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Recording of three species of the Contracaecum genus in Phalacrocorax pygmaeus and Phalacrocorax carbo in Basrah province

Duaa A. Hlail, Basim H. Abdullah*

Department of Biology, College of Education for pure Sciences, University of Basrah, Basrah, Iraq.

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K e y w o r d s :

Phalacrocorax, Contracaecum, Basrah.

A B S T R A C T

A total of 84 pygmy cormorant (Phalacrocorax pygmaeus) and 18 great cormorant (carbo) birds were hunted from the eastern Hammar marsh in Basrah province. These birds were examined, and it was found that they were infected with three types of nematodes: Contracaecum Phalacrocorax sp., C.microcephalum, C.rudolphii. The C.rudolphii species was compared with previous studies, while the other two species were considered new records.

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1. Introduction

Several types of Contracaecum Railliet & Henry, 1912 genus have been reported worldwide in many species of piscivorous birds including those of the Phalacrocoracidae family [1]. Their life cycle is heterogeneous, involving carnivorous birds or Snails (definitive hosts), small crustaceans (first intermediate host), and fish (second intermediate host). Birds usually get infected by eating fish that contain third stage (L3) larvae, and fish are infected by eating other crustaceans that contain second stage (L2) larvae (Anderson, 2000). Awad et al. [2] found out the infection of Phalacrocorax pygmaeus with two unidentified species of the Tetrameres genus. Al-Moussawi & Mohammad [3] further recorded the infection of Phalacrocorax carbo in Baghdad with Contracaecum rudolphii. In addition, Al-Tameemi [4] recorded the infection of Phalacrocorax pygmaeus and Phalacrocorax carbo birds with Contracaecum sp.

This study aims to shed more light on the parasites that infect Cormorant (Phalacrocorax) birds in the Eastern Hammar Marsh in Basrah and compare them with previous studies.

2. Methodology

A total of 102 Phalacrocorax pygmaeus and Phalacrocorax carbo birds were hunted with a hunting rifle in Eastern Hammar Marsh (northern Basra) from January 2021 to April 2022. These birds

***Corresponding author email : basim.abdullah@uobasrah.edu.iq**

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were dissected in search of parasitic worms, and the isolated worms were placed in a 0.9% physiological solution to loosen their parts, then preserved in alcohol (70% concentration) until they were prepared for taxonomic study. Glycerin was also used to clarify the internal features of worms after loading them between the glass slide and its cover according to the method of Abdullah [5] without the need to dye the worms. The diagnosis of parasitic worms was based on Yamaguti [6], Anderson et al. [7] and Gibbons [8].

3. Results and Discussion

A total of 84 Phalacrocorax pygmaeus and 18 Phalacrocorax carbo birds were hunted from the eastern Hammar marsh in Basrah province. The hunted birds were examined in search of parasitic worms; as it was found out that the Phalacrocorax pygmaeus birds were infected with five Species of nematodes: Contracaecum sp, C. microcephalum, and C.rudolphii. As for the Phalacrocorax carbo birds, two Species of nematodes were found, belonging to the Contracaecum sp., C. rudolphii, C. microcephalum genus. See Table (1)

The following is the taxonomic position of the helminths recorded in the current study:

Phylum: Nematoda (= Nemathelminthes)

Order: Ascarididae

Family: Heterochilidae

Genus: Contracaecum

Species: C.rudolphii

Species: C.microcephalum

Table (1). Type, percentage, and average severity of parasite infection

Host	Worms Group	Parasitic Worms Scientific Name	Percentage of Infection	Average Severity of Infection
P.ygmeu	Nematode	Contracaecum sp.	14.3	3
	Nematode	C.rudolphii	47.6	9.9
	Nematode	C. microcephalum	40.5	8.1
P. carbo	Nematode	Contracaecum sp.	66.6	12.1
	Nematode	C.rudolphii	100	17.6
	Nematode	C. microcephalum	100	20.8

The following is a description of the species recorded in the current study, noting that all measurements are in (mm) except for what is mentioned otherwise in the text.

