

CONTRIBUTION TO THE KNOWLEDGE OF GYRODACTYLUS GURLEYI PRICE, 1937 (MONOGENEA: GYRODACTYLIDAE)

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Abstract. *Gyrodactylus longoacuminatus* Žitňan, 1964, forma *minor* sensu Ergens (1985) was identified as *G. gurleyi* Price, 1937. Morphological and metrical evaluations of the hard parts of opisthaptor of more than 200 specimens provided data on the variability of this parasite; *Cyprinus carpio haematopterus* represents its new host. Since the shape of the hard parts of opisthaptor of *G. gurleyi* is very similar to that of *G. longoacuminatus*, further detailed studies of the two species will be necessary, particularly of their reaction to the changes of environmental temperature.

During long-term investigations of the species of *Gyrodactylus* Nordmann, 1832 parasitizing fish from the Amur river, which were performed in 1961—1970, specimens of a species were repeatedly found on the fins, skin and gills of fry of *Carassius auratus* (L.) and *Cyprinus carpio haematopterus* Temminck et Schlegel always in summer months (June—August). Due to its great morphological similarity with *G. longoacuminatus* Žitňan, 1964, this species has been determined until recently as *G. longoacuminatus* f. *minor* (Ergens 1985). The reason of this determination was the fact that the species differed from a typical *G. longoacuminatus* only in smaller size of the hard parts of opisthaptor and that all studied specimens were obtained from the fry so that they could have represented a so-called fry form of *G. longoacuminatus*, as it was the case with the fry forms of some members of *Dactylogyrus* Diesing, 1850.

In summer 1984, another 27 specimens of *G. longoacuminatus* were obtained, this time from two- and three-year-old hosts (*C. auratus*). However, the results of their morphological and metrical evaluations showed that they could not be regarded as *G. longoacuminatus* f. *minor* because none of the specimens differed from those from the fry. Moreover, exact data of *G. gurleyi* Price, 1937, obtained by reexamination of its type material and published by Cone and Wiles in 1983, were available at that time. Consequently, after a comparison of these data with those of the specimens under study we arrived at the conclusion that the specimens identified as *G. longoacuminatus* f. *minor* were in fact *G. gurleyi*.

In order to supplement the data of *G. gurleyi*, which were based on 8 specimens from the goldfish (*Carassius auratus*) originating from aquarium breeding in the USA and Canada (Cone and Wiles 1983), results of our studies of more than 200 specimens of this parasite are presented in this paper. *G. gurleyi* specimens were obtained from *C. auratus* and *C. carpio haematopterus* caught in several localities in the region of their natural occurrence (lakes Bolon and Golovino and the river Amur near Khabarovsk and Leninskoe).

All parasites examined were fixed in 4 % formalin and mounted in glycerine jelly. They are deposited in the collections of the Institute of Parasitology, Czechoslovak Academy of Sciences, České Budějovice, Zoological Institute, USSR Academy of

Sciences, Leningrad, and Amur Department of the Pacific Research Institute of Fishery and Oceanography (TINRO), Khabarovsk. The observations were made with a phase-contrast microscope and illustrations were prepared with the aid of a camera lucida. The technique of Ergens and Lom (1970) was used in measurements of the hard parts of opisthaptor. All measurements are in millimeters.

RESULTS

A. Metrical variability

As it is evident from Table 1, the measurements of anchors and their individual parts are rather variable. By contrast, the metrical variability of the ventral bars and shields is low and the measurements of the hooks proper of marginal hooks are almost constant.

Table 1. Measurements of individual hard parts of opisthaptor of *G. gurleyi* Price, 1937 and *G. longoacuminatus* Žitňan, 1964

Measurements		<i>G. gurleyi</i>		<i>G. longoacuminatus</i> Ergens (1985)
		Cone and Wiles (1983)	Present authors	
Anchors	Total length	0.047—0.056	0.045—0.055	0.058—0.071
	Shaft	0.033—0.043	0.033—0.042	0.045—0.054
	Point	0.021—0.027	0.023—0.028	0.029—0.036
	Root	0.010—0.018	0.013—0.019	0.018—0.024
Ventral bar	Length	0.003—0.005	0.005—0.006	0.006—0.008
	Width	0.018—0.025	0.018—0.022	0.023—0.029
	Shield	0.009—0.014	0.010—0.013	0.014—0.017
Dorsal bar	Length	—	0.001—0.002	0.002—0.004
	Width	0.019—0.022	0.012—0.018	0.015—0.024
Marginal hooks	Total length	0.024—0.028	0.023—0.028	0.029—0.036
	Hook proper	0.005	0.005	0.005—0.007
Localities		Texas, Nova Scotia	Far East	Eurasia

Due to the fact that only specimens collected in summer season were available and with regard to the known relationship between the environmental temperature and size of attaching structures in some members of the genus *Gyrodactylus* (Ergens 1975, 1976, Ergens and Gelnar 1985), the recorded range of metrical variability of *G. gurleyi* cannot be considered to be definitive. It is probable that the metrical values of individual hard parts of opisthaptor in specimens collected in a cold season will be greater and that the range of metrical variability will be thus extended.

