

On the larval *Gnathostoma doloresi* found in snakes, *Trimeresurus flavoviridis flavoviridis*, from Amami-oshima Is., Kagoshima, Japan

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Introduction

Snakes have been often reported to be parasitized with the 3rd stage larvae of several gnathostomes by various investigators. Infection of those snakes with larval gnathostomes presumably occurred due to the "secondary infection", designated by Miyazaki and Kikuchi (1954).

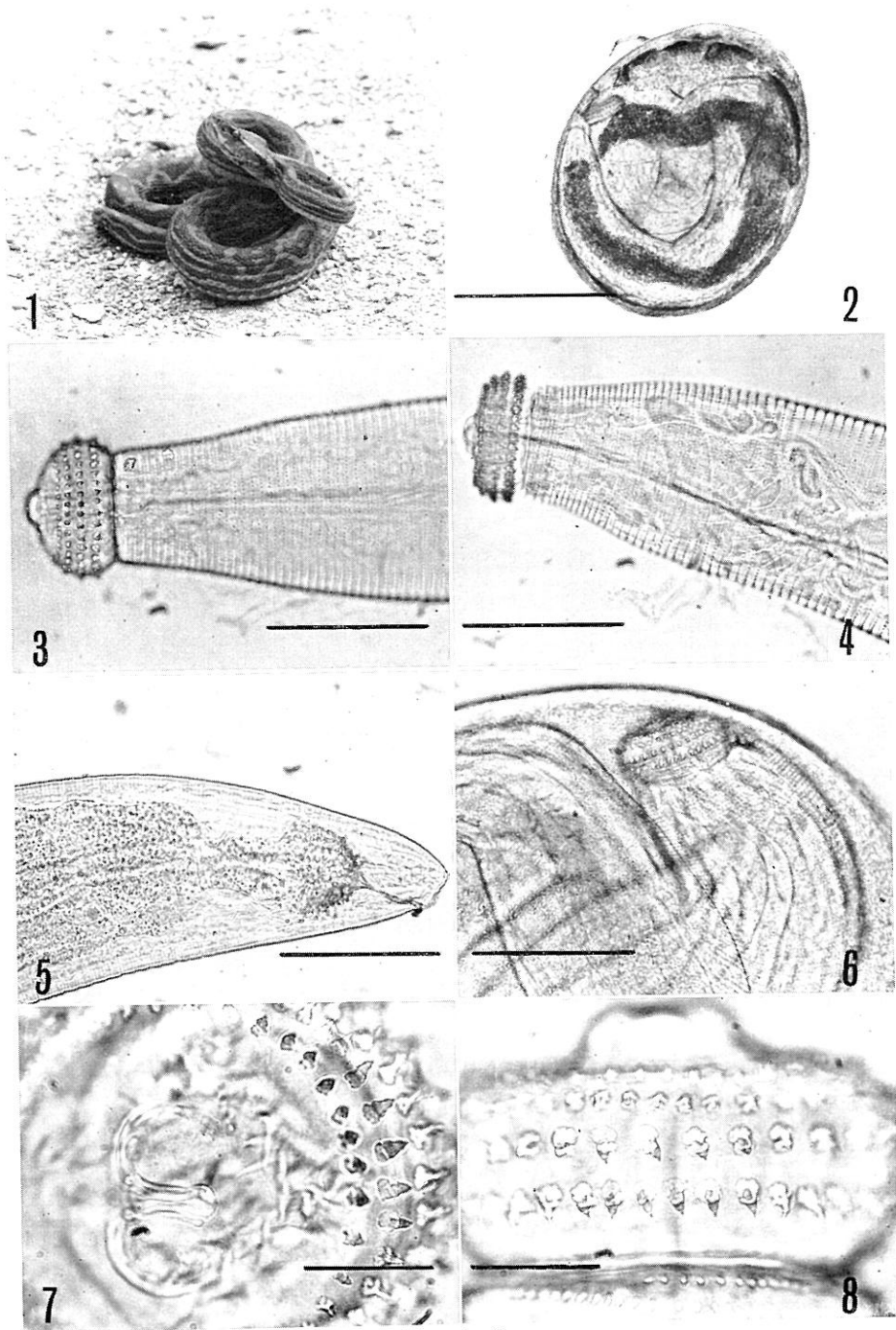
In January 1969, the present authors examined poisonous snakes, *Trimeresurus flavoviridis flavoviridis*, in Amami-oshima Is., Kagoshima, Japan, and found larval gnathostomes in the muscle of the snakes. These larvae were identified as the 3rd stage larvae of *Gnathostoma doloresi* from the morphological characteristics. In this paper, the authors wish to report on the first finding of the larval *G. doloresi* in the Amami Islands, and the snake *Trimeresurus flavoviridis flavoviridis* as its new second intermediate host.

