

## THE MURGUCEVA AND SVINITA FORMATIONS (LATE TITHONIAN-APTIAN) OUTCROPS NORTH OF THE SVINITA VILLAGE AREA (SW ROMANIA)

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**Abstract.** The two formations under discussion constitute the top of the Jurassic-Cretaceous rock-sequence of the Sirinia Nappe (Marginal Dacides innermost unit), still preserved in the Svinita village area (where its Lower Cretaceous succession and fossil content were the subjects of several papers – see Chapter 1. Introduction), but also at Zeliste (immediately north of Svinita, Fig. 1C), some additional 6 km northward – at Ravniste and Drenetina (Fig. 1B) and 7 km more in the same direction – in the Sirinia Valley basin (Fig. 1A). In the last three areas, the Murguceva Formation (uppermost Tithonian-Lower Hauterivian) deposits are mainly exposed, while the Svinita Formation (Upper Hauterivian-Albian) is preserved only locally, in the right slope of the Sirinia Valley near its mouth, by its two lower members (Upper Hauterivian-Lower Aptian). Their ammonites, recorded in 22 outcrops, range in age from Late Berriasian to Early Aptian; a Late Tithonian age of the Murguceva Formation bottom was also established, on the ground of the content in tintinnids (of *Calpionella alpina* Zone or, locally, of the top of *Crassicollaria* Zone). From a structural point of view, the intense folding of the Sirinia Nappe sedimentary cover in the Sirinia Valley basin, as opposed to its monoclinical (in Svinita and in Zeliste) or horizontal (in Ravniste) position, is due to the closeness to the Getic/Danubian realms contact (located immediately north of the Sirinia Valley). On the other hand, two faults oriented NW-SE (parallel to the Danube) in the middle course of the Sirinia Valley, emphasized by the Cretaceous deposits uplift in the Sacalovacia Summit, belong to a NW-SE fault system, obviously younger than the main SW-NE or S-N Late Cretaceous structural lines in the region.

**Key words:** South Carpathians, Marginal Dacides, Upper Tithonian-Aptian, stratigraphy, ammonites, structure.

### INTRODUCTION

In his "Svinita-Svinecea Mare Zone", Raileanu (1953) identified four areas where the Lower Cretaceous deposits are still preserved: (1) in the Svinita village area; (2) immediately north of it, at Zeliste; (3) some 7 km north – at Ravniste and Drenetina; (4), the largest one, some 15 km north of the Svinita village, in the Sirinia valley basin between the Danube left bank and the Bigar village. The same author observed this succession of deposits, which he framed between the Berriasian and Upper Barremian, from the "lithographic limestones" toward the marls ("the Svinita Beds").

The only area mentioned above, which yielded so far rich Lower Cretaceous ammonite assemblages, was the Svinita village area (south of the Svinita Fault). These faunas were repeatedly published, the most famous paper on this subject belonging to Tietze (1872). It was followed by detailed biostratigraphical studies (Raileanu et al., 1969; Boldor, Avram, 1972; Avram, 1976, 1988, 1994; Nastaseanu, Avram, 1986) part of them being contributions to the modern Ammonite zonation of the Tethyan domain (Avram, 1988, 1994).

By comparison, the other areas (2 to 4) were investigated only for tintinnids (Rusu, 1970, Avram, 1984, Pop, 1986), while the last detailed map, with new

contributions especially in the Sirinia valley basin, (Năstăseanu et al., 1982) was newer published.

Consequently, a complete presentation of the map and of the biostratigraphic data concerning the (mainly) Lower Cretaceous deposits in the areas 2-4 (above) is still actual, not only for the stratigraphy and biostratigraphy, but also for their tectonic implications.

The biostratigraphic data include the ammonite and tintinnid age indicators, the latter referring mostly to the lower boundary of the succession we focused on. The ammonites presented below are all housed in the Museum of the Geological Institute of Romania (with inventory numbers IGP).

