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The Fossil Leptostracan *Rhabdouraea bentzi* (Malzahn, 1958)

Frederick R. Schram

Department of Geology, Paleontology Section, San Diego Natural History Museum, San Diego, CA 92112 USA

Eric Malzahn

Auf der Heide 33, D-3004 Isernhagen, German Federal Republic

Abstract. The type material of the only known fossil leptostracan phyllocarid, *Rhabdouraea bentzi*, is reexamined. This species was originally placed in the genus *Nebalia*. The distinctive caudal rami and the form of the carapace, however, require separate generic and familial status for this Permian material. A redefinition of the living family Nebaliidae is also provided.

INTRODUCTION

The fossil record of the Phyllocarida has always presented problems for phylogenetic analysis because of the incomplete nature, generally, of the fossils (Rolfe 1981). This has been especially vexing for the assessment of the living order Leptostraca where, with a single exception, fossils are non-existent. Malzahn (1958) described *Nebalia bentzi* on the basis of a single specimen from the Upper Permian Zechstein of West Germany. Further discussion of this species was provided by Glaessner and Malzahn (1962). Initial assignment of this material to the living genus *Nebalia* reflected a conservative approach pending the discovery and study of more and better material. Unfortunately, despite continuing efforts at collection and study of this fauna by the junior author, no additional specimens have turned up. However, restudy of the known material has enabled us to clarify the relationship of this Permian species to the living leptostracans.

SYSTEMATIC PALEONTOLOGY

Class Malacostraca Latreille, 1806
Subclass Phyllocarida Packard, 1879
Order Leptostraca Claus, 1880
Family Rhabdouraeidae n. fam.

Diagnosis.—Same as that of the genus.

Type genus.—*Rhabdouraea* n. gen.

Rhabdouraea new genus

Diagnosis.—Carapace short, not covering abdomen. Caudal rami rod-like, at least as long as abdomen.

Etymology.—From the Greek *rhabdos* (=rod) and *uraea* (=tail), gender feminine.

Type species.—*Nebalia bentzi* Malzahn, 1958.

Rhabdouraea bentzi (Malzahn, 1958)

Diagnosis.—Since only one species is known, the diagnosis of the species is the same as that of the genus.

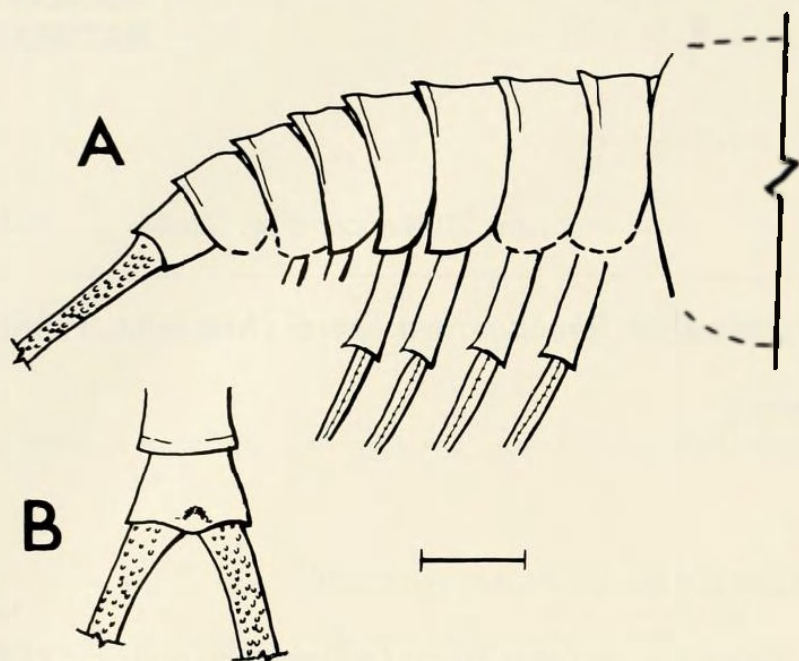


FIGURE 1. Partial reconstruction of *Rhabdouraea bentzi* (Malzahn). A.) lateral view of abdomen. B.) dorsal view of telson and caudal rami. Scale 2 mm.

Holotype.—Z45, in the collection of the Niedersächsisches Geologisches Landesamt, Hannover. From a depth of 280–282 m, Shaft 4, of the Friedrich-Heinrich Mine, near Ort Hoerstgen, Niederrhein, German Federal Republic. Zechstein 1, Upper Permian.

Description.—The posterior margin of the carapace is visible on the type, and covers the posterior aspect of the thorax while leaving the anterior pleomeres exposed (Figs. 1 and 2). The pleomeres are subequal, each about 0.7 mm in length. The posterior margin of the abdominal tergites are raised as a slight ridge. The abdominal pleura are rounded anteriorly and somewhat acuminate posteriorly. At least the four anterior pleopod protopods are long and robust; the fifth and sixth are present, appear to be somewhat smaller than those of the anterior limbs, but cannot be clearly discerned because of the preservation of the specimen. The seventh pleomere appears to lack appendages. The distal branches of the anterior pleopods are robust, and marked by a line of lateral pits (which may have been sockets of marginal setae). The telson is only slightly shorter than the pleomeres, and with a slight fossa or depression on the dorsal surface between the bases of the caudal rami. The telson bears terminally a set of large, rod-like, papillose caudal rami. The length of these rami cannot be determined exactly since their distal ends are broken off. However, the longer ramus (now broken in two pieces) is at least 3.5 mm and indicates the rami were probably at least as long as the abdomen.

