

Studies on Schistosomatosis, made in the North of Brazil, by a commission from the Instituto Oswaldo Cruz.

Report and travelling notes presented

by

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Programme of the Expedition.

The Commission designed by Dr. CARLOS CHAGAS, Director of the Institute, to study schistosomatosis in its Brazilian foci (all situated in the North), consisted of Drs. ADOLPHO LUTZ and OSWINO PENNA, each one accompanied by a servant.

Our scope being the gathering of information on the prevalence of *Schistosomum mansoni* and the study of local conditions in the foci of infection, we decided to visit the schools of "Aprendizes Marinheiros" in the North which had already furnished observations to Dr. PENNA and material for studies to Dr. LUTZ. With the indications obtained by examining all the apprentices we would determine the foci in the interior. At the same time many other people, in health or diseased, were to be examined, using every occasion to obtain an estimate of the percentage of infection and the symptoms produced. In the foci of infection the mollusks harbouring the parasite would be searched for, and the species and the proportion of

natural infection determined. The *cercariae* obtained would be used for animal experiments.

While pursuing the principal object of the journey, all opportunities for other studies of local pathology and, specially, of parasitical diseases and medical zoology were to be seized.

This programme was calculated for an absence of at least two months. We intended to travel by sea to Recife and from there by railway to Rio Grande do Norte, the most distant of the states we expected to visit.

The return journey, always from North to South, would take us through the States of Parahyba, Pernambuco, Alagoas and Sergipe, ending in the Capital of Bahia from where, after finishing our studies, we would return to Rio de Janeiro by sea.

This programme was entirely carried out without serious difficulties. Our intention however of doing much work in little time, being in opposition to the general habits, was not favoured by the conditions we found,

though everywhere the authorities and also a large number of colleagues gave us their help. If we required nearly three months for this expedition it must be taken into account that we covered much ground (3.000 to 4.000 kilometers), while nearly one month was absorbed by the necessary journeys, not counting a large number of local excursions.

Diary.

Follows an extract from the diary of Dr. LUTZ:

"We left Rio in the small steamer "Itapacy" at 4 p. m. of August 3d, with a rather rough sea. On 5 VIII at 7 h. a. m. we entered the port of Victoria, where we went on shore for an excursion. On the rocks we found numerous *Bromeliaceae* containing a rich fauna and, on shore, several interesting plants. Here already there appeared a *Montrichardia*, large araceous plant, common in the swamps of the North.

On 6 VIII we passed the Abrolhos reefs.

7 VIII. We arrived in Ilheos, where the superintendent of the Railway accompanied us on a motor excursion along the railway line to kilometer 20. 8 VIII. We made another excursion to the lake of Almada. On these excursions we collected some interesting mollusks, but failed to find *Planorbis olivaceus*, described by SPIX from Ilheos and Almada, nor could we obtain reliable information as to its existence. Later researches, made by Mr. ZEHNTNER, also failed to give results, showing that in the last century this conspicuous species either disappeared or at least became very rare.

The fact is very important, because it refers to the largest species capable of transmitting Schistosomiasis. No other *Planorbis* was found, but the landscape and the flora offered much interest. Our steamer left at 6 p. m.

9. VIII. In Bahia we stayed only four hours, and visited some colleagues. Afterwards we made an excursion to the "dique", a large pond formed by an old dam, where there are plenty of *Montrichardia*. We col-

lected numerous specimens of *Planorbis olivaceus* and received some more from Dr. OCTAVIO TORRES, but none of them were infected by *Schistosomum mansoni*, though they contained some other trematodes. The snails were mostly adult, 30 mm. of diameter, which points to an age of at least 2 years.

10 VIII. In the afternoon we arrived in Aracajú, where the Itapacy stayed till 11 a. m. of the following day. During this time we visited the school of marine apprentices and made the necessary arrangements for staying on our return. We collected a large number of *Planorbis olivaceus* but failed to find infected specimens.

11 VIII. We spent the night near to the mouth of the São Francisco river, up which we ran the next day, stopping at the "Ilha das Galinhas". We found the river and its banks prettier than they are higher up, near Joazeiro. On an excursion by canoe, we visited two islands with an interesting flora and observed flocks of a species of goat-sucker. There were no fresh water mollusks.

12 VIII. Towards the evening we passed the dangerous bar of the São Francisco river again; the surf offered a beautiful sight.

