

Parasitic Fauna of Some Amphibians (Anura: Ranidae, Bufonidae) From Erbil City, Kurdistan Region, Iraq

Qaraman M.K. Koyee¹, Chreska N. Ahmed², Zhwan O. Kanabe³, Sarween Y. Sabir⁴,
Lana O. Kanabe⁵, Shamall M.A. Abdullah⁶

¹⁻⁴Department of Biology, Salahaddin University-Erbil, Kurdistan Region - Iraq

Abstract—Amphibians especially frogs still used as important model in scientific researches, and are conventional used in several branches of biomedical research and teaching process, including toxicology, physiology, phylogenetic relationship, and reproductive biology. The principal purpose of the current study is to recognize the parasites of *Bufo viridis*, *B. regularis* and *Rana pipiens*, which collected from Erbil city in Kurdistan region- Iraq. A total of 29 frogs (14 of *Bufo viridis*, 12 of *B. regularis* and 3 of *Rana pipiens*) were gathered by hand from various places of Sami Abdul-Rahman Park in Erbil city, Kurdistan Region-Iraq, during the period from November 2020 to the end of April 2021. The frogs were inspected for ecto- and endoparasites. The study exhibited the presence of seven parasite species (with a total prevalence of 89.6%) comprising: three protozoan species (*Cepedea dimediata*, *Protoopalina intestinalis* and *Opalina ranarum*), one cestode species (*Proteocephalus* sp.), two nematode species (*Cosmocercoides variabilis* and *Rhabdias bufonis*) and one species of monogena (*Polystoma integerrimum*). *Cepedea dimediata* and *Protoopalina intestinalis* as protozoa were recorded for the first time among frogs of the species *B. regularis* and *R. pipiens* respectively in the Kurdistan Region, *Bufo regularis* considered as a new host for *Polystoma integerrimum*, *Proteocephalus* sp. and *Cosmocercoides variabilis*.

Index Terms— Parasite, Frog, Ranidae, Bufoniade, Hawler, Iraq.

I. INTRODUCTION

The frog species belong to Class: Amphibia, Order: Anura (including frogs and toads), Family: Bufonidae, Ranidae and Hylidae. They are amphibians, which the only vertebrates that have a transition from water to land. Frogs are cold-blooded, heart with three chambered, two atria and one ventricle and they have four limbs and without tail in the adult stage only found in larval stage (tadpole). Their skin properties are with the moist and smooth (frog) or warty and dry (toad), but without claws or scales. The fore legs are short, but the back legs are elongated and muscular for skipping especially in Family Ranidae ⁽¹⁾.

Amphibians persist to set out as principal non-human models in different discipline of science, and are used as usual in several biomedical studies and instruction of teaching, including pharmacology, homeostatic body functions, phylogeny, and other branches of biology ⁽²⁾.

The most important functions of frogs in human societies are involved in controlling of malarial disease, via engulfing mosquitoes as a dietary intake. Like other animals in nature, frogs are exposed to many problems for instance competition, parasitism and predation. Parasites exert some degree of harmful influence on their hosts, such as utilization of the host's nutrition, mechanical wounds, chemical injuries, tissue-organ alteration and sometimes they might cause death ⁽³⁾. Generally, the effect of a parasitic infection on the host depends on the parasite species and numbers, host species and the site of infection ⁽⁴⁾.

In the face of its importance, the topic of parasitic community of Iraqi amphibians and other neighbored countries has been awarded observation only from certain researchers. Saoud and León-Règagnon ^(5,6) found two digenetic trematode species in *Rana esculenta*, isolated from Basrah governorate. Dauood ⁽⁷⁾ recorded eight parasitic protozoan species, nine digenetic trematode species and the only monogenetic trematode, from *Rana ridibunda*, *Hyla arborea* and *Bufo viridis* from Nineveh Province.

Al-Barwari and Nassir ⁽⁸⁾ from their study recorded the only one cestode species and four nematode species in *R. ridibunda* and *H. arborea* from Baghdad city. Hamad ⁽⁹⁾ found eight digenetic trematode species in *R. ridibunda* and *B. viridis* from Erbil governorate. Molan *et al.* ⁽¹⁰⁾ reported five species of *Trypanosoma* and one species for each of *Haemogregarina*, *Dactylosoma* and *Cytamoeba* in *R. ridibunda* from north part of Iraq. Saed *et al.* ⁽¹¹⁾ recorded 24 species of helminthes, 16 species of them were trematodes, one cestode species and seven nematode species in the intestine of *R. ridibunda*, *B. viridis* and *H. arborea* from north part of Iraq also.

