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# CHROMOSOME NUMBER CHANGES WITHIN TERRESTRIAL MAMMALIAN FAMILIES

**Karen Bedinger,** Concord, CA

**KEYWORDS:** diploid number, chromosome number, karyotype, mammalian families, baramin

## ABSTRACT

This study comprehensively surveys diploid chromosome numbers across terrestrial mammal families using Wilson and Reeder's classification. The data are organized around families, subfamilies, tribes, and genera to determine the extent of and identify trends and patterns in diploid number changes. A preliminary survey of nine established baramins revealed approximately 75% with significantly variable diploid numbers. An extensive compilation of chromosome numbers across 113 families that contain more than one species shows similar distribution with 75% variability using a strict definition of stability. There are many factors to examine such as speciose groups, high reproductive rates, and identifying parameters for defining stability. However, karyotype form diversity was found to be prevalent in spite of these considerations. Assuming that the rank of family approximates a baramin and using looser parameters to define constancy in diploid numbers, 62 families exhibit relative karyotype stability, 19 families with more extensive variation might be explained by multiple centric fusions and the remaining 48 families have unusual karyotype deviations.

## INTRODUCTION

Chromosomal speciation, or chromosomal variability within lineages, continues to perplex scientists and numerous models have been put forth to explain the proliferation of karyotype changes seen within taxonomic groups. Tracing these karyotype changes helps to establish pathways of speciation. Take for example family Canidae. To trace the karyotype speciation from the consensus ancestral carnivore of 2n=42, as proposed by Murphy, *et al*. (cited by Graphodatsky, *et al*., 2008), could have given rise to the proposed Canidae ancestral karyotype of 2n=82 by way of at least 42 fissions and 25 fusions – a total of at minimum 67 chromosomal rearrangements. They suggest this took place over the past 45-50 million years prior to the modern Canidae lineage. Considering that fissions and fusions are not well understood and that the rearrangements mentioned above only reflect gross morphology, this represents a continual challenge from a naturalistic worldview. For the creationist, attempting to trace a lineage with chromosome variability, such as Canidae, who range from 2n=34 to 2n=78, back to two mating pairs aboard the Ark holds similar challenges, though on a smaller scale.

Multiple studies have shown that the currently identified mono and holobaramins (designations for biblical created kinds) contain a very wide range of varying diploid numbers of chromosomes (Hennigan, 2009; Lightner, 2006; Bedinger, 2012). For example, family Canidae members, identified as a monobaramin (Wood, 2008), include fox, wolves, jackals, dogs, dholes, and coyotes. Diploid numbers (pairs of chromosomes) of 2n = 34, 36, 38, 40, 42, 48, 50, 54, 56, 60, 64, 66, 72, 74, 76, and 78 are represented in this family. The general creation model of diversity easily explains variation of phenotypes within kind through Mendelian genetics such as the variety in dogs but not so easily the diversity of karyotypic changes as seen in family Canidae. If these genera are all descendants from one mating pair of the dog kind on board the Ark, there must be a mechanism to explain the diverse range in chromosome numbers.

Mechanisms that change diploid number include centric fusions, also known as a Robertsonian translocation (Rb), and centric fissions. A fusion reduces the number of chromosomes while a fission increases it. An Rb results when a long arm of an acrocentric chromosome (centromere near the end) fuses with another, losing both short arms in the process and becomes a metacentric chromosome (centromere in the middle of two long arms). A fission starts as a metacentric and ends as two non-homologous acrocentric or telocentric (centromere at the end of an arm) chromosomes. Both processes can produce unbalanced gametes that segregate abnormally at meiosis but fusions seem to be more tolerated than fissions (see below). Other chromosome rearrangements, where the karyotype differs from the normal presentation, involve inversions and reciprocal translocations. These produce gross morphological changes but not diploid number differences. This paper does not address these kinds of alterations.

A few studies have shown that centric fusions found as polymorphisms are well tolerated in a population with minimal reduction in fitness but may be species specific (Baker & Bickham, 1986; Eaker, *et al*. 2001; O'Toole, 1998; Pardo-Manuel de Villena & Sapienza, 2001; Wallace & Searle, 1994). These studies support the presence of designed mechanisms that reduce the potential deleterious effects of such arrangements. However, more complicated rearrangements such as multiple chromosomes involved in centric fusions, monobrachial centric fusion (two independent fusions in conspecific organisms where one arm of the new metacentric chromosome is homologous and the other is not), and centric fission result in high incidents of sterility, birth defects and death (Baker & Bickham, 1986; Imai, *et al*., 1988; Lespinasse, *et al*., 2003; O'Toole; 1998; Perry, *et al*., 2005;). The wide variation of diploid numbers within baramins must be explained within this paradox. Another possibility may be that the diploid diverse families contain more than one baramin. In either case, refinement reflecting one or both alternatives is necessary to account for the data.

An initial survey of nine established baramins revealed that 78% had considerable variation in chromosome numbers and only 22% exhibited stability. Diploid numbers spanned a minimum of a 14-point range and a maximum of a 44-point range. For example, Canidae has a range of 2n=34-78 which is a 44-point spread between the lowest and the highest diploid numbers represented in that family. The conclusion, given the data presented, seems to point to diploid number changes being the rule within a baramin and stasis the exception (Bedinger, 2012). Therefore a larger data set is needed to confirm or refute this generalization. Following Wood's lead (2011) of approximating terrestrial mammalian baramins to be at the level of the family or subfamily, this study provides a comprehensive survey of 129 families (Wilson & Reeder, 2005a) to determine the extent of their diploid number diversity.

## RESULTS

Secondary to the large volume of data, the results have been consolidated into tables for ease in reviewing. These tables are contained in Appendix 1. Table A1 contains data for families with only one genus. Tables A2-A8 divide the data into sections in increments of five, ten, twenty-five, fifty, and greater than 100 genera. Less than 5% of mammals have been described as having B chromosomes, therefore Bs have been left out of the dataset for better comparison of diploid numbers. B chromosomes are composed of heterochromatin and segregate abnormally during meiosis (Pardo-Manuel de Villena, 2005). Families, subfamilies or genera found to be extinct were eliminated from the dataset. Because of the overwhelming numbers, family Muridae, with its 148 genera, 732 species, and a diploid number spread of 2n=16-76, was eliminated from this study to be considered separately at a later date. Some families have a scarcity of genetic information while others are well studied. To reflect the amount of data uncovered within a family, the number of species found with well-documented karyotypes versus those without information is shown as a percentage of the total number of species in that family. There are three families without any karyotype information and they were excluded from the original 132 total.

Various aspects of the data were examined. Of the 129 families with available data, 44 or 34% show no diploid diversity following a strict definition of variability. Of those 44 families, 16 contain single-species. Removing these 16 from the mix, as there is very low probability of diploid variation given only one species, reduces the number of families with good potential for variability to 28 out of 113, or 25% with stable chromosome numbers (Figures 1 and 2). Within the 41 single-genus families including single-species, 25 or 61% are stable and 39% are variable. Surprisingly, even with one genus, the range of diploid numbers can be great within a family, anywhere from a difference of two points up to a 34-point spread. 44% of the single-genus families with karyotype variability have diploid variations with greater than a 22-point spread. Within this group the greatest disparity is found within Cuniculidae where its two species have diploid numbers of 42 and 74. Unless otherwise stated the remaining analyses are done excluding single-specie families.

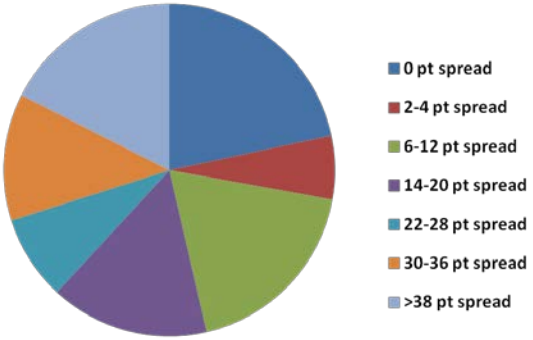

**Figure 1**. Diploid spread of all families with more than two species.

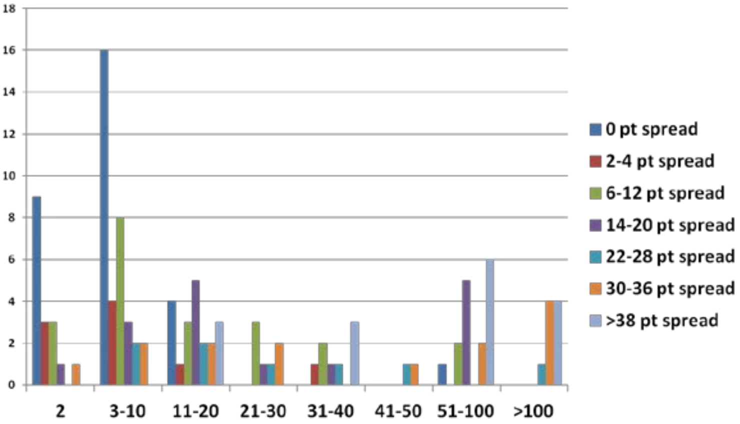

**Figure 2**. Comparison of number of species and their diploid number range.

Over three-quarters of the total families studied have less than 50 species and half of this total contains 10 species or less (Figure 3). Given this, 29 of the 88 families with less than 50 species, or 33%, have stable karyotypes leaving 67% with variable diploid numbers. Of those remaining 59 families, 32, or 54% have diploid number ranges of greater than a 14-point spread, 21 with a range greater than 22 points or 36%, 15 or 25% with greater than a 30-point spread and 7, or 12%, greater than a 38-point spread. The largest spread for this group belongs to Octodontidae with a 64-point spread among 13 species and includes six karyotype variations.

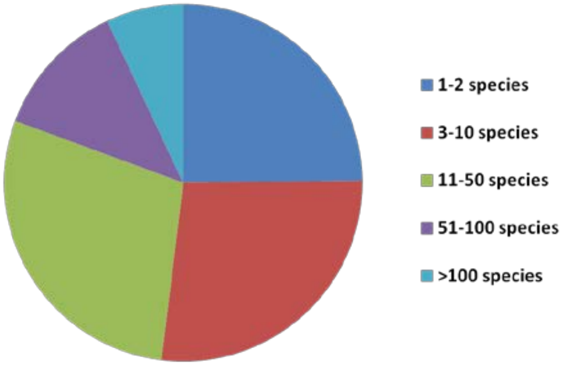

**Figure 3.** Families and the number of species found within them.

Breaking it down further to those with 2-10 species, 49%, or 25 of the 51 remaining families contain chromosome number differences (Figure 4). Of those 25, nine families or 36% are significantly altered with a 14-point or greater spread, five are greater than 22 and three are greater than a 30-point spread in diploid numbers. The largest spread for this group belongs to Equidae with a 34-point spread across nine species representing 9-11 karyotype variations (male/female difference in two karyotypes).

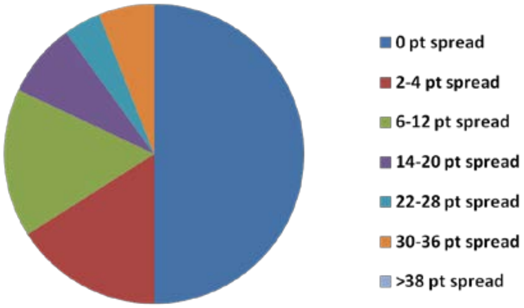

**Figure 4.** Diploid spreads in families with 2-10 species.

Omitting the five most speciose families (Muriadae, 732 species; Cricetidae, 683 species; Vespertilionidae, 407 species; Soricidae, 375 species; Sciuridae, 279 species) from the dataset to get a sense of variability without extreme family groups shows the following: 51% still exhibit ranges greater than 14-point spreads in diploid numbers, 35% with greater than 22-point spreads, 26% greater than a 30-point spread, and 15% greater than a 38-point spread (Figure 5). The largest spread for this group belongs to Echimyidae with 84 species, a range of diploid numbers from 2n=28 to 2n=118 for a 90-point difference and 18 different chromosome numbers documented. Family Cervidae, with 51 species, also has an impressive spread of 64 points from 2n=6 to 2n=70 with 25 different diploid numbers studied. Four of the five most speciose groups are from order Rodentia. Examining the 16 families with greater than 50 species shows that two-thirds have a diploid number range of a 30-point spread or higher.

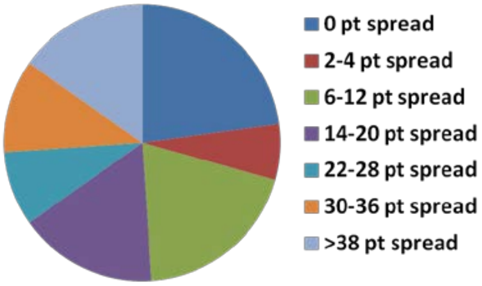

**Figure 5**. Diploid spread of all families with >2 species, omitting the five most speciose families.

The number of karyotype variations warrant investigation. Dividing the families into groups by common number of species gives the following percentages of diploid number variations: 2-10 species – 49% stable, 45% with two to five variations and 6% between 6 and 15 variations; 11-50 species – 10% stable, 51% with two to five variations, 33% with 6-10 variations and 10% over 11 variations including one at 24 rearrangements; 51-100 species – no stability, 33% with two to five variations, 33% with 6-10 variations and 33% over 11 variations; >100 species – no stability, 33% with 11-15 variations, 22% between 16 and 25 rearrangements and 33% with greater than 25 variations. Looking at the large group between 2-50 species the numbers are consistent with 32% stable, 48% with the majority of variability between two and five changes, and 22% with over 6 rearrangements.

Families have been broken down into subfamilies, tribes, and genera to see at what taxonomic level their chromosome numbers become stable. In this study, for analysis purposes only, a family is considered stable if it has a diploid spread of six points or less as this may represent a few centric fusions that may be well tolerated. A review of the literature, especially of FISH or G-Banding analysis would provide more detailed data for resolution of a family but for ease in determining which families to look more closely at and which are easily explainable by centric fusion six was chosen as the cut-off for stability. A detailed analysis of this section has been omitted secondary to the large number of variables and will be dealt with in a subsequent study. 19 families that fall outside of the six-point 2n spread criterion exhibited karyotype variation (progressed by 2's) such that they still may (or may not) easily resolve by an explanation of centric fusion and would benefit from closer examination. 47 families exhibited an unusual presentation in their diploid numbers that are more difficult to explain by centric fusion alone and definitely need closer examination.

To determine if karyotype variability is biased towards small rodent-like animals, 31 families representing order Rodentia were compared to 93 non-rodent families. Percentages were calculated for each diploid range spread and for the number of karyotype forms represented in each family for their respective groups, non-rodent or rodent, and then compared.

32% of Rodentia demonstrated diploid ranges of greater than a 36 point spread while only 5% of non-Rodentia exceeded that limit. On the opposite end, 23% of Rodentia had very stable karyotypes versus 42% in non-Rodentia. Using the criteria for stability of a six-point spread or less in diploid range resulted in 36% of Rodentia and 53% non-Rodentia demonstrating relative stability. Regarding number of karyotype forms, Rodentia contained 55% families with zero to four forms while non-Rodentia families had 67% of their karyotypes within that range. Non-Rodentia families did not exceed 28 different diploid number forms while 7% of Rodentia families had between 29-36 different forms.

## DISCUSSION

The results of this 129-family study at first glance seem to mirror the initial survey of nine established baramins and point to diploid number variability as the norm and stability the exception. The first study discovered that 78% of the published terrestrial mammalian baramins showed considerable variation in chromosome numbers. The current comprehensive study found the similar proportions with 75% variable and only 25% stable of those families with two or more species (potential for variability). When including the 16 single-species families back in the mix, 66% of the total 129 families had variable karyotypes and 34% exhibited stability. However there are many factors to consider before arriving at conclusions that will be useful or have implications for creation diversity studies.

Concern over statistical problems associated with karyotypic diversity such that “a speciose group may appear to have high karyotypic diversity simply because of the high number of species” (Prescott, 1972, p.45) has been addressed in this study. Wood (2011) referred to this as the power law distribution where two quantities, in this case species and karyotype variation, increase in size proportionally to the number of variation or species already in the mix. Restating his findings for the occurrence of speciation, the likelihood is higher for a larger genus than a smaller genus “simply by virtue of the greater number of species” (p. 4). To mitigate the effects of a power law distribution, the five most speciose groups of 278-730 species (Wood, 2011), four of which are from order Rodentia, were removed to find diploid number diversity without these large family groups. Half of the families still showed extreme karyotype diversity of over a 14-point spread and a full quarter of the group exceeded a 30-point diploid number spread. Adding back in those with over a six-point spread represents two-thirds of the total families with significant diversity. This supports widespread karyotype diversity at the level of the family.

Relating this study to a recent article on speciation, Wood (2011) referred to the most speciose terrestrial mammal families as small-bodied animals with an implied high reproductive rate. This also suggests a highly variable diploid number. To test this assumption the families were divided into two groups, Rodentia and non-Rodentia. Indeed, Rodentia did show great diversity with two-thirds of the families having a range of greater than six in their diploid numbers and a third of those showed greater than a 36-point spread. However, the remaining third exhibited very little diversity. In contrast, the non-rodent group dropped to a little over half of the families with diversity and just under a half being stable. Those with diversity of over a 36-point spread represented a small minority. Thus, small-bodied mammals, specifically rodents, have a higher diploid diversity than their counterparts. However, high variability remains in more than half of non-Rodentia families.

