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First Record of the Presence of *Ceratothoa capri* parasite on *Oblada melanura* Fish along Tripoli Coast

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Abstract

Al-kahal fish (*Oblada melanura*) is considered one of the marine species of significant economic and nutritional importance, particularly in the mediterranean region, where it represents an important source of essential nutrients for human health. However, it is susceptible to infection by various external crustacean parasites such as *Ceratothoa capri* That may negatively affect its quality and nutritional value. In the current study, the presence of *C. capri* on *O. melanura* fish along the Tripoli coast was recorded for the first time. 60 fish samples were collected and investigated orally for the presence of *C. capri* on male, female, and immature fish. The obtained results were evaluated depending on statistical analysis and a comparative study with recently published literature. Results show that immature fish samples showed a high prevalence of infection (15.4 %) while male fish samples have a prevalence of (12.1%) with low variance (2.23) and very low standard deviation (1.49). The proportion of fish infected with the parasite was relatively low, therefore, it was difficult to find a clear relationship or trend between the size or weight of the fish and the percentage of infection. Thus, the only influencing factor in current study is the fish type. A comparative study shows that low prevalence rate (0.26% - 2.33%) across wild populations in the countries such as Turkey, Tunisia, and Algeria compared to Libya (average = 10%), due to the warm weather, environmental diversity, and the virginity of the Libyan marine ecosystem. In addition, descriptive

Identification, classification, and key features of both the host and parasite were described.

Keywords: *Ceratothoa capri*, *Oblada melanura*, Tripoli coast, Prevalence.

أول تسجيل لوجود طفيل *Ceratothoa capri* على أسماك *Oblada*

melanura على طول ساحل طرابلس

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الملخص

تُعد سمكة الكحلة من الأنواع البحرية ذات الأهمية الاقتصادية والغذائية، ولا سيما في مناطق البحر الأبيض المتوسط، حيث تمثل مصدراً مهماً للعناصر الغذائية الأساسية اللازمة لصحة الإنسان. ومع ذلك، فإنها تتعرض للإصابة بعدد من الطفيليات الخارجية القشرية التي قد تؤثر سلباً في جودتها وقيمتها الغذائية، مثل طفيلي *Ceratothoa capri* في الدراسة الحالية، تم تسجيل وجود طفيلي *Ceratothoa capri* على أسماك *Oblada melanura* على طول ساحل طرابلس لأول مرة. حيث تم تجميع عدد 60 عينة من الأسماك وفحصها فمويًا للكشف عن *C. capri* في الأسماك الذكور والإناث الناضجة وغير الناضجة. تم تقييم النتائج المتحصل عليها اعتماداً على التحليل الإحصائي ودراسة مقارنة مع الدراسات المنشورة حديثاً. أظهرت النتائج أن عينات الأسماك غير الناضجة سجلت أعلى معدل انتشار للإصابة (15.4%)، بينما سجلت الأسماك الذكور معدل انتشار بلغ (12.1%) مع تباين منخفض (2.23) وانحراف معياري منخفض جداً (1.49). وكانت نسبة الأسماك المصابة بالطفيلي منخفضة نسبياً، لذلك كان من الصعب إيجاد علاقة واضحة أو اتجاه محدد بين حجم أو وزن الأسماك ونسبة الإصابة. ظهرت نتائج الدراسة المقارنة تبايناً ملحوظاً في معدلات الانتشار بين التجمعات البرية، حيث سُجِّلَت نسب منخفضة تراوحت بين (0.26%–2.33%) في كلٍّ من تركيا وتونس والجزائر، في حين بلغ متوسط معدل الانتشار في ليبيا نحو (10%). ويُعزى هذا

الاختلاف إلى مجموعة من العوامل البيئية، من بينها ارتفاع درجات الحرارة، والتنوع البيئي. كما تضمنت الدراسة عرضًا تعريفيًا وتصنيفيًا، مع بيان أبرز الخصائص المورفولوجية المميّزة لكلٍ من العائل والطفيلي.

