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Comparative studies on *Paragonimus sadoensis* and *P. ohirai*. V. Comparison of susceptibility of *Assiminea japonica*, *Oncomelania hupensis chiui* and *Paludinella japonica*

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Introduction

In review, Kawashima (1965) reported that five species of snails, i. e., *Assiminea japonica*, *A. parasitologica*, *A. yoshidayukioi*, *Oncomelania hupensis nosophora* and *Paludinella japonica*, were susceptible to *P. ohirai* infection. In addition, five other species of snails, i. e., *Bythinella nipponica akiyoshiensis*, *O. h. chiui* (syn. *Tricula chiui*), *O. h. formosana* (locality strain from Changhua County), *O. h. quadrasi* and *O. minima*, have also been reported susceptible to infection with *P. ohirai* although no cercarial formation, except for the first generation rediae, occurred in *B. n. akiyoshiensis* (Hashiguchi *et al.*, 1968; Hashiguchi & Miyazaki, 1968; Chiu, 1969; Kawashima & Hamajima, 1969; and Yoshimura *et al.*, 1970a).

On the other hand, investigations on the susceptibility of various snails to *P. sadoensis* infections have revealed that four species of snails, i. e., *O. minima* (Hamajima *et al.*, 1968; Hashiguchi *et al.*, 1968; Kawashima & Hamajima, 1969; and Yoshimura *et al.*, 1970a), *B. n. akiyoshiensis* (Hashiguchi *et al.*, 1968), *O. h. nosophora* (Hembree *et al.*, 1970) and *A. parasitologica* (Yoshimura *et al.*, 1970a) could easily be infected with the lung fluke. Thus, the first intermediate host specificity of *P. sadoensis* is similar in some respects to that of *P. ohirai*.

In this study, susceptibility experiments were conducted on *A. japonica*, *O. h. chiui* and *P. japonica* snails against *P. sadoensis* and *P. ohirai* infections in order to determine whether significant differences are found in the first intermediate host specificity between the two lung flukes.

Materials and Methods

Snail species examined for susceptibility were *A. japonica*, *O. h. chiui* and *P. japonica*. Simultaneously, *O. minima* and *A. parasitologica* snails served as controls for *P. sadoensis* and *P. ohirai* respectively.

A. japonica and *A. parasitologica* were collected near the mouth of the Asahi river, Shimoda-machi, Kamo-gun, Shizuoka Prefecture while *P. japonica* snails were collected at Shirahama, Shimoda-machi. Adult *O. minima* snails were collected from small streams near the mouth of the Okura river, and from small streams near Iwayaguchi, Aikawa-machi, Sado-gun, Niigata Prefecture. *O. minima* snails used for experimental infections were the F_1 generation of field-collected snails reared in the laboratory. Mature *O. h. chiui* snails were collected at Alilao village, Shimen district, Taipei county, Taiwan, China, in 1968. *O. h. chiui* snails used for this study were also the F_1 generation of field-collected snails.

Both *O. h. chiui* and *P. japonica* snails were maintained as previously described for raising *O. minima* snail whereas *A. japonica* was maintained similar to *A. parasitologica* (Yoshimura *et al.*, 1970a).

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P. japonica snails were fed with a small amount of commercial tropical fish food (Kurorera Kagaku Kenkyusho) once or twice a month ; the snail care of other four species was according to the methods described by Yoshimura *et al.* (1970a). Room temperature varied from 15–28°C as recorded on an automatic recording thermometer (Ota Seisakusho).

P. sadoensis and *P. ohirai* adult worms both of which were developed through their own first and second intermediate hosts were previously described in Part IV of this study (Yoshimura *et al.*, 1970b). *P. sadoensis* and *P. ohirai* eggs shed from these adult worms were incubated for 15 days and artificially hatched by the procedures previously described (Yoshimura *et al.*, 1970a).

Both *A. japonica* and *A. parasitologica* snails were maintained in the laboratory for 5 months prior to infection whereas *P. japonica* snails were maintained for 20–26 days in the laboratory before exposure.

