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Helminth Fauna of Bats in Japan XXVII*

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Abstract

Twenty-nine specimens of forest bats were examined for the presence of cestodes, but no bats were infected with cestodes. Out of 144 cave bats belonging to 14 species examined, 23 bats were found infected with cestodes. The cestodes, *Hymenolepis rashomonensis* and *H. nishidai* were found in *Rhinolophus ferrumequinum nippon*, *H.* sp. in *R. ferrumequinum nippon* and *Myotis nattereri bombinus*, *Vampirolepis isensis* in *R. cornutus cornutus*, and *V. hidaensis* in *Miniopterus schreibersii fuliginosus*.

Up to the present time, as to cestodes parasitic in forest bats in Japan, only three species, *Hymenolepis bacillaris* Gieze 1782 from *Nyctalus maximus aviator* by Yamashita et Mori, 1953, *Vampirolepis ozensis* Sawada, 1980 from *Plecotus auritus sacrimontis* and *V. yoshiyukiae* Sawada, 1980 from *Myotis frater kaguyae* were described.

The present studies were carried out to examine the helmith fauna of forest bats in Fukuoka, Iwate and Wakayama Prefectures during the period from November, 1976 to October, 1978 and to report the systematic position of the cestode parasites of the cave bats collected from the various places of Japan during the period from February to December, 1981.

Result and discussion

The data on the forest and cave bats investigated and the cestodes found are given in Tables 1, 2 and 3, and the stations at which the collections of the cave bats were made are shown in the map (Fig. 1).

The rate of infection in the cave bats was 37.5 per cent, but that in the forest bats was zero per cent. The difference in the rate of infection seems to be due to the difference of hunting activity in the bats of both groups. The cave bat becomes infected with cestodes (Sawada, 1976 and 1979), as it, just before and just after hibernating, hunts the small insects (cysticercoid-infected intermediate host) swarming on bat's guano in a cave.

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Table 1. A list of the Japanese bats examined

Rhinolophidae

**Rhinolophus ferrumequinum nippon* Temminck

**R. cornutus cornutus* Temmink

Vespertilionidae

Barbastella leucomelas darjelingensis Hodgson

**Miniopterus schreibersii fuliginosus* Hodgson

Myotis hosonoi Imaizumi

M. frater kaguyae Imaizumi

M. macrodactylus Temminck

**M. nattereri bombinus* Thomas

Murina aurata ussuriensis Ognev

Nyctalus lasiopterus aviator Thomas

N. furvus Imaizumi and Yoshiyuki

Pipistrellus endoi Imaizumi

Plecotus auritus sacrimontis G. Allen

Vespertilio namiyei Kuroda

* The bats from which the cestode parasites have been discovered.