الكلمات المفتاحية: ساحل طرابلس، معدل الانتشار Oblada melanura ، Ceratothoa capri

1. Introduction

The saddled seabream (*Oblada melanura*) is an important fish both economically and nutritionally, particularly in the Mediterranean regions. It is valued in commercial fisheries, aquaculture, and provides essential nutrients for human diets. *O. melanura* is a commercially important species, contributing significantly to regional fisheries and local economies. It is a common target for various fishing methods, including gillnets, trammel nets, and longlines, supporting the livelihoods of commercial fishermen across its range e.g., in Turkey, Libya, and the Adriatic Sea [1]. *O. melanura* provides several essential nutrients vital for human health such as protein, essential minerals (Ca, Fe, Zn, Se), omega-3 fatty acids, and Vitamin A [2]. These nutritional components help prevent various human diseases and contribute to a balanced diet. *C. capri* is an external parasite that typically attaches to the gills or the buccal (mouth) cavity of its host fish. The isopoda parasite *C. capri* poses a significant risk to the health and commercial value of various fish species, both wild and farmed. The primary risks involve physical damage, reduced growth rates, secondary infections, and potential mortality, though the risk to human health from the parasite itself is considered minimal if proper food preparation guidelines are followed. The parasite attaches using its hook-like legs and is a hematophagous feeder, meaning it sucks the host's blood. This can cause anemia, tissue damage at the attachment site, and in some cases, destruction of the fish's tongue, which the parasite then replaces. The presence of a large isopoda in the mouth or gills can mechanically interfere with the fish's ability to feed, leading to reduced growth rates, malnutrition, and a diminished condition factor (overall health/plumpness). The lesions and attachment wounds created by the parasite can serve as entry points for opportunistic bacterial or viral pathogens, leading to secondary

infections that further compromise fish health. For commercial fisheries and aquaculture, the negative impact on fish health, appearance, and survival results in direct economic losses [3]. There is generally no significant human health risk from the *C. capri* parasite itself. In summary, the risk of *C. capri* is a major concern for fish populations and the fishing industry, but not a direct threat to human health provided the fish is handled and prepared correctly. This study comes in support of the general trend that aims to reduce the risks of parasites to fish in general, and the effect of the *C. capri* parasite on the *O. melanura* fish in particular. The current study aims to determine the prevalence of the parasite in the fish *O. melanura* along the coast of Tripoli. It also aims to compare the obtained findings with several recently published results from various countries in the Mediterranean basin.

2. Material and Methods

• Fish samples

The present study was conducted on saddled seabream (*O. melanura*) fish, collected from the coast of Tripoli, Libya (32° 53' 13.95" N, 13° 11' 28.82" E) [4]. A total of 60 samples with different lengths and weights were purchased freshly from the Tripoli fish-local market during September 2024. All fish samples were immediately transferred in a suitable cooling-ice bag to the investigating laboratory of the biology department, Faculty of Education, Qaser Bin Ghashir, University of Tripoli, Libya where all samples were examined and classified according to sex, weight, length, and the presence of isopoda parasites, especially *C. capri* on mouth. The weight, length and sex of fish samples were measured and identified according to the reference [5]. The average weight of fish samples ranges between (23.3-120.7) g while the average length ranges between (12.3-32.6) cm.

• Parasite Investigation and Classification

Parasites were obtained from the examined fish and preserved in alcoholic solution (70%) in individual vials for each isopoda parasite. The obtained parasites were examined under a binocular inspection microscope with different magnification power and the details of the pictures were presented and saved using a USB digital camera connected with the microscope. After complete investigations, the found isopoda parasite was classified using the

description method and classification keys according to different scientific literature [6, 7, 8, 9, 10].

