

ICHTHYDIUM HUMMONI N. SP.
A NEW MARINE CHAETONOTID GASTROTRICH
WITH A MALE REPRODUCTIVE SYSTEM (1).

by

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Résumé

Une espèce marine hermaphrodite du genre *Ichthydium* est décrite de la Caroline du Nord (U.S.A.) et d'Arcachon (France). Cette espèce cosmopolite a été rencontrée dans les parties les plus élevées des zones intercotidales de deux plages sableuses. Elle est caractérisée par sa petite taille, sa baguette cuticulaire de maintien rappelant une colonne vertébrale, la disposition des cils de type *Stylochaeta* et son hermaphroditisme successif. Sa position systématique doit être aussi proche que possible de la famille dulcaquicole des Dasydytidae.

Materials and Methods

One Holotype (female phase), AMNH 83; Paratype (male phase), AMNH 84; and Paratype (female phase, "winter" eggs), AMNH 85 are deposited as formalin fixed wholemounts in the Department of Living Invertebrates of the American Museum of Natural History in New York. Measurements were made of 21 individuals for this description (only the North Carolina material). Collection, extraction and handling procedures are given in Ruppert (1967a). This species is dedicated to Dr. William D. Hummon of Ohio University.

Introduction and Description

A comparative investigation was undertaken in 1971-1972 of the gastrotrich fauna of 3 high energy beaches, one in North Carolina and two on the west coast of France. The purpose of this investigation was to study the morphology and ecology of marine gastrotrich species over a geographic range. The results are published for the Xenotrichulidae (Ruppert, 1976a) and some general conclusions have been reported recently (Ruppert, 1976b). During this study, a cosmopolitan species of the interesting genus *Ichthydium* was encountered both in North Carolina and in France. In addition to the presence

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of a well developed male reproductive system in this species, several other unique structural characters are present. These morphological features may be important in making structural comparisons within the Chaetonotida Paucitubulatina and merit a brief description.

Ichthyidium hummoni n.sp. is minute, certainly one of the smallest described metazoans (Fig. 1; Planche 1). The mean total adult body length is 82 μm . The body is tenpin-shaped but more narrow in outline than other species of Chaetonotida Paucitubulatina, eg. species of the genus *Halichaetonotus*. There is a distinct caudal peduncle with two adhesive tubes distally located. The total length of the peduncle is 13 μm and it is 4 μm wide. The adhesive tubes are 7 μm long (Fig. 1; Planche 1).

I. hummoni is easily confused with interstitial rotifers in the dissecting microscope. It is very transparent, glides slowly and, occasionally, "flips" the caudal peduncle ventrally when disturbed or when floated off the substratum. Several specimens survived for more than 3 days in glass distilled water, showing only a slight swelling (removed alive after 3 1/2 days to make wholemounts).

The cuticle of *I. hummoni* is smooth and flexible and entirely lacking in spines, scales, etc. Interesting, however, is the occurrence of a middorsal, longitudinal fold or groove, immediately below the outermost layer of the cuticle (Fig. 1A; Planche 1, B,D,F,G). This fold has the appearance of a vertebral column, as seen in sharks. This fold, or reinforcement in the cuticle, often assumes an S-shape, anterior to posterior, as the body of the organism twists.

A *Stylochaeta*-type pattern of ventral cilia is present. There is a pair of tufts on the dorsofrontal margin of the head, on each side of the mouth (Fig. 1A; Planche 1 B). These cilia ("vorderes Lateralbüschele", Remane 1936) continue in an arc to the ventrofrontal margin of the head and are therefore continuous with the oral cilia ("oral Wimperbüschele"). These cilia further extend along the ventrolateral margins of the head to form the posterolateral sensory cilia ("hinteres Lateralbüschele"). The longest cilia in these groups are 15 μm long. There are approximately 6 cilia in each frontal group and 8 cilia in each of the more caudal groups. The remaining tufts are located, anterior to posterior, in groups of: 3 ventral to the head (ca. 15, 12, 2 cilia), 1 at the neck (ca. 10 cilia), 3 ventral to the trunk (6, 5?, 7 cilia) and 1 at the junction of the trunk and peduncle (4? cilia). Dorsally, there is a pair of sensory cilia (6 μm) at the neck and at the junction of the trunk and peduncle (Fig. 1 A, C; Planche 1A-C).

Brain cells (1 μm diameter) occupy the entire head region. The commissure is located dorsal to the middle of the pharynx (Fig. 1B).

A pair of protonephridia was observed lateral to the anterior portion of the intestine (Fig. 1B).

