

## On two new diplostome parasites of birds, with a note on *Hysteromorpha triloba* (Rud., 1819) Lutz, 1931 from India (Trematoda: Diplostomatidae)\*

by

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Family.— DIPLOSTOMATIDAE Poirier, 1886.

Subfamily.—Diplostomatinae Monticelli, 1888.

Subsubfamily.—Crassiphialini Dubois, 1936.

*Cercocotyla rudis* sp. nov.

Thirty-eight specimens of this diplostome parasite were obtained from the small intestine of a Pied Kingfisher, *Ceryle rudis* (Linnaeus), shot near Lucknow. The infection with this parasite is rare.

The body (fig. 1) of the fluke is small and distinctly bisegmented, with the segments slightly overlapping each other. The forebody is pouch-like with its dorsal wall strongly arched. It measures 0.185 — 0.231 mm in length and 0.220 — 0.294 mm in maximum breadth. The hindbody is sac-like with a truncated posterior extremity. It is about three times longer than the forebody and measures 0.521 — 0.611 mm in length and 0.261 — 0.363 mm in maximum breadth.

The terminal oral sucker is fairly muscular and measures 0.029 — 0.031 mm in diameter. There is no indication of a ventral sucker even in sections. The holdfast organ is situated in the posterior part of forebody. It has a slit-like

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opening and measures 0.058 — 0.069 mm by 0.069 — 0.076 mm. Radial muscles and minute gland cells are present in the wall of the holdfast organ. A small, but prominent adhesive gland is present immediately behind this organ.

A prepharynx being absent, the mouth directly leads into a muscular pharynx which measures 0.026 — 0.030 mm by 0.021 mm. The pharynx leads into a short oesophagus measuring 0.019 — 0.021 mm in length. The intestinal caeca are narrow and extend back almost up to the posterior end of body.

The gonads occupy the middle region of hindbody. The testes are tandem. They are smooth-margined and transversely elongated. The anterior testis measures 0.091 — 0.112 mm by 0.154 — 0.195 mm. The posterior testis is somewhat smaller and measures 0.067 — 0.088 mm by 0.149 — 0.190 mm. The vas deferens runs posteriorly and opens into a prominent U-shaped seminal vesicle. A prominent ejaculatory duct continues from the seminal vesicle and dorsally opens into the uterus to form a very short hermaphroditic duct. A pars prostatica, as described by YAMAGUTI (8) in *Cercocotyla cerylis*, is not observed in the present form.

The ovary is median and immediately pre-testicular. It is spherical and measures 0.049 — 0.054 mm in diameter. The vitellaria are confined to the hindbody and extend from behind the adhesive gland up to the posterior end. They consists of numerous large follicles which are dense in the pre-ovarian region, but sparse behind. The vitelline reservoir and Mehlis' gland are inter-testicular. The Laurer's canal is present. The uterus is short and contains only a few (up to six) eggs which are pale-yellow, operculate, and fairly large for the size of the fluke. The eggs are even larger than the ovary and measure 0.0791 — 0.0912 mm by 0.0514 — 0.0625 mm. The hermaphroditic duct opens into a large copulatory bursa by the genital pore (fig. 2) which is surrounded, as stated by YAMAGUTI (8) for *Cercocotyla cerylis*, with a mass of radial muscle fibres and a ring of several minute papilliform structures. A large sucker-like muscular structure, termed "atrial sucker" by SUDARIKOV (7) in Skrjabin's "*Trematody životny i cheloveka*", opens into the copulatory bursa immediately ventral to the genital pore. The bursa opens to the exterior by a wide aperture at the truncate posterior extremity of the body.