The principal objective of the current study is to recognize the frog parasites of the species *Bufo viridis*, *B. regularis* and *Rana pipiens*, which handled from Erbil city in the Kurdistan region- Iraq.

II. PROCEDURE FOR PAPER SUBMISSION

A. Sampling and Study Area:

The overall 29 frogs (14 of *Bufo viridis*, 12 of *B. regularis* and 3 of *Rana pipiens*) were caught and handle from different localities in Sami-Abdul-Rahman Park, Erbil city, Kurdistan Region. Throughout the period of November 2020 to the end of April 2021. According to the sexes, the frogs were classified into 13 females and 1 male of *B. viridis*, 3 females and 9 males of *B. regularis* and 3 males of *R. pipiens* (Table: 1). The frogs were handed over using cork container to the Advanced Zoology Research Lab., in Salahaddin University, Science College-Biology Department in Erbil city.

TABLE 1. ACCORDING TO THE SPECIES AND SEXES, THE FROGS WERE CLASSIFIED AS FOLLOWS:

Frog Species	Examined Male No.	Examined Female No.	Total No.
<i>B. viridi</i>	1	13	14
<i>B. regularis</i>	8	4	12
<i>R. pipiens</i>	3	0	3
Total	12	17	29

B. Anaesthetization and Dissection:

After the frogs were captured, the double pithing processes done, at that moment immediately the frogs were sacrificed and dissected. See Fig. 1.



Fig. 1. Dissected Frog after anaesthetization on the dissected cork board.

All internal organs were separated and pulled out, then each of them puts down in acceptable petri-dish which contained normal physiological saline 0.9%. Furthermore, the alimentary canal was divided into its anatomical pieces. Each piece of which was cleaved and its content snippet within a petri-dish containing physiological saline. The plates were inspected for the existence of parasites under stereoscopic microscope. Each of the separated organs (lungs, urinary bladder and other organs) were sliced into tiny sections and inspected for appearances of different stages of the parasites.

C. Frog Examination

The frogs superficially were checked out by naked eyes to notice the external parasites, and prepared the direct wet mount from the mouth, then microscopically inspected. The most

protozoan parasites were recognized in a direct in the absence of any approach using smear preparation, and the calculation key points were taken for each of them.

For the examination of blood protozoans, thin blood smears were prepared by withdrawing the blood directly from the heart following double pithing. The smears were desiccated, fixed in methanol for around 1-2 minutes, then stained with Leishman stain (1:6 dilutions) for 2-4 minutes, dried one more time and mounted with Canada balsam⁽¹²⁾. Helminthes were cleaned up in saline and examined a live macroscopically and microscopically. Samples furthermore, prepared for comprehensive microscopically inspection. Nematodes, cestodes and monogeneans were fixed in 70% Ethanol or 4-7% hot formalin⁽¹³⁾. Some females of Nematodes were burst with a delicate needle to examine the configuration of eggs and to take their measurements.

D. Photomicrography and Measurements:

Photos were taken with Olympus camera. The shapes were drawn using a Camera Lucida (Drawing tube). Measurements of the parasites were taken with an Olympus stage and ocular micrometer.

E. Parasite Identification

The identified parasites were described on the basis of their morphology and illustration. The succeeding morphological categories and demonstrative keys were discussed for identification^(14, 15, 16) support in the examination of the individual characters and ultimately in the identification of the most parasitic stages encountered.

F. Criteria of infection

The epidemiological expressions (Prevalence and mean infection intensity) were used at this moment depended on the standard terms of Margolis *et al.*⁽¹⁷⁾:

1. Prevalence (rate of infection): The rate of individual host species infected No. with a specific parasite species / No. of examined hosts.

