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COMPARATIVE PALYNOLOGY OF THE SENONIAN FORMATIONS IN THE PELSO AND TISZA UNITS (HUNGARY)

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ABSTRACT. In Hungary different Senonian sequences can be distinguished belonging to two remote tectonic units: the Pelso and Tisza. Based on integrated palynological results, in association with Nannoplankton zones (CC14/15 – CC22c), the different geological units can be reliably correlated and assigned to the Coniacian – Late Campanian period. Both units belonged to the littoral region of the Normapolles Phytogeographical Province. The dinoflagellate association of the Pelso Unit connects it to the western part of the Tethys (S France and Paris Basin). Whereas the Tisza Unit maintained a shallow-water coastal environment, that of the Pelso Unit was one of open sea with a noticeable oceanic effect.

KEY WORDS: Pelso and Tisza Units, Senonian, integrated palynostratigraphy, correlation, nannoplankton zones, palaeoenvironment

GEOLOGICAL BACKGROUND

Hungary is divided into two megatectonic units (Császár & Haas 1984, Haas 1987, Haas *et al.* 1990, Haas & Hámor 1996). To the north of the fracture belt the Pelso Unit shows similarities to the Alpine – Dinaric areas, to the south of it the Tisza Unit is related to the Transylvanian Central Range (Fig. 1). Upper Cretaceous processes with different formations are known in both tectonic units and they each contain clearly distinguishable freshwater and marine deposits. The most complete sequence can be found in the Pelso Unit in the area of the Transdanubian Central Range (TCR). It represents a classic transgressional sequence where the marine formations develop gradually from freshwater ones. On the older Mesozoic rocks, in some cases on the bauxite formations, the lacustrine-paludal Ajka Coal Formation and the fluviatile-lacustrine Csehbánya Formation were deposited. Above them, extending both horizontally and vertically, marine sediments settled, leading to the sequential development of the Jáko Marl, Ugod Limestone and Polány Marl Formations.

In the NE part of the Pelso Unit (N Hungary) the Nekézseny Conglomerate Formation shows some similarity to the classical Gosau Beds in Austria.

The Tisza Unit likewise contains different Upper Cretaceous sequences (Szentgyörgyi 1983, 1985). One of them is of flysch type, whereas the others in the southern and south-eastern parts of the Great Hungarian Plain (Alföld) consist of clearly distinguishable freshwater and marine deposits. Here the transgression was abrupt and not a gradual process.

The continuous Senonian shelf formations of the southern part of the Danube – Tisza confluence (Bácska area), can be assigned vertically to the Szank Conglomerate, Cikéria Marl and Bácsalmás Formations. To the east of that area, in the Körös Formation, two type facies have been distinguished: (a) terrigenous (sandstone and aleurolite) and (b) marl developed on a basal breccia, representing two different sedimentation cycles. Assigning different names to them has been suggested and this will be done in the near future. A fourth type, the Izsák Formation (oxidated, brownish, lime-marl and marl), was developed to the north of the three Senonian shelf Formations mentioned above.

PALYNOLOGICAL RESULTS

Palynology is the only micropalaeontological method which can be used for the correlation of freshwater and marine formations, combining the pollen and spore zones of terrestrial origin with the marine dinoflagellate zones. On the basis of the combined palynological results (pollen, spores and dinoflagellates) the different geological units can be reliably correlated (Fig. 2).

The combination of palynostratigraphy and nannoplankton zones, as worked out for the Mediterranean area of the Tethyan Realm (Wagreich 1992) and accepted for the Senonian formations of the Transdanubian Central Range (Pelso Unit) (Siegl-Farkas et Wagreich 1996), shows that the most complete profiles of both tectonic units (Transdanubian Central Range and Bácska area) were deposited over the same period of time, from

