DIGENETIC TREMATODES PARASITIC IN ANURANS FROM RAINFOREST BIOTOPES IN EDO STATE, NIGERIA

IMASUEN, A.A. and **AISIEN, M.S.O.***
Laboratory of Parasitology Research, Department of Animal and Environmental Biology,
Faculty of Life Sciences, University of Benin, P.M.B. 1154, Benin City, Nigeria

*Corresponding author: *msoaisien@hotmail.com*

Abstract

Digenetic trematodes parasitising amphibians in four rainforest locations (Okomu National Park, Ikoro, Ugbine, and Odighi) in Edo State, Nigeria, were investigated. The amphibians were collected using the Acoustic Encounter Survey (AES) and the Visual Acoustic Encounter Survey (VES) techniques. Of the 848 anurans examined from the four locations, 163 were infected, with an overall prevalence of 19.22%. In all, eight trematode parasites were found. At the Okomu National Park, six digenetic trematodes, including *Mesocoelium monas*, *Mesocoelium monodi*, *Mesocoelium cameroonensis*, *Halipegus* sp., *Diplodiscus fischthalicus* and *Ostioloides rappiae* were encountered in the amphibians examined. Whereas *M. cameroonensis* and *D. fischthalicus* were recovered only from *Ptychadena oxyrynchus* and *Pty. pumilio*, respectively, the other trematodes were multi-host parasites. At Ikoro, *Amietophrynus regularis* and *A. maculatus* examined were infected with *M. monodi*, while *M. monas* was haboured by *Pty. mascareniensis*, *Pty. bibroni*, *Pty. pumilio* and *Pty. oxyrynchus*. Apart from *M. monodi* and *M. monas* harboured by *A. maculatus* and *Ptychadena* spp., respectively, a third trematode, *Haplometroides eburnense* was recovered from *Amnirana albolabris* at Ikoro. Anurans from Ugbine harboured three *Mesocoelium* spp and *Haematoloechus exoterorchis*. At Odighi, *Pty. oxyrynchus*, *Pty. mascreniensis*, *Pty. bibroni* and *Pty. pumilio* harboured *Mesocoelium monas* while *A. regularis* and *A. maculatus* were hosts to *M. monodi*. *Mesocoelium cameroonensis*, *O. rappiae* and *H. eburnense* are new geographical records for Nigeria, while the finding of *D. fischthalicus* in *Pty. pumilio* represents a new host record for the parasite in the country.

Keywords: rainforest, amphibians, digenetic trematodes, new geographical records.

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Introduction

Investigations of the helminths parasitic in amphibians from the different bio-climatic zones of Nigeria have been undertaken by a number of workers (Avery, 1971; Thurston, 1967, 1970; Jackson and Tinsley, 1998a,b; Aisien *et al* 2001, 2003, 2004a,b, 2009, 2011a). The environments from which the investigated amphibians were collected include the Guinea savanna (Avery, 1971; Aisien *et al* 2004a), savanna-mosiac (Aisien *et al* 2003), the rainforest and mangrove (Thurston, 1967 1970; Jackson and Tinsley, 1998a,b; Aisien *et al* 2001, 2009a, 2011a). In a few of these publications, emphases were on the description of new species (Jackson and Tinsley, 1998a,b; Aisien *et al* 2011a) and re-description of known species (Aisien *et al* 2009b). The others (Avery, 1971; Thurston, 1967, 1970; Aisien *et al* 2001, 2003, 2004a, 2009a) were more generalized in their contents.

Continuing investigations of the parasitic infections of amphibians in different locations in Nigeria have revealed new host and geographical records as well as interesting host-parasite relationships worthy of

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documentation. In this paper, we report the investigation of the trematodes parasitising anurans from four rainforest locations in Edo State of Nigeria.

