İskenderun Neojen Havzasının Stratigrafisi (Özet)

A. ten DAM

iskenderun Neojen havzasına ait olan bu etüd bölgedeki çalışmalarm kısa bir tarihçesini verdikten sonra sahada 1300 metre ter lar deniz Mioseni ve 1200 metre kadar da Karasal Pliosenin mevcu-jiyëti zikredilmektedir. Miosen sedimarilarının çöken bir havza i-•ire kenarlarında kumtaşları ve basenin ortasına doğru kil ve kumaşı ile nihayet marnai olarak teressüp ettiklerine işaret edilmekte-jir. Kenarlarda görülen kumtaşlaranm hazne taşı ve ortadaki marnaarın ana taşı vazifesini! görebilecekleri ve kumtaşları basenin ortama doğru incelip kaybolmadıkları takdirde teraküm kabil olacağıı söylemiştir.-^ Havzanın serpantinleşmiş ofioliit sahalariyle çevril-!i|i ve bunların üzerinde görülen kalkerlerin bir Lithotamniüm ve: ilercan resifi olduğu[fc;] ve founüaran Miosenüı kaidesini teşkil et-jiyerek basenin ortalarında teşekkül eden bütün sedimanlara tekaüt ettiği illeri sürülmektedir. Ofidlitlerle bahsedilen resifü kalkerin emas satıhları normal olarak görülen yerlerde resifli kalkerin içinle serpantin çakılları müşahede edilmiştir. Bu resif kalkerleri az bir satıh üzerinde değill ilvicaclı bir transgresiyon sathı üzerinde şekül ederken basenin diğer taraflarında mili kumpasları ve mamır hemen inkıtasız bir surette çökmekte olan basenin içinde teresip etmişlerdir.

Miosen sedimantasyonu sonunda altere marnlar ve killer üze-?mde ıgörüıeri *bâc* itikal satha üstünde Karasal Pliosen teressüpeni gelmektedir. Her nekadar bu sahraların yaşı fosillerle tesbit elememiş ise de yeni bir sedimantasyon devri başladığı aşikârdır. Kosen sedimanlarmm oldukça büyük bir kakniık göstermesi deniz ekildikten sonra basende bir miktar çökmenin, vaki olduğuna işaret Sinektedir.

Pliosen konglomeralar ve milli kumlardan mürekkep olarak tik bir sel vadisi teressübüdür. Konglomeralarda ofiolitik unsurlar ffülür. Serinin üstünde bir kaliş zonu müşahede edilir.

Pliosen ve ekseriya Miosen tabakalarına genç mil, kumtaşı,.

konglomera ve kaidşden. mürekkep sel vadisi teressüpleri örter. Bazı yerlerde bu genç sahralar teile meyilli olmaları tektonik hareketlerin son zamanlara kadar faal olduğunu göstermektedir.

Miosenin başlangıcından itibaren basenin etrafında mavimsi marnlar ve kumtaştarı teressiip ederken sahil yakınlarında da Lithothamnium resifleri transgresiyonla beraber gittikçe sahile yaklaşarak teress-üp etmekte idi. Nihayet basenin çökmesi sona ererek şurada burada gölcükler hasıl oldu ve marnla jipslerle masiv jips tabakaları teşekkül etmeğe başladı. Çökmedeki bu tevakkuf sahayı çevrdiyen ofiolitik sahraların yükselmesinin daha evvel başlamış olduğuna ve yükselme Pliosen iptidalarında âzami hadde vardığına işaret etmektedir.

Çengen 1 ve 2 numaralı kuyularda rastlanan mikrofosillerin etüdünden bunların tipik Miosen mikrofonası oldukları ve Miosenin altından üstüne kadar devam ettikleri görülür. Basenimizde Oligosene veya daha eski bir devre ait fosil bulunmamıştır. Pelajik mikrofonanin detaylı etüdü bunların topluluklar hallinde bir müşir ro lü oynamalanna imkân verebilir. Rastlanan mikrofonarun kısa bir incelenmesi neticesi olarak bunların Mısır, Cezayir ve Fas'da görülen mikrofonaya müşabih olduğunu göstermektedir.

Petrol emareleri Çengen köyünde Miosen kumlara içinde gaz emaresi de Ekver köyü civarında Yanartaş mevkiinde Serpantin içinde görülür. Ayrıca Çengen 1 kuyusunda da Miosen içinde bariz gaz tezahürüne rastlanmıştır.

