Blue Economy

Manuscript 1029

Systematic study on the Egyptian squids Using their sucker ring structures

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ISSN: 2805-2986 – e-ISSN: 2805-2994

RESEARCH ARTICLE

Systematic Study of Egyptian Squids Using Their Sucker Ring Structures

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Abstract

The recorded squid species in the Egyptian Mediterranean and Red Seas are *Loligo vulgaris*, *Loligo forbesii*, *Illex coindetii*, *Alloteuthis media*, *Uroteuthis* (*photololigo*) *duvaucelii*, and *Sepioteuthis lessoniana*. *A. media*, *L. vulgaris*, and *I. coindetii* are restricted to the Egyptian Mediterranean waters. However, *U.* (*photololigo*) *duvaucelii* is an Egyptian Red Sea dweller. *L. forbesii* and *S. lessoniana* exist in both localities.

This study primarily focused on using sucker ring structures as a main tool for species identification. The tooth counts for the arm sucker rings varied across different species 11–13 for *L. vulgaris*, 8–10 for *L. forbesii*, 8–10 for *I. coindetii*, seven to eight for *A. media*, seven to eight for *U.* (*photololigo*) *duvaucelii*, and 18–20 for *S. lessoniana*.

The tooth counts for the tentacular club sucker rings varied across different species 15–17 for *L. vulgaris*, 15–18 for *L. forbesii*, 17–19 for *I. coindetii*, 22–24 for *A. media*, 20–23 for *U.* (*photololigo*) *duvaucelii*, and 20–22 for *S. lessoniana*.

Keywords: Egyptian waters, Squids, Structures, Sucker rings

1. Introduction

The Egyptian waters are home to six different squid species: *Loligo vulgaris*, *Loligo forbesii*, *Illex coindetii*, *Alloteuthis media*, *Uroteuthis* (*photololigo*) *duvaucelii*, and *Sepioteuthis lessoniana*. Three of them live in the Egyptian Mediterranean waters: *I. coindetii*, *L. vulgaris*, and *A. media* (Riad, 1993). Egyptian Red Sea inhabitants include *U.* (*photololigo*) *duvaucelii* (Riad, 2008a). *L. forbesii* and *S. lessoniana* are found in the Egyptian Mediterranean and Red Sea waters (Riad, 2020).

The use of sucker rings as a practical tool for squid identification was heavily stressed in this study. In Egypt, squids have been the subject of numerous researches. Riad (1993) studied the biology and morphometry of the squid *L. vulgaris* from the Alexandria, Egyptian Mediterranean waters. Hasan *et al.* (1994) investigated the trophic relations of *L. vulgaris* from Mediterranean waters off Alexandria, Egypt. El-Sayed *et al.* (1996) studied the biochemical composition of *L. vulgaris* from the Mediterranean waters off Alexandria, Egypt.

Emam and Aly (2000) examined the male reproductive system of *S. lessoniana* from the Egyptian Red Sea's Suez Gulf. The morphology, age, and growth of *U.* (*photololigo*) *duvaucelii* from the Gulf of Suez, in the Egyptian Red Sea, were investigated by Emam *et al.* (2007). Two squid species, *L. forbesi* and *U.* (*photololigo*) *duvaucelii* from Suez Gulf of the Egyptian Red Sea were identified by Riad (2008a). One new record squid species, *S. lessoniana* was discovered by Riad (2008b) in the Egyptian Mediterranean waters off Alexandria, migrated from Red Sea through the Suez Canal.

Gabr and Riad (2008) investigated the morphometry and reproductive biology of *L. forbesii* from the Egyptian Red Sea's Suez Gulf. The seasonal variations in the biochemical composition of *L. forbesii* from the Egyptian Mediterranean and Suez Gulf,

Received 10 July 2024; revised 31 August 2024; accepted 2 September 2024.
Available online 21 October 2024

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https://doi.org/10.57241/2805-2994.1029

Red Sea were examined by Kilada and Riad (2008). Riad and Abd El-Hafez (2008) investigated the bio-economic squids in the Red Sea of Egypt. The seasonal reproductive biology of *U.* (*photololigo*) *duvaucelii* in the northern Red Sea of Egypt was examined by Kilada and Riad (2010).

