

STUDIES ON *LEUCOCHLORIDIUM PASSERI* WU FROM TAIWAN (DIGENEA: LEUCOCHLORIDIIDAE)

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ABSTRACT

C. T. Lo and C. P. Chen (1973). *Studies on Leucochloridium passeri Wu from Taiwan (Digenea: Leucochloridiidae)*. Bull. Inst. Zool., Academia Sinica 12(2): 71-77. The snail, *Succinea* sp. and the tree sparrow, *Passer montanus*, caught within the compound of Academia Sinica in the suburbs of Taipei, were found to be naturally infected by *Leucochloridium passeri*. Experimentally, 2 species of passerine birds, *Lonchura domestica* and *L. striata* were also susceptible to infection. Morphology of the parasite and its development in birds were studied. This is the first record of *L. passeri* from Taiwan.

As early as 1963 we noticed that succineid snails from the compound of Academia Sinica in the suburbs of Taipei were infected with an unknown species of trematode. Detailed study of this parasite revealed it to be *Leucochloridium passeri* Wu. Results of this investigation are reported in this paper.

MATERIALS AND METHODS

Larval and adult stages of *Leucochloridium passeri* were obtained respectively from infected *Succinea* snails and the tree sparrow *Passer montanus*, collected within the compound of Academia Sinica. The parasites were fixed in formalin-acetic acid-alcohol (FAA) under cover glass pressure, and morphological observations made either with or without staining by Semichon's acetocarmine.

Two species of munias, *Lonchura domestica** and *L. striata* were purchased from a pet shop in Taipei for experimental infection. Those munias not infected with *Leucochloridium* or other helminths were fed 25-50 encysted cercariae freshly dissected from brood sacs of sporocysts. The birds were killed between 5-35 days after feeding, and the parasites recovered also fixed in FAA under cover glass pressure.

OBSERVATIONS AND RESULTS

1. Molluscan Host, Sporocyst and Cercariaeum

The land snail *Succinea* sp. is found on the walls of ditches or in humid places in the compound. Infected specimens are distinguishable by the characteristic brood sacs of sporocyst in the snail's head and the tentacles. The pulsation of the brood sac together with its brilliant color bands make it easy to separate infected snails.

* This species was artificially formed by crossing between *L. striata* and *L. punctulata topela* and has been bred for many generations.

