

ONCHOLAIMUS BALLI (N. SP.) (NEMATODA: ONCHOLAIMIDAE)
FROM A VOLCANIC CRATER LAKE IN PAPUA NEW GUINEA,
WITH OBSERVATIONS ON THE COLONISATION OF THE LAKE
BY NEMATODES

BY

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Oncholaimus balli n. sp. is described from a freshwater crater lake in Papua New Guinea. It is the third freshwater species of *Oncholaimus* from the primarily marine Oncholaimidae. It most closely resembles *O. aquaedulcis* Schneider 1937, a freshwater species from Java, but differs in its spicules. Some observations are made on the re-colonisation of a volcanic island in the lake by other nematodes.

Keywords: Ecology, habitat, description, taxonomy, freshwater nematode.

The Oncholaimidae (Enoplida) are mostly marine nematodes, but with some species occurring in brackish water and including two species of *Oncholaimus* inhabiting freshwater habitats. Collections from a freshwater caldera lake in Papua New Guinea contained numerous specimens of a third freshwater species of *Oncholaimus* that differs from *O. aquaedulcis* Schneider, 1937 from a waterfall in Java and *O. deconincki* Heyns & Coomans, 1977, from South Africa, and other brackish water and marine species in various ways. We have included in our descriptions the demanian system, an organ characteristic of many Oncholaimidae, linking the female gonoduct with the intestine and described very fully by Rachor (1969).

Our collections were provided by Dr. E. Ball, who has been studying the re-colonisation of Motmot Island, a recently created island in the crater lake, Lake Wisdom, on Long Island, off the coast of Papua New Guinea. A major eruption occurred in the 18th century, but volcanic activity as late as 1969 re-formed Motmot Island (Ball & Glucksman, 1975; 1978). Our samples, fixed in formalin at the time of collection, came from the lake sediments and moss, algae and muddy soil from Motmot Island. Nematodes were recovered by washing samples onto sieves with a minimum pore size of 40 μm .

Twenty six specimens of the new species of *Oncholaimus* were obtained from the lake's silty sediments in 1973 and 1975. Numerous additional specimens were obtained from muddy soil beneath moss in 1980.

DESCRIPTION

Oncholaimus balli n. sp.

(Figs. 1, 2, 3 and 4; measurements Table I)

Male (holotype). Body long, slender and cylindrical with a smooth cuticle. Large deep barrel-shaped buccal cavity with strong cuticular walls, one long ventrosublateral tooth (left) and two smaller teeth, ventrosublateral and dorsal. Apices of these sharply pointed teeth, lying well within buccal cavity, directed anteriorly. Six lips, each bearing externally a minute inner labial papilla. Ten equal cephalic setae, $7.5\text{ }\mu\text{m}$ long, in one ring, paired in each subdorsal and subventral sector (outer labial and cephalic setae) with a single outer labial seta lying mediolaterally, directly in front of each amphidial opening. Amphids with small pocket-shaped laterally elongated apertures just posterior to the level of the teeth. Oesophagus long, cylindrical and muscular, surrounded by nerve ring about mid-way along its length. Duct of 'excretory' organ opening ventrally $73\text{ }\mu\text{m}$ from the anterior end, about mid-way between nerve ring and mouth with ventral cell left of intestine posterior to base of oesophagus. Two large cells of unknown function lie at this level on the right of the intestine. Oesophagus leads into pyriform cardia, enclosed within anterior intestine. Intestine long uniform, followed by short rectum opening into cloaca. Two outstretched opposed testes on right of intestine leading into a vas deferens in mid-region of the body. Vas deferens continues as ejaculatory duct surrounded by conspicuous bands of muscle along the posterior part of the body. Two equal, short, slightly curved, spicules of simple shape. No gubernaculum evident, but dorsal wall of cloaca thickened. One row of ventrosublateral setae on either side of cloacal opening, three posterior to cloaca and five anterior in each row (Fig. 1A). Few short somatic setae located over whole length of the body. Prominent mid-ventral tubercle, bearing opening of hypodermal gland, approximately $2/3$ rd of distance from cloaca to tip of short curved tail. Spinneret opens at tip of tail, with two lateral setae set close to opening of spinneret. Metanemes not found.

