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UPPER JURASSIC - LOWER CRETACEOUS "MOLASSIC-TYPE" SEDIMENTATION IN THE WESTERN PART OF ALMOPIA SUBZONE, LOUTRA ARIDHEA UNIT (NORTHERN GREECE)

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ABSTRACT

The metamorphic basement of the Aridhea Loutra Unit {Almopia Subzone} is followed by two thick -molassic type- siliciclastic transgressive series of Upper Jurassic-Lower Cretaceous age. In the Northwestern coarse-grained series, the following members are dinstinguished:- Ophiolitic conglomerates "transgressive basal unit".- Reef limestones with Corals of Upper Jurassic age , marking the first clastic-carbonate, transitional episode.- Quartzitic breccia, accumulated during episodes of high discharge in marine environment.- Quartzitic sandstones and mudstones.- Neritic limestones with Foraminifera and pollen of Late Aptian - Middle Albian age represent the second clastic-carbonate, transition episode.

ΠΕΡΙΛΗΨΗ

Πάνω στο μεταμορφωμένο υπόβαθρο της ενότητας Λουτρών Αριδαίας, κάθονται με επίκλυση, δύο μολασσικού τύπου - παχιές πυριτοκλαστικές σειρές, ανωκρητιδικής - κάτω ιουρασικής ηλικίας. Στη βορειοδυτική αδροκλαστική σειρά, διακρίθηκαν οι παρακάτω σχηματισμοί: - οφιολιθικά κροκαλοπαγή "κροκαλοπαγή βάσεως" - Υφαλογενείς ασβεστόλιθοι με κοράλλια, ηλικίας Ανώτερο Ιουρασικό, που δείχνουν το πρώτο κλαστικο - ανθρακικό μεταβατικό επεισόδιο. - Χαλαζιακά λατυποπαγή, που συσσωρεύτηκαν κατά τα επεισόδια μεγάλων εκφορτίσεων. - Γυρεόκοκκους, ηλικίας Ανώτατο 'Απτιο - Μέσο 'Αλβιο, που εκπροσωπούν το δεύτερο κλαστικο-ανθρακικό, μεταβατικό επεισόδιο.

GEOLOGICAL SETTING

The Almopia Subzone forms the western part of Axios Zone and it extends between the Pelagonian Zone and the Paikon Subzone [Mercier 1966d]. The northern part of the Almopia Subzone, which corresponds to the Voras mountain from W to E is formed of the following units:- The "Aridhea Loutra {Pozar}" Unit {Mercier 1966d}- The "Anna {Ano Peternik}" Unit {Mercier 1966d}- The "Kakourou-Livadia" Unit- The "Garefi Ophiolitic Window" Unit {Migiros & Galeos 1990}. The "Aridhea Loutra" unit{Fig.1}includes:

- A thick {more than 1000 m} metamorphic {greenschist phase} and multifolded basement {Mercier 1966b, Mountrakis 1976,1985, Migiros & Galeos 1990} on which the ophiolite displacement took place, during the Upper Jurassic obduction.

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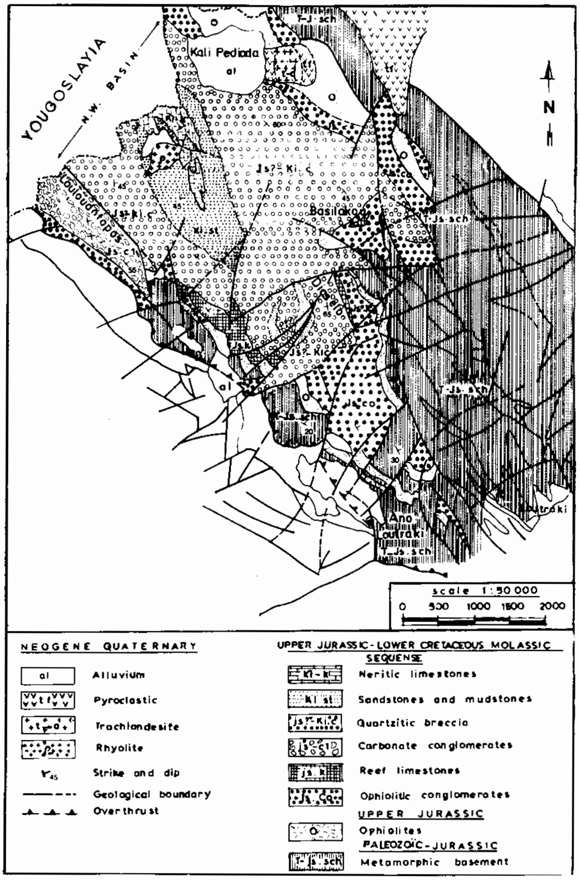

