

Revision of Families Veneridae and Mactridae (Mollusca: Bivalvia) From the Suez Gulf, Egypt

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ABSTRACT

Thirteen species of bivalves belong to families Mactridae and Veneridae (Mollusca: Bivalvia) were identified and revised during the present study. These species were collected from 10 sites of the intertidal coastal area along the western coasts of the Suez Gulf during the period from summer 2017 to spring 2018. Family Veneridae dominated Mactridae and was represented by 11 species distributed within 8 genera belonging to 4 subfamilies called Callocardiinae, Circinae, Dosiniinae and Tapetinae. The venerid species comprised *Callista florida*, *Pitar hebraea*, *Circe corcea*, *C. rugifera*, *C. scripta*, *Circenita callipyga*, *Gafrarium pectinatum*, *Dosinia erythraea*, *D. hepatica*, *Paphia textile*, and *Tapes deshayesii*. In contrast, family Mactridae had only two species (*Mactra lilacea* and *M. olorina*), belong to subfamily Mactrinae. The synonyms, diagnostic characteristics, size, habitats, status, the color of live and dead shells and distribution of the identified species were recorded. The taxonomic position was given provided with a constructed key for identification.

INTRODUCTION

Mollusks represent the second-largest animal phylum in the marine realm (Sharabati, 1984; FAO, 2016; Rusmore- Villaume, 2008), therefore, they consider one of the most important elements within food chains and are the most prominent members of marine faunal ecosystems. Certain species have direct or indirect commercial importance and even medical importance to humans (Vine, 1986; Mastellar, 1987; Rusmore-Villaume, 2008). This phylum comprises several classes of the class Bivalvia which includes molluscs enclosed in two shell valves as mussels, oysters, scallops and clams. It constitutes the second-largest class of Mollusca; with about 7500 species are well distributed in different marine environments (Sharabati, 1984; FAO, 2016; Rusmore- Villaume, 2008).

Family Mactridae comprises about 180 species have shells are commonly known as “surf clams”, or “trough clams” (Huber 2010), most of them have important ecological and economic roles in marine environments. According to Dall (1895) Mactridae comprises five subfamilies it called Mactrinae, Lutrariinae, Kymatoxinae, Tanysiphoninae and Zenatiinae.

Members of mactrid bivalves occupy the sandy and muddy bottoms (Lamprell & Whitehead 1992) and some of them act as suspension filter-feeding animals in the soft bottom ecosystem (Poutiers, 1998). Some species of genus *Mactra* can also be found in mangrove zones (Masagca *et al.* 2010) and seagrass beds (Mudjiono *et al.*

1992). For economic roles, some of mactrid bivalves have economic importance in some countries. They are edible; hence they are actively collected and consumed in the Philippines (Li *et al.*, 2011 and Wang *et al.*, 2011).

Taxonomically, members of family Mactridae are most easily distinguished from other bivalve families by the nature of their hinge appearance, which consists of a characteristic internal resilifer in each valve that is broad and placed directly under the umbones. The anterior cardinal teeth of the hinge form an inverted V-shape, differentiating the family from other members of the superfamily Mactroidea occurring in the Gulf of Suez (Oliver, 1992; Rusmore-Villaume, 2008).

During the 19th and early 20th centuries, several authors contributed valuable knowledge on the mactrids over the world introducing new species (e.g. Deshayes 1855; Reeve 1854; Dall, 1895, 1915; Smith 1915; Doello-Jurado 1949). Lamy (1913, 1914, 1925) studied those species described by Lamarck (1815–1822) at the Muséum National d'Histoire naturelle in Paris. Species catalogues were provided by Rios (1966, 1969, 1975, 1994, and 2009), Abbott & Dance (1986), Díaz Merlano & Puyana Hegedus (1994), and Mikkelsen & Bieler (2007).

On the other hand, Family Veneridae was first established by Rafinesque (1815) and it was included in the order Veneracea (Adams and Adams, 1856). The early classifications by the previous authors such as Adams and Adams (1857); Chenu (1862), Gill (1871), Tryon (1884) and Fischer (1887) had grouped Veneridae with Petricolidae and Glauconomidae (Mikkelsen *et al.*, 2006).

Family Veneridae is known as Venus clams. It is the largest marine family of bivalves and the richest species family of heterodont bivalve mollusks (Oliver, 1992; Da Costa, 2012). The members of this heterodont group are typified by characters such as three cardinal teeth in each valve, feeble or wanting lateral teeth and well-developed lunule and escutcheon (Keen 1969). Many species of Veneridae are economically important and ecologically crucial due to their huge abundance in benthic environments (Vine, 1986; Mastellar, 1987; Oliver, 1992).

In the current systematic position, family Veneridae includes more than 800 extant species, distributed within about 14 subfamilies (Keen 1969; Habe 1977; Da Costa, 2012), in approximately 170 genera (Mikkelsen *et al.*, 2006; Da Costa, 2012). The fourteen subfamilies of Veneridae are called Venerinae, Callocardiinae, Chioninae, Clementiinae, Dosiniinae, Gemminae, Gouldiinae, Lioconchinae, Meretricinae, Samarangiinae, Petricolinae, Sunettinae, Tapetinae and Turtoniinae.

Along the entire Red Sea including the Egyptian coasts and associated gulfs (Suez and Aqaba), taxonomy, ecology, fisheries, and bioindicators of the mollusks had treated in several studies (Aboul- Dahab, 1983; Hasan, 1983; Sharabati, 1984; Vine, 1986; Head, 1987; Mastellar, 1987; Rusmore-Villaume, 2008). The taxonomy of Suez Gulf mollusks had treated in a few detailed studies (Ismail, 2005; Gab-Allah *et al.*, 2007; El-Mekawy, 2016). All these studies covered certain species or dealt with the general distribution or taxonomy of certain groups.

Therefore, this study aims at through light on the taxonomy of the occurred species of families Mactridae and Veneridae at the western coasts of the Suez Gulf.

MATERIALS AND METHODS

Ten sites extend between Suez City (north) and Ras Gharib (south) along the western coastal plain of the Gulf of Suez (Figure 1) were studied during the period from summer 2017 to spring 2018. The local name of each site was recorded and the accurate position was determined using the GPS (Global Positioning System) and

given in Table (1). All observations on the nature of habitats at each site and were noticed and recorded during sampling.

At each site, all individuals belong to families Mactridae and Veneridae were recorded and representative specimens were collected from their habitats by hand or dredging using hand dredge supported with the metal frame of 30 x15 cm, then sorting and fixed in 95% alcohol. Some specimens were preserved in 10% buffered formalin in seawater, and then after stored in 70% ethanol for further studies. Other specimens collected previously from the Suez Gulf, placed among the Reference Collection in Marine Invertebrates Laboratory, Section of Marine Biology, Al Azhar University were also examined.

At the laboratory, all specimens were firstly cleaned from the attached sediments and the extraneous bio-fouling organisms were removed by scraping from the ventral and dorsal shell, then identified to the specific level using identification keys according to Oliver (1992) and FAO (2016), in addition to available books and works of literature including Sharabati (1984), and Rusmore-Villaume (2008). The shell length, shell height and breadth of the identified species were measured using Caliper Vernier with an accuracy of 0.01 mm. The color of both live and dead shells and the number of cardinal teeth were recorded. The substratum and zones occupied by each individual were recorded.

All terminology and measurements (Figs. 2&3) were recorded for each individual according to Oliver (1992); Rusmore-Villaume (2008) and FAO (2016), and comprised mainly the following terms:

- a) Shell length (L): It represents the maximum distance between the anterior and posterior margins of the shell (Fig. 2).
- b) Shell height (H): It represents the maximum distance from dorsal to the ventral margin of the shell (Fig. 2).
- c) Shell breadth (B): It represents the maximum inflation of the outer edges of the two valves when joined (Fig.2).

Photographs: All photographs were taken by Fujifilm Power Shot Camera (Fujifilm FinePix AX, HD Movie- 16 Megapixels).

All identified specimens were deposited among the Reference Collection in Marine Invertebrates Laboratory, Section of Marine Biology, Department of Zoology, Al-Azhar University, Egypt.

Table (1): Local names and coordinates of study sites at the western coasts of the Suez Gulf.

Site name	GPS Coordinates	
	Longitudes	Latitudes
I- Suez Bay at Suez City (north)	32°32'51.03" E	29°57'22.92" N
II- Kabanon at Suez City (south)	32°29'12.02" E	29°56'37.20" N
III- Adabia	32°30'3.84" E	29°50'46.41" N
IV- Ain Sokhna (Km65 south Suez City)	32°21'39.30" E	29°33'29.40" N
V- Km72 south Suez City	32°25'54.77" E	29°29'27.58" N
VI- Km75 south Suez City	32°27'18.90" E	29°28'16.80" N
VII- Porto Sokhna	32°28'28.64" E	29°27'24.42" N
VIII- Km85 south Suez City	32°30'46.83" E	29°25'12.50" N
IX- Zaafarana	32°37'0.47" E	29°15'23.56" N
X- Al Azazia (20 km north Ras Gharib)	32°51'46.44" E	28°34'39.00" N



Figure. (1): Map shows sites of study at the western coasts of the Suez Gulf.

