

養殖コイから得た本邦初報告のDactylogyrus minutus Kulwiec', 1917 (Monogenea: Dactylogyridae)

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The First Record of *Dactylogyrus minutus* KULWIEĆ, 1927 (Monogenea: Dactylogyridae) from the Reared Carp (*Cyprinus carpio*) in Japan

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A dactylogyrid was found parasitizing the gills of the 0 year carp (*Cyprinus carpio*) reared at farms in Nagano Prefecture. The dactylogyrid was identified as *Dactylogyrus minutus* (Monogenea: Dactylogyridae). The discovery of this species is the first recorded case in Japan. The chitinous parts and the other structures of the species are also redescribed in this paper. The shape and the size of the chitinous parts almost agree with those reported by foreign authors, except the lack of a chitinous ring at the distal end of the uterus. No such structure was found in the present specimens. KULWIEĆ did not mention a chitinous ring at the site in his original description of the species.

Morphologically this species is characterized by the structure of the ovary and the vagina. The former originates behind the testis and is curved or folded in shape. The latter has a chitinous ring at its opening. The vaginal duct is dilated to form the receptaculum seminis.

Although dactylogyroses are very common among cultured carps (*Cyprinus carpio*) in Japan, little work has been done on the classification of dactylogyrids of the carp. Among the species belonging to *Dactylogyrus*, *D. extensus* was formerly the only one reported from carps in Japan¹⁾. The present authors had a chance to examine gill parasites of carps reared at farms in Nagano Prefecture and found out the other species, *D. minutus*, there for the first time. Since KULWIEĆ (1927)²⁾ reported *D. minutus* n.sp. on carps in Poland, this species is known to distribute among East European countries and Far East, and to be a very common parasite of carps. Although many authors have mainly described the chitinous structures of the species³⁻⁵⁾, the other structures have still remained to be clarified.

The present paper is the first record of *D. minutus* in Japan and deals with the re-description of whole structures including the chitinous ones.

Materials and methods

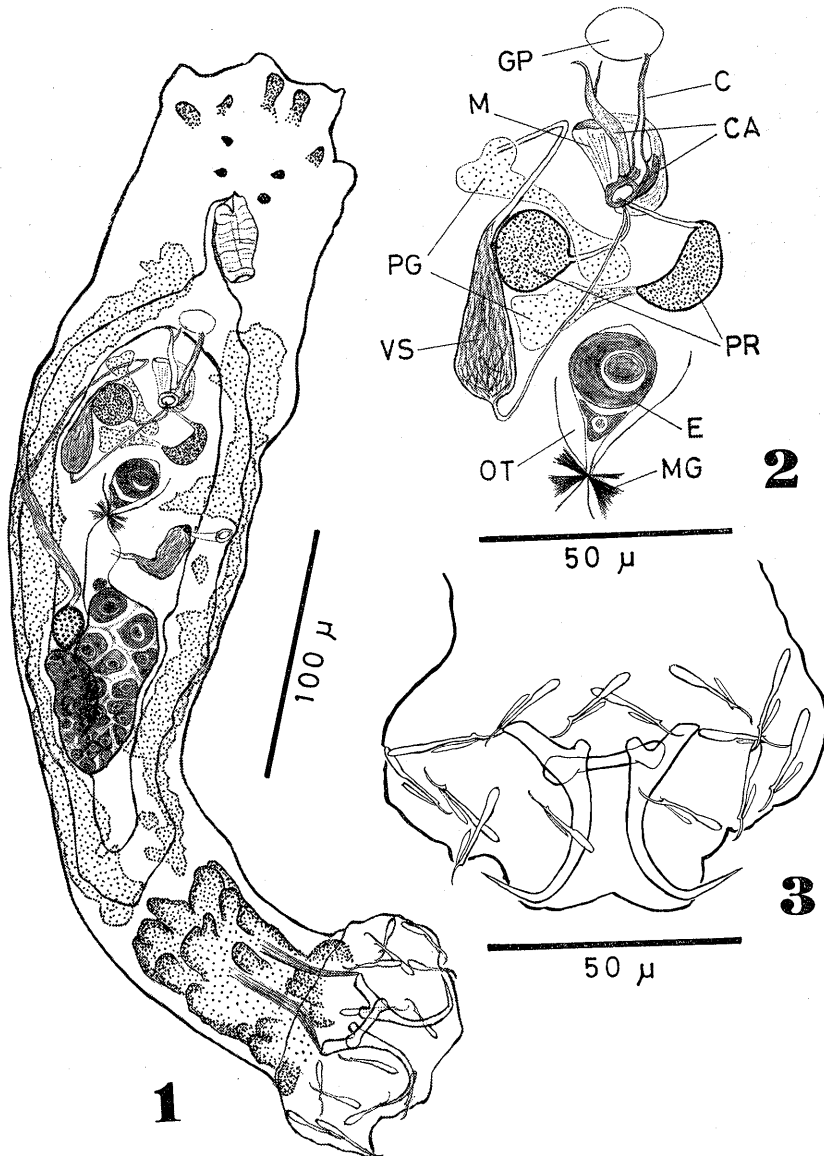
The hosts were all 0 year carp (*Cyprinus carpio*) of 10.4-14.2 cm in total length and 16-40 gr. in weight. The specimens of the dactylogyrid were prepared according to the methods of OGAWA and EGUSA (1976)⁶⁾. The morphology and the measurements of various body parts of the dactylogyrid were all based on stained specimens thus prepared. To examine the additional hooks⁷⁾, some living specimens were observed under a phase-contrast microscope. All drawings except Fig. 4 were made with the aid of a camera lucida.

