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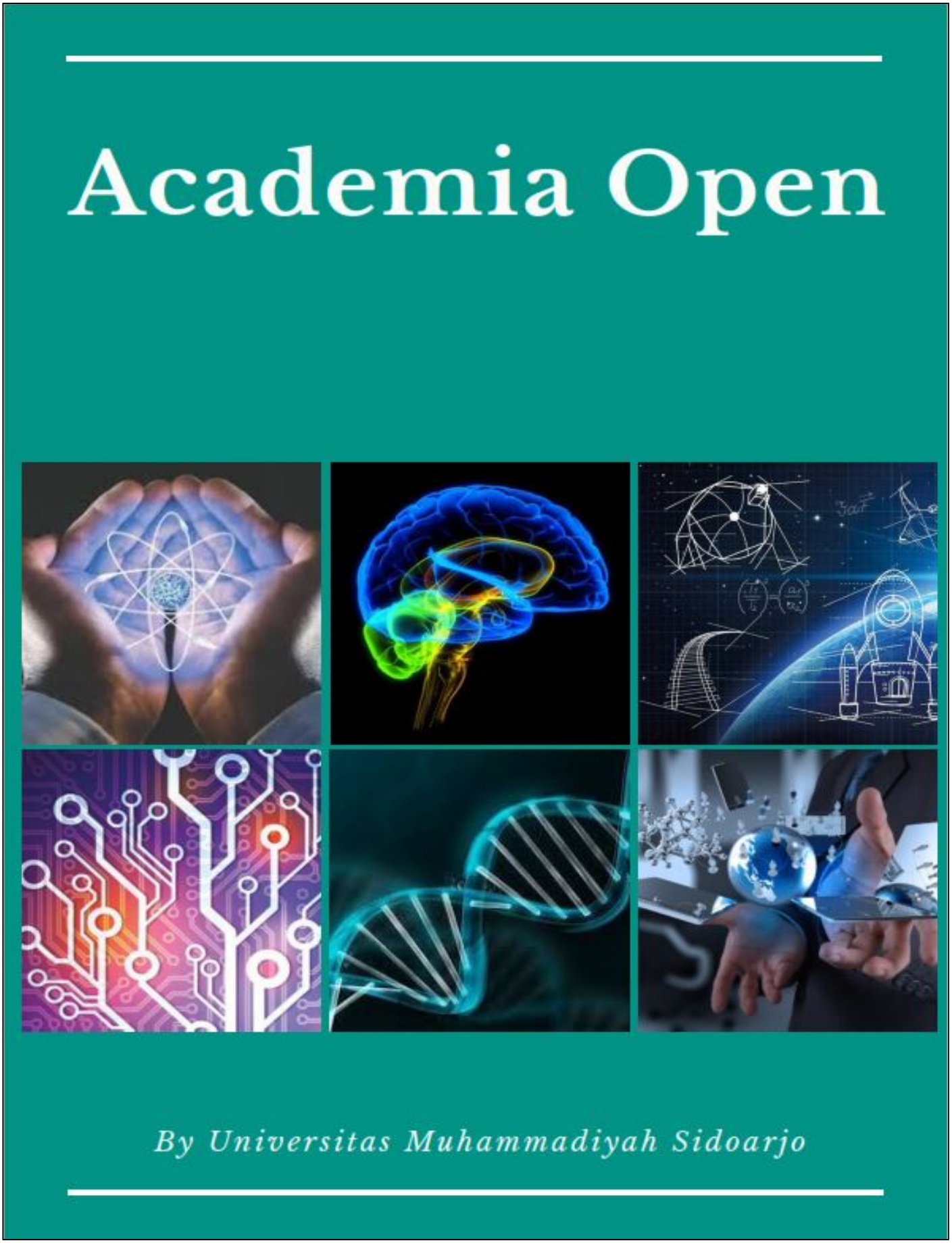

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First Record of Pygidiopsis summa and Ascocotyle longa in Iraq

Catatan Pertama Pygidiopsis summa dan Ascocotyle longa di Irak

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Abstract

General Background: Heterophyid flukes are zoonotic parasites with complex life cycles involving multiple hosts, including fish and mammals, and pose significant public health risks. **Specific Background:** Despite global studies on heterophyid infections, their presence in Iraq has not been previously documented. **Knowledge Gap:** There is a lack of data on the distribution, taxonomy, and potential health implications of these parasites in the region. **Aims:** This study reports the first record of *Pygidiopsis summa* and *Ascocotyle longa* in Iraq, providing taxonomic descriptions and assessing their significance. **Results:** A total of 150 *Rattus norvegicus* were captured in Basrah, and their small intestines were examined, revealing both fluke species. Morphological analysis showed slight variations in spine length. **Novelty:** This is the first documentation of these species in Iraq. **Implications:** Findings highlight the need for awareness of foodborne parasitic infections and further molecular and epidemiological studies on heterophyid transmission dynamics.

Highlights:

1. First record of *Pygidiopsis summa* and *Ascocotyle longa* in Iraq.
2. Highlights *Rattus norvegicus* as a potential reservoir for heterophyid flukes.
3. Emphasizes foodborne parasitic risks, urging further molecular and epidemiological studies.

