

# MONOGENEANS FROM PANGASIIDAE (SILURIFORMES) IN SOUTHEAST ASIA: III. FIVE NEW SPECIES OF *THAPAROCLEIDUS* JAIN, 1952 (ANCYLODISCOIDIDAE) FROM *PANGASIUS BOCOURTI*, *P. DJAMBAL* AND *P. HYPOPHthalmus*

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## Summary:

The examination of gill parasites from *Pangasius bocourti* Sauvage, 1880; *P. djambal* Bleeker, 1846; *P. hypophthalmus* (Sauvage, 1878) and *P. gigas* Chevey, 1930 (Siluriformes, Pangasiidae) revealed the presence of seven species of Monogenea among which five are considered new species. They all belong to *Thaparocleidus* Jain, 1952 (Ancylodiscoididae) as defined by Lim (1996) and Lim *et al.* (2001).

- . *P. bocourti*: *T. combesi* n. sp., *T. komarudini* n. sp. and *T. vietnamensis* n. sp.
- . *P. djambal*: *T. caecus* (Mizelle & Kritsky, 1969), *T. combesi* n. sp., *T. euzeti* n. sp., *T. komarudini* n. sp. and *T. sadilii* n. sp.
- . *P. hypophthalmus*: *T. caecus*, *T. siamensis* (Lim, 1990) and *T. vietnamensis* n. sp.
- . *P. gigas*: no Monogenea were found on this host species.

**KEY WORDS** : Monogenea, Ancylodiscoididae, *Thaparocleidus combesi* n. sp., *Thaparocleidus euzeti* n. sp., *Thaparocleidus komarudini* n. sp., *Thaparocleidus sadilii* n. sp., *Thaparocleidus vietnamensis* n. sp., *Thaparocleidus caecus*, *Thaparocleidus siamensis*, freshwater fish, Siluriformes, Pangasiidae, *Pangasius bocourti*, *Pangasius djambal*, *Pangasius hypophthalmus*, *Pangasius gigas*, South East Asia.

**Résumé** : MONOGENES DE PANGASIIDAE (SILURIFORMES) EN ASIE DU SUD-EST : III. CINQ ESPÈCES NOUVELLES DE *THAPAROCLEIDUS* JAIN, 1952 (ANCYLODISCOIDIDAE) CHEZ *PANGASIIUS BOCOURTI*, *P. DJAMBAL* ET *P. HYPOPHthalmus*

L'examen des parasites branchiaux de *Pangasius bocourti* Sauvage, 1880 ; *P. djambal* Bleeker, 1846 ; *P. hypophthalmus* (Sauvage, 1878) et *P. gigas* Chevey, 1930 (Siluriformes, Pangasiidae) a révélé la présence de sept espèces de Monogenea appartenant au genre *Thaparocleidus* Jain, 1952 (Ancylodiscoididae) tel que défini par Lim (1996) et Lim *et al.* (2001). Parmi ces espèces, cinq sont considérées comme nouvelles.

- . *P. bocourti* : *T. combesi* n. sp., *T. komarudini* n. sp. et *T. vietnamensis* n. sp.
- . *P. djambal* : *T. caecus* (Mizelle & Kritsky, 1969), *T. combesi* n. sp., *T. euzeti* n. sp., *T. komarudini* n. sp. et *T. sadilii* n. sp.
- . *P. hypophthalmus* : *T. caecus*, *T. siamensis* (Lim, 1990) et *T. vietnamensis* n. sp.
- . *P. gigas* : aucun Monogène branchial n'a été trouvé sur cet hôte.

**MOTS CLÉS** : Monogenea, Ancylodiscoididae, *Thaparocleidus combesi* n. sp., *Thaparocleidus euzeti* n. sp., *Thaparocleidus komarudini* n. sp., *Thaparocleidus sadilii* n. sp., *Thaparocleidus vietnamensis* n. sp., *Thaparocleidus caecus*, *Thaparocleidus siamensis*, poissons d'eau douce, Siluriformes, Pangasiidae, *Pangasius bocourti*, *Pangasius djambal*, *Pangasius hypophthalmus*, *Pangasius gigas*, Asie du Sud Est.

## INTRODUCTION

Within the framework of an EC project on the bio-diversity and culture of Southeast Asian catfishes, the gills from pangasiid fishes (Siluriformes, Pangasiidae) were examined for monogeneans. This third paper (see Pariselle *et al.*, 2001a, b) presents the descriptions of the five new species of *Thaparocleidus* Jain, 1952 (Monogenea, Ancylodiscoididae) found on *Pangasius bocourti* Sauvage, 1880,

*P. djambal* Bleeker, 1846, *P. hypophthalmus* (Sauvage, 1878) and *P. gigas* Chevey, 1930. Only *P. hypophthalmus* have been previously examined for parasites (see Lim, 1990). To date a total of 12 species of *Thaparocleidus* have been described from *Pangasius humeralis* Roberts, 1989; *P. hypophthalmus* (Sauvage, 1878); *P. kinabatanganensis* Roberts & Vidthayanon, 1991; *P. lithostoma* Roberts, 1989; *P. nieuwenhuisii* (Popta, 1904); *P. pangasius* (Hamilton, 1822) and *P. rheophilus* Pouyaud *et al.*, 2000 from Bangladesh, India, Indonesia, Malaysia and Thailand (see Tripathi, 1957; Lim, 1990; Pariselle *et al.*, 2001 a, b).

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## MATERIALS AND METHODS

Fish were bought in fish markets or directly from fishermen: *P. bocourti* from Vietnam, *P. djambal* from Indonesia (Java, Sumatra and Kalimantan Islands), *P. hypophthalmus* from Vietnam and Indo-

nesia, and *P. gigas* from Thailand. Fish were caught in rivers using lines, nets or in aquaculture facilities (cages or ponds). The left branchial arches of each fishes were separated into dorsal and ventral sections, and frozen in liquid nitrogen, until examination. The host carcasses were numbered, fixed and preserved in formalin to verify the specific identity of host fishes. In the laboratory, the gills were thawed and the monogeneans were detached from the gill using a strong water current. The monogeneans were then transferred individually on a slide with a mounted needle, into a drop of ammonium picrate-glycerine (mixture

described by Malmberg (1957)). The preparation was then covered with a round cover slip and sealed with Glyceel (GURR - BDH Chemicals Ltd.). From these preparations, drawings were made of the sclerotised pieces of the haptor and of the copulatory complex using a camera lucida. Measurements, made with a digitiser, in micrometers as the mean  $\pm$  the standard deviation followed by the range in parentheses, are those proposed by Gussev (1962) (Fig. 1). The method of numbering of the haptoral pieces is that adopted at ICOPA IV (Euzet & Prost, 1981). Terminology is that of Pariselle & Euzet (1995) and N'Douba *et al.* (1999).

