THE LIBYAN JOURNAL OF AGRICULTURE
Volume (29): No. (1), 2024: 16 - 27

Original Article

Study on Some Parasitic Helminthes Infection in Red Mulluet Fish (*Mullus surmuletus* Linnaeus, 1758) From Al-Khums Coast, Libya

Abdusalam Saleh Abusdel[1], Milud Alsaid1, Ali F. Abuseliana[2] and Atia Ramadan Elkilany[1]

1- Department of Biology, Faculty of Science, ELmergib University, Libya.

2- Department of Aquaculture, Faculty of Agriculture, University of Tripoli, Libya.

Abstract

This study was aimed to identify some parasitic helminths (nematode and acanthocephalan) infecting *Mullus surmuletus* from the coast of the city of Al-Khums, Libya, and studying the relationship between the prevalence of some parasitic helminths and the variables of sex, body weight, and body length of *M. surmuletus*. One hundred and twenty three samples of *M. surmuletus* were collected randomly from ALkums cost during the period from April 2022 to May 2023. The weight and length of all fish were measured, and each fish was opened up dorso-ventrally. The sex of the examined fish was determined, and parasites were collected. The results revealed that four species of parasitic helminths were detected during the examination, three nematodes sp. (*Anisakis* sp. larva, *Contracaecum* sp. larva and *Hysterothylacium adecipiens*) and one species of Acanthocephalan (*Echinorhynchus gadi*). The result showed that the most common helminths with the highest infection rate were *Anisakis* sp. larva at 39.29%, followed by *H. adecipiens* at 21.05%, Contracaecum sp. larva at 28.58%, and *E. gadi* at 18.19%, respectively. The results of this study add information about some parasitic helminths that infect fish in the Libyan coast. This information, along with other studies, will contribute to understanding the spread of parasitic helminths and their impact on fish.

Keywords: Parasite helminthes, *M. surmuletus*, AL-khums, Libya.

Introduction

The striped red mullet, *Mullus surmuletus* (Linnaeus, 1758) (Perciformis: Mullidae), is considered one of the most abundant and widely distributed fish in the sublitoral zone along the Eastern Atlantic, from the North Sea to the northern part of West Africa and the Mediterranean Sea. (Klimpel *et al.*, 2008; Barreiro *et al.*, 2017). Helminths may harm their hosts in several ways, and can cause mechanical injury such as irritation and atrophy of tissues and blockage of the digestive tract, blood vessels or other channels associated with the digestive system, and may lead to a defect in the enzymes or hormonal activity of the host, affecting the growth rate and size of the fish, as well as suppressing the immune system (Hoole *et al.,*

Corresponding Author: Abdusalam Saleh Abusdel, Department of Biology, Faculty of Science, ELmergib University, Libya.
Phone: +218 942914554 Email: : a.abuseliana@uot.edu.ly
Received: 25/12/2023 Accepted: 23 / 5/ 2024

2003). Many parasitic helminths use fish either as their second intermediate host or as a paratenic (transport) host. These helminths complete their life cycle when their intermediate or paratenic host is ingested by definitive host, which is either another fish or some other vertebrate (Poulin and Valtonen, 2001). Commercial coastal fish parasites have rarely been studied in the coast of Al-khums, this research aims to give some information about some of parasitic helminthes that infect the *Mullus surmuletus*.

Materials and Methods

One hundred and twenty three samples of striped red mullet (*M. surmuletus*) were obtained from fishermen in the region of Al-Khums city, south of the Mediterranean Sea, Libya, during the period from April 2022 to May 2023. The samples were transported to the laboratory in a clean plastic bag for examination and identification according to Schultz, 2003. The total body length from the tip of the snout to the end of the caudal fin was measured to the nearest centimeter (cm), and body weight was measured to the nearest gram using electronic scale. After dissection, the sex of the examined fish was determined.

Samples were dissected and the abdominal cavities were examined, the internal organs were removed, separated into Petri dishes and washed well with saline (0.9%). The intestines were carefully opened looking for parasites, and their contents were examined using dissecting microscope. The collected nematodes were isolated, counted and their location were recorded, and then washed several times in physiological solution, and finally the samples were preserved in 70% ethyl alcohol. Nematode specimens were identified according to Anderson *et al.*, 2009.

