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MÉMOIRES ORIGINAUX

PARASITES OF THE RELICT FAUNA OF CEYLON

VIII. Helminths from *Ichthyophis* spp. (Amphibia : Gymnophiona)

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SUMMARY. Trematodes and nematodes are recorded for the first time, and described, from the endemic caecilians *Ichthyophis glutinosus* (L) and *I. orthoplicatus* Taylor, 1965 of Sri Lanka. The trematodes are of the species *Gorgoderina carli* Baer, 1930, from the urinary bladder, and *Mesocoelium monas* (Rudolphi, 1819) from the small intestine. The nematodes are referred to the species *Rhabdias escheri* Baer, 1930, from the body cavity and lungs, a new host-record; *Pelodera chabaudi* sp. nov., from the stomach, small intestine and rectum; and *Meteterakis sinharajensis* Cruz and Ching, 1976, from the rectum, also a new host-record. *Pelodera chabaudi* is recognised as a new species on the basis of the arrangement of the bursal papillae, the very prominent pair of fleshy papillae on the cloacal elevation, and the markedly anterior position of the free proximal ends of the distally fused spicules.

Parasites de la faune relict de Ceylan. VIII. Helminthes, parasites d'*Ichthyophis* spp. (Amphibiens, Gymnophiona).

RÉSUMÉ. Étude des Trématodes et Nématodes parasites d'Amphibiens gymnophiones *Ichthyophis glutinosus* (L) et *I. orthoplicatus* Taylor, 1965, endémiques à Sri Lanka. Ont été identifiés les Trématodes *Gorgoderina carli* Baer, 1930, dans la vessie urinaire et *Mesocoelium monas* (Rudolphi, 1819) dans l'intestin grêle; les Nématodes *Rhabdias escheri* Baer, 1930, dans la cavité générale et les poumons (nouvel hôte), *Pelodera chabaudi* n.sp. dans l'estomac, l'intestin grêle et le rectum et *Meteterakis sinharajensis* Cruz et Ching, 1976 du rectum (nouvel hôte). *Pelodera chabaudi* n.sp. diffère des autres espèces du genre, notamment par la disposition des papilles bursales, par la paire de papilles proéminentes sur la lèvre antérieure du cloaque, par la grande taille des spicules dont les pointes distales sont fusionnées.

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Introduction

"This is not the place to delve deeply into the possible explanations of Sri Lankan-Malaysian faunal similarities, but it should be remarked that Wallace's (1876) theory of an extensive land bridge between Sri Lanka and Malaysia seems too simple. Any explanation should also deal with the important similarities and differences between Sri Lankan and Indian faunas".

— Nussbaum and Gans, 1980

Sri Lanka has three species of *Ichthyophis*, namely *I. glutinosus*, *I. pseudoangularis* and *I. orthoplicatus*, all of which are endemic (Nussbaum and Gans, 1980). The present paper deals with helminths obtained from *Ichthyophis glutinosus* (L) and *I. orthoplicatus* Taylor, 1965.

Three specimens of *Ichthyophis glutinosus* (3 females) collected in August 1972 in Gammaduwa (elevation 720 m, in the Central Province) were found to be infected with trematodes and nematodes. The trematodes, (4 specimens), were taken from the urinary bladder. They were released into 0.9% saline, pressed, preserved in Bouin's fluid, stained with acetic alum carmine, and permanently mounted. They were found to belong to the species *Gorgoderina carli* Baer, 1930. Twelve nematodes (8 mature and 4 immature females) belonging to *Rhabdias escheri* Baer, 1930 were collected from the body cavity of one host and fixed in hot 70% alcohol.

One female *I. glutinosus* collected in 1980 in Kandy (at Aniewatte, elevation 510 m) was also found to be infected with trematodes and nematodes. A large number of trematodes were collected from the small and large intestines, fixed in Bouin's fluid, and preserved in 5% formalin. A few of them were stained in potassium alum carmine. These were identified as belonging to *Mesocoelium monas* (Rudolphi, 1819). The nematodes were collected from the body cavity, lungs, stomach, small intestine, and rectum. They were fixed in hot 70% alcohol and cleared in lactophenol. The specimens from the body cavity (6 mature and 3 immature females) and lungs (2 mature females) belong to *Rhabdias escheri*, those from the stomach (6 males, 1 female) and small intestine (2 males) to a new species of *Pelodera*, and the rectal nematodes (23 in all) to two different species: seventeen (4 males, 13 females) to the new species of *Pelodera*, and six (2 males, 4 females) to *Meteterakis sinharajensis* Crusz and Ching, 1976.

