

DACTYLOGYRIDAE (MONOGENOIDEA) FROM THE STOMACH OF FISHES

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Abstract. A description is given of the new species *Enterogyrus papernai* sp.n., and a redescription of *E. globodiscus*. The original arrangement of the latter species to the genus *Haploleidus* (Kulkarni 1969) has been amended in view of an incorrect determination of the genus. Clear evidence is given of the importance of the host-parasite system for modern taxonomy. Unobservance of these principles may cause considerable confusion which could be avoided by personal contacts among the specialists.

In January 1965, a large number of small monogeneans was collected from the folds of the stomach wall of *Etroplus suratensis* (Cichlidae) caught in the district Polonnaruva (Ceylon) by C. H. Fernando. The material fixed with Bouin's fixative, was sent to the first author for examination. He embedded part of the material unstained in glycerine-gelatine or ammonium-picrate; the remaining worms were stained with aluminous carmine and embedded in Canada balsam. Series of transversal, frontal and sagittal sections were made from several worms for the purpose of detailed study on their anatomy.

At the time when this paper was being prepared for printing, Kulkarni (1969) reported his finding of one of the two species under consideration isolated from the gills of *E. suratensis* in India, (4 worms were recovered from two of the 200 fishes examined) and proposed the name *Haploleidus globodiscus* Kulkarni, 1969. The arrangement of this species to the genus *Haploleidus* was, however, incorrect. A comparison of both species with *Enterogyrus cichlidarum* Paperna, 1963 from Israel indicated that all three species are closely related. This means that they all belong to a single genus, i.e., *Enterogyrus*.

Part of the material including the syntypes is deposited in the collection of the Parasitological Laboratory, Zoological Institute, Acad. Sci. U.S.S.R.; the remaining worm material is in the private collection of professor C. H. Fernando.

***Enterogyrus globodiscus* (Kulkarni, 1969) Gussev et Fernando comb. n.**

(10 worms measured in whollemounts, 10 in histological slides).

Description: body spindle-shaped, moderately flattened dorsoventrally; length 0.35 mm, width 0.12 mm. Haptor distinctly demarcated from body, dome-shaped, distally attenuated, length 0.050 mm, width 0.090 mm. Its anterior widened part armed with 5 pairs of hooks arranged in a row: pair 1-3 pointing in ventral direction, pair 4-5 raised to the

lateral edges and to the back; pair 6 and 7 placed in posterior attenuated portion of the haptor pointing in ventral direction from the ventral anchors. All hooks are of similar size (0.013-0.015 mm) and shape, except that the handle of pair 6 and 7 is thinner than that of the remaining hooks. The two pairs of anchors of similar shape have well-developed roots: inner root massive, outer root thin, often showing a backward bending in the slides. Length of ventral anchors 0.018-0.020 mm, of dorsal anchors 0.034-0.041 mm) (measured from the bending of the point to the end of the outer root); point 0.006 mm and 0.010 to 0.012 mm respectively. Two connecting bars: ventral bar fine, shaped as a reversed widely open letter V, frequently with slightly enlarged ends; measurements 0.001 × 0.018-0.020 mm; dorsal bar massive, straight, measurements 0.002-0.006 × 0.023-0.028 mm (measurements given in the original description: ventral bar 0.021-0.025 mm, dorsal bar 0.025-0.035 mm).

Copulatory organ, a bending tube bounded by a membrane, with a slightly enlarged basal portion; length of tube 0.070 to 0.090 mm. Vaginal armament not

