



## Intestinal helminths of four species of skinks (*Mabuya*) (Sauria: Scincidae) from southern Africa

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### ABSTRACT

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Intestinal helminths are reported from four species of scincid lizards from southern Africa: *Mabuya occidentalis*, *Mabuya spilogaster*, *Mabuya striata* and *Mabuya variegata*. The helminth fauna consisted of one species of Cestoda, *Oochoristica truncata* and five species of Nematoda, *Abbreviata paradoxa*, *Maxvachonia dimorpha*, *Parapharyngodon rotundatus*, *Spauligodon petersi* and *Thubunaea fitzsimonsi*. All findings represent new host records. Ascarid larvae were also found. It appears that *Mabuya* is infected by generalist helminths that occur in other species of African lizards.

**Keywords:** Cestodes, lizards, *Mabuya*, nematodes, southern Africa

### INTRODUCTION

*Mabuya* is a cosmopolitan genus containing about 90 species which are distributed throughout sub-Saharan Africa and the Indian Ocean (65 species), southeast Asia and the Pacific (15 species), and South America and the Caribbean (10 species) (Branch 1998). Nineteen species occur in southern Africa (Branch 1998). Southern Africa is defined by Branch (1998) as the area south of a line connecting the Cunene and Zambezi Rivers and includes Zimbabwe, Botswana, Mozambique, Swaziland, Lesotho, South Africa and Namibia. There are reports of helminths from 20 species of *Mabuya*, seven of which are found in southern Africa (Table 1). The purpose of this paper is to list additional helminths for *Mabuya* from southern Africa, namely, the western three-striped skink, *Mabuya occidentalis* (Peters 1862); the Kalahari tree skink, *Mabuya spilogaster* (Peters 1882); the striped skink, *Mabuya striata* (Pe-

ters 1844) and the variegated skink, *Mabuya variegata* (Peters 1867). A check-list of nematode parasites of South African snakes and lizards was recently published by Hering-Hagenbeck & Boomker 2000.

### MATERIALS AND METHODS

One hundred and sixteen skinks of the genus *Mabuya* were borrowed from the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, USA: *M. occidentalis* ( $n = 30$ ); *M. spilogaster* ( $n = 30$ ); *M. striata* ( $n = 30$ ); *M. variegata* ( $n = 26$ ). Museum catalogue numbers and locality information are given in the appendix. The skinks were collected during 1969 and 1970 as part of an ecological study (Pianka 1971) and were originally fixed in 10% formalin and preserved in 70% ethanol. *Mabuya occidentalis* is known from the Karoo region of South Africa and south-west Botswana and its distribution also extends through Namibia and south-west Botswana to southern Angola. *Mabuya spilogaster* occurs from the northern Cape Province, through Botswana and Namibia to southern Angola. *Mabuya striata* is known from East Africa, south to the Eastern and Northern Cape Provinces extending along the Orange River to the Richtersveld and

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west through Zambia to Angola and southern Namibia. *Mabuya variegata* ranges through most of the African subcontinent and extends into southern Angola (Branch 1998).

The stomachs of the skinks had previously been removed for diet analyses and were thus not available for helminth recovery. The small and large intestines were removed, slit longitudinally, and the mucosae and contents examined under a dissecting microscope. The livers and body cavities were also inspected for helminths. Each helminth, previously formalin-fixed *in situ*, was transferred to a vial with 70% ethanol and then cleared on a glass slide in undiluted glycerol. All the nematodes were identified and counted from these preparations under a compound light microscope. Selected cestodes were rehydrated in water, stained in hematoxylin, dehydrated through a graded series of ethyl alcohol, cleared in xylene, mounted on glass slides in Canada balsam and identified with a compound light microscope. Selected helminths were deposited in the United States National Parasite Collection (USNPC), Beltsville, Maryland, USA (see Appendix).

## RESULTS

One species of Cestoda, *Oochoristica truncata* (Krabbae 1879), and five species of Nematoda, *Abbreviata paradoxa* (Linstow 1908), *Maxvachonia dimorpha* Chabaud & Brygoo 1960, *Parapharyngodon rotundatus* (Malan 1939), *Spauligodon petersi* Bursey, McAllister & Freed 1997 and *T. fitzsimonsi* Ortlepp 1931, were found in the intestines. Each occurrence represents a new host record. Also, larvae of unidentified ascarid nematodes were occasionally found encysted in the mesenteries. The prevalence and mean intensity of helminth infections by host are given in Table 2.