- **Prevalence of parasites *Ceratomyxa capri***

Prevalence (P), defined as the percentage of fish infested with *C. capri* in the mouth cavity, was calculated using the formula [11]:

$$P = \frac{n}{N} * 100$$

Where (n) is the number of infested fish and (N) is the total number of fish examined. Prevalence (P) of parasites was calculated for male, female, and immature fish samples. Mathematically, variance (σ^2) and standard deviation ($SD = \sqrt{\sigma^2}$) are calculated using the following formulas [12, 13]:

$$\sigma^2 = \frac{\sum_{n=1}^{n=\infty} (X - \mu)^2}{N - 1}$$

$$SD = \sqrt{\sigma^2} = \sqrt{\frac{\sum_{n=1}^{n=\infty} (X - \mu)^2}{N - 1}}$$

Where:

X: is the value of the data distribution.

μ : is the average value of population sample.

N: the total number of observations or the size of samples.

3. Results and Discussion

- **Descriptive Identification of *O. melanura***

The whole body and classification of the *O. melanura* fish under investigation is presented as shown in Figure (1). As shown in this figure, *O. melanura* has a distinctive, prominent black spot on the caudal peduncle (the "wrist" of the tail), which is often edged in white. This spot is the origin of the common name "saddled" seabream. The body is elongated and laterally compressed, typical of many sparids, with a silvery-grey coloration. It is a coastal, benthopelagic species found in the Mediterranean Sea and the eastern Atlantic Ocean from the Bay of Biscay to Angola, including the Canary Islands and Cape Verde. It is an omnivorous feeder, consuming small invertebrates, zooplankton, and algae. Fins are

continuous dorsal fin with 11 spines and 13-14 soft rays. The anal fin has 3 spines and 13-14 soft rays [14, 15].

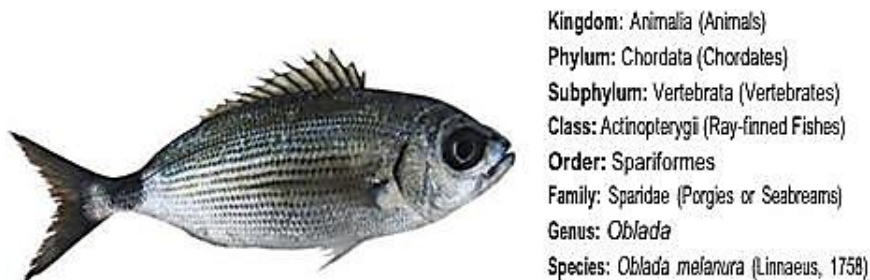


Figure (1): *O. melanura* fish and its classification [16]

• Identifying Characteristics features of *C. capri*

The presence of *C. capri* parasite on *O. melanura* Libyan fish was recorded for the first time in the present study. According to the macroscopic and microscopic studies of *C. capri* parasite founded in *O. melanura* fish samples, complete identifying characteristics features of *C. capri* are summarized and presented in table (1). *C. capri* parasite can be identified and described according to different body parties such as the body shape/size, head, thorax, abdomen, mouth, and Uropods. *C. capri* parasite and its taxonomy are presented in figure (2).

Table (1): Identifying Characteristics Features of *C. capri*

Character	Description details
Body Shape and Size	The body is typically elongate, oval, and dorsoventrally flattened (a common feature in isopods), but robust. Size: Adults typically range between 10-20 mm in length, with females generally being larger than males.
Cephalon (Head)	The cephalon is trapezoidal and is deeply immersed (embedded) into the first pereonite (thoracic segment). The eyes are relatively small and distinct, but not large and prominent as in some other cymothoid genera. Antennae and antennulae are short but the antennulae being shorter than the antennae. This is a characteristic feature of the genus <i>Ceratothoa</i>
Pereon (Thorax)	The coxae (lateral plates on the thoracic segments) are short and broad. They are visible along the sides of the body but do not form long, pronounced lateral plates. The seven pereonites (thoracic segments) are

Character	Description details
	all distinct and well-defined. The first pereonite is the largest, and the subsequent ones gradually decrease in width towards the posterior.
Pleon (Abdomen)	The pleon consists of five pleonites (abdominal segments). The first pleonite is not obscured by the last pereonite. The pleotelson (the fused last abdominal segment and telson) is broader than it is long. Its posterior margin is broadly rounded or truncate, often with a slight medial indentation or notch. This is a key diagnostic feature for the genus <i>Ceratothoa</i> .
Mouthparts (Peraeopods)	The first pair of peraeopods (walking legs) are prehensile (subchelate), meaning they are modified for grasping and holding onto the host's tissues. The following six pairs of peraeopods are ambulatory (for walking/clinging). The terminal segment (dactylus) of the peraeopods is simple and sharp, well-adapted for clinging.



