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## Terrestrial Vertebrate Families on Noah's Ark

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## Abstract

One of the central challenges faced by young-Earth creation researchers who believe the Bible to be the inerrant Word of God is defending the Biblical claim that two of every kind of *nephesh* animal was saved from the great flood on Noah's ark. Recently, *Answers in Genesis* became involved in the design and construction of a full-sized, authentic replica of Noah's ark. They have endeavored to be as accurate as possible in presenting the number of kinds that would have needed to be on the ark in order to have the diversity in species that we observe today. In order to expand creationist's understanding of the animal "kinds" and their relation to Noah's ark, this thesis 1) estimates a minimum number of 1438 animals, representing 719 terrestrial vertebrate families from Classes Mammalia, Aves, and Reptilia; and 2) describes many of the characteristics of those kinds which may have been on the ark. As a result, a better understanding of both the contents of Noah's ark and the meaning of the word *min* as it relates to the flood narrative are possible.

## Terrestrial Vertebrate Families on Noah's Ark

The account of Noah's ark in Genesis 6-8 is one of the most widely known passages of Scripture. Children are taught the familiar tale of God's destruction of the earth with a global flood at a very young age in Sunday schools, and fanciful drawings of a small and often "cute" ark with human and animal heads popping out of the windows are a familiar sight to people of diverse beliefs and cultures. Much of the world calls this Biblical account a myth and instead believes the secular story of competition, survival, and extinction promoted through old-age geology and biological evolution. Moreover, skeptics assert that the ark is an impossible solution to the destruction of the world. Arguments are often repeated against the possibility of one boat carrying two of every terrestrial animal species alive today. Noah's ark, however, was a massive structure that had the ability to hold many different animals of different shapes and sizes, and the feat of carrying two of every terrestrial animal becomes more feasible when considering the taxonomic data that evolutionists and creationists alike have been collecting. By looking at the same data that evolutionists use to compare close "relatives" among species, a creationist and believer in the global flood can gain a more realistic number of animals that would have been needed on the ark.

Here I present data that have been collected from primary and secondary sources in a manner that will further the research on the number of animals that would have needed to be on the ark. The research was performed by using one of the most complete taxonomical records to date of both extinct and extant vertebrates that is found in the book *Vertebrate Paleontology and Evolution* by Robert Carroll (1988). While many discoveries have been made since the compilation of this record, the comprehensiveness

of the listing was the best for the purpose of this research. This text, as well as other sources on mammals, birds, the dinosaurs, and other extant and extinct organisms, was used for an estimation of the number of terrestrial vertebrates that would have been housed on the ark, and to serve as a guideline for descriptions of the lesser-known extinct animals. First the background of this study (and past ark research) will be presented, and then the description of the groups of animals that were possibly on the ark along with the number of terrestrial families in each category will be discussed.

### **Statistics of the Ark and Flood**

To preface the presentation of research results and an overview of the types of animals that would have been on the ark, the size and feasibility of the ark is an important foundational issue. In order to defend the possibility of an ark being built for a flood of global magnitude, Biblical apologists have taken the information that is found in the book of Genesis and translated the data into modern terminology. For example, according to the text in Genesis 6, the ark was 300 cubits in length, 50 cubits in width, and 30 cubits in height. Since this measurement system is no longer employed, the statistics must first be converted so that their meaning becomes clear. The Scriptural account provides the details in a manner that the people of the time were able to understand.

In order to provide contextual data for the research that was performed, a brief survey of the studies performed on the ark's specifications is needed. Whitcomb and Morris (1961) provide numerous detailed arguments for the accuracy of the Biblical account of the flood by looking into the size of the ark and the possibility of an ark of such proportions being built by a few people without modern technological aids. The text shows that there are several different modern lengths that can be attributed to the word

cubit that is used in Genesis 6:15. The lengths noted range anywhere from 17.5 inches to 20.65 inches. Another study into the size of the ark has shown that other structures, such as Solomon's temple, that were made according to the specifications of God used the "long cubit" which is between 19.8 and 20.6 inches (Lovett & Hodge, 2010, p. 26). In order to avoid criticism alleging that the estimate of the size of the ark is too large, the calculations were done using the smaller cubit size of 17.5 inches (Whitcomb & Morris, 1961). The main concern for the animals that were to be put on the ark would have been the amount of room that they had in the form of surface area and volume. These measurements were estimated to be about 95,700 square feet for the surface area of the three decks, and a volume of approximately 1,396,000 cubic feet (1961). This massive floating structure would have been able to hold a very large number of animals.

Further recent research into the size and shape of the ark has shown that the ark was also very seaworthy despite its large size. In fact, the dimensions are very similar to modern cargo ships (Lovett & Hodge, 2010). The balance of the dimensions between stability, comfort, and strength insinuate that the dimensions are based on a well-engineered design rather than folklore. The ship would have been able to withstand high waves, and with a possible modification of a keel and wind sail, the ship could have oriented itself with the wind in order to hit the waves in a smoother fashion (2010). The ark was not a wooden box that would have been a danger to the inhabitants, but was a rather well built and safe sea vessel that may have been a precursor to other ancient ship designs.

Previous research suggests that the ark not only could have fit a large number of animals, but also that there would have been enough extra room to store the needed water

and food that Noah's family needed for their own sustenance as well as that of the animals. Woodmorappe (1996) performed a feasibility study of Noah's Ark in which he performed detailed evaluations about whether the ark could have held and supported the ancestors of the variety of life we see today, as well as if such few animals could have repopulated the world. Many of the current creation researchers agree that both scriptural and biological evidence show the identity of the meaning of created kind to be somewhere around the family or subfamily level for most species (Jones, 1972; Scherer, 1993). This greatly narrows down the number of animals that would have needed to be on the ark. In fact, some believe the number to be as small as 2000 animals (Woodmorappe, 1996).

Woodmorappe (1996) also showed that even if the created kind is found to be equal with the genus level, there would still be enough room on the ark for every animal; especially if juveniles were used to save space. In fact, his generous estimate of 16,000 animals (8,000 pairs) was still feasible, although conditions would have been crowded and difficult for the inhabitants of the ark. Furthermore, even with the estimate of 16,000 animals, the space needed of the three floors of the ark would have only amounted to about 50% of the total space (1996). This leaves sufficient room for food and water storage as well as room for Noah and his family.

### **Duration of the Flood**

Even with enough space on the ark, an extended period of time in those conditions would have been quite difficult. Furthermore, in order for animals that are semiaquatic to survive without needing the shelter of the ark, the duration would have needed to be within the correct time frame which would vary considerably among groups.

Studies have been performed into the duration of the flood, which provide information on the length of time that the occupants of the ark would have needed to be in the safe confines of the structure. The passage in Genesis 7-8 describes the amount of time, including the days of months, over which the flood occurred. The flood began on the seventeenth day of the second month of Noah's six-hundredth year of life and he left the ark on the twenty-seventh day of the second month of Noah's six-hundred and first year of life (Genesis 7:11 and 8:14, NASB). According to Snelling (2009), who uses Whitcomb and Morris (1961) as a model, a look into the biblical account of the flood shows that from the time the waters began to fall and the door of the ark was shut, to the time God told Noah it was safe to leave the ark, 371 days had elapsed. This time period, the text states, can be broken into two sections which can be simply summarized as the waters rising to remain at flood level, and the waters receding enough for the animals to be able to exit the ark. For the first 150 days, the waters rose and "prevailed" on the earth. For the following 221 days, the waters receded to the extent needed for the repopulation of the earth. After this, the process of diversification that was possible due to the animal kinds who were on the ark was able to begin, and the new earth was ready to sustain life once more.

### **Meaning of the Word *Min***

In order to look further into the number of kinds of animals that would have needed to be on the ark, and a description of these kinds, the meaning of the Hebrew word *min*, which is translated "kind," must first be understood. This research of semantics affects the creation-based biological approach termed baraminology, the study of the relationships of animals in terms of kinds, which finds its root words from *bara*



(create) and *min* (kind). The meaning of *min* can be simply defined as kind, and some literal translations of the word can sometimes go as far as to say species. The term species was originally used because it is Latin for “kind.” However, since species is a concept that was created by human reason in the 18<sup>th</sup> century, the word *min* cannot be defined by the word species. As Ernst Mayr said of the differing opinions of how a species is determined, “It may not be exaggeration if I say that there are probably as many species concepts as there are thinking systematists and students of speciation” (Mayr, 1942, p. 115). While Mayr attempted to create a systematic concept of species differentiation which is widely used today, an exact definition of species has been disputed since its inception and is not agreed upon by either evolutionists or creationists.

The word *min*, while seemingly quite simple in its direct translation, raises many questions about what we can define as a kind in modern terms. This has been disputed and discussed amongst theologians and creationists for some time. The context of the word *min* that will be looked at is taken from the passage in Genesis 6:18-21:

<sup>18</sup> But I will establish My covenant with you; and you shall enter the ark—you and your sons and your wife, and your sons’ wives with you. <sup>19</sup> And of every living thing of all flesh, you shall bring two of every *kind* into the ark, to keep *them* alive with you; they shall be male and female. <sup>20</sup> Of the birds after their kind, and of the animals after their kind, of every creeping thing of the ground after its kind, two of every *kind* will come to you to keep *them* alive. <sup>21</sup> As for you, take for yourself some of all food which is edible, and gather *it* to yourself; and it shall be for food for you and for them. (NASB)

The word *min*, which is found in this passage translated as the unitalicized “kind,” is the same Hebrew word that is used in the creation account to describe how God created every fish, bird, and land animal “after their kinds.” The diverse number of species that we observe today is a result of differentiation and microevolution among the animals that God selected to represent their created kinds on the ark, and those other organisms (primarily marine) which survived the Flood.