DISCUSSION: The presence of a so-called "atrial sucker" and a mass of muscular fibres, together with a ring of minute papilliform structures around the genital pore, clearly indicates that the present fluke belongs to the diplostome genus *Cercocotyla* Yamaguti, 1939. The genus *Cercocotyla* was established by YAMAGUTI (8), with *Cercocotyla cerylis* Yamaguti, 1939 as the genotype, for a diplostome fluke obtained by him from the small intestine of *Ceryle lugubris lugubris* (Temm.) from Japan. No subsequent record of this genus is found in the literature. The finding of the present fluke is, therefore, the second record of this genus.

The present form can be easily distinguished from the genotype by several important features. It is much smaller with a considerably shorter and stouter hindbody. An adhesive gland is distinctly visible in the present form. The gonads are relatively large in the present form and, moreover, they are situated in the middle, and not in the posterior region of the hindbody. The vitellaria are

distributed throughout the hindbody in the present form, whereas they are limited to the posterior half of the hindbody in the genotype. Furthermore, the eggs of the present form are considerably larger, even larger than the ovary of the fluke. From these differences it becomes evident that the present fluke represents a new species of the genus *Cercocotyla* Yamaguti, 1939, and the name *Cercocotyla rudis* is proposed for it.

### EMENDED DIAGNOSIS OF THE GENUS **CERCOCOTYLA** YAMAGUTI, 1939

The present form necessitates an elaboration of the generic diagnosis of *Cercocotyla* Yamaguti, 1939 as follows:

Diplostomatidae; Diplostomatinae; Crassiphialini: Body distinctly bisegmented. Forebody spoon-shaped or pouch-like. Hindbody long and slender or short and stout. Oral sucker small. Ventral sucker absent. Pseudosuckers absent. Holdfast organ well-developed. Prepharynx, if present, very short. Small pharynx and short oesophagus present. Intestinal caeca extend up to posterior end of body. Gonads in middle or posterior part of hindbody. Testes tandem and smooth-margined. Seminal vesicle sigmoid or U-shaped. Pars prostatica may be present. Ovary median and immediately pre-testicular. Vitellaria confined to hindbody. Ootype complex and vitelline reservoir inter-testicular. Laurer's canal present. Ductus hermaphroditicus short, opening into a large copulatory bursa by a genital pore which is surrounded by a dense muscular tissue and a ring of minute papilliform structures. A large muscular sucker ("atrial sucker" of Sudarikov) opens into the copulatory bursa ventral to the genital pore. Copulatory bursa opens to the exterior at posterior end of body by a wide aperture. Parasites of intestine of birds.

Type species:— *Cercocotyla cerylis* Yamaguti, 1939.

### A KEY TO THE SPECIES OF THE GENUS **CERCOCOTYLA** YAMAGUTI, 1939

1. Hindbody long and slender. Gonads in posterior region of hindbody. Vitellaria in posterior half of hindbody. Eggs smaller than ovary ..... *C. cerylis* Yamaguti, 1939

Hindbody short and stout. Gonads in middle region of hindbody. Vitellaria extending throughout hindbody. Eggs larger than ovary ..... *C. rudis* sp. nov.

Family.— DIPLOSTOMATIDAE Poirier, 1886.

Subfamily.—Diplostomatinae Monticelli, 1888.

Subsubfamily.—Diplostomatini Dubois, 1936.

*Neoharvardia pandubi* gen. nov., sp. nov.

Two specimens of this diplostome fluke were obtained from the small intestine of the Large Cormorant, *Phalacrocorax carbo* (Linnaeus). The infection with this fluke is rare.

The body (fig. 3) of the fluke is distinctly bisegmented. The segments are strongly retroflexed. The lateral margins of the forebody are ventrally incurved to form a deep ventral concavity. The forebody measures 1.450 — 1.617 mm in length and 1.100 — 1.289 mm in maximum breadth in the region of the holdfast organ. The hindbody is bluntly conical and measures 1.296 mm in length and 0.905 — 1.000 mm in maximum breadth in its anterior region.

