

Morphological Features of an Adult of *Pseudoterranova decipiens* (Krabbe, 1878) Found in Human Stomach Wall

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Abstract

A nematode was removed from the stomach wall of a 58-year-old woman living in Shimane Prefecture. The worm, 33 mm in length and 1.0 mm in maximum width, was identified as an adult male of *Pseudoterranova decipiens* (Krabbe, 1878), because of the presence of an intestinal caecum, the absence of a venticular appendix and the arrangement of the pre- and the postanal papillae. This is the first record of a human case of an adult *P. decipiens* penetrating into the stomach wall.

Under SEM observations, some of the morphological findings obtained are as follows: 85 pairs of the preanal papillae were located on the subventral surface of the posterior portion of the worm. Numerous longitudinal squamate frills project out from the cuticular surface around the preanal papillae. There are three postanal plates and six pairs of postanal papillae on the tail region.

Key words: Gastric anisakiasis, *Pseudoterranova decipiens*. Adult worm infection, SEM

Introduction

In Japan, there have been reports of at least 335 individual cases of human infection with *Pseudoterranova decipiens* larvae. Diagnoses are frequent in the northern regions (especially Hokkaido), but very rare in the western and southern regions (Nagano, 1989; Ishikura, 1990). The authors have examined a case of gastric disorder due to an adult *P. decipiens* invasion of the stomach wall of a woman living in Shimane Prefecture, Sanin District, western Japan. No previous cases of human infection with *P. decipiens* larvae have been reported in the Sanin District, where anisakiasis caused by *Anisakis*

simplex larvae occurs commonly. The present paper deals with the first confirmed record of an adult male *P. decipiens* removed from the human stomach wall and describes the morphological features of the worm.

Case report

The patient is a 58-year-old nurse, living in Hamada City, Shimane Prefecture. She was admitted to the National Hamada Hospital on 15 February 1991, reporting three-days of continuous stomach pain. In the gastroendoscopic examination, a living nematode was found partly penetrating the stomach wall, with edema in the cardia region. The patient's symptoms disappeared soon after the worm was endoscopically removed with biopsy forceps. The patient had eaten a kind of angler fish prepared at home in boiled form about two days before the onset of symptoms. She had not eaten fish in an undercooked state for several weeks when she consumed the angler. The removed nematode was preserved in 10% formalin and later was cleared in creosote for a light microscopic examination.

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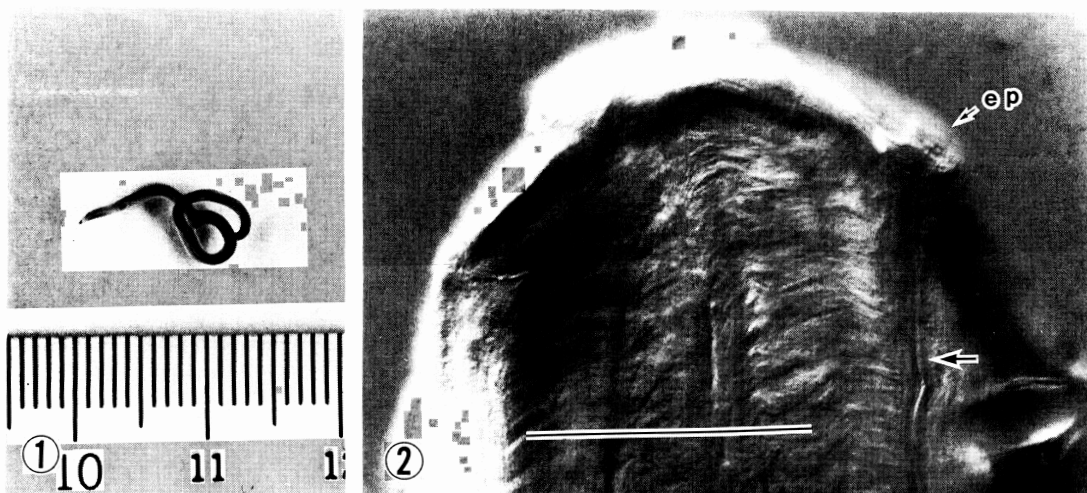


Fig. 1 A whole specimen of the worm removed.

Fig. 2 Anterior end of the worm, showing excretory pore (ep). Large arrow indicates the excretory duct. (Scale = 100 μ m)

After light microscopic observation, the anterior portion of the nematode was embedded in paraffin, sectioned serially into pieces of 10 μ m thickness and stained with Mayer's hematoxylin and eosin for observation of the internal organs. The posterior portion of the worm was examined in a Hitachi S-450 scanning electron microscope.

