

PERUTAENIA THREIKELDI, A NEW GENUS AND NEW SPECIES OF
TAPEWORM (CESTODA: ANOPILOCEPHALIDAE) FROM
LAGIDIUM PERUANUM

by

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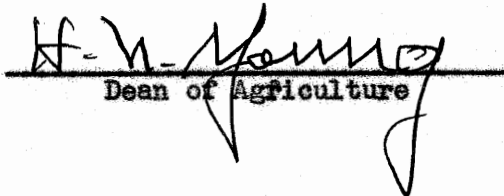
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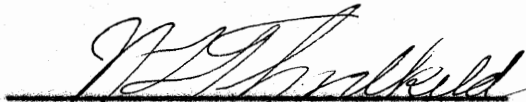
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INTRODUCTION

During the years 1950 and 1951 there were collected five specimens of Lagidium peruanum Meyen, a small rodent which lives at high altitudes on the Sierra of Peru. The five rodents were collected in the province of Jauja at altitudes of 11,850 and 11,950 feet.

On examination of the intestine there were found many very small cestodes which appeared to represent a new genus and species in the family Anoplocephalidae Cholodkowsky, 1902, Fuhrmann, 1907, and sub-family Anoplocephalinae Blanchard, 1891, and Fuhrmann, 1907.

The author wishes to express her profound appreciation to Dr. W. L. Threlkeld for his aid, efforts and advice, and under whose supervision this work was carried out. Grateful acknowledgment is also expressed to Dr. I. D. Wilson, Head of the Biology Department, for his encouragement and for all the facilities he has made available for satisfactory completion of the work. The author is indebted to Dr. M. O. Veliz for all the material which made this study possible and to Dr. W. B. Gross of the Virginia Agricultural Experiment Station staff for his friendly aid in obtaining the photographs and photomicrographs employed. The author wishes to express her appreciation to Dr. L. Gonzales-Mugaburu who is responsible for her fundamental training and interest in the field of parasitology and to Miss Frances B. Craig for her aid in typing this manuscript.

REVIEW OF LITERATURE

The review of literature reveals reports of several cestodes of the family Anoplocephalidae which parasitize rabbits and other rodents. In the host animal from which this parasite is described there have been reported several Anoplocephalinae cestodes, notably: Paranoplocephala omphalodes Herman, 1783, Baer (1), Syn. Bertiella forcipata Linstow, (3), Cittotaenia quadrata Linstow (3), and Cittotaenia pectinata Stiles and Hassall (5). While there has not been found in the literature consulted a description of a cestode whose characteristics resemble those of the one here reported, the paper by Baer (1), the studies by Douthitt (2), and the publication of Wardle and McLeod (7), afford the most practicable keys for identification purposes and the basis for the ultimate taxonomic position of the species here described.

EXPERIMENTAL

Objective

The objective of this study is the description, classification, and naming of a heretofore unknown Anoplocephalidae parasite of the small Peruvian rodent, Lagidium peruanum Meyen.

Materials and Methods

A total of sixty-two specimens were fixed in 10 per cent formalin. Fifty-seven of the cestodes were mounted and stained in Delafield's hematoxylin (4), ferric acetocarmine and a creosote-azo-carmin mixture (6). Some were cleared in xylene and some in creosote. Five specimens were sectioned in series: two in cross sections; two in longitudinal; and one in sagittal section and stained in Delafield's hematoxylin-eosin. An ocular micrometer was employed to obtain the necessary biometric data. The drawings were made with the aid of a camera lucida. Photomicrographs were taken as herein described.

Results

The results of the biometric and comparative studies of 62 tapeworms collected from 5 different specimens of Lagidium peruanum, are shown in Tables 1 and 2, respectively. Histologic and morphologic characteristics are shown in plates I, II, III, and IV.

In consequence of the above mentioned studies a new genus Perutaenia

and a new species Perutaenia threlkeldi have been described in the sub-family Anoplocephalinae as follows:

PERUTAENIA N.G.

