MONOGENEANS FROM PANGASIIDAE (SILURIFORMES) IN SOUTHEAST ASIA: V. FIVE NEW SPECIES OF *THAPAROCLEIDUS* JAIN, 1952 (ANCYLODISCOIDIDAE) FROM *PANGASIUS NASUTUS*

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Summary:

The examination of gill parasites from *Pangasius nasutus* (Bleeker, 1862) (Siluriformes, Pangasiidae) revealed the presence of five new species of Monogenea, all belonging to *Thaparocleidus* Jain, 1952 (Monogenea, Ancylodiscoididae) as defined by Lim (1996) and Lim *et al.* (2001): *T. serpens* n. sp., *T. ocrea* n. sp., *T. megagripus* n. sp., *T. citreum* n. sp. and *T. alatus* n. sp.

KEY WORDS : Monogenea, Ancylodiscoididae, *Thaparocleidus alatus* n. sp., *Thaparocleidus citreum* n. sp., *Thaparocleidus megagripus* n. sp., *Thaparocleidus ocrea* n. sp., *Thaparocleidus serpens* n. sp., freshwater fish, Siluriformes, Pangasiidae, *Pangasius nasutus*, Southeast Asia.

Résumé : MONOGÈNES DE PANGASIIDAE (SILURIFORMES) EN ASIE DU SUD-EST: V. CINQ ESPÈCES NOUVELLES DE *THAPAROCLEIDUS* JAIN, 1952 (ANCYLODISCOIDIDAE) CHEZ *PANGASIUS NASUTUS*

L'examen des parasites branchiaux de Pangasius nasutus *(Bleeker, 1862) (Siluriformes, Pangasiidae) a révélé la présence de cinq espèces nouvelles de Monogenea appartenant toutes au genre* Thaparocleidus *Jain, 1952 (Ancylodiscoididae) tel que défini par Lim (1996) et Lim* et al. *(2001) :* T. serpens *n. sp.,* T. ocrea *n. sp.,* T. megagripus *n. sp.,* T. citreum *n. sp. et* T. alatus *n. sp.*

MOTS CLÉS : *Monogenea, Ancylodiscoididae,* Thaparocleidus alatus *n. sp.,* Thaparocleidus citreum *n. sp.,* Thaparocleidus megagripus *n. sp.,* Thaparocleidus ocrea *n. sp.,* Thaparocleidus serpens *n. sp., poissons d'eau douce, Siluriformes, Pangasiidae,* Pangasius nasutus, *Asie du Sud Est.*

INTRODUCTION

Within the framework of an European Commission project on the biodiversity and culture of Southeast Asian catfishes, the gills from pangasiid fishes (Siluriformes, Pangasiidae) were examined for monogeneans. This paper presents the descriptions of five new species of *Thaparocleidus* Jain, 1952 (Monogenea, Ancylodiscoididae) found on *Pangasius nasutus* (Bleeker, 1862). This host species has not been previously examined for parasites. To date 22 species of *Thaparocleidus* have been described from *Pangasius bocourti* Sauvage, 1880; *P. djambal* Bleeker, 1846; *P. gigas* Chevey, 1930; *P. humeralis* Roberts, 1989; *P. hypophthalmus* (Sauvage, 1878); *P. kinabatanganensis* Roberts & Vidthayanon, 1991; *P. krempfi* Roberts & Vidthayanon, 1991; *P. kunyit* Pouyaud, Teugels & Legendre, 1999; *P. lithostoma* Roberts, 1989; *P. mekongensis* Gustiano, Teugels & Pouyaud, 2003; *P. nieuwenhuisii* (Popta, 1904); *P. pangasius* (Hamilton, 1822); *P. rheophilus* Pouyaud &Teugels, 2000 and *P. sabahensis* Gustiano, Teugels & Pouyaud, 2003, from India, Bangladesh, Indonesia, Malaysia, Thailand and Vietnam (see Tripathi, 1957; Lim, 1990; Pariselle *et al.*, 2001a, 2001b, 2002a and 2002b).

