AN UPPER OLIGOCENE MOLLUSC FAUNA FROM KESZTÖLC, HUNGARY

by

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Abstract

There are Upper Oligocene beds cropping out in the NW side of Magosi Hill S of village Kesztölc. Clayey-silty sand with thin clay intercalations, sand, and sandstone form the 8 m thick sequence exposed in the 40 m long outcrop.

A typical brackish water fauna of medium preservation was collected from the first bed. It belongs to the *Polymesoda-Tympanotonus* association (after the classification of BÁLDI, 1973). Its most characteristic forms are Polymesoda convexa, *Tympanotonus margaritaceus*, *Ostrea cyathula*, and *Pirenella plicata*. A molar of a small herbivorous mammal, *Chalicotherium* was found here.

The artificial outcrop ot the 8th bed yielded a mollusc fauna of 30 species. It forms a transition between the associations *Glycymeris latiradiata* and *Pitar polytropa*. Solitary corals were collected in the exposure, too.

Fauma of the Ist bed idicates oscillating salinity between 4-10 %, and up to some metres deep water.

The fauna from the 8th bed indicates a normal saline, oxygen-rich environment in 20-30 m depth.

The fauna was compared to that of some famous Hungarian and foreign localities, and conclusions to its biogeographical relationships were drawn.

Introduction

Several authors have studied the Upper Oligocene sequence of *Magosi Hill* S of village Kesztölc. SCHAFARZIK (1884) described the most important fossils of the *Pectunculus* Beds *(Pectunculus obovatus, Turritella enus).*

SCHRÉTER (1953) listed seven mollusc species from Kesztölc. JASKÓ (1957) stated that the beds with *Pectunculus obovatus* and *Cyrena semistriata* filled flat basins. As these basins were formed among Triassic carbonate blocks, the Upper Oligocene sediments (being the youngest ones in the stratigraphic column) did not form a continuous sedimentary cover in the region.

PÁLFALVI (1965) described plant fossils from the lower part of the exposure. SIPOSS (1963, 1964a, 1964b) recognized differences between the Esztergom-Dorog and the Buda facies, both being dependent on distance from the shore and the submarine topography.

BÁLDI (1965a, 1973) published the most detailed description of the above mentioned locality. He considered all Upper Oligocene, polyhaline, clastic sedimentary rocks deposited in shallow sublittoral environment as *Pectunculus* Beds; while *Cyrena* Beds constitute of all mesohaline sediments deposited in a tidal lagoon. He published the stratigraphic profile of the locality together with a long list of the fauna. He discussed the lower and middle part of the exposure only; the rich fauna in the upper part was not known at that time. The latter fauna is discussed in the present paper.

The profile

Most of the Magosi Hill south of Kesztölc is made of Upper Oligocene strata. The hilltop is covered by thick loess, outcrops occur only in the NW side, along the creek passing the village from the south *(Fig. 1)*. The Oligocene strata forms minor outcrops in the southern side of the creek valley. There is only a single continuous, long profile in the last exposure downstream. This profile *(Fig. 2)* is the most complete sequence in the Kesztölc region. It is 40 m long, striking 71-251°. Its lowermost strata are covered by ca. 2 m thick slope debris. The sequence is as follows:

1. 3,0 m mollusc sand: monotonous, unbedded, contains much mica flakes. Weakly cemented, forms vertical walls (10-11 % carbonate content). Yellowish grey, medium-grained (BÁRDOSSY, 1961). Very well sorted (FOLK-WARD, 1957). DTA analysis showed montmorillonite in the pelitic fraction. Contains much heavy minerals, including hornblende, tourmaline, and apatite. Crossed by steep fractures (dip: 70-80°, strike: 60-240°, 45-225°, 30-210°). Strong limonitisation along fractures. Frequent pelite pebbles in the sand *(Fig. 3)*, ranging from 1 to 20 cm in diameter. The pebbles are slightly rounded, distributed irregularly, but form thin beds in the upper part of the sequence. Typical brackish water fauna of medium preservation was easily collected from the bed.

