

MEDCORE International Conference
Firenze 10-14 Nov.2005

**BENTHIC POPULATIONS DIVERSITY OF SOFT
SUBSTRATUM ALONG THE LEBANESE COAST
(Levantine Basin, Eastern Mediterranean)**

Sami LAKKIS* & Vanda NOVEL-LAKKIS**

***Section of Oceanography, Faculty of Sciences I, Lebanese
University, Beirut, Lebano**

****Laboratory of Plankton and Marine Ecology, NCMS/NCSRL,
Batroun, Lebanon**

slakkis@ul.edu.lb ; www.arabscientist.org



Climate of Lebanon

- * Mediterranean temperate: summer (25-30 °C), winter (8-12 °C)
- * Atmospheric humidity : 60-90%
- * Precipitation 1000 mm/year (coastal area)
- * Frequency average of raining 79-82 days/year
- * 45 snowing days > 1500m , covering snow 115 days

Hydrological Properties

- * Water surface temp.: 17-30°C
- * Salinity offshore: 39.40-39.75‰
- * Thermocline in summer 0-75 m
- * Isothermic conditions in winter
- * Semi-diurnal Low Tide Amplitude : 10-15cm
- * Rough waves in winter, spring , summer
- * General Circulation S-North direction surface current
- * Origin of the Mediterranean Intermediate Water in west Basin

CHARACTERISTICS OF SOFT BOTTOM

- Seashore of Lebanon 220 km, 15% sandy
- Sediment cover 50% of neritic bottom
- Sediments are more abundant near rivers
- and around bottom freshwater springs

ZONATION & BIODIVERSITY

-Supra-littoral zone: dry and poor in organisms

*Community of *Talitrus saltator*, *Caretta caretta*(breeding)

-Medio-littoral zone (intertidal) of sandy bottom is characterized with

*Polychetes (*Ophelia*,*Nerine*), Crustacean (peracarides,crabs, amphipods (*Bathyporeia*), Mollusks pelecypodes (*Donax*,*Tellina*).

▶ **Meiofauna is very important in wet sandy and muddy beaches (Medio and Infralittoral)**

**Archiannelida, Gastrotricha, Nematoda, Harpacticoida, Turbellaria, Oligochaeta, Ostracoda, Tardigrada, Mistococarida, Polychaeta and Halocarida.*

▶ **Polluted sandy beach rich in:**

Nematoda, Turbellaria

▶ **Soft bottom infralittoral and circalittoral includes populations without metaphytes:**

** Mollusks pelecypods (Tapes, Venus, Tellina, Mactra, Ensis, Nassa, Donax, Cardium,), Crustaceans (crabs Neptunus pelagicus)*

**Polychetes (Arenicola)*

▶ **Macrophytes (photophile algae)**

* **Between 10 and 25 m , mostly near river and underwater freshwater springs**

* ***Caulerpa group : C.racemosa, C.prolifera
C.scalpelliformis , C.mexicana.***

▶ **Monocyledones :*Halophyla stipulacea ,Zostera noltii ,Cymodocea nodosa.***

► Macrozoobenthos

The number of Identified sp in soft bottoms:

*Polychetes.....	56 incl	25% Exotic
*Molluscs	146 incl.	54 Exotic
*Crustacea.....	80 incl.	35 Exotic
*Echinoderms.....	9 species	??
*Nematods	2 species	?
*Sipunculida.....	2 species	?
*Ascidacea.....	1 species	?
*Sponges	1 species	?

► Meiofauna

- * *Archiannelida, Gastrotricha, Nematoda, Harpacticoida,*
- * *Turbellaria, Oligochaeta, Ostracoda, Tardigrada,*
- * *Mistococarida, Polychaeta, Halocarida*

► Ichtyofauna

- * Flatfish : *Soleidae, Bothidae, Cynoglossidae*
- * Demersal : *Mullidae, Serranidae, Mugilidae, Rajidae*

Major taxa living on Soft bottom substrates along the Lebanese coast .

BENTHIC MICROPHYTES

Benthic Diatoms

MACROALGAE (Exotic species in green)

Caulerpa prolifera (Forsskal) Lamoureux

C.racemosa (Forssk)Ag.

C.scalpelliformis(Forssk.)Lamoureux

MONOCOTYLEDONAE (Exotic species in green)

Halophila stipulacea (Forssk.)Asch.

