

DACTYLOGYRIDAE AND GYRODACTYLIDAE (MONOGENOIDEA) FROM SOME FISHES FROM MONGOLIA*

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Abstract. 24 monogenoid species were found to parasitize the gills and fins of 15 species of Salmonidae, Thymallidae, Esocidae, Cyprinidae, Gadidae, Percidae and Cottidae. Of these *Gyrodactylus szanagai* and *G. tuimeni* are new species. New hosts of these species are: *Microphysogobio tungtingensis anudarini* for *Ancyrocephalus polymorphus*, *Cottus szanaga* for *Gyrodactylus cotti* and *G. hrabei*, *Gobio gobio cynocephalus* for *Gyrodactylus gobii*, *Acanthorhodeus asmussii* for *Gyrodactylus rhodei* and *Pseudaspis leptcephalus* for *Gyrodactylus sprostonae*.

The paper presents the results of systematic studies on Dactylogyridae and Gyrodactylidae from several Salmonidae, Thymallidae, Esocidae, Cyprinidae, Gadidae, Percidae and Cottidae collected during the Czechoslovak-Mongolian ichthyoparasitological expedition in 1966. Of the 24 species collected 11 are members of the genus *Dactylogyrus* Diesing, 1850, one of the genus *Ancyrocephalus* Creplin, 1839 and 12 of the genus *Gyrodactylus* Nordmann, 1832.

MATERIAL AND METHODS

We examined parasitologically 28 specimens of *Brachymystax lenok* (Pallas), 5 specimens of *Hucho taimen* (Pallas), 31 specimens of *Thymallus arcticus* (Pallas), 14 specimens of *Esox lucius* L., 2 specimens of *Rutilus rutilus* L., 2 specimens of *Hemibarbus labeo* (Pallas), 4 specimens of *Gobio gobio cynocephalus* Dybowski, 3 specimens of *Gobio albipinnatus tenuicorpus* Mori, 4 specimens of *Microphysogobio tungtingensis anudarini* Holčík et Pivnička, 4 specimens of *Acanthorhodeus asmussii* (Dybowski), 2 specimens of *Pseudaspis leptcephalus* (Pallas), 4 specimens of *Culter alburnus* Basilewski, 10 specimens of *Lota lota* (L.), 7 specimens of *Percina fluviatilis* L. and 7 specimens of *Cottus szanaga* Dybowski.

The examined fishes were caught in the localities: River Tul near the settlement Songino and near U-Bulan, River Selenga near Muron, Lake Ugiy, Khubsugul and Tirkhin tsagan (basin of the River Selenga), River Kherlen near Bayandelger, River Khalkhingol, River Onon near Binder and Lake Buyr nur (basin of the River Amur) and Lake Dod tsagan and its tributaries (basin of the River Yenisei).

The parasites were fixed in ammonium-pierate (after Malmberg 1956). The specimens (including holotypes) are deposited in the collection of the Institute of Parasitology, Czechoslovak Academy of Sciences, Prague, the collection of comparative material in the Biological Institute of the Mongolian Academy of Sciences, Ulan Bator.

*) This is Communication No. 10 in the series of papers on the results of the joint Czechoslovak-Mongolian expedition to Mongolia in 1966.

RESULTS

1. *Dactylogyrus crucifer* Wagener, 1857

Host: *Rutilus rutilus*; location: gills; locality: Lake Ugiy nur. This species (39 specimens) was found on one of the two hosts examined.

All morphological and metrical data obtained from our material are within the range of variability of this species.

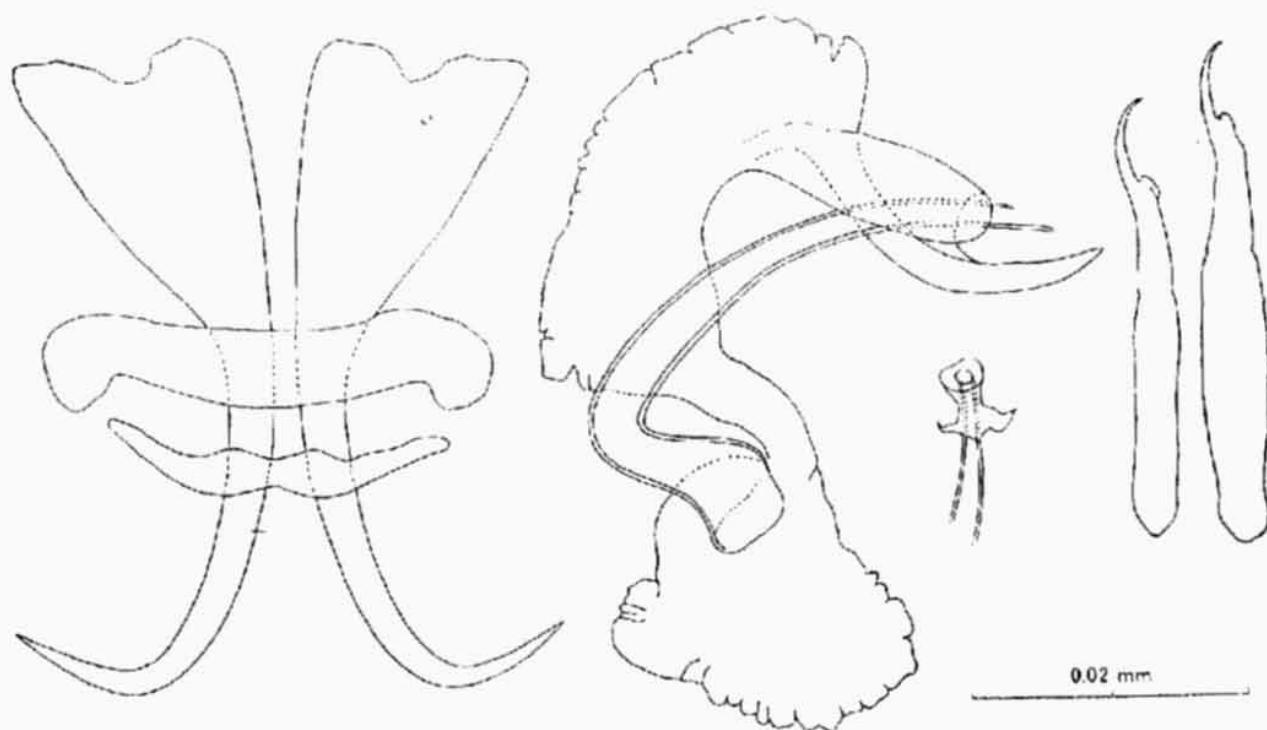


Fig. 1. Chitinoid parts of the haptor, vaginal support and copulatory complex of *Dactylogyrus cryptomeres* Bychowsky, 1934.

2. *Dactylogyrus cryptomeres* Bychowsky, 1934

Host: *Gobio gobio cenocephalus*; location: gills; locality: River Onon near Binder. One specimen was found on one of the four hosts examined.

No differences were observed in the shape and size of the chitinoid parts of the haptor and the copulatory complex of our specimen and in those of typical *D. cryptomeres*. It seems important, however, to draw attention to the finding of a vaginal support in this parasite and, therefore, we have changed the original description in this respect.

3. *Dactylogyrus curvicirrus* Achmerow, 1952

Fig. 2

Host: *Culter alburnus*; location: gills; locality: Lake Buyr nur. This species was found on 3 of the 4 hosts examined, the worm load was up to 36 specimens on one fish.

All morphological and metrical data obtained from our material are within the range of variability of this species.

4. *Dactylogyrus dubius* Gussev, 1955

Fig. 3a

Host: *Microphysogobio tungtingensis anudarini*; location: gills; locality: Lake Buyr nur. This species was found on 3 of the 4 hosts examined, the worm load was up to 2 specimens on one fish.

No differences have been found in size and shape of the principal characteristic signs of our specimens and in those of the typical *D. dubius*. *M. tunglingensis anudarini* is a new host for this species.