Materials and methods

Amphibians were collected using the Acoustic Encounter Survey (AES) and the Visual Encounter Survey (VES) techniques from the Okomu National Park (6° 15′N and 6° 25′ N; 5° 9′ E and 5° 23′ E), between April 2007 and July 2008; Ikoro (6° 16′ N; 5° 24′ E) from April to October, 2008; Odighi (6° 38′ N; 5 °46′ E), as shown in Figure 1, from March to October, 2008; Ugbine (6° 13′ N and 5° 24′ E) from March to July, 2009), all within Ovia North-West Local Government Area of Edo State, Nigeria. Of these four locations, Okomu National Park is a protected sanctuary while the other three (Ikoro, Odighi and Ugbine) are rainforest habitats altered by deforestation activities of timber loggers. Except for *Silurana tropicalis*, the anurans were collected by hand near water puddles or from vegetations overhanging water bodies. *Silurana tropicalis* was collected using baited aquatic traps. The amphibians were identified following Rodel (2000); Frost *et al* (2006) and Frost (2007), while the parasites were identified with the aid of appropriate keys (Yamaguti, 1971; Prudhoe and Bray, 1982). Prevalence rate of parasites was calculated as a percentage of the number of a particular host species infected with a specific helminth parasite divided by the total number of host examined. The mean intensity of infection refers to the average number of parasites per host (calculated only for the infected hosts examined).

The amphibian specimens were anaesthesized with benzocaine solution and examined within 18 hours of collection. The oesophagus, stomach, small intestine, large intestine and rectum were examined for parasites. Other parts examined include the liver/gall bladder, lungs, urinary bladder and the body cavity. Trematodes were fixed in 5% formol-saline under cover slip pressure for about 30 minutes after which they were carefully removed from the slide and transferred to specimen bottles containing 5% formol-saline. The worms were washed in several changes of tap water to remove the formalin preservative. Thereafter, they were stained overnight with a dilute solution of acetocarmine. The worms were dehydrated in ethanol series, cleared in xylene and permanent mount made in Canada balsam.

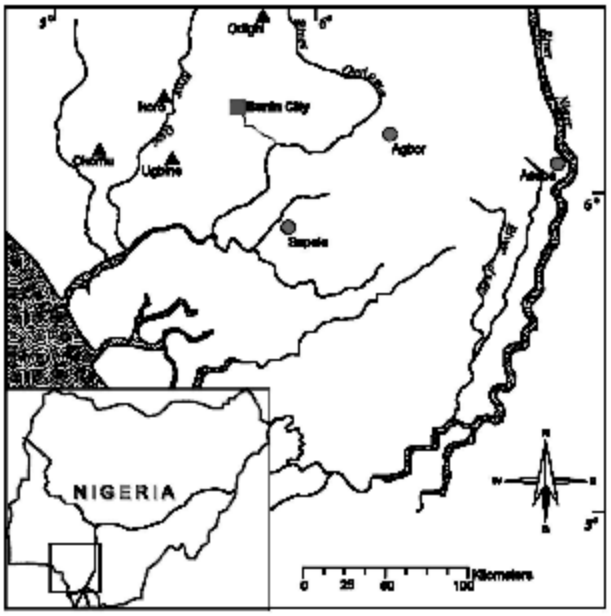


Figure 1. Map of the study-area showing the four sampling sites (s) at Okomu, Ikoro, Ugbine and Odighi).

Results

In this study, 848 anurans were examined (588 from Okomu National Park; 102 from Ikoro; 71 from Ugbine and 87 from Odighi). The anurans were predominantly frogs, spread across nine families and 24 species (Table 1). Okomu National Park had the highest species diversity. The overall prevalence of trematodes with respect to the four locations investigated were: Okomu National Park (10.7%), Ikoro (20.6%), Ugbine (81.7%) and Odighi (24.1%). In all, eight trematode parasites were recovered from the anurans examined (Table 2 and Figures 2 A-H). The trematodes parasites found were *Mesocoelium monas*, *M. monodi*, *M. cameroonensis*, *Halipegus*sp., *Diplodiscus fischthalicus*, *Ostioloides rappiae*, *Haplometroides eburnense* and *Haematoloechus exoterorchis*. As shown in Table 2, the parasites were recovered from the lungs (*H. exoterorchis*), the oesophagus/stomach (*Halipegus* sp.), small intestine (*M. monodi*, *M. monas*, *M. cameroonensis*, *O. rappiae*), large intestine/rectum (*D. fischthalicus*, *H. eburnense*).

