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GYRODACTYLUS PRESIDENCYUS SP. NOV. (TREMATODA : MONOGENEA) FROM A FRESH WATER TELEOST, *CHANNA PUNCTATUS* (BLOCH) IN WEST BENGAL, INDIA

ANIRUDDHA JHA, RUPENDU RAY# AND SUMIT HOMECHAUDHURI*
Post Graduate Department of Zoology, Presidency College, Kolkata-700 073, India

INTRODUCTION

Members of the Genus *Gyrodactylus* include viviparous Monogenean ectoparasites characterised by relatively small size, two anterior cephalic lobes, a haptor, a pair of anchors with eight pairs of marginal hooks and a pair of intestinal ceaca ending blindly. They occur on the gills of fresh water and marine fishes. Later, Mizelle and Kritsky (1967) found the species from the skin of the fishes and even on the skin of the frogs (Mizelle *et al.*, 1969).

Different species of *Gyrodactylus* are very narrowly specific as judged by their occurrence in host fishes. Specificity develops over a period of long term mutual adaptation between parasite and host (Bychowsky, 1957). Viviparous Gyrodactylids give birth to individuals containing well developed embryos, have high reproductive rates and these promote effective transmission under crowded conditions. Invasion is caused by adult parasites which transfer directly between adjacent hosts and its intensity increases rapidly and thus kills host directly (Lester and Adams, 1974).

Gussev (1978) opined that Indian Monogeneans are found on single species of host (monohostal). But instances exist when the species of worms occur in more than one host species. Bychowsky (1957) is of the opinion that if this occurs, then the host species belongs to the same genera. Yin and Sproston (1948) disregarded the total consideration and arranged five previously well known species into sub specific ranks on the basis of direction of anchor roots, *viz.*, anterior (*G. elegans* gr.), inward (*G. medius* gr.) and outward (*G. rasus* gr.) and one more subspecies to *G. elegans* from Gold fish in China. Tripathi (1957), following Sproston (1946) further compounded the confusion describing several well known species to sub specific ranks. He described *G. elegans indicus* for the first time from India but the description of this new sub species was most inadequate. Later Venkatanarsaiah (1979) described *G. hyderabadensis* from *Channa* sp. and another species *G. eutheraponsis* was described by Venkatanarsaiah and Kulkarni (1980) from a marine perciform

Corresponding author
**Department of Zoology, University of Calcutta, Kolkata-700 019, India*

fish *Eutherapons therops*. Rukmini and Madhavi (1989) described *G. recurvensis* from two larvivorous fishes *Aplocheilus panchax* and *A. blochi*. Three new species of *Gyrodactylus viz. G. raipurensis, G. gussevi* and *G. mizellei* were also reported by Dubey, Gupta and Agarwal (1990) from *C. punctatus* and *C. gachua, Heteropneustes fossilis* and *Mystus vittatus* respectively. Another new species *G. neonephrotus malmbergi* described from *Heteropneustes fossilis* by Singh and Agrawal (1994).

A new species of *Gyrodactylus viz. G. presidencyus* has been proposed and described in this present communication for the first time from West Bengal, India. The type slides will be deposited in the National Collection of the Zoological Survey of India, Kolkata.

Key Words : *Gyrodactylus presidencyus* sp. nov.; Monogenea; Trematoda; Teleost; *Channa punctatus*.

MATERIAL AND METHODS

The common snake-headed fish *Channa punctatus* (Bloch) were collected from a pond of South Bengal (Port Canning, South 24 Parganas, West Bengal) and were brought alive to the laboratory. They were kept in the aquarium with aerated water. Meanwhile, some fishes were observed to be a little discoloured and also found to move listlessly. They were taken out of the water and observed under binocular microscope. The Gyrodactylids were teased out from the surface of the infected regions of the fishes and were fixed directly in AFA for 3–5 minutes in the watchglass. They were stained with semichons' Carnine. Some photomicrographs were taken by Zeiss Axiolab Microscope using MC-80 camera. Measurements were taken with the help of an ocular micrometer.

RESULTS

Gyrodactylus presidencyus sp. nov. (TEXT FIGURE 1a–c; PLATE I, Figs. 1 & 2).