The oral sucker is terminal and measures 0.140 — 0.163 mm by 0.130 — 0.182 mm. A highly mobile and muscular cup-like pseudosucker is present on each side of the oral sucker. The ventral sucker is situated in the posterior half of the forebody. It measures 0.184 — 0.241 mm by 0.301 — 0.310 mm. The holdfast organ is situated immediately behind the ventral sucker in the posterior region of forebody. It is oval and measures 0.419 mm by 0.530 — 0.725 mm. A small adhesive gland is present immediately behind the holdfast organ.

The mouth leads into a short prepharynx which opens into a small pharynx measuring 0.078 — 0.097 mm by 0.098 — 0.113 mm. A short oesophagus is present. The intestinal caeca are greatly obscured by various organs.

The testes are large structures, situated obliquely one behind the other in the middle region of the hindbody. The anterior testis is sinistral and obliquely placed to the long axis of the body. It is oval and smaller than the posterior testis, measuring 0.392 — 0.507 mm by 0.310 mm. The posterior testis is large, transversely elongated, and slightly constricted in the middle, appearing somewhat bilobed. It measures 0.418 — 0.530 mm by 0.593 — 0.668 mm. The vas deferens is continued posteriorly into a coiled seminal vesicle situated just behind the posterior testis. The ductus ejaculatorius, leading from the seminal vesicle, joins the female duct to form a ductus hermaphroditicus.

The ovary is submedian and situated obliquely dextral to the anterior testis. It is subspherical and measures 0.151 — 0.170 mm by 0.190 — 0.258 mm. The vitellaria consists of small follicles which are uniformly distributed from the region of the holdfast organ upto the hind end of body. A prominent vitelline reservoir and the ootype complex, with a large Mehlis' gland, are situated dextral to the anterior testis. The uterus contains several eggs (twenty-one) in the co-type, but none in the type specimen which is fully mature and seems to have voided its eggs. The eggs in the co-type measure 0.0946 — 0.1062 mm by 0.0610 — 0.0725 mm. The uterus joins the male duct at the base of a large and protrusible genital cone to form the ductus hermaphroditicus which traverses the cone and opens at its tip by the genital pore. The genital cone is placed in a large copulatory bursa whose inner wall is raised to form a prominent prepuccial fold around the cone. The bursa opens to the exterior by a wide terminal aperture.

DISCUSSION: The fact that the present form belongs to the subsubfamily Diplostomatini Dubois, 1936 of the subfamily Diplostomatinae Monticelli, 1888 is evident from the distribution of its vitelline follicles in both segments of the body. Of all such genera of this subsubfamily which possess lateral pseudosuckers, the present form shows a close resemblance only with the genus *Harvardia* Baer, 1932 (1) in the retroflexion of the body segments and in the shape of the forebody. However, the presence of a large copulatory bursa, together with a

prominent genital cone and a prepuccial fold around the cone, does not permit an inclusion of the present form in the genus *Harvardia* Baer, 1932. These features, in fact, indicate that the present form represents a new diplostome genus closely allied to *Harvardia* Baer, 1932. The name *Neoharvardia*, with *Neoharvardia pandubi* gen. nov., sp. nov. as the genotype, is here proposed for this new genus.

### GENERIC DIAGNOSIS OF **NEOHARVARDIA** GEN. NOV.

Diplostomatidae; Diplostomatinae; Diplostomatini: Body distinctly bisegmented, with segments strongly retroflexed. Forebody with its lateral margins ventrally incurved to form a deep concavity. Hindbody bluntly conical. Suckers well developed. Muscular cup-like pseudosuckers present. Holdfast organ large, without gland cells in its wall. Prepharynx, pharynx, and oesophagus present. Intestinal caeca extending up to posterior end of body. Testes large, obliquely tandem. Anterior testis obliquely sinistral. Posterior testis transversely elongated and somewhat bilobed. Ovary obliquely dextral to anterior testis. Vitellaria consists of small follicles distributed in both segments of body. Ootype complex dextral to anterior testis. The ductus hermaphroditicus traverses a large and protrusible genital cone placed in a large copulatory bursa. The inner wall of the bursa is raised to form a prominent prepuccial fold around the genital cone. Eggs large. Parasites of small intestine of birds.

