

# TWO NEW LUNGWORMS FROM NORTH AMERICA RUMINANTS AND A NOTE ON THE LUNGWORMS OF SHEEP IN THE UNITED STATES

By G. DIKMANS

Associate Parasitologist, Zoological Division, Bureau of Animal Industry  
United States Department of Agriculture

Early in 1930 some sections from the lungs of a mountain sheep (*Ovis canadensis*) from Pikes Peak, Colo., were sent to the Zoological Division by Dr. George W. Stiles, of the Denver Pathological Laboratory of the Bureau of Animal Industry, with the information that a number of these sheep had died as a result of lungworm infestation. Macroscopically the lesions in the lungs presented an appearance similar to that found in sheep lungs infected with *Muel-lerius capillaris*. Microscopic examination demonstrated that the lungworms present belong to a species not previously described. It is, therefore, here described as a new species.

Owing to their location in the parenchyma of the lungs and the difficulty involved in their removal from the tissues, no entire specimens were collected. The largest single piece obtained was part of a male, the fragment measuring 8 millimeters in length.

## PROTOSTRONGYLUS STILESI, new species

### PLATE I

*Specific diagnosis.*—*Protostrongylus*: *Male*: Length uncertain, but more than 8 mm.; width,  $150\mu$  to  $160\mu$  immediately in front of the bursa. The esophagus is  $235\mu$  to  $270\mu$  long by  $50\mu$  wide at its base, where it narrows in joining the intestine.

The spicules are equal and are  $300\mu$  to  $340\mu$  long; the spicular sheath begins about  $50\mu$  to  $60\mu$  from the proximal end and extends to well below the distal termination of the spicules; the sheath is supported by a series of digitations, which reach a length of about  $23\mu$  in the widest portion of the sheath. The digitations extend to about  $40\mu$  from the distal end of the spicules. The telamon roughly

approaches the letter **H** in shape. Contrary to the condition described as occurring in *Protostrongylus rufescens*, the proximal part of this structure, while not so deeply pigmented as the distal part, has a distinct yellowish-brown coloration, which makes it quite noticeable in cleared specimens. This part of the telamon is  $58\mu$  long. The ventral part of the telamon consists of two deeply colored rods, joined at their upper ends and with boot-shaped terminations; the toe of the "boot" is very sharp in some specimens, in others there seems to be a solid chitinous structure from the instep to the toe so that the termination appears to be triangular; this part of the telamon is  $96\mu$  long. The gubernaculum is an arc-shaped structure with its convexity directed toward the head end; there are two sharp prolongations on the dorsal side, and on the ventral side the gubernaculum has the shape of a plate with a convex semi-circular edge. The bursa is short. The ventral rays are united for the greater part of their length. As in other members of the Protostrongylidae the other rays are somewhat modified. The externo-dorsals are slender and do not reach the margin of the bursa. The dorsal ray is represented by a solid spherical body, which bears a series of five papillae on its ventral surface. The chitinous arcs described and figured for other members of this genus are present.

*Female*: Length uncertain; width, about  $100\mu$  in the region of the vagina. The body terminates in an acute point. The distance from the anus to the tip of the tail is  $67\mu$  to  $75\mu$ , and from the anus to the vulva  $190\mu$  to  $200\mu$ . The vulva is covered by a backward-projecting cuticular flap, which forms the provagina mentioned in descriptions of other members of this genus. There is a knoblike enlargement immediately posterior to the vulva. The vagina is about  $475\mu$  long. The eggs in the vagina are  $85\mu$  to  $90\mu$  long by  $30\mu$  to  $38.5\mu$  wide.

*Host*.—Mountain sheep (*Ovis canadensis*).

*Location*.—Lungs.

*Locality*.—Pikes Peak, Colo.

*Type specimen*.—U.S.N.M. Helm. Coll. No. 29379.

This species is named for Dr. George W. Stiles, who collected the material.

During the early part of 1930, the Bureau of Animal Industry was informed that the deer and elk in the Yellowstone Park, Wyo., were suffering from lungworm disease, and lungworms collected on post-mortem examination by Dr. H. B. Raffensperger, of Miles City, Mont., were forwarded for study. The nematodes collected from the lungs of the elk were identified as *Dictyocaulus hadweni*, but those from the deer proved to be a new species of *Protostrongylus*.

