

Redescription of *Lemuricola (Madoxyuris) vauceli* (Nematoda, Oxyuridae) from *Eulemur fulvus* (Primates, Lemuridae)

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Abstract

Lemuricola (Madoxyuris) vauceli Chabaud, Brygoo et Petter, 1965 is redescribed on the basis of a re-examination of type and voucher specimens. Using both light and SEM microscopy, structures such as the cephalic papillae, details of the lateral alae, area rugosa and tail cuticular ornamentation, are described or redescribed with more precision. The detailed measurements of several male and female specimens are given in a table. In the original description, using light microscopy only, the authors had described 3 pairs of pedunculated papillae in the male of *L. vauceli*. The present study establishes the precise number, shape and disposition of the end of the male tail to include only two pairs of pedunculated papillae, 2 pairs of sessile papillae, and 1 pair of phasmids. As the same pattern was observed in all descriptions and recent redescriptions of species classified in the Enterobiinae, the present work confirms that the number and disposition of the caudal papillae observed in the subfamily is constant.

Keywords

Lemuricola (Madoxyuris) vauceli, oxyurids, Enterobiinae, SEM, *Eulemur*

Introduction

The subfamily Enterobiinae Hugot, Gardner et Morand, 1996 includes 47 species of pinworm parasites of primates (Hugot *et al.* 1996). Cladistic analysis supports the monophyly of this subfamily, as well as its subdivision into three monophyletic genera: *Enterobius* Leach, 1853, *Trypanoxyuris* VEVERS, 1923 and *Lemuricola* Chabaud et Petter, 1959 (Leach 1853, VEVERS 1923, Chabaud and Petter 1959, Hugot 1999). The genus *Lemuricola* includes 9 species distributed within 3 subgenera: *Lemuricola* Chabaud et Petter, 1959; *Protenterobius* Inglis, 1961; and *Madoxyuris* Chabaud, Brygoo et Petter, 1965 (Chabaud and Petter 1959, Inglis 1961, Chabaud *et al.* 1965, Hugot *et al.* 1996, Hugot 1999). Because detailed features of the caudal bursa are difficult to observe using light microscopy only, a doubt existed about the number and disposition of the caudal papillae present in several species as originally described.