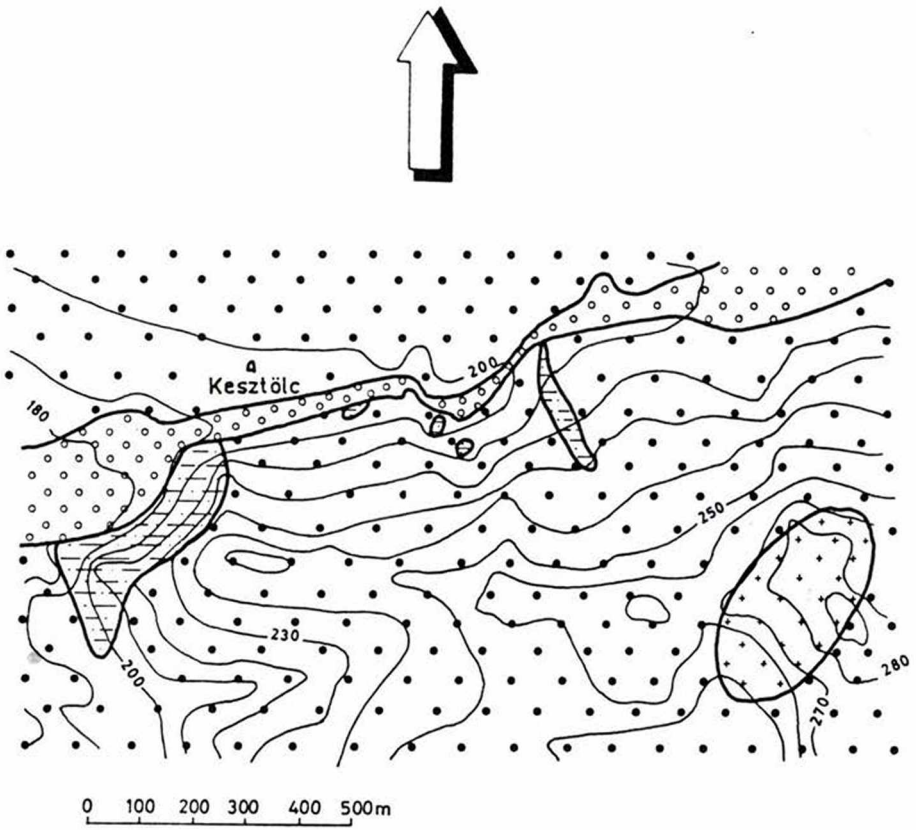

Fig. 1. Geological map of the surroundings of Kesztölc by Szabolcs Leél-Őssy, 1984

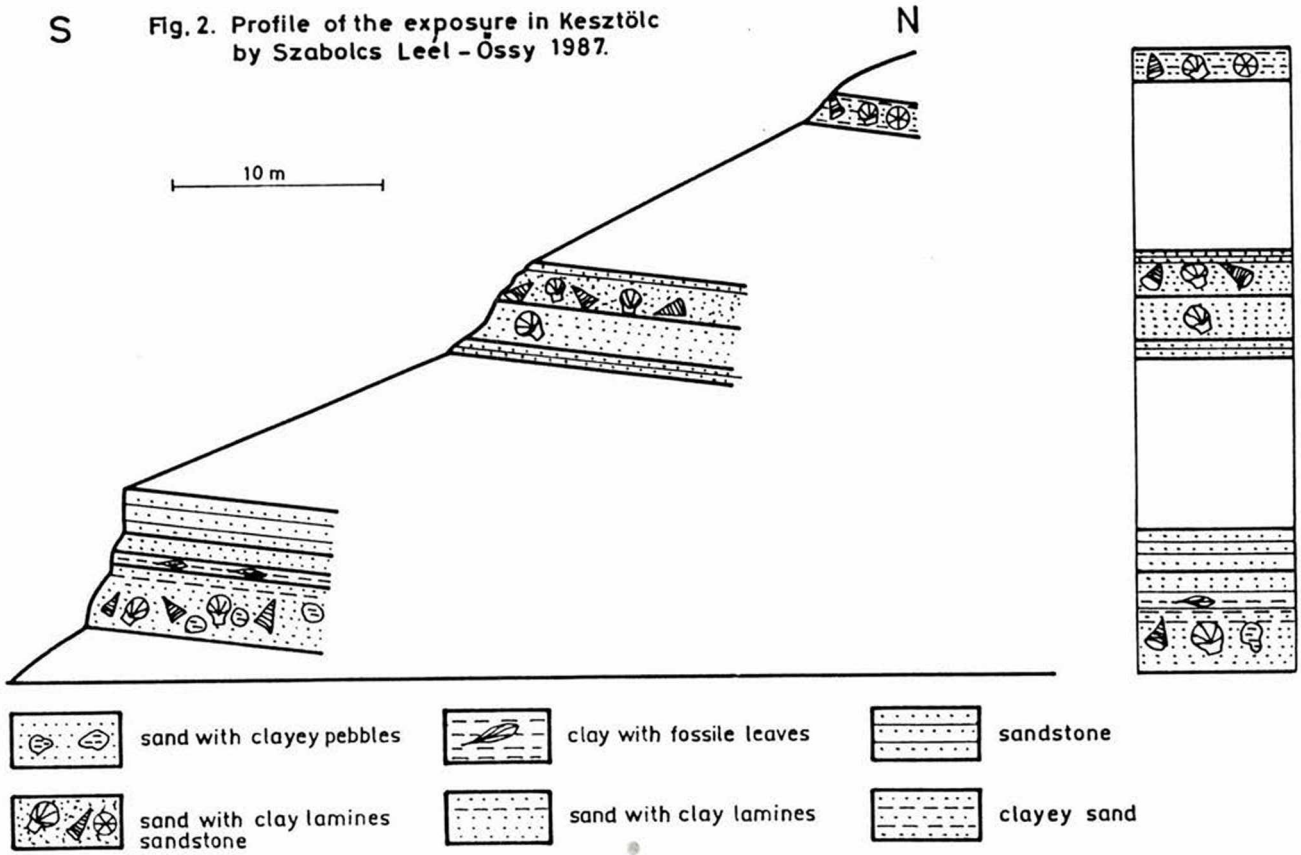

Fig. 2. Profile of the exposure in Kesztölc by Szabolcs Leél – Össy 1987.