The mouth (3 μm) consists of a folded, funnel-shaped tube with short bristles extending frontally from its margins (Fig. 1 B,C,F; Planche 1 E). The pharynx has an anterior bulb and is 28 μm long. The myofibrils are arranged in a discrete series along the pharynx, giving the pharynx an annulated appearance in optical frontal section (Planche 1C-E). There is a valve developed at the junction of the pharynx and intestine. The intestine is ca. 37 μm long and appears to

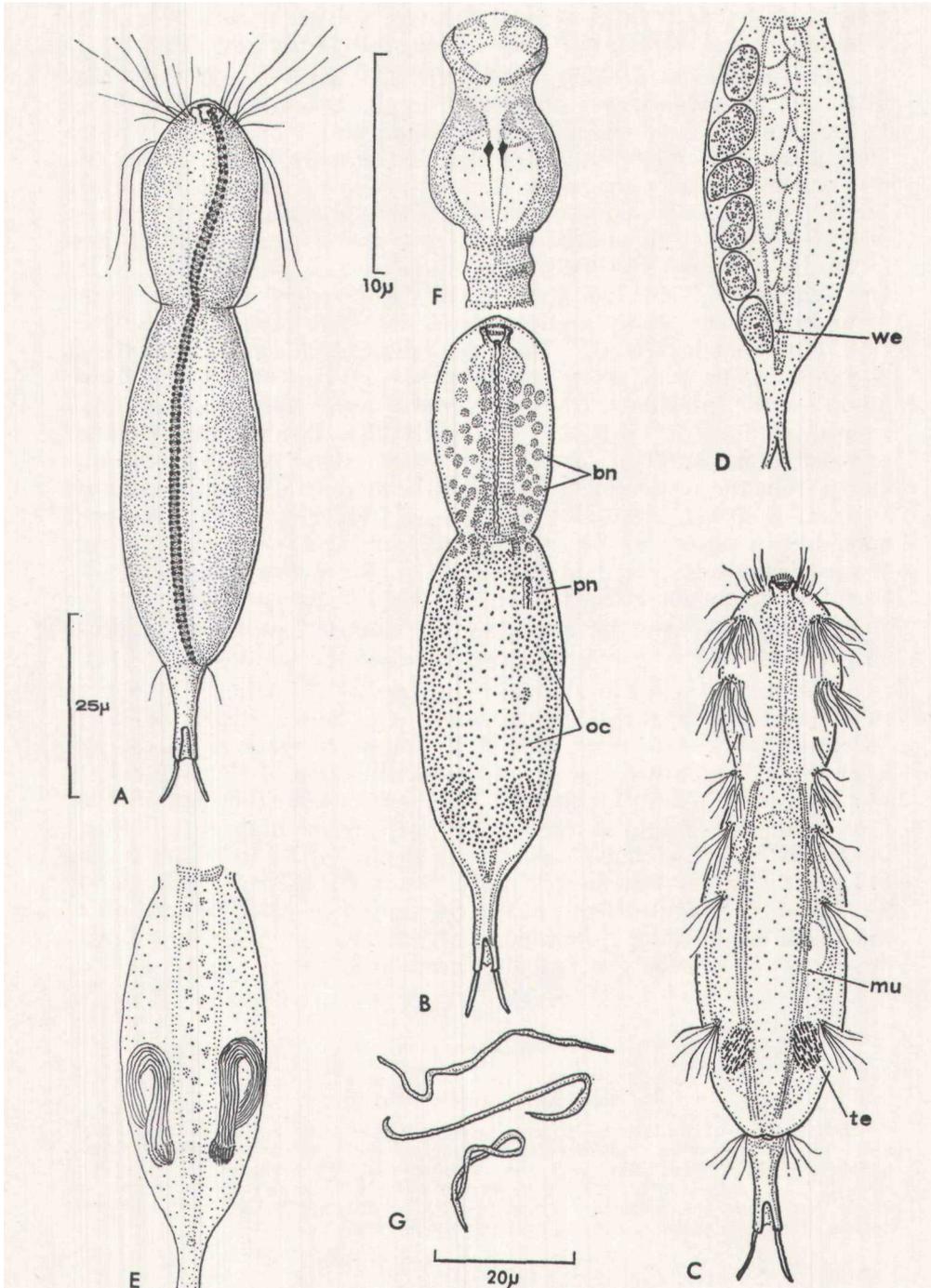


FIG. 1

Ichthydium hummoni n. sp.

