

## On a lung fluke found in Amami-Oshima Is., Kagoshima, Japan

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The distribution of *Paragonimus* and the prevalence of paragonimiasis have not been fully elucidated in the Nansei-shoto, which is composed of the Ryukyu and the Amami Islands. Tada and Nagano (1968) reported the new locality record of *Paragonimus ohirai* in Tanegashima Is., which was situated about 240 km to the north of Amami-oshima Is. Based on this finding, the authors carried out an extensive survey in an attempt to find *Paragonimus* parasitic in crabs in Amami-oshima Is., in October 1968. From the present survey, the crabs, *Sesarma dehaani*, from Sumiyo village were found to harbour the metacercaria of *P. iloktsuenensis*. In this paper, the result of survey and the characters of the metacercaria obtained are given.

### MATERIALS AND RESULTS

In October 1968, the crabs, *S. dehaani*, were collected from 5 areas at Sumiyo village in Amami-oshima Is., as shown in Fig. 1 and Table 1. Examination techniques utilized in this study is as follows: Livers from about 20 crabs were triturated in about 250 ml tap-water in a conical glass. The mixture was then left for 30 minutes. The supernate was discarded

gently through a siphon tube. The sediment was then washed twice with water. The final sediment obtained was examined under microscopes. Excysted metacercariae were stored in 10% formalin solution and measured with micrometer without pressure. Encysted metacercariae were measured without pressure under fresh condition.

At Misato area, a total of 53 crabs were examined and a total of 50 metacercariae of *Paragonimus* were recovered from the livers. The average number of metacercaria found in a crab was 1.0. The heaviest infection was found in the crab from Kawauchi-gawa River, recovering 1,140 metacercariae from 138 crabs.

An average number of the metacercaria per crab was 8.3 in this area. In Yakkatsu-gawa R., each crab harboured 4.0 metacercariae on an average. The lowest number was shown in the crabs collected from Kanekuta-gawa R., which had 0.6 metacercaria per crab. The average number of the metacercaria was 3.8 per crab in these areas examined, as shown in Table 1. Summarizing the results, it should be concluded that the crab, *S. dehaani*, harboured 1 to 8 metacercariae at Sumiyo village, Amami-oshima Is.

A great majority of the metacercariae was

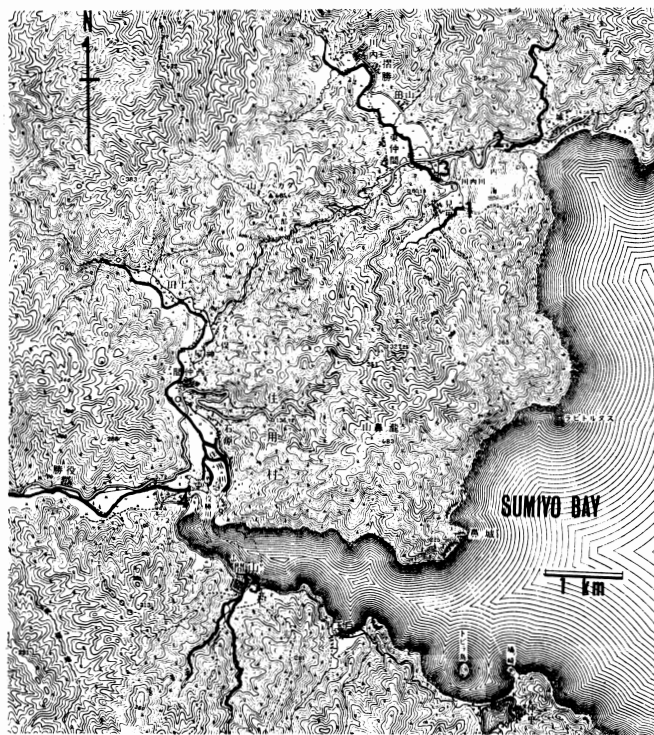


Fig. 1 A map of Sumiyo village, Amami-oshima Is. in Kagoshima.  
1: Misato, 2: Kanekuta-gawa 3: Kawauchi-gawa R., 4: Yakkatsu-gawa  
and 5: Yanma-gawa.

