

**BULGARIAN-SWISS BIODIVERSITY CONSERVATION PROGRAMME**  
**ROPOTAMO PROJECT**

**R O P O T A M O**

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**The Ministry of the Environment SVS**  
**National Natural Protection Service**

**SDC.-SWISS AGENCY FOR**  
**DEVELOPEMENT AND COOPERATION**

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IMPORTANCE – INTERNATIONAL, NATIONAL, LOCAL  
SECOND EVALUATION

## RESUME OF THE PLAN FOR MANAGEMENT

**LOCATION:** The Ropotamo Complex covers a part of the Stranja Mountain, near the Mouth of the Ropotamo river and the Southern Black Sea Coast. It includes territories of Primorsko and Sozopol Municipalities.

It is bordered on the East by the Sea, - on the West - by the Central Water supply System for the South Black Sea and the opening for high Voltage, on the North - by “Duni” Vacational Village, on the South - by Primorsko town.

Thus the area of the Complex is 5061 ha of which:

- 1453,0 ha - sea water area
- 1982,3 ha -protected by the Law for nature protection
- 1625,7 ha - territories including the five km long Black Sea Line / Protected by Decree for Black Sea Coast’s Organization/. The following protected areas are included in the borders of the Ropotamo Complex.
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<i>Name</i>	<i>Statute</i>	<i>tm. Gryd.</i>
1. The Ropotamo Reserve including	Ramsar	NG 5868
• The Arkutino marsh	Ramsar place	NG 68
• The Mouth of the Ropotamo River		NG 68
• Zmiisky ostrov		NG 68
1. The Vodny lilies Reserve		NG 58
1. The Alepu marsh natural sights	Place of Ornithological Importance, code 015	NG 59,58
1. The Stamopolu marsh protected area	Suggested to be Place of Ornithological Importance,	NG 68
1. “Alepu sand dunes” nature sights		NG 59
1. “Perla sand dunes” natural sights		NG 68
1. Rock formations and seal cave in the “Maslen nos locality” natural sights		NG 68
1. Buffer area of the Ropotamo Reserve		

**THE ROPOTAMO RESERVE** - It is declared by the Order N 318/ 07.05.1992 / published in the Official gazette 41/ 1992/ of the MoE on the strength of article 14 and article 22 of the Law for Nature Protection on purpose preserving the deposits species that are rare and endangered of extinction as well as the unique complex from the natural inhabitable place that are of International significance, area 1000,7 ha. Any human activiti is forbidden in the Ropotamo Complex with the exception of :

- organizing of tourist trips by boats along the Ropotamo river.
- coming into the Mouth of the Ropotamo River by fishing boats when the sea is rough and keeping the fishermen’s shelter.
- visiting on educational purpose on routes determined by the Plan for Management.
- using the road between 485 and 486 sections, near the Mouth of the Ropotamo River by the local fishermen during the fishing season from October to December.

### ***THE VODNY LILIES RESERVE***

The Vodny lilies Reserve covers 13,6 ha. It was declared by Order N 2080/24.07.1962 of the Main Administration of the Forests on purpose preserving the primitive character, a great beauty and the various landscape of “Kaisheva shuma “ locality dense by nature.

Every activity breaking the primitive feature of the nature is forbidden. Moving is allowed on some paths only

### ***THE ALEPU MARSH NATURAL SIGHTS***

The Alepu marsh together with the common pasture belonging to it and with the cultivated lands covers the territory of 166,7 ha.

It was declared as a natural sights by Order N 709/ 22.07.1986 of the Committee for preserving of the Nature to the Ministerial Council on purpose preserving natural inhabitant places of the protected and rare water swimming birds and the only one deposit of the devil walnut on the Black Sea Coast.

In the borders of the Natural sight the following activities are forbidden.

1. Building and any other activities that change the natural characteristics of the locality or the water regime.
1. Destroying the marshy plants and picking the fruit of the devil walnut up.
1. Making fires, burning the reed and other plants down.
1. Bringing in and breeding of vertebrate - species without agreement of the Committee for preserving the Nature to the Ministerial Council and the Bulgarian Academy of Sciences.
1. Killing, catching and disturbing the birds, breaking their nests and taking their eggs.
1. Hunting and fishing.
1. Polluting the Water

### ***The following activities are allowed in the border of the natural sights:***

1. Pasture of the Domestic animals during in reproduction period of the birds / June 1<sup>st</sup> - July 30<sup>th</sup>./
1. Hay production and traditional using of cultivating lands.

### ***THE STAMOPOLU PROTECTED LOCALITY***

It is declared as a protected locality by the Order N 332/ 16.05.19921 of the MoE on purpose preserving inhabitable places of rare and endangered of extinction plant and animal species.

The following activities in the border of the protected area are forbidden:

1. Pasture of goats and pigs.
1. Hunting.

Stocking a pond with local fish species, sports fishing, from the shore of the lake from June 30<sup>th</sup> - March 1<sup>st</sup> cutting or burning the reed after agreement with the MoE and Bulgarian Academy of the Science, pasture and watering-place of the sheeps and cattle.

### ***ROCK FORMATIONS, FIORDS SEAL CAVE IN THE "MASLEN NOS" NATURAL SIGHTS - 17,6 ha***

Rock formations, fiords and Seal cave in the "Maslen nos" locality that are beautiful and rarely coastal rocks with fiords are declared as a natural sights by Order N 4051/ 29.12.1973 of the Ministerial of the Forests and preserving of the Environment.

*The following activities are forbidden in the region of the protected area*

1. Cutting down, trimming, stumping out and breaking the trees.
1. Pursuit the wild animals and their babies as well as breaking their nests or their dens.
1. Pasture of any cattle in any time.
1. Opening pits for stone, sand or soil.
1. Breaking, scratching and damage of rocks and ground formations.
1. Bringing out clear felling and intensive main fellings.
1. Bringing of sanitary felling is allowed.

### ***ALEPU SAND DUNES AND PERLA SAND DUNES***

They are declared as natural sights by Order N 2109/ 20.12.1994 of the Committee for preserving of the Environment to the Ministerial Council

- Alepu Sand dunes - 12 ha
- Perla Sand dunes - 24 ha

*The following activities are forbidden in the boundary of the natural sights.*

1. Building
1. Opening pits, minor-geological and other activities that damage or change the natural characteristics of the place and the water regime.
1. Coming in, Camping, passing or parking of the Motor vehicles.
1. Pasture of domestic animals.
1. Disturbing of the wild animals and taking their babies or eggs as well as destroying their nests or dens.

## ***BUFFER AREA OF THE ROPOTAMO RESERVE***

It covers 707,7 ha and is declared as a buffer area of the Ropotamo reserve on the grounds of article 3 from Decree N4 of the Committee preserving of the Environment to the Ministerial Council by Order N 318/ 07.05.1992.

