DOI:10.25092/baunfbed.826447 *J. BAUN Inst. Sci. Technol., 23(1), 65-71, (2021)*

Anisakis spp. (Nematoda: Anisakidae) case in the small spotted dogfish (*Scyliorhinus canicula* (Linneaus, 1758)) caught from the sea of Marmar (Turkey)

Hatice TORCU KOÇ*, Zeliha ERDOĞAN

Balikesir Üniversitesi, Fen-Edebiyat Fakültesi, Biyoloji Bölümü, Çağış Yerleşkesi, Balıkesir, Turkiye

Geliş Tarihi (Received Date): 04.03.2020
Kabul Tarihi (Accepted Date): 30.09.2020

Abstract

One specimen of the small spotted dogfish, Scyliorhinus canicula (L.) was caught with a liver having encapsulated cysts including Anisakis spp. larvae. Tumors occurred on the surface of the liver of this fish species, mostly. After dissection, a total of five nematod larvae were found on surface of liver to be encapsulated. In the macroscopic examination, liver was seen to pale and its surface was haemorhagic due to cysts including larvae. The larvae were morphologically identified as Anisakis spp. and the importance of such cases in small spotted dogfish in base of public health was here pointed out.

Keywords: *Small spotted dogfish, Anisakis sp., the encapsulated liver.*

Marmara Denizi (Türkiye)'nden yakalanan kedi balığı, (*Scyliorhinus canicula* (Linneaus, 1758))'nda *Anisakis* spp. (Nematoda: Anisakidae) olgusu

Öz

Anisakis spp. larvaları içeren kistlere sahip karaciğerli bir kedi balığı bireyi, Scyliorhinus canicula (L.) yakalandı. Tümörlerin en fazla bu türün karaciğerinin yüzeyinde oluşmuştu. Diseksiyondan sonra, toplam 5 nematod larvası kapsüllü şekilde karaciğerinin yüzeyinde bulundu. Makroskobik incelemede, karaciğerin soluk ve

* Hatice TORCU KOÇ, htorcukoc@hotmail.com, https://orcid.org/0000-0003-0678-1509
Zeliha ERDOĞAN, zaka@balikesir.edu.tr, https://orcid.org/0000-0002-5725-4402

larvalı kistlerden dolayı kanamalıydı. Larvalar morfolojik olarak Anisakis spp. olarak teşhis edildi ve kedi balığındaki böyle vakaların halk sağlığı açısından önemi vurgulandı.

Anahtar kelimeler: *Kedi balığı, Anisakis sp., kapsüllü karaciğer.*

1. Introduction

The small spotted dogfish, *Scyliorhinus canicula* is one of the most abundant elasmobranchs which live in many different types of soft bottom substrates, at depths mainly between 10–100 and up to 780 m in the the northeast Atlantic and Mediterranean Sea [1, 2, 3]. The nematodes of the family Anisakidae were probably first recognized in fish hosts as early as the 13th. century, an occasional human disease in 1867, and as a more common human infection between the 1950's and 1960's. Since 1970, eight human cases have been documented from North America [4]. A first record of Anisakis sp. infections of *S. canicula* in the north-eastern Mediterranean by Bakopoulos et al. [5]. Anisakids are marine cosmopolitan parasites which show highly prevalent in wild fish stocks of commercial interest species. There are some metazoan parasites of the small spotted dogfish in the world. Henderson and Dunn [6] and Casadevall et al. [7] observed Anisakis parasites of *S. canicula* from Ireland. They are usually found in high amount in the third larval stage in the abdominal cavity [8]. Anisakid nematodes are heteroxenous and their life cycles involve small crustaceans as first intermediate or paratenic hosts, where second stage larvae (L2) mutate to L3, thus becoming potentially infective to their definitive hosts. *A*nisakis spp. was determined encysted in stomach wall from the Galway Bay with no information on pathology of this nematode [9]. While Sanmartin Duran et al. [9] reported the prevalence of *Anisakis simplex* infection of *S. canicula* specimens caught in the N.W. Spain, Casadeval et al. [7] recorded quantitative data of anisakiasis in this species in the north-western Mediterranean with prevalence, mean abundance, and mean intensity.