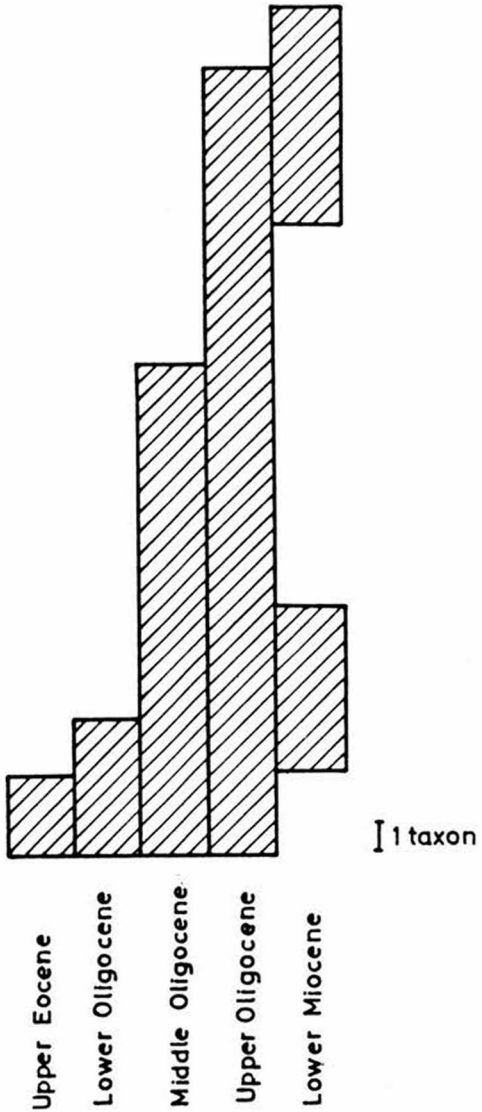

Fig. 3. Chronogram of the mollusc-fauna in Kesztölc

2. Grey, micaceous, calcareous clay bands alternate with sand. A 30 cm thick clay bed contains abundant *Cinnamomum* leave imprints.

3. 1 m coarse sand with thin clay bands.

4. 2 m well-bedded fine-grained sandstone with limonitic tint.
– 8 m uncovered part with slope debris.

5. 0,5 m coarse sandstone, containing 0,5 cm well-rounded quartzite pebbles.

6. 2 m coarse sand, with a few, thin mollusc fragments.

7. 2 m weakly cemented, poorly sorted medium to fine-grained sand (BÁRDOSSY, 1961) with tiny pebbles, and much, but poorly preserved fossils. The bottom of the bed is formed of a *Glycymeris* horizon, while the upper part contains 20-30 cm lenses of *Tympanotonus* indicating brackish environment. The upper part of the sand contains two, strongly cemented sandstone beds, 15 cm thick each. Heavy minerals contain garnet, hornblende, tourmaline, and zircon.
– 8 m covered slope with debris.

8. 0,5-1 m fine-grained sandy-silty clay with species-rich, well-preserved mollusc fauna. Carbonate content: 6 %. Scattered 1-2 cm quartzite pebbles occur. A SW extension of this bed ca. 90 m away from the main exposure yielded a rich fauna, which can be collected easily due to the less cemented matrix. Dip of the fossil bed is 7-8° N.

Mollusc fauna

Several beds of the profile contain typical Upper Oligocene mollusc fauna; fossils indicating alternating normal saline and brackish water conditions occur.

The 1st bed contains a *Polymesoda-Tympanotonus* association (BÁLDI, 1973), indicating brackish water environment. The single mammal molar is of a *Chalicotherium* (KORDOS, L., pers. commun.).

Fauna of the 1st bed:

BIVALVIA
Nucula sp.
Glycymeris latiradiata SANDBERGER in GÜMBEL, 1861
Ostrea cyathula LAMARCK, 1806
Polymesoda convexa (BRONGNIART, 1822)

GASTROPODA
Theodoxus crenulatus (KLEIN, 1853)
Turritella sp.

Melanopsis impressa hantkeni (HOFMANN, 1870)
Pirenella plicata (BRUGUIÈRE, 1792)
Tympanotonus margaritaceus (BROCCHI, 1814)
Terebralia bidentata (DEFRANCE, 1840)
Natica sp.
Babylonia eburnoides umbilicosiformis (TELEGDI-ROTH, 1914)

A typical normal saline fauna was collected from the 7th bed. BÁLDI (1973) described 21 species from this bed. The lower level belongs to the *Glycymeris latiradiata* biocoenosis, while the upper one forms transition between the *Pitar polytropa* and *Turritella venus* biocoenoses (BÁLDI, 1973). Fossils of the *Turritella* horizon are very poorly preserved and can be collected very hardly.

The new artificial outcrop of the 8th bed yielded 30 species (see list). The fauna forms transition between the *Glycymeris latiradiata* and *Pitar polytropa* biocoenoses.

Although the fossils form lumachelles, the shells are weakly eroded, and there are many double-valved bivalves *(Glycymeris latiradiata, Crassatella carcarensis, Pholadomya puschi, Lutraria oblonga soror, Panopea meynardi,* etc.). It indicates that water action was not considerably strong, and the shells were not transported for long distances. The shells occupy a concave-upward position.

Besides the rich macrofauna the microfauna is relatively poor: there is almost no nannoplankton, and only two foraminifer species: *Rotalia propinqua* REUSS and *Florilus boueanus* (D'ORBIGNY) were kindly determined by M. HORVÁTH.

Mollusc fauna of the 8th bed:

BIVALVIA

Nucula sp.
Glycymeris latiradiata (SANDBERGER in GÜMBEL, 1861)
Flabellipecten burdigalensis (LAMARCK, 1809)
Ostrea cyathula (LAMARCK, 1806)
Ostrea sp.
Astarte gracilis degrangei (COSSMANN et PEYROT, 1912)
Crassatella (Eucrassatella) carcarensis (MICHELOTTI, 1847)
Arctica islandica rotundata (BRAUN in AGASSIZ, 1845)
Isocardia subtransversa abbreviata (SACCO, 1890)
Cardium egerense (TELEGDI-ROTH, 1914)
Cardium sp.
Laevicardium cyprium (BROCCHI, 1814)

Venus (Ventricola) multilamella (LAMARCK, 1818)
Pitar (Cordiopsis) polytropa (ANDERSON, 1958)
Angulus (Peronidia) nysti (DESHAYES, 1860)
Dosiniopsis sublaevigata (NYST, 1843)
Lutraria oblonga soror (MAYER, 1867)
Panopea meynardi (DESHAYES, 1828)
Pholadomya puschi (GOLDFUSS, 1837)

GASTROPODA
Turritella (Haustator) venus (D'ORBIGNY, 1852)
Turritella sp.
Tympanotonus margaritaceus (BROCCHI, 1814)
Drepanocheilus speciosus digitatus (TELEGDI-ROTH, 1914)
Polinices catena achatensis (RECLUZ in DE KONINCK, 1837)
Globularia rothi (COSSMANN, 1925)
Zonaria cf. *globosa* (DUJARDIN, 1835)
Cassidaria depressa (BUCH, 1831)
Fusus columballiformis gradatus (GABOR, 1936)
Volutilithes permulticostata (TELEGDI-ROTH, 1914)
Athleta rarispina (LAMARCK, 1811)
Athleta ficulina (LAMARCK, 1811)
Turricula regularis (DE KONINCK, 1837)

SCAPHOPODA
Dentalium kickxi (NYST, 1843)
Fustiaria cf. *taurogracilis* (SACCO, 1897)

ANTHOZOA
Glabellum sp.

