three year period, some of the latter personally by Munro. The book must be used in conjunction with the checklist "The Fishes of the New Guinea Region" (Papua and New Guinea Agr. J. 10:97–339, 1958), a sizable work in itself, including a full list of bibliographic material related to the area, fuller than the book here reviewed. In addition the paper "Additions to the fish fauna of New Guinea" (Papua and New Guinea Agr. J. 16:141–186, 1964) presents additions to the checklist and describes a new family (*Rhinoprenidae*, close to the *Scatophagidae*), three new genera, and 11 new species. This trilogy is part of one major work, and a most useful tool for anyone interested in the fishes of the Indo-West Pacific region.

The "Fishes of New Guinea" covers the whole of New Guinea and its surrounding island groups, including Waigeu, the Bismark Archipelago, the Admirality Islands and the British Solomons. Numerous keys are one of the book's strong points. The 1076 species considered have brief diagnoses, and in almost all cases are illustrated by black and white plates taken, with a few originals, from published works. The fish color plates were clearly chosen in many cases because they are beautiful, and not because they needed depiction for taxonomic reasons.

I find, in those few groups with which I am conversant, that errors have been carried over with no attempts at solution and taxonomic problems have not been probed adequately. This is to be expected in any major compilation. The work is indispensible.

"Fishes of Arnhem Land" by Ralph Taylor is a very different type of regional work. Collections, accompanied by adequate field data, were made by R. R. Miller and were clearly a good collection from the area. They have been meticulously worked over by a very competent professional, and the result is a scholarly addition to the literature. Many problems have been resolved by this work. It is a pity that Australian museums were apparently not visited as a study of their collections in conjunction with the collection from Arnhem Land would have further improved this work.

Ralph Taylor states, "Much of the difficulty in the identification of the fishes of the Indo-Pacific region results from lack of revisions of genera and families." One might add—not only the Indo-Pacific, but this Indo-Australian archipelago, the richest area in the world for marine fish species, badly needs more work of this high calibre.—F. H. Talbot, *Australian Museum, 6-8 College Street, Sydney, Australia.*

THE CAECILIANS OF THE WORLD: A TAXONOMIC REVIEW. By Edward Harrison Taylor. University of Kansas Press, Lawrence, Kansas, 1968. vii + 848 pp., illus. $25.00.—Dr. Taylor's years of field work in Central and South America and southeast Asia and his extensive visits to museums throughout the world have resulted in the publication of this compendium of taxonomic information about caecilians.

The book is of two parts—an introductory section of 44 pages, and a treatment of caecilian taxa for some 748 pages. After 48 pages of bibliography, a valuable topic and taxon index closes the volume. Two new families, the Typhlonectidae and the Ichthyophiidae, are designated. The aquatic Typhlonectidae includes the genera *Typhlonectes, Potamotyphlus, Nectocaecilia,* and *Chthonerpeton.* The genera of Ichthyophiidae recognized are *Ichthyophis, Rhinatrema, Caudacaecilia,* and *Epicrionops. Afrocaecilia, Boulengerula, Brasilotyphlus, Caecilia, Cryptopsophis, Dermophis, Gymnopis, Microcaecilia, Parvicaecilia, Siphonops, Pseudosiphonops, Luetkenotyphlus, Mimosiphonops, Copeotyphlinus, Oscaecilia, Idiocranium, Scolecomorphus, Schistometopom, Herpele, Uraeotyphlus, Geotrypetes, Gegeneophis, Indotyphlus, Grandisonia, Praslinia,* and *Hypogeophis* comprise the Caeciliidae. There are more new forms described in the work than are included in Taylor's putative list on page 9. Thirteen new genera are named (*Copeicaecilia* of the list is not a described genus and is perhaps a typographical contraction of *Copeotyphlinus* and *Caudacaecilia,* neither being present in the list, but both are described in the text; *Copeicaecilia* is changed to *Copeotyphlinus* in a separate list of errata, but *Caudacaecilia* remains omitted). I count 42 new species and subspecies, not the 32 mentioned, for a grand total of 165 forms. The summary of previous work on caecilian taxonomy is valuable, but much of the material in the introduction is too cursory to be useful. Dr. Taylor states that certain morphological characteristics are

used as taxonomic characters, but he does not state in a definitive manner how they are used. Even a parenthetical insertion of genera when a character state is discussed would have been helpful. For example, some indication of the forms in which fins have been observed (see page 18) would be appropriate.