One of the simplest ways of attempting to define the word *min* is what is known as a *cognitum* (Sanders & Wise, 2003). A *cognitum* is a concept that is created by people in attempting to group things together logically and not necessarily scientifically. The basis of this approach is that God used the term *min* because of the simplicity of its meaning. The definition of *min* is simply how the average person or “proto-scientific” person typically categorizes animals logically (P. J. Williams, 1997, p. 344). Sometimes the *cognitum* is more broad or narrow than what would define a *min*, but people usually classify animals in their own minds based on observable similarities and differences (Lightner, Hennigan, Purdom, & Hodge, 2011). To some extent, a *cognitum* is used by all scientists who attempt to classify an animal. Before doing a statistical analysis, they use their cognitive abilities to determine to which species the organism should be compared.

### **Determining the Level(s) of Baramins**

Ernst Mayr's Biological Species Concept, which defined a species based on their reproductive abilities to produce a fertile offspring between other members of the group (Mayr, 1942), is similar to the concept that is used by many to determine what taxonomic range is included in a baramin (created kind). One such way to determine members of a baramin is by observing and recording the ability of two species to reproduce even if the

offspring is sterile (Lightner, et al., 2011). According to Frank Marsh's (1941) definition of a created kind, "Two organisms are members of a kind if their germ cells will join in true fertilization" (p. 169). Furthermore, Siegfried Scherer (1993) noted that if two organisms are unable to meet the criteria described by Marsh, but they are both found to interbreed with the same third organism, all three are logically part of the same kind. These ideas and definitions were compiled by Todd Wood, et al., (2003) in their work entitled "A Refined Baramin Concept." In this article, the researchers compiled theories that had been made pertaining to baraminological research and used the theories to refine the meaning of baramin by focusing solely on similarities and theoretical baramin constructs based on these similarities (Wood, Wise, Sanders, & Doran, 2003).

A significant separation of two species from mating for a long enough period of time could lead to significant changes in DNA which would lead to sterility upon reproduction. Species are not generally defined in this manner because most taxonomists are attempting to identify or separate animals into new and different species. In contrast, creationists desire to see which species were able to mate with other species within the last few thousand years. Examples of the types of animals that could be combined into a baramin but are not defined as a species include some very familiar and some quite unique animals. Probably the most familiar example is used by Lightner, et al. (2011) to describe the complexities of reproduction between species in discussing the cross between a horse and a donkey to produce a mule. The resulting hybrid mule is usually sterile, but the cross-breeding demonstrates that donkeys and horses may have belonged to a single species at one point, but have diverged as a result of mutations and geographical separations since the flood. This phenomenon is also observable between

cows and buffalo (beefalos), lions and tigers (ligers), and even marine iguanas with land iguanas (Alberts, 2004). Furthermore, some animals are able to mate, but after conception the embryo is unable to survive past a certain point. This is demonstrated by the example of a sheep crossed with a goat. While they are able to fertilize an egg, the resultant life is not able to fully develop (Kelk, Gartley, Buckrell, & King, 1997). Observations such as these show that many species are probably derived from each other, and hence may be in the same baramin, yet they are separate from other baramins because of significant morphological or other differences.

The problem with this definition of species arises when considering the separation into species of fossilized remains that have no scientific historical documentation as to how they mated and what they were actually like. This raises several problems for the taxonomical classification of dinosaurs and other extinct organisms. Through direct observations, creationists are able to determine whether a horse and a donkey would be able to reproduce. This can and does happen to produce a mule as has been shown for many centuries. A comparison of the bone structures of a horse, a donkey, and a mule, without the knowledge that we have concerning their mating habits would result in a conclusion of perhaps three different species of animal. However, the observations that we have show us that the two species and their cross are quite similar, and descended from the same created kind.

Observations concerning the possibility and vitality of offspring between two species are not possible from the fossil record. This limits the evaluations of baramins that are now extinct, both in terms of the number of now-extinct baramins and the number of extinct animals that would be a part of baramins (both extant and extinct). Any

character data that have been collected do not give researchers an understanding of the behaviors and fertilization abilities of the organisms. Comparisons between dinosaurs, for example, are based solely on fossil data, which can give scientists an idea of how closely they are related to each other (from similarities in skeletal structure, for example), but are inherently more limited in classifying animals within species or baramins.

### **Baramin and Species Analyses**

A specific example of several different specimens that can be placed into a baramin can be seen as a result of our knowledge of the domestication and artificial selection of dog breeds. An often used example by Ken Ham is the existence of speciation through mutations in dogs which cause them to have the massive variance that we observe today (Lovett & Hodge, 2010). According to Jensen (2007) dogs can trace their lineage back to wolves, and the different types of dogs that exist today are a result of domestication and selective breeding over thousands of years. Indeed, most dog breeds are even more recent, with lineages tracing back only to the late 18<sup>th</sup> and early 19<sup>th</sup> centuries in Europe. This genetic modification, which has been observed and duplicated by humans for thousands of years, is just one example of the kinds of diversity that can result from a single created kind in a relatively short amount of time.

Another example of several species that can be condensed into a baramin, or in these cases even a single species, has been found recently in studies of different dinosaur species and characteristics. As noted above, one obstacle to determining which groups of extinct animals are species or baramins is that one cannot observe the reproductive capabilities of fossilized skeletons. The characters can be observed and compared, but there is no way of knowing with certainty if an observed difference has been caused by

speciation or by other morphological differences such as sexual dimorphism (different characters between genders of the same species) or ontogenesis (drastic changes in characters as a result of aging). Sexual dimorphism is observed in species alive today, such as *Odocoileus virginianus* (white-tailed deer), in which the males have antlers and the females do not. This change is observable since we can see the differences between a male and female deer and we have been able to study their entire anatomy. However, it is possible that other drastic changes could be observed and misinterpreted as different species if only the fossil remains are available when it is actually a single species with sexual dimorphism.

One of the dinosaurian examples of a possible single species being confused as several species is that of *Corythosaurus casuarius*. Peter Dodson, a paleontologist who has done extensive research into the morphology of both horned and duck-billed dinosaurs, has argued that several members of the same genus which were previously thought to be separate specimens are actually male and female morphologies of the same species. His argument is that many times sexual dimorphisms get lost in the attempt to use taxonomy and character analyses to classify fossils. Among his findings, females are usually similar to males, but males have certain characteristics that are more defined and elaborate (Dodson, 1975). From a creationist perspective, this argument not only lowers the total number of extinct species that are found in the record, but it also shows that without a living specimen, fossils may be difficult to define taxonomically. This happens not only with sexual dimorphisms, but also with age in ontogenesis.

An example of ontogenesis can be found in the bone structure of human beings throughout the life-span. Ontogenesis in human bone structure happens rather rapidly in

children and adolescents and is not very noticeable as adults continue to age. Many minute changes in skull structure have been noted with age in both the spongy tissue and the compact bone structures. One example of this is noted in the facial structures of humans as they age. A recent study concluded that facial aging observed in humans is not just caused by changes in the skin, but also in the underlying bone structures of the face such as in the orbital and maxillary regions (S. E. Williams & Slice, 2010). If these minute changes happen in all humans depending on their life spans, then it is possible that changes may occur to the same or greater extent in other specimens.

An example of ontogeny from the animal kingdom is found in the bird known as the cassowary found in Australia. The discoverer of possible ontogenesis among dinosaurs, John Scannella, uses the cassowary as an example to show that some animals develop rather protrusive features later in development and this happens sometimes quite suddenly. Cassowaries develop a large bony head shield, which is the distinguishing feature of the bird, at the end of their adolescence and this characteristic is present in multiple varieties of cassowary (Romer, 1997). Had the cassowary been initially discovered as fossilized remains, the adolescent and adult varieties would have probably been classified as different species altogether.

Just as was mentioned above with the recent discoveries of genera that could be condensed from two or more species into a fewer number of species due to the presence of sexual dimorphisms, the same can be shown with ontogenesis. The goal of research done by John Scannella and Jack Horner was to investigate speculations that the ceratopsian genus *Torosaurus* was actually the more mature version of the well known genus *Triceratops*. Their research shows that after studying the fossil skeletons of many

different specimens of *Triceratops* and *Torosaurus*, the defining characters of *Torosaurus* seem to be the result of ontogenesis in *Triceratops*. The lengthening of the frill and the forward turning of the horns in aging *Triceratops*, when continued, would result in the skull structure of *Torosaurus*. This theory is supported by evidence that more bone remodeling had occurred in *Torosaurus* than even the oldest of the *Triceratops* specimens (Scannella & Horner, 2010). This evidence shows that even some of the best known species of dinosaurs still have mysteries that can only fully be known if a living specimen were available for study. The actual number of species, genera, or even families may require additional re-analysis. However, the numbers can be estimated to an accurate enough value that will help further baraminological research in conjunction with Noah's ark.

### **Description of Extinct and Extant Vertebrates**

Following the above excursions into the biblical and scientific issues surrounding the understanding of animal "kinds," I return to the primary task of this thesis: an estimation of the number of organisms carried aboard Noah's ark. In the following sections, details are given for groups of animals that may have been present on the ark. Most of these descriptions group similar families that are typically allied at the ordinal level, while some of the more interesting varieties will be described at the family level. A full list of the families mentioned is provided in the appendix. This list has been derived mainly from Carroll (1988) with a few recent discoveries being added.

