The bathybenthic and pelagic molluscan fauna off the Levantine coast, eastern Mediterranean

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KEY WORDS: New records, bathyal, benthic, pelagic, Levantine Basin, eastern Mediterranean.

ABSTRACT A total of 4580 molluscan specimens, identified to 43 species, have been collected during eleven cruises off the Mediterranean coast of Israel at depths between 734 and 1558 m. Much of the material examined consists of juvenile specimens and empty shells – only 23 species were represented by living specimens, 11 of these were represented solely by juvenile specimens. Five species constitute new records for the eastern Mediterranean, 8 are newly recorded from the Levantine sea. The deep waters of the eastern Mediterranean are effectively separated from the Atlantic Ocean by the shallow Gibraltar and Sicilian sills. Yet, the most common benthic molluscs in depths greater than 1000 m off the Israeli coast are of Atlanto-Mediterranean and Boreal distribution, either eurybathic species with upper bathymetric range well within the circalittoral, or having epipelagic larvae. Though the benthic molluscan fauna is considerably impoverished compared with the western Mediterranean, 12 of 13 of the Mediterranean pelagic thecosomate species were collected. The Quaternary anoxic events, combined with the barrier posed by the shallow Siculo-Tunisian sill, and the basin's oligotrophy provide a plausible explanation for the sparse and impoverished mollusc fauna in the Levantine bathyal.

RIASSUNTO Durante undici crociere oceanografiche intraprese al largo delle coste d' Israele a profondità comprese tra 734 e 1558 metri, sono stati raccolti 4580 esemplari di molluschi ascrivibili a 43 specie differenti. Gran parte del materiale esaminato è costituito da esemplari giovanili e conchiglie vuote. Solo 23 specie sono state rinvenute viventi e, tra queste, 11 specie sono rappresentate esclusivamente da esemplari giovanili. Cinque specie sono state raccolte per la prima volta nel Mediterraneo Orientale: *Akritogyra conspicua* (Monterosato, 1880), *Alvania electa* (Monterosato, 1874), *Turbonilla micans* (Monterosato, 1875), *Gleba cordata* Forskål, 1776, *Thyasira oblonga* (Monterosato, 1878). Otto specie costituiscono nuovi ritrovamenti per il Mar di Levante: *Carinaria lamarckii* (Peron & Lesueur, 1810), *Xenoskenea pellucida* (Monterosato, 1874), *Diacria trispinosa* (Lesueur, 1821), *Yoldiella philippiana* (Nyst, 1845), *Cyclopecten* cf. *hoskynsi* (Forbes, 1844), *Thyasira granulosa* (Monterosato, 1874), *Thyasira eumyaria* (Sars, M., 1870), *Allogramma formosa* (Jeffreys, 1882).
Nonostante le acque profonde del Mediterraneo Orientale siano separate dall'Oceano Atlantico da ben due barriere geografiche, le soglie poco profonde di Gibilterra e del Canale di Sicilia, i molluschi bentonici più comuni rinvenuti a profondità maggiori di mille metri al largo delle coste israeliane hanno affinità Atlanto-Mediterranea e Boreale. La loro presenza è spiegabile grazie all'elevata euribatia delle specie, presenti anche nel piano Circalitorale, e grazie alla presenza di larve epipelagiche a sviluppo planctotrofico. Benché la malacofauna dell'area appaia notevolmente impoverita in confronto a quella del Mediterraneo Occidentale, sono state raccolte 12 delle 13 specie pelagiche Mediterranee note di Thecosomata. L'anossia avvenuta nel Quaternario, le condizioni oligotrofiche del bacino, e la presenza della poco profonda soglia Siculo-Tunisina che ha funzionato da barriera, forniscono una plausibile spiegazione alla bassa diversità specifica ed alla bassa densità della malacofauna batiale del Mar di Levante.

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INTRODUCTION

The study of the Levantine Sea bathyal molluscs commenced with the voyages of the "POLA" (1890-1893), the most extensive deep-sea expedition to take place in the Levant Basin (STURANY, 1896). The Danish Oceanographical Expedition to the Mediterranean, aboard the "THOR", sampled nine sites along the western limits of the Levantine Sea, from Cyrenaica to Rhodes, in 1910. In 1987, the German research vessel "METEOR" [cruise 5] collected benthic samples at sites between Crete and Israel at depths ranging between 95 and 4396 m (JANSSEN, 1989). In 1993, the "METEOR" [cruise 25] obtained deep-sea biota from the region between Crete, Cyprus and Egypt at depths ranging between 200 and 2900 m (HIEKE *et al.*, 1994). The fauna of Eratosthenes Seamount, south of Cyprus, was briefly sampled by the "POSEIDON" [cruise 201/2] on February 1994 (GALIL & ZIBROWIUS, 1998). Thus, when discussing the Mediterranean deep sea gastropod fauna BOUCHET & TAVIANI (1992) declared that the *"Eastern Mediterranean is the least adequately sampled region"*.

A series of eleven cruises conducted between 1994 and 1999 as part of pollution monitoring surveys by the Israel Oceanographic and Limnological Research (IOLR) off the northern coast of Israel, at depths between 734 and1558 m, added to our knowledge of the Levantine bathyal mollusc fauna.

STUDY AREA

The Levantine Sea at the easternmost Mediterranean, east of the line connecting Rhodes and Cyrenaica is isolated from the deep Atlantic and western Mediterranean waters by the shallow Gibraltar Straits and the Siculo-Tunisian sill.

The Levantine deep water mass is distinguished by salinity and temperature values that are higher than in the rest of the Mediterranean (T< 13.8ºC, S < 38.74, below 700 m) (HECHT *et al.*, 1988). The Levantine Sea is ultra-oligotrophic (BERMAN *et al.*, 1984; KROM *et al.*, 1991). Chlorophyll-a concentrations are as low as 0.4 μg l^{-1} nearshore, and decrease offshore to 0.05 μg l^{-1} (BERMAN *et al.*, 1986; YACOBI *et al.*, 1995).

The area investigated is located off the northern coast of Israel, at depths between 734 and 1558 m (Plate 1, table 1).

MATERIALS AND METHODS

The material was collected during some monitoring surveys of two deepwater waste-dumping sites: an acidic sludge disposal site off

Haifa, coal fly ash site off Hadera, and a control site off Atlit. The samples were collected using a 0.5 mm plankton net secured atop a Marinovich-type deep water trawl. The sample was preserved in 10% buffered formalin aboard ship. In the laboratory samples were washed and sieved through a 500 µm mesh, preserved in 70% alcohol, and stained in Rose Bengal. The sorted material was sent to Livorno for identification. The material is deposited in the collection of the first author and the National collection, Tel Aviv University. Taxonomy follows the Check List of European Marine Mollusca (http://www.mnhn.fr/mnhn/bimm/clemam).
For each species only records within the Levantine sea and adjacent areas (southern Aegean sea, eastern Ionian sea) are cited, or, if none known, the easternmost Mediterranean record. Only synonyms used in the cited records are given. The number of specimens in each sample is given in parenthesis following the station number.

Gastropoda Cuvier, 1797
Prosobranchia Milne Edwards, 1848
Vetigastropoda Salvini-Plawen & Haszprunar, 1987
Trochoidea Rafinesque, 1815
Skeneidae Clark, 1851
Akritogyra conspicua (Monterosato, 1880)
Distribution.- Mediterranean endemic. Central and Western Mediterranean (WARÉN, 1992).
Material examined.- 97HF1 (2 + 12 juvs.); living specimens.
Remarks.- First record in the Eastern Mediterranean.

Caenogastropoda Cox, 1959
Rissooidea Gray, 1847
Rissoidae Gray, 1847
Alvania electa (Monterosato, 1874)
Distribution.- Atlantic-Mediterranean. Sicily (CARUS, 1893).
Material examined.- 95700 (2); living specimens.
Remarks.- First record in the Eastern Mediterranean.