4. Contracaecum spp.

164 specimens of this nematode (male); 146 of which were found in the giblets of Phalacrocorax carbo birds with an infection rate of 66.6% and an infection severity rate of 12.1. The rest of 18 specimens are in Phalacrocorax pygmaeus birds with an infection rate of 7.1% and an average infection severity of 3. See fig (1).

4.1. Males

Cylindrical nematodes that are 5.3–40.6 in length, and 0.32–1.50 in width. The head diameter is 0.08–0.51; and the lip length is 0.031–0.21. The distance between the nerve ring and the anterior end is 0.21–0.75; while the posterior distance is 0.19–0.43. The two spicules of nematodes are approximately of equal length (0.98–3.91); or otherwise, there is one spicule with a length of 2.9. The papillae are present in the tail region, which are conical at the end.

4.2. Females

Length of nematodes is 10.8–41.3; the width is 0.17–1.5; the head diameter is 0.11–0.35; the lip length is 0.05–0.28; and the distance between the nerve ring and the anterior end is 0.38–0.77. The tail is longer than that in males and it narrows gradually. The distance between the anus hole and the posterior end is 0.21 – 0.65.

The Contracaecum spp. genus is one of the large genera in the Ascaridoidea superfamily, which includes about 50 different species [9], most of which are parasitoid in fish-eating birds, a few in marine mammals such as seals, and rarely in dolphins [10]. The problem facing workers in the field of classifying the species of this genus is the lack of phenotypical traits adopted in distinguishing between species [11].

Hartwich [12] created a new taxonomic system at that time for genera of the Ascaridoidea superfamily, based on the morphology of the excretory system, then [13] modified the species of the Contracaecum genus after presenting a complete list of synonymous species and their hosts; classifying all the species of this genus into five main categories, depending on the characteristics of lips and labia, shape of the distal end of the spicule, number and distribution of post-cloaca tail papillae.

Nematodes of the Contracaecum genus, in their adult stages, infect a wide range of piscivorous birds as well as mammalian hosts associated with fresh birds, including cormorants, pelicans, and phocidae, Anderson [21]

As for records of species of this genus in Iraq, the first record of adult worms was made by Al-Hadithi and Habish [14] who recorded C. micricephalum on Purple Heron (Ardea purpurea) in Basrah Province, southern Iraq. From the same bird and same governorate, Al-Hadith and Abdullah [14] [5] recorded the C. ovale species. Also in Basrah, Awad et al. [2] recorded the C.spiculigerum, C.microcephalum and C.multipapillatum species from the Phalacrocorax pygmaeus birds and C.microcephalum from the Little Egret (Egretta garzetta). Mhaisen [15] indicated that the Contracaecum spp. genus is found in Phalacrocorax carbo, Great Whit Egret (Egretta Alba), Little Egret (Egretta garzetta), Pelecanus onocrotalus, Platalea leucorodia, and Common Greenshank (Tringa nebularia). Abed [16] recorded three types of the latter genus from Phalacrocorax carbo in Baghdad and Babil Provinces. Ali [17] listed three species of the C.microcephalum genus found on Eurasian Bittern (Botaurus stellaris), Little Egret (Egretta garzetta), Ardeola ralloides; as well as C.microcpapillatum from grey heron (Ardea cinerea), Eurasian Bittern (Botaurus stellaris); and the C. ovale from Eurasian Bittern. This genus was also recorded by Al-Tameemi [4] in Phalacrocorax pygmaeus and Phalacrocorax carbo birds.

5. Contracaecum Rodolphii (Hartwich,1964)

A total of 373 specimens of this nematode were found in the giblets of Phalacrocorax pygmaeus and Phalacrocorax carbo birds; 200 in females and 150 in males, with an infection rate of 100% in Phalacrocorax carbo and 47.6% in Phalacrocorax pygmaeus birds. See Tables (2),(3) and fig (2).

5.1. Males:

Cylindrical nematodes that are 10.8–30.3 in length, 0.52–0.97 in width, with a head diameter of 0.14–0.31, and a lip length of 0.046–0.11. The distance between the nerve ring and the anterior end is 0.37–3.88. There are 7 pairs of papillae in the tail region that is conical at the end, 0.28–0.37.

