

GEOECOMAR ACTIVITIES DEDICATED TO EDUCATION AND PROMOTION OF EARTH SCIENCES

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Abstract. Education was an objective of NRD GeoEcoMar since its foundation, in order to attract young students to research through organizing various scientific meetings, summer schools, coordinating Master and PhD theses, etc. As European Centre of Excellence for Environmental and Geocological Studies on River – Delta – Sea Systems in Europe – EuroGeoEcoCentre, during 2003-2006 the institute organized summer schools in the Danube Delta in order to train students from Romania and European countries in the sedimentology of terrestrial and marine systems. Since 2013, annual programs of education and internship for undergraduate students are run by the National Center for Monitoring and Warning on Marine Natural Hazards – Black Sea Security System – in Constanța. Activities for schools and the general public started in 2010, with public conferences, temporary and travelling exhibitions, as well as various events. Such activities increased between 2016-2017, when a project dedicated to education and promotion of earth sciences was run by the institute. The educational program included educational activities for various types of target audience, activities of popularization and promotion of geological and paleontological sites in two Romanian geoparks, promotion of results accomplished by GeoEcoMar in earth sciences, ecology, marine biology, etc. The educational program developed was structured as education in schools, internship for students and geological literacy of the general public. For education in primary and secondary schools, ten lesson plans on earth sciences were elaborated, with associated hands-on activities. A 5 days field trip in Dobrogea was organized for undergraduate students, while various activities and events were proposed for the general public: public conferences, geological field trips, the *Day of Open Doors* at GeoEcoMar, *Earth Science Week*, the *School Differently* and workshops for children. Geological education is a necessity in Romania, especially as earth sciences do not have an adequate public presence and geological literacy of people is rather low. As geology is no longer part of the school curricula for almost 20 years, except some basic concepts included in the geography programs, education and promotion of earth sciences has to continue, which implies the existence of adequate financial and human resources.

Key words: summer school, center of excellence, exhibitions, public conferences, events, educational package for schools

1. INTRODUCTION

Educational activities were an objective of the Institute since its establishment, in order to attract young students to research through organizing various scientific meetings, summer schools, coordinating Bsc, Master and PhD theses, involving students in research projects of the institute, thus contributing to a constant development of human resources. GeoEcoMar collaborates with numerous universities from Romania, Western Europe – Austria, Scotland, Belgium, France, Italy. The institute has the appropriate infrastructure for educational and promotional activities. GeoEcoMar manages two research vessels – *Mare Nigrum* for marine and *Istros* for fluvial and coastal research, a floating laboratory, *Halmyris* and sever-

al boats. The research vessels and the floating lab are endowed with accommodation spaces, while *Halmyris* also has a meeting room which can be used for workshops and summer schools. Both headquarters – Bucharest and Constanța, have conference rooms for 40-50 participants, properly equipped for presentations, public lectures, workshops and conferences.

Educational activities for students were constantly organized each year for 12 years, until the first activities for the general public were started. Considering the necessity to promote its image and increase its visibility, education and promotion of earth sciences became an important objective in the research strategy of NRD GeoEcoMar since 2008 (Oaie, 2012).

Such activities included exhibitions, public lectures and events like *the School differently* and *Day of open doors at GeoEcoMar*. In 2016, GeoEcoMar undertook a project financed by the Ministry of Research, dedicated to education and promotion of earth sciences, entitled *Promotion and education in earth sciences: implementation of a program dedicated to education and the general public*.

This paper presents the main educational and promotional activities organized by GeoEcoMar in the last 20 years.

2. EDUCATING UNDERGRADUATE AND GRADUATE STUDENTS

During its 25 years since its establishment, the main targets of educational activities of GeoEcoMar were undergraduate and graduate students, in order to attract them to marine research and sedimentology and also to a research career at the institute.

GeoEcoMar organized the first summer school in Romania in 1998 in the framework of project NEAR – *Network for environmental assessment and remediation of aquatic ecosys-*

tems, an institutional partnership Switzerland-Romania-Poland in the Danube Delta (1996-1998). The first summer school in this project took place in Switzerland in 1997, in collaboration with the Geneva University. NEAR was followed by NEAR-2, *Network for Environmental Assessment and Remediation – Research, Education and Training*, a SCOPES project deployed during 2000-2003 and NEAR 3, *Network for environmental assessment and remediation in the aquatic system: Environmental curriculum and training at the postgraduate level*.

A special achievement of the institute in the beginning of the 21-st century was the statute of *European Centre of Excellence for Environmental and Geocological Studies on River – Delta – Sea Systems in Europe: case study River Danube – its Delta – Black Sea System (EuroGeoEcoCentre)*. The statute was granted by the European Commission and attracted international recognition by the majority of the partners operating in marine research. During 2003-2005, the center organized two events each year, as summer schools and workshops in the Danube Delta in order to train students from Romania and European countries in sedimentology of terrestrial and marine systems (Figs. 1-3).



Fig. 1. The workshop organized in September 2003 by EuroEcoGeoCentre on house boat *Halmyris*, moored on the Sf. Gheorghe distributary. **Left:** Among participants, professors How Kin Wong, Corneliu Dinu and Gilles Lericolais. **Right:** group photo onboard research vessel *Istros*, with house boat *Halmyris* in the background.



Fig. 2. Summer school organized by EuroEcoGeoCentre in July 2004. **Left:** lecture held by Prof. Nicolae Panin, then general director of GeoEcoMar. **Right:** Participants onboard the fluvial R/V *Istros* of GeoEcomar. Among participants, lecturers Prof. Marian Traian Gomoiu and Drs. Silviu Rădan (center) and Constantin Bondar.