Out of a total of 7 specimens (4 males, 3 females) of *Ichthyophis glutinosus* collected in July 1976 at Dewatura Estate (860 m), 5 (2 males, 3 females) were found to be infected with nematodes, in the lungs, small intestine and rectum. The single nematode, a female, from the lung belongs to *Rhabdias escheri*. Those from the small intestine and rectum belong to two species, namely the new species of *Pelodera* (19 males, 3 females) and *Meteterakis sinharajensis* (4 males, 5 females).

Another collection of *I. glutinosus* (5 males, 1 female) was made in Gammaduwa in 1980. Four specimens (3 males, 1 female) harboured nematodes in the stomach

and rectum, those from the stomach (2 females) and some from the rectum (12 males, 3 females), belonging to the same new species of *Pelodera*, and the rest from the rectum (1 male, 6 females) to *Meteterakis sinharajensis*.

Trematodes and nematodes were also recovered from 5 (2 males, 3 females) out of 9 (3 males, 6 females) specimens of *Ichthyophis orthoplicatus*, collected at Dewatura Estate in July 1976. The trematodes (4 specimens), from the urinary bladder, belong to the species *Gorgoderina carli*; the nematodes, from the lungs, to *Rhabdias escheri* (5 females), while those from the small intestine and rectum to the new species of *Pelodera* (1 male, 1 female), and *Meteterakis sinharajensis* (3 males, 4 females).

Gorgoderina carli Baer, 1930

(Trematoda: Digenea: Gorgoderidae)

(fig. 1)

Description

The worms are elongated and spindle-shaped, with bluntly rounded anterior, and pointed posterior, end. The maximum body-width is at the testicular region. The cuticle is smooth and aspinose. The oral sucker is terminal and spherical. There is no pharynx. A short oesophagus is present. The caeca are simple and do not extend to the caudal end. The acetabulum is very prominent and situated in the anterior third of the body. The oral-sucker ventral-sucker ratio varies from 1.6-2.0, with an average of 1.80.

The gonads are concentrated in the middle third of the body. The two testes are long, ovoid, diagonally placed, and intercaecal. They are ovarian and post-ovarian in position, respectively. The vas deferens runs forward to the vesicula seminalis which ends in a cirrus. The genital pore is median or submedian, behind the intestinal bifurcation.

The ovary is spherical, pre-testicular and submedian. The two vitellaria are compact and pre-ovarian, and situated just below the acetabulum. Their ducts unite to form a common duct lateral to the ovary. The uterine coils are extensive and packed with small ovoid eggs. They occupy the available space between the acetabulum and the posterior end of the body. The eggs are small, thin-shelled and embryonated.

MEASUREMENTS IN MM. :

	From <i>Uraeotyphlus oxyurus</i> in India	From <i>Ichthyophis glutinosus</i> and <i>I. orthoplicatus</i> in Sri Lanka
Body length	3.0	2.27-3.96
Body width (maximum)	0.56	0.76-1.06
Oral sucker	0.38	0.23-0.39 × 0.27-0.31
Ventral sucker	0.63 × 0.25	0.46-0.65 × 0.44-0.62
Sucker ratio (o.s.:v.s.)	1:1.6	1:1.6-2.0 or 1:1.80 (average)

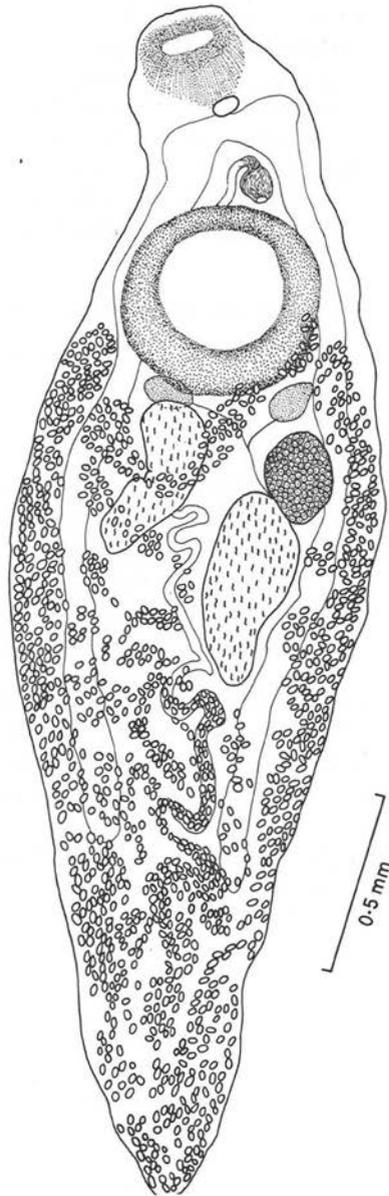


FIG. 1. — *Gorgoderina carli* Baer, 1930. Ventral view.