Diagnosis: Cestode Anoplocephalinae of small-sized form, with linear segments. Genital apertures regularly alternate. Sexual ducts running over dorsal surface of osmoregulatory vessel and nerve. Dorsal vessel is displaced to the ventral side. Few testes antero-median; they are dispersed equally to both sides. Cirrus pouch well-developed. Cirrus spiny. Female glands situated in the middle and posterior part of the segment. Uterus a transverse and lobulated sac between the osmoregulatory vessels. Eggs with a well-developed pyriform body. Adults in rodents. Type species: Perutaenia threlkeldi.

PERUTAENIA THRELKELDI N. SP.

Diagnosis: This is a very small cestode. The length is from 6 mm. to 14 mm. and the width is from 0.4 mm. to 2 mm. The width of the unarmed scolex exceeds that of its length and the measurements are 333 to 466 microns in length by 439 to 532 microns in width. The circular suckers measure 160 to 186 microns in diameter. There is no neck and segmentation begins immediately behind the scolex. The strobila is formed by 25 to 41 linear proglottids. The transverse diameter of the strobila is greatest at its middle point. The margin of the strobila is serrate. Behind the scolex the first segment measures 26 to 53 microns in length and 339 to 599 microns in width. The matured segment measures 0.2 to 0.33 mm. in length and 0.91 to 1.67 mm. in width. The gravid segments measure

0.60 mm. to 1.13 mm. in length and 0.64 mm. to 1.46 mm. in width.

Numerous calcareous corpuscles were observed. Four longitudinal osmoregulatory vessels are present, two running along each lateral margin of the segment and under the cirrus pouch. The ventral osmoregulatory vessel is 21 to 24 microns in diameter and the dorsal is 3 to 6 microns in diameter and situated laterally outside of the ventral one; (the measurements were obtained from longitudinal sections).

Genital primordia appear just behind the scolex in the first segment. The genital atria are regularly alternate, comparatively large and deeply situated in the mid-proglottid level or slightly posterior to the middle. They indent 146 to 173 microns. They measure 80 to 92 microns at the peripheral and gradually increase in diameter from 161 to 173 microns as they pass inward. Fifteen to twenty small round testes, about 25 microns in diameter, are present. They are dispersed anterior to the female glands and in the dorsal face extending symmetrically in the segment, and they are confined to the space between the osmoregulatory vessels. The genital ducts run dorsally to both osmoregulatory canals; the dorsal vessel is displaced to a ventral position by the cirrus pouch. External and internal seminal vesicles are present.

The cirrus pouch is large, possessing a strong muscular wall composed of longitudinal and transverse muscles and extends inward well beyond the osmoregulatory canals, thus occupying the third part of the width of the segment. Its position is horizontal in the mature segment and diagonal in the gravid segment; the cirrus pouch measures 360 to 439 microns in

length and 133 to 160 microns in width. The cirrus is armed with spines, its length is 333 microns and its width 27 microns. The female glands are placed ventrally in the middle and posterior part of the segment. The small ovaries are present formed as two oval lobules. Each lobule measures about 83 by 56 microns. The uterus is a transverse elongated sac and later develops into a lobulated structure. It occupies the area between the osmoregulatory canals never extending beyond them even in the gravid segments. The vagina was only observed in longitudinal sections; it is very inconspicuous and runs parallel to the anterior middle of the cirrus pouch on the ventral face. The receptacle seminal has not been observed. The eggs possess a well-developed pyriform body, which has two horns. The diameter of the egg measures 60 to 66 microns and the onchosphere diameter is 12 microns.

| | |
|---------------------------------|--------------------------------|
| <u>Host:</u> | <u>Lagidium peruanum</u> Meyen |
| <u>Location:</u> | Small intestine |
| <u>Geographic distribution:</u> | Peru, South America |

