

SOME HELMINTH PARASITES OF PANAMANIAN PRIMATES

VERNON E. THATCHER and JAMES A. PORTER, JR.

Made in United States of America

Reprinted from

TRANS. AMER. MICROSC. SOC. 87(2): 186-196, 1968.

SOME HELMINTH PARASITES OF PANAMANIAN PRIMATES¹

VERNON E. THATCHER² and JAMES A. PORTER, JR.

Gorgas Memorial Laboratory, Panama, R. P.

ABSTRACT: Helminths were recovered from 235 (57%) of 412 Panamanian primates. Five species of trematodes, three species of cestodes, 14 species of nematodes, and three species of acanthocephalans were found. Seventeen new host records and 15 new locality records are reported. *Spirura tamarinii* Cosgrove, Nelson & Jones, 1963, is regarded as a synonym of *S. guianensis* (Ortlepp, 1924). *Zonorchis goliath* Travassos, 1945, and *Echinostoma aphyllactum* Dietz, 1909, are reported from primates for the first time and *Parabronema bonnei* (van Thiel, 1925) Diaz-Ungria, 1965, and *Controrchis biliophilus* Price, 1928, are reported from primates for the third time.

Although helminths have been reported from Panamanian primates (McCoy, 1936; Faust, 1935; Caballero et al., 1952), apparently no general survey for these parasites has been made previously in Panama. The present study, while not exhaustive, is a record of helminths found in primates maintained in the laboratory varying lengths of time for malarial studies. From August 1965 to May 1967 helminths were recovered from 235 (57%) of 412 primates autopsied. Table I shows the species distribution of the primates examined, the numbers examined, and the numbers positive.

MATERIALS AND METHODS

Primates were purchased at the laboratory from native collectors. When an animal died, it was autopsied to determine the cause of death. First, the skin was removed and filarial worms were searched for in the subcutaneous tissues. Next, the internal organs were removed, placed individually in dishes of physiological saline, and either incised or teased apart. The intestinal tract, on being opened, was cut into sections and washed in saline. Any helminths seen were preserved for subsequent study.

Trematodes and cestodes were killed with gentle heat, fixed in alcohol-formalin-acetic acid solution, stained with Mayer's carmalum, and cleared in methyl salicylate. Acanthocephalans were killed in freshwater in order to make the proboscis protrude, preserved in 70% alcohol, and stained in the same manner as the trematodes and cestodes. Nematodes were killed and preserved in 70% alcohol. They were then studied in lacto-phenol solution and mounted in polyvinyl alcohol containing lacto-phenol. Face-on views of the nematodes were obtained by mounting the heads in glycerine jelly.

SYSTEMATIC RECORD

- Phylum Platyhelminthes Gegenbaur, 1859
- Class Trematoda Rudolphi, 1808
- Subclass Digenea Carus, 1863
- Family Dicrocoeliidae Odhner, 1910
- Athesmia heterolecithodes* (Braun, 1899)

HOSTS: *Saguinus geoffroyi*, *Aotus trivirgatus*, *Cebus capucinus*.
SITE: Bile ducts.

¹This study has been supported in part by the United States Army Medical Research and Development Command under Grant DA-MD-49-193-67-G-9234 and in part by The National Institute of Allergy and Infectious Disease, N.I.H., U.S.P.H.S. under Grant AI-01251. This is contribution No. 287 to the Army Research Program on Malaria.

²Present address: International Center for Medical Research and Training, Universidad del Valle, Tulane University, Aptdo. Aereo 5390, Cali, Colombia.

TABLE I

Species distribution of Panamanian primates showing numbers examined and numbers positive for helminths

Primate species	Number examined	Number positive for helminths
Cebidae		
<i>Aotus trivirgatus</i>	125	72
<i>Cebus capucinus</i>	19	10
<i>Ateles fusciceps</i>	46	17
<i>Ateles geoffroyi</i>	7	4
<i>Alouatta villosa</i>	54	17
Callitrichidae		
<i>Saguinus geoffroyi</i>	161	115
Totals =	412	235

LOCALITIES: Panama, San Blas, and Chiriqui Provinces; and (Barro Colorado Island) Panama Canal Zone.

Athesmia heterolecithodes was the commonest trematode encountered. It was found in 36 marmosets, eight night monkeys, and two white-faced monkeys. From one to 70 trematodes were recovered from each infection.