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Keywords: wild rat, *Pygidiopsis summa*, *Ascocotyle longa*, Basrah

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Introduction

The family Heterophyidae includes 36 genera of flukes. Out of them, 13 genera have species that infect humans [3]. The presence of an oral sucker and a ventral sucker characterizes species belonging to this family. The presence of a third genetic sucker characterizes some of them. For example, species belonging to the genus *Ascocotyle* are characterized by the absence of a genital sucker. Species belonging to the genus *Pygidiopsis* are characterized by the presence of this sucker [4,27]. Most of these flukes are harmful to humans, as they cause damage to the digestive system, bile ducts, pancreas and lungs. Intestinal fluke infections are endemic in some Asian countries [8]. Due to the expansion of trade, the improvement of transportation systems and changes in eating habits, the number of people infected with these parasites has increased [24]. This study, which is part of a comprehensive study on parasitic worms in the Norway rat in Basrah Governorate, aims to describe two types of flukes belonging to this family, which are recorded for the first time in Iraq.

Methods

150 *Rattus norvegicus* were caught from local markets in Basrah Governorate center using locally made non-lethal traps. The samples were transferred alive to the laboratory. They were anesthetized with chloroform and dissected for parasitic flukes. Worms were isolated from the small intestine. They were preserved using 70% ethyl alcohol. Parasites were prepared for taxonomic study in a temporary way, which is using glycerin [1]. Another permanent method was to follow the steps mentioned by. The samples were left in Acetocarmine dye overnight. The excess dye was removed, and water was withdrawn from the sample by passing it through different concentrations of ethyl alcohol (80%-95% and 100%). Then, the samples were filtered with xylene, placed on glass slides and classified according to [27,4]. The specimens were drawn using a camera lucida, and full measurements were taken. They were compared with recorded specimens from around the world .

The ecological terms used in parasitology and includes them in this study [12]. The specimens were photographed using a Sony camera.

Results and Discussion

Ascocotyle longa (Ransom, 1920) (Fig. 1)

Only three specimens of this fluke were found in the small intestine of one *Rattus norvegicus*. These specimens appeared during December.

These flukes are characterized by being transparent, and their structures are clearly visible. They are almost pointed in the anterior part and rounded in the posterior part; their length ranges from 0.7 mm, and their maximum width in the middle is approximately 0.3 mm.

The oral sucker is muscular and is distinguished by being armed with a single row of spines. The spine is 20 microns long, and its number is constant in this genus, as it amounts to 16 spines, round at one end and pointed at the other free end. The digestive system begins with the mouth located in the middle of the oral sucker. Then comes a muscular pharynx with a diameter of 0.7 mm and then a long esophagus that branches into two caecal branches. The testes are two oval, adjacent structures located at the back of the body. The length of the testes is 0.1 mm, and the width is 0.08 mm. The vitelline glands are located on both sides of the testes. The uterus is filled with oval-shaped eggs measuring 0.01 mm in length and 0.008 mm in width. The ovary is located above the testes and is very clear and oval.

This fluke was described based on specimens of Alaskan foxes at the Washington Zoo [15]. It is distributed worldwide [26]. It has been recorded in many hosts, including pelicans, eagles, cats, and dogs. The measurements of the current model are consistent with the description provided by [20]. However, there is a slight difference in the length of the spines in the current study model, which were slightly longer. Eating raw or undercooked fish is one of the causative factors of heterophyasis in humans [11, 21,7]. Although these infections are more common in Southeast Asia due to dietary habits, the risk of infection is expanding to other regions due to increased global trade and the transfer of goods and some food and cultural habits from other countries [23].

[20] stated that the life cycle of this fluke includes birds and mammals, including humans, as definitive hosts. Fish are also intermediate hosts, especially mullet *Mugil* spp. Humans and other hosts are infected by eating raw fish. The infective metacercariae are found in various parts of infected fish. The snail *Heleobia australis* is the primary intermediate host in which the larvae of this fluke develop [28].

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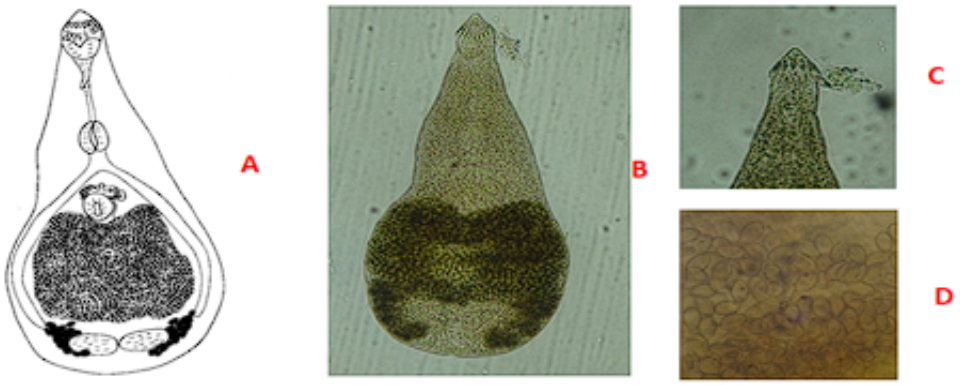