Snail exposure was made by immersing individual snails for 5 hours in a small dish (12 mm wide and 13 mm deep) which contained 5 miracidia in dechlorinated water.

Cercarial emergence was determined by examining individual snails in the same type of dish as used for exposure. Snails were immersed in dechlorinated water and examined for 1–4 hours.

Exposed snails were crushed to determine snail infection rates. Morphological observations and measurements of larval forms separated from infected snails were performed by the methods described by Ito *et al.* (1969).

Results

1. Experimental infection of five species of snails with *P. sadoensis* miracidia

At the completion of exposure, only one miracidium remained in a single dish of each of four species of snails, the exception being *O. h. chiui* in which no miracidia remained in any dishes.

Table 1 Experimental infection of five species of snails with *Paragonimus sadoensis* miracidia

Snails	Snail exposure			Examination of exposed snails			
	Date	No. of snails used	Average No. of Mir. exposed/ snail	Days after exposure	No. of snails examined	No. of snails infected (%)	Larval stages found
A. j	3 Sept. '69	25	5	71–75	5	0(0)	
				79–83	4	0(0)	
				Total	9	0(0)	
A. p	3 Sept. '69	25	5	71–75	11	2(18)	2nd G.R. & Cer.
				79–83	10	2(20)	2nd G.R. & Cer.
				Total	21	4(19)	
O. h. c	3 Sept. '69	20	5	71–75	9	3(33)	2nd G.R. & Cer.
				79–83	10	7(70)	2nd G.R. & Cer.
				Total	19	10(53)	
O. m	3 Sept. '69	25	5	71–75	9	4(44)	2nd G.R. & Cer.
				79–83	10*	7(70)	2nd G.R. & Cer.
				Total	19	11(58)	
P. j	3 Sept. '69	25	5	75	2	1(50)	2nd G.R. & Cer.

Mir.=miracidia. *A. j=Assiminea japonica. A. p=Assiminea parasitologica. O. h. c=Oncomelania hupensis chiui. O. m=Oncomelania minima. P. j=Paludinella japonica.* 2nd G.R.=the 2nd generation redia. Cer.=cercaria.

* Three of 10 snails released cercariae 68 days after exposure.

Results of experimental infections are summarized in Table 1. Snail infection rate was highest in *O. minima* (58%), followed by *O. h. chiui* (53%), *P. japonica* (50%), and *A. parasitologica* (19%). However, all of 9 *A. japonica* snails crushed were negative for *P. sadoensis* infection.

No cercariae emerged from either of five species of snails 56 days after exposure. Fifteen-45 cercariae emerged from 3 individuals of *O. minima* snails 68 days after exposure but not from the remaining four species of snails.

The mean numbers of rediae and cercariae found per snail were 111 (Range 74-130; N=3) and 154 (Range 4-438) respectively in *A. parasitologica*, similarly, 58 (Range 22-96; N=10) and 186 (Range 1-963) in *O. h. chiui*, and 66 (Range 29-114; N=10) and 168 (Range 13-641) in *O. minima* snail. A single positive snail of *P. japonica* harboured 34 rediae and 15 cercariae.

Morphology of *P. sadoensis* second generation redia and cercaria separated from *O. h. chiui* and *P. japonica* was identical with the descriptions made in Part I of this study (Ito *et al.*, 1969) (Figs. 1, 2, 3 & 4).

As previously described (Ito *et al.*, 1969), the extraordinarily large intestine (Fig. 5) was rarely noted in the second generation rediae separated from *O. minima* snail. As Ito *et al.* (1969) previously stated in *P. ohirai* second generation rediae taken from *A. parasitologica*, intestinal contents of *P. sadoensis* rediae separated from *A. parasitologica* were more bright red brown in color than those from *O. minima* snails.

