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# Parasitic Infections of Two Species of Lizard (*Hemidactylus frenatus* and *Mabuya quiquetaeniata*) from Two Cities in Southwest Nigeria

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### Authors' contributions:

This work was carried out in collaboration between all authors. Author OAS designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author TAO collected data and managed the analyses of the study. Author OAS performed the literature searches. All authors read and approved the final manuscript.

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## ABSTRACT

**Aim:** To study the endoparasitic fauna of two species of lizard, a gecko (*Hemidactylus frenatus*) and a skink (*Mabuya quiquetaeniata*) from two cities in Southwest Nigeria.

**Study Design:** A parasitological survey was conducted between February and October, 2015 among lizards collected randomly by handpicking.

**Methodology:** A total of 233 lizards comprising 172 specimens of gecko (*H. frenatus*) and 61 specimens of skink (*M. quiquetaeniata*) were captured by hand, kept in ventilated cages and then examined for helminths. The lizards were dissected open, and the various organs were examined for the presence of parasites. The helminth parasites recovered were identified based on morphometric parameters.

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**Results:** Endoparasites were recovered from both *H. frenatus* and *M. quinquetaeniata*. Parasite species which were recovered includes: three nematodes, *Parapharyngodon* sp., *Spirura* sp., and *Pharyngodon* sp., one cestode, *Oochoristica truncata*, one trematode, *Mesocoelium monas*, one Pentastomid, *Raillietiella frenatus* and cytaecanth of an unidentified species of Acanthocephala. Five helminth species each was recovered from both species of lizard, however only two helminth species were common to both lizard species. The overall prevalence of helminth species from both lizard species *H. frenatus* and *M. quinquetaeniata* was high 64.0% and 72.1% respectively. The overall prevalence of helminth species was higher in males than in females in both species of lizard ( $p > 0.05$ ).

**Conclusion:** *H. frenatus* and *M. quinquetaeniata* in Southwest Nigeria, are infected by generalist helminths which have been reported in other species of African lizards. This study reported for the first time the occurrence of *Spirura* sp. and Acanthocephalan in Nigerian lizards.

**Keywords:** Parasites; lizards; Nematodes; cestodes; *Mabuya quinquetaeniata*; *Hemidactylus frenata*; Nigeria.

## 1. INTRODUCTION

Geckos (*Hemidactylus* sp.) are house lizards commonly found in human dwellings in tropical countries, thus has a close association with humans. Geckos are nocturnal lizards which feed mainly on arthropods such as spiders, insect larvae and termites [1,2]. Geckos are unique among lizards in vocalization, making chirping sounds in social interactions with other geckos. They move with remarkable agility usually in search of pursuit of insect preys. Over 140 species of gecko have been identified in Nigeria and other areas in the West African sub-region [3,4].

Skink of the genus *Mabuya* is cosmopolitan, containing about 90 species which are distributed throughout sub-Saharan Africa [5]. *M. quinquetaeniata* is one of the species which has been reported to occur in Zambia [6], Sudan [7] and Angola [8].

Like all vertebrates, geckos and skinks are susceptible to parasitism in their niche. Studies have reported macro-endoparasitic faunas associated with *Hemidactylus* sp. to include species of Acanthocephala, Cestoda, Nematoda, Pentastomida and Trematoda [9,10,11,12].

In Nigeria, there are few studies on the endoparasitic fauna of gecko lizard from Northern and Eastern part of the country [4,13], however, there are no studies reported from Southwestern Nigeria. In addition, to our knowledge there are no published studies on the endoparasites associated with skinks in Nigeria.

The study aimed at identifying the macro endoparasitic fauna infecting the two species of

lizard, *H. frenatus* and *M. quinquetaeniata* from Southwest Nigeria and compared our findings with previous studies on the host species.