Benthonella tenella (Jeffereys, 1869)
Plate 2, Figure A.
Distribution.- Atlantic-Mediterranean. Crete (JANSSEN, 1989; KOUTSOUBAS *et al.*, 1992); southwest of Cyprus, 34.08.27N, 31.52.52'E (JANSSEN, 1989); Israel (JANSSEN, 1989).
Material examined.- 94H15 (1); 95HF1 (11); 95HF2 (2); 95HF3 (2); 95HF8 (12); 95HF9 (1); 95H4 (2); 95H7 (1); 95H13 (4); 95H14 (1); 95H15 (1); 95H19 (1); 95H20 (1); 96A1 (1); 96A2 (4); 96A5 (1); 96A6 (1); 96HA (1); 96H4 (2); 96H6 (2); 96H14 (1); 96H20 (1); 97H7 (10); 97H14 (3); 97H19 (2); 97H21 (5); 97H52 (4); 97HF1 (3); 97HF2 (2); 97HF3 (3); 97HF4 (2); 97HF6 (3); 97HF7 (3); 97HF8 (1); 97HF9 (6); 98H4 (3); 98H15 (11); 98H19 (9); 98H20 (8); 98H21 (4); 98H23 (5); 98H24 (8); 98H25 (3); 98H26 (9); 98H27 (7); 99A1 (2); 99A3 (3); 99A4 (3); 99A6 (32); 99A7 (4); 99H7 (2); 99H15 (3); 99H19 (2); 99H20 (3); 99H21 (1); 99H23 (2); 99H25 (1); 99H27 (3); 99H28 (1). A total of 230 living specimens, about 80% juveniles.

Firoloidea Rafinesque, 1815
Atlantidae Rang, 1829
Atlanta fusca Souleyet, 1852

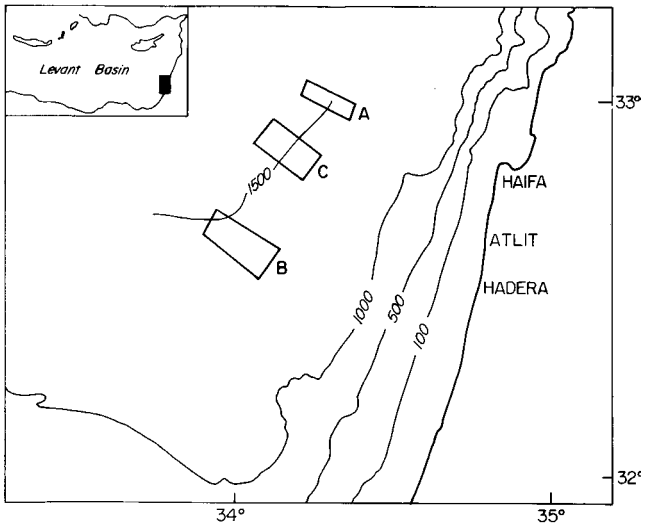

Plate 1. Map of the Mediterranean coast of Israel showing the locations of the Investigated areas (see also table 1). A, Haifa; B, Hadera; C, Atlit.
Tavola 1. Mappa delle coste Mediterranee di Israele con l'indicazione delle aree studiate (vedi anche tab.1). A, Haifa; B, Hadera; C, Atlit.

Distribution.- Cosmopolitan. South Aegean Sea (KIORTOSIS, 1969; KOTSOUBAS *et al.*, 1997); Levant sea (VATOVA, 1974); Israel (VAN AARTSEN *et al.*, 1989).
Material examined.- 94H19 (1); 94A4 (1); 95A4 (1); 97H14 (1); 99A6 (13). A total of 17 adult shells, no living specimens.

Atlanta peronii Lesueur, 1817
Distribution.- Cosmopolitan. South Aegean Sea (KOTSOUBAS *et al.*, 1997); Crete, (FORBES, 1844; JEFFREYS, 1883; KOUTSOUBAS *et al.*, 1992); Cyclades (FORBES, 1844); Dodecanese (FORBES, 1844); Israel (BARASH & DANIN, 1992).
Material examined.- 94H6 (1); 96HA (11); 96H4 (3); 96H6 (1); 96H14 (1); 97H7 (1); 97H19 (1); 97H52 (3); 97HF1 (4); 97HF3 (3); 97HF7 (3); 97HF8 (3); 97HF9 (9); 98H15 (9); 98H19 (3); 98H20 (2); 98H22 (4); 98H23 (2); 98H25 (2); 98H28 (2); 99A1 (1); 99A3 (1); 99A5 (1); 99A6 (88); 99A7 (2); 99H4 (2); 99H19 (2); 99H21 (1); 99H23 (1); 99H27 (5). A total of 172 adult shells, no living specimens.

Oxygyrus keraudrenii (Lesueur, 1817)
Bellerophina minuta Forbes, 1844:186.
Distribution.- Cosmopolitan. South Aegean Sea (FORBES, 1844; KOTSOUBAS *et al.*, 1997); Levant sea (VATOVA, 1974); Israel (BARASH & DANIN, 1992).
Material examined.- 94A1 (1); 94A4 (1); 94A7 (1); 95A1 (1); 95A4 (1); 95A7 (1); 97H21 (2). Juvenile shells only.

Carinariidae De Blainville, 1818
Carinaria lamarckii (Peron & Lesueur, 1810)
Distribution.- Cosmopolitan. Ionian sea (VATOVA, 1974).
Material examined.- 99A6 (1 juv.) shell.
Remarks.- First record in the Levant sea.

Firolidae Rafinesque, 1815
Firoloida desmarestia Lesueur, 1817

Plate 2, Figures B,C.
Cyclostrema minutum Jeffereys, 1883:395, pl. 16, fig. 1.
Cyclostrema solutum Di Geronimo, 1974:148.
Distribution.- Atlantic-Mediterranean. South Aegean Sea (JEFFREYS, 1883; KOTSOUBAS *et al.*, 1992, 1997); Aegean (MORAITOU-APOSTOLOPOULOU, 1985); Israel (BARASH & DANIN, 1992).
Material examined.- 99A6 (72) adult shells, no living specimens.

Conoidea Rafinesque, 1815
Conidae Rafinesque, 1815
Microdrillia loprestiana (Calcara, 1841)
Pleurotoma loprestianum – Sturany, 1896:10.
Distribution.- Atlantic-Mediterranean. Crete (JEFFREYS, 1883; STURANY, 1896; KOUTSOUBAS *et al.*, 1992; 1997); Dodecanese (STURANY, 1896); Libya (STURANY, 1896); Rhodes (ZENETOS & VAN AARTSEN, 1995); Israel (HAAS, 1951; BARASH & DANIN, 1992).
Material examined.- 97H52 (1 juv.) living specimen.

Benthomangelia macra (Watson, 1881)
Plate 3, Figures A-C.
Pleurotoma (Mangelia) macra Sturany, 1896:11.
Distribution.- Atlantic-Mediterranean. Crete, (STURANY, 1896; JANSSEN, 1989; KOUTSOUBAS *et al.*, 1992; 1997; 2000); Dodecanese (STURANY, 1896); Southwest of Cyprus, 34.08.27N, 31.52.52'E (JANSSEN, 1989); Israel (JANSSEN, 1989).
Material examined.- 94H5 (1); 94H15 (2); 94H16 (1); 94H19 (1); 94A1 (1); 94A5 (1); 94A7 (1); 95A5 (1); 95A7 (1); 95HF2 (2); 95HF3 (5); 95HF6 (2); 95HF8 (5); 95HF9 (1); 95H4 (5); 95H7 (4); 95H13 (3); 95H15 (1); 95H19 (4); 96A1 (1); 96A2 (1); 96A3 (1); 96HA (1); 96H6 (4); 96H20 (3); 97H7 (1); 97H21 (2); 97H52 (3); 97HF1 (2); 97HF6 (1); 98H20 (3); 98H21 (4); 98H23 (2); 98H24 (2); 98H25 (2); 98H26 (3); 98H27 (2); 98H28 (2); 99A4 (2); 99A6 (5); 99A7 (5); 99H7 (2); 99H19 (2); 99H20 (2); 99H21 (3); 99H23 (2); 99H25 (1); 99H27 (2); 99H28 (2); 99H29 (2). A total of 112 living specimens, about 90% juveniles.

