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Report

JCTS
SERIES B

Terrestrial Mammal Families and Creationist Perspectives on Speciation

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Abstract

Even though intrabaraminic speciation is a topic of concern to creationists, there is no general agreement on the magnitude of the speciation within baramins. To rectify this, three mammal classifications were surveyed to identify the number of species or genera in a typical terrestrial mammal family, assuming that the rank of family approximates the baramin. The results of this survey indicate that most mammal families contain relatively few species, but a few families are extremely speciose. Any creationist mechanism of speciation must therefore account for both trends: widespread lack of speciation but occasional extravagant speciation. Likewise, baraminology methods might need to be modified to accommodate the prevalence of small or monospecific baramins.

Editor: M. Ross
Received February 16, 2011; Accepted June 23, 2011; Published July 8, 2011

Introduction

Limited evolution has been a feature of creationist or otherwise Christian reactions to evolution since the early twentieth century (Wood 2008a), but agreement on details of how and how much speciation occurred has not been forthcoming. On the mechanism of speciation, some have argued for acceptance of neodarwinian mechanisms (Marsh 1947), while others appeal to Mendelian genetics (Tinkle 1967) or genomic or chromosomal rearrangements (Wood 2003). With regard to the magnitude of speciation, Wise (2002, p. 218) and Wood and Murray (2003, p. 47) have emphasized rapid speciation producing many species (and genera), while Morris (1974) saw "no need to believe that new genera developed after the Flood."

Lacking from all these discussions is a simple estimate of the average number of species in a created kind, which could give us some sense of how widespread speciation has been. For example, while Cavanaugh et al. (2003) and Wood (2008b) present evidence that a typical baramin contains many species, their work is biased against monospecific baramins, such as might be the case with the platypus or pronghorn antelope. Likewise, Lammerts (1975) remained skeptical of claims of rapid, post-Flood biological change because of the lack of a mechanistic explanation; however, his argument is based on lack of knowledge. It is at least possible that there could be a yet-undiscovered speciation mechanism that could produce many species in a short time.

At present, no creationist has attempted to simply count the number of species in a comprehensive list of created kinds, primarily because such a list does not presently exist. Nevertheless, even estimating the number of species in baramins could reveal important insights on baramins and speciation. Although a comprehensive list of baramins is not forthcoming in the near future, we can still attempt to estimate the membership of terrestrial baramins. Surveys of baramins (Wood 2006) and basic types (Scherer 1993) suggest that the subfamily or family might approximate the created kind among mammals. This approximation is congruent with the 1938 suggestion of George McCready Price, "We may admit that many changes have come about *within the family*, that families have split up and have produced many various forms, without being obliged to admit that this process of splitting or differentiation has gone any further than this." Thus, there seems to be some broad, creationist consensus that the taxonomic rank of family may approximate a created kind.

To estimate the magnitude of speciation among terrestrial mammals, I surveyed the number of species and/or genera in mammal families in three comprehensive treatments of mammal classification: Nowak (1999), McKenna and Bell (1997), and

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Citation: Wood. 2011. Terrestrial Mammal Families and Creationist Perspectives on Speciation. *Journal of Creation Theology and Science Series B: Life Sciences* 1: 2-5.

Wilson and Reeder (2005). I focused on terrestrial mammals (excluding sirenians, pinnipeds, and cetaceans), since modern species presumably would descend from just two members surviving the Flood aboard the Ark. I also excluded Hominidae, since biblical and baraminological evidence suggests this family contains more than one baramin (see Wood 2010). Whereas Nowak (1999) and Wilson and Reeder (2005) list only extant and recent mammals, McKenna and Bell (1997) include all fossil forms known at the time of publication. Thus, McKenna and Bell's classification can help to distinguish monospecific baramins that never speciated from monospecific baramins that are relicts.