MATERIALS AND METHODS

Fish were bought in fish markets or directly from fishermen in Indonesia (Sumatra and Kalimantan Islands). Fish were caught in the rivers using hook and line or from aquaculture facilities. The fish were dissected as soon as possible, and the left branchial arches were frozen in liquid nitrogen, until examination. To verify the specific identity of host fishes, the carcasses were numbered, fixed and preserved in formalin. In the laboratory, the gills were thawed and the monogeneans were detached from the gill using a strong water current. The worms were then transferred individually on a slide with a mounted needle, directly 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 are presented as the mean

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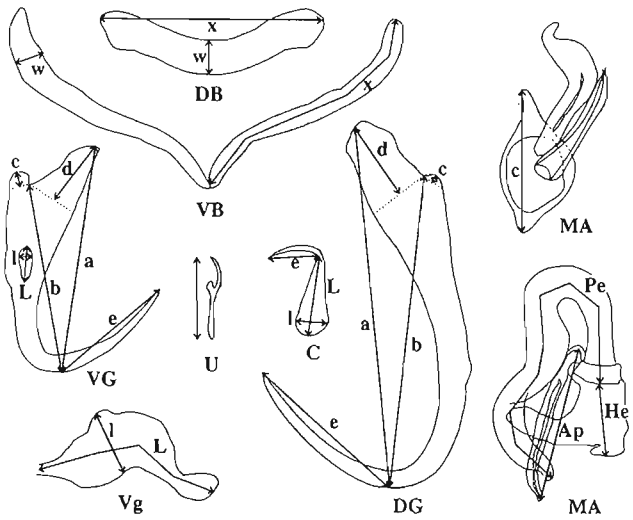

Fig. 1. – Measurements used in this study.
C = cuneus: L = length; l = largest width; e = extension length.
DB = dorsal transverse bar: x = total length; w = width in the middle.
DG = dorsal gripus: a, b, c, d and e = standard measurements.
MA = male apparatus: Pe = total length of the penis; Ap = length of the accessory piece; He = length of the heel; c = cupule-like structure maximum diameter.
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.
Vg = vagina: L = total length; l = maximum width.

± 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). Terminologies used are those of Pariselle and Euzet (1995) and N'Douba *et al.* (1999).

RESULTS

Six monogenean species[1] were recorded in Southeast Asia from *P. nasutus* (Siluriformes, Pangasiidae). One has been previously described (*Thaparocleidus caecus* (Mizelle & Kritsky, 1969)), five are considered as new species (see descriptions below), their anatomy (soft and hard parts) complies with that of *Thaparocleidus* (Ancylodiscoididae, Monogenea) as defined by Lim (1996) and Lim *et al.* (2001): Ancylodiscoididae. Three pairs of head glands. Two pairs of eye-spots. Haptor slightly separated from body. Haptoral sclerites include two pairs of anchors, with patches on dorsal anchor; two connecting bars, with dorsal single and ventral bar single or paired; and seven pairs of marginal hooks. Ovary antero-ventral to testis; uterine pore ventral near copulatory organ. Dextral vaginal opening sclerotised or non-sclerotised. Vas

