GASTROINTESTINAL HELMINTH PARASITES OF *AMIETOPHYRNUS REGULARIS,* BUFONIDAE (AFRICAN COMMON TOAD) IN ANYIGBA, KOGI STATE, NIGERIA

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ABSTRACT

Gastrointestinal helminth parasites of Amietophyrnus regularis (African Common Toad) in Anyigba were investigated. A total of 120 specimens were examined for helminth parasites, 113(94.17%) toads were infected, while 7(5.8%) were uninfected. Helminth parasites recovered were 1576, comprising of 1 Cestode: Baerietta jaegerskioeldi (2.50%) and 3 Nematodes: Amplicaecum africanum (92.50%), Cosmocerca ornata (16.67%) and Physaloptera spp. (6.67%). Nematodes had the highest occurrence with A. africanum as the most prevalent. The cestode, B. jaegerskioeldi and the nematode, C. ornata exhibited specific sites of infection, being found in the small intestine and large intestine/rectum, respectively. Small intestine of hosts harboured the highest number of parasites with a prevalence of 90%. Although infection increased with the size of hosts examined, there was no significant difference in the infection of size categories. Similarly, there was no significant difference in the infection of male and female toad hosts (p>0.05). The toads with 1 – 10 worms had the highest frequency of infections, 61(50.83%). Multiple infections were recorded in several of the toad hosts, an indication of the rich parasitic fauna of Amietophyrnus regularis in Anyigba. This study is an attempt to bridge the dearth of information on the helminth parasites associated with Amietophyrnus regularis in Anyigba, Kogi State, Nigeria.

Keywords: Gastrointestinal parasites, *Amietophyrnus regularis*, Savanna, Nigeria

INTRODUCTION

Amietophyrnus regularis a synonym of *Bufo regularis* is an amphibian in the family Bufonidae*. A. regularis* is commonly known as the African common toad in English (IUCN, 2012). The species which are also called true toads have fat bodies with warts, and can live in drier climates while most frogs usually live in or near water (Nworah and Olorunfemi, 2011).

They are widespread in the tropics, especially in Savannas, montane, grassland, forests and are beneficial animals to have in the home garden, as well as on farms. Toads play roles in nutrients cycles and as environmental indicators. Nutrients are recycled from aquatic systems to terrestrial when the toads enter the land after metamorphosis. Tadpoles, the swimming larval forms of toads and frogs that hatch from fertilized eggs in water, are important food source for fish and other aquatic organisms (Towle, 1989; New World Encyclopaedia, 2008).

Amphibian parasitology has attracted the attention of many scientists in the recent past due to the declining amphibian populations

(Heyer *et al.,* 1994). The possible negative effects of parasites on amphibians have become a topic of interest (Cunningham *et al.,* 1996; Longcore *et al.,* 1999). Gut helminth parasites cause damage of the intestinal mucosa, as they attack the sensitive epithelium, resulting in ulcers, severe enteritis and extensive connective tissue proliferation which may lead to morbidity and eventual death (Egusa, 1992). The presence of parasites in large numbers may also cause obstruction in the digestive tracts (Williams, 1967).

Several studies on helminth parasites of amphibians include those of Abudullahi and Abudullazeez (2000), Aisien *et al.* (2001), Aisien *et al.* (2003), Aisien *et al.* (2004), Aisien *et al.* (2009), Dusen and Oguz (2010), Aisien *et al.* (2011), Akani *et al.* (2011), Imasuen *et al.* (2012) among many others. The present study investigates the gastrointestinal helminths of *A. regularis* in a derived Guinea Savanna zone at Anyigba, Kogi State, Nigeria.

MATERIALS AND METHODS

Study Area: The study area is Anyigba, a town in Okura district, Dekina Local Government Area of Kogi State, Nigeria. The town is located between Latitude 7°27' – 7°31' North of the equator and between Longitude 7°09' – 7°12' East of the Greenwich Meridian (Ifatimehin *et al.,* 2014). The altitude of Anyigba is about four hundred and twenty meters above sea level in the derived Guinea Savanna vegetation zone of Nigeria (Figure 1).

Sample Collection: *A. regularis* males and females were collected from three localities; (1) Kogi State University (KSU) borehole area, (2) University village area (in uncompleted houses and uncovered dug pit) and (3) in dirty water pools around post office area (Figure 1) The specimens were collected with a net cage and brought into the laboratory for parasitic examination.

Measurement: Freshly killed toads were weighed using an electronic weighing balance. The length of the toads were measured using a thread and meter rule.

