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Distribution of Intertidal Molluscs along Tarut Island Coast, Arabian Gulf, Saudi Arabia

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A B S T R A C T

To document the frequency and diversity of molluscs and the factors controlling their distribution along the coastline of Tarut Island, Arabian Gulf, 4221 gastropod valves and bivalve shells were collected from 10 stations along the coast. 30 gastropod and 32 bivalve species belong to 49 genera and 33 families/superfamilies were identified. Stations 5 and 7 recorded the highest abundance of gastropod and bivalve respectively. Family Veneridae represented 85% of the recorded bivalves, while Ceriithiidae represented 41% of the recorded gastropods. Family Veneridae was the high diverse bivalves, while Trochidae was the high diverse gastropods. Nature of habitats and wind direction were the factors that may control occurrence and accumulation of seashells along the intertidal zone of the studied coasts. The low diversity in most of the studied fauna may attributed to the extreme environmental conditions and the deterioration resulting from land reclamation, urbanization and dredging around Tarut Island; industrial and sewage effluents, wastewater discharges from desalination plants; dust storms; oil leak and solid wastes.

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AES, MY and NAO collected and identified the seashells. AES and MY wrote the article. KAK helped in collection of seashells.

Key words:
Gastropoda, Bivalvia, Intertidal, Arabian Gulf, Saudi Arabia.

INTRODUCTION

The Arabian Gulf is a marginal and semi-enclosed sea situated in the subtropical region of the Middle East between latitudes 24º - 30º N and longitudes 48º - 57º E (Fig. 1). The Arabian Gulf constitutes part of the Arabian Sea ecoregion, and represents a realm of the tropical Indo-Pacific Ocean (Spalding *et al*., 2007). It is a shallow sedimentary basin with an average depth of 35 m and a total area of approximately 240,000 km^2 (Barth and Khan, 2008; Naser, 2014).

Due to the latitude geographical position, the relative shallowness and the high evaporation rates, the Arabian Gulf is characterized by extreme environmental conditions. Sea temperatures are markedly fluctuated between winter and summer seasons (15-36°C). Salinity can exceed 43 psu and may reach 70-80 psu in tidal pools and lagoons. Therefore, marine organisms in the Arabian Gulf are living close to the limits of their environmental tolerance (Price *et al*., 1993).

Many studies have been dealt with fauna, environmental assessment, and sedimentology of the Arabian and Oman gulfs (Dance and Eames, 1966; Biggs, 1958, 1969; Currie *et al*., 1973; Ahmed, 1975; Moolenbeek and Coomans, 1982; Bosch and Bosch, 1982, 1989; Beu, 1986; Sadiq and Alam, 1989; Coomans and Moolenbeek, 1990; Dance *et al*., 1992; Bosch *et al*., 1995; Pourang *et al*., 2005; Loughland *et al*., 2012; Naser, 2013; Almasoud *et al*., 2015; El-Sorogy and Youssef, 2015; El-Sorogy *et al*., 2016; Yossef *et al*., 2015).

The works dealt with frequency and diversity of molluscs along the Arabian Gulf coastline were very rare. Therefore, the present study aims to document the distribution of gastropods and bivalves along the Tarut coast, Arabian Gulf, Saudi Arabia. As well as discuss the environmental factors affecting the distribution of these fauna.

MATERIALS AND METHODS

Through four days field trip, a team work of 6 persons collected gastropod and bivalve shells from the intertidal zone of ten stations along Tarut coast, Arabian Gulf, Saudi Arabia (Fig. 1). The team work nearly takes the same time in each of the study stations. Collected fauna have been cleaned, photographed by digital camera and identified. The identification of the present fauna is based on classification of Moore (1960, 1969) and Bosch *et al*. (1995).The materials are deposited in the Museum of the Geology and Geophysics Department, College of Science, King Saud University under numbers MGD-CSc-KSU-1:85.

Study area

Tarut is an island in the Arabian Gulf belonging to

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the Eastern Province of Saudi Arabia, connected by two causeways to Qatif (Fig. 1). It is six kilometers from the coast, and is the longest island in the Arabian Gulf after Qeshm Island, extending from Ras Tanura in the north to Qatif in the west. The island has an area of 70 square kilometers. It contains a number of populated sectors, including Tarut itself, Deyrah, and Darin (Al Ruwaie 2007). According to the type of shore materials, the shoreline of Tarut Island could be classified into the following types (Figs. 2, 3):

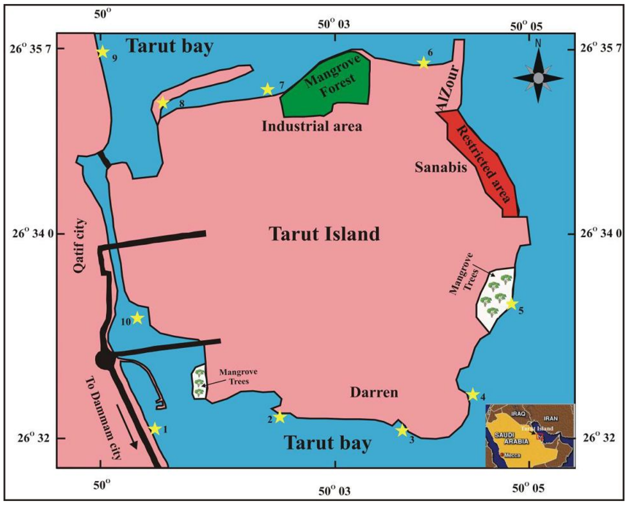


Fig. 1. Location map of the study area.

Sandy beaches

These beaches are mostly formed of friable sandy and locally gravelly sediments as well as shell fragments of molluscs, algae, corals, and foraminifera, which drifted by storms and high tide above these beaches (Fig. 2A). The bivalves and gastropods may form up to 75 % of the beach fauna (Fig. 2B).

