FOLIA PARASITOLOGICA (PRAHA) 14: 321–333, 1967.

Monogenoidea from the Genus *Phoxinus* (Cyprinidae) from Mongolia

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Abstract. Our paper presents a systematical evaluation of Monogenoidea parasitising three species of the genus *Phoxinus* on the territory of Mongolia. Most of the recorded specimens are not too different from the species known up to date, as illustrated in the tables and figures. One of the species of the genus *Gyrodactylus* is new for science—*G. llewellyni*. In addition the description of the species *Dactylogyrus merus* Zaika, 1961 has been completed and the morphogenesis of its determining signs described. The problem of the range of variability in connection with the occurrence of a single parasite species on several phylogenetically very closely related host species has been discussed in the case of *G. macronychus* Malmberg, 1956.

In 1966, parasitological investigations of fishes from the territory of the Mongolian Republic were conducted following agreements between the Czechoslovak and Mongolian Academies of Sciences. Such investigations were conducted for the first time in Mongolia and all findings of parasites contribute not only to a better knowledge of the parasites, but also of the fauna of this territory in general.

The entire material obtained by standard methods in post mortem examinations of the fishes and with the extensive help of all workers of the Biological Institute of the Mongolian Academy of Sciences, has been elaborated in the Institute of Parasitology of the Czechoslovak Academy of Sciences in Prague, where also the type specimens are deposited. The collection of comparative material is deposited in the collection of the Biological Institute of the Mongolian Academy of Sciences in Ulan Bator.

MATERIAL AND METHODS

Three species of the genus *Phoxinus* have been examined parasitologically: *Ph. phoxinus* (L.), *Ph. lagowskii* Dybowski and *Phoxinus* sp. The species designated as *Phoxinus* sp., caught in the river

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The parasitological results obtained by the Mongolian-Czechoslovak expedition to Mongolia, 1966, Communication No. 1.

Selbe near Ulan Bator, become too damaged in post mortem examination so that it was impossible to determine with complete accuracy to which genus it belonged. A certain guidance for listing this fish to the genus *Phoxinus* was the fact that it was parasitized only by Monogenoidea, although some of them (*Dactylogyrus ersinensis*) parasitize also the representatives of the genus *Oreoleuciscus* Warpachowski. However, it is not very likely to find fishes of this genus in the vicinity of Ulan Bator. The examined fishes were caught in the localities:

Basin of the river Selenga:

1. River Tul near Ulan Bator, 2. River Tul near the settlement Songino, 3. River Selbe near Ulan Bator, 4. Lake Tirkhin tsagan and its tributaries

Basin of the river Yenisei:

5. Lake Dod tsagan and its tributaries

Basin of the river Kherlen:

6. river Kherlen and its tributaries near Bayandelger

All the parasites were fixed in a mixture of amonium picrate and glycerin, recommended by MALMBERG (1956).

RESULTS

The recorded Monogenoidea are represented by a total of 16 species belonging to two genera—*Dactylogyrus* Diesing, 1850 and *Gyrodactylus* Nordmann, 1832.

1. *Dactylogyrus amurensis* Achmerow, 1952 Fig. 1a

Host: *Ph. lagowskii*
Location: gills
Locality: river Kherlen near Bayandelger

The shape and dimensions of the chitinoid haptor parts of our specimen are in full agreement with the specimens described by AKHMEROV (1952). Differences were observed only in the structure and dimensions of the copulatory organ. In our specimens the base of this organ is well developed, its overall length is 0.048 to 0.057 mm; in the specimens of AKHMEROV the base of this organ is not developed, its overall length ranges from 0.035—0.045 mm.

2. *Dactylogyrus borealis* Nybelin, 1937 Fig. 1b

Host: *Ph. phoxinus*
Location: gills
Locality: river Tul near Ulan Bator and in the vicinity of the settlement Songino; the lake Dod tsagan and its tributaries.

No differences were observed in the shape and also in most of the determining signs of our specimens and the specimens known up to date, including the specimens described by NYBELIN (1937). Only certain differences were found in the shape of the copulatory organ.