The focus of the tabulation will be on the families within the classes Mammalia, Aves, and Reptilia. According to the text of Genesis 7, God brought to Noah two of every kind of beast, cattle, creeping thing, and bird and they were put on the ark (vs. 13-14).



This includes all of the animals that are air breathing and land dwelling. Amphibians are not included in this list because of their ability to survive on land and in the water. At least a period of each amphibian's life takes place in the water and each would have had the ability during that stage of life to survive the flood. Furthermore, fish would have been able to survive the flood because of their ability to extract oxygen from water, thus excluding them from the air-breathing animals on the ark. According to Whitcomb and Morris (1961), the extent of the death caused by the flood included every air-breathing animal except those that were placed on the ark. The animals that are included in the description and tabulation may not be completely up to date and accurate due to the ever-changing process of the classification of animals, but the main goal is to attempt to estimate what animals were included in the beasts, cattle, creeping things, and birds.

### **Class Mammalia**

**Order Monotremata.** Within this order are two families that include the modern platypus and echidna. These families are a few of the extant non-eutherian mammals. These unique animals, especially the platypus, have left evolutionists unable to determine how they evolved (Lillegraven, 1979), which is expected if they were created kinds and here supports the "kind" defined at the level of family.

**Order Triconodonta.** Triconodonta is a group of five families that is typically viewed by evolutionary paleontologists as some of the earliest mammals. These families are grouped together based on their unique jaws and teeth. They share the characteristic of molars with a tricuspid alignment. The most well known example of a triconodontid is the now-extinct *Morganucodon* who is typically considered (in old-Earth views) as the most primitive mammal (Lillegraven, 1979).

**Order Docodonta.** This order is not very diverse or well known, but it can be separated from other orders based on its molar teeth structures. The order is only made up of one family, Docodontidae (Carroll, 1988).

**Order Multituberculata.** These specimens are a part of the subclass Altheria. There are estimated to be 14 families within Multituberculata. They are named for their unique teeth which have multiple “tubercles,” and were mostly about the size of a rat. The members of this order of mammals are all extinct and many of them lived in North America. The largest of the multituberculates was known as *Taeniolabis*, and was about the size of a beaver. These types of mammals probably ate mostly plants but some may have been partially carnivorous (Janis, Gunnell, & Uhen, 2008).

**Order Symmetrodonta.** Once again, these mammals are named for their tooth structures since they have almost symmetrical upper and lower molars that have a unique triangle shape. Three families are recognized within this group. This order, much like the rest of the orders discussed thus far, were small (rodent sized). The most well known genus within the symmetrodonts is *Spalacotherium*. All members of Symmetrodonta are extinct (Carroll, 1988).

**Order Eupantotheria.** Eupantotheria, another group of mammals recognized by their jaws and teeth, contains 4 known families. These mammals are known for significantly wider upper than lower teeth and a similar triangular shape as that of symmetrodonts. Many of these species are only known from the jaws and teeth that have been found. One of the known specimens is *Amphitherium* (Carroll, 1988).

**Theria of Metatherian-Eutherian Grade.** Some families are related informally to each other in different kinds of assemblages, especially if little is known about their

morphology. Three families are grouped together and known as “theria of metatherian-eutherian grade.” These mammals cannot be classified as either marsupials or placentals and are thus described separately. *Deltatherium* is one of the most well known of these families and has been described based on a nearly complete skull found in Mongolia (Carroll, 1988). The skull structure sets these mammals apart from others of similar size and shape.

**Order Marsupalia.** It is thought by evolutionists that marsupials and placentals evolved around the same time from a common ancestor in the therians of metatherian-eutherian grade, likely during the Cretaceous period, because of their distribution patterns in the late Cretaceous. Within this order can be found, according to Carroll (1988), 29 different families. Marsupials are distinguished from placentals in the fossil record due to the reflected angular processes on their jaws (Carroll, 1988). In modern marsupials, the presence of a pouch and the very early developed state of newborns is the main distinguishing characteristic. In the Americas, one of the most common marsupials is the opossum, from the Family Didelphidae. In Australia, one of the most recognizable marsupials is the kangaroo from the Family Macropodidae.

**Order Apatotheria.** This order is comprised of one family, Apatomyidae, and begins the classification of mammals known as Eutheria. Little is known about these mammals but they have been described and characterized in Janis, et al. (2008) to some extent as having a lack of an ossified bulba in its cranium and a grooved astragalus in its legs. The exact ordinal location of this family is still disputed as can be seen in the discrepancies in the classification location between Carroll (1988) and Janis, et al. (2008).

**Order Leptictida.** This order is known mostly from jaw and skull remains, but some complete skeletons have been discovered. There are three families listed within this order that share some characteristics. One such of these characteristics is that of a triangular exposure of the parietal bone of the skull on the occipital surface of the skull (Carroll, 1988). One genus, *Leptictis*, is thought to have been insectivorous and the families may need to be classified in a different order altogether due to its similarities to other insectivoran mammals such as their dentitions (Janis, et al., 2008).

**Orders Pantolesta, Scandentia, Dermoptera, and Macroscelida.** These groups are quite different orders that do not have much diversity within their families. Pantolesta contains an estimated three families and they are known from the representative genus *Pantolestes*. These mammals may have been semiaquatic and they appear to be predominantly piscivorous (Carroll, 1988). Members of the order Scandentia are known as tree shrews such as the living *Ptilocercus*. Scandentia contains one family, and is comparable to squirrels in size and ecology, but they are distinct in characters from any other order. Order Dermoptera is made up of four families and is known as the flying lemurs because of the presence of a gliding membrane that connects the limbs to the tail. The living genus, *Cynocephalus*, is similar in appearance to lemurs (Carroll, 1988). Finally, Macroscelida consists of one family of small mammals that live in Africa and are known as elephant shrews (Carroll, 1988).

**Order Insectivora.** One of the most diverse mammalian orders is Insectivora. There are 14 families estimated to be within the Insectivora and one more family that is unnamed. A familiar family within this order is that of Erinaceidae, best characterized by the living genus of European hedgehog, *Erinaceus*. Shrews, from Family Soricidae, are

also members of Insectivora. Some of these small mammals have the ability to secrete an immobilizing toxin (Janis, et al., 2008). One way to define this order is by the characteristics of a small body, eyes, ears, and brains, along with elongate snouts. The insectivores are also similar in their dental patterns which allude to their diet on insects. Many of the other families within Insectivora are loosely related and do not share many of the same characters (2008).

**Orders Tillodontia, Pantodonta, Dinocerata, and Taeniodontia.** Carroll (1988) mentions these four orders as those that represent the mammal radiation. This is viewed in evolutionary terms, but the similarities of the orders are still notable. Altogether, 14 families belong to these orders and have quite different characteristics. Some of the taeniodonts are compared to the living opossum but are slightly larger in size. They may have climbed and burrowed to an extent as well. Tillodontia and Pantodonta are known for their larger builds and herbivorous diets. They ranged from the size of a rat to the size of a rhinoceros. Furthermore, the Dinoceratans were the most unique in that they were rather large in size and had a skull with many bony protuberances (Carroll, 1988).

**Order Chiroptera.** Chiroptera, otherwise known as bats, is one of the most diverse orders of mammals. It is made up of 11 different families that are quite separate from other families of mammal due to one key feature. The distinct characteristic of this order is their ability of powered flight. They are also typically insectivorous and nocturnal (Janis, et al., 2008). The bats are divided into Megachiroptera and Microchiroptera. Megachiropterans, known as fruit bats, are represented by one family, Pteropodidae. They are separated from the ten families of microchiropterans who are known for their insectivorous diets and use of sonar to hunt their prey (Carroll, 1988).

**Order Primates.** Order Primates contains 26 families and includes species as diverse as lemurs to humans. We are able to definitely distinguish one baramin in this order due to the specificity of the Bible when it says that Noah and his family, who were humans, were saved from the flood. The other members of this order are known due to their relatively large braincases and the uniqueness of their dental patterns (Carroll, 1988).

**Orders Creodonta and Carnivora.** Surprisingly, there are only two orders that contain the carnivorous terrestrial mammals. These include the orders Creodonta and Carnivora. The extinct Creodonta was made up of animals from the size of a small cat to that of a lion (Janis, Scott, & Jacobs, 1998). The two families within the order share a distinction from Carnivora due to the location in the jaw of shearing teeth, known as carnassials, and the absence of crushing or grinding teeth. Carnivorans have these grinding surfaces in their mouth and are represented by many living species. The 10 terrestrial families are diverse in size and features and range from coyotes and wolves, to weasels and snow leopards, and all other living terrestrial carnivorous mammals (Carroll, 1988). Within the family are five semiaquatic families that include animals such as seals and walruses, which can stay in water as long as they do not need to molt, mate, or give birth. These animals should have been able to survive the flood due to their reliance on sea life for food and the appearance of the mountain tops at day 224, which was 147 days before the end of Noah's time on the ark (Whitcomb & Morris, 1961). The mountain tops would have been sufficient enough for the semiaquatic organisms to return to land to meet their terrestrial needs, especially given many species' preference for rocky coastal areas.