Materials and Results

Ten snakes, *Trimeresurus flavoviridis flavoviridis* (Hallowell, 1860), were captured in Amami-oshima Is., Kagoshima in January 1969. Among them, 3 snakes were found to be parasitized with larval gnathostomes (Table 1). The body length of the infected snakes ranged from 160 to 200 cm and the body weight, from 0.6 to 1.5 kg. The snake No. 3 was most

heavily parasitized. In this snake, 37 encysted larvae were recovered from the muscle. All of the larvae were enclosed in fibrous and thin membranes as shown in Figs. 2 and 6. The encysted larvae were preserved in 70% ethanol solution after the removal from the muscle and afterwards brought to the laboratory. The shape of the encysted larvae was spherical. The average length of 5 encysted larvae was 1.2 mm, ranging from 0.9 to 1.4 mm, and the average width was 0.7 mm, ranging from 0.6 to 0.8 mm.

The larvae were removed from the cysts and mounted in gum-chloral for the measurements and observations. The body of the larva was almost colorless except for the brownish intestine. Furthermore, the whole body was covered with about 200 transverse rows of minute cuticular spines (Figs. 3, 4 and 5). The average body length of 10 larvae was 2.3 mm, ranging from 1.7 to 2.7 mm, and average width was 0.3 mm, ranging from 0.2 to 0.4 mm. The head-bulb of the larva was provided with 4 transverse rows of hooklets and every row was composed of hooklets less than 40 in number. The shape of the hooklets of the 1st row was conspicuously smaller than the others (Figs. 7 and 8). The average number of the hooklets of the 1st, 2nd, 3rd and 4th rows were 37.4, 35.6, 35.4 and 36.4, respectively. Number of the 4th row was a little fewer,



Figs. 1—8

-1.0 on an average, than that of the 1st one as shown in Table 2. The hooklets had each a roundish or irregularly square base. These morphological features agreed approximately with those of the 3rd stage larvae of *G. doloresi*, mentioned previously by Miyazaki (1960) for the criteria in distinguishing larval gnathostomes from each other.

From these results, the larval gnathostomes

Table 1 *Trimeresurus flavoviridis flavoviridis* infected with larval gnathostomes

Snake No.	Sex	Body length in cm	Body weight in kg	No. of larval gnathostomes obtained from the muscle
1	male	200	1.5	1
2	male	165	0.6	2
3	male	160	0.6	37

Table 2 Number of hooklets on the head-bulb of 10 larval gnathostomes obtained from the snake

No. of larvae	No. of row				
	1st	2nd	3rd	4th	4th-1st
1	40	43	38	39	-1
2	38	32	32	33	-5
3	34	31	37	39	5
4	40	35	32	35	-5
5	38	42	37	39	1
6	38	39	39	36	-2
7	38	36	37	37	-1
8	36	38	35	35	-1
9	35	36	33	36	1
10	37	34	34	35	-2
Average No. of hooklets	37.4	35.6	35.4	36.4	-1.0

obtained from the muscle of *T. f. flavoviridis* were identified as the 3rd stage larvae of *G. doloresi* Tubangu, 1925.

Discussion

In the Nansei-shoto (the Ryukyu and the Amami Islands), the distribution of *G. doloresi* was first reported by Miyazaki (1957) through the fecal examination of a wild boar from Iriomote-jima Is., Okinawa. The adult worms, however, were not demonstrated from wild boars up to 1968. From the food habit of wild boars, Kawashima examined snakes, *Trimeresurus elegans*, from Ishigaki-jima Is., and found larval gnathostomes in the muscle of a snake. Later, these larvae recovered were identified as *G. doloresi* (Miyazaki & Kawashima, 1962). However, they failed to find larval gnathostomes from 30 *T. f. flavoviridis*, which had been captured in Okinawa-jima Is. and Kume-jima Is. The existence of this species in the Ryukyu Islands was more confirmed according to their survey. In March 1968, Tada (1968) examined a stomach of a wild boar from Iriomote-jima Is., Okinawa, and found 25 adults *G. doloresi*. In the present study, many larval gnathostomes were found in *T. f. flavoviridis* from Amami-oshima Is. From these findings by various investigators, it is gradually elucidated that *G. doloresi* is widely distributing in the Nansei-shoto.