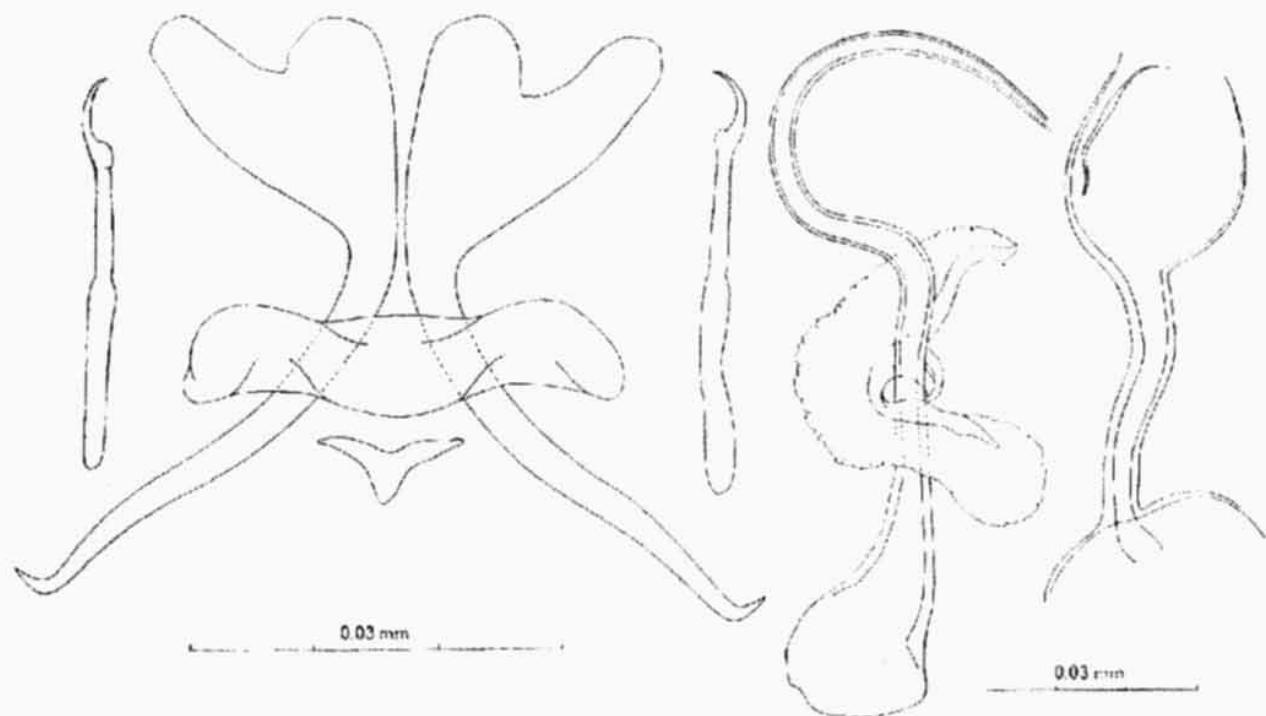


Fig. 2. Chitinoid parts of the haptor, copulatory complex and vaginal support of *Dactylogyrus curvicirrus* Achmerow, 1952.

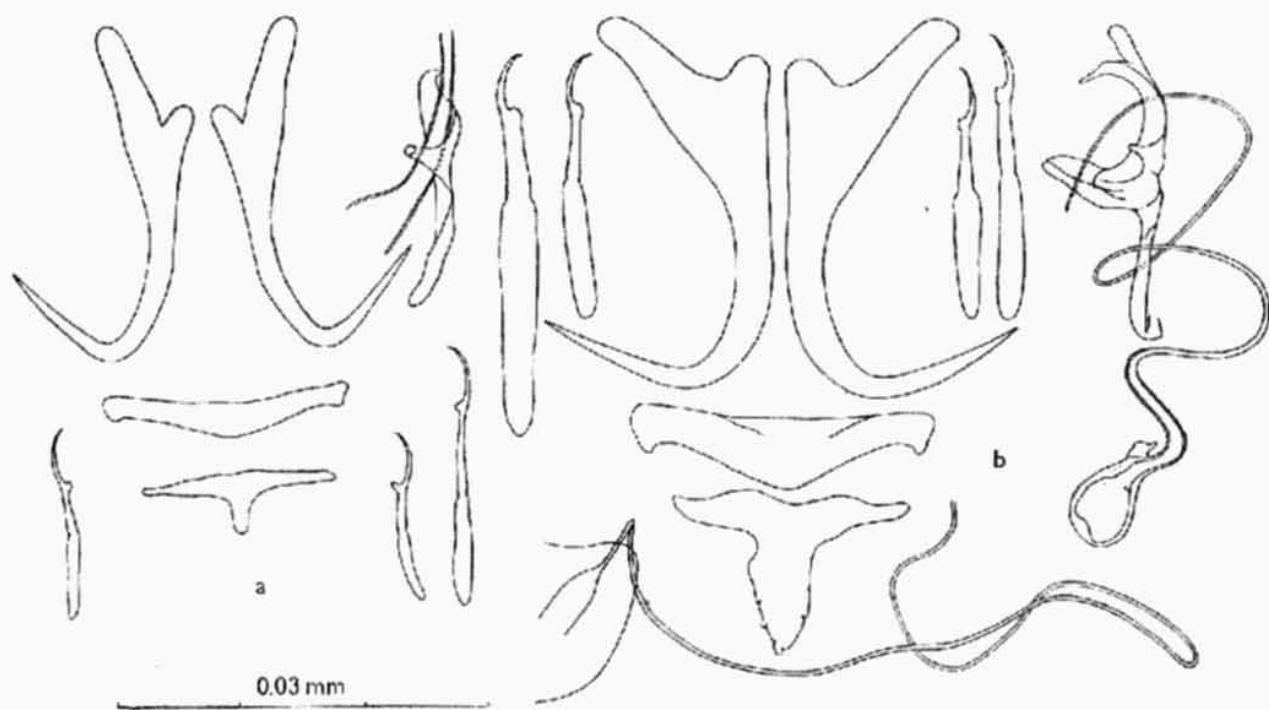


Fig. 3. a — chitinoid parts of the haptor and copulatory complex of *Dactylogyrus dubius* Gussev, 1955; **b** — chitinoid parts of the haptor, copulatory complex and vaginal support of *Dactylogyrus flagellicirrus* Gussev, 1955.