Table 1 Metacercariae of a lung fluke found in the crab, *Sesarma dehaani*,  
collected in Sumiyo village, Amami-oshima Is., Kagoshima

Areas	No. of crabs examined	Total No. of metacercariae obtained	Average No. of metacercaria per crab
Misato (見里)	53	50	1.0
Kanekuta-gawa (金久田川)	16	10	0.6
Kawauchi-gawa (川内川)	138	1,140	8.3
Yakkatsu-gawa (役勝川)	19	76	4.0
Yanma-gawa (山間川)	153	165	1.1
Total	379	1,441	3.8

already excysted before microscopic observations. The remainder was encysted with a thin and transparent layer. The inner layer which is demonstrable on the metacercaria of *P. miyazakii* or *P. westermani* was not shown. The thickness of the layer ranged from 1.9 to 4.0 microns. The shape of the encysted metacercaria was oval and had much space around

the larva (Figs. 2-5). The metacercaria usually contained pink granules in the body especially in the posterior half of the body, and had small stylet on the oral sucker (Figs. 6-7). The larva showed no contraction within the cyst and moved slowly. The excretory bladder was stretched and was often transparent on the ventral sucker area.

The average length of encysted metacercariae was  $381\mu$ , ranging from  $328$  to  $418\mu$ , and the average width was  $280\mu$ , ranging from  $234$  to  $369\mu$ . On the other hand, the average body length of excysted metacercariae was  $448\mu$ , ranging from  $316$  to  $569\mu$ , and the average body width was  $202\mu$ , ranging from  $158$  to  $237\mu$ . The average width of oral suckers was  $61.9\mu$ , ranging from  $49$  to  $70\mu$ , average length of ventral suckers,  $65.6\mu$ , ranging from  $57$  to  $74\mu$ , and the average width,  $66.6\mu$ , ranging from  $62\mu$  to  $74\mu$ , respectively.

Based on the characters of the metacercaria mentioned above, the metacercariae found in Amami-oshima Is. were identified as *Paragonimus iloktsuenensis* Chen, 1940.

### Comments

The measurements of metacercariae of *P. iloktsuenensis* reported by various investigators were shown in Table 2. Body length and width described in this paper was almost identical to those by other workers. The difference in size of suckers was considered as insignificant between the previous measurements and the results reported by present authors. In this study, the size of stylet was not measured. A most part of metacercariae, however, had short stylet on the oral sucker. On the basis of the result of measurements and several features of metacercariae, it was concluded that the metacercariae found in this survey were *P. iloktsuenensis*. Further studies are needed to conclude final identification examining adult flukes obtained from natural and experimental infections. From this point of view, 13 albino rats were inoculated with 20

metacercariae each, which were recovered in this study. The result of morphological features of these adult worms will be described elsewhere.

In the Nansei-shoto, the presence of *P. westermani* was reported in Ginoza village of Okinawa-jima Is. by Sasa *et al.* (1959) and Kuniyoshi *et al.* (1960). In addition, Kuniyoshi and Onaka (1956) showed only one spontaneous infection case in a pig from Itoman on the same island, with *P. ohirai*. Other investigators failed to show the prevalence of lung flukes in other islands except Okinawa-jima Is., mentioned above (Yaeyama Islands, Kawashima and Tada, 1963; Amami-oshima Is., Fukushima and Hamada, 1967). For this reason, present finding is apparently not only the first for Amami-oshima Is., but first record on the distribution of *P. iloktsuenensis* for the Nansei-shoto.

In this study, only one species of the intermediate host, *S. dehaani*, was examined. The first intermediate hosts and the natural definitive hosts were not studied yet. Extensive investigations are needed to elucidate these problems in the near future.

### Summary

A total of 379 crabs, *Sesarma dehaani*, were collected from 5 areas of Sumiyo village in Amami-oshima Is. in October 1968. From the livers of these crabs, a total of 1,441 metacercariae were recovered. The average number of the metacercariae per crab was 3.8. The metacercariae obtained were identified as *Paragonimus iloktsuenensis* Chen, 1940. This report is concerned in the first finding on the

Table 2 Measurements of *Paragonimus iloktsuenensis* metacercariae which were reported by various workers in microns

Authors	Body		Oral sucker	Ventral sucker	Stylet
	Length	Width			
Chen (1940)	417	194	53	59	10
Miyazaki (1945)	462	198	56×47	60×60	11
Mannoji (1952)	376	208	57×55	60×59	10

distribution of *Paragonimus* in Amami-oshima Is., Kagoshima, Japan.