Heterobranchia Gray, 1840
Heterostropha Fisher, P., 1885
Valvatoidea Gray, 1840
Hyalogyrinidae Warén & Bouchet, 1992
Xenoskenea pellucida (Monterosato, 1874)
Distribution.- Atlantic-Mediterranean. Central and Western Mediterranean (WARÉN *et al.*, 1993); South Aegean Sea (TENEKIDIS, 1989; KOUTSOUBAS *et al.*, 1997).
Material examined.- 95HF2 (1, juv.); 95HF8 (1, juv.); shells.
Remarks.- First record in the Levantine sea.

Pyramidelloidea Gray, 1840
Pyramidellidae Gray, 1840
Chrysallida flexuosa (Monterosato, 1874)
Distribution.- Atlantic-Mediterranean. Crete (KARAKASSIS, 1991; KOUTSOUBAS *et al.*, 2000); Israel (CARROZZA, 1984).
Material examined.- 95700 (1) living specimen.

Turbonilla micans (Monterosato, 1875)

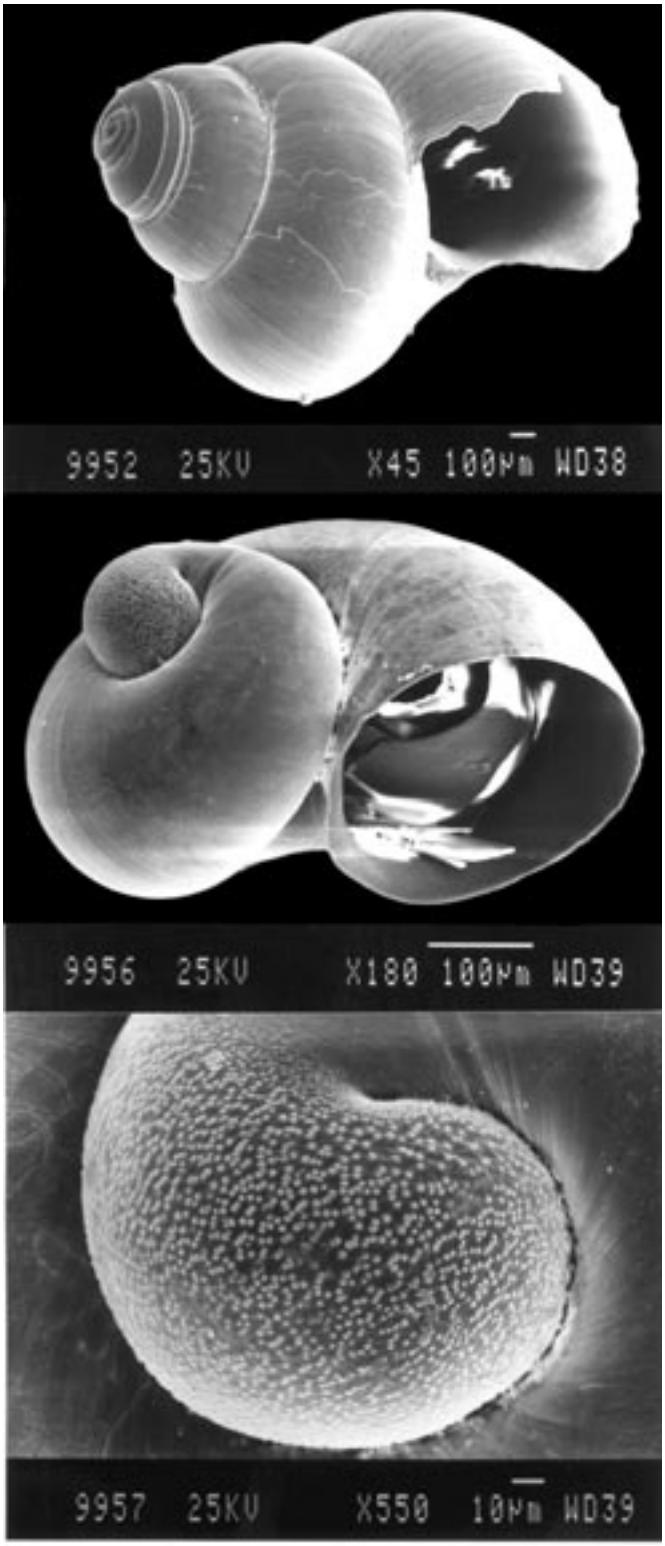

Plate 2. *Benthonella tenella* (Jeffreys, 1869), A. x 45; *Firoloida desmarestia* Lesueur, 1817, B. x 180; C. x 550 detail of protoconch.

Distribution.- Atlantic-Mediterranean.
Material examined.- 97HF9 (2); 99H23 (1); adult, living specimens.
Remarks.- First record in the Eastern Mediterranean.

Opistobranchia Milne Edwards, 1848
Cephalaspidea Fisher, P., 1883
Acteonidae D'Orbigny, 1842
Crenilabium exile (Jeffreys, 1870)
Distribution.- Atlantic-Mediterranean. Aegean Sea (CARUS, 1893; KOUTSOUBAS & KOUKOURAS, 1993); Crete, (JANSSEN, 1989; KOUTSOUBAS *et al.*, 1992; 2000); Rhodes (TENEKIDIS, 1989; ZENETOS & VAN AARTSEN, 1995); Israel (JANSSEN, 1989; s, 1992).
Material examined.- 98H23 (1); 98H27 (1); 99A6 (1); juvenile, living specimens.

Cylichnidae Adams, H. & A., 1854
Roxania utriculus (Brocchi, 1814)
Bulla utriculus Forbes, 1844:164.
Distribution.- Atlantic-Mediterranean. Aegean Sea (KOUTSOUBAS & KOUKOURAS, 1993); Crete, (FORBES, 1844; KOUTSOUBAS *et al.*, 1992); Cyclades (FORBES, 1844); Rhodes (TENEKIDIS, 1989; ZENETOS & VAN AARTSEN, 1995); Israel (HAAS, 1951; BARASH & DANIN, 1971, 1992).
Material examined.- 97HF9 (1 juv.) shell only.

Thecosomata De Blainville, 1824
Euthecosomata Meisenheimer, 1905
Cavoliniidae Gray, 1850
Cavolinia gibbosa gibbosa (D'Orbigny, 1835)
Hyalea gibbosa Forbes, 1844:132.
Distribution.- Endemic to the eastern Mediterranean. Aegean Sea (RAMPAL, 1970; KOUTSOUBAS & KOUKOURAS, 1993); Crete, (FORBES, 1844; JEFFREYS, 1883); Egypt (RAMPAL, 1970); Cyprus (RAMPAL, 1970); Israel (ALMOGI-LABIN & REISS, 1977; BARASH & DANIN, 1971, 1992).
Material examined.- 99A6 (2) adult specimens, shell only.
Remarks.- The morphological characters of our specimens correspond to the eastern Mediterranean subspecies, which is distinguished from *C. gibbosa flava* (rarely collected in the Mediterranean) in its more rounded ventral surface. CORSELLI and GRECCHI (1987, 1990) considered *C. gibbosa gibbosa* a geographically-isolated entity of a recent (Holocene) penetration from the Atlantic Ocean.

Cavolinia inflexa (Lesueur, 1813)
Distribution.- Cosmopolitan. Aegean Sea (FORBES, 1844; KOUTSOUBAS & KOUKOURAS, 1993); Levantine basin (PASTOURET, 1970; RAMPAL, 1975).
Material examined.- 99A6 (5) adult specimens, shells only.

Diacria trispinosa (Lesueur, 1821)
Distribution.- Cosmopolitan. Aegean Sea (PASTOURET, 1970; RAMPAL, 1975; KOUTSOUBAS & KOUKOURAS, 1993).
Material examined.- 99A6 (1) single broken shell.
Remarks.- Though *D. trispinosa* is widely distributed in the Mediterranean, its presence in the sea was considered accidental by CORSELLI and GRECCHI (1990). First record in the Levantine sea.