Type species:— *Neoharvardia pandubi* gen. nov., sp. nov.

Family.— DIPLOSTOMATIDAE Poirier, 1886.

Subfamily.—Diplostomatinae Monticelli, 1888.

Subsubfamily.—Diplostomatini Dubois, 1936.

*Hysteromorpha triloba* (Rudolphi, 1819) Lutz, 1931

A large number of specimens of this diplostome fluke were obtained from the small intestine of the Large Cormorant, *Phalacrocorax carbo* (Linnaeus). The infection with this fluke is quite common.

This species has so far been recorded from different parts of the world (various countries of Europe, Japan, Canada, U.S.A., Brazil, South and Western Australia, and Russia), but never from India. The present record of this species, therefore, extends its range of geographical distribution to India.

Since the present specimens show some variations, a brief redescription of the species is given below:

The body (fig. 5) consists of two segments—a pear-shaped anterior segment measuring 0.876 — 1.170 mm in length and 0.774 — 1.096 mm in maximum breadth in its middle region, and a bluntly conical posterior segment measuring 0.651 — 0.755 mm in length and 0.581 — 0.866 mm in maximum breadth.

The terminal oral sucker measures 0.066 — 0.083 mm by 0.094 — 0.117 mm. The ventral sucker measures 0.081 — 0.092 mm by 0.125 — 0.199 mm. The large holdfast organ, located in the middle of anterior segment, measures 0.290 — 0.418 mm by 0.351 — 0.651 mm. It appears funnel-shaped with an anterior cleft, exactly as sketched by HUGGINS (6). Regarding the holdfast organ, HAWKINGS (1936), in his unpublished thesis (vide CHANDLER and RAUSCH (2)), stated, "In a contracted state the most prominent feature is the median furrow", but unfortunately the figure given by him (as reproduced by CHANDLER and RAUSCH (2)) does not show the furrow at all. YAMAGUTI (8), however, described a median "incision" in the holdfast organ in Japanese specimens. In none of the specimens collected by the present writer the holdfast organ appears trilobed as stated by HUGGINS (6) and by CHANDLER and RAUSCH (2). In the present specimens a narrow circular ridge, not described by any previous worker, is present around the holdfast organ. This ridge abuts against the holdfast organ on all sides except anteriorly where it is quite apart from the organ. A large adhesive gland lies immediately behind the holdfast organ.

A prepharynx is absent as stated by previous workers. The small pharynx measures 0.058 — 0.061 mm by 0.058 — 0.064 mm. A short oesophagus is present. The intestinal caeca extend up to a slightly behind the posterior testis, but are greatly masked by the vitellaria.

The testes are asymmetrical and tandem. The anterior testis is sinistral or dextral as stated by CIUREA (3) and HUGGINS (6). It is oval, obliquely placed, and measures 0.246 — 0.385 mm by 0.213 — 0.250 mm. In none of the specimens in the possession of the present writer, the anterior testis is transversely elongated as HUGGINS (6) described in some of the specimens collected by him, nor there is, in any specimen, a ventral folding of the sides of the anterior testis as stated by DUBOIS (4,5) and by SUDARIKOV (7). The posterior testis is, however, transversely elongated and turned ventrally on one side as described by previous workers. It measures 0.190 — 0.241 mm in length and 0.432 — 0.617 mm in breadth excluding the folded part. The coiled seminal vesicle is median and immediately post-testicular.