SeEImentatiöM$_f$ Faciès and Stratigraphy in the Southern part of the Neogene Basîn of İskenderun

A *ten DAM*[1])

This is a study of the sedimentary and faciès conditions in .the Neogene of the southern part of the iskenderun basin. The oontinous doiAnwarping of this basin during neogene times resul ted in the accumulation of marine sediments of miocène age up to a thickness of 1800 meters and of continental sediments of probable pliocene age up to a ttMcJçness over , 1200 meters, It is possible that the deep neritic sediments of miocène age? towards the centre of the hasin, $n the form of blue marls or marly alay stone home constituted a sou/nce-fock for petroleum, whereas a part of the sandy banhs- in the shallow neritic fades towards the border of the basin may have constituted a reasonably good reservoir* H *rock. So it seems possible that there exists petroleum™accumulation in these sandy parts if favorable structures cam be discovered. The presence of petroleum in the miapene rocks is proven by the petroleumsee** pages .near the village of Ç eng en aind by the gas* seepages near Yanantaş» It is however probable that these sandstones amd sands wedge out too rapidly towards the centre of the basin, so that it will be impossible to find any sufficient]^ porous rocks in the parts of the basin where we might expect some favorable structures üthough it is possible that the sandy beds in the upper parts of the miocène, wedge out someiohat farther from the basin-border then the lower miocène sandstones. It must be excluded to expect {my aecomulaibion in the ireef -*[1] *limestofne of the Miocene? because those limestones are only to be found on the border of the basin, where they constitute a fringing eerf.*

1 — INTRODUCTION

This study was carried out in order to try to reconstruct the

[1]) Senior **Paieonto'lioigiiisit** «M. T". A. Institute; paper **presented** before **the session oif** the Geotogiiciail **(Soteiety of Turkey ön October 31, 1951.**

stratigmphifeal and sedimentary history of the Neogene in the Çengen-Arsuz area of the Iskenderun-toamn and finally to examine whether formation and accumulation of petroleum might have been possible in the sequence of Neogene sediments.

The part of the basin studied by the author is situated between Aşağı Çengen in the NE and the village of Kışlaçayı in the SW and comprises the zone of Neogene sedimentation in between the ophiolitic mountain - bloc of the Kazıldağ and the Gulf of iskenderun. The lengh of this part of the basin is approximately 25 km,. and the maximum breadth 9 km.

In order to be abte to draw a picture of the sedimentary and stratigraphicali conditions in this basin four type - sections have been measured, mapped and sampled in the southern part of the basin, We have been obliged to choose our sections in the southern part of the basin, because everywhere else we are sure that the Miocene overlies unconformaMy the premiocene basement, and is thrust against or over it, whereas in certain points in the southern part of the basin the contact between Miocene and basement is a normal one and not by fault. None of these sections showed faulting; of the Miocene beds so that we may expect a continuous section. Since sedimentery conditions seem to be identical in the northern and southern parts of the basin, it will have no effect on the general sedimentary picture, The type-sections are not described here in detafl, since all essential details will figure in the chapter on stratigraphy.

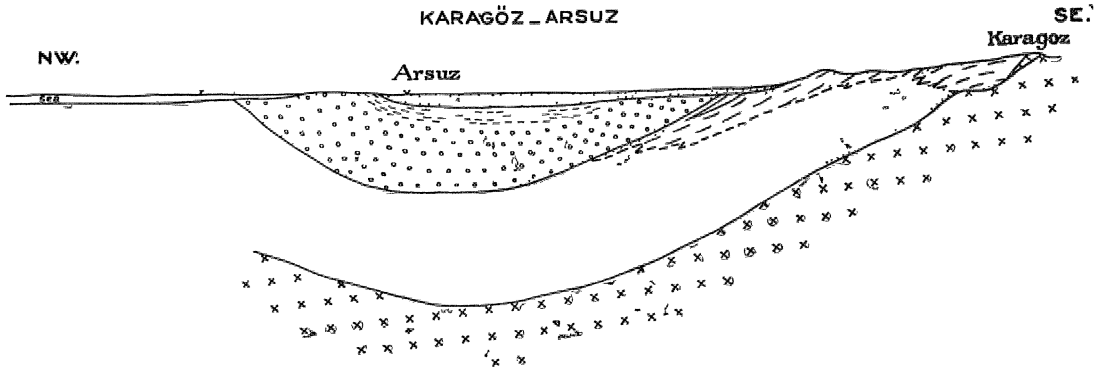
The fieldwork was carried out in the spring of 1951 on behalf of M, T, Â, Enstitüsü. The collected samples have been analysed in the Paleontoiiogical Laboratory at Ankara and have been compared with the results of the two deep test-wells that have penetrated the whole Miocene into the ophiolitic basement.

It has been impossible to incorporate In this study also the results of ‘a detailed analysis of the microfaunae, A rapid survey of the 'samples from the sections and from the two test-wells shows clearly that a detailed and scientific study of the miicrofauna© from the Miocene of the iskenderun basin wll give positive results for the correlation.

