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MONOGENEAN FAUNA OF DISTRICT SAHARANPUR, U. P., PART-III

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ABSTRACT

Present communication deals with two new species of the genus *Neocalceostoma* Tripathi, 1959, from freshwater fishes, *Mystus seenghala* (Sykes) and *Wallago attu* (Bl. & Schn.).

Key Words: Monogenea, *Neocalceostoma*, *Mystus seenghala*, *Wallago Attu*

INTRODUCTION

During the general survey of freshwater fishes of district Saharanpur, U.P., India, for ectoparasitic monogeneans, I came across two specimens of a freshwater fish, *Mystus seenghala* (Sykes) and one specimen of *Wallago attu* (Bl. & Schn.), infected with several specimens of a rare monogenean belonging to genus *Neocalceostoma* Tripathi, 1959. On detailed study, they were found new to me, therefore, described here as such.

MATERIALS AND METHODS

Fishes, for the present investigation, were collected from ponds and local fish markets of district Saharanpur. They were brought to laboratory and identified. The identification of piscine hosts was made with the help of classical works of McInerney and Gerard (1958), Misra (1959), Srivastava (1980), Nelson (1984) and Day (1989). Monogeneans were collected by freezing technique of Mizelle (1936 and 1938). Worms thus collected, were washed thoroughly, and fixed in hot 70% alcohol or 10% neutral Formaline. Study of chitinous hard parts was made in temporary Glycerin mounts. Permanent mounts were also made after staining in Aceto alum carmine, dehydrating through ascending grades of Alcohol, clearing in Xylene, and mounting in Canada balsam. Camera lucida sketches were made both from temporary and permanent preparations. Besides this, morphological studies were made using Motic Microscope and Image analyzing system. All measurements were taken with the help of stage micrometer and oculometer by method suggested by Mizelle (1936 and 1938), Gussev (1955), Malmberg (1957) and Singh (1959). The measurements were also compared with the measurement taken by Motic image analysis software 2000.

Observation

***Neocalceostoma indicus* n.sp.**

(Plate I, Figure 1-5, and Plate III, Microphotograph 5, 3, 7 & 2)

Worms are elongated, measuring 1.47-1.49 mm in length. Maximum width, 0.15-0.17 mm is recorded in the ovarian region. Head is lobed, bears three pairs of head organs and two pairs of eyespots (posterior pair being slightly larger). Head organs are three pairs, well-developed and appear as floral whorls. Anterior most pair is being largest of all. From the posterior border of each head organ, a fine duct arises, extends posteriorly along sides of pharynx and joins cephalic glands. Pharynx is muscular elongate oval, measuring 0.081-0.085 x 0.072-0.075 mm. On the postero-lateral sides of the pharynx, darkly stained, several pairs of pharyngeal glands are found. Intestine simple, bifurcate and crura terminate blindly.

Male reproductive system consists of a testis, vas deferens, seminal vesicle and male copulatory complex. Testis simple, large, elongated, inter-caecal, post-equatorial, post-ovarian and measures 0.42-0.44 x 0.053-0.055 mm. From the anterior border of testis, a fine vas deferens arises, extends anteriorly, forms loop around left intestinal limb, and finally dilates to form an elongate oval seminal vesicle, located opposite and slightly anterior to vagina measuring 0.095-0.099 x 0.032-0.036 mm. Male copulatory complex consists of elongated tubular cirrus and an accessory piece. The cirrus proper is double walled chitinous tube, measuring 0.13-0.14 mm in length. Ejaculatory ducts open at the distal part of accessory

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piece. At the base of accessory piece, a wide, double walled, chitinoid tube originated which extends posteriorly and terminates in the vicinity of base of cirrus proper, measures 0.082-0.085 mm in length. Accessory piece of the cirrus is made up of two pieces. First piece is broad in middle but narrow at both ends, measures 0.055-0.058 mm, it has avian beak like projection at its anterior end and tip of second piece fits in it. Second piece is elongate, measures 0.045-0.047 mm in length.

Female reproductive system consists of an ovary, vagina, vitelline glands, and receptaculum seminis. Ovary is equatorial, pre-testicular, oval in shape measuring 0.142-0.147 x 0.120-0.141 mm. Vagina is dextral, oval in shape, and muscular, having ridges, measuring 0.075-0.077 x 0.079-0.081 mm. It communicates to a well-developed receptaculum seminis. Receptaculum seminis is elongate oval, measuring 0.011-0.012 x 0.051-0.055 mm. Vitelline follicles are co-extensive with intestinal caeca and densely distributed specially in posterior region of the body.