Pharynx diameter	—	0.061-0.082
Right testis	—	0.23-0.47 × 0.07-0.25
Left testis	—	0.23-0.54 × 0.08-0.39
Ovary	—	0.14-0.25 × 0.07-0.20
Compact vitellarium: Right	—	0.14-0.17 × 0.07-0.11
Left	—	0.12-0.20 × 0.07-0.11
Vesicula seminalis	—	0.11-0.19 × 0.04-0.07
Eggs	0.027 × 0.019	0.012-0.029 × 0.008-0.016

Discussion

Following Olsen's Key (1937), the present specimens are referred to the species *Gorgoderina carli* Baer, 1930, first recorded from the urinary bladder of the caecilian *Uraeotyphlus oxyurus* from the Palni Hills in South India. In view of finding that "the caecilian fauna of Sri Lanka has affinities with the Indo-malaysian species rather than with species found on nearby peninsular India" (Nussbaum and Gans, 1980), it would be worth paying attention to their parasites, with a view to tracing possible parasitological connections between them.

Mesocoelium monas (Rudolphi, 1819)

(Trematoda: Digenea: Mesocoeliidae)

The worms resemble *M. monas* (Rudolphi, 1819) in all respects. The size-range of this species is very wide (De Freitas, 1963), and the measurements of the present specimens fall within this. Ubelaker (1966) reports the occurrence of *M. monas* in *Ichthyophis glutinosus* from Palembang, Sumatra. However, *I. glutinosus* is not found in Sumatra, but is endemic to Sri Lanka. The Sumatran host species is probably *I. paucisulcus* Taylor, 1960, which is lateral-striped like *I. glutinosus* (see Nussbaum and Gans, 1980, p. 152). The present report would therefore be a new host-record for this trematode.

Nineteen species of *Mesocoelium*, of worldwide distribution in amphibians and reptiles, were synonymised with *M. monas* by De Freitas (1963). The present finding, considered together with Ubelaker's record of *M. monas* from a Sumatran species of *Ichthyophis*, lends further support to De Freitas's synonymy.

MEASUREMENTS IN MM.:

Body length	0.502-2.600
Body width	0.396-1.271
Oral sucker	0.112-0.317 × 0.188-0.314
Ventral sucker	0.079-0.195 × 0.139-0.175
Sucker ratio (v.s.:o.s.)	1:1.4-1.6
Pharynx	0.073-0.099 × 0.069-0.119
Oesophagus length	0.083
Oesophageal caeca lengths: Right	0.132-1.115
Left	0.125-1.007
Right testis	0.257 × 0.172
Left testis	0.198-0.182
Ovary	0.182 × 0.195
Eggs	0.033-0.036 × 0.020-0.023

Rhabdias escheri Baer, 1930

(Nematoda: Rhabdiasidae)

Description

The worms, all of which are females, are medium-sized and slender, with bluntly rounded anterior ends and pointed tails. The mouth, surrounded by six insignificant lips, leads into a small buccal capsule which opens into a short oesophagus. The oesophagus, which is club-shaped and indistinctly divided into two regions, leads into a simple intestine.

The ovaries are reflexed. The vulva is situated just behind the middle of the body. The uteri are packed with thin-shelled embryonated eggs. The eggs hatch inside the parent and the young larvae were seen escaping through the vulva when observed (in 0.9% saline) under the microscope.

