

**SEVEN NEW SPECIES OF *DACTYLOGYRUS* DIESING, 1850  
(MONOGENEA) FROM *PUNTIUS* HAMILTON  
(CYPRINIDAE) OF THAILAND**

**S. Chinabut and L. H. S. Lim**

**ABSTRACT.**- Seven new species of *Dactylogyrus* were found on several *Puntius* species from Thailand. They are *D. tapienensis* new species from *P. gonionotus*, *P. altus* and *P. schwanenfeldii*; *D. viticulus*, new species, from *P. gonionotus*, *P. altus* and *P. schwanenfeldii*; *D. tonguthaii*, new species, from *P. gonionotus*; *D. siamensis*, new species, from *P. gonionotus* and *P. daruphani*; *D. kanchanaburiensis*, new species, from *P. gonionotus*; *D. pseudosphyrna* new species, from *P. gonionotus* and *P. schwanenfeldii*; and *D. kwainensis*, new species, from *P. daruphani*. Besides these new species, *D. lampam* Lim, 1992, was found on *P. gonionotus*, *P. schwanenfeldii* and *P. altus*; while *D. perakensis* Lim & Furtado, 1986, and *D. cristatocleithrium* Lim & Furtado, 1986, were obtained from *P. orphoides*. No dactylogyrids were found on *P. partipentazona* from Thailand. *D. pseudosphyrna*, new species, was also found on *Cyclocheilichthys enoplos*.

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**INTRODUCTION**

This is part of a series of reports on monogeneans from freshwater fishes of Thailand (see Chinabut & Lim, 1991). Previous studies from the Oriental zoogeographical region reveal the presence of 35 species of *Dactylogyrus* on at least 15 *Puntius* species (Lim & Furtado, 1986; Lim, 1991). Twelve species of *Dactylogyrus*, several gyrodactylids and one species of diplozoid were obtained from the six species of *Puntius* in Thailand. Of the 12 *Dactylogyrus* species, nine are new species. This paper presents the descriptions of seven of these nine new species due to insufficient materials for the other two species.

**MATERIALS AND METHODS**

Seventy-six fishes belonging to *Puntius gonionotus* (20), *P. altus* (15), *P. orphoides* (10), *P. schwanenfeldii* (15), *P. daruphani* (9) and *P. partipentazona* (7) from the Vachiralongkorn Reservoir in the Kanchanaburi Province and the Cho Praya River at Chainat Province were examined for monogeneans. The fishes were necropsied in the laboratory after basic fish measurements have been recorded. The gills were removed into petric dishes containing water and gently scraped to dislodge monogeneans. The monogeneans were collected and fixed as

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indicated in Lim & Furtado (1986). The monogeneans were measured according to Gussev (1976) and measurements given in micrometer ( $\mu\text{m}$ ) with the averages first followed by the ranges in parentheses. In cases where specimens of the same species were obtained from different host species the measurements given in the descriptions are taken from representatives of the specimens collected each hosts except in one species where the measurements given in the description are those from the type host.

Specimens were deposited in the Zoological Reference Collection (ZRC), Department of Zoology, National University of Singapore, and in the authors' collection at Aquatic Animal Health Research Institute (AAHRI) and National Inland Fisheries Institute, Bangkok and at the Institute of Advanced Studies (IPT), University of Malaya, Kuala Lumpur.

## RESULTS

In this study, 12 species of *Dactylogyrus* have been collected. Of these nine are new species and three previously described. These three species are *Dactylogyrus lampam* Lim, 1991, found on *P. gonionotus*, *P. altus*, and *P. schwanefeldii*, and *D. perakensis* Lim & Furtado, 1986, and *D. cristatocleithrium* Lim & Furtado, 1986, on *P. orphoides*. Thus far no dactylogyrids were found on the Thai *P. partipentazona*, although one species of *Paradiplozoon* was collected from this host species.

## TAXONOMY

### FAMILY DACTYLOGYRIDAE BYCHOWSKY, 1933

#### *Dactylogyrus tapienensis*, new species

(Fig. 1)

**Materials.-** Host: *Puntius gonionotus* (Bleeker, 1850) (Type host), *P. altus* (Gunther, 1868), *P. schwanefeldii* (Bleeker, 1853). Localities: Vachiralongkorn Reservoir, Kanchanaburi Province (Type locality); Cho Praya River, Chainat Province, Thailand. No. of hosts examined: 20 *P. gonionotus*, 15 *P. altus*, 15 *P. schwanefeldii*. No. of monogeneans obtained: 49 from *P. gonionotus*, 11 from *P. altus*, 3 from *P. schwanefeldii*. No. of specimens measured: 22 specimens from *P. gonionotus*. Type specimens: Holotype (NIFI MONO 1990-001), 1 paratype (ZRC 1990.11810), and 1 paratype (IPT).

**Description.-** Body length 1013 (640-1256), width 166 (112-200). Anchors: inner length 59 (46-62), main part 42 (38-46), outer length 49 (36-52), inner root 21 (14-26), outer root 7 (4-10), and recurved point 17 (12-19). One dumb-bell shape connective bar, length 6 (4-8), width 25 (24-26) 14 marginal hooks, 25 (23-28) long, well demarcated gourd-shape handle. Two needles present. Copulatory tube (cirrus) 86 (64-90) long, elongated accessory piece, 81 (62-89) long. Dextral vaginal opening round, sclerotised; short sclerotised vaginal tube, length 15 (14-18).