To determine if speciose families of any kind follow a high diversity pattern, those with greater than 50 species were evaluated. The results showed that 96% of the 25 families had highly diverse karyotype forms. This is in contrast to 56% of the 87 families with less than 50 species exhibiting diversity. Wood (2011) found that the median family size contains eight species. Of the 50 families having between two and ten species, only 34% had diverse karyotypes. Because of the sharp distinction in numbers of karyotype forms between those families with greater than or less than 50 species, this division line was used in further comparisons.

The extreme contrast between families with greater than 50 species and those with less continues when considering the number of variations in diploid numbers. For example, the chromosome numbers listed in the introduction for Canidae contains 16 different diploid numbers. The data reveals 79% of those families with less than 50 species had five or less variations in contrast with 21% of those with over 50 species. Canidae falls within the 6% bracket of families with less than 50 species for having over 11 variations. Interestingly, half of the families with less than 50 species have between 2-5 variations in their diploid number. In other words, having variation at the family level is typical, especially when considering both groups together at 75% with two or more forms.

Comparing karyotype forms of Rodentia and non-rodent mammals shows essentially the same distribution when looking at zero to four variations in diploid number. Significant differences appear when looking at 13 karyotype forms and higher. Very few, in fact only 5% of non-rodent type mammals, have greater than 13 different diploid numbers in contrast with 24% of rodent families. This supports the hypothesis of a bias towards small, highly reproductive mammals having greater karyotype diversity.

Using karyotype variability to test the assumption that the level of family or subfamily approximates a baramin (Wood, 2011), families were divided into taxonomic levels down to genera and examined to see at what point, if any, the karyotype became stable. Bickham and Baker (1979, p. 76, 77) found that chromosomal variation at the generic level in most families showed “consistent stability” but “considerable variation among genera” in the bat families.

They further state that Robertsonian translocations (fusions) were found within families but more extreme mechanisms of rearrangements were needed to explain karyotype differences between families, particularly in Phyllostomatidae, Molossidae, and Vespertilionidae. Their conclusions support the concept of a family approximating a baramin. This current study confirms that, at the level of genus, most karyotypes are fairly stable. At the family level, using a looser definition of stability of a six-point spread in diploid numbers, 62 families displayed stability (Table 1). This raises the statistical picture to 48% with low variability and 52% with variability. Further research and correlation with previous work on baramins would be needed to confirm and establish if these were mono or holobaramins. The groups that require more in-depth study and may be especially useful for examining mechanisms that allow significant karyotype variability are shown in Tables 2 and 3. Families that fall outside of the six-point 2n spread criterion in diploid number but whose karyotype variation may (or may not) easily resolve by an explanation of centric fusion (their 2n numbers progress by twos) are listed in Table 2. Table 3 delineates families with unusual presentations in diploid numbers that warrant a closer look at either the mechanism for karyotype variation or a baramin boundary refinement different from the level of the family.

**Table 1.** Families with relatively stable diploid numbers of a six-point spread or less. Heading Key: A= # of Genera; B= # of Species;

| Classification Level | Common Name | A | B | Classification Level | Common Name | A | B |
|---|---|---|---|---|---|---|---|
| F-Ornithorhynchidae | Platypus | 1 | 1 | F-Hypsiprymnodontidae | Rat kangaroo | 1 | 1 |
| F-Myrmecobiidae | Numbat | 1 | 1 | F-Phascolarctidae | Koala | 1 | 1 |
| F-Tarsipedidae | Honey pos | 1 | 1 | F-Mirobitheriidae | M. del M. | 1 | 1 |
| F-Orycteropodidae | Aardvark | 1 | 1 | F-Cyclopedidae | Pygmy anteat | 1 | 1 |
| F-Aplodontiidae | Mt. beaver | 1 | 1 | F-Daubentoniidae | Aye-aye | 1 | 1 |
| F-Dinomyidae | Pacarana | 1 | 1 | F-Petromuridae | Dassie rat | 1 | 1 |
| F-Nandiniidae | A. palm civet | 1 | 1 | F-Myocastoridae | Nutria | 1 | 1 |
| F-Antilocapridae | Pronghorn | 1 | 1 | F-Myzopodidae | Sucker-ft bat | 1 | 1 |
| F-Ailuridae | Red panda | 1 | 1 | F-Mystacinidae | NZ sh. tail bat | 1 | 2 |
| F-Thylacomyidae | Bilby | 1 | 2 | F-Noctilionidae | Bulldog bat | 1 | 2 |
| F-Thryonomyidae | Cane rat | 1 | 2 | F-Notoryctidae | Mar. mole | 1 | 2 |
| F-Megalonychidae | 2-toed sloth | 1 | 2 | F-Solenodontidae | Solendon | 1 | 4 |
| F-Solenodontidae | Solendon | 1 | 4 | F-Bradypodidae | 3-toed sloth | 1 | 4 |
| F-Bradypodidae | 3-toed sloth | 1 | 4 | F-Tarsidae | Tarsier | 1 | 7 |
| F-Moschidae | S. musk deer | 1 | 7 | F-Manidae | Pangolin | 1 | 8 |
| F-Nycteridae | Slit faced bat | 1 | 16 | F-Acrobatidae | Pygmy glider | 2 | 2 |
| F-Cynocephalidae | Flying Lemur | 2 | 2 | F-Platacanthomyidae | Spiny dormice | 2 | 2 |
| F-Pedetidae | Spring hare | 2 | 2 | F-Furipteridae | Smokey bat | 2 | 2 |
| F-Hippopotamidae | Hippopotamus | 2 | 2 | F-Vombatidae | Wombat | 2 | 3 |
| F-Elephantidae | Elephant | 2 | 3 | F-Tachygossidae | Echidna | 2 | 4 |
| F-Burramyidae | Pygmy pos | 2 | 5 | F-Abrocomic | Chinchilla rat | 2 | 10 |
| F-Mormoopidae | Mustached bat | 2 | 10 | F-Dasyproctidae | Agouti | 2 | 13 |
| F-Procaviidae | Hyrax | 3 | 4 | F-Hyaenidae | Hyena | 3 | 4 |
| F-Caenolestidae | Shrew op | 3 | 6 | F-Hominidae | Gorilla, chimp | 3 | 6 |
| F-Camelidae | Camel | 3 | 6 | F-Natalidae | Funnel-ear bat | 3 | 7 |
| F-Tragulidae | A. mouse deer | 3 | 8 | F-Petauridae | Gliding pos | 3 | 11 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F-Hystricidae | OW porcupine | 3 | 11 | F-Rhinocerotidae | Rhinoceros | 4 | 5 |
| F-Ctenodactylidae | Gundi | 4 | 5 | F-Suidae | Pig | 5 | 19 |
| F-Procyonidae | Raccoon | 6 | 17 | F-Peramelidae | Bandicoot | 6 | 18 |
| F-Eupleridae | Fossa | 7 | 8 | F-Octodontidae | Rock rat | 8 | 13 |
| F-Felidae | Cat | 14 | 40 | F-Dasyuridae | Marsupials | 21 | 69 |

**Table 2.** Families that fall outside of the six-point 2n spread criterion in diploid number but whose karyotype variation may (or may not) easily resolve by an explanation of centric fusion;
Heading Key: A= # of Genera; B= #of Species; C=2n range; D= # of 2n Variations; E= Mode of 2n; F= Diploid Numbers (2n); Abbreviation key: F=Family. Diploid numbers are written in stem-leaf format where "1-2446" means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature.

| Classification Level | Common Name | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| F-Aotidae | Nght monkey | 1 | 8 | 46-58 | 11 | - | 4-6789, 5-0012234468 |
| F-Macroscelididae | El. shrew | 4 | 16 | 26-34 | 4 | 26 | 2-66666888, 3-004 |
| F-Lemuridae | Lemur | 5 | 19 | 44-60 | 8 | - | 4-4688, 5-0468, 6-000 |
| F-Pseudocheiridae | Ring-tail p. | 6 | 17 | 10-22 | 6 | - | 1-022668, 2-022 |
| F-Spalacidae | Subterranean rat | 6 | 36 | 38-64 | 13 | 60 | 38, 4-048889, 5-000244466, 58x3, 6-0000022224 |
| F-Cebidae | NW Monkey | 6 | 57 | 44-54 | 5 | 44x10<br>46x10 | 44x10, 46x10, 48, 5-2222444 |
| F-Heteromyidae | Kangaroo rat | 6 | 60 | 34-74 | 19 | 60 | 3-4688, 4-0222244466, 48x5, 50x4, 56x6, 5-22244448, 60x12, 6-24444, 7-00222224 |
| F-Geomyidae | Pocket gopher | 6 | 40 | 36-88 | 24 | - | 3-688, 40x8, 42x5, 4-4446666888, 5-022446666, 58x5, 6-008, 70x4,74x4, 7-22266888, 8-02468 |
| F-Chrysochloridae | Golden mole | 9 | 21 | 26-36 | 5 | 30 | 2-68, 3-000000046 |
| F-Gliridae | Dormouse | 9 | 28 | 44-62 | 4 | - | 4-4688, 62 |
| F-Erinaceidae | Hedgehog | 10 | 24 | 40-48 | 2 | 48 | 40, 48x9 |
| F-Leporidae | Rabbit, hare | 11 | 52 | 38-52 | 6 | 48 | 3-88, 4-222224446, 48x15, 52 |
| F-Macropodidae | Wallaby | 11 | 67 | 10-24 | 8 | 16x13<br>22x12 | 16x13, 1-0000244488, 22x12 |
| F-Talpidae | Mole | 17 | 39 | 32-42 | 5 | 34 | 34x14, 3-26666688, 42 |
| F-Mustelidae | Erm, mk wsl | 22 | 59 | 30-44 | 7 | 38 | 3-026, 38x22, 4-0000222244 |
| F-Soricidae | Shrew | 26 | 375 | 20-68 | 35 | 36x18<br>38x17<br>40x17<br>42x14<br>50x16 | 22x4, 24x3, 26x3, 28x5, 2-0013355799, 30x7, 34x7, 36x18,38x17, 3-2222335557, 40x17, 42x14, 4-4444666888, 50x16, 52x13, 54x5, 5-3566888, 60x3, 6-2224466688 |
| F-Vespertilionidae | Evening bat | 48 | 407 | 20-52 | 15 | 44 | 2-022266, 28x7, 30x9, 36x21, 3-2222444488, 42x8, 44x54, 4-00666666, 50x13, 52 |
| F-Sciuridae | Squirrels | 52 | 279 | 30-62 | 13 | 38 | 30, 32x11, 34x4, 36x13, 38x35, 40x14, 42x7, 4-666668, 5-000468, 62 |
| F-Phyllostomidae | NW Leaf-nosed bat | 55 | 155 | 13-46 | 20 | 30x19<br>32x18 | 1-36668, 20/21x3, 2-01222444, 26x7, 28x11, 30/31x11, 30x19, 32x18, 3-444466888, 4-0002466 |

**Table 3.** Families with unusual presentations in diploid numbers that warrant a closer look at either the mechanism for karyotype variation or a baramin boundary refinement different from the level of the family

Heading Key: A= # of Genera; B= # of Species; C = 2n range; D= # of 2n Variations; E= Mode of 2n; F= Diploid Numbers (2n);

Abbreviation key: F=Family

Diploid numbers are written in stem-leaf format where “1-2446” means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature

| Classification Level | Common Name | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| F-Castoridae | Beaver | 1 | 2 | 40-48 | 2 | - | 4-08 |
| F-Cuniculidae | Paca | 1 | 2 | 42-74 | 2 | - | 42, 74 |
| F-Thyropteridae | Disc-wg bat | 1 | 3 | 32-40 | 2 | - | 32, 40 |
| F-Rhinopomatidae | Mouse tl bat | 1 | 4 | 36-42 | 2 | - | 36, 42 |
| F-Tapiridae | Tapir | 1 | 4 | 52-80 | 3 | 80 | 52, 76, 8-00 |
| F-Lepilemuridae | Sport. Lemur | 1 | 8 | 20-34 | 3 | - | 2-006, 34 |
| F-Calomyscidae | M-lk hamster | 1 | 8 | 30-52 | 7 | 44 | 3-027, 4-44448, 5-002 |
| F-Equidae | Horse | 1 | 9 | 32-66 | 11 | - | 32, 4-4456, 5-2456, 6-2446 |
| F-Ochotonidae | Pika | 1 | 30 | 38-68 | 7 | - | 38, 4-02, 50, 6-022888 |
| F-Ctenomyid | Tuco-tuco | 1 | 60 | 26-56 | 13 | 48x5<br>26x4 | 10, 2-6666, 3-46, 4-456688888, 5-02456 |
| F-Rhinolophidae | Horseshoe bat | 1 | 76 | 28-62 | 7 | 58 | 28, 3-66, 44, 5-2666, 58x9, 6-22222 |
| F-Giraffidae | Giraffe | 2 | 2 | 30-46 | 3 | - | 30, 4-56 |
| F-Myrmecophagidae | Anteater | 2 | 3 | 54-60 | 2 | - | 54, 60 |
| F-Tayassuidae | Peccary | 3 | 3 | 20-30 | 3 | - | 2-06, 30 |
| F-Chinchillidae | Chinchilla | 3 | 7 | 56-64 | 2 | 64 | 56, 6-444 |
| F-Indridae | Sifaka | 3 | 18 | 40-70 | 5 | 70 | 4-0222248888, 7-00000000 |
| F-Galagidae | Galago | 3 | 19 | 38-62 | 4 | - | 3-688, 40, 6-22 |
| F-Megadermatidae | False V. Bat | 4 | 5 | 0 | 0 | 62 | 62 |
| F-Potoroidae | Variety | 4 | 10 | 12-32 | 4 | 22 | 1-2, 2-2224, 3-2 |
| F-Mephitidae | Skunk | 4 | 12 | 46-64 | 6 | - | 4-68, 5-008, 6-04 |
| F-Hylobatidaae | Gibbon | 4 | 14 | 38-52 | 4 | 44 | 38, 4-4444, 5-02 |
| F-Tupalidae | Tree shrew | 4 | 19 | 44-68 | 6 | - | 44, 52, 6-00268 |
| F-Pitheciidae | Titi | 4 | 40 | 16-54 | 9 | - | 16, 20, 4-245666888, 5-0000444 |
| F-Ursidae | Bear | 5 | 8 | 42-74 | 3 | 74 | 42, 52, 74x6 |
| F-Lorisidae | Loris | 5 | 9 | 50-62 | 3 | - | 5-00022 , 6-22 |
| F-Bathyergidae | Mole rat | 5 | 16 | 40-78 | 10 | - | 40, 5-04444688, 6-0028, 7-488 |
| F-Atelidae | NW monkey | 5 | 25 | 32-62 | 11 | - | 3-244444, 4-245789, 5-0002222, 62 |
| F-Caviidae | Guinea pig | 6 | 18 | 52-68 | 5 | 64 | 52, 6-22444444468 |
| F-Phalangeridae | - | 6 | 28 | 12-20 | 3 | 20 | 1-244, 2-000 |
| F-Capromyidae | Hutia | 6 | 16 | 40-88 | 2 | - | 40, 88 |
| F-Octodontidae | Rock rat | 8 | 13 | 38-102 | 6 | 58 | 38, 5-4668888, 78, 102 |
| F-Dasypodidae | Armadillo | 9 | 21 | 38-64 | 6 | 64 | 38, 5-0088, 6-0222444444 |
| F-Hipposideridae | OW L.ns bat | 9 | 81 | 32-52 | 5 | 32 | 32x12, 3-006, 5-022 |

|  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|
| F-Tenrecidae | Tenrec | 10 | 31 | 14-56 | 7 | 30x5<br>32x5<br>38x4 | 1-4, 30x5, 3-222228888 4-00, 5-46 |
| F-Canidae | Dog, fox, jackal... | 12 | 37 | 34-78 | 16 | 78x8<br>74x5 | 3-46888, 4-028, 5-00046, 6-046, 7-02, 74x5, 78x8 |
| F-Emballonouridae | Sac wing bat | 13 | 50 | 22-44 | 7 | - | 2-24668, 3-222, 4-22224 |
| F-Herpestidae | Mongoose | 14 | 33 | 35-44 | 5 (8) | 35/36x 736x7 | 35/36x7, 36x7, 39/40, 41/42, 43/44 |
| F-Viverridae | Civet, Genet | 15 | 35 | 34-54 | 9 | 38x4<br>42x5 | 3-468888, 4-02222244, 5-00244 |
| F-Dipodidae | Jerboas | 16 | 51 | 18-72 | 14 | - | 1-89, 2-0446, 3-226, 58, 4-02246888, 72 |
| F-Molossidae | Free-tl bat | 16 | 100 | 34-48 | 4 | 48 | 3-444, 4-02, 48x25 |
| F- Didelphidae | Opossum | 17 | 90 | 14-22 | 3 | 14 | 1-4x31, 1-8x7, 2-2x8 |
| F-Echimyidae | Spiny rat | 18 | 84 | 14-118 | 19 | - | 1-46, 2-2488, 3-0000244, 4-0268, 5-022, 6-0222224, 98, 118 |
| F-Cervidae | Deer | 19 | 51 | 6-70 | 25 | 68x11,<br>70x-11 | 0-6678889, 1-24, 3-67789, 4-046689, 5-0066668, 6-0245666, 68x11, 70x-11 |
| F-Cercopithecidae | Old World Monkey | 21 | 133 | 42-84 | 11 | 42 x17<br>44x11 | 42x17, 44x11, 4-88, 5-4488, 60x5, 64, 66x5, 7-022, 84 |
| F-Nesomyidae | Rat/mouse | 21 | 61 | 32-76 | 8 | - | 32, 48, 5-28, 60, 7-4456 |
| F- Pteropodidae | Fruit bat | 42 | 186 | 24-48 | 8 | 36x16<br>38x15 | 2-46, 34x8, 35, 36x16, 38x15, 4-088 |
| F-Bovidae | Bovid | 50 | 143 | 30-60 | 21 | 60 | 30/31x2, 32/31x3, 32/33x2, 34/33, 34/35, 56/55, 3-0002388, 4-00246669, 48x8, 50x4, 52x7, 53, 54x5, 56x9, 58x16, 60x24 |
| F-Cricetidae | Vole, hamster | 129 | 683 | 9-92 | 36 | 48x36<br>52x30<br>56x25<br>54x20<br>50x18 | 0-99, 1-445667778, 22x7, 24x5, 2-00066, 28x9, 30x4, 32x4, 34x7, 3-666667, 38x13, 40x9, 42x9, 44x9, 4-366666, 48x36, 50x18. 52x30, 54x22, 56x25, 5-8888, 60x9, 62x8, 64x8, 6-6668, 7-00, 80x6, 82, 9-22 |

Studies on specific baramins not easily resolved at the chromosome level will be important going forward. Technology such as zoo-FISH or chromosome painting has significantly enhanced our vision into the genome however it often generates more questions than answers. According to multiple studies (Graphodatsky, *et al*. 2008; Wienberg 2004; Yang, *et al*. 1999; Yang, *et al*. 2000), Canidae, classified as a monobaramin, has one of the most rearranged karyotypes. In the preliminary survey of nine baramins (Bedinger, 2012), the following was reported:

> All red fox probes painted on corsac fox chromosomes split into multiple segments, including one that split into eight pieces, with not a single autosome shared between them even though they are considered to be from the same genus per Graphodatsky, *et al.* (2008). They further show the complexities of family unity with the following findings: Raccoon dogs and gray fox do not resolve well in phylogenetic analyses and remain so

> despite current technology; corsac fox and arctic fox lineages are isolated from red fox…hybridization data separates *Canis* from *Vulpes* (Gray 1972) and zoo-FISH does not resolve the family.

