Mitt. Geol.-Paläont. Inst. Univ. Hamburg	Heft 77	Seite 83-88	Hamburg, Mai 1996

Faunal changes in the Valanginian of Poland: tectonic or eustatic control?

by

JAN KUTEK & RYSZARD MARCINOWSKI*)

Abstract

At Wawal, the sole locality at which Neocomian strata are exposed in platform Poland (Fig. 1), Lower Valanginian deposits representing the *Platylenticeras* Beds are followed by transgressive sediments (clays with sideritic nodules, 5-6 m thick) of the Verrucosum Zone (the basal horizon of the Verrucosum Zone which is the lowest Zone of the Upper Valanginian; THIEULOY, 1979). These clays are overlain by the *Dichotomites* Beds (silty and clayey sediments, ca. 7 m). The whole section at Wawal was described by KUTEK, MARCINOWSKI & WIEDMANN (1989) but some new stratigraphical and palaeontological data have been provided by a collection of over 1300 ammonites, recently obtained from Wawal. In particular, there is good evidence indicating that a stratigraphic gap at the base of the Verrucosum Horizon at Wawal encompasses all of the *Polyptychites* Beds, which are known to occur farther north in central Poland. Some of the new data relevant to the Upper Valanginian strata at Wawal are presented below.

The collection of ammonites found in the Verrucosum Horizon (ca. 1000 specimens) predominantly consists of genera of Tethyan origin (Fig. 2): *Saynoceras, Valanginites, Karakaschiceras, Olcostephanus, Dicostella, Neocomites, Sarasinella, Neohaploceras* and *Bochianites*. Boreal ammonites *(Prodichotomites)* only account for ca. 3 % of the collection. *Saynoceras verrucosum* (37 % of the specimens) extends up to the base of the *Dichotomites* Beds, which is a sharp lithological boundary with no erosional features. There is good evidence that the strata characterized by these ammonites belong to the Verrucosum Horizon, and correspond to some part of the Hollwedensis Zone of NW Germany (comp. THIEULOY, 1979, KEMPER & al., 1981, HOEDEMAEKER, 1987, KUTEK & al., 1989).

All the ammonites collected at Wawal in the *Dichotomites* Beds (over 150 specimens) are Boreal forms belonging to the restricted genus *Dichotomites* (Fig. 3). Nearly all, if not all of them, are assigned to *D. evolutus* KEMPER. Therefore the *Dichotomites* Beds exposed at Wawal correspond to the Crassus Zone of NW Germany (comp. KEMPER, 1978, JELETZKY & KEMPER, 1988).

The distribution of ammonites in the Wawal section, as well as the absence of any ammonites indicative of the German Polytomus Zone (KEMPER, 1978, KEMPER & al., 1981) give evidence of a significant stratigraphical discontinuity at the base of the Dichotomites Beds at Wawal (Fig. 1B). It encompasses the Polytomus Zone and possibly also the uppermost part of the Hollwedensis Zone. Also the higher portions of the Tethyan Verrucosum Zone (those above the Verrucosum Horizon) have no counterpart in the Wawal section (comp. HOEDEMAEKER, 1987, 1991).

The Wawal section exhibits two faunal turnovers: at the base of the Upper Valanginian (that of the Verrucosum Horizon) and at the base of the *Dichotomites* Beds. Coeval faunal events have been recognized in several regions in and beyond Europe; they were related by HOEDEMAEKER (1987, 1991) to a high and low stand of sea level respectively.

Address of the authors: Prof. Dr. J. KUTEK, Prof. Dr. R. MARCINOWSKI, Institute of Geology, University of Warsaw, Al. Zwirki i Wigury 93, PL - 02-089 Warszawa, Poland.