**Etymology.-** This species is named after "Tapein" the Thai name for *Puntius*.

**Remarks.-** Dactylogyrids with relatively larger anchors and one dumb-bell shape dorsal bar include *D. pahangensis* Lim & Furtado, 1986, *D. contraarmatus* Lim & Furtado, 1984, and *D. sclerovaginalis* Lim & Furtado, 1986. Superficially the present species is similar to *D. pahangensis*

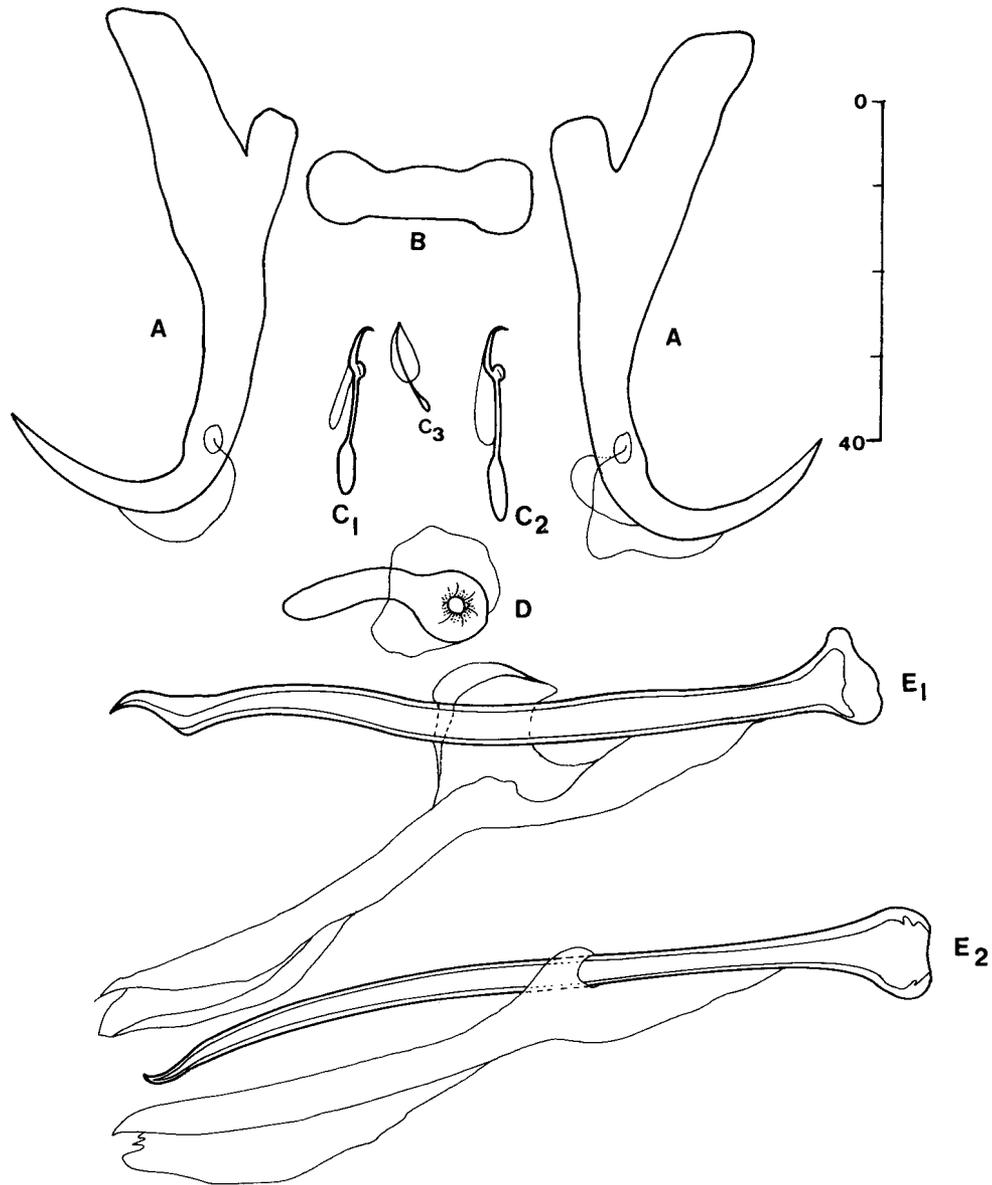


Fig. 1. Hard parts of haptor, copulatory organ and vaginal system of *Dactylogyrus tapienensis*, new species (A = anchors, B = dorsal bar, C1 & C2 = marginal hooks, C3 = needle, D = vaginal tube, E1 & E2 = copulatory organ). (Scale in  $\mu\text{m}$ .)

in the general morphology of the copulatory tube, vaginal system, and hooks, but differ in detailed morphology. The accessory piece in *D. pahangensis* is different from that in the present species. The bar in *D. pahangensis* is also wider and the inner root and point of the anchors are longer compare to that in the present species. The two species are also different in the morphology of the hooks. The single bar in *D. contraarmatus* is similar to that in the present species, however *D. contraarmatus* is different from the present species in the morphology of the hooks, copulatory organs and anchors. *D. sclerovaginalis* differs from the present species in possessing an extra sclerotised J-shape structure.

The measurements of the specimens from the other two host species are given in Table 1 (the measurements given in the description are from the specimens from the type host species). The specimens from *P. altus* have slightly larger anchors, bar and marginal hooks compared to the specimens from *P. gonionotus*. The specimens from *P. schwanefeldii* are the smallest. The sizes of monogenean may be related to the size of the hosts; *P. schwanefeldii* were smaller (8-10 cm) when compared to the other two host species.

