis | 1 |
| 460101 | Emberiza citrinella | 1 |
| 460201 | Geospiza magnirostris | 1 |
| 460301 | Cardinalis cardinalis | 1 |
| 460401 | Tangara chlorotica | 1 |
| 370101 | Mniotilta varia | 1 |
| 370201 | Zeledonia coronata | 1* |
| 370301 | Coereba flaveola | 1 |
| 370401 | Icteria virens | 1 |
| 370501 | Seiurus noveboracensis | 1 |
| 370601 | Stothylpis ?sp. | 1 |
| 470101 | Loxops coccinea | 1 |
| 470201 | Palmeria dolei | 1 |
| 480101 | Cyclarhis gujenensis | 1 |
| 480201 | Vireo flavifrons | 1 |
| 490101 | Cacicus haemorrhous | 1 |
| 490201 | Sturnella neglecta | 1 |
| 500101 | Fringilla coelebs | 1 |
| 500201 | Pinicola enucleator | 1 |
| 510101 | Spermophaga haematina | 1 |
| 510201 | Emblema picta | 1 |
| 510301 | Lonchura fringilloides | 1 |
| 510401 | Pholidornis rushiae | 1 |
| 520101 | Dinemellia dinemelli | 1 |
| 521101 | Passer griseus | 1 |
| 522101 | Ploceus cucullatus | 1 |
| 523101 | Steganura paradisea | 1 |
| 530101 | Gracula religiosa | 1 |
| 530201 | Sturnus vulgaris | 1 |
| 533101 | Buphagus africanus | 1 |
| 533102 | B. erythrorhynchus | 1 |
| 540101 | Oriolus sagittatus | 1 |
| 550101 | Dicrurus hottentotus | 1 |
| 560101 | Callaeus cinereus | 1 |
| 570101 | Grallina cyanoleuea | 1 |
| 570201 | Struthidea cinerea | 1 |
| 570301 | Corcorax melanorhamphos | 1 |
| 580101 | Artamus melanops | 1 |
| 590101 | Gymnorhina tibicen | 1 |
| 590201 | Strepera graculina | 1 |
| 590301 | Cracticus nigrogularis | 1 |
| 600101 | Ptilonorhynchus violaceus | 1 |
| 610101 | Paradisea raggiana | 1 |
| 620101 | Cyanocitta cristata | 1 |
| 620201 | Corvus monedula | 1 |
| 620301 | Zavattariornis stresemanni | 1 |

NON-PASSERIFORMES

(@ = from drawings by Lennerstedt, 1973)

| | | |
|---|---|---|
| 987101 | Streptopelia chinensis | 1 |
| 990101 | Treron australis | 1@ |
| 990201 | Columba palumbus | 1@ |
| 975101 | Tauraco livingstonii | 1 |
| 986101 | Cuculus canorus | 1 |
| 982101 | Coua cristata | 1 |
| 985101 | Aratinga aurea | 1@ |
| 974101 | Asio otus | 1@ |
| 966101 | Caprimulgus europaea | 1@ |
| 954101 | Streptoprocne zonaris | 1 |
| 953101 | Apus apus | 1 |
| 952101 | Hemiprocne comata | 1 |
| 951101 | Eulampis jugularis | 1 |
| 940101 | Colius macrourus | 1@ |
| 930101 | Harpactes diardi | 1 |
| 921101 | Ceryle alcyon | 1 |
| 922101 | Alcedo atthis | 1@ |
| 923101 | Dacelo novaegiuniae | 1 |
| 923201 | Halcyon sancta | 1 |
| 919101 | Todus todus | 1 |
| 918101 | Baryphthengus mertii | 1 |
| 916101 | Coracias glandarius | 1@ |
| 917101 | Merops apiaster | 1@ |
| 915101 | Brachypteracias squamigera | 1 |
| 914101 | Leptosomus discolor | 1 |
| 913101 | Upupa epops | 1 |
| 912101 | Rhinopomastus minor | 1 |
| 911101 | Tockus camurus | 1 |
| 908101 | Galbula galbula | 1 |
| 907101 | Malacoptila panamonsis | 1 |
| 906101 | Trachyphonus erythrocephalus | 1 |
| 905101 | Indicator indicator | 1 |
| 904101 | Pteroglossus viridis | 1 |
| 902101 | Jynx torquilla | 1@ |
| 903101 | Sasia abnormis | 1 |
| 901101 | Picus viridis | 1@ |

## APPENDIX B

Character scores of species used in this study.

NON-PASSERIFORMES (OUTGROUP)

| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 987101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 982101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 975101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 954101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 952101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 951101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 930101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 923201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 923101 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 921101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 919101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 918101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 915101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 914101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 913101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 912101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Character Nos. | | | | | | | | | | | | | | | |
| 908101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 907101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 906101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 905101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 904101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 903101 | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 901101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 902101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 986101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 985101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 974101 | 0 | 0 | 0 | - | - | - | 0 | 0 | 1 | 1 | 0 | 0 | - | 0 | 0 | - |
| 990201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 990101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 916101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 917101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 940101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 966101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 987101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 982101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 975101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 954101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 952101 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 951101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 930101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 923201 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 923101 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 921101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 919101 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 918101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 915101 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 914101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 913101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 912101 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 908101 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 907101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 906101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 905101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 904101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 903101 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 901101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 902101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 986101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 985101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 974101 | 0 | 0 | 1 | 1 | 0 | 0 | - | - | - | - | 0 | 0 | 1 | 1 | 0 | 0 |
| 990201 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 990101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 916101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 917101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 940101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 966101 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 987101 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 982101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 975101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 954101 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 |
| 952101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 951101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 930101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 923201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 923101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 921101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 919101 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 918101 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 915101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 914101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 913101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 912101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 911101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 908101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 907101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 906101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 905101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 904101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 903101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 901101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 902101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 986101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 985101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 974101 | - | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | - | - | - |
| 990201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 990101 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 916101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 917101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 940101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 966101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 987101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 982101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 975101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 954101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 952101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 951101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 930101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 923201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 923101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 921101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 919101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 918101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 915101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 914101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 913101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 912101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 908101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 907101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 906101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 905101 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 904101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 903101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 901101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 902101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 986101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 985101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 974101 | - | - | - | - | - | 0 | 0 | 1 | 1 | 0 | - | - | 0 | 0 | 1 | 0 |
| 990201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 990101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 916101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 917101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 940101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 966101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 987101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 982101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 975101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 954101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 952101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 951101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 930101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 923201 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| 923101 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 921101 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 919101 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 918101 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 915101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 914101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 913101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 912101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 908101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 907101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 906101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 905101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 904101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 903101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 901101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 902101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 986101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 985101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 974101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 990201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 990101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 916101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 917101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 940101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 966101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 987101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 982101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 975101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 954101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | - | - | - | 0 |
| 952101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | - | - | - | 0 |
| 951101 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | 0 |
| 930101 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 923201 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 923101 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 921101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | - | - | - | 0 |
| 919101 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 918101 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 915101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 914101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 913101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 912101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 911101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 908101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 907101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 906101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 905101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 904101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 903101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 901101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 902101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 986101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 985101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 974101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 990201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 990101 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 916101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 917101 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 |
| 940101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 |
| 966101 | 0 | 0 | 0 | - | - | - | - | - | - | - | - | - | - | - | - | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 987101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 982101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 975101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 954101 | 1 | 1 | 0 | 0 | 0 | 0 |
| 952101 | 1 | 1 | 0 | 0 | 0 | 0 |
| 951101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 930101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 923201 | 1 | 0 | 0 | 0 | 1 | 0 |
| 923101 | 1 | 0 | 0 | 0 | 0 | 0 |
| 921101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 919101 | 1 | 0 | 0 | 0 | 0 | 0 |
| 918101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 915101 | 1 | 0 | 0 | 0 | 0 | 0 |
| 914101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 913101 | 1 | 0 | 0 | 0 | 0 | 0 |
| 912101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 911101 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 908101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 907101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 906101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 905101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 904101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 903101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 901101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 902101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 986101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 985101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 974101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 990201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 990101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 916101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 917101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 940101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 966101 | 0 | 0 | 0 | 0 | 0 | 0 |

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| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 640801 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640601 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640102 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 640701 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640702 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640703 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | V | 1 | 1 | 0 | 0 |
| 640201 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640401 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640402 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640501 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 640801 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640601 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640102 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 640101 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 640301 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640701 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640702 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640703 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640201 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 |
| 640401 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 640402 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 640501 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 640801 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 640601 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 640102 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 640101 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 640301 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 640701 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640702 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640703 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640201 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640401 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 640402 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 640501 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | - | - | - |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 640801 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 640601 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 640102 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 640101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 640301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 640701 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 640702 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 640703 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 640201 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 640401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 640402 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 640501 | - | - | - | - | - | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 640801 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| 640601 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| 640102 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 640101 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 640301 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 640701 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 640702 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| 640703 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| 640201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 640401 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| 640402 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 640501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 640801 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 640601 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 640102 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 640101 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 640301 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 640701 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| 640702 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| 640703 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 640201 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| 640401 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 640402 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 640501 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | - | - | - | - |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 640801 | 0 | 1 | 1 | 0 | 0 | 0 |
| 640601 | 0 | 1 | 1 | 0 | 0 | 0 |
| 640102 | 0 | 1 | 1 | 0 | 0 | 0 |
| 640101 | 0 | 1 | 1 | 0 | 0 | 0 |
| 640301 | 1 | 1 | 0 | 0 | 0 | 0 |
| 640701 | 0 | 1 | 1 | 0 | 0 | 0 |
| 640702 | 1 | 0 | 0 | 0 | 0 | 0 |
| 640703 | 1 | 0 | 0 | 0 | 0 | 0 |
| 640201 | 1 | 1 | 1 | 0 | 0 | 0 |
| 640401 | 0 | 1 | 1 | 0 | 0 | 0 |
| 640402 | 0 | 1 | 1 | 0 | 0 | 0 |
| 640501 | 1 | 0 | 0 | 0 | 0 | 0 |

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| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 652401 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 651401 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 652301 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 652901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 652101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 651701 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 652701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 652201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 652601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 650201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 650401 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 651101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 652801 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 650101 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 651801 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 651601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 651201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 651301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651501 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 650301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 652501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 652401 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651401 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 652301 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 652901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652101 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651701 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652701 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652201 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652601 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650201 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650401 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 651101 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652801 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650101 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651801 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651601 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651201 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651301 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651501 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 652401 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 651401 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652301 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652901 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651701 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 652701 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652201 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 652601 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 650201 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 650401 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 651101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 652801 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 650101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 651801 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 651601 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 651201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 652501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |

|  | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 652401 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 651401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 652301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 652901 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 652101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651701 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 652701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 652201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 652601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 650201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 650401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 651101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 652801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 650101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 651801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 651601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 651201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 651501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 650301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 652501 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 652401 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 651401 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 652301 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |
| 652901 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 652101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 651701 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 652701 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 652201 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 652601 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 650201 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 650401 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 651101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 652801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 650101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 651801 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 651601 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 651201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 652401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 651401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 |
| 652301 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 652901 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 652101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 651701 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 652701 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 652201 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 652601 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 650201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 650401 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 651101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 652801 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 650101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 651801 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 651601 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | - | - | - | - |
| 651201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 651301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 651501 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 650301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 652501 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 652401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652301 | 0 | 1 | 0 | 0 | 0 | 0 |
| 652901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652201 | 0 | 1 | 0 | 0 | 0 | 0 |
| 652601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650201 | 0 | 1 | 0 | 0 | 0 | 0 |
| 650401 | 0 | 1 | 0 | 0 | 0 | 0 |
| 651101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651801 | 0 | 1 | 0 | 0 | 0 | 0 |
| 651601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651201 | 0 | 1 | 0 | 0 | 0 | 0 |
| 651301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 651501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 650301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 652501 | 0 | 0 | 0 | 0 | 0 | 0 |

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| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 660201 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 660501 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 660101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 660401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 660301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 660601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 670101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 670201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 680101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 660201 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 660501 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 660101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 670101 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 670201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 680101 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 660201 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 660501 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 660301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 670101 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 670201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 680101 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 660201 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 660501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| 660101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 660401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 660301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 660601 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 670101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 670201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 680101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 660201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 660501 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 670101 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 670201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 680101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 660201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 660501 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 660101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 660401 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 660301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 660601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 670101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 670201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 680101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 660201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 660601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 670101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 670201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 680101 | 0 | 1 | 0 | 0 | 0 | 0 |

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| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 690201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 690501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 690401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 690301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 690601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 690101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 693101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

Character Nos.

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 690201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 693101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 690201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 690501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 690401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 690301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 693101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 690201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 690401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 690301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690601 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 690101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 693101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 690201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 693101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 690201 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 690501 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 690401 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 690301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 690601 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 690101 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 693101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |

|  | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 690201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 690101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 693101 | 0 | 0 | 0 | 0 | 0 | 0 |

PIPRIDAE & PHYTOTOMIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 700101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 700201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 700301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 700401 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 730101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |

Character Nos.

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 700101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 700201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 700301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 700401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 730101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Taxon Nos. | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 700101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 700201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 700301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 700401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 730101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 700101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 700201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 700301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 700401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 730101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 700101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 700201 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 700301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 700401 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 730101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 700101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 700201 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 700301 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 700401 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 730101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 700101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 700201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 700301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 700401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 730101 | 0 | 0 | 0 | 0 | 0 | 0 |

TYRANNIDAE

| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 710401 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 714401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 719201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 710601 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 719301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 717201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 714501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 717101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 714301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710501 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 |
| 714201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 719101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 714101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 716101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 716201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 710201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 710701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 711301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 710901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 710101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 710801 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 717301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 718101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 710401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714401 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719201 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 717201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 717101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 714201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716301 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710701 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 711301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 717301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 718101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 710401 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714401 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 719201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 710601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 719301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 717201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 714501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 717101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 714301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 710501 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 710301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716301 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 719101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 716101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 716201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 710201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 711301 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 710901 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 710801 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 717301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 718101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 710401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| 710601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 719301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 717201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 714501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 717101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714301 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 710301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 716101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 710201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710701 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 711301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 710901 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 710101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 710801 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 717301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 718101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 710401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719201 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 710601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 717201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 717101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 714101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 716101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 716201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 710201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 711301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 717301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 718101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 710401 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 714401 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 719201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 710601 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 719301 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 717201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 714501 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 717101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 714301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 710501 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 714201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 710301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 716301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 719101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 714101 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 716101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 716201 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| 710201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 710701 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 711301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 710901 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710801 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 717301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 718101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 710401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 717201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 717101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 719101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 714101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 716201 | 0 | 1 | 0 | 0 | 0 | 0 |
| 710201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 711301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 710801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 717301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 718101 | 0 | 0 | 0 | 0 | 0 | 0 |

OLD WORLD SUBOSCINES

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 630401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 630501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 630101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 630301 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 630201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 740101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 630401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 630501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 630101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 630301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 630201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 740101 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 630401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 630501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 630101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 630301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 630201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 760501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 740101 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 630401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 630501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 630101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 630301 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 630201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 740101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 630401 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 630501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 630101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 630301 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 630201 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 760101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 740101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 630401 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | - | - | - | - |
| 630501 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| 630101 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 630301 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 630201 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 760101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 760501 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 740101 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 630401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 630501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 630101 | 0 | 0 | 0 | 0 | 0 | 1 |
| 630301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 630201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 760501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 740101 | 0 | 0 | 0 | 0 | 0 | 0 |

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Taxon Nos. — Character Nos.

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 750101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 750201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 770101 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 780901 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V | 0 | 0 |
| 780902 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 750101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 750201 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 770101 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 780901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 780902 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 750101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 750201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 770101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | - | - | - |
| 780901 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 780902 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 750101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 750201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 770101 | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 780901 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 780902 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 750101 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 750201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 770101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 780901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 780902 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 750101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 750201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 770101 | 1 | 0 | - | 1 | 0 | 1 | 1 | 1 | 1 | 1 | - | 0 | - | - | - | - |
| 780901 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 780902 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 750101 | 0 | 1 | 0 | 0 | 0 | 0 |
| 750201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 770101 | 0 | 1 | 0 | 0 | 0 | 0 |
| 780901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 780902 | 0 | 0 | 0 | 0 | 0 | 0 |

ALAUDIDAE

Taxon Nos. / Character Nos.

