

New data on the Upper Barremian biostratigraphy of the Georgian region (Caucasus)

Nuovi dati sulla biostratigrafia del Barremiano superiore della regione georgiana (Caucaso)

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IGCP Projects
343: Stratigraphic Correlations Basins of Peritethyan
362: Tethyan and Boreal Cretaceous

ABSTRACT - The type section is selected for the Upper Barremian of Georgia. Besides the four previously established ammonite zones of *Heinzia matura*, *Hemihoplites feraudianus*, *Imerites giraudi* and *Colchidites securiformis*, two new Horizontes - *Ancyloceras vandenheckii* (lowermost Upper Barremian) and *Pseudocrioceras waagenoides* (uppermost Upper Barremian) are proposed.

KEY-WORDS: Biostratigraphy, Upper Barremian, Correlation, Zone, Horizon, Ammonites, Western Georgia.

RIASSUNTO - E' stata selezionata una sezione tipo per il Barremiano superiore della Georgia. Oltre alle quattro zone ad ammoniti definite in lavori precedenti (*Heinzia matura*, *Hemihoplites feraudianus*, *Imerites giraudi* e *Colchidites securiformis*), vengono proposti due nuovi orizzonti: *Ancyloceras vandenheckii* (parte basale del Barremiano superiore) e *Pseudocrioceras waagenoides* (tetto del Barremiano superiore).

PAROLE CHIAVE: Biostratigrafia, Barremiano superiore, correlazione, zona, orizzonte, ammoniti, Georgia occidentale.

1. - INTRODUCTION

The problem of Global biostratigraphical correlation of the Cretaceous is currently under active investigation. Two IGCP Projects (343 and 362), concerned with inter-regional correlation within the Tethys as well as between the Tethyan and Boreal regions, have started simultaneously. Hence new data on the Cretaceous biostratigraphy of any individual region is important.

Until recently the biostratigraphical scheme of Upper Barremian of Georgia consisted of 4 zones: 1) *Heinzia matura*, 2) *Hemihoplites soulieri* (we believe that *Hemihoplites feraudianus*, instead of *Hemihoplites soulieri*, should be regarded as index-species for this Zone, despite its relatively rare occurrence in Georgia), 3) *Imerites giraudi* and 4) *Colchidites securiformis*. New data from the lowermost and uppermost Upper Barremian of Western Georgia allows the Upper Barremian biostratigraphic scheme to be supplemented here.

2. - AVAILABLE DATA

Both the lowermost and uppermost Barremian are well represented at Tvishi village, and this locality is

proposed here as the type section for the Georgian Upper Barremian (Fig. 1, 2). A summary description of this section was published recently (ADAMIA *et alii*, 1988), but it is now apparent that the range of Upper Barremian has to be expanded significantly and its biostratigraphical interpretation to be modified.

This section is situated to the north of Tvishi village on the right bank of the river Rioni, along the Kutaisi-Oni road. Above the massive Urgonian limestones are:

1. Spontaneously outcropping, medium-bedded whitish limestones (17m).
2. Similar limestones with brachiopod debris (7 m).
The sequences can be followed along the Lakhephistskali (the right tributary of the Rioni).
3. White limestones with rather abundant ammonites - *Ancyloceras vandenheckii* ASTIER, *A. sp. ind.*, *Pseudocrioceras ex gr. waageni* (ANTHULA), *Eulytoceras phestum* (MATHIERON) (0.4 m).
4. (In the flood plane) white limestone with *Spitidiscus sp. ind.*, *Paracrioceras rondishiense* KAKABADZE (0.8 m).
5. Limestone layer with *Heinzia costata* KOTETISHVILI, *H. sp. ind.* (0.6 m).

