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REDESCRIPTION OF *GIBSONIELA MANDUBE* (WOODLAND, 1935) (CESTODA: PROTEOCEPHALIDEA), A PARASITE OF *AGENEIOSUS BREVIFILIS* (PISCES: SILURIFORMES), AND REAPPRAISAL OF THE CLASSIFICATION OF THE PROTEOCEPHALIDEANS

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The proteocephalid species Gibsoniela mandube *(Woodland, 1935) from the siluriform fish* Ageneiosus brevifilis *from rio Paraná, is redescribed. This species was originally described from the same species of fish from the Amazon. The genus* Gibsoniela *Rego, 1984 is redefined and confirmed in the Monticelliidae. Comments are made on the relationships of the proteocephalid and monticelliid subfamilies.*

Key words: Cestoda – Proteocephalidea – *Gibsoniela mandube* – freshwater fish – *Ageneiosus brevifilis*

Recently we collected cestode parasites from fishes in the Paraná River and Itaipu reservoir, including samples from *Ageneiosus brevifilis* (Cuvier & Valenciennes) a common fish called "mandubé" in the Amazon. The proteocephalidean *Anthobothrium mandube* was described from this fish species by Woodland on the basis on the material from the Amazon. I (Rego, 1984) discussed the nature of the suckers which resemble the bothridia of the Tetraphyllidea. Woodland (1935) believed that this species was a form intermediate between the proteocephalideans and the tetraphyllideans.

Fortunately, I have obtained some good samples of this species and have been able reestudy it, since Woodland's material kept in the British Museum (Natural History) is not in a suitable condition for study. Rego (1984) had the opportunity to examine material from this host in the BM (NH) labelled *Endorchis mandube* Woodland, 1935 and A. mandube Woodland, 1935 and concluded that the specimens designated as *A. mandube* must be transferred to the Proteocephalidea. I proposed a new genus *Gibsoniela,* in the Zygobothriinae, for proteocephalid species having triloculate suckers. In the other species, *E. mandube,* I noted that the suckers are similar to that of *Gibsoniela,* Later, Chambrier (1990) confirmed *E. mandube* as a synonym of *G. mandube.* As a matter of fact, the name *E. mandube* could have priority on *G. mandube* due to its description on a previous page of the original paper, but, according to the ICZN, page priority is no longer a valid criterion. *Endorchis* was the type-genus of the *Endorchiinae* Woodland, 1935. Since Rego (1991) have invalidated the genus *Endorchis* and the *Endorchiinae,* I consider it preferable to use the name *G. mandube* rather than *E. mandube* for this species, in order to avoid taxonomic confusion.

As already mentioned, most of the descriptions by Woodland of fish cestodes from South America are inadequate, making the identification of species almost impossible; so it is necessary to redefine each species from new samples which are well fixed and well preserved. In this work the species *G. mandube* (Woodland, 1935) is redescribed and the genus *Gibsoniela* is redefined. Some considerations are also made on the taxonomy of the proteocephalideans, specially on the subfamilies of the Monticelliidae, whose species are restricted to Neotropical South America and present characteristics quite different from related forms in other continents.

MATERIALS AND METHODS

The samples were fixed in hot formalin in order to get well distended specimens. The strobila were stained by haematoxylin Delafield's or alcoholic carmine. Pieces of strobila