Statistical analysis :

Data were computed and analyzed by using (SPSS) program. T-Test and Mann -Whitney U test were employed to find out the significances of the relationships between length, body weight and sex. The accepted level of significance was $P < 0.05$.

Results and discussion

From a total of 123 samples, only 58 (47.15%) were found to be infected with parasitic helminthes, and a significant difference between infected and non-infected fish was found. The result revealed that three species of nematodes helminth (*Anisakis* sp. larva, *Contracaecum* sp. larva, and *Hysterothylacium adecipiens*) and one species of acanthocephalan (*Echinorhynchus gadi*) were detected during the examination of the fish samples (Table 1).

Table1. Overall incidence of parasitic helminths in examined *M. surmuletus*.

Samples No.	Infected (%)	Non-infected (%)
123	58(47.15%)	65(52.85%)

The same parasitic helminth species were recorded to infect various fish species around the world (El-Daly *et al.*, 2004; Ahmed, 2010; Quiazon *et al.*, 2008; Felizardo *et al.*, 2009; Shamsi and Aghazadeh-Meshgi, 2011; Nada and Abd El-Ghany, 2011; Sobecka *et al.*, 2012;

Al-Zubaidy *et al.*, 2012; Adel *et al.*, 2013; Debenedetti *et al.*, 2013; Hassani, *et. al.*, 2015; Çelik and Oguz, 2021; Kassem *et al.,* 2023 and Almashay 2021). Red mullets are suitable hosts for a variety of parasitic helminth transferred through the marine food web, because of the benthic habitat of red mullet and the wide variety of prey they feed on, such as crustaceans, shellfish and small fish, which act as intermediate hosts for a large number of parasites (Ferrer-Castello *et al.*, 2007; Marcogliese, 2002).

The parasitic helminths that infect *M. surmuletus* have been studied, recorded, and identified by several researchers in the Mediterranean area. Figus *et al.*, (2005), in his research, identified 18 helminth species from *M. surmuletus* samples in Italy with an overall infection rate of 65.5%. Ferrer *et al.*, (2005) examined a collection of nematodes from *M. surmuletus* from 2 localities off the Valencian coast from the western Mediterranean coast of Spain. Bayomy *et al.*, (2008) collected and identified four species of helminth parasites from the coast of Sirt, Libya, with a 67.6% infection rate from the collected samples. Klimpel *et al.*, (2008) found fourteen different parasite species of *Mullus surmuletus* from the North Sea and the Mediterranean. Hassan (2019) also described Anisakidai in the *M. surmoletus* in Alexandria, Egypt as a new host, where 45 (37.5%) of the fish (120) were found to be infected with the parasite.

The current study found that the parasitic helminths infection rate in the fish tested was 47.15%. This rate was higher than that of the same fish species found in Sirt, Libya, recorded by Ahmed (2010), and Valero *et al.*, (2006) reported in their study an infection rate of 41.27%, and Paradzinik and Radujkovic (2007) reported a 33.33% infection rate, and lastly, Al-Bassel and Hussein (2012) reported a 31.5% infection rate in their study.

While other studies showed that their infection rates were higher than this study's results. Bayoumi *et al.*, (2008) reported a 67.6% infection rate from samples collected from the coast of Sirt, Libya, and a 65.5% infection rate of parasitic helmenths was reported by Figus *et al.,* (2005) in Italy; Hristovsky *et al.*, (1989) recorded a 50% infection rate; 67.6% were reported by Ahmed (2010); and Klimpel *et al.*, (2011) reported a 63.11% infection rate from fish samples. Also, our result was lower than those reported by Kassem *et al.*, (2023) with an 87.5% infection rate among *M. surmuletus* samples, Mansour *et al.*, (2003) from Egypt with an infection rate of 97.7%, and Felizardo *et al.*, (2009) with a 100% infection rate. The difference in data and results obtained in previous studies may be due to the difference in living environment, environmental and geographical distribution of fish, as well as the health and physiological state of the fish (Piaza *et al.*, 2006; Kayis *et al.*, 2009 and Kassem *et al.* 2023). Out of the total examined *M. surmuletus*, 42 males and 81 females were examined for parasitic helminths; both males and females were found to be infected with parasitic helminths. The result showed that the incidence

of infection was higher in males than females. The number of infected males was 19 out of a total of 42 male samples, and 39 females were found infected out of 81 female samples, at incidence rates of infection of 45.23% and 48.14% in males and females, respectively (Table 2). The results showed that there was no significant difference between incidence and sex.