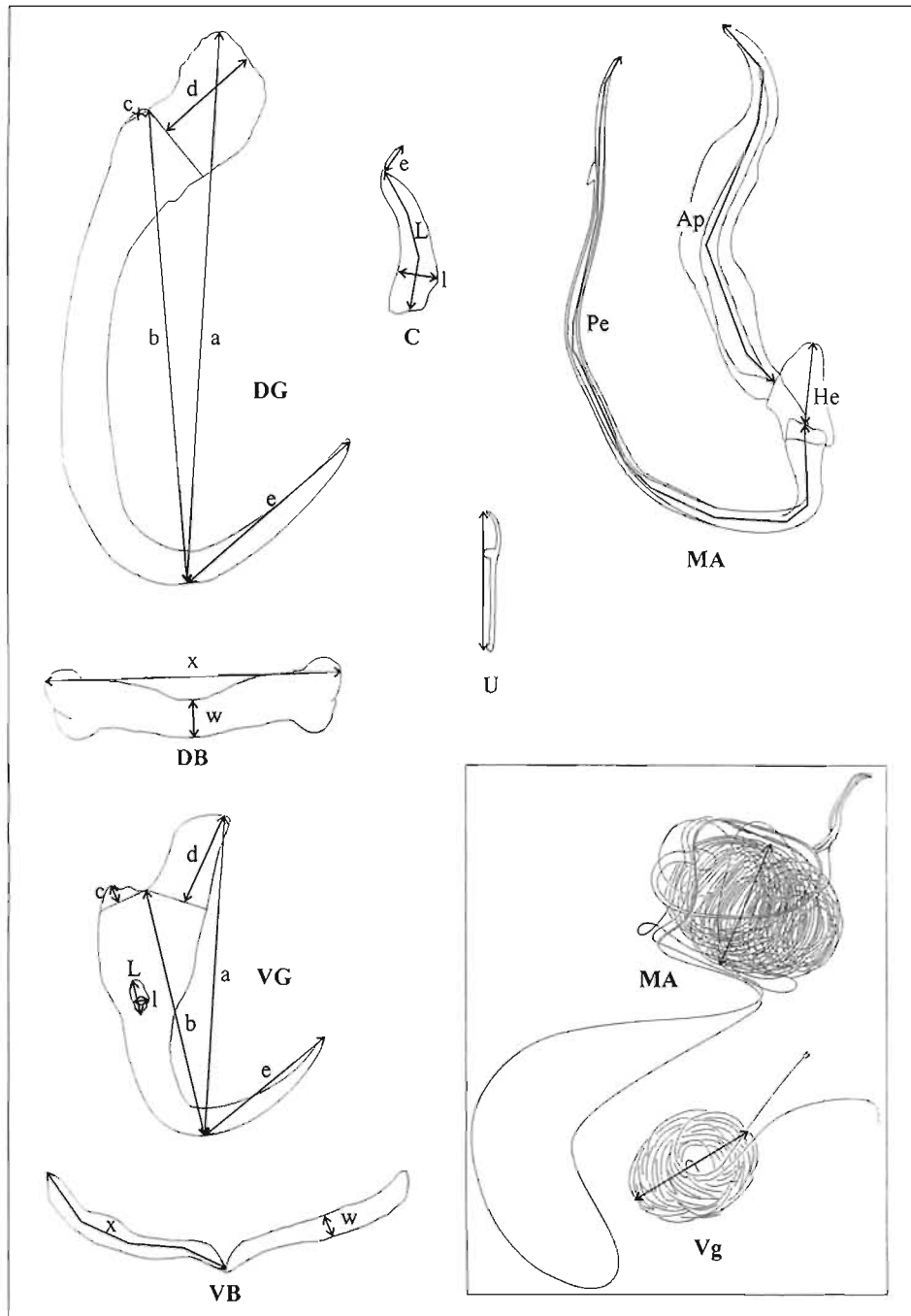


Fig. 1. - Measurements used in this study.

C = cuneus: L = length; l = largest width; e = extension length. DB = dorsal transverse bar: x = total length; w = width in the middle.

DG = dorsal gripus: a, b, c, d and e = standard measurements.

MA = male apparatus: Pe = total length of the penis; Ap = length of the accessory piece; He = length of the heel.

U = total length of the uncinuli.

VB = ventral transverse bar: x = length of one branch; w = largest width.

VG = ventral gripus: a, b, c, d and e = standard measurements; L and l = length and width of gripus aperture.

Box: measurements of spiral diameter for the penis (MA) and the vagina (Vg) in *T. euzeti* n. sp.

## RESULTS

Seven monogenean species<sup>1</sup> were recorded from *P. bocourti*, *P. djambal* and *P. hypophthalmus*, all belonging to *Thaparocleidus* (Ancylo-discoidinae, Monogenea) as defined by Lim (1996). Two have been

<sup>1</sup> An eighth species was found on *P. djambal* from the Indragiri River at Rengat (Riau province, Sumatra Island, Indonesia), but only four worms could be examined, it is too few to describe this new species.

previously described: *Thaparocleidus caecus* (Mizelle & Kritsky, 1969), recovered from *P. djambal* both in ponds (Sukamandi Research Station, West Java, Java Island, Indonesia) and in the wild (Solo River at Cepu, East Java, Java Island, Indonesia); and on *P. hypophthalmus* at the Sukamandi Research Station (West Java, Java Island, Indonesia). *Thaparocleidus siamensis* (Lim, 1990) recovered on *P. hypophthalmus* in aquaculture facilities from Vietnam (cage on the Mekong River at Can Tho) and Indonesia (Sukamandi Research Station, West Java, Java Island). *Thaparocleidus komarudini*