In Abo Qir Bay, in the Mediterranean waters of Egypt, Emam and Ghareb (2010) investigated the morphology of digestive system and reproductive system of male *S. lessoniana*. The reproductive biology of *L. forbesii* from the Mediterranean Sea off Alexandria, Egypt was investigated by Riad and Alwerfaly (2014). Emam *et al.* (2014) investigated the morphometry and length–weight relationship of the Egyptian Mediterranean squid *L. forbesii* in the waters off Alexandria, Egypt.

The capacity to use sucker rings to identify squid to the species level is obviously lacking. Thus, the use of sucker rings as a practical tool for squid identification was heavily stressed and illustrated in this study.

2. Materials and methods

The study was carried out on specimens collected from the Egyptian Mediterranean waters (Fig. 1) and the Suez Gulf, Egyptian Red Sea (Fig. 2). The squids were preserved in 5% formalin solution and kept in the "National Reference collection center Laboratory, National Institute of Oceanography and Fisheries, Alexandria, Egypt".

Tentacular clubs, tentacular club suckers, tentacular club sucker rings, arm suckers, and arm sucker rings for each squid species were drawn by means of a zoom stereoscopic microscope provided with a Camera Lucida drawing tube.

3. Results and discussion

3.1. Loligo vulgaris

Habitat: *L. vulgaris* inhabits the Egyptian Mediterranean waters (Riad, 1993).

Fig. 1. The Egyptian Mediterranean Sea.

Fig. 2. Suez Gulf, Egyptian Red Sea.

3.1.1. General description

For about two-thirds of its length, the front part of the body is cylindrical. Two rows of suckers, supported up by rings are carried by each arm. The fins are subtriangular and surround it (Plate 1).

3.1.2. Sucker ring description

Eight larger median suckers are present on the tentacular club each bearing approximately 15–17 teeth within their sucker rings (Plate 2). In contrast, the arm sucker rings support a range of 11–13 teeth per ring (Plate 2).

3.2. Loligo forbesii

Habitat: *L. forbesii* inhabits the Egyptian Mediterranean waters (Riad, 1993) and the Egyptian Red Sea (Riad, 2008a).

3.2.1. General description

The fins extend to approximately 75% of the mantle length and are elongated and posteriorly concave. The mantle is thin (Plate 3).

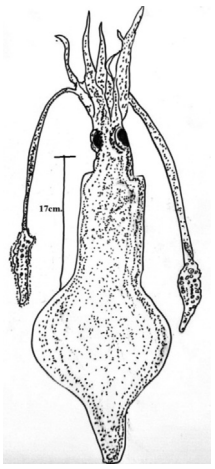

Plate 1. Loligo vulgaris.

