



MAMMALS OF THE ISLANDS OF THE BLACK SEA BIOSPHERE RESERVE

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Abstract

The island fauna has special characteristics that depend not only on biotope diversity, but also on the island's geographical features: area, provenance, distance from the mainland, and hydrodynamic processes. Black Sea Biosphere Reserve includes islands located in Tendrivska and Yagorlytska bays. The islands of Babyn, Smalenyi, Potiyivski, Sybirski, and others are located in Tendrivska Bay. The island of Tendrivska Kosa (Tendra Island) separates Tendrivska Bay from the Black sea. In Yagorlytska Bay, there are the Malyi and Velykyi Kinskyi islands, Dovhyi and Kruhlyi islands, and the Yehypetski Islands. The total area of the islands of protected bays of the Black Sea Biosphere Reserve is 3365 hectares, and the length of the outer coastlines is 179.5 km. The following biotopes were identified on the islands: reed thickets, sandy and shell beaches on the sea coasts and coasts of the deep-water parts of the bays; flooded solonchaks; the inner parts of the islands with plant associations that are typical for the coastal steppe and the littoral-coastal complex. The mammal assemblage of the islands includes 18 species belonging to 6 orders, 10 families, and 16 genera. From 0 to 15 species of mammals live on individual islands. The species composition of the mammal fauna depends on the area of the island, available biotopes, the possibility of animal exchange between the island and the mainland. A number of islands have no other inhabitants except birds during the nesting period, primarily colonial ones. A number of islands belong to the complex of reed thickets, in particular the Yehypetski and Sybirski islands. These islands are located along the mainland coast and are regularly visited by wild boars and carnivorans; other islands are littoral (Novi, Potiyivski), and there are no permanent residents on them. Other islands are covered only with reeds and have no permanent inhabitants. On large islands, such as Dovhyi and Tendrivska Kosa, there are 11–15 species of mammals (migrating dolphins and bats not included), of which almost 20% are invasive and associated with human activity. The species composition and state of populations of micro- and mesomammals on the islands depend on many factors, mainly catastrophic flooding, storms, local epizootics, which can occur due to both natural abiotic and anthropogenic factors.

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Ссавці островів Чорноморського біосферного заповідника

Зоя Селюніна, Дмитро Черняков

Резюме. Острівна фауна має особливі характеристики, які залежать не лише від біотопного різноманіття, а й від географічних ознак острову: площі, походження, віддаленості від материка, гідродинамічних процесів. У складі Чорноморського біосферного заповідника є острівний комплекс, розташований в Тендрівській та Ягорлицькій затоках. У Тендрівській затоці розташовані острови Бабин, Смалений, Потіївські, Сибірські, тощо. Відокремлює Тендрівську затоку від моря острів Тендрівська коса (о. Тендра). В Ягорлицькій затоці розташовані Малий та Великий Кінські острови, острови Довгий та Круглий, Єгипетські острови. Загальна площа островів заповідних заток Чорноморського біосферного заповідника складає 3365 га, а протяжність зовнішніх берегових ліній — 179,5 км. На островах були визначені наступні біотопи: очеретяні зарості, піщані та мушлеві пляжі на морських узбережжях та узбережжя глибоководних частин заток; підтоплені солонці; внутрішні ділянки островів з рослинними асоціаціями, що характерні для приморського степу та літорально-прибережного комплексу. До теріокомплексу островів входять 18 видів ссавців, що відносяться до 6 рядів, 10 родин, 16 родам. На окремих островах мешкають від 0 до 15 видів ссавців. Видовий склад теріофауни залежить від площі острова, наявних біотопів, можливості обміну тваринами між островом та материком. Ряд островів не мають інших мешканців, крім птахів в період їх гніздування, в першу чергу колоніальних. Ряд островів відносяться до комплексу очеретяних заростів, зокрема Єгипетські та Сибірські. Ці острови знаходяться вздовж материкового узбережжя, сюди регулярно заходять свині та хижі; інші острови — літоральні (Нові, Потіївські), і на них немає постійних мешканців. Великі острови, а саме Довгий та Тендрівська коса, нараховують 11–15 видів ссавців, крім мігрантів (дельфіни і кажани), з яких майже 20 % складає інвазійна фауна та фауна, пов'язана із людською діяльністю. Склад та стан популяцій мікро- та мезомамалій на островах залежить від багатьох факторів; переважно це катастрофічні підтоплення, шторми, локальні епізоотії, що можуть викликати як через природні абіотичні, так і антропогенні фактори.