Cynodocea nodosa

Zostera noltii Hornem

SPONGIARIA

Ciocalypta penicillum Bowerbank

NEMATODA

Enoplus meridionalis Steiner

Monohystra parua (Bastian)

POLYCHAETA in soft bottom substrates (**Exotic species in red**)

Scalisetosus pellucidus (Ehlers)

Hesione pantherina (Risso)

Podarke pallida (Claparède)

Pilargis verrucosa Saint. Joseph

Syllis hyalina (Grube)

Sphaerosyllis claparedii Ehlers

Spermosyllis torulosa Claparède

Ceratonereis costae (Grube)

Perinereis cultrifera (Grube)

Platynereis dumerilii (Audouin et Milne Edwards)

Micronephthys stammeri (Augener)

Sphaerodorum peripatus (Claparède)

Glycera convoluta Keferstein

G. rouxii Aud. et Milne Edw.

Hyalinoecia bilineata Baird

Eunice harassii Audouin et Milne Edwards

E. torquata Quatrefages

Lysidice ninetta Audouin et Milne Edwards

Nematonereis unicornis (Grube)

POLYCHAETA (cont..d) in soft bottom substrates (**Exotic species in red**)

Lumbriconereis gracilis Ehlers

L. latreillii Audouin et Milne Edwards

Dorvillea kefersteini (Mc Intosh)

Scoloplos armiger (Müller)

Aricidea cerrutii Laubier

Aricidea sp

Cirrophorus cf. lyriformis (Annenkova)

Aonides oxycephala (Sars)

Onuphis sp

Staurocephalus ? rudolphii (Delle Chiaje)

Euphrosyne foliosa (Audouin et Milne Edwards)

Euphrosyne sp

Eurythoe syriaca Caries

Pseudoeurythoe cf. acarunculata Monro

Kefersteinia ? cirrata (Keferstein)

Nainereis ? laevigata (Grube)

Audouinia filigera (Delle Chiaje)

A. tentaculata (Montagu)

POLYCHAETA (cont..d) in soft bottom substrates (**Exotic species in red**)

Cirratulus cirratus O.F. Müller

Cirriformia anchylocheata (Schmarda)

C. semicineta (Ehlers)

Heterocirrus ? caputesosis (Saint Joseph)

Tharyx marioni (Saint Joseph)

Rahidrillus ? nemasoma (Monticelli)

Prionspio malmgreni Claparede

Prionspio sp.

Poecilochaetus serpens Allen

Ophelia bicornis Savigny

Nicomache sp

Paraonis ? fulgens Levinsen

Sternaspis scutata (Renier)

Amage adpersa (Grube)

Amphitrite rubra (Risso)

Lanice conchilega (Pallas)

Arenicola sp

Branchioma cingulata (Grube)

Fabricia ? sabella (Ehrenberg)

MOLLUSCA in soft bottom substrates in Lebanon, Exotic species

Acteocina mucronata (Philippi, 1849)

Adelactaeon amoenus (Adams A., 1851)

Afrocardium richardi (Audouin, 1826)

Anadara natalensis (Krauss, 1848)

Atactodea glabrata (Gmelin, 1791) Syn. *Mactra glabrata* (Gmelin 1791)

Bulla ampulla Linnaeus, 1758

Bursatella leachi De Blainville 1817

Ceritium egeum Gould, 1849

Cerithium nesioticum Pilsbry & Vanatta, 1906)

Cerithium scabridum Philippi, 1848

Chama pacifica Broderip, 1834

Chelidonura fulvipunctata Baba, 1938

Chrysallida fischeri (Hornung & Mormod, 1925)

C. maiae (Hornung & Mormod, 1925)

Circenita callipyga (von Born, 1778

Clathrofenella ferrugina (Adams A., 1860)

Clypeomorus bifasciatus (Sowerby G.B.II, 1865)

Cylichnina girardi (Audouin, 1826

Diplodonta cf. subrotunda Issel, 1869

Diplodonta cf. subrotunda Issel, 1869

Divalinga arabica Dekker & Goud, 1994

MOLLUSCA in soft substrates Exotic species (cont..d)

Dosinia erythraea Römer,1860

Finella pupoides Adams A.,1860

Fulvia fragilis(Forsskal in Niehbur,1775)

Fusinus verrucosus (Gmelin,1791)

Gafrarium pectinatum(L,1756). Syn.*Venus pectinata* L.,1758)

Gastrochaena cymbium(Spengler,1783)

Glycimeris arabicus (Adams H.,1871)

Hiatula ruppelliana (reeve,1857)

Laternula anatine (Linn.,1758)

Limopsis multistriata(Forsskal,11775)

Mactra lilacea Lamarck,1818

Mactra olorina (Philippi,1846)

Musculista perfragilis (Dunker,1857)=*Modiola glaberrima*, *Mytilus glaberrimus*

M. senhousia (Benson in Cantor 1842)

Murex forskoehli Röding,1798 (Syn.*M.tribulus* L.)

