

## The Second Species of the Lung Fluke in Peru, *Paragonimus caliensis* Little, 1968

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### Introduction

*Paragonimus caliensis* was first described by Little (1968) from common opossums, *Didelphis marsupialis* (type host) and four-eyed opossums, *Philander opossum* in Cali, Colombia. But, it has never been reported from other countries, though he briefly stated in the same paper that two of 12 lung flukes in Panama were very similar to *P. caliensis*, and Miyazaki and Ishii (1968 a, b) noted that one of 27 flukes in Mexico was closest to the same species, illustrating its ovary and testes in their second paper. In 1971, the senior author visited Peru and had the opportunity to investigate four adult specimens which were stained and mounted by the junior author. These adults were experimentally obtained in 1968 from a dog in Cajamarca, northern part of Peru, where human paragonimiasis was known to be present and in 1969 a new lung fluke, *Paragonimus peruvianus* was found by Miyazaki, Ibáñez and Miranda. Three of the four specimens mentioned above were readily identified as *P. peruvianus*, but the remaining one was quite different, suggesting *P. caliensis* to the senior author. Accordingly, the valuable specimen was brought to Japan, and carefully compared with two specimens of the Colombian lung fluke which were used

by Little (1968) in his original description of the new fluke. The specimen concerned was finally identified as *P. caliensis*, and in the present paper it is recorded as the second species of *Paragonimus* in Peru.

### Materials and Methods

The four adult flukes stated above were obtained in 1968 by Grados *et al.* (1972) from an experimental dog which had been infected with *Paragonimus* metacercariae collected from a crab, *Pseudothelphusa chilensis* in Cajamarca, the endemic area of paragonimiasis. The worms were double-stained with carmine and fast green, and mounted in balsam by the junior author. The single specimen close to *P. caliensis* was brought to Japan and remounted by the senior author after the cuticle and vitellaria covering the ovary and testes were removed in order to show their shape and branching clearly (Fig. 1). Two adult specimens of *P. caliensis* used for comparison in this paper were obtained by Little (1968) from the common opossum in Colombia, and stained with Semichon's aceto-carmine and mounted in permount. Measurements were made on these three specimens, particular attention being paid to the oral and ventral suckers, ovaries and testes. Size of suckers was shown by the transverse and the longitudinal diameter, and that of the gonads was by the length and width of their outlines. Drawing of the latter were made by projecting method.

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## Results and Discussion

Since the oral sucker is situated subterminally, its longitudinal diameter (or length) is variable by pressure; therefore, the transverse diameter (or width) is usually more suitable for comparison with the ventral sucker. As shown in Table 1, the oral sucker of the Peruvian strain is slightly larger than the ventral, just like that of the Colombian. According to Little (1968) who measured 30 specimens of *P. caliensis* from Colombia, the oral sucker averaged 0.99 mm wide by 0.76 long and the ventral 0.96 wide by 0.91 long, in holotype the oral and the ventral sucker measuring 1.03 by 0.70 and 0.95 by 0.99, respectively; i.e. the former was slightly larger than the latter, like in the Peruvian strain. Generally speaking, size and shape of the ovary and testes are changeable by pressure during fixation, but they are useful for identification of *Paragonimus* spp. As shown in the table, the Peruvian strain has a little smaller ovary than testes, while both of the Colombian have slightly larger ovary than testes, except the right testis of worm B. Little (1968) briefly stated in his paper that testes were about same size as ovary, but judging from Fig. 1 of his paper, testes of the holotype of *P. caliensis* are slightly larger than its ovary. Therefore, it is reasonable to think that the Peruvian strain agrees with *P. caliensis* in the size of gonads.

On the other hand, the shape and branching of the gonads are quite similar between the Peruvian and the Colombian strain as shown in Figs. 2-4. The ovary of the former (Fig. 2) has a big central mass and seven short and broad lobes, three of which are subdivided into two short branches each;

while that of the latter has a somewhat smaller central mass and five (Fig. 4) or six (Fig. 3) broad lobes, some of them being shortly subdivided. These features in the three specimens agree with description of *P. caliensis* by Little, though the number of lobes are not the same. The left and the right testis of the Peruvian strain (Fig. 2) are divided into five and six lobes, respectively. All lobes, except one, are swollen at terminal part, and some of them are provided with small processes at tip. Testes of the Colombian strain (Figs. 3, 4) are also divided into five lobes on the left and six lobes on the right in both specimens. All lobes are also swollen like clubs at terminal part, but without processes. Since the ovary is situated on the right side of the body in all of the three specimens, it is most likely that the testis on the same side as the ovary has more lobes than the opposite testis. These results agree with Little's description that in 23 of 24 *P. caliensis*, the testis on the same side of the body as the ovary had six lobes and the opposite testis five. Ultimately, there are no fundamental differences in the features of suckers and gonads between the Peruvian and the Colombian strain. The cuticular spines are mostly singly spaced, and the uterine eggs are provided with thin and somewhat irregular shells in the three specimens.

