Prevalence and Infection Rate of Three Gizzard Nematodes in the Mallard *Anas Platyrhynchos* L., 1758 Collected in Al-Diwaniya and Diyala Provinces , Central Iraq

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Abstract

Three nematodes : *Amidostomum acutum* , *Epomidiostomum uncinatum* and *Hadjelia truncata* , were recovered from the gizzards of wintering mallard collected at two sites in central Iraq. A brief description of the parasites along with some notes on their infection rate, prevalence and discussion with the pertinent literature are provided.

Key words : Iraq , mallard , gizzard worms, *Amidostomum acutum* , *Epomidiostomum uncinatum* , *Hadjelia truncata* , *Anas Platyrhynchos* .

Introduction

The mallard, *Anas platyrhynchos*, is the most widely distributed duck in the Northern Hemisphere, ranging from the Arctic to the subtropics of North America, Asia, and Europe [1] .It is usually infected with gizzard worms. The gizzard worm belongs to the genera *Amidostomum*, *Epomidiostomum* and *Hadjelia* are the most common helminth infecting waterfowl [2]. Species of *Amidostomum* and *Epomidiostomum* are widely distributed among variety of migratory birds . Adult worms of both genera live under the lining tunic of the gizzard. They were reported from gizzards of anatids in Europe and their distribution reflects the geographic ranges of their hosts [3].

Gizzard worm infection is considered a contributing factor to low weights and looses in birds [4]. May be because mature worms feed on blood in the gizzard mucosa [3] causing hemorrhage, leakage of plasma proteins, and potential ischemia resulting in erosions and ulcers [5] . Severe infections with *Amidostomum* spp. may be associated with esophageal impaction [6] . It may substantially contribute to fatal debilitation. The effect of combination of other parasitic worms with *A. acutum* (Lundahl 1848) Seurat 1918 may damage tissues of the bird and may constitute one of the causes of mass mortality among the common eiders [7] .

The infection with *H. truncata* caused serious lesions in the gizzard in *Columbia livia domestica* from Cyprus [8] Severely infected birds may even die consequently, and the death of juveniles is more common than that in adults [9] . Moreover, there is a possibility for transmission of gizzard worms between domestic and wild birds those share the same habitats, causing economic losses.

The aim of this study is to survey and identify the gizzard worms of the wintering mallard in Iraq as a part of more studies on their parasitic fauna through Iraq.

Materials and Methods

During the period from December 2008 to February 2009, a total of 20 specimens including 6 males and 14 females of the mallard *Anas platyrhynchos* were collected from Qara Tapa 34° 26 ` N , 45° 02` E , Diyala Province and Hawr Al-Malih 32° 20`N , 45° 30` E , Al-Diwaniya Province . Birds killed with a shotgun and examined for parasites immediately or within a few hours, identified according to [10] , then dissected immediately. The gizzard was separated and tunic lining carefully removed and searched for parasites with the aid of the dissecting microscope (Kruss) and the compound microscope (Olympus BH) . The recovered nematodes were kept 70% ethanol, immersed overnight in lactophenol at room temperature for clearing. Identification was done according to [11,12] . Measurements are in millimeters calculated by using ocular and stage micrometers. Photos were taken with a digital camera .

Results and Discussion

Table 1 summarizes the results of finding three nematodes namely, *Amidostomum acutum, Epomidiostomum uncinatum* (Lundahl,1848) Seurat, 1918 and *Hadjelia truncata* underneath the gizzard lining of mallard specimens collected in central Iraq.

This would show that the total infection rate is 55%. The infection rate for Qara Tapa site is 100%, while for Hawr Al-Malih is 43.75%. The infection among male birds is 50%, while for females is 57.1%. Table 1 shows also that single infections constitute the most infections recorded in this study with only one exception of *A. acutum* and *E. uncinatum.* This mode of infection is in general agreement with [13] . However, this may be related directly to the smaller sample size in the present study. It is found also, that females acquired higher infection rate compared with their mates. This may be due, partly, to the difference between them during the breeding season in regard to their behavior and feeding which may act as an important factor contributing for getting more parasites. However, the results are in agreement with [14, 15].