Kingdom: Animalia
Phylum: Arthropoda
Subphylum: Crustacea
Class: Malacostraca
Order: Isopoda
Family: Cymothoidae
Genus: **Ceratothoa**
Species: *C. capri* (Trilles, 1964)

Figure (2): *C. capri* and its classification

• Prevalence Comparative Study

Percentage of prevalence rate of *C. capri* on *O. melanura* Libyan fish was calculated and presented in table (2). From this table, it was noticed that the high prevalence rate of *C. capri* on *O. melanura* ($\approx 15.4\%$) was recorded for immature phase of *O. melanura* fish, while female fish has no parasites at all. Male of *O. melanura* has prevalence rate of 12.1% and the total mean value is 10% . Statistical analysis of the presence of *C. capri* on *O. melanura* fish was carried out for the three types of all investigated samples as shown in table (2). Variance (σ^2) and standard deviation ($SD = \sqrt{\sigma^2}$)

are chosen as the main statistical parameters in this part to show the optimum validity of the obtained results. It was concluded that the values of variance and standard deviation are 2.23 and 1.49 respectively. It was noticed that the presence of *C. capri* on *O. melanura* fish has very low values of variance and standard deviation with studied variables (X_n : X_1 , X_2 , X_3); and this may be explained by the very low prevalence level measured for fish samples, and this behavior can interpreted in the light of the fact that as the measured parameter increased numerically, its statistical value will increased linearly and vice versa. Addition of standard deviation value (SD) to each studied variable (X) gives the validity of measured ranges as $(X \pm SD)$, from which the minimum and the maximum value of each variable can be predicted as (X_{min} & X_{max}).

Results show that the valid measuring range of the presence of *C. capri* on *O. melanura* fish can be written as $[(X) \pm 1.49 \text{ \%}]$, the valid measuring range of *C. capri* on male fish can be written as $[(12.1) \pm 1.49 \text{ \%}]$, and the valid measuring range of *C. capri* on immature fish can be written as $[(15.4) \pm 1.49 \text{ \%}]$ respectively, and hence the calculated values of (X_{min} & X_{max}) for the presence of *C. capri* on male fish are equal to (10.61 & 13.59 %) and the value of X_{max} increased more than X_{min} by about ~ 1.28 times, so the expected acceptable values of the presence of *C. capri* on male fish should be within this range along the Tripoli coast according to the obtained results. For the presence of *C. capri* on immature fish, the calculated values of (X_{min} & X_{max}) are equal to (13.91 & 16.89 %) and the value of X_{max} increased more than X_{min} by about ~ 1.21 times. According to the fact that the standard deviation reflects the distribution of the variables and the distribution curve with the lowest standard deviation has a high peak and a small spread, while the curve with the highest standard deviation is more flat and widespread, and consequently it was expected that the distribution curve of *S*(*C. capri* on *O. melanura*) with low SD has a high peak and a small spread. In this context, it should be noted that the percentage of fish infected with the parasite was relatively low, as shown in Table (2). Therefore, it was difficult to find a clear relationship or trend between the size or weight of the fish and the percentage of infection. Thus, it can be said that the only influencing

factor in our current study is the fish type or sex, not the fish size or weight.

