

University of Athens - Department of Geology
Natural History Collection of Vrissa

Exploring Lesbos



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The Lesvos Island



Fig. 1. Location map of Lesvos Island.

Lesvos island is lying in the Northeast part of the Aegean Sea, north of Chios Island and near the coasts of Minor Asia, between the latitude of 39° N and longitude of 26° W. It is the third biggest island of the Aegean, smaller than Crete and Euboeia. Its maximum length is about 70 Km and its maximum width is about 45 Km. Mount Olymbos reaching an altitude of 968 m and placed on its southeast part, is the most important mountain in the island.

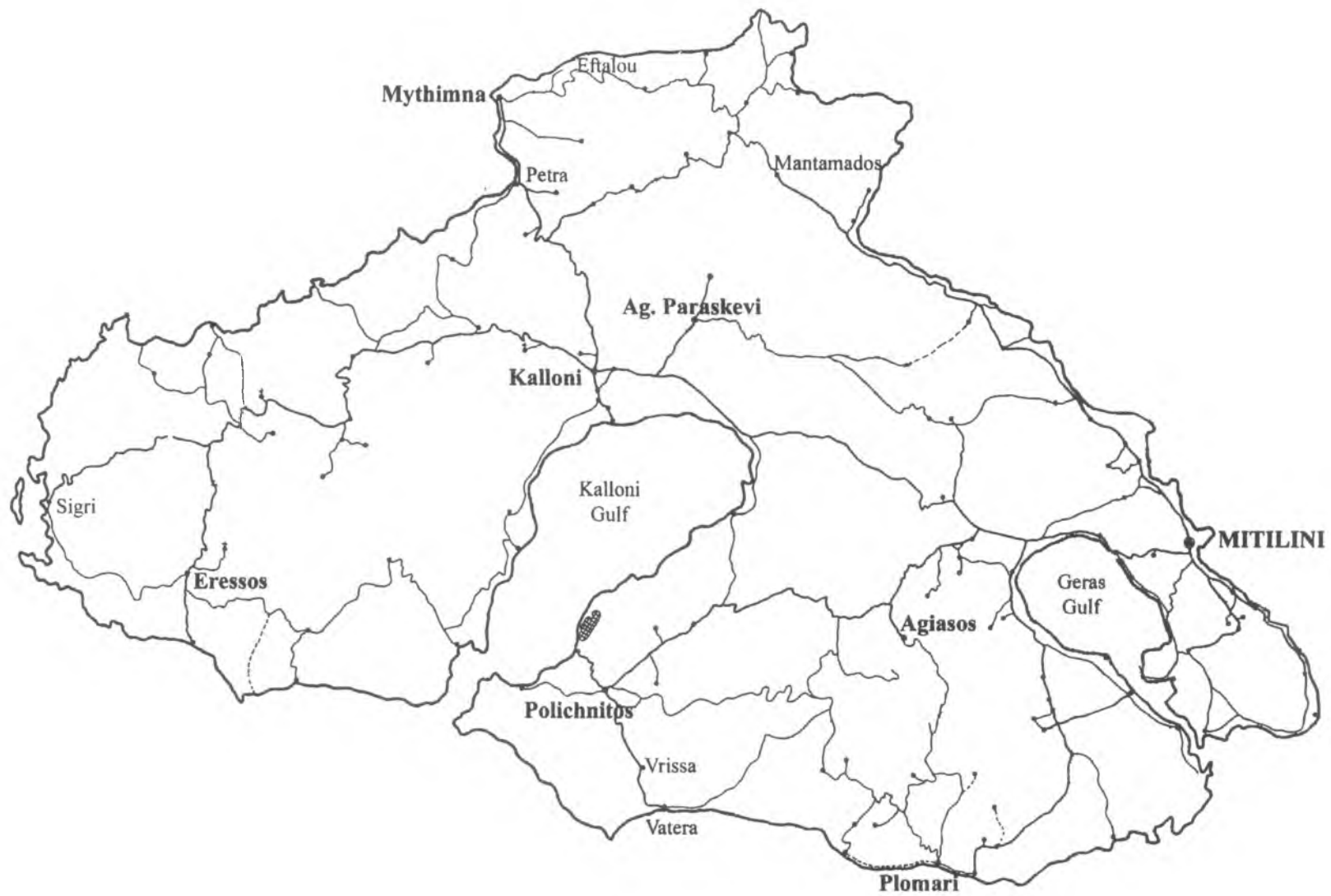


Fig. 2. *Topographical map of Lesbos Island.*

HISTORY AND CIVILIZATION

Lesvos was inhabited by the Pelasgians in the 15th century BC. Achaians flooded the island during the Trojan war, because of the proximity of Lesvos with Troy. According to Iliad, Achilles raided Lesvos frequently, and during one of his raids he captured Brysiida, the young girl that ignited Achille's feud with Agamemnon, the Achaian chief. After the capture of Troy, the Aeolians, a new wave of Greeks, settled the island. According to the tradition, the Aeolian dynasty of Penthilides ruled the island since the 11th century BC. By the 7th century the Lesvians had expanded over the adjacent Asia Minor shore.

Strongly linked with the Greek colonies of the Asia Minor shore and with the metropolitan centers in the continental Greece, the island followed the historic voyage of the Hellenism throughout all its phases.

The Mytilineans spoke the Aeolic dialect, similar to the Ionic. The Aeolic style, forebear of the classic Ionic style, is the first among the Greek styles to bear the two symmetric snails, as we can see from the capitals that remain in the temple of Napaïos Apollon in central Lesvos - near the village of Agia Paraskevi, and in the archaeological museum in Mytilini.

Being a large island, Lesvos constituted a great naval force which lasted for a long period of time. After a short Persian occupation (492-479 BC), Lesvos participated in the Athenian League, but during the Peloponnesian War, the island rebelled and fought together with Sparta. In 427 BC Mytilini was subjected to the wrath of the Athenians, who demolished its walls and killed 1,000 Mytilineans. In 405 BC Sparta occupied the island until 334 BC when the Lesbians made an alliance with Alexander the Great; after Alexander's death the island came under the Ptolemaic rule, and in 88 BC it was conquered by the Romans.

During the Byzantine era the island was used as an exile place for eminent personalities, such as Irene the Athenian and Constantine Monomachos the 9th. In 1354 Lesvos was offered as a dowry to the Genovese noble Frangisco Gatelouzi. On 14 October 1462 the island was subjected to the forces of Moameth the Conqueror. After the end of the Russian-Turkish war of 1774 the Turkish grasp on the island relaxed, allowing partial freedoms to the Christian subjects. Gradually Lesvos prospered and started preparing the revolution against the Turks. Nevertheless, the brave revolution of the Mytilineans, in 1824, was covered with blood. On 8 November 1912 Mytilini was liberated by the Hellenic Navy led by admiral Koundouriotis, and after the Treaty of Athens in 1914 the island formally joined Greece.



