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Phase II – year 2023

Scientific report for the 2nd year of the PCE project PalRom: The dawn of Cenozoic climate changes: The Eocene-Oligocene terrestrial bio-events in Romania, part of the European geological Heritage

YEAR II ACTIVITY

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1. Achievements in the first phase according to the objectives mentioned in the implementation plan

The main objectives have been divided into the following steps:

Ob.1. Preparation of specimens existing in the collections of Babes-Bolyai University and the correction of the systematic determination for some specimens.

Ob.2. To collect new fossils from new areas of interest in order to diversify the valid material for study and to identify new fossil sites.

Ob.3. Detailing the anatomy of some vertebrate taxa by micro-scanning.

Ob.4. The study of taphonomy in different fossil localities (e.g. north-western part of the Transylvanian Basin).

Ob.5. To create a database of fossil assemblages, stratigraphic ranges of taxa, distribution area and relationships between taxa.

Ob.6. Providing details on the sedimentological context, primarily based on mineralogical studies and sedimentary structures, for all the studied areas.

Ob.7. Reconstructing Palaeogene terrestrial ecosystems in Romania, highlighting the main biotopes.

Ob.8. Comparison of the identified ecosystems with each other and with equivalent, similar ecosystems in Europe and other parts of the world, in order to better understand their evolution.

The achievement of the objectives can be seen in the list of activities completed according to the Phase II plan below. Similar to the previous year, complex and demanding field campaigns were carried out throughout the year. Some field missions were also carried out in connection with scientific events (symposiums and national/international conferences) organised in Romania, precisely in order to maximise the efficiency of the project costs in those chapters. All these campaigns are explicitly specified below. The fact that we managed to overlap some field periods with the scientific events we mentioned above helped us to effectively check - in some cases - local museum collections, adding field prospections in the vicinity of these localities, where

sedimentary deposits with geological ages of interest for the project are outcropping, i.e. where the Eocene/Oligocene boundary can be found, particularly in the continental domain.

1.1. Preparing materials (existing and newly collected)

Similar to Phase I from a procedural point of view, we continued our research by preparing the fossil material already existing in the collection of the Paleotheriology and Quaternary Geology Laboratory of "Babeș-Bolyai" University of Cluj-Napoca, including the paleontological material sampled in the previous year, but also for pieces from other established collections, such as those of the Crișurilor County Museum in Oradea, the Museum of Natural Sciences in Aiud, the Bistrița County Museum and the Museum of Natural Sciences in Piatra Neamț. Outcrops from areas we investigated in the previous year, such as Suceag, Morlaca, Bociu etc., were monitored and new quantities of sediments from these localities were sampled and processed in order to obtain relevant microfossils, particularly micro-vertebrates. At the same time, new field campaigns were carried out in areas such as Dobârca, Apoldu de Sus, Coza, Hodișu, Pria, Bizușa, Giurtelecul Șimleului, Mălădia, Poiana Blenchii, Borod, the whole Prelucii area and others.

On the basis of the new material collected during the course of this phase of the project, it can be argued that we have achieved significant new results, particularly in terms of interpretations of some of the elements related to marine-terrestrial relationships in terms of the areal distribution of deposits and facies, related palaeontological associations and ancient climatic aspects. Some of the fossil vertebrate finds from the research/prospecting and excavations in 2022-2023 are still being prepared, but we have already managed to systematically classify some of them in order to complete the knowledge of the geological events that took place in this part of Europe at the Eocene/Oligocene boundary, implicitly of the relevant palaeogeographic and palaeoclimatic messages that can be determined from them.

