RESEARCH FORERUNNERS IN THE FIELD OF AQUATIC ECOLOGY FROM ROMANIA

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Abstract. Research studies in the field of aquatic ecology (hydrobiology) from Romania are among the priorities of this science at European level. The founder of this field is Grigore Antipa. Contemporary and future researchers ensured the development of aquatic ecology in Romania – Ion Borcea, Emil Racoviță, Constantin Motaş, Theodor Buşniță, Mihai Băcescu, C. S. Antonescu, Nicolae Botnariuc. Besides them, future researchers' generations develop their forerunners' work.

Keywords: aquatic ecology, forerunners, Romania.

Rezumat. Precursori ai cercetării în domeniul ecologiei acvatice din România. Cercetările în domeniul ecologiei acvatice (hidrobiologiei) în România se înscriu între prioritățile acestei ştiințe pe plan european. Fondatorul acestui domeniu este Grigore Antipa. Contemporani şi continuatori au asigurat dezvoltarea ecologiei acvatice în România: Ion Borcea, Emil Racoviță, Constantin Motaş, Theodor Buşniță, Mihai Băcescu, C. S. Antonescu, Nicolae Botnariuc. Alături de aceştia, generațiile următoare de cercetători au preluat şi dezvoltă opera înaintaşilor.

Cuvinte cheie: ecologie acvatică, precursori, România.

In a previous volume of *Oltenia. Studies and communications. Nature Sciences*, it was widely analysed Grigore Antipa's activity and work (BREZEANU & CIOBOIU, 2010). He is the founder of modern hydrobiology, ecology from our country; he set up the theoretical and applicative basis of hydrobiology that brought to the development of this field. His work represented and continues to represent a reference point in assessing the stages that marked the knowledge of aquatic ecosystems structures and functions (ANTIPA, 1910, 1921, 1941; BÂRCA & BĂCESCU, 1969; MOTAŞ, 1961).

Referring to Antipa, it is fully justified the statement which underlines that "*Posterity, which is an implacable, but also impartial judge, assumed and developed his work through his capable successors. He remained a great scientist, a pioneer both at national and international level*" (NEGREA, 1990). This genuine truth was confirmed by the contemporary and future researchers' generations.

Ion Borcea (1879-1936), a passionate researcher in the field of marine biology, is considered the founder of oceanography in our country. His studies aimed at knowing the biology of the Black Sea (BĂCESCU, 1971).

As a professor of the University of Iaşi, he fought for setting up a marine research station. Due to his perseverance and efforts, he succeeded in overcoming the inertia of the administration system of the time, and, in 1926, he accomplished his dream and set up the first station of marine research at Agigea.

Agigea Research Station became an important study centre, greatly considered both in the country and abroad. As a station of the University "Al. I. Cuza" from Iaşi, year after year, their students perfected their studies together with numerous Romanian and foreign scientists.

Ion Borcea had remarkable results in the field of biology, his studies focussing on the Black Sea. He discovered and described more than 150 invertebrates and 90 fish species living in the Black Sea. He studied the anatomy and embryology of many fish species, their ecology, migration, reproduction and feeding aspects (BORCEA, 1930).

Among his most important works we mention: "*Crustacées Phyllopodes de Roumanie*", 1912; "*Faune survivante de type caspien dans les limans d'eau douce de Roumanie*", 1925; „*Fauna Mării Negre pe litoralul Dobrogei*", 1928; "*Observations sur les poissons migrateurs dans les eaus roumaines de la Mer Noire*", 1929; "*Nouvelles contributions a l'étude de la faune bentonique dans la Mer Noire, près du litoral roumaine*", 1931; "*Les clupeides de la région littorale roumaine de la Mer Noire des eaux intérieus*", 1936.

Emil Racoviță (1868-1947) started his activity as an expert in the field of bio oceanography; his participation and contribution as a naturalist at the expedition in Antarctica, on the ship Belgica (1897-1899), is well-known. The scientific activity he devoted the rest of his life is biospeleology. He explored numerous caves in France where he set up the basis of biospeleology for the first time (RACOVITZA, 1907).

In 1920, when coming back to Romania, Emil Racoviță set up the first Institute of Biospeleology in the world within the framework of the University of Cluj; he was the director of this institute between 1926 and 1939.

Racoviță was also involved in setting up the international society called "Biospeologica"; he also published the journal with the same name. He led the exploration of more than 800 caves from Europe and Northern Africa; during these exploration studies, there were collected more than 20,000 samples on the basis of which there were published 41 memories in the series "Biospeologica" (RACOVIȚĂ, 1926, 1929, 1964, 1993). In Romania, in the period 1921-1931, he explored more than 150 caves in the Apuseni Mountains and 100 caves in the Southern Carpathians (ARDELEAN et al., 2000; RACOVIȚĂ et al., 2002).

Constantin Motaş (1891-1980) was a great personality of the Romanian science who left numerous fundamental works in the fields of zoology, limnology, hydrobiology, phreatobiology – a topic the basis of which was set up by him, oceanology, biospeleology (MOTAŞ, 2007).

In the field of hydrobiology, it is worth mentioning the monograph "*Hydrobiological research within the Bistriţa River basin*" published together with V. ANGELESCU in 1944 (MOTAŞ & ANGELESCU, 1944). It is a reference work for limnological research. We must also mention the work "*Limnological-piscicultural monograph of the Bistriţa River – Moldavia*" published together with V. ANGELESCU in 1939.

In order to emphasize the diversity of his scientific research, we mention "*Biology of the Black Sea*" (1928) and an important work of systematic zoology "*Contribution a la connaissance des Hydrocariens français, particulierement du Sud-Est de la France*".

