A taxonomic revision of some previously described species of monogenoideans found on Indian Siluriform fishes

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Abstract A Taxonomic revision of *Bychowskyella bagariusi* Sharma, 1983 and *Bychowskyella singhi* Rajeshwari & Kulkarni, 1983 Jain, 1952 found on Indian Siluriform fishes is being done in the present work. These species were considered as *species inquirenda* or *nomen nudum*, (Lim et al. Syst Parasitol 50:159–197, 2001) and thus, their taxonomical clarification was required. Among them, *B. bagariusi* Sharma, 1983 from *Bagarius bagarius* (Hamilton) is considered as valid and *B. singhi* Rajeshwari & Kulkarni, 1983 from *Wallago attu* (Bloch & Schneider), belongs to the genus *Thaparocleidus* Jain, 1952.

Keywords *Bychowskyella* · Status · *Wallago attu* · Misidentification · Revision

Introduction

The genus *Bychowskyella* Achmerov (1952) (syns: *Silonditrema* Tripathi; *Sprostonia* Jain; *Neosprostonia* Jain; *Clariotrema* Long; *Neobychowskyella* Ma, Wang & Li) was established by Achmerov (1952) with *Bychowskyella pseudobagri* Achmerov, 1952 as its type species from bagrid fishes of the Amur-Chinese region of China. To date, this genus comprises 32 species, reported from South East Asia, parasitizing 28 catfish species of 15 genera (Lim et al. 2001). Among these, 22 species have been reported from

India; infesting cat-fishes of the families: Clariidae, Siluridae & Sisoridae of the order Siluriformes.

During the present investigation on monogenoidean parasites of Indian Siluriform fishes, it was understood that diagnosis of some previously described species of *Bychowskyella* is incomplete, as it is primarily based on illustration of hard parts alone. Some were misidentified at generic and specific level based on minor morphological variations, demanding further examination of type specimens. Also, in almost all the cases, the type-material was either in poor condition or not available. In addition, (Lim et al. 2001), in their exhaustive review of monogenoidean parasites of siluriform fishes from Old World, considered only 17 Indian species of *Bychowskyella* as valid and five species either *species inquirenda* or *nomen nudum* (Table 1). This paper reviews the taxonomy of Indian species of *Bychowskyella*. The genus *Bychowskyella* is characterized by the presence of three pairs of hooks with dilated proximal handles (henceforth referred to as large hooks) others of larval types (henceforth referred to as small hooks) and two additional rodlike sclerites one on either side of dorsal anchors; two dorsal anchors without roots, stout base, long shaft, long recurved patches; two ventral anchors without roots, with stout base, dorsal connective bar almost straight, fenestrated in middle and, ventral bar paired (Lim et al. 2001).

Materials and methods

The host fishes were collected from Gomti River, Lucknow and adjoining areas. The worms, collected from gills, were studied mostly live under a phase contrast microscope or after being fixed in 3 % formalin diluted with lukewarm water. The methods of staining, mounting, and illustrating

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Table 1 List of Indian species of the genus *Bychowskyella* (Lim et al. 2001)