(All measurements in microns, range in parentheses; N = 20)

Description : Body elongated, dorsoventrally flattened; body measures 410.5 (324–630) in length and width at the pharyngeal level, 94.5 (90–108), at middle region, 98 (90–108) and at the posterior end, 79 (54–90). Anterior part of the body bilobed, provided with a pair of antero-lateral papillae and head organs in either lobe. Globular vesicle present in the head organs, each terminates in an extrusible anterior spine. Pharynx oval, 33 (31.5–43) long, 37 (34–45) wide. It consists of two lobes. The anterior prepharynx 17 (11–22) long, 26 (25–27) wide, while the posterior pharynx proper 13.5 (11–16) long, 36 (31.5–40.5) wide. Haptor slightly demarcated from the body, sub circular, 68.5 (58.5–94.5) long, 66.5 (54–90) wide with fringed margin, each projection accommodating a hooklet

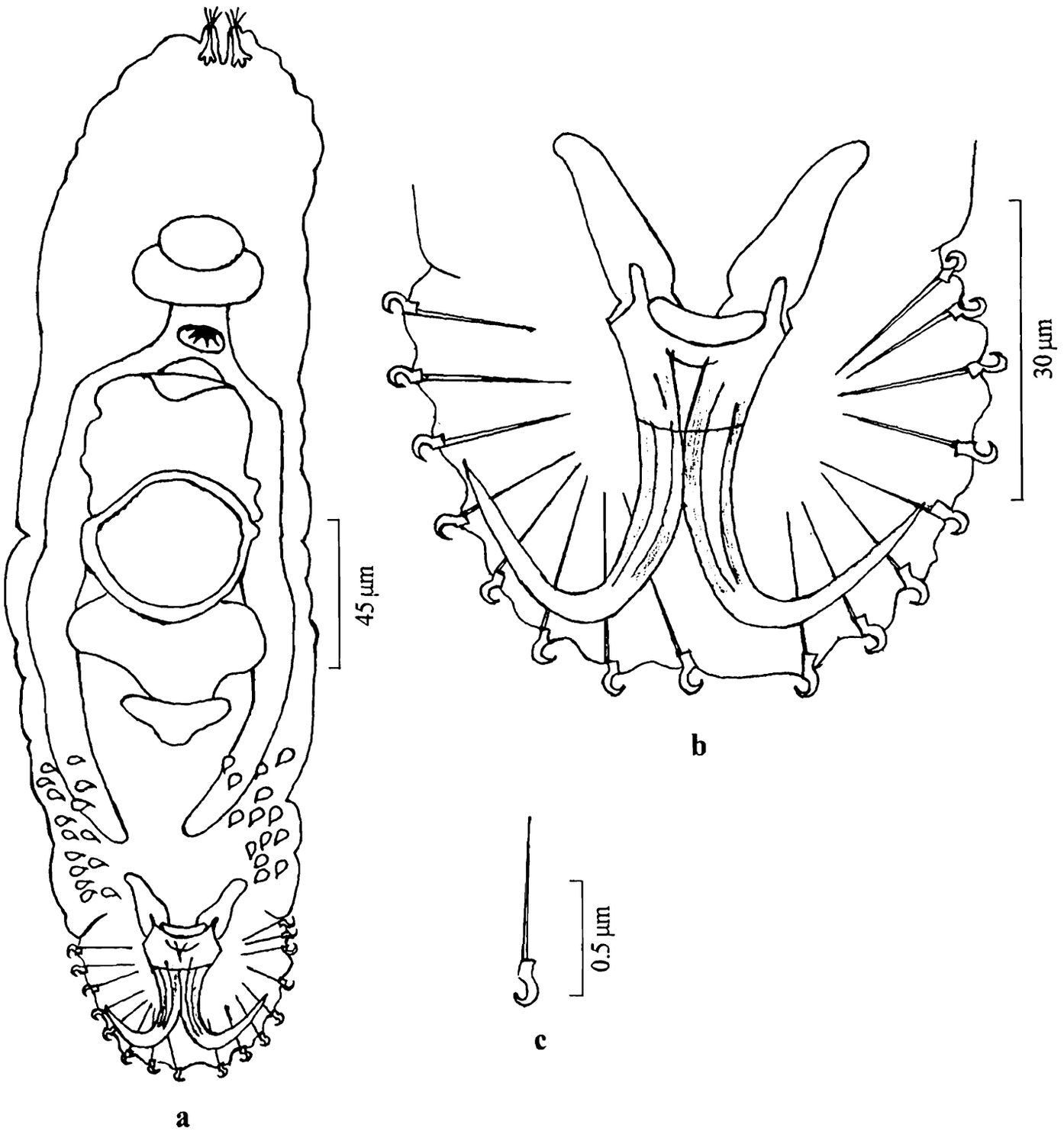

Fig. 1. (a) *Gyrodactylus presidencyus* sp. nov.; (b) Enlarged view of the haptor; (c) Single marginal hooklet.