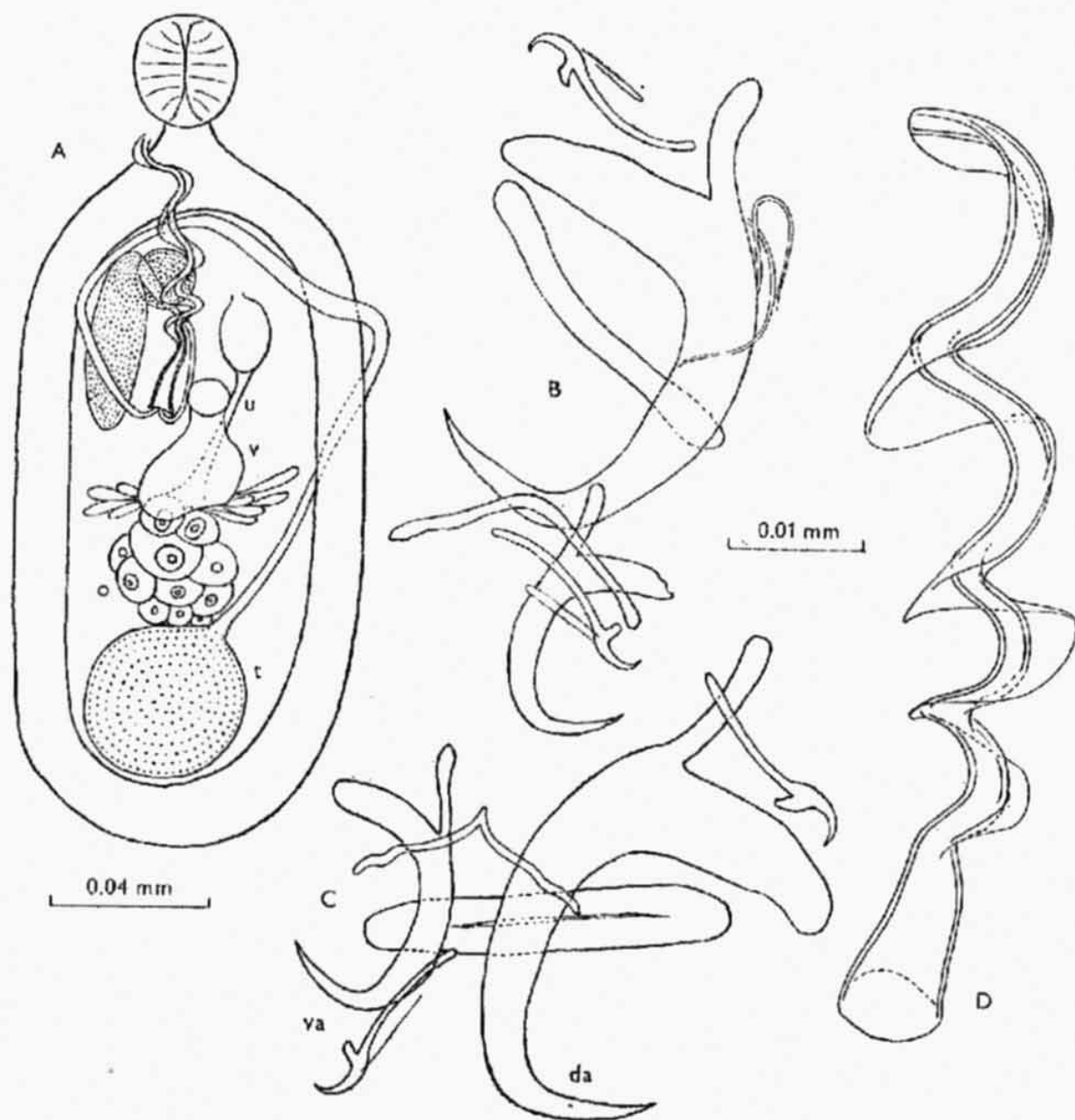


Fig. 1. *Enterogyrys globodiscus* (Kulkarni, 1969). A — schematic illustration of its anatomy (o — ovary, t — testis, u — ootype, v — receptaculum seminis); B, C — chitinoid haptor elements (da — dorsal anchors, va — ventral anchors); D — copulatory organ.

distinct, except a bladder-like receptaculum seminis with a chitinous lining visible only in azo-carminic stained sections.

Anterior glandular end of body rounded without distinct lobes (in the slides). Two pairs of eye-spots, a widely-set pair anterior to the oesophagus, the other pair above the anterior edge of the oesophagus appearing like a bilobate mass of pigment granules. Body covered by a thick cuticle. Its division into three layers visible in azo-carminic stained sagittal sections: outer layer loose, finely granular; middle layer (basal membrane) continuous, dense, staining blue. Both layers (viewed in fixed specimens) form transverse folds in the cuticle. The third, inner, layer similar to the middle layer in thickness, but in appearance similar to the outer layer. Thickness of the cuticle in mid-body approximately 0.006 mm, decreasing towards the anterior end. Basal membrane not present on the anterior end up to the level of the eyes. Absent also from the haptor.

In spite of certain differences in the appearance of the cuticle in the wholmounts and sections (Fig. 2B, C), its extreme thickness is always evident.