The ellipsoidal ovary is pre-testicular, median or submedian, and 0.081 — 0.102 mm by 0.149 — 0.215 mm. The vitellaria have the usual distribution. The maximum number of eggs in the uterus reaches thirty, and not only twenty as stated by previous workers. The eggs measure 0.0796 — 0.0962 mm by 0.0601 — 0.0713 mm. The uterus joins the ejacutory duct as usual to form the ductus hermaphroditicus which traverses a genital cone placed in a small bursa. The opening of the bursa is subterminal and dorsal, not terminal as stated by YAMAGUTI (8).

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## SUMMARY

*Cercocotyla rudis* sp. nov., the second species under the genus *Cercocotyla* Yamaguti, 1939, is described from the small intestine of the Pied Kingfisher, *Ceryle rudis* (Linnaeus) from India. The diagnosis of the genus *Cercocotyla* Yamaguti, 1939 is emended and a key is given to differentiate the two species.

A new genus, *Neoharvardia*, with *N. pandubi* gen. nov., sp. nov., is proposed for diplostome parasites collected from the small intestine of the Large Cormorant, *Phalacrocorax carbo* (Linnaeus) in India. The new genus is closely allied to *Harvardia* Baer, 1932.

*Hysteromorpha triloba* (Rudolphi, 1819) Lutz, 1931 is reported from India for the first time, and is briefly described.

## RESUMEN

Se describe la segunda especie del género *Cercocotyla* Yamaguti, 1939, *C. rudis* sp. nov., a partir de ejemplares encontrados en el intestino delgado del ave *Ceryle rudis* (Linnaeus) de la India. La descripción del género *Cercocotyla* Yamaguti, 1939 es enmendada y se presenta una llave para diferenciar las dos especies del género.

Se propone el género *Neoharvardia* con *N. pandubi* gen. nov., sp. nov., para un diplostoma del intestino delgado de *Phalacrocorax carbo* (Linnaeus) también de India. El nuevo género es próximo a *Harvardia* Baer, 1932.

Se da a conocer por primera vez para India, con una redescrición breve, el diplostómido *Hysteromorpha triloba* (Rudolphi, 1819) Lutz, 1931 del mismo huésped *P. carbo*.

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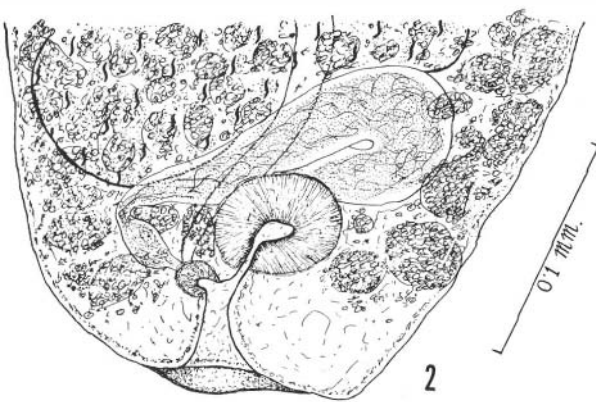
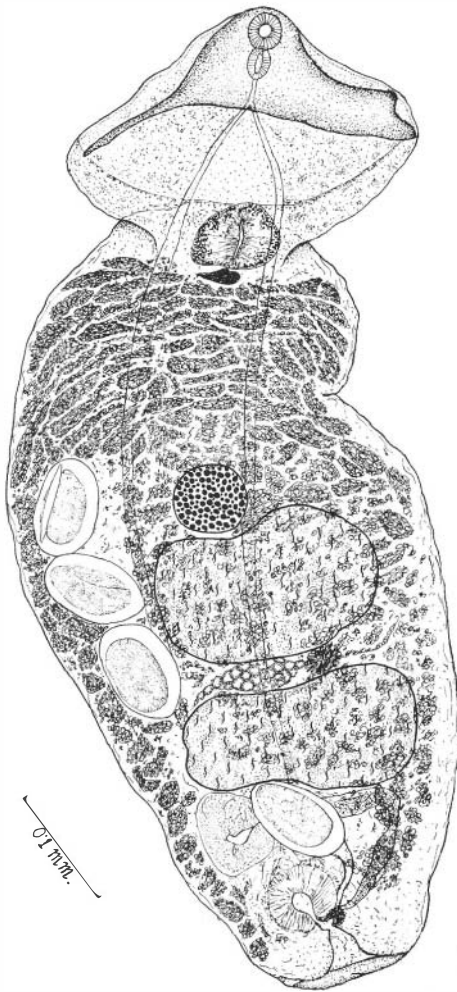
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Figs. 1 - 2. *Cercocotyla rudis* sp. nov.