Examination of *A. regularis* for Parasites: The toads were dissected ventrally from the cloacae region to the anterior end on the dissecting board. The gastrointestinal tracts (oesophagus/stomach, small intestine, large intestine/rectum) were examined for helminth parasites. Each organ was excised and placed in a separate Petri-dish which contained normal saline and thoroughly searched for helminth parasites using magnifying lens and a dissecting microscope.

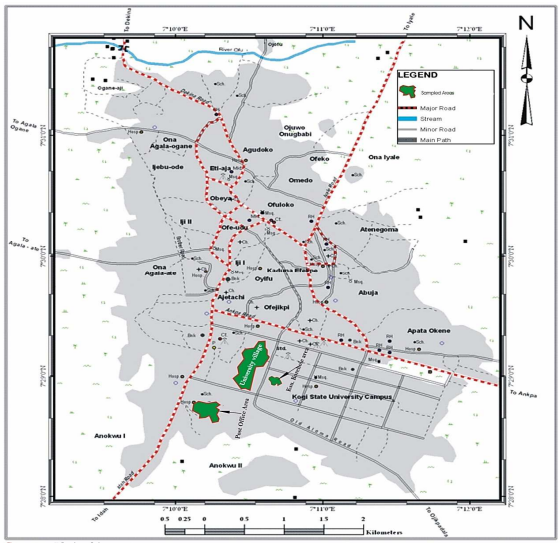

Figure 1: Map of Anyigba showing the sampled areas. Source: Ifatimehin *et al.* (2014)

Collection and Preservation of Isolated Parasites: Helminth parasites were picked with dissecting needle (forceps) and washed in normal saline. The parasites recovered were counted and recorded. Nematodes were preserved in 70% alcohol. Cestodes were fixed with formal-saline. The fixed specimens were preserved in the same medium.

Preparation of Parasites for Identification: Cestodes were removed from the preservative medium, washed to remove the fixative and stained in acetocarmine, dehydrated and cleared in xylene and examined with the microscope. Nematodes were cleared in lactophenol before being examined under the microscope.

Identification and Confirmation of Parasites: The helminth parasites were identified and microphotographed in the University of Benin by a specialist in this field, Professor M. S. O. Aisien and his team in the Laboratory of Parasitology Research, Department of Animal and Environmental Biology, Faculty of Life Sciences, University of Benin, Benin City, Nigeria.

Statistical Analysis: The ecological terms; prevalence (%), mean intensity and mean abundance were analysed according to Bush *et al.* (1997). The relationship between the host factors such as the parasite infection, sites of infection, sex, weight, and length were examined from data pooled from the three sampled areas in Anyigba using Chi-square analysis at 5% level of significance. All statistical analysis were done using SPSS version 17 for windows.

RESULTS

A total of 120 *Amietophyrnus regularis* hosts were examined for gut helminth parasites. 113(94.17%) were infected with a prevalence of 94.17%, mean intensity of 13.95 ± 18.64 and mean abundance of 13.13, while 7(5.8%) were not infected. The total parasite recovered was 1576. *Amplicaecum africanum* recorded the highest infection with 110 hosts infected, a prevalence of 91.67%, mean intensity of 11.55 ± 17.85 and abundance of 10.59. The overall parasitic infection of *A. regularis* is shown in (Table 1). Out of 98 males examined 88 were infected with prevalence, mean intensity and mean abundance values of 94.62%, 15.42 ± 19.88 and 14.75 respectively, while 24 out of 27 females examined were infected with prevalence, mean intensity and mean abundance values of 88.90%, 8.50 ± 11.84 and 7.55 respectively. Parasite taxa and species encountered included; the Cestode, *Baerietta jaegerskioeldi* and the Nematodes, *Amplicaecum africanum, Cosmocerca ornata* and *Physaloptera sp*. The identified helminth parasites and their morphological features are shown in Figures 2 – 5.

Baerietta jaegerskioeldi and *Cosmocerca ornata* exhibited specific sites of infection, being found in the small intestine and large/rectum respectively. Small intestine had the highest infection rate with prevalence of 90%, mean intensity of 7.89 ± 10.91 and mean abundance of 7.11 (Table 2).

The distribution of the parasites species in relation to infection sites, *A. africanum* had the highest prevalence in the stomach (40%) and small intestine (88.33%). This same parasite species has the highest mean abundance of 6.92 in the small intestine while *Physaloptera* spp*.* had the highest mean intensity of 12.00 ± 18.52 in the stomach (Table 3).

