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Revision of some trematodes (Plagiorchiida: Microphallidae) from different birds in Iraq

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Abstract

The adult worms of the Microphallidae family are mainly found as intestinal parasites of birds and mammals, while metacercariae is most commonly found in decapodal crustaceans. The Microphallidaeare family is spread throughout the world. It includes approximately 47 genera. Mature worms usually enter the digestive system of vertebrates, especially birds and mammals. Microphallidae contain eight subfamilies: Androcotylinae - Basantisiinae - Endocotylinae - Gynaecotylinae - Levinseniellinae - MaritrematinaeMicrophallinae - Sphairiotrematinae. Therefore, due to the lack of studies on the Microphallidae family in Iraq, we began to develop a database on this important family.

Keywords: Trematoda; Microphalidae; Birds; Classification; Iraq

1. Introduction

Microphallidae are found mainly in birds and mammals, the first intermediate host being gastropods and crustaceans as the second intermediate host [1].

Small worms are found in the intestine of most species of vertebrates, especially birds that infected as a result of eating some species of crustaceans, Also, adult worms are distinguished by these characteristics. Abdominal and gastrointestinal tract shortening, as well as its branches (less than 1 mm) and small in scale. It exceeds the level of the abdomin volume the ovary is found on the opposite side of genital aperture [2]. Microphallidae have been found in different parts of the world, birds acting as a final hosts. Intestinal infections caused by Maritrema genus infection that occurred by waterfowl. [3].

The life cycle of Plagiorchiida (Microphallidae) is occur inside of (sporocysts) the daughter, metacercariae: Metacercariae in mature daughter sporocysts be similar to adult worms that have not yet begun to lay eggs. They have almost fully developed somatic organs but not fully developed reproductive system. This hastens maturation and increases reproduction efficiency in the case of definitive host infection. [4],[5]. Infective metacercariae are remarkably variable in their body size and shape among hosts individuals. Furthermore, this trematode species has a large genetic diversity, the sequences of cytochrome c oxidase subunit 1 (COI) and the internal transcribed spacer region were used to study the genetic variability of trematodes (ITS-1) [6]. Studies used for amplification of molecular markers as Bowles *et al.,* 1992 and Galaktionov *et al.,* 2012 [7], [8]

The aim of this work is to review some studies related to trematodes family: (Plagiorchiida: Microphallidae) that infects different species of birds in Iraq.

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2. Methodology

2.1. Scientific classification

Plagiorchiida is a trematode order that is related to *Echinostomida*. They are part of the Digenea, a broad fluke subclass. There are only a few major human parasites in this order. [9].

- Kingdum: Animalia
- Phylum: Platyhelminthes
- Class: Trematoda
- Subclass: Digenea
- Superfamily: Microphalloidea
- Family: Microphallidae
- Subfamily: Maritrematinae
- Genus: Maritrema
- Species: Maritrema sp.
- Subfamily: Microphallinae
- Genus: Microphallus
- Species: Microphallus sp.
- Subfamily: Levinseniellinae
- Genus: Levinseniella
- species: *L. propinqua* [10]

2.2. Species of Microphallidae

Microphallidae Ward, 1901 is a large family of small flukes that can be found in the intestines of crustacean-eating birds [3]. *Microphalloides japonicus* from Helicetridens, *Levinseniella* spp. from *Macrophthalmus japonicus, Gynaecotyla squatarolae, and Microphallus koreana* from *Macrophthalmus dilatatus* have all been identified from crustacean hosts in South Korea [11]. In terms of human infections by microphallids, only a few cases of *Spelotrema brevicaeca* and *Gynaecotyla squatarolae* have been recorded [12]. A fifth Microphallidae species was discovered in an Asian shore crab, *Hemigrapsus sanguineus*, caught in Jebu-do, Gyeonggi-do, last year. Adult flukes with a symmetric ribbon-like vitellarium were discovered during an experimental infection, and this feature, along with other detailed morphology, identified them as a new Maritrema species, *Maritrema jebuensis* [13]. Trematodes infect birds in a wide variety of ways. The Microphallidae is a widespread family with a diverse range of species. The parasitic trematodes of four microphallid species were discovered in the intestine and caeca. *Maritrema formicae, Odhneria odhneri, Levinseniella cruzi*, and *Maritrema pichin*. sp. are the four microphallid species discovered. The species with the highest prevalence was *M. formicae,* while *M. pichi n*. sp. had the highest mean intensity and mean abundance. The new species *M. pichi n.* sp. differs from congeners by the position of the acetabulum that is included within the vitellarium ring, the ovary is anterior to the acetabulum, and the testes are lateral to it [14].

2.3. Morphology of Microphallidae cercaria

Is a cercaria with an oval-shaped body that is slightly elongated? It measures (95 – 135) inches length, (50– 70) inches width. The oral sucker is a huge, clear creature. It is situated on the body's front. The Stylet penetration organ is found inside it. There is no esophagus (pharynx).Three or four pairs Penetration glands have been observed. There are no eyespots or a ventral sucker. The spines on the body are very small, tail is cylindrical and not bifurcated, and it measures (75-95) cm length. Fin folds are not present. Cercariae have a simple movement consisting of body contraction and relaxation, as well as a simple tail movement. The sporocysts of these cercariae were oval or bag-shaped whose length is about (0.2-0.25) mm. It has been observed that these sporocyst contain cercariae at different maturation stages. [15].

