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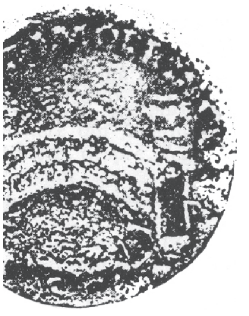

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BYTTNERIOPHYLLUM TILIAEFOLIUM (AL. BRAUN) KNOBLOCH ET KVACEK – THE MAIN TAXON IN PLIOCENE COAL-GENERATING FROM DANUBE-MOTRU SECTOR

Florina Diaconu[1]

***BYTTNERIOPHYLLUM TILIAEFOLIUM* (AL. BRAUN) KNOBLOCH ET KVACEK – THE MAIN TAXON IN PLIOCENE COAL-GENERATING FROM DANUBE-MOTRU SECTOR**

Abstract: This paper present the results of researches concerning contribution in Pliocene coal-generating of the *Byttneriophyllum tiliaefolium* (Al. Braun) Knoblok et Kvacek. This taxon gave an impressive quantity of vegetal material during coal accumulation in the Dacian-Romanian interval from Danube-Motru.

Keywords: taxon, Pliocene coal-generating, Danube-Motru sector.

Preview researches

For the first time in Pliocene deposits from Oltenia, the taxa *Byttneriophyllum tiliaefolium* (Al. Braun) Knoblok et Kvacek was identified by Barbu (1933) at Timişani (today Pinoasa open pit) under the name *Ficus tiliaefolia* Heer.

Among the species pointed out by Barbu (1954) and subsequently revised include: samara *Acer giganteum* = *Banisteriaecarpum giganteum* (Goppert) Krause after Barbu & Givulescu (1965) and Givulescu (1966). Ţicleanu (1989) it belongs to the species fossils *Byttneriophyllum tiliaefolium*.

The flora Dacian-Romanian deposits of drilling is studied (Ţicleanu, 1986, 1995), comprises the main taxon and *Byttneriophyllum tiliaefolium*. This taxon is found in the list presented by Ţicleanu (1992) in his doctoral thesis.

From Dacian-Romanian deposits at Dedoviţa, Danube-Motru sector, Ţicleanu et al. (1982) described and illustrated a flora which the authors consider as belonging to the Late Dacian. Diaconu & Enache (2007) add at this list from Dedoviţa,

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taxa *Byttneriophyllum tiliaefolium* (Al. Braun) Knobloch et Kvacek and *Carpinus betulus* L. – bractee.

The research realized by Diaconu (2000–2007) in Husnicioara open pit led to the identification of deposits with macroflora poor in species, but sometimes very rich in individuals. Thus, from the roof IVth coal seam in Husnicioara open pit was identified (Diaconu, 2000): *Byttneriophyllum tilliaefolium* (Al. Braun) Knobloch & Kvacek, *Glyptostrobus europaeus* (Brongniart) Heer, *Glyptostroboxylon tenerum*, *Salix ştefănescui* Mar. & Laur. Salix sp., *Potamogeton* cf. *nodosus* Poir, *Phragmites oeningensis* Al. Br., *Ceratophyllum* sp. aff. *C. demersum* L., *Quercus* sp. and *Acer* sp.

Later, in the same site, but above VIth coal seam (Diaconu, 2002) identified the following species: *Byttneriophyllum tilliaefolium* (Al. Braun) Knobloch & Kvacek, *Glyptostrobus europaeus* (Brongniart) Heer. Of the 16 taxa identified in Husnicioara open pit, *Byttneriophyllum tilliaefolium* (Al. Braun) Knobloch & Kvacek belongs to the group of taxa dominant in the marshes coal-generating from Dacic Basin.

Since the first macroflora researches of the Pontian deposits from Batoţi (Mehedinţi), Ţicleanu et al. (2002) identified the taxon *Byttneriophyllum tiliaefolium* (Al. Braun) Knobloch et Kvacek.

Resultats and discusions

Although the Batoti found only a few fragments (Fig. 1), no leaf whole, however the venation indicated this species *B Byttneriophyllum tiliaefolium*. That would not have retained only fragments is explained because they come obviously from large leaf and were destroyed in transport. This fact has been noted by Ţicleanu et al. (2002), which means that leaves belonged to trees located at a distance of hundreds of meters, maybe 1–2 km.

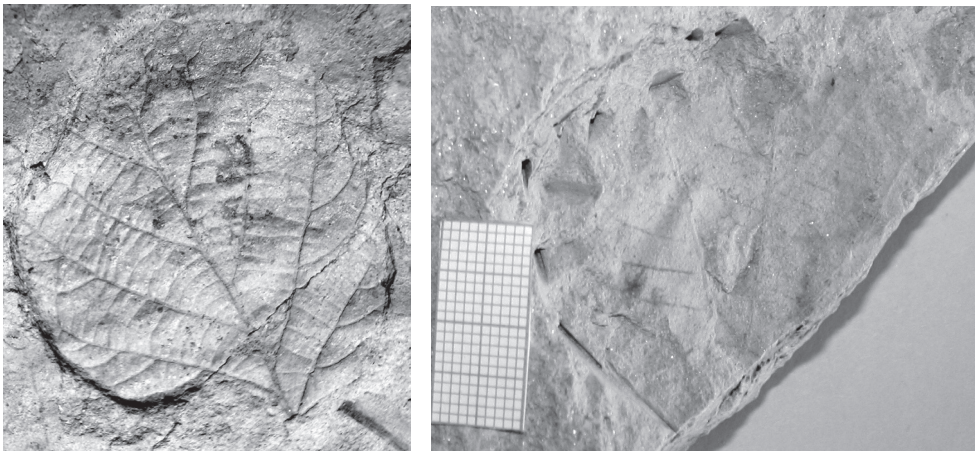

Fig. 1. The imprints of the leaves *Byttneriophyllum tiliaefolium* from Batoţi

From Dedoviţa – Balota is described the imprint of leaf *B. tiliaefolium* leaf almost the entire to which is kept and petiole (Fig. 2).

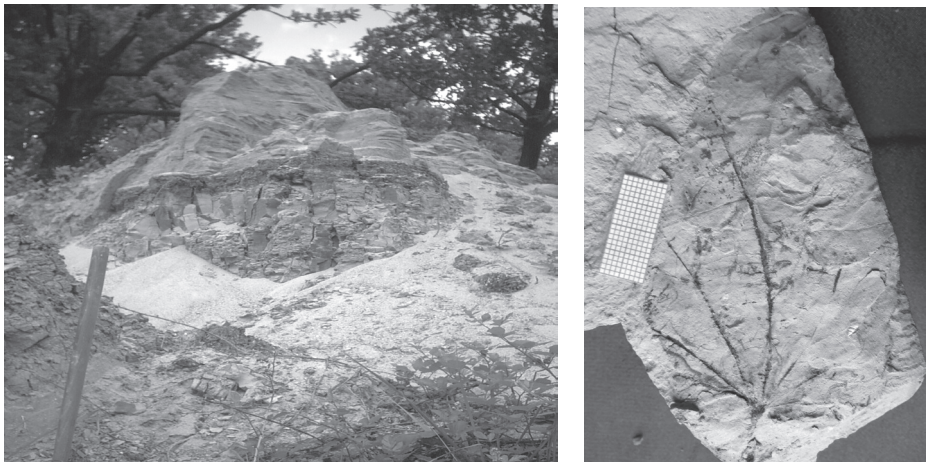

Fig. 2. The outcrop and the imprints of the *B. tiliaefolium* from Dedoviţa – Balota

The samples of *B. tiliaefolium* from Husnicioara open pit are the most numerous. It described and illustrated from the roof between the IVth and VIth coal seams over 100 imprints (HS 11 – 110) leaves and fragments of leaves (Fig. 4, 5). *B. tiliaefolium* leaves are large and very hard can keep whole, but one of this exemplar is a leaf with small dimensions and has been kept almost the entire, including petiole.

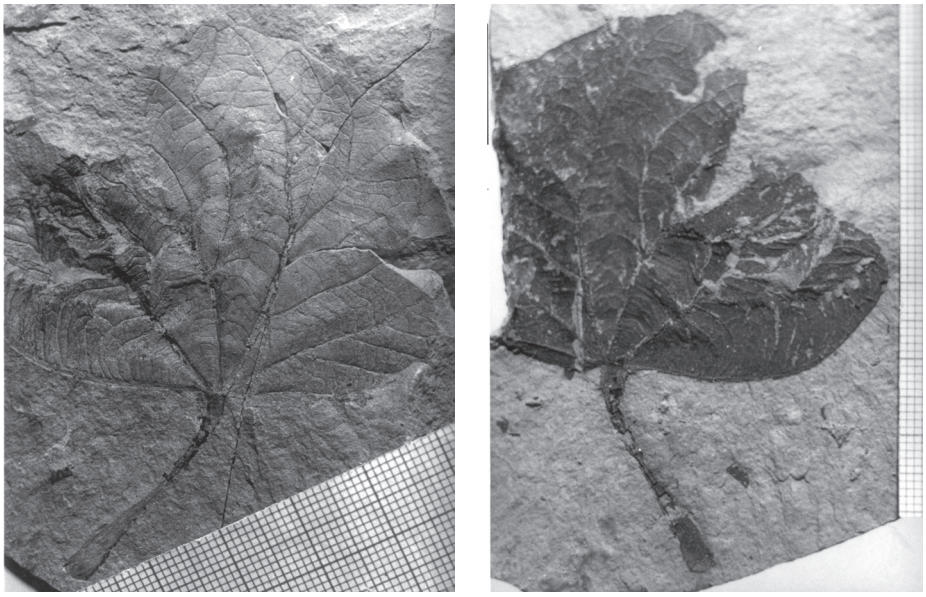

Fig. 4 The imprint an entire leaf of *B. tiliaefolium* from Husnicioara open pit

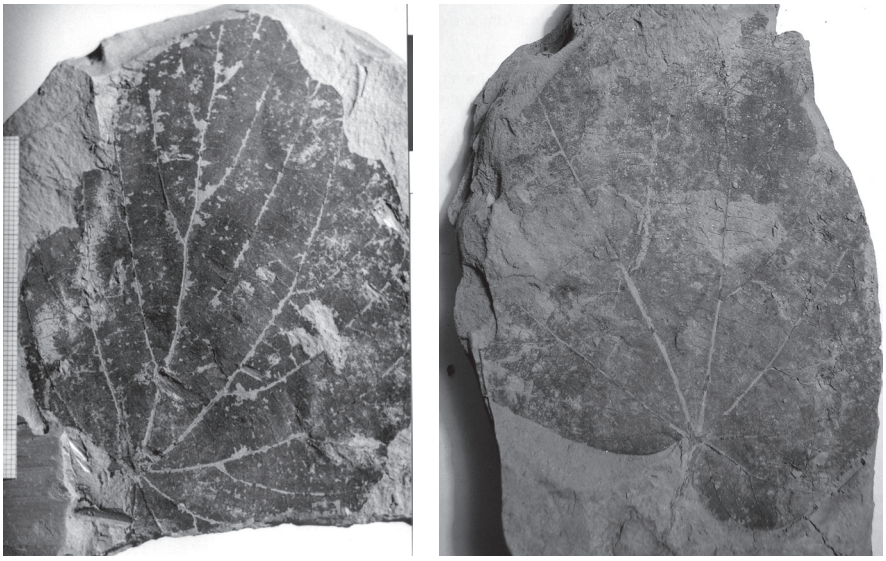

Fig. 5 The imprints of the *B. tiliaefolium* from Husnicioara open pit

As regards the current correspondent, after Ţicleanu (1982, 1989), this taxon is exclusively fossil and represent a common ancestor of the modern genera *Tarrietia* and *Buttneria* from the Indochina Peninsular regions. *B. tiliaefolium* is a tree that gave an impressive quantity of vegetal material during coal accumulation in the Early Sarmatian – Middle Romanian interval, including of the Dacian-Romanian from Danube – Motru.

Byttneriophyllum tiliaefolium was a tree exceeding 25 m in height and formed pure phytocoenoses (Ţicleanu, 1992), and sometimes vegetating in association with *Glyptostrobus europaeus*; the fossil remains of these two species founded together prove for that.

Byttneriophyllum tiliaefolium is present and in the description (Diaconu, 2004a, 2008) of the representative macropetrgraphic profiles of the IVth and VIth coal seams from Husnicioara open pit. Thus, in the petrograpfic profile 2/IV (fig. 4.25) and 3/IV (fig. 4.27) in the eastern part of open pit, at the top is clay with numerous vegetable remains of *B. tiliaefolium*, respectively compact gray clay, with a few remains of the same taxon.

In general, the microcomposition of the coals in sector investigated, from point of view quality in the specifics of the entire coal basin, being quantitative differences. The IVth and VIth coal seam, although relatively close from point of view petrographic, nevertheless present differences, which, the nature of material vegetal parental were comparable, show different significantly genetic conditions. The content in cutinit on account of the increase in importance of the marshes of coal facies with hygrophyte decidual, especially *Byttneriophyllum*, which very frequently accompanies the V coal seam all of the coal-generating.

The knowledge of coal-generating elements (flora factor) represented by certain taxa, is a condition for evaluation of chemical composition of vegetable origin. In flora from Batoti, *Glyptostrobus europaeus* and *Byttneriophyllum tiliaefolium* are coal-generating elements commonly found in Pontian (Givulescu, 1992). The last two floras being characterized by Mihajlovic & Lazarovic (1999) belongs to „facies lignite".

Through the discovery of three species of *Pandanus* (Diaconu & Ţicleanu, 2008), a thermopile recognized in Husnicioara open pit, confirms the higher temperatures of 15°C during Early Dacian. In this site is present in large quantities and *B. tiliaefolium*, another important termophile what show a climatically optimal.

The amount of rainfall can be assessed only by taking account of the frequency of species in the vegetation floors associations. Plants with large leaves, as is *Byttneriophyllum*, even if it is hygrophyte and lived exclusively in the marshes, especially in those coal-generating, is nevertheless a valuable indicator assuming existence of precipitation over 1400 mm/year.

Diaconu (2000) identified the fossil leaves *B. tiliaefolium* from the roof the IV coal seam associated with branches and decidual stems. Thus, considers that the rainfall must have exceeded 1400 mm/year in the intervals in which the accumulated the vegetable material for forming the main coal seam (I, III and IV) from Danube-Motru sector.

After Teichmuller & Teichmuller (1979) the most important coal deposits in the world are autochthons, formed "in situ", originating in the local peat bog. In Husnicioara open pit among the evidence autochthony strata of coal are the presence of fossil plants in perfect state of preservation and the large number of specimens of the same species (Ex. leaves of *B. tiliaefolium*).

The paleoecological analysis of the floristic list from Batoţi show the existence oh the *Byttneriophyllum tiliaefolium* in the sedimentary basin where there was azonal vegetation in forest swamps with plant hygrophyte. The coal facies of this swamps formed the detritic coals and less xylitic poor coal.

After Ţicleanu (1986), the participation of the *Byttneriophyllum* in Pliocene coal-generating phytocoenoses from Oltenia is 14%. In Husnicioara open pit the frequency (Diaconu, 2004) the imprints of this taxon is over 90%.

In the reconstructing of the phytocoenoses and vegetal association from Danube-Motru sector present by Diaconu & Ticleanu (2006) *B. tiliaefolium* is identified in paleobiotop the swamp with decidual hydrophytes forest.

The fact that in Husnicioara open pit the fossil leaves of the *B. tiliaefolium* occur without being accompanied by other species confirm the view expressed by Ţicleanu (1992) that this tree tall, due to its large leaves did not allow the development of other species in the lower floors. Sometimes, only the passenger, it is paired with *G. europaeus* and *Nyssa*.

Conclusion

Trough the researches of outcrops from Danube – Motru sector it can be said that *Byttneriophyllum tiliaefolium* is one of the main elements they come from the coals from Dacian-Romanian deposits. At Batoti and Dedoviţa found only a few fragments of the samples of *B. tiliaefolium*, but in Husnicioara open pit this taxon is the most numerous.

B. tiliaefolium is a taxon that gave an impressive quantity of vegetal material during coal accumulation in the Early Sarmatian – Middle Romanian interval, including of the Dacian-Romanian from Danube-Motru.

REFERENCES

BARBU I. Z., 1933: *Flora fosilă de la Timişani, jud. Gorj*, Not. Biol. I, 2, p. 37–52, Bucureşti.

BARBU I. Z., 1954: *Flora fosilă din Terţiarul Olteniei*, Anuarul Comitetului Geologic, Vol. XXVII, p. 1–101, Bucureşti.

BARBU I. Z., GIVULESCU R., 1965: *Banisteriaecarpum giganteum (Goepp) Kr. în pliocenul superior din România*, Studii Cercetări Geologice Geofizice, seria Geologie, vol. 10/2, p. 463–465, Bucureşti.

DIACONU F., 2000: *Date preliminare privind studiul paleoflorei din cariera Husnicioara Vest*, Armonii naturale, nr. 4, Arad.

DIACONU F., 2002: *Observaţii recente în punctele fosilifere pliocene dintre Dunăre şi Motru*, Drobeta, vol. XI–XII, p. 199–207, Editura Radical, Drobeta Turnu Severin.

DIACONU F., **2004 a**: *Caracteristici petrografice ale ligniţilor din cariera Husnicioara (Judeţul Mehedinţi),* Argesis, Studii şi comunicări, Seria Ştiinţele Naturii, Tom XII, p. 23–33, Piteşti.

DIACONU F., 2004 b: *The comparative study of the coal forming Pontian and Dacian-Romanian flora from the sector Danube-Motru, SW Romania,* Acta Paleontologica Romanie, vol. 4, p. 105–111, Cluj-Napoca.

DIACONU F., 2008: *Reconstituirea mediilor carbogeneratoare pliocene dintre Dunăre şi Motru*, Editura Universitaria Craiova, 321 pp., Drobeta Turnu Severin.

DIACONU F., ENACHE C., 2007: *Considerations concerning the Balota hill Site (Mehedinţi District),* Drobeta, Ştiinţele Naturii, vol. XVII, Editura Universitaria Craiova, p. 17–27, Drobeta Turnu Severin.

DIACONU F., ŢICLEANU N., 2006: *Reconstituirea paleomediilor carbogeneratoare în sectorul Dunăre-Motru (sud-vestul Olteniei),* Oltenia. Studii şi Comunicări, Ştiinţele naturii, vol. XXII, p. 11–14, Editura Muzeului Olteniei, Craiova.

DIACONU F., ŢICLEANU N., 2008: *Contribuţii privind studiul florei daciene în sud-vestul Olteniei*, Oltenia, Studii şi comunicări, Ştiinţele naturii, vol. XXIV, p. 11–14, Craiova.

GIVULESCU R., 1966: *Funde von Banisteriaecarpum giganteum (Goepp) Krausel in Rumanien*, N. Jb. Geol. Palaont. Mb., p. 211–214, Stuttgart.

GIVULESCU R., 1992: *Les forets marécageuses du Miocène supérieur de Roumanie: un paleobiotope d'exception et sa végétation dans le Miocène supérieur de l'ouest de la Roumanie,* Proceeding Europe, Paleobotanique, Conference Vienne, september 1991, p. 147–151, Viena.

MIHAJLOVOC D., LARAROVIC Z., 1999: *The late pontian leaf-floras from Northern Serbia reflecting different environments,* Acta Paleobotanica Suppl. Nr. 2, p. 341–347, Proceedings 5th EPPC, Krakow.

TEICHMULLER M., TEICHMULLER R., 1979: *Diagenesis of coal (coalification)* In: Larsen G. and Chilingar G.V. (Edits.) – Diagenesis in sediments, p. 391–415, Elsevier, Amsterdam-London-New York.

ŢICLEANU N., HUICĂ I., TICLEANU M., 1982: *Contributions a la connaissance de la flore pliocène de la Roumanie. La flore dacienne de Dedoviţa (District de Mehedinţi).* Dări de Seamă, Institututul de Geologie-Geofizică, vol. LXVI, 3 p. 127–143, Bucureşti.

ŢICLEANU N., 1986: *Date preliminare privind studiul paleobotanic al unor foraje de referinţă pentru cărbunii din Oltenia*, Dări de Seamă, Institututul Geologie-Geofizică, vol. 70–71/3, p. 235–248, Bucureşti.

ŢICLEANU N., 1989: *Nouvelles données sur la taxonomie, le habitus et l'écologie des Byttneriophyllum tiliaefolium (Al. Braun) Knobloch et Kvacek et Byttneriophyllum giganteum (Goeppert) Comb. Nov,* Studia Universitatea Babeş-Bolyai, seria Geologie Geografie,vol. XXXIV/2, p. 83–87, Cluj-Napoca.

ŢICLEANU N., 1992: *Studiul genetic al principalelor zăcăminte de cărbuni neogeni din România pe baza paleofitocenozelor caracteristice, cu privire specială la Oltenia*. Teză de doctorat, Universitatea din Bucureşti.

ŢICLEANU N., 1995: *Macroflore et végétation daciènnes du Bassin Dacique*, în „*Chronostratigraphie und Neostratotypen, Pl1, Dazien*", Editura Academiei Romane, p. 473–498, Bucureşti.

ŢICLEANU N., PETRESCU I., DIACONU F., MEILESCU C., PĂTRUŢOIU I., 2002: *Fossil plants from Pontian deposits at Batoţi – Mehedinţi*, Studia, Universitatea Babeş-Bolyai, Geologia, Special ISSUE, 1, p. 351–364, Cluj-Napoca.

DATA ON THE CRAINIMĂT SANDSTONE CONCRETIONS: PROPOSAL OF A NEW PROTECTED AREA

Ioan Chintăuan[1], Marius Horga[2]

DATA ON THE CRAINIMĂT SANDSTONE CONCRETIONS: PROPOSAL OF A NEW PROTECTED AREA

Abstract: This exposure „Râpa Caprelor" is situated at about 100 m, right to the national road Bistriţa-Cluj, before entering Crainimăt village and is visible from the road.
Such shapes are spectacular, esthetical attractive, so that this outcrop should be included in the list of the natural protected areas as "geological".
Publication of researches and observations on this outcrop with sandstone concretions hopefully coincide with the inclusion of the site in the list of protected areas.

Keywords: Crainimăt sandstone concretions, "Râpa Caprelor" outcrop, Middle Sarmatian, geological heritage.

Sandstone concretions are present in almost all Middle Sarmatian compact sands in northeastern Transylvania (Bistriţa-Năsăud District), but only a few sites (e.g. Rusu Bârgăului, Domneşti) until now, drew attention of researchers.

The studied outcrop is located ten km southwest of Bistriţa town, at the northeastern limit of Crainimăt village, on the left side of a creek covered by vegetation. This exposure „Râpa Caprelor" is situated at about 100 m, right to the national road Bistriţa-Cluj, before entering Crainimăt village and is visible from the road. The ravine consists of thick layers of compact sands, here and there real sandy gritstone with rare and thin interbreeding of marl and marl clays.

The compact sands are bearing cores concretion centers, juvenile concretions and concretions with different shapes and sizes (Fig. 1). The ravine has a

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length of about 80 m and about 30 m high. There, the layers clearly exposed (in the southern half of them) are dipping about 45° to southeast (which remains, being observable in the all right flank of the anticline Caila, starting from the right bank of the river Şieu, downstream the Railway bridge, near the „Râpa Caprelor" outcrop until upstream the „Râpa cu Păpuşi" from Domneşti upstream of Mărişel.

Fig. 1. "Râpa Caprelor" outcrops of Crainimăt

The stratification is present only in the half from the road (south) of the outcrop, where thick layers of compact sands, with sandstone concretions and concretion cores are interrupted by thin intercalations of marl and marl clay. Towards the edge of the ravine, in the southern terminal sector, sandstone concretions are missing and there are more frequent intercalations of marl layers.

The sandstone concretions are numerous on layer surfaces and have enigmatic shapes; are twin shapes elongated and more rarely singular (Fig. 2).

Such shapes are spectacular, esthetical attractive, so that this outcrop should be included in the list of the natural protected areas as "geological". The central sector of the outcrop, until a near-vertical fissure, consists of a thick deposit of compact sand (sandy grit), which includes, along with that of concretion core centers of large concretions, twin (associated) with smaller concretions giving

bizarre shapes. Towards the top of the outcrop the number of these concretions is increasing and the shapes are even more spectacular.

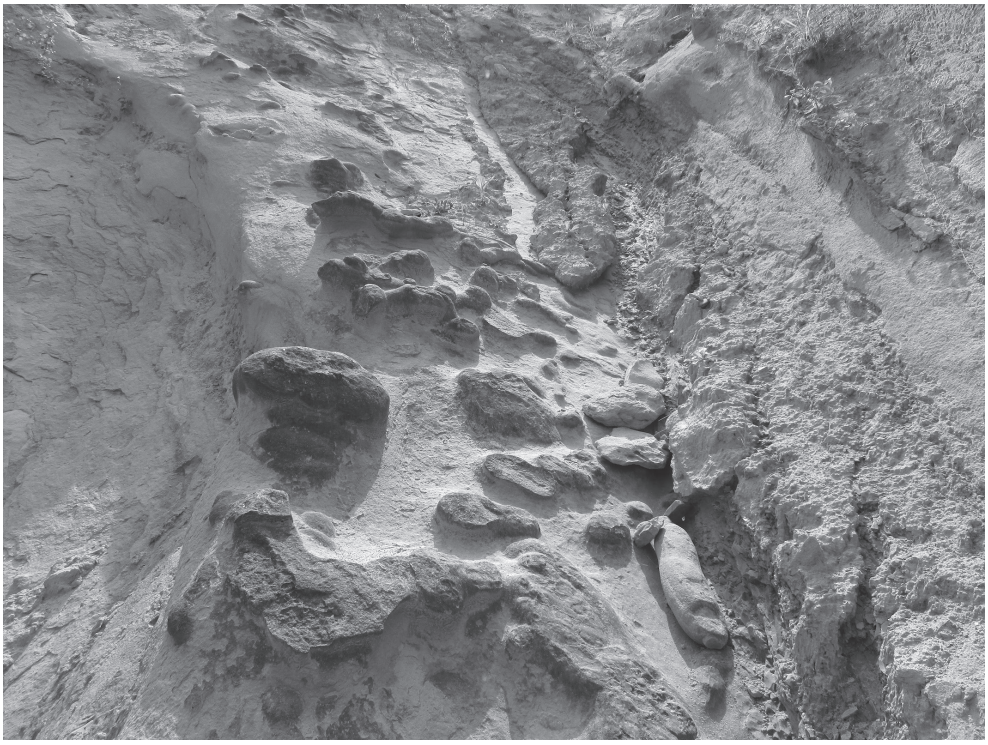

Fig. 2. Sandstone concretions on the layer surface at "Râpa Caprelor"

In the northern half of the ravine, north-west of the rift bounded to the south-east by several interlaced thin marl clays, sands deposit compact form thick, layered, but with large sandstone concretions, simple and twin.

From the outcrop in the heavy rain seasons, concretion and concrete cores are liberating falling to the bottom of ravine. The large number of shapes which shows the genesis trajectory of shapes, to which is added the valuable decorative of shapes, would attract the tourist, if through this location or in the neighborhood a tourist route would pass. Some of the forms were taken, many years ago by one of the authors (Chintăuan & Codrea 2000) to the Bistriţa-Năsăud County Museum and today is part of the museum's collection of sandstone concretions, the richest (1020 shapes) collection of sandstone concretions in Europe.

The same researcher, who discovered the first fossil sandstone concretions and first cyneritic concretions in Romania, avoided until today, to propose this outcrop as geological reservation. Experience of authors, connoisseurs of outcrops with sandstone concretions, recognized as real outdoor museums in Romania (Oteşani-Valea Gresarea, Costeşti, Izvoarele, Domneşti, Feleacu etc.)

made to avoid emptying these natural treasures (Chintăuan, 2004a). From the sites of Costeşti, Oteşani, Valea Gresarea, Feleacu, Domneşti, very many spectacular and valuable forms have disappeared.

Fig. 3. The sequence of gritstone, sandy marl and marl clay in the outcrop from Crainimăt

Today, their similarity with human creations, sculptures, makes that their decorative value high and to be searched, sold and the money transactions are not neglected. In some sites, these includes fossils, which made them more attractive to tourists, but most important for specialists and default for science (Chintăuan, 2004b, 2005, 2008; Codrea, 2008).

The concretion kernels centers are present everywhere in the thick deposit of sand compact, which allowed us to return with remarks on the genesis of these natural formations, known as the "Trovanţi", "Dorobanţi", "Bălătruci", "Stones of Fire" (Chintăuan, 1994; Chintăuan, 1998).

Formation of the concretion kernels centers which are composed of marl with vegetal organic debris should be attributed to the affinity of interstitial solutions, richer in various chemicals (siliceous, carbonate, ferrous solutions) plus CO_2 and watery solutions of vegetable organic debris. It thus creates an imbalance between these solutions, imbalance which leads to a process of osmosis,

which ultimately means that, in a first stage, to produce disulfide oxidation of iron and other minerals with iron, and their transformation in limonite, mineral crust covering a fragment of shale. This stage is followed by another, in which occurs the dissolution of iron hydroxides by bicarbonate solutions, product of carbon dioxide and removal of the slightly soluble bicarbonates of iron. From the same interstitial solutions takes after that place the deposition among grains of sand which are surrounding the center of concretion of calcium carbonate and silica, which cements sand, producing concretions. Through continuous submitting, takes place the growth of concretion, which ends at cessation solution intake. The shape of the concretion is that of concretion nucleus and the presence in the compact sand of several cores of different shapes, located close to each other, by cementation of sand around each nucleus, the concretions merge, giving twin/ aggregate, bizarre shapes (Chintăuan & Codrea, 2000).

On the shape of concretion a great influence have: the amount of solution, speed, pH, lithostatic pressure, CO_2 pressure etc. Including, alongside sandy gravels (as microconglomerates or conglomerate), for example, shows a flow and a „greater" speed of interstitial solution, plus the sudden blockage at the boundary between sand and impermeable rock (Chintăuan & Codrea, 2000). Because of such circumstances, sometimes the concretions, allows the formation of a central axial channel (Mârza et al., 2002).

Publication of researches and observations on this outcrop with sandstone concretions hopefully coincide with the inclusion of the site in the list of protected areas (Chintăuan et al., 2004).

REFERENCES

CHINTĂUAN I., 1994: *Consideraţii privind formarea concreţiunilor grezoase*, Revista Bistriţei, vol. VIII, Muzeul Judeţean Bistriţa-Năsăud, Editura Glasul Bucovinei Iaşi, p. 271–284, Bistriţa.

CHINTĂUAN I., 1998: *Consideraţii privind protecţia aflorimentelor de nisipuri cu concreţiuni grezoase*, Studii şi cercetări, Ştiinţele Naturii, nr. 4, Muzeul Judeţean Bistriţa-Năsăud, p. 43–51, Bistriţa.

CHINTĂUAN I., 2004a: *Valoarea culturală a concreţiunilor grezoase*, Environment and Progress, 2, Universitatea Babeş-Bolyai, p. 71–76, Cluj-Napoca.

CHINTĂUAN I., 2004b: *Les concrétions gréseuses fossiliféres en Sarmatien de Izvoarele (Dobrogea de Sud-Ouest),* Studii şi cercetări, Seria Geologie-Geografie, nr. 9, Complexul Muzeal Bistriţa-Năsăud, p. 47–59, Bistriţa.

CHINTĂUAN I., 2005: *Cineritic concretion in the volcanic tuff from Valea Stejarului (Maramureş)*, Studii şi cercetări, Seria Geologie-Geografie, nr. 10, Complexul Muzeal Bistriţa-Năsăud, p. 65–72, Bistriţa.

CHINTĂUAN I., 2008: *The fossiliferons gritty sandy concretions in Cicău (Alba),* Studii şi cercetări, Seria Geology-Geography, nr. 13, Complexul Muzeal Bistriţa-Năsăud, p. 23–29, Bistriţa.

CHINTĂUAN I., CODREA V., 2000: *Aceste pietre stranii*, Editura Supergraph, 133 pp., Cluj-Napoca.

CHINTĂUAN I., ŞTEFAN V., MARQUIER IOANA, COLDEA GH., 2004: *Arii protejate din Bistriţa-Năsăud*, Edititura Supergraph, 226 pp., Cluj-Napoca.

CODREA V., 2008: *A fossil-bearing «Feleacu concretion» in Vâlcele (Cluj District),* Studii şi cercetări, Geology-Geography, nr. 13, p. 19–22, Bistriţa.

MÂRZA I., CONSTANTINA C., PÂRLEA H., 2002: *Arenite concretions with axial channel from the Badenian deposits of Cheia (Turda) – a new type of concretions.* Studia Universitatis Babeş-Bolyai, Geologia, vol. XLVII, 1, p. 85–92, Cluj-Napoca.

„THE AGES OF THE EARTH”. THE CULTURAL-SCIENTIFIC AND EDUCATIONAL VALORIZATION OF PALAEONTOLOGICAL HERITAGE FROM MEHEDINŢI

Florina Diaconu[1]

***„THE AGES OF THE EARTH”*. THE CULTURAL-SCIENTIFIC AND EDUCATIONAL VALORIZATION OF PALAEONTOLOGICAL HERITAGE FROM MEHEDINŢI**

Abstract: The paper presents the possibilities of scientific and cultural-educational valorization of palaeontological heritage from Mehedinţi preserved at the Natural Sciences Department of Iron Gates Region Museum. It also highlights the role of the natural sciences museums in making education and palaeontology culture to the visiting public.

Keywords: palaeontological heritage, temporary exhibitions, educational valorization, visitors.

Introduction

The palaeontological heritage preserved at Iron Gates Region Museum, totalize 1842 pieces, representing almost 9.47% of the heritage of the Natural Sciences Department. Most parts come from palaeontological an outcrop in the Mehedinţi County.

Through palaeontological heritage valorization on following present their scientific importance to know these natural areas which, sometimes, can preserve on large territories some very important entities. In fact, it is a real palaeontological itinerary which crosses from West to East Jurassic deposits (170 million years old), Badenian (16 million years old), Pontian (6 million years old) and Dacian-Romanian deposits (4–2 million years old) (Diaconu, 2006).

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Material and methods

The material represented by the collection palaeontology was valorized using various specific museum means. Of these, the temporary exhibitions *„Mesozoic creatures"* (2010), *„The ages of the Earth – Miocene"* (2012) and *„The ages of the Earth – MioPliocene"* (2014) held at the facility is presented more ample.

Other ways to exploit cultural, scientific and educational (itinerant photo exhibitions, presentations within the various activities of the educational projects carried out by the museum in collaboration with educational establishments, publicity materials) are only summarized.

Results and discussions

In order to facilitate the possibility of knowledge of the best palaeontological heritage of the museum were made temporary exhibitions and itinerant photo exhibitions. Through representative pieces, through the illustration and scientific-documentary materials they offered to visitors the opportunity to know many information about sedimentation deposits of different ages from Mehedinţi County, where one can find fossils that attest the life from the geological past and the environment conditions of those living being (Diaconu, 2008).

Dedicated to the Earth Day celebrations, the exhibitions were designed to be accessible to all categories of visitors regardless of their age or training. The purposes of the exhibitions have been the knowledge of the animals that lived in the Mesozoic-Quaternary period (248–2.5 million years ago) on the present territory of Mehedinţi County.

The temporary exhibitions „*Mesozoic creatures*" held from 22 April – 30 June (2010) was exhibited in the hall of honor in the Iron Gates Region Museum, 2, Independenţei Street.

The choice of the theme started from the idea that the Mesozoic period is very well represented in the collection palaeontology of the museum through the pieces collected in outcrops of the palaeontological reserves: Sviniţa, Limestone with hippurites from Criş Valley, Cernavodă, Haţeg (Sanpetru) and deposits with nummulites from Dumbrava-Cluj.

The exhibition presents through illustrative texts general aspects regarding terrestrial and marine fauna characteristic of Mesozoic era and three-dimensional pieces of foraminifera (nummulites), gastropods (Pleurotomaria, Conus, Actaeonella), lamelibranhiate (hippurites, Diceras, Pecten, Inoceramus), cephalopods (ammonites, belemnites) and a few fossils remains of dinosaurs.

In the exhibitions *„Mesozoic creatures"* have been exploited much of pieces donated by Dr. Emil Avram. Through field research and his scientific focus in the Sviniţa (Mehedinţi) has contributed to the enrichment and diversification to heritage of the collection of palaeontology in Iron Gates Region Museum. In addition,

he produced many approaches to the relevant authorities for the declaration as palaeontology reserve of the area Sviniţa-international scientific interest area (Avram, 1995).

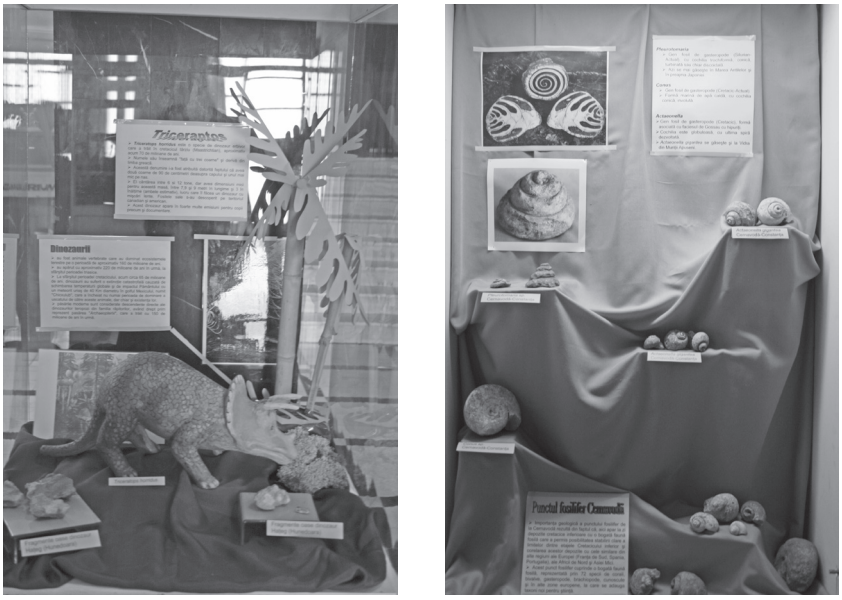

Fig. 1. Images from the exhibition "*Mesozoic creatures*"

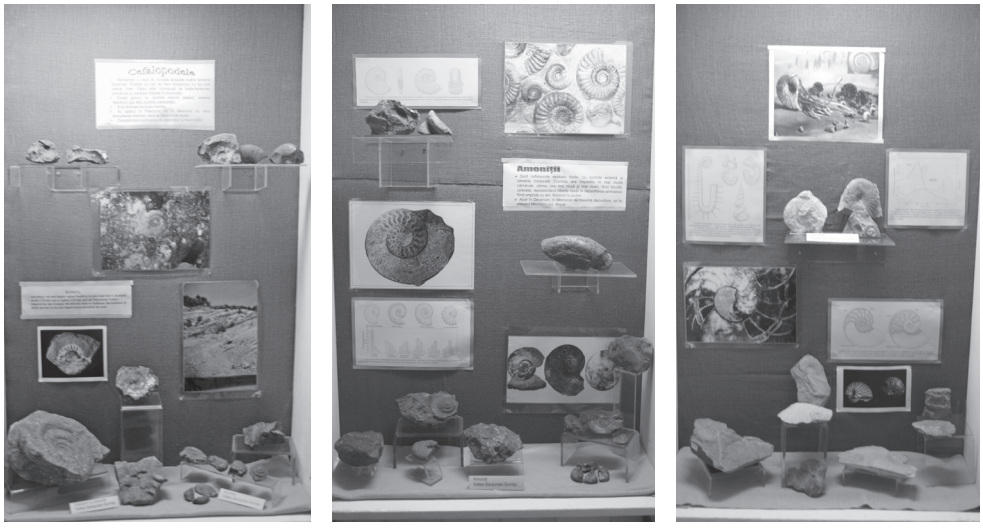

Fig. 2. Images from the exhibition "*Mesozoic creatures*"

Bearing in mind that, the Sviniţa region imposes oneself like an international scientific interest area, being one of the richest fossil areas from Middle Jurassic

and Aptian of Tethys Domain, favorable to the magnetostratigraphy, biostratigraphy and palaeontology studies and promotion of local heritage, most of the exposed pieces on come from deposits sites in this area: Saraorski, Ţiganski, Vodinicki.

The exhibition photo "*The ages of the Earth-Miocene*" was opened during the days dedicated to Severin Days (21–23 April 2012) in the House of Youth in Drobeta Turnu Severin. Subsequently, this exhibition was exposed and in the National Symposium of Iron Gates Region Museum "Centennial Collections 1912–2012" at 11–12 May 2012.

Through pictures and texts are shown two zones representative with Miocene deposits from Mehedinţi County: the Bahna Reserve of the Iron Gates Natural Park and the Pârlagele site of the Mehedinţi Geoprak Plateau.

The Bahna reserve is one of the oldest and most interesting areas, out of the country, high scientific value, with a rich and well-preserved fauna of vertebrates and invertebrates Badenian (Popa, 2003). In the posters are highlighted the palaeontological heritage of the Iloviţa, Lespezi, Curchia sites (Marinescu, 1965; Bleahu et al., 1976).

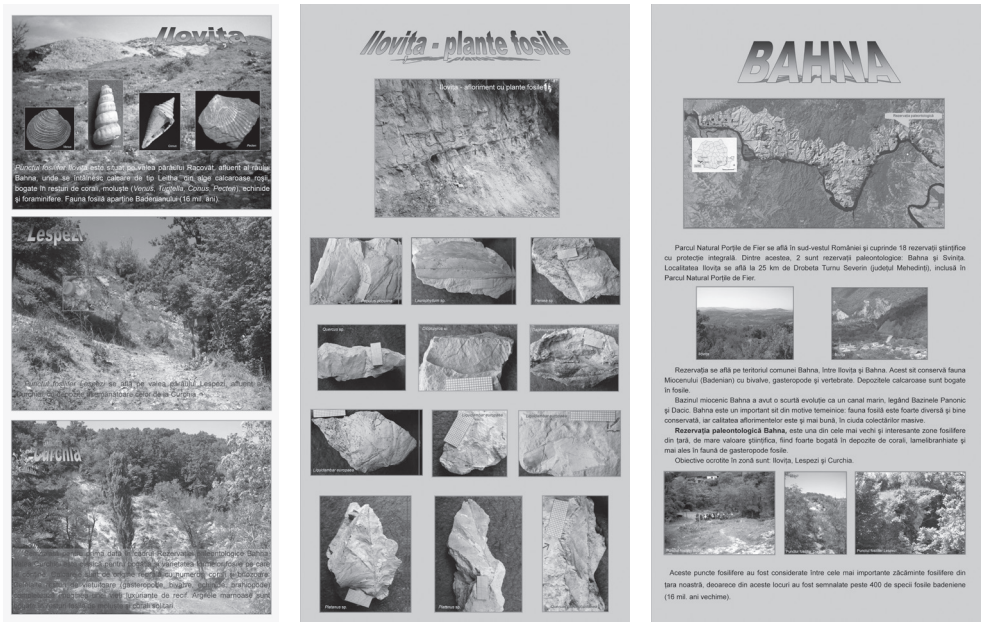

Fig. 3. Images from the exhibition "*The ages of the Earth-Miocene*"

The *Iloviţa* site is situated on the Racovăţ Valley, tributary to the Bahna River, where there can be find Leitha limestone, from red limestone alga, enriched with corals remainder, mollusks (*Venus*, *Turitella*, *Conus, Pecten*), echinoids and foraminifers.

Pointed out for the first time as part of the Bahna Palaeontological Reserve, the Curchia Valley is important due to the richness and variety in fossils forms which it contains.

The *Lespezi* site is situated on Lespezi Valley, tributary to the Curchia river, having deposits similarly to Curchia ones.

In the Badenian deposits from Pârlagele, have been identified mollusk and fossil plants species, In the Sarmatian deposits some species of corals (Stancu & Ţicleanu, 1974; Diaconu & Meilescu, 2011). This interesting fossil place being part of the Mehedinţi Geopark Plateau is probably the most important among Badenian sites, including of Mehedinţi County.

Based on these considerations Diaconu & Meilescu (2012) proposes a geo-tourist route on Neagonea Valley from Pârlagele opened for scientific tourism to promote and support the research aimed to preserving the natural heritage of the Mehedinţi Plateau Geopark area.

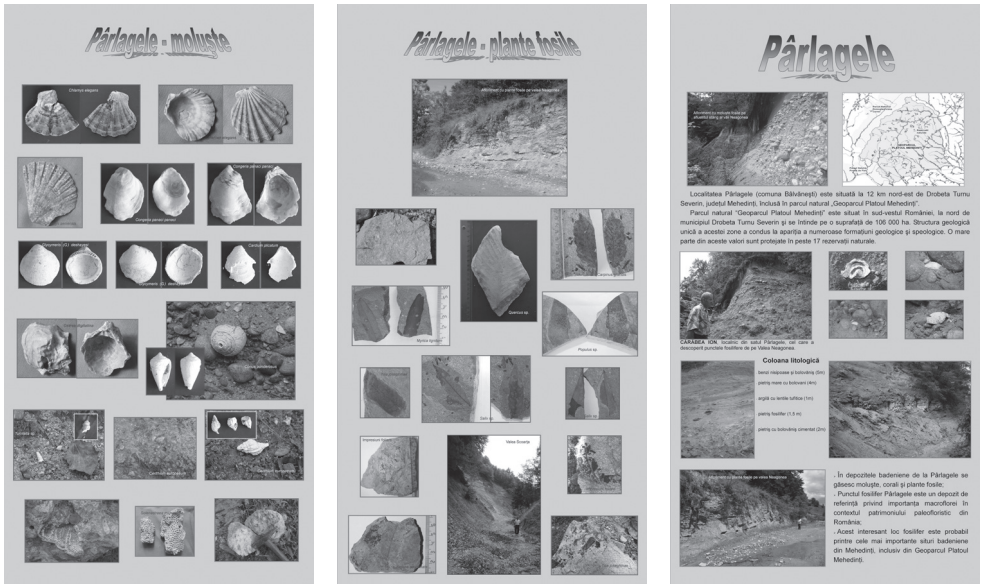

Fig. 4. Images from the exhibition "The ages of the Earth-Miocene"

For both areas, Bahna and Pârlagele, were proposed measure for geoconservation (Diaconu, 2013a; 2013b) due to anthropogenic pressures and threats relating to geodiversity from the natural parks area, that include these sites.

The exhibition photo "*The ages of the Earth-MioPliocene*" was opened during the days dedicated to Severin Days in the Severin Shopping Center S.R.L. from Drobeta Turnu Severin.

In addition to promoting local heritage, the theme of the exhibition was based on the following considerations:

– in the Mehedinţi County most Pontian-Romanian fossil deposits outcrop at the surface, being exposed to natural factors of erosion.

– the human interventions have led to the disappearance of palaeontological sites, but there are many cases where, due to exploitation of mineral resources identified new places with bio and cronostratigraphic importance (Meilescu, 1994; Diaconu, 2008).

– the information about geological and palaeontology patrimony from Mehedinţi, in fact a ecological education, a youth education.

Thus, trough pictures displayed on easels were presented species of flora and fauna from the following sites: Batoţi, Cariera Husnicioara, Dedoviţa-Balota, Brezniţa de Motru, as well as two reconstitutions during the Pliocene.

The flora from *Batoţi* represents the only Lower Pontian assemblage described until now from Romania (Diaconu et al., 2004). From a palynological point of view, is not other similar microflora – as far as its richness and diversity are concerned – is known from Romania and its neighboring areas (Petrescu et al., 2002).

Due to changes that occur as a result of exploitation of lignite, *Husnicioara* open pit offers the opportunity to further geological research, especially palaeontological, which led to the discovery in recent years of new fossil with importance concerning the stratigraphy, paleoecology, paleogeografy area. The palaeontology collection of museum has been enriched with new species and genera.

The fauna from *Dedoviţa-Balota* site represents trough a sequence from lithological succession indicates the border of the lacustrine basin, where lives especially *Viviparus* sp., but there is not excluded that the limit between lacustrine domain and an estuary, or delta which provide sweet water of basin. Being terrestrial paleoflora and lacustrine fauna is explains by this fact (Diaconu & Enache, 2007).

Breznita-Motru site is an outcrop with a Romanian fauna a rich (fossiliferous level especially with gastropods) similar with that from Bucovăţ (Diaconu, 2002).

Fig. 5. Images from the exhibition “The ages of the Earth-MioPliocene”

Conclusions

In general, the exhibition represents the specific method, the most frequent and most important for the promotion of a heritage Museum.

The exhibition photo "*The ages of the Earth*" achieved in various forms (three-dimensional, two-dimensional) and displayed differently (showcases, posters, easels) was one of the most effective ways to scientific and cultural-educational valorization of palaeontological heritage from Mehedinţi preserved at the Natural Sciences Department of Iron Gates Region Museum.

REFERENCES

AVRAM E., 1995: *Sviniţa (Banat), regiune de importanţă palaeontologică şi biostratigrafică internaţională,* în Ocrotirea Naturii şi a Mediului Înconjurător, t 39, nr. 1–2, p. 43–49, Bucureşti.

BLEAHU M., BRĂDESCU VL., MARINESCU FL., 1976: *Rezervaţii naturale geologice din România*, Editura Tehnică, p. 151–154, Bucureşti.

DIACONU F., 2002: *Observaţii recente în punctele fosilifere pliocene dintre Dunăre şi Motru*, Drobeta, vol. XI–XII, p. 199–207, Editura Radical, Drobeta Turnu Severin.

DIACONU F., 2006: *Itinerarii palaeontologice mehedinţene*, Lucrările conferinţei internaţionale „La un pas de integrare: oportunităţi şi ameninţări", vol. I, Editura Universitaria, p. 232–237, Craiova.

DIACONU F., 2008: *Reconstituirea mediilor carbogeneratoare pliocene dintre Dunăre şi Motru*, Editura Universitaria Craiova, 321 pp., Drobeta Turnu Severin.

DIACONU F., 2013a: *The geoconservation of the middle Miocene deposits from Bahna Basin*, Drobeta, Seria Ştiinţele Naturii, Vol. XXIII, Editura Universitaria Craiova, p. 24–30, Drobeta Turnu Severin.

DIACONU F., 2013b: *The geoconservation of the Badenian deposits from Neagonea Valley (Mehedinţi Plateau Geopark),* Argesis, Studii şi Comunicări, Seria Ştiinţele Naturii, Vol. XX, Muzeul Judeţean Argeş, Piteşti.

DIACONU F., ŢICLEANU N., PETRESCU I., BARBU V., MEILESCU C., 2004: *Importanţa micro- şi macroflorei de la Batoţi (judeţul Mehedinţi), pentru patrimoniul palaeontologic al României*, Environment & Progress, nr. 2, p. 113–116, Cluj-Napoca.

DIACONU F., ENACHE C., 2007: *Considerations concerning the Balota Hill site (Mehedinţi District)*, Drobeta, vol. XVII, seria Ştiinţele Naturii, p. 17–27, Editura Universitaria Craiova, Drobeta Turnu Severin.

DIACONU F., MEILESCU C., 2011: *Preliminary results on the Pârlagele site (Mehedinţi)*, Drobeta, Ştiinţele Naturii, vol. XXI, Editura Universitaria Craiova, p. 13–15, Drobeta Turnu Severin.

DIACONU F., **MEILESCU T.**, **2012:** *The geotourist route Neagonea Valley Mehedinţi Plateau Geopark*, Drobeta, Ştiinţele Naturii, vol. XXII, Editura Universitaria Craiova, p. 9–16, Drobeta Turnu Severin.

MARINESCU FL., 1965: *Fauna tortoniană de la Bahna – Orşova*, Ocrotirea Naturii, vol. 9/2, Editura Academiei Republicii Socialiste România, p. 217–221, Bucureşti.

MEILESCU C., 1994: *Contribuţii la cunoaşterea geologică a depozitelor Pliocenului din cariera Husnicioara,* "Drobeta", Buletin Ştiinţific Muzeul „Porţile de Fier", p. 25–26, Drobeta Turnu Severin

POPA M. E., 2003: *Geological heritage values in the Iron Gates Natural Park, Romania*, ICERA 2003, Ars Docendi Publishing House, p. 742–751, Bucureşti.

STANCU J., ŢICLEANU N., 1974: *Date noi privind flora Badenianului din România*, Dări de seamă ale şedinţelor vol. LXI (1973–1974), p. 185–203, Bucureşti.

PETRESCU I., BICAN BRIŞAN N., MEILESCU C., PĂTRUŢOIU I., 2002: *The palynology of the Pontian from Batoti-Mehedinti (South – Western Romania),* Acta Palaeontologica III, Cluj-Napoca.

ON THE STRATIGRAPHIC DISCONFORMITY IN ROVINARI MINING FIELD, GORJ COUNTY

Daniel Aninoiu[1]

ON THE STRATIGRAPHIC DISCONFORMITY IN ROVINARI MINING FIELD, GORJ COUNTY

Abstract: In the Rovinari mining field, apart of the folded tectonics (anticlines and synclines) or the disjunctive ones (breaks, fissure), other processes occurred too such as: erosions, discordant attenuations, etc. The stratigraphic disconformities occur due to the lack of beading between the layer and package of layers. Even when layer erosion occurs, this process can be an erosion lacuna or sedimentation. All these phenomena are controlled by movements of the lifting and lowering the sedimentation area, defending the transgressive series or regressive. The outcrops of the Dacian and Romanian deposits in the quarries Rovinari Mining Field allowed the direct observation of the geologic processes that occurred during these stages. Thus, a series of layer are abnormal relations with other.

Keywords: stratigraphic disconformities, Rovinari mining field.

1. The sedimentary deposits of the Dacian Basin were affected during the Middle Sarmatian by the Attic Stage. The effects are the compression of the Dacian Basin, the occurrence of the eastward anticline vaulting. After this stage, the sedimentation phase followed Middle Sarmatian – Pliocene. During this period deposited coal seam and permanent oscillator movements took place of the basin.

Towards the limit of the Early and Middle Romanian, an emergence occurred and throughout the Middle Romanian an erosion palaeoenvironment was formed, followed by a transgression at the end of the Middle Romanian.

2. During the Late Romanian – Early Pleistocene occurred the Wallach phase. The effects are the regression, the emergence of the sedimentary field and the occurrence of a stratigraphic lacuna. During the Late Romanian (Wallachian), no deposits were recorded due to the emergence of the sedimentary field.

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Old terraces were developed from the Early Pleistocene and the process of sculptogenesis started. The action of the vertical and side tectonic forces and the new paleoenvironment, together with the differential actions of subsidence which took place in time, led to the formation of a certain structural range. In that same period took place anticlines and formation of landslides.

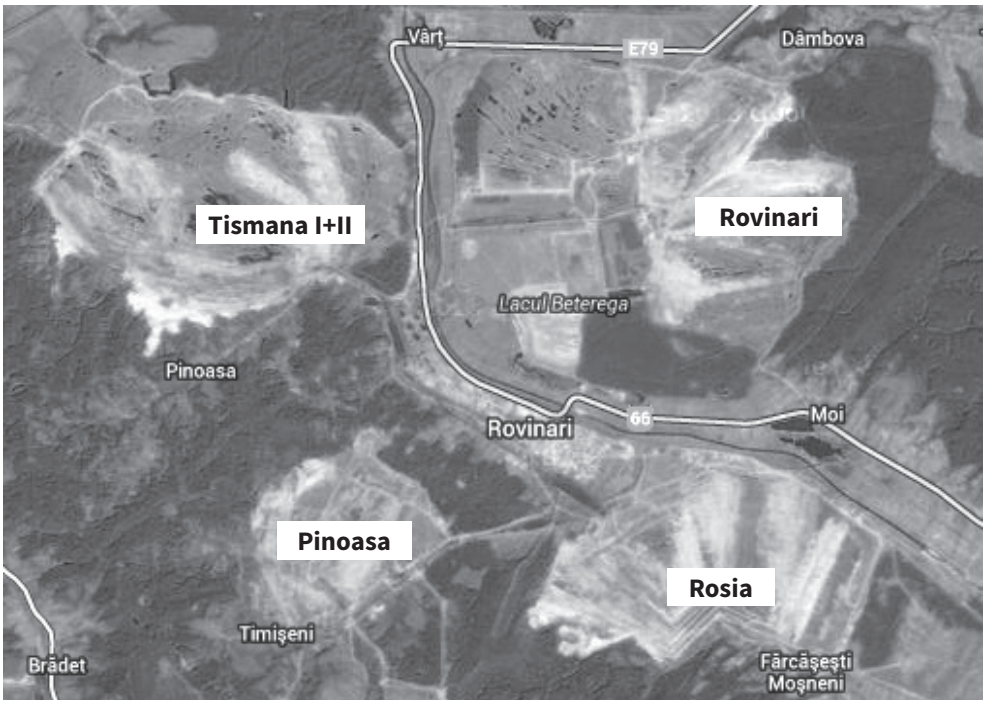

Fig. 1 Rovinari Mining Field, Northern side: Tismana, Rovinari, Pinoasa, Rosia open pits

Rovinari Mining Field (Fig. 1) is crossed from north to south by an anticline and synclinal series.

Câlnic – Tg. Jiu Synclinal delimits the north Pliocene with coal deposits from Gîrla area, Tismana I. It spreads wide and includes the IIIth, IVth, Vth coal seams in the northern part of Gîrla open pit, and Vth, VIth, VIIth coal seams in the northern part of Tismana I open pit, Şomăneşti area.

The survey made by the Oil and Gas Trust, Tg. Jiu, highlighted these layer. The recent geologic survey and drilling in Buduhala-Telesti area revealed that the Pontian/Romanian boundary is disconformities.

The outcrops of the Dacian and the Romanian deposits in the quarries of Rovinari Mining Field allowed the direct observation of certain geologic processes, which took place during these stages. Thus, a series of layer are abnormal relations with other.

The *stratigraphic conformity* represents a sequential disposition of the layers with no sedimentary disruption. In many cases the concordant layers is parallel. There are cases when a series the stratigraphical conformity of the layers can have different angles of inclination, especially in the case of the cross-stratification at the level of Early and Middle Romanian.

The *stratigraphic disconformity* is a non-depositional surface separating two layers or layers of different ages, or when is erosion between layers. The time interval that is missing in a sequence of layer related to the rocks which disappeared due to multiple causes is called the lacuna stratigraphic or sedimentation, respectively lacuna of erosion.

The *sedimentation lacuna* is the time interval in which did not occur sedimentation of rocks.

The *lacuna of erosion* is the time interval corresponding to the package of rocks removed by erosion.

Disconformity has several stages:

– the deposition of several sediments followed by a positive vertical emergence stage. During this interval waters recede and the region emerges.

– the erosion of the layer including in the interval of the sedimentation lacuna.

– the area dip results in the transgressive progression of the sea or the lake, with the related sediments or with a regressive continental deposits coverage.

Disconformities can be:

– simple disconformities, they occur when the layers above and under are parallel;

– angle disconformities, they occurs at the contact surface of the two layers with different gradients;

– local disconformity, it develops on short surfaces in areas where particular sedimentation conditions take place such as: river layers, underwater canyons, underwater valleys, etc.

In the case of sedimentation in a field with a smooth tectonic evolution, the deposits are gravitationally separated from the shore to the deep areas: gravel, sands, clays, slurries.

The emergence or submergence of the sedimentation area takes place frequently with a series of transgression or regression. In the transgression series the newer stratigraphic terms overcome the older ones. In the regression series the terms are increasingly more new direction of withdrawal.

The regression series kept less as it is eroded simultaneous with the occurrence of the regression. In Rovinari Field, have been observed deposits of *Unionidae* sculpted on VIIth or Xth coal seams, *Viviparidae* belonging to Middle Romanian, *Melanopsidae* from the Middle Romanian, the Late Dacian, etc.

We will illustrate below a few cases (Fig. 2–9) of disconformities due to erosion lacuna, followed by a trangression which took place late in the Middle Romanian throughout the entire Rovinari Field.