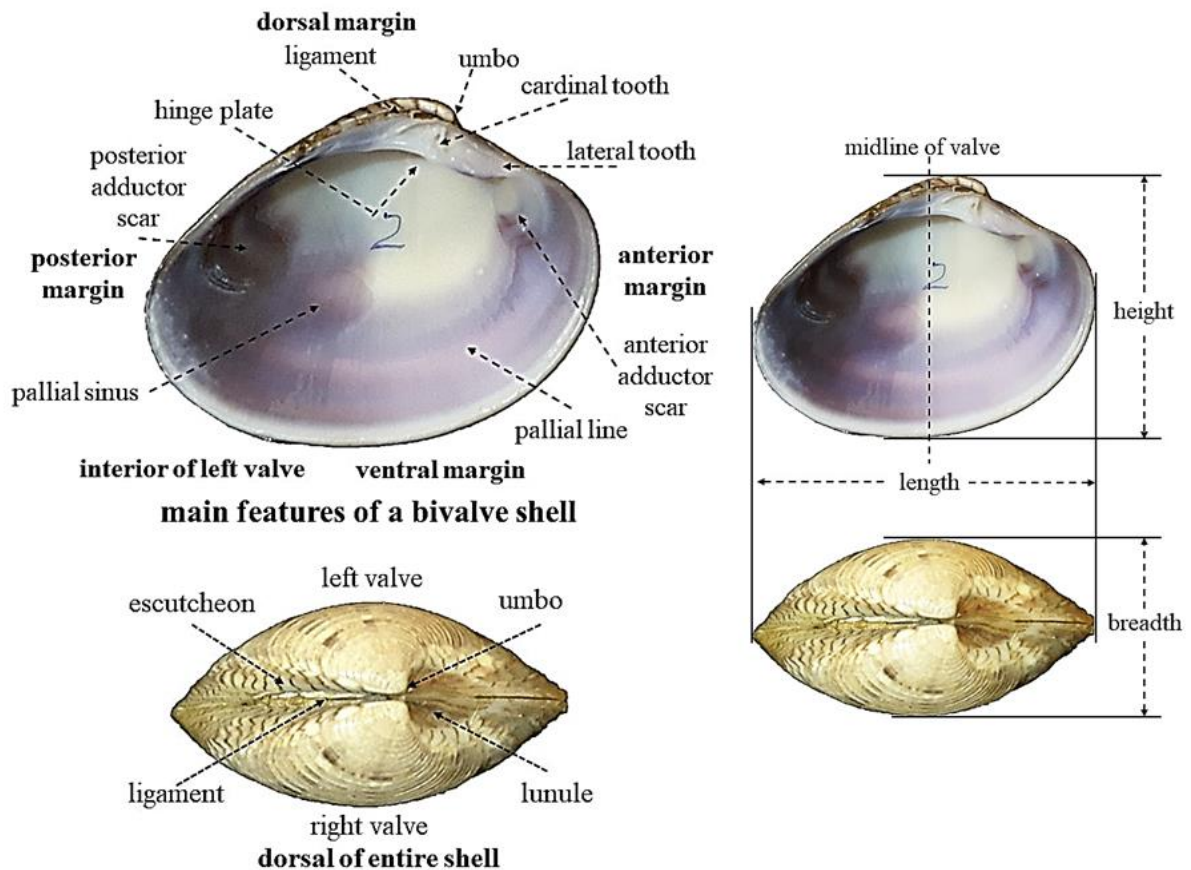


Figure (2): Shows main features, general terms and measurements of bivalve shells according to FAO (2016).

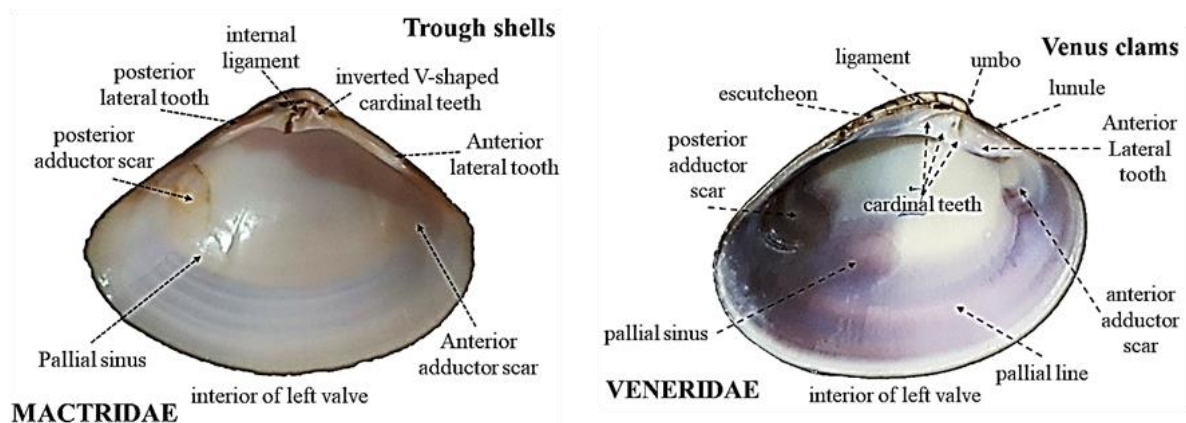


Figure (3): Shows main features of families Mactridae and Veneridae according to FAO (2016).

RESULTS

A- Systematic account

Kingdom: Animalia Linnaeus, 1758

Phylum: Mollusca Cuvier, 1795

Class: Bivalvia Linnaeus, 1758

Subclass: Heterodonta Neumayr, 1884

Infraclass: Euheterodonta Giribet & Distel, 2003

Order: Veneroida Gray, 1854

Superfamily (1): Mactroidea Lamarck, 1809

Family: Mactridae Lamarck, 1809

Subfamily: Mactrinae Lamarck, 1809

Genus: *Mactra* Linnaeus, 1767

Mactra lilacea Lamarck, 1818

Mactra olorina Philippi, 1846

Superfamily (2): Veneroidea Rafinesque, 1815

Family: Veneridae Rafinesque, 1815

Subfamily (1): Callocardiinae Call, 1895

Genus: *Callista* Poli, 1971

Callista florida Lamarck, 1818

Genus: *Pitar* Römer, 1857

Pitar hebraea (Lamarck, 1818)

Subfamily (2): Circinae Dall, 1896

Genus: *Circe* Schumacher, 1817

Circe crocea (Gray, 1838)

Circe rugifera (Lamarck, 1818)

Circe scripta (Linnaeus, 1758)

Genus: *Circenita* Jousseau, 1888

Circenita callipyga (Born, 1778)

Genus: *Gafrarium* Röding, 1798

Gafrarium pectinatum (Linnaeus, 1758)

Subfamily (3): Dosiniinae Deshayes, 1853

Genus: *Dosinia* Scopoli, 1777

Dosinia erythraea Römer, 1860

Dosinia hepatica (Lamarck, 1818)

Subfamily (4): Tapetinae Adams & Adams, 1857

Genus: *Paphia* Röding, 1798

Paphia textile (Gmelin, 1791)

Genus: *Tapes* Megerle von Mühlfeldt, 1811

Tapes deshayesii (Sowerby, 1852)

B- Identification key for the recorded families and species:

- 1- Hinge heterodont with 2 fused cardinal teeth forming an 'inverted V-shaped in the left valve; ligament internal with chondrophore **Family Mactridae (Subfamily Mactrinae)**..... 2
- Hinge heterodont with 3 cardinal teeth in each valve; ligament external **Family Veneridae** 3
- 2- Shell outline oval-trigonal; concentric ridges evenly spaced, prominent over the anterior area; color pale..... ***Mactra olorina***

- Outline oval; concentric ridges irregular; color variable often shades of lilac, with a very small dark dot on the beak..... *Mactra lilacea*
- 3- Outline ovate to subovate, inequilaterally; shell smooth and glossy; pallial sinus wide, nearly deep, horizontal and pointed..... **Subfamily Callocardiinae**4
- Outline subovate, semicircular to triangular; shell with prominent ridges 5
- 4- Thick; shining shells; pallial sinus, broad and subrectangular; the area below nymph smooth; concentric ridges not very broad, wide, weak, smooth and glossy, with faint concentric ribs; color mostly brown/ purple..... *Callista florida*
Thin; porcellanous shells; pallial sinus rounded; concentric ridges virtually smooth with shining lines and well clear growth lines; color pattern with fine brown zigzag markings..... *Pitar hebraea*
- 5- Outline subovate to triangular; radial ribs coarser; shells laterally compressed..... **Subfamily Circinae** 6
Outline semicircular, almost equilateral; shell with concentric sculptures **Subfamily Dosiniinae** 10
- Outline rectangular to ovate, sculpture with fine concentric lines**Subfamily Tapetinae**11
- 6- Umbonal flattened 7
Umbonal not flattened 9
- 7- Umbonal sculpture of diverging threads; concentric sculpture of finely evenly spaced ridges *Circe scripta*
Umbonal sculpture of diverging undulating ridges; concentric sculpture of finely lined or irregularly and broadly ridged.....8
- 8- Concentric sculpture of irregularly spaced undulating ridges; umbonal ridges with divergent threads *Circe rugifera*
Concentric sculpture of lines and occasional growth ridge; umbonal ridges very coarse, extending beyond umbonal disc; color pale, often with brown umbonal rays *Circe crocea*
- 9- Part of the whole shell with divergent or divaricate sculpture; radial ribs broad diverging down posterior slope *Gafrarium pectinatum*
Shell devoid of radial sculpture; sculpture lirate overall; shell subovate, not compressed; lunule area smooth..... *Circenita callipyga*
- 10- Sculpture irregularly spaced liration; posterodorsal margin sloping gently, anterior edge of lunule scarcely penetrating hinge plate; color usually with radial brownish rays..... *Dosinia erythraea*
Sculpture smooth with lines only; posterodorsal margin smooth and sloping steeply; lunule elevated, color usually tinged violet *Dosinia hepatica*
- 11- Outline elongate; pallial sinus ascending, short, rectangular..... *Paphia textile*
Outline subrhomboidal; pallial sinus horizontal, and broad. *Tapes deshaysii*

C- Family: Mactridae (Surf clams)

Diagnostic characters of family Mactridae:

Shells are equivalves, have oval, or oval-trigonal form, with heterodont hinge provided with 2 fused cardinal teeth forming an 'inverted V-shaped in left valve. The ligament is internal with chondrophore. Umbones are prosogyrate more or less prominent. The outer surface is either smooth or mostly has concentrically sculptured lines. Concentric ridges are evenly spaced or irregular and prominent over the anterior area. The external ligament is short, not prominent and lies just behind the umbones. Color either pale (*Mactra olorina*) or variable often shades of lilac, with a very small dark dot on the beak (*M. lilacea*).

Subfamily: Mactrinae Lamarck, 1809**Genus: *Mactra* Linnaeus, 1767 p. 1125*****Mactra lilacea* Lamarck, 1818**

(Plate I A; shell length: 2.4 cm)

Synonyms:

Mactra lilacea Lamarck, 1818. Anim. Sans.Vert., 5:479; Lamy, 1916 b: 238-241; Lamy, 1938: 38; Oliver, 1992, P. 131. Pl., 27 figs. 3a-4b; Dekker & Orlin, 2000, P.12; Zuschin & Oliver, 2003, Pl. 35.2: Rusmore-Villaume, 2008. P. 234-235.

Mactra lilacea var. *alba*- Lamy 1916 b: 240.

Mactra lilacea var. *decora* - Lamy 1916 b: 240.

Mactra lilacea var. *fauroti* - Lamy 1916 vb: 240.

Mactra lilacea var. *jickeli* - Lamy 1916 b: 240.

Mactra lilacea var. *pallida* - Lamy 1916b: 240.

Mactra decora - Smith 1891:428; Shopland 1896: 230; Sturany 1899: 276; Shopland, 1902: 177.

Mactra fauroti - Jousseume, 1888, Mem. Soc. Zool. France, 1: 200-201; Sturany 1905: 137.

Mactra fauroti var. *alba* - Shopland 1896: 230; Shopland 1902: 177.

Material examined: 3 specimens and 2 separate valves.