**Orders Anagalida, Rodentia, and Lagomorpha.** These three orders are often compared to each other. This is due to their relatively small size and similar herbivorous diets. The first, Anagalida, is made up of 4 families and was once mistaken for tree shrews due to limited fossil knowledge of the extinct animals. Once again, the order is distinguished mostly by their jaw structure and the worn teeth that may have been caused by dirt from digging for food (Carroll, 1988). Rodentia is the most diverse of the mammalian orders. Most are small, but some can be large such as the extinct *Eumegamys*. Rodents are divided into four main subgroups due to their differences in jaw musculature and the configuration of the jaw and skull as a result. The “primitive” rodents share either the characteristic protrogomorphus pattern of jaw muscles, seen in the extinct Paramyidae, or the sciuriform pattern, seen in Sciuridae (squirrels). Porcupines have the jaw pattern known as the hystricomorphous condition while rats and mice have the myomorphous condition of jaw muscles. Rodentia is comprised of 48 different families (Carroll, 1988). This makes the number of animals on the ark jump rather drastically; however, due to the small size of most of these mammals, like mice and rats, they would have been housed easily. The Lagomorphs are well known from their living members, the rabbits and hares. The order is divided into two families, and the diversity of this order is much greater in the fossil record than today (Carroll, 1988).

**Order Condylartha.** The extinct order of Condylartha has the characteristic of containing both omnivores and herbivores. The diversity of this order is shown by the presence of ten different families within the order. The earliest of these animals is *Protungulatum* and is distinguished, like the rest of the order, by jaw and tooth patterns as well as the evidence of a unique diet of insects and plants (Carroll, 1988). The

uniqueness of the families suggests that the order could not be grouped more closely as a baramin as may be possible for some other orders.

**Ungulates.** The next large classification of mammals is the ungulates, which are identified due to their hooved toes. Many orders are included in or compared with the ungulates. The first, and most diverse, of these is Order Artiodactyla. The 31 families show a wide ranging variety of characters and sizes that can be seen in the large number of extant genera (Carroll, 1988). These animals have a long history of domestication and were an important part of the survival of the human race. The types of animals range from a hippopotamus to a giraffe and share the characteristic of having an even number of hooved toes. Certainly many of the baramins within this order that were taken on the ark would have been distinguishable, as would the size of their living space allotments. Giraffes are a part of the artiodactyls, as well as Hippopotamuses which shows that some of the areas needed to be either high or wide (though some fossil species of both of these groups were smaller than extant members, reducing the needed space on the ark). The family Merycoidodontidae contained animals that were about the size of pigs. Also, Family Antilocapridae is represented today by the pronghorned antelope. The artiodactyls also include camels (Camelidae), and mountain goats (Bovidae). The extinct Order Mesonychia resembles ungulates in almost every way, but the sole family was made up of likely carnivorous mammals (Carroll, 1988).

**Orders Perissodactyla and Proboscidea.** Another ungulate order is Perissodactyla, which is identified by an odd number of hooved toes. The 15 families of the order are slightly less diverse than that of the Artiodactyla but still contribute to the vast diversity of medium to large mammals we see today. Perissodactyla is comprised



primarily of animals that are similar to horses, tapirs, and rhinoceroses (Carroll, 1988).

The elephants are a part of a separate order of ungulates known as Proboscidea. The African and Asian elephants, along with Pygmy elephants, are the only living species from this unique order, although at one time there was a diversity of eight different families (1988).

**Orders Desmostylia, Hyracoidea, Embrithopoda, and Tubilidentata.** The next four orders are not very diverse; however they have quite unique features that separate them from each other. The first, Desmostylia, is comprised of one extinct family that may have been a marine mammal. This is thought due to its paddle like hands and feet and location in marine deposits (Carroll, 1988). Members of the Hyracoidea, of which there are three living genera, are rabbit-like in appearance and belong to two families. Embrithopoda is an order that is comprised of one family in which is found an extinct animal that is similar in size and shape to an elephant yet different in skull structure, *Arsinoitherium*. The skull contains four bony processes, two large and two small, on the face of the animal much like a rhinoceros. Lastly, Tubilidentata, an order which includes the modern armadillo, is made up of one family whose members are known for their digging ability and insectivorous diet (1988).

**Orders Notoungulata, Litopterna, and Xenungulata.** Continuing the line of ungulate orders is the order Notoungulata. These extinct animals are found in South America and share the character of a unique and particular pattern of molar cusps. The 14 families are different in body forms from each other, and size ranges from rabbit sized to hippo sized (Carroll, 1988). Animals in the order Astrapotheria are an extinct group of animals divided into two families. The skulls were domed in appearance and their bodies

were up to three meters in length. Members of Order Litopterna are split into 4 families, all of which are extinct. Some families were horse-like while others were camel-like in appearance. Order Xenungulata is native to South America, and it is comparable to many other orders from other continents. The extinct order, which is made up of one family, is distinguished by its unique combination of teeth as compared to other orders. Another extinct order of ungulates is that of Pyrotheres. The order contains two families that have long and large bodies with limbs similar to elephants. The skull also had tusks and teeth that are reminiscent of elephant features (1988).

**Orders Xenartha and Pholidota.** The final two orders of mammals are grouped together as edentates, or toothless mammals. The first is order Xenartha, which is made up of 11 different families. This order has many living examples such as the sloths, anteaters, and armadillos. These animals appear quite different, but they all share the characteristics of a similar pelvic girdle. Also, they each have unique characters and behaviors such as the armadillo's armor and the tree sloth's inability to hold itself up while walking on the ground. Finally, the Pholidota is an order that is made up of one family and has seven living species of pangolins today. These mammals often live in trees but most of them also have limited subterranean abilities that they use to scavenge for food (Carroll, 1988).

Of the many families within the Infraclass Eutheria, three families cannot be placed into orders. One of these families remains to be named and thus is not completely defined (Carroll, 1988). These families are reminders of the difficulty of placing extinct vertebrates into defined taxonomic classifications due to the lack of knowledge of their physiologies.

### **Class Aves**

The animals that are classified as Aves, or birds, are divided into two subclasses and four main superorders that will now be discussed in brief detail. Two of the bird families belong to Subclass Archaeornithes. Perhaps the most primitive of the birds is Archaeopteryx of Family Archaeopterygidae. While the classification of this bird has proven to be difficult for paleontologists, it is generally accepted as a part of class Aves. Archaeopteryx is known for its teeth, S-curved neck, and long bony tail. A further example of an extinct family of birds that has only been known for a few decades is Confusiusornithidae. Their fossilized remains, which range from about the size of a starling to a rook, are widely found throughout China and have the characters of a horned beak with large nostrils (Benton, 2005).

The rest of the bird families belong to Subclass Neornithes. Superorder Odontognathae is broken up into two orders, Hesperornithiformes and Ichthyornithiformes that contain three and one family respectively. These extinct birds are named due to the presence of teeth in their jaw. Some of the unique characteristics of the families in this superorder are the absence of wings altogether in some species as well as the marine location of the majority of the fossils. This seems to suggest that *Hesperornis* was a diving bird that used its feet as paddles as it hunted for food (Carroll, 1988). Two other extinct orders of birds belong to a superorder classified as incertae sedis (uncertain placement). Being made up of 3 different families, this group of birds is not very diverse and is only known from *Gobipteryx* and *Enantiornis*. These species were able to fly, unlike the previous superorder, and they shared the characteristic of having teeth (1988).

The remaining birds to be discussed are classified into two other superorders of which there are living examples. The first of these is the Superorder Palaeognathae. This group is distinguished by a palate that is much more immobile than other birds. There are five orders of Palaeognathae that contain living specimens, and of these five orders only one has the ability to fly. This order, Tinamiformes, is made up of only one family and is the only bird order in Palaeognathae that is not classified as a Ratite. The remaining four extant orders and two extinct orders classified as ratites, and are flightless birds with the same characteristic palates. The eight total orders contain 11 total families. Some of the living representatives of this superorder are rheas, cassowaries, emus, kiwis, and ostriches (Carroll, 1988).

The final superorder of birds is the largest in both diversity and number of families. This group, Neognathae, is characterized by its more mobile palate structure and contains mostly flying birds. All remaining extant species of bird and many more extinct species are found within this large superorder. In fact, the group is made up of 24 different orders and an estimated 121 families. One of the more notable orders that show the diversity of Class Aves are the pelicans, or Pelecaniformes, of which there are 7 families that have long beaks with throat pouches, and can stay in flight for extremely long periods of time. On the opposite side of the Aves spectrum is the penguins (Sphenisciformes), which are unable to fly in the air, but have large flight muscles that give them the ability to fly underwater (Carroll, 1988).

Class Aves also contains a large diversity in the relative sizes of birds today. For example, the largest living bird, according to wingspan of around ten feet, is the wandering albatross from Family Diomedidae. This bird spends most of its life at sea so

it may have actually been able to survive the flood without the aid of the ark, along with other members of the four families within Order Procellariiformes. The group of birds containing the world's smallest members, Family Trochilidae, is known as the hummingbirds (Carroll, 1988). The hummingbirds surely would have needed to be on the ark, but they would have taken up little space compared to some of the other avian varieties listed in the appendix.

### **Class Reptilia**

Class Reptilia is divided into 4 subclasses, three of which are based on skull structure and the other being the unique subclass of turtles, or Testudinata. This section will deal briefly with the major characteristics of each subclass and will focus on the characteristics of the different dinosaur orders and families due to skepticism that exists against the ark being able to hold dinosaurs. The diversity of the reptiles is profound and little is known about the actual relations of many of the dinosaurs, but a brief overview will establish an estimated number of reptiles that would have needed to be carried on the ark.

To begin with, in order to eliminate the reptiles that were not on the ark, the marine reptiles are addressed first. The first of these is found in the single family from the Order Mesosauria in the Subclass Anapsida. Within the Subclass Testudines is the order Chelonioidae, known commonly as the sea turtles. To this order belong six families which can be eliminated from the ark. The next order to be eliminated due to its marine lifestyle is that known as Thalattosauria, which contains three families. Furthermore, the family Mosasauridae was composed of completely marine reptiles as part of the squamate order. The sea snakes are found in the family Elapidae, within the Suborder Serpentes.