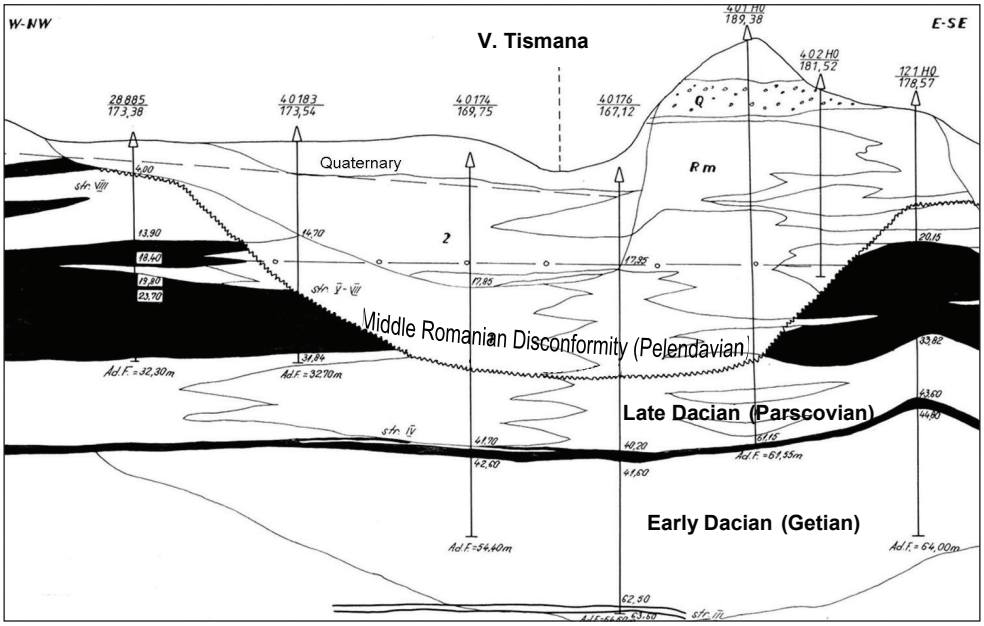

Fig. 2. Stratigraphic Disconformity Tismana I open pit Late Dacian – Middle Romanian – Quaternary Period

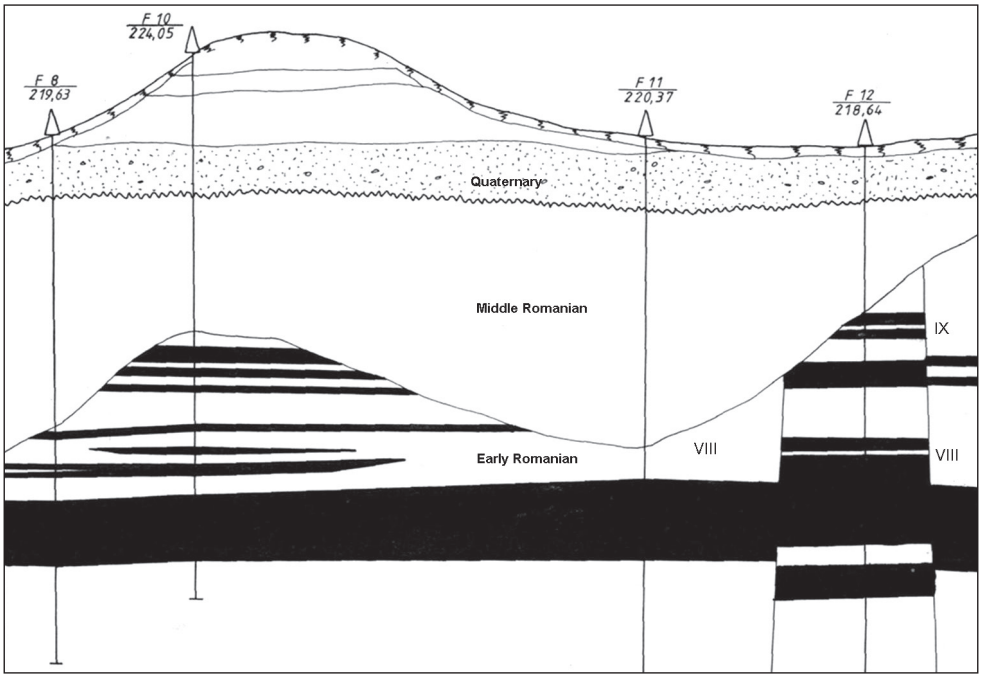

Fig. 3. Stratigraphic Disconformity Rogojelu Mine Early Romanian – Middle Romanian – Quaternary Period

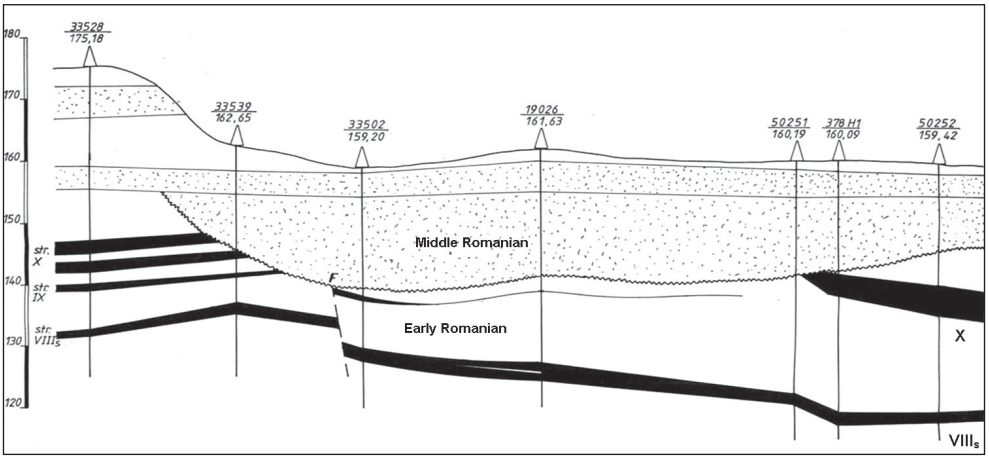

Fig. 4. Stratigraphic Discomformity Roşia de Jiu open pit Early Romanian – Middle Romanian – Quaternary Period

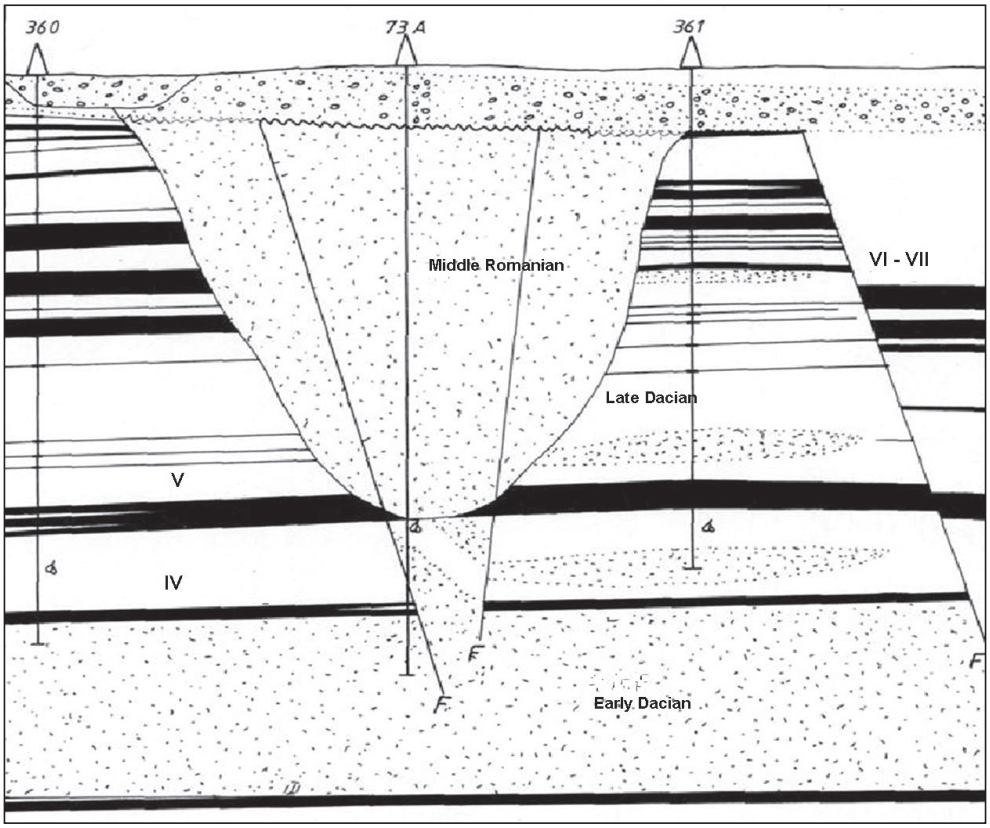

Fig. 5. Canyon like Disconformity – Gîrla open pit Late Dacian – Middle Romanian – Quaternary Period

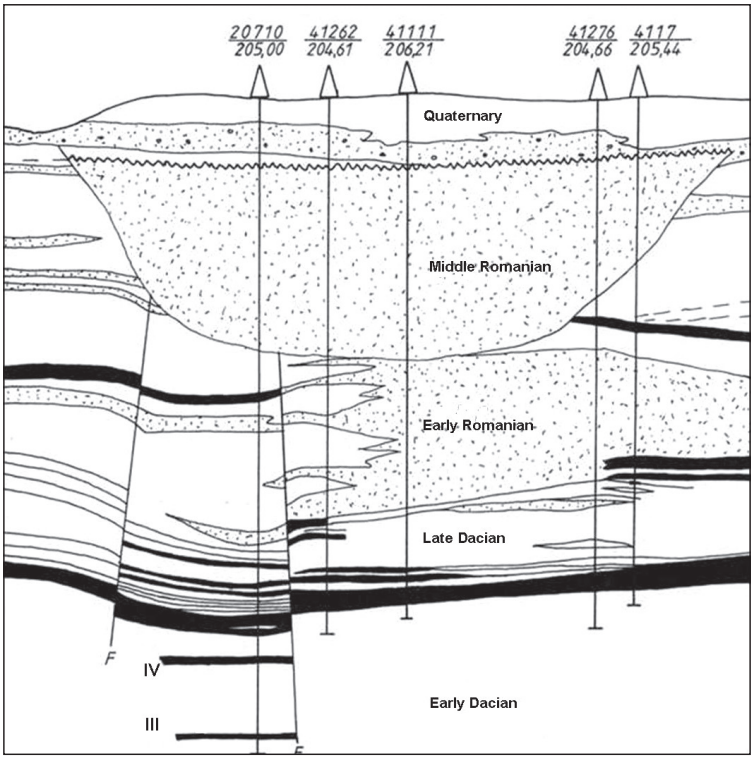

Fig. 6. Stratigraphic Disconformity Rovinari Eastern open pit Early Romanian – Middle Romanian – Quaternary Period

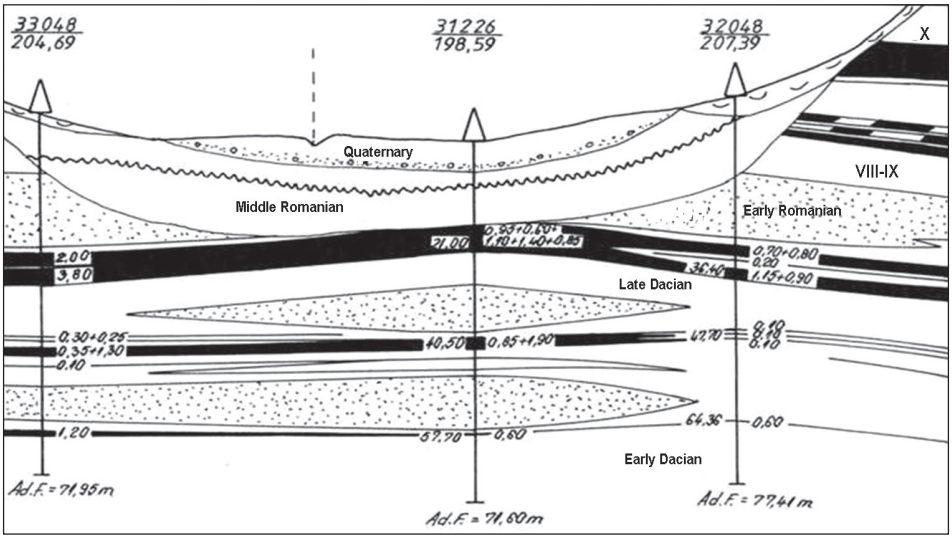

Fig. 7. Stratigraphic Disconformity South Pinoasa open pit Early Romanian – Middle Romanian – Quaternary Period

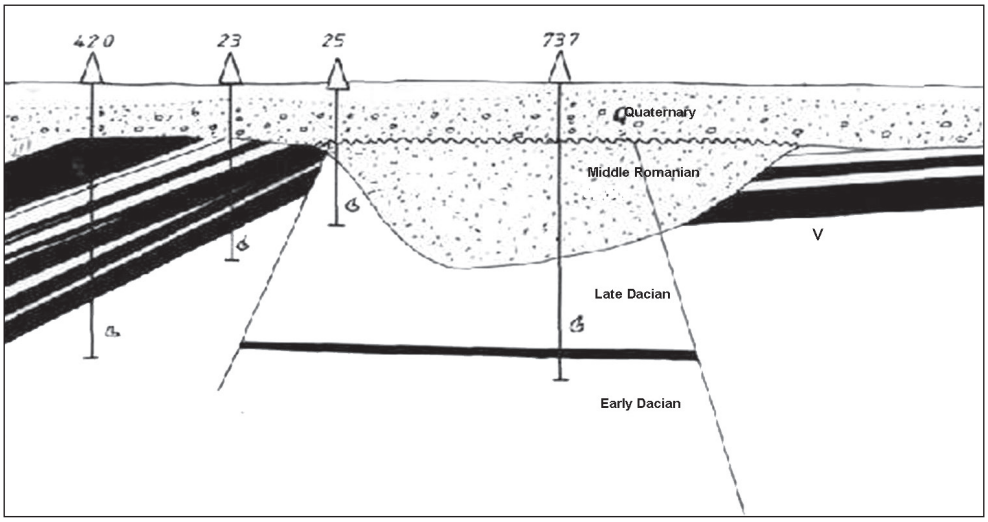

Fig. 8. Stratigraphic Disconformity Gîrla open pit Late Dacian – Middle Romanian – Quaternary Period

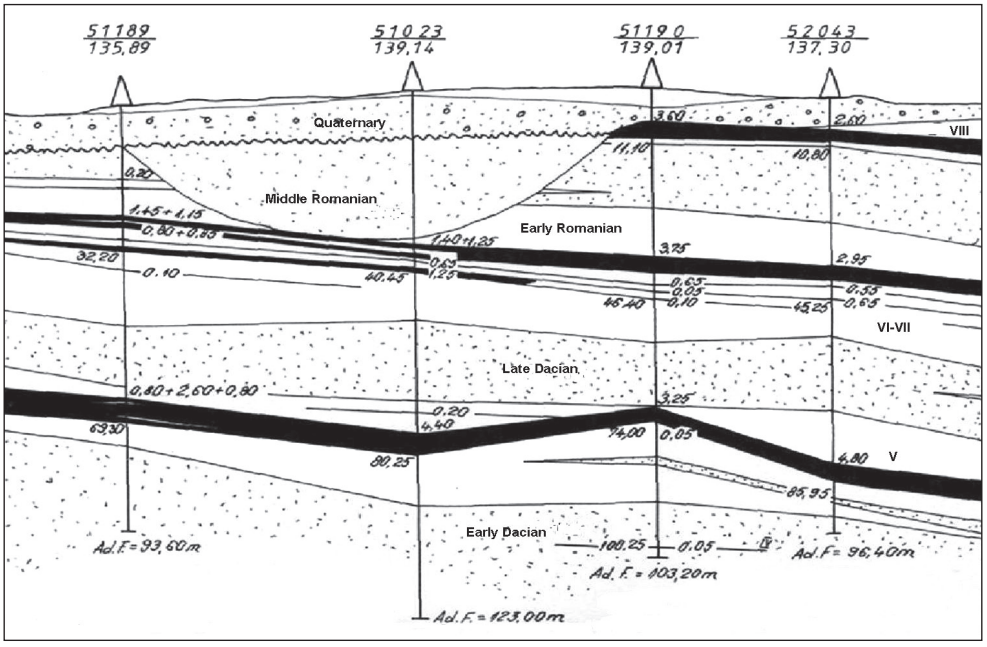

Fig. 9. Stratigraphic Disconformity – Peşteana Sud Early Romanian – Middle Romanian – Quaternary Period

According to the limits of the geologic ages of the Pliocene, in the pictures above the stratigraphic disconformities can be easily observed. The limits of the Pliocene layer in Rovinari Field are mentioned again here:

Period	Epoch	**Lignite layer**
Quaternary Period		No coal
Romanian	Late Middle Early	- no deposits in the area XII, XIII, XIV VIII, IX, X, XI
Dacian	Late Early	V, VI, VII I, II, III, IV

Conclusions

In Rovinari Mining Field, during the Pliocene and the Quaternary Periods, a range of disconformities of the lignite layer formed during the Parscovian, Siensian, Pelendavian Ages were registered.

Thus layer lacunae, layer erosions or layer ranges can be found. The time scale which is absent in the sequence of layers related to the range of rocks which disappeared due to various causes, leads to a stratigraphic or sedimentary lacuna as well as an erosion lacuna.

Disconformities were classified as simple disconformities, angle disconformities and local disconformities.

In Rovinari Field, have been observed deposits of *Unionidae* sculpted on layer VIIth or Xth coal seams, *Viviparidae* belonging to Middle Romanian, *Melanopsidae* from the Middle Romanian, the Late Dacian, etc.

The recent geologic prospect and drilling in Buduhala and Telesti area revealed that the limit between the Pontian and the Romanian is stratigraphic disconformities.

REFERENCES

ANINOIU D., 1998: *Geologia aplicată în carierele de lignit din Oltenia*, Editura Prodcom, p. 302 Tg. Jiu.

ANINOIU D., 2004: *Geologia structurală a depozitelor pliocen-cuaternare din Bazinul minier Rovinari*, Editura Academică Brancuşi, p. 133, Tg. Jiu.

CLICHICI O., STOICI S., 1985: *Cercetarea geologică a substanţelor minerale solide*, Editura Tehnică, p. 486, Bucureşti.

PAULIUC S., CORNEL D., 1985: *Geologie structurală*, Editura Tehnică, p. 339, Bucureşti.

Bathymetric Measurements on the Southern Coastal Zone on the Romanian Shelf, 2 Mai – Vama Veche Area

Bogdan Alexandrescu[1]

BATHYMETRIC MEASUREMENTS ON THE SOUTHERN COASTAL ZONE ON THE ROMANIAN SHELF, 2 MAI – VAMA VECHE AREA

Abstract: The main goal of this article is to raise the local awareness on the tectonic features in a considered perimeter (2 Mai – Vama Veche) on the shelf area. Considering the erosion and sedimentation rates in the region, local factors as the geomorphological submerse topography is needed so a better understanding of the local dynamics can be attained.
Using the latest measurement data, newer equipment and different measuring methods we can achive a more complete view on the same processes that took place in the studied area.
For this reason, we have used the oldest data recorded in the area (around 30 years ago) and combined it with the latest measurements that took place in 2011.

Keywords: bathymetry, black sea shelf, methodology, 2 Mai – Vama Veche, coastal dynamics.

Introduction

Usually the processes that took place on the surface can be better explained by a more complex understanding of the surface dynamics. Considering the fact that the area we are focused on is on the Romanian shelf between the 2 Mai – Vama Veche towns, on the N-S axis and about 3.5 km from the Romanian beach line towards E, the main tool for this study are the bathymetrical measurements that were overlapped with the older navigational maps.

The main goal is to determine the differences that took place in about 30 years in this region considering the dynamics and local factors that influence the

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erosion and sedimentation rates – so proving the existence of a local fault system that has some indications on the surface/in the field.

Localization

The study area is located on the southern unit on the Romanian Black Sea coast, starting on the southern limit of the 2 Mai town up to the entrance of the Vama Veche town (Fig. 1).

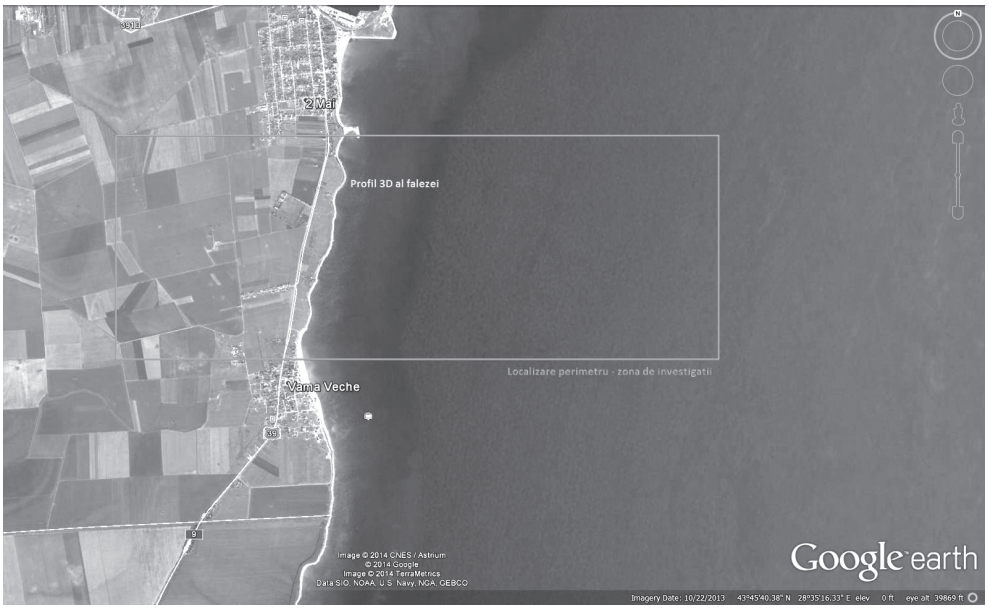

Fig. 1. Location if the study perimeter

This perimeter has been chosen considering the local indicators of tectonic activity that can be interpreted as such by the existing valley which has the tendency to continue itself in the submerse area up to a distance of about 1 km.

The existence of the Mangalia harbour with the tool main jettys tends to modify on a large enough scale the sediment flow and the erosion rates of the beaches of the southern area, so by comparing the two sets of bathymetric data with the local tectonic frame we can obtain and indicative of where the fault may be located by observing the contextual differences and local dynamics that can only be seen in a larger timeframe.

The local tectonical frame is composed of the secondary faults between the two large fault systems (Intramoesian fault and Palazu fault on the NE-SV main direction – red –, and the complex secondary fault system that mainly has a NNE-SSV orientation – black –.

Fig. 2. Main fault systems – the Intra – Moesian Fault and the Palazu Fault

Equipment

The latest measurements were possible by using the research vessel Carina, in the property of INCD GeoEcoMar, and a single beam equipment – Ceeducer and Ceeducer pro.

The first Ceeducer model operates on a single acoustic frequency, while the second one operates on two frequencies, which, in most cases can reveal the fine sediment accumulation (silt, clay) on the bottom of the water bodies thus creating a detalied map of the surficial sediment thickness. The frequency rates of the system are from 3.5 kHz to 200 kHz.

Considering the frequency of the recordings (about 6 readings / second) measured along the profile and the speed of the boat approximate 6–10 km/h we can consider the bathymetric measurements to be of continous nature.

In this case, there was a very large volume of the recorded data which in term was logged by using the automated incorporated data logger and the MatLogNT programme running on a portable computer on the side.

In the next figure (Fig. 3) we can see an example of a hull mounted transducer represented as a red box.

The equipment can either be mounted on the hull of the ship as a permanent equipment or on one side on a smaller boat, the difference being the fact that the hull mounted one is usually considered permanent equipment since the removal consists in dry docking the ship while the second one is easily maneuvered.

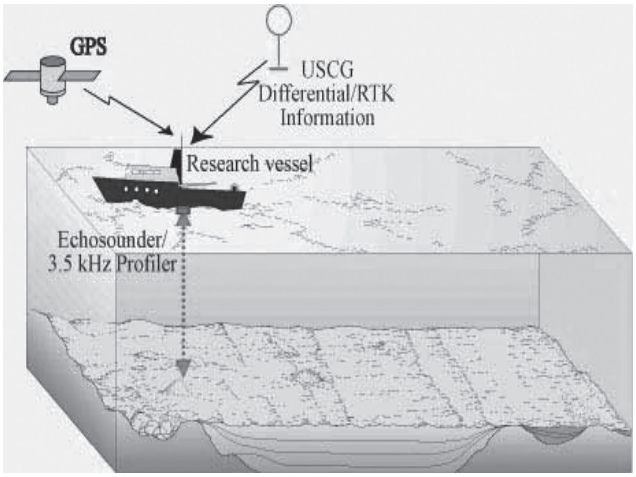

Fig. 3. Hull mounted equipment; (http://woodshole.er.usgs.gov/operations/sfmapping/singlebeam.htm)

Data processing

The total length of the profiles, in this sector was around 740 km while the distance between the independent profiles was 25 m up to a total of 28 profiles (Fig. 4).

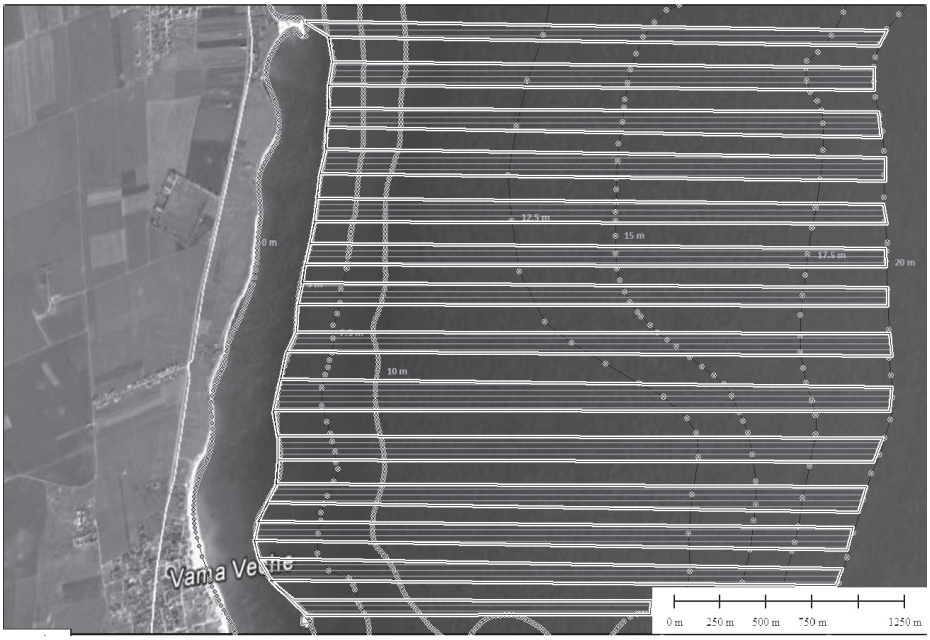

Fig. 4. Orientation and localization of the measure profiles

For the data correction and the continuous possibility for futher references, the altimetric level was considered by using the Black Sea – Constanta measurements which is 22.4 cm higher than Black Sea – Sulina. Most of the data processing and representation were done by the use of the SANDS™ software and the maps and individual profiles were exported for redrawing in AutoCAD and Global Mapper.

Methodology

Considering the main topic of this paper, two types of maps have been used to achieve the general purpose and conclusion on the subject. The 1992 navigation maps which represent a mosaic (considering the large scale/area) have been used independently so a newer .shp file can be generated by using the GeoEcoMar database and above mentioned processing software according to the subject. The newer measurement data is represented in Fig. 8 considering that each dot represented on the isobath has specific values.

The values have been tracked to ensure the vectorization is linear and there are no "blind spots" on the interpolated profile. By overlapping the two bathymetric maps a clear difference between the positions of the isobaths can be measured and observed (Fig. 5).

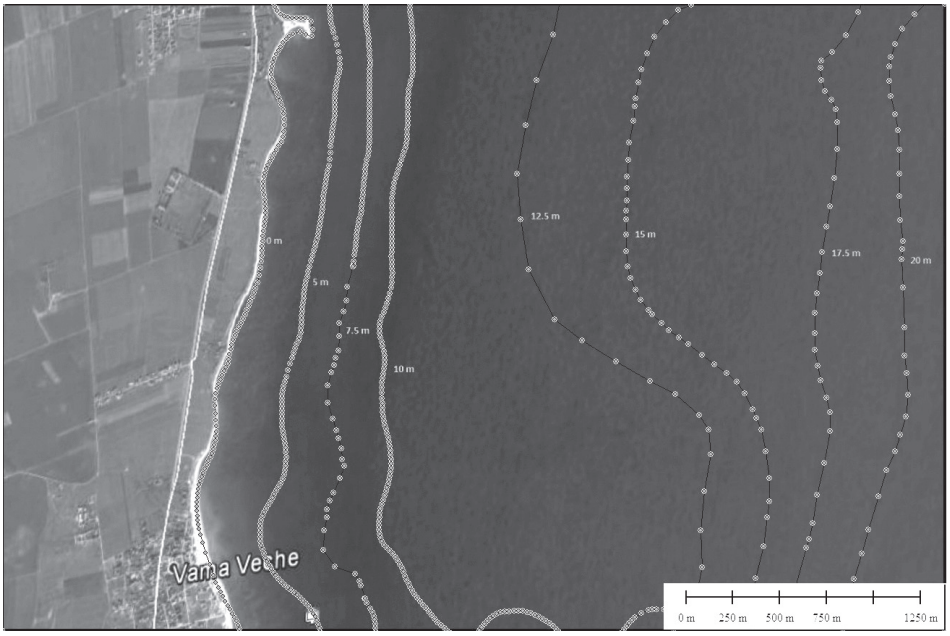

Fig. 5. Izobaths after the new data, representation with a factor of 2.5 m between lines

Conclusions

After the observation of the generated map results (Fig. 6) we can conclude that the submerse geomorphology has suffered some accelerated modifications which can only represent (considering the lack of local natural hazards) the anthropic activity. Because of this, the normal erosion and sedimentation rates have been modified thus the migration of the non-consolidated sedimentary bodies in an approximate 30 years timeframe had to suffer.

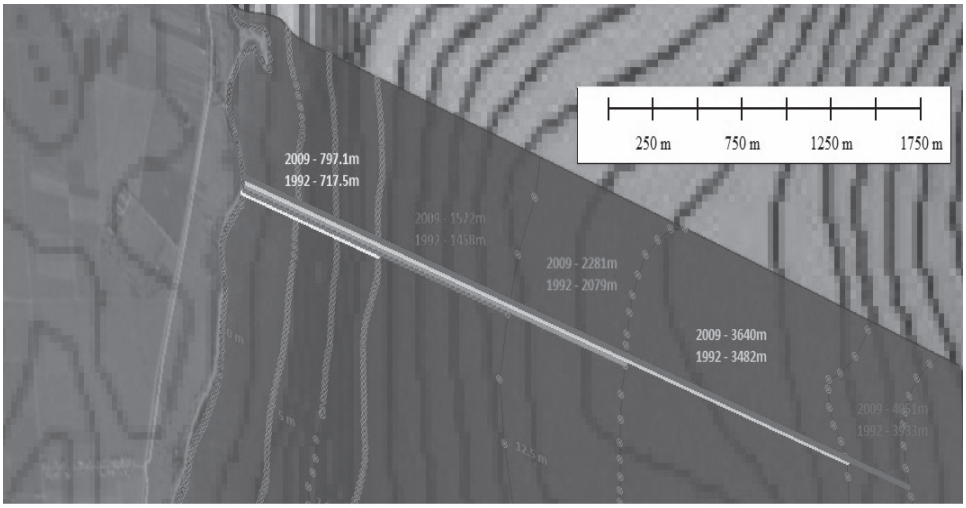

Fig. 6. Differences between the two maps and the distances of each shifted isobath

The main results as seen on the previous figure are:

10 m Isobaths – 79.6 m
12.5 m Isobaths – 114 m
15 m Isobaths – 202 m
17.5 m Isobaths – 158 m
20 m Isobaths – 118 m

Because of the latest improvements on the Mangalia harbour and the construction of "Portile de Fier" dam, a large part of the sediment that was supposed to be washed by currents along the sea coast does not reach the destination by so providing us with a better view of the submerse valley.

Considering this, we can assume that a general direction for a local fault system exists in the area, as presented in the introduction, which may have a surface component (the valley located between the two towns).

Taking this into account, the results provide us with a better localization for other complex geophysical studies so in the future all the data may be available for the exact identification and characteristics of the fault system.

REFERENCES

DIMITRIU R. G., POP I. C., DUDU A. C., MELINTE M. C., 2009: *Ridicări batimetrice realizate pe suprafața Parcului Natural Balta Mică a Brăilei*, Geo-Eco-Marina, supliment.

DINU I., BAJO M., LORENZETTI G., UMGIESSER G., ZAGGIA L., MAXIMOV G., STĂNICĂ A., 2013: *Discussion concerning the current circulation along the Romanian Black Sea coast,* Geo-Eco-Marina, No.19.

LAZĂR A. V., BUGHEANU A. D., UNGUREANU Gh. V., IONESCU A. D., 2013: *Side-scan sonar mapping of anthropogenically influenced seafloor. A case study of Mangalia harbour, Romania*, Geo-Eco-Marina, 19.

SĂNDULESCU M., 1984: *Geotectonica României*, Editura Tehnică.

*** National Institute of Marine Geology and Geo-ecology (GeoEcoMar), Bucharest, Romania, Department of Natural History of the Regional Historical Museum Varna, Bulgaria, IGCP 521 – INQUA 0501 FOURTH PLANETARY MEETING AND FIELD TRIP, IGCP 521 "Black Sea – Mediterranean corridor during the last 30KY: sea level change and human adaptation (2005–2009), INQUA 0501: Caspian – Black Sea – Mediterranean corridor during the last 30KY: sea level change and human adaptive strategies (2008–2010); Extended abstracts.

http://www.nauticexpo.com/prod/cee-hydrosystems/echo-sounders-hydrographic-surveys–39818–310444.html

http://woodshole.er.usgs.gov/operations/sfmapping/singlebeam.htm

GEODIVERSITY MAP OF SOHODOLULUI VALLEY (VÂLCAN MOUNTAINS) – AN EXAMPLE FOR RUNCULUI GORGE

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GEODIVERSITY MAP OF SOHODOLULUI VALLEY (VÂLCAN MOUNTAINS) – AN EXAMPLE FOR RUNCULUI GORGE

Abstract: The geoconservation's outlooks in Romania are motivated by the existence of a Geopark recognized by UNESCO and by the geological diversity particularly important for understanding the Earth's history. Due to the fact that geodiversity requires adequate protection, it is important for evaluation studies to be undertaken. Geodiversity map presents the most important elements of geodiversity of an area and is one of the supports in promoting geotourism. In this respect, it has been proposed several methods for the geodiversity map. There were used the following six methods which are interdependent: rasterization, vectorization, georeferencing, overlapping, juxtaposition and interpolation. Sohodolului Valley, although it is within a biodiversity area, do not enjoy special protection for geodiversity. Protecting geodiversity contributes to conservation of biotic environment.

Keywords: geodiversity, geodiversity map, geoconservation, Geopark, geotourism, Runcului Gorge.

Introduction

Geodiversity map is created as a result of the identification and evaluation of the elements of geodiversity, which need to be conserved and between which are set the geodroms used for promoting the geotourism. The area covered by the geodiversity map aggregates geosites, which could be included in a Geopark, Natural Park or National Park. The geodiversity map includes geological, structurals, geomorphological, hydrographic, hydrogeological elements connected to the itinerant routes called geodroms.

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The main concepts of geoconservation, identified by Andrăşanu (2009) are: evaluation of geodiversity, geotourism, Geopark and geoeducation. As Stanley (2000) mentioned, geodiversity represents "the various environments, phenomena, and active geological processes which creates landscapes, rocks, minerals, fossils, soils and other surface deposits providing life on Earth". Wilson (1996) identifies the conservation of heritage on Earth as "...maintenance of landforms, natural and artificial exposure of sites when the geological processes are seen in action today". Sharples (1998) identifies in geoconservation a new concept where can be used to define initiatives which maintain geodiversity.

Shortly, geoconservation can be defined as the conservation of the geological diversity from some protected natural areas and from some museum collections. The protection of geodiversity is most assured inside geosites and Geoparks where these include the first ones. The Geosites coresponds to Natural Reservations and Natural monuments and Geoparks are similar to Natural Parks.

Other similar concepts with the one of "geosite" are "geological reservation" and "geomorphosites". At the moment, the only Geopark recognised in Romania is the Dinosoaurs Geopark-Ţara Haţegului. Haţeg Geopark is included in the European Geoparks Network and in the Global Network of National Geoparks under the auspices of UNESCO. In 2014, Haţeg Geopark status was revalidated for another four years. The Romanian legislation provides that after the status of Geopark was give to an area, it will be provided also the status of Natural Park to the same area. Thereby, Haţeg Geopark is also Natural Park.

Platoul Mehedinţi is a Natural Park, but the administration consider it also Geopark, even though was not formally recognised as a Geopark by UNESCO. It is my professional view that any other protected areas that have all the characteristics to be named Geoparks need first to be recognised by UNESCO.

There are other natural areas which can be recognised as Geoparks and all the efforts are made for the formal process to be finalised. An example in this way is Buzăului Land Geopark, where are included 18 communes from North part of Buzău county. Natural Parks and Geoparks are the only protected areas which include natural and anthropic zones because besides conservation of the nature is also provided the sustainability of the communities. Thereby, the area of the Geopark, where does allow it, corresponds with the limits of administrative units like communes, cities or municipalities. This is one of the reasons for delimitation of the area proposed between Runcu and Schela.

The predecessors of the protection of geological elements, before the concept of geoconservation was defined, could be considered Gheorghe Munteanu-Murgoci and Marcian Bleahu. Munteanu-Murgoci (1898), referred to the protection of endokarstic phenomena (speleothems, sinkholes, underground karst flow, springs), expressing this imperative need by saying: "*În calcarele nostre sunt forte multe cavităţi de acestea datorită apei, grote, ce-şi fac intrarea prin nisce guri negre şi fiorose, conducând prin colosale galerii cotite departe în inima munţilor. Multe din ele sunt cunoscute, visitate şi*

devastate de turişti; la unele din ele n'a rămas aproape nimic din splendorea ornamentelor naturale. Iată un punct, unde atenţiunea statului îndreptată, ar aduce mult bine ţărei, conservând aceste măreţe monumente artistice, imposante prin natura lor şi prin darul naturei." Bleahu (1976) had made the first general list of geological natural reservation from Romania, offering a description to each natural reservation.

Almost a century later, after Munteanu-Murgoci, Grigorescu (1994, a, b) highlighted the need of geological diversity by involving the state and international organisations. The Romanian state reacted, hardly, in 2007 as a result of "necessity and urgency of full compatibility of national legislation with the European Union in the field of nature protection" (Government Emergency Ordinance 57/2007). Also the Government Emergency Ordinance 57/2007 was adopted and published because "the member states could be sanctioned for incomplete transposition or inconsistent implementation of Community provisions".

Due to the interest of Professors Dan Grigorescu and Alexandru Andrăşanu, in 2004 was established the Dinosaurs Geopark-Ţara Haţegului and in 2005 was included in the Global Network of Geoparks. Further steps were made by Andrăşanu (2010) for establishing the second Geopark in the north part of Buzău county. In 2013, Buzău Land Geopark was named as the Romanian destination for the theme "Rural Tourism" as part of the Project EDEN (European Destinations of Excellence) run by European Commission. One of the first initiatives in the context of conservation of geological diversity is of Grădinaru et al. (2006) where, two years before the first Global Conference of Geotourism (2008), they created the first geotouristic map of Romania and made classified the geotouristic sites from Hăghimaş Mountains (National Park Cheile Bicazului-Hăşmaş).

The area between Runcu and Schela, from the South part of Vâlcan Mountains is proposed as an area that could become National Park or Geopark where not only the biodiversity could be protected but also the geodiversity. Although there is a major geological diversity potential which could be preserved, there were only few Natural Reservations and Natural Monuments demarcated. These are Cheile Sohodolului, Izbucul Jaleşului, Cheile and Peştera Pătrunsa. In terms of the importance of geodiversity elements, geosites list needs to be completed by other areas, including Cheile Şuşiţei Seci, Cheile Şuşiţei Verzi, Valea Măcrişului, Cheile Vidra and the rest of the valleys developed in non-karstic rocks.

Also, in those valleys are present numerous exokarstic and endokarstic phenomena. Hydrogeological karst areas correspond to areas, to which water captions stations from Runcu and Vaidei are dependent (Iurkiewicz, 1994).

The karst aquifers have both a autogenic power source and allogenic one, and they are very sensitive to pollution caused by mining activities. Because of these, it is necessary that the karst area to be considered together with other non-karst areas, which form a whole system.

Usually these complex systems meet locally, some watersheds. The proposed area corresponds to three basins: Sohodol, Şuşiţa Seaca and Şuşiţa Verde.

Regionally, there are relations between these basins and karstic aquifers that have been proven in tests with tracers (Sencu, 1976; Iurkiewicz, 1994).

Although the abiotic environment provides support for the biotic environment, experience so far shows that geodiversity did not receive adequate protection established by an administration for biodiversity. In support of this statement may be given two negative examples: logging inside of Cheile Vidra and the removal of debris material from the left side of Cheile Sohodolului. Cheile Vidra is a sector of Sohodolului Valley located between Natural Reservation Cheile Sohodolului (recognized by Law no. 5 of 6 March 2000 (Law 5/2000)) and Natural Reservation Cheile Pătrunsa (recognized by Government Decision no. 1143 of 18 September 2007 (HG 1143/2007).

There were several discussions around distribution of Natural Reservations and Natural Monuments in the custody of the sites, preferring for these to be administrated by Natural and National Parks, and where the latter are not covered, the administration to be done by the Environment Agencies from the territory.

Over the area between Runcu and Schela there is overlapped the site of community importance – Nord Gorjului de Vest (NVG). The same aspects discussed above are available for the geosites which could be created inside the area of the site of community importance-Nordul Gorjului de Est (NGE).

Moreover, the two Natura 2000 sites are rivals in terms of the value of natural heritage and the spectacular karst by the following representative areas: Cheile Olteţului with Peştera Polovragi and Cheile Galbenului with Peştera Muierii (NGE) and Sohodolului Valley with Peştera de Florii (NGV).

Amongst comparison with other areas, must be recalled the one made by Ion Conea (1932): "*Iată, ce este în palidă icoană de cuvinte, acel cuib de sălbătică frumuseţe a naturii oltene, şi care se cheamă Cheile Runcului: măreaţă replică olteană la moldovenele, fermecate, Cheile Bicazului*".

On the relationship between geodiversity and biodiversity, already mentioned above, in the area between Runcu and Schela, it ensures the perpetuation of rare species particularly important among which is the serpent of glass (*Anguis fragilis*), horned viper (*Vipera ammodytes*), swallow rock (*Ptyonoprogne rupestris*), gentian (*Gentiana punctata*), "smârdar" or "mountain rose" (*Rhododendron kotschy*) and bats (*Rhinolophus hipposideros*, *Barbastella barbastellus*, *Eptesicus serotinus*, *Myotis bechsteinii*, *Myotis dasycneme*, *Myotis daubentonii*, *Myotis emarginatus*, *Myotis myotis*, *Myotis Natterer*, *Nyctaylus noctula* etc.).

Methods and materials

Methods (Fig. 1) proposed to design the geodiversity map were used through GIS and CAD software. Cartographic materials (Table 1), which have been used, were published in some papers or were edited by specialized institutions such as Institute of Geology and Institute of Geodesy.

Table 1. Materials used for the design of geodiversity map

Type of map	Author (s) – year	Scale	Nomenclature
Topographic maps	Institutul de Geodezie, Fotogrammetrie, Cartografie şi Organizarea Teritoriului (1990)	1:5000	L–34–107-A-a–3-IV; L–34–107-A-a–4-I, II, III, IV; L–34–107-A-b–3-I, II, III, IV; L–34–107-A-b–4-I, III, IV; L–34–107-A-c–1-II, III, IV; L–34–107-A-c–2-I, II, III, IV; L–34–107-A-d–1-I, II, III, IV; L–34–107-A-d–2-I, II, III, IV; L–34–107-A-c–3-I, II, IV; L–34–107-A-c–4-I, II, III, IV; L–34–107-A-d–3-I, II, III, IV; L–34–107-A-d–4-I, II, III; L–34–107-C-a–1-II, IV; L–34–107-C-a–2-I, II, III, IV; L–34–107-C-b–1-I, II, III, IV; L–34–107-C-b–2-I, II, III, IV; L–34–107-C-a–3-II; L–34–107-C-a–4-I, II, III, IV; L–34–107-C-b–3-I, II, III, IV; L–34–107-C-b–4-I; L–34–107-C-c–2-I, II; L–34–107-C-d–1-I, II.
	Direcţia Topografică Militară (1996)	1:100 000	L–34–107 (Tîrgu Jiu 1), Zona 34T
Geological maps	Institutul Geologic Bercia I., Marinescu Fl., Mutihac V., Pavelescu Maria, Stancu Iosefina (1967)	1:200 000	L–34–XXX (33. Tg. Jiu)
	Pop Grigore (1973)	1:50 000	Harta geologică a regiunii dintre Valea Motrului şi Schela
	Institutul de Geologie şi Geofizică Stan N., Stănoiu I., Năstăseanu S., Moisescu V., Seghedi Antoneta, Pop Gr. (1979)	1:50 000	L–34–107-A (124 a Cîmpu lui Neag)
	Institutul de Geologie şi Geofizică Marinescu Fl., Pop Gr., Stan N., Ogridan T. (1989)	1:50 000	L–34–107-C (124 c Peştişani)
Geomorphological maps	Sencu V. (1972)	1:50 000	Schiţa Cheilor Runcului; Schiţa carstului din zona Cheilor Runcului între „Căldare” şi Runcu
Hydrogeological maps	Iurkievich A. şi Magin A. (1994)	1:50 000	Carte hydrogeologique du versant sud des Monts Vâlcan; Schema generale du karst du versant sud des Monts Vâlcan

Photogrammetric maps	Agenţia Naţională de Cadastru şi Publicitate Imobiliară (2005)	1:5000	Runcu (81576–18–4)

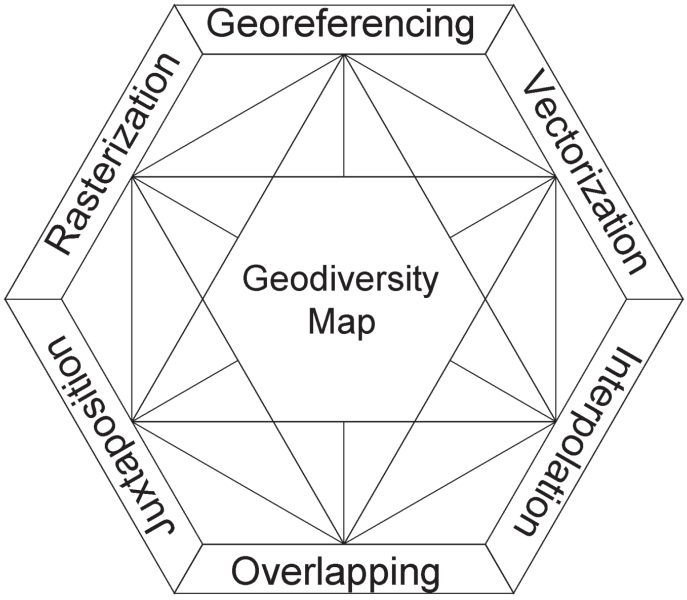

Fig. 1. Scheme of the methods used to obtain the geodiversity map

Fig. 2. Rasterization

Rasterization (Fig. 2) is defined most often as transforming an image from a vector graphics format in a raster format. The raster format is used for printing the map or keeping it in a bitmap file format (BMP) or Tagged Image File Format (TIFF). Older maps are scanned and then are vectorized.

Fig. 3. Vectorization

Vectorization is the "redrawing" of the elements of a map, which was georeferenced. All these elements have been placed into layers. Each rasterized element (Fig. 3) becomes a selectable object whose properties can be accessed anytime. These items can be checked or changed after new measurements and investigations have been made in the field.

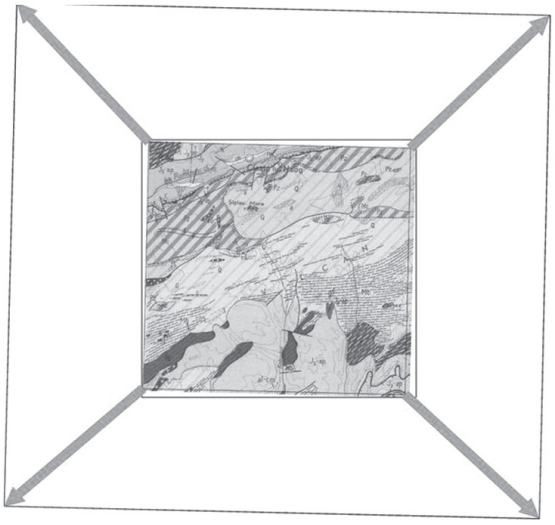

Fig. 4. Georeferencing

Georeferencing (Fig. 4) is scaling and positioning of a rasterized image into the original geographic coordinates of the scanned map. The maps, of which coordinates are not known, are scaled after at least a few points with the coordinates already known. When you overlap two different maps, most of the points or of some common elements should confirm a correct scaling. Georeferencing maps can be likened with the smoothing of a piece of paper.

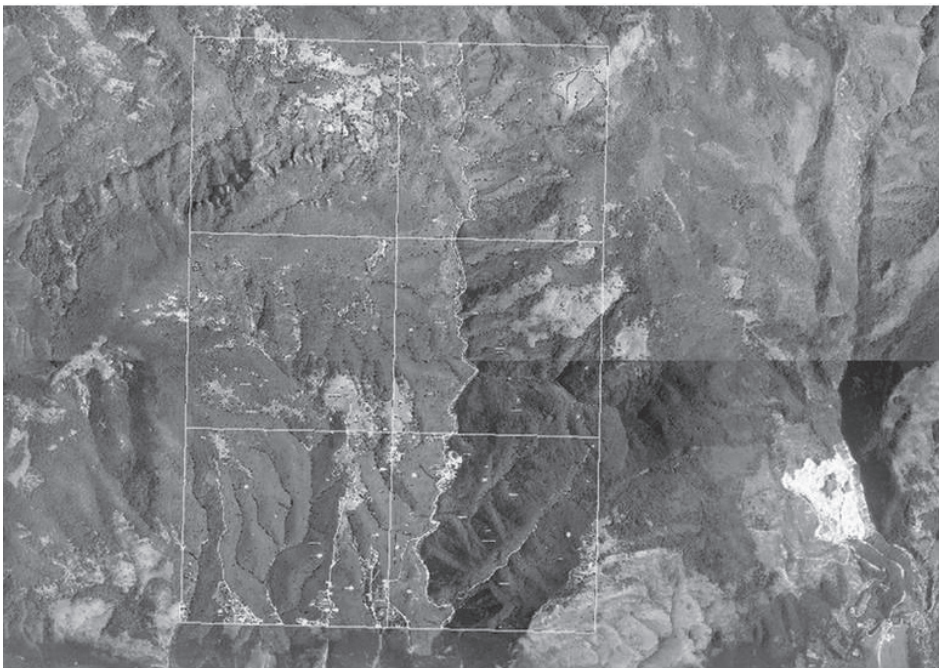

Fig. 5. Overlapping

The **overlapping** is needed to verify the commonalities and differences between two rasterized maps. Also, you could see the progress of the details of a map of one area, made over time. The changes of the land caused by human activities or natural processes can be suggested by comparing maps made in different periods. It is known that for geological maps, scale 1: 200 000 and 1:50 000, the drawings had a great support from topographic maps scale 1:25 000 and 1:50 000. The topographic elements on these geological maps can be replaced with those from topographic maps scale 1: 5000.

Photogrammetric images (Fig. 5) doesn't always provide a certainty about land geomorphology, but can be better understood by overlapping some props from other maps. When you use an updated topographic map and photogrammetric images will facilitate the identification of outcrops of land. Thanks to details, topographic maps scale 1: 5000 provides precise indications for certain outcrops.

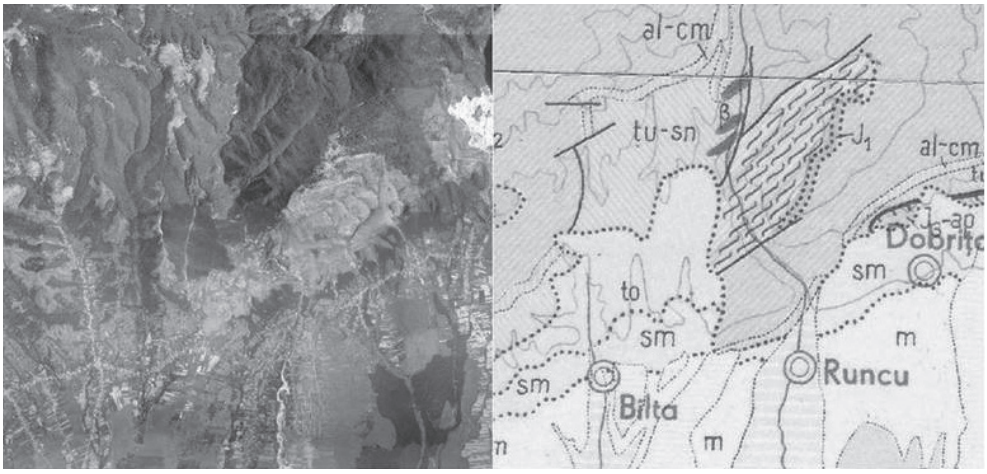

Fig. 6. Juxtaposition

Juxtaposition (Fig. 6) is a technique whereby two maps are placed side by side, in order to develop comparisons and contrasts. Juxtaposition is useful to describe in detail an area highlighting points of interest. Understanding an area is more accessible by comparing different types of maps. Therefore, some characteristics of a place are better highlighted by comparing several maps.

Interpolation is a method by which area's maps and profiles are estimated on the basis of what is known about the surrounding areas, where there is more information. Geomorphological maps can be enlarged on the surrounding areas after there have been researched in the field and verified by topographic and photogrammetric maps. With this method, as well as the others, can be correlated new data obtained from the field, which have not been published yet.

Results

Cartographic materials were used to obtain the geodiversity map through the methods which were described. Runcului Gorge is the first sector downstream to Sohodolului Valley. The geodiversity map's features (Fig. 7) are karst phenomena, structural elements and geological formations. Karst phenomena are exemplified by caves, sinkholes, springs, tunnels, ditches, and by an arch and the dry valley of Sohodol. Surface water is lost through faults, sinkholes and has an underground flow, coming back to the surface through springs. This phenomenon is best observed during dry periods, when swallets can be easily observed. Karst rocks are represented by Aptian-Barremian and Aptian-Medium Jurassic limestones. Geodiversity map itself is accompanied by a photogrammetric image, which aims to facilitate the tracing of geodiversity features.

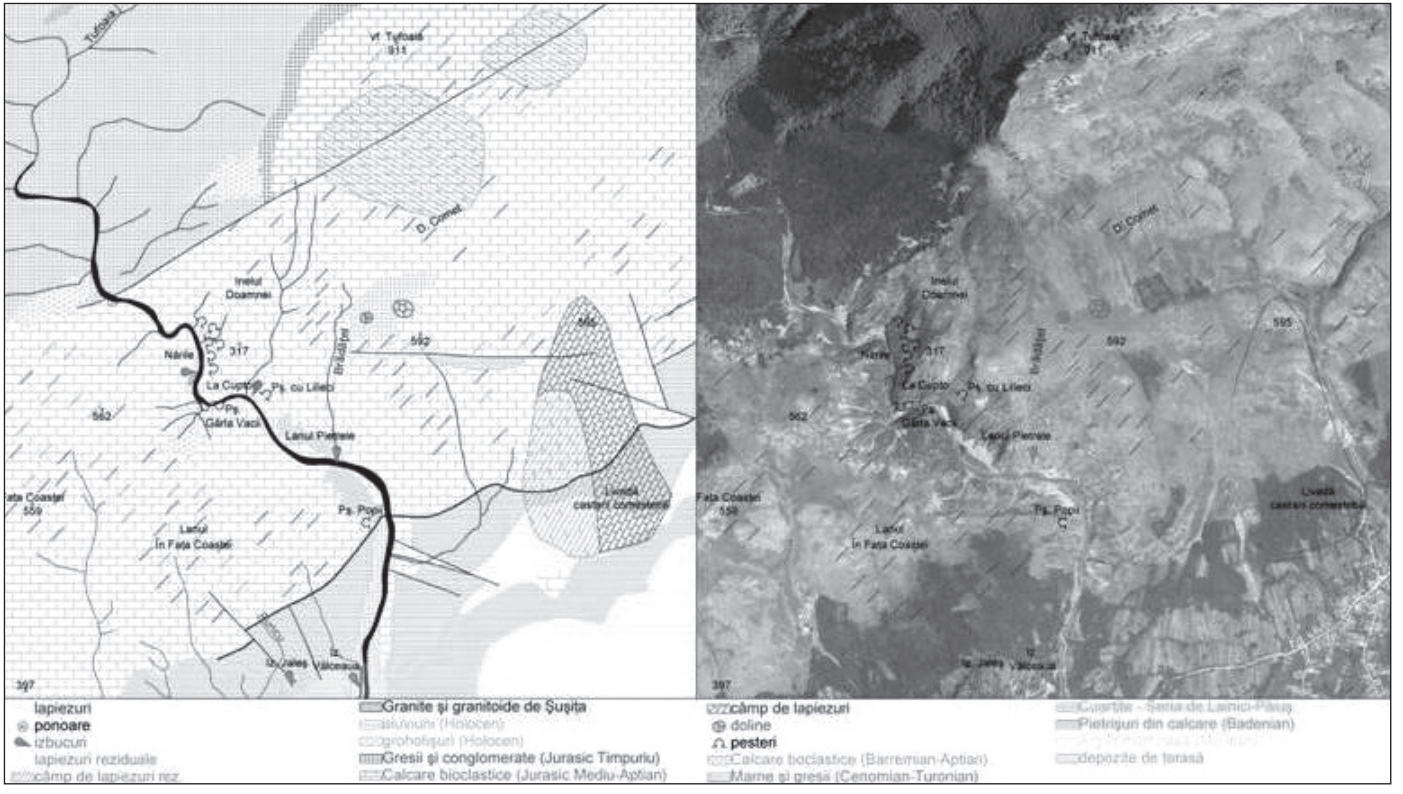

Fig. 7. The geodiversity map of Runcului Gorge

Conclusions

The geodiversity map was realised for Runcului Gorge in the context of geoconservation. Six methods were used (rasterization, vectorization, georeferencing, overlapping, juxtaposition and interpolation) which are interdependent. The cartographic materials that were used are topographic, geological, hydrogeological, geomorphological and photogrammetric maps. Sohodolului Valley and its drainage basin present karst and geological features which deserves to be preserved by a specific management.

In this study, it was shown only the geodiversity map of the southern part of the Sohodolului Valley, sector known as the Runcului Gorge. The purpose of such maps is to provide support for promoting geotourism and implementation of geoconservation plans.

Not ultimately, Sohodolului Valley deserves a specific protection because of the link between geodiversity and biodiversity. If some of the elements of biodiversity will be removed, this can bring irreparable harm to geodiversity. Therefore, assessment of geodiversity and geodiversity mapping of the entire area is a prerequisite for good practice to be applied for natural protected areas.

REFERENCES

ANDRĂŞANU A., 2009: *Geoeducation – a key part of Geoconservation*, Studia Universitatis Babeş Bolyai, Geologia, Special Issue, MAEGS – 16.

Andrăşanu A., 2010: *Buzău Land Geopark. Steps in building a new geopark in Romania*, Scientific Annals, School of Geology, Aristotle University of Thessaloniki Proceedings of the XIX CBGA Congress, Thessaloniki, Greece, Special volume 100, 503–512, Thessaloniki.

Bleahu M., Marinescu F., Brădescu V., 1976: *Rezervaţii naturale geologice din România*, Editura Tehnică, Bucureşti.

Conea I., 1932: *Cheile Runcului*, Bul. S.R.R. de Geografie, vol. L.

Grădinaru E., Barus T., 2006: *The geotouristic sites of Haghimas Mountains (East Carpathians)*, Romania, Geologia & Turismo, Bergamo.

Grigorescu D., 1994 a: *A brief account on the geological site conservation in Romania: past and future*, Memoir. Soc. Geol. de France, Nouv. Ser., no. 165, 157–158.

Grigorescu D., 1994 b: *The geo-ecological education and geological site conservation in Romania*, in Geological and Landscape Conservation, vol. , Geological Society, p. 467–472, London.

Iurkiewicz A., Magin A., 1994: *Utilisation de l'analyse systemlque dans l'etude des aquiferes karstiques des Monts Vâlcan (Roumanie)*, Theoretical and Applied Karstology, vol. 7, p. 9–97, Editura Academiei Române, Bucureşti.

Munteanu-Murgoci Gh., 1898: *Calcare şi fenomene de erosiune în Carpaţii Meridionali (clina română)*, Buletinul Societăţii de Sciinţe, Bucuresci.

Sencu V., 1972: *Cheile Runcului, observaţii geomorfologice*, St. Cerc. Geol., Geof., Geogr., Seria Geografie, T. XIX, Nr. 1, p. 81–94, Bucureşti.

Sharples C., 1998: *Concepts and Principles of Geoconservation*, Tasmania, Australia: Parks and Wildlife Service, Department of Environment and land Management: 86 pp.

Stanley M., 2000: *Geodiversity*, Earth Heritage 14: 15–18.

Wilson R.C.L., 1996: *An introduction to the Geological Conservation*, Review: Joint Nature Conservation Committee, Peterboroug.

*** HG 1143/2007, *Hotărârea de Guvern nr. 1143 din 18 septembrie 2007 privind instituirea de noi arii naturale protejate*, publicată în Monitorul Oficial al României nr. 691 din 11 octombrie 2007 (M. Of. 691/2007).

*** Legea 5/2000, *Legea nr. 5 din 6 martie 2000 privind aprobarea Planului de amenajare a teritoriului naţional – Secţiunea a III-a – zone protejate*, publicată în Monitorul Oficial al României, nr. 152 din 12 aprilie 2000 (M. Of. 152/2000).

*** OUG 57/2007, *Ordonanţa de urgenţă a Guvernului nr. 57 din 20 iunie 2007 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei şi faunei sălbatice*, publicată în Monitorul Oficial al României, Partea I, nr. 442 din 29 iunie 2007, cu modificările şi completările ulterioare.