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 210501 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 210301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 210101 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 210401 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 210601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 210201 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 210501 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| 210301 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 210101 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 210401 | 0 | 0 | 0 | 1 | 0 | -1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 210601 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 210201 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

| Taxon Nos. | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 210501 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| 210301 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 210101 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 210401 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 |
| 210601 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| 210201 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 210501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 210301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 210101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 210401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 210601 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 210201 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 210501 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 210301 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 210101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 210401 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 210601 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 210201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 210501 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 210301 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 210101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 210401 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 210601 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 210201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 210501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 210301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 210101 | 0 | 1 | 0 | 0 | 0 | 0 |
| 210401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 210601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 210201 | 0 | 0 | 0 | 0 | 0 | 0 |

HIRUNDINIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 220501 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 220101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 220401 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 220301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 220201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |

Character Nos.

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 220501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 220101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220401 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220201 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 220501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 220101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 220401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 220501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 220101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 220401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 220301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 220201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 220501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 220101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 220401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 220301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 220201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 220501 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 220101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 220401 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 220301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 220201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 220501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 220201 | 0 | 0 | 0 | 0 | 0 | 0 |

MOTACILLIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 230201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 230401 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 230301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

Character Nos.

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230101 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 230201 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 230401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 230301 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 230201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |
| 230401 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| 230301 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 230201 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 230401 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 230301 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 230201 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 230401 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 230301 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 230201 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 230401 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 230301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 230101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 230201 | 0 | 1 | 0 | 0 | 0 | 0 |
| 230401 | 0 | 1 | 0 | 0 | 0 | 0 |
| 230301 | 0 | 1 | 0 | 0 | 0 | 0 |

PYCNONOTIDAE

| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 200301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 200101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 200103 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 70601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 200403 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 240201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 240101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 240301 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 350201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200103 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200403 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 240201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 240101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 240301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350301 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 200301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 200101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 200103 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 70601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V | V | V |
| 200403 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 240201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 240101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 240301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 350201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 350301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 200301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 200101 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 200103 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 70601 | 0 | V | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 200403 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 240201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 240101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 240301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350301 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200103 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200403 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 240201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 240101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 240301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 200301 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 200101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 200103 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 70601 | 0 | 0 | V | V | V | 1 | V | 0 | 0 | 0 | 1 | 0 | V | V | 1 | 0 |
| 200403 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 240201 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 240101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 240301 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 350101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 350201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 350301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 200201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200103 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 200403 | 0 | 0 | 0 | 0 | 0 | 1 |
| 240201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 240101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 240301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 350301 | 0 | 0 | 0 | 0 | 0 | 0 |

LANIIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 250101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 250401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 251001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 251201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 250301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |

Character Nos.

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 251001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 251201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250201 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 250301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 250101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 250401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 251001 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 251201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 250201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 250101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 251001 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 251201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 250301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 251001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 251201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 250301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 251101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 250101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 250401 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 251001 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 251201 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 250201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 250301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 251101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 251001 | 0 | 0 | 0 | 0 | 0 | 0 |
| 251201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 250301 | 0 | 0 | 0 | 0 | 0 | 0 |

VANGIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 430201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430501 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 430601 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 430801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 430101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 430401 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |

Character Nos.

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 430201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430701 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430401 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 430201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 430301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 430701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 430601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 430801 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 430401 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 430201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 430301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 430701 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 430501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 430601 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 430801 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 430101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 430401 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 430201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 430701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 430601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 430801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 430101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 430401 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 430201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 430301 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 430701 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 430501 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 430601 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 430801 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 430101 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 430401 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 430201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 430401 | 0 | 1 | 0 | 0 | 0 | 0 |

DULIDAE & BOMBYCILLIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 360401 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 360301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 360201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

Character Nos.

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 360401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 360301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 360101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 360401 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 360201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 360401 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 360301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 360101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 360201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 300101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 360201 | 0 | 0 | 0 | 0 | 0 | 0 |

STURNIDAE ETC

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Character Nos. | | | | | | | | | | | | | | | |
| 530101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 530201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 533101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 320101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 320201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 330101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 330201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 340101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 310101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 530101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 530201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 533101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 320101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 320201 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 330101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 330201 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 340101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 310101 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 530101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 530201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 533101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 320101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 320201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 330101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 330201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 340101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 310101 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 530101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 530201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 533101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 320101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 320201 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 330101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 330201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 340101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 310101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 530101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 530201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 533101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 320101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 320201 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 330101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 330201 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 340101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 310101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 530101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 530201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 533101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 320101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 320201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 330101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 330201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 340101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 310101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 530101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 530201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 533101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 320101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 320201 | 0 | 1 | 0 | 0 | 0 | 0 |
| 330101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 330201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 340101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 310101 | 0 | 0 | 0 | 0 | 0 | 0 |

TURDIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100601 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 101401 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 101901 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 100101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 101101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 103301 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 101001 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 101801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 101701 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 102801 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 103101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 103201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 100401 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 100701 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 101301 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 100201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 101501 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 102301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 102701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |

Character Nos.

| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100501 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 100801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 101201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 101601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 102001 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 |
| 102201 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 102501 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 102601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 103001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 102901 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 103401 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 100314 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 103601 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 100901 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 |
| 102101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 102401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 103501 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 103701 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101401 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 101001 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101801 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 101701 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102801 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103201 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100401 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100701 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 101301 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 100201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102301 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 102701 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100501 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100801 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 101201 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101601 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102001 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102201 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102501 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102601 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 103001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102901 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 103401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100314 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103601 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100901 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 102101 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102401 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103501 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103701 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

|  | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 101401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 101901 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 100101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 101101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 103301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 101001 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101801 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 101701 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 102801 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 103101 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 100401 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 100701 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 101301 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 100201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101501 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 102301 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 102701 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100501 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 100801 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 101201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 101601 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102001 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 102201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102501 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 102601 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 103001 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 102901 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 103401 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 100314 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 103601 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 100901 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 102401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 103501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 103701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 101401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 101901 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 100101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 103301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 101001 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 101801 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 101701 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 102801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 103101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 103201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 100401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 100701 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| 101301 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 100201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 101501 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 102301 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 102701 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 |
| 100801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 101201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 101601 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 102001 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 102201 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 102501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 102601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 103001 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 102901 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| 103401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 100314 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 103601 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 100901 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 102401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 103501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 103701 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100601 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 101401 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 101901 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 100101 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 101101 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 103301 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 101001 | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 101801 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 101701 | Ø | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | 1 |
| 102801 | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | 1 |
| 103101 | 1 | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | 1 |
| 103201 | 1 | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | 1 |
| 100401 | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | 1 |
| 100701 | 1 | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | 1 |
| 101301 | 1 | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | 1 |
| 100201 | Ø | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 101501 | Ø | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 |
| 102301 | Ø | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 102701 | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 |

|  | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102601 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 103001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103401 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100314 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100601 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 101401 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 101901 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 100101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 101101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 103301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 101001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 101801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 101701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 102801 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 103101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 103201 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 100401 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 100701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 101301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 100201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 101501 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 102301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 102701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 100801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 101201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 101601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 102001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 102201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 102501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 102601 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 103001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 102901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 103401 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 100314 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 103601 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 100901 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 102101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 102401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 103501 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 103701 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |

|  | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 100601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101001 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102701 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 100501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102001 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103001 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100314 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 100901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 102401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 103701 | 0 | 0 | 0 | 0 | 0 | 0 |

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| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20202 | 0 | 0 | V | V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | V | 0 | 1 |
| 90801 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 90601 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 90901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 90701 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90301 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | V | V | 0 | 0 | 0 | 0 | 0 | 0 |
| 90501 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 50102 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 90101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 90201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 91001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20202 | 0 | 0 | 0 | 0 | 0 | 1 | V | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90801 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 90601 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90701 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 90301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 90501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 50102 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 90101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 91001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20202 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | V | 0 | 0 |
| 90801 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 90601 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| 90901 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 90701 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 90301 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 90501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 50101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 50102 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 90101 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 90201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V | 0 | 0 |
| 91001 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20202 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | V | 0 | V | 1 | 0 | 1 | 0 | 0 | 0 |
| 90801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 90601 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 90901 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 90701 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 90301 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 90501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 50101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | V | 0 | V | V | 0 | 0 | 0 | 1 | 0 |
| 50102 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 90101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 90201 | 0 | V | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 91001 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20202 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | V | 0 | 0 | 0 | 0 | 1 |
| 90801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | V | 0 | 0 |
| 90301 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 90501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 50102 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 90101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 90201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 91001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20202 | 0 | 0 | 0 | 1 | 0 | 1 | V | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 90801 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 90601 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 90901 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 90701 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 90301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 90501 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 50101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 50102 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 90101 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 90201 | 0 | V | V | 0 | 1 | 1 | 0 | 0 | 0 | V | 0 | 0 | V | V | 1 | 0 |
| 91001 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 20202 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90301 | 0 | 1 | 0 | 0 | 0 | 0 |
| 90501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 50102 | 0 | 0 | 0 | 0 | 0 | 0 |
| 90101 | 0 | 1 | 0 | 0 | 0 | 0 |
| 90201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 91001 | 0 | 0 | 0 | 0 | 0 | 0 |

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| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10101 | 0 | 0 | 1 | V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V | 1 | 1 | 0 | 1 |
| 10102 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V | 0 | 0 | 1 |
| 10201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 10204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | V | 0 | 1 |
| 10301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| 10601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 20401 | 0 | 0 | V | V | 0 | 0 | 0 | 0 | V | 0 | V | 0 | V | 0 | 0 | 1 |
| 20601 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | V | 0 | V | 0 | V | 0 | 0 | 0 |
| 21001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 30102 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 20901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 20504 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 10401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 10405 | 0 | 0 | V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | V | 0 | 1 |
| 20301 | 0 | 0 | V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | V |
| 30501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 40501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 40105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 41101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 40901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 40301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 40103 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | V | 0 | 1 |

(Column headings: Character Nos.)

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Character Nos. | | | | | | | | | | | | | | | |
| 20101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 20701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 20801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | V | 0 | 0 |
| 21101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 21201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 30101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 30201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 30301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 30401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 30601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 40201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 40401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 40801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 41601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 40601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 40701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10102 | V | 0 | 0 | V | 0 | 1 | V | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10204 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10301 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10601 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20401 | 1 | 0 | 0 | 1 | 0 | V | V | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20601 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30102 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20504 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10405 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | V | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30501 | V | 0 | 0 | V | 0 | V | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40105 | V | 0 | 0 | V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40103 | V | 0 | 0 | V | 0 | V | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20701 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30301 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41701 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40701 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10101 | Ø | 1 | 1 | Ø | Ø | Ø | 1 | V | 1 | Ø | Ø | Ø | Ø | 1 | Ø | Ø |
| 10102 | Ø | 1 | 1 | Ø | Ø | Ø | 1 | V | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 10201 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | V | V | V |
| 10204 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | V | V | Ø |
| 10301 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø |
| 10601 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø |
| 20401 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | 1 | Ø | 1 | V | Ø |
| 20601 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | V | Ø | Ø |
| 21001 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø |
| 30102 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | V | Ø |
| 20901 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø |
| 20504 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | 1 | Ø |
| 10401 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | 1 | 1 | Ø | Ø | Ø | 1 | 1 | 1 |
| 10405 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | Ø | Ø | 1 | Ø | 1 |
| 20301 | Ø | V | 1 | Ø | Ø | Ø | Ø | Ø | V | Ø | Ø | Ø | Ø | 1 | 1 | 1 |
| 30501 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | V | Ø | Ø | 1 | Ø | Ø |
| 40501 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø | 1 | Ø | Ø |
| 40105 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø |
| 41101 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 41301 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 41501 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø |
| 40901 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø |
| 40301 | Ø | Ø | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø |
| 40103 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | Ø | Ø |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 20701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 20801 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 21101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 30101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 30201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 30301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 30401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 30601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 40201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 40401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 41701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 41801 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 40801 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 41001 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 41201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 41401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 41501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 40601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 40701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10101 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 10102 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | V | 0 |
| 10201 | 0 | V | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | V | 0 |
| 10204 | 0 | V | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 10301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 10601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 20401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | V | 0 | 0 | 0 | V | 0 |
| 20601 | V | V | 0 | 0 | 1 | 0 | 0 | V | 0 | V | V | 0 | 0 | 0 | V | V |
| 21001 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 30102 | V | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V | 0 |
| 20901 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 20504 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | V | 0 | V | 1 | 0 | 0 | 0 | 0 | 0 |
| 10401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 10405 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 20301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | V | 0 | 0 | 0 |
| 30501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 40501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | V | 0 |
| 40105 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 40901 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 40301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | V | 0 | 0 | 0 | 0 | 0 |
| 40103 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 20701 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 20801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 21101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 21201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 30101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 30201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | V | 0 | V | V | 0 | 0 | 0 | 0 | 0 |
| 30301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 30401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 30601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 40201 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 40401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41701 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 40801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41001 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 41601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 40601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 40701 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10101 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10102 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10204 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20601 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30102 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20504 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 10401 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 10405 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 20301 | 0 | 0 | 0 | V | V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V |
| 30501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V | 0 | 0 | 0 | 0 | 1 |
| 40501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40103 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 21201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10101 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø | Ø | 1 | Ø | Ø | Ø | 1 | Ø |
| 10102 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø | Ø | 1 | Ø | Ø | Ø | 1 | Ø |
| 10201 | Ø | Ø | 1 | V | V | 1 | V | Ø | Ø | Ø | 1 | Ø | V | V | 1 | Ø |
| 10204 | Ø | Ø | 1 | V | V | 1 | V | V | Ø | Ø | 1 | Ø | V | V | 1 | Ø |
| 10301 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 10601 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 20401 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | 1 | Ø | 1 | V | 1 | Ø |
| 20601 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | 1 | Ø | V | V | 1 | Ø |
| 21001 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 30102 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 20901 | Ø | Ø | Ø | 1 | Ø | 1 | Ø | Ø | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø |
| 20504 | Ø | Ø | Ø | 1 | Ø | 1 | Ø | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 10401 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | 1 | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 10405 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | 1 | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 20301 | Ø | Ø | V | Ø | 1 | 1 | Ø | 1 | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 30501 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | 1 | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 40501 | Ø | Ø | V | Ø | 1 | 1 | Ø | Ø | Ø | Ø | V | Ø | 1 | 1 | 1 | Ø |
| 40105 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | 1 | V | 1 | V | V | Ø |
| 41101 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | 1 | 1 | 1 | Ø | - | - |
| 41301 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | 1 | 1 | 1 | Ø | - | - |
| 41501 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | 1 | 1 | 1 | Ø | - | - |
| 40901 | Ø | Ø | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | 1 | 1 | 1 | Ø |
| 40301 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 40103 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 20701 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 20801 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 21101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 21201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 30101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 30201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 30301 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 30401 | 0 | 0 | V | 0 | 1 | 1 | 0 | 0 | 0 | 0 | V | 0 | 1 | 1 | 1 | 0 |
| 30601 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 40201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 40401 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 41701 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 41801 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 40801 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 41001 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 41201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 41401 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 41501 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | - | - |
| 41601 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | - | - |
| 40601 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 40701 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 10101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10102 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10204 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20601 | V | 0 | 0 | 0 | 0 | 0 |
| 21001 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30102 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20901 | 0 | 1 | 0 | 0 | 0 | 0 |
| 20504 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10405 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40105 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40103 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 20101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 21201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41701 | 0 | 1 | 0 | 0 | 0 | 0 |
| 41801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41001 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 41601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40701 | 0 | 0 | 0 | 0 | 0 | 0 |