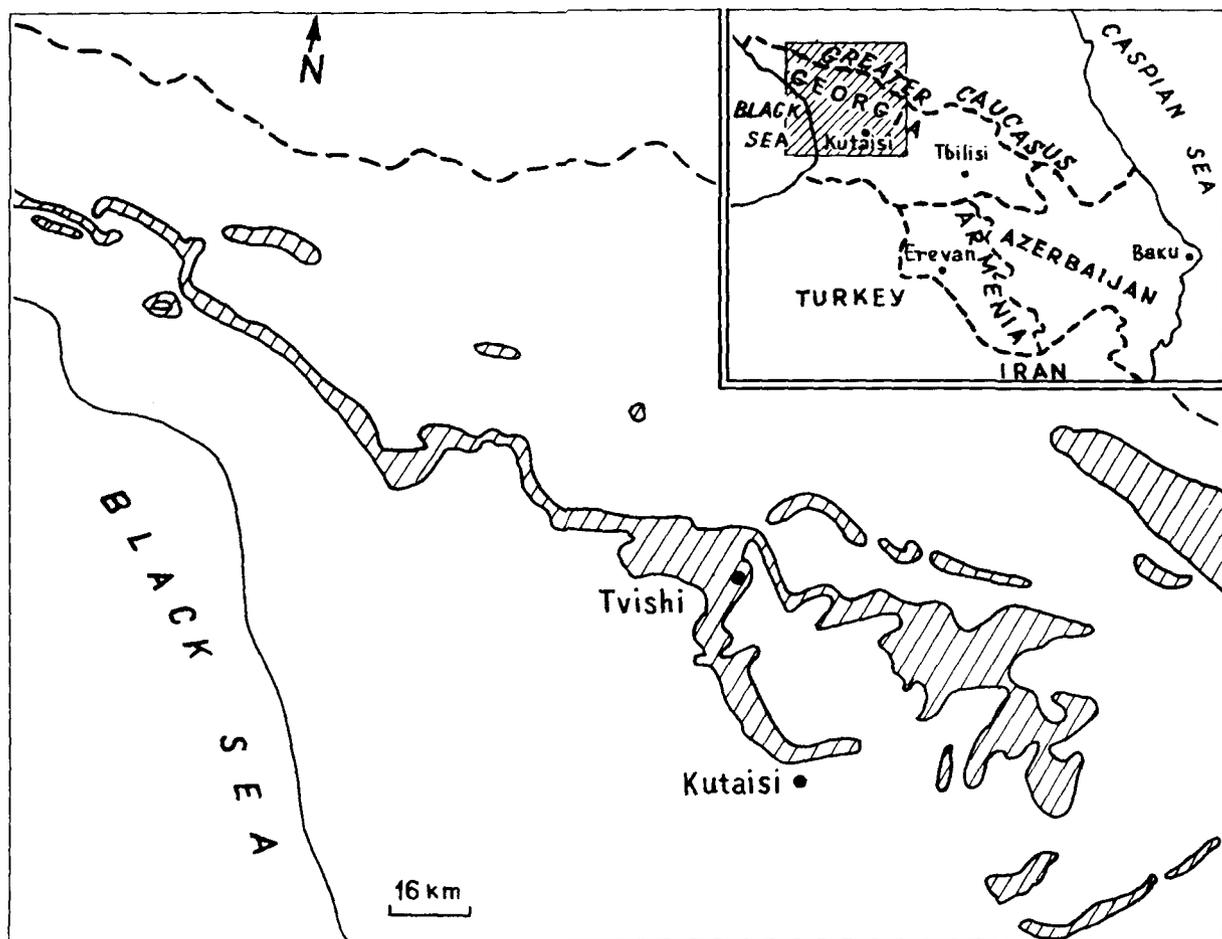


Fig. 1. Schematic map of Lower Cretaceous outcrops in Western Georgia.
- Carta schematica degli affioramenti del Cretaceo inferiore nella Georgia occidentale.