Also, the Superorder Sauropterygia contains the Nothosauria and Plesiosauria which can be set aside as ten families of marine reptiles. The marine crocodile-like reptile families known as Teleosauridae and Metriorhynchidae are also excluded from the ark. The four families that are a part of Placodontia were also marine and thus able to survive the flood without the aid of the ark (Carroll, 1988). Finally, the nine families within the Order of Ichthyopterygia were marine animals that resembled fish or dolphins in their outward appearances, especially their thunniform body shape (Benton, 2005). These families, while quite diverse, all share the ability to survive in marine environments for an extended period of time.

The first terrestrial reptiles discussed are the Subclass Anapsida. These reptiles all share the characteristics of not having any temporal fenestrae (Benton, 2005). To this subclass belong two orders, Captorhinida and Mesosauria (already eliminated because it is aquatic). Of the Captorhinida, 11 families have been distinguished including some that are very unusual in appearance such as Pareiasauridae. These reptiles had a wide and relatively flat skull with several bony knobs on different parts of the skull (Carroll, 1988).

The subclass Testudinata is made up of 22 extant and extinct terrestrial families. The characteristics of turtles are easily recognizable as they have a hard carapace, or shell, on their backs that is a part of their skeleton, and a plastron on their underside (Benton, 2005), except for in the aquatic family Odontochelyidae which only possesses a plastron. The differences in the kinds of turtles is usually determined by differences in skull, neck, or shell structure (Carroll, 1988).

The third and largest subclass of the reptiles is that of Subclass Diapsida. These reptiles are grouped together due to the presence of two temporal fenestrae in their skulls

(Benton, 2005). The animals in this subclass are very diverse, which is seen in that all extant reptiles, except for the turtles, have a diapsid skull condition. The first four terrestrial orders are extinct among the diapsids. These orders are Araeoscelida, incertae sedis, Choristodera, and Eosuchia. Eleven families are classified under these orders and are each diverse with relatively little known about their structures (Carroll, 1988).

Reptiles belonging to the superorder Lepidosauria include most of the living species of reptiles we see today. The first of these are those belonging to the order Sphenodontida of which the only surviving genus is *Sphenodon*, or the tuatara. Originally, there were three families within the Sphenodontida class. The rest of the Lepidosauria belong to the order called Squamata. This includes all of the lizards and snakes that we see today. Lizards are classified as part of the Suborder Lacertilia, while Snakes are classified according to the Suborder Serpentes (Carroll, 1988). Lacertilia is divided into 38 terrestrial families and Serpentes is divided into 17 terrestrial species. This would make up much of the diversity on the ark as far as reptiles are concerned and results in the diversity that we know today.

Continuing in the diapsid skull condition is the Infraclass Archosauromorpha. Within this group are the three orders that are similar to crocodiles, dinosaurs, and pterosaurs, yet they contain five families that are not classified as a part of any of those groups. These orders, Protorosauria, Trilophosauria, and Rhynchosauria are unique from the previously mentioned groups because they have characteristic thecodont, or socketed, teeth as well as other important Archosauromorph features (Carroll, 1988).

The Superorder Archosauria includes all modern crocodiles as well as extinct crocodiles, dinosaurs, and pterosaurs. Altogether, the Archosauria contains 94 different

terrestrial families. Of these there are 28 different terrestrial families within the Order Crocodylia, nine within Order Pterosauria, and 44 different families of dinosaurs (Orders Saurischia and Ornithischia).

The dinosaurs are classified into two orders due to their differences in pelvic girdle structure. Example of Saurischian dinosaurs would be the carnivorous *Tyrannosaurus* of the family Tyrannosauridae (Suborder Theropoda), or the immense, long-necked *Brachiosaurus* of the family Brachiosauridae (Suborder Sauropodomorpha). One of the families that was mentioned in the above discussion of morphological differences among dinosaurs was that of Ceratopsidae, which is a part of the Order Ornithischia (Carroll, 1988). Other ornithischian dinosaurs include the heavily armored *Ankylosaurus* (Family Ankylosauridae) and the hard headed *Pachycephalosaurus* (Family Pachycephalosauridae) (Benton, 2005).

The final subclass of the Class Reptilia is Synapsida, which is characterized by the presence of a single temporal opening in the skull between the jugal, postorbital, and squamosal bones (Benton, 2005). This subclass includes 55 families of extinct reptiles. Some of these animals, such as those belonging to the order Pelycosauria have very unique neural spines that form a sort of sail on their backs. Others, such as those belonging to the suborder Cynodontia had large canine-like teeth and were very heavily built (Carroll, 1988).

Other members of Synapsida are the cynodonts which include a variety of ten different families. Research shows that many of the skull features of the cynodonts are similar to mammalian characters including the enlarged nasal bone and flaring zygomatic arches. Evolutionists interpret these similarities as evidence for a relation between the



two groups. Also, the members of Suborder Gorgonopsia are carnivorous and had long fangs and a large range of jaw motility which made it possible for them to feed on thick-skinned prey (Benton, 2005). These reptiles show that a large amount of diversity would have needed to be on the ark, but none of these wide ranging synapsid reptiles are alive today.

### **Conclusion**

The previously described orders, families, and other classifications serve as an imperfect frame of reference for researchers, from creationists to evolutionists alike, in their attempts to put order to the vast diversity that we see before us in the animal kingdom. The taxonomic locations of the vertebrates have changed and will continue to change as more information is discovered and presented, so the exact number of created kinds and the exact number of ark kinds will not be able to be precisely determined. Especially due to the limited knowledge that we have of certain extinct species, an approximation, using the family as a proxy for the "kind," is the most useful and feasible.

The results of the estimation that was completed show that as of the 1988 list of genera, there were approximately 719 families within the classes of Reptilia, Aves, and Mammalia that would not have been able to survive the global flood without the aid of Noah's Ark. Of these families, 139 belonged to Class Aves, 259 belonged to Class Reptilia, and 321 belonged to class Mammalia. Within Class Reptilia, 37 of the families listed by Carroll were excluded due to their aquatic abilities. Within Class Mammalia, 29 of the families were excluded due to their aquatic abilities. This estimation shows that, assuming each animal had at least two of every kind on the ark, a minimum of 1438

animals would have needed to be on the ark. This does not include the extra animals that were brought onto the ark according to the specifications that God had given Noah.

This process of estimation serves its purpose well, however, as the amount of room for error that has been allowed by the ark feasibility studies of Woodmorappe (1996) shows that a number much greater than the number of families and subfamilies would have been able to fit on the ark. Furthermore, evidence like that presented by Dodson (1975) and Scannella and Horner (2010) challenge the assumptions that have stood for decades about the classification of extinct animals and reveal a need for reevaluation of certain defined species. The research presented here clearly demonstrates that an ark as described in the Bible could easily contain the number of animals estimated here. If the family closely approximates the "kind," then the number of organisms contained is even less than previous estimates.

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## Appendix

## List of Terrestrial Vertebrate Families

\* marine, and not included in tally of ark-borne families

**Class Reptilia****Subclass Anapsida****Order Captorhinida****Suborder Captorhinomorpha**

Protorothyrididae

Captorhinidae

Bolosauridae

?Batropetidae

Acleistorhinidae

**Suborder Procolophonia****Superfamily Procolophonoidea**

Nyctiphruetidae

Procolophonidae

Sclerosauridae

**Suborder Pareiasauroidea**

Rhipaeosauridae

Pareiasauridae

**Suborder Millerosauroidea**

Millerettidae

**Order Mesosauria**

Mesosauridae\*

**Subclass Testudinata****Order Chelonia****Suborder Proganochelydia**

Odontochelyidae\*

Proganochelyidae

Proterochersidae

**Suborder Pleurodira**

Pelomedusidae

Chelidae

Platycheilyidae

Eusarkiidae

**Suborder Cryptodira****Superfamily Baenoidea**

Glyptopsidae  
 Baenidae  
 Neurankylidae  
 Meiolaniidae

**Superfamily Trionychoidea**

Kinosternidae  
 Dermatemydidae  
 Carettochelyidae  
 Trionychidae

**Superfamily Chelonioidea**

Plesiochelyidae\*  
 Protostegidae\*  
 Toxochelyidae\*  
 Dermochelyidae\*  
 Cheloniidae\*  
 Thalassemyidae\*

**Superfamily Testudinoidea**

Chelydridae  
 Emydidae  
 Testudinidae

**Chelonia Incerte Sedis**

Sinemydidae  
 Kallokibotiidae  
 Pleurosternidae  
 Chelycarapookidae  
 Family Undesignated

**Subclass Diapsida**

**Order Araeoscelida**

Petrolacosauridae  
 Araeoscelididae

**Order Incertae Sedis**

Mesenosauridae  
 Coelurosauravidae  
 Drepanosauridae  
 Endennasauridae

**Order Choristodera**

Champsosauridae

**Order Thalattosauria**

Thalattosauridae\*

Askeptosauridae\*

Claraziidae\*

**Infraclass Lepidosauromorpha**

**Order Eosuchia**

Acerosodontosauridae

Younginidae

Tangosauridae

Galesphyridae

**Superorder Lepidosauria**

**Order Sphenodontida**

?Gephyrosauridae

Sphenodontidae

Pleurosauridae

**Order Squamata**

**Suborder Lacertilia**

**Infraorder Eolacertilia**

Paliguanidae

Kuehneosauridae

Fulengidae

Eolacertilia Incertae Sedis

**Infraorder Iguania**

Euposauridae

Arretosauridae

Iguanidae

Agamidae

Chameleontidae

**Infraorder Nyctisauria (Gekkota)**

Ardeosauridae

Bavarisauridae

Gekkonidae

Pygopodidae

**Infraorder Leptoglossa (Scincomorpha)**

Paramacellodidae

Xantusiidae

Teiidae

Scincidae

Lacertidae

Cordylidae (Gerrhosauridae Zonuridae)

