STUDIES ON THE NEMATODE PARASITES OF VERTEBRATES
OF
MARATHWADA
MAHARASHTRA STATE (INDIA)

PART II

BY

P.G. Deshmukh, M.Sc.,
Department of Zoology,
Marathwada University,
Aurangabad (M.S.), INDIA.

*DIPETALONEMATIDAE Wehr, 1935
Onchocercinae Leiper, 1911
Lemdiana Seurat, 1917
Lemdiana francolinia n.sp.

On two occasions this interesting species of
Lemdiana was collected from grey partridge Francolinus
pondicerianus. The worms were found underneath the
skin just wriggling above the pectoral muscles.
Altogether three males and two females were available
for study.

These are thin worms, milky white in colour.
The body is cylindrical, with both the ends bluntly
rounded. The cuticle is smooth and transparent. The
mouth is simple and without lips. A pair of cephalic
papillae is present on each side. The nerve ring is

*Onchocercidae, Chabaud et Anderson, 1959
Plate XVIII

Lemdana francolinia n.sp.

Figs.  
91 Female : Anterior end, lateral view.  
92 Male : Posterior end, ventral view.  
93 Male : Posterior end, lateral view.  
94 Female : Tail end.

Scale.  
0.3 mm. applies to fig. 91.  
0.2 mm. applies to figs. 92 and 94.  
0.1 mm. applies to fig. 93.
situated at 0.05 - 0.06 mm. from the anterior end in
the male and 0.06 - 0.07 mm. in the female. The
anterior oesophageal region is short measuring
0.07 - 0.08 mm. long in the male and 0.07 - 0.10 mm.
in the female. The posterior glandular portion is much
longer being 1.04 - 1.64 mm. in the male and 1.89-2.23 mm.
in the female.

**MALE:** The male is much smaller than the female. Only
three males were available for study, out of which one
was double the length of the others. The variations in
the body length and maximum thickness were from
4.40 - 8.69 mm. and 0.13 - 0.17 mm. respectively. The
head diameter is 0.04 mm. The cloacal aperture is
0.03 - 0.06 mm. from the tip. There are two pairs of
cloacal papillae, one immediately in front of the cloaca,
the other just behind it. The spicules are similar but
unequal in size and well sclerotised. The left spicule
is 0.32 - 0.37 mm. long, and the right is 0.13-0.15 mm.

**FEMALE:** The female is much thicker and longer than
the male, measuring 13.50 - 14.96 mm. in length and
0.22 - 0.24 mm. in maximum body thickness. The tail
is almost absent, the anal aperture being almost near
the tip. On either side of the anal aperture a
papilla is present. The vulva opens in the region of
the oesophagus at a distance of 0.40 - 0.43 mm. from the
head end. The uteri are filled with microfilariae measuring 77 - 84 \( \mu \) long and 4 - 5 \( \mu \) wide. The juveniles are unsheathed and bluntly rounded at both the ends.


"*L. subspiralis* (Diesing, 1851) Lopez-Neyra, 1956 is probably referable to *Pharyngo setaria* or even identical with *P. ardeae* (Nawrotzky, 1914)" - Chabaud et Choquet, 1955. Similarly "*L. urbaini* Campana-Rouget, 1949 is identical with *P. ardeae*. *L. dartevallei* Ezzat and Tadros, 1958 has a doubtful position, hence not included under this genus by Yamaguti.

The present worm resembles *L. singhi* Sultana, 1961 as far as the body length is taken into consideration. But they differ from each other as shown in the following table:
All measurements are in mm.

<table>
<thead>
<tr>
<th></th>
<th>L. singhi</th>
<th>L. francolinia n.sp.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body length</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4.00</td>
<td>4.40 - 8.69</td>
</tr>
<tr>
<td>Female</td>
<td>16.41</td>
<td>13.50 - 14.96</td>
</tr>
<tr>
<td><strong>Spicules</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>0.064</td>
<td>0.32 - 0.37</td>
</tr>
<tr>
<td>Right</td>
<td>0.039</td>
<td>0.13 - 0.15</td>
</tr>
<tr>
<td><strong>Caudal papillae</strong></td>
<td>Two pairs, one precloacal, one postcloacal</td>
<td>Two pairs, one immediately in front of cloaca and the other just behind it</td>
</tr>
<tr>
<td><strong>Position of vulva</strong></td>
<td>0.58</td>
<td>0.40 - 0.43</td>
</tr>
<tr>
<td>Female tail end</td>
<td>No papillae at the tip of the tail; anus subterminal</td>
<td>Papillae at the tip of the tail; anus terminal</td>
</tr>
</tbody>
</table>

It is evident from the table that the males of the two species distinctly differ from each other in the length and in the shape of the spicules. The tail end in the female does not possess papillae in *L. singhi* whereas a pair of papillae is present around the anus in the present form. Moreover the anus is subterminal in *L. singhi* and terminal in the present form.
worm. Hence it is regarded as a new species and named as *Lemdana francolinia* n.sp.