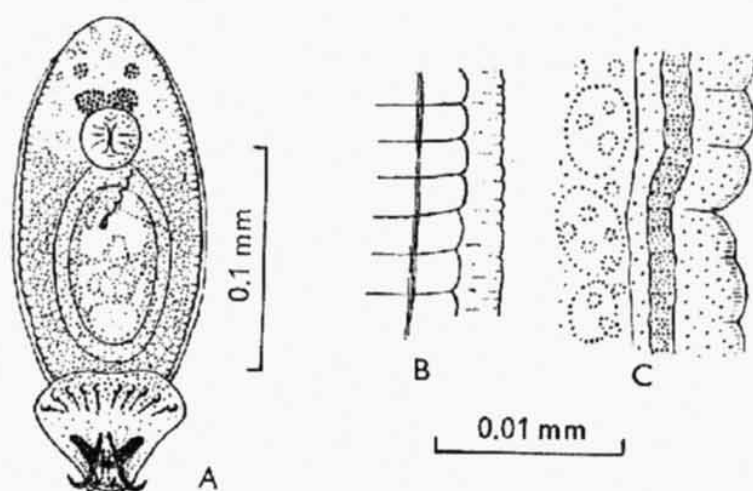


Fig. 2. *Enterogyryus globodiscus* (Kulkarni, 1969) A—general view; B,C—cuticle in mid-body (B—in the wholmount; in glycerine-gelatine. C—in the section).

The anatomical structure is that of the *Ancyrocephalus* type. The intestinal tract consists of a pharynx, a short oesophagus and two lateral intestinal branches joining behind the testis. The vas deferens which in its course encircles the left intestinal branch, proceeds along the front and dorsally of the copulatory organ and opens into its basic funnel; it emerges from the large testis lying behind the oval ovary. In dorsal direction, to the right of the copulatory organ, lies the spindle-shaped prostate reservoir and a spherical, coarsely granulated, gland. The vaginal pore lies ventrally at the level of the initial part of the copulatory organ and opens in a bottleneck into the receptaculum seminis.

The shape of the body and haptor, the armament and shape of the chitinoid formations and their measurements given by Kulkarni (1969, Fig. 44) in his original description, and finely also the host species involved suggest that our form is identical with that of Kulkarni (1969), although numerous diagnostic signs are different. We failed in observing a bilobate seminal vesicle in worms of our material similar to that described by Kulkarni (1969); this author may have mistaken the ootype for this vesicle. Another mistake in the original description is the statement that the ductus ejaculatoris opens into the genital pore. In all Dactylogyridae, this duct never extends past the copulatory organ, but opens always into its initial part.

In addition we failed in observing the accessory piece of the copulatory tube. Kulkarni must have mistaken the widened end of the membrane of this tube for the accessory piece. The uterus does not open at the posterior part of the cirrus, but at its anterior end as this is evident also in the sections. This indicates that Kulkarni mistook the uterus for the receptaculum seminis which opens at the level of the initial cirrus portion. Finally, in his text, Kulkarni made a mistake in the measurements of the anchors; his measurements, i.e., 0.051-0.065 and 0.025-0.030 are one and a half times bigger than those given in his text-figure 44 (0.040 and 0.019 respectively, this being in accord with our measurements). Unfortunately, the scale given in Figs. 46 and 47 (Kulkarni 1969) for the anchors is indistinct and we can only guess that it may have been 0.025 mm. In this case the measurements of the hooks in these figures are consistent with our values, but 1.5 times smaller than given in Kulkarni's text.

Enterogyrus papernai Gussev et Fernando sp. n.

We examined a total of 15 worms. Body very wide, length up to 0.25 mm, width 0.14 mm. Haptor 0.070 mm in diameter, pharynx approximately 0.020 mm. Cuticle thick, bilayered - outer layer loose, finely granular; inner layer (basal membrane) thick. Maximum thickness of this layer and maximum depth of its folds at posterior body end above the haptor. Thickness of cuticle and depth of folds decrease in anterior direction; folds are absent from the anterior end. The inner layer is missing from the haptor area near the vaginal pore and the genital atrium. Thickness of outer layer 0.003 mm, of inner layer (posterior end) 0.006 mm, at mid-body 0.004 mm. Two pairs of eye-spots in front of pharynx. Haptor armament: 7 pairs of hooks, 2 pairs of anchors, 2 connecting bars. Hook arrangement similar to that in *E. globodiscus*, i.e., pair 1-5 dorsally at the anterior margin of the haptor; pair 6-7, ventrally from the ventral anchors. The handle of hook pair 1 and 5 is slightly thicker and shorter than that of the remaining hooks, overall length approximately 0.013 mm, length of handle 0.009 mm. Length of hooks of pair 6 and 7 approximately 0.014 mm, of handle 0.010 mm. Anchors unequal in shape and size. Ventral anchors similar to those of *E. globodiscus*, total length 0.016-0.018 mm, length of both roots approximately 0.007 mm, of point 0.006-0.007 mm. Dorsal anchors have a considerably bent inner root and a straight outer root (similar to *E. cichlidarum* Paperna 1963). The "supplementary" hook on their point gives it the appearance of anchors of the genus *Dogielius* and *Falciunguis*. Length of dorsal anchors 0.041-0.045 mm, of "supplementary" hook approximately 0.005; length of both roots 0.012-0.013 mm. Connecting bar of ventral anchors fine, indistinct in the slides, measurements approximately 0.001×0.015 mm. Connecting bar of dorsal anchors massive, $0.004-0.005 \times 0.015-0.018$ mm. Not always distinctly visible in the slides. Copulatory organ similar to that of *E. globodiscus*, only larger, its length 0.080-0.120. Vaginal armature not observed.