Measurements: Shell size varied from 1.52 to 3.7 cm in length, 1.16 to 2.66 cm in height and from 0.90 to 1.34 cm in breadth.

Localities: Gulf of Suez: RCAZUE-Mol-11001; **Adabia:** 3 specimens and 2 shells (2 shells (21/3/2014), one specimen (9-2-2018) and 2 specimens (14-4-2018).

Description:

Shells are equivalve, slightly inequilateral, inflated with a slight gape posteriorly (Plate 1 A). Shells are oval in outline with rounded anterior margin but being convex forming posterior dorsal slope. Sculptures are characterized by irregularly spaced and dense concentric ridges and lines, being more pronounced at the anterior part of the shell but are less prominent towards the posterior half. Umbo has inflated anteriorly and prosogyrate. Ligament is internal. Dentition is heterodont, with an inverted V-shaped cardinal tooth in left valve and has long sharp lateral teeth. Two subequal adductor muscle scars are found. Pallial sinus is small and oval. Shell margin is smooth.

Color:

Live shells have variable color varied from yellowish-beige color, with or without darker and lighter rays and a touch of lilac on the exterior. Dead shells are nearly a quite plain color. Beak has a tiny dark spot. Umbones are purple. In contrast, the interior has violet or white to deep purple color

Habitat: This species lives in sandy bottom habitats in the littoral and sublittoral zones.

Status: Very rare.

Distribution:

Local: Red Sea, Gulfs of Aqaba and Suez (Vine, 1986; Oliver, 1992; Rusmore-Villaume, 2008; El-Mekawy (2016). This species absents from the Suez Canal but recorded in Bardawil Lagoon (Egypt) (Mienis, 2000c, 2002b).

World: Indo-west Pacific (Oliver (1992) including Eastern Arabian Sea western Indian Ocean (Spry, 1964; Bosch *et al.*, 1995). It is invasive species and recorded in eastern Mediterranean (Zenetos *et al.*, 2004, 2005, 2010; Streftaris, *et al.*, 2005; Galil, 2007; Heiman and Mienis, 2010).

Remarks:

M. lilacea is very similar to *M. olorina*. However, the color of the first species varies considerably and can be distinguished by the presence of a very small dark dot on the beak, which never found in *M. olorina*. Also, the concentric ridges are irregularly spaced in *M. lilacea* and evenly spaced in *M. olorina*.

***Mactra olorina* (Philippi, 1846)**

(Plate: I B; shell length: 5.04 cm)

Synonyms:

Mactra olorina Philippi, 1846, Abb. Besch. Conch. 2:72, pl. 2; Fig. 2; Oliver, 1992. P.131, Pl, 27; Dekker & Orlin, 2000, P.12; Rusmore-Villaume, 2008. P. 234-235

Trigonella olorina - Vaillant, 1865: 121; Cooke, 1886: 104; Macandrew, 1870:445 Issel, 1869: 52; Fischer, 1871: 217; Sturany, 1899: 276; Sturany, 1905: 137; Tillier and Bavay, 1905: 176; Lamy, 1916b: 237; Pallary 1926:237; Tomlin 1927: 308; Lamy, 1938:37; Moazzo 1939:103-104; pl.9; fig.3; pl.10; fig.2; Barash and Danin, 1972:342,365; Mastaller, 1978:139

Mactra isthmia- Jousseume, 1888, Mem. Soc. Zool. France, 1:199-200

Material examined: 105 specimens, 252 separate valves (right and left).

Measurements: Shell size varied from 1.65 to 6.15 cm in length, 1.26 to 4.78 cm in height and from 1.54 to 2.69 cm in breadth.

Localities: Gulf of Suez: RCAZUE-Mol-11002 **Suez Bay:** 3 shells (26/6/2018).

Kabanon: 5 specimens, 8 shells (27-10-2017), 12 shells (9-2-2018), 24 specimens, 9 shells (26-6-2018), 9 specimens, 11 shells (28-8-2018). **Adabia:** 22 shells (17-1-2014), 19 shells (22-2-2014), 20 shells (21-3-2014), 18 shells (22-5-2014), 11 shells (24-6-2014), 14 shells (23-8-2014), 10 shells (27-9-2014), 15 shells (25-10-2014), 11 shells (25-11-2014), 11 shells (26-12-2014), 19 specimens, 13 shells (15-8-2017), 16 specimens, 12 shells (27-10-2017), 12 specimens, 16 shells (9-2-2018), 20 specimens, 6 shells (14-4-2018). and **Ain Sokhna:** 2 shells (25-4-2014), one shell (24-6-2014), one shell (23-8-2014), 2 shells (25-10-2014), 2 shells (25-11-2014), one shell (15-8-2017), one shell (27-10-2017), one shell (14-4-2018).

Description:

Shells are equivalve, and slightly inequilateral, inflated with a slight gape posteriorly. The outline is oval-trigonal with concave posterior dorsal slope and subacute posterior margin, and all shells have smooth margins. Sculptures have dense concentric striae, being more pronounced at the anterior part of the shell but become less prominent towards the posterior half of the shell. The shells have oblong-oval lunules, clear escutcheons and internal ligament. Pallial sinus is small and oval.

Color:

Most of the live shells have externally pale color, even plain white, but some have pale tan rays and purplish-brown markings on the dorsal areas on one or both sides of the umbo. No tiny dark dot on the beak. The Interior is usually plain white, while escutcheon and lunule are dark brown.

Habitat: This species lives buried in sand or mud habitats at the littoral and sublittoral zones. It is edible, but not of high economic interest.

Status: Frequent.

Distribution:

Local: Red Sea, Gulf of Aqaba Gulf and Gulf of Suez (Vine, 1986; Dexter, 1989; Mona, *et al.* 1989; Oliver, 1992; El-Komi, 1997; Gab-Alla, *et al.* 2007; Rusmore-Villaume, 2008; El-Mekawy, 2016), Suez Canal and its lakes (Dexter, 1989; Mona, *et al.* 1989; Fouda and Abou Zied, 1990, Abou-Zied, 1991; Hoenselaar &

Dekker, 1998). It was also recorded from the Egyptian coasts of the Mediterranean Sea (Zenetos, *et al.*, 2004, 2005, 2010; Heiman and Mienis, 2010) and from Bardawil Lagoon (Hoffman, *et al.* 2006; Heiman and Mienis, 2010).

World: Indian Ocean particularly Arabia Sea (Bosch, *et al.* 1995; Dekker and Orlin, 2000). It is an invasive species and recorded from eastern basin of the Mediterranean (Zenetos, *et al.*, 2004, 2005, 2010; Heiman and Mienis, 2010).

Remarks:

The oval-trigonal outline and the prominent anterior sculpture are diagnostic features of this species. The small individuals of this species can be confused with *M. lilacea* Lamarck, 1818, in the Red Sea, but they can be distinguished by the color of the umbonal area, which is white in *M. olorina*, purple-brown in *M. lilacea*. Moreover, *M. olorina* never has a tiny dark dot on the beak, which agrees with Oliver (1992) and Rusmore- Villaume (2008).

D- Family: Veneridae Rafinesque, 1815

Diagnostic characters of family Veneridae:

Members of family Veneridae are known as “Venus clams” and they are generally subtriangular form in outline, some are roundly triangular or oval. The shells are mostly solid, equivalve, inequilateral, with prosogyrate umbones (anterior to midline). Shell ornamentation predominantly beings concentric; sometimes radial ribs appear, the sculpture is usually concentric, sometimes is lacking. Ligament is external and hinge has 3 or rarely 2 cardinal teeth in each valve. Lateral teeth feeble or wanting; anterior lateral found in some species. Pallial sinus varying in size and shape and the pallial line may be indented. Lunule and/or escutcheon usually present. The two adductor muscles and their scars are usually equivalent (equal) in size. The body has a pair of eulamellibranch gills. The foot is well developed, and the two siphons are of moderate length.

Family Veneridae is divided into several subfamilies, but is represented here by 4 subfamilies comprised Callocardiinae, Circinae, Dosiniinae and Tapetinae and 8 genera called *Callista*, *Pitar*, *Circe*, *Circenita*, *Gafrarium*, *Dosinia*, *Paphia*, and *Tapes* with elven species.

Subfamily: Callocardiinae Call, 1895

Genus: *Callista* Poli, 1971

***Callista florida* (Lamarck, 1818)**

(Plate: I C; shell length: 4.53 cm)

Synonyms:

Cytherea florida Lamarck, 1818. Anim. Sans. Verts, 5: 565-566.

Cytherea florida – Fisher, 1865:244; Vaillant 1865: 119.

Cytherea hagenowi – Dunker, 1849, Z. Malakozool, 1848:184-185

Cytherea (Callista) florida -Issel, 1869: 68-69; Smith 1891: 423

Cytherea (Callista) hagenowi -Issel, 1869:69

Callista costata- Shopland, 1896: 231; Shopland 1902: 177.

Callista florida – Lamy, 1930, Bull. Mus. P 133; Shopland 1902: 177; Sturany, 1905: 138; Pallary, 1926: 106; pl. 13; figs. 1.1-1.3; Lamy 1938: 25; Moazzo 1939: 82-83; pl. 7, fig.5; Barash and Danin 1972: 363-364; Taylor and Reid 1984: 207; Oliver, 1992, P.187, pl. 40.; Dekker & Orlin, 2000, P.14; Zuschin and Oliver, 2003: 150-151, Pl. 48.1&2; Rusmore- Villaume, 2008, P.268-269.

Callista lilacina –Shopland, 1896: 231; Shopland 1902: 177.

Macrocallista florida –Tomlin, 1927: 306.

Lepidocardia florida –Sharabati, 1984:pl.47; figs.10-10a.

Material examined: 62 specimens and 200 separated left and right shells.

Measurements: Shell size varied from 1.28 to 5.77 cm in length, 0.92 and 4.12 cm in height, and from 1.49 to 2.09 cm in breadth.

Localities: Gulf of Suez: RCAZUE-Mol-12001; **Suez Bay:** 1 specimen, 2 shells (26-6-2018). **Kabanon:** 16 shells (27-10-2017), 14 shells (9-2-2018), 3 specimens, 22 shells (26-6-2018), 27 shells (28-8-2018). **Adabia:** 8 shells (17-1-2014), 17 shells (22-2-2014), 20 shells (21-3-2014), 6 shells (22-5-2014), 8 shells (24-6-2014), 9 shells (23-8-2014), 2 shells (27-9-2014), 3 shells (25-10-2014), 6 shells (25-11-2014), 3 shells (26-12-2014), 49 specimens, 12 shells (15-8-2017), 1 specimens, 5 shells (27-10-2017), 6 specimens, 11 shells (9-2-2018), 2 specimens, 6 shells (14-4-2018) and **Ain Sokhna:** one shell (25-4-2014), one shell (15-8-2017), one shell (14-4-2018).

