

First Record of *Dichelyne (Cucullanellus) tripapillatus* (Nematoda: Cucullanidae) Parasitic in King Soldier Bream *Argyrops spinifer* (Pisces: Sparidae) in Arabian Gulf, off Iraq

Jawad A. Mizher & Atheer H. Ali*

Department of Fisheries and Marine Resources, College of Agriculture,
University of Basrah, Basrah, Iraq

*Corresponding author: atheeralibu@gmail.com

Abstract: A total of 42 specimens of *Argyrops spinifer* were caught from Iraqi territorial waters during the period from October 2019 till September 2020. The adult nematodes were isolated from the infected fishes. Morphological features of both males and females of nematodes matched with that of *Dichelyne (Cucullanellus) tripapillatus* (Gendré, 1927). This nematode is distinguished by the location of nerve ring in relation to the length of oesophagus, as well as the distribution of the ten caudal papillae of males. The record of this species and its subgenus represent its first one in the Arabian Gulf and Iraq.

Keywords: Parasites, Marine Fishes, Sparidae, Nematodes, *Dichelyne*, Iraq

Introduction

King soldier bream, locally named Endek, is an economically important fish desirable for the Iraqi consumer and the female has the ability of sex reversal during its late age (Khalaf et al., 2020). This teleost spreads in the western Pacific and Indian regions to northern Australia. Fries are usually shallow water dwellers, while adults are deep water bottom dwellers, and feed on invertebrates, especially molluscs and crustaceans (Froese & Pauly, 2021).

Parasitic studies dealt with *Argyrops spinifer* (Forsskål) are few in the Arabian Gulf Region. This fish were found to be infected with trematodes and larvae of nematodes (Saoud et al., 1986; Petter & Sey, 1997; Sey et al., 2003; Kardousha, 2016).

The family Cucullanidae includes three genera: *Cucullanus*, *Dichelyne* and *Oceanicucullanus*. *Dichelyne* is a global genus with 36 valid species parasitize many species of teleosts from different habitats, including marine, river and brackish waters (WoRMS, 2021).

Two species and one unidentified species of *Dichelyne* were recorded from fishes of Arabian Gulf: Petter & Sey (1997) recorded *D. (Dichelyne) exiguus* (Yamaguti, 1954) from *Otolithes argenteus* (= *O. ruber*) (Sciaenidae) and *Dichelyne (D.)* sp. from the snapper *Lutjanus coccineus* (= *Lutjanus sanguineus*)

(Lutjanidae) from Kuwaiti water. Moravec et al. (2014) described *Dichelyne* (*D.*) *spinigerus* from *O. ruber* off Iranian coasts.

Cucullanidae species reported in Iraq are all belong to *Cucullanus*, with three species and two unidentified species viz., *C. armatus* Yamaguti, 1954 from *Netuma thalassina* (Ali, 2008; Al-Salim & Ali, 2011), *C. extraneus* Li, Ali, Zhao, Lü, & Xu, 2017 was described as a new species from *Pomacanthus maculosus* (Li et al., 2016), *C. otolithi* (Ashraf, Khanum & Farooq, 1977) from *O. ruber* (Al-Daraji, 1995, Ali et al., 2014); *Cucullanus* sp. 1 from *Lethrinus nebulosus* (Ali, 2008; Ali et al., 2014) and *Cucullanus* sp. 2 from of two sparids; *Acanthopagrus arabicus* and *A. spinifer* (Al-Hasson, 2015; Mhaisen et al., 2018; Al-Hasson et al., 2019).

Local studies of parasites of king soldier bream were rare. Al-Hasson (2015) and Al-Hasson et al. (2019) isolated *Cucullanus* sp., *Hysterothylacium* sp. type BA, *Hysterothylacium* sp. type BC and unidentified mazocraeid monogenoidea. Bannai (2018) recorded *Gnathostoma binucleatum* Almeyda-Artigas, 1991. However, it is known that the spiny body is a distinguishing character between *Gnathostoma* and *Echinocephalus* (Anderson et al., 2009). It was impossible to see that in the photos of figure 2, and no mention to this character was given in the brief description of *G. binucleatum*. So, such specimens may belong to *Echinocephalus*.