Comparisons of measurements of the second generation rediae and cercariae were made between *O. h. chiui* and *O. minima* snails (Tables 2 & 3). Ratios (%) of redial intestinal length to body length were 13.6±3.05 in the redia taken from *O. h. chiui* and 15.9±6.79 in that from *O. minima* snail. No significant difference was found between these values. Only one specimen of the second generation redia taken from *P. japonica* was available for measurement. The measurements on this individual are as follows: Body, 643×173 μ; pharynx, 52×57 μ; intestine, 112×81 μ; No. of germ balls contained, 8 (one of them was cercaria).

Snail mortality was highest in *P. japonica* (92%), followed by *A. japonica* (64%), *O. minima* (24%), *A. parasitologica* (16%) and *O. h. chiui* (5%).

2. Experimental infection of five species of snails with *P. ohirai* miracidia

At the completion of exposure, only one living miracidium remained in a single dish of each of *O. h. chiui* and *O. minima*, and in 6 dishes of *A. japonica* snails. One-2 corresponding miracidia found in 12 dishes of *P. japonica*.

Results of experimental infection are presented in Table 4. Snail infection rate was

Table 2 Size of mature second generation redia of *Paragonimus sadoensis* obtained from *Oncomelania hupensis chiui* and *O. minima* (in microns)

Snail species	No. of rediae measured		Body		Pharynx		Intestine		Ratio of intestinal length/ body length ×100	No. of germ balls (including cercariae)
			Length	Width	Length	Width	Length	Width		
O. h. c	31		418*	133	39	42	52	26	8.9	3(1)
			951**	235	68	75	143	112	22.7	18(5)
			641.7†	179.0	47.8	57.5	85.6	60.8	13.6	9.7(2.1)
O. m	31		321*	143	34	44	44	34	8.1	3(1)
			1002**	235	62	73	255	179	36.7	21(7)
			673.6†	180.9	45.0	56.2	105.1	76.3	15.9	12.4(2.0)

O. h. c=*Oncomelania hupensis chiui*. *O. m*=*Oncomelania minima*.
* Minimum. ** Maximum. † Mean.

Table 3 Size of *Paragonimus sadoensis* cercaria obtained from *Oncomelania hupensis chiui* and *O. minima* (in microns)

Snail species	No. of cercariae measured		Body		Oral sucker		Acetabulum		Stylet		Tail	
			L	W	L	W	L	W	L	W	L	W
O. h. c	22	176*	176	70	45	41	22	32	29	5	16	13
		262**	262	114	55	51	39	42	33	7	24	20
		236.2†	236.2	98.0	51.6	46.3	27.6	35.8	30.4	6.3	19.7	16.3
O. m	20	189*	189	59	40	42	23	28	29	6	17	13
		286**	286	109	58	53	31	39	33	7	26	18
		240.1†	240.1	95.1	50.9	48.2	27.5	35.1	30.5	6.7	21.9	15.4

L=length. W=width. *O. h. c=Oncomelania hupensis chiui*. *O. m=Oncomelania minima*.
* Minimum. ** Maximum. † Mean.

Table 4 Experimental infection of five species of snails with *Paragonimus ohirai* miracidia

Snails	Snail exposure			Examination of exposed snails			
	Date	No. of snails used	Average No. of Mir. exposed/ snail	Days after exposure	No. of snails examined	No. of snails infected (%)	Larval stages found
A. j	9 Sept. '69	25	5	78	3	0(0)	
A. p	9 Sept. '69	25	5	70	3*	3(100)	Spor., 1st & 2nd G.R., & Cer.
				83	6	4(67)	2nd G.R., & Cer.
				97-98	8	5(63)	2nd G.R., & Cer.
				Total	17	12(71)	
O. h. c	9 Sept. '69	20	5	78	6	2(33)	1st G.R.
				83	3	3(100)	Spor., & 1st G.R.
				97	5	3(60)	Spor., 1st & 2nd G.R. (young form)
				Total	14	8(57)	
O. m	9 Sept. '69	26	5	70	9	0(0)	
				78	2**	2(100)	2nd G.R., & Cer.
				97	5	1(20)	1st & 2nd G.R.
				Total	16	3(19)	
P. j	9 Sept. '69	25	5	78	3	1(33)	2nd G.R., & Cer.