In Turkey, *Anisakis* spp. was morphologically identified in different fish species [10, 11, 12, 13]. Some reports about the pathogenic effect of larval Anisakis in fish are correlated with the effects of the larvae to the liver and other abdominal organs of the host [14].

To date, no work on *Anisakis* parasitism of *S.canicula* in Turkish Seas has been published. The aim of the present case is to report the occurence and pathology of *Anisakis* sp. larvae from the small spotted dogfish from the Sea of Marmara for the first time.

2.Material and methods

Of 91 the small spotted dog fishes caught by trawl survey in Sea of Marmara, between October 2013 and April 2014, one specimen was found its liver to be infected by Anisakis spp. (Figure 1). Then, the parasitic nematod larvae were stored in 70% ethanol and were examined with a stereomicroscope at x12 and x50 magnifications in Hydrobiology laboratory. Morphological identifications of Anisakis larvae were conducted according to Berland [15].

Figure.1. *Scyliorhinus canicula* infected with *Anisakis* sp.(Original photo).

3. Results and discussion

A total of five larvae were macroscopically found in the abdominal cavity to be encapsulated on surface of liver and were identified morphologically as *Anisakis* larvae (Figure. 2, 3). In the macroscopic examination, liver was seen to pale and its surface was haemorhagic with subcapsular cysts including larvae. Just below the liver capsula, *Anisakis* spp. larvae having a thin cuticle were seen covered with fibrous capsula. The nematodes were identified as larvae of *Anisakis* spp. Bakopoulos et al. [5] found larval forms of of the genus Anisakis nematode under the serosa layer of the liver, stomach and intestine of 14 *S. canicula* specimens caught in the north-eastern Aegean Sea. Our findings confirm the previous study.

According to Berland [15] larval morphological features including the absence of a ventricular appendage and an intestinal caecum are useful for the distinction between several anisakid genera. Similarly, the identification was made according to the presence of a long ventriculus with an oblique ventricular-intestinal junction, and absence of a ventricular appendage and intestinal caecum. The parasite has also a rounded tail possessing a mucron, (Figure 3) [13, 14, 16]. Some of our morphological measurements were similar to the relevant literature (Table 1).

Figure 2. Infestation of Anisakis sp. in viceral organs of small spotted dogfish *S. canicula* specimen (Original photo).

Figure 3. Infestation of *Anisakis* sp. in viceral organs of small spotted dogfish, *S. canicula* specimen in a different view (Original photo).

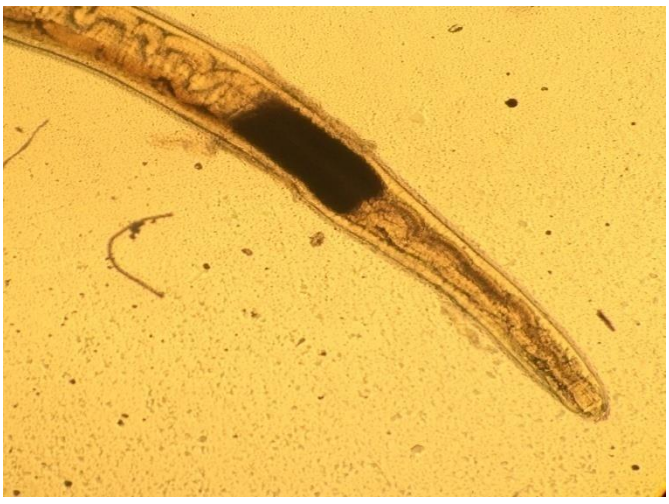

Figure 4. Posterior end of *Anisakis* sp. parasite found in liver of a small spotted dogfish, *S. canicula* specimen (4X, Scale 0.1 millimeter) (Original photo).

Table 1. Some morphometric measurements (mm) in third-stage larvae of *Anisakis* sp.