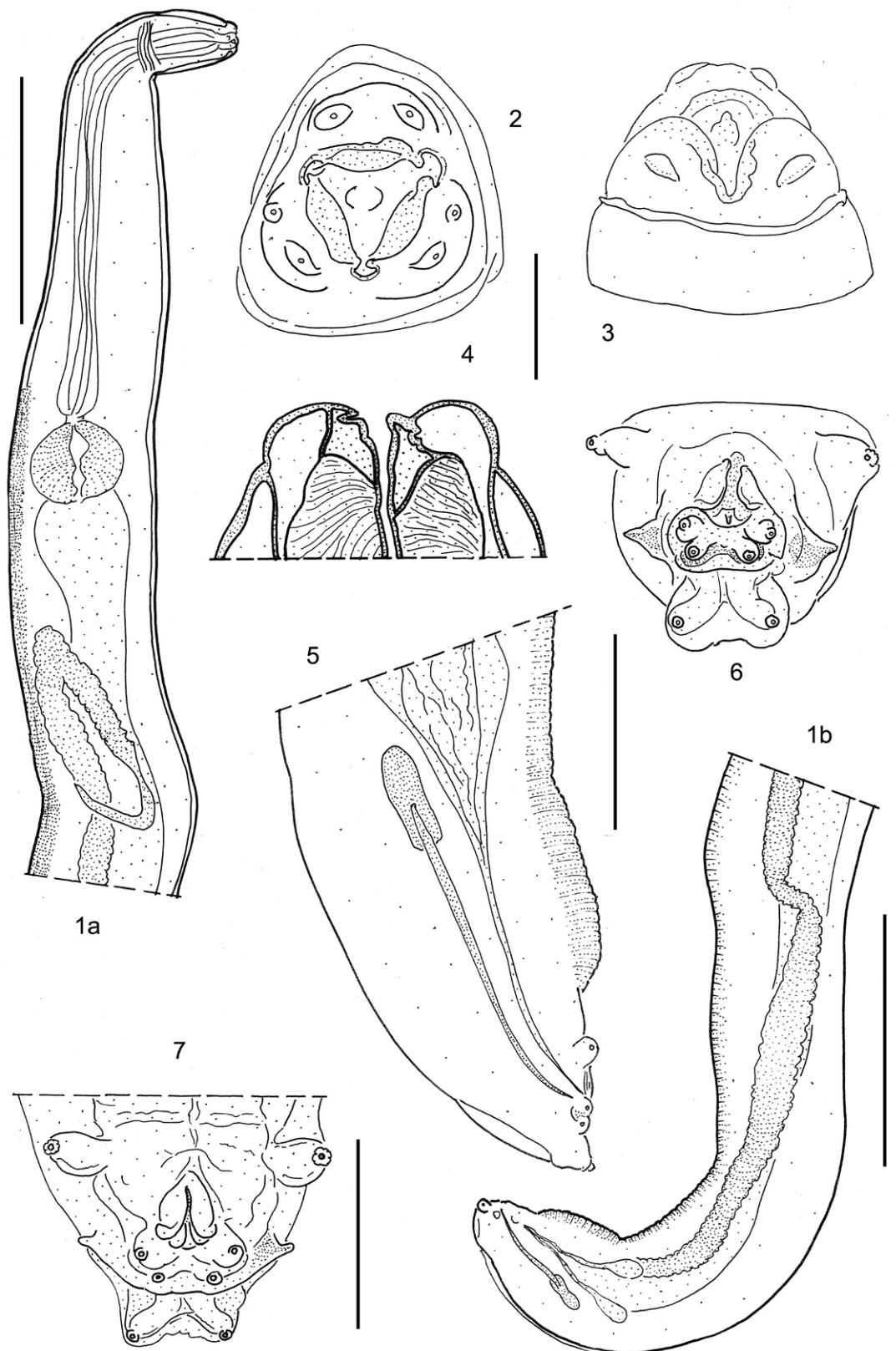
The aim of this paper is to redescribe *L. (M.) vauceli* Chabaud, Brygoo et Petter, 1965. In particular, we are attempting to validate the characters of the caudal bursa in this

species on the basis of a re-examination of type and voucher specimens and using scanning electron microscopy (SEM).