The species of *Athesmia* found in simians has been called *A. foxi* Goldberger & Craue, 1911, and this name was recognized by Faust (1967). However, Teixeira de Freitas (1962) believed that the only valid species in the genus is *A. heterolecithodes*. He pointed out that there was no valid morphological basis for the separation of the alleged species of *Athesmia*. Since specimens in our collection showed a range of intraspecific variation that overlapped the various published descriptions in the genus, we are in agreement with Freitas. *A. foxi* has been reported previously from the Panama Canal Zone by Caballero et al. (1952) from *Cebus capucinus*.

Zonorchis goliath Travassos, 1945

HOSTS: *Saguinus geoffroyi*, *Aotus trivirgatus*.

SITE: Bile ducts.

LOCALITIES: Panama Province and (Barro Colorado Island) Panama Canal Zone.

From one to 21 specimens of *Zonorchis goliath* were found in ten marmosets, and a single specimen was found in one night monkey. In two marmosets this trematode was present in a mixed infection with *Athesmia heterolecithodes*. *Z. goliath* was described from a Brazilian common opossum (*Didelphis marsupialis*). As far as can be determined, *Z. goliath* has been reported previously neither from Panama nor from simian hosts. We compared *Z. goliath* with *Z. allentoshi* (Foster, 1939) from Panamanian opossums. *Z. goliath*, by possessing longer caeca, a smaller acetabulum, and more limited vitellaria, is plainly distinct from *Z. allentoshi*.