TABLE 1 - BIOMETRIC DATA IN MILLIMETERS AND MICRONS

| | Measurements | Average | No. of Meas. |
|--|-----------------|----------|--------------|
| Strobila length | 6.0 - 14 mm. | 10 mm. | 10 |
| Strobila width behind the scolex | 339 - 599 u | 469 u | 10 |
| Strobila maximum width | 0.8 - 2 mm. | 1.4 mm. | 10 |
| Scolex length | 333 - 466 u | 339.5 u | 12 |
| Scolex width | 439 - 532 u | 485.5 u | 12 |
| Sucker diameter | 160 - 186 u | 173 u | 10 |
| Immature segment length | 26 - 53 u | 39.5 u | 10 |
| Immature segment width | 339 - 599 u | 469 u | 10 |
| Mature segment length | 0.2 - 0.33 mm. | 0.27 mm. | 10 |
| Mature segment width | 0.91 - 1.67 mm. | 1.29 mm. | 10 |
| Gravid segment length | 0.6 - 1.13 mm. | 0.87 mm. | 10 |
| Gravid segment width | 0.6 - 1.46 mm. | 1.03 mm. | 10 |
| Ventral osmo. vessel (Cross and longitudinal sections) | 21 - 24 u | 22.5 u | 4 |
| Dorsal osmo. vessel (Cross and longitudinal sections) | 3 - 6 u | 4.5 u | 4 |
| Genital atria depth | 146 - 173 u | 159.5 u | 4 |
| Genital atria aperture | 80 - 92 u | 86 u | 4 |
| Genital atria - maximum diameter | 161 - 173 u | 167 u | 4 |
| Cirrus pouch length | 360 - 439 u | 426.5 u | 5 |
| Cirrus pouch width | 133 - 160 u | 146.5 u | 5 |
| Cirrus length (Approx) | 333 u | 333 u | 4 |
| Cirrus width | 27 u | 27 u | 4 |
| Testes (Cross and longitudinal sections) | 20 - 30 u | 25 u | 10 |
| Ovaries (each lobule) length | 75 - 90 u | 82.5 u | 4 |
| Ovaries (each lobule) width | 51 - 60 u | 55.5 u | 4 |
| Egg diameter | 60 - 66 u | 63 u | 10 |
| Onchosphere diameter | 12 - 12 u | 12 u | 10 |