Trends in the chromosome patterns show that at the genus level *Canis, Cuon, Lycaon, Chrysocyon, Atelocynus,Lycalopex, Speothos, Cerdocyon,* and *Otocyon*, all cluster around the karyotype forms of 2n=70, 72, 74, 76 and 78. *Urocyon* (grey fox) stands isolated at 2n=66. *Nyctereutes* (raccoon dog) and *Vulpes* (true fox) have similar patterns to each other in they are highly diversified within their respective genus. The former with 2n=38, 42, 54, 56 and the latter with 2n=34, 36, 38, 40, 50, 60, 64. An in-depth review of family Canidae (Pendragon, 2011) contends that they have the taxonomic status of a basic type, capable of hybridization. Given their significant karyotype variability, further study into this group will be invaluable for understanding designed mechanisms in karyotype rearrangements and speciation, and possible further baramin refinement.

The data on karyotype diversity collected for this study represents the most comprehensive compilation found in the literature to date. This dataset could be used not only to add another element to the holistic view of a baramin but also as a starting point for determining which families warrant further study, especially those with significant variability. Fundamental arm number or number of chromosome types (e.g., metacentrics or acrocentric) could be added to further round out the picture for deeper analysis, especially on unusual presentations such as seen in Canidae. A copy of the full dataset which includes diploid numbers for each species is available on request and represents a work in progress.

## CONCLUSIONS

Chromosome number diversity is widespread across families. At first glance, roughly three-quarters of all terrestrial mammal families contain members with variability in their karyotype form. Speciose families with greater than 50 members are just shy of 100% for significant karyotype diversity. Those with less than 50 species drop to a little over 50% for diversity. This number is also consistent with removing members of order Rodentia from the dataset, implicating high reproduction rates with high karyotype diversification rates. Based on the assumption that a taxonomic family approximates a baramin and using a looser definition of stability (a six-point spread or less), 62 baramins can be identified by their karyotypes with relatively few discrepancies in their diploid numbers. Using this new definition brings the total to 48% of all families are relatively stable and 52% have significant variability. The dataset provided represents the most comprehensive compilation found in the literature to date.

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# APPENDIX

**Table A1**. Diploid numbers of families with only one genus. Diploid numbers are written in stem-leaf format where “1-2446” means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature. Heading Key: A= # of Genera; B= # of Species; C= # Karyotyped species used in dataset; D= % 2n known; E=2n range; F=#of 2n Variations; G= Mode of 2n; H= Diploid Numbers (2n); I= Reference. Abbreviation key:  F=Family.

| Classification Level | Common Name | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|
| F-Ornithorhynchidae | Platypus | 1 | 1 | 1 | 100 | 0 | 0 | 52 | 52 | 1 |
| F-Mirobitheriidae | M. del M. | 1 | 1 | 1 | 100 | 0 | 0 | 14 | 14 | 15 |
| F-Myrmecobiidae | Numbat | 1 | 1 | 1 | 100 | 0 | 0 | 14 | 14 | 3 |
| F-Phascolarctidae | Koala | 1 | 1 | 1 | 100 | 0 | 0 | 16 | 16 | 1 |
| F-Tarsipedidae | Honey pos | 1 | 1 | 1 | 100 | 0 | 0 | 24 | 24 | 1 |
| F-Hypsiprymnodontidae | Rat kangaroo | 1 | 1 | 1 | 100 | 0 | 0 | 22 | 22 | 12 |
| F-Orycteropodidae | Aardvark | 1 | 1 | 1 | 100 | 0 | 0 | 20 | 20 | 1 |
| F-Cyclopedidae | Pygmy anteat | 1 | 1 | 1 | 100 | 0 | 0 | 64 | 64 | 1 |
| F-Ptilocercidae | Tree shrew | 1 | 1 | 0 | 0 | - | - | - | - | - |
| F-Daubentoniidae | Aye-aye | 1 | 1 | 1 | 100 | 0 | 0 | 30 | 30 | 1 |
| F-Aplodontiidae | Mt. beaver | 1 | 1 | 1 | 100 | 0 | 0 | 46 | 46 | 1 |
| F-Petromuridae | Dassie rat | 1 | 1 | 1 | 100 | 0 | 0 | 56 | 56 | 72 |
| F-Dinomyidae | Pacarana | 1 | 1 | 1 | 100 | 0 | 0 | 58 | 58 | 1 |
| F-Myocastoridae | Nutria | 1 | 1 | 1 | 100 | 0 | 0 | 42 | 42 | 1 |
| F-Craseonycteridae | K. hog nose bat | 1 | 1 | 0 | 0 | - | - | - | - | - |
| F-Myzopodidae | Sucker-foot bat | 1 | 1 | 1 | 100 | 0 | 0 | 26 | 26 | 82 |
| F-Nandiniidae | A. palm civet | 1 | 1 | 1 | 100 | 0 | 0 | 38 | 38 | 40 |
| F-Ailuridae | Red panda | 1 | 1 | 1 | 100 | 0 | 0 | 36 | 36 | 1 |
| F-Antilocapridae | Pronghorn | 1 | 1 | 1 | 100 | 56-58 | 2 | - | 5-68 | 1, 40 |
| F-Noctilionidae | Bulldog bat | 1 | 2 | 2 | 100 | 0 | 0 | 34 | 34 | 1, 6 |
| F-Mystacinidae | NZ sh. tail bat | 1 | 2 | 1 | 50 | 0 | 0 | 36 | 36 | 1 |
| F-Notoryctidae | Mar. mole | 1 | 2 | 1 | 50 | 0 | 0 | 20 | 20 | 1, 11 |
| F-Thylacomyidae | Bilby | 1 | 2 | 1 | 50 | 0 | 0 | 18 | 18 | 1 |
| F-Megalonychidae | 2-toed sloth | 1 | 2 | 2 | 100 | 50-53 | 2 | - | 50, 53 | 1 |
| F-Castoridae | Beaver | 1 | 2 | 2 | 100 | 40-48 | 2 | - | 4-08 | 1 |
| F-Thryonomyidae | Cane rat | 1 | 2 | 2 | 100 | 40-44 | 2 | - | 4-04 | 59, 62 |
| F-Cuniculidae | Paca | 1 | 2 | 2 | 100 | 42-74 | 2 | - | 42, 74 | 71 |
| F-Thyropteridae | Disc-wing bat | 1 | 3 | 2 | 67 | 32-40 | 2 | - | 32, 40 | 40 |
| F-Bradypodidae | 3-toed sloth | 1 | 4 | 1 | 25 | 0 | 0 | 54 | 54 | 6 |
| F-Solenodontidae | Solendon | 1 | 4 | 1 | 25 | 0 | 0 | 34 | 34 | 1 |
| F-Rhinopomatidae | Mouse tail bat | 1 | 4 | 2 | 50 | 36-42 | 2 | - | 36, 42 | 1, 40 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| F-Tapiridae | Tapir | 1 | 4 | 4 | 100 | 52-80 | 3 | 80 | 52, 76, 8-00 | 1 |
| F-Tarsidae | Tarsier | 1 | 7 | 2 | 29 | 0 | 0 | 80 | 80 | 1, 30 |
| F-Moschidae | S. musk deer | 1 | 7 | 7 | 100 | 0 | 0 | 58 | 58 | 94, 95 |
| F-Lepilemuridae | Sport. Lemur | 1 | 8 | 4 | 50 | 20-34 | 3 | - | 2-006, 34 | 1, 6 |
| F-Aotidae | Night monkey | 1 | 8 | 5 | 63 | 46-58 | 11 | - | 4-6789<br>5-0012234468 | 1, 31, 32, 33 |
| F-Calomyscidae | Mouse-like hamster | 1 | 8 | 6 | 75 | 30-52 | 7 | 44 | 3-027, 4-44448, 5-002 | 1, 48 |
| F-Manidae | Pangolin | 1 | 8 | 2 | 25 | 36-42 | 4 | - | 3-688, 4-02 | 1 |
| F-Equidae | Horse | 1 | 9 | 9 | 100 | 32-66 | 11 | - | 32, 4-4456, 5-2456, 6-2446 | 1, 40, 90 |
| F-Nycteridae | Slit faced bat | 1 | 16 | 2 | 13 | 0 | 0 | 42 | 42 | 40, 81 |
| F-Ochotonidae | Pika | 1 | 30 | 10 | 33 | 38-68 | 7 | - | 38, 4-02, 50, 6-022888 | 1, 40 |
| F-Ctenomyid | Tuco-tuco | 1 | 60 | 18 | 30 | 26-56 | 13 | 48x5<br>26x4 | 10, 2-6666, 3-46, 4-456688888, 5-02456 | 1, 6, 69 |
| F-Rhinolophidae | Horseshoe bat | 1 | 76 | 19 | 25 | 28-62 | 7 | 58 | 28, 3-66, 44, 5-2666, 58x9, 6-22222 | 1, 6, 40, 78, 80 |

**Table A2.** Diploid numbers of families with two to five genera. Diploid numbers are written in stem-leaf format where “1-2446” means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature. Alternating gray areas separate families for easier comparison;Heading Key: A= # of Genera; B= # of Species; C= # Karyotyped species used in dataset; D= % 2n known; E=2n range; F=#of 2n Variations; G= Mode of 2n; H= Diploid Numbers (2n); I= Reference. Abbreviation key: F=Family, SF=Subfamily, T=Tribe, G=Genus, SG=Subgenus; “OW” = Old World; “NW” = New World.

| Classification Level | Common Name | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|
| F-Acrobatidae | Pygmy glider | 2 | 2 | 2 | 100 | 0 | 0 | 14 | 14 | 1, 16 |
| F-Cynocephalidae | Flying Lemur | 2 | 2 | 1 | 50 | 0 | 0 | 38 | 38 | 1 |
| F-Platacanthomyidae | Spiny dormice | 2 | 2 | 1 | 50 | 0 | 0 | 38 | 38 | 43 |
| F-Pedetidae | Spring hare | 2 | 2 | 2 | 100 | 38-40 | 2 | - | 38, 40 | 1 |
| F-Furipteridae | Smokey bat | 2 | 2 | 1 | 50 | 0 | 0 | 34 | 34 | 40 |
| F-Hippopotamidae | Hippopotamus | 2 | 2 | 1 | 50 | 0 | 0 | 36 | 36 | 1 |
|  |  |  |  |  |  |  |  |  |  |  |
| F-Giraffidae | Giraffe | 2 | 2 | 2 | 100 | 30-46 | 3 | - | 30, 4-56 | 1 |
| G-G.*Giraffa* | Giraffe | - | 1 | 1 | 100 | 0 | 0 | 30 | 30 | 1 |
| G-G.*Okapia* | Okapi | - | 1 | 1 | 100 | 45-46 | 2 | - | 4-56 | 1 |
|  |  |  |  |  |  |  |  |  |  |  |
| F-Vombatidae | Wombat | 2 | 3 | 2 | 50 | 0 | 0 | 14 | 14 | 1 |
| F-Elephantidae | Elephant | 2 | 3 | 2 | 67 | 0 | 0 | 56 | 56 | 1 |
|  |  |  |  |  |  |  |  |  |  |  |
| F-Myrmecophagidae | Anteater | 2 | 3 | 2 | 67 | 54-60 | 2 | - | 54, 60 | 1 |
| G-M.Myrmecophaga | Giant A. | - | 1 | 1 | 100 | 0 | 0 | 60 | 60 | 1 |
| G-M.*Tamandua* | Tamandua | - | 2 | 1 | 50 | 0 | 0 | 54 | 54 | 1 |
|  |  |  |  |  |  |  |  |  |  |  |
| F-Tachygossidae | Echidna | 2 | 4 | 2 | 50 | 0 | 0 | 64 | 64 | 1 |
| F-Burramyidae | Pygmy pos | 2 | 5 | 4 | 80 | 0 | 0 | 14 | 14 | 1, 6, 12, 15 |
| F-Abrocomic | Chinchilla rat | 2 | 10 | 2 | 20 | 0 | 0 | 64 | 64 | 1 |
| F-Mormoopidae | Mustached bat | 2 | 10 | 7 | 70 | 0 | 0 | 38 | 38 | 1, 40 |
| F-Dasyproctidae | Agouti | 2 | 13 | 5 | 39 | 0 | 0 | 64 | 64 | 69, 70 |
|  |  |  |  |  |  |  |  |  |  |  |
| F-Tayassuidae | Peccary | 3 | 3 | 3 | 100 | 20-30 | 3 | - | 2-06, 30 | 1, 40 |
| G-T.*Catagonus* | Tagua peccary | - | 1 | 1 | 100 | 0 | 0 | 20 | 20 | 1 |
| G-T.*Pecari* | Collared p. | - | 1 | 1 | 100 | 0 | 0 | 26 | 26 | 1 |
| G-T.*Tayassus* | White-lipped p. | - | 1 | 1 | 100 | 0 | 0 | 30 | 30 | 1, 40 |
|  |  |  |  |  |  |  |  |  |  |  |
| F-Procaviidae | Hyrax | 3 | 4 | 1 | 25 | 0 | 0 | 54 | 54 | 1 |
| F-Hyaenidae | Hyena | 3 | 4 | 3 | 75 | 0 | 0 | 40 | 40 | 1, 40 |
| F-Caenolestidae | Shrew op | 3 | 6 | 4 | 67 | 0 | 0 | 14 | 14 | 1, 10, |