Fig. 1: Aridhea Loutra Unit

The lower part of the basement consists of a metasedimentary series, principally composed of gneisses and greenschists, with thick lenticular marble intercalations. The age of this lower part is possibly Paleozoic-Triassic {Mercier & Galeos 1988, Migiros & Galeos 1990, Stais & Ferriere 1991, Galeos 1994}.

The upper part gradually passes to a pelagic, volcano-sedimentary series, consisting of prasinites and metabasites, of Triassic{?}-Jurassic age {Migiros et al.1986}.

-The ophiolites are represented as lenticular tectonite intercalations into the upper layers of prasinites-metabasites, with a maximum thickness of 200m. The lower part of the ophiolites consists of serpentinised harzburgites,whereas at the upper part outcrop dunites of a pseudoconglomeratic texture, with chromite schlierens {Mountrakis 1976 Mercier & Galeos 1988, Galeos 1994 }. The obduction of the ophiolites took place during the Upper Jurassic first tectonic phase JE1, followed by a greenschist phase metamorphosis {Mercier 1961, Tsoutrelis-Chiotis 1973, Mercier et al 1975, Vergely 1977,1984, Katsikatsos 1992, Ferriere et al 1991}. These ophiolitic relics {mantle} in the upper part of the metamorphic basement {oceanic crust}, confirm that the subduction to the East of the "Almopia ocean" was underneath the oceanic crust { Tsoutrelis & Chiotis 1973, Boillot 1977, Vergely 1976,1984, Ferriere et al 1991, Katsikatsos 1992}

- Two thick siliciclastic -molassic type- series of Upper Jurassic-Lower Cretaceous age, lay transgressively on the ophiolites and the metamorphic basement: a northwest coarse grained and a northeast fine-grained series accordingly.

The "Aridhea Loutra" Unit thrusts towards the West on the Cretaceous limestones and the flysch of the Pelagonian Zone,whereas towards the East is thrusted by the "Anna" Unit.

DESCRIPTION OF THE GEOLOGICAL SECTION

In the present paper the NW transgressive coarse grained silisiclastic series of "Aridhea Loutra" Unit is studied {Mariam's clastic formation, Mountrakis 1977, Galeos 1994} . This forms a syncline of SE-NW direction, deeping towards NW in Yugoslavia .On the Greek territory it extends from the village of Ano Loutraki up to Kali Pediada parallel to the syncline axis, of about 8 Km long, occupying an approximate surface of 20 Km2. The sequence has suffered a very low grade metamorphism and a deformation {pebbles have been compacted and oriented parallel to the stratification}, which probably took place on an early Cretaceous or Tertiary tectonic phase JE1b,CT1,CT2 {Mercier & Vergely 1972,1977, Katsikatsos 1992}. Towards the syncline's centre the studied sequence reaches an average thickness of 2000m {Fig.2}, and is distinguished from bottom to top into five petrographic formations :

- Js.co:ophiolitic conglomerates reaching a thickness of 300 m.
- Js.k:reef limestones ranging from 0,5 up to 150m.
- Js?-Ki.c:quartzitic breccia of an average thickness of 800m.
- Ki.st:quartzitic sandstones-siltstones of a thickness of 500m.
- Ki.k:neritic limestones with maximum thickness in the range of 150m.