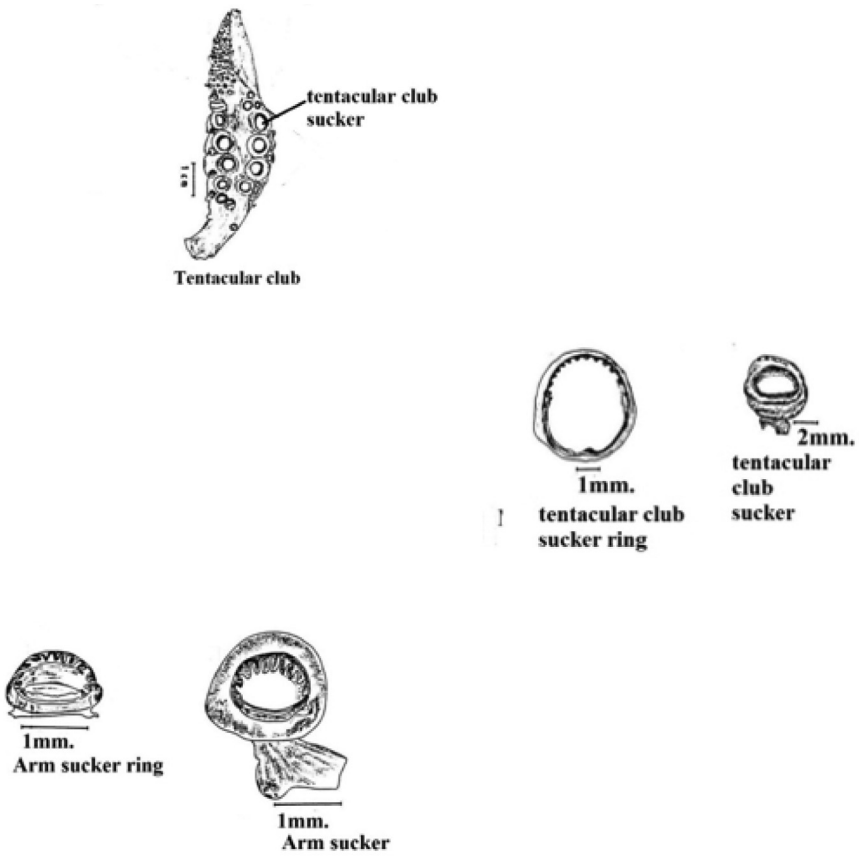

Plate 2. Loligo vulgaris sucker rings.

3.2.2. Sucker ring description

There are equal suckers on the tentacular club (Plate 4). Each sucker ring has between 15 and 18 sharp teeth. Each arm has two rows of suckers; each arm sucker ring is provided with about 8–10 teeth (Plate 4).

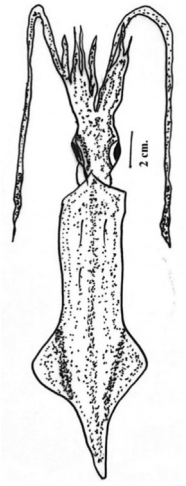

Plate 3. Loligo forbesii.

3.3. Illex coindetii

Habitat: *I. coindetii* inhabits the Egyptian Mediterranean waters (Riad, 1993).

3.3.1. General description

The mantle's front portion is wider than its posterior portion. The fins have a pointed tail and a large fin angle that exceeds 50°. The width and length of the head are roughly equal (Plate 5).

3.3.2. Sucker ring description

Eight longitudinal rows of tiny suckers are supplied for the tentacular club (Plate 6). There are 17–19 blunt teeth on the tentacular club sucker ring (Plate 6). The elongated arms are equipped with two rows of suckers, each containing two suckers. There are roughly 8–10 blunt teeth in the arm sucker ring, with an enlarged center sharp tooth.

3.4. Alloteuthis media

Habitat: *A. media* inhabits the Egyptian Mediterranean waters (Riad, 1993).