*The following activities are forbidden in the boundary of the buffer zone:*

1. Any new building.
1. Pasture of goats and pigs.
1. Clear felling and afforestation with tree species that are not typical for the region.

*The following activities are allowed in the boundary of the buffer zone.*

1. Using the forests as the forests in the protected areas.
1. Regulating the number of the game.
1. Using of pasture lands, meadows and cultivating lands.
1. Using of sand strip for beach.

The common balance, sheet of the protected area is: two Reserves with total area of 1014,3 ha, one protected area covers 40 ha, four natural sights with total area of 19,9 ha and one buffer area with 707,7 ha.

## ***ECOLOGICAL EVALUATION***

The Ropotamo Complex is marked by its wild nature, harmony of nature features, rocky beaches, sand dunes, dense forests and Marsh areas.

The Southern situation of the region, the variety of landscape, the presence of food base in winter and the shelters that are assured, made the place to be preferred by birds and by migrating birds mostly.

The analysis of the biota, of conservation importance habitats and every biological groups in the Ropotamo Complex show its International significance as a protected area.

The Arkutino marsh is declared as an object of Ramsar. The Ropotamo Reserve and the protected damp area of Alepu are declared as places International significance, according to Bulgarian legislation / Order N 988/ 04.11.1993 Of MoE/.The Stamopolu damp zone, "Maslen nos" natural sights, "Alepu sand dunes" and "Perla sand dunes" are determined to be protected areas of International importance by the same Order.

Also CORINE BIOTOPES is determined European conservation importance of the Complex.

The Ropotamo Complex has unique biodiversity: 60% of the species of the Cherpetafauna of the country, 57% of the Mammal species, 60% of the water fresh ichthyofauna, 50% of breeding Ornitofauna. Higher flora is not completely explored but it includes 15% of all species, determined in our country.

The Complex is of utmost importance for preserving the species that are endangered and rare. From the World Red List Book / 1996 /, 21 Mammal species are widely distributed in the Complex of which 7 are in the category "Vulnerable" and 1 - "critical endangered".

7 species of birds are classified as globally endangered according to the CPES Special category. Of them two species are breeding in the Ropotamo Complex.

180 species of birds are included in Bern Convention, 138 migrating species are enlisted in Bon Convention as two of them are breeding in the Complex, 84 species are

included in CORINE BIOTOPES, 67 species are enlisted in the Red List Book of Bulgaria. Of them 28 are breeding and 226 species are protected by the Order N 729/1986 of the MoE.

6 species written in the World Red List, 2 species in the European Red List, 15 - in Bern Convention, 6 - in the Red List Book of Bulgaria and 19 species protected by Order N 729/1986 of the MoE belonging to Amphibians and Reptiles are specified in the Ropotamo Complex.

41 endemite species of which 18 species are Balkan and 23 are Bulgarian belonging to Invertebrate fauna are determined in the damp areas of the Ropotamo Complex.

About 11 % of the plant species written in the Red List Book of Bulgaria, that means 83 species / 71 - rare; 11 -endangered;1-- extincted/ are conserved in the Ropotamo Reserve. 16 species higher plants are endemites and 23 tree and frutex species are Tertiary relicts.

The variety of habitat types is unique for our country and probably for Europe.

The conservation importance of the biota, a great diversity and population significance determine the high price of the Complex that requires preserving of the biodiversity in it and taking effective measurements for its protection.

### ***MAIN MANAGEMENT POLICIES***

1. Preserving the unimpaired wild nature and unique features of the Ropotamo Reserve.
1. Using the Complex for social - economical development of the region.
1. Conservation and keeping ecosystems that are of international importance - dense forests, sand dunes, coastal lagoons and forests, breed of plant and animal associations of International and National significance.
1. Supporting the natural geomorphologic processes that formed and go on forming the Complex of existing habitats.
1. Restoration of the sand dunes near the Alepu marsh.
1. Improving the Alepu, Arkutino, Stamopolu marshes, dominated by Phragmites, the marshy sections near the Ropotamo river mouth, as well as the sections with open water area on purpose helping wintering and breeding populations of the water swimmings that are of the International significance, otter and rare invertebrate fauna and the species of water plants and breeding birds of National importance .
1. Monitoring on population of the plant Key species, Mammals, Invertebrates, Fishes, Amphibians, Reptiles, Breeding and wintering birds on purpose taking Measurements for improving their inhabitable places on.
1. Creating suitable conditions for feeding, resting of the migrating and wintering birds in the damp areas of the Ropotamo Complex.
1. Creating suitable conditions for sea eagle/ *Haliaeetus albicilla*/ coming back as a breeding species in the Complex.
1. Creating conditions for coming back and reproduction of the world endangered seal - Monk / *Monachus monachus*/ near Maslen nos.

## ROPOTAMO PROJECT Management Plan

1. Working out the Plan for visiting in the Complex and building equipment to visitors' facilitate / Information Centre, watching towers, shelter, routes for Moving, parkings and etc.
1. Drawing Educational Programme for the visitors of Ropotamo Complex - students, pupils, naturelovers, tourists, people on holidays/.

### ***MAIN MANAGEMENT DIRECTIONS AND ACTIONS***

1. Inhabitable places for nesting of the stocking birds, Black-necked grebe, Little grebe as well as the feeding places of the wintering water-swimmings to be kept, preserved and increased.
1. The dune systems to be preserved on purpose conservation the rare plant species and associations of invertebrates without intervention to be conserved and kept.
1. The Reed massifs and the open water areas to be managed and controlled from the undesired grown plant penetration / alder tree and willow mostly/.
1. Biotechnical activities for reducing some of the water lily population to be organized on purpose increasing open water areas, saprobiological condition bettering in the Arkutino marsh and conservation the population of rare plant species.
1. Each damp zone in the Ropotamo Complex and each protected area to be marked on spot by signs in English and Bulgarian, giving information about the conservation importance of the object.
1. Building and improving management of water in the Alepu and Stamopolu - North marshes, using gates existing flexibly after regular researching of the Water level.
1. Warden to be put from March to July on purpose avoiding the disturb of breeding heron stockings in the Alepu and Stamopolu marches, breeding one pair of Ferruginous duck / *Aythya nyroca*/.
1. Seven information folders to be published / about the Ropotamo Complex, the Ropotamo Reserve, the Vodny lilies Reserve, the Alepu marsh Natural sights, the Stamopolu marsh protected area, the Alepu sand dunes, the Perla sand dunes/.
1. Plan for Visitors to be Worked out.
  1. Equipment for bird watching near the damp areas of the Complex to be built on the sports.
  1. Fishing places and poundnet along the coast of the Complex to be fixed and Marked.
  1. The contacts with all organizations and person that are interested in and having any attitude toward the region to be built, supported and bettered on purpose realizing the International and, National importance of the Complex and achieving agreements and interaction when the Plan for Management is enforced.
  1. Programme for photographing of the damp areas in the Complex from the fixed point to be built on purpose watching the changes in the succession of the habitats (reed massifs especially).
  1. The water balance of the Alepu, Arkutino, Stamopolu, the Ropotamo River and Velyov vir to be explored and the monitoring on the quality of the water to be continued by seasonal samples.
  1. Bird counting to be made once weekly by standard ways.
  1. Monitoring on the breeding populations such as *Ardea purpurea*, *Podiceps grisegena*, *Aythya nyroca*, *Circus aeruginosus*, *Charadrius dubius*, *Tachybaptus ruficollis* to be realized.