Infection of *A. regularis* in relation to sex (Table 4) showed that females were more infected with the cestode *B. jaegerskioeldi*. Although *A. africanum* has the highest prevalence in both sexes, the males were more infected with *A. africanum* than the females, followed by *Cosmocerca ornata*. There was no significant difference ($p>0.05$) in the infection of males and females. Both sexes were highly infected. In the weight range of the hosts examined, prevalence increased with the weight of the hosts (Table 5). The relationship of host weight and parasitic infection showed that there was no significant difference ($p>0.05$) in the infection of weight ranges. Parasitic infection in relation to length ranges of the hosts examined, (Table 6) showed that the length ranges of 11.0 – 11.9 cm and 12.0 – 12.9 cm had the highest prevalence of 100% but no significant difference ($p>0.05$) in the infection within the length ranges.

Parasite species infection in relation to the weight ranges, the cestode, *B. jaegerskioeldi* had the highest prevalence of 4% in 81 – 110g weight range. Among the nematodes, *A. africanum* had higher prevalence in all the weight ranges but highest in 111 – 140g weight range with 100% prevalence. *C. ornata* had the highest prevalence of 75% in 111 – 140g weight range and *Physaloptera sp.* had the highest prevalence of 12% in 51-80g weight range (Table 7).

Table 1: Overall parasitic infection of *Amietophyrnus regularis*

Parasite phyla	Parasite species	Number examined	Number infected	Parasite recovered
Cestode	***Baerietta jaegerskioeldi***	120	3	22
Nematodes	***Amplicaecum africanum***	120	110	1271
	Cosmocerca ornata	120	20	198
	***Physaloptera* sp.**	120	8	85
		Prevalence (%)	**Mean intensity**	**Mean abundance**
Cestode	***Baerietta jaegerskioeldi***	2.50	7.33±10.12	0.18
Nematodes	***Amplicaecum africanum***	91.67	11.65±17.85	10.59
	Cosmocerca ornata	16.67	9.90±8.53	1.65
	***Physaloptera* sp.**	6.67	10.63±17.58	0.71

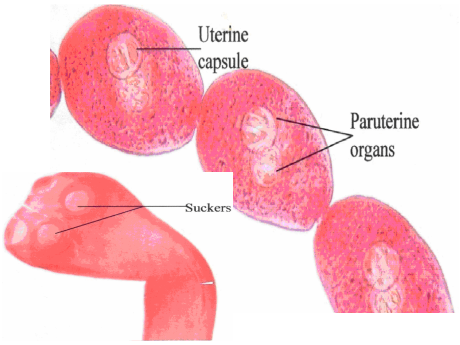

Figure 2: *Baerietta jaegerskioeldi* infecting *Amietophrynus regularis*

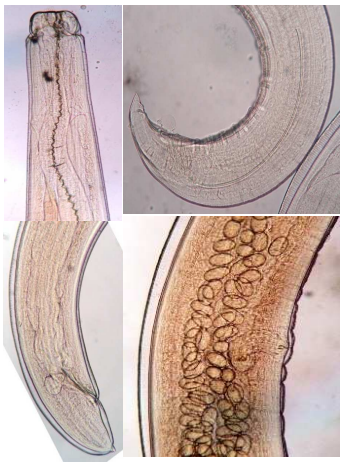

Figure 3: *Amplicaecum africanum* infecting *Amietophrynus regularis*. (A) anterior end, (B) male posterior end, (C) female posterior end, (D) vulva region of female with ovary showing eggs

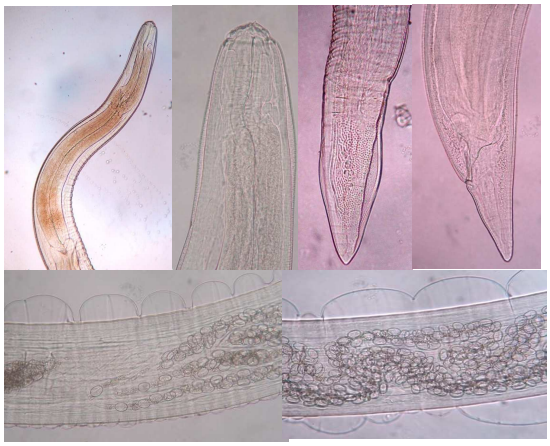

Figure 4: *Physaloptera* sp. infecting *Amietophrynus regularis*. (A) anterior end showing long oesophagus, (B) anterior end enlarged, (C) male, posterior end, (D) female, posterior end, (E, F) sections of the the uterus with eggs

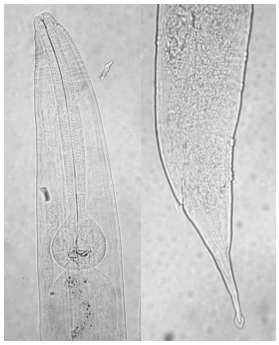

Figure 5: *Cosmocerca ornata* infecting *Amietophrynus regularis*. (A) anterior end, (B) posterior end

Infection of parasites species within the length ranges of *A. regularis* examined (Table 8), showed that *B. jaegerskioeldi* had the highest prevalence of 14.3% in 11.0 – 11.9 cm length range. *A. africanum* had the overall highest prevalence in all the length ranges but with highest prevalence of 100% in 12.0 – 12.9 cm length range.