Indian species of the genus <i>Bychowskyella</i>	Status	Hosts
<i>B. asiatica</i> (Jain, 1959) Gusev, 1961	Valid	<i>Ompok pabda</i> (Ham. 1822)
<i>B. wallagonia</i> (Jain, 1959) Gusev, 1961	Valid	<i>Wallago attu</i> (Bl. & Sch., 1801)
<i>B. gomtia</i> (Jain, 1959) Gusev, 1961	Valid	<i>Eutropiichthys vacha</i> (Ham. 1822)
<i>B. indica</i> (Jain, 1959) Gusev 1961	Valid	<i>Eutropiichthys vacha</i> (Ham. 1822)
Syn: <i>B. garuai</i> (Agrawal & Singh, 1982) Agrawal & Sharma, 1990		<i>Clupisoma garua</i> (Ham. 1822)
<i>B. gharui</i> (Tripathi, 1959) Gusev, 1961	Valid	<i>Lupisoma garua</i> (Ham. 1822)
Syn: <i>B. gussevi</i> Majumdar & Agarwal, 1989		<i>Clupisoma garua</i> (Ham. 1822)
<i>B. vacha</i> (Tripathi, 1959) Gusev, 1961	Valid	<i>E. vacha</i> (Ham. 1822)
Syn: <i>B. lucknowensis</i> Agrawal & Sharma, 1990	–	<i>E. vacha</i> (Ham. 1822)
<i>B. cauveryi</i> (Tripathi, 1959) Gusev, 1961	Valid	<i>Silonia silondia</i> (Ham. 1822)
<i>B. bychowskii</i> Gusev, 1977	Valid	<i>Pseudotropius takree</i>
<i>B. caballeri</i> Gusev, 1977	Valid	<i>C. garua</i> (Ham. 1822)
<i>B. chauhani</i> Venkatanarsaiah, 1989	Valid	<i>W. attu</i> (Bl. & Sch., 1801)
<i>B. raipurensis</i> Majumdar & Agarwal, 1989	Valid	<i>Rita-rita</i> (Ham. 1822)
<i>B. pricei</i> Majumdar & Agarwal, 1989	Valid	<i>C. garua</i> (Ham. 1822)
<i>B. fossilisi</i> Majumdar & Agarwal, 1989	Valid	<i>Heteropneustes fossilis</i> (Bloch, 1794)
<i>B. kanpurensis</i> Agrawal, Shukla & Vishwakarma, 1996	Valid	<i>Ompok bimaculatus</i> (Bloch, 1794)
<i>B. jaini</i> Agrawal, Shukla & Vishwakarma, 1996	Valid	<i>C. garua</i> (Ham. 1822)
<i>B. tchangii</i> Gusev, 1976	Valid	<i>Clarius batrachus</i>
<i>B. tripathii</i> Kumar & Agrawal, 1981 [originally mentioned as <i>Silonditrema tripathii</i> Kumar & Agrawal, 1977 nomen nudum]	Valid	<i>W. attu</i> (Bl. & Sch., 1801)
<i>B. bagariusi</i> Sharma, 1987	Sp.Inq.	<i>Bagarius bagarius</i> (Ham., 1822)
<i>B. singhi</i> Rajeshwari & Kulkarni, 1983	Sp.Inq.	<i>W. attu</i> (Bl. & Sch., 1801)
<i>Silonditrema kanpurensis</i> Gupta & Sachdeva, 1986	Sp.Inq.	<i>Mystus tengara</i> (Ham. 1822)
<i>Silonditrema ritai</i> Gupta, 1986	Sp.Inq.	<i>Rita-rita</i> (Ham. 1822)
<i>Neosprostonia garuai</i> Agrawal & Singh, 1982	Sp. Inq.	<i>C. garua</i> (Ham. 1822)

Fig. 1 *Bychowskyella bagariusi* Sharma, 1987 (ventral view)

the dactylogyrids were based on Kritsky et al. (1986). Measurements were taken using a calibrated micrometer, and are given in micrometers (μm) with the mean followed by the range and the number (n) of specimens measured in parentheses. Unstained, unflattened specimens were used to obtain the measurements of the internal organs (pharynx and gonads), the body and the haptor sclerites. Illustrations were prepared with the aid of a camera lucida attached to a phase-contrast microscope. Host name follows FishBase (Froese and Pauly 2007).

Voucher specimens were deposited in the ZSI, Kolkata.

Results

Class Monogenoidea Bychowsky, 1937

Order: Dactylogyridea Bychowsky, 1937

Fam: Dactylogyridae Bychowsky, 1933

Genus: *Bychowskyella* Achmerov, 1952

Species: *Bychowskyella bagariusi* Sharma, 1983 (Figs. 1, 2–8b)

Figs. 2–8b *Bychowskyella bagariusi* Sharma, 1987. **2** Dorsal anchor. **3** Patch. **4** Ventral anchor. **5** Ventral bar. **6** Dorsal bar. **7** Hooks. **8** Onchium. **8a** Sclerite. **8b** Copulatory complex

Previous host record and locality: Host: The Devil catfish or dwarf goonch, *Bagarius bagarius* (Hamilton) (Siluriformes: siluridae), Locality: River Yamuna, Etawah, U.P., India.