13 VIII. We arrived in Maceió and went to Bebedouro, where we failed to find *Planorbis olivaceus*, which apparently does not exist in these parts. In the house of Dr. LUIZ VASCONCELLOS we saw several chickens suffering from an infectious disease, with leucocytosis but apparently without spirillae. Perhaps it might be acute leucemia. We visited the hospital at Maceió and saw a patient whose bloody and mucous dejections contained a large number of eggs of *Schistosomum mansoni*.

14 VIII. We arrived early in Recife and were met by the chief of the school of marine apprentices; here we established a laboratory. Afterwards we visited the governor, the prefect and the director of the sanitary service; all of them received us very well and helped us to arrange the necessary ex-

cursions. We stayed at a boarding house in the rua Conde Bomfim.

15 VIII. Using the Prefect's motor-car, we visited the slaughter-house where we gathered information about parasites and diseases of cattle. We obtained none concerning Trematodes, nor did our examinations give any result. A bullock come from the direction of Bahia, was said to suffer from "mal triste". After being killed, it showed countless hemorrhages in the intestine, gall-bladder and mesentery, also hemorrhagic nephritis, but the spleen was small. Macroscopical and cultural examination showed *Bacillus anthracis*. We also worked in the laboratory. Examination of numerous *Planorbis* from Bahia and Aracajú failed to reveal any *cercariae*.

16 VIII We visited the Hospital D. Pedro II, where we saw many patients, suspected of schistosomiasis or suffering from malaria, anemia, tuberculosis, heart disease etc. and left many small tin boxes for samples of feces. Afterwards we went to the isolating hospital and saw a few cases of bubonic pest and some other patients, from whom we ordered samples for examination. Dr. PENNA and our servants found eggs of *Schistosomum* in specimens furnished by five pupils of the school.

17 VIII. In the morning we worked in the laboratory; in the afternoon the director of the sanitary service took us to the Hospital for ulcers where we found more than a thousand patients, almost all of them with ulcers, either common, or due to syphilis, ankylostomiasis or fuso-spirillar infection. Cases of *leishmaniosis* were rare or absent, as far as we could judge from mere sight. We ordered some specimens and combined a day for working at the Hospital. From there, we went to the leper hospital.

18 VIII. At the school we were informed that the director of the sanitary service was prevented from accompanying us, so we resolved to visit the veterinary school, established in Olinda by the order of St. Benedict. We saw the convent rich in interesting historical relics and memories

and the garden with its secular trees, also the school and the hospital. There we found a horse with *osteomalacia* and a dog with *filariosis* and *sero-hemorrhagic peritonitis*.

19 VIII. Accepting an invitation from the Director, Mr. FELICIANO DA ROCHA, we visited the agricultural school in Socorro, where we saw interesting culture plants and gathered several insects as well as land and fresh water shells. Among them were a *Physa* and a small *Planorbis*, which I considered as a young and little pigmented specimen of *Pl. centimetralis* LUTZ. They were not infected.

20 VIII. We visited the lunatic asylum where I failed to find any indications of *pellagra*. We saw cases of *ankylostomiasis*, *scabies*, and an ulcer with abundant spirillae and spindle-shaped bacilli. There were some cases of *infantilism*, but we noticed the absence of *goitre*.

20 VIII. In the Hospital for Ulcers we examined 20 cases of untreated ulcers, many of the patients showing signs of *ankylostomiasis*. Many of the ulcers were due to *syphilis*, as shown by the bone lesions, which complicated them; some gave the impression of common ulcers with few bacteria. We failed to find a case of *fuso-spirillar ulcer* or of *leishmaniosis* but found 2 typical cases of *yaws* (bouba).

From Socorro we received living specimens of *Pseudofiersia meleagridis*, a pupiparous fly, common on the turkey in Pernambuco; blood slides of turkeys did not reveal any blood parasites.

In the material from the lunatic asylum and the hospital for ulcers, we discovered 2 specimens with eggs of *Schistosomum*; one of them was from a patient whose infection was referred to Palmares.

In some pools near Afogados one of the servants found *Planorbis melleus* LUTZ and larvae of *Mansonia*.

22 VIII. In the morning we worked in the laboratory, and found eggs with lateral spine in two more samples, sent from the General Hospital. In the afternoon we made an excursion to Dous Irmãos where we examined a pond with aquatic vegetation,

finding a few small *Planorbis* and also mosquito larvae and nymphae. We were not troubled by blood-sucking flies or gnats.

23 VIII. The morning was spent at the laboratory; in the afternoon we visited the old water reservoir of Beberibe. We caught adult mosquitos of the genera *Taeniorhynchus*, *Mansonia* and *Haemagogus*. There were some larvae of *Culex* and *Anopheles* but no signs of *Planorbis*.