Table 2. Relationship between infection and sex of examined fish.

	Samples No.	Infected / (%)	Non-infected / (%)
Male	42	19 (45.23%)	23 (54.77%)
Female	81	39 (48.14%)	42 (51.86%)
Total	123	58 (47.15%)	65(52.85%)

According to the current study, the prevalence of parasitic helminths infection was 48.1% in females and 45.2% in males. These results are similar to the results of previous studies conducted by Hassan et al. (2010), Al-Zubidy (2009) and Idris *et al.*, (2013). The difference in the infection rate between the sexes may be due to the difference in physiological status between females and males, which affects the quantity and type of food that fish eat, as well as the difference in degrees of resistance to infection between them (Emere and Egbe, 2006).

The results showed that, the most common parasitic helminthes with highest infection rate was *Anisakis* sp. larva with 39.29% of total infected fish, followed by *Hysterothylacium adecipiens* with 21.05% of total infected fish, and then *Contracaecum* sp. larva with 28.58% of total infected fish, then finally *Echinorhynchus gadi* with 18.19% of total infected fish (Table 3). All parasitic helminths were found attached to different site of the intestinal mucosa, liver and gonads but were not found in body cavity. Thirty-six (62.06%) of infected *M. surmuletus* had a single infection with one species of parasite, and twenty-two (37.14%) had a mixed infection with more than one parasite (Table 3). The highest single infection of parasitic helminths of *M. surmuletus* was detected in *Anisakis* sp. larva at an incidence rate of 39.29%, followed by *H. adecipiens* at 21.05% and *Contracaecum* sp. larva at 28.58%, and the lowest rate was detected in E. *gadi* at 18.19%. On the other hand, most mixed infections were observed between two species, *Anisakis* sp. larva and *H. adecipiens* (15.55%), *H. adecipiens* and *Contracaecum* sp. larva (10.34%), and *H. adecipiens* and *E. gadi* (6.90%), while mixed infections with three species were observed between *Anisakis* sp. and *H. adecipiens* and *E. gadi* (3.17%) (Tables 3, 4). The results showed that there was a significant difference between single and mixed infections with parasitic helminths.

Table 3. Single and mixed infections of parasitic helminths species in infected *M. surmuletus*.

Helminths sp.	Type of infection	
	Single no/%	Mixed no/%
Anisakis sp. Larva	22(39.29%)	34(60.71%)
Hysterothylacium adecipiens	8(21.05%)	30(78.95%)
Contracaecum sp. larva	4(28.58%)	10(71.42%)
Echinorhynchus gadi	2(18.19%)	9(81.81%)
Total	36(62.06%)	22(37.94%)

Table 4. Mixed infections of parasitic helminths in infected *M. surmuletus*.

Parasitic helminthes sp.	No.	%
Anisakis sp. larva	22	37.94
Hysterothylacium adecipiens	8	13.80
Contracaecum sp. larva	4	6.90
Echinorhynchus gadi	2	3.44
Anisakis sp. & H. adecipiens	9	15.55
H. adecipiens & Contracaecum sp.	6	10.34
Anisakis sp. & H. adecipiens and E. gadi	3	3.17
E. gadi & H. adecipiens	4	6.90
Total	58	100%

The difference between single and mixed helmenhs infection in *M. surmuletus* may be due to the difference in the type and quantity of food, which is considered the intermediate host for the transmission of parasitic helminths, and this is consistent with studies conducted by Hassan et al. (2010), Khanum *et al.,* (2011), Aliyu and Solomon (2012) and Kassem *et al.*, (2023).The parasitic helminth infection varied according to the different body lengths of *M. surmuletus; a higher incidence rate was* ocbserved in fish with a length of 15 to 26 cm (39.65%), followed by those measuring more than 25 cm (32.76%), and the lowest incidence rate was in fish whose length was less than 15 cm (27.59%) (Table 5). There was no significant difference between incidence and body length for *M. surmuletus*. The Man -Whitney U test shows no statistically significant difference between the middle ranks of the body lengths of the infected fish and the healthy fish (P >0.05).