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Results

Out of the eight fish examined seven were found parasitized with the dactylogyrid on the gills. The parasites numbered up to several hundreds per fish.

The dactylogyrid examined by the present authors was identified as *Dactylogyrus minutus* KULWIEĆ, 1927 because the shape and the size of the chitinous parts mostly agree



Figs. 1-3. *Dactylogyrus minutus* KULWIEĆ, 1927. 1: The whole worm, dorsal view. 2: The terminal genitalia, dorsal view. (C: cirrus, CA: cirrus accessory, E: egg, GP: genital pore, M: muscle, MG: MEHLIS' glands, OT: ootype, PG: prostate glands, PR: prostatic reservoir, VS: vesicula seminalis) 3: The haptoral armatures, ventral view.

with those of the latter species described by various authors²⁾³⁾⁴⁾⁵⁾⁸⁾.

Table 1. Measurements of *D. minutus* reported by various authors

Locality	Present authors (1977) Japan	KULWIEĆ (1927) Poland	PAPERNA (1959) Israel	MOLNÁR and NEMETH (1962) Hungary
Body length	282-550 (375)	320-440	257-532	340-400
width	83-125 (103)	48-72	29-110	60-80
Opisthaptor l.	53-67 (59)	38-45		
w.	85-111 (98)	64-77		
Pharynx l.	19-28 (24)	21-23		
w.	15-21 (18)	16	11-21	
Cirrus l.	31-34 (33)	35-40	25-36	34-37
total l.	36-43 (40)	43-49 (46)	33-48	44-46
base l.	30-36 (33)	37-40 (39)	29-37	35-37
Anchor {	internal process l.	12-16 (14)	9-14	15-18
	external process l.	4-6 (4)	2-5	4-6
point l.	12-15 (13)	12-16		14
Bar l.	23-27 (25)	25-30	22-26	28-29
Marginal hook l.	18-25	20-28	18-26	21-25
Nos. measured	10		10	

Dimensions in microns; parentheses represent mean.

Dactylogyrus minutus KULWIEĆ, 1927

Host: Reared carp, *Cyprinus carpio* L. (0 year old)

Locality and date: Nagano Pref., March, 1976.

Specimens: Deposited in the Meguro Parasitological Museum, Tokyo, M.P.M. Coll. No. 19177 and in the authors' collection.

The body is very small. The total length is 282-550 μ (mean 375 μ) long and the maximum width is 83-125 μ (mean 103 μ).

At the anterior edge of the body, two pairs of the head lobes exist, forming the prothaptor. There are three pairs of head organs, where the ducts of the sticky glands open.

The opisthaptor is well marked off from the body proper, transversely wide and 53-67 μ (mean 59 μ) long by 85-111 μ (mean 98 μ) wide. A pair of anchors (36-43 μ , mean 40 μ) is slender, supported by a bar (23-27 μ , mean 25 μ) at the dorsal side. The external process of the anchor is very short, 4-6 μ long and the internal one is 12-16 μ long, about three times longer than the former. The basal portion of the anchor is long, 30-36 μ in length. The anchor point directs dorsally and is 12-15 μ long. The marginal hooks are in seven pairs and measure 18-25 μ long. The additional hooks as described by ALLISON and ROGERS (1970)⁵⁾ are seen under a phase-contrast microscope, but their size and shape were not confirmed.