Fig. 3. One of the most famous paintings of Theophilus: Erotokritos and Aretoussa.

Lesvos island is well known as the island of poets and novelists (Fig. 4, 5). Deep roots of Greek civilization and famous ancient greek names date back to many centuries B.C.: The philosopher Theophrastos, the historian Theophanes, the guitarist Arion, the composer Terpander, the poet Alkaios, and the greatest lyric poetess Sappho. The lesvian ruler Pittakos was among the Seven Sages of antiquity.

The cultural tradition continued through the centuries. Venjamin of Lesvos was a prominent scholar during the years preceding the liberation of the island from the Ottoman occupation. Carrying on the heritage in the contemporary years, Odysseas Elytis, Nobel laureate in Literature was

Venezis, Stratis Myrivilis, Kostas Kontos, Kostas Friliggos, Kostas Makistos, Pepi Daraki, Stratis Paschalis, Dimitrios Vernadakis, Miltiades Kountouras, to name a few.

We are also proud of the contemporary painter George Iakovidis, the folk painter Theophilos and the internationally acclaimed art critic Teriade.



Fig. 4. *The statue of Sappho in the entrance of the entrance of the harbour.*

The renowned philosopher **Theophrastos** was a native of Erressos (372 -287 B.C.) He studied with Plato and Aristotle and followed their Peripatetic school. His writings deal with all the issues of the then-known scientific horizon, like Metaphysics, Logic, Ethics, and Rhetoric. He particularly studied the plants, and for his work was named the Father of Botany

The Roman era historian **Theophanes** (100 B.C.) was born in Mytilene. He accompanied Pompei in his military operations in Asia Minor and wrote an account of them. Pompei, in return of these services, accorded him the rights of a Roman Citizen. Stravo says that such was Pompei's trust in Theophane's abilities that he never did anything without taking his advice. Theophanes made use of Pompei's favor for the benefit of his native town, Mytilene, which Pompei, on his return from Asia in 62 B.C., declared to be free and adomed lavishly. The Mytileneans honored Theophanes by minting coins with the inscription "Theophanes god of Mytileneans"

The guitarist **Arion** was a native of Mythimna (625 - 585 B.C.). He is renowned for perfecting the dithyramb, the ancient singing pattern, by embedding rhythm and orchestration. He spent time in Corinth, in the court of the tyrant Periander, where he acquired reputation, fame and wealth. There is a story telling about Arion and his lyre: Arion was aboard a ship travelling from Sicily to Corinth, when the Mafia-sailors plotted to kill him. Arion then asked to sing to the Gods before being thrown to the sea. So charming he played his guitar that a dolphin, attracted by his music, was so delighted that brought him off to the shore at Cape Taenarum.

Terpander was born in Antissa circa 710 B.C. Famous musician and father of the choral poetry. Terpanndros added three more strings in the until-then four-string guitar. He is said to have made possible a peace deal between warring Spartans and Messenians, largely because of the popularity of his music.

The poet **Alcaeos** was native of Mytilene, and was contemporary to Sappho and Pittakos. He is the founder of the alcaean meter, principal representative of the aiolic poetic style. His poetry reflects his own eventful life most expressively. Alcaeos' work was held in the highest regard; among his admirers was the Latin poet Horace, who said that Alcaeos "sang to a golden plectrum"

Patriot, he combined poetry with politics and love spirit. He opposed with sarcastic wit the opposing democrats of his time, but even the republican Pittacus. He took part in the war against the Athenians and also was involved in the struggle against the tyrants Melancrus and Myrsilus.

Sappho, the woman associated the most with the word "lesbian" was born in Erressos in 612 B.C. She was regarded as a great lyric poetess. Plato calls her "the tenth muse". She founded a school in Mytilene, devoted to the education of girls, where she taught music, poetry and etiquette. Progressive ideas were prevalent in the Lesvos of that period and women were regarded as individual beings with their own independent existence. Sappho's concern with the good conduct of the girls fulfilled a social need felt by the aristocracy of Lesvos, who laid great emphasis on poetry and music as element in the proper role of a woman.

The poetry of Sappho is marked by warmth of feeling and spontaneity, together with the passion, which is the distinguishing feature of the Aeolian school. It is true that her verses vibrate with erotic feeling, which often reaches a high pitch, but should not be interpreted as a moral deviation as much as genuine lyrical outburst. The shadows cast over her personality and morals by the Athenian comic poets are due, it is believed, to misunderstanding on their part, since they were not in position to appreciate that women in Lesvos were free to express their opinions and feelings. Never mind that any erotic relationship between teacher and student (like Socrates/Alceviades) was meant to be only men's business...So that's how the name lesbian became associated to what most people know...

Pittakos was one of the Seven Sages of antiquity, and was native of Mytilene (648 B.C). He was devoted to public service, associated with the aristocratic party, and fought in many wars, eventually becoming a General. He was renowned for his adamant

dictatorial powers, a kind of elected tyrant. He introduced and applied many new laws and granted amnesty to his enemies, believing that forgiveness is better than punishment. He opted to rule for only ten years, relinquishing power with his own free will. The Mytileneans, on his decision to leave public life, presented him with a piece of land, the "Pittakean plot", from which he kept only an area as far as he could throw his spear, since he said "a fair amount is more than enough". Too bad his paradigm has not been followed by many.

Venjamin Karres (of Lesbos) is one of the most important and attractive figures to whom the title "Teacher of the Nation " is given. He was a native of Megalochori of Lesbos (1762) and he studied at Kydonies, as well as in Europe. His studies included Mathematics, Physics, Astronomy, and Philosophy. He served as director of the Evaggeliki School of Smyrna, the second most important center of Hellenic studies during the Ottoman Empire. The European enlightenment movement, and introduced modern Philosophy and Physical Sciences inspired Venjamin to Greece.

Patriot, he was involved with the Friendly Society, a movement to enlighten the Ottoman-occupied Greeks and plant the seeds of liberation. When the struggle for independence began he took part in the assemblies of Epidavros and Astros.

GEOLOGICAL HISTORY OF LESVOS

The Geological history of Lesvos is largely known by the studies of Hecht (1972; 1974; 1975), Pe-Piper (1977) and Katsikatsos *et al.*, (1982; 1986).