Table **5.** Relationship between incidence rate and body length (cm) of *M. surmuletus.*

Body length (cm)	Samples (no=123)	Infected (no=58)
less than 16	28 (22.76%)	16 (27.59%)
16-25	53 (43.08%)	23 (39.65%)
More than 25	42 (34.14%)	19 (32.76%)

There was no significant difference detected in the study between body length and helminth infestation, and this is consistent with the results of other studies reported by Idris *et al.*, (2013). While another study reported that the direct relationship between body length and infection level in Atlantic horse mackerel is a widespread phenomenon in many fish species (Shawket *et al.,* 2017). The incidence of the helminthes varied according to the different body weights of *M. surmuletus* (Table 6). A higher incidence was observed in fish with body weights of 53–75 gm (50%), followed by those with body weights greater than 75 gm (29.31%), and the lowest incidence rate was in fish with body weights less than 53 gm (20.69%). The result revealed that there was a difference between statistically significant differences and the body weight of infected fish ($P < 0.001$).The results of this study showed that the body weight of *M. surmuletus* has an effect on parasitic worm infection, as the incidence of parasitic infection increases with the increase in the body weight of the fish. The results showed that there is a significant relationship between infection and the body weight of the fish, and these results are consistent with the results of previous studies (Yakhchali *et al.*, 2012 and Dahani *et al.*, 2019). The cause of increased infection rate with increased fish body weight may be due to the growth of the interfaces of hosts resulting in an increase in the surface areas of infection, The larger the size of a fish, the size of the space and target site for the colonization and infection of parasite will also increase (Palm *et al.*, 2007; Rahman and Hamidah 2012; and Dahani *et al.*, 2019), and also could be the increase in body weight is often related to the increase in fat, to which the larvae of *Anisakis* sp. migrate (Abattouy *et al.*, 2011; Mo *et al.*, 2021).The seasonal variations of parasitic helminth infection rate were variable; the high incidence rate was in spring (17.89%) and summer (13.82%), respectively, and the incidence was moderate to low in autumn (6.50%) and winter (8.94%) (Table 7).

Table 6. Relationship between infection and the body weight (gm) of infected fish.

Body Weight (gm)	Samples (no=123)	Infected (no=58)
less than 53	17 (13.83%)	12 (20.69%)
53-75	87 (70.73%)	29 (50%)
More than 75	19 (15.44%)	17 (29.31%)

Table 7. Relationship between infection rate and seasons.

Seasons	No. of examined fish	Non infected fish	Infected fish
Spring	33	11(8.96%)	22(17.89%)
Summer	36	19(15.44%)	17(13.82%)
Autumn	29	21(17.07%)	08(6.50%)
Winter	25	14(11.38%)	11(8.94%)
Total	123	65(52.85%)	58(47.15%)

Seasonal variations in the infection rate of parasitic helminth peaked in the spring and summer seasons in fish, and the result were almost consistent with the results of Eissa (2002). The reason may be due to the high water temperature, which plays a major role in enhancing the life cycle of parasitic helminth and increasing their spread in the spring and summer. These results are consistent with published results of other researches (Choi *et al.*, 2011; Li *et al.*, 2011 and Kassem and Bowahi, 2015).

Mullus surmuletus are demersal species of mullids distributed throughout the Mediterranean Sea and lengthwise on its shelf. In many countries, this fish are among the valuable edible and high economic value species for fisheries (Barreiro *et al.*, 2017). This fish is distinguished by its quality and nutritional value and is found in large quantities in Libyan coastal waters. The results of this study showed differences in the rates of infection of *M. surmuletus* fish with parasitic helminth by sex and size, as well as the difference in the percentage of infection by different seasons of the year. These results may help fishermen and fish breeders on the Libyan coasts choose the appropriate fishing seasons to obtain fish that have a low incidence of infection and also pose less danger to the consumer.