24 VIII. In the sugar-factory of S. João near Varzea we examined two ponds, one of them in communication with the river Capiparibe, but though they looked very promising, they contained no *Planorbis*. We caught some frogs and enormous tadpoles, the gut of which was quite free from parasites, not containing even *Opalinae*. We also collected larvae of *Aedeomyia squamipennis* and of *Anophelinae*.

25 VIII. We made all the preparations for a journey to Natal.

26 VIII. We left by train for Natal and travelled all day through country which became gradually more dry, after we left the coast. In many places we saw cotton plantations. We passed the night in Guabira or Independencia, where there are two ponds. In one of them we found some very large frogs, known in the North by the name of *gia*, some *Bufo marinus* and specimens of a large *Ampullaria*; none of them contained interesting parasites. The inns, where travellers have to pass the night, are very primitive and abound in *Stegomyia*, making the place rather dangerous.

27 VIII. In the morning we saw the damage done by the "lagarta rosea" (larva of *Gelechia gossypiella*) to the cotton of this region. During the whole expedition we never saw plantations quite free from it. — We continued our journey and arrived at Natal, in time to visit the governor, who introduced us to the authorities of the place.

28 VIII. We visited the hospital where we found a patient with *Schistosomum*, arrived from Boa Cica.

29 VIII. We made an excursion to the lake of Estremoz, but failed to obtain a canoe. Still, we gathered two species of *Planorbis*. The first, of which we obtained numerous live specimens, was *guadaloupensis*. Of the second, *centimetralis*, we only obtained a few small specimens alive, but a large number of empty and quite bleached shells.

30 VIII. In the morning we visited the water supply and a pool near it, without finding any *Planorbis*; in the afternoon we went to the strand of Areia Preta and returned over very high dunes without finding anything of great interest.

31 VIII. Excursion to Ceará-Mirim. We took an early train to Estremoz, from where we went on a trolley, driven on the rails by men with poles. During the traject we examined a large number of pools and some more after arriving, but only in one of them did we find *Pl. centimetralis*, in fair number.

1 IX. We returned by train and found that one of the servants had collected some *Pl. centimetralis* and many *nigrilabris* inside the limits of the city.

2 IX. Failing to find enough material for study, we decided to proceed to Parahyba. The train stopped in Independencia for the night, giving us the chance of examining the other pond. Here we found many *centimetralis*, which were wanting in the ponds first examined. It is not at all uncommon to find such differences in fresh water collections, situated close to one another.

3 IX. During the journey we saw a good deal of cotton attacked by *Gelechia gossypiella*. We arrived early in Parahyba. After visiting the governor who received us very kindly, we went with the director of the sanitary service to the general Hospital. We noticed the comparative frequency of stones in the bladder and saw a good deal of ankylostomiasis, malaria and many ulcers of the leg. We visited the Lagoa de Baixo, which is rather shallow and covered with *Pistia stratiotes*, on which we found many *Planorbis cimex* and another small species of the same sub-genus *Spirulina*. There

were other land and fresh water shells but no larvae of *Mansonia*.

4-6 IX. I visited a new asylum for poor people and made several excursions without finding any *Planorbis*. Only in the Rio Jaguaribe did we collect a few *centimetalis* and the common black *Physa*. The rest of the time was spent in the hospitals, where several cases of *Schistosomum* were discovered.

7 IX. We took the train to Pernambuco. While Dr. PENNA with his servant went on to Pau d'Alho, Dr. LUTZ and the other servant stopped in Floresta dos Leões and walked on the line to Lagoa do Carro. On this side of the station, there is a brickfactory where they found many *Planorbis cultratus* and some *centimetalis*. In the large pond, which gave its name to the place, there were no *Planorbis*. Dr. PENNA also, found *centimetalis* in Pau d'Alho; besides the normal type, there was an orange colored variety. He also verified the existence of *Triatoma rubrofasciata*. From Lagoa do Carro we took the train to Limoeiro.

8 IX. In the Rio Capybaribe, I found numerous *Planorbis centimetalis* and *Planorbis cultratus*, in some ponds covered with *Pistia stratiotes*. They also contained larvae and nymphae of *Taeniorhynchus pseudomansonia*.

9 IX. In Limoeiro we found many *Pl. centimetalis*. Excrements found on the bank of the Rio Capybaribe were examined and two of them showed eggs of *Sch. mansoni*.