**ROPOTAMO PROJECT Management Plan**

1. The population of the word endangered bird species and other organisms in the damp zones of the Complex to be watched.
1. Realization the Plan for Management of the Ropotamo Complex passed and approved to be assigned a task to the administrative of the MoE

## **PART 0 - INTRODUCTION**

### **0.1 NATURE - PROTECTIVE POLICY**

Care and treatment of Bulgarian nature include more than hundred years - activities and about seventy years organized nature-protective policy.

Bulgaria is one of the first countries signed the Ramsar *Convention* in 1976 for protection of damp areas.

During the past years the Ministry of the Environment and Water pursues :

1.Reassessment of the priorities in long-term conservation of nature and using of natural resources.

2.Working of series documents out concerning nature protection and biodiversity.In 1992 - 1993 this was the National Plan for priority activities concerning the most important damp zones in Bulgaria. This Plan became an integral part from the bio-variety protection.

3. The Ministry of the Environment and Water in its activity concerning the preservation is based on intersectorial method of approach i.e., searching of wide collaboration including the State Institutions, non-government organizations, local self-government authorities and Science Institutes.A great number of projects of International significance were carried out in the last few years. The Bulgarian-Swiss Programme including bio-variety protection of Bulgaria, holds a place apart in this International activity. The present *Project for management* of Ropotamo Complex is a part of this programme.

### **0.2. NATIONAL AND OTHER RESEARCHES**

The Ministry of the Environment and Water gave spare room for Ropotamo Complex in this worked out National Project, including priority activities for protection of the most important damp areas. Actually these are several protected areas. First of them were announced as protected in 1940

The protected areas evoked scientific interest during all their period and that was why periodical researches were done . Individual biological groups were begun to be researched ever since 1913.

### **0.3. IDENTIFICATION OF THE PROTECTED AREAS**

Ropotamo Complex covers several one another connected regions. That is why the *Project for management* is directed to specify the regime of all protected regions both the reserve buffer area and some unprotected areas.

The *Project for management* enhances necessity of protection of the sea area by the bays of "Ropotamo" reserve and the big bay situated between the "Duni" Vacational village " and the mouth of the Ropotamo river

### **0.4. CHOICE OF PROTECTED AREA**

The *Project for management* presents a new protected area. This area should be completed with intermediate regions. If these regions haven't protective statute they can be changed into sources of extremely harmful, negative anthropogenical effect which endangers the unique biota and the habitats on the region.

The sea area on its part could complete the bio-variety. This area is researched as an inhabitable place of many sea mammals, hundreds water-love birds and a great number of rare and threatened of extinction pass fish. All these collection including the protected areas, sea, fluvial inhabitants needs of united *Project for management* .It is desirable all these regions and inhabitants to be separated on the unified protected area.

## 0.5. ANNOUNCEMENT AND PROPERTY OF THE PROTECTED AREA

The offering for announcement of Ropotamo Complex, Alepu and Stamopolu marshes to be protected areas is given by the Institutes of the Bulgarian Academy of Sciences.

The protected areas announced until now are state property as one part of them is exclusive state property / the two Reserves and Sand dunes/ according to article 18 paragraph 1 from the Bulgarian Constitution.

The process connected with the ownership of land restoration and the passing of the projects including land-share areas which belong to Primorsko and Sozopol where Ropotamo Complex is situated, finished in 1998.

There will be social and private property together with state property on the boundaries of the Complex..

This change situation requires working of the *Project for management* out of the Ropotamo Complex according to the change being done on the land property.

## PART 1. DESCRIPTION AND EVALUATION OF THE PROTECTED AREA

### GENERAL INFORMATION

#### 1.0. LOCALITION AND FRONTIERS OF THE PROTECTED AREA

Ropotamo Complex is situated:

country - Bulgaria

province - Bourgas

municipality - Primorsko, Sozopol

Ropotamo Complex takes a part of Strandja Sakar Mountain, by the mouth of Ropotamo river and South Black sea-shore. Towns - It is fifty km far away from Bourgas, between Sozopol and Primorsko.

The region of Ropotamo Complex is bordered by :

- on the East - sea-shore including bays and St. Toma Island (Zmiisky ostrov).
- on the West - central water-supply for the South Black Sea-shore with the opening of high voltage.
- on the North - Vacation Village "Duni".
- on the South - town of Primorsko.

Area 5061.0 ha. This area includes the following regions

Name of the Area	TM-gryd
<b>1. Ropotamo reserve</b>	58, 63
This region covers:	
- Arkutino marsh	68
- Mouth of Ropotamo river	68
- Zmiisky ostrov	
<b>2. Vodny lilies reserve</b>	58
<b>3. Alepu marsh</b>	59, 58
<b>4. Stamopolu marsh</b>	68
<b>5. Rock formations, fiords, the cave of seals</b>	
<b>on Maslen nos</b>	68
<b>6. "Alepu" - sand dunes</b>	59
<b>7. "Perla" - sand dunes</b>	68
<b>8. Buffer area of Ropotamo reserve</b>	
<b>9. Unprotected areas according to the Defense of Nature Act.</b>	
<b>10. Sea water area</b>	

#### 1.1. PROVISIONS OF THE LAW

The Ministry of the Environment announces the protected natural objects and specified the regime of their using and protection.

Article 14 from the Defense Natural Act announced the natural objects which are of scientific, historic significance or cultural importance or which are distinguished for natural beauty, or recreation and tourism centers for protected.

Article 15 from Defense Natural Act fixes the following sights, characteristic landscape places, historic places as well as some plants and animals of value.

Article 16 from the Defense Natural Act announced the following places for reserved: detached localities or natural recesses with spectacular or scientific - valuable species living on these regions, as well as those ones which are threatened of extinction as well as those ones whose terrain shapes do matter for the science and their natural mode must be preserved.

It is not allowed any kind of human activities breaking the natural originality.

Article 17 from the Defense Natural Act announced some detached recesses which are distinguished for a wide variety and natural beauty and are of scientific, cultural, healthy significance and can be used as recreation and tourism centers, for the National Parks.