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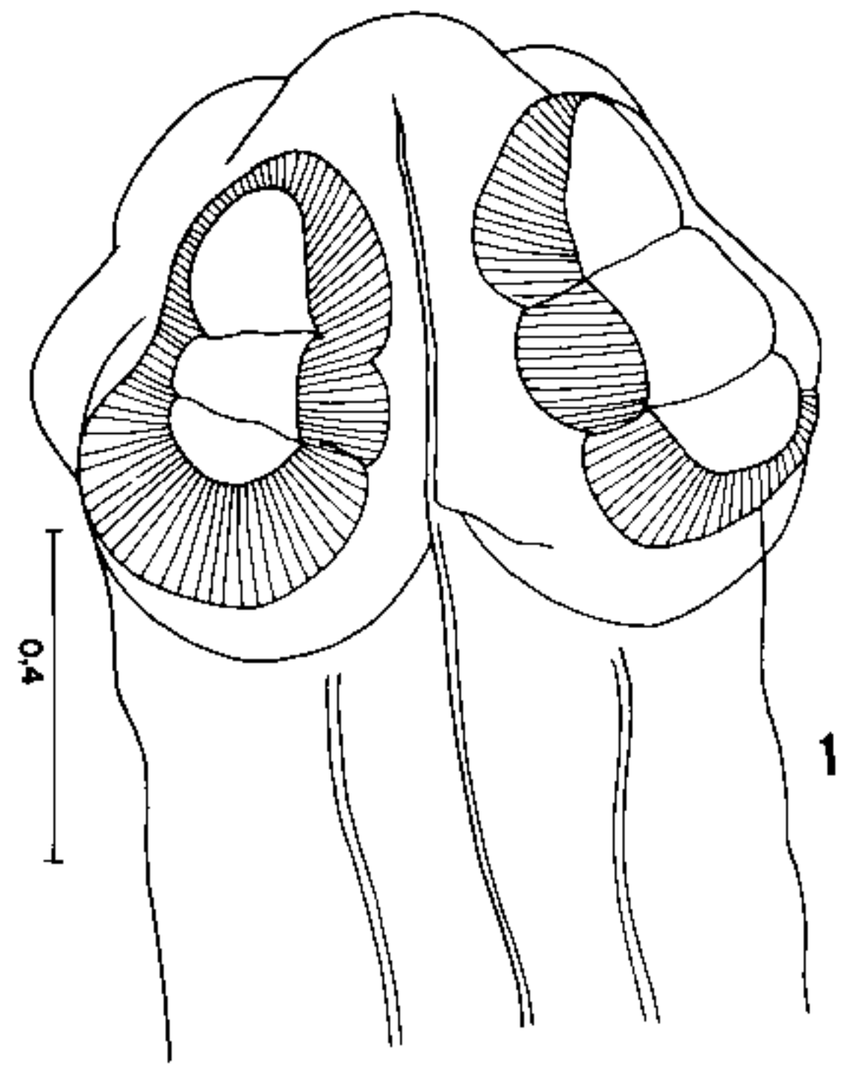