- Ophiolitic conglomerates {Js.co}

The ophiolitic conglomerates derive from the weathering of the subjacent ophiolitic complex interpreted as fragments of ocean crust and mantle, and overlay transgressively the prasinites and metabasites of the volcanosedimentary series and the ophiolites, and represent "the trangressive basal unit".

The ophiolitic conglomerates start with serpentinitic components.The main matrix consists of serpentine {antigorite}, talc, actinolite and chlorite. Towards the top the composition of the matrix changes by the addition of calcite.Moreover in the upper part lime pebbles are observed. The ophiolitic conglomerates,due to their stratigrapic position are also considered to belong to the Upper Jurassic. This involves that during the Late Jurassic - Lower Cretaceous tectonic phase JE2a, the western metamorphosed margin of Almopia's ocean was transformed into a small oblong sea-trough, in which a molassic-type sedimentation took place on the back side of the Pelagonian orogenesis, during the first tectonic Upper Jurassic phase JE1 {obduction of Almopia's ocean ophiolites}{Mercier et al 1975, Vergely 1976, Mercier & Vergely 1977, Vergely 1979}.

This sedimentation was simultaneous with the transgressive Upper Jurassic series of the Pre-Peonia Subzone{Pre-Pa¥kon, Katsikatsos 1992},onto the Paikon ophiolites, as appears in the units of Guevgeli, Oreokastro, Vafiochori, Kastro {Artzan},with ophiolitic conglomerates, sandstones and coral lime intercalations of Portlandian Age {Kossmat 1924, Mercier 1966a, 1966d, Mercier & Bebien 1977, Katsikatsos 1992}. These transgressive, Upper Jurassic series of the Pre-Paikon Subzone, correspond also to molassic type sediments accumulated in the rear side of Paikon orogenesis [obduction of the marginal {Peonia's}oceanic basins ophiolites].

Reef limestones {Js.k}

On the ophiolitic conglomerates formation, patch reefs {Diasello limestones Mountrakis 1977}, have developed, marking the first clastic-carbonate transition. They constitute two microfacies types, predominantly consisting of Corals, Sponges and Algae. The determination of the Corals species: Comophylia polynomorpha, Fungiastraea arachnoides, Dermosmilia laxata and Placophyllia dianthus, attributes an Upper Jurassic age to this formation. {see below: paleontological description}.

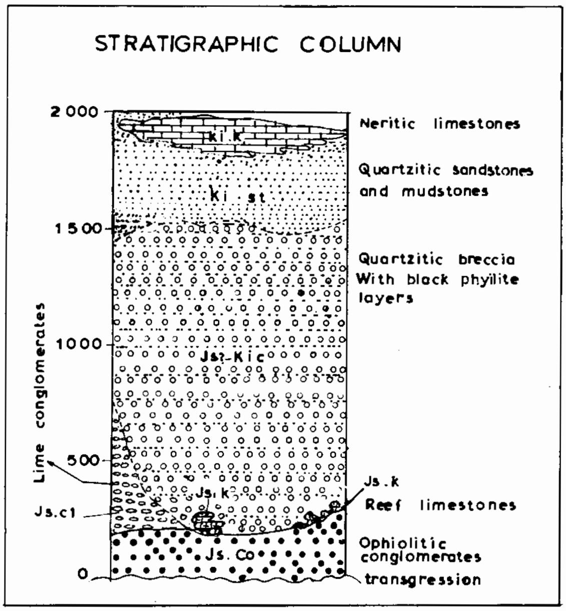

Fig. 2: NW Upper Jurassic - Lower Cretaceous Molassic Sequence

- The first reef microfacies occurs at the southwestern part and is characterized by differential blackening of the coral chambers, whereas the skeletal material has been either recrystallized or dissolved and filled by black spar. Blackening is attributed to blackening substances, including silt-sized clastic material {quartz, calcite, clays}, infiltrated by percolating waters, as well as to iron sulfides. According to {Strasser 1984} differential blackening is dependent on primary mineralogy and crystal size, as well as on porosity and permeability changes. Black substances {iron sulfides} derive from decayed organic material {terrestrial plants e.t.c.}, that resisted to disintegration and oxidation, probably due to neomorphism of aragonite to calcite, in an anoxic-alkaline microenvironment {Strasser 1984}.