## 2. MATERIALS AND METHODS

This study was carried out in two similar geographical locations, Ile-Ife and Ibadan, Southwest Nigeria. Ile-Ife is located within latitude 07° 26' N- 07° 33' N and longitude 004° 30' E - 004° 35' E. Ile-Ife is in Ife Central Local Government Area with a population size of 188, 027. Ibadan is located in southwestern Nigeria, it is 128 km inland northeast of Lagos and 530km southwest of Abuja, the Federal capital and is a prominent transit between the coastal region and the area to the north.

The climate of the two locations is typically tropical, with a characteristic dry season of about 6months (October- March) and a wet season of about 6months (April-September) [14]. The mean annual rainfall ranges between 1000 and 1250 mm [15], the mean annual relative humidity from 75 to 100% [16], and the mean annual temperature is about 30°C [17].

### 2.1 ETHICAL APPROVAL

Ethical approval for the study was given by the Ethical Committee of the Institute of Public Health (IPH), Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria.

### 2.2 Samples Collection

A total of 233 lizard specimens comprising of 172 geckos (*H. frenatus*) and 61 skinks (*M. quinquetaeniata*) were collected between February and October, 2015. The lizards were

captured by hand from various locations within the study areas and kept in ventilated cages. They were then transported to the parasitology laboratory of the Department of Zoology, Obafemi Awolowo University, Ile-Ife for dissection and examination for helminth parasites.

### 2.3 Laboratory Examination of Lizard Specimens

The lizard specimens were euthanized with chloroform in a desiccator; the weight was taken to the nearest 0.1g using a digital scale and the snout-vent length (SVL) measured with a caliper (to the nearest 0.1 mm). The lizards were dissected and their digestive tracts were removed. The digestive tracts comprising the stomach, intestine, caecum and rectum were removed and placed in a petri dish containing physiological saline (0.86%). Other organs comprising the heart, liver and lungs were also removed, separated and put in petri dishes containing saline. Each organ was cut open longitudinally and the contents expressed in a petri dish containing physiological saline. The contents were then examined closely on a dark background under a dissecting microscope. The helminths observed were removed and sorted according to their kind, washed in saline to remove adhering debris, counted, fixed and mounted according to standard techniques [18].

Nematodes were fixed in Alcohol Formo Acetic (AFA) and then preserved in 70% ethanol to which 5% glycerol was added [19]. The worms were cleared and mounted in Lactophenol before examination under a binocular microscope at X40 magnification.

Trematodes and cestodes were first placed in warm water at 60°C for 10 min to make it relaxed and later fixed in Alcohol Formo Acetic (AFA). The worms were stained in acetic haemotoxylin for 10 min and destained in acid alcohol. Thereafter, they were differentiated in 45% acetic acid and transferred in glacial acetic acid for 10-15 min for dehydration. The worms were cleared in 3:1, 1:1 and 1:3 series of mixture of glacial acetic acid and methyl salicylate. The worms were mounted in Canada balsam and examined under binocular microscope at X40 magnification. Parasites were identified when possible to species and the number and location of the individual parasite species were recorded.

Nematodes were identified to genus using the CIH keys to the Nematode Parasites of Vertebrates [20,21]. Cestode was identified by comparison with previous studies using Yamaguti [22].

### 2.4 Statistical Analysis

Prevalence (lizards infected/total number of lizards examined) and mean intensity of infection (number of parasites/number of infected hosts) were calculated according to Bush et al. [23]. Chi squared test was used to compare the differences in parasite prevalence between the sexes.