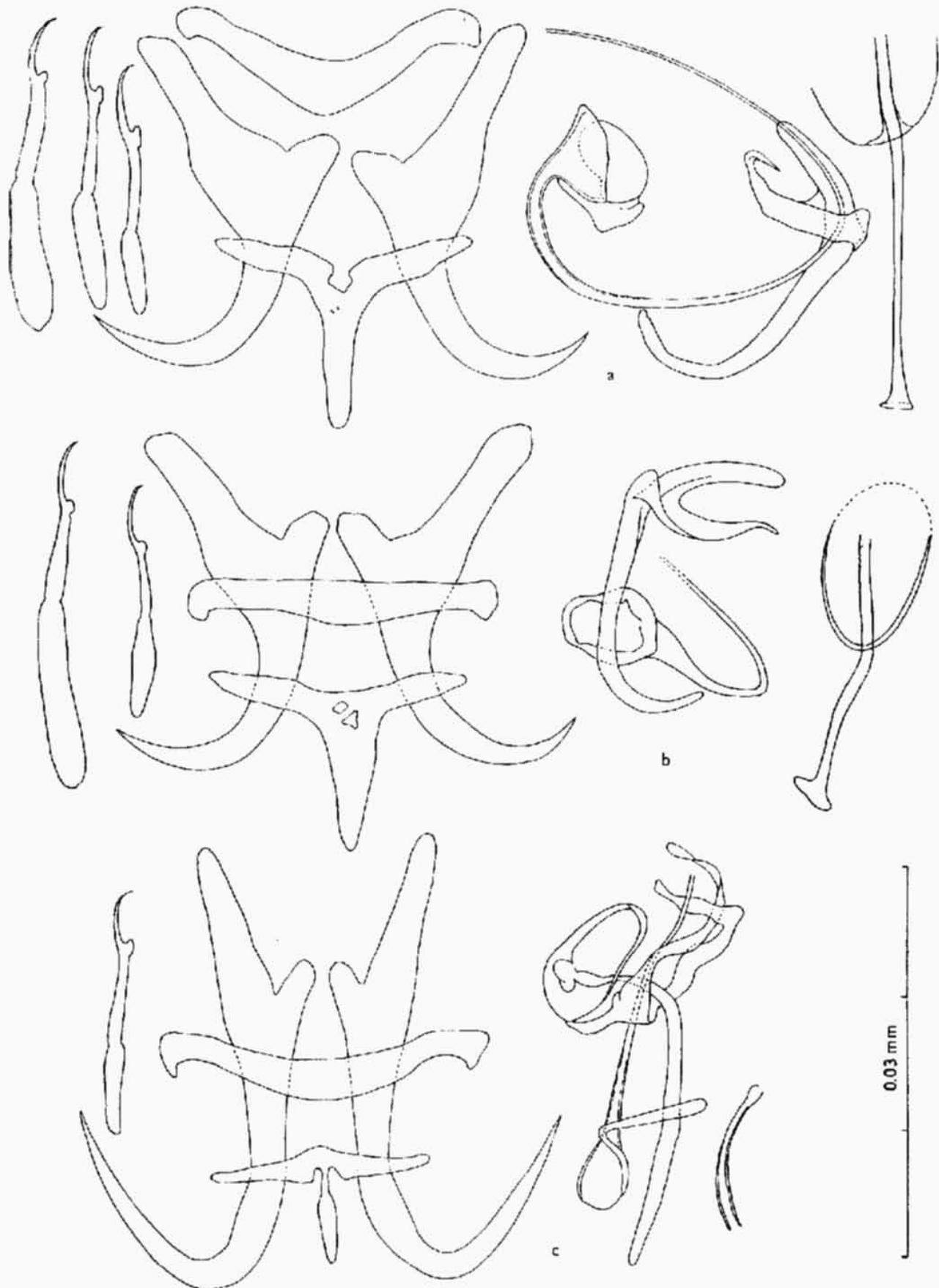


Fig. 4. Chitinoid parts of the haptor, copulatory complex and vaginal support. a, b — *Dactylogyrus trioxonius* Achmerov, 1952; c — *D. montrechadskyi* Gussev, 1955.

5. *Dactylogyrus flagellicirrus* Gussev, 1955

Fig. 3b

Host: *Culter alburnus*; location: gills; locality: Lake Buyr nur. This species (3 specimens) was found on one of the four hosts examined.

All morphological and metrical data obtained from our material are within the range of variability of this species.

6. *Dactylogyrus montschadskyi* Gussev, 1955

Fig. 4c

Host: *Culter alburnus*; location: gills; locality: Lake Buyr nur. This species (19 specimens) was found on 3 of the 4 hosts examined, the worm load was up to 7 specimens on one fish.

No differences have been found in size and shape of the principal characteristic signs of our specimens and in those of the typical *D. montschadskyi*.

7. *Dactylogyrus rostrum* Gussev, 1955

Host: *Hemibarbus labeo*; location: gills; locality: River Khalkhingol. This species (7 specimens) was found on one of the two hosts examined.

The shape and size of the principal characteristic signs of our specimens are consistent with those of the specimens described up to date.

8. *Dactylogyrus similis* Wegener, 1909

Host: *Rutilus rutilus*; location: gills; locality: Lake Ugiy nur. This species (3 specimens) was found on one of the two hosts examined.

All morphological and metrical data obtained from our material are within the range of variability of this species.

9. *Dactylogyrus trixonis* Achmerow, 1952

Fig. 4a, b

Host: *Acanthorhodeus asmuissii*; location: gills; locality: Lake Buyr nur. This species was found on three of the four hosts examined, the worm load was up to 9 specimens on one fish.

Description: Overall length of anchors 0.025—0.026 mm, the length of their base 0.017—0.020 mm, the point measures 0.006—0.007 mm. The anchor base consists of two well developed roots, the inner root is 0.011—0.012 mm long, the outer root about 0.003 mm. The connecting bar, mostly straight or only moderately arched, is 0.004 mm long and 0.024—0.025 mm wide. The supplementary bar is T-shaped; it measures 0.012—0.015 by 0.019—0.021 mm. The marginal hooks with well discernible base and shaft and a rounded projecting "opposable piece" of the point; their total length is 0.017—0.026 mm. The copulatory complex consist of a thin and long tube and a supporting piece; its total length ranges from 0.022—0.023 mm. The vaginal tube is 0.025—0.026 mm long.

The shape of the anchors, marginal hooks and of the copulatory complex of our specimens is in agreement with that of the specimens described up to date. Also their metric values are still within the framework of recorded variability, although certain deviations have been observed in comparison with the specimens recorded by Achmerow (1952) and Gussev (1955, 1962).

In addition to these specimens we have found also others resembling *D. trioxonis* in the shape and size of anchors and marginal hooks of the haptor, as well as of the copulatory complex and vaginal support, while the shape and size of the connecting bar resembled *D. liaohoensis* Gussev, 1962 (see Fig. 4). However, we assigned all these specimens to *D. trioxonis*, at least for the time being, for the species independence of *D. liaohoensis* has not been cleared as yet.

10. *Dactylogyrus* sp. 1.

Fig. 5b

Host: *Gobio albipinnatus taenicorpus*; location: gills; locality: Lake Buyr nur. This species (2 specimens) was found on one of the three fishes examined.

Description: The anchors with well developed roots and moderately bent point. Their total length is 0.044—0.045 mm, the length of the anchor base is 0.038—0.041 mm, of the inner root 0.011—0.012 mm, of the outer root 0.002—0.003 mm, of the point

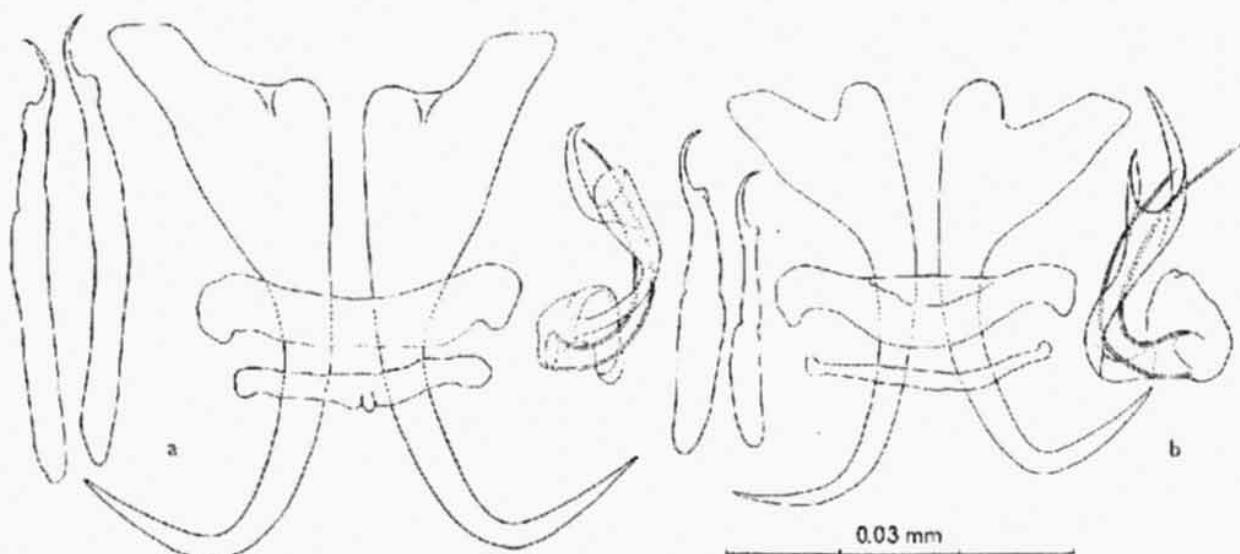


Fig. 5. Chitinoid parts of the haptor and copulatory complex. a — *Dactylogyrus* sp. 2; b — *Dactylogyrus* sp. 1.

