

ON THE ZONAL SUBDIVISION OF THE LOWER BARREMIAN SEQUENCES IN GEORGIA, CAUCASUS

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(Manuscript received September 21, 1995; accepted in revised form June 20, 1996)

Abstract: On account of the analysis of the rich stratigraphic and paleontological material from the Khidikari section (Georgia) in Lower Barremian sediments three biostratigraphic zones, corresponding to the French subdivision, could be distinguished — *Spitidiscus hugii*, *Pulchellia compressissima* and *Holcodiscus caillaudianus*. This is the first evidence that the Lower Barremian subdivision into three zones can be applied not only in Georgia but in the vast Crimean-Caucasian region as a whole.

Key words: Lower Barremian, Caucasus, Georgia, ammonite biostratigraphy.

Introduction

The Lower Cretaceous sediments of Georgia (Figs. 1-2) are mainly represented by flysch and subplatform facies. Flysch facies occur on the southern slope of the Greater Caucasus in two separate basins — Western and Eastern. In the extreme north-west, in the Tuapse-Novorossiisk Zone carbonaceous-terrigene sediments occur without the distinctive features of the eastern flysch basin. In the north-east, in the Mestia-Tuapse Zone the flysch sediments of the lower part (up to Lower Hauterivian) are represented by carbonaceous sediments, those of the upper part (beginning from the Upper Hauterivian) by terrigene sediments. Subplatform limestone facies in the Gagra-Djava Zone extend from the north-west to south-east as an almost uninterrupted narrow stretch and they fringe the Dzirulla crystalline salient of the Transcaucasian Median Massif. Separate isolated outlets occur in the south-east of the Republic, within the limits of Khrami and Locki massifs and in the Trialeti range. They form part of the carbonate belt, that was formed in the epicontinental seas of the Mediterranean paleogeographical province. At present, the biostratigraphic subdivision of the Barremian sediments of Georgia and especially of the lower substage, well established in the Gagra-Djava Geotectonic Zone is the most topical problem of Lower Cretaceous stratigraphy.

Stratigraphy

The Barremian stage of Georgia, especially its upper substage, was the subject of long-term researches and was studied in detailed by Eristavi (1952, 1960, 1962), Kotetishvili (1970, 1979, 1980, 1986, 1989), Kakabadze (1971, 1981, 1987), Kakabadze & Kotetishvili (1995) etc. A scheme of Upper Barremian subdivision widely accepted not only in Georgia, but also in other countries in the Mediterranean regions (Hoedemaeker et al. 1990, 1993). The *Ancyloceras vandenheckii* and *Subpulchellia plana-Heinzia matura* (Kakabadze 1987; Kvantaliani 1989; Kakabadze & Kotetishvili 1995) Zones were also attributed to the Upper Barremian, although earlier in Georgia they were considered Lower Barremian (Kotetishvili 1986, 1989; Kakabadze 1987; Adamia et al. 1988). Therefore, at present the Lower Barremian is limited by the top of the Upper Hauterivian *Pseudothurmannia angulicostata* at its base and by the base of the Upper Barremian *Ancyloceras vandenheckii* Zone at its top. However, between these boundaries exists only one zone, the *Holcodiscus caillaudianus* Zone, which corresponds to the whole lower substage (Kakabadze 1987). Therefore, the revision of the biozonal subdivision of the Lower Barremian became indispensable. Consequently, the best exposed section of the Khidikari gorge is situated in the area occupied by the so called "ammonitic facies", consisting of marly micritic limestones favourable for fossils accumulation (especially ammonites), in the vicinity of village Kvatskhuti.

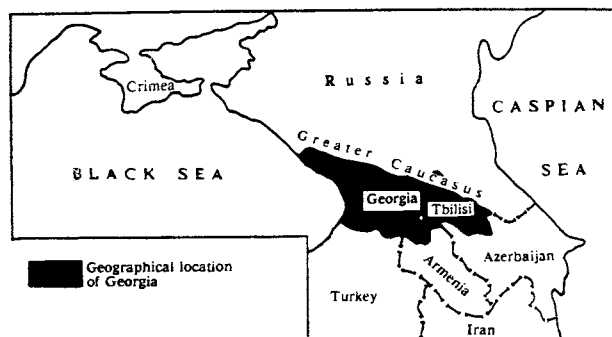


Fig. 1. Geographical position of Georgia and its adjacent countries.

