Ochoterenella esslingeri n. sp. (Nematoda: Onchocercidae: Waltonellinae) from Bokermannohyla luctuosa (Anura: Hylidae) in Minas Gerais, Brazil, with notes on Paraochoterenella Purnomo & Bangs, 1999

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INTRODUCTION

The filarial Onchocercidae Leiper, 1911 from anurans belong to either the Waltonellinae Bain & Prod’Hon, 1974 or the Icosiellinae Anderson, 1958. The presence of a long tail and the absence of cephalic spines distinguish the Waltonellinae from the Icosiellinae, which have a very short tail and bear two pairs of submedian cephalic spines (Anderson & Bain, 1976). The present filariae from an anuran host in Brazil belong to the first subfamily.

The Waltonellinae are represented by four genera that were redefined by Esslinger (1986a, b) namely Foleyel-

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MATERIAL AND METHODS

The filariae were recovered from a single heavily infected specimen of Bokermannohyla luctuosa (Pombal & Hadad, 1993), captured in the Municipal Park Lajinha (21º 47’ 45.3” S – 43º 22’ 14.9” W), Juiz de Fora, state of Minas Gerais, Brazil. Living nemato- 

des could be observed through the host’s skin and
the anuran was euthanized. Subsequently, the body cavity was opened by a longitudinal ventral incision from the cloacal opening to the mouth. The filariae were removed from the body cavity and muscular aponeuroses of the thighs. They were fixed in AFA (95 parts 70 % ethanol, three parts 40 % formalin, and two parts glacial acetic acid), stored in 70 % ethanol and cleared in lactophenol for examination. The anterior extremity was studied in apical view, after the head was cut with a razor blade.

In Waltonellinae the cuticular ornamentation is of taxonomic importance (Bain & Prod’Hon, 1974; Esslinger, 1986a, 1989). The presence of cuticular bosses and their arrangement was analyzed, the diameter of these bosses and distances between them were measured at levels defined by Esslinger (1986a); at mid-body of the females and at three times the length of the oesophagus from the apex of the males. The width of the lateral chords in lateral view were measured or illustrated at several levels. Samples of microfilariae were extracted from the uterus near the ovijector for detailed study, and the ovijector was dissected out in one specimen. The ratio of the oesophagus length/body length is given as a percentage, and the vulvar ratio is distance of vulva from anterior extremity/body length, also given as a percentage. The tail ratio is the tail length/body length, expressed as a percentage. The spicular ratio is the length of left/right spicule. Specimens were drawn using a microscope equipped with a camera lucida. Measurements were made on drawings and are given in micrometres, except where otherwise stated. Authority names and dates of the species of *Ochoterenella* are listed in Table III, as well as the type host and family and its geographic origin. The nomenclature of anuran hosts follows that of Frost (2009).

**RESULTS**

**OCHOTERENELLA ESSLINGERI** N. SP. SOUZA LIMA & BAIN

The description is based on seven females and four males (Figs 1, 2; Tables I, II).

- Female

Body cylindrical, anterior and posterior extremities gradually attenuated (Fig. 1A, E), maximum body width in the vulvar region. Cuticle thin, without lateral alae. Cuticular ornamentation present only in the caudal region (Fig. 1G); bosses on ventral and dorsal aspect, small and rounded, three-six in diameter, irregularly arranged and varying in density between females. Width of lateral chords about half of body width at mid-body. Head rounded, with flattened top. Rectangular cephalic plate expanded laterally, 53-58 × 30-36 (Fig. 1B, C), with two pairs of external labial papillae and two pairs of cephalic papillae, each with a prominent cuticularized process (“articulated papillae”, Bain & Prod’Hon, 1974); amphids small. Circular mouth; a pair of small lateral cuticular flap-like parasomal structures. Buccal capsule small and weakly cuticularized; buccal cavity 3 long and 6 wide, its lumen Y-shaped in transverse section (Fig. 1B, D). Oesophagus divided into short anterior muscular portion and long, thick glandular portion (Fig. 1A); oesophagus ratio 3.2-4.3. Intestine broad with wide lumen. Vulva, a transverse slit, posterior to oesophago-intestinal junction; radiating muscles attached to vulva and directed laterally from its opening; vulvar ratio 4.8-6.5. No vagina differentiated; ovijector 2,920 long, simple (Fig. 1H), extending anteriorly, bifurcated to form uteri after coiling around glandular oesophagus; amphidelphic. Anus on a small elevation, tail conical, extremity rounded (Fig. 1E, F); phasmids identified; tail ratio 1.9-2.8.

