

## DANUBE DELTA BIOSPHERE RESERVE. TOURIST POTENTIAL, TURNING TO GOOD ACCOUNT, IMPACT

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**Abstract.** The Danube Delta Biosphere Reserve, with a surface of 5800 km<sup>2</sup> within which 20 strictly protected areas are delimited, summing-up 506 km<sup>2</sup>, with corresponding buffer areas bringing the area to 2233 km<sup>2</sup> and economic areas which widen the surface under scrutiny to 3061 km<sup>2</sup> had a very good reason to become a biosphere reserve in the year 1990. The Danube Delta was declared a biosphere reserve due to its morpho-hydrographic bio-geographic and landscape uniqueness in Europe as regards bio-diversity, ecosystems and habitats characteristic to the Delta-specific humid environment. The complex landscape (relief, water, vegetation, fauna, population and human settlements) within the Danube Delta Biosphere Reserve has attracted ever since the second half of the 20<sup>th</sup> century numerous tourists having come to enrich their knowledge and for recreation purposes. The originality of Romania's tourist potential is a representative feature of the tourist product that Romania can supply, as promoted on the internal and external tourist market respectively, however not at the level of its true potential. The new statute of the Danube Delta, as a biosphere reserve, following the year 1990, meant a change of direction and reorganizing of the tourist activity, in the context of protecting biodiversity and the landscape and of a sustainable turning to good account of the renewable natural resources. The assets of the natural tourist potential are completed by the anthropic potential, there resulting an indivisible, unique complex, specific to the Danube Delta Biosphere Reserve. Overall, tourism is one of the major components of the social and economic life, having become nowadays an economic sector with tangible development resources. Due to the fact that the Danube Delta is a geographic environment under permanent formation, fragile and vulnerable, the impact of tourism in general can be felt at the level of the natural and anthropic habitats, with major consequences on the whole ecological balance. Since tourism is a main development vector, it is necessary to pay the utmost attention to the consequences of this activity on all the other sectors of activity. Tourism must represent not only a positive and dynamic development factor but also a practical solution to keeping the environment unaltered.

**Key-words:** Danube Delta, natural and anthropic tourist potential, tourism-environment, sustainable development

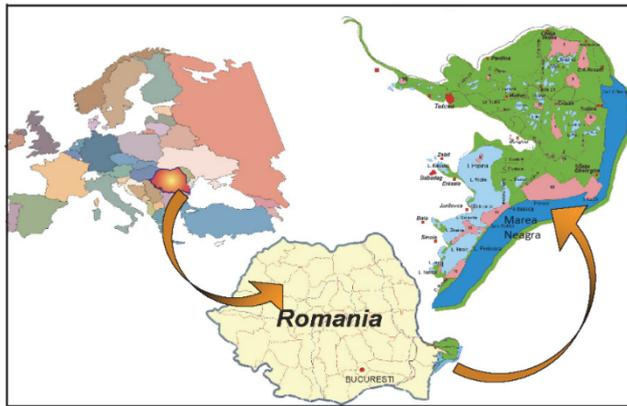
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## INTRODUCTION

The *Danube Delta*, the second largest in Europe after that of the Volga river and the 20th worldwide, through its extraordinary biodiversity, with its fauna richness where birds hold the most important place, is extremely interesting from the scientific standpoint, a true laboratory in the making with respect to the Delta ecosystems also with respect to tourism and economy, through its renewable natural resources. These arguments have constitute arguments for extending protection beyond the proper delta borders of the *Danube Delta Biosphere Reserve* after the year 1989, as legislated through *Law 82/1993*.

**Geographic position and area.** The Danube Delta Biosphere Reserve (DDBR) is situated in the eastern part of Europe -România and lies at the intersection of 45° N (parallel of latitude) with 29° E (longitude) (fig.1).



**Fig. 1.** Geographic position of the Danube Delta Biosphere Reserve Source: <http://www.ddbra.ro>

*The Danube Delta Biosphere Reserve (DDBR)* has a **surface of 5,800 km<sup>2</sup>, 3,510 km<sup>2</sup>** of which represents the **delta proper** (on the territory of Romania, the delta **surface is 2,540 km<sup>2</sup>**, and if the meadow is added from the right side of Sfântu Gheorghe arm and the Dranov unit (970 km<sup>2</sup>) the surface of the delta properly reaches la 3,510 km<sup>2</sup> (0.84% of DDBR) from which: **1,145 km<sup>2</sup> Razim-Sinoie Lake Complex, 1,030 km<sup>2</sup> the marine coastal waters up to the 20 m isobath; 13 km<sup>2</sup> the Danubeto Ukrainian border channel-bed up; 102 km<sup>2</sup> floodplain in natural regime between Isaccea and Tulcea** (Găștescu, P., Știucă, R., 2008). Within the limits of DDBR (5800 km<sup>2</sup>) there are include: 18 **core areas (strictly protected areas)** summing-up 509 km<sup>2</sup> (8.7%), destined to the conservation and protection of birds, made up of forests preserving their original aspect, high-salt environments, as well as samples with a peculiar delta-type landscape; **buffer areas** with differentiated protection regime, summing-up 2229,96 km<sup>2</sup> (38.5%), encompassing the buffer areas aimed at reducing the economic activity and the

anthropic pressure exerted on those areas; **economic areas** – some of which enlisted for ecological reconstruction, summing-up 3,061 km<sup>2</sup> which represents 58.2% of the Danube Delta Biosphere Reserve surface; the economic areas comprise the surfaces fitted for fish farming, agriculture, forestry and other purposes, the plots subjected to the free-flooding regime, that do not belong to the protected areas, the historical centres of the localities as well as other land uses (fig. 2).

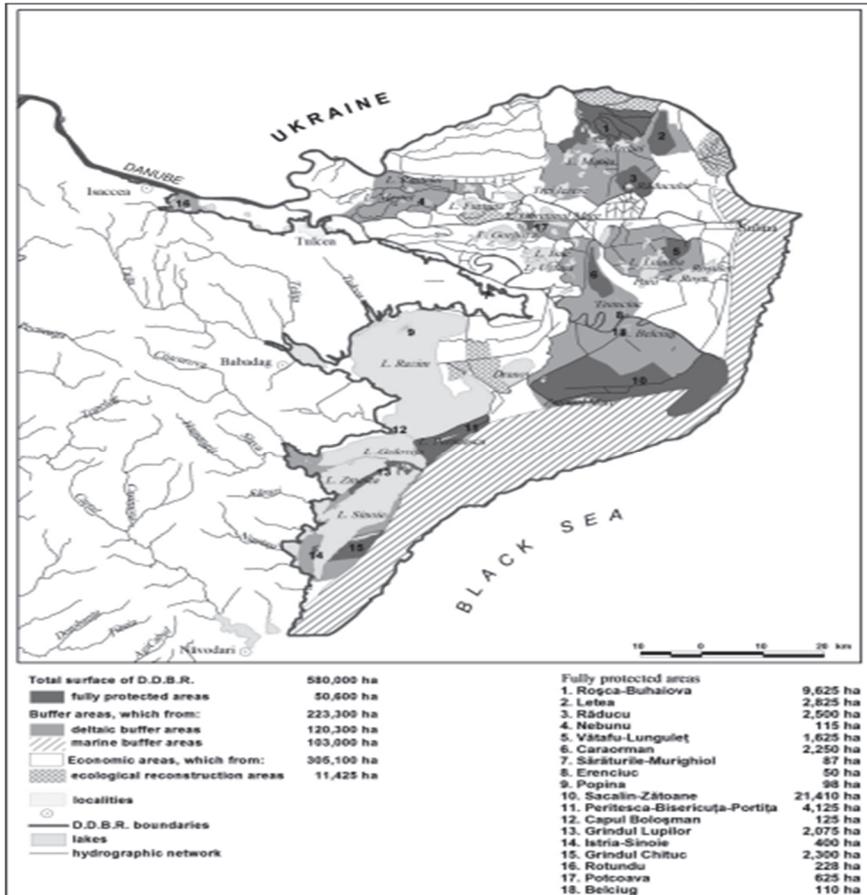


Fig. 2. The structure of the Danube Delta Biosphere Reserve

### Morphohydrographic configuration

*The delta proper* is an alluvial plain undergoing formation, divided into two major sectors: *the fluvial delta* in the west, formed through the process of river accumulation, and the *fluvial-marine delta* in the east, resulted from river and marine accumulation processes. The limit between the two sectors is the western border of the marine levees Letea – Răducu – Ceamurlia – Caraorman – Crasnicol – Perişor. The mean altitude of the delta is + 0.52 m.

