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MONOGENEANS FROM *WALLAGO ATTU* (BLOCH & SCHNEIDER, 1802) OF THAILAND

L.H.S. Lim and **T. Lerssutthichawal**

ABSTRACT. - Three species of monogeneans, *Mizelleus siamensis*, new species, *Thaparocleidus indicus* (Kulkarni, 1969) Lim, 1996, and *Thaparocleidus kao*, new species, were found on *Wallago attu* in Thailand. *M. siamensis*, new species, differs from *Mizelleus indicus* Jain, 1957, in having a sclerotised vaginal tube and in lacking prominent spines on the dorsal patches. *M. siamensis*, new species, is further characterised by patches on the ventral anchors and two dactylogyrid-type seminal vesicles, similar to those found in *Bychowskyella* and *Quadriacanthus*. *Thaparocleidus kao*, new species, differs from other *Thaparocleidus* found on *W. attu* by having a short twisted vaginal tube and a coiled copulatory tube with a stick-like accessory piece which is expanded at the distal end.

INTRODUCTION

This is part of a study to document the monogeneans on freshwater siluriformes of Thailand. In this study, three species of monogeneans were found on the gills of *Wallago attu* obtained from four localities in Thailand (Table 1). Of the three species obtained, two are new and are described herein. According to Ng (1992), there are only three valid species for the genus *Wallago* Bleeker, 1851, viz., *Wallago attu, W. leerii* and *W. maculatus*.

Table 1: Distribution of *Mizelleus* and *Thaparocleidus* species on *Wallago attu* in Thailand.

Localities	*M. siamensis*	*T. kao*	*T. indicus*
Pitsanulok	43	25	0
Sukhothai	3	11	13
Tak	3	10	4
Ayuttaya	1	6	5
Total	50	52	22

L.H.S. Lim, T. Lerssutthichawal - Institute of Advanced Studies, University of Malaya, 59100 Kuala Lumpur, Malaysia.

MATERIALS AND METHODS

Wallago attu were obtained from four localities in Thailand: the Nan River [Menam Nan] in Pitsanulok, Northern Thailand, the Ping River, in Tak, the Yhoa River, in Sukhothai and the Chao Praya River, in Ayuttaya. The fishes were caught using long lines. The methods used to collect, prepare, preserve, study and measure the monogeneans were as outlined by Lim (1991). The measurements of the monogeneans are given to the nearest whole number in micrometers; averages are followed by the ranges in parentheses. In order to reduce redundancy in the descriptions, an amended diagnosis of *Mizelleus* is given first.

Holotypes and some paratypes are kept in the Zoological Reference Collection (ZRC), Department of Zoology, National University of Singapore; while other paratypes are kept at the Institute of Advanced Studies (IPT), University of Malaya, Kuala Lumpur and Aquatic Animal Health Research Institute (AAHRI), Bangkok, Thailand.

TAXONOMY

Two species of *Thaparocleidus* Jain, 1952 (one new species) and one new species of *Mizelleus* Jain, 1957 were obtained from *Wallago attu* in Thailand. [*Silurodiscoides* Gussev, 1976 is a junior subjective synonym of the senior valid name *Thaparocleidus* Jain, 1952 (see Lim, 1996)]. The presence of the two dactylogyrid-type of seminal vesicles and patches on the ventral anchors in the species of *Mizelleus* make it necessary to amend its generic diagnosis. Kritsky and Boeger (1989) reduced the family Ancyrocephalidae to a subfamily within the Dactylogyridae Bychowsky, 1933 (see also Boeger & Kritsky, 1993). We would like to place *Mizelleus* into the subfamily Ancyrocephalinae Bychowsky, 1937 along with *Bychowskyella* and *Quadriacanthus* (see Lim, 1991); and to retain *Thaparocleidus* in the subfamily Ancylodiscoidinae Gussev, 1961 (see Discussion).

SUBFAMILY ANCYROCEPHALINAE BYCHOWSKY, 1957

Mizelleus Jain, 1957

Emended diagnosis. - Ancyrocephalinae. Three pairs of head organs. Two pairs of eyespots with anterior pair smaller. Haptor armed with two pairs of anchors, two pairs of (dorsal and ventral) patches, two connective bars, 14 marginal hooks. Dorsal anchors with spines ('beak') on mainpart. Intestine bifurcate; caeca reuniting just posterior to testis. Vas deferens arises from anterior of testis in the dorsal region, to loop round left intestinal ceacum, onto ventral region, ascending, distending twice to form distal seminal vesicle and smaller proximal seminal vesicle, narrowing to form ductus ejaculatorius prior to entering initial part of copulatory tube. Copulatory organ consists of tube and accessory piece. Vaginal opening dextral. Ovary anterior to testis.

