34 UPPER CRETACEOUS INTEGRATED BIOSTRATIGRAPHY OF ROMANIA

Jana ION, Emanuel ANTONESCU, Mihaela Carmen MELINTE, Ladislau SZASZ

Geological Institute of Romania, Str. Caransebeş 1, 78344 Bucureşti 32

Abstract: The paper presents/proposes for the Upper Cretaceous in Romania the first model for the integrated biostratigraphy based on ammonites, inoceramids, planktonic foraminifera, dinoflagellates, pollen and calcareous nannoplankton.

Key words: South and East Carpathians, Dobrogea, Upper Cretaceous, integrated biostratigraphy, ammonites, inoceramids, planktonic foraminifera, dinoflagellates, pollen, calcareous nannoplankton.

This paper presents/proposes for the Upper Cretaceous in Romania the first model for the integrated biostratigraphy based on ammonites and inoceramids (L.S.), planktonic foraminifera (J.I.), dino-flagellates and pollen (E.Antonescu), calcareous nannoplankton (M. C.M.) (Fig.1-4). It represents a summary of the data obtained by us from the study of several biostratigraphic sections through the sedimentary successions in Northern Dobrogea (in the Babadag Basin), Southern Dobrogea (outcropping and by drilling shelf deposits in the Moesian Platform), East and South Carpathians. The principal biostratigraphic sections in the Carpathians are situated in the basinal deposits of the Median Dacides major tectonic unit. For the Cenomanian and Campanian-Maastrichtian, additional data given by the deposits of the Outer Dacides and Moldavides, respectively. For the Cenomanian-Coniacian interval but especially for the Coniacian, the calibration of the ranges of the planktonic foraminifera, microflora and nannoflora was achieved by direct correlation with the ammonite and/or inoceramid faunas. For the Santonian-Maastrichtian the orthochronologic role was played mostly by planktonic foraminifera. The macrofauna being poorly represented, spread in places/ punctiform made possible the direct chronostratigraphic evolution only punctiform or on short segments (Fig. 5-9). According to the fossil group to which the orthochronology for direct calibration was assigned, some correlation with the global/reference biozonal scales for the Tethys is made in the model exposed by us.

In point of the chronostratigraphic value, the principal and secondary marker datum level/marker bioevents utilised by us to class the stages, substages and biostratigraphic units, into four categories are (Fig. 5-10): of global value; Tethyan value; regional value; local value (known only in Romania) but synchronous or complementary to the some bioevents in the first three categories. Also the biostratigraphic units of the ammonite, inoceramid, planktonic foraminifera and calcareous nannoplankton zonal scales fall in three categories: of global value or regional value for the Tethys; emended units ; new units defined on the basis of the data for Romania (see Szasz in: Ion et al., Melinte in: Ion et al., Ion in: Ion et al., 1996 in print). All biostratigraphic units of the dinoflagellate and pollen zonal scales are new (see Antonescu in: Ion et al., 1996 in print). The biostratigraphic units classed are based on the first most significant chronostratigraphic appearances, extinction or total ranges of the taxa. The categories of zones/subzones are taken in the sense of the International Stratigraphic Guide, 1979 edition.

From the point of view of the fossil group studied, the trend of the biostratigraphic evolution in the Upper Cretaceous in Romania displays: in a certain interval, global features or common to the whole Tethys, in others they are similar to or the same as those typical of some areas of the Tethys, while in others the characteristics are local (known only in Romania) but sometimes intermediate between the eastern and western or the northern and southern parts of the Tethyan (s.s.) Realm.

All these data mentioned above proved the necessity to work out regional biochronological models in order to have correct chronostratigraphic criteria.

This integrated biostratigraphic model has long been elaborated by us. Most data concerning this subject, especially the detailed data, are unpublished (Archive of Geological Institute). Some are published in: Szasz & Ion 1984, 1988; Ion & Szasz 1989, 1994; Antonescu et al., 1978; Ion et al., 1994, 1996, 1996 in print, 1997 a,b,c in print). There are many additional papers concerning the biostratigraphic data only for the ammonites and inoceramids (e.g. Szasz in Pop & Szasz 1973, Szasz 1974, 1976 a,b, 1981, 1982, 1983, 1985, 1986 a-d), or for planktonic foraminifera (e.g. Ion 1978, 1982, 1983, 1993), pollen (Antonescu in print) or for the calcareous nannoplankton (Melinte 1997).

Acknowledgements. We are indebted to Dr. Antoaneta Seghedi (Geological Institute of Romania) for the graphics on computer.

References:

Bellier, J.P., Caron, M., Donze, P., Herm, D., Maamouri, A.L., Sălaj, J. (1983) Le Campanien sommital et le Maastrichtien de la coupe du Kef (Tunisie septentrionale), zonation sur la base des Foraminifères planctoniques. Zitteliana 10, pp. 609-611, München.

Caron, M. (1985) Cretaceous planktonic foraminifera. In: H. M. Bolli, J. Saunders, K. Perch-Nielsen (Eds.) Plankton stratigraphy (Cambridge Univ. Press), pp. 17-86.

Ion, J. & Szasz, L. (1994) Biostratigraphy of the Upper Cretaceous of Romania. Cretaceous Research, 15, pp. 59-87, London.

Ion, J., Antonescu, E., Alexandrescu, Gr. (1994) Contributions to the stratigraphy of the Upper Cretaceous and Paleocene in the northern part of the Tarcău Nappe (East Carpathians). Rom. J. Stratigraphy, 76, pp. 25-60, Bucureşti.

Ion, J., Iva, M., Melinte, M. C., Florescu, C. (in print) Subsurface Santonian-Maastrichtian deposits in the north-eastern South Dobrogea (Romania). Rom. J. Stratigraphy, 77 (1996-1997), Bucureşti.