Figure 1. ***Ascocotyle longa , A : adult fluke W.M. , b ar =0.2mm , B : Scanning microscopic view of adult fluke . 10X , C : S pine of oral sucker . 40X , D : Egg . 40X .***

Pygidiopsis summa Onji and Nishio, 1916 (Fig. 2)

Only two of these flukes were found in the small intestine of one Rattus norvegicus. These specimens appeared during December. These flukes are transparent, 0.6 mm long and 0.3 mm wide. The body shape is characterized by being pear-shaped, wide from the back and slightly rounded from the front.

The oral sucker is muscular and circular in shape, with a diameter of 0.09 mm. The ventral sucker is circular and has a diameter of 0.08 mm. The genital sucker is elongated and curved, attached to the ventral sucker, with a length of 0.1 mm and a width of 0.03 mm. The digestive system begins with the mouth located in the middle of the oral sucker. It is followed by an oval-shaped muscular pharynx with a length of 0.05 mm and a width of 0.04 mm, then a long esophagus that branches into two caecal branches that extend to the middle of the body.

The testes are oval, adjacent, and located at the posterior end of the body, with a length of 0.1 mm and a width of 0.07 mm. The uterus is filled with oval-shaped eggs with a length of 0.02 mm and a width of 0.01 mm. The vitelline glands are located on both sides of the testes. The ovary is located above the testes and is clear and spherical.

This parasite was first described in the intestines of dogs in Japan by [14]. It is widespread in southern Korea and Vietnam [25,19] and has been recorded in wild cats as a natural host [17] and experimentally in rats [6]. In humans, it was first recorded in Japan [22] through the discovery of eggs in the faeces that are similar to species belonging to the genus *Heterophyes*, *Haplorchis*. However, they are smaller in size, and this is the characteristic through which the diagnosis can be made.

The measurements of the current model agree with what was stated in the description provided by [2].

[13] described the life cycle of this parasite. The eggs hatch in the aquatic environment into ciliated meracedium larvae that penetrate the body of the intermediate host, which is the snail *Tympanotonus microptera*, and develop into a sporocyst, then the rediae stage, then the cercaria are released to encapsulate in the form of metacercaria on the gills, scales, and muscles of saltwater fish, the mullet *Mugil* spp., which is the infective stage of the final hosts.

Humans, some other mammals, and birds are hosts. Possible terminal effects of this parasite. If eaten raw or undercooked [5,10,18]. Villous atrophy and severe mucosal inflammation are the most prominent pathological effects of this parasite[16].

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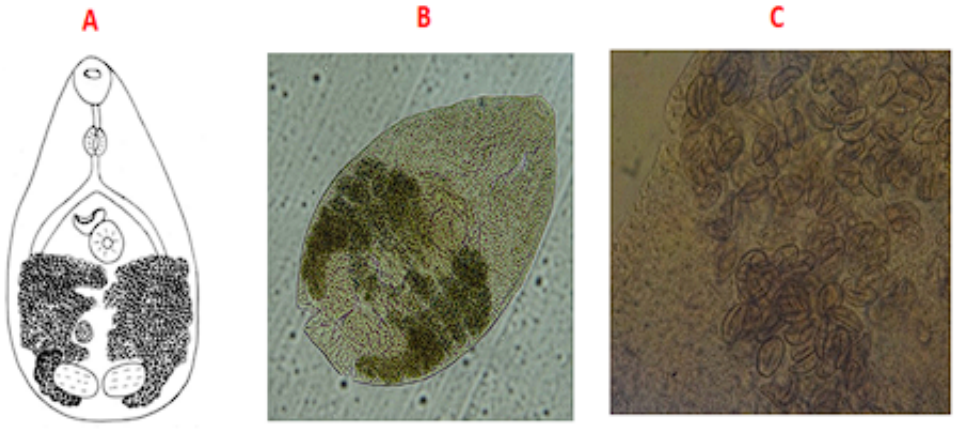

Figure 2. ***Pygidiopsis summa , A : A dult fluke W.M., bar=0.2mm , B : Scanning microscopic view of adult fluke . 10X , C : Egg . 40X .***

Conclusion

The present study provides the first record of Pygidiopsis summa and Ascocotyle longa in Iraq, expanding the known geographical distribution of these heterophyid flukes. The taxonomic descriptions of these species align with previous findings, though slight variations in morphological characteristics, such as spine length, were observed. Given the zoonotic potential of these parasites and their association with raw or undercooked fish consumption, these findings underscore the need for increased awareness of foodborne parasitic infections in the region. The identification of Rattus norvegicus as a host further highlights the complex transmission dynamics of these flukes. Future research should focus on the molecular characterization of these species to confirm their genetic identity, investigate their life cycles in local intermediate hosts, and assess their potential public health risks in Iraq.

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