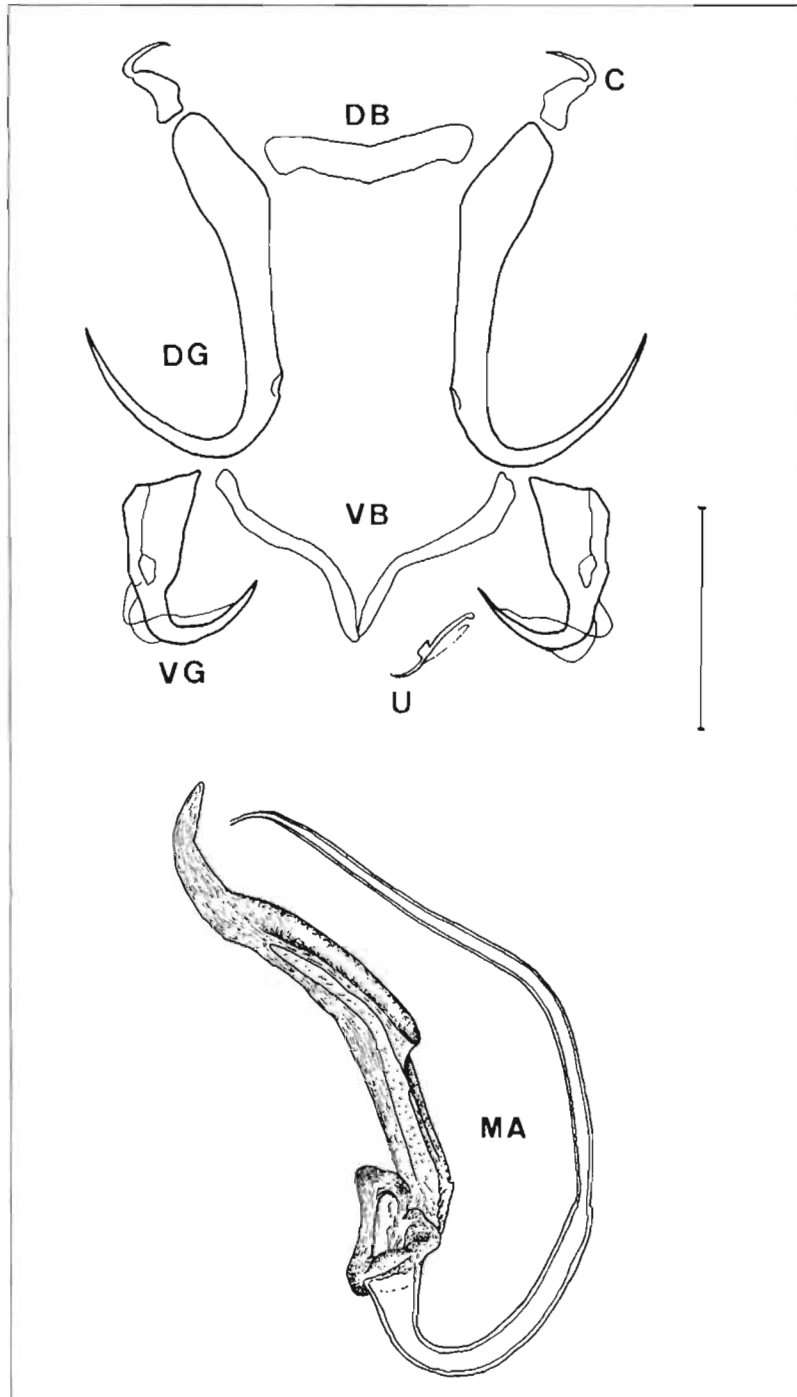


Fig. 2. – *Thaparocleidus sadilii* n. sp. C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; MA = male apparatus; VB = ventral transverse bar; VG = ventral gripus; U = uncinuli. Bar = 30  $\mu$ m.

n. sp. and *T. combesi* n. sp. were recorded from *P. bocourti* and *P. djambal*. *Thaparocleidus vietnamensis* n. sp. was found in Vietnam on *P. bocourti* and *P. hypophthalmus*. *Thaparocleidus sadilii* n. sp. and *T. euzeti* n. sp. were recorded from *P. djambal* only (see descriptions below). No monogenean parasites were recorded on *P. gigas* in The Mekong River at Nong Khai (Thailand) (only two specimens examined).

## DESCRIPTIONS

### *THAPAROCLEIDUS SADILII* N. SP. (Fig. 2)

Type-host: *P. djambal* Bleeker, 1846.

Site: gills.

Type-locality: Solo River at Cepu (East Java, Java Island, Indonesia).

Material studied: 18 individuals<sup>2</sup>.

Type-material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris): n° 42 HG, slide Tg 185. Paratypes deposited at the Muséum National d'Histoire Naturelle (Paris): n° 42 HG, slide Tg 186; at The Natural History Museum (London): 2001.11.27.5.

Adults: 595 ± 96.7 (415-755) long, 115 ± 20.4 (79-159) wide at level of penis. Pharynx: 51 ± 7.1 (40-64) wide. Dorsal gripus with blade bent at distal third, poorly marked guard: a = 44 ± 2 (38-48), b = 36 ± 1.8 (32-40), c = 1 ± 0.4 (0.5-2), d = 10 ± 1.1 (9-13), e = 25 ± 1.1 (23-27). Small cuneus with long extension: L = 9 ± 1.2 (6-12), l = 4 ± 0.4 (3-5), e = 7 ± 1.2 (4-10). Slightly curved, short dorsal transverse bar: x = 28 ± 1.8 (24-32), w = 5 ± 0.4 (4-6). Ventral gripus with well-marked aperture, poorly developed guard: a = 23 ± 0.8 (21-25), b = 21 ± 0.9 (19-23), c = 1 ± 0.2 (0.7-1.5), d = 6 ± 0.6 (5-7), e = 14 ± 0.6 (12-15), L = 5 ± 0.5 (4-6), l = 2 ± 0.4 (1-3). Thin V-shaped ventral transverse bar with rounded extremities: x = 30 ± 1.5 (28-34), w = 4 ± 0.6 (3-4). Very thin uncinuli II = 12 ± 0.9 (9-13) long, uncinuli I and III to VII = 12 ± 0.8 (9-16) long. Long penis folded after bell-shaped basal bulb, constricted after proximal third and well developed heel: Pe = 123 ± 4.8 (113-130), He = 11 ± 1.5 (8-14). Long, large, S-shaped accessory piece linked to basal bulb of the penis: Ap = 63 ± 3.9 (55-73). No visible vagina.

#### Comments

Among the 12 described species belonging to *Thaparocleidus* on *Pangasius* hosts only four have a non spirally coiled penis longer than 100 µm. *T. sadilii* n. sp. is easily distinguishable (no overlapping between the range of measurements) from:

- *T. chandpuri* Pariselle *et al.*, 2001 by the shape and size of all the haptorial sclerotised parts, by the shape (non spirally coiled, thickening at the extremity) and the size (123 *vs.* 106 µm) of the penis.

- *T. pangasi* (Tripathi, 1957) by the size of the penis (123 *vs.* 181 µm) and the size of the cuneus (9 *vs.* 20 µm) (measurements from Pariselle *et al.*, 2001).

- *T. mabakamensis* Pariselle *et al.*, 2001 by the size of the penis (123 *vs.* 169 µm) and the size of the dorsal and ventral gripus (44 *vs.* 59 µm and 23 *vs.* 27 µm). *T. sadilii* n. sp. is close to *T. sinespinae* Pariselle *et al.*, 2001 but may be distinguished in having a shorter penis (123 *vs.* 152 µm).

*Thaparocleidus sadilii* n. sp. is named for M. Didi Sadili from the Department of Sea Exploration and Fisheries in Jakarta who provide the specimens of *P. djambal* from Java Island.

### *THAPAROCLEIDUS KOMARUDINI* N. SP. (Fig. 3)

Type-host: *P. djambal* Bleeker, 1846.

Site: gills.

Type-locality: Batang Hari River at Jambi (Jambi province, Sumatra Island, Indonesia).

Also found on *P. bocourti* Sauvage, 1880 in aquaculture cages on the Mekong River at Chau Doc (Vietnam).

Material studied: 30 individuals (15 from *P. djambal* and 15 from *P. bocourti*).

