First report on a natural infection of an adult snake-headed fish (Ophicephalus striatus) with a presumably Gnathostoma vietnamicum advance third-stage larva (Le-Van-Hoa, 1965) in southern Thailand.

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An encysted gnathostome larva was discovered in the abdominal flesh of an adult snake-headed fish caught from a fresh-water canal at Nakornsrithammarat province. The larva was identified as presumably a G.vietnamicum advance third-stage. This is the first report on a natural infection of this fish in Thailand. The authors now believe that to complete the life cycle of G.vietnamicum, two intermediate hosts may be needed before the adult can develop in an otter’s urinary system. In addition, this report describes the external morphological structures of the worm which is worth noting in order to differentiate worms discovered in animals and man from G. spinigerum and from other gnathostomes.

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รายงานผลการตรวจสุราของจังหวัดนครศรีธรรมราช พบว่าเนื้อหน้าก้ามของปลาม้าพฤติวิศิษฐ์หนึ่งครั้งอยู่ภายในปลากุ้งมี ต้นไม้ต้นด้านใต้สภาพป่าพืชตัวต่อต่อต่อพื้นที่พื้นที่ Gaussian vietnamicum นับเป็นการพบตามธรรมชาติ หรือแม้กระทั่งยากจะค้นพบก็ได้ว่าเจริญเติบโตในจังหวัดที่สำคัญของพืชวิศิษฐ์หนึ่งการยืดตัว ที่กล่าว 2 คำ ตอนที่จะมีผลบ่อยก็เป็นพืชวิศิษฐ์เพิ่มขึ้นได้ในระบบขบวนการมาก ถึงแม้ ในรายงานนี้ได้ระบุถึงยาภูมิคุ้มกันของพืชวิศิษฐ์ เพิ่มขึ้นได้สำหรับการวิจัยผลผลิตของพืชวิศิษฐ์ ที่ตรวจพบในภาคและสัตว์ต่อไป
Adult males and females including the larval stage of **G. vietnamicum** were first found naturally infecting the renal pelvis of the otters (Lutra elioti, Hogson) obtained from the Saigon Zoological Garden in Vietnam Le-Van-Hoa (1965)(1) and Le-Van-Hoa et al. (1965). (2) Subsequently Daengsvang (1973)(3) reported that adult males and females and presumably larval stage of the worm were also naturally infecting kidneys, ureters and a urinary bladder of the otters, Aonyx (Amblonyx) cinerea, Illiger in Thailand. The result of the preliminary study on its life cycle then showed the fresh-water cyclops acting experimentally as the first intermediate host. Additionally one living undeveloped larva was found in the stomach wall of one of the two fighting fish on necropsy 21 days after being experimentally fed with 16 fully developed larvae of the worm in cyclops.

During a survey to determine sources of **G. spiningerum** infection in southern Thailand, an encysted living gnathostome larva was discovered in the abdominal flesh of an adult snake headed fish (O. striatus) caught from a fresh-water canal at Nakornsrihammarat province. The larva found in the fish was of the same morphological characteristics as the presumably **G. vietnamicum** larvae from the kidney and urether of the otters. (3)

This report describes the external morphological structures of a presumably Gnathostoma vietnamicum advance third-stage larva microscopically.

**Materials and Methods**

An adult snake - headed fish identified as **Ophicephalus striatus** caught from a fresh - water canal at Nakornsrihammarat province was examined for the presence of gnathostomes by the impression method. An encysted coiled gnathostome larva was discovered in the abdominal flesh of the fish. This cyst was more or less rounded in shape measuring 1.25 mm. in diameter and the wall consisted of thin fibrous - liked semitranslucent tissue. The larva was removed from the cyst and placed in normal saline, and then washed.

The gnathostome found was grossly and microscopically studied in living condition and some days after, it was fixed in A.F.A. solution. Measurements were also made after the worm was fixed. Observations for detailed morphology of the worm were done by a light microscope.