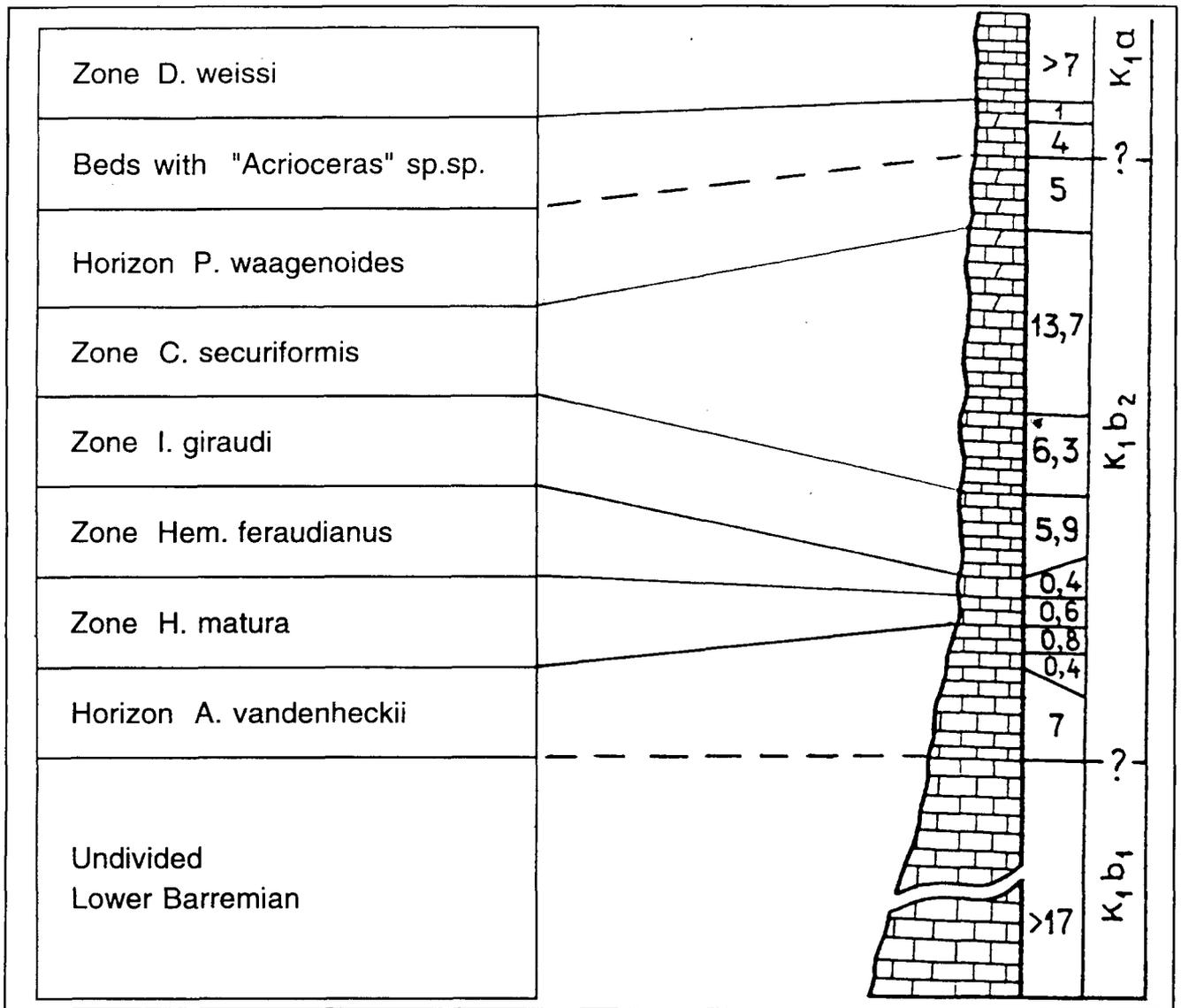


Fig. 2. Biostratigraphical subdivision of the Upper Barremian deposits in the village of Tvishi (Western Georgia).
- Suddivisione biostratigrafica dei depositi del Barremiano superiore nel villaggio di Tvishi (Georgia occidentale).