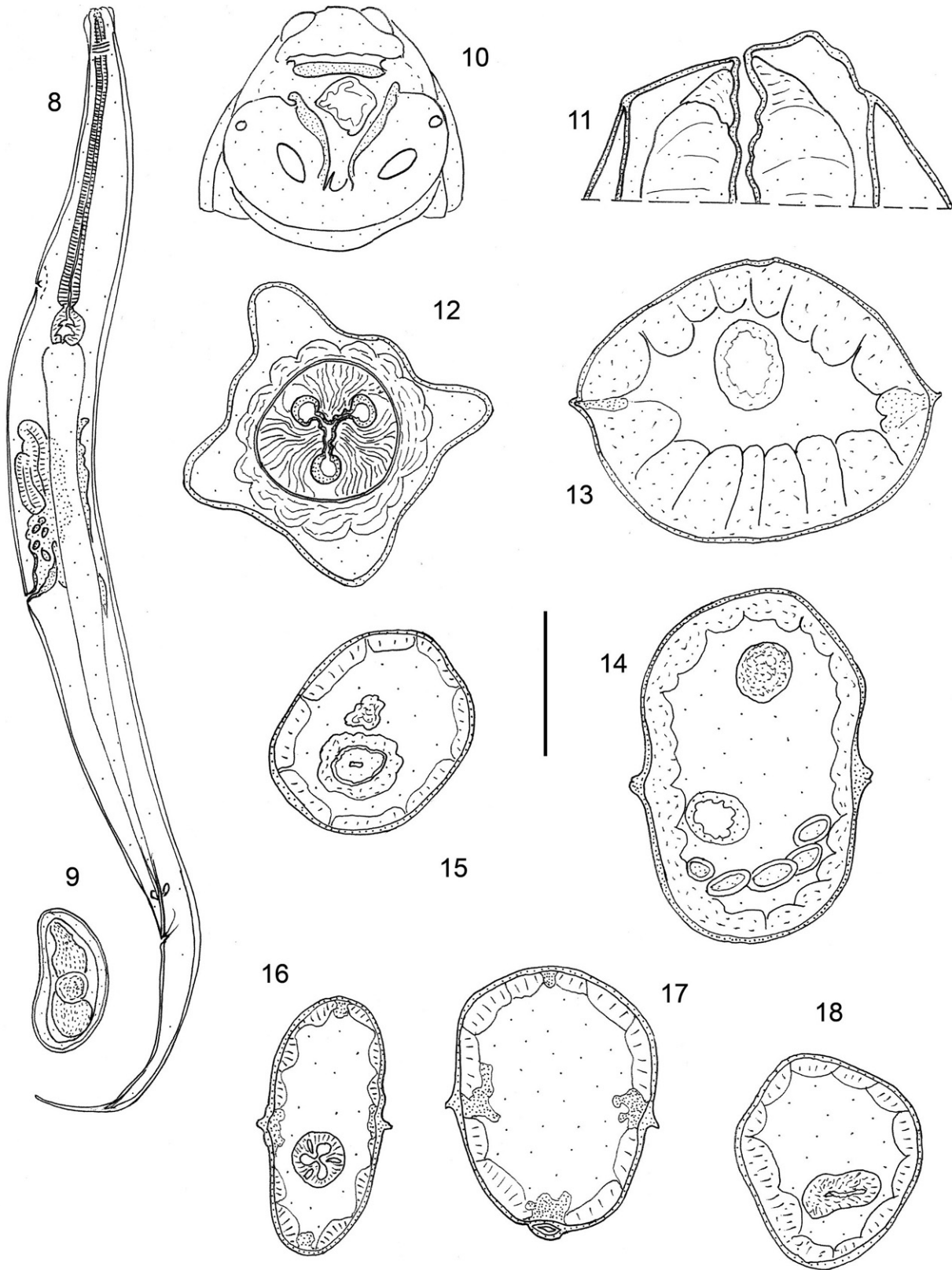
Materials and methods

Eighteen specimens of *L. (M.) vauceli* from *Eulemur fulvus* (É. Geoffroy), collected in Ampijoroa (Madagascar) and deposited in the Collection of Helminthology, Muséum National d'Histoire Naturelle (MNHN), Paris, France (Nos. 836 F and 849 F), were studied. The nematodes were studied in temporary mounts of lactophenol. Cross-sections of worms were made “free-hand” using small pieces of razor blade and a small brush. Drawings were made with the aid of a drawing tube. Some specimens were dried using the critical point method, examined under SEM (Jeol 6360 LV), and photographed. In the table measurements are given in micrometers. Terminology follows Hugot (1988, 1999), Hugot and Baylac (2007) and Hugot *et al.* (1995, 1996). The names of the hosts were updated following Wilson and Reeder (2005).