## 3. RESULTS

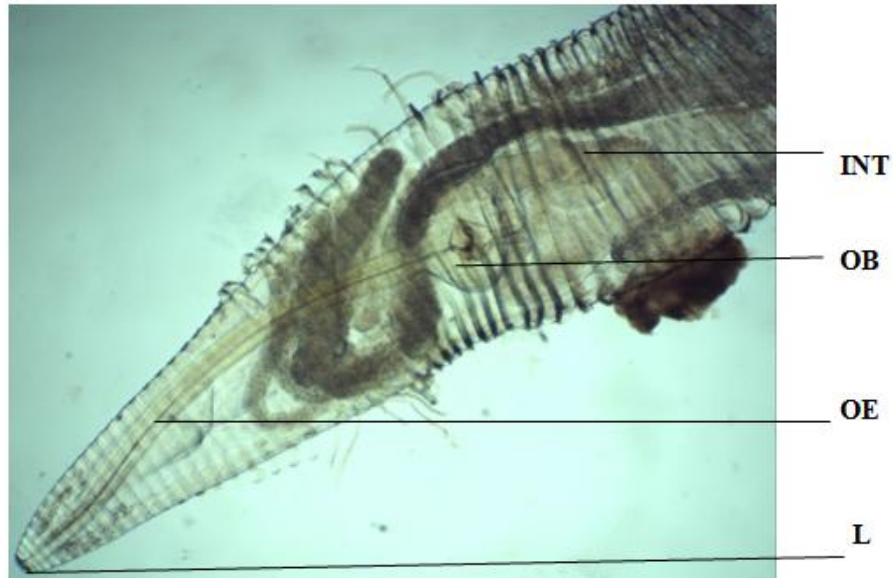
A total of 233 lizards comprising 172 specimens (92 males and 80 females) of *Hemidactylus frenatus* and 61 specimens (25 males and 36 females) of *Mabuya quinquetaeniata* were examined for helminth parasite.

A total of seven parasite species were recovered from both *H. frenatus* and *M. quinquetaeniata* and they include three nematodes, *Parapharyngodon* sp., *Spirura* sp. and *Pharyngodon* sp., one cestode, *Oochoristica truncata*, one trematode, *Mesocoelium monas*, one pentastomid, *Raillietiella frenatus* and cystacanth of an unidentified species of Acanthocephala. The prevalence, mean intensity and range of helminth parasites recovered are presented in Table 1. Five helminth parasites were recovered from *H. frenatus* which include, *Parapharyngodon* sp. (Plate 1a & b), *Pharyngodon* sp. (Plate 3), *Spirura* sp. (Plate 4a & b), *R. frenatus* (Plate 5a & b), *O. truncata* (Plate 6). Out of 172 specimens of *H. frenatus* examined, 110 specimens were infected with at least one parasite species giving an overall prevalence of 64.0%. The prevalence of infection in males and females were 67.4% and 60.0% respectively. The overall intensity of infection was  $3.49 \pm 0.39$ . The prevalence of helminth infection increased significantly from 16.7% in juvenile lizards (SVL 3.0-4.5cm) to 85.7% in adult lizards (SVL 6.2-7.7cm) ( $X^2 = 27.7$ ;  $P = 0.000$ ).

Five parasites were recovered from *M. quinquetaeniata*; *Parapharyngodon* sp., (Plate 2a & b), *Spirura* sp. (4a & b), *R. frenatus* (5a & b), *M. monas* (Plate 7) and cystacanth of an unidentified Acanthocephala (Plate 8). Out of 61 specimens of *M. quinquetaeniata* examined, 44 specimens were infected with at least one

parasite species given an overall prevalence of 72.1%. The prevalence of parasitic infection in males and females were 84.0% and 63.9% respectively. The overall intensity of infection was  $3.70 \pm 0.52$ . The distribution of the helminth parasites in the gut of the two species of lizards is presented in Table 1. Both *Parapharyngodon* sp. and *Pharyngodon* (nematodes) were

recovered from the rectum of *H. frenatus*. *R. frenatus* (Pentastomid) was recovered from the lungs of the two lizard species. *M. monas* (trematode) was recovered from the intestine of Scincid lizard while *O. truncata* (cestode) was recovered from the intestine of the gekkonid lizards.