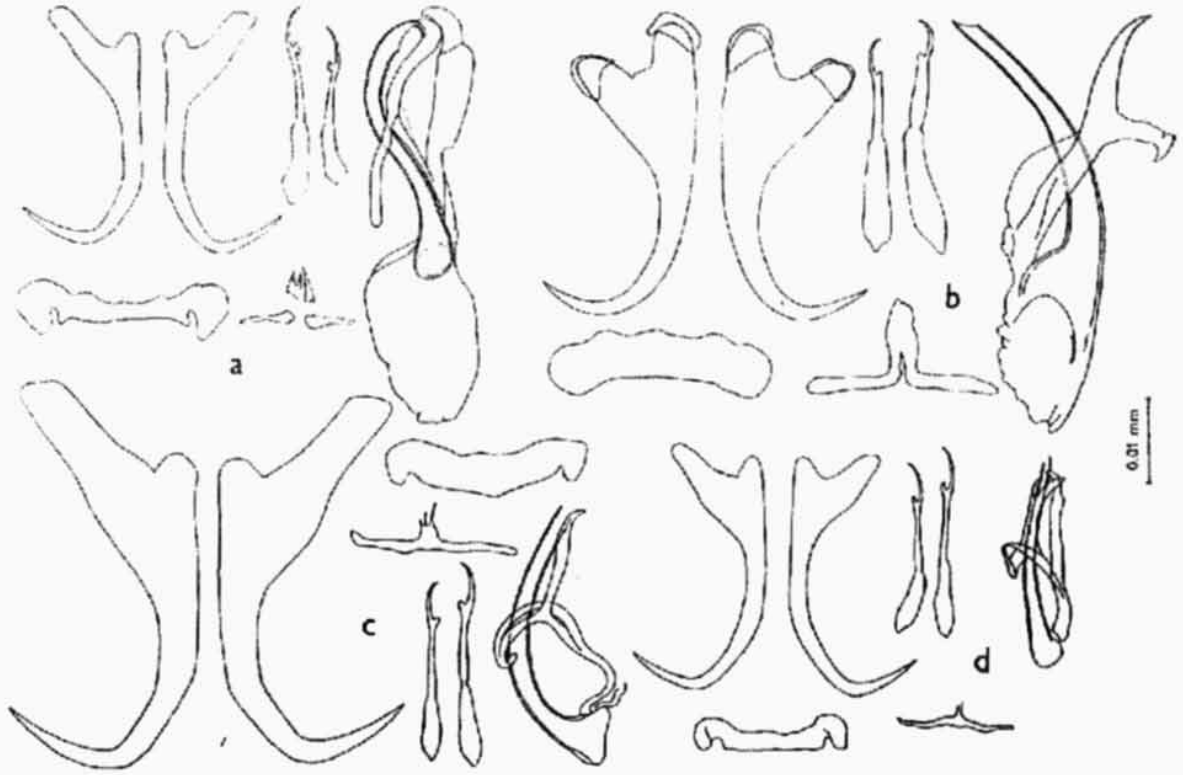

Fig. 1. Anchors with connecting bars, marginal hooks and copulatory organ. a — *Dactylogyrus amurensis* Achmerow, 1952; b — *D. borealis* Nybelin, 1937; c — *D. phoxini* Malewitzkaja, 1949; d — *D. ersinensis* Spassky et Roytman, 1960.

3. *Dactylogyrus ersinensis* Spassky et Roytman, 1960 — Fig. 1d

Host: *Phoxinus* sp.
Location: gills
Locality: river Selbe near Ulan Bator

The shape and dimensions of the determining signs of our specimens are in full agreement with those described by Spassky and Roytman (1962). Different dimensions were found only in the overall length of the copulatory organ, which measured in our specimens 0.025—0.027 mm, in the specimens of the type material 0.028 to 0.037 mm.

4. *Dactylogyrus merus* Zaika, 1961 — Fig. 2a—f

Host: *Ph. phoxinus*
Location: nose cavities, gill cavity, skin, gills
Locality: river Tul near Ulan Bator and in the vicinity of the settlement Songino

In our material this species was very plentyful so that we were not only able to describe more exactly and to complete the existing description of its determining signs, but to find also some morphogenetical stages of the chitinoid haptor parts and of the copulatory organ.

Description: overall length of anchors 0.076—0.086 mm. The roots of their basal part form an angle of more than 90°, which is a typical sign of this species. The

basal part of these hooks is 0.046—0.071 mm long, the point measures 0.019 to 0.026 mm, the internal root is 0.012—0.018 mm long, the external root is 0.014 to 0.027 mm long. The dimensions of the solitary connecting bar, which is mostly straight or only moderately arched, are 0.007—0.013 mm by 0.041—0.062 mm. All fourteen marginal hooks are of the embryonic type, their length ranges from 0.015—0.020 mm. The copulatory organ is formed by an elongated, oval basal part, an arched copulatory tube, which is slightly funnel-shaped at its base and by a slender, fork-like branched supporting part. The overall length of the copulatory organ is 0.044—0.056 mm. The vaginal support is not developed.

The differences in metric values of the individual determining signs between our specimens and the specimens described up to date are given in Tab. 1. The morphological variability of the anchors and the connecting bar is illustrated on Fig. 2b, c.

Table 1. Comparison of dimensions (in mm) of the individual determining signs of the species *Dactylogyrus merus* Zaika, 1961

	Bykhovskiy et al. (1962)	Material from the territory of Mongolia
Overal length of anchors	0.066—0.068	0.076—0.086
Length of basal part	—	0.046—0.071
Length of point	—	0.019—0.026
Length of the internal process	—	0.012—0.018
Length of the external process	—	0.014—0.027
Length of connecting bar	0.008	0.007—0.013
Width of connecting bar	0.042—0.048	0.041—0.062
Length of marginal hooks	0.017	0.015—0.020
Length of copulatory complex	0.037	0.044—0.056

The morphogenesis of the chitinoid haptor part of the species *D. merus* occurs as follows: the anchors in their first developmental phase are shaped as fine, arched plates, each of them representing substantially the future point and partly also the basal part of the hooks. This phase is followed by the growing of the basal part and the thickening of the point. The basal part of the hook appears simultaneously with the connecting bar, which is at first very fine. The growth of both roots of the basal part is accompanied by the further growth of the connecting bar, which is extending mostly into length. The morphogenesis of the anchors and the connecting bar terminates with an overall strengthening of these parts. It remains only to be said that in *D. merus* the shape and dimensions of the marginal hooks do not outgrow their larval stage.