Nassarius arcularia plicatus Röding,1798

Natica gualteriana Récluz,1844

Paphia textile (Gmelin,1791)

MOLLUSCA in soft substrates Exotic species (cont..d)

P. speciosa Muhlfeld

Pleurobranchus f Chelidonura fulvipunctata Baba,1938

Pleurobranchus forskalii Rüppel & Leucart,1828

Psammotreta praerupta (Salisbury,1934) =*Tellina dubia*

Pseudochama corbieri(Jonas,1846) (

Pseudominolia nedyma(Melvill,1897)

Pyrunculus fourieri (Audouin,1826)

Rhinoclavis kochi Philippi,1848

Rissoine bertholleti Issel,1869

Strombus persicus Swainson,1821

Styloptygma beatrix Melvill,1811

Smaragdia souverbiana(Montrouzier,1863)

Syrnola fasciata (Jickeli,1882)

T. valtonisHanley,1844

Timoclea roemeriana (Issel,1869)

Woodwindia tiberiana (Issel,1869)

Zafra Savignyi(Moazzo,1939)

CRUSTACEA Exotic species in soft substrates

Alpheus inopinatus Holthuis & Gottlieb, 1958

A. migrans Lowinsohn & Holthuis, 1978

A. rapacida de Man, 1908

Ashtoret lunaris (Forsskal, 1775)

Callinectes sapidus Rathbun

Charybdis hellerii A. Milne Edwards

C. longicollis Leene

Erugosquilla massavensis (Kossmann, 1880)

Eucrate crenata de Haan, 1835

Halimede tyche (Herbst, 1801)

Hyastenus hilgendorfi de Man, 1887

Ixa monody Holthuis & Gottlieb

Leptocheirus guttatus (Grube)

Leptochela aculeocaudata Paulson, 1875

Leptochela pugnax de Man, 1916

Macrophthalmus graeffei (A. Milne-Edwards, 1873)

Marsupanaeus japonicus (Bata, 1888) = *Penaeus japonicus*
= *P. canaliculatus*

Melicertus hathor (Burkenroad, 1959).

CRUSTACEA Exotic species in soft substrates

Metapenaeopsis aegyptia Galil & Golanbi,1990

Metapenaeus mogiensis consobrina (Nobil,1904)

Metapenaeus monoceros (Fabricius,1798)

Metapenaeus stebbingi (Nobil,1904)

Micippa thalia Herbst,1803

M. subgranulata Kossmann,1877

Notopus dorsipes(Linn.,1758)

Nototropis swammerdami (H. Milne-Edw.)

Palaemonella rotumana(Borradaile,1898)

Panulirus ornatus (Fabricius,1798)

Penaeus semisulcatus de Haan,1844 (Syria,1928) (= P.monodon)

Periclimenes calmani Tattersal,1921

Pilumnepus vauquelini (Audouin,1826)

Pilumnus hirsutus Stimpson,1858

Thalamita poissonii(Audouin,1826)

Trachysalambria palaestinensis (Steinitz,1932)

Thalamita poissonii (Audouin)

FISH Exotic species in Soft Bottom in Lebanon

Callionymus filamentosus Valenciennes, 1837

Coryogalops ochetica (Norman, 1927)

Crenidens crenidens (Forsskäl, 1775)

Cynoglossus sinusarabici (Chanunaud, 1913)

Diplodus bellottii (Steindachner, 1882)

Epinephelus malabaricus (Bloch & Schneider, 1804)

Himantura uarnak (Forsskäl, 1775)

Lagocephalus suezensis Clark & Gohar, 1953

Microchirus (Zevaia) hexophthalmus (Bennett, 1831)

Muraenesox cinereus (Forsskäl, 1775)

Osargus haffara (Forsskäl, 1775)

Oxyurichthys petersi (Klunzinger, 1971)

Pagellus bellottii (Steindachner, 1882)

Papilloculiceps longiceps (Ehrenb. in Valenciennes, 1829)

Platycephalus indicus (L., 1758)

Pseudupeneus prayensis (Cuvier, 1829)

FISH Exotic species in Soft Bottom in Lebanon

Petroscrites ancylodon Ruppell,1838

Rhyncoconger trewavasse Ben-Tuvia ,1993

Saurida undosquamis (Richardson,1848)

Siganus rivulatus Forsskäl,1775

Silhouetta aegyptia (Chabunaud,1933)

Sillago sihama (Forsskäl,1775))

Sorsogona prionota (sauvage,1873)

Sphoeroides pacygaster (Muller & Troschel,1848)

Synagrops japonicus(Doderlein,1884)

Syngnathus rostellatus Nilsson,1855

Tetrosomus gibbosus(L.,1758)

Trachyscorpia cristulata echinata(Koehler,1896)