Description:

Shells are equivalve, inequilaterally, strong and shiny. Outline is ovate, extends posteriorly, with rounded anterior, ventral and posterior margins, but beings nearly straight on the anterior-dorsal and subconvex on the posterior-dorsal margins. The sculpture consists of clear growth lines, appears as wide, weak, smooth and glossy with faint concentric ribs. Lunule without ribs but appears as spear-shaped, defined by a fine and shallow groove, extends half the anterior dorsal margin. Umbo lies sub anteriorly with slightly pointed anterior beaks. Escutcheon lacks ribs but is otherwise not well defined. Ligament is external and supported by nymphal ridges. Hinge has three cardinals in each valve, in addition to one anterior lateral tooth on the left valve, compared with two anterior lateral teeth on the right valve. Hinge in the left valve has anterior cardinal very close to anterior laterals. Adductor muscle scars are equal. Pallial sinus is pointed horizontally towards the posterior end. The inner margin of the shell is smooth.

Color:

The external coloration of live specimens is highly variable, varied from white, tan to light brown, and becomes typically darkens at the posterior. There are many light brown, dark brown and/or purple-brown comarginal stripes, radial stripes and/or tent marks. In some specimens, the color of two or three of the radial stripes appears more prominent than the rest; however, dark brown radial stripes are the most common pattern. The interior is white with purple coloration at the anterior and/or posterior, generally overlapping with the anterior and posterior adductor muscle scars. Dead shells fade quickly on the beach.

Habitat: This species occurs in littoral and sublittoral sandy and muddy habitats, burrowing at 15 to 25 cm depth of the bottom surface.

Status: Abundant in the Gulf of Suez.

Distribution:

Local: Red Sea, Gulf of Suez, Gulf of Aqaba, Suez Canal and its lakes including Timsah and Bitter Lakes (Vine, 1986; Mona *et al* 1989, 2010; Fouda and Abou Zied, 1990, Abou-Zied, 1991; Hoenselaar & Dekker 1998; Zuschin and Oliver, 2003; EL-Sorogy *et al* 2006; Hoffman *et al*, 2006; Rusmore-Villaume, 2008; Ibrahim, *et al* 2015; El-Mekawy, 2016).

World: Indian Ocean (Moazzo, 1939; Spry, 1964; Oliver, 1992; Zuschin and Oliver, 2003). It was also recorded as an invasive species in the eastern Mediterranean (Zenetos *et al.*, 2005, 2010).

Remarks:

The general characters of this species agree well with those given by Oliver (1992), Zuschin and Oliver (2003), and Rusmore-Villaume (2008).

Genus: *Pitar* Römer, 1857
***Pitar hebraea* (Lamarck, 1818)**
 (Plate: I D; shell length: 2.62 cm)

Synonyms:

- Cytherea hebraea* Lamarck, 1818. Anim. Sans Verts., 5:568.
Cytherea (Caryatis) hebraea – Smith, 1891: 423.
Circe (Lioconcha) castrensis – Macandrew, 1870: 447.
Circe (Lioconcha) hebraea – Macandrew, 1870: 447.
Lioconcha castrensis – Cooke, 1886: 101.
Lioconcha hebraea – Cooke, 1886: 101; Shopland, 1896: 231.
Caryatis varians - Hanley, 1896: 231; Shopland, 1902: 177.
Caryatis hebraea – Shopland, 1902: 177.
Pitar hebraea- Taylor and Reid 1984: 207; Sharabati 1984:pl. 47; figs.9-9a; Oliver, 1992, P.184, pl. 40; Dekker & Orlin, 2000, P. 15; Zuschin and Oliver, 2003: P. 152 Pl. 48.5; Rusmore-Villaume, 2008, P. 280-281.

Material examined: Only one valve (left shell).

Measurements: Shell valve has 2.62 cm in length and 2.12 cm height.

Localities: Gulf of Suez: RCAZUE-Mol-12002 **Adabia:** one shell (15-8-2017).

Description and general characters:

Shell beings equivalve and inequilaterally with another half, thin, lightweight, and subovate in outline. Escutcheon is very weak, while lunule is heart-shaped, slightly impressed rather large. Umbo has a relatively long anterior end. Pallial sinus is deep, almost reaches the umbonal line. Sculpture characterizes with virtually smooth concentric shining lines, with well clear growth lines. Ligament is external. Hinge has three cardinals, right posterior cardinal of which is bifid. The presently obtained valve (left valve) has posterior lateral not quite confluent with nymph. Median and anterior cardinals barely fused, socket between those and anterior lateral small.

Color:

Color is beige with reddish-brown zigzags and tents with undulating stripes, extending to the posterior edge and interior rim, with a radial fulvous streak near the umbo. Lunule and escutcheon being lighter; while umbo has violaceous stain anteriorly.

Habitat: It was found at a littoral zone of fine sand mixed with mud.

Status: Rare.

Distribution:

Local: Red Sea and Gulf of Suez (Vine, 1986; Oliver, 1992; Zuschin and Oliver, 2003; Rusmore-Villaume, 2008).

World: Indo-west Pacific regions comprising Gulf of Aden, Indian Ocean and Arabian Sea (Mac Nae, & Kalk, 1958; Spry, 1964; Branch, *et al.*, 2002).

Remarks: The general characters of the present specimen agree with those reported by Oliver (1992) and Rusmore-Villaume (2008).

Subfamily: Circinae Dall, 1896
Genus: *Circe* Schumacher, 1817
***Circe crocea* (Gray, 1838)**
(Plate: I E; shell length: 3.41 cm)

Synonyms:

- Circe crocea* Gray, 1838, Analyst, 8:307.
Cytherea sugillata - Jonas, 1846, Z. Malako. Zool., 1846: 64.
Cytherea sugillata – Vaillant, 1865: 118
Circe crocea – Issel, 1869: 71; Fischer, 1870: 170; Mac Andrew, 1870: 447; Cooke, 1886: 100; Sturany, 1899: 280; Hall and Standen, 1907:68; Pallary, 1926: 106; pl. 13; figs. 3.1-3.5; Moazzo, 1939: 77-78; pl. 7; fig.2; Brash and Danin, 1972:363; Taylor and Reid, 1984: 207; Oliver, 1992, P.182, pl. 39; Dekker and Orlin, 2000, P14; Zuschin and Oliver, 2003: 147, Pl. 45.3; Rusmore-Villaume, 2008, 268-269.
Circe (Parmulophora) corrugate- Sharabati, 1984, P. 112-113; Pl. 49; figs. 4-4c

Material examined: Two specimens and one shell.

Measurements: Shell size varied from 2.82 to 3.68 cm in length, 2.44 to 3.38 cm in height and from 1.51 to 1.53cm in breadth.

Localities: Gulf of Suez: RCAZUE-Mol-12003 **Adabia:** one shell (23-8-2014), one specimen (14-4-2018); **Ras Gharib:** one specimen (10-2-2018).

Description:

Shells are equivalves and equilateral, being massive, flat and thick with a shallow shell cavity. Outline is oval-trigonal. Posterior margin is longer than the anterior one and is steeply sloping from the beaks. Umbonal area has weak divaricate ribbing showing mostly as projections along the escutcheon margin. The inner margin is finely crenulate.

Color:

Shells have pale color, with red or fulvous rays and blotch umbonally. Inside is white, flushed with yellow, apricot, or oven red and yellow.

Habitat: This species inhabits sandy habitats the intertidal sandy habitats.

Status: Rare at the present study.

Distribution:

Local: Red Sea, Gulf of Aqaba and Gulf of Suez (Vine, 1986) and beings endemic to the Red Sea only till now (Rusmore- Villaume, 2008). It extended to Suez Canal (Lamy, 1930; Moazzo, 1939; Brash and Danin, 1972, 1982; Hassan, 1983; Fouda and Abou Zied 1990; Abou Zied 1991).

World: It did not record from other regions outside the Red Sea and Suez Canal (Rusmore- Villaume, 2008).

Remarks:

In *C. crocea* the escutcheon and lunule may be darker than the rest of the shell, but never have fine dark lines in them. The present specimens are in good agreement with that described by Oliver (1992) and Rusmore- Villaume, 2008).

***Circe rugifera* (Lamarck, 1818)**
(Plate: I F; shell length: 4.03 cm)

Synonyms:

- Cytherea rugifera* - Lamarck, 1818, Anim. Sans. Verts. 5: 579.
Circe corrugata - Dillwyn, 1817, Brash and Danin, 1972: 363.
Venus corrugata - Dillwyn, 1817. Cat. Rec. Shells, 1:201; Lamy & Fischer-Piette, 1939, pp. 464, 465.

Circe rugifera - Dekker & Orlin, 2000, P. 14; Zuschin and Oliver, 2003, p.147, pl.45.2; Rusmore-Villaume, 2008, 268-269.

Material examined: 55 specimens and 54 separate shell valves.

Measurements: Shell size varied from 1.89 to 4.34 cm in length, 1.63 to 3.85cm in height and from 1.11 to 1.96 cm in breadth.

Localities: Gulf of Suez: RCAZUE- Mol-12004: **Kabanon:** 2 shells (27-10-2017), 2 specimens, one shell (9-2-2018), 6 specimens 6 shells (26-6-2018), 4 specimens 5 shells (28-8-2018) and **Adabia:** one shell (17-1-2014), 2 shells (22-2-2014), 9 shells (21-3-2014), one shell (22-5-2014), one shell (24-6-2014), one shell (23-8-2014), one shell (25-10-2014), one shell (25-11-2014), 2 shells (26-12-2014), 17 specimens, 9 shells (15-8-2017), 16 specimens, 3 shells (27-10-2017), 7 specimens, 5 shells (9-2-2018), 3 specimens, 4 shells (14-4-2018).

Description:

Shells are ovate in general shape, equivalve and equilateral. Shells are characterized by slightly concave anterior dorsal margins but being slightly convex at the posterior dorsal margin. Umbo is central, with slightly pointed beak anteriorly and has strong divaricating ridges in the umbonal area. Concentric ridges are strong and appear in the form of oblique ribs. Lunule beings lightly impressed, defined by a fine shallow groove, extends half the anterior dorsal margin. Escutcheon beings lightly impressed, but not well defined. Ligament is external, slightly sunken supported by nymphal ridges. Hine is provided with three cardinal teeth in each valve; in addition to one lies on the anterior lateral tooth on the left valve and two on the right valve. The anterior and posterior adductor muscle scars being similar in area, but the anterior scar is slightly more elongated. Pallial sinus is absent, but the inner margin being very finely crenulate.

