

First record of *Spinitectus carolini* Holl, 1928 of family *Cystidicolidae* from a bullet tuna fish, *Auxis rochei* from marine water of Lattakia Governorate, Syria

ABSTRACT

The aim of the current research was to investigate the infection with internal and external parasites in the bullet tuna fish *Auxis rochei*. Fish samples were collected from different fishing sites on the shore of Lattakia (Ras Al-Basit), during the study period extending from September 15\9\2024 to February 24\2\2025, a total number 12 fish sample was of collected. Measurements were taken, the external and internal organ were The internal organs (museles, pyloric appendages, stomach, intestines, liver, gonads, swim bladder, and eye) examined to detect infection with internal parasites. In this research, the parasitic species *Spinitectus carolini*, Holl, 1928 belonging to the class nematoda, was isolated recovered from the digestive system, specifically in the stomach of fish (*Auxis rochei*). During current research, the species *Spinitectus carolini*, Holl, 1928 was the first record isolated for the first time from the fish *Auxis rochei* in marine water of Lattakia Governorate, Syria.

Keywords: *Auxis rochei*, *Spinitectus carolini*, Nematode, Marine water, Lattakia, Syria.

1.Introduction:

Fish is a rich source of proteins and amino acids necessary for growth and maintenance of body tissues, as well as their importance in the repair processes that occur in the human body. Fish meat is rich in minerals such as phosphorus (which helps the spine and teeth grow and maintains acid base balance in the blood), calcium, and iodine. Fish oil is also a primary source of vitamins A and D and omega-3 fatty acids, which are essential fatty acids that are vital for healthy skin, heart, and bones (Hasan, 2011). Fish parasitology is one of a leading field in aquatic biology. It is of great importance in uncovering the effects of pollution on fish health and is receiving increasing attention in marine biology.

Consequently, identifying the types of parasites that infect tuna species will expand knowledge in the field of aquatic biology (Noga, 2011; Rueckert, *et al.*, 2009).

Fish, like other organisms, are vulnerable to parasites and diseases, despite their high resistance to these diseases. The pathological effects of parasites that infect fish vary from depriving the host of its food or feeding on its tissues and body fluids, affecting its growth and disrupting its organ functions. Parasites are among the factors that negatively impact fish population growth, and increasing knowledge about the animal populations that parasitize fish is important for controlling them and reducing their harm. The spiny oleander is a fish found in warm and temperate waters throughout the world's oceans and seas, in surface waters down to depths of 50 meters, and is also found in the eastern Pacific Ocean (Collette, BB, and CR Aadland, 1996).

Spiny oleander is caught using a variety of fishing methods, including trawls, longlines, and hook-and-eye fishing. This species is considered an economic fish in many countries, such as China, which is the largest consumer of this species (Armani et al., 2016). Numerous studies have been conducted on the parasites of marine commercial fish, including:

Globally:

Merella et al.,(2015) in Spain examined the head region of 72 *Auxis rochei* fish from the western Mediterranean (southeastern Spain and the Strait of Gibraltar) for parasites. They found seven metazoan species in the fish from southeastern Spain, three of which were monogenetic. Researchers Garippa et al. (2014) also examined the gills of 63 Atlantic tuna samples from three regions of the Mediterranean. The results showed the presence of 11 parasite species: five didymozoid trematodes, three capsules, one monogenetic hexapod, and one pseudocopepod. Researchers Leinweber et al., (2016) in Indonesia recorded the parasite *Rhadinorhynchus zhukovi* on *Auxis rochei*, *Auxis thazard*.

Regionally:

A study was conducted in Algeria by Amine and Euzet (2005) on parasites in two fish species, *D. vulgaris* and *D. sargus*, caught from Algerian coastal waters. They classified two species of the genus *Lamellodiscus* in the Diplectandae family: *L. falcus* and *L. ignoratu*.

Also in Tunisia, researchers Dhaouadi et al., (2021) conducted a study to determine the presence and distribution of anisakids in three Scombridae species from the Tunisian coast: *Scomber japonicas*, *Scomber scombrus*, and *Auxis rochei*.