DROBETA TURNU SEVERIN RAILWAY STATION (ROMÂNIA) – RECEIVER OF INVASIVE AND POTENTIALLY INVASIVE ALIEN PLANTS SPECIES

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DROBETA TURNU SEVERIN RAILWAY STATION (ROMÂNIA) – RECEIVER OF INVASIVE AND POTENTIALLY INVASIVE ALIEN PLANTS SPECIES

Abstract: The article presents a list of plant species identified in the Drobeta Turnu Severin Railway Station. Of the 243 species identified over nine years, 61 species are alien. In this article is done an analysis of alien species in terms of invasive potential.

Keywords: alien plants, invasive, naturalized species, casual alien plant, Romania.

Introduction

It is widely agreed negative effect of alien species in general, and specifically of the invasive species, on the biodiversity, the structure and function of ecosystems, the conservation of the protected areas. Invasive alien species can cause significant losses in the agriculture, forestry, fishing and other activities, as well as human health.

Alien plants (adventives) reached in another area (other than natural) casual or intentionally. Some have been reached naturally by climate change which enabled them to conquer new territories. However, in most cases, the human factor played an important role in dissemination. The pathways penetration of alien plants into a new area is the ports (maritime and fluviatile) and the terrestrial communication ways-road and rail. Among them, the railways play an important role in dissemination.

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Because for several years we improve botanical and mycological research in Mehedinţi County, we consider it timely to present some data on the subject – alien plants (alien). Drobeta Turnu Severin Railway Station (Fig. 1) is a gateway for alien plants in Mehedinţi County and a source of threat to the biodiversity of protected areas, being situated near two natural parks: the Plateau Geopark County and the Iron Gates Natural Park.

Material and methods

The data presented is the result of own field observations along many years (1989, 1994, 2003, 2009, 2010–2014). The research was done occasionally, only 2010 were made, somewhat, systematic observations from May to September-October of each year. The lists were made using a simple diktafon, the problematic plants were collected to be determined in the laboratory or have made photos. The outstanding species were deposited in official herbariums.

Presentation of results: all species have been listed in a summary table. For each taxon we registered: origin, life form, identification date, invasive status. The terminology and definitions recommended by Richardson et al., 2000; Pyšek et al., 2004 and Sîrbu & Oprea 2011 were used to establish the status of alien plants in our country. Nomenclature of species is according to *Flora Europaea* (Tutin et al., 1964–1980, 1993) and *Flora României* (Săvulescu, 1952–1976). Life form, generally, is according to Popescu & Sanda, 1998; origin is according to Popescu & Sanda, 1998 and Sîrbu & Oprea, 2011.

Fig. 1. Location of Drobeta Turnu Severin Railway Station

Results

The total number of species identified in the Drobeta Turnu Severin Railway Station is 243 and they are presented in Table 1.

Table 1. Species recorded from Drobeta Turnu Severin Railway Station

No	Species	Origin	Life form	Identific. date	Invasive status
1.	*Acer campestre* (juv.)	Eur	MM-M	2011	
2.	*Acer negundo* (juv.)	AmN	MM	1994, 2003, 2009–2014	Inv
3.	*Acer pseudoplatanus* (juv.)	Euc	MM	2014	
4.	*Achillea coarctata*	Pont-balc	H	2003, 2013	
5.	*Achillea crithmifolia*	Balc-pan	H	2010, 2013	
6.	*Achillea setacea*	Eua(Cont)	H	2010	
7.	*Ailanthus altissima* (juv.)	China	MM	1989, 1994, 2003, 2009, 2010–2014	Inv
8.	*Amaranthus albus*	AmN	Th	1989, 2010,	Inv
9.	*Amaranthus blitoides*	AmN	Th	1989	Nat
10.	*Amaranthus deflexus*	AmS	H	2009, 2010, 2012–2014	Nat
11.	*Amaranthus powellii*	AmN	Th	1989	Nat
12.	*Amaranthus retroflexus*	AmN	Th	1989, 2010, 2012–2014	Inv
13.	*Ambrosia artemisiifolia*	AmN	Th	1989, 2009–2014	Inv
14.	*Anchusa officinalis*	Eur(Med)	TH-H	2010–2014	
15.	*Anthemis arvensis*	Eur(Med)	Th	1994	
16.	*Anthemis austriaca*	Eur(Cont)	Th	2010, 2011	
17.	*Anthriscus caucalis*	Eua	Th	2010, 2011	
18.	*Anthriscus trichosperma*	Pont(Med)	Th	2010	
19.	*Apera spica venti spi-ca-venti*	Eua	Th	2014	
20.	*Arctium minus*	Eur	TH	2003, 2009	
21.	*Arenaria serpyllifolia*	Eua(Med)	Th	2010, 2011, 2014	
22.	*Arrhenatherum elatius s. l.*	Eua(Med)	H	2011, 2014	
23.	*Artemisia absinthium*	Eua(Med)	Ch-H	1994, 2009, 2010, 2011, 2013, 2014	
24.	*Artemisia annua*	Eua(Cont)	Th	2003, 2010,	Nat -Inv
25.	*Artemisia scoparia*	Eua(Cont)	TH	2012	

No	Species	Origin	Life form	Identific. date	Invasive status
26.	*Artemisia vulgaris*	Circ	H(Ch)	1989, 2003, 2010–2013	
27.	*Atriplex patula*	Circ(Med)	Th	1989, 2009	
28.	*Atriplex tatarica*	Eua(Med)	Th	2010	
29.	*Avena fatua*	Eua(Sm)	Th-TH	2012	
30.	*Avena sativa sativa*	As	Th	2010, 2013, 2014	Cas
31.	*Ballota nigra nigra*	Med-Euc	H	2003, 2009–2014	
32.	*Bassia scoparia*	AsW,EurE	Th	1989, 1994, 2009–2013	Nat
33.	*Bassia sieversiana*	AsC, Siberia	Th	2014	Cas
34.	*Berteroa incanna*	Eua(Cont)	Th(TH)	2012–2014	
35.	*Bidens vulgata*	AmN	Th	2003	Inv
36.	*Brassica rapa oleifera*	Med	Th(TH)	2014	Nat
37.	*Bromus hordeaceus*	Eua(Sm)	Th-TH	2010, 2014	
38.	*Bromus madritensis 10–15*	EuW&S, AfrN	Th	2013	Cas
39.	*Bromus rigidus*	Med.	Th-TH	2014	Cas
40.	*Bromus sterilis*	Eua(Med)	Th	1994, 2010–2014	
41.	*Bromus tectorum*	Eua(Cont)	Th	1994, 2010–2014	
42.	*Buglossoides arvensis arvensis*	Eua	Th-TH	2010, 2011, 2014	
43.	*Calamagrostis epigejos*	Eua(Med)	H-G	1994, 2003, 2009–2014	
44.	*Capsella bursa-pastoris*	Cosm(Med)	Th	1994, 2010, 2011, 2014	
45.	*Cardaria draba*	Eua(Med)	H	1994, 2010, 2011, 2013	
46.	*Carduus acanthoides*	Eur(Med)	TH	1994, 2003, 2009–2012	
47.	*Carex hirta*	Eua(Med)	G	2012	
48.	*Catalpa bignonioides* (juv.)	AmN	MM	2010	Nat
49.	*Celtis australis* (juv.)	Med Cult	MM(M)	2009, 2010, 2012, 2013	Nat
50.	*Celtis occidentalis* (juv.)	AmN	MM(M)	2010	Nat -Inv
51.	*Centaurea biebersteinii*	Eur(Cont)	TH-H	2003, 2009–2014	
52.	*Centaurea cyanus*	Med(Cosm)	Th	2010–2014	Nat
53.	*Centaurea diffusa*	Eua(Cont)	Th	2009–2014	
54.	*Cephalaria transsilvanica*	Pont-Med	TH	2010–2014	

No	Species	Origin	Life form	Identific. date	Invasive status
55.	*Cerastium brachypetalum*	Med	Th	1989, 1994, 2003, 2009–2013	
56.	*Cerastium fontanum*	Eua	Ch-H	2010–2013	
57.	*Cerastium glomeratum*	Cosm	Th	2010–2014	
58.	*Chelidonium majus*	Eua	H	1994	
59.	*Chenopodium album*	Cosm	Th	2010–2013	
60.	*Chenopodium strictum*	Eua(Cont)	Th	2010–2014	
61.	*Chondrilla juncea*	Eua	H	2003, 2010–2014	
62.	*Cichorium intybus*	Eua	H-TH	2012, 2014	
63.	*Cirsium arvense*	Eua(Med)	G	2003, 2009–2013	
64.	*Cirsium vulgare*	Eua	TH	2003, 2011, 2012, 2014	
65.	*Clematis vitalba*	Euc(Med)	N-Li	2009–2011, 2013, 2014	
66.	*Convolvulus arvensis*	Cosm	H-G	2009, 2010, 2012, 2014	
67.	*Conium maculatum*	Eua	Th-TH	1989, 2009–2012	
68.	*Consolida regalis s. l.*	Eua	Th	2009, 2014	
69.	*Conyza bonariensis*	AmS	Th	2010, 2012–2014	Cas
70.	*Conyza canadensis*	AmN	Th	1989, 2003, 2009–2014	Inv
71.	*Crepis foetida rhoeadifolia*	Pont-Med	Th	1989, 2003, 2009–2014	
72.	*Cuscuta sp.*	-	Th	2012, 2013	Inv
73.	*Cynodon dactylon*	Cosm	G-H	1989, 2009–2013	
74.	*Cynoglossum officinale*	Eua	TH	2009–2011, 2013, 2014	
75.	*Dactylis glomerata s. l.*	Eua(Med)	H	2009–2011, 2014	
76.	*Dasypyrum villosum*	Med	Th	2010–2014	
77.	*Datura stramonium*	Cosm	Th	2009	Nat
78.	*Daucus carota carota*	Eua(Med)	TH-H	2009, 2011, 2012, 2013	
79.	*Descurainia sophia*	Eua	Th	1994	
80.	*Dichanthium ischaemum*	Eua(Med)	H	2012	
81.	*Digitaria ischaemum*	Circ	Th	2010, 2012, 2013	
82.	*Digitaria sanguinalis*	Cosm	Th	2003, 2009, 2010, 2012, 2013	
83.	*Diplotaxis muralis*	Med	Th(TH)	2009	
84.	*Echinochloa crus-galli*	Cosm	Th	1989, 2010	

No	Species	Origin	Life form	Identific. date	Invasive status
85.	*Echium vulgare*	Eua	TH	2010, 2011–2014	
86.	*Elymus hispidus s. l.*	Eua(Cont)	G	2010	
87.	*Elymus repens repens*	Circ	G	2010, 2012	
88.	*Eragrostis minor*	Euc(Med)	Th	2009–2011, 2013	
89.	*Eragrostis pilosa*	Euc(Med)	Th	1989, 2010	
90.	*Erigeron annuus*	AmN	Th-TH-H	2009–2014	Inv
91.	*Erigeron strigosus*	AmN	Th-TH-H	2013, 2014	Inv
92.	*Erodium cicutarium*	Cosm	Th	2014	
93.	*Eryngium campestre*	Pont-Med	H	2012	
94.	*Erysimum cuspidatum*	Eua(Cont)	Th(TH)	2010	
95.	*Erysimum diffusum*	Eua(Cont)	TH(H)	2010, 2013, 2014	
96.	*Euphorbia cyparissias*	Eua	H-G	2010, 2011, 2013, 2014	
97.	*Euphorbia esula tommasiniana*	Eua-Cont	H	2014	
98.	*Euphorbia maculata*	AmN	Th	2009, 2010, 2012–2014	Inv
99.	*Falcaria vulgaris*	Eua(Med)	Th-TH	2012	
100.	*Fallopia aubertii*	As	H	2010	Cas
101.	Fallopia convolvulus	Circ	Th	2010, 2013, 2014	
102.	*Festuca arundinacea orientalis*	Euc	H	2010	
103.	*Fraxinus?americana*	AmN	MM	2010, 2012, 2014	Cas
104.	*Fraxinus ornus* (juv.)	Med	M-MM	2010	
105.	*Galium aparine*	Circ	Th	2010, 2014	
106.	*Galium humifusum*	Pont-Balc	H	2011, 2013, 2014	
107.	*Galium spurium*	Circ	Th	1994, 2011	
108.	*Geranium purpureum* (RL)	Med	H	2010	
109.	*Geranium pusillum*	Eur(Med)	Th	2010, 2011	
110.	*Geranium robertianum*	Cosm	Th-TH	2010	
111.	*Geranium rotundifolium*	Eua(Med)	Th	2010, 2011, 2014	
112.	*Gleditsia triacanthos* (juv.)	AmN	MM	2009, 2010, 2012, 2014	Nat
113.	*Glycyrrhiza echinata*	Pont-Med	H	2010	
114.	*Helianthus annuus*	AmN-AmCentr	Th	2014	Nat
115.	*Helianthus tuberosus*	AmN	G	2009, 2010, 2012	Inv
116.	*Hordeum murinum*	Eua(Med)	Th	2003, 2009–2014	

No	Species	Origin	Life form	Identific. date	Invasive status
117.	*Hordeum vulgare*	Orientul Apropiat	Th	1994	Nat
118.	*Humulus lupulus*	Eua	U	2009, 2010	
119.	*Hypochoeris radicata*	Eur	H	2010	
120.	*Ipomoea purpurea*	AmTrop	Th	2010	Nat
121.	*Juglans regia* (juv.)	Balc-Cauc-Anat	MM	2009–2014	Nat
122.	*Juncus tenuis*	AmN	H	2010, 2013	Nat
123.	*Knautia arvensis*	Eur	H	2012	
124.	*Lactuca saligna*	Med	TH	2009, 2010, 2014	
125.	*Lactuca serriola*	Eua(Med)	Th-TH	2009–2014	
126.	*Lamium purpureum*	Eua	Th	2010, 2011, 2014	
127.	*Lathyrus tuberosus*	Eua(Med)	H(G)	2010, 2013	
128.	*Lepidium campestre*	Eur(Med)	Th	2010	
129.	*Lepidium virginicum*	AmN	Th(TH)	2009, 2010, 2014	Cas
130.	*Linaria genistifolia*	Eua(Cont)	H	1989, 1994, 2003–2014	
131.	*Linaria vulgaris*	Eua	H	2009, 2010, 2012	
132.	*Lolium perenne*	Cosm	H	2009, 2013	
133.	*Lotus corniculatus*	Eua	H	2009, 2011, 2012	
134.	*Lycopersicon esculentum*	AmS	Th	2010	Cas
135.	*Lythrum salicaria*	Cosm	H-HH	2003	
136.	*Mahonia aquifolium*	AmN	M	2010, 2013	Nat
137.	*Malus domestica* (juv.)	Hybrid	MM	2009–2013	Nat
138.	*Malva sylvestris*	Eua-Cosm	Th-TH-H	2003, 2010, 2011	
139.	*Matricaria chamomilla*	Eua(Med)	Th	2010–2014	
140.	*Matricaria perforata*	Eua	Th-TH	1994, 2010, 2014	
141.	Medicago lupulina	Eua	TH(H)	2010, 2011	
142.	*Medicago minima*	Eua(Med)	Th	2014	
143.	*Medicago sativa falcata*	Eua	H	2003, 2012	
144.	*Medicago sativa sativa*	AsCentrW	Ch-H	2009–2011, 2013, 2014	Nat
145.	*Melica?transsilvanica*	Eua(Cont)	H	2010	
146.	*Melica ciliata*	Euc-Balc	H	2010, 2011, 2013	
147.	*Melilotus alba*	Eua	Th(TH)	2011	
148.	*Melilotus* sp.	Eua	Th(TH)	2010, 2011	
149.	*Melilotus officinalis*	Eua(Cont)	Th(TH)	2009–2013	
150.	*Mentha longifolia*	Eua(Med)	H-G	2011	
151.	*Morus alba* (juv.)	China	MM	2009–2014	Inv

No	Species	Origin	Life form	Identific. date	Invasive status
152.	*Nasturtium officinale*	Cosm	HH	1989, 1994, 2003, 2009–2014	
153.	*Onopordum acanthium*	Eua	Ht	1989, 1994, 2009, 2011, 2012, 2014	
154.	*Oxalis stricta*	AmN	TH	2009	Nat
155.	*Oxalis dillenii*	AmN	Th-TH	2010, 2014	Nat
156.	*Panicum dichotomiflorum*	AmN	Th	1994, 2003, 2009, 2010, 2012	Cas
157.	*Panicum miliaceum*	AmN	Th	1989	Nat
158.	*Papaver rhoeas*	Cosm	Th	2010, 2011–2014	
159.	*Parietaria officinalis*	Med	H	2009	
160.	*Parthenocissus inserta*	AmN	N-Li	1989, 1994, 2003, 2009–2011, 2014	Inv
161.	*Petrorhagia prolifera*	Pont-Med	Th	2012	
162.	*Petrorhagia saxifraga*	Pont-Med	Ch	2009, 2010, 2012–2014	
163.	*Phaseolus vulgaris*	Venez, NW Argent	Th	2010	Cas
164.	*Philadelphus coronarius*	Italia, Austria, Cauc	M	2010	Cas
165.	*Phragmites australis*	Cosm	G(HH)	2010	
166.	*Phytolacca americana*	AmN	Th	2009	Inv
167.	*Picris hieracioides*	Eua	TH-H	2010, 2012, 2014	
168.	*Plantago indica*	Eua(Cont)	Th	2012	
169.	*Plantago lanceolata*	Eua	H	2010, 2014	
170.	*Plantago major major*	Eua(Med)	H	2010	
171.	*Poa angustifolia*	Eua	H	1994, 2010, 2011, 2014	
172.	*Poa annua*	Cosm	Th(TH)	2010, 2014	
173.	*Poa compressa*	Eur	H	2013	
174.	*Poa pratensis*	Circ	H	2010	
175.	*Polygonum aviculare*	Cosm	Th	2003, 2009–2014	
176.	*Polygonum persicaria*	Cosm	Th	2012	
177.	*Populus ×canadensis* (juv.)	Canada	MM	2010	Cas
178.	*Populus alba* (juv.)	Eua	MM(M)	1989, 2009–2011, 2013	
179.	*Populus nigra* (juv.)	Eua	MM	2009, 2010–2014	
180.	*Populus tremula* (juv.)	Eua	MM(M)	2010	

No	Species	Origin	Life form	Identific. date	Invasive status
181.	*Portulaca oleracea oleracea*	Cosm	Th	2003, 2010, 2012–2014	Nat
182.	Potentilla argentea argentea	Eua	H	2010, 2013, 2014	
183.	*Prunus cerasifera* (juv.)	Pont-Balc	M	1994, 2009–2014	Nat
184.	*Prunus persica* (juv.)	China	MM	2010	Nat
185.	*Pyrus pyraster*	Eur	M-MM	2013	
186.	*Raphanus sativus*	Cult	Th-TH	2014	Cas
187.	*Reseda lutea*	Eua(Med)	TH(H)	1994, 2003	
188.	*Robinia pseudacacia* (juv.)	AmN	MM	1989	Inv
189.	*Rosa sp.*	-	N	2009, 2012	
190.	*Rubus caesius*	Eur	N	2003, 2010–2012	
191.	*Rubus sp.*	-	N	2012–2014	
192.	*Rumex?acetosella*	Cosm	H(G)	2013	
193.	*Rumex obtusifolius s. l.*	Eur	H	2010, 2014	
194.	*Rumex patientia s. l.*	Eua(Cont)	H	2010, 2011, 2014	
195.	*Rumex pulcher s. l.*	Atl-Med	Th(TH)	2012	
196.	*Salsola kali ruthenica*	Eua	Th	2003, 2010, 2012, 2014	
197.	*Salvia nemorosa nemorosa*	Euc	H	2012	
198.	*Sambucus ebulus*	Eua(Med)	H	1989, 2003, 2010–2012, 2014	
199.	*Saponaria officinalis*	Eua(Med)	H	1989	
200.	*Senecio vernalis*	Eua(Cont)	Th-TH	2010, 2011, 2014	
201.	*Senecio vulgaris*	Eua	Th-TH	2011, 2011, 2014	
202.	*Setaria pumila*	Cosm	Th	2009–2012	
203.	*Setaria viridis*	Eua	Th	2009–2013	
204.	*Silene latifolia alba*	Eua	Th(Th)	2009, 2010, 2014	
205.	*Silene vulgaris vulgaris*	Eua	H(Ch)	2010, 2011, 2014	
206.	*Sisymbrium loeselii*	Eua(Cont)	Th(TH)	2011	
207.	*Sisymbrium orientale*	Pont-Med	Th(TH)	1994, 2009–2014	
208.	*Solanum nigrum*	Cosm	Th	2009, 2010, 2013, 2014	
209.	*Sonchus oleraceus*	Cosm	Th	2003, 2009–2014	
210.	*Sorghum halepense*	AfrN As EurS	H(G)	1998, 1994,2003, 2009–2014	Inv
211.	*Stellaria media*	Cosm	Th(TH)	2010, 2011, 2014	

No	Species	Origin	Life form	Identific. date	Invasive status
212.	*Tanacetum vulgare*	Eua	H	1994, 2010, 2011	
213.	*Taraxacum erythrospermum*	Eua(Med)	H	2009	
214.	*Taraxacum officinale*	Eua(Cosm)	H	1994, 2009–2011, 2014	
215.	*Thlaspi arvense*	Eua(Med)	Th	1994	
216.	*Tilia platyphyllos* (juv.)	Eua	MM	2009	
217.	*Tilia tomentosa viridis* (juv.)	Balc-Pan	MM	2013	
218.	*Torilis arvensis*	Euc(Med)	H	2009–2014	
219.	*Tragopogon dubius*	Euc(Med)	TH	2009–2011, 2013, 2014	
220.	*Tragopogon orientalis*	Euc, EurE	Th-TH	2014	
221.	*Tribulus terrestris*	Med	Th	2009, 2010, 2013	
222.	*Trifolium sp.*	-	Th(TH)	2009	
223.	*Triticum aestivum*	Cult	Th	2010, 2011, 2013, 2014	Cas
224.	*Ventenata dubia*	Med	Th	2010	
225.	*Verbascum banaticum*	Pont-Balc	TH	1994, 2010	
226.	*Verbascum phlomoides*	Eur	TH	2003, 2009–2014	
227.	*Verbascum speciosum*	Pont-Pan-Balc	TH	2011	
228.	*Verbena officinalis*	Cosm	H	2009–2012	
229.	*Veronica arvensis*	Eua	Th	2010, 2011	
230.	*Veronica persica*	AsSW	Th-TH	2014	Inv
231.	*Vicia cracca*	Eua	H	2010, 2011, 2013	
232.	*Vicia grandiflora*	Pont-Pan-Balc	Th	2010, 2011, 2014	
233.	*Vicia sativa nigra*	Eua	Th	2010, 2014	
234.	*Vicia sativa sativa*	?Med	Th	2013, 2014	Cas
235.	*Vicia villosa*	Eur	Th(TH)	2010, 2014	
236.	*Viola arvensis*	Cosm	Th	2009–2011, 2013, 2014	
237.	*Viola kitaibeliana*	Pont-Med	Th	2014	
238.	*Viola tricolor*	Eua	TH-Th-H	2010, 2011	
239.	*Vitis vinifera s. l.*	AsSW-Med	M-Li	2009, 2010, 2013, 2014	
240.	*Vulpia myuros*	Eua(Cosm)	Th	2010, 2011, 2013, 2014	
241.	Xanthium italicum	EurS	Th	1989	Inv

No	Species	Origin	Life form	Identific. date	Invasive status
242.	*Xeranthemum annuum*	Pont-Med	Th	2003	
243.	*Zea mays*	Cult(Mexic)	Th	1989, 2014	Cas

Abbreviations: *Origin:* Afr – Africa; Argent – Argentina; Am – America; Amc – Central America; Anat – Anatolia; As – Asia; Balc – Balcanic; Eur – Europe; Eua – Eurasia; Euc – Central Europe; Cauc – Caucasus; Circ – Circumpolare; Cult – cultivate; Cosm – Cosmopolite; Med – Mediterranean; Sm – Submediterranean; Pan – Panonic; Pont – Pontic; Trop – Tropical; Venez – Venezuela; N – North; E – East; S – South; W – West. *Life form:* Ch – Chamaephyte; G – Geophyte; H – Hemicryptophyte; HH – Helohydrophyte; Li – Liana; MM – Macrophanerophyte; M – Microphanerophyte; N – Nanophanerophyte; Th – Therophyte annual; TH – Therophyte biannual; juv. – juvenile. Red List – RL. *Invasive status:* Cas – casual (an alien plant that reproduces occasionally in an area, but requires repetitive introductions for its persistence); Nat – naturalized (an alien plant that reproduces constantly and sustains populations over several life cycles without direct human intervention); Inv – invasive (an alien plant that produces reproductive offspring, often in large numbers, at considerable distances from the parental plants and over large areas).

Analyzing the the list of species is found following numerically situation, presented in Table 2.

Table 2. The total species from analizing categories

	No species	Invasive	Potentially invasive (Nat-Inv)	Casual	Naturalized	Segetale	Red List (RL)
Native	182	-	-	-	-	-	1
Aliens	62	19	2	17	24	12	-
Total	243	16	2	17	24	12	1

Discussions

Among the main adventives species with invasive character from Romania (Anastasiu & Negrean, 2005; 2007), in Drobeta Turnu Severin railway station have been identified the following: *Ambrosia artemisiifolia, Acer negundo, Conyza canadensis, Erigeron annuus, Ailanthus altissima, Xanthium italicum, Morus alba, Helianthus tuberosus, Robinia pseudoacacia* and *Parthenocissus inserta.*

The following segetal species belong to the 132 problematic weeds species from România (Chirilă, 2001): *Amaranthus albus, A. blitoides, A. powellii, A. retroflexus,*

Conyza canadensis, Veronica persica, Xanthium italicum, Sorghum halepense, Centaurea cyanus, Datura stramonium, Portulaca oleracea and *Vicia sativa.*

Ambrosia artemisifoliia – demonstrate tendency to invade agricultural crops. In România was included in the list of quarantine weeds in 1972 (Anghel et al., 1972, in Sîrbu C., 2012). *A. artemisiifolia* is considered one of the most harmful plants that produce allergies (hay fever, dermatitis) (Sîrbu C, 2012). In company of *Robinia pseudoacacia* and *Ailanthus altissima* is on the blacklist of the most aggressive 100 species of the world (DAISIE). From Mehedinţi County was first identified into Romania, to the Orşova Railway Station in the year 1908 (leg. Jávorka) (Jávorka 1925, Prodan 1939, Borza 1947). It summoned from the: Atârnaţi, Balota, Butoieşti, Ciochiuţa, Drobeta Turnu Severin, Erghevița, Gârniţa, Gura Motrului, Gura Văii, Igiroasa, Lunca Banului, Orşova, Prunişor, Strehaia, Tâmna, Valea Alba, Valea Cernei (Ianovici, 2003). It forms true belts on the roadside in the Danube Gorge and the Geopark Platoul Mehedinţi: between Cireşu and Jupâneşti.

Sorghum halepense – is one of the most aggressive weed species of the world, causing serious losses into agricultural cultures, especially in those hoes, vineyards, orchards. Because of this aggression is on the quarantine weed list of many countries (Sârbu C., 2012).

Artemisia annua – reported in 1858 from Banat (Heuffel, 1858).

Bidens vulgata – reported for the first time from the Danube Gorge – Orşova (Morariu, 1966) where he arrived with maritime and fluviatile transports.

Bromus madritensis – recently reported from Constanţa Harbour and the Bucureşti Triaj Railway Station (Anastasiu & Negrean, 2008, Făgăraş et al, 2008; Anastasiu et al., 2009; Anastasiu et al, 2011).

Conyza bonariensis – recently reported as a new species for Romania Drobeta Turnu Severin Railway Station (Negrean & Ciortan, 2012).

Celtis australis – sporadically in Banat, Oltenia and Dobrogea, and Matacă în 2003 indicates the species from the Iron Gates Natural Park (Sârbu & Oprea, 2011). Found by the authors in the Danube Gorge – August 2012.

Celtis occidentalis – invasive plant (weed) in SUA and Chile, in Hungary considered among the most invasive neophytes, in Romania subspontan in Muntenia, northwestern of the Country (Sîrbu & Oprea, 2011). Found by the authors in the Danube Gorge – August 2012.

REFERENCES

ANASTASIU A., NEGREAN G., 2005: *Alien plants in Romania (I*), Analele Horti Bot. Bucurest. /1993–1994/, p. 135–137, Bucureşti.

ANASTASIU A., NEGREAN G., **2008:** *Invadatori vegetali în România*, Editura Universităţii Bucureşti, 81 pp., Bucureşti.

ANASTASIU A., NEGREAN G., 2008: *New alien plants to Romania*, Analele Universităţii Craiova. Seria Agricultură, Montanologie, Cadastru, 38/B:1–10, Craiova.

ANASTASIU P., NEGREAN G., FĂGĂRAŞ M., SAMOILĂ C., COGĂLNICEANU P., 2009: *Constanţa harbour (România) as a major gateway and reservoir for alien plant species*, Acta Horti Bot. Bucurest., 36, p. 41–60, Bucureşti.

ANASTASIU P., NEGREAN G., SAMOILĂ C., MEMEDEMIN D., COGĂLNICEANU D., 2011: *A comparative analysis of alien plant species along the Romanian Black Sea coastal area. The role of harbours*, J. Coast. Conserv. DOI 10.1007/s11852–011–0149–0.

BORZA Al., 1947–1949: *Conspectus Florae Romaniae Regionumque Affinium*, Tipografia Cartea Românească, 360 pp., Cluj.

CHIRILĂ C., 2001: *Biologia buruienilor. Organografie, corologie, dinamică, importanţă*, Editura Ceres, 303 pp., Bucureşti.

DAISIE, 2014: *Delivering Alien Invasive Species Inventories for Europe*. http://www.europe-aliens.org/ [accessed: 2014 Oct. 31].

FĂGĂRAŞ M., SKOLKA M. ANASTASIU P., COGĂLNICEANU P., NEGREAN G. BĂNICĂ G., TUDOR M., SAMOILĂ C., 2008: *Biodiversitatea zonei costiere a Dobrogei dintre Capul Midia şi Capul Kaliacra*, Editura Ex. Ponto, 428 pp., Constanţa.

HEUFFEL L., 1858: *Enumeratio Plantarum in Banatu Temesiensis sponte crescentium et frecventius cultarum*, Verh. Zool.-Bot. Ges., 8, p. 39–240, Wien.

IANOVICI N., 2003: *Approaches on the Invasive alien taxa in Romania – Ambrosia artemisiifolia (Ragweed) I*, Annals of West University of Timişoara, ser. Biology, XII, p. 87–104, Timişoara.

JÁVORKA S., 1925: *Magyar flora (Flora Hungarica*) (I+II), 1307 pp., Budapest.

POPESCU A., SANDA V., 1998: *Conspectul florei cormofitelor spontane din România*, Editura Universităţii din Bucureşti, 336 pp., Bucureşti.

MORARIU I., 1966: *Bidens vulgatus Green, specie nouă în flora României*, Stud. Cerc. Biol. Ser. Bot., 18(4), p. 303–306, Bucureşti.

NEGREAN G., CIORTAN I., 2012: *Conyza bonariensis*, *o nouă plantă cu caracter invaziv în flora României*, Analele Univ. Craiova, Facultatea de Horticultură, Ser. Biologie, XVII (LIII), p. 743–748, Craiova.

PRODAN I., 1939: *Flora pentru determinarea şi descrierea plantelor ce cresc în România*, Ed. a II-a, I (1+2), Editura Cartea Românească, 1278 pp., Cluj-Napoca.

PYŠEK P., RICHARDSON D. M., REJMÁNEK M., WEBSTER G. L., WILLIAMSON M., KIRSCHNER J., 2004: *Alien plants in checklists and floras: towards better communication between taxonomists and ecologists*. *Taxon*, 51(1), p. 131–143.

RICHARDSON D. M., PYŠEK P., REJMÁNEK M., BARBOUR M. G., PANETTA F. D., WEST C. J., 2000: *Naturalization and invasion of alien plants: concepts and definitions*. *Diversity & Distrib.,* 6, p. 93–107.

SĂVULESCU T. (ed.) 1952–1976: *Romanian Flora*. Vols 1–13, Editura Academiei Române, Bucureşti.

SÂRBU C., 2012: *Plantele de carantină invasive în România*. http://www.uaiasi.ro/PN_2/ALIPLASP/files/Plante-carantina-invazive-RO.pdf

TUTIN T. G., HEYWOOD V. H., BURGES N. A., MOORE D. M., VALENTINE D. H., WALTERS S. M., WEBB D. A. (eds.), 1964–1980: *Flora Europaea*, Cambridge University Press, 1–5 (1: 464 pp.; 2: 455 pp.; 3: 370 pp.; 4: 505 pp.; 5: 452 pp.), Cambridge.

TUTIN T. G., BURGES N. A., CHATER A. O., EDMONDSON J. R., HEYWOOD V. H., MOORE D. M., VALENTINE D. H., WALTERS S. M., WEBB D. A., (eds.), 1993, reprinted 1996: *Flora Europaea*, 2nd ed., *Psilotaceae to Platanaceae,* Cambridge University Press, 1, 581 pp., Cambridge.

THE CONSERVATION STATUS OF NATURA 2000 HALOPHILOUS HABITATS IN GURGHIU VALLEY (MUREŞ COUNTY)

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THE CONSERVATION STATUS OF NATURA 2000 HALOPHILOUS HABITATS IN GURGHIU VALLEY (MUREŞ COUNTY)

Abstract: The study includes the results of the research, embodied in the identification and analysis of the conservation status of halophilous habitats in Gurghiu Valley.
Based on the dominant and characteristic species in the vegetal communities installed on the salt soils in the studied area, we consider that these fall within two types of Natura 2000 habitats: 1310 – *Salicornia* and other annuals colonising mud and sand and 1530* – Pannonic salt-steppes and salt-marshes.
The assessment of the conservation status of habitats was done by assessing the conservation status at EU level, namely by the integration into one of the four categories: "favourable", "unfavourable-inadequate", "unfavourable-bad", and "unknown", according to the stated attributes for each habitat, to the threats of destruction and to the dangers that may lead to their destruction or disappearance.
From our investigations and using the assessment matrix of conservation status of habitats in terms of the occupied area, it has been found that, the habitat 1310 is in a favourable conservation status, with the current tendency of a stable surface of the habitat type, and the habitat 1530 is in an unfavourable-inadequate conservation status – the current tendency of the area occupied by the type of habitat is shrinking.
Considering the assessment matrix of the conservation status of the habitat in terms of structure and specific functions of the habitat, both types of habitats identified are in an unfavourable-inadequate conservation status – structure and functions of the habitat type, including its typical species, are not in good

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conservation conditions, much of the area occupied by the habitat are damaged regarding its structure and functions.

Keywords: Natura 2000, habitats, conservation status.

Introduction

Mures county is located in the center-north area of Romania, with a surface of 6696 km^2, lowers slightly in steps from the volcanic peaks in Gurghiu and Calimani Mountains to the middle of Transylvanian Plain. It is crossed by Mures Valley and fragmented by its tributaries.

Salted lakes and springs in Mures county are located along diapire folds crease county on the eastern part in the area of Subcarpathians and Târnavelor Plateau, on a clearing line connecting localities Sovata, Ideciu de Jos, Jabeniţa and Brâncoveneşti.

The studied area belongs to communes Gurghiu and Solovastru located in Gurghiu Valley, Mureş county.

Salt massif is situated in the center of the eastern diapir alignment, namely on the west side of the anticline lifting of Ilimbav-Benţid-Gurghiu foundation. Jabenita salt body is one of the largest in Transylvania Depression, salt thickness in its central part reaching about 2000 m.

Here are likely to be faced halophytic phytocoenosis developed on solonetz and solonchak soils.

Climate in the territory in which this salty vegetation grows is boreal-continental type, with moderate temperatures and rainfall and average middle strength winds. Mean annual temperature ranges between 7.6–9.2°C and average annual precipitation are 595,6–750 mm/year.

Material and methods

Observations and field researches were conducted in the territory belonging to the villages Jabeniţa (Solovăstru commune), Orşova and Comori (Gurghiu commune), during the plants vegetation period (2013–2014).

The presence of Natura 2000 habitats was established based on the dominant and characteristic species identified. The codes and the description of the habitat types correspond to the NATURA 2000 and Romanian system of classification (Doniţă et al., 2005; Doniţă et al., 2008; Gafta & Mountford, 2008).

In a natural habitat, the conservation status is derived from all the factors acting upon it and upon the characteristic species, which may affect long-term distribution, structure and functions, as well as the survival of the characteristic species.

The parameters used to calculate the conservation status of a habitat are present-day range, area covered by habitat within range, specific structures and functions, and future prospects.

For each habitat type, each parameter is assessed according to specific criteria using reference to threshold and maximum values and is assigned to one of three classes, "Favourable" (green), "Unfavourable-Inadequate" (amber) or "Unfavourable-Bad" (red). A fourth classification, "Unknown" (grey) is used if the available information does not allow exact classification of the parameters (Habitats Directive 92/43/EEC).

Results and discutions

Despite their limited extension, the studied continental salty areas show a remarkable phytogeographic interest. Their phytosociological interest becomes even greater as this salty vegetation is an isolated enclave of salted areas from the direction Dej that heads east.

The vegetation pattern is closely related to the relief determined by salt content, salt quality, and the depth of soil layer with higher salt concentration.

The variation of salt concentration in the soil determines a micro-zonal distribution of phytocenoses.

Based on the dominant and characteristic species in the vegetal communities installed on the salt soils in the studied area, we consider that these fall within two types of Natura 2000 habitats:

- **1310 – *Salicornia* and other annuals colonising mud and sand**
- **1530* – Pannonic salt-steppes and salt-marshes**

The high salinity tolerant vegetation edified by *Salicornia* ssp. (habitat 1310) grow on solonchak soil and requires a concentration of soluble salts of 1,5–3%.

All the other phytocoenoses identified in this salty land are more cohesive meadows assigned to priority habitat 1530* which prefer concentration of salts in the surface horizon of soil between 0.03–1.5%.

1310 *Salicornia* and other annuals colonising mud and sand

Correspondence with habitat's classification in Romania: R1511, R1515, R1518, R1527, R1528.

CLAS. PAL.: 15.1

In the studied area this type of habitat was described on the Jabeniţa Salty Lake, where seasonal variations of the water level occur, and also on Slatini Hill, on both slopes of it to Comori Village and Orşova village. This is an intrazonal type of vegetation and stretch on relatively small areas.

The origin of salt in Slatini Hill is quite recent and comes from leaks from several salty springs. The salt here is part of salty layers from Ideciu-Praid.

The vegetation of these salty habitats has a permanent pioneer character and supports various conditions of moisture; it can be found in areas susceptible to temporary inundation in spring and high aridity in summer.

The vegetal communities of this habitat in the studied area are dominated by *Salicornia europaea*.

The identified plant associations:

Salicornietum europaeae Wendelbg.1953

This association includes halophilic phytocenosis grown as a belt in the upper (western) part of Jabeniţa lake and on the Slatini Hill, Orşova.

Floristically, this association is characterized by the almost exclusively dominance of *Salicornia europaea* species and the presence of some obligate halophytes (eu-halophyte) such as *Suaeda maritima, Aster tripolium* ssp. *pannonicus, Puccinellia limosa.* All these species achieves a vegetation level of about 30 cm height. The lower level, most often lying on the ground, is made of *Spergularia salina*, and *Cryspis aculeatus*.

Phytocoenoses of this association are the only ones that can withstand such high concentrations of salts. Among them often are empty saline places where the solonchak soil produces on dry summers white scabs („deserta salsis").

It has high conservation value.

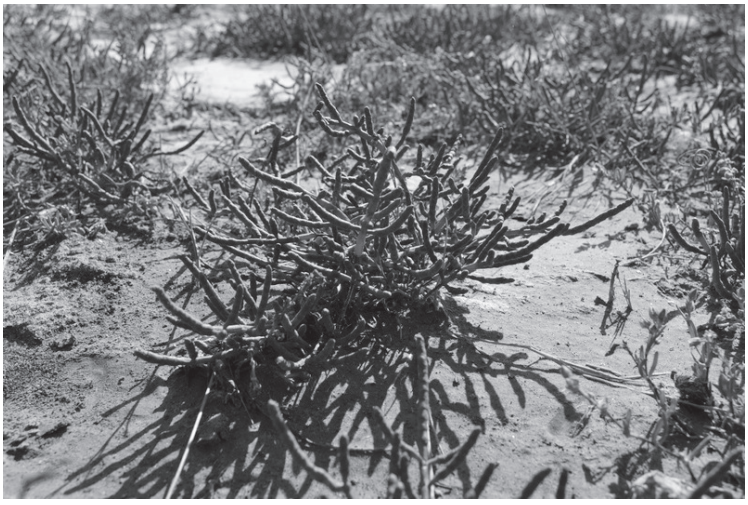

Fig. 1. Habitat 1310 – *Salicornia* and other annuals colonising mud and sand

The overall state of conservation of the habitat is relatively good or satisfactory, confirmed by the presence and abundance of characteristic species, with a tendency to improve by the application of management measures

The natural range of habitat and areas it covers within this site are stable.

1530* Pannonic salt-steppes and salt-marshes

Correspondence with habitat's classification in Romania: R1502-R1510, R1512-R1514, R1516, R1517, R1519-R1526, R1529-R1533

CLAS. PAL.: 15.A1, 15.A2

Salt steppes and salt marshes are highly influenced by a Pannonian climate with its extreme temperatures and arid summers. The enrichment of salt in the soil is due to high evaporation of groundwater during summer. There is a characteristic zoning of vegetation, based on the flooding regime, with dominant salt tolerant grasses and herbs that withstand or even demand salt concentrations in the groundwater.

These habitats are mostly of a natural origin and partly influenced by grazing and drainage.

The halophytic vegetation consists of plant communities on dry saltpans and steppes, wet salt meadows and the annual plant communities of periodically flooded salt lakes, with their typical zoning.

In the studied territory this type of habitat was identified in the south part of Jabeniţa Lake where seasonal oscillation of soil moisture occurs.

On the Slatini Hill this habitat cover large areas on the sides of salty springs.

The plant associations identified in territory:

Puccinellietum limosae Soó 1936

The *Puccinelia* and other herbaceous halophytic species are plant communities that prefer a fluctuation of soil moisture and a high salinity in the soil (1–1.5%).

This is the most representative halophilous plant association of the investigated area. The recognition species of Festuco-Puccinellietea class have a relatively high constancy

Plantaginetum maritimae Rapaics 1927

Phytocoenosis of this association occupies relatively small areas in the north of the Jabenita lake and compact groups on Slatini Hill, between Gurghiu and Orşova. These phytocoenoses stretch on the edges of *Salicornia europaea* communities giving this salty landscape a mosaic appearance.

Triglochineto maritimi – Asteretum pannonici (Soó 1927) Ţopa 1939

It is one of the most representative halophilous associations of the investigated area, occupying variable territories. Populate fields with moderate salinity and excess moisture, often reaching into contact with the *Phragmitetum vulgaris* association.

Scorzonero – Juncion gerardii (Wendelberger 1943) Vicherek 1973

Include phytocenosis in areas with salt concentrations between 0.5–1% in the first 15 cm of soil and constant moisture.

Coenoses are dominated by *Juncus gerardii*, with a remarkable abundance of *Aster tripolium* ssp. *pannonicus*.

It is the most common type of halophilous hygrophile lawn.

The general state of conservation of the habitat is relatively good, confirmed by the great variety of species, with a tendency to improve by the application of management measures.

The natural range of habitat and areas it covers within this site are stable or slightly decreasing due to overgrazing. This habitat has specific structure and functions necessary for its long-term conservation, and a high probability of maintaining them in the foreseeable future.

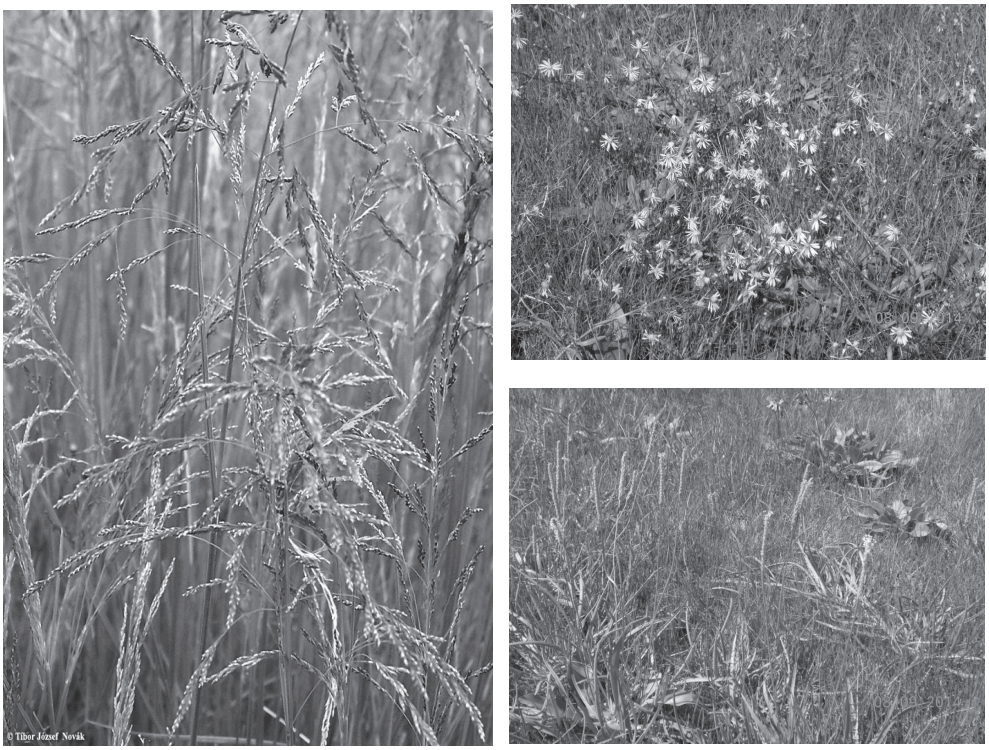

Fig. 2. 1530* – Pannonic salt-steppes and salt-marshes

Table 1. Evaluation matrix for conservation status of habitats in terms of occupied area and in terms of structure and specific functions of the habitat

Habitat type	Conservation status	
	in terms of occupied area	in terms of structure and specific functions of the habitat
1310 – *Salicornia* and other annuals colonising mud and sand	F	U-I
1530* – Pannonic salt-steppes and salt-marshes	U-I	U-I

Conservation status of habitats in terms of structure and specific functions of the habitat: F (Favourable) – The current trend of the area of the habitat type is stable; U-I (Unfavourable – Inadequate) – The current trend of the area of the habitat type is decreasing (less than

25% of habitats' area); U-B (Unfavourable – Bad) – The current trend of the area of habitat type is decreasing (more than 25% of area).
Conservation status of habitats in terms of structure and specific functions of the habitat: F (Favourable) – Structure and functions of the habitat type, including its typical species, are in good condition; U-I (Unfavourable – Inadequate) – Structure and functions of the habitat type, including its typical species, are not in good condition, in less than 25% of area habitats are damaged in terms of their structure and functions; U-B (Unfavourable – Bad) – Structure and functions of the habitat type, including its typical species, are not in good condition, in more than 25% of area habitats are damaged in terms of their structure and functions.

The main risk factors/threats for these habitats are:
For the habitat 1310
– A major threat is drainage, which lowers the groundwater level. The lowering of the water table connected with river regulation especially the drainage, have a very negative impact on this habitat. As a consequence leads to a gradual loss of salinity as the salts are slowly washed back into the soil, leading to the disappearance of salt-tolerant plant communities.
– Ploughing for agriculture is still a major threat. Surviving areas are also threatened by other effects of agriculture – the impact of eutrophication and a lack of management. These leads to changes in the floristical composition of phytocoenoses.
– Arable fields and other agricultural areas often surround salty lands. The main source of pollution tends to be fertilizers and herbicides from farms, which cause the eutrophication of waters and a change in the plant communities composition.

For the habitat 1530
– Traditional forms of land use, such as grazing by domestic livestock, have been practiced in this region for many years. High stocking rates during dry summers usually result in overgrazing. Overgrazing brings with it other threats related to the transporting of livestock, the proliferation of weeds, rubbish deposits, trampling. The main effects of overgrazing include negative changes in the species composition of communities, a decreased vegetation cover, and an increase of nitrophilous and ruderal plant species.
– The change of land use, by extending the crops could also involve a change in the floristic composition of these grasslands.
– The ruderalisation of habitat, and the intrusion of invasive species.
– Climate change has serious effects on the water level in salt marshes and steppes. Climatic changes can be a primary reason behind invasions of alien and native species. Long droughts or heavy rainfall leading to water regime change, and that cause the changes in the structure of flora (xerofile or hygro-and hydrophilic species appear and develop).

Proposed management measures

– Traditional grazing consistent with local practices:

– maintaining a traditional use of grasslands where it enabled the emergence of high conservation value grasslands;

– grazing intensity will be controlled as to be within acceptable limits established for defining favourable conservation status

– Carrying out reconstruction activities of the soil for degraded and abandoned lands.

– Restricting the use of fertilizers, especially of those chemicals that can induce sequence to another type of habitat.

– Controlling invasive species, including the woody plants: inhibits the expansion of invasive allochthonous or woody species by removing them manually or mechanically.

– Increasing or maintaining at least the current level of plant populations, and maintaining the natural status of the habitats, or as close to it as possible.

– Continuing education and raising awareness on the need to preserve species and habitats where people live.

Conclusions

There were studied the halophilous habitats in Jabeniţa village (Solovăstru commune), Orşova and Comori villages (Gurghiu commune).

In the study area two halophilous Natura 2000 habitate types were identified:

– 1310 – *Salicornia* and other annuals colonising mud and sand

– 1530* – Pannonic salt-steppes and salt-marshes

From our investigations and using the assessment matrix of conservation status of habitats in terms of the occupied area, it has been found that, the habitat 1310 is in a favourable conservation status, with the current tendency of a stable surface of the habitat type, and the habitat 1530 is in an unfavourable-inadequate conservation status – the current tendency of the area occupied by the type of habitat is shrinking.

Considering the assessment matrix of the conservation status of the habitat in terms of structure and specific functions of the habitat, both types of habitats identified are in an unfavourable-inadequate conservation status – structure and functions of the habitat type, including its typical species, are not in good conservation conditions, much of the area occupied by the habitat are damaged regarding its structure and functions.

The most important risk factors/threats are: overgrazing, the regularisation of water courses especially drainage works; the change of land use and the occurrence of some alien invasive species.

Regarding the impact that these threats will have on long term, if the management measures will not be taken they will cause the decrease of specific halophilous plant communities in favour of ruderal plants and also changes in floristical composition as a result of invasion of alien species.

REFERENCES

BOŞCAIU N. ET. AL., 1994: *Lista roşie a plantelor vasculare dispărute, periclitate, vulnerabile şi rare din flora României*, Ocrot.Nat.Med.Înconj., 38(1): 45–56.

CIOCÂRLAN V., 2009: *Flora ilustrată a României. Pteridophyta et Cormophyta*. Editura Ceres, 1141pp., Bucureşti.

COLDEA GH., (red.) 1997: *Les associations végétales de Roumanie*, tom 1, *Les associations herbacées naturelles*, Presses Universitaires de Cluj, Cluj-Napoca.

COLDEA GH., (red.) 2012: *Les associations végétales de Roumanie*, tom 2, *Les associations herbacées anthropogène*, Presses Universitaires de Cluj, Clluj-Napoca.

COMBROUX I., SCHWOERER CH., 2007: *Evaluarea statutului de conservare a habitatelor şi speciilor de interes comunitar din România-Ghid metodologic*, Editura Balcanic, Timişoara.

DONIŢĂ N., POPESCU A., PAUCĂ-COMĂNESCU M., MIHĂILESCU S., BIRIŞ I.-A., 2005: *Habitate din România*, Editura Tehnică Silvică, 496 pp., Bucureşti.

DONIŢĂ N., POPESCU A., PAUCĂ-COMĂNESCU M., MIHĂILESCU S., BIRIŞ I. A., 2006: *Habitatele din România. Modificări conform amendamentelor propuse de România şi Bulgaria la Directiva Habitate (92/43/EEC)*, Editura Tehnică Silvică, Bucureşti.

GAFTA D., MOUNTFORD O. (coord.), 2008: *Manual de interpretare a habitatelor Natura 2000 din România*, Editura Risoprint, 101pp., Cluj-Napoca.

IUCN, 1994: *IUCN Red List Categories. Prepared by the IUCN Species Survival Commission.* IUCN, Gland, Switzerland.

OPREA A., 2005: *Lista critică a plantelor vasculare din România*, Editura Univ. „Al. I. Cuza", 668 pp., Iaşi.

SĂMĂRGHIŢAN M., 2005: *Flora şi vegetaţia Văii Gurghiului*, Ed. University Press, Târgu-Mureş.

SÎRBU I., ŞTEFAN N., OPREA A., 2013: *Plante vasculare din România, determinator ilustrat de teren*, Editura „Victor B. Victor", 1320 pp., Bucureşti.

STANOVA V., VALACHOVIC M. (EDS.) 2002: *Katalog biotopov Slovenska*, Edit. Daphne, 225 pp., Bratislava.

TUTIN T. G., BURGES N. A., CHATER A. O., EDMONSON J. R., HEYWOOD V. H., MOORE D. M., VALENTINE D. H., WALTERS S. M., WEBB D. A. (eds.) 1993: *Flora Europaea, (Psilotaceae to Platanaceae)*, 2nd ed., Cambridge University Press, 1, 581 pp., Cambridge.

TUTIN T. G., HEYWOOD V. H., BURGES N. A., MOORE D. M., VALENTINE D. H., WALTERS S. M., WEBB D. A. (eds) 1964–1980: *Flora Europaea*, 1–5. 1st Ed., Cambridge University Press, 464, 455, 370, 523, 467 pp., Cambridge.

*** 1979 *Bern Convention on the Conservation of European Wildlife and Natural Habitats; and all further recommendations and resolutions*.

*** *Habitats Directive 92/43/EEC – Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora* (OJ L 206, 22.7.92).

*** 2007, *Ordonanţa de Urgenţă nr. 57 din 20 iunie 2007 privind regimul ariilor naturale protejate, conservarea habitatelor naturale, a florei şi a faunei sălbatice, Anexa 3b. MO nr. 442/29 iunie*.

Fig. 3. Jabeniţa salt lake

Fig. 4. Slatini Hill

EVALUATING THE CONSERVATION STATUS OF ENDEMIC, RARE AND STRICTLY PROTECTED FLORA FROM GRADISTEA MUNCELULUI CIOCLOVINA NATURAL PARK

Elena Alina Rovină[1], Liviu Rovină[2]

EVALUATING THE CONSERVATION STATUS OF ENDEMIC, RARE AND STRICTLY PROTECTED FLORA FROM GRADISTEA MUNCELULUI CIOCLOVINA NATURAL PARK

Abstract: Gradistea Muncelului Cioclovina Natural Park is located within the domain of Sureanu Mountains in the Southern Carpathians. The flora and fauna diversity is unique through its composition. The wooden vegetation forms natural forests. Natural meadows and pastures give us a whole world of colors and smells which delights our senses. The wonderful world of plants shelters thousands of creatures of various sizes, from large carnivores (bear, wolf and lynx) to gracious deer, wildcat, badger and many others. More than 500 plant species have been identified throughout the park, some endemics: *Hepatica transsilvanica*, *Thymus comosus*, *Symphytum cordatum* and *Sorbus borbasii*. Among the rare species the following are worth mentioning: *Drosera rotundifolia, Campanula serrata* and *Galanthus nivalis.*

Keywords: conservation status, endemic, rare, strictly procteted flora.

Introduction

PNGMC is a protected natural area meant for the protection and preservation of landscape complexes where the interaction of human activities with nature over time has created distinct areas with high cultural, biological and landscaping value.

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The study undertaken between 2013 and 2014 had as its main objective the assessment of the conservation status of endemic, rare and strictly protected flora identified in Grădiştea Muncelului Cioclovina Natural Park, namely: *Hepatica transsilvanica, Thymus comosus, Symphytum cordatum, Sorbus borbasii, Drosera rotundifolia, Galanthus nivalis* and *Campanula serrata.*

Materials and methods

To assess the conservation status of plant species in the park area several routes were observed, as follows: Grădiştei Valley, Godeanu Valley, Streiului Valley, Crivadiei Gorges, Cioclovina, Fundatura Ponorului.

For each species the following were noted: lifespan, flowering period, living environment, bioforms, geoelements, ecological indexes, protection status, characteristic habitats.

The parameters used for the assessement of the conservation status of plant species were: species habitat, population size and characteristics of the species, distribution area, pressure and threat factors. Assessment of the conservation status of flora (according to Article 17 of the Habitats Directive 92/43/EEC) was conducted based on the methodology developed by Combroux & Schwoerer (2007) – „the traficlight method", by including them in one of four categories: green (favorable conservation status), orange (inappropriate, unfavorable conservation status), red (totally inadequate, unfavorable conservation status) and gray (unknown, insufficient information).

Results and discussions

Between 2013 and 2014 inventoring and monitoring activities were undertaken for endemic, rare and strictly protected flora in PNGMC, leading to the identification of the following species: *Hepatica transsilvanica*, *Thymus comosus, Symphytum cordatum, Sorbus borbasii, Drosera rotundifolia, Galanthus nivalis* and *Campanula serrata.*

1. *Hepatica transsilvanica* Fuss. – liverworts (Fam. *Ranunculaceae*)

Perennial species, hemicriptophyte, sporadically found in forests, thickets and groves in hilly and mountainous regions, as high as the spruce area. It blooms in April-May. It is a mesophilic species, microthermic, which prefers moderately moist and moderately acid soils. It is a Romanian endemic species, also known as a tertiary relict in the flora of Romania (Sârbu et al., 2013).

Habitats where it can be seen: 91V0 (Dacian Beech forest – *Symphyto-Fagion*), 9160 (Sub-Atlantic & Medio-European oak or oak-hornbeam forests of *Carpinion betuli)*, 8210 (Calcareous rocky slopes with chasmophytic vegetation).

This taxon is referred to as not threatened in the Red List of superior plants in Romania (Oltean et al., 1994).

While the study was conducted, some individuals with white flowers were identified.

LOCATION PLOTS	CRIVADIEI GORGES, BOLII HILL, FUNDĂTURA PONORULUI, STREIULUI VALLEY, COSTEŞTI – GRĂDIŞTEI VALLEY
Habitat type	91V0 Dacian Beech forest – (Symphyto – Fagion)
Habitat surface	Cca 11 ha
Vegetation cover	70–100% herbaceous layer
Species richness	10–20 species / plot
Total number of individuals/mp	12–15
Pressures	Grazing in the forest, solid waste disposal upstream in innapropriate places, which are then transported downstream to the characteristic habitats of the species (Crivadiei Gorges)
Threats	deforestation, reducing of the characteristic habitat of the species, harvesting this species for sale
Distribution area	Stable
Population	Stable
Habitat	Sufficient for the long-term survival of the species
Perspectives	Long-term viability is not jeopardized. The influence of pressure and threat factors is not significant.
CONSERVATION STATUS	FAVORABLE

Fig. 1. *Hepatica transsilvanica* Fuss.

2. *Thymus comosus* Heuff. – thyme (Fam. *Lamiaceae*)

The species is a perennial cameophite, known as a Carpathian endemic of Romania. It blooms in June-July. It grows sporadically on grassy, sun-exposed rocks, from oak to spruce areas. It is a rock-inhabiting species, heliophyte, from temperate areas (temperate, sub-mountainous), widespread on moderate to slightly acid soils that are poor in mineral nitrogen.

Habitats where it can be found: 4060 (Alpine and boreal heaths), 6170 (Alpine and subalpine calcareous grasslands), 6190 (Rupicolous Pannonian grasslands – Stipo-Festucetalia pallentis), 6210 (Semi-natural dry grasslands and scrubland facies on calcareous substrates – Festuco – Brometea (*important orchid sites), 8120 (Calcareous and calcashist of the mountain to alpine levels (*Thlaspietea rotundifolii*), 8220 (Siliceous rocky slopes with chasmophytic vegetation), 91Q0 (Pinus sylvestris forests calcicolous Carphatian Western), 8230 (Siliceous rock with pioneer vegetation of the Sedo-Scleranthion or of the *Sedo-white-Veronicion dillenii*) 6240* (Sub-Pannonian steppic grasslands), 8160* (Medio-European Calcareous scree of hill and mountain levels), 8210 (Calcareous rocky slopes with chasmophytic vegetation), 40A0* (Subcontinental peri-Pannonian scrub).

This secies is referred to as not threatened in the Red List of superior plants in Romania (Oltean et al., 1994).

Fig. 2. *Thymus comosus* Heuff.