0.013—0.014 mm. The connecting bar bent in the middle has its extremities expanded backwards and measures 0.005—0.006 by 0.027—0.029 mm. The supplementary bar, mostly straight or only moderately arched, is 0.002—0.003 mm long and 0.022 to 0.025 mm wide. The total length of marginal hooks ranges from 0.030—0.044 mm.

The copulatory complex consists of a tube and supporting piece. Its total length is 0.021—0.022 mm. The tube is sickle-shaped in its proximal part, almost straight in its distal part, slightly expanded in its initial part, then almost cylindrical; the supporting piece starts from the initial part of the tube as an elastic band intersecting the bend of the tube and continuing as a groove-like part which envelops the tube. The vaginal armature was not detected.

Dactylogyrus sp. 1 is most similar to *D. pseudogobii* Achmerow, 1952, from which it differs in the shape of the marginal hooks. Its species specification will be possible on the grounds of studies of more specimens and after establishing the morphological and metrical variability of *D. pseudogobii*.

11. *Dactylogyrus* sp. 2.

Fig. 5a

Host: *Gobio gobio cenocephalus*; location: gills; locality: River Onon near Binder. This species (1 specimen) was found on one of the four hosts examined.

Description: The anchors with well developed roots; their total length is 0.034 to 0.035 mm, the length of the anchor base is 0.029—0.030 mm, of the inner root 0.010 mm, of the outer root 0.004 mm, of the point 0.010—0.011 mm. Measurements of the connecting bar 0.005—0.006 by 0.026 mm, of the supplementary bar 0.002 by 0.022 mm. Overall length of marginal hooks ranges from 0.023 to 0.028 mm.

The copulatory complex is almost identical with that of *Dactylogyrus* sp. 1. The vaginal armature was not detected.

Dactylogyrus sp. 2 is very similar to *D. gobioninum* Gussev, 1955 in the shape of anchors and marginal hooks. It differs, however, in the shape of the connecting bar and in some details of the copulatory complex.

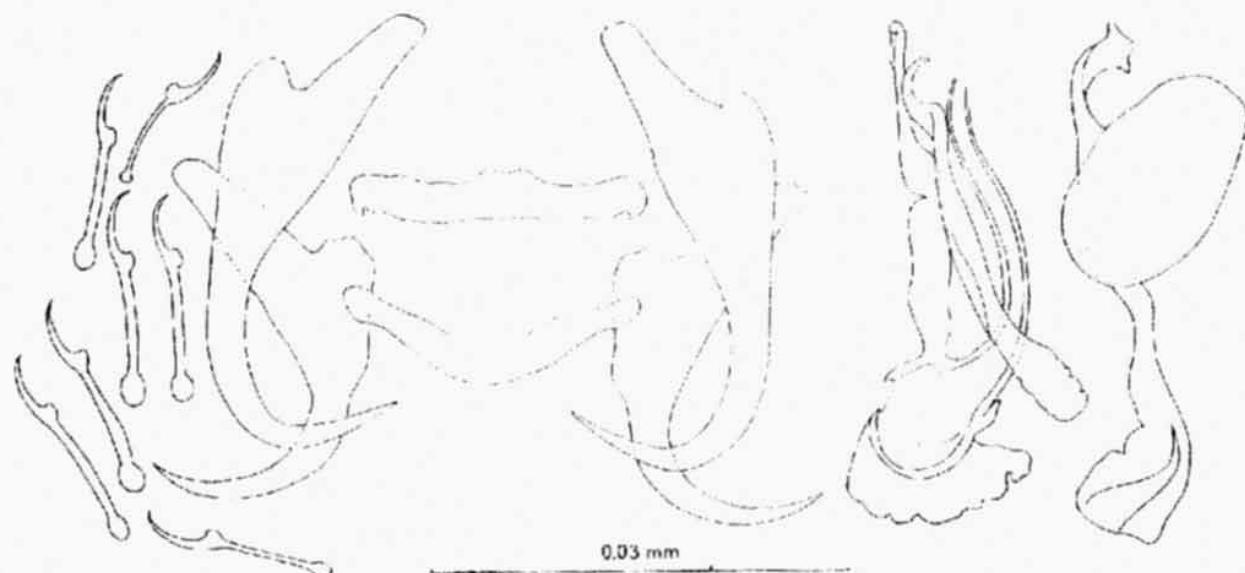


Fig. 6. Chitinoid parts of the haptor, copulatory complex and vaginal support of *Ancyrocephalus polymorphus* Gussev, 1955.

12. *Ancyrocephalus polymorphus* Gussev, 1955

Fig. 6

Host: *Microphysogobio tungtingensis anudarini*; location: gills; locality: Lake Buyr nur. This species was found on three of the four hosts examined, the worm load was up to 14 specimens on one fish.

No differences have been found in size and shape of the principal characteristic signs of our specimens and those of the typical *A. polymorphus*. *Microphysogobio tungtingensis anudarini* is a new host for this species.

13. *Gyrodactylus cotti* Roman, 1956

Host: *Cottus szanaga*; location: gills; locality: River Onon near Binder. This species was found (2 specimens) on one of the 7 hosts examined.

All morphological and metrical data obtained from our material are within the range of variability of this species. *Cottus szanaga* is a new host for this species.

14. *Gyrodactylus gobii* Schulman, 1953

Fig. 7a

Host: *Gobio gobio cymocephalus*; location: fin; locality: River Onon near Binder. This species was found (3 specimens) on two of the four hosts examined.

All specimens isolated are almost consistent with the morphological character of the determining signs of the typical specimen of *G. gobii*. Differences were observed only in metric values, which are given in Table 1. *G. gobio cymocephalus* is a new host for this species.