6. White limestone with *Hemihoplites* sp. (0.4 m).
7. Light grey limestones containing *Imerites giraudi* (KILIAN), *Imerites favrei* ROUCHADZE, *Eristavia dichotoma* (ERISTAVI), *Triplasia georgsdorfensis* (BART. & BRUND.), *Lenticulina praegaultina* BART., BETT. ET BOLLI, *Conorotalites intercedens* (BETT.), *Ganelinella barremiana* BETT., etc. (5.9 m).
8. Medium-bedded grey, compact limestones with *Colchidites securiformis* (SIMONOVICH, BACEVICH, SOROKIN), *C. ratszensis* ROUCHADZE, *Paraimerites* sp., *Dasmiospis* sp. (6.3 m).
9. Whitish-grey, medium-bedded marly limestones containing *Colchidites securiformis* (SIMONOVICH, BACEVICH, SOROKIN), *C. sp. ind.* (13.7 m).
10. Similar to 9 but without *Colchidites*. *Pseudocrioceras waagenoides* (ROUCHADZE), *P. sahorienense*

(ROUCHADZE), *Heteroceras* sp., *Opis rionensis* ROUCHADZE (5 m).

11. Similar to 9 with "Acrioceras" sp. ind. in the uppermost part of the layer (4 m).
12. Grey, compact, medium-bedded marly limestones with "Acrioceras" ex gr. *furcatum* D'ORBIGNY, "A." sp. ind., *Costidiscus* cf. *recticostatus* D'ORBIGNY (1 m).
13. Thin-bedded compact grey limestones with *Deshayesites weissi* NEUMAYR & UHLIG, *Chelonicerias* sp., *Opis rionensis* ROUCHADZE (7 m).

In the absence of ammonites bed 1 is provisionally referred to the Lower Barremian, and bed 2 to the Upper Barremian. So, because of the lack of palaeontological data, the Lower/Upper Barremian boundary

can only be placed between these beds provisionally. Beds 3 and 4 contain typical late Barremian ammonites and together with the bed 2 correspond to the lowermost Upper Barremian *Ancyloceras vandenheckii* Horizon. Bed 5 is referred to the *Heinzia matura* Zone and bed 6 corresponds to the *Hemihoplites feraudianus* Zone. Bed 7 is well characterized by typical ammonites of *Imerites giraudi* Zone, while the beds 8, 9 belong to the *Colchidites securiformis* Zone. Bed 10 still belongs to the Upper Barremian. It is impossible to determine a reliable age for beds 11 and 12 (see Discussion). Bed 13 contains *D. weissii* (NEUMAYR & UHLIG) and corresponds to the Lower Aptian *Deshayesites weissii* Zone.

3. - DISCUSSION

It must be noted first that descriptions and biostratigraphical interpretations of the characteristic Lower Cretaceous deposits and fossils of the *Heinzia matura* Zone, as well as of the other Upper Barremian Zones (*Hemihoplites feraudianus*, *Imerites giraudi*, *Colchidites securiformis*) are already published (ROUCHADZE, 1933, 1938; ERISTAVI, 1952, 1955, 1964; KOTETISHVILI, 1958, 1970, 1980, 1987; KAKABADZE, 1971, 1981, 1987, 1989) and hence, in order to avoid repetition, a detailed account of these zones is omitted here, and only problems of lowermost and uppermost of Upper Barremian biostratigraphy are considered.

3.1. - LOWERMOST UPPER BARREMIAN

According to the specific ammonite assemblage (*Ancyloceras vandenheckii* ASTIER, *A. sp. ind.*, *Pseudocrioceras ex gr. waageni* (ANTHULA), *Eulytoceras phestum* (MATHERON), *Paracrioceras rondishiense* KAKABADZE, *Spitidiscus sp. ind.*) and to the stratigraphical position (directly under beds of the Upper Barremian *Heinzia matura* Zone) beds 3 and 4 and presumably bed 2 are ascribed to the lowermost Upper Barremian. It is notable that a lowermost Upper Barremian ammonite complex with *A. cf. vandenheckii* ASTIER, *A. ex gr. mojsisovicsi* HAUG, ? *Heinzia sp. ind.*, *Hibolites jaculum* PHILLIPS, *H. subfusiformis* RASPAIL has been collected also in the Gagra section (Western Georgia, Abkhazia).