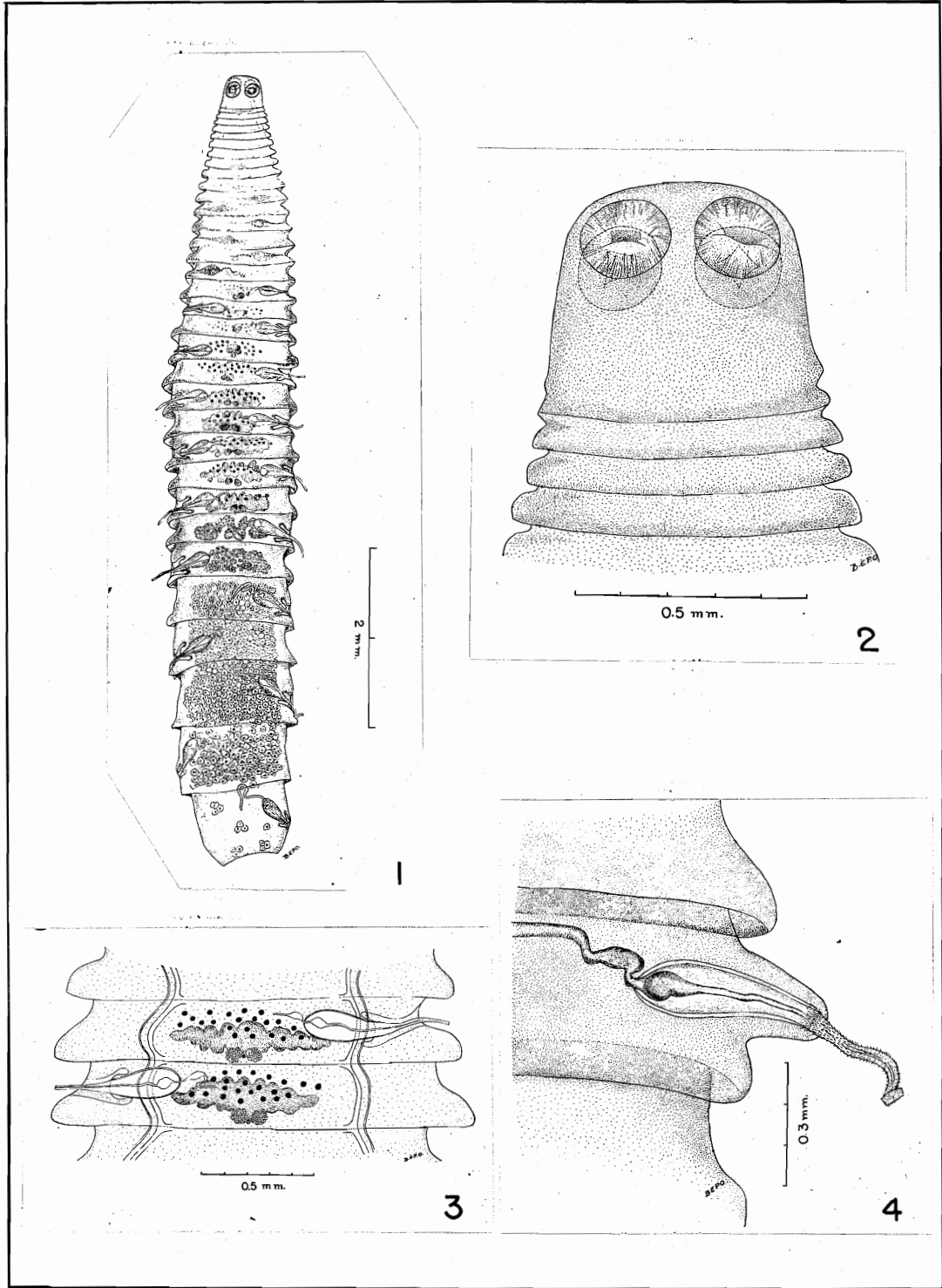
TABLE 2 - COMPARISON OF SOME GENERA OF THE SUBFAMILY ANOPLICEPHALINAE

| | ANDRYA Railliet, 1883 | BERTIELLA Stiles & Hassall, 1902 | PARABERTIELLA Nybelin, 1917 | PROTOTAENIA Baer, 1927 | MONOECOCESTUS Beddard, 1914 | PARAMOPLICEPHALA Luhe, 1910 | PERUTAENIA n.g. |
|----------------------------|--|---|---|---|---|--|--------------------------------------|
| SCOLEX SUCKER | | | Globular Pedunculate | More or less pedunculate | | | |
| SIZE | Large | Medium | Small | Variable | Medium | Variable | Small |
| GENITAL PORE | Unilateral or Irreg. alternate | Irregularly alternate | Irregularly alternate | Irregularly alternate | Regular or irregularly alt. | Unilateral or irreg. alternate | Regularly alternate |
| EXCRETORY VESSEL | | | | Dorsal inside of the ventral | Numerous anastomoses | | Dorsal outside of the ventral |
| GENITAL DUCT | Passing dorsally to both excretory vessel and nerve | Ibid | Ibid | Ibid | Ibid | Ibid | Ibid |
| TESTES | Numerous aporal side sometimes beyond the excretory vessel of the same side | Numerous. A continuous field between the excre- tory vessels | In only one field: | Numerous | Numerous. Middle posterior of the segment | Numerous on aporal side of the ovaries sometimes beyond the excretory vessels of the same side | Few anterior to the female glands |
| CIRRUS POUCH CIRRUS | Poorly developed | Poorly developed | Well developed to the middle of the segment | Well developed armed cirrus | Well developed armed cirrus | | Well developed armed cirrus |