The copulatory organ occurs at the time when the basal part of the anchors is being formed. The first part of this organ to originate is the fine, arched copulatory tube with thin walls; soon afterwards the basal and supporting part is formed. This organ attains its definitive shape before the anchors complete their development.

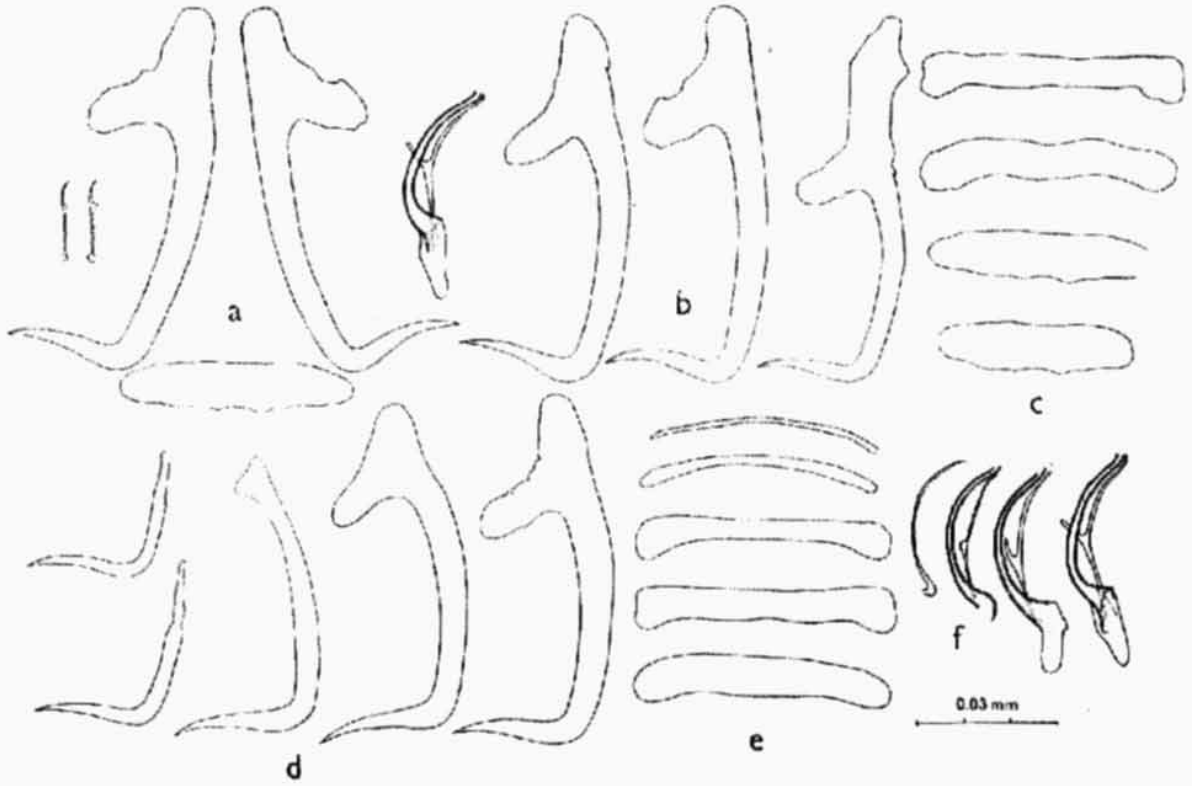

Fig. 2. *Dactylogyrus merus* Zaika, 1961. a — chitinoid armament of haptor and copulatory organ; b — morphological variability of anchors; c — morphological variability of connecting bar; d — stages of the morphogenesis of the anchors; e — stages of the morphogenesis of the connecting bar; f — stages of the morphogenesis of the copulatory organ.

In this connection it seems necessary to point out the fact that *D. merus* develops in the nasal cavities of its host. Adult worms are located principally on the ventral surface of the head, eventually in the anterior part of the gill cavity. Their location on the leaf-like processes of the gills and on the skin seems atypical and may be considered more or less accidental.

5. *Dactylogyrus phoxini* Malewitzkaja, 1949

Fig. 1c

Host: *Phoxinus sp.*
Location: gills
Locality: river Selbe near Ulan Bator

Our specimens differ from the so far described specimens of this species only in the longer copulatory organ (0.030—0.037 mm).

6. *Gyrodactylus aphyae* Malmberg, 1956

Fig. 3a

Host: *Ph. phoxinus*
Location: fins, gills
Locality: river Tul near Ulan Bator and in the vicinity of the settlement Songino; lake Tirkhin tsagan and its tributories; lake Dod tsagan and its tributories

The shape of the anchors and of the marginal hooks of our specimens is in agreement with the specimens described up to date. Also their metric values are still within

the framework of the known variability, although certain deviations have been observed in comparison with the specimens recorded by MALMBERG (1956) and with those from the territory of Czechoslovakia (Tab. 2).

