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Larval *Gnathostoma* recovered from amphibian and reptilian hosts in Okinawa Island, Japan

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Surveys on the zoonotic parasites have been carried out in the Ryukyu Islands, Japan, since 1980. Larvae of a nematode species belonging to the genus *Gnathostoma* (Gnathostomatidae) were recently recovered from several species of amphibians and reptiles collected in the northern mountainous area of Okinawa Isl. Since there has been no record on this genus from Okinawa Isl., the authors would like to describe the morphological characteristics of the parasite and to make some comments on the pathogenicity for man.

MATERIALS AND METHODS

Two species of amphibians, *Racophorus japonicus* (Japanese name: Nihon-kazika-gaeru) and *Cynops pyrrhogaster ensicaudata* (Japanese name: Shiriken-imori), and two species of reptilians, *Natrix pryeri pryeri* (Japanese name: Garasu-hibaa) and *Trimeresurus okinavensis* (Japanese name: Hime-hahu), were collected in the valleys in Ada area, Kunigami Village, Okinawa Isl., July, 1981.

The viscera and flesh of the animals were minced and digested in artificial gastric juice. The residues were examined under the dissecting microscope. Detected nematodes were fixed in hot 70% ethanol, cleared in glycerin-alcohol solution and mounted in 50% glycerin jelly. For counting of number of the hooks on the cephalic bulb, the heads of some larvae were cut off from body and mounted in gum-chloral solution.

RESULTS

Two *R. japonicus*, 7 *C. p. ensicaudata*, 2 *N. p. pryeri* and 1 *T. okinavensis* were examined, and 1, 29 and 4 *Gnathostoma* larvae were detected from each one of *C. p. ensicaudata*, *N. p. pryeri* and *T. okinavensis*, respectively. Most of the larvae were collected from the flesh, while 2 worms were recovered from the viscera of *N. p. pryeri*.

Description of larvae (Fig. 1, Plate 1).

The body is small but thick, and almost translucent except dark intestine when alive. Anterior part is provided with two lateral pseudolabia each of which with two papillae and amphid. The mouth is elongated dorso-ventrally. The cephalic bulb is provided with 4 transverse rows of cuticular hooks which increase in size posteriorly. The number of hooks are 33-38 (mean 35.9) in 1st row, 35-38 (36.0) in 2nd,

30–39 (33.6) in 3rd and 31–35 (32.8) in 4th, in 8 larvae from *N. p. pryeri*. In one worm of these 8 larvae, an additional hook is found in front of 1st row and 9 hooks form a short arc behind 4th row. The whole larval body is covered with small cuticular spines forming 172–220 transverse rows. These spines become minute in the posterior part of body. Four cervical glands are present. The esophagus is club-shaped and divided into anterior muscular and posterior glandular portions. The tail is round.

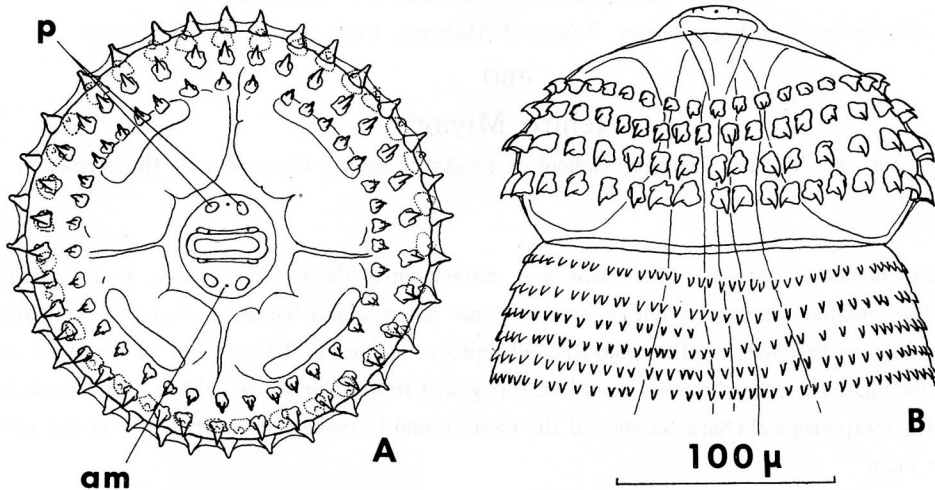


Figure 1 Cephalic extremity of *Gnathostoma* larva from *Natrrix pryeri pryeri*. A, apical view. B, lateral view. am, amphid; p, papillae.

Measurements of larvae.