Ion, J., Antonescu, E., Melinte, M. C., Szasz, L. (in print) Attempt at an interrelated standard biostratigraphy - on the basis of macrofauna, planktonic foraminifera, dinoflagellates, pollen, calcareous nannoplankton - for the Upper Cretaceous deposits of Romania. Rom. J. Stratigraphy, 77 (1996-1997), Bucureşti.

Kaplan, U., Keller, S., Wiedmann, J, (1984) Ammoniten und Inoceramen Gliederung des norddeutschen Cenoman. Schrift. Erd. Kommis., 7, pp. 307-347, Wien.

Kennedy, W.J. (1984a) Ammonite faunas and the "standard zones" of the Cenomanian to Maastrichtian stages in their type areas with some proposals for the definition of the stage boundaries by ammonites. Bull. Geol. Soc. Denmark, 33, pp. 147-161, Copenhagen.

Matsumoto, T., Noda, M. (1985) A note on an inoceramid species from Lower Coniacian (Cretaceous) of Hokkaido. Trans. Proc. Paleont. Soc. Japan., N.S., 140, pp. 263-273, Tokyo.

Robaszynski, F., Caron, M., Gonzales, J. M., Wonders, A. A. (Eds.) (1984) Atlas of Late Cretaceous Planktonic Foraminifera. Revue de Micropal., 26, pp. 145-305, Paris.

Sălaj, J. (1983) Quelques problèmes taxonomiques concernant les foraminifères planctoniques et la zonation du Senonien supérieur d'El Kef. Geologica Carpathica, 34, 2, pp. 187-212, Bratislava.

Melinte, M. C. (1997) Biostratigrafia Cretacicului superior din România pe baza nannoplanktonului calcaros aplicată in flişul din zona de curbură a Carpaţilor Orientali. Ph. D. thesis, Bucharest University.

Szasz, L. (1982) Les subdivisions et les corrélations du Cénomanien de la Roumanie à partir de la faune d'ammonites. D.S. Inst. Geol., 67, 4, pp. 97-113, Bucureşti.

Szasz, L. (1986a) Biostratigraphy and correlation of the Turonian in Romania on the basis of ammonites and inoceramids. D.S. Inst. Geol., 70-71, 4, pp. 147-174, Bucureşti.

Szasz, L. (1986b) Coniacian in Romania: boundaries, subdivisions, ammonite and inoceramid assemblages and their importance for global correlations. D.S. Inst. Geol., 70-71, 4, pp. 175 - 201, Bucureşti.

Troger, K. A. (1989) Problems of Upper Cretaceous Inoceramid Biostratigraphy and Palaeobiogeography in Europe and Western Tethys. Proc. 3rd Internat. Cretaceous Symposium, Tübingen 1987, Stuttgart.

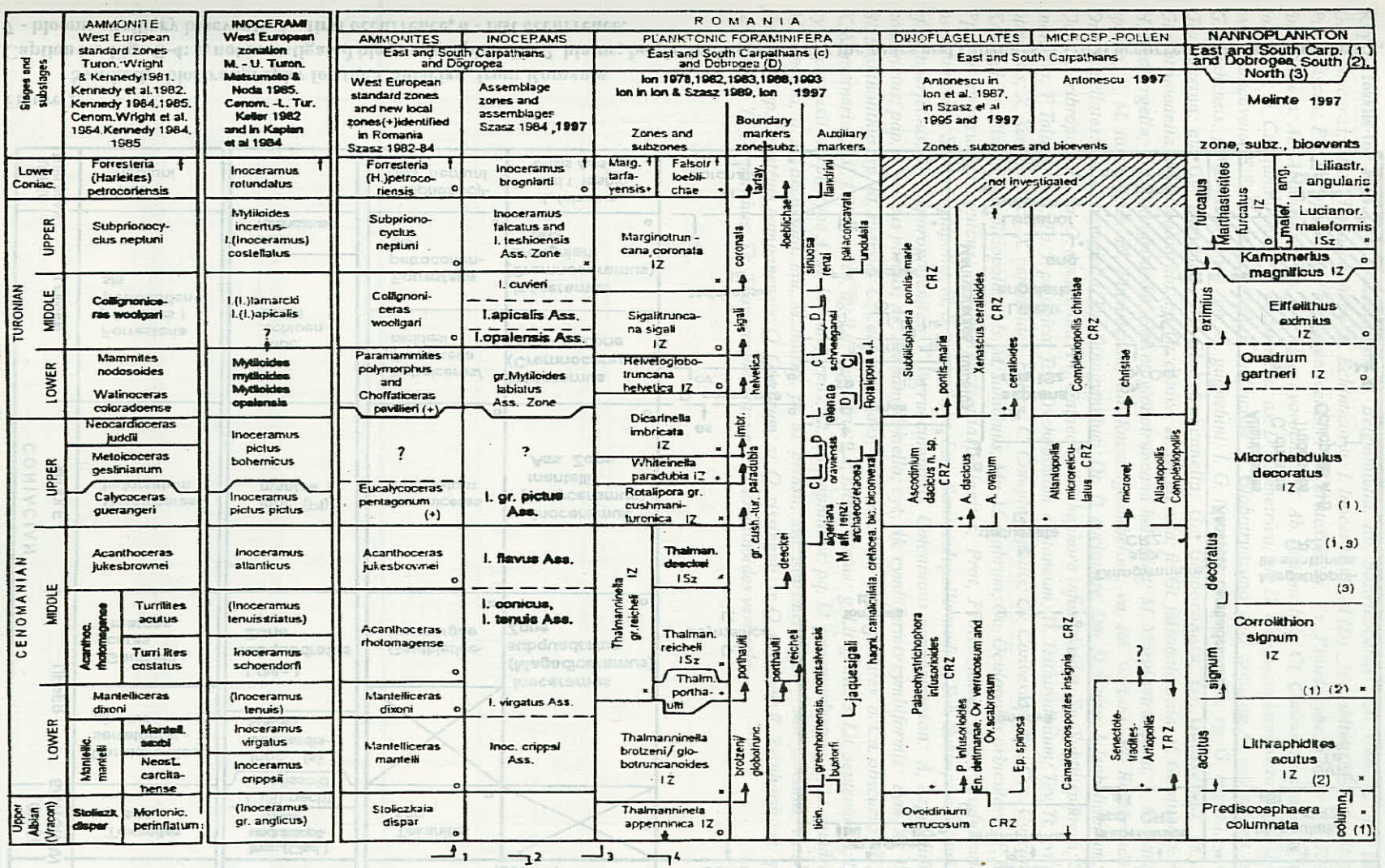

Figure 1.