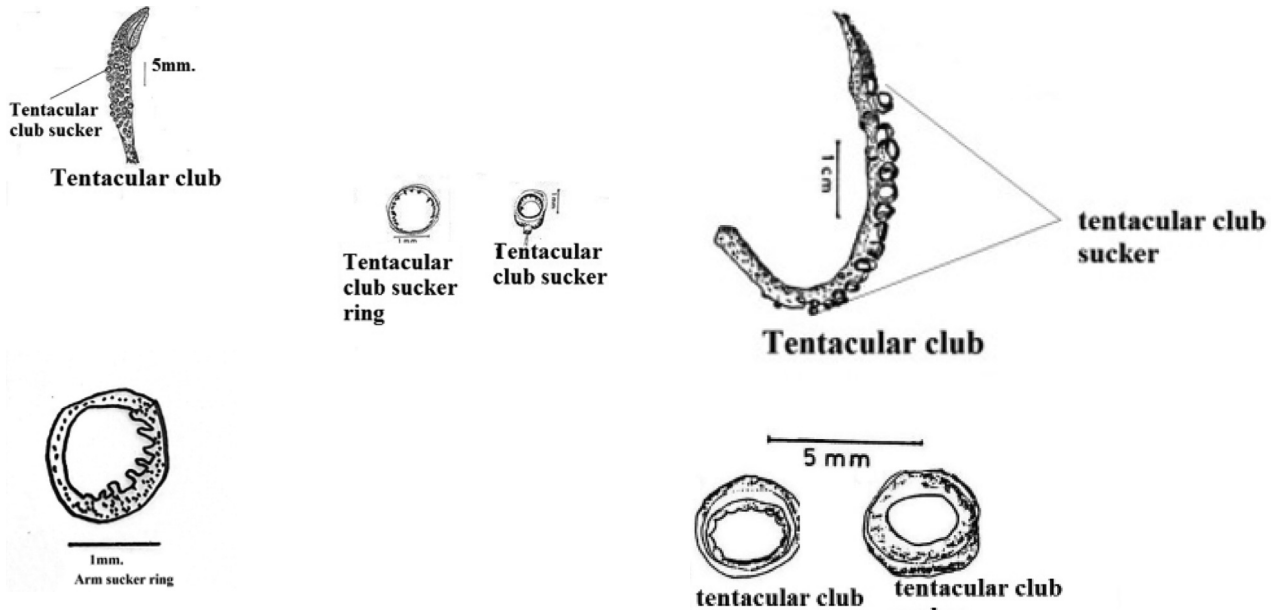

Plate 4. Loligo forbesii sucker rings.

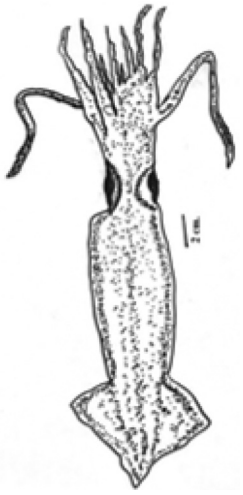

Plate 5. Illex coindetii.

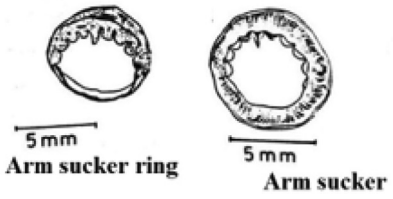

Plate 6. Illex coindetii sucker rings.

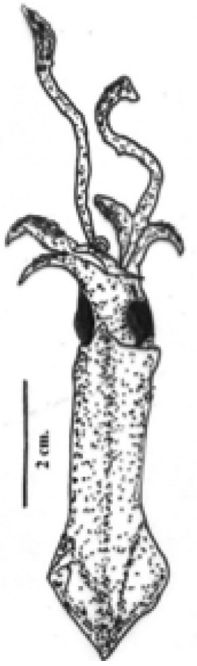

Plate 7. Alloteuthis media.

3.4.1. General description

The tail is pointed and the head is large and short. The fins are approximately 40% of the mantle length and have a heart-shaped appearance. The mantle is narrow and long (Plate 7).

3.4.2. Description of sucker rings

In addition to the two outer rows of tiny suckers, the tentacular club bears four suckers in each row; two median rows are well-developed suckers (Plate 8). There are 22–24 teeth on the tentacular club's sucker ring (Plate 8). There are two rows of suckers on the arms. Each arm sucker ring has seven to eight teeth (Plate 8).