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|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 15 |
| F-Hominidae | Gorilla, chimp | 3 | 6 | 5 | 83 | 0 | 0 | 48 | 48 | 1 |
| F-Camelidae | Camel | 3 | 6 | 6 | 100 | 72-74 | 2 | 74 | 7-2244444 | 1, 40 |
| F-Anomaluridae | Scaly tail squir. | 3 | 7 | 0 | 0 | - | - | - | - | - |
| F-Natalidae | Funnel-ear bat | 3 | 7 | 3 | 43 | 0 | 0 | 36 | 36 | 1, 40 |
| | | | | | | | | | | |
| F-Chinchillidae | Chinchilla | 3 | 7 | 4 | 57 | 56-64 | 2 | 64 | 56, 6-444 | 1, 6, 64 |
| G-C.*Chinchilla* | Chinchilla | - | 2 | 2 | 100 | 0 | 0 | 64 | 64 | 6, 64 |
| G-C.*Lagidium* | Viscacha | - | 3 | 1 | 33 | 0 | 0 | 64 | 64 | 64 |
| G-C.*Lagostomus* | Chinchilla | - | 2 | 1 | 50 | 0 | 0 | 56 | 56 | 1 |
| | | | | | | | | | | |
| F-Tragulidae | A. mouse deer | 3 | 8 | 2 | 25 | 0 | 0 | 32 | 32 | 1, 92 |
| F-Hystricidae | OW porcupine | 3 | 11 | 3 | 27 | 60-66 | 2 | 60 | 6-006 | 59, 60, 61 |
| | | | | | | | | | | |
| F-Petauridae | Gliding pos | 3 | 11 | 5 | 46 | 18-22 | 2 | 22 | 1-88<br>2-222 | 1, 15, 16 |
| G-P.*Dactylopsila* | Triok | - | 4 | 2 | 50 | 0 | 0 | 18 | 18 | 15, 16 |
| G-P. *Gymnobelideus* | Possum | - | 1 | 1 | 100 | 0 | 0 | 22 | 22 | 15 |
| G-P.*Petaurus* | Gliders | - | 6 | 2 | 33 | 0 | 0 | 22 | 22 | 1, 15 |
| | | | | | | | | | | |
| F-Indridae | Sifaka | 3 | 18 | 18 | 100 | 40-70 | 5 | 70 | 4-0222248888<br>7-00000000 | 1, 23 |
| G-I.*Avahi* | Woolly lemur | - | 8 | 8 | 100 | 0 | 0 | 70 | 70 | 23 |
| G-I.*Indri* | Babakoto | - | 1 | 1 | 100 | 0 | 0 | 40 | 40 | 23 |
| G-I.*Propithecus* | Sifika | - | 9 | 9 | 100 | 42-48 | 3 | - | 4-2224888 | 1, 23 |
| | | | | | | | | | | |
| F-Galagidae | Galago | 3 | 19 | 5 | 26 | 38-62 | 4 | - | 3-688, 40<br>6-22 | 1, 6, 25, 31 |
| G-G.*Galago* | Bushbaby | - | 14 | 3 | 21 | 36-40 | 3 | - | 3-688, 40 | 1, 6, 25 |
| G-G.*Otolemur* | Greater gal. | - | 3 | 2 | 67 | 0 | 0 | 62 | 62 | 1, 31 |
| | | | | | | | | | | |
| F-Ctenodactylidae | Gundi | 4 | 5 | 4 | 80 | 36-40 | 2 | 40 | 36, 4-000 | 1 |
| | | | | | | | | | | |
| F-Megadermatidae | False vamp. Bat | 4 | 5 | 2 | 40 | 38-54 | 2 | - | 38, 54 | 1 |
| G-M.*Megaderma* | | - | 2 | 2 | 100 | 38-54 | 2 | - | 38, 54 | 1 |
| | | | | | | | | | | |
| F-Rhinocerotidae | Rhinoceros | 4 | 5 | 4 | 80 | 82-84 | 2 | 82 | 8-2224 | 1, 91 |

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|---|---|---|---|---|---|---|---|---|---|---|
| F-Potoroidae | Variety | 4 | 10 | 6 | 60 | 12-32 | 4 | 22 | 1-2<br>2-2224<br>3-2 | 1, 12, 14, 15 |
| G-P.*Aepyprymnus* | R. rat kang | - | 1 | 1 | 100 | 0 | 0 | 32 | 32 | 14 |
| G-P.*Bettongia* | Bettong | - | 4 | 3 | 75 | 0 | 0 | 22 | 22 | 12, 15 |
| G-P.*Potorous* | Potoroo | - | 4 | 2 | 50 | 12-24 | 2 | - | 12<br>24 | 1, 12, 15 |
| | | | | | | | | | | |
| F-Mephitidae | Skunk | 4 | 12 | 6 | 50 | 46-64 | 6 | - | 4-68, 5-008, 6-04 | 1, 40, 87 |
| G-M.*Conepatus* | Hog-nose sk. | - | 4 | 1 | 25 | 0 | 0 | 46 | 46 | 87 |
| G-M.*Mephitis* | Skunk | - | 2 | 2 | 100 | 0 | 0 | 50 | 50 | 40, 87 |
| G-M.*Mydau*s | Stink skunk | - | 2 | 0 | 0 | - | - | - | - | - |
| G-M.*Spilogale* | Spotted skunk | - | 4 | 3 | 75 | 48-64 | 3 | - | 48, 6-04 | 1, 87 |
| | | | | | | | | | | |
| F-Hylobatidaae | Gibbon | 4 | 14 | 5 | 36 | 38-52 | 4 | 44 | 38, 4-4444, 5-02 | 1, 6, 31 |
| G-H.*Bunopithecus* | Hoolock G. | - | 1 | 1 | 100 | 38-44 | 2 | - | 38, 44 | 31 |
| G-H.*Hylobates* | Gibbon | - | 7 | 3 | 43 | 0 | 0 | 44 | 44 | 1, 31 |
| G-H.*Nomascus* | Gibbon | - | 5 | 1 | 20 | 0 | 0 | 52 | 52 | 1 |
| G-H.*Symphanlangus* | Siamang | - | 1 | 1 | 100 | 0 | 0 | 50 | 50 | 1 |
| | | | | | | | | | | |
| F-Macroscelididae | Elephant shrew | 4 | 16 | 9 | 60 | 26-34 | 4 | 26 | 2-66666888<br>3-004 | 19, 40 |
| | | | | | | | | | | |
| F-Tupalidae | Tree shrew | 4 | 19 | 7 | 37 | 44-68 | 6 | - | 44, 52, 6-00268 | 1, 21 |
| G-T.*Tupaia* | Tree shrew | - | 15 | 6 | 40 | 52-68 | 5 | - | 52, 6-00268 | 1, 21 |
| G-T.*Urogale* | Tree shrew | - | 1 | 1 | 100 | 0 | 0 | 44 | 44 | 21 |
| | | | | | | | | | | |
| F-Pitheciidae | Titi | 4 | 40 | 15 | 38 | 16-54 | 9 | - | 16, 20<br>4-245666888<br>5-0000444 | 1, 6, 31, 32, 33 |
| SF-P.Callicebinae | Titi | 1 | 28 | 8 | 29 | 16-50 | 6 | 50 | 16, 20, 4-268<br>5-0000 | 1, 6, 31, 32, 33 |
| SG-P.C.*C.Callicebus* | Titi | - | 22 | 6 | 27 | 42-50 | 4 | 50 | 4-268<br>5-0000 | 1, 31, 32, 33 |
| SG-P.C.C *Torquatus* | Collared titi | - | 5 | 2 | 40 | 16-20 | 2 | - | 16, 20 | 6 |
| SF-P.Pitheciinae | variety | 3 | 12 | 7 | 59 | 44-54 | 5 | - | 4-456688<br>5-444 | 1, 31, 33 |
| G-P.P.*Cacajao* | Uakari | - | 2 | 2 | 100 | 44-46 | 3 | - | 4-456 | 1, 31, |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 33 |
| G-P.P.*Chiropotes* | Saki | - | 5 | 3 | 60 | 0 | 0 | 54 | 54 | 32, 33 |
| G-P.P.*Pithecia* | Saki | - | 5 | 2 | 40 | 46-48 | 2 | - | 4-68 | 31, 32 |
| | | | | | | | | | | |
| F-Ursidae | Bear | 5 | 8 | 8 | 100 | 42-74 | 3 | 74 | 42, 52, 74x6 | 40 |
| G-U.*Ailuropoda* | Giant panda | - | 1 | 1 | 100 | 0 | 0 | 42 | 42 | 40 |
| G-U.*Tremarctos* | Spectacled bear | - | 1 | 1 | 100 | 0 | 0 | 52 | 52 | 40 |
| | | | | | | | | | | |
| F-Lorisidae | Loris | 5 | 9 | 4 | 44 | 50-62 | 3 | - | 5-00022<br>6-22 | 1, 6, 28 |
| G-L.*Arctocebus* | Gold. Pottos | - | 2 | 1 | 50 | 0 | 0 | 52 | 52 | 28 |
| G-L.*Loris* | Slender loris | - | 2 | 1 | 50 | 0 | 0 | 62 | 62 | 1 |
| G-L.*Nycticebus* | Slow loris | - | 3 | 3 | 100 | 50-52 | 2 | 50 | 5-0002 | 1, 28 |
| G-L.*Perodicticus* | Potto | - | 1 | 1 | 100 | 0 | 0 | 62 | 62 | 6 |
| | | | | | | | | | | |
| F-Bathyergidae | Mole rat | 5 | 16 | 13 | 81 | 40-78 | 10 | - | 40, 5-04444688, 6-0028, 7-488 | 1, 6, 57, 62 |
| SF-B.Bathyerginae | Mole rat | 4 | 15 | 6 | 40 | 40-78 | 10 | - | 40, 5-04444688, 6-028<br>7-488 | 1, 6, 62 |
| G-B.B.*Bathyergus* | | - | 2 | 2 | 100 | 54-56 | 2 | - | 5-46 | 1, 6 |
| G-B.B.*Crytomys* | | - | 11 | 8 | 73 | 40-78 | 6 | | 40, 5-04, 68, 7-488 | 1, 6, 62 |
| G-B.B.*Georychus* | | - | 1 | 1 | 100 | 0 | 0 | 54 | 54 | 1 |
| G-B.B.*Heliophobius* | | - | 1 | 1 | 100 | 60-62 | 2 | - | 6-02 | 57 |
| SF-B.Hetrocephalinae | Naked mole rat | 1 | 1 | 1 | 100 | 0 | 0 | 60 | 60 | 57 |
| | | | | | | | | | | |
| F-Cheirogaleidae | Mouse lemur | 5 | 16 | 16 | 100 | 46-66 | 2 | 66 | 66x12<br>46x4 | 1, 22 |
| G-C.*Phaner* | | - | 4 | 4 | 100 | 0 | 0 | 46 | 46 | 22 |
| | | | | | | | | | | |
| F-Erethizontidae | NW porcupine | 5 | 16 | 10 | 63 | 42-74 | 4 | 42 | 4-2222, 52, 7-2444, 62 | 58, 63, 65 |
| SF-E.Chaetomyinae | Bristle spine rat | 1 | 1 | 1 | 100 | 0 | 0 | 52 | 52 | 58 |
| SF-E.Erthizontinae | Porcupine | 4 | 15 | 9 | 60 | 42-74 | 3 | 42x4,<br>74x3 | 4-2222, 62, 7-2444 | 58, 63, 65 |
| G-E.E.*Coendou* | Prehensile tail porcupine | - | 4 | 3 | 75 | 0 | 0 | 74 | 7-444 | 58, 63 |
| G-E.E.*Erethizon* | Common p. | - | 1 | 1 | 100 | 0 | 0 | 42 | 42 | 58 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G-E.E.*Sphiggurus* | Porcupine | - | 9 | 6 | 68 | 42-72 | 3 | 42 | 4-222, 62, 72 | 58, 63, 65 |
| | | | | | | | | | |
| F-Lemuridae | Lemur | 5 | 19 | 10 | 53 | 44-60 | 8 | - | 4-4688, 5-0468, 6-000 | 1, 6 |
| G-L.*Eulemur* | True lemur | - | 11 | 6 | 55 | 44-60 | 5 | - | 4-4688, 50, 6-00 | 1, 6 |
| G-L.*Hapalemur* | Gentle l | - | 4 | 2 | 50 | 54-58 | 2 | 58 | 5-488 | 6 |
| G-L.*Lemur* | Ring tail l | - | 1 | 1 | 100 | 0 | 0 | 56 | 56 | 6 |
| G-L.*Prolemur* | G. bamboo l | - | 1 | 1 | 100 | 0 | 0 | 60 | 60 | 6 |
| | | | | | | | | | |
| F-Suidae | Pig | 5 | 19 | 10 | 53 | 32-38 | 4 | 34x5 38x4 | 3-24444468888 | 1, 40 |
| SF-S.Suinae | Babirusa | 5 | 19 | 10 | 53 | 32-38 | 4 | 34x5 38x4 | 3-24444468888 | 1, 40 |
| T-S.S.Suini | Pig | 1 | 10 | 4 | 40 | 34-38 | 3 | 38 | 3-46888 | 1, 40 |
| T-S.S.Babyrousini | Babirusa | 1 | 4 | 1 | 25 | 0 | 0 | 38 | 38 | 1 |
| T-S.S.Potamo-choerini | Hog | 3 | 5 | 5 | 100 | 32-34 | 2 | 34 | 3-24444 | 1, 40 |
| | | | | | | | | | |
| F-Atelidae | NW monkey | 5 | 25 | 12 | 48 | 32-62 | 11 | - | 3-244444, 4-245789, 5-0002222, 62 | 1, 6, 31, 33 |
| SF-A.Alouattinae | Howler mon | 1 | 11 | 5 | 46 | 44-52 | 7 | 50x4 52x4 | 4-45789, 5-00002222 | 1, 6, 33 |
| Sp-A.A.*Alouatta seniculus* | Red Howler | - | 1 | 1 | 100 | 44-52 | 7 | - | 4-45789, 5-02 | 1, 33 |
| SF-A.Atelinae | Spider/wool | 4 | 14 | 6 | 43 | 32-62 | 3 | 34 | 3-2244444, 62 | 6, 31, 33 |
| G-A.A.*Lagothrix* | Woolly mon | - | 4 | 1 | 25 | 0 | 0 | 62 | 62 | 6 |

**Table A3.** Diploid numbers of families with six to 10 genera. Diploid numbers are written in stem-leaf format where “1-2446” means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature. Alternating gray areas separate families for easier comparison; Heading Key: A= # of Genera; B= # of Species; C= # Karyotyped species used in dataset; D= % 2n known; E=2n range; F=#of 2n Variations; G= Mode of 2n; H= Diploid Numbers (2n); I= Reference. Abbreviation key: F=Family, SF=Subfamily, T=Tribe, G=Genus, SG=Subgenus; “OW” = Old World; “NW” = New World.