LOCATION PLOTS	CRIVADIEI GORGES, LUNCANI-TÂRSA, POIANA OMULUI, FUNDĂTURA PONORULUI
Habitat type	6230* (Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and sub-mountain areas, in Continental Europe*)*, 6520 (Mountain hay meadows), 4060 (Alpine and boreal heaths), 6170 (Alpine and subalpine calcareous grasslands), 8210 (Calcareous rocky slopes with chasmophytic vegetation)
Habitat surface	Cca 2 ha
Vegetation cover	60–90%
Species richness	23–31 species / plot
Total number of individuals/mp	10–12
Pressures	grazing harvesting this species for medicinal purposes
Threats	grazing harvesting this species for medicinal purposes
Distribution area	Stable
Population	Stable
Habitat	Sufficient for the long-term survival of the species
Perspectives	Long-term viability is not jeopardized. The influence of pressure and threat factors is not significant.
CONSERVATION STATUS	FAVORABLE

3. *Symphytum cordatum* Wᴀʟᴅs (Fam. *Boraginaceae*)

The species is perennial, hemicriptophyte, frequently common in beech-spruce areas, in forests or weedy areas. It blooms in May-June. It is a mezohigrophylic species, heliosciaphylic – sciaphylic, microthermic, euritrophic. Prefers moderately moist, moderately acid soils. It is considered a Carpathian endemic of Romania.

Habitats where it can be found: 91V0 (Dacian Beech forest – *Symphyto – Fagion*), 9410 (Acidophylous *Picea* forests of montane to alpine levels – *Vaccinio – Piceetea*), 40A0* (Subcontinental peri-Pannonic scrub).

LOCATION PLOTS	Crivadiei Gorges, Strei Valley, Grădiştei Valley, Godeanu Valley
Habitat type	91V0 (Dacian Beech forest – *Symphyto-Fagion)*
Habitat surface	Cca 100 ha
Vegetation cover	50–85% herbaceous layer
Species richness	15–25 species / plot
Total number of individuals/mp	15–20
Pressures	Were not observed

Threats	Deforestation, grazing in the forest
Distribution area	Stable
Population	Stable
Habitat	Sufficient for the long-term survival of the species
Perspectives	The influence of pressure and threat factors is not significant.
CONSERVATION STATUS	FAVORABLE

Fig. 3. *Symphytum cordatum* Walds

4. *Sorbus borbasii* Jav. – rowan (Fam. *Rosaceae*)

Shrub species, fanerophyte, rare, common in oak-beech areas, prevalent on limestone cliffs. It blooms in May-June. The species is mezotermophylic, xero-mezophylic and preferes a calcarous substrate. The species preference for light is moderate, the species prefering light and less shading. It is described as an endemic, Carpathian species of Romanian flora.

Habitats where it can be found: 40A0* (Subcontinental peri-Pannonic scrub*)* 9530* (Sub-Mediteranean pine forests with endemic black pines).

LOCATION PLOTS	Crivadiei Gorges, Bolii Hill
Habitat type	40A0* (Subcontinental peri-Pannonic scrub*)*
Habitat surface	Cca 3 ha
Vegetation cover	25–35%
Species richness	11–28 species/plot

Total number of individuals/mp	3
Pressures and Threats	Were not observed
Distribution area	Stable
Population	Stable
Habitat	Sufficient for the long-term survival of the species
Perspectives	The influence of pressure and threat factors is not significant.
CONSERVATION STATUS	FAVORABLE

Fig. 4. *Sorbus borbasii* Jav.

5*. Drosera rotundifolia* L. – heaven's dew (Fam. *Droseraceae)*

The species is perennial, hemicriptophyte, sporadically spread in *Sphagnum* bogs. Blooms in June-August. It has oligotrophic, higrotrophyc and strongly acidophilic preferences. It is a plant with a preference for light, microthermic, that grows on moist soils, often poorly ventilated. It is a Glacial relict in Romanian flora. Habitats where it can be seen: 7110* (Active raised bogs), 7140 (Transition mires and quaking bogs*),* 7150 (Depressions on peat surfaces of the Rhynchosporion). It is listed as rare species in the Red List of superior plants in Romania (Oltean et al., 1994).

Fig. 5. *Drosera rotundifolia* L.

Fig. 6. Peat bog

LOCATION PLOTS	Poiana Omului
Habitat type	R5411 Southeast Carpathian marshes, eu-mezotrophyc with *Carex nigra* ssp. *nigra*, *Juncus glaucus* and *J. effusus*

Habitat surface	Cca 1 ha
Vegetation cover	100%
Species richness	35 species/plot
Total number of individuals/mp	Over 100 rosettes/mp
Pressures	grazing
Threats	Grazing, draining the bogs
Distribution area	Stable
Population	Unstable population. For the persistence and expansion of the habitat of this species, we considered necessary to prohibit grazing in the vicinity and within the marsh and the prohibition of draining
Habitat	Sufficient for the long-term survival of the species.
Perspectives	Long-term viability is at risk due to grazing inside the bog
CONSERVATION STATUS	UNFAVORABLE – INADEQUATE

6. *Campanula serrata* (Schult) Hendrych (*Campanula napuligera* Schur) (Fam: *Campanulaceae*)

The species is a perennial hemicriptophyte, a Carpathian endemite frequent in pastures, shrubs, rock debris from beech to alpine areas. It blooms in July-September. Demands mesophilic oligomezotrophic, moderately acid conditions.

Habitats where it can be found: 4060 (Alpine and boreal heaths*),* 4030 (European dry heaths) 6230* (Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and sub-mountain areas, in Continental Europe), 6150 (Siliceous alpine and boreal grasslands).

The species is listed in Annex II b of the Habitats Directive (European Endangered) and the Emergency Ordinance no. 57 of 20 June 2007 on the status of protected natural areas, natural habitats, flora and fauna, Annex 3b, M.O. no. 442/29 June.

LOCATION PLOTS	Poiana Omului
Habitat type	6230* Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and sub-mountain areas, in Continental Europe)
Habitat surface	Cca 4 ha
Vegetation cover	85–100%
Species richness	35 species/plot
Total number of individuals/mp	5–10 individuals
Pressures	Excessive grazing
Threats	excessive grazing, harvesting

Distribution area	Stable
Population	Stable
Habitat	Sufficient for the long-term survival of the species.
Perspectives	Long-term viability is at risk due to excessive grazing
CONSERVATION STATUS	FAVORABLE

Fig. 7. *Campanula serrata* (Schult) Hendrych

7. *Galanthus nivalis* L. – snowdrop (Fam. *Amaryllidaceae*)

Perennial species, Geof, Central European, sub-Mediterranean. In terms of preferences versus ecological factors is a species of semiumbra, euriterma, eurihidra, euriionica mesophyll eutrophic, prevalent on soils with a moderate content in mineral nitrogen. Caryology index 2n = 24. Blooms in the period from February to March. It grows from steppe to the lower alpine region in the woods, thickets and meadows.

Listed as a not threatened species in the Red List of superior plants in Romania (Oltean et al., 1994) and in Annex 5A of OUG 57 / 2007; Annex V of the Habitats Directive.

Habitats where it can be found: 91L0 (Illyrian oak-hornbeam forests – Erythronio-Carpinion), 91Y0 (Dacian oak-hornbeam forests), 9160 (Sub-Atlantic & medio-European oak or oak-hornbeam forests of Carpinion Bethulia).

Fig. 8. *Galanthus nivalis* L.

LOCATION PLOTS	Fundătura Ponorului, Lunca Ponorului
Habitat type	9150 (Medio-European limestone beech forests of the Cephalanthero-Fagion)
Habitat surface	Cca 1 ha
Vegetation cover	85–100% herbaceous layer
Species richness	15–25 species / plot,
Total number of individuals/mp	More than 50 individuals
Pressures	Harvesting for marketing
Threats	grazing in the forest, deforestation, harvesting for marketing
Distribution area	Stable
Population	Stable
Habitat	Sufficient for the long-term survival of the species
Perspectives	The influence of pressure and threat factors is not significant.
CONSERVATION STATUS	FAVORABLE

Conclusion

In order to maintain the favorable conservation status, we consider the following management measures as necessary:

– Ensuring a constant grazing with a rigorous number of animals established on the basis of studies;

– Respecting the grazing period;

– Prohibiting drainage;

– Awareness raising for shepherds and pasture owners regarding the importance of these species.

REFERENCES

ARDELEAN A., MOHAN G., 2008: *Flora medicinală a României*, Editura ALL, Bucureşti.

ARDELEAN A., MOHAN G., 2006: *Botanică sistematică*, Editura „Vasile Goldiş" University Press, Arad.

BOŞCAIU N., PETERFI ŞT. L., 1993: *Aspecte de vegetație din Cheile Crivadiei* (judeţul Hunedoara), Sargetia, Acta Musei Devensis, Deva.

CIOCÂRLAN V., 2009: *Flora ilustrată a României*, Editura Ceres, Bucureşti.

CIOCÂRLAN V., 1996: *Împărţirea fitogeografică a teritoriului României. Provinciile floristice*, St. Cercet. Biol., seria Biol. Veg., 48, Bucureşti.

CRISTEA V., GAFTA D., PEDROTTI F., 2004: *Fitosociologie*, Editura Presa Universitară Clujană, Cluj-Napoca.

DIHORU G., NEGREAN G., 2009: *Cartea roşie a plantelor vasculare din România*, Editura Academiei Române, Bucureşti.

DONIŢĂ N., IVAN D., COLDEA G. SANDA V., POPESCU A., CHIFU T., PAUCĂ – COMĂNESCU M., MITITELU D., BOŞCAIU N., 1992: *Vegetația României*, Editura Tehnică Agricolă, Bucureşti.

SÂRBU I., ŞTEFAN N., OPREA A., 2013: *Plante vasculare din România. Determinator ilustrat de teren*, Editura Victor B. Victor.

POPESCU G., 2009: *Introducere în botanica filogenetică,* Editura Sitech, Craiova.

SANDA V., ÖLLERER K., BURESCU P., 2008: *Fitocenozele din România*, Editura ARS Docendi, Bucureşti.

TUTIN T.G., BURGES N.A., CHATER A.O., EDMONDSON J.R., HEYWOOD V.H., MOORE D.M., VALENTINE D.H., WALTERS S.M., WEBB D.A., 1993: *Flora Europaea*, Vol. 1, Ed. II, Cambridge University Press.

WEBER HE, MORAVEC J., THEURILLAT JP, 2000: *International code of phytosociological nomenclature*. J. Veg. Sci., 11: 739–768.

NATURAL HABITATS IN THE IRON GATES NATURAL PARK AREA

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NATURAL HABITATS IN THE IRON GATES NATURAL PARK

Abstract: This paper presents the natural habitats in the Iron Gates Natural Park, as and associations making up these habitats. Also, are present locations of the associations wich constitute the natural habitats in the Iron Gates Natural Park area.

Keywords: natural habitats, Iron Gates Natural Park area.

FRESHWATER HABITATS

3150 Natural eutrophic lakes with Magnopotamion or Hydrocharition – type vegetation

PAL.CLASS.: 22.13 x (22.41 or 22.421)

Lemnetea de Bolós et Masclans 1955

Hydrocharitetalia Rübel 1933

Hydrocharition Rübel 1933

Hydrocharitetum morsus-ranae van Langendonck 1935 – Calinovăţ Island, Gurile Nerei area (Matacă, 2005)

Ceratophylletum demersi Hild 1956 – Calinovăţ Island (Matacă, 2005)

Salvinio-Spirodeletum Slavić 1956 – Gurile Nerei area, Dunăre-in nearby locality Pojejena (Matacă, 2005)

Potametea Tx. et Prgs. 1942

Potametalia W. Koch 1926

Potamion pectinati (Koch 1926) Görs 1977

Potamogetonetum nodosi (Soó1960) Segal 1964 – in nearby ruins of Tricule, Ponicova Valley, Divici (Matacă, 2005)

Nymphaeion Soó 1964

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Polygono-Potametum natantis Soó 1927 – Pojejena, Ostrovul Moldova Veche (Matacă, 2005)

Trapetum natantis Kárpati 1963 – Gurile Nerei area, Divici, Calinovăţ Island, Ostrovul Moldova Veche (Matacă, 2005)

Magnopotamion (Vollmar 1947) Den Harto get Segal 1964 p. foed.

Myriophyllo-Potametum Soó 1934 – deep water in the south of Ostrovul Moldova Veche (Morariu, Danciu, Ularu, 1973)

NATURAL AND SEMI-NATURAL GRASSLAND FORMATIONS

6110 * Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi

PAL.CLASS.: 34.11

Koelerio-Corynephoretea Klika in Klika et Novák 1941

Alysso-Sedetalia Moravec 1967

Alysso alyssoides-Sedion albi Oberd. et T. Müller in T. Müller 1961

Alysso petraei-Sedetum hispanici Schneider-Binder et al. 1971 – Plavişeviţa, Cazanele Mari, Dubova, Mraconia Valley (Schneider-Binder, Boşcaiu, Coldea, Lupşa, Resmeriţă, 1971); – Cazanele Mari, Cazanele Mici, Cazanele Mari near Ponicova Cave, Cazanele Mari near Cave of Veterani, Saraorschi Valley (Matacă, 2005)

Alysso-Sedetum Oberd. et Th. Müller 1961 subass. *banaticum* Boşcaiu et Resmeriţă 1069 – meadow of Mraconia, Ogradena Valley, Ogaşul Căprăriţa, Sohodol Valley (Boşcaiu, Resmeriţă, 1969)

Saponario glutinosae-Convolvuletum cantabricae Matacă 2003 – Danube Valley – downstream of Iuţi, Danube confluence with Valea Roşie, upstream of Schela Cladovei (Matacă, 2005)

Convolvulo cantabricae-Dasypyretum villosae Matacă 2003 – Saraorschi Valley, Gura Văii (Matacă, 2005)

ROCKY HABITATS AND CAVES

8120 Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)

PAL.CLASS.: 61.2

Thlaspietea rotundifolii Br.-Bl. 1948

Galio-Parietarietalia officinalis Gergely et al. 1966

Stipion calamagrostis Jenny-Lips et al. 1952

Parietarietum officinalis Csűrös 1958 – Mraconia Valley (Dihoru, Cristurean, Andrei, 1973); – Cazanele Mari, Ponicova Valley, Mraconia Valley (Matacă, 2005)

Parietario-Geranietum lucidi Gergely et al. 1966 – Danube Valley, the entrance of the Ponicova Cave, rock above the aven in the Ponicova Valley (Matacă, 2005)

Lamio bithynici-Parietarietum officinalis Matacă 2003 – Cazanele Mari, Cave of Veterani (Matacă, 2005)

Galietum erecti Pop et Hodişan 1964 – Cazanele Mici, Ponicova Valley, Cazanele Mari (Matacă, 2005)

Peltarion alliaceae H-ič (1956) 1958

Geranietum macrorrhizi Boşcaiu 1971 – left shore of Eşelniţa Valley (Matacă, 2005)

8210 Calcareous rocky slopes with chasmophytic vegetation

PAL.CLASS.: 62.1

Asplenietea trichomanis (Br.-Bl. in Meier et br.-Bl. 1934) Oberd. 1977

Potentilletalia caulescentis Br.-Bl. in Br.-Bl. et Jenny 1926

Potentillion caulescentis Br.-Bl. in Br.-Bl. et Jenny 1926

Drabo lasiocarpae-Ceterachetum officinarum Peia 1978 – Tricule-Cazanele Mari, Mraconia-Eşelniţa (Schneider-Binder, Boşcaiu, Coldea, Lupşa, Plămadă, Resmeriţă, Stoicovici, 1970); – Cazanele Mari, Valea Mare, Ponicova Valley, Tisoviţa Valley (Matacă, 2005)

Moehringion muscosae Horv. et H-ič in Horv. 1962

Campanuletum crassipedis Borza (1931) 1936 – Cazanele Mari (Schneider-Binder, Boşcaiu, Coldea, Lupşa, Plămadă, Resmeriţă, Stoicovici, 1970); (Matacă, 2005); – Cazanele Mici (Dihoru, Cristurean, Andrei, 1973)

Festuco-Brometea Br.-Bl. et R. Tx. ex Klika et Hadač 1944

Festucetalia valesiacae Br.-Bl. et R. Tx. ex Br.-Bl. 1949

Festucion valesiacae Klika 1931

Stachyo nitens-Cachrysetum ferulaceae Sanda et Popescu 1999 – south of the Plateau Mehedinţi-Târziu Valley, Oglănic Valley (Roman, 1974); – Virul Mic viaduct (Matacă, 2005)

Stipo pulcherrimae-Festucetalia pallentis Pop 1968

Seslerio-Festucion pallentis Klika 1931

Melico-Phleetum montani Boşcaiu et al. 1966 – Tisoviţa (Ogaşul Mare Valley), slope between Tisoviţa and Plavişeviţa (Schneider-Binder, Boşcaiu, Coldea, Lupşa, Plămadă, Resmeriţă, Stoicovici, 1970); – Oglănic Valley, Tisoviţa (Cioaca Goală), Padina Crucii viaduct, Slătinicul Mic, Ungureanu-Viaductul Padina Mică viaduct, Moşu viaduct, Bahna Valley, downstream of Moldova Nouă (Matacă, 2005)

Convolvulo cantabricae-Stipetum eriocaulis Matacă 2003 – Oglănic Valley, Tisoviţa (Ogaşul Mare Valley) (Matacă, 2005)

Brachypodio-Chrysopogonetalia (Horvatič 1958) Boşcaiu 1972

Danthonio-Brachypodion Boşcaiu 1972

Danthonio-Chrysopogonetum grylli Boşcaiu (1970) 1972 – Moldova Veche-Măceşti, Măceşti-Pojejena (Todor, Gergely, Bârcă, 1971); – Cerna Valley (Csűrös, Pop, Hodişan, Csűrös, 1968); – Sviniţa-Tricule (Popescu, Ştefureac, 1976);

– Plavişeviţa-Cazanele Mari (Şerbănescu, Sanda, 1970); – Dubova, Mraconia (Dihoru, Cristurean, Andrei, 1973); – downstream of Cazanele Mici, Saraorschi Valley, Hill of Eşelniţa, Cerna Valley, downstream of Moldova Nouă, Tricule, Oglănic Valley, Tisoviţa (Ogaşul Mare Valley) (Matacă, 2005)

Seslerietea albicantis Oberd. 1978 corr. Oberd. 1990

Seslerietalia coeruleae Br.-Bl. in Br.-Bl. et Jenny 1926

Seslerion rigidae Zólyomi 1939

Campanulo crassipedis-Seslerietum filifoliae Domin 1932 – Cazanele Mari (Matacă, 2005)

Campanulo crassipedis-Seslerietum filifoliae Domin 1932 – Cazanele Mari (Matacă, 2005)

Jurineo glycacanthae-Cephalarietum laevigatae Matacă 2003 – Coronini (mila 1039), Cazanele Mici (Matacă, 2005)

Forests of temperate Europe

91E0 * Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

PAL.CLASS.: 44.3, 44.2 and 44.13

Salicetea purpurea Moor 1958

Salicetalia purpureae Moor 1958

Salicion albae (Soó 1930 n. n.) Müller et Görs 1958

Salicetum albae Issler 1924 s. l. – Moldova Veche (Todor, Gergely, Bârcă, 1971); – Fântâna Ciucar area, Greben (Popescu, Ştefureac, 1976); – Cazanele Mari-Plavişeviţa (Şerbănescu, Sanda, 1970); – Danube confluence with Mraconia (Dihoru, Cristurean, Andrei, 1973); – Danube confluence with Eşelniţa, meadow of Danube between Eşeniţa and Orşova (Csűrös, Pop, Hodişan, Csűrös, 1968); – Bahna Valley (Roman, 1974)

91H0 * Pannonian woods with Quercus pubescens

PAL.CLASS.: 41.7373, 41.7374

Quercetea pubescenti-petraeae (Oberd. 1948, 1957) Jakucs 1961

Orno-Cotinetalia Jakucs 1931

Syringo-Carpinetum orientalis Jakucs 1959

Acantho longifolii-Quercetum pubescentis Jakucs et Fekete 1958 – Slătinicul Mic viaduct, Ungureanu-Viaductul Padina Mică viaduct, Oglănic Valley (Matacă, 2005)

Echinopo banatici-Quercetum pubescentis Boşcaiu et al. 1971 – Cazane, Porţile de Fier (Vârciorova-Gura Văii) (Jakucs, 1961); – Porţile de Fier (Horvat, Glavač, Ellenberg, 1974); – Tisoviţa (Valea Mare), Liubotina, Plavişeviţa (Boşcaiu, Lupşa, Resmeriţă, Coldea, Schneider, 1971); – Padina Mică viaduct, Baziaş (Matacă, 2005)

Aceri tatarico-Quercetum pubescentis Zólyomi et Jakucs 1957

Ceraso mahaleb-Quercetum pubescentis Jakucs et Fekete 1957 in Zólyomi 1958; – Cazanele Mici (Matacă, 2005)

9280 Quercus farnetto woods

PAL.CLASS.: 41.1B

Quercetea pubescenti-petraeae (Oberd. 1948, 1957) Jakucs 1961

Orno-Cotinetalia Jakucs 1931

Quercion farnetto Horvat 1954

Quercetum farnetto-cerris Georgescu 1945, Rudski 1949 – Caraşovăţ Valley (Dihoru, Cristurean, Andrei, 1973); – Sviniţa-Tricule, Glaucina Hill, Vârtop (Popescu, Ştefureac, 1976); – Tisoviţa, Plavişeviţa, Mraconia Valley (Boşcaiu, Lupşa, Resmeriţă, Coldea, Schneider, 1971); – south of the Plateau Mehedinţi-Alion Mountain, Târziu Valley (Roman, 1974); – Hill of Eşelniţa, Tricule, downstream of Moldova Nouă, Mraconia Valley, Tisoviţa (Cioaca Maslat), Cazanele Mari, Ciucarul Mare, plateau of Ciucarul Mare (Matacă, 2005)

9530 * (Sub-)Mediterranean pine forests with endemic black pines

PAL.CLASS.: 42.61 to 42.66

Quercetea pubescenti-petraeae (Oberd. 1948, 1957) Jakucs 1961

Orno-Cotinetalia Jakucs 1931

Syringo-Carpinetum orientalis Jakucs 1959

Pinetum pallasianae auct. rom. – Tricule (Matacă, 2005)

Special Areas of Conservation (SCI) in the Iron Gates Natural Park area (proposal)

REFERENCES

BOŞCAIU N., LUPŞA V., RESMERIŢĂ I., COLDEA G., SCHNEIDER E., 1971: *Vegetaţia lemnoasă mezo-xerotermă (Orno-Cotinetalia) din Defileul Dunării*, Ocrot. Nat., 15(1): 49–55, Bucureşti.

BOŞCAIU N., RESMERIŢĂ I., 1969: *Vegetaţia ierboasă xerofilă de aluviuni din sectorul valea Eşelniţa-valea Mraconiei al Defileului Dunării*, Stud. cerc. biol., ser. bot., 21(3), p. 209–216, Bucureşti.

CSŰRÖS ŞT., POP I., HODIŞAN I., CSŰRÖS-KÁPTALAN M., 1968: *Cercetări floristice şi de vegetaţie între Orşova şi Eşelniţa*, Contribuţii botanice, p. 277–312, Cluj-Napoca.

DIHORU G., CRISTUREAN I., ANDREI M., 1973: *Vegetaţia dintre Valea Mraconiei-Depresiunea Dubova din Defileul Dunării*, Acta Bot. Horti Buc. (1972–1973), p. 353–423, Bucureşti.

HORVAT I., GLAVAČ V., ELLENBERG H., 1974: *Vegetation Südosteuropas*, VEB Gustav Fischer Verlag Jena.

JAKUCS P., 1961: *Die phytozönologischen Verhältnisse der Flaumeichen-Buschwälder Sudöstmitteleuropas*, Akadémiai Kiadó, Budapest.

MATACĂ S. Ş, 2005: *Parcul Natural Porţile de Fier. Floră, vegetaţie şi protecţia naturii*, 550 pp., Editura Universitaria Craiova, Drobeta Turnu Severin.

MORARIU I., DANCIU M., ULARU P., 1973: *Die Vegetation der flussinel Moldova Veche*, Acta Botanica Horti Bucurestiensis 1972–1973, p. 465–500, Bucureşti.

POPESCU A., ŞTEFUREAC T. I., 1976: *Vegetationsforschungen aus dem Sektor Sviniţa-Trikule-Eisernes Tor Rumäniens*, Acta Bot. Horti Buc. (1975–1976), p. 341–368, Bucureşti.

ROMAN N., 1974: *Flora şi vegetaţia din sudul Podişului Mehedinţi*, Editura Acad. R.S.R., Bucureşti.

SCHNEIDER-BINDER E., BOŞCAIU N., COLDEA G., LUPŞA V., PLĂMADĂ E., RESMERIŢĂ I., STOICOVICI L., 1970: *Zur Felsenvegetation der Sektoren Eşelniţa-Mraconia und Kazanpass-Tricule (Durchbruchtal der Donau) I*, Rev. Roum. Biol.-Botanique, 15(5), p. 311–322, Bucharest.

SCHNEIDER-BINDER E., BOŞCAIU N., COLDEA G., LUPŞA V., RESMERIŢĂ I., 1971: *Zwei neue xerotherme Felsengesellschaften aus dem Durchbruchtal der Donau*, Rev. Roum. Biol.-Botanique, 16(2), p. 97–103, Bucharest.

ŞERBĂNESCU G., SANDA V., 1970: *Cercetări asupra vegetaţiei de luncă şi dealuri între Cazanele Mari şi Plavişeviţa*, Stud. cerc. biol., ser. bot., 22(3), p. 171–178, Bucureşti.

TODOR I., GERGELY I., BÂRCĂ C., 1971: *Contribuţii la cunoaşterea florei şi vegetaţiei din zona Defileului Dunării între oraşul Moldova Veche şi comuna Pojejena (judeţul Caraş-Severin)*, Contribuţii botanice, p. 203–256, Cluj-Napoca.

***** 2013:** *Interpretation manual of European Union habitats*, http://ec.europa.eu/environment/nature/legislation/habitatsdirective/docs/Int_Manual_EU28.pdf

"FLORAL JEWELRY" IN THE IRON GATES DEFILE

Sorina Ştefania Matacă[1]

"FLORAL JEWELRY" IN THE IRON GATES DEFILE

Abstract: This paper present the temporary exhibition "Floral jewelry" in the Iron Gates Defile. This exhibition presents phyto-historical considerations regarding the flora genesis of Iron Gates Natural Park. The exhibition was realized with occasion of *European Day of Parks* (EDoP) and World *Environment Day* (WED).

Keywords: exhibition, floral jewelry, the Iron Gates Defile.

The richness of flora discovered by eminent botanists in the first decades of the nineteenth century conferred the deserved prestige of unique European flora to the Danube Gorge. It was natural that the luxuriance flora of steep slopes in this area of the Danube continues to draw attention of botanists who helped establish phyto-geographic features of this territory.

Flora and geo-botanic research intensified in the latter part of the twentieth century along with hydropower construction due to the Iron Gates. The works for the construction of Hydropower System and Navigation of the Iron Gates were carried out in cooperation between Romania and Yugoslavia, occasioned scientific research of multilateral initiative of the Danube Gorge.

Since the territory was to expand the reservoir of the hydroelectric system could not be investigated further, Romanian Academy Presidium adopted the initiative of setting up in 1964 of the „Research Group Complex Iron Gates", which went multi-complex research- and this interdisciplinary area. Of the 14 collectives established in this research group, Collective of Flora and Vegetation, attended by 60 botanists in the country, has worked in 13 sectors of the Danube Gorge bounded between Moldova Veche and Turnu Severin on a length of 140 km.

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Fig. 1. "Floral jewelry" in the Iron Gates Defile

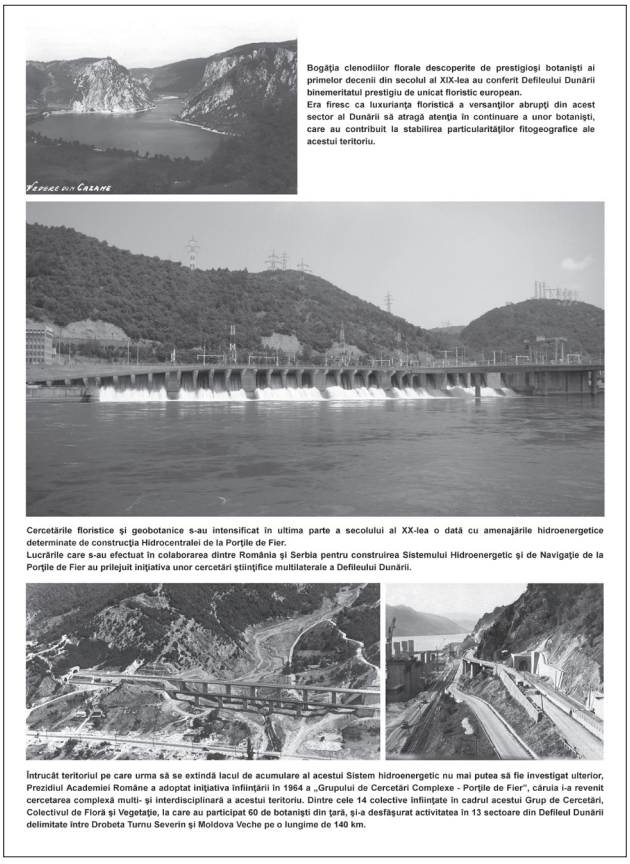

Fig. 2. Brief history of the flora and geo-botanic research

The complexity of the geological substratum and the rich limestone karsts areas has given the Iron Gates Gorge the reputation of being one of the most spectacular gorges in Europe. Floristic diversity of the Iron Gates Natural Park is explained by the assumption of many and varied interfering waves of migration from different types of flora-genetic whose remains have survived to these days in the shelter of rocks steep.

The large number of categories (taxa) determined to date (1875 vascular taxon, of which 1749 species, 120 subspecies, six varieties, divided into 570 genus and 131 families) representing 49.97% of all known species of our country. Thus, 0.48% of the country, as is the Iron Gates Natural Park, is half of the known species of our country, which explains the acquired floristic prestige of Iron Gates Gorge.

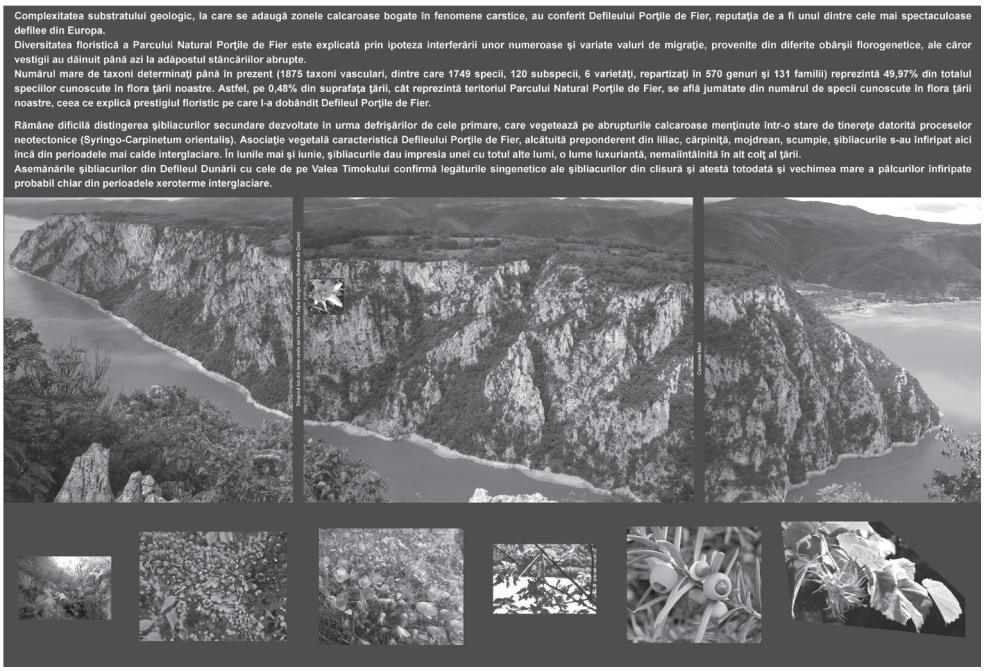

Fig. 3. Floristic diversity of the Iron Gates Natural Park

Phyto-historical considerations regarding the flora genesis of Iron Gates Natural Park

In the Danube Gorge there is a complex of species from the Ponto – Mediterranean strain, with extremely low current migration and colonization that seem to endure here at the end of the Miocene (6 million years). We could refer to *Saponaria glutinosa*, *Paronychia cephalotes*, *Ephedra distachya* (tendril).

If at the beginning of the twentieth century appeared in the Iron Gates Gorge from Drencova to Schela Cladovei, today, *Paronychia cephalotes* is found only in Tisoviţa and upstream of Schela Cladovei, and there are very few.

A similar age (6 million years) is attributed to *Cachrys ferulacea* (Iron Gates dill), suggested the extended area in South Western Balkans to Italy with Sicily irradiation. Iron Gates dill is one of the most interesting plants in the eastern part of the Danube Gorge.

Despite the link between the Pannonian Basin and the Pontic Danube Gorge flora and vegetation has largely kept its own Carpathian-Balkan mountain flora characteristic. Most items remain stationed in the Eastern Pontic gorge (*Goniolimon tataricum*).

Also, most Ponto – Balkans items remain located in the Eastern part of the gorge (*Crocus moesiacus*, *Jurinea mollis*, *Piptatherum holciforme*).

Ponto-Mediterranean species have a wide spread over the entire length of the gorge (*Asparagus tenuifolius*, *Cotinus coggygria*, *Piptatherum virescens*, *Xeranthemum annuum*, *Petrorhagia saxifraga*, *Lathyrus venetus*, *Scutellaria altissima*, *Stipa bromoides*, *Convolvulus cantabrica*).

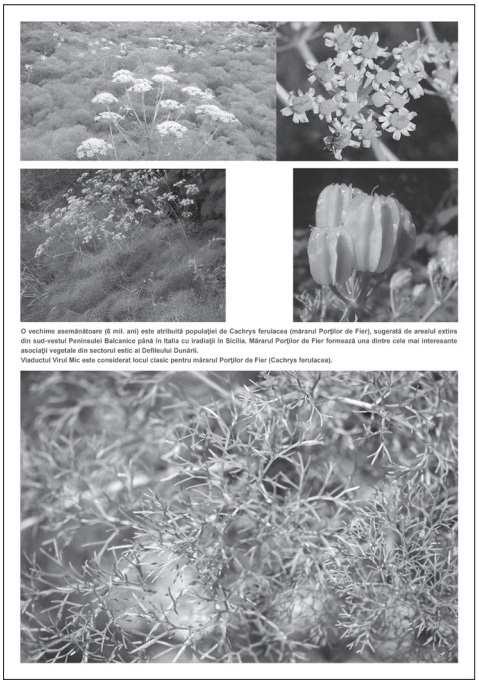

Fig. 4. Ponto-Mediterranean species (*Saponaria glutinosa, Paronychia cephalotes, Ephedra distachya*)

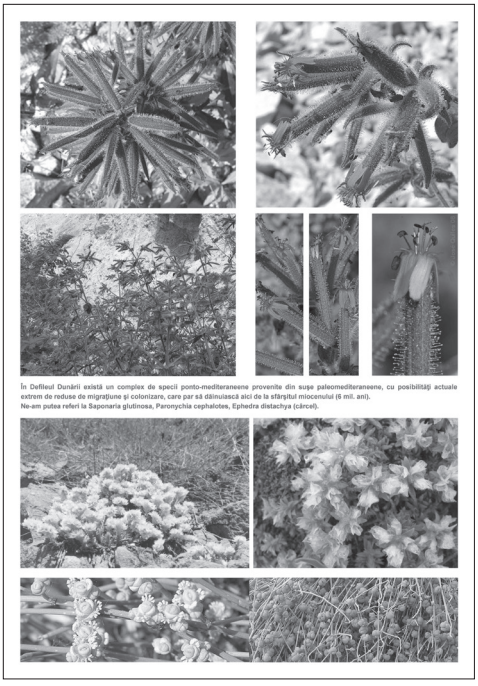

Fig. 5. *Cachrys ferulacea* (Iron Gates dill)

Fig. 6. *Goniolimon tataricum*

Fig. 7. *Convolvulus cantabrica*

Mediterranean elements that have survived into the gorge are represented by saxicole species.

Danube Gorge flora distinctive colour is given by the abundance of Balkan elements. On the Balkan element states the footprint of Moesic flora. On the Danube Gorge rocks have survived some of the most representative plant populations (*Campanula crassipes*, *Ferula heuffelii*, *Peucedanum longifolium*).

Illyrian elements show the links that existed between Banat flora and massives of the Western Balkans (*Gladiolus illyricus*, *Onobrychis alba*).

Plant populations of Atlantic and Atlanto – Mediterranean origin appear to have migrated into the Danube Gorge later in terms of a more humid climate (*Asplenium ceterach*, *Ruscus aculeatus*, *Tamus communis*, *Hedera helix*).

Regarding arbustive population (*Acer monspessulanum*, Daphne *laureola*), arguments suggest their late radiation geographical spread during beech woods expansion.

Romanian Carpathians endemic plant with low requirements and high resistance to dry and sunny shores, the black pine of Banat (*Pinus nigra* ssp. *pallasiana* var. *banatica*) has been here before the reinstalling of other deciduous species.

Fig. 8. *Campanula crassipes*

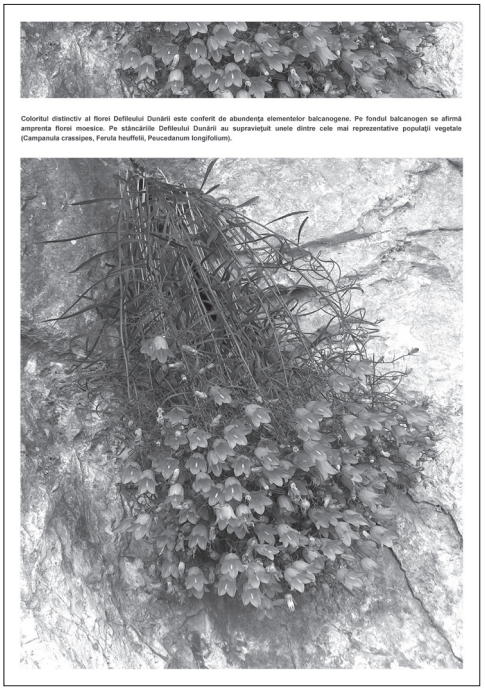

Fig. 9. *Daphne laureola*

Fig. 10. The black pine of Banat (*Pinus nigra* ssp.*pallasiana* var. *banatica*)

Fig. 11. The Trescovăţ mountain

Identified and first described in 1828 by Antonius Rochel on the Danube cliffs between Sviniţa and Berzasca, today, *Cerastium banaticum*, this rare plant, is confined only in Tisoviţa and Great Cazan gorge.

In 1882, Vincze Borbás describes for the first time the tulip of Cazane (*Tulipa hungarica*) on the steep slope of Romanian Great Cazane. Two years later, in 1884, the Serbian scholar I. Pančiči indicates the same plant on the coast of the Veliki Štrbac peak in Serbia. Today, the only place where one can find tulip of Cazane is here, in Romania, on the Danube side of Great Cazane. In Serbia this plant was disappearing around 1940.

In the mid-nineteenth century, rock iris (*Iris reichenbachii*) was met throughout the entire Iron Gates Defile. Due to installation works to shore, made 40 years ago, rock iris is found today only in Baziaş between Great Slătinic and Padina Viaduct fence.

Researchers of Collective complex "Iron Gates" of the Romanian Academy made before the construction of the Iron Gates Hydroelectric Power Station, identified a new plant for science. It is *Stipa danubialis* (Iron Gates feather grass), described for the first time in 1969 in the Găioara Branch. It is the only place in the world where this plant grows.

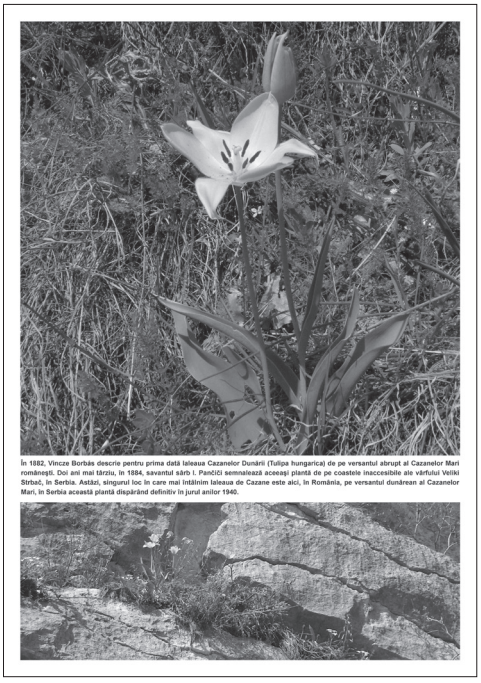

Fig. 12. *Cerastium banaticum*

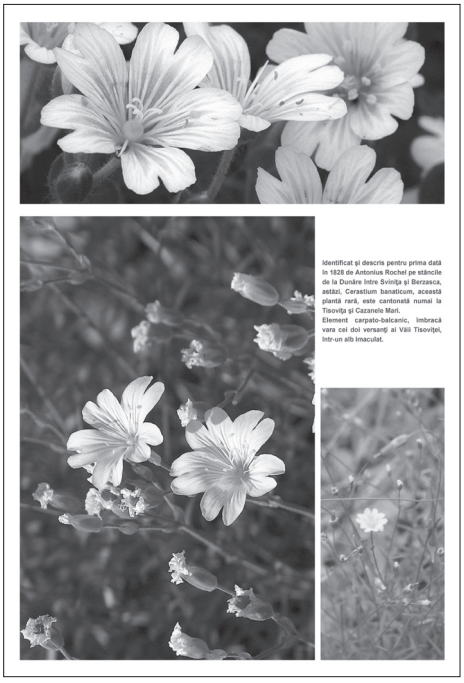

Fig. 13. *Tulipa hungarica*

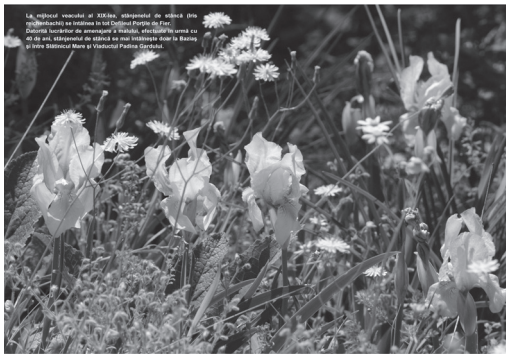

Fig. 14. Iris reichenbachii

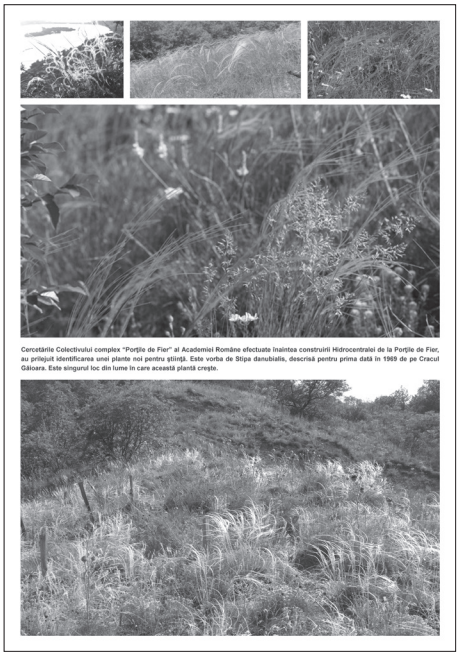

Fig. 15. Stipa danubialis

Iron Gates Natural Park is unique European flora:

– The area where we can find half of the plant species identified in our country;

– The place where 80 categories and subcategories of phyto-geographic elements interfere;

– Great Cazane Gorge is the only resort in the world where we can find *Tulipa hungarica*;

– Găioara Branch is the only resort in the world where we can find *Stipa danubialis*;

– 60 endemic taxons for the Iron Gates Natural Park.

The diversity of phyto-geographic elements of the Iron Gates Defile is reflected in the most conclusive phyto-historical complex elements of the current aspects of flora and vegetation.

Fig. 16. The temporary exhibition "Floral jewelry" in the Iron Gates Defile

Fig. 17. The temporary exhibition "Floral jewelry" in the Iron Gates Defile (interactive activities)

Fig. 18. The temporary exhibition “Floral jewelry” in the Iron Gates Defile (interactive activities)

REFERENCES

BOŞCAIU N., LUPŞA V., RESMERIŢĂ I., COLDEA G., SCHNEIDER E., 1971: *Vegetaţia lemnoasă mezo-xerotermă (Orno-Cotinetalia) din Defileul Dunării*, Ocrot. Nat., 15(1): 49–55, Bucureşti.

DIHORU G., CRISTUREAN I., ANDREI M., 1973: *Vegetaţia dintre Valea Mraconiei-Depresiunea Dubova din Defileul Dunării*, Acta Bot. Horti Buc. (1972–1973), p. 353–423, Bucureşti.

HORVAT I., GLAVAČ V., ELLENBERG H., 1974: *Vegetation Südosteuropas*, VEB Gustav Fischer Verlag Jena.

MATACĂ S. Ş, 2005: *Parcul Natural Porţile de Fier. Floră, vegetaţie şi protecţia naturii*, 550 pp., Editura Universitaria Craiova, Drobeta Turnu Severin.

POPESCU A., ŞTEFUREAC T. I., 1976: *Vegetationsforschungen aus dem Sektor Svinița-Trikule-Eisernes Tor Rumäniens*, Acta Bot. Horti Buc. (1975–1976), p. 341–368, Bucureşti.

ROMAN N., 1974: *Flora şi vegetaţia din sudul Podişului Mehedinţi*, Editura Acad. R.S.R., Bucureşti.

SCHNEIDER-BINDER E., BOŞCAIU N., COLDEA G., LUPŞA V., PLĂMADĂ E., RESMERIŢĂ I., STOICOVICI L., 1970: *Zur Felsenvegetation der Sektoren Eşelnița-Mraconia und Kazanpass-Tricule (Durchbruchtal der Donau) I*, Rev. Roum. Biol.-Botanique, 15(5), p. 311–322, Bucarest.

SCHNEIDER-BINDER E., BOŞCAIU N., COLDEA G., LUPŞA V., RESMERIŢĂ I., 1971: *Zwei neue xerotherme Felsengesellschaften aus dem Durchbruchtal der Donau*, Rev. Roum. Biol.-Botanique, 16(2), p. 97–103, Bucharest.

LATRIDIIDAE (COLEOPTERA) IN THE REPUBLIC OF MOLDOVA: NEW RECORDS AND DISTRIBUTION

Svetlana Bacal[1], Natalia Munteanu[2]

LATRIDIIDAE (COLEOPTERA) IN THE REPUBLIC OF MOLDOVA: NEW RECORDS AND DISTRIBUTION

Abstract: The paper presents data on the distribution and economic importance of the species from Latridiidae family in the Republic of Moldova, with records of two new species, *Dienerella filum* and *Corticarina minuta*. Beetles are found in associations with stored grains and moldy plants. Dienerella filum also has been reported as a potential pest of air-conditioning and refrigeration systems. Despite their ecological role Latridiidae requires future investigation.

Keywords: Coleoptera, Latridiidae, Republic of Moldova, new records.

Introduction

Latridiidae (Coleoptera) or minute brown scavenger beetles is a family of very small (0.8–3 mm) and obscure insects. The family includes 29 genera and approximately 1050 species placed in two subfamilies, Latridiinae Erichson and Corticariinae Curtis (Andrews, 2002). Latridiidae are common inhabitants of decomposing vegetation and can occur in leaf litter, on herbaceous vegetation, on trees, in decomposing wood, and in bird, mammal, and Hymenoptera nests. Many species prefer wet or damp habitats. Numerous species are frugivorous associated with phycomycete, deuteromycete and ascomycete, although species of some genera, including *Enicmus* Thomson, feed on the spores of Myxomycetyes (Andrews, 2002). Species from genera *Cartodere* Thomson, *Corticaria* Marsham, *Corticarina* Reitter, *Dienerella* Reitter, *Enicmus* Thomson and *Latridius* Herbst,

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frequently occur in dried stored products, where adults and larvae feed on fungi that grow in damp conditions (Bousquet, 1990). Adults are frequently collected by beating decaying vegetation and from sifted leaf litter. Sometimes they are collected in pitfall traps and light traps.

Latridiidae in the Republic of Moldova has been relatively poorly investigated compared with other families of Coleoptera. Despite the economic impact on dried food products and the importance in saproxylic food chains, much remains to be learned about most species.

Material and methods

The survey was conducted during 2010–2011 in Copanca (Latitude: 46°42'55" N, Longitude: 29°37'37" E) and Troita (Latitude: 46°33'54" N, Longitude: 28°27'58" E), Republic of Moldova. The faunistic material was collected using pitfall traps throughout spring and summer time. Beetles were identified using available literature (Freude et al., 1967; Arnett et al., 2002) the taxonomy is based on the work of Bouchard (2011). Voucher specimens were deposited in the collection of the Entomological Museum, Institute of Zoology of the Academy of Sciences of Moldova.

Results and discussion

Based on the study of morphological characters within the Cerylonid Series of the Cucujoidea, Slipinski and Pakaluk (1991) state that the family appears monophyletic. The classification of Latridiidae is unstable due to the lack of discrete family-level synapomorphies, with few higher-level characters that adequately encompass the heterogeneity of the group.

Each of the two currently recognized subfamilies, Latridiinae and Corticariinae, are characterized by several morphological characters. Members of the subfamily Latridiinae have widely separated procoxal cavities that are broadly closed behind. The clypeus is on a lower plane than the frons and is sharply delimited by a deep transverse suture. The pronotum of subfamily Latridiinae often have conspicuous grooves and carinal ornamentation. Members of the subfamily Corticariinae have narrowly separated procoxal cavities that are broadly closed behind. The clypeus and frons are on the same plane and are either separated by a fine transverse suture or fused. Corticariines are generally pubescent and lack the grooves (Lord, 2010).

In the Republic of Moldova relatively little attention has been paid to Latridiidae family. Miller and Zubowsky (1917) recorded four species from two locations, later on other two species from three locations were mentioned by Medvedev and Shapiro (1957). Recent collection in the region has revealed two new species, *Dienerella filum* and *Corticarina minuta*. At the present time altogether 7 species from 6 genera and two subfamilies were revealed.

Subfamily Latridiinae

Dienerella (=*Lathridius*) *filum* (Aube 1850).

Adults are 1.2–1.6 mm long and brown. The antennal club is two-segmented. The anterior half of the pronotal disk has a broad, moderately deep, oval depression; the head has a median suture. Hind wings are lacking and adults do not fly. Larvae are 1.7–2 mm long and pale white. Pupae are about 1 mm long and yellowish white. Eggs are laid singly on the substrate; fecundity is about 20 eggs. Development is 36 days at 24˚C and 54 days at 18˚C; at lower temperatures, development takes around 5 month (Robinson, 2005).

The species is adventive Palearctic, recently found in Neotropical region (Majka et al., 2009). It occurs in North Africa and Europe including, Austria, Belarus, Belgium, Great Britain, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Norway, Poland, Northwest and Central Russia, Slovakia, Spain, Sweden, Switzerland, The Netherlands, Ukraine, Serbia, Kosovo, Voivodina and Montenegro (www.faunaeur.org).

Beetles are found in associations with stored grains, moldy plants and animal material (Bocher, 1988). It feeds on the hyphae and spores of filamentous fungi. The species also has been reported as a potential pest of air-conditioning and refrigeration systems (Carlton, 1988).

Enicmus transversus (Olivier 1790) (=*Ips transversus* Olivier 1790, *Lathridius sculptilis* Hummel 1827).

In the Republic of Moldova first time it was recorded by Miller and Zubowsky from two localities Chisinau (24.03.1917) and Bender (25.05.1917). It favors forest and steppe litter in the dying remnants of herbaceous plants and firewood (Trikhleb, 2001). The species is known from Afro-tropical region, West and East Palaearctic, Near East including Asian Turkey, Caucasian Russian republics, Georgia, Armenia, Azerbaidjan, Lebanon, Syria, Israel, Jordan, Sinai Peninsula, Arabian Peninsula, Iran and Iraq, North Africa and Oriental region (www.faunaeur.org).

Stephostethus lardarius (DeGeer 1775) (=*Tenebrio lardarius* DeGeer 1775, *Lathridius dilaticollis* Motschulsky 1866, *Lathridius pini* Motschulsky 1866, *Corticaria rugicollis* Marsham 1802, *Lathridius subbrevis* Motschulsky 1866, *Lathridius acuminatus* Paykull 1798, *Lathridius qudratus* Panzer 1795). In the Republic of Moldova species was firstly mentioned by Medvedev and Shapiro (1957) as *Latridius lardarius* (DeGeer 1775), collected from Calarasi (09–19.06.1955). This is an adventive Palearctic species found through Europe including, Austria, Belarus, Belgium, Britain, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Norway, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, The Netherlands and Ukraine (Majka et al., 2009; www.faunaeur.org). It has been recorded from fallen oak, grass tussocks, hothouse beds, vegetable refuse and moss (Hinton 1945).

Latridius minutus (Linnaeus 1767) (=*Tenebrio minutus* Linnaeus 1767). First time in Moldova the species was recorded by Miller and Zubowsky from Chisinau (15–17.03.1917, 17.04.1917) and Bender (30.05.1917). This is a synanthrope wide distributed species known from Afro-tropical region, Australian region, West and East Palaearctic, Near East, Nearctic region, Neotropical region, North Africa and Oriental region.

Subfamily Corticariinae

Corticaria fulva (Comolli 1837) (=*Lathridius fulva* Comolli 1837, *Corticaria attenuata* Motschulsky 1867, *Corticaria cardiadera* Fairmaire 1875, *Corticaria ciliata* Motschulsky 1867, *Corticaria concolor* Brisout 1880, *Corticaria cypria* Baudi 1870, *Corticaria flavescens* Thomson 1871, *Corticaria hirtella* Thomson 1863, *Corticaria pharaonis* Motschulsky 1867, *Corticaria tenuicornis* Motschulsky 1867, *Corticaria transversicollis* Motschulsky 1867). In Moldova first time the species was collected by Miller and Zubowsky from Bender (03.09.1902). The species is distributed through West Palearctic, including Austria, Azores, Belgium, Great Britain, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Madeira, Norway, Slovakia, Spain, Sweden, Switzerland, The Netherlands, Near East, Nearctic region, North Africa and Oriental region (www.faunaeur.org).

Corticaria pubescens (Gyllenhal 1827) (=*Lathridius pubescens* Gyllenhal 1827, *Corticaria capensis* Motschulsky 1867, *Corticaria concinnula* Mannerheim 1844, *Corticaria diluta* Mannerheim 1844, *Corticaria intricata* Mannerheim 1844, *Corticaria robusta* Broun 1914, *Corticaria testacea* Dalla Torre 1879, *Corticaria brouni* Hetschko 1926, *Corticaria grossa* LeConte 1855). First mention in the republic was made by Miller and Zubowsky the species was collected from Chisinau (07.02.1904). It is distributed through West Palearctic including Austria, Belarus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Madeira, Norway, Poland, Portuguese, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Ukraine, Afro-tropical region, Australian region, Near East, Nearctic region and North Africa. The species is primarily fungus feeders and was found in nests of birds, their occurrence in animal nests indicates the presence of appropriate molds (Gorton, 1944).

Corticarina

Corticarina minuta (Fabricius 1792) (=*Dermestes minuta* Fabricius 1792, *Corticaria brevicollis* Mannerheim 1844, *Corticaria compta* LeConte 1855, *Corticarina fuscula* Gyllenhal 1827, *Corticaria melanocara* Gistel 1857, *Corticaria ovalipennis* Reitter 1875, *Corticaria trifoveolata* Redtenbacher 1849, *Corticaria americana* Mannerheim 1844, *Latridius fusculus* Gyllenhal 1827).

Adult's body form is more elongate and usually paler in the color. Antennae are 11-segmented with a 3 segmented apical club. Pronotum is widest at midpoint,

lateral margins are lightly arcuate. The elytra widest at middle, and longer relative to the thorax; the latter more transverse and more regularly rounded at the sides, with less deeply impressed fovea; the metasternum very distinctly longer than the post-coxal length of the first ventral. First metatarsomere barely produced ventrally, not extending to apex of second abdomen with 5 visible sterna. Body length is 1.3–1.8 mm (Fall, 1899; Majka et al., 2009).

It is a Holarctic species widely distributed through Nearctic region and most of Europe: Austria, Belarus, Belgium, Great Britain, Corsica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Liechtenstein, Lithuania, Norway, Poland, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, The Netherlands and Ukraine. Recently it has been recorded from China (Johnson, 2007; www.faunaeur.org).

The species is frequently associated with stored products, including grains. It is particularly common in a wide variety of rotting vegetables (Bousquet, 1990; Rucker, 2004).

Corticarina gibbosa (Herbst 1793) (=*Lathridius gibbosa* Herbst 1793, *Corticaria fuscotestacea* Motschulsky 1861, *Melanophthalma gibbula* Motschulsky 1866, *Melanophthalma intricata* Rey 1889, *Corticaria pallida* Marsham 1802, *Corticaria resecta* Walker 1859, *Melanophthalma cylindricollis* Motschulsky 1866, *Latridius herbacea* Gistel 1857). In the Republic of Moldova the species was recorded by Medvedev and Shapiro from Calarasi, Radeni and Cornesti (09–19.06.1955). This is a wide distributed species known from Afro-tropical region, Australian region, East Palaearctic, Near East, Nearctic region, Neotropical region, North Africa and Oriental region.

By feeding on decomposing vegetation Latridiidae are an important component of food web and contribute to nature's recycling system. Some species are known as stored-product pest, others attack museum herbarium. Despite of its economic impact, Latridiidae family has remained relatively poor studied in the Republic of Moldova.

REFERENCES

ANDREWS F.G., 2002: *Latridiidae* Erichson 1842. In. *American beetles*. Volume 2: Polyphaga: Scarabaeoidea through Curculionoidea, Edited by Arnet R.H., Thomas Jr. M.C., Skelley P.E., and Frak J.H. CRC Press, Boca Raton, p. 395–398, Florida.

ARNETT R.H., THOMAS M.C., SKELLEY P.E., FRANK J.H., 2002: *American Beetles*, Volume II: Polyphaga: Scarabaeoidea through Curculionoidea, CRC Press LLC, Boca Raton, Florida.

BOCHER J., 1988: *The Coleoptera of Greenland*, Meddelelser om Grenland. Bioscience, 26: p. 1–100, Copenhagen.

BOUCHARD P., BOUSQUET Y., DAVIES A.E., ALONSO-ZARAZAGA M.A., LAWRENCE J.F., LYAL C.H.C., NEWTON A.F., REID C.A.M., SCHMITT M., ŚLIPIŃSKI S.A. SMITH A.B.T., 2011: *Family-group names in Coleoptera (Insecta),* In: ZooKeys, 972 p.

BOUSQUET Y., 1990: *Beetles associated with stored products in Canada: an identification guide,* Publication 1837, Research Branch, Agriculture Canada. Ottawa, Ontario.

CARLTON C.E., 1988: *Dienerella filum (Aube) (Coleoptera: Lathridiidae), a potential pest of air conditioning systems,* The Coleopterists Bulletin, 42(3), p. 263–264.

FALL H.C., 1899: *Revision of the Lathridiidae of boreal America*, Transactions of the American Entomological Society, 26, p. 101–190.

FREUDE H., HARDE K.W., LOHSE G.A., 1967: *Die Käfer Mitteleuropas*, Band 7: Clavicornia (Ostomidae-Cisdae). Goecke and Evers, 280 p. , Krefeld.

GORTON L.E., 1944: *Natural sources, habitats, and reservoirs of insects associated with stored food products*, Hilgardia, vol. 16 (4), p. 41.

HINTON H.E, 1945: *A monograph of the beetles associated with stored products*, British Museum (Natural History), vol. I, London, England.

JOHNSON C., 2007: *Latridiidae*. In. Catalogue of Palaearctic Coleoptera, vol. 4. Edited by: I, LobI and A. Smetana. Apollo Books. Stenstrup. Denmark 2007, p. 74–80; 635–648.

LORD N., HARTLEY C., LAWRENCE J., MCHUGH J., WHITING M., MILLER K. 2010: *Phylogenetic analysis of the minute brown scavenger beetles (Coleoptera: Latridiidae), and recognition of a new beetle family, Akalyptoischiidae fam.n. (Coleoptera: Cucujoidea),* Systematic Entomology 35, p. 753–763.

MAJKA C., LANGOR D., RUCKER W., 2009: *Latridiidae (Coleoptera) of Atlantic Canada: new records, key to identification, new synonyms, distribution, and zoogeography*, Canadian Entomologist, 141, p. 317–370.

MEDVEDEV S., SHAPIRO D. 1957: *To the knowledge of beetle fauna (Coleoptera) of the Moldavian Soviet Socialist Republic and the neighboring regions of Ukraine*, Scientific works on the IBF, Nr. 30, p. 173–206.

MILLER E., ZUBOWSKY N., 1917: *Materials on the entomological fauna of Bessarabia*, Proceedings of the Bessarabian Society Naturalists and Life Science Amateurs, vol. 2, Part 1, Typography Bessarabian Provincial Board, p. 32–150, Chişinău.

ROBINSON W.H., 2005: *Urban Insects and Arachnids: A Handbook of Urban Entomology*, Cambridge University Press, 456 p.

RUCKER W., 2004: *Latridiidae (Coleoptera)* In. Invertebrati di una foresta della Pianura Padana, Bosco della Fontana. Secondo contributo. Edited by: P. Cerretti, S. Hardersen, F. Mason, G. Nardi, M. Tisato and M. Zapparoli, Conservazione Habitat Invertebrati. 3. Cierre Grafica Editore, p. 149–153, Verona, Italy.

