Some Hookworms of the Genus *Ancylostoma* from Colombia and Panama

VERNON E. THATCHE R
Tulane ICMRT, Universidad del Valle, Cali, Colombia

**ABSTRACT**: The following species of *Ancylostoma* are reported for the Colombia-Panama area: *A. duodenale* (Dubini, 1843); *A. caninum* (Ercolani, 1859); *A. tubaeforme* (Zeder, 1800); *A. pluridentatum* (Alessandrini, 1905); and *A. buckleyi* Le Roux and Biocca, 1957. The latter two species are reported from Colombia for the first time, and *A. pluridentatum* is reported from Panama for the first time. Additionally, this paper constitutes the first report of *A. buckleyi* since the original description. This species is also recorded from a new host (*Atelocynus microtis* Schlater). Measurements of *A. pluridentatum* and *A. buckleyi* are presented. Methods of distinguishing the four species of animal ancylostomes are discussed and illustrated.

Hookworms of the genus *Ancylostoma* are widespread and important pathogens of man and his domestic animals. Other species of as yet unassessed infectivity for man occur in wild carnivorous mammals. Although it had been thought that these nematodes were highly host specific (Scott, 1930), in recent years it has become apparent that some of the animal ancylostomes pose a threat to man. *Ancylostoma ceylanicum*, for example, has been found to mature in the intestine of man. Other species, such as *A. caninum* and *A. braziliense*, seem not to be able to mature in man, but they may produce larval invasions of the skin or internal organs.

The series of papers by Biocca (eg. 1954, 1961) and by Biocca and Le Roux (1957) have helped to clarify the formerly confused systematics of the genus. The subgenera proposed in the latter paper are herein accepted and followed.

**Materials and Methods**

Nematodes were washed from the opened intestinal tract and fixed in 70% alcohol. The worms were cleared in lacto-phenol solution and mounted in glycerine jelly. The ventral tooth-plates were dissected out with needles and mounted in glycerine jelly. Drawings were made by means of a Wild microscope equipped with a drawing tube. All measurements are in millimeters.

Host names and synonyms were verified by reference to Cabrera (1961), Handley (1966), and Hershkovitz (1957).

**Family Ancylostomatidae Nicoll, 1927**
**Subfamily Ancylostomatinae Nicoll, 1927**

*Ancylostoma (Ancylostoma) duodenale* (Dubini, 1843)

(Figs. 4a, 4b)

**HOST**: Man.
**LOCATION**: Upper intestinal tract.
**LOCALITY**: Cali, Colombia.
**Geographic range**: Cosmopolitan.

This species may well be a common and widespread parasite of man in Colombia, but it has seldom been reported. The most prevalent human hookworm, by far, in Colombia is *Necator americanus* (Stiles, 1902). Patino-Camargo (1940) mentioned the occurrence of *A. duodenale* in Colombia, but gave no supporting data. Gonzalez (personal communication) found *A. duodenale* in post-treatment stools from several patients at the state hospital in Cali.

*Ancylostoma (Ancylostoma) buckleyi*

Le Roux and Biocca, 1957

(Figs. 3a, 3b, 8, 12, 16)

**HOSTS**: *Felis concolor* L. (?), (puma); *Atelocynus microtis* Schlater, (short-eared fox).
**LOCATION**: Upper intestinal tract.
**LOCALITY**: Leticia, Amazonas, Colombia.
**Geographic range**: Colombia and Argentina.

This species has three pairs of ventro-lateral teeth, similar to *A. caninum*, but it also has two pairs of dorso-lateral teeth which are not
found in the other species. The terminal portion of the dorsal lobe of the male bursa is also distinctive in *A. buckleyi*. Each side of the terminal fork is tridigitate, as is characteristic of the genus, but the inner two branches are fused to near their tips.

*A. buckleyi* was described by Le Roux and Biocca (1957) on the basis of a few specimens from a puma that died in the London Zoo. The host was believed to have come from Argentina. The present collection consists of 30 specimens from an Amazonian short-eared fox.

As far as can be determined, no other reports of this species exist.

**Comparative measurements**

Specimens from *F. concolor* (reported by Le Roux and Biocca, 1957).

**Adult males**: Length, 8.8–10.9 mm; esophagus length, 0.78–0.89 mm; spicules, 0.68–0.82 mm.

**Adult females**: Length, 9.9–12.8 mm; esophagus length, 0.88–0.96 mm; tail length, 0.19–0.21 mm; tip of tail to vulva, 3.8–4.5 mm.