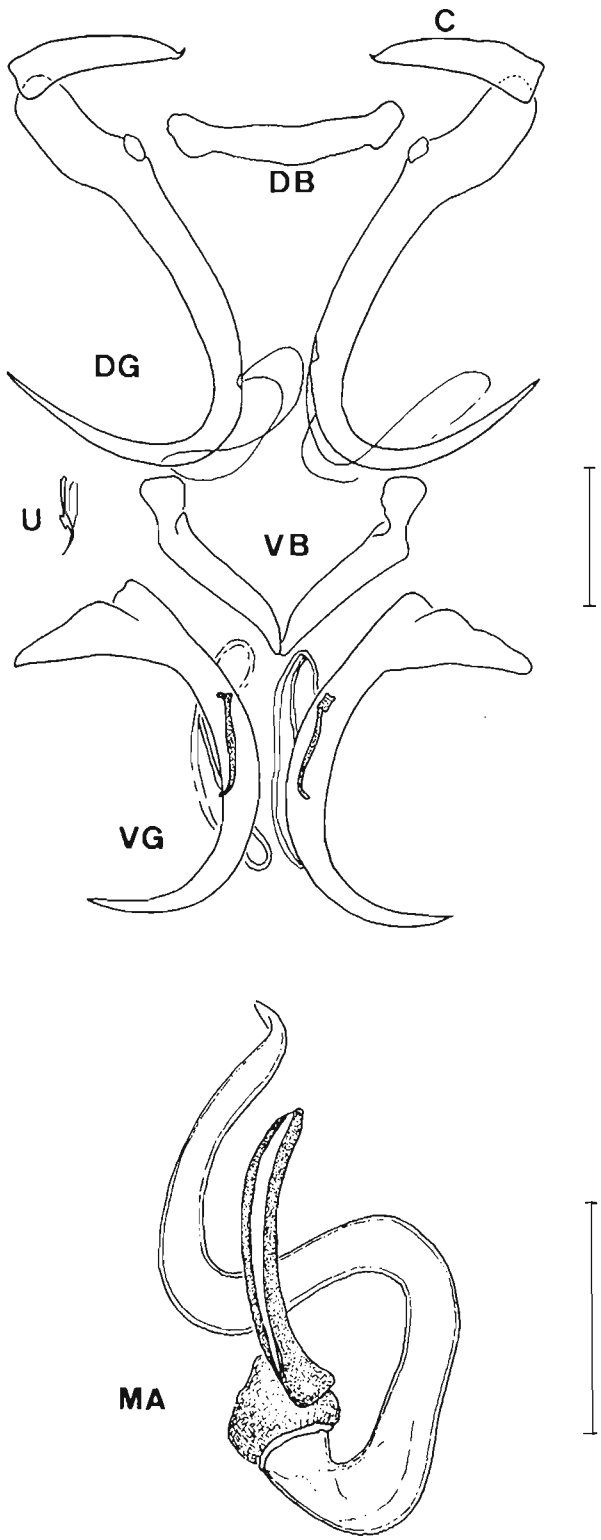

Fig. 2. – *Thaparocleidus serpens* n. sp. C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; MA = male apparatus; VB = ventral transverse bar; VG = ventral gripus, U = uncinulus. Bar = 30 µm.

[1] A seventh species was found, but with too few specimens to be legitimately described.

deferens arising from anterior region of testis, crossing to left, looping intestinal caecum to ventral side, ascending, forming blind saccular seminal vesicle; ductus ejaculatorius leaving seminal vesicle entering proximal part of copulatory organ. Parasites of freshwater catfishes of Eurasia and Southeast Asia.

DESCRIPTIONS

THAPAROCLEIDUS SERPENS N. SP. (Fig. 2)

Type host: *P. nasutus* (Bleeker, 1862).
Site: gills.
Type locality: Barito River at Banjarmasin (South Kalimantan Province, Borneo Island, Indonesia).
Other records: found on the same host in the Batang Hari River at Jambi (Jambi Province, Sumatra Island, Indonesia) and in the Musi River at Palambang (South Sumatra Province, Sumatra Island, Indonesia).
Material studied: 30 individuals.
Type material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris): 75HG Tk 230. Paratypes deposited at the Muséum National d'Histoire Naturelle (Paris): 75HG Tk 231; and The Natural History Museum (London): n° 2003.6.18.1.

Adults: 1,149 ± 305.7 (433-1,823) long, 181 ± 37.4 (106-271) wide at level of penis. Pharynx: 81 ± 12.4 (57-101) wide. Large dorsal gripus with blade bent at distal third, poorly marked guard: a = 92 ± 4.7 (81-103), b = 72 ± 4 (64-82), c = 1 ± 0.5 (0.8-3), d = 24 ± 1.8 (20-29), e = 45 ± 2.8 (37-50). Very large cuneus with short extension: L = 35 ± 2.3 (27-40), l = 10 ± 0.7 (9-12), e = 3 ± 1 (2-6). Slightly curved dorsal transverse bar: x = 52 ± 2.1 (48-56), w = 9 ± 0.9 (7-11). Very large ventral gripus with unique shape among *Thaparocleidus* from *Pangasius* hosts, blade regularly arched, poorly developed guard, no aperture: a = 70 ± 3.7 (64-78), b = 70 ± 3.1 (65-75), c = 1.8 ± 0.6 (0.8-3), d = 23 ± 1.7 (19-27), e = 25 ± 3.4 (15-32). Ventral grippi present on their blade an elongated thickly structure slightly curved posteriorly which have never been observed before. Thick, strong V-shaped ventral transverse bar with rounded extremities: x = 50 ± 3.2 (32-56), w = 8 ± 0.8 (7-10). Very thin and long uncinuli: I to VII = 19 ± 1.9 (13-22). Long, large sinuous penis, well-developed heel: Pe = 121 ± 5.6 (109-131), He = 11 ± 1.3 (9-15). S-shaped accessory piece linked to basal bulb of penis: Ap = 43 ± 3.2 (38-51). No visible vagina.

Comments

Thaparocleidus serpens n. sp. is easily distinguishable from the 22 species belonging to this genus described from *Pangasius* hosts by the size and shape of the ventral gripus which are unique in this group.

Thaparocleidus serpens n. sp. is named for the shape of the penis (*serpens* (Latin) = snake).

THAPAROCLEIDUS OCREA N. SP. (Fig. 3)

Type host: *P. nasutus* (Bleeker, 1862).
Site: gills.
Type locality: Musi River at Palambang (South Sumatra Province, Sumatra Island, Indonesia).
Other records: found on the same host in the Barito River at Banjarmasin (South Kalimantan Province, Borneo Island, Indonesia), and in the Batang Hari River at Jambi (Jambi Province, Sumatra Island, Indonesia).
Material studied: 30 individuals.
Type material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris): 76HG Tk 232.