Dibamidae

**Infraorder Annulata (Amphisbaenia)**

Oligodontosauridae  
 Amphisbaenidae  
 Rhineuridae  
 Hyporhinidae  
 Bipedidae  
 Trogonophidae

**Infraorder Diploglossa (Anguimorpha)**

**Superfamily Uncertain**

Paravaranidae  
 Bainguidae

**Superfamily Anguioidea**

Anguidae  
 Anniellidae  
 Xenosauridae  
 Dorsetisauridae

**Superfamily Varanoidea (Platynota)**

Necrosauridae  
 Helodermatidae  
 Varanidae  
 Lanthanotidae  
 Aigialosauridae  
 Dolichosauridae  
 Mosasauridae\*  
 Anguimorpha Incertae Sedis

**Suborder Serpentes**

**Infraorder Scolecophidia**

Typhlopidae  
 Leptotyphlopidae

**Infraorder Henophidia**

**Superfamily Simoliopheoidea**

Lapparentopheidae  
 Simoliopheidae

**Superfamily Anilioidea**

Aniliidae  
 Uropeltidae

**Superfamily Booidea**

Diniliidae  
 Xenopeltidae



Boidae

?Palaeophidae

**Superfamily Acrochordoidea**

Acrochordidae

Nigeropheididae

**Infraorder Caenophidia**

**Superfamily Colubroidea**

Anomalopheididae

Russellopheididae

Colubridae

Elapidae [including Hydrophidae]

Viperidae [including Crotalidae]

**Superorder Sauropterygia**

**Order Incertae Sedis**

Claudiosauridae\*

**Order Nothosauria**

Pachypleurosauridae\*

Simosauridae\*

Nothosauridae\*

Cymatosauridae\*

Pistosauridae\*

**Order Plesiosauria**

**Superfamily Pesiosauroidae**

Plesiosauridae\*

Cryptoclididae\*

Elasmosauridae\*

**Superfamily Pliosauroidae**

Pliosauridae\*

**Infraclass Archosauromorpha**

**Order Protorosauria**

Protorosauridae

Prolacertidae

Tanystropheidae

**Order Trilophosauria**

Trilophosauridae

**Order Rhynchosauria**

Rhynchosauridae

**Superorder Archosauria**

**Order Thecodontia**

**Suborder Proterosuchia**

Proterosuchidae  
Erythrosuchidae  
?Proterochampsidae

**Suborder Ornithosuchia**

Euparkeriidae  
Ornithosuchidae  
Lagosuchidae

**Suborder Rausuchia**

Rausuchidae  
Poposauridae

**Suborder Aetosauria**

Stagonolepididae

**Suborder Incertae Sedis**

Erpetosuchidae  
Ctenosauriscidae  
Gracilisuchidae  
Scleromochlidae

**Suborder Phytosauria**

Phytosauridae

**Order Crocodylia**

**?Suborder Trialestia**

Trialestidae

**Suborder Sphenosuchia**

Saltoposuchidae  
Sphenosuchidae

**Suborder Protosuchia**

Platygnathidae  
Protosuchidae

**Suborder Hallopoda**

Hallopidae

**Suborder Mesosuchia**

Teleosauridae\*  
Metriorhynchidae\*  
Pholidosauridae  
Atoposauridae  
Goniopholididae  
Dyrosauridae  
Paralligatoridae

Hsisosuchidae  
Bernissartiidae  
Trematochampsidae  
Libycosuchidae  
Notosuchidae  
Uruguaysuchidae  
Baurusuchidae  
Sebecidae  
?Gobiosuchidae  
?Edentosuchidae

**Suborder Eosuchia**

?Hylaeochampsidae  
Stomatosuchidae  
Dolichochoampsidae  
Gavialidae  
Alligatoridae  
Crocodylidae

**Order Pterosauria**

**Suborder Rhamphorhynchoidea**

Dimorphodontidae  
Eudimorphodontidae  
Campylognathoididae  
Rhamphorhynchidae

**Suborder Pterodactyloidea**

Dsungaripteridae  
Ctenochasmatidae  
Pterodaustriidae  
Pterodactylidae  
Ornithocheiridae

**Order Saurischia**

**Suborder Staurikosauria**

Stuarikosauridae  
Herrerasauridae

**Suborder Theropoda**

Podokesauridae  
Coeluridae  
Shanshanosauridae  
Compsognathidae  
Ornithomimidae

Deinocheiridae  
Therezinosauridae  
Elmsauridae  
Oviraptoridae  
Dromaeosauridae  
Saurornithoididae  
Megalosauridae  
Allosauridae  
Spinosauridae  
Ceratosauridae  
Dryptosauridae  
Tyrannosauridae

**Suborder Sauropodomorpha**

**Infraorder Plateosauria**

Anchisauridae  
Melanorosauridae  
Blikanasauridae

**Infraorder Sauropoda**

Cetiosauridae  
Diplodocidae  
Brachiosauridae  
Titanosauridae  
Camarasauridae  
Euhelopodidae

**Dinosauria Incertae Sedis**

Segnosauridae

**Order Ornithischia**

**Suborder Ornithopoda**

Fabrosauridae  
Heterodontosauridae  
Dryosauridae  
Hypsilophodontidae  
Iguanodontidae  
Hadrosauridae

**Suborder Pachycephalosauria**

Pachycephalosauridae  
Homalocephalidae

**Suborder Stegosauria**

?Scelidosauridae

Stegosauridae

**Suborder Ankylosauria**

Nodosauridae

Ankylosauridae

**Suborder Ceratopsia**

Psittacosauridae

Protoceratopsidae

Ceratopsidae

**Diapsida Incertae Sedis**

**Order Placodontia**

?Helvetosauridae\*

Placodontidae\*

Cyamodontidae\*

Henodontidae\*

**Order or Subclass Ichthyopterygia**

?Hupehsuchidae\*

Utatsusauridae\*

Omphalosauridae\*

Mixosauridae\*

Shastasauridae\*

Ichthyosauridae\*

Stenopterygiidae\*

Protoichthyosauridae\*

Leptopterygiidae\*

**Subclass Synapsida**

**Order Pelycosauria**

Ophiacodontidae

Varanopseidae

Eothyrididae

Sphenacodontidae

Edaphosauridae

Caseidae

**Order Therapsida**

**Suborder Eotitanosuchia**

Biarmosuchidae

Eotitanosuchidae

Phthinosuchidae

Incertae Sedis

**Suborder Dinocephalia**

**Infraorder Titanosuchia**

Brithopodidae  
 Deuterosauridae  
 Estemmenosuchidae  
 Anterosauridae  
 Titanosuchidae

**Infraorder Tapinocephalia**

Tapinocephalidae  
 ?Incertae Sedis

**Suborder Dicynodontia**

**Infraorder Venjukoviamorpha**

Venjukoviidae

**Infraorder Dromasauria**

Galeopsidae

**Infraorder Eodicynodontia**

Eodicynodontidae

**Infraorder Endothiodontia**

Endothiodontidae

**Infraorder Pristerodontia**

Aulacocephalodontidae  
 Dicynodontidae  
 Kannemeyeriidae  
 Lystrosauridae  
 Oudenodontidae  
 Pristerodontidae

**Infraorder Diictodontia**

Emydopidae  
 Cistecephalidae  
 Robertiidae  
 Diictodontidae

**Infraorder Kingoriamorpha**

Kingoriidae

**Suborder Gorgonopsia**

?Ictidorhinidae  
 ?Hipposauridae  
 ?Burnetiidae  
 Gorgonopsidae

**Suborder Therocephalia**

Crapartinellidae

Priesterognathidae  
 Hofmeyriidae  
 Lycideopsidae  
 Ictidosuchidae  
 Whaitsiidae  
 Moschorhinidae  
 Eriolacertidae  
 Scaloposauridae  
 Simorhinellidae  
 Bauridae

**Suborder Cynodontia**

**Infraorder Procynosuchia**

Procynosuchidae  
 Dviniidae  
 Galesauridae

**Infraorder Eucynodontia**

**Superfamily Cynognathoidea**

Cynognathidae

**Superfamily Tritylodontoida**

Diademodontidae  
 Trirachodontidae  
 Traversodontidae  
 Tritylodontidae

**Superfamily Chiniquodontoida**

Chiniquodontidae  
 Tritheledontidae

**Class Aves**

**Subclass Archaeornithes**

**Order Archaeopterygiformes**

Archaeopterygidae

**Order Incertae Sedis**

Confusciousornithidae

**Subclass Neornithes**

Ambiortidae

**Superorder Odontognathae**

**Order Hesperornithiformes**

Enaliornithidae  
 Baptonithidae  
 Hesperornithidae

**Order Ichthyornithiformes**

Ichthyornithidae

**Superorder Incertae Sedis**

**Order Gobipterygiformes**

Gobipterygidae

**Order Enantiornithiformes**

Enantiornithidae

?Zhyaornithidae

**Superorder Palaeognathae**

**Order Unnamed**

Lithornidae

**Order Tinamiformes**

Tinamidae

**Order Struthioniformes**

Struthionidae

**Order Rheiformes**

Opisthodactylidae

Rheidae

**Order Casuariiformes**

Casuariidae

Dromaiidae

Cromornithidae

**Order Aepyornithiformes**

Aepyornithidae

**Order Dinornithiformes**

Dinornithidae

**Order Apterygiformes**

Apterygidae

**Superorder Neognathae**

**Order Cuculiformes**

Opisthocomidae

Musophagidae

Cuculidae

**Order Falconiformes**

Falconidae

Sagittariidae

Accipitridae

Pandionidae

**Order Galliformes**



Cracidae  
 Megapodiidae  
 Numididae  
 Phasianidae  
 ?Turnicidae

**Order Columbiformes**

Pteroclididae  
 Columbidae

**Order Psittaciformes**

Psittacidae

**Order Incertae Sedis**

Zygodactylidae

**Order Coliiformes**

Coliidae

**Order Coraciiformes (Including Trogoniformes and Galbulae)**

**Suborder Incertae Sedis**

?Halcyornithidae

**Suborder Coracii**

Atelornithidae  
 Leptosomidae  
 Galbulidae  
 Bucconidae  
 Coraciidae  
 Primobucconidae