MEASUREMENTS IN MM.:

	Baer's collection	Gammaduwa collection 1972 (Body cavity)	Kandy collection 1980 (Body cavity)
Body length	5.0-6.0	5.40-7.00	4.224-4.943
Body width	0.25-0.26	0.307-0.328	0.198-0.238
Head diameter	—	0.049-0.065	0.046
Buccal capsule diameter	0.145	0.012-0.020	0.013-0.017
Oesophagus length	0.5	0.401-0.410	0.356-0.370
Bulb diameter	—	0.061-0.082	0.069-0.073
Nerve ring from anterior end	0.167	0.246-0.328	0.152-0.155
Tail length	0.120	0.184-0.225	0.116-0.132
Vulva from anterior end	0.15	2.930-3.700	2.442-2.660
Egg dimensions	No eggs seen	0.069-0.090 × 0.028-0.061	0.098-0.100 × 0.056-0.058

Discussion

Though many species of *Rhabdias* have been described from amphibians, *Rhabdias escheri* Baer, 1930 is the only species described from a caecilian. It was collected from the body cavity of *Uraeotyphlus oxyurus* on the Palni Hills, S. India, and appeared to be an immature specimen, as no eggs were observed.

The present specimens differ from *R. escheri* only in body measurements, and therefore belong most probably to the same species. A detailed study of mature specimens from *Uraeotyphlus oxyurus* would be necessary to confirm this identification.

Pelodera chabaudi sp. nov.

(Nematoda: Rhabditidae)

(fig. 2-5)

Description

A total of 43 worms (26 males, 17 females) were collected, from the stomach, small intestine and rectum of the hosts. The worms are medium sized. The head

bears 6 very indistinct lips. The different parts of the stoma appear to be fused and indistinct, forming a buccal capsule. There is no pharynx. The oesophagus has a posterior bulb and slight anterior bulb. The excretory pore is at the level of the oesophageal bulb. This was seen mainly in the females. The nerve ring is at the lower end of the isthmus, nearer the posterior bulb.

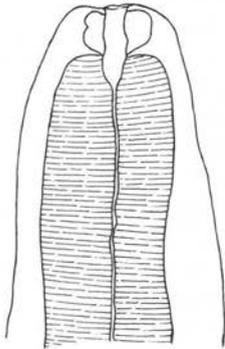


FIG. 2.

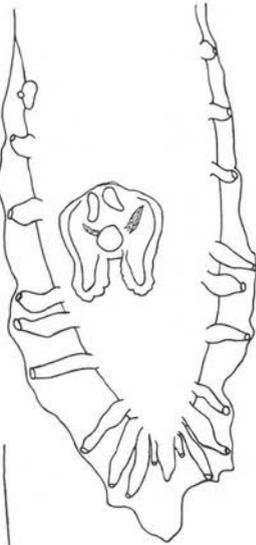


FIG. 3.

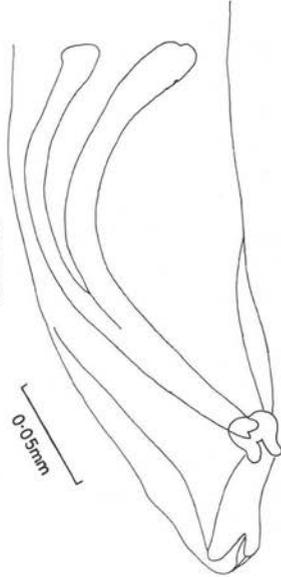


FIG. 4.

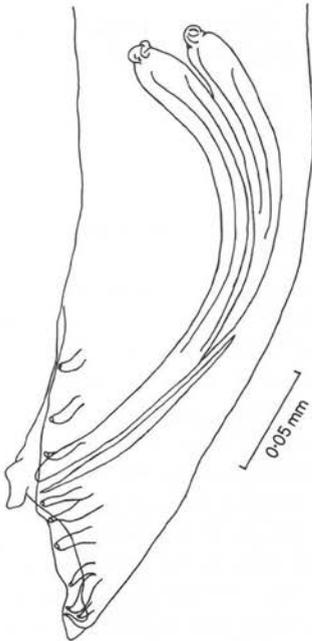


FIG. 5.

FIG. 2. — *Pelodera chabaudi* sp. nov. Anterior region.

FIG. 3. — *Pelodera chabaudi* sp. nov. Posterior end, ventral view.

FIG. 4. — *Pelodera chabaudi* sp. nov. Posterior end, ventro-lateral view.

FIG. 5. — *Pelodera chabaudi* sp. nov. Posterior end, lateral view.