Integrated biostratigraphy for the Cenomanian - Turonian of Romania

Caption: boundary bioevents for the zones and subzones, 1 - first occurrence, 2 - last occurrence; auxiliary bioevents, 1 - first occurrence, 2 - last occurrence. Other signs (for Figs. 1-4): IZ, Interval Zone; ISz, Interval Subzone; TRZ, Total Range Zone; CRZ, Concurrent Range Zone; + new biostratigraphic unit defined in Romania ; x biostratigraphic unit emended in Romania; o, biostratigraphic unit from other zonal scales.

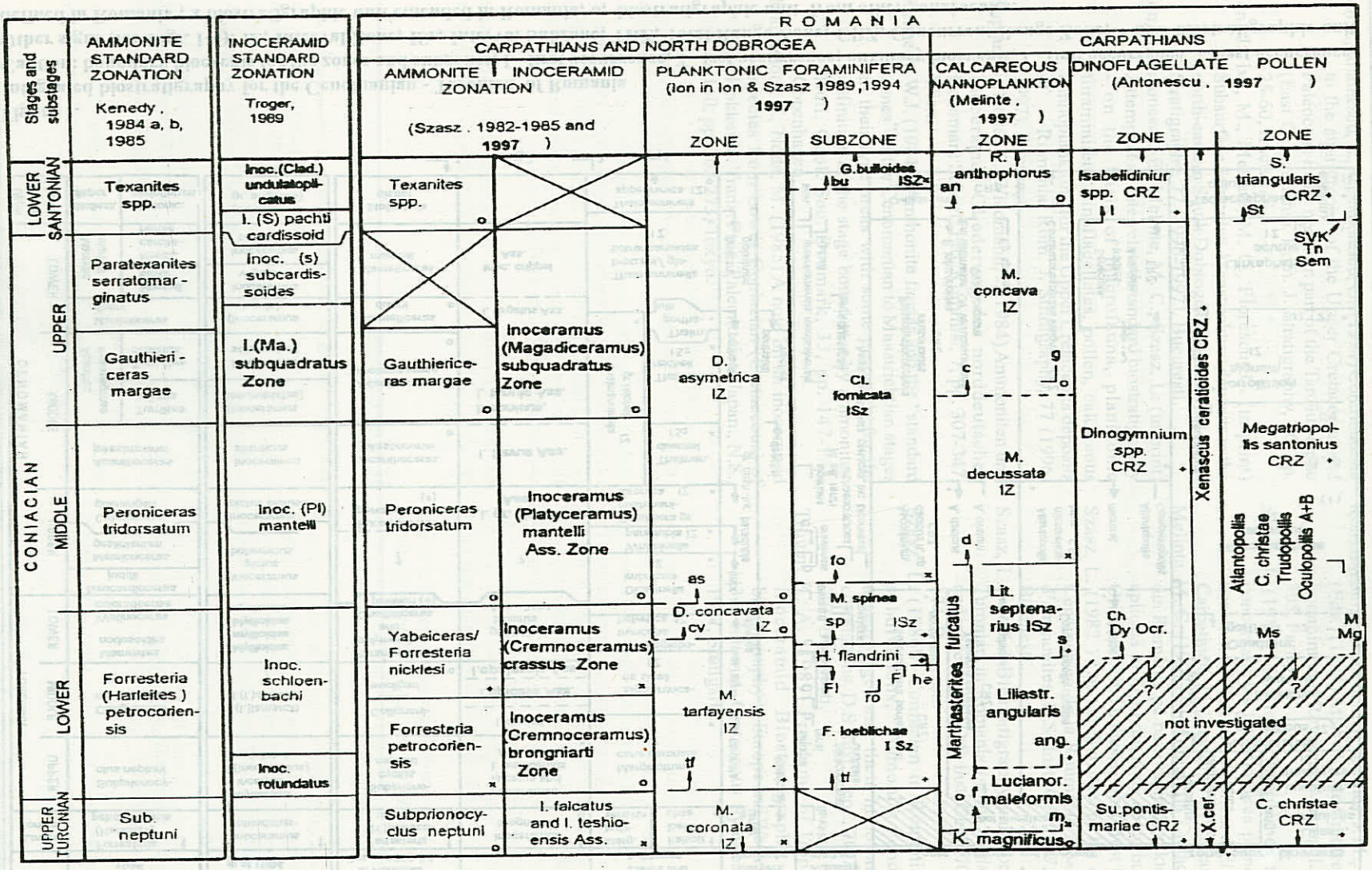

Figure 2.

Synthetic biostratigraphy for the Coniacian from Romania

Caption for Figs. 2-4: 1, not investigated biostratigraphically; 2, hiatus; boundary bioevents for the zones and subzones, 3 - first occurrence, 4 - last occurrence, 7 - bloom: auxiliary bioevents, 5 - first occurrence, 6 - last occurrence.