Controrchis biliophilus Price, 1928

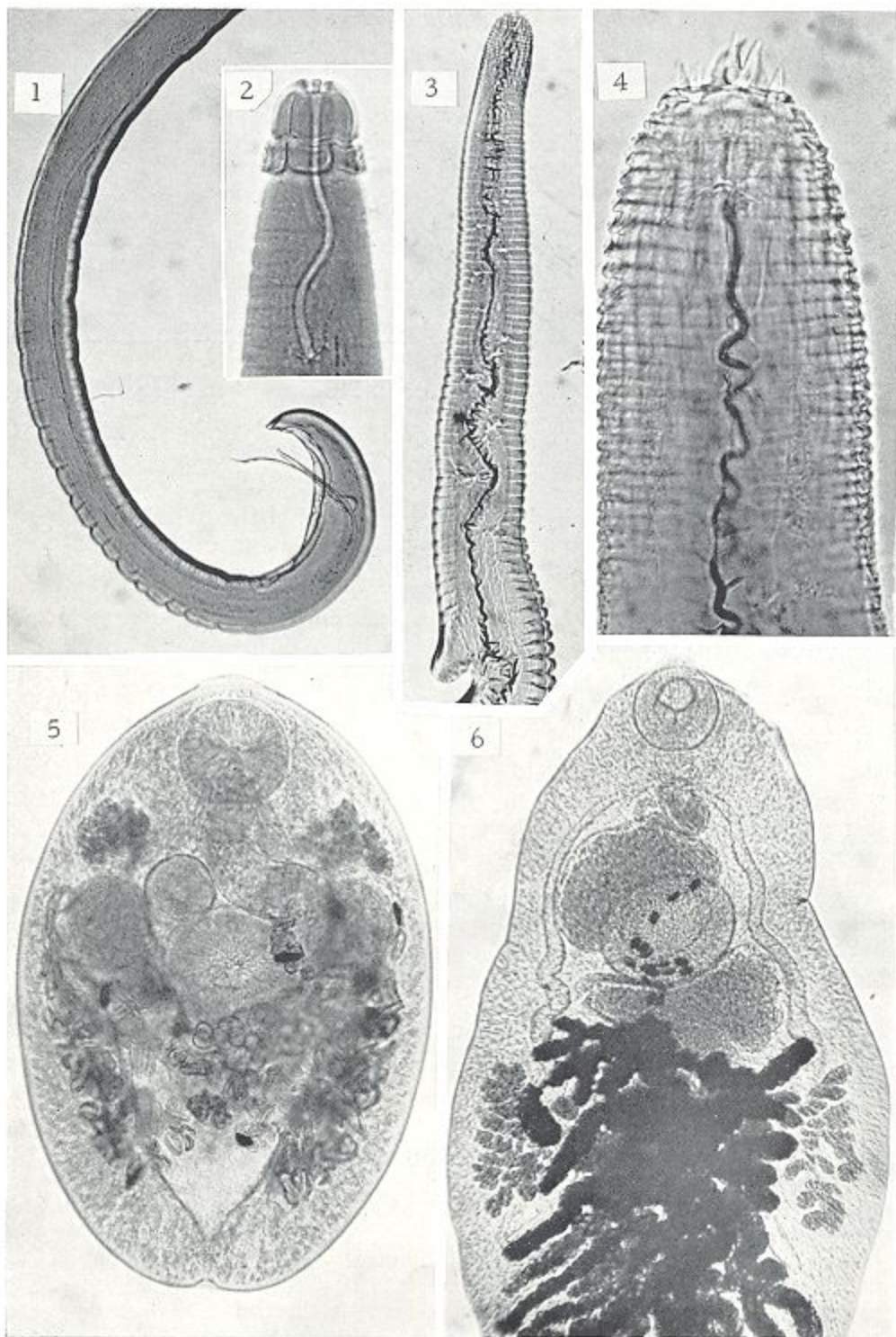
Figure 6

HOST: *Ateles geoffroyi*.

SITE: Bile ducts.

LOCALITY: Panama Province.

Some 135 specimens of *Controrchis biliophilus* were found in a single red spider monkey. Price (1928) described this trematode from a red spider monkey that originated from Nicaragua and died in a zoo in the United States. Jiménez-Quirós & Brenes (1957, 1958) have reported *C. biliophilus* from *Alouatta palliata* (Gray) from Costa Rica.



Travassos (1944) reduced Price's genus to the level of a subgenus of *Dicrocoelium*, but Skrjabin & Evranova (1952), as well as Yamaguti (1958), recognized *Controrchis* as a valid genus.

Present specimens are closely comparable to Price's description. Apparently *C. biliophilus* has been reported only twice previously.

Family Lecithodendriidae Odhner, 1910

Phaneropsolus orbicularis (Diesing, 1850) Braun, 1901

Figure 5

HOST: *Aotus trivirgatus*.

SITE: Small intestine.

LOCALITY: Panama Province.

About 80 specimens of *Phaneropsolus orbicularis* were recovered from a single night monkey. This trematode has been reported previously from South America but not Panama. Cosgrove (1966) lists *P. orbicularis* from the following genera of New World primates: *Aotus*, *Cebus*, *Saimiri*, and *Tamarinus*.

Family Echinostomatidae Poche, 1926

Echinostoma aphylectum Dietz, 1909

HOST: *Saguinus Geoffroyi*.

SITE: Small intestine.

LOCALITY: Panama Province.

Five specimens of *Echinostoma* were recovered from a single marmoset. All were fully mature and contained numerous eggs. The specimens measured 5–5.5 mm in length and had from 38 to 39 spines on the head collar. These specimens are closely comparable to *E. aphylectum*, which was originally described from Brazilian birds. We have not found any previous records of natural infections of *Echinostoma* in monkeys, but *E. revolutum* (Froelich, 1802) and *E. ilocanum* (Garrison, 1908) have been reported from man in Asia. According to Yamaguti (1958), the latter species has developed experimentally in monkeys.

Class Cestoidea (Rudolphi, 1808) Fuhrmann, 1931

Subclass Cestoda van Beneden, 1848

Family Davaineidae Fuhrmann, 1907

Railletina (Railletina) demerariensis (Daniels, 1895)

HOST: *Alouatta villosa*.

SITE: Small intestine.

LOCALITY: San Blas Province.

A single cestode was found in one of 54 black howler monkeys examined. Although the scolex was not recovered, the strobila was mature and plainly belongs to the genus *Railletina*. According to Dunn (1963), three species of this genus occur in neotropical primates, namely: *R. alouattae* Baylis, 1947; *R. demerariensis* (Daniels, 1895); and *R. trinitatae* (Cameron & Reesal, 1951). The present specimen is assigned to *R. demerariensis* on the basis of the number of

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FIGS. 1, 2. Male of *Parabronema bonnei* (van Thiel, 1925) Diaz-Ungria, 1965. 1. Tail, showing spicules, $\times 56$. 2. Head, showing plates and esophagus, $\times 400$.

FIGS. 3, 4. Anterior end of *Spirura guianensis* (Ortlepp, 1924). 3. Ventral boss, $\times 56$. 4. Pseudolabia, $\times 310$.

FIG. 5. *Phaneropsolus orbicularis* (Diesing, 1850) Braun, 1901, $\times 125$.

FIG. 6. *Controrchis biliophilus* Price, 1928, $\times 40$.

testes and egg capsules and the size and shape of the cirrus sac. The determination must be considered tentative, however, since variation is known to occur within the genus. Dunn (1963) stated, "The final taxonomic status of these three species remains in doubt."