Clio pyramidata lanceolata (Lesueur, 1813)
Cleodora pyramidata Forbes, 1844:132.
Distribution.- Indo West Pacific Ocean, Eastern Atlantic, Mediterranean. Crete (FORBES, 1844; KOUTSOUBAS & KOUKOURAS, 1993); Cyclades (FORBES, 1844); Asia Minor (FORBES, 1844); Cyprus (TORNARITIS, 1987; CECALUPO & QUADRI, 1996).
Material examined.- 94A1 (2); 95A1 (1); 98H24 (2); 98H26 (1); 98H28 (2); 99A6(160). A total of 168 adult specimens, shells only. Many more fragments were collected, but not counted.
Remarks.- Most reports of this species refer to a subspecies known from the Mediterranean only from shells (BEDULLI *et al.*, 1995). The specimens collected off the Israeli coast present the morphological characters of the subsp. *C. pyramidata lanceolata* (RAMPAL, 1975).

Clio cuspidata (Bosc, 1802)
Cleodora cuspidata Forbes 1844:132.
Distribution.- Cosmopolitan. Aegean Sea (KOUTSOUBAS & KOUKOURAS, 1993); Crete (FORBES, 1844); Cyprus (TORNARITIS, 1987); Israel (ALMOGI-LABIN & REISS, 1977; BARASH & DANIN, 1992).
Material examined.- 99A6 (3) adult specimens, shells only.

Creseis acicula Rang, 1828
Distribution.- Cosmopolitan. Aegean (MORAITOU-APOSTOLOPOULOU, 1985; KOUTSOUBAS & KOUKOURAS, 1993); Crete (JEFFREYS, 1883; KOUTSOUBAS *et al.*, 1992); northern Levantine Sea (BERDUGO & KIMOR, 1967); Egypt (VATOVA, 1974); Israel (BERDUGO & KIMOR, 1967; ALMOGI-LABIN & REISS, 1977; BARASH & DANIN, 1971, 1992).
Material examined.- 99A6 (4) adult specimens, shells only.
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Creseis virgula virgula Rang, 1828
Distribution.- Cosmopolitan. Aegean Sea (KOUTSOUBAS & KOUKOURAS, 1993); Crete (KOUTSOUBAS *et al.*, 1992); Egypt (VATOVA, 1974); Israel (ALMOGI-LABIN & REISS, 1977; BARASH & DANIN, 1971, 1992).
Material examined.- 94A4 (1); 95A4 (1); 99A6 (18), adult specimens, shells only.

Hyalocylis striata (Rang, 1828)
Criseis striata Forbes, 1844:132.
Distribution.- Atlantic-Mediterranean. Aegean Sea (RAMPAL, 1970; KOUTSOUBAS & KOUKOURAS, 1993); Crete (FORBES, 1844); Cyclades (FORBES, 1844); Asia Minor (FORBES, 1844); Cyprus (RAMPAL, 1970); Libya (RAMPAL, 1970); Egypt (RAMPAL, 1970); Israel (ALMOGI-LABIN & REISS, 1977; BARASH & DANIN, 1992).
Material examined.- 96H4 (1); 99A6 (3) juvenile specimens, shells only.

Styliola subula (Quoy & Gaimard, 1827)
Clio subula Jeffreys, 1883:401.
Distribution.- Cosmopolitan. Crete (JEFFREYS, 1883); Cyprus (CECALUPO & QUADRI, 1996); Israel (ALMOGI-LABIN & REISS, 1977; BARASH & DANIN, 1971, 1992).
Material examined.- 94H5 (3); 94H15 (3); 95A1 (1); 94A2 (3); 94A7 (3); 95A2 (3); 95A7 (3); 95HF1 (1); 95HF8 (1); 95HA (2); 95H15 (3); 95H19 (1); 96H4 (2); 96H14 (2); 97H14 (1); 97H21 (1); 97HF7 (1); 98H21 (1); 99A4 (1); 99A6 (277); 99A7 (1). A total of 314 adult specimens, shells only.

Limacinidae Gray, 1840

Limacina trochiformis (D'Orbigny, 1836)
Spirialis trochiformis Jeffreys, 1883:401.
Spiratella trochiformis Vatova, 1974:107.
Distribution.- Tropical and subtropical seas. Aegean Sea (VATOVA, 1974; KOUTSOUBAS & KOUKOURAS, 1993); Crete (JEFFREYS, 1883; CARUS, 1893; KOUTSOUBAS *et al.*, 1992); Rhodes (BERDUGO & KIMOR, 1967); Cyprus (BOGI *et al.*, 1989); Israel (ALMOGI-LABIN & REISS, 1977; BARASH & DANIN, 1992).
Material examined.- 94A1 (1); 94A4 (1); 95A1 (1); 95A4 (1); 95H4 (1); 95H13 (2); 95H19 (2); 95700 (1); 99A6(411). A total of 421 adult shells, no living specimens.

Limacina inflata (D'Orbigny, 1836)
Distribution.- Cosmopolitan. Aegean Sea (KOUTSOUBAS & KOUKOURAS, 1993); Crete (JEFFREYS in CARUS, 1893; BERDUGO & KIMOR, 1967; KOUTSOUBAS *et al.*, 1992); northern Levantine Basin (BERDUGO & KIMOR, 1967); Cyprus (BOGI *et al.*, 1989); Israel (BERDUGO & KIMOR, 1967; BARASH & DANIN, 1971, 1992; ALMOGI-LABIN & REISS, 1977).
Material examined.- 94H16 (1); 94A2 (2); 94A4 (3); 94A7 (2); 95A2 (2); 95A4 (3); 95A7 (2); 95HF7 (1); 95HA (3); 95H7 (1); 95H13 (2); 95H15 (1); 95H19 (1); 96A2 (1); 96A3 (1); 96HA (5); 96H4 (10); 96H20 (1); 97HF1 (3); 97HF9 (7); 99A4 (1); 99A6 (445). A total of 498 adult shells, no living specimens.

Peraclidae Tesch, 1913
Peracle reticulata (D'Orbigny, 1836)
Distribution.- Cosmopolitan. Aegean Sea (VATOVA, 1974; KOUTSOUBAS & KOUKOURAS, 1993); Israel (ALMOGI-LABIN & REISS, 1977; BARASH & DANIN, 1992).
Material examined.- 99A6 (8) adult specimens, shells only.

Cymbuliidae Gray,1840
Gleba cordata Forskål, 1776
Plate 4, Figure A.
Distribution.- Cosmopolitan. Between Sicily and Libya (RAMPAL, 1975).
Material examined.- 99A6 (31). Adult specimens, shells only.
Remarks.- First record in the Eastern Mediterranean.

Bivalvia Linnaeus, 1758
Protobranchia Pelseneer, 1889
Nuculoida Dall, 1889
Yoldiidae Glibert & Van De Poel, 1965
Yoldia micrometrica (Seguenza, G., 1877)
Plate 4, Figure B.
Distribution.- Atlantic-Mediterranean. Crete (JANSSEN, 1989; KOUTSOUBAS *et al.*, 1992); Eratosthenes seamount (GALIL & ZIBROWIUS, 1998); Israel (JANSSEN, 1989).
Material examined.- 94H3 (1); 94H4 (4); 94H5 (1); 94H6 (1); 94H7 (1); 94H9 (1); 94H19 (1); 94A1 (1); 94A4 (2); 94A5 (9); 94A1 (1); 95A1 (1); 95A4 (2); 95HF1 (20); 95HF2 (7); 95HF3 (16); 95HF4 (4); 95HF6 (3); 95HF7 (12); 95HF8 (37); 95HF9 (7); 95HA (19); 95H4 (27); 95H7 (4); 95H13 (8); 95H14 (7); 95H15 (11); 95H19 (6); 95H20 (6); 96A1 (18); 96A2 (6); 96A3 (2); 96A4 (7); 96A5 (4); 96A6 (5); 96HA (15); 96H4 (10); 96H6

