Fish

1. Fossil Ceratioid Anglerfishes , By Giorgio Carnevale
Although the usual biological features and bizarreness of these fishes have stimulated intense **debate** and discussion, attracting the curiosity of many ichthyologists during the last century (see, e.g., Regan, 1926; Regan and Trewavas, 1932; Beebe and Crane, 1947; Waterman, 1948; Bertelsen, 1951; Maul, 1961; Pietsch and Orr, 2007), their evolutionary history remains elusive, mostly because they are nearly unrepresented in the fossil record. Page 996

Unfortunately, lack of resolution, for the most part due to a lack of salient morphological data (certainly caused by the strongly reductive trends in skeletal architecture), resulted in the origin of polytomies at the basal and derived positions of the phylogenetic tree. Moreover, because of their virtual absence in the fossil record, ceratioids cannot be used to define the exact sequence of events in the phylogeny of such a group. Page 1004

2. A New Actinopterygian From Greenland, By Matt Friedman
Although there are some areas of agreement between their phylogenies, such as the basal or near-basal position of *Cheirolepis*, a consensus remains elusive. Studies with broader taxonomic and character samples also fail to retrieve consistent patterns of interrelationships. Page 1193

Given the uncertainties regarding the phylogenetic position of *Dialipina*, we have decided to carry out our analysis in two parts. Page 1194

The relationships among the major sarcopterygian clades were left free to vary, thereby accommodating a wide range of conflicting phylogenetic hypotheses (Cloutier and Ahlberg, 1996; Chang and Yu, 1997; Zhu and Schultze, 2001). As our study does not include non-osteichthyans, it is impossible for us to address the position of *Dialipina* within Osteichthyes. Page 1194

Unfortunately, the limited taxonomic and morphological scope of our study does not permit us to make any further contributions to the **debate** on the phylogenetic position of *Dialipina* and other putative early actinopterygians. Page 1198

The environmental context for the origins and evolution of early vertebrates has been a subject of considerable interest and **debate** (Romer and Grove, 1935; Thomson, 1980; Halstead, 1985). Page 1198

3. Relationships of the Coelacanth, By Rafael Zardoya
Yet, despite many studies that are based on either morphology or molecules, the phylogenetic relationships among tetrapods and the other two living groups of lobe-finned fishes, the coelacanth and the lungfishes, are still unresolved and **debate**d. Page 5449

4. Hagfish embryos, By Nicholas D. Holland
The corrected version of neural crest origin in hagfishes, although important in itself, takes on a broader significance for questions about the phylogeny of vertebrates (a term used inclusively here to include jawless forms lacking vertebrae). It is still unsettled whether the most-basal group of living vertebrates consists of the hagfishes alone or comprises a clade including lampreys along with hagfishes (this latter arrangement is the cyclostome hypothesis). Page 835

This is unfortunate, because the nature of the head mesoderm in basal vertebrates is central to the old **debate**s between segmentalists and anti-segmentalists. Segmentalists presume that the protochordate ancestor of the vertebrates (being rather like an amphioxus) had a head region including muscular somites that, during early vertebrate evolution, became the segmented head mesoderm. In contrast, the anti-segmentalists are of two main sorts. The more extreme view is that the protochordate ancestor of the vertebrates (being rather like the tadpole larva of an ascidian tunicate) lacked muscular somites of any kind anteriorly. Page 835

5. Ribosomal RNA genes, By Jon Mallatt
The relationships among the three subgroups of sarcopterygians— lungfishes, coelacanth, and tetrapods—have generated much **debate** (reviewed by Meyer and Zardoya, 2003). Obviously, we cannot resolve this **debate**, because we did not even recover a monophyletic Sarcopterygii. Page 1017

6. Phylogeny of the Gasterosteidae, By Michelle Y. Mattern
Using five mitochondrial genes produced a topology that is not significantly different from the phylogenetic tree based upon morphology and behavior. However, those two topologies do produce different pictures of character evolution in the gasterosteids. Page 375

In order to resolve this problem, additional data need to be incorporated into the dataset. The behavioral and morphological data are currently being revised and combined with the molecular characters to produce a total evidence study for the family. Hopefully that analysis will resolve the issue of two statistically equivalent, yet topologically different, trees. Page 375

7. Shark tales, By Ximena Vélez-Zuazo
However, despite a long evolutionary history, commercial, and conservation importance, phylogenetic relationships within the sharks are poorly understood. Page 207