**The main positive morpho-hydrographic units of the delta are:**

- **the river sandbanks (502 km<sup>2</sup>, 14.3%)**, located on one side and the other of the Danube's (ex) **branches (Rusca, Șontea, Păpădia)**, **better developed at the tip of the delta(2.5 km wide)** with an alluvial field aspect, 2-5 m high, getting thinner seawards;
- the **marine sandbanks (349 km<sup>2</sup>, 9.9%)** are almost perpendicular to the branches of the Danube, being located in the east of the delta, with significant altitudes of 2-13 m.a.s.l., the most important being **Letea, Caraorman, Sărăturile** and **Crasnicol** (fig.3,4,5);



**Fig. 3.** Sărăturile sandbank **Fig. 4.** Lete sandbank **Fig. 5.** Caraorman sandbank

Source:<http://www.info-delta.ro>

- **predeltaic territories (82 km<sup>2</sup>, 2.3%)**, also named **continental fields – swampy fields** (swampy plains, depressions), situated, as a rule, between the sandbanks, with shapes and positions that change function of the level of the Danube;
- **lakes** that occupy the depressions situated below 0 m.a.s.l., in the western part (**the fluvial delta**) and under 0.5 m.a.s.l. in the eastern part (**the fluvio-marine delta**), associated in watery complexes, the lakes summing-up a surface of 31,260 ha in the year 1964 with an additional 25 700 ha (8%) before the draining works within the buffer strips; some of the largest lakes are: **Dranov, Roșu, Gorgova, Lumina, Merhei, Furtuna and Matîța**;
- **-Danube arms (Chilia, Sulina, Sfântu Gheorghe)**, the **brooks (Lopatna, Perivolovca, Șontea)**; - **channels and canals (Lîtcov, Sireasa, Eracle, Crișan-Caraorman, Dunavăț and Dranov)**.

Within the delta environment, there were delimited three main deltaic units: **Letea unit** (encompassing the area in-between Chilia, Tulcea and Sulina arms, **Caraorman unit** (in-between the Sulina and Sfu Gheorghe arms and the Black Sea shore) and **Dranov unit** (centered on the lake with the same name, located south of Sfântu Gheorghe arm, the eastern shore of Razim lake and the Black Sea shore.

## NATURAL TOURIST POTENTIAL

**The Relief** – represented by the *sand dunes* on Letea and Caraorman sand banks, associated with a specific form of fauna and vegetation; the *beaches* undergoing continuous modification: Sulina, Sf. Gheorghe, Gura Portiței, are natural tourist resources turned to good account directly through practicing *balneary tourism, physical sports and the helio-marine treatment* (fig.6,7,8);



**Fig.6.** Sfântu Gheorghe beach



**Fig.7.** Sulina beach  
Source: infodelta.ro



**Fig.8.** Gura Portiței beach,

The *climate* of the land that surrounds the Danube Delta is continental, with hot dry summers and very cold winters. Clear-sky days average 66 days/annum in Tulcea, while Sfântu Gheorghe enjoys an average of 80 such days each year. Tulcea has some 2,260 hours of sunshine and Sfântu Gheorghe averages 2,502 hours of sunshine each year. The average annual temperature in Tulcea is 11°C, max 39.7°C min – 27°C. Similar measurements for Sfântu Gheorghe show an average of 11.4°C, with maxima of 36.3°C and minima or – 21.5°C. The first date for autumn freezing in Tulcea is around the 31st October, while Sfântu Gheorghe remains frost free until about the 12th November. Average rainfall is higher in Tulcea, with 438.4 mm whereas Sfântu Gheorghe receives 403.6 mm. Average humidity is higher in Sfântu Gheorghe at 86 % compared to Tulcea's 80 %. The Biosphere Reserve is one of the windiest zones in Romania.

The *Danube hydrographic system* at the top of the delta - Ceatalul Chiliei (first fork), drain a catchment area of 805,300 km<sup>2</sup> with 120 major tributaries and average flow (6510 m<sup>3</sup>/s) distributing its waters on the three main arms (Chilia, Sulina, Sfântu Gheorghe), channels, canals, also in lakes and swampy areas and the marine coastline. Along time, the main arms of the Danube have suffered modifications because of the natural conditions, which demanded certain correction works in order to facilitate navigation.

The hydrographic patrimony represents an outstanding tourist potential through the numerous and very diverse lakes (almost 500 of various sizes), brooks, canals and the vicinity of the Black Sea arms of the Danube is a tourist attraction for the sportsmanship fishing lovers. manship fishing, both in the Danube Delta and in the perimeter neighbouring it.

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**Chilia arm** with its many ramifications and islets, being the youngest and longest (120 km), carries the greatest water volume (58%) and sediments. Throughout its evolution, it has formed several secondary deltas- first one Pardina depression, the second after Chilia Veche locality and the third (in full process of formation) - the secondary **Chilia Delta**.

**Sulina arm** detaches from Tulcea arm at Ceatalul Sfântu Gheorghe was preferred for maritime navigation according to the studies of the Danube European Commission (1856) which led to meanders' correction and the deepening of the riverbeds between 1862 and 1902. As a result, the length was reduced from 92 km to 63.7 km, while the water volume and transported silts increased from 7-8% to 18.8%. Sulina town, as entrance port for marine vessels suffered changes in its economic development.

**Sfântu Gheorghe arm** the most southern and the oldest arm with a length of 109 km in 1980-1990 suffered changes by correcting the six meanders and shortening down to 69.7 km. The volume of water and the silts flowing on this arm is about 23.2%. Before its end into the Black Sea, from the Sfântu Gheorghe arm, on the right side, which in turn, bifurcates into Gârla de Mijloc (presently blocked by the attachment of the Sacalin island nowadays peninsula) and Gârla Turcească.

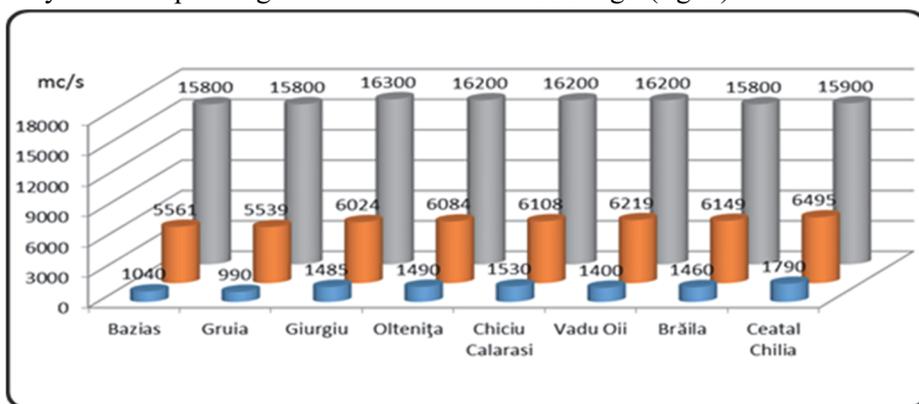
**The secondary hydrographic network is** made up of **canals** (artificially created for socio-economic purposes, for pisciculture, reed exploitation and for navigation. The most important are: Litcov, Sireasa, Eracle, Crișan-Caraorman, Mila 35, Stipoc - Ocolitor, Dunavăț, Dranov, Buhaz - Zăton), **brooks** (the best known being Arhipenco, Erenciuc, Împutița, Lopatna, Roșuleț). The former arms of the Danube undergoing certain phases of silting - Lopatna, Perivolvca, Șontea, Pardina, and the natural depressions that separate the lakes from the sea, make up a web of waters which is extremely important for the existence and evolution of the delta ecosystems, maintaining active circulation between the main hydrographic network and the inner areas.

**Lakes are** of great economic importance since they are the main reservoir of ichthyological fauna of the delta. About 7.8% of the surface of the Danube Delta is made up of lakes, mainly situated in the areas in-between the main branches but also in the floodable meadow of the Danube.