According to Katsikatsos *et al.* (1982, 1986) the geological structure of Lesvos Island from base to top consists from the following units (Fig. 5):

- a. The autochthonous unit which includes:
 - the neopaleozoic formations
 - the triassic formations
- b. The allochthonous units which include:
 - The tectonic nappe of the volcanosedimentary formations
 - the unit of the tectonic nappe of the ophiolitic rocks
- c. The unit of postalpine formations.

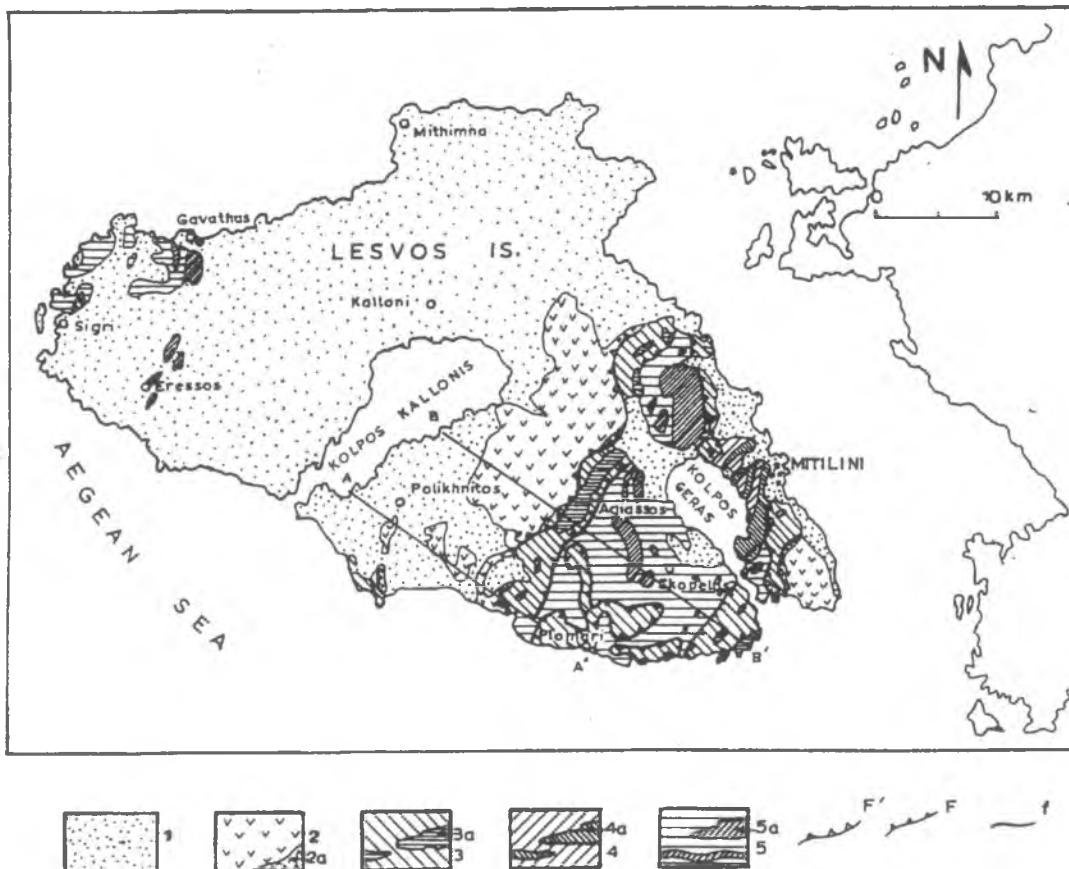


Fig. 5. Geological sketch map of Lesvos Island (after Katsikatsos *et al.*, 1982).

1. Quaternary and Neogene formations, 2. Peridotites and serpentinites, 2a. Amphibolites – amphibole schists, 3. Triassic metabasites and metaclastic formations, 3a. Intercalations of crystalline carbonate rocks, 4. Triassic schists and metasandstones, 4a. Intercalations of crystalline carbonate rocks, 5. Neopaleozoic schists and metasandstones, 5a. Intercalations of crystalline carbonate rocks, F, F' : overthrust, f: tectonic contact.

Autochthonous unit

This unit is a series of formations from the Neopaleozoic until the Upper Triassic without stratigraphic unconformities and it consists entirely of metaclastic rocks with lenses and intercalations of crystalline limestones and dolomites. It is characterized by a very low-grade metamorphism and by the absence of rocks of igneous origin.

The Neopaleozoic formations are extended on the southeast part of the island, where the visible thickness, in places, is more than 1.000 m.. In the northwest part of the Island they have relatively small extension (areas of Sigri, Gavathas, Eressos) and they are found under the postalpine volcanic and lacustrine formations of this area.

They consist of schists (mainly micaceous, sericitic and chloritic) alternating with metasandstones (mainly arkoses), quartzites and crystalline carbonate rocks in the form of lenses and intercalations. Generally the extension and the thickness of the carbonate rocks are always limited, except in the upper parts of certain areas, where the carbonates dominate. In these rocks and in several localities and different stratigraphic horizons, a rich fauna was found (Hecht, 1972, 1974 and 1975; Katsikatsos *et al.*, 1982) consisting of foraminifers, algae, lamellibranchs, gastropods, echinoderms, crinoids and corals, of Carboniferous-Permian age.

The Triassic formations represent the upward normal transition of the Neopaleozoic formations and they are found only in the southeast part of Lesvos. They consist mainly of schists and metasandstones. Within these formations usually occur very thick intercalations of crystalline carbonates, where *Megalodon* have been found by Katsikatsos.

Characteristic of these formations is the presence of breccia and big carbonate blocks, mainly within the upper horizons of these formations.

Allochthonous units

Those units overthrust above the autochthonous formations and they are divided into two tectonic nappes: a. the lower comprising Triassic volcanosedimentary formations and b. the upper comprising ophiolitic rocks.

The nappe of the Triassic volcanosedimentary formations occupy a large area in the southeast part of the island and its thickness exceeds, in places, the 1.000 m.. It consists of various types of metabasites, which usually dominate in the upper parts, and metasediments represented mainly by crystalline limestones and dolomites and secondarily by schists of various mineralogical composition (chlorite, mica, sericite, e.t.c.) and conglomerates.

The crystalline limestones and dolomites appear in the form of lenses and intercalations of various thicknesses (from a few up to several hundred meters). The age of these formations has been determined by the characteristic fossils of Lower-Middle Triassic, found in the carbonate rocks of these formations (Katsikatsos *et al.*, 1982). The rocks of the volcanosedimentary formations have suffered initially a low-grade metamorphism in the pumpellyite-actinolite-chlorite zone.