| FEMALE GLANDS | Middle poral | Middle poral | Middle aporal | Middle poral | Middle or poral | Middle poral | Middle & posterior |
| UTERUS | Reticulate at first, later sacciform and lobulated | Transverse tube between excretory vessels | Transverse tube extending beyond the excretory vessels on both sides | Transverse tube later: sacciform extending beyond excretory vessels on both sides: | Reticulate | Transverse tube some- times extending be- yond the exc. vessels: later sacciform and lobulated | Sacciform and diverticulated |
| VAGINA | Behind the cirrus pouch | Surrounded by glandular cells | Posterior and ventral to the cirrus pouch. A large seminal receptaculum | | Anterior to the cirrus pouch | | Ventral to the cirrus pouch |
| EGG | Pyriiform body | Ibid | Ibid | Ibid | Ibid | Ibid | Ibid |
| HOST | Rodents | Primates & rodents | Marsupial | Marsupial and insectivores | Rodents and artiodactyls | Rodents and perissodactyls | Rodent |
| GEOGRAPHIC DISTRIBUTION | Europe and North America | India, Philippines, Indonesia, Central and South America | Australia | Australia, Southern Asia and Indonesia | North America South America | Europe, South America: Southern Africa | South America |

EXPLANATION OF PLATE I

- Figure 1 - Entire strobila
- Figure 2 - Scolex
- Figure 3 - Mature proglottids, dorsal view showing the cirrus pouch, the testes, ovaries, uterus and the osmoregulatory system.
- Figure 4 - Protruded cirrus pouch showing the internal and external seminal vesicle and the spiny cirrus.