- Male

Anatomy of head and oesophagus as in female, but processes of cephalic papillae shorter. Laterally elongated rectangular cephalic plate 54 × 30. Posterior region helically coiled with three-five turns (Fig. 2B). Rounded cuticular bosses present on the ventral surface of the body from the glandular oesophageal region to the caudal region; bosses initially large, not numerous and irregularly arranged (Fig. 2F), becoming more numerous and organized along the body, to gradually form transverse bands; distance between bosses within a band, measured at 3,700-3,900 from tail tip, about three times shorter than between bands (Fig. 2G). In the *area rugosa*, the start of which is indistinguishable from the ventral ornamentation of the body, the bosses are smaller and more numerous (Fig. 2H). In the caudal region, the *area rugosa* is made of smaller bosses and again irregularly arranged (Fig. 2C). Caudal papillae: a single large precloacal papilla (or plaque, according to Esslinger, 1986a, 1987, 1988) with an internal transverse furrow, and four pairs of large sessile papillae; the latter arranged symmetrically in two groups: one precloacal pair; three postcloacal pairs, equidistant (20 to 30 apart), the last pair located about 50 from end of tail (Fig. 2B, C). Spicules distinctly unequal and dissimilar, spicular ratio 3.7-4.1; right spicule simple, distal end tapered and rounded, proximal end expanded and strongly cuticularized for the insertion of the retractor muscle (Fig. 2E); left spicule slender, ventrally curved, with narrowing at the transition between handle and blade; blade about two thirds of the spicule length, lined with narrow alae, slightly widening distally; attenuated membranous tip (Fig. 2D).
Fig. 1. – Ochoterenella esslingeri n. sp. A-H: Female.
A, anterior region, right lateral view (coils of ovijector not represented); B, head, dorso-ventral view (holotype); C, head, apical view; D, buccal capsule, optical transverse section; E, tail, right lateral view, lateral chord dotted (holotype); F, tail, ventral view; G, cuticular bosses in the caudal region, ventral view; H, ovijector and beginning of the uteri, after dissection. I-K: Microfilaria. I, immature folded microfilaria, extracted from uteri; J, mature microfilaria from uteri within sheath with small, refractile granules; K, head with small hook and sheath. Scales in μm: A, H, 200; B, C, I, J, 20; D, K, 10; E, F, 100; G, 50.
### Table I. - Morphological characteristics of the females of *Ochoterenella esslingeri* n. sp. from *Bokermannohyla luctuosa* in Minas Gerais, Brasil.