Dr. Taylor's evaluation of the scales, unique to caecilians among amphibians, arouses one's curiosity. He begins by citing the commonly held presumption that scales are part of an ancestral piscine inheritance to prevent desiccation or uncontrolled water intake. He then discusses the presence in many caecilians of scales associated with the annuli (page 19), and then mentions the presence of curious subdermal scales (page 20) in some forms. On page 21 he suggests that the annular scales are produced by secretions from skin glands. If this is indeed the mode of production, previous consideration of the scales as homologues of dermal scales of fish and correlations with labyrinthodont scales must be discarded. This leaves open to question the origin of the "subdermal" scales.

The sketchy nature of the general morphology section might have been improved by some literature citation, especially in such sections as that on tentacle ontogeny (page 23). A complete review of the literature on amphibian dental replacement patterns seems warranted before Dr. Taylor presents further ideas on caecilian dentitional patterns. While I recognize that Taylor does not intend the section to be a definitive work on caecilian morphology, the usefulness of the book to herpetologists not working primarily on caecilians would be enhanced by references. A number of hypotheses are presented as fact, such as that of the mechanism of cloacal extrusion (page 31). Some phenomena worth citing in this section are briefly mentioned in the "remarks" or "variation" sections in the taxonomic accounts, such as the ability of female *Typhlonectes obesus* to evert the cloaca. This may have some bearing on the as yet unobserved means of copulation among caecilians. While Taylor has mentioned before, and does here, the probable value of characters of cloacal morphology as taxonomic criteria, he does not delineate these characters. Information may not be available for all forms, but this taxonomic work is the place for an initial evaluation of their use. Sketches of cloacal morphology for a few species in the taxonomic section without evaluation and, indeed, without reference to them, renders them rather meaningless.

The section on life histories would be enhanced by lists of genera for each general mode, and more information on habitats could be gleaned from Dr. Taylor's incomparable experience without enlarging these sections too greatly. The discussion of distribution is well prepared and cogent, though placing paragraphs on *Ichthyophis* and India under the heading of the Seychelles detracts somewhat from the organization.

The discussion of family and generic criteria, approached by the reviewer with anticipation, proved disappointing. Dr. Taylor merely lists the characters that he used with neither discussion of variation of the characters nor presentation of his philosophical basis for establishing taxonomic criteria. In the light of current work in taxonomy with its multiplicity of approaches, careful character evaluation is essential as a basis for understanding the taxonomic treatment of a group.

Of greatest value to the herpetologist who will use the volume would have been the inclusion of generalized labelled sketches showing such characters as nuchal collars, eye-tentacle positions, *etc.*, and an indication of Taylor's method of counting and measuring. If Boulenger, Dunn, and Taylor differ greatly on such "routine" characters, what of the rest of us? The briefness of the account of caecilian morphology and ecology points up the many problems available for study on members of the order Gymnophiona. We have Dr. Taylor to thank for advancing our knowledge of the group to the place that we can begin again to consider these problems.

The bulk of the book is devoted to the taxonomy of caecilians. Keys to orders, families, genera, and species are included, generally utilizing only external characters. The keys, by and large, are readily useable, but some difficulties may occur. Some overlap in counts is noted at critical dichotomies, and occasional use of locality or of skeletal morphology as characters may prove difficult in the identification of newly collected material. Two of Taylor's new species are omitted from the key to *Caecilia*, as is a species from the *Ichthyophis* key. Taxa are

consistently illustrated by drawings or photographs of heads (dorsal, ventral, and lateral views) and the posterior ventral end of the body. Frequently included are drawings or photos of dentition patterns, whole specimens, choanae and tongues, and radiographs of whole specimens. The quality of photographs and x-rays is highly variable, but considering the scarcity and state of preservation of much of the material, it is worthwhile to have even the worst of them included. Indications of size are often not available or are inapplicable, rendering the illustrations of less value.