### STRATIGRAPHY

As it was established in the Svinita village area (1), the uppermost Tithonian-Albian rock sequence in the region is built up of several members, belonging to two formations, as follows (from the base to the top): (a) **the Calcareous Member** (uppermost Tithonian - lowermost Valanginian), up to 25 m thick: light gray or cream cherty micritic limestones, with white calcarenite interbeds; (b) **the Marly-Calcareous Member** (Valanginian-Lower Hauterivian): an almost 50 m thick succession of gray, clayey cherty limestones, with clayey and shally marly interbeds (Avram, 1984); (c) **the Vodiniciki Valley Member** (Upper Hauterivian-Lower Barremian): an up to 45 m thick succession, similar to (b), but chertless and



progressively richer in marly interbeds towards its upper boundary; (d) the **Temeneacia Valley Member** (top of Lower Barremian-Lower Aptian): some 70 m thick gray-bluish marlstones with shally-marly and clayey interbeds (Avram, 1976); and (e) the **Tiganilor/Tiganski Valley Member** (Upper Aptian-Albian), some 40 m thick, built up of gray clayey, muscovite-rich sandstones with plant debris and of siltstones (Nastaseanu, Avram, 1986). The members a+b constitute the **Murguceva Formation** (Avram, 1976), while the members c+d+e belong to the **Svinita Formation** (Raileanu, 1953, revised by Avram, 1976 and by Năstăseanu, Avram, 1986).

North of the Svinita village, the Lower Cretaceous deposits are still preserved in only a few areas, as mentioned above. Among these areas, the largest one is the Sirinia Valley basin (Fig.1 A), where the two members of the Murguceva Formation are mostly exposed, as a folded cover on the Jurassic or older formations. These latter crop out around the Lower Cretaceous deposits' spread area, but also from below in the deep valleys, along the anticline axes. As it is shown by tintinnids (Avram, 1984), the bottom of the Murguceva Formation is transgressive on the Lower Tithonian nodular limestones (with *Saccocoma*) and is lowermost Berriasian in age (= *Calpionella alpina* zone), although, locally (at Munteana; South of the Bigar village, etc.), the uppermost Tithonian (= upper part of the Crassicollaria zone) is still preserved. The two lower members of the Svinita Formation (c+d) are here developed only locally, in the hills north and south of the Belareka Seaca Valley, and in the northern slope of the Sirinia Valley near its mouth.

The ammonite species gathered in this area lead to these lithostratigraphical units' age, as it was established in the Svinita village area. Thus, the Upper Valanginian age (of the member "b") is proved by the species/assemblages: *Olcostephanus* cf. *sayni* KILIAN (IGP 16597 = Pl. I, Fig.13), from **site 3**, located in the right slope of the Sirinia Valley, nearby the Raichici Valley mouth; *Ptychophylloceras ptychoicum* (QU.) (Pl. I, Fig.1), *Neocomites* (*Teschenites*) sp. ex gr. *N. (T.) flucticus* THIEULOY (IGP 16592 = Pl. II, Fig.1), *Olcostephanus* (O.) cf. *catulloi* (RODIGHERO) (IGP 16599), *O. (O.)* cf. *psilostomus* (NEUMAYR & UHLIG) (IGP 16603 = Pl. I, Fig.11) from **site 4**, located in the cutting of the road on the left bank of the Sirinia Valley, upstream from the Raichici Valley mouth; *Neocomites* (*Teschenites*) cf. *scioptychus* (UHLIG) (IGP 16591 = Pl. II, Fig. 6), from **site 6** (in the left tributary of the Socolovacia Valley, 940 m upstream its mouth); *Neocomites* (*Teschenites*) cf. *callidiscus* THIEULOY (IGP 16588 = Pl. II, Fig.5) from **site 11** (on the Cenusarilor Hill). Some other species indicate the latest Valanginian or the earliest Hauterivian age, of the same "b" member: *Oosterella villanovae* (NICKLES) (IGP 19551 = Pl. II, Fig. 9), from **site 13** (at Piatra Lunga, in the cutting of the Svinita-Moldova Noua highway) and *Bochianites goubachensis* MANOLOV (IGP 19579 = Pl. I, Fig. 2) from **site 14** (south of the Dumbravita Hill). Finally, the Early Hauterivian age of the same member is shown by the species: *Bochianites* cf. *renevieri* (OOSTER) (Pl. I, Fig. 3) recorded in **site 1** (in a small tributary of the Cozla Valley), *Distoloceras spiniger* (v. KOENEN) (IGP 16605 = Pl. II, Fig. 3) from **site 9** (in the cutting of the road along the Sirinia Valley, some 1100 m north of the

Belareka Valley mouth, or 270 m north of the road-bridge over the Sirinia Valley), and *Crioceratites* cf. *matsumotoi* (SARKAR) found in **site 10** (in the Belareka Valley).

The Late Hauterivian age of the member "c" is emphasized by the species: *Paraspinoceras* cf. *jourdani* (ASTIER) (IGP 16502) from **site 2** (on the old road/path between the Cozla and Bigar villages) and *Pseudothurmannia* cf. *pseudomalbosi* (SAR. & SCHÖND.) (IGP 16572 = Pl. I, Fig. 8), from **site 12** (on the Cenusarilor Hill), while its Early Barremian age is shown by *Pulchellia* cf. *schlumbergeri* NICKLES (IGP 19646 = Pl. II, Fig. 8) from **site 8** (in the cutting of the road along the Sirinia Valley, some 135 m north of the Belareka Valley mouth).