Table 1. The measurements ( $\mu\text{m}$ ) of *Dactylogyrus tapienensis*, new species, from *Puntius gonionotus*, *P. altus* and *P. schwanefeldii*. (L = length; W = width; il = inner length; ol = outer length; ir = inner root; or = outer root; pt = point).

Hosts		<i>P. gonionotus</i>	<i>P. altus</i>	<i>P. schwanefeldii</i>
No. examined:		20	15	15
No. infected:		15	3	2
Monogeneans				
No. collected:		49	11	3
No. measured:		22	5	3
Body:	L	1013 (640-1256)	1016 (1050-1450)	580 (570-590)
	W	166 (112-200)	188 (136-304)	140 (130-150)
Anchors:	il	59 (46-62)	60 (58-65)	54 (53-55)
	ol	49 (36-52)	49 (46-50)	45 (43-46)
	ir	21 (14-26)	22 (19-24)	19 (17-20)
	or	7 (4-10)	8 (8-9)	6 (5-6)
	pt	17 (12-19)	18 (18-21)	16 (15-16)
Dorsal bar:	L	6 (4-8)	8 (6-9)	5 (5-6)
	W	25 (24-26)	25 (23-25)	24 (23-24)
Copulatory tube:	L	86 (64-90)	88 (85-94)	80 (80-82)
Accessory pieces:	L	81 (62-89)	85 (84-87)	83 (82-84)
Vaginal armament:	L	15 (14-18)	14 (14-18)	11 (10-12)
	W	4 (3-4)	3 (3-4)	3 (3-4)
Marginal hooks:	L	25 (23-28)	35 (33-39)	24 (22-26)

*Dactylogyrus viticulus*, new species  
(Fig. 2)

**Materials.-** Host: *Puntius gonionotus* (Type host), *P. altus*, *P. schwanefeldii*. Localities: Vachralongkorn reservoir, Kanchanaburi Province (Type locality) and Cho Praya River, Chinat Province, Thailand. No. of hosts examined: 20 *P. gonionotus*, 15 *P. altus*, 15 *P. schwanefeldii*. No. of monogeneans obtained: 6 from *P. gonionotus*, 4 from *P. altus* and 4 from *P. schwanefeldii*. No. of specimens measured: 6 specimens from *P. gonionotus*, 4 specimens from *P. altus* and 4 specimens from *P. schwanefeldii*. Type specimens: Holotype (NIFI MONO 1990-002), 1 paratype (ZRC 1990. 11811) and 1 paratype (IPT).

**Description.-** Body length 640 (480-760), width 160 (158-180). Anchors: main part 41 (40-43), inner length 60 (57-65), outer length 47 (46-48), inner root 23 (22-25), outer root 6 (4-7) and recurved point 20 (20-24). One short stout connective bar, length 4 (4-5), width 18 (16-20). 14 marginal hooks, handle spindle-like, thin pivot, total length 35 (32-38). Two needles present. Copulatory tube, simple slightly twisted (tendrill-like) distally, length 43 (40-44); elongated accessory piece 44 (42-46) long. Vaginal armament not observed.

**Etymology.-** This species is named *viticulus* because of the slightly twisted distal end of the copulatory tube which resembles the tendril of vine (*viticulus* (L.) = little vine.)

**Remarks.-** This species is similar to *Dactylogyrus tapienensis* new species in having a single dorsal bar and large anchors and in the general morphology of the hooks. However the present species differs from *D. tapienensis* new species in having smaller anchors and in the morphology of the copulatory organ.

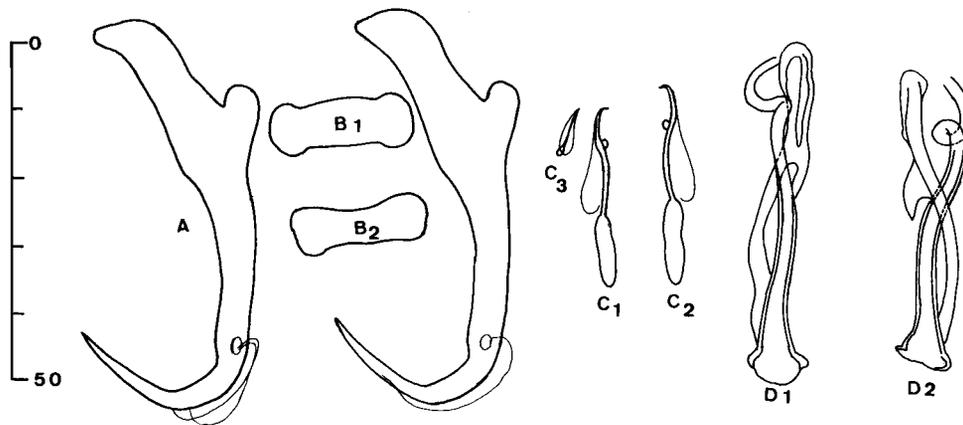


Fig. 2. Hard parts of haptor and copulatory organ of *D. viticulus*, new species (A = anchors, B1 & B2 = dorsal bar, C1 & C2 = marginal hooks, C3 = needle, D1 & D2 = copulatory organ). (Scale in  $\mu\text{m}$ .)