Morphology of the worm

The nematode is slender, 33 mm in length and 1.0 mm in maximum width, tapering at both extremities (Fig. 1). The anterior region is blood colored, while the rest of the body is yellowish-brown. The cuticle of the anterior extremity is torn, obscuring cephalic structures. The excretory canal opens at ventral side of the cephalic end (Fig. 2). The lateral alae are absent. The esophagus is slender and 2.10 mm in length. The ventriculus is 1.10 mm in length. The intestinal caecum is 1.22 mm in length. The ventricular appendix is absent. The intestine is brown in color and has an undulating lumen (Fig. 3). The nerve ring is located at 0.55 mm from the cephalic extremity. At the posterior portion of the worm, 85 pairs of preanal papillae are irregularly arranged in two subventral rows (Fig. 4). The tail is conical, and 6 pairs of postanal papillae are

regularly arranged (Fig. 5). The second pair of the postanal papillae is doubled, while the other pairs are simple papillae. Three postanal plates with notched margins are visible (Fig. 6). The caudal alae are not developed. Weakly developed spicules can be recognized near the rectal glands (Fig. 7). The testis appears as a thin winding string along the intestine (Fig. 3). The cuticle around the preanal papillae has numerous longitudinal squamate projections (Fig. 8).

In the transverse sections of the worm, the intestinal caecum, ventriculus, and seed-leave-shaped lateral cords can be observed (Fig. 9). A large renette cell extending from the left chord to the ventral part of the pseudocoelom is visible. The cuticle is about 7 μ m thick. The somatic musculature is of the polymyarian coelomyarian type, and about 90 muscle cells are present in a quadrant.

Discussion

It is difficult to identify the worm in question because its cephalic portion was damaged by the removal from the stomach wall. However, the presence of a large renette cell and the anterior location of the excretory pore indicate its taxo-

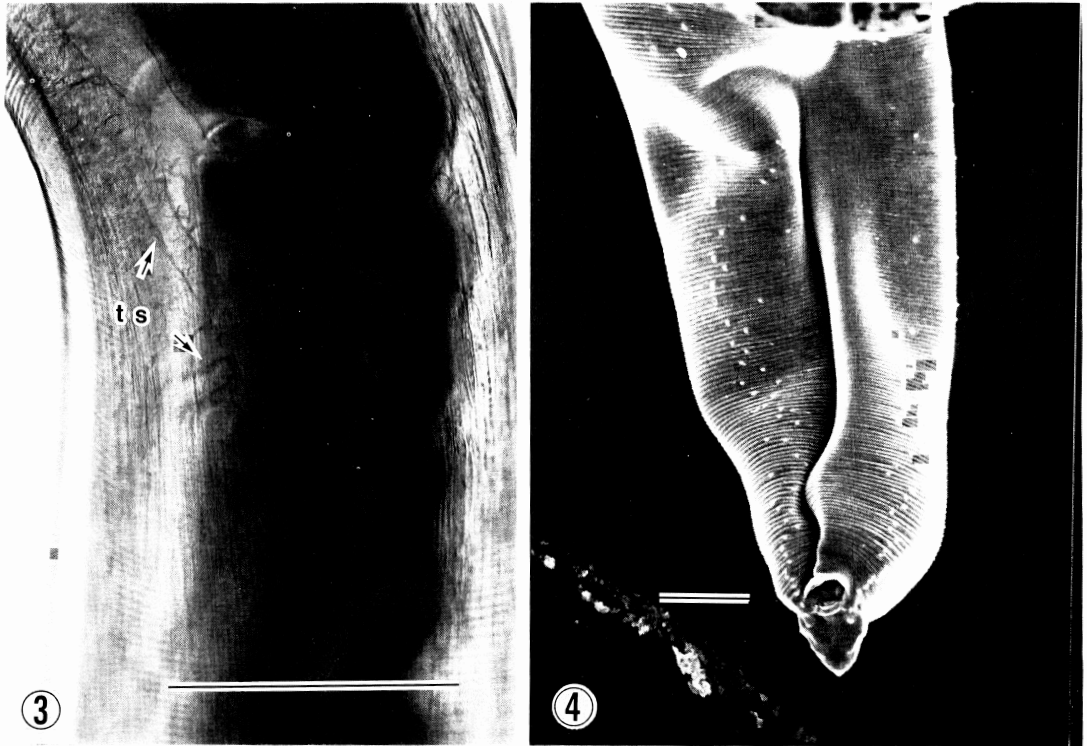


Fig. 3 Middle part of the worm, showing testis (ts) and intestine with undulating lumen. (Scale = 0.5 mm)

Fig. 4 Posterior part of the worm showing pre- and post-anal papillae by scanning electron microscopy. (Scale = 100 μ m)

nomical position in the subfamily Anisakinae (Ascaridida: Ascaridoidea: Anisakidae) (cf. Hartwich, 1974; Gibson, 1983). Moreover, the presence of an intestinal cecum and the absence of a ventricular appendix suggest that it belongs to the genus *Pseudoterranova* (Gibson, 1983). The arrangement of postanal papillae and the morphology of the postanal plates of this worm are similar to those of a *P. decipiens* removed from the mouth of a woman in the USA (Kliks,

1983) and to those of the male adult of the type B complex which is one of three sibling species to the *P. decipiens* found in Canada (Paggi, *et al.*, 1991).