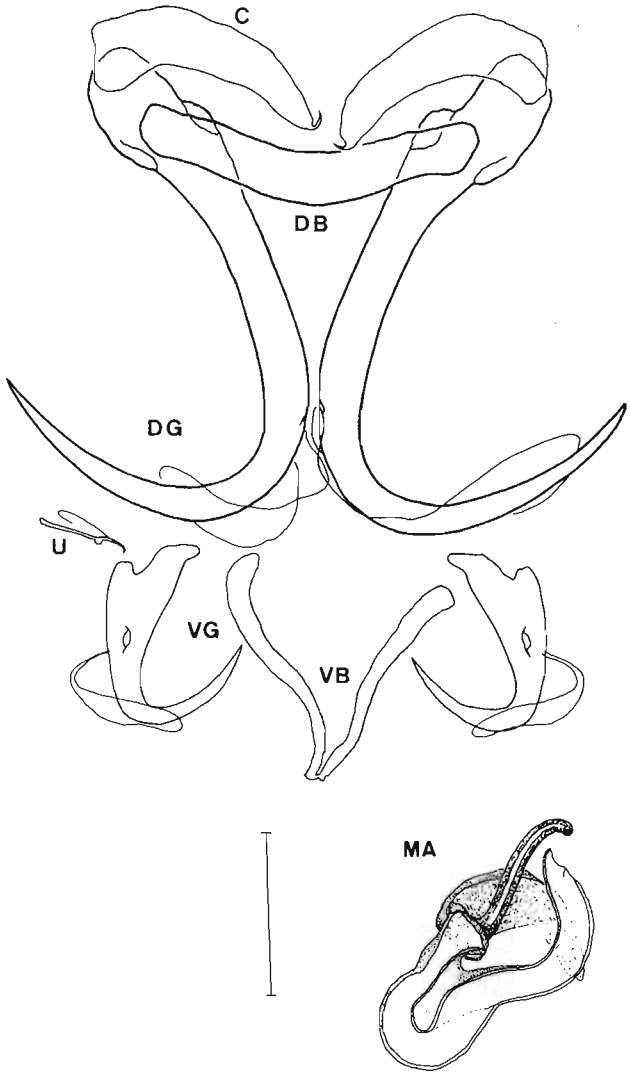

Fig. 3. – *Thaparocleidus ocrea* n. sp. C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; MA = male apparatus; VB = ventral transverse bar; VG = ventral gripus; U = uncinulus. Bar = 30 µm.

Paratypes deposited at the Muséum National d'Histoire Naturelle (Paris): 76HG Tk 233; and at The Natural History Museum (London): n° 2003.6.18.2.

Adults: 1,015 ± 172.5 (564-1,309) long, 149 ± 23.5 (102-194) wide at level of penis. Pharynx: 62 ± 8 (43-77) wide. Large dorsal gripus with blade bent at distal third, poorly marked guard: a = 88 ± 3.5 (74-97), b = 74 ± 3.2 (59-82), c = 3 ± 0.9 (0.5-5), d = 17 ± 1.8 (10-21), e = 48 ± 2.3 (42-54). Very large curved cuneus with short extension: L = 42 ± 2.7 (30-47), l = 12 ± 0.9 (10-13), e = 4 ± 1.4 (1-8). Slightly curved dorsal transverse bar: x = 62 ± 2.4 (57-67), w = 9 ± 1 (7-11). Ventral gripus with small aperture, blade bent at proximal third, well marked guard: a = 33 ± 0.9 (31-36), b = 27 ± 1.1 (25-30), c = 1.9 ± 0.5 (1-4), d = 10 ± 0.8 (9-13), e = 22 ± 0.9 (19-23), L = 4 ± 0.6 (3-5), l = 1 ± 0.3 (0.4-2). V-shaped ventral transverse bar: x = 43 ± 1.7 (40-48), w = 4 ± 0.5 (4-6). Uncinuli II = 16 ± 1.1 (11-18) long, uncinuli I and III to VII = 15 ± 1.7 (11-18) long. Penis consisting of a large thin-walled tube, folded back at proximal quarter after poorly marked basal bulb. First and second parallel quarters of this copulatory tube are linked all along, the rest (third and fourth quarters) is S-shaped. Very large, "boot" shaped heel: Pe = 85 ± 3.3 (79-91), He = 14 ± 1.4 (10-17). Simple, short accessory piece linked to basal bulb of penis: Ap = 30 ± 2.8 (24-36). No visible vagina.