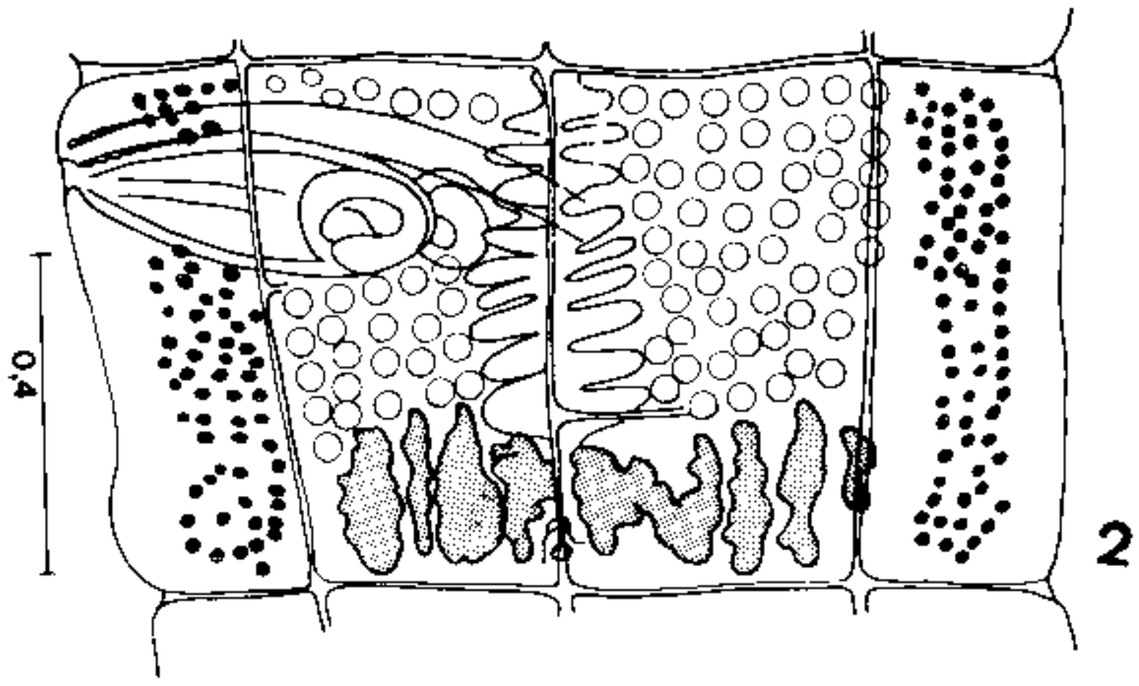
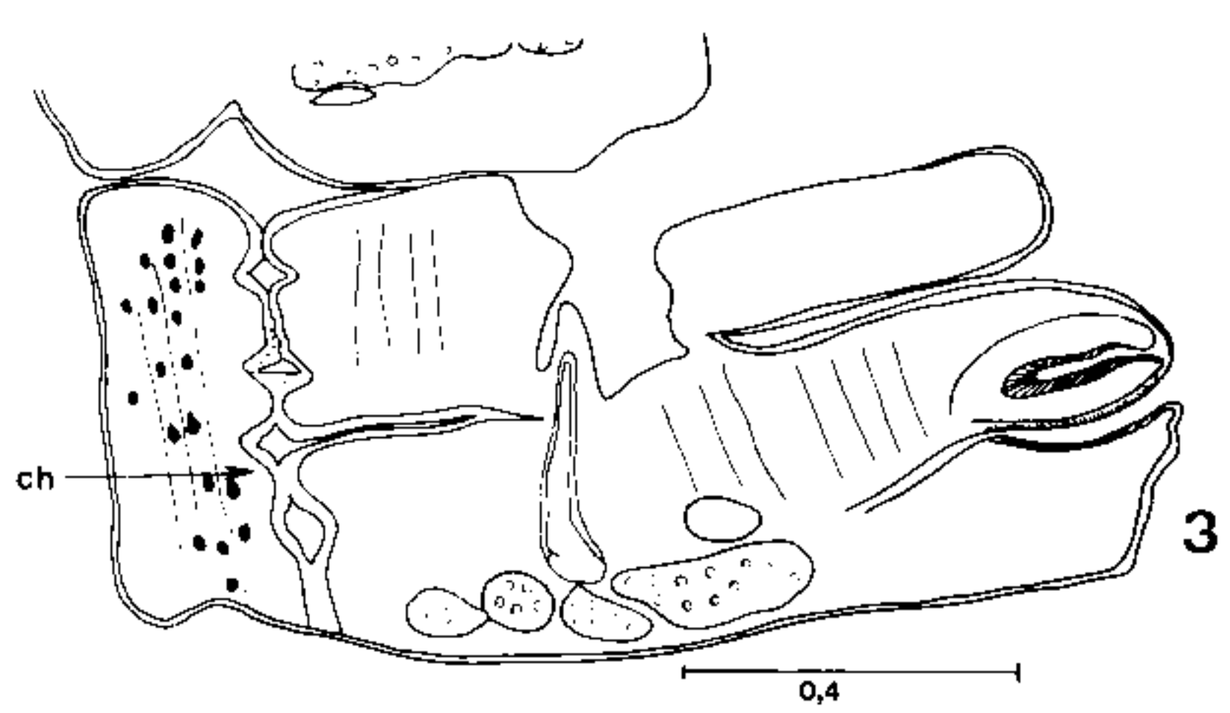