5.2. Females:

Relatively larger than males, their length is 30.5–40.3, the width is 0.97–1.5, and the head diameter is 0.20–0.31. The lip length is 0.088–0.13 and the distance between the nerve ring and the anterior end is 0.58–0.71. The vulva is located in the anterior third of the body with a distance of 11.21–13.81 from the anterior end. The tail is longer than that in males and it narrows gradually. The distance between the anus hole and the posterior end is 0.31–0.45.

Table (2). showing the numbers of male and female nematodes C. rodolphii, number of immature specimens, with the infection percentage and severity

	P.pygmeus	**P.carbo**
Number of female C. rodolphii	103	117
Number of male C. rodolphii	89	61
Immature C. rodolphii	5	18
Infection percentage	47.6%	100%
Infection severity rate	9.9	17.6

Most of the characteristics of C. rudolphi samples in this study are closely related to those reported by Amato et al. [18] by the presence of the same shape of the head, lips, labia, bifurcation at the base, excretory pores, distribution of papillae on the tail of the male, the shape of the posterior end of the spicules, the length of the body, the esophagus and the tail. The latter author also indicated that the distal end of the spicules and the number and position of the caudal papillae confirm the specification of this type.

On the other side, regarding records of this species in Iraq, Awad et al. [2] recorded the species C. rudolphii and C. multipapillatum on the Phalacrocorax pygmaeus birds in Basrah, as well as finding immature larvae of the Contracaecum genus in the secreting stomachs of each Platalea leucorodia and Great Whit Egret (Egretta Alba). Mhaisen [15] also recorded immature stages in the Phalacrocorax carbo birds; in addition to as recorded Al-Moussawi et al. [19] who recorded this species in Phalacrocorax carbo birds from Baghdad region, central Iraq. Furthermore, in Poland, Kanarek and Bohdanowicz [20] reported that the stomach of Phalacrocorax carbo birds contained adult C. rudolphii larvae identified as third (L3) and fourth (L4) larval instars. The mentioned larval stages were identified in the current study in Phalacrocorax pygmaeus and Phalacrocorax carbo birds.

Table (3). Comparison of the parasite C.rodolphii recorded in the current study with the study of Al-Moussawi et al [3]

Parasite Dimensions (Male)	**C.rodolphii in Al-Mousawi (2011)**	**C.rodolphii in Current Study**
Parasite length	24.3–34.2 (26.02)	10.3–30.3
Parasite width	0.63–0.86 (0.74)	0.52–0.97
Head diameter	0.17–0.26 (0.21)	0.14–0.31
Lip length	0.067–0.109	0.11–0.046
Spicule length	6.4–8.1 (7.5)	0.73–3.88
Nervous ring distance to body front	0.46–0.58 (0.52)	0.61–0.37
Tail length beyond body length	0.16–0.26	0.37–0.28

Parasite Dimensions (Female)		
Parasite length	32.4–59.8	30.5–40.3
Parasite width	0.99–1.83	0.97–1.5
Head diameter	0.22–0.33	0.20–0.31
Lip length	0.10–0.15	0.088–0.13
Nervous ring distance to body front	0.62–0.78	0.58–0.71
Distance between the vulva opening and the front end	11.49–15.54	11.21–13.81
Distance between the anus hole and the posterior end	0.25–0.36	0.31–0.45
Infection percentage	91.7	100 in P.carbo 47.6 in P.pygmeus
Host	Phalacrocorax carbo	Phalacrocorax pygmaeus & Phalacrocorax carbo

6. Contracaecum microcephalum (Rudolphi,1809)

A total of 305 specimens of this nematode were found in the giblets, 138 of which (90 females, 48 males) are in Phalacrocorax pygmaeus, with an infection rate of 40.5% and an average infection severity of 8.1. The rest of 188 specimens (110 females, 78 males) are found in Phalacrocorax carbo with an infection rate of 100% and an infection severity rate of 20.8.