Comments

T. ocrea n. sp. is morphologically close to *T. bahari* Pariselle, Lim & Lambert, 2001; *T. redebensis* Pariselle, Lim & Lambert, 2001; *T. culter* Pariselle, Lim & Lambert, 2002 and *T. culteroides* Pariselle, Lim & Lambert, 2002 in having a large copulatory tube folded back at proximal quarter and a simple accessory piece.
T. ocrea may be easily distinguished from *T. bahari* by the size and shape of cuneus (42 *vs.* 16 µm) and length of its extension (4 *vs.* 12 µm), from *T. redebensis* which has a long thin branched penis wall expansion, from *T. culter* and *T. culteroides* by the size of the copulatory tube (85 *vs.* 67 and 45 µm) and of the cuneus (42 *vs.* 20 and 13 µm).
Thaparocleidus ocrea n. sp. is named after the "boot" shaped heel (*ocrea* (Latin) = boot).

THAPAROCLEIDUS MEGAGRIPUS N. SP. (Fig. 4)

Type host: *P. nasutus* (Bleeker, 1862).
Site: gills.
Type locality: Barito River at Banjarmasin (South Kalimantan Province, Borneo Island, Indonesia).
Other records: found on the same host in the Batang Hari River at Jambi (Jambi Province, Sumatra Island, Indonesia) and on *Pangasius conchophilus* Roberts & Vidthayanon, 1991 in aquaculture cages on the Mekong River at Chau Doc (Vietnam).

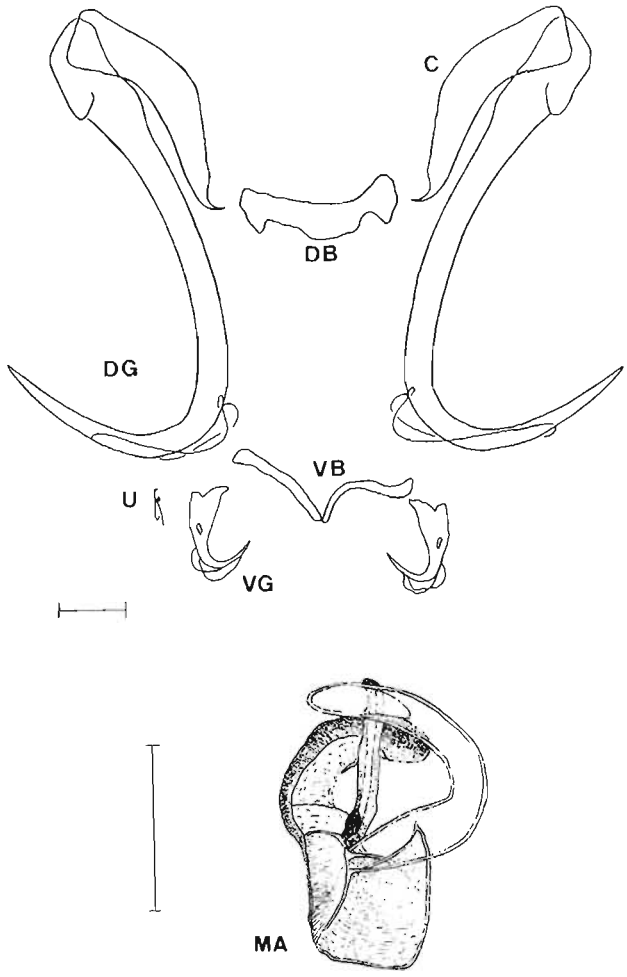

Fig. 4. – *Thaparocleidus megagripus* n. sp. C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; MA = male apparatus; VB = ventral transverse bar; VG = ventral gripus; U = uncinulus. Bar = 30 µm.

Material studied: 15 individuals[2].
Type material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris): 77HG Tk 234. Paratypes deposited at the Muséum National d'Histoire Naturelle (Paris): 77HG Tk 235; and at The Natural History Museum (London): n° 2003.6.18.3.

Adults: 1,085 ± 162.9 (810-1,462) long, 185 ± 28.3 (128-226) wide at level of penis. Pharynx: 70 ± 11.8 (49-89) wide. Extremely large dorsal gripus with blade bent at distal third, poorly marked guard: a = 289 ± 10.8 (271-313), b = 249 ± 9.9 (233-275), c = 5 ± 1.5 (2-8), d = 48 ± 4.4 (39-57), e = 123 ± 6.2 (111-135). Extremely large cuneus with very short extension: L = 96 ± 6.4 (83-108), l = 22 ± 2 (17-26), e = 2 ± 1 (0.2-5).

[2] This species seems to be rare, only 26 individuals were found among more than 1,000 worms collected from 11 fishes dissected. Only 15 (14 from *P. nasutus*, one from *P. conchophilus*) have all the hard parts, the other 11 lost their ventral gripus and bar.