Results

Nowak (1999) and Wilson and Reeder (2005) had very similar lists of recent and extant mammal families. According to Nowak (1999), there are 4728 terrestrial mammal species in 362 genera and 127 families. The families had a median of eight species and three genera. Only 37 families (29%) have ≥20 species. The top five largest families are Muridae (1336 spp.), Vespertilionidae (342 spp.), Soricidae (322 spp.), Sciuridae (272 spp.), and Pteropodidae (169 spp.). Nowak (1999) lists 57 families (45%) with five or fewer species. Eighteen terrestrial mammal families (14%) have only one species: Ornithorhynchidae, Myrmecobiidae, Phascolarctidae, Myzopodidae, Aplodontidae, Dinomyidae, Glironiidae, Thylacinidae, Tarsipedidae, Orycteropodidae, Pedetidae, Hydrochaeridae, Microbiotheriidae, Notoryctidae, Craseonycteridae, Antilocapridae, Petromuridae, and Myocastoridae.

Wilson and Reeder (2005) list 5283 terrestrial mammal species in 1161 genera and 136 families, but the median family is exactly the same as Nowak's (1999): eight species and three genera. Wilson and Reeder (2005) list 43 families (32%) of ≥20 species. Wilson and Reeder's (2005) top five largest families are Muridae (730 spp.), Cricetidae (681 spp.), Vespertilionidae (407 spp.), Soricidae (376 spp.), and Sciuridae (278 spp.). Compared to Nowak's (1999) list, Wilson and Reeder (2005) have split Muridae into two families, Muridae *sensu stricto* and Cricetidae, thus demoting the bat family Pteropodidae to the sixth largest in their treatment. Wilson and Reeder (2005) list 55 families (40%) with five or fewer species and 23 (17%) with only one species: Ornithorhynchidae, Microbiotheriidae, Thylacinidae, Myrmecobiidae, Chaeropodidae, Phascolarctidae, Vombatidae, Tarsipedidae, Hypsiprymnodontidae, Orycteropodidae, Cyclopedidae, Ptilocercidae, Daubentoniidae, Aplondontiidae, Petromuridae, Dinomyidae, Myocastoridae, Prolagidae, Craseonycteridae, Myzopodidae, Nandiniidae, Ailuridae, and Antilocapridae.

The family lists of Nowak (1999) and Wilson and Reeder (2005) have fourteen monospecific families in common. The remainder largely represent unusual species that are separated into monospecific families by one source but not the other. For example, Nowak (1999) places the capybara *Hydrochaeris hydrochaeris* in its own family Hydrochaeridae, while Wilson and Reeder (2005) place it in Caviidae with seventeen other large rodent species. In three cases (Daubentoniidae, Notoryctidae, and Pedetidae), one source recognizes two species while the other recognizes only one. Thus, there is congruence between the recognized monospecific families of Nowak (1999) and Wilson and Reeder (2005).

The classification of McKenna and Bell (1997) does not list individual species, presenting only higher classification at and above the rank of genus, but they also list taxa known only from fossils. In the following, I will analyze only families and genera that occur in Cenozoic strata, which correspond to post-Flood deposits according to numerous creationist authors (Austin et al. 1994; Whitmore and Garner 2008; Snelling 2009, chap. 94).

According to McKenna and Bell (1997), there are 4400 terrestrial mammal genera in 347 families, with a median of five genera per family. Only 57 (16%) have ≥20 genera, and only 108 families are still extant. The majority of families recognized by McKenna and Bell (69%) are extinct. Of the 108 extant families, a median of 51% of genera per family are extinct. The five largest families in McKenna and Bell's (1997) classification are Muridae (471 genera), Bovidae (191 genera), Mustelidae (120 genera), Sciuridae (86 genera), and Soricidae (79 genera). Three of these families (Muridae, Sciuridae, and Soricidae) also appear in the top five largest families of Nowak (1999) and Wilson and Reeder (2005). Considering only extinct families, the five largest are Glyptodontidae (65 genera), Hyaenodontidae (50 genera), Oreodontidae (47 genera), Brontotheriidae (43 genera), and Borhyaenidae and Anthracotheriidae (tied for fifth at 37 genera each). McKenna and Bell (1997) list 178 families (51%) with five or fewer genera and 68 monogeneric families (20%). Of the monogeneric families, 14 are extant and 54 extinct.