10 IX. We took an early train and spent the day and the night in Campo Grande, where we collected *Pl. centimetalis* in the rivers Tranquinhaem and Capybaribe. There were also some very large *Ancylus*. *Gelechia gossypyella* was common on the cotton plantations. We also collected specimens of *Pseudolfersia* on turkeys. The local flora is interesting. I found *Cochlospermum insigne* ST. HIL. (*Bixaceae*).

11 IX. We returned to Recife, where we attended to the most pressing business.

12 IX. In the Hospital do Isolamento we saw a patient with yellow fever who had

come from Natal and slept in Independencia. We made macroscopical examinations in cases of *ankylostomiasis* from Campo Grande and places on the river Capybaribe. We also observed that *Pl. centimetalis* and its light variety offered great attraction to the miracidia of *Schistosomum mansoni*.

13 IX. I went to Jabotão taking with me a boy, infected with *Sch. mansoni*, to show a pond where he used to bathe; there we found many *Pl. centimetalis*, but failed to find any *cercaria* with forked tail. We made various studies at the laboratory.

14 IX. Excursion to the river Beberibe where we failed to find any *Planorbis*, though we found eggs of *Schistosomum* in excrements, left close to the water.

15 IX. In the laboratory we infected some *Planorbis* with the miracidia of *Sch. mansoni*; afterwards we took the train to Victoria and found many *Pl. centimetalis* and some *cultratus* in a brook which passes through the town; on its banks we found excrements containing eggs with a lateral spine.

16 IX. We took the train early in the morning and passed by Gravatá, where we noticed conditions favourable to the formation of a focus of infection. We passed the night in Bezerro, and found many *centimetalis* in the Rio Ipojuca.

17 IX. We went to Gonçalves Ferreira by a freight train and visited some places, where a patient had been infected. In the river there were many *centimetalis*. Afterwards we continued the railway journey to Caruarú, where we enjoyed a fine view from the Morro da Igreja.

18 IX. In the morning we collected many *centimetalis* in the Rio Ipojuca, which passes through the town. In the afternoon we made about 40 kilometers on horseback to the Fazenda Fortaleza near Altino; we were informed of the existence of *Triatoma megista* in the neighbourhood. Dr. CAMARA and his family received us very well and gave us valuable information.

19 IX. We went on horseback to Furna d'Água, where we found *Triatoma* but no infected specimens, and returned to Fortaleza, the distance covered being about 13 to 14 kilometers. Afterwards we found some *Planorbis centimetralis* in an affluent of the river Una and obtained evidence of Schistosomum infection in man. Near the house there were some large breeding places of *Culex taeniorhynchus*. On the return journey we stopped at the falls of the rio Mentiroso, where there was a species of *Podostemonaceae* with larvae and nymphae of *Simulium orbitale*. The flora was rich and interesting, as the road crosses some mountain chains, where the land was less dry than in the other country we had passed through.

20 IX. We took the train to Bello Jardim, where we found *centimetralis* in some ponds and in the river Bitury. We also got some evidence of the presence of *Sch. mansoni*.

20 IX. We returned by rail from Bello Jardim to Recife.

22 to 24 IX. The weather was rainy. We worked in the laboratory, visited the hospital and got ready for a new journey.

25 IX. We took the train to Palmares where we examined the river Una up stream from the town; we collected many *centimetralis*, one species of *Ancylus* and several of *Simulium*.

26 IX We walked to the rapids at the railway bridge, where we found the beautiful flowers of a *Podostemonacea* and many larvae and nymphae of *Simulium*. Afterwards, we accepted the amiable invitation of Coronel PEDRO LUIZ PARANHOS FERREIRA, who showed us his important fazenda, in which there are some fine woods. We took a ride with him and collected some 50 *Tabanidae* belonging to about 12 species. The most common was *Tabanus (Macrocormus) oculus* which I knew from Pará; it is also very common in *Venezuela* and *Ecuador*.

27 IX. We took a freight train to Colonia, where there is a sugar factory, and after-

wards the passenger-train to Guaranhuns where we passed the night.

28 IX. We left at four o'clock in the morning, and motored the 240 kilometers which separated us from the factory and settlement of Pedra, in CORONEL DELMIRO DE GOUVEIA's cars. We passed through a very arid region, where all the rivers were either dry or interrupted. In their remnants and in some ponds which still remained, we found several specimens of *Planorbis centimetralis*. The xerophytic flora was very poor, but we saw some interesting animals.

29 IX. We visited the factory and the settlement, finding both of them very interesting. In the afternoon we went by motorcar to the celebrated falls of Paulo Affonso, walking the last 3 kilometers.