Type-material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris): n° 39 HG, slide Tg 179. Paratypes deposited at the Muséum National d'Histoire Naturelle (Paris): n° 39 HG, slide Tg 180; at The Natural History Museum (London): 2001.11.27.2.

Very large worms, adults: 1436 ± 384.6 (751-2107) long, 210 ± 37.8 (129-285) wide at level of penis. Pharynx: 105 ± 15.6 (52-133) wide. Dorsal gripus with blade bent at distal third, poorly marked guard: a = 47 ± 2.5 (39-52), b = 37 ± 1.5 (34-40), c = 1 ± 0.4 (0.5-3), d = 14 ± 1.5 (10-18), e = 25 ± 1.3 (22-28). Short cuneus with short extension: L = 9 ± 1.3 (7-13), l = 4 ± 0.7 (3-6), e = 2 ± 0.9 (1-5). Slightly straight dorsal transverse bar: x = 36 ± 1.8 (33-40), w = 6 ± 0.6 (5-7). Ventral gripus with very small aperture (sometimes not visible), large, rounded blade, poorly developed guard: a = 25 ± 1 (22-27), b = 21 ± 0.8 (19-23), c = 1 ± 0.4 (0.4-2), d = 8 ± 1 (6-10), e = 14 ± 1 (12-16), L = 2 ± 0.9 (0-5), l = 1 ± 0.4 (0-2). Thin V-shaped ventral transverse bar: x = 34 ± 2 (29-38), w = 4 ± 0.7 (3-6). Thin uncinuli II = 14 ± 1.5 (11-17) long, uncinuli I and III to VII = 12 ± 0.8 (9-15) long. Long penis folded after bell-shaped basal bulb, distal quarter covered with very thin scabbard, which extremity is thickened, developed heel: Pe = 101 ± 7.4 (91-115), He = 7 ± 1.8 (5-11). Double accessory piece linked to basal bulb of the penis: one long and S-shaped: Ap = 75 ± 4.7 (65-82), the second

<sup>2</sup> Only 18 individuals should be measured because *P. djambal* has become rare in the rivers of Java Island.

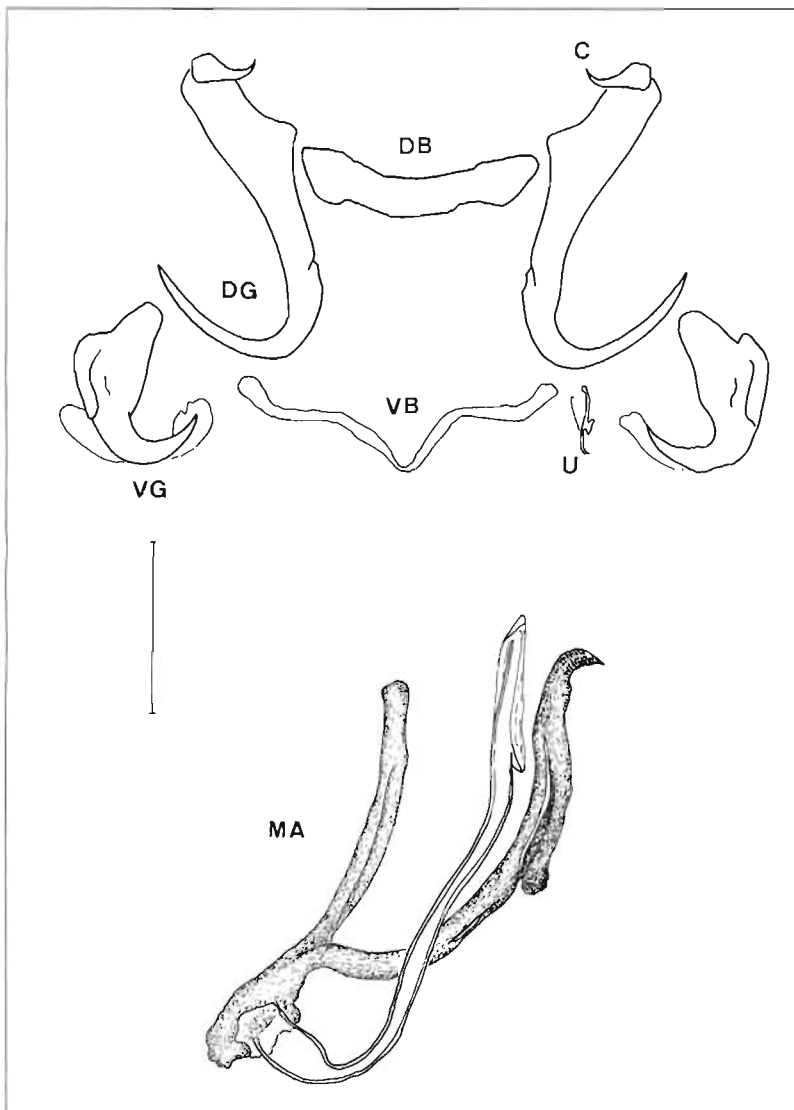


Fig. 3. – *Thaparocleidus komarudini* n. sp. C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; MA = male apparatus; VB = ventral transverse bar; VG = ventral gripus; U = uncinuli. Bar = 30  $\mu$ m.

one straight and round ended:  $50 \pm 4.4$  (40-58) long. No visible vagina.

#### Comments

*T. komarudini* n. sp. is morphologically close to the previously cited *Thaparocleidus* species found on *Pangasius* host (see above), but may be easily distinguished in having a double accessory piece.

*Thaparocleidus komarudini* n. sp. is named for M. Oman Komarudin from the Central Research Institute for Freshwater Fisheries in Sukamandi (Indonesia) who help in collecting material.

#### *THAPAROCLEIDUS COMBESI* N. SP. (Fig. 4A and B)

Type-host: *P. djambal* Bleeker, 1846.

Site: gills.

Type-locality: Barito River at Buntok (Central Kalimantan province, Borneo Island, Indonesia).

Other locality: also found on the same host in the Batang Hari River at Jambi (Jambi province, Sumatra Island, Indonesia); in the ponds of Sukamandi Research Station (West Java, Java Island, Indonesia) and in the Solo River at Cepu (East Java, Java Island, Indonesia).

Also found on *P. bocourti* Sauvage, 1880 in aquaculture cages on the Mekong River at Chau Doc (Vietnam).

Material studied: 30 individuals.

Type-material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris): n° 38 HG, slide Tg 177. Paratypes deposited at the Muséum National d'Histoire Naturelle (Paris): n° 38 HG, slide Tg 178; at The Natural History Museum (London): 2001.11.27.1.

