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EVOLUTIONARY MONOGRAPHS
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EVOLUTIONARY MONOGRAPH 1. The comparative osteology and phylogeny of the Beryciformes (Pisces: Teleostei), by Steven J. Zehren. ii + 389 pp. November, 1979. Initial price \$38.50; \$32.75 to individuals.

Abstract: A comparative osteological examination of the living members of the Order Beryciformes is performed in order to determine their phylogenetic relationships. The degree of phylogenetic relationship among taxa is determined by measuring the amount of similarity in derived character states.

26 species (representing 24 genera and 11 families) of beryciforms were cleared and stained for examination. Complete osteological descriptions and numerous illustrations of eight of these species [Polymixia lowei (Family Polymixiidae), Anoplogaster cornuta (Anoplogasteridae), Diretmus argenteus (Diretmidae), Centroberyx affinis (Berycidae), Photoblepharon palpebratus (Anomalopidae), Monocentris japonicus (Monocentridae), Paratrachichthys sp. (Trachichthyidae) and Ostichthys trachypoma (Holocentridae)] are included.

70 characters, representing all parts of the skeleton, are selected for analysis. For each character numerical states are assigned to represent the categories of phenetic expression present in the members of the Beryciformes. In addition to the 26 Recent species examined, the phenotype of numerous fossil beryciforms is taken into consideration when designating character states (the data for the fossils are taken from the literature).

After defining the states present in a character, it is necessary to construct a character state tree showing the sequence of change in states. The method which is used to determine the primitive states of characters (i.e., the states from which the sequences of change began) involves making "out-group" comparisons. The Beryciformes compose the "in-group" while all other teleosts constitute the "out-group". By examining members of the "out-group" both below (more primitive than) and above (more advanced than) the Beryciformes in terms of their level of structural organization, it is usually possible to determine which state represents the primitive beryciform condition. A wide variety of teleosts, including members of the Myctophoidae, Ctenothrissiformes and Pattersonichthyiformes, is selected to represent the "out-group". A detailed analysis reveals that although there is no strong evidence to suggest that any one of the three groups noted above is particularly closely related to the ancestor(s) of the Beryciformes, all three groups lie closer to this ancestry than any of the other members of the "out-group" examined. Emphasis is therefore placed on the character states present in myctophoids, ctenothrissiforms and pattersonichthyiforms when attempting to determine the primitive vs. derived nature of the states present in beryciforms.

For multiple state characters (characters with three or more states), it is also necessary to determine the correct sequence of change in the derived states.

This is done by ordering the states such that the least complex evolutionary pathway is assumed (i.e., the states are ordered in a logical numerical or phenetic sequence after the primitive state is determined).

A computer program, the Combinatorial Method, is used to investigate the phylogenetic relationships of the Beryciformes. The Combinatorial Method utilizes the phylogenetic information contained in the character state trees. It does this by generating a list of all of the nonredundant, monothetic combinations of OTUs (operational taxonomic units). A nonredundant, monothetic combination is the largest combination of OTUs possess, beginning at the highest level. The degree of phylogenetic relationship among OTUs is considered to be proportional to the number of derived states which they share. Thus, combinations whose OTUs share more derived states are selected in favor of those with fewer states. In those cases where an OTU appears in two different combinations at the same level of shared states, additional criteria are applied in order to choose between the combinations.

By using the Combinatorial Method, a dendrogram showing the phylogenetic relationships within the Beryciformes is constructed. The relationships shown in this dendrogram are discussed in detail. A second dendrogram showing the possible relationships within the Beryciformes is also included. A comparison reveals that although many of the groups present in the two dendrograms are identical, the second dendrogram is a better representation of the phylogenetic relationships of the 26 species examined in terms of 1) the number of groups defined by the presence of unique, derived states and 2) the consistency of the arrangement of the groups with respect to additional morphological data.

Some of the more important systematic conclusions resulting from this study are as follows. 1) With regard to the 26 species examined, it is possible to identify derived character states which are unique to each of the families represented (except the Trachichthyidae) 2) Polymixia should not be included in the Order Beryciformes 3) Anoplogaster is more closely related to "typical beryciforms" (in particular, to trachichthyids, monocentrids and anomalopids) than to stephanoberyciforms (stephanoberycids, gibberichthyids and melamphaeids) 4) Stephanoberyciforms constitute a monophyletic group, but should not be placed in an order separate from the Beryciformes and 5) the Order Beryciformes (even after the removal of Polymixia may not constitute a monphyletic group.

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EVOLUTIONARY MONOGRAPH 2. Fossil history of the rodent genus Sigmodon, by

Robert A. Martin. ii + 36 pp. November, 1979. Initial price \$3.65; \$3.10 to individuals.

Abstract: Extinct and extant species of Sigmodon are referred to three species groups: the hispidus species group, including S. hispidus, S. ochrognathus, S. alleni, S. fulviventer, S. mascotensis, S. arozonae, and S. bakeri; the leucotis species group including S. leucotis, S. alstoni, S. peruanus, S. hudspeithensis, S. curtisi, and S. libitinus (new species); and the medius species group, including S. medius and S. minor. A new subspecies of S. medius is described. The diminutive S. minor evolved from S. medius through character displacement away from large, advanced cotton rats of the leucotis species group. Increase of roots on the first lower molar, from two to four, is a feature which characterizes Sigmodon evolution, and is directly coupled with the evolution of hypsodonty and the successful transition from browsing to grazing. A chronology of North American deposits with fossil Sigmodon is provided.

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EVOLUTIONARY MONOGRAPH 3. Swain Quarry of the Union Formation, Middle Paleocene (Torrejonian), Carbon County, Wyoming: geologic setting and mammalian fauna, by J. Keith Rigby Jr. vi + 179 pp., 14 plates. January, 1980. Initial price \$20.00; \$17.00 to individuals.

Abstract: Swain Quarry has produced 28,000 fossil mammalian specimens. Based upon comparison and similarity to faunas from the San Juan Basin, New Mexico, and the Crazy Mountain Field, Montana, the Swain Quarry fauna is middle Paleocene (Torrejonian) in age.

Named new taxa include 3 multituberculates, 2 adapisoricids, 3 palaeoryctids, 1 primate, 1 miacid, 2 arctocyonids, and 1 anisonchine.

The purpose of this study is to document dental morphological variability from a single Paleocene locality. Populational variability, deme diversity, and their relationship to biostratigraphy are discussed. Metric properties of dental elements are of primary interest. The large sample size permits the comparison of statistical data derived from samples containing at least 10 specimens of a single dental element. Multituberculate dentitions are found to be exceptionally variable with coefficients of variation of many metric properties exceeding 4-6.

The ungulate family Hyopsodontidae is reviewed. Litomylus, Haplomylus, Haplaletes, Louisina, Microhyus, and Paschatherium are referred to the Adapisoricidae. Protoseleninae, a new subfamily of the Peripitychidae, is constructed for the genus Protoselene. Oxyacodon is referred to the Anisonchinae. The subfamily Apheliscinae is referred to the Pentacodontidae. Asmithwoodwardia, once regarded as a didolodont, is included in the Hyopsodontidae. "Jepsenia" is a junior synonym of Litaletes and the subfamily Tricuspidodontidae is referred to the Phenacodontidae.

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