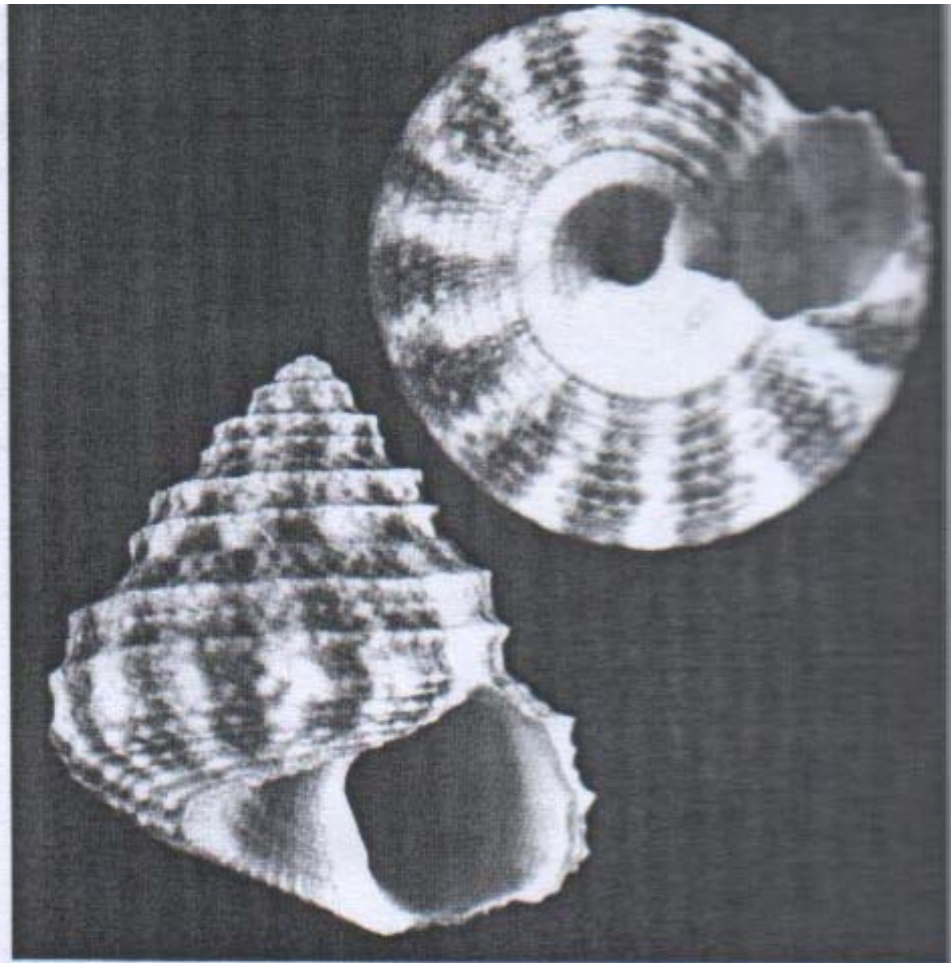
Troquigener flavimaculosus Hardy & Randall,1983

Upeneus moluccensis (Bleeker,1855)

U.pori Ben-Tuvia & Golani,1989)



**A: Soft Bottom in Batroun Bay (-10 m)
showing *Cymodocea nodosa* & *Halopteris scoparia* (Dive 22.11.1999)**
B: Rocky Bottom Infralittoral photophile



Pseudominolia nedyma

(Melvill, 1897)

