

BIODIVERSITY OF THE DANUBE DELTA

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ABSTRACT

The topic was chosen out of a desire to explore the impressive biodiversity of the Danube Delta Biosphere Reserve. A considerable amount of time was allocated for the preparation of the paper, in order to try to produce a study that would contain as concrete and complex information as possible. To this end, three trips to the Danube Delta were made in previous years, and the research area was located in the south-east of the Danube Delta (Sfântu Gheorghe arm). The paper describes the physical-geographical framework of the area, presents informations on the history of research in the field of biodiversity of species and ecosystems in the research area, details the material and the working method, the results, the discussions and the conclusions of the study.

INTRODUCTION

Originating in Germany, the Danube River ends in Romania, forming the Danube Delta, the second largest in Europe. Its formation began about 12 000 years ago when the present-day Danube Delta was a bay. After this bay was filled with sediments, different lobes were formed and evolved shaping the present Danube Delta (Panin 2005).

The Danube Delta Biosphere Reserve of Romania (DBRD) is located in the eastern part of Europe and lies at the intersection of 45° N (parallel of latitude) and 29° E (longitude). The total area of the RBDD is about 5,800 km² of which more than half (3,510 km²) belong to what is commonly called the "Danube Delta", while the remaining area is divided between the Danube Plain upstream (Isaccea-Tulcea sector 102 km²), the Razim-Sinoie lagoon complex (1.145 km²), the neighbouring strip in the Black Sea (1.030 km²) up to the 20 m isobath and the Danube river between Cotul Pisicii and Isaccea -13 km² (Gâștescu 2009).

The Danube Delta is located in the eastern part of Romania and in the southern part of Ukraine. The Danube Delta Biosphere Reserve is located in the eastern part of Europe and lies at the intersection of 45° N (latitude parallel) and 29° E (longitude), with a total area of approximately 5,800 km². The main physical and geographical units of the reserve are: The Danube Delta, the maritime Danube up to Cotul Pisicii, the Isaccea-Tulcea sector with the floodable region, the Murighiol-Plopu marshes, the Razim-Sinoie lagoon complex, the Black Sea coastal

area from the Chilia arm to Cape Midia, inland maritime waters and the territorial sea up to the 20m isobath.

(https://www.academia.edu/11938011/ecobiomul_delta_dunarii).

In terms of genesis, hypsometry, water relations between the arms of the Danube and inland areas, climatic conditions and landscape, two main delta sectors can be distinguished: the fluvial delta and the fluvio-marine delta.

The process of the Danube Delta's formation began in the Quaternary, during two distinct phases: the continental phase, caused by marine regression in relation to the retreat of the coastline, the river arms built canyons in the present continental shelf, and the bay phase, a consequence of transgression.

The main soil types found in the Danube Delta are: hydromorphic soils (lacustrine), alluvial soils, sandy soils (on sandstone) and cernozones (Chilia sandstone) over a relatively small area, and the main morphohydrographic categories are predelta territories, river and marine sandy banks, the network of river channels and canals, lakes and marshes.

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The Danube Delta is characterised by a temperate semi-arid climate with hot dry summers and very cold winters typical of the Pontic steppes. Average rainfall is highest in Tulcea at 438.4 mm, while Sfântu Gheorghe receives 403.6 mm.

Today 80% of the Danube Delta is preserved in its natural state, including 18 strictly protected areas, buffer zones, transition zones and ecological restoration areas: Roşca-Buhaiova, Letea Forest, Lake Răducu, Lake Nebunu, Vătafu Lunguleţ, Caraorman Forest, Sărăturile de la Murighiol, Arinişul Erenciuc, Popina Island, Sacalin-Zătoane, Periteaşca-Leahova, Capul Doloşman, Grindul Lupilor, Istria-Sinoe, Grindul Chituc, Lake Rotundu, Lake Potcoava, Lake Belciug (<http://www.ddbra.ro>, quoted by Făgăraş et al 2008).