Type species: *Mizelleus indicus* Jain, 1957

Type host species: *Wallago attu* (Bloch & Schneider, 1802)

Type locality: Lucknow, India

***Mizelleus siamensis*, new species**
(Figs. 1, 2)

Type-host: *Wallago attu* (Bloch & Schneider, 1802)

Localities (no. of fish examined): River Nan (Menam Nan), Pitsanulok, Northern Thailand (type locality) (1); Ping River, Tak (1); Yhom River, Sukhothai (1); Chao Praya River, Ayuttaya (1)

No. of specimens collected and studied: 50

No. of specimens measured: 15

No. of host sampled (% prevalence): 4 (100%)

Host specimens: Nakornsithammarat Campus, Rajamangala Insitute of Technology.

Type-specimens: Holotype and paratype in ZRC. Paratypes in IPT and AAHRI

Description. - With the characters of the genus. Body size 1047(672-1260) x 169(134-210). Haptor triangular, length 155(126-210), greatest width 329(252-378). Dorsal anchors: without roots, total length 94(86-100), mainpart with beak-like spine, gently curving point 29(26-30); two dorsal patches of *Mizelleus*-type. Ventral anchors: without roots, total length 35(32-36), gently curving point 23(20-24). Two small ventral patches. Dorsal bar: size 14(10-16) x 62(56-70), fenestrated, protuberances at each end for articulation with spine on dorsal anchor. Ventral bar: v-shape, thining at mid-region, size of one side 6(6-8) x 82(76-90). 14 hooks: one pair larval-type, length 16(15-17), near ventral anchors; other 4 pairs have handles: 1 pair long, 29(28-30); 1 pair medium, 24(24-26); 4 pairs small, 18(18-20), along lateral edges of haptor, of which 3 pairs have protrusions on handles. Vaginal tube, length 18(12-24). Copulatory tube tapering distally, length 49(40-52); proximal region of accessory piece shield-like with a bifurcated piece, ending distally as a process, length 56(40-60). Two glands entering initial part of copulatory organ separately.

Etymology. - This species is named after Siam.

Remarks. - The present species is similar to *Mizelleus indicus* Jain, 1957 as described by Gussev (1976) except that *M. indicus* has a non-sclerotised vaginal tube, lacks patches on the ventral anchors and lacks protrusions on the handles of the small marginal hooks (Fig. 2). It is possible that the latter two characteristics are not present in *M. indicus*. But the absence of these two characteristics could be apparent in that these structures were not noticed by Gussev (1976) and Jain (1957). Aside from these differences *M. siamensis,* new species does not have a prominent spine on the dorsal patches as depicted by Jain (1957) and Gussev (1976) for *M. indicus*. A few specimens in the present collection have such spines although not as sharp as those found in *M. indicus*. The copulatory organ of the present species and *M. indicus* (see Gussev, 1976) are only slightly different, although Jain (1957) noted the shield-like structure (which he referred to as a 'bag-like' structure) on the proximal part of the accessory piece.