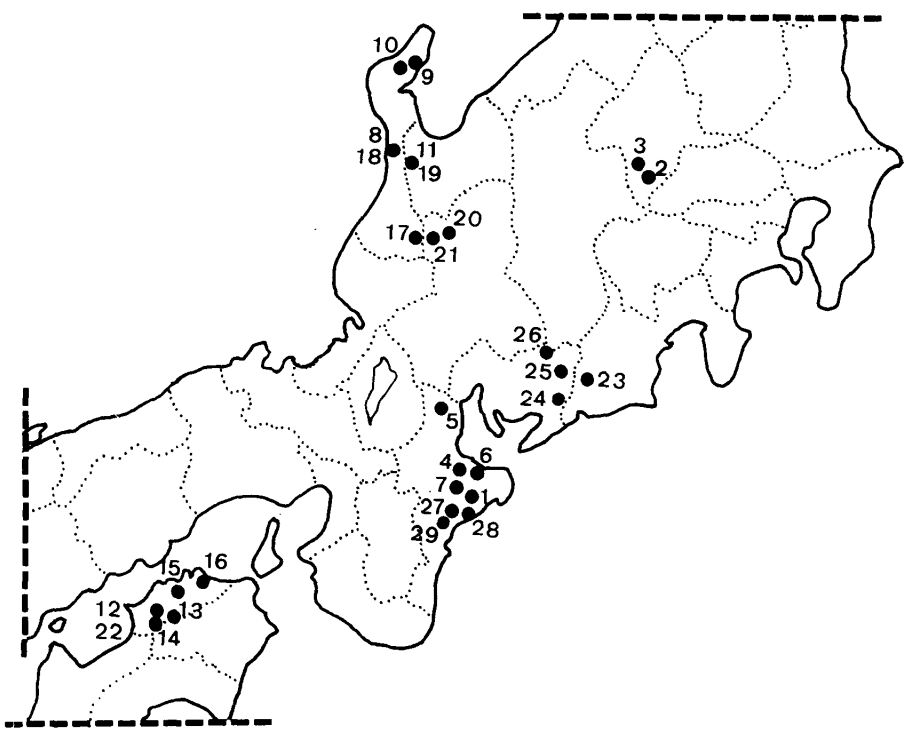

Fig. 1. Sketch map showing the collecting sites of the bats.

Table 2. Summary of cestodes found in forest bats collected during the period from November, 1976 to October, 1978

Locality	Date	Bat species	Number of bat			Cestode species
			examined	infected	%	
Fukuoka-shi, Fukuoka Pref.	12-VIII-1975	*Vespertilio namiyei*	1	0	0	
Shuho-chô, Yamaguti Pref.	10-XI-1976	**Murina aurata ussuriensis*	2	0	0	
〃 〃	〃	**Myotis nattereri bombinus*	1	1	100	*Hymenolepis* sp.
Tamayama-mura, Iwate Pref.	29-VII-1976	*Myotis hosonoi*	1	0	0	
〃 〃	〃	*Myotis frater kaguyae*	1	0	0	
〃 〃	〃	*Barbastella leucomelas darjelingensis*	1	0	0	
〃 〃	30-VIII-1976	*Plecotus auritus sacrimontis*	1	0	0	
Yabukawa-mura, Iwat Pref.	31-VIII-1976	*Pipistrellus endoi*	1	0	0	
Yamada-chô, Iwate Pref.	10-V-1978	*Barbastella leucomelas darjelingensis*	2	0	0	
〃 〃	10-VII-1978	〃	1	0	0	
Narusawa-mura, Iwate Pref.	25-VII-1978	*Plecotus auritus sacrimontis*	5	0	0	
〃 〃	〃	*Nyctalus lasiopterus aviator*	2	0	0	
〃 〃	〃	*Myotis hosonoi*	1	0	0	
〃 〃	〃	*Murina aurata ussuriensis*	1	0	0	
Miyako-shi, Iwate Pref.	9-VIII-1978	*Pipistrellus endoi*	6	0	0	
〃 〃	〃	*Nyctalus noctula*	1	0	0	
〃 〃	〃	*Nyctalus furvus*	1	0	0	
Kôyaguchi-chô, Wakayama Pref.	?	*Vespertilio orientalis*	1	0	0	

* These dats were collected in the stalactite cave, Akiyoshi-dô.

Table 3. Summary of cestodes found in cave bats collected during the period from February to December, 1981

