

Biostratigraphic correlation of the marine and nonmarine Neogene rocks in the Eastern Mediterranean area

by

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At numerous localities in the eastern Mediterranean area, the interfingering of marine (shown by foraminifera and nannoplankton), nonmarine (shown by sporomorphs and vertebrates) and caspi-brackish sediments (shown by ostracods and molluscs) makes direct correlation of the three facies possible. Correlation is also facilitated by sporomorphs which occur in deposits of all three facies. Also, there are radiometric data from the nonmarine Neogene rocks. At present, the following correlations have been made :

The pollen-assemblages of Kurbalik and Kale have been found not only in nonmarine sediments but also in marine deposits of late Oligocene to early Aquitanian and late Aquitanian to early Burdigalian age. The succeeding Eskihisar assemblage has been found to be 15.0 to 19.8 m.y. old and is approximately correlative with the Badenian stage of the Paratethys. Ages of 11.0 and 11.6 m.y. have been found for vertebrate faunas of the uppermost Miocene (Sarmatian) and for the Yeni-Eskihisar pollen-assemblage.

The lower Tortonian (basal part of N 16) is correlative with the upper Vallesian. At the same stratigraphic level, the Kizilhisar assemblage has been found for the first time. In marine sediments it extends as high as the upper Messinian while in nonmarine rocks it is characteristic for deposits of Vallesian and Turolian or Pannonian age. It has also been found in brackish Chersonian deposits which, on the other hand, contain vertebrates of middle Vallesian age. Two vertebrate faunas of the middle Vallesian have been dated at 7.9 to 9.1 and 9.25 m.y. The results of pollen analysis (Akça assemblage) finally indicate that the marine Pliocene (and lowermost Pleistocene?) is time equivalent to the interval between the Ruscinian and Villanyian of the continental scale.

These results have been obtained in close cooperation with the Geological Department of the University of Utrecht and have, to a major extent, been published recently. Based on the new correlations, paleogeographic maps of the late Cenozoic of Turkey have been drawn. They will be published at about the end of 1975 and comprise 7 sheets: *Early - middle Oligocene* (Lattorfian - Rupelian/Lower Maikopian), *late Oligocene* (Chattian s.l. / Middle Maikopian), *early Miocene* (Aquitanian - Burdigalian / Eggenburgian - Ottnangian - Karpatian (?) / Upper Maikopian), *middle Miocene* (Langhian - Serravallian/Karpatian (?) - Badenian - Sarmatian/Volhynian - lower Bessarabian), *late Miocene* (Tortonian - Messinian / Vallesian - Turolian = Pannonian / upper Bessarabian - Chersonian - Meotian - Pontian s. str.), *Pliocene* (Tabianian - Piacenzian / Ruscinian / Dacian - Romanian / Cimmerian - Aktchagylian), *lower Quaternary* (Calabrian / lower Pleistocene / Apcheronian - Bakinian). Present knowledge is not adequate to correlate the *boundaries* of the stages with certainty.

Intervention

M. B. Cita. — I have 2 questions, or better a question and a precision. In your presentation you pointed out that the chronostratigraphic subdivisions you used for marine stratigraphy are not time-synchronous with those used for continental sequences or in other words the Lower Pliocene “ in conti-

mental sense ” corresponds to the Upper Miocene “ in marine sense ” and so on. The question is : How long do you intend to go on following this line of thinking? Do you accept the basic principle that chronostratigraphic subdivisions have to be founded on marine section?

The precision concerns the calibration of the stratotype sections of the Mediterranean Neogene, now available after the careful paleomagnetic investigations carried on by our colleagues of the Tohokou University, their up-to-date interpretation, accompanied by a close biostratigraphic control. As presented in a paper by NAKAGAWA, NIJTSUMA, TAKAYAMA, KITAMURA, MATOBA, ASANO, RYAN & CITA submitted for publication at the next Congress on Mediterranean Neogene stratigraphy to be held in Bratislava in 1975,

- the base of the Calabrian falls in Olduvai event of Matuyama Magnetic Epoch at about 1,8 my.
- the base of the Zanclean falls approximately at the Gilbert/Magnetic Epoch 5 boundary at about 5,1 my.
- the base of the Messinian falls in uppermost Magnetic Epoch 7 at about 6,6 my.
- the base of the Tortonian near the base of Magnetic Epoch 11 at about 12 my.
- the base of the Serravallian falls within the upper part of Magnetic Epoch 15 at about 15,6 my.
- the base of the Langhian falls within the upper part of Magnetic Epoch 16 at 16,5 my.

Réponse — It is without doubt that the chronostratigraphic subdivision has to be based on marine sections. But in view of the present state of the biostratigraphic correlations it is impossible to transfer names of stratigraphic units, which have been defined in marine sediments, to those of non-marine areas. The creation of independant continental stages therefore would be very convenient.

B. Biju-Duval — Please, I have not understood very well in which area is your study limited? Did you work in Sivas and Central Anatolian Basins of Turkey where evaporites are known? Do you agree with an Upper Miocene age?

In a first time, as the bibliography shows, we thought the evaporites were Oligocene, but after fieldtrip in Central Turkey we think they are Upper Miocene (stratigraphical study not finished).

Réponse — Our paleogeographic studies cover the whole country of Turkey. Most of the evaporites in Central Anatolia are of Oligocene age. In the Sivas region they are discordant overlain by transgressive marine sediments of the Lower Miocene. Younger evaporites are also known in these areas. Their origin may be combined with the regression of the sea, which has started in the Middle Miocene.

B. Biju-Duval — I agree with your opinion about a very extensive Lower Miocene transgression, but what are your arguments for an Aquitanian age? We think the transgression is younger : Burdigalian or even Langhian.

Réponse — The Aquitanian age of the lowermost parts of the Miocene has been determined by DIZER [1964] and own studies of microfauna (MEULENKAMP & collab.)

P. Sonnenfeld — How do you distinguish paleontologically or otherwise between limnic (lacustrine) limestones on the rims of Anatolia and any freshwater or brackish limestones that may be derived from a local transgression of the Upper Miocene brackish or fresh Paratethys.

Réponse — Limestones of Limnic or brackish origin can only be distinguished by their faunistic or floristic content.

P. Sonnenfeld — What do you do with the marine channel which M.N. SHAKLOV extends from the southern Caspian Sea through Azerbaidzhane and Sowjet Armenia *south* of the Caucasus to the Turkish border to a point from where Erentöz (Turkish Geological Survey) continues to Iskenderun. This continuation is also shown by the succeeding speaker, BIJU-DUVAL (Miocène inférieur).

Réponse — During Oligocene and Early Miocene time the marine transgressions in Turkey started from the East. Connections of the Caspi-region and the Tethys may have existed at several times. In the Upper Miocene we have no exact arguments for such a marine “ channel ”.