Of interest is the fact that there were only negligible differences in the range of metrical variability of our specimens originating from nature and of those described by Cone and Wiles (1983), which came from aquarium breeding of *C. auratus*. It may be supposed that goldfish were maintained at a water temperature similar to summer temperatures in the regions of natural occurrence of *G. gurleyi* and its hosts.

An almost identical metrical variability of hard parts of opisthaptor was found in

specimens collected from fins, skin and gills of both young and older specimens of *C. auratus* and *C. carpio haematopterus*. This indicates that the size of attaching structures of opisthaptor in *G. gurleyi* is not affected either by the localization of the parasite or its age or host species.

B. Morphological variability

The marginal hooks of *G. gurleyi*, as of all other species of *Gyrodactylus* are stable in the shape. On the other hand, the shape of anchors is somewhat variable due to the differences in the ratio of shaft and root lengths occurring during the postembryonal phase of ontogenetic development of this parasite. Small changes of the shape of ventral bar are caused particularly by the changes of its length : width ratio.

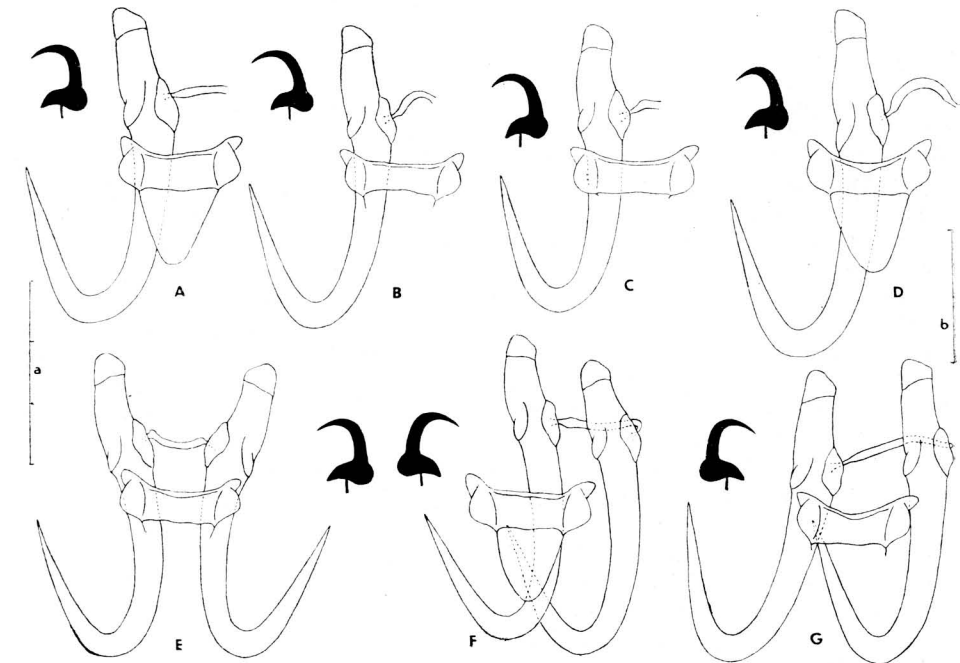


Fig. 1. Hard parts of opisthaptor of *G. gurleyi* Price, 1937 from the fins and skin of *Carassius auratus* (A—D), *Cyprinus carpio haematopterus* (E, F) and *Hypophthalmichthys molitrix* (G): A, C, E, F, G — from the Lake Golovino; B, D — from the River Amur. Scales (1 part = 0.01 mm): a — for anchors, b — for hook proper of marginal hooks.

In no case there was a direct relation between the morphological changes of the hard parts of *G. gurleyi* opisthaptor and changes of the localization of the parasite, its age, or host species.

It can be assumed that the morphological as well as metrical differences between individual specimens of the given species are due particularly to the genetic intrapopulation variability and non-genetic individual variability in time (growth variability).

C. Hosts, location, distribution

In addition to *Carassius auratus* (type host), also *Cyprinus carpio haematopterus* is parasitized by *G. gurleyi* on fins, skin and gills. We have not managed to demonstrate whether older specimens of the latter host were also infected by this parasite. In some cases, single specimens of *G. gurleyi* were found even on the skin of fry of *Hypophthalmichthys molitrix* (Valenciennes) and *Leuciscus waleckii* (Dybowski). However, both fish species should be considered (in the sense of Malmberg's (1970) terminology) a temporary substrate.

