

NOTES

WHAT IS *PARAGONIMUS RUDIS* (DIESING, 1850)?  
REPORT ON A FIELD STUDY IN MATO GROSSO, BRAZIL

JOHANNES VOELKER\*  
GÜNTHER MÜLLER\*  
ALUIZIO PRATA\*\*

*Paragonimus rudis* was found in the lungs of a giant otter *Lutra (pteronura) brasiliensis* by Natterer in 1828, who dissected the animal in the former capital Mato Grosso (= Vila Bela), Brazil. The flukes were described by Diesing in 1850, and redescribed by Braun in 1901. Both descriptions do not allow to identify the species. Therefore, *P. rudis* must be regarded a "nomen nudum". Because its rediscovery is desirable with regard to historical reasons and nomenclatoric questions, a field study was performed in Mato Grosso in 1980. Of 354 freshwater crabs from 24 localities collected and examined for parasitic infections, about 25% were found to be infected with 7 kinds of trematode larvae, which differed distinctly from *Paragonimus-metacercariae*. The question, whether *P. rudis* or other lung fluke species do not seem to occur or cannot be found any longer in the area investigated by us, is discussed.

HISTORICAL BACKGROUND

*Paragonimus* research was started more than 150 years ago in Brazil. In 1850 (and again in 1855) Diesing described the first lung fluke (Trematoda) under the name *Distomum rude*. The parasites were found by Natterer 1828 in the lungs of a giant otter; the host's valid scientific name at present is *Lutra (Pteronura) brasiliensis*.

The Austrian zoologist Johann Natterer (1787-1843) was curator at the "K.K. Naturalienkabinett" in Vienna. Between 1817 and 1831 he had been travelling in Brazil and collecting any kind of vertebrates and their helminths. On his sixth journey he stayed

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\*Bernhard-Nocht – Institut für Schiffs – und Tropenkrankheiten, D – 2000 Hamburg 4, Germany (FRG).

\*\*Núcleo de Medicina Tropical e Nutrição, Faculdade de Ciências da Saúde, Universidade de Brasília, 70910 Brasília, DF, Brasil.

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in Mato Grosso, the former capital of the Capitania and later of the state Mato Grosso, from the 17th of May 1828 to the 15th of July 1829. The town was founded in 1742 under the name Vila Bela da Santíssima Trindade, which changed to Mato Grosso in 1820 and again to Vila Bela da SS. Trindade in 1978. Today the town exists as a village. The place is located at the upper course of Rio Guaporé (a tributary of Rio Amazonas) near the Bolivian frontier.

The records of J. Natterer still exist. Under the date of September 19/20, 1828 there are the following notes on his findings in the course of the dissection of one otter (translated in English): "No. 926, *Lutra ariranha*."

14 *Distomum* in pairs encapsulated in the lungs, the inside of the capsule is half covered with bony substance, the capsules are scattered in the whole lung tissue"; findings on other parasites are added. The original description of *Distomum rude* by Diesing in Latin is very short and insufficient. Braun redescribed these flukes in 1901 under the name *Paragonimus rudis* after he had established the genus *Paragonimus* in 1899. Braun however did not succeed in describing the internal structure. Recently, one of us reexamined the type material of *P. rudis*, kept at the "Naturhistorisches Museum Wien" (Museum of Natural History Vienna). Unfortunately, it turned out to be impossible to stain the taxonomically important internal organs as Braun had experienced 80 years before. Because *P. rudis* cannot be identified anymore, it must be regarded as a "nomen nudum" according to the international taxonomical regulations. One cannot exclude that the first lung fluke-species ever found is identical with one of those *Paragonimus*-species which had been newly described in Central and South America between 1968 and 1979:

*Paragonimus mexicanus* Miyazaki et Ishii, 1968

*P. caliensis* Little, 1968

*P. peruvianus* Miyazaki, Ibáñez et Miranda, 1969

*P. amazonicus* Miyazaki, Grados et Uyema, 1973

*P. inca* Miyazaki, Mazabel, Grados et Uyema, 1975

*P. ecuadoriensis* Voelker et Arzube, 1979

Miyazaki (1980) regards *P. peruvianus* and *P. ecuadoriensis* as being synonymous with *P. mexicanus*.