1.2. Bibliographical documentation

The documentation continued by collecting basic geological bibliographical references in Romania [publications of the Geological Institute of Romania (Memories of the Institute, Reports of meetings, Yearbook of the Geological Institute, journals of the Technical and Economic Studies series, and specialized journals on Mineral Deposits, Mineralogy, Paleontology, Petrology,

Stratigraphy, and Tectonics and Regional Geology), of various national museums, of the universities of Cluj-Napoca, Bucharest, Iași], but also from abroad (publications of various universities, museums and research institutes). Further, we carried out in-depth bibliographical studies, by consulting old manuscripts from the 18th-19th centuries, in order to clarify old records of areas of interest for Palaeogene deposits in North-Western Transylvania and beyond, but also to verify the affiliations of some stratigraphic units (groups, formations, members, strata) to patterns already established in the geological literature. A number of older publications related to Transylvania have been further identified in the Central University Library Cluj-Napoca, in the Library of the Geology Department of Babeș-Bolyai University, in archives of former state enterprises, but also in international online libraries.

1.3. Field activities

Field campaigns have been carried out since the beginning of the year in several Romanian territories. As in the previous year, the research carried out was based on our conceptual models, subsequently verified by geological-palaeontological surveys, followed by systematic excavations in the various areas that are of major interest for the project, with specific processing for animal or vegetal palaeontology, directly in the field or in the laboratory.

In a first stage, part of the team re-checked areas of interest near Alba Iulia (Alba County), Sebeș and Călan (Hunedoara County) in order to prospect part of the surrounding areas that could be of interest in providing Paleogene fossils in situ, but also reworked in subsequent, geologically younger deposits.

This was followed by a period of prospecting over a large area of Bihor County, during which we systematically covered a series of trails in search of possible Paleogene-Oligocene deposits. So far, there are no certainties for deposits of such ages. In parallel, however, we have examined some core samples, as well as borehole documentation (borehole logs, geophysical sections of various types), especially geothermal, to see to what extent the Palaeogene deposits related to the Maramureș-Solnok Trough may extend southwards. We also focused our attention on the Biharea Horst, which, however, turned out not to host Palaeogene sedimentary sequences.

In the Eastern Carpathians area, in Neamț and Bacău counties, we have resumed field campaigns in an attempt to find areas of shoreline at the Eocene/Oligocene boundary, and to

consult museum collections. At the same time, we started working on the identification of vertebrate fossils mentioned in the previous report. These are still being investigated with the aim of publication.

Excavations in the continental deposits at Morlaca continued this year, and again brought satisfaction in terms of the richness and diversity of the fossil material. Some of the fossils recovered from the concentration level have already been prepared and are in the process of being determined, but we are waiting to complete the preparation of additional ones, in order to determine whether they belong to the same taxa already discovered in the previous year. As mentioned in Phase I, they come from the Nadășului Valley Formation (Priabonian) and prove migration processes of large mammals of Asian origin, which precede in terms of geological time the "Grande Coupure" event in the classical sense of the term.

Frequently this year we have continued to examine the collections of the Crișurilor County Museum in Oradea for Paleogene fossils, many of the laboratory preparations being carried out in that museum's laboratory (particularly the very fine ones).

The paleontological investigations and monitoring carried out in the surroundings of Cluj-Napoca continued, thanks to the fact that world-famous outcrops are located here. Reference localities such as Rădaia, Mera and Suceag, but also parts of the area of the municipality in question have been monitored continuously (weekly), mainly the outcrops in the bed of the Someșul Mic River, where a succession can be traced that also captures the Eocene/Oligocene boundary, at the level of the Brebi Marls Formation.

Other areas of particular geological importance have been covered. These include localities such as Zimbor, Jibou, Cuciulat. Their investigation remains to be continued in the project, given that in these localities there are mainly continental deposits typical of fluvial plains in which the sedimentary fills of the channels may prove to be a source of micro and macrovertebrate fossils, but also marine-coastal sequences, in which fossils of terrestrial representatives may have arrived through hydrodynamic mobilizations determined by the continental water courses.