Locally:

Othman et al., (2022) recorded the first recorded nematode parasites of the Anisakidae family on *Euthynnus allteratus* caught from Syrian marine waters. In the study by Al- Sheikh Rashid et al., (2023) the parasite *Glugea sp.* was recorded for the first time in *Alosa fallax* in the marine waters of Lattakia Governorate. In a study conducted by Badour et al.,(2024) on the reproductive biology and food spectrum of the blue spotted cornet, the parasite *Rocinela signata* was recorded for the first time on the gills of this fish.

The importance of the research and its objectives:

The importance of the research lies in its alignment with the directions of governmental and scientific bodies in the Syrian Arab Republic toward completing biological and environmental studies of marine economic fish and the diseases they infect as a result of parasitism (internal and external), and ways to combat them. It also contributes to establishing a database on fish stocks and methods for developing them. Therefore, studying the qualitative composition of parasites that parasitize the twisted bream fish in the marine waters of Lattakia Governorate, and the negative effects they cause on longitudinal and weight growth, reduced productivity, and poor meat quality, is of great scientific and applied importance. This study is being studied for the first time. This study aimed to identify parasites in the twisted bream fish (*Auxis rochei*) in the marine waters of the coast of Lattakia Governorate.

2. Research Materials and Methods:

1- Sample Collection:

A total of twelve (12) bullet tuna fish samples were collected from Syrian marine waters between September 15, 2024, and February 24, 2025, using trawls and hooks from the Ras al-Basit area of Syria.