Gibsoniela mandube (Woodland, 1935) – Fig. 1: scolex. Fig. 2: mature segment. Fig. 3: longitudinal section of proglotid; ch = channels.

were enbedded in paraffin wax and sectioned at 5 μ both transversally and longitudinally. Drawings were made with the aid of a camara lucida. Measurements are in mm.

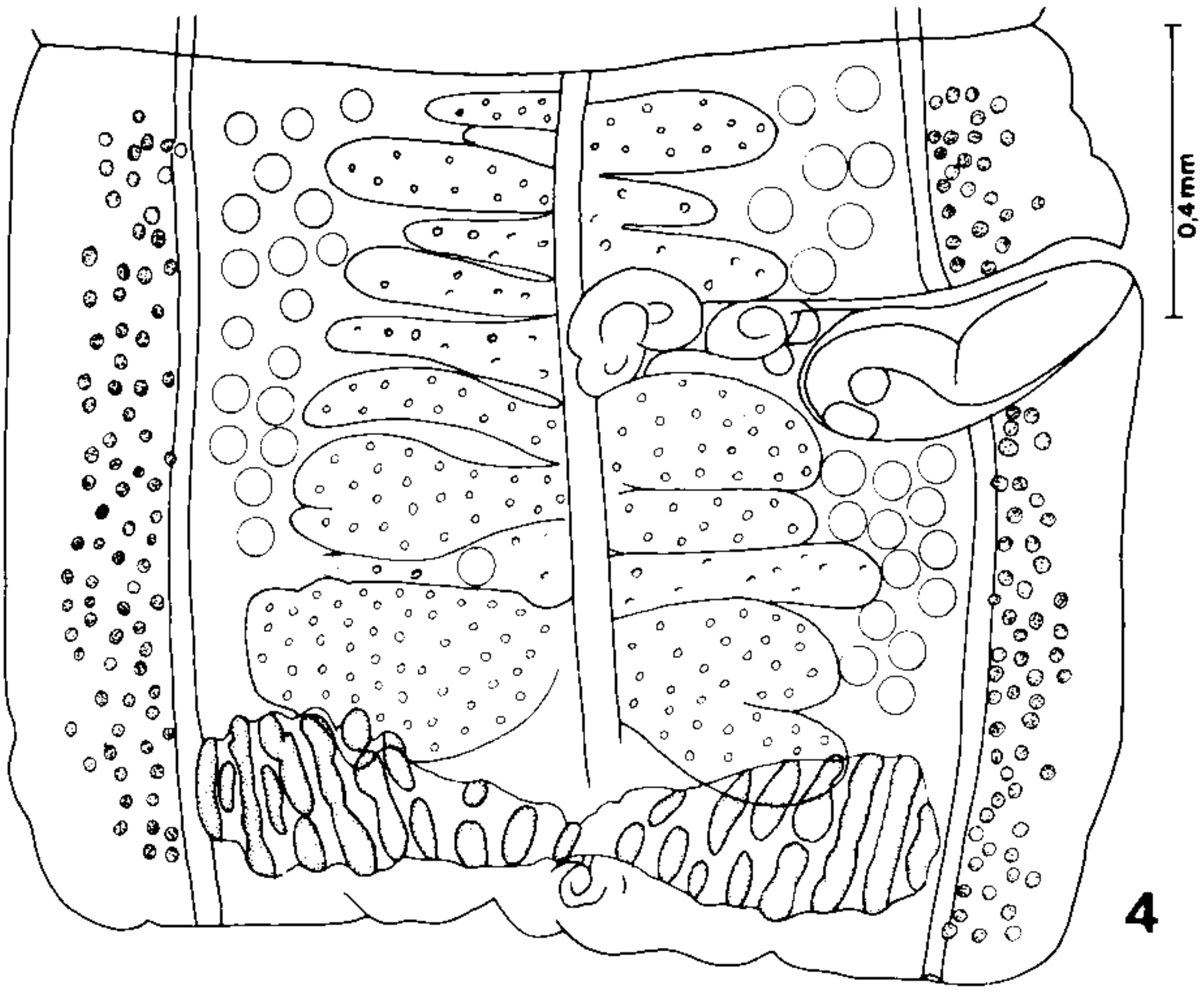
MONTICELLIIDAE LA RUE, 1911
ZYGOBOTHRIINAE WOODLAND, 1933

Gibsoniela mandube (Woodland, 1935)
syn.: *Anthobothrium mandube* Woodland, 1935
Endorchis mandube Woodland, 1935
Host: *Ageneiosus brevifilis* (Cuvier & Valenciennes)

Localities: Amazon river, Amazon, and Paraná river, Paraná. Slides and vials of fixed material are deposited in the Helminthological colletion of Oswaldo Cruz Institute, numbers, 32.792a-b, 32. 793, 32.794a-c and 32.795a-b.

Worms of medium size, 67-170 long (122), with about 500 segments, several immature. Mature segments are wider than long (Fig. 2), 0.234-0.390 x 0.640-1.05 (0.400 x 0.860). Gravid proglottids also wider than long (Fig. 4) 0.491-0.980 x 0.820-1.47 (0.732 x 1.26). Scolex relatively large, well delineated from neck, 0.819-0.882 x 1.07-1.10 (0.850 x 1.10); with apex but no apical organ. Suckers longitudinally