1.4. Determination of taxa, identification of local tafocenoses

Most of the fossils discovered both last year and this year, in the consulted museum collections and in the field, are still being prepared and determined. These include various taxa of relatively

large land and marine mammals (e.g. sirenians, brontotherians, anthracotherians, etc.) as well as medium and small land mammals. Reptiles such as crocodilians have begun to become of interest to local taphocenes, as will be seen in the paper submitted for publication to the journal *Comptes Rendus Palevol*, as well as that published in *Frontiers*. Crocodilians are excellent palaeoenvironmental indicators, and the reconstruction of their Cenozoic history that is of interest to our research even exceeds that which strictly concerns the Upper Eocene-Lower Oligocene interval. Late Palaeocene fossils may be indicative of evolutionary and/or adaptive trends. Paleogene birds that we have identified in some museum collections (Neamț County Museum) will be able to provide more details about seasonal migrations across Eurasia but also towards Africa. Other relevant vertebrate forms (chelonians, small reptiles, etc.) are still under study to establish their relevance in local, regional and continental food chain reconstructions and correlations. Marine vertebrate forms such as the priabonian fishes from Leghia have provided palaeogeographic information and more. As mentioned in the previous year, although initially not planned, in order to complete the picture of the ecosystems as a whole, we also started to study invertebrate forms such as molluscs, which are of interest for the project because they can be found right at the Eocene/Oligocene boundary, and provide additional new environmental information compared to that known so far. Carophyte-like plants have not been omitted either, as taxa belonging to this group of plants are proving to be of biostratigraphic value.

1.5. Reconstruction of palaeobiocenoses by correlation with depositional environments

Following the geological and palaeontological investigations carried out so far, we have established a number of details concerning the systematic aspects of the biodiversity of the Eocene - Oligocene interval, more specifically those of the north-western Transylvanian Basin and the southern sector of the sedimentary basin. As already mentioned, an example is provided by the crocodilians in the associations in question: gavials are not reported from north-western Transylvania, from where we only have data on the presence of alligators (*Diplocynodon*). Such a differentiated distribution is an argument for different food chains in the two areas under discussion. The basal alligatoroid crocodile *Diplocynodon kochi* collected from the Cluj Limestone Formation (Late Eocene, Priabonian) in the former Mănăștur quarry at Cluj-Napoca represents one of the easternmost occurrences for Diplocynodontidae at European level. New fossils we have

added, as well as postcranial elements, provide new information on the diagnostic characteristics, phylogenetic relationships and life style of this taxon, extending the fossil record of this group with four new localities from the north-western sector of Transylvania. Specific diagnostic elements that are highlighted by the holotype refer to an enlarged insertion surface for the maxillary adductors on the parietal and squamosal, and a single enlarged, prominent tooth on the mandible. The teeth that succeed it in position on the mandible, as well as the alveoli that house them, exhibit lateral compression. These attributes could be associated with prey procurement strategy in this species, the prey referring to taxa from that food chain, both continental (fluvial and telmatic) and shallow coastal marine environments, as indicated by the taphonomy of the fossil deposits studied. Whereas until now the Palaeogene climate in this interval has been characterised strictly as 'warm and humid', with reconstructions based mainly on palynomorphs, the presence of 'growth rings' and 'suture lines' on the prezygapophyses of a dorsal vertebra is more indicative of a seasonal climate installed well before the Eocene/Oligocene boundary. Positioned between western and eastern European faunas, diplocynodontid populations in the Transylvanian Basin probably survived the transition from this boundary, as suggested by the early Oligocene (Rupelian) in the area. In any case, the Pariabonian crocodilians of north-western Transylvania were different from earlier forms, such as the Turnu Roșu (=Porcești) gavials, and even more so from the yet to be defined taxon from the continental deposits of the terminal Palaeocene Jibou Formation (a crocodilian form that differed in physiognomy and adopted hunting strategies that were as different as they were surprising; more details to be reported after publication of the data, as it has not yet been published). A possible explanation for this situation, as we have already pointed out, could derive from the effects of the Bartonian Crisis. In western Europe, during this event, gradual north-south distribution declines are recorded: thermophilic survivors remain only in the southern sectors, with those representatives disappearing from the northern biodiversities. Such a pattern would be worth confirming/infirming in Transylvania, as it could possibly be correlated with what is already known from the western continent. The fossils studied originate mostly from sedimentary environments specific to river plains, mainly from clastic channel fills. The case of Morlaca is illustrative, but Rădaia also follows the same trend. Overbank deposits dominate, but channels are common.