Key to fossils for Figs. 2-4. Macrofossils: *B, Belemnitella; Bo, Bostricoceras; Co, Conulus; Di, Diplacmoceras; Ga, Gauthiericeras; ; Ho, Hoploscaphites; E, Echinocorys; I. Inoceramus; M (D) , Menabites (Delawarella); Mi, Micraster; P. Pachydiscus; Pa, Parapuzosia; Pl, Placenticeras; Pr, Paratexanites; Px, Pseudoxybeloceras; Tx, Texanites. Planktonic foraminifera: Ab, Abathomphalus; my, Ab. mayaroensis; it, Ab. intermedius; Ct, Contusotruncana; ct, Ct. contusa; fo, Ct. fornicata; m, Ct. manaurensis; D, Dicarinella; as, D. asymetrica; bb, D. biconvexa biconvexa; bg, D. biconvexa gigantea; cv, D. concavata; F, Falsotruncana; Fl, F. loeblichae; G, Globotruncana; a, G. arca; ag, G. aegyptiaca; bu, G. bulloides; es, G. esnehensis; fs, G. falsostuarti; gn, G. gagnebini; l, G. linneiana; ro, G. rosetta; rg, G. rugosa; v, G. ventricosa; Gg, Globigerina; eu, Gg. eugubina; Gl, Globotruncanella; Gn, Globoconusa; Gs, Gansserina; gs, Gs. gansseri; Gt, Globotruncanita; cl, Gt. calcarata; cn, Gt. conica; el, Gt. elevata; fc, Gt. falsocalcarata; sf, Gt. stuartiformis; st, Gt. stuarti; H, Hedbergella; fl, H. flandrini; he, Helvetoglobotruncana helvetica; M, Marginotruncana; p, M. paraconcavata; sp, M. spinea; tf, M. tarfayensis; Pl, Plummerita; Ra, Racemiguembelina; va, Ra. varians; Rt, Rugotruncana; k, Rt. kefiana. Dinoflagellates: Ch, Chatangiella; Dy, Dinogymnium; De, D. euclaense; Dm, D. majus; I, Isabelidinium; O, Odontochitina; Ocr, O. cribropoda; Oop, O. operculata; Pif, Palaeohystrichophora infusorioides; Su, Subtilisphaera; Si, Senoniasphaera inornata; T, Talasiphora; Tp, T. pelagica; Tcc, Trichodinium castaneum; Tt, Trithirodinium; Tev, Tt. evittii; Tru, Triblastula utinensis; X, Xenascus; ce, X. ceratioides. Pollen: C, Complexiopollis; Cv, Convexiopollis; Cvc, Cv. convexigerminalis; K, Krutzschiopollis; M, Megatriopollis; Ms, M. santonius; Mg, M. glabrum; Oo, Oculopollis orbicularis; P, Pseudopapilopollis; Ppr, P. praesubherczynicus; Po, Pompeckjoidaepollenites; Prot, Proteacidites; Ps, Pseudotrudopollis; Psps, Ps. pseudalnoides; S, Suemeghipollis; St, S. triangularis; Sem, Semioculopollis medius; Sub, Subtriporopollenites; Tn, Trudopollis cf. nonperfectus; Tr, Triporopollenites; V, Verruoculopollis. Calcareous nannoplankton: A, Aspidolithus; pac, A. parcus constrictus; pap, A. parcus parcus; Ak, Arkhangelskiella; cyc, Ak. cymbiformis cymbiformis; cym, Ak. cymbiformis minor; Bt, Biantholithus; sp, Bt. sparsus; C, Ceratolithoides; ac, C. aculeus; Ca, Calculites; o, Ca. obscurus; fl, Eprolithus floralis; K, Kamptnerius; Lil, Liliasterites; ag, Lil. angularis; Lit, Lithastrinius; g, Lit. grillii; s, Lit. septenarius; L, Lucianorhabdus; cy, L. cayeuxii morphotype A; m, L. maleformis; Lt, Lithraphidites; pq, Lt. praequadratus; q, Lt. quadratus; M, Micula; c, M. concava; d, M. decussata; mu, M. murus; pr, M. prinsii; Ma, Marthasterites; f, Ma. furcatus; N, Nephrolithus; fr, N. frequens; cp, Orastrum campanensis; Q, Quadrum; si, Q. sissinghii; tr, Q. trifidum; R, Reinhardtites; an, R. anthophorus; le, R. levis; Tr, Tranolithus; Th, Thoracosphaera; ve, Ceratholithoides verbeeki.*