Amidostomum acutum (Fig.1A;B;C&D)

Mouth opening surrounded with 4 papillae, varying in size , the tooth is conical with slightly convex ventral surface directly at the apex it is situated on dorsal plate of bottom of buccal capsule. Excretory pore and nerve ring situated ahead from cervical papillae. Cylindrical pharynx gradually widening toward back , all the body with transverse striations.

Male: Only 8 males isolated from the gizzard of *A. platyrhynchos* from Hawr Al-Malih. Body 8.928 (7.365 - 10.258) long , 0.074 (0.062 - 0.086) wide, dorsal tooth 0.00412 (0.0032 - 0.0048) long , internal diameter of buccal capsule0.0068 (0.0048 - 0.0080) , its depth 0.0092 (0.0080 - 0.0096) , pharynx 0.612 (0.572 - 0.676) long , 0.0381 (0.026 - 0.052) width , nerve ring distance from anterior end 0.254 (0.230 - 0.285) , distance from excretory pore to anterior end 0.39475 (0.350 - 0.399) , spicules equal or almost equal 0.121 (0.1168 - 0.1312) long, its number branches are three .

Female: Seventeen females of *A. acutum* isolated from the gizzard of *A.platyrhynchos* from Hawr Al-Malih. Females are larger than males 13.448 (12.312 -14.773) long, 0.121 (0.1144 - 0.126) wide , dorsal tooth 0.0061 (0.0048 - 0.008) long , internal diameter of buccal capsule somewhat larger than in male 0.0104 (0.0096 - 0.0112) , its depth is more also 0.0112 (0.0096 - 0.0128), Pharynx is longer than males also 0.779 (0.665 -0.899) long , 0.5218 (0.0468 - 0.052) width ,

Vulva provided with cuticular protuberance varying in size, it is closer to the posterior end of the body 2.6305 (2.415 - 2.9925) , eggs 0.0694 (0.053-0.104) x 0.05224 (0.038 - 0.0936) , tail length 0.2625 (0.208- 0.354).

A. acutum is a common parasite of ducks in Europe including *Anas platyrhynchos* [16 . Infection rate with this species in this study is almost in agreement with that reported by [17] . The first

description of *A. acutum* was done by Lundahl 1848, from the ventriculus of *Nettion crecca* ; *Oidemia nigra* ; *Melanitta fusca* ; *Eider molissimus*; and *Fuligula fuligula* from Finnland , then Travassos 1937 added *Fulica atra* as another host for this nematode [16].

This nematode was also frequently reported from Anseriformes; in Australia [18] ; in North America[19], and In Poland [17] From another anatinds it was reported: In Canada from *Bucephala clangula*[16] ; *Anas americana* ; *Anas acuta ; Anas strepera ; Aythya affinis ; Aythya valisineria*. In USA from the anatids : *Anas fulvigula* in Florida [20] *;* in North America from *Aix sponsa*[21] , *Dendrocygna autumnalis* [22], from *Aramus guarauna* (Gruiformes: Aramidae) [23] . in Europe it was reported from the anatids : *Anas carolinensis ; Anas querquedula* ; *Anser albifrons ;Aythya ferina* ; *Aythya nyroca* [16] ; *Anas acuta ; Anas penelope* [24].In France from Charadriiformes: Recurvirostridae in *Himantopus himantopus*[16] and from the Phasianids *Tetrao parvirostris ; Tetrao urogallus* (Galliformes) [25] . In Taiwan from the anatids : *Anas carolinensis* and from Charadriiformes: Scolopacidae : *Gallinago gallinago*[28] . In Australia from the anatids : *Anas gracilis ; Biziura lobata; Stictonetta naevosa ;* and from *Himantopus leucocephalus* (Charadriiformes: Recurvirostridae) [18].

Epomidiostomum uncinatum (Fig.2 A & B)

Syn.: *Epomidiostomum anatinum S*krjabin, 1915 ; *Amidostomum anatinum* BayLis, 1928 [16].