1.6. Inventorying fossil taxa and recording assemblages and distribution of taxa

The determined taxa are in addition to those reported last year, which referred to: gavialoids (Turnu Roșu = Porcești), brontotheriids (one very large, similar to the Asian genus *Embolotherium*, and a second, medium-small, which may be close to *Dolichorhinus*), an anthracother associated with *Prominatherium dalmatinum*, an amynodontid determined as *Aminodontopsis* aff. *bodei*, all these last large vertebrates coming from Morlaca. To these are now added diplocynodontidae (*D. kochi*, but also as yet undetermined forms coming in particular from the Priabonian deposits of the Turbuța Formation at Treznea), a crocodilian to which we have assigned a new name from the Palaeocene deposits at Jibou. Until now, no small mammal taxa were known from the Upper Eocene, except for some marsupials, which can now be attributed to the genus *Peratherium*, discovered at Treznea. As a result of recent research, we are able to provide new insights into rodents, about which very little was known. These additional data allow a biochronological revision for a number of localities not only in Romania, but also throughout Central Europe. A review of the ages for some fossil localities (now Late Eocene rather than Oligocene) in southern Germany and the Czech Republic indicates that fossil associations and certain taxa differ from those in western Europe and points to two landmark renewals: one at the end of the Eocene (involving immigrant taxa until recently considered to be strictly post-Grande Coupure), and a second at the beginning of the Oligocene. Excavations by our team in deposits of the specified ages have resulted in the reporting of cricetid rodents with Asian affinities. New cricetids discovered in the Late Eocene of Transylvania (specifically, representatives of the genera *Wittenia*, *Bustrania* and *Eocricetodon*) are in contrast to Late Eocene associations from southern Germany and the Czech Republic, which are themselves closer to taxa discovered later in the Oligocene of western Europe (e.g., *Eucricetodon*, *Pseudocricetodon*, *Paracricetodon*). In the early Oligocene, rodent associations become more similar between eastern and western Europe, with only a few taxa of Asian origin differentiating the east from the west of the continent. Revised records of large mammals from central and eastern Europe show a clear difference between the terminal Eocene and a more homogeneous distribution in the early Oligocene, consistent with the observations carried out on cricetids. All these observations suggest that the 'Grande Coupure' sensu Stehlin may be an exception restricted at the extreme western edge of the European continent (Belgium, England, France, Spain and Switzerland), areas isolated from the rest of Europe by the Rhine

Graben and the 'Molasse Sea'. In the rest of Europe, the transition was much more complex, involving numerous migrations that followed different dispersal patterns.