The lakes situated in-between the main arms are very numerous, they vary in surface and they lack a proper morphological contour. Those lakes are fit for sportsmanship fishing and hunting and for practicing nautical sports (rowing, nautical skating, yachting), for leisure generally speaking. The largest lakes included in various touristic routes are: Furtuna, Matița, Merhei, Babina, Gorgova, Bogdaproste, Isac, Roșu, Puiu, Lumina, Dranov etc.

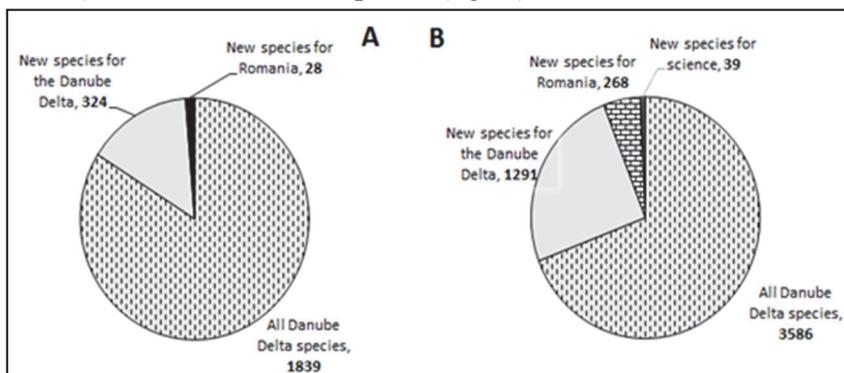
The **hydrological regime** basically the water circulation, represents the vital component of the very existence of the delta space. Since the water volume

transported by the Danube to Ceval Chilia is 205 km<sup>3</sup>/year at a multiannual mean of 6,510 m<sup>3</sup>/sec (1921 – 2016), maximum discharge 16,500 m<sup>3</sup>/sec (2006), and minimum discharge 1,790 m<sup>3</sup>/sec (October, 1921) and with it a quantity of alluvia of 58.75 million t/year (the average for the same period), and 90 million tons of salts/year corresponding to a mineralisation of 350 mg/l (fig. 9).



**Fig. 9.** The multiannual mean, maximum and minimum discharges at main hydrometric stations (period 1931 – 2016)

***Biodiversity and ecosystems within the DDBR.*** The Danube Delta maintains its enormous biodiversity in a better state than most other deltas in Europe, even in the world. It contains a greater range of habitat types, lower and higher ***plants, invertebrates and vertebrates*** than all other deltas in Europe. Many of the species that live within the delta are unique to it, these include plants and animals. The floristic and faunistic inventory will be enriched by ongoing research developed by some profile programmes. So far now inventoried ***2,380 flora species and 4,030 fauna species***, of which around ***2,260 insect species, 84 mollusk species, 135 fish species, 11 reptile species, 8 frog species, 340 bird species (10 species monuments of nature and 224 species protected under the Berna Convention) and 44 mammalian species*** (fig. 11).



**Fig. 11.** Flora (A) and fauna (B) species inventoried in the DDBR (1999)

**Vegetation** has a very important role in diversifying the natural tourist potential, contributing to the preservation of the tourist phenomenon and even generating several forms of tourism.

The natural potential of vegetation within the Danube Delta is particularly varied and complex, representing an element of striking specific tourist attraction, original through the landscapes it helps creating: from the wide reed surfaces (*Phragmites communis*), mace reed (*Typha latifolia*, *T. angustifolia*) the most compact in the whole world (1500 km<sup>2</sup>) and the various *brook plants*, with white water lilies and yellow pond lilies (*Nymphaea alba*, *Nuphar luteum*) and *floating reed islets-plaur* (fig.12), the *willow riverside coppices* (fig.13), the *black poplars* that flag the water banks.



**Fig. 12.** Floating reed islets-plaur



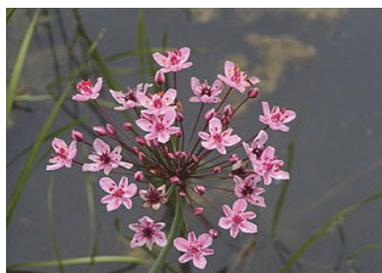
**Fig. 13.** Willow riverside coppices

Source: [www.info-delta.ro](http://www.info-delta.ro)

The **forest vegetation** holds a high aesthetic, scientific and ecological value, the **aquatic vegetation**, through the presence of species like: the mad-dog weed, arrow head, white water lily (fig.14), flowering rush (fig.15), hornwort, the lesser pond sedge pond weed, frogbit, and other plants that float freely at the surface; all these, together with the terrestrial vegetation induce strong motivation for tourist travels with recreation purposes;



**Fig. 14.** White water lily  
(*Nymphaea alba*)



**Fig. 15.** Flowering rush  
(*Butomus umbellatus*)

Source: [www.info-delta.ro](http://www.info-delta.ro)

On the **marine levees Letea and Caraorman** with a sand dune relief, **forests** of oaks had been developed in a mixture with another species of trees and liana, which give them a subtropical aspect, forest that have been strictly protected area. On Letea

marine levee, these forests are growing in depressions between sand dunes as small groups called **hasmace**. In the floral spectrum of these entities, we mention various species of **trees** as: *Quercus robor*, *Q. pedunculiflora*, *Fraxinus angustifolia*, *F. pallise*, *Ulmus foliacea*, *Populus alba*, *P. canescens*, *P. tremula*; **shrubs**: *Prunus spinosa*, *Rosa canina*, *Hyppophae rhamnoides*; **climbing plants**: *Vitis silvestris*, *Hedera helix* and the most interesting **liana** with 25 m length-*Periploca graeca* (fig.16, 17).



**Fig. 16.** Letea forest  
(sursa: <http://ulitanica.wordpress.com>)



**Fig. 17.** Caraorman forest  
(sursa: [www.info.delta](http://www.info.delta))

On the **river bank** are periodically flooded kept in natural regime small groups of **willow trees** can still be found (*Salix alba*, *S. fragilis*, *S. purpurea*, *S. petandra*, *S. cinerea*) together with **white poplar** (*Populus alba*) and other **shrubs**. Sometimes the willow trees form corridors along the Danube arms and bigger channels.



**Fig.18.** Danube herring (*Alosa pontica*)



**Fig.19.** Balkan loach (*Cobitis taenia*)

Source: [www.info-delta.ro](http://www.info-delta.ro)

**Fauna.** The fish species (**ichthyofauna**) display remarkable variety, with 135 species (71.8% of the Roman fish fauna and 45% of the European one). The majority of these, 44, are fresh water species, but there are also euryhaline species, living in both fresh and brackish waters or even in the **Black Sea** (some of which reach the delta and the Danube during the spawning season), 14 species of fish were also identified ranked of community importance with the nature 2000 network, among which we mention: the Danube mackerel (*Alosa pontica*) (fig.18), Danube

shad (*Alosa tanaica*), rapacious carp (*Aspius aspius*), loach (*Cobitis taenia*), (fig.19) and sturgeons-beluga (*Huso huso*), common sturgeon (*Acipenser guldenstaedti*), stor sturgeon (*A.stellatus*), starlet (*A.ruthenus*).

The **birds** are those that have preserved the fame of the Danube Delta as a bird paradise ever since the beginning of the 20th century. The Danube Delta owes its fame to the 320 species to be encountered in the Danube Delta, representing 80% of the Romanian bird fauna. 174 of those species nest in the delta, the others just flow through, staying there over various time intervals spanning the autumn, the winter and the spring. Amongst the protected birds, there can be found: the great white pelican (*Pelecanus onocrotalus*), considered the symbol of the Danube Delta, where 90% of the pelicans existing in Europe gather, the Dalmatian pelican - *Pelecanus cripsus*, considered one of the most valuable birds that live in the Danube Delta, the pigmy cormorant (*Phalacrocorax pygmaeus* (60% of its world population live in the Danube Delta), the red-breasted goose (*Branta ruficollis*) (50% of its world population living in the Danube Delta), the mute swan (*Cygnus olor*), great white heron (*Egretta alba*), little egret (*Egretta garzetta*), grey heron (*Ardea cinerea*), squacco heron (*Ardeola ralloides*), spoonbill (*Platalea leucorodia*), black - backed stilt (*Himantopus himantopus*), red-crested pochard (*Netta rufina*) a.s.o.(fig.20, 21,22,23).