Mir.=miracidia. Spor.=sporocyst. 1st G.R.=the 1st generation redia. 2nd G.R.=the 2nd generation redia. Cer.=cercaria. * One of 3 snails released cercariae 69 days after exposure.
** One of 2 snails released cercariae 69 days after exposure.

highest in *A. parasitologica* (71%), followed by *O. h. chiui* (57%), *P. japonica* (33%), *O. minima* (19%) and *A. japonica* (0%; only 3 individuals were examined). Differences in the period necessary for intramolluscan *P. ohirai* larval development were found between *O. h. chiui* and the other three species of snails; cercarial formation occurred in *O. minima*, *A. parasitologica* and *P. japonica* snails 69–78 days after exposure, conversely, no cercariae appeared in *O. h. chiui* even 97 days after exposure although a few young

forms of the second generation redia were found (Table 4).

Cercarial emergence was not observed in any species of snails up to 55 days after exposure but one individual of both *O. minima* and *A. parasitologica* snails released 3–4 cercariae 69 days after exposure.

The mean numbers of rediae and cercariae found per snail were 123 (Range 78–166; N =6) and 80 (Range 1–183) respectively in *A. parasitologica*, similarly, 111 and 52 in *O. minima*, and 98 and 117 in *P. japonica*.

Morphological features of *P. ohirai* second generation rediae and cercariae taken from *P. japonica* were analogous to those of *P. sadoensis* as previously described in Part I of this study (Ito *et al.*, 1969). *P. ohirai* second generation redia and cercaria separated from *P. japonica* are shown in Figs. 6 & 7.

Measurements of the second generation redia and cercaria taken from *P. japonica* are compared with those from *A. parasitologica* (Tables 5 & 6). The ratios (%) of redial intestinal length to body length were 15.0± 2.28 in the redia taken from *P. japonica* and 15.6±4.20 in that from *A. parasitologica*. No significant difference was observed between these ratios.

Snail mortality was highest in both *A. japonica* and *P. japonica* (88%), followed by *O. minima* (38%), *A. parasitologica* (32%), and *O. h. chiui* (30%).

Discussion

Contaminations of natural *Paragonimus* infection in *A. parasitologica* used for this

Table 5 Size of mature second generation redia of *Paragonimus ohirai* obtained from *Paludinella japonica* and *Assiminea parasitologica* (in microns)

Snail species	No. of radiae measured	Body		Pharynx		Intestine		Ratio of intestinal length/ body length ×100	No. of germ balls (including cercariae)
		Length	Width	Length	Width	Length	Width		
P. j	15	500*	168	44	47	65	42	11.5	9(1)
		1079**	230	83	86	168	120	19.9	21(2)
		756.9†	201.1	53.2	60.1	113.0	83.6	15.0	16.3(1.3)
A. p	30	583*	153	49	49	48	36	4.4	3(1)
		1105**	296	65	78	245	179	23.8	18(5)
		829.7†	221.1	53.5	59.4	130.5	96.2	15.6	10.6(1.6)

P. j=*Paludinella japonica*. *A. p*=*Assiminea parasitologica*. * Minimum. ** Maximum. † Mean.

Table 6 Size of *Paragonimus ohirai* cercaria obtained from *Paludinella japonica* and *Assiminea parasitologica* (in microns)

Snail species	No. of cercariae measured	Body		Oral sucker		Acetabulum		Stylet		Tail	
		L	W	L	W	L	W	L	W	L	W
P. j	10	221*	88	38	45	25	34	28	6	19	15
		311**	120	56	53	34	40	31	7	27	20
		245.9†	110.8	51.3	49.2	28.7	37.5	29.8	6.8	21.8	17.6
A. p	20	224*	104	53	46	29	35	29	7	18	17
		296**	135	59	53	41	46	32	8	30	24
		254.3†	122.4	55.0	50.1	35.1	39.6	30.5	7.7	23.3	19.7

L=length. W=width. *P. j*=*Paludinella japonica*. *A. p*=*Assiminea parasitologica*.
* Minimum. ** Maximum. † Mean.