Color:

Exterior in most specimens is white tends to light tan, but there is light brown, extremely fine tent patterns on the flank or concentrated at the escutcheon and/or lunule. Marginal ribs have brown coloration. The interior is white with a light brown-pink blotch in the center and/or concentrated at the posterior margin.

Habitat: This species inhabits the intertidal sandy and muddy habitats.

Status: Common.

Distribution:

Local: Red Sea, Gulf of Suez, Gulf of Suez (EL-Sorogy *et al* 2006; Ibrahim, *et al* 2015; Rusmore-Villaume, 2008; El-Mekawy, 2016) and Suez Canal including Lake Timsah and Bitter lakes (Moazzo,1939; Brash and Danin, 1972; Hasan, 1983; Fouda and Abou Zied 1990; Abou Zied 1991 ; Hoenselaar & Dekker 1998; Oliver, 1992; El-Gamal, 1988; Ghobashy *et al.*,1992).

World: Tropical Indo-West Pacific regions (Spray, 1964; Zuschin and Oliver, 2003).

Remarks:

Circe rugifera is distinguished by its ovate, less trigonal shape and the wider angle between the anterior and posterior teeth at the hinge plate. *Circe rugifera* always has strong umbonal and concentric sculpture and fine brown lines across the lunule and escutcheon which agree well with that mentioned by Rusmore- Villaume (2008).

***Circe scripta* (Linnaeus, 1758)**
(Plate: II A; shell length: 4.57 cm)

Synonyms:

Venus scripta Linnaeus, 1758, Syst. Nat., ed. 10: 689.

Cytherea scripta – Vaillant, 1865, P. 118.

Circe lenticularis – Macandrew, 1870:447; Cooke, 1886: 101.

Circe scripta- Issel, 1869: 71-72; Smith, 1891: 424; Shopland, 1896: 232; Sturany, 1899: 280; Shopland, 1902: 178.

Circe scripta var. *fulgurata* - Shopland, 1902:178; Shopland 1896:232.

Circe scripta - Lamy 1938: 26; Moazzo, 1939: 78; Röss and Stuckey, 1952: 199; Oliver, 1992, 181, pl. 39; Dekker & Orlin, 2000, P.14; Zuschin and Oliver, 2003, 147, pl. 4501; Rusmore-Villaume, 2008, 270-271.

Material examined: Two specimens.

Measurements: Shell length varied from 4.26 to 4.58 cm, and height from 3.83 to 4.24 cm, but its breadth varied from 1.44 to 1.55 cm.

Localities: Gulf of Suez: RCAZUE- Mol-12005: **Adabia:** one specimen (15-8-2017) and **Kabanon:** one specimen (26-6-2018).

Description:

Shells are equivalves, equilateral and solid, but very compressed laterally. The outline has semi ovate-trigonal shaped, about as long as high. Valves are not very inflated. Posterior is lightly truncate, and characterizes with vertical parallel growth lines, while the anterior and ventral margins are rounded. Umbo is small, submedian, flattened, lies on top of the strongly sloping anterodorsal and posterodorsal margins. Lunule is flattened, lanceolate, set off by a thin groove. Escutcheon is narrow and elongate, poorly distinct, without ribs. Shell has smooth interior, while its exterior has evenly concentric sculptures; the latter is characterized with numerous low and rounded ridges, but being closely spaced low narrow concentric ridges, vanishing towards the umbo and crossed by diverging radial riblets on anterodorsal and posterodorsal areas. Ligament is external and sunken in posterodorsal margin, supported by nymphal ridges. Hinge has 3 cardinal teeth in each valve, in addition to a well-developed anterior lateral tooth in the left valve, and two anterior laterals on the right valve. Adductor scars are unequal. Pallial sinus is very shallow, reduced to a slight depression under the posterior adductor scar. Internal margin is flattened and smooth.

Color:

Shell exterior has pale grey to cream; with various patterns of dark brown markings often take zigzag patterns to vary from being weak and interrupted, to broad and dense. Lunule and escutcheon have dark brown pigmentation. The interior is white with large purple to dark brown coloration concentrated in the central upper area in addition to very small ones in the mid and upper posterior areas.

Habitat: This species inhabits the subtidal shallow sandy bottom areas.

Status: Very rare.

Distribution:

Local: Red Sea and Gulf of Suez (Vine, 1986; Mona *et al.*, 1989; EL-Sorogy *et al.*, 2006; Rusmore- Villaume, 2008); Suez Canal (Lamy, 1930, 1938; Moazzo, 1939; Mona *et al.* 1989; Fouda and Abou Zied, 1990; Abou Zied, 1991; Hoenselaar & Dekker 1998).

World: Indo-West Pacific from East Africa to Papua New Guinea, north to Japan and south to New South Wales and New Caledonia (Spray, 1964; Oliver, 1992; Zuschin and Oliver, 2003). It invaded the Mediterranean Sea and reached the Greek part of the Aegean Sea (Young *et al.*, 2007; Zenetos *et al.*, 2008, 2009, 2010; Katsanevakis *et al.*, 2012).

Remarks:

The characters of this species agree well with those mentioned by Oliver (1992), but the interior has darker brown coloration in addition to brown bars on the

inner margin, beings more prominent than that illustrated by Oliver (1992) and Rusmore- Villaume (2008).

Genus: *Circenita* Jousseaume, 1888

Circenita callipyga (Born, 1778)

(Plate: II B; shell length: 3.69 cm)

Synonyms:

- Venus callipyga* Born, 1778, Nat. Mus. Caes. Vind. Test., P.1:68; Pl. 5.
Cytherea adenensis Philippi, 1848, Abb. Besch. Conch, 3:73; Pl. 9; fig.6.
Lioconcha funiculata Römer, 1864, Novit. Conch. Abb. Besch., supp. 3 (1): 152-153; pl. 41; fig.3.
Lioconcha limenia Römer, 1864. Novit. Conch. Abb. Besch., Supp. 3 (1): 155-156; pl. 42; fig.2.
Cytherea arabica – Vaillant 1865: 119; Fischer 1870: 170.
Cytherea (Lioconcha) arabica– Issel 1869: 65.
Cytherea (Lioconcha) callipyga – Issel 1869: 66.
Cytherea (Lioconcha) deshaysiana – Issel, 1869: 67.
Cytherea (Lioconcha) funiculate – Issel 1869:67.
Cytherea (Lioconcha) lentiginosa – Issel 1869: 66.
Cytherea (Lioconcha) limentia – Issel 1869: 67.
Cytherea pulchra – Fischer, 1870: 170; Macandrew 1870: 447.
Circe arabica– Macandrew, 1870: 446; Cooke, 1886: 100; Shopland, 1896: 231; Shopland, 1902: 177.
Circe (Circentia) arabica – Lamy, 1938: 27
Circe adenensis – Macandrew, 1870: 446.
Circe callipyga – Shopland 1896: 231; Shopland 1902: 177.
Circe lentiginosa – Macandrew. 1870: 447; Cooke 1886: 100; Shopland 1896: 232.
Circe semiarata – Macandrew. 1870: 447
Circe (Lioconcha) callipyga – Smith 1891: 424
Circenita arabica – Jousseaume, 1888: 208
Lioconcha arabica – Sturany 1899: 280; Sturany 1905: 138; Pallary 1926: 107; pl. 13; figs. 4.1-4.2; Tillier and Bavay 1905: 177,179; Moazzo 1939: 79-80.
Lioconcha callipyga – Sturany, 1905: 138.
Lioconcha lentiginosa – Shopland, 1902: 177.
Meretrix pulchra – Jousseaume, 1888: 206.
Meretrix (Liochonca) callipyga – Anthony, 1906: 494.

Material examined: 3 specimens and 18 separate shells.

Measurements: Shells length varied from 2.02 to 3.93 cm, height from 1.72 to 3.46 cm and from 1.86 to 1.98 cm in breadth.

Localities: Gulf of Suez: RCAZUE-Mol-12006- **Kabanon:** one shell (26-6-2018), one shell (28-8-2018). **Adabia:** 2 shells (22-2-2014), 1 shell (25-10-2014), one specimen, one shell (15-8-2017), one shell (27-10-2017), one specimen, 2 shells (14-4-2018). **Ain Sokhna:** one shell (25-4-2014), 2 shells (25-10-2014), 2 shells (25-11-2014), one shell (14-4-2018), one shell (27-10-2017) and **Al Azazia (Ras Gharib):** one specimen, 2 shells (10-2-2-18).

Description:

Shells have strong texture, and varied from small to medium-sized, with equivalves, almost equilateral. Umbo is located slightly at the anterior part and beaks are anteriorly pointed. Outline is variable, but most shells being subovate, distinctly longer than high but some are shortened posteriorly, becoming rhomboidal with a rather straight high posterior margin. Sculptures are characterized with low simple

concentric lines and little irregular ridges at the posterior part. Lunule beings slightly impressed and defined by a fine shallow groove, extends half the anterior dorsal margin. The internal margin is smooth. Escutcheon is not well defined. Ligament is external, supported by nymphal ridges. Hinge area is thick, and has 3 cardinals in each valve, being prominent at the anterior laterals. The anterior lateral tooth lies on the left valve and two at the anterior lateral on the right valve. Posterior adductor muscle scar is slightly larger and rounded than the anterior adductor one. The pallial sinus is small and beings extremely shallow.

Color:

Color is variable; some shells have a white background with cream, beige, tan, orange to yellow and brown color. Some specimens have alternative brown, dark brown and grey color extend from umbo downwards to the interior margin. The pale specimens have gray radial lines on the inferior margins. Internal is white with dark brown to violet at the anterior and posterior margins, sometimes extend parallel inferior margins. The zigzag-like pattern takes radial rays are observed in some specimens and around beaks.

Habitat: It lives in sandy and muddy areas in shallow subtidal waters.

Status: Common.

Distribution:

Local: Red Sea, Gulf of Suez, Gulf of Aqaba (EL-Sorogy *et al.*, 2006, Rusmore-Villaume, 2008, Ibrahim, *et al.*, 2015; El-Mekawy, 2016); Suez Canal (Mona *et al.*, 1989).

World: Indian Ocean (Oliver, 1992). It invaded Mediterranean Sea but was recorded as *Gafrarium callipygum* in the eastern basin (Mienis, 2000; Barash and Danin, 1986; Zenetos *et al.*, 2004, 2005, 2010; Streftaris, *et al.* 2005, Galil, 2007).

Remarks:

The characters of examined specimens agree well with those reported by Oliver (1992) and Rusmore-Villaume (2008). However, there are slight variations in shape occurs during growth, probably due to crowded or cramped living conditions.