SLIPINSKI S.A., PAKALUK J. 1991: *Problems in the classification of the Cerylonid series of Cucujoidea (Coleoptera). Advances in Coleopterology*. Ed. by Zunino M., Belles X. and Blas M., European Association of Coleopterology, Silvestrelli and Cappelletto, p. 79–88, Torino.

TRIKHLEB T.A., 2001: Struktura i funkcionalna rol tvarynnogo naselennja v pryrodnyh ta transformovanyh ekosystemah: Tezy I mizhnarodnoi konferencii. Dnipropetrovsk: DNU. S. 105–106 (original Ukrainian).

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THE TEMPORARY EXHIBITION „THE MYSTERIOUS WORLD OF INSECTS”

Cornelia Chimişliu[1]

THE TEMPORARY EXHIBITION „THE MYSTERIOUS WORLD OF INSECTS”

Abstract: The paper presents the exhibition „The mysterious world of insects”, made at the Department of Natural Sciences of Craiova Oltenia Museum. The scientific theme was developed by Dr. Cornelia Chimişliu. The purpose of the exhibition is the introduction of the visitors into the world of insects. The following aspects are addressed: morphology, metamorphosis, sexual dimorphism, systematics of insects, their importance to human activity, insect adaptations for survival and their role in the trophic relations in the biocoenosis. In the creation of the exhibition we used panels with documentary-scientific text and insects thematically arranged in insect exhibit cases.

Keywords: temporary exhibition, biology, ecology and ethology insects, importance for the human economy.

Introduction

The entomological heritage of the Department of Natural Sciences totalizes over 53,000 insects. In addition to its purely scientific importance this heritage has also cultural and educational value.

Because the class of insects has the largest number of species and individuals of the animal kingdom and because little is known about their biology, ecology and ethology, we made several temporary exhibitions with and about insects. One of these exhibitions is „The mysterious world of insects”. The exhibition is a brief incursion into the vast and unknown world of insects.

Its purpose is to initiate visitors into the world of these creatures, representing an introduction into the knowledge of the mysterious world of insects.

The scientific topic of the exhibition was developed after consulting papers published by Romanian and foreign authors: (Chimisliu, 1990–1993, 2008; Ene,

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1971; Fabre, 1919; Ionescu, 1962, 1973; Ionescu & Weinberg, 1971; Niculescu, 1963, 1965; Panin, 1955, 1957; Panin & Săvulescu, 1961; Paulian, 1941; Simionescu, 1938; Staněk, 1989; Zaiancicovski, 1991).

Contents

The theme of the exhibition addresses issues regarding: morphology, metamorphosis, sexual dimorphism, systematics of insects, and their importance to human activity, insect adaptations for survival and their role in the trophic relations in the biocoenosis.

The exhibition is composed of three-dimensional material (insect exhibit cases) and two-dimensional materials (panels and plasticized A3 boards).

Insect morphology

The insect's body consists of segments, like all other arthropods. It is covered by a chitinous protective skin, which is sometimes thin, transparent, sometimes hard and thick. The body is made up of three distinct parts: head, thorax and abdomen.

The mouthparts and the orientation organs (two antennae, two compound eyes and oceli) are located at the head.

The thorax consists of three segments. On the thorax are two pairs of wings and three pairs of legs.

The abdomen is the largest part of the body and consists of segments similar to those of the thorax. We illustrated this topic by using an illustration panel and insect exhibit cases (Fig. 1, Fig. 2).

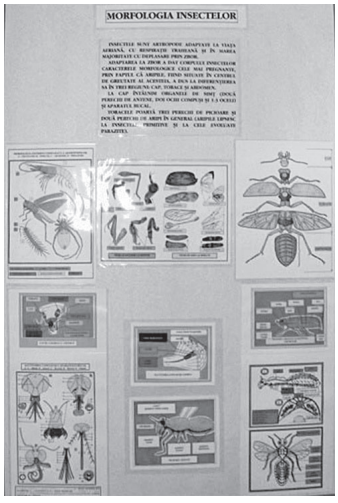

Fig. 1. Insect morphology (original)

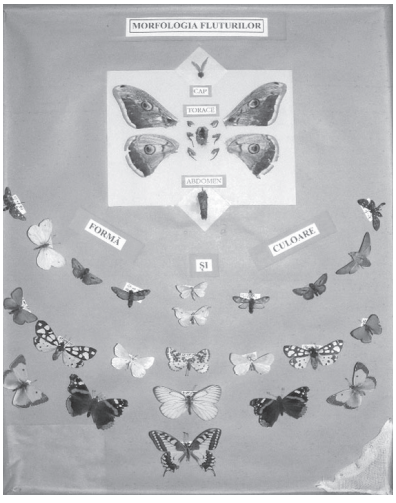

Fig. 2. Insect morphology (original)

The metamorphosis

The metamorphosis is the development of insect from egg stage to the adult stage. During the metamorphosis, the insects go through different stages of development. The metamorphosis may be complete (Fig. 3) or incomplete (Fig. 4).

The insects with complete metamorphosis pass through four stages of development: egg-larva-pupa-adult (ex.: butterflies, beetles, dragonflies, flies, etc.). This aspect was shown with biological material and also with images for several species of butterfly: *Lymantria dispar* (Linnaeus 1758), *Pieris brassicae* (Linnaeus 1758), *Celerio euphorbiae* (Linnaeus 1758), *Vanessa cardui euphorbiae* (Linnaeus 1758), and dragonflies.

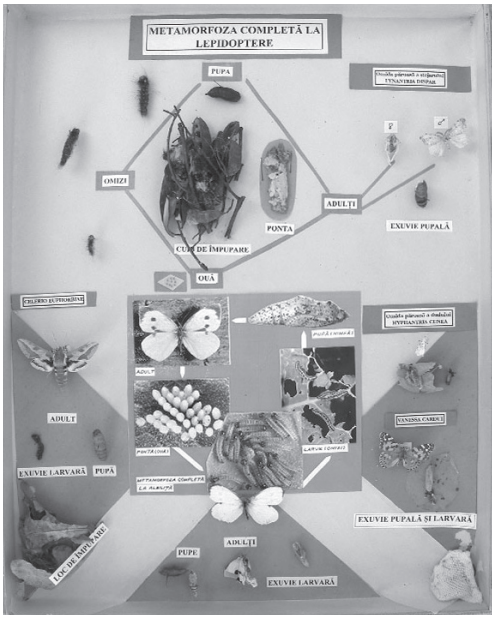

Fig. 3. The complete metamorphosis (original)

Fig. 4. The incomplete metamorphosis (original)

The insects with incomplete metamorphosis have a larva which resembles the adult from the moment it hatches from the egg (ex.: grasshoppers, bugs, nuns and others). These insects pass through three stages of development: egg-larva-adult. The pupal stage is missing. The adult is the last stage of insect development and has a reproduction role.

The sexual dimorphism

The sexual dimorphism consists in the morphological differences between the sexes and is quite common in insects. It is manifested by the differences in

size and colors between male and female, shape and size differences between the antennae, mandibles shape and size, wing shape etc.

In general, insect males have brighter colors than females, and when the dimorphism is manifested by body size, the female is larger than the male.

The dimorphism was displayed by using both explanatory and illustrative material and biological parts, presented in insect exhibit cases. We used different species of beetles (*Lucanus (Lucanus) cervus* (Linnaeus 1758)*, Oryctes (Oryctes) nasicornis* (Linnaeus 1758), *Copris lunaris* (Linnaeus 1758), lepidopteran (*Gonepteryx rhamni* (Linnaeus 1758)*, Parnassius mnemosyne* (Linnaeus 1758)*, Colias croceus* (Fourcroy 1785), *Maniola jurtina* (Linnaeus 1758)*, Pontia daplidice* (Linnaeus 1758), *Pieris brassicae* (Linnaeus 1758), *Lithosia quadra* (Linnaeus 1758)), orthopteran (*Tettigonia viridissima* (Linnaeus 1758), dragonfly (*Calopteryx splendens* (Harris 1782) and scorpion fly (*Panorpa communis* Linnaeus 1758) (Fig. 5).

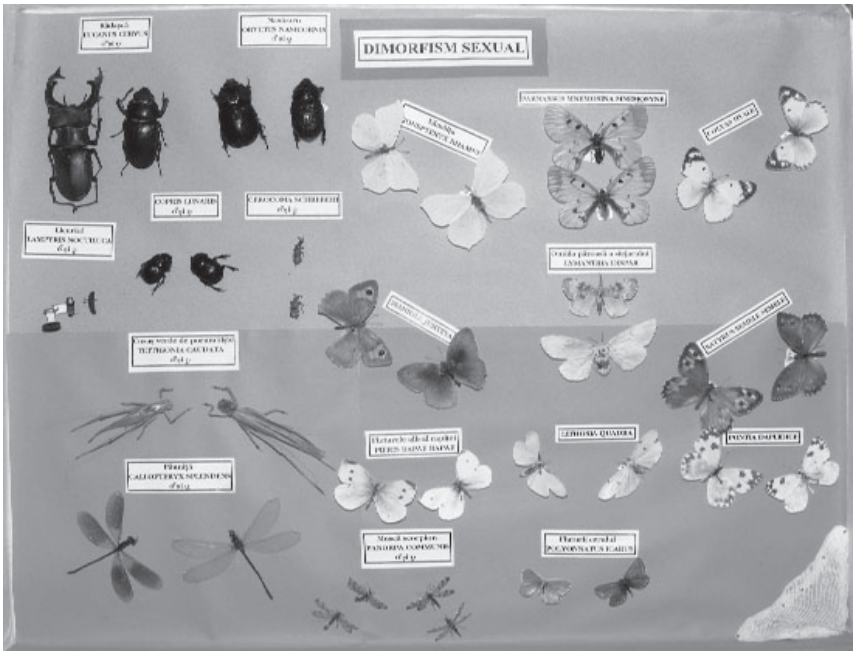

Fig. 5. The sexual dimorphism in insects (original)

The classification of insects

The insects are the first invertebrate animals that have adapted to terrestrial life, being now the main occupants of the planet. It is estimated that their number is a million and a half, maybe two million species, representing 2/3 of the animal species living on Earth (Fig. 6). The actual number of species is much higher because there are still unstudied areas.

Fig. 6. The proportion of insects in the animal kingdom (after Chimişliu, 2008)

The classification of insects is continously changing. Several classification systems exist. In developing the exhibition, we used the classification adopted by Ionescu (1962) in which insects in Romania are included in 32 orders (Ionescu, 1962). This aspect was shown in the exhibition through texts and insect exhibit cases with representatives of the winged insect orders (Fig. 7).

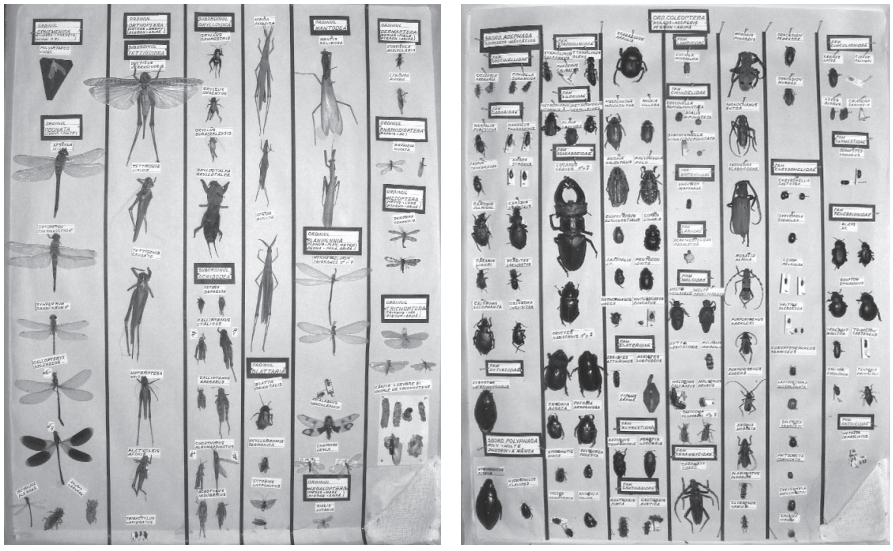

Fig. 7. Classification of insects (original)

The importance of insects to human activity

There are species of insects that bring direct and indirect benefits to man, but also species that can cause many problems regarding the health, the comfort and the quantity or quality of the food.

Insects directly useful

Throughout human history two insect species brought direct benefits to people: silk moth from whose yarn people weave natural silk and honeybees who gave honey, wax, propolis and other bee products useful to human economy (Chimişliu, 2008).

Silk butterfly – *Bombyx mori* Linnaeus 1758

The Silk Butterfly was domesticated and raised for the first time by the Chinese people, approx. 4,500 years ago. From the cocoon produced by its larvae, the silk yarn is extracted and it is used at silk factories, as raw material for making clothes. For centuries, the natural silk has been very appreciated and sought after (Fig. 8).

The natural silk highly appreciated in the past, used to manufacture traditional costume and silk veils was gradually replaced by artificial fibers. Today we are less dependent on the silk, but it is still intensly used for expensive luxury garments.

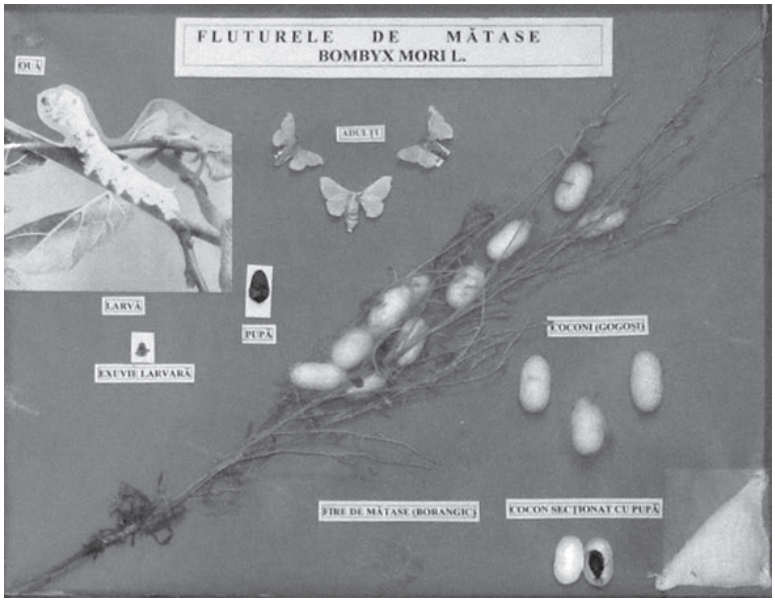

Fig. 8. The butterfly silk and a veil of silk (original)

Honeybee – *Apis mellifera* Linnaeus 1758

Formed as a species on earth long before human species, the bee has played an essential role in the evolution of flowering plants as a pollinator agent (Fig. 9).

Human life was closely related to bees, from the earliest stages of development of human society. No one knows exactly when the honey appeared in the diet of humans. Drawings were found in a cave in Spain representing scenes of beekeeping, dating from approx. 7,000 years. The ancient writings of Herodotus (485–425 BC) refer to the bees in Thrace and Dacia.

Indirect useful insects

By their diet (food), many insects fulfill useful functions for humans and in nature they fullfil a very important role in maintaining ecological balance. The following insects belong to the category of insects indirectly useful to man: pollinating insects, predatory insects, necrophagous insects, coprophagous insects etc.

Pollinating insects

The pollinating insects provide cross pollination of plants and contribute to seeds formation and their survival. Pollinating insects and plants have been living together for thousands of years, helping each other. The plant provides the insect with food, and the insects help the plant to multiply.

Most cultivated and spontaneous plants (80%) have an entomophilous pollination. Out of these, about 77% are pollinated by honeybees and the rest of other Hymenoptera (bumble bees, hornets, wasps) – approx. 7%, Diptera (flies) – 3.5%, Coleoptera (beetles) – 3.5%, Heteroptera (bugs) – 3%, Lepidoptera (butterflies) – 2%, other insects – 4%.

Many plants pollinated by insects are used fresh or preserved by humans for food, others are used in the food, cosmetic, pharmaceutical, textile, clothing industry etc. Thus, human life and human economy depends indirectly on pollinating insects.

The illustration of this issue was done through explanatory text and images, as well as pollinating insects, arranged on a hexagonal panel and also by using insect exhibit cases (Fig. 9).

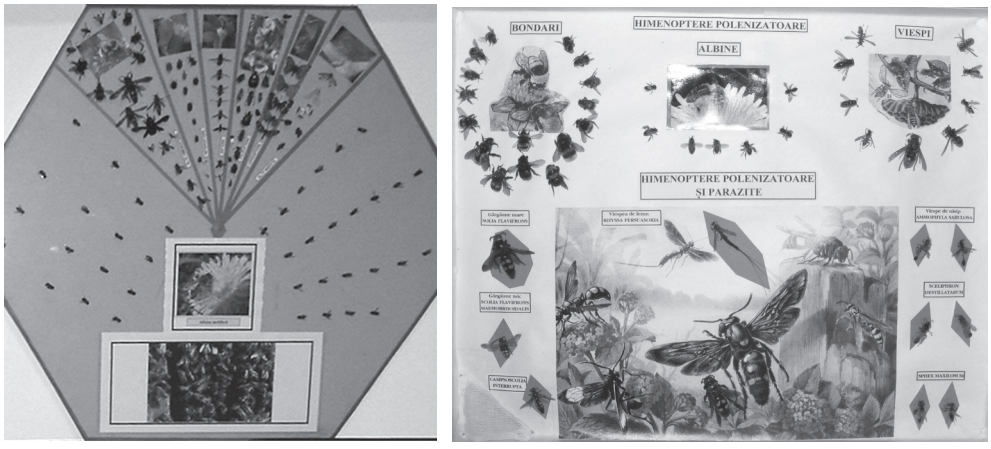

Fig. 9. Pollinating insects (original)

Predatory insects

Among the creatures that contribute to reducing the number of insect pests, there are also the predatory insects. Annually, millions of insects in various stages of development fall prey to predatory insects. This fact saves from destruction many agricultural crops, forests, and also plants from the wild flora. There are predatory insects living in all environments (Fig. 10).

In order for the visitors to know these insects, we used explanatory texts, images, and insect exhibit cases with predatory aquatic insects (coleopteran and heteropteran) and terrestrial insects (beetles, dragonflies, neuropteran, dipteron, mantises, mecopteran etc.).

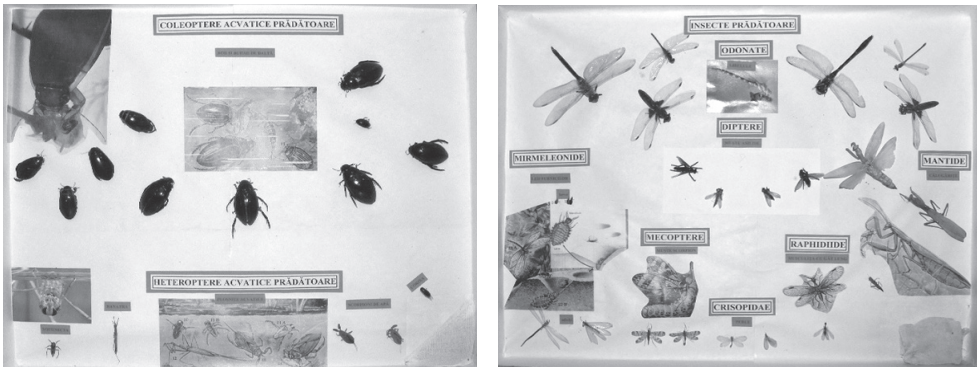

Fig. 10. Predatory aquatic insects and terrestrial insects (original)

Necrophagous insects

Necrophagous insects are „sanitation voluntary agents" of nature. They feed on dead bodies in nature which affect the quality of the environment and endanger human health. They contribute to ensuring the substances circuit in nature. Because of them, the dead bodies are decomposed and inserted into the circuit of matter in nature. Many species of Coleoptera and Diptera feed on corpses. Explanatory texts and images with necrophagous insect, were accompanied by insect exhibit cases with necrophagous insects (Fig. 11).

Coprophagous insects

Along necrophagous insects, coprophagous insects are part of the „team of voluntary sanitation agents" of the nature. Their food consists of animal manure, which they decompose and thus help to ensure circuit of matter in nature. The group with most coprophagous species is the Scarabaeidae beetles that have been known since ancient times. The ancient Egyptians worshiped the scarab along with other animals. Facts about diversity, biology and ethology of these insects were presented through text and images on a panel, together with insect exhibit cases containing coprophagous scarabeide (Fig. 12).

Insects that can cause damage to human economy

Insects that feed on different plant parts (roots, leaves, flowers, fruits, seeds), under certain conditions can multiply excessively and can cause damage to crops and forests.

Xylophagous insects from forests

The Xylophagous insects belong to the category of insects that are potentially harmful to human economy. Their larvae develop in branches, stems or roots of trees, in which they are digging galleries that affect wood quality. If no action is taken to prevent and combat them, they can cause great damage to the forestry sector. Some species of Coleoptera, and Lepidoptera develop the larval stage in various species of cultivated plants.

Phyllophagous insects

This type of insects feeds on plant foliage either in the larval or in the adult stage. There are insects that are filofage only in the larval stage (several species of Lepidoptera) sometimes causing significant damage and as adults feed on nectar, making plant pollination, thus belonging to the category of pollinating insects useful to human economy.

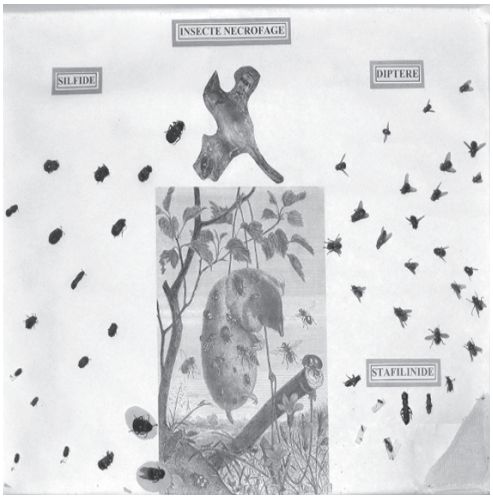

Fig. 11 Insect exhibit case with necrophagous insects (original)

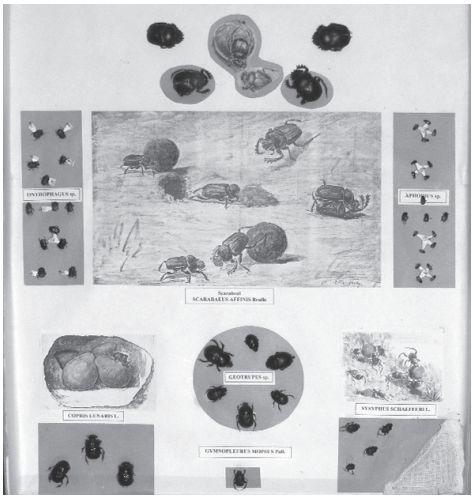

Fig. 12 Insect exhibit case with coprophagous insects (original)

In order to show this theme we used panels with text and images and also insect exhibit cases containing xylophagous insects from the forests (Fig. 13) phyllophagous insects from forests and orchards (Fig. 14), phytophagous insects from vegetable gardens (Fig. 15) etc.

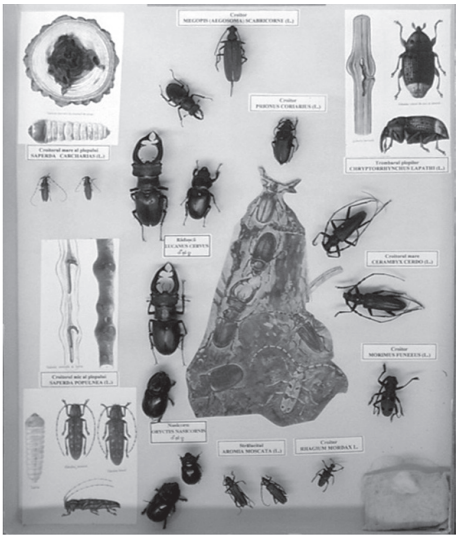

Fig. 13 Xylophagous insects from forests (original)

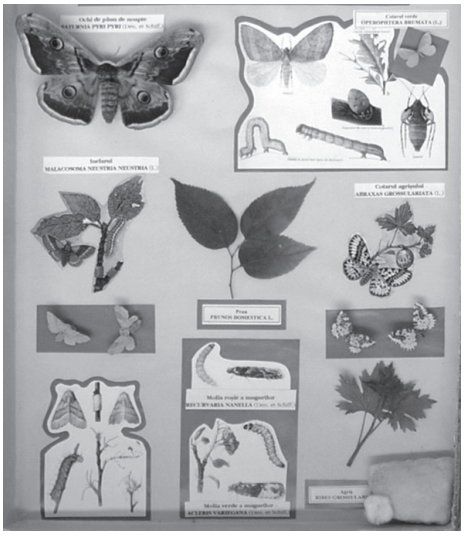

Fig. 14 Phyllophagous insects from forests and orchards (original)

Polyphagous insects

Polyphagous insects can be very harmful to the human economy. Their mass multiplication leads to repeated invasions with negative consequences on the vegetation. In the past, the invasions of locusts caused great damage to the vegetation. In the past, the invasions of locusts caused great damage to human economy. The first invasions in Romania were recorded since 1475, in Moldova and Transylvania. The last invasion was in 1955 caused by the Moroccan locust.

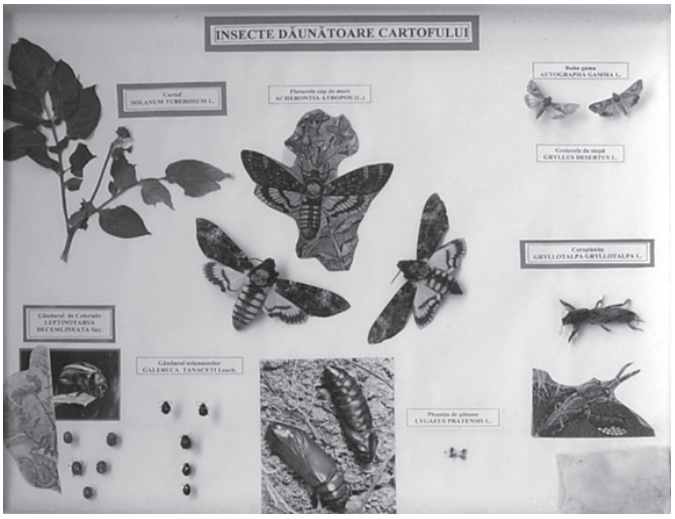

Fig. 15. Phytophagous insects in vegetable gardens (original)

Texts and images used in the exhibition were supplemented with insect exhibit cases with polyphagous insects (Fig. 16).

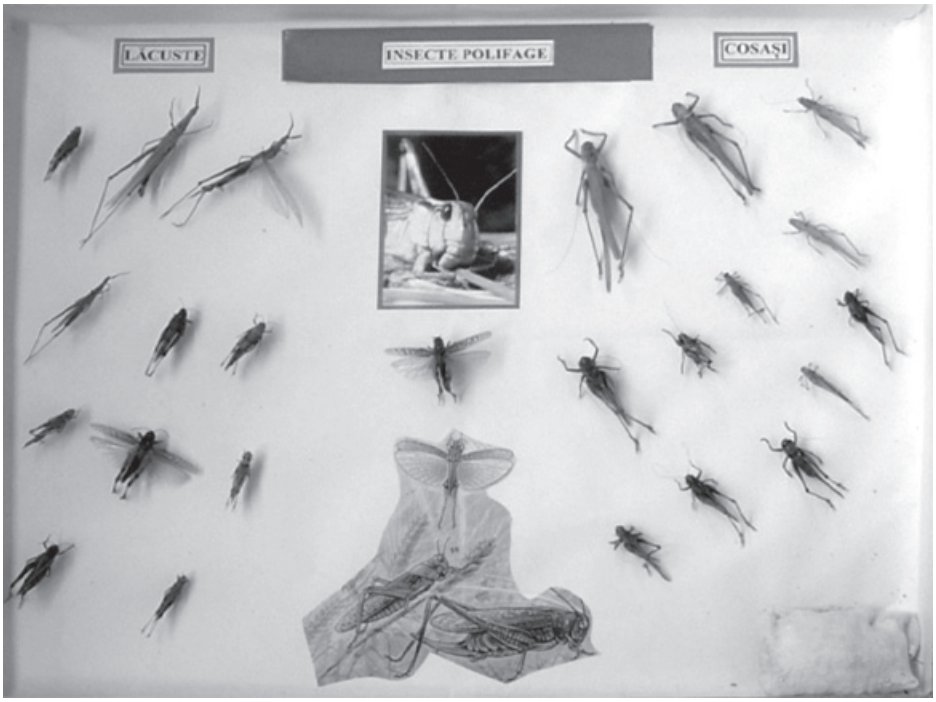

Fig. 16. Polyphagous insects (locusts and grasshoppers) (original)

Adaptations for survival (Fig. 17)

To ensure their survival in nature, insects exhibit various adaptations passive or active.

Some of the passive adaptations are: homocromia, intimidation coloration, warning coloration, mimicry etc.

Homocromia (gr. homos – similar, chroma – color)

Homocromia consists in the daptation of some of the insect species, through color, design and shape of the body, to the environment in which they live.

The intimidation coloration consists in the presence on the insect wings of drawings that look like the eyes of predators. These drawings are meant to scare the natural enemies of these insects.

The warning Coloration occurs in insect species that have specific means of defense.

Through **mimicry** the insect species with no specific means of defense, take the shape and color of the species that have means of defense.

Fig. 17. Ways of defense at insects (original)

Meteorologists insects

One aspect of the adaptations for survival is the reaction of insects to changes in weather conditions. In time, they have learned to be good meteorologists, to foresee the change of weather and to hide from wind, rain, storm etc. There are many meteorologists insects: housefly, honey bee, mosquitoes, crickets, cycads, dragonflies etc.).

The role of insects in trophic relations

In nature there are trophic relations between different species. The plants are eaten by phytophagous insects, which are eaten by predatory insects, birds and insectivorous mammals. Insects are important trophic links in the biocoenosis of all types of ecosystems.

The exhibition also included several panels with curiosities from the world of insects.

Conclusions

Insects are unavoidable life partners for humans and people should know, both „friends" and „foes" of their world.

The exhibition is a plea for the benefits that man has from certain insects. At the same time it is a source of information about the damages caused to human economy by the potentially harmful insects.

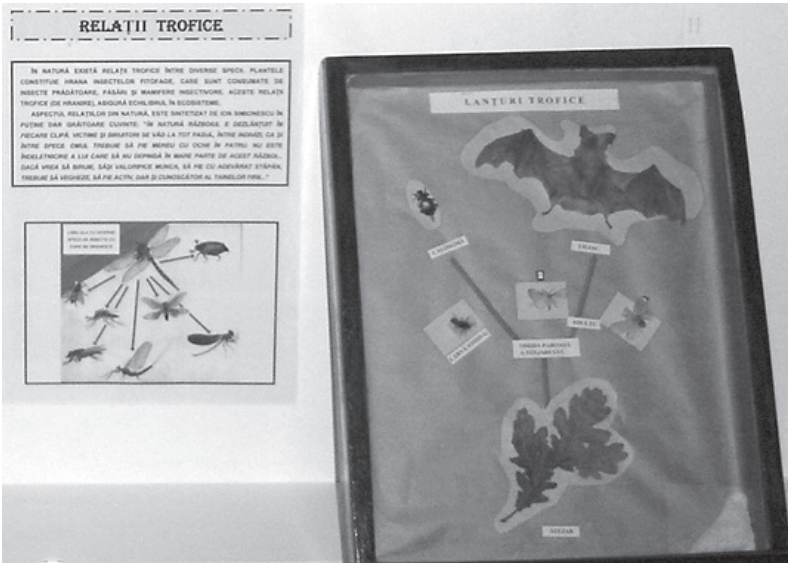

Fig. 18. Trophic relations

The exhibits highlights the insects role in nature and present scientifically correct information useful to pupils, students, teachers of natural sciences and to the general public.

REFERENCES

CHIMIŞLIU C., 1990–1993: *Rolul insectelor în prognoza timpului*, Oltenia. Studii şi comunicări. Ştiinţele Naturii. Muzeul Olteniei Craiova, 11–13, p. 46–48, Craiova.

CHIMIŞLIU C., 2008: *Insectele – prietenii neştiuţi ai omului,* Editura SITECH Craiova, 88 pp., Craiova

ENE I. M., 1971: *Entomologie forestieră,* Editura Ceres, p. 311–315, Bucureşti.

FABRE J. H., 1919: *Les Ravageurs,* Librairie Delagrave, p. 138–150, Paris.

IONESCU M., 1962: *Entomologie,* Editura de Stat Didactică şi pedagogică, 414 pp., Bucureşti.

IONESCU M., 1973: *Insecte folositoare şi dăunătoare,* Editura Ştiinţifică, p. 16–38, Bucureşti.

IONESCU M., WEINBERG M., 1971: *Diptera-Asilidae.* Fauna R.S.R. Insecta. 11(11), Editura Academiei R.S.R., 288 pp., Bucureşti.

NICULESCU E. V., 1963: *Lepidoptera, Familia Pieridae.* Fauna R.P.R., Insecta. 11(6), Editura Academiei R.P.R., Bucureşti.

NICULESCU E. V., 1965: *Insecta*. *Familia Nymphalidae (Fluturi).* Fauna R.P.R. 11(7), Editura Academiei R.P.R., 361 pp., Bucureşti.

PANIN S., 1955: *Insecta. Coleoptera. Fam. Scarabaeidae I.* Fauna R.P.R. 10(3), Editura Academiei R.P.R., 121 pp., Bucureşti.

PANIN S., 1957: *Insecta. Coleoptera. Fam. Scarabaeidae II.* Fauna R.P.R. 10(4), Editura Academie Române, 315 pp., Bucureşti.
PANIN S., SĂVULESCU N., 1961: *Insecta. Coleoptera. Fam. Cerambycidae.* Fauna R.P.R., 10(5)., Editura Academiei R.P.R., 509 pp., Bucureşti.
PAULIAN R., 1941: *Coléoptères Scarabéides.* In: Faune de Frances, 38, 239 pp., Paris.
SIMIONESCU I., 1938 : *Fauna României,* Fundaţia pentru Literatură şi Artă, 478 pp., Bucureşti.
STANĚK V.J., 1989: *Encyclopédie des papillons,* Artia, 325 pp., Praga.
ZAIANCICOVSKI I. F., 1991: *Barometre vii*, „Ştiinţa", Chişinău.
******* *http//www.faunaeur.org* (accesat în septembrie 2014).

RECENT PHENOLOGICAL, ECOLOGICAL AND TAXONOMICAL NOTES OF THE VERTEBRATE'S AND INSECTS FAUNA FROM THE TINCA AREA (BIHOR COUNTY, ROMANIA)

Aurelian Leonardo Ilie[1]

RECENT PHENOLOGICAL, ECOLOGICAL AND TAXONOMICAL NOTES OF THE VERTEBRATE'S AND INSECT'S FAUNA FROM THE TINCA AREA (BIHOR COUNTY, ROMANIA)

Abstract: In this article we were presented the results of the researches performed about the vertebrate's and insects fauna from the Tinca area during August 2013 – January 2014. We were identified a new species in the fauna of area – *Canis aureus* and were obtained interesting notes looking the phenology of much species, due to the climatic modifications from the analyzed period.

Keywords: phenologycal, ecological and taxonomical notes, Tinca area.

Introduction

The Tinca area is situated in the south-western part of the Bihor County, on the banks of the Crişul Negru River. The climate is temperate-continental, the vegetation belongs to the oak stage. The average altitude is approximately 120 m and the relief is hillocky-hilly. Notes looking the vertebrate's and insects fauna of Tinca area were published by the author in books or scientifically articles, during 2007–2013.

Material and methods

The faunistical researches were performed in the period August 2013-January 2014. The collect of the insects was achieved with the entomological net by the method "mowing", completed with direct observations. The identification of bird

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species was made by the direct observations and with the help of binoculars 20x50 and 8x25 through the method of fixed points and the method of routes. Notes about the species on fish were obtained through the examination of the individuals supplied by the fishermen and the notes looking the mammal's results from the personal observations and notes supplied by the woodmen. Personal observations were realized too about the amphibian's fauna.

Results and discussions

In the analyzed period in the Tinca area were identified the following species:

Insecta Class

Lepidoptera Order

Vanessa cardui L. – 1 individual, Râpa (Corna Hill), 2.XI.2013, t=16ºC.

Colias erate Esp. – the same notes like the preceding species.

Colias croceus Fourc. – 25 individuals, Râpa, 2.XI.2013, t=16ºC.

Issoria lathonia L. – 1 individual, Râpa, 2.XI.2013.

Pararge aegeria ticris Butl. – 1 individual, Râpa (the limestone quarry), 2.XI.2013.

Coenonympha pamphylus L. – 1 individual, Râpa, 2.XI.2013.

Cupido alcetas Hoffm. – 1 individual, Râpa, 2.XI.2013.

Inachis io L. – 1 individual, Râpa, 2.XI.2013.

Papilio machaon L. – 1 individual, 6.XI.2013, Gurbediu, t= 14ºC, 1 individual, 15 XI 2013, Gurbediu, t=15ºC.

The very high temperatures from that period were determined the prolongation of the activity of these species, the literature (Szekely, 2008) indicates her presence only till included the September moth.

The same cause determined the prolongation of the activity period at the species: *Nymphalis antiopa* L. – 1 female individual, 17.XI.2013, Belfir; *Colias croceus* Fourc. – numerous individuals observed till at the end of November. The frequent still collects of the species *Nymphalis antiopa* in the last years in this species than we considered initially. I mention that the species is specific to more high altitudes (over 200 m) and his presence at one more reduced altitude (100 m) we can explain through the relatively little distance (approximately 30–35 km) compared to the mountain zone (Codru-Moma montains).

In fact actually numerous faunistical mountain elements (the lynx, the crested till the dipper, the grey wagtail) were observed sporadically in area.

Looking the species *Colias croceus*, the activity period was prolonged with one month and half compared to indicated period in the literature (the half of October month, Szekely, 2008).

The record of presence during winter in the world of butterflies is holded by the species *Vanessa atalanta* L.: 1 individual, 6.I.2014, Tinca, t=14ºC and 1 individual, 20.I.2014, Tinca, t=4ºC.

Odonata Order

Aeschna mixta Latreille – 1 female individual, 1 male individual, 16.X.2013, Râpa.

Sympetrum flaveolum L. – 3 female individuals, 3 male individuals coupling, 3.XI.2013, Râpa (location: Rogoaze), t=17°C.

Anax imperator Leach – one female individual, 12.XI.2013, Tinca, t=12°C.

The temperatures over 20°C, recorder in october and in the beginning of november were determined the prolongation of the species activity, the literature indicating the cessation of these in september.

Aves Class

Oriolus oriolus L.

– one male and one female having insects in the beak, feeding the third generation of chicks, Tinca, 17.VIII.2013.

– one individual, 29.VIII.2013, Tinca.

– two individuals, 7.X.2013, Tinca. In this case, probably they are northern individuals in migration.

Passer montanus L. – was observed the sixth generation on year and the chicks were flied. The literature (Ciochia, 1994) mentiones only 4–5 generations at national level.

Ciconia nigra L.

– one individual, 20.VIII.2013, Tinca.

– one individual, 30.VIII.2013, Tinca.

– three individuals, 31.VIII.2013, Tinca.

Ardea purpurea L.

– one individual, 7.X.2013, Tinca.

– one individual, 13.XI.2013 Tinca (on the Crişul Negru river).

Falco vespertinus L.

– one female individual, 21.VIII.2013, Tinca at 20:45 hour.

– one female individual, 22.VIII.2013, Tinca.

Glaucidium paserinum L.

– three individuals, 15.VI.2013, Tinca.

Alt though the bird is characteristic of the mountain zone, it was observed nesting too in the Tinca area.

Lanius collurio L.

– one juvenile individual, 8.XI.2013, Tinca (location Huta).

Ciconia ciconia L.

– two individuals, 10.XI.2013, Tinca. It seems that we are northern individuals, losted, being in migration.

Accipiter nisus L.

– one male individual, 8.IX.2013, Tinca (Huta).

– one juvenile individual, 8.XI.2013, Tinca.

– one female individual, 1.I.2014, Tinca, one male individual, 5.I.2014, Tinca.

Troglodytes troglodytes L.

– one individual singing, 14.XI.2013, Tinca.

– one individual, 24.XI.2013, Tinca.

– one individual, 19.XII.2013, Tinca.

– one individual, 2.XI.2013, Râpa (Corna Hill).

The previous and present signals proove the sporadic but constant presence of species in area during the winter.

Aegithalos caudatus L.

– one individual, 2.XI.2013, Râpa.

Turdus pilaris L.

– one individual, 29.I.2014, Tinca.

Lanius excubitor L.

– one individual, 2.XI.2013, Râpa (Corna Hill).

Phalacrocorax carbo L.

– one individual, 2.XI.2013, Râpa (the banks of Crisul Negru river). The numerous signals from area during the winter in the last years proove the changing of the phenological statute of this species from summer visitor, rarely winter in sedentary.

Merops apiaster L.

– some individuals singing, 18.IX.2013, Tinca.

– the same situation, 24.IX.2013, Tinca.

– numerous nests were dinged in the clayey hills from the exit of the Râpa vilage (Pusta zone), source of water.

Surprise the very little high regarding the soil (1m) at who were builded those nests, fact unmentioned just in present in literature.

A strange nesting, due to absence of the holows was observed too at the species *Strix aluco* L., but in Oltenia. In this way, in Caralua area (Dolj county), 20.VII.2013, I noticed two adults and four chicks, exiting from the nests builded in clayey hills or even hillocks of earth having heights of highest one meter. Although the adults presented a usual gray colour, the chicks presented colour belonging to rusty variety, more rare meeted.

The nesting in the mentioned conditions is not mentioned in literature, prooving a big adaption at the environment conditions, in area missing totally the holow trees. In the same area was observed the same type of nesting too at hoopae and roller, who nests generally in holows. The chicks observed of *Strix aluco* belonged to the second generation.

Egretta alba L.

– one individual, 19.IX.2013, Tinca.

– one individual, 24.IX.2013, Tinca.

– three individuals, 10.XII.2013, Tinca. From five years this species hibernate in area in isolated individuals or small flocks.

Circus pygargus L.

– one individual, 16.XI.21013, Tinca. Relativelly rare species, summer visitor, surprises his presence in this period in area.

Falco columbarius L.

– one individual, 24.XII.2013, Tinca.

Charadrius dubius Scop.

– one individual, nesting, 13.IV.2013, Gurbediu (Gurbediu Valley).

– one individual, 20.VII.2013, the same location.

Riparia riparia L.

– was observed nesting in Gurbediu Valley and Râpa.

Motacilla alba L.

– one male individual, having the winter coloring, 16.IX.2013, Tinca.

The presence of this coloring we can explained through the fact that the species moult before the departure in the autumm migration. Simultaneously, the frightened behaviour in the human presence proove that the individual was the northern one, the local individuals being tames, usualed with the human presence.

Larus argentatus Pont.

– ten individuals, 9.IX.2013, Tinca, on the banks of Crisul Negru river.

– one juvenile individual flying, 24.IX.2013, Tinca.

– eight individuals, 14.XII.2013, Gurbediu (Gurbediu Valley).

– forty individuals, 18.XII.2013, Gurbediu (some location).

– twenty individuals, 27.XII.2013, Gurbediu (some location).

– five individuals, 5.I.2014, Tinca (Băile Tinca).

Aquila clanga Pall.

– one individual, 17.XI.2013, Râpa.

Extremelly rare presence at national level, passage species, represents the third mention in area, all the mention being made during december (Gurbediu) and february (Tinca).

Dendrocopos syriacus Hempr. et Bibr.

– one female individual, 6.X.2013, Tinca.

– one adult female individual and one juvenile individual, 29.X.2013, Tinca. It records the apperance of species in the inside of the localities particularly the autumm and the winter.

Were recorder songs during the winter similar to the songs from spring in the mating period of the fallowing species: *Streptopelia decaocto* Friv. – 15.XII.2013, 6.I.2014, 7.I.2014, Tinca; *Parus major* L. – 6.I.2014, 18.I.2014, Tinca.

These songs were determined by the wery big temperatures for this period (14–18°C.), the birds being really „deceived" by the good weather who remember the spring.

Pelecanus onocrotalus L.

– ten individuals, 2.X.2013, Girişul Negru (on Crişul Negru river).

– six individuals, 11.X.2013, Girişul Negru (same location).

– four individuals, 17.IX.2013, Râpa (location Rogoaze) in mixture with some individuals of *Anas platyrhynchos* L. and *Anser anser* L.

– one individual, 19.XI.2013, Girişul Negru (on Crişul Negru river).

– one individual, 12.I.2014, Gurbediu (Gurbediu Valley).

The high temperatures from the end of autumm and from the course of winter (december – january) determined that isolated individuals or small groups to deviate from the routes of migration and to remain in area for a period of time. Also, the notes looking the presence of species in the inside of Carpathian arch are extremely few, proceeding from Transilvania, the notes from Crişana (Bihor) in winter being thus unpublished.

Buteo buteo L.

– one individual, 14.XI.2013, Tinca, 7:30 hour. Surprise to me his flight very low, at one meter above my head, without to be afraid of me.

Accipiter gentilus L.

– one individual, 12.IV.2013, nesting in the falow of one poplar tree situated at little high (2 m) above the soil, Gurbediu forest. The literature not mentioned the nesting in the holow but in nests builded on branches. Although in area extensive afforested surfaces, it surprise the choice of nesting location.

Phoenichurus ochruros Gmel.

– by one individual observed in the days: 17, 22, 23, 24.X.2013, Tinca. In all these cases it seems that they are either northern individuals, who migrate to south or local individuals who postponed temporarily the departure in migration.

Dryocopus martius L.

– one individual, 16.X.2013, Tinca park. The individual observed presented the skullcap of the head coloured yellow-orange and not intense red, like the classic individuals. This individual positively belongs to some chromatic aberrant who was not discribed in literature just now. I mention that some individuals with the same chromatic characteristics were observed too in Anieş – Maieru area (Bistriţa-Năsăud County) by the teacher ornithologist Ilie Hoza:

– one individual with skullcap yellow, 3.III.2001.

– one individual with skullcap orange, 2.II.2005.

– two individuals with skullcap yelow-orange, 11.I.2006.

– one individual with skullcap white-yellowish, 27.I.2008.

– one individual with skullcap orange, 4.IV.2010.

– one individual with skullcap white-yellowish, 10.IV.2013.

– one individual with a little and thin skullcap white-yellowish, 12.X.2013.

Cinclus cinclus L.

– one individual, Râpa, 26.I.2014 (the banks of Crişul Negru river). The appearance of this mountain species is very rare in area and is due of some unfair winters from the mountain area, the bird going down at lower altitudes where the running waters – the place of hunting are not freezed in one big proportion.

Amphibia Class

Salamandra salamandra L.

– four individuals, Râpa forest (the sector of beech trees), 235 m altitude, 23.I.2014, t=3ºC. The appearance of this species in this period, but also at lower temperatures is surprising.

Mammalia Class

Vulpes vulpes L.

– one female individual, 11.IX.2013, around Tinca village.

Canis lupus L.

– one individual, 10.VIII.2013, Tinca forest.

Sciurus vulgaris L.

– one individual with the fur black, 29.VIII.2013, Tinca forest.

– one individual with the fur black, 3.XI.2013, Tinca forest. The literature mentions the presence of some individuals only at relatively high altitudes, not in the plain area.

Canis aureus L.

– twenty – five individuals shooted in one pest control, Tinca area, december 2013. We observed too the adults with the puppies in Tinca vilage area. The appearance of this spesies in area is very recent (maximum two years), the first individuals were comer from Hungary, penetrating in Arad County (Mureş basin) and then migrating to north (Bihor County).

Lynx lynx L.

– one female with two kittens, going out from one badger's den, 26.V.2013, Râpa forest. That hypostasis is new because just that date the lynx presented the sporadic appearances in area.

Pisces Class

Barbus meridionalis petenyi Heck.

– one individual, 15.XI.2013, Tinca (around Tinca spa). This species is considerated relatively more rare at national level.

Anquilla anquilla L.

– one juvenile individual, 5.I.2014, L=27 cm, Tinca (Crişul Negru river). Sporadic individuals of this species penetrates from the Danube to the inside of the country in different rivers, presence relatively more rare in the inchthyofauna of the area.

Conclusions

Faunistical researches recorded in Tinca area during August 2013-January 2014 emphasized the fallowing:

– Was identified a new species in area: *Canis aureus*.

– Were identified new locations of nesting owed to the absence of the traditionals of respective species.

– The high temperatures from the period of autumm and a good part from winter determined the prolongation of the period of activity at numerous insects, the prolongation of the period of sitting and even the stability of some little populations of some migratory bird species, the deviation from the routes of migration and the stopping for a short period of time of one migratory bird species non-existent before in area (*Pelecanus onocrotalus*), the emission of the mating songs typical of spring (*Parus major*, *Streptopelia decaocto*), the appearance of one supplementary generation (*Oriolus oriolus*, *Passer montanus*).

– The new behaviours of some species: *Buteo buteo*.

– The identification of new chromatic aberrant at the species *Dryocopus martius*.

– The geographical positioning of area compare to mountain area determined the spreading at lower altitudes of some species typical to high altitudes.

REFERENCES

CIOCHIA V., 1992: *Păsările clocitoare din România*, Editura Ştiinţifică, Bucureşti.

ILIE A.L., 2007: *Contribution of the Knowledge of the mammalian fauna from Tinca area (Bihor County, Romania)*, Analele Universităţii din Craiova, vol. XII (XLVIII), p. 295–298, Craiova.

ILIE A.L., 2008: *Monografie faunistică – Păsările din zona Tinca (Judeţul Bihor, România)*, Editura Sitech, Craiova.

ILIE A.L., 2008: *Specii rare de păsări din fauna zonei Tinca*, Revista Pro Educaţia, Anul I, Nr. 1, p. 16–19, Tinca.

ILIE A.L., 2008: *Păsările din zona satului Tinca (jud. Bihor) în timpul sezonului serotinal*, Revista Pro Educaţia, Anul I, Nr. 2, p. 7–10, Tinca.

ILIE A.L., 2008: *Aspecte fenologice ale ornitofaunei din zona Tinca (jud. Bihor, România)*, Revista Pro Educaţia, Anul I, Nr. 3, pag.17–21, Tinca.

ILIE A.L., 2009: *Consideraţii privind fauna de păsări răpitoare diurne din zona Tinca (jud. Bihor, România)*, Revista Pro Educaţia, Anul II, nr. 4, p. 24–29, Tinca.

ILIE A.L., 2009: *Monografie faunistică – ciclostomii, peştii, amfibienii, reptilele şi mamiferele din zona Tinca (Judeţul Bihor, România)*, Editura Sitech, Craiova.

ILIE A.L., 2010: *Noi semnalări avifaunistice din zona Tinca (jud. Bihor, România)*, Revista Pro Educaţia, Anul II, nr. 5, p. 22–24, Tinca.

ILIE A.L., 2011: *Aspecte inedite ale faunei de vertebrate din zona Tinca (jud. Bihor, România)*, Revista Pro Educaţia, Anul III, nr. 6, p. 23–30, Tinca.

ILIE A.L., 2011: *Ornithological observations in the area of the Crisul Negru river middle course (the Tinca area, Bihor County, Romania) during the hiemal season*, Muzeul Naţional de Etnografie şi Istorie Naturală a Moldovei, Buletin ştiinţific. Revista de Etnografie, Ştiinţele Naturii şi Muzeologie. Serie Nouă, vol. 14(27), Fascicula Ştiinţele Naturii, p. 28–34, Chişinău.

ILIE A.L., 2012: *Menţionări faunistice noi în zona Tinca (jud. Bihor, România)*, Revista Pro Educaţia, Anul IV, nr. 8, p. 41–49, Tinca.

ILIE A.L., 2012: *The dragon – flies (Insecta, Odonata) from the Tinca area (Bihor County, Romania)*, Drobeta, Seria Ştiinţele Naturii, vol. XXII, p. 46–49, Editura Universitaria Craiova, Drobeta Turnu Severin.

ILIE A.L., 2012: *Noutăţi faunistice, aspecte etologice şi fenologice ale faunei de vertebrate şi de insecte din zona Tinca (jud. Bihor, România)*, Revista Educaţia omului de azi pentru ziua de mâine, nr. 9, p. 152–156, Oradea.

ILIE A.L., 2013: *Fluturii de zi din zona Tinca (jud. Bihor, România)*, Editura Sitech, Craiova.

ILIE A. L., MARINESCU M., 2013: *The population dynamics of some aquatic birds in the Tinca area (Bihor County, Romania)*, Buletin Ştiinţific. Revistă de Etnografie şi Istorie Naturală a Moldovei, p. 42–46, Chişinău.

MURARIU D., MUNTEANU M., 2005: *Mammalia Carnivora*, Fauna României, vol. XVI, Fascicula 5, Editura Academiei Române, Bucureşti.

POPESCU A., MURARIU D., 2001: *Mammalia Rodentia*, Fauna României, vol. XVI, Fascicula 2, Editura Academiei Române, Bucureşti.

SZEKELY L., 2008: *Fluturii de zi din România*, Muzeul Judeţean Braşov.

ORNITHOLOGICAL OBSERVATIONS ON THE BASCOV BASIN BETWEEN FEBRUARY 2013 AND JANUARY 2014

Adrian Mestecăneanu[1], Radu Gava[2]

ORNITHOLOGICAL OBSERVATIONS ON THE BASCOV BASIN BETWEEN FEBRUARY 2013 AND JANUARY 2014

Abstract: In this paper are showed the results of the researches performed between February 2013 and January 2014 on the avifauna from the Bascov Basin. The 38 observed species belong to 11 orders, Passeriformes are the richest (with 16 species). Anseriformes and Charadriiformes (each with 5 species) were the best represented among the wetland birds. *Fulica atra* was the only euconstant species and *Fulica atra* and *Larus ridibundus* were the eudominant species. *Fulica atra* counted most individuals in a month in March and *Larus ridibundus* in August. For the Bascov Basin avicoenose, Gruiformes and Charadriiformes were the overdominat orders and, inside the Charadriiformes order, *Larus ridibundus* was overdominant species. From the observed species, 9 (*Gavia arctica*, *Egretta garzetta*, *Egretta alba*, *Nycticorax nycticorax*, *Ciconia ciconia*, *Mergus albellus*, *Chlidonias hybridus*, *Sterna hirundo*, and *Alcedo atthis*) are in the Annex I of the Bird Directive.

Keywords: *ornithological observations, Bascov Basin, Argeş*, protection.

Introduction

The first studies about the ornithofauna of the basins from the Argeş River were performed at the end of '60s, soon after the building of the basins (Mătieş, 1969; Munteanu & Mătieş, 1983). The studies were intensified after 1995, when the Midwinter Census starts at the national level (co-ordinated by the Romanian Ornithological Society, in the last years in alliance with the Association for Birds and

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Nature Protection "Milvus Group"), (Gava, 1997; Gava et al., 2004a; Mestecăneanu et al., 2010 etc.). Thenceforth, the avifauna of the whole year of the basins from Vâlcele to Goleşti, that are included in the ROSPA0062 – "Lacurile de acumulare de pe Argeş" protected area was the subject of many works (Mestecăneanu et al., 2003; Gava et al., 2004b; Mestecăneanu et al.; 2004, Conete et al., 2006; Conete et al., 2010; Conete, 2011; Conete et al., 2012). Among them, the Bascov Basin was less researched (Conete et al., 2008).

Material and methods

The Bascov Basin is an accumulation lake on the Argeş River. Its building was finished in 1970. The dam of 21 m height, behind which 5.3 million m^3 of water can be accumulated with a surface of 140 ha, is made out of gravity and earth, having breast and concrete type of watertight and rocky and unrocky ground foundation type. Its purposes are: the supplying with water, the production of electrical energy and the irrigations. The area of catchment is 1162 km^2 (cf. http://www.baraje.ro/rrmb/rrmb_d4.htm).

It is placed immediately downstream of Budeasa Basin, close to Bascov locality (after which it is named) and Piteşti, too. Sudeaua Road is the access road that goes on the east and south parts. This is connected (through DN7) with the end of A1 Highway and with DJ703K (Fig. 1).

Upstream (over the Budeasa dam) crosses the road that links DJ703K with DN7C, from where another road starts and directs toward the nautical base. This is constructed on the right bank of the basin. There are three big islands in the perimeter of the lake, two of them (together with the right bank of the basin) forming a corridor that was developed as place of training for athletes. The left bank of the basin is frequented by fishermen. The quality of the water is good. So, according to the rapports of National Agency for the Environmental Protection – Argeş, in 2010, from the biological point of view, the Bascov accumulation is oligotrophic and from the physic-chemical point of view it is in the second class of quality (http://apmag.anpm.ro/).

The climate of the region is temperate continental with hilly influence, with the mention that in the meadow of the Argeş River a plain influence is noticed. The annual mean of the air temperature is ca. 9.5^0C (ca. -2.2^0C in January and ca. 20.5^0C in July). The annual mean of the water temperature is 1^0C more than the one of the air. The ice sheet forms when the temperature of the air maintains many days below -10^0C. The precipitations measure ca. 650 mm/year. Generally, the driest month is February and the rainiest is June (Barco & Nedelcu, 1974). By the National Administration of Meteorology, between 1961 and 1990, the mean monthly temperature of the air in July varied between 18.1 and 20.0^0C and the mean monthly temperature of the air in January varied between –1.9 and 0^0C. By the same source, the mean precipitation amount in July (1961–1990) is between

80.1 and 90 mm and the mean precipitation amount in January (1961–1990) is between 30.1 and 40 mm (http://www.meteoromania.ro). The level of water of the lake varies according to the rains and melting of the mountains snow. Generally, it grows in spring and decreases during the summer.

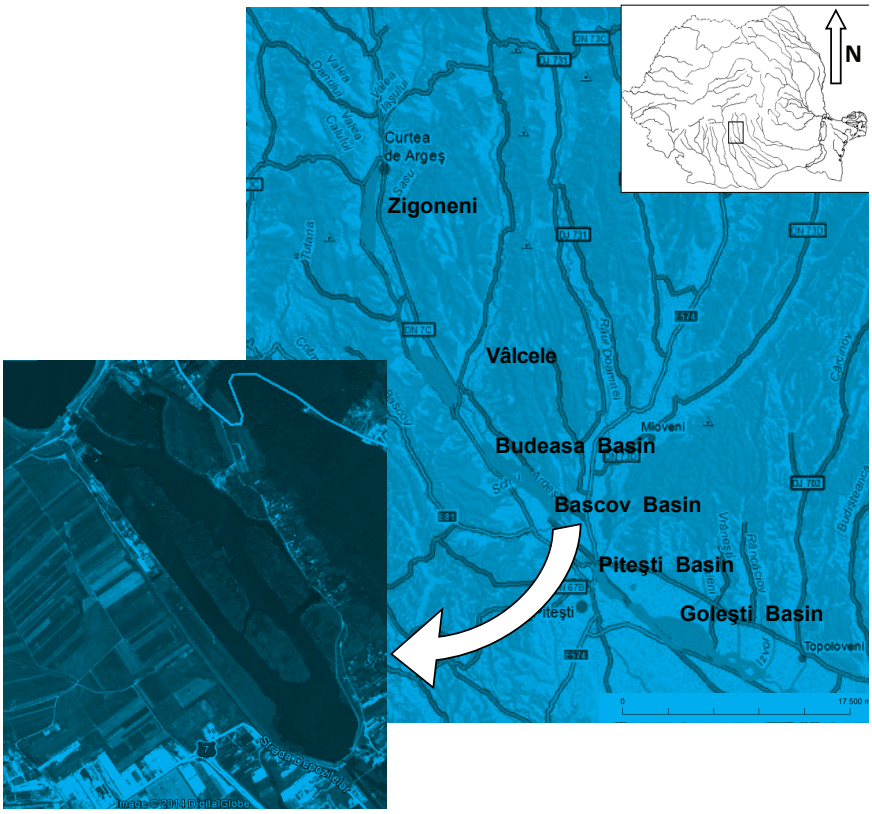

Fig. 1. The map of the ROSPA0062 – "Lacurile de acumulare de pe Argeş" (by http://dev.adworks.ro/natura, modified) with the place of Bascov Basin (in Google Earth view)

The vegetation is quite abundant. Preponderantly on the inlands and less on the shores grow various species of *Carex*, *Juncus*, *Salix*, *Alnus*, *Populus*, *Typha*, *Phragmites*, etc. In water there are: *Myriophyllum spicatum*, *Alysma plantago-aquatica*, *Potamogeton crispus*, *Sparganium erectum*, *Lemna minor*, etc. The neighbouring hills are covered with broad leaf forests (beech, hornbeam, diverse species of oak, etc.) and orchards, too. The meadow is cultivated with cereals, fodder, green goods, etc.

The fauna of fish includes: *Squalius cephalus*, *Barbus petenyi*, *Sabanejewia romanica*, *Stizostedion lucioperca*, *Perca fluviatilis*, *Esox lucius*, *Alburnus, alburnus*, *Carassius gibelio*, *Cyprinus carpio*, etc. (Ureche et al., 2007, discussions with the fishermen). It appertains to the afterbarbe (*Barbus* sp.) zone (Bănărescu, 1964).