30 IX. We visited the falls of Paulo Affonso. They are divided and can not be seen entirely except from a great distance, but their sight is very beautiful. The most imposing and impressing view is that from the iron stairs leading down to the engine-house, which is suspended above the last and most perpendicular fall, like a bird cage on a wall. The river, at the time of our visit, was very low and allowed us to gather some *Podostemonaceae* (of the genus *Ligea*) on which there were larvae and pupae of *Simulium orbitale* LUTZ. In another arm of the river, now dry, I found the same pupae on a stone wall, which is very unusual. It is remarkable that this species, is the only one, found in the large falls of Pirapora and Paulo Affonso.

1 X. In PEDRA we observed a small epidemic of *alastrim* (milk-pox). We examined specimens from 15 people, without finding one egg with lateral spine.

2 X. I examined and photographed a case of madura-foot. This disease, probably imported to Brazil where it is generally rather rare, seems somewhat more frequent in the State of Alagoas, to judge by some observations made in Bahia. Shortly after noon we took the train and reached Piranhas a little before 4 p. m. We hired a large

and heavy boat with its fore part roofed over; it is here called a *canoa*. We left at 6 p. m. but stopped soon because of a strong headwind and only took to the oars at 9 o'clock.

3 X. We passed PÃO DE ASSUCAR and many other places. The wind was always very strong and unfavourable. We observed no shells, no game and no fish. The night was spent on board.

4 X. We cruised all day with an unfavourable wind and arrived at night only, in PROPRIÁ, where we landed.

5 X. In the town there is a pond, now half filled up by order of the Federal Government, where we found many *Planorbis centimetralis*, containing two species of *Cercariae* with forked tail, one of them with eyes and the other showing a very deeply divided tail. There was a third *Cercaria* with a single and very long tail found in *centimetralis* which I collected in the Lagoa da Pedrinha below the town.

6 X. We went by canoe to the Lagoa de Oity, above the town, where, as in the one just mentioned, there is an extensive culture of rice. We found two species of *Bivalves* but no *Planorbis*. We collected several *Paederus*, here called *potó*.

7 X. With Dr. MOACYR LEITE, I visited the hospital and saw a patient with cirrhosis of the liver. The stools contained a large number of *Schistosomum* eggs, which were buried in mucus and had a white shell. The patient confessed to a taste for strong drinks, so that the influence of the parasites was uncertain. — Afterwards we took the train to Aracajú. During the journey I found the first *Planorbis olivaceus* in Murta, near to a tributary of the Rio Japaritubá.

8 X. The secretary of the Interior, to whom we had a letter of introduction, received us very well and attended to all our wishes. We collected many *olivaceus* near to the school and in a pond called Lagoa da Egoa. They contained *Tetracotylus* and *Cercariae* with simple tail, but none of *Schistosomum mansonii*.

9 X. We went by steam-launch to La-

rangeiras where at that time, *Planorbis* were rare and uninfected, but we found evidence of infection by *Schistosomum mansonii* in man.

10 X. In the hospital, we saw many cases of ulcers, some of them due to tertiary syphilis. Stones in the bladder were comparatively frequent. Afterwards, we searched several pools unsuccessfully and examined specimens, some of which contained eggs of *Schistosomum*.

11 X. We went on horse back to the *Colonia Agricola*, accompanied by its director, Mr. TRAVASSOS. The road crosses dunes and plains of pure sand with a very interesting vegetation. In the river POXY-MIRIM, there were some *Planorbis* which seemed to be small *olivaceus*. They contained three kinds of *Cercariae* with forked tail, one of them belonging to *Schistosomum mansonii* and the others like those of Propriá. With great difficulty we obtained a few specimens of *Triatoma rubrofasciata* in a house where they had been discovered before.

12 X. A large number of examinations, made in Aracajú, yielded a proportion of 27 to 28 % showing eggs with lateral spine. They were most numerous in the specimens obtained from a girl come from Capella. I went to the prison, where I chose twenty men from different regions, so as to obtain some information on the distribution of the parasite in this country.

13 X. In the hospital, we examined the girl from Capella, and found her spleen and liver small. Her mother infected in lesser degree had a large spleen and a small liver. We examined more pools and ponds, near to the hospital, which is rather far from the town. Only in the Lagoa da Telha did we find *Planorbis olivaceus*, some of the specimens being infected with the first stages of *Schistosomum mansonii*. Examining 22 specimens mostly sent from the prison, the eggs with lateral spine were found seven times. Taking into account that recent or slight infections may escape a somewhat superficial examination, the average proportion of infected people among the lower classes is probably more

than 1 to 3.—To-day I saw a large goitre of old standing, acquired in Propriá where no other case was known.