According to article 18 from the Defense Natural Act, geological, paleontological, botanical objects which are of great scientific, cultural, historic or aesthetic significance has been announced for natural sights.

Article 19 from the Defense Natural Act announced natural recesses which are distinguished for characteristic landscape, for protected localities.

The following territories are included in the boundaries of the Ropotamo Complex:

- The Ropotamo Complex, area 1000,7 ha
- The Vodny lilies Reserve, area 13,6 ha
- The Natural sights of the Alepu marsh, area 166,7 ha
- The protected area of the Stamopolu marsh, area 40,0 ha
- The Natural sights of the Maslen nos, area 17,6 ha
- The Natural sights of Alepu sand dunes area 12,0 ha
- The Natural sights of Perla sand dunes, area 24,0 ha
- The Buffer area of the Ropotamo Reserve, area 707,7 ha

### ***1.1.1. LAW STATUTE OF THE PROTECTED AREA***

**Ropotamo reserve** - announced by Order of the Ministry of the Environment N 318, May 7<sup>th</sup>, 1992. (published in the State gazette, 41, 1992), on the Strength of article 16 and article 22 from the Defense of Natural Act, to protect the habitats of 5 rare and threatened of extinction species and to preserve 1000,7 ha unique complex of natural places of inhabitants that are of International importance .

Ropotamo reserve covers:

346,2 ha area belong the forestry of "Ropotamo", Sozopol municipality

628,5 ha area belong to the forestry of "Ropotamo", Primorsko, including the Arkutino marsh - 62,2 ha .

Ropotamo river from the mouth to the bridge located on "Kaldarum getchit" place with 25,0 ha area.

"St. Toma" island (Zmiisky ostrov) situated on 1,0 ha area.

Any kinds of human activities are forbidden on the Ropotamo Complex area with the exception of:

- tourist travells organized along the Ropotamo river by boats
- getting out by fishing boats to the Ropotamo mouth when the sea is rough and keeping up fishermen's shelters.
- visiting with aid in knowledge on routes, given by the project for management.
- using the road passing between 485 and 486 sectors near the mouth of the Ropotamo river by native fishermen from October to December (during the fishing season)

**Vodny lilies Reserve** - by Order N 2080 on the 24<sup>th</sup> July, 1962, Central Forest Administration announced Vodny lilies covers 13,6 ha for reserve to protect the virgin nature of area, the unique beauty and the variety landscape of "Kaisheva shuma" place including water-lilies habitat and nice ash forest with dense relief. Any kinds of activities, breaking the virgin nature of locality are forbidden in this region.

The travelling is allowed on fixed paths only.

**Natural sights of the Alepu marsh** - by Order N 709 on the 22<sup>nd</sup> of July, 1986, Committee of the Environment Protection of the Ministerial Council announced Alepu-166.7 ha for Natural sights to preserve natural places of inhabits of protected and rare water swimming birds and the only one habitat of **Devil's nut**, living on the Black Sea Coast..

It is forbidden on the boundary of the Natural sights :

1. Building or other activities which can change the natural relief or its water regime.
2. Destroying of marsh plants and collecting the **Devil nut**.

3. Making a fire, destroying the reed other plants by fire.
4. Bringing and raising of vertebrates without permission given by the Committee of Council of Ministers or by Bulgarian Academy of Science.
5. Killing, catching and disturbing the birds, breaking their bird nets and collecting their eggs.
6. Fishing and hunting.
7. Polluting the water.

The following activities are allowed on the area of the Natural sights:

1. Pasture of domestic animals during out breeding season of the birds. (from April, 1st to June 30<sup>th</sup>)
2. Hay getting and traditional using of the cultivable land.

**Protected area of the Stamopolu marsh - 40,0 ha**

By the Order N 332 on May 16<sup>th</sup>, 1991, The Ministry of the Environment announced Stamopolu marsh for protected area to preserve the places of habitat of rare and threatened of extinction plants and animals.

Activities, which are forbidden on the boundary of the protected area:

1. Pasture of goats and pigs
2. Hunting.

The following human activities are allowed on the marsh area:

Stocking a pond with native breed fish, sports fishing from the side of the lake, by fishing rod from June 30<sup>th</sup> to March, 1st, cutting and making fire of the reed after agreement with the Ministry of the Environment or Bulgarian Academy of Science, as well as pasture and taking to water by cattle.

**Rock formations, the fiords and the Seal Cave on Maslen nos place, 17,6 ha.**

By Order N 4051 on 29 of December the Ministry of the Forests and Environment Preserve announced the rock formations, the fiords and the Seal cave on Maslen nos-place, which are beautiful, preserved coastal rocks with fiords, for natural sight.

It is forbidden on the protected area:

1. Feeling, trimming, eradication and damages of the trees.
2. Wild animals chasing as well as the chasing of their babies, breaking of their nests and dens.
3. The pasture of any cattle in anytime.
4. Opening the stone-pits, sand-pits, or soil-pits.
5. Breaking, scribbling and damages of land formations and rocks.
6. Clear and intensive feeling.

Sanitary feelings are allowed on this area.

**Alepu - sand dunes and Perla - sand dunes**

By Order N 2109 on December of 20<sup>th</sup>, 1994 the Committee of the Environment Protection of the Ministerial Council announced for natural sights:

- "Alepu" - sand dunes on 12,0 ha area;
- "Perla" - sand dunes on 24,0 ha area.

It is not forbidden on this protected region:

1. Building of any kind.
2. Opening of pits, prospecting and other activities which can change the natural character of the locality and its water regime.
3. Entering, camping, passing or parking by the vehicles.
4. Pasture of domestic animals.
5. Disturbing of wild animals, catching of their babies or eggs as well as breaking their nests or dens.

### **Buffer area of the Ropotamo reserve**

According to article 3 of Decree N4 and Order N 318 on May 7<sup>th</sup>, 1992 the Committee of the Environment Protection of the Ministerial Council announced Ropotamo reserve for buffer area. This reserve has total region of 707,7 ha.

The following activities are forbidden on this area:

1. Any kind of new building.
2. Pasture of goats and pigs.
3. Clear feelings and forestation with kind of trees not typical for the region.

It is allowed to do on the buffer area:

1. Using of the forests, as forests on special function.
2. Regulation of game numbers.
3. Using of pasture land, meadows and cultivable lands.
4. Using of beach-shore.

The total balance - sheet of the protected areas is: two reserves- total area of 1014,3 ha, one protected locality - 40 ha, four natural sights- total area of 319,9 ha and one buffer are - 707,7 ha.