Table (2): Prevalence rate of *C. capri* on *O. melanura* fish

Type	Number of samples		Dimensions (g, cm)				%
			Maximum		Minimum		Infection ± SD
			Weight	Length	Weight	Length	
Male	33	55.0%	127	42.4	8	9.5	(12.1 % ± 1.49)
Female	14	23.3%	135	30.0	45.0	17.5	(0.0 % ± 1.49)
Immature	13	21.7%	100	25.4	17.0	10.0	(15.4 % ± 1.49)
Total	60	100%	120.7*	32.6*	23.3*	12.3*	(10 % ± 1.49)

***Mean values**

Table (3) represents prevalence rate of the parasitic isopoda *C. capri* across different regions and host species, from which the highest reported prevalence was in *Pagellus acarne* of the coast of Algeria. The study from South Africa was a taxonomic review and did not provide epidemiological prevalence data. It was noticed that the low prevalence rate (0.26% - 2.33%) across wild populations in the Mediterranean coastal country like Turkey, Tunisia, and Algeria compared to Libya (10%), this is can attributed to the warm weather, environmental diversity, and the virginity of the Libyan marine environment. The comparative study suggests that *C. capri* is typically low-density parasite in natural ecosystems. However, the nearly tenfold difference in prevalence between the lowest (Tunisia: 0.26%) and highest (Algeria: 2.33%) values indicates significant spatial and host-specific variability that can be attributed to different ecological influencers such as local geographic conditions where factors such as seawater temperature, salinity, and local hydrology current can influence the survival and transmission of parasitic isopoda larvae. Also, aggregations/accumulation of host fish can facilitate higher transmission and breeding rates. The mentioned studies were conducted at different times of the year and with varying fishing conditions and therefore can significantly impact the final result of parasite prevalence. In Greece, the prevalence of 1.65% in cage-reared *Sparus aurata* is scientifically reported, while this value falls within the range of wild populations, the context is

fundamentally different. In the high-density, confined environment of a marine culture, transmission efficiency for parasites can dramatically increase.

Table (3): Prevalence rate of the parasitic isopoda *C. capri* across different regions and host species

Country / Region	Host Fish Species	Sample Size (N fish)	Prevalence Rate (%)	Notes	Ref.
Libya Tripoli	Oblada melanura	60	10%	First record in Libya on this host species.	Present Study
Turkey	Boops boops (Bogue)	1,134	0.44%	5 infested fish found.	[17]
Algeria	Pagellus acarne (Axillary seabream)	215	2.33%	First record in Algeria and on this host species.	[18]
Tunisia (Gulf of Tunis)	Serranus cabrilla (Comber)	380	0.26%	A single infested fish was found.	
Greece (Adriatic Sea)	Sparus aurata (Gilthead seabream)	3,818	1.65%	Study conducted in mariculture (cage-reared fish).	[20]
South Africa	Various wild fish species	Not Specifically Stated	Not Reported	This is a taxonomic review paper; it describes species and reports hosts but does not focus on calculating prevalence rates.	[21]

4. Conclusion

This study documents the first recorded presence of the parasitic isopoda *C. capri* in the oral cavity of the saddled seabream (*O. melanura*) along the Tripoli coast, Libya. The overall prevalence of

C. capri in the sampled fish was 10%, with the highest infection rate found in immature fish (15.4%), followed by male fish (12.1%). No parasites were found in female fish. Due to the relatively low infection rates, no clear relationship was found between the size or weight of the fish and the prevalence of the parasite. The main influencing factor was the sex/maturity stage of the fish. The prevalence in Libyan waters (10%) is significantly higher than rates reported in other Mediterranean countries such as Turkey (0.44%), Tunisia (0.26%), and Algeria (2.33%). This difference is attributed to factors like warmer climate, environmental diversity, and the relatively undisturbed (virgin) marine ecosystem in Libya. The low values of variance (2.23) and standard deviation (1.49) indicate that the results are statistically consistent and reliable, despite the low prevalence. While *C. capri* poses a risk to fish health and may cause economic losses in fisheries and aquaculture, it does not pose a direct threat to human health if fish are properly handled and cooked. In summary, this study provides the first baseline data on *C. capri* infection in *O. melanura* from Libya and highlights the need for further monitoring and research into parasitic infections in the region's marine ecosystems.

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