**1st record in the Levantine Basin in
1966. Shallow soft bottom (sand, mud)**

Strombus persicus (Swainson 1821)
Syn. *Strombus decorus raybaudi*



Murex forskoehli Roding, 1798

Syn. *Murex Tribulus* Linnaeus, 1758

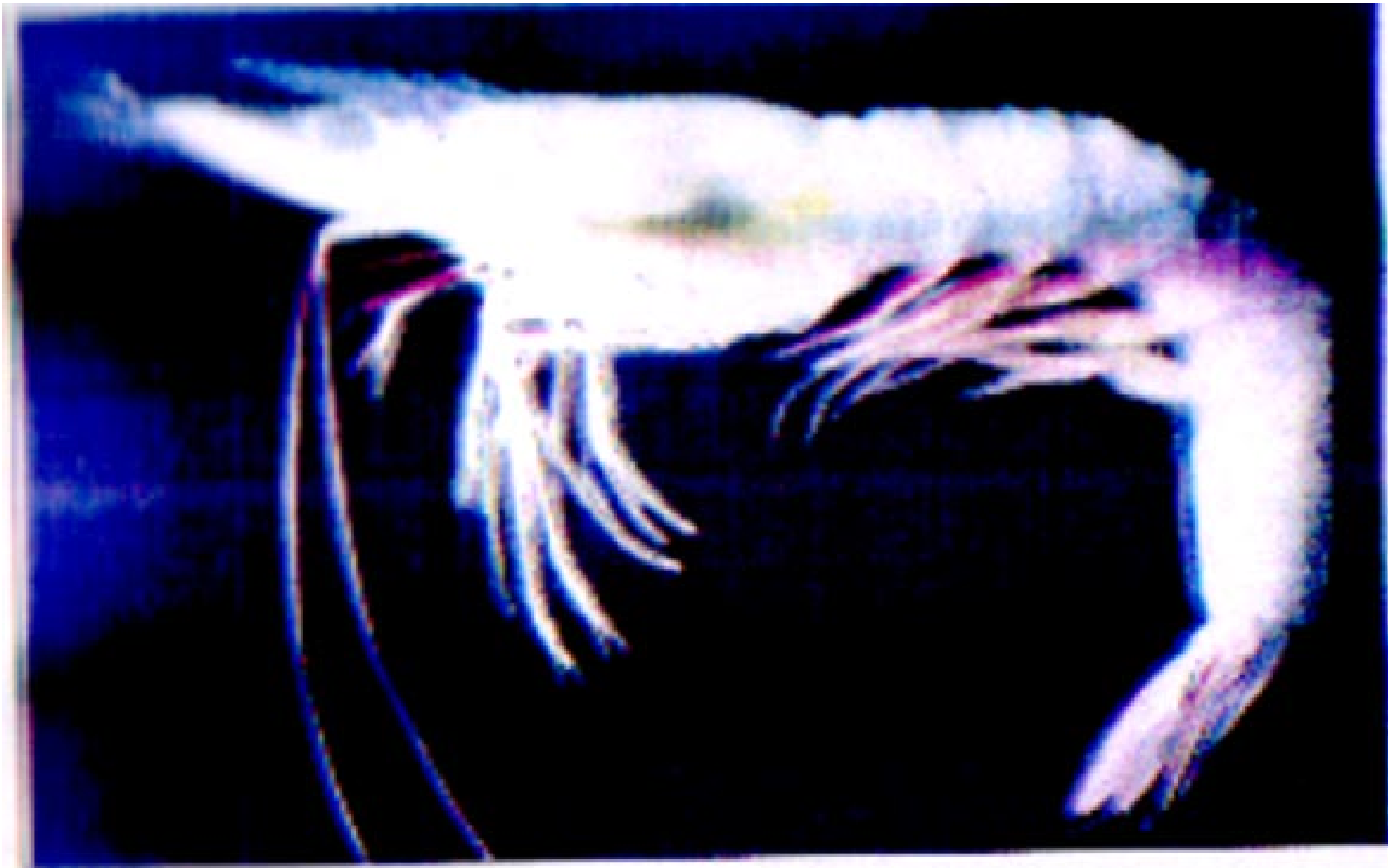


Penaeus semisulcatus de Haan, 1844
Syn. *Penaeus monodon* Fabricius, 1998



Marsupenaeus japonicus (Bate, 1888)
Syn. *Penaeus japonicus* Monod, 1930



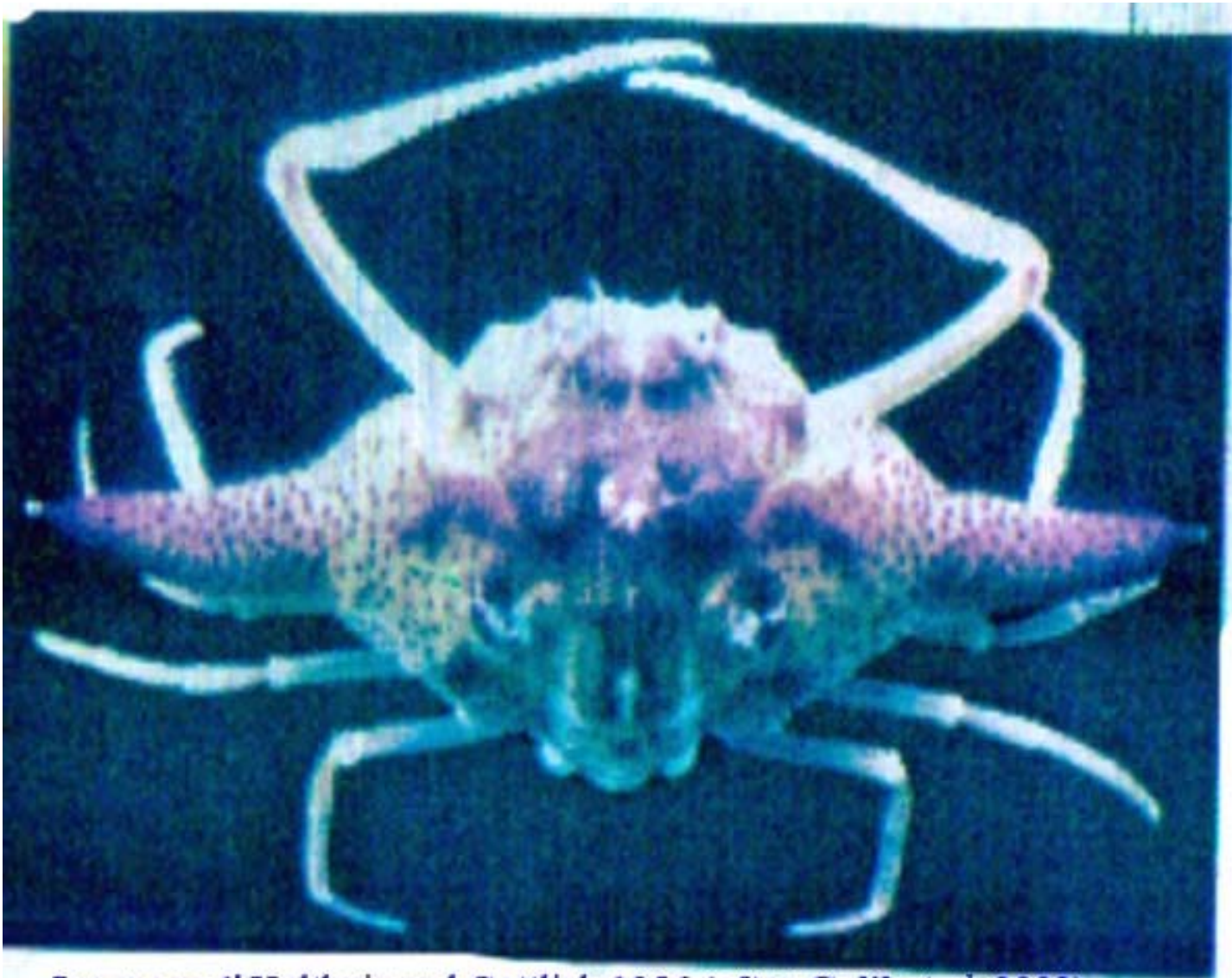


Metapenaeus monoceros (Fabricius,1798)

(after Galil) *et al.*,2002.

TL=15 cmales, 20 cm females

Sandy or sandy-mud bottoms. (First record in Egypt,1927)



Ixa monodi Holthuis and Gottlieb, 1956 (after Galil *et al.*, 2002)

Habitat: sandy-mud bottoms, 14-60m

First record, Turkey, 1956

Size: 3.5 cm.



Myra subgranulata (Kossmann, 1877)

Exotic Indo-pacific species ; Habitat :8-150 m
sandy-muddy bottoms.

Callinectes sapidus (rathbun, 1896)



Exotic sp. Portunidae, Habitat: Estuaries and shallow coastal waters; intertidal to -50 m

