

**Measures for conservation and restoration of natural heritage in Bourgas and Enez
(MoreCare), CB005.12.1.115**

“Development of a joint model and an assessment methodology for ecosystem services in
Vaya (Burgas) and Gala (Enez) lakes”, CB005.1.12.115/S-4

**ECOSYSTEM RESOURCES
VAYA LAKE**



Associate Professor D-r Maria Broshtilova
Eng. Vladimir Dimitrov

ECOSYSTEM RESOURCES AND SERVICES OF VAYA LAKE, BURGAS

Coordinates - 42.502471, 27.400832



"Burgas Lake" (Vaya) is the largest natural lake in Bulgaria, located in the Black Sea bio-geographic region, the Black Sea area, the South Coast. The lake and its adjacent territories fall in the territory of the city of Burgas, Burgas Municipality.

It is a shallow-water brakish coastal lake - open liman, known under two names - Lake Bourgas and Vaya. It is located to the west of Bourgas, and its entire eastern part rests on the industrial and residential districts of the city. It has a length of 9.6 km west, its width reaches 4.5 km (an average of 2.8 km). The lake itself is at sea level, but its western coast is about 0.2 m and the northern and southern shores reach 15-20 m above sea level.

Burgas Lake occupies an area of 3092.02 ha. The total water surface is 2760 ha and the water volume - 19.0 million m³. The lake is connected to the sea through a narrow channel, 350 meters long with a gateway, the cleaning of which in recent years one of the most important challenges is facing the normal functioning of the lake. The channel provides vital fresh water from the sea, with nutrients and many marine inhabitants in the freshwater lake. From the sea is separated from sandy landform, on which today is built an industrial zone and a residential quarter of Burgas. Years ago it has created the biggest problems for the living world of this liman. The depth of the lake reaches up to 1.3 m. The salinity of the water is about 10.58 miles and has significant seasonal and annual fluctuations. With long east winds on the sea, additional salting of a part of the lake takes place. In the western part of Vaya flows the waters of the Aitoska, Sunderere and Chukarska rivers.



The area of the lake is 87%, state –owned, 7% - municipal property and 6% - private property. The water area is an exclusive state property.

In the southwest, the lake is surrounded by smaller ponds - marshes that are densely overgrown with marshy vegetation and fishponds. The lake and the near marshes are the biggest *Typha* massif in the country. The lake shores are all in water plants, mainly *Phragmites* (*Phragmites australis*), *Typha* (*Typha angustifolia*), *Typha* with wide leaves (*Typha latifolia*)

and so on, which form large massive in the west and northwest part. Around the lake are wet meadows, halophytic grasslands dominated by *Puccinellia* (*Puccinellia convoluta*), grass, mainly bulbosa (*Poa bulbosa*), pasture *Lolium* (*Lolium perenne*), arable land and pastures.

Part of Lake Vaya (12%) is legally protected under national environmental law. In 1997, the Protected Area (PA) Vaya (379.4 ha) was declared for the conservation of endangered bird species, covering the reed massifs in the southwestern part of the lake.

In 1998, the lake was designated a CORINE site because of its European importance for the conservation of rare and endangered bird species, code: F00007600. In 2003, the Burgas Lake was declared a Wetland of International Importance, according to the Ramsar Convention with an area of 2899.9 hectares, including the entire lake aquarium and the channel connecting the wetland with the Black Sea, the territory of the Vaya Protected Site, as and sections along the left bank of the Aitos River and a small stretch southwest of Vaya fishponds. In 2005 the site was declared by BirdLife International for BirdLife (IBA) - IBA BG035. In 2007 IBA "Burgas Lake" was included in the European Ecological Network Natura 2000 as a protected area under the two directives (for the protection of wild birds and for habitats) - Code in the register: BG0000273. The area of the lake Vaya is included in the network of the background and impact zones (stations) of the National Program for Biomonitoring of Bulgaria.



