ISSN 1759-0116

ZooNova

Occasional Papers in Zoology

Volume 1, Number 3, Pages 34 - 43

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FRANK L. FARQUHARSON; MARGARET I. ROOS;
LYNN R. G. RAW AND BRUCE LESLIE

Published in print and on-line
at zoonova.afriherp.org

Afriherp Communications, Greenford, United Kingdom

Date of publication: 14 June 2018

Printed and electronic copies deposited in: The British Library; National Library of Scotland; National Library of Wales; Bodleian Library, Oxford; University Library, Cambridge; Library of Trinity College, Dublin.

First Record of Reptilian Dracunculiasis from Southern Africa

Frank L. Farquharson[1]; Margaret I. Roos[2]; Lynn R.G. Raw[3] and Bruce Leslie[4]

[1] 6 Valmar Mews, 57 Main Street, Howick, 3291, KwaZulu-Natal, South Africa
[2] Ebenezer Veterinary Consulting Room, PO Box 20557, Durban North, Durban, 4016, South Africa
[3] Kirkebakken 37, Aalsoe, 8500 Grenaa, Denmark
[4] c/o Kruger National Park, PO Box 176, Skukuza, 1350, South Africa

Correspondence: Lynn Raw (lynn@afriherp.org)

ABSTRACT
This paper reports on the first recorded case of a guinea-worm (*Dracunculus* sp.) infection in Southern Africa. This was in a wild caught specimen of Southern African Python (*Python natalensis*) from Swaziland (eSwatini). The symptoms and treatment are described as well as details of the larvae and adult nematodes.

KEY WORDS:
Guinea worm, *Dracunculus,* Swaziland (eSwatini), *Python natalensis*

INTRODUCTION
Early in 1979, a Southern African Python (*P. natalensis* Smith, 1840), approximately two metres in length and recently wild-caught at Mhlumi, Manzini District, Swaziland, was observed to have an open lesion on its flank from which a small hard, white, curved object protruded. The schoolboy owner (Bruce Leslie) was concerned that this might be part of a broken rib and took the snake to the first author (Frank Farquharson). Closer examination revealed three separate lesions, one with the "rib-like" projection (Fig. 1), as well as several older scars. When the snake was held at a particular angle to light, a vague impression of a "varicose vein" could be seen. A guinea-worm infection was suspected and a consultation at a local veterinary clinic was arranged.

DIAGNOSIS AND TREATMENT
The site of the protruding "rib-like" lesion of the python was immersed in a bowl of cold water. Within 15 seconds the uterus of the worm (Fig. 2) had penetrated through the body wall of the parasite at the soft base of the "rib-like" projection and was releasing a milky translucent liquid containing innumerable larvae that were streaming into the water (Fig. 3). This observation is in accordance with the apparently unique behaviour typical of *Dracunculus* spp. (Palmer & Reeder, 2001: Ch. 27) and thus confirmed the initial suspicions. The uterus continued to pass larvae for approximately two hours, before breaking off and rapidly disintegrating.

The three lesions were then closely examined and a worm (Fig. 4) was carefully dissected from each of the first two with the aid of 2% Xylotox© (Lignocaine hydrochloride 2% m/v with Adrenalin 1:80 000) solution while the third lesion only yielded an empty subcutaneous pocket. An attempt to preserve the extracted worms in a preservative solution (10 parts 40% formalin: 1 part glacial acetic acid: 89 parts water) was unsuccessful and the two specimens disintegrated rapidly (NB. In retrospect, immersion in 70-80% ethanol in water would have been more effective.) The wounds on the snake were then treated locally with Duramast© general purpose wound ointment.

Follow up treatment consisted of Lincospectin© (lincomycin hydrochloride and spectinomycin sulfate tetrahydrate) soluble powder and Terramycin© (oxytetracycline) animal formula in solution given orally for about 10 days. The python was subsequently kept at the University of Durban-Westville but deteriorated and died some four months later apparently from unrelated causes. It was frozen for subsequent autopsy but was later destroyed along with many other specimens following a power failure.

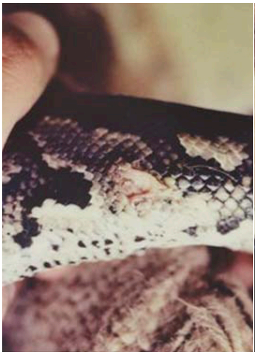


Fig. 1 (left): Lesion in skin of python
Fig. 2 (centre): Curved head of worm protruding from lesion in skin of python with uterus hanging from ruptured body wall. Uterus extruded from body approximately15 seconds after immersion in cold water.
Fig. 3 (right): Larvae passing down extruded uterus, note that the vertical line is from top right to bottom left. (Photographs by Frank Farquharson & Lynn Raw)

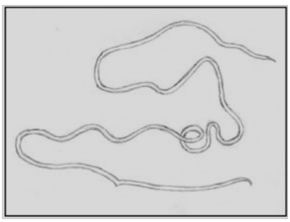
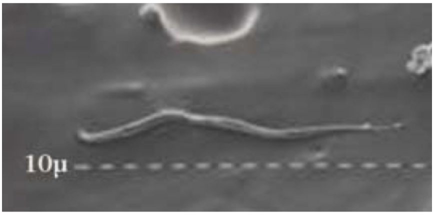


Fig 4 (above)**:** Drawing of extracted worm approximately 37cm in length and 2mm diameter. (del. Margaret Roos)

INVESTIGATION OF LARVAL SAMPLES

Samples of larvae were kept alive in tap water and in saline for further investigation. Some were stained with iodine for further examination. These larvae, with their thin tails, are morphologically very similar to the example of *D. medinensis* illustrated in Palmer & Reeder (2001: Fig. 27.4 C) and were approximately 330 μ in length and 8 μ in diameter when measured by scanning electron microscopy. (Figs. 5 & 6).