## PROTOSTRONGYLUS MACROTIS, new species

## PLATE 2

*Specific diagnosis.*—*Protostrongylus*: *Male*: 26 mm. long and 165 $\mu$  wide. Immediately anterior to the bursa the body narrows to about 95 $\mu$  to 100 $\mu$ . The esophagus is 440 $\mu$  long and 77 $\mu$  wide at its base. The spicules are 200 $\mu$  long. The spicule sheath extends from the proximal end of the spicule to within about 10 $\mu$  to 15 $\mu$  from the distal end. The telamon is usually situated immediately behind the terminal portion of the spicules and is difficult to study. In its general pattern it resembles similar structures figured for other members of this genus. It terminates in two sharply curved, acute points. There is no gubernaculum. The bursa when spread out is 180 $\mu$  to 190 $\mu$  wide and about 160 $\mu$  long. The ventro-ventral ray is 25 $\mu$  to 27 $\mu$  long, the ventro-lateral 37 $\mu$ , the externo-lateral 35 $\mu$ , the medio-lateral 46 $\mu$ , the postero-lateral 44 $\mu$ , and the externo-dorsal 38.5 $\mu$  to 42 $\mu$ . Chitinous arcs are present.

*Female*: 45 mm. to 47 mm. long by 190 $\mu$  to 200 $\mu$  wide in the region of the vulva. The two uteri unite to form a vagina, which is 575 $\mu$  to 600 $\mu$  long. The distance from the vulva to the anus is 250 to 260 $\mu$ , and from anus to the tip of the tail 110 $\mu$  to 120 $\mu$ . The tail ends in a bluntly rounded point. The eggs in the terminal portion of the uteri are from 57 $\mu$  to 65 $\mu$  long by 38.5 $\mu$  wide.

*Host.*—Mule deer (*Odocoileus hemionus hemionus*).

*Location.*—Bronchi.

*Locality.*—Yellowstone Park, Wyo.

*Type specimen.*—U.S.N.M. Helm. Coll. No. 30406.

## A NOTE ON THE LUNGWORMS OF SHEEP IN THE UNITED STATES

Curtice, in 1890, records the occurrence of two lungworms in sheep in the United States. He named one "the hair lungworm, *Strongylus ovis pulmonalis* Diesing" and the other "the thread lungworm, *Strongylus filaria* Rud." Hall considered *Strongylus ovis pulmonalis* as identical with *Synthetocaulus rufescens* and placed Curtice's name for the hair lungworm in synonymy. A cursory examination of some of the material in the United States National Museum collection labeled *Synthetocaulus rufescens* has shown that part of the material so labeled is in reality *Muellerius capillaris* Cameron, 1927. Examination of material macroscopically similar to that described by Curtice, obtained from a sheep at Washington, D. C., also demonstrated that the worms present were *Muellerius capillaris*. Nematodes found in the bronchi of the same animal

were identified as *Dictyocaulus filaria*. *Protostrongylus rufescens* has so far not been found in an examination of material collected from sheep in the United States. Further investigations of ruminant lungworms are desirable to ascertain which species occur in this country.

A PROVISIONAL KEY TO THE SPECIES OF PROTOSTRONGYLUS<sup>1</sup>

- |   |            |
|---|------------|
| 1. Provagina and gubernaculum present.....  | stilesi    |
| Provagina present and gubernaculum absent, or provagina<br>absent and gubernaculum present, or both provagina and<br>gubernaculum absent..... | 2          |
| 2. Provagina present and gubernaculum absent.....   | sagittatus |
| No provagina present.....   | 3          |
| 3. Gubernaculum absent.....   | macrotis   |
| Gubernaculum present.....   | 4          |
| 4. Distal parts of telamon straight, with inner margins serrated.<br>Spicules 260 $\mu$ long; telamon 60 $\mu$ long.....                      | rufescens  |
| Distal part of telamon boot-shaped with inner margins smooth.....   | 5          |
| 5. Spicules 260 $\mu$ long; telamon 40 $\mu$ long.....  | ocreatus   |
| 6. Spicules 160 $\mu$ to 170 $\mu$ long; telamon 33 $\mu$ long.....   | commutatus |

REFERENCES

CAMERON, T. W. M.

1927. Studies on three new genera and some little-known species of the nematode family Protostrongylidae Leiper, 1926. Journ. Helm., vol. 5, pp. 1-24, figs. 1-14, March.