2. Mean infection intensity: The sum No. of individual parasite species / total No. of infected hosts in a sample.

Mean Intensity = Total No. of each collected parasite species / Total No. of host infected with each parasite species

III. RESULTS AND DISCUSSION

The current study represented the existence of seven parasites species that occurred indifferent organs of the examined frogs. These included three protozoan species, one cestode species, two nematode species and one monogenean species. The parasites distribution and their sites on or in the frog body host (*B. viridi*, *B. regularis* and *R. pipiens*) are summarized in Table (2), (3) and (4) respectively. Also, the rate of infection and mean infection intensity are shown in the same table. The subsequent is an explanation on illustration and measurements of the identified parasites.

TABLE (2): PARASITIC SPECIES ENCOUNTERED IN 14 SAMPLES OF *Bufo viridis* WITH SOME RELEVANT INFORMATION, ERBIL CITY.

Parasite species	Infected Host No.	Host Sexes	Infection Site	Mean Intensity	% of Infection
<i>Opalina ranarum</i>	1 0	♂ ♀	Large intestine	1.5	7.14 %
<i>Protoopalina intestinalis</i>	0 1	♂ ♀	Large intestine	36	7.14 %
<i>Cepedea dimidiata</i>	0 1	♂ ♀	Large intestine	5.0	7.14 %
<i>Polystomum integerrimum</i>	0 6	♂ ♀	Urinary bladder	3.0	42.8 %
<i>Proteocephalus</i> spp.	0 3	♂ ♀	Small Intestine	4.3	21.4 %
<i>Cosmocercoids variabils</i>	1 10	♂ ♀	Large intestine	9.0	78.5 %
<i>Rhabdias bufonis</i>	0 1	♂ ♀	Lung	1.0	7.14 %

Table (3): PARASITIC SPECIES ENCOUNTERED IN 12 SAMPLES OF *Bufo regularis* WITH SOME RELEVANT INFORMATION, ERBIL CITY.

Parasite species	Infected Host No.	Host sexes	Infection Site	Mean Intensity	% of Infection
<i>Cepedea dimidiata</i>	1 0	♂ ♀	Large intestine	2	8.3 %
<i>Polystomum integerrimum</i>	0 4	♂ ♀	bladder	2.75	33.3 %
<i>Proteocephalus</i> sp.	1 1	♂ ♀	Small Intestine	3	16.6%
<i>Cosmocercoids variabils</i>	8 4	♂ ♀	Large intestine	7.75	100 %

Table (4): PARASITIC SPECIES RATE OF INFECTION ENCOUNTERED FROM THE LARGE INTESTINE OF 3 MALE SAMPLES (*Rana pipens*) IN ERBIL CITY.

Parasite species	Infected Host No.	Mean Intensity	% of Infection
<i>Balantidium elongatum</i>	1	1.0	33.33 %
<i>Balantidium entozoon</i>	1	2.0	33.33 %
<i>Cepedea dimidiata</i>	1	2.0	33.33 %
<i>Opalina ranarum</i>	1	2.0	33.33 %
<i>Protoopalina intestinalis</i>	2	34.0	66.67 %
<i>Cosmocercoids variabils</i>	3	3.5	100 %

Opalina ranarum (Purkinje and valentine, 1835)

This ciliated protozoan was found in the large intestine of *B. viridi* with the rate of 7.14% and mean intensity 1.5 and 33.33% in *R. pipens* as shown in Table (2, 4). *Opalina ranarum* can easily be recognized as an actively motile ciliated, with pale cytoplasm which has a yellowish-brown color. They are distinguished by disc-like motility about its major axis additionally to coiled motility. Sometime perform a circular movement as well as a directional movement. The individuals very much in shape and size since they show a range of 140 - 270 μm .

As regards the shape they may be elongated, disk-shaped or rod-shaped and much narrow in thickness. The multinucleated body lacks the peristome and is covered with a distinct pellicle.

A clear ectoplasmic layer is seen below the pellicular covering of the body. This area is devoid of nuclei but appears to be vacuolated myoneme fibrils. The cilia are arranged longitudinally in parallel rows which are more clearly seen at one end of the organisms than the other. The endoplasm contains numerous nuclei which are evenly distributed in the cytoplasm (Fig. 2).



Fig. (2): Photomicrograph and camera lucida of *O. ranarum* (400 X).

Formerly, *O. ranarum* was described in Iraq from the gut of *R. ridibunda* and *B. viridis* from Nineveh governorate (7). On the other hand, in Erbil City was reported by Abdulrahman *et al.* (18), the later who reported with the prevalence of 33.3%, which was much higher prevalence than the results of the present study, it could be due to the sampling and examination processes.