From the results stated above the lung fluke obtained in Cajamarca was identified as *P. caliensis* Little, although it was only a single specimen. Based upon this identification, it is certain that *P. caliensis* occurs in the northern part of Peru, though it is less prevalent than *P. peruvianus*. Consequently, it is presumed that some cases of human

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### Explanation of Figures

- Fig. 1. *P. caliensis* from Peru. Ventral view. Cuticle and vitellaria partly removed.  
S: oral sucker, A: ventral sucker, O: ovary, U: uterus, H: testis.
- Fig. 2. Details of gonads in figure 1.  
O: ovary, RH: right testis, LH: left testis, a: vas deferens.
- Figs. 3. and 4. Gonads of *P. caliensis* (A and B) from Colombia. Ventral view.  
Abbreviation same as figure 2.

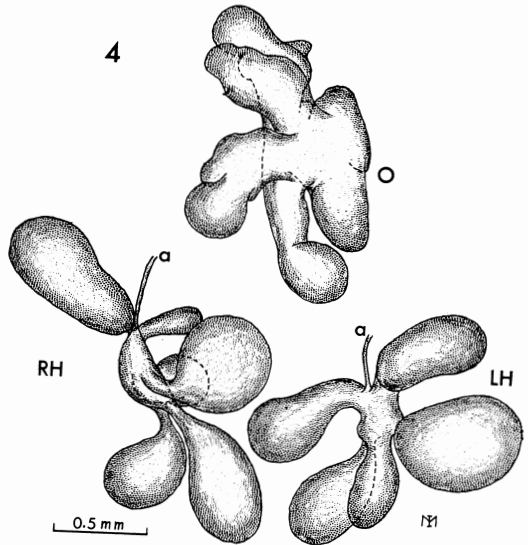
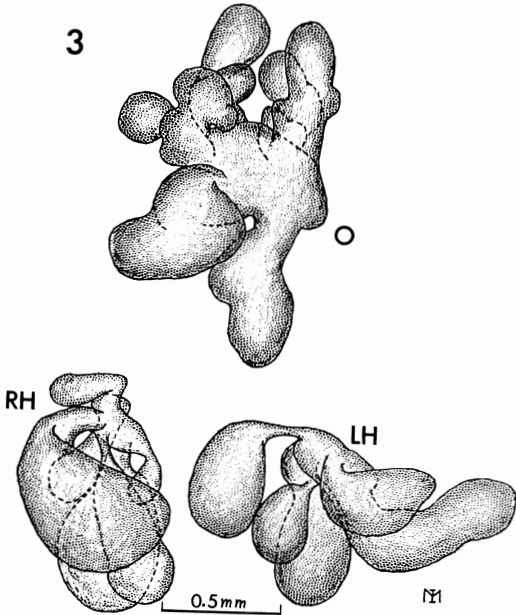
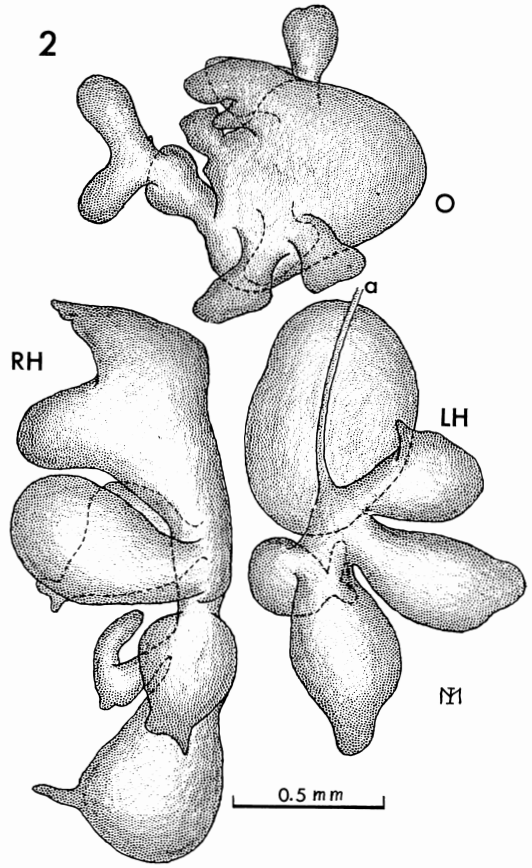
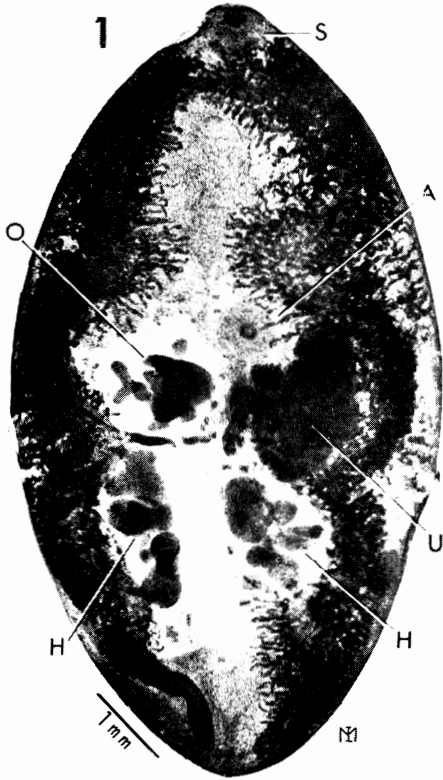


