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2. Гавич И.К. Теория и практика применения моделирования в гидрогеологии. М.: Недра, 1980. - 358 с.

3. Гидрогеологическое прогнозирование. Под ред. М.Г. Андерсона и Т.П. Берта. М.: Мир, 1988. - 736 с.

4. Ломакин Е.А., Мироненко В.А., Шестаков В.М. Численное моделирование геофильтрации. М.: Недра, 1988. - 228 с.

5. Лукнер Л., Шестаков В.М. Моделирование геофильтрации. М.: Недра, 1976. - 407 с.

6.Шестаков В.М. Динамика подземных вод. (2-е изд.). М.: Изд-во МГУ, 1979.-368 с.

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BIOSTRATIGRAPHY OF THE CALLOVIAN DEPOSITS OF THE CAUCASUS

1. Introduction

Callovian deposits crop out in the Northern Caucasus in a narrow strip extending from the river Belaja in the West, on the territory of Krasnodar, to Daghestan in the East, inclusive (Fig.1). Their thicknesses vary. In the mountains of Daghestan they range from 30 to 60 m; in Ingushetia, 0,5-183 m; in Northern Osetia, 5-25 m; in Kabardino-Balkaria, 6-25 m; in the basin of the r. Malaja Laba, less than 30 m, decreasing westwards to 10 m at the r. Belaja. On the southern slopes of the Great Caucasus, Callovian deposits are known in the Gagra-Djava tectonic zone, sometimes reaching a thickness of 300 m, while in Shida Kartli the thickness is only 10-80 m. The variations in thickness of Callovian deposits are also significant in the Lesser Caucasus (50-350 m). Callovian deposits everywhere cover the more ancient geological formations transgressively with angular and stratigraphical unconformity.

The biostratigraphical classification of Callovian deposits of the Caucasus is based on ammonites, which are distributed rather irregulary both within the section and throughout the area, this being duo to differences of ecology and palaeogeography during Callovian times. The Collovian stage is most complete in the Northern Caucasus, where it may be subdivided into Substages, Zones and Subzones.

2. Collovian deposits of the Caucasus

The Lower Callovian substage is present nearly everywhere in the Caucasus, but it can

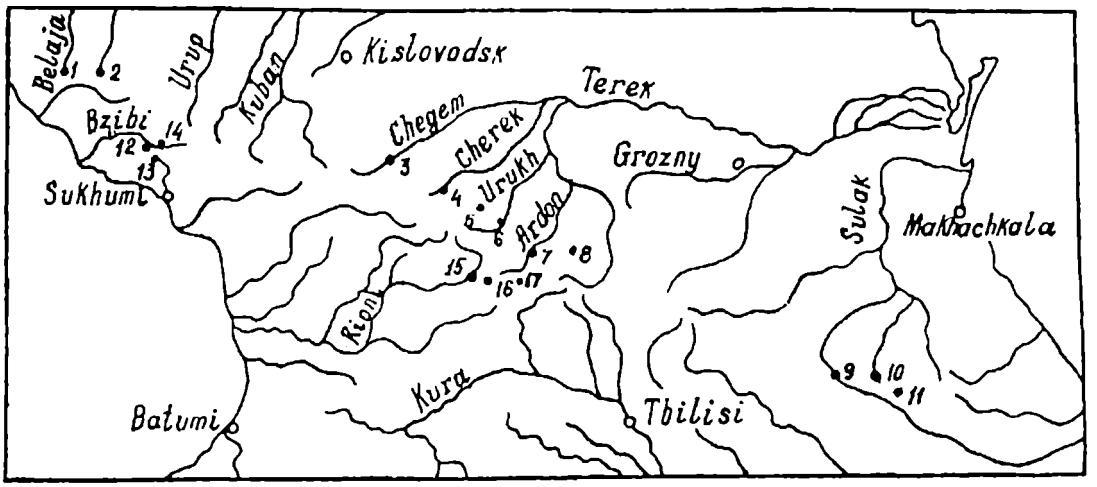

Fig. 1. Map of the Caucasus region. Main sections of Callovian deposits. North Caucasus: 1. Belaja, 2. Psebai, 3. Tschegem, 4. Cherek Balkarsky, 5. Sekheladon, 6. Urukh, 7. Ardon, 8. Fiag-don, 9. Golotl, 10. Ameterk-Makhi, 11. Tsudakhar. Georgia: 12. Reschava, 13. Adzaga, 14. Bzibi, 15. Tsessi, 16. Korta, 17. Kemulta

be subdivided into Zones only in Abkhazeti (West Georgia), Zemo Racha, Shida Kartli and the mountains of Ingusheti.