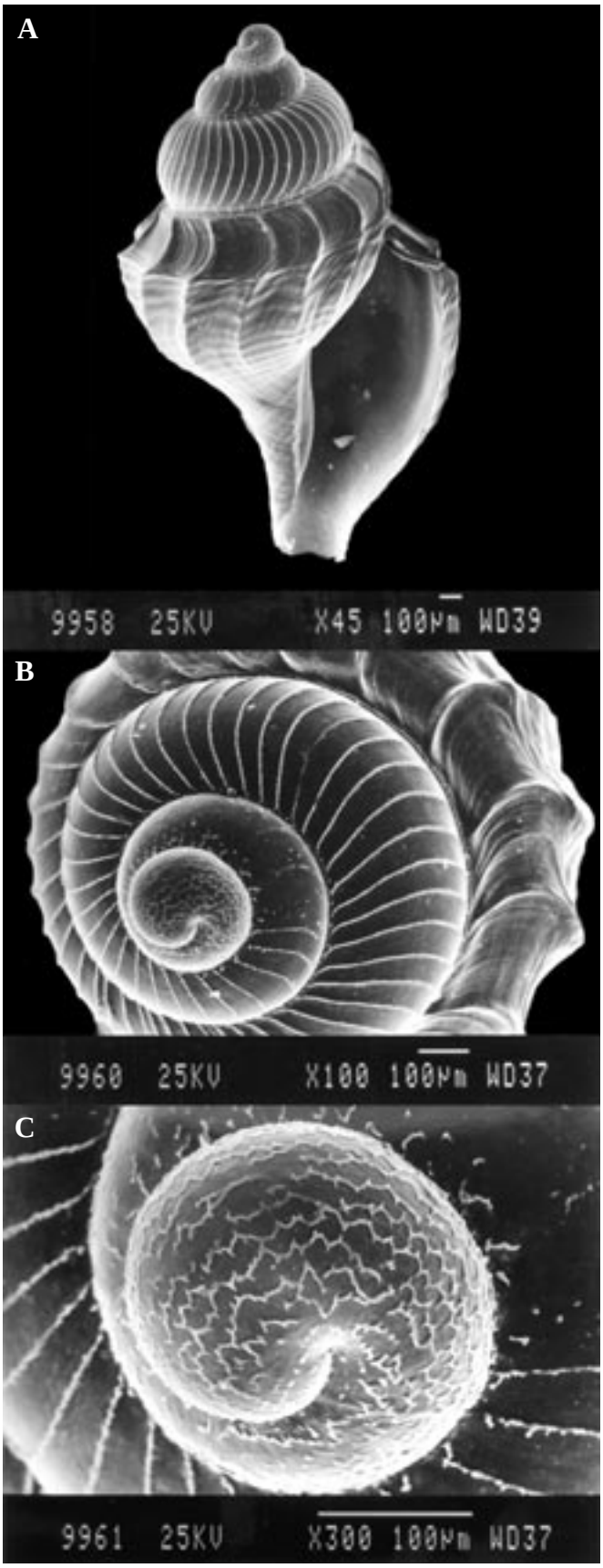

Plate 3. *Benthomangelia macra* (Watson, 1881). A. x 45; B. x 100 detail of protoconch; C. x 300 detail of protoconch.

(12); 96H14 (6); 96H20 (20); 97H7 (7); 97H14 (21); 97H19 (5); 97H21 (29); 97H51 (14); 97H52 (25); 97HF1 (19); 97HF3 (15); 97HF4 (2); 97HF6 (3); 97HF7 (7); 97HF8 (16); 97HF9 (37); 98H4 (19); 98H7 (2); 98H19 (8); 98H20 (22); 98H21 (18); 98H22 (6); 98H23 (13); 98H24 (8); 98H25 (21); 98H26 (9); 98H27 (26); 98H28 (9); 99A1 (4); 99A3 (3); 99A4 (7); 99A6 (2); 99A716 (2); 99H4 (24); 99H7 (3); 99H15 (11); 99H19 (19); 99H20 (9); 99H21 (21); 99H23 (11); 99H24 (4); 99H25 (5); 99H26 (3); 99H27 (12); 99H28 (1); 99H29 (1). A total of 827 living specimens, 80% juveniles.
Remarks.- *Y. micrometrica* is the most common and abundant species in our samples. As far as we can determine it is the first record of *Y. micrometrica* being collected in great numbers in the Mediterranean bathyal, conceivably, the species took advantage of the lack of competitors to occupy an empty ecological niche. Most of the specimens are juveniles.

Yoldiella philippiana (Nyst, 1845)
Arca (Bathyarca) koreni sensu (Kobelt, 1891) non (Danielseen, 1859).
Distribution.- Atlantic-Mediterranean. Lybia (STURANY, 1896); Crete (STURANY, 1896); Cyclades (STURANY, 1896).
Material examined.- 94H16 (1); 95HF7 (2); 96A1 (1); 96H4 (1); 96H6 (1); 96H14 (1); 97HF7 (1); living, juvenile specimens.
Remarks.- First record in the Levantine sea.

Pteromorphia Beurlen, 1944
Arcoida Stoliczka, 1871
Arcidae Lamark, 1809
Bathyarca pectunculoides (Sacchi, 1834)
Arca pectunculoides Jeffreys, 1883:394.
Arca (*Bathyarca) pectunculoides* Sturany, 1896:20.
Distribution.- Boreal. Aegean Sea (JEFFREYS in CARUS, 1893); Crete (JEFFREYS, 1883; STURANY, 1896; JANSSEN, 1989; KOUTSOUBAS *et al.*, 2000); Libya (STURANY, 1896); Dodecanese (STURANY, 1896); Rhodes (ZENETOS & VAN AARTSEN, 1995); Israel (JANSSEN, 1989; BARASH & DANIN, 1992).
Material examined.- 94H15 (1); 95HF1 (2); 95HF8 (2); 95HF9 (1); 95HA (2); 95H4 (1); 95H7 (2); 95H13 (2); 95H14 (1); 95H15 (1); 96A4 (1); 96H4 (2); 96H14 (1); 97H7 (5); 97H14 (2); 97H19 (3); 97H21 (2); 97H51 (2); 97H52 (4); 97HF1 (2); 97HF3 (3); 97HF7 (1); 98H20 (2); 98H21 (1); 98H22 (4); 99A4 (1); 99A6 (1); 99H7 (2); 99H15 (4); 99H19 (1); 99H21 (2); 99H23 (2); 99H27 (1). A total of 64 living specimens, 50% juveniles.

Bathyarca philippiana (Nyst, 1848)
Distribution.- Atlantic-Mediterranean. Crete (JANSSEN, 1989; KOUTSOUBAS *et al.*, 1992); Eratosthenes seamount (GALIL & ZIBROWIUS, 1998).
Material examined.- 94A5 (5 juvs.), living specimens.

Pterioida Newell, 1965
Limidae Rafinesque, 1815
Limatula subauriculata (Montagu, 1808)
Lima elongata Forbes, 1844:192.
Lima (Limatula) subauriculata Sturany, 1896:21.
Distribution.- Boreal. Aegean Sea (JEFFREYS, 1879); Crete (FORBES, 1844; STURANY, 1896; KOUTSOUBAS *et al.*, 1992; 2000); Libya (STURANY, 1896); Cyclades (FORBES, 1844); Dodecanese (FORBES, 1844); Israel (BARASH & DANIN, 1992).
Material examined.- 97HF9 (53).

Pectinidae Rafinesque, 1815
Cyclopecten cf. hoskynsi (Forbes, 1844)
Pecten hoskynsi Forbes, 1844:192.
Pecten (Amussium) hoskynsi Sturany, 1896:20.
Distribution.- Atlantic-Mediterranean. Aegean Sea (JEFFREYS, 1879); Crete (KOUTSOUBAS *et al.*, 2000); Asia minor (FORBES, 1844); Cyclades (STURANY, 1896); Dodecanese (STURANY, 1896); Libya (STURANY, 1896).
Material examined.- 99H27 (1), valve of adult specimen.
Remarks.- First record in the Levantine sea.

Heterodonta Neumayr, 1884
Veneroida Adams, H. & A., 1857
Thyasiridae Dall, 1900
Thyasira granulosa (Monterosato, 1874)
Distribution.- Atlantic-Mediterranean. Crete (KOUTSOUBAS *et al.*, 1992); Rhodes (ZENETOS & VAN AARTSEN, 1995).
Material examined.- 97HF9 (1 juv.) living specimen.
Remarks.- First record in the Levantine sea.