Female (allotype). Female generally resembles male, though larger. Single prodelphic gonoduct containing one or two fully developed uncleaved eggs at a time, opens by ventral slit-shaped vulva slightly posterior to median ventral position. Gonad on right hand side of intestine. Demanian system (Fig. 2) consists of narrow ductus uterinus from the uterus, which it joins close to vulva, to main duct on left side, which it enters through conspicuous ring of cells, the uvette (Fig. 3D). Main duct opens into intestine at osmosium, between levels of vulva and uvette, but apparently ends blindly posterior to uvette. Intestine leads into short rectum and anus. Relatively long (for Oncholaimidae) slightly ventrally curved postanal tail, bearing two lateral setae, and terminating with spinneret into which open ducts of three caudal glands.

TABLE I

Oncholaimus balli; measurements in μm ; specimens fixed in formalin and mounted in glycerol

Male	Depth buccal cavity	Excretory pore	Anterior end to: Nerve ring	End of oesophagus	Cloaca to tip of tail	Spicule chord length	Total length	Maximum width	
Holotype	26	73	151	305	44	30.0	2203	36	
Paratypes, (mean, n = 5)	26.9	—	135	293	52	29.3	2106	35	
Range	26-28	—	128-152	272-330	44-70	33.5-26	1834-2314	32-37	
Female	Depth buccal cavity	Excretory pore	Anterior end to: Nerve ring	End of oesophagus	Vulva	Vulva to uvette	Anus to tip of tail	Total length	Maximum width
Allotype	31	69	140	315	1571	221	77	2599	36
Paratypes, (mean, n = 5)	28.7	—	149	330	1479	237	84	2458	37
Range	28.5-31	—	160-142	315-348	1862-1235	210-288	77-93	2800-2086	36-51
de Man's Index		a	b	c	c'	V%			
Holotype male		61	7.2	50	2.42	—			
Allotype female		72	8.25	34	2.35	60			
Paratype male		69-52	7.9-6.8	33-51	2.6-2.85	—			
Paratype female		72-55	8.3-6.2	22-36	3.04-3.55	56-64			

Cephalic setae, both sexes, 6.5 to 8.0 μm .