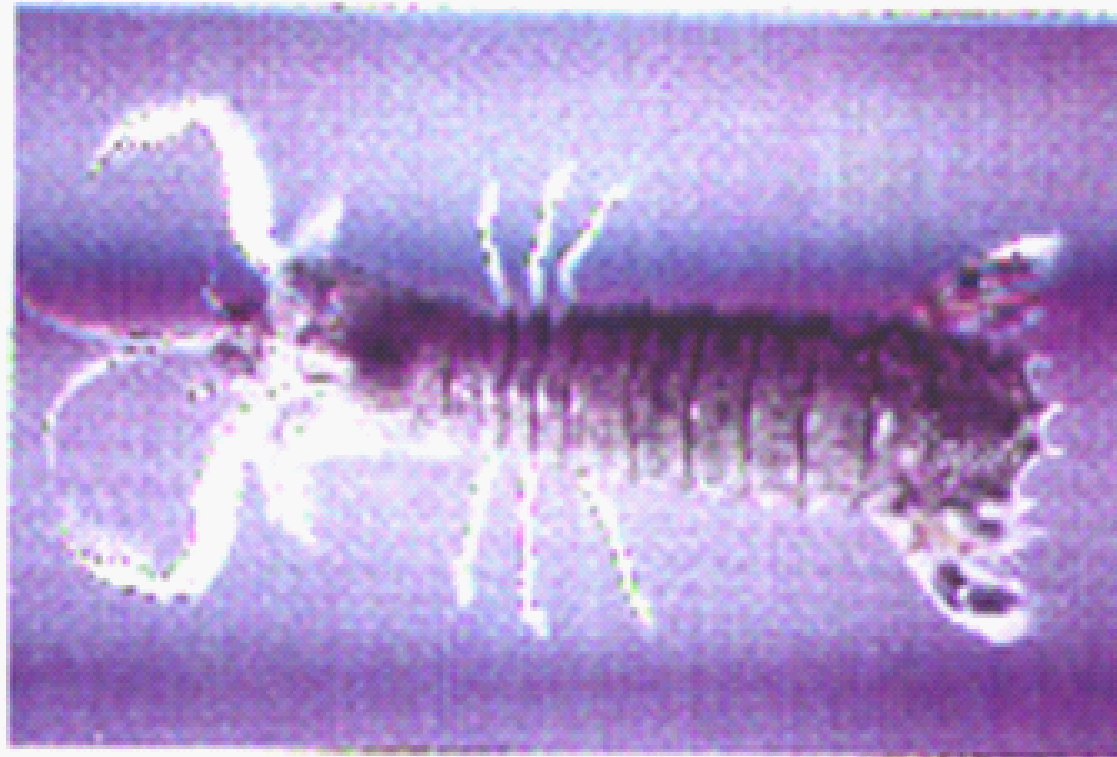


Portunus pelagicus (Linnaeus, 1758)
Exotic species (Syn. *Neptunus pelagicus*)
Habitat: Sandy or muddy substrate,
from intertidal to - 90 m

Erugosquilla massavensis (Kutsemann, 1890)

Syn.
Squilla
masawensis
(Por, 1971)

(after Galil
et al., 2002)



Red Sea Exotic species via Suez Canal (1rst record Egypt)
Habitat: sublittoral 5-74 m fine sand with little mud

Cerithium scabridum Philippi, 1848

Syn.

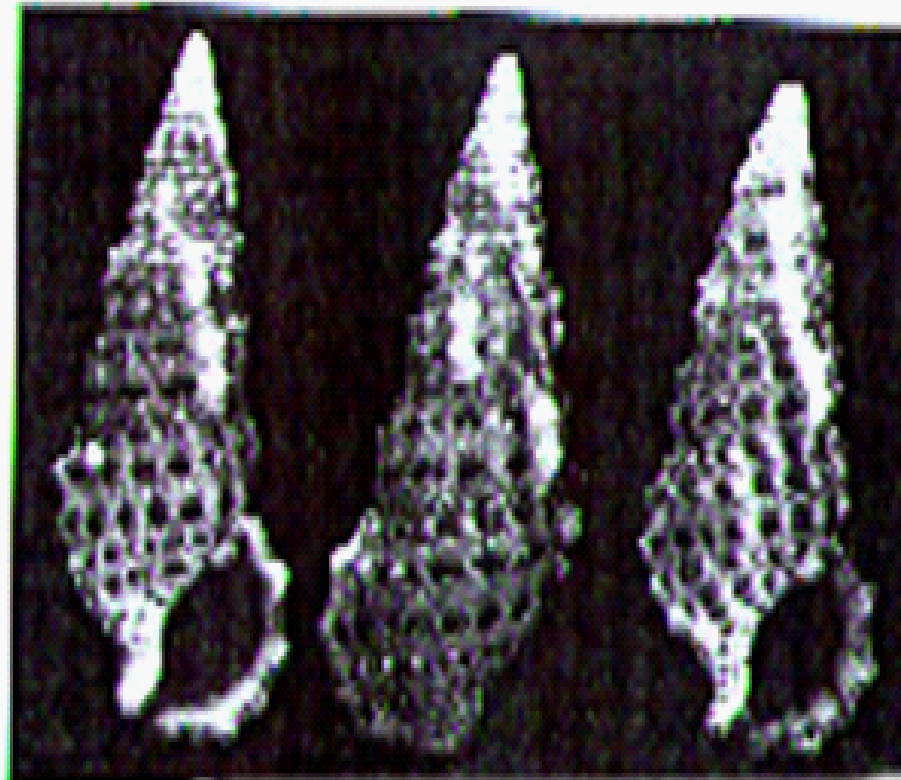
C. scabridum

var. *hispidum*

Pallary 1938

(Syria)

(after Galil *et al.*,
2002)