Very large worms, adults:  $1372 \pm 152.3$  (1066-1622) long,  $197 \pm 37$  (128-328) wide at level of penis. Pharynx:  $77 \pm 6.6$  (63-90) wide. Very large dorsal gripus

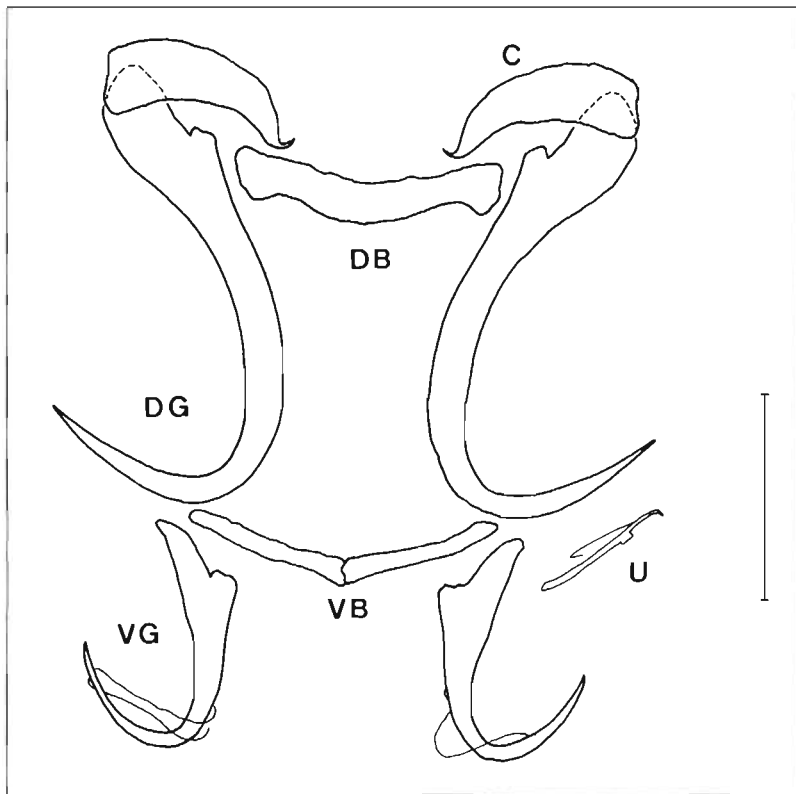


Fig. 4A. - *Thaparocleidus combesi* n. sp. haptorial sclerotised parts: C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; VB = ventral transverse bar; VG = ventral gripus; U = uncinuli. Bar = 30  $\mu$ m.

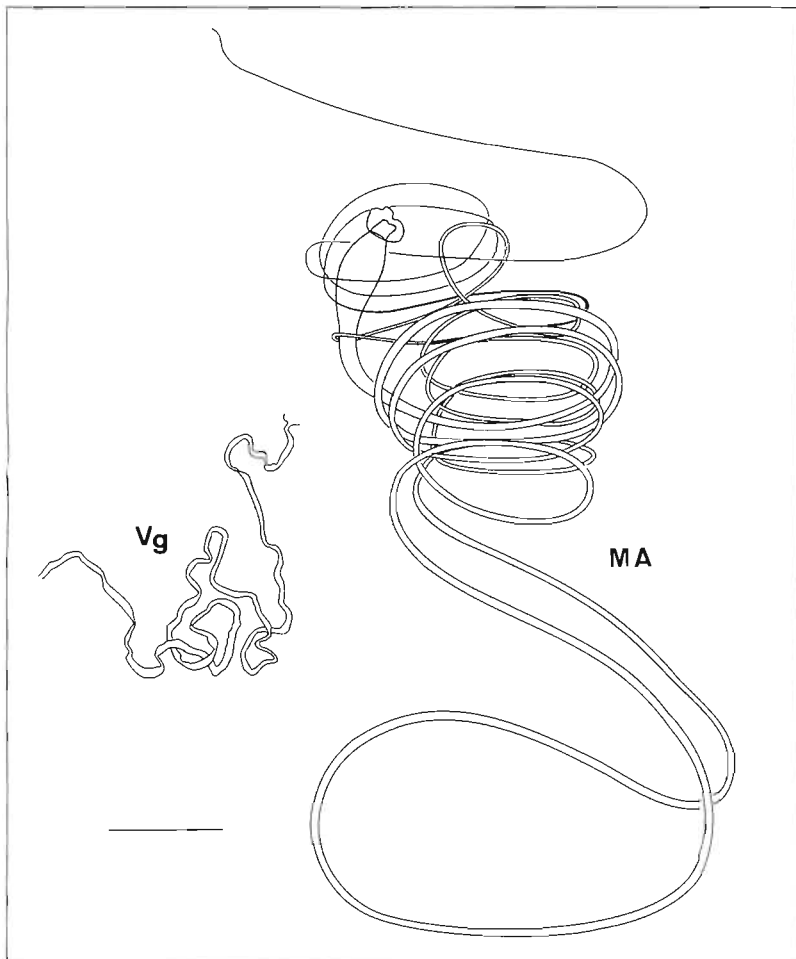


Fig. 4B. - *Thaparocleidus combesi* n. sp. genitalia: MA = male apparatus; Vg = vagina. Bar = 30  $\mu$ m.

with blade bent at distal third, short guard:  $a = 141 \pm 3.5$  (134-147),  $b = 116 \pm 3.3$  (110-125),  $c = 3 \pm 1$  (1.4-6),  $d = 31 \pm 2.7$  (22-38),  $e = 63 \pm 2.8$  (57-70). Very large cuneus with short extension:  $L = 65 \pm 3$  (57-69),  $l = 19 \pm 1.1$  (16-22),  $e = 4 \pm 1.5$  (2-9). Very large, slightly curved dorsal transverse bar:  $x = 87 \pm 2.5$  (82-91),  $w = 11 \pm 1$  (8-13). Very large ventral gripus without aperture:  $a = 68 \pm 2.7$  (62-74),  $b = 53 \pm 3.1$  (46-61),  $c = 3 \pm 1.3$  (1-8),  $d = 22 \pm 2$  (19-27),  $e = 40 \pm 1.3$  (36-42). V-shaped ventral transverse bar:  $x = 54 \pm 2.1$  (49-59),  $w = 6 \pm 0.8$  (5-8). Thin uncinuli II =  $13 \pm 1.3$  (10-15) long, strong uncinuli I and III to VII =  $17 \pm 1.4$  (11-21) long. Very long, thin, spirally coiled (14-15 turns) penis with short heel, ovoid basal bulb: as this tube is very long, coiled in a double helix and with a very thin ending it is virtually impossible to take a reliable measurement, the length have been estimated on one specimen:  $Pe = 2245$ , heel (measured on 30 specimens):  $He = 7 \pm 1.1$  (5-11). No accessory piece. The vagina is very long, sinuous and become less and less sclerotised so no measurement could be taken.

#### Comments

Only three *Thaparocleidus* species have been described with a spirally coiled penis: *T. brevicochleus* Pariselle *et al.*, 2001, *T. kapuasensis* Pariselle *et al.*, 2001 and *T. gustianoi* Pariselle *et al.*, 2001. *T. combesi* n. sp. is easily distinguishable from all these species (and all the species of *Thaparocleidus* described until now) by

the larger size of all the sclerotised parts of genitalia and haptor apparatus.