- **Host**: *Francolinus nondicerianus*
- **Habitat**: Subcutaneous tissue
- **Locality**: Aurangabad, Maharashtra, India.
DIPETALONEMATIDAE Wehr, 1935
Onchocercinae Leiper, 1911
Paronchocerca Peters, 1936

The genus Paronchocerca was erected by Peters in 1936 for the worm Paronchocerca ciconiarum which he described from saddle billed stork. He also transferred O. hambusicolae Li, 1933 into his genus and renamed as P. hambusicolae. Since then the following species have been added: i) P. sanguinis ardeae (Leger et Noc, 1921) Chabaud et Biocca, 1951 proposed for Filaria sanguinis - ardeae soliath; ii) P. tonkinensis (Chow, 1939); iii) P. rousseloti Chabaud et Biocca, 1951; iv) P. mirzai Ali, 1956; v) P. straeleni Chabaud et Ball, 1964; and vi) P. mansoni Faust, 1966.

Chabaud et al 1956, synonymised Paronchocerca with Striato filaria Lubimov, 1927. But in 1959 Chabaud et Anderson again separated the two as independent genera, placing them under Ornithofilariae genera. Yamaguti has however included Paronchocerca in family Dipetalonematidae Wehr, 1935 and Striato filaria in family Filiariae Claus, 1885. In 1964 Chabaud et Ball while describing a new species Paronchocerca straeleni, synonymised with it the genus Aproctoides Chandler,
Plates XIX

Paronchocerca thapari n.sp.

Figs. 95 Female: Anterior end, lateral view.

96 Male: Head end, magnified.

97 End-on view.

98 Male: Posterior end, lateral view.

99 Female: Tail end, lateral view.

Scale. 1 mm. applies to fig. 95.

A 0.1 mm. applies to fig. 96.

B 0.1 mm. applies to fig. 97.

0.2 mm. applies to figs. 98 and 99.
1929. The author feels this combination to be unnatural and that the two genera should remain separate. While the cuticle of Paronchocerca has rugae, that of Aproctoidae is without any transverse striations and is smooth. Moreover the spicules of the former are very stout, thick and cuticularised, while those of the latter are very minute and small. The position of the vulva in Aproctoidae is preoesophageal while in Paronchocerca, it is postoesophageal. The oesophagus in the two genera is of quite different types. In Aproctoidae it is well developed, long and clearly divided into two portions. In Paronchocerca the same is narrow, thin and not markedly divided into two portions. The disposition of caudal papillae is also quite different in the two genera. As against the typical circum-cloacal papillae of Paronchocerca, the Aproctoidae has the caudal papillae evenly spaced and distributed laterally both in precloacal and postcloacal regions. In view of the differences discussed above the author feels that the two genera are quite distinct and separate. Thus the species reported under Aproctoidae are retained as such.

At present the following species are included under Paronchocerca: i) *P. ciconiarum* Peters, 1936; ii) *P. bambusicolae* (Li, 1933) Peters, 1936; iii) *P. sanguinia*
ardeae (Leger et Noc, 1921) Chabaud et Biocca, 1951; iv) P. tonkinensis (Chow, 1939); v) P. roussaeloti Chabaud and Biocca, 1951; vi) P. mirzai Ali, 1956; vii) P. straeleni Chabaud et Ball, 1964; and viii) P. mansoni Faust, 1966.

The description of P. sanguinis-ardeae is very inadequate, not even supported by a figure. Hence it is not included in the key.

Paronchocerca thanari n.sp.

Three males and three females of this worm were once collected from black partridge *Francolinus francolinus*. The worms were found entangled in the tissue of the lungs.

The worms are cylindrical in shape with attenuated head and tail ends. The cuticle is 9 - 11 μ thick and bears annular rugae. The rugae are superficial and do not form continuous rings, intercepted at lateral fields. The cuticle is further reinforced by closely set fine transparent striae which are 5 - 7 μ apart. In the posterior region, short rod-like cuticular projections are arranged in transverse rows.

The head is slightly globular in shape. The mouth is surrounded by cephalic papillae arranged in two circles, each having two pairs of submedian papillae. The amphids are at the level of the outer circle. The
nerve ring surrounds the muscular portion of the oesophagus at 0.14 - 0.15 mm. from the anterior end in the male and 0.15 - 0.18 mm. in the female. The oesophagus is short measuring 1.07 - 1.34 mm. long in the male and 1.47 - 1.61 mm. in the female. The muscular and glandular portions measure 0.34 - 0.36 mm. and 0.73 - 0.98 mm. long in the male and 0.38 - 0.46 mm. and 1.09 - 1.15 mm. in the female.

**Male**: The male is half the size of the female and possesses a posterior extremity, which is very much coiled but devoid of caudal alae. The body of the male measures 24.26 - 26.33 mm. and its width is 0.26-0.28 mm. The tail is 0.10 - 0.12 mm. in length. There are two pairs of caudal papillae. One pair is immediately in front of the cloaca and the other behind it. Another pair of papillae, comparatively smaller one, is seen near the tip of the tail. The spicules are unequal in length and dissimilar in shape being 0.29 - 0.31 mm. and 0.13 - 0.16 mm. long. The left spicule is somewhat of equal breadth throughout its length with knife blade-like proximal end, its anterior margin being serrated. The right spicule has wide rectangular distal end, with a knob-shaped tip, immediately preceded by a narrow depression.