### ***1.1.2. ANNOUNCING NEW PROTECTED AREA***

The area of Ropotamo Natural Complex includes the mouth of the same name with variety neighbour biotas of dense forests and marshes, mountain hills with broad-leaved forest on them, rocky sea-shore, coastal marshes reed massifs on the river sides and in the marshes, sand beaches with dunes, sea bays and a small island.

Ropotamo reserve, Vodny lilies reserve, "Alepu" and "Stamopolu" marshes, "Alepu" and "Perla" - sand dunes, the rocky and the fiord formations on "Maslen nos" and the Buffer area of Ropotamo Complex are announced for protected regions on purpose to preserve the virgin nature of locality and the habitats of the rare and threatened with extinction species.

This *Project for management* presents cooperation of all existing areas into one area

### ***1.1.3. PAST STATUTE AND FUNCTION IN THE PAST***

By decree of the Ministry of Agriculture and the State Properties N 957 on January 13<sup>th</sup>, 1940, on the grounds of article 20 of the Law of Forests, in connection of articles 1 and 2 of Law of Nature Protection, according to Proceedings on July, 10<sup>th</sup>, 1939 of Commission appointed on the grounds of Order N 298 on March 21<sup>st</sup>, 1939 and the Decree N 34 on November, 11<sup>th</sup>, 1938 of the Standing Forest Council and the Memorandum N 956 on January 18<sup>th</sup>, 1940, announced Ropotamo for conservation region in connection of article 25 of the Law of the Forests.

The protected area covers the Arkutino marsh and the Ropotamo river on 2000 dca, which are part of Sozopol municipal forest.

They are announced for natural monuments in Sozopol municipal forest:

1. Trees, bushes and plants in conservated area.
2. "Pool of Velyo" and 200 meters strip from all sides, belong to it.
3. Sand dunes in conservated area.
4. Spring the hazelbush.
5. Rocks.
6. All useful and harmful game - mammals and birds with the exception of the wolf and the poison snakes.

A part of Primorsko municipal forest covers: lyparskia dense forest, Buhovo gnezdo, Kaleto, Krastava kabatchast and Ropotamo river with total area of 3000 dec. According to article 3 of the Decree of Nature Protection and on the grounds of Decree on January 31<sup>st</sup>, 1956, the Council of Ministers specified the protected area as a reserve - natural monument on total area of 2540 ha.

By Order N 2080 on July 24<sup>th</sup>, 1962 (Published in State Gazette N 71 on September, 4<sup>th</sup>, 1962), Central Forest administration crossed out Ropotamo protected natural object from the category "reserve" and put it in the category "National park" on area of 846,9 ha. According to the same Order some recesses of the Ropotamo National park which were of interest for the science, were announced for reserved to protect their virgin nature of locality.

1. Sector N 250 on total area of 966 dca, including Arkutino marsh on 344 dec.
2. Deposit of sea-wormwood under sector 1 from 14 on area of 140 dec.
3. Water lilies in place of "Kaisheva shuma", sector i244, letter "1 and 2", on area of 86 dca and one part of sector i245 on area of 50 dca, including the region between path and the forest on total area of 136 dec.
4. Zmiisky ostrov - situated opposite the Ropotamo mouth 200 m faraway from the shore, on the area of 10 dca.

By Order N 4051 on December, 29<sup>th</sup>, 1973, on the grounds of article 18 and 22 of the Law for Nature Protection the Ministry of the Forests announced for natural sights:

- The Ropotamo mouth, situated on the area of Ropotamo National Park, sector 453-2 in Forestry, Bourgas town on area of 7,7 ha.
- Rock formations, the fiords and the seal cave on the place of "Maslen nos", sector 495 - 1,2 on total area of 17,6 ha in Forestry, town of Bourgas.

By Order N 1427 on May, 13<sup>th</sup>, 1974, the Ministry of Forests and the Environment Protection announced rock formation called: "Luvskata glava" in "Kaletu" - place for natural sights on grounds of article 18 and 22 of the Law for Nature Protection. This mentioned rock formation is situated on the Ropotamo National Park, a part of sector N 481-a on area of 0,5 ha in Bourgas Forestry.

#### ***1.1.4. VIOLATIONS OF THE LAW***

About 5000 dca area of Ropotamo Complex was announced for protected with reserved statute in 1940.

In 1962 the reserved area was reduced to 1252 dca. It was the beginning of the crisis moment, followed by those violations of the law:

- Building of "Lilia" camp with capacity about 3000 tourists on Ropotamo National Park in the 60ies years.
- Building of "Arkutino" camp for 2000 tourist capacity on Ropotamo National Park in the 60ies years.
- Unpurification of every day faecal waters, rising from the camps, mentioned above. Now the camps are liquidated.
- Coming into the protected areas by the tourists, illegally picking of the wild flowers as well as illegally collecting of the reptiles by the foreigners.
- In 1978 giving up the area of 336,6 ha of Ropotamo National Park to UBO for building of intensive game reserve.
- By building of Perla government Residence, one part of National Park became a game land.
- Building of asphalt roads on this area.
- Overpopulation by game, hunting on this area, building of hunting towers.
- By Resolution N155 in 1984 the Bureau of the Council Ministers gave up 148,9 ha area from Ropotamo National Park for great-educational-recreational complex building, which hasn't finished yet.
- That building was wanted of water-supply and high voltage. The road passed through Ropotamo National Park was built.
- Actually the right side of Ropotamo river is used as a game land and the left one - for the building.
- The river has been used for rowing since 1962 and stop being reserved area.

- 1962-1992 was a period of degradation by building of camps, parking lots, game roads, government residence and etc.
- Ropotamo set a typical example for violation of nature-protective legislation.
- In bays of Alepu, Arkutino, Stamopolu rubble groins has been build. They break the normal sea-streams near the sea-shore and cause a lot of sand pilings around them.
- In the end of 80ies years the road had been built illegally. It connects town of Primorsko with "Perla" Residention and separates Stamopolu marsh from the sand dunes and sea.
- In 1990 the asphalt road had been built. It connects Alepu marsh with Arkutino marsh and passes through Ropotamo National Park area.
- In 1990 the dig workings were done, and the road-bed from Sozopol to Alepu was formed, to the west of the marsh without permission for building and without building permission.
- It was allowed illegally ramshackle buildings near Ropotamo mouth, on the reserve area.
- "Novo Panicharevo" - artificial lake has been built. It collects Ropotamo river waters, using for drinking needs.
- Sand theft, breaking of dunes and polluting by building waste.
- Illegally built asphalt road from Bourgas harbor Complex to Ropotamo Complex.

Counting the alarming situation of the Ropotamo Complex on time the representatives of the Ecological.

Institute in Sofia tried attempt to save the reserve ever since 1975 .

In 1992 the Ministry of the Environment did the procedures on announcing the Ropotamo reserve as increases its area 5 times in comparison with the area announced in 1940.