Thyasira oblonga (Monterosato, 1878)
Plate 4 , Figure C.
Distribution.- Atlantic-Mediterranean.
Material examined.- 95HF2 (4); 95HF7 (2) living adult specimens.
Remarks.- This species was often erroneously described and depicted as *Thyasira* (or *Leptaxinus*) *subovata* (JEFFREYS, 1881), a species we consider distinct from *Thyasira oblonga* (GIRIBET & PEÑAS, 1997; CECALUPO & GIUSTI, 1989). First record in the Eastern Mediterranean.

Thyasira eumyaria (Sars, M., 1870)
Distribution.- Ionian Sea (PARENZAN, 1976; DI GERONIMO, 1974).
Material examined.- 95HA (1); 96A1 (1); 96H4 (2); 98H28 (1); 99H27 (1) living specimens, 2 adults, 4 juveniles.
Remarks.- First record in the Levantine Sea.

Semelidae Stoliczka, 1870
Abra longicallus (Scacchi, 1834)
Scrobicularia longicallis Jeffreys, 1883:395.
Syndosmya longicallis Sturany, 1896:15.
Distribution.- Atlantic-Mediterranean. Crete (JEFFREYS, 1883; JEFFREYS in CARUS, 1893; STURANY, 1896; KOUTSOUBAS *et al.*, 1992; 2000). Libya (STURANY, 1896); Cyclades (STURANY, 1896); Dodecanese (STURANY, 1896); Rhodes (JEFFREYS, 1881a; ZENETOS & VAN AARTSEN, 1995); Cyprus (HADJICHRISTOPHOROU *et al.*, 1997); Israel (JANSSEN, 1989).
Material examined.- 97HF9 (1 juv.) living specimen.

Kelliellidae Fischer, P., 1887
Kelliella abyssicola (Forbes, 1844)
Kellia abyssicola Forbes, 1844:192.
Kelliella miliaris Sturany, 1896:17.
Distribution.- Boreal. Crete (Forbes, 1844; Sturany, 1896; Janssen, 1989; Koutsoubas *et al.*, 1992; 2000); Libya (Sturany, 1896); Cyclades (Forbes, 1844); Dodecanese (Sturany, 1896); Asia Minor (Forbes, 1844); Rhodes (Zenetos & Van Aartsen, 1995); Eratosthenes seamount (Galil & Zibrowius, 1998); Israel, (Janssen, 1989).
Material examined.- 94H4 (3); 94H5 (7); 94H15 (5); 94H16 (2); 94H19 (5); 94A1 (1); 94A2 (1); 94A5 (12); 94A6 (1); 95A1 (1); 95A2 (1); 95A6 (1); 95HF1 (10); 95HF2 (4); 95HF3 (6); 95HF4 (2); 95HF6 (3); 95HF7 (3); 95HF8 (11); 95HF9 (2); 95HA (8); 95H4 (10); 95H7 (5); 95H13 (7); 95H14 (4); 95H15 (7); 95H19 (11); 95H20 (1); 95700 (66); 96A1 (7); 96A2 (1); 96A3 (2); 96A4 (1); 96A5 (1); 96A6 (1); 96HA (13); 96H4 (14); 96H6 (8); 96H14 (3); 96H20 (8); 97H7 (9); 97H13 (1); 97H14 (6); 97H21 (7); 97HF1 (22); 97HF2 (3); 97HF3 (9); 97HF4 (3); 97HF6 (2); 97HF7 (3); 97HF8 (16); 98H4 (5); 98H7 (3); 98H15 (7); 98H19 (3); 98H20 (6); 98H21 (6); 98H22 (4); 98H23 (7); 98H24 (6); 98H25 (8); 98H26 (7); 98H27 (6); 98H28 (4); 99A3 (1); 99A6 (112); 99A7 (1); 99H4 (3); 99H7 (2); 99H15 (2); 99H19 (5); 99H20 (6); 99H21 (8); 99H23 (2); 99H26 (3); 99H27 (3); 99H29 (2). A total of 561 living specimens, 50% juveniles.

Anomalodesmata Dall, 1889
Pholadomyoida Newell, 1965
Lyonsiidae Fischer, P., 1887
Allogramma formosa (Jeffreys, 1882)
Lyonsia aegeensis Sturany 1896:15.
Lyonsia formosa aegeensis Parezan, 1976:390.
Distribution.- Atlantic-Mediterranean. Sicily (Jeffreys, 1881b).
Material examined.- 95HA (1 juv.); 97H52 (1 juv.) broken, living specimens.
Remarks.- First record in the Levantine Sea.

Cuspidariidae Dall, 1886
Cuspidaria rostrata (Spengler, 1793)
Neaera rostrata Sturany, 1896:16.
Distribution.- Atlantic-Mediterranean. Aegean Sea (Jeffrey in Carus, 1893); Crete (Janssen, 1989; Koutsoubas *et al.*, 1992; 2000); Libya (Sturany, 1896); Cyclades (Sturany, 1896); Rhodes (Zenetos & Van Aartsen, 1995); Cyprus (Demetropoulos, 1971; Hadjichristophorou *et al.*, 1997); Israel (Haas, 1951; Barash & Danin, 1982, 1992).
Material examined.- 94A7 (1); 95A7 (1); 96A1 (2); 99H20 (1); juvenile, living specimens.

Cardiomyia costellata (Deshayes, 1835)
Neaera costellata Sturany, 1896:16.
Distribution.- Atlantic-Mediterranean. Crete (Forbes, 1844; Jeffreys, 1883; Jeffreys in Carus, 1893; Janssen, 1989; Koutsoubas *et al.*, 1992; 2000); Cyclades (Forbes, 1844); Asia Minor (Forbes, 1844); Libya (Sturany, 1896); Rhodes (Zenetos & Van Aartsen); Cyprus (Demetropoulous, 1971); Eratosthenes seamount (Galil & Zibrowius, 1998); Israel (Haas, 1951; Barash & Danin, 1982, 1992; Janssen, 1989).
Material examined.- 94H5 (7); 94H6 (3); 94H15 (6); 94H16 (15);