Another remarkable work published in 1962 in collaboration with L. BOTOŞĂNEANU and ŞT. NEGREA, "*Research regarding the biology of springs and phreatic water from the central part of the Romanian Plain*", represents a real fundamental book in this scientific branch. Of course, the list of his works comprises many more titles – 527, which reflects his prodigious activity (MOTAŞ, 1962; MOTAŞ & ORGHIDAN, 1948; MOTAŞ et al., 1962, 1967; NEGREA et al., 2004).

He was a professor at the Zoology Department of the University of Iaşi and at the Faculty of Natural Sciences of the University of Bucharest, member of the Romanian Academy and director of the Institute of Speleology "Emil Racoviţă" from Bucharest between 1956 and 1963.

Theodor Buşniţă (1900-1977), Antipa's disciple and collaborator, is one of the personalities of the Romanian science that contributed to the development of hydrobiology and pisciculture. From his mentor, he inherited the rigor in organizing his scientific research and training in the field of fishing and pisciculture.

At his initiative, in 1953, it is set up the "*Commission of hydrobiology, hydrology, and ichthyology of the Romanian Academy*" that succeeded in reuniting a group of young researchers whose target was to develop the research of the aquatic bodies from our country. This commission represented a starting point for the future section of hydrology (oceanography and limnology) of the Biology Institute of the Romanian Academy. As leader of this section (1959-1970), he coordinated vast research programs regarding the hydrobiological study of the Danube, its floodplain, and the Danube Delta. Within this framework and under his direct coordination, it was elaborated the work "*Limnology of the Romanian Sector of the Danube*" (1967), considered a reference study of the Danube and the Danube Delta that analyses the physical-geographical features, limnology, and economic importance of the river, its floodplain, and delta.

In his first activity years, as a young researcher, he dedicated himself to the hystophysiological research of certain fish species. His results are mentioned in famous treatises. In the field of ichthyology, he brought original contributions to the creation of new carp breeds, the understanding of their behaviour, and study of the gynogenesis of the silver crucian carp.

The studies regarding the structural characteristics of fish populations from the Danube and other rivers are quite important as they define the specific zones in terms of ichthyofauna distribution (BUŞNIŢĂ, 1965, 1967a, b; BUŞNIŢĂ & ALEXANDRESCU, 1963).

Continuing Antipa's work, he set up the bases of the modern system of piscicultural exploitation – the passage from extensive to intensive, industrial pisciculture.

During his entire life, due to his skills and organizational talent, he held important functions: director of the State Fisheries, director of the Institute of Piscicultural Research, dean of the Faculty of Fishing and Pisciculture – the first such faculty in our country set up at his initiative, deputy director of the Biology Institute of the Romanian Academy and chief of the Section of Limnology and Oceanography.

Mihai Băcescu (1908-1999), a continuator of Grigore Antipa's work, can be considered the founder of modern oceanography in Romania. In 1958, he organized the oceanography section of the Romanian Academy. He and the researchers he guided developed a vast research program regarding the shelf of the Romanian sector of the Black Sea. He organized numerous expeditions and the results of their field and laboratory investigations are rendered in a great number of scientific studies published in four volumes of "*Marine Ecology*" (BĂCESCU, 1965, 1967; BĂCESCU et al., 1971).

His faunistic and taxonomic works comprised mainly studies regarding certain groups of marine and fresh water crustaceans; these papers were published in "*Fauna of Romania*". He had remarkable contributions to the knowledge of the biology and taxonomy of the crustaceans from the Indian Ocean, the Mediterranean Sea, the Atlantic Ocean, the seas neighbouring Australia and Latin America and this is only a part of his activity in the field. At the same time, he studied the rivers and lakes from our country (BĂCESCU, 1984). He continued the Grigore Antipa's museographic work as director of the museum with the same name.

C. S. Antonescu, a professor of hydrobiology at the Biology Faculty of the University of Bucharest, was also a researcher characterised by a great capacity of analysis and synthesis of the aquatic ecosystems (ANTONESCU & RUDESCU, 1958).

In his works regarding the water flora and fauna, he skilfully described plants and animals life. One of his most important works is "*Waters biology*" of more than 500 pages, where he minutely rendered life aspects from continental and marine water bodies (ANTONESCU, 1967).

Nicolae Botnariuc (1915 – 2011) contributed to the development of aquatic ecology and applied, for the first time in our country, the principle and conception of systemic analysis (BOTNARIUC, 1999, 2003; BOTNARIUC & VĂDINEANU, 1982).

He performed vast research studies aiming at the knowledge of the functional structures of the aquatic ecosystems from the Danube Delta and the river floodplain together with the teams he led at the Biology Institute of the Academy and at the Biology Faculty of the University of Bucharest (BOTNARIUC et al., 1964a, b).

The work "*Monograph of Crapina-Jijila pools complex*" (1961) published in collaboration with S. BELDESCU represents an important contribution to the establishment of the mechanisms that determine the production and productivity of such types of aquatic ecosystems. He underlined the role of the floods duration and period within the Danube Floodplain as an essential factor for the development of macrophytes and phytoplankton. In his work, he emphasized the role of light and water transparency upon aquatic life, underlining the importance of the rapport between transparency and depth, namely the transparency index (T/D) (BOTNARIUC & BELDESCU, 1961).

Analysing the development of hydrobiology in Romania, we may establish two representative stages – one stage belonging to Grigore Antipa and his contemporaries and the second post-war stage, when hydrobiological-ecological research knows a new development on the basis of former traditions.

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