**Plate 1a. Anterior end of adult female of *Parapharyngodon* recovered from *H. frenatus* (Mag x 40)**

*INT* = Intestine, *OB* = Oesophageal bulb, *OE* = Oesophagus, *L* = Lips



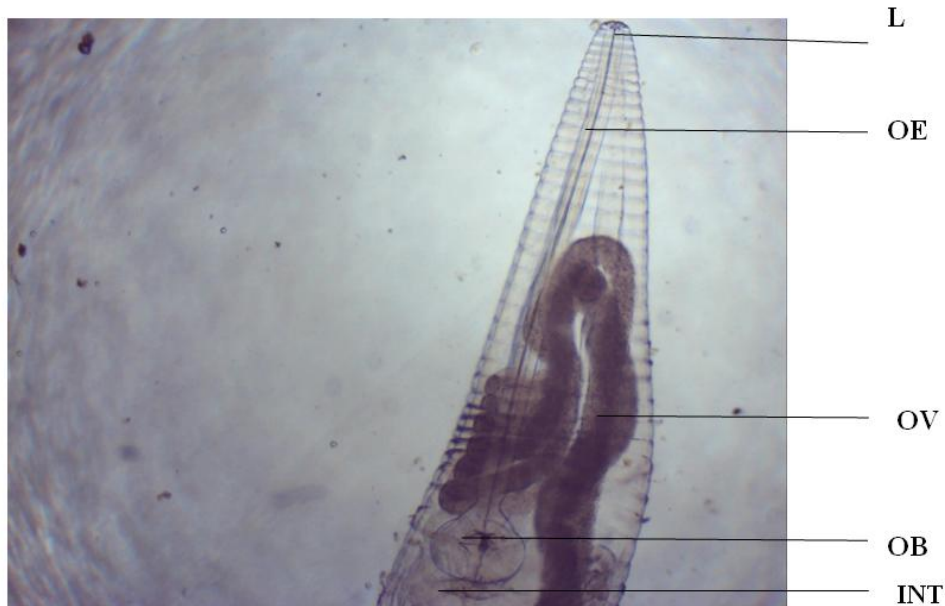
**Plate 1b. Posterior end of adult female of *Parapharyngodon* recovered from *H. frenatus* (Mag x 40)**

*E* = Eggs; *TA* = Tail

**Table 1. Prevalence and Intensity of parasites recovered from *H. frenatus* and *M. quinquetaeniata* in Ile-Ife and Ibadan**

Parasite group	Parasite	<i>Hemidactylus frenatus</i>				<i>Mabuya quinquetaeniata</i>			
		P (%)	Intensity	Range	Site	P (%)	Intensity	Range	Site
Nematode	<i>Paraphayngodon sp</i>	49.4	1.16 ± 0.22	0 - 11	Rectum	65.6	2.27 ± 0.43	0 – 9	Rectum
	<i>Pharyngodon sp.</i>	1.20	0.09 ± 0.06	-	Rectum	-	-	-	-
	<i>Spirura sp.</i>	1.20	-	-	Stomach	19.7	0.56 ± 0.39	0 - 16	Intestine
Cestoda	<i>Oochoristica truncata</i>	8.10	0.43 ± 0.18	0 - 9	Stomach	-	-	-	-
Trematoda	<i>Mesocoelium monas</i>	-	-	-	-	1.60	2.0 ± 2.0	0 – 2	Intestine
Pentastomid	<i>Raileteilla frenatus</i>	42.4	1.5 ± 0.36	0 - 16	Lungs	13.1	0.98 ± 0.36	0 – 9	Lungs
Acanthocephala	<i>Cystacant</i>	-	-	-	-	1.60	0.33 ± 0.33	0 – 1	Rectum

*P* = Prevalence



**Plate 2a. Anterior end of adult female of *Parapharyngodon* recovered from *Mabuya quinquetaeniata* (Mag x 40)**

*L = Lips, OE = Oesophagus, OB = Oesophageal bulb, INT = Intestine, OV = Ovary*



**Plate 2b. Posterior end of adult female of *Parapharyngodon* recovered from *Mabuya quinquetaeniata* (Mag x 40)**

*INT = Intestine, OB = Oesophageal bulb, OE = Oesophagus, L = Lips, E = Eggs, TA = Tail, OV = Ovary*