**Fig. 20.** Great white pelican



**Fig. 21.** Pigmy cormorant

Source: [www.info-delta.ro](http://www.info-delta.ro)



**Fig. 22.** Red-breasted goose (*Branta ruficollis*)



**Fig. 23.** Mute swan (*Cygnus color*)

Source: [www.info-delta.ro](http://www.info-delta.ro)

Aquatic birds are the most numerous: 81 species nest and 60 species travel the Delta, which gives a total of 141 species, i.e. 82% of the European aquatic avifauna.

**Mammals** are represented by 44 species, including some of European conservation importance like: European otter (*Lutra lutra*) and European mink (*Mustela lutreola*). Other predators are: muskrat (*Ondatra zibethicus*), wild boar (*Sus scrofa*), stoat (*Mustela erminea*), weasel (*Mustela nivalis*), raccoon dog (*Nyctereutes procyonoides*), fox (*Vulpes vulpes*), wild cat (*Felis silvestris*) and not only.

**The fauna-based types of tourism** are: **sportsmanship fishing tourism** (the species subjected to fishing are: crucian, carp, zander, catfish, pike, rapacious carp, bream, roach, rudd, Danube mackerel, all in fresh water, and the sprat in marine coastal waters), **game** (rabbit, wild boar, jackal, muskrat, raccoon dog – hunt for their fur and meat). Also, all the fauna species are interesting to **scientific tourism**.

## ANTHROPIC TOURIST POTENTIAL

Within the area of the Danube Delta, there are located 24 villages, Tudor Vladimirescu suburb included, that administratively belongs to Tulcea municipium, and a city – Sulina. With regard to administration, the villages from the Danube Delta belong to the following communes: Sfântu Gheorghe, Crișan, Maliuc, C.A. Rosetti, Chilia Veche, Pardina and Ceatalchioi and to three communes situated on the right side of Sfântu Gheorghe branch, namely: Murighiol, Beștepe and Nufăru. According to the census of 2011, two other localities face the risk of being dissolved: Cardon (27 inhabitants) and Uzlina (3 inhabitants), because of their ever decreasing population. In fact, Uzlina has become a quasi-tourist settlement in the latest years, with prevalingly holiday houses, boardinghouses and hotels that supply a wide range of accommodation and recreation options for tourists.

In general, the population of the localities within the Danube Delta has decreased steadily (from 17,806 inhabitants in 1912 to 11,167 inhabitants in 2011). At present, there is an increase of the rural population determined by the return of people to their birth villages as much of the labour force from the urban environment (Tulcea city) has been left jobless, also as a result of tourist activity development and the creation of jobs in the rural area. Demographic ageing is mostly noticeable in Pardina, Cardon, C.A. Rosetti and other remote localities located at long distances from the main river transport routes.

The main characteristic of the ethnical structure within the Danube Delta is its homogeneity. Thus according to the 2011 census, in the proper delta, the nationality holding the majority is the Romanian one, with 86.85% of the total population, followed by four more important national minorities: Lipovans – 9.46%, Ukrainians 2.5%, Russians 0.40%, which yields an aggregated 12.83%.

Within the Danube Delta Biosphere Reserve, especially in the border-continental area, there are numerous **vestigies, monuments and museums** ascertaining the habitation stages from the antiquity to present-day. The population within the proper delta observes highly valued traditions, types of houses, costumes and customs.

***The anthropic tourist potential of the Danube includes:***

***Archeological vestiges and fortress ruins*** representing the stages when the Danube Delta was populated, along with the contact area with the Dobruđja Plateau, an area of military strategic and economic importance): the vestiges of the Argamum (Orgame) fortress from Cape Doloșman (Jurilovca), the ruins of the Byzantine fortress on the island, The Small Church in Razim Lake, the vestiges of the Beștepe fortress, Mahmudia (traces of the fortification system dating back from the 4<sup>th</sup> century BC), the ruins of the Dinogeția settlement, the traces of the Genoan fortress of Enisala from the 12<sup>th</sup> – 14<sup>th</sup> centuries (the last Byzantine rule period) – Heraclea Fortress - fig. 24), of the Noviodunum fortress (close to Isaccea), dating from the pre-Roman Getic period;



**Fig.24.**Heracleea fortress  
(source: <https://www.google.ro>)

***Historical, architecture and art monuments*** generate the cultural

- historic interest function of the localities on the territory where they are located. Such monuments exist in a number of localities, as follows: in Malcoci, the Catholic church can be visited, having a 33-m high tower, in Tulcea, on the Hora hillock the Monument of Independence built in 1899, in the memory of the heroes fallen during the War of Independence of 1877-1878, the obelisque-shaped Commemorative Monument built

in Crișan locality, erected on the occasion of concluding the fitting works at the Sulina branch, Sulina River Halt Point (19<sup>th</sup> century) the Lighthouse Museum in Sulina, built in 1802, the New Lighthouse in Sulina, built in 1982 and the New Lighthouse in Sfântu Gheorghe, built in 1968.

Sulina, with its church dating from the period when the European Danube Commission was settled, an imposing building with artistically and spiritually valuable interior paintings, strained glass windows and a bell tower with three bronze bells. The Saint Nicholas church in Chilia is also remarkable – an architecture monument built at the end of the 19<sup>th</sup> century and the beginning of the 20<sup>th</sup> century, whose main characteristic is the mixture of the Slavic, Gothic and Romanian styles.

Of the places of worship, Celic Dere Monastery (Telia ), built in the 19<sup>th</sup> century is remarkable and so are the Stipoc Monastery (Saint Anastasie hermitage), close to Chilia, on the Stipoc sand bank, the Vovidenia Intrarea în biserică a Maicii Domnului Monastery from Slava Cercheză, the Monastery Church with connected apses, from Cetățuia, close to Niculițel, the paleo-Christian tomb from Niculițel, a basilica erected in honour of the *Zotikos, Attalos, Kamasis and Philippo* martyrs of

outstanding importance for the Romanian Orthodox Church, the Saint Nicholas Cathedral in Tulcea – an architecture monument and Sfinții Voievozi Church.

Another valuable monument is the building of the city hall of Isaccea, with Dobrudja specificity and the Muslim worship place Ali-Gazi-Paşa of Babadag, built during the time of sultan Murad I (1359-1389), the Azzizie Mosque in Tulcea, built in the 19<sup>th</sup> century and the synagogue – a worship place of the Jewish community.

**Museums and memorial houses** at the visitors' disposal are: the Ecotourist Museum Centre "Danube Delta" (Tulcea), the Museum of Popular Art and Ethnography (Tulcea), the Museum of History and Archeology, the Memorial House of the poet Panait Cerna, the Oriental Art Museum (Babadag), the Peasant Household Museum from Enisala (in Enisala village), also the memorial house of the poet Eugen Botez (at Sulina), the Museum of history, ethnography and popular art in Jurilovca.

**Tourist villages** of cultural – historic interest (with monuments, museums, vestiges mainly located at the western border, close to the Dobrudja Plateau: Nufăru, Enisala, Mahmudia, Malcoci, Istria.

**Testimonies of the popular art (elements of ethnography and folklore)** are remarkable through the architecture of the traditional households of the Lipovans (houses with thatched, ridged roofs, narrow dams on two sides, ornaments with floral, zoomorphic and geometric patterns that can be visited in the Mila 23 (fig.25, 26), Sfiștofca, Periprava, Chilia Veche villages in the Delta or at Jurilovca. Tourists can also attend or join the performance of dance or vocal bands at Sulina (Romanian or Lipovan), Sfântu Gheorghe and Crișan – Ukrainian ones, at Jurilovca and Sarichoi (Lipovan ones).

Usually, another starting point for an adventure in the Delta is **Tulcea**, a city almost as old as Rome, situated close to the place where the Danube separates into its three main branches, i.e. where the meadow starts unfolding. In Tulcea there are modern hotels and museums like the Museum of Natural Sciences of the Delta. The city is 71 km far from Sulina, a settlement situated at the other end of Sulina branch. Trips can be made between these two points during which tourists can admire from the comfortable decks of the boats the flora and, the fauna and the villages in the Delta.