14–15 X. These days were spent in working at the laboratory, preparing the journey and taking leave.

16 X. We travelled by train to Bahia and spent the night in Timbó.

17 X. Before leaving, we collected many adult *Pl. olivaceus* in a small pond near to the station. Then we continued our journey through a region where *Pl. olivaceus* is found, and collected some specimens in Alagoinhas where according to Dr. MAURILIO PINTO, the shell is common. At night we arrived in Bahia.

18 X. We established our laboratory in the house of the Capitão do Porto, kindly offered to us.

19 X. We collected large *Pl. olivaceus* in the *Tanque da Conceição*; they only contained a *Cercaria* with unforked tail, and many cysts of *Schistosomum*.

20 X. Excursion to the Lagoa da Amalinhá where we found only *Pl. nigricans* LUTZ.

21 X. We examined the waterworks in Queimadas and Cabulla without finding any shells. We collected larvae and nymphae of *Simulium brevibranchium*, a species characteristic of the State of Bahia.

22 X. We worked at the laboratory.

23 X. We made a journey to Cachoeira, where we collected many *Planorbis* in the river Catinga. They seemed to be small *olivaceus* and contained the cercaria of *Sch. Mansoni* and another with unforked tail.

24 X. In the morning, we explored the river Paraguassú but found no *Planorbis*. In the rapids there grew a *Podostemonacea* with many larvae and nymphae of *Simulium orbitale*. In the afternoon we took the train to Feira de Sant'Anna.

25 X. In a well near the town, we found many specimens of *Physa* and, in a large pond, adult *Pl. olivaceus*, infected with *Sch. mansoni*. While examining several pools which were almost dry and very much exposed to sunrays, we found empty shells

of the same species and very few living specimens, all of them small.

26 X. Return-journey to Bahia.

27 X. Excursion to the island of Itaparica. In the Lagoa Grande we found a few *Planorbis* and close by, several *Tabanidae* and many ticks. On account of the heavy sea we spent the night on the island.

29 X. We returned early and found that there was no accommodation in the Lloyd steamer, so we resolved to embark on the Itaquera. We hurried our preparations and leave taking and went on board under torrential rain.

30 X. Heavy storm at sea.

31 X. The weather improved.

1 XI. We stopped a short time only, in Victoria.

2 XI. We cast anchor in the harbour of Rio de Janeiro at 9.30 a. m.—

The following chapters are written by Dr. OSWINO PENNA:

On the frequency of *Schistosomum Mansoni* in the visited States as shown by macroscopical examination.

“During our journey we took notes of 312 coprological examinations. There were a good many others, of which, for various reasons, we took no notes. We give the results by order of the States in which they were made.

Rio Grande do Norte.

At Natal, we examined specimens from 25 pupils of the School of Marine Apprentices, as regards eggs of *Schistosomum mansoni*. At the General Hospital we examined specimens from 19 individuals, obtaining 3 positive results; these patients had come from the place called Boacica, where, as we were told, there is a pond containing *Planorbis*.

Parahyba.

We examined specimens from 25 pupils of the Marine School finding eggs of *Schistosomum* in 3 of them. Out of 32 patients of the Sta. Isabel Hospital there

were results in 4 cases. The bearers of these eggs had apparently been infected in the Capital and in Lagoa Grande; one of them had come from Pau d'Alho in Pernambuco.

Pernambuco.

Shortly after arriving, we examined specimens from 25 marine apprentices; 7 of them were infected by the trematode under study. We received specimens for examination from the hospital, the lunatic asylum and the alms-house. 15 out of 46 individuals contained eggs of *Schistosomum*. We also made 22 examinations of specimens, gathered at random during our journey in the interior of the State; 8 of them gave positive results. The bearers of these eggs came from the following places in the interior of Pernambuco: Bom Jardim, Bello Jardim, Limoeiro, Campo Grande, Pau d'Alho, Victoria, Bezerros, Beberibe, Gonçalves Ferreira, Caruarú, Altino, Palmares, and Jaboatão. These places are situated on the banks of the following rivers: Capibaribe, Ipojuca, Beberibe, Una and their affluents. In all these, the Rio Beberibe excepted, *Planorbis centimetralis* LUTZ was found.

Sergipe.