Environmental interpretation

Fauna of the lst bed clearly belongs to the *Polymesoda-Tympanotonus* biocoenosis. All characteristic species occur: *Polymesoda convexa, Tympanotonus margaritaceus, Ostrea cyathula, Pirenella plicata, Melanopsis impressa hantkeni.* The associated fossils are: *Theodoxus crenulatus,* and a molar small herbivorous mammal: *Chalicotherium* (KORDOS, L., pers. commun.). The latter genus persisted from Early Oligocene till Badenian time; it is characteristic for the Hungarian Oligocene.

This association indicates oscillating salinity between 4-10 %, characteristic for estuaries.

Water depth was not more than some metres. Strong wave action is indicated by the characteristic rounding of some *Tympanotonus* shells, and by excellent sorting.

Members of the biocoenosis belonged to the epifauna; these were herbivores (or detritus feeders): *Tympanotonus, Pirenella, Theodoxus, Melanopsis.* Suspension feeders were the Ostreas and the infaunal Polymesodas.

Establishment of a brackish water environment indicates humid climate, supported by modern faunas.

The uppermost, 8th level contains a fauna showing transition between the *Glycymeris latiradiata* and *Pitar polytropa* biocoenoses. Large frequency of *Glycymeris latiradiata,* and presence of *Ostrea cyathula, Crassatella carcarensis, Pholadomya puschi, Turritella venus, Panopea meynardi, Polinices catena achatensis,* and *Venus multilamellata* indicates *Glycymeris latiradiata* biocoenosis, while *Pitar polytropa, Laevicardium cyprium, Angulus nysti, Turricula regularis, Drepanocheilus speciosus digitatus, Athleta rarispina, Arctica islandica rotundata,* and *Lutraria oblonga soror* indicates the *Pitar polytropa* biocoenosis. The great species diversity also indiates the latter one.

Extremely large number of suspension-feeders occur in the fauna: coral, *Pecten, Venus, Ostrea, Pitar, Turritella, Laevicardium, Arctica, Panopea, Pholadomya,* and *Isocardia.*

Herbivores were: *Tympanotonus* specimens, which may be redeposited after death. Sediment feeders were members of the following genera: *Angulus, Drepanocheilus, Nucula,* and echinoderms (indicated by echinoid spines in washing residues). Predators were: *Athleta, Turricula, Polinices, Dentalium,* and *Volutilithes.* Distribution of genera according to feeding modes shows no significant differences from the usual distribution. This mollusc fauna – and the relatively large number of solitary corals – indicates normal saline, marine environment. Salinity did not decrease below 30‰ (it is the first occurrence of solitary corals in this biocoenosis in Hungary). Depth may be ranged between 20-30 metres. Concave-upward position of bivalve shells indicate rare wave agitation. Weak sorting indicates slow sedimentation.

The Magosi Hill complex was deposited in a shallow marine, sublittoral environment. The high-diversity fauna needed oxygen-rich water.

The lithology of the sequence does not provide any evidences for contemporaneous surface occurrence of either Traissic of Eocene carbonate rocks, as supposed by JASKÓ, (1957), and SIPOSS (1963).

Paleobiogeographical relations

The collected material was compared to the published lists of the Máriahalom, Törökbálint, and Eger faunas. The following foreign faunas were considered for comparison purposes: Slovenia: ANIC (1952); Alpine molasse:

SCHAFFER (1912); HÖLZL (1957, 1958, 1962); Boreal province: SANDBERGER (1863); GÖRGES (1952); SPEYER et KORENEN (1884); GLIBERT (1957); NEUFFER (1973); Atlantic province: COSSMANN et PEYROT (1909-1932); Mediterranean province: BELLARDI et SACCO (1873-1904) and ROVERETO (1900). Bioprovince relations of the collected fauna were established (following BÁLDI, 1973, 1983): 46 % of the species is cosmopolitan, 20 % Boreal, 10 % Atlantic, 16 % Mediterranean, 4 % endemic. These data fit well the national data of BÁLDI (1983), only the endemic and cosmopolitan values show significant differences.

Comparing the Kesztölc fauna to other Upper Oligocene localities in Hungary, we found especially close relationships to the Kovácov and Eger faunas. Twenty-three taxa determined to the species level (from among 36 ones) can be found in the Kovácov fauna, while 28 in the Eger fauna.

Jaccard coefficient values are very low: e. g. 0.123 compared to the Kovácov fauna, possibly due to the samller number of species at Kesztölc. While the Kovácov fauna contains 158 species (SENES), 1958), the Eger fauna 170 species (BÁLDI, 1973), comparisons applying the Jaccard coefficient provide insufficient results.

Similarities occur with the Törökbálint (16 common species) and Máriahalom (15 species) faunas.

Upper Oligocene age of the Kesztölc fauna is proved by chronograms (BÁLDI, 1976), considering appearances and disappearances of the species. Eighteen species from Kesztölc (more than 50 %) did not live before Late Oligocene, while 13 species did not cross the Oligocene/Miocene boundary.