## DISCUSSION

Because stomachs were unavailable for examination, it is most likely that the stomach nematodes, *A. paradoxa* and *T. fitzsimonsi*, are under-reported in Table 2. However, none of the helminths found in this study was unique to *Mabuya*.

*Oochoristica truncata*, a linstowiid cestode, is a host-generalist species that has been reported in South Africa from the agamid lizards *Agama aculeata*, *Agama hispida* and *Agama planiceps*, a chamaeleonid lizard, *Chamaeleo namaquensis*, a gekkonid lizard, *Rhoptropus barnardi*, a lacertid lizard, *Meroles knoxii* and a colubrid snake, *Psammophis sibilans* (Malan 1939; Fantham & Porter 1950; Prudhoe & Harris 1971; Heidemann 1991; Goldberg, Bursey, Bauer & Cheam 1999). Although the life cycle of *O. truncata* has not been studied, the basic host sequence in all

linstowiid life-cycles includes tenebrionid beetles or other insect intermediate hosts alternating with various amniote definitive hosts (Conn 1985).

The oxyuroid nematodes, *Parapharyngodon rotundatus*, originally described from the agamid lizard, *Agama atra*, and the cordylid lizard, *Pseudocordylus microlepidotus* and *S. petersi*, originally described from the scincid lizard, *Mabuya sulcata*, have also been reported from the gekkonid lizards, *Rhoptropus afer* and *R. barnardi* (Malan 1939; Bursey, McAllister & Freed 1997; Goldberg *et al.* 1999). Members of the order Oxyurida are strictly monoxenous (Anderson 2000). The cosmocercoid nematode, *Maxvachonia dimorpha* was originally described from a chamaeleonid lizard, *Furcifer pardalis*, from Madagascar and subsequently reported in other Madagascan lizards, another chamaeleonid, *Furcifer oustaleti*, a cordylid lizard, *Zonoaaurus maximus*, and a scincid lizard, *Mabuya gravenhorstii*. From the African continent, it has been reported from the gekkonids, *R. afer* and *R. barnardi* (Chabaud & Brygoo 1960; Chabaud, Caballero & Brygoo 1964; Caballero 1968; Goldberg *et al.* 1999). The transmission of species of *Maxvachonia* has not been studied (Anderson 2000). The two physalopterid nematodes, *A. paradoxa* previously known from the varanid lizards, *Varanus albigularis* and *Varanus griseus* and the colubrid snake, *P. sibilans*, and *T. fitzsimonsi*, previously known from the lacertid lizard, *Ichnotropis squamulosa* and the gekkonid, *R. barnardi*, (Ortlepp 1922; 1931; Schultz 1927; Andrusko & Markov 1956; Goldberg *et al.* 1999) are reported here for the first time in scincid lizards. Members of the superfamily Physalopteroidea are heteroxenous and involve a wide range of aquatic or terrestrial arthropods as intermediate hosts (Anderson 2000). These nematodes are host-generalist species and each has been reported to occur in at least two lizard families.

The encysted ascarid larvae found in this study represent a family for which adults have not yet been found in *Mabuya*. Larvae of the ascarid *Hexameta boddaertii* have been reported from cysts found in the coeloms of three species of Brazilian skinks namely, *Mabuya agilis*, *Mabuya frenata*, and *Mabuya macroryncha* (Table 1). *Hexameta boddaertii* is a parasite of viperid and colubrid snakes in the Americas (Sprent 1978). The description by Vrcibradic, Rocha, Ribas & Vicente (1999) agrees with what we have observed in southern African *Mabuya* spp. Many species of ascarids utilize vertebrates as intermediate hosts (Anderson 2000), and although we know of no reports in which lizards have been reported as intermediate hosts for ascarids, this is the most likely explanation for the encysted ascarid larvae found in the mesenteries of southern African skinks. Studies of the predators of the *Mabuya* spp. will be required before these ascarid larvae can be identified and their life cycle understood.

TABLE 1 Previous reports of helminths from *Mabuya* spp.