Digenetic trematodes parasitising anurans at the Okomu National Park

Six trematode parasites were recovered from the amphibians examined at the Okomu National Park (Table 3). The parasites include *Mesocoelium monas, M. monodi, M. cameroonensis, Diplodiscus fischthalicus, Halipegus* sp. and *Ostioloides rappiae.* The prevalence of parasites at the park ranged from 2.8% to 100%, while the mean intensity was between 1.0 and 10.3 parasites/infected host (Table 3). Of the 6 trematode species recorded, *M. monas* and *M. monodi* were found to be multi-host parasites while *D.*

Table 1. Anurans examined for trematode infections in the four rainforest biotopes in Edo State, Nigeria.

Anurans	Locations and numbers examined			
	Okomu	Ikoro	Ugbine	Odighi
Artholeptidae				
Leptopelis hyloides	30	-	-	-
L. spitusnoctis	15	-	-	-
Bufonidae				
Amietophrynus	-	-	-	08
regularis	-	82	27	34
A. maculatus				
Dicroglossidae	-	01	03	01
Hoplobatrachus				
occipitalis	108	-	-	01
Hyperoliidae	04	-	-	-
Afrixalus. dorsalis	12	-	-	-
Hyperolius concolor	22	-	-	-
H. fusciventris	17	-	-	-
H. sylvaticus	09	-	-	-
Hyperolius sp. 1	05	-	-	-
Hyperolius sp. 2				
Hyperolius sp. 3	25	-	-	-
Phrynobatrachidae	25	-	-	-
Phrynobatrachus	33	-	-	-
calcaratus				
P. liberiensis	142	02	-	-
P. plicatus				
Pipidae	02	-	-	-
Silurana tropicalis	06	-	10	04
Ptychadenidae	27	04	05	-
Ptychadena	06	02	07	16
aequiplicata	01	08	19	07
Pty. bibroni	35	02	-	16
Pty. longirosris				
Pty. mascareniensis	-	01	-	-
Pty. oxyrynchus				
Pty. pumilio	64	-	-	-
Ranidae				
Amnirana albolabris				
Rhacophoridae				
Chiromantis				
rufescens				
Total	588	102	71	87

Table 2. Trematode parasites recovered from anurans in the four rainforest biotopes and their sites of infection.

Trematode	Host	Site of Infection
M. monas	*L. hyloides*	Small intestine
	L. spiritusnoctis	Small intestine
	Hyperoluis	Small intestine
	concolor	
	H. fusciventris	Small intestine
	H. sylvaticus	Small intestine
	Hyperoluis sp. 1	Small intestine
	Hyperoluis sp .2	Small intestine
	P. calcaratus	Small intestine
	S. tropicalis	Small intestine
	Pty. bibroni	Small intestine
	Pty. longirostris	Small intestine
	Pty.	Small intestine
	mascareniensis	
	Pty. oxyryhnchus	Small intestine
	Pty. pumilio	Small intestine
	C. rufescens	Small intestine
M. Monodi .	*A. regularis*	Small intestine
	A. maculatus	Small intestine
	P. plicatus	Small intestine
	Pty. aequiplicata	Small intestine
	Pty. bibroni	Small intestine
	Pty. longirostris	Small intestine
	Pty. oxyrhynchus	Small intestine
	C. rufescens	Small intestine
M. cameroonensis	*Pty. oxyrhynchus*	Small intestine
D. fischthalicus	*Pty. pumilio*	Large intestine
Halipegus sp.	*P. calcaratus*	Stomach/esophagus
	P. liberiensis	Stomach/esophagus
	P. plicatus	Stomach/esophagus
O. rappiae	*H. fusciventris*	Small intestine
	Hyperolius sp. 2	Small intestine
	A. dorsalis	Small intestine
H. eburnense	*A. albolabris*	Large intestine
H. exoterorchis	*H. occipitalis*	Lungs