Lake Burgas (Vaya) is a representative ecosystem of the West Black Sea coastal limans, with a high importance for the conservation of a number of rare and endangered



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species of national, European or world importance. It is part of the Burgas Lake Complex - one of the three most important complexes of wetlands for waterfowl on the Bulgarian Black Sea coast.

Until the present moment, the flora of the Vaya Protected Site and the Ramsar site are set to 77 families and 255 genus and includes 326 species of higher plants. The number of trees and shrubs introduced is high, especially on the eastern shore of the lake and the channel connecting it with the Black Sea. 14 of these species are included in the Red book of Bulgaria, as 12 of them are in the category "rare": *Silene euxina*, *Polycnemon heuffelii*, *Acanthus spinosus*, *Aeluropus littoralis*, *Bupleurum flavum*, *Heptaptera triquetra*, *Erodium hoefftianum*, *Halimone pedunculata*, *Gypsophila trichotoma*, *Phalaris tuberosa*, *Saccharum ravennae* *Lemna gibba*; 2 types in the category "endangered" – *Limonium latifolium* and *Goniolimon tataricum*; 1 type is in the category "disappeared" – *Halimone portulacoides*; 3 types: *Aeluropus littoralis*, *Limonium latifolium* and *Goniolimon tataricum* are protected with an Order / 718/1989 of the Ministry of environment. One type is included in the Red book of Europe: *Goniolimon tataricum*. On the territory are found 2 types of Balkan endemics: *Heptaptera triquetra* and *Bupleurum flavum*. Three types are in the list of CITES: *Orchis elegans*, *Paeonia peregrina* and *Ruscus aculeatus*. With conservation importance is also the population of the *Sternbergia colchiciflora*, although unprotected, distributed in separate places south of the protected area. There are set total of 57 species of medicinal plants included in the Annex to Art. 1, para. 2 of the Medicinal Plants Act (State gazette, issue 29, 2000).

Until 1956 the number of permanently inhabiting fish species in Lake Burgas is 20, of which only 11 are in the lake. The other species are mostly marine, represented by single specimens in the sea and the mouth of the canal - the triangle orchard, the arterium, etc. 5 species are listed in the list IUCN – *Atherina boyeri*, *Syngnathus abaster*, dragonfly (*Hippocampus ramulosus*), Round goby (*Neogobius melanostomus*) and Monkey goby (*Neogobius fluviatilis*). 3 types – eel (*Anguilla anguilla*), atherina (*Atherina boyeri*) and three-spined stickleback (*Gasterosteus aculeatus*) are included in the red book of Bulgaria. Syngnathiformes and Monkey goby are in the list of the Bern convention, 4 species are in the list of CORINE. Due to the changes in the hydrological regime and the composition of the lake waters, after 1970 the lake of Burgas is characterized by a very poor qualitative



ichtiofauna. Most of the species currently found are characterized by high adaptability and great resistance to unfavorable conditions. Permanent ichthyofauna is represented by inferior and introduced species such as silver carassius (*Carassius auratus gibelo*), pseudorasbora (*Pseudorasbora parva*), gambusia (*Gambusia affinis holbrooki*), European perch (*Perca fluviatilis*), Pumpkinseed (*Lepomis gibbosus*). 7 types of the Red Book, which are found in the lake in 1967 now are gone - six of them due to the change in salt regime (Syrman goby, European sprat, Nine-spine and three-spined stickleback, Caucasian dwarf goby, atherin) and one – oblezat, because of disconnection to the Mandra Dam.

So far eight types of amphibians and 14 species of reptiles have been identified in Vaya. From amphibians: Pelobates syriacus (*Pelobates syriacus balcanicus*) е включена в is included in the Red book of Bulgaria and the Red book of Europe; 2 species – голям Smooth newt (*Triturus cristatus*) and European tree frog (*Hyla arborea*) are included in the International red list (IUCN). 5 species are protected with an Order 729/1986 of the Ministry of environment and waters, 5 are in the list of CORINE, 5 are included in Attachment II and 2 – in Attachment III of the Bern Convention.