CURTICE, C.

1890. The animal parasites of sheep. 222 pp., 36 pls. U. S. Dept. Agr., Bur. Animal Industry.

KOCH, A.

1883. Die Nematoden der Schafllunge (Lungenwurmkrankeheit der Schafe). Rev. f. Thierh., vol. 6, no. 2, pp. 17-28, pls. 1-2, Feb. 1; no. 3, pp. 33-38, pl. 3, figs. 1-16, Mar. 1; no. 5, pp. 65-68, pl. 4, figs. 1-5, May 1; no. 7, pp. 97-99, pl. 5, figs. 1-5, July 1; no. 8, pp. 113-122, pl. 6, figs. 1-3, Aug. 1.

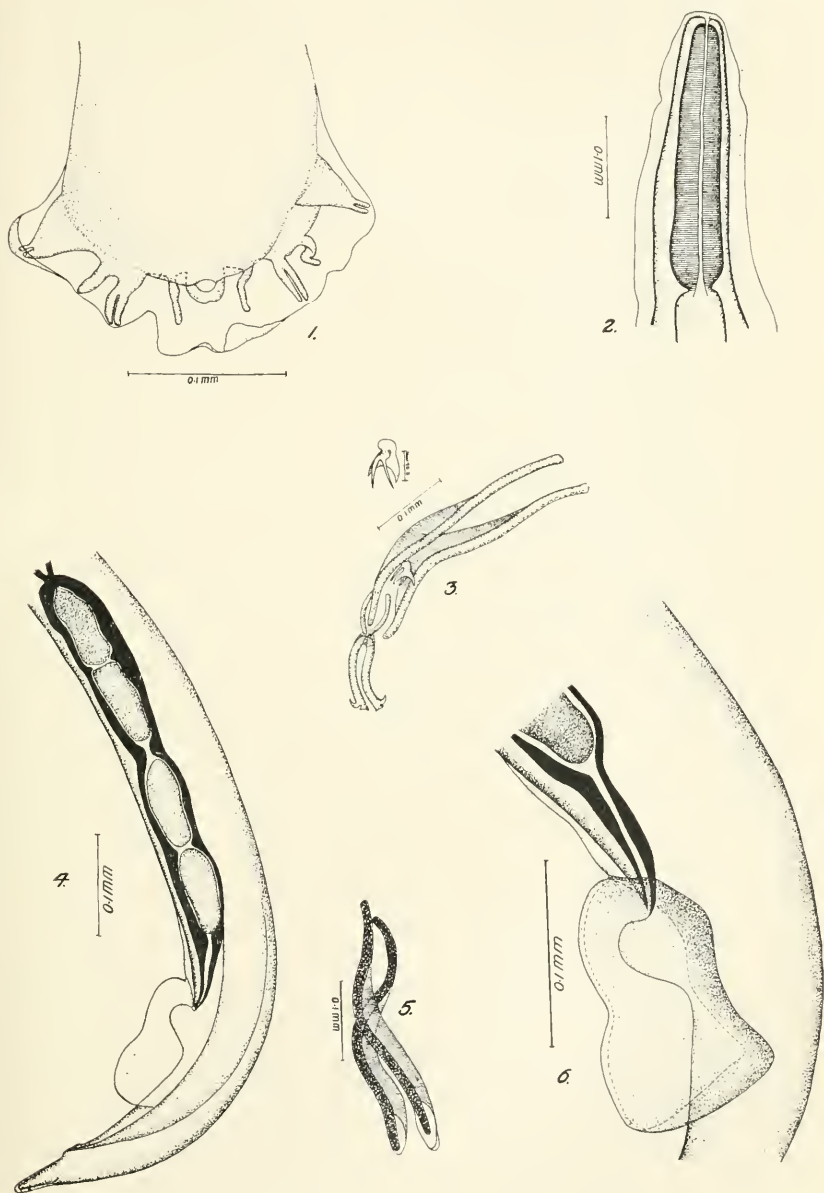
LEIPER, R. T.

1926. On the round worm genera *Protostrongylus* and *Angiostrongylus* of Kamensky, 1905. Journ. Helm., vol. 4, pp. 203-207, November.

MUELLER, A.