**Suborder Halcyones (Alcedini)**

Alcedinidae  
 Meropidae  
 Todidae  
 Momotidae  
 Trogonidae  
 Archaeotrogonidae

**Order Strigiformes**

Ogygoptyngidae  
 Protostrigidae  
 Strigidae  
 Tytonidae

**Order Caprimulgiformes**

Aegothelidae  
 Podargidae

Steatornithidae

Caprimulgidae

**Order Apodiformes**

**Suborder Apodi**

Aegialornithidae

Apodidae

**Suborder Trochili**

Trochilidae

**Order Bucerotiformes**

Bucerotidae

Upupidae

Phoeniculidae

**Order Piciformes**

Indicatoridae

Capitonidae

Picidae

**Order Passeriformes**

?Palaeoscinidae

Alaudidae

Corvidae

Sittidae

Fringillidae

Eurylaimidae

**Order Gruiformes**

**Suborder Cariamae**

Cariamidae

?Cunampaiidae

Phorusrhacidae

Bathornithidae

Idiornithidae

**Suborder Grues**

Geranoididae

Eogruidae

Ergilornithidae

Eleutherornithidae

Gruidae

Aramidae

Psophiidae

Heliornithidae

Rhynochetidae  
Eurypygidae  
Mesitornithidae

**Suborder Ralli**

Rallidae  
Apterornithidae

**Suborder Incertae Sedis**

Ardeidae

**Order Podicipediformes**

Podicipedidae

**Order Diatrymiformes**

Diatrymatidae (Gastornithidae)

**Order Charadriiformes**

Burhinidae  
Plataleidae  
Chionidae  
Graculavidae  
Cimolopterygidae  
Dakotornithidae  
Rostratulidae  
Dromadidae  
Thinocoridae  
Pedionomidae  
Jacanidae  
Scolopacidae  
Charadriidae  
Haematopodidae  
Recurvirostridae  
Phoenicopteridae  
Glareolidae  
Otididae  
Stercorariidae  
Laridae  
Alcidae

**Order Anseriformes**

Presbyornithidae  
Anatidae  
Anhimidae

**Order Ciconiiformes**

Ciconiidae  
Scopidae  
Balaenicipitidae  
Teratornithidae  
Vulturidae

**Order Pelecaniformes**

**Suborder Phaethontes**

Prophaethontidae  
Phaethontidae

**Suborder Odontopterygia**

Pelagornithidae

**Suborder Fregatae**

Fregatidae

**Suborder Pelecani**

Pelecanidae

**Suborder Sulae**

Sulidae  
Plotopteridae  
Anhingidae  
Phalacrocoracidae

**Order Procellariiformes**

Diomedeidae  
Procellariidae  
Pelecanoididae  
Oceanitidae (Hydrobatidae)

**Order Gaviiformes**

Gaviidae

**Order Sphenisciformes**

Spheniscidae

**Class Mammalia**

**Subclass Prototheria**

**Order Monotremata**

Ornithorhynchidae  
Tachyglossidae

**Order Triconodonta**

Sinoconodontidae  
Morganucodontidae  
Amphilestidae  
Triconodontidae

Incertae Sedis

**Order Docodonta**

Docodontidae

**Subclass Allotheria**

**Order Multituberculata**

**Suborder Plagiaulacoidea**

Arginbaataridae

Paulchoffatiidae

Plagiaulacidae

**Suborder Ptilodontoidea**

Boffidae

Neoplagiaulacidae

Cimolodontidae

Ptilodontidae

**Suborder Taeniolabidoidea**

Taeniolabididae

Eucosmodontidae

Chulsanbaataridae

Sloanbaataridae

**Suborder Incertae Sedis**

Cimolomyidae

Incertae Sedis

Haramiyidae

**Subclass Theria**

**Infraclass Trituberculata**

**Order Symmetrodonta**

Kuehneotheriidae

Spalacotheriidae

Amphidontidae

**Order Incertae Sedis**

Family unnamed

**Order Eupantotheria**

Amphitheriidae

Peramuridae

Paurodontidae

Cryolestidae

Incertae Sedis

**Theria of Metatherian-Eutherian Grade**

Aegialodontidae

Delatheridiidae

Incertae Sedis

**Infraclass Metatheria**

**Order Marsupialia (New World and European Marsupials)**

**Suborder Didelphoidea**

Didelphidae

Pediomyidae

Microbiotheriidae

Stagodontidae

Borhyaenidae

Thylacosmilidae

Argyrolagidae

**Suborder Caenolestoidea**

Caenolestidae

Polydolopidae

**Suborder Incertae Sedis**

Groeberiidae

**Incertae Sedis**

Bonapartheriidae

Necrolestidae

**Australasian Marsupalia**

**Suborder Dasyuroidea**

Dasyuridae

Thylacinidae

Myrmecobiidae

Notoryctidae

**Suborder Perameloidea**

Peramelidae

Thylacomyidae

**Suborder Diprotodonta**

**Superfamily Phalangeroidea**

Phalangeridae

Ektopodontidae

Petauridae

Thylacoleonidae

Macropodidae

**Superfamily Phascolarctoidea**

Phascolarctidae

**Superfamily Vombatoidea**

Vombatidae  
 Diprotodontidae  
 Palorchestidae  
 Wynyardiidae

**Suborder Incertae Sedis**

Tarsipedidae

**Infraclass Eutheria**

**Order Incertae Sedis**

Kennalestidae  
 Zalambdalestidae  
 Family unnamed

**Order Apatotheria**

Apatemyidae

**Order Leptictida**

Gypsonictopidae  
 Leptictidae  
 Pseudorhyncocyonidae

**Order Pantolesta**

Pantolestidae  
 Pentacodontidae  
 ?Ptolemyidae

**Order Scandentia**

Tupaiidae

**Order Macroscelidea**

Macroscelididae

**Order Dermoptera**

**Superfamily Plagiomenoidea**

Plagiomenidae  
 Galeopithecidae (Cynocephalidae)  
 ?Mixodectidae  
 Pacentidentidae

**Order Insectivora**

Family unnamed

**Suborder Erinaceomorpha (Lipotyphla)**

**Superfamily Erinaceoidea**

Dormaaliidae  
 Amphilemuridae  
 Erinaceidae  
 Incertae Sedis

**Suborder Soricomorpha**

Palaeoryctidae

**Superfamily Soricoidea**

Geolabididae

Talpidae

Proscalopidae

Plesiosoricidae

Soricidae

Nyctitheriidae

Micropternodontidae

Dimylidae

Incertae Sedis

**Suborder Zalambdodonta**

**Superfamily Tenrecoidea**

Tenrecidae (Centetidae)

**Superfamily Chrysochloroidea**

Chrysochloridae

**Order Insectivora Incertae Sedis**

**Order Tillodontia**

Esthonychidae

Incertae Sedis

**Order Pantodonta**

Archaeolambdidae

Bemalambdidae

Pantolambdidae

Barylambdidae

Titanoideidae

Coryphodontidae

Harpyodidae

Pantolambdodontidae

Pastoralodontidae

Cyriacotheriidae

**Order Dinocerata**

Untatheriidae

Gobiatheriidae

**Order Taeniodontia**

Stylinodontidae

**Order Chiroptera**

**Suborder Megachiroptera**



Pteropodidae

**Suborder Microchiroptera**

**Superfamily Icaronycterioidea**

Icaronycteridae

Palaeochiropterygidae

**Superfamily Emaballonuroidea**

Emballonuridae

**Superfamily Rhinolophoidea**

Megadermatidae

Rhinolophidae

Hipposideridae

**Superfamily Phyllostomatoidea**

Phyllostomatidae

**Superfamily Vespertilionoidea**

Myzopodidae

Vespertilionidae

Molossidae

**Superfamily Incertae Sedis**

**Order Primates**

**Suborder Plesiadapiformes**

**Superfamily Paramomyoidea**

Paromomyidae

Picrodontidae

?Microsyopidae

**Superfamily Plesiadapoidea**

Plesiadapidae

Saxonellidae

Carpolestidae

**Suborder Prosimii**

**Infraorder Adapiformes**

Adapidae

**Infraorder Lemuriformes**

**Superfamily Lemuroidea**

Lemuridae

Megalapidae

**Superfamily Lorisioidea**

Lorisidae

Cheirogaleidae

**Superfamily Indrioidea**

Indriidae  
 Daubentoniidae  
 Archaeoloemuridae  
 Palaeopropithecidae

**Infraorder Tarsiiformes**

Omomyidae  
 Tarsiidae

**Suborder Anthroidea**

**Infraorder Incertae Sedis**

**Infraorder Platyrrhini**

Cebidae  
 Atelidae

**Infraorder Catarrhini**

**Superfamily Parapithecoidea**

Parapithecidae

**Superfamily Cercopithecoidea**

Ceropithecidae  
 Oreopithecidae

**Superfamily Hominoidea**

Pliopithecidae  
 Hylobatidae  
 Pongidae  
 Hominidae

**Order Creodonta**

**Suborder Hyaenodontia**

Hyaenodontidae  
 Oxyaenidae

**Order Carnivora**

**Superfamily Miacoidea**

Miacidae  
 Viverravidae

**Superfamily Aeluroidea (Feloidea)**

Viverridae  
 Hyaenidae  
 Felidae

**Superfamily Arctoidea (Canoidea)**

Mustelidae  
 Phocidae\*  
 Canidae

Procyonidae  
 Amphicyonidae  
 Ursidae

**Superfamily Otarioidea**

Enaliarctidae\*  
 Desmatophocidae\*  
 Otariidae\*  
 Odobenidae\*

**Carnivora Incertae Sedis**

**Order Anagalida**

Anagalidae  
 Psuedictopidae  
 Eurymylidae  
 Mimotonidae  
 Family incertae sedis