1.7. Determining relationships between taxa and environments

The relationships between taxa and environments are as evident as possible in most of the localities studied, and conclusions are based on the study of the taxa determined and the indications of paleoenvironments provided by other types of investigations, such as the sedimentological. For the coastal marine Eocene of the Cluj area we can indicate without much hesitation that we are dealing with a carbonate continental shelf where limestones were built up mainly by algal and microfaunal participation (small foraminifera) to which is added in particular at certain levels the massive participation of molluscs (Vulsella dubia transylvanica) and other participants (echinoderms, etc.). We know that this carbonate platform has undergone episodes of exondation, with superficial, surface karstification. The *Diplocynodon* remains were either carried by river courses from the mainland after the death of the animal or evidence of the crocodile's ability to make incursions (possibly related to prey hunting) into the marine basin. This aspect remains to be further elucidated. Crocodilians of this type from other localities prove that they lived in the same type of environment, moreover with clearly marshy tendencies, as is the case of Treznea. For the older crocodile from Jibou, it signifies an eminently terrestrial representative, capable of moving over firm ground at considerable speed. However, it may also have spent time in the water near the shore, where it probably hunted dortokid turtles. Other examples indicative of palaeoenvironments with specificity are provided by sirenians of the dugongid group, which preferred shallow, coastal waters or estuarine areas, where they probably made incursions to shelter from shark-like predators. Priabonian cricetids from various localities such as Treznea or Bociu, as well as Oligocene cricetids from Cluj-Napoca, Suceag or Mera are indicative for the occurrence of grassy areas. For the Priabonian, floristic associations are already known (flora from Gârbău) which indicate gradual distribution of the vegetation cover, with differentiations between arboreal areas in the vicinity of watercourses, and areas at a certain distance from such places, which were in the form of more extensive grassy areas. This trend of expanding grassy areas certainly continued into the Oligocene, when climatic degradation became increasingly evident. Accordingly, the rodents may be considered indicative of such palaeoenvironments. However,

some differences in interpretation should be noted: in the case of Treznea, the participation of cricetids is not very consistent, which is why we can consider these fossils as not being strictly autochthonous in the taphocenosys: they may have originated from some distance away, having been brought to the marshy environment by carnivores or predatory birds. For this locality we assume the existence of well-represented arboreal areas, evidenced by the presence of didelphid marsupials.

1.8. Analysis of rocks in thin sections and determination of main rock types and depositional facies

We continue to analyse the mineralogy of the rocks corresponding to the Apuseni Orogen, in particular those related to the Bihor Unit and to the covering shifting nappes (the Codru and Biharia Systems) in order to determine the possible source areas and to better outline the palaeogeography of the area. The details of the rotational movements of the Preapulian Craton are undoubtedly also relevant to this discussion. As in the previous year, we further emphasize the participatory absence of Banatitic eruptive rocks, which we will explain in the following publications. At the same time, the lacustrine limestone levels identified in the previous year, levels that may be similar to those known from other areas of Transylvania also from Paleogene deposits (e.g., Rona, Horlacea), are under analysis. What makes them interesting for studies is their Priabonian age. For the time being, we are still trying to determine their areal extension, beyond the limits of Morlaca, particularly to the south-east, but also to the north, at Hodiș. For these we have taken into account the facies determination, in order to be able to identify which events led to the accumulation of fresh water in this geological episode.

1.9. Complex sedimentological analyses

Complex sedimentological analyses are still being carried out on the Morlaca area, but also on the levels of Bociu, Suceag and the Cluj-Napoca area. These are still in their early stages, as the work for such analyses is painstaking and several steps need to be taken in order to obtain concrete results on the sedimentological evolution of a small-scale outcrop. Together with the data that we will obtain from local paleontological and geological studies, but also with global data from the same geological periods, we will be able to characterise precisely the evolution of the areas of

interest, which will help us to better visualise the palaeogeographical development of these areas in a global palaeoclimatic context.

1.10. Establishing main assemblages, correlating different formations, creating palaeoecological graphs

The floristic and faunistic assemblages have been completed with new systematic elements, as already outlined in the report. In this way, we can state that contributions for more elaborate depictions have been made to the faunal assemblages of the specified Eocene and Oligocene localities. As correlation elements, the cricetids are valuable elements, because they allow the correlation of upper Eocene localities such as Treznea and Bociu, which, as is well known, are located in different sedimentation areas in the Transylvanian Depression, i.e., Gilău vs. Meseș (e.g., Popescu, 1984; Rusu, 1987). In other cases, correlations based solely on faunal elements remain difficult, in the absence of common taxa, as is the case for the diversity of titanotherans: those from Morlaca, already specified in the report, are different from *Brachydiastematherium transsylvanicum* from Rădaia. When correlations between outcrops of localities at short distances are in question, as is the case of Cluj-Napoca - Suceag - Mera - Sânpaul, the dilemmas are few and common taxa have been found. What is worth pointing out concerns more nuanced aspects: Cluj-Napoca at the level of the Dâncu Formation was a superficially flooded area; Suceag and Mera reflect more intensely flooded, marshy and/or estuarine palaeoenvironments, in which telmatic tendencies were already developing, with the development of coal-bearing levels; at Aghireș, coal deposits reached a level that allowed the development of exploitable coal strata with economic value. For coastal marine areas, correlations are also supported by fish fauna (we have underlined the selachian associations at Leghia), but also by sirenians which, without exception, refer strictly to dugongidae. The palaeoecological charts will be elaborated as soon as we accumulate enough systematic elements to give them consistency and, implicitly, credibility.