**Female**: The female is twice as long as the male,
Plate XX
(Diagramatic)

A Paronchocerca ciconiarum Peters, 1936.
B Paronchocerca bambusicolae (Li, 1933) Peters, 1936.
C Paronchocerca tonkinensis (Chow, 1939).
D Paronchocerca rousseloti Chabaud et Biocca, 1951.
F Paronchocerca straeleni Chabaud et Ball, 1964.
H Paronchocerca thapari n.sp.
measuring 50 - 54 mm. in length and 0.37 - 0.40 mm. in body diameter. The tail is 0.13 - 0.16 mm. long and has a rounded tip. The vulva is flush with the body surface and lies at 3.41 - 3.96 mm. from the head end. The vagina runs posteriorly from the vulva and turns into uteri. The uteri are very much coiled and occupy a greater part of the body. The microfilariae are 140 - 145 μ long and 5 - 6 μ wide.

DISCUSSION: The present species resembles *P. mirzai*, *P. roussaloti*, *P. tonkinensis* and *P. hambusicolae*, as far as the body range is concerned. But it differs from the above mentioned species in the number and arrangement of the caudal papillae. In *P. hambusicolae* and *P. mirzai*, the cloacal papillae are arranged in the form of a ring and are four pairs in number. In *P. tonkinensis* three pairs of papillae are arranged immediately behind the cloaca in a semicircle. In addition to these, two pairs of papillae are found on the tail (Plate No.20). In *P. roussaloti* two pairs of precloacal papillae and one pair of postcloacal papillae are present. There is also one pair of subterminal papillae. As against these the present form has one pair of precloacals, one pair of postcloacals and one pair of subterminal caudal papillae. The following table indicates the differences between the various species.
All measurements in mm.

<table>
<thead>
<tr>
<th></th>
<th>P. ciconiarum</th>
<th>P. bambusicola</th>
<th>P. tonkinensis</th>
<th>P. rousseloti</th>
<th>P. mirzai</th>
<th>P. straeleni</th>
<th>P. mansonii</th>
<th>P. thapari</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body length</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>68 - 70</td>
<td>53</td>
<td>45.5</td>
<td>58</td>
<td>40 - 48</td>
<td>38</td>
<td>35.8</td>
<td>50 - 54</td>
</tr>
<tr>
<td><strong>Spicules</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L.S.</td>
<td>0.34 - 0.37</td>
<td>0.19 - 0.21</td>
<td>0.23</td>
<td>0.3 - 0.34</td>
<td>0.23 - 0.26</td>
<td>0.26</td>
<td>0.22</td>
<td>0.29 - 0.31</td>
</tr>
<tr>
<td>R.S.</td>
<td>0.16 - 0.17</td>
<td>0.14 - 0.15</td>
<td>0.14</td>
<td>0.14 - 0.17</td>
<td>0.11</td>
<td>0.11 - 0.13</td>
<td>0.16</td>
<td>0.12 - 0.16</td>
</tr>
<tr>
<td><strong>Caudal</strong></td>
<td>3 pairs.</td>
<td>4 pairs.</td>
<td>5 pairs.</td>
<td>4 pairs.</td>
<td>4 pairs.</td>
<td>3 pairs.</td>
<td>4 pairs.</td>
<td>3 pairs.</td>
</tr>
<tr>
<td><strong>Papillae</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Position of vulva in body length.</strong></td>
<td>4.25 - 4.70</td>
<td>4</td>
<td>2.4 - 2.5</td>
<td>4.1</td>
<td>3.15 - 3.5</td>
<td>2.7 - 3.3</td>
<td>2.0</td>
<td>3.41 - 3.96</td>
</tr>
</tbody>
</table>
Chabaud et Ball, 1964 have reported
*P. straeleni* with three pairs of papillae immediately
behind the cloaca. In addition to these, are also
reported precloacal pedunculated papillae. The
description is based on two specimens and of these
only one is reported to possess the pedunculated
papillae, one on right and four on the left side.
This type of papillae are not reported so far in any
species of this genus.

In view of the facts mentioned above, the
present form is regarded as new and is named as
*Paronchocerca thanari* n.sp. after Professor Thapar,
G.J.