Fig. 3. The summer school organized in September 2005. **Left:** field trip in the Danube Delta. **Right:** Group picture of participants, with lecturers Dan Jipa, Gheorghe Oaie (second row) and Silviu Rădan (in front of the group).



Fig. 4. Summer school organized in the project *From source to sink* in 2009. **Left:** Dr. Cornel Olariu delivering a lecture onboard house boat Halmiris. **Right:** Dr. Dan Jipa, leading a field trip in Buzău area, in the Carpathians bend zone.

The summer schools were attended by students from Romania, Austria, Scotland, Italy, France and Belgium. Courses were delivered by Professor Nicolae Panin, then general director of GeoEcoMar, Corneliu Dinu (the University of Bucharest), How Kin Wong (the University of Hamburg, Germany), Giles Lericolais (IFREMER, France), Marian Traian Gomoiu (GeoEcoMar and University Ovidius, Constanța), as well as researchers from GeoEcoMar: drs. Dan Jipa, Silviu Rădan, Gheorghe Oaie, Radu Dimitriu. Papers presented during symposia organized within the EuroEcoGeoCenter – Romania were published in three issues of *Geo-Eco-Marina*, the journal of the institute: issue 9-10 (2004) *Modern and Ancient Fluvial, Deltaic and Marine Environments and Processes* (Proceedings of EuroEcoGeoCentre in the Danube Delta), issue 11 (2005) *European Seas: Coastal Zones and Rivers – Sea Systems* (Proceedings of EuroEcoGeoCentre organized in Snagov) and issue 12 (2006) *Coastal Zones and Deltas* (Proceedings of EuroEcoGeoCentre at Tușnad).

Another important summer school was organized in the project *From source to sink. A TOPO-EUROPE Collaborative Research Project*. The field trip on the Buzău valley organized in this project introduced participants to the sedimentological

issues of the Cenozoic in the Carpathians bend zone and in the Sarmatian Paratethys Sea.

In 2013, the National Center for Monitoring and Warning on Marine Natural Hazards – Black Sea Security System was established in Constanța, consequently to implementation of the *MARINEGEOHAZARD* project, a Romania-Bulgaria cross border collaboration funded by the European Union. Soon after its establishment, GeoEcoMar managed to obtain the status of objective of national interest with funding from the Ministry of Research. This second Research Infrastructure of the institute, which soon became EMSO EUXINUS, runs yearly programs of education and internship for 20-25 students of the Maritime University in Constanța.

Apart from summer schools and workshops, GeoEcoMar organized field workshops upon request, like that which took place in 2011 for students at University of Graz from Austria, led by Prof. Werner Piller. Participants in this field workshop travelled to Dobrogea in order to examine the Cretaceous sedimentation related to the opening of the West Black Sea basin (Fig. 6), as well as the Holocene sedimentation in the Danube Delta.

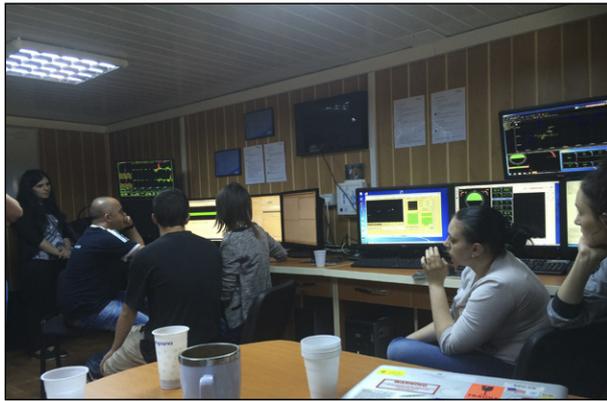


Fig. 5. Students of the Maritime University in Constanța participating in educational activities related to marine geohazards monitoring on EMSO EUXINUS, onboard R/V *Mare Nigrum* of GeoEcoMar.

GeoecoMar also sponsored field trips for undergraduate students of the Bucharest Student Chapter of AAPG (BSC), in order to provide a hands-on experience about sedimentology in modern and ancient environments (Fig. 7), and help them to do the field research necessary for their degree theses. The participants were selected from students that volunteered for organizational activities during the *3rd International Symposium on the Geology of the Black Sea Region (the 3rd ISGB)* in 2011. This meeting was organized by GeoEcoMar, in partnership with the Geological Society of Romania, the Romanian Academy and the University of Bucharest, following the 2nd ISGB organized in 2009 in Ankara, Turkey. The *3rd ISGB* has brought together 205 participants from 15 countries from Europe and North America. Three field guide books were published for the field trips related to this meeting, in the South Carpathians, Dobrogea and the Danube Delta (Ilinca *et al.*, 2011; Seghedi, Stoica, 2011; Panin, Rădan, 2011). The students also participated in the short course organized during this international symposium, entitled *Siliciclastic Shelf Margins Revisited: Source-to-sink within a sequence stratigraphy framework* and held by Prof. Ron Steel and Dr. Cor-

nel Olariu, from the University of Texas at Austin, USA (Fig. 8). During this symposium, GeoEcoMar organized the first activities for children: two workshops for primary and secondary school pupils, held at the National Museum of Geology by famous dinosaur sculptor Brian Cooley and his wife, visual artist Mary Ann Wilson.