| Classification Level | Common Name | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|
| F-Procyonidae | Raccoon | 6 | 17 | 8 | 57 | 0 | 0 | 38 | 38 | 1, 40, 89 |
| | | | | | | | | | | |
| F-Pseudocheiridae | Ring-tail p. | 6 | 17 | 10 | 59 | 10-22 | 6 | - | 1-022668,<br>2-022 | 1, 15, 16 |
| SF-P.Hemibelideinae | Variety | 2 | 2 | 2 | 100 | 20-22 | 2 | 22 | 2-022 | 1, 15 |
| G-P.H.*Hemibelideus* | Lemuroid | - | 1 | 1 | 100 | 20-22 | 2 | - | 2-02 | 1, 15 |
| G-P.H.*Petauroides* | Glider | - | 1 | 1 | 100 | 0 | 1 | 22 | 22 | 15 |
| SF-P.Pseudocheirinae | Ring-tail p. | 3 | 10 | 5 | 50 | 12-20 | 4 | - | 1-2268,<br>2-0 | 1, 15, 16 |
| G-P.P *Petropseudes* | Rock pos | - | 1 | 1 | 100 | 0 | 0 | 16 | 16 | 1 |
| G-P.P. *Pseudocheirus* | Ring tail pos | - | 1 | 1 | 100 | 0 | 0 | 20 | 20 | 1 |
| G-P.P.*Pseudochirulus* | Ringtail pos | - | 8 | 3 | 38 | 12-18 | 2 | 12 | 1-228 | 15, 16 |
| SF-P.Pseudochiropsinae | Ringtail pos | 1 | 5 | 3 | 60 | 10-16 | 2 | 16 | 1-066 | 15, 16 |
| | | | | | | | | | | |
| F-Peramelidae | Bandicoot | 6 | 18 | 8 | 44 | 0 | 0 | 14 | 1-44444444 | 1, 12, 15, 16 |
| | | | | | | | | | | |
| F-Caviidae | Guinea pig | 6 | 18 | 11 | 61 | 52-68 | 5 | 64 | 52,<br>6-22444444468 | 1, 6, 7, 66, 67, 68, 69 |
| SF-C.Caviinae | Guinea pig | 3 | 12 | 8 | 67 | 62-68 | 3 | 64 | 6-224444448 | 1, 6, 7, 66, 67, 68 |
| G-C.C.*Cavia* | Guinea pig | - | 6 | 6 | 100 | 62-64 | 2 | 64 | 6-2244444 | 7, 66, 68 |
| G-C.C.*Galea* | Yellow tooth c. | - | 3 | 2 | 67 | 64-68 | 2 | - | 6-48 | 6, 67 |
| G-C.C.*Microcavia* | Mountain cavy | - | 3 | 0 | 0 | - | - | - | - | - |
| SF-C.Dolichotinae | Paantagon.hare | 1 | 2 | 2 | 50 | 0 | 0 | 64 | 64 | 6 |
| SF-C.Hydrochoeris | Capybara, rock cavy | 2 | 4 | 2 | 50 | 52-66 | 2 | - | 52, 66 | 1, 69 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| G-C.H.*Hydrochoeris* | Capybara | - | 2 | 1 | 50 | 0 | 0 | 66 | 66 | 1 |
| G-C.H*kerodon* | Rock cavy | - | 2 | 1 | 50 | 0 | 0 | 52 | 52 | 69 |
| | | | | | | | | | | |
| F-Phalangeridae | - | 6 | 28 | 6 | 21 | 12-20 | 3 | 20 | 1-244<br>2-000 | 1, 12, 15, 16 |
| SF-P.Ailuropinae | Cuscus | 1 | 2 | 0 | 0 | - | - | - | - | - |
| SF-P.Phalangerinae | - | 5 | 25 | 6 | 24 | 12-20 | 3 | 20 | 1-244<br>2-000 | 15 |
| T-P.P.Phalangerini | Cuscus | 2 | 17 | 2 | 11 | 0 | 0 | 14 | 14 | 15 |
| T-P.P.Trichosurini | Possum | 3 | 8 | 4 | 50 | 12-20 | 2 | 20 | 1-2<br>2-000 | 1, 12, 16 |
| G-P.P.T.*Strigocuscus* | Cuscus | - | 2 | 1 | 50 | 0 | 0 | 12 | 12 | 16 |
| G-P.P.T.*Tricho-surus* | Brush tail possum | - | 5 | 3 | 60 | 0 | 0 | 20 | 20 | 1, 12, 16 |
| | | | | | | | | | | |
| F-Spalacidae | Subterranean rat | 6 | 36 | 15 | 42 | 38-64 | 13 | 60 | 38, 4-048889, 5-000244466, 58x3, 6-0000022224 | 1, 45, 46, 47, 48, 49, 52 |
| SF-S.Myospalacinae | Zokor | 2 | 6 | 6 | 100 | 44-64 | 5 | 62 | 44, 58, 6-02224 | 48, 49 |
| G-S.M.*Esopalax* | Zoker | - | 3 | 3 | 100 | 58-62 | 3 | 62 | 58, 6-022 | 48, 49 |
| G-S.M.*Myosplalax* | Zoker | - | 3 | 3 | 100 | 44-64 | 3 | | 44, 6-24 | 48 |
| SF-S.Rhizomyinae | Bamboo rat | 2 | 4 | 0 | 0 | - | - | - | - | - |
| SF-S.Spalacinae | Blind mole rat | 1 | 15 | 6 | 40 | 38-62 | 11 | - | 38, 4-089, 5-00244466888, 6-00002 | 45, 46, 47 |
| G-S.S.*Spalax* | Blind mole rat | - | 15 | 6 | 40 | 38-62 | 11 | - | 38, 4-089, 5-00244466888, 6-00002 | 45, 46, 47 |
| SF-S.Tachyoryctinae | Mole rat | 1 | 13 | 3 | 23 | 48-50 | 2 | 48 | 4-88, 50 | 1, 52 |
| | | | | | | | | | | |
| F-Cebidae | NW Monkey | 6 | 57 | 13 | 23 | 44-54 | 5 | 44x10<br>46x10 | 44x10, 46x10, 48, 5-2222444 | 1, 6, 32, 33 |
| SF-C.Marmoset | Marmoset | 4 | 43 | 19 | 44 | 44-48 | 3 | 44x9 | 44x9, 46x10, 48 | 1, 32, 33 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 46x10 | | |
| SF-C.Cebinae | Capuchin | 1 | 9 | 5 | 57 | 52-54 | 2 | 52x4<br>54x3 | 5-2222444 | 1, 6, 33 |
| SF-C.Saimiriinae | Squir mon | 1 | 5 | 1 | 20 | 0 | 0 | 44 | 44 | 1 |
| | | | | | | | | | | |
| F-Heteromyidae | Kangaroo rat | 6 | 60 | 50 | 83 | 34-74 | 19 | 60 | 3-4688, 4-0222244466, 48x5, 50x4, 56x6, 5-22244448, 60x12, 6-24444, 7-00222224 | 1, 6, 36, 37, 38, 39, 40 |
| SF-H. Dipodomyinae | Kangaroo rat | 2 | 21 | 19 | 91 | 40-74 | 10 | - | 4-02, 5-224, 6-0000024444, 7-00222224 | 1, 6, 39, 40 |
| G-H.H. *Dipodomys* | Kangaroo rat | - | 19 | 17 | 90 | 52-74 | 8 | 60x5<br>72x5 | 5-224, 6-0000024444, 7-00222224 | 1, 6, 39, 40 |
| G-H.H.*Micropodipops* | Kang. Mouse | - | 2 | 2 | 100 | 40-42 | 2 | - | 4-02 | 39 |
| SF-H.Heteromyinae | Pocket mouse | 2 | 13 | 13 | 100 | 40-60 | 6 | 60 | 4-2888, 5-6668, 6-0000000 | 6, 36, 37, 38, 39, 40 |
| G-H.H.*Heteromys* | Spiny pocket mouse | - | 8 | 7 | 88 | 42-60 | 3 | 60 | 42, 56, 6-00000 | 6, 36, 37, 38, 39 |
| G-H.H..*Liomys* | Sp. Pocket m. | - | 5 | 5 | 100 | 48-60 | 4 | - | 4-88, 5-668, 60 | 38, 40 |
| SF-H.Perognathinae | Pocket mouse | 2 | 26 | 17 | 65 | 34-56 | 11 | - | 3-4688, 4-224446688, 5-00002444666 | 39, 40 |
| G-H.P.*Chaetodipus* | Pocket mouse | - | 17 | 9 | 53 | 34-56 | 11 | - | 3-4688, 4-2244466688, 5-0246 | 39, 40 |
| G-H.P.*Perognathus* | Pocket mouse | - | 9 | 8 | 89 | 44-56 | 4 | 50x4<br>54x3<br>56x | 44, 5-0000444666 | 39, 40 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 3 | | |
| | | | | | | | | | | |
| F-Geomyidae | Pocket gopher | 6 | 40 | 19 | 48 | 36-88 | 24 | - | 3-688, 40x8, 42x5, 4-4446666888, 5-022446666, 58x5, 6-008, 70x4,74x4, 7-22266888, 8-02468 | 1, 39, 40 |
| G-G.*Geomys* | Eastern pocket gopher | - | 9 | 6 | 67 | 38-74 | 5 | - | 3-88, 4-22, 68, 7-000022244 | 39, 40 |
| G-G.*Orthogeomys* | Giant pocket g. | - | 11 | 3 | 27 | 44-58 | 3 | - | 44, 5-28 | 39 |
| G-G.*Pappogeomys* | Pocket gopher | - | 2 | 2 | 100 | 36-58 | 5 | 40 | 36, 4-000026, 58 | 39 |
| G-G. *Thomomys* | Small toothed pocket gopher | - | 13 | 12 | 92 | 40-88 | 19 | - | 4-0002244666, 48x3, 56x4, 5-0244888, 6-00, 7-4466888, 8-02468 | 1, 39, 40 |
| SG-G.*T.Thomomys* | Southern pocket gopher | - | 5 | 5 | 100 | 40-60 | 11 | - | 4-0002244666, 48x3, 5-02446666888 6-00 | 40 |
| SG-G.*T.Megascapheus* | Northern and Western pocket gopher | - | 4 | 4 | 100 | 74-88 | 8 | 76 | 7-4466888, 8-022468 (76x17 subspecies) | 39, 40 |
| G-G.*Zygogeomys* | Pocket gopher | - | 1 | 1 | 100 | 0 | 0 | 40 | 40 | 39 |
| | | | | | | | | | | |
| F-Capromyidae | Hutia | 6 | 16 | 2 | 13 | 40-88 | 2 | - | 40, 88 | 71 |
| SF-C.Capromyinae | Hutia | 4 | 13 | 2 | 15 | 40-88 | 2 | - | 40, 88 | 71 |
| G-C.C.*Capromys* | Desmarest’s h. | - | 2 | 1 | 50 | 0 | 0 | 40 | 40 | 71 |
| G-C.C.*Geocapromys* | Hutia | - | 2 | 1 | 50 | 0 | 0 | 88 | 88 | 71 |
| | | | | | | | | | | |
| F-Eupleridae | Fossa | 7 | 8 | 3 | 38 | 42-44 | 2 | 42 | 4-224 | 1 |
| SF-Euplerinae | M. civet | 3 | 3 | 2 | 67 | 0 | 0 | 42 | 42 | 1 |
| SF-Galidiinae | Mongoose | 4 | 5 | 1 | 20 | 0 | 0 | 44 | 44 | 1 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| F-Octodontidae | Rock rat | 8 | 13 | 10 | 77 | 38-102 | 6 | 58 | 38, 5-4668888, 78, 102 | 1, 6 |
| G-O.*Aconaemys* | Rock rat | - | 3 | 3 | 100 | 54-58 | 3 | - | 5-468 | 1 |
| G-O.*Octodon* | Degu | - | 4 | 3 | 75 | 58-78 | 2 | 58 | 5-88, 78 | 1, 6 |
| G-O.*Octodontomoys* | Mountain degu | - | 1 | 1 | 100 | 0 | 0 | 38 | 38 | 6 |
| G-O.*Octomys* | Mt Viscacha | - | 1 | 1 | 100 | 0 | 0 | 56 | 56 | 6 |
| G-O.*Spalacopus* | Coruro | - | 1 | 1 | 100 | 0 | 0 | 58 | 58 | 1 |
| G-.O.*Tympa-noctomys* | Red Viscacha | - | 1 | 1 | 100 | 0 | 0 | 102 | 102 | 1 |
| | | | | | | | | | | |
| F-Chrysochloridae | Golden mole | 9 | 21 | 11 | 53 | 26-36 | 5 | 30 | 2-68<br>3-000000046 | 1, 18 |
| SF-C.Chryso-chiorinae | G. Mole | 6 | 11 | 6 | 55 | 26-30 | 2 | 30 | 26, 3-00000 | 1, 18 |
| SF-C.Amblysominae | G. Mole | 3 | 10 | 5 | 50 | 28-36 | 4 | - | 28, 3-0046 | 18 |
| | | | | | | | | | | |
| F-Dasypodidae | Armadillo | 9 | 21 | 14 | 67 | 38-64 | 6 | 64 | 38, 5-0088<br>6-0222444444 | 1, 6 |
| SF-D.Dasypodinae | 9-banded A | 1 | 7 | 6 | 86 | 0 | 0 | 64 | 6-444444 | 1, 6 |
| SF-D.Euphractinae | 6-banded A | 5 | 7 | 4 | 57 | 58-62 | 3 | - | 5-8<br>6-022 | 1, 6 |
| SF-D.Tolypeutinae | Variety | 3 | 7 | 4 | 57 | 38-62 | 3 | - | 38, 5-00, 62 | 1, 6 |
| G-D.T.*Cabassous* | Naked tail A | - | 4 | 2 | 50 | 50-62 | 2 | - | 50, 62 | 1 |
| G-D.T.*Priodontes* | Giant A | - | 1 | 1 | 100 | 0 | 0 | 50 | 50 | 6 |
| G-D.T.*Tolypeutes* | 3-banded A | - | 2 | 1 | 50 | 0 | 0 | 38 | 38 | 1 |
| | | | | | | | | | | |
| F-Gliridae | Dormouse | 9 | 28 | 5 | 18 | 44-62 | 4 | - | 4-4688, 62 | 1 |
| SF-G.Graphiurinae | Afr. Dormouse | 1 | 14 | 0 | 0 | - | - | - | - | - |
| SF-G.Leithiinae | Dormouse | 6 | 12 | 4 | 33 | 44-48 | 3 | - | 4-4688 | 1 |
| SF-G.Glirinae | Edible d. | 2 | 2 | 1 | 50 | 0 | 0 | 62 | 62 | 1 |
| | | | | | | | | | | |
| F-Hipposideridae | OW Leaf nosed bat | 9 | 81 | 15 | 19 | 32-52 | 5 | 32 | 32x12, 3-006, 5-022 | 1, 20, 40, 81 |
| G-H.*Asellia* | Trident leaf n. | - | 2 | 1 | 50 | 0 | 0 | 50 | 50 | 40 |
| G-H.*Aselliscus* | Trident leaf n. | - | 2 | 1 | 50 | 0 | 0 | 30 | 30 | 80 |
| G-H.*Hipposideros* | Round leaf bat | - | 67 | 13 | 19 | 32-52 | 2 | 32 | 32x11, 5-22 | 1, 6, 40, 81 |
| | | | | | | | | | | |
| F-Erinaceidae | Hedgehog | 10 | 24 | 10 | 42 | 40-48 | 2 | 48 | 40, 48x9 | 1, 40 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SF-E.Erinaceinae | Hedgehog | 5 | 16 | 9 | 56 | 0 | 0 | 48 | 48 | 1, 40 |
| SF-E.Galericinae | Moonrat | 5 | 8 | 1 | 13 | 0 | 0 | 40 | 40 | 1 |
| | | | | | | | | | | |
| F-Tenrecidae | Tenrec | 10 | 31 | 20 | 65 | 14-56 | 7 | 30x5<br>32x5<br>38x4 | 1-4, 30x5,<br>3-222228888<br>4-00, 5-46 | 1, 14, 17, 40 |
| SF-T.Geogalinae | Large-ear T | 1 | 1 | 1 | 100 | 0 | 0 | 14 | 14 | 14 |
| SF-T.Oryzorictinae | Variety | 3 | 21 | 12 | 57 | 30-56 | 6 | 30x5<br>32x5 | 3-00000222228<br>5-46 | 17, 40 |
| G-T.O.*Microgale* | Shrew tenrec | - | 18 | 12 | 67 | 30-56 | 6 | 30x5<br>32x4 | 3-0000022228<br>5-46 | 17 |
| G-T.O.*Oryzorictes* | Rice tenrec | - | 2 | 1 | 50 | 0 | 0 | 32 | 32 | 17 |
| SF-T.Potamogalinae | Otter shrew | 2 | 3 | 2 | 67 | 38-40 | 2 | - | 38, 40 | 17, 40 |
| SF-T.Tenrecinae | Hedgehog Tenrec | 4 | 5 | 5 | 100 | 38-40 | 2 | - | 3-888<br>4-00 | 1, 17, 40 |

**Table A4.** Diploid numbers of families with 11 to 15 genera. Diploid numbers are written in stem-leaf format where “1-2446” means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature. Alternating gray areas separate families for easier comparison; Heading Key: A= # of Genera; B= # of Species; C= # Karyotyped species used in dataset; D= % 2n known; E=2n range; F=#of 2n Variations; G= Mode of 2n; H= Diploid Numbers (2n); I= Reference. Abbreviation key: F=Family, SF=Subfamily, T=Tribe, G=Genus, SG=Subgenus; “OW” = Old World; “NW” = New World.

