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Case Report

First Report of *Passerilepis parina* (Cestoda: Hymenolepididae) from *Parus major* in Iran: A Probable Fatal Case Due to Hyperinfection

Sina Mohtasebi¹, Aref Teimouri², Mohammad Javad Abbaszadeh Afshar^{1,3},
Hamed Abbasian¹, Iraj Mobedi¹, Mahya Allahmoradi¹, *Gholamreza Mowlavi¹

1. Department of Medical Parasitology and Mycology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
2. Department of Parasitology and Mycology, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran
3. Department of Medical Parasitology and Mycology, School of Medicine, Jiroft University of Medical Sciences, Jiroft, Iran

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***Correspondence**

Email:
molavig@yahoo.com

Abstract

Cestodes are important parasites that can affect the health of humans and wildlife. Among these, the genus *Passerilepis* is an important endoparasite of Passeriform birds while poorly studied in Iran. During a parasitological field survey in central parts of Iran in 2018, thirty-two cestodes, as an obstructive intertwined mass, recovered from the intestine of a recently dead *Parus major* (great tit). Morphological characteristics of recovered cestodes were drawn carefully by a camera lucida equipped microscope and identification was carried out using standard keys. All of the collected cestodes were identified as *P. parina*. In the current study, we recorded *P. parina* from great tit for the first time in Iran.



Introduction

In 1907, Fuhrmann described the avian hymenolepidid tapeworm *Hymenolepis parina* from *Parus major* (1). In 1966, Spasskaya re-described this tapeworm as *Passerilepis parina* and listed the species in this genus, and provided further host records from Paridae birds (2). The avian cestode *P. parina* is an important endoparasite of Passeriform birds (3). Around 520 species of birds inhabit Iran and the majority of them belong to the order Passeriformes. These birds include small and gregarious species, of which 7 of them have been identified in Iran, including *Parus major* (Great tit) which is common in northern Iran (4). The great tit is a distinctive bird with a black head and neck, prominent white cheeks, olive upperparts, and yellowish underparts, which is usually resident in woodlands and is non-migratory (5). It is broadly distributed from the Scandinavia region, Central Europe, the Middle East, Central Asia, and east across the Palearctic region and northern parts of Africa (6). Insects are the main food source for them in summer, which play the role of intermediate host for *P. parina* (7, 8).

The parasite fauna of wildlife in Iran is poorly known. As part of a parasitological field survey to investigate the wildlife parasitic infections in a rural area in central parts of Iran, we found a recently dead Great tit. We report here *P. parina* from great tit for the first time in Iran, with an emphasis on the re-characterization of morphological characters.

Case presentation

During a parasitological field survey in Jun 2018, a male *P. major* was found dead in the highlands of Kulej village, Taleghan, Alborz Province, Iran (36°11'19.7"N 50°45'03.6"E). After recording the geographical coordinates of the area and the bird's characteristics, the bird was dissected and the gastrointestinal tract removed and fixed in 70% ethanol. The

sample was transferred to the Helminthology Lab of the Department of Medical Parasitology and Mycology, Tehran University of Medical Sciences, Tehran, Iran.

The great tit has a distinctive appearance that makes it easy to recognize. Identification was made based on distinctive characteristics such as about 13 cm body length, black neck, throat, and head, white cheeks, and bright yellow torso, which a broad black mid-line stripe running from the bib to vent (4, 9).

The gastrointestinal tract was dissected and examined in a large Petri dish containing phosphate-buffered saline (PBS) for the presence of any helminths under a stereomicroscope. An intertwined mass of cestodes was recovered, separated, and preserved in 5% formalin and 70% ethanol for identification. For morphological identification the worms were stained with acid carmine, detained in 4% hydrochloric acid in 70% ethanol, dehydrated in ascending concentrations of ethanol reaching 100% (2 h each), and cleared in 100% xylene then in 50% Canada balsam and 50% xylene (2 h each). Whole worms were then mounted in Canada balsam (10). Cestodes were illustrated using a camera lucida and identified based on reference taxonomic keys (11, 12). Measurements are given in millimeters unless otherwise noted.

A recently dead great tit was found infected with a worm burden of thirty-two cestodes. Based on morphological characteristics, the cestodes were identified as *P. parina*. It is the first time this species is recorded in Iran.

The largest strobila, 19 mm long, consists of hundred and one segments and contains rudimentary male genital organs. The scolex is 0.31-0.35 mm wide with four unarmed suckers with a diameter of 0.133-0.145 × 0.113-0.127 mm and a rostellum, armed with ten hooks 0.059-0.062 mm long. The width of the strobila at the beginning of the neck was 0.10-0.14 mm, the width of sexually mature segments

was 0.46-0.51 mm, and the gravid segments were 0.58-0.63 mm. Genital pores were unilateral and there was no internal seminal vesicle, but the vas deferens inside the cirrus sac can form separate extensions that were not constant in size and shape. The measured cirrus sac was $0.050 \times 0.142-0.173$ mm. The external seminal vesicle was small, transversely elongated up to 0.045 mm wide. Three testes in a triangle situation were present. The ovary was

fan-shaped, consists of 4-6 lobes 0.090×0.060 mm.