- The second microfacies type occurs at the eastern part and is characterized by abundant infiltrated ophiolitic grains of silt to fine sand size, both in the matrix and the coral chambers. Both coral microfacies types have been strongly recrystallized and show evidence of very-low metamorphism. Finally, the primary sedimentary facies have been replaced by a granoblastic texture, whereas along microstylolites saddle dolomite crystals concentrate. Only echinoderm fragments survive over recrystallization and remained unaltered. In places megaquartz crystals have been developed, which tend to be calcitized. The primary mineralogy is evidenced by tiny inclusions preserved in the crystals interiors. By low-grade metamorphism coral skeletons are replaced by radially arranged laths of actinolite partially or wholly calcitized. Moreover dispersed amphibole rhombs or laths start to develop in the surrounding matrix including tiny carbonate relics aligned along the crystal long axis. By progressive alteration, recrystallization and metamorphism, the whole sediment is replaced by micrite. Clays have been concentrated either along microstylolites or microfractures {neostriants}.

The ophiolitic clastic material has been eroded from neighbouring ophiolitic or ophicalcitic bodies, as well as from the underlain ophiolitic conglomerate formation. Ophiolitic grains comprise serpentinized peridotite rocks and ophicalcite. They include separate antigorite flakes,ophiolitic-ophicalcitic rock fragments and opaque crystals, forming concentrations along microstylolites.

The cement consists of micrite that shows evidence of being developed during subaerial exposure-pedogenesis. In places pedogenic micritization progresses furthermore tending to replace the clastic components.By progressive alteration and burial diagenesis, the whole sediment tends to be replaced by a characteristic net of parallel oriented fibrous micritic mats. The necessary carbonate may be has been provided through dissolution of the primary precipitated calcium carbonate skeletal material by meteoric waters and reprecipitated as microcrystalline cement.

Terrigenous sedimentation exerts a strong influence on coral community structure, as different coral species have different capacities for rejecting sediment {Ott 1975, Hubbard 1983}. However, recently it has been recognized that reefs can even survive in areas of significant terrigenous influx and turbidity. The ability of the reef to survive under unfavourable conditions, like those which provoke a sedimentation stress, is a seldom geologic phenomenon and suggests a dynamic control of the carbonate by the clastic facies and vice-versa. K.M. Acker and C.W. Stearn {1990}mentioned that the deep-water reefs of the northeast shelf of Barbados {35-40m depth} are relatively healthy despite the periodic influx of large volume of siliciclastic input from the sediment plume and the decreased light intensity, due to turbid water. Such references led to a challenge of the generally accepted view, that the growth of coral reefs is precluded by significant siliciclastic input {Santisteban and Taberner 1988}.

In the studied reef limestones of Almopia Zone, terrigenous sedimentation is considered contemporaneous with the developing reef growth, either during life or immediately after death, provoked by sedimentation stress. The intensity of terrigenous sedimentation is incompatible with reefs lying further, off-shore. Instead it favours the possibility of fringing reefs development in the inner continental shelf, being in between the zone of rivers output {Johnson & Risk 1987}.

Quartzitic breccia {Js-Ki.c}

Massive non-layered to thick-layered quartzitic breccia, in banks of 1-5m, cut by thick quartzitic veins, gradually overlies the ophiolitic conglomerates. The quartzitic breccia are intercalated with lensoid layers of sandstones and siltstones. They principally contain pebbles of quartzitic composition and in smaller amounts, prasinites, sandstones and ophiolites.