Haptor is large, muscular, cup like, wider than body with a pair of small anchors, measuring 0.145-0.149 x 0.23-0.24 mm. Each anchor is with broad base, strong shaft and more or less straight points measuring 0.0192-0.0195 mm. Marginal hooklets were not visible on the margins of the haptor, possibly might have shed during processing.

Remarks

The present form differs from *Neocalceostoma elongatum* Tripathi, 1959; *N. microformis* Swarup, 1978 and *N. chauhani* Pandey and Mehta, 1986, in having different shape of male copulatory complex, dextral vagina and anchors. Moreover, it differs from *N. srivastavai* Singh and Agrawal, 1994 in having different shape of testis, shape of male copulatory complex, vagina and anchor. Besides this, position of the vagina is dextral and is highly muscular. It is therefore, described as a new species viz., *N. indicus* n.sp., named after the subcontinent collected from.

Neocalceostoma tripathii n.sp.

(Plate II, Figure 1-5, and Figure 3, Microphotograph 4, 6 & 1)

Worms are elongated measuring 0.99-1.15 x 0.14-0.21 mm. Head is lobed, bears five pairs of head organs and two pairs of eyespots (posterior pair being slightly larger). The head organs of the either side are connected with cephalic glands located, posterior to pharynx through separate ducts. Pharynx is round to oval, muscular, measuring 0.078-0.081 x 0.071-0.075 mm. On the antero-lateral and postero-lateral sides of the pharynx, darkly stained, several pairs of pharyngeal glands are found. Intestine simple, bifurcate and crura terminate blindly in posterior region of the body.

Male reproductive system consists of a testis, vas deferens, seminal vesicle, male gonopore and male copulatory complex. Testis simple, large, elongated, inter-caecal, post-equatorial, post-ovarian and measures 0.340-0.344 x 0.021-0.027 mm. From the anterior border of testis, a fine vas deferens arises, extends anteriorly, forms loop around left intestinal limb, takes turn near cirrus base on itself, encircle the male copulatory complex and dilates to form a fusiform seminal vesicle, opposite and slightly anterior to vagina, measuring 0.068-0.071 x 0.021-0.025 mm. Male copulatory complex consists of an elongated tubular cirrus and an accessory piece. The cirrus proper is chitinoid double walled tube, with swollen, bubble like base, measuring 0.051-0.052 mm in length. Accessory piece is double walled chitinoid tube with a broad rounded base and pointed tip measuring 0.038-0.039 mm. Female reproductive system consists of an ovary, vagina, vitelline glands, vitelline reservoirs, receptaculum seminis and ootype complex. Ovary is equatorial, pre-testicular, elongate oval in shape measuring 0.081-0.086 x 0.042-0.047 mm. Vagina is dextral, oval in shape, muscular, measures 0.061-0.067 x 0.051-0.055 mm. A fine duct arises from the vagina, which leads to receptaculum seminis. Receptaculum seminis is transversely elongated, measuring 0.058-0.059 x 0.022-0.027 mm and opens into ootype complex. Ootype complex is oval in shape surrounded by unicellular mehlis's glands and measures 0.051-0.055 x 0.025-0.028 mm. On either side of the body, at the level of ootype complex, well-developed vitelline reservoir is located which communicates with ootype complex by fine ducts. Vitelline follicles are co-extensive with intestinal caeca. Haptor is large, muscular and wider than body measuring 0.19-0.21 x 0.19-0.21 H 0.21-0.38 mm. It is equipped with a pair of small anchors and darkly stained haptoral glands. Each anchor is with bifid base,

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strong shaft and straight points measuring 0.015-0.018 mm. Inner roots are strong, well-developed and inwardly oriented but the outer roots are diverging making an obtuse angle with inner root. Marginal hooklets are not visible.

Remarks

The present form differs from all the known species of the genus including *N. indicus* n.sp., in having 5 pairs of head organs, difference in shape of male copulatory complex and difference in shape and form of the anchors. It is therefore described as new species viz., *N. tripathii* n.sp., named in honour of Dr. Y.R.Tripathi.