References

Al-Zubaidy, A. B.; Mhaisen, F. T.; Abker, M. A. 2012. Occurrence of five nematode species from some Red Sea fishes, Yemen, Mesopot. J. Mar. Sci. 27(2): 140-156.

Al-Zubaidy, A. 2009. Prevalence and Densities of *Contracaecum* sp. Larvae in Liza abu (Heckel, 1843) from Different Iraqi Water Bodies. Journal KAU: Marine. Sciences. 20: 3-17.

Anderson, R. C.; Chabaud, A. G.; Willmotts S. 2009. Keys to the Nematode Parasites of Vertebrates: Archival Volume. CAB International; Wallingford (UK).

Ahmed, A. M. 2010. Studies on Helminth parasites of Marine Fishes: Mullus serpentullus, Epinepheles guaza and Pargrus pargrus (Linnaeus , 1958) in coastal seawater of Sirt, Libya. Msc. Thesis, Sirt university.

Abattouy, N.; Valero, A.; Benajiba, M. H.; Lozano, J.; Martín-Sánchez, J. 2011. *Anisakis* simplex s.l. parasitization in mackerel (Scomber japonicus) caught in the North of Morocco-Prevalence and analysis of risk factors.

International Journal of Food Microbiology. 150 (2-3): 136-139.

Adel, M.; Reza H.; Nematolah, A. 2013. Scomberomorus commerson, a new paratenic host of Contracaecum sp. and *Anisakis* sp. 615 (Nematoda: Anisakidae) from Persian Gulf World. J. Fish Marine Sci. 5(3): 310-314.

Al-Bassel, D. A.; Hussein, A. 2012. A survey on parasites infecting mullets from Egypt and Libya .Journal Biology sciences. 4(1): 9 -19.

Aliyu, M. D.; Solomon, J. R. 2012. The intestinal parasite of Clarias gariepinus found at lower us man dam, Abuja. Res. 4(9): 38-44.

Almashay, A. A. 2021. Study on Some Types of Parasitic Nematodes, *Anisakis* simplex, *Contracaecum* multipapllatium and Hysterothylacium aduncum Affecting Fish, *Mullus surmuletus* in the Beach City of Sirte-Libya. Egyptian Academic Journal of Biological Sciences E. Medical Entom. & Parasitology. 13(1): 17-21.

Bayoumy, E. M.; El-Monem, S. A.; Ammar, K. A. 2008. Ultrastructural study of some helminth parasites infecting the goatfish, *Mullus surmuletus* (Osteichthyes: Mullidae) from Sirte coast, Libya. Life Science Journal. 5(1):17-24.

Barreiro, L.; Caamaño, R.; Cabaleiro, S.; Ruiz de Ocenda, M. V.; Villoch, F. 2017. Ceratomyxosis infection in cultured striped red mullet (*Mullus surmuletus* Linnaeus, 1786) broodstock. Aquaculture International. 25(6):2027-2034.

ÇELİK, B. A.; OĞUZ, M. C. 2021. Endohelminth fauna of teleost fishes from coasts of Şile region of the Black sea. Helminhologia. 58(3): 263 –270.

Choi, S. H.; Jung, K; Jin, O. k.; MinKyung, C. 2011. *Anisakis* simplex larvae; larvae infection status in marine fish and cephalopod purchased from cooperative fish market in Busan, Korea. Korean J. Parasitol. 49(1):39-44.

Dahani, S.; Bouchriti, N.; Benabbes, I.; Boudakkou, A.; Chiaar, A. 2019. Occurrence of Fish Parasites in the Moroccan Coast. European Scientific Journal. 15(36): 497-506.

Debenedetti, A. L.; Madrid, E.; Fuentes, M. V. 2013. Study of helminth parasites in the red mullet, Mullus barbatus, from the Mediterranean Sea and acquired in greater València, Spain, Rev. Ibero-Latinoam. Parasitol. 72 (2): 118-123.