3. PROMOTIONAL AND OUTREACH ACTIVITIES

3.1. EXHIBITIONS

So far, GeoEcoMar participated in the conception and achievement of several permanent, temporary or travelling exhibitions, a good way to promote earth sciences.

In 2008, declared by United Nations General Assembly the International Year of Planet Earth, the institute was partner in the Franco-Romanian action „*Trésor du fond des temps*”, a temporary exhibition at the National Museum of Geology, followed by a book. The Franco-Romanian action, supported by Embassy of France in Bucharest, intended to present



Fig. 6. Students from University of Graz examining sediments of a temporary flow in Aptian continental deposits in the Cuza Vodă abandoned quarry in South Dobrogea, during a field workshop organized in 2011.



Fig. 7. Participants in the field workshop organized by GeoEcoMar in August 2011 in Dobrogea and the Danube Delta, visiting the sand dunes at Caraorman.

an exhibition on the importance of fossils as witnesses of the evolution of biodiversity. The exhibition was meant to raise public awareness on the notion of geological heritage (Fig. 9). GeoEcoMar had an essential role in this action also by publishing the book *Trésor du fond des temps* under the aegis of the institute. This book includes a series of articles dedicated to multiple actions of education in geology and paleontology (Saint Martin *et al.*, 2010).

The second temporary exhibition co-organized by GeoEcoMar was *The Demidoff expedition through the Danube Countries to Crimea and southern Russia in 1837* (Fig. 10). This expedition of twenty two men, led by the 24 years old Anatole de Demidoff, prince of San Donato, took place along the Danube from Pesth to Giurgiu. A multinational, interdisciplinary project, the Demidoff expedition collected geographical, zoological, geological, botanical, sociological and anthro-



Fig. 8. Participants to the short course *Siliciclastic Shelf Margins Revisited: Source-to-sink within a sequence stratigraphy framework*, organized during the 3rd ISGB. Prof. Ron Steel and Dr. Cornel Olariu can be seen in the right picture.

Cu participarea










planeta pământ
Științe Pământului pentru Societate



Proiect cofinanțat de Ambasada Franței în România
Projet cofinancé par l'Ambassade de France en Roumanie

Comori din adâncul timpului Trésors du fond des temps

Colecțiile, martori ai istoriei Pământului
Les collections, témoins de l'histoire de la Terre

Muzeul Național de Geologie
3 octombrie - 2 noiembrie 2008




Expoziție realizată de :

Muzeul Național de Istorie Naturală din Paris
Muzeul Național de Geologie
Universitatea din București







Muzeul Național de Geologie
Șoseaua Kiseleff n°2
București

INFORMAȚII

PROGRAM DE VIZITARE:
Zilnic: 10.00 – 18.00
Accesul vizitatorilor in Muzeu este permis pana la orele 17.00

MIJLOACE DE TRANSPORT:
Metrou (magistralele M2 și M3): stația "Piata Victoriei"
Autobuz: liniile 182, 300, 783, 784
Tramvai: 20, 24, 34, 46

Telefon: 212.89.52
Site Internet: <http://www.geology.ro>

Fig. 9. Flyer of the exhibition „Treasures from deep time” organized in the International Year of Planet Earth with the participation of GeoEcoMar.

polological data about Banat, Wallachia, Moldavia, Bassarabia, Crimea and southern Russia. The outcome of the expedition was a richly decorated study, published in several editions during 1839-1849, including four volumes of hundreds of pages and two atlases, each with 100 plates. The atlases contain drawings and maps, many of them hand colored. The lithographs of the picturesque album belong to Auguste Raffet, and his landscapes drawn along the Danube River are remarkable (Fig. 11). Along with descriptions of flora and fauna, illustrated in detail in the natural sciences album, an important result of this expedition is, for us, the first geological map of the southern part of present Romania (Berza, 2011). This is the geological map of the Lower Danube, elaborated in 1837 by Huot, the geologist of the expedition, and published with explanations in the second volume in 1842, for Wallachia, Serbia and Bulgaria, countries still attached to the Ottoman empire. In the Natural Sciences album, fifty years before any other geologist, Huot presented a north-south geological section in Wallachia entitled „*Coupe théorique des terrains de la Valachie, depuis les Karpathes jusque vers la Mer Noire*” (Berza, 2013).

A collaboration between NRD GeoEcoMar and the Library of the Romanian Academy, the temporary exhibition dedicated to the Demidoff expedition was organized in October 2010 and exposed in the Theodor Pallady room of the Library of the Romanian Academy (Figs. 11, 12). In the opening day, a scientific session was also organized in the same room, in order to present the scientific results of this expedition along the Danube. Two of the presentations belonged to researchers from GeoEcoMar (Gomoiu *et al.*, 2010; Oaie *et al.*, 2010).