| Classification Level | Common Name | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|
| F-Leporidae | Rabbit, hare | 11 | 52 | 25 | 48 | 38-52 | 6 | 48 | 3-88,<br>4-222224446,<br>48x15, 52 | 1, 40 |
| G-L.*Brachylagus* | Pygmy rabbit | - | 1 | 1 | 100 | 0 | 0 | 44 | 44 | 1 |
| G-L.*Bunolagus* | Riverine rabbit | - | 1 | 1 | 100 | 0 | 0 | 44 | 44 | 1 |
| G-L.*Lepus* | Antelope jack r | - | 32 | 13 | 41 | 0 | 0 | 48 | 48x13 | 1, 40 |
| G-L.*Sylvilagus* | Cottontail | - | 17 | 7 | 41 | 38-52 | 5 | 42 | 3-88,<br>4-2222268,<br>52 | 1, 40 |
| | | | | | | | | | | |
| F-Macropodidae | Wallaby | 11 | 67 | 36 | 54 | 10-24 | 8 | 16x13<br>22x12 | 16x13,<br>1-024488<br>22x12, 1-0004 | 1, 12, 15, 16 |
| SF-M.Sthenurinae | B-hare wallaby | 1 | 1 | 1 | 100 | 0 | 0 | 24 | 24 | 15 |
| SF-M.Macropodinae | Variety | 10 | 66 | 35 | 53 | 10-22 | 7 | 16x13<br>22x12 | 16x13,<br>1-024488<br>1-000,<br>22x12 | 1, 12, 15, 16 |
| G-M.M.*Dendrolagus* | Tree kang | - | 12 | 3 | 25 | 12-14 | 2 | 14 | 1-244 | 15, 16 |
| G-M.M.*Dorcopsis* | Greater d | - | 4 | 1 | 25 | 0 | 0 | 22 | 22 | 16 |
| G-M.M.*Dorcopsulus* | Lesser d | - | 2 | 1 | 50 | 0 | 0 | 18 | 18 | 15 |
| G-MM.*Lagorchestes* | Hare-wallabies | - | 4 | 2 | 50 | 16-22 | 3 | - | 16<br>2-02 | 12, 15 |
| G-M.M.*Macropus* | Kangaroos Wallaroos | - | 14 | 12 | 86 | 16-20 | 2 | 16 | 1-66666666666<br>2-0 | 1, 12, 15, 16, |
| G-MM.*Onychogalea* | Nail tail w | - | 3 | 2 | 67 | 18-20 | 2 | - | 18, 20 | 12, 15 |
| G-M.M.*Petrogale* | Rock-wal | - | 16 | 7 | 44 | 16-22 | 3 | 22 | 16, 2-022222 | 1, 12 |
| G-M.M.*Setonix* | Quokka | - | 1 | 1 | 100 | 0 | 0 | 22 | 22 | 12 |
| G-M.M.*Thylogale* | Pademelons | - | 7 | 4 | 57 | 0 | 0 | 22 | 22 | 1, 12, 16 |
| G-M.M.*Wallabia* | Swamp wal | | 1 | 1 | 100 | 0 | 0 | 10 | 10 | 1 |
| | | | | | | | | | | |
| F-Canidae | Dog, wolf, | 12 | 37 | 25 | 68 | 34-78 | 16 | 78x | 3-46888, | 1, 40, |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | fox, jackal… | | | | | | | 8 74x5 | 4-028, 5-00046, 6-046, 7-02, 74x5, 78x8 | 86 |
| G-C.*Canis* | Dog, wolf | - | 9 | 7 | 78 | 0 | 0 | 78 | 78 | 1, 40 |
| G-C.*Cuon* | Dhole | - | 1 | 1 | 100 | 0 | 0 | 78 | 78 | 40 |
| G-C.*Lycaon* | Af. Wild dog | - | 1 | 1 | 100 | 0 | 0 | 78 | 78 | 40 |
| G-C.*Chrysocyon* | Maned wolf | - | 1 | 1 | 100 | 0 | 0 | 76 | 76 | 1 |
| G-C.*Atelocynus* | Short ear zorro | - | 1 | 1 | 100 | 0 | 0 | 74 | 74 | 1 |
| G-C.*Lycalopex* | Zorro | - | 6 | 3 | 50 | 0 | 0 | 74 | 74 | 86 |
| G-C.*Speothos* | Bush dog | - | 1 | 1 | 100 | 0 | 0 | 74 | 74 | 40 |
| G-C.*Cerdocyon* | Crab-eating fox | - | 1 | 1 | 100 | 70-75 | 2 | - | 70, 74 | 1, 40 |
| G-C.*Otocyon* | Bat eared dog | - | 1 | 1 | 100 | 0 | 0 | 72 | 72 | 40 |
| G-C.*Urocyon* | Grey fox | | 2 | 1 | 50 | 0 | 0 | 66 | 66 | 1 |
| G-C.*Nyctereutes* | Raccoon dog | - | 3 | 3 | 100 | 38-56 | 4 | - | 3-88, 42, 54, 56 | 1, 40 |
| G-C.*Vulpes* | True fox | - | 12 | 8 | 67 | 34-64 | 7 | 50 | 3-468, 40, 5-000, 6-04 | 1, 40 |
| | | | | | | | | | | |
| F-Emballonouridae | Sac wing bat | 13 | 50 | 14 | 28 | 22-44 | 7 | - | 2-24668, 3-222, 4-22224 | 1, 40 |
| SF-Taphozoinae | Tomb bat | 2 | 18 | 5 | 28 | 42-44 | 2 | 42 | 4-22224 | 1, 40 |
| SF-Emballonurinae | Sac wing bat | 11 | 32 | 9 | 28 | 22-32 | 5 | | 2-224668, 3-222 | 40 |
| G-E.E.*Balantiopteryx* | Sac wing bat | - | 3 | 1 | 33 | 0 | 0 | 32 | 32 | 40 |
| G-E.E.*Comura* | Chestnut s.w | - | 1 | 1 | 100 | 0 | 0 | 22 | 22 | 40 |
| G-E.E.*Saccopteryx* | Sac wing bat | - | 5 | 3 | 60 | 24-28 | 3 | - | 2-468 | 40 |
| | | | | | | | | | | |
| F-Herpestidae | Mongoose | 14 | 33 | 17 | 49 | 35-44 | 5 (8) | 35/36x7 36x7 | 35/36x7, 36x7, 39/40, 41/42, 43/44 | 1, 40 |
| | | | | | | | | | | |
| F-Felidae | Cat | 14 | 40 | 30 | 75 | 36-38 | 2 | 38 | 36x4, 38x27 | 1, 6, 40 |
| SF-F.Felinae | Sm-med cats | 11 | 34 | 24 | 71 | 36-38 | 2 | 38 | 36x4, 38x21 | 1, 6, 40 |
| SF-F.Pantherinae | Big cats | 3 | 6 | 6 | 100 | 0 | 0 | 38 | 38 | 1, 40 |
| | | | | | | | | | | |
| F-Viverridae | Civet, Genet | 15 | 35 | 15 | 43 | 34-54 | 9 | 38x4 42x5 | 3-468888, 4-02222244 5-00244 | 1, 40, 84, 85 |
| SF-V.Paradoxurinae | Binturong | 5 | 7 | 4 | 57 | 40-44 | 3 | 42 | 4-02224 | 1, 40 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SF-V.Hemigalinae | Civet | 4 | 4 | 2 | 50 | 0 | 0 | 42 | 42 | 1, 40 |
| SF-V.Prionodontinae | Lingsang | 1 | 2 | 1 | 50 | 0 | 0 | 34 | 34 | 1 |
| SF-V.Viverrinae | Genet, Civet | 5 | 22 | 8 | 36 | 36-54 | 5 | 38 | 3-68888,<br>5-00244 | 1, 40, 84, 85 |
| G-V.V.*Genetta* | Genet | - | 14 | 4 | 29 | 50-54 | 3 | - | 5-00244 | 1, 40, 85 |
| G-V.V.*Viverra* | Civet | - | 4 | 3 | 75 | 0 | 0 | 38 | 38 | 84 |

**Table A5.** Diploid numbers of families with 16-25 genera. Diploid numbers are written in stem-leaf format where “1-2446” means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature. Alternating gray areas separate families for easier comparison; Heading Key: A= # of Genera; B= # of Species; C= # Karyotyped species used in dataset; D= % 2n known; E=2n range; F=#of 2n Variations; G= Mode of 2n; H= Diploid Numbers (2n); I= Reference. Abbreviation key: F=Family, SF=Subfamily, T=Tribe, G=Genus, SG=Subgenus; “OW” = Old World; “NW” = New World.

| Classification Level | Common Name | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|
| F-Dipodidae | Jerboas | 16 | 51 | 20 | 39 | 18-72 | 14 | - | 1-89, 2-0446, 3-226, 58, 4-02246888, 72 | 1, 41, 42, 44 |
| SF-D.Allactaginae | Fat tail, 4-5 toe | 3 | 16 | 6 | 38 | 0 | 0 | 48 | 48 | 41 |
| SF- D.Cardiocraniinae | Pygmy jerboa | 3 | 7 | 1 | 14 | 0 | 0 | 46 | 46 | 1 |
| SF- D.Dipodinae | 3-toed jerboa | 5 | 9 | 3 | 33 | 48-58 | 2 | - | 4-88, 58 | 1, 44 |
| G-D.D.*Jaculus* | Jerboa | - | 3 | 2 | 67 | 0 | 0 | 48 | 4-88 | 44 |
| G-D.D.*Stylodipus* | 3-toed jerboa | - | 3 | 1 | 33 | 0 | 0 | 58 | 58 | 1 |
| SF-D.Euchoreutinae | Long-eared j. | 1 | 1 | 0 | 0 | - | - | - | - | - |
| SF- D.Sicistinae | Birch mouse | 1 | 13 | 9 | 69 | 18-44 | 10 | - | 1-89, 2-0446, 3-226, 4-0224 | 1, 42 |
| G-D.S.*Sicista* | Birch mouse | - | 13 | 9 | 69 | 18-44 | 10 | - | 1-89, 2-0446, 3-226, 4-0224 | 1, 42 |
| SF-D.Zapodinae | Jumping mouse | 3 | 5 | 1 | 20 | 0 | 0 | 72 | 72 | 1 |
| | | | | | | | | | | |
| F-Molossidae | Free-tail bat | 16 | 100 | 28 | 28 | 34-48 | 4 | 48 | 3-444, 4-02, 48x25 | 1, 40 |
| SF-M.Tomopeatinae | Blunt-eared bat | 1 | 1 | 0 | 0 | - | - | - | - | - |
| SF-M.Molossinae | Free-tail bat | 15 | 99 | 28 | 28 | 34-48 | 4 | 48 | 3-444, 4-02, 48x25 | 1, 40 |
| G-M.M.*Cynomops* | Dog-faced bat | - | 5 | 2 | 40 | 0 | 0 | 34 | 34 | 40 |
| G-M.M.*Eumops* | Mastiff bat | - | 10 | 4 | 40 | 40-48 | 3 | 48 | 4-0288 | 1, 40 |
| G-M.M.*Nyctinomops* | Free-tailed bat | - | 4 | 4 | 100 | 0 | 0 | 48 | 4-8888 | 1, 40 |
| | | | | | | | | | | |
| F-Talpidae | Mole | 17 | 39 | 23 | 59 | 32-42 | 5 | 34 | 34x14, 3-26666688, 42 | 40, 74 |
| SF-T.Scalopinae | NW mole | 5 | 7 | 4 | 57 | 0 | 0 | 34 | 34 | 40 |
| T-T.S.Condylurini | Star-nosed m. | 1 | 1 | 1 | 100 | 0 | 0 | 34 | 34 | 40 |
| T-T.S.Scalopini | Mole | 4 | 6 | 3 | 50 | 0 | 0 | 34 | 34 | 40 |
| SF-T.Talpinae | Old World | 11 | 28 | 18 | 64 | 32-42 | 5 | 34 | 3- | 40, 74 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Talpid | | | | | | | | 226666688, 34x10, 42 | |
| T-T.T.Desmanini | Desman | 2 | 2 | 2 | 100 | 32-42 | 2 | - | 32, 42 | 40 |
| G-T.T.D.*Desmana* | | - | 1 | 1 | 100 | 0 | 0 | 32 | 32 | 40 |
| G-T.T.D.*Galemys* | | - | 1 | 1 | 100 | 0 | 0 | 42 | 42 | 40 |
| T-T.D.Neurotrichini | Am. Shrew m. | 1 | 1 | 1 | 100 | 0 | 0 | 38 | 38 | 40 |
| T-T.T.Scaptony-chini | Short faced m. | 1 | 1 | 1 | 100 | 0 | 0 | 34 | 34 | 74 |
| T-T.T.Talpini | Mole | 5 | 22 | 12 | 55 | 32-38 | 4 | 34 | 34x8, 3-2666668 | 40 |
| G-T.T.T.*Mogera* | | - | 5 | 4 | 80 | 32-36 | 2 | 36 | 3-2666 | 40 |
| G-T.T.T.*Talpa* | | - | 9 | 6 | 67 | 34-38 | 3 | 34 | 3-444468 | 1, 6, 40 |
| T-T.T.Urotrichini | J. shrew mole | 2 | 2 | 2 | 100 | 0 | 0 | 34 | 34 | 40, 74 |
| SF-T.Uropsilinae | Shrew-like m. | 1 | 4 | 1 | 25 | 0 | 0 | 34 | 34 | 74 |
| | | | | | | | | | | |
| F- Didelphidae | Opossum | 17 | 90 | 48 | 53 | 14-22 | 3 | 14 | 1-4x31<br>1-8x7<br>2-2x8 | 1, 2, 3, 5, 6, 8, 9, 12, 15 |
| SF-D. Caluromyinae | Wooly op. | 3 | 5 | 4 | 4 | 14-18 | 2 | 14 | 1-4448 | 1, 2, 3, 5, 12, 15 |
| G-D.C.*Caluromys* | Wooly op. | - | 3 | 3 | 100 | 0 | 0 | 14 | 14 | 1, 2, 5, 12, 15 |
| G-D.C.*Glironia* | Bushy tail | - | 1 | 1 | 100 | 0 | 0 | 18 | 18 | 3 |
| SF-D.Didelphinae | American opppssum | 14 | 82 | 44 | 54 | 14-22 | 3 | 14 | 14 x 27<br>18x7<br>22x10 | 1, 2, 3, 4, 6, 9, |
| G-D.D.*Chironectes* | Water op | - | 1 | 1 | 100 | 0 | 0 | 22 | 22 | 2, 9 |
| G-D.D.*Didelphis* | Large Am | - | 6 | 4 | 67 | 0 | 0 | 22 | 22 | 1, 2, 6, 9 |
| G-D.D *Gracilinanus* | Mouse op | - | 9 | 3 | 33 | 0 | 0 | 14 | 14 | 2, 6, 9 |
| G-D.D.*Lestodelphis* | Patagon.op | - | 1 | 1 | 100 | 0 | 0 | 14 | 14 | 9 |
| G-D.D.*Lutreolina* | Thick tail | - | 1 | 1 | 100 | 0 | 0 | 22 | 22 | 2, 9 |
| G-D.D.*Marmosa* | Mouse op | - | 12 | 6 | 50 | 14-22 | 2 | 14 | 1-44444<br>22 | 1, 2, 9 |
| G-D.D. *Marmosops* | Variety | - | 14 | 4 | 30 | 0 | 0 | 14 | 14 | 1, 4, 9, 13 |
| G-D.D. *Metachirus* | Br 4-eyed | - | 1 | 1 | 100 | 0 | 0 | 14 | 14 | 1, 9 |
| G-D.D. | Wooly m | - | 6 | 3 | 50 | 0 | 0 | 14 | 14 | 1, 2, |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Micoureus* | | | | | | | | | | 4, 9 |
| G-D.D. *Monodelphis* | Variety | - | 18 | 7 | 39 | 0 | 0 | 18 | 18 | 1, 2, 3, 6, 9 |
| G-D.D. *Philander* | Gr 4-eyed | - | 4 | 3 | 75 | 0 | 0 | 22 | 22 | 1, 2, 9 |
| G-D.D. *Thylamys* | Variety | - | 10 | 10 | 100 | 0 | 0 | 14 | 14 | 1, 8, 9 |
| | | | | | | | | | | |
| F-Echimyidae | Spiny rat | 18 | 84 | 33 | 39 | 14-118 | 19 | - | 1-46, 2-2488, 3-0000244, 4-0268, 5-022, 6-0222224, 98, 118 | 1, 6, 58, 69 |
| SF-E.Dactylomyinae | Bamboo rat | 3 | 6 | 2 | 33 | 96-118 | 2 | - | 98, 118 | 1, 58 |
| G-E.D.*Dactylomys* | Coro-coro | - | 3 | 2 | 67 | 96-118 | 2 | - | 98, 118 | 1, 58 |
| SF-E.Echimyinae | Spiny rat | 6 | 29 | 14 | 48 | 22-52 | 3 | - | 22, 28, 50, 52 | 1, 58, 69 |
| G-E.E.*Callistomys* | Painted tree rat | - | 1 | 1 | 100 | 0 | 0 | 42 | 42 | 73 |
| G-E.E.*Echimys* | Arboreal sp. Rat | - | 3 | 2 | 67 | 90-94 | 3 | - | 9-024 | 73 |
| G-E.E.*Isothrix* | Toro | - | 4 | 4 | 100 | 22-60 | 3 | - | 2-28, 6-00 | 1, 73 |
| G-E.E.*Makalata* | Tree rat | - | 6 | 2 | 33 | 66-70 | 2 | - | 66, 70 | 73 |
| G-E.E.*Phyllomys* | Tree rat | - | 12 | 5 | 42 | 52-96 | 5 | - | 5-02, 7-22, 80, 96 | 58, 69, 73 |
| SF-E.Eumysopinae | Primitive spiny rat | 9 | 49 | 17 | 35 | 14-64 | 15 | - | 1-46, 2-48, 3-0000244, 4-0268, 52, 6-0222224 | 1, 6, 58, 69 |
| G-E.E.*Clyomys* | Spiny rat | - | 3 | 2 | 67 | 34-46 | 2 | - | 34, 46 | 69 |
| G-E.E.*Lonchothrix* | Tuft tail sp. Rat | - | 1 | 1 | 100 | 0 | 0 | 62 | 62 | 1 |
| G-E.Eproechimyss | Spiny rat | - | 25 | 11 | 44 | 14-62 | 11 | - | 1-46, 2-48, 3-00024, 4-228, 52, 6-222 | 1, 6, 58, 69 |
| G-E.E.*Trinomys* | Punare’ | - | 11 | 1 | 9 | 60-64 | 3 | - | 6-024 | 69 |
| | | | | | | | | | | |
| F-Cervidae | Deer | 19 | 51 | 37 | 73 | 6-70 | 25 | 68x 11, 70x-11 | 0-6678889, 1-24, 3-67789, 4-046689, 5-0066668, 6-0245666, 68x11, 70x-11 | 1, 40, 96, 97, 98, 99, 100, 101 |
| SF-C.Capreolinae | New World deer | 9 | 22 | 16 | 73 | 36-70 | 11 | 70x 10 | 3-67789, 4-049, 5-006, 6-8888, | 1, 40, 96, 97, |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 70x10 | 98, 99 |
| G-C.C.*Mazama* | | - | 9 | 5 | 56 | 36-70 | 11 | - | 3-67789, 4-049, 5-006, 68, 7-00 | 40, 96, 97, 98, 99 |
| SF-C.Cervinae | Old World deer | 9 | 28 | 20 | 71 | 6-68 | 16 | 68 | 0-6678889, 1-24, 4-668, 5-668, 68x7, 6-0245666, | 1, 40, 100, 101 |
| G-C.C.*Muntiacus* | Muntjac | - | 11 | 6 | 55 | 6-46 | 7 | 8 | 0-6678889, 1-24, 46 | 1, 40 |
| SF-Hydropotinae | Ch. Water deer | 1 | 1 | 1 | 100 | 0 | 0 | 70 | 70 | 40 |
| | | | | | | | | | | |
| F-Dasyuridae | Marsupials | 21 | 69 | 15 | 22 | 0 | 0 | 14 | 14 | 1, 12, 15, 16 |
| SF D. Dasyurinae | Variety | 17 | 39 | 10 | 26 | 0 | 0 | 14 | 14 | 1, 12, 15, 16 |
| T-D.D.Dasyurini | Quoll + | 10 | 22 | 7 | 33 | 0 | 0 | 14 | 14 | 1, 16 |
| T.D.D. Phascogali | Wambenger | 7 | 17 | 3 | 18 | 0 | 0 | 14 | 14 | 16 |
| SF-D.Sminthopsinae | Variety | 4 | 30 | 5 | 17 | 0 | 0 | 14 | 14 | 1, 12, 15 |
| T.D.S.Sminthopsini | Dunnart | 3 | 25 | 3 | 12 | 0 | 0 | 14 | 14 | 1, 12 |
| T.D.S Planigalini | Planigale | 1 | 5 | 2 | 40 | 0 | 0 | 14 | 14 | 1, 15 |
| | | | | | | | | | | |
| F-Cercopithecidae | Old World Monkey | 21 | 133 | 46 | 35 | 42-84 | 11 | 42x17<br>44x11 | 42x17, 44x11, 4-88, 5-4488, 60x5, 64, 66x5<br>7-022, 84 | 1, 6, 31, 32, 34, 35, |
| SF-C.Cercopithecinae | Macaque, baboon, vervet. | 11 | 73 | 34 | 47 | 42-84 | 9 | 42 | 42x17, 48, 5-4488, 6-0000066666, 7-022, 84 | 1, 6, 31, 34 |
| G-C.C.*Allenopithecus* | A. swamp mon. | - | 1 | 1 | 100 | 0 | 0 | 48 | 48 | 1 |
| G-C.C.*Cerocebus* | Mangabey | - | 6 | 2 | 33 | 0 | 0 | 42 | 42 | 1 |
| G-C.C.*Cercopithecus* | Guenon | - | 25 | 10 | 40 | 58-72 | 5 | 66 | 5-88, 7-022<br>6-066666, | 1, 6, 31 |
| G-C.C.*Chlorocebuss* | Vervet | - | 6 | 4 | 67 | 60-84 | 2 | 60 | 6-0000, 84 | 1, 6 |
| G-C.C.*Macaca* | Macaque | - | 21 | 9 | 43 | 0 | 0 | 42 | 42x9 | 1, 6 |
| G-C.C.*Papio* | Baboon | - | 5 | 4 | 80 | 0 | 0 | 42 | 42x4 | 1, 31 |
| G-C.C.*Erythrocebus* | Patas monkey | - | 1 | 1 | 100 | 0 | 0 | 54 | 54 | 1 |
| SF-C.Colobinae | Colobus, | 10 | 60 | 13 | 22 | 44-64 | 3 | 44 | 44x11, 48, 64 | 1, 6, |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | proboscis, langur monkey | | | | | | | | | 31, 32, 35 |
| G-C.C.*Colobus* | Colobus | - | 5 | 3 | 60 | 0 | 0 | 44 | 44x3 | 1, 6 |
| G-C.C.*Nasalis* | Proboscis m. | - | 1 | 1 | 100 | 0 | 0 | 48 | 48 | 1 |
| G-C.C.*Rhinopithecus* | Snub nose m. | - | 4 | 1 | 25 | 0 | 0 | 64 | 64 | 34 |
| | | | | | | | | | | |
| F-Nesomyidae | Rat/mouse | 21 | 61 | 7 | 12 | 32-76 | 8 | - | 32, 48, 5-28, 60, 7-4456 | 18, 51, 52, 53, 55 |
| SF-N.Cricetomyinae | Pouched rat | 3 | 8 | 1 | 13 | 0 | 0 | 52 | 52 | 18, 51 |
| SF-N.Delanymyinae | Delaney mouse | 1 | 1 | 0 | 0 | - | - | - | - | - |
| SF-N.Dendromurinae | Climbing m. | 6 | 24 | 1 | 4 | 0 | 0 | 48 | 48 | 52 |
| SF-N.Mystromyinae | White-tail m. | 1 | 1 | 1 | 100 | 0 | 0 | 32 | 32 | 53 |
| SF-N.Nesomyinae | Malagasy rat | 9 | 23 | 4 | 17 | 58-76 | 5 | - | 58, 60, 7-4456 | 55 |
| G-N.N.*Eliurus* | Tufted tail rat | - | 10 | 3 | 30 | 58-76 | 4 | - | 58, 7-4456 | 55 |
| G-N.N.*Nesomys* | Nesomys | - | 3 | 1 | 33 | 0 | 0 | 60 | 60 | 55 |
| SF-N.Petromyscinae | African rock m. | 1 | 4 | 0 | 0 | - | - | - | - | - |
| | | | | | | | | | | |
| F-Mustelidae | Ermine, mink weasel, stoat | 22 | 59 | 32 | 54 | 30-44 | 7 | 38 | 3-026, 38x22, 4-0000222244 | 1, 40 |
| SF-M.Lutrinae | Otter | 7 | 13 | 6 | 46 | 36-40 | 3 | 38 | 3-688888, 40 | 1, 40 |
| SF-M.Mustelinae | Wolverine, mink, weasel | 15 | 46 | 26 | 57 | 30-44 | 6 | 38 | 3-02, 38x17, 4-0002222444 | 1, 40 |
| G-M.M.*Neovison* | Mink | - | 2 | 1 | 50 | 0 | 0 | 30 | 30 | 1 |
| G-M.M.*Taxidea* | Badger | - | 1 | 1 | 100 | 0 | 0 | 32 | 32 | 1 |
| G-M.M.*Martes* | Marten | - | 8 | 6 | 75 | 38-40 | 2 | 38 | 3-888888, 40 | 1, 40 |