As usual, we first examined specimens from pupils of the Marine School; 6 out of 25 were proved to be bearers of *Schistosomum* eggs. We examined specimens from 18 prisoners with 5 positive results, and from 24 patients of the Hospital; 8 of these had *Schistosomum*. Out of 8 examinations of specimens, gathered at random, 5 showed the eggs. The places where the bearer of the adult form of this worm had stayed for some time, were: Aracajú, Japarutuba, Maroim, São Christovão, Laranjeiras, Itaporanga, Capella and Propriá. In several of these places we personally verified the presence of *Planorbis olivaceus*; some of them had been infected by the miracidium of *Schistosomum*

mansoni, as was proved by their producing cercariae of this trematode. In Propriá we found moreover *Planorbis centimetralis* LUTZ.

Bahia

Out of 25 oohelminthological examinations of specimens, sent from the School of Marine Apprentices, 4 were positive as regards *Schistosomum*. From the Hospital we obtained 8 different specimens, of which 3 contained eggs with a lateral spine. In 9 specimens, gathered near rivers and ponds containing infected *Planorbis*, we obtained 5 positive results. The places in Bahia, where the bearers of these *Schistosomum* eggs had always lived or had stayed for some time, were: Feira de Santa Anna (here we found *Planorbis olivaceus* in the Tanque da Nação), Cachoeira with the rivers Pitanga and Caquende (here we verified the presence of *Planorbis* infected by this trematode), Itapagipe and Silva Jardim.

On our first journey to Pernambuco, we went on shore at Maceió and visited the Hospital. In answer to our inquiry, as to whether there were patients suffering from amoebic dysentery we were told that there was an old and exceptionally severe case, which had defied all treatment. We asked them to send us a specimen from the patient, if possible, so that we might examine it on board. On our returning to the ship we found the specimen which was immediately examined; we failed to find any amoeba, but discovered plenty of *Schistosomum* eggs; it even showed a greater proportion of eggs than any specimen examined up to that date. We wrote several times asking for information about this patient, but unfortunately failed to get any.

Of 312 specimens examined, 71 contained eggs of *Schistosomum*, giving an average of 22, 75 o/o. Resuming these rapid and insufficient statistics of human bearers of the parasite found in the northern States visited on our journey, we have:

Rio Grande do Norte.	44	examinations	3	positive.	.....	6,81	%
Parahyba do Norte.	57	«	3	«	.....	5,26	%
Pernambuco.	93	«	30	«	.....	32,25	%
Sergipe.	75	«	23	«	.....	30,66	%
Bahia.	42	«	12	«	.....	28,57	%

At first sight already, one notices the difference between the States of Rio Grande do Norte and Parahyba on one side, and the remaining States on the other, as regards the percentage of bearers of *Schistosomum*. On account of this we stayed only a short time in the former states and gave most of our time to the latter, specially to Pernambuco and Sergipe as more favourable to our studies and hardly investigated before. We almost expected this beforehand as the examinations of specimens furnished by the patients of the Marine Hospital, had always shown the greatest percentage of bearers of eggs of *Schistosomum* among individuals come from Pernambuco, Sergipe and Bahia.

None of the examined specimens was entirely free from worm eggs, excepting those from 4 members of a family, come to Aracajú only 4 months before from the South of Brazil. As to the frequency of eggs of the several species of worms found in feces, the order is as follows: 1^o *Ankylostoma*, 2^o *Trichocephalus*, 3^o *Ascaris*, 4^o *Schistosomum mansonii*, many specimens showing eggs of all 4 species; these cases we called "polyvalent".

Plague.

On arriving at Recife, we were invited to visit the Isolation Hospital of Santa Aguida, where patients suffering from dysentery were received: here we looked out for cases of infection by amoebae and *Schistosomum*. We were shown two cases considered suspect of plague, one almost cured and the other one much improved. From the latter, we withdrew some pus of a bubo, which on examination proved sterile; this result favours the diagnosis plague. While going down the São Francisco we were told of cases suspect of plague, in Villa Nova (Sergipe), on the banks of the same river. By very circum-

stantial and often repeated information, we feel sure that it really was plague, some of the cases even showing the pulmonary form. Later on, our suspicions were confirmed by information obtained from two doctors, appointed by the Government of Sergipe to study this epidemic. After our return from Rio Grande do Norte to Recife, we found in the same hospital, four typical cases of plague, in which all the circumstances justifying the diagnosis of epidemical plague, were present.