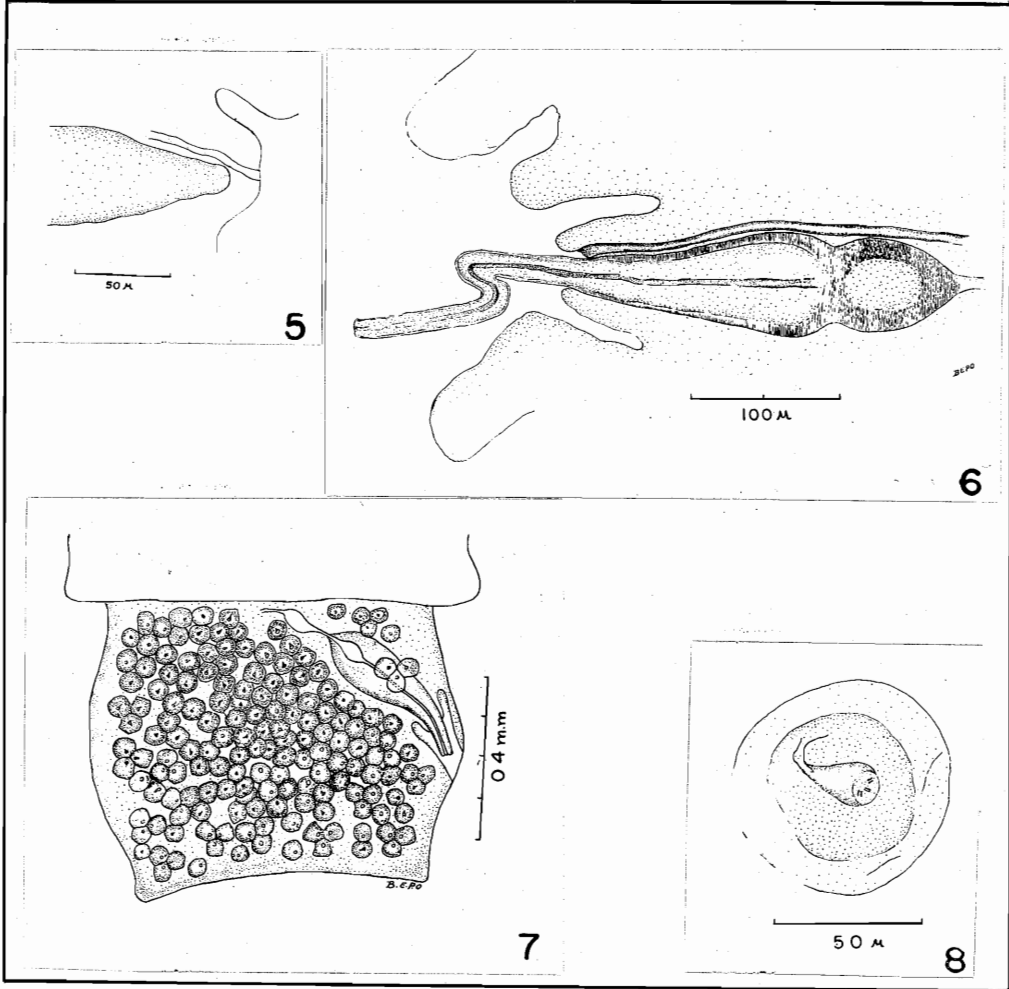
PLATE I



EXPLANATION OF PLATE II

- Figure 5 - Longitudinal section showing the relation between the vagina and cirrus pouch.
- Figure 6 - Longitudinal section, composite drawing of the vagina.
- Figure 7 - Gravid segment
- Figure 8 - Egg

PLATE II

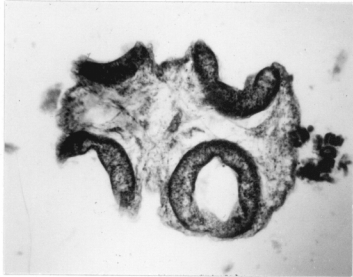


EXPLANATION OF PLATE III

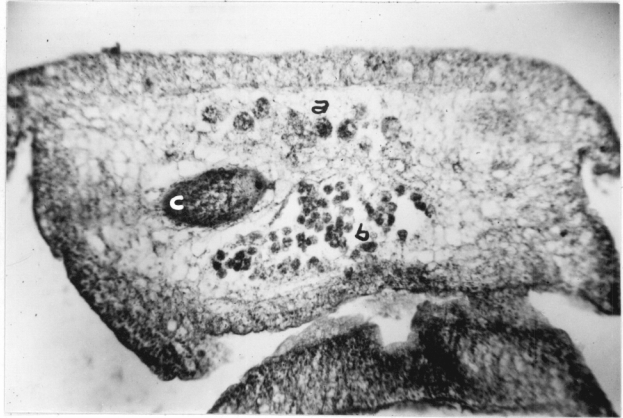
Photomicrographs

- Figure 9 - Cross section of the scolex, 85 X
- Figure 10 - Longitudinal section of a mature segment, showing the testes (a), uterus (b), and cirrus pouch (c), 85 X.
- Figure 11 - Cross section of a mature segment, showing testes (a), ovaries (b), and cirrus pouch (c), 85 X.
- Figure 12 - Longitudinal section showing the osmoregulatory system, note the connections of the ventral vessel, 85 X.
- Figure 13 - Cross section of a gravid segment showing the osmoregulatory vessels (a), uterus (b), and cirrus pouch (c), 85 X.
- Figure 14 - Longitudinal section showing the vagina, 340 X.