Although the internal anatomical structure of *E. papernai* could not be distinguished in the wholemounts this appears to be similar to that of *E. globodiscus*.

The species has been named in honour of Dr. I. Paperna, the author of the genus *Enterogyrus*.

In his original diagnosis of the genus *Enterogyrus* Paperna (1969) did not mention the presence of connecting bars; he has given, however, data on at least one connecting bar in his description of the species *E. cichlidarum*, and that of the ventral bar. Apparently, the author failed in noticing the dorsal bar because it is very fine, and neither did we observe this bar in the slides of *E. cichlidarum* obtained by courtesy

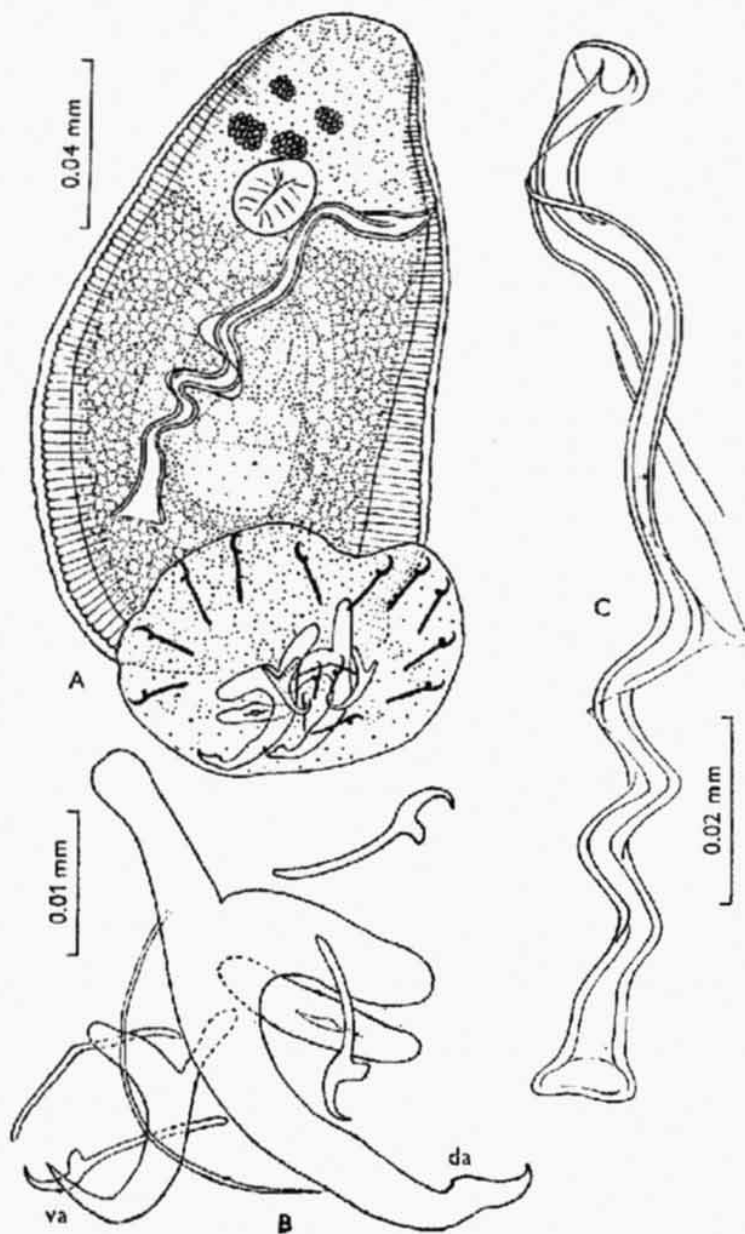
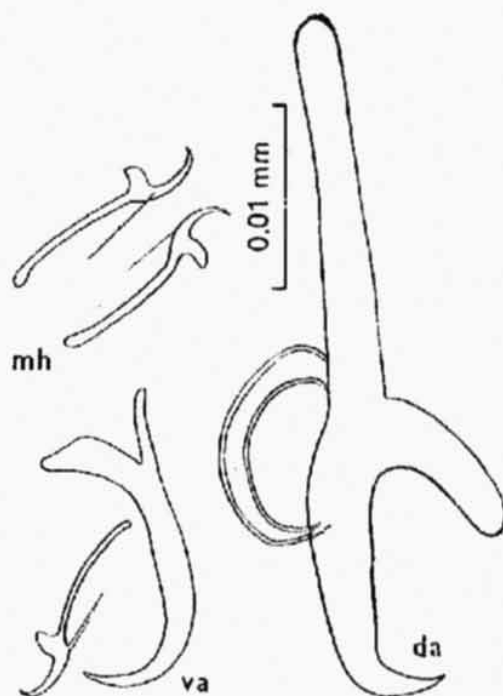