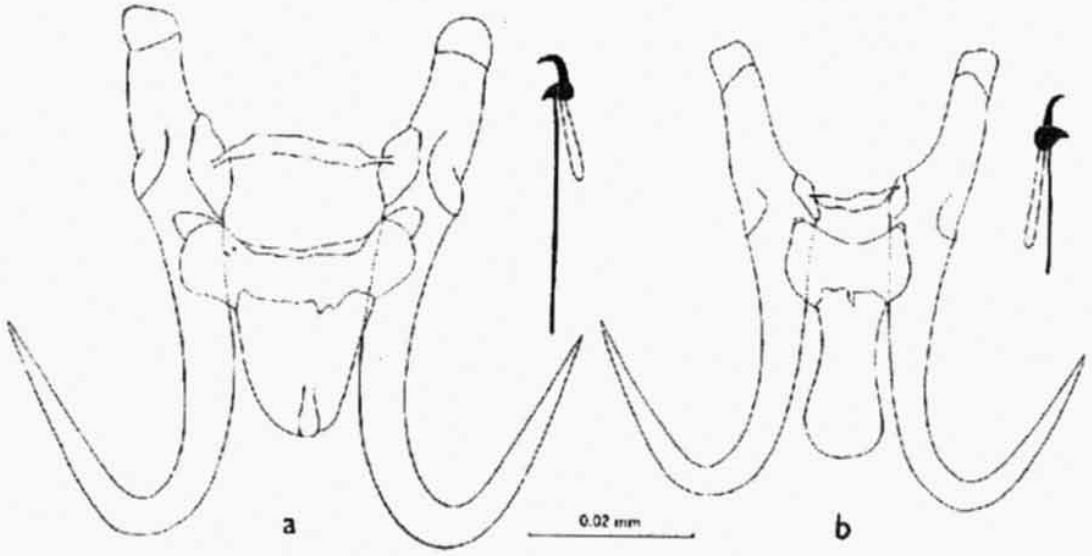

Fig. 3. Anchors with connecting bars and marginal hooks of the haptor. a — *Gyrodactylus aphyae* Malmberg, 1956; b — *G. phoxini* Malmberg, 1956.

Table 2. Comparison of dimensions (in mm) of the individual determining signs of the species *Gyrodactylus aphyae* Malmberg, 1956

	MALMBERG (1956)	Material from Czechoslovakia	Material from Mongolia
Overal length of anchors	0.052—0.064	0.055—0.058	0.054—0.067
Length of basal part	—	0.040—0.043	0.037—0.048
Length of point	0.023—0.032	0.027—0.030	0.026—0.033
Length of root	0.012—0.020	0.016—0.020	0.018—0.022
Length of principal connecting bar	0.007—0.010	0.005—0.007	0.006—0.009
Width of principal connecting bar	0.023—0.031	0.024—0.027	0.024—0.030
Length of membrane	0.009—0.016	0.014	0.012—0.016
Length of auxiliary connecting bar	0.001—0.003	0.002—0.003	0.002—0.003
Width of auxiliary connecting bar	0.018—0.028	0.018—0.022	0.018—0.023
Overall length of marginal hooks	0.026—0.034	0.028—0.031	0.030—0.036
Length of marginal hooks without "handle"	0.005—0.006	0.005—0.006	0.005—0.006

7. *Gyrodactylus laevis* Malmberg, 1956 Fig. 4a

Host: *Ph. phoxinus*
Location: gills
Locality: river Tul near Ulan Bator and in the vicinity of the settlement Songino

In all specimens found, the shape of the individual chitinoid haptor part is in agreement with the specimens known up to date, recorded both from Sweden

(MALMBERG 1956) and from Czechoslovakia (ERGENS 1966). The dimensions of the individual determining signs of our specimens are slightly larger, extending the determined metric variability of this species (Tab. 3).

Table 3. Comparison of dimensions (in mm) of the individual determining signs of the species *Gyrodactylus laevis* Malmberg, 1956

	MALMBERG (1956)	Material from Czechoslovakia		Material from Mongolia
		Phoxinus phoxinus	from other hosts	
Overal length of anchors	0.034—0.036	0.038—0.039	0.034—0.039	0.042—0.044
Length of basal part	0.027—0.030	0.032—0.033	0.026—0.031	0.033—0.037
Length of point	0.015—0.017	0.015—0.017	0.013—0.015	0.016—0.018
Length of root	0.011—0.013	0.013—0.014	0.012—0.014	0.014—0.019
Length of principal connecting bar	0.004	0.005—0.006	0.005	0.005—0.006
Width of principal connecting bar	0.011—0.012	0.013	0.009—0.013	0.013—0.015
Length of membrane	0.009	0.012	0.010—0.013	0.010—0.012
Length of auxiliary connecting bar	0.001	0.001	0.001—0.002	0.001—0.002
Width of auxiliary connecting bar	0.007—0.008	0.009	0.007—0.008	0.008—0.010
Overall length of marginal hooks	0.016—0.018	0.016—0.019	0.018—0.024	0.020—0.021
Length of marginal hooks without "handle"	0.005	0.005—0.006	0.005—0.006	0.005—0.006