In relation to this question it is necessary to note that in some other sections of Western Georgia, such as Gelaveri and Rondishi, directly under the beds of the *Heinzia matura* Zone, limestones with concretions of chert are exposed. Biostratigraphical analysis of the fossils (*Paracrioceras rondishiense* KAKABADZE, *Barremites sp.*, *Mesohibolites beskidensis* UHLIG, *Cymatoceras sp.*, *Grammatodon securis major* LEYMERIE, *Amphidonta sp. ind.*, *Turnus cf. dallasi* (WALKES), *Neithea atava* ROEMER, *Panope cf. gurgitis* BROGNIART, *Spondylus sp.*, *Camptonectes cf. cottaldinus* D'ORBIGNY, *Barbatia cf. aptiensis* PICTET & CAMPICHE, *Toxaster argilaceus* (D'ORBIGNY), *T. exilis* (LORIOU))

of these limestones shows that among them there are no genera or species whose stratigraphical ranges are limited only to the Lower Barremian substage. Most of them have a more extensive stratigraphical distribution, but *Mesohibolites beskidensis* (UHLIG), and *Toxaster argilaceus* D'ORBIGNY are known only in the Upper Barremian and Aptian. It should also be noted that *Paracrioceras rondishiense* KAKABADZE is typical representative of the group of *P. barremense* KILIAN. Based on stratigraphical position (directly under the *Heinzia matura* Zone) and the above mentioned fossil composition, these beds in the Gelaveri and Rondishi sections should also be attributed (opinion of M.K.) to the lowermost Upper Barremian and regarded as equivalent to the *Ancyloceras vandenheckii* Horizon of the Tvishi section. However, in order to prove fundamentally this point of view it is necessary to make more detailed biostratigraphical investigation of the Gelaveri and Rondishi sections, as well as of other Barremian sections in Georgia.

This stratigraphical level with *A. vandenheckii* ASTIER in Georgia is considered only as a Horizon, since its precise boundary with the Lower Barremian *Holcodiscus caillaudianus* Zone is still impossible to trace. As to its upper boundary, limestones of the *Ancyloceras vandenheckii* Horizon in the Tvishi section are conformably overlain by the limestones layer of the *Heinzia matura* Zone and the boundary between them is clearly determined. We conclude that only after a detailed study of the lower boundary problem, as well as the wider geographic recognition of the *A. vandenheckii* Horizon, might it be considered to rank as a Zone.

As to the *Heinzia matura* Zone, recently redetermined as Upper Barremian (KAKABADZE, 1987; 1989), it is remarkable to note that among its various late Barremian ammonite species, representatives of *Heinzia ouachensis* (COQUAND), *H. provincialis* (D'ORBIGNY), *H. lindigi* (KARSTEN), *H. sartousiana* (D'ORBIGNY), etc. (i.e. characteristic species of lowermost Upper Barremian of SE France) are frequent.

Thus, the *Ancyloceras vandenheckii* Horizon and *Heinzia matura* Zone comprise the lowermost Upper Barremian scheme of Georgia. Owing to the above mentioned ammonite species association and to the stratigraphical position, the two stratigraphical levels in Georgia correspond to the "*Emericiceras*" *barremense* Zone of SE France (of the scheme by BUSNARDO, 1984), as well as to the *Ancyloceras vandenheckii* and *Heinzia sartousiana* Zones of SE Spain (COMPANY *et alii*, 1992).

3.2. - UPPERMOST UPPER BARREMIAN

In the Tvishi section, above the limestones (20 m) with characteristic species of the *Colchidites securiformis* Zone, there follow 10 m of limestones, the lower part (bed 10; 5 m) of which contains *Pseudocrioceras*

waagenoides (ROUCHADZE) and *P. sahariense* (ROUCHADZE). The uppermost part of the overlying marly limestones (beds 11 and 12; 5 m) is characterized by "*Acrioceras*" ex gr. *furcatum* D'ORBIGNY, "*A.*" sp. ind., *Costidiscus* cf. *recticostatus* D'ORBIGNY