Geographical position and characteristic facies succession indicates that the Kesztölc fauna belongs to the Kovácov Formation (altogether the Eger fauna contains more common species with the Kesztölc fauna.)

There are several species at Kesztölc which occur in almost all famous Hungarian Upper Oligocene localities: *Glycymeris latiradiata, Ostrea cyathula, Angulus nysti, Pitar polytropa, Panopea meynardi, Pholadomya puschi, Polymesoda convexa, Tympanotonus margaritaceus, Pirenella plicata,* etc., indicating that the Kesztölc fauna may be considered a typical Hungarian Upper Oligocene, Egerian mollusc fauna.

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Plate I.

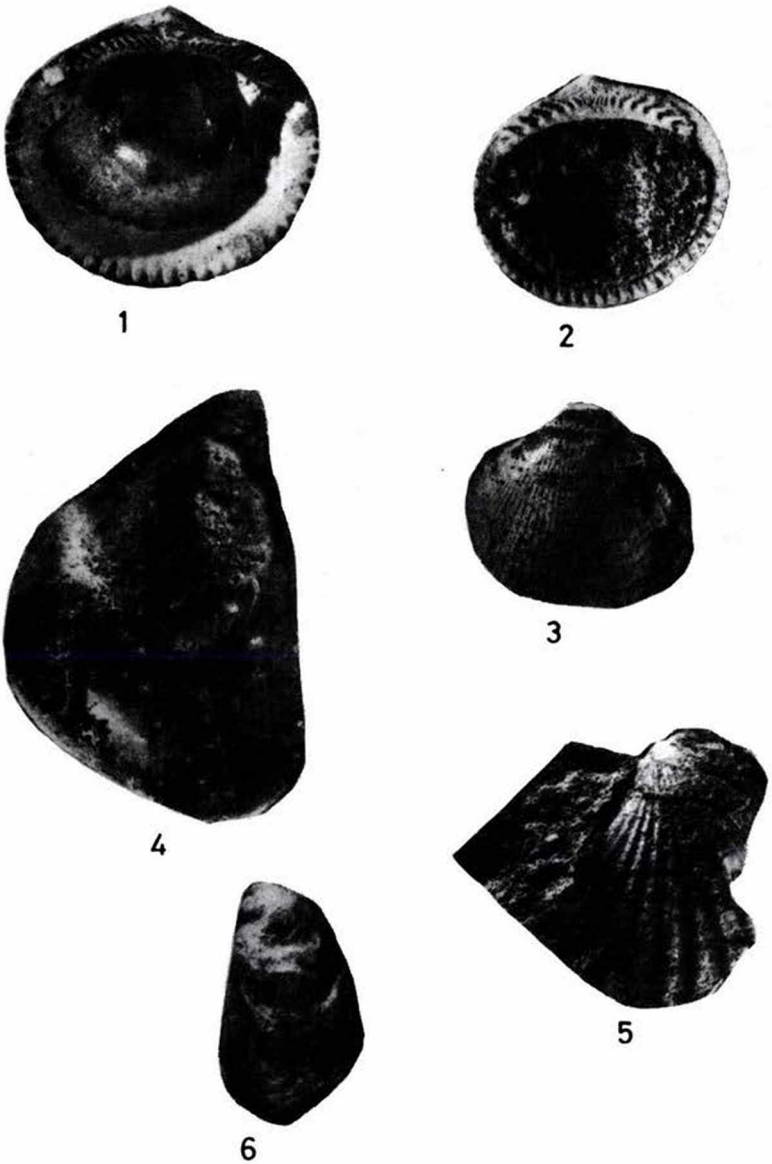

Fig. 1–3. *Glycymeris latiradiata* (SANDBERGER in GÜMBEL, 1861)
Fig. 4. *Ostrea cyathula* (LAMARCK, 1809)
Fig. 5. *Pecten (Flabellipecten) burdigalensis* (LAMARCK, 1809)
Fig. 6. *Ostrea cyathula* (LAMARCK, 1809)

Plate II.

