

**OCCURRENCE OF DACTYLOGYRUS CRUCIFER WAGENER, 1857, D. SIMILIS WEGENER, 1909 AND D. SPHYRNA LINSTOW, 1878 (MONOGENEA: DACTYLOGYRIDAE) ON THE GILLS OF ROACH RUTILUS RUTILUS (L.) IN ROSTHERNE MERE, CHESHIRE**

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*Dactylogyrus crucifer*, *D. similis* and *D. sphyrna* are recorded for the first time in the British Isles. They occurred on the gills of roach *Rutilus rutilus* in Rostherne Mere, Cheshire, an eutrophic lake. A comparison of the British specimens with those from other countries was made. The dimensions of the hooks and copulatory organs were the same.

### Introduction

The first British record of a *Dactylogyrus* sp. which has remained unidentified, was made by Ashworth and Bannermann<sup>2</sup> from the gills of minnow *Phoxinus phoxinus* (L.) in Scotland. Vickers<sup>19</sup> reported the presence of an undetermined *Dactylogyrus* species on a rudd *Scardinius erythrophthalmus* (L.) from Ireland. Bychowsky<sup>3</sup> listed 221 species of *Dactylogyrus* found all over the world, and Gussev<sup>8</sup> counted about 260 species in Soviet Union alone. Dawes<sup>4</sup> suggested that some species of *Dactylogyrus* might occur in British waters, because of the large number of species found on similar fish in Continental Europe.

Three species, *Dactylogyrus crucifer* Wagener,<sup>20</sup> *D. similis* Wegener,<sup>21</sup> and *D. sphyrna* Linstow,<sup>9</sup> have now been found on the roach *Rutilus rutilus* (L.) of Rostherne Mere, Cheshire, an eutrophic lake. This lake is 1.1 × 0.6 km in size, and is situated in the north of the County of Cheshire at a distance of about 50 km from Liverpool.

The hooks and the copulatory organs of the worms are the only structures dealt with here, because they are of importance in the specific identification of the members of the Dactylogyridae. They are sclerotized bodies, and so are of constant shape.

### Materials and Methods

The parasites were collected from freshly captured fish. The gill filaments bearing the worms were placed in cold water, the mucus was removed from the worms, and they were then fixed and stored in an alcohol-formol-acetic solution (formula of Van Cleave).<sup>18</sup> For examination the specimens were mounted in glycerine jelly, as recommended by Gussev (personal communication). Details of the hooks and copulatory organs were revealed by the use of the phase contrast microscopy.

*Dactylogyrus crucifer* Wagener<sup>20</sup>  
*Syn Dactylogyrus dujardianus* Linstow,<sup>9</sup>  
*Neodactylogyrus crucifer* (Wagener, 1857)<sup>2c</sup>  
 Price<sup>12</sup>

*Previous Records*—Authors: Sproston,<sup>17</sup> Dawes,<sup>4</sup> Gussev,<sup>7</sup> Roman,<sup>15</sup> Ergens,<sup>5</sup> Lucky and Dyk<sup>10</sup> Bychowsky,<sup>3</sup> Prost,<sup>13</sup> Agapova,<sup>1</sup> Prost,<sup>14</sup> Roman,<sup>16</sup> Ergens,<sup>6</sup> Gussev.<sup>8</sup> Fish hosts: *Scardinius erythrophthalmus* (L.), *Rutilus rutilus* (L.) *Rutilus rutilus fluviatilis* (L.) *Leuciscus leuciscus* (L.) *Leuciscus idus* (L.) *Alburnus alburnus* (L.) *Blicca bjoerkna* (L.) and *Abramis brama* (L.)

*Specimens Collected*.—Seven hundred and eighty specimens of *Dactylogyrus crucifer* were collected from the gills of 199 roach from March 1963 to February 1964.