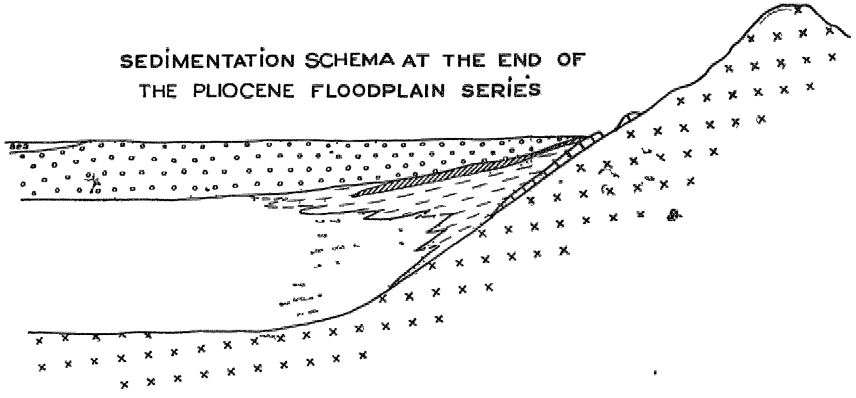
SCHEMATIC SEDIMENTATION HISTORY IN THE SOUTHERN PART of THE NEOGENE ISKENDERUN BASIN

Dr A ten Dam

SEDIMENTATION SCHEMA ALONG A SECTION KARAGÖZ - ARSUZ



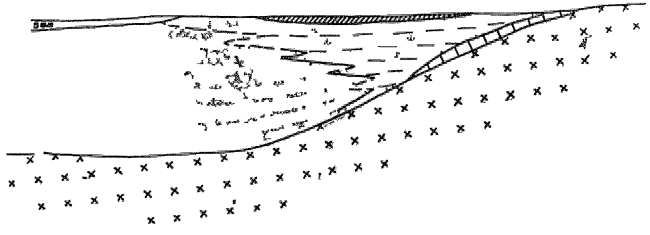
SEDIMENTATION SCHEMA AT THE END OF THE PLIOCENE FLOODPLAIN SERIES



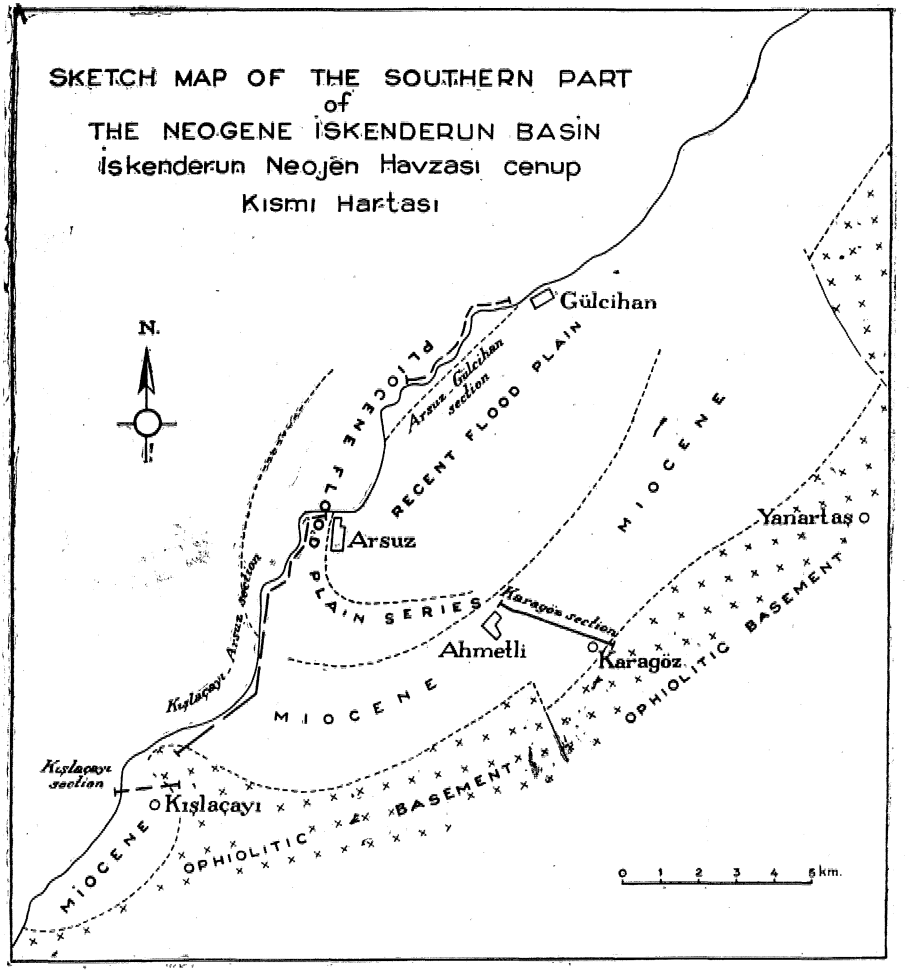
LEGEND

- *Recent flood plain series*
- Pliocene: *Lacustrine series*
- Pliocene: *Flood-plain series*
- *Gypsum*
- Miocene: *Silty-sandy formation*
- Miocene: *Marly-sandy formation*
- *Marly formation*
- *Reef limestone*
- *Ophiolitic basement*

SEDIMENTATION SCHEMA TOWARDS THE END OF THE MIOCENE



nal elaboration of the results have been carried out in close and cordial collaboration with Mr, Ziya KIRMAN, who was charged with the geological and tectonic study of the same basin.