A number of findings of infection with larval gnathostomes in snakes have been reported by several investigators. Chandler (1925) found the larvae of *G. spinigerum* in snakes, *Python reticularis*, *Naja bungarus* and *N. tripudians* from India. In Shikoku, Japan, Yamaguchi et al. (1956) found *Natrix tigrina tigrina* and *Dinodon orientale* parasitized with *G. spinigerum* larvae. Miyazaki & Ash (1959) examined

Explanation of Figures

Fig. 1 A male *Trimeresurus flavoviridis flavoviridis* captured on Amami-oshima Is.

Fig. 2 An encysted larva of *Gnathostoma doloresi* from the muscle of *T. f. flavoviridis* (Scale: 0.50 mm).

Figs. 3 and 4 Anterior part of the larval body (Scale: 0.25 mm).

Fig. 5 Posterior part of the larval body (Scale: 0.25 mm).

Fig. 6 A high power view of an encysted larva (Scale: 0.25 mm).

Figs. 7 and 8 Head-bulbs of the larvae (Scale: 0.05 mm).

snakes, *Agkistrodon piscivorus* and *Natrix sipedon confluens* at New Orleans, the United States of America, and found the larvae of *G. procyonis*. In Kyushu, Miyazaki (1960) found the 3rd stage larvae of *G. spinigerum* in the muscle of *Elaphe quadrivirgata*. Recently, Miyazaki & Kawashima (1962) discovered the 3rd stage larvae of *G. doloresi* in the muscle of a poisonous snake, *T. elegans*, in Okinawa. The snake, *T. f. flavoviridis*, called "Habu" is one of the most common poisonous snake in the Amami Islands. In this study, the present authors first found larval *G. doloresi* in this snake.

Miyazaki & Kawashima (1962) suggested that the snake, *T. elegans*, which was called "Sakishima-habu", was parasitized secondarily with larval gnathostomes by the ingestion of small vertebrates such as frogs which harboured the encysted larvae. In the Amami Islands, Mishima (1966) examined the food habit of *T. f. flavoviridis*, and found that 43 species, 38 genera and 27 families of whole class of vertebrates had been ingested, examining 927 snakes. He stated that, *Triturus pyrrhogaster ensicauda*, *Hyla halloellii*, *Rana limnocharis limnocharis*, *R. narina*, *R. (Babina) subaspera*, *Rhacophorus viridis amamiensis* and *R. japonicus* among amphibia had been ingested by the snakes. Based on this finding, it should be considered that the snake was parasitized with gnathostomes through the course of "secondary infection" ingesting the parasitized small animals. The most interesting problem is that what kind of animals were primarily infected with gnathostomes. This is certainly the subject for a future study.

Summary

The snake, *Trimeresurus flavoviridis flavoviridis* (Hallowell, 1860), from Amami-oshima Is. was found to harbour the 3rd stage larvae of *Gnathostoma doloresi* Tubangui, 1925. In

addition, *T. f. flavoviridis* was shown as a new second intermediate host of *G. doloresi*.

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鹿児島県奄美大島のハブ *Trimeresurus flavoviridis flavoviridis*
に見出したドロレス顎口虫 *Gnathostoma doloresi* 幼虫について

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1969年1月、奄美大島において捕獲したハブ10頭のうち3頭の筋肉中から合計40個体の顎口虫幼虫を検出した。幼虫はいずれも筋肉内に被囊した状態で見出された。70%エタノール固定標本での計測では被囊した幼虫は平均1.2mm×0.7mmであつた。機械的に脱囊せしめた虫体は平均体長2.3mmで体幅は0.3mmであつた。頭球は4列のhookletを備え、特に第1列目のhookletが他の3列のものに比べ著明に小さい。第1~4

列のhooklet数は夫々37.4, 35.6, 35.4および36.4個であつた。全体表は微小なspineにておおおわれ、およそ200列から成つていた。これらの特徴と計測値から幼虫はドロレス顎口虫 *Gnathostoma doloresi* の第III期幼虫と同定し得た。

本報告は奄美群島におけるドロレス顎口虫の分布を始めて記載すると同時に、ハブをドロレス顎口虫の第2中間宿主の1つとして新たに追加した。