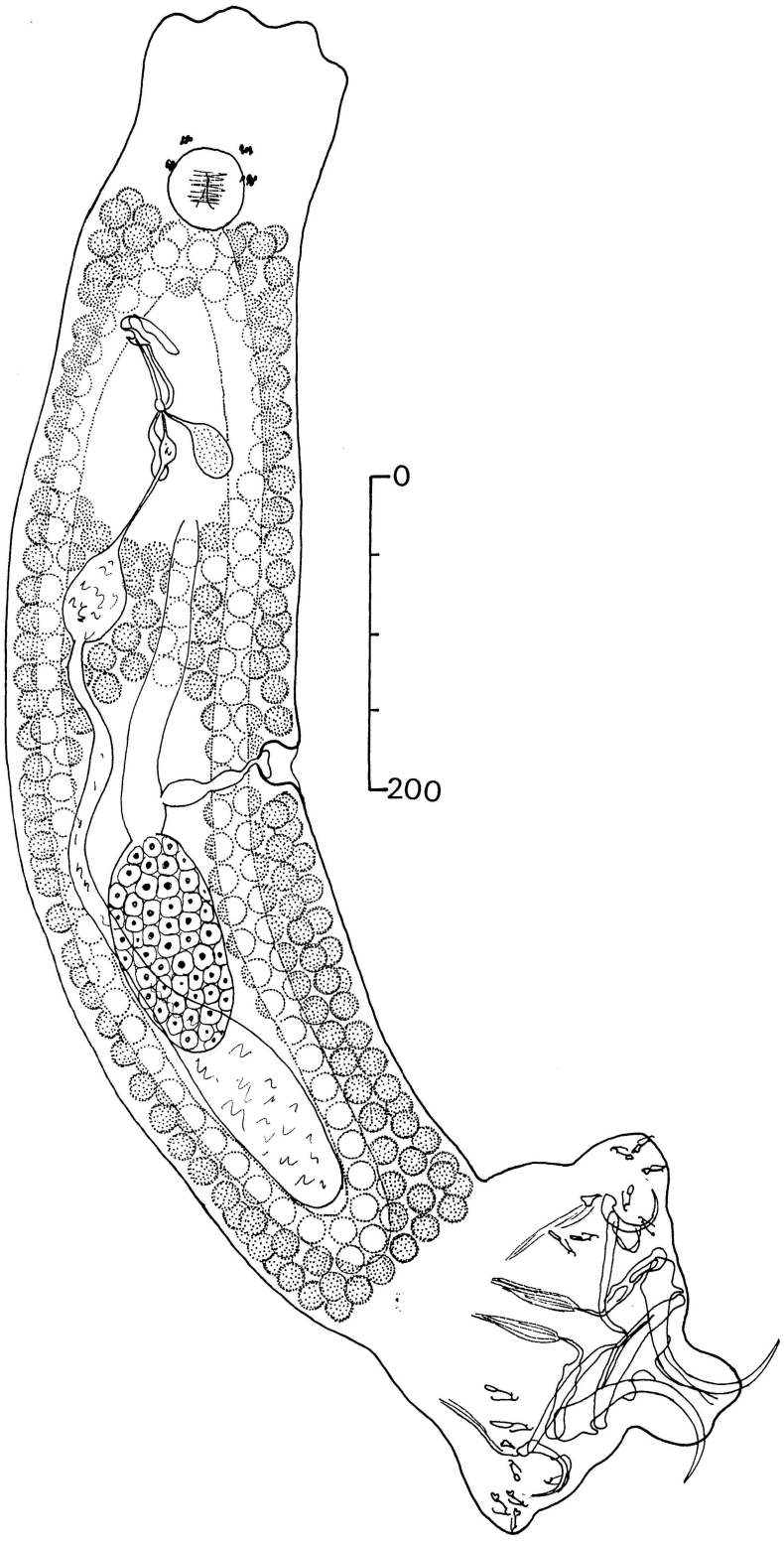

Fig. 1: Composite illustration of *Mizelleus siamensis*, new species (dorsal view) (scale in μm.)

