

Original Research

Ultrastructure Comparison of The Mouth Opening between Two Marine Fishes with Different Feeding Habits (Red Porgy and Boops Boops Fish)

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The present investigation aimed to describe two types of marine fish of different eating behavior (Carnivorous and omnivorous). The samples were collected from two different places, the Red porgy fishes were collected from the Red Sea while the Boops boops fishes were collected from the Mediterranean Sea. The total length of the Red porgy fishes was 20:23 cm while in Boops boops fishes were 17:18 cm. The gross morphology and scanning electron microscopy (SEM) explored the following. The mouth of the Red porgy fish was very large in size, very wide and broad, half circle shaped with a very prominent and strong premaxilla while Boops boops was very thin. By SEM, the Red porgy upper lip was surrounded by different size teeth, it showed very striated and corrugated surface with different lines in its surface while the lower lip appeared with a cilia-like structure with different tall length and its apex somewhat thinner than its base. Boops boops fish upper lip appeared as a thick round structure with multiple prominent bumps which look-like small bushes gets out along the surface while its lower lip appeared very close to the teeth, it narrow anteriorly and increased in width posteriorly.

Keywords: Red porgy, Boops boops, mouth opening, gross morphology, scanning electron microscopy.

ABSTRACT

INTRODUCTION

Fishes are divided into 3 species according to its main type of food eaten, Herbivores fish which depends on plant food, Carnivores one that depends on animal material food and the last one Omnivore eating fish which eat both plant and animal related food (Evans and Claiborne, 2006). The mechanism of fish feeding and this point become significant to show the alimental relation inside the watery system and give full picture on the community of fishes (Beukers-Stewart & Jones, 2004 and Matich et al., 2011). There are a great difference in both of morphological and histological description of the lips and even in buccopharyngeal cavity of fishes that may returns to their difference in feeding habit, processed food, body format and over these the various environmental conditions they live in (Bone & Moore, 2008 and Khalaf -Allah, 2009). Aristizaba and Suarez (2006) reported that the Red porgy is play an important

commercially role in fish species of the Libyan Mediterranean Sea coast and it considered as a carnivorous fish type. The lips of fish species had different to correlated with the frequent functions as; picking, catching, food particles, deglutition, and pre-digestive mechanism of the different food particles inside the oral cavity (Elsheikh et al., 2012, El-Gendy et al., 2016, Alsafy et al., 2021.) The upper lip had of a median labial fissure or elongated ridge-like structure (Yashpal et al. 2006). Santos et al (2015) in *Trachelyopterus striatulus* fish describe that, the oral cavity is surrounded anteriorly by the upper and lower lips. With terminal mouth, the lips are thin, the upper lip appear to be attached with maxilla and pre-maxilla and the lower one attached to the mandible otherwise, Parenti (2019) said that the mouth of *sparidae* fish always small, horizontal or oblique. The present work was designed to give a detailed gross morphological and ultrastructural study to the floor of the mouth opening of the red porgy and Boops boops fishes.

MATERIALS AND METHODS

Samples The samples collected from two different places a Red porgy fish from Red Sea and Boops boops fish from Mediterranean Sea, they are collected in spring season. A total of 10 fishes were used in our study at total length of 20:23 cm in Red porgy fish and 17:18 cm in Boops boops fish, firstly wash the oropharyngeal cavities by normal saline then preserved at formalin 10%. Then those were preserved at formalin 10%. These collected fishes must be free from any oral injuries or any abnormalities, especially in the oropharyngeal cavity. **Gross Anatomy** The gross morphological examination was performed on a three fishes of about 20:23 cm total length in Red porgy fish and about three fishes of 17:18 cm total length of Boops boops fish. The full gross morphological picture to the mouth of both examined species was photographed by a digital camera. **Scanning Electron Microscopy** The specimens of the mouth cavity were extracted from a number of two studied fishes of Red porgy and another two fishes of Boops boops. The specimens were then fixed in fixation buffered solution (2% formaldehyde, 1.25% glutaraldehyde in 0.1M sodium cacodylate buffer, pH 7.2) at 48C. Once fixed, the samples were washed in 0.1M sodium cacodylate containing 5% sucrose, processed through tannic acid, and finally dehydrated in increasing concentrations of ethanol (15 min each in 50, 70, 80, 90, 95, and 100% ethanol). The samples were then at critical point dried in carbon dioxide, attached to stubs with colloidal carbon, and coated with gold palladium in a sputtering device. Specimens were examined and photographed with a JEOL JSM 5300 scanning electron microscope operating at 15 kV (Faculty of Science, Alexandria University).