The fixed point of observation was the main field method used. It was combined with the itinerary method. Our principal objective was to register the aquatic birds. The field trips were performed between 10 and 20 of every month. The same track on the eastern bank of the basin on the road was crossed, because it is the most favourable for the observation of the water birds. It started on the Bascov Dam and finished on the Budeasa Dam. The birds were visually and auditory identified. Binoculars (10x50), a spotting scope (14–45x50) and a photo device (42x optical zoom) were used.

The scientific nomenclature of the birds is compatible with the Hamlin Guide (Bruun et al., 1999).

Results and discussions

In the period February 2013 – January 2014, 38 bird species were observed on the Bascov Basin. They belong to 11 orders: Gaviiformes, Podicipediformes, Pelecaniformes, Ciconiiformes, Anseriformes, Falconiformes, Gruiformes, Charadriiformes, Columbiformes, Coraciiformes, and Passeriformes. Passeriformes was the richest (with 16 species); it is followed by Anseriformes and Charadriiformes (each with 5 species). Gaviiformes, Pelecaniformes, Falconiformes, Gruiformes, Columbiformes, Coraciiformes and Strigiformes were the least represented (each with 1 species).

The most number of species was registered in March, May, December and January (each with 10 species); the smallest was registered in August (6 species). The number of individuals was the highest in March (229 individuals). The minimum was in November (36 individuals) (Table 1).

The small number of species and individuals registered along the year and, respectively, every month is influenced by two aspects: the method of monitoring focused on the aquatic species and on the anthropogenic pressure, respectively. When the habitats are good for breeding, feeding and resting and the hunting is impossible, due to the proximity of the settlements, there is however a strong negative human impact. This fact was remarked on other occasion, too (Mestecăneanu et al., 2010; Conete, 2011, Mestecăneanu & Gava, 2013).

It is determined by the presence of the houses and of the people on its banks that drive away the birds (they see people as a threat, because of the hunting from nearby basins) and, more importantly, by the athletes. They train all year long though not regularly outside the specific area on the right side of the basin (except in winter, when the water freezes) and often they use the left side for returning to start, practically encircling the two middle islands (Fig. 2).

Table 1. The occurrence along the year, some ecological indexes and the conservation status of the species

No.	Species	Month												Absolute abundance	Class of constancy	Class of dominancy	Class of Dzuba index of ecological significance	Birds Directive (2009/147/CE)	Bern Convention	Bonn Convention	
		February	March	April	May	June	July	August	September	October	November	December	January								
I. Ord. Gaviiformes																					
1.	*Gavia arctica**											+		2	C1	D1	W1	AI	AII	AII	
II. Ord. Podicipediformes																					
2.	Podiceps cristatus*					+								1	C1	D1	W1		AIII		
3.	Tachybaptus ruficollis*		+						+		+	+	+	18	C2	D2	W2		AII		
III. Ord. Pelecaniformes																					
4.	Phalacrocorax carbo*				+				+		+	+	+	38	C2	D3	W2		AIII		
IV. Ord. Ciconiiformes																					
5.	Egretta garzetta*						+	+						17	C1	D1	W2	AI	AII		
6.	Egretta alba*	+											+	2	C1	D1	W1	AI	AII	AII	
7.	Nycticorax nycticorax*					+								1	C1	D1	W1	AI	AII		
8.	Ciconia ciconia*						+							1	C1	D1	W1	AI	AII	AII	
V. Ord. Anseriformes																					
9.	Cygnus olor*											+	+	9	C1	D1	W1		AIII	AII	
10.	Anas platyrhynchos*	+	+	+	+				+			+	+	104	C3	D4	W3		AIII	AII	
11.	Anas penelope*		+									+		29	C1	D2	W2		AII	AII	
12.	Aythya ferina*		+	+	+						+		+	103	C2	D4	W3		AIII	AII	
13.	Mergus albellus*												+	3	C1	D1	W1	AI	AII	AII	
VI. Ord. Falconiformes																					
14.	Buteo buteo								+					1	C1	D1	W1		AII	AII	
VII. Ord. Gruiformes																					
15.	Fulica atra*	+	+	+	+	+	+	+	+	+	+	+	+	620	C4	D5	W5		AIII	AII	
VIII. Ord. Charadriiformes																					
16.	Larus argentatus cachinnans/ michahellis*	+	+		+	+				+			+	105	C2	D4	W3				
17.	Larus canus*												+	7	C1	D1	W1		AIII		
18.	*Larus ridibundus**	+	+				+	+	+	+	+			316	C3	D5	W5		AIII		

No.	Species	Month												Absolute abundance	Class of constancy	Class of dominancy	Class of Dzuba index of ecological significance	Birds Directive (2009/147/CE)	Bern Convention	Bonn Convention	
		February	March	April	May	June	July	August	September	October	November	December	January								
19.	Chlidonias hybridus*							+						4	C1	D1	W1		AI	AII	
20.	Sterna hirundo*						+							7	C1	D1	W1		AI	AII	AII
IX. Ord. Columbiformes																					
21.	Streptopelia decaocto								+					3	C1	D1	W1			AIII	
X. Ord. Coraciiformes																					
22.	Alcedo atthis*									+	+			2	C1	D1	W1		AI	AII	
XI. Ord. Passeriformes																					
23.	Riparia riparia				+									40	C1	D3	W2			AII	
24.	Hirundo rustica			+	+	+		+						22	C2	D2	W2			AII	
25.	Delichon urbica						+							4	C1	D1	W1			AII	
26.	*Motacilla cinerea**	+												1	C1	D1	W1			AII	
27.	Motacilla alba		+		+		+	+	+					9	C2	D1	W2			AII	
28.	Garrulus glandarius										+			1	C1	D1	W1				
29.	Pica pica	+	+	+		+	+		+	+	+	+		30	C3	D2	W3				
30.	Corvus monedula											+		20	C1	D2	W2				
31.	Corvus frugilegus											+		60	C1	D3	W2				
32.	Corvus corax		+											1	C1	D1	W1			AIII	
33.	Prunela modularis									+				2	C1	D1	W1			AII	
34.	Acrocephalus arundinaceus*				+	+								4	C1	D1	W1			AII	AII
35.	Sylvia curruca			+										1	C1	D1	W1			AII	AII
36.	Luscinia megarhynchos			+										1	C1	D1	W1			AII	
37.	Passer domesticus			+	+	+	+			+				30	C2	D2	W2				
38.	Emberiza schoeniclus*									+				1	C1	D1	W1			AII	
Number of species		7	10	8	10	8	9	6	9	8	8	10	10								
Number of individuals		219	229	88	91	63	139	204	104	95	37	215	136								

Legend**:**

* – aquatic or amphibious birds; + – presence; AI, AII, AIII – annexes

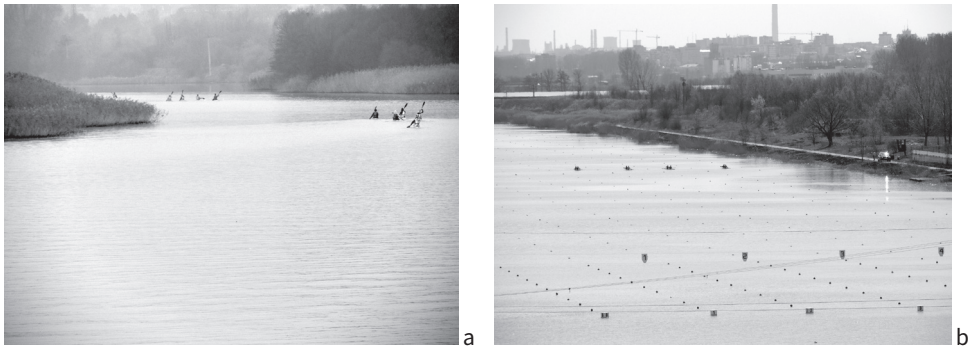

Fig. 2. Athletes training on the basin
(a – in the specific area from the right side, in view from upstream, at April 13, 2013; b – returning in the outer of the specific area, in view from downstream, at November 18, 2013)

Of the 38 species, 23 are aquatic or amphibious species (according to the main habitat of breeding and/or feeding). The month with the smallest number of these species was April (with 3 species) and the month with the most of these species was January (with 10 species). From, June to November the number of species is small. Regarding the individuals number, the smallest number was in November (with 34 individuals) and May and June (each with 39 individuals). February (with 218 individuals) March (with 222 individuals) and August (with 199 individuals) were the month the richest in individuals (Fig. 3). The figures can vary from a day to another in the same month under the effect of the anthropogenic pressure. A special case is that of the drainage of the basin (Fig. 4).

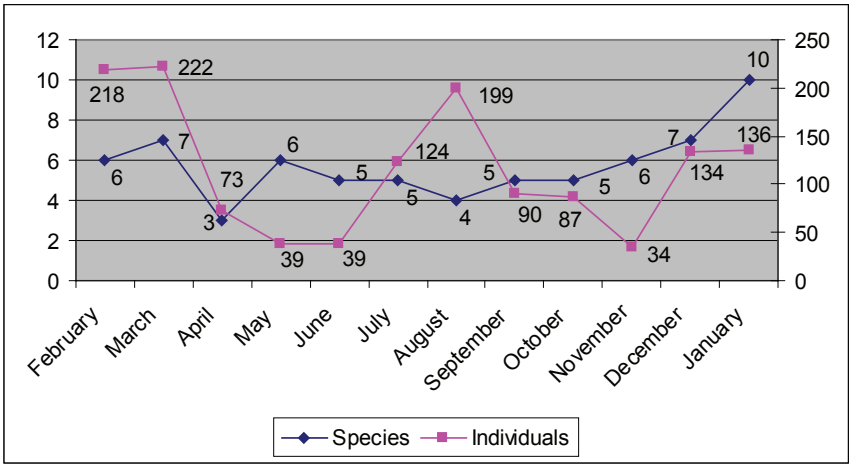

Fig. 3. The monthly variation of the number of aquatic or amphibious species and of their number of individuals

Fig. 4. The drainage of the basin (at August 20, 2013)

Few species bred in the area. *Anas platyrhynchos* and *Fulica atra* certainly bred and *Podiceps cristatus*, *Tachybaptus ruficollis*, *Nycticorax nycticorax*, *Aythya ferina*, *Larus cachinnans/michahellis*, and *Larus ridibundus* is possible to breed. *Ciconia ciconia* was observed feeding on the shore, but it does not breed here, as it is a species characteristic to the settlements. *Alcedo atthis* was considered a species dependent on water, because it breeds inside the banks created mainly of water and eats small animals which live in this environment. Inside the banks of the water *Riparia riparia* breeds too and it is not considered as an aquatic bird.

Among the aquatic or amphibious species, 15 species were counted in the hiemal period. Their number varied from 34 individuals in November to 218 individuals in February. Certainly, these numbers will grow in the future reducing the anthropogenic impact through adequate measures of protection.

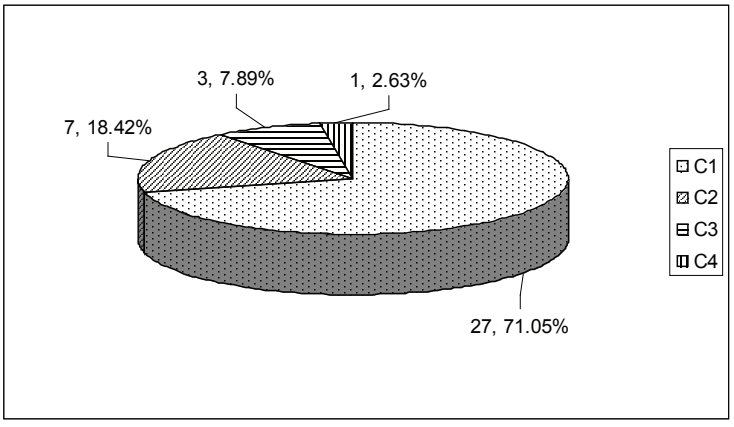

Fig. 5. The species distribution according to the index of constancy

By the index of constancy, 27 species (71.05%) were accidental (C1), 7 species (18.42%) were accessory (C2), 3 species (7.89%) were constant (C3) and 1

species (2.63%) were euconstant (C4) (Table 1, Fig. 5). The constant species are: *Anas platyrhynchos*, *Larus ridibundus*, and *Pica pica* and the euconstant species is *Fulica atra*.

By the index of dominancy, 24 species (63.16%) were subrecedent (D1), 9 species (15.79%) were recedent (D2), 3 species (7.89%) were subdominant (D3), 3 species (*Anas platyrhynchos*, *Aythya ferina* and *Larus argentatus cachinnans/ michahellis*, 7.89%) were dominant (D4) and 2 species (*Fulica atra* and *Larus ridibundus*, 5.26%) were eudominant (D5) (Table 1, Fig. 6).

According to the Dzuba index of ecological significance, 22 species (57.89%) were subrecedent (W1), 10 species (26.32%) were recedent (W2), 4 species (10.53%) were subdominant (W3), 0 species (0%) were dominant (W4) and 2 species (*Fulica atra* and *Larus ridibundus*, 5.26%) were eudominant (W5) (Table 1, Fig. 7).

The eudominant species (both in the case of index of dominancy and in the case of Dzuba index of ecological significance) are *Fulica atra* and *Larus ridibundus*. *Fulica atra* was represented every month. The minimum number was in October (6 individuals) but a minimum was in May (7 individuals), too. Between these, a maximum was in March (138 individuals), in July (96 individuals) and in January (70 individuals). For the hiemal period, the minimum was in December (65 individuals). So, *Fulica atra* is the species the least affected by the human impact. Its variation in numbers reflects the migratory movements and the appearance of the juveniles (Fig. 8). *Larus ridibundus* was absent (or almost absent) from March to June and from November to January, the months with the biggest numbers being August and October (Fig. 8). Generally, the basin is unfavourable for these birds in winter. The probability that they breed in this area in the warm period is very small, the increased number of individuals observed in August and October represents more the result of the displacement from other areas at the end of the breeding season.

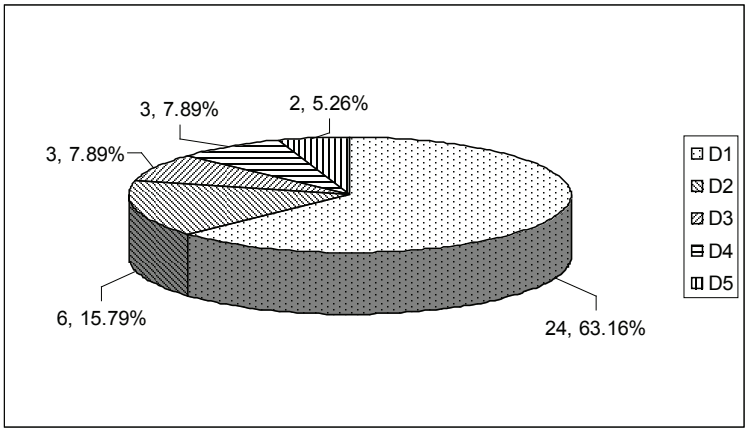

Fig. 6. The species distribution according to the index of dominancy

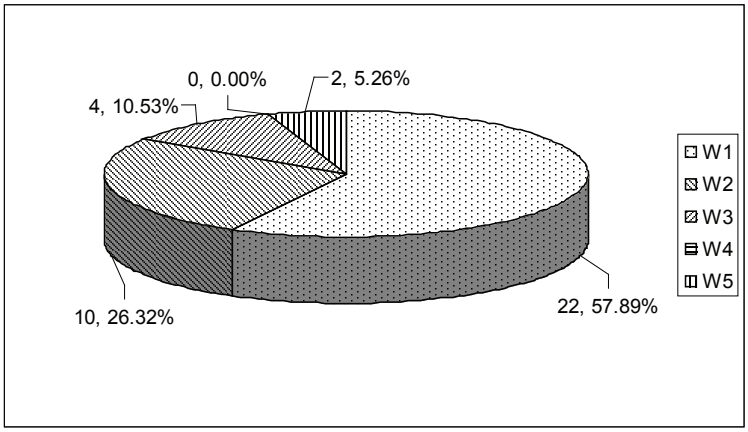

Fig. 7. The species distribution according to the index of Dzuba ecological significance

Concerning the connexion between the orders, on the whole year, Gruiformes and Charadriiformes were the overdominat orders, Anseriformes and Passeriformes were dominant orders and the other orders were complementary, where the static axis (As) is 9.09 and the dominance axis (Ad) is 18.18 (Fig. 9). Gruiformes numbered 620 individuals and Charadriiformes 439 individuals. About the dominance in the Charadriiformes order, it is obvious that *Larus ridibundus* was the most abundant species, as it was the only overdominant species. *Larus argentatus cachinnans/michahellis* was the only dominant species. There were both subspecies of the species, *L. a. cachinnans* being observed mainly after the breeding period. The other species were complementary, where the static axis (As) is 20 and the dominance axis (Ad) is 40 (Fig. 10).

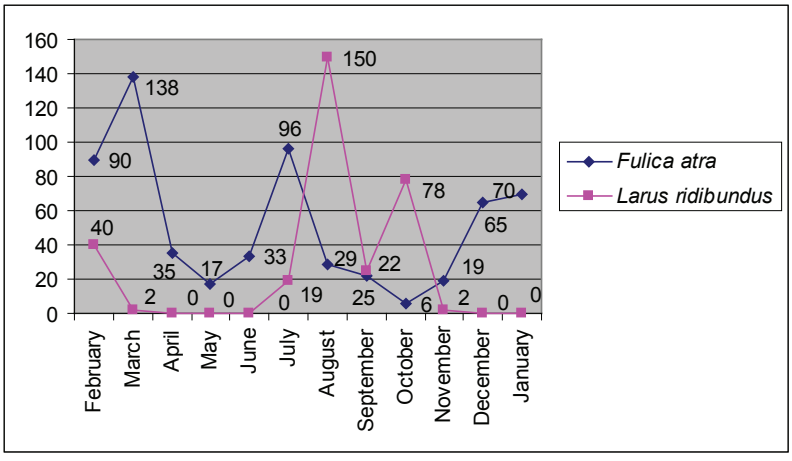

Fig. 8. The monthly variation in number of *Fulica atra* and *Larus ridibundus*

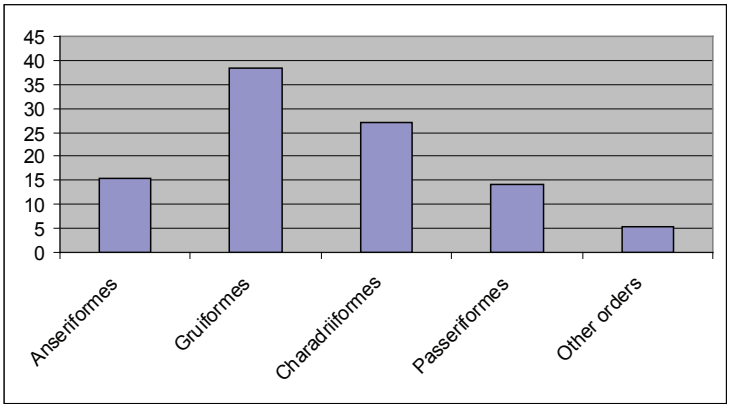

Fig. 9. The participation of the orders to the formation of the birds' population from the Bascov Basin

Regarding the monthly dynamics of the orders (figure 11), we observe that Pelecaniformes (in September), Anseriformes (in March – May, September and December and January), Gruiformes (in February – July, September and November – January), Charadriiformes (in February and July – October) and Passeriformes (in May, June and December) were overdominant orders, Podicipediformes (in November), Pelecaniformes (in November), Gruiformes (in August), Charadriiformes (in January) and Passeriformes (in April, July, September, and October) were dominant. In the rest of the time, these orders and the other orders (when they where present) were complementary. The dynamics is influenced by Gruiformes and Charadriiformes on a hand and by Anseriformes and Passeriformes, on the other hand. The migration of the component species is strongly reflected in this relationship. The static axis (As) is 9.09 and the dominance axis (Ad) is 18.18.

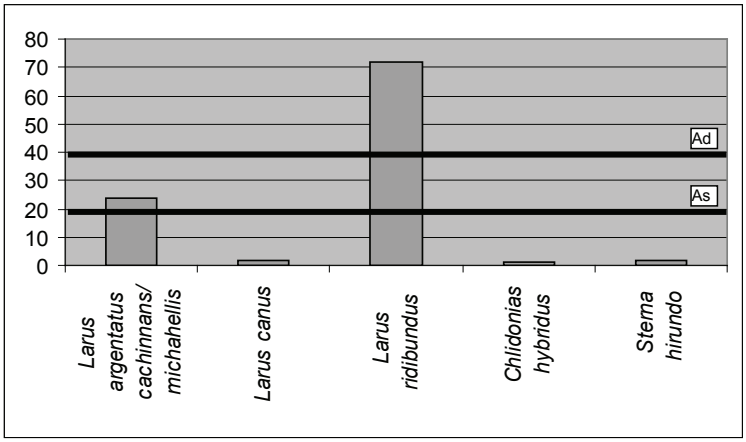

Fig. 10. The participation of the species to the formation of the Charadriiformes coenose from the Bascov Basin

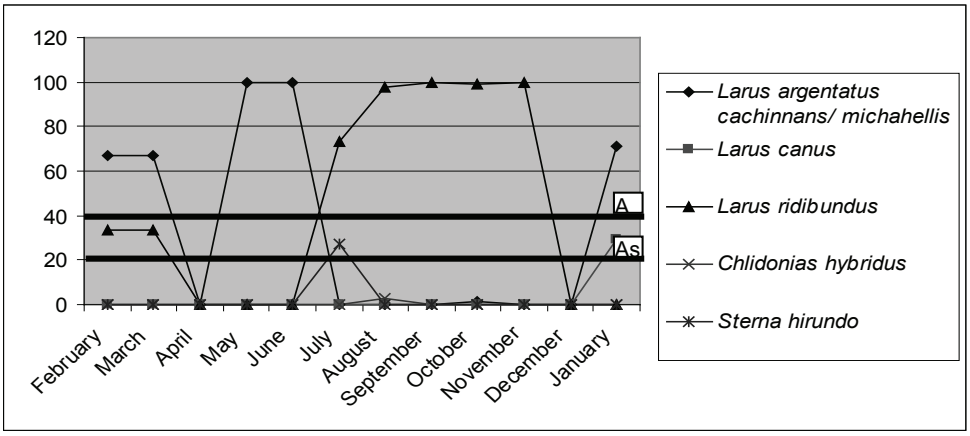

Fig. 11. The monthly dynamics of the orders

Regarding the monthly dynamics of the species of Charadriiformes (Fig. 12), we see that *Larus argentatus* (in February, March, May, June, and January) and *Larus ridibundus* (in July – November) were overdominant, *Larus canus* (in January), *Larus ridibundus* (in February and March) and *Sterna hirundo* (in July) were dominant and *Larus argentatus* (in October), and *Chlidonias hybridus* (in August) were complementary. Except the months April and December, when no species of Charadriiformes were observed, practically, from July to November *Larus ridibundus* was the overdominant species, in the rest of the time its place is occupied by its relative, *Larus argentatus*. The static axis (As) is 20 and the dominance axis (Ad) is 40.

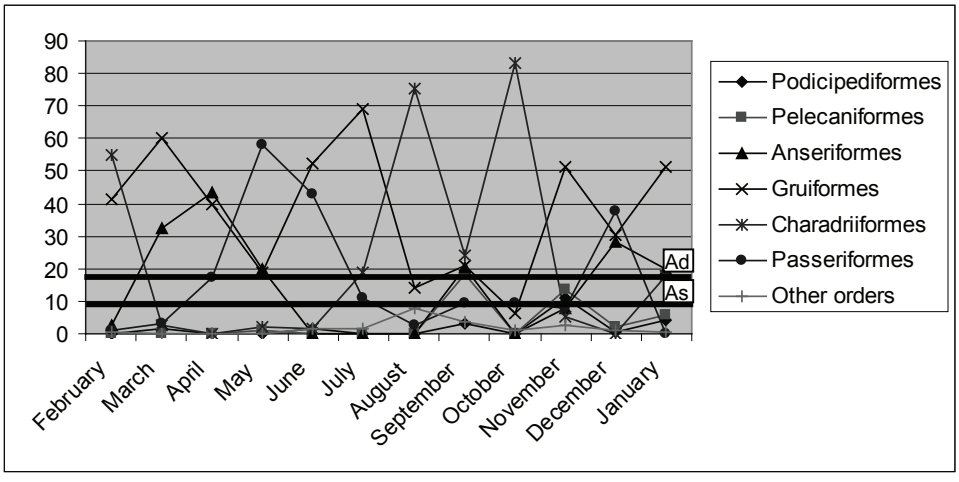

Fig. 12. The monthly dynamics of the species of Charadriiformes

By the Bird Directive, 9 species (23.68%, *Gavia arctica*, *Egretta garzetta*, *Egretta alba*, *Nycticorax nycticorax*, *Ciconia ciconia*, *Mergus albellus*, *Chlidonias hybridus*, *Sterna hirundo*, and *Alcedo atthis*) are in the Annex I (AI). These species shall be the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution (http://eur-lex.europa.eu/). By the Bern Convention, 22 species (57.89%) are in the Annex II (AII, strictly protected species) and 10 species (26.31%) are in the Annex III (AIII, protected species) (http://conventions.coe.int/). By the Bonn Convention, 13 species (34.21%) are in the Annex II (AII, migratory species which have an unfavourable status of protection and that demand international agreements for their protection) (http://eur-lex.europa.eu/legal-content/).

Conclusions

– Between February 2013 and January 2014, on the Bascov Basin were identified 38 bird species that appertain to 11 orders;

– Passeriformes was the richest (with 16 species); it is followed by Anseriformes and Charadriiformes (each with 5 species);

– *Fulica atra* is the only euconstant species;

– *Fulica atra* and *Larus ridibundus* were the eudominant species;

– *Fulica atra* counted most individuals a month in March and *Larus ridibundus* in August;

– On the whole year, Gruiformes and Charadriiformes were the overdominat orders and, inside the Charadriiformes order, *Larus ridibundus* was overdominant species;

– The migration of the Gruiformes, Charadriiformes, Anseriformes and Passeriformes is strongly reflected in the dynamics of the orders;

– Except the months April and December, when no species of Charadriiformes was observed, practically, from July to November *Larus ridibundus* was the overdominant species, in the rest of the time its place is occupied by *Larus argentatus*;

– 9 species (23.68%, *Gavia arctica*, *Egretta garzetta*, *Egretta alba*, *Nycticorax nycticorax*, *Ciconia ciconia*, *Mergus albellus*, *Chlidonias hybridus*, *Sterna hirundo*, and *Alcedo atthis*) are in the Annex I of the Bird Directive.

The biodiversity of the aquatic or amphibious species of the Bascov Basin is relatively modest. For its development, it is obviously necessary a better protection of the area through the reducing of the negative human impact. The best way to do this is to eliminate the training of the athletes on its water. If it is not possible, at least it must limit the surface used by them to the one from the right side of the accumulation, from the dam of Budeasa Basin to the end of its central downstream island. Also, the fishing must be reduced. The cockboats must be banned and the fishing must be done only with the line. The avifaunistical list of the Bascov basin will considerably grow through studying of the central islands,

less accessible, rich in terrestrial and amphibious vegetation, where species of Passeriformes and other orders are expected to live.

REFFERENCES

BARCO AURELIA, NEDELCU E., 1974: *Judeţul Argeş*, Editura Academiei Republicii Socialiste România, 168 p, Bucureşti.

BĂNĂRESCU, P., 1964: *Fauna R.P.R., Pisces-Osteichthyes.* Editura Academiei Române, XIII, 959 p. , Bucureşti.

BRUUN B., DELIN H., SVENSSON L., SINGER A., ZETTERSTRÖM D., MUNTEANU D., 1999: *Păsările din România şi Europa. Determinator ilustrat. Hamlyn Guide,* Societatea Ornitologică Română. Octopus Publishing Group Ltd., 320 p. , London.

CONETE DENISA, 2011: *Cercetări ecologice asupra avifaunei unor lacuri de baraj din zona mijlocie a văii Argeşului.* PhD thesis, Institutul de Biologie al Academiei Române, Bucureşti.

CONETE DENISA, MESTECĂNEANU A., GAVA R., 2008: *Ecological researches about the avifauna of the Bascov Basin in the hiemal and prevernal aspects (2008–2009),* Argessis. Studii şi Comunicări. Seria Ştiinţele Naturii. Muzeul Judeţean Argeş, XVI, p. 83–92, Piteşti.

CONETE DENISA, MESTECĂNEANU A., GAVA R., 2010: *Ecological researches about the avifauna of the Budeasa Basin (Argeş River, Romania) in the hiemal and prevernal aspects (2008–2009),* Analele Universităţii din Oradea, Fascicula Biologie, University of Oradea Publishing House, 17 (1), p. 90–94, Oradea.

CONETE DENISA, MESTECĂNEANU A., GAVA R., 2012: *Ornithological researches on the Goleşti Dam Lake (Argeş County, Romania) during 2003–2010.* Analele Universităţii din Oradea, Fascicula Biologie, University of Oradea Publishing House, 19 (1), p. 84–92, Oradea.

CONETE MARIA DENISA, MESTECĂNEANU A., GAVA R., 2006: *Speciile de păsări din situl AIA „Lacurile de acumulare de pe Argeş" protejate pe plan naţional şi european,* Argesis. Studii şi Comunicări, Ştiinţele Naturii, Muzeul Judeţean Argeş, 14, p. 103–115, Piteşti.

DIACONU MARILENA, 2008: *Calitatea apei din bazinul superior al râului Argeş – amonte de Goleşti.* IWM 2008 Conference,
http://www.environheal.pub.ro/portal_001/images/stories/diaconu marilena.pdf.

GAVA R., 1997: *Acumulările hidroenergetice de pe râul Argeş, posibile Arii de Importanţă Avifaunistică.* Lucrările simpozionului Arii de Importanţă Avifaunistică din România. Publicaţiile S.O.R., 3, p. 39–42, Cluj Napoca.

GAVA R., MESTECĂNEANU A., CONETE DENISA, 2004: *The reservoirs of the Argeş River valley – important bird areas.* Limnological Reports, Internat. Assoc. Danube. Res., Sebia and Muntenegro, 35, p. 619–631, Novi Sad.

GAVA R., MESTECĂNEANU A., CONETE DENISA, MESTECĂNEANU F., 2004: *Recensământul păsărilor de baltă din ianuarie de pe lacurile din bazinul mijlociu al râului Argeş, în perioada 2000–2004,* Argessis, Studii şi Comunicări, Ştiinţele Naturii, Muzeul Judeţean Argeş, 12, p. 125–132, Piteşti.

MĂTIEŞ M., 1969: *Cercetări avifenologice de-a lungul bazinului mijlociu şi superior al Argeşului între 1 ianuarie – 31 mai 1968,* Muzeul Judeţean Argeş, Studii şi Comunicări, 2, p. 73–90, Piteşti.

MESTECĂNEANU A., GAVA R., 2013: *The avifauna from Vâlcele, Budeasa, Bascov, Piteşti, and Goleşti basins observed in the prevernal season in 2013,* Argesis, Studii şi comunicări, seria Ştiinţele Naturii, Muzeul Judeţean Argeş, 21, p. 71–86, Piteşti.

MESTECĂNEANU A., CONETE DENISA, GAVA R., 2003: *Date despre prezenţa a 12 ordine de păsări (Aves), cu dinamica anseriformelor pe lacul Piteşti în iarna 2002–2003,* Studii şi Comunicări, Ştiinţele Naturii, Muzeul Olteniei, 19, p. 195–201, Craiova.

MESTECĂNEANU A., CONETE DENISA, GAVA R., 2004: *Date despre prezenţa păsărilor pe lacul Piteşti în toamna anului 2003,* Studii şi Comunicări, Complexul Muzeal de Ştiinţele Naturii „Ion Borcea", Editura „Ion Borcea", 19, p. 212–217, Bacău.

MESTECĂNEANU A., CONETE DENISA, GAVA R., 2010: *Ecological research-studies regarding the avifauna during the hiemal period from the basins area of the Argeş River between 2000 and 2010,* Annals. Food Science and Tehnology, Universitatea Valahia, 11 (2), p. 127–135, Târgovişte.

MUNTEANU D., MĂTIEŞ M., 1983: *Modificări induse de lacurile de acumulare în structura şi dinamica avifaunei,* Analele Banatului. Ştiinţele Naturii. Muzeul Banatului, 1, p. 217–225, Timişoara.

*** Google Earth Database.

*** http://apmag.anpm.ro/upload/72682_raport%20anual%202010%20Arges.pdf.

*** http://dev.adworks.ro/natura/situri/65/Lacurile-de-acumulare-de-pe-Arge.html#map-holder.

***http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:01:EN:HTML.

***http://conventions.coe.int/Treaty/Commun/QueVoulezVous.asp?NT=104&CM=8&DF=&CL=ENG.

*** http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31982D0461.

*** http://www.baraje.ro/rrmb/rrmb_d4.htm.

*** http://www.meteoromania.ro/anm/?page_id=114.

DATA ON BAT HIBERNATION (MAMMALIA, CHIROPTERA) IN ABANDONED STONE QUARRIES NEAR CRICOVA TOWN

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DATA ON BAT HIBERNATION (MAMMALIA, CHIROPTERA) IN ABANDONED STONE QUARRIES NEAR CRICOVA TOWN.

Abstract: The studies were performed at the end of hibernation period in 2013 and in winter of 2013–2014 at the abandoned stone quarries near Cricova town of Chişinău district. In total 137 individuals belonging to 8 species were registered (*Rhynolophus hipposideros*, *Myotis daubentonii, M. dasycneme, M. mystacinus, M. bechshteini, Plecotus austriacus, P. auritus, Eptesicus serotinus*). After analyzing the structure of hibernating colony it was established that the dominant species was *M. daubentonii*, which constituted almost half of all registered individuals, followed by *M. dasycneme*, which constituted about 15% and *M. mystacinus* with more than 10% of all bats. The rest of the species registered less than 10% each.

Keywords: bats, hibernation, underground shelter, structure.

Introduction

The order Chiroptera is one of the most numerous in the fauna of the Republic of Moldova, it comprises 21 species belonging to families Rhynolophidae and Vespertilionidae. Many bat species hibernate in underground shelters of various

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origins, including anthropogenic ones. Therefore, the abandoned stone quarries represent important bat hibernation sites. Various bat species find favorable wintering conditions in such habitats due to low antropogenic disturbances, large surfaces and presence of high number of suitable shelters. The studies on bat hibernation in artificial underground shelters were performed in 60's–70 of the past century in different areas of the republic, but mostly in the northern and central zones (Averin & Lozan, 1965; Lozan, 1969; Kuciuc & Lozan, 1970; Doroshenko, 1975; Averin et al., 1979). After that the bat studies were practically ceased and at the end of 90's they were continued by several researchers mostly in the central part of Moldova and in Nistru river valley (Vasiliev & Corcimaru, 1995; Vasiliev & Andreev, 1998). After 2000 only general data on bat species can be found in some bibliographic sources (Munteanu & Lozan, 2004; Andreev & Bondarenco, 2006; Munteanu et al., 2013). Since 2013 intense studies on bat species hibernating in various underground shelters from the central part of Moldova have started and preliminary results were published mostly as abstracts (Nistreanu et al., 2013a, b; Nistreanu et al., 2014).

Since the 70's the abandoned stone quarries near Cricova town were mentioned as important bat hibernation site (Doroshenko, 1975). Therefore, we considered that the bat study in this area will be of high importance in comparative aspect with the previous years, as well as for emphasizing the importance of this site in bat hibernation and their diversity conservation.

Materials and methods

The studies were performed at the end of hibernation period in 2013 and in winter of 2013–2014 at the abandoned stone queries near Cricova village of Chişinău district ($47^0$09.04 N, $28^0$51.44 E, altitude – 85–90 m). The abandoned stone quarries near Cricova village represent two levels of underground passages and are located on the left bank of Ichel river. The upper level, situated at 90 m a.s.l., has one entrance of 3.5 m wide and 1.5 m height. The lower level, situated at 85 m a.s.l., has 5 entrances, of which 3 are blocked by fallen stones and 2 are accessible for entering inside the queries. At the end of 90's – beginning of 2000 in this stone queries were recorded several bat species at hibernation and the site was proposed to be declared as protected area, but till now this fact wasn't yet realized. At least, the metal grilles installed at that time to a several entries, are partially preserved and limit public access. The quarry ceiling height is between 0.5–2.5 m, in some places it is knocked down. The depth of the queries is about 500 m and the underground passages are chaotic. The ceiling contains many holes remained after the supports used to sustain the mine roof during the work. The holes are relatively small, with a diameter between 3 and 10 cm and a depth of 5 to 20 cm.

The underground shelters were studied in March of 2013, in December of 2013 and in February of 2014. The bats were studied directly by visual observations,

all individuals were identified, and some of them were extracted from the ceiling holes in order to determine their sex and age, weight and morphological peculiarities.

Results and discussions

In total 137 individuals belonging to 8 species were registered (*Rhynolophus hipposideros*, *Myotis daubentonii, M. dasycneme, M. mystacinus, M. bechshteini, Plecotus austriacus, P. auritus, Eptesicus serotinus*). Immediately after the quarries entry, at about 4–5 m, the first specimens of bats were found. They were representatives of *Plecotus* genus and *Rh. hipposideros* that usually hibernate near the entrances of underground shelters.

Most of the individuals were found in hollows solitarily, but in some deeper and larger holes several individuals were found together. All individuals found in a single hole were *M. daubentonii*, and their number varied between 1 and 4 per hole. Other species were found exclusively solitarily (Fig. 1).

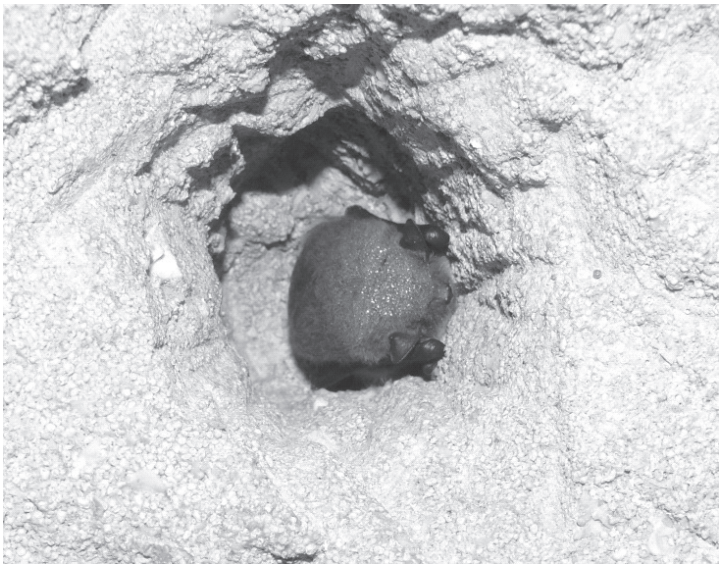

Fig. 1. Daubenton's bat (M. daubentonii) found solitary in the holes

The long-eared bats (P. auritus and P. austriacus) and the lesser horseshoe bat (Rh. hipposideros) weren't found in holes from the ceiling, but only on the edges, in cracks side of the corbels, niches or recesses in the ceiling side (fig. 2). All individuals were found to be solitary. In spatially aspect these three species were located in the output area of the quarries, all individuals have been found up to a distance of 30 m from one of the exits.

Fig. 2. Lesser horseshoe bat (*Rh. hipposideros*) attached to the ceiling

After analyzing the structure of hibernating colony it was established that the dominant species was *M. daubentonii*, which constituted almost half of all registered individuals, followed by *M. dasycneme*, which constituted about 15% and *M. mystacinus* with more than 10% of all bats. The rest of the species registered less than 10% each. *M. bechshteini* individuals constituted about 8% and it must be mentioned that at present the abandoned quarries near Cricova is one of the two known hibernation places of this species on the republic territory. *P. austriacus* was recorded at a rate of about 9%, while *P. auritus* individuals were found in very low number, representing 2%. In general, the long-eared grey bat is more frequent and more numerous than the brown one on the territory of the republic. Although *E. serotinus* is a wide spread species, even in synanthopic biotopes, in this site it was found in low number, representing only 1% of all the bats (Fig. 3).

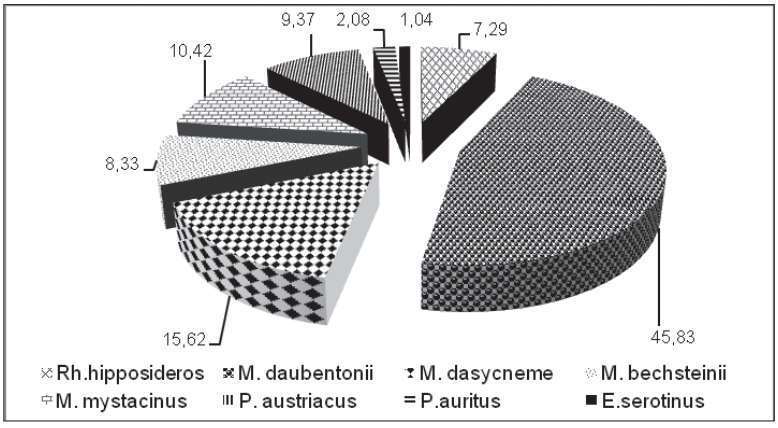

Fig. 3. Structure of bat colony hibernating in abandoned stone quarries near Cricova town

In the previous studies accomplished in 60's–70's (Doroshenko, 1975) there were recorded 11 species of bats in comparison with 8 species registered in the last years. The *Plecotus* genus species were considered as one species, *P. austriacus* was differentiated and described only in the last years (Andreev, Bondarenco, 2006). Among the species that weren't recorded in our studies can be mentioned *M. nattereri*, *M. myotis* and *Barbastella barbastellus* (Doroshenko, 1975). It must be mentioned that *M.myotis* and *B. barbastellus* are very rare o the territory of the R. Moldova and their disappearance from the hibernation colonies in the abandoned stone quarried near Cricova is a great loss. The studies in this site will continue and hopefully this species will be registered again at hibernation.

Although the studies in the past century were performed during about 15 years the number of recorded individuals is much lower than in the last years of study. The minimum number of registered bats was 1 in 1959, 1964, 1970 and the maximum number was 51 in 1957 (Doroshenko, 1975). In our study there were recorded more than 30 individuals in March 2013 and about 100 individuals in January-March 2014. The number of Rh. hipposideros individuals was much higher in the 60's–70 of the past century, the species being dominant in the majority of study years. At present it wasn't recorded at all in March 2013, while in 2014 it constituted about 7%. It must be mentioned rather high percent of *M. bechsteinii* (over 8%) in comparison with the previous studies where this species was represented by 1–2 individuals.

The abandoned stone quarries near Cricova town are important places for hibernation of bats in the central zone of Moldova. Mixed colonies of hundred individuals of about 8 species hibernate here, including some rare species, and these habitats must be protected.

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REFERENCES

ANDREEV S., BONDARENCO A. 2006: *Liliecii fiinţe remarcabile*, 36 pp. Chişinău.

AVERIN IU. V., LOZAN M. N., 1965: *Rukokrylye Moldavii*, Voprosy ecologii i practicheskogo znachenia ptits i mlekopitayushcih, Nr. 2, p. 25–33, Chişinău.

AVERIN IU.V., LOZAN M. N., MUNTEANU A. I., USPENSKII G. A., 1979: *Jivotnyi Vir Moldavii. Mlekopitaiushcie,* 188 pp, Chişinău „Stiinta".

DOROSHENKO A. V., 1975: *Mesta obitania i chislennost letuchih myshei Moldavii,* In „Ecologia ptits i mlekopitayushcih Moldavii", p. 82–96, Chişinău „Stiinta".

LOZAN M. N., 1969: *Ostrouhaia nochnitsa (Myotis blythi Tom) v Moldavii,* Voprosy ecologii i practicheskogo znachenia ptits i mlekopitayushcih, Nr. 4, p. 69–84, Chişinău.

KUCIUC A. V., LOZAN M. N. 1970: *Letuchie myshi Moldavii,* In „Fauna Moldavii i ee ohrana", p. 166–167, Chişinău.

MUNTEANU A., LOZANU M., 2004: *Lumea Animală a Moldovei. Mamifere,* 132 pp., Chişinău „Stiinta".

MUNTEANU A., NISTREANU V., SAVIN A., TURCANU V., CORCIMARU N., CEBANU A., MOŞU A., ROMANESCU V., BONDARENCO A., ANDREEV S., LARION A., SÎTNIC V., 2013: *Atlasul speciilor de vertebrate (mamifere, reptile, amfibieni, peşti) incluse în cadastrul regnului animal al Republicii Moldova,* 100 pp., Chişinău, S.n., „Elan Poligraf".

NISTREANU V., CALDARI V., ANDREEV S., LARION A., POSTOLACHI V., 2013: *Preliminary data on hibernation peculiarities of bats (Mammalia, Chiroptera) in abandoned stone quarries near Cricova village*, VIII International Conference of Zoologists "Actual problems of protection and sustainable use of animal world diversity", Chişinău 10–12 October, p. 72–73.

NISTREANU V., CALDARI V., ANDREEV S., LARION A., POSTOLACHI V., 2013: *Preliminary data on bat hibernation in abandoned quarries from Saharna, Republic of Moldova,* Scientific Symposium „Biology and Sustainable Development", p. 36, December 5–6, Bacău, Romania.

NISTREANU V., CALDARI V., ANDREEV S., LARION A., POSTOLACHI V., 2014: *Abandoned stone quarries from Saharna – suitable site for bat (Mammmalia, Chiroptera) hibernation*, International Symposium"Sustainable use and protection of animal world diversity", p. 75–76, Chişinău.

VASILIEV A., ANDREEV S., 1998: *Fauna rukokrylyh (Chiroptera) podzemelii doliny Dnestra,* Materialele Conferinţei Internaţionale "Problemele conservării biodiversităţii din cursul medial şi inferior al fluviului Nistru", p. 30–32, Chişinău.

VASILIEV A., CORCIMARU N. 1995: *New data about bats of R. Moldova*, Materialele Conferintei a III-a a Zoologilor din Moldova cu participare internaţională, p. 22, Chişinău.

FAUNISTIC AND ECOLOGICAL PECULIARITIES OF SMALL MAMMALS (MAMMALIA: RODENTIA, INSECTIVORA) FROM THE SOUTHERN ZONE OF THE REPUBLIC OF MOLDOVA

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FAUNISTIC AND ECOLOGICAL PECULIARITIES OF SMALL MAMMALS (MAMMALIA: RODENTIA, INSECTIVORA) FROM THE SOUTHERN ZONE OF THE REPUBLIC OF MOLDOVA

Abstract: The studies were performed in 2011–2012 in various types of ecosystems from the southern zone of the Republic of Moldova. There were registered 249 small mammals from 13 species, of which 10 rodent and 3 insectivore species. The dominant species were the wood mouse 31.7%, the pigmy filed mouse with 23.3% and the yellow-necked mouse with 17.3%. The highest species diversity was revealed at forest edge (1.91), in shelter belts (1.54) and in woods (1.33), while in paludous biotops (0.64), abandoned orchards/gardens (0.35) and in

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rural ecosystems it was much lower. In all the studied ecosystems the wood mouse was the dominant and the most spread species.

Keywords: small mammals, southern zone, abundance, diversity.

Introduction

In the last decades the communities of small mammals (Mammalia: Rodentia, Insectivora) have suffered a series of changes both qualitative and quantitative due to the increasing of anthropogenic pressure, as well as to modifications of climatic factors. The mentioned negative for animal communities factors are more pronounce in the southern zone of the republic, where the average temperatures are higher, the aridity degree is increased and the forest ecosystems are rare. Many of small mammal species can serve as indicators of ecosystem stability. Thus, by studying the ecological peculiarities of micromammal species can be emphasized the changes occuring in the last years in certain area, as well as the adaptive capacities of some species toward the environmental modifications.

There are many studies on small mammal fauna on the republic territory, where data on fauna from the sounthern zone can be found (Lozan, 1975; Averin et al., 1979; Munteanu & Savin, 1981; Munteanu & Lozanu, 2004; Munteanu et al., 2006; Nistreanu, 2007; Savin & Nistreanu, 2009; Nistreanu, 2011a,b; Nistreanu et al., 2011; Postolachi et al., 2012 etc.). But, there are no papers concerning small mammal fauna specifically from the southern zone, which from biogeographic point of view, represent a transition area between Mediterranean and Palearctic regions. Therefore, the aim of the study was to emphasize the structure, diversity and influence of some factors upon the micromammal communities in various ecosystems from the southern zone of the republic.

Materials and methods

The studies were performed in spring-autumn period of 2011–2012 in three districts of the southern zone: Cahul, Ştefan Vodă and Ciadîr Lunga. The districts are located in Prut river valley and in Nistru river valley.

In order to determine the species composition and animal number there were used standard methods (Novikov, 1953; Chicu et al., 2012). The snap traps nr. 0, nr. 1 and Hero traps were used for catching small rodents and shrews, as well as medium sized rodents. The traps we placed in lines at the distance of 5 m between the traps and 25 to 50 m distance between the rows. As bait small pieces of bread imbued with sun-flower oil were used. Also, direct visual observation of vital activity and traces were made. The study of small mammals was accomplished in various types of ecosystems: woods, forest edge, forest shelter belts, paludous, agrocenoses, represented mostly by abandoned gardens and orchards. The following ecological indexes were considered: the abundance, the trappability coefficient (no of caught individuals vs trap number in%), diversity

index (Shannon). The obtained data were processed using computer programs Word and Excel 2007.

Results and discussions

On the whole in the southern zone were processed 2331 trap/nights and caught 249 small mammals from 13 species, of which 10 rodent and 3 insectivore species. Out of these species only 3 had a high abundance in the area: the wood mouse (*Apodemus sylvaticus)* with 31.7%, the pigmy filed mouse (*A. uralensis*) with 23.3% and yellow-necked mouse (*A. flavicollis*) with 17.3%. The other species were recorded in low number, each of them having less than 10% abundance: field vole (*Microtus arvalis*) with 6.8%, bank vole (*Clethrionomys glareolus*) with 5.6%, striped field mouse (*A. agrarius*) with 4.0%, mound building mouse (*Mus spicilegus*), common shrew (*Sorex minutus*) and pigmy shrew (*S. araneus*) with 2.8% each, while forest dormouse (*Dryomys nitedula*), house mouse *(M. musculus*) and brown rat (*Rattus norvegicus*) constituted only 0.4% each (Fig. 1, Table 1).

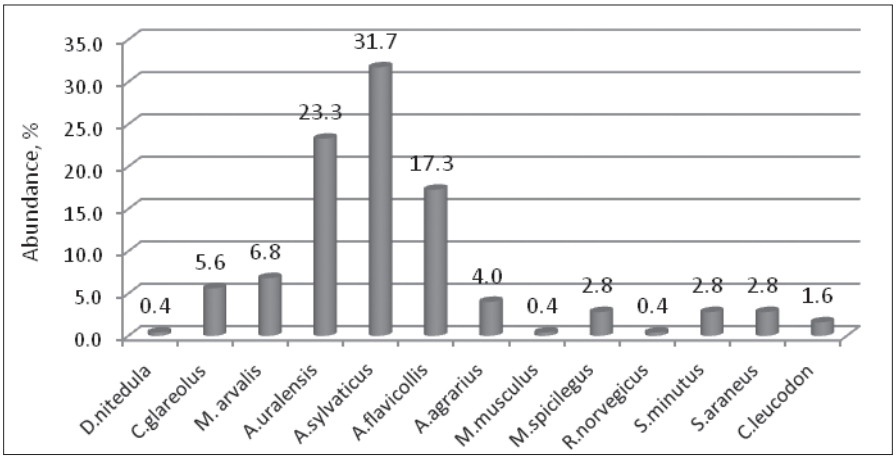

Fig. 1. Relative abundance of small mammal species in the ecosystems from the southern zone of the republic

Table 1. Small mammal species and number of individuals caught in the ecosystems from the southern zone of the republic

No	Species	Ecosystem type						
		Forest edge	Wood	Shelter belt	Orch.gard.	Paludous	Rural	Total
	Ord Rodentia	**80**	**33**	**98**	**9**	**10**	**1**	**231**
1.	Dryomys nitedula	0	1	0	0	0	0	**1**

2.	Clethrionomys glareolus	9	3	2	0	0	0	**14**
3.	Microtus arvalis	15	0	2	0	0	0	**17**
4.	Apodemus uralensis	6	3	48	0	1	0	**58**
5.	Apodemus sylvaticus	23	5	34	8	8	1	**79**
6.	Apodemus flavicollis	19	20	4	0	0	0	**43**
7.	Apodemus agrarius	7	1	2	0	0	0	**10**
8.	Mus musculus	0	0	0	1	0	0	**1**
9.	Mus spicilegus	1	0	6	0	0	0	**7**
10.	Rattus norvegicus	0	0	0	0	1	0	**1**
	Ord. Insectivora	**7**	**1**	**10**	**0**	**0**	**0**	**18**
11.	Sorex minutus	2	0	5	0	0	0	**7**
12.	Sorex araneus	5	0	2	0	0	0	**7**
13.	Crocidura leucodon	0	1	3	0	0	0	**4**
Total small mammals		**87**	**34**	**108**	**9**	**10**	**1**	**249**

The highest abundance of small mammals was recorded in forest shelter belts with 43.4% from the total number of caught individuals. At forest edge the small mammal abundance was also high – 34.9%, while in the woods it was much lower, only 13.7%. A lower abundance was registered in paludous ecosystems (4.0%), abandoned gardens and orchards (3.6%) and in rural ecosystems – 0.4% (Fig. 2).

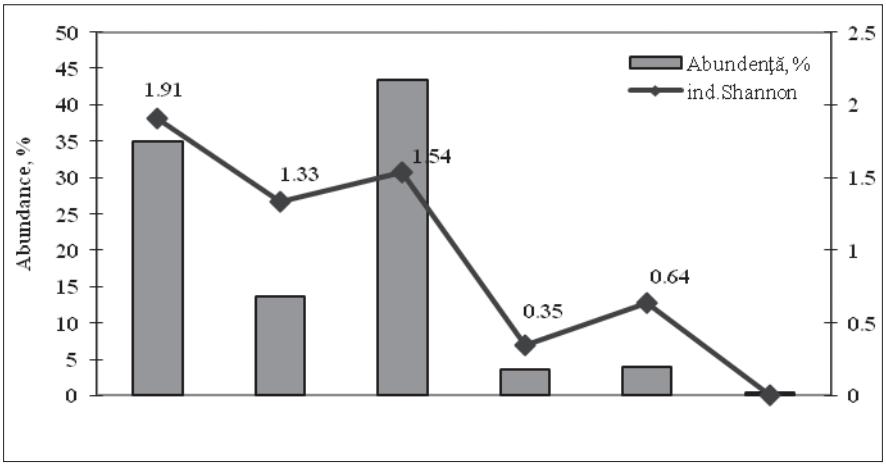

Fig. 2. Abundance and diversity of small mammal communities in the ecosystems from the southern zone of the republic

The highest species diversity was revealed at forest edge (1.91), in shelter belts (1.54) and in woods (1.33), while in paludous biotopes (0.64), abandoned orchards/gardens (0.35) and in rural ecosystems it was much lower (Fig. 2).

The trappability index of small mammals constituted 21.2% at forest edge, 13.1% in woods, 12.2% in shelter belts, which is due to higher abundance of the

individuals in these types of ecosystems, as well as to their higher activity in such biotopes. In abandoned orchards/gardens the index constituted 3.2% and in paludous only 2.5%.

The high abundance and diversity of small mammals in shelter belts and at forest edge is conditioned by varied composition of the vegetation, abundant trophic resources and suitable shelter places. Furthermore, these ecosystems represent ecotone zones between various type of biotopes, where both forest and open type habitat species can find favorable conditions for their existence. In paludous ecosystems mostly hygrophilous and eurytopic species were recorded. In rural ecosystems only the wood mouse was caught, which is the most spread species, and by visual observation were registered the house mouse and the rat.

In the studied area *A. sylvaticus* was the dominant species, being registered in all the ecosystems. In present conditions the species manifest remarkable adaptive capacities and have the dominance of about 35–40% in various ecosystems. This species, with large limits of ecological valence, has the ability to quickly adapt to the ecological conditions modifications. Therefore, in the last years, in spite of arid conditions and anthropic pressure, the wood mice is the most prosperous species among the rodents, being dominant and constant in various types of ecosystems, even in rural and urban ones. The adaptive potential of *A. sylvaticus* consist in the solitary way of life, the use of a large trophic resources spectrum, use of most various biotopes as refuge stations, intense migration to optimal habitats during the year, the high reproductive potential, as well as the extensive period of reproduction activity (Munteanu et al., 2007; Savin, 2003; Savin & Nistreanu 2009).

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REFERENCES

AVERIN IU. V., LOZAN M. N., MUNTEANU A. I., USPENSKII G. A., 1979: *Jivotnyi Vir Moldavii. Mlekopitaiushcie,* 188 pp, Chisinau „Stiinta". [In Russian].

CHICU V., GHEORGHIŢA S., BURLACU V., GUŢU A., CULIBACINAIA E., MELNIC V., NISTREANU V., LARION A., 2012: *Colectarea, evidenţa şi pronosticarea numărului mamiferelor mici în anumite teritorii*, Indicaţie metodică, 52 pp., Chişinău.

LOZAN M. N., 1975: *Nasekomoyadnye mlecopitayushchie Moldavii (Insectivora, Mammalia),* In Ecologia ptits i mlekopitaiyushchikh Moldavii, p. 96–118, Chişinău „Stiinta". [In Russian].

MUNTEANU A., LOZANU M., 2004: *Lumea Animală a Moldovei. Mamifere,*132 pp., Chisinau „Stiinta".

MUNTEANU A., SAVIN A., 1981: *Ecologiceskaia structura populiatsii lesnoi myshi v agrocenisah*, In Ecologia ptits i mlekopitaiyushchikh Moldavii, p. 66–79. Chisinau „Stiinta". [In Russian].

MUNTEANU A., SAVIN A., CORCIMARU N., NISTREANU V., 2007: *Rolul structurii ecosistemelor în menţinerea diversităţii grupărilor taxonomice de mamifere,* Conferinţa a VI-a a Zoologilor din Moldova cu participare internaţională, p. 38–39, Chişinău.

MUNTEANU A., ZUBCOV N., SAVIN A., CORCIMARU N., SITNIC V., 2006: *Diversitatea comunităţilor de vertebrate terestre pe păşuni şi terenuri degradate*. Materialele Conferinţei a V-a a Zoologilor din Moldova „Diversitatea, valorificarea raţională şi protecţia lumii animale", p. 95–97, Chişinău.

NISTREANU V., 2011: *Distribution of shrews from genus Sorex Linnaeus, 1758 (Mammalia: Insectivora) on the territory of Republic of Moldova*, Travaux du Muséum National d'Histoire Naturelle Grigore Antipa. Vol. LIV (2), p. 555–561, Bucharest.

NISTREANU V., 2007: *Spreading of insectivore species (Erinaceidae, Talpidae, Soricidae, Insectivora) in Nistru river basin,* Transboundary Dniester river basin management and the EU Water Framework Directive, International Conference, 2–3 October, p. 213–217, Chisinau.

NISTREANU V., SAVIN A., LARION A., SÎTNIC V., CHIHAI O., 2011: *Ecological aspects of rodent communities in agrarian ecosystems of Moldova,* Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Volume 68, issue 1, p. 272–276, Cluj-Napoca.

NISTREANU V., SAVIN A. L, BURLACU V., LARION A., CARAMAN N., CORCIMARU N., BURDUNIUC O., 2011: *Distribution of shrews from genus Crocidura on the territory of Republic of Moldova*, Academician Leo Berg – 135: Collection of Scientific Articles, p. 350–353, Bender.

POSTOLACHI GH., MUNTEANU A., POSTILACHE D., COJAN C., 2012: *Rezervaţia "Prutul de Jos"*, 152 pp., Chişinău.

SAVIN A., 2003: *Dinamica sezonieră a reproducerii speciilor Apodemus sylvaticus şi Apodemus uralensis în condiţiile agrocenozei,* Culegere jubiliară dedicată lui Spassky A. Chiinu: 127–129.

SAVIN A., NISTREANU V.: *Structural – functional transformations of rodent communities in ecosystems of Moldova against a background of anthropogenic and climatic changes,* Oltenia Journal for Studies in Natural Sciences, Tom 25, p. 275–280, Craiova.

BIODIVERSITY MONITORING IN GRADISTEA MUNCELULUI CIOCLOVINA NATURAL PARK BETWEEN 2013 AND 2014 – PRELIMINARY DATA

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BIODIVERSITY MONITORING IN GRADISTEA MUNCELULUI CIOCLOVINA NATURAL PARK BETWEEN 2013 AND 2014 – PRELIMINARY DATA

Abstract: Assessment of biodiversity vegetation dynamics is a very important objective, taking into account that vegetation is a major component of ecosystems. Most research findings on the biodiversity of vegetation, especially forest vegetation, shows that it's decline can be understood as a reaction to antropozoogenic stress which largely resulted in habitat modification and air, water and soil pollution (Barker et al., 1991 Szaro and Johnston, 1996, which Grodzinska, 2004). The effects of environmental changes on biodiversity, including the impact of air pollution, are reconsidering long-term monitoring of vegetation dynamics to provide scientific information on the change of variables characterizing ecosystems (microclimate, soil, etc.). Herpetofauna, mainly amphibian species, because of the fine adjustments and responses to environmental factors, can be indicators of habitat quality. Thus, the study of these groups is beneficial not only to determine the value of biodiversity indicators, but also to determine the conservation status of the habitats in which they are found. In forest ecosystems, birds are part of biocenosis hence an indicator of biodiversity and ecosystem stability.