## **TOURIST INFRASTRUCTURE**

The private infrastructure has undergone significant development through an increase of the accommodation offer, with respect to both quantity and quality. However, it has not been accompanied by a

proportional increase of the infrastructure quality with respect to the access on both land and water, because of the insufficient funds and of the restrictions imposed by the special statute of the Danube Delta Reserve.

The access inside the Danube Delta is mainly made by water.

*The naval transport for passengers* (fig. 25) towards the localities within the Danube Delta (along the three arms of the Danube and the channels) is performed by (classical) passenger vessels of the catamaran/express type and of the lifting wing-type along the following routes: *Tulcea – Partizani – Maliuc – Gorgova – Crișan – Sulina and back; Tulcea – Pătlăgeanca – Ceatalchioi – Plauru – Pardina – Tatanir – Chilia Veche – Periprava and back; Tulcea – Bălteni de Jos – Mahmudia – Sfântu Gheorghe and back.*



**Fig.25.** Naval transport for passengers **Fig. 26.** Motorboat transport **Fig.27.** Boat transport  
 Source: <https://www.delta-dunari.info>

One can also travel towards the Danube Delta with cruising ships along the Danube. Cruises are organized the year long, but mostly from March to November. To access the inner channels, transportation takes place with low draught-ships and boats, small and large motorboats (fig. 26), rowing boats (fig. 27) and floating pontoons.

Having in view that the area is part of a protected area and has a peculiar statute, with strictly protected surfaces, buffer and economic areas, *tourist routes* have been established with various degrees of accessibility for navigation (fig. 28), with certain restrictions as regards the use of boats inside the Danube Delta.

**Tourist structures.** In the Danube Delta, there is a wide range of hotels boardinghouses, tourist complexes, floating hotels, possibilities to hire both new and second-hand boats, for all kind of tourists eager to spend their spare time in an unforgettable way in the wonderful Delta. The degree of endowment and tourist development at the level of the Danube Delta Biosphere Reserve is given by the technical-material base of tourism: transportation means, accommodation capabilities, public nourishment, means and endowments destined to ensure proper practicing of the previously mentioned activities.

The distribution of the tourist accommodation structures by communes in the Danube Delta and the neighbouring localities highlights that the highest number

of tourist accommodation structures can be found in Crișan and Murighiol, Sulina and in Tulcea municipium, then in Sfântu Gheorghe and Jurilovca communes.

**Accommodation in the Danube Delta.** The Danube Delta holds a wide array of tourist structure types, like hotels (fig. 29), motels, tourist villas, motels, chalets, bungalows, holiday villages, camping facilities, boardinghouses (fig. 30), pupil's pre-school camps, along with accommodation places on river and maritime ships.

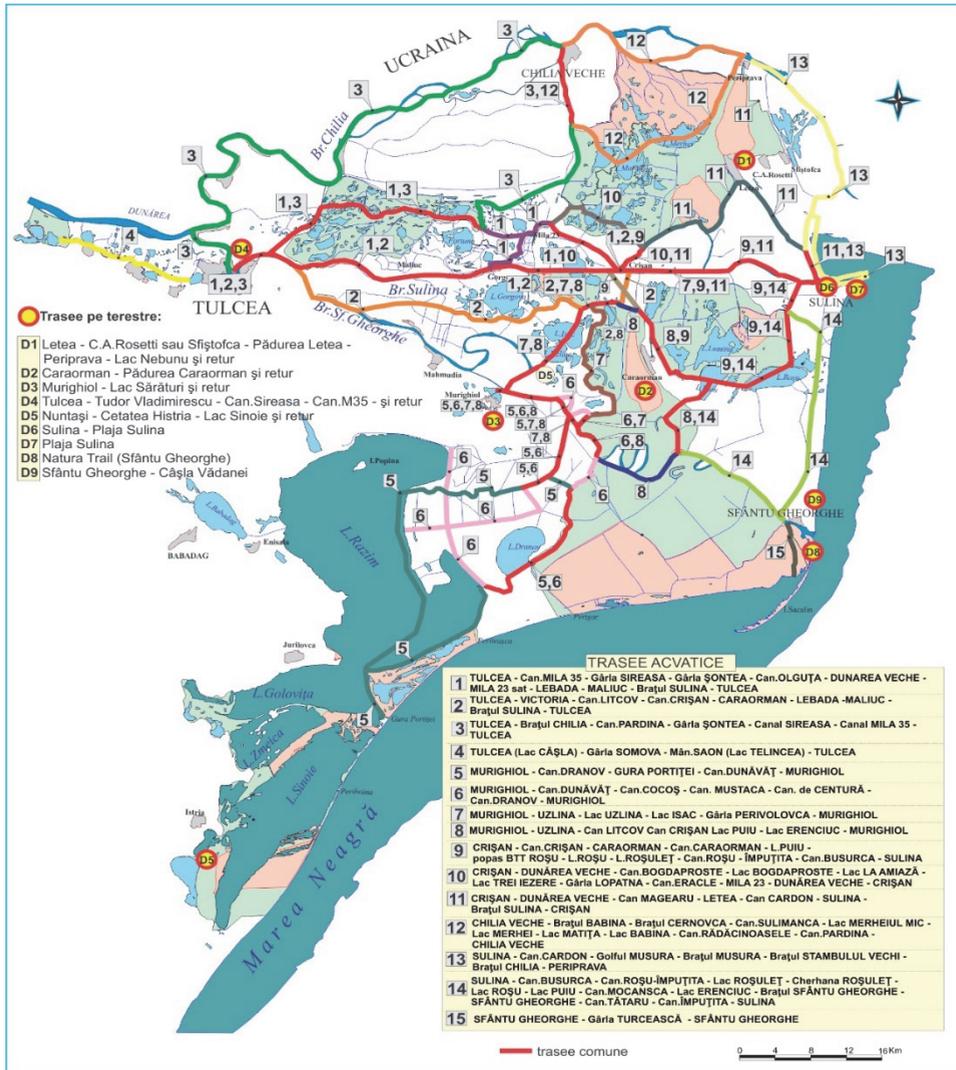


Fig.28. Tourist routes within the Danube Delta Biosphere Reserve



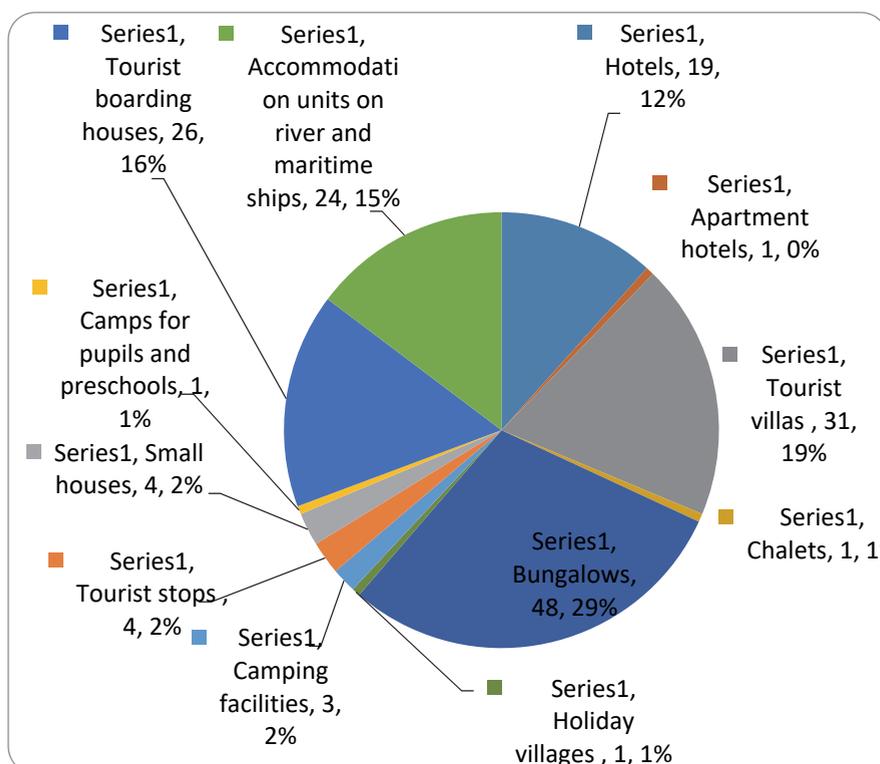
**Fig. 29.** Delta Palace Hotel, Sulina



**Fig. 30.** Guest house at Mila 23

With the help of data processed at the National Institute of Statistics (NIS), we noticed that the largest number of accommodation units was reported in the year 2012, in 136 tourist structures within the Danube Delta, Tulcea city included.