#### 4. DISCUSSION

The prevalence of parasitic infections in both lizard species was high, 64.0% in *H. frenatus* and 72.1% in *M. quinquetaeniata*. The same number

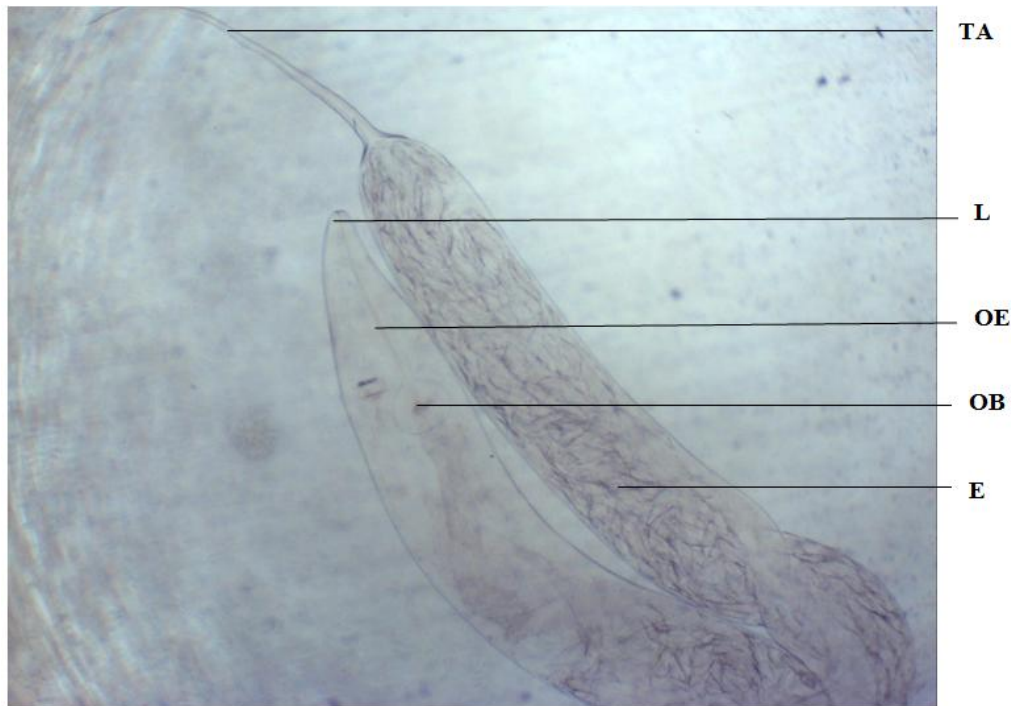
[5] of helminth species was recovered from both lizard species, though the number of *H. frenatus* examined was almost thrice that of *M. quinquetaeniata*. Only three helminth species (*Parapharyngodon* sp., *R. frenatus* and *Spirura*

sp.) were common to both species of lizard. *Parapharyngodon* sp., a nematode was recovered from both *H. frenatus* and *M. quinquetaeniata*. In this study, the identification of the genus *Parapharyngodon* could not be confirmed to species level because no adult male specimens were recovered from the specimens examined. *Parapharyngodon rotundatus* was first recovered from the agamid lizard, *Agama atra* [24], and then from the gekkonid lizards, *Rhotropus afer* and *R. barnardi* [10,25], and also from scincid lizard, *Mabuya occidentalis*, *M. spilogaster* and *M. striata* [26]. *Parapharyngodon* sp. was also recovered in a recent study from *Agama agama* in Southwest Nigeria [27].