*Thaparocleidus combesi* n. sp. is named in honour of Pr. Claude Combes, parasitologist from the University of Perpignan (France).

#### *THAPAROCLIDUS EUZETI* N. SP. (Fig. 5A and B)

Type-host: *P. djambal* Bleeker, 1846.

Site: gills.

Type-locality: Batang Hari River at Jambi (Jambi province, Sumatra Island, Indonesia).

Other locality: also found on the same host in the Indra-giri River at Rengat (Riau province, Sumatra Island, Indonesia).

Material studied: 30 individuals.

Type-material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris); n° 41 HG, slide Tg 183. Paratypes deposited at the Muséum National d'Histoire Naturelle (Paris); n° 41 HG, slide Tg 184; at The Natural History Museum (London); n° 2001.11.27.4.

Adults:  $599 \pm 106.8$  (384-765) long,  $131 \pm 13.3$  (107-164) wide at level of penis. Pharynx:  $43 \pm 4.2$  (34-49) wide. Dorsal gripus with blade bent at distal third, poorly marked guard:  $a = 61 \pm 2.1$  (60-68),  $b = 52 \pm 2.1$  (44-55),  $c = 1 \pm 0.4$  (0.5-3),  $d = 17 \pm 1.7$  (13-21),  $e = 30 \pm 1.2$  (28-34). Large cuneus with extension:  $L = 25 \pm 1.4$  (22-28),  $l = 7 \pm 0.6$  (6-8),  $e = 6 \pm 1$  (3-9). Strong, slightly curved dorsal transverse bar:  $x = 43 \pm 1.9$  (39-47),  $w =$

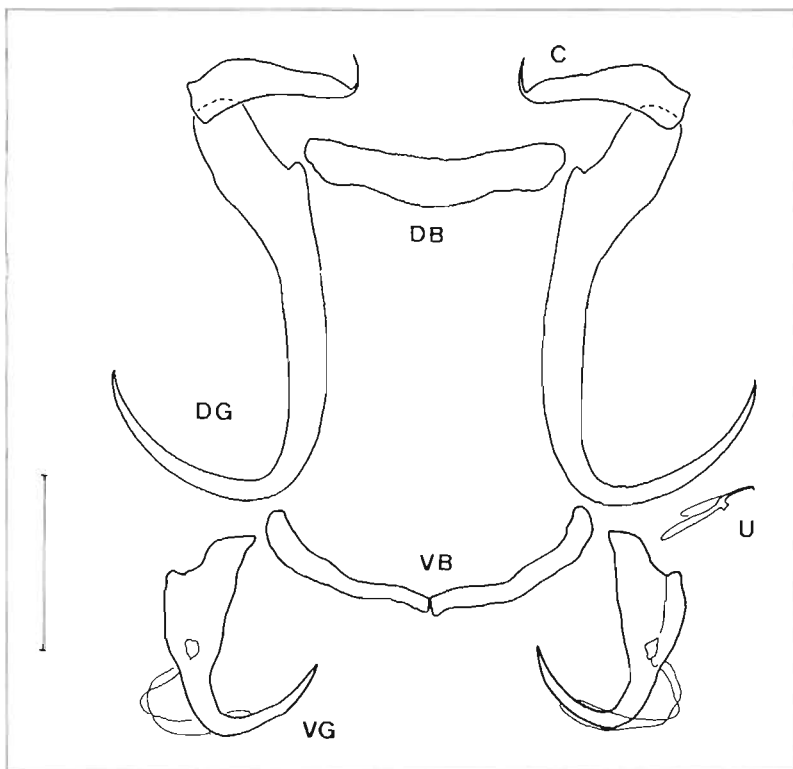


Fig. 5A. - *Thaparocleidus euzeti* n. sp. haptorial sclerotised parts: C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; MA = male apparatus; VB = ventral transverse bar; VG = ventral gripus; U = uncinuli. Bar = 30  $\mu$ m.

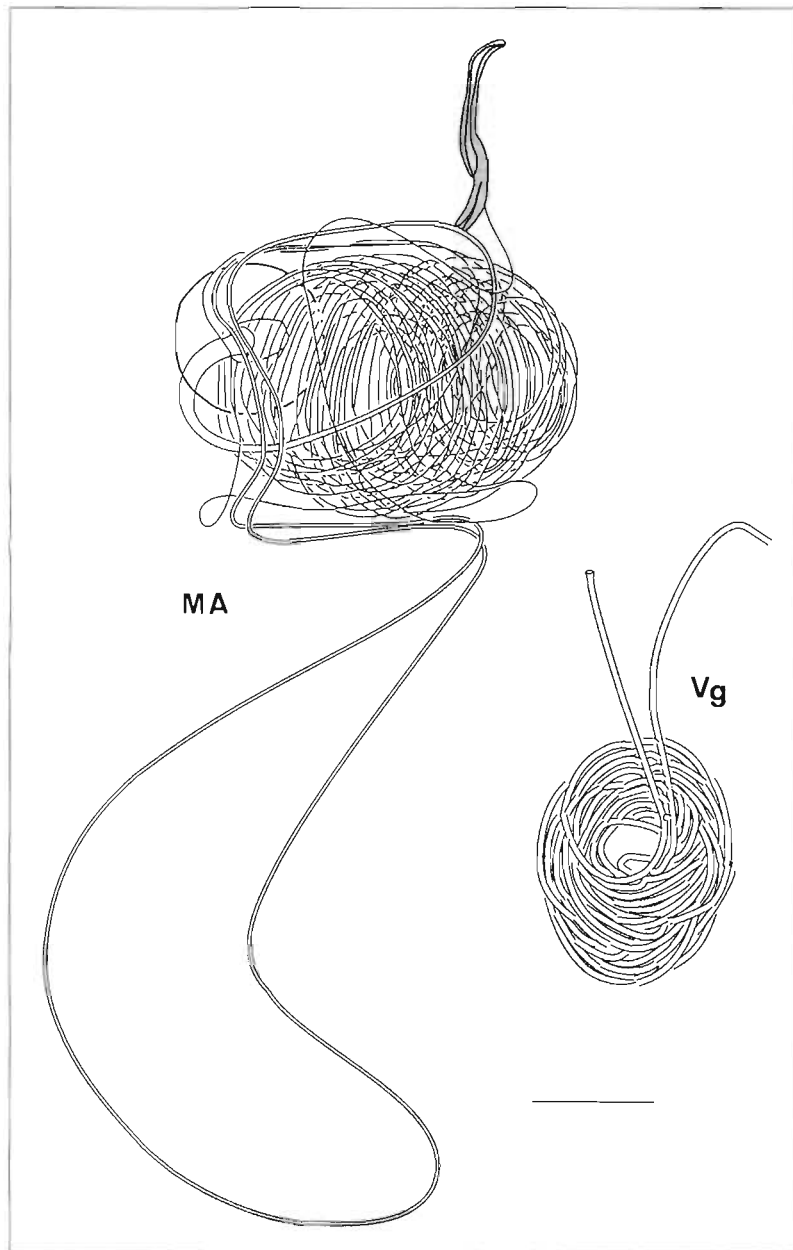


Fig. 5B. – *Thaparocleidus euzeti* n. sp. genitalia: MA = male apparatus; Vg = vagina. Bar = 30  $\mu$ m.