PARADOXORNITHIDAE ETC

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 60201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 60301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 60302 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 60401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 60501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 60601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 70101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 70201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 70301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 80101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 80201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60302 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70301 | 1 | 0 | 0 | 1 | 0 | 0 | V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80101 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 60201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | V | V |
| 60302 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60401 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 60501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 60601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 70101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 70201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | V | 0 |
| 70301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 60201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60301 | V | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 60302 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 60401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 60501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 60601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 70101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 70201 | V | V | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | V | 0 | 0 | 0 | 0 | 0 |
| 70301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | V | 0 | V | 0 | 0 | 0 | 0 | 0 | 0 |
| 70401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 80101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 80201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60201 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 60301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60302 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60401 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | V | V | V | 0 | 0 | 0 | 0 | 0 |
| 60501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 70301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80201 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60101 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | V | Ø | 1 | 1 | V | Ø |
| 60201 | Ø | Ø | Ø | Ø | 1 | 1 | Ø | 1 | Ø | Ø | Ø | 1 | - | - | - | - |
| 60301 | Ø | Ø | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | V | V | 1 | Ø |
| 60302 | Ø | Ø | V | Ø | 1 | 1 | Ø | Ø | Ø | Ø | V | Ø | Ø | Ø | 1 | Ø |
| 60401 | Ø | Ø | Ø | V | V | 1 | Ø | Ø | Ø | Ø | Ø | Ø | 1 | 1 | V | Ø |
| 60501 | Ø | Ø | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | 1 | 1 | 1 | Ø |
| 60601 | Ø | Ø | Ø | Ø | 1 | 1 | Ø | Ø | Ø | Ø | Ø | Ø | 1 | 1 | 1 | Ø |
| 70101 | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |
| 70201 | Ø | Ø | V | Ø | 1 | 1 | Ø | 1 | Ø | Ø | V | Ø | V | V | 1 | Ø |
| 70301 | Ø | Ø | Ø | 1 | Ø | 1 | V | Ø | Ø | Ø | V | Ø | Ø | Ø | 1 | Ø |
| 70401 | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | Ø | 1 | 1 | Ø |
| 80101 | Ø | Ø | Ø | 1 | Ø | 1 | 1 | Ø | Ø | Ø | 1 | Ø | Ø | Ø | 1 | Ø |
| 80201 | Ø | Ø | Ø | 1 | Ø | 1 | Ø | Ø | Ø | Ø | 1 | Ø | 1 | 1 | 1 | Ø |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 60101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60302 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 60601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 70401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 80201 | 0 | 0 | 0 | 0 | 0 | 0 |

SYLVIIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 111401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 111501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 111901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 111301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 111601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 110801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 110301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 110701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 111801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 110601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 110101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 110201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 111001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 110901 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 110501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 110401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 112001 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 111401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110701 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 112001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111201 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 111401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 111901 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 111301 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110801 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111801 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 110601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 110101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 111001 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110901 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 110401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 112001 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 111401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 111501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 111901 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 111601 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110801 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110701 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 111801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110201 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 111001 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110901 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 110401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 112001 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 111401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 111301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111001 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 110901 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 110501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 112001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 111401 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 111501 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 111901 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 111301 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 |
| 111601 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 110801 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| 110301 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 110701 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 111801 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 110601 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 110101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 110201 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 111001 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 110901 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 110501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 112001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 111201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 111401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111001 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 110401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 112001 | 0 | 0 | 0 | 0 | 0 | 0 |
| 111201 | 0 | 0 | 0 | 0 | 0 | 0 |

MUSCICAPIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 121401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 120701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 120101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 120801 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 121201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 120201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

Character Nos.

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120701 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 121401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 120701 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 120101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 120801 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 121401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 120701 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 120101 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 120801 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 121201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 120201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 121401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 120701 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 120101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 120801 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 121201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 120201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 121301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120701 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120101 | 0 | 1 | 0 | 0 | 0 | 0 |
| 120801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120201 | 0 | 0 | 0 | 0 | 0 | 0 |

PARIDAE ETC

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 260101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| 270101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 280101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 260201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 270201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Character Nos.

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 260101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 270101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 280101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 260201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 270201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Taxon Nos. | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 260101 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| 270101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 280101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 260201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 270201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 260101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 270101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 280101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 260201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 270201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 260101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 270101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 280101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 260201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 270201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 260101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 270101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 280101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 260201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 270201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 260101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 270101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 280101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 260201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 270201 | 0 | 0 | 0 | 0 | 0 | 0 |

SCANSORIALS

| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 380201 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 390101 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 380101 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 390201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 410101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 390301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 420101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 380201 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 390101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 380101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 390201 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 410101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 390301 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 420101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 380201 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 390101 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 380101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 390201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 410101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 390301 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 420101 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 380201 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 390101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 380101 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 390201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 410101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 390301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 420101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 380201 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 390101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 380101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 390201 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 410101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 390301 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 420101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 380201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 390101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 380101 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 390201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 410101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 390301 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 420101 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |

|  | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 380201 | 0 | 1 | 1 | 0 | 0 | 0 |
| 390101 | 0 | 1 | 0 | 0 | 0 | 0 |
| 380101 | 1 | 1 | 0 | 0 | 0 | 0 |
| 390201 | 0 | 1 | 0 | 0 | 0 | 0 |
| 410101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 390301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 420101 | 0 | 1 | 0 | 0 | 0 | 0 |

NECTARIVORES

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400401 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 400501 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 400301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 400101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 400201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 440101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 450101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 290101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 290201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 400501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 440101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 450101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 290101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 290201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400401 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 |
| 400501 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| 400301 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 400101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 400201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 440101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 450101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 290101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 290201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 400501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 400301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 440101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 450101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 290101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 290201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400401 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 400501 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 400301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 440101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 450101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 290101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 290201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400401 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 400501 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 400301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 400101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 400201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 440101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 450101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 290101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 290201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 400401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 400201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 440101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 450101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 290101 | 0 | 1 | 0 | 0 | 0 | 0 |
| 290201 | 0 | 0 | 0 | 0 | 0 | 0 |

MALURIDAE

| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 170101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 170201 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 170301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 170401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 170501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 170601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 170701 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 170801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 170901 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 171001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 171101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 171301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 171401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 170101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170201 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170401 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170701 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 170801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171101 | V | 0 | V | V | 0 | V | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171401 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 170101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 170201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 170301 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 170401 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 170501 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 170601 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170701 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| 170801 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 170901 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 171001 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 171101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | V | 0 | 0 |
| 171201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 171301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 171401 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 170101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 170201 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 170301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 170501 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 170601 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 170701 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 170801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 170901 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 171001 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171101 | 0 | V | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 171301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 171401 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 170101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 170201 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 170301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170401 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 170501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 170601 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 170701 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171401 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 170101 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 170201 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 170301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 170401 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 170501 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 170601 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 170701 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 170801 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 170901 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 171001 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 171101 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 171201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 171301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 171401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 170101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170401 | 0 | 1 | 1 | 0 | 0 | 0 |
| 170501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170701 | 0 | 1 | 0 | 0 | 0 | 0 |
| 170801 | 0 | 0 | 0 | 0 | 0 | 0 |
| 170901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171001 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 171401 | 0 | 0 | 0 | 0 | 0 | 0 |

MONARCHIDAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 141201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 130101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 130401 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 140601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 140901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 140501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 140401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 140301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 140201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 140101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 141001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 130301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 141101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140801 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 140401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141001 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130301 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140801 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 141201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 130101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 130401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 |
| 130201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 140601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 121001 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 140701 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 140901 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140501 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 140401 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 140101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 141001 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140801 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 130101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 130401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 140601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121001 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 140701 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 140901 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 140501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 140401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 140301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 140101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141001 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 130301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 141101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140801 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130101 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 130401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130201 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 140601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121001 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140701 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 140201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 140101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141001 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 141101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 140801 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 141201 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 130101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 130401 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 130201 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 140601 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 121001 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 140701 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |
| 140901 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 140501 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 140401 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 140301 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 140201 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| 140101 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 |
| 141001 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 130301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 141101 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |

|  | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 140801 | Ø | Ø | Ø | Ø | Ø | Ø |
| 141201 | Ø | Ø | Ø | Ø | Ø | Ø |
| 130101 | Ø | Ø | Ø | Ø | Ø | Ø |
| 130401 | Ø | Ø | Ø | Ø | Ø | Ø |
| 130201 | Ø | Ø | Ø | Ø | Ø | Ø |
| 140601 | Ø | Ø | Ø | Ø | Ø | Ø |
| 121001 | Ø | Ø | Ø | Ø | Ø | Ø |
| 140701 | Ø | Ø | Ø | Ø | Ø | Ø |
| 140901 | Ø | Ø | Ø | Ø | Ø | Ø |
| 140501 | Ø | Ø | Ø | Ø | Ø | Ø |
| 140401 | Ø | Ø | Ø | Ø | Ø | Ø |
| 140301 | Ø | Ø | Ø | Ø | Ø | Ø |
| 140201 | Ø | Ø | Ø | Ø | Ø | Ø |
| 140101 | Ø | Ø | Ø | Ø | Ø | Ø |
| 141001 | Ø | Ø | Ø | Ø | Ø | Ø |
| 130301 | Ø | Ø | Ø | Ø | Ø | Ø |
| 141101 | Ø | Ø | Ø | Ø | Ø | Ø |

EOPSALTRIIDAE

| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 3 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 120901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 121101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 120601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 120401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 120301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120501 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120901 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120401 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120301 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120501 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120901 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 121101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 120601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | V | 0 |
| 120401 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 120301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 120901 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 121101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 120601 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 120401 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 120301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 120901 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 121101 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 120601 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | V | 0 | 1 | 1 | 1 | 0 |
| 120401 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 120301 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 120501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120901 | 0 | 0 | 0 | 0 | 0 | 0 |
| 121101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 120301 | 0 | 0 | 0 | 0 | 0 | 0 |

PACHYCEPHALINAE & RHIPIDURINAE

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 160201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 160301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 160401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160501 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 150101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 160501 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| Taxon Nos. | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 160301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 160401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 160501 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 150101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 160201 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160401 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160501 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 160301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 160101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 160201 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 160301 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 160401 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 160501 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 150101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 160101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 160501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 150101 | 0 | 0 | 0 | 0 | 0 | 0 |

NINE-PRIMARIED OSCINES

| Taxon Nos. | Character Nos. 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 370501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 370201 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 370401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 370301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 370601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 490101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 490201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| 470101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 470201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 500101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 500201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 460201 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 460401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 460301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 480101 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 480201 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 370501 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370201 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370601 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 490101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 490201 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 470101 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 470201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 500101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 500201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | e | 0 | 0 | 0 | 0 |
| 480101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 480201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 370501 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 370201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 370101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 370401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 370301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370601 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 490101 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 490201 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 470101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 470201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 500101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 500201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 |
| 460401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 460301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 480101 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| 480201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 370501 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 370201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 370101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 370401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 370601 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 490101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 490201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| 470101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 470201 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 500101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 500201 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 460201 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 460401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 480101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 480201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 370501 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370601 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 490101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 490201 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 |
| 470101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 470201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 500101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 500201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 460201 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 460401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 480101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 480201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 370501 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 370201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 370101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 370401 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 370301 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 370601 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 490101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 490201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 470101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 470201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 500101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 500201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 460201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 460401 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 460101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 |
| 460301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 480101 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 480201 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 370501 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 370601 | 0 | 0 | 0 | 0 | 0 | 0 |
| 490101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 490201 | 0 | 1 | 0 | 0 | 0 | 0 |
| 470101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 470201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 500101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 500201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 460301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 480101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 480201 | 0 | 0 | 0 | 0 | 0 | 0 |

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| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 510201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 510301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 510101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 510401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 520101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 521101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 523101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| 522101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| Taxon Nos. | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 510201 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510401 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 520101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 521101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 523101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 522101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 510201 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 510101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| 510401 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 520101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 521101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 523101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 522101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 510201 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 510301 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510401 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 520101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 521101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 523101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 522101 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 510201 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510401 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 520101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 521101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 523101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 522101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 510201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 510301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 510101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 510401 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 520101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 521101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 |
| 523101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 522101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 510201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 510401 | 0 | 0 | 0 | 0 | 0 | 0 |
| 520101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 521101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 523101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 522101 | 0 | 0 | 0 | 0 | 0 | 0 |

CORVIDAE ETC

| Taxon Nos. | 1.1 | 1.2 | 2 | 3 | 4 | 5 | 6.1 | 6.2 | 7.1 | 7.2 | 7.3 | 7.4 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 620201 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 620301 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 620101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 570201 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| 570301 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| 570101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 590201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 590301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| 590101 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 560101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 580101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 600101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 610101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| 550101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 540101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |

| | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 13 | 14.1 | 14.2 | 15 | 16 | 17.1 | 17.2 | 18.1 | 18.2 | 18.3 | 18.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 620201 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 620301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 620101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 570201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 570301 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 570101 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 590201 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 590301 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 590101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| 560101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 580101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 600101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 610101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 550101 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 540101 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 19 | 20 | 21.1 | 21.2 | 21.3 | 21.4 | 22 | 23 | 24 | 25 | 26 | 27 | 28.1 | 28.2 | 28.3 | 28.4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 620201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 620301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 620101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 570201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 570301 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 570101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 590201 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 |
| 590301 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 590101 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 560101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 580101 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 600101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 610101 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 |
| 550101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 540101 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 28.5 | 28.6 | 65 | 66 | 67 | 29.1 | 29.2 | 30.1 | 30.2 | 30.3 | 31 | 32 | 33 | 34.1 | 34.2 | 34.3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 620201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 620301 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 620101 | 0 | 1 | 0 | 0 | V | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 570201 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 570301 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| 570101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 590201 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 590301 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 590101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 560101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 580101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| 600101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 610101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| 550101 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 540101 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |

| | 35 | 36.1 | 36.2 | 37 | 38 | 39 | 40 | 41.1 | 41.2 | 41.3 | 42 | 43 | 44 | 45.1 | 45.2 | 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 620201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 620301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 620101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 570201 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 570301 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 570101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 590201 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 |
| 590301 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| 590101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| 560101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 580101 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| 600101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 610101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 550101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 540101 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | 47 | 48 | 49 | 50.1 | 50.2 | 50.3 | 50.4 | 51 | 52 | 53 | 54 | 55 | 61 | 62 | 63 | 64 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 620201 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 620301 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 620101 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 570201 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 570301 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 570101 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 590201 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 590301 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 |
| 590101 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 560101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | - | - | - | - |
| 580101 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 600101 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 610101 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 |
| 550101 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 |
| 540101 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |

| | 56 | 57.1 | 57.2 | 58 | 59 | 60 |
|---|---|---|---|---|---|---|
| 620201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 620301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 620101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 570201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 570301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 570101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 590201 | 0 | 0 | 0 | 0 | 0 | 0 |
| 590301 | 0 | 0 | 0 | 0 | 0 | 0 |
| 590101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 560101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 580101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 600101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 610101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 550101 | 0 | 0 | 0 | 0 | 0 | 0 |
| 540101 | 0 | 0 | 0 | 0 | 0 | 0 |

# APPENDIX C

LeQuesne test results from complete sets of data before removal of any characters.

DENDROCOLAPTIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1.1 : | 9 | 22.17 | 0.41 | - 0 | 1.2 : | 9 | 22.17 | 0.41 | - 0 |
| 2 : | 25 | 38.65 | 0.65 | - 2 | 3 : | 41 | 41.35 | 0.99 | - 3 |
| 4 : | 40 | 41.35 | 0.97 | - 2 | 5 : | 0 | - | - | - 27 |
| 7.1 : | 0 | - | - | - 0 | 7.2 : | 0 | - | - | - 0 |
| 7.3 : | 0 | - | - | - 0 | 7.4 : | 19 | 22.23 | 0.85 | - 0 |
| 9 : | 0 | - | - | - 17 | 10 : | 0 | - | - | - 0 |
| 11 : | 17 | 18.04 | 0.94 | - 1 | 12.3 : | 17 | 17.51 | 0.97 | - 1 |
| 12.4 : | 38 | 40.38 | 0.94 | - 4 | 14.1 : | 34 | 38.65 | 0.88 | - 1 |
| 16 : | 26 | 33.1 | 0.79 | - 0 | 17.2 : | 17 | 30.93 | 0.55 | - 16 |
| 18.4 : | 10 | 22.48 | 0.44 | - 1 | 20 : | 26 | 33.1 | 0.79 | - 13 |
| 21.1 : | 12 | 21.54 | 0.56 | - 0 | 21.2 : | 17 | 29.73 | 0.57 | - 1 |
| 21.3 : | 34 | 39.58 | 0.86 | - 3 | 26 : | 26 | 30.93 | 0.84 | - 7 |
| 27 : | 25 | 38.65 | 0.65 | - 2 | 28.2 : | 28 | 36.06 | 0.78 | - 3 |
| 28.3 : | 23 | 34.01 | 0.68 | - 2 | 28.6 : | 23 | 34.01 | 0.68 | - 2 |
| 65 : | 23 | 35.89 | 0.64 | - 4 | 66 : | 27 | 35.89 | 0.75 | - 4 |
| 67 : | 28 | 37.94 | 0.74 | - 7 | 29.1 : | 29 | 37.66 | 0.77 | - 9 |
| 29.2 : | 40 | 41.13 | 0.97 | - 4 | 31 : | 21 | 18.04 | 1.16 | - 17 |
| 34.2 : | 17 | 30.21 | 0.56 | - 1 | 34.3 : | 31 | 37.88 | 0.82 | - 1 |
| 36.1 : | 32 | 37.74 | 0.85 | - 7 | 36.2 : | 38 | 40.01 | 0.95 | - 2 |
| 38 : | 38 | 41.35 | 0.92 | - 6 | 41.2 : | 38 | 42.06 | 0.9 | - 4 |
| 45.1 : | 25 | 22.05 | 1.13 | - 14 | 45.2 : | 34 | 40.8 | 0.83 | - 2 |
| 47 : | 43 | 42.06 | 1.02 | - 2 | 48 : | 30 | 33.1 | 0.91 | - 0 |
| 49 : | 38 | 38.6 | 0.98 | - 0 | 50.2 : | 31 | 36.87 | 0.84 | - 7 |
| 50.3 : | 37 | 30.21 | 1.22 | - 4 | 51 : | 33 | 37.55 | 0.88 | - 7 |
| 52 : | 35 | 33.18 | 1.06 | - 9 | 53 : | 22 | 33.1 | 0.66 | - 1 |
| 54 : | 33 | 30.93 | 1.07 | - 5 | 61 : | 20 | 30.95 | 0.65 | - 16 |
| 62 : | 22 | 21.25 | 1.04 | - 12 | 63 : | 0 | - | - | - 22 |
| 64 : | 25 | 37.94 | 0.66 | - 7 | 56 : | 34 | 40.93 | 0.83 | - 5 |
| 57.1 : | 32 | 30.28 | 1.06 | - 10 | 57.2 : | 34 | 36.87 | 0.92 | - 7 |

Grand total - 703 849.56 0.83

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5 | 9 | 63 | 7.1 | 7.2 | 7.3 | 10 | 1.1 |
| 1.2 | 18.4 | 17.2 | 21.1 | 34.2 | 21.2 | 65 | 61 |
| 2 | 27 | 64 | 53 | 28.3 | 28.6 | 67 | 66 |
| 29.1 | 28.2 | 16 | 20 | 34.3 | 56 | 45.2 | 26 |
| 50.2 | 36.1 | 7.4 | 21.3 | 51 | 14.1 | 41.2 | 48 |
| 38 | 57.2 | 12.4 | 11 | 36.2 | 4 | 12.3 | 29.2 |
| 49 | 3 | 47 | 62 | 52 | 57.1 | 54 | 45.1 |
| 31 | 50.3 | | | | | | |

FURNARIIDAE

Incompatibilities: observed expected ratio - polar

| | observed | expected | ratio | polar | | observed | expected | ratio | polar |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 46 | 41.83 | 1.1 | 1 | 3 | 39 | 43.93 | 0.89 | 3 |
| 4 | 21 | 19.02 | 1.1 | 0 | 5 | 39 | 40.08 | 0.97 | 2 |
| 7.4 | 30 | 28.26 | 1.06 | 0 | 8 | 37 | 39.74 | 0.93 | 3 |
| 9 | 38 | 39.97 | 0.95 | 1 | 11 | 27 | 37.42 | 0.72 | 5 |
| 12.1 | 7 | 17.36 | 0.4 | 0 | 12.3 | 27 | 27.52 | 0.98 | 1 |
| 12.4 | 31 | 33.01 | 0.94 | 1 | 13 | 27 | 39.74 | 0.68 | 4 |
| 14.1 | 30 | 39.34 | 0.76 | 5 | 14.2 | 29 | 27.62 | 1.05 | 1 |
| 15 | 41 | 44.46 | 0.92 | 1 | 18.4 | 32 | 28.26 | 1.13 | 1 |
| 20 | 18 | 36.64 | 0.49 | 6 | 21.1 | 37 | 41.78 | 0.89 | 7 |
| 21.2 | 12 | 18.1 | 0.66 | 0 | 21.3 | 34 | 38.59 | 0.88 | 1 |
| 22 | 37 | 41.96 | 0.88 | 2 | 24 | 34 | 37.17 | 0.91 | 4 |
| 25 | 17 | 19.02 | 0.89 | 0 | 26 | 11 | 19.02 | 0.58 | 0 |
| 27 | 13 | 19.02 | 0.68 | 0 | 28.2 | 45 | 41.77 | 1.08 | 1 |
| 28.3 | 31 | 37.58 | 0.82 | 1 | 28.4 | 26 | 25.81 | 1.01 | 1 |
| 28.6 | 27 | 31.41 | 0.86 | 0 | 65 | 21 | 19.02 | 1.1 | 0 |
| 67 | 41 | 44.46 | 0.92 | 2 | 31 | 40 | 39.74 | 1.01 | 3 |
| 32 | 23 | 17.94 | 1.28 | 0 | 33 | 28 | 43.93 | 0.64 | 2 |
| 34.2 | 45 | 41.96 | 1.07 | 1 | 35 | 37 | 37.52 | 0.99 | 1 |
| 36.1 | 20 | 19.02 | 1.05 | 0 | 37 | 22 | 39.74 | 0.55 | 6 |
| 38 | 22 | 39.74 | 0.55 | 6 | 42 | 34 | 42.87 | 0.79 | 4 |
| 45.1 | 26 | 33.57 | 0.77 | 0 | 46 | 25 | 39.2 | 0.64 | 6 |
| 47 | 21 | 17.94 | 1.17 | 0 | 48 | 21 | 28.26 | 0.74 | 0 |
| 49 | 24 | 27.72 | 0.87 | 0 | 50.1 | 22 | 27.3 | 0.81 | 10 |
| 50.3 | 12 | 18.3 | 0.66 | 17 | 50.4 | 38 | 40.79 | 0.93 | 1 |
| 51 | 38 | 40.08 | 0.95 | 1 | 54 | 0 | - | - | 33 |
| 55 | 41 | 42.07 | 0.97 | 0 | 61 | 37 | 37.85 | 0.98 | 5 |
| 62 | 30 | 37.85 | 0.79 | 5 | 63 | 0 | - | - | 0 |
| 57.1 | 39 | 39.98 | 0.98 | 1 | | | | | |

Grand total - 775 886.14 0.87

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 54 | 63 | 12.1 | 20 | 37 | 38 | 26 | 33 |
| 46 | 50.3 | 21.2 | 13 | 27 | 11 | 48 | 14.1 |
| 45.1 | 62 | 42 | 50.1 | 28.3 | 28.6 | 49 | 21.3 |
| 22 | 21.1 | 3 | 25 | 24 | 15 | 67 | 8 |
| 50.4 | 12.4 | 51 | 9 | 5 | 55 | 57.1 | 61 |
| 12.3 | 35 | 31 | 28.4 | 14.2 | 36.1 | 7.4 | 34.2 |
| 28.2 | 2 | 4 | 65 | 18.4 | 47 | 32 | |

FORMICARIIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | : 14 | 19.82 | 0.71 | - 2 | 3 | : 17 | 22.17 | 0.77 | - 3 |
| 7.4 | : 13 | 14.02 | 0.93 | - 2 | 8 | : 0 | - | - | - 23 |
| 11 | : 6 | 22.17 | 0.27 | - 4 | 12.1 | : 6 | 21.34 | 0.28 | - 0 |
| 12.3 | : 11 | 18.77 | 0.59 | - 1 | 12.4 | : 0 | - | - | - 16 |
| 13 | : 11 | 22.1 | 0.5 | - 2 | 14.1 | : 11 | 21.27 | 0.52 | - 2 |
| 14.2 | : 11 | 18.77 | 0.59 | - 1 | 15 | : 15 | 19.61 | 0.77 | - 2 |
| 19 | : 13 | 14.02 | 0.93 | - 2 | 20 | : 11 | 22.1 | 0.5 | - 2 |
| 21.1 | : 18 | 21.55 | 0.84 | - 1 | 21.3 | : 12 | 13.47 | 0.89 | - 1 |
| 22 | : 11 | 22.1 | 0.5 | - 2 | 24 | : 11 | 22.1 | 0.5 | - 2 |
| 25 | : 11 | 22.1 | 0.5 | - 2 | 28.2 | : 17 | 14.02 | 1.21 | - 0 |
| 31 | : 12 | 14.02 | 0.86 | - 4 | 33 | : 9 | 14.02 | 0.64 | - 1 |
| 34.3 | : 21 | 14.02 | 1.5 | - 1 | 37 | : 9 | 14.02 | 0.64 | - 1 |
| 38 | : 9 | 14.02 | 0.64 | - 1 | 46 | : 18 | 14.02 | 1.28 | - 1 |
| 49 | : 17 | 19.82 | 0.86 | - 2 | 50.1 | : 16 | 20.32 | 0.79 | - 1 |
| 50.3 | : 17 | 20.39 | 0.83 | - 1 | 50.4 | : 11 | 17.94 | 0.61 | - 1 |
| 61 | : 17 | 14.07 | 1.21 | - 0 | 62 | : 17 | 14.07 | 1.21 | - 0 |

Grand total - 196 271.15 0.72

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 | 12.4 | 11 | 12.1 | 13 | 20 | 22 | 24 |
| 25 | 14.1 | 12.3 | 14.2 | 50.4 | 33 | 37 | 38 |
| 2 | 15 | 3 | 50.1 | 50.3 | 21.1 | 31 | 49 |
| 21.3 | 7.4 | 19 | 61 | 62 | 28.2 | 46 | 34.3 |

COTINGIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.1 | : 1 | 4.29 | 0.23 - 4 | 12.4 | : 1 | 4.29 | 0.23 - 4 |
| 28.2 | : 3 | 5.43 | 0.55 - 1 | 28.6 | : 3 | 5.43 | 0.55 - 1 |
| 31 | : 2 | 4.76 | 0.42 - 4 | 49 | : 1 | 4.76 | 0.21 - 0 |
| 50.2 | : 0 | - | - - 5 | 50.3 | : 8 | 4.76 | 1.68 - 1 |
| 54 | : 5 | 6.29 | 0.8 - 2 | 61 | : 2 | 6.29 | 0.32 - 2 |
| 62 | : 2 | 6.29 | 0.32 - 2 | | | | |

Grand total - 14 26.29 0.53

Ranking ratios

50.2 49 12.1 12.4 62 61 31 28.2
28.6 54 50.3

PIPRIDAE & PHYTOTOMIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.1 | : 5 | 4.4 | 1.14 - 4 | 12.4 | : 5 | 4.4 | 1.14 - 4 |
| 67 | : 0 | - | - - 9 | 40 | : 7 | 5.7 | 1.23 - 0 |
| 43 | : 5 | 4.93 | 1.01 - 1 | 44 | : 2 | 4.93 | 0.41 - 0 |
| 48 | : 4 | 5.7 | 0.7 - 1 | 49 | : 4 | 4.93 | 0.81 - 3 |
| 50.3 | : 7 | 4.93 | 1.42 - 2 | 53 | : 5 | 4.93 | 1.01 - 1 |
| 54 | : 4 | 4.93 | 0.81 - 3 | 63 | : 0 | - | - - 4 |

Grand total - 24 24.9 0.96

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 67 | 63 | 44 | 48 | 49 | 54 | 43 | 53 |
| 12.1 | 12.4 | 40 | 50.3 | | | | |

TYRANNIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 : | 21 | 23.13 | 0.91 - 1 | | 3 : | 27 | 23.76 | 1.14 - 1 |
| 7.4 : | 13 | 10.03 | 1.3 - 0 | | 8 : | 19 | 22.3 | 0.85 - 2 |
| 10 : | 15 | 10.03 | 1.5 - 0 | | 12.1 : | 23 | 22.77 | 1.01 - 2 |
| 12.4 : | 23 | 22.77 | 1.01 - 2 | | 13 : | 13 | 14.86 | 0.88 - 0 |
| 15 : | 15 | 14.86 | 1.01 - 0 | | 20 : | 10 | 10.03 | 1 - 0 |
| 21.1 : | 12 | 10.03 | 1.2 - 6 | | 24 : | 10 | 10.03 | 1 - 0 |
| 26 : | 12 | 14.26 | 0.84 - 0 | | 28.2 : | 25 | 21.52 | 1.16 - 2 |
| 28.3 : | 11 | 19.27 | 0.57 - 1 | | 28.6 : | 22 | 22.54 | 0.98 - 1 |
| 67 : | 0 | - | - - 9 | | 31 : | 22 | 24.61 | 0.89 - 2 |
| 44 : | 13 | 17.4 | 0.75 - 0 | | 48 : | 12 | 14.26 | 0.84 - 0 |
| 49 : | 12 | 14.26 | 0.84 - 0 | | 50.1 : | 22 | 20.82 | 1.06 - 0 |
| 50.2 : | 21 | 21.4 | 0.98 - 1 | | 50.3 : | 5 | 8.63 | 0.58 - 7 |
| 50.4 : | 20 | 18.92 | 1.06 - 0 | | 53 : | 10 | 14.86 | 0.67 - 0 |
| 54 : | 16 | 24.48 | 0.65 - 1 | | 55 : | 6 | 15.55 | 0.39 - 0 |
| 61 : | 20 | 20.25 | 0.99 - 1 | | 62 : | 21 | 21.22 | 0.99 - 1 |
| 63 : | 4 | 9.7 | 0.41 - 6 | | 64 : | 3 | 9.7 | 0.31 - 0 |

Grand total - 239 264.12 0.9

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 67 | 64 | 55 | 63 | 28.3 | 50.3 | 54 | 53 |
| 44 | 48 | 49 | 26 | 8 | 13 | 31 | 2 |
| 28.6 | 50.2 | 61 | 62 | 20 | 24 | 15 | 12.1 |
| 12.4 | 50.1 | 50.4 | 3 | 28.2 | 21.1 | 7.4 | 10 |

OLD-WORLD SUBOSCINES

Incompatibilities: observed expected ratio - polar

| | | observed | expected | ratio | polar | | | observed | expected | ratio | polar |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | : | 9 | 10.96 | 0.82 | - 3 | 8 | : | 16 | 16.74 | 0.96 | - 1 |
| 12.1 | : | 0 | - | - | - 11 | 12.4 | : | 0 | - | - | - 11 |
| 20 | : | 10 | 10.96 | 0.91 | - 4 | 21.1 | : | 0 | - | - | - 14 |
| 21.3 | : | 10 | 10.96 | 0.91 | - 3 | 26 | : | 12 | 15.64 | 0.77 | - 4 |
| 28.2 | : | 14 | 14.3 | 0.98 | - 1 | 28.3 | : | 11 | 9.89 | 1.11 | - 0 |
| 28.6 | : | 14 | 14.3 | 0.98 | - 1 | 67 | : | 17 | 16.74 | 1.02 | - 2 |
| 31 | : | 12 | 15.64 | 0.77 | - 4 | 34.2 | : | 16 | 10.96 | 1.46 | - 3 |
| 40 | : | 17 | 16.74 | 1.02 | - 1 | 43 | : | 15 | 15.07 | 1 | - 1 |
| 44 | : | 16 | 16.74 | 0.96 | - 5 | 47 | : | 16 | 16.74 | 0.96 | - 2 |
| 48 | : | 1 | 10.96 | 9E-2 | - 12 | 49 | : | 0 | - | - | - 9 |
| 50.2 | : | 12 | 14.84 | 0.81 | - 3 | 50.3 | : | 16 | 14.84 | 1.08 | - 4 |
| 52 | : | 13 | 15.07 | 0.86 | - 1 | 53 | : | 13 | 15.07 | 0.86 | - 1 |
| 54 | : | 0 | - | - | - 11 | 61 | : | 14 | 15.43 | 0.91 | - 1 |
| 62 | : | 10 | 15.43 | 0.65 | - 1 | 63 | : | 0 | - | - | - 0 |

Grand total - 142 157.04 0.9

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.1 | 12.4 | 21.1 | 49 | 54 | 63 | 48 | 62 |
| 26 | 31 | 50.2 | 3 | 52 | 53 | 61 | 20 |
| 21.3 | 8 | 47 | 44 | 28.2 | 28.6 | 43 | 67 |
| 40 | 50.3 | 28.3 | 34.2 | | | | |