The present parasitological survey of endoparasitic helminths of marine fishes of Iraq, revealed of one interest nematode record. It was identified as *Dichelyne* (*Cucullanus*) *tripapillatus* from the intestine of *A. spinifer*. This is the first record of this parasite in fishes of the Arabian Gulf. So, comprehensive descriptions of its male and female specimens were given.

Materials and Methods

A total of 42 specimens of *A. spinifer* were caught from Iraqi marine waters during the period from October 2019 to May 2020, for parasitic worm's examination. The helminths were isolated from intestine of a single fish host, cleaned with tap water and fixed with 4% hot formalin. After two days, parasites were transported to 70% ethanol. The worms were cleared by 1:9 glycerin-water solution (Moravec, 1994). The illustrations were made using camera Lucida mounted on Leica compound microscope. All measurements are in micrometers, with mean between parentheses.

Results

Dichelyne (*Cucullanellus*) *tripapillatus* (Gendré, 1927) Törnquist, 1931

Host: *Argyrops spinifer*

Site of infection: intestine

Prevalence and mean of intensity: 2.5% and 4, respectively.

Deposition: Iraq Natural History Research Center and Museum, SN: INHM-NC22-NC225.

Description (Fig. 1)

White-coloured worms, small-length characterized by a thick cuticle 30-50 at the front of the body and 15-20 at the middle and posterior ends of the body. Maximum

width of the body at the middle, the body narrows after the middle to be tapered at the posterior end (Figs. 1B-1E), ala absent. The anterior end is rounded, the mouth is large ventrodorsally forming vertical incision at the level of the body, denticles up to 40 on each inner side of the mouth. Anterior part of the oesophagus is much distended forming false oral capsule (= oesophastome) ending with the nerve ring that surrounds the oesophagus almost in the middle (Fig. 1A). The posterior end of oesophagus is also distended but less breadth than that of anterior part of esophagus. The oesophagus connects to the intestine through a small valve (Fig. 1A). Intestinal cecum in some specimens reaches the level of the nerve ring, deirids in the middle of the distance between the end of the oesophagus and the nerve ring, the excretory pore opens at the level of the posterior end of the esophagus, abdominal muscular sucker present and the conical tail has a sharp end in both sexes (Figs. 1B, 1C & 1E).

Male (Fig. 1)

Based on three specimens, body length 4200-6760 (5570), maximum width 390-600 (480), oesophagus length 750-960 (857) forming 14.2-17.8% (15.7%) of the total length of the body, oesophastome width 100-120 (110) and its length 150-220 (183), oesophagus width at the nerve ring level and at the posterior end is 70-100 (87) and 90-120 (103), respectively. The nerve ring and deirids 350-390 (363) and 650-970 (807), respectively from the anterior end of the body, intestinal cecum length 350-450 (400), distance between the mid-ventral sucker and cloacal opening 420-700 (557), the cloacal opening surrounded by elevated lips. Spicules, similar and equal 850-900 (883) in length and 13.3-20.2% (16.4%) from body length, Gubernaculum short, rod-like shaped, 27-40 (35), caudal papillae 10 pairs arranged as follows: Precloacal papillae consist of four pairs, one pre ventral sucker and three pairs between the sucker and cloacal opening, four pairs of paracloacal papillae; fourth and fifth subventral, The sixth ventral on both sides of the cloacal opening and the seventh sublateral, the postcloacal papillae consist of three pairs located at the end of the tail, eighth and tenth subventral, while the ninth pair lateral. Pair of phasmids on the middle of the tail. Tail conical with sharp end, 120-200 (166) in length.

Female (Fig. 1)

Based on one specimen, body length 6030 and maximum width 580, total oesophageal length 1020 and constitutes 16.9% of the total length of the body, oesophastome length 200 and width 215, width of the oesophagus at the level of the nerve ring, and at the posterior end 100 and 200, respectively. The nerve ring, deirids and excretory pore located 400, 850, and 930, respectively from anterior extremity, the length of the intestinal cecum 270, vulva elevated, post equatorial, 3700 with a ratio 61.4% from the anterior end, vagina is 240 long and the nearby eggs are oval 35-60 (49) x 30-43 (37), tail 270 in length.