Family Nebaliidae Baird, 1850

Diagnosis.—Carapace generally large, covering anterior pleomeres as well as the thorax. Caudal rami relatively short, as flaps with marginal setae.

Type genus.—*Nebalia* Leach, 1814.

DISCUSSION

The two distinct features of *Rhabdouraea bentzi* are the short carapace and the long, rod-like caudal rami, so diagnostic in fact as to warrant separate generic and familial status for this species.

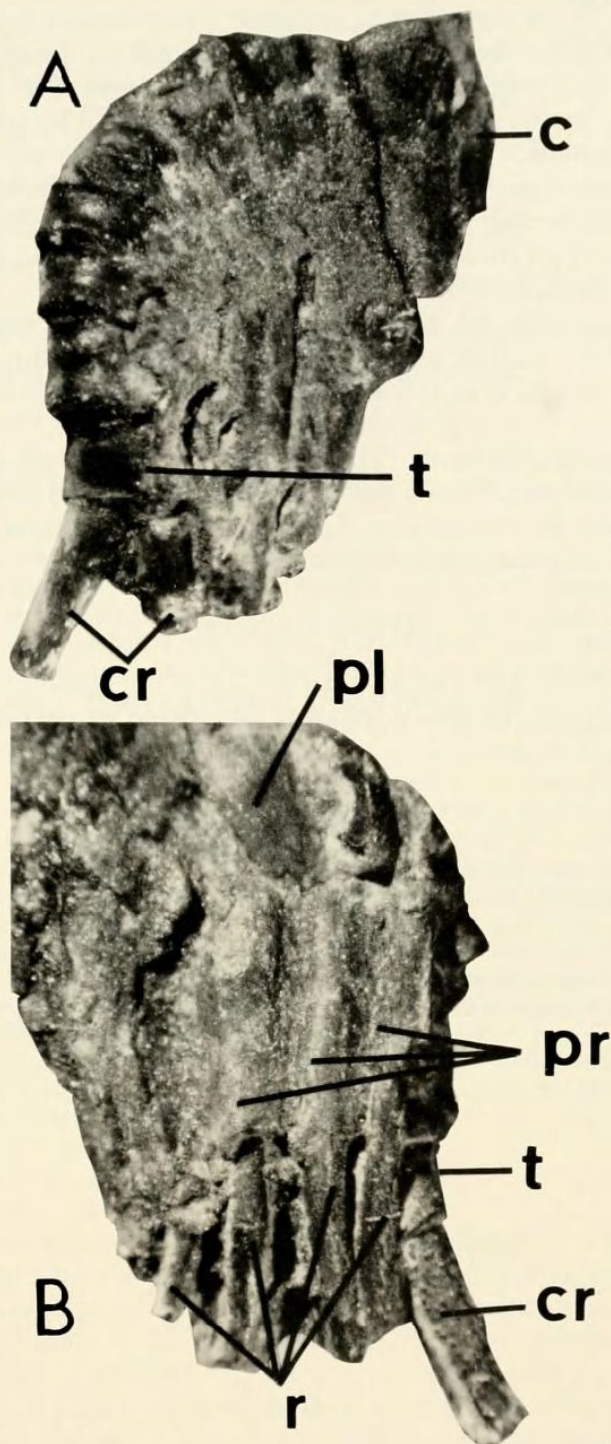


FIGURE 2. *Rhabdouraea bentzi* (Malzahn), holotype, Z45. A.) Right side [right caudal ramus visible on original illustrations since broken off, but still retained with specimen], 10x. B.) Left side, closeup of anterior pleopods and caudal ramus, 16x; c—carapace, cr—caudal ramus, pl—pleuron of second pleomere, pr—pleopodal protopods, r—distal rami of pleopods, t—telson.

The living leptostracans typically have a large carapace that completely encloses the body, except for the posteriormost portions of the abdomen, and lobate, setose caudal rami. The only exception to these features occurs in the genus *Nebaliopsis*. This pelagic form has the posterolateral aspect of the carapace truncate, exposing the pleomeres and ventral portions of the posterior thoracomeres. In addition, the caudal rami in *Nebaliopsis* are thin and leaf-like. These features are prompting Hessler (in prep.)

to place *Nebaliopsis* in its own family, separate from the benthic nebaliid genera. The differences noted on *Rhabdouraea*, incomplete though the fossil is, are of a magnitude at least as great as that which separates *Nebaliopsis* from *Nebalia*, *Paranebalia*, and *Nebaliella*, and thus justify separating this Permian taxon by itself.

All the living nebaliids, benthic or pelagic, have relatively short or modest sized caudal rami with setose margins. These rami function in a manner analogous to uropods, and assist the animal in swimming. The very long, papillose, rod-like rami in *Rhabdouraea* are unlike any of those seen among leptostracans, and are more akin to those seen in notostracan branchiopods.

Several features of *Rhabdouraea bentzi* ally this species to the leptostracan phyllocarids, viz., the four well-developed anterior pleopods, the two apparently small posterior pleopods, the lack of the seventh pleopods, the robust pleopod protopods, the lateral row of pits on the pleopod distal branches, and the telson not developed dorsally between the caudal rami. The recognition of the separate familial status of *Rhabdouraea bentzi* seconds the suspicions of Rolfe (1969) that this species was not referable to any of the Recent genera. This requires an emendation of the diagnosis of the living family Nebaliidae noted above.

ACKNOWLEDGMENTS

Drs. Robert Hessler and Ian Rolfe examined the material and offered valuable counsel on the taxonomic issues. Work was supported in part by NSF grant DEB 79-03602 (FRS).

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