RESULTS

Red porgy (pagrus pagrus) lineaus 1857.

Gross anatomy

In our work the mouth of the Red porgy fish is somewhat very large in size, very wide and broad, half circle shaped and surrounded dorsally by both of upper lip and its related upper jaws where, ventrally surrounded by the opposite lower lip and the lower jaw (**Fig.1/A**). Mouth opening high was 2.2cm and mouth-opening width at the angle point was 1.1cm. Very prominent and strong premaxila appeared by the naked eye and it forms the upper lip of the fish which appears well, it related ventrally with the dentary that resemble the lower lip by a specific connection part, that present in both right and left side of the mouth which look like the joint and also, they form the oral commissure in the Pagrus Pagrus fish (**Fig.1/A**).

The both lips appeared very strong and the upper one appeared as a very wide, strong, large cartilage surrounds all the upper part of the mouth till its point of connection with the opposite lower one. (Table 1)

SEM

On SEM examination the mouth of the red porgy fish surrounded by the ridged, semilunar upper lip (**Fig.2/A**) that surrounds the different size upper teeth, it shows very striated and corrugated surface with different lines in its surface where, the lower lip (**Fig.3/A**) appears with a cilia-like structure with different tall length and its apex somewhat thinner than its base.

BOOPS BOOPS (BOGUE) (Linnaeus, 1758)

Gross anatomy

In our investigation, we found that, Boops boops fish appears to have a somewhat small, oblique mouth opening in compare with the previous type of examined fish, mouth opening high was 1.1cm and mouth opening width at the angle point was 0.6cm. The two lips are attached together on both lateral side of the mouth at its mouth angle or it called mouth commissure (**Fig.1/B**) the lips here appears well but it seems to be less in strength than that in Red porgy fish not very wide with relatively small mouth opening in compare with Red porgy mouth opening.

In the same time the lips appears as a very thin, weak sheath and thus come in contrast to that present in Red porgy (**Fig.4 and Table 1**).

SEM

The upper lip (**Fig.2/B**) appears as a thick round structure with multiple prominent bumps which look-like small bushes gets out along the dorsal surface lower lip which (**Fig.3/B**) appears well it very close to the lower teeth surrounding them, take the shape of the relating jaw, get narrow anteriorly and increase in width posteriorly toward the esophagus, the lower lip gets striated in several irregular layers arranged behind each other.

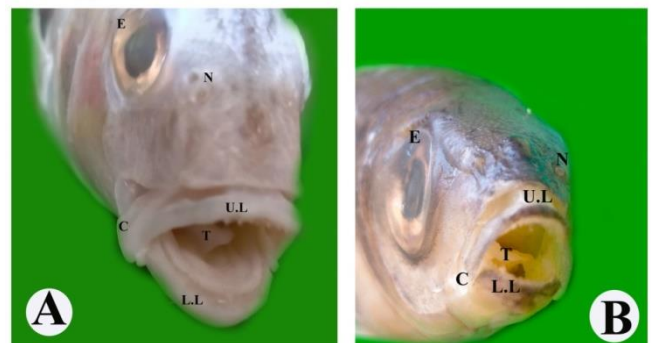


Figure (1): Gross morphological image of the mouth of two different marine fish type.

(A): opened mouth of Red porgy fish: Lower lip (L.L), Connection part (C), Upper lip (U.L), Tongue (T), Nostrils (N), Eye (E).

(B): opened mouth of Boops boops fish: Lower lip (L.L), Connection part (C), Upper lip (U.L), Tongue (T), Nostril (N), Eye (E).

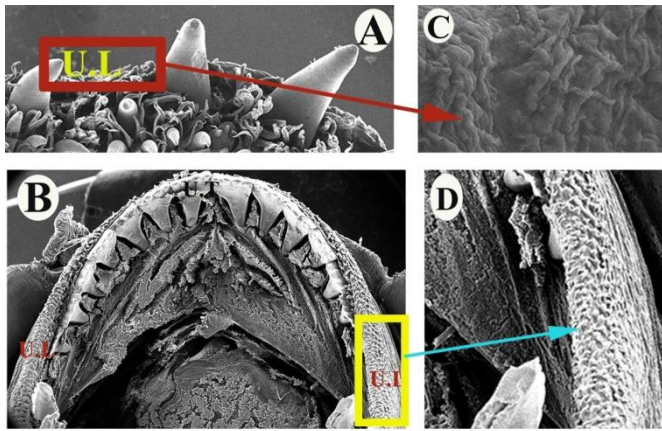


Figure (2) SEM (A): Red porgy upper lips. (C): show corrugated much-striated surface. (B): Boops boops fish shows the upper lip. (D): the prominent like pumps in the (U.L).