Morphological characters	Tepe and Oguz [13]	Yardımcı et al. [14]	Quiazon et. al. [16]	Al-Zubaidy [17)	Present study
Total body length	12.05-17.64	12.80-24.65	11.10-26.78	12.45-22.5	12.79-27.69
Body width	0.30-0.54	0.40-0.51	0.38-0.60	0.13-0.41	0.42-0.63
Length of oesophagus	0.69-1.78	0.98-1.87	1.04-2.11	1.302-2.98	1.02-2.14
Ventriculus length	0.50-0.81	0.53-0.74	0.50-0.78	0.564-0.985	0.55-0.84
Tail length	0.07-0.21	0.08-0.11	0.05-0.12	0.088-0.579	0.09-0.13
Mucro length	-	0.01-0.02	0.02-0.03	(0.015-0.022	-

In the present study, for the first time, we reported on the morphological identification of *Anisakis* larva from *S. canicula* and described its pathological significance in a fish species from Turkish waters. Capsule formation around the *Anisakis* larva is a feature common in the parasitic infection in the other species of fish such as whiting [18]. The most probable larval damage is mainly caused by compression of the tissues [19, 20]. The measurements obtained in this study were harmony in the literature with small differences (e.g. minimum and maximum values).In the present case, the lower rate of infected small spotted dogfish (1/91) might not be assessed as a potential intermediate host of anisakiasis for Turkish waters. It is suggested that it might penetrate into the visceral organs of the specimen with its diet accidentally.

5. Conclusions

In Turkish coasts, fishermen either discard the captured spotted dogfish due to its low commercial value as by-catch or remove the intestines on board, in order to sell the cleaned fillets in the market. It is caught as by-catch, and has a moderate commercial value in the north-west Mediterranean traditional fish markets. In spite of its rare consumption in internal market, sharks fishery contributes to Turkey's economy as export fresh/chilled, frozen, topeshark fillets, dried, salted or in brine products [21]. The disposing of infected viscera into the sea of Marmara may therefore lead to parasite loading in the fishes. It is suggested that hygien control protocols should be increased for those areas carrying out such practices. Such protocols should also be extended to include Turkish Seas in the future [21].

Besides, Anisakiasis is a zoonotic disease with a dramatic and serious increase in its reported prevalence throughout the world in the last years [7, 22]. The occurrence of Anisakis sp. larvae in the fish may be reducing the quality and be harmful for consumer. These nematode causes human health implication and reduce the commercial value of fish. Human can act as incidental host by ingestion of raw or undercooked infected fish. Anisakis causes several symptoms such as stomach pain, vomiting [23], allergic reaction [24, 25] and in humans [26]. Anisakis should be evaluated as a public health problem by health authorities.

References

[1] Ellis J.R. and Shackley, S.E., The reproductive biology of *Scyliorhinus canicula* in the Bristol Channel, U.K., **Journal of Fish Biology**, 51, 361–372, (1997).

[2] Mytilineou, C., Politou, C.-Y., Papaconstantinou, C., Kavadas S., D'Onghia G. and Sion, L., Deep-water fish fauna in the Eastern Ionian Sea, **Belgian Journal of Zoology**, 135, 229–233, (2005).

[3] Ballard, W., Mellinger, J. and Lechenault, H., Series of normal stages for development of *Scyliorhinus canicula* the lesser spotted dogfish (Chondrichthyes: Scyliorhinidae), **Journal of Experimental Zoology**, 267, 318-336, (2005).

[4] Myers, B. J., Research then and now on the Anisakidae nematodes, **Transactions of the American Microscopical Society**, 95 (2), 137-142, (1976).

[5] Bakopoulos, V., Tsepa, E., Diakou, A., Kokkoris, G., Kolygas, M.N. and Athanassopoulou, F., Parasites of *Scyliorhinus canicula* (Linnaeus, 1758) in the north-eastern Aegean Sea, **Journal of the Marine Biological Association of the United Kingdom**, 98 (8), 2133–2143, (2018).

[6] Henderson, A.C. and Dunne, J.J., The Metazoan parasites of the lesserspotted dogfish *Scyliorhinus canicula* (L.) from the Galway Bay Area, **Journal of Irish Naturalist's**, 26 (3/4), 104-107, (1998).

[7] Casadevall, M., Martinez, N. and King, P., The lesser-spotted dogfish (*Scyliorhinus canicula*): parasites and scavenger habits, **Rapport Commission International de Mer Mediterranee**, 39, 470, (2010).

[8] Abollo, E., Gestal, C. and Pascual, S., Anisakis infestation in marine fish and cephalopods from Galician waters: an updated perspective, **Parasitological Research**, 87, 492-499, (2001).

[9] SanmartinDuran, M.L.,Quinteiro, P. and Ubeira, F.M., Nematode parasites of commercially important fish in NW Spain, **Diseases of Aquatic Organisms**, 7, 75–77, (1989).