***Dactylogyrus tonguthaii*, new species**

(Fig. 3)

**Materials.**- Host: *Puntius gonionotus*. Locality: Vachiralongkorn Reservoir, Kanchanaburi Province and Cho Praya River, Chainat Province, Thailand. No. of hosts examined: 20. No. of specimens collected: 29. No. of specimens measured: 10 specimens. Type specimens: Holotype (NIFI MONO 1990-003), 1 paratype (ZRC 1990. 11812) and 1 paratype (IPT).

**Description.**- Body length 554 (480-600), width 86 (80-88). Anchors: inner length 36 (34-38), outer length 38 (36-40), inner root 12 (11-13), outer root 4, main part 34 (35-36), recurved point 14 (13-15). Two connective bars: saddle-shaped dorsal bar length 7 (6-8), width 25 (24-28); shallow thin v-shape ventral bar, 18 (16-20) long. 14 marginal hooks, total length 20 (18-24) with slightly demarcated handle. Two needles present. Copulatory tube short, curved tapering, length 21 (20-22); stick-like accessory piece with expanded distal end.

**Etymology.**- This species is named *tonguthaii* in honour of Dr. Kamonporn Tonguthai, Director of AAHRI, Department of Fisheries, Bangkok.

**Remarks.**- The copulatory organ of this species is similar to *D. angularis* Gussev 1976 (from *P. stigma*), but differs in detailed structure; in *D. angularis* the tube is longer and accessory piece is more leaf-like compared to that of the present species. Dactylogyrids with two bars, tapering copulatory tube and hooks with demarcated handles are *D. spiruli* Lim and Furtado, 1984, *D. malayanus* Lim & Furtado, 1984, *D. sagittavaginalis* Lim & Furtado, 1986, and *D. fasciati* Lim & Furtado, 1986. However the present species is different from the abovementioned species in possessing a more robust saddle-like dorsal bar, and shorter more tapering copulatory tube. The anchors of the present species are also different from any of the aforementioned species.

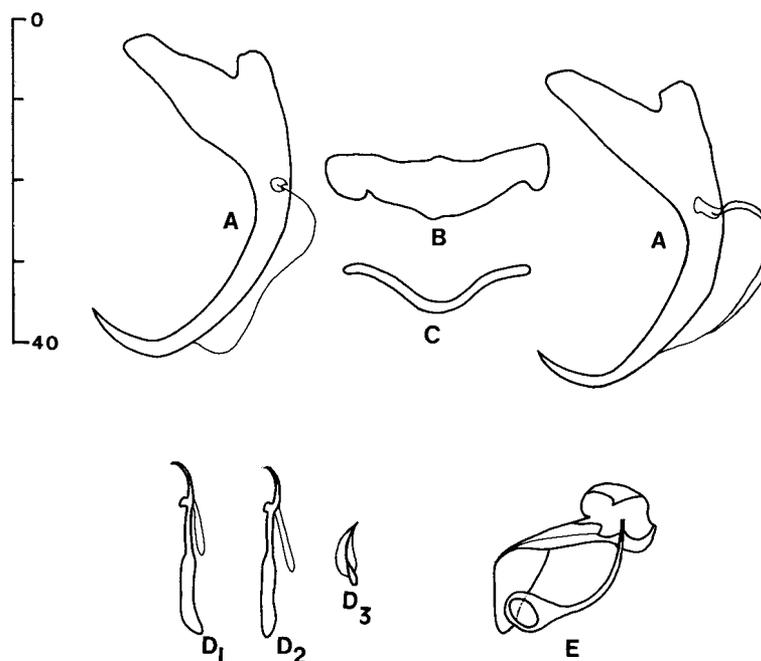


Fig. 3. Hard parts of haptor and copulatory organ of *Dactylogyrus tonguthaii*, new species (A = anchors, B = dorsal bar, C = ventral bar, D1 & D2 = marginal hooks, D3 = needle, E = copulatory organ). (Scale in  $\mu\text{m}$ .)

*Dactylogyrus siamensis*, new species

(Fig. 4)

**Materials.-** Host: *Puntius gonionotus* (Type host), *P. daruphani* Smith, 1934. Localities: Vachiralongkorn Reservoir, Kanchanaburi Province and Cho Praya River, Chainat Province, Thailand. No. of host examined: 5 *P. gonionotus* and 5 *P. daruphani*. No. of specimens collected: 30 *P. gonionotus* and 1 from *P. daruphani*. No. of specimens measured: 10 specimens from *P. gonionotus* and 1 specimens from *P. daruphani*. Type specimens: Holotype (NIFI MONO 1990-006), 1 paratype (ZRC 1990. 11815) and 1 paratype (IPT).

**Description.-** Body length 396 (315-500), width 61 (50-80). Anchors inner length 29 (20-42), outer length 24 (18-30), inner root 9 (8-10), outer root 6 (5-7), main part 18 (16-22), very short recurved point 4 (3-6). Two connective bars: saddle-shape dorsal bar, length 6 (5-8), width 28 (22-35); thin v-shape ventral bar, length 2(1-2), width 22 (20-24). 14 hooks, one pair longer, 25 (24-26), others 19 (17-22) long. Two needles present. Copulatory tube short thin curved, length 20 (18-25); leaf-like accessory piece. Vaginal system not observed.