Genus: *Gafrarium* Roding, 1798
***Gafrarium pectinatum* (Linnaeus, 1758)**
(Plate: II C; shell length: 3.92 cm)

Synonyms:

Venus pectinata Linnaeus, 1758. Syst. Nat., ed. 10:689.

Cytherea pectinata – Vaillant, 1865: 119.

Cytherea (Crista) savignyi – Issel, 1869: 70.

Circe pectinate – Fischer, 1870: 171; Shopland, 1896: 232; Anthony, 1906: 495; Hall and Standen, 1907: 68.

Circe savignyi - Macandrew, 1870: 447; Cooke, 1886: 100.

Circe (Crista) pectinate – Smith, 1891: 424; Lamy, 1938: 27

Crista pectinate – Jousseume, 1888: 208; Sturany, 1899: 280; Shopland, 1902: 177; Tillier and Bavay, 1905:177, 179; Sturany, 1905: 138; Moazzo, 1939: 80-82; pl. 7; fig.4.

Crista savignyi – Pallary, 1926: 105; pl. 12; figs. 17.1-17.3.

Gafrarium pectinatum –Tomline, 1927: 306; Biggs, 1965: 339; Brash and Danin, 1972: 339-340,363; Sharabati, 1984: pl. 49; figs. 6-6c; Taylor and Reid, 1984: 207; Oliver, 1992, 182, pl. 39; Dekker and Orlin, 2000, P.14; Zuschin and Oliver, 2003, 148, Pl. 45.15-45.17; Rusmore-Villaume, 2008, 274-275.

Material examined: 308 specimens and 77 shells (right and left valves).

Measurements: Shells varied from 2.05 to 5.03 cm in length and from 1.48 to 3.72 cm in height, with breadth varied from 1.30 to 1.94 cm.

Localities: Gulf of Suez: RCAZUE-Mol-12007: **Suez Bay:** 4 separate shells (26-6-2018). **Kabanon:** 77 specimens, 4 separate shells (27-10-2017), 1 specimen, 3 separate shells (9-2-2018), 131 specimens, 9 separate shells (26-6-2018), 99 specimens, 10 separate shells (28-8-2018); **Adabia:** 1 shell (17-1-2014), 4 shells (22-2-2014), 2 shells (21-3-2014), 2 shells (22-5-2014), 1 shell (24-6-2014), 1 shell (23-8-2014), 2 shells (27-9-2014), 1 shells (25-10-2014), 1 shells (25-11-2014), 1 shells (26-12-2014), 5 shells (15-8-2017), 3 shells (27-10-2017), 2 shells (9-2-2018), 8 shells (14-4-2018). **Ain Sokhna:** 1 shell (25-4-2014), 1 shell (24-6-2014), 2 shell (25-10-2014), 2 shells (25-11-2014), 1 shell (27-10-2017), 1 shell (14-4-2018) and **Al Azazia (Ras Gharib):** 5 separate shells (10-2-2018).

Description:

Shell has thick and solid texture, medium-sized, and equivalves, slightly laterally compressed. It has an elongated shape, subovate in outline (subovate distinctly longer than high). Umbones direct towards the anterior part. Lunule is lanceolate, often slightly depressed (narrow heart-shaped lunule). Escutcheon is long and narrow. Sculptures have concentric growth marks; outer sculptures are coarse with strong nodulous radial ribs, often dividing into 2 with growth and diverging obliquely towards anterior and posterior parts of each valve (dichotomous anteriorly and posteriorly); posterior ribs are very coarse and widely spaced. Ligament is external. Hinge plate is strong, with 3 cardinal teeth at each valve and well-developed anterior lateral teeth (1 in left valve, and 2 in right valve), separated by a deep socket. Adductor muscle scars are unequal. Pallial sinus is absent. Inner ventral margin is crenulated.

Color:

Shell color varied from off-white to buff-colored with fawn or brown blotches or spots throughout. Lunule is darker towards the umbones. Interior has porcelaneous white with a cream flush within the pallial line area, and purple-brown blotching on lunular margin, posteroventral part of hinge and posterior margin of valves.

Habitat: It lives in the intertidal and shallow sublittoral waters and burrows in muddy gravels and sandy bottom to 10 to 15 cm depth.

Status: Frequent.

Distribution:

Local: Red Sea, Gulf of Suez, Suez Canal and its lakes (Hassan, 1983; Vine, 1986; Fouda and Abou Zied, 1990, Abou-Zied, 1991; El-Komi 1997, 1996; Hoenselaer and Dekker 1998; EL-Sorogy *et al.*, 2006; Gab-Alla, *et al.*, 2007; Mona *et al.*, 2010; Belal and Ghobashy, 2014; Ibrahim, *et al.*, 2015; El-Mekawy, 2016).

World: Tropical Pacific and Indian Oceans including Arabian Gulf to eastern Polynesia; north to Japan and south to Queensland (Spry, 1964; Sheppard, 1984; Drivas and Jay, 1987). It invaded the Mediterranean Sea (Mienis, 1999; Zenetos *et al.*, 2004, 2005, 2010; Streftaris *et al.*, 2005; Galil 2007; Huber, 2010).

Remarks:

This species was recorded before from the Suez Canal as *C. (Crista) pectinate* by Tillier and Bavay (1905), Moazzo (1939) and as *Gafrarium pectinate* by Tomlin (1924), Brash and Danin (1972), Hasan (1983), Fouda and Abou Zied (1990) and Abou Zied (1991). It is one of the Indo-Pacific species which migrate into the Mediterranean Sea and spread to Eastern Mediterranean up to Syria and to the west up to Tunisia. It is the most common species in sea-grass beds.

Subfamily: Dosiniinae Deshayes, 1853

Genus: *Dosinia* Scopoli, 1777

Species: *Dosinia erythraea* (Römer, 1860)

(Plate: II D; shell length: 5.66 cm)

Synonyms:

Dosinia erythraea Römer, 1860, Proc. Zool. Soc. Lond., 1860:117-118; Römer, 1862. Novit. Conch. Abb. Besch. Supp., 1:36; pl. 7; fig.1.

Dosinia radiata – Vaillant, 1865: 118; Shopland, 1902: 178, Sharabati, 1984, pl. 49; figs 3-3a.

Dosinia erythraea – Fischer 1871: 216; Sturany 1899: 282; Hall and Standen 1907: 68; Oliver, 1992, 187, pl. 42; Dekker & Orlin, 2000, P.14; Rusmore-Villaume, 2008, 272-273.

Artemis erythraea – Issel, 1869: 72.

Artemis radiata – Issel, 1869: 72.

Artemis erythrostroma – Cooke, 1886: 102.

Dosinia erythrostroma – Macandrew, 1870: 447.

Dosinia (Artemis) erythraea – Tillier and Bavay, 1905: 177-179.

Dosinia amphidesmoides – Lamy, 1929c: 261-262.

Material examined: 3 specimens and 36 separate shell valves.

Measurements: Shell varied from 2.68 to 2.44 cm in length, and from 2.44 to 5.48 cm in height and from 1.84 to 2.64 cm in breadth.

Localities: Gulf of Suez: RCAZUE-Mol-12008-**Kabanon:** 3 shells (27-10-2017), 3 shells (9-2-2018), 5 shells -2 specimens (26-6-2018), 8 shells -1 specimen (28-8-2018); **Adabia:** one shell (17-1-2014), one shell (22-2-2014), one shell (25-10-2014), one shell (26-12-2014), 6 shells (15-8-2017), 2 shells (27-10-2017), one shell (9-2-2018), 3 shells (14-4-2018)- and **Ain Sokhna:** one shell (15-8-2017), one shell (14-4-2018).

Description:

Shell is equivalve, subequilateral, medium-sized. Outline is almost circular as long as high, beings longer in larger specimens. Ligament margin is long; not steeply sloping; posterior margin is suddenly curving away. Lunule is heart-shaped, deeply impressed, and not steeply sloping. Escutcheon is absent. Sculptures take form of separated concentric raised ridges have little irregular over the posterior slope, rough to touch but not sharp. Hinge has strong cardinals. Adductor muscle scars are dimyarian and heteromyarian. Pallial sinus is present, extends anteriorly over half of the distance between the adductor scars. Inner shell margins are smooth.

Color:

Externally shells have white to beige color, usually with radial brownish rays, and are internally yellowish white.

Habitat: It lives in sandy and muddy habitats in the different study areas.

Status: Common.

Distribution:

Local: Red Sea, Gulf of Suez, Gulf of Aqaba, Suez Canal, Lake Timsah and Bitter Lake (Brash and Danin, 1972; Hasan, 1983; Vine, 1986; Mona *et al.*, 1989, 2010; Fouda and Abou Zied 1990; Abou Zied 1991; Oliver, 1992; El-Komi 1997; Hoenselaar and Dekker 1998; Rusmore- Villaume, 2008; El-Mekawy, 2016).

World: Arabian Gulf (Oliver, 1992; Bosch, *et al.*, 1995). It invaded the Mediterranean Sea (Zenetos *et al.*, 2004, 2005, 2010; Streftaris *et al.*, 2005).

Remarks:

Dosinia erythraea is edible and very similar to the Mediterranean and Atlantic species *Dosinia exoleta* Linnaeus, 1758. It considers congeneric those species (Tunberg, 1984). It differs from the latter in having a rougher sculpture which elevated concentric ridges. The absence of the escutcheon distinguishes small worn specimens with no color pattern from *D. histrio*, which has a small escutcheon. In addition, it differs from *D. exoleta* which inhabits deep habitats down to 140 m in Mediterranean (Forbes and Hanley, 1853).

Species: *Dosinia hepatica* (Lamarck, 1818)

(Plate: II E; shell length: 1.45 cm)

Synonyms:

Cytherea hepatica Lamarck, 1818, Anim. Sans Verts., 5:572.

Dosinia hepatica – Macandrew, 1870: 447; Shopland, 1896: 232; Shopland, 1902: 178; Sturany, 1905: 138; Lamy, 1929c: 260-261; Lamy, 1938: 25; Moazzo, 1939: 83-84; Taylor and Reid, 1984: 207; Oliver, 1992, 188, pl. 42; Dekker & Orlin, 2000, P. 14; Rusmore-Villaume, 2008, 274-275.

Artemis hepatica – Cooke 1886: 102.

Material examined: Seven separate shells (right and left).

Measurements: Shells varied from 1.01 to 1.47 cm in length, and from 0.95 to 1.33 cm in height.

Localities: Gulf of Suez: RCAZUE-Mol-12009- **Adabia:** one shell (24-6-2014), one shell (15-8-2017) and two shells (14-4-2018) and **Ain Sokhna:** one shell (15-8-2017) and two shells (27-10-2017).