**MENURAE & ACANTHISITTIDAE**

Incompatibilities: observed expected ratio - polar

| | | | | |
|---|---|---|---|---|
| 2 | : 5 | 10.47 | 0.48 | - 3 |
| 9 | : 7 | 11.1 | 0.63 | - 1 |
| 12.1 | : 5 | 9.87 | 0.51 | - 3 |
| 13 | : 5 | 10.47 | 0.48 | - 1 |
| 21.1 | : 0 | - | - | - 10 |
| 25 | : 5 | 10.47 | 0.48 | - 1 |
| 28.5 | : 1 | 7.93 | 0.13 | - 1 |
| 67 | : 0 | - | - | - 0 |
| 36.1 | : 11 | 7.8 | 1.41 | - 1 |
| 51 | : 11 | 7.8 | 1.41 | - 2 |
| 61 | : 1 | 8.6 | 0.12 | - 1 |
| 57.1 | : 11 | 7.8 | 1.41 | - 1 |
| 8 | : 11 | 7.8 | 1.41 | - 2 |
| 11 | : 5 | 10.47 | 0.48 | - 1 |
| 12.4 | : 5 | 9.87 | 0.51 | - 3 |
| 20 | : 5 | 10.47 | 0.48 | - 1 |
| 24 | : 5 | 10.47 | 0.48 | - 1 |
| 28.2 | : 0 | - | - | - 0 |
| 28.6 | : 1 | 7.93 | 0.13 | - 1 |
| 31 | : 2 | 10.77 | 0.19 | - 5 |
| 50.1 | : 0 | - | - | - 13 |
| 54 | : 13 | 8.6 | 1.51 | - 1 |
| 63 | : 1 | 0.6 | 1.67 | - 5 |

Grand total - 55 84.63 0.65

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21.1 | 50.1 | 28.2 | 67 | 61 | 28.5 | 28.6 | 31 |
| 2 | 11 | 13 | 20 | 24 | 25 | 12.1 | 12.4 |
| 9 | 8 | 36.1 | 51 | 57.1 | 54 | 63 | |

ALAUDIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 24 | 25.2 | 0.95 | 2 | 4 | 25 | 25.2 | 0.99 | 3 |
| 7.4 | 20 | 19.27 | 1.04 | 6 | 8 | 25 | 25.2 | 0.99 | 3 |
| 9 | 25 | 25.2 | 0.99 | 3 | 11 | 24 | 19.27 | 1.25 | 2 |
| 12.1 | 21 | 24.3 | 0.86 | 6 | 12.4 | 0 | - | - | 22 |
| 12.5 | 21 | 24.3 | 0.86 | 6 | 14.1 | 18 | 19.27 | 0.93 | 1 |
| 15 | 21 | 25.2 | 0.83 | 1 | 16 | 27 | 25.2 | 1.07 | 4 |
| 18.4 | 20 | 19.27 | 1.04 | 6 | 20 | 16 | 19.27 | 0.83 | 5 |
| 21.2 | 24 | 25.2 | 0.95 | 2 | 24 | 27 | 25.2 | 1.07 | 2 |
| 28.2 | 0 | - | - | 19 | 28.3 | 21 | 18.13 | 1.16 | 1 |
| 28.4 | 29 | 24 | 1.21 | 1 | 28.6 | 18 | 18.13 | 0.99 | 1 |
| 31 | 10 | 19.27 | 0.52 | 1 | 33 | 25 | 25.2 | 0.99 | 2 |
| 34.2 | 11 | 18.73 | 0.59 | 1 | 34.3 | 16 | 18.73 | 0.85 | 1 |
| 35 | 0 | - | - | 17 | 36.1 | 11 | 19.27 | 0.57 | 1 |
| 37 | 16 | 19.27 | 0.83 | 5 | 38 | 16 | 19.27 | 0.83 | 5 |
| 41.2 | 16 | 18.73 | 0.85 | 5 | 41.3 | 16 | 18.73 | 0.85 | 1 |
| 45.1 | 21 | 25.2 | 0.83 | 1 | 46 | 22 | 25.2 | 0.87 | 3 |
| 50.1 | 22 | 23.1 | 0.95 | 4 | 50.2 | 10 | 17.53 | 0.57 | 1 |
| 50.3 | 17 | 17.53 | 0.97 | 9 | 50.4 | 22 | 23.1 | 0.95 | 4 |
| 51 | 10 | 19.27 | 0.52 | 14 | 62 | 21 | 25.2 | 0.83 | 3 |

Grand total - 344 380.07 0.91

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.4 | 28.2 | 35 | 51 | 31 | 50.2 | 36.1 | 34.2 |
| 20 | 37 | 38 | 45.1 | 62 | 15 | 41.2 | 34.3 |
| 41.3 | 12.1 | 12.5 | 46 | 14.1 | 21.2 | 50.1 | 50.4 |
| 3 | 50.3 | 33 | 4 | 8 | 9 | 28.6 | 7.4 |
| 18.4 | 16 | 24 | 28.3 | 28.4 | 11 | | |

HIRUNDINIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | : 9 | 6.6 | 1.36 | - 0 | 9 | : 3 | 5.53 | 0.54 | - 6 |
| 12.1 | : 4 | 5.53 | 0.72 | - 2 | 12.4 | : 0 | - | - | - 3 |
| 20 | : 6 | 6.6 | 0.91 | - 6 | 21.1 | : 4 | 5.53 | 0.72 | - 2 |
| 28.2 | : 4 | 5 | 0.8 | - 0 | 28.6 | : 4 | 5 | 0.8 | - 0 |
| 34.2 | : 8 | 5.53 | 1.45 | - 3 | 46 | : 4 | 5.53 | 0.72 | - 2 |
| 50.1 | : 7 | 5.53 | 1.27 | - 0 | 50.3 | : 0 | - | - | - 3 |
| 61 | : 0 | - | - | - 3 | 62 | : 9 | 6.6 | 1.36 | - 0 |

Grand total - 31 31.5 0.98

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.4 | 50.3 | 61 | 9 | 12.1 | 21.1 | 46 | 28.2 |
| 28.6 | 20 | 50.1 | 3 | 62 | 34.2 | | |

MOTACILLIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | : 5 | 6.67 | 0.75 | - 4 | | 8 | : 7 | 6.67 | 1.05 | - 7 |
| 12.1 | : 0 | - | - | - 12 | | 12.4 | : 0 | - | - | - 12 |
| 13 | : 10 | 6.67 | 1.5 | - 4 | | 14.1 | : 7 | 6.67 | 1.05 | - 7 |
| 15 | : 7 | 6.67 | 1.05 | - 7 | | 24 | : 0 | - | - | - 12 |
| 27 | : 0 | - | - | - 11 | | 28.2 | : 0 | - | - | - 12 |
| 28.5 | : 7 | 6.67 | 1.05 | - 2 | | 35 | : 5 | 6.67 | 0.75 | - 5 |
| 36.1 | : 5 | 6.67 | 0.75 | - 5 | | 37 | : 5 | 6.67 | 0.75 | - 4 |
| 41.2 | : 5 | 6.67 | 0.75 | - 5 | | 42 | : 5 | 6.67 | 0.75 | - 5 |
| 46 | : 0 | - | - | - 14 | | 50.4 | : 0 | - | - | - 12 |
| 51 | : 0 | - | - | - 12 | | 57.1 | : 0 | - | - | - 12 |

Grand total - 34 36.67 0.93

Ranking ratios

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12.1 | 12.4 | 24 | 27 | 28.2 | 46 | 50.4 | 51 | 57.1 | 3 |
| 35 | 36.1 | 37 | 41.2 | 42 | 8 | 14.1 | 15 | | |
| 28.5 | 13 | | | | | | | | |

PYCNONOTIDAE ETC

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | : 12 | 12.64 | 0.95 | - 4 | 8 | : 9 | 11.31 | 0.8 | - 5 |
| 26 | : 9 | 9.58 | 0.94 | - 1 | 28.2 | : 13 | 9.1 | 1.43 | - 3 |
| 28.3 | : 14 | 11.61 | 1.21 | - 1 | 28.5 | : 6 | 5.39 | 1.11 | - 1 |
| 28.6 | : 13 | 9.1 | 1.43 | - 3 | 67 | : 0 | - | - | - 14 |
| 31 | : 11 | 12.49 | 0.88 | - 1 | 34.2 | : 13 | 11.23 | 1.16 | - 2 |
| 44 | : 9 | 9.58 | 0.94 | - 1 | 48 | : 10 | 11.23 | 0.89 | - 1 |
| 49 | : 13 | 11.33 | 1.15 | - 1 | 50.1 | : 11 | 7.18 | 1.53 | - 0 |
| 50.2 | : 13 | 9.88 | 1.32 | - 3 | 50.3 | : 0 | - | - | - 10 |
| 50.4 | : 11 | 7.18 | 1.53 | - 0 | 53 | : 7 | 9.69 | 0.72 | - 1 |
| 54 | : 0 | - | - | - 8 | 61 | : 8 | 2.95 | 2.72 | - 5 |
| 62 | : 12 | 7.88 | 1.52 | - 3 | 63 | : 0 | - | - | - 0 |

Grand total - 97 84.68 1.15

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 67 | 50.3 | 54 | 63 | 53 | 8 | 31 | 48 |
| 44 | 26 | 3 | 28.5 | 49 | 34.2 | 28.3 | 50.2 |
| 28.2 | 28.6 | 62 | 50.1 | 50.4 | 61 | | |

LANIIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2 | : 10 | 8.36 | 1.2 - 0 | 3 | : 4 | 6.04 | 0.66 - 0 |
| 7.4 | : 10 | 8.36 | 1.2 - 0 | 8 | : 7 | 6.04 | 1.16 - 3 |
| 12.1 | : 7 | 5.61 | 1.25 - 0 | 12.4 | : 7 | 5.61 | 1.25 - 0 |
| 24 | : 3 | 6.04 | 0.5 - 0 | 28.2 | : 6 | 8 | 0.75 - 1 |
| 28.6 | : 4 | 7.5 | 0.53 - 0 | 31 | : 9 | 8.36 | 1.08 - 0 |
| 54 | : 7 | 8.36 | 0.84 - 0 | 61 | : 6 | 8.36 | 0.72 - 1 |
| 62 | : 6 | 8.36 | 0.72 - 1 | | | | |

Grand total - 43 47.48 0.91

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 24 | 28.6 | 3 | 62 | 61 | 28.2 | 54 | 31 |
| 8 | 2 | 7.4 | 12.1 | 12.4 | | | |

VANGIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | : 7 | 8.39 | 0.83 | - 0 | 8 | : 11 | 11.75 | 0.94 | - 5 |
| 12.1 | : 0 | - | - | - 11 | 12.4 | : 0 | - | - | - 11 |
| 21.1 | : 0 | - | - | - 11 | 26 | : 7 | 8.39 | 0.83 | - 0 |
| 28.2 | : 9 | 10.5 | 0.86 | - 4 | 28.4 | : 13 | 10.5 | 1.24 | - 4 |
| 28.6 | : 8 | 7.39 | 1.08 | - 4 | 67 | : 9 | 8.39 | 1.07 | - 5 |
| 34.2 | : 12 | 8.39 | 1.43 | - 0 | 40 | : 9 | 8.39 | 1.07 | - 4 |
| 43 | : 10 | 11.75 | 0.85 | - 5 | 44 | : 14 | 13.02 | 1.08 | - 4 |
| 47 | : 10 | 11.75 | 0.85 | - 5 | 48 | : 6 | 8.39 | 0.72 | - 6 |
| 49 | : 14 | 11.75 | 1.19 | - 0 | 50.2 | : 0 | - | - | - 11 |
| 52 | : 7 | 8.39 | 0.83 | - 0 | 53 | : 13 | 11.75 | 1.11 | - 1 |
| 54 | : 12 | 13.02 | 0.92 | - 7 | 61 | : 12 | 13.02 | 0.92 | - 4 |
| 62 | : 11 | 11.75 | 0.94 | - 0 | | | | | |

Grand total - 97 98.33 0.99

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.1 | 12.4 | 21.1 | 50.2 | 48 | 3 | 26 | 52 |
| 43 | 47 | 28.2 | 54 | 61 | 8 | 62 | 67 |
| 40 | 44 | 28.6 | 53 | 49 | 28.4 | 34.2 | |

BOMBYCILLIDAE & DULIDAE

| Incompatibilities: | observed | expected | ratio - polar | | | | |
|---|---|---|---|---|---|---|---|
| 2 | : 1 | 3.4 | 0.29 - 1 | 3 | : 1 | 4.2 | 0.24 - 1 |
| 8 | : 0 | - | - - 6 | 28.2 | : 1 | 2.8 | 0.36 - 2 |
| 28.6 | : 1 | 3.6 | 0.28 - 1 | 31 | : 3 | 3.4 | 0.88 - 1 |
| 50.3 | : 0 | - | - - 5 | 61 | : 1 | 3.4 | 0.29 - 2 |
| 62 | : 4 | 4.2 | 0.95 - 1 | | | | |

Grand total - 6 12.5 0.48

Ranking ratios
8 50.3 3 28.6 2 61 28.2 31
62

STURNIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | : 18 | 14.78 | 1.22 - 0 | | 3 | : 24 | 21.94 | 1.09 - 0 |
| 8 | : 21 | 14.78 | 1.42 - 9 | | 9 | : 1 | 15.88 | 6E-2 - 13 |
| 11 | : 1 | 15.88 | 6E-2 - 13 | | 12.1 | : 21 | 23.84 | 0.88 - 5 |
| 12.4 | : 21 | 23.84 | 0.88 - 5 | | 13 | : 3 | 22.49 | 0.13 - 12 |
| 15 | : 21 | 24.8 | 0.85 - 7 | | 18.1 | : 22 | 14.39 | 1.53 - 0 |
| 18.3 | : 22 | 14.39 | 1.53 - 0 | | 20 | : 3 | 22.49 | 0.13 - 12 |
| 21.1 | : 22 | 14.39 | 1.53 - 9 | | 21.3 | : 22 | 14.39 | 1.53 - 0 |
| 24 | : 3 | 22.49 | 0.13 - 12 | | 25 | : 23 | 21.94 | 1.05 - 4 |
| 27 | : 23 | 14.78 | 1.56 - 0 | | 28.2 | : 14 | 15 | 0.93 - 8 |
| 28.3 | : 14 | 13.89 | 1.01 - 0 | | 28.6 | : 22 | 20.94 | 1.05 - 5 |
| 30.1 | : 24 | 21.19 | 1.13 - 0 | | 30.3 | : 24 | 21.19 | 1.13 - 0 |
| 33 | : 21 | 21.94 | 0.96 - 0 | | 34.2 | : 11 | 24.96 | 0.44 - 4 |
| 35 | : 21 | 21.94 | 0.96 - 0 | | 36.2 | : 19 | 22.49 | 0.84 - 0 |
| 37 | : 21 | 21.94 | 0.96 - 0 | | 38 | : 21 | 21.94 | 0.96 - 0 |
| 42 | : 21 | 21.94 | 0.96 - 0 | | 46 | : 21 | 21.94 | 0.96 - 0 |
| 50.1 | : 17 | 15.11 | 1.13 - 10 | | 50.3 | : 17 | 15.11 | 1.13 - 10 |
| 50.4 | : 17 | 15.11 | 1.13 - 10 | | 54 | : 0 | - | - - 11 |
| 61 | : 17 | 17.54 | 0.97 - 2 | | 62 | : 11 | 16.45 | 0.67 - 6 |
| 63 | : 0 | - | - - 11 | | | | | |

Grand total - 302 334.06 0.9

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 54 | 63 | 9 | 11 | 13 | 20 | 24 | 34.2 |
| 62 | 36.2 | 15 | 12.1 | 12.4 | 28.2 | 35 | 37 |
| 38 | 42 | 46 | 33 | 61 | 28.3 | 25 | 28.6 |
| 3 | 50.1 | 50.3 | 50.4 | 30.1 | 30.3 | 2 | 8 |
| 18.1 | 18.3 | 21.1 | 21.3 | 27 | | | |