Other issues of **debate** are the relative position of Squatiniformes, Squaliformes, and Pristiophoriformes within Squalimorphii, and those of Carcharhiniformes, Orectolobiformes, and Lamniformes within Galeomorphii. Early morphological data placed Squaliformes sister to Pristiophoriformes. Page 208

At the family level, there is even less agreement among studies. The monophyly and placement of many, perhaps most, families are still in **debate**. Page 208, 209

Both the lack of clear phylogenetic understanding at the higher level, as well as the absence of species-level phylogenies are a hindrance for making other evolutionary inferences, for example, studying character evolution, the rate of molecular evolution and approximate time of appearances. Page 209, 210

The monophyly and position of the family Odontaspididae are unresolved in our phylogeny. Page 212

In sum, our results are incongruent with a large number of taxonomical groups, especially at the family and genus level. Given that many prior phylogenetic studies also conflict with taxonomy, it seems that existing taxonomy will require careful revision. Our results should provide a guide to where further effort in phylogenetic knowledge is most needed so as to satisfactorily resolve shark phylogeny and taxonomy. Page 216

8. North American minnows, By G. R. Moyer
Although much is known about the taxonomy, biology, and life history of Hybognathus species, their phylogenetic relations with each other remain unclear. Page 514

The phylogenetic relations among members of this clade were left unresolved by morphological data; likewise, due to incongruence in mtDNA and nuclear datasets, phylogenetic relationships among these closely related taxa remain unclear. Phylogenetic placement of H. regius and H. hankinsoni also were unresolved using morphological data; however, molecular data resolved them as sister taxa. Page 523

9. Phylogeny and biogeography, By John S. Sparks
Relationships among constituent taxa remain, for the most part, unresolved. Page 720

10. Molecular phylogeny of damsel fishes, By Nian-Hong Jang-Liaw
However, there is some **debate** over the monophyly of this suborder. Based on morphological characters, these four families form a monophyletic group (Kaufman and Liem, 1982; Stiassny and Jensen, 1987). Page 445

11. Major groups of catfishes, By John P. Sullivan
Deep within Siluroidei are 12 large, strongly supported groups with poorly resolved interrelationships. Page 636

Despite such recent progress, relationships among catfish families, genera and most species are not sufficiently resolved to craft a comprehensive classification, or to allow precise higher level biogeographic analyses or character mapping (e.g. Diogo, 2004a). The many conflicting or incompletely resolved hypotheses of relationships based on morphology or molecules need testing with additional characters and species. Page 637

12. Diversification of rockfishes, By John R. Hyde
Phylogenetic lineage reconstruction is often obscured or poorly supported due to saturation and back mutation at informative genetic loci while paleo-geographic landmarks are often so distant they do not provide good mileposts for estimating the timing of speciation events. Page 791

The phylogeny and evolution of the group has been the subject of much **debate** and has resulted in a great deal of confusion (see Kendall, 2000; for a comprehensive and entertaining review). Page 791

13. Evolutionary affinity of bill fishes, By A. G. Little
These attributes, combined with analyses of other morphological and molecular data, have led to a general perception that tunas and billfishes are close relatives, though this hypothesis has been vigorously **debate**d. Page 897

At the center of **debate** surrounding scombroid phylogeny are the billfishes, comprised of the monotypic Xiphiidae and the monophyletic Istiophoridae (Collette et al., 2006). The phylogenetic relationships of billfishes have been explored in numerous morphological and molecular studies with resulting phylogenetic hypotheses differing dramatically, but more recently edging toward classifying billfishes in their own suborder, Xiphioidei. Page 897

These similarities have led to a general perception that tunas and billfishes are close relatives, though the “closeness” has been vigorously **debate**d. Page 900

14. Molecular Phylogeny of the Prickly Shark, By Giacomo Bernardi
The relationships between the squalomorphs and other superorders of sharks and the relationships between the different orders within the squalomorphs are a matter of **debate**. Page 161

The classification of the cartilaginous fishes, and of the sharks in particular, is still under **debate**. The phylogeny of the sharks proposed by Compagno (1977) leaves many uncertainties that have not been clarified. Page 161

15. Phylogeny of elasmobranchs, By Christopher J. Winchell
The interrelationships of the extant elasmobranchs (neoselachians), a group that evidently originated in the Early Triassic (Cuny and Benton, 1999; Thies, 1982), are subject to **debate**. Page 214

The taxonomic positions of Heterodontus and Chlamydoselachus are controversial. Page 221
The positions were so unstable that we cannot disprove the idea that Heterodontus is in a monophyletic. Page 221