The travelling exhibition *Dobrogea, between land and sea, the mark of time and man* was elaborated in 2012 (Oaie, 2012; Saint Martin, 2013). Sponsored by the French Embassy in Bucharest, this exhibition was the result of collaboration between Romanian and French institutions: the University of Bucharest, NRD GeoEcoMar, Museum of Romanian Peasant, Vasile Pârvan Institute of Archaeology Bucharest, Museum National d’Histoire Naturelle, Paris and IFREMER. Exhibition *Dobrogea* was inaugurated in May 2012, at the three museums in the Victoria square: the National Museum of Natural History „Grigore Antipa” (Fig. 12), the National Museum of Geology and the National Museum of Romanian Peasant. In the opening day, a scientific symposium was organized at the National Museum of Geology, with presentations on geology and archeology of Dobrogea. GeoEcoMar participated in the concept of several modules of this exhibition, collaborating mostly with the Natural History Museum in Paris, IFREMER and GESS – the Group of Subaqueous and Speleological Exploration (the NGO managing two of the most important caves in Romania: Movile and Limanu caves). The exhibition had several modules: a module of GeoEcoMar Mare Nigrum R/V, with a core in bottom sediments of the Black Sea (Fig. 13); a module on microfossils and oil and gas; a module of Movile

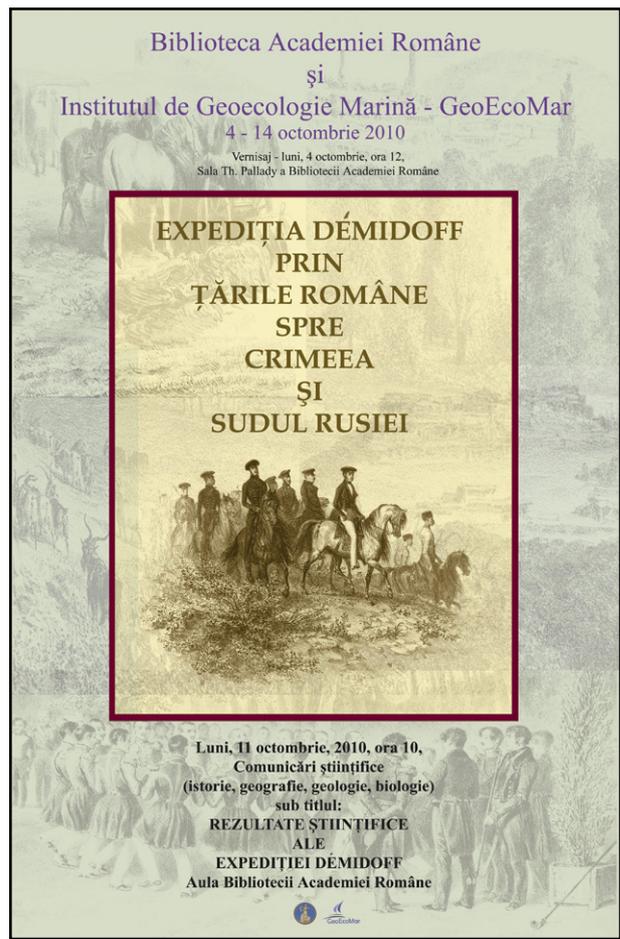


Fig. 10. Poster of the exhibition *The Demidoff expedition through the Romanian Countries to Crimea and southern Russia in 1837*.

cave (where a sulphur based chemoautotrophic ecosystem was found for the first time in the world, isolated from the outer world for over 5 million years); a module on sulphurous springs at Mangalia (a marine protected area in custody of GeoEcoMar); 4 modules of geology (reconstruction of life during the Ediacaran, the Lower Triassic, the Late Jurassic and the Sarmatian) (Fig. 14). At the „Grigore Antipa” National Museum of Natural History, this exhibition was accompanied by a space dedicated to hands-on activities, equipped with binoculars, fossils and microfossils, where children could actually see microfossils and examine fossil and recent molluscs.

At the end of 2013, several modules of the exhibition were transported for several months to the Museum of History and Archaeology in Tulcea. GeoEcoMar was again involved in the selection of modules, arrangement of the exhibition at the new location and in the official opening in Tulcea (Fig. 15).

In 2014, GeoEcoMar contributed to a permanent exhibition in the Hațeg Country Dinosaur Geopark, the only international UNESCO geopark in Romania. The geopark is home to 16 fossil sites with an unusual fauna of dwarf dinosaurs that lived in the Maastrichtian on the Hațeg island (Nopcsa, 1915; Weishampel, Jianu, 2011; Grigorescu *et al.*, 2014; Csi-



Fig. 11. Silistra, lithograph exposed during the exhibition along with other 20 lithographs of landscapes along the Danube River drawn by Raffet.



Fig. 12. Exhibition partners (Gheorghe Oaie – GeoEcoMar and Jean-Paul Saint Martin – Museum National d’Histoire Naturelle, Paris) talking to Emil Constantinescu (president of Romania during 1996-2000) at the opening of the exhibition *Dobrogea, between land and sea, the mark of time and man*.



Fig. 13. A relevant exhibit of the exhibition *Dobrogea, between land and sea, the mark of time and man* was the largest core extracted by the institute from the Black Sea sediments. The panel also features microfossils found in marine sediments.

ki-Sava *et al.*, 2015, 2016). The dwarf dinosaur and associated microvertebrate fauna is the most important paleontological heritage in Romania and GeoEcoMar agreed to contribute to promotion of this exceptional heritage by participating in the *Transylvanian Dinosaur Museum* (TDM) project. Despite the fact that it was an unfinanced project, three museum quali-

ty, life-size dinosaurs were reconstructed for the geopark in 2014, one of them sponsored by GeoEcoMar (Andrășanu *et al.*, 2015; Seghedi, Andrășanu, 2017).