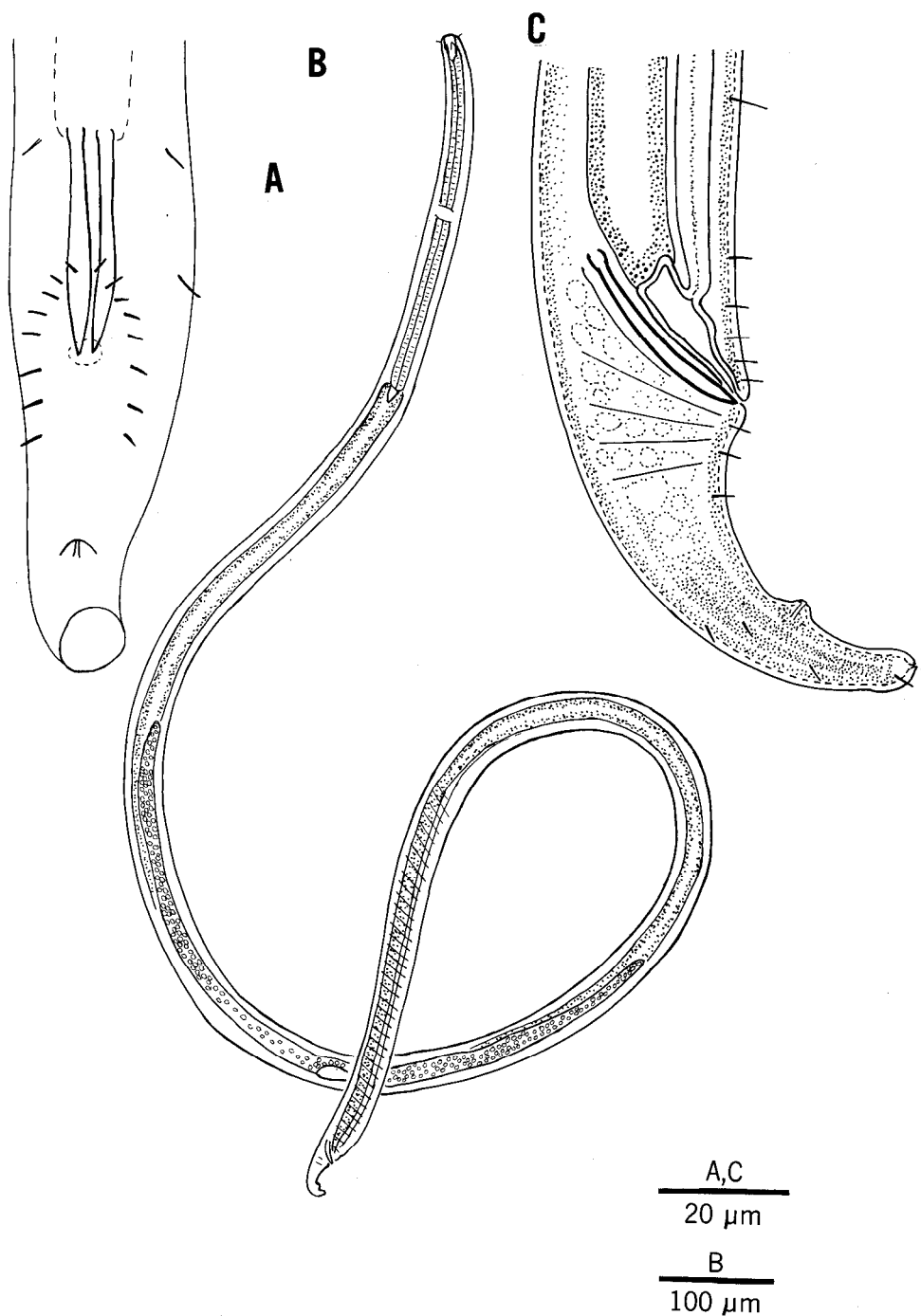


Fig. 1. *Oncholaimus balli* male; A, spicules and setae in ventral view; B, an entire male and C, the spicules, cloaca, setae and post-cloacal tubercle in lateral view.