Larva from *C. p. ensicaudata*: Body is 2.02mm long and 0.25mm wide. Cephalic bulb is 143 μ m in diameter and 50 μ m long. Distances from cephalic apex to nerve ring, deirids, posterior ends of esophagus and cervical glands are 113 μ m, 118 μ m, 0.52mm and 0.36mm, respectively. Maximum width of esophagus is 75 μ m. Distance from caudal apex to anus is 48 μ m.

Larvae from *N. p. pryeri* (based on 27 worms): Body is 1.98–3.10mm long and 0.17–0.25mm wide. Cephalic bulb is 135–195 μ m in diameter and 55–80 μ m long. Distances from cephalic apex to nerve ring, deirids, posterior ends of esophagus and cervical glands are 113–200 μ m, 133–234 μ m, 0.42–0.78mm and 0.36–0.57mm, respectively. Maximum width of esophagus is 80–140 μ m. Distance from caudal apex to anus is 30–58 μ m.

Larvae from *T. okinavensis* (based on 4 worms): Body is 2.44–3.10mm long and 0.28–0.33mm wide. Cephalic bulb is 148–190 μ m in diameter and 60–75 μ m long. Distances from cephalic apex to nerve ring, deirids, posterior ends of esophagus and cervical glands are 128–160 μ m, 110–228 μ m, 0.66–0.80mm and 0.48–0.54mm, respectively. Maximum width of esophagus is 115–138 μ m. Distance from caudal apex to anus is 38–76 μ m.

DISCUSSION

The morphological characteristics of the present larvae, e. g. number and shape of cuticular hooks on the cephalic bulb, and dimensions of body, are identical with those of the third-stage larvae of *Gnathostoma doloresi* Tubangu, 1925¹⁾²⁾. Although some of the present worms are provided with more than

200 transverse rows of spines on body, the authors consider that they are *G. doloresi*. This species is a parasite of pigs and wild boars, and is distributed widely in Far East, Southeast Asia and Oceania¹⁾³⁾. Three islands of the Ryukyu Archipelago, namely, Iriomote Isl., Ishigaki Isl. and Amami-oshima Isl., have been already recorded as the locality of this parasite: The adults or eggs of *G. doloresi* have been found in the wild boars, *Sus riukiensis*, from Iriomote Isl. and Amami-oshima Isl.¹⁾⁴⁾⁵⁾⁶⁾ and the third-stage larvae have been demonstrated in *Trimeresurus elegans* (Japanese name: Sakishima-habu) from Ishigaki Isl.⁷⁾, *T. flavoviridis flavoviridis* (Japanese name: Habu) and *T. okinavensis* from Amami-oshima Isl.⁸⁾⁹⁾. However, no report has been made on the gnathostome from Okinawa Isl., the main island of the Ryukyu Archipelago, where the wild boar is distributed locally.

Up to date, two species of amphibians, *Hynobius naevius* (Japanese name: Buchi-sanshou-uo) and *H. stejnegerii* (Japanese name: Bekkou-sanshou-uo)¹⁰⁾¹¹⁾, and three *Trimeresurus* species mentioned above⁷⁾⁸⁾⁹⁾ have been known as the second intermediate hosts for *G. doloresi*. Therefore, *C. p. ensicaudata* and *N. p. pryeri* are recorded as the new second intermediate hosts of this parasite.

As a human parasite, *Gnathostoma spinigerum* is very famous, and most of the causing agents of the human gnathostomiasis have been identified as *G. spinigerum*. However, in some of the cases, the worms were found in the sections of tissues on which identification of species was usually difficult, and the possibility that other gnathostome species had participated in those cases could not be excluded. Indeed, recent cases of gnathostomiasis occurred in Japan were suspected to be caused by some other species¹²⁾¹³⁾¹⁴⁾¹⁵⁾. Since the life cycle of *G. doloresi* is closely similar to that of *G. spinigerum*, the human infectivity of this parasite is strongly expected. The biology and pathogenicity of *G. doloresi* should be studied extensively.