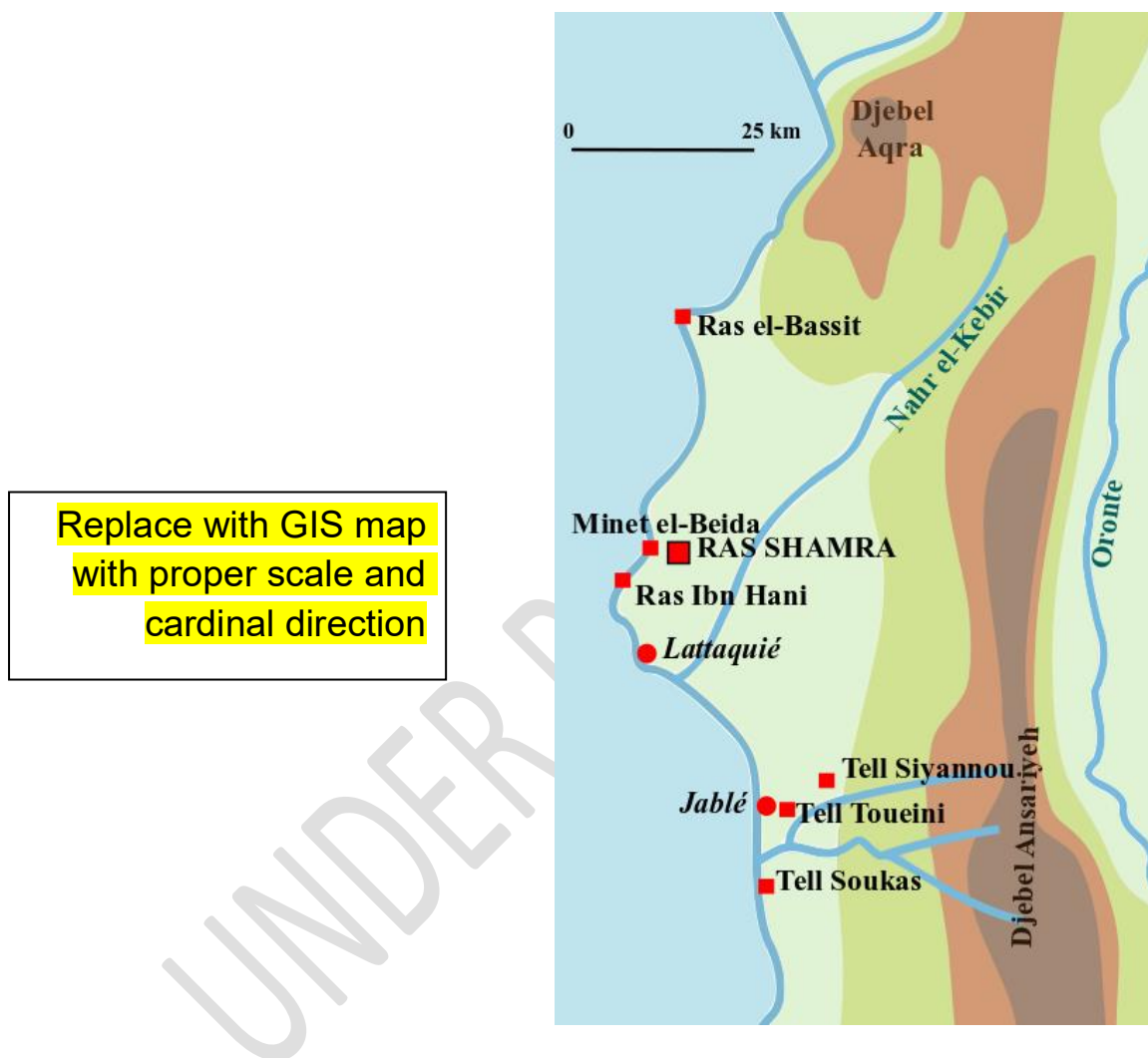


Figure (1): Shows the location of Ras Al-Basit area on the map using Google Earth.

2- Method:

First: Measurement Phase:

The samples were transported to the fish laboratory at the College of Science, and measurements were taken (total length, standard length, and weight) of the fish studied in centimeters and weighed in grams using a sensitive digital balance.



Figure 2: General shape of *Auxis rochei* (Total length 40 cm, Standard length 38 cm, Weight 850 g) caught in Ras El Basit area on 18/2/2025.

Second: Examination Phase:

After taking measurements, the fish were dissected according to the method described by the researchers (Moti, 2004; Amlacher, 1977).

A longitudinal incision was made in the midline of the abdomen, extending from the beginning of the head to the end of the anus. Another incision was then made from the end of the first incision to the gill cover. The internal organs were then exposed for examination. They were examined with the naked eye and then with a magnifying glass to detect parasitic worms. The internal organs were then examined and their contents placed in a Petri dish with a small amount of water to prevent the sample from drying out. The stomach, intestines, and liver were sliced to detect the parasites within. The parasite species in this study was isolated after being placed in a lactic acid solution, according to the researchers (Amlacher, 1977; Lucky, 1977; Pritchard and Kruse, 1982). It was identified based on a number of global taxonomic keys that focused on external and internal morphological characteristics, and the anterior and posterior ends of the parasite's body, according to researchers (Bykhovskaya et al., 1964; Mollre and Anders, 1986; Moravec, 1994; Anderson, 2000). The parasite species (*Spinitectus carolini*) was found in the digestive system, specifically the stomach, of one individual from the fish examined. The parasites were isolated and fixed with 70% alcohol.

3.Results and Discussion:

In this study, for the first time, the parasitic species *Spinitectus carolini* was isolated recovered and identified from the digestive system, specifically the stomach, of the Bullet tuna fish *Auxis rochei* (Figure 2) in Syrian marine waters.

Its length is approximately Whole body of the present species is approximately 4 cm (3.5 cm - 4 cm) long (Figure 3). Its species was identified as male, distinguishing it from the female by its tail being curved evenly along the body and its slender body. In contrast, the female has a heart-shaped tail and a modified vagina facing backward.

Table (1): The Classification of the Species *Spinitectus carolini*.

Kingdom	Animalia
Phylum	Nematoda
Class	Chromadorea
Order	Rhabditida
Family	Cystidicolidae
Genus	Spinitectus
Species	<i>S. carolini</i> Holl, 1928

General characteristics of the parasite:

This type of parasitic nematode (Spiny worm) infects the digestive system. It has rings of spines attached to its anterior end. This parasite is characterized by the presence of anterior rows of spines arranged in four segments, and a spineless head region. Spines are absent on the lateral lines, and their number and size decrease toward the rear. The muscular esophagus begins at the level of the second row of spines. **Males:** Slender body, 3.31 (3.45-2.78) cm long and 0.0098 cm wide. A narrow, glandular esophagus, 1.497 cm long, and a tail curved evenly with the body. **Females:** Slender body, 5.13 (5.70-4.35) cm long and 0.110 cm wide. A glandular esophagus, 0.194 cm long. A retroverted vagina. Eggs with a thick shell and a heart-shaped tail.