In 1970 it was made an attempt for park-planning project of the National Ropotamo Park. This project was worked out in 1979 but it didn't see the light of the day because the understanding of the government system.

### ***1.1.5. INFORMATION ABOUT THE PROTECTED AREAS INCLUDING THE ROPOTAMO COMPLEX.***

The Arkutino marsh, Ramsar place from 1976, damp zone of International importance and inhabitation place for water - loved birds.

The Alepu marsh - ornithological damp place/ ODP/ code 015

Ropotamo - written on the UNO list for National Parks and other protected areas.

The Ropotamo Complex is offered to be a zone of European conservation importance.

## **1.2. EXISTING STRUCTURE OF MANAGEMENT**

### ***1.2.1. ORGANIZATIONAL STRUCTURE AND ADMINISTRATION***

We cannot talk about one unified structure of the Ropotamo Complex because it is speaking of seven different protected areas.

The Ministry of the Environment carries out a general *management* and control under the managing, restoration and preservation of the protected objects in Bulgaria.

Juridical base is the Law for Protection of the Nature - article 24 (Statutes book for putting into practice of the Law for Protection of Nature - article 34, Decree of the Council of Ministers N 14 in 1992, Appendix article 4, point 4) is a juridical base.

The management powers of the Ministry of the Environment on paragraph 1,15 are completed by the following law and sublaw texts:

- article 27 from the Law of Nature Protection - permission of building on the protected natural sights area.
- article 18 - drawing up of special Decrees for Protected Natural objects.
- article 28 - activities, which change or endanger the protected natural objects.

- article 32 - drawing up of special planning projects for natural sights that are important for the science and economy .
- article 34 - regulating the visitings in the protected natural objects.
- article 37 - state control and coordination between the departments of the natural protection.
- article 39 (2) - opening of researching basis and etc.
- article 5 from the Law of Nature Protection fixes that the landowner is a master of the protected area.
- article 26 from the Law of Nature Protection fixes the duties of the landowners to preserve the protected natural objects.

According to Statutes book for putting into a practice of the Law of Nature Protection:

- article 27 - the owners of the protected natural objects must look after and preserve them as well as to inform the Ministry of the Environment about all changes happened on the protected areas.

According to the Law of the Nature Protection and the Orders for announcing Protected areas, the keeping and preserving organizations in the Ropotamo Complex are:

- **The Ropotamo reserve** - its area is exclusively state property, managing by: National Management of the Forests to the Ministry of Agriculture Forests and agricultural Reform - state forest fund.

The Ministry of Culture given to it areas by the - Resolution N 155 of the Bureau of the Council of Ministry on 10 February'1984.

The Ministry of Agriculture Forests and Agricultural Reform - the Ropotamo river.

- **The Buffer area of the Ropotamo reserve** - managing by: National Management of the Forests to the Ministry of Agriculture Forests and agricultural Reform - state forest fund.

The Ministry of the Culture - the territory included in the boundaries : - in the East - the sea; in the West - Sozopol-Primorsko road bed in the North - Andrea bair and in the South - the base of the big sand dune, including the frontier of the Ropotamo reserve.

- **The "Vodny lilies reserve"** - managing by Ministry of Agriculture Forests and agricultural Reform - state forest fund.
- **The sand dunes. of "Alepu" and "Perla"** - their areas are exclusively state property; they are managed by Regional Manager of the Bourgas District according to the Law of the State property.
- **The Maslen nos** - National Management of the Forests to the Ministry of Agriculture Forests and agricultural Reform - state forest fund.
- **The Alepu marsh** - the largest part (marshy) is exclusively state property that is managed by Regional Manager of the Bourgas District according to the Law of the State property. The private property on the agricultural lands is coming to restore.
- **The Stamopolu marsh** - its territory is exclusively state property that is managed by Regional Manager of the Bourgas District according to the Law of the State property.

There is a complicated administrative structure in Bulgaria, because the owners of land must preserve the protected area and from the other hand, the Ministry of the Environment must control this area, carrying out the state control.

Two purposes were achieved by founding the Regional Inspection for the Environment for National Parks as well as founding Management office to the Ministry of the Environment, concerns "Sreburna" reserve.

In the "Sreburna" reserve, the functions including managing and the preservation are taken from the landowners of protected area and given to the Ministry of the Environment.

Structure that controls on place, was determined to watch powers of the Ministry of the Environment and was built by the Regional Inspections for the environment preserving.

Bearing in mind the crisis condition (missing of financial funds) and ineffectiveness of the existing Regional Inspections, the new-created Parks and Inspections are given territorial rights for activity.

By Order N RD - 49 on February, 7<sup>th</sup>, 1997, the Minister of the Environment gave a task to Regional Inspection for Environment "Stranja" to control all protected areas in the Ropotamo Complex, as well as unprotected forest fund in the Complex. In this way, the seven protected areas are under the direct control of the Regional Inspection for the Environment to the Strandja National Park and the Ropotamo reserve and its Buffer area managed and preserved by the authorities of the Committee of the Forests and of the Ministry of Culture.

Actually the two damp areas (Alepu and Stamopolu marshes), the two sand dunes (Perla and Alepu) as well as Ropotamo river, are left without food and managing.

### ***1.2.2. STAFF AND DUTY***

The specializing Inspection "Stranja" on head office in Primorsko, carries out common guidance and control under the managing, restoration and preservation of the protected areas in Strandja mountains region, according to article 24 from the Law of Nature Protection.

This Inspection controls Ropotamo Complex by Order N RD -49 on February, 7<sup>th</sup>, 1997 of the Ministry of the Environment.

The Inspection has staff, which includes: one director and three experts respectively: for forests, hunting, fishing and protected areas, for territorial planning and building, and for protection of bio-variety.

Ropotamo Forestry discharges its duties, including preserving and managing the protected areas in the Ropotamo Complex as following:

- By written Order, the director of the forestry fixed engineer-forester being responsible for the protected natural objects in the region of forestry, to fill the register of the same objects and to complete the dossier of each object.
- A servant has been appointed to guard this objects, to follow standing by the regime in them and to sanction the violators.
- A servant has been appointed to take the tourists to the Arkutino marsh.
- Tourist routes along Ropotamo river by boat has been done by the guide.

The Ministry of the Culture appointed four uniformed policemen being responsible for the guard of the protected area.