The considered level (beds 10, 11, 12), situated between the Upper Barremian *Colchidites securiformis* and the Lower Aptian *Deshayesites weissi* Zones, is well traced only in those sections (Tvishi, Bethlevi, Skhvava, Khashupse, etc.) where the uppermost Barremian-lowermost Aptian sequences are represented by comparatively deep neritic facies without hiatuses. In the shallower marine facies there is a hiatus at the Barremian-Aptian boundary in several sections. In the Tskhetidjvari section (periphery of Dzirula massif) there are no uppermost Barremian-lowermost Aptian (including *D. weissi* Zone) sediments, but in some sections (e. g. Godogani section) only the sediments corresponding to the uppermost part of the *Colchidites securiformis*-lowermost part of the *Deshayesites weissi* Zones are absent. It is obvious that for precise zonal (biostratigraphical) purposes such sections are less important (while in sequence stratigraphy research they are of great value).

There is a similar situation in SE France, where only sections in the pelagic deposits (facies) are convenient for detailed biostratigraphic purposes. In the Barremian-Aptian transitional beds of this region the zonal am-

monites are also absent. In the stratotype section (Angles) the Barremian-Aptian boundary is drawn at the base of bed 197, where *Pseudohaploceras matheroni* D'ORBIGNY was found (BUSNARDO, 1965). It is now known that *P. matheroni* appears earlier (in the Upper Barremian) and, unfortunately, until today there are no sufficient supplementary data to prove this boundary. Recent discoveries (DELANOY, 1991) of *Paradeshayesites* gr. *laeviusculus* and *Prodeshayesites* gr. *fissicostatus/tenuicostatus* in the pelagic Lower Aptian of the Vocontian Basin delineate the *Prodeshayesites fissicostatus* Zone in the SE France. Moreover, the finds of ? *Prodeshayesites* in bed 206 and *Deshayesites* sp. gr. *spathi/normani* in bed 210 (DELANOY, this volume) are very important for the Lower Aptian biostratigraphical zonation in the Angles section. On the other hand, after the recent find (by J. WIEDMANN and M. KAKABADZE, in 1989) of a fragment of ? *Prodeshayesites* sp. ind. in bed 200, we can conclude that in the Angles section the Lower Aptian begins at least from bed 200.

Thus, until today there are no finds of zonal Upper Barremian or Lower Aptian ammonite species at least in beds 194 up to 199; therefore the suggested Barremian/Aptian boundary at the base of bed 197 in the Angles section has still to be considered as a lithostratigraphical and not a biostratigraphical boundary. Nevertheless, we suppose that until definite sufficient supplementary biostratigraphical data are received, the