**Results**

Microscopically the larva was identified tentatively as **G. vietnamicum** advance third-stage. Morphological larva was cylindrical and slightly tapered at its posterior end. The size of the larva was 3.2 mm. in length and 0.15 mm. in width and the length-width proportion of this larva was found to be about 21:1 (Fig.1). The larva showed a cephalic bulb covered with four rows of hooklets of which the first and the fourth rows were obviously smaller and shorter than those of the other two rows. The average sizes of the hooklets in microns were 6.8 × 2.1, 6.2 × 2.2 and 9.2 × 4.9, 10.8 × 4.3 respectively for the above-mentioned rows. The numbers of hooklets were 44, 45, 46 and 43 on rows 1-4 respectively (Fig. 2)

**Figure 1.** Photomicrograph of a slender larva of the presumed **G. vietnamicum** advance third stage obtained from a snake-headed fish measuring 3.2 × 0.15 mm. H (head), T (tail), B (body), C (cervical sac).
The body cuticle had regularly arranged transverse rows of small numerous single-pointed cuticular spines pointing posteriorly with wide spaces between them. These were similar to those previously described for the larval stages found in the urinary system of the otter by Daengsvang (1973)(3) These spines were more frequent at the anterior end of the body and gradually decreased in number but increasing in size posteriorly. A short distance thereafter they diminished in size and number and were hardly seen beyond the middle part of the body by the light microscope. Each spine in the short distance of the anterior part of the body except at the neck area, showed T-shaped character with a long single posteriorly-pointed end and a wide conspicuous base (Fig. 3).

Figure 2. Photomicrograph presumably of the G.vietnamicum cephalic bulb being crowned with four rows of different numbers and sizes of hooklets (L,lips; H, hooklets; N, neck; B, body.)

Figure 3. Photomicrograph showing T-shaped character of body cuticular spines, S each with a long single posteriorly-pointed end and a wide conspicuous base at the anterior body cuticular area of the presumably Gnathostoma vietnamicum advanced thrid - stage larva.
Discussion

The authors hope to confirm the identification of this larva of presumably the G. vietnamicum advance third-stage pending further experimental proof by developing a fertilized egg obtained from the female worm to the same larval stage and morphology in the snake-headed fish etcetera, or by finding the adult worm in the definitive host after being fed with the same type of larva obtained from the intermediate host. Further study on the life cycle of this worm and the vertebrate hosts carrying the infective larval stage is worth continuing for the differentiation of worms discovered in vertebrates as to whether they are G. Spinigerum or from other gnathostomes, and for identifying the source of infection for the definitive host and man.

It is worthwhile to note that the larva is impressively slender in appearance due to its length - width proportion of approximately 21 : 1 thus easily recognisable from the same larval stage of other gnathostomes so far reported in the literature. More-over, it is reasonable to believe that the snake-headed fish and other kinds of fish and vertebrates eaten by otters could act as the second intermediate hosts of this worm. Thus, the problem should be worthy of further investigations to clarify the last unsolved part of the worm’s life cycle. In this respect, the authors wish to quote the findings of Lauhachinda(4) on life history of the river otter in Aladbama U.S.A. with emphasis on food habits as freshwater fish made up the most important food of the river otter. He also found that river otters were infected with many adult G. miyazakii in the kidneys. Similar discoveries by Miller and Harkema,(5) Fleming et al.(6) and Whelan et al.(7) with G. miyazakii in the kidney, suggested that the fish could potentially act as a second intermediate host of the kidney worm.

In conclusion the authors strongly believe that the abovementioned findings have given much support to the assumption on the would be life cycle of G.vietnamicum Le-Van-Hoa (1965) and G.miyazakii Anderson (1964)(8) in needing two intermediate hosts before developing into an adult worm in the urinary system of the otter namely; cyclops (Mesocyclops leuckarti, Claus ect.) and fish (O. striatus ect.) as the first and the second intermediate hosts respectively. In this respect, the following brief diagram is presented herein for better understanding of the hypothetical life cycle of the worm. (Fig. 4). There is little doubt that the kidney worm of the same genus (G.miyazakii) occasionally reported infecting kidneys of otters in Canada and U.S.A. would show a similar life cycle.

Figure 4. Diagram of the hypothetical life cycle of G.vietnamicum Le-Van-Hoa (1965) and G. miyazakii Anderson, (1964).
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