8. *Gyrodactylus llewellyni* sp. n. Fig. 5a

Host: *Ph. phoxinus*
Location: fins, nasal cavities
Locality: river Tul near the settlement Songino; lake Dod tsagan and its tributaries

Holotype: Overall length of anchors 0.059 mm, length of basal part 0.044 mm, point measures 0.030 mm. Internal root of anchor, greatly extended at its base, is 0.021 mm long. Dimensions of principal connecting bar 0.005—0.006 mm by

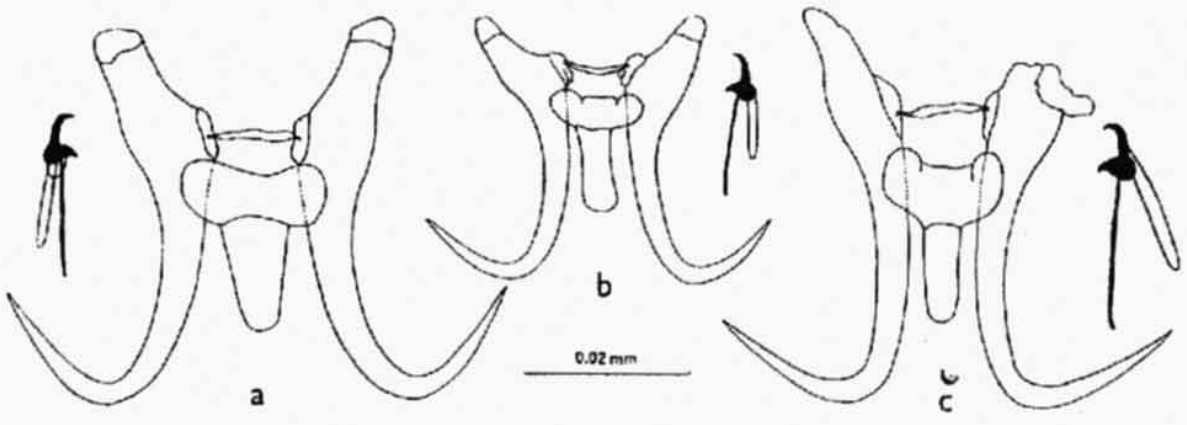

Fig. 4. Anchors with connecting bars and marginal hooks of the haptor. a — *Gyrodactylus laevis* Malmberg, 1956; b — *G. minimus* Malmberg, 1956; c — *G. paralaevis* Ergens, 1966 (?).

0.022 mm. Bar archlike curved, with small extensions at the margins. Membranous extension 0.011 mm long. Dimensions of auxiliary connecting bar 0.002 mm by 0.016 mm. Overall length of marginal hooks 0.043 mm, the hook itself measures 0.006 mm. (Type locality: river Tul near Songino.)

The variability of the other recorded specimens including the paratypes is as follows: overall length of anchors 0.053 mm to 0.056 mm, length of basal part 0.042 mm—0.045 mm, of point 0.025 mm—0.030 mm, of the internal root 0.017 mm to 0.021 mm. Dimensions of principal conecting bar 0.005 mm—0.006 mm by 0.020 mm—0.022 mm, of auxiliary bar 0.001 mm—0.002 mm by 0.016 mm by 0.017 mm. Length of membranous extension of the principal connecting bar is 0.011 mm—0.013 mm. Overall length of marginal hooks ranges from 0.036 mm to 0.042 mm. The hook proper measures 0.005 mm—0.006 mm.

From all the other known species of the genus *Gyrodactylus* these worms, named after the British parasitologist J. LLEWELLYN, differ in the shape of the anchors and of the marginal hooks.

9. *Gyrodactylus lucii* Kulakowskaja, 1951 (?) Fig. 6d

Host: *Ph. lagowskii*
Location: skin
Locality: river Kherlen near Bayandelger

All specimens isolated are almost in full agreement with the morphological character of the determining signs of the typical specimen *Gyrodactylus lucii*. Differences

Table 4. Comparison of dimensions (in mm) of the individual determining signs of the species *Gyrodactylus lucii* Kulakowskaja, 1951

	MAIMBERG (1956)	Material from Czechoslovakia	Material from Mongolia	KULAKOWSKAJA in MARKEVITCH (1951)
Overal length of anchors	0.065–0.071	0.067–0.075	0.081–0.088	0.073–0.076
Length of basal part	—	0.053–0.055	0.060–0.064	—
Length of point	0.030–0.039	0.034–0.035	0.035–0.038	0.036
Length of root	0.020–0.026	0.023–0.024	0.026–0.029	—
Length of principal connecting bar	0.012–0.013	0.009–0.011	0.009–0.010	0.007
Width of principal connecting bar	0.027–0.029	0.029–0.030	0.037–0.039	0.028
Length of membrane	0.014–0.018	0.018–0.019	0.014–0.019	—
Length of auxiliary connecting bar	0.002–0.003	0.002–0.003	0.003	—
Width of auxiliary connecting bar	0.024–0.033	0.023–0.025	0.026–0.031	0.022
Overall length of marginal hooks	0.032–0.034	0.035–0.036	0.041–0.043	0.038–0.040
Length of marginal hooks without "handle"	0.008–0.009	0.008–0.009	0.009–0.010	—

were observed only in the metric values, which are given in Tab. 4. The occurrence of these worms on an uncommon host suggests the mere possibility of direct contact with the typical host, in this case the pike.