- **Host**: *Francolinus francolinus*
- **Habitat**: Lungs
- **Locality**: Aurangabad, Maharashtra, India.
Key to the species of the genus *Paronchoceerca* Peters, 1936

1 Caudal papillae both sessile and pedunculated ...  
   Caudal papillae sessile only ... 2

2 Precloacal papillae absent ...  
   Precloacal papillae present ... 3

3 Circum anal papillae four pairs ... 4
   Circum anal papillae less than four pairs ... 5

4 Spicules 0.19 - 0.21 mm. and 0.14 - 0.15 mm. ...  
   Spicules 0.23 and 0.11 mm. ...  
   Spicules stout, right spicule forked at tip  
   Spicules slender right spicule with pointed tip ...  
   *P. straeleni*  
   *P. tonkinensis* (Chow, 1939)  
   *P. bambusicolae* (Li, 1933)  
   Peters, 1936  
   *P. mirzai* Ali, 1956  
   *P. riconiarium* Peters, 1936  
   *P. rousseloti* Chabaud et Biocca, 1951  
   *P. mansoni* Faust, 1966
DIPETALONEMATIDAE Wehr, 1935
Splendidofilariinae Chabaud et Choquet, 1953
Thamradia Seurat, 1917
Thamradia hemidactyli n.sp.*

Several males and females of filariids belonging to the genus Thamradia Seurat, 1917 were collected on two occasions from the subcutaneous tissue of the lizard, Hemidactylus giganteus.

The worms are very thin and transparent; the cuticle is without any striation; the body is cylindrical almost throughout its length; both anterior and posterior ends are bluntly rounded in the males as well as in the females. The mouth is surrounded by six papillae and a pair of amphids. The nerve ring is located at 0.18 - 0.19 mm. from the anterior end in the male and 0.23 - 0.24 mm. in the female.

MALE: The male measures 5.67 - 5.99 mm. in length and 0.13 - 0.14 mm. in maximum body thickness. The head diameter varies from 29 - 31 μ. The oesophagus is 0.48 - 0.70 mm. long. The tail is sufficiently prominent and long, measuring 0.07 - 0.11 mm. It is devoid of caudal alae, but there are three pairs of caudal papillae, one of these being postcloacal and the others precloacal. The postcloacal papillae are at the

* in press.
Plate XXI

*Thamugadia hemidactyli* n.sp.

Figs. 100 Female: Anterior end, lateral view.
     101 End-on view.
     102 Male: Posterior end, lateral view.
     103 Female: Tail end.

Scale. 0.1 mm. applies to figs. 101 and 102.
       0.3 mm. applies to figs. 100 and 103.
junction of the middle and the last thirds of the tail, at a distance of 0.08 mm. from cloaca. The papillae are prominently displayed though all the papillae are sessile. The spicules are unequal measuring 0.086 - 0.11 mm. and 0.064 - 0.068 mm.

**FEMALE:** The female is about one and a half times the length of the male, measuring 8.72 - 11.22 mm. Its body diameter is 0.19 - 0.26 mm. The head diameter ranges between 40 - 50 u. The oesophagus is 0.53 - 0.78 mm. long. The vulva is postoesophageal, opening at 0.77 - 1.13 mm. from the head end. The uteri are opisthodelphic and are tightly packed with embryonated eggs and microfilariae measuring 100-130 μ long and 7 - 8 μ wide. The tail is fairly long, measuring 0.17 - 0.25 mm. The anus is atrophied.

**DISCUSSION:** The genus *Thamugadina* was erected by Seurat, 1917 with *T. hyalina* as type species. This is the only species known so far. The present worm differs from the type species in the following respects.

1) *Thamugadina hyalina* has males and females measuring 9 mm. and 11 mm. respectively. The corresponding measurements in the species under discussion are 5.67 - 5.99 mm. and 8.72 - 11.22 mm.
2) The present worm possesses three pairs of caudal papillae which are absent in the type species.

3) The spicules are equal in *T. hvalina* and unequal in the present form.

4) The vulva is considerably behind the oesophagus in the present form and slightly posterior to the oesophagus in *T. hvalina*.

Thus it is considered as a new species and is named *Thamugadia hamidactyli* n.sp.

**Host**: *Hemidactylus giganteus*

**Habitat**: Subcutaneous tissue

**Locality**: Aurangabad, Maharashtra, India.
DIPETALONEMATIDAE Wehr, 1935

*Splendidofilariinae Chabaud et Choquet, 1953

Neofilaria n.gen.

The genus Eufilaria was erected by Seurat, 1921 for the worm he described as Eufilaria sergenti. Since then the following species were described. E.capsulata (Annet et al, 1901) Seurat, 1921; E.lari Yamaguti, 1935; E.asiatica Singh, 1949; E.delicata Supperer, 1957; E.buckleyi Rasheed, 1960 and E.sinchi Chabaud et al, 1964. Of these E.capsulata is described inadequately. The description of E.lari is based on a female specimen only and its position is doubtful. It may be referred to Anroctiana Skrjabin, 1934 or Sarconema Wehr, 1939. E.buckleyi may be referred to either Aprocta Linstow, 1883 or Ornithofilaria Gonnert, 1937 as suggested by Chabaud, et al, 1964 because neither the cloaca in the male is subterminal nor the arrangement of the caudal papillae is like those of species described under this genus.

Chabaud, 1964 recognises only the following species as valid: E.sergenti, E.delicata, E.asiatica and E.sinchi. E.sergenti the type species still remains different from all the species described later as Eufilaria, in having marked sexual dimorphism, fairly

Plate XXII

Neofilaria aliiv n.gen. n.sp.