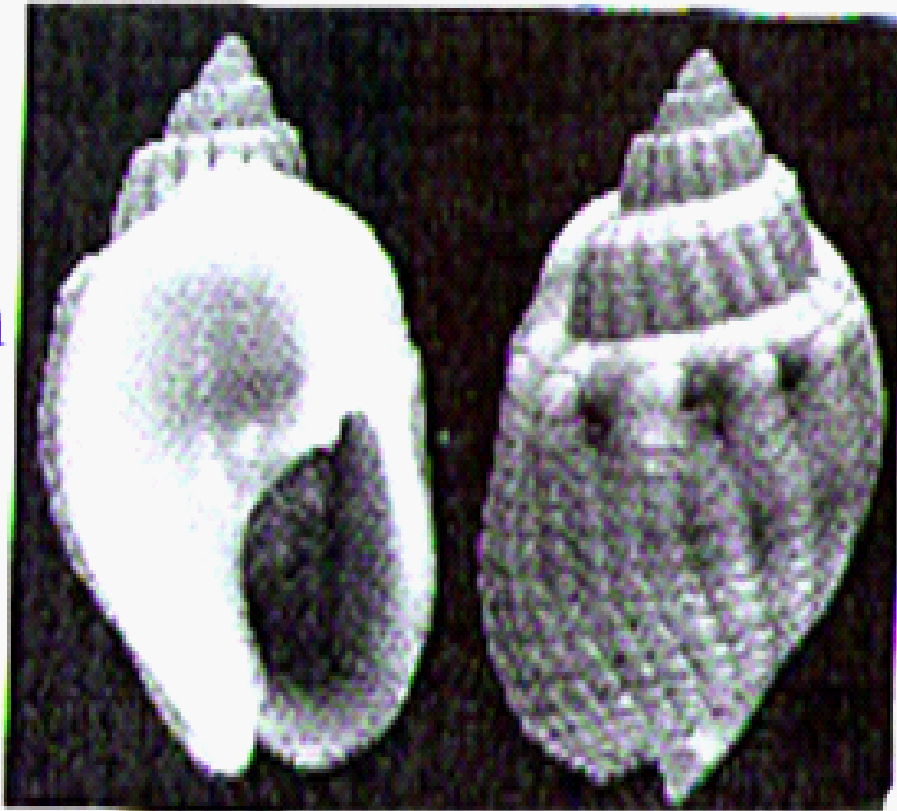


Exotic Red Sea species 1st record Egypt (1883)

Habitat: Intertidal shallow water sandy nud substrates

Nassarius arcularia plicatus (Roding, 1798)

Syn.
Nassarius
oblivatus
Deshayes in
Laborde,
1844.
(after Galil
et al., 2002

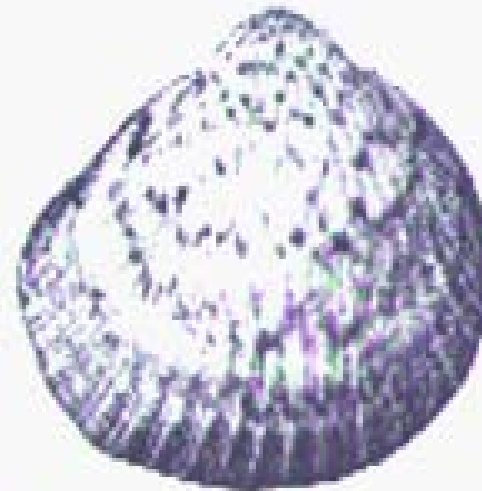


Indo-Pacific Lessepsian species, 1st record
Israel 1977. Habitat sand intertidal to 24 m

Glycimeris arabicus (Adams H.,1871)

Syn.

Pectunculus
arabicus



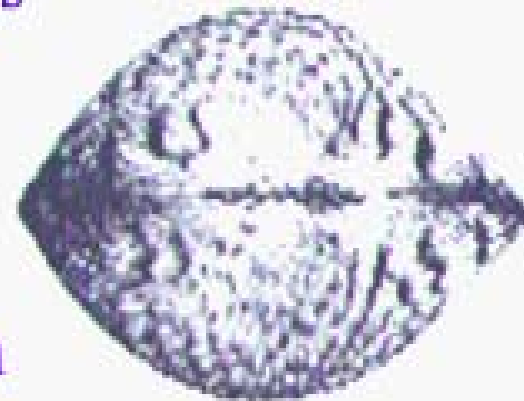
(Adams,1871)

(After Galil *et al.*,2002)

Exotic Indo-Pacific species

1rst record Israel ,1977

Habitat: shallow water
sands intertidal up to 46 m



CONCLUSION

- ▶ **Need for Protection of Sandy beach from deterioration and urban and touristic exploitation**
- ▶ **Conservation strategy to protect globally threatened Mediterranean and endemic species in soft bottom habitat**
- ▶ **Soft bottom (sandy,muddy) constitute important for marine fauna and flora**
- ▶ **Threatened species the sensitivity levels of soft bottom habitat**
- ▶ **Identify an efficient protection policy of concerned soft bottom Habitats and species**
- ▶ **Determine priority protection objectives for rare, endemic and threatened species in soft bottom ecosystems**
- ▶ **Propose immediate conservatory measures for noteworthy species**
- ▶ **Formulate headlines of a sustainable conservatory management strategy**
- ▶ **Formulation of a monitoring program for species and key indicators of soft bottom substratum**

**THANK YOU
FOR ATTENTION**