Characteristic of these formations is the presence, in places, of glaucophane, fact providing a higher pressure during their period of metamorphism.

The ophiolitic nappe occupies a large area in the southeast part of Lesvos and towards the north they are covered by the volcanic formations of the island. The ophiolitic rocks are found overthrust, in their larger part, on the volcanosedimentary formations and they are divided into two parts which are in tectonic relation: a. The upper part which mainly consists of ultramafic rocks and b. The lower part consisting of metamorphic basic ophiolitic rocks.

- The upper part consists entirely of ultramafic rocks, of various degrees of serpentization. Veins of pyroxenites and gabbros intersect these ultramafic rocks, in places. The thickness of the upper part exceeds in places the 1000 m.
- The lower part appears in several places, always intercalated tectonically between the upper part of the ophiolitic rocks and the underlying volcanosedimentary formations. The thickness of the lower part of the formations reaches, in places, the 300 m and they are mainly amphibolites and amphibolitic schists, originating from mafic ophiolitic rocks.

The rocks of the two groups of the ophiolitic tectonic nappe have suffered at least one very low grade metamorphism in the pumpellyite-actinolite-chlorite zone, similar to the one that they have suffered the formations of the volcanosedimentary nappe (Katsikatsos *et al.*, 1986; Katagas & Panagos, 1979).

The unit of postalpine formations

The postalpine formations are extended in large areas of the island and mainly volcanites and Neogene formations of lacustrine facies, as well as Tertiary deposits represent them.

THE SEISMIC HISTORY OF LESVOS

Lesvos is one of the main islands of Eastern Aegean, and its seismicity is known to us from the antiquity, through historical descriptions, inscriptions, marginal notes, archive material, post-earthquake damage reports and instrumental records.

The island belongs to the Aegean microplate and therefore it is affected from the extensional field of the Aegean. In addition, and due to its vicinity to the southwestern branch of the North Anatolian fault, which is one of the main tectonic features in Turkey, it is also affected from the major earthquakes originating from this fault system.

The seismicity of the island during the 20th century is characterized from shallow earthquakes, originating mainly from sources within the gulf of Kalloni, as well as in the gulf of Mytilinaion Aiyialos. Seventeen earthquakes with magnitude greater than 5 on the Richter scale are reported from the broader area of Lesvos since 1900. The event of 1981, with an epicentre west of Lesvos, caused considerable damage on some villages of the island. This medium to high seismic activity of Lesvos corresponds to zone III (out of IV) of seismic hazard in Greece.

However, serious destruction has been reported from Lesvos due to earthquakes since the ancient times. Historians speak about the complete loss of towns due to earthquakes and seismic sea waves. Out of a long list of the historical earthquakes (i.e. earthquakes before 1900) of Lesvos, the most important are listed below:

231 B.C. Arisvi, Pyrra

In the year 231 BC, an earthquake with epicentre in the gulf of Kalloni destroyed Arisvi and Pyrra, ancient towns of Lesvos. It is possible that the earthquake caused a seismic sea-wave.

167 B.C. Antissa

Around 167 BC, due to a very strong earthquake the small island, upon which the ancient town Antissa was built, sunk under the sea.

1383 August 6, Mytilini

In this year an earthquake destroyed the castle and killed most of the inhabitants, and the rulers of the town, together with their families. This must have been one of the strongest earthquakes of the island.

1845 October 11 Lisvori

A sequence of earthquakes shook the island and destroyed many towns. In Lisvori, where the epicentre of the mainshock was estimated, only two out of 70-80 houses did not collapse. It was strongly felt on all the islands of Eastern Aegean.

1865 July 23 Molyvos

The earthquake caused the collapse of most buildings in Molyvos and the destruction of most buildings in the neighboring villages.

1867 March 7 Ayia Paraskevi

This major earthquake destroyed most of the houses on the island and killed more than 500 inhabitants. It was felt all over Greece and Asia Minor, and it is the first earthquake of Lesvos, for which we have a detailed report of in situ observations on damage.

1889 October 25 Chidyra (Lesvos)

Many houses in the eastern part of the island were destroyed and more than 30 people were killed because of the earthquake. Damage is reported from all the towns and villages of the island.

PALAEOGEOGRAPHICAL EVOLUTION OF LESVOS ISLAND

It is well known that the study of fossil mammals on islands is interesting as they can give information on palaeogeography and in consequence on tectonic movements (Dermitzakis & Sondaar, 1979).

Palaeogeographic sketches, indicating the relative positions of various palaeogeographic domains during some critical periods, will describe the palaeogeographic evolution of Lesvos Island during the Late Cainozoic (Fig.6, 7; Dermitzakis, 1996; Dermitzakis & Drinia, *in press*).

Late Oligocene-Early Miocene (Fig. 6a)

A volcanic zone from Eastern Thrace to the North of Samos Island, going parallel to the present coastline of Minor Asia, is evident.

In North Aegean region volcanic rocks of Late Eocene or Oligocene age are well extended.

During the same period in the NW part of Lesvos Island a Petrified Forest is buried in tuffites from the nearby volcano. This rather extended Petrified Forest is of autochthonous origin. Its formation is highly connected with the volcanic activity of the surrounding area of Lesvos Island. It is believed that the Forest of Lesvos Island has been growing during subtropical climatic conditions, which abruptly changed into continental-tropical climatic conditions.

Middle-Late Miocene (Fig. 6b)

During this period, volcanism is still present along the same N-S trending zone as before, but has been extended through the Island of Kos.

During this time span a faunal exchange from Minor Asia took place. The first occurrence of Asiatic immigrants shows a unique presence in MN3 zone, that is to say about 20 Ma and in MN12-MN13 zones about 6-7 Ma (de Bruijn & Zachariasse 1979).

At the boundary interval from the Serravallian to the Tortonian, about 10.6 Ma, the palaeogeographic configuration changed completely. Intra-Tortonian tectonics (between 8 and 9 Ma ago) resulted to the fragmentation of the existing landmass. In general, the late Tortonian was characterised by a flattening of relief.