Table A6. Diploid numbers of families with 26-50 genera. Diploid numbers are written in stem-leaf format where “1-2446” means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature. Alternating gray areas separate families for easier comparison; Heading Key: A= # of Genera; B= # of Species; C= # Karyotyped species used in dataset; D= % 2n known; E=2n range; F=#of 2n Variations; G= Mode of 2n; H= Diploid Numbers (2n); I= Reference. Abbreviation key: F=Family, SF=Subfamily, T=Tribe, G=Genus, SG=Subgenus; “OW” = Old World; “NW” = New World.

| Classification Level | Common Name | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|
| F-Soricidae | Shrew | 26 | 375 | 98 | 26 | 20-68 | 35 | 36x18<br>38x17<br>40x17<br>42x14<br>50x16 | 22x4, 24x3, 26x3, 28x5, 2-0013355799 30x7, 34x7, 36x18,38x17, 3-2222335557, 40x17, 42x14, 4-4444666888, 50x16, 52x13, 54x5, 5-3566888, 60x3, 6-2224466688 | 1, 6, 40, 73, 74, 75, 76, |
| SF-S.Crocidurinae | White-tooth shrew | 9 | 210 | 55 | 26 | 22-68 | 21 | 36x14<br>38x12<br>40x13<br>50x12 | 2-2266888, 30x5, 36x14, 38x12, 3-224444557, 40x13, 42x5, 4-4446688, 50x12, 5-22222268, 6-08 | 1, 40, 73, 75, 76, |
| G-S.C.*Crocidura* | Musk shrew | - | 172 | 51 | 30 | 22-68 | 21 | 36x13<br>40x12<br>50x12 | 2-2266888, 30x3, 36x13, 38x9, 3-24444557, 40x12, 42x4, 4-44668, 50x12, 5-22222268, 6-08 | 1, 40, 73, 75, 76, |
| G-S.C.*Diplomesodon* | Pie-bald shrew | - | 1 | 1 | 100 | 0 | 0 | 44 | 44 | 40 |
| G-S.C.*Suncus* | shrew | - | 18 | 3 | 17 | 30-48 | 6 | - | 3-025,<br>4-028 | 40, 76 |
| G-S.C.*Sylvisorex* | Forest shrew | - | 12 | 6 | 50 | 30-38 | 3 | 38 | 3-06888 | 76 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| SF-S.Myosoricinae | African w.t.s | 3 | 18 | 4 | 22 | 38-42 | 3 | - | 3-88, 4-02 | 76 |
| SF-S. Soricinae | Red-tooth shrew | 14 | 147 | 50 | 34 | 20-68 | 34 | 42 | 2-001223344455678899, 34x3, 36x4, 3-0022335888, 42x8, 4-0004688, 50x4, 52x7, 5-3444445688, 6-00222446668 | 1, 6, 40, 74, 76 |
| T-S.S.Anourosoricini | Asian mole s. | 1 | 4 | 1 | 25 | 48-50 | 2 | - | 48, 50 | 6, 40 |
| T-S.S.Blarinellini | Short tailed s. | 1 | 3 | 0 | 0 | - | - | - | - | - |
| T.S.S.Blarinini | Sh. t/small ear | 2 | 34 | 5 | 15 | 46-52 | 4 | - | 4-68, 5-000222 | 1, 40 |
| T-S.S.Nectogalini | OW water shrew | 7 | 25 | 7 | 32 | 44-64 | 4 | 52 | 44, 5-2228, 64 | 40, 74, 76 |
| G-S.S.N.*Chimarrogale* | Asiatic water s. | - | 6 | 1 | 17 | 0 | 0 | 52 | 52 | 40 |
| G-S.S.N.*Chodsigoa* | - | - | 8 | 1 | 13 | 0 | 0 | 44 | 44 | 76 |
| G-S.S.N.*Episoriculus* | Brown toothed | - | 4 | 2 | 50 | 58-60 | 2 | - | 58, 60 | 74, 76 |
| G-S.S.N.Neomys | Water shre | - | 3 | 3 | 100 | 0 | 0 | 52 | 52 | 40. 76 |
| T-S.S.Notiosoricini | Gray/Mexican | 2 | 5 | 2 | 40 | 62-68 | 2 | 62 | 6-228 | 40, 76 |
| T-S.S.Soricini | Common shrew | 1 | 76 | 35 | 46 | 20-66 | 29 | 42 | 2-001223344455678899, 34x3, 36x4, 3-0022335888, 4-000, 42x8, 5-2344444568, 6-0024666 | 1, 6, 40, 74, 76 |
| | | | | | | | | | | |
| F- Pteropodidae | Fruit bat | 42 | 186 | 40 | 22 | 24-48 | 8 | 36x16<br>38x15 | 2-46, 34x8, 35, 36x16, 38x15,, 4-088 | 1,40, 77 |
| G-P.*Balionycteris* | Spotted-wing | - | 1 | 1 | 100 | 0 | 0 | 24 | 24 | 40 |
| G-P.*Megaerops* | Tailless fruit b. | - | 4 | 1 | 25 | 0 | 0 | 26 | 26 | 40 |
| G-P.*Otopteropus* | Luzon fruit | - | 1 | 1 | 100 | 0 | 0 | 48 | 48 | 1 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | bat | | | | | | | | | |
| G-P.*Penthetor* | Dusky fruit bat | - | 1 | 1 | 100 | 0 | 0 | 48 | 48 | 40 |
| G-P.*Pteropus* | Flying fox | - | 65 | 7 | 11 | 38-40 | 2 | 38 | 3-888888, 40 | 1, 40 |
| G-P.*Macroglossus* | Long tongue | - | 2 | 2 | 100 | 0 | 0 | 34 | 34 | 40 |
| | | | | | | | | | | |
| F-Vespertilionidae | Evening bat | 48 | 407 | 126 | 31 | 20-52 | 15 | 44 | 2-022266, 28x7, 30x9, 36x21, 3-2222444488, 42x8, 44x54, 4-00666666, 50x13, 52 | 1, 6, 20, 40, 79, 81, 82, 84 |
| SF-V.Vespertilioninae | Vesper bat | 38 | 237 | 73 | 31 | 22-52 | 13 | 36 | 2-22266, 28x7, 30x9, 36x21, 3-222244448, 42x8, 44x9, 4-0666, 50x13, 52 | 1, 6, 20, 40, 79 |
| T-V.V.Eptesicini | Pipistrelle | 3 | 32 | 12 | 38 | 32-50 | 2 | 50 | 32, 50x11 | 1, 6, 40 |
| G-V.V.E.*Eptesicus* | House bat | - | 22 | 11 | 50 | 0 | 0 | 50 | 50 | 1, 6, 40 |
| G-V.V.E.*Hesperopterus* | False serotine | - | 5 | 1 | 20 | 0 | 0 | 32 | 32 | 1 |
| T-V.V.Lasiurini | Hairy tail bat | 1 | 17 | 8 | 47 | 22-28 | 3 | 28 | 2-26888888 | 1, 6, 40 |
| T-V.V.Nycticeiini | Evening bat | 8 | 37 | 13 | 35 | 30-52 | 8 | 36 | 36x6, 3-000244, 4-222446, 52 | 1, 20, 40 |
| G-V.V.N.*Scotophilus* | Yellow bat | - | 12 | 5 | 42 | 0 | 0 | 36 | 36 | 1, 40 |
| G-V.V.N.*Rhogeessa* | Rhogeesa bat | - | 10 | 4 | 40 | 30-52 | 6 | - | 3-024, 4-2244, 52 | 6, 40 |
| T-V.V.Pipistrellini | - | 4 | 42 | 18 | 43 | 26-46 | 9 | - | 2-68, 3-00024666, 4-22224446 | 1, 40 |
| G-V.V.P.*Nyctalus* | Noctule bat | - | 8 | 5 | 63 | 42-46 | 3 | 42 | 4-22246 | 40 |
| G-V.V.N.*Pipistrellus* | Pipistrelle bat | - | 31 | 12 | 39 | 26-44 | 8 | - | 2-68, 3-0024666, 4-244 | 1, 40 |
| G-V.V.N.*Scotozous* | Dormer’s bat | - | 1 | 1 | 100 | 0 | 0 | 30 | 30 | 1 |
| T-V.V.Piecotini | Big eared bat | 6 | 16 | 8 | 50 | 30-32 | 2 | 32 | 3-00222222 | 1, 6, |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 40 |
| T-V.V.Vespertilionini | - | 14 | 81 | 14 | 17 | 22-50 | 11 | 44 | 2-22, 3-02468, 4-0244446, 50 | 1, 20, 40, 79, 81 |
| G-V.V.V.*Glauconycteris* | Butterfly bat | - | 12 | 2 | 17 | 0 | 0 | 22 | 22 | 81 |
| G-V.V.V.*Falsistrellus* | Pipistrelle | - | 5 | 3 | 60 | 34-44 | 3 | - | 3-46, 44 | 1, 40 |
| G-V.V.V.*Tylonycteris* | Bamboo bat | - | 2 | 2 | 100 | 32-46 | 2 | - | 32. 46 | 1 |
| SF-V.Antrozoinae | Pallid bat | 2 | 2 | 1 | 50 | 0 | 0 | 46 | 46 | 84 |
| SF-V.Myotinae | Wing-gland bat | 3 | 107 | 43 | 40 | 20-46 | 3 | 44 | 20, 44x41, 46 | 1, 6, 40 |
| G-V.M.*Laionyceteris* | Silver haired b. | - | 1 | 1 | 100 | 0 | 0 | 20 | 20 | 40 |
| SF-V.Miniopterinae | Bent-winged bat | 1 | 19 | 3 | 16 | 0 | 0 | 46 | 46 | 6, 79, 82 |
| SF-V.Murininae | Tube nosed bat | 2 | 19 | 5 | 26 | 40-44 | 2 | 44 | 4-04444 | 1, 40 |
| SF-Kerivoulinae | Painted bat | 2 | 23 | 1 | 4 | 0 | 0 | 38 | 38 | 40 |
| | | | | | | | | | | |
| F-Bovidae | Bovid | 50 | 143 | 86 | 60 | 30-60 | 21 | 60 | 30/31x2, 32/31x3, 32/33x2, 34/33, 34/35, 56/55, 3-0002388, 4-00246669, 48x8, 50x4, 52x7, 53, 54x5, 56x9, 58x16, 60x24 | 1, 40, 93 |
| SF-B.Aepycerotinae | Impala | 1 | 1 | 1 | 100 | 58-60 | 2 | - | 58, 60 | 1 |
| SF-B.Alcelaphinae | Wildebeest | 4 | 10 | 6 | 60 | 36-58 | 6 | - | 3-689, 4-04, 5-88 | 1, 40 |
| G-B.A.*Alcelaphus* | Hartebeest | - | 3 | 1 | 33 | 39-40 | 2 | - | 39, 40 | 1, 40 |
| G-B.A.*Beatragus* | Hirola | - | 1 | 1 | 100 | 0 | 0 | 44 | 44 | 1 |
| G-B.A.*Connochaetes* | Wildebeest | - | 2 | 2 | 100 | 0 | 0 | 58 | 58 | 1 |
| G-B.A.*Damaliscus* | Korrigum | - | 4 | 2 | 50 | 36-38 | 2 | - | 3-68 | 1 |
| SF-B.Antilopinae | True antelope | 15 | 38 | 21 | 55 | 30-60 | 20 | - | 30/31x2, 32/31, 32/33x2, 34/35, 3-0038, | 1, 40 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 4-066889, 5-02266888, 6-000 | |
| G-B.A.*Antilope* | Blackbuck | - | 1 | 1 | 100 | 30-33 | 2 | - | 30, 33 | 1 |
| G-B.A.*Eudorcas* | Gazelle | - | 3 | 2 | 67 | 0 | 0 | 58 | 58 | 1 |
| G-B.A.*Gazella* | Gazelle | - | 10 | 7 | 70 | 30-52 | 10 | - | 3-0112223345, 4-69, 5-23 | 1, 40 |
| G-B.A.*Lithocranius* | Gerenuk | - | 1 | 1 | 100 | 0 | 0 | 60 | 60 | 1 |
| G-B.A.*Madoqua* | Dik-dik | - | 3 | 3 | 100 | 46-50 | 3 | 48 | 4-688, 50 | 1 |
| G-B.A.*Nanger* | Gazelle | - | 3 | 3 | 100 | 30-40 | 6 | - | 3-01489, 40 | 1 |
| SF-B.Bovinae | Bison, cattle | 9 | 24 | 18 | 75 | 31-60 | 17 | 60 | 32/31x2, 34/33x2, 56/55, 3-028, 4-688, 5-024688, 6-0000, | 1, 40 |
| G-B.B.*Bos* | Cattle, yak | - | 5 | 4 | 80 | 58-60 | 2 | 60 | 5-88, 6-000 | 1 |
| G-B.B.*Boselaphus* | Blue bull | - | 1 | 1 | 100 | 0 | 0 | 46 | 46 | 1 |
| G-B.B.*Bubalis* | Water buffalo | - | 4 | 2 | 50 | 48-50 | 2 | 48 | 4-88, 50 | 1 |
| G-B.B.*Syncerus* | African buffalo | - | 1 | 1 | 100 | 52-56 | 3 | - | 5-246 | 1, 40 |
| G-B.B.*Taurotragus* | Eland | - | 2 | 2 | 100 | 31-32 | 2 | 32/31 | 32/31 | 1 |
| G-.B.B.*Tetracerus* | 4-horn antelope | - | 1 | 1 | 100 | 0 | 0 | 38 | 38 | 40 |
| G-B.B.*Tragelaphus* | Kudo | - | 7 | 6 | 86 | 30-56 | 7 | - | 3-0233448, 56/57 | 1, 40 |
| SF-B.Caprinae | Goat-antelope | 12 | 35 | 20 | 57 | 42-60 | 8 | 60 | 4-2888, 5-0222444666, 58x3, 60x6 | 1, 40 |
| G-B.C.*capra* | Ibex, goat | - | 8 | 6 | 75 | 0 | 0 | 60 | 60 | 1, 40 |
| G-B.C.*Oreamnos* | Rocky Mt goat | - | 1 | 1 | 100 | 0 | 0 | 42 | 42 | 1 |
| G-B.C.*Ovibos* | Musk ox | - | 1 | 1 | 100 | 0 | 0 | 48 | 48 | 1 |
| G-B.C.*Ovis* | Sheep | - | 5 | 4 | 80 | 52-58 | 4 | 54 | 5-2244468 | 1, 40, 93 |
| SF-B.Cephalophinae | Duiker | 3 | 18 | 9 | 50 | 58-60 | 2 | 60 | 58, 60x8 | 1, 40 |
| SF-B.Hippotraginae | Grazing antel. | 3 | 8 | 6 | 75 | 56-60 | 3 | 58 | 5-668888, 6-00 | 1, 40 |
| SF-B.Reduncinae | Antelope | 3 | 9 | 5 | 56 | 48-56 | 6 | - | 48, 5-02346 | 1 |