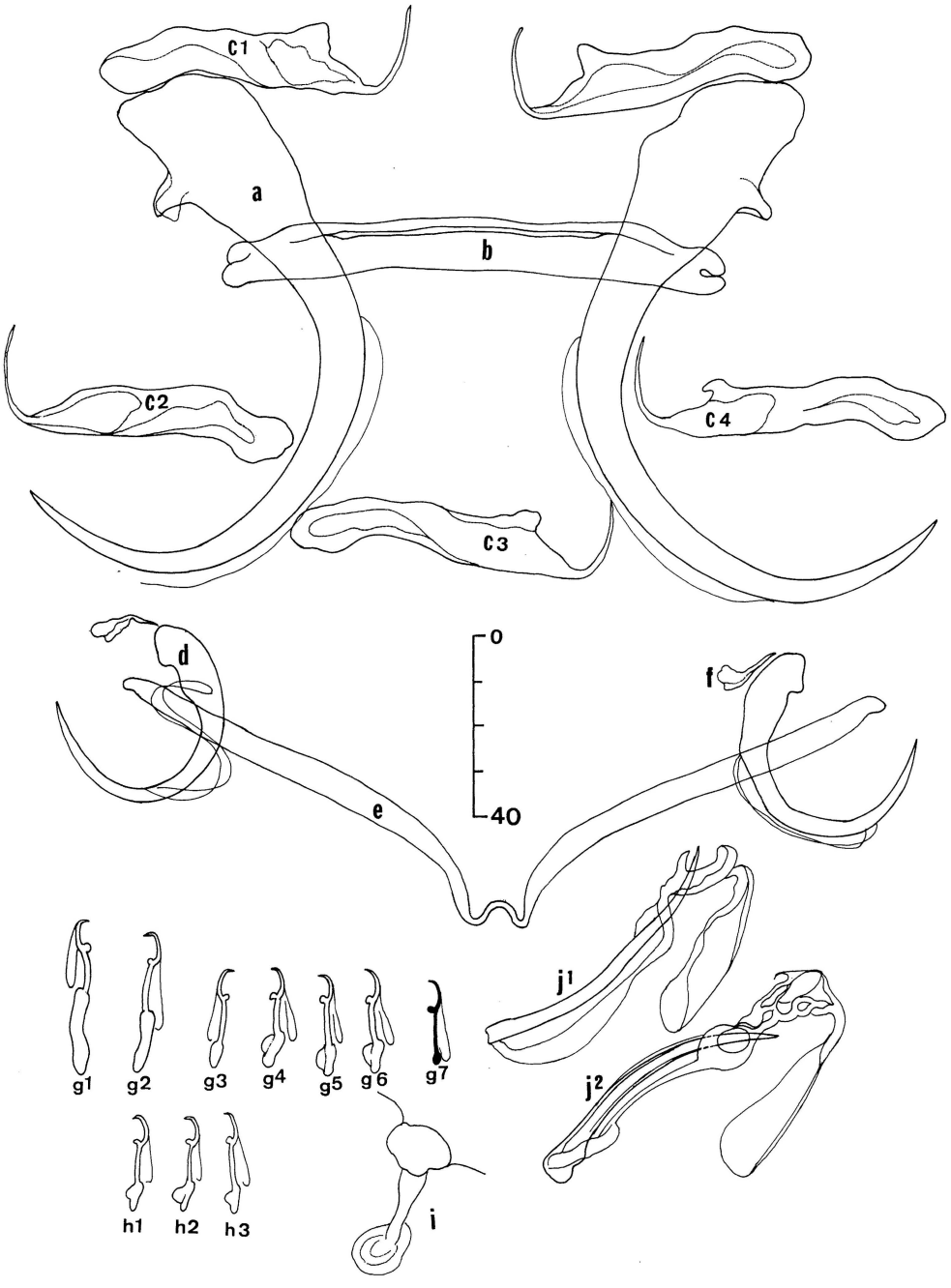

Fig. 2: Hard sclerotised parts of *Mizelleus siamensis*, new species. A= dorsal anchor; B= dorsal bar; C1, C2, C3, C4= different views of dorsal patch; D= ventral anchor; E= ventral bar; F= ventral patch; G1, G2, G3, G4, G5, G6, G7= different hooks; H1, H2, H3= variations of lateral hooks with protrusions; I= vaginal system; J1, J2=different views of copulatory organ (scale in µm.)

SUBFAMILY ANCYLODISCOIDINAE GUSSEV, 1961

***Thaparocleidus indicus* (Kulkarni, 1969) Lim, 1996**
(Fig. 3)

Host: *Wallago attu* (Bloch & Schneider, 1802)

Localities (No. of fish examined): River Nan (Menam Nan), Pitsanulok Northern Thailand (1 fish); Yhom Ping River, Tak (1); Yhom River, Sukhothai (1); Chao Praya River, Ayuttaya (1)

No. of specimens collected and studied: 22

No. of specimens measured: 10

Host specimens: Nakornsithammarat Campus, Rajamangala Insitute of Technology.

Type-specimens: Types in ZRC. Paratypes in author's collection.

Description. - Body size (860-1400) x 171(150-190). Haptor demarcated from body size: 217(150-260) x 255 (160-300). Dorsal anchor: inner length 50(48-50), outer length 39(36-40), inner root 15(13-18), stumpy outer root, recurved point 28(25-30). Patches trapezoid, size 9(8-13) x 5. Ventral anchors: inner length 32(30-38), outer length 37(35-40), inner root 9(6-13), outer root 12(10-15), recurved point 18(15-20). Dorsal bar broad, size 5(5-6) x 39(38-43). Ventral bar, v-shape size 3(3-4) x 24(21-28). 14 marginal hooks, total length 17(16-17). Vaginal opening, round sclerotised, with short tube. Copulatory tube 36(30-40), accessory piece long 49(45-53). Soft parts as given in Gussev (1976).