Ключові слова: острови заток, морські затоки, теріофауна, видовий склад.

Introduction

Island fauna is a separate field of research, both in terms of methodological support and geographical features. The main features of island fauna are poverty and defectiveness, certain endemism, a small number of archaic forms, and adaptive radiation [Witteker, 1975; Lopatin 1989]. The biota of islands depends on the origin of the islands (continental or accumulative), the time when the island has separated or formed, the distance from the mainland, the area of the island, and the diversity of biotopes [Abdurakhmanov *et al.* 2003].

The fauna of islands may consist of species that have remained on the island after its separation from the mainland; have immigrated from the mainland; have been accidentally spread onto the island such as by predators [Ivanenko 1935] or watercraft; have been specially released by humans. Groups of vertebrates living on islands permanently, primarily micromammals and reptiles, can be quite stable. Populations of those species that appear on the islands by accident have practically no future on the island. The dynamics of the species composition and the number of individual populations often depend on extreme abiotic factors: flooding, storms, fires, and others. Depending on the degree and duration of isolation, animal populations with a phenotype or genotype different from that of the parental populations on the mainland may form on islands [Zagorodniuk 1993; Schmidt & Jensen 2003].

Researchers single out the territory of the Black Sea Biosphere Reserve (BSBR) as one of the most valuable in Ukraine in terms of the fauna [Kotenko 1992]. There are five main natural complexes in the territory of BSBR: coastal steppe and forest steppe in the Lower Dnipro sand dunes, aquatic, insular, and littoral. The nature reserve includes a number of islands of different size and origin, located in Yagorlytska and Tendrivska bays between the Dnipro–Bug Estuary and the village of Zaliznyi Port (between 31°31' and 32°15' E) on the northern coast of the Black Sea (Fig. 1).

Materials and Methods

Surveys on the islands are conducted as part of the general representative monitoring system that was developed in the Black Sea Biosphere Reserve. This system has a long history of use—more than 35 years, and allows for appropriate analyses of results regarding the state of animal populations, particularly of mammals, and natural complexes as a whole. The following methods were used to study the fauna of the islands. On small islands (Kinski, Orlov, Babin, Smalenyi, and Kruhlyi), a total census of burrows, traces, and animals was conducted annually in June–July. These censuses were carried out together with that of colonial birds. Using the run-through method of counting, the enumerators, who were located at a distance of no more than 15 m, inspected the entire island and recorded burrows, traces, or other signs of vital activity of mammals, as well as visual encounters of animals. These data were used as a qualitative parameter of population abundance.

On large islands (Dovhyi and Tendra), census of traces, burrows, droppings, and animals were carried out on transects. On Dovhyi Island, census is carried out annually in May. On Tendra Island, such censuses are conducted annually in August; in addition, the trap-line method is used to survey micromammals, which is conducted annually in the summer in various biotopes of the island.

Cartographic methods were used to describe geomorphological changes on the islands: original mapping, distance determination using GPS and satellite images, and retrospective analysis of cartographic materials.

In addition, archival and literature data were also included in the analysis, as well as indirect data of observations that came from employees of the reserve, fishermen, employees of the Tendriv Lighthouse, and border guards.



Fig. 1. The territory of the Black Sea Biosphere Reserve with islands in the sea bays.

Рис. 1. Територія Чорноморського біосферного заповідника з островами в морських затоках.

Description of the Islands

There are 11 relatively large islands in Tendrivska and Yagorlytska bays. Their total area is 3365 hectares, and the length of the outer coastlines is 179.5 km. There are 470 inland water bodies on the islands with a total area of 324.4 hectares with a coastline length of 139.3 km.

Islands of Yagorlytska Bay. There are four islands in Yagorlytska Bay: Dovhyi, Kruhlyi, and Velykyi and Malyi Kinskyi islands. The total area of the islands of Yagorlytska Bay is 517 hectares, including 181.7 hectares (35.1%) of inland water bodies. The total length of the outer coastlines is 37.6 km.