Table 7 Comparison of the susceptibility of various snails against experimental *Paragonimus sadoensis* and *P. ohirai* infections

Snail species	*Paragonimus sadoensis*				*Paragonimus ohirai*			
	No. of snails examined	No. of snails infected (%)	Final forms of larvae found	Investigators (year)	No. of snails examined	No. of snails infected (%)	Final forms of larvae found	Investigators (year)
Assiminea castanea	–	–	–	–	97	0(0)		Kawashima (1961)
A. japonica	9	0(0)		Present authors		+	Cer.	Ogita (1954)
						+	Cer.	Ikeda (1957)
					33	0(0)		Yokogawa *et al.* (1958)
					50	1(2.0)	Cer.	Yoshida & Miyamoto (1959)
					72	4(5.6)	Cer.	Kawashima (1965)
					3	0(0)		Present authors
A. kushimotoensis	–	–	–	–	?	(0)		Yoshida (1960)
A. latericea miyazakii	–	–	–	–	44	0(0)		Kawashima (1961)
					104	0(0)		Kawashima (1965)
A. parasitologica	145	66(46*=38–55)	Cer.	Yoshimura *et al.* (1970a)	30	10(33.3)	Cer.	Yokogawa *et al.* (1958)
	21	4(19)	Cer.	Present authors	69	42(60.8)	Cer.	Yoshida & Miyamoto (1959)
					14	4(28.5)	Cer.	Kawashima (1961)
					48	31(64.6)		Kawashima (1965)
					48	37(77)	Cer.	Yoshimura *et al.* (1970a)
					17	12(71)	Cer.	Present authors
A. yoshidayukioi	–	–	–	–	33	19(57.6)	Cer.	Yoshida & Miyamoto (1960)
					45	26(57.8)		Kawashima (1965)
Bythinella nipponica akiyoshiensis		(52.5±9.6)	1st G.R.	Hashiguchi *et al.* (1968)		(87.5±16.1)	1st G.R.	Hashiguchi *et al.* (1968)
					228	177(77.6±12.8)		
					237	182(76.8)	1st G.R.	Hashiguchi & Miyazaki (1968)

Table 7 Cont.

Clithon retropictus	–	–	–	–	10	0(0)		Yoshida & Miyamoto (1959)
					50	0(0)		Kawashima (1965)
Oncomelania hupensis chiui	19	10(53)	Cer.	Present authors	88	46(52*=40.7-69.2)	Cer.	Chiu (1969)
					14	8(57)	2nd G.R. (young form)	Present authors
O. h. formosana	–	–	–	–	56**	5(9*=8.0-9.7)	Cer.	Chiu (1969)
					46***	0(0)		Chiu (1969)
O. h. nosophora	118	82(69.5)	Cer.	Hembree *et al.* (1970)	66	66(100)	Cer.	Kawashima & Miyazaki (1963)
					22	22(100)	Cer.	Kawashima (1965)
O. h. quadrasi	–	–	–	–	49	49(100)	Cer.	Chiu (1969)
O. minima	21	11(52.3)	Cer.	Hamajima *et al.* (1968)	10	5(50)	Cer.	Hashiguchi *et al.* (1968)
	10	10(100)	Cer.	Hashiguchi *et al.* (1968)	?	(100)	Cer.	Kawashima & Hamajima (1969)
	?	(100)	Cer.	Kawashima & Hamajima (1969)	102	67(66)	Cer.	Yoshimura *et al.* (1970a)
	551	502(91*=84-98)	Cer.	Yoshimura *et al.* (1970a)	16	3(19)	Cer.	Present authors
	19	11(58)	Cer.	Present authors				
Paludinella japonica	2	1(50)	Cer.	Present authors	?	(30.0)	Cer.	Yoshida (1960)
					3	1(33)	Cer.	Present authors
Semisulcospira bensoni	–	–	–	–	?	(0)		Yoshida (1960)
					55	0(0)		Kawashima (1965)

Cer.=cercaria. 1st G.R. =the 1st generation redia. 2nd G.R.=the 2nd generation redia.