These are variable sized pebbles with diameter averaging from some mm up to 30cm, slightly rounded, compacted and oriented. The main matrix is composed of microcrystalline quartz, epidote, mica, chlorite, actinolite, biotite and in places calcite. Due to the high amounts of hematite, a characteristic deep purple colour is observed.

Towards the top, the quartzitic breccia formation passes gradually to lensoid layers of sandstones-siltstones, whereas towards the base the amount of the ophiolitic material increases and through a polygenic, multicoloured and characteristic breccioid formation with flattened pebbles, passes to the underlain ophiolitic breccia.

In the upper part of the quartzitic breccia formation, occurrences of thin black phyllite layers have been rarely observed, showing a pollen assemblage characteristic of the Upper Jurassic-Lower Cretaceous age {see Palynology}.The quartzitic breccias have , accumulated during episodes of high discharge in marine environments, with concomitant lateral and vertical accumulations {phase A}. Phase A corresponds to the begining of the extension and the creation of a paleotectonic trough {graben}.

To the western part of the studied syncline, between the basal ophiolitic conglomerates and the quartzitic breccia, a lensoid intercalation of lime conglomerates has been observed, that disappears, to the south, whereas to the north it reaches an average thickness of 500m. The lime conglomerates are characterized by compacted and clearly oriented pebbles and are considered to derive from subjacent marbles of the Pelagonian Zone by epi-sodic weathering.

Both quartzitic breccias and lime conglomerates formations are characterized by great thickness and big sized pebbles, which prove a strong rise of the Pelagonian Zone with a simultaneous change of flow direction.

Quartzitic sandstones-siltstones {Ki.st}

Towards the top the quartzitic breccia pass gradually to thin-medium layered polygenic sandstones-siltstones of variable granulometric composition. They are black in colour and are composed of calcite-sericite with feldspars and ophiolitic material. Towards the base they gradually pass to green marly sandstones, rich in Fe-oxides. The accumulation of quartzitic sandstones - siltstones suggests a gradual deepening of the basin. The clastic deposits derive from weathering of the schistogneiss basement of the Pelagonian Zone and the obducted ophiolitic complex. The marine origin of the previously described clastic formations is also suggested by the fact, that they are interfingered with marine facies.

Neritic limestones {Ki.k}

On the quartzitic sandstones-siltstones, towards the north of the syncline top, a fossiliferous neritic limestone occurs, subwhite-grey or reddish in colour and commonly breccioid, with pebbles of limestones marbles, compacted and parallel oriented. The main matrix is principally calcitic with admixtures of Fe-oxides and clay minerals. Towards the base, it gradually passes to black sandy fossiliferous limestones, alternating with black schisto-sandstones and siltstones. Two types of microfacies have been distinguished: pellet-supported packstones and biomicrudites with floating fine clastic grains.

The pellet-supported packstones consist of parallel to bedding pellets. Alignement created probably prior to compaction and due to vertical pressure loading, they have been realigned. The pellets vary both in size and form, suggesting probably an origin by physical reworking of sediments in near-shore shallow-shelf areas, contributing to the destruction and winnowing away of fecal pellets {Cuomo & Rhoads 1987}, rather than by chemical precipitation as high Mg-calcite peloids. Pellets are cemented either by micrite or microcrystalline sparite. Open cavities, dessiccation cracks, fractures aligned by clays {neostriants} and shell solution molds suggest influence of meteoric solutions and intermittent subaerial exposure during early diagenesis.

The second microfacies is characterized by a cement-supported fabric, with floating fine sand and silt-sized quartz crystals and muscovite flakes. Concentrations of this material is absorbed in intergranular pore space of molluscs. This texture suggests infiltration of the particles into pores, where they are stopped by expanding surfaces of crypto-microcrystalline calcite cement.