Dovhyi and Kruhlyi islands are elongated submeridionally (at an angle of about 150° to the meridian) between the Pokrovsky Spit on the Kinburn Peninsula and the Yagorlytsky Peninsula. They partially cover the mouth of Yagorlytska Bay, but there is a wide strait between the southern end of Dovhyi and the northern shore of the Yagorlytsky Peninsula; its depth reaches 8 m and its width is up to 6 km. Dovhyi Island is 6.6 km long and up to 1 km wide. The length of Kruhlyi Island is up to 700 m, its width is up to 120 m. The entire system of Dovhyi and Kruhlyi islands is 7.7 km long. The islands are separated by a narrow (300 m) channel with a depth of up to 2 m. Kruhlyi is separated from the Pokrovsky Spit by a channel, the width of which reaches 1.1 km.

The islands are accumulative, composed of sand and shell material. The surf (western) shore of Dovhyi is 7.2 km long. The area of the island is 470 hectares according to the land management materials. In terms of area and length, it is the second (after Tendra Island) largest island of the Black Sea Biosphere Reserve. Of the island's area, 165.7 hectares (38.2%) are inland waters. The land area of the island is 269 hectares. The length of the coastline of Kruhlyi Island is 2.6 km; the western shore (about 700 m) is surf. There are five small lakes with a total area of 0.9 hectares on the island. The length of their coastlines is about 1 km.

The Kinski Islands (Velykyi and Malyi Kinskyi) are located in the eastern corner of Yagorlytska Bay, 2.8 km west of the western outskirts of the village Ivanivka (Holoprystan Raion, Kherson Oblast), 1.7 km west of the eastern shore of the bay. There is a distance of 0.6 km from the northern end of Malyi Kinskyi Island to the shore of the bay, and less than 200 m from the southern end of Velykyi Kinskyi Island to the mainland shore; at low water level in the bay, the island is almost connected to the mainland. The Kinski Islands have an area of 27 hectares. At a high water level, they can be almost completely flooded.

The Kinski Islands are a remnant of the mainland. In the past, a powerful distributary of the Ancient Dnipro flowed here into Yagorlytska Bay [Agbunov 1987]. The coasts of the islands are low-lying and mostly covered with reed thickets. The eastern shores of the islands are lower and dissected by many ingressive channels. Bottom areas adjacent to the islands are heavily silted (Fig. 2).

The Yehypetski Islands are remnants of the mainland coast of the Yagorlytsky Peninsula. Located on the border of Yagorlytska and Tendrivska bays, the distance from the islands to the coast of the Yagorlytsky Peninsula is 300–700 m. The chain of the three Yehypetski Islands stretches 2.2 km along the north-western coast of the peninsula, at an angle of about 140° to the meridian. A narrow (several tens of metres wide) trough with a depth of up to 1.5 m runs between the islands and the mainland coast (Fig. 1).

Islands of Tendrivska Bay. Tendrivska Bay is separated from the open sea by the largest island of the Black Sea, the Tendrivska Kosa (Tendrivska Spit, Tendra Island), which is 67–70 km long. In Tendrivska Bay are located the islands of Orlov, Babyn, Smalenyi, Novi, Sybirski, Potiyivski, and others (Fig. 2). Tendra Island also belongs to Tendrivska Bay (Fig. 4). The total area of islands of Tendrivska Bay is 2787.5 hectares, including 149.3 hectares (5.4%) of inland water bodies. The length of the outer coastlines of the islands of Tendrivska Bay is 154.9 km (144 km of Tendra Island); the total length of coastlines when taking into account the shores of internal water bodies is 236.8 km.

Along the northern coast of Tendra Island (in the eastern part of Tendrivska Bay), small alluvial islands are regularly formed, which are, for the most part, ephemeral. An exception are three islets near the root of the Tendrivska Spit—Blyzhniy Island, 150 m off the shore of the bay opposite to the

‘Morsky’ border of the BSBR, and the Potiivski Islands. In various years, there can be up to a dozen of such islands along the Tendrivska Spit. Though including them in our calculations is impractical given their non-permanent nature. The actual area of the islands is 14.6 hectares, and the length of the outer coastlines is 4.9 km.

