Amended Descriptions of Belonolaimus gracilis Steiner, 1949 and B. longicaudatus Rau, 1958 (Nematoda: Tylenchida)*

GEORGE J. RAU**

The genus Belonolaimus was established with B. gracilis as the only species (Steiner, 1949). All populations of the genus were usually referred to this species until 1958, when Rau, on the basis of extensive collections, described B. longicaudatus and expressed the opinion that this species, not B. gracilis, is the common sting nematode in the southeastern United States. This opinion was based on the fact that collections made in the vicinity of Ocala, the type location for B. gracilis, and in many other parts of Florida did not contain nematodes corresponding to the description of this species. Since 1958, many additional collections of Belonolaimus longicaudatus have been made, and sting nematodes corresponding in most details to the description of B. gracilis have been found around the roots of long leaf pine (Pinus palustris Mill.) in the Ocala National Forest near Ocala, Florida. This is the reported type location, and the nematodes were successfully transferred to the reported type host, slash pine (Pinus elliottii Engelm. (P. caribaea Morelet)), growing only on Lakewood sand, in the greenhouse. Steiner also reported long leaf pine as a host of B. gracilis.

The purposes of this paper are to amend the original description of B. gracilis, record variation in this species, amend the description of B. longicaudatus by correction of some of the dimensions originally given, and present additional information on another collection from the type location. The specimens of B. gracilis used in this study have been deposited in the United States Department of Agriculture Nematoide Collection, Nematology Investigations, Beltsville, Maryland.

Measurements in Table 1 include those from the original illustration and drawings of B. gracilis as well as of specimens collected December 12, 1958, near the type location. For B. longicaudatus, measurements from the original description are given as well as of a population collected September 24, 1958, from the type location. In addition, some useful ratios were calculated. These are the styli length divided by the tail length (S/T) and an index number obtained by dividing the length anterior to the vulva (A) by the length posterior to the vulva (P) and then dividing the quotient by S/T.

The females of B. gracilis can usually be separated from those of B. longicaudatus by average styli length since styli lengths overlap only at the extremes of the ranges. The same is true of tail length or of tail length as related to width of the body at the anus. When the ratio of styli length to tail length is calculated, there is no overlap of ratios.

The median bulb of B. gracilis is nearly spherical, while that of B. longicaudatus is elongated. Individuals of the latter species nearly always have an opposing pair of sclerotized pieces in the vagina which are lacking in B. gracilis. Also, in B. longicaudatus the tail is hemispherical with terminus 5.0 microns (4.2-7.8 microns) from the protoplasmic portion while that of B. gracilis is convex-conoid with the terminus 11.5 microns (8.4-15.4 microns) from the protoplasmic portion of the tail.

Ten female specimens of Belonolaimus gracilis were also found on a slide sent in by Simon Malo, formerly of the Lake Alfred Experiment Station.

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Florida. This slide was labeled "Hammilin Red grapefruit on lemon. Grove 304, Tavares, Florida."

As stated in the previous paper (Rau, 1958), *B. longicaudatus* is apparently the common sting nematode of Florida. Large numbers were found on the slides of nematodes from citrus groves sent in by Mr. Malo. *B. longicaudatus* was also found on the roots of slash pine at the Tarptune Experiment Station, Olustee, Florida. It was successfully transferred from sweet corn to slash pine seedlings growing in Leon sand. Along the seashore, *B. longicaudatus* is often found on various hosts, but particularly on sea oats (*Uniola paniculata L.*) growing in damp coarse white sand. Another undescribed species of *Belonolaimus* is found on this host growing in damp fine grey sand or sand containing large quantities of red coquina shell.

The ratios between stylet and tail lengths and index numbers of various

### Table 1. Measurements of *Belonolaimus gracilis* and *B. longicaudatus*

<table>
<thead>
<tr>
<th></th>
<th><em>Belonolaimus gracilis</em></th>
<th><em>Belonolaimus longicaudatus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Steiner 1949 (I)</td>
<td>Type Locality (II)</td>
</tr>
<tr>
<td><strong>Female</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length (mm)</td>
<td>2.15 ± 1.9 (1.4-2.3)</td>
<td>2.3 (2.0-2.6)</td>
</tr>
<tr>
<td>a</td>
<td>52 ± 49 (50-63)</td>
<td>65 (53-73)</td>
</tr>
<tr>
<td>b</td>
<td>6.1 ± 6.7 (5.1-9.8)</td>
<td>8.4 (7.3-9.9)</td>
</tr>
<tr>
<td>c</td>
<td>19.2 ± 23 (16-28)</td>
<td>16 (15-18)</td>
</tr>
<tr>
<td>Values</td>
<td>52% ± 53% (50-63)</td>
<td>50% (46-54)</td>
</tr>
<tr>
<td>Tail length (microns)</td>
<td>120 ± 78 (53-134)</td>
<td>140 (117-165)</td>
</tr>
<tr>
<td>Stylet length (microns)</td>
<td>157 ± 152 (133-168)</td>
<td>118 (100-133)</td>
</tr>
<tr>
<td>Phasmid-terminus (microns)</td>
<td>77 ± 65 (49-82)</td>
<td>96 (79-109)</td>
</tr>
<tr>
<td>Tail length</td>
<td>3.0 ± 2.6 (1.8-3.6)</td>
<td>4.4 (3.5-5.0)</td>
</tr>
<tr>
<td>Anal width</td>
<td>1.31 ± 1.76 (1.33-2.31)</td>
<td>.84 (1.6-1.66)</td>
</tr>
<tr>
<td>Stylet length (N/T)</td>
<td>.82 ± .84 (1.6-20)</td>
<td>1.17 (1.6-4.16)</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length (mm)</td>
<td>1.7 ± 1.9 (1.4-2.5)</td>
<td>2.3 (2.0-2.6)</td>
</tr>
<tr>
<td>a</td>
<td>52 ± 52 (44-61)</td>
<td>64 (54-76)</td>
</tr>
<tr>
<td>b</td>
<td>6.3 ± 6.7 (5.1-7.2)</td>
<td>7.1 (6.3-8.1)</td>
</tr>
<tr>
<td>c</td>
<td>14.7 ± 17 (13-29)</td>
<td>15 (13-17)</td>
</tr>
<tr>
<td>Tail length (microns)</td>
<td>116 ± 99 (60-214.0)</td>
<td>127 (100-150)</td>
</tr>
<tr>
<td>Stylet length (microns)</td>
<td>137 (99-154)</td>
<td>113 (107-125)</td>
</tr>
<tr>
<td>Stylet length (N/T)</td>
<td>1.37 ± 1.07 (1.96)</td>
<td>.95 (1.7-1.9)</td>
</tr>
<tr>
<td>Phasmid-terminus (microns)</td>
<td>87 ± 71 (34-95)</td>
<td>94 (83-102)**</td>
</tr>
<tr>
<td>Spicle length (microns)</td>
<td>51 ± 45 (35-50)</td>
<td>44 (43-46)</td>
</tr>
<tr>
<td>Gubernaculum (microns)</td>
<td>20 ± 16 (14-18)</td>
<td>16 (15-17)</td>
</tr>
</tbody>
</table>