TURDIDAE

Incompatibilities: observed expected ratio polar

| | observed | expected | ratio | polar | | observed | expected | ratio | polar |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 32 | 39.99 | 0.8 | 0 | 3 | 37 | 39.99 | 0.93 | 4 |
| 7.1 | 23 | 23.07 | 1 | 0 | 7.3 | 14 | 15.39 | 0.91 | 0 |
| 7.4 | 39 | 27.88 | 1.4 | 2 | 8 | 35 | 34.28 | 1.02 | 4 |
| 9 | 45 | 42.01 | 1.07 | 0 | 11 | 27 | 37.75 | 0.72 | 2 |
| 12.1 | 34 | 41.43 | 0.82 | 0 | 12.4 | 32 | 41.01 | 0.78 | 0 |
| 13 | 38 | 43.13 | 0.88 | 2 | 14.1 | 43 | 42.01 | 1.02 | 3 |
| 14.2 | 35 | 33.31 | 1.05 | 1 | 15 | 35 | 38.99 | 0.9 | 2 |
| 18.1 | 35 | 27.5 | 1.27 | 1 | 18.2 | 23 | 15.19 | 1.51 | 1 |
| 18.3 | 23 | 22.77 | 1.01 | 0 | 18.4 | 28 | 27.5 | 1.02 | 1 |
| 20 | 31 | 41.47 | 0.75 | 2 | 21.1 | 42 | 39.4 | 1.07 | 0 |
| 21.2 | 22 | 14.91 | 1.48 | 1 | 21.3 | 39 | 38.6 | 1.01 | 1 |
| 22 | 36 | 37.75 | 0.95 | 2 | 24 | 31 | 42.01 | 0.74 | 2 |
| 25 | 43 | 42.01 | 1.02 | 2 | 27 | 41 | 36.22 | 1.13 | 2 |
| 28.2 | 40 | 35.31 | 1.13 | 2 | 28.6 | 37 | 39.08 | 0.95 | 1 |
| 65 | 37 | 31.76 | 1.16 | 1 | 67 | 0 | - | - | 31 |
| 30.1 | 35 | 31.23 | 1.12 | 1 | 30.3 | 37 | 31.23 | 1.18 | 1 |
| 31 | 42 | 36.22 | 1.16 | 1 | 32 | 30 | 23.52 | 1.28 | 1 |
| 33 | 40 | 43.21 | 0.93 | 1 | 34.2 | 39 | 42.43 | 0.92 | 3 |
| 35 | 34 | 34.28 | 0.99 | 2 | 36.1 | 18 | 15.74 | 1.14 | 0 |
| 37 | 37 | 38.99 | 0.95 | 2 | 38 | 36 | 40.81 | 0.88 | 2 |
| 42 | 31 | 36.22 | 0.86 | 2 | 46 | 37 | 39.99 | 0.93 | 2 |
| 50.1 | 32 | 38.01 | 0.84 | 1 | 50.3 | 39 | 41.14 | 0.95 | 1 |
| 50.4 | 33 | 38.83 | 0.85 | 1 | 51 | 23 | 28.37 | 0.81 | 1 |
| 54 | 28 | 15.74 | 1.78 | 6 | 61 | 33 | 36.22 | 0.91 | 3 |
| 62 | 33 | 40.81 | 0.81 | 1 | 63 | 0 | - | - | 28 |

Grand total - 807 822.34 0.98

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 67 | 63 | 11 | 24 | 20 | 12.4 | 2 | 62 |
| 51 | 12.1 | 50.1 | 50.4 | 42 | 13 | 38 | 15 |
| 7.3 | 61 | 34.2 | 3 | 46 | 33 | 28.6 | 50.3 |
| 37 | 22 | 35 | 7.1 | 18.3 | 21.3 | 18.4 | 8 |
| 14.1 | 25 | 14.2 | 21.1 | 9 | 30.1 | 27 | 28.2 |
| 36.1 | 31 | 65 | 30.3 | 18.1 | 32 | 7.4 | 21.2 |
| 18.2 | 54 | | | | | | |

ORTHONYCHINAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 39 | 35.55 | 1.1 | 1 | 3 | 29 | 36.93 | 0.79 | 2 |
| 7.1 | 22 | 19.04 | 1.16 | 0 | 7.2 | 22 | 19.04 | 1.16 | 0 |
| 8 | 24 | 27.61 | 0.87 | 3 | 9 | 24 | 19.29 | 1.24 | 1 |
| 11 | 22 | 28.28 | 0.78 | 0 | 12.1 | 30 | 33.4 | 0.9 | 0 |
| 12.3 | 20 | 16.87 | 1.19 | 1 | 12.4 | 33 | 34.19 | 0.97 | 1 |
| 13 | 16 | 20.5 | 0.78 | 0 | 14.1 | 33 | 32.52 | 1.01 | 0 |
| 14.2 | 21 | 18.53 | 1.13 | 0 | 15 | 22 | 28.28 | 0.78 | 0 |
| 18.1 | 31 | 26.59 | 1.17 | 0 | 18.2 | 22 | 18.38 | 1.2 | 0 |
| 18.3 | 22 | 26.69 | 0.82 | 0 | 20 | 22 | 28.28 | 0.78 | 0 |
| 21.1 | 36 | 31.42 | 1.15 | 2 | 21.3 | 3 | 18.68 | 0.16 | 0 |
| 21.4 | 22 | 17.15 | 1.28 | 1 | 24 | 22 | 28.28 | 0.78 | 0 |
| 26 | 19 | 27.18 | 0.7 | 1 | 28.2 | 28 | 30.9 | 0.91 | 2 |
| 28.3 | 9 | 17.55 | 0.51 | 0 | 28.5 | 26 | 17.75 | 1.46 | 0 |
| 28.6 | 37 | 32.78 | 1.13 | 1 | 67 | 0 | - | - | 20 |
| 30.1 | 40 | 35.01 | 1.14 | 0 | 30.2 | 21 | 18.34 | 1.14 | 0 |
| 30.3 | 37 | 27.61 | 1.34 | 0 | 31 | 38 | 32.76 | 1.16 | 2 |
| 33 | 22 | 28.28 | 0.78 | 0 | 34.2 | 34 | 34.75 | 0.98 | 2 |
| 36.1 | 20 | 17.95 | 1.11 | 1 | 44 | 3 | 19.46 | 0.15 | 0 |
| 45.1 | 29 | 27.63 | 1.05 | 1 | 48 | 25 | 31.75 | 0.79 | 1 |
| 49 | 25 | 34.41 | 0.73 | 1 | 50.1 | 29 | 33.92 | 0.86 | 1 |
| 50.2 | 29 | 33.92 | 0.86 | 0 | 50.4 | 30 | 26.8 | 1.12 | 0 |
| 52 | 3 | 19.46 | 0.15 | 0 | 53 | 16 | 27.56 | 0.58 | 0 |
| 54 | 35 | 32.62 | 1.07 | 2 | 61 | 34 | 32.1 | 1.06 | 0 |
| 62 | 34 | 32.1 | 1.06 | 0 | 63 | 0 | - | - | 0 |
| 57.1 | 20 | 17.95 | 1.11 | 1 | | | | | |

Grand total - 590 628.03 0.94

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 67 | 63 | 52 | 44 | 21.3 | 28.3 | 53 | 26 |
| 49 | 11 | 15 | 20 | 24 | 33 | 13 | 3 |
| 48 | 18.3 | 50.1 | 50.2 | 8 | 12.1 | 28.2 | 12.4 |
| 34.2 | 14.1 | 45.1 | 61 | 62 | 54 | 2 | 36.1 |
| 57.1 | 50.4 | 28.6 | 14.2 | 30.1 | 30.2 | 21.1 | 7.1 |
| 7.2 | 31 | 18.1 | 12.3 | 18.2 | 9 | 21.4 | 30.3 |
| 28.5 | | | | | | | |

TIMALIIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 35 | 22.6 | 1.55 | 0 | 3 | 31 | 17.1 | 1.81 | 0 |
| 7.1 | 21 | 12.02 | 1.75 | 0 | 7.3 | 21 | 12.02 | 1.75 | 0 |
| 7.4 | 18 | 9.89 | 1.82 | 0 | 8 | 28 | 17.76 | 1.58 | 4 |
| 9 | 35 | 33.22 | 1.05 | 0 | 11 | 36 | 30.61 | 1.18 | 0 |
| 12.1 | 36 | 28.66 | 1.26 | 1 | 12.4 | 36 | 25.62 | 1.41 | 1 |
| 13 | 33 | 24.37 | 1.35 | 0 | 14.1 | 30 | 20.49 | 1.46 | 0 |
| 15 | 33 | 33.98 | 0.97 | 0 | 16 | 23 | 9.52 | 2.42 | 0 |
| 20 | 35 | 29.23 | 1.2 | 0 | 22 | 12 | 10.1 | 1.19 | 0 |
| 23 | 12 | 11.06 | 1.09 | 0 | 24 | 33 | 24.32 | 1.36 | 0 |
| 26 | 9 | 10.28 | 0.88 | 0 | 28.2 | 30 | 24.88 | 1.21 | 2 |
| 28.3 | 28 | 25.12 | 1.11 | 0 | 28.4 | 18 | 16.77 | 1.07 | 0 |
| 28.5 | 32 | 16.77 | 1.91 | 0 | 28.6 | 32 | 28.48 | 1.12 | 2 |
| 30.1 | 30 | 18.49 | 1.62 | 0 | 30.3 | 30 | 18.49 | 1.62 | 0 |
| 31 | 32 | 24.77 | 1.29 | 2 | 33 | 13 | 15.41 | 0.84 | 0 |
| 34.2 | 37 | 29.54 | 1.25 | 0 | 37 | 34 | 23.91 | 1.42 | 0 |
| 38 | 34 | 23.91 | 1.42 | 0 | 42 | 16 | 10.03 | 1.59 | 0 |
| 46 | 34 | 27.85 | 1.22 | 0 | 49 | 33 | 34.02 | 0.97 | 0 |
| 50.1 | 29 | 30.18 | 0.96 | 1 | 50.2 | 29 | 30.18 | 0.96 | 1 |
| 50.4 | 26 | 28.28 | 0.92 | 1 | 51 | 32 | 25.96 | 1.23 | 0 |
| 54 | 6 | 14 | 0.43 | 10 | 55 | 7 | 17.46 | 0.4 | 0 |
| 61 | 34 | 24.94 | 1.36 | 2 | 62 | 36 | 34.84 | 1.03 | 1 |
| 63 | 9 | 10.14 | 0.89 | 6 | 57.1 | 4 | 9.39 | 0.43 | 0 |

Grand total - 581 473.33 1.23

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 55 | 57.1 | 54 | 33 | 26 | 63 | 50.4 | 50.1 |
| 50.2 | 49 | 15 | 62 | 9 | 28.4 | 23 | 28.3 |
| 28.6 | 11 | 22 | 20 | 28.2 | 46 | 51 | 34.2 |
| 12.1 | 31 | 13 | 24 | 61 | 12.4 | 37 | 38 |
| 14.1 | 2 | 8 | 42 | 30.1 | 30.3 | 7.1 | 7.3 |
| 3 | 7.4 | 28.5 | 16 | | | | |

PARADOXORNITHIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12.1 | : 0 | - | - | - 2 | 12.4 | : 0 | - | - | - 2 |
| 15 | : 2 | 3.25 | 0.62 | - 4 | 28.2 | : 5 | 3.19 | 1.57 | - 0 |
| 28.3 | : 2 | 3.06 | 0.65 | - 0 | 28.4 | : 2 | 3.06 | 0.65 | - 0 |
| 28.6 | : 3 | 3.27 | 0.92 | - 2 | 31 | : 0 | - | - | - 2 |
| 49 | : 6 | 4.68 | 1.28 | - 0 | 50.2 | : 1 | 0.47 | 2.14 | - 7 |
| 54 | : 6 | 4.63 | 1.3 | - 0 | 61 | : 6 | 4.72 | 1.27 | - 2 |
| 62 | : 6 | 4.72 | 1.27 | - 2 | 63 | : 5 | 4.57 | 1.09 | - 3 |

Grand total - 22 19.81 1.11

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.1 | 12.4 | 31 | 15 | 28.3 | 28.4 | 28.6 | 63 |
| 61 | 62 | 49 | 54 | 28.2 | 50.2 | | |

POLIOPTININAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 : | 3 | 1.39 | 2.16 | - 5 | 12.1 : | 0 | - | - | - 7 |
| 12.4 : | 0 | - | - | - 7 | 14.1 : | 4 | 7.13 | 0.56 | - 3 |
| 15 : | 8 | 7.7 | 1.04 | - 0 | 28.2 : | 4 | 7.92 | 0.5 | - 0 |
| 28.6 : | 9 | 9.37 | 0.96 | - 0 | 67 : | 0 | - | - | - 7 |
| 31 : | 12 | 7.9 | 1.52 | - 4 | 46 : | 8 | 7.7 | 1.04 | - 0 |
| 49 : | 7 | 9.67 | 0.72 | - 0 | 50.1 : | 8 | 7.35 | 1.09 | - 4 |
| 50.2 : | 7 | 7.72 | 0.91 | - 0 | 50.3 : | 0 | - | - | - 6 |
| 50.4 : | 4 | 6.02 | 0.66 | - 3 | 54 : | 13 | 11.36 | 1.14 | - 3 |
| 61 : | 9 | 10.23 | 0.88 | - 0 | 62 : | 10 | 9.78 | 1.02 | - 1 |

Grand total - 53 55.62 0.95

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 12.1 | 12.4 | 67 | 50.3 | 28.2 | 14.1 | 50.4 | 49 |
| 61 | 50.2 | 28.6 | 62 | 15 | 46 | 50.1 | 54 |
| 31 | 8 | | | | | | |

SYLVIIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | : 10 | 10.64 | 0.94 | - 0 | 8 | : 14 | 13.75 | 1.02 | - 0 |
| 11 | : 16 | 16.02 | 1 | - 2 | 12.1 | : 1 | 0.28 | 3.56 | - 9 |
| 12.4 | : 1 | 0.28 | 3.56 | - 9 | 15 | : 7 | 11.66 | 0.6 | - 0 |
| 20 | : 14 | 11.66 | 1.2 | - 2 | 21.1 | : 0 | - | - | - 1 |
| 24 | : 6 | 9.05 | 0.66 | - 0 | 25 | : 7 | 6.19 | 1.13 | - 1 |
| 28.2 | : 13 | 13.53 | 0.96 | - 0 | 28.3 | : 7 | 8.77 | 0.8 | - 0 |
| 28.4 | : 5 | 5.94 | 0.84 | - 0 | 28.6 | : 11 | 10.69 | 1.03 | - 0 |
| 31 | : 12 | 12.37 | 0.97 | - 0 | 33 | : 0 | 0.2 | 0 | - 0 |
| 34.1 | : 0 | - | - | - 0 | 34.2 | : 8 | 7.1 | 1.13 | - 2 |
| 36.1 | : 0 | - | - | - 0 | 36.2 | : 0 | - | - | - 0 |
| 37 | : 0 | - | - | - 0 | 38 | : 0 | - | - | - 0 |
| 45.1 | : 1 | 0.42 | 2.35 | - 0 | 46 | : 0 | 0.72 | 0 | - 0 |
| 48 | : 7 | 7.03 | 1 | - 2 | 49 | : 10 | 10.07 | 0.99 | - 2 |
| 50.1 | : 8 | 12.5 | 0.64 | - 0 | 50.2 | : 10 | 9.51 | 1.05 | - 2 |
| 50.3 | : 7 | 9.54 | 0.73 | - 2 | 50.4 | : 8 | 10.75 | 0.74 | - 0 |
| 53 | : 10 | 7.97 | 1.25 | - 2 | 54 | : 9 | 11.62 | 0.77 | - 2 |

Grand total - 101 109.14 0.93

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21.1 | 33 | 34.1 | 36.1 | 36.2 | 37 | 38 | 46 |
| 15 | 50.1 | 24 | 50.3 | 50.4 | 54 | 28.3 | 28.4 |
| 3 | 28.2 | 31 | 49 | 48 | 11 | 8 | 28.6 |
| 50.2 | 34.2 | 25 | 20 | 53 | 45.1 | 12.1 | 12.4 |

**MUSCICAPIDAE**

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | : 11 | 7.43 | 1.48 | - 0 | 3 | : 10 | 7.43 | 1.35 | - 3 |
| 8 | : 0 | - | - | - 11 | 9 | : 8 | 7.43 | 1.08 | - 0 |
| 12.1 | : 0 | - | - | - 4 | 12.4 | : 0 | - | - | - 4 |
| 20 | : 7 | 5.71 | 1.23 | - 2 | 24 | : 7 | 5.71 | 1.23 | - 2 |
| 28.2 | : 7 | 6.57 | 1.07 | - 2 | 28.6 | : 7 | 6.57 | 1.07 | - 2 |
| 31 | : 0 | - | - | - 4 | 34.2 | : 7 | 5.71 | 1.23 | - 3 |
| 50.2 | : 6 | 5.24 | 1.15 | - 2 | 50.3 | : 6 | 5.24 | 1.15 | - 2 |
| 61 | : 4 | 5.71 | 0.7 | - 2 | 62 | : 6 | 5.71 | 1.05 | - 2 |
| 63 | : 0 | - | - | - 11 | | | | | |