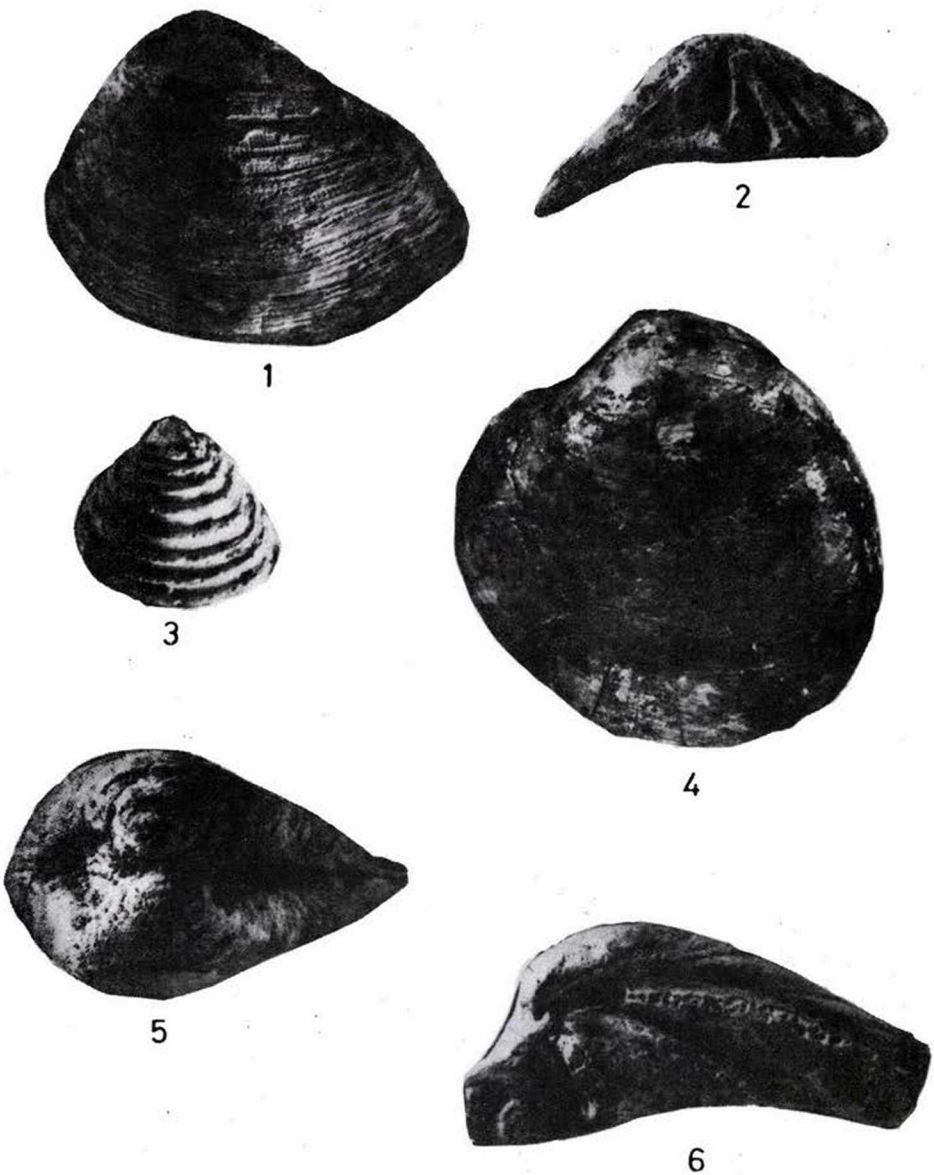

Fig. 1–2. *Crassatella (Eucrassatella) carcarensis* (MICHELOTTI, 1847)
Fig. 3. *Astarte gracilis degrangei* (COSSMANN et PEYROT, 1912)
Fig. 4. *Arctica islandica rotundata* (BRAUN in AGASSIZ, 1845)
Fig. 5. *Crassatella (Eucrassatella) carcarensis* (MICHELOTTI, 1847)
Fig. 6. *Arctica islandica rotundata* (BRAUN in AGASSIZ, 1845)

Plate III.

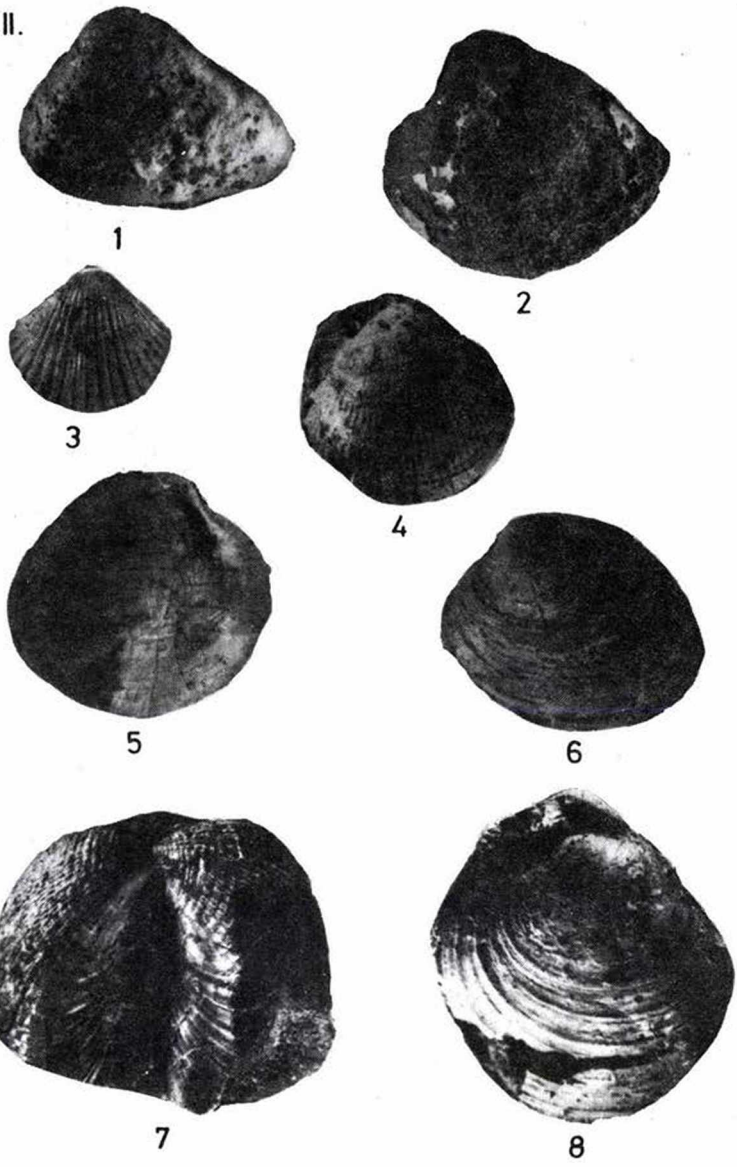

Fig. 1. *Polymesoda convexa* (BRONGNIART, 1822)
Fig. 2. *Isocardia subtransversa abbreviata* (SACCO, 1890)
Fig. 3. *Cardium egerense* (TELEGDI-ROTH, 1914)
Fig. 4. *Laevicardium cyprium* (BROCCHI, 1814)
Fig. 5. *Venus (Ventricola) multilamella* (LAMARCK, 1818)
Fig. 6. *Pitar (Cordiopsis) polytropa* (ANDERSON, 1958)
Fig. 7. *Pholadomya puschi* (GOLDFUSS, 1837)
Fig. 8. *Dosiniopsis sublaevigata* (NYST, 1843)

Plate IV.