A: dorsal view; B: medial view; C: ventral view; D: female phase with second type of eggs; E: male phase with spermatozoa; F: mouth tube and pharyngeal bulb; G: spermatozoa.

bn: brain cells; mu: ventral longitudinal muscle bands; oc: oocyte; pn: protonephridia; te: testicular "cells"; we: second egg type.

consist of 4 longitudinal rows of 8 large, polygonal cells (Fig. 1 D). The anus is not dorsal, but terminal, ventral to the peduncle.

This species is probably hermaphroditic even though only male or female individuals were observed. In all, 21 adults were observed, 14 females and 3 males in North Carolina and 4 females in France. Only a single oocyte (40 μm) was observed in mature females and this cell occupied nearly the entire trunk region. A pair of large oval "cells" (6 μm), corresponding in position to the testes of the males, was also observed in mature female specimens suggesting that these forms have temporally distinct male and female phases (Fig. 1B,C). One female (?) individual from North Carolina had 6 cellular bodies arranged linearly along the left side of the trunk portion of the body (Fig. 1 D; Planche 1 D, G). These cells might be a second type of egg. A pair of testes was located posteriorly and ventrally in the trunk, lateral to the intestine. The testes appear to be cells containing rod-shaped inclusions (Fig. 1C,E; Planche 1B,C,F). Spermatozoa, oriented parallel to one another, form bundles that extend dorsally and anteriorly from the testicular "cells", then bend ventrally and posteriorly to form a closed, circular loop (Fig. 1E; Planche 1B,F). No male opening was observed. The spermatozoa are 40-45 μm long and taper toward both ends (Fig. 1G; Planche 1I). The spermatozoa tended to fray into filaments after fixation.

A pair of ventrolateral longitudinal muscle bands was observed on each side of the intestine in the region of the trunk (Fig. 1 C).

I. hummoni was collected on both sides of the Atlantic at comparable positions in the intertidal zone. On Bogue Banks in North Carolina, BIB, see Ruppert 1976a), *I. hummoni* occurred at the tide level of mean high water mean at sediment depths of 40 to 70 cm. It was not found in association with high densities of other gastrotrichs. *I. hummoni* was found at the tide level of extreme high water springs (above the wrack strings) at sediment depths of 35 to 80 cm on the Plage d'Eyrac in Arcachon, France (Ruppert, 1976a). During my 2 1/2 months visit to France, the tide never covered the portion of the beach occupied by *I. hummoni*. It was not found associated with other gastrotrichs on the Plage d'Eyrac.

Diagnosis

Ichthydium hummoni n. sp.

Ichthydium of minute body size with a middorsal, longitudinal, segmented groove in an otherwise undifferentiated cuticle. Body narrow, terminating in a peduncle with 2 distal adhesive tubes. *Stylochaeta*-type arrangement of ventral cilia in 8 locomotory tufts. A pair of sensory cilia at the neck and at the junction of the trunk and the peduncle. Pharynx with an anterior bulb. Hermaphroditic with a strong separation of male and female phases.

Discussion

The genus *Ichthydium*, as Remane noted (Remane, 1936), is defined on a negative character, viz. the lack of cuticular differentiations, and this fact increases the likelihood that species of *Ichthydium* do not form a natural group.