| Specimen number | Paratype | Holotype | Paratype | Paratype | Paratype | Paratype | Mean | SD |
|-----------------|----------|----------|----------|----------|----------|----------|------|----|
| Body length (mm) | 36.6     | 34.7     | 36.5     | 35.2     | 36.5     | 34.5     | 37.7 | 35.9 ± 1.3 |
| Body width at mid-body | 450 | 440 | 470 | 390 | 450 | 320 | 440 | 422.9 ± 51.6 |
| Body width at nerve ring | 220 | 200 | 195 | 200 | 202 | 160 | 212 | 198.4 ± 18.9 |
| Body width at end of muscular oesophagus | 260 | 230 | 210 | 230 | 220 | 200 | 235 | 226.4 ± 19.3 |
| Body width at level of vulva | 500 | 485 | 490 | ND | ND | 470 | 520 | 493 ± 18.6 |
| Cephalic plate: lateral × dorso-ventral | 53 × 36 | 55 × 30 | 58 × 35 | ND | ND | ND | ND | 55 × 34 ND |
| Nerve ring to apex | 295 | 270 | 275 | 210 | 265 | 250 | 270 | 262.1 ± 26.6 |
| Oesophagus total length | 1360 | 1330 | 1570 | 1132 | 1410 | 1380 | 1410 | 1370 ± 130.2 |
| Glandular oesophagus length | 1030 | 1040 | 1250 | 885 | 1020 | 1050 | 1040 | 1045 ± 106.9 |
| Oesophagus ratio | 3.7 | 3.8 | 4.5 | 3.2 | 3.9 | 3.4 | 3.7 | 3.8 ± 0.3 |
| Distance vulva – anterior extremity | 1955 | 1930 | 2300 | 1672 | 1900 | 1770 | 1810 | 1911 ± 219.8 |
| Vulvar ratio | 5.3 | 5.6 | 6.5 | 4.8 | 5.2 | 5.1 | 4.8 | 5.3 ± 0.6 |
| Ovijector length | ND | ND | ND | 2920 | ND | ND | ND | ND |
| Tail length | 250 | 200 | 260 | 250 | 340 | 265 | 320 | 269.3 ± 46.9 |
| Tail width at anus | 122 | 100 | 135 | 100 | 120 | 125 | 170 | 124.6 ± 23.8 |
| Cuticular bosses at mid-body (dorsal and ventral) | absent | absent | absent | absent | absent | absent | absent | absent |
| Cuticular bosses on tail region (dorsal and ventral) | present | present | present | 750-130* | present | present | present | present |
| Distance between bosses on tail region | irregular | irregular | irregular | irregular | irregular | irregular | irregular |
| Diameter of cuticular bosses on ventral/dorsal surface of tail | 3/4 | ND | 3/ND | 4/5 | 4/6 | 4/5 | 4/ND | ND |

* from caudal end; SD: standard deviation; ND: not determined; measurements are in micrometres, unless otherwise stated.

- **Microfilariae**

Sheath present, exceeding the length of the larva to a larger or lesser extent at the anterior and posterior extremities (Fig. 1J); tiny refractile granules seen along its entire length. At dissection, microfilariae adhered to each other and to uterine wall. Anterior extremity wider and rounded, body gradually tapering to posterior region; very small cephalic hook (Fig. 1K); short cephalic space, oesophageal axis often conspicuous in anterior end (Fig. 1I); rounded tail tip with terminal nucleus (Fig. 1I, J). Measurements (n = 25, from paratype): body 112 ± 24 (97-132) long, 4.5 ± 0.7 (4-6) wide; cephalic space 2.5 long. Immature microfilariae folded in sheath (Fig. 1I).

Type host: *Bokermannohyla luctuosa* (Pombal & Hadad, 1993) (Anura: Hylidae), a single type host specimen deposited in “Coleção Herpetologia/Anfíbios, Departamento de Zoologia, Universidade Federal de Juiz de Fora”, registration number 968.

Type locality: Parque Municipal da Lajinha (21° 47’ 34.14” S – 43° 22’ 03.28” W), Juiz de Fora, Minas Gerais, Brazil.

Type material: female holotype, male allotype, eight female and seven male paratypes (172 YU); deposited in the helminth collection of the Muséum National d’Histoire Naturelle (MNHN), Paris. Other paratypes deposited in the Laboratório de Taxonomia e Ecologia de Helminhos, Departamento de Zoologia, Instituto de Ciências Biológicas, Universidade Federal de Juiz de Fora, Brazil (accession number B8-13).

Site of infection: body cavity and muscular aponeuroses of the thighs.

Prevalence and intensity: a single host specimen with 24 male and 32 female nematodes.

Etymology: named in honor of J.H. Esslinger for his contribution to the knowledge of the biodiversity of Neotropical Waltonellinae and other filarial nematodes.
Fig. 2. – Ochoterenella esslingeri n. sp., male.
A, anterior region, left lateral view; B, caudal region, lateral view (lateral chord dotted); C, tail, ventral view; D, left spicule, right lateral view; E, right spicule, right lateral view; F, cuticular bosses irregularly arranged in anterior region, dorso-ventral view; G, bands of cuticular bosses in anterior third region, 5,200 from apex, left lateral view (lateral chord dotted); H, cuticular bosses of the area rugosa, 1,250 from tail tip, left lateral view (lateral chord dotted).