**Table A7**. Diploid numbers of families with 51-100 genera. Diploid numbers are written in stem-leaf format where “1-2446” means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature. Alternating gray areas separate families for easier comparison; Heading Key: A= # of Genera; B= # of Species; C= # Karyotyped species used in dataset; D= % 2n known; E=2n range; F=#of 2n Variations; G= Mode of 2n; H= Diploid Numbers (2n); I= Reference. Abbreviation key: F=Family, SF=Subfamily, T=Tribe, G=Genus, SG=Subgenus; “OW” = Old World; “NW” = New World.

| Classification Level | Common Name | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|
| F-Sciuridae | Squirrels | 52 | 279 | 93 | 33 | 30-62 | 13 | 38 | 30, 32x11, 34x4, 36x13, 38x35, 40x14, 42x7, 4-666668 5-000468, 62 | 1, 40 |
| SF-S.Ratufinae | Giant tree sq. | 2 | 5 | 0 | 0 | - | - | - | - | - |
| SF-S.Sciurillinae | Squirrel | 21 | 82 | 11 | 13 | 38-46 | 4 | 40 | 38, 40x8 4-26 | 1, 40 |
| T-S.S.Sciurini | Squirrel | 5 | 37 | 10 | 27 | 40-46 | 3 | 40 | 40x8, 4-26 | 40 |
| T-S.S.Pteromyini | Flying squirrel | 15 | 44 | 1 | 2 | 0 | 0 | 38 | 38 | 1 |
| SF-Callosciurinae | Asiatic squirrel | 14 | 64 | 8 | 13 | 38-62 | 7 | - | 3-888, 4-00668, 5-46, 62 | 1, 40 |
| SF-S.Xerinae | Squirrel | 15 | 128 | 74 | 58 | 32-50 | 8 | 38 | 32x11, 34x4, 36x13, 38x31, 40x4, 42x6, 4-66 5-000 | 1, 40 |
| T-S.X.Xerini | Long clawed s. | 3 | 6 | 0 | 0 | - | - | - | - | - |
| T-S.X.Protoxeri | African tree s. | 6 | 30 | 1 | 3 | 0 | 0 | 46 | 46 | 40 |
| T-S.X.Marmotini | Marmot, Chipmunk, Prairie dog | 6 | 92 | 73 | 79 | 32-50 | 8 | 38 | 32x11, 34x4, 36x13, 38x31, 4-00002222226 5-000 | 1, 40 |
| G-SXM*Ammospermophilus* | Antelope squirrel | - | 5 | 4 | 80 | 0 | 0 | 32 | 32 | 40 |
| G-S.X.M.*Cynomys* | Prairie dog | - | 5 | 4 | 80 | 40-50 | 2 | 50 | 40, 5-000 | 40 |
| G-S.X.M.*Marmota* | Marmot | - | 14 | 13 | 93 | 38-42 | 3 | 38 | 38x8, 4-00222 | 40 |
| G-S.X.M.*Spermophilus* | Ground squirrel | - | 41 | 32 | 78 | 32-46 | 8 | 36 | 32x7, 36x13, 3-044448888, 4-0226 | 1, 40 |
| G-S.X.M.*Tamias* | Chipmunk | - | 25 | 19 | 76 | 0 | 0 | 38 | 38 | 1, 40 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| G-S.X.M.*Sciurotamias* | Rock squirrel | - | 2 | 0 | 0 | - | - | - | - | - |
| | | | | | | | | | | |
| F-Phyllostomidae | NW Leaf-nosed bat | 55 | 155 | 74 | 48 | 13-46 | 20 | 30/31 x11, 30x19, 32x18 | 1-36668, 20/21x3, 2-01222444, 26x7, 28x11, 30/31x11, 30x19, 32x18, 3-444466888, 4-0002466 | 1, 6, 40 |
| SF-P.Desmodontinae | Vampire bat | 3 | 3 | 3 | 100 | 28-32 | 2 | 32 | 28, 3-22 | 1 |
| SF-P.Brachyphyllinae | Fruit eating bat | 1 | 2 | 2 | 100 | 0 | 0 | 32 | 32 | 40 |
| SF-P.Phyllonycterinae | Flower bat | 2 | 5 | 5 | 100 | 0 | 0 | 32 | 32 | 1, 40 |
| SF-P.Glossophaginae | Long tongue bat | 13 | 32 | 14 | 44 | 16-32 | 6 | 32x5<br>30x4 | 1-66, 2-0488, 3-000022222 | 1, 6, 40 |
| T-P.G.Glossophagini | Long tongue bat | 10 | 23 | 11 | 48 | 16-32 | 5 | 30x3<br>32x4 | 1-66, 2-04, 3-0002222 | 1, 6, 40 |
| G-P.G.*Anoura* | Long nosed bat | | 5 | 3 | 60 | 0 | 0 | 30 | 3-000 | 1, 6 |
| G-P.G.*Choeronycteris* | Long tail bat | - | 1 | 1 | 100 | 0 | 0 | 16 | 16 | 1 |
| G-P.G.*Hylonycteris* | Long tongued | - | 1 | 1 | 100 | 0 | 0 | 16 | 16 | 1 |
| G-P.G.*Lichonycteris* | Dark lg tongue | - | 1 | 1 | 100 | 0 | 0 | 24 | 24 | 1 |
| G-P.G.*Monophyllus* | Single leaf bat | - | 2 | 1 | 50 | 0 | 0 | 32 | 32 | 1 |
| T-P.G.Lonchophyllini | Long tongue bat | 3 | 9 | 3 | 33 | 28-32 | 3 | 28 | 2-88, 3-02 | 1, 40 |
| SF-P.Phyllostominae | Big-eared bat | 16 | 46 | 29 | 69 | 16-46 | 10 | 30x6<br>32x9 | 16, 28x6, 2-26, 30x6, 32x9, 3-448, 4-00066 | 1, 6 |
| G-P.P.*Lophostoma* | Round ear bat | - | 5 | 4 | 80 | 26-34 | 4 | - | 2-68, 3-04 | 40 |
| G-P.P.*Macrotis* | Big ear bat | - | 2 | 2 | 100 | 40-46 | 2 | - | 4-06 | 1, 40 |
| G-P.P.*Micronycteris* | Little big ear | - | 9 | 4 | 44 | 28-40 | 4 | - | 2-88, 3-08, 40 | 1, 40 |
| G-P.P.*Mimon* | Spear nose bat | - | 4 | 3 | 75 | 30-34 | 3 | - | 3-024 | 1, 6, 40 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| G-P.P.*Tonatia* | Round ear bat | - | 2 | 1 | 50 | 0 | 0 | 16 | 16 | 1 |
| SF-P.Carolliinae | Short-tail leaf nose bat | 2 | 9 | 6 | 67 | 20-36 | 5 | - | 20/21x3, 22, 3-446 | 1, 40 |
| G-P.C.*Carollia* | Sht tail leaf bat | - | 6 | 4 | 67 | 20-22 | 3 | 20/21 | 2-0001112 | 1, 40 |
| G-P.C.*Rhinophylla* | Little fruit bat | - | 3 | 2 | 67 | 34-36 | 2 | 34 | 3-446 | 1, 40 |
| SF-P.Stenodermatinae | Fruit bat | 18 | 67 | 39 | 58 | 13-44 | 13 | 30/31 x11, 30x9 | 1-38, 26x6, 2-124488, 30/31x11, 30x9, 3-688, 4-24 | 1, 6, 40 |
| T-P.S.Sturnira | Yellow sh. bat | 1 | 14 | 7 | 50 | 0 | 0 | 30 | 30 | 1, 6, 40 |
| T-P.S.Stenodermatini | Tent making b. | 17 | 53 | 32 | 60 | 13-44 | 13 | 30/31 x11 30x8 | 1-38, 26x6, 2-124488, 30/31x11, 30x8, 3-688, 4-24 | 1, 6, 40 |
| G-P.S.S.*Artibeus* | Fruit eating bat | - | 18 | 8 | 42 | 30-31 | 2 | 30 | 30x8, 31x5 | 1, 6, 40 |
| G-P.S.S.*Chiroderma* | Big eyed bat | - | 5 | 4 | 80 | 0 | 0 | 26 | 26 | 1, 40 |
| G-P.S.S.*Mesophylla* | MacConnell’s | - | 1 | 1 | 100 | 21-22 | 2 | 22/21 | 22/21 | 40 |
| G-P.S.S.*Sphaeronycteris* | Visored bat | - | 1 | 1 | 100 | 0 | 0 | 28 | 28 | 1 |
| G-P.S.S.*Uroderma* | Tent making b. | - | 6 | 5 | 83 | 13-26 | 4 | - | 1-38, 2-4466 | 1, 6, 40 |

**Table A8.** Diploid numbers of families with >100 genera. Diploid numbers are written in stem-leaf format where “1-2446” means diploid numbers of 12, 14, 14, 16; not all diploid numbers are available in the literature. Alternating gray areas separate families for easier comparison; Heading Key: A= # of Genera; B= #of Species; C= # Karyotyped species used in dataset; D= % 2n known; E=2n range; F=#of 2n Variations; G= Mode of 2n; H= Diploid Numbers (2n); I= Reference. Abbreviation key: F=Family, SF=Subfamily, T=Tribe, G=Genus, SG=Subgenus; “OW” = Old World; “NW” = New World.

| Classification Level | Common Name | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|---|
| F-Cricetidae | Vole, hamster | 129 | 683 | 252 | 37 | 9-92 | 36 | 48x36<br>52x30<br>56x25<br>54x20<br>50x18 | 0-99, 1-445667778, 22x7, 24x5, 2-00066, 28x9, 30x4, 32x4, 34x7, 3-666667, 38x13, 40x9, 42x9, 44x9, 4-366666, 48x36, 50x18. 52x30, 54x22, 56x25, 5-8888, 60x9, 62x8, 64x8, 6-6668, 7-00, 80x6, 82, 9-22 | 1, 6, 40, 54, 69 |
| SF-Arvicolinae | Vole, muskrat, lemming | 27 | 152 | 60 | 40 | 17-62 | 19 | 50x7, 54x13, 56x12 | 1-778, 22 3-0006668, 4-02466688, 50x7, 54x13, 5-222238, 56x13, 6-022 | 1 |
| SF-Cricetinae | Hamster | 7 | 20 | 17 | 85 | 20-44 | 9 | - | 20x3, 22x3, 2-44, 28x3, 3-48, 4-244 | 1,56 |
| SF-Lophiomyinae | Crested rat | 1 | 1 | 0 | 0 | - | - | - | - | - |
| SF-Neotominae | New World rat | 16 | 124 | 54 | 44 | 40-58 | 9 | 48 | 4-0026, 48x31, 52x13, 5-004688, | 1, 40 |
| SF-Sigmodontinae | NW rat, mouse | 74 | 377 | 117 | 31 | 9-92 | 35 | 38 | 0-99, 1-445667, 2-2224446, 28x6, 34x6, 3-02222667, | 1, 6, 40, 54 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 38x11, 40x6, 42x5 44x6, 4-3688, 50x8. 52x12, 54x8, 56x11, 5-88, 60x8, 64x8, 6-22226668, 7-00, 80x6, 82, 9-22 | |
| SF-Tylomyinae | Vesper, climbing rat | 4 | 10 | 4 | 40 | 42-52 | 4 | - | 42, 48, 50, 52 | 40 |

**Reference key for tables 1-8**: 1. O'Brien *et al*., 2006; 2. Carvalho and Mattevi, 2000; 3.Fantin and da Silva, 2011; 4. Pereira *et al*., 2008; 5. Casartelli *et al*., 1986; 6. Gregory, 2010; 7. Gava *et al*., 2012; 8. Carvalho *et al*., 2009; 9. Voss and Jansa, 2003; 10. Svartman, 2009; 11. Calaby *et al*., 1974; 13. Carvalho *et al*., 2002; 14. Rens *et al*., 2003; 15. Rens and Ferguson-Smith, 2010; 16. Westerman *et al*., 2010; 17. Gilbert *et al*., 2007; 18. Hubert, 1978; 19. Smit, *et al*., 2008; 20. Bronner *et al*., 2003; 21. Arrighi *et al*., 1969; 22. Swindler, 1998; 23. Rumpler *et al*., 2011; 25. Stanyon *et al*., 2002; 28. Boer, 1973; 30. Fridman, 2002; 31. Ankel-Simons, 2007; 32. Chiarelli *et al*., 1979; 33. Dumas and Sineo, 2004; 34. Haipeng *et al*., 2002; 35. Chaveerach *et al*.,2007; 36. Schmidt *et al*., 1989; 38. Anderson *et al*., 2006; 39. Hafner and Hafner, 1982; 40. Diploid numbers, 2000. 41. Arslan and Zima, 2009; 42. Baskevich, 1996; 43. Abramov *et al*., 2012; 44. Faleh *et al*., 2010; 45. Nevo *et al*., 1994; 46. Sozen *et al*., 2011; 48. Shahabi *et al*., 2010; 49. Li and Chen, 1987; 52. Matthey, 1967; 53. Srivastava *et al*., 1974; 54. Andrades-Miranda *et al*., 2001; 55. Solano *et al*., 2011; 56. Ross, 1995; 57. Deuve *et al*., 2008; 58. Vileta *et al*., 2009; 59. George, 2008; 60. Arsian, 2006; 61. Tanomtong, 2008; 62. Deuve, 2008; 63. Bonvicino *et al*., 2000; 65. Voss, 2011; 66. Gava *et al*., 1998a; 67. Dunnum and Salazar-Bravo, 2010b; 68. Dunnum and Salazar-Bravo, 2009; 69. Kasahara and Yonenaga-Yassuda, 1984; 70. Souza *et al*., 2007; 71. Henriques-Gil *et al*., 1996; 72. Wilson and Reeder, 2005a; 73. Ventura *et al*., 2008; 74. Motokawa *et al*., 2009; 75. Bannikova *et al*., 2005; 76. Wilson and Reeder, 2005b; 77. Haiduk, 1983; 78. Mao *et al*., 2007; 79. Ao *et al*., 2006; 80. Ao *et al*., 2007; 81. Porter, 2010; 82. Matsuda, 2010; 84. Tanomtong *et al*., 2006; 85. Gaubert *et al*., 2004; 86. Solar and Rau, 2004; 87. Perelman *et al*., 2008; 89. Castro *et al*., 2011; 90. Musilova *et al*., 2009; 91. Houck *et al*., 1995; 92. Bunjongrat *et al*., 2009; 93. Huang *et al*., 2005; 94. Studies on the Cytogenetics, 2012; 95. Groves, 2011; 96. Resende *et al*., 2011; 97. Bello *et al*., 2008; 98. Abril and Duarte, 2008; 99. Giannoni *et al*., 1991; 100. Idris and Moin, 2009; 101. Meijaard and Groves, 2003.