Infection site: Gills.

Present host record, additional locality & collection dates: *Host*: *Bagarius bagarius* (Hamilton), Locality: River Sharda,

Lakhimpur Khiri, India (27°5' 83–28°6'N; 80°34'–81°30'E)

River Gomti, Lucknow, India (26°45' 84–27°N; 80°50' 85–81°05'E)

Number of parasite specimens examined: 10

Specimens deposited: Voucher specimens W9370/1, W9376/1–W9378/1 in ZSI, Kolkata.

Redescription: Body length 370 (350–380; $n = 10$); maximum width 120 (110–125; $n = 10$) at mid-length of

body. Cephalic region well developed; four cephalic lobes. Two pairs of eye spots, posterior pair larger, accessory granules absent. Pharynx spherical, 22 (20–25; $n = 10$) in diameter; oesophagus short to non-existent.

Testis 30 (25–35; $n = 8$) long, 12 (10–14; $n = 8$) wide; vas deferens loops left intestinal caecum; two seminal vesicle, a sigmoid dilation of vas deferens, present. Two Prostatic reservoirs present. Copulatory complex consists of a copulatory tube, proximally articulating accessory piece. Copulatory tube sclerotised, 45 (40–47; $n = 10$) long. Accessory piece, divided into two pieces, 60 (55–65; $n = 10$) long. Ovary round to oval, long, intercaecal; oviduct, ootype, uterus not observed. Seminal receptacle, vaginal armament not observed. Vitellaria dense, throughout trunk, except in regions of reproductive organs.

Haptor 120 (110–125; $n = 10$) long, 140 (135–145; $n = 10$) wide. Dorsal anchor, inner length 60 (55–65;

Figs. 10–16 *Thaparocleidus indicus* (Kulkarni 1969) Lim, 1996. **10** Dorsal anchor. **11** Ventral anchor. **12** Dorsal bar. **13** Ventral bar. **14** Vagina. **15** Hooks. **16** Copulatory complex

workers). The present study revealed it to be a species of *Thaparocleidus* (as pointed out by Lim 2001) because the dorsal bar of *B. singhi*, lacked central fenestration (a generic feature of *Bychowskyella*); patches on dorsal anchors are long and recurved in *Bychowskyella*, while those of *B. singhi* are very small; 1st, 3rd and 4th hooks are with dilated proximal handles and 2nd, 6th, 5th and 7th are of larval type in *Bychowskyella* while in *B. singhi*, all hooks are of variable shapes and sizes (a character of the genus *Thaparocleidus*.) Present study has, therefore, revealed it to be *Thaparocleidus indicus* (Kulkarni 1969) Lim, 1996, owing to the ‘spicule-like’ copulatory complex, ‘V-shaped’ ventral bar, and ‘shaft-like’ dorsal connective bar.

Discussion

Misidentification and misinterpretation of monogenetic parasites often creates problems in their taxonomy leading to incorrect phylogenies. Owing to the confusion prevailing in

India regarding these parasites, where types have almost never been, properly deposited or made available to taxonomists, problems like this needs to be focused upon. Thus, for correct evolutionary studies, proper identification and authenticity of these parasites is of utmost importance. *Bychowskyella* species possesses three pairs of large hooks and four pairs of small hooks and two additional rod-like sclerites one on either side of dorsal anchors (Lim et al. 2001). Genus *Bychowskyella* Achmerov, 1952 has 17 valid species as listed by Lim 2001 in India. Based on present study, *B. bagariusi* is valid and *B. singhi* Rajeshwari & Kulkarni 1983 belongs to the genus *Thaparocleidus* Jain 1952.

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