Fig. 3. *Enterogyryus papernai* sp.n. A — general view; B — chitinoid elements of the haptor (da = dorsal anchors; va — ventral anchors); C — copulatory organ.

Fig. 4. Chitinoid elements of the haptor of *Enterogyryus cichlidarum* Paperna, 1963. (mh = marginal hooks; da = dorsal anchor; va = ventral anchor).



of Dr. Paperna. However, the general shape of anchors and hooks (Fig. 4), the copulatory organ, the extreme thickness of the cuticle, its location in the host and the close relationships of the hosts under consideration, leave little doubt on the generic diagnosis of these forms, i.e., that they are members of the genus *Enterogyryus*, in spite of the fact that one connecting bar only was found in *E. cichlidarum*.

The extreme thickness of the cuticle, particularly that of the basal membrane, is a constant feature of Monogenoidea at the conversion to endoparasitism. It appears to be a defence reaction against the effect of digestive juices (in the case under consideration) or against excretory products (in members of the genus *Acolpenteron*). In contradiction are the well-developed eyes in all species of the genus *Enterogyryus*, but they may have another function than only the perception of light.

Although we do not intend to discuss phylogenetic relationships of the genus *Enterogyryus*, various peculiarities in the morphology of its species suggest that these are ancient forms.

E. papernai sp.n. differs from *E. globodiscus* in smaller measurements and in the shape of its body; in the shape of the haptor; in the considerably thicker cuticle;

in the shape of the dorsal anchors; in the length of the copulatory organ. Both these species differ from *E. cichlidarum* in the shape of the dorsal anchors; in the longer copulatory organ; in the host species; in the presence of two connecting bars (under the assumption that the dorsal connecting bar of *E. cichlidarum* has been overlooked in the original description as suggested in the foregoing text).

In our opinion, *E. globodiscus* should not be arranged to the "genus" *Haploleidus* for the following reasons. This genus was erected to receive American Ancyrocephalinae parasitizing Centrarchidae. Later, this genus was placed in synonymy with the genus *Urocleidus*. Nevertheless, numerous authors continued to list newly found forms to the genus *Haploleidus*, although these should be placed into completely different genera. The first author of the present paper has, repeatedly drawn attention to the confusion in the group Ancyrocephalinae, and to the purely formalistic approach of several authors to that or the other parasite without considering them to be one of the components of the parasite-host system. An example of such formalistic approach was the arrangement of forms from India and from North America to the genus *Haploleidus*, although it is evident that these cannot belong to the same genus (Gussev 1961).

The arrangement of species such as "*H.*" *octotylus* Kulkarni (1969), a parasite of siluroid fishes, and "*H.*" *globodiscus* Kulkarni (1969), a parasite of fishes from a completely different order, to the genus *Haploleidus*, supports our statement. "*H.*" *octotylus* is, in fact, a member of the genus *Ancylodiscoides* s.l., the other species, as mentioned afore, a member of the genus *Enterogyrus*. This shows that these species belong to different subfamilies, i.e., to Ancylo-discoidinae and Ancyrocephalinae.

Although several of the data in Kulkarni's papers are incorrect and the author has not made full use of the pertinent literature (e.g., he did not use the paper by Paperna 1963, Gussev 1961, 1963, a.o.), his work has contributed considerably to our knowledge of Indian Monogenoidea. Unfortunately, we have been unable to establish personal contacts, which are always very useful among specialists working in related fields.

ДАКТУЛОГУРИДАЕ (МОНОГЕНОИДЕА) ИЗ ЖЕЛУДКА РЫБ

А. В. Гусев и К. Г. Фернандо

Резюме. Описание нового вида *Enterogyrus papernai* и переописание *E. globodiscus* (Kulkarni, 1969). Некоторые соображения о недопустимости формализма в систематике и необходимости кооперации в работе между специалистами.

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