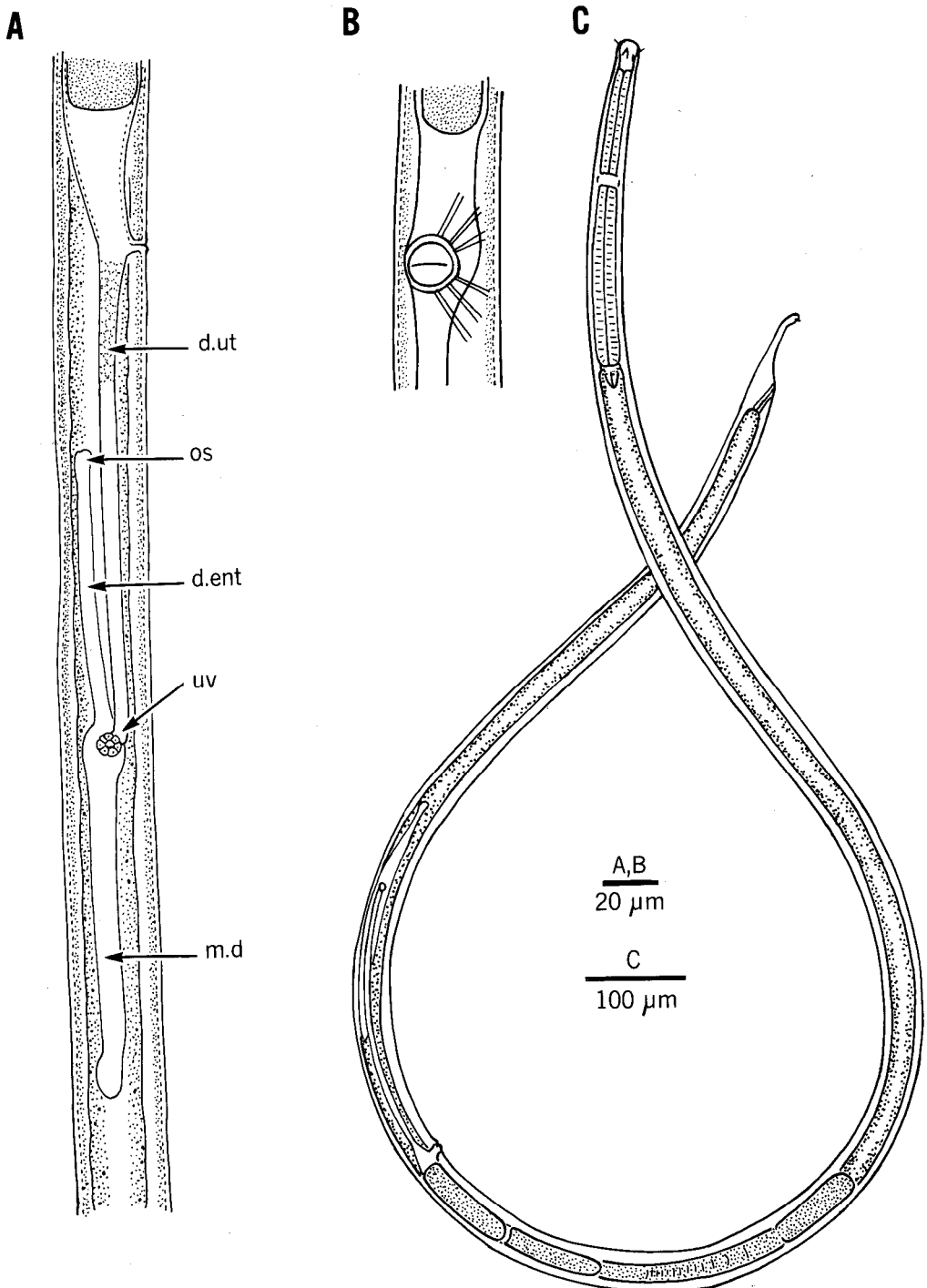


Fig. 2. *Oncholaimus balli* females; A, demanian system; B, vulva in ventral view; C, an entire female.