Mohammad *et al.* (19) in Malaysia reported the prevalence of *Opalina* sp. ranging from 30.8-55.6% among different frog host species.

Protoopalina intestinalis Raff, 1911:

Protoopalina intestinalis were commonly found in the large intestine of *B. viridis* and *R. pipens*, with the prevalence of 7.14% and 66.67% respectively. They are tubular or spindle-like and with double nuclei. The cytostome is absent. The *P. intestinalis* measures 330 μm long by 68 μm wide (Fig. 3). *P. intestinalis* has been isolated in the intestine of different species of frogs, for instances (the grass frog, edible frog, and European tree frog, toads). The stages in the life cycle are direct, and is look-like to that of *Opalina*. Neither pathologic effects nor clinical disease have been described in amphibians infected with *Protoopalina* spp.

Protoopalina does not infect humans (2). This parasite species was considered as a first report in the Kurdistan Region; it was colorless and covered with long cilia (referred to as multiple thread-like flagella) which move continuously.



Fig. (3): Photomicrograph and camera lucida of *P. intestinalis* (400 X).

Cepedea dimidiata (Stein, 1860) Metcalf, 1923:

This protozoan parasite was found in the large intestine of the three examined frog species with different rate of infection, for instance in *B. viridis* 7.14%, *B. regularis* 8.3% and *R. pipens* 33.33% (Table 3, 4).

They were cylindrical to spindle-shaped (Fig. 4), *C. dimidiata* measures about 75 μm wide and 250 μm long. This parasite species was considered as a first report in the Kurdistan Region and it was colorless. The result of Mohammad *et al.*⁽¹⁹⁾ in Malaysia was in agreement with that reported in the current study regarding to the prevalence of *C. dimidiata* ranging from 11.1-34.5% among different frog host species.

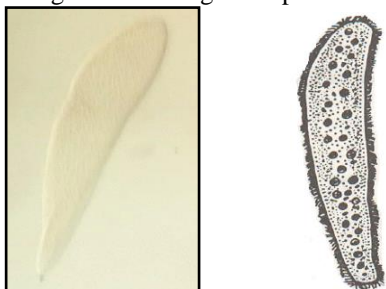


Fig. (4): Photomicrograph and camera lucida of *C. dimidiata* (400 X).

Balantidium entozoon Ehrenberg, 1838

Balantidium elongatum Stein, 1867

These two ciliated protozoan species were found in the large intestine of 3 examined male *Rana pipens* with the rate of infection 33.33% (Table 4) and Fig. (5).

The detailed description with the morphology and the division of both species reported by Dobell⁽²⁰⁾. On the other hand, Kornilova and Chistyakova⁽²¹⁾ collected a data on the *Balantidium* ciliates species from the fishes and amphibian with creative images and re-descriptions. A reasonable structural investigation of the *Balantidium* species was performed.

The results of the present investigation were situated to a certain degree in agreement with those reported in Spain. In which the authors recorded 7.9% of *B. elongatum* and 80.3% of *B. entozoon* parasites of *Rana perezi*⁽²²⁾.

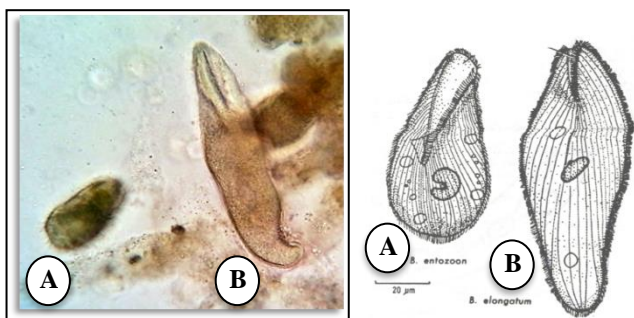


Fig. (5): Photomicrograph and camera lucida of *Balantidium* spp. (400 X).

A- *Balantidium entozoon*

B- *Balantidium elongatum*

The morphometric characteristics can be summarized as follows: Fusiform-shaped organism, *B. elongatum* longer (200 μm) than *B. entozoon* (70 μm), both of them were somewhat with pointed anterior end and bluntly with rounded posterior end (more in *B. entozoon*). The average width was 35 μm for *B. entozoon* and 80 μm for *B. elongatum*. Broad anterior cytostome present in *B. entozoon*, that prolonged about half the

distance of the body. On the other hand, the cell mouth in *B. elongatum* was extended only 1/4 of the entire length.