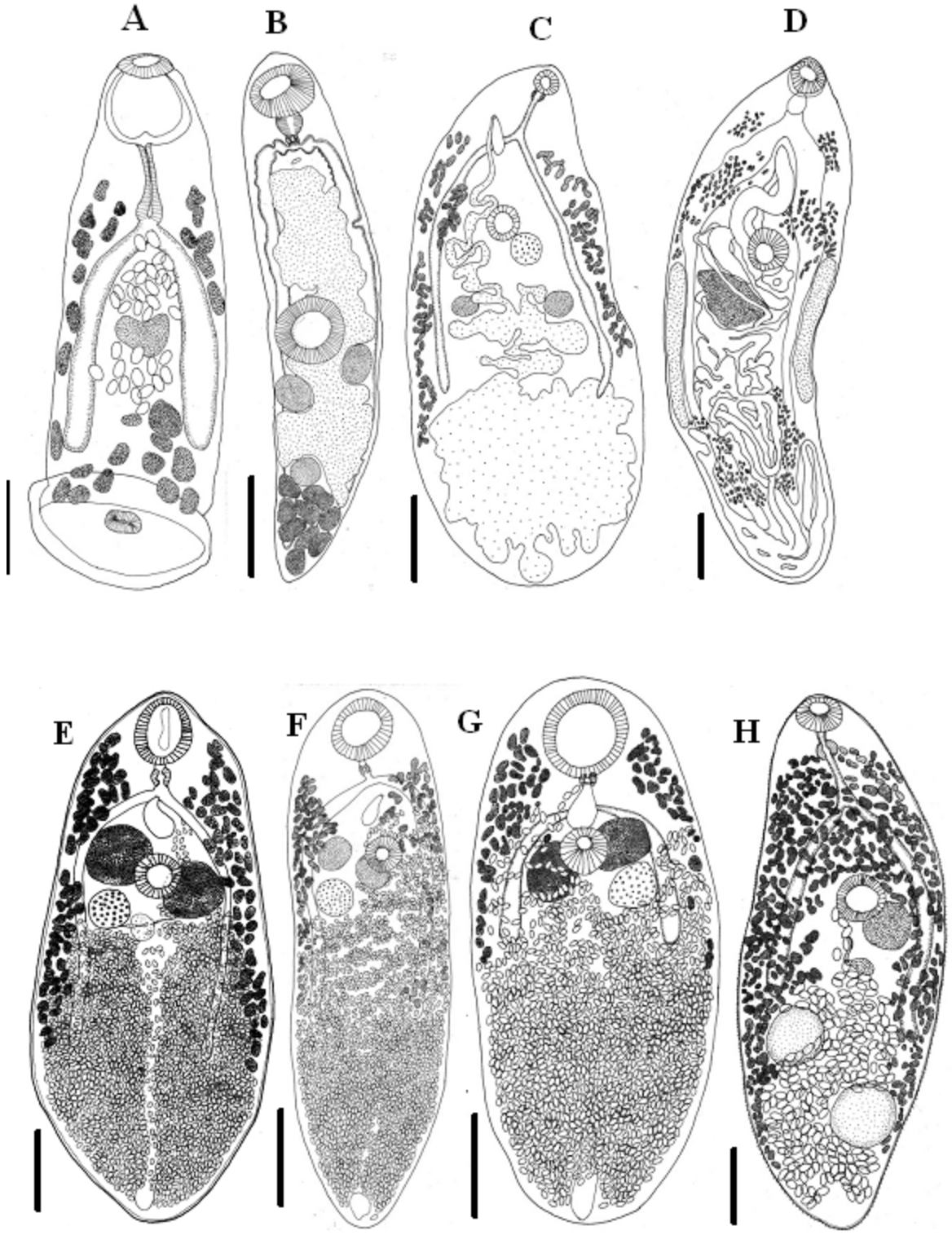
fischthalicus and *M. cameroonensis* infected one host each. *Halipegus* sp. and *Ostioloides rappiae* infected three hosts each. Seven of the thirteen host species infected by *M. monas* were tree frogs. *Ostioloides rappiae* infected only tree frogs (*A. dorsalis, H. fusciventris* and *Hyperolius* sp. 2) while *Halipegus* sp. was recorded only in *Phrynobatrachus* spp. (*P. calcaratus, P. liberiensis* and *P. plicatus)*.