RESULTS AND DISCUSSION

Discussion

Family Calceostomatidae was established by (Parona and Perugia, 1889) Poche, 1926 to accommodate *Calceostoma* van Beneden, 1858. Sproston (1946) included six genera in this family viz.,

1. *Tricotyle* Manter, 1938
2. *Anoplodiscus* Sonsino, 1890
3. *Calceostoma* van Beneden, 1858
4. *Acolpenteron* Fischthal and Allison, 1940
5. *Feridericianella* Brandes, 1894 and
6. *Anoncohaptor* Mueller, 1938.

Palombi (1943) synonymized *Tricotyle* Manter, 1938 with *Loimos* MacCallum, 1917 and genus *Anoplodiscus* Sonsino, 1890, was transferred to family Udonellidae Taschenberg, 1879. He also established a new genus *Calceostomella* to accommodate *Calceostoma inverte* Parona and Perugia, 1889, under the family Calceostomatidae.

Tripathi (1959) established another genus *Neocalceostoma* under the family Calceostomatidae. Subsequently, Yamaguti (1963) described family Calceostomatidae with eight genera in all viz.,

1. *Pseudocalceostoma* Yamaguti, 1940
2. *Calceostoma* van Beneden, 1858
3. *Acolpenteron* Fischthal and Allison, 1940
4. *Neocalceostoma* Tripathi, 1959
5. *Fridericianella* Brandes, 1894
6. *Anoncohaptor* Mueller, 1938
7. *Calceostomella* Palombi, 1943 and
8. *Paracalceostoma* Caballero and Bravo-Hollis, 1955.

As far as genus *Neocalceostoma* is concerned it was Tripathi (1959), who established this genus for the worms, collected from *Osteogeneosus militaris* and *Arius arius*, with *Neocalceostoma elongatum* as type species.

Generic diagnosis of genus *Neocalceostoma* Tripathi, 1959

Calceostomatidae has three pairs of glandular pseudosuckers at anterior end of the body. Haptor muscular, cup like with a pair of anchor and ten pairs of marginal hooklets. Intestinal crura simple not confluent. Ovary and testis oval, vagina median and ventral, cirrus long, with a long coiled accessory piece, two pairs of eyespots.

Since then, three more species have been added to the genus besides genotype viz.,-

1. *N. microformis* Swarup, 1978
2. *N. chauhani* Pandey and Mehta, 1986 and
3. *N. srivastavai* Singh and Agrawal, 1994.

Moreover, during the course of study two more species is added to the genus by authors —

4. *N. indicus* n.sp.
5. *N. tripathii* n.sp.

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In the light of present observation and study of previous forms, it was found that the generic diagnosis warrants a through revision and amendments.