Grand total - 43 37.24 1.15

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 | 12.1 | 12.4 | 31 | 63 | 61 | 62 | 28.2 |
| 28.6 | 9 | 50.2 | 50.3 | 34.2 | 20 | 24 | 3 |
| 2 | | | | | | | |

PARIDAE ETC

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | : 13 | 12.9 | 1.01 | - 0 | 11 | : 10 | 12.9 | 0.78 | - 3 |
| 12.1 | : 9 | 9.2 | 0.98 | - 0 | 12.4 | : 9 | 9.2 | 0.98 | - 0 |
| 13 | : 10 | 12.9 | 0.78 | - 3 | 15 | : 10 | 12.9 | 0.78 | - 3 |
| 24 | : 10 | 12.9 | 0.78 | - 3 | 25 | : 5 | 9.73 | 0.51 | - 0 |
| 28.2 | : 10 | 8.53 | 1.17 | - 0 | 28.3 | : 11 | 11.4 | 0.96 | - 0 |
| 28.6 | : 11 | 11.4 | 0.96 | - 0 | 67 | : 13 | 12.9 | 1.01 | - 3 |
| 31 | : 12 | 12.9 | 0.93 | - 0 | 34.2 | : 5 | 9.73 | 0.51 | - 0 |
| 50.1 | : 14 | 11.7 | 1.2 | - 0 | 50.2 | : 10 | 8.6 | 1.16 | - 0 |
| 50.4 | : 12 | 8.6 | 1.4 | - 0 | 54 | : 12 | 9.73 | 1.23 | - 0 |
| 61 | : 0 | - | - | - 5 | 62 | : 0 | - | - | - 5 |
| 63 | : 0 | - | - | - 5 | | | | | |

Grand total - 93 99.07 0.94

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 61 | 62 | 63 | 25 | 34.2 | 11 | 13 | 15 |
| 24 | 31 | 28.3 | 28.6 | 12.1 | 12.4 | 8 | 67 |
| 50.2 | 28.2 | 50.1 | 54 | 50.4 | | | |

SCANSORIALS

Incompatibilities: observed  expected  ratio - polar

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.1 | : | 19 | 18.64 | 1.02 | - | 5 | | 2 | : | 18 | 18.64 | 0.97 | - | 0 |
| 4 | : | 18 | 18.64 | 0.97 | - | 1 | | 5 | : | 23 | 28.34 | 0.81 | - | 6 |
| 6.1 | : | 20 | 18.64 | 1.07 | - | 0 | | 8 | : | 0 | - | - | - | 21 |
| 9 | : | 10 | 18.64 | 0.54 | - | 13 | | 12.3 | : | 18 | 18.11 | 0.99 | - | 1 |
| 12.4 | : | 26 | 25.66 | 1.01 | - | 2 | | 15 | : | 0 | - | - | - | 26 |
| 17.1 | : | 20 | 18.64 | 1.07 | - | 0 | | 20 | : | 0 | - | - | - | 24 |
| 21.1 | : | 23 | 25.66 | 0.9 | - | 9 | | 21.2 | : | 19 | 18.11 | 1.05 | - | 5 |
| 22 | : | 23 | 26.2 | 0.88 | - | 7 | | 24 | : | 33 | 26.2 | 1.26 | - | 9 |
| 25 | : | 26 | 26.2 | 0.99 | - | 3 | | 26 | : | 29 | 28.34 | 1.02 | - | 7 |
| 27 | : | 18 | 18.64 | 0.97 | - | 1 | | 28.2 | : | 12 | 17.57 | 0.68 | - | 15 |
| 28.3 | : | 23 | 24.86 | 0.93 | - | 3 | | 28.6 | : | 23 | 24.86 | 0.93 | - | 9 |
| 67 | : | 16 | 18.64 | 0.86 | - | 16 | | 29.1 | : | 20 | 18.64 | 1.07 | - | 0 |
| 31 | : | 28 | 26.2 | 1.07 | - | 5 | | 33 | : | 0 | - | - | - | 16 |
| 34.2 | : | 21 | 26.2 | 0.8 | - | 5 | | 35 | : | 26 | 26.2 | 0.99 | - | 11 |
| 36.1 | : | 20 | 18.64 | 1.07 | - | 0 | | 37 | : | 28 | 28.34 | 0.99 | - | 9 |
| 38 | : | 13 | 18.64 | 0.7 | - | 12 | | 41.2 | : | 30 | 26.2 | 1.15 | - | 5 |
| 42 | : | 26 | 28.34 | 0.92 | - | 10 | | 45.1 | : | 23 | 28.34 | 0.81 | - | 9 |
| 46 | : | 0 | - | - | - | 16 | | 48 | : | 29 | 28.34 | 1.02 | - | 7 |
| 49 | : | 29 | 28.34 | 1.02 | - | 7 | | 50.1 | : | 27 | 25.34 | 1.07 | - | 5 |
| 50.3 | : | 0 | - | - | - | 21 | | 50.4 | : | 24 | 27.49 | 0.87 | - | 2 |
| 51 | : | 35 | 26.2 | 1.34 | - | 0 | | 53 | : | 20 | 18.64 | 1.07 | - | 1 |
| 54 | : | 30 | 28.34 | 1.06 | - | 4 | | 61 | : | 0 | - | - | - | 20 |
| 62 | : | 0 | - | - | - | 20 | | 63 | : | 0 | - | - | - | 20 |
| 57.1 | : | 18 | 26.2 | 0.69 | - | 10 | | | | | | | | |

Grand total - 432   446.94   0.97

Ranking ratios

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 15 | 20 | 33 | 46 | 50.3 | 61 | 62 | 63 | 9 |
| 28.2 | 57.1 | 38 | 34.2 | 5 | 45.1 | 67 | 50.4 | | |
| 22 | 21.1 | 42 | 28.3 | 28.6 | 2 | 4 | 27 | | |
| 37 | 35 | 25 | 12.3 | 12.4 | 1.1 | 26 | 48 | | |
| 49 | 21.2 | 54 | 50.1 | 31 | 6.1 | 17.1 | 53 | | |
| 29.1 | 36.1 | 41.2 | 24 | 51 | | | | | |

NECTARIVORES

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | : 14 | 8.94 | 1.57 | - 0 | 5 | : 6 | 8.94 | 0.67 | - 0 |
| 8 | : 4 | 8.94 | 0.45 | - 1 | 11 | : 7 | 13.57 | 0.52 | - 0 |
| 15 | : 8 | 12.25 | 0.65 | - 0 | 20 | : 8 | 12.25 | 0.65 | - 0 |
| 24 | : 6 | 8.94 | 0.67 | - 0 | 25 | : 6 | 8.94 | 0.67 | - 0 |
| 28.2 | : 13 | 7.39 | 1.76 | - 6 | 28.3 | : 5 | 10.17 | 0.49 | - 0 |
| 28.4 | : 14 | 10.17 | 1.38 | - 2 | 28.6 | : 14 | 11.35 | 1.23 | - 0 |
| 31 | : 7 | 13.57 | 0.52 | - 1 | 33 | : 6 | 8.94 | 0.67 | - 0 |
| 37 | : 6 | 8.94 | 0.67 | - 0 | 38 | : 6 | 8.94 | 0.67 | - 0 |
| 42 | : 6 | 8.94 | 0.67 | - 0 | 46 | : 6 | 8.94 | 0.67 | - 0 |
| 49 | : 15 | 12.25 | 1.22 | - 1 | 50.2 | : 0 | - | - | - 2 |
| 51 | : 6 | 8.94 | 0.67 | - 0 | 54 | : 15 | 12.25 | 1.22 | - 1 |
| 61 | : 0 | - | - | - 0 | 62 | : 0 | - | - | - 0 |
| 63 | : 0 | - | - | - 2 | | | | | |

Grand total - 89 106.8 0.83

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 50.2 | 63 | 61 | 62 | 8 | 28.3 | 11 | 31 |
| 15 | 20 | 33 | 42 | 51 | 5 | 24 | 25 |
| 37 | 38 | 46 | 54 | 49 | 28.6 | 28.4 | 2 |
| 28.2 | | | | | | | |

MALURIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | : 28 | 23.46 | 1.19 | - 0 | 3 | : 21 | 19.84 | 1.06 | - 2 |
| 8 | : 18 | 13.61 | 1.32 | - 5 | 9 | : 20 | 19.84 | 1.01 | - 2 |
| 11 | : 23 | 26.88 | 0.86 | - 2 | 12.1 | : 24 | 22.79 | 1.05 | - 3 |
| 12.4 | : 24 | 22.79 | 1.05 | - 3 | 12.5 | : 0 | - | - | - 0 |
| 13 | : 25 | 23.66 | 1.06 | - 2 | 15 | : 18 | 26.86 | 0.67 | - 6 |
| 20 | : 16 | 23.16 | 0.69 | - 3 | 21.1 | : 0 | - | - | - 17 |
| 24 | : 29 | 27.3 | 1.06 | - 2 | 25 | : 20 | 19.84 | 1.01 | - 2 |
| 26 | : 11 | 19.37 | 0.57 | - 0 | 28.2 | : 23 | 21.84 | 1.05 | - 3 |
| 28.5 | : 14 | 12.59 | 1.11 | - 2 | 28.6 | : 25 | 24.31 | 1.03 | - 1 |
| 67 | : 11 | 13.48 | 0.82 | - 10 | 31 | : 24 | 25.81 | 0.93 | - 3 |
| 33 | : 23 | 25.55 | 0.9 | - 2 | 34.2 | : 17 | 13.48 | 1.26 | - 0 |
| 35 | : 15 | 13.48 | 1.11 | - 2 | 37 | : 19 | 19.37 | 0.98 | - 0 |
| 38 | : 19 | 19.37 | 0.98 | - 0 | 46 | : 23 | 23.22 | 0.99 | - 0 |
| 48 | : 7 | 13.48 | 0.52 | - 0 | 49 | : 27 | 26.86 | 1.01 | - 4 |
| 50.1 | : 23 | 22.98 | 1 | - 0 | 50.2 | : 24 | 24.58 | 0.98 | - 4 |
| 50.3 | : 19 | 17.64 | 1.08 | - 8 | 50.4 | : 18 | 20.7 | 0.87 | - 0 |
| 53 | : 7 | 13.48 | 0.52 | - 0 | 54 | : 0 | - | - | - 12 |
| 55 | : 19 | 19.07 | 1 | - 0 | 61 | : 22 | 18.87 | 1.17 | - 1 |
| 62 | : 14 | 21.83 | 0.64 | - 0 | 63 | : 0 | - | - | - 17 |

Grand total - 335 350.71 0.96

Ranking ratios.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21.1 | 54 | 63 | 12.5 | 48 | 53 | 26 | 62 |
| 15 | 20 | 67 | 11 | 50.4 | 33 | 31 | 50.2 |
| 37 | 38 | 46 | 55 | 50.1 | 49 | 9 | 25 |
| 28.6 | 28.2 | 12.1 | 12.4 | 13 | 3 | 24 | 50.3 |
| 28.5 | 35 | 61 | 2 | 34.2 | 8 | | |

MONARCHIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | : 21 | 17.45 | 1.2 | - 3 | 11 | : 15 | 17.45 | 0.86 | - 0 |
| 12.1 | : 17 | 18.28 | 0.93 | - 6 | 12.4 | : 17 | 18.28 | 0.93 | - 6 |
| 15 | : 12 | 17.45 | 0.69 | - 0 | 20 | : 12 | 17.45 | 0.69 | - 0 |
| 21.1 | : 0 | - | - | - 10 | 24 | : 9 | 9.99 | 0.9 | - 0 |
| 26 | : 18 | 20.27 | 0.89 | - 0 | 28.2 | : 19 | 19.77 | 0.96 | - 2 |
| 28.3 | : 11 | 8.94 | 1.23 | - 0 | 28.6 | : 22 | 19.45 | 1.13 | - 0 |
| 31 | : 24 | 20.27 | 1.18 | - 3 | 34.2 | : 15 | 9.99 | 1.5 | - 0 |
| 41.2 | : 11 | 9.99 | 1.1 | - 0 | 43 | : 15 | 14.05 | 1.07 | - 2 |
| 44 | : 11 | 8.6 | 1.28 | - 2 | 47 | : 19 | 17.09 | 1.11 | - 2 |
| 48 | : 21 | 21.28 | 0.99 | - 2 | 49 | : 17 | 20.17 | 0.84 | - 1 |
| 50.2 | : 0 | - | - | - 9 | 50.3 | : 15 | 14.74 | 1.02 | - 6 |
| 52 | : 17 | 14.74 | 1.15 | - 0 | 53 | : 23 | 21.3 | 1.08 | - 0 |
| 54 | : 15 | 19.15 | 0.78 | - 3 | 61 | : 18 | 20.44 | 0.88 | - 2 |
| 62 | : 19 | 20.25 | 0.94 | - 0 | 63 | : 0 | - | - | - 5 |
| 64 | : 15 | 14.5 | 1.03 | - 0 | | | | | |

Grand total - 214 215.66 0.99

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 21.1 | 50.2 | 63 | 20 | 15 | 54 | 49 | 11 |
| 61 | 26 | 24 | 12.1 | 12.4 | 62 | 28.2 | 48 |
| 50.3 | 64 | 43 | 53 | 41.2 | 47 | 28.6 | 52 |
| 31 | 8 | 28.3 | 44 | 34.2 | | | |

EOPSALTRIIDAE

Incompatibilities: observed expected ratio - polar

| | observed | expected | ratio | polar |
|---|---|---|---|---|
| 9 | 8 | 7.43 | 1.08 | 3 |
| 12.1 | 0 | - | - | 10 |
| 14.1 | 6 | 6.05 | 0.99 | 2 |
| 20 | 5 | 6.43 | 0.78 | 6 |
| 28.2 | 5 | 5.57 | 0.9 | 6 |
| 28.6 | 0 | - | - | 8 |
| 50.2 | 6 | 5.83 | 1.03 | 3 |
| 54 | 11 | 8.55 | 1.29 | 0 |
| 63 | 0 | - | - | 8 |
| 11 | 5 | 6.43 | 0.78 | 6 |
| 12.4 | 0 | - | - | 10 |
| 15 | 5 | 6.43 | 0.78 | 6 |
| 21.1 | 0 | - | - | 10 |
| 28.3 | 7 | 5.79 | 1.21 | 0 |
| 34.2 | 4 | 6.05 | 0.66 | 2 |
| 50.3 | 7 | 6.83 | 1.03 | 3 |
| 62 | 7 | 7.43 | 0.94 | 3 |

Grand total - 38 39.4 0.96

Ranking ratios

12.1 12.4 21.1 28.6 63 34.2 11 15
20 28.2 62 14.1 50.3 50.2 9 28.3
54

PACHYCEPHALINAE & RHIPIDURINAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | : 0 | 2.8 | 0 | - 2 | 28.2 | : 0 | - | - | - 3 |
| 28.6 | : 2 | 3.3 | 0.61 | - 0 | 67 | : 4 | 2.8 | 1.43 | - 2 |
| 31 | : 3 | 2.8 | 1.07 | - 1 | 50.3 | : 0 | - | - | - 2 |
| 61 | : 2 | 3.3 | 0.61 | - 0 | 62 | : 1 | 2.8 | 0.36 | - 0 |
| 63 | : 0 | - | - | - 0 | | | | | |