elongate, similar to bothridia of tetraphyllidean; they are septate, forming three approximately equal loculi (Fig. 1), and measure 0.526-0.670 x 0.327-0.374 (0.543 x 0.350). No metascolex present, but there are grooves in neck. Neck elongate, 6.26-7.80. Strobila acraspedote; proglottids well delimited.

Genital atrium irregularly alternate and opening in anterior 1/3 or 1/4 of segments. Vagina opens anteriorly to cirrus pouch. There is no vaginal sphincter, but walls of proximal portion are thick (Fig. 3). Cirrus pouch 0.300-0.409 x 0.125-0.140 (0.335 x 0.132) Ratio of cirrus pouch lenght to proglottids width 1: 2,13-3. Vas deferens very coiled. There are 160-200 testes in two fields, separated by uterine field. Bilobated ovary basal, lobulate, 0.650-0.994 (0.820) wide. Vitellaria lateral, follicles distributed in 4-6 longitudinal bands. Uterus grows initially in longitudinal axis with small outgrowths but in terminal proglottids some of diverticula are more expanded than others; there are about 10-12 outgrowths in developed uterus. Uterine split present. Eggs with delicate external membrane, 0.036; onchosphera 0.021 and embriophorus, 0.014. Onchosphera has visible hooks, this is exceptional in