Digenetic trematodes parasitising anurans at Ikoro

At Ikoro three trematode species were recovered from the amphibians examined and these were *M. monas, M. monodi* and *H. eburnense* (Table 3). A prevalence of 100% was recorded for *M. monas* in *Pty. longirostris* and *Pty. mascareniensis* while in *Pty. oxyrynchus* and *Pty. pumilio* the prevalence was 62.5% and 50%, respectively. The single specimen of *Amnirana albolabris* examined was infected with *Haplometroides eburnense* with an intensity of infection of 4 (Table 3).

Digenetic trematodes parasitising anurans at Ugbine

The amphibians examined at Ugbine were infected with *M. monas, M. monodi, M. cameroonensis* and *H. exoterorchis*. *Mesocoelium monas* was observed to be a multi-host parasite, infecting *Pty. bibroni*, *Pty. longirostris*, *Pty. mascareniensis* and *Pty. oxyrynchus* with prevalence values ranging from 41.2% to 87.7%.



Figures 2 A-H. Trematode parasites infecting anurans in some rainforest biotopes in Edo State, Nigeria. **A,** *Diplodisccus fischthalicus*, **B,** *Halipegus* sp., **C,** *Ostioloides rapiae*, **D,** *Haematoloechus exoterorchis*, **E,** *Mesocoelium monodi*, **F,** *M. monas*, **G,** *M. cameroonensis*, **H,** *Haplometroides eburnense*. Scale Bar: A, B, C, D, F = 0.5 mm; E, G, H = 0.25 mm.

Table 3: Prevalence and mean intensity of infection of trematodes in anurans from the four rainforest locations investigated.

Parasites	Host	Okomu		Ikoro		Ugbine		Odighi	
		%	MI	%	MI	%	MI	%	MI
M. monas	*L. hyloides*	16.6	4.6	-	-	-	-	-	-
	L. spiritusnoctis	6.7	9.0	-	-	-	-	-	-
	H. concolor	25.0	1.0	-	-	-	-	-	-
	H. fusciventris	20.0	1.0	-	-	-	-	-	-
	H. sylvaticus	9.0	1.0	-	-	-	-	-	-
	Hyperolius sp. 1	5.8	2.0	-	-	-	-	-	-
	Hyperolius sp. 3	20.0	1.0	-	-	-	-	-	-
	P. calcaratus	4.0	3.0	-	-	-	-	-	-
	S. tropicalis	3.5	1.6	-	-	-	-	-	-
	Pty. bibroni	33.3	1.0	-	-	-	-	-	-
	Pty. longirostris	30.0	10.3	100	5.3	60.0	22.0	-	-
	Pty. mascareniensis	-	-	100	10.0	41.2	4.7	31.2	15.6
	Pty. oxyrhynchus	-	-	62.5	18.2	87.7	30.8	87.7	30.8
	Pty. pumilio	20.0	2.9	50.0	5.0	83.3	12.8	25.0	5.0
	C. rufescens	7.8	4.6	-	-	-	-	-	-
M. monodi	*A. regularis*	-	-	-	-	-	-	20.0	3.5
	A. maculatus	-	-	9.8	4.9	37.0	8.4	12.5	7.7
	P. plicatus	12.1	3.3	-	-	-	-	-	-
	Pty. aequiplicata	50.0	1.0	-	-	-	-	-	-
	Pty. bibroni	16.6	1.0	-	-	-	-	-	-
	Pty. longirostris	59.3	9.9	-	-	-	-	-	-
	Pty. oxyrhynchus	100.	37.0	-	-	84.2	34.9	-	-
	C. rufescens	4.7	2.3	-	-	-	-	-	-
M. cameroonensis	*Pty. oxyrhynchus*	100.	1.0	-	-	-	-	-	-
	Pty. bibroni	-	-	-	-	30.0	7.7	-	-
Halipegus sp.	*P. calcaratus*	12.0	3.0	-	-	-	-	-	-
	P. liberiensis	20.0	14.0	-	-	-	-	-	-
	P. plicatus	15.1	2.6	-	-	-	-	-	-
D. fischthalicus	*Pty. pumilio*	8.6	2.0	-	-	-	-	-	-
O. rappiae	*A. dorsalis*	2.8	1.0	-	-	-	-	-	-
	H. fusciventris	8.9	4.0	-	-	-	-	-	-
	Hyperolius sp. 2	10.1	1.0	-	-	-	-	-	-
H. eburnense	*A. albolabris*	-	-	100	4.0	-	-	-	-
H. exoterochris	*H. occipitalis*	-	-	-	-	33.3	1.0	-	-