It can be supposed that the original distribution of *G. gurleyi* is the same as the original distribution of its hosts. However, the records of this parasite in bred domesticated forms of *C. auratus* (Japanese fan-tail) in the USA and Canada show that this parasite can be successfully introduced into other regions destined for the acclimatization of its hosts.

DISCUSSION

According to Cone and Wiles (1983), the outer part of the base of the hook proper of marginal hooks of *G. gurleyi* is regularly rounded, but more or less distinctly oblique. A similar shape of this part was found also in some of 16 marginal hooks in several of the specimens studied by us. It seems, however, that in all these cases the marginal hooks were unsuitably orientated or slightly deformed, since marginal hooks with regularly rounded outer part of base of hook proper prevailed in each specimen.

Although complete data on the excretory system are lacking, the morphological type of the hard parts of opisthaptor of *G. gurleyi* allows us to place it in the subgenus *G. (Limnonephrotus)* Malmberg, 1964 (syn. *G. wagneri*-complex Malmberg, 1957), the members of which are characterized, among others, by long pharyngeal processes. The long pharyngeal processes were really found by us in all specimens with observable pharynx. It will be therefore necessary to verify on a larger number of suitably fixed or live specimens from the domesticated form of *C. auratus* for the USA or Canada whether the above two authors were right in describing short pharyngeal processes in *G. gurleyi*.

As it was said above, *G. gurleyi* is almost identical in its morphology with *G. longoacuminatus* Žitňan, 1964 parasitic on fins, skin and gills of *C. carassius* (L.) and *C. auratus*. At the present time, the two species can be differentiated only on the basis of the size of hard parts of opisthaptor. It will be, however, necessary to verify this mode of differentiation, since the maximum measurements of the individual parts of the complex of anchors and marginal hooks of *G. gurleyi* are very similar to minimum measurements of the same structures in *G. longoacuminatus*. If it is demonstrated that the maximum measurements of the hard parts of *G. gurleyi* opisthaptor concern only its "winter" populations and minimum measurements of the same parts in *G. longoacuminatus* are characteristic only of specimens from its "summer" populations, then it will be possible to regard the differences in the measurements of attaching structures of opisthaptor and their individual parts as a quite significant criterion for the differentiation of the two species. In an opposite case, it will be necessary to solve experimentally the problem of mutual relation between *G. gurleyi* and *G. longoacuminatus*.

К ИЗУЧЕНИЮ ВИДА *GYRODACTYLUS GURLEYI* PRICE, 1937
(MONOGENEA: GYRODACTYLIDAE)

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Резюме. Вид *Gyrodactylus longoacuminatus* Žitňan, 1964, forma *minor* sensu Ergens (1985) определили как *G. gurleyi* Price, 1937. При морфометрической оценке твердых частей прикрепительного диска более чем 200 экземпляров получились данные об изменчивости этого паразита; *Cyprinus carpio haematopterus* является его новым хозяином. Имея в виду, что твердые части прикрепительного диска *G. gurleyi* и *G. longoacuminatus* очень похожие, авторы считают необходимым дальнейшее подробное изучение этих видов, особенно их реакции на изменения температуры окружающей среды.

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Important anniversary of Dr. Božena Kotrlá, D.Sc.

The outstanding Czechoslovak helminthologist and scientific worker, Dr. Božena Kotrlá, D.Sc., will celebrate her 60th birthday this year.

She was born on 12th October 1927 at Uhřetěves near Prague. Having completed her secondary school education in 1946, she enrolled in the Natural Sciences Faculty, Charles University in Prague. She elaborated her diploma thesis "Parasitism artificially evoked by free-living protozoans" which she defended in 1951. In 1950 she started to work in the Central Institute of Biology, later the Institute of Biology of the Czechoslovak Academy of Sciences, where together with Dr. Ryšavý studied intensively

helminths of sheep and hoofed game animals. She successfully elaborated life cycles of the lungworms and helminths in digestive tract of ruminants. In 1953 she published in co-authorship with Dr. Ryšavý a handbook "Parasites of sheep" which has become a basic aid for veterinary parasitologists. In the same year she wrote with co-authors the book "Infections of game animals" which is an indispensable manual for Czechoslovak gamekeepers.

Besides problems of fauna and taxonomy, Dr. Kotrlá has solved problems of ecology and life cycles of some nematodes, which led to practical prophylactic measures against helminths of sheep and game animals. She also