Description:

Shells are equivalve, subequilateral, very fine. Outline is almost circular. Ligament margin is sloping steeply, angulate junction with straightening posterior margin. Escutcheon is weak, and lunule does not deeply sunken, slightly domed. Sculptures have smooth concentric lines, with a little rough along posterior margin. Pallial sinus is deep and extends close to the anterior adductor scar.

Color:

Exterior of collected shells is a plain shade of dusty violet or yellow, few have violet rays or bands. Interior is partially or all purple or brownish-purple.

Habitat: This species was collected from intertidal sandy habitat.

Status: rare.

Distribution:

Local: Red Sea, Gulf of Suez and Gulf of Aqaba (Vine, 1986; Rusmore- Villaume, 2008; Ibrahim, *et al* 2015; El-Mekawy, 2016).

World: Tropical Indo-West Pacific (Oliver, 1992; Branch, *et al.*, 2002).

Remarks:

Characters of this species are in good agreement with those described by Oliver, 1992) and Rusmoer- Villaume (2008), but color was slightly different. This shell tends to look unusually beautiful while wet extremely plain and dusty when dry, therefore it called as " Lesser Heart Clam" as a common name. The Latin name for this species means liver-colored but the colors and patterns vary.

Subfamily: Tapetinae H. & A. Adams, 1857

Genus: *Paphia* Röding, 1798

***Paphia textile* (Gmelin, 1791)**

(Plate: II F; shell length: 5.64 cm)

Synonyms:

Venus textile Gmelin, 1791, Syst. Nat., (éd. XIII), p. 3280.

Paphia textile - Crichton, 1941, 42, no. 2: 325; Ray, 1950, XLVI: 119; Satyanlurti, 1956, N.S., I, no. 2: 129, pl. 20; Shikama, 1964, D: 81, pl. 47; Kundu, 1965, 62 (2): 211, pl. XVI; Fischer-Piette et Metivier 1971b, N.S., Zool., LXXI: 51; Fischer-Piette, 1974, 5(2-3): 296; Dekker & Orlin, 2000, P. 15; Rusmore-Villaume, 2008, 278-279.

Tapes sumatranus - Jaeckel & Thiele, 1931, 21 (1932): 235, pl. IV, fig. 109.

Tapes textrix - Deshayes, 1853, Cat. Conch. Brit. Mus., I, Veneridae, etc., p. 171.

Venus textrix - Schroter, 1788, X, Namen. Register: 112; Pfeiffer, 1869, cd. II, XI (1): 169, pl. 15, fig. 7.

Tapes textrix - Reeve, 1864, XIV, pl. II, fig. 3; Mitchell, 1867: 66; Romer, 1870, D: 19, pl. V, fig. 1a, 1b, 1c; Melvill et Abercrombie, 1893, sere 4, VB: 46; Standen et Leicester, 1906, V: 293.

Venus reticulina - Bory de Saint-Vincent, 1827, P. 154, Pl. 283

Venus undulata - Dillwyn, 1817, Descr. Cat. Rec. Sh., I. no. 106, P.204 avec fig.

Material examined: Three specimens only.

Measurements: Shell length varied from 3.77 to 5.64 cm, height from 2.14 to 3.25 cm and breadth from 1.18 to 1.94 cm.

Localities: Gulf of Suez: RCAZUE-Mol-12010- 3 specimens: **Kabanon**; one specimen (28-8-2018). **Adabia**; one specimen (23-8-2014) and **Ras Gharib**; one specimen (10-2-2018).

Description:

Shells are compressed medium-sized, solid, equivalve, and subequilateral. Outline is strongly elongated transversely, elliptical-ovate, almost twice longer than high. Umbo lies in the anterior part of the shell. The anterodorsal and posterodorsal margins are gently sloping, while both anterior and posterior margins are obviously rounded. Ventral margin is broadly rounded. The surface of shells has glossy and shining appearance ornamented with circular smooth sculptures and obvious growth lines without oblique sculpture. Lunule slightly depressed. Escutcheon is obvious and takes lanceolate shape. Ligament is external. Hinge is narrow, concentrated under the umbo of each valve, with 3 radiating cardinal teeth but no lateral teeth. Pallial sinus is shallow and rounded. Internal margins of shells are smooth.

Color:

Shells have externally a characteristic color pattern and white internally; outside of shell is highly glossy, beige, pale yellow, cream to pinkish-brown, with a netted pattern of darker tan to greyish brown zigzag lines; dorsal margins are dark purplish-brown, short and transverse lines anterior and posterior to the umbones; outer shell rim s whitish.

Habitat: This species lives in sandy and muddy intertidal habitats.

Status: Rare.

Distribution:

Local: Red Sea and Gulf of Suez (Vine, 1986; Oliver, 1992; Rusmore-Villaume, 2008; El-Mekawy, 2016). It was recorded from Suez Canal by Moazzo (1939) as *Tapes undulates* and reached Bardawil Lagoon (Barash and Danin 1977; Niederhöffer, et al., 1991; Kucheruk and Basin, 1999).

World: Indo-West Pacific regions from East Africa to Papua New Guinea, north to South China Sea and south to Indonesia (Drivas and Jay, 1987). It invaded the Mediterranean and reaching Bardawil Lagoon (Barash and Danin 1977; Niederhöffer, *et al.*, 1991; Kucheruk and Basin, 1999; Zenetos *et al.*, 2004, 2005, 2010; Streftaris, *et al.*, 2005; Galil 2007).

Remarks:

This species may be confused with *Paphia undulata* (Born, 1778). The latter species has a characteristic undulated sculpture varied from oblique to the growth line forms, less elevated in outline and less inflated valves (Fischer-Piette and Métivier, 1971). It was recorded in Suez Canal as *Tapes undulatus* (Moazzo, 1939).

Genus: *Tapes* Megerle von Mühlfeld, 1811

Tapes deshayesi (Sowerby, 1852)

(Plate: II G; shell length: 4.43 cm)

Synonyms:

Tapes deshayesi Sowerby 1852, The Conch., 2; pt. 13: 685; pl.144; figs. 34-38.

Tapes deshayesi- Oliver, 1992, 189, pl. 43; Dekker & Orlin, 2000, P. 15; Zuschin and Oliver, 2003, 157, Pl. 50.7-50.9; Rusmore-Villaume, 2008, 282-283.

Venus deshayesi- Hanley, 1856. Cat. Rec. Biv. Shells: 363; pl.16; fig.35.

Tapes deshayesii – Issel 1869: 62-63; Fischer, 1871: 216; Cooke, 1886: 103; Jousseume, 1888: 209; Smith, 1891: 424; Shopland, 1896: 232; Shopland, 1902: 178; Sturany, 1905: 138; Anthony, 1906: 496; Pallary, 1926: 105; pl. 12; Lamy, 1938: 29; Moazzo, 1939: 75-76; Brash and Danin, 1972: 364.

Tapes litterata – Vaillant 1865: 119

Tapes obscuratus- Smith, 1891: 424-425; Shopland, 1902: 178.

Tapes rodatzi - Taylor and Reid 1984: 207.

Material examined: Tow specimens and 2 separate shells.

Measurements: Shells varied from 3.43 to 4.43 cm in length, between 2.22 and 2.97 cm in height and from 1.46 to 1.82 cm in breadth.

Localities: Gulf of Suez: RCAZUE-Mol-12011-**Adabia**: Tow specimens and 2 separate shells; one separate shell (24-6-2014), one separate shell (25-10-2014), one specimen (9-2-2018) and one specimen 14-4-2018).

Description:

Shells are equivalves, inequilateral, moderately medium-sized, and inflated. Outline is elongated and rhomboidal in general shape. Anterior margin is shorter compared with long and straight posterodorsal margin, with gently sloping. Sculptures are characterized with obvious anteriorly irregular, closely spaced concentric ridges, showing raised lines posteriorly. Lunule is short and narrow. Escutcheon is long and obvious. Ligament is external. Hinge plate is narrow; posterior socket of the right valve is wide, with small tooth-like notches at the bottom. Adductor scars are subequal, showing an oval anterior adductor scar, beings slightly smaller than the subcircular posterior one. Pallial sinus is deep and rounded, reaching beyond the posterior end of the nymph, showing very short confluent with pallial line.

Color:

Live specimens have faint brownish to a creamy or pale color. Darker markings of shades of brown ranging from sparse spots only to radial blotched rays to zigzag lines are also found. Inner coloration is pale to faint yellowish white.

Habitat: This species lives in sandy intertidal habitats.

Status: Rare.

Distribution:

Local: Red Sea, Gulf of Suez and Gulf of Aqaba (Vine, 1986; Rusmore-Villaume, 2008; Ibrahim, *et al.*, 2015; El-Mekawy, 2016). It penetrated northwards to Suez Canal and its lakes (Brash and Danin, 1972; Fouda and Abou Zied, 1990 and Abou Zied 1991; Hoenselaar & Dekker 1998).

World: Indo-Pacific regions (Oliver, 1992; Bosch, *et al.*, 1995).

Remarks:

The characters of this species agree with that mentioned by Oliver (1992) and Rusmore-Villaume, 2008).