The rediscovery of *Paragonimus rudis* at the "locus typicus" in Mato Grosso is not only important for historical reasons. The rediscovery of this species would help to elucidate nomenclatoric problems of lung flukes occurring in Central and South America. Also Miyazaki (1974) points to the necessity for studying "Brazilian lung fluke(s) in the type host at the type locality from new taxonomic viewpoint" (p. 121).

#### AREA AND MODE OF FIELD WORK

The search for *Paragonimus* foci in the field was based on collection and parasitological examination of freshwater crabs, which serve as second intermediate hosts of lung flukes. Hunting of mammals was not allowed (only once we had the chance to examine the viscera of a giant otter near Vila Bela; the lungs were not infected with *Paragonimus*). We started the study in Vila Bela (= Mato Grosso) and began collecting crabs in the vicinity of the village along Rio Guaporé and in ponds and swamps near the river. The area of investigation was gradually extended to Rio Galero in the north, Rio Sararé in the east, Rio Alegre and Rio Barbados in the south. All these rivers are tributaries of Rio Guaporé. Within this area we checked also creeks, ponds, and "lagoas" as frequently as possible. All locations where crabs were found are listed separately and marked in the map (Fig. 1). Also those places where crabs had been suggested to live but where we could not find any are added. Mountain creeks e.g., flowing off from the "Serra Ricardo Franco" to Rio Guaporé, appear as suitable habitats for freshwater crabs in the dry season.

but slowly running creeks change, as we were told by native people, to rapid turbulent streams in the rainy season, where crabs have no chance to survive.

The freshwater crabs were obtained in various ways according to their life habits. They show a marked adaptation to land life. The crabs spend the dry period in burrows made by themselves in the soil along the banks of rivers, creeks, ponds, and in desiccated parts of the "pantanal". During the night and after rain the crabs leave their holes and crawl on land searching for food. Accordingly we collected the crabs by digging them out of their burrows or caught them on land at night. Sometimes we found the crabs hidden in thick water vegetation, especially between the roots of *Eichhornia*. Furthermore, we observed crab populations which had been extremely reduced by crab-eating storks or by pigs. Remains of crab meals were scattered everywhere and it was very difficult to find even one or two living crabs in those habitats.

### FRESHWATER CRABS AND THEIR LOCALITIES

The following species of freshwater crabs, all of them belonging to the family *Trichodactylidae*, were collected:

*Dilocarcinus (Dilocarcinus) pagei pagei* Stimpson, 1961 (most abundant species; localities No. 1-14, 18, 19, 22-24).

*Sylviocarcinus pardalinus* (Gerstaecker, 1857) (locality No. 22).

*Zilchiopsis sattleri* Bott, 1969 (in sensu Bott 1969) (loc. No. 16).

*Zilchiopsis* sp. (species not determinable) (loc. No. 9).

*Valdivia* sp. (species not determinable) (loc. 2, 8, 15, 24).

In and around Vila Bela 242 crabs from 15 different localities were examined for parasitic infections. Later we continued the field studies in the vicinity of Cáceres and Cuiabá in the basin of Rio Paraguai and its "pantanal". Here 112 more crabs from 9 localities were examined. The studies were carried out during the dry season of 1980.

#### *Localities of Freshwater Crabs collected in Mato Grosso 1980* (number of crabs examined in brackets).

1. Vila Bela, Rio Guaporé; swampy place covered with shrub (30).
2. Cabral Vasco, Rio Barbados (14).
3. Rio Barbados, 16 km south of Cabral Vasco (33).
4. Lagoa Grande; Pau Maribo, ca. 23 km west of Cabral Vasco (24).
5. Vila Bela, Rio Guaporé; shallow bight at the port (11).
6. Ponte Lacerda, Rio Guaporé; ponds at brickyard near the river (11).
7. Fazenda Formosa near Vila Bela (25).
8. Vila Bela, Rio Guaporé; sawmill (10).
9. Fazenda Eunice, Rio Sararé (12).
10. Fazenda Sta. Amélia, Rio Galero (8).
11. lagoa, ca. 7 km north of Cabral Vasco (4).
12. creek, crossing highroad 416, 10 km north-west of Ponte Lacerda (2).
13. Bom Futuro, Pantanal of Rio Alegre; desiccated lagoa (4).
14. Vila Bela, Rio Guaporé; ponds at brickyard (9).
15. tributary of Rio Alegre, ca. 15 km south of Vila Bela; shallow creek in rain forest; crabs hidden on land under roots etc. (45).
16. lagoa, 10 km north-west of Cáceres; Pantanal (11).
17. Capão Grande, 40 km north-east of Cáceres; tributary of Rio Paraguai (1).
18. Rio Paraguai, 10 km south of Cáceres (10).
19. lagoa, 20 km west of Cáceres; Pantanal (20).
20. tributary of Rio Paraguai near highroad 070, 20 km west of Cáceres, large bight; dense vegetation of *Eichhornia* sp. (16).