**Site 7** (the last = westernmost outcrop in the cutting of the new road Cozla-Bigar near the Sirinia Valley mouth) yielded the only Lower Aptian ammonite: *Deshayesites* sp. (IGP 18822 = Pl. I, Fig. 9) from the top of marly/marlstone member "d" succession in the Sirinia Valley basin.

At Ravniste (Fig.1B), a single ammonite was recorded, in **site 15** (on the road descending southwards from the Ravniste flat-field): *Criosarasinella mandovi* THIEULOY (IGP 19500 = Pl. II, Fig. 4) showing to a Late Valanginian age of the member "b", at a level where the *Calpionellites oblonga*, *Remaniella cadischiana* and *Lorenziella hungarica* are still present (layer 237 in Avram, 1984, Text-Fig. 3).

The Zeliste monoclin (Fig. 1C) exposes both members of the Murguceva Formation, in which the Late Berriasian age of the member "b" is pointed to in **sites 19 and 20**, located along the Svinita-Moldova Noua highway 350 m south of the Saraorski Valley and immediately west of the Varnicika Valley, respectively. The ammonites there: *Spiticeras* (S.) *multiforme* DJ. (IGP 19557 = Pl. I, Fig. 10 a-b) and, respectively, *Fauriella* cf. *rarefurcata* (PICTET) (IGP 19577 = Pl. I, Fig. 14) and *Jabronella* cf. *paquieri* (SIMIONESCU) (IGP 19578 = Pl. II, Fig. 2) indicate the Boissieri Zone (Paramimounum and Picteti Subzones). The uppermost Early Valanginian age of the same member was documented along the same highway, in **site 22** (some 1200 m north of the Tiganski Valley mouth), by *Busnardoites campilotoxus* (UHLIG) (IGP 16584), while its Late Valanginian age is shown in **site 18** (270 m south of the Saraorski Valley mouth) by *Olcostephanus* cf. *catulloi* (RODIGHERO) (IGP 19590 = Pl. I, Fig. 12) and in **site 21** (370 m south of the Varnicika Valley) by *Sarasinella* cf. *ambigua* (UHLIG) (IGP 19585 = Pl. II, Fig. 7).

Finally, the uppermost Early Hauterivian age of the same member top is proved in the fossiliferous sites 16 and 17, both located along a cart-route from Svinita to Bigar some 250 and 150 m west of the Varnicika Valley, respectively: in **site 16** - *Crioceratites matsumotoi* (SARKAR) (IGP 16521 = Pl. I, Fig. 5), *Crioceratites* n. sp. aff. *C. loryi* (SARKAR) (IGP 15534 = Pl. I, Fig. 4) and *Protacrioceras* ? sp. (IGP 16515 = Pl. I, Fig. 7); in **site 17** - *Crioceratites* ? *monotuberculatus* n. sp. (largely uncoiled open spire, bearing numerous thin, transverse, single ribs, part of them uniting by 2 or 3 in strong marginal tubercles, and the other, some 7-12 on each interval, crossing the ventral side almost perpendicularly; an ornamentation announcing that of the Barremian genus *Lytocrioceras*