The central piece of the exhibition *Dragons, griffins and dinosaurs*, inaugurated in June 2014 at the Visitor Center of the Geopark in Hațeg town, is *Balaur bondoc*, a feathered theropod



Fig. 14. A sea full of life is the title of this reconstruction of the shallow marine environment which occupied the territory of South Dobrogea in the Sarmatian. Drawing by French artist Charlène Letenneur (Saint Martin *et al.*, 2013).



discovered recently (Csiki *et al.*, 2010, Brusatte *et al.*, 2013). Despite its turkey-size, *Balaur* is the most well known dinosaur in the Hațeg basin. The life-size, museum quality reconstruction of *Balaur* was made by the famous Canadian dinosaur sculptor Brian Cooley. The reconstruction of *Balaur* was sponsored by GeoEcoMar and proper credit is given to the institute and people involved from GeoEcoMar in the Transylvania Dinosaur Museum project (Seghedi, Andrașanu, 2017) (Fig. 16).

◀ **Fig. 15.** At the opening of the traveling exhibition *Dobrogea* in the Museum of History and Archaeology in Tulcea, Cristian Micu (director of the Museum), Gheorghe Oaie (director of GeoEcoMar) and the cultural attaché to the French Embassy in Bucharest.



Fig. 16. The life-size reconstruction of *Balaur bondoc* in the exhibition *Dragons, griffins and dinosaurs* (left) and the credits to GeoEcoMar for sponsoring this sculpture, visible at the entrance to this exhibition at the Geopark visitor center in Hațeg (right).

GeoEcoMar also contributed to the TDM project by helping the transportation of reconstructions of other two dinosaurs, granting incentives and logistic support and organizing two workshops for first to fifth grade school children in village General Berthelot (Seghedi *et al.*, 2017).

The travelling exhibition *Brian Cooley – dinosaur art*, dedicated to the dinosaur sculptures created by Brian Cooley for famous museums in the world, also includes the reconstruction of three dwarf dinosaurs from Hațeg basin for the TDM (Fig. 17). The exhibition was elaborated by the fall of 2015 and was first hosted at the Center of Science and Art of the Geopark in village General Berthelot.

3.2. PUBLIC CONFERENCES

The first public lecture organized by GeoEcoMar, in partnership with the Geological Society of Romania and entitled

GeoEco Israel or How is infrastructure controlling the life at a continental plate margin was presented in 2010 by Dr. Barbu Lang from the Geological Survey of Israel (Fig. 18). Other lectures were organized since, and in 2016 a schedule for 5 lectures per year was elaborated in the project *Promotion and education in earth sciences: implementation of a program dedicated to education and the general public*. Many of these lectures have raised the interest of Radio Romania Cultural, and interviews with the speakers were broadcasted before the lectures.

Some lectures were organized in partnership with the Geological Society of Romania and/or the Faculty of Geology and Geophysics, the University of Bucharest. Public lectures had various subjects: *Evolution in the deep sea* (prof. Dolf Seilacher, University of Tübingen, Germany), *Geoconservation* prof. Jose Brilha (the University of Minho, Portugal), *Blue*



Fig. 17. A part of the exhibition *Brian Cooley – dinosaur art*, exposed in village Sânpetru from the Hațeg Geopark.

schists from Naxos (Prof. Horst Hann, University of Tübingen, Germany), *Iceland between Pluto and Neptun* (prof. N. Anastasiu, University of Bucharest), *From Cretaceous to Renaissance: Florence unprecedented* (Tina Miheșan, Florence, Italy), etc.



Fig. 18. The first public conference organized in the new conference room at the headquarters of GeoEcoMar in Bucharest.

3.3. EVENTS

In 2010, GeoEcoMar became directly involved in the management of marine protected areas of the Natura 2000 network, as custodian of two MPAs – marine protected areas (ROSCI 0094 the *Submarine sulphurous springs at Mangalia* and ROSCI 0273 *Marine area at cape Tuzla*). In this quality, the institute collaborates with managers of other protected areas or sustainable development areas like geoparks, in order to contribute to conservation and promotion of both natural heritage and of geological sites (Seghedi *et al.*, 2013; Begun *et al.*, 2013). Every year, GeoEcoMar organizes various hands-on activities in Constanța or Mangalia, for students from secondary and high schools, in order to increase awareness on Marine Protected Areas, beach pollution, ecology, marine biodiversity, etc. Lately, the institute developed activities within a project of the Ministry of Education, *the School differently* (Fig. 19).



Fig. 19. Children from secondary schools in Constanța involved in hands-on activities organized on the beach, in the project *The school differently* of the Ministry of Education.

Increasing awareness related to the protection of marine sites, especially targeting the 9-15 years age segment of young people (more receptive and willing to change things for the better), and even younger children, could contribute in the future to improve the state of marine environment (Menabit *et al.*, 2017).

The Day of Open Doors at GeoEcoMar is an event organized for several years now in Constanța. Students from various partner schools are invited to visit *Mare Nigrum*, our research vessel for the Black Sea.



Fig. 20. Booth of GeoEcoMar at the *Science show* organized in Bucharest in 2010, where Tatiana Begun is talking to visitors about GeoEcoMar.

3.4. PROMOTION AND VISIBILITY IN MEDIA

The institute also participated in various other events organized by other institutions, like the *International Year of Planet Earth*, *Earth Science Week*, *Researchers' Night* and *Science show* (Fig. 20), as well as in national and international fairs and exhibitions organized in Romania (*Exhibition of Research, National Conference of Research*) and abroad (Nicosia – Cyprus, Bruxelles – Belgium, Denver – USA, Salonic – Greece, in 2013, Versailles – France, in 2014, the universal exhibition in Milan – Italy, 2015, etc.) (Figs. 21, 22).

Promotion of GeoEcoMar projects, infrastructure and activities are done through its website and pages on social media (Facebook, Instagram), while films about GeoEcoMar shot during the project *MARINEGEOHAZARD* are posted on YouTube. Also, meetings with groups of science journalists were organized.