Figs. 104 Female : Anterior end, lateral view.
105 End-on view.
106 Male : Posterior end, lateral view.
107 Male : Posterior end, ventral view.
108 Female : Tail end, lateral view.

Scale. 0.2 mm. applies to figs. 104 and 108.
A 0.1 mm. applies to fig. 105.
B 0.1 mm. applies to figs. 106 and 107.
massive tail in the male, with cloacal papillae absent, and also in having the vulva quite anterior. Thus the validity of other species included in this genus becomes doubtful. The caudal papillae are described as absent both in E. sercenti and E. delicata, whereas in E. asiatica and E. singhi the caudal papillae are not only present, but some are even compound. Such being the case the four known species comprise two groups of two species each i.e. 1) E. sercenti and E. delicata with no caudal papillae and II) E. asiatica and E. singhi possessing both simple and compound papillae.

As the genus Eufilaria was erected by Seurat, 1921 the author feels that with E. delicata the genus may be retained as such and the other two species may be assigned to a new genus. Thus in order to maintain the homogeneity of characters in species included in a genus, the author feels advisable to erect a new genus Neofilaria to accommodate E. asiatica and E. singhi.

Neofilaria alii Gen.et.sp.nov.

Three males and five females of this interesting filariid were collected from the button quail Turnix tanki. The worms were found underneath the skin.

The body is cylindrical, slender and whitish
in colour. The anterior and posterior ends are bluntly rounded in both the sexes. However, the posterior extremity is somewhat narrower than the anterior. The cuticle is thin and transparent. The mouth is devoid of lips. Two pairs of cephalic papillae and a pair of amphids are present. The oesophagus is very thin and not divided into two portions. The narrow, tube-like muscular oesophagus is 0.19 - 0.22 mm. in the male and 0.21 - 0.28 mm. in the female. The nerve ring is present at 0.12 - 0.15 mm. from the anterior end in the male and 0.13 - 0.17 mm. in the female.

**Male**: The male is 8.03 - 11.70 mm. in length and 0.11 - 0.13 mm. in maximum width of the body. The cephalic diameter is 0.04 - 0.05 mm. The tail is almost absent, the cloacal opening being very near the tip, at 0.01 - 0.02 mm. The caudal alae are absent. Five pairs of caudal papillae are present. Of these, the first two pairs and the fifth pair are simple; but the third and the fourth pairs of papillae are very close together forming compound papilla on each side. The first two pairs are precloacal. The first pair is somewhat subventral and the second lateral. The compound is adcloacal. The last pair is simple and somewhat sublateral. In addition to these a single terminal papilla is present at the tip. The spicules are subequal
and well cuticularised. The two measure 0.07 - 0.08 mm. and 0.06 - 0.07 mm. The left spicule has a broad distal and a narrow proximal portion, the latter almost twice as long as the former. The right spicule has a uniform thickness except the spear-shaped tooth and a narrower portion behind it.

**Female**: The female ranges in length between 17.77-37.73 mm. with a body diameter of 0.19 - 0.28 mm. The head diameter is 0.05 - 0.06 mm. The vulva is postoesophageal and opens at a distance of 0.50 - 0.95 mm. The uterus is tightly packed with microfilariae, measuring 88 - 97 μ in length and 4 - 5 μ in width. The anus opens at 0.08-0.16 mm. from the tip of the tail.

**Discussion**: The present species differs from *N. asiatica* (Singh, 1949) n.comb. and *N. singhi* (Chabaud et al, 1964) n.comb. as indicated in the following table.

<table>
<thead>
<tr>
<th></th>
<th><em>N. asiatica</em> (Singh, 1949)</th>
<th><em>N. singhi</em> (Chabaud et al, 1964)</th>
<th><em>N. alii</em> n.sp.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body length</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>8.90 - 10.28</td>
<td>10.20</td>
<td>8.00 - 11.70</td>
</tr>
<tr>
<td>Female</td>
<td>Not known</td>
<td>19.00</td>
<td>17.77-37.73</td>
</tr>
<tr>
<td><strong>Caudal papillae</strong></td>
<td>One pair simple, two pairs simple, one pair compound, one pair simple and one median papilla at the tip</td>
<td>Two pairs simple, one pair compound, one pair simple and one median papilla at the tip</td>
<td></td>
</tr>
<tr>
<td><strong>Spicules</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>0.119</td>
<td>0.075</td>
<td>0.07 - 0.08</td>
</tr>
<tr>
<td>Right</td>
<td>0.113</td>
<td>0.065</td>
<td>0.06 - 0.07</td>
</tr>
</tbody>
</table>
Moreover the shape of the spicules and the number and disposition of the papillae are markedly different in the three species. Hence the present worm is named as *Neofilaria ali* n.gen. n.sp., after Professor Syed Mehdi Ali.

**Host** : *Turnix tanki*

**Habitat** : Subcutaneous tissue

**Locality** : Aurangabad, Maharashtra, India.
Neofilaria buckleyi n.sp.

The material for study was collected from the bush quail *Perdicula asiatica*. The worms were found under the skin. Two males and five females were available for study.