10. *Gyrodactylus macronychus* Malmberg, 1956 Fig. 6a—c

Host: *Ph. phoxinus*
Location: fins, gills, nasal cavities
Locality: river Tul near Ulan Bator and in the vicinity of the settlement Songino, river Selbe near Ulan Bator, lake Tirkhin tsagan, lake Dod tsagan and its tributaries

In these worms an important problem, complicating the determination of not only this species, but often of other representatives of the genus *Gyrodactylus* becomes evident in its whole complexity. It is based on the quite natural and common

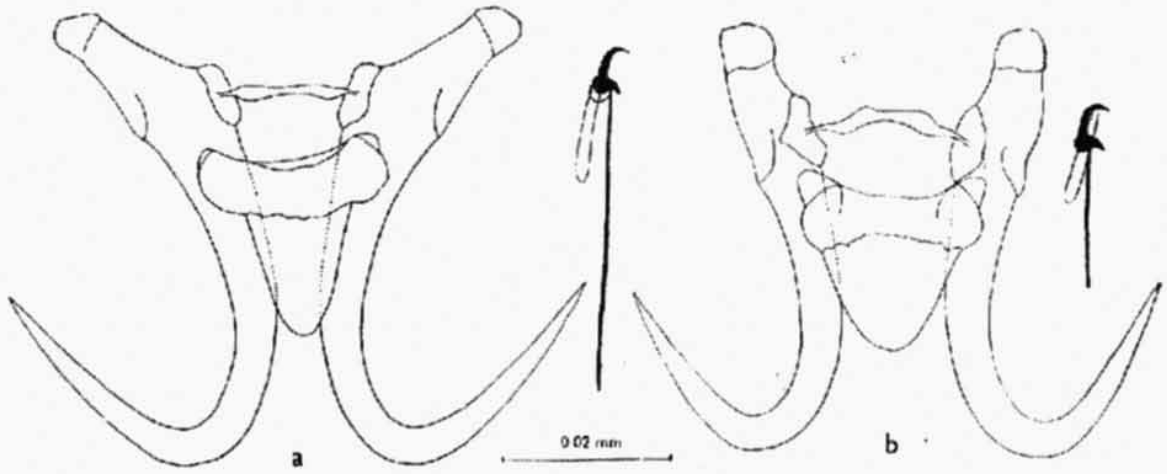

Fig. 5. Anchors with connecting bars and marginal hooks of haptor. a — *Gyrodactylus llewellyni* n. sp., b — *Gyrodactylus* sp.

occurrence of one and the same species of parasites on several host species, which are phylogenetically very closely related to each other. Such cases bring up the question, whether and under which conditions the extended morphological and metric variability of the determining signs can still be considered to fall within the range of the originally determined morphological and metric variability of typical specimens, to which, in addition to the specimens described by the author (holotype, paratypes), belong also the corresponding specimens occurring on the same host and under more or less equal conditions of the environment of the second order.

We assume that the solution of this question requires to keep in mind the grade of claims asserted by a certain complex of factors (in this case principally the mutual phylogenetical relation of the hosts and last not least also the geographical factor), which are becoming evident on the given species and consequently also on the morphological and metric changes of its determining signs.

Table 5. Comparison of dimensions (in mm) of the individual determining signs of the species *Gyrodactylus macronychus* Malmberg, 1956

	Malmberg (1956)	Material from Czechoslovakia	Material from Mongolia		
			Ph. phoxinus	*Ph. lagowskii*	*Phoxinus* sp.
Overal length of anchors	0.066–0.078	0.078–0.085	0.073–0.080	0.072–0.086	0.081–0.092
Length of basal part	–	0.056–0.061	0.053–0.059	0.053–0.062	0.062–0.067
Length of point	0.029–0.036	0.037–0.042	0.033–0.038	0.035–0.038	0.037–0.040
Length of root	0.020–0.026	0.025–0.029	0.022–0.027	0.022–0.030	0.023–0.031
Length of principal connecting bar	0.008–0.013	0.009–0.011	0.009–0.010	0.009–0.011	0.008–0.010
Width of principal connecting bar	0.026–0.040	0.035–0.040	0.032–0.035	0.034–0.035	0.034–0.041
Length of membrane	0.012–0.020	0.019–0.025	0.015–0.018	0.016–0.021	0.019–0.020
Length of auxiliary connecting bar	0.001–0.002	0.002–0.003	0.001–0.003	0.003	0.002
Width of auxiliary connecting bar	0.027–0.033	0.028–0.032	0.024–0.030	0.027	0.026–0.033
Overall length of marginal hooks	0.029–0.038	0.036–0.040	0.035–0.040	0.037–0.041	0.040–0.045
Length of marginal hooks without "handle"	0.008–0.010	0.009–0.012	0.010–0.011	0.009–0.010	0.010