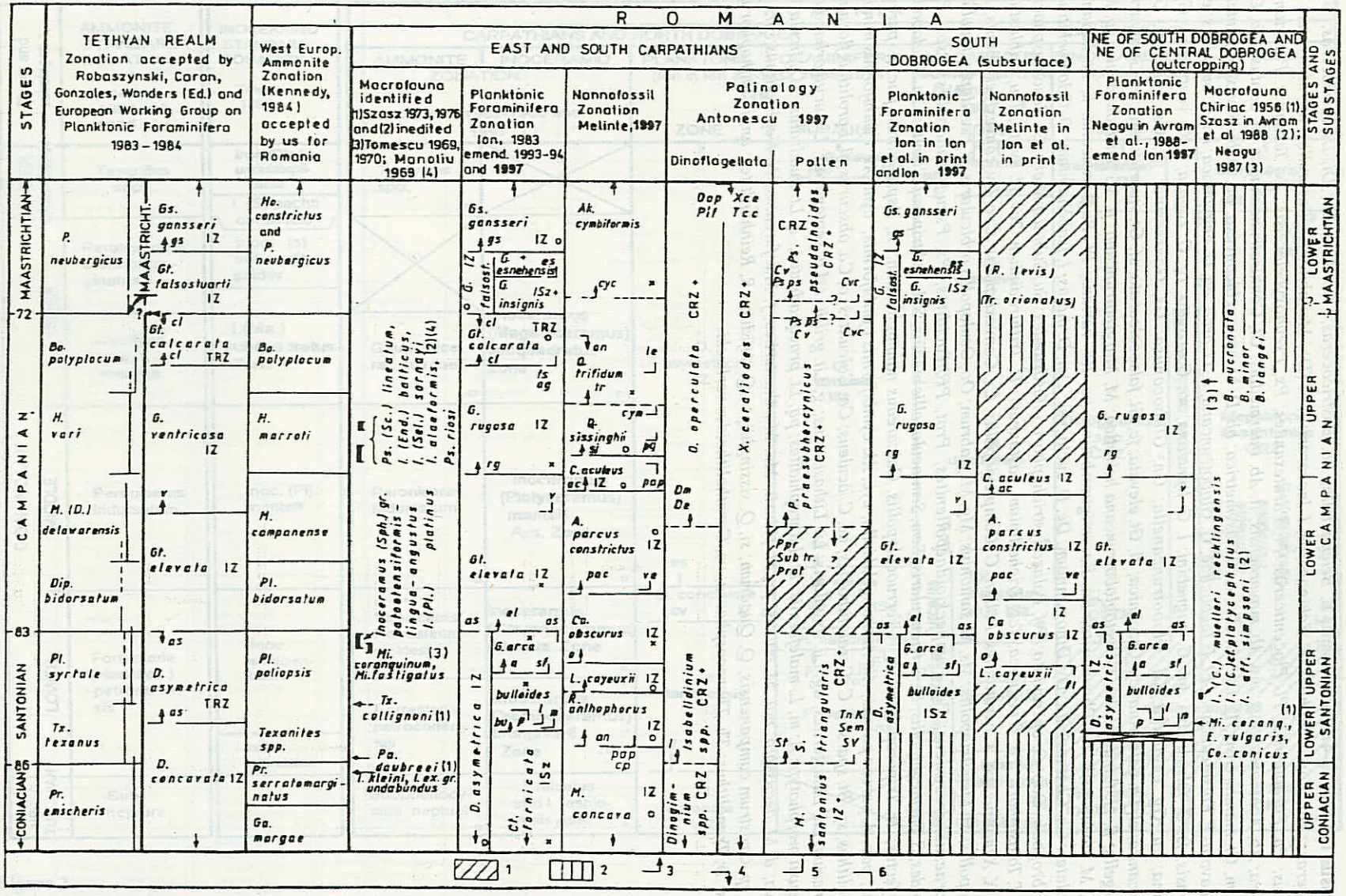

Figure 3.
Integrated biostratigraphy for the Santonian-Campanian from Romania

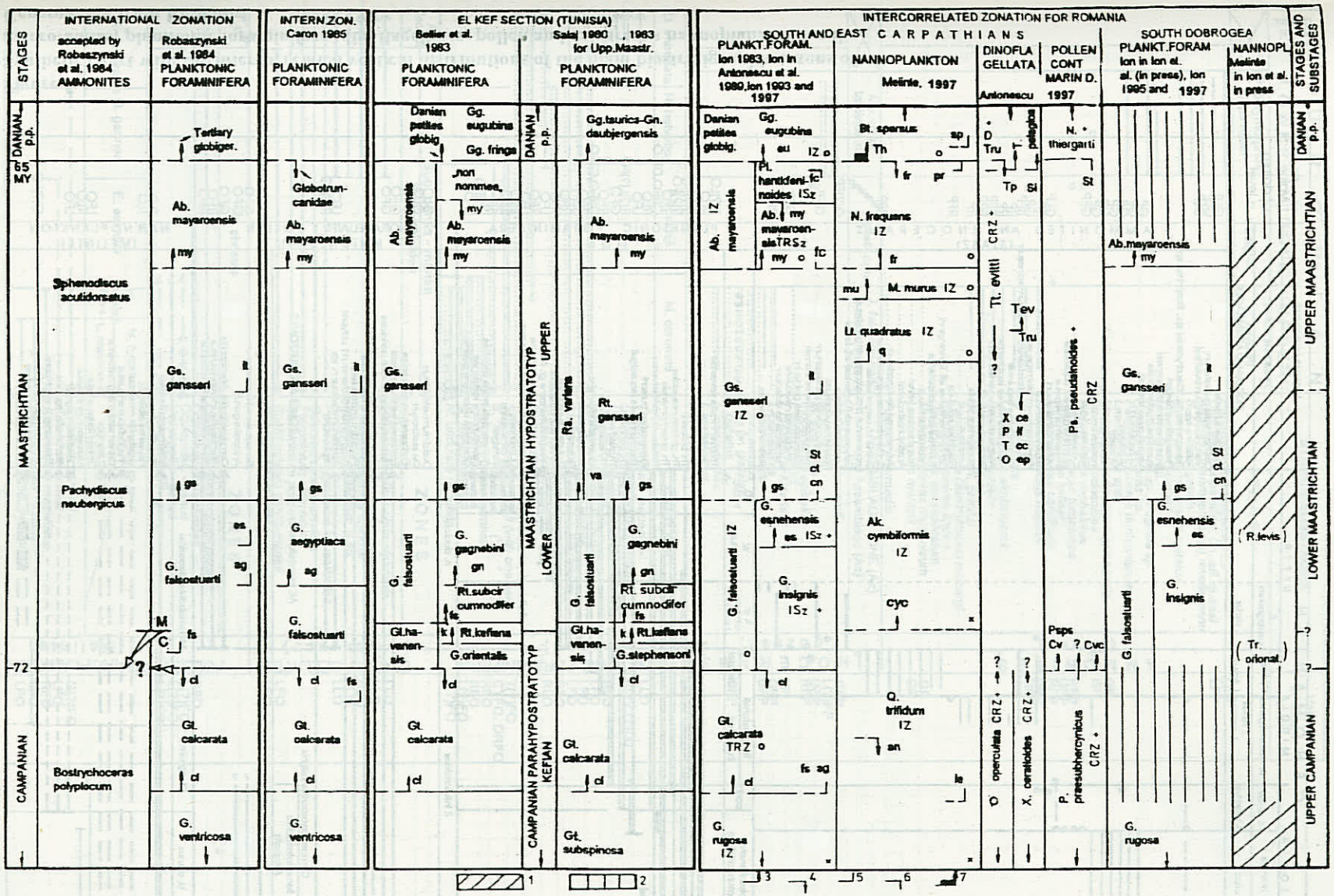

Figure 4.
Integrated biostratigraphy for the Maastrichtian from Romania

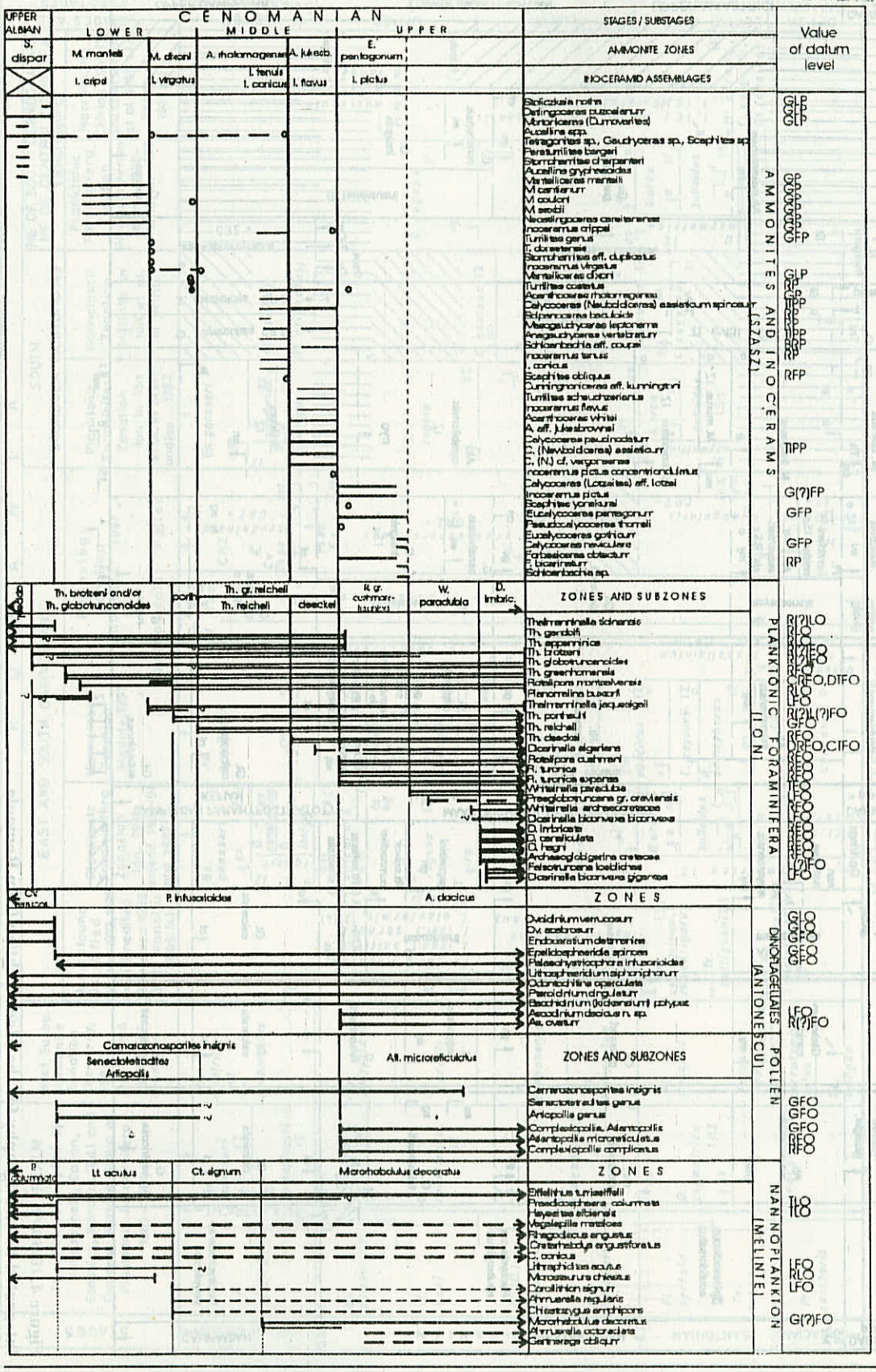

Figure 5.
Synthetic chart with the intercorrelated vertical distributions of the main biostratigraphic taxons of macrofaunas, planktonic foraminifera, dinoflagellates, pollen and calcareous nannoplankton for the Cenomanian from Romania