It is characteristic with 6 cephalic appendages surround the oral opening. Females are larger than males, The distance between the transverse cuticular striation, slightly smaller in male than in female.

Male: Only one male isolated from the gizzard of *A.platyrhynchos* , the male is shorter and thinner than female. Body : 6.962 long , 0.176 width , inner diameter of buccal capsule 0.0096,its depth 0.008 Pharynx 0.972 length, 0.0416 width , excretory pore at 3.82 from the anterior end of the body, the nerve ring is 0.230 from anterior end. The spicules equal or nearly equal, reach 0.021 long, the distal end of each spicule is cleaved into three unequal branches

Female: Body 10.615 long , 0.399 width at vulva region, Pharynx 1.055 length, 0.0624 width , excretory pore at 0.376 from the anterior end of the body. Nerve ring lies at a distance of 0.255 from anterior end, the vulva is smooth, placed at a distance of 2.42 from the posterior end , eggs 0.126x0.063 , tail, narrowing just behind the anus is 0.140.

It is isolated from the gizzards of *A. platyrhynchos* collected from Hawr Al-Malih.

It was isolated from the gizzard of the mallard *A. platyrhynchos* in North America by [44] and in Europe by [45]. From other anatids in USA it was reported: in North America from *Anas discors* [27] ; *Aix sponsa*[21]. In Florida from *Anas fulvigula* [20] ; in Texas from *Dendrocygna autumnalis* ; *Dendrocygna bicolor* [22]. In India from *Dendrocygna bicolor* [28] . In Taiwan from *Anas carolinensis* [26] . In Canada from *Anas carolinensis* [27]

Species of *Epomidiostomum* appear more restricted to the Anatidae , moreover, this species was recovered from females only, two in number, from Hawr al-Malih (Table 1). This is rather hard to explain and it seems that collecting more specimens from these two sites as well as other sites in Iraq may show different result. However, it is uncertain why differences in prevalence or intensity of gizzard worms is associated by host sex in some species and not others [3] .

Hosts infected with species of *Amidostomum* and *Epomidiostomum* are typically associated with aquatic habitats. *Amidostomum acutum* and *Epomidiostomum uncinatum* are widely distributed in migratory waterfowl [3] they occur mainly in Anatini and Aythyini [16]. Species of *Amidostomum* in Anatidae are: *A. acutum* in the ducks of Anatinae ; *A. petrovi* in the ducks of Aythinae; *A. monodon* in the ducks of Merginae and the fourth one is *A. auriculatum* in *Anas crecca* [29] In Slovakia [30] found low numbers of *A. acutum* in *Anas crecca,* whereas [31] found 5 out of 23 mallards infected with this worm. In Poland [17] found 40 % of mallards positive for *A. acutum*. The present results also show that *A. acutum* is more prevalent than *E. uncinatum* , this agrees with the findings of [3 ,20].

Hadjelia truncata (Fig.3 A;B&C)

Twenty four females of *H .truncata* were found in the gizzards of specimens of Qara -Taba. Body cylindrical attenuated at extremities, 13.15 (11.10 - 14.88) long , 0.23 (0.18 - 0.28) wide ,cuticle transversely striated, Mouth with large well developed trilobed lips without teeth with two wings set on external surface of each. Head separated from body by a slight constriction, 0.014 (0.010- 0.015 long , 0.048 (0.041- 0.056) in diameter, mouth leads to a cylindrical vestibule, 0.038 (0.031- 0.046) long , 0.011 (0.010 - 0.015) wide . Oesophagus consists of two parts an anterior short, narrow and muscular 0.461 (0.450-0.566) long , 0.038 (0.026 - 0.062) wide ; and posterior longer, wider and glandular 2.435 (1.47 - 3.32) long, 0.056 (0.208-0.083) wide. Nerve ring 0.032 (0.26 - 0.052) long, 0.038 (0.026 - 0.046) wide. Vulva is 2.281 (1.575 - 2.730) from anterior end , eggs thick –shelled, slightly thickened at the poles , 0.044 (0.033-0.057) long , 0.034 (0.015 -0.041) wide , tail short and rounded.