Mesocoelium monodi was recorded in *A. maculatus* and *Pty. oxyrynchus* while *M. cameroonesis* was only found in *Pty. bibroni* (Table 3). One of the three *H. occipitalis* caught at Ugbine was infected with a single specimen of *H. exoterorchis*.

Digenetic trematodes parasitising anurans at Odighi

In this location, only two trematode species (*M. monas* and *M. monodi*) were recorded in the anurans examined. *Mesocoelium monas* infected *Pty. mascareniensis* (31.2%), *Pty. oxyrynchus* (87.7%) and *Pty. pumilio* (25%) as presented in Table 3. *Mesocoelium monodi* was recorded in the two *Amietophrynus* spp. (*A. regularis* and *A. maculatus)* caught in this location albeit with low intensity of infection (Table 3).

Discussion

In this study, more amphibian species (20) were encountered in the protected environment of the Okomu National Park than in the altered forests at Ikoro (8), Ugbine (6) and Odighi (8). The lower species number in the altered forests must have arisen from the logging activities in these forests. Habitat alteration arising from anthropogenic activities such as logging, agricultural land use and oil exploration are known to negatively impact on amphibian species composition (Sparling *et al* 2001; Akani *et al* 2003; Beja and Alcazar, 2003; Knutson *et al* 2004; Ernst *et al* 2006; Hillers *et al* 2008). Prevalence of trematode parasites was however higher in the altered forest locations, with Ugbine recording 81.7% prevalence, followed by Odighi (24.1%) and Ikoro (20.6%). In contrast, Okomu National Park had only 10.7% prevalence. From

previous studies (McKenzie, 2007; Rohr, 2008a,b; Aisien *et al* 2011), infection rates have been observed to change according to land use, with higher infection rates occurring in altered habitats. The lower numbers of parasite species recorded in the amphibians of the altered forest habitats in this study, is in agreement with earlier observations that such environments hinder the ability of some parasites to complete their life cycles and maintain infection in their normal hosts (Aisien *et al* 2009)

Of the eight trematode species recorded in this study, five (*M. monas*, *M. monodi*, *Halipegus* sp., *D. fischthalicus* and *H. exoterorchis*) have been reported from anurans in other rainforest biotopes previously investigated in Nigeria (Aisien *et al* 2001, 2009); from the savanna and savanna-mosaic zones of the country (Aisien *et al* 2003, 2004a), and other African countries (Rees, 1964; Saoud, 1964; Thomas, 1965; Gassmann, 1975; Thurston, 1970; Fischthal, 1977; Maeder, 1969; Maeder *et al* 1969a,b, 1970a,b; Pike, 1979; Aisien *et al* 2011). It can be concluded therefore that these parasites are not restricted to the rainforest or to the amphibians of Nigeria.

Until recently the reports of *M. monas* in the anurans of West Africa were those of Maeder *et al* (1969) in *Bufo camerunensis camerunensis, A. subsigillata, Hylarana albolabris albolabris, H. lepus lepus* from Gabon; Maeder *et al* (1970a) in *H. albolabris albolabris*, *Pty. bibroni*, *A. poecilonotus* and *H. fusciventris fusciventris*) from Ivory Coast; Maeder *et al*. (1970b) in *C. rufescens*, *H. albolabris albolabris*, *Pty. oxyrynchus*, *Pty. perreti* and *Pty. superciliaris* from the Central African Republic and Gassmann (1975) in *Bufo maculatus*, *B. latifrons*, *H. albolabris*, *Hylarana* sp., *Pty. mascareniensis*, *Pty. oxyrynchus*, *Pty. perreti*, *Astylosternus diadematus*, *A. batesi* and *Scotobleps gabonicus* from Cameroon. The first report of the occurrence of *M. monas* in Nigerian anurans was that of Aisien *et al* (2009) from the Gelegele Forest Reserve. The present study has further confirmed the occurrence of this trematode in Nigeria.