$8 \pm 0.9$  (7-10). Ventral gripus with large aperture, poorly developed guard:  $a = 33 \pm 0.7$  (31-34),  $b = 26 \pm 0.7$  (25-28),  $c = 1.5 \pm 0.4$  (0.8-3),  $d = 12 \pm 0.9$  (10-15),  $e = 19 \pm 0.7$  (16-20),  $L = 4 \pm 0.6$  (3-6),  $l = 2 \pm 0.4$  (1-3). V-shaped ventral transverse bar:  $x = 33 \pm 1.4$  (31-37),  $w = 4 \pm 0.5$  (3-5). Long, thin uncinuli II =  $17 \pm 1.8$  (12-20) long, strong uncinuli I and III to VII =  $17 \pm 2.4$  (10-20) long. Extremely long and thin spirally coiled penis with an ovoid basal bulb attached on a large cupule like structure (diameter =  $35 \pm 4.3$  (19-41)), no visible heel. The length of such very thin tube is impossible to measure because the specimens are squashed between slide and cover slip. We could only give the diameter of the spiral ( $61 \pm 7.5$  (47-78) from the 30 specimens) and a rough estimation of the total length and number of turns,

taken from one very well preserved individual:  $7450 \mu\text{m}$  and  $\approx 35$  turns. Very simple accessory piece apparently not linked to basal bulb of penis:  $Ap = 48 \pm 2.7$  (42-53). Extremely long, thin, well sclerotised, spirally coiled (double pitch) vagina, largest diameter of spiral =  $53 \pm 4.8$  (44-61), diameter of tube at distal extremity =  $2 \pm 0.3$  (1-3), the total length is impossible to estimate as we could not count the number of turns (squashed individuals and double pitch spiral).

#### Comments

Now four *Thaparocleidus* species have been described with a spirally coiled penis: *T. brevicochleus* Pariselle *et al.*, 2001, *T. kapuasensis* Pariselle *et al.*, 2001, *T. gus-tiano* Pariselle *et al.*, 2001 and *T. combesi* n. sp. (see



above); *T. euzeti* n. sp. is easily distinguishable from all these species by the great number of turns and the huge length of the penis, and by the shape of the vagina (spirally coiled).

The name *Thaparocleidus euzeti* n. sp. is proposed in honour of Pr. Louis Euzet, parasitologist from the University of Montpellier (France).

*THAPAROCLEIDUS VIETNAMENSIS* N. SP. (Fig. 6)

Type-host: *P. bocourti* Sauvage, 1880.

Site: gills.

Type-locality: Aquaculture cages on the Mekong River at Chau Doc (Vietnam).

Also found at the same location on *P. hypophthalmus* Roberts, 1989, *P. kunyit* Pouyaud *et al.*, 2000 and *P. conchophilus* Roberts & Vidthayanon, 1991.

Material studied: 33 individuals (10 from *P. bocourti*, *P. hypophthalmus*, *P. conchophilus* and three from *P. kunyit*).

Type-material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris): n° 40 HG, slide Tg 181. Paratypes deposited at the Muséum National

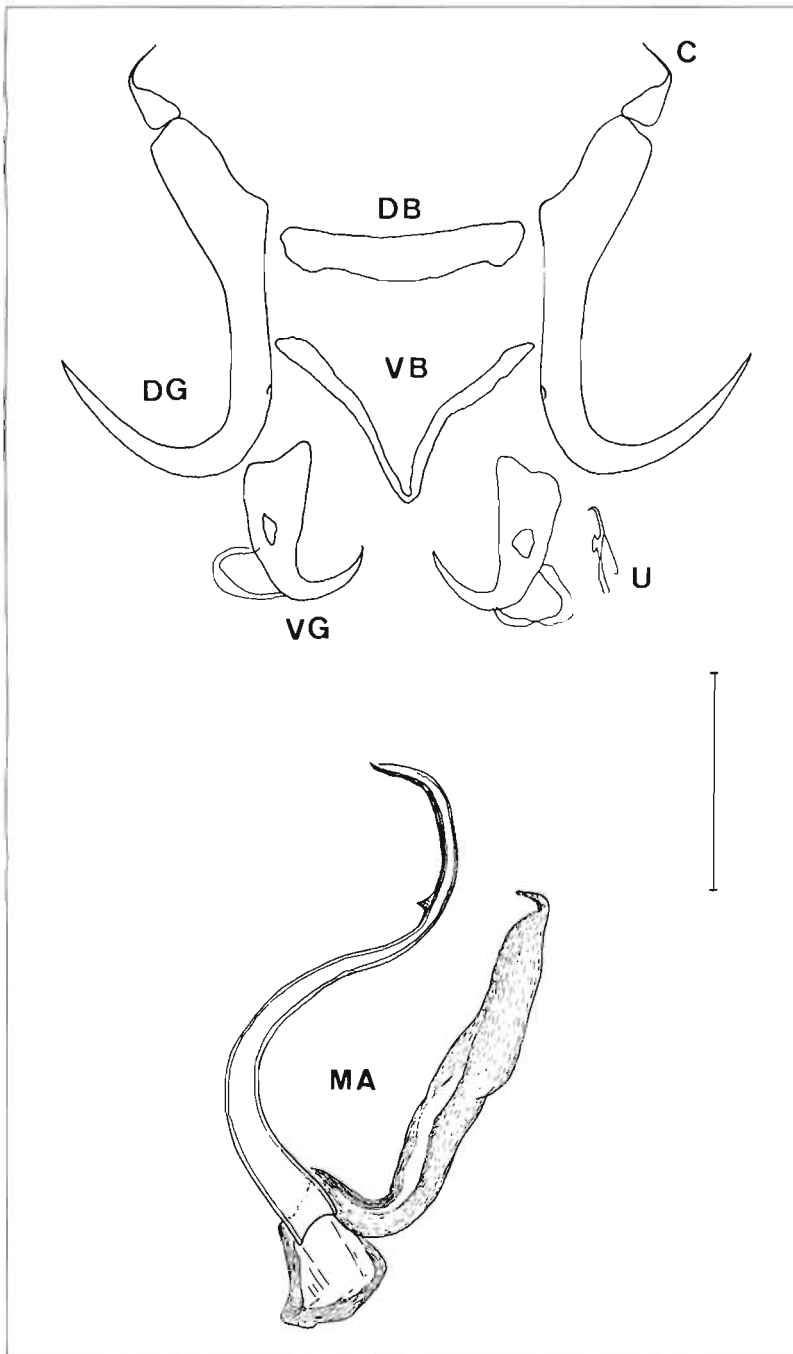


Fig. 6. – *Thaparocleidus vietnamensis* n. sp. C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; MA = male apparatus; VB = ventral transverse bar; VG = ventral gripus; U = uncinuli. Bar = 30  $\mu$ m.

