Frasnian – lower Famennian stratigraphy and biota in the northern Gondwana margin preserved in Armenia

Vahram Serobyan*[1], Sirush Khachatryan[2], Vachik Hairapetian[3], Carine Randon[4], Philippe Steemans[5], Pierre Beuer[5], Bernard Mottequin[6], Borja Cascales-Miñana[7], Araiyk Grigoryan[1], Ivan Gabrielyan[8], Catherine Crônier[9], and Taniel Danelian†[10]

[1]Institute of Geological Sciences, National Academy of Sciences of the Republic of Armenia – Armenia
[2]Institute of Geological Sciences and A.L. Takhtajyan Institute of Botany, National Academy of Sciences of the Republic of Armenia – Armenia
[3]Department of Geology, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan – Iran
[4]UMR 7207 Centre de recherche en Paléontologie (CR2P) – Sorbonne Universités, UPMC, CNRS – France
[5]Evolution Diversity Dynamics Lab (EDDy Lab), University of Liège – Belgium
[6]Operational Directorate Earth and History of Life, Royal Belgian Institute of Natural Sciences – Belgium
[7]UMR 8198 Evolution-Ecology-Paleontology – CNRS, University of Lille – France
[8]A.L. Takhtajyan Institute of Botany, National Academy of Sciences of the Republic of Armenia – Armenia
[9]UMR 8198 Evolution-Ecology-Paleontology – University of Lille, 59655 Villeneuve d'Ascq – France
[10]UMR 8198 Evolution-Ecology-Paleontology – University of Lille, 59655 Villeneuve d'Ascq - France – France

Abstract

The Upper Devonian sequences of Armenia consist of carbonate and siliciclastic sedimentary rocks, which deposited on a shallow water platform in the northern margin of Gondwana. Although they crop out only in a few places (Ertych, Djravank and Noravanak sections), they are rich in fossils (brachiopods, corals, bryozoans). These faunas were being studied since the 19th century and more systematically during the 1950s to 70s.
More particularly, the Frasnian–lower Famennian sequences of Armenia were subdivided into three 'formations' (Baghrsagh, Noravank and Ertych), which regrettably were mainly characterized by their fossil record, rather than distinct lithological differences. In practice, they have very similar lithological characteristics and they cannot be distinguished on the field without knowledge of their brachiopod assemblages.

Recent studies on brachiopods established that these benthic organisms are present essentially in two distinct limestone intervals, each one bearing a distinct brachiopod assemblage.

*Speaker
†Corresponding author: taniel.danelian@univ-lille.fr

The lower limestone interval contains eleven brachiopod species; the assemblage is characterized by the presence of atrypides, in addition to some rhynchonellides and spiriferides. We establish a new brachiopod assemblage zone of Frasnian age, notably based on *Ripidiorhynchus gnishikensis*. Preliminary work on conodonts extracted from this limestone interval shows the presence of species including *Icriodus excavatus*, *I.? expansus*, *Polygnathus aequalis*, *P. praepolitus*, *P. webbi* and *P. xylus xylus* characterizing the Frasnian interval.

The upper limestone interval contains 24 brachiopod species; the assemblage is characterized mainly by the presence of spiriferide and rhynchonellide species and is assigned to the lower Famennian *Aramazdospirifer orbelianus–Tornatospirifer armenicus* brachiopod zone, which is correlated with the *crepida* standard conodont zone.
The limestone intervals are separated by 80-90 meters of terrigenous sediments, which are dominated by shales in its lower and upper parts and by mature sandstones in its middle part. Palynological preparations of shales coming mainly from the upper shales of the Ertych section allowed us to discover a miospore assemblage that may be correlated with the *triangulatus–catillus* and *langii–concinna* miospore biozones of northern Gondwana (late Givetian–late Frasnian). Most of the identified species, such as *Acinosporites lindlarensis, Geminospora lemurata*, *Kraeuselisporites ollii?*, *Samarisporties triangulatus, Ancyrospora langii*, *Cymbosporites caillus, Chelinospora concinna, Verrucosisporites nitidus?*, *Krauselisporites ollii?*, *Rugospora bricei* and *Teichertospora torquata* are similar to those coeval assemblages documented from Iran, Saudi Arabia, North Africa, Canada and Europe (Spain, Belgium). Moreover, the parent plants of miospores documented from the Ertych section mainly belong to different classes such as Rhyniopsida, Zosterophyllopsida, Lycopsida and Progymnospermopsida (Archaeopteridales and Aneuropthytales) assemblages, and the range of the latter varies from the late Givetian to the middle Frasnian.

Keywords: Frasnian, Famennian, stratigraphy, Armenia, Gondwana