(1) From the original description and illustrations of Steiner, 1949. There is probably an error in the stated magnification of the drawing of the male tail (Fig. 32B). By calculation from the reported length and gamma value, the tail of the male is 116 microns long. If this is correct, the magnification of the drawing is 546 and not 450.
(II) 61 females and 58 males from a population collected near type location at Ocala, Florida, December 12, 1958.
(III) 22 females and 22 males described by Rau, 1958, including corrections.
(IV) 31 females and 28 males from a population collected at the type location, Sanford, Florida, September 24, 1958.
* The length of the esophagus was measured to the posterior end of the glandular lobe.
* The original description these figures were reported as 126 microns (104-144) for females and 98 microns (83-131) for males, because of improper calibration of the micrometer used.
* Some confusion seems to have resulted from the failure of the author to indicate the exact position of the anus in Figure 1C (Rau, 1958). This is located at the small irregularity of the body contour on the left side of the drawing. This drawing, being on a much larger scale, gives a better idea of the average proportion of tail length to anal body diameter than Figure 1E, which was intended only to indicate the general size and shape of the body.
* Tail length of the male was measured along the chord, that is, along the straight line from anus to terminus, except for the measurement in the first column, which was made from a drawing of a ventral view.
* Spicle length was measured along the chord.
* The measurement was made from a ventral view, not along the chord.
populations of *Belonolaimus longicaudatus* and the undescribed species of
*Belonolaimus* apparently indicate that there are many ecotypes which can be
correlated with the environmental conditions. A great majority of the popu-
lations of *B. longicaudatus* have lip regions set off from the head by deep
constrictions. Populations agreeing with the one from the type location in
all other respects have been found with distinctly less marked constrictions
which is characteristic for the undescribed species. These have been collected
from beans in West Palm Beach County, Florida, sea oats at Cape Blas,
Florida, and Padre Island, Texas. In addition, a large population received
from W. Birchfield from an unknown host at Grand Island, Louisiana, ex-
hibited similar characteristic but in degrees varying from slight to very slight
constricted lip regions. A population of *Belonolaimus* sent by L. Miller had
convex conoid tails with terminus 7.7 microns (5.6-9.8 microns) from the
protoplasmic portion of the tail. Data received from L. Miller showed several
populations of *Belonolaimus* from Holland, Virginia with stylet lengths
longer than those generally found in this species. Also populations of Belo-
nolaimus from sea oats, Padre Island, Texas, and peanuts, Margaretsville,
North Carolina, sent by J. Sasser did not show the opposing sclerotized
pieces in the vagina which are characteristic for the populations of *B. longicaudatus*.

The above variant populations apparently belong to the same species—
*B. longicaudatus*—and also fall within the limits of the S/T and the A/P
÷ S/T indexes. The various characters of these populations probably pro-
vide a basis for the study of adaptability to specific environments, but this
has not as yet been established.

**LITERATURE CITED**

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*Macrostomtrema tamsuiensis*, n. gen., n. sp. (Trematoda: Microphallidae) from river crabs of Taiwan (Formosa)

**JUI-KUANG CHIU**

During a study on trematodes for which river crabs are the intermediate
host, an undescribed species of metacecaria was recovered from two species
of crabs, *Sesarma bidens* and *Sesarma plicatum*, collected from the Tamsui
River in northern Taiwan. After experimental feedings of the metacecariae
to mammals and birds, adult flukes were obtained from the small intestine
of ducklings. Careful observations of the flukes showed them to represent a
new genus and a new species in the family Microphallidae. Hence a new
genus *Macrostomtrema* is established and the species is named as *Macros-
tomtrema tamsuiensis*, n. gen., n. sp.

**MATERIALS AND METHODS**

During the period from October 1959 to August 1960, six species of river

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cine, National Taiwan University, Taipei, Taiwan.

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