Keywords: monitoring, fauna, flora, habitats, management measures.

Introduction

Grădiştea Muncelului-Cioclovina Natural Park aims at the protection and preservation of landscape complexes where the interaction of human activities with nature over time has created a distinct area with significant landscaping and / or cultural value, often with high biological diversity.

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Materials and method

Investigations on biodiversity (flora, fauna, habitats) in Grădiştea Muncelului Cioclovina Natural Park were conducted between February 2013 and September 2014 as part of the monitoring process, according to the park's monitoring plan Identified cormophytes in the park area were collected (starting with vernal and continuing with summer plants) and botanized, and for endemic, rare and endangered species geographic coordinates were noted for monitoring the conservation status of their populations.

Based on data from scientific literature and field investigations a database was created with the cormophyte species in the park area. The following information are recorded within this database: scientific name, common name, family, bioforms, geoelement, ecological indexes, cariology, sozological category, spread.

The floristic outline was drawn based on both data from the literature (Flora of Romania, 1952–1976; Boşcaiu et Péterfi, 1974), and the field research. Systematic classification of taxa was realized according to the paper Excursionflora von Österreich (Adler et al., 1994), respecting the Flora Europaea taxonomic concept (1964–1980), vol. 1–5.

For bioforms, geoelementes and ecological indexes (light, moisture, soil reaction, the amount of mineral nitrogen in the soil). For ecological indexes the scale by H. Ellenberg et al. (1992) was used, adapted to the physical and geographical conditions of Romania.

Habitat structure characterization was done using phytosociological surveys which can be defined as "the basic method in the qualitative and quantitative study of vegetation, consisting of a sequence of observations and measurements (most of them made in the field), completed by overlapping eco-cenotic ambience graphics from a surface sample (fragment) determined within individual associations (phytocoenosis)" (Cristea et al. 2004).

The avifauna monitoring methods we used include the fixed points and transect methods. This method involves standing in a certain place (point) and recording all the birds seen in that place for a certain period of time.

For collecting insects, Barber traps were installed in all habitats according to the Monitoring Plan, and butterfly collection was realized using enthomological nets.

To record data on reptiles the direct observation monitoring method was used. Mammalian species will be found throughout the year throughout the park area. The method used in the study of mammals is the transect method. Their monitoring was done according to the monitoring plan and consisted of field data collection and completing observation sheets, based on traces identified on soft soil or snow (footprints, droppings, scratch marks, etc) and direct observations.

Results and discussion

Preliminary floristic research conducted in 2014 revealed the existence of over 550 cormophyte species, belonging to 215 genus and 75 families. In terms of numbers, most species belong to the family *Poaceae*, followed by *Rosaceae, Asteraceae, Caryophyllaceae, Ranunculaceae, Fabaceae, Apiaceae, Lamiaceae, Scrophulariaceae, Brassicaceae*, other families being represented by less than 10 species.

The species identified and inventoried in this period include some of priority and of community and national interest, rare, endangered, endemic species, etc.

The species identified and inventoried include: *Hepatica transsilvanica, Thymus comosus, Symphytum cordatum, Sorbus borbasii, Galanthus nivalis, Leucojum vernum Helleborus purpurascens, Carex caryophyllea, Centaurea scabiosa, Scabiosa columbaria, Dianthus carthusianorum, Veronica teucrium, Salvia divinorum, Salvia hispanica, Clematis alpina, Silene pusilla, Poa nemoralis, Cystopteris fragilis, Sesleria rigida, Daphne mezereum, Dianthus spiculifolius, Hieracium transsilvanicum, Sedum hispanicum, Telekia speciosa, Lysimachia vulgaris, Filipendula ulmaria, Knautia arvensis, Trifolium pannonicum, Gentianella amarella, Astrantia major, Angelica sylvestris, Angelica arhangelica, Campanula serrata* (European endangered species, listed in Annex II b of the Habitats Directive and the Emergency Ordinance no. 57 of 20 June 2007 on the status of protected natural areas, conservation of natural habitats, flora and fauna, Annex 3b, MO no. 442/29 June (species whose conservation requires the designation of special areas of conservation), *Campanula patula* ssp. *abietina* (species listed in Annex I of the Bern Convention), *Campanula cervicaria*, *Drosera rotundifolia* (rare flora species listed in the Red List of Romanian Superior Plants in Romania (Oltean et al., 1994). Also, the coenotic ambience vegetation of xero-mesophile and xerofile grassland elements characteristic to *Festuco-Brometea* class (*Anthyllis vulneraria, Asperula cynanchica*, *Echium vulgare, Dianthus carthusianorum, Euphrasia stricta, Galium album, Pimpinella saxifraga, Plantago media, Scabiosa ochroleuca, Sanguisorba minor, Teucrium chamaedrys, Trifolium pannonicum, Bruckenthalia spiculifolia, Jovibarba heuffelii, etc.)*.

Fig. 1. *Campanula cervicaria*

Fig. 2. *Gentianella amarella*

Fig. 3. *Bruckenthalia spiculifolia*

Fig. 4. *Jovibarba heuffelii*

In habitat 6210 – Semi-natural dry grasslands and scrubland facies on calcareous substrates – Festuco-Brometea (*Important orchid sites) identified in Grădiştei and Godeanu Valleys, Ponorici, Merisor, a number of orchid species were inventoried and collected, namely: Orchis maculata, Orchis morio, Platanthera bifolia, Dactylorhiza maculata, Anacamptis pyramidalis, Spiranthes spiralis.

The four endemic species, those listed by the Annexes of the Habitats Directive and other species of national and community interest, observed and located using GPS, will be noted and the coordinates will be the basis for the realization of distribution maps.

A wide range of species of mushrooms (fungi) and ferns have been identified and inventoried, found mostly in forest habitats, as follows:

– *Amanita rubescens, Amanita muscaria* (Fam. *Amanitaceae,* Ord. *Agaricales*);

– *Clathrus archeri* (Fam. *Phallaceae*, Ord. *Phallales*);

– *Mutinus canninus* (Fam. *Phallaceae*, Ord. *Phallales*);

– *Lactarius vellereus*, *Lactarius rufus* (Fam. *Russulaceae*, Ord. *Russulales*);

– *Russula vesca* (eggplant), *Russula emetic foetens, Russula cyanoxantha* (Fam. *Russulaceae*, Ord. *Russulales*);

– *Stereum hirsutum* (Fam. *Stereaceae*, Ord. *Russulales*);

– *Boletus edulis*, *Boletus pinicola*, *Boletus erzthropus* (Fam. *Boletaceae*, Ord. *Boletales*);

– *Astraeus hygrometricus* (Fam. *Astraeaceae,* Ord. *Boletales*);

– *Scleroderma citrinum* (Fam. *Sclerodermataceae*, Ord*. Boletales*);

– *Coprinus comatus*, *Coprinus disseminatus*, *Chlorophyllum rhacodes* syn *Macrolepiota rhacodes*, *Macrolepiota procera* var. *procera* (Fam. *Agaricaceae*, Ord. *Agaricales*);

– *Lactarius piperatus* (Fam*. Russulaceae, Ord. Russulales*);

– *Craterellus cornucopioide*s (Fam. *Cantharellaceae*, Ord. *Cantharellales*);

– *Cantharellus cibarius (chanterelle mushrooms*) (Fam. *Cantharellaceae,* Ord. *Cantharellales*);

– *Trametes versicolor* (Fam. *Polyporaceae,* Ord. *Polyporales*);

– *Fomes fomentarius* (Fam. *Polyporaceae,* Ord. *Polyporales*);

– *Ganoderma lucidum* (Fam. *Ganodermataceae,* Ord. *Polyporales*);

– *Piptoporus betulinus* (Fam. *Fomitopsidaceae*, Ord. *Polyporales*);

– *Pleurotus ostreatus* (Fam: *Pleurotaceae,* Ord. *Agaricales*);

– Cyathus striatum (Fam: Nidulariaceae, Ord. Agaricales).

Fig. 5. *Clathrus archeri*

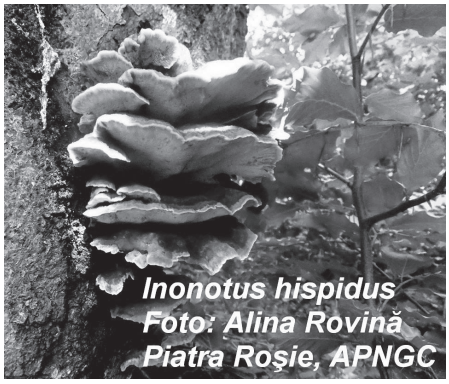

Fig. 6. *Inonotus hispidus*

The species of ferns inventoried and identified in habitats in the park area include: *Pteridium aquilinum, Athyrium filix-femina, Matteuccia struthiopteris,*

Polystichum aculeatum, Polypodium vulgare, Cystopteris fragilis, Asplenium scolopendrium, Asplenium ruta-muraria, Asplenium trichomanes, Asplenium viride, Lycopodium clavatum, Selaginella helvetica, Huperzia selago, Equisetum vulgare, Equisetum arvense, Equisetum sylvaticum, Equisetum hyemale; Marchantia polymorpha; Sphagnum sp., *Polytrichum commune, Grimmia pulvina, Xanthoria parietina, Evernia prunastri, Cladonia stellaris, Cladonia portentosa, Cladonia fimbriata* etc.

Fig. 7. *Asplenium scolopendrium*

Research carried out during 2013–2014 in PNGMC allowed for the identification of five natural habitats in Strei Valley as follows: 6430 – Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels; 6520 – Mountain hay meadows; 91E0* – Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae); 91V0 Dacian beech forests (Symphyto-Fagion); 3230 – Alpine rivers and their ligneous vegetation with Myricaria germanica.

Also in 2014 a series of natural habitats in Poiana Omului were inventoried and monitored, namely: 6430 – Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels; 6230 * [Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and sub-mountain areas, in Continental Europe)] and R5411 – southeast Carpathian eu-mesotrophic marshes, with Carex nigra ssp. nigra, Juncus glaucus and Juncus effusus.

In Poiana Omului hydrophilic weed communities are in a good conservations state, no additional steps being required for their restoration. However, special attention should be paid to antropozoogenic impact as a cows and sheep sheepfold is active close by. During field research, the practice of grazing was noted within the swamp of Poiana Omului where these groups vegetate, which in time could affect the floristic composition.

In order to maintain an appropriate conservation status, the following management measures are required: banning grazing in or near the marsh; maintaining natural water levels by prohibiting drainage and creating dams which can increase the water level; banning the use of chemicals in the vicinity of the marsh (50 m).

Other habitats were also identified and inventoried next to the habitats described for the areas: Costeşti – Grădişte Valley – Godeanu Valley – Tampu and Costeşti-Prihodiste – Tarsa – Ponorici – Fundatura Ponorului – Lunca Ponorului, namely:

– 6110 * – Rupicolous calcareous or basophile grasslands of the Alysso -Sedion albi;

– 6210 – [Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometea) (* important orchid sites)];

– 6420 – Mediterranean tall humid herb grasslands of the Molinio -Holoschoenion;

– 5130 – Juniperus communis formations on heaths or calcareous grasslands.

They correspond mainly to the phytodinamic stages of succession for the following types of vegetation: generally mesophilic limestone meadows or xerophyle, poor in nutrients, grazed or abandoned, of the Festuco-Brometea. This habitat is evolving; there are plant-specific habitat associations, but groups as juniper glades, are corresponding to dynamic stages of secondary succession

The area investigated for inventory, identification and monitoring activities for habitats, flora, vegetation and fauna also included forest habitats of Community, national and priority interest, namely:

– 9150 – Medio-European limestone beech forests of the Cephalanthero -Fagion;

– 9170 – Galio – Carpinetum oak – hornbeam;

– 91Y0 – Dacian oak – hornbeam forests;

– 91M0 – Pannonian – Balkanic turkey oak – sessile oak forests;

– 9110 – Luzulo-Fagetum beech forests;

– 9130 – Asperulo-Fagetum beech forests;

– 9410 – Acidophilous Picea forests of the mountane to alpine levels – Vaccinio – Piceetea.

Fig. 8. 91E0* habitat

Fig. 9. 3230 – Alpine rivers and their ligneous vegetation with *Myricaria germanica*

At the same time, in each survey plant species were collected for identification and completing a herbarium, at the same time completing monitoring charts.

Field activity was conducted for determining transects and survey plots for the identification of flora and habitats that are representative of the park.

In the 2013–2014 period monitoring activities were conducted for large mammal species of community, priority and national interest, including those admitted for hunting (*Canis lupus, Ursus arctos, Capreolus capreolus, Cervus elaphus, Sus scrofa, Vulpes vulpes*) and the identification and monitoring of bird species in the park area (*Buteo buteo*, *Corvus corax*, *Parus major, Fringilla coelebs, Turdus philomelos, Garullus glandarius, Motacilla alba, Turdus merula, Columba livia, Cinclus cinclus, Circaetus gallicus, Pernis apivorus, Buteo buteo, Ciconia nigra, Dendrocopos major*, *Dryocopus martius, Pica pica, Emberiza citrinella, Falco tinnunculus, Accipiter nisus, Tetrao urogallus*).

Fig. 10. *Fringilla coelebs*

– *Turdus merula* – European species, sedentary, common in lowlands and mountainous forests, commonly seen throughout the park.

– *Dendrocopos major* – paleartic, sedentary, less common, although environmental conditions would favor its presence in Godeanu and Strei Valleys.

– *Emberiza citrinella* – sedentary species, summer guest, frequently observed on the sunny coasts of Godeanu Valley.

– *Falco tinnunculus* – transpaleartic species, summer guest (March-November) partially sedentary, strictly protected, found in all studied areas such as Strei Valley, Bulzu, Lola, Godeanu.

– The capercaillie, *Tetrao urogallus* – bird species of Community interest in PNGMC, tends to migrate to sub-alpine habitat, a change caused by logging and changing age structure of the forest. Eggs and 2 individuals (female and male) were identified and photographed in the sub-alpine floor close to the park limit.

Fig. 11. Eggs of *Tetrao urogallus*

Fig. 12. *Coronella austriaca*

The inventory and monitoring of amphibians and reptiles:

– *Lacerta viridis* – atlantic – mediteranean poly-typical species, common in Merisor, Gradiste Valley, Crivadiei Gorges, Crivadiei Tower;

– *Salamandra salamandra* – common in forest habitats in Costeşti, Rea Valley, Vârtoape areas;

– *Anguis fragilis* – North Eurasian element, often found at the edge of forests, wet pastures, forests; the studied areas it is found in relatively large numbers in Ponor, Fundatura Ponorului, Cioclovina, Costesti;

– *Coronella austriaca* – poly-typical species, West paleartic, common in Gradiste Valley, Godeanu Valley due to the presence of numerous lizards in the area;

– *Vipera ammodytes* – strictly protected species, rare in rocky, carstic areas such as Piatra Rosie, Godeanu, Crivadia;

– *Natrix natrix* – grass snake, identified Godeanului Valley, wet, puddle, politipică widespread species both near water and n humid;

Fig. 13. *Anguis fragilis*

– *Podarcis muralis* – poly-typical species, euro-asian, living in hilly and mountainous areas, preferring dry, rocky places, very common in the Grădişte and Godeanu Valleys;

– *Triturus cristatus* – Eurasian North Atlantic species, spread across the country, up to 1000 m altitude, observed in two permanent ponds in the Godeanu Valley area;

– *Triturus vulgaris ampelensis* – observed in two permanent ponds in the Godeanu Valley area;

– *Austropotamobius torrentium* – observed in two permanent ponds in the Godeanu Valley area and Poiana Omului;

Fig. 14. *Podarcis muralis*

– *Bombina variegata* – West paleartic species present in all areas investigated, large population in Poiana Omului, Godeanu Valley, identified in still water, puddles, and even springs;

– *Rana dalmatina* – Central European species, common in deciduous forests, pastures and meadows, found in large numbers along the Godeanu Valley, at Ponorici, Lunca Ponorului;

Fig. 15. *Rana dalmatina*

– *Rana temporaria* – observed in large numbers in the spring months (March-April) in small puddles that form after snowmelt usually observed in Ponor, Ohaba Ponor, Strei and Godeanu Valley.

Fig. 16. *Austropotamobius torrentium*

The research areas host many species of vertebrate fauna, of which we mention those belonging to Class *Mammalia,* seen and identified in Godeanu Valley:

– *Talpa europaea* – paleartic, widespread species, common in Godeanu River meadows and hillside pastures;

– *Glis glis* – in central and eastern European deciduous forests, identified in Godeanu Valley;

– *Eliomys quercinus* – central and northern Mediterranean, isolated populations are clustered in mixed deciduous forests and sometimes in the old-growth forests from Tampu and higher mountainour areas, near the upper limit of the pine forests;

– *Muscardinus avellanarius* – central and eastern European populations living in relatively large in the mixed deciduous forests and identified throughout the Godeanu Valley, near the old-growth forests from Tampu at the forest limit, and even wood clearings.

Identification and monitoring of existing entomofauna in the park area. Lepidoptera species have been identified, such as:

– *Apatura iris* – found throughout the park area;

– *Vanessa atalanta* – six females and four males in the same area;

– *Vanessa cardui, Inachis io* – one male and one female, Luncanilor Valley, Cioclovina, Bolii Cav, Godeanu Valley, Anineş;

– *Papilio machaon machaon* – male and female, in Luncani, Godeanu, Anineş Valleys;

– *Iphiclides podalirius podalirius* – male and female, Taia, Godeanu Valley, Anineş;

– *Parnassius mnemosyne* – 3 males and 6 females, identified in Godeanu, Grădişte Strei Valleys;

– *Aglais urticae* – eight females and five males were identified and inventoried, Costeşti Grădişte and Godeanu Valleys;

– *Polygonia c-album* – 5 females and 3 males, observed in Taia, Godeanu, Anineş and Strei Valleys;

– *Colias myrmidone, Euphydryas aurinia* seen at Costeşti and Grădişte;

– *Nymphalis vaualbum* and *Antiope nymphalis* – a male and a female, noticed in Bolii Cave, Grădişte and Godeanu Valleys.

Entomofauna is varied and quite rich in the studied areas, included in the monitoring plan because, geographically, the research areas possess both forests, hills and river valleys, temporary ponds, meadows, secondary steppe, limestone and sandy areas, etc., but we identified most existing entomofauna species in the park in the Grădişte and Godeanu Valley.

Of Ord. *Opthoptera* were identified: *Tettigonia viridissima* – European species, common in meadows and *Locusta migratoria* in Godeanu Valley and Anineş areas. Among *Coleoptera, Rosalia alpina, Protaetia elegans, Lucanus cervus, Isophya costata Morimus funereus* etc. were observed in Bolii Cave, Cioclovina Godeanu Valley.

Fig. 17. Female of the *Lucanus cervus*

Conclusion

• The study and monitoring of the qualitative structure was intended to highlight the complex habitats of the different species and functional groups that characterize each habitat separately. 19 habitats were identified and inventoried in the park area.

• Preliminary floristic research conducted during 2013–2014 revealed the existence of over 550 cormophyte species, belonging to 215 genus and 75 families. In terms of numbers, most species belong to the family *Poaceae,* followed by *Rosaceae, Asteraceae, Caryophyllaceae, Ranunculaceae, Fabaceae, Apiaceae, Lamiaceae, Scrophulariaceae, Brassicaceae*, other families being represented by less than 10 species.

• Over 30 species of fungi and about 30 species of ferns have been identified and inventoried, commonly found in forest habitats.

• The entomofauna and herpetofauna identified are quite rich and varied throughout the park area.

• Large carnivores, specifically strictly protected species (wolf, bear, wildcat) are spread throughout the park, the frequented areas being Strei Valley, Bulzu, Lola, Tampu, Godeanu, etc.

• To protect and conserve habitats of Community interest several overall management measures are imposed, in order to maintain an optimal level of all these habitats. These are:

• Prohibition of any cutting in priority forest habitats of Community interest – (9180, 91E0) Prohibition of drainage orconstruction of forestry roads in priority forest habitats of Community interest – (9180, 91E0), no grazing and keeping the herds of domestic animals under control, limiting the use of herbicides, chemical fertilizers and amendments, prohibition of vegetation burning.

• Management Measures for Species. The species of fauna and flora are particularly vulnerable and are constantly under pressure, especially from people. Therefore it is necessary to have general management measures for all species of community interest:

• Mapping, maintenance and enhancement of existing species and population monitoring, avoiding peace disturbance for mammalian species, banning the practice of motor sports with ATVs, motorcycles or jeeps on forestry roads, prohibiting the removal of pups / juveniles / seedlings from their habitat.

• Regulation hunting for priority species such as bear, wolf, lynx, educating the younger generation on the need to preserve species and the habitats they live in., Fighting against poaching., controlling the use of herbicides, chemical fertilizers and amendments, Regulating mowing, preferably done from early July to late August, maintaining the water level of groundwater in the soil, prohibiting the collection of this species by tourists, locals, shepherds, prohibiting the harvesting of species for commercial purposes.

REFERENCES

CIOCÂRLAN V., 2009: *Flora ilustrată a României*, Editura Ceres, Bucureşti.

CIOCÂRLAN V., 1996: *Împărţirea fitogeografică a teritoriului României. Provinciile floristice*, St. Cercet. Biol., seria Biol. Veg., 48, Bucureşti.

CRISTEA V., GAFTA D., PEDROTTI F., 2004: *Fitosociologie*, Editura Presa Universitară Clujană, Cluj-Napoca.

DIHORU G., NEGREAN G., 2009: *Cartea roşie a plantelor vasculare din România*, Editura Academiei Române, Bucureşti.

DONIŢĂ N., IVAN D., COLDEA G. SANDA V., POPESCU A., CHIFU T., PAUCĂ – COMĂNESCU M., MITITELU D., BOŞCAIU N., 1992: *Vegetația României*, Editura Tehnică Agricolă, Bucureşti.

GAFTA D., MOUNTFORD J.O., 2008: *Manual de interpretare a habitatelor Natura 2000 din România.*

PREDOIU G., 2010: *Managementul populaţiilor de urs şi lup în România,* Green Steps, ISBN 978–606–92081–9–9, Braşov.

PROMBERGER C., 2000: *Lupul, biologie, ecologie şi management*, Editura Haco.

TUTIN T.G., BURGES N.A., CHATER A.O., EDMONDSON J.R., HEYWOOD V.H., MOORE D.M., VALENTINE D.H., WALTERS S.M., WEBB D.A., 1993: *Flora Europaea*, Vol. 1, Ed. II, Cambridge University Press.

WEBER H. E., MORAVEC J., THEURILLAT J. P., 2000: *International code of phytosociological nomenclature*, J. Veg. Sci., 11: p. 739–768.

ASPECTS CONCERNING ECOLOGICAL TOURISM IN THE MEHEDINŢI COUNTY

Ramona Eliza Diaconu[1]

ASPECTS CONCERNING ECOLOGICAL TOURISM IN THE MEHEDINŢI COUNTY

Abstract: The Mehedinţi County holds an impressive natural and cultural heritage, concentrated in protected areas like Iron Gates Natural Park, Mehedinţi Plateau Geopark, Blahniţa and Gruia-Gârla Mare protected areas. These parks are near Drobeta Turnu Severin. The northwestern part of the county is included in Domogled-Cerna Valley National Park.
The natural and cultural heritage of the Mehedinti County offers the opportunity to develop all forms of tourism: scientific, cultural, ecumenical, itinerate, ecotourism, etc.
The ecological tourism or "green" is one of the viable alternatives for sustainable development of the Mehedinţi County and does not exclude economic development, but it supports, within the limits of the equilibrium condition of maintaining territories in natural parks.

Keywords: natural and cultural heritage, ecological tourism, Mehedinţi.

Introduction

In order to promote the natural and cultural heritage of Mehedinţi County, various projects with European funding grants were initiated and carried out. The participation as a volunteer in the implementation of some EU-funded projects that had as main objective the promotion and development of cross-border tourism in the Iron Gates, have facilitated for me the access to information and acquiring knowledge and skills. The volunteer tour guide activity on guidance Romanian and foreign visitors in the Iron Gates Region Museum and the city Drobeta Turnu Severin gave me the opportunity to see that are the targets of major tourist attraction for the visitors.

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The tourism in Mehedinţi – history

The presence of visitors and tourism, in the Orşova-Cazane area, began in the nineteenth century by hiking and admiring the picturesque or historical valuable places. Tourism has grown to the end of the century, the navigation on the Danube, by visiting Ada-Kaleh and other targets.

The complexity of the geological substratum plus the rich limestone karst areas, gave Defile the reputation to be one of the most spectacular gorges in Europe, a real attraction for tourists. Through its natural heritage and remarkable historical and cultural potential, Iron Gates Natural Park which includes all Danube Gorge, is a place opened for organized ecological tourism, offering the visitor the chance to combine leisure activities and entertainment, with the instructive-educational ones, or activities of perception and protection of the environment and of the natural resources and of the cultural history.

In terms of its historical heritage, the tourist area „Iron Gates" is (Dumbrăveanu, 2004) a very special case in Romanian tourism. The real situation of the historic heritage tourism in the „Iron Gates" is the result of its own history, which is as logical as it is paradoxical. The geography of the „Iron Gates" in its entirety physical and human elements comes to reason why Danube Gorge was a large area attraction.

Natural border, barrier to military strategies of the ancient and medieval empires, European navigation and commerce path, Danube added itself, in first quarter of the nineteenth century a new value, the cultural landscape value, offered by many travel albums and memorials of Western authors: Auguste Raffet, Bartlett, Karl Begenau, Carol Szatmari, Hans Ch. Andersen (Bosoancă, 2005). We discover, beyond the image, the thrill before the spectacular landscape, the rigor in representing cultural otherness, the interest in immediate and precise capitalization of those seen. Famous authors were impressed by the beauty of Mehedinţi places: Vlahuţă (1961), Popovici (1966), Vâlsan in Popp (1971).

Favorable for human presence from ancient times, the Danube valley was not only a place of transit, but also a place where people could settle. Both sides of the Danube are dotted with historical evidence, evidence of the presence and evolution of human culture. Thus, following an imaginary Danube cruise, we discover a unique cross-border cultural landscape in Europe. Since the entering of Danube in our country, the Golubac fortification medieval monument of military architecture from the Serbian bank – welcomes us, and on the Romanian shore are the St. Ladislau fortress and the medieval ruins of the Tricule. Arriving in the Cazane, we admire Tabula Traiana, the only vestige that is part of UNESCO, and next to Hidrocentala Iron Gates we find Karataš-Diana, Roman-Byzantine. The Schela Cladovei is the first human settlement in Europe dating back to CH 7–6 millennium. The river, emerged from hydroelectric Iron Gate, the most modern and grandiose economic objective, meeting the ruins of the bridge built by the great architect Apollodorus of Damascus, the boldest work of the ancient world.

The natural background of the Iron Gate area, a true outdoor geological museum, the floristic biological richness, the cultural diversity of the landscape, have included this area in the European and international tourist circuit.

Material and methods

The paper was developed based on own research (Diaconu, 2011) and bibliographical information. To these are added the information provided by the Iron Gates Region Museum, Iron Gates Natural Park Administration, Mehedinţi Plateau Geopark Administration and Department of Statistics County.

Among the methods and techniques used must be specified questionnaires used as a basis for making surveys of opinion. The results of these questionnaires were used to obtain information of a base, of recent data, for the study.

Results and discussion

1. *The geographical position, basic element for the specificity of tourist attractions*

Historical personality of the county is complemented by its geographical features core. These are, first, the great diversity of physical and geographical conditions, the social-economic, ethnographic and cultural profile. County is located in the south – west of the country, bordering on the South – East of Dolj County, in west Caraş – Severin, Gorj County to the north and south two of the countries of the Balkan Peninsula, that Serbia and Bulgaria, which is separated by the Danube River, the river that forms the natural border of the county over a length of 220 km.

Complex geological structure, the differential action of external factors have contributed to a wide variety of landforms throughout the county, grouped in units of area mountains, hills and plains (Cucu & Popova Cucu, 1980). Mehedinţi landscape consists of mountains, hills, plateaus and plains, takes the form of a natural stepped amphitheater, which is oriented from the North-West North South East direction. Through its positioning in the South West of Romania, Mehedinţi County has a temperate continental climate where we can feel a pronounced Mediterranean influence. In order to protect flora and fauna characteristic for Mediterranean subclimate, the area upstream of Iron Gate I and karst area of North Mehedinti were declared protected areas.

2. *The importance of demographic factors in ecological tourism practice*

Recent data taken from the County Department of Statistics shows population decline reaching 265390 people (according to 2011 census). After percentage of urban population, Mehedinţi is categorized as a medium urbanized County. In rural areas the decline was the dominant feature, assisting at a continuous process of easy depopulation of localities. In conclusion, demographic decline

is recorded at the county level as a consequence of an accumulation of negative social and economic factors and emphasizes in a differentiated way administrative units according to the potential economic and employment opportunities of labor resources.

The Iron Gates Natural Park population is concentrated on the Danube, its terraces and basins formed at the mouth of tributaries. Romanians represented the majority population, with Serbs, Czechs. To these are added a few Slovaks, Ukrainians, Bulgarians and other nationalities.

3. *Tourist resources in Mehedinţi*

The Mehedinţi County holds an impressive natural and cultural heritage, concentrated in protected areas like Iron Gates Natural Park, Mehedinţi Plateau Geopark, Blahniţa protected area, and protected area Gruia-Gârla Mare. These parks are near Drobeta Turnu Severin. The northwestern part of the county is included in Domogled-Cerna Valley National Park. Drobeta Turnu Severin city is located in southwest part of the County and in the western part of Oltenia, on the left bank of the Danube River at the exit of the gorge, in the Carpathian basin of Topolniţa (Şchiopoiu, 1982).

Among the sights of Drobeta Turnu Severin include: historical vestiges: Medieval Fortress of Severin, Drobeta Roman castrum, Trajan's Bridge at Drobeta, thermae Drobeta, Severin Metropolitan Church Ruins; cultural institutions: Iron Gates Region Museum, Art Museum, Cultural Palace Th. Costescu, National College Traian, Radu Negru Hall, County Library I.G. Bibicescu; art monuments: Water Castle, Monument heroes of World War, Decebal`s bust and bust of Emperor Trajan, places of worship, churches, parks.

4. *Natural and cultural tourism resources in protected areas*

Iron Gates Natural Park is located in the south-western Romania, on the border with Serbia and Montenegro, with an area of 115 655 ha, partially occupying territories in the counties of Caras-Severin County in southern and Locvei Mountains and Almăj Plateau in southwest County.

The relief Iron Gates Natural Park appears as a reflection of the geological structure and petrographic composition, constituting a polarizing element of tourist interest. The lithological diversity (crystalline rocks, igneous and sedimentary) led to the individualization of a very complex landscape with many spectacular elements (The "Cazane" of Danube, limestone ridges and cliffs, gorges, caves, waterfalls, volcanic landforms-Trescovăţ, depressions, etc.) (Popa, 2003).

The biodiversity of this protected area prevails in rare plants, some of them unique in the world: golden tulip, Iron Gates feather grass, thorn, rock iris, Bells "Cazane", etc. The fauna elements of the park are as diverse; most species of reptiles, amphibians and birds are protected at national and international level (eg. Land tortoise, viper, etc)

Among the cultural objectives are: Monastery Ruins Vodiţa, Vodiţa Monastery, Monastery Mraconia, Monastery St. Ana, Roman Catholic Cathedral of Orşova, Tricule Medieval Fortress Ruins, Fortress Ladislau, Rock sculpture of Decebal, Chindia Hole Cave II, Veterans Cave, Dacian Fortress Divici, the Iron Gates Hydropower.

Mehedinti Plateau Geopark is located in southwestern Romania, north of Drobeta Turnu Severin and covers an area of 106 000 ha. The temperate continental climate with Mediterranean influences and varied topography created conditions for many species of rare plants and animals. Unique geological structure of the area has led to numerous geological formations and caves. Most of these values are protected in over 17 natural reservations. In addition to these natural values, in this space and see many historical and cultural traditions and crafts (weaving, pottery, etc.) are still present (Meilescu et al., 2004).

The Danube Green Corridor (the area between Simian and Salcia) is located in southwestern Romania, Mehedinţi County. In this area are numerous architectural monuments and archaeological evidences from the Iron Age, Roman period to the Middle Ages. The most important archaeological sites are Roman castrum Hinova and Villa rustica from Gârla Mare. Natural heritage is represented by natural scientific reservation: Blahniţa Natural area (includes Ostrovul Corbului-Hinova wetland) Gruia-Gârla Mare protected area and Stârmina Forest.

With an area of 45,286.3 ha, Part of the Continental biogeographical region, bathed by the waters of the Danube – at the southern edge of the Blahniţa Plain and crossed the Blahniţa river, the Special Protected Blahniţa Area delight the eye through the variety and unexpected transitions from one type habitat to another.

Gruia – Gârla Mare protected area is part of the European ecological network Natura 2000 in ROSPA0046 code as a Special Protected Area. Gruia – Gârla Mare site is important for the conservation and sustainable use of natural heritage (endangered, vulnerable, endemic species of flora and fauna, and / or rare and natural habitats of Community interest).

Within the sedimentary formations of different ages from Danube's Green Corridor, are fossils proving the geological past life and environmental conditions in which these creatures lived (Diaconu, 2008). Their care and places in which they appear on the surface is determined by their palaeoecological and paleogeographic importance. Ex. Simian, Hinova, Ostrovul Corbului, Batoti. Batoti city is a natural area that includes natural heritage values, requiring their protection in order of the conservation of the national scientific interest values.

Domogled – Cerna Valley National Park is located in southwestern Romania and covers the area from three districts, namely: Caras-Severin, Mehedinti and Gorj.

5. Types and forms of tourism in the Mehedinţi County

Harnessing natural landscapes and cultural assets is a long historical process, with which gradually, the resources and objectives of major interest, with

exceptional value, have been highlighted by various forms of tourism. On the same geographic area we can practice many types of tourism based on the resources of space. Depending on the main reason for the trip we differentiate (Gheorghilaş, 2008) several types of tourism.

With the natural and ethnocultural heritage held by the Iron Gates Natural Park, this space offers the possibility of developing all main forms of tourism. Under the management plan, tourism strategy in Iron Gates Natural Park Administration focuses on two main areas:

– Encouraging and developing forms of controlled, organized tourism, especially ecotourism. Ecological tourism is one of the viable alternatives for sustainable development of the Iron Gates Natural Park region, an activity that can be conducted in accordance with the absorption capacity of the area with the cultural situation and environmental aspects of its;

– Discouraging unorganized forms of tourism, uncontrolled tourism forms which on one hand may affect the natural and social environment, and on the other hand don't optimally exploit the tourism potential of the park.

Tourist activities that can take place, as forms of ecotourism in the protected areas: scientific tourism, cultural tourism, ecumenical tourism, hiking, traveling tourism, leisure and tourism recruit, rural tourism, ecotourism, birdwatching site, forest tourism, tourism spelunking, mountain biking, nautical tourism, cycling tourism.

Of all tourism forms, ecotourism development can be achieved through collaboration between all stakeholders in the preservation and tourism potential of the area, namely: Iron Gates Natural Park Administration, local authorities, tour operators and travel agencies, educational and research institutes, local businesses with specific activity.

The project „*Environmental Education through recreation – ecotourism in the Iron Gates Natural Park*" founded the ecotourism in the Iron Gates Natural Park, and built integrated tourism itineraries: ecotourism trails, ecotourism information center (School Coordinator Dubova), tourist equipment rental center, including dinghies and pedal boats (School Coordinator Dubova). Going through ecotourism trails, the tourist meets natural attractions and cultural tourist encounters, some of them unique even in Europe.

The ecotourism routes identified in the park area of County (Matacă et al., 2005, 2008) and approved in 2011 are: Trescovat, Sviniţa-Tricule, Liubotina-Rudina, Cioaca Cremenească-Rudina, Cazanele Mari, Cazanele Mici, Ţarovăţ, Alion, Racovăţ-Boldovin, Vodita Valley-Duhovna Hill. Subsequently were identified and marked other routes: Cazanele Mari 2, Crucea St. Petru and Dubova-Cazanele Mici.

In order to evaluate the State of knowledge on the ecological tourism in Mehedinti County, I realized the following questionnaire:

Please answer the following questions one of the variants proposed.

This questionnaire is anonymous, but your answers are important to us!
Sex?
a) female
b) male
Studies?
a) average
b) enhancement
The Profession?

1. Why do you think that means „ecology”?
a) environmental protection
b) environmental protection organizations
c) a term in vogue
2. Would you be interested to get involved in an association for the protection of the environment?
a) yes
b) may be
c) no
3. How many times have you participated in volunteer activities for environmental protection?
a) every time I’ve heard that there are
b) occasionally with friends/colleagues
c) I have not attended
4. Which of the following statements is closer to your point of view?
a) protecting the environment needs to be done, even if it involves high costs
b) economic development must be given priority, even if the state of the environment is not very good
5. How much are you concerned with environmental health in Mehedinti County and not only?
a) very concerned about
b) quite concerned about
c) I am not interested
6. You know that there are in Mehedinti the associations of ecological tourism?
a) yes
b) no
7. How would appreciated you the involvement of the Mehedinti Environmental Protection Agency in ecological accidents on the Danube?
a) good
b) very good
c) I don’t know
8. Do you think that the aim of ecological tourism associations in Mehedinţi is next?

a) sustainable development of communities and infrastructure in Mehedinti
b) knowledge of the tourism potential of the Mehedinti County
c) both

9. You know that in Mehedinţi there are three nature parks with ecotourism potential?
a) yes
b) no
c) I do not know

10. Which of the three natural parks does it most potential ecotourism?
a) Iron Gates Natural Park
b) Geopark Mehedinti Plateau
c) Danube Green Corridor (Turnu Severin – Salcia sector)

11. Have you ever practiced ecotourism in Mehedinti County and not only?
a) Yes, where?
b) No

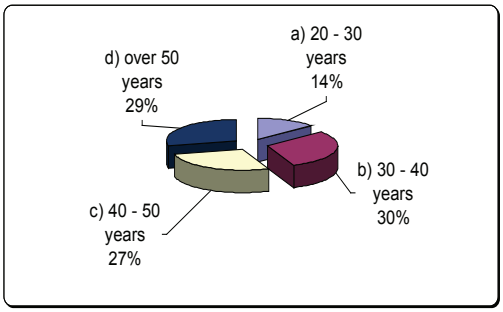
12. You know any ecological route in Mehedinti County? Which?
a) yes
b) no
c) for example:

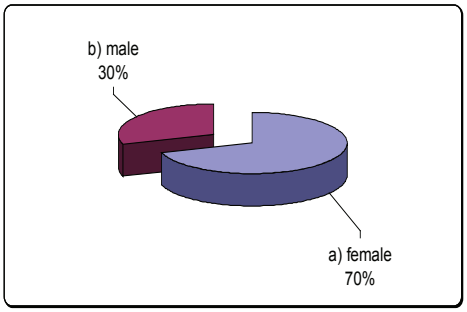
13. When going out in nature, what to do with the trash generated?
a) leave in kind
b) you squeeze in a bag and throw it to the maid bin
c) tighten it, but they let in nature

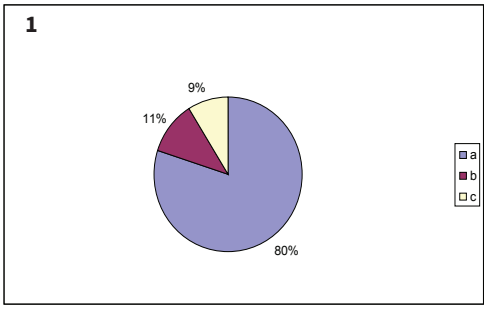
14. Which of the three options it considered closer to the meaning of the expression „ecological tourism”?
a) the green tourism
b) rural tourism
c) ecotourism

Most questionnaires were distributed in the following institutions: Iron Gates Region Museum, Mehedinti County Council, Department of Culture Mehedinti, Prefecture Mehedinţi, Mehedinti Environmental Protection Agency, Mehedinti Plateau Geopark, Association Pro-Mehedinţi.

The number of people surveyed was not great because he has sought to disseminate the questionnaire in different places for more conclusive results. In general, those who answered prevailed, women age 30–40 years and as a profession have been: curator, professor, geologist, lawyer, secretary, engineer, administrator, archaeologist, medical assistant, inspector, supervisor, teacher, car mechanic, hall custodian, policeman, draftsman, engineer, librarian, doctor, etc. Answering questions can be seen in the graphs below:


a) 20 - 30 years 14%
b) 30 - 40 years 30%
c) 40 - 50 years 27%
d) over 50 years 29%


b) male 30%
a) female 70%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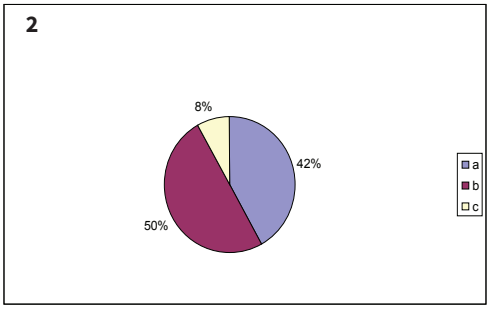
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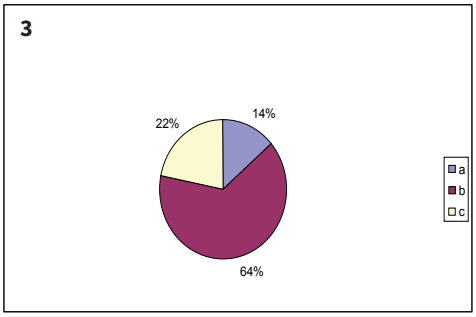
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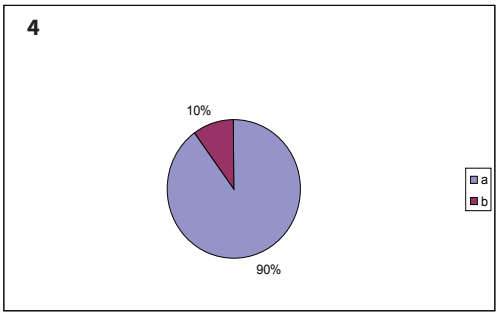
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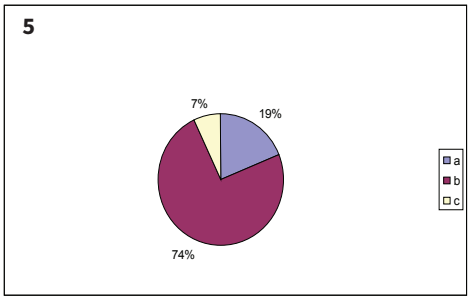
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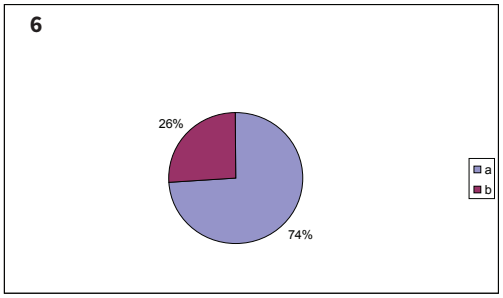
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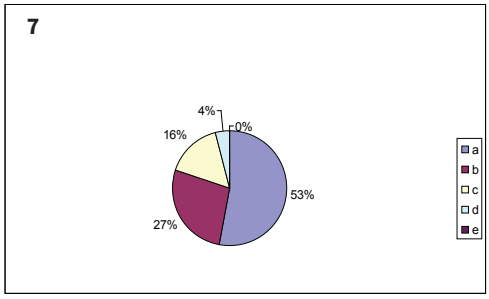
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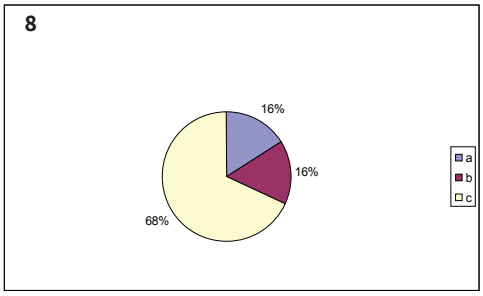
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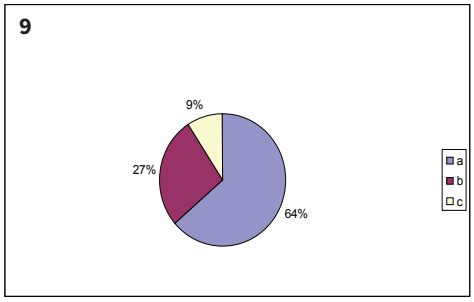
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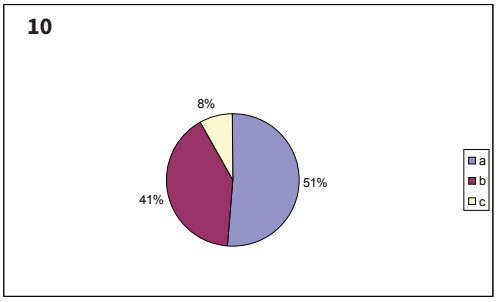
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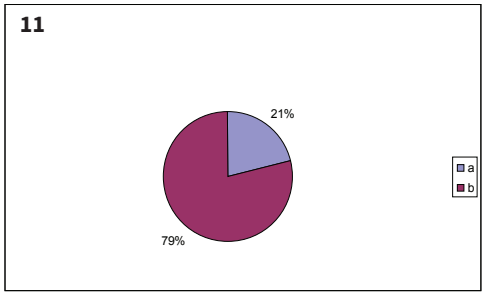
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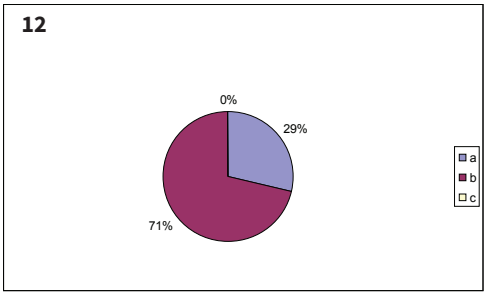
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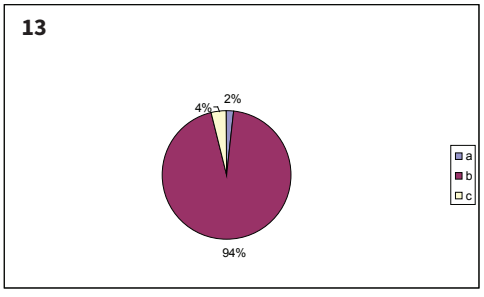
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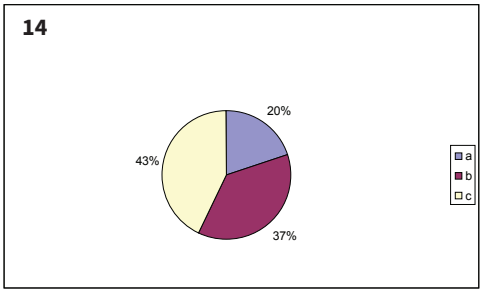
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Analyzing the above diagrams (1–14) it can be said that in general people know quite well the requirements of environmental-friendly tourism with nature.

6. *The tourist circulation in Mehedinti County*

To analyze tourist circulation in Mehedinti County were taken over from the Iron Gates Region Museum (IGRM) and at the Department of Statistics County. For visitors IGRM have downloaded data in the period (2000–2009) of the three offices: headquarters, Museum of Art and, "Iron Gates I" Hydro-electric Power Station Museum.

In 2010, Iron Gates Region Museum is housed in a comprehensive process of rehabilitation by project *"The rehabilitation, modernization of the Iron Gates Region Museum and valorization as touristic product"*. The headquarters has been closed, which resulted in a decrease in the number of visitors. Trough rehabilitation and valorization as touristic product, the number of tourists will increase considerably and the Iron Gates Region Museum will certainly be one of the most visited in Europe.

In the period 2000–2009 it is observed (Table 1) that in 2009 the number of visitors is the largest, representing 13% of total percentage

Table 1. The statistics of visitors in the Iron Gates Region Museum (2000–2009)

No. crt.	Year	Number of visitors (individual)			Number of visitors (groups)			**Total**
		IGRM Head -quarters	IGRM Museum of Art	IGRM "Iron Gates I" Museum	IGRM Head-quarters	MRPF Museum of Art	IGRM "Iron Gates I" Museum	
1.	2000	7112	2623	621	17011	574	6165	34106
2.	2001	5458	492	997	26082	2225	9526	44780
3.	2002	6444	2721	115	23016	712	2128	35136
4.	2003	4821	2722	0	23922	1464	0	32929
5.	2004	4972	556	0	23603	2873	0	32004
6.	2005	5838	365	192	15232	2812	2242	26681
7.	2006	5365	613	607	12924	1685	9574	30768
8.	2007	14401	228	2293	17284	2022	7843	44071
9.	2008	6144	401	2904	17425	1975	8799	37648
10.	2009	10497	1037	3064	20303	3812	7881	46594

In statistics of visitors in 2009 (Table 2, Fig. 1) it can be seen that in the winter months the number of visitors is very small compared to the months of May and June when the number of visitors grows, and the number drops fall, remarking an increase in October. This variation is explained by the fact that most of the visitors are students who visit the museum during the beginning of the school year and from 15 May–15 June, before the summer holidays.

Table 2. The statistics of visitors in the Iron Gates Region Museum (2009)

No crt	Month	Number of visitors (individual)			Number of visitors (groups)			**Total visitors**
		IGRM Head -quarters	IGRM Museum of Art	IGRM "Iron Gates I" Museum	IGRM Head-quarters	MRPF Museum of Art	IGRM "Iron Gates I" Museum	
1.	January	218	56	21	85	99	94	573
2.	February	363	62	24	314	65	59	887
3.	March	451	88	17	361	482	201	1600
4.	April	1802	95	108	3353	603	502	6463
5.	May	1376	79	169	4883	514	2.515	9536
6.	June	597	152	220	6357	534	1.896	9756
7.	July	1669	132	719	1256	68	692	4536
8.	August	2107	0	1370	1001	195	365	5038
9.	September	793	205	303	635	212	206	2354
10.	October	468	60	73	1489	393	921	3404
11.	November	402	56	16	439	224	411	1548
12.	December	250	52	24	130	423	113	992
Total		14597			32090			46687

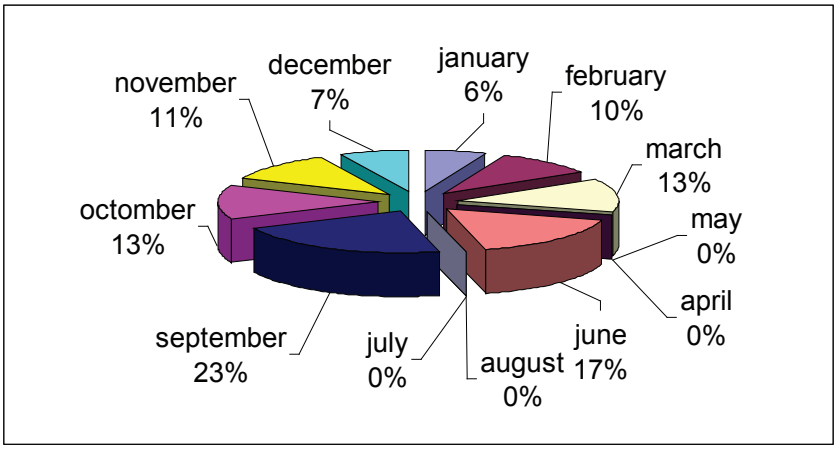

Fig. 1. The diagram with the visitors IGMR on Month in 2009

The Romanian visitors prevail compared to those foreigners (Table 3) from Belgium, Czech Republic, Denmark, Switzerland, Germany, Greece, Italy, Japan, the United Kingdom, the Republic of Moldova, Norwegian, USA, Serbije, Sweden, Turkey, Hungary. The frequencies of foreign visitors to the country of origin are Denmark, Germany and Italy. The last time foreign tourists arrive in Drobeta Turnu Severin through the Danube River Cruises.

Table 3. The number of visitors in the Iron Gates Region Museum after provenience in 2009

No. crt.	Provenience	Number of visitors			**Total**
		IGRM Headquarters	IGRM Museum of Art	IGRM "Iron Gates I" Museum	
1.	Romanian	28540	4544	10609	43693
2.	foreigners	2259	305	430	2994
Total		30799	4849	11039	46687

Table 4. The statistics of visitors of the Iron Gates Region Museum after country of origin in 2009

	Ţara	Number of visitors			**Total**
		IGRM Headquarters	IGRM Museum of Art	IGRM "Iron Gates I" Museum	
1	Belgium	15	0	0	15
2	Czech Republic	30	0	30	60
3	Denmark	467	0	0	467
4	Switzerland	70	0	0	70
5	Germany	387	0	50	437
6	Greece	0	290	30	320
7	Italy	361	0	20	381
8	Japan	0	15	0	15
9	United Kingdom	68	0	0	68
10	Republic of Moldova	0	0	60	60
11	Norwegian	243	0	0	243
12	U. S. A.	298	0	0	298
13	Serbije	30	0	0	30
14	Sweden	169	0	0	169
15	Turkey	91	0	0	91
16	Ungaria	30	0	240	270
Total					2994

Analyzing data received from the Department of Statistics County it can be said that the total number of tourists staying in Mehedinţi County was 45596. Of those, 36947 were from our country and 8649 were foreigners. In a ranking of South West region, with total tourist arrivals, the Mehedinţi County occupies the second place after the Vâlcea, but at a very large distance (189844 in Vâlcea versus 45596 in Mehedinţi). In terms of the number of foreign tourists, Mehedinţi County ranks first in the same regions, with 8400 compared to 8649 in Dolj County. In what concerns the forms of tourism that offers them Mehedinţi County, one can

speak of a competitive advantage in relation to the Olt and Dolj counties, almost regardless of the form of tourism practiced.

Conclusions

Through its "strategic" position, Mehedinţi County located between the Western Balkans the Carpathians and with direct access to the main European Roads, road, rail and waterways, with an enviable geographic landscape, crossed by the Danube, Mehedinţi County offers a great potential for tourism development.

The natural and cultural heritage of the Mehedinţi County offers the opportunity to develop all forms of tourism: scientific, cultural, ecumenical, itinerate, ecotourism, etc. Traversing the touristic routes of natural parks in Mehedinţi, the tourist meets natural and cultural attractions, some of them unique in Europe.

The protected natural areas from Mehedinţi have a scientific and landscaping heritage with a wide international reputation.

For the most efficient possible use of the rich heritage of this unique areas in the country through diversification of the natural and cultural resources, the development of tourist activity must comply with the principles of sustainable development, taking into account the harmonization of tourist activities in the context of regional and local economic development in conjunction with the requirements of legislation for the protection of the environment.

The ecological tourism or "green" is one of the viable alternatives for sustainable development of the Mehedinţi County and does not exclude economic development, but it supports, within the limits of the equilibrium condition of maintaining territories in natural parks.

The factors influencing the development of ecological tourism are: natural potential, rural population, rich traditions and geographical position attractive.

REFERENCES

BOSOANCĂ E., STÎNGĂ I., CRĂCIUNESCU G., MATACĂ S. Ş., DIACONU F., MEILESCU C., FLORESCU V., MILANOVICI S., SEVERINEANU R., 2005: *Parcul Natural Porţile de Fier. Istorie şi civilizaţie*, 136 pp., Drobeta Turnu Severin.

CUCU V., POPOVA-CUCU A., 1980: *Judeţul Mehedinţi*, Editura Academiei R.S.R., 204 pp., Bucureşti.

DUMBRĂVEANU D., 2004: *Zona turistică „Porţile de Fier". Analiză geografică*, Editura Universitară, 359 pp., Bucureşti.

DIACONU F., 2008: *Reconstituirea mediilor carbogeneratoare pliocene dintre Dunăre şi Motru*, Editura Universitaria Craiova, 321 pp., Drobeta Turnu Severin.

DIACONU R. E., 2011: *Turismul ecologic În perspectiva dezvoltării durabile a judeţului Mehedinţi*, Lucrarea de licenţă, Universitatea din Bucureşti, Facultatea de Geografie, specializarea Geografia Turismului, 115 pp. Bucureşti.

GHEORGHILAŞ A., 2008: *Geografia turismului. Metode de analiză în tursim*, Editura universitară, 272 pp., Bucureşti.

POPP N., 1971: *Principalele probleme de geografie fizică în opera lui George Vâlsan in Vâlsan G.,* Opere alese, Editura Ştiinţifică, p. 38–69, Bucureşti.

POPA M. E., 2003: *Geological heritage values in the Iron Gates Natural Park, Romania*, Proceeding of the First International Conference on Environmental Research and Assessment, March 23–27 2003, p. 742–750, Bucharest.

MATACĂ Ş. S., DIACONU F., MEILESCU C., MILANOVICI S., 2005: *Educaţie ecologică prin recreere-ecoturism în Parcul Natural Porţile de Fier*, Drobeta, Ştiinţele Naturii*,* vol. XV, Editura Universitaria Craiova, p. 23–32, Drobeta Turnu Severin.

MATACĂ Ş. S., DIACONU F., CRĂCIUNESCU G., MARINESCU R., FLORESCU GH., 2008: *Peisaje danubiene transfrontaliere. Ghid turistic*, 150 pp., Drobeta Turnu Severin.

MEILESCU C., SÂRBULESCU C., SEMEN C., STÎNGĂ I., MATACĂ S. Ş., POPA A., DIACONU F., MEILESCU T., 2004: *Geoparcul Platoul Mehedinţi – Prezent şi perspective*, Drobeta, Ştiinţele Naturii*,* vol. XIV, Editura MJM, p. 193–198, Drobeta Turnu Severin.

ŞCHIOPOIU A., 1982: *Dealurile piemontane ale Coşuştei*, Editura Scrisul Românesc, Craiova.

www.coridorulverde.ro

http://www.portiledefier.ro

www.sejmh.ro/sites/.../geoparc

PROJECT RESBIOCLIM – REHABILITATION, CONSOLIDATION, MODERNIZATION AND ENDOWMENT OF ECOLOGICAL RESEARCH STATION SULINA

Mădălin Enache[1]

PROJECT RESBIOCLIM – REHABILITATION, CONSOLIDATION, MODERNIZATION AND ENDOWMENT OF ECOLOGICAL RESEARCH STATION SULINA

Abstract: The project aims to develop a modern research facility in the Danube Delta Biosphere Reserve that will have a significant role in identifying and implementing sound scientific solutions for the sustainable management of Danube Delta Biosphere Reserve. Improving the dialogue with the local communities and the stakeholders, designing together strategic measures for their area and raising public awareness about the importance of the environmental protection for human society are further foreseen as key actions to improve the implementation process and gain public support to tackle together with the scientific community the environmental emergencies. The financial support of the project is obtained from European Union by European Found for Regional Development (FEDR) into frame of POS-CCE program, priority axe 2, competitively by research, technological development and innovation.

Keywords: Sulina, Institute of Biology, European Union, POS-CCE.

General data about investment point

At the eastern end part of Romania and European Union, to the confluence of Danube River with Black Sea the town of Sulina representing the first or the last harbor on the Danube River. The history of the city is close related to the establishment in 1856 of the European Commission of the Danube in Sulina. As one of most important branches of the Danube Delta, the Sulina represent the main output of the so called "king of the rivers", in the Black Sea (Gavra & Peristeropoulou,

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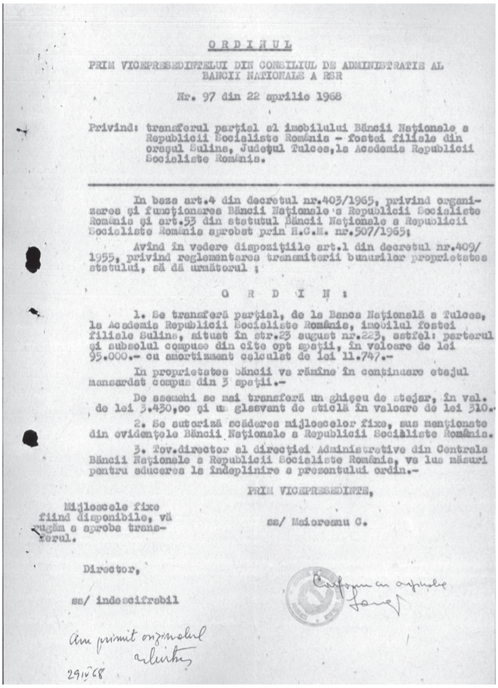
2013). Some references mark the city as „the dangerous and unique passage of ships directed from and towards Romania" (Gavra & Peristeropoulou, 2013). A lot of distinguished buildings for their architecture were constructed in the city of Sulina during his glorious age. Most of them today are either abandoned or in high deteriorate state (Peristeropoulou, 2012). One of this building is represented by the so called Camberi-Parparia house located to the second street (Strada a II-a) at number 35 (Fig. 1). After becoming Romanian state property in the years of 1954 the building hosting offices of Romanian National Bank – Sulina branch. In the year 1968, in order to development of aquatic ecological research in the Danube Delta area by the Institute of Biology Bucharest of the Romanian Academy, the building was transferred to the Romanian Academy (Fig. 2) with destination of "Ecological Research Station Sulina".