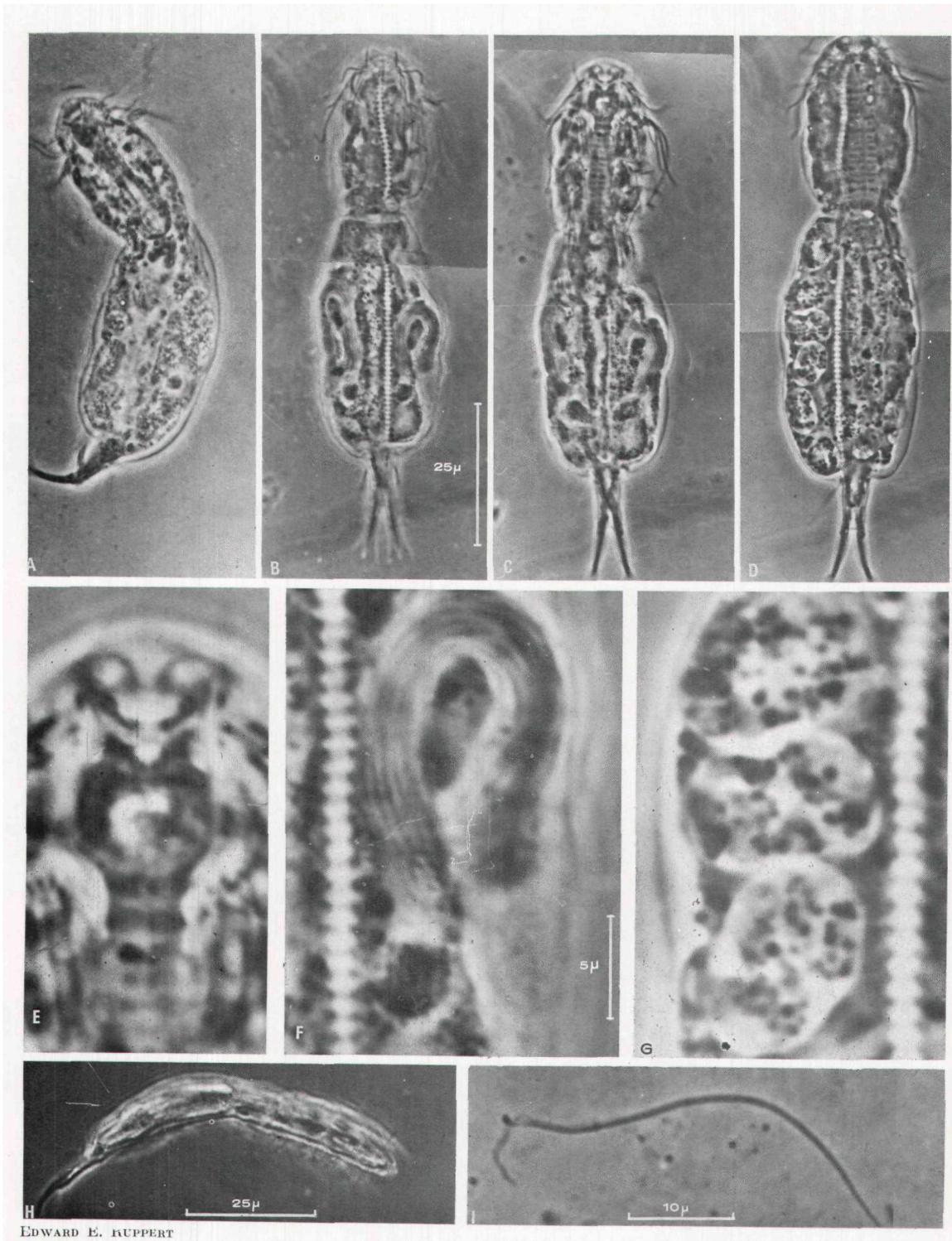


PLANCHE 1

Ichthyidium hummoni a. sp.

A: female phase from Arcachon (France); B: male phase, dorsal view from North Carolina; C: male phase, ventral view, from N.C.; D: female phase with second type of eggs, from N.C.; E: mouth tube and pharyngeal bulb; F: sperm bundle; G: second egg types; H: unsqueezed individual in lateral view I: isolated spermatozoon.

The *Stylochaeta*-type organization of the ventral cilia in *I. hummoni* would seem to link this species with the Dasydytidae, forms that are exclusively freshwater in occurrence, that lack adhesive organs, that have long cuticular spines, that are semi-pelagic in the water column and are exclusively parthenogenetic. If certain reasonable assumptions are made about the primitive conditions of several characters in the Chaetonotida Paucitubulatina (Ruppert, 1976a), then *I. hummoni* can be said to have: 1) retained hermaphroditism, 2) retained ciliary gliding, 3) derived a special cuticle structure, 4) derived a special pattern of ventral cilia and 5) to have perhaps derived the production of two types of eggs. The only question that remains in comparing *I. hummoni* to the Dasydytidae is whether the *Stylochaeta*-type pattern of ventral cilia should be considered to be derived only once in the Chaetonotida Paucitubulatina, ie. within the line to the Dasydytidae or whether the occurrence of this pattern has been arrived at independently in *I. hummoni* and in the Dasydytidae. If the former is true, then *I. hummoni* must represent an early line in the Dasydytidae that retained hermaphroditism, ciliary gliding, etc. If the latter proves correct, then there will be another line in the Chaetonotida Paucitubulatina like *Musellifer*, *Polymerurus delamarei*, nov. gen., nov. spec. (Ruppert, 1976a) that have uncertain links to the Chaetonotidae.

Note added in proof: H. Mock has correctly indicated to me that the "vertebral column" is not continuous through the "neck" region as shown in Fig. 1.

Acknowledgements

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Summary

An hermaphroditic, marine species of the genus *Ichthydium* is described from North Carolina, U.S.A. and from Arcachon, France. This cosmopolitan species occurred in the uppermost portions of the intertidal zones of two sandy beaches. It is characterized by its small body size, by its supporting rod in the cuticle that resembles a vertebral column, a *Stylochaeta*-type pattern of cilia and sequential hermaphroditism. Its systematic position may be closest to the freshwater family Dasydytidae.

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