Polystoma integerrimum (Froelich, 1798):

This monogenean parasite was isolated in the urinary bladder of *B. viridis* and *B. regularis* with prevalence 42.8% and 33.3% respectively. Only females of both frog species were infected with this parasite and the mean intensity was 3 and 2.75 for *B. viridi* and *B. regularis* respectively as shown in Table (2) and (3).

Adult *P. integerrimum* measured in size and morphology found in the bladder was as 250-450 μm long and 90-150 μm wide (Fig.6: A, B and C), while. The adult stage has a heart-like posterior disc with six hollow cup-like, well-developed suckers (Fig. 6 D) and the large double hooks.

Dauood⁽⁷⁾ was the earliest who described the presence of this parasite in the green toads of Iraq. The prevalence of this parasite in the current investigation was higher than those reported by Saeed *et al.*⁽¹¹⁾ for the same toad species in Iraq, in which they reported 2.9% and 5.3% for males and females of *B. viridy* respectively, but they couldn't find in *B. regularis*. However, they come across significantly lower degree of parasite intensity, rang but they encountered significantly lower levels of parasite burden, ranging one parasite per single infected host in comparison with the current finding which was 2.75-3.0 per host. On the other hand, Koyee *et al.*⁽²³⁾ reported this parasite on *B. regularis* as a new host.

Al-Sorkhy and Amr⁽²⁴⁾ In Jordan were reported 23% of this parasite among different frog species, and 16% for *B. viridi*, however they didn't examine *B. regularis*.

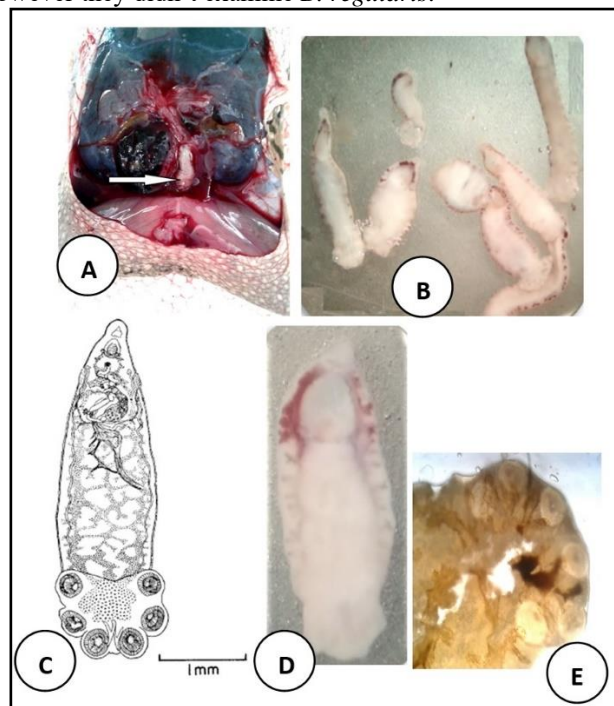


Fig. (6): *Polystoma integerrimum*

A- Dissected frog photograph harbored adult from bladder (1 X).

B- Whole Mount (W.M) of 8 adults of *P. integerrimuma* (3 X).

C- Camera lucida of *P. integerrimum*. Reproduced from Paul⁽²⁵⁾

D- Whole Mount of adult *P. integerrimum* (5X).

E- Caudal disc (Opisthohaptor) with six cup-shaped muscular suckers of *P. integerrimum* (40X).

The monogenean species reported upon in this study undoubtedly belongs to a unique and biologically very interesting group of animals. The much higher degree of host-specificity they display, for example, in comparison with the majority of other metazoan parasites of amphibia, may be attributed to specialization in their life cycles particularly their demand of specific stimuli for host recognition and sexual development⁽⁸⁾.

Rubtsova and Heckmann⁽²⁶⁾ investigated the biology of *P. integerrimum* with mentioning the egg-laying period for the adults, in which they deposited eggs only in the spring season. These eggs hatched to release larvae, then adhere themselves to the gills of tadpoles and persist fixed throughout the tadpole transfigurations, at which time the immature larval stage migrate via the alimentary canal to the urinary bladder.

