Title
OHBAYASHINEMA ABEI SP. N.(NEMATODA : HELIGMOSOMIDAE) FROM THE NORTHERN PIKA, OCHOTONA HYPERBOREA PALLAS, IN HOKKAIDO, JAPAN

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OHBAYASHINEMA ABEI SP. N.
(NEMATODA: HELIGMOSOMIDAE)
FROM THE NORTHERN PIKA,
OCHOTONA HYPERBOREA PALLAS, IN HOKKAIDO,
JAPAN

Shin-ichiro Fukumoto,1 Masao Kamiya2 and Masashi Ohbayashi2

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An intestinal nematode, Ohbayashinema abei sp. n., from the northern pika, Ochotona hyperborea yesoensis, in Hokkaido, Japan, was described and its morphological characteristics were compared with those of the previously known O. ochotoni Durette-Desset, 1974 and O. dubinini (Gvozdev, 1966) Durette-Desset, 1974.

Key words: Ohbayashinema abei sp. n., Ochotona hyperborea, Japan

Only two species have been recognized in the genus Ohbayashinema Durette-Desset, 1974 from pikas in Eurasia: O. ochotoni Durette-Desset, 1974 from Ochotona macrotis in Nepal, and O. dubinini from O. alpina in the U. S. S. R. The geographically isolated populations of the northern pika on Hokkaido Island, northern Japan are interesting from the view point of phylogeny of related genera in the family Heligmosomidae (fig. 1).

MATERIALS AND METHODS

In May of 1978, 5 northern pikas, Ochotona hyperborea yesoensis Kishida, were collected at a rocky area near Shikaribetsu Lake, Hokkaido, Japan. Five species of endoparasites had been detected (tab. 1; Ohbayashi et al., 1979).

Heligmosome nematodes were collected from the small intestine of the pikas. All the specimens were fixed with 10% formalin, preserved in 5% formalin and treated with lactophenol. Drawings and measurements were done with the aid of a camera lucida. The synlophe was examined on whole mounts and on cross sections of nematodes using a microscope. The cross sections at midbody were made by cutting with a blade using a dissection microscopy.

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2) Department of Parasitology, Faculty of Veterinary Medicine, Hokkaido University, N-18, W-9, Sapporo 060, Hokkaido, Japan.
FIGURE 1  Geographical distribution of the three species of the genus Ohbayashinema
DURETTE-DESSERT, 1974 from pikas, Ochotona spp. in Eurasia
Oa: O. abei sp. n. (Hokkaido, Japan)
Od: O. dubinini (GVOZDEV, 1966) DURETTE-DESSERT, 1974 (Altai, USSR)
Oo: O. ochotoni DURETTE-DESSERT, 1974 (Nepal)

TABLE 1  Endoparasites from the northern pika, Ochotona hyperborea yesoensis.
in Hokkaido, Japan*

<table>
<thead>
<tr>
<th>PARASITES</th>
<th>HABITAT</th>
<th>PREVALENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nematoda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ohbayashinema sp.</td>
<td>Small intestine</td>
<td>4/5</td>
</tr>
<tr>
<td>Labiostomum sp.</td>
<td>Caecum</td>
<td>3/5</td>
</tr>
<tr>
<td>Trichuris sp.</td>
<td>Caecum</td>
<td>1/5</td>
</tr>
<tr>
<td>Cestoda</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schizorchis yamashitai</td>
<td>Small intestine</td>
<td>2/5</td>
</tr>
<tr>
<td>Protozoa</td>
<td>Muscle</td>
<td>1/5</td>
</tr>
</tbody>
</table>

*After OHBAYASHI et al., 1979
Ohbayashinema abei sp. n.

RESULTS

Ohbayashinema abei sp. n.

Host: Northern pika, *Ochotona hyperborea yesoensis*

Habitat: Small intestine

Locality: Lakeside of Shikaribetsu Lake, Hokkaido, Japan

(43° 15' N, 143° 10' E)

Description (tab. 2 & fig. 2): Small nematode. Dark red in color and coiled tightly while alive and after fixation. Cephalic vesicle well developed with fine annulation. Cuticular ridges start from the margin of the cephalic vesicle, and continue the whole body length. The axis of orientation of ridges inclines 90° from the dorso-ventral axis. The size of ventral ridges greater than those in dorsal. Male (7 specimens): Number of ridges 12 or 13 at midbody, 6 or 7 in dorsal and 5 or 6 in ventral. The ridges terminate near bursa. Body 6.1–8.9 mm long and maximum width 129–174 \( \mu \)m. The distance from anterior end to nerve ring and excretory pore 185–207 \( \mu \)m and 217–304 \( \mu \)m, respectively. Esophagus 576–876 \( \mu \)m in length. Bursa well developed, asymmetrical, the right lateral lobe larger than the left one. Small prebursal papillae present on the base of antero-ventral rays. Ventral rays thick and long. Antero-ventral and postero-ventral rays divided at their base with short stem. Lateral rays with common stem, almost same size. Externo-dorsal rays thin and long, originated from the base of lateral rays. Dorsal ray small, and two branches originated at its stem and bifurcated twice at the distal end. Spicules slender and long, fused at the distal end, 944–1424 \( \mu \)m in length.