Description of the Khidikari section

In the Gagra-Djava Geotectonic Zone, in the northern wing of the Racha-Lechkhumi Syncline, in the Khidikari gorge (vicinity of the Kvatskhuti village), along the right bank of the Rioni River, well exposed Lower Barremian limestones (Fig. 3) resting conformably on the Upper Hauterivian rocks

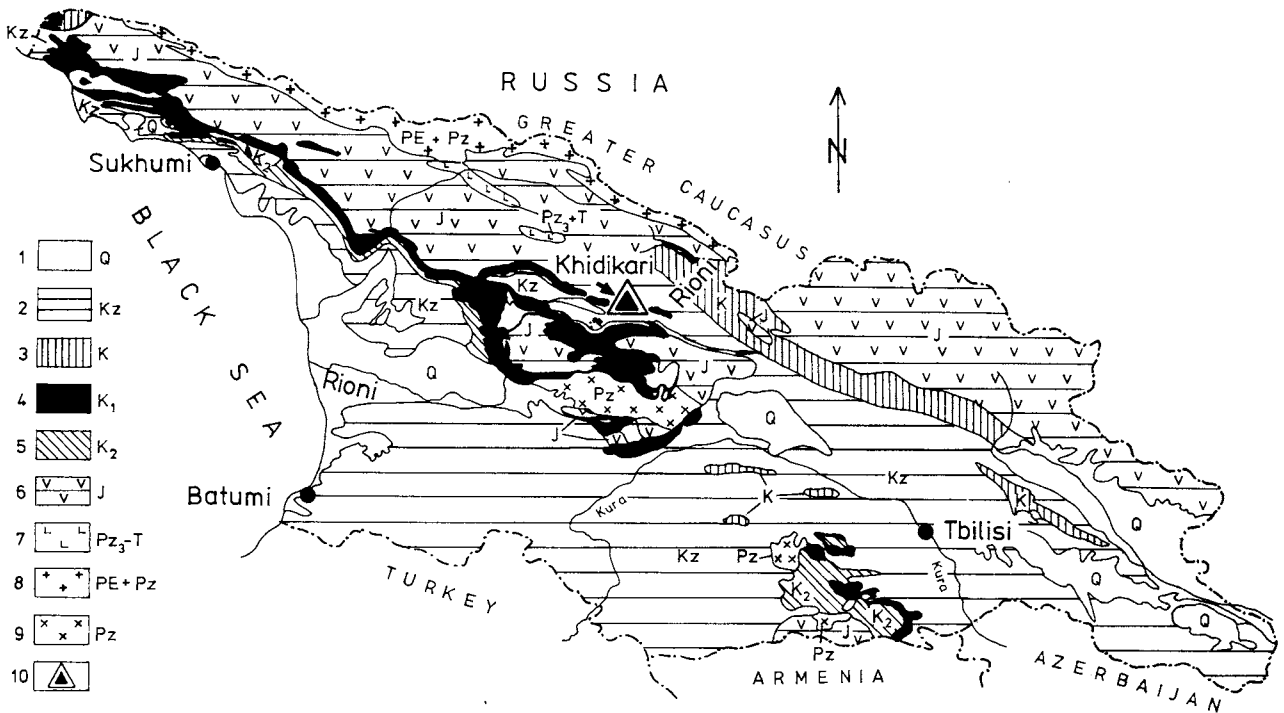


Fig. 2. Schematic geological map of Georgia and location of Khidikari section. 1. Q — Quaternary deposits; 2. Kz — Cenozoic deposits; 3. K — outcrops of Cretaceous flysch deposits without subdivision; 4. K1 — outcrops of subplatform Lower Cretaceous deposits; 5. K2 — outcrops of Upper Paleozoic-Triassic deposits; 6. J — Jurassic volcanogene formations; 7. Pz3-T — Upper Paleozoic-Triassic deposits; 8. P-Pz — Precambrian-Paleozoic granitoids; 9. Pz — Paleozoic granitoids; 10. Section Locality.