Specimens from *Atelocynus microtis* (reported in this paper).

**Adult males**: Length, 9.3–10.1 mm; esophagus length, 0.96–1.0 mm; spicules, 0.90–0.95 mm.

**Adult females**: Length, 11.6–14.3 mm; esophagus length, 1.0–1.1 mm; tail length, 0.20–0.22 mm; tip of tail to vulva, 3.4–3.6 mm.

As can be seen in the comparative measurements, present specimens are closely similar to the original description. The minor differences in measurements seen are herein regarded as normal intraspecific variation possibly host caused. The infection in the short-eared fox was a natural infection from the Amazon whereas the original infection in the puma was found in a zoo animal. For this reason it seems likely that the fox is the normal host for the species.

*Ancylostoma* (Ancylostoma) *tubaeforme* (Zeder, 1800)

(Figs. 2a, 2b, 7, 11, 15)

**Hosts in Panama**: *Felis catus* L., *Felis onca* L. (jaguar).

**Hosts in Colombia**: *F. catus*, *F. yagapouroundi* (jaguarundi).

**Location**: Upper intestinal tract.

**Localities**: Cali, Valle, Bogota, D. E., and Tumaco, Nariño, Colombia; Achiote, Colon, Panama.

**Geographic range**: Probably cosmopolitan.

This species has often been confused with *A. caninum* and has been considered to be a synonym of that species by many writers. Biocca (1954) redescribed *A. tubaeforme* and pointed out some of the distinguishing characters of the species. Marinkelle (1964) reported this species in 8/42 cats from Cali and Bogota. Infection densities in his cats were low (1–4 worms/host). He did not find any other species of hookworm in the cats.

In the present study, 2/2 Panamanian cats were infected with 12–32 (average 22) worms/animal. In Colombia 8/18 cats were positive with 2–62 (average 16) worms/host. Additionally, a young jaguarundi obtained in Nariño was injected with 0.10 cc of disophenol parenteral. Washings of the feces on the following day revealed 20 specimens of *A. tubaeforme* along with 130 specimens of *A. pluridentatum*. Since the animal had been in captivity for only a few days, this infection is regarded as of natural, though accidental, occurrence. Jaguarundis often approach dwellings at night, and have even been seen chasing chickens in the daytime. Thus, the animal possibly became infected by proximity to a household where domestic cats were kept.

Although *A. tubaeforme* and *A. caninum* are similar, they can be distinguished by several characters. *A. tubaeforme* is smaller, but it has longer spicules. Although both species have 3 pairs of ventral teeth, those of *A. caninum* are nearly equal in size while those of *A. tubaeforme* are unequal with the lateral ones considerably larger. The oral aperture of *A. caninum* is considerably more constricted than that of *A. tubaeforme*. The structural support ridges on the ventral surface of the ventral tooth plates are considerably thicker in *A. tubaeforme* than in *A. caninum* (Figs. 1a, 2a).
Ancylostoma (Ancylostoma) caninum (Ercolani, 1859)  
(Figs. 1a, 1b, 6, 10, 14)  
HOSTS: Canis familiaris L., Dusicyon thous L., (fox).  
LOCATION: Upper intestinal tract.  
LOCALITY: Cali, Valle, Colombia.  
GEOGRAPHIC RANGE: Cosmopolitan.

Foster (1939) reported this species in the dogs of Panama. Huber Luna (1961) found A. caninum to be a common parasite of dogs in the Cali area. He reported infection rates of from 50% to 90%.

In the present study the species was found in 11/12 dogs with infection densities of 1-120 (average 8) worms/host. The species was also found in 13/28 local foxes with densities of 1-28 (average 8). Most of the infected foxes were trapped near dwellings where dogs are kept, and they possibly got their infections from exposure to soil contaminated with dog feces. No hookworms specific to foxes were found in this study.

A. caninum has three pairs of ventral teeth and a dorsal notch. This species is larger than the others seen in this study. Biocca (1954) lists the length of A. caninum as 8.8-10.2 mm for males and 9.8-11.5 mm for adult females. In dogs from Cali, males up to 13.2 mm and females to 18.5 mm have been measured.

An attempt was made to infect the kinkajou Potos flavus (Schreber) with this species. Several thousands of infective larvae cultured from a dog were administered orally to two kinkajous. About 1 month after infection moderate numbers of eggs were seen in the feces of both animals. Egg production dropped off rapidly, however, and when the animals were autopsied 2 months after inoculation, only two specimens of A. caninum were recovered from each of the hosts.