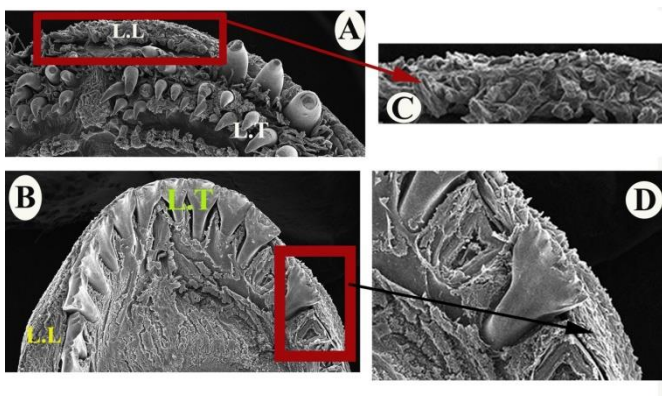


Figure (3) SEM (A): Red porgy fish lower lips. (C): shows a cilia-like structure adjacent to each other in its whole surface with different tall length. (B): Boops boops fish shows the lower lip. (D): shows much-striated rows of lower lips.

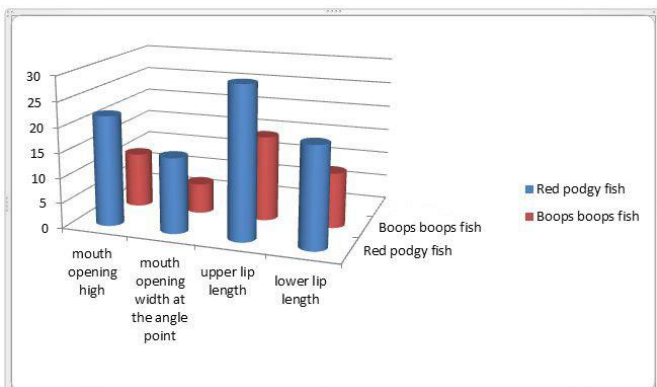


Fig.4. some measurements related to mouth opening and lips by mm.

Table (1) some measurements related to mouth opening and lips by mm

| Items | Red podgy fish | Boops boops fish |
|---|----------------|------------------|
| mouth opening high | 22 | 11 |
| mouth opening width at the angle point | 15 | 6 |
| upper lip length between the two commissure point | 30 | 17 |
| lower lip length between the two commissure point | 20 | 11 |
| Width of the lower lip at anterior part of mouth | 0.498 | 0.190 |
| Width of the lower lip at lateral part of mouth | 1.200 | 0.650 |
| Width of the upper lip at anterior part of mouth | 0.505 | 0.190 |
| Width of the upper lip at lateral part of mouth | 1.240 | 0.700 |

DISCUSSION

Red porgy (*pagrus pagrus*) lineaus 1857. Our study revealed that, the Red porgy fish is a bony fish which belong to Sparidae family and depends on its nutrition on the crustacean and other surrounding fish so, we can say that it considered a carnivorous fish type, similar observations obtained by Menezes and Figueiredo (1980), Manooch (1976) and Divanach et al. (1993), Aristizaba and Suarez (2006). The mouth opening of the Red porgy fish is somewhat large in size and supported by the presence of both upper and lower lip, moreover the maxillae is seem to be longer than the opposite mandible, this finding is agree with that obtained by Hassan (2013) in brown-spotted grouper fish and Elgendy et al. (2016) in gilthead sea bream (*Sparus aurata*) fish. The mouth here is protrusible in which premaxilla and dentary parts can be extended anteriorly freely, that is thought to be an important mechanism in fish life as it thought that it acts as a help factor in picking their prey. BOOPS BOOPS (BOGUE) (Linnaeus, 1758) Boops boops fish in our recorded data appears that, it has a relatively small mouth with oblique direction, the mouth not free, but it attached in both upper and lower part, the upper part of the mouth is attached to the relating upper lip, where the other opposing lower part is attached to the lower jaw, in the same time both of jaws related to upper and lower lips, the upper lip called the premaxillae and the lower one called the denteries. Both jaws are connected to each other at the mouth angle. These results come in the same line with that

recorded by Santos et al. (2015) In *Trachelyopterus striatulus* fish. In our work on Bogue fish, we found that, the upper jaw is seemed to be longer than its opposing, related lower one. In addition, the upper jaw is relating anteriorly with the upper lips, the premaxillae. These agree with that reported by Parenti (2019) in Sparidae fish.

CONFLICT OF INTEREST

The authors declare no conflicts of interest related to this report.

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