Proteocephalus species Weinland, 1858

This parasite is a larval stage cestode isolated from the small intestine of frog (Fig. 7 A) with the prevalence of 21.4% and 16.6% for *B. viridis* and *B. regularis* respectively (Table 2; 3). They were moderate in size. Head usually round, not armed with hooks, with four lateral suckers, perhaps bearing fifth crown (Fig. 7 B). The body of the worm is totally segmentation. The genital organs are not clear, since the parasite is immature. The length of the worm was 6-13 mm. The width was 0.1-0.3 mm, and the length of the sucker was 0.020-0.030 mm.

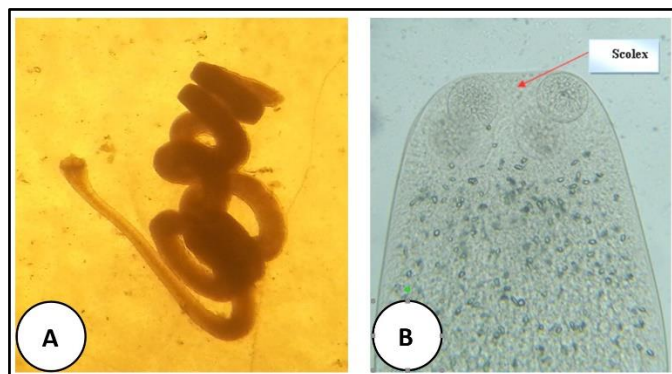


Fig. (7):
A- Photomicrograph of *Proteocephalus* sp. (40 X).
B- Photomicrograph of the scolex of *Proteocephalus* sp. (100 X).

Previously, one species of *Proteocephalus* namely *P. plerocercoids* was reported in *R. ridibunda* from Baghdad city⁽⁸⁾. This species was reported from *B. viridis* and *Hyla arborea* in Turkey^(27; 28), Mohammad *et al.*⁽²⁹⁾ reported 4% from *B. viridis* in Baghdad City and Abdulrahman *et al.*⁽¹⁸⁾ reported 25% from *B. viridis* in Erbil City, which was much closer to the result of the present study. The previously mentioned studies didn't work on the *B. regularis* frog species as a host for this parasite, therefore the aforementioned host species was considered as a new host for *Proteocephalus* sp. In the studied area.

Cosmocercoides variabilis (Harwood, 1930):

The illustration and the size measuring of the current nematode parasite were compatible with those reported by^(14; 30).

This parasite was reported from *B. viridis* with the rate of infection 78.5% and mean intensity 9.0 (Table: 2). On the other hand, 100% for both *B. regularis* and *R. pipens* as shown in Table (3, 4), *B. regularis* regarded as a new host for the identified nematode parasite (*C. variabilis*).

Body cylindrical attenuated at extremities, the female length 4.8 mm, width 0.34 mm, cuticle smooth, mouth with three small lips (Fig. 8A), esophagus with a short pharynx and posterior bulb (Fig. 8B), excretory pore anterior to esophageal bulb, tail long and tapering, vulva behind the middle of the body, Oviparous (Fig. 8C; D), eggs elliptical, thin-shelled (Fig. 8E).