Grand total - 6 8.9 0.67

Ranking ratios
8 28.2 50.3 63 62 28.6 61 31
67

NINE-PRIMARIED OSCINES

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | 25 | 21.49 | 1.16 | 0 | 3 | 24 | 21.49 | 1.12 | 0 |
| 8 | 25 | 24.07 | 1.04 | 1 | 9 | 15 | 17.84 | 0.84 | 0 |
| 11 | 26 | 27.97 | 0.93 | 0 | 12.1 | 18 | 17.4 | 1.03 | 5 |
| 12.4 | 18 | 17.4 | 1.03 | 5 | 13 | 17 | 12.14 | 1.4 | 0 |
| 14.1 | 6 | 17.84 | 0.34 | 0 | 15 | 18 | 27.97 | 0.64 | 1 |
| 16 | 10 | 12.14 | 0.82 | 0 | 20 | 19 | 27.97 | 0.68 | 1 |
| 21.1 | 17 | 11.93 | 1.43 | 7 | 21.2 | 17 | 11.93 | 1.43 | 0 |
| 22 | 17 | 12.14 | 1.4 | 0 | 24 | 26 | 21.49 | 1.21 | 0 |
| 27 | 21 | 12.14 | 1.73 | 0 | 28.2 | 19 | 21.27 | 0.89 | 4 |
| 28.3 | 21 | 15.58 | 1.35 | 0 | 28.4 | 15 | 10.53 | 1.42 | 0 |
| 28.5 | 19 | 18.9 | 1.01 | 0 | 28.6 | 29 | 24.79 | 1.17 | 0 |
| 31 | 30 | 25.93 | 1.16 | 0 | 32 | 8 | 12.14 | 0.66 | 0 |
| 33 | 26 | 24.07 | 1.08 | 0 | 34.2 | 17 | 12.14 | 1.4 | 0 |
| 37 | 17 | 12.14 | 1.4 | 0 | 38 | 23 | 17.84 | 1.29 | 0 |
| 46 | 23 | 17.84 | 1.29 | 0 | 49 | 17 | 12.14 | 1.4 | 0 |
| 50.1 | 25 | 11.35 | 2.2 | 2 | 50.2 | 20 | 20.36 | 0.98 | 3 |
| 50.4 | 21 | 22.88 | 0.92 | 1 | 54 | 31 | 25.93 | 1.2 | 0 |
| 61 | 19 | 24.07 | 0.79 | 4 | 62 | 19 | 24.07 | 0.79 | 4 |
| 63 | 16 | 21.49 | 0.74 | 8 | | | | | |

Grand total - 367 345.38 1.06

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 14.1 | 15 | 32 | 20 | 63 | 61 | 62 | 16 |
| 9 | 28.2 | 50.4 | 11 | 50.2 | 28.5 | 12.1 | 12.4 |
| 8 | 33 | 3 | 31 | 2 | 28.6 | 54 | 24 |
| 46 | 38 | 28.3 | 34.2 | 37 | 49 | 13 | 22 |
| 28.4 | 21.1 | 21.2 | 27 | 50.1 | | | |

PLOCEIDAE & ESTRILDIDAE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 0 | - | - | 12 | 9 | 10 | 12.76 | 0.78 | 3 |
| 11 | 10 | 12.76 | 0.78 | 3 | 12.1 | 9 | 10.86 | 0.83 | 5 |
| 12.4 | 9 | 10.86 | 0.83 | 5 | 13 | 9 | 11.61 | 0.78 | 1 |
| 15 | 5 | 11.61 | 0.43 | 7 | 20 | 8 | 12.87 | 0.62 | 5 |
| 24 | 14 | 12.76 | 1.1 | 1 | 28.2 | 8 | 6.63 | 1.21 | 7 |
| 28.3 | 5 | 9.77 | 0.51 | 0 | 28.5 | 5 | 6.63 | 0.75 | 0 |
| 28.6 | 12 | 10.92 | 1.1 | 3 | 31 | 14 | 12.87 | 1.09 | 4 |
| 38 | 5 | 8.07 | 0.62 | 1 | 50.1 | 0 | - | - | 9 |
| 50.4 | 0 | - | - | 9 | 54 | 9 | 8.07 | 1.12 | 7 |
| 61 | 13 | 11.95 | 1.09 | 5 | 62 | 13 | 11.95 | 1.09 | 5 |
| 63 | 0 | - | - | 12 | | | | | |

Grand total - 79 91.46 0.86

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 | 50.1 | 50.4 | 63 | 15 | 28.3 | 38 | 20 |
| 28.5 | 13 | 9 | 11 | 12.1 | 12.4 | 61 | 62 |
| 31 | 24 | 28.6 | 54 | 28.2 | | | |

CORVID ASSEMBLAGE

Incompatibilities: observed expected ratio - polar

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | : 37 | 37.23 | 0.99 | - 1 | 3 | : 29 | 34.47 | 0.84 | - 0 |
| 7.1 | : 15 | 17.26 | 0.87 | - 0 | 7.3 | : 30 | 25.59 | 1.17 | - 0 |
| 7.4 | : 23 | 25.59 | 0.9 | - 0 | 8 | : 36 | 37.24 | 0.97 | - 1 |
| 9 | : 30 | 26.44 | 1.13 | - 0 | 11 | : 28 | 36.37 | 0.77 | - 1 |
| 12.1 | : 28 | 36.24 | 0.77 | - 5 | 12.4 | : 28 | 36.24 | 0.77 | - 5 |
| 13 | : 30 | 31.38 | 0.96 | - 0 | 15 | : 37 | 34.51 | 1.07 | - 2 |
| 18.1 | : 23 | 17.28 | 1.33 | - 0 | 18.3 | : 23 | 17.28 | 1.33 | - 0 |
| 18.4 | : 36 | 30.54 | 1.18 | - 0 | 20 | : 37 | 36.25 | 1.02 | - 1 |
| 21.2 | : 0 | - | - | - 0 | 21.3 | : 19 | 17.95 | 1.06 | - 0 |
| 22 | : 19 | 17.95 | 1.06 | - 0 | 24 | : 37 | 34.31 | 1.08 | - 0 |
| 25 | : 19 | 17.15 | 1.11 | - 0 | 26 | : 21 | 31.38 | 0.67 | - 1 |
| 27 | : 24 | 17.95 | 1.34 | - 0 | 28.2 | : 19 | 32.99 | 0.58 | - 5 |
| 28.3 | : 18 | 17.05 | 1.06 | - 0 | 28.6 | : 17 | 29.87 | 0.57 | - 5 |
| 67 | : 9 | 17.4 | 0.52 | - 5 | 31 | : 28 | 37.24 | 0.75 | - 5 |
| 33 | : 22 | 17.95 | 1.23 | - 0 | 34.2 | : 24 | 34.47 | 0.7 | - 0 |
| 35 | : 29 | 26.44 | 1.1 | - 0 | 37 | : 29 | 26.44 | 1.1 | - 0 |
| 38 | : 29 | 26.44 | 1.1 | - 0 | 42 | : 29 | 26.44 | 1.1 | - 0 |
| 43 | : 39 | 26.44 | 1.47 | - 0 | 44 | : 35 | 26.44 | 1.32 | - 1 |
| 45.1 | : 9 | 17.95 | 0.5 | - 0 | 46 | : 29 | 26.44 | 1.1 | - 0 |
| 47 | : 39 | 26.44 | 1.47 | - 0 | 48 | : 37 | 34.47 | 1.07 | - 1 |
| 49 | : 36 | 36.37 | 0.99 | - 1 | 50.1 | : 32 | 35.21 | 0.91 | - 0 |
| 50.2 | : 32 | 35.21 | 0.91 | - 3 | 50.3 | : 0 | - | - | - 17 |
| 50.4 | : 37 | 34.38 | 1.08 | - 0 | 51 | : 24 | 17.95 | 1.34 | - 0 |
| 53 | : 15 | 26.44 | 0.57 | - 1 | 61 | : 14 | 26.7 | 0.52 | - 6 |
| 62 | : 16 | 31.56 | 0.51 | - 5 | 63 | : 0 | - | - | - 0 |

Grand total - 628 655.68 0.96

Ranking ratios

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 50.3 | 21.2 | 63 | 45.1 | 62 | 67 | 61 | 53 |
| 28.6 | 28.2 | 26 | 34.2 | 31 | 11 | 12.1 | 12.4 |
| 3 | 7.1 | 7.4 | 50.2 | 50.1 | 13 | 8 | 49 |
| 2 | 20 | 28.3 | 21.3 | 22 | 15 | 48 | 50.4 |
| 24 | 35 | 37 | 38 | 42 | 46 | 25 | 9 |
| 7.3 | 18.4 | 33 | 44 | 18.1 | 18.3 | 27 | 51 |
| 43 | 47 | | | | | | |

Appendix D (Character Indices)

| TAXON | SPECIES NUMBER | CLIQUE SIZE | INFORM CHAR(n) | TRANSF (x) | C.I. n/x |
|---|---|---|---|---|---|
| Dendrocolaptidae | 12 | 24 | 51 | 119 | 0.43 |
| Furnariidae A | 21 | 8 | 43 | 160 | 0.27 |
| Furnariidae B | 21 | 8 | 43 | 160 | 0.27 |
| Formicariidae | 6 | 17 | 21 | 25 | 0.84 |
| Formicariidae *etc.* | 9 | 17 | 25 | 35 | 0.71 |
| Cotingidae | 7 | 11 | 15 | 21 | 0.71 |
| Pipridae | 4 | 12 | 16 | 20 | 0.8 |
| Tyrannidae A | 25 | 10 | 35 | 120 | 0.29 |
| Tyrannidae B | 25 | 9 | 32 | 79 | 0.41 |
| Tyrannidae C | 25 | 8 | 28 | 100 | 0.28 |
| Old-World Suboscines | 10 | 11 | 33 | 62 | 0.53 |
| Menurae | 5 | 16 | 19 | 23 | 0.83 |
| Alaudidae | 6 | 17 | 30 | 47 | 0.64 |
| Hirundinidae | 5 | 14 | 15 | 16 | 0.94 |
| Motacillidae | 4 | 18 | 23 | 29 | 0.79 |
| Pycnonotidae | 6 | 16 | 16 | 21 | 0.76 |
| Laniidae | 7 | 10 | 20 | 30 | 0.67 |
| Vangidae A | 8 | 9 | 19 | 33 | 0.58 |
| Vangidae B | 8 | 9 | 14 | 20 | 0.7 |
| Bombycillidae *etc.* | 5 | 11 | 13 | 15 | 0.87 |
| Cinclidae *etc.* | 6 | 15 | 27 | 42 | 0.64 |
| Sturnidae *etc.* | 9 | 15 | 30 | 58 | 0.52 |

| TAXON | SPECIES NUMBER | CLIQUE SIZE | INFORM CHAR(n) | TRANSF (x) | C.I. n/x |
|---|---|---|---|---|---|
| Turdidae A | 36 | 6 | 36 | 184 | 0.2 |
| Turdidae B | 36 | 6 | 36 | 186 | 0.19 |
| Orthonychinae *etc.* | 12 | 18 | 42 | 102 | 0.41 |
| Timaliidae A | 46 | 12 | 36 | 162 | 0.22 |
| Timaliidae B | 46 | 13 | 40 | 143 | 0.28 |
| Paradoxornithidae | 7 | 14 | 15 | 21 | 0.71 |
| Polioptilinae *etc.* | 6 | 9 | 13 | 22 | 0.59 |
| Sylviidae | 19 | 11 | 25 | 62 | 0.4 |
| Muscicapidae | 7 | 12 | 14 | 16 | 0.88 |
| Paridae *etc.* | 5 | 13 | 16 | 18 | 0.89 |
| Scansorials A | 5 | 18 | 29 | 39 | 0.74 |
| Scansorials B | 8 | 12 | 33 | 65 | 0.51 |
| Nectarivores | 9 | 18 | 28 | 44 | 0.64 |
| Meliphagidae | 5 | 20 | 26 | 32 | 0.81 |
| Maluridae A | 14 | 9 | 32 | 86 | 0.37 |
| Maluridae B | 14 | 8 | 29 | 85 | 0.34 |
| Monarchidae | 18 | 6 | 30 | 65 | 0.46 |
| Eopsaltriidae | 6 | 8 | 15 | 24 | 0.63 |
| Pachycephalinae A(B) | 6 | 12(11) | 14 | 17 | 0.82 |
| 9-primaried Oscines | 18 | 4 | 27 | 60 | 0.45 |
| Parulidae | 6 | 7 | 12 | 18 | 0.67 |
| Emberizidae | 4 | 14 | 16 | 18 | 0.89 |
| Ploceidae | 4 | 10 | 13 | 16 | 0.82 |
| Estrildidae | 4 | 9 | 13 | 17 | 0.76 |
| Ploc. + Estril. | 8 | 6 | 17 | 31 | 0.55 |
| Corvid Assemb. | 15 | 11 | 34 | 89 | 0.38 |

## APPENDIX E (CORRIGENDA)

The way and extent to which each dendrogram is affected follows:

Dendrocolaptidae (Fig.175) - three less synapomorphies. *Dendrocolaptes* no longer forms a clade with *Sittasomus*, *Deconychura* & *Dendrocincla*, but becomes a third, independant line.

Furnariidae (Fig.176-7) - no change to structure, but *Phylidor/Syndactyla* clade now defined by four and not seven characters.

Pipridae (Fig.181) - one less autapomorphy.

Cotingidae (Fig.181) - two less synapomorphies. *Pachyrhamphus*, *Tityra* & *Perissocephalus* no longer form a clade by themselves.

Tyrannidae (Fig.182-184) - Alternative A - one less synapomorphy. No change in structure, but clade of *Syristes* to *Attila* no longer defined by a synapomorphy.

- Alternative B - one less synapomorphy. Four nodes disappear resulting in some loss of structure.

- Alternative C - three minor nodes disappear.

Old-World Suboscines (Fig.185) - slightly less definition; no loss of resolution.

Menurae/Acanthisittidae (Fig.186) - two less synapomorphies.

Hirundinidae (Fig.188) - loss of two synapomorphies.

Motacillidae (Fig.189) - loss of one autapomorphy.

Pycnonotidae (Fig.190) - loss of two synapomorphies;

*Phyllastrephus* & *Andropadus* no longer form a clade.

Campephagidae (Fig.192) - loss of two autapomorphies.

Laniidae (Fig.193) - loss of one synapomorphy. *Telophorus* no longer closer to *Eurocephalus* than it is to *Corvinella.*

Dulidae & Bombycillidae (Fig.194) - loss of two synapomorphies.

Sturnidae (Fig.198) - loss of two autapomorphies.

Cinclidae *etc.* (Fig.199) - *Cinclus/Thryothorus* no longer form a clade.

Sturnidae *etc.* (Fig.200) - *Cinclus/Thryothorus* no longer form a clade; *Buphagus/Accentor* no longer form a clade.

Turdidae (Fig.201-2) - loss of small amount of definition.

Timaliidae (Fig.203-4) - loss of small amount of definition in both alternatives, and in Alternative B *Pelloneum* & *Trichastoma* no longer form a clade.

Orthonychinae *etc.* (Fig.205) - some definition lost.

Paradoxornithidae *etc.* (Fig.206) - main clades persist with some loss of detail; three synapomorphies and one autapomorphy lost.

Muscicapidae (Fig.207) - two synapomorphies lost; slightly less resolution.

Polioptilinae *etc.* (Fig.208) - two synapomorphies lost.

Sylviidae (Fig.209) - small loss of resolution; *Sylvia/Regulus* and *Acrocephalus/Conopoderus* clades disappear.

Paridae (Fig.210) - two synapomorphies lost. Small loss of resolution.

Aegithalidae (Fig.211) - two autapomorphies lost.

Scansorials (Fig.213) - no effect on structure, but one synapomorphy lost in Alternative B.

Nectarivores (Fig.214) - two synapomorphies and one autapomorphy lost. *Certhionyx/Prionochilus* and *Paramythia* no longer form a clade.

Meliphagidae (Fig.215)- loss of one synapomorphy & two autapomorphies.

Maluridae (Fig.217)- some resolution lost; Alternative A loses two, and B loses three synapomorphies.

Monarchidae (Fig.218) - two synapomorphies and small amount of resolution lost.

Pachycephalinae (Fig.220)- Alternative A - two synapomorphies and one autapomorphy lost; one node lost.

- Alternative B - two synapomorphies and two autapomorphies lost.

Parulidae (Fig.221) - one synapomorphy and two autapomorphies lost.

Emberizidae (Fig.222) - four autapomorphies lost.

Drepanididae (Fig.223) - five autapomorphies lost.

Fringillidae (Fig.224) - four autapomorphies lost.

Icteridae (Fig.225) - three autapomorphies lost.

Vireonidae (Fig.226) - four autapomorphies lost.

Nine-primaried Oscines (Fig.227) - one autapomorphy and some resolution lost.

Ploceidae (Fig.229) - one autapomorphy lost.

*Corvidae* (Fig.231) - three autapomorphies and two synapomorphies lost.

*Grallinidae* (Fig.232) - two autapomorphies and three synapomorphies lost.

*Cracticidae* (Fig.233) - two autapomorphies lost.

TITLE A TAXONOMIC RE-APPRAISAL OF THE PASSERIFORMES (AVES) BASED ON THE MORPHOLOGY OF THE PLANTAR SURFACE OF THE FOOT.

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