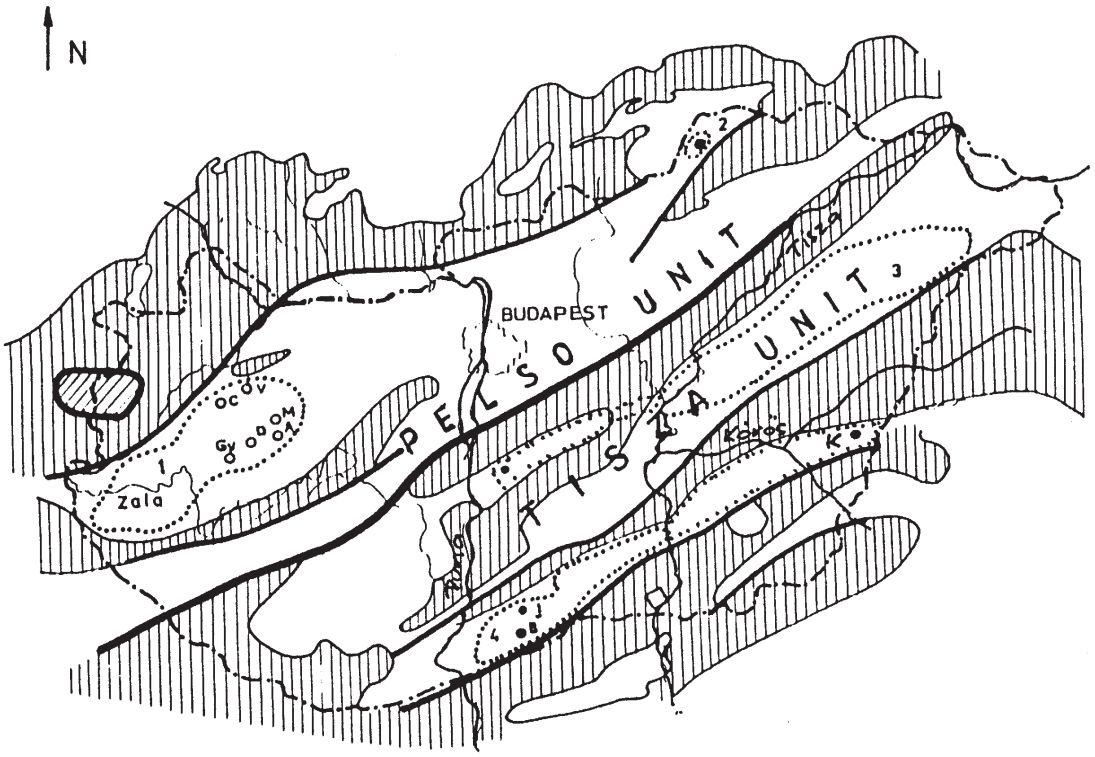

Fig. 1. Upper Cretaceous localities. 1. Transdanubian Central Range (A – Ajka; C – Celldomölk; D – Devecser; Gy – Gyepükaján; M – Magyarpolány; V – Vinár); 2. Gosau (N – Nekézseny); 3. Flysch; 4. South Great Hungarian Plain (B – Bácsalmás; J – Jánoshalma; K – Komádi)