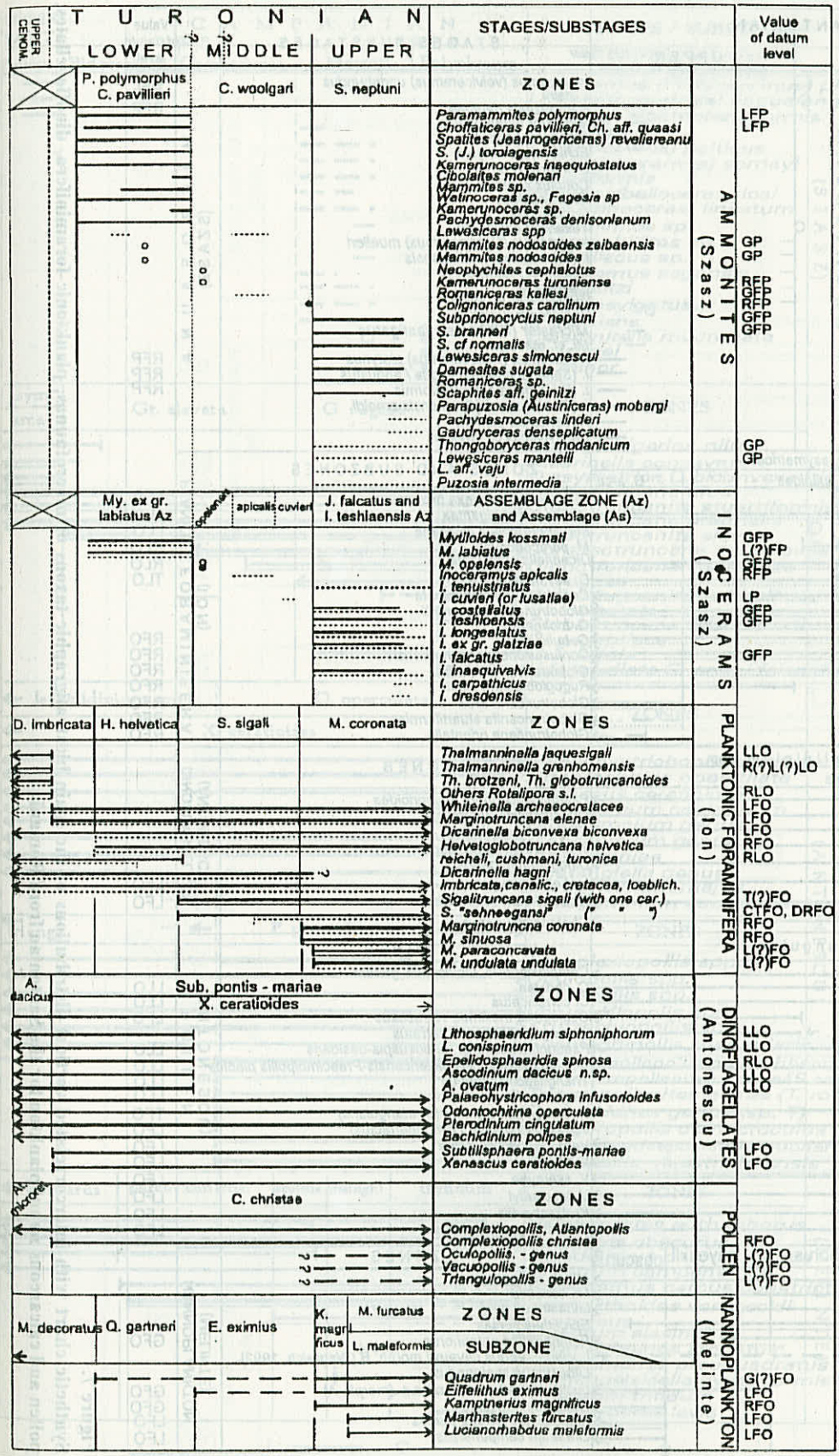

Figure 6.
Synthetic chart with the intercorrelated vertical distributions of the main biostratigraphic taxons of macrofaunas, planktonic foraminifera, dinoflagellates, pollen and calcareous nannoplankton for the Turonian from Romania

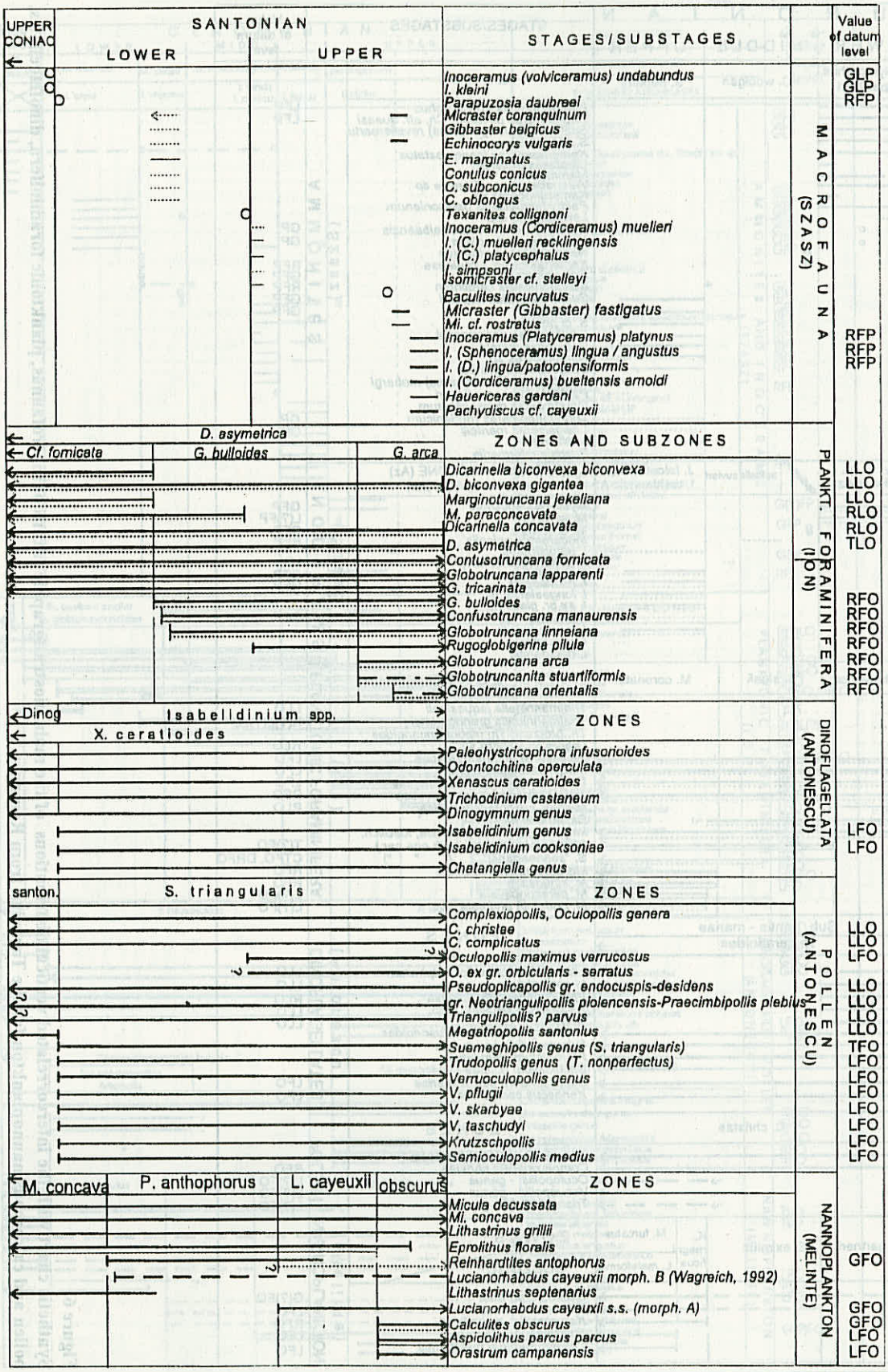

Figure 7.
Synthetic chart with intercorrelated vertical distributions of the main biostratigraphic taxons of macrofaunas, planktonic foraminifera, dinoflagellates, pollen and calcareous nannoplankton for the Santonian from Romania