Strong, curved and rounded ended dorsal transverse bar: x = 68 ± 4.3 (62-75), w = 11 ± 1.8 (8-15). Ventral gripus with blade bent at proximal third, poorly marked guard, marked aperture: a = 34 ± 1.4 (30-36), b = 31 ± 1.4 (28-33), c = 1 ± 0.3 (0.6-2), d = 10 ± 0.7 (8-11), e = 18 ± 1 (16-20). V-shaped ventral transverse bar: x = 45 ± 3.6 (41-52), w = 5 ± 0.7 (5-7). Uncinuli II = 17 ± 1.1 (14-18) long, uncinuli I and III to VII = 17 ± 2.3 (11-20) long. Penis consisting of a very large thin walled tube, folded back at proximal quarter after the poorly marked basal bulb. Very large heel: Pe = 110 ± 8.7 (100-134), He = 21 ± 3.2 (16-29). Simple and short accessory piece linked to the basal bulb of the penis: Ap = 41 ± 3.4 (31-46). No visible vagina.

Comments

T. megagripus n. sp. is morphologically close to *T. bahari*, *T. redebensis*, *T. culter*, *T. culteroides* and *T. ocrea* n. sp. in having a large copulatory tube folded back at proximal quarter and a simple accessory piece. It is easily distinguishable from these species, and from all *Thaparocleidus* species described on pangasiid hosts, by the size of dorsal gripus which is more than two time larger than the largest one already described [*T. combesi* Pariselle, Lim & Lambert, 2002 (289 *vs.* 141 µm)].

Thaparocleidus megagripus n. sp. is named after the huge size of the dorsal gripus.

THAPAROCLEIDUS CITREUM N. SP. (Fig. 5)

Type host: *P. nasutus* (Bleeker, 1862).

Site: gills.

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

Other records: found on the same host in the Musi River at Palambang (South Sumatra Province, Sumatra Island, Indonesia) and in the Barito River at Banjarmasin (South Kalimantan Province, Borneo Island, Indonesia).

Material studied: 30 individuals.

Type-material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris):78HG Tk 236. Paratypes deposited at the Muséum National d'Histoire Naturelle (Paris): 78HG Tk 237; and at The Natural History Museum (London): n° 2003.6.18.4.

Adults: 619 ± 106 (416-805) long, 87 ± 11.8 (61-110) wide at level of penis. Pharynx: 43 ± 4.2 (37-54) wide. Small dorsal gripus with blade bent at distal third, poorly marked guard: a = 39 ± 1.6 (35-43), b = 32 ± 1.3 (28-34), c = 1 ± 0.3 (0.5-2), d = 10 ± 0.8 (8-12), e = 21 ± 0.8 (19-24). Small cuneus peach shaped with thin extension: L = 6 ± 0.7 (4-8), l = 3 ± 0.4 (2-4), e = 2 ± 0.8 (1-5). Slightly curved dorsal transverse bar: x = 31 ± 1.2 (27-33), w = 4 ± 0.4 (4-5). Ventral gripus with

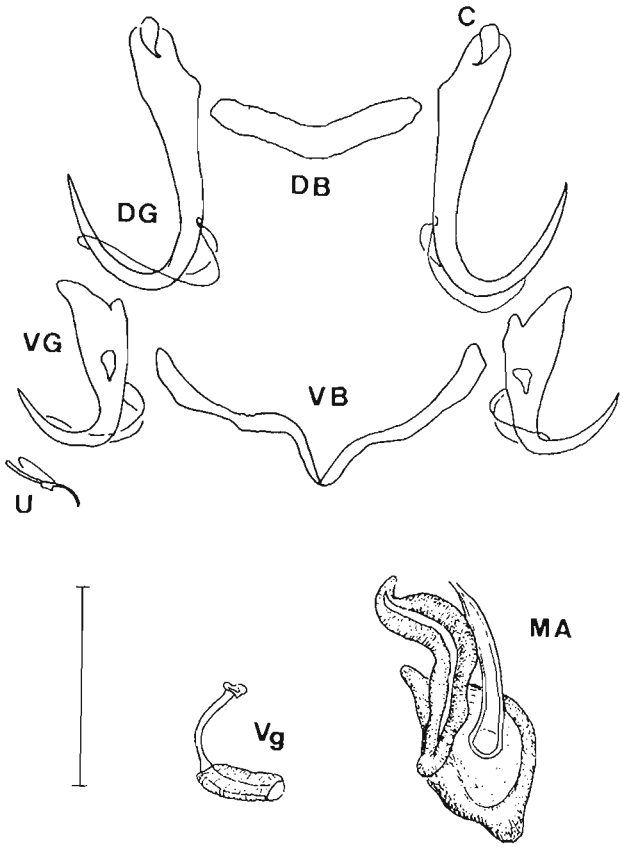

Fig. 5. – *Thaparocleidus citreum* n. sp. C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; MA = male apparatus; VB = ventral transverse bar; VG = ventral gripus; Vg = vagina; U = uncinulus. Bar = 30 µm.