The cement was probably precipitated as Mg-calcite cement in marine environment and later neomorphosed. The above described clastic material shows clear evidence of transportation and gradation, suggesting a wave induced pumping, depending on microenvironmental parameters, within individual pore (Schroeder 1973, Meyers 1987).

Authigenic coarse quartz crystals have been observed including tiny calcite inclusions. Both clastic and authigenic quartz crystals have been partially calcitized. Calcitization is of displacive type, as it is evi-denced by the presence of expanded muscovite flakes. Both microfacies have suffered a very-low grade metamorphism and dolomite has grown principally along microstylolites. Neostriants filled with clays and blocky spar are common.

Both neostriants and displacive calcite suggest subaerial diagenesis. Both microfacies are rich in Nerineas, Bivalvs (fragments of Rudistes), Gastropods, Echinids, Brachiopods, Corals, Algae (Acicularia) and Foraminifera: Palorbitolina (Palorbitolina) lenticularis BLUMENBACH), Orbitolina (Mesorbitolina) pervia DOUGLASS (determination by ARNAUD - VANNEAU), Mesoendothyra? complanata ARNAUD-VANNEAU, Sabaudiaminuta (HOFKER) ,Vercorsella sp.,Lituolidae, Miliolidae. According to microfauna, the age of this level is Upper Aptian - Middle Albian.

The neritic limestones described have been deposited during or after the final stage of the clastic sedimentation and mark the second clastic-carbonate transition episode, that suggests a relative sea-level drop. On the other hand,the lensoid pattern of the formations may be is attributed either to the anomalous paleotopography of the Almopia's basin, that permitted only the local growth of lagoonal conditions or to the strong weathering of the formation.

The above northwestern coarse-grained siliciclastic series of Aridhea Loutra Unit, has got all the characteristics of a typical molasse because:

- it corresponds to a post-orogenic phenomenon, which started from the Upper Jurassic paroxysmal tectonic phase JE1 with the obduction of ophiolites, and continued up to Lower Cretaceous (Aptian).
- it is composed of clastic sediments deposited in a small, parallel to the mountain-chains, narrow trough.
- the clastic material has been carried by the destruction of the mountain-chains, starting with the weathered obducted ophiolitic components.
- it is a very thick, non-cyclic and poor-sorted clastic sendimentation, including various facies. - it is layered with transgression and discordance on the metamorphic basement of the Aridhea Loutra Unit.
- the facies are neritic to offshore
- it remains on its substratum (metamorphic basement of Aridhea Loutra Unit) and thrusted with it.

According to the above characters, the studied clastic sedimentation is considered to be of molassic type (Van Houten 1973, Katsikatsos 1992). Previous authors refer to a jurassic molasse (Kossmat 1924, Migiros et al. 1988, Muller et al. 1991). For the same siliciclastic sequence Mountrakis 1976 kept the term clastic series.

PALEONTOLOGY

1. MACROPALEONTOLOGICAL DESCRIPTION OF THE REEF LIMESTONES

- ANTHOZOA

Placophyllia D'ORBIGNY
Dermosmilia KOBY
Comophyllia D'ORBIGNY
Fungiastraea ALLOITEAU

Determined Corals are attributed into two suborders: Faviina and Fungiina.

Short description of species

- *Placophyllia dianthus* {GOLDFUSS}

Distribution: Kimmeridgian of Germany, Portugal. Tithonian of CSR.

- *Dermosmilia laxata* ETALLON

Distribution: Oxfordian of Switzerland, Poland. Kimmeridgian of Spain. Oxfordian-Kimmeridgian of Germany, Slovenia, Tithonian of OSR.

- ? *Comophyllia polymorpha* {KOBY}

Distribution: Oxfordian-Kimmeridgian of Portlandian, Romania. Kimmeridgian of Spain. Very similar in form and dimensions is the species "Ellipsocoenia" lobata Beauvais 1972 from Upper Oxfordian Domvrena marble in Koronia, Beotia, Greece, which differs in having completely compact septa.