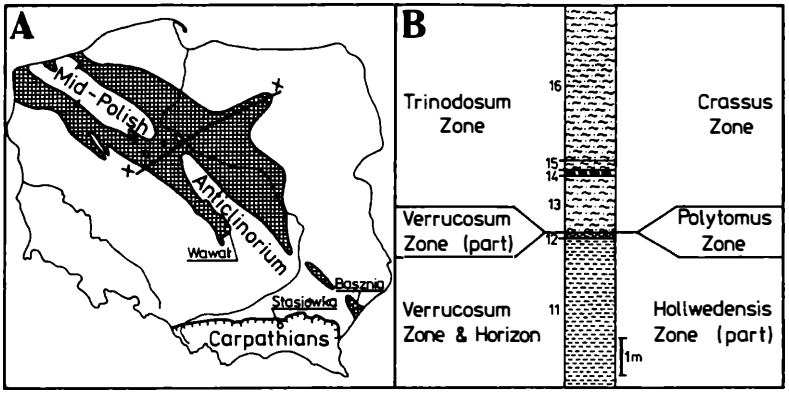
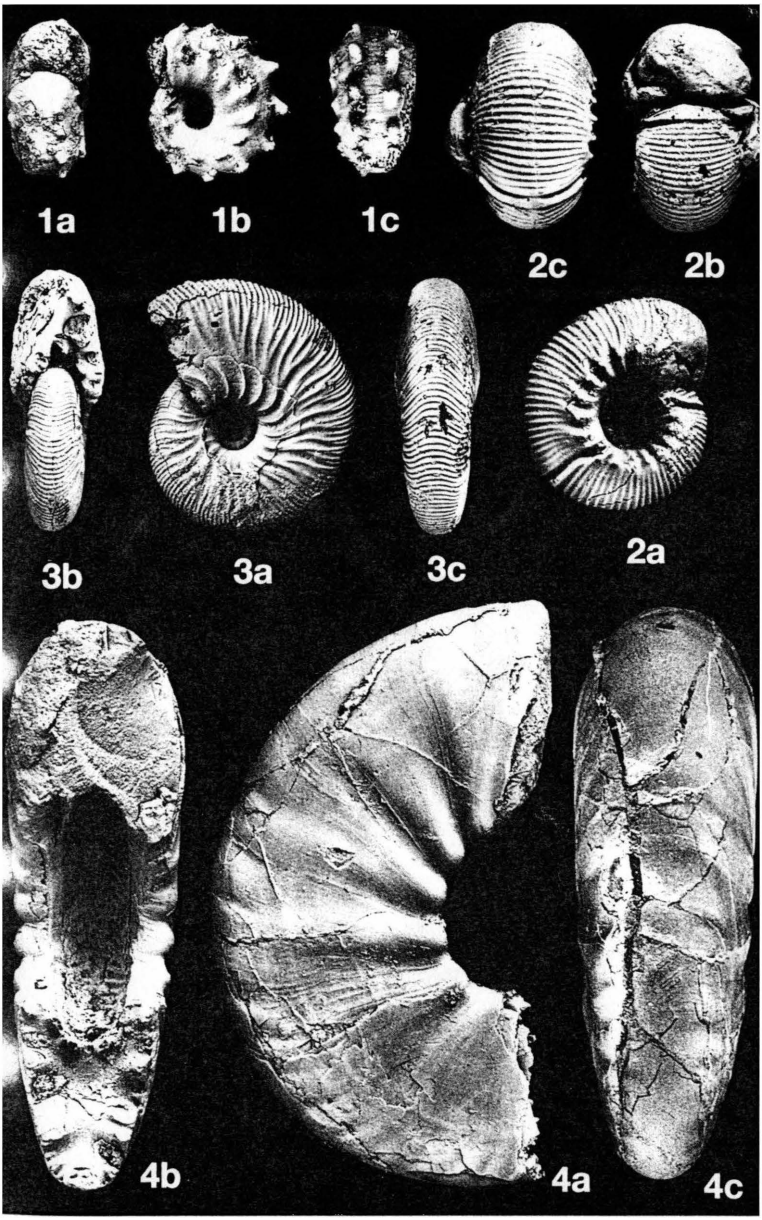


Fig. 1: A: Distribution of Upper Valanginian sediments in platform Poland; x-x – line of section shown in Fig. 4. – B: Biostratigraphic interpretation of the Upper Valanginian portion of the Wawal section; numbers 11–16 refer to beds described in KUTEK & al., 1989.