Family Diphyllbothriidae Luehe, 1910
Spirometra mansonoides (Mueller, 1935)

HOST: *Saguinus geoffroyi*.
SITE: Subcutaneous in scapular region.
LOCALITY: Panama Province.

Spargana were recovered from eight marmosets. The number per infection varied from one to eight. Five of the spargana, reared to maturity in a kitten, showed the characteristics of *Spirometra mansonoides*. This species has been reported from domestic cats in Panama under the name *Diphyllbothrium mansonii* by Foster (1939). As Dunn (1963) suggested, it is probable that marmosets acquire spargana infections by ingesting frogs.

Family unknown
Unidentified, immature cestode

HOST: *Cebus capucinus*.
SITE: Small intestine.
LOCALITY: Panama Province.

A single, immature specimen of Cestoda without scolex was recovered from a white-faced monkey. This specimen could not be identified but, since *Mathevotaenia megastoma* (Diesing, 1850) is a common cestode of primates that has been reported from several species of South American *Cebus*, it is possible that this specimen represented *M. megastoma*.

Phylum Nematoda (Rudolphi, 1808) Cobb, 1919
Family Oxyuridae Cobbold, 1864

The nomenclature followed in this section on oxyurids is that proposed by Inglis (1961).

Trypanoxyuris (*T.*) *minutus* (Schneider, 1866)

HOST: *Alouatta villosa*.
SITE: Colon.
LOCALITIES: Darien and Panama Provinces.

Helminths believed to belong to *Trypanoxyuris* (*T.*) *minutus* were found in 14 black howler monkeys. Infections ranged from a few worms to more than 200.

Trypanoxyuris (*T.*) *interlabiata* (Sandosham, 1950)

HOST: *Aotus trivirgatus*.
SITE: Colon.
LOCALITIES: Chiriqui, San Blas, and Panama Provinces.

Infections of from a few to over 200 oxyurids were seen in 51 night monkeys. *Trypanoxyuris* (*T.*) *interlabiata* has been reported previously from the same host in South America by Sandosham (1950).

Trypanoxyuris (*T.*) *atelis* (Cameron, 1929), Sandosham, 1950

HOST: *Ateles fusciceps*.
SITE: Colon.
LOCALITIES: Darien, San Blas, and Panama Provinces.

Infections of *Trypanoxyuris* (*T.*) *atelis* were found in 12 black spider monkeys. Most infections involved only a few worms but 75 were obtained from one monkey. These specimens are closely comparable to the published descriptions of *T.* (*T.*) *atelis*.

Trypanoxyuris (*T.*) *trypanuris* Nevers, 1923

HOST: *Ateles geoffroyi*.

SITE: Colon.

LOCALITIES: Darien and Panama Provinces.

Light infections of oxyurids were found in three red spider monkeys. We believe that these helminths are conspecific with *Trypanoxyuris* (*T.*) *trypanuris*.

Trypanoxyuris (*T.*) *callithricis* (Solomon, 1933)

HOST: *Saguinus geoffroyi*.

SITE: Colon.

LOCALITY: Panama Province.

Trypanoxyuris (*T.*) *callithricis* was found in 52 marmosets. Infections usually consisted of only a few worms but 120 specimens were found in one marmoset.

Family Subuluridae Yorke and Maplestone, 1926

Subulura jacchi (Marcel, 1857)

HOST: *Saguinus geoffroyi*.

SITE: Colon.

LOCALITY: Panama Province.

Infections of from one to 23 worms of *Subulura jacchi* were found in seven marmosets. *S. jacchi* has been reported previously from marmosets in Brazil and Colombia.

Family Spiruridae Oerley, 1885

Spirura guianensis (Ortlepp, 1924)

Figures 3, 4

HOST: *Saguinus geoffroyi*.

SITE: Oesophagus.

LOCALITY: Panama Province.

Ortlepp (1924) described as *Protospirura guianensis* a single, male nematode from the oesophagus of "monki-monki" from Surinam. Chitwood (1938) placed Ortlepp's species in the genus *Spirura* because of the form of the pseudolabia and the presence of a ventral boss. Skrjabin & Sobolev (1963) also listed the species in *Spirura*, but Yamaguti (1961) retained the species in *Protospirura*. Cosgrove et al. (1963), who were apparently unaware of Ortlepp's work, described as new, *Spirura tamarini* from a South American marmoset [*Tamarinus nigricollis* (Spix)]. In the present study, we compared Panamanian specimens with worms previously collected from the same species of South American tamarins. The Panamanian and South American worms are apparently conspecific and specimens of both samples compare closely to the description by Cosgrove et al. Although the description of Cosgrove et al. is superior to that of Ortlepp, we believe that the latter was describing the same species. It is necessary, therefore, to consider *S. tamarini* as a synonym of *S. guianensis*.