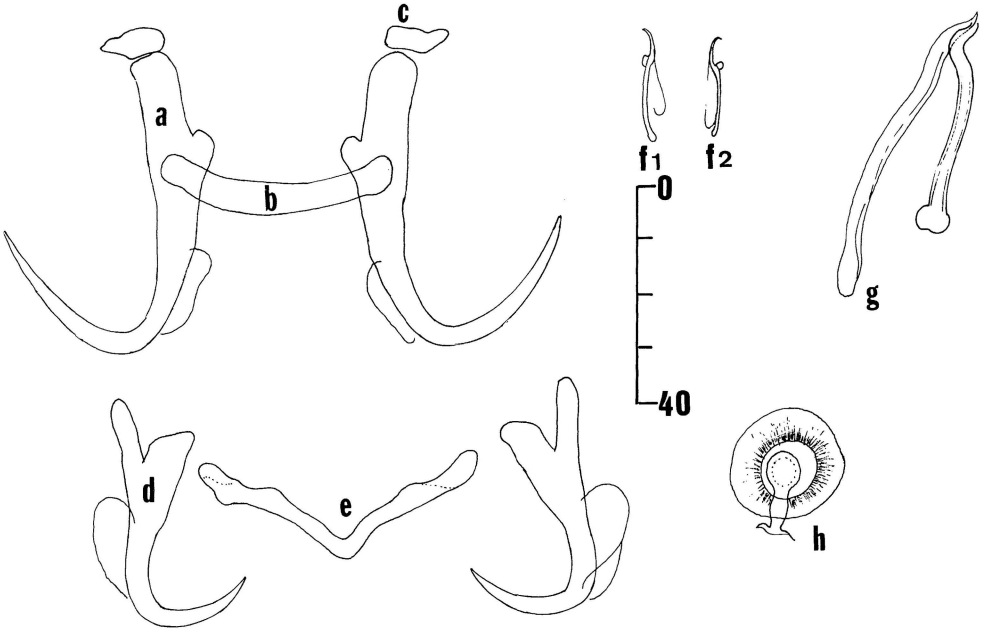

Fig. 3: Hard sclerotised parts of *Thaparocleidus indicus* (Kulkarni, 1969) Lim, 1996. A= dorsal anchor; B= dorsal bar; C= dorsal patch; D= ventral anchor; E= ventral bar; F1, F2= hooks; G= copulatory organ; H= vaginal system (scale in μm.)

Table 2: *Thaparocleidus indicus* (Kulkarni, 1969) Lim, 1996

	Kulkarni (1969)	Gussev (1976)	present data
No. measured	-	3	10
Hook length	(13-20)	14	17(16-17)
Dorsal anchor			
inner length	53	43-45	50(48-50)
outer length	-	-	39(36-40)
inner root	16	12	15(13-18)
outer root	-	2	
point	28	29-30	28(25-30)
Ventral anchor			
inner length	-	-	32(30-38)
outer length	42	45-46	37(35-40)
inner root	8	8	9(6-13)
outer root	14	15	12(10-15)
point	16	17-19	18(15-20)

Remarks. - This species is identified as *Thaparocleidus indicus* (Kulkarni, 1969) Lim, 1996, based on the morphology of the ventral anchors (where the outer roots are noticeably longer than the inner roots) and of the copulatory organ. The round sclerotised vaginal openings in the present specimens are different from those in the 3 specimens observed by Gussev (1976). The vaginal system is located almost at body midline displaced slightly to the left. The morphmetric data of *T. indicus* from the present study falls within the ranges of those from Kulkarni (1969) and Gussev (1976) (Table 2).

Thaparocleidus kao, new species
(Fig. 4)

Type-host: *Wallago attu* (Bloch & Schneider, 1802)

Localities (no. of fish examined): River Nan (Menam Nan), Pitsanulok Northern Thailand (type locality) (1); Ping River, Tak (1); Yhom River, Sukhothai (1); Chao Praya River, Ayuttaya (1)

No. of specimens collected and studied: 25

No. of specimens measured: 13

No. of host sampled (% prevalence): 4 (100%)

Host specimens: Nakornsithammarat Campus, Rajamangala Insitute of Technology.

Type-specimens: Holotype and paratypes in ZRC, and in author's collection.

Description. - Body size 711(546-966) x 143(118-185). Haptor size 101(67-159) x 149(100-294). Dorsal anchors: inner length 50(48-52); inner root 13(10-16); outer length 41(38-44); recurving point 28(26-30). Two dorsal patches, 12(10-14) x 6(4-8). Ventral