Scales in μm: A-C, 100; D, E, G, 50; F, 20; H, 30.
**TAXONOMIC DISCUSSION**

The filariae described in this paper present the main characters of the genus *Ochoterenella* as redefined by Esslinger (1986a, b): cuticularized parastomal structures, distinct buccal capsule, no lateral or caudal alae. The single discrepancy found is that the “bands of longitudinally oriented bosses in mid-region” which, according to Esslinger (1986a, b), are present in both sexes, are absent in the current females. However, bosses were not entirely absent in the females studied by us, but they were restricted to the posterior region; they are rounded and irregularly arranged. Using the key proposed by Esslinger (1989) for *Ochoterenella*, which is mainly based on the cuticular ornamentation of females, as males are often unknown, the studied specimens are clearly different from the 15 species described to date.

Numerous other characters distinguish the present material from the remaining species of *Ochoterenella* (Tables III-V). In ten species the glandular oesophagus is longer, nearly reaching or just exceeding 2,000; in descending order of length, these species are *O. figureroai*, *O. albareti*, *O. royi*, *O. chiapensis*, *O. lamothei*, *O. oumari*, *O. nanolarvata*, *O. caballeroi*, *O. digiticaudata* and *O. guyanensis* (Bain & Prod’Hon, 1974; Bain et al., 1979; Esslinger, 1987, 1988a, b). Among these species, the tail of the female is longer and the microfilariae are cylindrical with a rounded tail tip in *O. figureroai*, *O. albareti*, *O. royi*, *O. chiapensis*, *O. lamothei*, *O. oumari*, *O. nanolarvata*, *O. caballeroi*, *O. digiticaudata* and *O. guyanensis*; the microfilariae are shorter in *O. albareti*, *O. caballeroi*, *O. nanolarvata* and *O. chiapensis*, and they are also distinct in having an attenuated tail, with even an abrupt constriction in *O. oumari*. The males of *O. caballeroi* and *O. nanolarvata* have a shorter left spicule (≤ 280), particularly *O. oumari* (168).

Table II. – Morphological characteristics of the males of *Ochoterenella esslingeri* n. sp. from Bokermannohyla luctuosa in Minas Gerais, Brasil.

| Specimen number | Paratype | Allotype | Paratype | Paratype | Mean | SD |
|-----------------|----------|----------|----------|----------|------|----|
| Body length (mm) | 18.8     | 19.1     | 14.9     | 17.9     | 17.7 | ± 1.9 |
| Width at mid-body | 250      | 260      | 190      | 280      | 245 | ± 38.7 |
| Width at nerve ring | 120      | 130      | 105      | 150      | 126.3 | ± 18.9 |
| Width at oesophago-intestinal junction | 220 | 260 | 190 | 220 | 222.5 | ± 28.7 |
| Cephalic plate: length × width | 54 × 30 | ND | ND | ND | ND |
| Parastomal structures: height × width | 2.5 × 2.5 | 3 × 3 | ND | ND | ND |
| Buccal capsule | 8 × 7     | 8 × 7     | 6 × 8     | ND | ND | ND |
| Nerve ring to apex | 250      | 230      | 190      | 234      | 226 | ± 25.5 |
| Oesophagus total length | 1160     | 1050     | 890      | 1052     | 1038 | ± 96.3 |
| Glandular oesophagus length | 840      | 790      | 640      | 770      | 760 | ± 85.3 |
| Oesophagus ratio | 6.2      | 5.5      | 6        | 5.9      | 5.9 | ± 0.29 |
| Tail length | 155      | 160      | 160      | 203      | 169.5 | ± 22.5 |
| Tail width at anus | 90       | 90       | 70       | 118      | 92 | ± 19.7 |
| Caudal papillae: - precloacal | 1 + 2     | 1 + 2     | 1 + 2     | ND | ND |
| - postcloacal | 2 + 2 + 2 | 2 + 2 + 2 | 2 + 2 + 2 | ND | ND |
| Left spicule length | 337      | 345      | 345      | 320      | 336.8 | ± 11.8 |
| Distal extremity of left spicule | pointed membrane | pointed membrane | pointed membrane | pointed membrane | - |
| Right spicule length | 135      | 115      | 130      | 91       | 117.8 | ± 19.8 |
| Anterior extremity of right spicule | expanded | expanded | expanded | expanded | - |
| Spicular ratio | 3.37     | 3.83     | 4.1      | 3.52     | 3.7 | ± 0.3 |
| Cuticular bosses | only ventral | only ventral | only ventral | only ventral | - |
| Diameter of cuticular bosses at mid-body | 4        | 4        | 5        | 3        | 4 | ± 0.8 |
| Distance between bosses of *area rugosa* | 10       | 8        | 5        | 6        | 7.3 | ± 2.2 |
| Distance between bands of *area rugosa* | 26       | 29       | 19       | 18       | 23 | ± 5.4 |