Fig. 1. Type specimen, ventral view.

Fig. 2. Posterior end of a paratype specimen enlarged to show the structures associated with the copulatory bursa.





Figs. 3 - 4. *Neobartardius pandubi* gen. nov., sp. nov.

Fig. 3. Type specimen, lateral view.

Fig. 4. Posterior end of the co-type specimen, enlarged to show the eggs and copulatory apparatus.

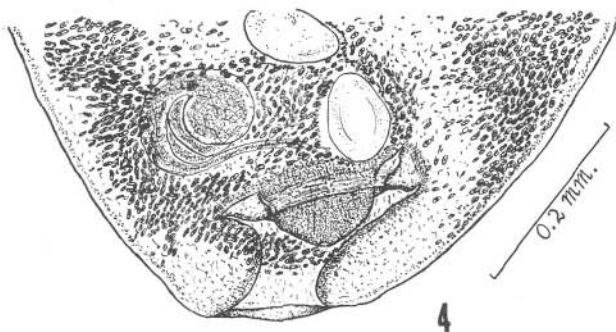
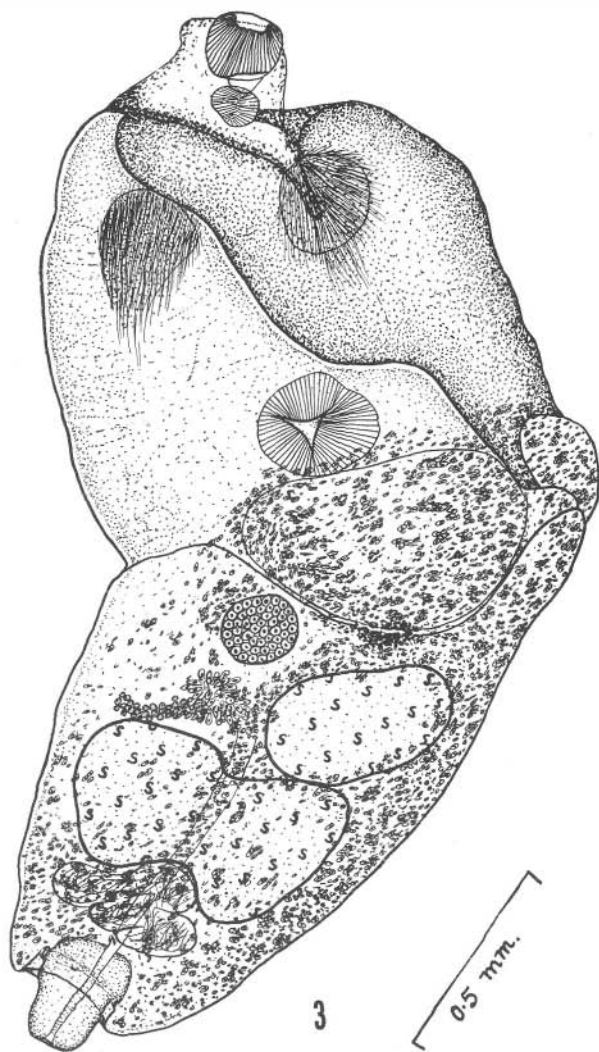


Fig. 5. *Hysteromorpha triloba* (Rudolphi, 1819) Lutz, 1931.  
A specimen from ventral view.