The mouth was not traced in the present specimens. The pharynx is 19-28 μ (mean 24 μ) by 15-21 μ (mean 18 μ) in size. Two pairs of eye spots are situated anterodorsally

to the pharynx. The oesophagus is short. The bifurcated intestines are running on either side of the body and united posteriorly. The cement glands start just behind the intestinal connection and are well developed.

The testis is small (8–19 μ wide), and usually elongated in shape. It is usually situated in the middle of the body, and sometimes overlaps with the anterior part of the ovary. The vas deferens starts from the anterior part of the testis, runs forwards and turns round the left intestine. Turning backwards at the level of the copulatory organ, it forms the vesicula seminalis (12–18 μ in diameter) which is sometimes larger than or almost the same size as the testis. The seminal duct turns forwards, reaching the base of the cirrus. Between the intestines, there are two kinds of prostate glands and their secretions gather into each prostatic reservoir. Both prostatic reservoirs are filled with granules and usually rounded. One on the right side is 11–20 μ (mean 16 μ) \times 9–11 μ (mean 10 μ) in size, and the granules are stained with carmine. Another is on the left side, 15–25 μ (mean 21 μ) \times 14–19 μ (mean 16 μ) in size, and the granules are not stained with carmine. The ducts of the two reservoirs reach the base of the cirrus together with the seminal duct. The copulatory organ consists of the cirrus and its accessory. The cirrus is a thin long tube, tapering gradually towards the tip. The base of the cirrus is widened and has a hole to which the three ducts open. The length of the cirrus is 31–34 μ (mean 33 μ). The cirrus accessory is made up of two components; one has a side branch at about the middle and diverges into two at the distal end, and another, originating at the opposite side to the branched accessory, is short and pointed distally. The copulatory complex reaches the genital pore which lies at about the level of the intestinal bifurcation.

The ovary (19–33 μ wide) originates behind the testis and directs backwards. The hind part is doubled and the extremity points upwards. The oviduct starts just from the anterior part of the ovary. The vagina opens on the right side of the body. At the distal end, it bears an ellipsoidal chitinous ring, its size being 6–7 μ \times 5–6 μ . The vaginal duct is dilated to form the receptaculum seminis (10–19 μ in diameter) on the way to the connection with the oviduct, and the receptaculum seminis is distinctively large and provided with a sphincter at the distal end. Receiving the MEHLIS' glands, the oviduct forms the ootype. The uterus was not seen in our stained specimens, but it is supposed to open into the genital pore together with the copulatory organ. There is no chitinous structure at the distal end of the uterus. The vitellaria extend from the level of the posterior end of the pharynx to that of the intestinal connection.

The whole worm, the terminal genitalia and the haptoral armatures are shown in Figs. 1–3. The present authors' data as well as the foreign authors' ones on the measurements of various body parts are listed on the Table 1. The lengths of the chitinous parts almost agree with those of PAPERNA and are somewhat shorter than those of the other authors.

Discussion

Morphological studies on *Dactylogyrus* are very few, though more than four hundred species of the genus have been as yet described. *Dactylogyrus* species studied morphologically are *D. anchoratus*⁸⁾, *D. apogonis*⁹⁾, *D. arcuatus*¹⁰⁾, *D. extensus*^{1,8)}, *D. minutus*⁸⁾, *D. spiralis*¹⁰⁾, *D. vastator*^{9,11)} and so on.