If there are more changes of a qualitative than of a quantitative character, this variability can no longer be considered to fall within the limits of the

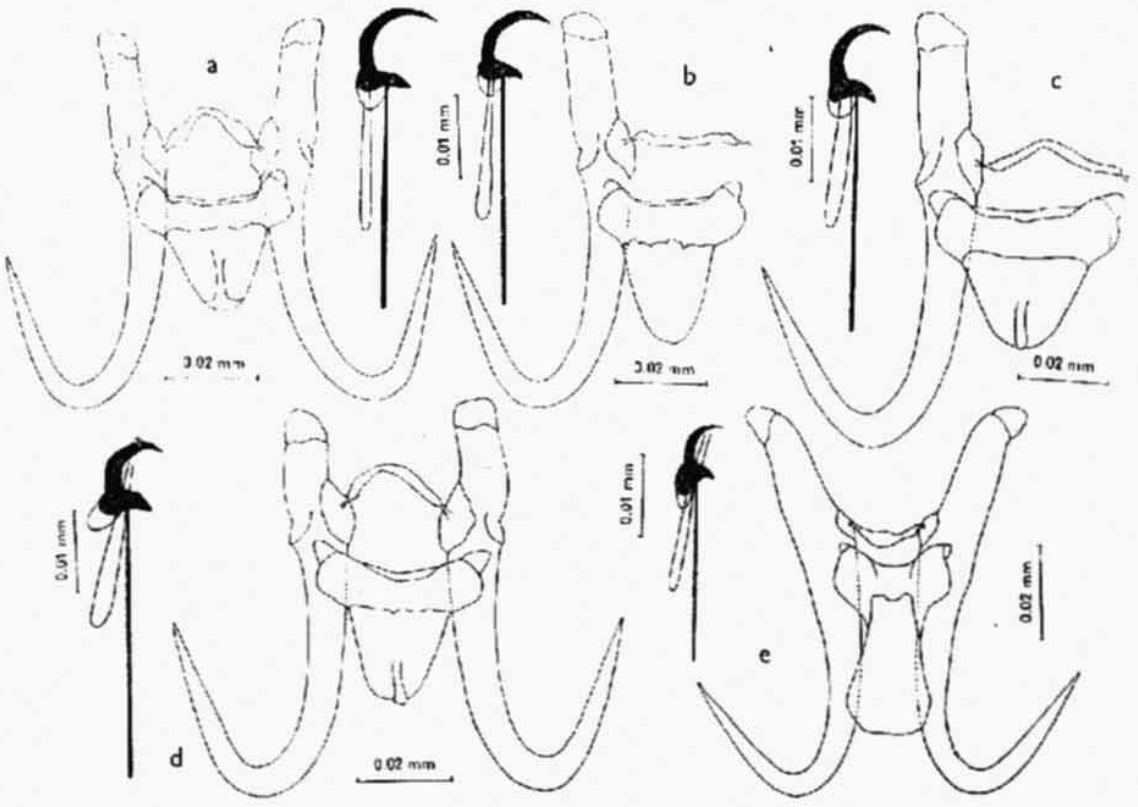

Fig. 6. Anchors with connecting bars and marginal hooks of haptor. a, b, c — *Gyrodactylus macronychus* Malmberg, 1956, (a — from *Phoxinus phoxinus*, b — from *Ph. lagowskii*, c — from *Phoxinus* sp.); d — *G. lucii* Kulakowskaja, 1951, e — *G. magnificus* Malmberg, 1956.

variability range of typical specimens and the rearrangement of one or more species becomes justified. In the opposite case, when changes of a quantitative character are prevalent, the originally determined variability has to be only extended.

At the present stage of research of the genus *Gyrodactylus*, qualitative changes are those concerned with the changes of the individual determining signs and namely changes of their morphological character. We thus exclude changes caused by the enlargement or reduction of dimensions.

In this connection we have listed to the species *G. macronychus* all parasites isolated not only from *Ph. phoxinus*, but also from *Ph. lagowskii* and *Phoxinus sp.*, because their determining signs retain in spite of some metric and thus also some morphological changes the morphological character of the determining sings of the typical specimens of this species (Tab. 5, Fig. 6).

11. *Gyrodactylus magnificus* Malmberg, 1956 Fig. 6e

Host: *Ph. phoxinus*, *Ph. lagowskii*
Location: fins, gills, nasal cavities
Locality: river Tul near Ulan Bator and the vicinity of the settlement Songino, lake Tirkhin tsagan, Dod tsagan and their tributaries, river Kherlen and its tributaries near Bayandelger

Similar as in *G. laevis*, the determining signs of our specimens are not different in the morphological sense from the determining signs of the specimens described by Malmberg (1956). The only differences were observed in the metric values (Tab. 6).