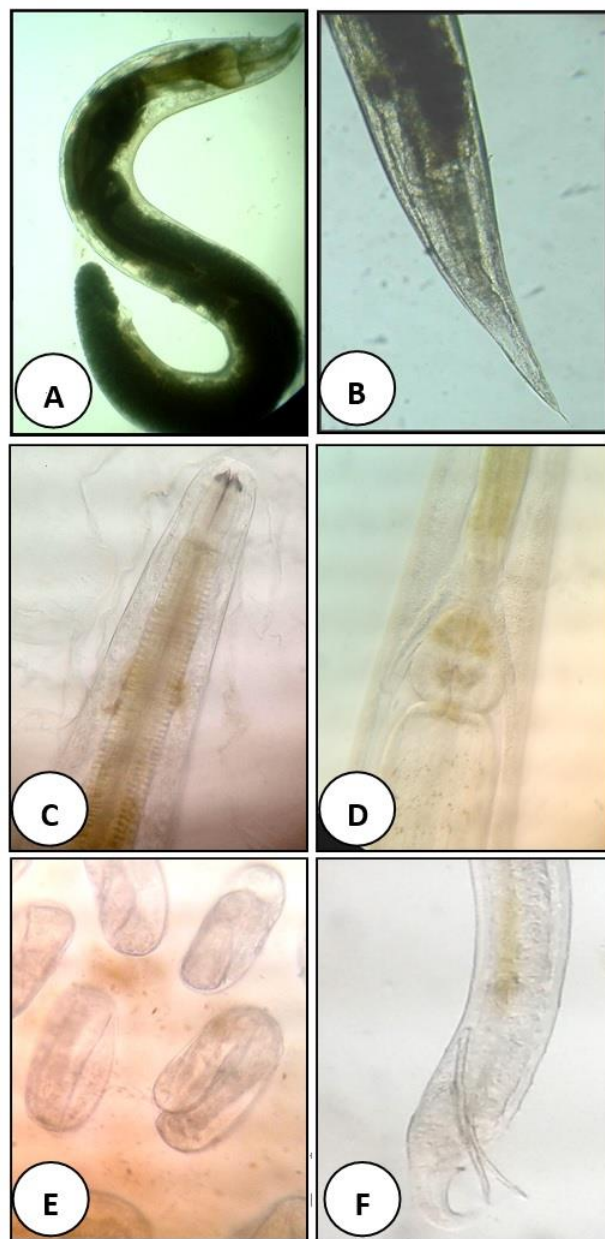


Fig. (8):
A- Photomicrograph of W.M. adult female of *C. variabilis*, (10 X).
B- Photomicrograph of female *C. variabilis* posterior end (40 X).
C- Photomicrograph of anterior end of *C. variabilis*, showing oral lips and bulbous esophagus (100 X).

D-Photomicrograph of anterior end of *C. variabilis*, showing bulbous esophagus (100 X).

E- Photomicrograph of eggs of *C. variabilis* (400 X).

F- Photomicrograph of posterior end of male of *C. variabilis* (100 X).

The male (Fig. 8F): posterior extremity obliquely truncated ventrally, body length 4 mm, width 0.2mm, tail long tapering; a number of simple papillae present on the tail. The bursa without caudal alae. The present species is a well-known nematode of the rectum mainly of Bufonidae but also of Hylidae and Miceohylidae^(31-33; 29).

Jasim⁽²⁷⁾ in Baghdad reported 43.75% of the mentioned parasite among *B. viridis*. This rate of infection was relatively lower than the rate of the present study. As he mentioned that the sample size in his study was relatively small and not allowed him to reach reasonable conclusions on the actual incidence, prevalence, host sex effect and distribution status of these parasites among the members of their hosts. However, it seems that *C. variabilis* is more common than the other nematode since it is found in all of the infected hosts, moreover it was considered as the first report among *B. regularis* in Iraq.

Anderson⁽³³⁾ correlated nematode infection of toads with eating of snails by the toads. The nematodes were isolated from the intestine of frogs with the total prevalence of 79.31% for both frog sexes, 34.48% and 44.82% for males and females respectively were reported as shown in Table (2 and 3).

Rhabdias bufonis (Schrank, 1788)

The adults of this parasite nematode were isolated only from the lungs of female *B. viridis* with the prevalence of 7.14% (Table 2).

The lifecycle of the reported nematode is direct (*i.e.*, toad to toad transmission), moreover with a short life-span. Therefore, they were represented as a possible model for exploring the common mechanisms elaborated in numeral critical occurrence of biological and biomedicine disciplines, for instance transmission, genetics, embryogenesis and ageing⁽¹¹⁾.

Previously, *R. bufonis* reported in the lungs of *B. viridis* in different places of Iraq, Saeed *et al.*⁽¹¹⁾ reported 48.6% and 32% for males and females respectively from different parts of Iraq, Abdulrahman *et al.*⁽¹⁸⁾ were recorded with the prevalence somewhat similar to the results of the present study (8.3%). On the other hand, *R. bufonis* considered as a worldwide of toad and frog parasites^(33; 34).