* 3600 to 3900 from tail tip; * single papilla; ** paired papillae; SD: standard deviation; ND: not determined; all measurements are in micrometres, unless otherwise stated.
| Ochoterenella species | Authority | Body length | Body width | Oesophagus total length | Glandular oesophagus length | Apex to vulva | Position of vulva | Tail length | Type host | Host family | Type country |
|----------------------|-----------|-------------|------------|-------------------------|-----------------------------|---------------|-----------------|-------------|-----------|-------------|-------------|
| esslingeri n. sp.    | This paper| 34.7-36.6 (36) | 390-470 (445) | 1132-1570 (1365) | 885-1250 (1045) | 1930-2360 | intestinal | 200-260 | Bokermannohyla luctuosa | Hylidae | Brazil |
| convoluta            | (Molin, 1858)* | 27-32 (29.5) | 500 | ND | ND | ND | ND | 270 | Leptodactylus pentadactylus | Leptodactylidae | Brazil |
| scalaris             | (Travassos, 1929) | ND | ND | ND | ND | ND | ND | ND | Leptodactylus ocellatus | Leptodactylidae | Brazil |
| vellardi             | (Travassos, 1929) | 37-50 (43.5) | ND | ND | ND | ND | ND | 1000 | Rhinella marina** | Bufonidae | Brazil |
| digiticaudata        | Caballero, 1944** | 44-57 (51) | 390-673 (605) | 1486-2474 (1896) | 1238-1589 (1537) | 1020-1782 (1420) | oeso | 371-639 (456) | Rhinella marina | Bufonidae | Mexico |
| guyanensis           | (Bain & Prod’Hon, 1974) | 47-57 (52) | 260-450 (356) | 1860 | 1550 | 1250 | oeso | 640 | Rhinella marina | Bufonidae | French Guyana |
| abarroti             | (Bain et al., 1979) | 49 & 55 | 650 & 645 | 2465 & 2910 | 2220 & 2650 | 2200 | oeso | 250 & 330 | Rhinella marina | Bufonidae | French Guyana |
| dufouriae            | (Bain et al., 1979) | 32-44 | 560 | 1750 | 950-1600 | 760-1410 | oeso | 128-285 | Rhinella marina | Bufonidae | French Guyana |
| oumari               | (Bain et al., 1979) | 39 | 590 | 2160 | 1800 | 1100 | oeso | 280 | Rhinella marina | Bufonidae | French Guyana |
| royi                 | (Bain et al., 1979) | 32-69 (51) | 400-520 (460) | 2370 | 2070-2400 | 1020-1650 | oeso | 240-410 | Rhinella marina | Bufonidae | French Guyana |
| caballeroi           | Esslinger, 1987 | 44 & 49 (51) | 416 & 436 | 1832 & 1931 | 1565 & 1705 | 1104 & 1406 | oeso | 259 & 370 | Rhinella marina | Bufonidae | Mexico |
| nanolactata          | Esslinger, 1987 | 38.8-47.9 (43.1) | 485-594 (528) | 1724-2316 (1927) | 1436-1851 (1665) | 1197-1960 | oeso | 144-320 | Rhinella marina | Bufonidae | Mexico |
| chiapensis           | Esslinger, 1988 | 57.7-57.6 (48.7) | 576-624 (497) | 1753-2624 (2235) | 1535-2507 (1952) | 881-2099 (1529) | oeso | 168-394 | Rhinella marina | Bufonidae | Mexico |
| figueroi             | Esslinger, 1988 | 58-71 (65) | 564-702 (607) | 2811-3980 (3159) | 2406-2792 (2652) | 1683-2574 (2141) | oeso | 293-504 | Rhinella marina | Bufonidae | Guatemala |
| lamotbei             | Esslinger, 1988 | 47-57 (52) | 446-594 (531) | 2149-2655 (2440) | 1832-2297 (2081) | 1554-2277 (1944) | oeso | 173-319 | Rhinella marina | Bufonidae | Mexico |
| complicata           | Esslinger, 1989 | 27-35 (30) | 356-594 (465) | 1188-2010 (1485) | 911-1733 (1217) | 762-1273 (1013) | oeso | 204-281 | Rhinella marina | Bufonidae | Columbia |