Sandy beaches are inhabited by burrowing bivalves and gastropods. Examples of bivalves inhabit intertidal sandy flats and sandy beaches are *Glycymeris, Ctena, Divalinga, Cardites, Acrosterigma, Mactra, Asaphis, Hiatula, Circe, Circenita, Gafrarium, Calista, Dosinia* and *Maria.* From gastropod examples: *Clanculus, Nassarius, Ancilla, Mitra, Conus, Potamides* and *Calliostoma.*

Rocky beaches

These are locally man-made landfill beaches formed of moderate to huge natural rock fragments (Fig. 2C). They are used as wave breaks to make artificial lagoons and pools as platforms to fishers harbors. Some sand beaches are covered by coral fragments of different sizes and growth forms. The rocky shore is a place for oysters and mussels, which cling to boulders and rocks, and for rock-boring mussels. It is not a place for tellins and other sand burrowers.

A

B

C

D

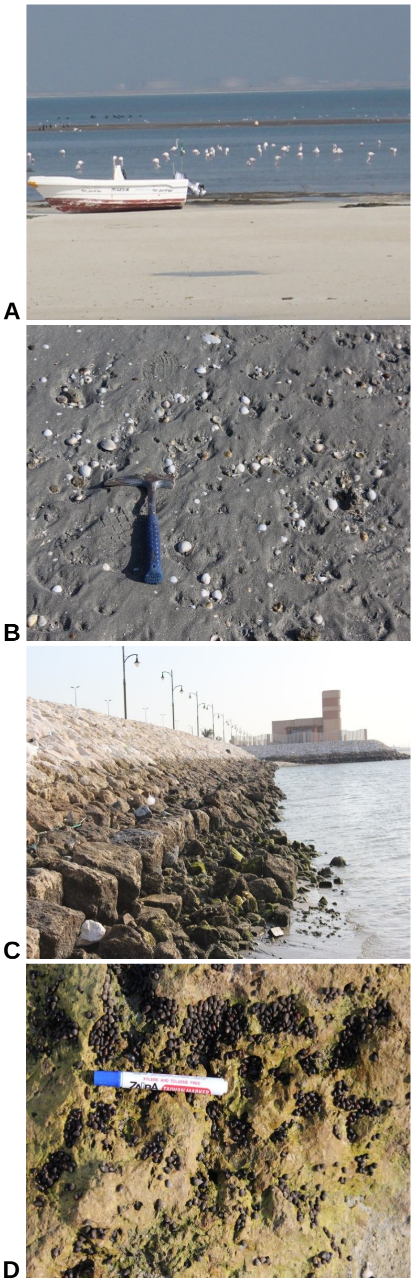


Fig. 2. A, sandy beach, station 4; B, accumulation of molluscs drifted by tidal currents on the sandy beach, station 7; C, rocky shores along the coast. Dark color illustrates the maximum high tide, station 1; D, abundant *Planaxis sulcafus* inhabit low sites of the artificial rocky shores, station 1.

Bivalves fixed by byssus or those cemented by shells prefer such offshore biotope. Examples of bivalves inhabit among rocks and in crevices under rocks are *Arca, Barbatia, Brachidontes, Madiolus, Pinctada, Alectryonella, Plicatula, Chlamys, Spondylus, Beguina, Chama* and *Trapezium.* The fissures and cracks in these rocky shores contain water during low tide and so some gastropods tolerate survival in such fissures (Fig. 2D). From gastropod inhabit among/under intertidal rocks: *Diodora, Trochus, Planaxis, Cronia, Lunella, Nerita, Cerithium, Cypraea* and *Hexaplex.*

Mangrove swamps

Mangrove stands are found in many stations on the Arabian Gulf coast. They become more frequent and extensive towards the northwest (Fig. 3A). The roots are nurseries and provide nests for several species of fish, shrimps, algae, bivalves and other crustaceans. The trees form breeding habitats and nesting sites for birds. The sediments between mangrove stands are very fine due to trapping away from strong waves. These mangrove ecosystems have been subjected to various impacts as a result of coastal development, with the most serious being smothering by landfilling (Loughland *et al*., 2012).

Mangrove swamps are inhabited by numerous molluscs (Fig. 3B). Examples are *Mactra, Hiatula, Calista, Dosinia* and *Chlamys.* From gastropod examples: *Trochus, Clanculus, Planaxis, Natica, Conus, Thais* and *Siphonaria.*

Tidal mudflats

Tidal mudflats are generally restricted to low energy environment associated with low water movement (Fig.3C). These habitats are favorable areas for the colonization by mangroves, algal and cyanobacterial mats, which play important roles in productivity and food chains. Subtidal and tidal muddy habitats are extremely rich in macrobenthic assemblages, which form the largest and most diverse marine ecosystem in the Arabian Gulf (Bosch *et al*., 1995).

Tidal mudflats are muddy and sandy by turns, often variegated with rocks, stones and seaweeds and protected from violent wave action. These flats provide some of the best conditions for molluscs to flourish. In these flats, cowries, cones, mitres, turrids, bubble shells, pen shells, cockles and scallops all living in close proximity and even the most delicate shells may survive intact.

From gastropod inhabit intertidal mud flats and rocks: *Planaxis, Potamides, Cerithium, Clypeomorus, Mitra* and *Hexaplex.* From recorded bivalves: *Anadara, Anadontia, Hiatula* and *Marcia* (Fig. 3D).