The worms are delicate, transparent and milky white in colour. The extremities are bluntly rounded in both the sexes. The cuticle is smooth and without striations. The mouth is without lips, but has four cephalic papillae and a pair of amphids. The nerve ring is located at 0.13 - 0.15 mm. from the anterior end in the male and 0.18 - 0.22 mm. in the female. The oesophagus is 0.23 - 0.25 mm. in the male and 0.26 - 0.28 mm. in the female respectively.

**MALE** : The male measures 7.63 - 9.04 mm. in length and 0.11 - 0.13 mm. in maximum diameter of the body. The tail is very short, the cloaca being subterminal and opening at 0.01 mm. from the tip of the tail. The spicules are unequal, measuring 0.07 - 0.08 mm. and 0.05 - 0.06 mm. while the left spicule is simple and acicular, the right has a spear-shaped tip. There are five pairs of caudal papillae, of which three pairs are simple and precloacal, the fourth pair is compound and adcloacal. In addition to these a pair of comparatively
PLATE XXIII

Neofilaria buckleyi n.sp.

Figs.
109 Female: Anterior end, lateral view.
110 End-on view.
111 Male: Posterior end, ventral view.
112 Male: Posterior end, lateral view.
113 Female: Tail end.

Scale. 0.3 mm. applies to fig. 109.
A 0.1 mm. applies to fig. 110.
B 0.1 mm. applies to figs. 111 and 112.
0.2 mm. applies to fig. 113.
smaller papillae is present at the tip of the tail.

**FEMALE**: The female ranges from 25.05 - 34.05 mm. in length and 0.19 - 0.22 mm. in maximum body diameter. The vulva is postoesophageal and opens at 0.54-0.96 mm. from the anterior end. The tail is fairly long being 0.19 - 0.27 mm. The uterus is filled with microfilariae measuring 75 - 93 μ in length and 3 - 4 μ in width. The microfilariae are unsheathed, with bluntly rounded anterior ends and tapering posterior extremities.

**DISCUSSION**: The present species differs from *N. asiatica* and *N. singhi* in having four pairs of simple and one pair of compound papillae as against one pair simple and one pair compound with a single median papilla in the former and two pairs of compound papillae in the latter. The arrangement of papillae is quite different in the three species. It differs from *N. alii* described earlier in having a pair of papillae at the tip and in having three pairs of simple precloacals.

In view of the differences, in the disposition of the papillae and structure of the spicules, this species is considered as different from *N. alii*. Hence, it is named as *Neofilaria buckleyi* n.sp. after Prof. J.J.C. Buckley.
Host: *Perdicula asiatica*

Habitat: Subcutaneous tissue

Locality: Aurangabad, Maharashtra, India.
DRACUNCULIDAE Leiper, 1912

Dracunculus Reichard, 1759

The genus Dracunculus consists of the following species:

1) D. madinensis (Linnaeus, 1758) Gallandant, 1773;
2) D. globoccephalus Mackin, 1927;
3) D. houdermani Hsu, 1933;
4) D. fauvelboroni Travassos, 1934;
5) D. dahomensis (Neumann, 1895) Moorthy, 1937;
6) D. oesophaga (Polonio, 1859) Desportes, 1938;
7) D. ophidensia Brackett, 1938; and
8) D. doi Chabaud, 1960.

Of these D. globoccephalus was separated by Yamaguti, 1961 and a new genus Chelonidracunculus was erected on the basis of being the only species with unequal spicules. In the author's opinion the reason for the erection of a new genus is not very valid, hence the species D. globoccephalus is retained under Dracunculus. Chabaud, 1960 also retains D. globoccephalus under Dracunculus only. D. insignis (Leidy, 1858) Chandler, 1942 is regarded by Chitwood, 1933 as a synonym of D. madinensis but the author agrees with Chabaud that it is identical with D. fauvelboroni Travassos, 1934. As the figure of the tail end of the male of D. fauvelboroni is not accessible to the author, the figure of D. insignis as given by Chandler, 1942 is substituted.

The author agrees with Moorthy, 1937 and
Plate XXIV

*Dracunculus ali* n.sp.

Figs. 114 Male: Anterior end, dorso-ventral.
115 Male: Anterior end, magnified.
116 End-on view.
117 Male: Posterior end, lateral view.
118 Male: Posterior end, ventral view.

Scale. 0.2 mm. applies to fig. 114.

A 0.1 mm. applies to fig. 115.

B 0.1 mm. applies to figs. 116, 117 and 118.
Brackett, 1938 that the description of *D. houdemeri* based on anterior end of the female only, cannot be regarded as sufficient evidence for establishing a new species. Yamaguti, 1961 has also erected a new genus *Ophiodracunculus* to accommodate the species from the snake, but in the author's view the erection of the new genus should be based on the morphological characters rather than on the differences in the host. Thus all the species are retained in *Dracunculus* only. The differentiation in the arrangement of the genital papillae in the male can be regarded as a very reliable character for the classification of the species.