are observed. This section starting from the Upper Hauterivian up to the Upper Barremian is as follows:

- K₁h₂ 1 — (Beds No. 155-230). Dark-grey limestones with chert nodules, alternating with marls. The rich fauna is mainly concentrated in the limestones: *Pseudothurmannia mortilleti* (Pictet & Lor.), *P. ex gr. angulicostata* (d'Orb.), *P. sp.*, *Barremites sp.*, *Crioceratites cf. nolani* (Kil.), *C. sp.*, *Phyllopachyceras sp.*, *Hibolites cf. subfusiformis* (Rasp.) > 10 m.
- K₁br₁¹ 2 — (Beds No. 231-300). Cherty limestones, here and there marly intercalations are observed. It contains numerous ammonites, gastropods and bivalves: *Spitidiscus hugii* (Oost.), *S. sp.*, *Astieridiscus uhligi* (Kar.), *Barremites charrierianus* (d'Orb.), *B. hemiptychus* (Kil.), *B. tenuicinctus* (Sar. & Schond.), *B. subdifficilis* (Kar.), *B. psilotatus* (Uhl.), *B. difficilis* (d'Orb.), *Crioceratites sp.*, *Phyllopachyceras infundibulum* (d'Orb.), *Biasaloceras subsequens* (Kar.), *Protetragonites eichwaldi* (Kar.), *P. crebrisulcatus* (Uhl.) etc. 36 m.
- K₁br₁² 3 — (Beds No. 301-326). Limestones with marly intercalations. The limestones yielded: *Pulchellia compressissima* (d'Orb.), *P. ex gr. changarnieri* (Sayn), *Astieridiscus uhligi* (Kar.), *A. cf. elegans* (Kar.), *Holcodiscus cf. gastaldinus* (Uhlig), *H. sp.*, *Spitidiscus sp.*, *Barremites cf. difficilis* (d'Orb.), *Phyllopachyceras infundibulum* (d'Orb.), *Duvalia grasiana* (Duv.-Jouv.), brachiopods and gastropods etc. 8.5 m.

- K₁br₁³ 4 — (Beds No. 327-369). Thick-bedded marls, alternating with thin bedded limestones. Marly layers prevail over limestones. The following ammonites and brachiopods were found in the lower part: *Holcodiscus cf. caillaudianus* (d'Orb.), *Barremites psilotatus* (Uhl.), *B. subdifficilis* (Kar.), *B. cf. tenuicinctus* (Sar. & Schond.), *B. sp.*, *Phyllopachyceras infundibulum* (d'Orb.), *Lacunosella eichwaldi* (Kar.) etc. 20 m.
- K₁br₂¹ 5 — (Beds No. 370-380). Alternation of marls and thin bedded limestones with chert nodules. 5-6 m.
- K₁br₂² 6 — (Beds No. 381-386). Limestones and marls, with intercalations of marlstones. These beds yielded: *Subpulchellia plana* Kot., *S. brevicostata* Kot., *Barremites strettostoma* (Uhl.), *B. psilotatus* (Uhl.), *B. sp.*, *Phyllopachyceras sp.*, *Cymatoceras neocomiensis* (d'Orb.), *Lacunosella cf. kolchidaensis* (Moiss.) > 2 m.

The stratigraphically higher more prominent Upper Barremian beds lie conformably.