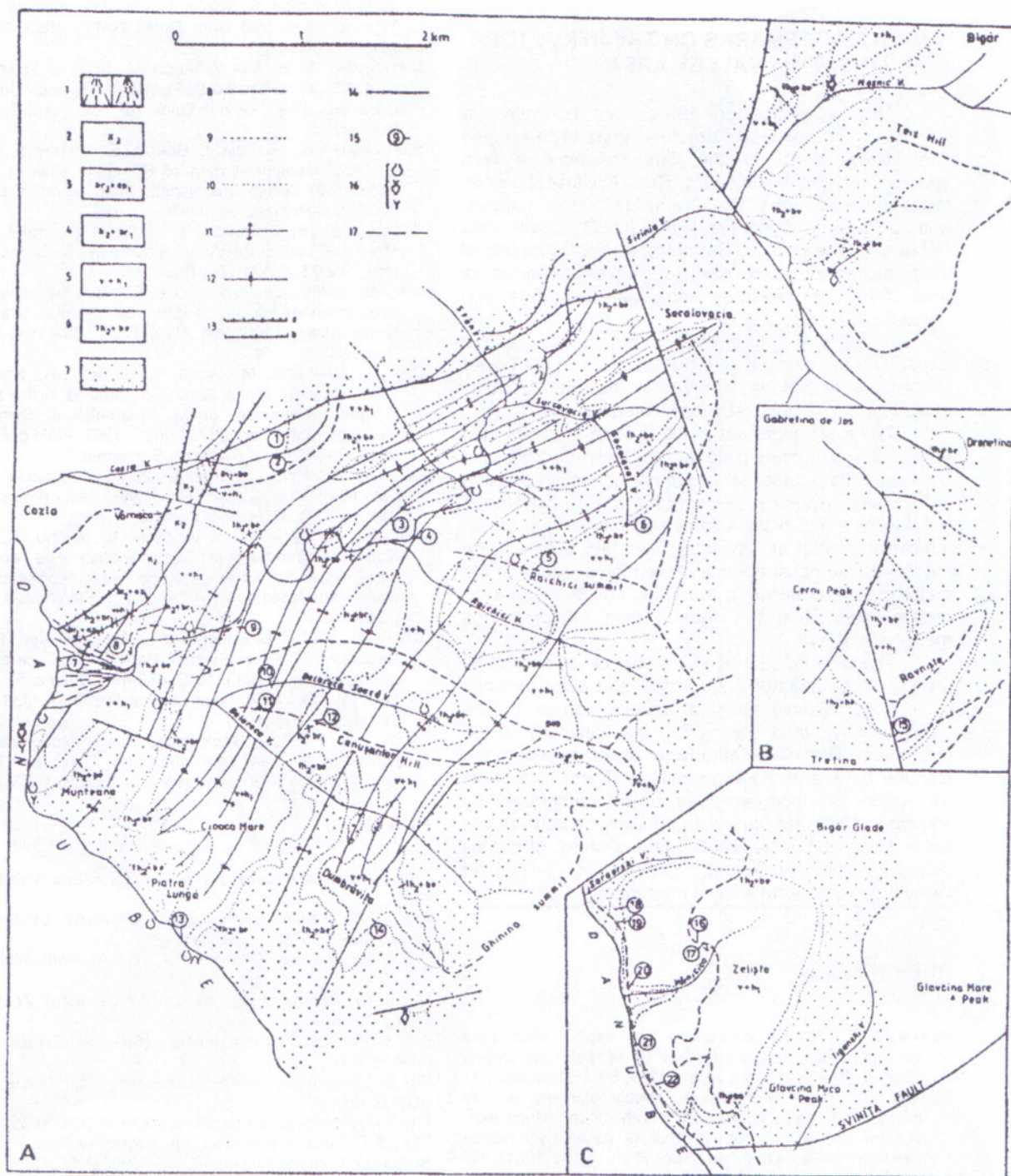


Fig. 1 A-C Sketch maps of the Murguceava and Svinita Formations north of the Svinita village area (the author's data in Nastaseanu *et al.*, 1982, completed, for the northern tectonic contact, after Iancu, Maruntiu, 1994 and Iancu, in Pop *et al.*, 1997). Legend: 1, Quaternary deposits. 2, Upper Cretaceous. 3+4, Svinita Formation: 3, top of Lower Barremian-Lower Aptian (the Temeneacia Valley Member); 4, Upper Hauterivian-Lower Barremian (the Vodniciki Valley Member). 5, Valanginian-Lower Hauterivian (the Marly-Calcareous Member). 5+6, Murguceava (the Calcareous Member). 6, uppermost Tithonian-lowermost Valanginian. 7, Pre-Upper Tithonian formations. 8, Boundary of the Quaternary deposits. 9, Stratigraphic boundary. 10, Unconformity. 11, Anticline. 12, Syncline. 13 a, Overthrust (the Getic Nappe = the Cozia Nappe, *sensu* Nastaseanu *et al.*, 1981); 13 b, reverse fault. 14, Fault. 15, Fossiliferous site. 16, Microfossil zones (a, *Calpionella alpina*; b, *Crassicollaria*; c, *Saccocoma*). 17, Roads or paths.



SPATH, 1924) typified by two specimens (IGP 16554 and 16555) of which only one is shown here (Pl. I, Fig. 6).

### SOME REMARKS ON THE STRUCTURE OF SIRINIA VALLEY AREA

The knowledge on the contact between the Danubian and the Getic structural units in the region immediately north of the Sirinia Valley evolved spectacularly in the last years. Thus, Nastaseanu *et al.* (1981) introduced the "Cozla" and the "Sirinia" nappes, both considered digitations within the Danubian units (= Marginal Dacides) by Sandulescu (1984); the first of them and possibly, the next, too, were interpreted as units of the Getic realm by Iancu, Maruntiu (1994) and Iancu (in Pop *et al.*, 1997).