MATERIAL AND METHODS

In this paper, observation and analysis were used as research methods.. As in any study of this kind, the first stage carried out was based on the consultation of specialist literature dealing with the study of plant and animal species in the area, as well as other specialist works in which we found some of the taxa identified. On the basis of the data in the literature, which were of real use, field trips were undertaken in the researched area between 2-5 May 2019, July 2020 and 9-12 July 2021, respectively, with the aim of observing and analysing all the characters of the species under study, considered useful for making a correct determination thereof. Based on the data obtained and the data provided by the literature, the characterization of the species observed in the Danube Delta was carried out.

RESULTS AND DISCUSSIONS

The landscape of the lakes in the Danube Delta is recognizable by the presence of the White water lily (*Nymphaea alba*) and the Yellow water lily (*Nuphar lutea*) at the edge. Alongside these pleasant-looking plants, other species coexist, such as false Yellow water lily (*Nymphoides peltata*), Water Chestnut (*Trapa natans*), Common water plantain (*Alisma plantago-aquatica*), Water arrow (*Sagittaria sagittifolia*) and *Hydrocharis morsus ranae*, which sometimes cover the entire surface of small lakes and make them unsuitable for fishing and other

economic uses. On the surface of the lakes, which are increasingly sheltered from the wind, but where the depth is greater, several species of floating plants develop, but not fixed to the bottom, such as: species of lentil (*Lemna sp.*) with penny-like leaves that cover large areas, floating fern (*Salvinia natans*), bladderwort- a carnivorous plant (*Utricularia sp.*), water silk (*Spirogyra sp.*). A forage plant known as *Stratiotes aloides* grows in heavily submerged lakes, which at first has a fixed root, but then the roots become loose and the female flowers sink after fertilisation, so that the seeds give rise to new plants in the deep water.

Ichthyofauna dominate the ecosystem of the Danube and its main arms and are represented by carp (*Cyprinus carpio*), zander (*Sander lucioperca*), wels catfish (*Silurus glanis*), asp (*Aspius rapax*), vimba bream (*Vimba vimba carinata*), bleak (*Alburnus alburnus*), ziege (*Pelecus cultratus*), sterlet (*Acipenser ruthenus*), sturgeon (*Acipenser nudiwendtris*), pontic shad (*Alosa pontica*), beluga (*Huso huso*), russian sturgeon (*Acipenser guldenstaedti*), stellate (*Acipenser stellatus*). The ichthyofauna of the lakes of the Danube Delta is represented by species that are also found in the flowing waters, such as carp, pike, perch, catfish, plus tench (*Tinca tinca*), common bream (*Abramis brama*), scardinius (*Scardinius erythrophthalmus*), prussian carp (*Carassius auratus gibelio*), white bream (*Blicca bjoerkna*), wild roach (*Rutilus rutilus sp. carpathorossicus*) and others. Gâștescu 2021 mentions among the fish species, in the canals with active water circulation, apart from the species listed in the arms of the Danube, predators such as northern pike (*Esox lucius*) and perch (*Perca fluviatilis*).

In this area the Danube crested newt (*Triturus cristatus dobrogicus Kiritescu*), an endemic species, has been observed.

Rare invertebrates are also found here, which have a limited distribution - *Stenocuma graciloides*, *Pterocuma rostrata*, *Paramysis ullskyi* (Comănescu & Savu 2008).

The meadow viper has been observed near Letea since 1937. In 1992 *Vipera ursinii* was again reported at Letea. Field investigations also revealed the presence of the meadow viper south-east of Rosetti. During the study the presence of the species was not reported. However, in the area of the Green Dolphin campsite in Sfântu Gheorge we observed an example of *Natrix natrix*.