well marked aperture (rarely not visible), marked guard: a = 24 ± 0.9 (22-25), b = 20 ± 0.9 (18-22), c = 1 ± 0.3 (0.5-2), d = 7 ± 0.7 (5-8), e = 14 ± 0.7 (12-16), L = 4 ± 0.9 (1-6), l = 2 ± 0.5 (0.6-3). V-shaped ventral transverse bar: x = 33 ± 1.3 (30-37), w = 3 ± 0.3 (2-3). Thin uncinuli II = 14 ± 0.9 (11-15) long, uncinuli I and III to VII = 14 ± 1.3 (11-17) long. Short, almost straight penis with a poorly marked basal bulb directly attached on a large cupule like structure (32 ± 1.2 (29-34)) lemon shaped, no visible heel: Pe = 27 ± 0.8 (26-29). Very simple accessory piece bended at the middle, ending in a large hook, this piece is apparently not linked to the basal bulb of the penis: Ap = 35 ± 1.6 (32-39). Thin and curved vagina, turned inside out at its distal third: L = 28 ± 2.8 (21-33), l = 1 ± 0.3 (1-2).

Comments

T. citreum n. sp. is easily distinguishable from all *Thaparocleidus* species found on Pangasiidae in having a straight and very short penis.The name *Thaparocleidus citreum* n. sp. is proposed for the shape of the cupule like structure at the base of the penis (*citreum* (Latin) = lemon).

THAPAROCLEIDUS ALATUS N. SP. (Fig. 6)

Type host: *P. nasutus* (Bleeker, 1862).
Site: gills.
Type locality: Batang Hari River at Jambi (Jambi Province, Sumatra Island, Indonesia).
Other records: found on the same host in the Musi River at Palambang (South Sumatra Province, Sumatra Island, Indonesia) and in the Barito River at Banjarmasin (South Kalimantan Province, Borneo Island, Indonesia). Material studied: 22 individuals[3].
Type material: holotype deposited at the Muséum National d'Histoire Naturelle (Paris): 79HG Tk 238. Paratypes deposited at the Muséum National d'Histoire Naturelle (Paris): 79HG Tk 239; and at the Natural History Museum (London): n° 2003.6.18.5.

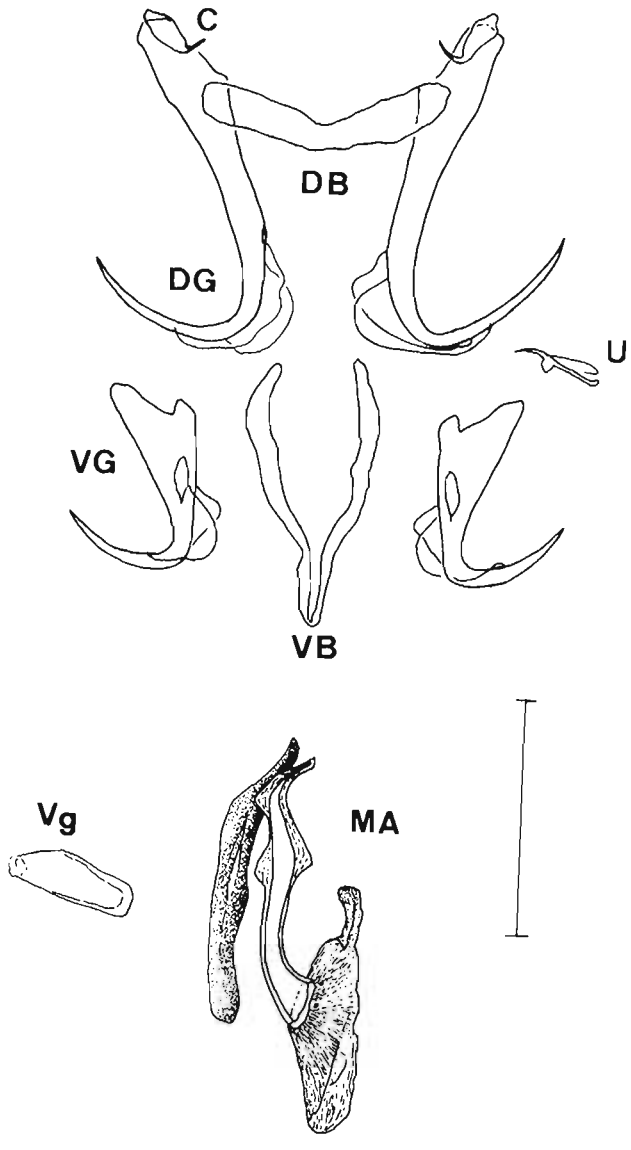

Fig. 6. – *Thaparocleidus alatus* n. sp. C = cuneus; DB = dorsal transverse bar; DG = dorsal gripus; MA = male apparatus; VB = ventral transverse bar; VG = ventral gripus; Vg = vagina; U = uncinulus. Bar = 30 µm.