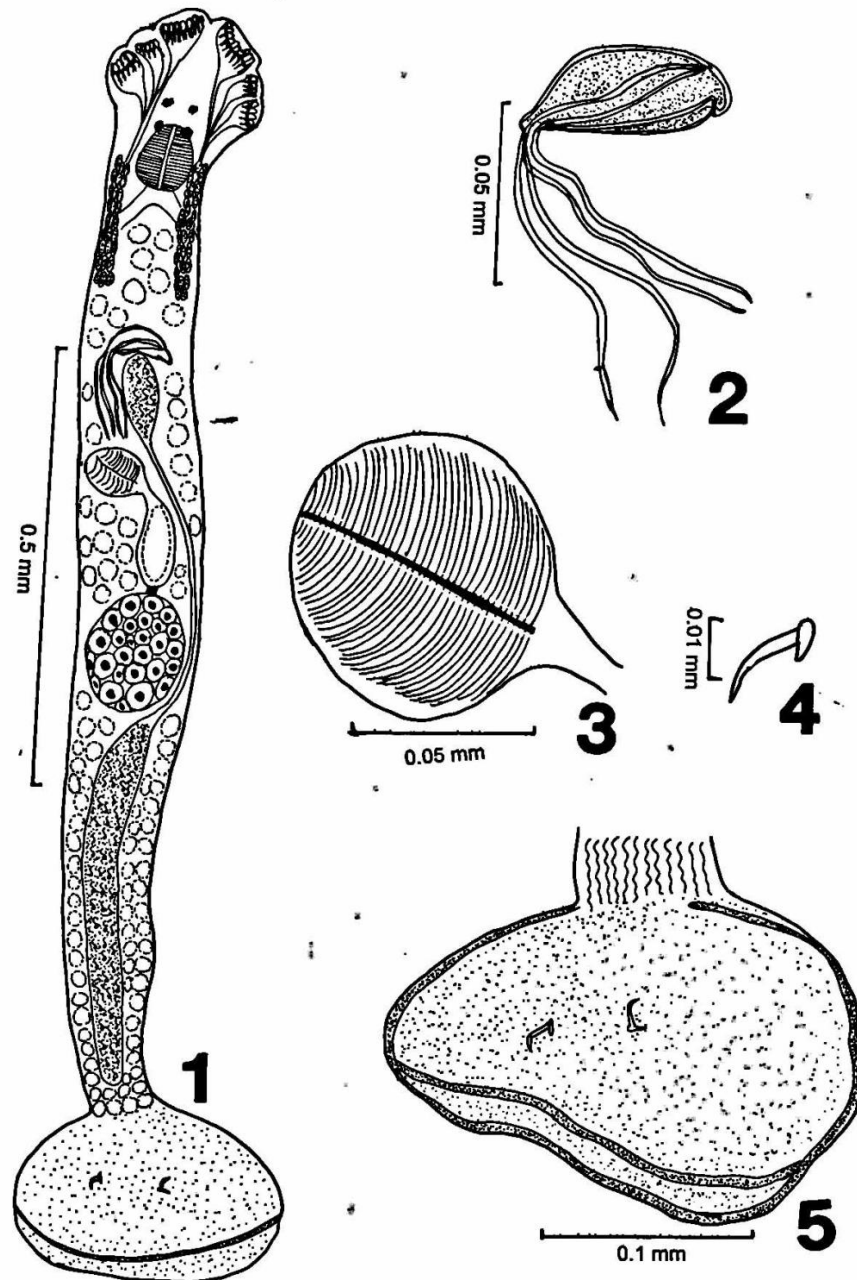


Plate I

- Figure 1: *Neocalceostoma indicus* n.sp. whole mount.
 Figure 2: Male copulatory complex.
 Figure 3: Vagina enlarged.
 Figure 4: Anchors enlarged
 Figure 5: Haptor