* reference of description: Travassos, 1929; ** reference of description: Esslinger, 1986; *** Rhinella marina (Linnaeus, 1758) = Bufo marinus; 4 position of vulva in relation to digestive tract; figures in brackets indicate the range where available; bold: characters distinct from the present material; ND: not determined; oeso: oesophageal.

Table III. – Comparative characteristics of the females of the species of Ochoterenella.
Considering the two species in which the glandular oesophagus is similar to the present specimens, females of *O. dufourae* are distinct in having a short robust tail (Bain et al., 1979), and *O. complicata* has microfilariae in which the posterior region is not attenuated and has a rounded tip (Esslinger, 1989).

The oesophagus was not measured in the remaining three species, *O. convoluta*, *O. scalaris* and *O. vellardi*, but detailed descriptions of their cuticular ornamentation, in which they are distinct from the present material, were provided. No illustrations but some measurements (Travassos, 1929) are available for the following two species: *O. vellardi* females have a long tail (1,000), and males have a shorter left and longer right spicule; two precloacal pairs of papillae are reported, as also in *O. convoluta*, but this might be an erroneous interpretation, the unpaired papilla being as large and salient as the paired papillae.

The single species of *Paraochoterenella* must be considered as well, since the definition of the genus does not appear clearly distinct from that of *Ochoterenella* when comparing Esslinger (1986b) and Purnomo & Bangs (1999). *Paraochoterenella javanensis* Purnomo & Bangs, 1999, a parasite of the dicroglossid *Fejervarya cancrivora* (Gravenhorst, 1829) (= *Rana cancrivora*) in Indonesia, was described as “cuticular bosses minute (< 2-3), non bacillary in appearance, with irregular distribution”. Therefore it is rather similar to the present material, but the bosses are not restricted to the posterior region. Moreover, in *P. javanensis*, both sexes are smaller, and the male differs in the absence of an unpaired precloacal papilla. In addition, the male is distinct in having two precloacal and four postcloacal pairs of papillae (instead of one and three, respectively), and the *area rugosa* is organized in transverse bands anterior and posterior to the cloacal aperture.

### Table IV. – Comparative characteristics of the microfilariae and cuticular bosses of the females of the species of *Ochoterenella*.