Male

The male is slightly smaller than the female. The caudal alae are well developed and do not meet anterior to the cloaca. The tail is entirely enclosed by the bursa. Hence the bursa is of the "open peloderan" type. The alae are supported by 9 pairs of pedunculate papillae arranged roughly in 3 groups of 3 pairs each, one group anterior to the cloacal opening, the second group beginning at about the level of the cloaca, and the third group at the very posterior end. The 3 pairs of anterior papillae are shorter than the rest. There is a pair of phasmids situated posterior to the ninth pair of papillae. The cloacal opening is on a very distinct elevation or prominence, and very prominent also is a pair of large, fleshy papillae, on the cloacal lips. These papillae are partially fused at the upper end. The posterior end of the worm is curved ventrally. The tail is abruptly tapered, obliquely truncate, and ends in a sharp point.

The spicules are equal in length, free proximally and fused distally. This was confirmed by staining specimens in eosin and making transverse serial sections of them. When viewed in plane-polarised light, the fused portion of the spicules was clearly seen. Also, the proximal ends of the spicules extend anteriorly, much beyond the proximal region of the caudal alae, unlike in the other species of *Pelodera*. A gubernaculum is present.

Female

The vulva is situated just anterior to the middle of the body. Amphidelphic. The eggs are thin-shelled and non-embryonated. The tail is longer than in the male and tapers to a sharp point.

Discussion

The present species belongs to the genus *Pelodera*, despite the fact that its lips are indistinct.

The genus has been further grouped under four subgenera, namely *Pelodera*, *Cruznama*, *Coarctadere* and *Cylindridere* (see Ritter, 1965). The present form fits into the subgenus *Pelodera*. In general, the species of *Pelodera* are considered to be free-living and bacteriophagous. However, parasitic forms are not unknown. Certain rhabditids parasitize earthworms. *Pelodera strongyloides*, which is usually a free-living rhabditid, can become parasitic in mammals and even man. There have also been records of species of *Pelodera* parasitising coleopteran insects (Rühm, 1964). The present species resembles *P. strongyloides* in general appearance and structure of its bursa, but the arrangement of the 9 pairs of bursal papillae is quite different, being in groups of 3. The cloacal elevation is quite prominent and carries a pair of very fleshy papillae, which are fused proximally and free distally. This is a very characteristic feature. Also characteristic is the markedly anterior position of the proximal ends of the distally fused spicules.

MEASUREMENTS IN MM.:

	Specimens from <i>Ichthyophis glutinosus</i>			
	Gammaduwa (Dec. 1980) Male (12)	Kandy (Jan. 1980) Male (12)	Gammaduwa (Dec. 1980) Female (5)	Kandy (Jan. 1980) Female (14)
Body length	2.925-4.030	3.234-3.887	3.900-4.420	3.135-4.455
Body width	0.109-0.168	0.099-0.142	0.142-0.162	0.112-0.165
Head diameter	0.026-0.033	0.023-0.030	0.030	0.023-0.030
Buccal cavity depth	0.010-0.017	0.013-0.017	0.010-0.013	0.010-0.013
Oesophagus + bulb, length	0.271-0.337	0.251-0.287	0.297-0.330	0.251-0.307
Oesophagus width	0.023-0.033	0.023-0.026	0.026-0.030	0.020-0.026
Bulb diameter	0.033-0.043	0.033-0.036	0.040-0.043	0.030-0.040
Nerve ring from ant. end	0.211-0.257	0.191-0.228	0.248-0.264	0.195-0.248
Excretory pore from ant. end	0.231-0.330	0.257-0.307	0.244-0.317	0.215-0.284
Spicule length	0.224-0.244	0.231-0.257		
Spicule width	0.017-0.020	0.017-0.020		
Gubernaculum length	0.083-0.109	0.089-0.099		
Tail length	0.086-0.122	0.076-0.092	0.132-0.188	0.165-0.188
Vulva from ant. end			1.924-2.275	1.462-2.244
Egg dimensions				0.033-0.053
				×
				0.030-0.046

Note: The measurements of *Pelodera chabaudi*, from *I. orthoplicatus* from Dewatura Estate, also conform to those listed above.

Owing to these marked differences, we consider these worms as belonging to a new species, which we name *Pelodera (P) chabaudi*, after Professor Alain G. Chabaud.

At first it was thought that this infection of a caecilian host by a peloderan rhabditid was accidental. But, the collection and examination of several host specimens from different localities (Dewatura, Kandy and Gammaduwa) confirmed that the parasitism was not accidental.