- ? *Fungiastraea arachnoides* {Parkinson}

Distribution: Oxfordian-Kimmeridgian of Portugal, Slovenia.Oxfordian of France, Poland, England. Kimmeridgian of Spain, Germany, Romania. - *Spongiomorpha sp*

Stratigraphical comparison of determined Coral species

From Greece only few Upper Jurassic Corals so far have been Known. There are three papers concerning these fossils: - 9 coral species are described from Upper Oxfordian " Domvrena marble " in Beotian Province{Beauvais 1972}, 18 species from Kimmeridjian unit Miamou on Grete {Bonneau & Beauvais & Middlemiss 1974}, and 3 species from probably Kimmeridgian of Argolide {Alloiteau & Dercourt 1966}. None of these species are identical with Almopias ones.

The determined Coral species have so far been found in several localities of Europe: England, France, Germany,Poland, Romania, Portugal, Spain, Slovenia, also in Azerbajdzhan. In all known places their age is Upper Oxfordian and Kimmeridgian. {Beauvais 1964, Turnsek 1972, Roniewicz 1976, Rosendahl 1985, Husanov 1987, Errenst 1990,1991}.Anyhow, two species in Sttramberk in CSR were attributed to the Tithonian age {Geyer 1955, Eliasova 1976}. So it is concluded that the Corals of Almopia zone in Northern Gree-ce can belong to any of the Malmian stages, their point of intersection being, however,Kimmeridgian.

Paleoecology

From the paleoecological point of view all Coral species found are colonial of massive or branching forms. If they are allochtone, they are considered to be reef building organisms, typical for shallow water environments. They build either smaller patch reefs in back reef areas or barrier reefs on the borders of the carbonate platforms.

In comparison with Slovenian Upper Jurassic coral localities the genera as Dermosmilia, Fungiastraea, and Placophyllia were found in central reef and in the back reef area of the Dinaric Carbonate Platform {Turnsek 1972}. In Spain Fungiid Corals build special "Microsoleniden-biostromkalk" which is proposed to be the pioneer settler of area in deeper lagoon environment {Errenst 1990}. Coral reef structures of every area depend also on the local tectonic events.

2. PALYNOLOGY

The palynological analysis revealed an interesting palynoflora of continental and marine origin. The recovered microfossils from the examined samples are considered as two assemblages. A total of 24 species has been distinguished, the identified microflora contain Pteridophytic Spores, Pollen and Dinocysts.

- The first assemblage, which is included in the black phyllite layers {Js-Ki.c}, is represented by a poor microflora of smooth trilete forms, Gymnospermous pollen grains include *Classopollis sp., Inaperturopollenites sp. and Araucariacites sp.* Saccate pollen are rare and no true angiospermous pollen grains are encountered. Also this assemblage include *Cyathidites minor, Cycadopites sp., Eucommiidites minor, Ephedripites sp.*associated to the Dinocysts, as *Dinogymnium sp., Chytroeisphaeridia pococki.* A comparative study of the prenoted microflora with those recorded from the equivalent horizons in other regions suggest similarities to the Upper Jurassic-Lower Cretaceous associations.

- In the second assemblage, neritic limestones, {Ki.k} the spores are mainly represented by smooth trilete forms also, Gymnospermous pollen grains common genera identified, include *Classopolis sp.,Inaperturopollenites sp, Araucariacites sp* Saccate pollen, assigneded to *Pityosporites* are sporadic. Three genera of Pteridophyts are found to be abundant: *Triplanosporites sp., Gleicheniidites senonicus* and *Concavisporites sp.* Common genera identified, include *Cyathidites minor, Cycadopites nitidus, Araucariacites sp., Classopollis torosus, Classopollis sp. Rare genera as Encommiidites minor, Inapeturopollenites giganteus, I. dubius and Ephedripites sp.,* constitute about 10% of the total microflora.