**Etymology.-** This species is named after Siam.

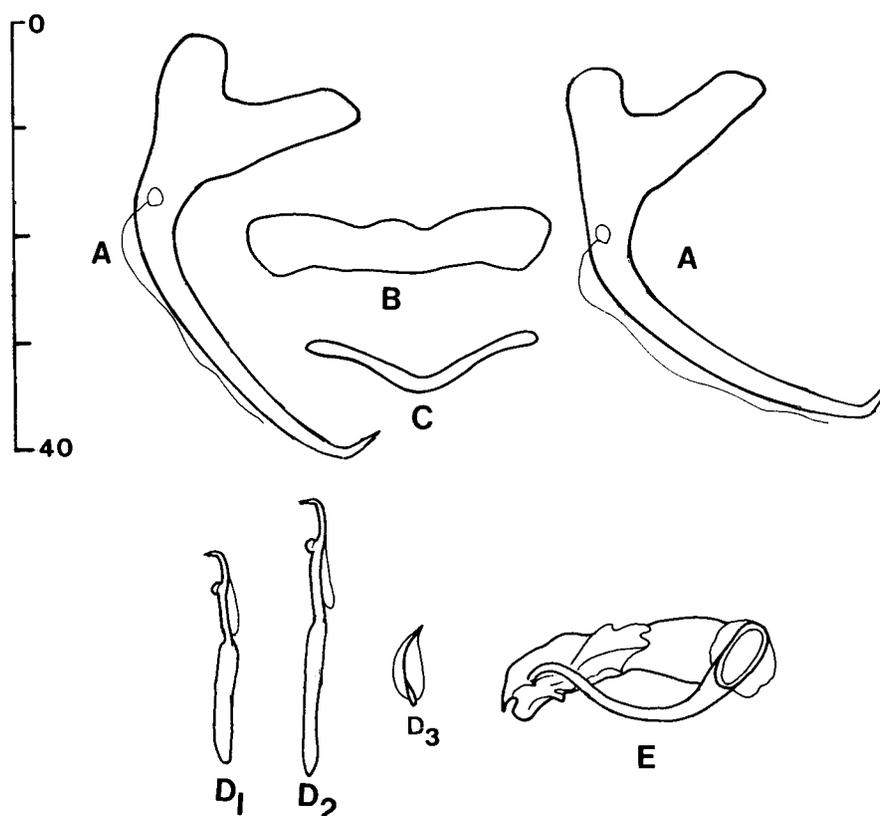


Fig. 4. Hard parts of haptor and copulatory organ of *Dactylogyrus siamensis*, new species (A = anchors, B = dorsal bar, C = ventral bar, D1 & D2 = marginal hooks, D3 = needle, E = copulatory organ). (Scale in  $\mu\text{m}$ .)

**Remarks.**- The anchors of this species are similar to that of *D. soikhaonensis* Chinabut & Lim, 1991 except in detailed morphology. This species is also different from *D. soikhaonensis* in having two bars (compared to one in *D. soikhaonensis*) as well as in the morphology of the hooks, and copulatory organ. The copulatory organ of the present species is similar to that of *D. tonguthaii* new species, but differ in the morphology of the hooks and anchors.

***Dactylogyrus kanchanaburiensis*, new species**

(Fig. 5)

**Materials.**- Host: *Puntius gonionotus*. Locality: Vachiralongkorn Reservoir, Kanchanaburi Province and Cho Praya River, Chainat Province, Thailand. No. of hosts examined: 20. No. of specimens collected: 7. No. of specimens measured: 7 specimens. Type specimens: Holotype (NIFI MONO 1990-004), 1 paratype (ZRC 1990. 11813) and 1 paratype (IPT).