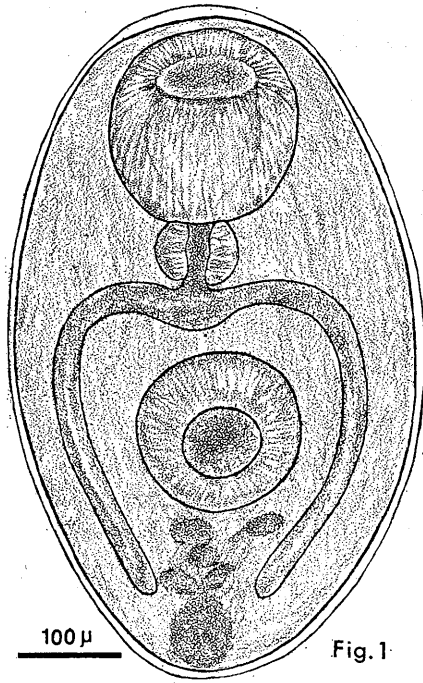


Fig. 1

Fig. 1. Encysted cercariaem of *L. passeri*

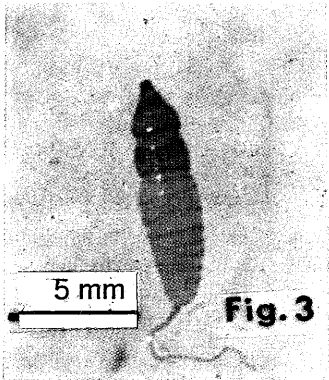


Fig. 3

Fig. 3. A brood sac of *L. passeri*

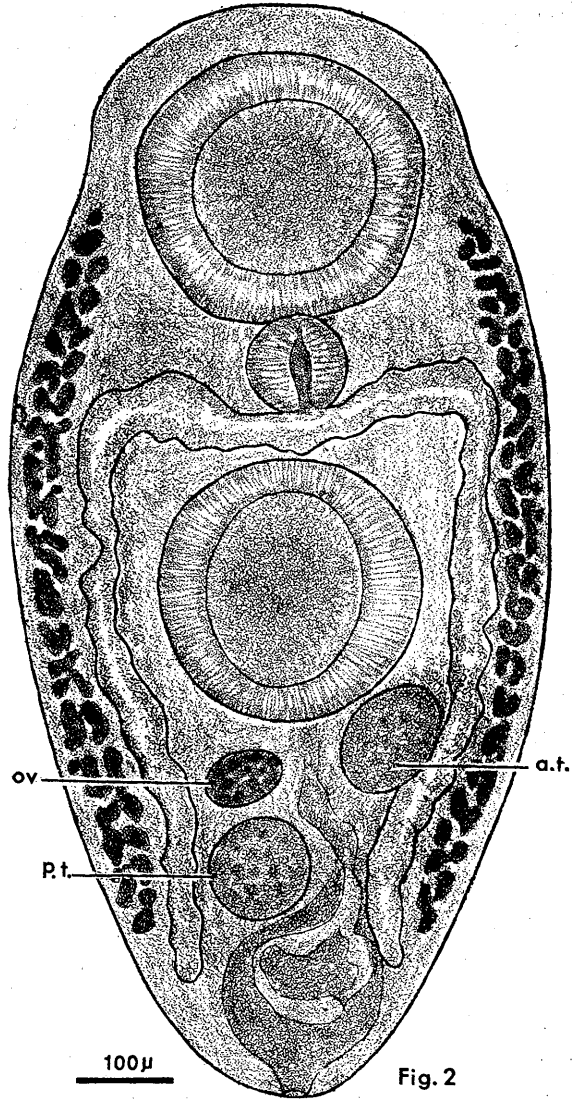


Fig. 2

Fig. 2. *L. passeri* after 5 days of infection in *L. striata*.

- a. t.: anterior testis
- p. t.: posterior testis
- ov: ovary

From August 1972 to May 1973 about a dozen infected snails were collected. The infection rate is unknown since the emphasis was placed on collecting infected snails for various studies rather than determining the incidence of infection. The succineid snails of Taiwan have never been studied in detail. In Kuroda's catalog⁽⁵⁾ only one species is listed, *Succinea* cf. *rubella* Heude. However, according to our preliminary collections, there are at least 2 species of *Succinea* in Taiwan which are morphologically distinct. In the compound of Academia Sinica only one form, which had 18 pairs of chromosomes in squash preparation of gonads, was found.

A large brood sac fixed in FAA measured 12 mm long with a diameter of 3 mm at the broadest part. The cap of the brood sac is brown (Fig. 3). Immediately posterior to the cap are 3-4 light brown or green colored bands with about a dozen dense brown dots scattered on them. About 2/5 of the distance from the anterior end is a distinct brown band 1-2 mm in width. On close observation, this band is made up of about 12 stripes, 1-2 mm long oriented longitudinally and parallel to each other. Posterior to this band are about 10 narrow light green bands. The number and color intensity of bands as well as brown dots vary slightly from one sac to another.

The sac is connected to the center of sporocyst by a thread-like stalk. A fully grown brood sac occupying the tentacular space was dissected and found to contain 194 encysted cercariae. Cercariae in the sac are mature or nearly mature. There are also brood sacs of small size in the liver region of the snail, the smallest of which contains as few as 2-3 cercariae. Since we did not see young developing cercariae in the brood sac, it seemed that they were formed in the center of the sporocyst and migrated to the sac as they matured. Mature looking cercariae are also found in the central area of the sporocysts.

The cercariae obtained from *Succinea* average 690 μ long and 402 μ wide (Table 2). They have a well developed pharynx, oral and ventral suckers. The intestinal caeca are evenly curved, reaching as far as the zone of the posterior testis (Fig. 1), as in the adult. The esophagus is very short or almost lacking. The primordia of testes, ovary and cirrus pouch are already present, though not well demarcated. The vitelline glands are not yet developed.

2. Natural and Experimental Final Hosts

Ten tree sparrows were caught within the compound and examined for trematode infections. Two were found infected with *L. passerii* and had 85 and 117 flukes in their cloacae. This heavy.