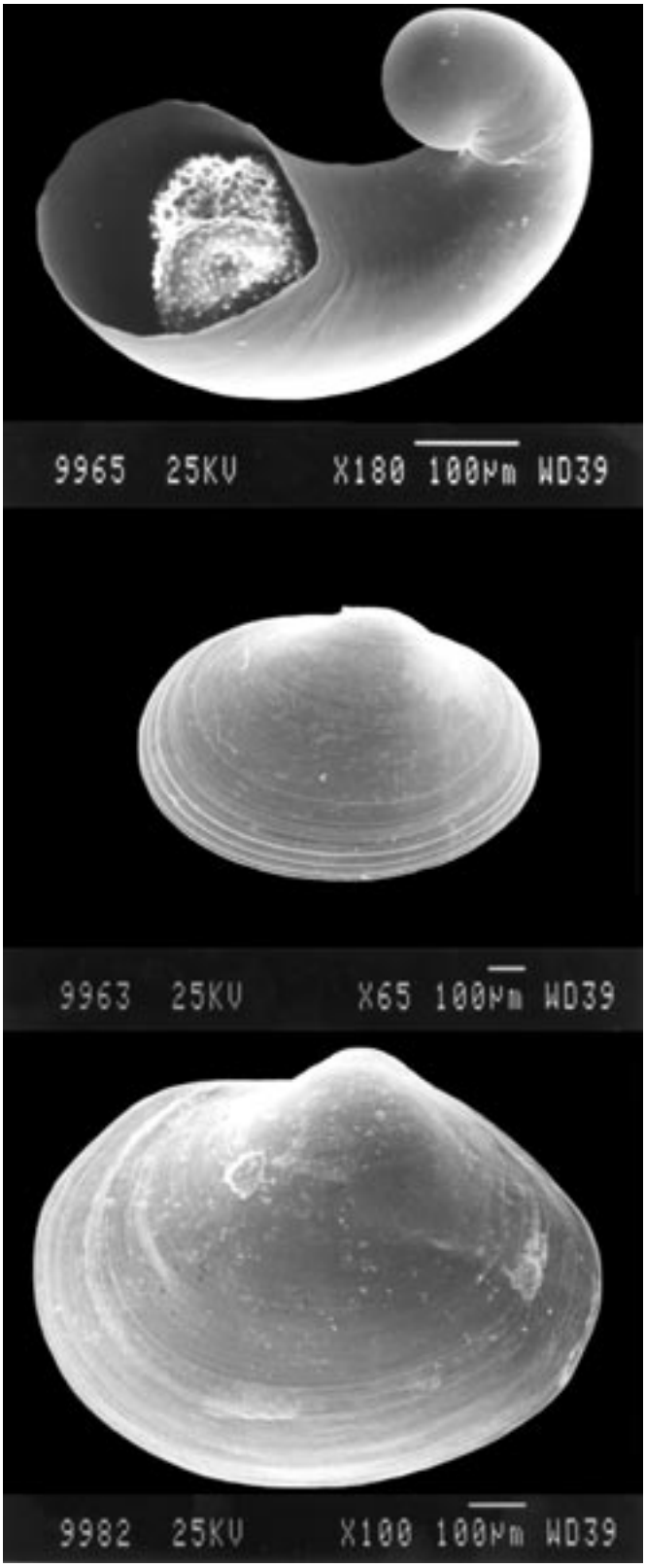

Plate 4. *Gleba cordata* Forskål, 1776. A. x 180; *Yoldia micrometrica* (Seguenza, G., 1877). B. x 65; *Thyasira oblonga* (Monterosato, 1878), C. x 100.

94H19 (3); 94A1 (3); 94A4 (6); 94A5 (3); 94A6 (5); 95A1 (3); 95A4 (6); 95A6 (6); 95HF1 (3); 95HF2 (3); 95HF3 (1); 95HF4 (2); 95HF6 (1); 95HF7 (1); 95HF8 (9); 95HF9 (3); 95HA (4); 95H4 (6); 95H13 (3); 95H15 (4); 95H19 (10); 95H20 (5); 96A1 (3); 96A2 (3); 96A3 (2); 96A4 (4); 96A5 (5); 96A6 (3); 96HA (1); 96H4 (9); 96H6 (12); 96H14 (5); 96H20 (7); 97H7 (10); 97H13 (3); 97H14 (1); 97H19 (3); 97H21 (4); 97H51 (3); 97H52 (6); 97HF2 (2); 97HF6 (1); 97HF7 (2); 97HF8 (3); 97HF9 (2); 98H4 (3); 98H15 (35); 98H19 (7); 98H20 (1); 98H22 (2); 98H23 (5); 98H24 (2); 98H26 (3); 98H27 (6); 98H28 (3); 99A1 (6); 99A3 (1); 99A4 (12); 99A5 (7); 99A6 (2); 99A7 (6); 99H4 (8); 99H7 (19); 99H15 (19); 99H19 (17); 99H20 (22); 99H21 (2); 99H23 (12); 99H24 (6); 99H25 (6); 99H27 (8); 99H29 (2). A total of 437 living specimens, all juveniles.

Scaphopoda Bronn, 1862
Gadilida Starbogatov, 1982
Entalinidae Chistikov, 1979
Entalina tetragona (Brocchi, 1814)
Dentalium quinquaulae Forbes, 1844:188.
Siphonodentalium quinquangulare Sturany, 1896:34.
Distribution.- Atlantic-Mediterranean. Aegean Sea (VAMVAKAS, 1971); Crete, (FORBES, 1844; JEFFREYS, 1883; STURANY, 1896; JANSSEN, 1989); Cyclades (FORBES, 1844); Asia Minor (FORBES, 1844); Israel (HAAS, 1951; JANSSEN, 1989; BARASH & DANIN, 1992).
Material examined.- 94H5 (2); 94H19 (7); 95HF2 (6); 95HF8 (9); 95HA (11); 95H4 (5); 95H7 (1); 95H13 (3); 95H14 (2); 95H15 (8); 95H19 (9); 95H20 (3); 96A1 (15); 96A4 (1); 96A5 (4); 96A6 (1); 96HA (48); 96H4 (13); 96H6 (13); 96H14 (4); 96H20 (14); 97H7 (3); 97H13 (1); 97H14 (20); 97H19 (3); 97H21 (31); 97H51 (2); 97H52 (28); 97HF1 (18); 97HF2 (4); 97HF3 (7); 97HF4 (1); 97HF7 (3); 97HF8 (8); 97HF9 (32); 98H4 (4); 98H7 (1); 98H15 (4); 98H19 (5); 98H20 (11); 98H21 (4); 98H22 (7); 98H23 (3); 98H24 (4); 98H25 (19); 98H26 (5); 98H27 (14); 99A1 (2); 99A4 (4); 99A5 (1); 99A6 (11); 99A7 (2); 99H4 (6); 99H7 (1); 99H15 (1); 99H19 (8); 99H20 (11); 99H21 (3); 99H23 (3); 99H25 (3); 99H27 (6); 99H28 (1); 99H29 (1). A total of 485 living specimens, 60% juveniles.

DISCUSSION

Much of the material examined consists of juvenile specimens and empty shells – only 23 of the 42 species collected were represented by living specimens, 11 of these were represented solely by juvenile specimens. Though an established method of collecting suprabenthic crustaceans, mainly percarids, from the deep sea (CARTES & SORBE, 1993, 1997), the use of a plankton net attached to a deep-water trawl may affect the components and size of the biota sampled, so that full-sized live molluscan specimens may be undercollected. However, DI GERONIMO (1974) found that in a sample collected by dredge at 1500 m *"non sono stati raccolti esemplari viventi"*, and that other samples *"è constituta da individui giovani o addirittura solo dalla protoconca"* (DI GERONIMO, 1974). JANSSEN (1989), whose material was collected both by beam-trawl and box-core, stated that *"all true deepwater species are represented by shells only"*.

The deep waters of the eastern Mediterranean are separated from the Atlantic Ocean by the Gibraltar and Sicilian straits, yet the most common benthic molluscs in depths greater than 1000 m off the Israeli coast are the Atlanto-Mediterranean and Boreal *Yoldia micrometrica, Kelliella abyssicola, Cardyomia costellata, Entalina tetragona, Benthomangelia macra, Benthonella tenella,* and *Bathyarca pectunculoides* present respectively in 83, 77, 76, 63, 59, 50 and 33 out of the 90 samples collected during our study. The same species were identified by JANSSEN (1989) in material sampled by boxcore at a station off the Israeli coast at 1217 m. *K. abyssicola, C. costellata, E. tetragona* and *B. pectunculoides* are eurybathic species with upper bathymetric range well within the circalittoral (>150 m), whereas both the more stenobathic *B. macra* and *B. tenella* have epipelagic larvae (BOUCHET & WARÉN, 1979), enabling them to overcome the barrier posed by the shallow Gibraltar and Sicilian sills.
BOUCHET & TAVIANI (1992) have suggested that much of the Mediterranean deep-sea fauna is made-up of non-reproducing pseudopopulations, whereas DI GERONIMO *et al.* (2001), who studied the bathyal thanatocoenoses molluscs in the Southern Tyrrhenian Sea, propose that the deep Mediterranean benthos is composed of biogeographically autochthonous species. Since the populations of the most common benthic molluscs in depths greater than 1000 m off the Israeli coast are composed of both adult and juvenile specimens, and gravid benthic decapod crustaceans and fish were collected from the depths of the Levantine sea, our results support the "autochthonous" model (GALIL & GOREN, 1994; GOREN & GALIL, 1997; FISHELSON & GALIL, 2001).
"The floro-faunistic impoverishment of the eastern Mediterranean compared with the western Mediterranean richness in species is well documented" (SARÀ, 1985), but on occasion inaccurate. Thus, SARÀ's (1985) assertion *"Not one of the eight species of Pteropoda of the western Mediterranean reaches the eastern zone"* is erroneous – already FORBES (1844) described nine thecostomate species from the Aegean sea. In fact, 12 of the 13 thecosomate species known from the Mediterranean (CORSELLI & GRECCHI, 1990) were collected in the present study off the coast of Israel. SARÀ's error notwithstanding, the progressive faunistic decrease from west to east in the Mediterranean Sea has been more pronounced for the deep benthos than for the whole fauna (FREDJ & LAUBIER, 1985). Indeed, the low-diversity, low-density Levantine deep water fauna is considered the poorest in the Mediterranean. Comparing extant benthic deep-water molluscs of the western with those of the eastern Mediterranean we find that species that are common in the western basin had not been found in the eastern.
DI GERONIMO *et al.* (2001) believe the impoverishment of the deep fauna stems from the onset of the warm homothermy that led to the *"disappearance of most cold-stenothermic species…, and a drop in diversity and richness in general"*.
The deep homothermy, extreme oligotrophy, and high salinity prevent settlement by members of the stenothermic and stenohalinic Atlantic bathyal, as far as they were able to cross the Gibraltar and the Sicilian sills (PÉRÈS, 1985). In addition, during the past 450 kyr eleven layers of organic-rich sediments (sapropels) have been deposited in the eastern Mediterranean, the most recent layer deposited between 9000 and 6000 years BP (TROELSTRA *et al.*, 1991; JORISSEN *et al.*, 1993; CHEDDADI & ROSSIGNOL-STRICK,