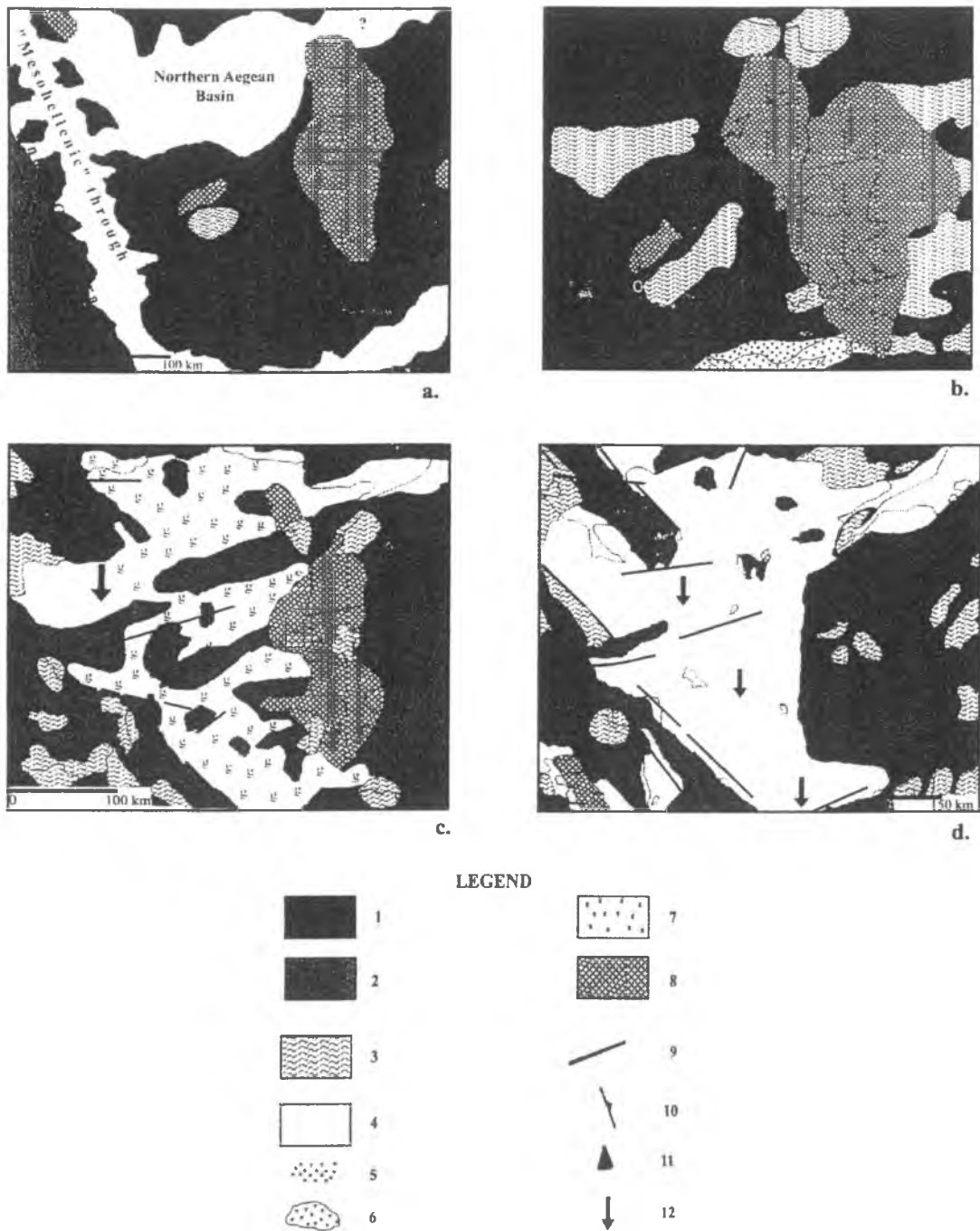


Fig. 6. Paleogeographical reconstruction of Lesbos Island during a. Late Oligocene-Early Miocene, b. Middle – Late Miocene, c. Messinian, d. Pliocene.

1. Continental areas, 2. Pre-apulian platform, 3. "Island" freshwater or brackish water basins, 4. Marine environment, 5. The Cycladic nappe, 6. Acid intrusives, 7. Evaporites, 8. Volcanic Zone, 9, 10. Fault zones, 11. Volcanoes, 11. Vertical tectonic movements.

Several brackish and fresh-water lakes were formed at that period i.e. during the Tortonian there was a fresh water basin in Rhodes Island,

whereas at the same time we can observe an interfingering of marine and fresh-water deposits in Kythera Island.

About 5-6 Ma ago (Fig. 6c), intra-Messinian tectonics are more difficult to unravel. We are nevertheless able to demonstrate that a major tectonic reorganisation occurred in Messinian times. Throughout the Middle Tortonian and the Messinian, temporary connections between the Mediterranean and the Northern Aegean existed, without however creating 'barriers' preventing mammal migrations from Minor Asia. During this part of Late Miocene, the former Aegean mainland formed an archipelago, in which landbridges between Minor Asia and Greece made the arrival of a large number of Asiatic steppe immigrants and African elements to the present Greek mainland possible.

Pliocene (Fig.6d)

From this period onwards the volcanic Aegean Arc has been developed.

During Pliocene/Pleistocene times, Lesvos Island was part of the continental Minor Asia (Sondaar & Dermitzakis 1985, Sondaar *et al.* 1986, Dermitzakis 1989). During that time, the mammals of Lesvos continued to spread over the island; new mammalian species started to invade. The transient volcanic activity in the island, the changes of the shape and size of Lesvos due to glacier alternations and tectonic movements, played a crucial role to the spreading of these mammals. The dispersal route of most of the mammals of Lesvos was a land corridor.

The faunal assemblage is characterised by abundant *Gazella borbonica*, an *Equus* of large size resembling *Equus stenonis*, an elephantoid which could be determined as *Anancus arvenensis*. Further *Nyctereutes megamastoides*, Giraffids, deer, rhinoceros and a sabre tooth cat. The presence of a dwarf antelope, a giant tortoise and a large terrestrial monkey (*Paradolichopithecus*) makes it unique (Dermitzakis *et al.*, b, in press). The discovery of this balanced fauna supports the conclusion that the island of Lesvos was connected with Minor Asia. This palaeobiogeographical interpretation is in accordance with the geomorphological, lithostratigraphical and tectonic observations, which showed that Lesvos became an island during Holocene.

The abundance of the *Gazella*, horses and antelope fossils indicates an open and dry environment, which corresponds to dry savannah or open forests. The sediments indicate a river system with the possibility of forest on the banks.

Pleistocene (Fig.7)

In general it can be said that the land-sea configuration of the Aegean Archipelago did not differ essentially in the Pleistocene from the present time. The Pleistocene of Lesvos is characterised mainly by breccia-

conglomerates and a high percentage of arenaceous material, which is, presented either as the matrix of breccia-conglomerates or as particular interbeds between the above formations or even between beds of clay. Pebbles are coming from the tuffs, the lava and the Neogene silicified marls. Sedimentological features indicate that the island of Lesvos was connected with the mainland during the Late Pleistocene period. Though with the interpretation of the scanty faunal composition which shows not endemic characters, a land connection of Lesvos Island with the opposite landmass of Minor Asia during the Late Pleistocene, does not seem excluded. Lesvos became an island again in the Holocene.