C. ornata had the highest prevalence of 29% in 11.0 – 11.9 cm length range and *Physaloptera* sp. had the highest prevalence of 12.5% in 8.0 – 8.9 cm length range. The toads were distributed unevenly in the three localities. In KSU bore hole area (locality 1), 70 hosts were examined, 65(92.9%) were infected, the total parasites recovered was 771.

Table 2: Parasitic infection in relation to sites of infection in *Amietophrynus regularis*

Sites of infection	Number examined	Number infected	Number of helminths recovered
Oesophagus/Stomach	120	53	500
Small intestine	120	108	853
Large intestine/Rectum	120	32	223
	Prevalence (%)	**Mean intensity**	**Mean abundance**
Oesophagus/Stomach	44.17	9.43±19.52	4.17
Small intestine	90.00	7.89±10.91	7.11
Large intestine/Rectum	26.67	6.97±8.01	1.86

Table 3: Parasite species in relation to sites of infection in *Amietophrynus regularis*

Sites of infection	Parasite species	Number examined	Number infected	Number recovered
Oesophagus/Stomach	*Physalopetera sp.*	120	7	84
	Amplicaecum africanum	120	48	416
Small intestine	*Amplicaecum africanum*	120	106	830
	Physaloptera sp.	120	1	1
	B. jaegerskioeldi	120	3	22
Large intestine/Rectum	*Cosmacerea ornate*	120	20	198
	Amplicaecum africanum	120	15	25
		Prevalence (%)	**Mean intensity**	**Mean Abundance**
Oesophagus/Stomach	*Physalopetera* sp.	5.83	12.00±18.52	0.70
	Amplicaecum africanum	40.00	8.67±19.42	3.50
Small intestine	*Amplicaecum africanum*	88.33	7.83±10.94	6.92
	Physaloptera sp.	0.83	1	0.01
	B. jaegerskioeldi	2.50	7.33±10.12	0.18
Large intestine/Rectum	*Cosmacerea ornate*	16.70	9.90±8.53	1.65
	Amplicaecum africanum	12.50	1.67±1.39	0.21

Table 4: Distribution of parasites species in relation to sex of *Amietophrynus regularis*

Parasites species	Male (N=93)				
	A	**B**	**C**	**D**	**E**
B. jaegerskioeldi	1	1	1.10	1	0.01
A. africanum	88	1116	94.62	12.68±12.00	12.00
C. ornate	16	174	17.20	10.88±8.70	1.87
***Physaloptera* sp.**	6	81	6.45	13.50±19.82	0.87
			Female (N=27)		
B. jaegerskioeldi	2	21	7.41	10.50±12.02	0.77
A. africanum	22	155	81.48	7.05±10.90	5.74
C. ornate	4	24	14.82	6.00±7.57	0.88
***Physaloptera* sp.**	2	4	7.41	2.00±1.41	0.15

A = Number of A. regularis Hosts Infected, B = Number of Parasites Recovered, C = Percentage Prevalence, D = Mean Intensity of Parasite, E = Mean Abundance of Parasite, N = Number of Toad Hosts Examined.

Table 5: Overall parasitic infection in relation to body weights of *Amietophrynus regularis*

Weight range (g)	Number examined	Number infected	Number recovered
20 – 50	29	26	177
51 – 80	60	56	922
81 – 110	27	27	400
111 – 140	4	4	77
	Prevalence (%)	**Mean intensity**	**Mean abundance**
20 – 50	90.00	6.42±9.08	6.10
51 – 80	93.33	16.50±21.33	15.36
81 – 110	100.00	14.82±19.29	14.82
111 – 140	100.00	19.25±8.06	19.25

Table 6: Overall parasitic infection in relation to body lengths of *Amietophrynus regularis*

Length range (cm)	Number examined	Number infected	Number recovered
7.0 – 7.9	13	11	96
8.0 – 8.9	16	15	147
9.0 – 9.9	39	38	529
10.0 – 10.9	43	40	713
11.0 – 11.9	7	7	76
12.0 – 12.9	2	2	15
	Prevalence (%)	**Mean intensity**	**Mean abundance**
7.0 – 7.9	85.00	8.73±13.17	7.38
8.0 – 8.9	94.00	9.80±7.27	9.19
9.0 – 9.9	97.44	13.92±13.70	13.56
10.0 – 10.9	93.02	17.83±26.66	16.58
11.0 – 11.9	100.00	10.86±7.06	10.86
12.0 – 12.9	100.00	7.50±9.19	7.50