21. Rio Paraguai, ca. 30 km south of Cáceres (10).
22. Rio Jauru; highway 40 km south of Cáceres, bridge; dense vegetation of *Eichhornia* sp. (9).
23. Sto. Antonio, south of Cuiabá; desiccated lagoon, Pantanal (10).
24. "Pantanal Matogrossense", 30 km south of Poconé; various desiccating lagoons (15).

Remarks: Pantanal = overflowed area during rainy season;

lagoa = remaining pond of desiccating Pantanal during dry season.

## PARASITOLOGICAL EXAMINATIONS

The parasitic larvae were isolated by fragmenting the crabs in a meat grinder in the usual way; the resulting pulp was strained and purified from all turbid agents by several washings and sedimentations. The cleared sediment was checked for parasites under a dissecting microscope. While none of 354 crabs from 24 localities were found to be infected with metacercariae of *Paragonimus*, about 25% of them harboured metacercariae of trematodes, which could not be determined but which differed distinctly from the *Paragonimus*-type. A few crabs were infected with plerocercoids belonging to the order *Trypanorhyncha* (Cestoda). *Turbellariae* of the family *Temnocephalidae*, which live as commensals in the gill chamber were observed in nearly all of the crabs; but only sporadic small *Hirudineae* and aquatic mites were seen.

## DISCUSSION

In regard to probable future studies it is necessary to look for possible reasons which might have caused the failure of rediscovering *Paragonimus rudis*. According to the original notes of Natterer concerning his stay in the former capital Mato Grosso there is no doubt that we carried out our studies at the same place and in the near and far distance of it. Furthermore, we know that at that time Natterer examined only a single otter and this one harboured lung flukes. These parasites had never been seen before. But it is not certain whether this otter was caught in the river near the town or not.

The distance between the otter's locality and Mato Grosso must have been short, if the animal was killed. It is suggested that carcass had not been transported longer than eight hours on foot or by boat for a distance of approximately 30 km, because in a tropical climate decay is going on very fast. Possibly the focus is limited to a small place in an unapproachable area of the rain forest, or the life cycle has been interrupted in the meantime by changing of the ecological conditions. Large areas of rain forest in the east and south-east of Vila Bela, e.g., have been burned down in the past to establish farm land. Moreover, we got the impression that the habitats which we studied seemed to be somewhat unsuitable for the life cycle of *Paragonimus* in comparison to natural foci which we have seen in other American and African countries.

Furthermore, it can not be excluded that the otter was brought alive from far away to Mato Grosso by traders and offered for sale. In that case it seems hopeless to find the origin of *P. rudis* again.

Under these aspects the discovery of the first lung flukes by Natterer in 1828 must be considered as a caprice of fortune and the question, "What is *Paragonimus rudis*?" remains furthermore unsolved.