2.4. Life cycle of Microphallidae

These family spread throughout the world. They include approximately 47 genuses [1]. Adult worms normally infiltrate the digestive tracts of vertebrates, especially birds and mammals. Their life cycle involves two intermediate hosts: Gastropods (mostly brackish water and aquatic gastropods) and Custaceans (mostly freshwater and marine gastropods) [16], [17].The first detailed accounts of an experimental life cycle for the Microphallus genus of the Microphallidae family. Sporocyst growth in the prosobranch snail *Bittiumalternatum,* release of Ubiquitacercariae, and metacercarial formation in the crustacean *Callinectes sapidus* were the essential developmental patterns for this genus and their rapid attainment of sexual maturity in intestine of the gull, *Larus argentatus*. This pattern was verified by a number of researchers for a variety of other microphallid species, as well as in the current analysis, where the

metacercariae was collected from the second intermediate host and fed to three separate experimental hosts. *M. sabanensisn*.sp.is a microphalline, like other microphallines mature rapidly and live in the definitive host for only a short period, and rat, mice and duck have been used as definitive experimental hosts [18] Most studies reported that microphallids mature in birds and mammals.(Figure 1).

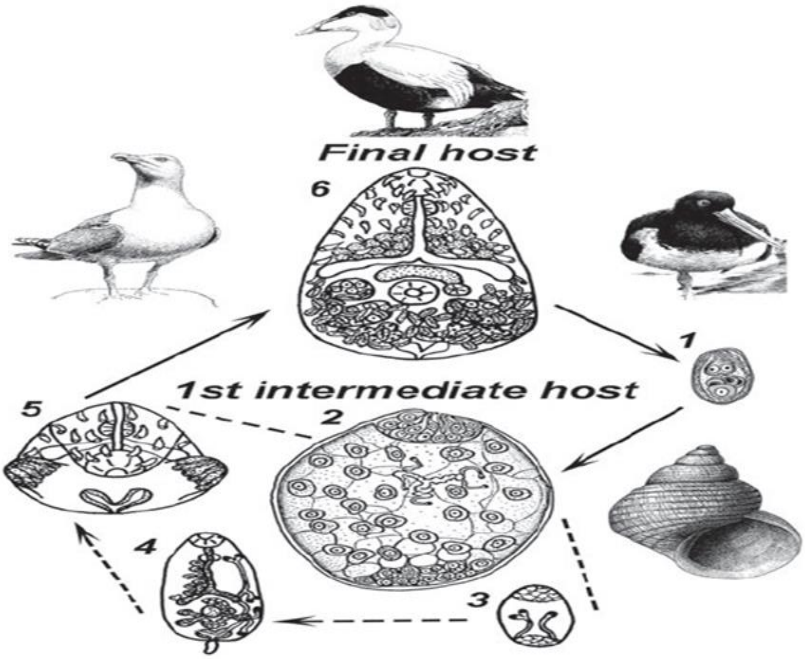

Figure 1 Life cycle of the 'pygmaeus 'microphallids. (1) Eggs containing miracidia in the environment; (2) daughter sporocysts in the molluscan host; (3 – 5) successive stages of metacercarial development inside of the daughter sporocyst (3 – 4 – embryos, 5 – fully- formed metacercaria); (6) adults in the final host .[19].

3. Previous studies of Plagiorchiida: Microphallidae in Iraq and world

Microphallidae was originally discovered in the small intestine of birds However, despite the numerous records of microphallids in their definitive hosts, there are few records of the larval stages from intermediate hosts in IraqFrom these studies [20]. In Basrah record of three trematodes (Family: Microphallidae) from some Aquatic Birds**.** [15**]** who recorded infection rate with some larval trematodes parasites (Microphallidae) was 15.6 % in Al- faw Bay, South of Iraq**,** Two species belonging to Microphallidae were recorded in Kuwait: [21] recorded [22] recorded Maritremaeroliae.While there are several studies in the world around Microphallidae metacercariae and of 12 species have been found in crustaceans [23,24,25,26]. The only study of microphallid cercariae in Australia was by [27], who recorded cercariae of four unidentified species in a marine cerithiid gastropod. There are no previous reports in the literature of microphallid cercariae from freshwater snails in Australia. Recently, however, cercaria of *Maritrema poulini* [28], and metacercariae of Microphallus sp. 'livelyi' were described from a freshwater snail. [29] recorded infection with *Microphallus piriformes* was 3.75% (Trematoda, Microphallidae): Effects of paraxenia and geographic location**.**

4. Conclusion

In conclusion, finding new species in previous-studied still surprising although far from rare. The application morphological distinguish between the sibling species. Our work highlights how ecological studies would benefit from biodiversity and taxonomic studies by gaining a better background knowledge on the systems, eliminating un-explained variation and thus, strengthening their conclusions.

Compliance with ethical standards

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Disclosure of conflict of interest

There was no conflict of interest in this study.

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