The results of the present study showed that females of *B. viridis* acquired more positive for this parasite than that of males, in contrast with Saeed *et al.*⁽¹¹⁾ who found that males of *B. viridis* collected from many localities of Iraq acquired more *R. bufonis* than females. Furthermore, the results of the current study were concurred with those described by Mohammad *et al.*⁽²⁹⁾ in Baghdad. Additionally, the nematode *R. bufonis* were earlier stated as a parasite of *B. viridis* from Iran by Mashaii⁽³⁵⁾ and Mashaii *et al.*⁽³⁶⁾ were reported 32% from the *B. viridis* of Iran.

The color of the viable worm was brownish to black with the elongated shape. The size measured 8.5-13.0 mm long and 0.2-0.7 mm wide. The anterior end was somewhat flat and the posterior end was tapered. The tegumentary cuticle at the anterior end was making obvious bulge (alae), on the anterior

outward and regularly declining posteriorly. The oral aperture was provided with four evolved lips (two of them sub-dorsal and the other two sub-ventral) and having two lateral teeth. The oral opening extended to a cupped oral cavity which measured from 0.01-0.032 mm long. It opened into a muscular esophagus which measured 0.25-0.5 mm in length, the posterior part of the esophagus was slightly expanded making a club-shaped structure. The anterior end of the gut was wider than the esophageal bulge. The intestinal space was narrowing in anterior part, moderately broaden posteriorly. Pre-rectal myosphincter was clear. The rectum is short, linear, lined with broad cuticle. The black colour intestine due to its contents. The anterior vulva was 3.75-5.5 mm and the posterior end was 3.5-4.95 mm. The situation of anus was 0.23-0.4 mm from the posterior end. The pointed tail was measured 0.23-0.4 mm from the anus (Fig. 9A; B). The egg with narrow shelled and embryonated, oval in shape, the size measured 0.1-0.12×0.06-0.08 mm in length and width respectively. Some were containing fully developed larvae (Fig. 9C).

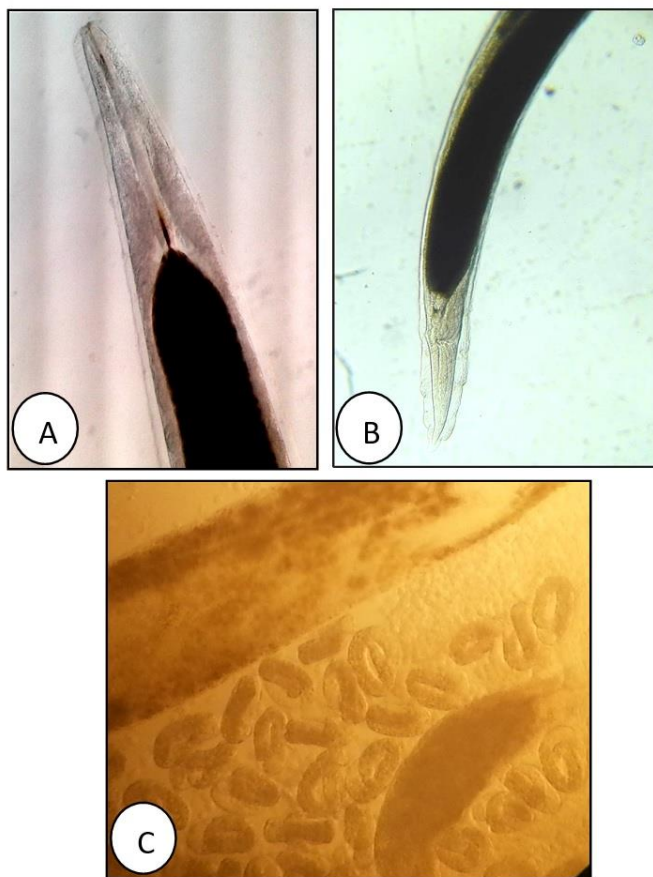


Fig. (9): *Rhabdias bufonis*

- A- Photomicrograph of female anterior end (100 X).
- B- Photomicrograph of female posterior end (100 X).
- C- Photomicrograph of liberated eggs (200 X)

CONCLUSION

On the light previous results, it was concluded that *Cepedea dimediata* and *Protoopalina intestinalis* as protozoa were recorded for the first time among frogs of the species *B. regularis* and *R. pipens* respectively in Kurdistan Region, *Bufo*

regularis considered as a new host for *Polystoma integerrimum*, *Proteocephalus* sp. and *Cosmocercoides variabilis*.

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