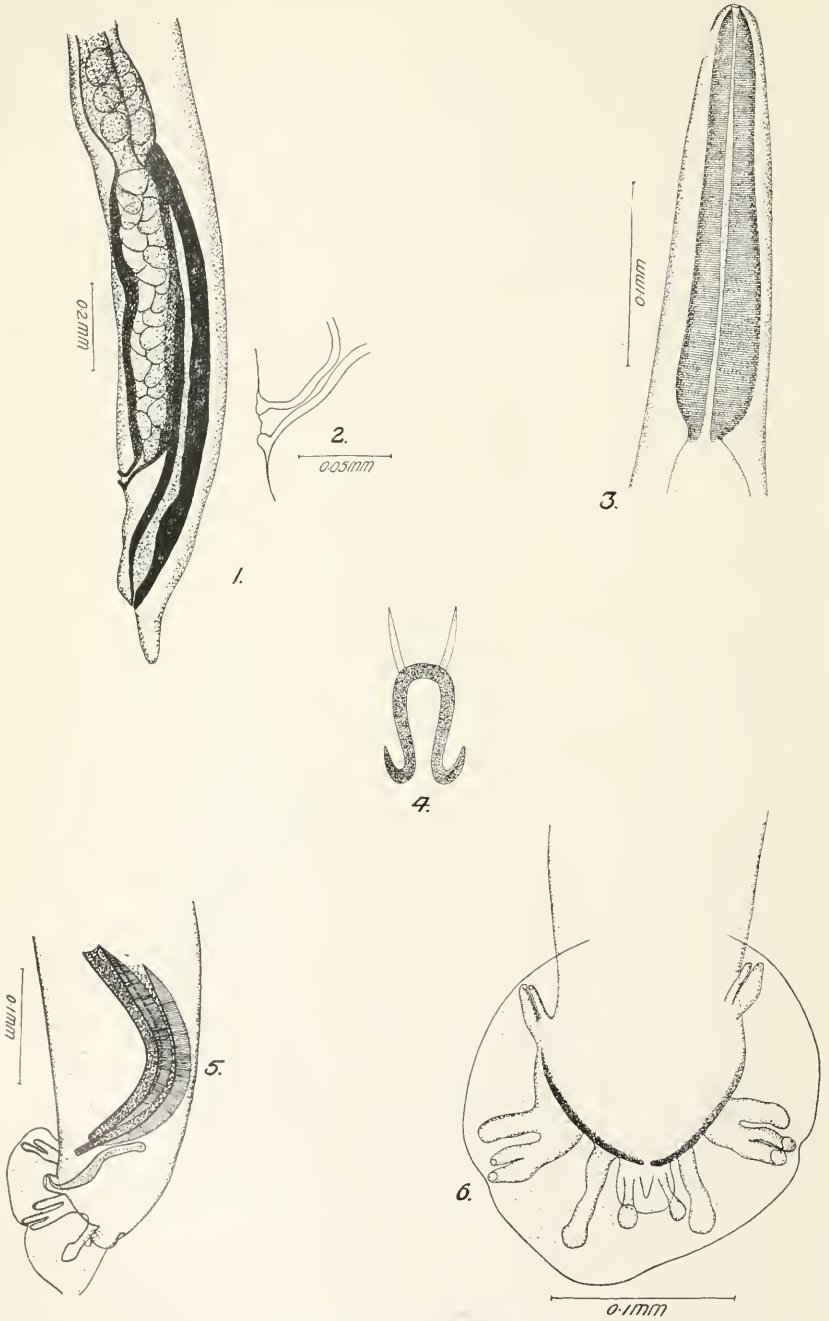
1889. Die Nematoden der Säugethierlungen und die Lungenwurmkrankeheit. Eine zoologisch-pathologische Untersuchung. Deutsche Zeitschr. f. Thier-med., vol. 15, pp. 261-321, pls. 6-9, Aug. 30.

<sup>1</sup>Owing to the absence of sufficient data, *Protostrongylus unciphorus* (Railliet and Henry, 1907), can not now be included in any key.



*PROTOSTRONGYLUS STILESII*

1, Bursa of male; 2, esophagus; 3, spicules, gubernaculum, and telamon; 4, tail end of female; 5, spicules; 6, vulva and provagina of female



PROTOSTROMGLYLUS MACROTIS

1, Tail end of female; 2, vulva; 3, esophagus; 4, telamon (diagrammatic); 5, tail end of male; 6, bursa of male