The Early Callovian is represented by the Macrocephalus Zone, characterized by numerous ammonites of Macrocephalitidae: *Macrocephalites macrocephalus* (Schloth.), *M. madagascariensis* Lem., *M. canizarroi* (Gemm.), *Indocephalites caucasicus* (Djan.), *Pleurocephalites tumidus* (Rein.), *Dolikephalites subcompressus* (Waag.), *D. typicus balkarensis* (Ilyin). Occasionally Oppeliidae also occur.

On the southern slopes of the Caucasus, above the Macrocephalus Zone, it is possible to distinguish the Gowerianus Subzone. It is represented by the following species: *Kepplerites (Kepplerites) keppleri* (Opp.), *K.(Gowericeras) gowerianus* (Sow.), *Homeoplanulites (Parachoffatia) funatus* (Opp.), *Choffatia (Choffatia) prorsicostata* (Siem.), *C. (C.) recuperroi* (Gemm.), *C. (Grossouvria) chanasiense* Mang. The same complex in the Northern Caucasus also yields numerous *Sigaloceras calloviense* (Sow). The extent of the two Zones in the Northern Caucasus is not clear. It would therefore be more correct not to classify the Lower Collovian deposits in the Northern Caucasus into Zones, but simply to distinguish the beds with *Macrocephalus* from those with *Gowerianus* (Lominadze, 1982).

Middle Callovian deposits nonconformably overlap Lower Callovian with basal conglomerate. The most complete section of the Middle Callovian is observed in the mountains of Daghestan. The lower zone of middle Callovian - that of Jason - commonly contains *Kosmoceras (Gulielmiceras) jason* (Rein.), *K. (G.) gulielmii* (Sow.), *K. (Kosmoceras) baylei* Tint., *Reineckeia anceps* (Rein.). Perisphinctidae are also numerous. On the southern slopes of the Caucasus the Middle Callovian ammonite fauna is composed of numerous Hecticoceratinae, making it possible to distinguish some beds with Metomphalum. In the Lesser Caucasus, Middle Collovian is represented by beds with Anceps (Lominadze, 1982; Lominadze et all., 1997).

The Coronatum Zone, which completes Middle Callovian, is chiefly documented palaeontologically in the mountains of Daghestan (Lominadze, Sakharov, 1969). With some hesitation these deposits can be picked out in Kabardino-Balkaria. The zone is charactarized by the

presence of *Erymnoceras coronatum* (d'Orb.), *E. doliforme* (Rom.), *E. baylei* Jeann., *Rollieritcs minuendum* Roll., *Putealiceras (Putealiceras) metomphalum* (Bonar.), *Kosmoceras (Kosmoceras) obductum* (Buck.), *K. (K.) crassum* Tint. Various Hecticoceratinae are numerous. The Zone may here be subdivided into two Subzones: of Coronatum and of Pollux.

Erymnoceras coronatum (d'Orb.) extends over all the zone, but the most typical forms of this species are mainly concentreted in its lower part - in the Coronatum Subzone. The species has an extraordinarily wide geographical distribution. It occurs in Middle Callovian of England, France, the Northern Caucasus, Tuarkyr, and on the Russian Platform. In England *Erymnoceras* is, however, of minor importance in comparison with *Kosmoceras*. Hence, the lower Subzone is there named after Obductum. The ammonite fauna of the Coronatum Subzone of the Northern Caucasus most closely resembles the one described by Tintant (1963) from the Subzone of the same name in the Paris basin. In England the analogous Subzone is that of Obductum which, according to Callomon(1964), is characterized by *K. obductum* (Buck.) and *K. castor* (Rein.), but not *K. pollux* (Rein.). In Daghestan the observations are similar.

The genus *Kosmoceras* ranges into the upper part of Middle Callovian in the East of the Northern Caucasus. On the basis of the species *K. pollux.* (Rein.) it is proposed to distinguish these strata in the Subzone of Pollux. The occurrence in the upper part of Perisphinctidae of the group of *mosquensis*, *comptoni*, *scopinensis*, noted by Callomon (1964) is also observed in Dagestan. It is especially noticeable in the boundary beds with the lower Zone of Upper Callovian - the Athleta Zone. Comparing Middle Callovian deposits of Daghestan with those of the Transcaucasus, it is seen that *Putealiceras* and several Perisphinctids were the common genera at the time.