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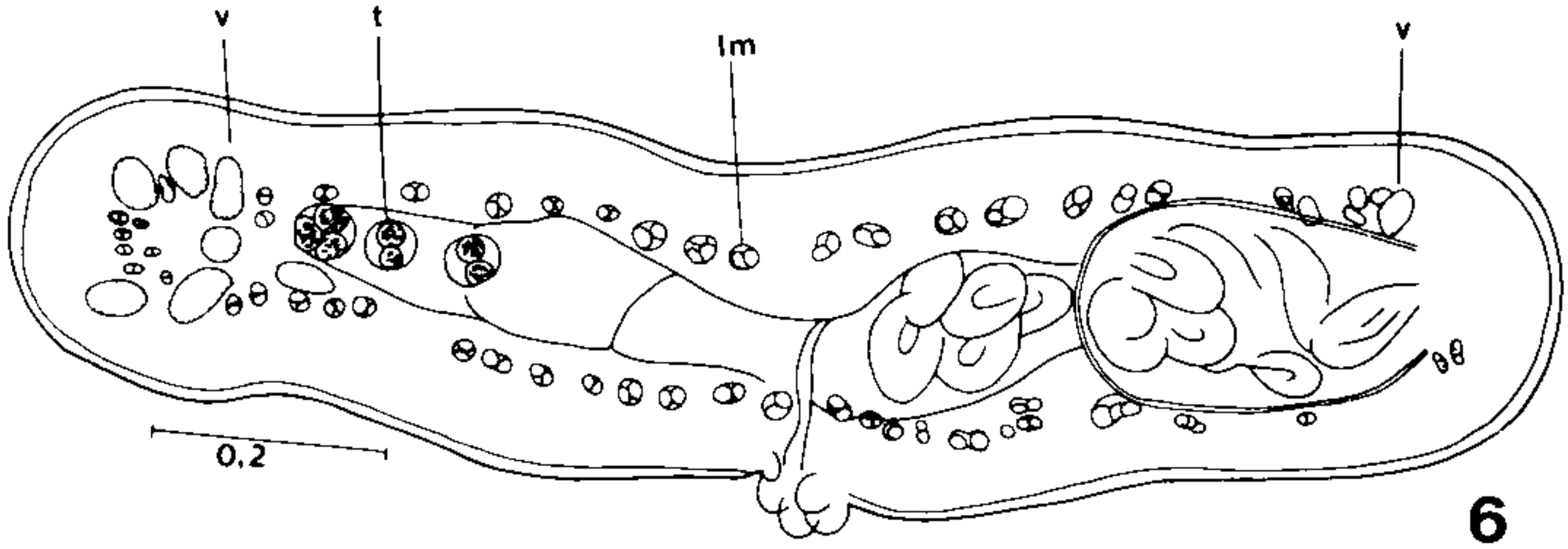

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Gibsoniela mandube – Fig. 4: gravid proglottid. fig. 5: transverse section of segment; v = vitellaria, o = ovary, u = uterus. Fig. 6: transverse section; V = vitellaria, t = testes, lm = longitudinal muscles.