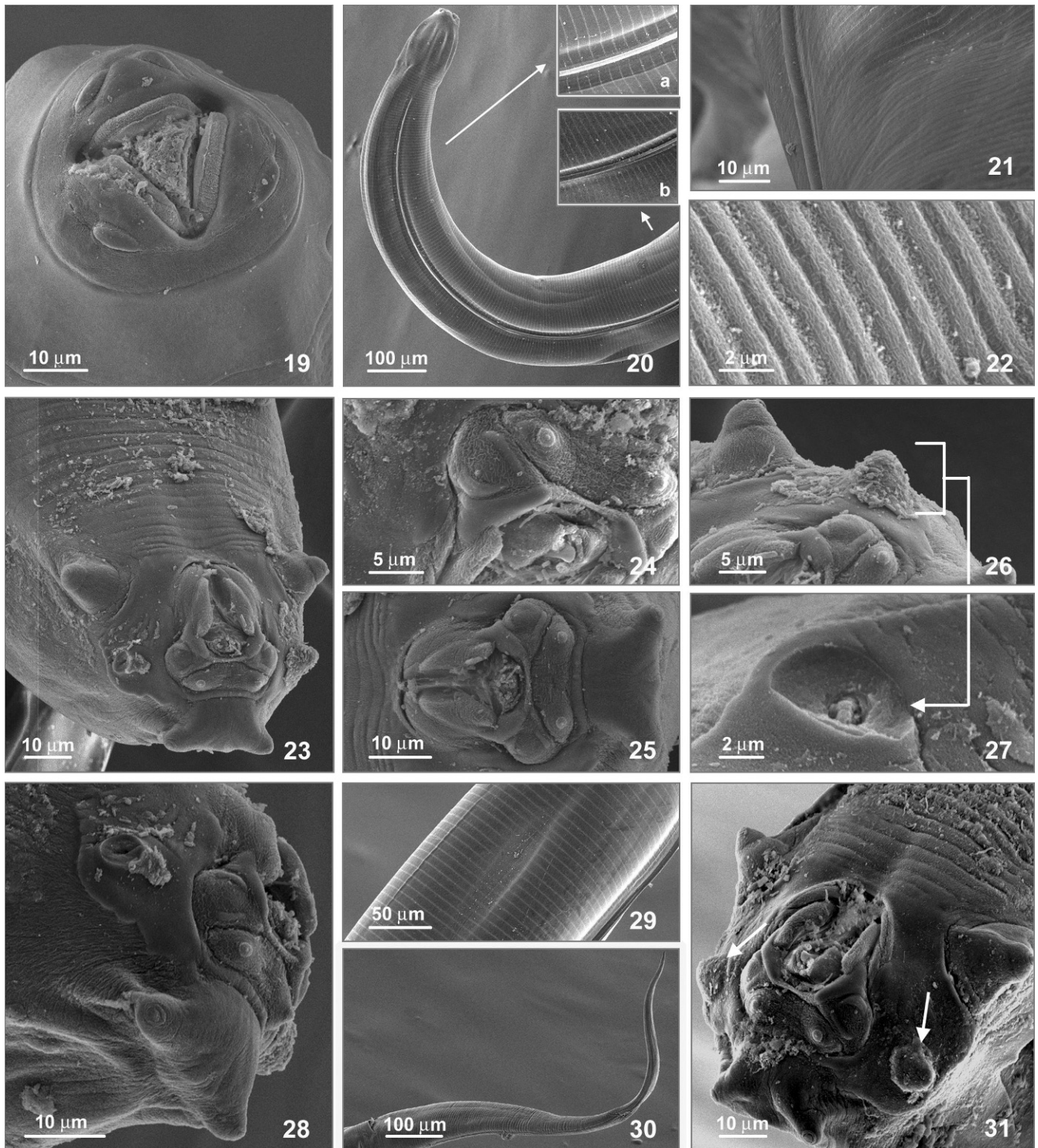
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Figs 1–7. *Lemuricola (Madoxyuris) vauceli*, male: **1a** – anterior part and **1b** – posterior part of a complete specimen, left lateral view; **2** – buccal aperture and cephalic plate, apical view; **3** – idem, ventral view; **4** – idem, frontal optical cut; **5** – right lateral view of posterior extremity; **6** and **7** – ventral view of caudal end (two different specimens). Scale bars: 1a, 1b = 400 μ m; 2–4 = 25 μ m; 5 = 100 μ m; 6, 7 = 50 μ m