II — HISTORY

Before going into details something has to be said about previous work in this region, as the area studied by the author has been the subject of several more or less detailed investigations by earlier authors.

Although Iraq Petroleum Company carried out some geological research in this area, nothing has ever been published about the results of these investigations.

The first publication concerning the iskenderun basin is from the hand of H. VAUTRIN (1933, Litt. 1). In his paper Vautrin gives a fairly detailed description of this basin and although he largely underrated the thickness of the neogene sediments and although he considered the different fades - units of the Miocene as stratigraphie horizons, his paper gives already a fair general picture of this area.

In 1940 D. B. ERIOSON (1940,Litt.2) prepared his report on the geology of Hatay, in- which he gives a detailed survey of the iskenderun basin. He did however not recognize the synclinal structure of the Arsuz-GüQcihan plain, the most striking character of the whole region and he did not understand the stratigraphie position of the reef-limestones along the border of the basin.

Finally in 1944 I. ORTYNSKI (1944, Litt. 3) made a detailed study of the area of Aşağı Çengen, only dealing with the direct neighbourhood of this village. His report does not enable us to draw a picture of the neogene sedimentary history of the iskenderun basin as a whole.

These few papers and reports constitute the entire written documentation on the. geology of the iskenderun basin although several geologists have visited this area occasionally.

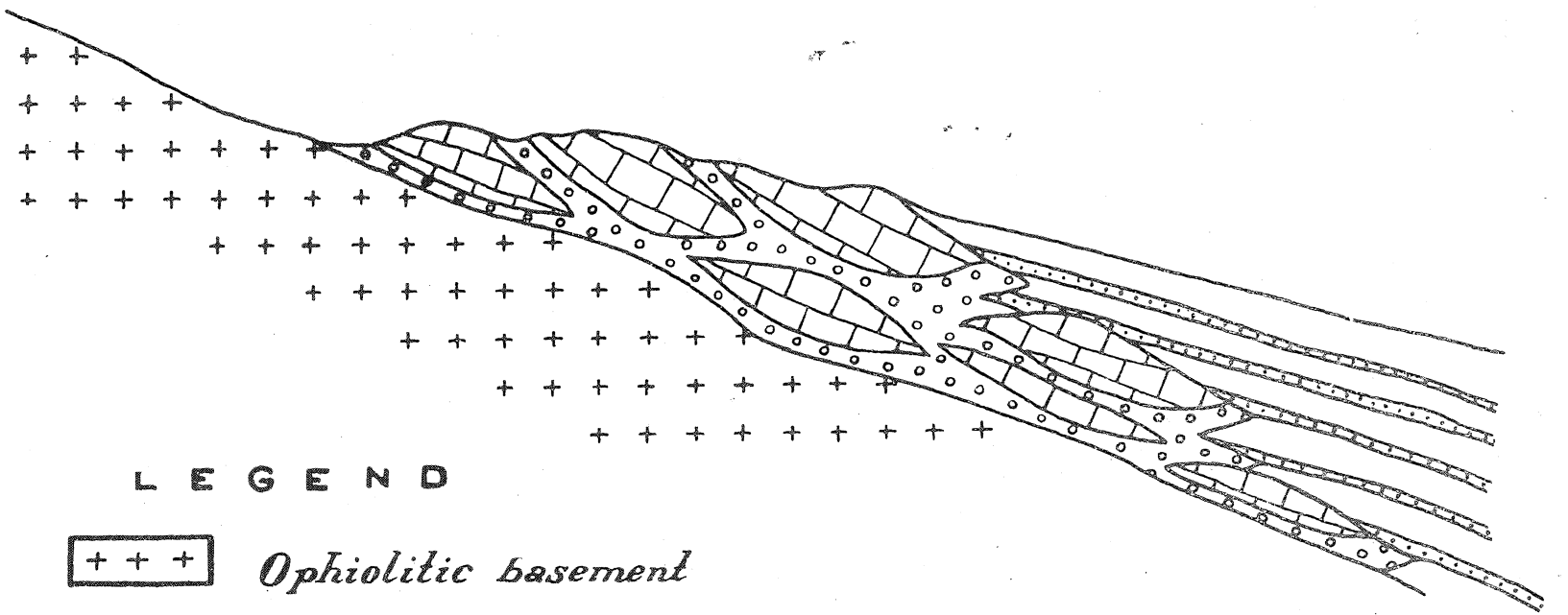
These investigations did not allow us to draw a clear picture of the stratigraphical, sedimentary and faciès conditions of the neogene Iskenderun-basin, so that a detailed study of this kind became a necessity.