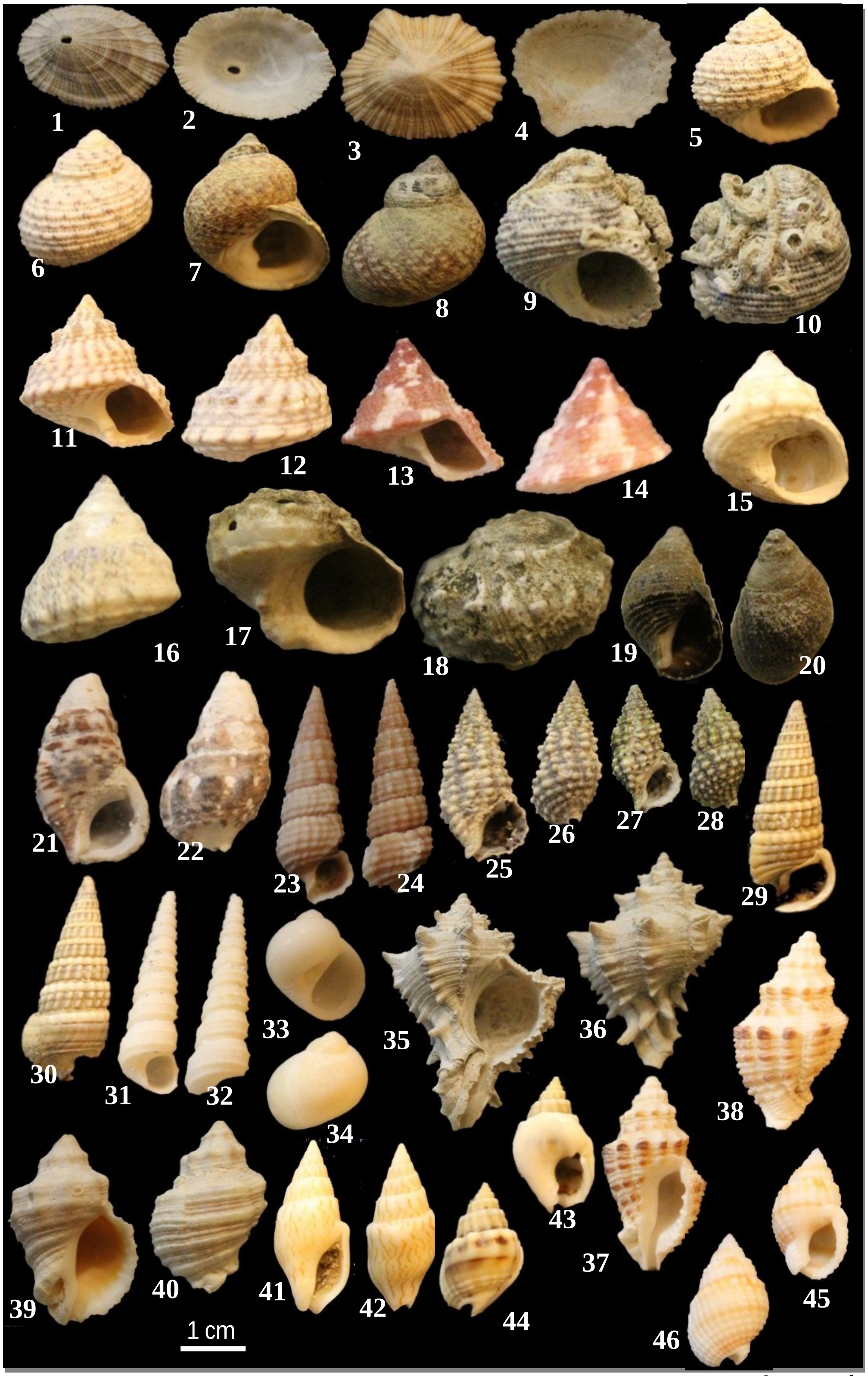

A


B


C


D

Fig. 3. A, mangrove and saline marsh shores, station 5; B, abundant cerithiid gastropod under mangrove trees, station 5; C, tidal mudflats, station 2; D, abundant *Cerithidea cingulata* on tidal mudflats, station 2.



For explanation of Figure 4 see opposite page

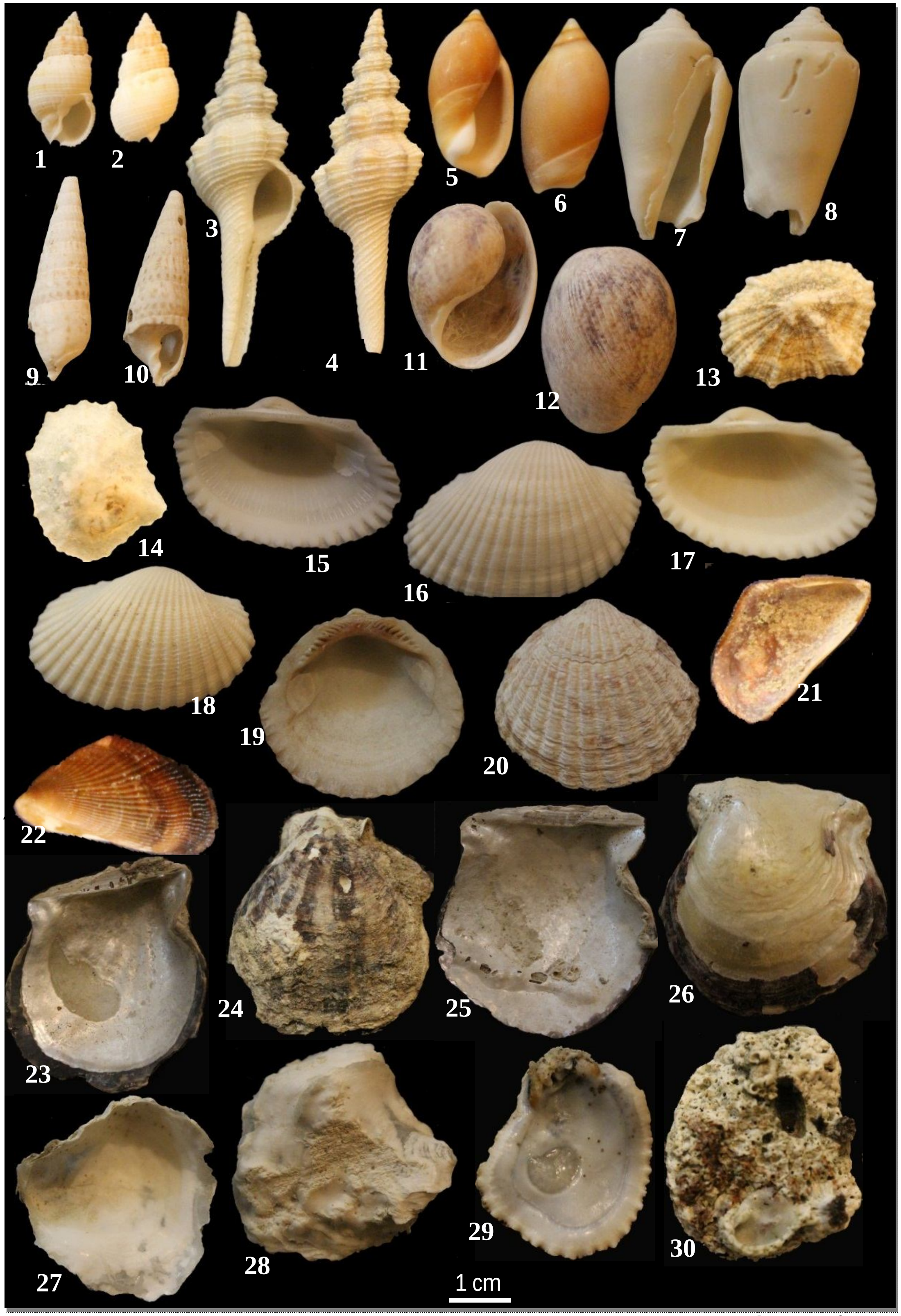
Table I.- Distribution of gastropods along Tarut Island coast.