The camera lucida drawings of the scolex, ten rostellar hooks, mature proglottid, and cirrus bursa are illustrated in Fig. 1. Furthermore, microscopic and stereomicroscope pictures of the cestode are represented in Fig. 2 and 3, respectively. The specimens are deposited in the Iranian National Parasitology Museum (INPM), Tehran, Iran.

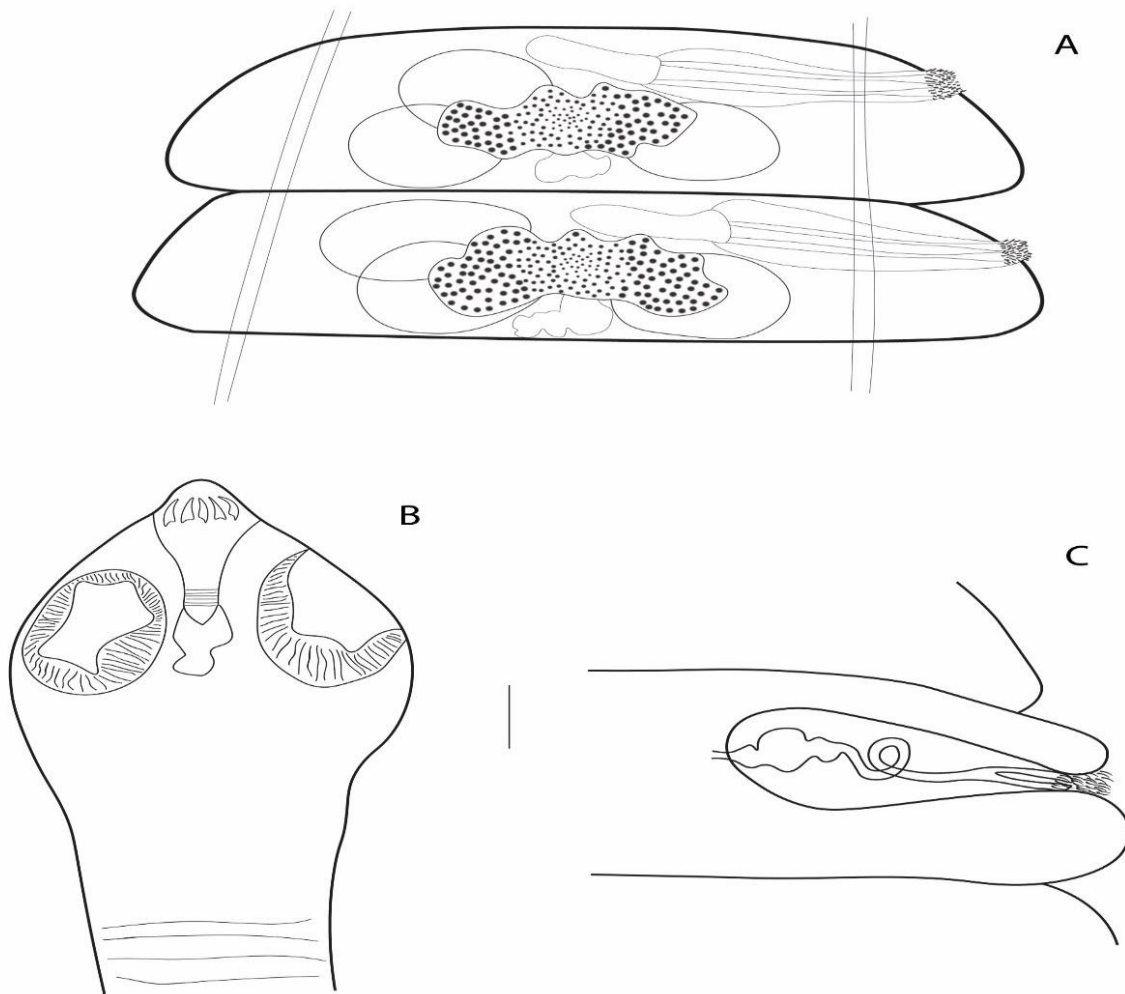


Fig. 1: Camera lucida drawings of *Passerilepis parina*. A: mature proglottids, Bar: 0.05 mm, B: scolex, Bar: 0.1 mm, C: cirrus bursa. Bar: 0.05 mm