From the reptiles, three species are included in the World Red Book – Common tortoise (*Testudo graeca graeca*), Hermann's tortoise (*Testudo hermanni boettgeri*) and European pond turtle (*Emys orbicularis*). Common tortoise is also included in the European red list. One unique snake for Bulgaria: Four-lined snake (*Elaphe quatuorlineata sauromates*).

In the area of the lake have been identified about 245 bird species, 9 of which are globally threatened: Pygmy cormorant (*Phalacrocorax pygmeus*), Dalmatian pelican (*Pelecanus crispus*), Red-breasted goose (*Branta ruficollis*), Ferruginous duck (*Aythya nyroca*), White-headed duck (*Oxyura leucocephala*), Corn crake (*Crex crex*), Greater spotted eagle (*Aquila clanga*), Red kite (*Milvus milvus*) and Lesser kestrel (*Falco naumanni*). 67 are included in the Red Book of Bulgaria. 123 species are of European conservation importance (SPEC), as in the category SPEC 1 are included 9 species, in the category SPEC 2 – 26, in SPEC 3 – 69 and in the category SPEC 4 – 43. The site provides suitable habitats for 89 species included in Attachment 2 of the Biodiversity Act, for which special protection measures are required. Of these, 80 are also listed in Annex I of EU Directive 79/409. Since

the lake is located on the Via Pontica migration route, it is one of the most important stations of bird migration on the Bulgarian Black Sea coast. Particularly numerous are the pelican-like, fox-like, rain-like and mistletoe birds.



Vaya is the place with the highest concentration in Bulgaria for Great white pelican (*Pelecanus onocrotalus*) during migration and for Dalmatian pelican (*Pelecanus crispus*) и White-headed duck (*Oxyura leucocephala*) during hibernation. As a migratory species in the area is established also Corn crake /*Crex crex*/. Burgas Lake is of international importance for the hibernation of a considerable number of waterfowl, mainly of Pygmy cormorant /*Ph. pygmeus*/, Great cormorant /*Ph. carbo*/, Whooper swan /*Cygnus cygnus*/, Greater white-fronted goose /*Anser albifrons*/, Common pochard /*Aythya ferina*/ и Tufted duck /*Aythya fuligula*/. Lake Bourgas is the only place in Bulgaria where it concentrates up to 7% of the Black Sea population of Bulgaria White-headed duck /*Oxyura leucocephala*/. In the winter were also seen the world threatened Dalmatian pelican /*P. crispus*/ and Red-breasted goose /*Branta ruficollis*/. The lake is one of the most important places in the country for the preservation of Little bittern /*Ixobrychus minutus*/. 90 species of breeding birds have been found on the wetland and 8 species have disappeared as such. Vaya is a nesting habitat for the globally threatened Ferruginous duck (*Aythya nyroca*).



The wetland territory is a "bottleneck" for a large number of migratory birds (day-long predators and water-lovers) from northern Europe ("bottleneck area").

Until the mid-1970s, the reedbeds of the protected area in the western part of the lake nest a large colony of Pygmy cormorant (*Phalacrocorax pygmeus*), Eurasian spoonbill (*Platalea leucorodia*), Glossy ibis (*Plegadis falcinellus*) and different types of Ardea.