Host	Locality	Parasite	Reference
<i>M. agilis</i>	Brazil Brazil Brazil Brazil Brazil Brazil	<i>Hexametra boddaertii</i> (larvae) <i>Parapharyngodon sceleratus</i> <i>Physaloptera retusa</i> <i>Physalopteroides venancioi</i> <i>Strongyluris oscar</i> Unidentified acuariid larvae	Vrcibradic <i>et al.</i> 2000 Van Sluys <i>et al.</i> 1997 Ribas <i>et al.</i> 1998 Vrcibradic <i>et al.</i> 2000 Ribas <i>et al.</i> 1998 Vrcibradic <i>et al.</i> 2000
<i>M. aureopunctata</i>	Madagasacar	<i>Parapharyngodon meridionalis</i>	Caballero 1968
<i>M. brevicollis</i>	Kenya	<i>Paraspirura mabuyae</i>	Sandground 1936
* <i>M. capensis</i>	South Africa	<i>Skryabinodon mabuiensis</i>	Malan 1939
<i>M. carinata</i>	India (Bombay) India (Calcutta)	<i>Parapharyngodon mabouia</i> <i>Meteterakis mabuyi</i>	Rao & Hiregauder 1962 Chakravorty 1944
<i>M. comorensis</i>	Madagascar Mozambique Madagascar	<i>Moaciria freitasi</i> <i>Abbreviata multipapillata</i> <i>Physalopteroides minor</i>	Caballero 1968 Caballero 1966 Caballero 1968
<i>M. dissimilis</i>	Burma	<i>Mesocoelium monas</i>	Bhalerao 1927
<i>M. frenata</i>	Brazil Brazil Brazil Brazil	<i>Hexametra boddaertii</i> (larvae) <i>Oswaldofilaria</i> sp. <i>Parapharyngodon sceleratus</i> <i>Skryabinodon</i> sp.	Vrcibradic <i>et al.</i> 1999 Vrcibradic <i>et al.</i> 1999 Vrcibradic <i>et al.</i> 1999 Vrcibradic <i>et al.</i> 1999
<i>M. gravenhorstii</i>	Madagascar Madagascar	<i>Parapharyngodon meridionalis</i> <i>Maxvachonia dimorpha</i>	Caballero 1968 Caballero 1968
* <i>M. homalocephala</i>	Kenya	<i>Physalopteroides asymmetrica</i>	Schmidt & Canaris 1968
<i>M. mabouya</i>	Brazil Brazil	<i>Oswaldofilaria spinosa</i> <i>Piratuboides zae</i>	Bain & Sulahian 1974 Bain 1974
<i>M. macrorhyncha</i>	Brazil Brazil Brazil	<i>Hexametra boddaertii</i> (larvae) <i>Physalopteroides venancioi</i> Unidentified acuariid larvae	Vrcibradic <i>et al.</i> 2000 Vrcibradic <i>et al.</i> 2000 Vrcibradic <i>et al.</i> 2000
<i>M. maculata</i>	Brazil Brazil	<i>Moaciria alvarengai</i> <i>Parapharyngodon alvarengai</i>	Freitas 1956 Freitas 1957
* <i>M. maculilabris</i>	Uganda	<i>Physalopteroides asymmetrica</i>	Baylis 1930
<i>M. multifasiata</i>	Java Philippines Borneo Borneo	<i>Oxyuris costata</i> (species inquirenda) <i>Meteterakis longispiculata</i> <i>Mertensinema sepilokensis</i> <i>Trichoskryabinia quentini</i>	Von Linstow 1907 Schmidt & Kuntz 1972 Durette-Desset 1980 Durette-Desset 1980
<i>M. planifrons</i>	Tanzania	<i>Physaloptera</i> sp.	Sandground 1933
* <i>M. quinquetaeniata</i>	Zambia Zambia Zambia Sudan Angola	<i>Abbreviata</i> sp. <i>Spauligodon morgani</i> <i>Thelandros</i> sp. <i>Physalopteroides asymetrica</i> <i>Piratuboides humabensis</i>	Simbotwe 1979 Simbotwe 1979 Simbotwe 1979 Khalil 1963 Petit <i>et al.</i> 1983
* <i>M. striata</i>	Zambia Nyasaland Zambia Zambia	<i>Abbreviata</i> sp. <i>Spauligodon morgani</i> <i>Spauligodon morgani</i> <i>Thelandros</i> sp.	Simbotwe 1979 Fitzsimmons 1961 Simbotwe 1979 Simbotwe 1979
* <i>M. sulcata</i>	South Africa	<i>Spauligodon petersi</i>	BurseY <i>et al.</i> 1997
* <i>M. varia</i>	Uganda	<i>Skryabinodon mabuyae</i>	Sandground 1936

\* Range includes South Africa

TABLE 2 Prevalence (P) and mean intensity (I ± 1 SD) of helminths from four species of *Mabuya* in southern Africa