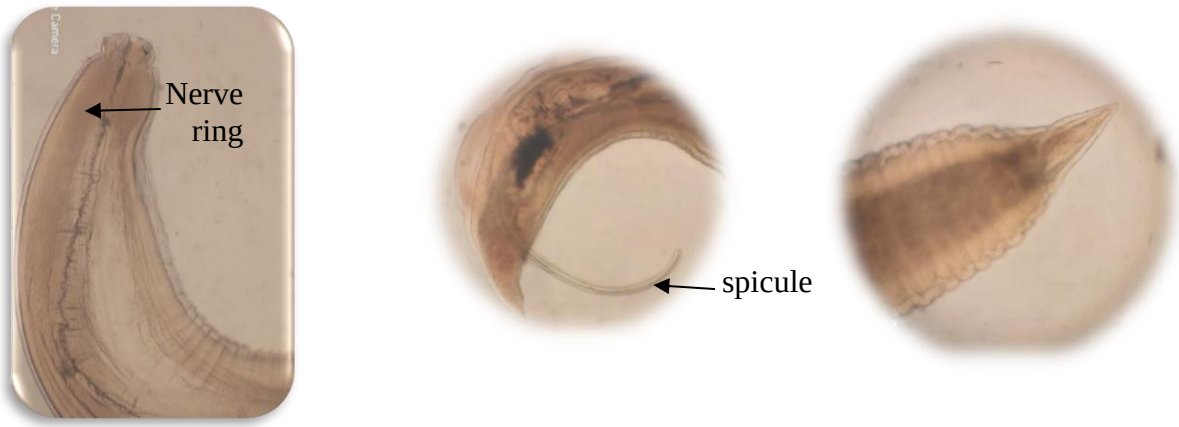

Fig. 1. *Contracaecum* spp.(40X)

a) Head b) Posterior end of male c) Posterior end of female

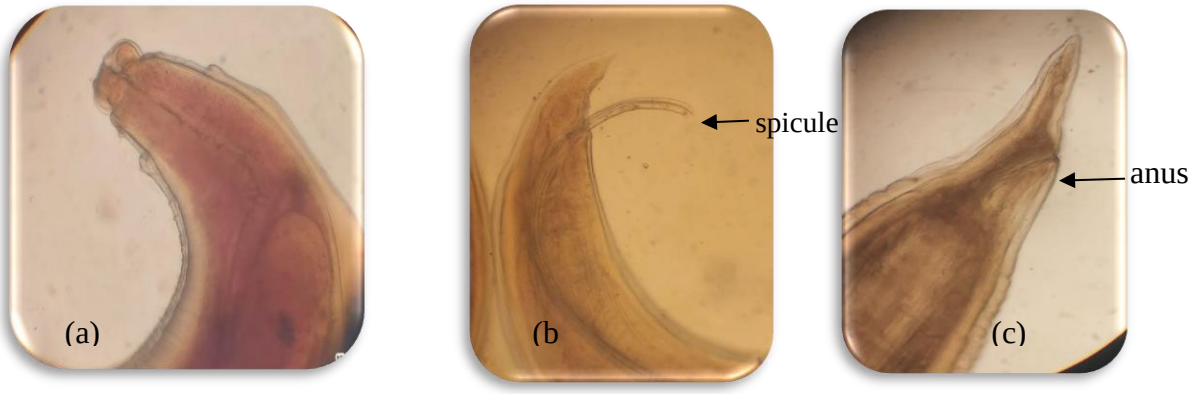

Fig. 2. *Contracaecum Rodolphii* (40X)