Family	Species	Number of collected gastropod shells									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Fissurellidae	*Diodora rueppellii* Sowerby, 1834)	-	-	-	-	-	-	-	-	-	1
Patellidae	*Patella flexuosa* Quoy & Gaimard, 1834	-	-	-	-	-	5	-	-	2	-
Trochidae	*Euchelus asper* (Cmelin, 1791)	-	-	-	1	6	-	-	-	-	-
	Mondonta nebulosa Forsskal, 1775)	-	-	-	2	-	-	-	-	-	-
	Clanculus pharaonius (Linnaeus, I 758)	-	-	1	-	-	-	-	-	-	
	Trochus (Infundibulops) erithreus Brocchi, 1823	10	7	5	2	12	17	31	3	3	22
	Trochus (Infundibulops) fultoni Melvill, 1898	8	-	-	2	26	4	-	-	2	-
	Osilinus kotschyi (Philippi,1849)		-	-	5	-	-	-	7	-	-
Turbinidae	*Lunella coronata* (Gmelin, 1791)	17	-	2	17	-	9	-	-	-	-
Planaxidae	*Planaxis sulcatus* (Born, 1780)	41	-			5		-	-	-	-
Cerithiidae	*Cerithium caeruleum* Sowerby,1855	12	-	-	3	83	24	43	-	2	-
	Cerithium rueppelli Philippi,1848	6	12	-	12	60	15	103		2	8
	Cerithium scabridum Philiirpi, 184,8	11	-	-	-	43	7	-	-	-	14
	Clypeomorus bifasciatu persicus Houbrick,1985	43	23	5	8	111	77	54	17	10	32
Potamididae	*Cerithidea cingulata* (Gmelin, l79l)	46	11	5	15	129	22	12	9	54	11
Turritellidae	*Turritella cochlea* Reeve, 1849	9	201	-	156	-	-		16	3	34
Naticidae	*Natica cernica* Jousseaume,1874	-	3	-	-	-	-	-	-	-	-
Muricidae	*Hexaplex kuesterianus* (Tapparone-Canefri, 1875)	-	10	11	12	-	-	-	-	2	3
	Cronia cf konkanensis (Melvill,1893)	-	2	3	2	-	-	-	-	-	5
	Thais tissoti (Petit, 1853)	8	-	-	4	-	-	5	-	-	-
Golmbellidae	*Mitrella blanda* (Sowerby, 1844)	-	-	-	-	5	-	-	-	-	-
Nassariidae	*Nassarius (Plicarcularia) persicus,* (Martens, 1874)	-	6	-	2	-	-	-	-	-	1
	Nassarius (Zeuxis) fredericì (Melvill & Standen, 1901)	-	2	-	4	-	-	-	-	-	-
	Nassarius (Zeuxis) pseudoconcinnus (Smith, 1895)	-	3	-	-	-	-	-	-	-	-
Fasciolariidae	*Fusinus arabicus* (Melvill, 1898)	-		1	-	-	-	-	-	-	2
Olividae	*Ancilla (Sparella) castanea* (Sowerby, 1830)	-	22	3	5	4	4	-	-	-	7
Conidae	*Conus ardisiaceus* Kiener,1845	2	3	-	-	-	2	3	-	-	2
Pyramideloidae	*Pyramidella acus* (Gmelin,l79l)	-	2	-	-	-	-	-	-	-	-
Bullidae	*Bulla ampulla* Linnaeus, 1758	-	14	-	4	-	4	-	-	-	11
Siphonariidae	*Siphonarìa belcheri* Hanley,1858	-	-	-	-	14	-	1	-	3	-

RESULTS

Gastropod shells (2054) were collected from 10 stations on the coastline (Fig. 1). Thirty species belonging to 25 genera and 18 families have been identified and illustrated (Table I, Figs. 4, 5). Station 5 recorded the highest gastropod frequency while station 3 recorded only one. Following is the order of shells abundance in a