Serial No. of locality in Fig. 2	Locality		Date	Bat species	Number of bat			Cestode species
					examined	infected	%	
1	Kane-ana	Iinan-chô, Mie Pref.	6-II	*R. cornutus cornutus*	2	0	0	
2	Fuji-ana	Ueno-mura, Gunma Pref.	19-III	*R. ferrumequinum*	5	1	20	*Hymenolepis* sp.
3	Oinu-ana	〃 〃	〃	〃	1	0	0	
4	Artificial cave	Tsu-shi, Mie Pref.	27-III	*R. ferrumequinum*	6	4	67	*H.* sp.
	〃	〃	〃	*M. schrebersii*	5	0	0	
5	Daitsudô-kô	Hokusei-chô, Mie Pref.	29-III	〃	11	2	18	*Vampirolepis hidaensis*
6	Ôsawa-no-ana	Isobe-chô, Mie Pref.	13-IV	*R. ferrumequinum*	4	4	100	*H.* sp.
7	Haigama-no-ana	Date-chô, Mie Pref.	〃	〃	1	0	0	
	〃	〃 〃	〃	*R. cornutus cornutus*	2	0	0	
8	Quarry	Shiga-chô, Ishikawa Pref.	18-IV	〃	10	0	0	
	〃	〃 〃	〃	*R. ferrumequinum*	5	2	40	*H.* sp.
	〃	〃 〃	〃	*M. schreibersii*	5	0	0	
9	〃	Suzu-shi, Ishikawa Pref.	19-IV	*R. ferrumequinum*	3	3	100	*H.* sp.
10	Artificial cave	〃 〃	〃	〃	3	2	67	*H.* sp.
11	Quarry A	Oyabe-shi, Toyama Pref.	20-IV	〃	5	4	80	*H.* sp.
	Quarry C	〃 〃	〃	*R. cornutus cornutus*	5	0	0	
12	Under draining	Mannô-chô, Kagawa Pref.	3-V	*M. schreibersii*	5	0	0	
13	Shioiri-under draining	〃 〃	〃	*R. ferrumequinum*	1	1	100	*H. nishidai*
	〃	〃 〃	〃	*M. schreibersii*	5	0	0	
14	Under draining	Onohara-chô, Kagawa Pref.	〃	*R. ferrumequinum*	2	2	100	*H. nishidai*
15	Artificial cave	Kokubunji-chô, Kagawa Pref.	4-V	*R. cornutus cornutus*	1	0	0	
16	Yashima-quarry	Takamatsu-shi, Kagawa Pref.	〃	*M. schreibersii*	2	0	0	
17	Snow tunnel	Oguchi-mura, Ishikawa Pref.	21-IX	*R. ferrumequinum*	5	5	100	*H. rashomonensis*
18	Quarry	Shiga-chô, Ishikawa Pref.	16-X	〃	5	2	40	*H. rashomonensis*
	〃	〃 〃	〃	*R. cornutus cornutus*	5	0	0	
19	Quarry A	Oyabe-shi, Toyama Pref.	17-X	*R. ferrumequinum*	5	5	100	*H. rashomonensis*
20	Nikoi-dô	Miyagawa-mura, Gifu Pref.	24-X	〃	7	6	86	〃
						2	29	*V. ogaensis*
21	Sangara-under draining	〃 〃	〃	*M. macrodactylus*	5	0	0	
22	Under draining	Mannô-chô, Kagawa Pref.	18-X	*M. schreibersii*	11	1	9	*V. hidaensis*
23	Grotto	Inasa-chô, Shizuoka Pref.	29-XI	*R. ferrumequinum*	1	1	100	*H. rashomonensis*
24	Shin-ana	Suse-chô, Aichi Pref.	1-XII	〃	1	1	100	〃
25	Artificial cave	Hôrai-chô, Aichi Pref.	6-XII	〃	1	1	100	〃
26	Futto cave	Tôei-chô, Aichi Pref.	〃	〃	1	1	100	〃
27	Fujigano-no-ana	Ômiya-chô, Mie Pref.	18-XII	〃	1	1	100	〃
28	Koya-no-komori-ana	〃 〃	〃	*R. cornutus cornutus*	3	1	33	*V. isensis*
				R. ferrumequinum	1	1	100	*H. rashomonensis*
29	Aso-no-fûketsu	〃 〃	〃	〃	2	1	50	〃

On the contrary, the forest bat may not be infected with cestodes, as it mainly hunts the insects flying on the suface of the forest and in the forest, but hardly hunts the cysticercoid-infected intermediate host.