a) Head b) Posterior end of male c) Posterior end of female

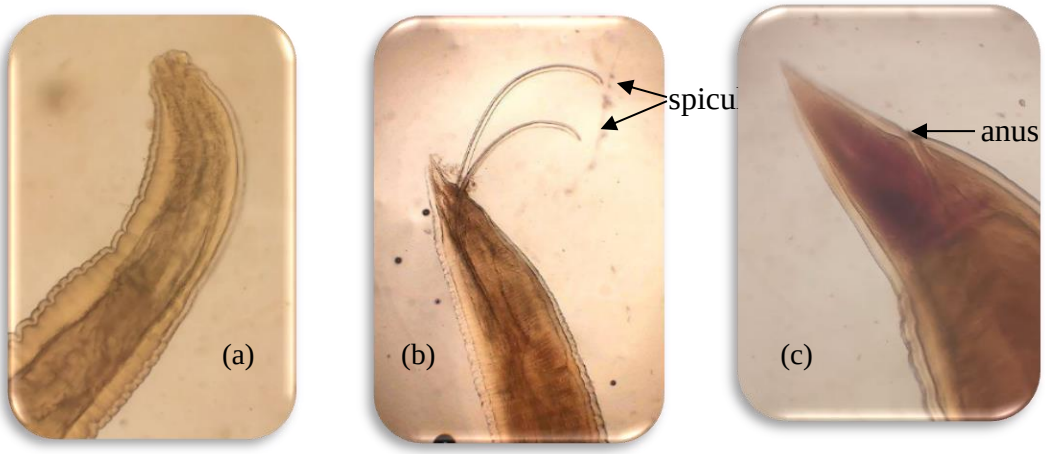

Fig. 3. Contracaecum microcephalum (40X)

a) Head b) Posterior end of male c) Posterior end of female

7. Conclusions

1- Since common crows are 100% infected with nematodes, while dwarf crows are 59% infected, thus these birds pose a threat to fish farms and wild and domestic birds in the region.
2- The current study has proven the role of waterfowl in introducing new types of parasites to the region, by recording new species.

8. References

[1] E. Abollo, C. Gestal, and S. Pascual, "Anisakid infection in the European shag Phalacrocorax aristotelis aristotelis," Journal of Helminthology, vol. 75, pp. 209-214, 2001.Doi:https://doi.org/10.1079/JOH200051

[2] A. Awad, B. A. Abdullah and S. H. Al-Mayah, "Some nematodes parasitized in seven species of aquatic brids in Iraq, Basrah," Journal of Zheijang University SCIENCE B - Biomedicine & Biotechnology, vol. 12, pp. 63-70, 1994.

[3] A. A. Al-Moussawi and M. K. Mohammad, "Contracaecum rudolphii Hartwich, 1964 (Nematoda: Anisakidae) in the cormorant Phalacrocorax carbo (Linnaeus, 1758) wintering