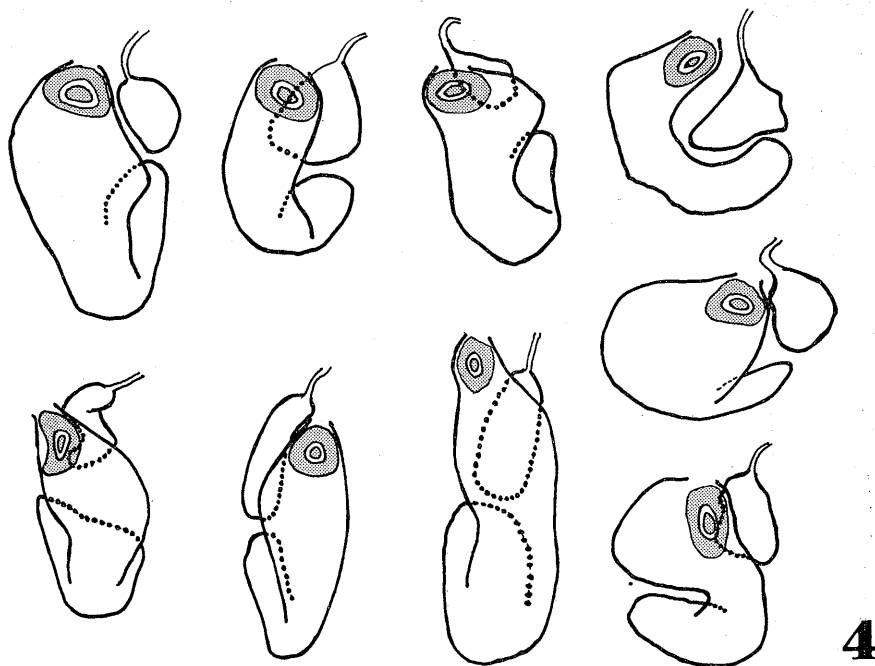


Fig. 4. Diagrams showing the various types of the relative positions of the ovary and the testis in *D. minutus*, all ventral view. In the ovary, the most mature ovum is illustrated.

D. minutus examined by the present authors is characterized by the morphological features of the ovary and the vagina. 1) The ovary starts behind the testis and directs backwards, and the hind part turns anteriorly as if it is curved or folded. The most mature ovum is seen at the anterior end of the ovary. The shape of the ovary and the positional relation of the ovary to the testis is very characteristic. BYCHOWSKY (1957)¹²⁾ mentioned that the ovary of the monogenea is usually situated anteriorly to the testis and rounded in shape. Fig. 4 shows the various types of the position of the ovary and the testis. The present authors think that these characteristic variations of the position and the shape of the ovary are very rare in the monogenea. 2) The vagina has a chitinous ring at its opening. The vaginal duct is dilated to form the receptaculum seminis. There is a sphincter at the distal end of the receptaculum seminis. There are two ways in the formation of the receptaculum seminis; first, it is formed by the dilatation of the vaginal duct

as in *D. apogonis* and *D. vastator*, and second, it is formed by the dilatation of the oviduct as in *D. arcuatus*, *D. extensus* and *D. spiralis*. *D. minutus* belongs to the former group.

PAPERNA⁸⁾ redescribed this species in detail, but there are some differences between his description and that of the present authors. He reported as follows. 1) The receptaculum seminis is located at the site of the vagina and connected with the latter through a sphincter-like opening. 2) There is a sclerotised ring at the distal end of the uterus. The present authors have doubts on the existence of a sphincter-like opening of the receptaculum seminis and a sclerotised ring of the uterus mentioned by him. ALLISON and ROGERS (1970)⁵⁾ also mentioned that the uterine aperture was surrounded by a chitinous plate. KULWIEĆ²⁾ did not mention that the uterine aperture was connected with a chitinous ring. It was the chitinous ring of the vagina that he called "Chitinplatte." The present authors' description on *D. minutus* coincides with the original one of KULWIEĆ in the characteristic that there is no chitinous structure at the distal end of the uterus.

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References

- 1) R. IMADA *et al.*: This Bull. **42**, 153-158 (1976).
- 2) Z. KULWIEĆ: *Bull. Internat. Acad. Polon. Sci. et Lettres, Cracovie, Cl. Sc. Math. et Nat. ser. B: Sc. Nat.*, 113-144 (1927).
- 3) A. P. MARKEVICH: Parasitic Fauna of Freshwater Fish of the Ukrainian S.S.R. (Kiev, 1951), Israel Program for Scientific Translation Ltd., Jerusalem, 388 pp. (1963).
- 4) K. MOLNÁR and I. NEMETH: *Acta Vet. Aca. Sci. Hungaricae*, **12**, 249-255 (1962).
- 5) R. ALLISON and W. A. ROGERS: *Proc. Helminth. Soc. Wash.*, **37**, 17-23 (1970).
- 6) K. OGAWA and S. EGUSA: This Bull., **42**, 395-404 (1976).
- 7) J. D. MIZELLE and C. E. PRICE: *J. Parasit.*, **49**, 1,028-1,029 (1963).
- 8) I. PAPERNA: *Bamidgeh*, **3**, 51-67 (1959).
- 9) S. YAMAGUTI: *Jap. J. Zool.*, **9**, 35-108 (1940).
- 10) S. YAMAGUTI: *Jap. J. Med. Sci.*, Part 6, Vol. 2, 105-129 (1942).
- 11) A. KOLLMAN: *Z. Fischerei*, NF Bd., **18**, 129-150 (1970).
- 12) B. E. BYCHOWSKY: Monogenetic Trematodes, Their Systematics and Phylogeny (1957), American Institute of Biological Science, U.S.A., 627 pp. (1961).