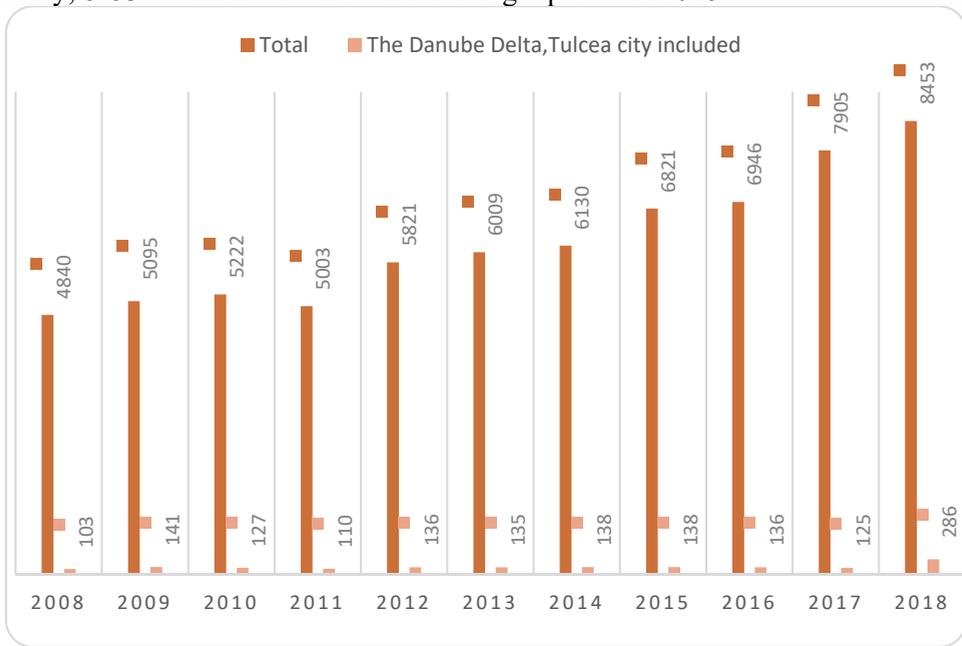
Below, follows an analysis of the share of the tourist structures, their trend and the trend of the accommodation units, both in the Delta, and overall in Romania (fig.31).



**Fig.31.** Accommodation structures within the Danube Delta, Tulcea city included, in 2018 (Source: NIS data)

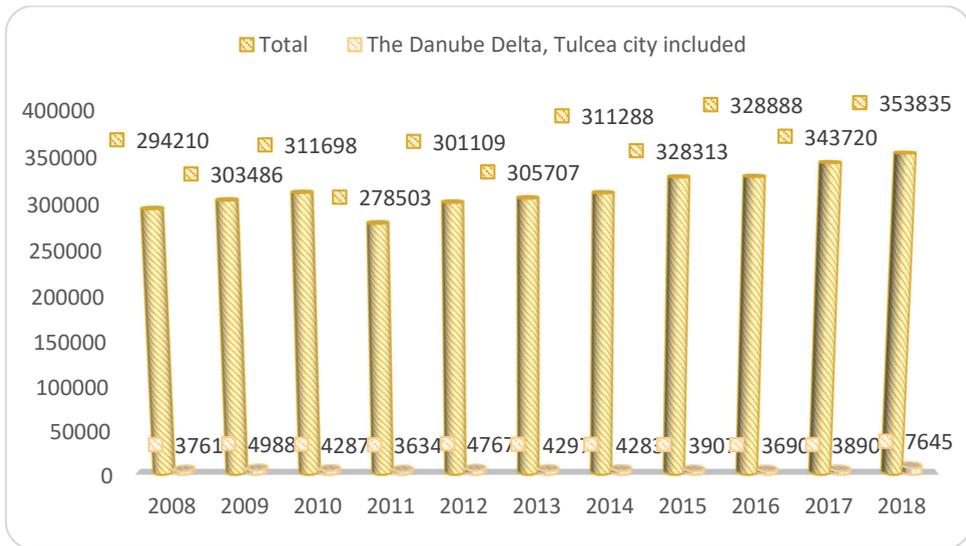
According to statistical data, it can be observed that tourist villas hold the largest share, 45%, of the total value of tourist structures within the Danube Delta, Tulcea city included, the share of the hotels being 12%, that of the bungalows – 29%, and tourist villas 19%, boardinghouses represent 16% of the total, whereas accommodation units or river and maritime ships – 15%, small houses – 2%. The rest of the structures represent just 1% of the total accommodation units.

According to the graph (fig. 32), one can see the evolution of the number of accommodation facilities at country level and at the level of the Danube Delta in 2008 through 2018. Thus, as regards the all-country total, a first significant increase is noticeable in the year 2013, when a number of 6009 accommodation facilities are reported, i.e. 1006 more than in 2011. The largest increase has been recorded lately, 8453 accommodation facilities being reported in 2018.



**Fig. 32.** Evolution of the number of accommodation facilities with a tourist destination in Romania and the Danube Delta, Tulcea city included, in 2008 through 2018  
(Source: NIS data)

As regards the Danube Delta, an increase was noticeable in 2014 that maintained in 2015, when the highest number of 148 accommodation facilities was reached. In the years that followed, there was a decreasing trend, such that 286 accommodation facilities were reported in 2018.



**Fig. 33.** Evolution of the number of accommodation units in Romania and the Danube Delta area, Tulcea city included in 2008 through 2018  
(Source: NIS data)

According to figure 35, the widest decrease was recorded in 2011, when the accommodation units decreased by 653 against the previous year. The highest number of accommodation units in the Danube Delta was 4767, recorded in 2012.

The graph above (fig. 33) shows a continuous increase of the accommodation facilities in Romania, in 2012 through 2018.

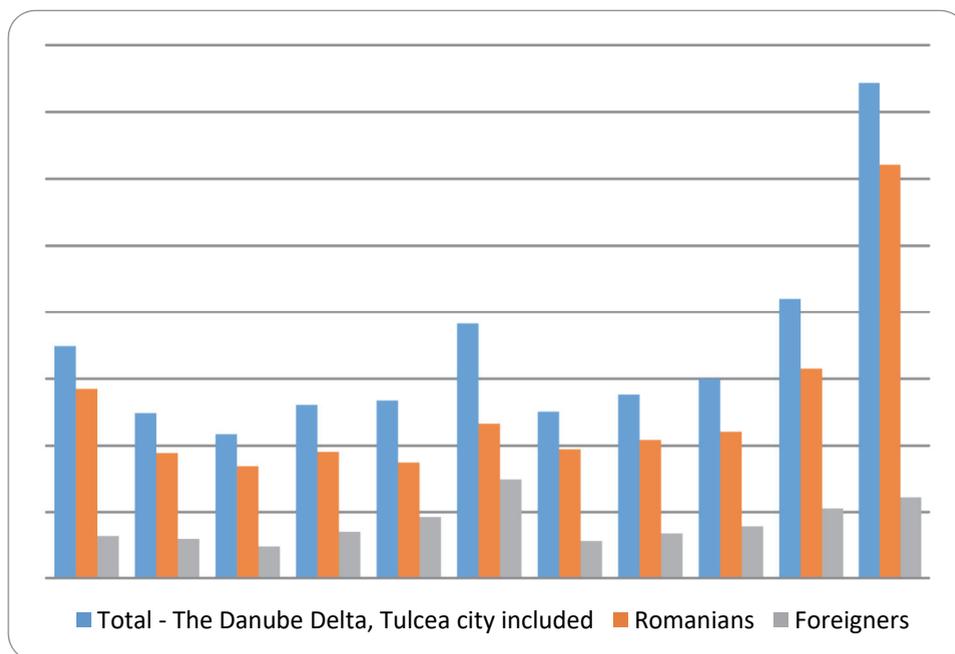
As regards the nights spent in the Danube Delta area, Tulcea city included, fluctuations are remarkable in 2008 through 2013 (table 1). The number of nights spent in accommodation facilities increased to 191,329 in the year 2013. Afterwards, this number decreased until 2016, then spectacularly went up again to 371797 in 2018.