in Baghdad area: A new host record in Iraq," Bulletin of the Iraq Natural History Museum, vol. 11, pp. 7-16, 2011.
[4] Al-Tameemi and I. Amer., "Helminthes parasitized of some aquatic birds & the impotance of insects in the life cycle of some of them in Basrah province.," M.Sc. Thesis, Univ, Basrah: pp 219., (in Arabic)., Basrah, 2013.
[5] B. Abdullah, "A study on parasites of some aquatic birds in Basrah," 1988.
[6] S. Yamaguti, "Systema Helminthum. Vol III The nematodes of Vertebrat es. Part I+II.," Intersci Publ. Inc. Ltd, New York, 1961.
[7] R. C. Anderson, A. G. Chabaud, S. Willmott, and C. A. Bureaux, CIH keys to the nematode parasites of vertebrates vol. 1: Commonwealth Agricultural Bureaux England, 1974.
[8] L. Gibbons, "Keys to the nematode parasites of vertebrates: Supplementary volume. CAB Int., Wallingford, 416pp," ed, 2010.
[9] S. D'AMELIO, N. Barros, S. Ingrosso, D. Fauquier, R. Russo, and L. Paggi, "Genetic characterization of members of the genus Contracaecum (Nematoda: Anisakidae) from fish-eating birds from west-central Florida, USA, with evidence of new species," Parasitology, vol. 134, pp. 1041-1051, 2007. Doi:https://doi.org/10.1017/S003118200700251X
[10] S. A. Nadler, S. D'Amelio, H.-P. Fagerholm and B. &. P. L. Berland, "Phylogenetic relationships among species of Contracaecum Railliet & Henry, 1912 and Phocascaris Høst, 1932 (Nematoda[ratio]Ascaridoidea) based on nuclear rDNA sequence data," Cambridge University Press, Newyork, 2000.
[11] H. Fagerholm, R. Overstreet, and I. Humphrey-Smith, "Contracaecum magnipapillatum (Nematoda, Ascaridoidea): resurrection and pathogenic effect of a common parasite from the proventriculus of Anous minutus from the Great Barrier Reef, with a note on C. variegatum," 1996.
[12] G. H. Hartwich, "Zurschlauchwrmer Nemat helminthes, Nematota,Parasitische rundulur mer von wirbbeltieren l: Rhabditida und Ascaridida. die Terwell.," Deuschlands, 1957. Doi:https://doi.org/10.1007/BF00716406
[13] G. H. Hartwich, "Revision der vogelparasitischen Nematoden Mitteleuropas. II. Die Gattung Contracaecum Railliet & Henry, 1912 (Ascaridoidea). Mitt. Zool. Mus," Berlin, 1964.
[14] I. A. W. &. H. A. H. Al-Hadithi, "Observations on nematode parasite (Contracaecum sp.) in some Iraqi fishes," Bull. Basrah Nat. Hist., 1977.
[15] F. T. MHAISEN, "of Basrah Province Marshy Area, Iraq," Jpn. J. Parasitol, vol. 43, pp. 274-279, 1994.
[16] J. Abed, "Biological and ecological survey of some enemies of fishes in three fish farms in Iraq," Ph. D. Thesis, Coll. Agric., Univ. Basrah: 111 pp.(In Arabic), 2005.
[17] A. Ali, "Taxonomy of helminth parasites in some marine and freshwater fishes and the relation of some of its with their final hosts in southern of Iraq," Ph. D. Thesis, Coll. Agric., Univ. Basrah: 336 pp.(In Arabic), 2008.
[18] J. F. Amato, C. M. Monteiro, and S. B. Amato, "Contracaecum rudolphii hartwich (nematoda, anisakidae) from the neotropical cormorant, Phalacrocorax Brasilianus (Gmelin)(aves, Phalacrocoracidae) in southern Brazil," Revista Brasileira de Zoologia, vol. 23, pp. 1284-1289, 2006. https://doi.org/10.1590/S0101-81752006000400046
[19] A. A. Al-Moussawi and M. K. Mohammad, "Contracaecum rudolphii Hartwich, 1964 (Nematoda: Anisakidae) in the cormorant Phalacrocorax carbo (Linnaeus, 1758) wintering in Baghdad area: A new host record in Iraq," Bulletin of the Iraq Natural History Museum, vol. 11, pp. 7-16, 2011.
[20] G. Kanarek and J. Bohdanowicz, "Larval Contracaecum sp.(Nematoda: Anisakidae) in the Great Cormorant [Phalacrocorax carbo (L., 1758)] from north-eastern Poland: A morphological and morphometric analysis," Veterinary parasitology, vol. 166, pp. 90-97, 2009. https://doi.org/10.1016/j.vetpar.2009.08.002
[21] R. Anderson, "Nematoda parasites of Vertebrates," Their development and transmission. New York: CAB International, vol. 650, 2000.

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تسجيل ثلاث أنواع من جنس Contracaecum في طيورغراب البحر الاقزم Phalacrocorax pygmaeus وغراب البحر العادي Phalacrocorax carbo في محافظة البصرة

دعاء عبدالحسين هليل، باسم هاشم عبدالله*

قسم علوم الحياة، كلية التربية للعلوم الصرفة، جامعة البصرة، البصرة، العراق.

معلومات البحث

الاستلام 14 اذار 2023
القبول 26 ايلول 2023
النشر 30 حزيران 2024

الكلمات المفتاحية

غراب البحر ، البصرة ، الخيطيات.

الملخص

تم اصطياد84 طيرا من غراب البحر الاقزم و18 طيرا من غراب البحر العادي من منطقة هور الحمار الشرقي في محافظة البصرة جنوب العراق. فحصت هذه الطيور بحثا عن الديدان الخيطية حيث وجد إصابة غراب البحر الاقزم وغراب البحر العادي بثلاث أنواع من الخيطيات وهي: Contracaecum sp. C.microcephalum, C.rudolphii جرى مقارنة النوع C.rudolphi مع الدراسات السابقه بينما عد النوعان الاخران تسجيل جديد.

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***Corresponding author email : basim.abdullah@uobasrah.edu.iq**

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