PLATE III



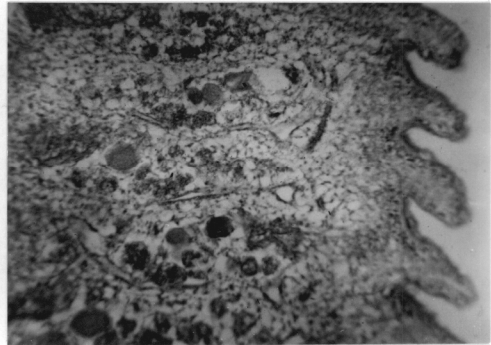
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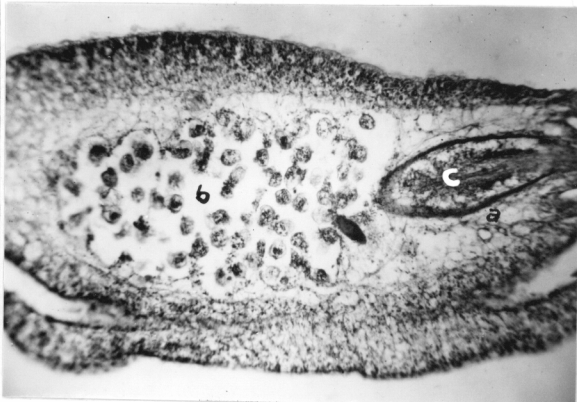
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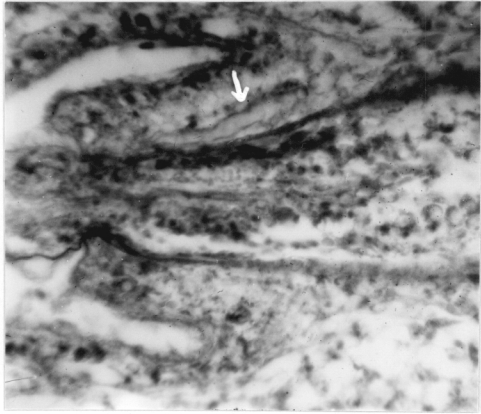
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EXPLANATION OF PLATE IV

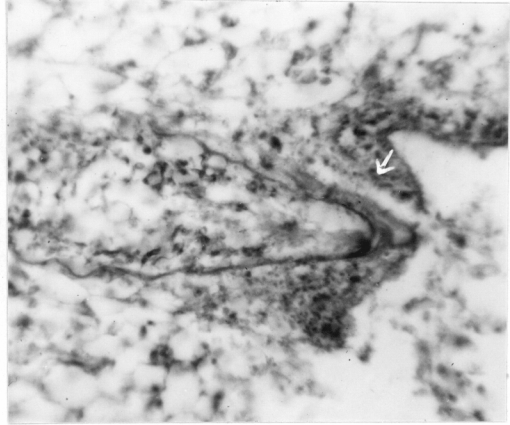
Photomicrographs

- Figures 15 and 16 - Longitudinal section showing the vagina, 340 X
Figure 17 - Cross section of a gravid segment, 85 X
Figure 18 - Longitudinal section of a gravid segment, 85 X

PLATE IV



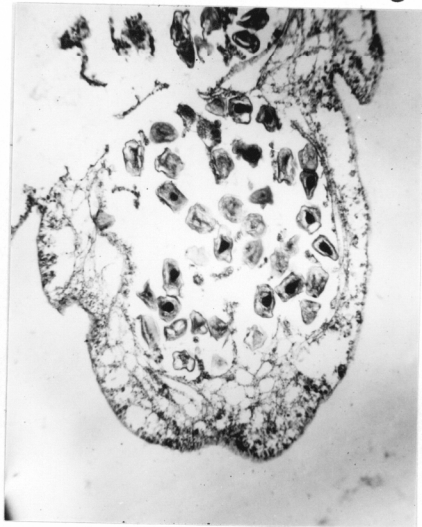
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DISCUSSION