Table 1. Data of sampling stations A- Atlit; H- Hadera; HF-Haifa

Station	coordinates		depth (m)	date
94H3	32º31'N	34º14'E	1336	December 1994
94H4	32º28'N	34º16'E	1290	December 1994
94H5	32º32'N	34º07'E	1374	December 1994
94H6	32º36'N	34º02'E	1456	December 1994
94H7	32º41'N	34º04'E	1482	December 1994
94H15	32º42'N	34º11'E	1439	December 1994
94H16	32º39'N	34º16'E	1403	December 1994
94H19	32º31'N	34º06'E	1390	December 1994
95A1	32º47'N	34º20'E	1437	January 1995
95A2	32º51'N	34º20'E	1454	January 1995
95A3	32º52'N	34º18'E	1487	January 1995
95A4	32º53'N	34º17'E	1503	January 1995
95A5	32º52'N	34º14'E	1533	January 1995
95A6	32º53'N	34º10'E	1558	January 1995
95A7	32º45'N	34º36'E	1012	January 1995
95HF1	32º59'N	34º34'E	1362	September 1995
95HF2	32º59'N	34º35'E	1337	November 1995
95HF3	32º57'N	34º37'E	1311	September 1995
95HF4	33º00'N	34º33'E	1384	September 1995
95HF5	33º00'N	34º28'E	1456	November 1995
95HF6	32º59'N	34º30'E	1433	September 1995
95HF7	33º00'N	34º41'E	1175	September 1995
95HF8	33º00'N	34º35'E	1345	November 1995
95HF9	33º01'N	34º28'E	1471	November 1995
95HA	32º30'N	34º11'E	1350	November 1995
95H4	32º29'N	34º15'E	1300	November 1995
95H7	32º40'N	34º11'E	1480	November 1995
95H13	32º41'N	34º11'E	1485	November 1995
95H14	32º38'N	34º15'E	1400	November 1995
95H15	32º40'N	34º14'E	1450	November 1995
95H19	32º31'N	34º7'E	1400	November 1995
95H20	32º32'N	34º18'E	1279	November 1995
95700	32º41'N	34.40'E	734	November 1995
96A1	32º46'N	34º20'E	1427	September 1996
96A2	32º54'N	34º22'E	1453	September 1996
96A3	32º50'N	34º17'E	1471	September 1996
96A4	32º52'N	34º17'E	1501	September 1996
96A5	32º52'N	34º14'E	1518	September 1996
96A6	32º54'N	34º15'E	1528	September 1996
96HA	32º31'N	34º12'E	1365	October 1996
96H4	32º30'N	34º17'E	1292	October 1996
96H6	32º39'N	34º02'E	1505	October 1996
96H14	32º40'N	34º11'E	1397	October 1996
96H20	32º30'N	34º06'E	1374	October 1996
97HF1	32º58'N	34º37'E	1299	September 1997
97HF2	32º59'N	34º33'E	1374	September 1997
97HF3	32º57'N	34º34'E	1349	September 1997
97HF4	32º59'N	34º33'E	1389	September 1997
97HF6	32º00'N	34º30'E	1434	September 1997
97HF7	32º57'N	34º40'E	1227	September 1997
97HF8	32º86'N	34º36'E	1313	September 1997
97HF9	32º1'N	34º28'E	1439	September 1997
97H7	32º41'N	34º3'E	1493	September 1997
97H1	32º41'N	34º10'E	1467	September 1997
97H14	32º40'N	34º13'E	1415	September 1997
97H19	32º33'N	34º4'E	1421	September 1997
97H21	32º29'N	34º17'E	1272	September 1997
97H51	32º27'N	34º4'E	1362	September 1997
97H52	32º30'N	34º19'E	1269	September 1997
98H4	32º29'N	34º15'E	1296	November 1998
98H7	32º40'N	34º2'E	1500	November 1998
98H15	32º41'N	34º13'E	1243	November 1998
98H19	32º33'N	34º3'E	1462	November 1998
98H20	32º31'N	34º3'E	1344	November 1998
98H21	32º27'N	34º15'E	1276	November 1998
98H22	32º30'N	34º2'E	1450	November 1998
98H23	32º28'N	34º2'E	1389	November 1998
98H24	32º29'N	34º3'E	1391	November 1998
98H25	32º25'N	34º6'E	1351	November 1998
98H26	32º27'N	34º16'E	1277	November 1998
98H27	32º29'N	34º19'E	1251	November 1998
98H28	32º25'N	34º5'E	1319	November 1998
99A1	32º47'N	34º21'E	1413	November 1999
99A3	32º51'N	34º17'E	1484	November 1999
99A4	32º51'N	34º16'E	1486	November 1999
99A5	32º52'N	34º15'E	1509	November 1999
99A6	32º53'N	34º13'E	1522	November 1999
99A7	32º53'N	34º10'E	1557	November 1999
99H4	32º31'N	34º17'E	1296	November 1999
99H7	32º41'N	34º3'E	1485	November 1999
99H15	32º41'N	34º13'E	1448	November 1999
99H19	32º33'N	34º4'E	1421	November 1999
99H20	32º31'N	34º5'E	1394	November 1999
99H21	32º29'N	34º16'E	1284	November 1999
99H23	32º31'N	34º58'E	1412	November 1999
99H24	32º28'N	34º4'E	1398	November 1999
99H25	32º26'N	34º4'E	1344	November 1999
99H26	32º30'N	34º18'E	1272	November 1999
99H27	32º27'N	34º18'E	1260	November 1999
99H28	32º25'N	34º5'E	1330	November 1999
99H29	32º25'N	34º2'E	1353	November 1999

1995), with upper depth limits quoted at 700 m (THUNELL *et al.*, 1984), 300 m (RHOLING & GIESKES, 1989), and 150 m in the north Aegean Sea (PERISSORATIS & PIPER, 1992). Sapropels contain microfossils of planktonic origin but benthic fossils are mostly absent (CASTRADORI, 1993; RHOLING, 1994), indicative of anoxic bottom waters. The recurring stagnant (dysoxic and anoxic) episodes resulted in a reduction, or even demise of deep bottom-living fauna unable to avoid extinction by adapting to shallower depth: *"Several species of deep-water ostracodes that are still common in the Western Mediterranean became extinct in the Eastern Mediterranean basin at the onset of early Holocene S1 sapropel deposition"* (VAN HARTEN, 1987). The epipelagic fauna was unhurt: 9 of the 12 thecosomate species collected in this work were recorded from cores dating to the upper and middle Pleistocene taken in the Ionian sea (GRECCHI, 1984). GEORGE & MENZIES (1968) and MENZIES (1973) believe that the bathyal bottoms of the Levant are still inhospitable, or even azoic, after the last sapropelic event. The Quaternary anoxic events, combined with the barrier posed by the shallow Siculo-Tunisian sill, and the basin's oligotrophy and homothermy provide a plausible explanation for the sparse and impoverished mollusc fauna in the Levantine bathyal.

ACKNOWLEDGEMENTS

This research was partially funded by the Israel Electric corporation. We gratefully acknowledge their generosity. We thank P. Bouchet (MNHN, Paris) for his comments on an earlier draft.

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Lavoro accettato il 22 Giugno 2002