Fig. 4. Different views of the identified gastropods. 1, 2, *Diodora rueppellii* (Sowerby, 1834), station 10; 3, 4, *Patella flexuosa* Quoy & Gaimard, 1834, station 6; 5, 6, *Euchelus asper* (Gmelin, 1791), station 5; 7, 8, *Mondonta nebulosa* (Forsskål, 1775), station 4; 9, 10, *Clanculus pharaonius* (Linnaeus, I 758), station 3; 11, 12, *Trochus (Infundibulops) erithreus* Brocchi, 1823, station 1; 13, 14, *Trochus (Infundibulops) fultoni* Melvill, 1898, station 5; 15, 16 *Osilinus kotschyi* (Philippi, 1849), station 8. 17, 18, *Lunella coronata* (Gmelin, 1791), station 3; 19, 20, *Planaxis sulcatus* (Born, 1780), station 1; 21, 22, *Cerithium caeruleum* Sowerby, 1855, station 5; 23, 24, *Cerithium rueppelli* Philippi, 1848, station 5; 25, 26 *Cerithium scabridum* Philippi, 1848, station 5; 27, 28, *Clypeomorus bifasciatu persicus* Houbrick, 1985, station 6; 29, 30 *Cerithidea cingulata* (Gmelin, l79l), station 6; 31, 32 *Turritella cochlea* Reeve, 1849, station 2; 33, 34 *Natica cernica* Jousseaume, 1874, station 2; 35, 36 *Hexaplex kuesterianus* (Tapparone-Canefri, 1875), station 10; 37, 38 *Cronia* cf. *konkanensis* (Melvill, 1893), station 4; 39, 40 *Thais tissoti* (Petit, 1853), station 1; 41, 42 *Mitrella blanda* (Sowerby, 1844), station 5; 43, 44 *Nassarius (Plicarcularia) persicus*, (Martens, 1874), station 4; 45, 46 *Nassarius (Zeuxis) frederici* (Melvill & Standen, 1901), station 2.



For explanation of Figure 5 see opposite page

descending order: Station 5 (498 shells), station 2 (321), Station 4 (256), station 7 (252), station 1 (313), station 6 (190), station 10 (153), station 9 (83), station 8 (52) and station 3 (36). Gastropods of family Cerithiidae are the most abundant (840 shells, 41% of the recorded gastropods) while families Fissurellidae, Patellidae, Naticidae, Golmbellidae, Fasciolariidae and Pyramideloidae are represented by less than ten shells for each (Table I, Fig. 6). Families Trochidae and Cerithiidae represent the highest diverse ones (6 and 4 species, respectively) followed by families Nassariidae and Muricidae by 3 species for each.

From the studied stations, 2267 valves were collected, comprising 32 species belonging to 24 genera and 15 families/superfamilies (Table II, Figs. 5, 7, 8). Station 7 recorded the most abundant bivalves, while station 8 had the lowest ones. The following is the order of abundance in a descending order for bivalve distribution: Station 7 (390), station 10 (323), station 4 (306), station 2 (301), station 1 (280), station 9 (215), station 5 (133), station 3 (116), station 6 (109) and station 8 (94). Family Veneridae recorded the most abundant (1917 bivalves, 85% of the recorded bivalves) while families Mytiloidea, Ostreidae, Plicatuloidea, Pectinidae, Spondylidae, Carditoidea and Arcticoidea were represented by less than ten valves for each (Table II, Fig. 9). Families Veneridae represented the highly diverse (15) species followed by family Cardiidae which was represents by 4 species. Each of the families Chamoidea and Arcidae were represented by 3 species. The present identified molluscs are very much the ones that have been reported by El-Sorogy 2015 along the Egyptian Red Sea coast.

DISCUSSION

At station 5, the members of families Cerithiidae and Potamididae represent 85% of the total gastropods. This abundance may attribute to the presence of muddy substrate suitable for cerithiid and planaxid mode of life. The most number of families Trochidae, Turbinidae, Cypraeidae, Olividae and Conidae are concentrated in stations of intertidal sandy beaches suitable for their habitats. The members of bivalve family Veneridae represent the most common bivalves in stations 7, 10, 4, 2 and 9, where intertidal sandy beaches and intertidal mudflats are suitable for their habitats as burrowing in soft sediments.

The lowest number of both gastropods and bivalves were recorded in stations 3, 6 and 8. Station 8 is located in a semi-closed area and therefore subjected to different environmental stresses as high salinity, temperature and water shallowness. Stations 3 and 6 are located in areas stressed by human wastes of different types (Fig. 10B-D).