However, because relationships among the rajid skates, some guitarfish genera, and stingrays are uncertain (McEachran et al., 1996), our trees placing Raja basally and Rhinobatos closer to the myliobatiforms (Potamotrygon, Urobatis) could be informative. Page 222

Outstanding problems to be addressed by future gene-based studies are: (1) relations of Heterodontus and hexanchiforms to other sharks; (2) relations among lamniforms, carcharhiniforms, and orectolobiforms; and (3) batoid interrelationships. Page 222

16. Gene tree parsimony, By James A. Cotton
There is no doubt that lizards and snakes form part of a monophyletic radiation of diapsid reptiles, although there has been some **debate** about the exact relationships between the different extant lineages within this radiation, as discussed above. Similarly, there has been **debate** about the exact relationships between hagfish, lampreys and gnathostomes (Delarbre et al., 2002; Janvier, 1996), but the only hypotheses supported by recent work are that lampreys and hagfish form a monophyletic cyclostomes group, or that hagfish are the most basal vertebrates, with lampreys a sister-group to the gnathostomes. Page 306

17. A problematic group of fishes, By Katriina L. Ilves
Relationships among the species of Northern Hemisphere smelts (family Osmeridae) have long been **debate**d in the fish systematics literature. Eight independent studies based on morphological characters failed to reach any consensus on osmerid interrelationships. Page 163

However monumental, McAllister’s (1963) study did not quell the **debate** about osmerid interrelationships, as the uncertainty surrounding the phylogenetic placement and biogeography of this group continues to the present day. Page 163

Eight morphology-based hypotheses of systematic relationships among osmerid genera. Page 164

18. The Dalmatian genus Phoxinellus, By Jörg Freyhof
The phylogenetic structure of this family is still under **debate**, but several subfamilies are widely accepted and seem to form strongly supported monophyletic clades (Chen et al., 1984; Howes, 1991; Liu et al., 2002). Page 416

19. Paleoclimatic history, By Tine Huyse
The systematic relationships of the sand gobies with other gobioids remains unclear from morphology but the most likely sister group to the sand gobies has to be looked for in the Indo-Pacific region (Mckay and Miller, 1997). Page 325

In conclusion, there are presently two scenarios on the origin of the freshwater lifestyle in the sand gobies. Page 333

20. The gonorynchiform fishes, By Sébastien Lavoué
Recurrent **debate**s concern the relative position of the paedomorphic fishes Cromeria and Grasseichthys (some of the smallest vertebrates) (Grande, 1994; Howes, 1985; Lenglet, 1974), and the relative positions of Chanos and Gonorynchus as the most basal group (Fink and Fink, 1981, 1996; Gayet, 1993; Grande and Poyato-Ariza, 1999; Greenwood et al., 1966; Patterson, 1984) (Figs. 2A–E). Page 167

The respective advantages of various methods of phylogenetic inference have also been largely **debate**d, with sometimes conflicting conclusions reached. Page 174

In part because their paedomorphic features makes it difficult to establish their phylogenetic affinities, the systematic of Cromeria and Grasseichthys have been **debate**d for a long time, and their phylogenetic placement is still uncertain. Page 174

21. Phylogenetic structure of Zacco platypus, By A. Perdices
The phylogenetic relationships of the genus Zacco are under **debate** and then, the selection of the closest outgroup is not straightforward. Page 194

22. Biogeography of the cyprinid tribe, By Lei Yang
Here, we do not intend to involve in the **debate** over the definitions over convergence and parallelism, and believe those three criteria also work for the detection of parallelism. Page 264

23. Lepidogalaxias salamandroides, By Jun Li
Fig. 1. Six recent major hypotheses for phylogenetic relationships of lower euteleostean fishes based on morphology (a–b) and molecules (c–f). Asterisk (*) indicates the new erected order in this study (for details see the section of Section 4). Page 933

24. Divergence times of Lizard Fishes, By Matthew P. Davis
There has been much **debate** on the taxonomy and phylogenetic interrelationships among members of the Dercetidae (e.g., Chalifa 1989a; Taverne 1987, 1991, 2005; Gallo et al. 2005). Page 1196

25. DNA in Dalmatian cyprinids, By Jorg Freyhof
The phylogenetic structure of the fish family Cyprinidae is still under **debate**, but several subfamilies are widely accepted forming well supported monophyletic units (Chen et al., 1984; Howes, 1991). Page 351

26. Evolution of the Metazoan PHD, By Kalle T. Rytkonen
Our results are more equivocal about the relationships among the HIF-3 alpha genes in cartilaginous fishes, teleosts, and mammals, which is currently a matter of some **debate** (Law et al. 2006; Richards 2009). Page 1921

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