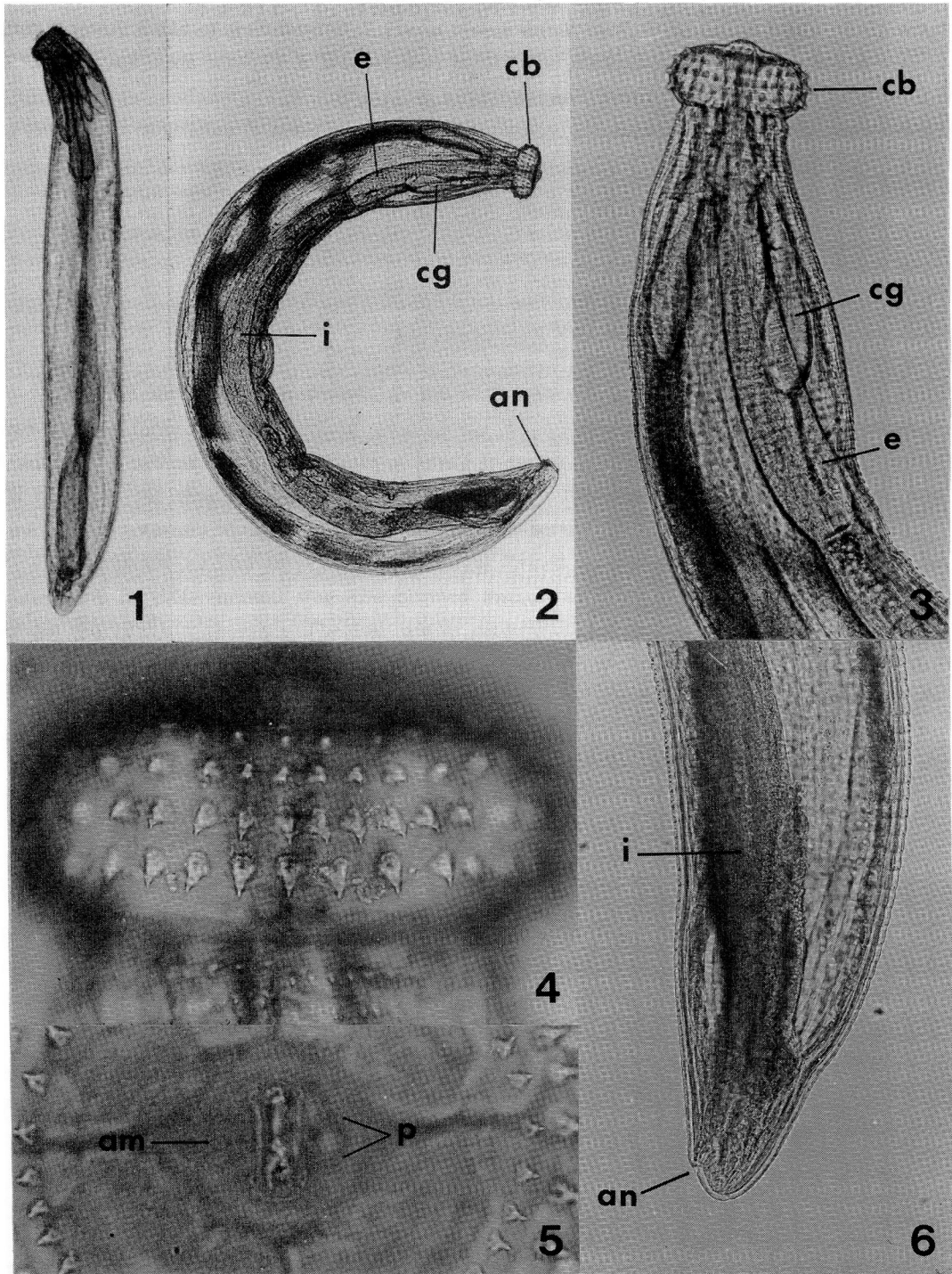
SUMMARY

The third-stage larvae of *Gnathostoma doloresi* Tubangui, 1925 were recovered from *Cynops pyrrhogaster ensicaudata*, *Natrix pryeri pryeri* and *Trimeresurus okinavensis* collected in the northern mountainous area of Okinawa Island, Japan. This is the first report on gnathostomes from Okinawa Island and *C. p. ensicaudata* and *N. p. pryeri* are recorded first as the intermediate hosts for *G. doloresi*.

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EXPIANATION OF PIATE 1

Photo 1 *Gnathostoma* larva from *Cynops pyrrhogaster ensicaudata*. (× 51)

Photos 2 - 6. *Gnathostoma* larvae from *Natrix pryeri pryeri*. 2, General view. (×61); 3, Anterior part, lateral view. (× 153); 4, Cephalic bulb, lateral view. (× 614); 5, Cephalic apex, apical view. (× 614); 6, Posterior part, lateral view. (× 153).

Abbreviations: am, amphid; an, anus; cb, cephalic bulb; cg, cervical gland; e, esophagus; i, intestine; p, papillae.