*Description* (based on a study of 5 specimens).—Moderately large dactylogyrid with a total length of 0.82–0.94 mm; width 0.09–0.11 mm. The marginal hooks are fourteen in number, of approximately equal size, length 0.031–0.037 mm. Each marginal hook has an ovate base, a comparatively short shaft, a sickle-shaped end and a needle-like process which is not very distinct (Fig. 1, No. 1 to 7). The central hook, or anchor is slim with a recurved blade and an inner root longer than the outer one (Fig. 1A). The total length is 0.041–0.051 mm, the inner root 0.015–0.017 mm, the outer root 0.005–0.007 mm, the shaft 0.03–0.036 mm, and the point 0.015–0.017 mm. The linking bar is more or less ox-yoke shaped with rounded ends (Fig. 1B), its dimensions are 0.005–0.006 by 0.023–0.028 mm. The accessory bar is composed of dorsal and ventral plates, the dorsal plate with two widely separated arms and the ventral plate with two fan-shaped processes (Fig. 1C). The dimensions of the accessory bar are 0.02–0.025 by 0.023–0.026 mm. The copulatory organ is composed of a supporting apparatus and a duct (Fig. 1D). The supporting apparatus is made up of three to four pieces, which are of a complex arrangement. The proximal part of the duct is figure 8 shaped.

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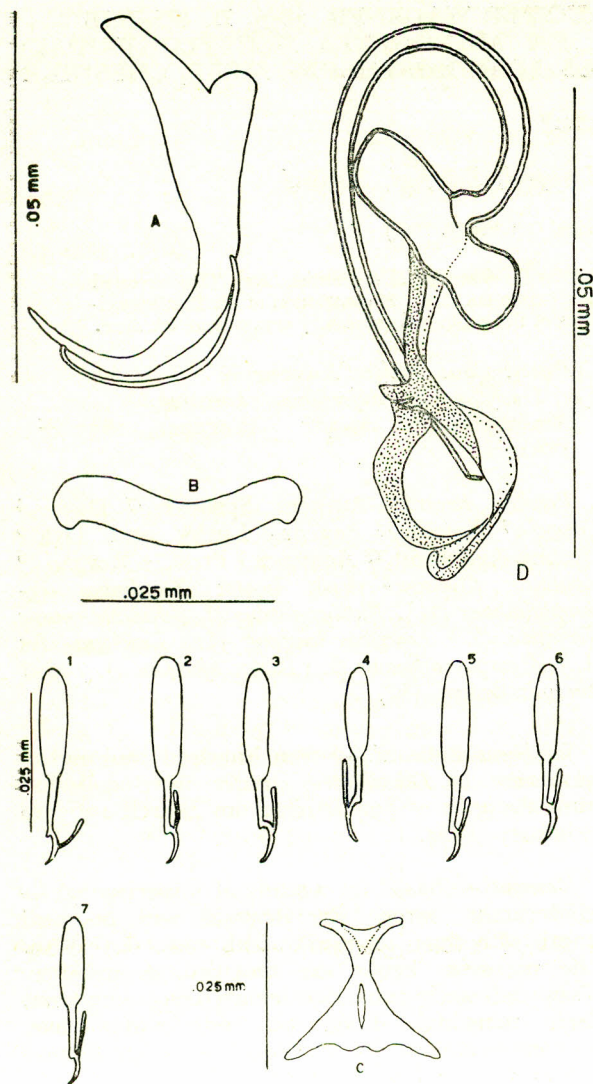


Fig. 1.—*Dactylogyrus crucifer* (1—7) marginal hooks: (A) central hook, (B) linking bar, (C) accessory bar, (D) copulatory organ.

The total length of the copulatory organ is 0.041–0.06 mm.

*Comparison.*—The structures and the measurements of the British specimens of *D. crucifer* fall into the range of data given by Prost<sup>13</sup> and Gussev.<sup>8</sup> With the exception of the body, the differences in size of the various organs of the three groups of specimens are very small (Table 1).

*Dactylogyrus similis* Wegener<sup>21</sup>

*Previous Records.*—Authors: Sproston<sup>17</sup> Dawes,<sup>4</sup> Gussev,<sup>7</sup> Ergens,<sup>5</sup> Bychowsky,<sup>3</sup> Prost,<sup>13</sup> Lucky and Dyk,<sup>10</sup> Agapova,<sup>1</sup> Ergens,<sup>6</sup> Gussev.<sup>8</sup> Fish hosts:

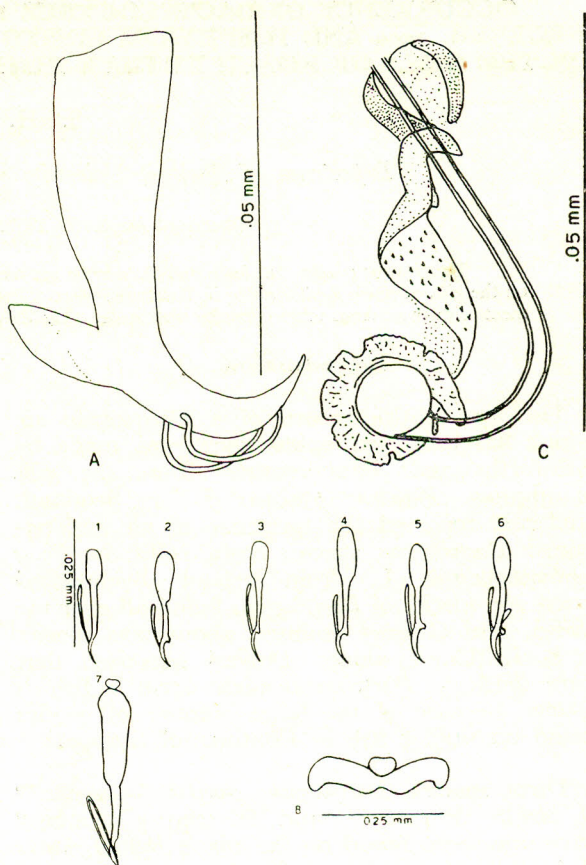


Fig. 2.—*Dactylogyrus similis* (1—7) marginal hooks: (A) central hook, (B) linking bar, (C) copulatory organ.

*Leuciscus cephalus* (L.), *Rutilus rutilus* (L.) *Alburnus alburnus* (L.) *Chondrostoma nasus* (L.) *Chondrostoma nasus variable* (Jakowlew), *Blicca bjoerkna* (L.) *Vimba vimba* (L.) *Aspius aspius* (L.) and *Tinca tinca* (L.).

*Specimens Collected.*—84 specimens of *D. similis* were collected from 53 roach *Rutilus rutilus* of Rostherne Mere during March to August.

*Description* (based on a study of 5 specimens).—Relatively large dactylogyrid, with a total length 1.19–1.88 mm, width 0.21–0.4 mm. The marginal hooks are fourteen in number, in seven pairs, of which the first to sixth are small and of approximately equal size; the seventh pair is large. Each marginal hook has a weakly developed handle, a shaft, a sickle-shaped termination and a distinct needle-like process; length 0.02–0.026 mm. The members of the sixth pair are provided with two processes. The seventh pair has stout handles and loop-like processes, length 0.033–0.038 mm, (Fig. 2, No. 1 to 7). The central hook is long with the inner root widened from the base towards the other end. The outer

TABLE I.—A COMPARISON OF THE SIZES OF *Dactylogyrus crucifer* FROM THREE DIFFERENT LOCALITIES.

Name of parts	British specimens	Polish specimens <sup>13</sup>	Russian specimens <sup>8</sup>
Body	0.82-0.94 × 0.09-0.11 mm	Expanded 1.2 × 0.025 mm contracted 0.16 × 0.15 mm	Up to 0.75 mm
Marginal hook	0.031-0.037 mm	0.023-0.04 mm	0.02-0.037 mm
Central hook	0.041-0.051 mm	0.039-0.046 mm	0.04-0.06 mm
Inner root	0.015-0.017 mm	0.011-0.016 mm	—
Outer root	0.005-0.007 mm	0.005-0.007 mm	—
Shaft	0.03-0.036 mm	0.030-0.034 mm	—
Point	0.015-0.017 mm	0.01-0.017 mm	—
Linking bar	0.005-0.006 × 0.023-0.028 mm	0.004-0.005 × 0.025-0.033 mm	0.005 × 0.025-0.033 mm
Accessory bar	0.02-0.025 × 0.023-0.026 mm	0.018-0.025 × 0.0185-0.027 mm	0.018-0.025 × 0.018-0.027 mm
Copulatory organ	0.041-0.06 mm	0.036-0.064 mm	0.04-0.06 mm