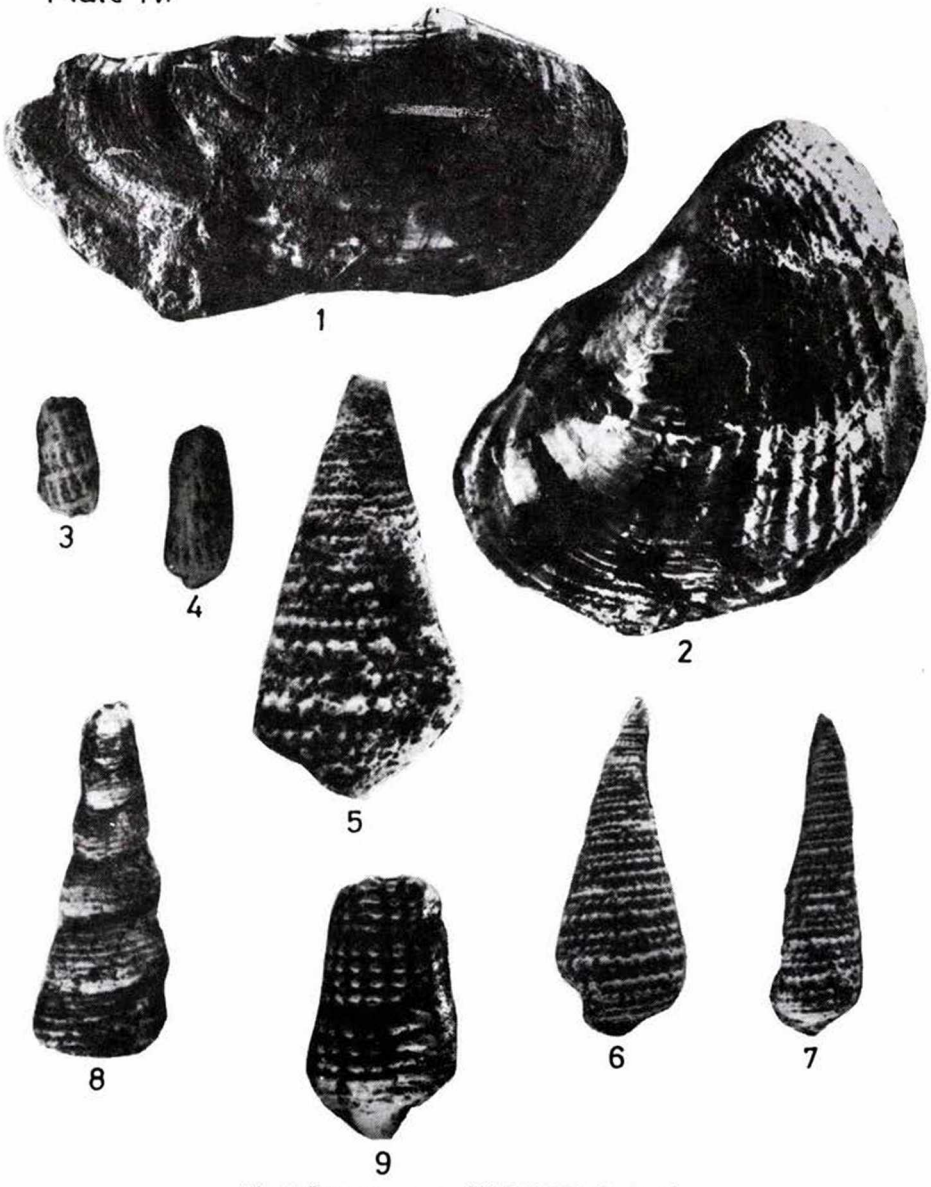

Fig. 1. *Panopea meynardi* (DESHAYES, 1828)
Fig. 2. *Pholadomya puschi* (GOLDFUSS, 1837)
Fig. 3–4. *Pirenella plicata* (BRUGUIÉRE, 1792)
Fig. 5–7. *Tympanotonus margaritaceus* (BROCCHI, 1814)
Fig. 8. *Turritella (Haustator) venus* (D'ORBIGNY, 1852)
Fig. 9. *Terebralia bidentata* (DEFRANCE, 1840)

Plate V.