Female (13 specimens): Ridges decreased in number posteriorly. A few ridges posterior to the vulva, 13 or 14 ridges are observed at midbody, 7 or 8 in dorsal and 5–7 ventral. Body, 6.3–13.9 mm long, 141–207 \( \mu \)m wide. The distance from anterior end to nerve ring and excretory pore, 125–239 \( \mu \)m and 212–304 \( \mu \)m, respectively. Esophagus 543–720 \( \mu \)m in length. Monodelphic. Anus and vulva situated at 50–181 \( \mu \)m and 189–381 \( \mu \)m from the tail end, respectively. Ovejector long, 739–1282 \( \mu \)m in length. Vestibulum longer than infundibulum. The cuticle inflated around the vulval region and the vulva opened at the bottom of the concaved area. A small spine, 12–31 \( \mu \)m long, at the tail end. The eggs in uterus are rather large, 83–111 \( \mu \)m by 47–75 \( \mu \)m in size.

The species name of this nematode has been dedicated to Dr. Hisashi Abe, Institute of Applied Zoology, Faculty of Agriculture, Hokkaido University.

DISCUSSION

Durette-Desset (1974) erected the genus *Ohbayashinema* in the subfamily Heligmosominae, family Heligmosomidae, superfamily Trichostrongyloidea. She separated this genus from other genera of the family Heligmosomidae by the following characteristics: 1) the synlophe is dorso-ventrally symmetrical, which means that the number...
Figure 2  Ohbayashinema abei sp. n.

A  Posterior end of female, lateral view
B  Caudal end of female, ventral view
C  Prebursal and bursal regions of male, ventral view
D  Anterior end of female, lateral view
E  Cross section of male, midbody
F  Cross section of female, midbody
G  Extero-dorsal and dorsal rays of male, ventral view
H  Proximal end of spicules
I  Distal extremity of spicules

d: dorsal, l: left, r: right, v: ventral
**Table 2** Comparison of three species of the genus *Ohbayashinema* Duretta-Desset, 1974

<table>
<thead>
<tr>
<th>Species</th>
<th><em>O. ochotoni</em></th>
<th><em>O. dubinini</em></th>
<th><em>O. abei</em> n. sp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authors</td>
<td>Duretta-Desset 1974</td>
<td>Gvozdev 1966</td>
<td>Present authors</td>
</tr>
<tr>
<td>Host</td>
<td><em>Ochotona macrotis</em></td>
<td><em>O. alpina</em></td>
<td><em>O. hyperborea yesoensis</em></td>
</tr>
<tr>
<td>Locality</td>
<td>Nepal</td>
<td>Altai, USSR</td>
<td>Hokkaido, Japan</td>
</tr>
</tbody>
</table>

**Male**

<table>
<thead>
<tr>
<th></th>
<th><em>O. ochotoni</em></th>
<th><em>O. dubinini</em></th>
<th><em>O. abei</em> n. sp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number examined</td>
<td>NI*</td>
<td>NI</td>
<td>7</td>
</tr>
<tr>
<td>Body length (mm)</td>
<td>8.7</td>
<td>7.0–8.2</td>
<td>6.1–8.9</td>
</tr>
<tr>
<td>Body width</td>
<td>150</td>
<td>150</td>
<td>129–174</td>
</tr>
<tr>
<td>Length of esophagus</td>
<td>710</td>
<td>400–430</td>
<td>576–826</td>
</tr>
<tr>
<td>spicules</td>
<td>560</td>
<td>670–690</td>
<td>944–1424</td>
</tr>
<tr>
<td>Number of ridges</td>
<td>10</td>
<td>14</td>
<td>12–13</td>
</tr>
</tbody>
</table>