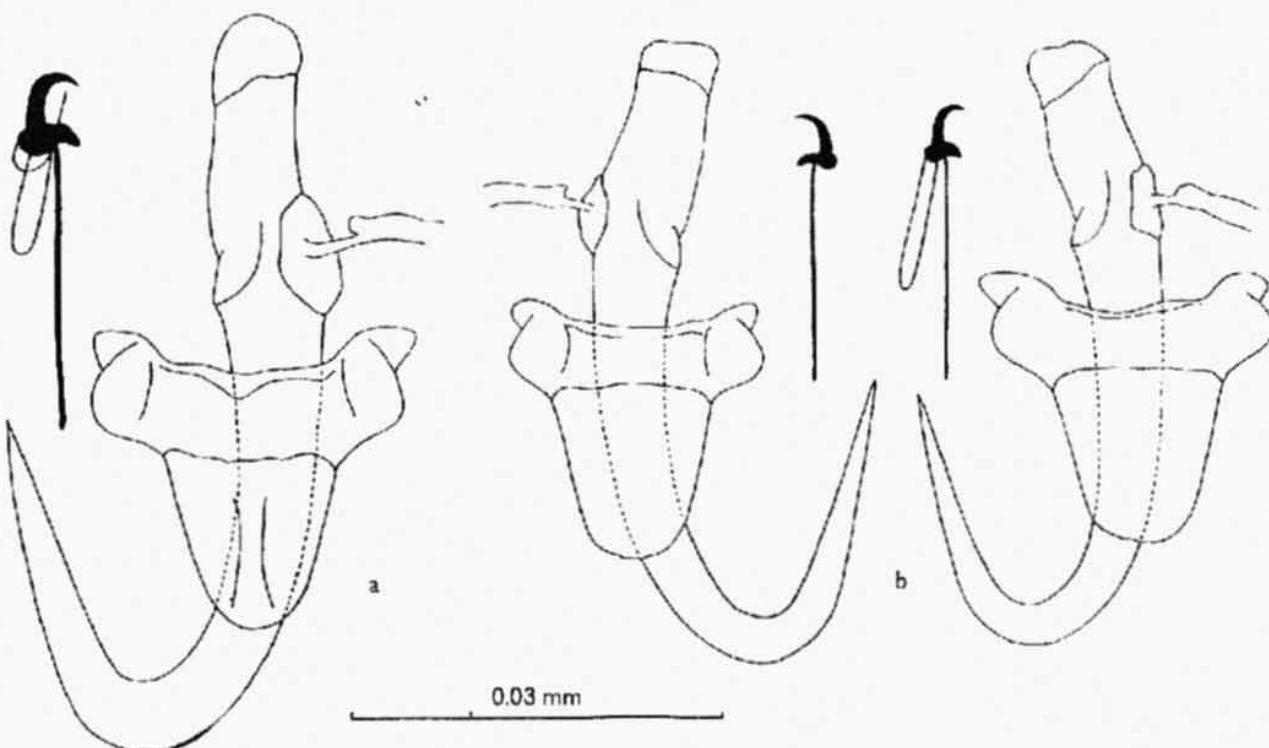


Fig. 7. Anchors with connecting bars and marginal hooks of the haptor. a — *Gyrodactylus gobii* Schulman, 1953; b — *G. rhodei* Zitnan, 1964.

Table 1. Comparison of dimensions (in mm) of the individual determining signs of the species *Gyrodactylus gobii* Schulman, 1953

	Typical specimens	Material from Czechoslovakia	Material from Mongolia
Overall length of anchors	0.049—0.050	0.047—0.056	0.059—0.060
Length of basal part	0.036—0.038	0.034—0.041	0.043—0.044
Length of point	0.024—0.025	0.022—0.029	0.026—0.027
Length of root	0.013—0.016	0.014—0.018	0.018—0.019
Length of principal connecting bar	0.006	0.006—0.007	0.007
Width of principal connecting bar	0.023	0.023—0.025	0.026—0.027
Length of membrane	—	0.012—0.014	0.015
Length of auxiliary connecting bar	0.002—0.003	0.002	0.003
Width of auxiliary connecting bar	0.015—0.018	0.016—0.019	0.016—0.018
Overall length of marginal hooks	0.024—0.025	0.024—0.027	0.027—0.028
Length of marginal hooks without "handle"	0.006	0.006—0.007	0.006

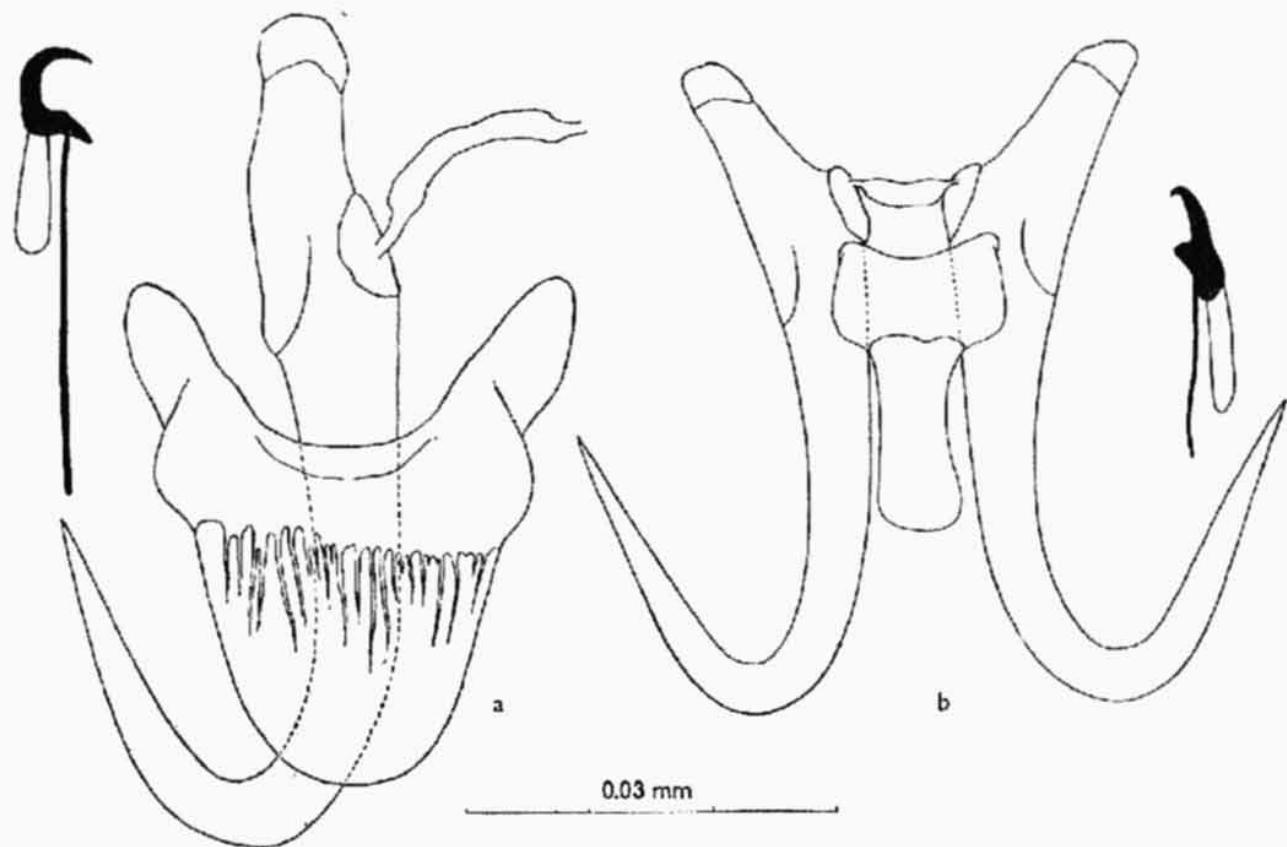


Fig. 8. Anchors with connecting bars and marginal hooks of the haptor. a — *Gyrodactylus hrabei* Ergens, 1957; b — *G. markakulensis* Gvosdev, 1950.