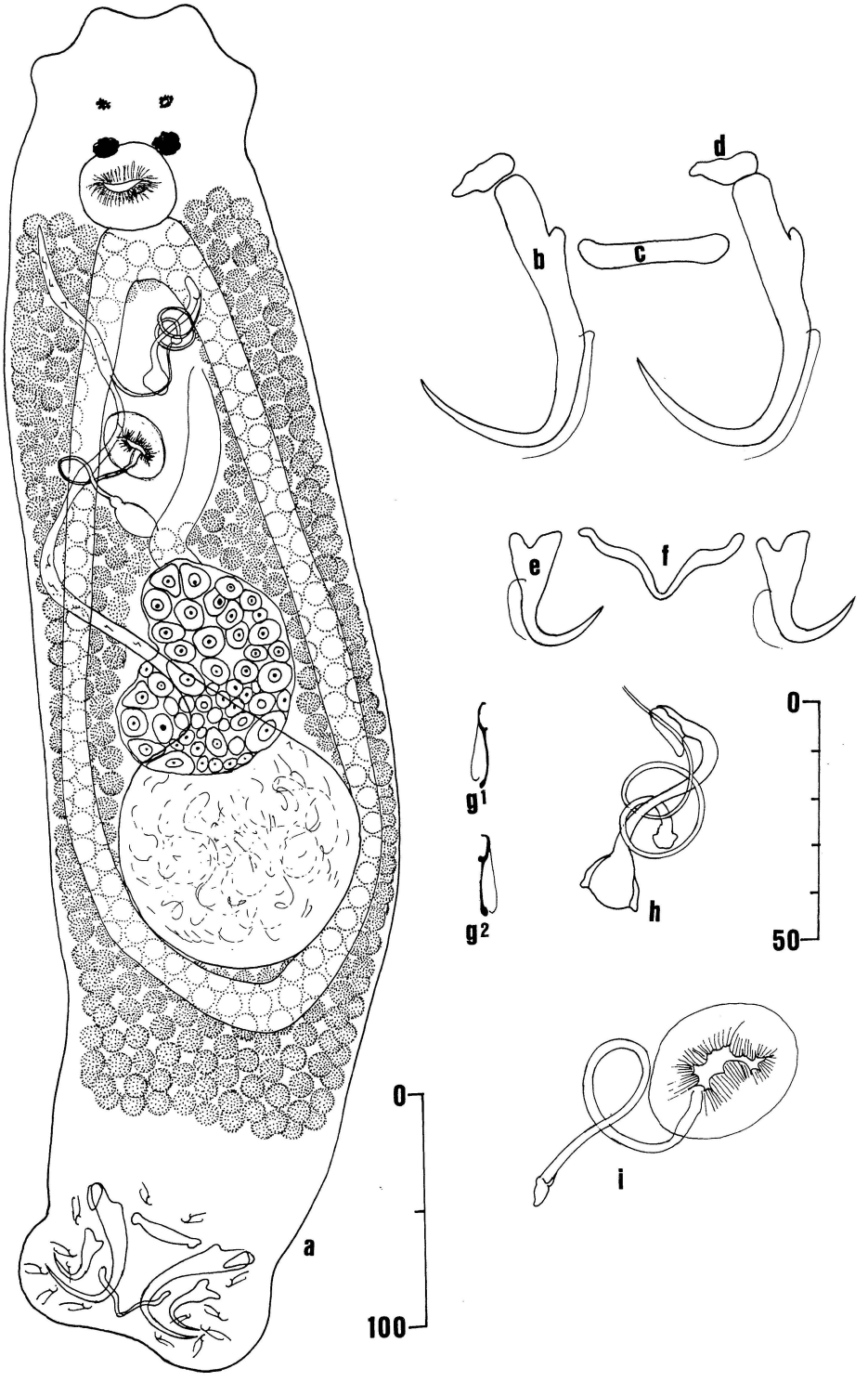

Fig. 4: *Thaparocleidus kao*, new species. A= Composite illustration of *T. kao*, new species (dorsal view). B= dorsal anchor; C= dorsal bar; D= dorsal patch; E= ventral anchor; F= ventral bar; G1, G2= hooks; H= copulatory organ; I= vaginal system (scales in µm.)

anchors: inner length 22(22-24); inner root 6(4-8); outer length 22(22-24); stumpy outer root, recurved point 14(14-16). Dorsal bar: 29(26-30) x 4(3-6). Ventral bar: v-shape bar, thinly connected at mid-length, length of one side 19(18-20). 14 hooks, larval-type, 1 pair near ventral anchors, 14(14-16); 6 pairs, 16(14-17). Vaginal opening sclerotised, almost midregion slightly to left side, short twisted vaginal tube, lightly sclerotised. Seminal vesicle a thin elongate blind sac. Copulatory tube coiled with small initial part. Accessory piece stick-like with expanded distal end length 41(36-46). Two glands entering initial part of copulatory organ separately.

Etymology. - Specific name *kao* refers to the native name of *W. attu*, *kao kau* [*kao* = *Wallago*]

Remarks. - The present species is similar to *Thaparocleidus wallagonius* Jain, 1952 (see Lim, 1996) found on Indian *W. attu* in having coiled copulatory tube with a simple stick-like accessory piece and a coiled vaginal tube. However, in the present species the vaginal tube does not have as many coils as the vaginal tube of *T. wallagonius*. The present species is also different from *T. wallagonius* in having a less coiled copulatory tube, a longer accessory piece with expanded distal end and the proximal end not forked (as in *T. wallagonius*). The present species is also different from *T. gomtius* (Jain, 1952) Lim, 1996, because the copulatory tube and vaginal tube are not coiled in the latter. *T. kao*, new species is different from *T. sudhakari* (Gussev, 1976) Lim, 1996 in the morphology of the copulatory tube, accessory piece, and the vaginal tube.

DISCUSSION

Two *Thaparocleidus* species (*T. indicus* and *T. kao,* new species) and one *Mizelleus* species (*M. siamensis,* new species) were collected from *W. attu* in Thailand. The vaginal opening of *T. indicus* and *T. kao*, new species, from the Thai *W. attu* are situated at body length slightly displaced to the left side and in the anterior half of the worm. The same is observed for *T. indicus* and *T. sudhakari* collected from *W. attu* of India (see Gussev, 1976).