[3] Only 22 individuals from the numerous collected ones have all the haptors, the other lost their ventral and/or dorsal gripus and bar.

Adults: 489 ± 106.2 (355-779) long, 77 ± 12.7 (51-101) wide at level of penis. Pharynx: 37 ± 6.9 (23-56) wide. Small dorsal gripus with blade bent at distal third, poorly marked guard: a = 41 ± 1.5 (38-44), b = 33 ± 1.5 (29-36), c = 1 ± 0.1 (0.5-1), d = 11 ± 0.8 (9-13), e = 22 ± 1 (19-24). Small cuneus with thin extension: L = 6 ± 0.8 (4-8), l = 3 ± 0.5 (2-4), e = 3 ± 1 (1-5). Slightly curved dorsal transverse bar: x = 30 ± 1.8 (25-34), w = 4 ± 0.6 (3-5). Ventral gripus with well marked aperture (rarely not visible), marked guard: a = 24 ± 0.8 (23-26), b = 21 ± 1.2 (17-23), c = 1 ± 0.3 (0.6-2), d = 7 ± 0.5 (6-9), e = 14 ± 0.7 (13-16), L = 5 ± 0.8 (3-7), l = 2 ± 0.4 (0.9-3). V-shaped ventral transverse bar: x = 33 ± 1.4 (30-36), w = 3 ± 0.3 (2-3). Thin uncinuli II = 13 ± 1 (11-16) long, uncinuli I and III to VII = 14 ± 1.3 (11-17) long. Short penis bent at distal quarter with wall extensions and lanceolate end, beginning with a poorly marked basal bulb directly attached on a large cupule like structure (36 ± 1.5 (32-38)), no visible heel: Pe = 37 ± 2 (31-41). Very simple and straight accessory piece, ending in a small hook, this piece is apparently not linked to the basal bulb of the penis: Ap = 36 ± 1.5 (32-38). Curved vagina, turned inside out at its distal third: L = 23 ± 3.4 (16-31), l = 3 ± 0.6 (2-4).

Comments

T. alatus n. sp. is morphologically (shape of sclerotised parts) close to *T. citreum* n. sp (small hard parts, short penis attached to a cupule like structure) but could be distinguished mainly by the shape (bent at distal quarter with wall extensions and lanceolate end *vs.* straight with no extensions) and the size (37 *vs.* 27 µm) of the penis.
The name *Thaparocleidus alatus* n. sp. is proposed for the shape of the penis wall (*alatus* (Latin) = winged).

CONCLUSIONS

Among the five new *Thaparocleidus* species described here, one – *T. megagripus* n. sp. – is shared by two different host species: *P. nasutus* and *P. conchophilus*. As indicated previously (see conclusions in Pariselle *et al.*, 2002a and 2002b) and because these fishes are also closely related (see Pouyaud *et al.*, 2000) and allopatric, we may suppose that this parasitic species occurs naturally on both host species.
One specimen of *P. nasutus* coming from Jambi (Sumatra Island) and reared in ponds together with cultured *P. hypophthalmus*, presents 30 Monogenea

among which 27 were identified as *T. caecus* (Mizelle & Kritsky, 1969). As indicated previously (see conclusions in Pariselle *et al.*, 2002a) since these fishes are not closely related (see Pouyaud *et al.*, 2000) and because *P. hypophthalmus* was introduced into Indonesia, we may suppose that there was a lateral transfer in culture conditions of *T. caecus* from the introduced fish to *P. nasutus*.*T. caecus* seems to easily infest exogenous fishes (compared to its Thailand origin), and to supplant their original ones. A particular attention has to be focus on this problem, as, in this case, the death of the *P. nasutus* examined may be due to its parasitic infection (see also Euzet & Pariselle, 1996). The present five new species bring the number of *Thaparocleidus* species described on 15 species of pangasiid hosts (*P. bocourti*, *P. djambal*, *P. gigas*, *P. humeralis*, *P. hypophthalmus*, *P. kinabatanganensis*, *P. krempfi*, *P. kunyit*, *P. lithostoma*, *P. mekongensis*, *P. nasutus*, *P. nieuwenhuisii*, *P. pangasius*, *P. rheophilus* and *P. sabahensis*) to 27.

The diversity of monogenean species on the 11 studied host species varies now from 0 to 7[4].

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[4] On *Pangasius nasutus* including *T. caecus* (lateral transfer) and the rare non described one.