In the Gelegele Forest Reserve, five anuran hosts (*A. maculatus*, *A. subsigillata*, *Pty. oxyrynchus*, *Pty. bibroni* and *Pty. longirostris*) haboured *M. monas*. In the altered forest environments at Ikoro, Ugbine and Odighi, the parasite was haboured by only *Ptychadena* spp. (*Pty. bibroni*, *Pty. longirostris*, *Pty. mascareniensis*, *Pty. oxyrynchus* and *Pty. pumilio*). In contrast, the host range infected by this parasite at the Okomu National Park was much wider, including tree frogs (*Leptopelis hyloides*, *L. spiritusnoctis*, *Hyperolius concolor*, *H. fusciventris*, *H. sylvaticus*, *Hyperolius* sp.1, *Hyperolius* sp. 2 and *Chiromantis rufescens*), a pipid anuran (*Silurana tropicalis*), a phyrobatrachid (*Phrynobatrachus calcaratus*) and grass frogs (*Pty. bibroni*, *Pty. longirostris* and *Pty. pumilio*). The host range in the park is presumably higher, because, as a protected sanctuary, it is devoid of anthropogenic activities that adversely affect amphibian diversity. Furthermore, the sampling duration in the park was much longer than in the other forest locations investigated.

As observed with *A. monas*, *M. monodi* was also a multi-host parasite at the Okomu National Park, infecting four *Ptychadena* spp, a phrynobatrachid and a tree frog. At Ikoro, Ugbine and Odighi, only a few anuran hosts (*A. regularis*, *A. maculatus* and *Pty. oxyrynchus*) were infected with this trematode. The prevalence of *M. monodi* in the anurans of other bio-climatic zones of Nigeria are in the reports of Aisien *et al* (2001, 2003, 2004). Reports on the occurrence of *M. monodi* in the amphibians of other West African countries include those of Capron *et al* (1961) from Madagascar; Saoud (1964) from Cameroun; Maeder (1969) from Ivory Coast; Fischthal and Thomas (1968) from Ghana; Pike (1979) from the Sudan and Aisien *et al* (2011) from Benin Republic.

The third *Mesocoelium* species (*M. camerunensis*) recorded in this study, from *Pty. oxyrynchus* at the Okomu National Park and from *Pty. bibroni* at Ugbine, is a new geographical record for Nigeria. Unlike *M. monas* and *M. monodi* which are widespread and infect a wide host range, this parasite has only previously been reported from the Camerouns but also from *Pty. oxyrynchus*. *Ptychadena bibroni* is therefore a new host record for this parasite.

Halipegus sp. was first reported in Nigeria from *Aubria subsigilata* from the Gelegele Forest Reserve by Aisien *et al* (2009). The specimens recovered in this study from three *Phrynobatrachus* spp. (*P. calcaratus*, *P. liberiensis* and *P. plicatus*) may be *Halipegus phrynobatrachi* previously recorded from *Phrynobatrachus alleni* and an *Arthroleptis* sp. from Côte d'Ivoire by Maeder (1969). More specimens will be needed for morphometric comparison of these parasite specimens. Other *Halipegus* sp. infecting amphibians in Africa include *H. ovocaudatus* in *Rana fuscigula* from South Africa (Beverley-Burton, 1963); a *Halipegus* sp. in *B. regularis* also from S. Africa (Beverley-Burton, 1963); *H. africana* in *Rana mascareniensis* from the Congo (Beverley-Burton, 1963); *H. insularis* in *Rana mascareniensis*, *Rhancophorus goudoti* and an unidentified frog from Madagascar (Beverley-Burton, 1963); *H. rhodesiensis* in *Xenopus laevis* from Zimbabwe (Beverley-Burton,

1963) and in the same host from Uganda (Thurston, 1970) and a *Halipegus* sp. from *H. occipitalis* (see Pike, 1979).