**Order Rodentia**

**Suborder Sciurognathi**

**Infraorder Protrogomorpha**

**Superfamily Ischyromyoidea**

Paramyidae  
 Sciuravidae  
 Cylindrodontidae  
 Protoptychidae  
 Ischyromyidae

**Ischyromyoidea Incertae Sedis**

**Superfamily Aplodontoidea**

Aplodontidae  
 Mylagaulidae

**Infraorder Sciuiromorpha**

**Superfamily Sciuroidea**

Sciuridae

**Infraorder Castorimorpha**

Castoridae  
 Eutypomyidae

**Infraorder Unnamed**

**Superfamily Gliroidea**

Gliridae (Myoxidae)  
 Seleviniidae

**Infraorder Myomorpha**

**Superfamily Geomyoidea**

Eomyidae  
 Florentiamyidae  
 Geomyidae  
 Heteromyidae

**Superfamily Dipodoidea**

Dipodidae  
 Zapodidae  
 Simimyidae

**Superfamily Muroidea**

Cricetidae  
 Muridae

**Superfamily Spalacoidea**

Rhizomyidae

**Infraorder Indeterminate**

**Superfamily Ctenodactyloidea**

Ctenodactylidae  
 Chapattimyidae  
 Cocomyidae

**Superfamily Pedetoidea**

Pedetidae

**Superfamily Anomaluroidea**

Anomaluridae

**Superfamily Threridomyoidea**

Theridomyidae (Pseudosciuridae)

**Suborder Hystricognathi**

**Infraorder Bathygeromorpha**

Bathygeridae  
 Tsaganomyidae

**Infraorder Hystricomorpha**

Hystricidae

**Infraorder Phiomorpha**

**Superfamily Thryonomyoidea**

Phiomyidae  
 Thryonomyidae  
 Diamantomyidae  
 Kenyamidae  
 Myophiomyidae

**Infraorder Caviomorpha**

**Superfamily Octodontoidea**

Octodontidae

Echimyidae

Ctenomyidae

Abrocomidae

Capromyidae

**Superfamily Chinchilloidea**

Chinchillidae

Dasyproctidae

Dinomyidae

**Superfamily Cavoidea**

Eocardiidae

Caviidae

Hydrochoeridae

**Superfamily Erethizontoidea**

Erethizontidae

**Order Rodentia Incertae Sedis**

**Order Lagomorpha**

Stem lagomorphs-no family designated

Ochotonidae

Leporidae

**Order Condylartha**

Arctocyoniidae (Oxyclaenidae)

Paroxyclaenidae

Tricuspidodontidae

Mioclaiidae

Hyopsodontidae

Meniscotheriidae

Periptychidae

Phenacodontidae

Didolodontidae

Phenacolophidae

**Order Artiodactyla**

**Suborder Palaeodonta**

Dichobunidae

Helohyidae

**Suborder Suina**

**Superfamily Entelodontoidea**

Choeropotamidae

Cebochoeridae

Entelodontidae (Elotheridae)

Leptocheridae

**Superfamily Suoidea**

Suidae

Tayassuidae (Dicotylidae)

**Superfamily Hippopotamoidea**

Anthracotheriidae

Haplobunodontidae

Hippopotamidae

**Suborder Tylopoda**

**Superfamily Merycoidodontoidea (Oreodontoidea)**

Agriochoeridae

Merycoidodontidae (Oreodontidae)

**Superfamily Anoplotheroidea**

Cainotheriidae (Caenotheriidae)

Anoplotheriidae

**Superfamily Cameloidea**

Camelidae

Oromerycidae

**Superfamily Incertae Sedis**

Xiphodontidae

Amphimerycidae

Protoceratidae

**Suborder Ruminantia**

**Infraorder Traguloidea**

Hypertragulidae

Tragulidae

Leptomerycidae

Gelocidae

**Infraorder Pecora**

**Superfamily Cervoidea**

Palaeomerycidae

Moschidae

Cervidae

Giraffidae

**Superfamily Cervoidea Incertae Sedis**

**Superfamily Bovoidea**

Antilocapridae

Bovidae

**Superfamily Bovoidea Incertae Sedis**

**Order Artiodactyla Incertae Sedis**

**Order Mesonychia (Acreodi)**

Mesonychidae

**Order Cetacea**

**Suborder Archaeoceti**

Protocetidae\*

Basilosauridae (Zeuglodontidae)\*

**Suborder Archaeoceti Incertae Sedis**

**Suborder Odontoceti**

Kentriodontidae\*

Squalodontidae\*

Platanistidae\*

Ziphiidae\*

Delphinidae\*

Rhabdosteidae (Eurhinodelphidae)\*

Albireonidae\*

Acrodelphidae\*

Monodontidae (Delphinapteridae)\*

Phocaenidae\*

Pontoporiidae\*

Physeteridae\*

Agorophiidae\*

**Suborder Odontoceti Incertae Sedis**

**Suborder Mysticeti**

Aetiocetidae\*

Cetotheriidae\*

Eschrichtiidae (Rhachianectidae)\*

Balaenopteridae\*

Balaenidae\*

**Order Cetacea Incertae Sedis**

**Order Perissodactyla**

**Suborder Hippomorpha**

**Superfamily Equoidea**

Equidae

Palaeotheriidae

**Superfamily Brontotherioidea**

Brontotheriidae (Titanotheriidae)

**Suborder Ancylopoda**

Eomoropidae

Chalicotheriidae

**Suborder Ceratomorpha**

**Superfamily Tapiroidea**

Isectolophidae

Helaletidae (Hyrachyiidae)

Lophialetidae

Deperetellidae

Lophiodontidae

Tapiridae

**Tapiroidea Incertae Sedis**

**Superfamily Rhinoceroidea**

Hyracondontidae

Amyndodontidae

Rhinocerotidae

Ceratomorpha incertae sedis

**Order Proboscidea**

**?Suborder Moeritherioidea**

Anthracobunidae

Moeritheriidae

**Suborder Euelephantoidea**

Gomphotheriidae (Trilophodontidae)

Elephantidae

**Suborder Mammutoidea**

Stegodontidae

Mammutidae

**Suborder Deinotherioidea**

Deinotheriidae

**Suborder Barytherioidea**

Barytheriidae

**Order Sirenia**

Prorastomidae\*

Dugongidae (Halicoridae)\*

Manatidae (Trichechidae)\*

Protosirenidae\*

**Order Desmostylia**

Desmostylidae

**Order Hyracoidea**



Procaviidae

Pliohyracidae

**Order Embrithopoda**

Arsinoitheriidae

**Order Tubulidentata**

Orycteropodidae

**Order Notoungulata**

**Suborder Notoprungonia**

?Arctostylopidae

Henricosborniidae

Notostylopidae

**Suborder Toxodontia**

Oldfieldthomasiidae (Acoelodidae)

Archaeopithecidae

Isotemnidae

Homalodotheriidae

Leotiniidae

Notohippidae

Toxodontidae

**Suborder Typotheroidea**

**Superfamily Typotheroidea**

Interatheriidae

Mesotheriidae

**Superfamily Hegetotheroidea**

Archaeohyracidae

Hegetotheriidae

**Notoungulata Incertae Sedis**

**Order Astrapotheria**

Trigonostylopidae

Astrapotheriidae

**Order Litopterna**

Protherootheriidae

Protolipternidae

Macraucheniidae

Adianthidae

**Order Xenungulata**

Carodniidae

**Order Pyrotheria**

Pyrotheriidae

Colombitheriidae

**Order Xenarthra**

**Infraorder Loricata (Cingulata)**

**Superfamily Dasypodoidea**

Dasypodidae

Palaeopeltidae

**Superfamily Glyptodontoidea**

Glyptodontidae (Hoplophoridae)

**Infraorder Pilosa**

**Superfamily Magalonychoidea**

Megalonychidae

Megatheriidae

**Superfamily Mylodontoidea**

Mylodontidae

Entelopidae

**Infraorder Vermilingua**

Myrmecophagidae

**Order Incertae Sedis**

**Suborder Palaeanodonta**

Metacheiromyidae

Epoicotheriidae

?Ernanodontidae

**Order Pholidota**

Manidae

**MAMMALIA INCERTAE SEDIS**

Didymoconidae (Tshelkariidae)