In all three classifications, the distribution of species (or genera) follows a power-law function (Figure 1). As noted previously, the majority of terrestrial mammal families contain few species or genera. Only a small minority of families contain many species or genera; however, those few families do tend to have a great deal of diversity, with species or genus counts in the hundreds.

Discussion

Considering all three classifications, we can draw some tentative conclusions. First, the number of terrestrial mammal families is relatively small (<500) compared to the total number of species. If the rank of family does approximate the baramin, this small number of terrestrial mammal baramins should have had sufficient space on Noah's Ark.

Second, most terrestrial mammal families are small, with very few species. This would seem to be inconsistent with the claims of creationists such as Wise (2002, p. 218) and Wood and Murray (2003, p. 47), who emphasize rapid and extravagant intrabaraminic speciation after the Flood. In contrast, the results presented here suggest that speciation within the typical mammal baramin has been moderate at most. Thus, the more conservative perspective on post-Flood speciation would seem to be correct for most terrestrial mammal baramins.

Third, creationists who emphasize rapid intrabaraminic speciation appear to be correct in the case of a minority of terrestrial mammal families. Indeed, the top five families in all three classifications contain a large diversity of species or genera, which alone should justify the search for a speciation mechanism to explain such rapid diversification (see Wood 2003). As long

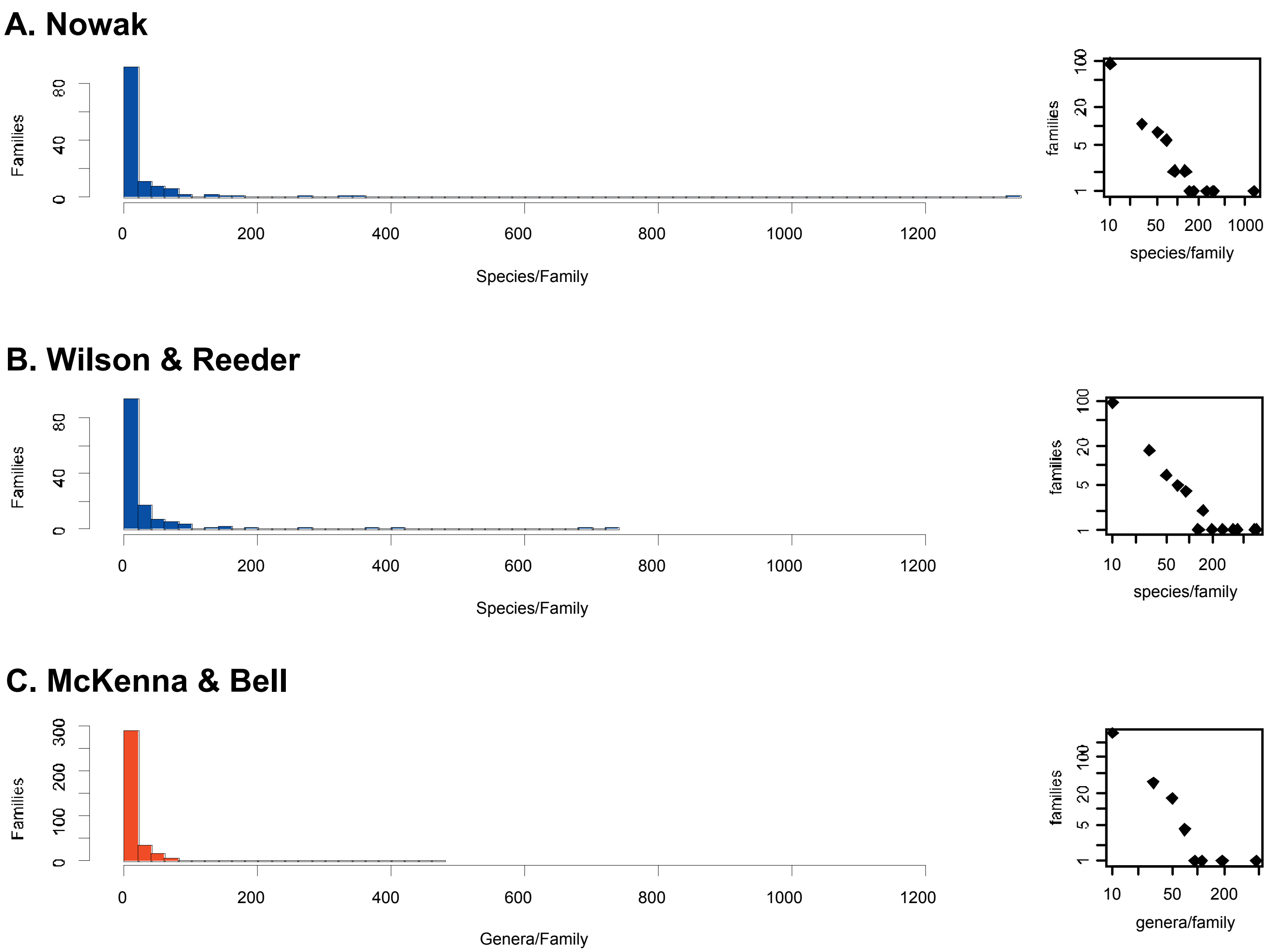

Figure 1. Histograms of species/family (blue, A and B) and genera/family (red, C) for the three classifications used in the text. Insets represent the same data as the histogram plotted on log scales, the linear character of which indicates a power-law distribution.

as it is recognized and noted that such rapid diversification is atypical of terrestrial mammal families, discussion and research on rapid diversification should continue.