As yet, there are no data from Poland allowing precise interpretation of the *Dichotomites* event in a larger regional context. In boreholes, Upper Valanginian sediments have usually been separated out collectively as the Beds with *Dichotomites* and *Saynoceras* (e.g. MAREK, 1983a, 1989); no discontinuities, and often no significant lithological changes have been detected within Upper Valanginian intervals. Nevertheless, available data suggest that all the ammonites hitherto found in sediments attributable to the *Dichotomites* interval in platform Poland (e.g. MAREK, 1977, 1983a, 1989, KUTEK & al., 1989) and in western Ukraine near the Carpathians (GRIGIALIS, 1985) belong to the genus *Dichotomites*.

The faunal turnover at the base of the Upper Valanginian, which was connected with a transgression that brought Tethyan ammonites from the Carpathian domain across Poland to NW Europe (KEMPER & al., 1981, KUTEK & al., 1989), is expressed in Poland by the contrast between the *Polyptychites* Beds, in which ammonites are only represented by the Boreal genus *Polyptychites* (MAREK, 1983a, 1989), and the Verrucosum Horizon dominated by Tethyan genera. Significantly, this transgression was coupled with the replacement of a rifting stage by a downwarp stage, and of confined sedimentation by expanded sedimentation in the development of the Polish Rift (Fig. 4).

Evidence for this interpretation can be found e.g. in papers by MAREK (1977, 1983a, 1983b). In Berriasian and Lower Valanginian sediments, the distribution of which was restricted, with a few exceptions, to the zone of the Polish Rift, dramatic changes in thicknesses can be recognized up to the base of the Upper Valanginian sediments which, in turn, widely overstep earlier Neocomian sediments. In the region of Wawal, Upper Valanginian sediments occur throughout the Tomaszów Syncline, overlying relics of Berriasian and Lower Valanginian sediments; this is a pattern indicative of rifting in pre-Valanginian time (KUTEK & al., 1989). The occurrences of Neocomian sediments in SE Poland that were encountered in boreholes, e.g. in the regions of Basznia and Stasiówka (Fig. 1A),



Ammonites from the Verrucosum Horizon at Wawal. 1: *Saynoceras verrucosum* (D'ORB.). 3/2; 2: *Olcostephanus (Rogersites)*, 1/1; 3: *Prodichotomites complanatus* (KOENEN). 1/1; 4: *Karakaschiceras* ex gr. *gibbosum* (KOENEN), body chamber, 1/1.