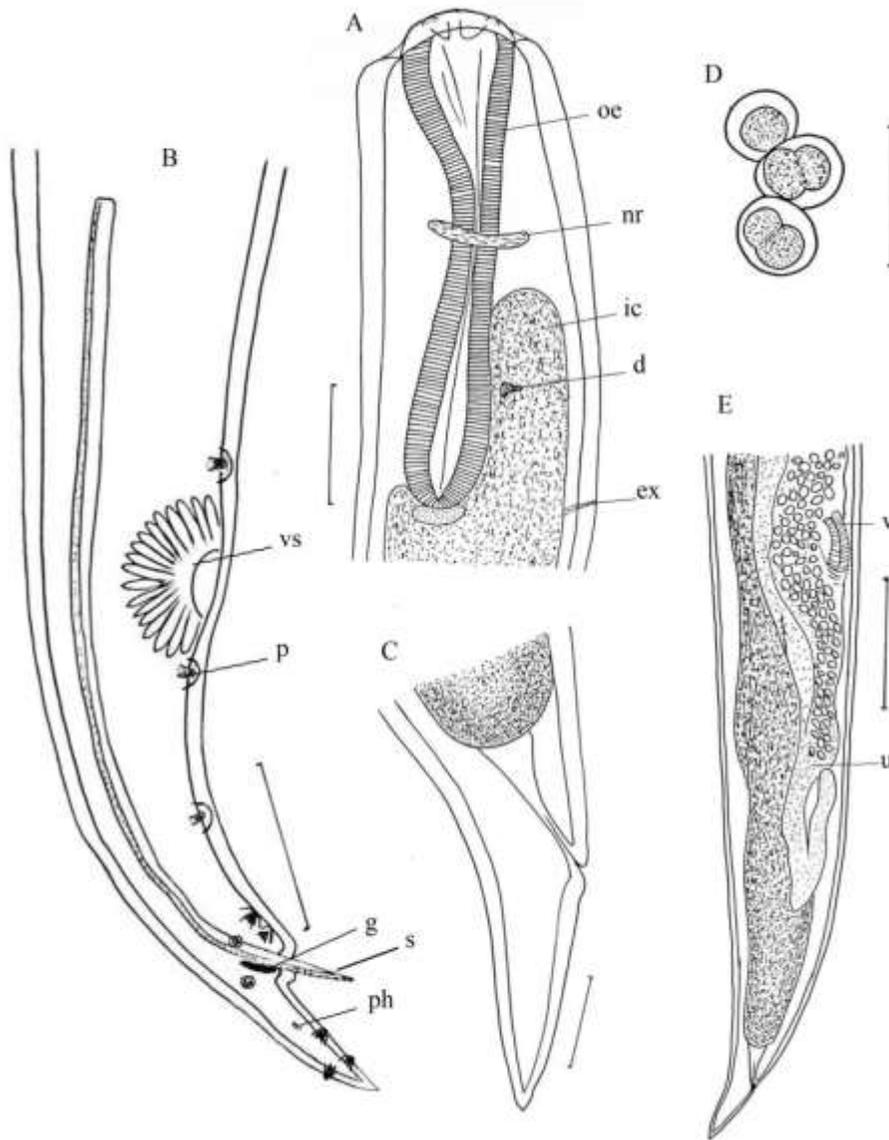


Figure 1: *Dichelyne (Cucullanellus) tripapillatus* male from *A. spinifer*. A- Anterior part, lateral, B-posterior end, lateral, C- female: Posterior end, D-eggs, E- Posterior part of female, Abbreviations: d: deirid, ex: excretory pore, g: gubernaculum, ic: intestinal cecum, nr: nerve ring, oe: oesophagus, p: papilla, ph: phasmid, s: spicule, u: uterus, v: vulva, vs: ventral sucker. Scale bar: A and B= 200 μ m, C and D= 100 μ m, E= 500 μ m.