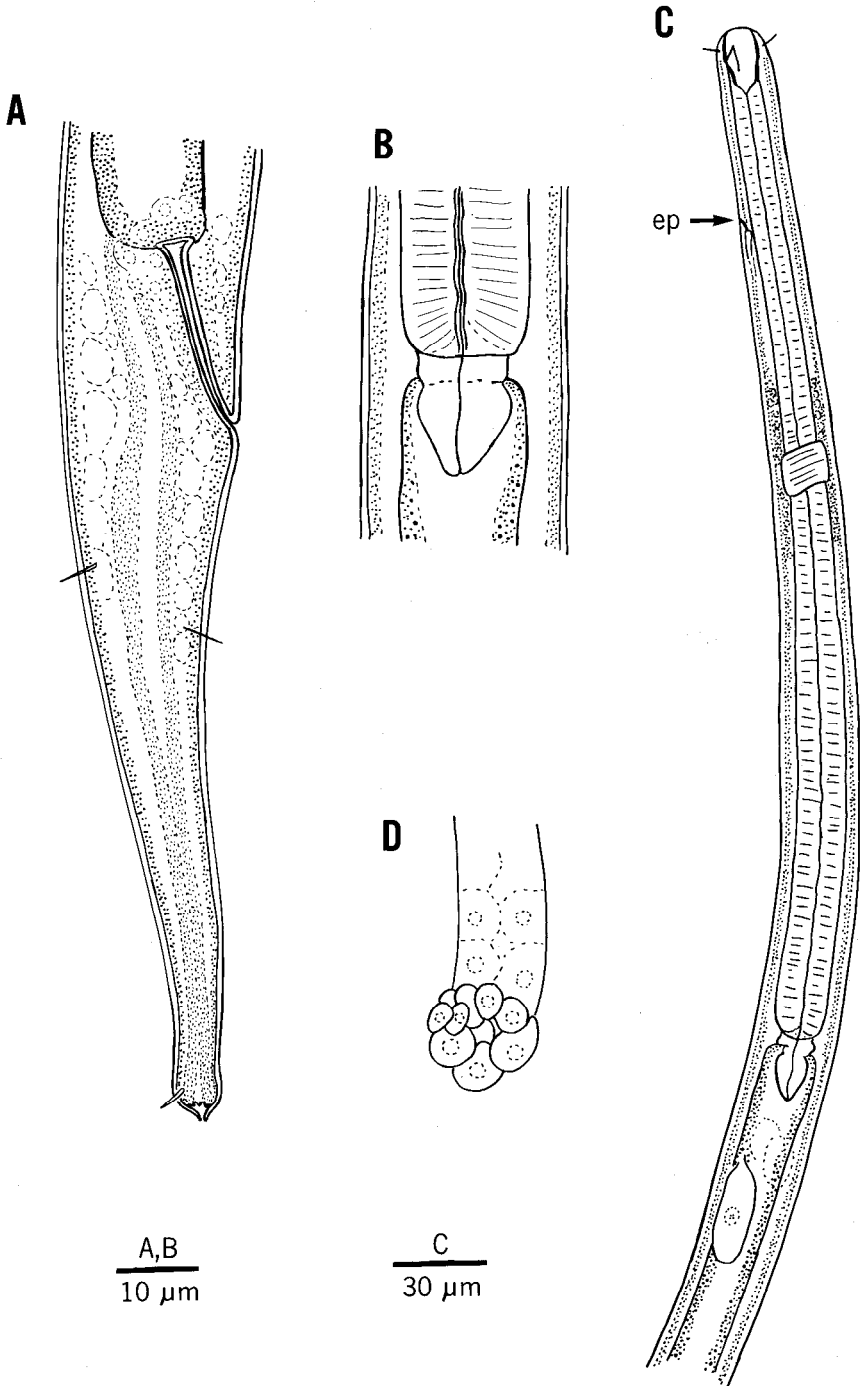


Fig. 3. *Oncholaimus balli* female; A, tail region; B, cardia; C, oesophagus, excretory pore and ventral cell; D, uvette (not strictly to scale).