Table 1 Measurements of 3 specimens of *P. caliensi* from Peru and Colombia. (in millimeters)

Strain	Body	Oral sucker width length		Ventral width	sucker length	Ovary	Left testis	Right testis
Peruvian	8.8×4.9	0.71	0.51	0.68	0.71	1.17×1.07	1.53×0.92	1.89×0.77
Colombian A	9.3×5.5	0.97	0.82	0.92	0.85	1.53×0.90	1.39×0.77	1.09×0.60
Colombian B	10.3×5.3	0.97	0.65	0.85	0.87	1.67×1.04	1.51×1.45	2.04×1.24

paragonimiasis in Cajamarca may possibly be caused by *P. caliensi*, as its crab host is frequently eaten uncooked by inhabitants and its eggs in sputum of patients can be confused with those of *P. peruvianus*, which is regarded as the main agent of the disease. From geographical point of view, it is likely that *P. caliensi* may occur also in Ecuador.

### Summary

In 1971, the senior author had the opportunity to investigate four adult specimens of *Paragonimus*, which were made in 1968 by the junior author. These adults were obtained from an experimental dog that had been infected with *Paragonimus* metacercariae collected from a crab, *Pseudohelphusa chilensis* in Cajamarca, the endemic area of human paragonimiasis in the northern part of Peru. Three of the four specimens were identified as *P. peruvianus* Miyazaki *et al.*, 1969 and the remaining one as *P. caliensi* Little, 1968, and the latter was recorded in this paper as the second lung fluke in Peru. It is presumed that some patients in Cajamarca may possibly be caused by *P. caliensi*, as its crab host is eaten by people and its eggs are very similar to those of *P. peruvianus*,

the main agent of the disease in that area.

### Acknowledgment

The authors express their appreciation to Dr. Maurice D. Little of Tulane University, New Orleans, USA., who sent two specimens of *P. caliensi* to the senior author.

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## ペルー産肺吸虫の第2種、カリ肺吸虫

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グラドスは1968年、即ち同国産肺吸虫の種類が不明な頃、ペルー北部の本虫症流行地、カハマルカで、チリーサワガニ寄生の幼虫をイヌに与えて成虫をえ、染色標本として保存していた。1971年に彼の研究室を訪れた宮崎は、その4個体を観察した結果、3つは容易にペルー肺吸虫と同定できたが、1つは明らかに異なるものであつた。そこで、これを日本にもちかえつて、標本を作りなおし、かつ、カリ肺吸虫の発見者 M. D. Little から分与されたコロンビア産の2個体と比較検討した。その結果、つぎの理由で、これをカリ肺吸虫と同定することができた。即ち、(1) 口吸盤が腹吸盤より、わずかに大きいこと、(2) 卵巣は分岐が非常にかんたんで、精巣より

やや小さいこと、(3) 精巣も分岐がかんたんで、卵巣と同側のが6本に、反対側のが5本に分れること、(4) 体表のトゲは、本来、単生であること、(5) 子宮内卵の卵殻がうすく、やや不規則なこと、などの特長にもとずいて同定した。

これによつて、カハマルカのチリーサワガニは2種の肺吸虫幼虫をもっていることが明らかとなり、このカニを生食する住民には、主役とみなされるペルー肺吸虫のほかに、カリ肺吸虫も感染しうることが考えられる。しかし、患者のタンに現われた卵によつて、両種を区別することは、非常にむずかしい。地理的にみて、カリ肺吸虫はエクアドルにも分布している可能性がよい。