Orlov Island is located 3.5 km southwest of the western coast of the Yagorlytsky Kut Peninsula. Cape Bili Kuchuhury is on Tendra Island 4.5 km southwest of Orlov Island. Orlov Island is a remnant of the mainland. Orlov Island has the shape of an irregular triangle, the top of which is directed to the north. According to land management materials, the area of the island was 28 hectares; the land area is 18.6 hectares (83.8%). The length of the outer coastline is 2.2 km. A sand spit is formed on the outer contour. The coasts of Orlov are relatively high. The highest part of the coast is on the north-western side. Here the coast is steep, the height of the cliff at the highest point exceeds 2 m. The lowest part of the coast is near the southern cove. The northern end of the island is also low, and is intensively eroding. Most of the shores of the island have a height of 0.2–0.5 m. The island is being destroyed quite intensively, therefore it is surrounded by shoals. The greatest width of shoals is along the southern coast (about 100 m) and at the northern cape (up to 150 m). Destruction of shores occurs due to hydrodynamic factors (currents, storms, and ice).



Fig. 2. Islands of the Black Sea Biosphere Reserve: (a) Kruhlyi; (b) Babyn; (c) Smalenyi; (d) Dovhyi; (e) Kinski Islands (view from the eastern shore of Yagorlytska Bay). Photo by D. Chernyakov.

Рис. 2. Острови Чорноморського біосферного заповідника: (а) Круглий; (б) Бабин; (с) Смалений; (д) Довгий; (е) Кінські острови (вигляд зі східного берегу Ягорлицької затоки). Фото Д. Чернякова.

Babin Island is a remnant of the mainland and is located on the edge of the relict (pre-transgression) coastline, at a distance of 3.1 km from the modern mainland shore of the eastern part of Tendrivska Bay. To the east of the island stretches a long spit, which runs along the relict coastline and reaches Cape Potiivska Strilka. Near the cape, the spit divides into two branches. The northern one adjoins the cape, and the southern one goes towards the Tendrivska Spit.

The island itself consists of two different parts. The western part is high (so-called ‘knoll’); its western and southern shores are cliffs with a height of 1 to 3 metres. In fact, the island is the remnant of a high hump that is subject to intense ice, wave and other types of water abrasion. In the eastern part, the island turns into a low and narrow sand-shell spit, the length, width and configuration of which changes significantly not only from year to year, but even during the year due to accumulative processes. The area of the island is about 5.2 hectares, and the length of the outer coastline is about 1.9 km.

Smalenyi Island is considered a completely accumulative form. The island is located 1.7 km north of the northern shore of the Tendrivska Spit and 4.4 km west of Babyn Island. The distance to Smalenyi from the mainland shore of Tendrivska Bay is a little more than 6 km. The island is strongly elongated along the meridian, its meridional length is about 600 m. The greatest width of the island is about 300 m. However, most of this distance falls on the eastern cove. The total length of the shorelines of inland water bodies of Smalenyi is 2.14 km (more than the outer coastline of the island). The total length of coastlines of Smalenyi is thus estimated at 4.2 km (see Fig. 2).

The Tendrivska Spit is the longest accumulative form within the Black Sea basin. This is the western lobe of the Dzharylhach–Tendra system; it begins near the ‘Morkiy’ border of the BSBP (3 km west of the western outskirts of the village of Zaliznyi Port) and extends west–north-west for 66 km (67 km along the sea coast). The large Cape Bili Kuchuhury is 46 km far from the root of the spit and has a form of a wide spur directed to north-east. West of Cape Bili Kuchuhury, the body of the spit begins to curve gradually to the north and 6 km west of the cape the spit begins to widen. The last 6 km of the spit is oriented almost meridionally. Here the spit acquires its maximum width (up to 2 km). The narrow part of the spit (from the root to cape Bili Kuchuhury) has a small width (50–500 m). Under the influence of strong southern storms and powerful surges in Tendrivska Bay, straits (so-called ‘breakthroughs’) are formed occasionally in the narrow part of the spit, which connect Tendrivska Bay with the open sea; the width of such channels can reach 1 km (according to some reports, even up to 2 km) [Davydov *et al.* 2022].

The current area of the Tendrivska Spit is 2748.2 ha; the total length of the outer coastline is 144.1 km. The length of the surf shores on the spit is 92 km, including 70 km of the seashore and 22 km of the shore of the deep-water (western) part of Tendrivska Bay (Fig. 3 a, c).

Island biotopes. The following biotopes are represented on the islands: 1) sandy and shell beaches on sea coasts and the coasts of deep-water parts of bays; 2) reed thickets on the shores of inland water bodies and shallow waters; 3) submerged salt marshes; and 4) internal areas of the islands with plant associations characteristic of the coastal steppe and littoral-coastal complex. The mammal assemblage of reed thickets consists partly of species that come from the steppe areas, namely the inhabitants of reeds. Voles, pygmy wood mice, and sometimes shrews are the most abundant species on the edges of reed thickets.