Ancylostoma (Ancylostoma) pluridentatum (Alessandriini, 1905)  
Schwartz, 1927  
(Figs. 5a, 5b, 9, 13, 17)  
HOSTS IN COLOMBIA: Felis wiedii Schinz, (margay cat); F. yagouaroundi; F. catus.  
HOST IN PANAMA: F. onca L., (jaguar).  
LOCATION: Upper intestinal tract.  
LOCALITIES: Choco and Nariño, Colombia; Achiote, Colon Panama.  
GEOGRAPHIC RANGE: Panama, Colombia, and Brazil.

The most complete description of this species seems to be that of Schwartz (1927). He reported A. pluridentatum from the following hosts: Felis mitis Cuvier (= F. pardalis L.); F. syra Fischer (= F. yagouaroundi Geoffroy); and F. tigrina Schreber (which is an animal similar to the margay cat, F. wiedii). Biocca and Le Roux (1957) have reported an experimental infection of these species in the house cat. Thus, A. pluridentatum is known to occur in the jaguar, the jaguarundi, the margay cat, the ocelot, and the house cat. The species probably occurs in the puma (F. concolor L.) as well, but no report of this can be found.

A. pluridentatum has two pairs of ventral teeth, but in fully mature specimens only the lateral pair is visible projecting into the oral aperture. The medial pair of teeth tends to lie along the ventral surface within the buccal cavity. In immature adults, on the other hand, the ventral tooth plates are oriented in such a way that both pairs of teeth project into the oral orifice. The dorsal edge of the oral aperture has three pairs of teeth, or projections. In some specimens, these projections are merely rounded undulations, but in others they have a definite hooked shape with the hook pointing medially (Fig. 9).

Measurements

ADULT MALES: Length, 8.6-9.4 mm; esophagus, 0.63-0.64 by 0.14-0.16 mm; spicules, 1.07-1.13 mm.

ADULT FEMALES: Length, 11.0-12.2 mm; esophagus, 0.72-0.74 by 0.17-0.18 mm; tail length, 0.18-0.21 mm; tip of tail to vulva, 3.4-3.7 mm.

Discussion

The species of Ancylostoma herein reported are different in a number of ways. They can most easily be distinguished however by the nature of the oral aperture. Three of the species, namely A. caninum, A. tubaeforme, and A. buckleyi.

A. buckleyi, have three pairs of ventral teeth. A. buckleyi is easily separated from the other two by the fact that it has two pairs of dorsal teeth, or protuberances. A. tubaeforme has a more open buccal aperture, more prominent lateral teeth, and thicker supporting ridges on the ventral tooth plates. Although both A. pluridentatum and A. duodenale have two pairs of ventral teeth, those of A. duodenale are of similar size and project side by side into the oral opening. Those of A. pluridentatum, on the other hand, arise from either side of the ventral tooth plate, and in fully mature specimens only the inner tooth on each side projects into the aperture. In addition, A. pluridentatum has three pairs of hook-like projections on the dorsal edge of the oral aperture which distinguishes it from the other species.

The species of Ancylostoma are generally difficult to distinguish on the basis of bursal characters. As can be seen from Figures 14, 15, and 16, the ventrals and laterals of A. caninum, A. tubaeforme, and A. buckleyi are rather similar except for size. A. pluridentatum, however, is distinct from the other species in that the ventrals and externolateral rays are reduced and the mediolateral and posterolateral rays tend to be close together or partially fused (Fig. 17).

The terminal portion of the dorsal ray seems to show some constant differences (Figs. 10–13). The principal difference appears to be in the amount of fusion between the terminal digitations. A characteristic of the genus is to have two, tridigite branches at the end of the dorsal ray. The three digitations on either side are plainly visible in A. caninum and A. tubaeforme. Because of fusion of the inner branches, this feature is barely visible in A. pluridentatum and even less prominent in A. buckleyi. It should be noted, however, that bursal characters show a good deal of intraspecific variation and should be used with caution in the separation of these species.

Although the spicules of the various species of Ancylostoma are similar morphologically, their relative lengths can sometimes be useful taxonomically. For example, the spicules of A. tubaeforme are usually longer than those of A. caninum in spite of the fact that the latter is a larger worm.

**Literature Cited**