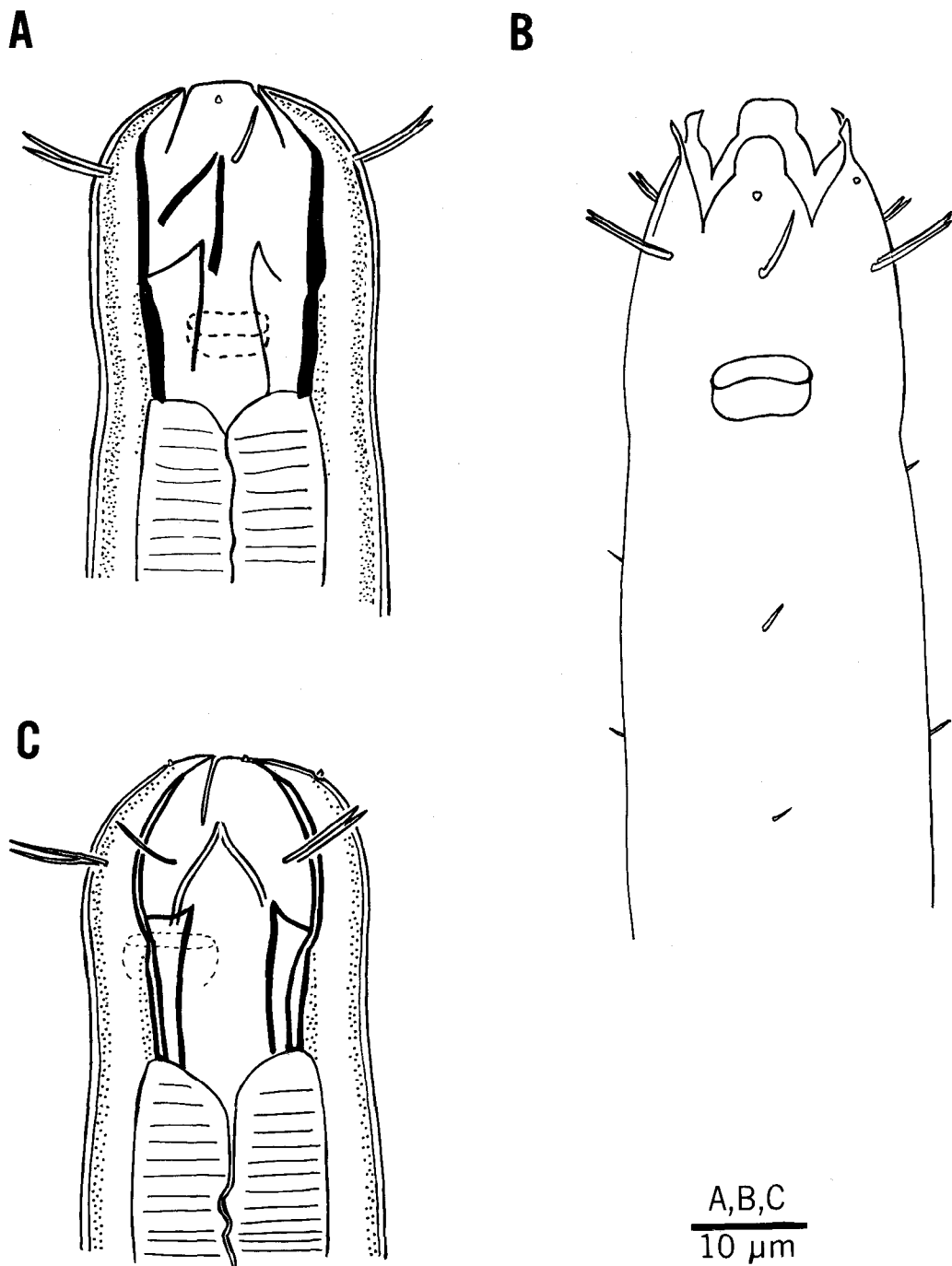


Fig. 4. *Oncholaimus balli* head and buccal cavity; A, female and C, male showing internal structure by light microscopy; B, external form from scanning electron microscopy.

Type locality. Lake Wisdom, Long Island, Papua New Guinea (5°20'S, 147°6'E). Type specimens from silt at bottom of lake, as were several paratypes. Other paratypes collected from moss on adjacent muddy shore.

Type material: holotype male and allotype female in South Australian Museum, V 3505 and V 3506, respectively. Paratype male and female in nematode collection at the Laboratoria voor Morfologie en Systematiek, Museum voor Dierkunde, Rijksuniversiteit, Gent, Belgium, Nos 533 and 534. Paratype male and female in British Museum (Natural History) London, Nos. 1983.7.1 and 1983.7.2, respectively.

TABLE II
Nematodes from the following genera were recovered

1973	<i>Oncholaimus</i>	silty lake sediment
1975	<i>Oncholaimus</i>	silty lake sediment
1975	<i>Paraphanolaimus</i>	silty lake sediment
1975	<i>Rhabditis</i>	silty lake sediment
1975	<i>Rhabditolaimus</i>	moss
1975	<i>Oncholaimus</i>	moss
1978	<i>Prodorylaimus</i>	moss
1980	<i>Actinolaimus</i>	moss
	<i>Mesodorylaimus</i>	moss
	<i>Oncholaimus</i>	moss
	<i>Dichromadora</i>	moss