Table 1. Vegetation types of the islands of Tendrivska Bay (% of the area of the islands)

Таблиця 1. Типи рослинності островів Тендрівської затоки (% від площі островів)

Vegetation type	Tendra Island	Babyn Island	Smalenyi Island	Orlov Island
Meadows	25.01	–	–	–
Reed marshes	24.79	13.46	–	3.68
Halophyte vegetation	2.89	48.08	58.18	11.08
Steppes	–	38.46	–	85.25
Psammophyte vegetation	43.08	–	41.82	–
Other	4.23	–	–	–

Table 2. Vegetation types of the islands of Yagorlytska Bay (% of the area of the islands)

Таблиця 2. Типи рослинності островів Ягорлицької затоки (% від площі островів)

Vegetation type	Malyi Kinskyi Island	Velykyi Kinskyi Island	Kruhlyi Island	Dovhyi Island	Yehypetski Islands
Meadows	83.08	–	7.70	29.58	12.5
Psammophyte vegetation	16.92	3.35	3.00	15.35	–
Reed marshes	–	24.58	88.31	17.27	87.5
Halophyte vegetation	–	6.70	–	37.80	–



Fig. 3. Tendrivska Spit island: (a) the narrow part of Tendra Island; (b) Cape Bili Kuchuhury, which separates the eastern (shallow-water) and western (deep-water) parts of Tendrivska Bay; (c) horses in the fog in the narrow part of Tendra Island; (d) horses in the wide part of Tendra Island; (e) the phenotype of horses. Photo by D. Chernyakov (a–c) and D. Korolesova (d–e).

Рис. 3. Острів Тендрівська коса: (a) вузька частина о-ву Тендра; (b) мис Білі Кучугури, що розділяє східну (мілководну) та західну (глибоководну) частини Тендрівської затоки; (c) коні в тумані на вузькій частині о-ву Тендра; (d) коні на широкій частині о-ву Тендра; (e) фенотип коней. Фото Д. Чернякава (a–c) та Д. Королєсової (d–e).

Results and Discussion

The mammal assemblage of the islands comprises 18 species belonging to 6 orders, 10 families, and 16 genera. According to the results of long-term monitoring, the species composition of individual islands ranges from 0 to 15 species. These estimates do not include migrants characteristic of Tendra Island, which include 3 species of dolphins and 5 species of bats.

According to their natural conditions, a number of islands belong to the complex of reed thickets, such as the Yehypetski and Sybirski islands. These islands are located along the mainland coast; wild boars and such predators as *Vulpes vulpes*, *Nyctereutes procyonoides*, and *Canis lupus* regularly appear here (Table 3), but there are no species inhabiting permanently on these islands.

The number of species depends on the area of the island (Fig. 4).

Small islands with low bare littoral shores have no other inhabitants than birds. Such islands include Novi and Potiivski.

On islands of Tendrivska Bay (Orlov, Babyn, and Smalenyi), 2–3 species of mammals live permanently: East European vole *Microtus levis*, house mouse *Mus musculus* near and inside human buildings, and pygmy wood mouse *S. uralensis* (= *A. microps*) near reed thickets. In winter, foxes and raccoon dogs move here from the mainland, but they are removed from the islands when these islands are prepared for the nesting of colonial birds.

On the Kinski Islands, due to constant flooding, the population of voles is renewed from the mainland. After the destruction of cattle farms near the villages of Ivanivka and Ochakivske, a colony of *Rattus norvegicus* was found on the islands, which lived there for 2–3 years and then disappeared. In different seasons, especially in winter, *V. vulpes*, *N. procyonoides*, *Canis lupus*, and sometimes *Sus scrofa* come to these islands.