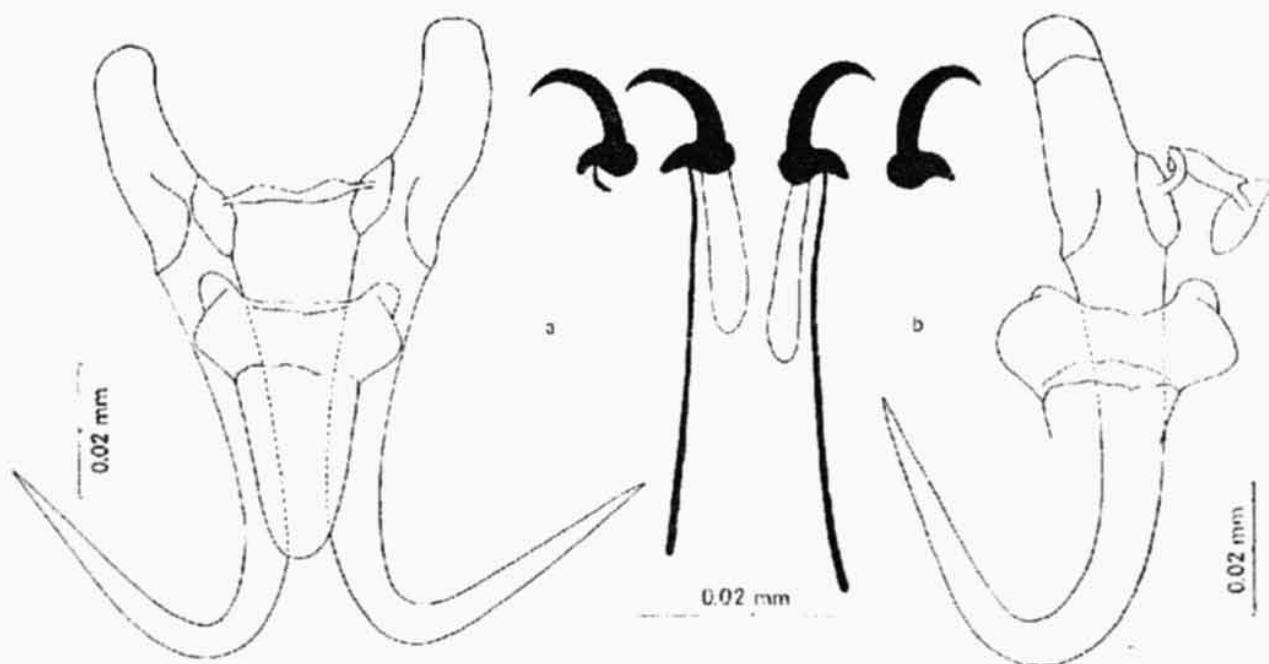


Fig. 9. Anchors with connecting bars and marginal hooks of the haptor of *Gyrodactylus lenoki* Gussev, 1953. a — syntype from the gills of *Brachymystax lenok* from the River Amur; b — specimen from the fin of *B. lenok* from Lake Tirkhin tsagan.

15. *Gyrodactylus hrabei* Ergens, 1957

Fig. 8a

Host: *Cottus szanaga*; location: fin; locality: River Onon near Binder. One specimen was found on one of the seven hosts examined.

No differences have been found in size and shape of the principal characteristic signs of our specimen and those of the typical *G. hrabei*. *Cottus szanaga* is a new host for this species.

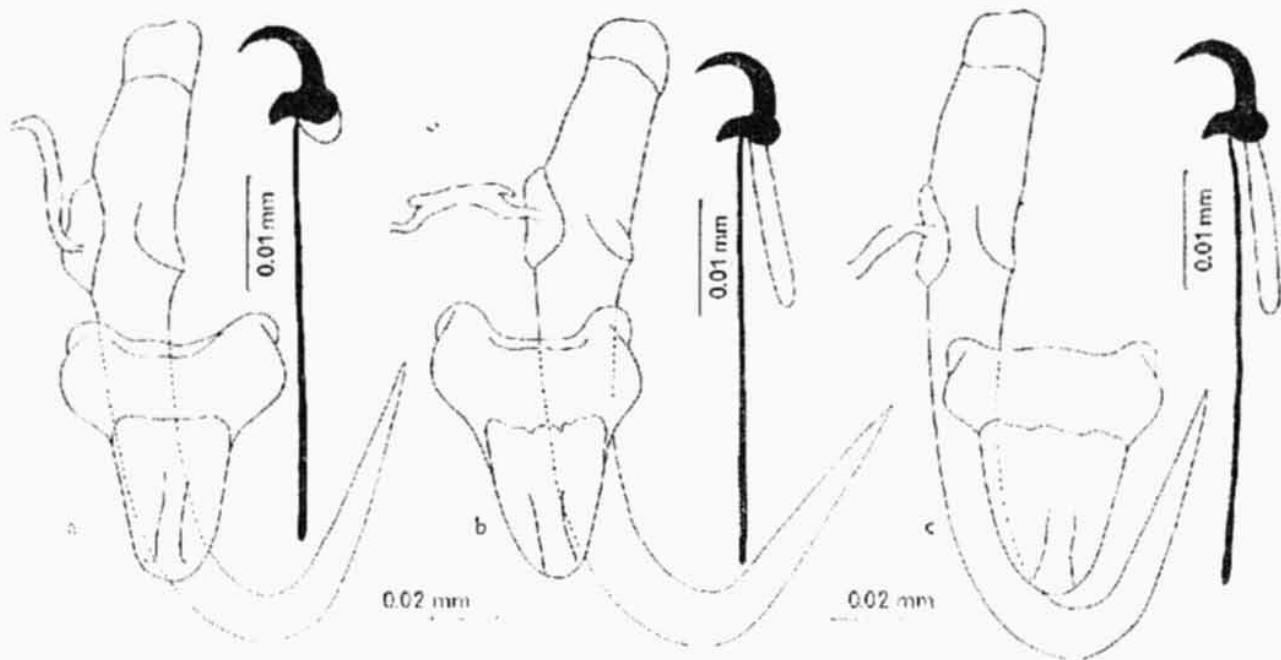


Fig. 10. Anchors with connecting bars and marginal hooks of the haptor of *Gyrodactylus lenoki* forma A from the fins of *Brachymystax lenok* from River Tul near the settlement Songino.

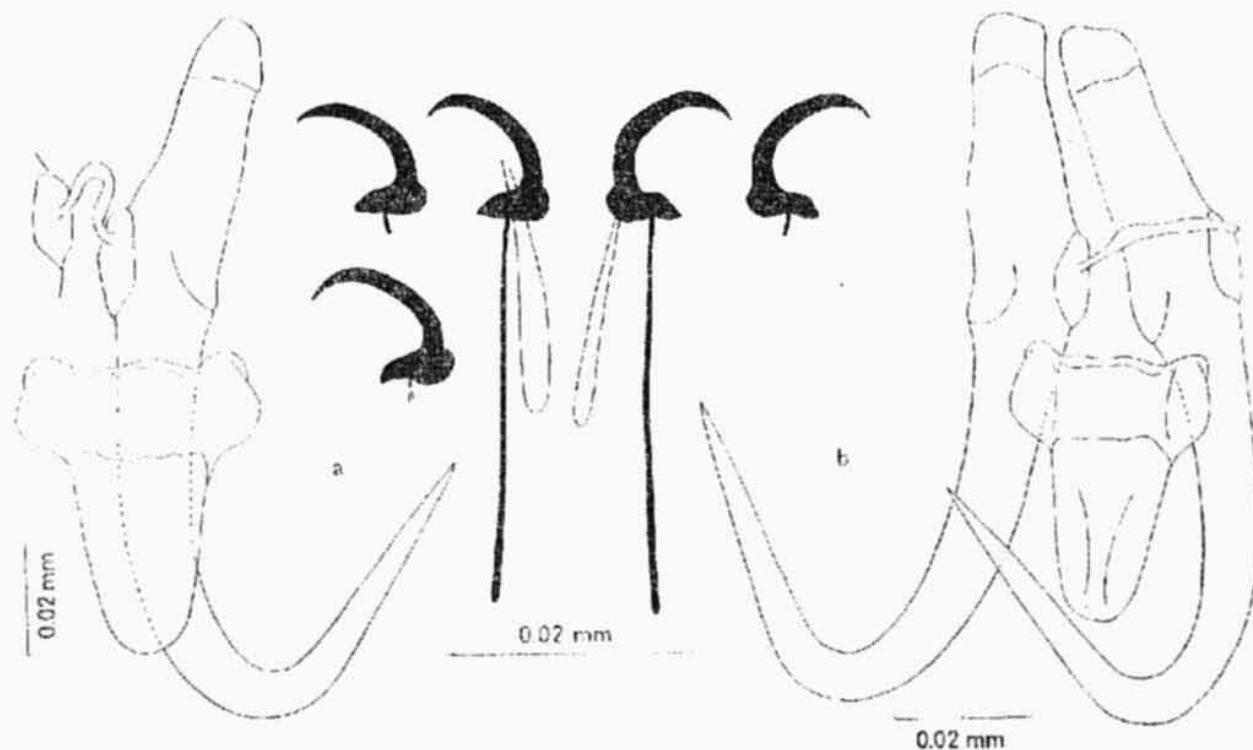


Fig. 11. Anchors with connecting bars and marginal hooks of the haptor of *Gyrodactylus lenoki* forma B. a — from the fin of *Brachymystax lenok* from Lake Tirkhin tsagan; b — from the gills of *B. lenok* from River Tul near the settlement Songino.