However, the worm in question has no developed caudal alae, which would be well developed in an adult male *P. decipiens* (cf. Machida, 1969). The alae could be clearly observed even in an adult male which had just molted but was still enclosed in the cuticle of

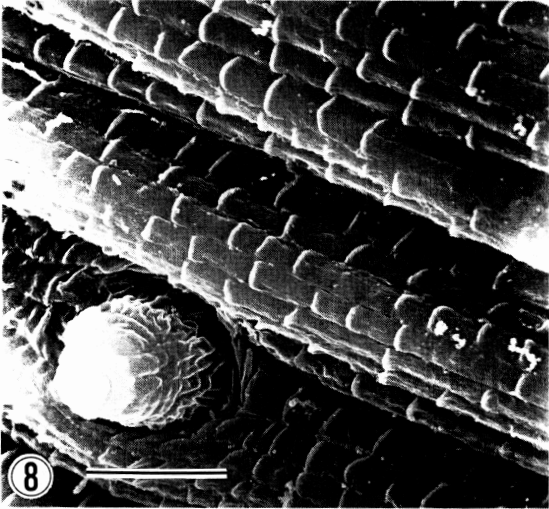
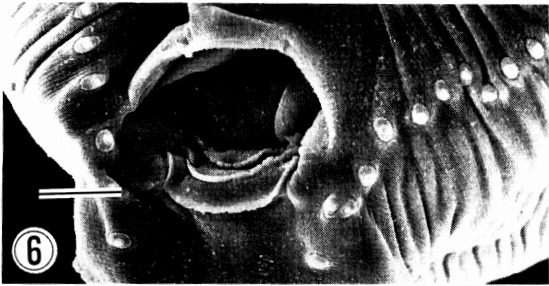
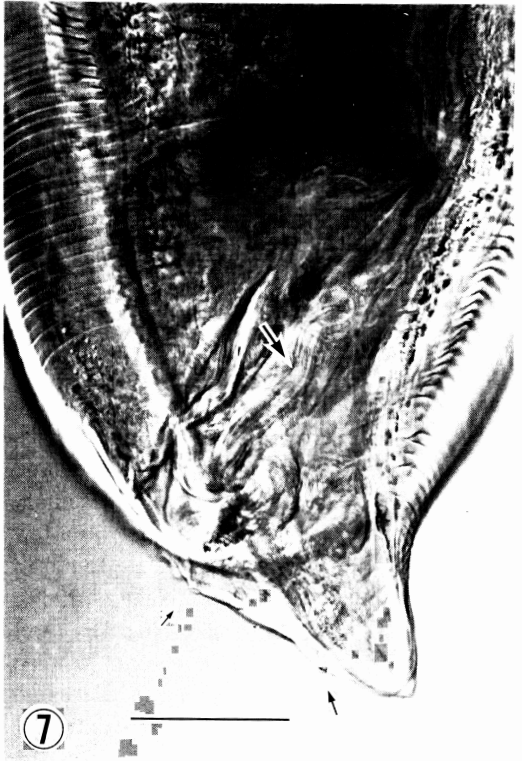
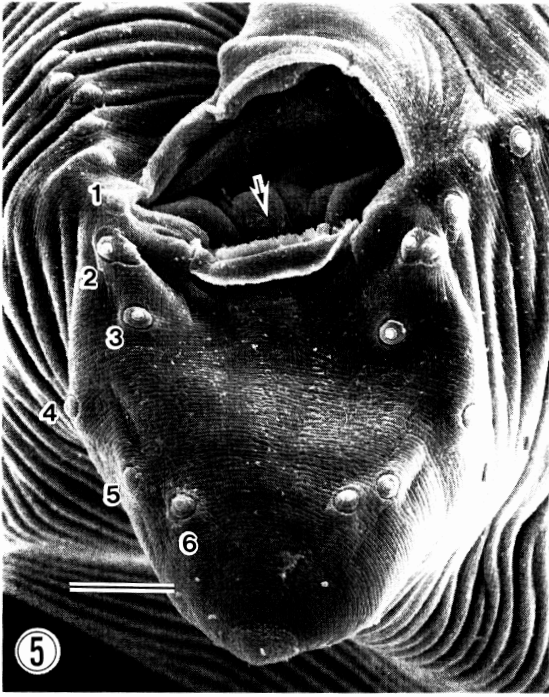
Fig. 5 Tail part of the worm, showing six pairs of the postanal papillae and three postanal plates (arrow) by scanning electron microscopy. (Scale = 25 μ m)