*Dracunculus alii* n.sp.

On several occasions the common water snake *Natrix piscator* was searched for dracunculids. The infection was most common during the monsoon season from June to September. Only males were available for the detailed study, as on no occasion females could be collected.

The worms are cylindrical in shape and milky white in appearance. The anterior end is blunt and rounded, while the posterior is curved ventrally and ends in a sharply pointed tip. The cuticle is smooth and striae are not visible. The body is of uniform
thickness throughout its length, except the tail. The mouth is surrounded by the cuticular rim. The end-on-view exhibits two rows of papillae, one external cephalic and another internal labial. The external papillae are in the submedian plane and are two pairs in number. Each papilla is a compound one. In the lateral plane the amphids are seen. The internal papillae are in three pairs and are simple.

The length of the male varies from 13.09 - 24.40 mm. and its maximum width 0.17 - 0.23 mm. The diameter of the head ranges from 0.03 - 0.04 mm. The nerve ring is present at 0.34 - 0.58 mm. from the head end. The oesophagus consists of a muscular and a glandular portion. The posterior portion is much more expanded than the anterior. The two portions measure 0.17 - 0.28 mm. and 0.18 - 0.29 mm. respectively.

The tail is ventrally curved and is devoid of caudal alae. The cloaca opens at 0.15 - 0.24 mm. from the tip of the tail. There are twelve pairs of caudal papillae. These are arranged typically as in other species of the genus. There are six pairs of precloacal papillae of which, one pair is immediately in front of the cloaca and midventral in position. Four pairs of papillae are arranged in two groups one on either side of the cloaca. The papillae diverge from somewhat
Plate XXV

(Diagramatic)

A  Dracunculus medinensis  (Linnaeus, 1758)  
    Gallandant, 1773.
B  Dracunculus globoccephalus  Mackin, 1927.
C  Dracunculus dahomensis  (Neumann, 1895)  
    Moorthy, 1937.
D  Dracunculus oesophagus  (Polonio, 1859)  
    Desportes, 1938.
E  Dracunculus fuelleborni  Travassos, 1934.
F  Dracunculus ophidensis  Brackett, 1938.
H  Dracunculus ali  n.sp.
mid-ventral to ventro-lateral position. Another pair of papillae is somewhat in front of these groups and mid-ventral in position. The postcloacal papillae are arranged in six pairs. One pair is mid-ventral, immediately behind the cloaca. The second pair is at the junction of the first and the second thirds of the tail and lateral in position. Another two pairs are mid-ventral, grouped together in between the second and the last two pairs. The last two pairs are again very close together but are lateral in position. The spicules are similar and almost equal, measuring 0.23 - 0.30 mm. and 0.22 - 0.29 mm. respectively. A well developed gubernaculum is also present, which is distinctly divided into two arms and has a maximum length of 0.05 - 0.07 mm. with the maximum width of 0.01 - 0.02 mm.

**DISCUSSION**: *D. globoccephalus* is the only species to have unequal spicules. The present species is different from all the known forms in the arrangement of the caudal papillae (as shown in the plate No. 25). In view of the difference in the arrangement of the caudal papillae and also taking into consideration the bifid gubernaculum it is regarded as a new species and is named as *Dracunculus alii* n.sp. after Professor Syed Mehdi Ali.
Host: *Matrix niscator*

Habitat: Body cavity

Locality: Aurangabad, Maharashtra, India.
**Dracunculus coluberena** n.sp.

A snake *Coluber helena* was found infested with a single male of *Dracunculus*. The parasite was found on the surface of the lung.

The worm is milky white in colour and cylindrical in shape. The anterior end is rounded while the posterior is sharply pointed. The cuticle is smooth. The mouth is surrounded by a cuticular ring, which has a pair of wing-shaped posteriorly directed projections and a small median lip-like conical projection anteriorly. The cephalic papillae are arranged in two rows; the external papillae are in submedian position and are in two pairs, each compound, with two papillae set together. The inner circle has simple papillae of which there are three pairs. A pair of amphids is also present.

The worm is 19.75 mm. long and has a body diameter of 0.2 mm. The oesophagus is 0.48 mm. long, the two component parts being 0.21 mm. and 0.27 mm. The posterior end of the oesophagus is much more expanded than the anterior. The nerve ring is situated at 0.48 mm.

The tail is devoid of caudal alae. There are six pairs of precloacal papillae, of these five pairs are arranged somewhat asymmetrically, and extend from
Plate XXVI

_Dracunculus coluberensis_ n.sp.

Figs. 119 Male: Anterior end, lateral view.

120 Male: Anterior end, magnified.

121 Male: Posterior end, ventral view.

Scale. 0.2 mm. applies to figs. 119 and 121.