proper. Anchor moderately stout and comprises three main parts, *viz.* root, shaft and point. Superficial anchor roots long, diverging; anchor points recurved; deep groove present in the anchor; anchor sharply pointed and curved. Anchor length 62 (58.5–63); length of the main part (shaft length) 59.5 (56–61), superficial root 21 (22–22.5) long, base 9.5 (9–11) wide, point 21 (18–24). Deep bar (dorsal bar) slightly curved, situated above the ventral bar and well secured in between the anchor knobs, measuring 21 (20–22.5) long and invariably 6.75 wide. Superficial bar (ventral bar) is larger than the dorsal bar, it comprises three parts, a median portion, a posterior membranous process and has antero-lateral processes at the extremities. The bar measures : total length 24 (22.5–25), distance between two processes of ventral bar 14.5 (13.5–16), total width 19 (18–20), length of processes 2.5 (2–3), median width 5 (4.5–6) and length of bar membrane 8 (7–9). Marginal hooks composed of a sickle proper, sickle membrane, a long handle, without sickle filament loop. Handle attached at the proximal part of the sickle. Articulating portion of handle slender, straight attached at the outer most portion of the sickle, while the other end is slightly swollen for providing site for the attachment of muscles. Detailed measurements are as follows; total length 24 (22.5–27), sickle length 5 (4.5–6) and length of handle 15 (17–18). Ovary triangular, pretesticular, 38 (36–45) long, 30.5 (27–36) wide. Uterus enclosing a fully developed embryo with its anchors observed in few flukes. Testis post ovarian, elongated and measures 16.5 (16–18) long, 22 (20–22.5) wide. Anteriorly it gives rise to a vas deferens runs forward and finally joins at the base of cirrus pouch. The spherical cirrus situated below the pharynx 16.5 (16–18) long and 14 (13.5–16) wide.

Type Host : *Channa punctatus* (Bloch)

Site of Infection : Skin, Gills [specially on the surface towards caudal peduncle, bases of the fin rays (dorsal, caudal, anal), in gills and in branchiostegal area.]

Type Locality : Port Canning; South 24-Parganas, West Bengal, India.

Prevalence : 60% (9 our of 15 host specimen examined).

DISCUSSION

Gussev (1978) held that the peculiarities of chitinoid armament of attachment disk, *viz.* number, shape, dimension and functioning of anchors, connecting bars and hooks are of great significance in species and generic diagnosis. Malmberg (1970) had earlier suggested that dimensions and shape of hooks represent the most constant characteristics of species of gyrodactylids of all the armament features. Anchors and connecting bars thus become very important in the species demarcation in gyrodactylids.

Concise keys and supplementary diagnostic features for most species of Gyrodactylids from Eurasia and North America are available from the works of Gussev (1985) and Beverly-Burton (1984).

Gyrodactylus anguillae has been found to parasitise on eels, *Anguilla rostrata* and *A. anguilla* (Malmberg, 1970) and is considered as euryhaline species. Both *Gyrodactylus salmonis* and *G. colemanensis* are common parasites of salmonid fishes in North America (Cone *et al.*, 1983). Another species, *Gyrodactylus crysoleucas* parasitises golden shiner (*Notemigonus crysoleucas*) and causes significant disease in bait fishes in the southern United States (Lewis and Lewis, 1970). *Gyrodactylus ictaluri* has been described from channel catfishes (*Ictalurus punctatus*) of south eastern United States (Hoffman, 1979) and *G. katharineri* parasitises *Cyprinus carpio* throughout Eurasia and caused disease problems in carp ponds. *Gyrodactylus turnbulli*, a common parasite has been reported from imported Guppies (*Poecilia reticulata*) of Singapore to England (Harris, 1986). A comparison of diagnostic specific characters of the above parasites with the present described one shows not only differences of measurements but also differences in habitat and host preferences.

Gyrodactylids from Indian water bodies shows inadequate reports (see Dubey *et al.*, 1990 and Singh and Agrawal, 1994). A comparative account of the measurements of different parts of the nine described species of *Gyrodactylus* from India, including the present one has been presented in the Table I.