The tables of data included for various taxa are of particular interest to those workers who deal with caecilians. Dr. Taylor presents some information on the degree of variation for the external and tooth characters he uses, though he does not analyze variation *per se*. Dr. Taylor cannot be faulted for failing to present lists of specimens for each taxon, as Dunn (1942, The American caecilians. Bull. Mus. Comp. Zool. 81(6):438–540) did with such care, because such lists would have disproportionately increased the length of the monograph.

Each section of the taxonomic portion contains a definition of each family and a key to the genera in it. It is interesting that recognition of the families Ichthyophiidae and Caeciliidae is based on separation of certain apparently primitive oviparous forms having aquatic larvae (the Ichthyophiidae) from the largely ovoviviparous terrestrial forms (the Caeciliidae) rather than following Dunn's suggestion that primitive-to-advanced lines exist on each of the major land masses where caecilians occur. Taylor suggests in this work that certain aspects of the morphology of members of the genus *Scolecomorphus* are so divergent that familial status is warranted, and he subsequently has so designated the group in a paper now in press. Each genus is diagnosed, comments about the type are made, and general remarks are presented. A key to the species follows. Species are dealt with according to the following format: list of type and paratypes, diagnosis, description of the type, dentition, color, measurements, variation, and distribution (and occasionally remarks). Synonymies precede the type-paratype lists for previously described species.

The diagnoses do not always diagnose, largely because different characters are often used for presumably closely related species. A statement of the derivation of proposed names is rarely included. Dr. Taylor usually fully justifies his designations of new genera and species, but some allocations are particularly interesting and reveal Dr. Taylor's intuition. A specimen at the Zoologisches Staatsinstitut und Zoologisches Museum, Hamburg, with data showing that it was collected in Africa, is the type of a new species *corrugatum*, placed in the American genus *Chthonerpeton*. The only other representative of the species is a no-data specimen at the Academy of Natural Sciences, Philadelphia. Dr. Taylor simply states that the specimens are probably South American and that there is no reason to suggest that *Chthonerpeton* occurs on two continents. *Copeotyphlinus syntremus* has a similarly interesting history. Described (meagerly) by Cope (1866, Fourth contribution to the herpetology of tropical America. Proc. Acad. Nat. Sci., Phila. 18:123–132) and included in *Siphonops*, the type and only specimen was lost. From the scanty information on annuli, tentacle position, and teeth, Dunn concluded that the form belonged to no recognized American genus and suggested that a new genus was warranted for its reception if more specimens could be obtained and an adequate description made. He left the form as *incertae sedis*. Taylor, without new specimens, without the type, and without new information, proposes the new genus.

Resurrection of *Epicrionops* and *Cryptopsophis* are based on characters overlooked by workers preceding Taylor. Inclusion of *oaxacae* as a species of *Dermophis* and recognition of *proxima* as a full species of *Gymnopis* are substantiated by Taylor. He clears up the puzzling distribution of *Herpele* in Africa and in India by showing that the Indian species is a *Gegeneophis*. Recognition of the genus *Grandisonia* and retention of *Praslinia* and *Hypogeophis* brings order to the taxonomy of the Seychelle Islands forms.

Inclusion of the previous descriptions of two fossil forms is of interest, but it should be noted that Taylor suggests that *Ichthyophis muelleri* cannot be associated with extant *Ichthyophis*. Further, Dr. Oskar Kuhn has stated in a letter that the late Tilly Edinger identified Marcus' *Prohypogeophis* material as a Devonian molluscan, a decision accepted by Marcus.

A certain redundance of criticism of Dunn's work throughout the monograph perturbed this reader, though that and some internal inconsistencies and a very few typographical errors do not seriously detract from the value of the work. Inclusion of a number of anatomical papers not mentioned in the bibliography would have added to the completeness of the volume, since this work is obviously the current authority on caecilian taxonomy and on general information about the members of the order as well. The comments made here and the requests for expansion of certain sections reflect confidence in the vastness of Dr. Taylor's knowledge of caecilians and the hope that he will continue to disseminate his information. *The caecilians of the world* will stand as a tribute to Dr. Taylor's knowledge, diligence, and appreciation of a neglected order of amphibians.—MARVALEE H. WAKE, *Department of Biological Sciences, University of Illinois, Chicago Circle, Chicago, Illinois 60680.*

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