To date, a total of 24 species of monogeneans from 13 genera have been recorded from Indian *W. attu* (Table 3). The present two new species increases the number of species described from *Wallago attu* to 26. Many of these species and genera have already been synonymised although there are disputes about the validity of some of these synonymised genera. *Wallagotrema* Tripathi, 1957 was considered a synonynm of *Silurodiscoides* by Gussev (1976) and of *Mizelleus* by Ventakanrasaiah & Kulkarni (1981). To resolve this issue, the type specimens of *Wallagotrema* species should be re-examined for the morphology of their seminal vesicle(s). The seminal vesicle of *Silurodiscoides* (a junior subjective synonym of *Thaparocleidus*: see Lim, 1996) is blind and sac-like; whilst in *Mizelleus* there are two seminal vesicles of the dactylogyrid type.

The existence of some genera (Table 3) could be due to misidentifications of the monogeneans or of the host species. *Hamatopeduncularia* and *Neocalceostoma* are thus far found on only the ariids (Kearn & Whittington, 1994; Lim, 1995, 1996; Lim, 1996). *Heteronchocleidus* are usually parasites of anabantoids (see Lim, 1986); and *Dactylogyrus* are monogeneans of cyprinids, with a few exceptions (Gussev, 1976; Lim, 1987). So far, there is only one valid species of *Dactylogyrus* from a catfish: *D. cranoglanis* Gussev, 1966 collected from catfish from China (Gussev, 1976). *Urocleidus ramalingami* Pandey & Mehta,

Table 3: Monogeneans recorded from *Wallago attu* in India and Thailand

Species	Synonyms	References
Ancylodiscoides Yamaguti, 1937:		
A. indicus Kulkarni, 1969	*S. indicus* (Kulkarni, 1969) Gussev, 1976	Kulkarni, 1969 Gussev, 1976
	Parancylodiscoides indicus (Kulkarni, 1969) Dubey, Gupta & Agarwal, 1992	Dubey, Gupta & Agarwal, 1992
	T. indicus (Kulkarni, 1969) Lim & Gusev, 1996	Lim, 1996
Bychowskyella Achmerov, 1952:		
B. singhi Rajeswari & Kulkarni, 1983		Rajeswari & Kulkarni, 1983
Dactylogyrus Diesing, 1850:		
D. kontii Tripathi, 1959	*S. kontii* (Tripathi, 1959) Gussev, 1976	Tripathi, 1959 Gussev, 1976
	T. kontii (Tripathi, 1959) Lim, 1996	Lim, 1996
Hamatopeduncularia Yamaguti, 1953:		
H. lucknowensis Agrawal & Sharma, 1988		Agrawal & Sharma, 1988
H. yongendrai Pandey & Mehta, 1986		Pandey & Mehta, 1986
Haplocleidus Mueller, 1937:		
H. gomtius Jain, 1952	*S. gomtius* (Jain, 1952) Gussev, 1976	Jain, 1952a Gussev, 1976
	T. gomtius (Jain, 1952) Lim, 1996	Lim, 1996
Heteronchocleidus Bychowsky, 1957:		
H. athari Pandey & Mehta, 1986		Pandey & Mehta, 1986
Mizelleus Jain, 1957:		
M. chauhani Agrawal & Sharma, 1989		Agrawal & Sharma, 1989
M. hindanensis Tewari & Agrawal, 1986		Tewari & Agrawal, 1986
M. indicus Jain, 1957	*M. linorchis* Kulkarni, 1969	Jain, 1957; Kulkarni, 1969; Gussev, 1976
M. lucknowensis Agrawal & Sharma, 1986		Agrawal & Sharma, 1986
M. siamensis new species		present data
M. wallagonius Singh, Kumari & Agrawal, 1992		Singh, Kumari & Agrawal, 1992
Neocalceostoma Tripathi, 1957:		
N. chauhani Pandey & Mehta, 1986		Pandey & Mehta, 1986