Hadjelia truncata was reported from a wide range of vertebrate (avian) and invertebrate hosts scattered among different families and orders[32]

. It is well recognized as an avian parasite, and has been found in the gizzard of a number of bird species in Europe , Asia [33]and Africa [34]

. It is present under the corned layer of the gizzard [8 ,34 , 32 ,35 , 36 , 37]. It was reported from the Starling *Sturnus vulgaris* L, Sturnidae, Passeriformes [38]; pigeons *Columba livia* , Columbidae, Columbiformes [8 , 37 ,39 , 40] ; hoopoe *Upupa epops* and *Upupa* sp., Upupidae, from Indian roller *Coracias beneghalensis* , from *Coracias* sp., from Coraciiformes : Coraciidae, [12 , 41] and Meropidae from the blue-cheeked bee –eater *Merops superciliosus persicus* [32] , and from a beetle *Phylan abbreviatus* , Tenebrionidae, Coleoptera [11].

The infection rate of parasites in this study within the two collection sites does not allow to withdraw any justified conclusion since the examined number of bird hosts is very low , although it indicates that Hawr Al-Malih specimens has a richer parasitic fauna than those of Qara Tapa . However, more specimens need to be examined to get a clear idea about this subject and about the relation between the bird sex and prevalence and rates of infection for the three gizzard nematodes.

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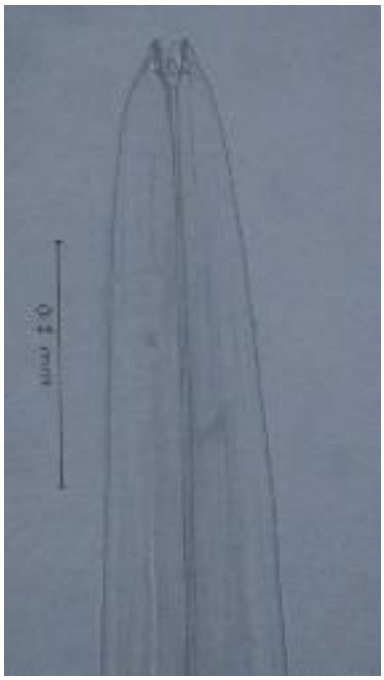
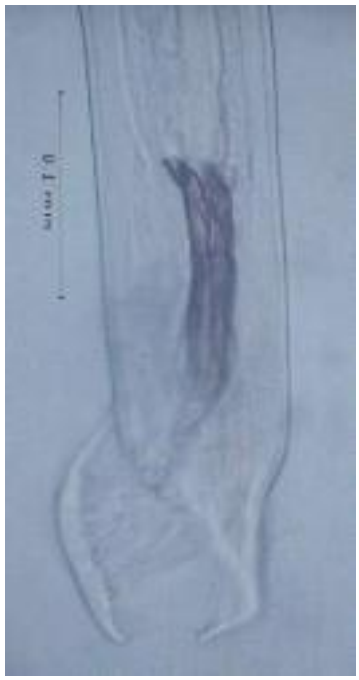
Table (1): Loclity, sex, no. examined, no. infected of *Anas platyrhynchos* and gizzard worm species and prevalence.

Locality	sex	No examined	No. infected	% infection	Parasite sp.	Range (mean no.)
Qara Tapa	♂	2	2	100	*Hadjelia truncata*	19-25 (22)
	♀	2	2	100	*H. truncata*	2(2)
Hawr Al-Malih	♂	4	1	25	*Amidostomum acutum*	1
	♀	12	6	50	*A. acutum* * + *Epomidiostomum uncinatum*	12-28(24) + 1-3 (2)
Total		20	11	55		

* Double infection in two cases.