The management or various researchers are interviewed for and participate in radio and TV shows, and during the years, the institute collaborated especially with Radio România Actualități, România Cultural, ProTV, Realitatea TV, Neptun TV, Digi 24, Radio Constanța, etc. GeoEcoMar regularly collaborates with Market Watch, the journal of intelligent management in IT, science and higher education. The July 2013 issue of Market Watch dedicated a cover article to the institute (*NRDI GeoEcoMar launches the Romanian research in the pan-European scientific elite*) (Fig. 23). Several media shows are worth mentioning: presentation of project Danubius RI in



Fig. 21. Mădălina Nailia and Bogdan Smărăndoiu standing at the GeoEcoMar booth at the 2013 exhibition in Salonica, Greece.

Fig. 22. At the universal exhibition in Milan, Italy, 2015, GeoEcoMar presented the Danubius project. ▶



Fig. 23. Cover of the July 2013 issue of Market Watch, featuring the title of the article dedicated to the institute (left) and a 2010 reportage on Realitatea TV about GeoEcoMar (right).

the Radio show Objective – Romania in 2013 (Radio România Actualități), in the Economist in 2014, presentation of NRD1 GeoEcoMar and R/V Mare Nigrum at the show *Romania, I love you* on ProTV in July 2015. Six interviews with the general director of GeoEcoMar, dedicated to ecological problems of the Black Sea were broadcasted during January-September 2017 by Radio România Actualități.

4. PROJECTS DEDICATED TO SCHOOLS AND THE GENERAL PUBLIC

In 2015, GeoEcoMar submitted to the Ministry of Education and Research a project dedicated to education, entitled *Promotion and education in earth sciences: implementation of a program dedicated to education and the general public*. The project was granted funding for two years and was implemented between 2016-2017. The main objective of this project was to raise awareness of population on the main domains and issues of the earth sciences, in order to understand the way our planet is functioning, the importance of geological phenomena to humans and society, thus increasing the responsibility for protection of the natural environment. Specific objectives were: implication of GeoEcoMar in educational activities for primary and secondary schools, but also in geological literacy of the general public, through elaboration of dedicated educational packages; a larger and more diversified involvement of the institute in higher geological education; increasing awareness on current priority areas in earth sciences (climate change, natural hazard, ecology, environmental issues of the Danube River-Danube Delta-Black Sea system, pollution, marine and terrestrial protected areas, etc.), as well as on the main domains of earth sciences (plate tectonics, volcanism, earthquakes, natural resources, etc.); popularisation and promotion of scientific results of the institute in areas of environmental pollution, ecology, natural hazards, protected areas, etc.); increasing visibility of GeoEco-

Mar, as an institution concerned with the formation of future generations and of transferring to the public the results of scientific research. The educational program was structured in three packages, school education, higher education and geological literacy of the general public.

The educational package for schools was focused on elaboration of the project *The lesson of geology* (Fig. 24). It contains 10 lessons inspired by the project *This dynamic Earth* of the United States Geological Service – USGS (Kious, Tilling, 2009), adapted to specific situations in Romania, with examples from Romania and Europe. Each lesson consists of a ppt presentation (about 20 minutes) and 25-35 hand-on activities and discussions. They include lesson plans for teachers and pupils' textbooks. The subjects of lessons are:

- Tectonic plates and supercontinents
- Oceans – formation and extinction
- How tectonic plates move and why?
- Hot spots on the planet
- Before Pangaea – brief history of Earth
- Plate tectonics and us. Earthquakes
- Plate tectonics and us. Volcanoes
- Plate tectonics and us. Tsunamis
- How we observe and record the movements of the planet
- The future of the planet

The educational package for higher education, intended to support the professional development of undergraduate and graduate students, included workshops for undergraduate students related to EUXINUS center, which take place each year in Constanța. A field trip in Central and North Dobrogea was organized, focused on ancient sedimentary environments, as well as on Hercynian and Cimmerian magmatism and deformation: the Ediacaran basement of Central Dobrogea – sedimentary facies and structures in deep marine turbidites; the Hercynian basement of North Dobrogea