Figs 8–18. *Lemuricola (Madoxyuris) vauceli*, female: **8** – complete specimen, left lateral view; **9** – egg; **10** – buccal aperture and cephalic plate, apical view; **11** – idem, frontal optical cut; female cross sections of body at level of: **12** – middle oesophagus, **13** – oesophagus end, **14** – immediately posterior to vulva, **15** – preanal part. Scale bars: **8** = 500 μ m; **9** = 50 μ m; **10**, **11** = 35 μ m; **12**, **15** = 100 μ m; **13** = 95 μ m; **14** = 126 μ m. Male cross sections of body at level of: **16** – middle oesophagus; **17** – posterior to excretory pore; **18** – preanal part. Scale bars: **16**–**18** = 100 μ m



Figs 19–31. *Lemuricola (Madoxyuris) vauceli*, SEM micrographs of: **19** – apical view of male buccal aperture, surrounded by lips, four cephalic papillae and amphids; **20** – female, detail of lateral view of anterior extremity, lateral alae sections; **21** and **22** – male, detail of lateral alae and area rugosa, post-excretory pore section; **23** – ventral view of posterior extremity, detail of 2 pairs of pedunculate papillae, 2 pairs of sessile papillae, and 1 pair of phasmids; **24** and **25** – detail of sessile papillae; **26** – detail of phasmid with secretion; **27** – detail of phasmid; **28** – apical view of posterior extremity; **29** – female, detail of excretory pore; **30** – detail of tail; **31** – male, ventral view of posterior extremity, both phasmids with secretion

Redescription

Lemuricola (Madoxyuris) vauceli Chabaud, Brygoo et Petter, 1965 (Figs 1–31)

General: Cephalic plate rounded; large triangular buccal aperture surrounded by 3 thickened lips; apex of teeth with a strong and sharp denticle (Figs 2–4, 10–12, 19). Four cephalic papillae: two on dorsal lip and one on each ventro-lateral lip; ventral cephalic papillae close to amphids (Figs 2, 3, 10, 19). Oesophageal bulb with smashing valvular apparatus; ratio total oesophagus length/oesophageal bulb length >3.15 in both sexes. Lateral alae beginning posterior to bulb; simple crested and ending before cloaca in males (Figs 16–18, 21); in females, beginning as a single crest until 3/4 of the body length where they split into two crests reaching the posterior end (Figs 13–15, 20a, b, 30).

Male. Area rugosa present, between excretory pore and cloacal aperture, as a ventral cuticle inflated into a large round crest, which appears U-shaped in cross-section (Figs 1a, b, 17, 18, 22). Cloacal opening I-shaped. Four pairs of caudal papillae, 1st and 4th pairs pedunculated and supporting the bursa, 2nd and 3rd pairs sessile flanking the opening of the cloaca; tubes of phasmids beginning at base of peduncles of 4th pair of caudal papillae; ring-shaped cuticular thickening around 2nd and 3rd pairs, forming two lateral cones including the phasmidian tubes (Figs 6, 7, 23, 26, 27, 31); this structure is connected with a small pitchfork ornamentation that longitudinally flanks the posterior edge of the

cloaca (Figs 24, 25). Spicule: with thick rectangular manubrium, corpus feebly curved ventrally, sharp pointed. Tip of tail absent (Figs 6, 7, 28).

Female. Genital tract amphidelphic; unpaired uterine tube divided into 2 equal parts by a cellular wall forming a diaphragm; muscular vagina directed anteriorly and impaired uterine tube directed posteriorly, forming a handle shaped curve. Spermatheca present on oviducts. Egg without embryo, non operculated, asymmetrical, 1 edge flattened, thin-shelled with rounded ends.

Measurements. Table I gives the range and average from 6 males and 6 females, taken from the original materials. These measurements are compatible with the values given in the original description.

Type host: *Eulemur fulvus* (E. Geoffroy).

Other host: *Eulemur mongoz* (Linnaeus).

Type locality: Ampijoroa, Madagascar.

Site of infection: Caecum.