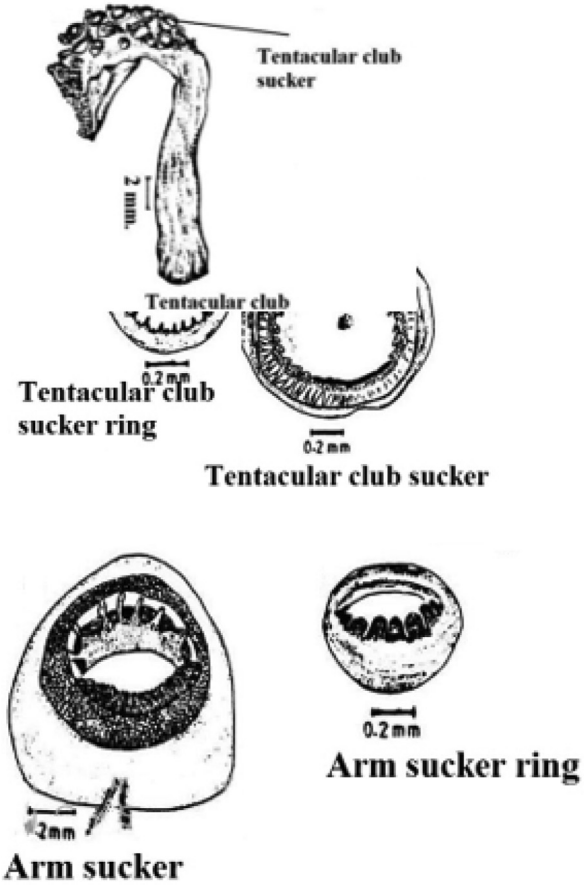

Plate 8. Alloteuthis media sucker rings.

3.5. Uroteuthis (photololigo) duvaucelii

Habitat: Suez Gulf (Red Sea of Egypt) dweller *U.* (*photololigo*) *duvaucelii* (Riad, 2008a).

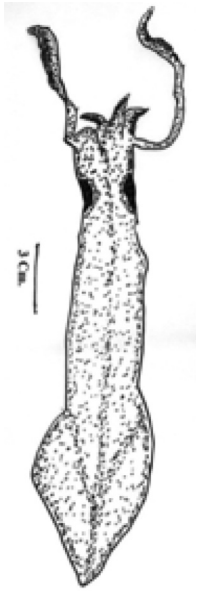

Plate 9. Uroteuthis (photololigo) duvaucelii.

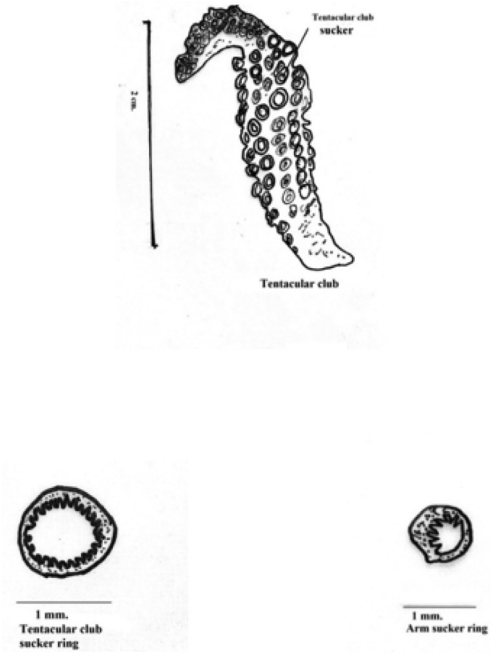

Plate 10. Uroteuthis (photololigo) duvaucelii sucker rings.

3.5.1. General description

The mantle is rather short and the fins are rhombic, approximately half of the mantle length (Plate 9).

3.5.2. Description of sucker ring

Tentacular club with bigger median suckers than marginal (Plate 10). Tentacular club sucker ring provided with 20–23 sharp teeth (Plate 10). A set of roughly equal-sized arm suckers. Each arm sucker ring has seven to eight teeth (Plate 10).

3.6. Sepioteuthis lessoniana

Habitat: *S. lessoniana* is a species that lives in the Suez Gulf, Egyptian Red Sea (Riad, 2008a) and Egyptian Mediterranean Sea (Riad, 2008b).

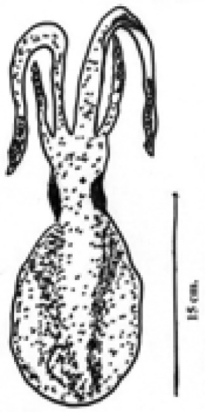

Plate 11. Sepioteuthis lessoniana.