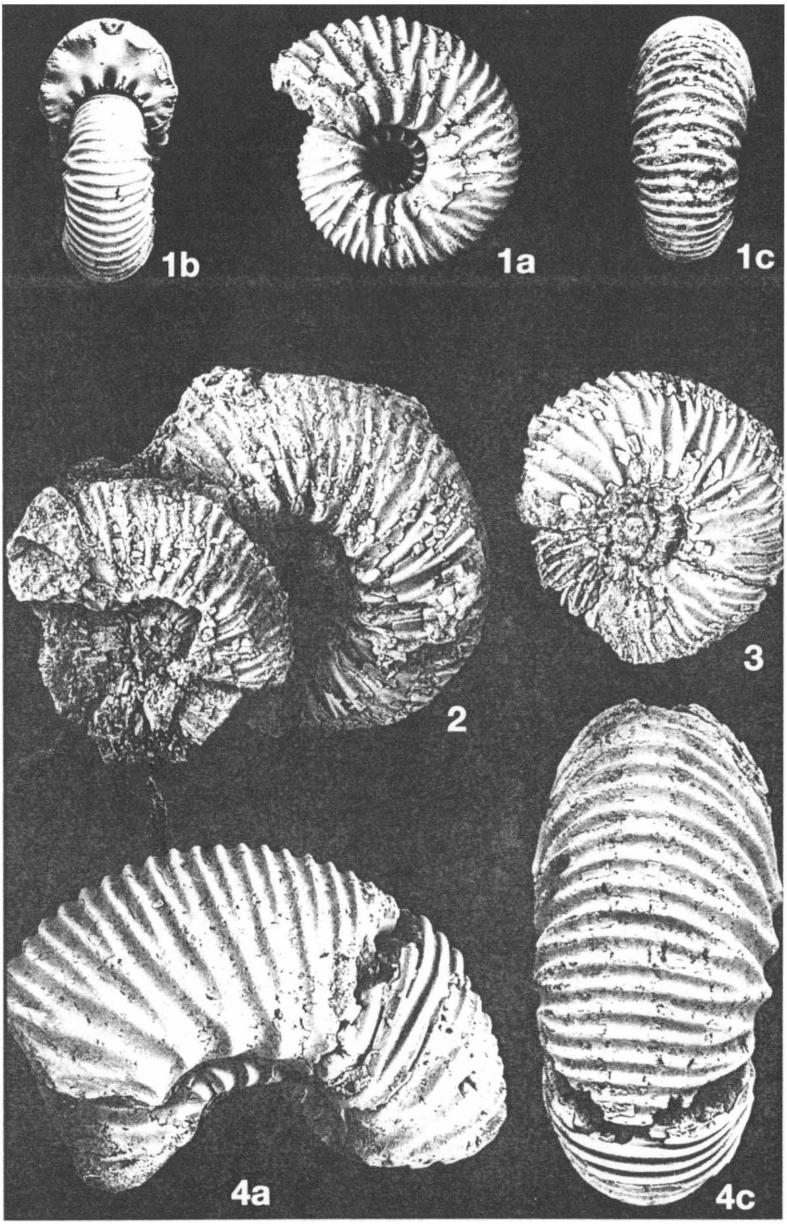


Fig. 3: Ammonites from the *Dichotomites* Beds at Wawal. 1, 2, 4 – *Dichotomites evolutus* KEMPER. 1/1; 3 – *Dichotomites* cf. *krausei* KEMPER. 1/1.

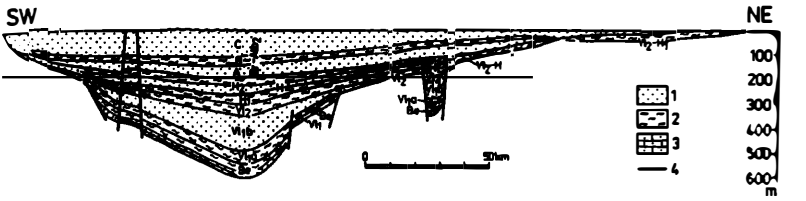


Fig. 4: Restored cross-section through Lower Cretaceous sediments in central Poland (after MAREK, 1983a). Be: Berriasian; VL_1a: Platylenticeras Beds; VL_1b: Polyptychites Beds; VL_2: Upper Valanginian; H_1: Lower Hauterivian; H_2: Upper Hauterivian; Br-Alb_2: Barremian through Middle Albian; A, B, C: lithostratigraphic units; 1: sandstones; 2: clays and silts; 3: calcareous sandstones; 4: faults.

near, but not within, the Mid-Polish Anticlinorium, are also significant. In these regions, the Neocomian sequences commence with Valanginian sediments which, as suggested by micropalaeontological evidence, may represent only the Upper Valanginian (KUTEK & al., 1989). On the other hand, there is evidence that ammonites migrated from the Carpathian Domain into cratonic Europe in Berriasian and *Platylenticeras* time through a marine strait that was established in SE Poland along the Polish Rift in the Berriasian. This suggests that the Berriasian and Lower Valanginian sediments that accumulated in the rift did not overstep its borders, and were totally removed by erosion subsequent to the Laramide transformation of this rift into the Mid-Polish Anticlinorium, in contrast with the more expanded Upper Valanginian sediments.

The transgression in cratonic Poland at the onset of the Late Valanginian was connected with a change in tectonic regime which implies that the transgression was induced, to some extent at least, by a regional tectonic event. Similar tectonic events inducing comparable changes in sedimentary environments have been recognized at or near the Lower/Upper Valanginian boundary in distant regions, e.g. in SE France (onset of deep-water sedimentation resulting from changes in plate kinematics; MASSE & LESBROS, 1987) and in the Great Banks of Newfoundland (replacement of fault-controlled sedimentation, continental in part, by expanded open-marine sedimentation; CLOETHINGH & al., 1989). This suggests that the faunal events at the base of the Upper Valanginian can be interpreted (e. g. with reference to mechanisms indicated by CLOETINGH, 1988) as due in part to regional or supraregional tectonic processes, and not necessarily in terms of pure eustasy.