Specimens studied: 836 F (6 males and 5 females) and 849 F (4 males and 3 females), Collection of Helminthology, MNHN.

Remarks

When compared with the description of Chabaud *et al.* (1965), and with the exception of the number of pedunculated caudal papillae, our study confirms and validates the characters and measurements of *L. (M.) vauceli*. This species can be differentiated from the other 4 species in the subgenus by the par-

Table I. Main measurements features and ratios (mean and ranges) of *Lemuricola (M.) vauceli*

	Male (n = 6)			Female (n = 6)		
	mean	min.	max.	mean	min.	max.
Body Length (body L)	2765	2400	3000	4616.6	3700	5500
Body Width (w max)	210	190	240	323.3	230	400
Oesophagus Length (ospg L)	786.6	730	850	1041.6	930	1100
Bulb Length (blb L)	127.5	110	150	143.3	130	160
Apex to :						
– nervous ring (nv)	152.5	140	175	166.6	110	200
– excretory pore (ex)	880	750	1100	1076.6	1000	1170
– vulva (vulv)				2095	1800	2330
Tail Length (T)	22.2	21	24	1140	870	1570
Spicule Length (spc L)	146.6	140	170			
Egg Length				55.7	50	60
Egg Width				27.2	25	30
Ratios:						
– body L/w (max)	13.3	10.8	15	11.1	8.8	13.6
– body L/ospg L	3.5	3	3.8	3.3	2.8	4
– body L/ex	3.2	2.6	3.5	3.2	2.6	4.1
– body L/spc L	18.9	16	21.4			
– body L-T/vulv				1.6	1.5	2
– ospg L/blb L	6.2	5.5	7.3	7.3	6.6	8.5
– ospg L/nv	5.2	4.9	5.3	6.5	5	8.4
– ospg L/ex	0.9	0.7	1.1	0.9	0.8	1.1

ticular distribution and ornamentation of sessile papillae and by different proportions in the different parts of the body. The distribution of the sessile papillae forms a cuticularized sheet with unique geometry. The oesophagus in both males and females is relatively longer than other species. Also in both sexes, *L. (M.) vauceli* differs from *L. (M.) daubentonii* Petter, Chabaud, Delavenay et Brygoo, 1972; *L. (M.) baltazaldi* Chabaud, Brygoo et Petter, 1965 and *L. (M.) bauchoti* Chabaud, Brygoo et Petter, 1965 by a relatively longer distance between the excretory pore and the anterior end. In *L. (M.) vauceli* females the distance between the vulva and the anterior end is relatively longer than in *L. (M.) daubentonii*, *L. (M.) lemuris* (Baer, 1935), *L. (M.) baltazaldi* and *L. (M.) bauchoti*. Finally, *L. (M.) vauceli* also has a much longer spicule than other species (Baer 1935, Chabaud *et al.* 1965, Petter *et al.* 1972).

Discussion

Lemuricola (Madoxyuris) vauceli Chabaud, Brygoo et Petter, 1965 is redescribed on the basis of a re-examination of type and voucher specimens. Using both light and SEM microscopy, structures such as the cephalic papillae, details of the lateral alae, area rugosa and tail cuticular ornamentation are described with precision.

In their original descriptions of different species of *Lemuricola* Chabaud *et al.* (1965) using light microscopy, described 3 pairs of pedunculated papillae, 2 pairs of sessile papillae, and 1 pair of amphids. In a previous study Robles *et al.* (2010) demonstrated the presence of only 2 pairs of pedunculated papillae in *L. (M.) bauchoti*, a parasite of the ring-tailed lemur, *Lemur catta* Linnaeus, in Madagascar. Using SEM microscopy, we also found only two pairs of pedunculated papillae (1st and 4th pairs) in *L. (M.) vauceli*. These observations confirm that the number of caudal papillae in the Enterobiinae is constant (Hugot *et al.* 1996, Hugot and Baylac 2007), with all species possessing 2 pairs of pedunculated and 2 pairs of sessile papillae.

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