In the Reserve can be found around 30 types of ecosystems, more than 5000 species of flora and fauna, including most of the European population of white pelican (*Pelecanus onocrotalus*) and dalmatian pelican (*Pelecanus crispus*); 60% of the world population of pygmy cormorant (*Phalacrocorax pygmeus*); 50% of the world's population of red-breasted goose (*Branta ruficollis*), night heron (*Nycticorax nycticorax*), yellow-legged goose (*Ardeola ralloides*), little egret (*Egretta garzetta*), great white egret (*Ardea alba*); purple heron (*Ardea purpurea*), glossy ibis (*Plegadis falcinellus*); Eurasian spoonbill (*Platalea leucorodia*); western marsh harrier (*Circus aeruginosus*).

In reedbeds, nearby willow swamps are nesting Savi's warbler (*Locustella luscinioides*), Bearded reedling (*Panurus biarmicus russicus*), Eurasian penduline tit (*Remiz pendulinus*). In reed thickets nest the tufted duck (*Aythya fuligula*), ferruginous duck (*A. nyroca*), red-crested pochard (*Netta rufina*), mallard (*Anas platyrhynchos*), grey and white geese (*A. anser*), pygmy cormorant (*Phalacrocorax pygmaeus*), purple heron (*Ardea purpurea*), great egret (*Egretta alba*), little egret (*E. garzetta*), squacco heron (*Ardeola ralloides*), eurasian spoonbill (*Platalea leucorodia*), glossy ibis (*Plegadis falcinellus*), grey heron (*Ardea cinerea*), black-

crowned night heron (*Nycticorax nycticorax*), great white pelican (*Pelecanus onocrotalus*), potamogeton crispus (*P. crispus*), mute swan (*Cygnus olor*).

Over the reeds and flats fly for food the western marsh harrier (*Circus aeruginosus*), the osprey (*Pandion haliaetus*), the white-tailed eagle (*Haliaeetus albicilla*), of which there are only a few left in the whole delta. These birds play a decisive role in maintaining the faunal balance, prevent the outbreak of fish epidemics and regulate the numbers of the respective populations (Comănescu & Savu, 2008).

The species analysed and studied include: water clover (*Marsilea quadrifolia*), European mistletoe (*Viscum album* L.) (Fig. 1), blackthorn (*Prunus spinosa* L.) (Fig. 2), common oak (*Quercus robur*) (Fig. 3), white water lily (*Nymphaea alba*) (Fig. 4), yellow water lily (*Nuphar luteum*) and reed (*Phragmites australis* Cav.(Trin) ex Steud) (Fig. 5), plaurus (Fig. 6), willow (*Salix* sp.) (Fig. 7), black alder (*Alnus glutinosa*), russian sturgeon (*Acipenser gueldenstaedtii*), common pheasant (*Phasianus colchicus*), common pelican (*Pelecanus onocrotalus* L.), white stork (*Ciconia ciconia*), little egret (*Egretta grazetta*), white-tailed eagle (*Haliaeetus albicilla*), grass snake (*Natrix natrix*), golden jackal (*Canis aureus*).



Figure 1. European mistletoe (*Viscum album*)



Figure 2. Blackthorn (*Prunus spinosa*)



Figure 3. Oak (*Quercus robur*)



Figure 4. White water lily (*Nymphaea alba*)



Figure 5. Yellow water lily (*Nuphar luteum*) and reed (*Phragmites australis* Cav.(Trin) ex Steud)



Figure 6. Reed



Figure 7. Willow (*Salix* sp.)

CONCLUSIONS

Through the vast diversity of ecosystems and habitats it includes, we can say that the Danube Delta is a true colosseum of biodiversity and an impressive gene bank of inestimable value for the world's natural heritage. The research area is characterised by a great diversity of species. A large number of species of flora and fauna constitute exploitable natural resources. In the Danube Delta Biosphere Reserve, in the Caraorman forest and in the surroundings of the Sfântu Gheorghe arm and the village of Sfântu Gheorghe, a relatively large number of flora and fauna species have been observed and identified, of which 19 species have been described. The Danube Delta is characterized by a large number of ecosystems, herbaceous and woody plant species, invertebrate animals (about 90 species of molluscs of which 18 are endangered, an impressive number of insects of which 196 are considered endangered) and vertebrates. Some plant and animal species found here are endemic.

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