The upper Callovian Substage is subdivided into two Zones: those of Athleta and Lamberti. The first can be traced in Upper Callovian deposits of Zemo Racha, in Kabardino-Balkaria and in Daghestan. There is evidence of the presence of the ammonites *Peltoceras athleta* (Phill.) (also in the Lesser Caucasus), *P. borissiaki* Amann., *P. angulosum* (Quenst.), *K. (Kosmoceras) spinosum* (Sow.), *Lunuloceras (Sublunuloceras) dynastes* (Spath) and others. In the deposits of the upper Zone in Daghestan and Zemo Racha occur: *Quenstedtoceras lamberti* (Sow.), *Q. leachi* (Sow.), *Q. flexicostatum* (Phill.), *Vertumniceras damoni* (Nik.), *V. caucasicum* Lom., *Eboraciceras rybinskianum* (Nik.), *Euaspidoceras* (Nik.), *E. ferrugineum* Jeann., *E. hirsutum* (Bayle). In the regions of the Northern Caucasus (Kabardino-Balkaria, Krasnodar territory, Northern Osetia) *Quenstedtoceras* has also been found (Lominadze, 1982).

Upper Callovian deposits are disconformably overlapped by Oxfordian rocks, the contact being rather abrupt.

The Upper Callovian - Lower Oxfordian boundary is marked by both changes of fauna and changes in lithology on the whole territory of the Northern Caucasus. Upper Callovian terminates with a conglomerate-like limestone and is characterized by an abundant content of leptochloric oolites. The conglomerate-like band is observed in the East, in mountain regions of Daghestan and Ingushetia. It can be clearly traced in the central part of the Northern Caucasus (Northern Osetia, Kabardino-Balkaria) and is also observed in the West (Krasnodar territory). The fauna of these bands contain typical Upper Callovian ammonites.

The Lower Oxfordian in the major part of the Northern Caucasus is represented by

sponge/algal bioherm limestones, characterized by ammonites of genus *Cardioceras*. In all of the sections studied, except those of the r. Chereck Balkarsky, Upper Callovian ammonites do not occur at the base of the thick sponge limestones. Fragments of *Quenstedtoceras* sp., *Peltoceras* sp. were discovered only on the right bank of the river Chereck Balkarsky in the lower part, approximately 5-10 cm from its base. Loginova (1971) cites a large fauna of ammonites from the same strata: *Vertumniceras mariae* (d'Orb.), *Quenstedtoceras henrici* Douv., *Q. praelamberti* Douv., *Peltoceras athletoides* Lah., *Kosmoceras spinosum* (Sow.). Thus, the formation contains both Upper Callovian and Lower Oxfordian ammonites. It is therefore quite possible that the lowest beds of sponge-algal limestones are still of Late Callovian age. But it is more probable that the age is Early Oxfordian, confirmed by numerous finds in Northern Osetia of *Cardioceras cordatum* (Sow.), *C. vertebrale* (Sow.), *C. excavatum* (Sow.), *C. tenuicostatum* Nik.

The deposits of the Middle and Upper Callovian in the larger part of the Northern Caucasus represent a single, common cycle of sedimentation.

3. Conclusion

As outlined above, the Callovian of the Caucasus can be classified on the basis of biostratigraphy of ammonites in the classical NW European standard zones: those of Macrocephalus, Gowerianus, Jason, Coronatum, Athleta and Lamberti. The zone of Coronatum can be subdiveded further into two subzones: Coronatum (Lower) and Pollux (upper).

ლიტერატურა-ЛИТЕРАТУРА-REFERENCES

1. Callomon J. Notes on the Callovian and Oxfordian Stages. Colloque du Jurassigue, Luxemburg (1962), 1964, p. 269-291.

2. Loginova G.A. Lover and Middle Callovian deposits of the central part of the Northern Caucasus. (in Russian). Vest. MGU, Geologia, 1971, 5, p. 42-52

3. Lominadze T. The Callovian Ammonitida of the Caucasus. (in Russian). "Metsniereba", Tbilisi, 1982, 268 p.

4. Lominadze T., Sakharov A. Kosmoceratidae of the Caucasus. (in Russian). "Metsniereba", Tbilisi, 1985, 62 p.

5. Lominadze T., Topchishvili M., Tsereteli I. Stratigraphy of Middle and Upper Jurassic sediments of Georgia by Ammonites. [illegible], Comm. IV Congr. de Jurassico de Espana, Alaniz, 1997, p. 95-96

6. Tintant H. Les Kosmoceratides du Callovian inferieur et moyen d Europe occidentale. Publ. de l Univ. de Dijon, 1963. t. XXIX, 500 p.

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