Table 3. Mammals of the islands of the Black Sea Biosphere Reserve

Таблиця 3. Ссавці островів Чорноморського біосферного заповідника

Species		Islands of Yagorlytska Bay			Islands of Tendrivska Bay			
		Dovhyi + Kruhlyi	Kinski	Yehypetski	Orlov	Babyn	Smalenyi	Tendrivska Spit
No.	Species name	478 ha	27 ha	17 ha	28 ha	6 ha	8 ha	2750 ha
1	<i>Microtus levis</i>	++	–	–	++	++	++	++
2	<i>Microtus socialis</i>	?	–	–	–	–	–	?
3	<i>Sylvaemus uralensis</i>	++	–	–	–	–	–	++
4	<i>Mus musculus</i>	++	–	–	++	++	++	++
5	<i>Mus spicilegus</i>	++	–	–	–	–	–	–
6	<i>Rattus norvegicus</i>	–	++	–	–	–	–	++
7	<i>Castor fiber</i>	(+)	–	–	–	–	–	–
8	<i>Lepus europaeus</i>	–	–	–	–	–	–	++
9	<i>Crocidura suaveolens</i>	++	–	–	–	–	–	++
10	<i>Sorex minutus</i>	–	–	–	–	–	–	++
11	<i>Erinaceus concolor</i>	–	–	–	–	–	–	++
12	<i>Vulpes vulpes</i>	++	+	+	+	+	+	++
13	<i>Canis lupus</i>	+	+	+	–	–	–	+
14	<i>Nyctereutes procyonoides</i>	++	–	+	+	–	–	++
15	<i>Lutra lutra</i>	+	–	–	–	–	–	–
16	<i>Sus scrofa</i>	+	–	+	–	–	–	+
17	<i>Equus ferus</i>	–	–	–	–	–	–	++
18	<i>Eptesicus serotinus</i>	–	–	–	–	–	–	++
	Total	12	3	4	4	3	3	15
	Permanent/Occasional	8/4	1/2	0/4	2/2	2/1	2/1	13/2

Notes: ++ species that occur permanently on the island; + species that regularly visit the island; (+) a single sighting; ? species that have not been recorded for the past 20 years, although it may occur.

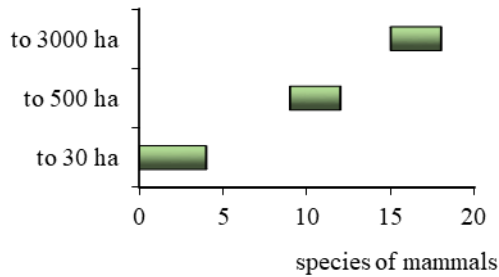


Fig. 4. The number of mammal species depending on the area of the islands.

Рис. 4. Кількість видів ссавців в залежності від площі островів.

On Dovhyi and Kruhlyi islands, which make up a single system, eight species of mammals live permanently and two more species regularly visit: wolves and wild boars. Among the micromammals, voles and the mound-building mouse are typical for meadows, and *S. uralensis* for the area of reed thickets. In recent years, the Pokrovska Spit in the south of the Kinburn Peninsula has been growing, which strengthens the connection of the island system with the mainland. One encounter with a Eurasian beaver was recorded on Kruhlyi Island [Selyunina & Plyusch 2014]. For three years (2018–2020), traces of a Eurasian otter were noted on Dovhyi Island [Selyunina 2017]. The number of foxes is up to 20–25 individuals. Due to the lack of food in winter, when ice forms around the islands, cases of cannibalism among foxes have been recorded.

The mammal assemblage of Tendra Island is more diverse. Tendra Island is a unique island sanctuary of terrestrial vertebrates. Its size and natural conditions determine the richest island fauna in the region. Unlike other islands, Tendra Island has biotopes that are not typical for islands [Umanets 2010]. Those include plantations of the black locust, mulberry, smoke tree, and invasive thickets of silverberry, which in recent years have created solid thickets on a vast area of the island. In addition, there are permanent human settlements on the island: the Tendrivsky Lighthouse with commercial buildings, residential and housekeeping buildings of the local military unit, the base of the Geophysical Institute, and the buildings of the former fish factory. There are navigational signs on the island.

On Tendra Island, 15 mammal species are permanent inhabitants. Among micromammals, *S. uralensis* is a common species of reed and silverberry thickets, *C. suaveolens* of solonchaks, and *M. levis* of meadows. The relative abundance of micromammals is low and varies from 0.1 to 2.0 ind./100 trap-days in different years. In anthropogenic habitats, *M. musculus* and *R. norvegicus* occur constantly. Unlike the other islands, *L. europaeus* and *E. roumanicus* are permanent inhabitants of Tendra Island and are under notable press of predators. The island plays an important role as a gathering site of bats during their migration; five species of bats use this island as a stopover site, including pipistrelle (*P. kuhlii*, *P. pipistrellus*, and *P. nathusii*) and noctule bats (*N. noctula*, *N. leisleri*). *E. serotinus* occurs permanently. Three species of dolphins occur along the shore of Tendra Island from April to October: *Delphinus delphis*, *Phocoena phocoena relicta*, and *Tursiops truncatus ponticus*. Dead dolphins can often be found on the shore of the island, which are additional food for predators and gulls (Fig. 5).