Fig. 1. Ecological Research Station Sulina in august 2014, at the start of ResBioClim project



ORDINUL

PRIM VICEPRESEDINTELUI DIN CONSILIUL DE ADMINISTRATIE AL BANCII NATIONALE A RSR

Nr. 97 din 22 aprilie 1968

Privind: transferul parțial al imobilului Băncii Naționale a Republicii Socialiste România - fostei filiale din orașul Sulina, Județul Tulcea, la Academia Republicii Socialiste România.

In baza art.4 din decretul nr.403/1965, privind organizarea și funcționarea Băncii Naționale a Republicii Socialiste România și art.53 din statutul Băncii Naționale a Republicii Socialiste România aprobat prin H.C.M. nr.507/1965;

Avînd în vedere dispozițiile art.1 din decretul nr.409/1955, privind reglementarea transmiterii bunurilor proprietatea statului, să dă următorul ;

O R D I N :

1. Se transferă parțial, de la Banca Națională a Tulcea, la Academia Republicii Socialiste România, imobilul fostei filiale Sulina, situat în str.23 august nr.223, astfel: parterul și subsolul compuse din cîte opt spații, în valoare de lei 95.000.- cu amortizment calculat de lei 11.747.-

In proprietatea băncii va rămîne în continuare etajul mansardat compus din 3 spații.-

De asemeni se mai transferă un ghișeu de stejar, în val. de lei 3.430,oo și un glasvant de sticlă în valoare de lei 310.-

2. Se autoriză scăderea mijloacelor fixe, sus menționate din evidențele Băncii Naționale a Republicii Socialiste România.

3. Tov.director al direcției Administrative din Centrala Băncii Naționale a Republicii Socialiste România, va lua măsuri pentru aducerea la îndeplinire a prezentului ordin.-

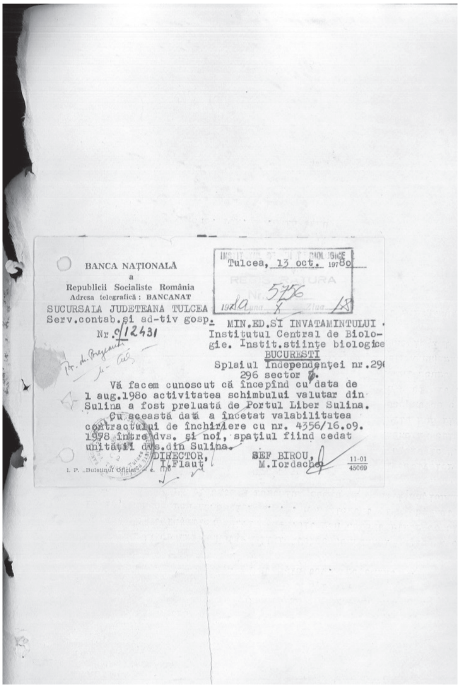
PRIM VICEPRESEDINTE,

ss/ Maioreanu C.

Mijloacele fixe fiind disponibile, vă rugăm a aproba transferul.

Director,

ss/ indescifrabil



BANCA NAȚIONALĂ
a
Republicii Socialiste România
Adresa telegrafică: BANCANAT
SUCURSALA JUDETEANA TULCEA
Serv.contab.și ad-tiv gosp.
Nr. c/12431

Tulcea, 13 oct. 1980

REGISTRATURA
Nr. 5756

MIN.ED.SI INVATAMINTULUI
Institutul Central de Biologie. Instit.stiințe biologice
BUCURESTI
Splaiul Independenței nr.296
296 sector 7.

Vă facem cunoscut că începînd cu data de 1 aug.198o activitatea schimbului valutar din Sulina a fost preluată de Portul Liber Sulina.

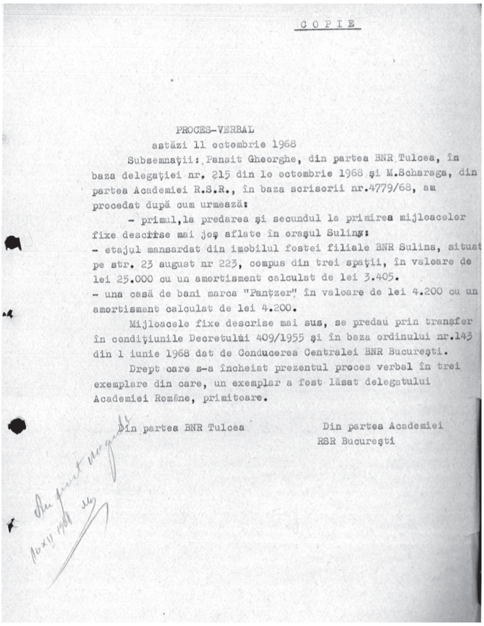
Cu această dată a încetat valabilitatea contractului de închiriere cu nr. 4356/16.o9.1978 între dvs. și noi, spațiul fiind cedat unității dvs.din Sulina.

DIRECTOR,
I.Flaut

SEF BIROU,
M.Iordache

I. P. „Buletinul Oficial" – c. 1120

11-01 / 45069



COPIE

PROCES-VERBAL
astăzi 11 octombrie 1968

Subsemnații: Panait Gheorghe, din partea BNR Tulcea, în baza delegației nr. 215 din lo octombrie 1968 și M.Scharaga, din partea Academiei R.S.R., în baza scrisorii nr.4779/68, am procedat după cum urmează:

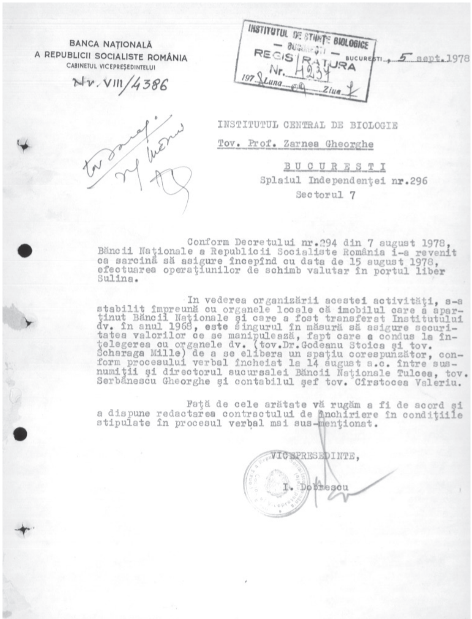
- primul, la predarea și secundul la primirea mijloacelor fixe descirse mai jos aflate în orașul Sulins:
- etajul mansardat din imobilul fostei filiale BNR Sulina, situat pe str. 23 august nr 223, compus din trei spații, în valoare de lei 25.000 cu un amortisment calculat de lei 3.405.
- una casă de bani marca "Panțzer" în valoare de lei 4.200 cu un amortisment calculat de lei 4.200.

Mijloacele fixe descrise mai sus, se predau prin transfer în condițiunile Decretului 409/1955 și în baza ordinului nr.143 din 1 iunie 1968 dat de Conducerea Centralei BNR București.

Drept care s-a încheiat prezentul proces verbal în trei exemplare din care, un exemplar a fost lăsat delegatului Academiei Române, primitoare.

Din partea BNR Tulcea

Din partea Academiei RSR București



BANCA NAȚIONALĂ
A REPUBLICII SOCIALISTE ROMÂNIA
CABINETUL VICEPREȘEDINTELUI
Nr. VIII/4386

INSTITUTUL DE ȘTIINȚE BIOLOGICE
— BUCUREȘTI —
REGISTRATURA
Nr. 4234

BUCUREȘTI, 5 sept.1978

INSTITUTUL CENTRAL DE BIOLOGIE
Tov. Prof. Zarnea Gheorghe
B U C U R E S T I
Splaiul Independenței nr.296
Sectorul 7

Conform Decretului nr.294 din 7 august 1978, Băncii Naționale a Republicii Socialiste România i-a revenit ca sarcină să asigure începînd cu data de 15 august 1978, efectuarea operațiunilor de schimb valutar în portul liber Sulina.

In vederea organizării acestei activități, s-a stabilit împreună cu organele locale că imobilul care a aparținut Băncii Naționale și care a fost transferat Institutului dv. în anul 1968, este singurul în măsură să asigure securitatea valorilor ce se manipulează, fapt care a condus la înțelegerea cu organele dv. (tov.Dr.Godeanu Stoica și tov. Scharaga Mille) de a se elibera un spațiu corespunzător, conform procesului verbal încheiat la 14 august a.c. între susnumiții și directorul sucursalei Băncii Naționale Tulcea, tov. Serbănescu Gheorghe și contabilul șef tov. Cîrstocea Valeriu.

Față de cele arătate vă rugăm a fi de acord și a dispune redactarea contractului de închiriere în condițiile stipulate în procesul verbal mai sus-menționat.

VICEPRESEDINTE,

I. Dobrescu

Fig. 2. Several copy of documents attesting the transfer of the Ecological Research Station Sulina to the Institute of Biology Bucharest of the Romanian Academy

General data of the project

Overall objective:

To foster the research of aquatic biodiversity in view of a sound scientific management of Danube Delta Biosphere Reserve and design sustainable solutions for the development of the area by mitigating the impact of the current environmental threats.

Specific objective(s):

To rehabilitate the Research Station Sulina and prepare the teams to perform integrative, multidisciplinary research;

To assess the major pressures on the aquatic ecosystems and identify efficient measures to mitigate their impact;

To initiate a dialogue with the local communities and raise public awareness regarding the role of environmental values for human society.

Target group: Romanian Academy, National Academy of Sciences of Danube river basin, water managers, administrators of the Danube Delta Biosphere Reserve, local communities in Danube Delta

Final beneficiaries: Local communities of Danube Delta, the academic research community

Estimated results: A modern research facility in the Danube Delta that will attract international teams and will contribute to improve the knowledge exchange; improved dialogue with local communities to design and implement together the measures to mitigate the anthropogenic impact

Main activities: Rehabilitation of the existing building and modernization of the research laboratories; initiate integrative studies in the area, that will consider human influence on the aquatic habitats; workshops with local authorities, water managers, governors of both Biosphere Reserves, NGOs, representatives of the local communities (fishermen, teachers) for knowledge exchange.

The financial support of the project is obtained from European Union by European Found for Regional Development (FEDR) into frame of POS-CCE program, priority axe 2, competitively by research, technological development and innovation. The total value of the project is 7561083.22 RON from which 85.26% is cover by FEDR and 14.74% from national budget.

The project aims to develop a modern research facility in the Danube Delta Biosphere Reserve that will have a significant role in identifying and implementing sound scientific solutions for the sustainable management of Danube Delta Biosphere Reserve. Improving the dialogue with the local communities and the stakeholders, designing together strategic measures for their area and raising public awareness about the importance of the environmental protection for human society are further foreseen as key actions to improve the implementation process and gain public support to tackle together with the scientific community the environmental emergencies.

The natural areas are subject to multiple pressures occurred as a result of human activity such as pollution with nutrients and xenobiotics, over-exploitation of resources, hydromorphological alterations, land use change, the presence of invasive alien species, the impact of climate change (increasing temperatures, droughts, floods), etc. As a consequence, the environmental quality declined dramatically in the last decades as many ecosystems ceased to function and provide services for the local communities, such as food, drinking water, fuel, purification of air, water and soil, climate regulation, etc. Conserving the ability of the natural ecosystems to provide goods and services is therefore vital for this region in order to ensure proper living conditions for the local inhabitants and for the tourists arrived here during the holiday seasons.

The project to rehabilitate the Ecological Research Station in Sulina (Tulcea county) proposed by the Institute of Biology Bucharest of the Romanian Academy, constitutes the basis to address further critical issues such as drinking water quality, joint preparedness to manage the impact of climate change and conserve the regional biodiversity. Modernizing the Ecological Research Station Sulina to offer the possibility to approach integrative, multidisciplinary research studies and to improve the involvement of local stakeholders in the decision making and the implementation processes will have a significant positive effect at local level by strengthening the local communities.

The rehabilitation and modernization of the research facility owned by the Institute of Biology Bucharest of the Romanian Academy in the Danube Delta, the activities devoted to raise public awareness about the environmental values and gain public involvement in nature conservation projects will strengthen the cooperation between the academic communities and the local stakeholders, in order to design joint solutions to these environmental problems. By rehabilitating the Ecological Research Station Sulina, a modern infrastructure will be available at local level to jointly develop and run future projects aiming to support the harmonization of environmental legislation between the Danube river basin countries. Romanian Academy and Institute of Biology have the best scientific background to design sound solutions to tackle the environmental problems, while the connection with the Biosphere Reserve managers and the local communities will support the implementation process.

The knowledge exchange envisaged initially at local level and further at international level, will support the identification of best available practices worldwide. Such approach would be beneficial as the development of a joint monitoring system of the environmental quality and the implementation of joint preventive solutions will strengthen the regional cooperation, improve the response to environmental challenges and ensure a sustainable use of the natural resources.

REFERENCES

GAVRA E.G., PERISTEROPOULOU D.CH., 2013: *Ekistic heritage and enhancement; The case of Sulina*, Mult. Acad. J. Of Educ. And Social Sciences, issue 1.

PERISTEROPOULOU CH. D., 2012: I eliniki parousia sti Dovroutsa kata ton 19o ai mehri tis arhes tou 20ou. I periptosi tis polis tou Sulina; dierevnisi tou ikistikou kai politistikou apothematos [Greek presence in Dobrogea during 19th century till the the beginning of 20th. Case study of the city of Sulina; exploration of ekistics and cultural heritage]. Unpublished master thesis, University of Western Macedonia, Department of Balkan Studies–Florina (supervision: Gavra G. Eleni).

http://www.hrmars.com/admin/pics/1846.pdf

UNCERTAINTIES OF A PALEONTOLOGIST

Constantin Enache[1]

UNCERTAINTIES OF A PALEONTOLOGIST

Abstract: This paper presents the trials of a palaeontologist, a work of more than 50 years, to find satisfactory answers to the problems concerning the evolution of the animal world.

Keywords: evolution, animal world.

For 50 years, on the field, in the laboratory and later in the course of Paleontology, trying to find satisfactory answers to questions concerning the evolution of the animal world. Many papers that talk about the evolution of life argue that the study of fossils has allowed the discovery of those *links* between different animal species (egg feathered reptile *Archaeopteryx*, which explains the transition from reptiles to birds).

Another approach to the "ancestor" regards the homology of certain organs, many animals with bone and muscle structures similar, which lead to the idea of a common ancestor. As shown in the simplified, published by Scientia in which every living animal and plant derived from an ancestral ancestor represented by mitochondria and nuclei that exist in plants, fungi and animal kingdoms.

A newer argument is that humans and sea sponges have something in common, namely 70 percent of the genes, according to Australian researchers findings (Bernard Degnan, University of Queensland).

I wonder rightly, if so stated in quite serious magazines that by variation has gradually evolved, as a result of adaptation to environmental or genetic mutation, the whole animal world from a common ancestor, how is explained that worms, clams, snails, butterflies which have been found in rocks 420 million years ago, are today on earth. Why they have not turned into higher forms of life?

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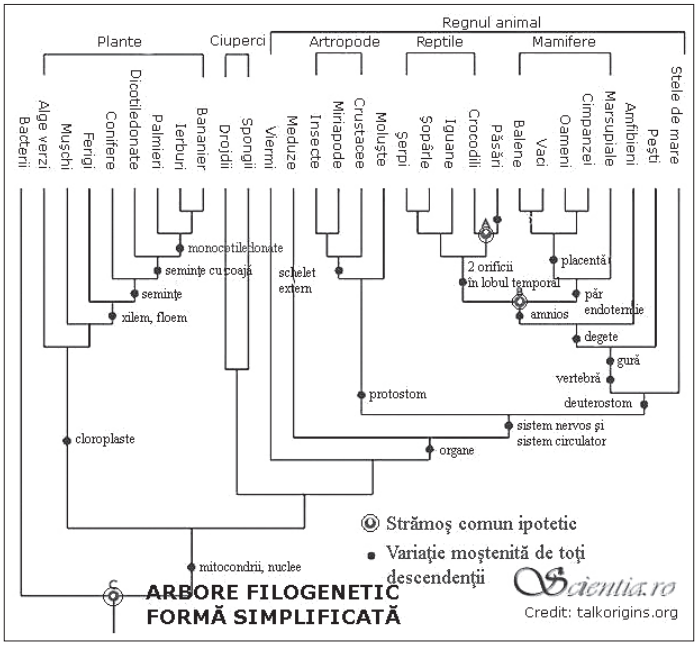

Further still, the Viviparus gastropod families like those common today in rivers and seas, is found in geologic sediments still over more than 350 million years. Also, the fish are known with 350 million years ago. These groups living, thing that remained the same so many millions of years?

I won't insist now on very many examples of the same kind, but an example I find interesting. Until recently it was argued, by even prestigious palaeontologists (Davitaşvili, 1956; Lotsi, 1916; Manoliu & Orbocea, 1981) development schemes that seem downright forced. For example, the development scheme presented during the palaeontology course by Hanganu et al. (1983).

As shown in Fig. 1, the phylogenetic relationship of one class of reptiles in the Triassic (190 million years ago over) called Phantotheria, extinct mammals, is usually recognized as marsupials and placental mammals ancestors.

How is it possible that this class of vertebrates, which did not evolved in the Cretaceous (130–65 milion years) to be the common ancestor of the 25 classes of vertebrates known only in Neozoic era sediments (current ® 65 million years)? In recent decades the palaeontologists have focused on the remains of small mammals to (mice, bats, etc.) and began to find many such residues, the same age with reptiles from which mammals are claimed to descend.

A classic example of animal that has not changed form Palaeozoic era so far is the Nautilus, a cephalopod (squid offspring but spiral shell that lives on the ocean floor). Recently it was caught a fish Latimeria identical to one of the Paleozoic Era which was thought long gone.

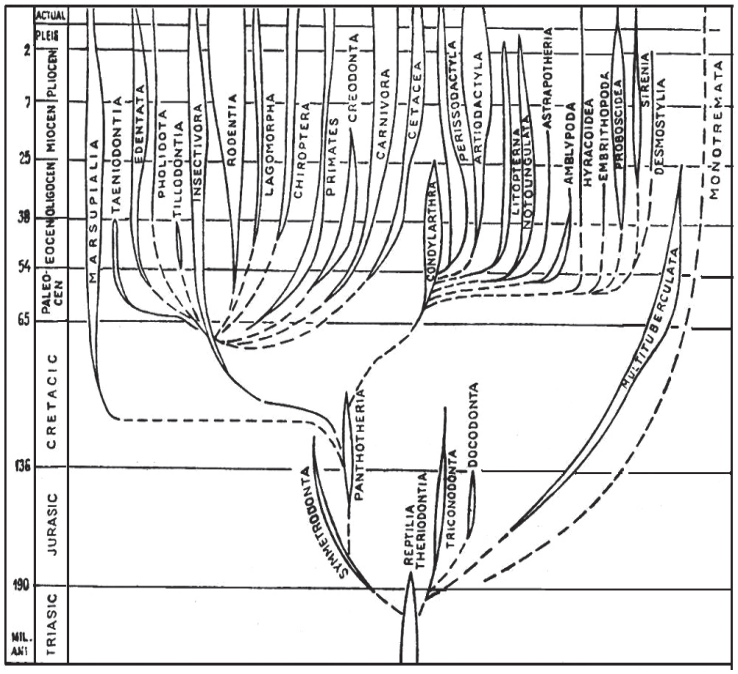

Fig. 1. The phylogenetic scheme after (Hanganu et. al., 1983)

As after technological evolution allowed drilling the ocean floor, it was found, for example, that from the Atlantic dorsal to the shores of the ocean, the rocks are getting older as we approach the land, which, together with the discovery that ironstones remains store the magnetic declination and inclination from epoch of the formation of respective layers, allowed the demonstration that the earth's crust is made of tectonic plates and oceans are opened or closed periodically, at their closure, the material deposited on the bottom, tighten and add dry land forming mountain chains by accretion.

This new theory invalidates the old theory of geosynclinals who believe that in the same place, due to adjacent forces crust forms a concavity (geosynclinals) which, after it fills with sediment rises to form mountains.

I gave this example to show that a theory considered perfectly demonstrated, was later refuted by new discoveries.

So in palaeontology lasted until recently the idea that a feathered lizard (Archaeopteryx) Upper Jurassic (200 million years) is the ancestor of birds, when it was discovered in China, in the Cretaceous deposits (100 million years) a feathered lizard-like bird (Gaudaepteryx) which demonstrates that feathered lizards have lasted another 100 million years while the birds have lived with them.

Homologous organs are presented as arguments of common origin. To give an extreme example, I will say that the fly (like all insects) reproduce by copulation

like all vertebrates, this does not mean that we come from a common ancestor. The similarity to human fingers, or primates, with fish fin bones, amphibians or reptiles limbs is actually an optimal gripping; walking or swimming solution resulted in the same necessity motion (similar opportunity for these classes of animals).

A recent discovery regarding the existence of every two types genes species, some "constructive" (individual building) and others called "selfish" that directs the construction of the fetus after the pattern given by the parents, not quite reconcile with the transformation of the fish in people, etc, as shown in mechanistic understood evolutionary theory. It turned out that stem cells in combination with telocytes, very small cells, invisible even when observed with an optical telescope, function as a remote control system which transmits information to other cells – what to do, how to grow, when to do it, after the memory of respective species.

Among the most bizarre species recently discovered in the oceans, are Dinochelus ausubeli, long claws lobster, at depths of 300 meters in the Philippine Sea. Many species were found in inhospitable waters of the Antarctic Ocean, including a giant spider crab, which is usually, does not exceed two inches. It was also found that "80% of Antarctic species live on the ocean floor in an unexpected diversity", said Dr. Huw Griffiths from the British Antarctic Survey. Below 2,000 meters deep, in the cold, dark waters were found large "surprises". The strange creature species inhabiting near rifts springs, feeding on nutrients coming from the depths of the crust. Other species feed on materials "fallen" from the depths, from the surface. Similar findings were made on the continental shelf of Costa Rica, where colonies of creatures live in the deep methane flow.

As known, in the eastern Indian Ocean occurred a great tsunami which threw some deeply strange animals on the Philippine shores (fish, crabs, and squid etc. bizarre shapes), unknown so far, others with uncertain classification or similar to very old forms, such as an animal similar to trilobite (Fig. 2), the oldest arthropods 500 million years ago.

Reflecting on the contradictory nature of these considerations, I wonder if natural selection theory developed by Charles Darwin, that nature spontaneously produces variations: harmful, indifferent, or beneficial, and the varieties that are emerging as nascent species not only applies to the species or families and not within classes and branching and whether there are evolutionary phenomena that do not follow the mechanism of natural selection.

It seems that natural selection is the engine of evolution; it only works as a means of adaptation to living conditions. The development of a common ancestor of all living creatures groups is shown palaeontology. Some of the "ancestors" were found, as shown, contemporary with the "children or grandchildren."

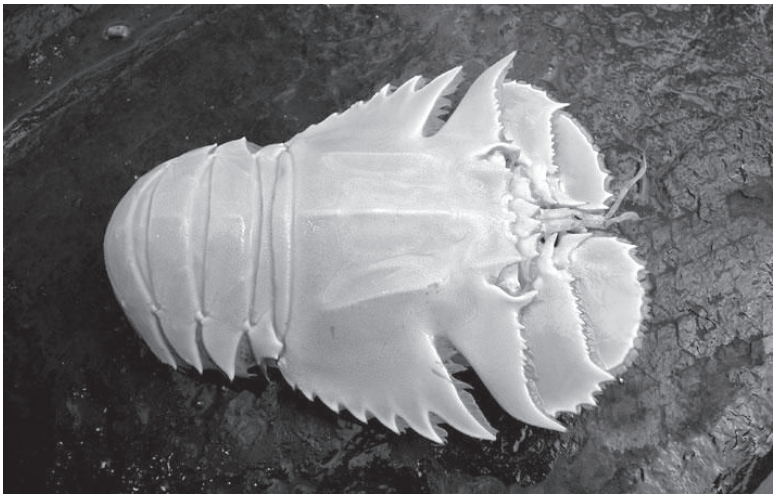

Fig. 2. Animal in the Indian Ocean, similar to the trilobite

Allegation that people and the sponges have a large number of identical chromosomes, confirms only that the living world is made up of similar systems starting from chromosomes, genes, mitochondria and cells, and that the feeding, walking and copulation means, etc., are similar when they were imposed by similar conditions (air, water, inorganic etc.).

If we consider the periodicals ecological disasters occurred during geological time, mainly due to opening and closing movement of the oceans and continental masses which united and or opened periodically, it can be concluded, in the words of the great geologist d'Orbigny, "*in the past of land evolution took place twenty-seven disasters, after which life was restored*". We have much to learn about the emergence and evolution of life because the associations of animals and fossil plants established are too often not sequential and not continuous.

REFERENCES

BOTNARIUC N., 1992: *Evoluţionismul în impas?* Editura Academiei Române.

DARWIN CH., 2007: *Originea speciilor prin selecţie naturală sau păstrarea raselor favorizate în lupta pentru existenţă*, Editura Beladi, Craiova.

DAVITAŞVILI L.S., 1956: *Curs de paleontologie*, Editura Tehnică, Bucureşti.

DAWKINS R., 2006: *Gena egoistă*, Editura Tehnică, Bucureşti.

FOREY P., 1989: *Le coelacanthe*, La Recherche.

LOTSI J. P., 1916: *Evolution by means of hybridization*, Editure Nijhoff, Haga.

MANOLIU E., ORBOCEA M., 1981: *Elemente de paleontologie*, Tipografia Universităţii Bucureşti.

NISTOR-HANGANU E., ŞURARU N., GRIGORESCU D., 1983: *Paleontologie*, Editura Didactică şi Pedagogică, Bucureşti.

BIORESONANCE – A METHOD FOR INFECTIOUS FURNACE VOLUME LOCATION

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BIORESONANCE – A METHOD FOR INFECTIOUS FURNACE VOLUME LOCATION

Abstract: Bioresonance, an investigation tool of quantum medicine, represents a novel medical approach based on a synthesis of recent achievements in quantum physics, combined with advanced knowledge about the profound nature of living creatures and the millennial experience of oriental medicine, i.e. on the energetic reality of these creatures.The functioning principle relies on the fact that any disequilibrium inside the organism is reflected into its energetic field, and consists in generation of electromagnetic radiation that interferes with the information biofield of the brain. Advantage of the method consists in detecting infectious furnace volume and mode of evolution of the disease.

Keywords: bioresonance, quantum medicine, biofield, entropy.

Introduction

Bioresonance, a tool of investigation and alternative complementary treatment, relies on recent discoveries in quantum physics. Quantum medicine is also known as energetic or vibrational medicine. The high precision of quantum medicine is a result of the fact that the study is performed at subatomic or quantum level (Bentolila et al., 2011; Zrazhevskiy et al., 2009). A quantum represents an indivisible quantity of energy or momentum of elementary particles of matter or interaction (fermions or bosons). Discovery of the fact that a physical property can be quantified led to "quantization", meaning that a property can take only discrete numerical values, instead of any value within a range. This generated the related term of "quantum number". The quantum of energy of an electromagnetic wave is equal to hc/λ (where h is the constant of Planck, c the speed of light in vacuum, and λ the wavelength). In nature, matter can be reduced to the level of elementary particles,

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the interaction of which, consisting in quantum fields and resonances, give the features of elementary particles (Affolder et al., 2001; Steiner, 2013). Any disease in the organism arises first at informational, energetic level, and thereafter develops at somatic level, within organs or tissues. DNA represents a matrix that stores information, forming a passive part of cells, while its surroundings represent an active part, conducting bioelectromagnetic signals that transmit information. Thus, bits of information are transmitted from cell to cell (these cells forming a network of relays), and eventually the entire organism is influenced. Quantum medicine utilizes minute doses of electromagnetic radiation in view of diagnosis, prevention, and recovery of health of the individual. To reach this goal, factors of electromagnetic action as similar as possible to the natural ones are used, aimed to exert a positive influence on functioning of cells, tissues, organs, systems, and the organism as a whole(Wetzel et al. 1998; Nagl et al. 1983). The cell is both receptor and emitter of electromagnetic waves, and intercellular communication via electrical waves allows the organism to maintain an equilibrium and, therefore, a state of good health. The brain, functioning as central coordinator of the organism, acts via an electromagnetic code and release of chemical substances (such as hormones and neuromediators), depending on received information. Cytoskeletal microtubules act as guidelines for millimetric electromagnetic waves, ensuring resonance and coherence for all biological entities (Collette et al. 2002; Huber et. al., 2003). Living cells can resonate at low frequencies, between 1.8 and 8.2 Hz. The Oberon Metatron bioresonance device works at such frequencies. By induction of a torsion electromagnetic field in the theta range, it produces bioelectric signals specific to brain neuronal circuits, rendering possible selective amplification of signals otherwise hard to detect due to statistical fluctuations, isolation and decoding of the information they contain. Thus, the Oberon Metatron equipment takes the "pulse" of this radiation at the very site of emission, in order to decode and display it on a computer monitor using virtual organ models and specific color codes. The modules of the Metapathia software offer to physicians three-dimensional projections of the inner organs. Points marked with colors, located on anatomical drawings, help to a more precise location of pathological processes (Beloussov et al., 2007; Bykov, 2007).

Material and methods

Using the Oberon Metatron bioresonance equipment produced by IPP Omsk (Russia) I succeeded to evidence evolution of pathological conditions, to establish precise diagnoses via detection of causes that produced imbalances within the body, and meanwhile to reequilibrate the perturbed physiological functions of various organs that resulted in pathology and disease.

The bioresonance equipment for volume scanning is composed of:

– a unit for generating variable magnetic fields (magnetic inducer, with modulation between 1.8 and 8.2 Hz, intensity of magnetic field 20 ± 1 mT), incorporated in the headset for patients;

– infrared scanner;

– resonance unit (modulation frequency 240 Hz – 1.5/4.5 GHz);

– personal computer connected to the equipment and having installed the diagnosis software – METAPATIA 3.

The device, using bioresonance, detects differences between input and output signals at different frequencies, and the associated software selects the most appropriate standards or models. After recording, the system compares the degrees of spectral similarity with these models.

This medically useful device can compare electromagnetic field emission recorded from the patient with data stored in memory regarding healthy tissues, different pathological changes or infectious agents. Thus, a virtual diagnosis can be issued.

The Oberon Metatron equipment, implementing this analysis system, functions in agreement with the principle of amplification of a signal of initiation of a new state of entropy, following emission of a magnetic vortex modulated at a θ cerebral frequency. This favors modification of brain activity, making possible access to information at subconscious level. In physical terms, Oberon Metatron is a quantum generator of electromagnetic radiation that interferes with the informational biofield of the brain.

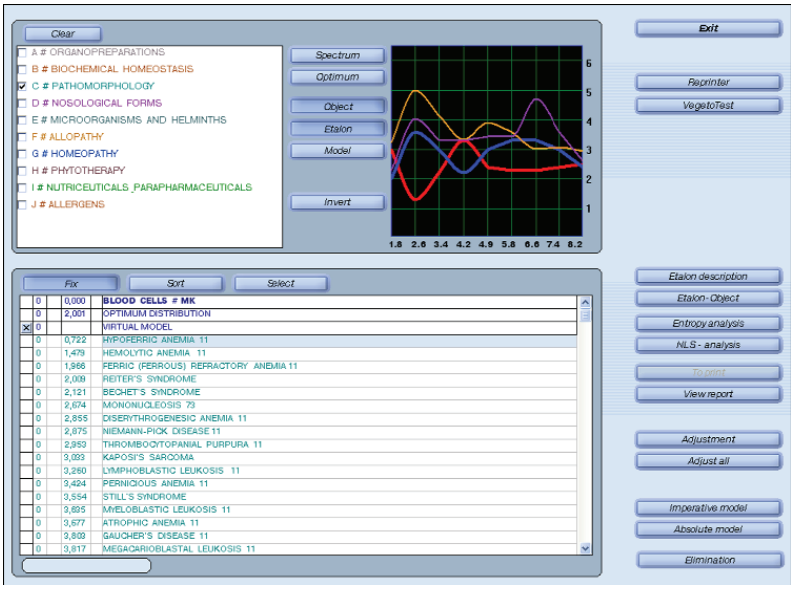

Fig. 1. In the upper left window the working mode is listed (pathomorphology, nosological forms, microorganisms and helmints). In the upper right window there is a graph of the metabolic processes (blue lines represent anabolic processes and red lines catabolic processes; these are standard graphs, while the patient's graphs are in yellow and violet). In the lower window diagnoses are listed in order of increasing entropy.

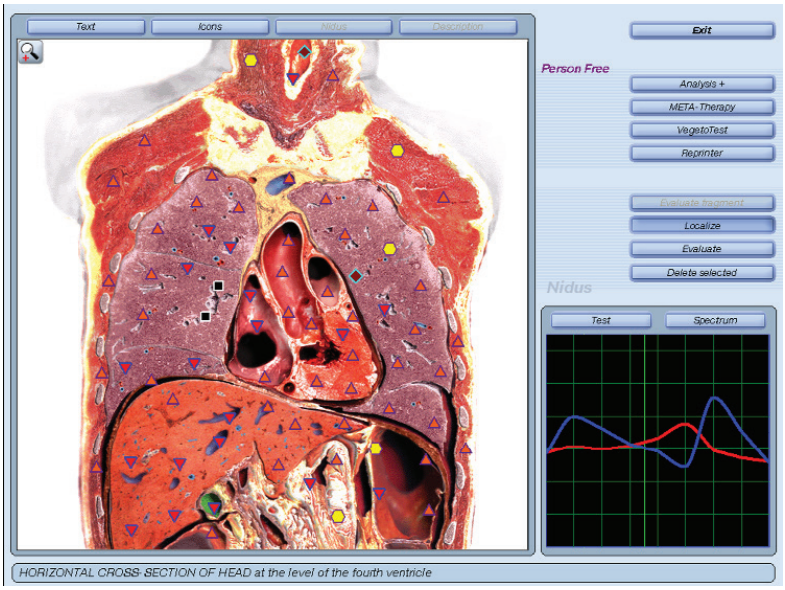

Fig. 2. In this anatomical diagram, entropy values are represented (yellow hexagons indicate optimal functioning, red triangles indicate the modality of cell response to stress factors, the black rhombs indicate existing pathology)

The method is based on emission and detection of biofields as interaction process between emitter-receiver and extra- and intracellular structures. Modifications of magnetic field vortex are determined by cellular metabolic activity and information transfer between regulatory systems (the nervous system). This connection allows diagnosis and influence on the activity via emission of modulating fields with therapeutic effects. The statistically averaged tissue noise background reflects the state of health or disease of a system of organs or intracellular elements; meanwhile, complex causes can be identified based on reception of fields and their statistical and spectral analysis. The hologram of the electromagnetic matrix is dynamically determined, allowing predictive diagnoses.

The device is capable to select signals and to decode accumulated information. The received signals are coded according to entropy. Information is further projected on a three dimensional model of the investigated region.

The noise spectrum resulting from oscillations at cell, tissue or organ level can represent a standard of abnormal function of the organism as a whole or of particular systems. The spectra plotted in Fig. 1 and 2 show on the ordinate the relative spectral power density at a certain frequency, expressed in dB, on a logarithmic scale from 0 to 266.6 dB. 266.6 dB represents the limit above which the system ceases to function. These power density spectra can reflect abnormalities in oxidation-reduction processes, formation or decomposition of chemical

substances, representing anabolic or catabolic processes, respectively. In the lower part of displayed diagrams, a table lists various pathological conditions assessed by spectral comparison, such as diskinesia, hypotonia, hypothyroidism, hypoplasia, adiposity, or incipient phases of acute inflammatory processes (but very rare). The anatomical section presents several graphical symbols that define a large number of pathological processes. The upper part of the diagram represents benign processes. The blue line reflects anabolic processes, trophic and accumulation processes, like initial phases of inflammatory processes. The red line reflects catabolic processes, atrophy and dystrophy, resulting in destruction or reduction of the mass of tissue. Normally, the red and blue lines are parallel and very closed, the blue line being situated above the red one. In pathological processes a line shift occurs. Acute afflictions are accompanied by significant displacements or shifts, increasing the separation between the two lines.

In an ideal case we could diagnose the state of an organ at all frequencies plotted on the graph, analyzing lesions of the vessels, epithelium, and muscle tissue of the organ. In reality, in a majority of cases it suffices to correctly interpret the indexes of organ function according to the coefficient of spectral similarity with pathology and analysis of entropy. Therapy using the same device (named metatherapy) is based on bioresonance effects, by inducing "inversed" electromagnetic oscillations in the patient.

I selected for presentation three clinical cases from a larger group, including patients with multiple afflictions and a longer history of disease.

The patients were informed about the principles of bioresonance, the indications for diagnosis and therapy of the medical device using bioresonance, the advantages of the method, duration of the study, and the requirement that they do not modify their treatment or way of life during this interval.

Results

CASE NO. 1

Name: T.G. sex: F, age: 44, resident in urban area.

Epicrisis. 2005: initial diagnosis: neoplasia (invasive ductal carcinoma) of the left breast, stage I, markers for estrogen receptors (RE) + and for human epidermal growth factor receptors 2 HER2 = 0. The patient underwent a surgical intervention, followed by chemotherapy (6+AC), radiotherapy, hormone therapy (Zoladex + Tamoxifen) between 2005–2008.

2008: relapse metastasis of bone marrow, pleura and mediastinal ganglia, treated with chemotherapy (2 × Docetaxel + Xeloda + 13 × Docetaxel + Avastin) (until July 2009) and bone radiotherapy (total dose = 20 Gy/5 fr/5 days left coxofemural joint). Fig. 3 shows a bone scintigraphic examination of the patient performed in 2008, evidencing a vertebral bone metastasis.

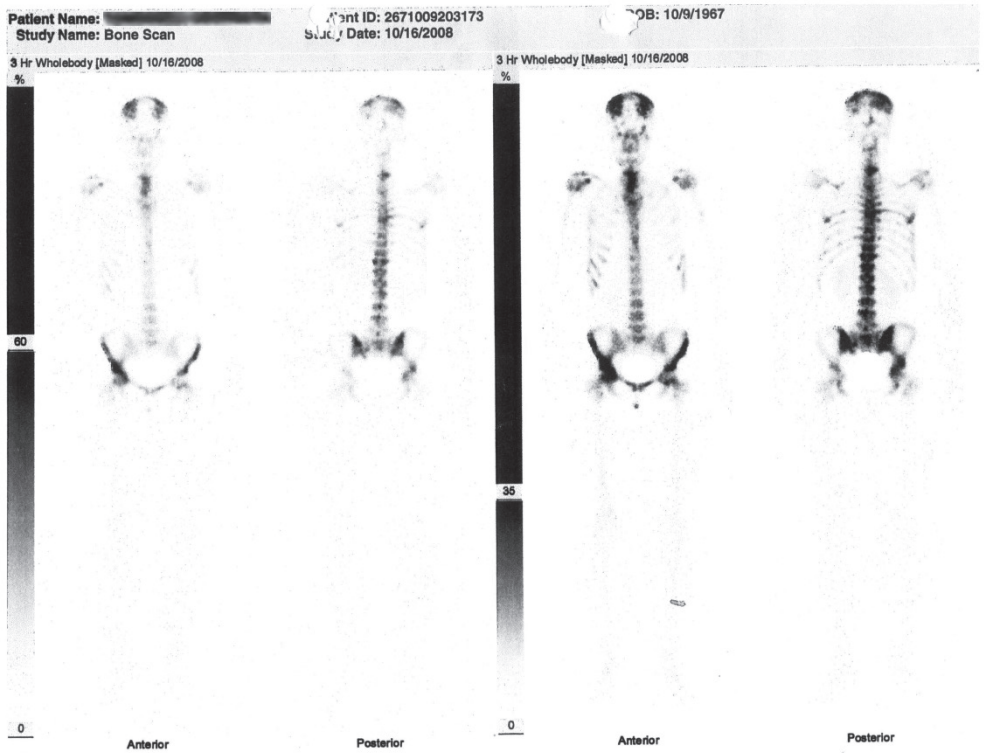

Fig. 3. Bone scintigraphy of case no. 1 performed in 2008

Treatment with biphosphates, hormone therapy (Zoladex + Exemestane), and from July 2011 Zoladex + Fulvestrant.

2010: viral C hepatitis, treated with Ribavirin and PEG-interferon for 6 months.

2012: disease in evolution in the liver and left pleura, anemia of second degree; chemotherapy with adriablastine weekly for 6 weeks, interrupted due to thrombocytopenia, hepatocytolysis and colestasis.

26.03.2012 – change of chemotherapy: vinorelbine (2)

11.04.2012 – change of chemotherapy: docetaxel + xeloda (14 days)

01.06.2012 – onset of icterus, hepatoprotective treatment with Aspatofort + Arginine + Essentiale + Lagosa + Rowachol

23.06.2013 – X-ray examination with intravenous contrast agents evidences fibrotic bands in the anterior segments of both superior lobes, ganglia of 0.8 cm in diameter in the tracheo-caval space, periaortic retroperitoneal ganglia of millimeter size in the lumbar and renal space, evidenced at previous examinations; partly opaque intestinal loops; examination in the bone window evidences inhomogeneous osteocondensation in all bones; osteolythic lesion of 1.2 cm, with edge, with interruption of bone cortical layer in the vertebral body L3; on the inner face of sternal manubrium an osteolythic lesion of 1.3 cm with interruption

of bone cortical layer is present; all bone lesions were not present at previous examinations. Pulmonary fibrosis; secondary bone lesions.

From June 2012 a complementary treatment with the bioresonance equipment was administered, with a follow-up of evolution by monitoring alkaline phosphatases, the CA 15–3 tumor marker, and aminotransferases, as shown in Fig. 4–5.

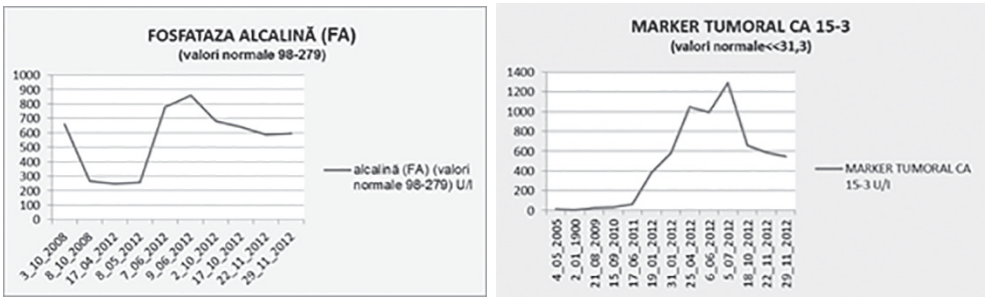

Fig. 4. Graphs showing the evolution in time of serum alkaline phosphatase and tumor marker CA 15–3. In June-July 2012 a peak appears, followed by decay coinciding with bioresonance therapy

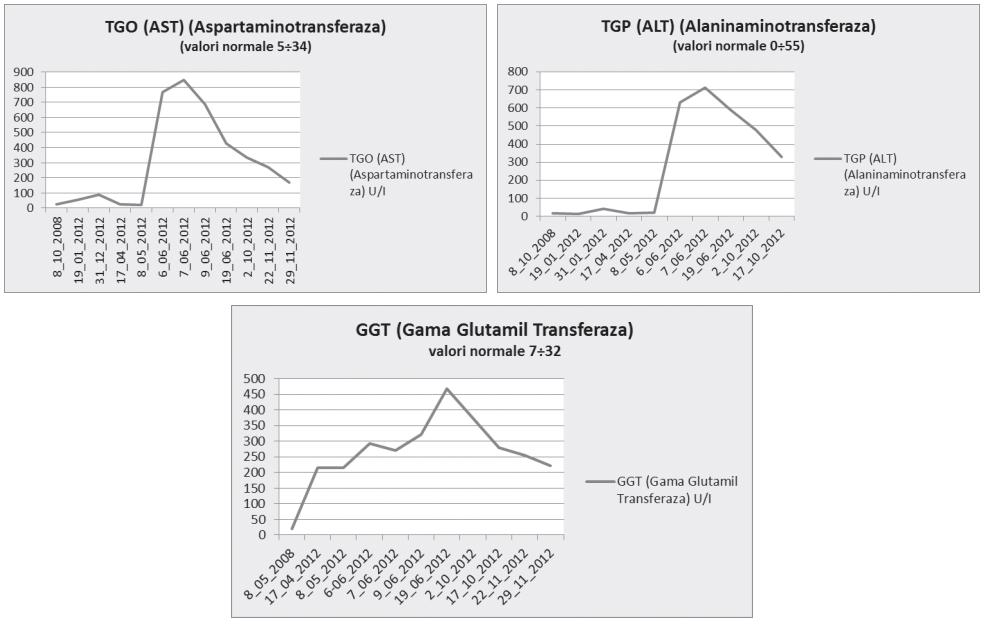

Fig. 5. Graphs showing the evolution in time of aminotransferases and gamma-glutamil-transferase. In June-July 2012 a peak appears, followed by decay coinciding with bioresonance therapy

Tables I and II show the results obtained via bioresonance examination with the Oberon-Metatron equipment in June and November 2012, respectively. The most likely diagnoses are marked with asterisks.

Table 1
Diagnoses assessed via bioresonance with the Oberon equipment for case no. 1 in June 2012.
CAS = spectral similarity coefficient

Organ	Pathology	CAS	ENTROPY
Uterus	Polyp	0.763	4
Uterus	Cervicitis	0.481	6
Ovary	Follicular cyst	0.819	4
Uterus	Angiofibroma	0.645	6
Uterus	Fibromyoma	1.206	6
Kidney	Hydronephrosis	0.715	5
Kidney	Renal polycystic disease	0.915	5
Kidney	Papilloma	0.824	6
Lung	Pseudomonas aeruginosa	0.968	-
Lung	Pleuritis	0.897	3*
Lung	Ankylostoma duodenale	0.798	-*
Suprarenal gland	Ganglioneuroma	0.919	3
Duodenum	Duodenitis	0.614	4
Small intestine	Ankylostoma duodenale	0.957	-
Stomach	Lipoma	1.430	5
Stomach	Cataral gastritis	0.684	4
Stomach	Hypertrophic gastritis	0.992	6
Gallbladder	Dyskinesia	0.428	3
Gallbladder	Fibroma	1.307	6
Liver	Polycystic disease	1.191	5*
Liver	Toxic hepatitis	0.561	5*
Liver	Opistorchis felineus	0.431	-*
Spinal cord	Neurinoma	1.564	6*
Spinal cord	Hemangioma	0.781	6*
Bone	Bone metastasis	2.178	1*
Brain	Meningioma	2.002	6
Brain	Gangliocytoma	1.481	5
Brain	Thrombocytopenic microangiopathy	0.898	4*
Blood	Iron deficiency anemia	0.665	4*
Vascular system	Atherosclerosis	0.922	5

Table 1I
Diagnoses assessed via bioresonance with the Oberon equipment for case no. 1 in November 2012.
CAS = spectral similarity coefficient

Organ	Pathology	CAS	ENTROPY
Uterus	Polyp	0.961	3
Uterus	Cervicitis	0.652	4
Ovary	Follicular cyst	0.916	4
Uterus	Angiofibroma	0.798	5
Uterus	Fibromyoma	1.243	5
Kidney	Renal polycystic disease	0.897	5
Kidney	Papilloma	0.871	5
Lung	Pleuritis	0.986	2*
Lung	Pseudomonas aeruginosa	1.897	-*
Suprarenal gland	Ganglioneuroma	1.576	1
Duodenum	Diskinesis	0.798	3
Large intestine	Myoma	0.919	3
Small intestine	Helminths	0.978	-
Small intestine	Ankylostoma duodenale	0.979	-
Stomach	Lipoma	1.689	4
Stomach	Cataral gastritis	0.754	3
Stomach	Hypertrophic gastritis	1.992	5
Gallbladder	Dyskinesia	0.395	4
Gallbladder	Fibroma	1.307	6
Liver	Polycystic disease	1.812	5*
Liver	Non-active hepatitis	0.961	2*
Spinal cord	Neurinoma	1.578	6*
Spinal cord	Hemangioma	0.861	5*
Bone	Bone metastasis	2.219	1*
Brain	Meningioma	1.981	6
Brain	Gangliocytoma	1.475	5
Brain	Thrombocytopenic microangiopathy	0.973	3
Blood	Iron deficiency anemia	0.915	3
Vascular system	Atherosclerosis	0.897	5

01.11.2012 – X-ray CT body scan with intravenous contrast agent reveals lack of tumor-like intrapulmonary condensation processes, lack of mediastinal adenopathy, left postero-basal pleuresia, discrete hepatomegaly with multiple hypodense infracentimetric lesions (stationary compared to previous control); examination in the bone window evidences partly confluent osteocondensing lesions in bone structures. Conclusion: secondary bone lesions, left pleuresia, stationary disease.

CASE NO. 2

Name: C.I. sex: M, age: 60, resident in urban area.

Epicrisis: 2007: Patient with known diabetes mellitus type II, under treatment with insulin, vitiligo, liver cirrhosis of viral etiology (virus C), hepatocarcinoma of segments III–IV, with an episode of upper digestive hemorrhage in December 2007, treated by vascular ligation, admitted for clinical and biological reevaluation. The clinical exam revealed hypopigmented spots on the face, chest and hands, blood pressure 150/90 mm Hg, heart rate 75/min, enlarged liver with increased consistency, Biological exams reveal slight anemia, hepatocytolysis, thrombocytopenia and increased gamma-glutamyl transpeptidases. Abdominal echography describes liver cirrhosis, portal hypertension, hepatocarcinoma of left lobe. Diagnosis: Liver cirrhosis of C viral etiology, Child-Turcotte-Pugh class A, hepatocarcinoma of segments III-IV, esophageal varices grade I, hypersplenism with thrombocytopenia, unbalanced diabetes mellitus type II requiring insulin, vitiligo, prostate adenoma.

Results of examination with the Oberon bioresonance equipment are presented in Table III.

Table 1II

Diagnoses assessed via bioresonance with the Oberon equipment for case no. 2
The most likely diagnoses are marked with asterisks
CAS = spectral similarity coefficient

Organ	Pathology	CAS	ENTROPY
Stomach	Cataral gastritis	0.458	5
Large intestine	Colitis	0.378	6*
Small intestine	Enteritis	0.432	5
Small intestine	Intestinal lambliasis	0.730	-*
Digestive system	Enzymopathy	0.323	6
Small intestine	Enzymopathy	0.431	6
Small intestine	Disaccharide deficit	0.543	6
Small intestine	Trichocephalus trichiurus	1.569	-
Prostate	Prostate adenoma	0.897	4
Large intestine	Strongyloides stercoralis	1.787	-*
Large intestine	Dyskinesia	0.349	6
Duodenum	Dyskinesia	0.423	5
Duodenum	Polyp	0.897	4
Thyroid gland	Thyreotoxicosis	0.631	5
Pancreas	Cystic adenoma	0.987	4*
Liver	Toxic hepatitis	1.543	4
Liver	Portal hypertension	1.341	4*

Liver	Opistorchis felineus	0.127	-*
Liver	Ascaris lumbricoides	0.985	-*
Liver	Echinococcus granulosus	0.869	-*
Liver	Liver cirrhosis	0.987	4*
Kidney	Cystopyelitis	1.335	4
Kidney	Escherichia coli	1.987	-
Kydney	Gout	0.675	5*
Kydney	Hydronephrosis	1.432	4
Kydney	Polakiurie	1.653	3
Bone	Spondylarthropathy	1.415	3
Bone	Osteoporosis	1.878	3
Bone	Kingella kingae	1.897	-
Eye	Hypermetropia	1.765	4
Blood	Hemolytic anemia	1.897	3*
Spine	Herpes zoster	1.987	3
Spine	Osteochondrosis	1.675	4
Nervous system	Prosopalgia	0.768	5
Vascular system	Esophageal varicose veins	0.875	5*
Vascular system	Thrombophlebitis	0.762	4*

CASE NO. 3

Name: M.L. sex: F, age: 43, resident in urban area.

Epicrisis. 2005: cervical uterine cauterization, uterine polyfibromatosis, ovarian cysts (echography in Fig. 6).

Thyroid echography: normal volume, inhomogeneous structure. Normal TSH values, treatment with prolactin.

NMR scan of the head: at the level of the sphenoidal sinus, in intimate contact with the superior nasal choana, on the body of the sphenoid bone, an area of 3.3/1.7/2.7 cm with discrete hyposignal in T1 and T2 relexation mode, with peripheral contrast agent capture, clearly delimited, resembling an inflammatory sphenoidal lesion. Hypophysis without changes of structure and signal. Brain without changes of structure or signal. Symmetrical ventricles, aligned at the midsagittal line, of normal size. Normal extracellular liquid spaces. NMR of the cervical spine: vertebral bodies aligned at the posterior and anterior edge C3-C6. Calcification of the posterior longitudinal ligament C4-C6, without disc herniation. Anterior stenosis of spinal canal C4-C6. Spinal cord without changes of structure and signal. Conclusion: left sphenoiditis.

ENT examination (2013): hypoacusis, bone pain, migraine, xanthoma (Fig. 7).

Results of examination with the Oberon bioresonance equipment are presented in Table IV.

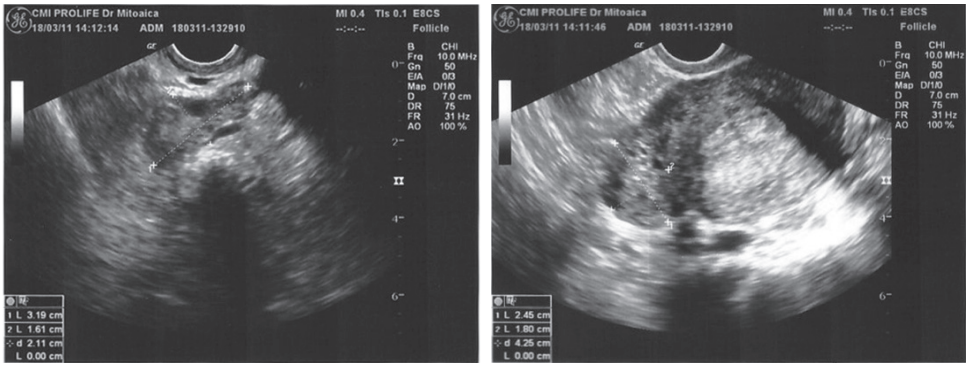

Fig. 6. Echography of left and right ovary; multiple benign cystic structures are present

Fig. 7. Multiple xanthoma around the eyelids

Table 1V

Diagnoses assessed via bioresonance with the Oberon equipment for case no. 3
The most likely diagnoses are marked with asterisks
CAS = spectral similarity coefficient

Organ	Pathology	CAS	ENTROPY
Uterus	Polyp	0.609	5*
Uterus	Papilllomavirus	0.731	-
Uterus	Ureaplasma urealyticum	0.985	-
Uterus	Angiofibroma	0.730	6
Uterus	Myoma	0.960	6
Uterus	Fibromyoma	0.977	6*
Ovary	Follicular cyst	0.677	6
Ovary	Theca lutein cyst	0.902	4
Ovary	Serous cystadenoma	1.233	6*
Ovary	Cystadenofibroma	1.137	6*
Ovary	Mucinous cystadenoma	1.178	6*
Vascular system	Thrombophlebitis	0.780	4
Suprarenal gland	Ganglioneuroma	0.702	5
Suprarenal gland	Suprarenal hypoplasia	2.141	0
Kidney	Polycystic kidney	1.063	4*

Kidney	Papilloma	1.148	5*
Blood	Chronic myeloid leukosis	2.298	4
Stomach (posterior)	Polypoid gastritis	1.211	6
Stomach (anterior)	Lymphoma	1.291	6
Stomach (anterior)	Carcinoma	1.752	1
Duodenum	Dyskinesia	0.348	7*
Duodenum	Ankylostoma duodenale	0.992	-
Pancreas	Adiposity	0.422	7*
Pancreas	Opistorchis felineus	0.818	-
Duodenum	Adenoma	1.437	5
Duodenum	Neurofibroma	1.423	6
Gallbladder	Dyskinesia	0.311	7
Bile ducts	Cholangitis	1.860	0
Liver	Strongyloides stercoralis	0.969	-
Liver	Echinococcus multilocularis	1.293	-
Liver	Steatosis	0.422	7*
Liver	Opistorchis felineus	0.818	-
Liver	Polycystic disease	0.968	6*
Liver	Hepatocellular adenoma	1.688	6
Ear	Otitis	0.743	6
Skin	Papillomavirus	0.851	-
Skin	Cutaneous lymphoma	0.763	-
Blood	Iron deficiency anemia	0.664	3*
Blood	Chronic lympholeukosis	0.825	6
Brain	Migraine	0.848	6*

Discussion

The process of diagnosis based on volume scanning of the electromagnetic field at organ, tissue or cell level using low frequency stimuli is dynamic, non-invasive, and yields large amounts of data. The approach could evidence the state of health of patients and its alteration in pathologies of different origins. For a better assessment, the analysis for patient 2 was performed both at organ and tissue level.

Many diagnoses are performed only when the patient becomes aware of the disease due to symptoms. Thus, a gastritis may not raise too many problems, but it can become chronic with time and trigger other pathologies such as gastric polyps (patient 3), and these processes can become malignant with time.

Sometimes social problems, depressive states caused by more or less objective factors create discomfort, migraine, fatigue, digestive troubles, affections of sensory systems, without raising a doubt that one or more pathological processes could exist within the organism (patient 3). Thus, after a routine examination,

patient 3 noticed a pathology involving several systems: genitourinary, digestive, nervous. The Oberon Metatron bioresonance equipment confirmed the existence of clinically diagnosed pathologies, and supplementary data to establish more precisely the triggering factor.

A great difficulty in establishing diagnoses arises for malignant processes with dissemination. Most often these processes cannot be located, they are asymptomatic during the first stages of development, and the use of conventional methods (CT) is not conclusive or cannot detect these processes in the incipient phase. The Oberon Metatron bioresonance equipment could detect bone metastases in patient 1, confirming results obtained via CT scan.

Most often the standard treatment in malignancies results in serious side effects, like liver disease for patient 1, or it cannot be tolerated by the patient, or it becomes ineffective with time by resistance mutations of the malignant cell. For patient 1, the chemotherapy regime has been modified 8 times since 2005 until 2012, and it was more and more difficult to tolerate by the organism and with multiple secondary effects. Therapy with the bioresonance equipment Oberon Metatron resulted into an improvement of vital functions, of the psychic state, and a normalization of physiology.

Some interpretations of echographic exams can be erroneous. For example, in patient 2, where the diagnosis established via echography was hepatocarcinoma, this diagnosis was not confirmed. The Oberon Metatron bioresonance examination detected a hydatid cyst with invasion of several parasitic species, an atypical cyst which can be confused with other pathologies at echographic examination.

The Oberon Metatron bioresonance equipment can detect and visualize not only the afflicted organ, but also the surroundings, i.e. the blood vessels that feed that organ and achieve connections with other organs/systems, helping in establishing a proper treatment.

The precision in diagnosis with Oberon Metatron resides in its capability to determine the causes leading to initiation of pathology, due to the property of the method of performing an overall examination of the entire organism and of discovering processes in evolution.

Conclusions

Use of the Oberon Metatron bioresonance equipment in diagnosing different pathologies, sometimes with involvement of multiple organs, is advantageous from the point of view of accuracy and possibility of visualization of the disease focus and formulation of a prognosis concerning its evolution. The treatment with METAPATIA, taking into account a variety of factors, has maximal effectiveness because it is highly specific for every organism. Costs are low and it does not imply risk factors.

REFERENCES

AFFOLDER T., AKIMOTO H., AKOPIAN A. ET. AL., 2001: *Search for neutral supersymmetric Higgs bosons in pp collisions at sqrt[s] =1.8TeV*Physical Review Letter. 2001 May 14;86(20): 4472–8.

BELOUSSOV, L.V., VOEIKOV V.L., MARTYNYUK V.S., 2007: *Biophotonics and Coherent Systems in Biology*, Springer Science+Business Media, LLC, New York.

BENTOLILA L.A., MICHALET X., PINAUD F.F., TSAY J.M., DOOSE S., LI J.J., SUNDARESAN G., WU A.M., GAMBHIR S.S., WEISS S., 2011: *Quantum dots for molecular imaging and cancer medicine.* J Food Sci. 2011 Nov-Dec;76(9).

BYKOV, A.D., 2007: *New technologies in diagnostics and integrated treatment of generalized purulent peritonitis* (experimental and clinical research).

COLLETTE F., VAN DER LINDEN M., 2002: *Brain imaging of the central executive component of working memory.* Neurosci Biobehav Rev. 2002 Mar; 26(2):105–25.

HUBER R., SCHUDERER J., GRAF T., JÜTZ K., BORBÉLY A.A., KUSTER N., ACHERMANN P., 2003: *Radio frequency electromagnetic field exposure in humans: Estimation of SAR distribution in the brain, effects on sleep and heart rate.* Bioelectromagnetics. 2003 May; 24(4): 262–76.

NAGL W., POPP F.A., 1983: *A physical (electromagnetic) model of differentiation. 1. Basic considerations.* Cytobios 1983, 37(145): 45–62.

STEINER R., 2013: *History and progress on accurate measurements of the Planck constant.* Rep Prog Phys. 2013 Jan;76(1):016101.

WETZEL M.S., EISENBERG D.M., KAPTCHUK T.J., 1998: *Courses involving complementary and alternative medicine at US medical schools*. JAMA. 1998;280(9): 784–787.

ZRAZHEVSKIY P., GAO X., 2009: *Multifunctional quantum dots for personalized medicine.* Nano Today. 2009 Oct 5; 4(5): 414–428.