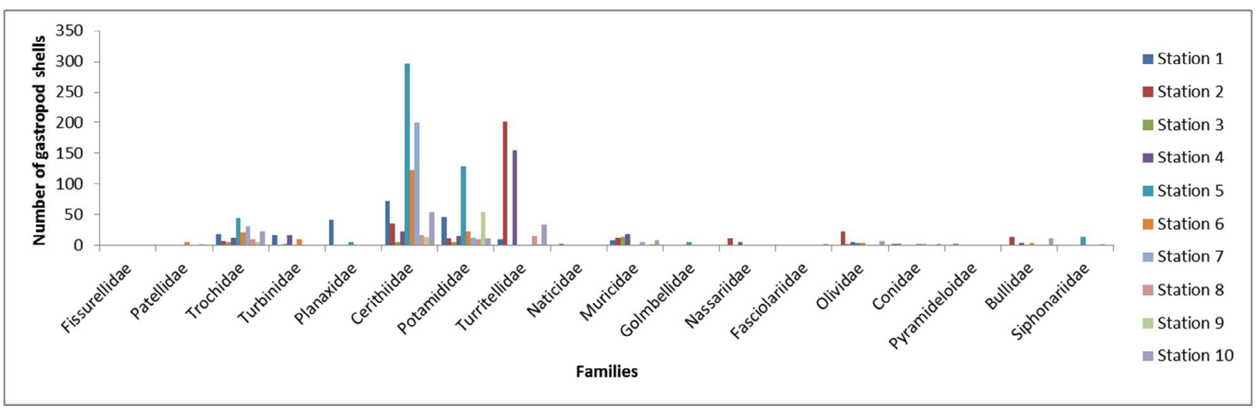
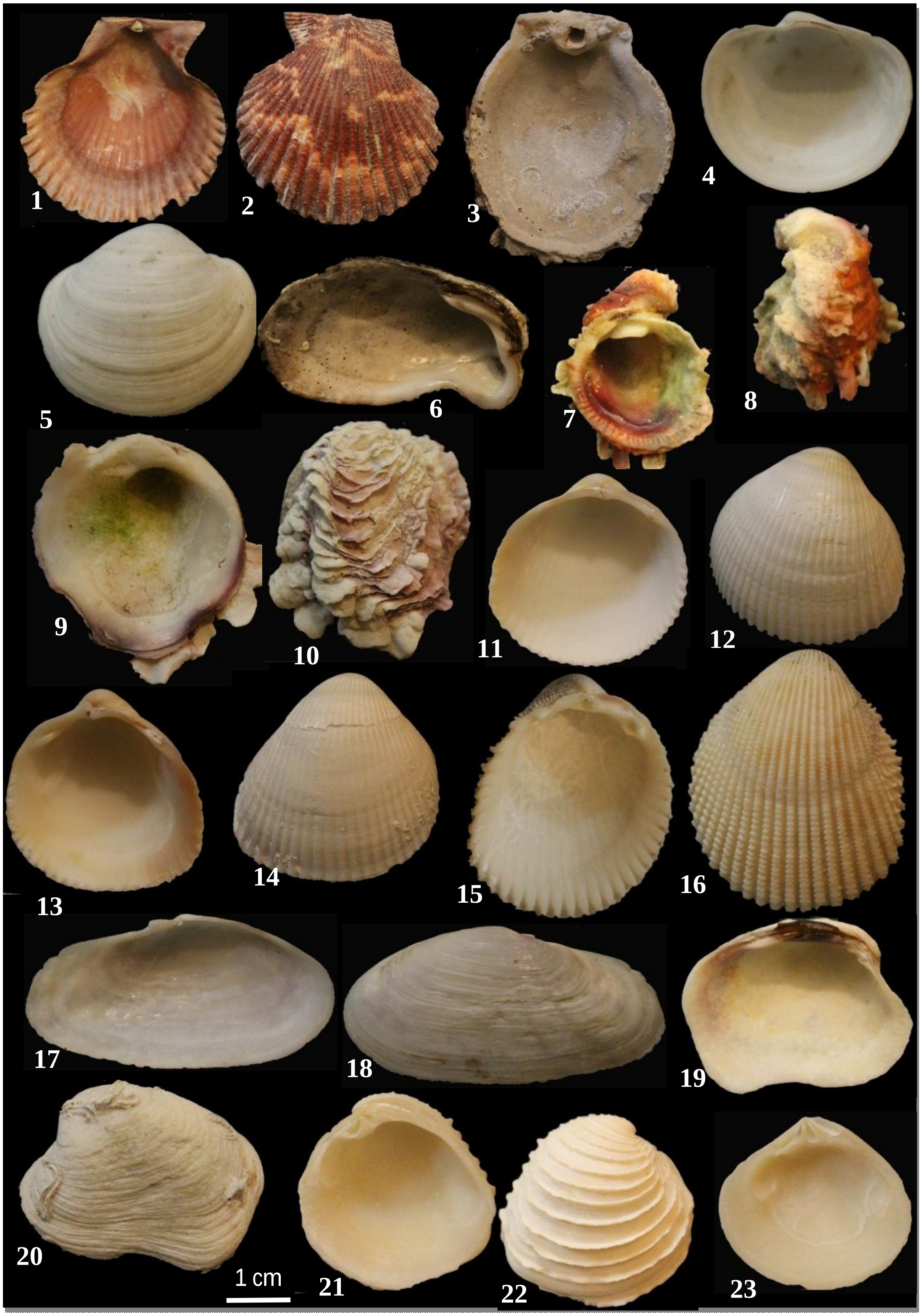


Fig. 6. Distribution of Gastropod families along the coastline of Tarut Island.

Fig. 5. Different views of the identified gastropods and bivalves. 1, 2 *Nassarius (Zeuxis) pseudoconcinnus* (Smith, 1895), station 2; 3, 4, *Fusinus arabicus* (Melvill, 1898), station 10; 5, 6, *Ancilla (Sparella) castanea* (Sowerby, 1830), station 2; 7, 8, *Conus ardisiaceus* Kiener, 1845, station 7; 9, 10, *Pyramidella acus* (Gmelin, l79l), station 2; 11, 12, *Bulla ampulla* Linnaeus, 1758, station 4; 13, 14, *Siphonarìa belcheri* Hanley, 1858, station 5; 15, 16, *Anadara antiquata* (Linnaeus, 1758), station 4; 17, 18, *Anadara erythraeo nensis* (Philippi, l85l), station 10; 19, 20, *Glycymeris pectunculus* (Linnaeus, 1758), station 2; 21, 22, *Brachidontes variabilis* (Krauss,1848), station 2; 23, 24, *Pinctada cf nigra* (Gould, 1850), station 7; 25, 26, *Pinctada margaritifera* (Liinnaeus, 1758), station 5; 27, 28, *Alectryonella plicatula* (Gmelin, 1 791), station 6; 29, 30 *Plicatula australis* Lamarck, 1819, station 4.