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#### References

1. Chen, H. T. (1940): Morphological and developmental studies of *Paragonimus iloktsuenensis* with some remarks on other species of the genus (Trematoda: Troglotrematidae). *Lingnan Sci. J.*, 19, 429-530.
2. Fukushima, H. and Hamada, M. (1967): Studies on the paragonimiasis (I) Surveys of paragonimiasis in Amami Islands, Kagoshima Prefecture. *Med. J. Kagoshima University*, 19, 439-446.
3. Kawashima, K. and Tada, I. (1963): A survey of helminths infections in man and animals on Yaeyama Group, the Ryukyu Islands. Reports of the Committee on Foreign Scientific Research, Kyushu University, No. 1, 139-148.
4. Kuniyoshi, S. and Onaka, R. (1956): On a lung fluke found in Itoman, Okinawa. *J. Veterinary Med.*, 180, 370.
5. Kuniyoshi, S., Shiroma, S., Nakaji, K., Uehara, N. and Heishiki, Z. (1960): Epidemiological studies on paragonimiasis in Okinawa (a preliminary report). *Bull. Ryukyu Hyg. Inst.*, 1, 1-7.
6. Mannoji, N. (1952): Further notes on the lung-fluke, *Paragonimus ohirai* Miyazaki, 1939. Part 1. A study on the second intermediate host of the lung-flukes, *P. ohirai* Miyazaki, 1939 and *P. iloktsuenensis* Chen, 1940. *Igaku Kenkyu*, 22, 1, 183-1, 190.
7. Miyazaki, I. (1945): The third species of *Paragonimus* found in Japan (*P. iloktsuenensis* Chen, 1940). *Rep. Kagoshima Med. College*, 1, 19-25.
8. Sasa, M., Teruya, K., Ikemiya, K. and Kuniyoshi, S. (1959): Paragonimiasis in Okinawa. *Bull. Ryukyu Ass. Med. Technologists*, 1, 1-4.
9. Tada, I. and Nagano, K. (1968): A new locality record for the lung fluke, *Paragonimus ohirai* Miyazaki, 1939 on Tanegashima Is. in Kagoshima. *Acta Med. Univ. Kagoshima.*, 10, 227-229.

## 鹿児島・奄美大島において見出された肺吸虫について

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1968年10月、著者らは鹿児島・奄美大島住用村に属する見里、金久田川、川内川、役勝川、山間川の5個所でクロベンケイを採集した。合計379個体のクロベンケイの肝から合計1,441個体の肺吸虫メタセルカリアを得た。カニ1個体あたりのメタセルカリア平均寄生率は3.8個であつた。カニにおける寄生密度の最も高いのは川内川でカニ1個体あたり8.3個のメタセルカリアが検出された。

メタセルカリアの大多数は肝から分離する過程で遊離し、被囊したものもきわめて脱囊しやすかつた。脱のうした幼虫をホルマリン固定して計測した結果：体長 $448\mu$  (316~519 $\mu$ )、体幅 $202\mu$  (158~237 $\mu$ )、口吸盤横径 $61.9\mu$  (49.2~69.7 $\mu$ )、腹吸盤長径 $65.6\mu$  (57.4~73.8 $\mu$ )、同横径 $66.6\mu$  (61.5~73.8 $\mu$ )であつた。

被囊したメタセルカリアは長径 $381\mu$  (328~418 $\mu$ )、横径 $280\mu$  (234~369 $\mu$ )であつた。

幼虫は短い穿刺棘を有し著明な淡紅色の顆粒が殊に体の後半部に充満していた。腸管は屈曲することなく、中央の部分が透明なものが多かつた。被囊したメタセルカリアにおいては虫体が屈曲せず、更に、典型的な内膜構造を欠いていた。

以上の計測値と幼虫の形態などの特徴からこれらはいずれも小形大平肺吸虫 *Paragonimus iloktsuenensis* Chen, 1940のメタセルカリアと考えられた。

この研究により奄美大島にも肺吸虫が分布していることが最初に明らかにされた。更に本研究により南西諸島における小形大平肺吸虫の分布について最初の知見が得られた。