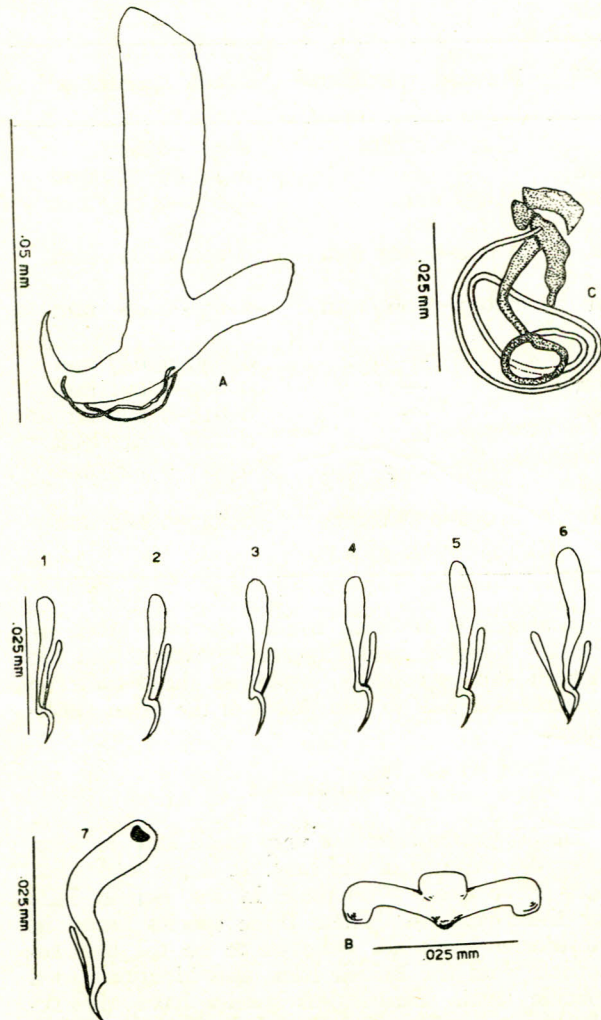


Fig. 3.—*Dactylogyrus sphyrna* (1-7) marginal hooks: (A) central hook, (B) linking bar, (C) copulatory organ.

root is small. The central hook is provided with a pair of wings (Fig. 2A). Length of central hook 0.041-0.051 mm, the inner root 0.03-0.038 mm, the outer root 0.01-0.011 mm, the shaft 0.017-0.025 mm, the point 0.011-0.017 mm. The linking bar is composed of two arms rounded at the ends with a knob in the middle (Fig. 2B). The copulatory organ is made up of supporting apparatus and a duct. The base of the duct is flower shaped (Fig. 2C). Total length of the copulatory organ is 0.053-0.065 mm.

*Comparison.*—Table 2 gives a comparison of the sizes of the sclerotized structures of specimens from different localities. Although the British specimens are nearly two and three times larger than the Soviet and Polish ones respectively, the dimensions of the sclerotized bodies remain more or less the same.

*Dactylogyrus sphyrna* Linstow.<sup>9</sup>

*Previous Records.*—Authors: Sproston,<sup>17</sup> Dawes, 4 Gussev,<sup>7</sup> Bychowsky,<sup>3</sup> Prost,<sup>13</sup> Lucky and Dyk,<sup>10</sup> Agapova,<sup>1</sup> Roman,<sup>16</sup> Paperna<sup>11</sup> Ergens,<sup>6</sup> and Gussev,<sup>8</sup> Fish hosts: *Scardinius erythrophthalmus* (L.), *Rutilus rutilus* (L.), *Rutilus rutilus fluviatilis* (L.), *Rutilus rutilus caspicus* (Jackowlew), *Leuciscus cephalus* (L.), *Blicca bjoerkna* (L.), *Vimba vimba* (L.), *Abramis brama* (L.), *Abramis vimba* (L.), *Acanthobrama terrae-sanctae* and *Gobio gobio* L.

*Specimens Collected.*—Only two specimens of *D. sphyrna* were found on two roach *Rutilus rutilus* of Rostherne Mere, in June.

*Description* (based on a study of two specimens mounted in Canada balsam).—Relatively large dactylogyrid, total length of body 1.23-1.49 mm, width 0.14-0.175 mm. Seven pairs of marginal

TABLE 2.—A COMPARISON BETWEEN THE SPECIMENS OF *Dactylogyrus similis* FROM THREE DIFFERENT LOCALITIES.