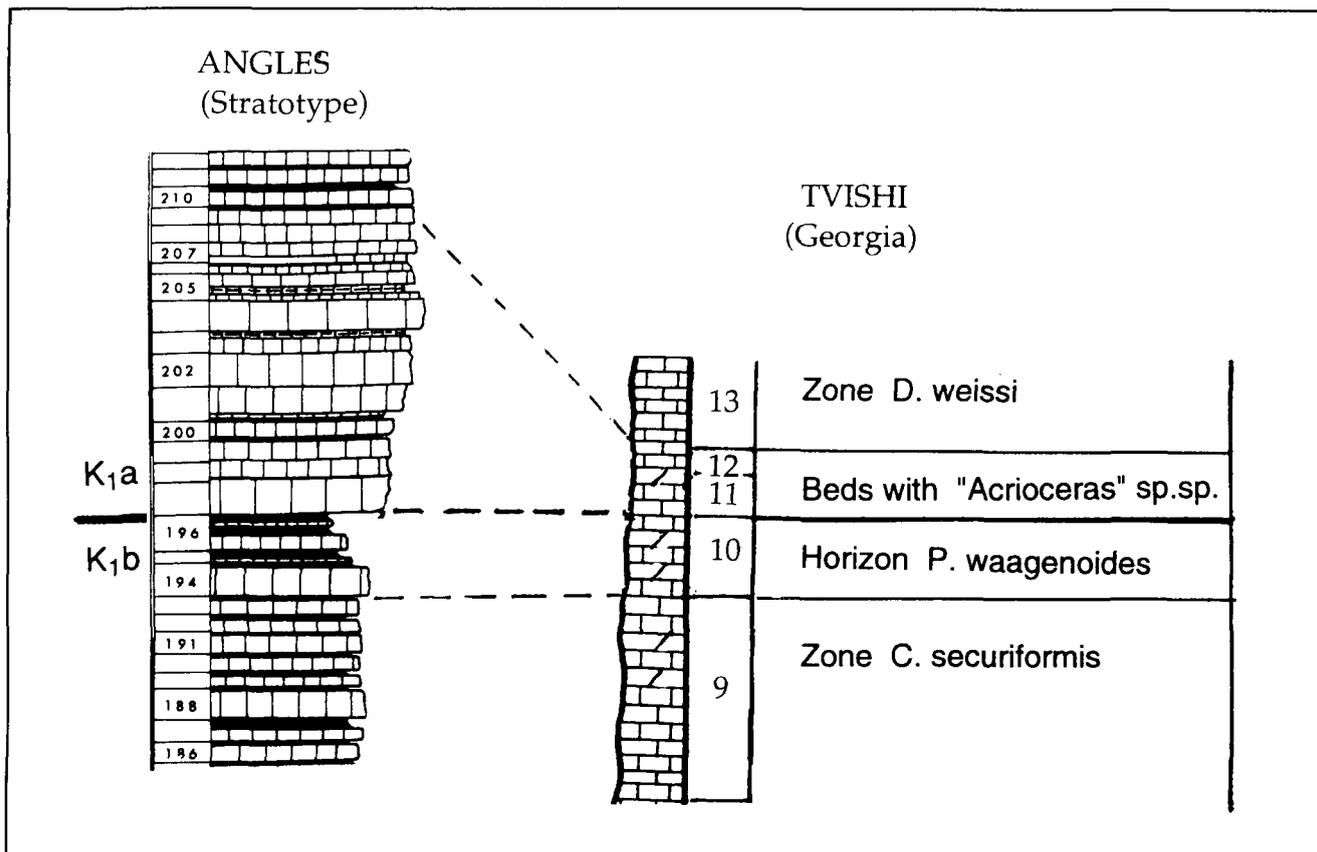


Fig. 3. Supposed correlation of uppermost Upper Barremian - lowermost Lower Aptian interval of the Angles (SE France) and Tvishi (Georgia) sections.
- Presunte correlazioni dell'intervallo Barremiano superiore - Aptiano basale nelle sezioni di Angles (SE della Francia) e di Tvishi (Georgia).

boundary at the base of bed 197 still has to be respected (i. e. it has to be remained unchanged).

Having such insufficient data, it is obvious that the uppermost Barremian - lowermost Aptian correlation of the Angles and Tvishi sections is very provisional. We suppose (Fig. 3) that the *Pseudocrioceras waagenoides* Horizon (bed 10 of the Tvishi section) should be correlated with the beds 194-196 of the Angles section, and beds 11 and 12 of the Tvishi section with beds 197-206 (perhaps also beds 207-209) of the Angles section.

As to correlation of the uppermost Barremian-lowermost Aptian of Georgia with the North Caucasus and Middle Asia, we can conclude that the *Pseudocrioceras waagenoides* Horizon should be regarded as equivalent to the *Turkmeniceras turkmenicum* Zone of Turkmenistan (Middle Asia) and of the "Matheronites" *ridzewskiyi* Zone of North Caucasus, but there are insufficient palaeontological data to solve this problem with confidence. As to the stratigraphical position of bed 12, we can only conclude the following: "*Acrioceras*" *furcatum* D'ORBIGNY, as well as *Costidiscus recticostatus* D'ORBIGNY, found in the Tvishi section (bed 12) is known from the Upper Barremian and Lower Aptian of the Caucasus and therefore until definite Lower Aptian ammonites (i.e. *Prodeshayesites*, *Deshayesites*, etc.) are found, the stratigraphical position of beds 11 and 12 of the Tvishi section remains questionable.

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