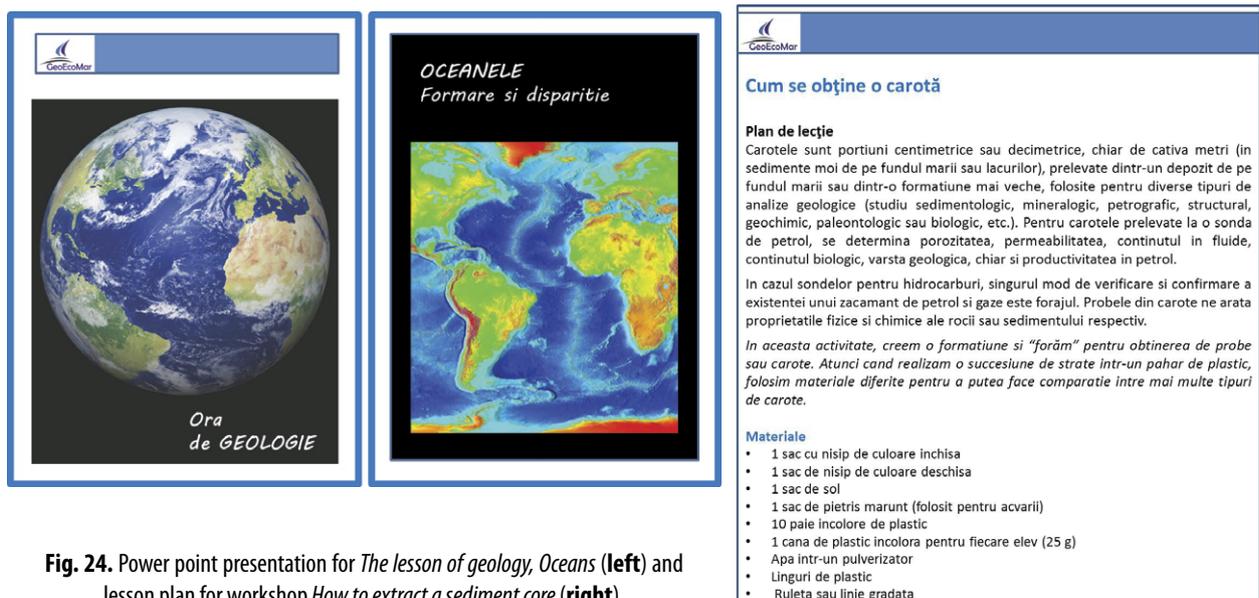


Fig. 24. Power point presentation for *The lesson of geology, Oceans* (left) and lesson plan for workshop *How to extract a sediment core* (right).

– Paleozoic sedimentation, magmatism and folding; the Cimmerian orogen of North Dobrogea – Triassic rifting, sedimentation, volcanism and inversion.

The package for the general public included elaboration and implementation of an annual agenda of 5 public lectures on geology and geological heritage; short summer field trips; organizing events (*Earth Science Week*, *Open doors at GeoEcoMar*) or participating in the *School differently* with ecological education and field trips to protected areas (Fig. 26).

A 4th, supplementary phase in this project was dedicated to promotion of the natural (geological and paleontological) heritage of Romanian geoparks: the Hațeg Country Dinosaur Geopark and Buzău Land aspiring Geopark, as specialists from GeoEcoMar have been involved in field research in previous projects in the areas of these geoparks (Seghedi *et al.*, 2008; Melinte-Dobrinescu *et al.*, 2016). This was an opportu-

nity to organize a new temporary exhibition, dedicated to the Maastrichtian fauna of the Hațeg basin. The exhibition had two modules. One module, *The dwarf dinosaurs of the Hațeg country*, showcases the pencil drawings of Polish geologist and paleoartist Jakub Kowalski (Fig. 27), who reconstructed all animals found in the Hațeg basin, from dwarf dinosaurs to pterosaurs, crocodylian, turtles, snakes and lizards, small multituberculate mammals. The artist also created six reconstructions of the Maastrichtian ecosystems, which were dominated by braided river environments in a warm, tropical climate, as results from various studies, including sedimentological data (Therrien, 2006). Another module was represented by *The European journey of a dwarf sauropod* (Fig. 28), which follows the transportation to Romania of the reconstruction of *Magyarosaurus dacus*, from Antwerp to Hațeg, through various cities and localities from Europe and Romania (Andrășanu *et al.*, 2015; Seghedi *et al.*, 2017). This exhibition is



Fig. 25. The 2018 field trip in North Dobrogea organized for students in the educational project.



Fig. 26. The *School differently*, field trip to the Agighiol fossil site with children from the secondary school in Agighiol village.

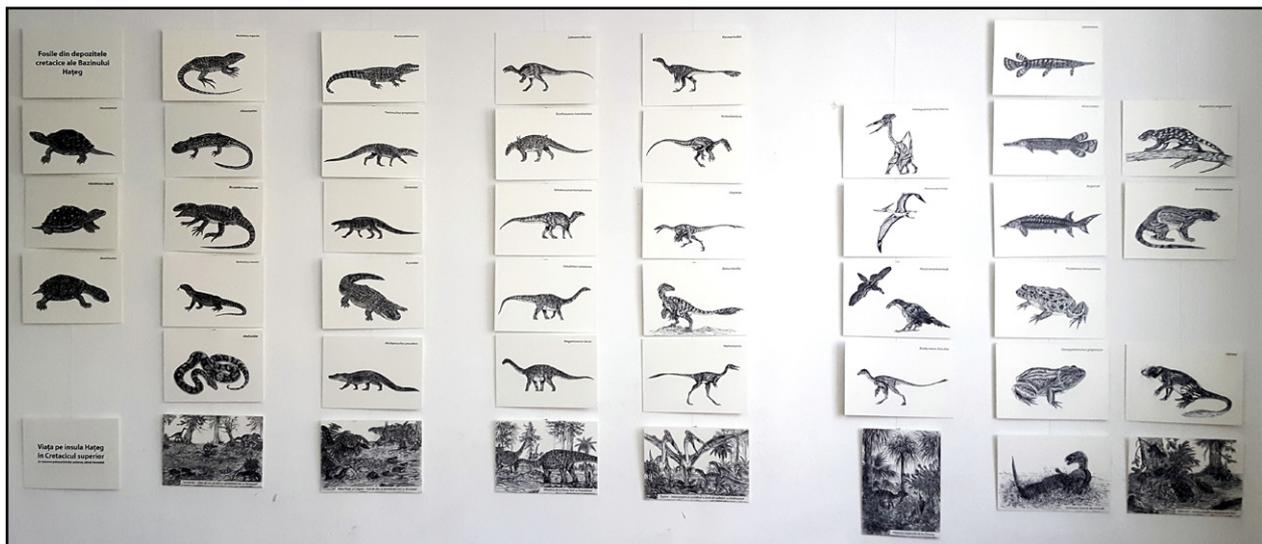


Fig. 27. Module of the travelling exhibition *The dwarf dinosaurs of the Hațeg country* featuring all vertebrates found so far in the Hațeg basin, as well as six ecosystem reconstructions by Polish geologist and paleoartist Jakub Kowalski.

accompanied by promotional materials (T-shirts, mugs, note books and pins), together with two workshops, one designed for the carnivore *Balaur bondoc*, the other for the herbivore *Magyarosaurus*. The children's workshop *Let's make a dinosaur* was organized on house-boat *Halmyris* in June 2017 (Fig. 29), when sculptor Brian Cooley visited Romania (Seghedi *et al.*, 2017).