*Pharyngodon* sp, a nematode and *O. truncata*, a cestode were recovered only from the gekkonid lizard, *H. frenatus*, in this study. Identification of the genus *Pharyngodon* could not be confirmed to the species level. Previous studies had reported *Pharyngodon* sp. and *Oochoristica* sp. from two species of house lizard (*Hemidactylus frenatus* and *Cosymbotus platyurus*) from Thailand [28]. Eight species of the genus *Oochoristica* have been reported to parasitize 13 lizard genera in Brazil [29]. *Oochoristica* sp. has also been reported in two species of gekkonid

lizard, *Hemidactylus mabouia* and *Phyllopezus pollicaris* from Northeastern Brazil [30]. *O. truncata* is a host generalist species and has a wide geographical distribution. It has also been reported in South Africa from the agamid lizards *Agama aculeata*, *A. hispida* and *A. planiceps*, a chamaelonid lizard, *Chamaeleo namaquensis*, a gekkonid lizard, *Rhoptropus barnardi*, a lacertid lizard, *Meroles knoxii*, a colubrid snake, *Psammophis sibilans* [24,25,31,32,33] and scincid lizards, *Mabuya occidentalis*, *M. spilogaster*, *M. striata* and *M. variegata* [26]. Little is known about the biology of this parasite, as most studies involving the genus *Oochoristica* have been limited to descriptions of new species and reports of new hosts [30].

A cystacanth of an unidentified Acanthocephalan was recovered from the scincid, *M. quinquetaeniata* in this study. The identification of Acanthocephala species requires adult individuals. The life cycle of Acanthocephalan species requires two hosts [34]. This begins with the ingestion of an egg (passed out by a definitive host) by an arthropod (intermediate host) in which development to an infective juvenile (cystacanth) stage occurs [35]. When the infected arthropod is ingested by a definitive



**Plate 3. Whole specimen of *Pharyngodon* sp. recovered from *H. frenatus* (Mag x 40)**  
 L = Lips, OE = Oesophagus, OB = Oesophageal bulb, E = Egg, TA = Tail

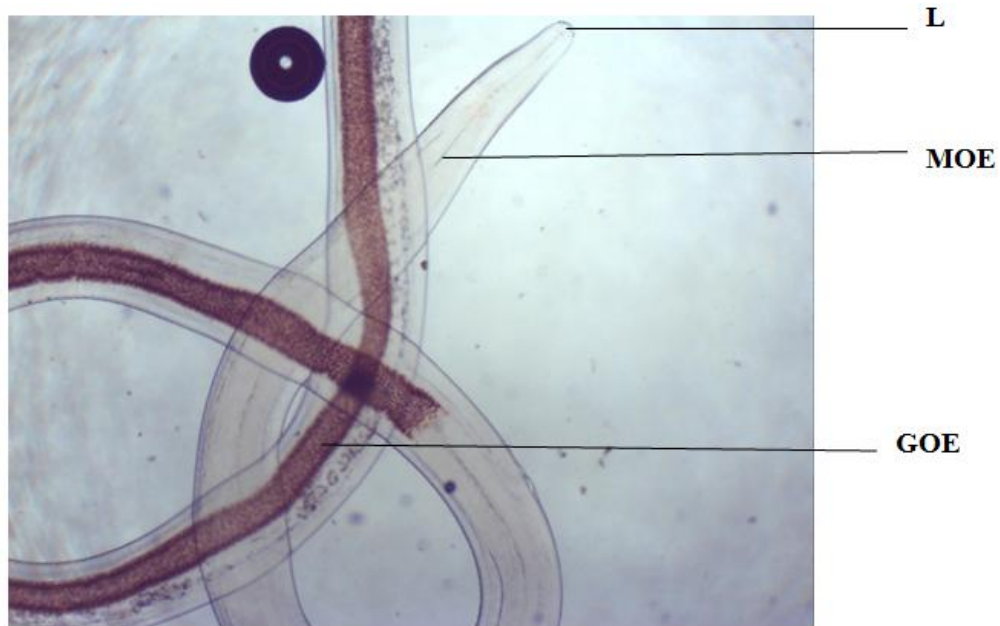


Plate 4a. Anterior & mid portion of *Spirura* sp. recovered from *H. frenatus* (Mag x 40)