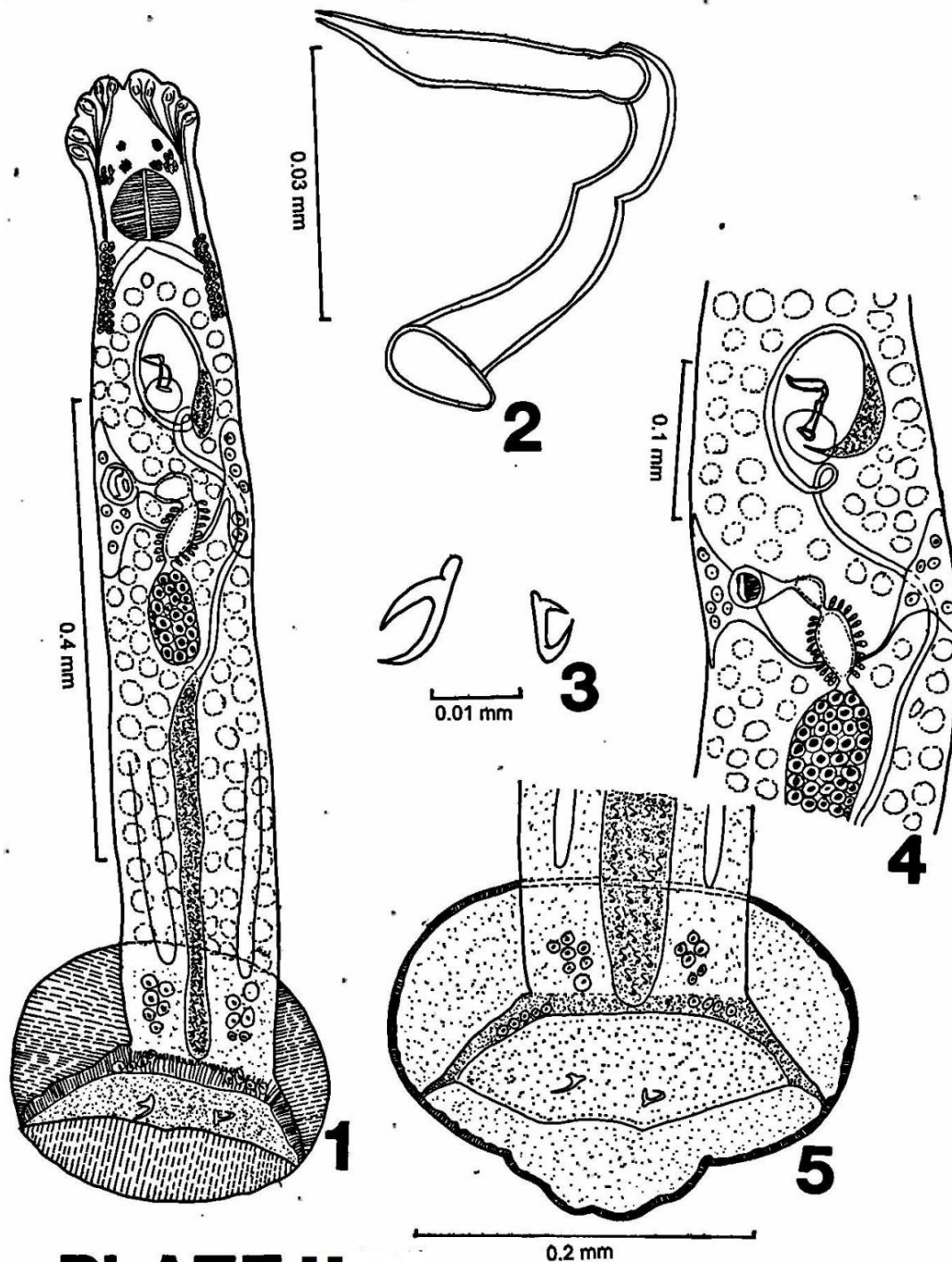


Plate II:

Figure 1: *Neocalceostoma tripathii* n.sp. whole mount.

Figure 2: Male copulatory complex.

Figure 3: Anchor enlarged

Figure 4: Gonadal portion enlarged.

Figure 5: Haptor.

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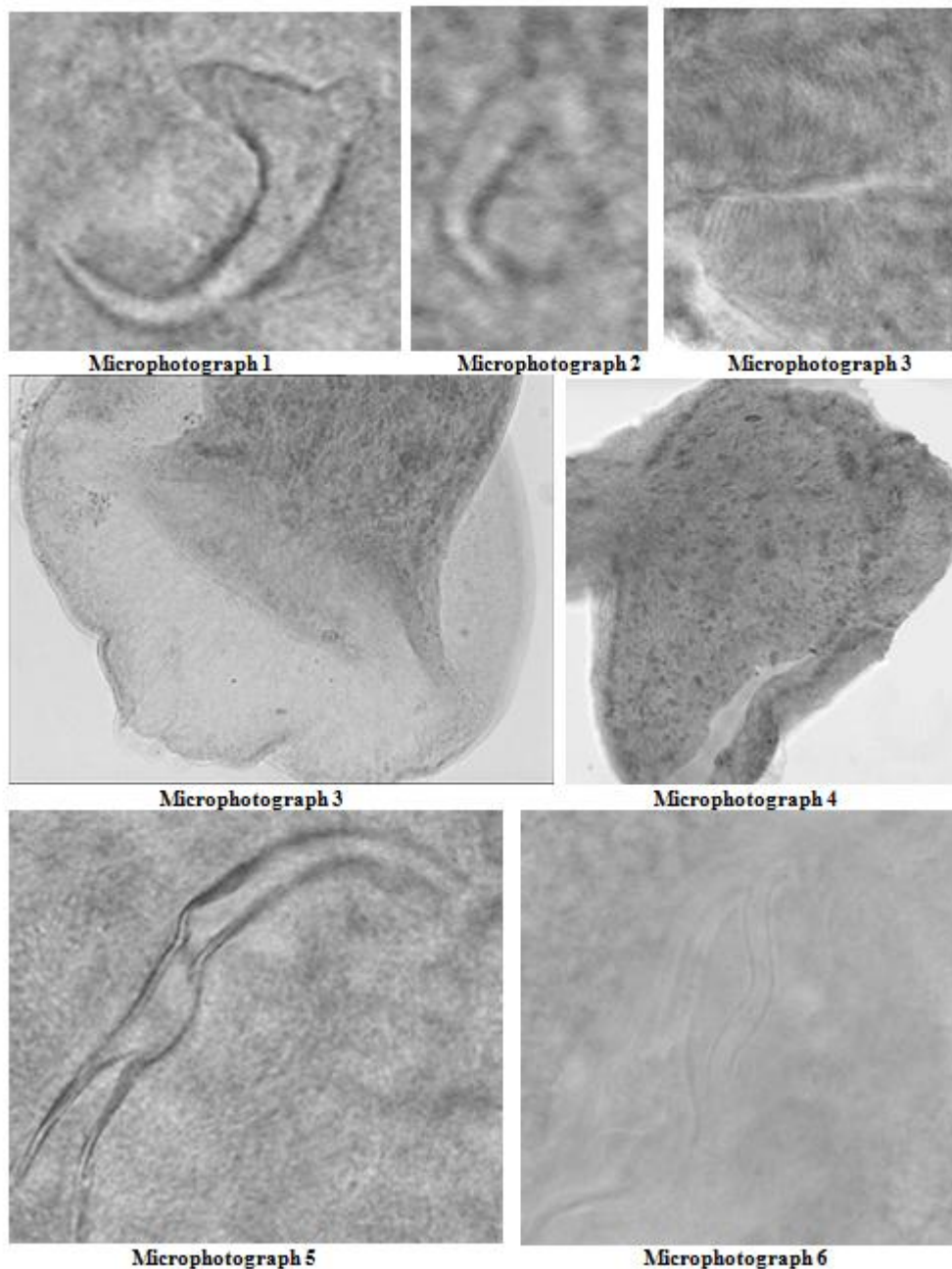