So far, 36 species of mammals have been identified. Of these, 6 species are globally threatened, included in the list IUCN – Eurasian otter (*Lutra lutra*), European ground squirrel (*Spermophilus citellus*), Lesser mole-rat (*Nannospalax leucodon*), Edible dormouse (*Glis glis*), Eurasian harvest mouse (*Micromys minutus*) and Greater mouse-eared bat (*Myotis myotis*). 6 species are included in the Red Book of Europe Eurasian otter, Greater mouse-eared bat, Eurasian harvest mouse, Jackal (*Canus aureus*), Eurasian otter and Wildcat (*Felis silvestris*). European ground squirrel, Greater mouse-eared bat, Lesser mouse-eared bat (*Myotis blythii*) and Eurasian otter are on the list of the European Habitats Directive. 22 species are listed in the Bern Convention, 4 species - CORINE list. The 9 species of bats established in the territory are included in the list EUROBATS. Eurasian otter and European pine marten (*Martes martes*) are included in the Red Book of Bulgaria, and another 11 species are protected by Order 1021/1986 of the Ministry of environment.

Lake Bourgas is an extremely important place to feed numerous bat species. The rich fauna of water insects, composed mainly of representatives of the Chironomidae is the main food base of the bat community. It is from a relatively small number of species, but extremely numerous. These are, above all, the two species of the family Vesper bat (Vespertilionidae): Common pipistrelle (*Pipistrellus pipistrellus*) and Nathusius's pipistrelle (*Pipistrellus nathusii*). Nathusius's pipistrelle, considered a rare species in Bulgaria, is widely distributed and shows very high nutritional activity. The next frequencies are Common noctule (*Nyctalus noctula*) and Serotine bat (*Eptesicus serotinus*). The listed species refer to the anthropological complex because in the area of the lake the settlements provide them with the best day shelters. Relatively fewer visitors to the lake area are several species of bats inhabiting forest, rocky or karst areas: Daubenton's bat (*Myotis daubentonii*), big or Lesser mouse-eared bat (*Myotis myotis/blythii* – both types give almost identical ultrasound signals, so their

distinction is impossible), *Hypsugo savii*, *Plecotus* (*Plecotus* sp.), which is explained by their far-flung day shelters.

By 1990, a fishing industry had been operating in the lake for nearly 70 years. Only up to 40 years ago it is known for the highest productivity of fish in Europe, it has produced over 800 tons of seasonal fish, with only 150 tons of sea lobster. Over the last few years Burgas Lake has returned to Bulgaria as a source of fish. At present, fishing in the lake. The annual amount is estimated at about 200-250 tons, mainly from silver caraway and significantly less carp. This is largely due to the cleaning of the canal linking the lake with the sea, which allows the penetration of the sea crayfish and other types of fish.

Research of the public opinion about the state of Lake Vaya and the ecosystem services it provides

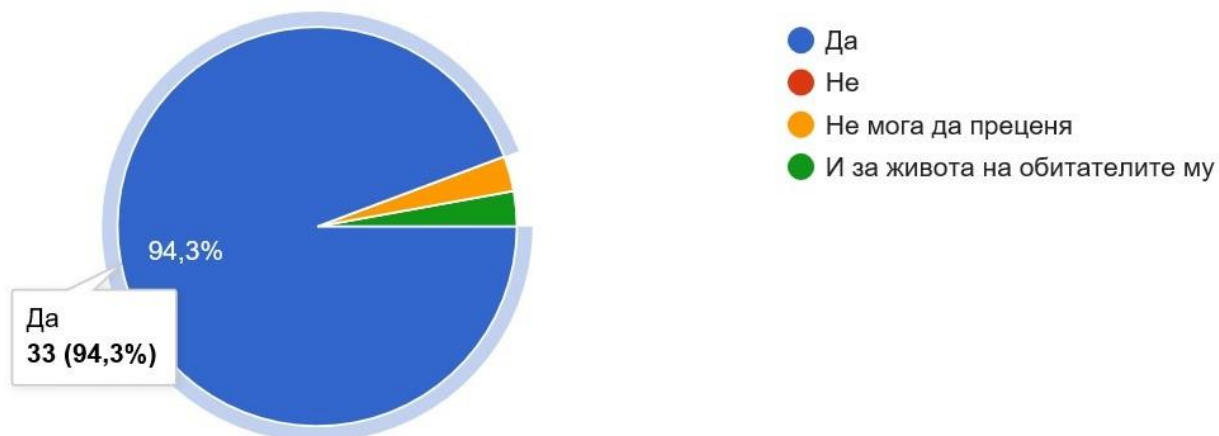
Local research was conducted through an online poll in the period April - May 2018.