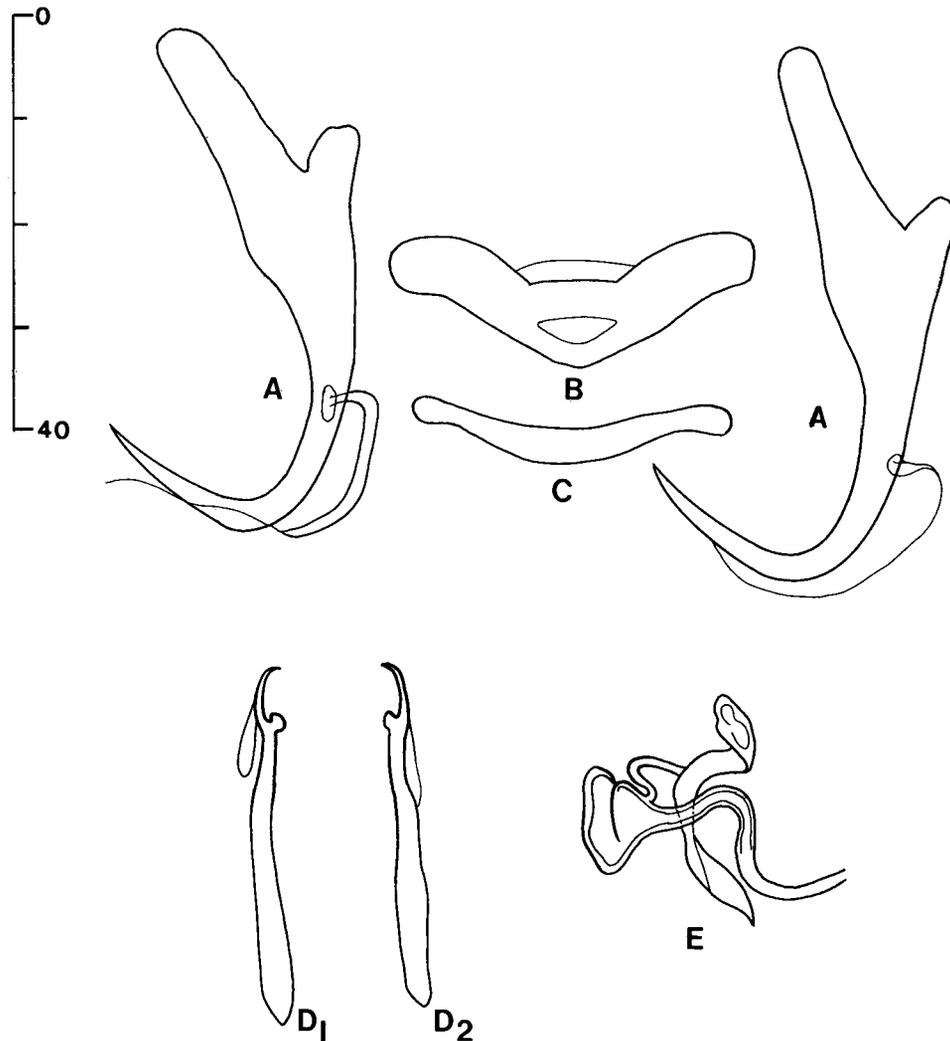


Fig. 5. Hard parts of haptor and copulatory organ of *Dactylogyrus kanchanaburiensis*, new species (A = anchors, B = dorsal bar, C = ventral bar, D1 & D2 = marginal hooks, E = copulatory organ). (Scale in  $\mu\text{m}$ .)

**Description.-** Body length 637 (530-740), width 113 (110-120). Anchors: inner length 48 (30-53), outer length 37 (35-40), inner root 16 (15-18), outer root 5 (3-6), main part 33 (32-34) and recurved point 17 (16-18). Two connective bars: saddle-shaped dorsal bar length 8 (7-9), width 35 (32-37); and lightly sclerotized v-shaped ventral bar. 14 marginal hooks with slightly demarcated handle, total length 27 (25-30). Two needles present. Copulatory tube short twisted, 25 (24-26) long; accessory piece lightly sclerotised.

**Etymology.-** This species is named *kanchanaburiensis* after the Kanchanaburi Province.

**Remarks.-** The dorsal and ventral bars of the present species are similar to *D. binotati* Lim & Furtado, 1986. *D. binotati* is different in having a longer copulatory tube and vaginal tube, and in the morphology of the accessory piece. This species is similar to *D. perakensis* in having similar types of bars, hooks and anchors; however differ in detailed morphology. *D. perakensis* is also different in having a coiled copulatory tube and a sclerotised vaginal tube which is not observed in the present species. This species are similar to *D. fasciculi* Lim & Furtado, 1986 in having similar type of haptor armaments and copulatory organ, but differ in detailed morphology; the accessory piece of *D. fasciculi* is twisted and the anchors have shorter inner root.

#### ***Dactylogyrus pseudosphyrna*, new species**

(Fig. 6)

**Materials.-** Host: *Puntius gonionotus* (Type host), *P. schwannfeldii* and *Cyclocheilichthys enoplos*. Localities: Vachiralongkorn Reservoir, Kanchanaburi Province (Type locality), Cho Praya River, Chainat Province, and Ubolrattana Reservoir, Khonkhan Province, Thailand. No. of hosts examined: 20 *P. gonionotus*; 6 *P. schwannfeldii*; 6 *C. enoplos*. No. of specimens collected: 13 from *P. gonionotus* and 1 from *C. enoplos*. No. of specimens measured: 10 specimens from *P. gonionotus* and 1 from *C. enoplos*. Type specimens: Holotype (NIFI MONO 1990-005), 1 paratype (ZRC 1990. 11814) and 1 paratype (IPT).

**Description.-** Body length 582 (560-670), width 80 (70-110). Anchors without outer roots, inner length 39 (38-40), inner root 15 (14-18), main part 33 (32-34) and recurved point 18 (16-20). Two connective bars: Y-shaped dorsal bar, length 7 (6-8), width 29 (28-30); thin, stick-like ventral bar, width 20 (18-20). 14 marginal hooks, one pair longer and stouter, total length 21 (22-24), others 19 (18-20) long. Two needles present. Copulatory tube curving 59 (58-60) long; accessory piece funnel-liked, length 49 (46-52).

**Etymology.-** This species is named *pseudosphyrna* because of the presence of sphyrnoid-type of haptor structures similar to that found in *D. sphyrna* Linstow, 1878 (see Gussev, 1976).

**Remarks.-** The present species is similar to *D. sphyrnoides* Gussev, 1976, *D. sphyrna*, *D. falciungius* Achmerow, 1952, and *D. niedashui* Gussev, 1967 (see Gussev 1985) in possessing sphyrnoid-type of haptor structures i.e. stout anchors and a pair of large stout marginal hooks (probably Hook No. 3). This present species is different from *D. sphyrnoides* and the other three species in the structures of the ventral bar, and hook No. 3 (which in this present species is comparatively less robust), and in the detailed structure of the anchors.