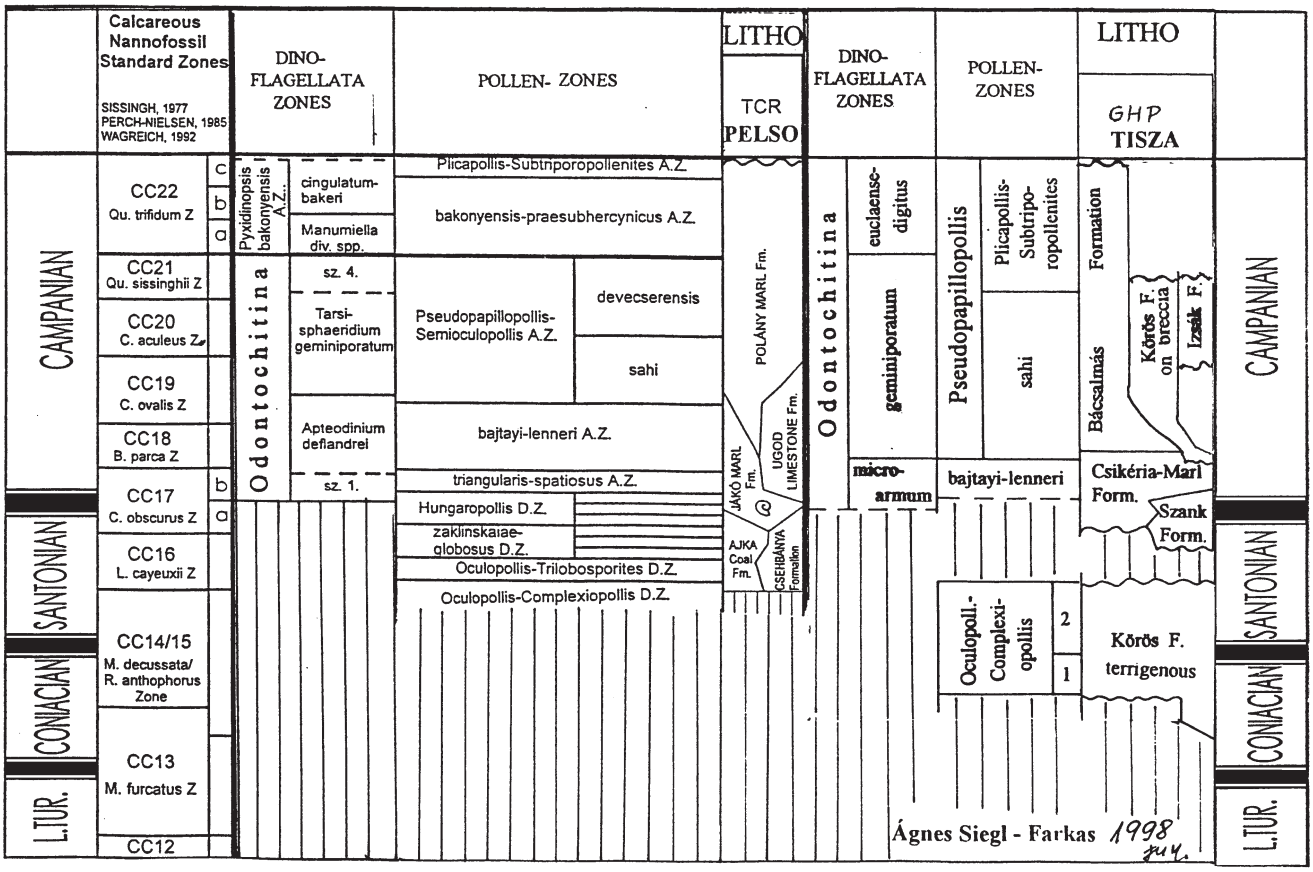

Fig. 2. Comparative palynology of the Senonian formations in the pelso and tisza units (Hungary)

the Late Santonian until the late Late Campanian (CC16 – CC22c).

In the case of the formations in the Pelso Unit, based on the spore-pollen stratigraphy, 9 assemblage or dominance zones, containing 8 subzones have been determined (Góczán 1964, 1973, Góczán & Siegl-Farkas 1990, Siegl-Farkas1993). The marine formations were divided into 2 dinoflagellate assemblage zones containing 6 subzones (Siegl-Farkas & Wagreich 1996, Siegl-Farkas 1997). Similarly the formations the of Tisza Unit were split into 3 pollen assemblage zones containing 4 subzones and the single dinoflagellate assemblage zone divided into 3 subzones. The most recent palynological studies (Siegl-Farkas 1999) show that the terrigenous Körös Formation (a) represents an earlier (Coniacian – Early Santonian) initial cycle, while the marl formation (b) on a breccia base is correlated with the youngest formation of the Bácska area (middle part of the Bácsalmás Formation). The studied part of the Izsák Formation was assigned to the Middle Campanian.

PALAEOENVIRONMENTAL RELATIONS

The Senonian sequences of the Pelso and Tisza Units, still situated far from each other during the Lower Cretaceous (Haas & Hámor 1996), were deposited in the subbasins of the Tethys in the course of the Upper Cretaceous transgression. In some places (and at certain times), there is evidence of similar sedimentary conditions (Bácska area and TCR). In others (eg the Körös neighbourhood) these would appear to have been different. By means of palynology, the Upper Cretaceous formations, with different facies but contemporaneous, can be well correlated with each other. The two areas belonged to the same floral province, as is proved by their common floral elements. Palynologically, greater differences between the two areas are apparent in the life spans of their biozones, their correlation and facies, respectively.

The presence of formations whose sequences display similar geneses is in accord with the fact, that during the Upper Cretaceous, on the northern margin of the Tethys, very similar sedimentary environments could be formed, even at great distances from one another.

According to the palynological data, the transgression in the southern parts of the Tisza Unit can be assigned an earlier date than that in the Pelso unit in TCR territory. While marine sedimentation had already begun to take place in the Tisza Unit, the paludal lacustrine layers of the Ajka Coal Formation and the fluviatile-lacustrine layers of the Csehbánya Formation were still being deposited in the Pelso Unit. Its characteristic sporomorph associations cannot be found in the Tisza Unit at all.

The youngest formations of the Bácska area (Tisza Unit) are of nearly the same age as the youngest Campanian-Maastrichtian near-boundary formations of the TCR (Pelso Unit). This means that in the territories of both tectonic units, the Senonian Formation which is younger than these is eroded equally due to the later geological events.

Both the subbasins above – mentioned of the Tethys were situated in the littoral region of the Normapolles Phytogeographical Province untill the end of the Late Campanian and the beginning of the Maastrichtian stages, respectively.

A greater difference between the assemblages of the two areas appears in the dinoflagellate association at the end of the Campanian. In the Tisza Unit at this time there was still a shallow marine environment while in the area of the Pelso Unit there was already deeper water, which had created an open marine environment with an oceanic effect (Siegl-Farkas 1997). This is proved by the fact that out of the largely similar dinoflagellate assemblages, an association of the *Pyxidinopsis bakonyensis* Assemblage Zone (Siegl-Farkas 1997) can be shown only for the TCR (Pelso Unit). At the same time, this assemblage was determined also from an association in the section designated as the stratotype of the Campanian – Maastrichtian in southern France (Tercis) (Odin *et al*. 1998). The connection with that section is confirmed by the appeareance of *Odontochitinopsis molesta* (Deflandre) Eis. in the Pelso Unit only, described and determined for the first time from the Paris Basin.

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