16. *Gyrodactylus lenoki* Gussev, 1953

Figs. 9, 10, 11

Host: *Brachymystax lenok*; location: fin, gills; locality: River Tul near the settlement Songino, River Kherlen near Bayandelger, Lake Tirkhin tsagan. This species was found on three of the 28 fishes examined.

In addition to specimens similar to the typical *G. lenoki* (Fig. 9) in size and morphology we have kept the two forms — *G. lenoki* forma A and *G. lenoki* forma B (Figs. 10, 11) within this species. They differ in the shape and partly also in the size of the marginal hooks (Table 2). We assume that it will be necessary to determine their species specification either experimentally or on the grounds of extensive studies of a large material collected from various localities and from hosts of different age groups.

Table 2. Comparison of the measurements of some chitinoid parts of the haptor in the individual forms of *Gyrodactylus lenoki* Gussev, 1953

	Typical specimens		Forma A		Forma B	
	syntype	Lake Tirkhin tsagan and River Kherulen	River Tul	River Tul	Lake Tirkhin tsagan	
Overall length of anchors	0.089-0.091	0.093-0.097	0.091-0.096	0.099	0.100-0.102	
Length of basal part	0.065-0.068	0.071-0.072	0.066-0.069	0.071-0.072	0.072-0.073	
Length of point	0.041	0.041-0.042	0.042-0.043	0.043-0.044	0.042-0.043	
Length of root	0.026-0.027	0.032-0.033	0.032-0.036	0.036	0.035	
Length of principal connecting bar	0.011	0.010-0.012	0.012	0.011-0.012	0.012	
Width of principal connecting bar	0.031-0.033	0.026-0.030	0.031-0.034	0.029-0.030	0.034-0.035	
Length of membrane	0.025	0.025-0.026	0.022-0.024	0.027	0.023	
Length of auxiliary connecting bar	0.002	0.003	0.002-0.003	0.002	0.002	
Width of auxiliary connecting bar	0.017-0.018	0.018-0.020	0.017-0.020	0.021-0.022	0.019-0.021	
Overall length of marginal hooks	0.044	0.043-0.044	0.043-0.046	0.044	0.042	
Length of marginal hooks without "handle"	0.011	0.010	0.008-0.009	0.011-0.012	0.010-0.011	

17. *Gyrodactylus lotae* Gussev, 1953

Host: *Lota lota*; location: gills, fin; locality: River Onon near Binder. Two specimens found on one of the 10 hosts examined.

All morphological and metrical data obtained from our material are within the range of variability of this species.

18. *Gyrodactylus lucii* Kulakowskaja, 1951

Host: *Esox lucius*; location: fin; locality: Lake Ugiy nur and Tirkhin tsagan, River Selenga near Muren. This species (14 specimens) was found on four of the 14 hosts examined.

All morphological and metrical data obtained from our material are within the range of variability of this species.

19. *Gyrodactylus magnus* Konovalov, 1967

Fig. 12

Host: *Thymallus arcticus*; location: fin; locality: River Tul near U-Bulan. One specimen was found on one of the 31 hosts examined.

Since the shape of the individual chitinoid parts of the haptor of the one specimen examined did not differ from that of the typical *G. magnus*, the slight metrical differences may be still within the range of variability.

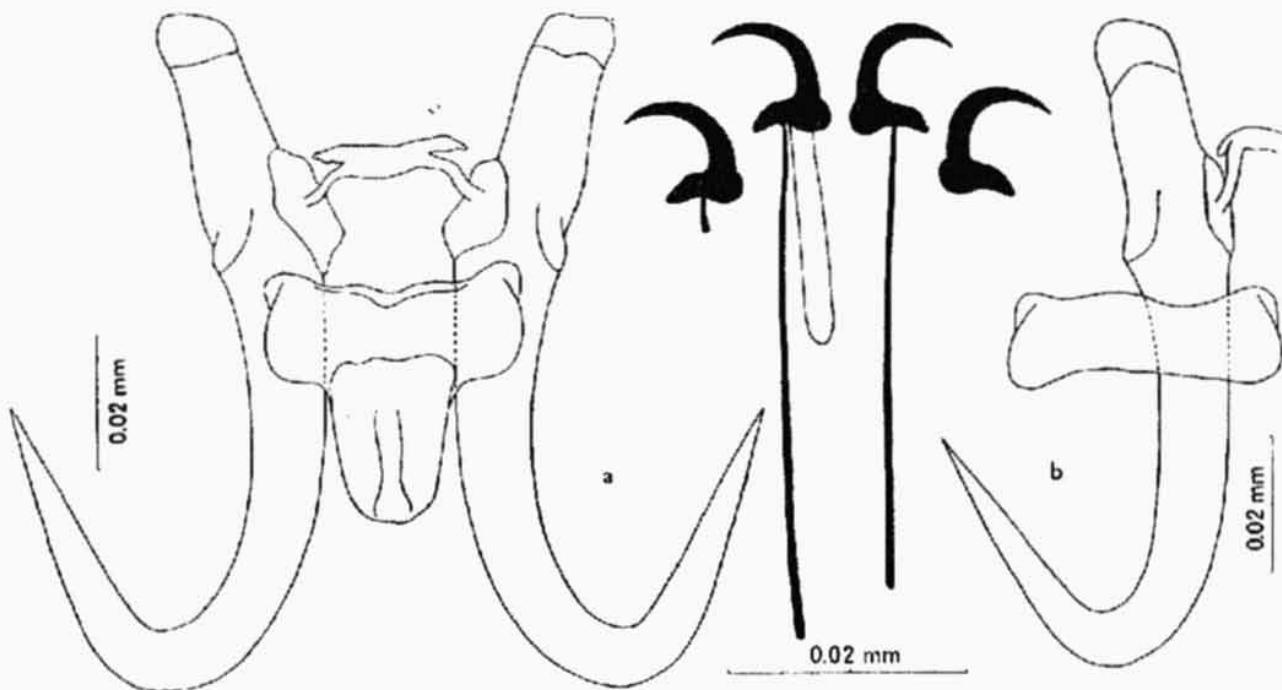


Fig. 12. Chitinoid parts of the haptor of *Gyrodactylus magnus* Konovalov, 1967. a — specimen from the fin of *Thymallus arcticus* from River Tul near U-Bulan; b — syntype from the fin of *T. arcticus grubei n. mertensi*.