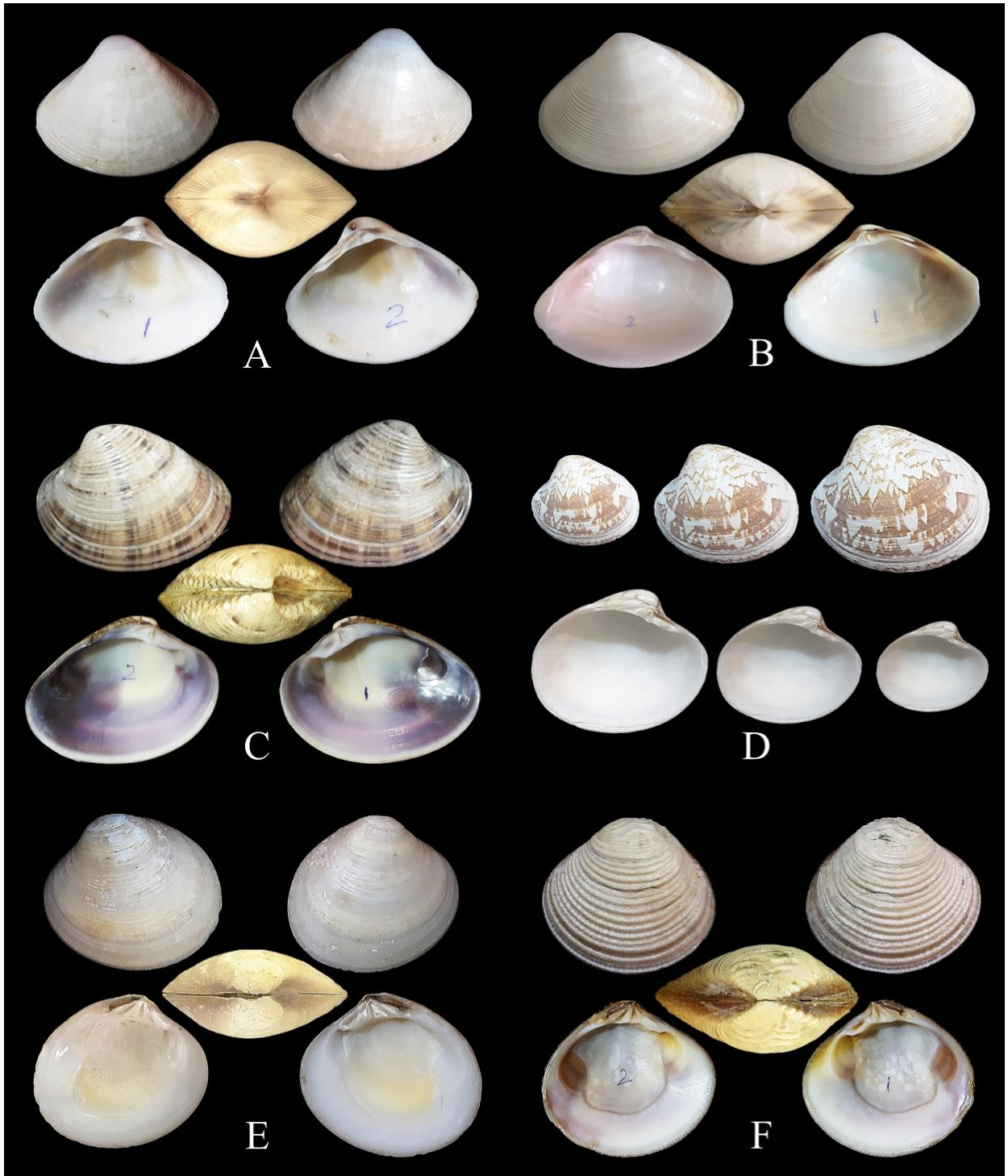


Plate I: A, *Mactra lilacea*; B, *Mactra olorina*; C, *Callista florida*; D, *Pitar hebraea*; E, *Circe crocea*; F, *Circe rugifera*.



Plate II: A, *Circe scripta*; B, *Circenita callipyga*; C, *Gafrarium pectinatum*; D, *Dosinia erythraea*; E, *Dosinia hepatica*; F, *Paphia textile*; G, *Tapes deshayesi*.

DISCUSSION

During the present study, 13 species of bivalves of them two species (*Mactra olorina* and *M. Lilacea*) belong to family Mactridae and 11 species of family Veneridae were revised from the western coast of Suez Gulf. The number of recorded species beings lower compared with those recorded previously from the entire Gulf of Suez (Sharabati, 1984; Oliver, 1992; Rusmore-Villaume, 2008). All of the revised species are Indo-Pacific origin and several of them were migrated northwards via Suez Canal and recorded from different localities at the eastern and Mid regions of Mediterranean and called as Lessepsian migrants (Steinitz, 1967; Por, 1978; Brash and Danin, 1972; Fouda and Abou Zied 1990; Abou Zied 1991; Young *et al.*, 2007; Zenetos *et al.*, 2008, 2009, 2010; Katsanevakis *et al.*, 2012), but no evidence for Antillessepsian species in the Gulf of Suez was noticed during this study.

The number of family Mactridae was very low compared with those species recorded by Rusmore- Villaume (2008) which listed 6 species, increased to 8 species by Dekker and Orlin (2000) and 10 by Oliver (1992). However, according to Oliver (1992) list, 4 species of Mactridae were recorded only from Gulf of Aden, while all previous references indicated that, *Mactra olorina* was endemic to the Red Sea and fluctuated from abundant in the Suez Gulf, to occasional in Gulf of Aqaba and not found south Safaga. In contrast, *M. lilacea*, was rare in both Gulfs but common between Marsa Alam-Wadi Lahmi to Shalatein. On the other hand, other mactrids comprised *Mactra achatina*, was occasionally in Gulf of Aqaba and rare at both Gulf of Suez and south Marsa Alam, and *Meropesta nicobarica* which was were very rare and recorded only from Hurghada and Shalatein, in addition to *Meropesta solanderi* which occurs in Suez Gulf around Ras Sudr and rare to never elsewhere; while *Raeta pellicula* was very rare and recorded from south Red Sea only. Therefore, the disappearance of these species during this study is attributed either to their rarity or to their occurrence at slightly deeper waters.

On the other hand, family Veneridae was represented by a higher number of species (11) during this study. This result agrees well with their number in the Red Sea and its associated gulfs (Suez and Aqaba). Rusmore- Villaume (2008) recorded 30 species of family Veneridae, distributed unequally between Gulf of Suez (22 species), Red Sea (23 species) and Gulf of Aqaba (19 species). Out of these species, 4 were recorded only in Gulf of Suez and 2 only in the Red Sea compared with only one species recorded at Tiran Straits between Gulf of Aqaba and Red Sea, in addition to one live in relatively deeper water at Jubal Straits between Gulf of Suez and Red Sea. Therefore, the recorded venerids represents at least 50 % of the Gulf's bivalve's fauna belong to family Veneridae and most of them were either common or abundant in the intertidal and shallow subtidal zones.

It was noticed that, *Circe scripta* is very rare but confined to the Gulf of Suez only, while other common species of venerids comprised, *Paphia textile*, *Timoclea roemeriana*, *Clementia papyracea* and the very rare species (*Ruditapes decussatus*) were occurring in the far northern part of the Gulf of Suez, of them the first and the last species migrated north into through Suez Canal into the Mediterranean Sea (Fouda and Abu Zied, 1990; Abu Zied, 1991; Rusmore- Villaume, 2008). In contrast, other species such as *Samarangia quadrangularis* was rare and lives in deeper water at Strait of Tiran only. Therefore, these species except *Paphia textile* did appear during the present study.

In contrast, the number of recorded species beings higher than those recorded by Sharabati (1984), which recorded only 13 species of Veneridae from the entire Red

Sea, of the 5 species were recorded during the present study, but she did not refer to their accurate occurrence or localities. In addition, the scientific names of several species of *Lepidocardia* and *Circe* were adjusted and synonymized for some species. However, Sharabati list did not comprise any species of Mactridae.

For comparison with the Suez Canal bivalves, a total of 12 venerid species and one species of mactrids were recorded by Abu Zied (1991) and Fouda and Abu Zied (1990) in the Suez Canal Lakes (Timsah and Bitter lakes), of the 7 species of venerids and *M. olorina* were recorded during the present study. In spite of *Tapes (Ruditapes) decussata*, *Venerupis (Paphirus) aurea* and *Chamelea gallina* were migrated from the Mediterranean Sea to Suez Canal and some of them had been reached Suez Gulf but no evidence for their occurrence was detected during the present study. In addition, *Paphia undulata* was recorded from the Suez Canal Lakes. According to Rasmont-Villaume (2008) this species is confused in literature with *P. textile*, and she never found any specimens of *P. undulata* in the Red Sea.

On the other hand, Oliver (1992) recorded 49 species from the entire Red Sea and the Gulf of Aden in addition to Mediterranean species in Suez Canal Lakes and the northern Gulf of Suez. He overdubbed the venerids in the Suez Gulf and increased to 33 species. Dekker and Orlin (2000) increased the number of venerids in the Red Sea and listed 54 species. Actually, a considerable number of their lists became synonyms, and at least 13 species were synonymies for the present valid species according to Rasmont-Villaume (2008) such as *Callista erycina*, *Dosinia histrio*, *D. alta* and so on; while Vine (1986) recorded 5 mactrids (2 common) and 37 venerids of them 11 are common.

Generally, the recorded bivalve species of families Mactridae and Veneridae during the present study over dominated other previous records of these families along the Gulf of Suez and sometimes all bivalves recorded by El-Mekawy (2016) which comprised 9 venerids and 2 mactrids, and other carried out by El-Komi (1996), Emara and Belal (2004), El Sorogy *et al.* (2006), Gab-Allah *et al.* (2007), Radwan (2014), Belal and Ghobashy (2014).

In spite of this is a comprehensive study on bivalves of the western coasts of the Suez Gulf and gave detailed information on synonyms, status, localities and preferable habitats of bivalves of the two studied families. However, other studies are necessary particularly on the eastern coasts of the gulf and at deeper water including all non-cryptic, day-active and non-minute bivalve species to give more precise information on all bivalves' species of the studied families and overcome other species at different depths and localities. As well as to cover all migratory species comprising at least 8 species of these families invaded the Mediterranean as mentioned by Zenotoes (2010).

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ARABIC SUMMARY

مراجعة تصنيفية لعائلتي فينيريدي وماكتريدي (الرخويات: ذوات المصراعين) من خليج السويس، مصر

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أجريت هذه الدراسة خلال الفترة من صيف 2017 إلى ربيع 2018 حيث تم مسح عشرة مناطق من المنطقة الساحلية بين المدية بالشواطئ الغربية لخليج السويس بدءاً من مدينة السويس شمالاً حتى العزيزية 20 كم شمال رأس غارب جنوباً. أظهرت النتائج المتحصل عليها تسجيل ثلاثة عشر نوعاً من المحاريات تتبع عائلتي ماكتريدي وفينيريدي (الرخويات: ذوات المصراعين) تم تعريفها ومراجعتها تصنيفية بناءً على الصفات المورفولوجية للعينات المجمعة. ولقد أظهرت نتائج الدراسة أن العدد الأكبر من الأنواع (11 نوعاً) تتبع عائلة فينيريدي شملت: كاليستا فلوريدا - بيتار هيبريا - سيرس كوركيا - سيرس رجفيرا - سيرس سكريبتا - سيرسينتا كالبيجا - جافراريم بيكتناتم - دوزينيا ارينيرا - دوزينيا هيبتاكا - بافيا تيكستيل - تابس ديشازي، تندرج تحت ثمان أجناس ضمن أربعة فصائل هي كالوكارديني - سيرسيني - دوزينيني وتابتيني، بينما سجل نوعين فقط هما: ماكترا ليلشيا وماكترا أولورينا من عائلة ماكتريدي تتبع فصيلة واحدة وهي ماكتريني. ولقد عمل مفتاح للتعرف مع تم تسجيل الأنواع المعرفة مع ذكر المرادفات وأهم الصفات التشخيصية والحجم واللون والموطن وحالة وتوزيع الأنواع المحددة، كما أعطت هذه الدراسة الموقف التصنيفي حسب الأبحاث التصنيفية في مجال الرخويات ذوات المصراعين بالمنطقة والمناطق المجاورة.