Table 7: Parasite species infection of *Amietophrynus regularis* in relation to their body weights

Parasites species	A	B	C	D	E	A	B	C	D	E
	20 – 50g (N = 29)					**51 – 80g (N = 60)**				
B. jaegerskioeldi	1	1	3.45	1	0.03	1	19	1.67	19	0.32
A. africanum	25	113	86.21	4.52±4.31	3.89	55	736	91.67	13.38±20.71	12.26
C. ornate	4	63	13.79	15.75±11.20	2.17	10	84	16.67	8.40±6.79	1.40
***Physaloptera* sp.**	0	0	0	0	0	7	83	11.67	11.86±18.61	1.38
	81 – 110g (N = 27)					**111 – 140g (N = 4)**				
B. jaegerskioeldi	1	2	3.70	2	0.07	0	0	0	0	0
A. africanum	26	379	96.29	14.58±19.40	14.04	4	43	100.00	10.75±5.85	10.75
C. ornate	3	17	11.11	5.67±8.08	0.63	3	34	75.00	11.33±11.06	8.50
***Physaloptera* sp.**	1	2	3.70	2	0.07	0	0	0	0	0

A = Number of Toad Hosts Infected, B = Number of Parasites Recovered, C = Percentage Prevalence, D = Mean Intensity of Parasite, E = Abundance of Parasite, N = Number of Toad Hosts Examined

Table 8: Parasite species infection of *Amietophrynus regularis* in relation to body length ranges

Parasites species	A	B	C	D	E	A	B	C	D	E
	7.0 – 7.9cm (N = 13)					**8.0 – 8.9cm (N = 16)**				
B. jaegerskioeldi	1	1	7.7	1	0.1	1	19	6.3	19	1.2
A. africanum	11	48	84.6	4.4±4.9	3.7	13	92	81.3	7.1±4.5	5.8
C. ornate	2	47	15.4	23.5±9.2	3.6	4	30	25	7.5±4.8	1.9
Physaloptera sp	0	0	0	0	0	2	6	12.5	3.0±2.8	0.4
	9.0 – 9.9cm (N = 39)					**10.0 – 10.9cm (N = 43)**				
B. jaegerskioeldi	0	0	0	0	0	0	0	0	0	0
A. africanum	38	464	97.4	12.2±13.5	11.9	40	589	93	14.5±25.9	13.7
C. ornate	5	42	12.8	8.4±8.5	1.1	7	68	16.3	9.7±8.7	1.6
Physaloptera sp	3	23	7.7	7.7±5.0	0.6	3	56	6.9	18.7±29.7	1.3
	11.0 – 11.9cm (N = 7)					**12.0 – 12.9cm (N = 2)**				
B. jaegerskioeldi	1	2	14.3	2	0.3	0	0	0	0	0
A. africanum	6	63	85.7	10.5±7.4	9	2	15	100	7.5±9.2	7.5
C. ornate	2	11	28.6	5.5±6.4	1.57	0	0	0	0	0
Physaloptera sp	0	0	0	0	0	0	0	0	0	0

A = Number of Toad Hosts Infected, B = Number of Parasites Recovered, C = Percentage Prevalence, D = Mean Intensity of Parasite, E = Abundance of Parasite, N = Number of Toad Hosts Examined.

In the University village area (locality 2), 12 hosts were examined 12(100%) were infected, the total parasites recovered was 262. Post office area (locality 3), 38 hosts were examined, 36(94.7%) were infected and the total parasites recovered was 543. *B. jaegerskioeldi* had the highest prevalence of 8.33%, mean intensity of 19 and mean abundance of 1.58, in the University village area. *A. africanum* had the highest prevalence of 93% in KSU borehole area but the mean intensity and mean abundance of the parasite were highest in University village

area with 12.00 ± 26.94 and 11.00 respectively. *C. ornata* recorded highest prevalence of 37% in post office area while the highest mean intensity of 14.25 ± 10.75 and mean abundance of 4.75 of the parasite were recorded in the University village area. *Physaloptera* sp. had the highest prevalence of 16.7%, mean intensity of 27.00 ± 36.77 and mean abundance of 4.50 in the University village area. *Amplicaecum africanum* had the highest prevalence all through the three localities.

The entire parasites in the individual hosts examined, showed that 61(50.83%) of sampled *A. regularis* harboured a total of 1 – 10 worms, 31(25.83%) harboured 11 – 20 worms, 10(8.33%) harboured 21 – 30 worms, 5(4.2%) harboured 31 – 40 worms, 3(2.50%) harboured 41-60 worms and another 3(2.50%) harboured 61 – 140 worms (Figure 6).