Although this discussion is not the goal of the paper, two facts concerning the tectonics of the Lower Cretaceous sedimentary cover in the Sirinia Valley could help the regional structural interpretation.

The most important of these facts is the intense folding of sedimentary cover in the Sirinia Valley basin, as against its monoclinical or almost horizontal position in southern exposure areas within the Sirinia Nappe (monoclinical in Svinita village and in Zeliste areas; almost horizontal at Ravniste). This fact seems to be the immediate consequence of the high stress near the tectonic contact between the Getic and the Danubian realms, supporting the most recent interpretations mentioned above.

The second fact is the presence of two faults producing the uplift of the Jurassic and older deposits in the Sacalovacia Summit (middle course of the Sirinia Valley), thus interrupting the continuity of the uppermost Tithonian-Hauterivian cover between the Danube bank and the Bigar village. These two faults (of which the northern was partly recognized by Raileanu, 1953) are parallel to the Danube course, and seem to belong to a NW-SE fault-system, obviously younger than the main, SW-NE or S-N Late Cretaceous structural lines in the region.

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### PLATE I

- Fig. 1 *Ptychophylloceras ptychoicum* (QU). Sirinia Valley, site 4.
- Fig. 2 *Bochianites goubenchensis* MANOLOV. South Sirinia, site 14 (IGP 19579).
- Fig. 3 *Bochianites cf. renevieri* (OOSTER). North Sirinia, site 1.
- Fig. 4 *Crioceratites* n. sp. aff. *C. loryi* (SARKAR). Zeliste, site 16 (IGP 16534).
- Fig. 5 *Crioceratites matsumotoi* (SARKAR). Zeliste, site 16 (IGP 16521).
- Fig. 6 *Crioceratites ? monotuberculatus* n. sp. Zeliste, site 17 (IGP 16555).
- Fig. 7 *Protacrioceras ?* sp. Zeliste, site 16 (IGP 16515).
- Fig. 8 *Pseudothurmannia cf. pseudomalbosi* (SAR. & SCHOND.). Cenusarilor Summit, site 12 (IGP 16572).
- Fig. 9 *Deshayesites* sp., Sirinia Valley, site 7 (IGP 18822).
- Figs. 10 a-b *Spiticerus* (S.) *multiforme* DJ. Zeliste, site 19 (IGP 19557).
- Fig. 11 *Olcostephanus* (O.) cf. *psilostomus* (NEUM. & UHLIG). Sirinia Valley, site 4 (IGP 16603).
- Fig. 12 *Olcostephanus* (O.) cf. *catulloi* (RODIGHERO). Zeliste, site 18 (IGP 19590).
- Fig. 13 *Olcostephanus* (O.) cf. *sayni* KILIAN. North Sirinia, site 3 (IGP 16597).
- Fig. 14 *Fauriella cf. rarefurcata* (PICTET). Zeliste, site 20 (IGP 19577).



PLATE I





## PLATE II

**Fig. 1** *Neocomites (Teschinites)* sp. ex gr. *N. (T.) flucticulus* THIEULOY. Sirinia Valley, site 4 (IGP 16592).

**Fig. 2** *Jabronella* cf. *paquieri* (SIMIONESCU). Zeliste, site 20 (IGP 19578).

**Fig. 3** *Distoloceras spiniger* (v. KOENEN). Sirinia Valley, site 9 (IGP 16605).

**Fig. 4** *Criosarasinella mandovi* THIEULOY. South Ravniste, site 15 (IGP 19500).

**Fig. 5** *Neocomites (Teschinites)* cf. *callidiscus* THIEULOY. Cenusarilor Summit, site 11 (IG P 16588).

**Fig. 6** *Neocomites (Teschinites)* cf. *scioptychus* (UHLIG). Socolovat Valley, site 6 (IGP 16591).

**Fig. 7** *Sarasinella* cf. *ambigua* (UHLIG). Zeliste, site 21 (IGP 19585).

**Fig. 8** *Pulchellia* cf. *schlumbergeri* NICKLES. Sirinia Valley, site 8 (IGP 19646).

**Fig. 9** *Oosterella vilanovae* (NICKLES). Piatra Lunga, site 13 (IGP 19551).

All fossils are figured in natural size. All come from the author's collection, except that from Pl. II, Fig. 9, which was collected by S. Năstăseanu.



PLATE II