Life Cycle:

S. carolini worms of the Cystidicolidae family are rare parasites that parasitize marine and freshwater fish in many seas, oceans, rivers, and lakes (Smith et al., 2016). The parasite passes through four larval stages during its life cycle and requires intermediate hosts such as insect larvae (mayfly nymphs, dragonfly nymphs, stonefly larvae, etc.) (Crites et al., 1982). Previous studies indicate that adult third- and fourth-stage larvae can be transmitted from one definitive host to another.

The parasite is transmitted to humans by eating raw fish infected with the parasite. There are no reports of *S. carolini* infection of *Auxis rochei* in Syria, but this parasite has been recorded on the common bluegill (Crites et al., 1982). A species of the genus *Spinitectus* also parasitizes the European eel, according to a study conducted in the Italian River Messima, where it was recorded. This species, *S. inermis*, was identified for the first time (Ribas et al., 2025).

There is insufficient information and reports on the prevalence of this species, *S. carolini*, in the eastern Mediterranean basin.

Females release eggs inside the intestine of the definitive host fish. The eggs are excreted into the water with fish feces. The eggs settle to the bottom where they are eaten by insect larvae (mayfly nymphs, dragonfly nymphs, stonefly larvae, and flea larvae).

First-stage larvae hatch from eggs inside the insect's midgut, penetrate the midgut wall, and enter the hemocoel. At 20°C, the first molt occurs within the hemocoel 18 hours after infection. Second-stage larvae penetrate the abdominal muscles 6 days after infection, with the second molt occurring 8 days after infection. Second- and third-stage larvae are encased within the abdominal muscles. Third-stage larvae continue to develop and do not become infective to the

definitive host until 14 days after infection. The third molt occurs two days after infection of the host. Final molt, where third-stage female larvae can be distinguished from fourth-stage males by the presence of mucus. The final molt occurs 14 days after infection of the definitive host (Crites et al., 1982).



Figure3: Whole mount of the *S. carolini* Holl, 1928 under a light microscope at 40 magnification. Its length is about 4 cm.

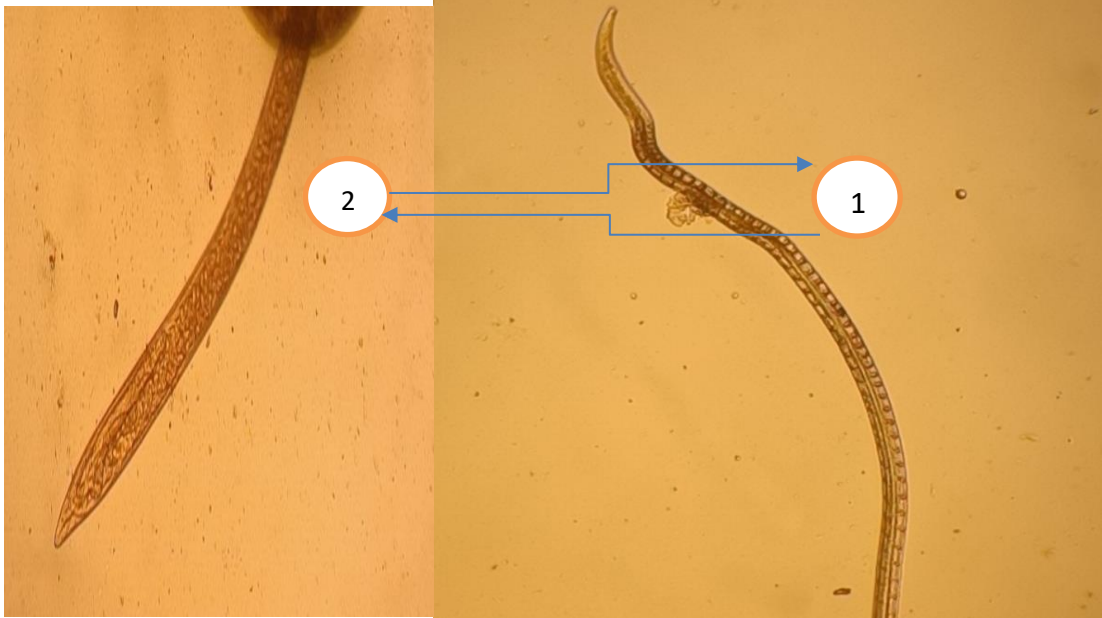


Figure 4: Microscopic images showing:

1- Anterior end of the parasite, 2-Posterior end of the parasite.