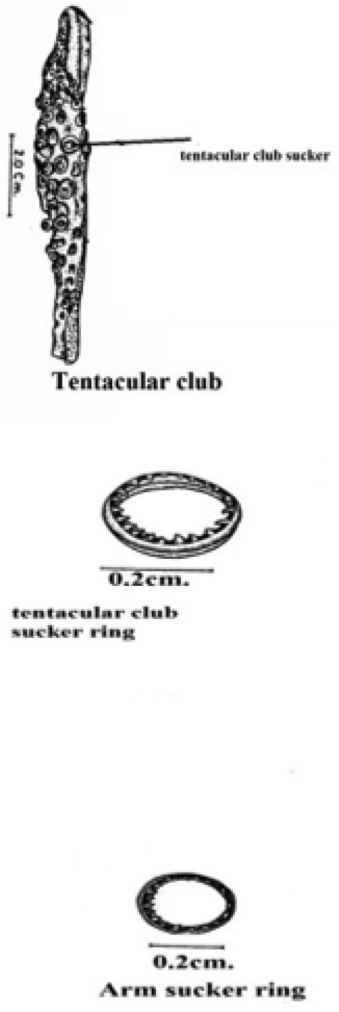

Plate 12. Sepioteuthis lessoniana sucker rings.

3.6.1. General description

The mantle is long, robust, with a width approximately 45% of the mantle length (Plate 11). Fins are broad, sepia-like, but considerably wider and more muscular, their length can reach up to 90% of the mantle length. Their breadth can also reach up to 75% of the mantle length (Plate 11).

3.6.2. Sucker ring description

The median tentacular club suckers grew and the tentacular club length extended with four rows of suckers (Plate 12). Tentacular club sucker ring has sharp teeth ranging from 20 to 22 teeth (Plate 12). Each arm sucker ring has 18–20 long sharp teeth (Plate 12).

4. Remarks

Table 1 shows the number of teeth in each sucker ring for each Egyptian squid species according to the results of the present study.

Notably, Jereb and Roper (2010) used a similar methodology, but their results as presented in Table 2 differ from those of the current study.

It is worth noting that Roper *et al.* (1984) used a comparable methodology; however, their findings as displayed in Table 3 diverge from those of the present investigation.

With the exception of *I. coindetii* and *A. media*, which have smooth tentacular club sucker and arm sucker rings, Tables 2 and 3 show that although the results of Jereb and Roper (2010) and Roper *et al.* (1984) are identical, they are slightly different from

Table 1. The number of teeth in each sucker ring for each Egyptian squid species according to the results of the present study.

Sucker rings	*Loligo vulgaris*	*Loligo forbesii*	*Illex coindetii*	*Alloteuthis media*	*Uroteuthis (photololigo) duvaucelii*	*Sepioteuthis lessoniana*
Tentacular club sucker ring	15–17 teeth	15–18 teeth	17–19 blunt teeth	22–24 teeth	20–23 teeth	20–22 teeth
Arm sucker ring	11–13 teeth	8–10 teeth	8–10 blunt teeth with center sharp tooth	7–8 teeth	7–8 teeth	18–20 teeth

Table 2. The number of teeth in each sucker ring for each squid species according to Jereb and Roper (2010) results.

Sucker rings	*Loligo vulgaris*	*Loligo forbesii*	*Illex coindetii*	*Alloteuthis media*	*Uroteuthis (photololigo) duvaucelii*	*Sepioteuthis lessoniana*
Tentacular club sucker ring	30 teeth	13–18 teeth	Smooth	Smooth	16–20 teeth	14–23 teeth
Arm sucker ring	20 teeth	7–8 teeth	Smooth	Smooth	7 blunt teeth with central one pointed	18–29 teeth

Table 3. The number of teeth in each sucker ring for each squid species according to the Roper et al. (1984) results.

Sucker rings	*Loligo vulgaris*	*Loligo forbesii*	*Illex coindetii*	*Alloteuthis media*	*Uroteuthis (photololigo) duvaucelii*	*Sepioteuthis lessoniana*
Tentacular club sucker ring	30 teeth	13–18 teeth	Smooth	Smooth	14–17 teeth	14–23 teeth
Arm sucker ring	20 teeth	7–8 teeth	Smooth	Smooth	7 blunt teeth with central one pointed	18–29 teeth

the results of the current study. This could be due to the different environments.

Ethics information

In studies involving animals, researchers must follow guidelines to ensure humane treatment and minimize suffering.

Funding

No funding was provided for this study.

Declaration of competing interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. He confirms the disclosures, declarations, and transparency on data statements that are included in the manuscript.

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