0.1 mm. applies to fig. 120.
ventral to the subventral plane. A single pair of papillae is found immediately in front of the cloaca and is midventral in position. The postcloacal papillae are arranged in four pairs. The first pair is immediately posterior to the cloaca and is midventral. The second pair is at half the distance between cloaca and the tip of the tail and is lateral in position. The fourth pair is also lateral, but the third pair is midventral, with the two papillae are arranged one behind the other. The spicules are very broad, thick, short and very much sclerotised. Their proximal ends are curved inwardly. The spicules are almost equal, being 0.07 mm. and 0.08 mm. A small gubernaculum is also present. The tail is 0.18 mm. long.

**DISCUSSION**: The present form resembles *D. oncidensia* Brackett, 1938 in having four pairs of postcloacal papillae, but it has six pairs of precloacal papillae as against five pairs in *D. oncidensia*. The arrangement of the papillae is also markedly different in the two (as shown in plate No.25 and 26). The new form also differs from *D. oncidensia* in having thicker and more sclerotised spicules. Hence it is regarded a species different from all the known forms and is named as *Dragunculus coluberensis* n.sp.
Host: Coluber halana
Habitat: Lung
Locality: Aurangabad, Maharashtra, India.

Key to the species of the genus Dracunculus Reichard, 1759

1 Spicules very unequal ... D. globoccephalus
Mackin, 1927

Spicules equal or subequal... 2

2 Precloacal and postcloacal papillae arranged in two lateral rows immediately in front and behind the cloaca ... ... D. suellahorni
Travassos, 1934

Caudal papillae not arranged as above ... ... 3

3 Precloacal papillae in four pairs ... ... 4

Precloacal papillae more than four pairs ... ... 5

4 Postcloacal papillae six pairs and precloacals extend from midventral to lateral ... ... D. medinensis
(Linnaeus, 1758)
Gallandant, 1773

Postcloacal papillae seven pairs, precloacals midventral and asymmetrical... D. dei
Chabaud, 1960

5 Five pairs of precloacal papillae ... ... 6

Six pairs of precloacal papillae ... ... 8
Five pairs of postcloacal papillae, spicules 297 μ and 283 μ ... D. oesophagae (Polonia, 1869) Desportes, 1938

Four pairs of postcloacal papillae ... ... 7

Spicules larger and acicular, 0.554 mm. and 0.523 mm. ... ... D. onhidensis Brackett, 1938

Spicules thicker and shorter 0.07 mm. and 0.08 mm. ... ... D. coluberensis n.sp.

Precloacals six to eight pairs postcloacals five pairs ... ... D. dahomensis (Neumann, 1895) Moorthy, 1937

Postcloacal papillae six pairs ... ... D. alii n.sp.
DRACUNCULIDAE Leiper, 1912
Avioserpentinae Chitwood, 1935
Aviosernana Wehr et Chitwood, 1934
Aviosernana multipapillosa Singh, 1949

Two male specimens were once collected from the common pond heron Ardeola cravii. The worms were found in the connective tissue of the body cavity.

The worms are small and pinkish in colour, with their posterior ends curved ventrally. In the two males, body length is 7.17 and 7.98 mm.; body thickness 0.14 and 0.15 mm. The cuticle is smooth and nonstriated; however in deeper focus, longitudinal striations are observed. The diameter of the head is 0.04 and 0.06 mm. The body is cylindrical almost all along its length and tapers sharply at the cloacal region. The mouth is surrounded by simple lips. There are altogether seven pairs of cephalic papillae surrounding the mouth. The oesophagus consists of muscular and glandular portions measuring 0.12 and 0.13 mm. and 0.19 and 0.21 mm. in length, respectively. The nerve ring is located at a distance of 0.33 and 0.35 mm. from the head region. The excretory pore is present at 0.34 and 0.41 mm. from the anterior end. The tail is devoid of caudal alae. The cloaca opens
Plate XXVII


Figs.

122 Male: Anterior end, dorso-ventral view.
123 Male: Posterior end, lateral view.
124 Male: Posterior tip, magnified.

Scale.
0.2 mm. applies to figs. 122 and 123.
0.1 mm. applies to fig. 124.
at 0.21 - 0.27 mm. from the tip of the tail. The tip of the tail possesses a bunch of cuticular tubercles. Altogether five pairs of caudal papillae are present, of which two are precloacal and three postcloacal in position. The spicules are equal, measuring 0.37 - 0.39 mm. in length. The gubernaculum is well developed and strongly cuticularised, measuring 0.12 - 0.13 mm. long.

**DISCUSSION**: Singh, 1949 described *Avioserpens multipanilllosa* from *Ardea gravii*. The present worm is also collected from the same host. As the original description of *A. multipanilllosa* is based on a single female, the present worm is provisionally regarded as the male of the same species. It may be noted that in no species reported so far, the caudal papillae are recorded. Singh perhaps inadvertently named this species as "multipanilllosa", though evidently he had the cuticular projections on the tip of the tail in his mind, when he named this species.

<table>
<thead>
<tr>
<th>Host</th>
<th><em>Ardea gravii</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat</td>
<td>Body cavity</td>
</tr>
<tr>
<td>Locality</td>
<td>Aurangabad, Maharashtra, India.</td>
</tr>
</tbody>
</table>