* These values were calculated by the present authors. ** Changhua locality strain. *** Ilan locality strain.

study can not be excluded because of collecting these snails from an endemic area of paragonimiasis ohirai. However, the chances of natural infection in *A. parasitologica* are minimized for reasons previously pointed out by Yoshimura *et al.* (1970a). *P. japonica* was also field-collected. However, natural *Paragonimus* infection of this snail has never been recorded and the distribution of the snail has no relation to the endemic area of paragonimiasis ohirai as previously pointed out by Miyazaki *et al.* (1960).

Present results revealed that both *O. h. chiui* and *P. japonica* snails could be easily infected with *P. sadoensis* and yielded the cercariae whereas *A. japonica* seemed to be insusceptible to *P. sadoensis* infection. Since only 9 *A. japonica* snails were examined, however, it is uncertain whether this snail is insusceptible to infection with this lung fluke.

As previously reported by Chiu (1969), *O. h. chiui* was found easily infected with *P. ohirai*; our infection rate (57 %) of *O. h. chiui* against *P. ohirai* is analogous to those (40.7–69.2 %) obtained by Chiu for *P. ohirai*. As far as the present results are concerned, however, intramolluscan development of *P. ohirai* larvae differed from that of *P. sadoensis* in the same snails; no *P. ohirai* cercariae, except for the young form of the second generation rediae, occurred in *O. h. chiui* snails even 97 days after exposure, conversely, the formation of *P. sadoensis* cercariae occurred 71 days after exposure in *O. h. chiui* which had been maintained in the same room as *P. ohirai* exposed *O. h. chiui* snails. This fact implies that *P. ohirai* larval development in *O. h. chiui* is slower than that of *P. sadoensis*. Chiu (1969) examined *P. ohirai* infected *O. h. chiui* snails 3–4 months following exposure, reporting that the cercariae were recovered from the snails. Therefore, it is surmised that *P. ohirai* cercarial formation could have occurred in *O. h. chiui* if the infected snails in this study had been maintained for a longer period than in our experiment (97 days).

When one considers the fact that the first intermediate host of *P. sadoensis* is *O. minima* which belongs to the genus *Oncomelania*, it is reasonable to assume that *O. h. chiui* snails could be infected with *P. sadoensis*. This study also showed that the morphology and size of larvae formed in *O. h. chiui* resembled those formed in *O. minima*.

Yoshida (1960) reported that *P. japonica* could be infected with *P. ohirai* (infection rate: 30.0 %) and yielded the cercariae. Our results confirmed the data reported by Yoshida. Measurements of *P. ohirai* larvae taken from *P. japonica* were also similar to those separated from *A. parasitologica* (Tables 5 & 6).

As summarized in Table 7, experimental infection of *A. japonica* with *P. ohirai* has beed made by Ogita (1954), Ikeda (1957), Yokogawa *et al.* (1958), Yoshida & Miyamoto (1959) and Kawashima (1965). All investigators, except for Yokogawa *et al.*, reported that *A. japonica* was positive for *P. ohirai* infection. Susceptibility of this snail to infection with *P. ohirai* could not be determined with certainty in this experiment since mortality of *A. japonica* (88 % = 22/25) was so high that only 3 snails exposed could be examined.