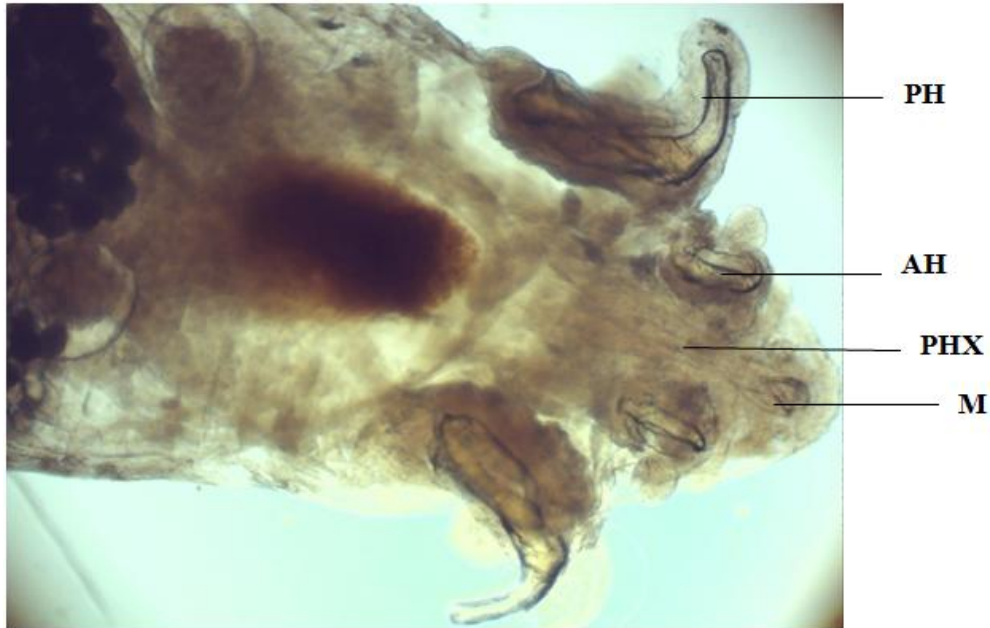
Plate 4b. Posterior end of *Spirura* sp. recovered from *H. frenatus* & *M. quinquetaeniata* (Mag x 40)

L = Lips, MOE = Muscular Oesophagus, GOE = Glandular Oesophagus, EP=Excretory pore, TA=Tail

host, excystation of the cystacanth occurs and the development to maturity begins. If the infected arthropod is eaten by an inappropriate host (paratenic host), then the cystacanth excysts and migrates from the digestive tract into

the body cavity, encysts and survives without further development [34,35]. Should a paratenic host be eaten by a proper definitive host, the parasite excysts and matures after attaching to the intestinal mucosa [35].