HI — STRATIGRAPHY

The complex of neogene formations in the iskenderun basin is unconf orniably . overlying the pre-miocene basement. In the investigated area, i. e. between Çengen and Kışlaçayı this basement complex is uniformously composed of more or less strongly serpentizined ophiolitic rock. The Mio-Pliocene formations are generally conformable among themselves and have been submitted to the same deformational stresses that folded and faulted the entire complex towards the end of the Pliocene.

EXAMPLE OF BIOHERMS (REEFS) DEPOSITED ON A STEEP SLOPE DURING TRANSGRESSION OF THE MIOCENE SEA

(observed near Karagöz)



LEGEND

- *Ophiolitic basement*
- *Algal reef-limestone*
- *Breccious limestone*
- *Silly-Sandy formation*

a — Pre-miocene basement

As already mentioned above, the pre-miocene basement, as far sus it is outcropping in the area investigated, is composed of the complex of ophiolitic rocks. It is constituted by more or less fresh gabbros, serpentinized gabbros and chloritized gabbros. An important part of these rocks are of a dark-green colour, sometimes -almost black. According to the authors who studied this ophiolitic formation, it constitutes an intrusion into sedimentary rocks of cretaceous age. Alteration products of these rocks build up a great part of the neogene sediments and continue still actually to contribute on a large scale to the recent sediments in the large Arsuz - Giilcihan flood-plain.

In certain parts of Hatay lutetian limestone with pebbles of ophiolitic rocks overlie the serpentine-formation, but in the investigated area no traces of these sediments have been observed, although it seems possible and even probable that they might be found more towards the centre of the Miocene basin, that is to say under the actual Gulf of iskenderun.

b •— Miocene

The Miocene formations are overlying unconformabily the ophiolitic basement and are composed of a series of beds deposited in continuous sedimentation. Since we can only observe the miocène deposits along the border of the basin and the more central part of the miocène basin is covered by the sea in the actual Gulf of iskenderun, it is difficult to draw here an exact picture of the beginning[1] of miocène transgression, which first affected the more central part of the subsidence basin anld finally reached the actual visible border after gradual downwarping of the basin.

The sedimentation-conditions on the border of the basin prove us that the lower parts of the Miocene must be expected towards the centre of the •basin, under the actual Gulf of iskenderun, since we only see neritic and 'shallow neritic faciès, with indication that the coast was never far away. Of this miocène basin we can only describe the sedimentary conditions along the border and only by extrapolation something might be said albout the conditions towards the middle of the basin.

I The stratigraphie units of the Miocene, as described by the Jifferent authors who .have investigated this basin are in no- way- leal stratigraphie units but clearly facies-units. The oldest horizons. |f the Miocene outcropping in our area are blue and blue-grey marls* |nd argillaceous marls with numerous thin-, more or less lenticular' Intercalations of very finely grained sandstone and silty sandstone |rit!h thicknesses'up to 5 cm« These blue marls are changing vertir |ally towards the top and horizontally towards the basin-border |ito silts and marly -silts with increasing amount of sandstone-beds* (the thickness of these -sandstone-beds is extremely* variable, kr pally reaching several) meters, the same bed splitting towards the pentre of the basin into sevetfal thin beds itnterfin'gering with silts |nd sillty marls finally -disappearing completely« Towards the end |f this siltyrsandy formation massive gypsum beds alternating with Joore or less gypsifero-us marls and silt's sometimes with thin sandy (beds are developped. Laterally this silty-sandy formation may |ramsgress immediately over the ophiolitic basement, locally with I well developped bafeal sandstone with «serpentine pebbles. More frequently however, especially on the basin-border, this siltjrsandy (formation changes lateriaHy into a transgressive reef-limestone, (nainly Lithothamnium-limestone, occasionally with corals. This |eef-limestone is composed of a series of superposed lenticular Jpeefs, separated by more less breccilöus zones, * Where there is. |L normal contact between the ophiolitic basement and the reef-limestone we have locally observed the presence of serpentine-Ipebbles in the limestone« These fringing reefs have been formed |iot on a, flat surface, but on a very irregular transgression-plane. IJThey have been formed at the same time as the silty-sandy series land show clearly the characters of a transgression reef. Conse-quently they represent a lateral facies change of a great part of Ijthe Miocene. In three of our type-siection these characters have Ifbeen observed with great clearness,

I Locally, where a complete section of the Miocene has been Ipbserved it has been found that the gypsiferous formation at the İlpnd of the miocène sedimentation cycle is- overlain by yelowish Ijbrown. more or less altered maris or clays/It is probable that these Iptered beds have to be considered as the ancient erosion surface ifcetween the Miocene and Pliocene,

On the border of the basin, im our type .sections, we come to a total thickness for the marine miocène sequence of approximately 800 m, but from the two deep tests at Çengen it is already known that the miocène series reaches thicknesses of over 1300 m, towards the centre of the basin. This proves that gradual thickening of the miocène sediments takes place from the original basin border towards the centre of the basin.