Flip the position of 1&2

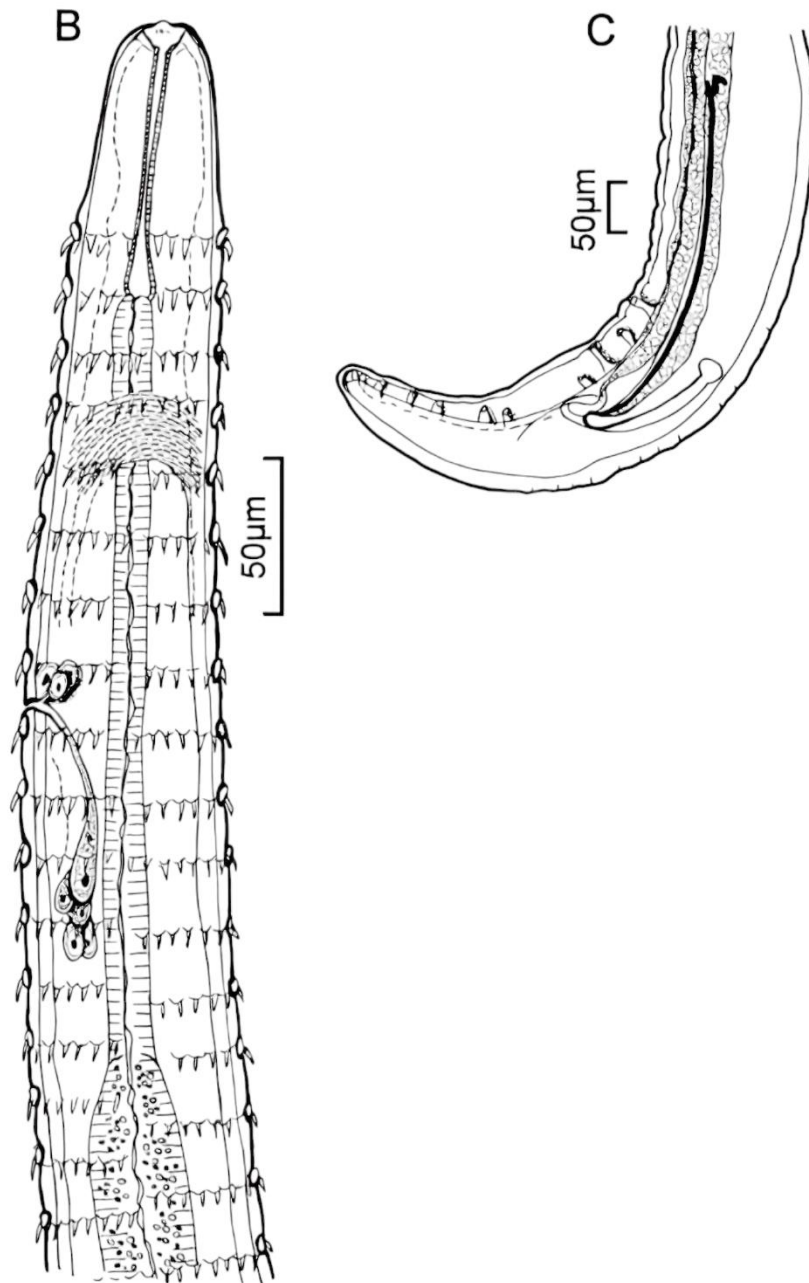


Figure (5): The general shape of the parasite according to the researcher (Mueller & Van Cleave 1932) B: Anterior end, C: Posterior end

provide original camera lucida
drawing image of present species



Figure(6): General appearance of the parasite *S.carolini*

4.Conclusion:

The parasite *Spinitectus Carolini* (Holl, 1928) was isolated and identified from the digestive system, specifically the stomach of the spiny-headed fish *Auxis rochei*, for the first time in Syrian marine waters.

5.Recommendations:

We recommend conducting periodic field studies to monitor changes in the prevalence of parasites in Syrian marine waters and to identify the biological environmental factors that facilitate their spread.

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