Name of parts	British specimens	Polish specimens <sup>13</sup>	Russian specimens <sup>8</sup>
Body .. ..	1.19-1.88 × 0.21-0.4 mm	0.950-1.900 × 0.250-0.470 mm	0.4-0.5 × 0.10-0.12 mm
7th pair of Marginal hook ..	0.033-0.038 mm	0.029-0.033 mm	0.040 mm
1st-6th pairs of Marginal hook ..	0.02-0.026 mm	0.017-0.023 mm	0.016-0.023 mm
Central hook .. ..	0.041-0.051 mm	0.045-0.053 mm	0.038-0.054 mm
Inner root .. ..	0.03-0.038 mm	0.029-0.034 mm	—
Outer root .. ..	0.01-0.011 mm	0.007-0.010 mm	—
Shaft .. ..	0.017-0.025 mm	0.024-0.034 mm	—
Point .. ..	0.011-0.017 mm	0.008-0.013 mm	—
Linking bar .. ..	0.007-0.008 × 0.017-0.025 mm	0.005-0.007 × 0.025-0.027 mm	0.004 × 0.020 mm
Copulatory organ .. ..	0.053-0.065 mm	0.056-0.067 mm	0.056-0.067 mm

TABLE 3.—A COMPARISON BETWEEN THE SPECIMENS OF *Dactylogyrus sphyrna* FROM FOUR DIFFERENT LOCALITIES.

Name of parts	British specimens	Polish specimens <sup>13</sup>	Russian specimens <sup>8</sup>	Israeli specimens <sup>11</sup>
Body	1.23-1.49 × 0.14-0.175 mm	0.100-1.00 × 0.145-0.200 mm	1.4 × 0.2 mm	0.51-0.62 × 0.11-0.15 mm
7th pair of Marginal hook	0.035-0.043 mm	0.037-0.046 mm	0.052 mm	0.034-0.039 mm
1-6 pair of Marginal hook	0.021-0.025 mm	0.015-0.026 mm	0.020-0.028 mm	0.011-0.02 mm
Central hook	0.06-0.066 mm	0.055-0.069 mm	0.055-0.069 mm	0.05-0.06 mm
Inner root	0.043 mm	0.043-0.0495 mm	—	0.039-0.047 mm
Outer root	0.015 mm	0.013-0.0165 mm	—	0.009-0.021 mm
Shaft	0.023 mm	0.024-0.028 mm	—	0.018-0.022 mm
Point	0.015 mm	0.007-0.013	—	0.008-0.01 mm
Linking bar	0.008 × 0.031 mm	0.005-0.007 × 0.024-0.030 mm	0.007-0.030 mm	× 0.025-0.027 mm
Copulatory organ	0.036 mm	0.042-0.060 mm	0.052-0.060 mm	0.049-0.062 mm

hooks. Each hook with a base, a shaft and a sickle-shaped termination with a needle like process. Seventh pair bigger than the others, length 0.035-0.043 mm. Sixth pair provided with two processes. Length of first to sixth pairs 0.021-0.025 mm. Central hook thickened and stout, with its root longer than the outer one, total length 0.06-0.066 mm, inner root 0.043 mm, outer root 0.015 mm. The linking bar is bent in the middle, its dimensions 0.008 × 0.031 mm. The copulatory organ has a long coiled duct and a large accessory piece, total length 0.036 mm (Table 3).

*Comparison.*—Table 3 gives the dimensions of specimens from four different localities. The

measurements are very similar to those given by Prost,<sup>13</sup> Gussev<sup>8</sup> and Paperna<sup>11</sup> except that the size of the copulatory organ of the Rostherne specimens is half to two thirds of the other specimens.

### Discussion

*Dactylogyrus* species are very small and die soon after the capture of the host. It is probable that they have been overlooked in the British Isles for these reasons. These three species found in Rostherne Mere are believed to be the first recorded from the British Isles, and identified to a specific level. *Dactylogyrus* species have also recently been collected from fish in the river Wye,

in Wales; from the Shropshire Union Canal in Cheshire; and from Llyn Padarn, in Caernavonshire (personal communication, Davies, Mishra, and Powell and Chubb respectively). It is likely that investigations in other regions of the British Isles will reveal more species of *Dactylogyrus*, and show that those recorded in this paper have a wide distribution.

Mizelle and Price<sup>22</sup> have mentioned the presence of 8th pair of hooks in *Dactylogyrus* spp. Their discovery is probably due to ligamentous specks as pointed out by Gussev.<sup>23</sup>

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