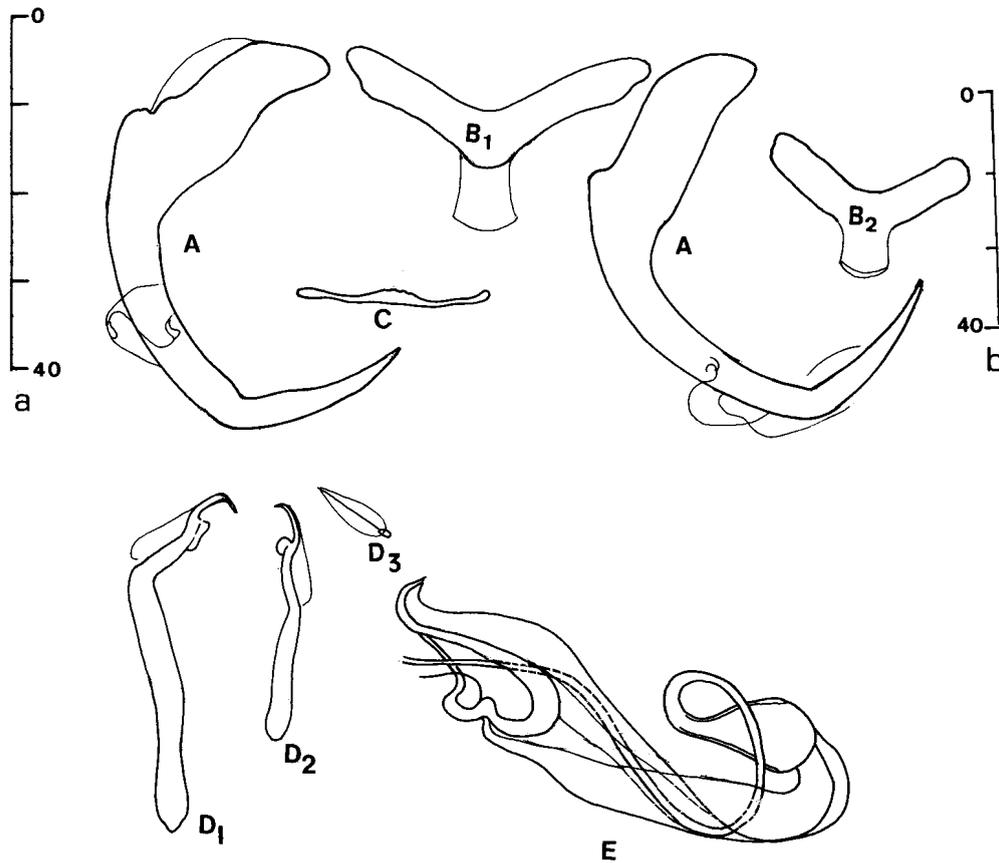


Fig. 6. Hard parts of haptor and copulatory organ of *Dactylogyrus pseudosphyrna*, new species (A = anchors, B = dorsal bar, C = ventral bar, D1 & D2 = marginal hooks, D3 = needle, E = copulatory organ). (Scales in  $\mu\text{m}$ . Scale b for Fig. B2 only)

***Dactylogyrus kwainensis*, new species**

(Fig. 7)

**Materials.-** Host: *Puntius daruphani*. Localities: Vachiralongkorn Reservoir, Kanchanaburi Province River Kwai and Cho Praya River, Chainat Province, Thailand. No. of hosts examined: 9. No. of specimens collected: 35. No. of specimens measured: 20 specimens. Type specimens: Holotype (NIFI MONO 1990-008), 1 paratype (ZRC 1990. 11817) and 1 paratype (IPT).

**Description.-** Body length 639 (560-720), width 117 (80-160). Anchors: inner length 49 (48-53), outer length 40 (38-42), inner root 19 (18-20), outer root 3 (2-4), main part 37 (34-40) and

short curved point 15 (14-16). Two connective bars: saddle-shape dorsal bar, length 17 (16-20), width 30 (26-32); lightly sclerotised V-shape ventral bar, length 2 (1-2), width 20 (18-22). 14 hooks, 26 (20-28) long. Two needles present. Copulatory tube coiled; accessory piece made up of several sclerotised pieces. Vaginal tube present.

**Etymology.**- This species is named *kwainensis* after the River Kwai, the main river of the Kanchanaburi Province.

**Remarks.**- The present species is similar to *D. lampam* in possessing similar type of anchors, dorsal bar, hooks, copulatory organs and vaginal tube, although they differ in detailed morphology as well as in the morphology of the ventral bar. This present species is similar to *D. perakensis* in having two bars, in the morphology of the hooks, copulatory organ and vaginal tube, and anchors although differing in detailed morphology.