DISCUSSION

The apparent blind ending of the main duct of the dcmanian system in *O. balli* calls for comment. It is generally considered as being involved in some way in copulation and fertilization. Maertens & Coomans (1979) describe terminal pores opening from the main duct in *O. oxyuris* to the exterior close to the anus. Males were observed inseminating females following insertion of their spicules into these pores. Sperm presumably reached the uterus by way of the ductus uterinus. We were unable to find any opening of the main duct to the exterior in any of the mature females or late juveniles of *O. balli*. It is interesting to note that Heyns & Coomans (1979) found these pores difficult to find in *O. deconincki* and thought they might be lacking in some specimens. Perhaps copulation in some Oncholaimids is by way of the vulva, while the demanian system may, nonetheless, be important in spermatozoan storage, nutrition and their final digestion. Chabaud *et al.* (1983) believe traumatic insemination may occur in some species of the genus, the spicules puncturing the cuticle during copulation.

Oncholaimus balli closely resembles *O. aquaedulcis*, but differs from it in possessing much shorter spicules (26-33 μm compared with 100 μm). They are

shorter both in absolute measurements and in their relative proportions to other body measurements.

Wieser included *O. aquaedulcis* in the genus *Oncholaimium*, a generic distinction which is no longer sustainable (Heyns & Coomans, 1977). *O. balli* also resembles the other truly freshwater species, *O. deconincki*, but is smaller, with shorter cephalic setae, and a longer demanian system. In *O. deconincki* the ductus uterinus is much larger and supplementary copulatory openings to the exterior were sometimes observed in the female. The demanian system also distinguishes *O. balli* from *O. oxyuris* Ditlevsen 1911, which more closely resembles *O. deconincki*, and in which the function of the system in copulation has been described (Maertens & Coomans, 1979). Schneider (1937) also briefly described *O. menzeli* from two males collected in Java from saline thermal water. From Schneider's drawings the spicules and shape of the male tail resembled that of *O. balli*, but there were 6 or 7 pairs of postanal genital setae and only two pairs pre-anal. The tail was relatively shorter, $c = \text{about } 2$ as was the ratio of oesophageal length to body length.

The new species is named after Dr. Eldon Ball in recognition of his work on the re-colonisation of Lake Wisdom.

O. balli was the only genus found in the samples collected in 1973, but in later years additional genera were found, see Table II. The small collections of other genera are not sufficiently representative to tell us much about re-colonisation of Motmot Island. They show that typical moss inhabiting nematodes reappear fairly soon after vegetation has become re-established, but suggest that it may take several years before a diverse moss fauna is established. Colonisation of the lake sediment by *O. balli* in 1973 and 1975 was puzzling because of the lack of potential organic food matter. The buccal cavities of all the specimens were filled with mineral particles. The later recovery of specimens from shore mud and moss suggests that they may have been washed into the lake from a food-rich moss habitat (where mineral particles were not found in the buccal cavity).

We are grateful to Dr E. Ball for the samples and to Dr A. Coomans for studying our specimens of *O. balli* and pointing out many features of their anatomy. We also thank him for identifying *Rhabditolaimus*, *Paraphanolaimus* and *Prodorylaimus*.

ZUSAMMENFASSUNG

Oncholaimus balli n. sp. (Nematoda: Oncholaimidae) aus einem Vulkankratersee in Papua-Neuguinea mit Beobachtungen über die Kolonisierung des Sees durch Nematoden

Aus einem Süßwasserkratersee in Papua-Neuguinea wird *Oncholaimus balli* n. sp. beschrieben. Dies ist die dritte Süßwasserart von *Oncholaimus* aus der in erster Linie marinen Familie Oncholaimidae. Sie ähnelt am meisten *O. aquaedulcis* Schneider, 1937, einer Süßwasserart aus Java, unterscheidet sich aber in den Spicula. Es wurden einige Beobachtungen gemacht über die Wiederbesiedlung einer vulkanischen Insel in dem See durch andere Nematoden.

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