Discussion

In the Lower Barremian of the stage stratotype, in southeastern France, Busnardo (1984) provisionally suggested the following stratigraphic zones (in ascending order): 1 — *Spitidiscus hugii*, 2 — *Pulchellia compressissima*, and 3 — *Moutoniceras sp.* Later on the working group of IGCP Project No. 262 in France (Hoedemaeker et al. 1990) recommended for the Mediterranean region to distinguish four ammonitic

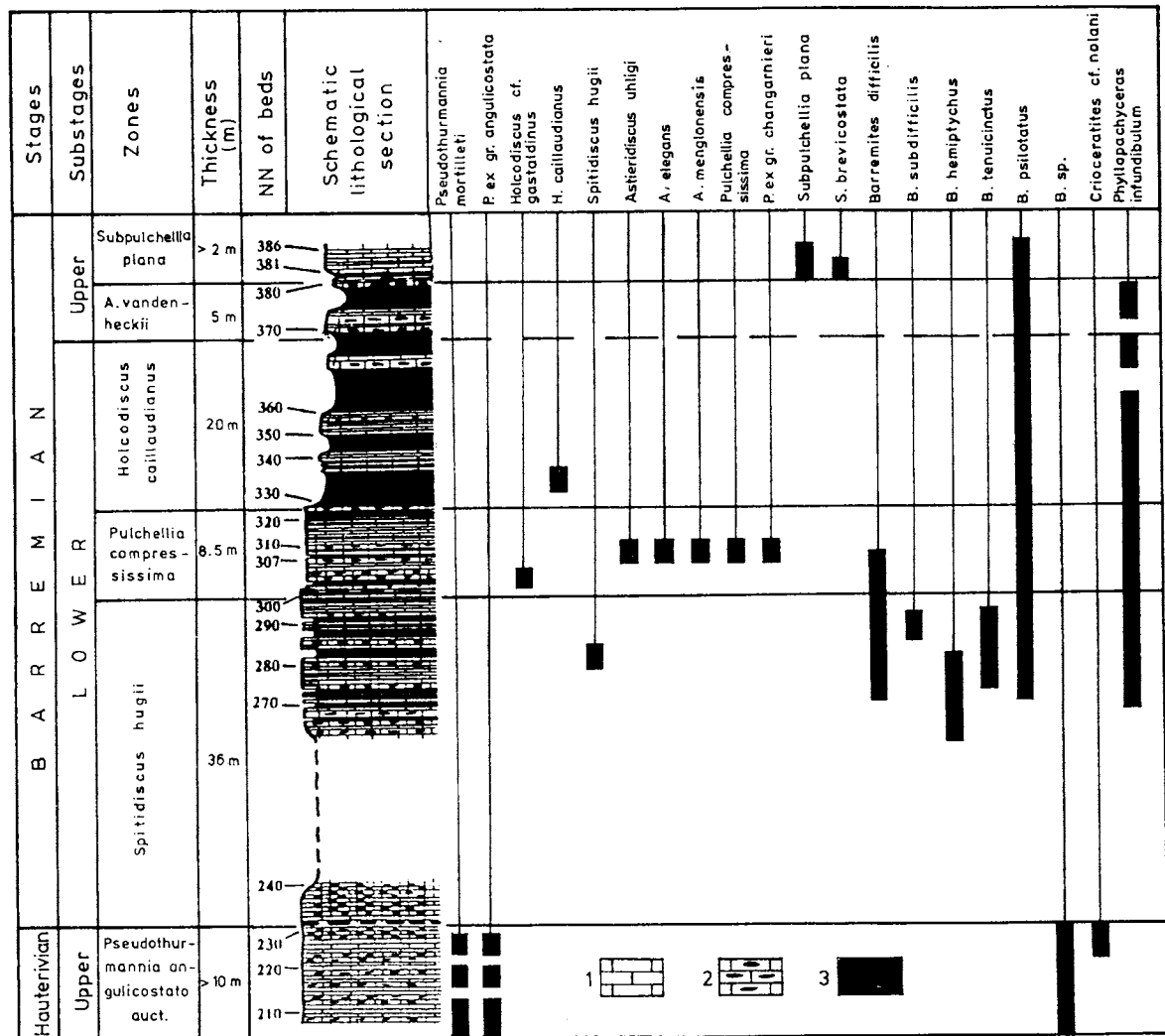


Fig. 3. Scheme of zonal subdivision of the Lower Barremian of Khidikari (Western Georgia) and stratigraphic distribution of the important ammonite species.

zones: 1 — *Spitidiscus hugii*, 2 — *Subpulchellia nicklesi*, 3 — *Nicklesia pulchella* and 4 — *Holcodiscus caillaudi*. In 1992 in Spain the working group of the same IGCP Project (Hoedemaeker et al. 1993) suggested the final variant of biostratigraphic division: 1 — *Spitidiscus hugii*, 2 — *Subpulchellia nicklesi* and 3 — *Holcodiscus caillaudianus*.