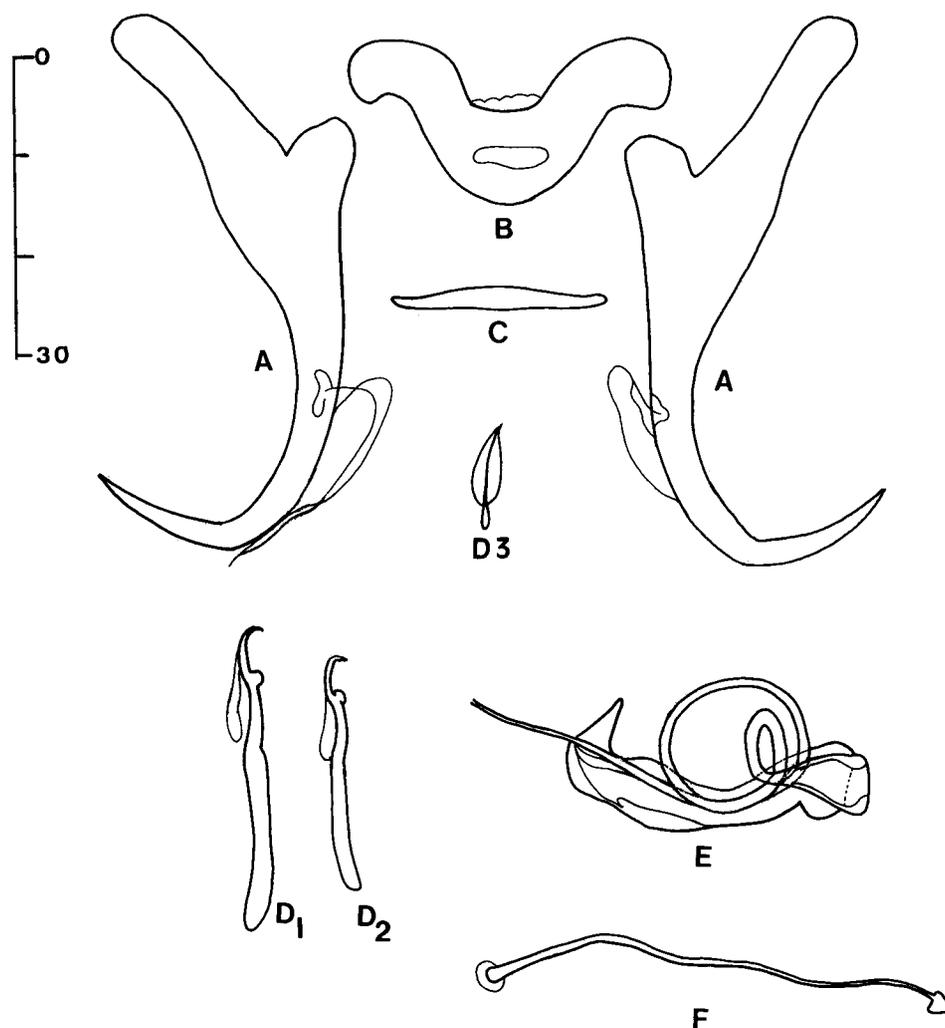


Fig. 7. Hard parts of haptor, copulatory organ and vaginal system of *Dactylogyrus kwainensis*, new species (A = anchors, B = dorsal bar, C = ventral bar, D1 & D2 = marginal hooks, D3 = needle, E = copulatory organ, F = vaginal tube). (Scale in  $\mu\text{m}$ .)

## DISCUSSION

In this study only 19 % (6 species) of the 31 *Puntius* species recorded by Smith (1945) were examined. *P. gonionotus* possesses the most number of *Dactylogyrus* species (7 *Dactylogyrus* species) compared to the other *Puntius* which possess about 1 to 4 species each (Table 2) with the exception of *P. partipentazona*. In the present study no dactylogyrids have been collected from *P. partipentazona*. This is probably because the number of host individuals examined is low, since *D. partipentazonae* Lim & Furtado, 1986, and *D. pentabrachicleithrium* Lim & Furtado, 1986, were described from *P. partipentazona* from Peninsular Malaysia. A *Paradiplozoon* species has also been recorded from *P. partipentazona* in Peninsular Malaysia.

The diversity of *Dactylogyrus* on *P. gonionotus* and *P. schwanenfeldii* in Thailand is greater than on the same two host species in Peninsular Malaysia; there are seven species of *Dactylogyrus* on *P. gonionotus* and four species on *P. schwanenfeldii* compared to only one, *D. lampam*, on the *P. gonionotus* and *P. schwanenfeldii* in Peninsular Malaysia (Lim & Furtado, 1986; Lim, 1991).

The Thai and Malaysian *Puntius* share some common species; for example *D. lampam* is found on *P. gonionotus*, *P. schwanenfeldii* and *P. altus* in Thailand and on *P. gonionotus* and *P. schwanenfeldii* in Malaysia (Lim & Furtado, 1986; Lim, 1991); while *D. perakensis* and *D. cristatocleithrium* are found on *P. orphoides* in Malaysia (Lim & Furtado, 1986) as well as in Thailand.

Table 2. Distribution of *Dactylogyrus* on six species of *Puntius* in Thailand.

<i>Puntius</i>	<i>gonionotus</i>	<i>altus</i>	<i>schwanenfeldii</i>	<i>orphoides</i>	<i>daruphani</i>	<i>partipentazona</i>
No. examined:	20	15	15	10	9	7
No. infected:	18	15	13	10	8	0
<i>Dactylogyrus</i>						
<i>tapienensis</i>	+	+	+	-	-	-
<i>viticulus</i>	+	+	+	-	-	-
<i>tonguthaii</i>	+	-	-	-	-	-
<i>siamensis</i>	+				+	
<i>kanchanaburiensis</i>	+	-	-	-	-	-
<i>pseudosphyrna</i>	+	-	+	-	-	-
<i>kwainensis</i>	-	-	-	-	+	-
<i>lampam</i>	+	+	+	-	-	-
<i>perakensis</i>	-	-	-	+	-	-
<i>cristatocleithrium</i>	-	-	-	+	-	-
No. of species	7	3	4	2	2	0

The Thai *Puntius* also share many common monogenean species (Table 2); for example, *P. gonionotus* and *P. schwanenfeldii* have 4 species in common, viz., *D. lampam*, *D. pseudosphyrna*, new species, *D. viticulus*, new species, and *D. tapienensis*, new species. Many of the presently described *Dactylogyrus* species have wide host ranges or host specificity; for example, *D. tapienensis*, new species and *D. viticulus*, new species are found on *P. gonionotus*, *P. altus* and *P. schwanenfeldii*. In fact *D. pseudosphyrna*, new species is found on *P. gonionotus*, *P. schwanenfeldii* and also on a non-*Puntius* host, *Cyclocheilichthys enoplos* (Table 2).

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