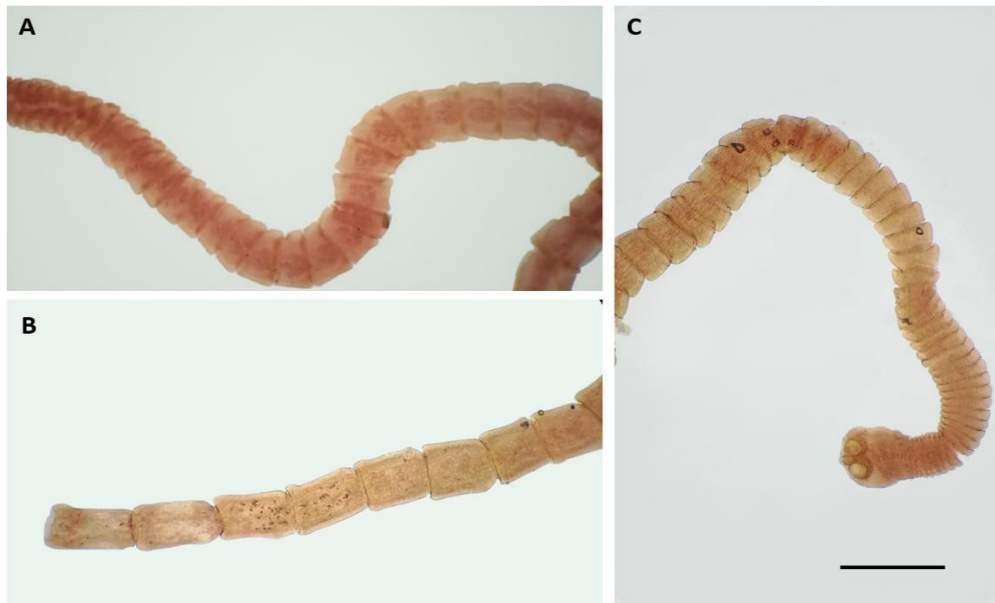


Fig. 2: *Passerilepis parina* (40×). A: mature proglottids, B: gravid proglottids, C: scolex and immature proglottids. Bar: 0.4 mm



Fig. 3: A: a part of intertwined mass of *Passerilepis parina* recovered from *Parus major* intestine. B: *Passerilepis parina* under stereo microscope (30×)

Discussion

Passeriformes birds are among the most abundant birds in Iran (4). Although the birds of Iran are well studied, their parasite fauna is poorly known. In the current study, we recorded, for the first time, *P. parina* from great tit in Iran. In this study, a recently dead great tit possibly died because of hyperinfection and intestine obstruction due to *P. parina* was found. According to the taxonomic criteria described by Spasskaya et al, *Passerilepis* spp.

vary primarily in the size and morphological features of the rostellar hooks and the size of their cirrus sac(8). *P. parina* was briefly described by Fuhrmann et al as *Hymenolepis parina* isolated from *P. major* (1). *P. parina* is mainly a specific parasite of tits (*Parus*) and has been previously recorded from *P. major*, *Parus ater*, and *P. palustris* worldwide (1, 3). However, this cestode has also been reported from *Dendrocopos major* (Piciformes) (3). In a recent study of cestodes fauna in Finland, *P. parina* was recorded from *P. major* (13).

The shape and size of rostellar hooks are important features for distinguishing species within this genus. For instance, *P. parina* has 10 rostellar hooks 0.059-0.062 mm which is similar to *P. zimbebel* (0.037 mm), *P. minor* (0.019 mm), *P. schmidt* (0.025 mm), *P. passeris* (0.027 mm), and *P. crenata* (0.024 mm) in hook number but distinguishable in shape and size (2, 14-16). However, some other species like *P. chiapensis* and *P. nebraskensis* contain 18 and 8 rostellar hooks, respectively (17). Another notable character in distinguishing the *Passerilepis* spp. cestodes are the size of the cirrus sac. In our study, the *P. parina* had a cirrus sac 0.142-0.173 mm long, whereas the previously studied species, the cirrus sac of *P. zimbebel* was 0.049-0.059 mm long, *P. minor* 0.055-0.134 mm long, *P. schmidt* was 0.173-0.231 mm long, *P. passeris* 0.140 and 0.180 mm long and *P. crenata* measured between 0.164-0.210 mm long (14, 16, 18).

In a recent study, *Diplotrriaena henryi* (Nematode) was recorded from *P. major* and *P. ater* in Iran (19). Another study of the gastrointestinal helminths of magpies in the north of Iran showed a 54% and 47.6 % infection rate in *Pica pica* with *P. stylosa* and *P. crenata*, respectively (20). In another study, *Pycnonotus leucotis* (white-eared bulbul) was found to host *P. passeris* in Minab, South of Iran (21).

Conclusion

The avian cestode *P. parina* is recorded for the first time from Iran based on specimens collected from the Great tit. Future studies must aim to elucidate the diversity and ecology of parasites in Iran's diverse bird fauna. However, the parasite fauna of Passeridae birds in Iran remains poorly known and in need of further research.

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Conflict of interest

The authors declare that there is no conflict of interest.

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