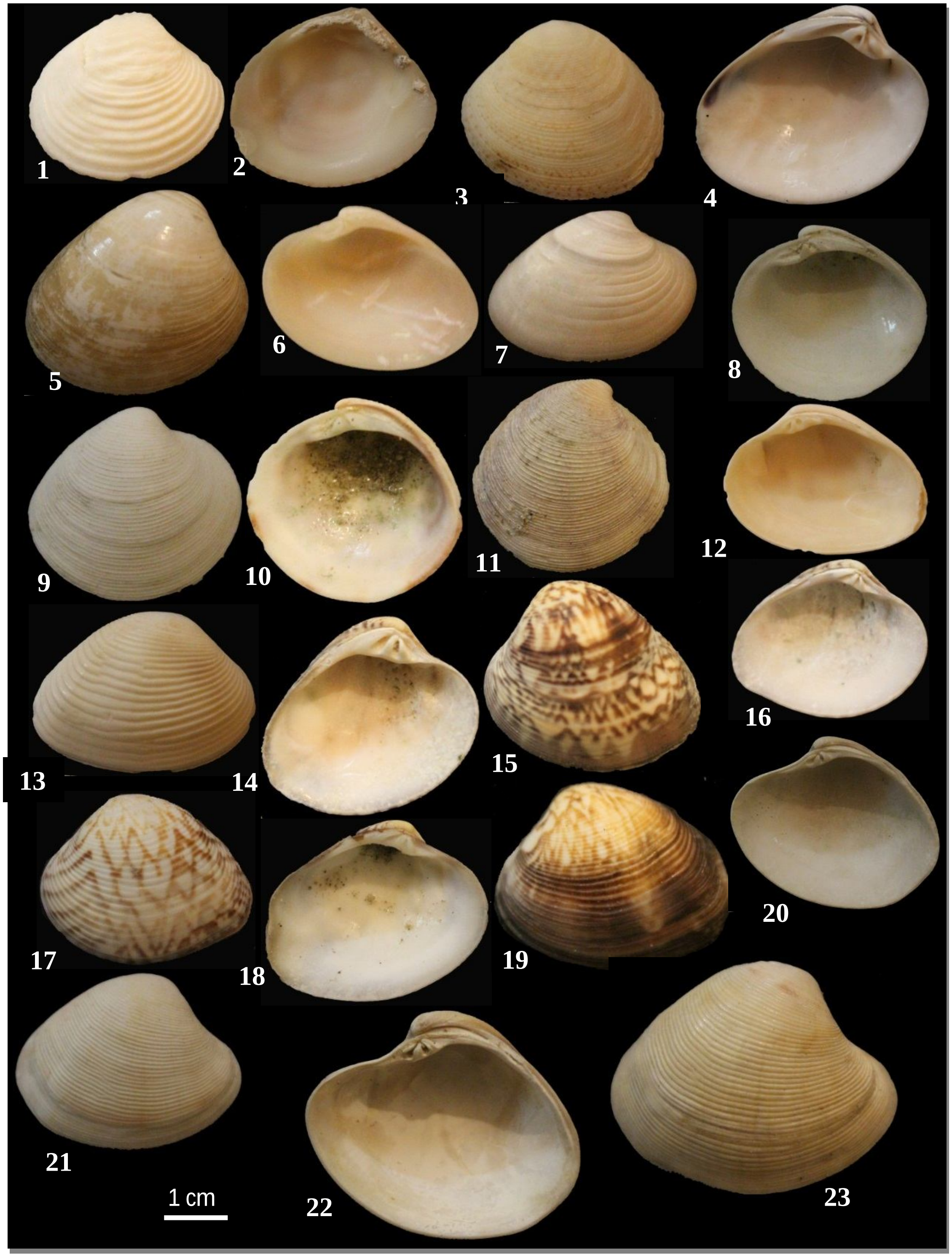
For explanation of Figure 7 see opposite page

Table II.- Distribution of bivalves along Tarut Island coast.

Family	Species	Number of collected gastropod shells and bivalve valves									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Arcidae	*Anadara antiquata* (Linnaeus,1758)	3	5	-	18	-	-	-	-	-	-
	Anadara erythraeo nensis (Philippi, l85l)	-		-	-	-	-	-	-	-	8
Glycymerididae	*Glycymeris pectunculus* (Linnaeus,1758)	-	22	-	-	-	-	-	-	-	2
Mytiloidea	*Brachidontes variabilis* (Krauss, 1848)	-		-	-	6	-	2	-	-	-
Pteriidae	*Pinctada cf nigra* (Gould, 1850)	-	2	-	-	6	-	2	-	-	-
	Pinctada margaritifera (Liinnaeus, 1758)	-		-	2	5	5	2	-	-	-
Ostreidae	*Alectryonella plicatula* (Gmelin,1 791)	-	2	-	-	2	5	-	-	-	-
Plicatuloidea	*Plicatula australis* Lamarck, 1819	-		-	1	3	4	-	-	-	-
Pectinidae	*Chlamys tounsendi* (Sowerby, 1895)	-		-	1	-	-	-	-	-	-
Spondylidae	*Spondylus hystrix* Roding, 1798	-	2	-	-	-	-	-	-	-	-
Lucinidae	*Anodontia edentula* (Linnaeus, 1758)	12	24	23	-	6	7	6	4	9	7
Carditoidea	*Beguina gubernaculum* (Reeve, 1843)	-	-	-	3	-		-	-	-	-
Chamoidea	*Chama reflexa* Reeve, 1846	-	-	-	-	-	7	-	-	-	-
	Chama aspersa Reeve, 1846	-	-	-	2	3	6	-	-	-	-
Cardiidae	*Plagiocardium pseudolima* (Lamarck, 1819)	-	-	-	8	-	-	-	-	-	2
	Fulvia fragile (Forrskàl, 1775)	6	3	-	6	-	-	4	-	11	-
	Acrosterigma lacunosa (Reeve, 1845)	5	9	3	7	-	-	-	-	-	7
Psamobiidae	*Hiatula mirbahensis* Morris & Morris. 1993	2	27	-		-	-	-	-	6	1
Arcticoidea	*Trapezìum sublaevigatum* (Lamarck, 1819)	-	-	-	3	-	-	-	-	-	-
Veneridae	*Bassina calophylla* (Philippi, 1846)	5	6	2	8	-	-	3	-	-	3
	Circe rugifera (Lamarck, 1818)	66	49	-	67	-	-	14	-	-	56
	Circenita callipyga (Born, 1780)	12	-	-	61	-	-	12	-	8	67
	Amiantis umbonella (Lamarck, 1818)	14	3	16	32	47	22	23	4	4	3
	Callista florida (Lamarck, 1818)	33	6		14	-	22	-	12	22	45
	Dosinia tumida (Gray, 1831)	3	8	24		-	-	-	-	4	5
	Dosinia ceylonica Dunker, 1865	10	-	-	6	-	-	16	-	1	-
	Marcia marmorata (larnarck, 1818)	6	13	-	12	-	11	10	13	9	43
	Marcia flammea (Gmelin, 1 791)	37	24	-	20	-	13	12	37	10	66
	Marcia opima (Grnelin, 1791)	15	35	13	9	9	-	-	-	13	-
	Protapes cor (Sowerby, 1853)	17	-	-	11	5	-	13	-	27	-
	Protapes sinuosa (Lamarck, 1818)	19	40	35	15	29	4	96	11	49	12
	Protapes sp.	15	6	-	-	12	3	75	13	42	-