1.11. Complex analysis of the results: comparison of Romanian ecosystems with their European equivalents, identification of the specificities of the Romanian ones, correlation with other ecosystems in order to understand their origin and evolution

This objective is at an intermediate stage, with much more data required on the main geological areas under investigation. Although a number of data have already been collected on outcrops and successions from abroad (Czech Republic, France, Germany, Turkey, Bulgaria, etc.) and contacts have been established with colleagues who have accumulated experience on outcrops of continental provenance in Europe and in the country, investigations are continuing. As we determine new taxa, Romanian ecosystems are beginning to take shape.

Having said that, we consider that we have achieved the objectives proposed for this year. Regarding Ob.3. we can say that we still have the materials prepared for the proposed analyses, but we will do them at the first opportunity next year. Next year we will also add the database with professional 3D scans of some fossils that are already published or will be published, making it the first of its kind in Romania.

2. Results and dissemination

The dissemination of the research in the second phase was as follows: we participated in 9 international and 4 national conferences. In addition, we also participated in two scientific events for the public. In terms of publications, we have 4 abstracts, two BDI indexed articles and two ISI indexed articles. One ISI article has already been published and the last one has been submitted for publication. We can thus say that we meet the deliverables for 2023.

2.1. Conference participations in 2023

International conferences

- Maridet O., Tissier J., Becker D., Codrea V. New data on the Eocene-Oligocene cricetid rodents of Central and Eastern Europe: Towards a new scenario of the “Grande Coupure” for all mammals in Europe. 2nd Asian Palaeontological Congress Tokyo, Japan, 3–7 August 2023.

- Codrea A. V., Venczel M., Solomon A. Al., Bordeianu M., Fărcaș C., Baciu S.. Schimbările de mediu cenozoice: cauze, consecințe. Muzeul Județean Mureș, Secția de Științele Naturii, Conferința de comunicări științifice cu participare internațională, Preocupări recente în cercetarea, conservarea și valorificarea patrimoniului cultural, Ediția XVII, Târgu Mureș, 7-9 iunie 2023.

- Grădianu I., Codrea A.V.. *Pristigenys* sp. (Perciformes: Priacanthidae) din formațiunile oligocene de la Schela - Vârfuri. Muzeul Județean Mureș, Secția de Științele Naturii, Conferința de comunicări științifice cu participare internațională, Preocupări recente în cercetarea, conservarea și valorificarea patrimoniului cultural, Ediția XVII, Târgu Mureș, 7-9 iunie 2023.

- Veress L., Codrea A.V. (2023). A catalogue of fossil sirenians housed in the Museum of Palaeontology-Stratigraphy, ”Babeș-Bolyai” University, Cluj-Napoca, Romania. The Museum of Oltenia Craiova Natural Sciences Department. The Scientific International Conference The Museum and Scientific Research The 30th Edition, Book of Abstracts V, p. 44, September 7th-9th, 2023 Craiova, Romania.

- Trif N., Codrea V.A., Pleș G., Bordeianu M. (2023). An upper Eocene fish fauna from Leghia Limestone (Transylvanian Basin, Romania). The 14th Romanian Symposium on Palaeontology, Bucharest September 14-15 2023.