According to Baer (1), and Wardle and McLeod (7), seven genera have been reported for rodents in the subfamily Anoplocephalinae: Cittotaenia Riehm, 1881, Fuhrmanella Baer, 1924, Andrya Railliet, 1883, Diandrya Darrah, 1930, Bertiella Stiles and Hassell, 1902, Paranoplocephala Luhe, 1910, Monoecocestus Beddard, 1914, and Prototaenia Baer, 1927. Parabertiella Nybelin, 1917, although it has been described for a marsupial, but because it shows a well-developed cirrus pouch and a single set of reproductive organs, it has been included in the comparison made in this paper. Cittotaenia, Fuhrmanella, and Diandrya, are different from Perutaenia in having a double set of reproductive organs. Andrya differs from Perutaenia in that the genital pores are situated unilaterally or irregularly alternate, the testes are on the aporal side of the segment and the cirrus pouch is small. The female genitalia are on the poral side and the uterus is typically reticular. Bertiella differs from Perutaenia in that the genital pores are irregularly alternate. They show a poorly developed cirrus pouch, and the female glands are in the middle poral of the segment. Paranoplocephala differs from Perutaenia in that the genital pores are unilateral or irregularly alternate. In Paranoplocephala the testes are numerous; they are situated aporally to the ovaries and often extend beyond the osmoregulatory canal on this side. The female glands are situated in the middle poral. The uterus is a transverse tube and extends beyond the osmoregulatory canal and towards the ventral face. Monoecocestus differs from

Perutaenia as it is characterized by numerous anastomoses of the osmoregulatory canals. The testes are situated in the middle posterior of the segment, the vagina is placed anterior to the cirrus pouch and the uterus is reticular. Prototaenia differs from Perutaenia as it is characterized by irregular genital pores, numerous testes and the female glands are in the middle poral of the segment. The uterus is a transverse tube extending beyond the osmoregulatory canals; the ventral osmoregulatory vessel is situated outside of the dorsal canal.

Parabertiella differs from Perutaenia in that the sexual pores are irregularly alternate, the testes are placed in only one field, and the female glands in the middle aporal of the segment. The uterus is a transverse tube and extends beyond the osmoregulatory canals on both sides.

It is interesting to note that Perutaenia threlkeldi is much smaller than the other cestodes which have been described in the subfamily Anoplocephalinae.

CONCLUSIONS

It is concluded that this new genus differs from other closely related genera of the subfamily Anoplocephalinae in the following important characteristics.

1. The genus Bertiella has a poorly developed cirrus pouch and Perutaenia has a well-developed cirrus pouch.
2. The genera Andrya and Monococcestus both have a reticular uterus. In Perutaenia this morphology has not been observed.
3. The genus Parabertiella shows a uterus extending beyond the osmoregulatory vessels on both sides, which has not occurred in Perutaenia.
4. The genus Prototaenia shows the ventral osmoregulatory vessels outside of the dorsal; in Perutaenia the opposite position was observed.
5. The genus Paranoplocephala shows a different disposition of the male and female glands. The male glands are in the middle aporal and in Perutaenia they are anterior to the female glands. In Paranoplocephala the female gland is in the middle poral and in Perutaenia it is in the middle of the segment.

SUMMARY

A new genus and species of the cestode Anoplocephalidae, Perutaenia threlkeldi, is described from Lagidium peruanum Meyen from the Sierra of Peru, South America. The specific name is dedicated to Dr. William Logan Threlkeld.

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BIOGRAPHICAL SKETCH

I was born on September 22, 1924, in Lima, Peru. I received my primary schooling in "Instituto Molinares" de Lima, Peru, from 1932 to 1936; later I attended the High School in "Liceo Santa Rosa" de Lima, Peru, from 1937 to 1941. I received my college education in Faculty of Science in Universidad Nacional Mayor de San Marcos de Lima, Peru, from 1942 to 1945. I received my degree of Bachelor of Science in 1946. Since graduation I have been teaching in the Faculty of Science in U.N.M. de S.M. and I was also employed as assistant in Research in the Faculty of Veterinary Medicine of U.N.M. de S.M.-


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