Discussion

The current specimens are small in size, characterized by an expansion at the beginning of the oesophagus and have intestine cecum and thick cuticle, that falling them within the genus *Dichelyne*. This genus is one of the three genera of Cucullanidae (Anderson et al., 2009).

Petter (1974) divided *Dichelyne* into three subgenera: *Neocucullanellus*, *Cucullanellus* and *Dichelyne*, depending on the presence or absence of ventral sucker and on the number and distribution of caudal papillae in the male. The present specimens are included within the subgenus *Cucullanellus* due to the possessing of precloacal ventral sucker and 10 pairs of papillae, the first pair being close to the ventral sucker.

Isbert et al. (2015) presented the species of *Dichelyne (Cucullanellus)* with the families of their hosts and the original geographical locations; three species were recorded as parasites of Sparidae. These were *D. (C.) adriaticus* (Törnquist, 1931) in the gilthead seabream *Sparus aurata* from the Mediterranean Sea off the Italian coast, *D. (C.) jialaris* Luo, Guo, Fang & Hang, 2004 in red seabream *Pagrus major* from the Taiwan Strait off China and *D. (C.) tripapillatus* (Gendre, 1927) in the zebra seabream *Diplodus cervinus* of the East Atlantic Ocean at the Mauritanian Coast.

The morphological characters of the current nematode agreed with the description of *D. (C.) tripapillatus*, which was historically recorded from three species of sparids excluded type host, *Sepioloa rondeleti* (= *Pagrus auratus*), *Chysophrys aurata* (= *Sparus aurata*) and *Chaetodon bifasciatus* (= *Acanthopagrus bifasciatus*) (Ivashkin & Khromova, 1976) and from *Diplodus sargus* (Sparidae) in the Adriatic Sea off the coast of Montenegro by Petter & Radajković (1989).

D. (C.) tripapillatus differs from *D. (C.) adriaticus* by smaller lengths (1900-3700 vs. 2400-6760). *D. (C.) tripapillatus* differs from *D. (C.) jialaris* described in by Luo et al. (2004) and re-described by Moravec et al. (2018) in nine species of fishes belonging to the Sparidae of East Asian waters, by smaller length (6760 compared to 5800) and the site of the nerve ring for the oesophagus (40-46% compared to 51-68.8%). Deirid distance from anterior end is slightly shorter than in the current study samples, while the length of the spicules to the body was slightly shorter than that of *D. (C.) jialaris* (13-20.2% compared with 18-21%). Moravec et al. (2018) also mentioned some characters that were not described in the original description, including eggs that were 72-81 x 42-51, which are larger than that in *D. (C.) tripapillatus* (35-60 x 30-43).

Terminology related to measurements associated with the male ventral sucker varied between various global studies; from the beginning of the sucker to the end of tail (Isbert et al., 2015), mid-sucker to end of tail (Luo et al., 2004), mid-sucker to the beginning of the cloaca (Li et al., 2014) or without giving importance to this character (Moravec et al., 2018).

It is worth mentioning that the morphological and genetic study of Li et al. (2014) on *D. (C.) pleuronectidis* (Yamaguti, 1935), which parasitizing flatfish *Pleuronichthys cornutus* in the South China Sea, showed that the length or loss of intestinal cecum in some specimens of *Dichelyne* species may be among the differences of the species, so caution should be exercised when distinguishing between the *Dichelyne* and *Cucullanus* genera based on this traditional characteristics. Based on the latter investigation, it can understand the reason why the caecum was absent or difficult to see in figure 3A and presented in plate 5A of

Cucullanus sp. of Al-Hasson et al. (2019) description. Even *Cucullanus* sp. 2 in *A. abrabicus* and *A. spinifer* by Al-Hasson et al. (2019) who accommodate their specimens in *Dichelyne* instead of *Cucullanus* based on female description only, differ from *D. (C.) tripapillatus* by length of body (10908 vs 6030) and distance of vulva to anterior end (95.8% vs. 61.4% from anterior extremity).