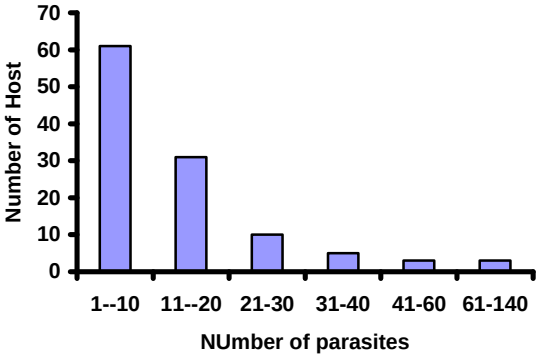

Figure 6: Total number of parasites recovered from *Amietophrynus regularis* in Anyigba

Multiple infections were frequently observed in the three localities. 86(71.7%) *Amietophyrnus regularis* were infected by one parasite species, 26(21.7%) infected by two parasites species and 1(0.83%) was infected by three parasites species (Figure 7). The stomach contents of *A. regularis* contained a variety of food materials mainly insects such as cockroach, beetles and crickets.

DISCUSSION

Amietophyrnus regularis from three localities in Anyigba were found with large number of parasites involving two parasite taxa and four parasites species.

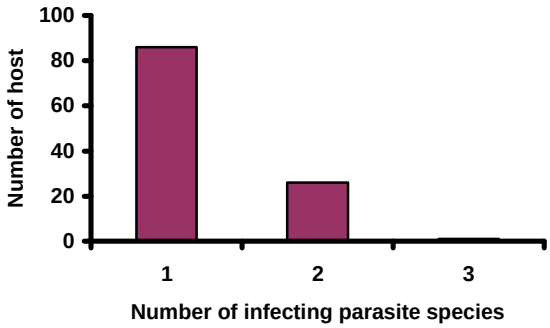

Figure 7: Multiple parasitic infections of *Amietophyrnus regularis*

The infections with nematode parasites were quite common in the three localities but prevalence varied while the cestode *B. Jaegerskioeldi* infected hosts only from two localities. For instance, the nematodes *A. africanum, C. ornata and Physaloptera sp*. were common in the three localities but *A. africanum* had the highest prevalence. This may be due to the fact that Savanna zone experiences less rainfall and its vegetation consists mainly of grassland, deciduous trees and also for its biotic and abiotic factors, it is expected that the prevailing ecological conditions may affect the amphibian faunal composition of this area as well as influence the parasites infecting the anuran resident there (Aisien *et al.,* 2001).

The overall parasites infection of 94.17% prevalence in this study compared favourably with 99% recorded in 162 of the same host species examined in Ile-Ife (Ayodele and Akinpelu, 2004) and also with 71% recorded in 100 samples examined in Awka (Nworah and Olorunfemi, 2011). According to Hudson *et al.* (2006) and Lafferty (2008), parasites may play a role in promoting biodiversity and function as indicators of ecosystem productivity and resilience. Among the parasites taxa recovered, nematodes had the highest infection rate. The high infection rate of nematode worms in *A. regularis* is in conformity with other findings in Ile-Ife and Awka (Ayodele and Akinpelu, 2004; Nworah and Olorunfemi, 2011).

Imasuen *et al.* (2012) reported that anurans serve as intermediate hosts of vertebrates' parasites especially those that they inhabit the same habitat.

Nworah and Olorunfemi (2011), reported on the kinds of food materials recovered from the stomach of the amphibian investigated (snails, beetles, earthworms and mainly insect varieties). These invertebrates they eat serve as intermediate hosts to the amphibians, they ingest eggs evacuated from anuran hosts while the intermediate hosts are in turn ingested by the anuran hosts like *A. regularis* where they grow into adult or larval stages in the host. There could have been damages of the intestinal mucosa as they attack the sensitive epithelium as reported by Egusa (1992).

The cestode parasite recovered occurred in a very low prevalence of 2.50% which is similar to the reports of Ayodele and Akinpelu (2004) where the same host species were examined but in contrast to Nworah and Olorunfemi (2011) where no cestode was recovered from the same kind of species examined.