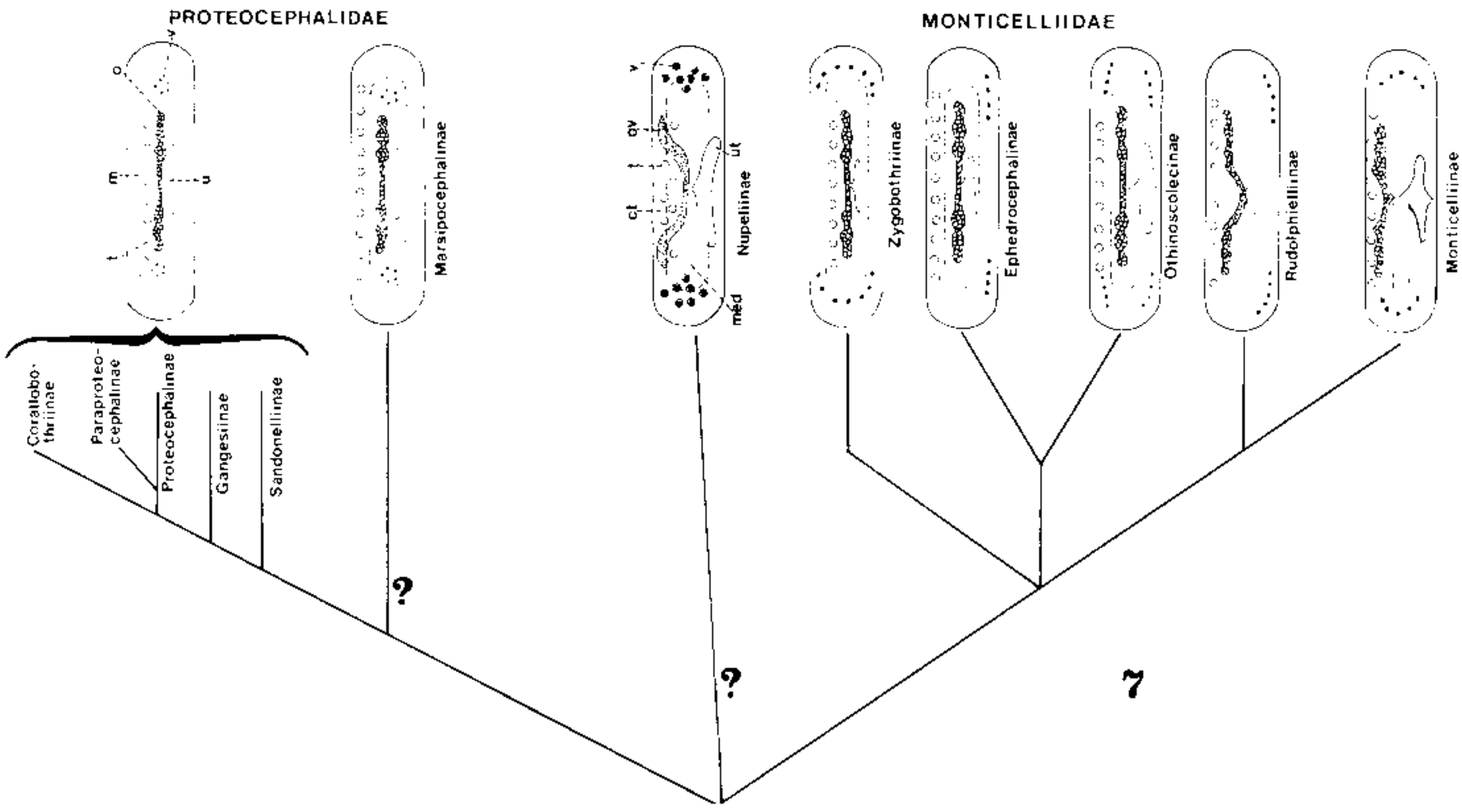

Fig. 7: relationship between the proteocephalidean subfamilies.

Monticelliidae, few species from freshwater fishes exhibited this particularity.

Tegument of strobila has longitudinal and regular furrows or channels throughout its entire lenght; some transverse grooves also present. These channels may be associated with uterus or osmoregulatory system.

Sections of proglottids (Figs 5, 6) confirmed that vitelline follicles occurs mostly in cortex, but some are also present in medulla and between muscle fibres. Ovary medullary but with some lateral regions situated between muscles and reaching the cortex. Testes are medullary, with some regions occuring between muscles. Uterus mostly medullary, but small projections attain the ventral cortex.

REMARKS

The most important characters of our specimens agree with the description of Woodland (1935), but there are some discrepancies. For instance, the shape of the ovary, which Woodland described as follows: "The ovary is remarkable for its narrowness anterior-posteriorly, consisting merely of a thin strip of tissue lying against the posterior border of proglottids". Our specimens differ in this character, since they have a typical bilobed ovary, with well defined lobules. Woodland did not refer in the description of *A. mandube* to those portions of the ovary that can occur between the muscles, but he referred to this feature in the description of *E. mandube* which is the same species as I indicated above; the names *Endorchis* and Endorchiinae have been supressed by myself (Rego, 1991). The most important character of *G. mandube* is the triloculate suckers, which have not been observed on other species of proteocephalidean. These suckers were described by Woodland as of small size, 0,18 x 0,21; in our specimens they are larger than this. These differences are probably due to the fact that Woodland examined specimens which were not fully developed.

Gibsoniela mandube is the only proteocephalidean species that exhibit true bothridia somewhat similar to those of *Onchobothrium,* a tetraphyllidean. It is an interesting case of parallel or convergent evolution. Nevertheless, the longitudinal muscles of the proglottids are certainly of the proteocephalidean type as previously reported by Woodland (1935).