Therefore, evidence for the age of this palynological assemblage includes:

- a. persistent presence of *Classopollis, Eucommiidites, Appendicisporites* and *Ephedripites*. These species are very common in Early Cretaceous but rare in the Late Cretaceous of Europe.

- b. infrequent occurence of *Tricolporopollenites, Multiporopollenites* in association with *Psilotriletes.*

- c. dominance of Dinocyst as *Oligosphaeridium complex, Epelidosphaeridia spinosa, Achomosphaera sagena, Tenua eisenackii, Aldorfia deflandrei, Dinogymnium sp.*

The Dinocysts associated in this assemblage are diversified and show similarities to late Albian assemblages described from England, France, Northwest Africa and the neighbouring countries.

However the morphotypes and stratigraphic interest are *Epelidosphaeridia spinosa, Achomosphaera sagena* and *Achomosphaera deflandrei. Achomospaera sagena* is common in the Cenomanian of England {Davey & Williams 1966}, France {Foucher 1979} and other offshore drillings of North America {Below 1984, Masure 1988}. *Epidosphaeridia spinosa* is used to delineate the early Cenomanian {Bujak & Williams 1978} in Canada, but in France appears in the

Albian {Fauconnier 1983}. *Achomosphaera deflandrei* is well know in the Vraconian {Masure 1984}.

Occurence of these species suggest a Late Albian to Early Cenomanian age. Moveover, an Albian dating is suggested for the neritic lime lenses on the basis of the foraminiferal evidence.

The presence of spores and pollen in association with scattered occurences of marine forms {Foraminifera and Dinocyst}, suggests than the Cretaceous sediments of Aridhea Loutra area, are of marginal facies. The persistent occurence of *Classopollis,* pollen in the associations indicate a near shore deposition under dry climatic conditions {Pocock & Jansonius 1961, Saad & Ghazaly 1976, Srivastava 1978}, concluded that plants producing *Classopollis*, preferred coastal areas and warm climate of transgessive sea {Sultan 1986}.

CONCLUSIONS

The Aridhea Loutra Unit consists the key for clarifying the pre-Cretaceous events in the area occupied by the Almopia Subzone. The following facts have been presumed:

- In the lower part of the Aridhea Loutra metamorphic basement, the prerifting-rifting Paleozoic?-Trias metasediments have been recognized, as well as the oceanic crust of Trias?-Upper Jurassic age, in the upper part, consisting of volcano-sedimentary series, prasinites and metabasites.
- The subduction to the East of "Almopia's ocean" was underneath the o-ceanic crust, as it is confirmed by the presence of ophiolitic relics in the upper part of the Aridhea Unit metamorphic basement.
- In the narrow trough of Aridhea Loutra Unit, behind the Pelagonian orogenic mountain chains, molassic type sediments have been accumulated during Upper Jurassic - Lower Cretaceous age.
- Molassic sedimentation of the western margin of Almopia Subzone was simultaneous with that of the western margin of Peonia Subzone {Pre-Paikon}.
- Uplift and strong relief of the Pelagonian platform in front of the Almopia Subzone, is suggested by the lack of ophiolites in the eastern margin of the Pelagonian Zone and the high quantity of quartzitic material and marble pebbles. Both the metamorphic basement and the obducted ophiolites, have suffered intensive weathering providing thick molassic type sediments in the Aridhea Loutra trough.
- Patch reefs have developed on both sides of the ophiolitic conglomerates formation, simultaneously with terrigenous sedimentation, indicating a dynamic control of the carbonate by the clastic facies {first clastic-carbonate transition episode}.
- Reefs at the eastern part are characterized by abundant infiltrated ophiolitic grains, indicating the ability of the reef to survive under unfavourable conditions, like those which provoke the sedimentation stress.
- The reef building organisms were Corals of an Upper Jurassic {Kimmeridgian-Oxfordian}. Several coral species have been recognized, most of them for first time in Greece {from the disponible refferences to date}.
- The neritic limestone contains a rich Foraminifera fauna of Late Aptian - Middle Albian age.

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