### ***1.2.3. BUILDINGS AND EQUIPMENTS***

A great number of buildings and appurtenances, existing on Ropotamo Complex area, are built illegally

- illegally wood-buildings on Ropotamo river side, near the mouth.
- illegally buildings by Ropotamo river wharf.
- ugly ramshackles in Arkutino place, near the new building.
- illegally built road, connecting "Perla" and Primorsko town.
- storage accommodations on "Perla" regions.
- half- in ruins fishing building and ruins from the military buildings near "Ropotamo" mouth.
- digging works to build the bed-road of Sozopol-Arkutino in the West of "Duni" Vacation village.
- illegally built asphalt road on the Andrea bair hills.
- motel and restaurant in Arkutino place.
- new building of educational-recreational Complex on "Andrea bair", on the buffer area of Ropotamo reserve.
- "Perla" Interhotel (ex-Residence of "Perla").
- hotel, which is being built now with 150 beds in "Perla"

#### **ROPOTAMO PROJECT Management Plan**

- solid fence, circled the area of "Perla" - ex-Residence, and passing through the Ropotamo reserve and its buffer area.
- holiday house "Ecoterm".
- solid structure in the west of "Stamopolu" marsh
- cooperative farm with buildings which belongs to the "Ropotamo" Forestry near the Ropotamo bridge.
- administrative building of "Ropotamo" Forestry with auxiliary buildings.

## **HYSICS CHARACTERISTICS (ABIOTIC FACTORS )**

### **1.3.CLIMATE**

#### ***1.3.1.NATIONAL CLIMATE***

The climate of Bulgaria is determined of geographical position in the South part of temperate latitudes.

In Bulgaria the characteristics features of climate are formed under the influence of series main factors. In the first place is the location of the country in comparison with the common atmospheric circulation, the nearness of Bulgaria from the Mediterranean, its closeness from the Black Sea and its situation in comparison with the Atlantic Ocean.

The variety relief of Bulgaria, the directions of the mountains their height, the degree of afforestation and etc., are important climatic-forming factors.

Black Sea has influence on narrow shore strip 20-40 km in Width.

The Bulgarian territory can be separated into five climatic regions:

- region of temperate continental climate;
- region of transitional continental climate;
- region of transitional Mediterranean climate;
- mountain climatic region;
- Black Sea climatic region.

In Bulgaria, an average annual temperatures is 10,5°C, in North Bulgaria it is 10°C, In South Bulgaria - 13,5-14°C

The minimal temperatures are in January. In North Bulgaria 1 -2°C, in South Bulgaria +2, +3°C.

The absolute minimal temperatures reach to -35°C.

The absolute maximal temperatures go beyond +40°C on shade.

Measuring the highest temperature - + 45°C, 2°C, Sadovo, 1916

The average temperature in July for all country is between 20-25°C.

The average annual rainfalls for the country are 698 mm.

- for plain and hilly regions between 450-850 mm.
- for mountain regions between 850-1200 mm.

#### ***1.3.2.REGIONAL CLIMATE***

The Bourgas region gets into Black Sea climatic region. Black Sea has influence on the climate of a narrow shore strip on 20-40 km in width.

An average annual air temperature for the country is 10,5°C but for the region it is 12,7°C.

Average annual rainfalls for Bulgaria are estimated to 698 mm and for Bourgas they are estimated to 543 mm.

Typical winds are:

- northwest and north winds in the Winter.
- east and west winds in the Summer, as well as the sea breeze

#### ***1.3.3. CLIMATE IN THE ROPOTAMO COMPLEX***

The region of Ropotamo Complex is not researched with respect to climate.

The climatic norms for Sozopol and Tsarevo points calculated in the period of 1931-1970, are on the table bellow:

**ROPOTAMO PROJECT Management Plan**

**AVERAGE MONTHLY RAINFALLS**

Place	I	II	III	IV	V	VI	VII	VIII	IO	O	OI	OII	Average annual rainfalls
Sozopol	46	40	38	38	39	41	25	22	35	52	64	54	494
Tsarevo	67	53	57	45	46	42	27	29	44	77	88	80	655

**AVERAGE MONTHLY TEMPERATURES**

Place	I	II	III	IV	V	VI	VII	VIII	IO	O	OI	OII	Average annual temperatures
Sozopol	3.0	3.8	6.0	10.6	15.9	20.7	23.7	23.5	20.3	15.8	11.0	5.0	13.3
Tsarevo	3.2	4.1	6.2	10.5	15.5	20.2	22.7	23.0	19.8	15.3	10.9	6.2	13.1

**AVERAGE MAXIMAL TEMPERATURES**

Place	I	II	III	IV	V	VI	VII	VIII	IO	O	OI	OII	Average annual temperatures
Sozopol	6.0	7.2	9.3	13.9	19.3	24.3	27.0	27.2	23.8	18.7	13.9	9.0	16.6
Tsarevo	6.4	7.7	9.7	14.5	19.5	24.2	27.1	27.1	23.6	18.8	14.4	9.5	16.9

## AVERAGE MINIMAL TEMPERATURES

Place													Average annual temperatures
	I	II	III	IV	V	VI	VII	VIII	IO	O	OI	OII	
Sozopol	0.0	1.0	2.9	7.0	12.3	16.8	19.3	20.1	16.7	12.1	7.7	3.1	9.9
Tsarevo	-0.2	0.5	2.6	6.8	11.7	15.9	18.3	18.5	15.3	11.7	7.4	2.8	9.3

I

Sozopol gets in the driest region of the Black Sea Coast, Tsarevo - in Stranja coast.

We can expect more rainfalls on Ropotamo Complex area than these, measured in Sozopol, and less rainfalls than these measured in Tsarevo. They are 494 mm in Sozopol. They are 655 mm in Tsarevo, and the average annual rainfalls for our country are 698 mm

The peak of Tsarevo rainfalls is Mediterranean on heaviest rainfalls between October and December. This is valid for Sozopol too.

But while there are 245 mm rainfalls for these three months in Tsarevo, in Sozopol they are 170 mm for the same period of time.

The biggest difference in average monthly temperatures between Sozopol and Tsarevo is 1,0°C but the difference in average annual temperatures is 0,2°C.

Both of the two regions there is no month when the difference as regards of average monthly temperatures are higher than 0,6°C.

It means that there is no difference in average monthly maximal temperatures and they are all the same for Ropotamo Complex region also.

1,6°C is the highest difference between average monthly temperatures of Tsarevo and Sozopol.

In Ropotamo Complex the highest average monthly temperatures can be expected in July and August 27-27,2°C temperatures are taken in the both points.

The difference is from 0,0°C to 0,2°C between average monthly temperatures.

The mezoclimate of Ropotamo Complex region must be researched because the climate of this area is not explored until now.

Typical winds are northwest and north winds in winter and east and west in the summer as well as sea breeze

### 1.4. GEOLOGY AND GEOMORPHOLOGY CHARACTERISATION AND PROCESSES

The territory of the Ropotamo Complex belongs to the Srednogorska tectonic zone. It is fill with the Upper Cretaceous sediments and vulcanites lain on the Stranja tectonic zone. The structural plans show up in tectonic development of Srednogorska zone. They are middle Alpine that concerns Upper Cretaceous rocks and Later Alpine which is relevant to Neotectonic development of the area.