TABLE 1
Experimental infection of munias with *Leucochloridium passerii*

Host	No. of cercariae	Days of autopsy after feeding cercariae	No. of flukes recovered
<i>Lonchura domestica</i>	25	5	0
	50	12	0
	25	34	0
	25	34	0
	25	34	1
<i>Lonchura striata</i>	25	5	5
	25	11	6
	25	35	2
	25	35	4
	25	35	0

infection may indicate that the sparrow is a suitable natural host for this parasite, as suggested by Neiland⁽⁷⁾ for other *Leucochloridium* species.

Experimental infection of 5 specimens each of *L. domestica* and *L. striata* shows that *L. domestica* is less susceptible than *L. striata* (Table 1). With *L. domestica* the infection only established itself in one bird in which only one fluke was found

in the cloaca, whereas with *L. striata* 4 of 5 birds became infected.

3. Development in Final Hosts

Growth and development of *L. passerii* in the final host were studied on specimens recovered from both natural and experimental infections. Measurements of various organs are shown in Table 2.

TABLE 2
Measurements (μ) of stained *Leucochloridium passerii* mounted in balsam

Bird host	Body		Oral sucker		Acetabulum		Pharynx	
	Length	Width	Length	Width	Length	Width	Length	Width
<i>P. montanus</i> (Nat. inf.)	1284	734	349	367	389	389	126	147
<i>P. montanus</i> (Nat. inf.)	1217	680	325	367	309	325	128	156
<i>P. montanus</i> (Nat. inf.)	1180	705	328	363	306	337	119	151
<i>L. domestica</i> (Exp. inf. 34 days)	1839	1344	402	433	402	479	177	181
<i>L. striata</i> (Exp. inf. 35 days)	1586	950	374	430	394	417	142	204
<i>L. striata</i> (Exp. inf. 11 days)	1518	803	328	371	317	355	116	156
<i>L. striata</i> (Exp. inf. 5 days)	896	525	240	270	240	240	98	110
<i>L. striata</i> (Exp. inf. 5 days)*	1118	567	283	304	265	270	107	119
Cercariaea	690	402	165	185	160	167	55	77

Bird host	Anterior testis		Posterior testis		Ovary		No. of specimens studied	Author
	Long axis	Short axis	Long axis	Short axis	Long axis	Short axis		
<i>P. montanus</i> (Nat. inf.)	120	78	158	95	168	118	2	Wu, 1938
<i>P. montanus</i> (Nat. inf.)	186	182	194	176	138	96	4	This report
<i>P. montanus</i> (Nat. inf.)	167	149	169	153	122	110	5	"
<i>L. domestica</i> (Exp. inf. 34 days)	—	—	197	193	200	200	1	"
<i>L. striata</i> (Exp. inf. 35 days)	248	185	208	197	200	169	6	"
<i>L. striata</i> (Exp. inf. 11 days)	197	133	164	134	161	143	4	"
<i>L. striata</i> (Exp. inf. 5 days)	130	94	114	92	98	53	2	"
<i>L. striata</i> (Exp. inf. 5 days)*	140	112	120	104	92	63	3	"
Cercariaea	39	35	39	39	—	—	3	"

* fixed but unstained

After 5 days of growth in *L. striata* the cercariae increase in length and width by 30%. Testes and ovary have grown considerably and have well-defined boundaries. The most prominent growth takes place in the vitelline glands, which are not discernible in cercariae but now extend from the zone of the posterior 1/3 of the oral sucker to near the end of the intestine; the follicles are large and densely stained. The intestine no longer has an even curvature or smooth wall; instead, it extends somewhat anteriorly on both sides, then abruptly turns toward the posterior. At the zone of the anterior testis and ovary, the intestinal crura make a characteristic turn inwards as described by Wu⁽¹⁰⁾. The diameter of the intestine increases by 60% and doubles in length. The intestinal wall is no longer smooth, but has a zigzag curvature indicating a considerable increase in surface area. One out of 5 flukes recovered had 5 eggs in the uterus but were not yet fully developed.

Worms recovered on the 11th day are all mature with numerous eggs in the uteri, and many of the eggs contained miracidia. This indicates that the maturing time of *L. passerii* in *L. striata* is about a week. Specimens from the 35-day infection are larger and the uteri contain many more eggs than those of 11-day infection. A fluke recovered from *L. domestica* on the 34th day was notably larger and packed with eggs.

The rate of growth is different for the testis and ovary. On the 5th day the ovary is smaller than the testis, but on the 11th day each are about equal in size. Beyond the 11th day, the testis grows faster and attains a larger size in fully matured specimens.