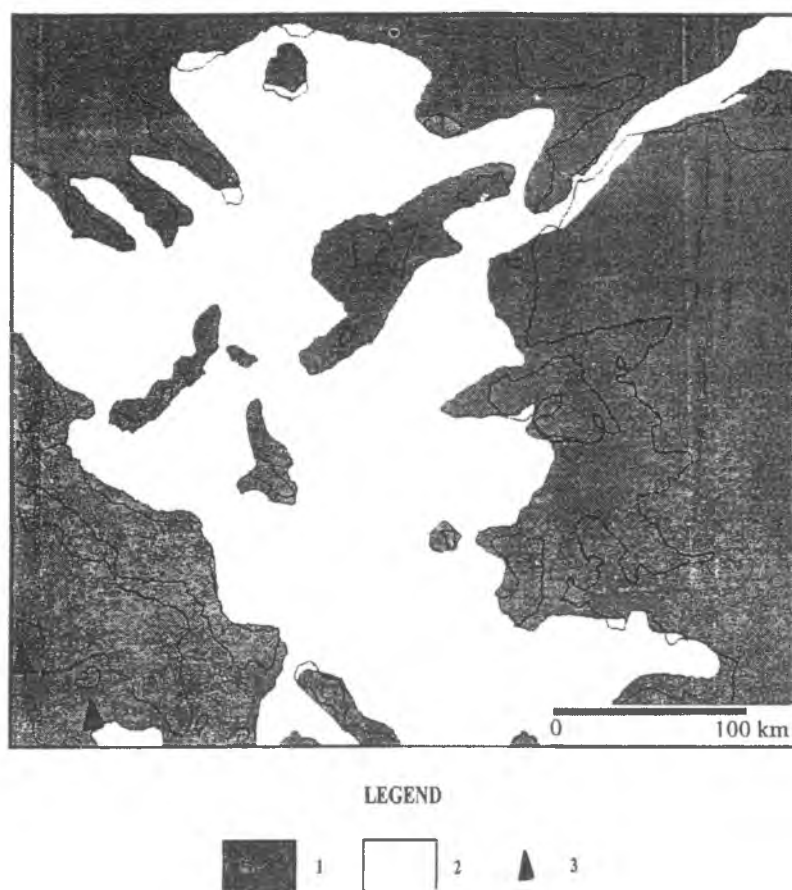


Fig. 7. Paleogeographical reconstruction of Lesvos Island during the Pleistocene.
1. Continental areas, 2. Marine environment, 3. Volcanoes.

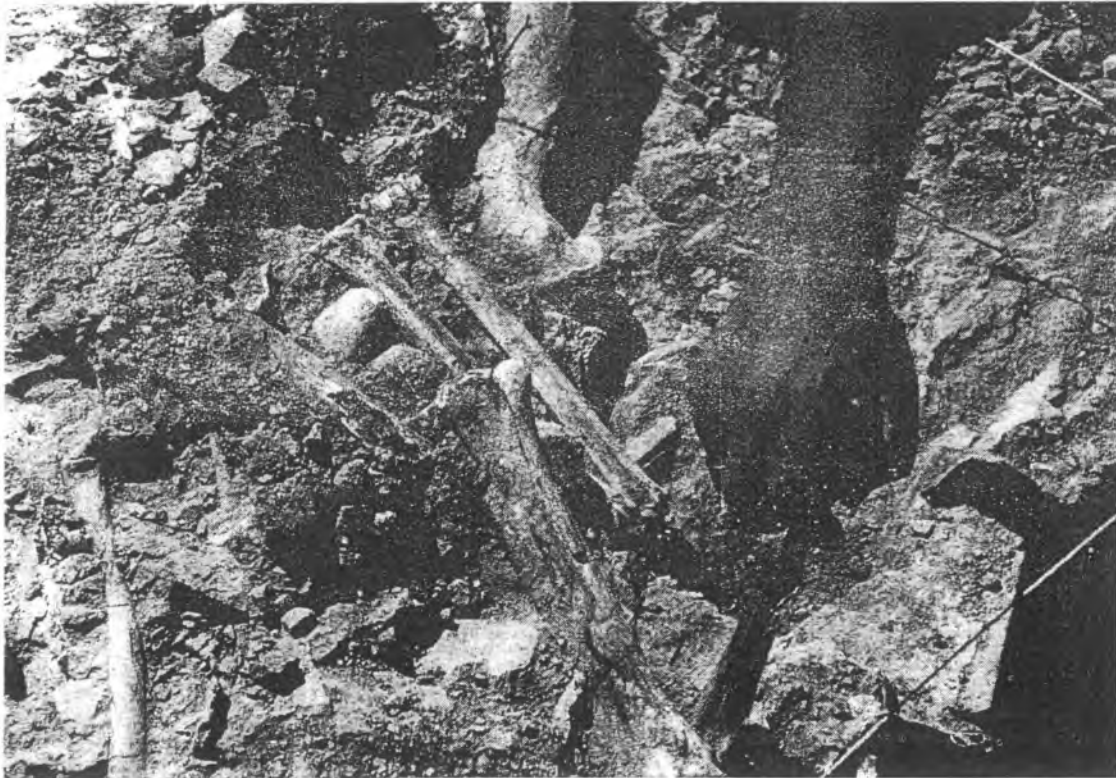
Lemnos Island, and Ag. Efstratios Island are likely to have been connected once, however it seems rather unlikely to have been connected with Lesvos mainland during Pleistocene (Boeger & Demitzakis 1986). During Early-Middle Pleistocene, Lesvos was connected with the opposite mainland of

Minor Asia. After the elevation of the island, during Middle Pleistocene, new species of mammals invaded Lesvos, without excluding the existence of a land bridge between Lesvos and Lemnos (Dermitzakis & Goetige 1977). This possibility is based on the resemblance of the Pleistocene mammal fauna, which has been found in both islands. Till the Middle Pleistocene, Inouses Island was still connected with the mainland of Minor Asia (Dermitzakis 1996). As far as Chios Island is concerned, it is clearly demonstrated that it became an island only recently (Late Pleistocene-Holocene?) and was before that connected with Minor Asia and Lesvos Island.