S. guianensis was found in nine Panamanian marmosets. In one, the oesophagus was partially occluded by more than 200 worms which may have contributed to the animal's death. The other marmosets had infections of from one to 28 worms. The present report apparently represents new host and locality records for the species.

Protospirura muricola (Geddoelst, 1916)HOST: *Cebus capucinus*.

SITE: Small intestine.

LOCALITY: Panama Province.

A single, male specimen of *Protospirura muricola* was found in an infant white-faced monkey. This helminth is a common parasite of rodents and sometimes infects monkeys. Foster & Johnson (1939) reported *P. muricola* as pathogenic to captive white-faced monkeys at the Gorgas Memorial Laboratory in Panama. Calero et al. (1950) reported that 29% of 400 rats from Panama City were infected with *P. muricola*.

Parabronema bonnei (van Thiel, 1925) Diaz-Ungria, 1965

Figures 1, 2

HOST: *Alouatta villosa*.

SITE: Stomach

LOCALITY: Panama Province.

Parabronema bonnei was originally described from a howler monkey, *Mycetes* (= *Alouatta*) *seniculus* L., from Surinam under the generic name of *Squam-anema*. This genus was recognized and placed in the Family Habronematidae Ivaschkin, 1961, by Skrjabin & Sobolev (1963). Yamaguti (1961) also recognized van Thiel's genus but placed it in the Family Spiruridae (Subfamily Gongylone-matinae Nicoll, 1927). Diaz-Ungria (1964, 1965) rediscovered *P. bonnei* in *A. ursina* Humboldt from the Federal Amazonian Territory of Venezuela. He redescribed the species and placed it in the genus *Parabronema* Baylis, 1921. We agree with his opinion as the platelike head structures plainly show close affinities with the species of *Parabronema*.

Our collection consists of 20 specimens from a single black howler monkey. These specimens compare closely to the description by Diaz-Ungria (1964, 1965). Our report apparently represents the third report of *P. bonnei*, the first record from Panama (or Central America), and the first collection from *A. villosa*.

Family Dipetalonematidae Wehr, 1935

Dipetalonema gracile (Rudolphi, 1809)HOSTS: *Aotus trivirgatus*, *Ateles fusciceps*, *Ateles geoffroyi*, *Cebus capucinus*.

SITE: Peritoneal cavity.

LOCALITIES: Darien and Panama Provinces.

Dipetalonema gracile was found in six black spider monkeys, one red spider monkey, three white-faced monkeys, and 17 night monkeys. Infections consisted of from one to five worms. *D. gracile* has been found in primates from southern Mexico to Brazil and has been reported previously from Panama by McCoy (1936).

Dipetalonema marmosetae (Faust, 1935)HOST: *Saguinus geoffroyi*.

SITE: Subcutaneous tissues in scapular and lumbar areas.

LOCALITY: Panama Province.

Dipetalonema marmosetae was described by Faust (1935) from Panamanian marmosets in his new genus *Tetrapetalonema*. McCoy (1936) described two new species in the same genus from Panamanian spider and white-faced monkeys. Caballero (1947) recognized Faust's genus, but placed both of McCoy's species in synonymy with *T. marmosetae*. Yamaguti (1961) considered *Tetrapetalonema* to be a synonym of *Dipetalonema*.

In our study, filarial worms were found in 52 marmosets. Apparently, all represented *D. marmosetae*.

Family Physalopteridae Leiper, 1908

Physaloptera sp.HOST: *Saguinus geoffroyi*.

SITE: Stomach.

LOCALITY: Panama Province.

A single, immature, female specimen of *Physaloptera* was recovered from a marmoset. Determination of the species was not possible. Yamaguti (1961) lists *P. dilatata* Rudolphi, 1819, and *P. lagothericis* (Kreis, 1945) as occurring in South American monkeys.

Family Ascarididae Blanchard, 1849

Unidentified, immature ascaridids

HOSTS: *Saguinus geoffroyi*, *Aotus trivirgatus*, *Cebus capucinus*, *Ateles fusciceps*.

SITES: Peritoneal cavity and large and small intestine.

LOCALITIES: Panama, Colon, and Darien Provinces.