**Table 1.** Nights spent in accommodation facilities (number of tourists) in the Danube Delta area, Tulcea city included Source: NIS data

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total	174355	124341	108705	130519	133797	191329	125416	138177	149798	210334	371797
Romanians	142451	94565	84791	95395	87493	116438	97318	104362	110480	157514	310552
Foreigners	31904	29776	23914	35124	46304	74891	28098	33815	39318	52820	61245

As regards the ratio foreign / Romanian tourists, a high share of the latter is noticeable. The evolution of the nights spent in hotels shows fluctuating values, with higher values in the analysed period recorded in the years 2008, 2013 and 2015. However, the highest number with respect to the nights spent in hotels was 310,552 – in 2018.

Night spending in hotels as regards foreign tourists from 2008 to 2018 highlights surprising evolution in 2013, when the highest number of tourists was recorded – 74,891. After the year 2013 the number of nights spent in hotels decreased and only in 2018 there was another increase to 61,245 foreign tourists (fig.34).



**Fig. 34.** Nights spent in accommodation facilities in 2008-2018 period

**Table. 2.** Number of Romanian tourists participating in internal tourist actions organized by tourist agencies in Romania and in the Danube Delta area (Source: NIS data)

Year	2008	2019	2010	2011	2012	2013	2014	2015	2016	2017	2018
<b>Romania Total</b>	416541	129990	113841	364107	642268	401726	374667	430832	590500	670428	959030
<b>Danube Delta</b>	4449	1958	2160	3917	6922	3521	5129	8984	6043	5090	5914

As regards the number of Romanian tourists participating in activities organized by the tourist agencies, it can be noticed that the highest values were reached in 2012- 642,268 tourists and in 2018- 959,030 tourists (table 2). At the level of the Danube Delta area, as regards the 2008-2018 interval the number of tourists was higher in 2015 – 8,984 tourists, decreasing continuously since then to 5,914 tourists at present.

## TOURISM FORMS AND PROGRAMS

The peculiarities of the geographic conditions of the Danube Delta have triggered practicing tourism forms and programs specific to this area. The natural and cultural assets of the Danube Delta are natural and anthropic resources of the Danube Delta Biosphere Reserve than can be turned to good account through practicing tourism.

Several tourist forms and programs are enumerated below:

- ***tourism for leisure and recreation*** (fig. 37) practiced through tourist companies, in one of the hotels within the biosphere reserve or using floating hotels, combining tours along the picturesque channels and lakes with sunbathing and marine water on the beaches from the ***tourism for knowledge (ambulant)*** (fig. 36), practiced either individually, or through organized trips), suitable for small groups of visitors who have the opportunity to explore the variety of the wild landscape, combining the leisure trips by manually propelled boats along picturesque channels with



longer strolls along the channels or and sea river sand banks etc.

**Fig. 35.** Leisure and recreation tourism

**Fig. 36.** Ambulant tourism

Source: <https://www.google.ro>

- ***specialized-scientific tourism*** (for ornithologists, specialists, researchers, students)
- ***special programmes for youngsters*** (for knowing, understanding and valuing nature)
- ***rural tourism*** (tourists are accommodated and guided by local people) has a tradition in the perimeter of the Danube Delta Biosphere Reserve; many local families guide and accompany tourists visiting the Danube Delta; this

type of tourism has an important potential as regards the incomes of the local population;

- ***tourism for practicing nautical sports;***
- ***tourism for practicing sportsmanship fishing***, highly appreciated by visitors of all ages, irrespective of season, for any species of fish;
- ***sportsmanship hunting***, organized in observance of the provisions “Law of the of the hunting stock and hunting stock protection”, published in September 1996, valid for the hunting areas of the Danube Delta Biosphere Reserve;
- ***technical-scientific tourism*** developed within the natural frame of the Delta, especially its natural and flora reserves and its natural monuments;
- ***tourism for business and scientific meetings***, which is a new form of tourism based on luxury tourist services (4 - 5 stars), practiced at the Conference Centre from Gheorghe (Define Private Tourist Village), the Conference Centre from Guar Portage (Eden Holiday Village); also on boats hired in a charter regime;
- ***other forms of tourism (photo-safari/ birdwatching)*** – arrangements of the photo-safari or cine-safari type where one can record on camera a wide array of birds and not only, are ever more demanded and preferred by both Romanian and foreign tourists (especially youngsters from France, Great Britain, Belgium, the Netherlands etc.);
- ***flyover tourism*** practiced with small flying vehicles;
- ***seasonal tourism, unorganized tourism, tourism for leisure and permanent tourism.***

Depending on duration, tourism is practiced as a rule during 3-5 days for fishing and hunting and for scientific monitoring and research (workshops and symposia), 10 - 15 days for leisure (recreation and helio treatment).

Depending on the used transportation means and due to the existing physico-geographic conditions, ***naval tourism*** is practiced almost exclusively.

***Nautical tourism*** is also practiced, demanding tourists better sportsmanship training in order to cross the Delta in small boats.

Depending on mobility, besides the sedentary tourism, there are practiced the following: ***rural sedentary tourism*** practiced at Sfântu Gheorghe, Uzlina,

Maliuc, Crișan, Jurilovca, Chilia Veche a.s.o.), *ambulant tourism* along predetermined routes, with ships (river vessels, boats of various types) and on land.

The Danube Delta is endowed with various natural and anthropic tourist resources that can fully meet a wide array of demands from spring till autumn through the forms of practiced tourism. Among the assets of the Danube Delta tourist potential, one may find: the landscape and leisure value of the Delta, a determining value in the formation of the tourist motivation; the qualities of certain natural treatment factors, the bioclimate included; the existence of conditions that generate specific tourism forms (lake and reed complexes, as specific and hunting resources); the cognition role of certain specific elements that have played a vital role in declaring the Delta a biosphere reserve.

## **IMPACT OF TOURIST ACTIVITY ON THE ENVIRONMENT**

The tourist activity is an important mean towards economic development, through specific offers, incomes and jobs within a territorial entity.

One positive effect of tourism development has already been felt in the mutations of the regional balance, in highlighting competitive areas, like the Danube Delta, which is a tourist attraction in itself, through its natural and ethnographic patrimony alike.

As an activity unfolding through the environment and in the environment, tourism has imposed as a dynamic factor through measures of protecting and preserving the environment, of combating pollution and so on.

The main forms of landscape degradation caused by practicing tourism, in general, in the perimeter and the proximity of the protected areas result from the use of the transport means, in the case of the Danube Delta – an improper use of the various types of transport by water, with a special reference of the mechanized ones.

The circulation of vessels that do not correspond to the ecological standards may cause erosion to the banks covered by riparian vegetation, because of their speed and the generated waves, the water pollution through releasing fuel waste and the phonic pollution, the latter affecting the aquifauna in the main.

Aquatic transportation means with a relatively minor impact on the aquatic ecosystems are the rowboats for utilitarian or leisure purposes, wooden rafts canoes or caiacs, as preferred transportation means.

Also, particularly harmful are the effects of certain practices that go against the principles of public use of those transportation means, as well as organizing noisy picnic events, abandoning the waste that in the Danube Delta is carried away by the water circulation along brooks, channels and the three branches of the Danube: Chilia, Sulina and Sfântu Gheorghe.

The intense tourist flow associated with certain specific sports may turn destructive in certain periods, such as *fishing* for leisure, if using sophisticated

techniques and materials – harpoons, gas tanks for diving etc.; *hunting* through chasing / observing from a small distance is very harmful, especially during the breeding and growing periods; as for hatching, if eggs are abandoned by parents and may become pray for consumers, nestlings left alone for longer times may leave their nests and fall victims to predators.