References

CLOETINGH, S., 1988: Intraplate Stresses: a Tectonic Cause for Third-Order Cycles in Apparent Sea-Level? – "Sea-Level Changes – An Integrated Approach", SEPM Special Puplication **42**: 19–29.

CLOETINGH, S., A. J. TANKARD, H. J. WESLINK & W. A. M. JENKINS, 1989: Vail's Coastal Onlap Curves and Their Correlation with Tectonic Events, Offshore Eastern Canada. – In "Extentional Tectonics and Stratigraphy of the North Atlantic Margins", AAPG Memoir **46**: 283–303.

GRIGIALIS, A. A., 1985: Stratigraphical outline (in Russian). – In "Sedimentation and Palaeogeography of the Western Part of the East-Europe Craton" (ed. R. G. GARETZKY), Nauka i Tekhnika, Minsk: 8–17.

HOEDEMAEKER, P. J., 1987: Correlation possibilities around the Jurassic/Cretaceous boundary. – Scripta geol. **84**: 1–55.

HOEDEMAEKER, P. J., 1991: Tethyan-Boreal Correlations and the Jurassic-Cretaceous Boundary. – Newsl. Stratigr. **25** (1): 37–60.

JELETZKY, J. A. & E. KEMPER, 1988: Comparative paleontology and stratigraphy of Polyptychinae and Simbirskitinae in Sverdrup Basin (Arctic Canada) and Lower Saxony Basin (Northwest Germany).- Geol. Survey Canada Bull. **377**: 1–355.

KEMPER, E. 1978: Einige neue, biostratigraphisch bedeutsame Arten der Ammoniten-Gattung Dichotomites (NW-Deutschland, Obervalangin). – Geol. Jb. **45**: 183–251.

KEMPER, E., P. F. RAWSON & J.-P. THIEULOY, 1981: Ammonites of Tethyan ancestry in the early Lower Cretaceous of north-west Europe. – Palaeontology **24** (2): 251–311.

KUTEK, J., R. MARCINOWSKI & J. WIEDMANN, 1989: The Wawal Section, Central Poland – An important link between Boreal and Tethyan Valanginian. – In: "Cretaceous of the Western Tethys. Proceedings 3rd International Cretaceous Symposium, Tübingen 1987" (ed. J. WIEDMANN), E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart: 717–754.

MAREK, S., 1977: Lower Cretaceous (in Polish). – In "The Geological Structure of the Mogilno-Lodz Trough, Goplo-Ponêtów-Pabianice Zone", Pr. Inst. Geol. **80**: 83–99.

MAREK, S., 1983a: Epikontinentale Unterkreide-Ablagerungen in Polen. – Zitteliana **10**: 55–64.

MAREK, S., 1983b: Lower Cretaceous (in Polish). – In "The Geological Structure of the Warsaw (Plock) Trough and Its Basement", Pr. Inst. Geol. **103**: 161–177.

MAREK, S., 1989: Sedimentäre und paläotektonische Entwicklung der epikontinentalen Unterkreide Polens. – In "Cretaceous of the Western Tethys. Proceedings 3rd International Cretaceous Symposium, Tübingen 1987" (ed. J. WIEDMANN), E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart: 755-770.

MASSE, J. P. & LESBROS, R. 1987: Évènements géodynamiques médiovalanginiens dans le S.E. de la France et leur retentissements bathymétriques. Leur signification dans le cadre géodynamique de la Méditerranée occidentale. – Mém. géol. Univ. Dijon **11**: 149–166.

SAVELIEV, A. A., 1981: Ammonite zonal Subdivision of the Albian Stage of Mangyshlak peninsula, western Kazakhstan (in Russian). – In: "Mid-Cretaceous bioevolution and biostratigraphy", 41-46. DVNC AN SSSR, Vladivostok.

THIEULOY, J.-P., 1979: III. La faune. B. Les Ammonites. Description des espèces indices et de quelques autres formes fondamentales. – In "Hypostratotype mésogéen de l'étage Valanginien (Sud-Est de la France). Les stratotypes français" (eds. R. Busnardo, J.-P. Thieuloy & M. Moulade), Edition C.N.R.S. 6: 37-57.