Flukes recovered from naturally infected tree sparrows were smaller than those from experimental infections. It is unknown whether the difference was due to the duration of infection or the host difference. It might be that with as many as 85 and 117 flukes in the cloaca, crowding has retarded their growth. Flukes from natural infections have slightly fewer eggs than worms from a 34 day infection in *L. striata*, but

have more eggs than those of an 11 day infection. Therefore these sparrows may have recently acquired the infection.

Ten mature eggs taken from the uterus varied from 20.0–25.6 μ long and from 15.5–17.1 μ wide (average 24.8 μ by 16.3 μ). Eggs in mounted specimens are 21.7–23.3 μ long, and 12.4–14.7 μ wide (average 22.9 μ by 13.6 μ).

Table 2 also shows that mounting in balsam after staining and dehydration caused a shrinkage of specimens by approximately 10%.

DISCUSSION

The genus *Leucochloridium* is a large group comprising many species found in various parts of the world. Yamaguti⁽¹¹⁾ listed 43 species of *Leucochloridium* including 4 larval forms. Some of the problems in the taxonomy of this group of trematodes possessing remarkable sporocysts can be found from previous works^(3,4,7,9). Robinson⁽⁹⁾ expressed that too much weight is given to variable morphologic characters in delineating species of *Leucochloridium*. In identifying our specimens we also encountered some difficulties due to the overlapping of characters among different species, and variations among the individuals. *L. passerii* was originally described from Canton, China⁽¹⁰⁾. According to Wu, *L. passerii* resembles *L. actitii* McIntosh and *L. variae* McIntosh. It is also said to resemble *L. fuscostriatum* Robinson, *L. cyanocittae* McIntosh⁽⁹⁾ and *L. beauforti* Hnnter & Vernberg⁽²⁾. In comparing our Taiwan material with the above species we have found more points in common with *L. passerii* than with other species.

Although our material agrees with *L. passerii* in the arrangement of gonads, size of eggs, distribution of vitellaria, size and position of oral and ventral suckers, position and morphology of intestine etc., we found it to vary from Wu's description on several points. A rather significant difference occurs in the shape of the testes, which are more elongated in Wu's specimens, showing a width : length ratio of about 1:1.5, while in our specimens the testes are more

spherical and larger in size. Another distinct difference is that *L. passerii* from Canton has a smooth cuticle, whereas our material has minute spines on the body surface. The spines are 2-2.5 μ long, the greater part of which are embedded in the cuticle. These spines are not visible in every specimen, and a high magnification (1000x) is required to see them clearly.

The parasites we have studied possess an oral sucker, acetabulum and pharynx, all of which are broader than long. In ventro-dorsally flattened specimens the oral sucker appears as roundly pentagonal whereas the acetabulum is round. Although, on the average our measurements of the testis show they are oval in shape, we have seen many testes which are quite round. It is our impression that the anterior testis is more elongated than the posterior testis. The anterior testis is close to the intestine, or even slightly overlaps it. It may be possible that the shape and relative position of the testes are affected by the growth of adjacent organs such as the intestine and uterus⁽⁶⁾. The size of the cirrus pouch is not easily determined because of the profusely developed egg-filled uterus which blocks the view. The cirrus is easily protrusible and armed with spines.

Only one species of *Leucochloridium* was formerly known from Taiwan⁽¹²⁾ namely, *L. turdi* Yamaguti, which was found from the cloaca of *Parus atricapillus restrictus**. *L. passerii* is now the second species in this genus to be found on this island. This parasite will most likely be found in other areas of Taiwan since both the succineids and the sparrows are widely distributed on the island.

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* According to Chen⁽¹⁾ and Peters⁽⁶⁾ this species does not occur in Taiwan.

寄生於麻雀之吸蟲 *Leucochloridium passerii* Wu.

羅 進 宗 陳 章 波

作者發現在臺北市南港區中央研究院所採集之陸生螺 *Succinea* sp. 及麻雀 *Passer montanus* 有吸蟲 *Leucochloridium passerii* 之寄生；在實驗室內十姊妹 (*Lonchura domestica*) 及尖尾文鳥 (*Lonchura striata*) 亦可感染。此種寄生蟲於臺灣地區為首次發現，本篇報告即述說有關 *L. passerii* 之形態及其發育情形。