Fig. 6 Anal part of the worm, showing three postanal plates at an angle by scanning electron microscopy. (Scale = 25 μ m)

Fig. 7 Posterior part of the worm, showing spicules (large arrow). Small arrows indicate postanal papillae. (Scale = 100 μ m)

Fig. 8 Cuticular surface around the preanal papillae, showing numerous longitudinal squamate projections by scanning electron microscopy. (Scale = 5 μ m)

Fig. 9 Transverse section of the worm, showing an intestinal caecum (arrow), a ventriculus, a pair of lateral chords and an excretory cell. (Scale = 0.3mm)



the previous stage that was recovered on 7th day of an infection from gray seal (McClelland, 1980). Nevertheless, the caudal alae could not be located in the scanning electron micrograph of an adult male *P. decipiens* recovered from a case in the USA (Kliks, 1983). Moreover, Yagi *et al.* (1992) also observed no developed caudal alae in an adult male resembling *P. decipiens* discharged from the nasal cavity of a woman in Hokkaido. It may thus be reasonable to identify the present nematode as *P. decipiens*.

In previous surveys of marine fish and squid caught off the Sanin District, *A. simplex* larva has been found in common and horse mackerels, sardines, squids and dorado, while *P. decipiens* larva has been not found in these fish (Maejima, 1990). *P. decipiens* larva is found only in a few kinds of fish, almost all of which are found in the seas around northern Japan (Nagano, 1989). This case in the Sanin District is extremely rare.

The final molt of *P. decipiens* occurs between 5 to 15 days in harbor or gray seals (McClelland, 1980). The patient had been complaining of abdominal pain for 3 days by the time of the onset until the medical examination. It is possible that *P. decipiens* larvae remained in the stomach lumen without invading gastric tissues or the larvae which penetrated in the stomach wall growing into the adult stages. Thanks to careful examination of the worms already removed from patients, additional adult worm infections similar to the present case will more readily be diagnosed.

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References

- 1) Gibson, D. I. (1983): The systematics of ascaridoid nematodes – a current assessment. In Concepts in Nematode Systematics. Stone, A. P. *et al.* ed., Academic Press, London, 321–338.
- 2) Hartwich, G. (1974): Keys to Genera of the Ascaridoidea. In CIH Key to the Nematode Parasites of Vertebrates, No. 2. Andersen, R. C. *et al.* ed., Commonwealth agricultural Bureaux, Farnham Royal, Buckinghamshire, 1–15.
- 3) Ishikura, H. (1990): New findings concerning *Anisakis* larva and anisakiasis. Nihon Rinsho Gekaigakkai zasshi, 50, 237–247. (in Japanese with English summary)
- 4) Kliks, M. M. (1983): *Anisakis* in the western United States: Four case reports from California. Am. J. Trop. Med. Hyg., 32, 526–532.
- 5) Maejima, J. (1990): *Anisakinae* in Sanin Waters of the Japan Sea. Intestinal Anisakiasis in Japan. Ishikura, H. and Kikuchi, K. ed. Springer-Verlag, Tokyo, 49–55.
- 6) McClelland, G. (1980): *Phocanema decipiens*: Molting in seals. Exp. Parasitol., 49, 128–136.
- 7) Machida, M. (1969): Parasitic nematodes in the stomach of northern fur seals caught in the western Pacific, off the coast of northern Japan. Jpn. J. Parasitol., 18, 575–579. (in Japanese with English summary)
- 8) Nagano, K. (1989): Gastric Terranovasis. Gastric anisakiasis in Japan. Ishikura H. and Namiki, M. ed. Springer-Verlag, Tokyo, 133–140.
- 9) Paggi, L., Nascetti, G., Cianchi, R., Orecchia, P., Mattiucci, S., D'Amelio, S., Berland, B., Bratney, J., Smith, J. W. and Bullini, L. (1991): Genetic evidence for three species within *Pseudoterranova decipiens* (Nematoda, Ascaridida, Ascaridoidea) in the North Atlantic and Norwegian and Barents Seas. Int. J. Parasitol., 21, 195–212.
- 10) Yagi, K., Yokoyama, K., Oku, Y., Ishikura, H. and Kikuchi, K. (1992): A male anisakid nematode discharged from the nasal cavity of human. Jpn. J. Parasitol., 41 (Suppl.), 125. (in Japanese)