| *Ochoterenella* species | References | Microfilaria | Cuticular bosses at mid-body |
|------------------------|------------|--------------|-----------------------------|
|                         |            | Length | Maximum width | Anterior end | Posterior end | Length | Distance between bosses | Distance between bands |
|                        |            |        |               |             |              |        |                         |                         |
| *eeslingeri* n. sp.    | This paper | 97-132 | 4.5*          | wider than mid-body | attenuated   | absent** | absent**                   | absent**                 |
| *convoluta*            | Travassos, 1929 | ND       | ND            | ND           | ND           | 6-20   | irregular               | no bands                 |
| *scalaris*             | Travassos, 1929 | ND       | ND            | ND           | ND           | 20     | 8                        | 5-6                      |
| *vellardi*             | Travassos, 1929 | ND       | ND            | ND           | ND           | 16     | 80-120                   | 40-112                   |
| *digiticaudata*        | Esslinger, 1986 | 96-134  | 2.6-3.6       | as wide as mid-body | not attenuated, rounded tip | 7-10   | 13-20                    | 62-93                    |
| *guyanensis*           | Bain & Prod’Hon, 1974 | 130-190 | 4.5          | slightly attenuated | not attenuated, rounded tip | 5      | 4-5                      | 30-35                    |
| *albareti*             | Bain et al., 1979 | 62-68   | 5-5.5        | as wide as mid-body | attenuated | 20     | 30-120                   | 18-20                    |
| *dufourae*             | Bain et al., 1979 | 108-138 | 4            | as wide as mid-body | slightly attenuated | 4-7    | 10-20                    | 30-80                    |
| *oumari*               | Bain et al., 1979 | 88-99   | 5            | as wide as mid-body | slightly attenuated | 6-12   | 10-40                    | 40-50                    |
| *royi*                 | Bain et al., 1979 | 130-163 | 5            | wider than mid-body | attenuated | 7-15   | 7-15                     | 30-50                    |
| *caballeroi*           | Esslinger, 1987 | 76-88   | 3.4-4.1      | subterminal constriction | attenuated | 9-16   | 15-48                    | 36-69                    |
| *nanolarvata*          | Esslinger, 1987 | 51-67   | 5.1-6.2*     | wider than mid-body | constructed | 8-15   | 28-37                    | 35-44                    |
| *chiapensis*           | Esslinger, 1988 | 68-91   | 5.7          | slightly constrained | abruptly attenuated | 10-15  | 20-70                    | 30-40                    |
| *figueroai*            | Esslinger, 1988 | 74-85   | 5.3-6.3      | wider than mid-body | attenuated | 10-24  | 37-44                    | 58-67                    |
| *lamothei*             | Esslinger, 1988 | 88-96   | 5.4-6.2*     | wider than mid-body | attenuated | 7-18   | 28-42                    | 48-59                    |
| *complicata*           | Esslinger, 1989 | 96-114  | 3.6-4.4      | as wide as mid-body | not attenuated, rounded tip | 3-7    | 18-27                    | 26-37                    |

* maximum width near anterior end; ** present in caudal region, rounded, 3-6 in diameter, irregularly arranged; figures in brackets indicate the range where available; bold: characters distinct from the present material; ND: not determined.

*Table IV.* – Comparative characteristics of the microfilariae and cuticular bosses of the females of the species of *Ochoterenella*. 
We therefore conclude that the material described herein represents a new species, *Ochoterenella esslingeri* n. sp.

**DISCUSSION**

*Ochoterenella esslingeri* n. sp. expands the host range of the genus to the Hylidae. Some representatives of this anuran family have been listed as hosts of a few *Ochoterenella* species that were described from other type hosts (Vicente et al., 1990; Azevedo-Ramos et al., 1998; Goldberg & Bursey, 2008). However, in cases where filarial identifications were not based on detailed morphological studies, these data ought to be considered with caution, since the works of Esslinger (1986a, 1987, 1988) demonstrated that worms identified as *O. digiticaudata* in the collection of Prof. E. Caballero in the Instituto de Biologia at Universidad Nacional de Mexico, contained three hidden species, *O. caballeroi*, *O. nanolarvata* and *O. chiapensis*.

*Ochoterenella esslingeri* n. sp. presents the main generic characters of *Ochoterenella*, and the slight particularities that were seen in the new species (female ornamentation and position of the vulva) do not deserve a higher taxonomic rank than specific. The two species parasitic in Leptodactylidae are too poorly known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions. What remains is an incredibly high diversity of known to draw any conclusions.
this delicate character is often very difficult to observe, particularly in Giemsa stained blood smears, where the sheath often remains unstained. It is expected that more species will be described in the Oriental Realm and will support this interpretation of a particular lineage of Waltonellinae. The present references on Waltonellinae from this region do not allow a generic assignation (Johnston, 1967; Moravec & Sey, 1985), except that of Petit & Yen (1979) in Malaysia, but it concerns a species of Foleyllellidae according to Esslinger (1986b). Interesting materials from anurans were reported more recently in India (Sarkar & Manna, 2008; Oinam & Gambbir, 2011), but descriptions were not accurate and the generic assignation to Ochoterenella was not supported.

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