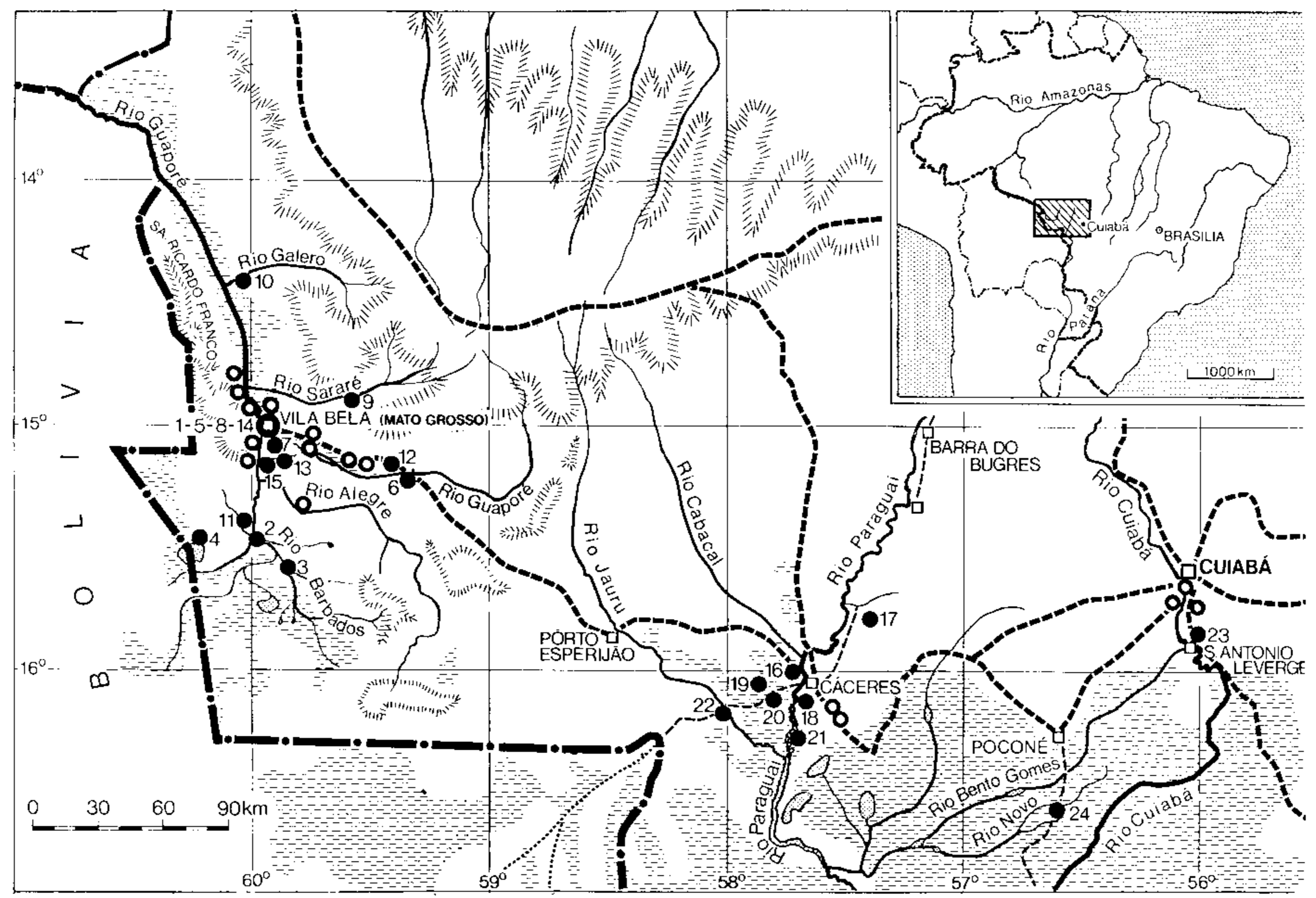


Fig. 1 – Investigated Area in Mato Grosso, Brazil.  
 ● = localities of freshwater crabs; ○ = habitats where crabs could not be found; [hatched pattern] = Pantanal

## RESUMO

Em 1828, Natterer encontrou o *Paragonimus rudis* nos pulmões de uma lontra gigante *Lutra (Pteronura) brasiliensis*, Vila Bela (Mato Grosso) Brasil. Os vermes foram descritos em 1850 por Diesing e novamente em 1909 por Braun. Ambas descrições não permitem a identificação das espécies e portanto *P. rudis* pode ser tido como "nomen nudum". Foi feita uma tentativa de se encontrar outros exemplares examinando 354 carangueijos de 24 localidades. Cerca de 25% deles estavam infectados com sete tipos de larvas de trematódeos que diferem das metacercárias de *Paragonimus*. Assim permanece sem resposta a pergunta: O que é o *Paragonimus rudi*?

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