- Codrea V.A., Venczel M., Solomon Al., Bordeianu M., Fărcaș C. (2023). The anthracotheres of Romania (Preliminary results). The 14th Romanian Symposium on Palaeontology, Bucharest September 14-15 2023.

- Venczel M., Codrea A.V., Solomon Al., Fărcaș C., Trif N.. Cenozoic crocodylians from the Transylvanian Basin. Sesiunea internațională de comunicări științifice a Muzeului Țării Crișurilor Oradea – Complex Muzeal, Interferențe. Trecut, prezent, viitor/The International Scientific Communications Session of the “Țării Crișurilor” Museum Complex, Oradea, Interferences. Past, Present, Future, Ediția a II-a 12-13 octombrie 2023.

- Bordeianu M., Novac M., Codrea V.. New data on the Biharia horst documented by deep drilling. Sesiunea internațională de comunicări științifice a Muzeului Țării Crișurilor Oradea – Complex Muzeal, Interferențe. Trecut, prezent, viitor/The International Scientific Communications Session of the "Țării Crișurilor" Museum Complex, Oradea, Interferences. Past, Present, Future, Ediția a II-a 12-13 octombrie 2023.

- Veress L., Codrea A.V.. List of sirenian fossils housed in the Bethlen Gábor College in Aiud, Romania. Sesiunea internațională de comunicări științifice a Muzeului Țării Crișurilor Oradea – Complex Muzeal, Interferențe. Trecut, prezent, viitor/The International Scientific Communications Session of the "Țării Crișurilor" Museum Complex, Oradea, Interferences. Past, Present, Future, Ediția a II-a 12-13 octombrie 2023.

National conferences

- Codrea V., Venczel M., Bordeianu M., Solomon Al., Fărcaș C., Baciu S.. Schimbările climatice cenozoice, impactul lor în evoluția paleomediilor și hominidelor. Muzeul "Vasile Pârvan" Bârlad, Sesiunea Internațională de comunicări științifice, Ediţia a XVIII - a, 19 - 20 mai 2023, Bârlad.

- Grădianu I., Codrea A.V.. "*Pristigenys spinosus* (Blainville, 1818) (Perciformes: Priacanthidae) din formațiunile oligocene de la Schela - Vârfuri". Consiliul Județean Gorj, Muzeul Județean Gorj "Alexandru Ștefulescu", Simpozionul Național Ion Popescu-Voitești "Trecut și prezent în cercetările geologice și arheologice din România", Târgu-Jiu, 4-7 Octombrie 2023.

- Codrea A.V.. Localități reper pentru evenimentele paleogene din Transilvania. Consiliul Județean Gorj, Muzeul Județean Gorj "Alexandru Ștefulescu", Simpozionul Național Ion Popescu-Voitești "Trecut și prezent în cercetările geologice și arheologice din România", Târgu-Jiu, 4-7 Octombrie 2023.

- Codrea V., Venczel M., Solomon Al., Bordeianu M., Fărcaș C., Horga M.. Bioevenimentul ”Grande Coupure” și evenimentele climatice subsecvente – dovezi din România. Complexul Muzeal Bistrița-Năsăud, Conferința națională de comunicări științifice, Ediția XXIX, 3-4 Noiembrie 2023, Muzeul Bistrița.

Public conferences

- Codrea A.. Lumea după dinozauri. Conferințele Complexului Muzeal Național Neamț, 22 Iunie 2023. Muzeul de Artă, Piatra Neamț.

- Codrea A.V., Solomon A., Bordeianu M., Stoicescu V.. Lumea după dinozauri: Începuturile vieții moderne. Noaptea Muzeelor, Muzeul Județean Mureș. 13 Mai, Târgu Mureș.

2.2. Publications

Abstracts

- Maridet O., Tissier J., Becker D., Codrea V., 2023. New data on the Eocene-Oligocene cricetid rodents of Central and Eastern Europe: Towards a new scenario of the “Grande Coupure” for all mammals in Europe. 2nd Asian Palaeontological Congress Tokyo, Japan, 3–7 August 2023, p. 164.