Amplicaecum africanum occurred in the oesophagus/stomach, small intestine and the large intestine**/**rectum of the toads examined in this study which is in conformity with the reports of Aisien *et al.* (2001), Aisien *et al.* (2003), Aisien *et al.* (2004), Ayodele and Akinpelu (2004) and Nworah and Olorunfemi (2011). *Amplicaecum africanum* was also recovered from the oesophagus**/**stomach of *Amietophyrnus maculatus* and *Phrynobatrachus latifrons* in Benin republic (Aisien *et al.,* 2011). *Cosmocerca ornata* occurred only in the large intestine**/**rectum of the host examined in this study. This is in line with Aisien *et al.* (2001), Aisien *et al.* (2003), Aisien *et al.* (2004), Aisien *et al.* (2009), Dusen and Oguz (2010), Aisien *et al.* (2011), Dusen (2011) and Imasuen *et al.* (2012) in which the parasite species were all recovered from the large intestines/rectum of the different kinds of anurans examined. *Physaloptera* spp. was recovered from the stomachs and small intestine of the toad hosts examined in this study. This is in contrast to the report of Gonzalez and Hamann (2010) where the parasite was only recovered from the stomach of the anuran hosts examined. Aisien *et al.* (2011) recovered the same parasite species only from the small intestine of the anuran hosts.

From findings, it has been deduced that *Physaloptera* spp. has the ability to attach itself to the stomach wall of its host using its mouth, and so it is not easy for this parasite to be pushed by peristaltic movement into the intestines. Recovering of this parasite in the small intestine might be due to less nutrition after the host is caught which caused the movement of the parasite down to the intestine. The cestode *Baerietta jaegerskioeldi,* a synonym of *Cylindrotaenia jaegerskioeldi* was recovered from the small intestines of the hosts. This is in conformity with Aisien *et al.* (2001), Aisien *et al.* (2003), Aisien *et al.* (2004), Aisien *et al.* (2009), Aisien *et al.* (2011) and Imasuen *et al.* (2012) where different species of anurans were examined including *A. regularis*. This infection pattern is indicative of a trophic relationship shared by these amphibians, in that they commonly prey on the intermediate hosts (beetles, crickets and cockroaches) of this parasite.

Parasite infections in relation to size ranges of the hosts, showed higher prevalence mean intensity and abundance rates in toads of larger ranges examined. This indicated the increase in parasitism with increase in size of the hosts. As stated by Poulin (2000), older hosts have longer time to accumulate parasites than younger hosts and they provide more internal and external space for parasite establishment. Nworah and Olorunfemi (2011), Ayodele and Akinpelu (2004), Brickle *et al.* (2003) affirmed positive correlation between the host size and increase in parasitism. Monoz and Cribb (2005) further stated that increase in parasitism with increase in size of host might be explained by the combination of resources, time and prey. In general, larger hosts have more space, more flux of energy (that is, food) and microhabitats for parasites than smaller hosts.

There was no evidence of the influence of sex on parasitic infection of *Amietophyrnus regularis*, both sexes were highly infected. A similar result was reported by Nworah and Olorunfemi (2011). The level of multiple infections and the number of worms recovered in this study was an indication of the rich parasitic fauna of *Amietophyrnus regularis* in Anyigba.

Conclusion: This study has shown that there is high level of parasitic infection in African common toads in Anyigba which is contributing to the ongoing declines in amphibian populations in the environment. These findings have opened the door for further research on amphibian parasitism, its threats to human health as they may infect frogs and fish in water, since they play vital role in the balancing of food chains and webs in the ecosystem.

REFERENCES

ABUDULLAHI, I. O. and ABUDULLAZEEZ, A. J. (2000). Prevalence of intestinal parasites in some human patients in Zaria. *Nigerian Journal of Parasitology*, 21: 25 – 30.

AISIEN, S. O., UGBO, A. D., ILAVBARE, A. N. and OGUNBOR, O. (2001). Endoparasites of amphibians from south-western Nigeria. *Acta Parasitologica*, 46(4): 299 – 305.

AISIEN, S. O., AJAKAIYE, F. B. and BRAIMOH, K. (2003). Helminth parasites of anurans from the savanna-mosaic zone of south-western Nigeria. *Acta Parasitologica*, 48(1): 47 – 54.

AISIEN, S. O., AYENI, F. and ILECHIE, I. (2004). Helminth fauna of anurans from the Guinea savanna at New Bussa, Nigeria. *African Zoology*, 39(1): 133 – 136.

AISIEN, S. O., OGOANNAH, S. O. and IMASUEN, A. A. (2009). Helminth parasites of amphibians from the rainforest reserve in south-western Nigeria. *African Zoology*, 44(1): 1 – 7.

AISIEN, M. S. O., NAGO, S. G. A. and RÖDEL, M. O. (2011). Parasitic infections of amphibians in the Penjari Biosphere Reserve, Benin. *African Zoology*, 46(2): 340 – 349.