Kawashima & Hamajima (1969) reported that both *P. sadoensis* and *P. ohirai* miracidia could develop to the cercarial stage in *O. minima* snail within 40 days after exposure. Yoshimura *et al.* (1970a) reported that *P. sadoensis* cercariae were first found in *O. minima* snails 70 days after exposure while *P. ohirai* cercariae were recovered from the same snails 95 days after exposure. In the present study, however, both *P. sadoensis* and *P. ohirai* cercariae were released from *O. minima* 68–69 days after exposure. This suggests that periods necessary for intramolluscan cercarial formation were similar between the two lung flukes. Discrepancies in periods necessary for intramolluscan larval development, reported by the aforementioned investigators, may be due to differences in temperature for maintaining exposed snails as previously suggested by Kawashima & Miyazaki (1963).

Many susceptibility studies of various molluscs to infection with *P. ohirai* and *P. sadoensis* have been made as summarized in Table 7. This table suggests that the first intermediate host specificity of *P. sadoensis* is closely allied to that of *P. ohirai* ; six species of snails, i. e., *A. parasitologica*, *B. n. akiyoshiensis*, *O. h. chiui*, *O. h. nosophora*, *O. minima* and *P. japonica*, can be infected with both lung flukes.

Summary

1. Both *Oncomelania hupensis chiui* and *Paludinella japonica* snails were easily infected with *Paragonimus sadoensis*, producing the cercariae. Conversely, 9 *Assiminea japonica* snails were all negative for *P. sadoensis* infection.

2. *O. h. chiui* snail could be easily infected with *P. ohirai*. However, *P. ohirai* larval development in this snail was slow, i. e., no cercarial formation occurred up to 97 days after exposure.

3. The first intermediate host specificity of *P. sadoensis* is similar to that of *P. ohirai*.

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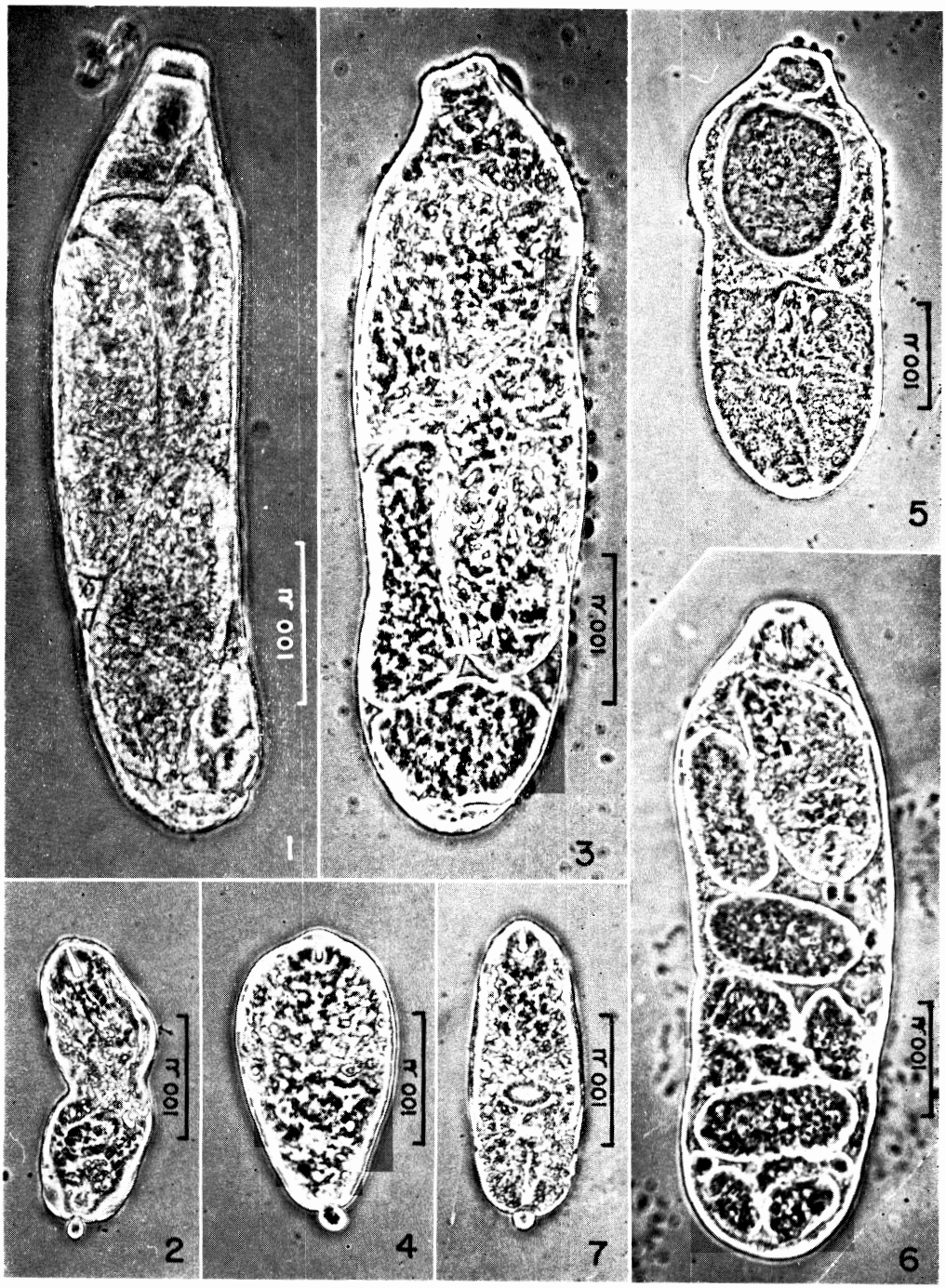
Explanation of Figures