Haematoloechus exoterorchis is a common parasite *H. occipitalis* in the various bio-climatic zones of Nigeria (Aisien *et al* 2001, 2003, 2004). This parasite has also been reported in *H. occipitalis* from Ghana (Rees, 1964; Fischthal and Thomas, 1968), Cameroon (Gassmann, 1975), Zaire and Togo (Fischthal, 1977). Other *Haematoloechus* spp. infecting anurans in Africa include *H. micrurus* (Rees, 1964; Fischthal and Thomas, 1968; Gassmann, 1975; Aisien *et al* 2003); *H. johnsoni* (Bourgat, 1977; Aisien *et al* 2011b); *H. aubriae* (Bourgat *et al* 1996; Aisien *et al* 2009); *H. darcheni* (Combes and Knoepffler, 1967); *H.* (*O.*) *dollfusinus* (Maeder, 1969); *H. lobogonadus* (Meskal, 1970) and *H. ocellati* (Gassmann, 1975).

The single paramphistomid trematode encountered in this study was *Diplodiscus fischthalicus*, which appears to be a multi-host parasite. In this study it was recovered from the rectum/large intestine of *Pty. pumilio* which is a new host record for this parasite in Nigeria. Previous records of *D. fischthalicus* in anurans investigated in Nigeria were predominantly in *Hoplobatrachus occipitalis* (see Aisien *et al* 2001, 2003, 2004) and in one instance from *Aubria subsigillata* (see Aisien *et al* 2009). The parasite was originally described by Meskal (1970) from *Rana angolensis* in Ethiopia. In Benin Republic this trematode was found parasitising *H. occipitalis* and *Phrynobatrachus latifrons* (see Aisien *et al* 2011b). *Diplodiscus* specimens recovered from *D. occipitalis* in Ghana were identified as *D. magnus* by Fischthal and Thomas (1968). Meskal (1970) and Yamaguti (1971) both questioned this identification since the original material from *D. occipitalis* (see Fischthal and Thomas, 1968) had a definite sphincter at its anterior end, a feature among others that it shares in common with *D. fischthalicus*. Gassmann (1975) also identified *Diplodiscus* specimens recovered from *D. occipitalis*, *Pty. mascareniensis* and *Leptopelis aubryi* from the Cameroons as *D. subclavatus*. However, in view of the close similarities between *D. subclavatus* and *D. fischthalicus*, Pike (1979) was of the opinion that there was insufficient evidence to distinguish the *Diplodiscus* in Africa recognized as *D. subclavatus* from that described as *D. fischthalicus*.

Ostioloides rappiae was only recovered from tree frogs, (*Afrixalus dorsalis, Hyperolius fusciventris, Hyperolius* sp. 2.) in Okomu National Park. This trematode was originally described from *Rappiae concolor* (also a tree frog) in Liberia (Szidat, 1932). Other records of this parasites elsewhere have also been in tree frogs: *Hyperolius* sp. in Ghana (Fischthal and Thomas, 1968); *Hyperoluis f. fusciventris* in Cote d'Ivoire (Maeder, *et al* 1970b) and in Cameroon, it was recorded in *Hyperolius nasutus, H. tuberculatus, H. viridistriatus* and *Scotobleps gabonicus* (Gassmann, 1975). Therefore, it thus appear that this trematode is exclusively a parasite of these arboreal frogs. The finding of this parasite Nigeria represents a new geographical record.

Haplometroides eburnense is a multi-host parasite being recorded in the anurans of Nigeria for the first time. Maeder, (1969) described the parasite from *Phrynobatrachus alleni, P. liberiensis, P. plicatus* and *Pty. longirostris* in Ivory Coast. In Gabon, the trematode was recovered from *Bufo funereus, B. camerunensis camerunensis, Hylarana (Amnirana) albolabris* and *Leptopelis calcaratus* (Maeder *et al* 1969). Unlike the other locations where the parasite occurred in several hosts, *H. eburnense* was recovered from a single host (*Amnirana albolabris*) at Ikoro, Nigeria.

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