	<i>M. occidentalis</i>		<i>M. spilogaster</i>		<i>M. striata</i>		<i>M. variegata</i>	
	P	I ± 1 SD	P	I ± 1 SD	P	I ± 1 SD	P	I ± 1 SD
<i>Oochoristica truncata</i>	7	1.5 ± 0.7	40	2.7 ± 3.1	3	1.0	4	5.0
<i>Abbreviata paradoxa</i>	10	1.3 ± 0.6	—	—	17	1.2 ± 0.4	—	—
<i>Maxvachonia dimorpha</i>	—	—	—	—	—	—	35	1.9 ± 1.6
<i>Parapharyngodon rotundatus</i>	3	1.0	7	1.0	10	1.3 ± 0.6	—	—
<i>Spauligodon petersi</i>	10	2.7 ± 1.5	67	13.0 ± 18.2	97	42.7 ± 56.8	—	—
<i>Thubunaea fitzsimonsi</i>	30	1.7 ± 0.9	17	2.0 ± 1.4	47	3.4 ± 3.9	—	—
Unidentified ascarid larvae	23	3.0 ± 2.2	3	1.0	33	2.3 ± 2.1	—	—

Currently, species of one family of Cestoda (Linstowiidae) and eight families of Nematoda (Pharyngodonidae, Cosmocercidae, Heterakidae, Physalopteridae, Spiruridae, Onchocercidae, Dictyocaulidae and Molineidae) are known to infect species of *Mabuya* (Table 1 and 2). It is of interest to note that in South Africa, helminth species reaching maturity in *Mabuya* are currently represented by only four helminth families (Linstowiidae, Pharyngodonidae, Cosmocercidae and Physalopteridae). Subsequent examination of additional species of *Mabuya* will be needed before the helminth diversity of this genus is known.

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## APPENDIX

Los Angeles County Museum of Natural History (LACM) accession numbers and locality information of four species of *Mabuya*, and the United States National Parasite Collection (USNPC) accession numbers for helminths (in brackets).

*Mabuya occidentalis* South Africa, Cape Province, Kalahari Gemsbok National Park, 1 km W Kameelsleep, 25°45'S, 20°44'E:

LACM 80744, 80746, 80748–80754, 80756, 80757, 80759, 80760, 80762, 80764, 80766, 80767, 80770–80774, 80776–80782, 80784. *Oochoristica truncata* (90816, 90817); *Abbreviata paradoxa* (90818); *Parapharyngodon rotundatus* (90819); *Spauligodon petersi* (90820); *Thubunaea fitzsimonsi* (90821); ascarid larvae (90822).

*Mabuya spilogaster* Botswana, 11 km S. Tsabong, 26°08'S, 22°28'E:

LACM 81006, 81028, 81030, 81044, 81046, 81052, 81054, 81058, 81059, 81062, 81065, 81068, 81069, 81071–81073, 81079, 81080, 81083, 81084, 81087, 81089, 81093, 81094, 81096, 81098, 81102, 81103, 81108, 81109. *Oochoristica truncata* (90823, 90824); *Parapharyngodon rotundatus* (90825); *Spauligodon petersi* (90826); *Thubunaea fitzsimonsi* (90827); ascarid larvae (90828).

*Mabuya striata* South Africa, Cape Province, Kalahari Gemsbok National Park, 1 km W. Kameelsleep, 25°45'S, 20°44'E:

LACM 81540, 81544, 81545, 8147, 81549, 81554, 81556, 81557, 81559–81563, 81566, 81567, 81569–81572, 81574–81580, 81582, 81584–81586. *Oochoristica truncata* (90829), *Abbreviata paradoxa* (90830), *Parapharyngodon rotundatus* (90831), *Spauligodon petersi* (90832), *Thubunaea fitzsimonsi* (90833), ascarid larvae (90834).

*Mabuya variegata* South Africa, Cape Province, 120 km N, 54 km W Upington, 27°22'S, 20°43'E:

LACM 80527, 80536, 80539, 80540, 80543, 80545, 80552–80554, 80558, 80565, 80569–80572, 80574, 80577–80579, 80583, 80585; South Africa, Cape Province, 29 km S., 40 km E, Farm Rietfontein, Bloukranz, 27°00'S, 20°27'E: LACM 80588; South Africa, 31 km N, 100 km E. Upington, Farm Geselkop, 28°13'S, 22°16'E: LACM 80698, 80600; South Africa, 121 km N, 16 km E Upington, Farm Vrederus, 27°22'S, 21°25'E: LACM 80617, 80627. *Oochoristica truncata* (90835); *Maxvachonia dimorpha* (90836).