Plate III:

- Microphotograph 1: Anchor *N. tripathii*
 Microphotograph 2: Anchor *N. indicus*
 Microphotograph 3: Vagina *N. indicus*
 Microphotograph 4: Haptor *N. tripathii*
 Microphotograph 5: Haptor *N. indicus*
 Microphotograph 6: Cirrus *N. tripathii*
 Microphotograph 7: Cirrus *N. indicus*

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Amended generic diagnosis of *Neocalceostoma* Tripathi, 1959

Calceostomatidae, Haptor muscular, cup like with a pair of poorly developed anchor and ten pairs of marginal hooklets, which may or may not be present. Head bears 3-5 pairs of glandular pseudosuckers at anterior end of the body and two pairs of eyespots. Pharynx muscular, round to oval in outline. Cephalic glands may or may not be present. Intestinal crura simple not confluent. Testis post ovarian, vas deferens forms loop around left intestinal limb and dilates to form seminal vesicle. Cirrus in the form of chitinous tube, with well-developed accessory piece. Ovary simple, pretesticular. Vagina median or dextral, muscular or tubular. Receptaculum seminis present. Vitelline follicles well developed, coextensive with intestinal caeca. Parasitic in freshwater, brackishwater and marine teleosts.

Key to various species of the genus *Neocalceostoma* Tripathi, 1959

- | | |
|---|--|
| 1. Head organs three pairs |2 |
| Head organs five pairs | <i>N. tripathii</i> n.sp. |
| 2. Cirrus without accessory piece | <i>N. microformis</i> Swarup,
1978 |
| Cirrus with accessory piece | 3 |
| 3. Vagina submedian, tubular | <i>N. elongatum</i> Tripathi,
1959 |
| Vagina dextral and tubular | <i>N. chauhani</i> Pandey and
Mehta, 1986 |
| Vagina median, funnel shaped | <i>N. srivastavai</i> Singh and
Agrawal, 1994 |
| Vagina dextral, muscular, provided with muscular ridges | <i>N. indicus</i> n.sp. |

Type host	: <i>Osteogeneosus militaris</i> and <i>Arius arius</i> .
Type Locality	: Chilka lake, Mahanadi and Matla estuary.
Type species	: <i>N. elongatum</i> .
Additional Host	: <i>Wallago attu</i> and <i>Mystus seenghala</i> .
Additional Locality	: Meerut, Mathura, and Saharanpur.
Additional Species	: <i>N. microformis</i> , <i>N. chauhani</i> , <i>N. srivastavai</i> , <i>N. indicus</i> and <i>N. tripathii</i> .