If we consider the chitinoid armament (hard parts) as the key feature of the species demarcation, then the newly described one shows its close proximity with *G. recurvensis*. Because the anchor measurements (i.e. length, superficial root, point) has close resemblance but the main part (shaft) differs. Again measurements of marginal hook shows similarity but differs highly in deep bar and superficial bar. Although these two species show similarities, close observation reveals *G. recurvensis* is smaller in dimension in all aspects of 'hard parts' with the newly described one. If we consider the other measurements like body length, width, pharynx, haptor etc., there is marked difference between the two species. Actually, *G. recurvensis* is almost half or less in length than the presently described species.

Another species *G. mizellei* shows close resemblance with the presently described one in anchor, superficial bar and marginal hook measurements. But the deep bar differs greatly. 'Hard parts' of *G. mizellei* are larger in dimension when all the measurements are compared. Comparison shows *G. mizellei* is almost three times larger in length than the presently described species.

The hooklet length and shaft (handle) shows resemblance with *G. eutheraponsis*, but the other parts differs significantly. Even *G. eutheraponsis* can be well demarked in the species level as it described from a completely different habitat (its host *E. therops* is a marine fish).

As regard to the anchor measurements of *G. hyderabadensis* with the described one, the main part, base and point shows resemblance, but the measurement of marginal hook is quite different and even the other measurements *viz.* the lenght of the body, width, pharynx show variations.

Table I. Comparative account of measurements of the different parts of Indian species of *Gyrodactylus*.
(All measurements in microns and range in parentheses)

	G. neonephrotus malmbergi	*G. raipurensis*	*G. gussevi*	*G. mizellei*	*G. recurvensis*	*G. eutheraponsis*	*G.hyderabadensis*	*G. elegans indicus*	*G. presidencyus n. sp.*
Host Species	*Heteropneustes fossilis*	*Channa gachua & C. punctatus*	*Heteropneustes fossilis*	*Mystus vittatus*	*Aplocheilus panchax & A. blochi*	*Eutherapon therops*	*Channa sp.*	*Labeo rohita, Cirrhinus mrigala, & C. reba*	*Channa punctaus*
Described by	Singh, H. S. & Agrawal, S. (1994)	Dubey, A., Gupta, A. K. & Agarwal, S. M. (1990)			Rukmini, C. & Madhavi, R. (1989)	Venkatanarsaiah, J. & Kulkarni, T. (1980)	Venkatanarsaiah, J. (1979)	Tripathi, Y. R. (1957)	Present Authors
Body Length	(938–1105)	468 (350–670)	370 (275–474)	1208 (950–1400)	(260–330)	(230–350)	(180–380)	(237–380)	410.5 (324–630)
Width									
Pharyngeal level		103 (60–138)	78 (50–100)	111 (100–150)					94.5 (90–108)
Middle region	(96.4–109)	133 (100–180)	102 (75–138)	195 (170–200)	(70–76)	(70–94)	(40–98)	(45–83)	98 (90–108)
Posterior end		117 (55–190)	81 (45–100)	193 (170–250)					79 (54–90)
Pharynx									
Length	(37–39)	49 (38–68)	40 (33–50)	94 (70–112)			(19–27)		33 (31.5–43)
Width	(34–39)	47 (35–68)	45 (38–50)	104 (85–120)	(17–19)	(20–30) Anterior (30–40) Posterior	(15–20) Anterior (20–30) Posterior	(19–22)	37 (34–45)
Haptor									
Length	(275–279)	64 (40–93)	76 (50–100)	125 (120–130)	(50–55)	(50–60)	(42–72)		68.5 (58.5–94.5)
Width	(302–305)	70 (45–112)	75 (50–100)	143 (110–175)	(50–56)	(50–80)	(42–64)		66.5 (54–90)
Anchor									
Length	(161–164)	36 (29–41)	42 (40–43)	74 (73–75)	(59–61)	(40–50)		(55–60)	62 (58.5–63)
Main Part (Shaft)	(164–165)	38 (28–40)	32 (28–33)		(32–40)		(48–61)		59.5 (56–61)
Superficial root		15 (13–20)	14 (13–15)	27 (23–30)	(21–24)				21 (20–22.5)
Base	(8–9)	10 (8–11)	10	16 (15–17)		(8–10)	(7–9)		9.5 (9–11)
Point	(52–53)	14 (12–17)	19 (18–20)	37 (35–40)	(21–25)	(20–30)	(18–21)		21 (18–24)