Species	Synonyms	References
Silurodiscoides Gussev, 1976:	*Thaparocleidus* Jain, 1952	Gussev, 1976; Lim, 1996
S. dayali Pandey & Agarwal, 1988	*T. dayali* (Pandey & Agarwal, 1988) Lim, 1996	Pandey & Agarwal, 1988 Lim, 1996
S. sudhakari Gussev, 1976	*T. sudhakari* (Gussev, 1976) Lim, 1996	Gussev, 1976 Lim, 1996
Thaparocleidus Jain, 1952:	*Silurodiscoides* Gussev, 1976	Gussev, 1976; Lim, 1996
T. jaini Agrawal, 1981		Agrawal, 1981
T. guptai Pandey & Mehta, 1986		Pandey & Mehta, 1986
T. kao new species		present data
T. saharanpurensis Pandey & Agrawal, 1990		Pandey & Agrawal, 1990.
T. sharmae Lim, 1996	*Wallagotrema indicus* Singh Singh & Sharma, 1992	Singh & Sharma, 1992 Lim, 1996
T. sohani Pandey & Mehta, 1986		Pandey & Mehta, 1986
T. surendrai Pandey & Agrawal, 1990		Pandey & Agrawal, 1990
T. wallagonius Jain, 1952	*S. wallagonius* (Jain, 1952) Gussev, 1976	Jain, 1952b Gussev, 1976; Lim, 1996
	Thaparocleidus isostylus Kulkarni, 1969	Kulkarni, 1969b; Gussev, 1976
	Parancylodiscoides wallagonius Dubey, (Jain, 1952) Dubey, Gupta & Agarwal, 1992	Gupta & Agarwal, 1992
T. yogendrai Agrawal, 1981		Agrawal, 1981
Wallagotrema Tripathi, 1959:	*Silurodiscoides* Gussev, 1976	Gussev, 1976
	Thaparocleidus Jain, 1952	see Lim, 1996
W. longicirrus Tripathi, 1959	*S. longicirrus* (Tripathi, 1959) Gussev, 1976	Tripathi, 1959 Gussev, 1976
	T. longicirrus (Tripathi, 1959) Lim, 1996	Lim, 1996
W. chauhani Agrawal & Pandey, 1981	*T. chauhani* (Agrawal & Pandey, 1981) Lim, 1996	Agrawal & Pandey, 1981 Lim, 1996
Urocleidus Mueller, 1934:		
U. ramalingami Pandey & Mehta, 1986		Pandey & Mehta, 1986
Parancylodiscoides Achmerow, 1964:	*Thaparocleidus* Jain, 1952	Achmerow, 1964; Lim, 1996
	Silurodiscoides Gussev, 1976	Gussev, 1976; Lim, 1996
P. gussevi Dubey, Gupta & Agarwal, 1992	*T. gussevi* (Dubey, Gupta & Agarwal, 1992) Lim, 1996	Dubey, Gupta & Agarwal, 1992 Lim, 1996

1986, should also be re-examined since the presence of *Urocleidus* (a monogenean of North American fishes) is unlikely on an old world catfish. There should be a concerted effort by Indian scientists to resolve the identities of the monogeneans found on Indian *W. attu*. Until this is done, it is not possible to ascertain the actual number of species and genera of monogeneans found on the *W. attu*. It is probable that there are only two genera, *Mizelleus* and *Thaparocleidus*, on *W. attu* in India as in Thailand.

The presence of spines/beaks on the mainpart of the dorsal anchors and patches on the ventral anchors neccessitated the amendment of the generic diagnosis of *Mizelleus*. The beaks on the main part of the anchors found on *Mizelleus* species could also be found in *Chauhanellus* Bychowsky & Nagibina, 1969 (see Lim, 1994).

Currently there are seven recorded *Mizelleus* species (see Table 3). *Mizelleus postorchoidis* Kulkarni, 1969 from *Mystus aor* was transferred to *Silurodiscoides* by Gussev (1976) and to *Thaparocleidus* by Lim (1996) [since *Mizelleus ramalingami* Agrawal & Sharma, 1988 is from *Clupiosoma garua* it will not be discussed in this paper]. *M. linorchis* Kulkarni, 1969 was considered a junior synonym of *M. indicus* by Gussev (1976). It is necessary to re-examine *M. lucknowensis* Agrawal & Sharma, 1986, *M. wallagonius* Singh, Kumari & Agrawal, 1992, *M. chauhani* Agrawal & Sharma, 1989, and *M. hindanensis* Tewari & Agrawal, 1986, for synonyms. It is difficult to ascertain the validity of these species without thorough examinations of the type specimens and attempts to obtain type specimens from India were unsuccessful. It will be no surprise if future studies should reveal that there is only one valid *Mizelleus* species.

Mizelleus as exemplified by *M. siamensis*, new species has two dactylogyrid-type seminal vesicles, similar to those found in *Bychowskyella* and *Quadriacanthus* (see Lim, 1991). The anchors of *Mizelleus* are similar to that of *Bychowskyella*. *Bychowskyella* differs from *Mizelleus* in lacking a pair of ventral patches and in having ventral bar in two parts. Although both *Mizelleus* and *Quadriacanthus* have a pair of ventral patches, *Quadriacanthus* differs from *Mizelleus* in the morphologies of the dorsal and ventral bars. The presence of two dactylogyrid-type seminal vesicles, the morphology of the anchors and their presence on freshwater siluriforms suggest that *Mizelleus*, *Bychowskeylla* and *Quadriacanthus* are closely related.

Mizelleus was included in the subfamily Ancylodiscoidinae Gussev, 1961 by Gussev (1976) but the presence of the two dactylogyrid-type seminal vesicles in *Mizelleus*, as well as in *Bychowskyella* and *Quadriacanthus* suggest that this placement should be reconsidered or at least the significance of the seminal vesicles should be elucidated. *Mizelleus* is placed within the subfamily Ancyrocephalinae until more studies could be done.

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