Eissa, I. A. M. 2002. Parasitic fish diseases in Egypt. El-Nahda El-Arabia Publisher, Cairo, Egypt.

El–Daly, E. A.; Amer, O. H.; Zaher, T. I. 2004. Prevalence of Anisakid nematodes among marketed smoked and frozen marine fishes at Sharkia Governorate with special reference to their public health importance. Z. U. M. J. Special Issue, 11: 647 – 655.

Emere, M. C.; Egbe, N. E. L. 2006. Protozoan parasites of Synodontis Clarias (a fresh water fish) in River Kaduna. Biol. Environ. Sci. J. Tropic. 3(3): 58-64.

Ferrer, E.; Aznar, F. J.; Balbuena, J. A.; Kostadinova, A.; Raga, J. A.; Moravec, F. 2005. A new cystidicolid nematode from Mullus surmuletus (Perciformes: Mullidae) from the

Western Mediterranean. J. Parasitol. 91: 335 – 344.

Ferrer-Castello, E.; Raga J. A.; Aznar F. J. 2007. Parasites as fish population tags and pseudoreplication problems: the case of striped red mullet *Mullus surmuletus* in the Spanish Mediterranean. Journal of Helminthology. 81: 169 -178.

Figus, V.; D'amico, V.; Loddo, S. L.; Siddu, N. L.; Canestri -Trotti, G. 2005. Helminth parasites of Serranus cabrilla (L.) (Osteichthyes, Serranidae) from Gulf of Cagliari, South-Western Mediterranean Sea. Ittiopatologia. 2: 207 – 215.

Felizardo, N.; Knoff, M.; Pinto, R.; Gomes, D. 2009. nemátodos anisakidos larva Rios del lenguado paralichthys isosceles jordan, 1890 (pisces: teleostei) en brasil Neotrop. Journal of Helminthology. 3(2):57-64.

Hassan, A.; Akinsanya, B.; Adegbaju, W. 2010. Impacts Of Helminth Parasites On Clarias gariepinus And Synodontis clarias From Lekki Lagoon, Lagos, Nigeria. Report and Opinion. 2 (11):42-48.

Hassani, M. M.; Kerfouf, A.; Boutiba, Z. 2015. Checklist of helminth parasites of Striped Red Mullet, *Mullus surmuletus* (Linnaeus, 1758) (Perciformes: Mullidae), caught in the Bay of Kristel, Algeria (western Mediterranean). Journal of biodiversity data 11(1): Article 1504.

Hassan, R. G. 2019. Morphological characterization of Dujardinascaris spp. (Nematoda: Anisakidae) from the striped red mullet *Mullus surmuletus* in the Mediterranean Sea Helminologia. 56(4): 338 – 346.

Hristovski, N.; Arculeo, M.; Riggio, S. 1989. Helminth parasite fauna of *Mullus surmuletus* L. (Pisces, Mullidae) in the Bay of Palermo (Sicily-Italy).Bilješke Notes. 75: 1-6.

Hoole, D.; Lewis, J. W.; Schuwerack, P. M.; Chakravarthy, C.; Shrive, A. K.; Greenhough, T. J.; Cartwright, J. R. 2003. Inflammatory interactions in fish exposed to pollutants and parasites: a role for apoptosis and C reactive protein. Journal of Parasitology. 126: 71-85.

Idris, H. S.; Balarabe-Musa, B.; Osawe, S. O. 2013. The Incidence of endo-parasites of Clarias gariepinus (sharp tooth Catfish) (Burchell, 1822) and Oreochromis niloticus (Tilapia fish) (Linnaeus, 1758) in Jeremiah Usein river, Gwagwalada, Nigeria . Intercontinental Journal of Biological Science. 1 (1): 1-5.

Kayis, S.; Ozcelep, T.; Capkin, E.; Altinok, L. 2009. Protozoan and Metazoan Parasites of Cultured Fish in Turkey and their Applied Treatments. The Israeli Journal of Aquaculture – Bamidgeh. 61(2): 93-102.

Khanum, H.; Begum, S.; Begum, A. 2011. Seasonal prevalence, intensity and organal distribution of helminth parasites in macrognathus aculeatus. Dhaka University Journal Biology Science. 20(2): 117-122 .