Table I. *(Contd.).*

	G. neonephrotus malmbergi	*G. raipurensis*	*G. gussevi*	*G. mizellei*	*G. recurvensis*	*G. eutheraponsis*	*G.hyderabadensis*	*G. elegans indicus*	*G. presidencyus n. sp.*
Host Species	*Heteropneustes fossilis*	*Channa gachua & C. punctatus*	*Heteropneustes fossilis*	*Mystus vittatus*	*Aplocheilus panchax & A. blochi*	*Eutherapon therops*	*Channa sp.*	*Labeo rohita, Cirrhinus mrigala, & C. reba*	*Channa punctaus*
Described by	Singh, H. S. & Agrawal, S. (1994)	Dubey, A., Gupta, A. K. & Agarwal, S. M. (1990)			Rukmini, C. & Madhavi, R. (1989)	Venkatanarsaiah, J. & Kulkarni, T. (1980)	Venkatanarsaiah, J. (1979)	Tripathi, Y. R. (1957)	Present Authors
Deep bar (Dorsal bar)									
Length	(21–24)	16 (13–20)	8 (8–10)	12.5 (12–13)	(13–19)	(16–20)	(10–20)		21 (20–22.5)
Width	(1–3)	4 (3–6)			(8–9.6)	(1–2)	1		6.75
Superficial bar (Ventral bar)									
Length	(20–22)	34 (30–43)	14 (13–15)	26 (24–28)	(13–16)	(20–21)	(18–26)	19	24 (22.5–25)
Width		18 (12–25)	12 (10–13)	19 (15–22)	(3–3.2)	(5–6)	(3–6)		19 (18–20)
Marginal hook									
Hook length	(37–39)	16 (14–18)	20 (18–23)		(21–25)			(22–30)	24 (22.5–27)
Hooklet length	(9–11)	6 (5–8)	5	5 (4–5)	(6–8)	(5–6)	(6–8)		5 (4.5–6)
Shank (Handle)	(28–29)	10 (8–13)		24 (22–25)	(13–21)	(20–22)	(13–20)		15 (17–18)
Lamella (Filament)	(13–14)	10 (8–10)	15 (13–18)	15 (13–16)	(3–4)	(7–8)	11		—
Ovary									
Length	(71–72)	29 (22.5–40)	28 (25–33)		(20–24)	(20–24)	27		38 (36–45)
Width	(52–53)	26 (17.5–43)	23 (15–33)		(36–38)	(30–40)	12		30.5 (27–36)
Testis									
Length	(49–51)	47 (38–55)	33 (28–38)			(30–40)	27		16.5 (16–18)
Width	(22–25)	33 (25–45)	18			(40–50)	13		22 (20–22.5)
Cirrus									
Length		16 (13–28)	12.5						16.5 (16–18)
Width	(22–24)	16 (13–23)	12.5	15		(20–21)	8		14 (13.5–16)

Blank spaces indicate non availability of the data.

However, if body length, width etc. are considered, *G. raipurensis* shows close resemblance with the newly described one. Moreover, the measurements of key specific characters such as the haptoral armaments, the deep bar, superficial bar, marginal hooks etc. are quite distinct in the present species in comparison to the others.

Comparison between the measurement of different body parts of *G. gussevi* and *G. elegans indicus* with our described one shows vast differences. Both this two species are smaller in size than the newly described one.

The newly described species when compared with *G. neonephrotus malmbergi* shows a marked difference in 'hardparts' All parts are larger in dimension. Even, Singh and Agrawal (1994) draw and described this species by mentioning 14 hooklets in the haptor (!) which is typical generic character in Dactylogyrids (Cone, 1995). Considering its viviparous nature its position in the Gyrodactylidae family might be right but the generic characters requires attention to compare with other described ones.

Considering the comparison of measurements in 'hard parts' and other morphological criteria (there are two unique characters, a deep groove runs along the length in the main part of anchors and marginal hooks without sickle filament loop or lamella.) between the described species of *Gyrodactylus* and the present one, a new name *Gyrodactylus presidencyus* sp. nov. has been proposed for the present parsite infecting *Channa punctatus* from West Bengal, India. The species has been coined after the name of the historic Presidency College, Kolkata where the work has been carried out.

SUMMARY

A new species of Monogenean trematode under the genus *Gyrodactylus* from the teleostean host *Channa punctatus* (Bloch) is described and illustrated. The other known species from India along with the present one has been critically reviewed and compared in a comparative chart. The new species has been described for the first time from West Bengal, India.

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