Biodiversity and distribution of macrobenthos in the Arabian Gulf are primarily governed by sediment type, temperature, salinity, primary productivity, depth and physical disturbance (Coles and MacCain, 1990). Forty two of the recorded genera (60%) have one species. The low diversity in most of the studied fauna may be also related to anthropogenic pollutants spreading in the study area, in the form of deterioration as a result of land reclamation, urbanization and dredging around Tarut Island; industrial and sewage effluents, wastewater discharges from desalination plants from Al Jabail industrial city, 60 km to the north of the study area; and

Fig. 7. Different views of the identified bivalves. 1, 2 *Chlamys tounsendi* (Sowerby, 1895), station 4; 3 *Spondylus hystrix* Roding, 1798, station 2; 4, 5 *Anodontia edentula* (Linnaeus, 1758). 6 *Beguina gubernaculum* (Reeve, 1843), station 4; 7, 8 *Chama reflexa* Reeve, 1846, station 6; 9, 10 *Chama aspersa* Reeve, 1846, station 5; 11, 12 *Plagiocardium pseudolima* (Lamarck, 1819), station 10; 13, 14 *Fulvia fragile* (Forrskàl, 1775), station 7; 15, 16 *Acrosterigma lacunosa* (Reeve, 1845), station 1; 17, 18 *Hiatula mirbahensis* Morris & Morris, 1993, station 9; 19, 20 *Trapezìum sublaevigatum* (Lamarck, 1819), station 4; 21, 22 *Bassina calophylla* (Philippi, 1846), station 7; 23 *Circe rugifera* (Lamarck, 1818), station 10.



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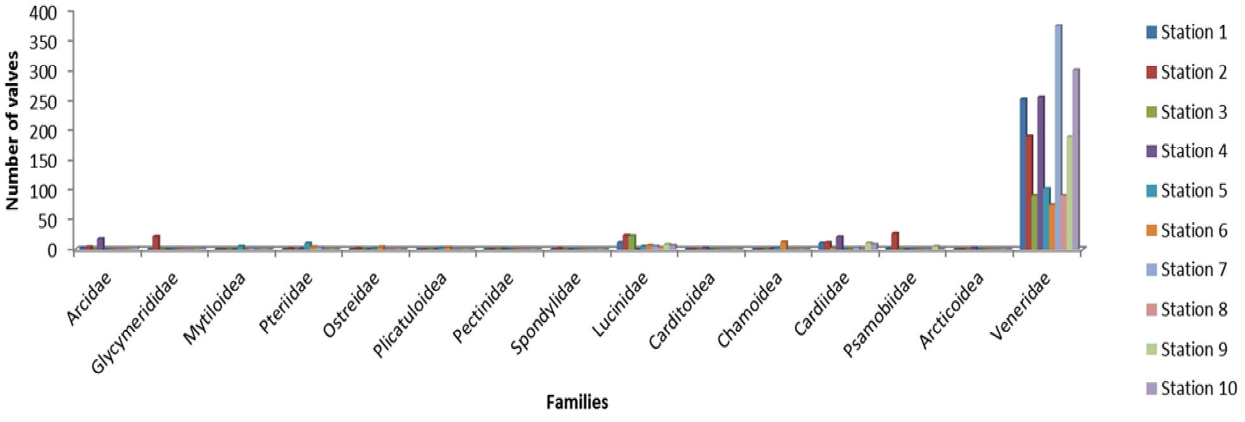

Fig. 9. Distribution of bivalve families/superfamilies along the coastline of Tarut Island.

Fig. 10. A, solid wastes in the form of rubber tires in the intertidal zone, station 9; B, crowded fishing boats in the intertidal zone, station 3; C, construction and fishing remains along the coast, station 3; D, solid wastes in the form of plastic bottles in the intertidal zone, station 6.

Fig. 8. Different views of the identified bivalves. 1 *Circe rugifera* (Lamarck, 1818), station 10; 2, 3 *Circenita callipyga* (Born, 1780), station 7; 4, 5 *Amiantis umbonella* (Lamarck, 1818), station 8; 6, 7 *Callista florida* (Lamarck, 1818), station 6; 8, 9 *Dosinia tumida* (Gray, 1831), station 3; 10, 11 *Dosinia ceylonica* Dunker, 1865, station 3; 12, 13 *Marcia marmorata* (lamarck, 1818), station 6; 14, 15 *Marcia flammea* (Gmelin, 1791), station 10; 16, 17 *Marcia opima* (Gmelin, 1791), station 2; 18, 19 *Protapes cor* (Sowerby, 1853), station 5; 20, 21 *Protapes sinuosa* (Lamarck, 1818), station 7; 22, 23 *Protapes* sp., station 7.

solid wastes of different construction remnants, plastic, wood, metals, concrete, tar balls and from fishing boats (Fig 10A-D), in addition to dust storms and oil leak which were considered significant and chronic source of pollution in the Gulf environment.

CONCLUSIONS

The coastline of Tarut Island along Arabian Gulf coast was classified into sandy beaches, rocky beaches, mangrove swamps and tidal mudflats, according to the type of shore materials. Sixty two gastropod and bivalve species belong to 49 genera and 33 families/superfamilies were identified from 10 stations along Tarut coast. Family Veneridae recorded the highest and diverse number of bivalves. Family Cerithiidae recorded the highest abundant while Trochidae recorded the highest diverse gastropods. Nature of habitats and wind direction were the factors controlling occurrence and accumulation of seashells along coastline. The low diversity of most of the studied fauna may be attributed to the extreme environmental conditions and the anthropogenic pollutants spreading in the study area.

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