Unidentified, immature ascaridids were found in five marmosets, eight night monkeys, one white-faced monkey, and one black spider monkey. Infections consisted of from one to three worms located in either the intestinal lumen or in the peritoneal cavity. These helminths measured 10–30 mm in length and possibly represent a single species.

Family Ancylostomatidae Nicoll, 1927

Necator americanus (Stiles, 1902)HOST: *Cebus capucinus*.

SITE: Colon.

LOCALITY: Darien Province.

A single male of *Necator americanus* was recovered from a white-faced monkey. It is probable that this infection resulted from association with man prior to arriving at the laboratory.

Phylum Acanthocephala Rudolphi, 1808

Family Oligacanthorhynchidae Southwell & Macfie, 1925

Prosthenorchis elegans (Diesing, 1851)HOST: *Saguinus geoffroyi*, *Alouatta villosa*.

SITE: Lower ileum, cecum, and proximal colon.

LOCALITY: Panama Province.

Prosthenorchis elegans was encountered in only seven of 161 marmosets examined. From one to 12 worms were found per infection. An additional worm was found in a black howler monkey but, since this animal had been in captivity more than a month, this infection could have occurred in the laboratory. *P. elegans* has been reported many times from South American marmosets and monkeys.

Prosthenorchis lenti Machado, 1950HOST: *Saguinus geoffroyi*.

SITE: Proximal colon.

LOCALITY: Panama Province.

Three specimens of *Prosthenorchis lenti* were recovered from two marmosets. *P. lenti* differs from *P. elegans* in being smaller and lacking the conspicuous collar at the anterior end of the trunk.

Family Moniliformidae Van Cleave, 1924
Moniliformis moniliformis (Bremser in Rudolphi, 1819)

HOST: *Aotus trivirgatus*.

SITE: Proximal colon.

LOCALITY: Panama Province.

A single, immature specimen of *Moniliformis moniliformis* was recovered from a night monkey. The monkey had been maintained in the laboratory about four months, so this probably represents a laboratory infection due to the ingestion of an infected cockroach. Sandground (1926) reported accidental infections of immature *M. moniliformis* in toads and lizards of Central America. It is unlikely that this species could mature in a primate.

HOST-PARASITE LIST

Cebidae

- Aotus trivirgatus* Humboldt (night monkey)
Athesmia heterolecithodes (Braun, 1899)
Zonorchis goliath Travassos, 1945
Phaneropsolus orbicularis (Diesing, 1850)
Trypanoxyuris (T.) *interlabiata* (Sandosham, 1950)
Protospirura muricola Geddoelst, 1916
Dipetalonema gracile (Rudolphi, 1809)
 Unidentified, immature ascaridids
Moniliformis moniliformis (Bremser in Rudolphi, 1819) (immature stage)

- Cebus capucinus* L. (white-faced monkey)
Athesmia heterolecithodes (Braun, 1899)
 Unidentified, immature cestode
Protospirura muricola Geddoelst, 1916
Dipetalonema gracile (Rudolphi, 1809)
 Unidentified, immature ascaridids
Necator americanus (Stiles, 1902)
- Ateles fusciceps* Gray (black spider monkey)
Trypanoxyuris (T.) *atelis* (Cameron, 1929), Sandosham, 1950
Dipetalonema gracile (Rudolphi, 1809)
 Unidentified, immature ascaridids

- Ateles geoffroyi* Kuhl (red spider monkey)
Controrchis biliophilus Price, 1928
Trypanoxyuris (T.) *trypanuris* Vevers, 1923
Dipetalonema gracile (Rudolphi, 1809)
- Alouatta villosa* Gray (black howler monkey)
Raillietina (*Raillietina*) *demerariensis* (Daniels, 1895)
Trypanoxyuris (T.) *minutus* (Schneider, 1866)
Parabronema bonnei (van Thiel, 1925) Diaz-Ungria, 1965
Prosthenorchis elegans (Diesing, 1851)

Callithricidae

- Saguinus geoffroyi* Pucheran (marmoset)
Athesmia heterolecithodes (Braun, 1899)
Zonorchis goliath Travassos, 1945
Echinostoma aphylectum Dietz, 1909
Spirometra mansonoides (Mueller, 1935) (spargana)

- Trypanoxyuris (T.) callithricis* (Solomon, 1933)
Subulura jacchi (Marcel, 1857)
Spirura guianensis (Ortlepp, 1924)
Dipetalonema marmosetae (Faust, 1935)
Physaloptera sp.
 Unidentified, immature ascaridids
Prosthenorchis elegans (Diesing, 1851)
Prosthenorchis lenti Machado, 1950

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