Table 6. Comparison of dimensions (in mm) of the individual determining signs of the species *Gyrodactylus magnificus* Malmberg, 1956

	Malmberg (1956)	Material from Mongolia
Overal length of anchors	0.073—0.081	0.067—0.090
Length of basal part	—	0.049—0.066
Length of point	0.031—0.035	0.029—0.036
Length of root	0.023—0.029	0.024—0.035
Length of principal connecting bar	0.012—0.014	0.009—0.013
Width of principal connecting bar	0.021—0.024	0.019—0.025
Length of membrane	0.028—0.031	0.023—0.030
Length of auxiliary connecting bar	0.003—0.004	0.003—0.005
Width of auxiliary connecting bar	0.014—0.017	0.011—0.016
Overall length of marginal hooks	0.026—0.029	0.026—0.031
Length of marginal hooks without "handle"	0.008—0.009	0.008—0.009

At the same time there is the question whether *G. magnificus* is not in synonymy with the species *G. decorus* Malmberg, 1956, because the borderlines of metric variability of the individual determining signs of both these very closely related species are overlapping to quite a degree.

12. *Gyrodactylus minimus* Malmberg, 1956 Fig. 4b

Host: *Ph. phoxinus*
Location: gills
Locality: river Tul near the settlement Songino, lake Dod tsagan and its tributaries

In shape and dimensions of the individual determining signs our specimens are in full agreement with those found in Sweden (Malmberg 1956) and in Czechoslovakia (Ergens 1966).

13. *Gyrodactylus paralaevis* Ergens, 1966 (?) Fig. 4c

Host: *Phoxinus sp.*
Location: gills
Locality: river Selbe near Ulan Bator

The dimensions of the determining signs of the single specimen found are: overall length of anchors 0.048 mm, length of basal part 0.036 mm, of the point 0.019 mm, of the internal root 0.016 mm. Length of principal connecting bar 0.006 mm, width 0.015 mm, length of its membranous extension 0.013 mm. Length of auxiliary connecting bar 0.001 mm, width 0.009 mm. Overall length of marginal hooks 0.025 mm, the hook itself measures 0.006 mm. Because the only specimen found was greatly deformed, this worm had to be designated *G. paralaevis* (?).

14. *Gyrodactylus phoxini* Malmberg, 1956 Fig. 3b

Host: *Ph. phoxinus*, *Ph. lagowskii*, *Phoxinus sp.*
Location: gills, fins, nasal cavities
Locality: river Tul near Ulan Bator and in the vicinity of the settlement Songino, lake Dod tsagan and its tributaries

All determining signs of this species are both in shape and in the dimensions of the individual determining signs in full agreement with the specimens described by Malmberg (1956).

15. *Gyrodactylus prostae* Ergens, 1963

Host: *Ph. phoxinus*
Location: gills
Locality: River Tul near the settlement Songino

We consider the finding of the two specimens of *G. prostae* on a single specimen of this host species more or less accidental. The determining signs of both parasites, one of them in its juvenile stage, are in agreement with the determining signs of typical specimens, parasitising e.g. *Rutilus rutilus*.

16. *Gyrodactylus* sp. Fig. 5b

Host: *Ph. lagowskii*
Location: skin
Locality: river Kherlen near Bayandelger

In view of the fact that we found only a solitary specimen, no species designation has been given for this worm. The metric valus of its determining signs are as follows: overall length of the anchors 0.053 mm, their basal part measures 0.040 mm, the point 0.024 mm, the internal root 0.016 mm. Dimensions of the principal connecting bar, to which a membranous extension of 0.012 mm in length is attached, are 0.005 — 0.006 mm by 0.023 mm, dimensions of the auxiliary bar 0.002—0.20 mm. Overall length of marginal hooks varies from 0.023 mm—0.025 mm, the hook is 0.005 mm—0.006 mm long.

In most of its determining signs this parasite resembles the species *G. scardinii* MALMBERG, 1956.

REFERENCES

AKHMEROV A. KH., (New species of monogenetic trematodes of fishes from the river Amur). Parazitol. Sb. Zool. Inst. AN SSSR, 14: 181—212, 1952. (In Russian.)

BERG L. S., (Freshwater fishes from the U.S.S.R. and the neighbouring countries). Publ. House Acad. Scie U.S.S.R., Moscow—Leningrad, 1949. (In Russian.)

BYKHOVSKIY B. E. et al., (Key to parasites of freshwater fishes of the U.S.S.R.). Publ. House Acad. Scie U.S.S.R. Moscow—Leningrad, 1962. (In Russian.)

ERGENS R., Vier neue Arten des Genus *Gyrodactylus* Nordmann, 1832 (Monogenoidea) aus Fischen der Tschechoslowakei. Z. Fischerei u. deren Hilfswissenschaften 11: 753—741, 1963.

—, Revision of the helminthofauna of fishes from Czechoslovakia IV. Group of species *Gyrodactylus elegans* Nordmann, 1832 (Monogenoidea). Folia parasitol. (Praha) 13: 212—221, 1966.

MALMBERG G., Om förekomsten av *Gyrodactylus* pa svenska fiskur. Skrifter utgivna av Södra Sveriges Fiskeriförening, Arsskrift, pp. 19—76, 1956.

MARKEVICH A. P., (Parasite fauna of freshwater fishes of the Ukrainian S.S.R.). Publ. House Ukrain. S.S.R., Kiev, 1951. (In Russian.)

NYBELIN O., Kleine Beiträge zur Kenntnis der *Dactylogyren*. Ark. Zool. 29: 1—29, 1937.

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