There have been no previous record of this nematode in Iraq or Arabian Gulf, so the current study is the first report of this subgenus and species in the region, and *A. spinifer* is a new host for *D. (C.) tripapillatus* in the World.

Acknowledgement

We thank Dr. David González-Solís of El Colegio de la Frontera Sur, unidad Chetumal, Mexico for confirming the identification of nematode, Dr. František Moravec of the Institute of Parasitology of the Biological Center of the Czech Academy of Sciences for providing some rare literature and translating one of them from German to English and Mr. Fouad M. Assi of the Iraqi Fishing Association for providing fish samples.

References

- Al-Daraji, S.A.M. (1995). Taxonomical and ecological studies on the metazoan parasites of some marine fishes of Khor Al-Zubair Estuary, north-west of the Arabian Gulf. Ph. D. Thesis, Coll. Agric., Univ. Basrah: 182 pp.
- Al-Hasson, H.A.H. (2015). Taxonomical and pathological studies on parasites of some perciform fishes in Iraqi marine waters. M. S. Thesis, Coll. Vet. Med., Univ. Basrah: 162 pp.
- Al-Hasson, H.A.; Al-Niaeem, K.S. & Al-Azizz, S.A. (2019). Occurrence of six larval nematode species from marine fishes of Iraq. Biol. Appl. Environ. Res., 3(2): 127-141.
- Ali, A.H. (2008). Taxonomy of helminth parasites in some marine and freshwater fishes and the relation of some of it's with their final hosts in southern of Iraq. Ph. D. Thesis, Coll. Agric., Univ. Basrah: 336pp. (In Arabic).
- Ali, A.H.; Mhaisen, F.T. & Khamees, N.R. (2014). Checklists of nematodes of freshwater and marine fishes of Basrah Province, Iraq. Mesopot. J. Mar. Sci., 29(2): 71-96.
- Al-Salim, N.K. & Ali, A.H. (2011). First record of three nematode species parasitized some marine fishes in Iraq. J. Basrah Res., (Sci.), 37(4 E): 17-26.
- Anderson, R.C.; Chabaud, A.G. & Willmott, S. (2009). Keys to the nematode parasites of vertebrates: Archival volume. CAB Int., Wallingford: 463 pp.
- Bannai, M.A.A. (2018). Gnathostomatoidea nematode: Parasite of *Sillago sihama* Forsskal, 1775, Sillaginidae, and *Argyrops spinifer* Forsskal, 1775, king soldier bream, in the Iraqi marine water fishes, with notes on clinical pathology and feeding habit of infection. Int. J. Mar. Sci., 8(20): 166-171. DOI:10.5376/ijms.2018.08.0020.
- Froese, R. & Pauly, D. (eds.). (2021). FishBase. *Argyrops spinifer* (Forsskal, 1775).