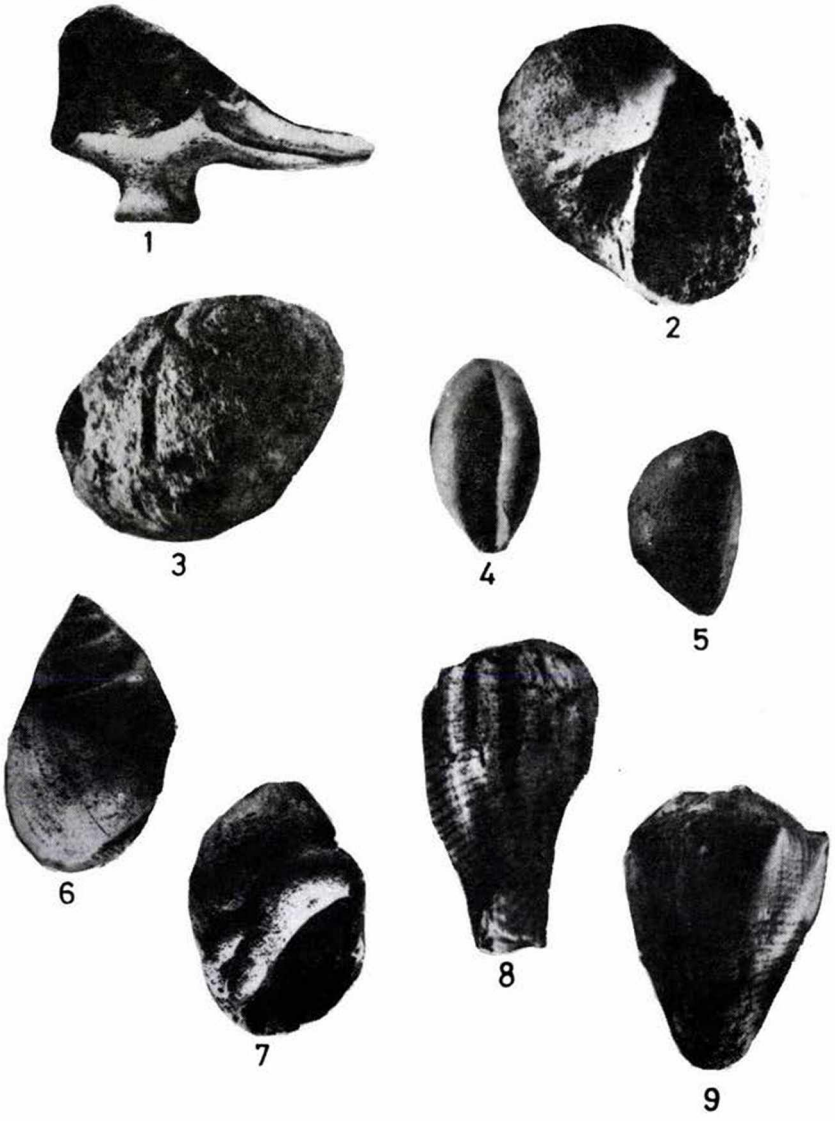

Fig. 1. *Drepanocheilus speciosus digitatus* (TELEGDI-ROTH, 1914)
Fig. 2. *Polinices catena achatensis* (RECLUZ in DE KONINCK, 1837)
Fig. 3. *Globularia rothi* (COSSMANN, 1925)
Fig. 4–5. *Zonaria* cf. *globosa* (DUJARDIN, 1835)
Fig. 6–7. *Babylonia eburnoides umbilicosiformis* (TELEGDI-ROTH, 1914)
Fig. 8. *Volutilithes permulticostata* (TELEGDI-ROTH, 1914)
Fig. 9. *Athleta rarispina* (LAMARCK, 1811)

Plate VI.

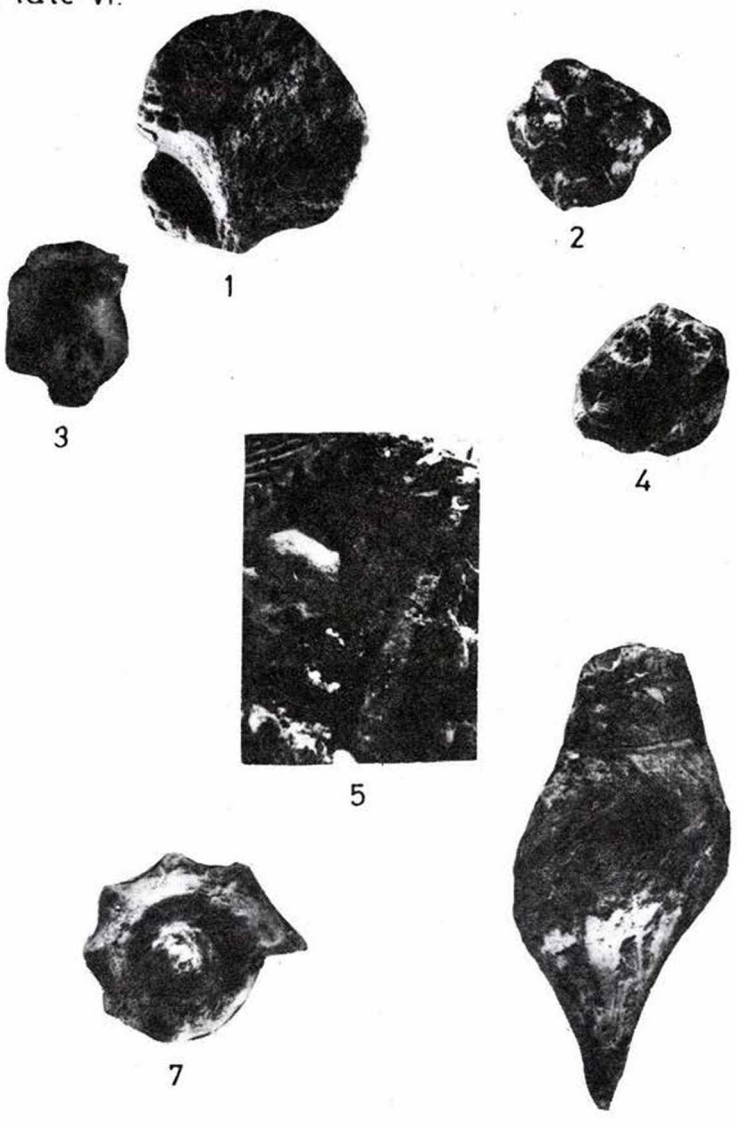

Fig. 1. Coral colony
Fig. 2. *Chalicotherium* sp.
Fig. 3. Coral colony
Fig. 4. Coral colony
Fig. 5. *Dentalium kickxi* (NYST, 1843)
Fig. 6. *Turricula regularis* (DE KONINCK, 1837)
Fig. 7. *Athleta rarispina* (LAMARCK, 1811)