**Female**

<table>
<thead>
<tr>
<th></th>
<th><em>O. ochotoni</em></th>
<th><em>O. dubinini</em></th>
<th><em>O. abei</em> n. sp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number examined</td>
<td>NI*</td>
<td>NI</td>
<td>13</td>
</tr>
<tr>
<td>Body length (mm)</td>
<td>NI</td>
<td>11.0–12.0</td>
<td>6.3–13.9</td>
</tr>
<tr>
<td>Body width</td>
<td>NI</td>
<td>220</td>
<td>141–207</td>
</tr>
<tr>
<td>Length of esophagus</td>
<td>NI</td>
<td>600–610</td>
<td>543–720</td>
</tr>
<tr>
<td>caudal spine</td>
<td>NI</td>
<td>11–12</td>
<td>12–31</td>
</tr>
<tr>
<td>Distance from caudal end</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>anus</td>
<td>NI</td>
<td>25–30</td>
<td>50–181</td>
</tr>
<tr>
<td>vulva</td>
<td>NI</td>
<td>210–220</td>
<td>189–381</td>
</tr>
<tr>
<td>Number of ridges</td>
<td>NI</td>
<td>14</td>
<td>13–14</td>
</tr>
<tr>
<td>Size of eggs</td>
<td>NI</td>
<td>110–120</td>
<td>83–111</td>
</tr>
<tr>
<td></td>
<td></td>
<td>83–88</td>
<td>47–75</td>
</tr>
</tbody>
</table>

*Measurements in μm unless otherwise indicated.
*NI: Not indicated
and size of ridges are the same on the dorsal and ventral sides of the body, and that
the orientation of ridges inclines 90° to the dorso-ventral axis; 2) number of ridges is
small compared to that of other species of Heligmosomum and Heligmosomoides
(Durette-Desset, 1974, 1983). She also moved Heligmosomum dubinini into the
genus Ohbayashinema, because of its fewer number of ridges (14) and the phylogeny
of the host. There is no detailed description of the morphology of sylnophe, espe-
cially in the cross section.

O. ochotoni is distinguished from O. dubinini by; 1) the length of spicule is
shorter; 2) the antero-lateral and medio-lateral rays have a common stem and the
postero-lateral ray originates from the stem of the lateral rays. In O. dubinini, the
 medio-lateral and postero-lateral rays have a common stem; 3) the morphology of
dorsal ray and 4) the number of cuticular ridges is different from that of O. ochotoni.

O. abei differs from O. ochotoni in the following characteristics; 1) length of
spicule is longer; 2) the number of ridges is larger and 3) the ventral ridges are
larger and more protruded.

O. abei is also distinguishable from O. dubinini in the following characteristics: 1)
arrangement of the lateral rays; 2) shape of dorsal ray and 3) length of spicules.

Durette-Desset (1974, 1983) defined that the female of the genus Ohbayashinema
is monodelphic depending on the description of Heligmosomum dubinini. The mor-
phology of female O. ochotoni, however, was not described. The present paper
describes for the first time the figures of the adult female. There are no figures or
pictures of the female of the genus Ohbayashinema.

According to the definition by Durette-Desset (1983), O. abei cannot be included
in the genus Ohbayashinema because its synlophe is not symmetrical with respect to
the frontal axis. Moreover, the ventral ridges are larger and more protruded than
those in the dorsal side.

Durette-Desset (1974) discussed that the synlophe characteristics of the genus
Ohbayashinema might be an intermediate form between the genera Molineus and the
Citellinema. The female is monodelphic. The origin of these genera was supposed
to be a hypothetic didelphic genus related to the genus Molineus. This hypothetic
ancestor 'Molineus' gave rise to two branches; 1) the genus Ohbayashinema in
Lagomorpha and 2) the genus Citellinema in Sciuromorpha, and then to the genera
Heligmosomoides and Heligmosomum in Microtidae (fig. 2).

The authors considered that Ohbayashinema abei might have intermediate charac-
teristics between Ohbayashinema ochotoni and the genus Heligmosomoides. The au-
thors also speculated that the genus Ohbayashinema is more closely related to the
genus Heligmosomoides than the genus Citellinema. Thus, following Durette-Desset's
recent hypothesis (Durette-Desset, 1985), the authors concluded that the genus
Ohbayashinema might be the direct ancestor of the genus Heligmosomoides (fig. 3).
Ohbayashinema abei sp. n.

Microtidae Heligmosomum (Rodentia) Heligmosomoides

Arvicoridéae Heligmosomum (Rodentia) Heligmosomoïdes (monodelphic)

Sciromorpha (Rodentia) Heligmosomoides

Sciuromorpha (Rodentia) Heligmosomoides

Lagomorpha Ohbayashinema (monodelphic)

Hypothetic 'Molineus' type ancestor

(DURETTE-DESSET, 1974)

FIGURE 3 Phylogeny of the genus Ohbayashinema and related genera (DURETTE-DESSET, 1974 & 1985, modified)

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REFERENCES