Fourth, the distribution of species per baramin appears to follow a power-law distribution not a lognormal distribution as previously reported (Wood 2008b). Consequently, Wood's (2008b) attempt to model speciation within baramins after the Flood is not valid and will need to be revised. A power law or Zipfian distribution is often attributed to a preferential attachment growth model, in which categories (such as genera or families) increase in size proportionally to the number of items already in the category (*e.g.*, Barabási and Albert 1999, Mitzenmacher 2004). Specifically, Yule's (1924) model predicted that a power law distribution of the number of species in genera would result from a speciation model wherein the probability of one species generating a new one was constant (see also Reed and Hughes 2002). Thus, the expectation that speciation would occur in a large genus is higher than in a smaller genus, simply by virtue of the greater number of species. In this present work, the largest terrestrial mammal families were generally small-bodied animals, implying a higher reproductive rate, which could also contribute to the increased expectation of speciation events within those families.

Finally, the prevalence of terrestrial mammal families with few species might require modifications to the refined baramin concept (Wood et al. 2003) or to statistical baraminology. Currently, monobaramins and holobaramins are described as "groups of organisms," which in the practice of statistical baraminology typically equates to groups of species or even genera. Theoretically, the *holobaramin* and *monobaramin* definitions given by Wood et al. (2003) could apply to monospecific baramins, where the "organisms" in the group are individual members of the species (or possibly subspecies or varieties). In statistical baraminology, however, the baraminic distance correlation (BDC) technique relies on numerous taxa (often species) to calculate the correlations that permit the assigning of taxa to monobaramins or holobaramins. It is not presently clear how BDC would handle monospecific taxa.

In this work, I have assumed that the terrestrial mammal families are approximately equal to the baramin, but some creationists have disagreed with this approximation (*e.g.*, Morris 1974). If the genus is a better approximation, the numbers of baramins will increase, but the power law distribution and median baramin size will likely remain (see Reed and Hughes 2002).

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