**Plate 5a. Anterior end of *Raillietiella frenatus* recovered from *H. frenatus* & *M. quinquetaeniata* (Mag x 40)**



**Plate 5b. Posterior end of *Raillietiella frenatus* recovered from *H. frenatus* (Mag x 40)**

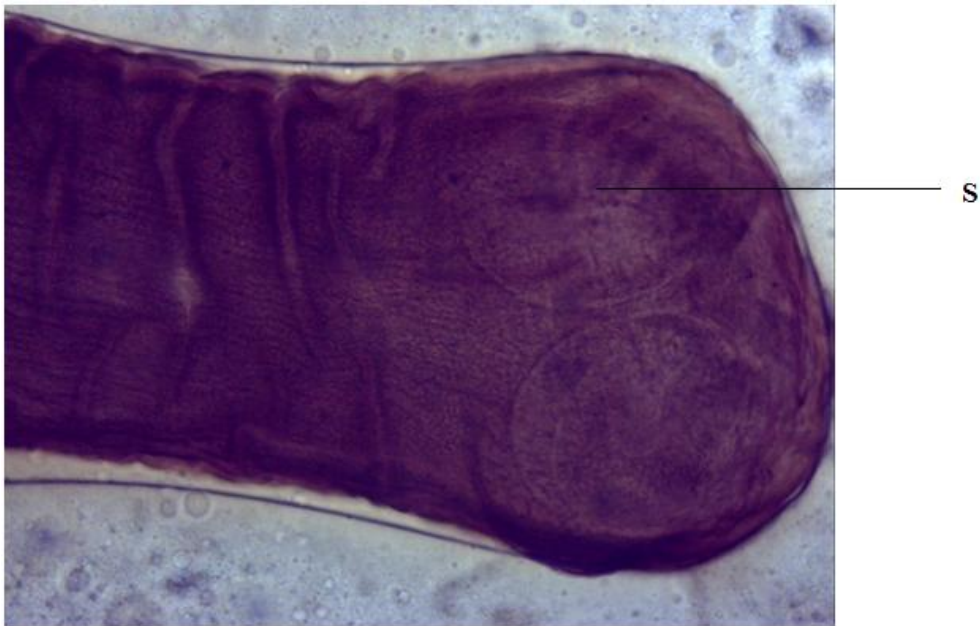
PH = Posterior hook, AH = Anterior hook, PHX = Pharynx, M = Mouth, E = Eggs, A = Anus, INT = Intestine, DTA = Divergent tail lobes

In this study, the prevalence of parasitic infections was higher in adult males than females in both *H. frenatus* and *M. quinquetaeniata*. This observation was in contrast to the findings of Obi et al. [13] who reported that the prevalence of

infection was higher in females (51.3%) than in males (46.2%) among 400 specimens of *H. frenatus* studied. This study also observed that the prevalence of helminth infections in gecko, *H. frenatus* was significantly higher among adults

than the juveniles. Similar finding was reported by Obi et al. [13] among the same species of gecko, *H. frenatus*, where parasite burden was higher among adults than the juveniles.

According to Ribas et al. [36], Amo et al. [37] and Adeoye and Ogunbanwo [38], prevalence of helminth infection was positively correlated with the size of the lizards studied.



**Plate 6. Scolex of *Oochoristica truncata* recovered from *H. frenatus* (Mag x 40)**  
S = Sucker



**Plate 7. Whole mount of *Mesocoelium monas* recovered from *Mabuya quinquetaeniata* (Mag x 40)**  
OS = Oral sucker; AC = Acetabulum



**Plate 8. Excysted Acanthocephala Cystacant recovered from *Mabuya quinquetaeniata* (Mag X 40)**

*PB = Proboscis, PH =Proboscis, PR=Proboscis receptacle*

*Spirura* sp., a nematode and *M. monas*, a trematode, were recovered only from the skink, *M. quinquetaeniata* in this study. To the best of our knowledge, this study gives the first report of the occurrence of *Spirura* sp. in any lizard species in Nigeria. Identification of the genus *Spirura* could not be confirmed to species level. *M. monas* has been reported previously from rainbow lizards (*Agama agama*) from Lagos, Nigeria [38]. *M. monas* is known as a parasite of amphibians and reptiles in Southeast Asia [39]. *M. monas* was originally described from the small intestine of an undetermined species of *Amphisbaena*, collected in Brazil and has been reported from 137 poikilothermic hosts [39].

## 5. CONCLUSION

This study has provided additional information on the endoparasites of two lizard species (*Hemidactylus frenatus* and *Mabuya quinquetaeniata*) in Southwest Nigeria. Further studies are required to find the male specimens of *Parapharyngodon*, in order to identify the parasite to the species level. This study on the helminths of skinks is the second in Nigeria hence; more studies are needed to establish the parasitic fauna of skinks in Nigeria.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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