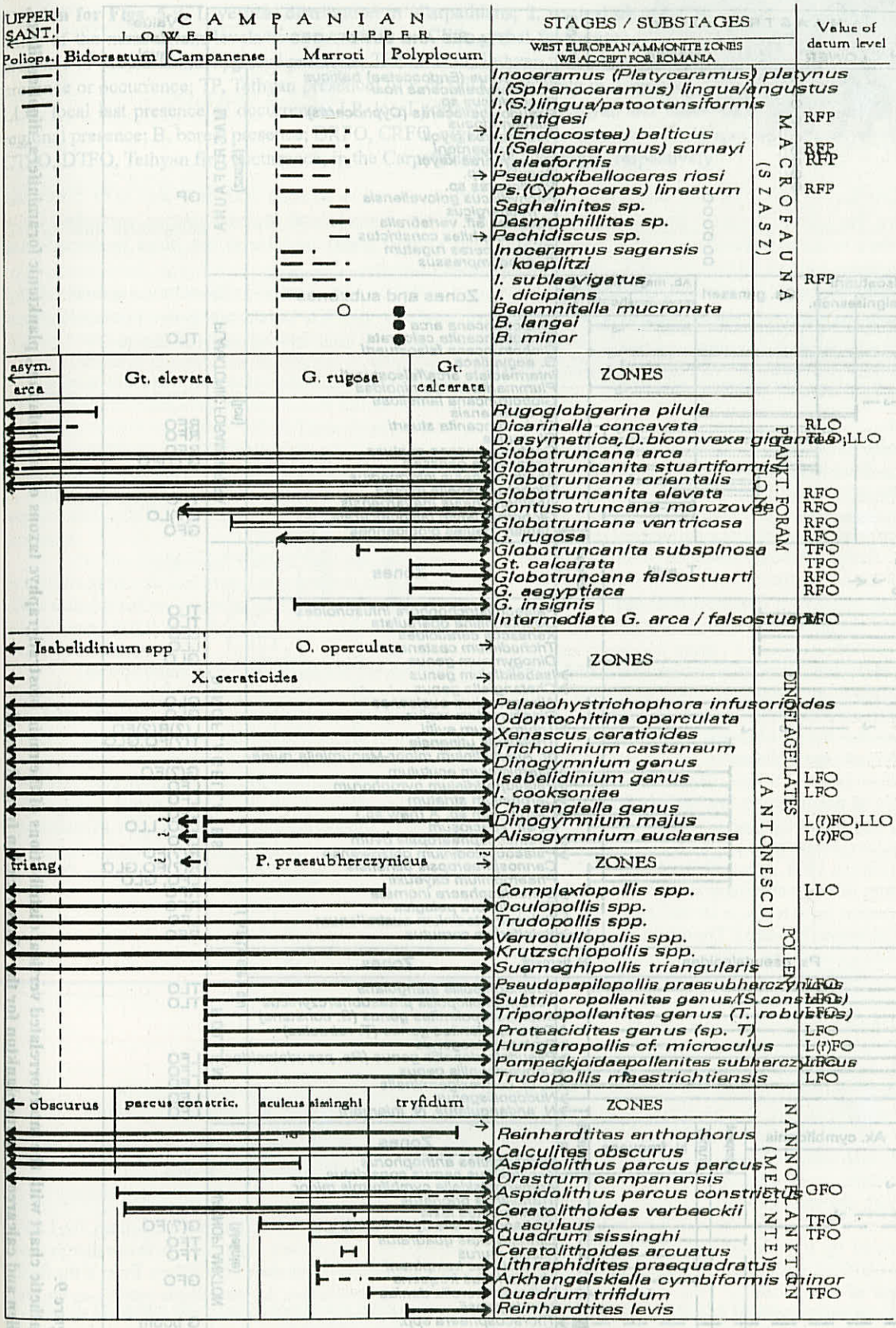

Figure 8.
Synthetic chart with the intercorrelated vertical distributions of the main biostratigraphic taxons of macrofaunas, planktonic foraminifera, dinoflagellates, pollen and calcareous nannoplankton for the Campanian from Romania

Figure 9.
Synthetic chart with the intercorrelated vertical distributions of the main biostratigraphyc taxons of macrofaunas, planktonic foraminifera, dinoflagellates, poHen and calcareous nannoplankton for the Maastrichtian from Romania

Caption for Figs. 5-9. 1, vertical distribution in Carpathians; 2, vertical distribution in Dobrogea. Chronostratigraphic value of the main datum levels/bioevents: GFP or GFO, global first presence or occurrence; GLP or GLO, global last presence or occurrence; GP, global presence; TFP or TFO, Tethyan first presence or occurrence; TLP or TLO, Tethyan last presence or occurrence; TP, Tethyan presence; LFP or LFO, local (only in Romania) first presence or occurrence; LLP or LLO, local last presence or occurrence; LP, local presence; TIPP, Tethyan and Indo-Pacific presence; BRP, boreal and regional presence; B, boreal presence; DRFO, CRFO, regional first occurrence, in Dobrogea and Carpathians respectively; CTFO, DTFO, Tethyan first occurrence, in the Carpathians and Dobrogea, respectively.