- Veress L., Codrea A.V., 2023. A catalogue of fossil sirenians housed in the Museum of Palaeontology-Stratigraphy, ”Babeș-Bolyai” University, Cluj-Napoca, Romania. The Museum of Oltenia Craiova Natural Sciences Department. The Scientific International Conference The Museum and Scientific Research The 30th Edition, Book of Abstracts V, p. 44, September 7th-9th, 2023 Craiova, Romania.

- Trif N., Codrea V.A., Pleș G., Bordeianu M., 2023. An upper Eocene fish fauna from Leghia Limestone (Transylvanian Basin, Romania). The 14th Romanian Symposium on Palaeontology, Abstract book: 122-133, Bucharest, September 14-15.

- Codrea V.A., Venczel M., Solomon Al., Bordeianu M., Fărcaș C., 2023. The anthracotheres of Romania (Preliminary results). The 14th Romanian Symposium on Palaeontology, Abstract book: 35-36, Bucharest, September 14-15.

ISI Articles

- Girbau J.S., Bordeianu M., Codrea A.V., 2023. Charophyte flora from the Oligocene fossil site of Suceag (Transylvanian Basin, Romania). Review of Palaeobotany and Palinology, 312, 104861. – sent in December 2022 was published.

https://doi.org/10.1016/j.revpalbo.2023.104861

- Trif N., Codrea A.V., Pleș G., Bordeianu M., 2023. The Priabonian fish from Leghia (Transylvanian Basin, Romania). Historical Biology

https://doi.org/10.1080/08912963.2023.2253273

- Venczel M., Codrea V.A., 2023. Un nouveau crocodilien planocraniidé du Paléocène tardif de Jibou, Roumanie. Comptes Rendu Palevol. Sent to publishing.

BDI Articles

- Venczel M., 2023. Updating the fossil record of the alligatoroid crocodylian Diplocynodon from the late Eocene of Transylvanian Basin. Frontiers in Amphibian and Reptile Science.

https://doi.org/10.3389/famrs.2023.1217025

- Bordeianu M., Novac M., Codrea V., 2023. New data on the Biharia Horst documented by deep drilling. Nymphaea. Accepted for publishing.

Project website: https://palrom.granturi.ubbcluj.ro/

3. Summary for 2023

As in the previous year, the achievements of the second phase met expectations without encountering any insurmountable obstacles. With the exception of one objective (Ob.3.), all the other objectives have been successfully achieved and will be completed in the next phase.

All the activities mentioned in the project for the second stage have been completed, and the objectives can be achieved in the next stage, and even before then (in the form of publications).

The field trips have proved useful, as the project team has managed to collect a large amount of fossil material in terms of quantity and diversity. The geological and palaeontological information collected in the field or acquired through bibliographical and sedimentological studies will also be gathered in the next phase, which will add to the existing knowledge. All the initiated investigations are proceeding as expected, and will yield results as long as they are continued.

We have also managed to identify fossils in some museum collections, which are of particular interest for the project. As in the previous phase, in a few cases we have carried out field trips in parallel with the examination of museum collections, coinciding with symposiums/conferences. We were thus able to attend some sessions without incurring additional costs, thus saving some money in the project budget.

We managed to participate with 9 contributions to international congresses/ conferences/symposiums and 4 national ones. Among the international ones, the largest Asian Palaeontological Congress held in Tokyo (Japan), where Romania was put in a good light worldwide in terms of the rich palaeontological information that can be gathered from the Tertiary fossils found here. Among other things, we also participated in two events to popularize our science.

Among the publications in the project we mention: 4 abstracts in English; 2 articles in BDI indexed journals, one of which is published and the other is accepted for publication; 2 ISI indexed articles, one of which is published and the second is already submitted for publication.

Project Director, Vlad A. CODREA