- A -



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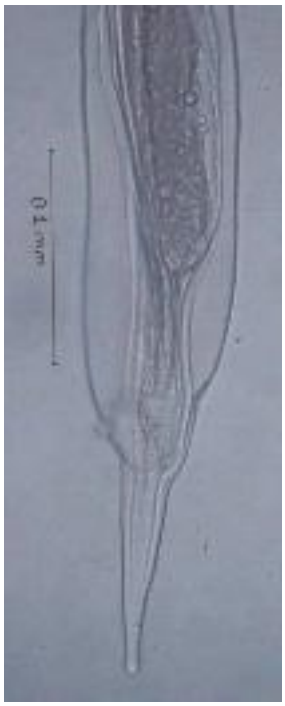

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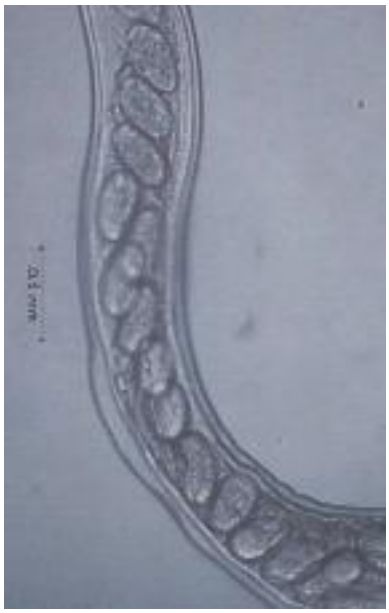
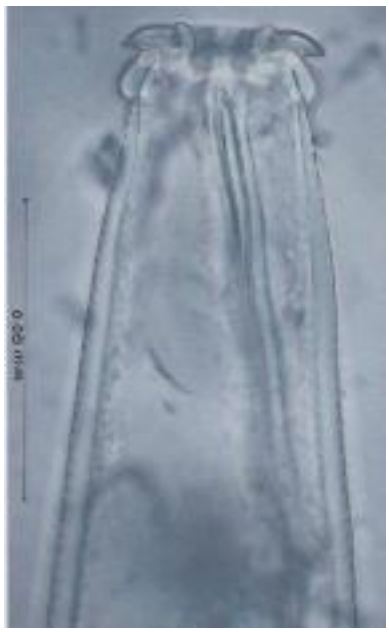


- D -

Fig.(1): ***Amidostomum acutum***
A – Anterior end
B –Posterior end of male
C - Posterior end of the female
D - Eggs in uterus

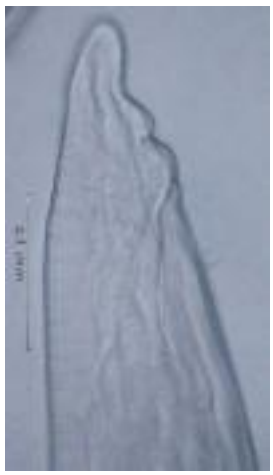


- A -

-B-

Fig.(2): ***Epomidiostomum uncinatum***
A – Anterior end
B – Posterior end of male

- A -



-B-

- C -

Fig.(3): ***Hadjelia truncata***
A – Anterior end
B – Posterior end of female
C – Eggs and vulva

نسبة و شدة الإصابة بثلاثة أنواع من ديدان القانصة الخيطية لطير الخضيري *Anas Platyrhynchos* L., 1758 في محافظتي ديالى و الديوانية وسط العراق

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قبل البحث في: 13 أذار 2011

الخلاصة

تم الحصول على ثلاثة أنواع من الديدان الخيطية هي: *Amidostomum acutum* ، و *Epomidiostomum uncinatu* ، و *Hadjelia truncata* من افراد بط الخضيري المشتية في وسط العراق.

أعطي وصف مختصر للطفيليات مع بعض الملاحظات عن نسبة وشدة الإصابة وتمت مناقشة المعلومات في ضوء البحوث ذي العلاقة.

الكلمات المفتاحية : العراق ، ديدان القانصة ، بط الخضيري ، *Amidostomum acutum* ، *Hadjelia truncata , Epomidiostomum uncinatum*