Ichthyophis glutinosus and *I. orthoplicatus* are endemic, burrowing amphibians, living in loose, moist soil. A certain amount of earth goes through them when feeding, and earthworms too are known to form part of their diet. It is possible that a free-living peloderan rhabditid had got adapted to a parasitic life in the gut of these caecilians. It would be interesting also to see if there is any similarity in helminth faunal complex between burrowing amphibians and burrowing reptiles, in Sri Lanka. The occurrence of *Meteterakis sinharajensis* (hitherto recorded from permanently or temporarily burrowing reptiles) in *I. glutinosus* and *I. orthoplicatus* also, as reported below, would seem to indicate this trend.

Type-specimens: Syntypes and paratypes are deposited in the Department of Zoology, University of Peradeniya, Sri Lanka. (Reg. No. RTS 43).

Meteterakis sinharajensis Cruz and Ching, 1976

The structure and measurements of these worms, both male and female, conform in all respects to those of *M. sinharajensis* Cruz and Ching, 1976.

Although various species of *Meteterakis* have been described from amphibians and reptiles, so far none has been recorded from burrowing amphibians such as *Ichthyophis glutinosus* and *I. orthoplicatus*. These latter therefore are new host records, as well as a pointer to a community of the same nematode species in burrowing hosts, whether they be amphibian or reptile.

MEASUREMENTS IN MM.:

	Specimens from <i>Ichthyophis glutinosus</i>			
	Gammaduwa (Dec. 1980) Male (1)	Kandy (Jan. 1980) Male (2)	Gammaduwa (Dec. 1980) Female (6)	Kandy (Jan. 1980) Female (4)
Body length	4.030	3.861-5.227	4.030-5.590	5.191-5.792
Body width	0.182	0.198	0.145-0.320	0.210-0.287
Head diameter	0.043	0.040	0.046-0.050	0.043-0.050
Pharynx length	0.066	0.063	0.063-0.079	0.063-0.066
Oesophagus + bulb, length	0.937	0.782-0.871	0.934-1.132	0.881-0.917
Oesophagus width	0.046	0.040-0.043	0.043-0.050	0.046-0.053
Bulb diameter	0.135	0.129-0.136	0.122-0.165	0.135-0.142
Nerve ring from ant. end	0.314	0.314	0.310-0.373	0.320-0.330
Excretory pore from ant. end	0.500	0.568-0.578	0.469-0.551	0.528-0.554
Spicule length	0.386	0.472-0.508		
Spicule width	0.026	0.043-0.056		
Tail length	0.182	0.231-0.238	0.287-0.380	0.337-0.383
Vulva from ant. end			1.755-2.509	2.145-2.376
			0.046-0.072	0.067-0.070
			×	×
Egg dimensions			0.043-0.047	0.040-0.042

Note : The measurements of *M. sinharajensis* from *I. orthoplicatus* from Dewatura Estate, also conform to those listed above.

ACKNOWLEDGEMENTS. We thank Mrs. V. Sanmugasunderam and Mr. L. Nugaliyadde, former Research Assistants, for their help at the commencement of this work; Dr. Sumana Wijekoon, for kindly providing the specimen from Aniewatte, Kandy; Mr. and Mrs. Frank Dharmarajah for hospitality and facilities on our collecting trips at Opalgalla Estate, Gammaduwa; Mr. R. A. Ariyadasa for assistance in the field; Mr. T. S. B. Alagoda for help with the drawings; Mrs. Priscilla Pereira for preparing the typescript; and the University of Peradeniya for providing grants which partly supported this work.

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ERRATA. — We take this opportunity to make the following corrections in previous papers (Parts III and VI, of this series) published in this journal.

Tome 48 (6), 1973.

— Page 773, Table II, column 3: the oesophagus length of *Entomelas* sp. should read: 0.748-0.769.

Tome 48 (6), 1973.

— Page 767, paragraph 3: for 'relic', read 'relict'.

In view of the precise definitions of relic (relique) and relict (relicte) referred to by Cruz and Nugaliyadde (1978) (*C.R. Soc. Biogéogr.* 447: 85-106), attention is drawn to the constant, perhaps imprecise, use of the word 'relique' in the French titles and résumés of this series of papers. In the English texts, however, the word 'relic' has intruded apparently only into one place, as stated above.

Tome 50 (5), 1975.

— Page 532, last paragraph of the Résumé: for '*philippinensis*', read '*philippinus*'.

— Page 546, Table VI, column 3: below 'Hakgala (1707 m)', add 'Horton Plains (2195 m)'