Kassem, H. H.; Bowashi, S. M. 2015. Prevalence of Antiskid Nematode Larvae Infecting Some marine fishes from the Libyan coasts. Journal of the Egyptian Society of Parasitology. 45(3): 609 -616.

Kassem, H.; EL-Maadani, R.; Bojwari, G.; Bowashi, S.; Hador, A. 2023. Nematode infestation in Red Mullet (*Mullus surmuletus*, Linnaeus, 1758) From Benghazi Coast, Libya. AlQalam Journal of Medical and Applied Sciences. 6(1): 81-88.

Klimpel S.; Abdel-Ghaffa R. F.; Al-Rasheid, K. A.; Aksu, G.; Fischer, K.; Strassen, B.; Mehlhorn, H. 2011. The effects of different plant extracts on nematodes. Parasitol. Res. 108(4):1047–1054.

Klimpel, S.; Kleinertz, S.; Palm, H. 2008. Distribution of parasites from red mullets (*Mullus surmuletus* L., Mullidae) in the North Sea and the Mediterranean Sea. Bulletin of Fish Biology. 10 (1/2): 25 – 38.

Li, W.; Song, R.; Wu, S.; Zou, H.; Nie, P.; Wang, G. 2011. Seasonal occurrences of helminthes in the Anadromous Fish Coilia nasus (Engraulidae): parasite indicators of fish migratory movements. J. Parasitol. 97(2):192-196.

Mansour, M.; Hassan, S.; Khidr, A.; Ghanem, M. 2003. General Survey on Certain Helminth Parasites Infecting Some Nile Fishes At El-mansoura, Egypt. Journal AquaticBiology and Fish. 7 (4):423 – 446.

Marcogliese, D. J. 2002. Food webs and the transmission of parasites to marine fish. Parasitology. 124: 83-99.

Mo, T. A.; Fossøy, F.; Poppe, T. T. 2021. Increasing intensities of *Anisakis* simplex (Rudolphi, 1809 det. Krabbe, 1878) larvae with weight and sea age in returning adult Atlantic salmon, Salmo salar L., of coastal waters of Norway. Journal of Fish Diseases. 44(8):1075-1089 .

Nada, M. S. M.; Abd El-Ghany, A. M. 2011. Anisakid nematodes in marine fishes. Journal of American Science. 7(9):1000-1005.

Palm, H. W.; Klimpel, S.; Walter, T. 2007. Demersal fish parasite fauna around the South Shetland Islands: high species richness and low host specificity in deep Antarctic waters. Polar Biology. 30:1513-1522.

Paradiznik, V.; Radujkovic, B. 2007. Digenea trematodes in fish of the North Adriatic Sea. Acta adriatica .48(2): 115-129.

Piazza, R. S.; Martins, M. l.; Guiraldelli, L.; Yamashut, A. 2006. Parasitic Diseases of Freshwater Ornamental Fishes Commercialized in Florianopolis, Santa Catarina, Brazil. Journal Brazilian of Biology. 32(1): 51 – 57.

Poulin, R.; Valtonen, E. T. 2001. Interspecific associations among larval helminths in fish. International Journal for Parasitology. 31: 1589–1596.

Quiazon, K.; Yoshinaga, T.; Ogawa, K. 2008. Taxonomical study into two new species of Philometra (Nematoda: Philometridae) previously identified as Philometra lateolabracis (Yamaguti, 1935). Journal Folia parasitological. 55: 29–41.

Rahman, W. A.; Hamidah, S. 2012. Relationship between Size of Fish and Parasitic Intensity in Four Freshwater Fish Species from Tasik Merah, Perak, Peninsular Malaysia. Pertanika J. Trop. Agric. Sci. 35 (4): 805 – 814.

Schultz, K. 2003. Field Guide to Saltwater Fish. John WIley & Sons, Inc., Hoboken, New Jersey.

Shamsi, S.; Aghazadeh-Meshgi, M. 2011. Morphological and genetic characterisation of selected *Contracaecum* (Nematoda: Anisakidae) larvae in Iran. Iranian Journal of Fisheries Sciences. 10(2): 356-361.