Among predators, *Vulpes vulpes* is the most abundant species on Tendra Island, the subdominant being the raccoon dog. The relative abundance of foxes is 1–2 individuals per 1 km of route. Seafood makes up to 90% of the diet of predators on the island. Outbreaks of rabies are being noted on Tendra Island in almost every 2–3 years.

The wild horse population on Tendra Island is quite peculiar. Previously, it was suggested that horses appeared on Tendra Island in the 1920s. But the study of archival data (State Kherson Regional Archive)¹ revealed that there was a so-called ‘Fish Factory’ on the island in the later decades of the 19th century, which was a series of fishing stations transferring their catch to ‘Labaz’ and therefrom to Odesa and Mykolaiv, as well as to Turkey and Romania. Horses were the only means of transport.

¹ Archive of Kherson Oblast, Fund 302, description 1. Access: <https://bit.ly/3WVZFzN>



Fig. 5. Carcass of *Phocoena phocoena* on the shore of Tendra Island, scavenged by a fox, 05.09.2018. Photo by Z. Selyunina.

Рис. 5. Труп *Phocoena phocoena* на березі о. Тендра, пошкоджений лисицею, 05.09.2018. Фото З. Селюніної.

When the factory collapsed during the First World War, the horses were left to fend for themselves. The lack of fresh water and fodder, as well as poaching, limited the size of the herd. In the 1980s–1990s, up to 20–30 horses lived on the island. The number of horses has gradually increased in the 1990s. After 25–30 years, their number has increased considerably, to almost 200 individuals in three herds. The phenotype of ‘Tendra’ horses is uniform: they are short, brown to black horses (see Fig. 3 e). Due to the increase in the number of horses and domestic animals, the vegetation of the island has suffered substantial losses. Meadows, reed thickets, and bushes were damaged. Sandy soils were damaged by overgrazing. The damage to indigenous biotopes led to a decrease in the number of small mammals.

In 2021–2022, a pack of wolves appeared on the island (V. Syrotyuk, pers. comm., Tendrivsky Lighthouse).

Conclusions

The territory of the Black Sea Biosphere Reserve includes coastal islands and islands located in Tendrivska and Yagorlytska bays of the Black Sea. The islands of Babyn, Smalenyi, Potiyivski, Sybirski are located in Tendrivska Bay. The island of Tendrivska Spit (Tendra Island) separates Tendrivska Bay from the sea. In Yagorlytska Bay are located the Malyi and Velykyi Kinskyi islands, and the Yehypetski Islands. The system of Dovhyi and Kruhlyi islands separates Yagorlytska Bay from the sea. All islands of protected water areas are located at a distance of no more than 6 km from the mainland coast. Coastal islands have a constant faunal exchange with the mainland. On islands located far from the mainland, the fauna of small mammals has not changed for many years.

The islands have a poor diversity of biotopes: reed thickets, sand and shell beaches on sea coasts and coasts of deep-water parts of bays; submerged salt marshes; inland areas of the islands with plant associations characteristic of the coastal steppe and the littoral-coastal complex, which connects the fauna of the islands with the mainland fauna. On small islands, the area of these biotopes is small, which determines the small number of local terrestrial species.

From 0 to 15 mammals species occur permanently on individual islands. In total, the island mammal assemblage includes 18 species belonging to 6 orders, 10 families, and 16 genera.

The species composition of mammals depends on the area of the island, available biotopes, and the possibility of faunal exchange between the island and the mainland. A number of islands have no other inhabitants than birds during the nesting period, primarily colonial ones. Other islands are covered only with reeds and have no permanent inhabitants. Large islands, namely the islands of Dovhyi and Tendra, harbour 11 to 15 mammal species, almost 20% of which are invasive species or those associated with human activity.

The state of populations of micro- and mesomammals on the islands depends on many factors, mainly of catastrophic impact, such as flooding, storms, local epizootics, which can occur due to both natural abiotic and anthropogenic factors.

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