AKANI, G. C., LUISELLI, L., AMUZIE, C. C. and WOKEM, G. N. (2011). Helminth community structure and diet of three afrotopical anuran species: a test of the interactive versus isolationist parasite communities' hypothesis. *Web Ecol.*, 11: 11 – 19.

AYODELE, H. A. and AKINPELU, A. I. (2004). The helminth parasitofauna of *Bufo regularis* (Reuss) in Ile-Ife. *Ife Journal of Science*, 6(2): 101 – 104.

BRICKLE, P., BUXTON, N. G. and VILLALON, E. (2003). Infection of *Sphyrion laevigatum* (Copepod: Sphyriidae) on *Genypterus blacodes* (Pisces: Ophidiidae) from the Falkland Islands, South Atlantic. *Parasitology,* 89(2): 242 – 244.

BUSH, A. O., LAFFERTY, K. D., LOTZ, J. M. and SHOSTAK, A. W. (1997). Parasitology meets ecology on its own terms: Margolis *et al.* Revisited. *Journal of Parasitology*, 83(4): 575 – 583.

CUNNINGHAM, A. A., LANGTON, T. E. S., BENNETT, P. M., LEWIN, J. F., DRURY, S. E. N., GOUGH, R. E. and MACGREGOR, S. K. (1996). Pathological and microbiological findings from incidents of unusual mortality of the common frog (*Rana tempraria*). *Philosophical Transactions of the Royal Society of London, Series B: Biological Sciences,* 351: 1539 – 1557.

DÜŞEN, S. and OĞUZ, M. C. (2010). Metazoan endoparasites of three species of anurans collected from the middle black sea region of Turkey. *Helminthology*, 47: 226 – 232.

EGUSA, S. (1992). *Infections Diseases of Fish.* A. A. Balkema, Rotterdam, Brookfield.

GOLDBERG, S. R., BURSEY, C. R. and HAY, C. (1998). Helminths of two native frog species (*Rana chiricahuensis, Rana yavapaiensis*) and one introduced frog species (*Rana catesbeiana*) (Ranidae) from Arizona. *Journal of Parasitology*, 84: 175 – 177.

GONZALEZ, C. E. and HAMANN, M. I. (2010). First report of nematode parasites of *Physalaemus santafecinus* (Anura: Leiuperidae) from Corrientes, Argentina. *Revista Mexicana de Biodiversidad,* 81: 677 – 687.

HEYER, W. R., DONNELLY, M. A., MCDIARMID, R. W., HAYEK, L. C. and FOSTER, M. S. (1994). *Measuring and Monitoring Biological Diversity: Standard Methods*

for Amphibians. Smithsonian Institution Press, Washington DC, USA.

HUDSON, P. J., DOBSON, A. P. and LAFFERTY, K. D. (2006). Is a healthy ecosystem one that is rich in parasites? *Trends* in *Ecology and Evolution,* 21: 381 – 385.

IFATIMEHIN, O. O., UJOH, F. and ENECHE, P. S. U. (2014). Attributes of topographic mapping of a fast urbanising area in Nigeria, using remote sensing and GIS. *Journal of Scientific Research and Reports,* 3(1): 170 – 178.

IMASUEN, A. A., OZEMOKA, H. J. and AISIEN, M. S. O. (2012). Anurans as intermediate and paratenic hosts of helminth infections in the rainforest and derived savanna biotopes of southern Nigeria. *International Journal of Zoology*, 2012: 1 – 7. Doi 10.1155/2012/823970.

LONGCORE, J. E., PESSIER, A. P. and NICHOLS, D. K. (1999). *Batrachochytrium dendrobatidis* gen. and sp. Nov., a chytridpathogenic to amphibian. *Mycologia*, 91: 219 – 227.

MUNOZ, G. and CRIBB, T. H. (2005). Infracommunity structure of parasites of *Hemigymnus melapterus* (Pisces: Labridea) from Lizard Island, Australia: The importance of habitat and parasite body size. *Journal of Parasitology,* 91(1): 38 – 44.

NEW WORLD ENCYCLOPAEDIA (2008). *Toad.* http://www.newworldencyclopedia.org/entry/Toad Accessed May 23, 2015.

NWORAH, D. C. and OLORUNFEMI, O. J. (2011). The helminth parasitifauna of *Bufo regularis* (Reuss) in Awka, Anambra State, Nigeria. *International Journal of Parasitology Research*, 3(2): 26 – 30.

POULIN, R. (2000). Variation in the intraspecific relationship between fish length and the intensity of the parasitic infection: Biological and statistical causes. *Journal of Fish Biology,* 56: 123 – 137.

WILLIAMS, H. H. (1967). Helminth diseases of fish. *Helminthological Abstracts*, 36: 261 – 295.