Measurements	Species							
	<i>T. vietnamensis</i>				<i>T. caecus</i>			
	Mean	St. D.	Min	Max	Mean	St. D.	Min	Max
Total length	765	176	431	1125	632	164.3	372	870
Width at level of penis	137	24.7	103	201	102	17.2	78	126
Pharynx diameter	52	8.3	37	69	51	7.5	37	67
Copulatory tube total length	91	3.8	81	97	69	4.3	61	76
Heel	11	1.4	8	13	11	1.5	8	14
Accessory piece total length	54	3.1	48	60	42	2.3	38	47
Uncinuli II total length	12	1.1	8	14	12	0.8	10	13
Other uncinuli total length	12	0.7	9	15	12	0.7	10	15
Dorsal transverse bar total length	29	1.6	25	32	27	1.1	25	29
Dorsal transverse bar width at middle	6	0.7	4	7	5	0.5	4	6
Cuneus length	9	1.2	6	11	8	1	6	10
Cuneus extension length	7	1.6	3	11	7	1.3	4	10
Cuncus maximum width	4	0.5	3	5	4	0.6	3	5
Dorsal gripus a	46	1.8	41	50	43	2.4	38	47
Dorsal gripus b	37	1.8	33	41	34	2	31	37
Dorsal gripus c	1.5	0.3	0.7	2.3	1.7	0.5	0.9	2.9
Dorsal gripus d	13	1.3	11	17	11	1.1	9	13
Dorsal gripus e	24	1.4	21	27	22	1.2	20	25
One branch of ventral bar length	27	1.8	24	32	26	1.7	23	30
Ventral bar maximum width	3	0.5	2	5	3	0.5	3	4
Ventral gripus a	20	0.7	19	22	20	0.8	18	22
Ventral gripus b	18	0.8	16	20	17	0.8	15	19
Ventral gripus c	1.2	0.4	0.4	2.6	1.1	0.3	0.6	2.2
Ventral gripus d	5	0.6	4	7	6	0.6	4	7
Ventral gripus e	10	0.7	8	11	10	0.8	8	12
Ventral gripus aperture length	4	0.6	2	6	4	0.6	2	5
Ventral gripus aperture width	3	0.4	2	4	2	0.5	1	3

Table 1. – Measurements from *T. vietnamensis* n. sp. and *T. caecus*.

d'Histoire Naturelle (Paris): n° 40 HG, slide Tg 182; The Natural History Museum (London): n° 2001.11.27.3.

Measurements are given in Table 1, with those from 15 *T. caecus* individuals recovered on both *P. djambal* and *P. hypophthalmus* from the ponds of the Sukamandi Research Station (West Java, Java Island, Indonesia). The morphology of all sclerotised parts is very close to that of *T. caecus* (see Lim, 1990): dorsal gripus with blade bent at distal third, poorly marked guard; cuneus with marked extension; slightly curved dorsal transverse bar; ventral gripus with large aperture, poorly developed guard; V-shaped thin ventral transverse bar; thin uncinuli I to VII; S-shaped penis with thin, curved extremity, spine like structure at  $31 \pm 3.3$  (26-41); cylindrical basal bulb attached on a large heel; no visible vagina.

Comments

*T. vietnamensis* n. sp. is morphologically (shape of sclerotised parts) close to *T. sadilii* n. sp., *T. mahakamensis* Pariselle *et al.*, 2001 and *T. sinespinae* Pariselle *et al.*, 2001; but could be distinguished mainly because all these species have a copulatory tube longer than 100 µm (*vs.* 91 µm for *T. vietnamensis*).

*T. vietnamensis* is very close to *T. caecus*, but could be easily distinguished (no overlap of range) by: the length of the copulatory tube (91 *vs.* 69 µm), of the accessory piece (54 *vs.* 42 µm and the distance between the spine like structure and the extremity of the copulatory tube (31 *vs.* 21 µm).

The name *Thaparocleidus vietnamensis* n. sp. is proposed for the location (Vietnam *vs.* Peninsular Malaysia (Lim, 1990) or Indonesia and Malaysia (Pariselle *et al.*, 2001b) for closely related species).

CONCLUSIONS

*Thaparocleidus caecus*, described in the United States on an unidentified aquarium fish coming from Thailand (Mizelle & Kritsky, 1969), was recovered by Lim (1990) from cage culture in Malaysia on *P. sutchi* (syn. *P. hypophthalmus*) also imported from Thailand. This parasitic species was found again in Indonesia (nobis) on *P. hypophthalmus* introduced from Thailand for culture purpose, and on *P. djambal* in the wild and in aquaculture facilities. So we may wonder what is the natural host for *T. caecus*, as Mono-

genera are considered species specific toward their hosts. We may say that it is *P. djambal* (only occurrence in the wild), but:

- *T. caecus* was found on *P. djambal* in two locations only (Solo River and Sukamandi Research Station), the ones where *P. hypophthalmus* was also introduced (for culture purpose).

- These two host species are naturally allopatric (*P. hypophthalmus* from the Mekong basin, *P. djambal* from Indonesia) and phylogenetically well separated (Pouyaud *et al.*, 2000).

- No *P. djambal* was introduced to Thailand or Malaysia. So we may suppose that there was in Indonesia a lateral transfer of *T. caecus* between *P. hypophthalmus* and *P. djambal* both in the wild and in the ponds of the Sukamandi Research Station.

Is the presence of *Thaparocleidus combesi* n. sp. and *T. komarudini* n. sp. both on *P. bocourti* and *P. djambal*, due to lateral transfers? In this case:

- There was no introduction neither of *P. djambal* in Vietnam nor of *P. bocourti* in Indonesia.

- These two fish species are closely related (Pouyaud *et al.*, 2000).

So we may suppose that *T. combesi* and *T. komarudini* occur naturally on both host species and were inherited from their ancestor.

The presence of *T. vietnamensis* n. sp. on four different host species (*P. bocourti*, *P. hypophthalmus*, *P. kunyit* Pouyaud *et al.*, 2000 and *P. conchophilus* Roberts & Vidhayanon, 1991) sampled in aquaculture facilities on the Mekong Delta, may be the result of lateral transfer or of natural occurrence, as all these host species originate from this river.

The present five new species bring the number of *Thaparocleidus* species described on 10 species of pangasiids (*P. bocourti*, *P. djambal*, *P. gigas*, *P. humeralis*, *P. hypophthalmus*, *P. kinabatanganensis*, *P. lithostoma*, *P. nieuwenhuisii*, *P. pangasius* and *P. rheophilus*) to 17. The diversity of monogenean species on the 10 studied host species is now variable from zero to six<sup>3</sup>.

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<sup>3</sup> On *P. djambal*, including *T. caecus* (lateral transfer?) and the rare non described one.

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