Although this educational project terminated in December 2017, educational and promotional activities continued in GeoEcoMar in 2018, in the new project financed by the Ministry of Research – *Emphasizing the geodiversity and geo-conservation values of Natura 2000 sites from Dobrogea, contributing to promotion of geological sciences at national level*. Two workshops for children were organized in this project in July, during the Dinosaurs festival in Hațeg Geopark (Fig. 30). A workshop was also organized in the summer of 2018, with

pupils and teachers from Sântămărie Orlea, in order to set up a rock and fossil collection, several Cretaceous dioramas and a land art featuring a large mosaic ammonite made of boulders and rock slabs (Fig. 31) and a pterosaur silhouette, made of granite boulders and pebbles.

GeoEcoMar was partner to the event *Earth Science week* entitled *Dialogue between man and Earth*, which took place in the third week of October, with activities in five counties of Romania (Maramures, Cluj, Iasi, Prahova and Hunedoara). In Bucharest, workshops for primary and secondary schools were proposed by GeoEcoMar and the Geological Society of Romania in the Văcărești Natural Park, in collaboration with Bucharest Student Chapter of AAPG. A guided trip to the *Reef in the subway* (Fig. 32), as well as the exhibition *Objects made of stone* and a *Fair of geoproducts* were organized at the Ark, in partnership with the University of Bucharest.



Fig. 28. Modules of the exhibition *The European journey of a dwarf sauropod*.



Fig. 29. Children from school in Murighiol modeling and painting dinosaurs during workshop *Let's make a dinosaur* organized on house-boat *Halmyris* in June 2017.



Fig. 30. Workshop on fossils with children in village Sălașu de Sus, at the *Dinosaurs festival* organized in the Hațeg Country Dinosaur Geopark in the summer of 2018.



Fig. 31. Large mosaic ammonite, reconstructed in the school yard of village Sântămărie Orlea, during the summer school organized in 2018.



Fig. 32. Earth Science week in Bucharest. Professor Mihai Emilian Popa (the Faculty of Geology and Geophysics, the University of Bucharest), explains the rudists from red limestone slabs cut from the Late Cretaceous Săvădisla reef to pave the Politehnica subway station (**left**). Earth Science Week poster and agenda for Sunday, 28 October 2018 (**right**).

	<h2>PROGRAM</h2> <p>Duminică 28 octombrie</p>
<p>SĂPTĂMÂNĂ GEOLOGICĂ de neobrădare, știință</p>	<p>Stația de metrou Politehnica, București 10:00 Reciful de la metrou, introducere în lumea recifilor jurasici, de Prof. Dr. Mihai Emilian Popa, Facultatea de Geologie și Geofizică, Universitatea din București</p> <p>The ARK & Restaurant Ivan Pescar, Uranus 150 (fostă Calea Rahovei 196A), București Forumul Tradițiilor Creative, organizat de Geoparcul Dinozaurilor Țara Hațegului, Geoparc Internațional UNESCO – Universitatea din București și Asociația Geomedia</p> <p>Expoziția Stone made objects Târg de geoproducte 15:00 Prezentare – conceptul de <i>Geoproduct</i></p>
<p>PROIECTUL ORIENT CU PĂMÎNTUL</p>	

CONCLUSIONS

NRDI GeoEcoMar will continue to be involved in higher education of undergraduate and graduate students, trying to support these activities from various projects. However, involvement of research institutes in geoscience education in primary and secondary schools started to be considered important only recently. As geology is no longer part of the school curricula, along with other institutions (faculties of geology in Romania, the Geological Institute of Romania through its National Museum of Geology, “Victor Gordan” County Museum of Mineralogy in Baia Mare, the Geological Society of Romania, the Romanian Society of Paleontologists, etc.), GeoEcoMar has to be involved in education and promotion of earth sciences in schools, which implies the existence of adequate human and financial resources. Involvement in education in primary and secondary schools will make children learn basic notions of geology and understand that this is a very important science for the society. This will increase awareness on geological processes and how they are con-

stantly affecting our lives, even if we choose not to care about them. This is also a way to help teenagers to consider choosing a career in earth sciences. Publishing books targeting primary or secondary school pupils, or teenagers, can also be helpful to attract the young generation to geology.

Public conferences can attract the general public only if organized in museums or book shops. From our own experience, it is clear that the general public is not attracted and it is not used to attend lectures held in research institute or universities. To be more successful with public lectures, media partnerships are also required, to help advertising and attracting people to such events.

Publishing books on various subjects of earth and marine sciences to a non-specialized audience can also help promoting earth sciences, as well as the results of the institute in fluvial and marine research, sedimentology, ecology, paleontology. This and can also contribute to an increased visibility of GeoEcoMar activities and of their usefulness for the society.

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