[10] Akmirza, A., Occurence of *Callitetrarhynchus gracilis* (Rudolphi, 1819) in little thunny-bonito, **Journal of Turkish Parasitology**, 30 (3), 231-232, (2006) (In Turkish),.

[11] Keser, R., Bray, R.A., Oğuz, M.C., Çelen, S., Erdoğan, S., Doğutürk, S., Aklanoğlu, G. and Martı, B., Helminth parasites of digestive tract of some teleost fish caught in the Dardanelles at Çanakkale, Turkey, **Helminthologia**, 44 (4), 217-221, (2007).

[12] Akmirza, A., Parasithic nematodes of fishes coasts of Gökçeada. **Journal of Turkish Parasitology**, 3, 199-202, (2013) (In Turkish).

[13] Tepe, Y. and Oğuz, M.C., Nematode and acanthocephalan parasites of marine fish of the eastern Black Sea coasts of Turkey, **Turkish Journal of Zoology**, 37, 753–760, (2013).

[14] Yardımcı, B., Pekmezci, G.F. and Onuk, E.E., Pathology and molecular identification of *Anisakis pegreffii* (Nematoda: Anisakidae) infection in the John Dory, *Zeus faber* (Linnaeus, 1758) caught in Mediterranean Sea, **Veterinary Journal of Ankara University**, 61, 233-236, (2014).

[15] Berland, B., Identification of larval nematodes from fish. International Council of Explorartion Sea C.M./F, 6**,** 16-22, (1989).

[16] Quiazon, K.M.A., Yoshinaga, T., Ogava, K. and Yukami, R., Morphological differences between larvae and in vitro cultured adults of *Anisakis simplex*

(sensu stricto) and *Anisakis pegreffii* (Nematoda: Anisakidae), **Parasitology International**, 57, 483–489, (2008).

[17] Al-Zubaidy, A., Third-stage larvae of *Anisakis simplex* (Rudolphi, 1809) in the Red Sea Fishes, Yemen Coast. **Journal of King Abdülaziz University, KAU, Marine Sciences**, 21, 1, 95-112, (2010).

[18] Elarifi, A.E., The histopathology of larval anisakid nematode infections in the liver of whiting, *Merlangius merlangus* (L.), with some observations on blood leucocytes of the fish, **Journal of Fish Diseases**, 5, 411-419, (1982).

[19] Kahl, W., Nematoden in Seefischen. 11. Erhebungen uber den Befall von Seefischen mit Larven von *Anacanthocheilus rotundatus* (Rudolphi) und die durch diese Larven hervorgerufenen Reaktionen des Wirtsgewebes. Zeitschrift fur Parasitenkunde, 10, 513-534, (1938).

[20] Brian, L., Ricerche sul ciclo biologico e l'ecologia di *Ascaris capsularia* Rud. **Atti dell'Accademia ligure di scienze e lettere**, 14, 249-263, (1958).

[21] Doğan, K., The production and economic importance of sharks in Turkey. Proceedings of the International Workshop on Mediterranean Cartilaginous Fish with Emphasis on South- Eastern Mediterranean, Istanbul, Turkey, 79-87, (2006).

[22] Chai J.Y., Murrell K.D. and Lymbery A.J., Fish-borne parasitic zoonoses: Status and issues, **International Journal of Parasitology**, 35, 1233- 1254,(2005).

[23] Smith J.W. and Wooten, R., Anisakis and anisakiasis. **Advances in Parasitology**, 16, 93-163, (1978).

[24] Ancillo, M., Cabalerro, M.T, Cabanas, R., Contreras, J., Baroso, J.A.M., Barranco, P. and Serrano, M.C.L., Allergic reactions to *Anisakis simplex* parasitizing seafood. Annals of Allergy, **Asthma and Immunology**, 79, 246-250, (1997).

[25] Audicana, M.T., Ansotegui, I.J., Corres, L.F. and Kennedy, M.W., *Anisakis simplex*: dangerous-dead and alive?, **Trends in Parasitology**, 18, 20-25, (2002).

[26] Setyobudi, E. and Helmiata, S.P., Infection of Anisakis sp. larvae in some marine fishes from the southern coast of Kulon Progo, **Yogyakarta. Biodiversitas**, 12, 1, 34-37, (2011).