Dorsoventral view of a *Nautilus pompilius* from the Philippines, "showing the final two septa thickened and strongly approximated." [From D. Collins and P. D. Ward, "Adolescent growth and maturity in *Nautilus*," in *Nautilus: The Biology and Paleobiology of a Living Fossil*]

dictated not only by the efficacy of buoyancy control, but also by the mechanical strength of the shell and siphuncle. Contrary to what might have been expected for a living fossil like *Nautilus*, the half a dozen or so species of this genus display considerable genetic variation both within and between populations, as is particularly well documented in the chapter by D. Woodruff *et al.* in the Saunders-Landman volume.

Inferences about fossils depend on the judicious application of the principle that the observed relationships among form, function, and ecology in living representatives also held in fossil forms. In the final section of his book, Ward demonstrates the power of this approach by applying his data on buoyancy control in *Nautilus* to the interpretation of fossil chambered cephalopod shells. From their thinner shells, more complex and thinner chamber partitions, smaller larval shells, smaller muscle-attachment areas, and marginal position of the siphuncle, he convincingly argues that, compared to *Nautilus*, ammonoids grew faster, hatched at much smaller sizes, lived in shallower waters, and were for the most part sluggish swimmers. Mesozoic nautiloids grew more slowly and lived in deeper water than did most contemporaneous ammonoids. The decline and ultimate demise of the ammonoids in the Cretaceous, in Ward's view, is explained in part by the fundamental incompatibilities among the demands for rapid density compensation, rapid locomotion, and adequate passive protection by the external gas-filled chambered shell. Such a body plan is still adequate in the deep-water habitats of *Nautilus*, but in shallow waters it has been eclipsed by the endoskeletal plans of fishes and the other living cephalopods, in which more active forms of defense and higher locomotor performance have evolved. Given that the deep-water habitat of *Nautilus* may not have been typical for many other fossil cephalopods, we must be wary of speculations by several authors in the Saunders-Landman volume that the poorly developed eyes and other characteristics of *Nautilus* represent the primitive condition in the Paleozoic ancestors of the other living cephalopods.

These books should be required reading for anyone working with living or fossil cephalopods. At a time when some paleobiologists are dismissing functional morphology as irrelevant to the interpretation of life's history, it is heartening to see in these two books how illuminating the study of form and function can be for an understanding of large-scale evolutionary patterns. The general reader will probably find Ward's the more concise and unified account, as well as the source for the more interesting speculations, but both books provide a wealth of valuable information that will serve as the springboard for all future work.

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Unusual Fishes

Frogfishes of the World. Systematics, Zoogeography, and Behavioral Ecology. THEODORE W. PIETSCH and DAVID B. GROBECKER. Stanford University Press, Stanford, CA, 1987. xxiv, 420 pp., illus., + plates.

This monograph focuses on a remarkable assemblage of marine shorefishes, the Antennariidae, that qualify as one of nature's most novel evolutionary products. A wide interest in frogfishes beginning with 18th-century naturalists resulted in a descriptive proliferation of 165 nominal species (41 are currently recognized) and a confusing taxonomic history involving over 350 different scientific name combinations. This monograph consists mainly of descriptive accounts (including many drawings and 16 pages of color plates), identification keys, comprehensive synonymies, nomenclatural and distributional comments, and other such material. Many original observations are presented, and with this reference antennariids can be readily identified. Several chapters make interesting reading, especially the "historical perspective," which includes brief biographies of selected workers and fascinating accounts of folklore and erroneous observations of frogfish biology. The chapter on "behavioral ecology" will be of interest to the widest audience and covers such diverse topics as feeding dynamics, defensive behavior, locomotion, and reproductive biology. Frogfishes are cryptic mimics that attract prey with a fleshy lure; all that is known concerning a wide range of morphological, functional, and behavioral adaptations associated with this mode of existence is discussed in eloquent detail.

The frogfish *Histrio histrio* (Linnaeus) as represented by Albertus Seba in the *Locupletissimus Rerum Naturalium Thesaurus* of 1734 (plate 74, figure 3). [From *Frogfishes of the World*; courtesy of Ben Williams and the Field Museum of Natural History, Chicago]

The infraordinal classification and specific taxonomy of frogfishes appear to be well established, but other aspects of their systematics are not resolved. No derived characters have been identified that unite the 24 species assigned to *Antennarius*, and none of the 11 other genera contain more than 3 species. Despite considerable effort, no synapomorphies have been discovered that convincingly establish the intrafamilial relationship of any of these genera. A reader attempting to re-evaluate antennariid character-state polarities and phylogenetic relationships is at a disadvantage because only partial data are given for the three other families included in the suborder Antennarioidei: Tetrabrachiidae and Lophichthyidae (both monotypic) and Brachionichthyidae (with about four species). This omission is the only fault I have to find with this otherwise comprehensive monograph. Biogeographic patterns are discussed and spot distribution maps are given for each species, but incomplete knowledge of antennariid phylogeny precluded a detailed analysis.

Easily maintained in aquaria and fascinating to observe, frogfishes are recommended as ideal laboratory animals for scientific investigations of all kinds. Perhaps the most important contribution of this book is that it identifies a challenging array of unanswered questions about a remarkable group of animals and serves as a basic foundation for further inquiry.

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