All the patients came from the same part of the city, from neighbouring houses, (where a few dead rats had been found,) except one who came from another part of the city; he had, however, shortly before passed a night in one of the above mentioned houses. It was not the first time that cases with similar symptoms had occurred in this place. The laboratory researches also confirmed the clinical diagnosis. On our way to Caruarú in the South of the State of Pernambuco, in a place called Gonçalves Ferreira, where we looked for Planorbis and patients suffering from schistosomatoses, we were told that some kilometers away some people had died with buboes in the inguinal and axillary regions; their death was preceded by the finding of dead rats. At first we intended to verify the exactness of this information, in loco, but gave it up, as we were told that there were no more patients.

Yellow fever.

As to the presence of yellow fever, we invariably got negative information even in Alagoas. We left however convinced, that cases of yellow fever had occurred or were occurring. From time to time, a doctor spoke to us in undecided terms of suspect cases, but immediately tried to divert suspicion by affirming that the disease was

bilious remittent fever. So we arrived at Rio Grande do Norte and went back to Recife, having obtained no reliable information as to the existence of yellow fever. Some days after our return to Recife, we again visited the Isolating Hospital in search of cases of dysentery. On being invited to see an interesting patient, we found a typical case of yellow fever, already diagnosed and conveniently protected from blood-sucking insects, or to be more exact protecting them from the patient. We followed up this case; the disease lasted four days and ended in death. This patient had come from Natal in Rio Grande do Norte, having passed the night in Guarabira or Independencia. (in Parahyba); he became ill three days after his arrival at Recife.

The patient was a Syrian, recently come to Brasil (about three months before). During our travels through these two States we heard of another case of yellow fever, diagnosed by local doctors. We believe that there is an endemical occurrence of uncharacteristical yellow fever cases, which pass unnoticed, the patients not being isolated. This facilitates the infection of *Stegomyia* which, by biting not immune people, generally strangers, produce the severe forms. It is quite possible that countless patients, classified as cases of bilious remittent fever, are really cases of mild yellow fever, and that instead of being treated as important cases of common infections, they ought to be isolated as suspect cases. This may be the only way of putting an end to such bearers of virus, forming foci of infection for the transmitting mosquito.

On leaving the State of Bahia, we were informed by Dr. OCTAVIO TORRES that another case of yellow fever had been verified. The patient was a priest come from a town in the interior of Sergipe where he had been nursing a colleague suffering from symptoms, similar to those he now showed himself.

So we have endemical cases of yellow fever and a very large quantity of *Stegomyia* in these northern States.

Paludism.

As to paludism, we did not observe anything little known or specially noticeable. What we saw, is already common knowledge. Cases of malaria and *Anophelinae* in every part. In some places, there were exacerbations of the endemic in the form of more or less severe epidemics. This has happened of late in Alagoinhas, in Parahyba and in Cachoeira de Paulo Affonso. We arrived with the impression that the greater part of hypoemic patients suffered from malaria, but returned convinced that two thirds of the cases of anemia are due to ankylostomiasis and one third only to paludism. Many patients had the worm in the intestine and the protozoon in the blood. We even found some patients suffering from the five most common infections which are the heaviest scourges of Northern Brasil: ankylostomiasis, paludism, syphilis, dysentery and schistosomiasis. The latter, although the mildest, is nowadays spreading at an astonishing rate.

Of all the places we visited in the North, only in the city of Propriá, on the bank of the São Francisco in Sergipe, was there anything done against this endemical disease. They were filling up a large pool, which, besides being a breeding place of *Anophelinae*, was full of *Planorbis*, infected by several species of cercariae; the same pool received all kinds of refuse.

Ankylostomiasis.

This scourge is a true calamity in the North. One may say that 85 % of the coprological examinations, made in the interior of these Northern States show the presence of *Ankylostomum* eggs. We feel sure that at least 70 % of the individuals who furnished this material, really suffered from ankylostomiasis while the others were only bearers.

All the clinical forms of this worm disease are met with. It is quite interesting to see how other lesions which intercurrently appear in patients suffering from this form of helminthiasis, differ from the usual form in

their course and features. It is hard to imagine what will become of these people and their offspring in course of time, if nothing is done against this disease. After visiting the interior of these four States, one feels how absurd it is to talk of ankylostomiasis in certain other regions, so high is the proportion in number and intensity here shown by this parasitical disease.

Nobody can have even a faint idea of the intensity and the extension of ankylostomiasis in these northern States, nor is any

one troubling about it and few are the people in these regions, who, in all their lives have taken some antihelminthic, or who are in the habit of using sanitary installations or shoes".

Conclusion.

This number also contains a monograph on brazilian Planorbis. Later on, we hope to publish a paper on the Trematodes found in them.