THE PALEONTOLOGICAL WEALTH OF LESVOS ISLAND

Vatera (Fig. 8a, b)

In the SE part of Lesvos Island (Vatera Formation), a thick succession of Late Pliocene-Early Pleistocene terrigenous, fluvatile and lacustrine deposits containing ostracodes, plant remains and fishes has been observed. In particular the lake deposits are composed of greenish marls, marly limestones and diatomites, which are bearing huge concretions and traces of mammal footprints. Dermitzakis *et al.* 1998 describe Pliocene fluvatile deposits that contain a fauna whose composition indicates that Lesvos must have been a part of the mainland and that it contains Asiatic and European elements. Their age is Late Pliocene-Lower Pleistocene and they are not endemic. The possible dispersal route of the mammals was a corridor where the dispersal was taking place in both directions.



a.



b.

Fig. 8a, b. Fossilized mammal bones from the excavation area of Vatera.

This faunal assemblage is characterized by abundant *Gazella borbonica*, an *Equus* of large size resembling *Equus stenonis*, an elephantoid which could be determined as *Anancus arvenensis*, the girrafid *Macedonitherium martini*, *Nyctereutes megamastoides*, deer, rhinoceros, sabre tooth cat. This mammal association is common in Late Pliocene (2.5-1.8 Ma) Euro-Asia and has been also found in many localities of Northern Greece. Yet the presence of a dwarf antelope, a giant tortoise and a large terrestrial monkey *Paradolichopithecus* makes it unique.

The Petrified Forest (Fig. 9, 10)

Remains of fossil plants are found in many locations on the western part of Lesvos island. They cover an area of about 37.50 acres which are included in the boundaries of the municipality of Eressos and the communities of Antissa and Sigri and form the famous *Petrified Forest of Lesvos*. According to a special Presidential Decree (443/1985), which has been issued by the Greek Government in order to protect the petrified forest and ensure its proper management, five terrestrial and marine areas, where fossil accumulations are found, as well as all the isolated fossils located within the area of 37,50 acres, were declared Protected Natural Monument. Major exposures of the fossilised forest are located in the districts of Sigri, Megalonissi, Palia Alhonia and the greater area of Antissa and Eressos. Isolated exposures exist in the districts of Polichnitos, Rougada, Molyvos, Akrasi, Plomari etc.



Fig. 9. Standing fossilized tree trunk (*Taxodioxylon gypsaceum*) with excellent preservation of the morphological features and the structure of the wood. Lower Miocene (20.000.000 B.P.) (Identification: Prof. E. Velitzelos).

The Petrified Forest of Lesvos represents a complete, autochthonous forest ecosystem. This can be inferred from the high proportion of upright petrified tree trunks with well preserved roots in the fossilised soil. The fossilised forest was preserved due to favourable fossilisation conditions from a forest which existed on the north- west part of the island and it was

developed during the time period of the end of the Upper Oligocene to Lower - Middle Miocene (ca. 20-15 million years before present) in contrast to most of the well known fossilised forests on Earth, which were developed in earlier geological periods. The composition of the fossil flora is characterised by the high proportion of angiosperms (flowering plants) and gymnosperms (conifers) and the low proportion of Pteridophytes (ferns). The formation of the petrified forest is directly related to the volcanic activity in the greater area of Lesvos. During periods of intense volcanic activity, lava, pyroclastic materials and volcanic ash covered the vegetation of the area. Along with the volcanic activity hot solutions of silicon dioxide covered the tree trunks. The fossilisation was perfect, so the morphological characteristics of the tree trunks such as the annual rings, barkers, as well as the internal structure of the wood, are all preserved in excellent condition. Further research will provide more scientific data concerning the stratigraphy, paleoecology and paleogeography of the Southeast Mediterranean.

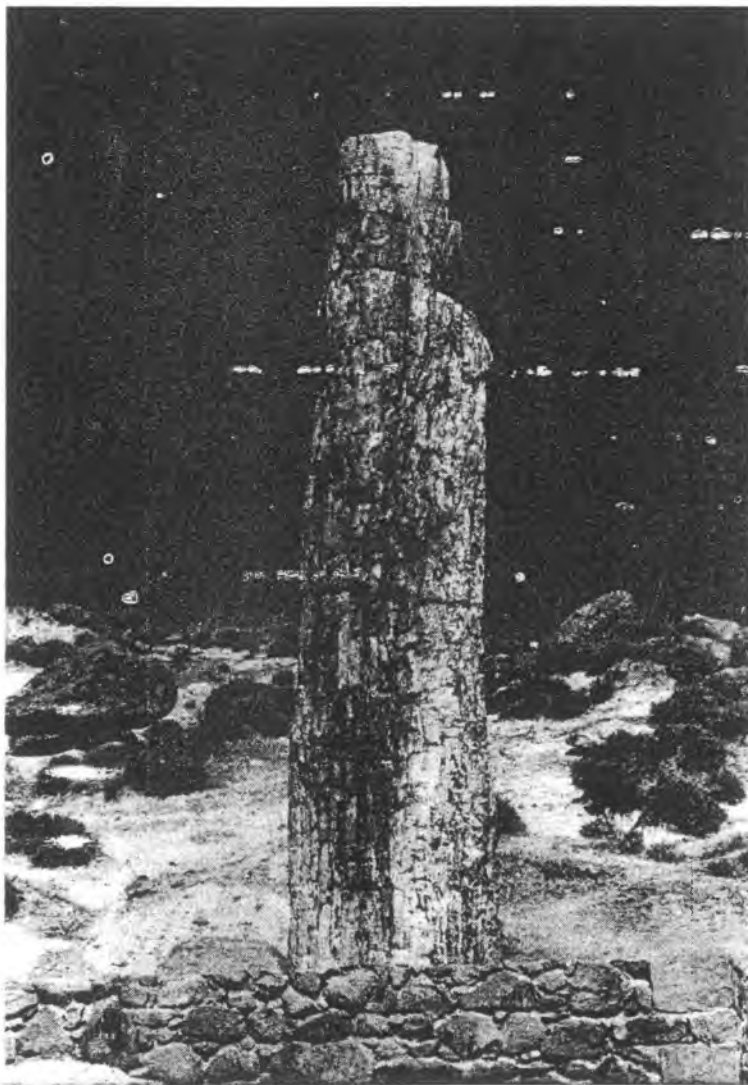


Fig. 10. Standing fossilized tree trunk (*Taxodioxydon gypsaceum*) exposed by natural erosion of the volcanic rocks. It is a precursory form of the modern species *Sequoia sempervirens* (identification: Prof. E. Velitzelos).