- Accessed through: World Register of Marine Species at: <http://www.marinespecies.org/taxdetails&id=218590> on 2021-04-16.
- Isbert, W.; Montero, F.E.; Carrassón, M. & González-Solís, D. (2015). *Dichelyne (Cucullanellus) romani* n. sp. (Nematoda: Cucullanidae) in notacanthid fishes from the Northeast Atlantic and Western Mediterranean. *Syst. Parasitol.*, 91(1): 35-47. DOI:10.1007/s11230-015-9556-1.
- Ivashkin, V.M. & Khromova, L.A. (1976). Cucullanata and Gnathostomatata of animals and man and the diseases caused by them. *Osnovy Nematodol.*, 27. Moscow: Nauka, 436 pp. (In Russian).
- Kardousha, M.M. (2016). Fish parasites of Qatari waters of the Arabian Gulf: Current status with an annotated checklist. *Int. J. Recent Sci. Res.*, 7(7): 12388-12393.
- Khalaf, K.A.S.; Al-Mudhaffar, R.A.A. & Jassim, F.K. (2020). Histological study of some internal organs and their relationship to the reproduction of king soldier bream, *Argyrops spinifer* (Forsskål 1775), Family Sparidae, from Iraqi marine waters. *Egypt. J. Aquat. Biol. Fish.*, 24(1): 407-419. DOI:10.21608/EJABF.2020.71124.
- Li, L.; Ali, A.H.; Zhao, W.-T.; Lü, L. & Xu, Z. (2016). First report on nematode parasite infection in the yellowbar angelfish *Pomacanthus maculosus* (Perciformes: Pomacanthidae) from the Iraqi coral reef, with description of a new species of *Cucullanus* (Nematoda: Ascaridida) using the integrated approaches. *Parasitol. Int.*, 65: 677-684. DOI:10.1016/j.parint.2016.08.007.
- Li, L.; Du, L.-Q.; Xu, Z.; Guo, Y.-N.; Wang, S.-X. & Zhang, L.-P. (2014). Morphological variability and molecular characterisation of *Dichelyne (Cucullanellus) pleuronectidis* (Yamaguti, 1935) (Ascaridida: Cucullanidae) from the flatfish *Pleuronichthys cornutus* (Temminck & Schlegel) (Pleuronectiformes: Pleuronectidae) in the East China Sea. *Syst. Parasitol.*, 87(1): 87-98. DOI:10.1007/s11230-013-9456-1.
- Luo, D.; Guo, S.; Fang, W. & Huang, H. (2004). Observations on a cucullanid nematode of marine fishes from Taiwan Strait, *Dichelyne (Cucullanellus) jialaris* n. sp. *J. Parasitol.*, 90(3): 608-611. DOI:10.1645/GE-166R.
- Mhaisen, F.T.; Ali, A.H. & Khamees, N.R. (2018). Marine fish parasitology of Iraq: A review and checklists. *Biol. Appl. Environ. Res.*, 2(2): 231-297.
- Moravec, F. (1994). Parasitic nematodes of freshwater fishes of Europe. Academia, Prague & Kluwer Acad. Publ., Dordrecht: 473 pp.
- Moravec, F.; Khosheghbal, M. & Pazooki, J. (2014). *Dichelyne (Dichelyne) pinigerus* sp. nov. (Nematoda: Cucullanidae) from the marine fish *Otolithes ruber* (Sciaenidae) off Iran and first description of the male of *Philometra otolithi* Moravec et Manoharan, 2013 (Nematoda: Philometridae). *Acta Parasitol.*, 59(2): 229-237. DOI:10.2478/s11686-014-0228-0.
- Moravec, F.; Nagasawa, K. & Madinabeitia, I. (2018). Redescription of *Dichelyne (Cucullanellus) jialaris* (Nematoda: Cucullanidae), a parasite of seabreams (Perciformes: Sparidae) in East Asia. *Acta Parasitol.*, 63: 802-807. DOI:10.1515/ap-2018-0097.

- Petter, A.J. (1974). Essai de classification de la famille des Cucullanidae. Bull. du Mus. Natl. d'Hist. Nat., 3e Serie, Zoologie, 177: 1469-1490.
- Petter, A.J. & Radajković, B.M. (1989). Parasites of marine fishes from Montenegro: Nematodes. Acta Adriat., 30(1-2): 195-236.
- Petter, A.J. & Sey, O. (1997). Nematode parasites of marine fishes from Kuwait, with a description of *Cucullanus trachinoti* n. sp. from *Trachinotus blochi*. Zoosystema, 19(1): 35-59.
- Saoud, M.F.A.; Ramadan, M.M. & Al-Kawari, K.S.R. (1986). Helminth parasites of fishes from the Arabian Gulf. 1. Preliminary general survey of fishes mainly from Qatari waters. Qatar Univ. Sci. Bull., 6: 199-229.
- Sey, O.; Nahhas, F.M.; Uch, S. & Vang, C. (2003). Digenetic trematodes from marine fishes off the coast of Kuwait, Arabian Gulf: Fellodistomidae and some smaller families, new host and geographic records. Acta Zool. Acad. Sci. Hung., 49(3): 179-200.
- WoRMS (2021). World Register of Marine Species at <http://www.marinespecies.org>. (Accessed 9 Mar. 2021).