Sportsman or amateur fishing / hunting must observe the areas stipulated by the Danube Delta Biosphere Reserve Administration, the intervals of prohibition, hibernation and migration.

Feeding certain species from the autochthonous fauna is also not recommendable because of the negative effects it may induce: domestic waste and various wrapping abandoned by the tourists may hurt the bird or animals and affect their health.

A negative impact on the *strictly protected areas within the Danube Delta Biosphere Reserve* is that of the loose or abandoned domestic animals, pigs, catles and horses becoming semi-savage, after having left autochthonous human settlements.

Knowing the impact of tourism on the environment through the summing-up of all the positive and negative impacts imposes the preservation of the ecological balance, avoiding to overstress the natural resources and observing their periods of regeneration / replenishing.

In the latest years, the impact of tourism on the environment has determined the emergence of novel concepts in materializing the relationship between the tourist potential and the degree in which the latter is turned to good account, i.e. *ecotourism*.

At the same time, ecotourism is a practical concept, with an educational feature that mostly imposes respect for nature and awareness of tourists and the local communities for the values withheld by nature and not only.

The development of tourism must be *ecologically* sustainable, *economically* viable and profitable and *ethically and socially* fair for the local community. In this context, tourism must integrate within the natural, cultural and human environment and observe the fragile balance, characteristic to the tourist destinations from the Danube Delta.

The *tourism-environment relationship* is vital, since the protection and preservation of the environment is the key condition for tourism to exist and develop. This connection is a complex, bidirectional one. The natural environment, through its components is one of the basic resources of tourism and on the other hand the tourist activity has both a positive and a negative influence on the ecological balance, however dangerously fragile in the Danube Delta, modifying its structure and ecosystemic functions.

However, unlike the negative consequences on the environment generated by the activities specific to tourism within the Danube Delta, there may be significant consequences with respect to protecting and preserving the environment and ensuring sustainable development.

The impact on the original/natural impact of the Danube Delta has also been determined by the numerous anthropic interventions that have begun with constructing the maritime navigable way along the Sulina branch, has continued with the channels dedicated to the circulation of the water in the watery complex and with the works dedicated to the reed surfaces – later abandoned, continuing with the works dedicated to agriculture, pisciculture and forestry. All these interventions have reduced the area of the natural landscape by 30% of the Danube Delta surface, rendering poorer the biodiversity patrimony unique and unequalled in Europe.

The inherited status, with the occurred modifications imposed what was achieved after 1989, namely the settlement of the Danube Delta Biosphere Reserve, as stipulated in Law no. 82/1993. This law mainly protects biodiversity but also turns it to good account through tourist activity based on the *sustainable ecotourism* principles.

Ecotourism is a form of tourism emerged in step with the need of the humans to retreat in nature and to visit and get acquainted with the natural areas protected or not by a national or international protection statute.

Ecotourism stands apart from the other forms of tourism through a tighter and more direct connection with the natural and cultural-historic environment. When integrated within the sustainable development, ecotourism implies activities destined to directly contribute to the protection of nature and the unaltered preservation of the ancient human creation.

## CONCLUSIONS

The Danube Delta Biosphere Reserve, through its morpho-hydrological, biogeographic and landscape uniqueness at European level as regards biodiversity, ecosystems and habitats characteristic to the delta / humid environment constituted the motivation for the settlement of the Biosphere Reserve in 1990.

The complex landscape (relief, water, vegetation, fauna, population with its ethno-cultural specific) has attracted from the second half of the 20<sup>th</sup> century numerous tourists coming here for leisure. The originality of the tourist potential is a trademark with respect to the Romanian tourist product promoted on the internal and external market respectively.

The new statute of the Danube Delta and its affiliation to RAMSAR Convention and Man and the Biosphere Programme (MAB) meant repositioning and reorganizing of the tourist activity in the context of protecting biodiversity and turning to good account the renewable natural resources.

The development of tourism within the Danube Delta Biosphere Reserve can be sustainable only if there is careful planning and harmonization of the economic and social development interests with those of maintaining the high quality of the delta ecosystems and of preserving biodiversity. Planning must be performed through settling a partnership amidst all the involved players and

through maintaining it during the monitoring and measure-taking phases concerning the negative impact abatement.

The development of sustainable ecotourism on the territory of the Danube Delta Biosphere Reserve may be achieved through identifying and using certain sets of indicators, adapted to the conditions of the specific environment, with the desired results, of the potential impact of sustainable tourism in the protected areas, of the decision-makers involved in *sustainable tourism*.

*Ecotourism may be considered the main way of turning to good account the resources with the Danube Delta Biosphere Reserve, which goes contrary to the classical forms of tourism, given the economic – social benefits that may result from practicing it by the local population.*

Developing ecotourism within the local communities from the Danube Delta Biosphere Reserve brings socio-economic benefits, such as jobs on a local scale (directly into the tourist sector or in the connexed ones), stimulates the local economy, the infrastructure, the tourist services (accommodation, nourishment, transport, recreational facilities, manufacture products, guiding services, souvenirs), improves inter-cultural relationships, gives a new vigour to the local traditions, brings awareness and education as regards the conservation and protection of the environment and convinces the authorities and the public about the importance of the natural reserve.

## REFERENCES

1. Antipa, Gr., (1914), *Delta Dunării*, București
2. Banu .A., Rudescu, I., (1965), *Delta Dunării*, Edit. Științifică, București
3. Bran, Florina, Simon, Tamara, Nistoreanu, P., (2000), *Ecotourism*, Edit. Economică, București
4. Căndea Melinda, Simon Tamara, (2006), *Potențialul turistic al României*, Edit. Universitară, București
5. Cucu V., (2002), *România. Geografie umană și economică*, Edit. Oraj 2001, Târgoviște
6. Gâștescu, P., (1971), *Lacurile din România, Limnologie regională*, Edit. Academiei Române, București
7. Gâștescu, P., (1992), *Delta Dunării, hartă turistică*, Edit. RAR
8. Gâștescu, P., (2004), *Delta Dunării, hartă turistică, ediția a II-a*, GIPO
9. Gâștescu, P., (2008), *Danube Delta Romania in Europe*, Edit. Technological Information Center, Tulcea
10. Gâștescu, P., Baboianu G., (2011), *Ghidul vizitatorului Delta Dunării*, ADDBR Tulcea
11. Gâștescu, P., Știucă, R., (2008), *Delta Dunării Rezervație a Biosferei*, Edit. CD Press, București
12. Gâștescu P., (2001), *Managementul mediului*, Edit. Sfinx 2000, Târgoviște
13. Munteanu, D. (2006), *The Danube Delta avifauna*, chapter 15 from *Danube Delta. Genesis and Biodiversity*, Backhuys Publishers, Leiden, The Netherlands
14. Nițu, M., (1982), *Turismul în Delta Dunării*, Edit. Sport-Turism, București

15. Oțel, V. (2007), *Atlasul peștilor din Rezervația Biosferei Delta Dunării*, INCDDD, Tulcea
16. Poruncia - Ipate, Alina, (2012), *Rezervația Biosferei Delta Dunării, potențial turistic și valorificare*, Edit. Transversal, Târgoviște
17. Radu, D., (1979), *Păsările din Delta Dunării*, Edit. Academiei Române, București
18. Sorocovschi, V., (2008), *Climatologie și aplicații bioclimatice în turism*, Edit. Casa Cărții de Știință, Cluj-Napoca
19. Sorocovschi, V., (2017), *Fenomene și procese hidrice de risc, Partea I, Domeniul continental*, Edit. Casa Cărții de Știință
20. Teodoreanu, Elena (2002), *Bioclimatologie umană*, Edit. Academiei Române
21. Vădineanu, A. (1991), *The Danube Delta. A natural monument*, Naturopa, 66, Council of Europe, Strasbourg
22. Vădineanu, A. (1963), *Zona de vărsare a Dunării-monografie hidrologică*, ISCH, Edit. Tehnică, București
23. Vădineanu, A. (2000), *Lista Roșie a speciilor de plante și animale din Rezervația Biosferei Delta Dunării*, INCD-DD, Edit. Fundația Aves
24. <http://www.insse.ro/>; <http://www.info-delta.ro/>; <http://www.cjtulcea.ro/>; <http://www.ddbra.ro/>; <http://www.google.com/>