Shawket, N.; El Aasri, A.; Elmadhi, Y.; Idoumou, M.; El Kharrim, K.; Belghyti, D. 2017. Anisakis simplex (Nematoda: Anisakidae) from horse mackerel (Trachurus trachurus) in Atlantic coast of Morocco. Asian Pacific Journal of Tropical Disease. 7(8):463-466.

Sobecka, E.; Szostakowska, B.; MacKenzie, K.; Hemmingsen, W.; Prajsnar, S. 2012. Genetic and morphological variation in Echinorhynchus gadi Zoega in (Muller, 1776) (Acanthocephala: Echinor- hynchidae) from Atlantic cod Gadusmor- hua L. J. Helminthol. 86:16-25.

Valero, A.; López-Cuello, M.; Benítez, R.; Adroher, F. 2006. *Anisakis* spp. in European hake, Merluccius merluccius (L.) from the Atlantic off north-west Africa and the Mediterranean off southern Spain .Acta Parasitological. 51(3): 209-212.

Yakhchali, M.; Tehrani, A. A.; Ghoreishi, M. 2012. The occurrence of helminth parasites in the gastrointestinal of catfish (Silurus glanis Linnaeus 1758) from the Zarrine-roud river, Iran. Veterinary Research Forum. 3(2): 143-145.Watson, K. and Walker, C.1986. Dough Mixing Characteristics. Cereal Chemistry, 63 (6).

دراسة لبعض الديدان الطفيلية التي تصيب أسماك التريليا (*Mullus surmuletus*, Linnaeus,1758) في ساحل مدينة الخمس، ليبيا.

عبدالسلام سالم ابوسديل[1]، ميلود الصيد[1]، علي فرج ابوسليانة[2] و عطية رمضان الكيلان[1]

1 قسم الأحياء، كلية العلوم، جامعة المرقب، ليبيا.

2 قسم الزراعات المائية، كلية الزراعة، جامعة طرابلس، ليبيا.

المستخلص

تهدف هذه الدراسة إلى تحديد بعض الديدان الطفيلية (nematode and acanthocephalan) التي تصيب أسماك التريليا الحمراء (*Mullus surmuletus*) في سواحل منطقة الخمس ليبيا ودراسة العلاقة بين انتشار بعض الديدان الطفيلية والجنس وطول ووزن الجسم؛ حيث تم جمع مائة وثلاث وعشرين سمكة من *M. surmuletus* بشكل عشوائي خلال الفترة من أبريل 2022 إلى مايو 2023. تم فتح بطن الأسماك وتحديد الجنس وفحص التجويف البطني والأعضاء الداخلية للأسماك لتحديد الإصابات بالديدان الطفيلية. كشفت النتائج أن نسبة الإصابة قد بلغت 47.15 % في العينات التي تم دراستها؛ حيث تم العزل والتعرف على ثلاثة أنواع من ديدان *Anisakis* sp. larva, Hysterothylacium adecipiens and *Contracaecum* sp. larva ونوع واحد من ديدان *Echinorhynchus gadi* حيث كانت نسبة الإصابة بيرقات *Anisakis* و 39.29% *Hysterothylacium adecipiens* و 21.05% على التوالي وجنس طفيل *Contracaecum* sp. بنسبة إصابة 28.58% في حين سجلت الإصابة بطفيل *Echinorhynchus gadi* بنسبة 18.19%. تضيف نتائج هذه الدراسة معلومات عن بعض الديدان الطفيلية التي تصيب الأسماك في الساحل الليبي. وستساهم هذه المعلومات إلى جانب معلومات من دراسات أخرى في فهم انتشار الديدان الطفيلية وتأثيرها على الأسماك.

الكلمات الدالة: الديدان الطفيلية، *M. surmuletus* ، الخمس، ليبيا.

للاتصال: عبدالسلام سالم ابوسديل، قسم الأحياء، كلية العلوم، جامعة المرقب، ليبيا

هاتف: 94291554 218+ **البريد الالكتروني:** a.abuseliana@uot.edu.ly

استلمت بتاريخ: 2023/12/25 **أجيزت بتاريخ: 2024/5/23**