The Paleoflora developed during the Tertiary, approximately 20-15 million years ago, under subtropical or warm temperate seasonal climatic conditions. The flora includes Gymnosperm (such as *Pinus*, *Taxodioxyton gypsaceum*, *Pinoxyton*, *Cedroxylon lesbium*) and Angiosperm (such as *Alnus*, *Carpinus*, *Populus*, *Quercus*, *Platanus*, *Laurus*, *Cinnamomum*, *Palmoxylon* etc.

LESVOS ISLAND MINERAL WEALTH

Introduction

Several important minerals and rocks have been described from Lesvos Island. Among them, mixed sulfides, kaolin, perlite and magnesite were under exploitation in the past. Other materials such as calcareous diatomite, zeolitic tuffs, bentonite, opal, lignite and chromite occur in such small amounts that their exploitation is not presently possible. Currently, industrial clays and reddish lava used as building blocks are extracted from the areas of Vatera and Thermi respectively. Recent research projects on gold mineralization have shown that there exist promising areas for gold a possible exploitation.

· **Mixed sulfides**

Quartz veins containing mixed sulfide mineralization such as galena, sphalerite, pyrite and chalcopyrite occur near Thermi and Argenos villages in the eastern and northern part of the island respectively. Silver and gold enrichments are recently reported associated with these sulfides. Some representative samples extracted from the areas above are included in the **Natural History Collection** in Vrissa.

· **Gold**

An epithermal gold deposit occurs near Megala Terma. Gold enrichments occur in chalcedony/quartz veins associated with silicified volcanic rocks of andesitic composition. The area is currently under exploration by private mining companies.

· **Kaolin**

The hydrothermal activity has altered the volcanic substrate in two distinct areas, namely near the villages of Petra in the northern part of the island, and Mesotopos in the western part of the island, forming irregular masses of kaolin, hosted in lava and tuffs. The white color of the kaolin is locally turning to reddish-yellowish, because of its iron oxides-hydroxides content. In the past, a selective mining of the best quality kaolin were performed. At present, IKA Cement Company have tested the material for uses in the white cement, but the results are not promising because the iron oxide content of the bulk samples is undesirably high. Some representative samples extracted from the areas above are included in the **Natural History Collection** in Vrissa.

· **Magnesite**

Veins up to 5 m thick of massive magnesite occur in the southern part of Kalloni bay, between Vassilika and Polychnitos villages. Magnesite has a pure white color and is hosted in greenish-brownish serpentine rock. According to the literature, some magnesite bodies of the area have undergone exploitation in the past. Some representative samples extracted from the areas above are included in the ***Natural History Collection*** in Vrissa.

· **Lignite**

In NW Lesbos, near Antissa village, small lignite seams occur, hosted in Pliocene marlstone of lacustrine origin. Small exploitation was in progress during the 2nd war world, but the limited reserves make the deposit not exploitable today. Some representative samples extracted from the areas above are included in the ***Natural History Collection*** in Vrissa

· **Opal**

Small veins or irregular nodules of white to greenish-bluish opal occur in Mesotopos in association with the kaolin deposit of that area. Even though the greenish-bluish color of the opal is exiting, the absence of big opal bodies makes the deposit of no commercial interest. Some representative samples extracted from the areas above are included in the ***Natural History Collection*** in Vrissa.

· **Zeolite (clinoptilolite) tuff**

In the northeastern part of the island, near Klio village, a green yellowish tuff has been transformed to zeolitic tuff. It is mainly consisted of clinoptilolite and secondarily by feldspars and quartz. Eventhough the tuff is very rich in zeolite (clinoptilolite), the possibility of its exploitation is very limited, due to the limited reserves of the material. It could be used only locally as soil amendment, especially in greenhouse plantation. Some representative samples extracted from the areas above are included in the ***Natural History Collection*** in Vrissa.

· **Calcareous diatomite**

It is recently discovered that the marlstone of Vrissa-Vatera-Polychnitos area contains some intervals that host cylindrical and disk-shaped diatom frustules of lacustrine origin. Most of the diatoms have been dissolved due to high heat flow rates that exist in the geothermal field of Polychnitos. As a result, black ?orcelanite nodules are formed, mainly consisted of opal-CT

are included in the ***Natural History Collection*** in Vrissa.

· **Perlite**

It has been reported that perlite occurrences are located near the village of Skoutari, and in the way from Kalloni to Molyvos villages. There is not any mining activity on the perlite deposit so far.

· **Bentonite**

Bentonite occurrences are referred from Vassilika area. In that area, glassy tuffs are altered to bentonite in an alkaline environment. The area is under exploration by Greek private companies.

· **Chromite**

Near the village Lampou Myli in central part of the island, small chromite occurrences have been reported as disseminated grains in serpentine rock. The reserves are very limited and there is not any suggestion of exploitation of that mineral.

· **Nickel iron ores**

Near Vrissa village, a small occurrence of Ni-iron ore has been reported in the past, having nickel content of less than 1%. The reserves of the deposit are assumed to be extremely low, so any thinking of possible exploitation is excluded.

· **Industrial clays**

Near Vatera coastline, a private company is extracting brick clays for the local market. The material is a claystone of Neogene age and is mainly composed of illite, chlorite, quartz and feldspars. Minor amounts of smectite and carbonates also occur. Environmental reasons and the limited reserves are predictable factors for the expansion of the company' s activities.

· **Building stones**

Near the village of Thermi, a pinky volcanic rock is quarried as building stone. The market is currently confined within the island, but it could be expanded to more wide markets by making an Techno-Economic assessment.

THE THERMAL SPRINGS OF LESVOS

Yera Bay

Water temperature 39.7 C.. Radioactivity 1.8 units. Recommended for rheumatism, arthritis, kidney and gall gravel bronchitis, gynecological complaints, etc. Separate public baths for men and women.

Polichnitos

Water temperature 76-91 C, the hottest in Europe. Saline. Radioactivity 1.606 units. Suitable for rheumatism, arthritis, sciatica, gynecological and dermatological ailments.

Agios Ioannis Lisvoriou

Water temperature 69 C. Saline. Radioactivity 2.6 units. Separate public baths for men and women. Recommended for rheumatism, arthritis, sciatica, neuralgia, kidney and gall gravel, gynecological complaints, etc.

Eftalou

Water temperature 43.6-46.5 C. Radioactivity 14.7 units. Saline. Appropriate for rheumatism, arthritis, sciatica, neuralgia, kidney and gall gravel, gynecological complaints, etc.

Thermi

Water temperature 49.9 C. Ferrous. Radioactivity 0.8 units. Recommended for the treatment of rheumatism, arthritis, gynaecological ailments, kidney ailments, digestive disorders, neurological ailments, hardening of the arteries, etc.

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