It ils clear that the Ithologic units, mentioned above are the same as those,of the previous authors, but contrary to their opinion we are obliged to consider these units fas faciès units in the entire miocène sedimentation cycle. The blue marls with thin- sandy streaks -are probably intermediate between the sandy-silty-marly series on the basin border and a more marly formation which will probably constitute the bulk of the sediments in the centre of the basito, although no outcrops of this formation- are known from our area. It seems possiibte that the thick complex of marls, melt in the deeper' parts of the Çengen No. 3 test-weM. represents already partially this deep faciès of 'the more central parts of the basin. It is also clear that the limestone series, only observed along the 'actual border of the basin, does by no means represent the statigraphic base of the Miocene sequence/ but is ai lateral öhanîge of a great part of the Miocene, forming a transgressing fringing reef. This fact is- öf primary importance for the understanding of the structure of this

The miocène basin was distinctly a subsidence-basin and one. must expect that the total thickness of miocène sediments is regularly increasing towards the centre of the basin» This thickness may be a few meters on the border of the basin and will increase to far over 1200-4800 m. towards the centre, A real marly series is not represented on. the border, but will certainly constitute a great part of the whole miocène sequence towards the middle of the basin, whexeas the silty-sandy series on the basin border is decreasing considerably towards the centre in thickness. The gypsif erousi beds represent-locally developped regressive conditions 'and are only of secondary importance. Towards the centre of the bassin we can not expect them« The reef-limestones only rarely reach more than 80 m of thickness and are distinctly a border-facies. Towards the centre of

4e 'basin no reef-limestones should be expected, except perhaps. *i$* some local reefs on ridges im the original miocène sea.

c —- Pliocene

The altered marls and clays, probable the ancient erosion irface of the Miocene, "marking -an interruption in the sedimentajoii; form the limit between the Miocene with principally marine. edimentation and the Pliocene with principally continental sedimentation; Only in one of.our sections the relation between these-fo sedimentation cycles has been observed in all detail It must owever be stated here that lit is impossible to be sure of the plioene age of this continental sedimentation cycle, as no fossils have-jeen met with in this formation» Since there is a, distinct indication if an interruption in the sedimentation between the marine *se*** {jments and tlje continental sediments it seems reasonable to consider this limit as the limit .between the Miocene and the Pliocene. *the* possibility exists'.however that also this complex of eontànenjal deposit^ belongs stpl to- the Miocene, In this study itt is nevertheless accepted that this complex is of pliocene age.

I

The Pliocene outcropping* on the border of the iskenderun ba*en* is entirely of continental origin, so that the emersion starting towards the end *of* the Miocene, has continued during Pliocene, but: pie often considerable thickness of this continental Pliocene tells us (hat the down warping of the basing has continued during the Pliocene.

Pliocene sediments are only outcropping along the actual coast îf the Gulf of iskenderun on the NW flank of the Arsuz-Gülcdihan peline, .-where they are conformable ' with the Miocene« It is proable that there exists a slight unconformity between Miocene and liiocene towards the border of the basin, on the other flank of lie Arsuz-Giilcihan syncline, where the Pliocene and Miocene are actually covered by recent flood-plain deposits«

The pliocene sedimentary sequence is principally composed of m enormous mass of conglomérats, loams and sandstones, a typical * lood-'piain-complex. The maximum thickness observed in our- type ~ •actions is over 1000 m_8 It is an 'alternation of more or less'lentr 'Jar conglomerate- beds,, composed of ophiolitic elements, and of

equally lenticular fine to coarsely grained sandstones, with serpentine pebbles. It represents a typical flood-plain series, as deposited at the foot of a nearby mountain-chain, The conglomerates «*and* sandstones are generally well cemented *W* calcareous material. Towards the top of the series a few fossilized caliche-horizons have been observed. This series reaches its greatest thickness near the andient pliocene coast and will wedge out towards the sea and towards the mountains.

Between this flood-plain series and the underlying Miocene beds there is locally an intercalation of fine and very finely grained, yellowish, thinly bedded, sandstones with cross-bedding, typically a sanddune - formation, deposited at the beginning of the Pliocene* This sanddune-f OMwation has up tM now only been observed in the section between Arauz and KışlaşayL It is certainly not more than a local phenomena and it should not be expected elsewhere at the base of the flood-plain series. In the Arauz - Kaşlaçayaı section this sanddune complex reaches a maximum thickness of 395 m.

Between Arsuz and Gülcihan, along the coast, whitish or brownish argiiaeeous Mimestone with more or less lignitic traces have been found overlying the flood-plain series. This formation is of lacustrine origin and shows occasionally & few beds of conglomerate or conglomeratic sandstone and it represents the highest known part of the Pliocene in our area.

The entire Miocene and Pliocene have been summitted to deformaJtional stresses that are at the origin of the actual structure of this basin,

d — Pleistocene and recent

The Pliocene and often also the Miocene formations in and along the Arsuz-Oülcîhan plain are overlain horizonMly or subhorizontally by a recent or subrecent flood-plain series composed of loams, sandstones and conglomerates and locally by caliche. These deposits show the same characters as the pliocene flood-plain series and are certainly of the same origin. These recent conglomerates ^however are more varied in their composition as the pÜocetıe conglomerates, They are composed of numerous pebbles from the ophiolitic formation, and of sandstone and limestone pebbles from the miocène forinatiions.