For correlation of the zonal subdivision we have applied the last variant, with the difference that for the second zone an index-species *Pulchellia compressissima* — probable equivalent of *Subpulchellia nicklesi* — is chosen.

From the detailed description of Khidikari section (Fig. 3) it is quite obvious that the sequence is represented by calcareous-marly facies containing a rather rich fauna, particularly ammonites — among them index-species which allow us to subdivide the Lower Barremian into three zones and correlate them with the Mediterranean region.

Pseudothurmannia angulicostata auct. Zone has been observed for a long time in Georgia, particularly in the Khidikari section, in band 1 and is characterized by Upper Hauterivian markers (*Pseudothurmannia mortilleti*, *P. ex gr. angulicostata*). It is correlated with the zone of the same name in the Mediterranean region. Alongside them an assemblage of ammonites and

belemnites, also characteristic of the given zone (*Crioceratites cf. nolani* and *Hibolites cf. subfusiformis*) is observed.

Spitidiscus hugii Zone is determined for the first time in Georgia (as well as the following one) by collecting the index-species in band 2 (bed 280). It is correlated with the Lower Barremian zone of the same name in the French stratotype section (Busnardo 1984). The interval corresponding to beds No. 241-265 is convectionally restricted to the given zone, because of its bad exposure.

Pulchellia compressissima Zone (band 3) is characterized by a rich ammonite assemblage. Bed No. 307 deserves special attention, because it contains the index-species *Pulchellia compressissima* of the middle Lower Barremian of France. Numerous representatives of *Asteridiscus*, *Holcodiscus*, *Spitidiscus*, *Barremites* occur in association with the above-mentioned species.

Holcodiscus caillaudianus Zone is faunally not so rich in comparison to the others. *Holcodiscus cf. caillaudianus* in band 4 (bed No. 335) deserves special attention, because this species is the index-species of the uppermost zone of the Mediterranean Lower Barremian (Hoedemaeker et al. 1990, 1993). On account of the absence of a zonal division for the

Lower Barremian, there was no clear idea of the stratigraphic distribution of this species in Georgia and its presence in the zone was considered to represent the whole Lower Barremian.

?Ancyloceras vandenheckii Zone. Band 5 (5 m thick) did not yield fossils, but by its stratigraphic position between the Upper Barremian zone of *Subpulchellia plana* and Lower Barremian zone of *Holcodiscus caillaudianus*, it must be attributed, though preliminarily to the lowermost Upper Barremian zone of *A. vandenheckii*, which is correlated with the zone of the same name in the Tvishi section in Western Georgia (Kakabadze & Kotetishvili 1995) and in sections of the Mediterranean region (Hoedemaeker et al. 1990, 1993).

Subpulchellia plana Zone (band 6) contains index-species of the given zone and is correlated with the **Heinzia sarsousiana Zone** of the Mediterranean region (Hoedemaeker et al. 1990, 1993).

Conclusions

Thus, detailed analysis of the rich material from the Khidkari section allows us to subdivide the Lower Barremian sequence into three biostratigraphic zones: **1 — Spitidiscus hugii**, **2 — Pulchellia compressissima** and **3 — Holcodiscus caillaudianus**. This subdivision is applied for the first time in Georgia.

Acknowledgements: The authors are thankful to Dr. Eliso Kotetishvili for presenting the manuscript, and to Dr. Jozef Michalik for editorial work. Simultaneously we are grateful to Dr. Jozef Michalik and Philip. J. Hoedemaeker for revising the article.

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