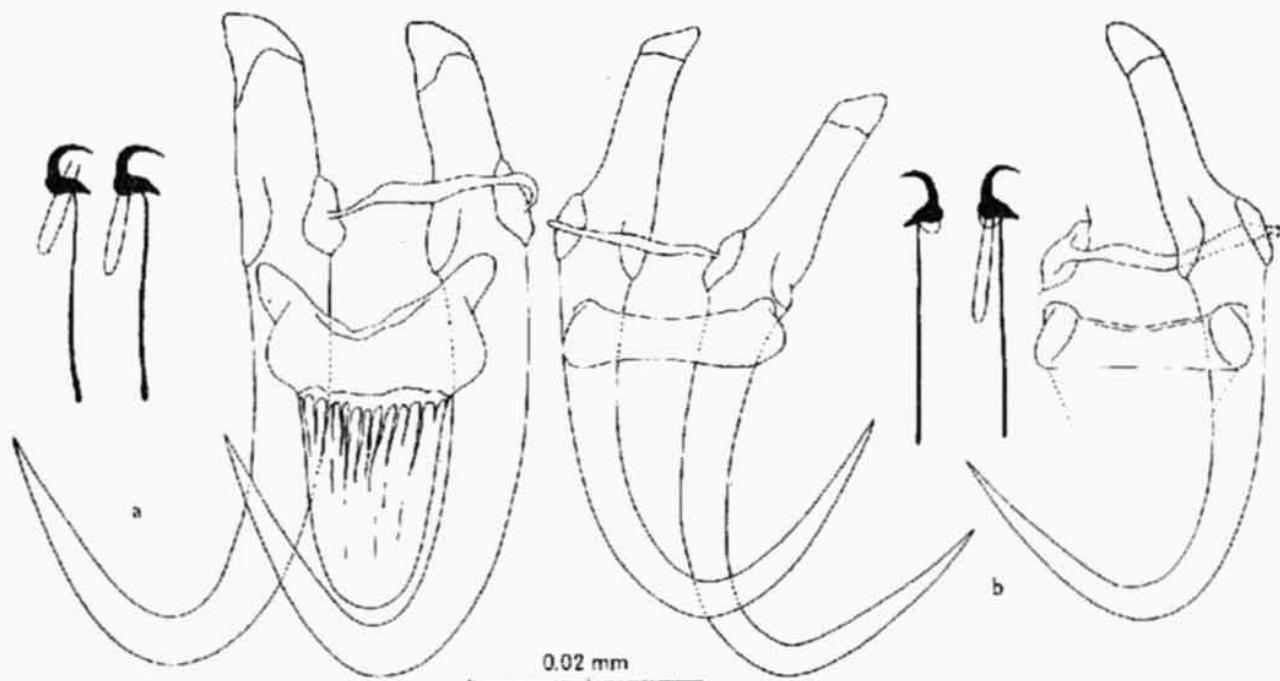


Fig. 13. Chitinoid parts of the haptor. a — *Gyrodactylus szanagai* n.sp. (holotype); b — *G. sprostoniae* Ling Mo-en, 1962.

20. *Gyrodactylus markakulensis* Gvosdev, 1950

Fig. 8b

Host: *Gobio albipinnatus tenuicorpus*; location: fin; locality: River Khalkhingol. One specimen was found on one of the three hosts examined.

All morphological and metrical data obtained from our specimen are within the range of variability of this species.

21. *Gyrodactylus rhodei* Žitňan, 1964

Fig. 7b

Host: *Acanthorhodeus asmussii*; location: fin; locality: Lake Buyr nur. This species was found (6 specimens) on one of the 4 hosts examined.

No differences have been found in size and shape of the principal characteristic signs of our specimens and those of the typical *G. rhodei*. *Acanthorhodeus asmussii* is a new host for this species.

22. *Gyrodactylus sprostonaee* Ling Mo-en, 1962

Fig. 13b

Host: *Pseudaspius leptocephalus*; location: gills; locality: River Khalkhingol. This species (63 specimens) was found on one of the two hosts examined.

All morphological and metrical data obtained from our specimens are within the range of variability of this species. *Pseudaspius leptocephalus* is a new host for this species.

23. *Gyrodactylus szanagai* n. sp.

Fig. 13a

Host: *Cottus szanaga*; location: fin; locality: River Onon near Binder. One specimen (holotype) was found (September 9, 1966) on one of the 7 hosts examined.

Description: Overall length of anchors 0.057 mm, length of basal part of anchors 0.042 mm, of point 0.024 mm, of root 0.018 mm. Measurements of principal connecting bar with well developed lateral roots and a 0.017 mm long membranous extension are 0.006—0.007 by 0.021 mm. Measurements of the fine auxiliary connecting bar 0.001 to 0.002 by 0.018 mm. Overall length of marginal hooks 0.025—0.026 mm, the hook itself measures 0.004—0.005 mm.

G. szanagai n. sp. differs markedly from all other so far described species of *Gyrodactylus* from Palearctic freshwater Cottidae in the shape of the principal connecting bar and, partly, also in the shape and size of other chitinoid parts of the haptor.

24. *Gyrodactylus taimeni* n. sp.

Fig. 14

Host: *Hucho taimen*; location: gills; locality: Lake Dod tsagan. This species was found on two of the five hosts examined (27 and 79 specimens). The holotype is represented by a specimen collected on the gills of *H. taimen* caught on August 9, 1966. The metrical values of the determining signs are given in brackets in the description.

Description: Overall length of anchors 0.067—0.072 (0.068) mm, length of basal part of anchors 0.051—0.055 (0.052) mm, of point 0.033 mm, of root 0.025—0.027 (0.025) mm. Measurements of principal connecting bar with well developed and a 0.015—0.017 (0.015) mm long membranous extension are 0.008—0.009 by 0.026—0.029 (0.008 by 0.027) mm, measurements of the fine auxiliary connecting bar 0.002 by 0.022 mm.

Overall length of marginal hooks 0.033—0.034 (0.033) mm, the greatly developed hook itself measures 0.008—0.009 (0.009) mm.

G. taimeni n. sp. resembles closely the species *G. slovacicus* Ergens, 1963 in the shape and, partly, in the size of marginal hooks but can be distinguished from this species by the shape of anchors.

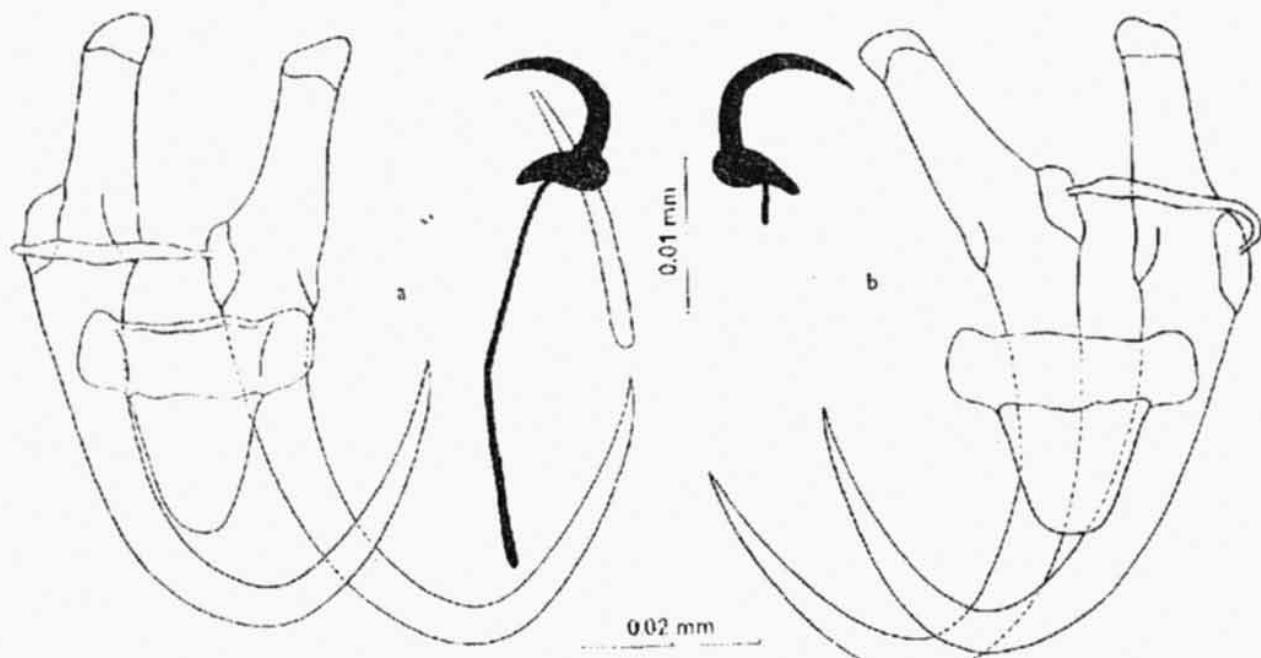


Fig. 14. Anchors with connecting bars and marginal hooks of the haptor of *Gyrodactylus taimeni* n.sp. a — holotype; b — paratype.

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