At certain points even these recent sediments have been tited, proving that the deformational stresses have still been working in recent times,

IV — SEDIMENTATION AND FACIES

As already mentioned above the sequence of Neogene sediments has been deposited in a subsidence basin, of which only a part of the ancient border is outcropping and of which no sediments are known, clearly representing basinal conditions. A, downwarping movement continued throughout the Neogene period, almost without Interruption, M

Except for a few serpentine pebbles at the base of the Miocene reef-limestones and at the base of the silty-sandy formation where it transgresses directly over the ophioHtic basement no coarse detriîîc material ils known from the entire Miocene. The Miocene sediments are composed of fine or very finely grained, partMly argillaceous sands and sandstones, finely sandy silstones, siltstones and marls or silty marls, all of them distinctly of fine or very fine texture. So it is quite evident thalt during Miocene time there did exist only very little coastal relief, i. e. no high hulls or mountadn ridges near the coast. The transgression! must have been fairly rapid, since there has been no time for the formation of real basal conglomerates. From the beginning of the Miocene blue marls have been deposited, towards the border of the basin with increasing amounts of sandstone and eltstone, on the border typically fringing reefs, maifcnly composed of Lithothaiminium. The sedimentary series is fairly uniform, although more or less rhytmical, especially in the upper parts of the Miocene, where frequent alternations of marly, sandy and silty beds have been observed. For the greatest part of the Miocene the speed of sedimentation was equal to the speed of subsidence of the basin. As already mentioned above this marly formation becomes finally towards the top and laterally towards the border more and more sandy and silty, indicatinig shallower depths and increased speed of sedimentation. Simultaneously with the formation of these marly and siltysandy deposits» fringing reefs of calcareous algae grew along the border of the basin and gradually advanced over the continental slope with the

progression of the miocène transgression. Finally the subsidence of the basin must have become nearly stopped since salty lagoons could be formed, where the gypsiferpus marls and the massive gypsum-beds were deposited. These gypsiferous beds were finally covered by more or less sandy loams and clays, marking the end of Miocene sedimentation. This interruption of the gradual subsidence of the basin towards the end of the Miocene is an indication that the upwarping of the ophioltic masses along the border of the basin had already started, reaching its dimax in early Pliocene times.

The faciès of the Miocene sediments is not very variable. The marly-sandy formation represents a neritic faciès, whereas the silty-sandy formation represents a shallow neritic faciès, partially very close to the coast. Locally there was sufficient dnfülux of fresh-water from rivers that brackish water conditions could be formed, so that a part of the silty-sandy formation represents a brackish-water faciès..

At the foeiginnig of the Pliocene there were locally deposits of sanddunes on the miocène erosion-surface and at the same time increasing amounts of pebbles, blocks and sandy material started to flow down from the upwarping ophiolitic masses into the coastal plain. Subsidence of this part of the basin continued during the entire Pliocene and an impressive thickness of flood-plain sediments has been deposited in this part of the neogene basin. At the end of the Pliocene a lake has been formed in certain parts on this coastal plain where lacustrine limestones have been deposited At the same time the flow of flood-plain sédiments was somewhat interrupted, starting again after the tlting of the Pliocene sediments and continuing up till recent times, the actual plain between Arauz and Gulcihan being filled up again by pebbles, sand and blocks, flowing down from the ophiolitic mountain-chains of the Kızıldag.

The prinipal character of the neogene basin as a whole is certainly the deep Arauz-Gülcäian synclilne, approximately coincMïn«-with the actual Arsuz-Gülcihan plain. I_n the SW the Miocene overlies normally the premiiocene basement, but towards the NE the Miocene has been thrust against and partially on the premiocene-basement.

V — MICROFAUNA

A rapid survey of the samples of the **Çengen** No$_e$ 1 **and** 2 **test-wels** and of the samples of the type-sections enabled us to draw **a** picture of the general composition of these microfaunae,

It can be said that the Miocene of the 'iskenderun basin is characterized by typically'a neocene **microfauna.** Many species oc~ curing in the lower parts of the Miocene continue into the upper parts of the Miocene or may even be found in the actual Gulf of İskenderun, 'At the other hand no Oligocène or older **species** have been observed. It is probable that the evolution or the variation of the pelalgilc forms will be sufficiently rapid to enable us to use them as stratigraphie markers,but this would require a detailed study of these forms, We%ave also observed that several! representatives of tht foraminifera! family Buliminidae show a similar evolutionary ^ trend, but Jiere also it wGll require **a** detailed study of the species \ concerned » *At fürst view and certainly with the method only counting the different genera one must have the impression that this' fauna is fairly uniform and that there are almost no genera with restricted vertical distribution. The same problem lias' been met in other parts of the world : Algeria, Trinidad, Venezuela and Egypt. Only a very detailed study of the species and of the distribution of these -species throughout the miocène column did **give** in those regions satisfactory results for the stratigraphy.