Concerning the vitellaria, I have described some vitelline follicles occurring between the muscle fibres and reaching the medullary parenchyma: this characteristic can not be due to the weakness of the muscular system, as stated by Freze (1965) with reference to species of the Monticelliidae. In *G. mandube* the longitudinal muscles are well developed. This special

configuration of the vitellaria causes some difficulties for the inclusion of *G. mandube* in the Proteocephalidae or Monticelliidae, but if we accept that the follicles are mostly cortical, it is possible to consider it as species of Zygobothriinae monticelliid. However, this arrangement is only provisional, until a revision of the systematic of the group can be carried out. As for the absence of vaginal sphincter, it is not exceptional, many species of proteocephalids from freshwater fishes don't have it.

In view of this description it is necessary to redefine the genus *Gibsoniela*.

Diagnosis – Medium sized worms, with numerous segments. Acraspedote. Scolex with apex and four trilocular bothridia-like suckers. Mature and gravid segments wider than long. Testes numerous. Longitudinal muscles well developed in regular bundles. Vitellaria cortical, but some follicles medullary. Testes medullary, but close to the longitudinal muscles. Uterus mostly medullary. Parasites of siluriform fishes from tropical South America.

There are some recent studies on the classification and phylogeny of proteocephalids. The most important are those of Freze (1965), Brooks (1978), and muyself (Rego, 1992) in addition to that of Woodland (1934). Freze (1965) revised the group and provided a great contribution to our knowledge of the Order Proteocephalidea, but he apparently gave only limited significance to he disposition of the vitellaria in relation to cortex or medulla. For instance, the Zygobothriinae he placed in the Proteocephalidae. Books (1978) did not agree with this assertion and, based in various assumptions on the morphology and phylogeny, considered the Zygobothriinae related to the Monticelliidae. I (Rego, 1992) followed the opinion of Brooks, considering the position of the vitellaria as the principal character for defining these two large groups. Books (1978) also noted that information on proteocephalidean from fishes is sadly lacking.

Recently, Pavanelli & Rego (1991), have published data on some proteocephalidean species that show some intermediate characteristics concerning to the position of the vitellaria and gonads, i. e. not being exclusively medullary or cortical. Species like these constitute a difficult task in terms of identification at subfamily level. For instance, *Jauella glandicephalus* Rego & Pavanelli, 1985, a species that exhibits characteristics of the Othinoscolecinae and Ephedrocephalinae, and *Nupelia portoriquensis* Rego & Pavanelli, 1991 (Nupeliinae), in which the vitellaria and reproductive organs are almost equally distributed in the cortical and medullary parenchyma. The taxonomic position of the latter species has not been fully established, although it has been placed provisionally in the Monticelliidae.

Only a fraction of the possible, proteocephalidean fauna in freshwater fishes in South America has been described. Future findings of more species with characteristics intermediate between the accepted subfamilies may invalidate the currently accepted scheme of classification and could indicate that the position of gonads and vitellaria may not be so important as systematic criteria.

A dendogram, adapted from the cladogram of Brooks (1978) indicates the relationships of the Proteocephalidea (Fig. 7). The Order clearly splits into two groups, but the links are not clear. The anomalous position of the Nupeliinae, close to the Zygobothriinae, and the Marsipocephalinae are exposed. The Marsipocephalinae is limited to Africa and, despite its inclusion in the Proteocephalidea (due to the medullary position of vitellaria), it has a distinctive character of the Monticelliidae in that the disposition of testes is in the dorsal cortex.

In the family Monticelliidae, with the supression of the Endorchiinae (Rego, 1991) these remains: the Monticelliinae, Rudolphiellinae, Othinoscolecinae, Ephedrocephalinae and Zygobothriinae, plus the Nupeliinae which was recently proposed by Pavanelli & Rego (1991).

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