The poll is available at:

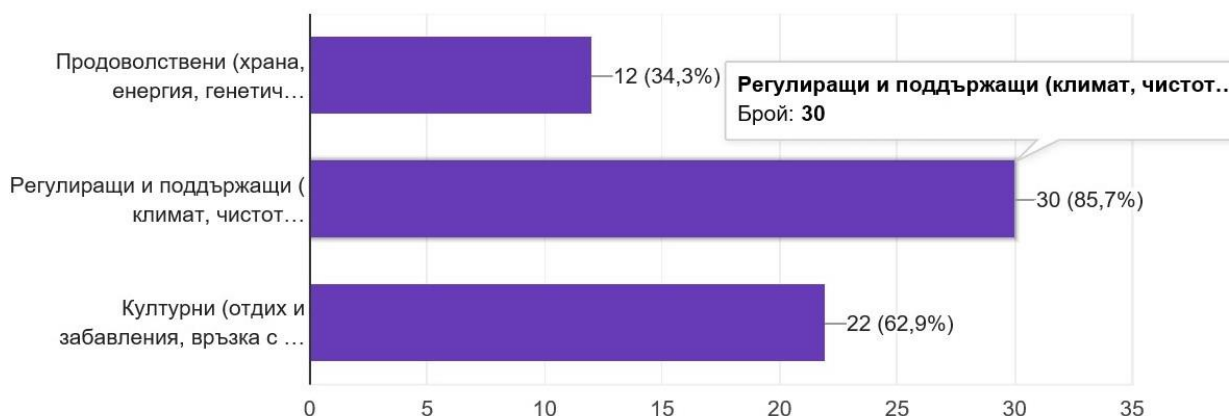
<https://docs.google.com/forms/d/1NLIquN0D9d4cpaEd9ybPZeY6qqEGH2mo5w1Xl5yMSBc>

The questionnaire was filled by 35 persons.

On the first question: *"Lake Burgas (Vaya) is the largest natural lake in Bulgaria, part of the Burgas Lake Complex, a protected area with 245 species of birds. It is located within the boundaries of the city of Burgas and is strongly influenced by the human activity. Do you think the lake is important to people's lives?"* 97% of the respondents answered positively, 1 person replied that they could not judge.



On the second question: "What are the most important ecosystem services (benefits) that the lake provides?" Most of the respondents - 86% mentioned the regulatory and maintenance services. This coincides with the assessment of the ecosystem services on the developed model for lakes Vaya and Gala where it is seen that the indicators of the regulating and supporting ecosystem services have the highest score of points



The third question: "Have you benefited directly from any particular service? If yes - what?" 16 of respondents or 46% responded negatively or simply did not respond. Other positive responses include bird watching, fishing, cycling, recreation among nature - all activities belonging to the group of cultural ecosystem services. This is because people mostly appreciate the services they can use to their own choices, while food and regulators are taken



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for granted. The large number of negative answers to this question is evidence of the incomplete potential of the cultural ecosystem services provided by Lake Vaya.

The fourth question: *"Are you interested in developing more cultural ecosystem services in the Lake Vaya area? Describe briefly what."* 80% respond positively, giving suggestions for the development of cycling, hiking, kayaking, ornithology, fishing, family recreation, photography, environmental education. It is noteworthy that 34% of responses raise concerns about the cleanliness of the lake, as well as suggestions or calls for greater environmental responsibility on the part of people and institutions.

On the last question: *"Are you interested in developing ecosystem services in the Lake Vaya? What exactly?"* The positive answers are only 20%, most of which relate not to the direct organization and provision of some kind of services, but rather to joining activities to clean the lake or participate in cultural ecosystem services.