1. *Paragonimus sadoensis* second generation redia separated from *Oncomelania hupensis chiui* snail.
2. *P. sadoensis* cercaria separated from *O. h. chiui* snail.
3. *P. sadoensis* second generation redia separated from *Paludinella japonica* snail.
4. *P. sadoensis* cercaria separated from *P. japonica* snail.
5. Premature form of *P. sadoensis* second generation redia separated from *Oncomelania minima* snail. Note the large intestine.
6. *Paragonimus ohirai* second generation redia separated from *Paludinella japonica* snail.
7. *P. ohirai* cercaria separated from *P. japonica* snail.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佐渡肺吸虫ならびに大平肺吸虫の比較に関する研究. V. *Assiminea japonica*, *Oncomelania hupensis chiui* および *Paludinella japonica* の2種肺吸虫感染に対する感受性の比較

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佐渡肺吸虫と大平肺吸虫の第1中間宿主特異性に差異が見られるかどうかを究明することは2種肺吸虫の種差や類似点の解明に重要な手がかりを提供するものと思われる. そこで今回は, 従来大平肺吸虫感染に感受性があるとされている *Assiminea japonica*, *Oncomelania hupensis chiui* (syn. *Tricula chiui*) ならびに *Paludinella japonica* に2種肺吸虫を感染させ, これらの貝の佐渡肺吸虫と大平肺吸虫に対する感受性を比較した.

その結果, 佐渡肺吸虫は *P. japonica* (感染率: 50 %=1/2) ならびに *O. h. chiui* (感染率: 53 %=10/11) によく感染し, セルカリアにまで発育することが解つた. これに対して *A. japonica* では被検9個体の総てが陰性であつた. 佐渡肺吸虫が *O. h. chiui* によく感染することは本種の第1中間宿主が *Oncomelania* 属に属する *Oncomelania minima* であることを考えると極めて興味深い.

大平肺吸虫は *O. h. chiui* (感染率: 57 %=8/14) によく感染したが, 少なくとも今回の実験に関する限りでは, この貝における大平肺吸虫幼虫の発育は遅く, 感染後97日に至つてもセルカリアの形成は認められず, わずかに第2代レジアの幼若型を認めたにすぎない. *P. japonica* の大平肺吸虫感染率は33 % (1/3) であつたが, *A. japonica* では被検3個体の総てが陰性であつた.

以上の成績から, 2種肺吸虫はその第1中間宿主特異性においても類似点の多いことが推察される.