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REFERENCES

- Beneden PJ Van (1858)**. Memoire sur les vers intestinaux. *Paris, J.B. Baillière et fils*, pp 376.
- Brandes G (1894)**. *Fridericianella ovicola* n.g. et n. sp. Ein neuer monogenetischer Trematode. *Abhandlungen der Naturforschenden Gesellschaft zu Halle* **20** 305-311.
- Caballero YCE and Bravo-Hollis M (1955)**. Trematodes de pescos marinos de aguas Mexicanas del Oceano Pacifico. VIII. Descripcion de tres nuevos generos de trematodes monogeneos. *An. Ins. Biol. Mex.* **26(1)**:89-115.
- Day F (1989)**. *The fauna of British India including Ceylon and Burma Fishes I & II*. Today & Tomorrow's Printers and Publishers, New Delhi.
- Fischthal JH and Allison LN (1940)**. *Acolpenteron ureteroecetes* n.g., n.sp., a monogenetic trematode from the ureters of black basses. *Journal of Parasitology* **26** 34-35.
- Gussev AV (1955)**. Monogenetic trematodes of fishes of Amur River system. *Trudy Zoologicheskogo Instituta AN, USSR* **19** 171-398.
- Maccallum GA (1917)**. Some new forms of parasitic worms. *Zoopathologica* **1** 43-75.

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- Malmberg G (1957).** On the occurrence of *Gyrodactylus* on Swedish fishes. *Skrifter utgivna av Södra Sveriges Fiskeriförening, Årsskrift*, 19-76.
- Manter HW (1938).** Two new monogenetic trematodes from Beaufort, North Carolina. *Livro Jub, Travassos*, 293-298.
- McInerny D and Gerard G (1958).** *All about tropical fish*. George G. Harrap & Co. Ltd. London, Toronto, Wellington, Sydney 480.
- Misra KS (1959).** Fishes of Eastern Uttar Pradesh. *Records of the Indian Museum* **57** 1-320.
- Mizelle JD (1936).** New species of trematodes from gills of Illinois fishes. *American Midland Naturalist* **17** 785-806.
- Mizelle JD (1938).** Comparative studies on trematodes (Gyrodactyloidea) from gills of North American freshwater fishes. III *Biol. Mongr.* **17** :1-81.
- Mueller JF (1938).** Additional species of North America Grydactyloidea. *American Midland Naturalist* **19**(1) 220-235.
- Nelson JS (1984).** *Fishes of the World* 2nd Edition. John Wiley and Sons, New York.
- Palombi A (1943).** *Notizie elmintologiche VI*. Le specie italiane del gen. *Calceostoma* e revisione del genere, *Ibid* **7**(17) 1-8.
- Pandey KC and Mehta T (1986).** Studies on some new monogenetic trematodes of *Wallagonia attu* (Bloch.) at Meerut, Uttar Pradesh, India. *Proceedings of 2nd National Convention of Youth Science*, Meerut University, Meerut 114-132.
- Parona C and Perugia A (1889).** Di alcuni trematodi ectoparassiti di pesci marini. Nota preventiva (Res Ligusticae 8). *Annali del Museo Civico di Storia Naturale di Genova* **27**(2 & 7) 740-747.
- Poche F (1926).** Das System der Platodaria. *Arch Naturg A* **91** (2-3): 458.
- Singh SN (1959).** On the direct application of the camera lucida in measuring worms. *Journal of Institute of Science & Technology (London) Proceedings* 23-24.
- Singh HS and Agarwal S (1994).** On three new monogeneans from Meerut. Dr. C. B. Srivastava comm, edited by Pandey KC 207-217.
- Sonsino P (1890).** Notizie di trematodi della collezione del Museo di Pisa. *Atti Soc. Tosc. Sc. Nat. Proc. Verb.*, **7**: 137-143.
- Sproston NG (1946).** A synopsis of the monogenetic trematodes. *Transactions of The Zoological Society of London* **25**(4) 185-600.
- Srivastava GJ (1980).** *Fishes of Eastern Uttar Pradesh*, Vishwavidyala Prakashan, Varanashi.
- Swarup M (1978).** A new monogenean, *Calcaistoma microformis* n.sp., from a freshwater fish at Mathura, *Veterinary Research Bulletin* **1** 154-155.
- Taschenberg EO (1879).** Zur Systematik der monogenetischen Trematoden. *Mitteilungen aus dem Museum für Naturkunde in Berlin - Deutsche Entomologische Zeitschrift* **52** 232-265.
- Tripathi YR (1959).** Monogenetic trematodes from fishes of India. *Indian journal of Helminthology* **9**(1-2) 1-149.
- Yamaguti S (1940).** Über den Infektionsmodus von *Diplorchis ranae* Ozaki 1931. *Zeitschrift für Parasitenkunde* **12**(1) 84-85.
- Yamaguti Y (1963).** *Systema helminthum IV*. Interscience Publication.