Hymenolepis Weinland, 1858

Hymenolepis rashomonensis Sawada, 1972

Host: *Rhinolophus ferrumequinum nippon*

The bats, collected during an active period and in an early stage of hibernation (Locality Nos. 17, 18, 19, 23, 24, 25, 26, 27, 28 and 29), were infected with *H. rashomonensis*, but those collected during an inactive peroid and in an early spring were infected with only immature cestodes which were invisible to the naked eyes, therefore, the identification of species is impossible (Locality Nos. 2, 4, 6, 8, 9, 10 and 11) (Fig. 2). But from the morphology of scolex, they may be classified into *H. rashomonensis* peculiar to *R. ferrumequinum* throughout Japan.

Fig. 2. Minute cestodes shortly after infection

Hymenolepis nishidai Sawada, 1982

Host: *Rhinolophus ferrumequinum nippon*

The present species was first recorded from *R. ferrumequinum* collected in the abandoned adit of the copper mine called Fukisaka Mine at Honai-chô, Ehime Prefecture (Sawada, 1982). This time, *H nishidai* was isolated from *R. ferrumequinum* collected in the draining at Mannô-chô, Kagawa Prefecture.

Hymenolepis sp.

Host: *Myotis nattereri bombinus*

On November 10, 1976, two *Myotis nattereri bombinus* were collected in Akiyoshi-dô, Yamaguti Prefecture. One out of two bats harbored 53 minute larval cestodes. These specimens were larvae shortly after infection, so, the mature proglottides are not found.

However, from the morphology of scolex, the present specimen may be regarded as a species belonging to the genus *Hymenolepis*. Measurements are given millimetres.

Diagnosis: Total length 0.78-0.97. Scolex, 0.140-0.175 long and 0.140-0.182 wide. Unarmed suckers 0.056-0.070 in diameter. Rostellum absent. Neck 0.105-0.119 wide.

The author (1972) described a minute larval form of *Hymenolepis grisea* parasitic in *Myotis nattereri bombinus* from Akiyoshi-do, Yamaguti Prefecture. The present specimen differs from the larval form of *H. grisea* in the shape and size of suckers.

Vampirolepis Spassky, 1954

Vampirolepis isensis Sawada, 1966

Host: *Rhinolophus cornutus cornutus*

Three specimens of the present species were obtained from the intestine of one out of three *R. cornutus cornutus* collected in Koya-no-komori-ana, Mie Prefecture. In Mie Prefecture, *V. isensis* was isolated from *R. cornutus cornutus* collected in Shûrei-no-mizuana, Daitsudô-kô and Koya-no-komori-ana (Sawada, 1982).

Vampirolepis ogaensis Sawada, 1974

Host: *R. ferrumequinum nippon*

Two out of seven *R. ferrumequinum nippon*, collected from Nikoi-dô at Miyagawa-mura, Gifu Prefecture, were mix-infected with *H. rashomonensis* and *V. ogaensis*.

In Gifu Prefecture, it was known that *R. ferrumequinum* from Nojiri B-dô at Wara-mura was found infected with *V. ogaensis* (Sawada, 1977). From the standpoint of bat's cestode fauna, the result reveals that *R. ferrumequinum* in Nikoi-dô seems to be closely connected with that in Nojiri B-dô.

Vampirolepis hidaensis Sawada, 1967

Host: *Miniopterus schreibersii fuliginosus*

The present species was first recorded from *R. ferrumequinum* collected in a basalt cave at Hidaosaka, Gifu Prefecture (Sawada, 1967). After then, *V. hidaensis* was isolated chiefly from *Miniopterus schreibersii fuliginosus* collected at the various places in Japan (Sawada 1978, 1980 and 1982).

Two out of eleven *M. schreibersii fuliginosus* from Hokusei-chô, Mie Prefecture and one out of eleven from Mannô-chô, Kagawa Prefecture, were infected with the present species peculiar to *M. schreibersii fuliginosus* throughout Japan. This is the first report from Shikoku.

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