Ä rapid survey of the species has shown us already that the miocène microfauna of the iskenderun basin is closely related and . -even mainly identical with the miocène microfauna of Egypt, Algeria, Morocco and the **Baléars.**

VI — HYDROCARBONS

Liquid hydrocarbon shows and gas-seeps have been observed in different parts of this basin, mainly 'as surface indications^ rarely as subsurface- indication in testwells .

k •— Surface -•• Indications

The known oil-seepaiges in the neogene iskenderun basin are all concentrated in the direct neighbourhood 'of **Çengen,** approximately

at 250 m S of this village. The oKl seeps from a finely grained, more or less argillaceous sandstone with grey marly intercalations. ît seems probable that this seepage is connected with the faults traversing this area.

Some gas-seepages are known since a very loing time. They are oceuring aroumd Yanantaş, S of Ztttlli Çayi and seem to come from more or less fractured serpentines. It is possible that these gas - seepages are originating from the Miocene through faults, but it is equally possible that they are **coming-** from petroliferous formations below the serpentine, migrating along faults.

b — Subsurface - **indicaiions**

These surface indications near Çengen were the reason of the wells drilled in this area. Several older wells drilled by previous investigators near the end of the last century in the direct neighbourhood of Çengen have found smal quantities of gas at very shallow depths. The deeper tests 'drilled by MTA between 1939 and 1951 did find only small quantities of gas at very shallow depths and only once very slightly impregnated sands. No other shows are known from the wells drilled in this region.

c — Possibilities

Nowhere in this region we have been able to observe miocène sediments which might be considered with a certain probability as source-beds of petroleum. It seems however possible that the marly faciles with thin silty or sandy beds, probably changing to plain blue marls towards the centre of the basin might be considered as source-beds for petroleum. It must be emphasized here that these rocks are not known from surface sections and that only indications exist that the marly section in both of the deeps test-wells at Çengen might represent deeper neritic conditions and point towards the presence of an entirely marly section towards the centre of the basin.

As for reservoir-rocks, it is sure that the marly-sandy and silty-sandy faciès along the border of the basin can a priori be considered as a fairly favorable reservoirrock. It must however be feared that a great part of the sandstones are too finely grained

|d top much mixed with argillaceous material to be able to show §y appreciable porosity or permeability. À great part of the sands- |nes observed in the field are in any case too argillaceous and they Sow only a very reduced apparent porosity and permeability,

Ill There is still another factor which plays a big role and that is. Je fact that most of the sandstones are thinning out considerably |wards the centre of the basin and that finally they disappear Şmpletely, BO that already at a short distance from the actual border jf the basin, only very little 'sandstones are left in the miocène. jection, as has been proven in both of the deep tests- at Çengen,. Jfnly the upper parts of the Miocene section, might show some. jjarous beds at greater distances from the basin border.

I Some of tHfe geologists who have worked in this area, previously Iptached mpch importance to the possibility of- oil. accumulations ji fractured limestones at the base, of the Miocene section,, also • |)wairds the centre of the basin. Since these limestones, have only fteen observed along, the border of the basin and are certainly only 1| lateral equivalent of the marly-silty-sattdy series and since even. Ipieilr absence has been proven in the two deep tests at Çengen and: §1 some of the field sections it seems highly improbable that these limestones should be found towards the centre of the "basin, so - §hat ûü-aecumuliation in, fractured limestones of miocène age must. ||e excluded, Only if further towards the centre of the- basin, under Ijhe actual sealevel of the Gulf of ' iskenderun there existed in« mio- ||ene times underwater ridges, shallow enough to permit formation • ||f Lithothamnium reefs or coral reefs, lenticular bodies of reef - limestones can be expected towards the centre of the basin. Since ||othing is known about the central parts of the basin, now covered Illy the sea, this is only hypothetical.

1 The conclusion must be that the best chances for petroleum ~ llccumuîiation in the neogene basin of iskenderun should be ex- llected in the apparently fairly porous sandstones towards the top Iff the Miiocene series, if these sandstones can be found under a.

sufficiently impervious cover. Near the border, where most of th wells have been drilled, the upper parts of the Miocene are f$_{or}$! the greatest part eroded, especially on the structures where! drilling[1] has been going on. ^

LITERATURE

1 — H. VAUTRIN : Le Miocène de la région côtière d'Alexandrette - Contr. à l'étude géol. de la Syrie Septentrionale - Tome I - 1983,

2 - **D.B.ERICSON** *î* Report on the Geology of Hatay - MT.4 Report No. 1118 - dd. 20. 5. 1940.

S — I. ORTYNSKI : Geological Report on Aşağı Çengen - MTA Report No. 1635 - dd. 28, 12. 1944