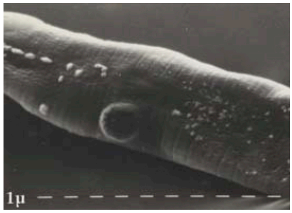


Fig 5 (left): Scanning electron micrograph (SEM) showing a larva approximately 330 µ in length.
Fig. 6 (right): SEM showing enlarged portion of larva approximately 8 µ in diameter.

The unstained larvae remained active for up to 11 days. A sample of living larva was introduced to some local pond water containing copepods (*Thermocyclops oblongatus* (G. O. Sars, 1927)) and within a few minutes all the copepods had ingested larvae. These could still be seen wriggling within the copepods for several hours after ingestion. This copepod species is a known intermediate host of *Dracunculus* spp. (Bimi, 2007; Cairncross, Muller and Zagaria, 2002; Muller, 1991).

DISCUSSION AND CONCLUSIONS

While dracunculiasis is well-known in mammals (including humans), fish (Cleveland, et al, 2017), amphibians (Eberhard, et al, 2016) and reptiles further north across sub-Saharan Africa as well as elsewhere in Asia, Australasia, Europe, and North America (Gosling, 2005; Cairncross, Muller and Zagaria. 2002; Jones & Mulder, 2007; Moravec & Gibson, 2007**)** it has not been previously reported in Africa south of the equator other than a single report from Lambaréné, Gabon(Cohen, 1959), which is only 75 Km south of the equator A human case report from Australia (Menon, 2005) concerned an immigrant from an infected area in Africa.

This discovery of this single case in a *Python natalensis* is puzzling in that it is so far from known infected areas (Map 1). None of the known hosts except humans are capable of moving such large distances. We could speculate about the possibility of transmission through a prey species such as a migratory bird that had recently ingested infected copepods while watering in transit through dracunculiasis endemic areas further north in Africa and then having been caught and swallowed by the snake. Pythons are known predators of birds so feeding on a recently arrived migrant bird is not an unlikely occurrence. If this were the case then it would explain why dracunculiasis is otherwise unknown in southern Africa. If ingesting infected copepods while drinking water had infected the snake in the normal process it is likely that more cases in other species, including humans, would have been detected. Birds are apparently not affected by this parasitic nematode so would be an unlikely route for infection of copepods in Southern African water bodies. Some bird species are, for example, known to transfer aquatic snails between water bodies in their feathers, beaks and legs (Dundee, Phillips & Newsom, 1967; van Leeuwen & van der Velde, 2012) while ingested snails can also survive passage through the gut of birds (Kawakami, Wada and Chiba, 2008; van Leeuwen, et al, 2012).

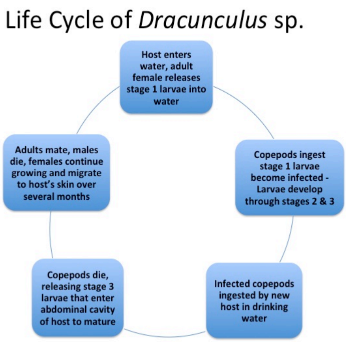
The species that affects humans is *Dracunculus mediensis* (Linnaeus, 1758), with other species known to infect other animals (Table 1.). The African species known to infect reptiles is *D. dahomeyensis* (Neumann, 1895) and it is possible that this is the species involved here.

Unfortunately this could not be confirmed due to the failed preservation of the adult specimens collected.

Species	**Host**	**Geographical distribution**
D. alii	Snakes	India
D. coluberensis	Snakes	India
D. dahomensis	Snakes	West and Central Africa
D. doi	Snakes	India
D. fuellebornius	Opossums	Brazil
D. globocephalus	Turtles	USA
D. houdemeri	Snakes	Vietnam
D. insignis	Dogs, wild carnivores	Canada, USA
D. lutrae	Otters	Canada
D. medinensis	Many mammals	Africa, Americas, Asia
D. mulbus	Snakes	Australia, Papua New Guinea
D. oesophageus	Snakes	Italy, Madagascar
D. ophidensis	Snakes	Italy, USA
Dracunculus spp.	Snakes	England, Brazil, Trinidad, USA

Table 1. Reported species of *Dracunculus*. (Adapted from that of Cairncross, Muller and Zagaria (2002), who note that some authorities only recognize two species, i.e., *D. medinensis* in mammals and *D. oesophageus* in reptiles (Muller, 1971)).

Although this information has previously been provided in the form of poster presentations at meetings of the Limnological Society of South Africa and the Herpetological Association of Africa, it has never been published before. The contents of this report should alert those concerned to be aware of the possibility of dracunculiasis infections in reptiles in Africa south of the equator.



ACKNOWLEDGEMENTS

The authors thank June Lawton for preparing the electron micrographs and Nancy Rayner and Allan Connell for identifying the copepods. We are grateful to Dr Ortwin Bourquin for his useful comments on an early draft and to the peer reviewers for their valued feedback.

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Submitted: 22 April 2018.

Accepted for publication: 25 May 2018.

Printed in the United Kingdom by FilePrint

Zoonova 1 (3) - Errata

The following map was unfortunately omitted from the printed and PDF versions of the article.

Map 1: shows the collective area of the affected continental African countries historically associated with cases of dracunculiasis in blue with the new record from Swaziland in red (red arrow)