The negative movements of the shore have predetermined the formation of drown valleys, firths and lagoons. These movements are going on now too since the sinking is 1 mm in the region of Complex. The uneven sinking has an affect on the asymmetry of water-catchers that are in the sea-side of Black Sea rivers. The left water-catcher of the Ropotamo river is two times larger than the right one in its mouth part

#### **1.4.1 -1.4.2.MASSIVE ROCKS. SEDIMENTARYROCKS (SEDIMENTS)**

Lithostratigraphical units building the region of the Ropotamo Complex take considerably wide chronostratigraphical range from Upper Cretaceous to Quaternary.

The following Litho- and chrono -stratigraphical units are ascertained in the range of the considered territory: Upper Cretaceous sediments, Volcanic and Intrusive rocks, Neogenic sedimentic rocks and Quaternary formations. The borderlines of the lithostratigraphical units are shown on the geological map.

Sedimentic and Volcanic rocks differentiated by lithostratigraphical principle in two groups: Michurin's (volcanogen) and Bourgas (predominant volcanogen) participate in the region, in the section of Upper Cretaceous. They are in complicated relationship with respect to space and time. The Upper Cretaceous includes also secant magmatic subvolcanic and injection bodies that are fitted into different levels of Upper Cretaceous stratumline.

The neogenic sediments are widely spread to the North - in the region of the damp zone of Alepu and to the South,-South-West - in the water catcher of the damp areas of Stamopolu. It is presented by the sediments of the Galat's suite, and the Evksinovgrad's suite and unevenless Neogen-Down Pleistocenic sediments. The Quaternary deposits are met in the rivers' valleys, the rivers' are of Holocene age. The Quaternary deposits by their genesis are: alluvial, diluvial, proluvial, lake-marshy and sea. The alluvial, lake-marshy and sea formations are of utmost significance.

The alluvial deposits are related to low bay terrace of the Ropotamo river mainly and to rivers and gullies.

They are widely met in the mouth part of the Ropotamo river and Vodny lilies reserve.

The lake-marshy formations are as a result of forming and development of Alepu lagoon, Arkutino lagoon, Stamopolu lagoon and the firth of the Ropotamo river . This fact explains the widely spreading of them in the region. They cover the regions between Alepu, Arkutino and Stamopolu and sea shore line. The sea sediments shape the beach near the mouth of the Ropotamo river. The sea sand is fixed in the depth and considerably far away from the sea shore where they are related to evolution of sea shore line in connection with tectonic movements

#### **1.4.3. GEOMORPHOLOGY**

The territory of the Ropotamo Complex is bounded by North and North-East Stranja mountain spur and South-East enclosure part of Bourgas lowland. These great morphostructures have left their profound imprint on the formation of geomorphological features of the terrain.

The region including damp zones of Alepu, Arkutino, Stamopolu, Vodny lilies reserve and near-mouth parts of the Ropotamo river, is distinguished by complicated plan. The complicated geology-tectonic conditions and first of all the presence of fold and block-failure structures have a principal role.

The territory has gone through long and complicated evolution and it has been path for series geological processes slow rate of the process that build the structures is being seen in the present stage of morphostructures development. The negative and positive partly earth's cruses movements and related to them abrasive-advance activity of sea waves are especially characteristic. The sea waves are the main power of the modern morphological process.

The sea terraces are the main element of the thalogenetic type relief (fig 2). The whole Complex of terraces covers narrower or wider strip (up to 4 km) which is disconnected on some places by the sea. There is difference about parameters for individual terraces in the understanding given by different authors that have researched this part of Bulgarian sea shore.

The working of Bozkova and & (1990) presents more rational and modern treatment of this problem. According to her the sea terraces are determined into 8 groups with corresponding their height 110-120 m, 50-65 m, 35-45 m, 20-25 m, 10-15 m, 4-5 m 1.2-2 m. Alepu, Arkutino, Stamopolu are lagoon lakes on aqial subaquial type of landscape - subtype - lakes and marshes

### **Geomorphology of dunes and sand beach strips in the Ropotamo Complex**

The sand beach strips and dunes that separate Alepu, Arkutino, Stamopolu lagoons and firth of the Ropotamo river from the sea (fig 2) are ones of the most widely spread.

The opening of the beach strips to East-North-East gives them possibility to be get-at-able for strong North, North-East and East wind. That is why their middle and South parts are of dune relief. The dune's banks are of different height. The highest are characteristic of Arkutino and Ropotamo regions (up to 50 m) where these dunes are probably younger than these in Alepu (high 7-8 m).

Stoyanov, Gurov and Spassov (1997) launch for Stadial Character of moving done by the mouth of the Ropotamo river in recent geological past and the relation of this moving to deflation process, i.e. dunogenesis but specialized researches have not done. Everyone of the sand-dunes strips has its specific characteristic that is expressed by configuration, exposition, coefficient of segmentation, relief, mineral and grainmetric composition, lithodynamic of sand alluvium.

### **Ropotamo reserve**

#### **A) Sand-dune strip separating Arkutino lagoon**

It cover's vast territory (about 0,9-1,0 km<sup>2</sup>). It is built of well sorted alevrit sand out with considerable quantity of white transparent quartz. Heavy fraction is about 7-8%. The carbonate content in beach sand is 35,7% and in dune sand - 33,7. The coefficients of segmentation of the bay and of the beach are correspondingly 1,31 and 1,12.

To the West and South-West from the beach strip complicated dunes are formed as the dunes by parabolioic crest predominated.

The relief is outlined by four lines of dunes since the biggest dune in Bulgaria - 50 m high is located on the South-East part. Most of the dunes are orientated towards 165° (the direction in which winter wind predominates). 26% of the frequency of wind are fall to them. They have not formed the dune banks only but they have moved the sand from strips on the abrasion terraces in senonic-vulcanogenic complex.

#### **B) Sand strip to the West of the mouth of the Ropotamo river**

It is built of close (fine) sand. The carbonate content is 37%. The heavy fraction is 7,1%. It consists of epidote amphibole and isolated grain of hematite that color the sand in dark. Towards the mouth of the river, the sand became in alevrit as the heavy fraction reduces five times because the clay component increases. The coefficients of segmentation of the bay and the beach are correspondingly 1,64 and 1,06. Two lines of dunes are formed to the South and South-East. The vast low land is formed between the two dune banks.

#### **Natural sights "Sand dunes in Alepu locality"**

The beach-dune strip separating the Alepu lagoon from the sea is about 200 m wide. The coefficients of the sedimentation for the bay and for the beach are correspondingly 1,35 and 1,1. The sand building the beach strip is medium sand since the fraction 0,1-0,5 mm is about 70%. It consists of destroyed periwinkles' and mussel's shells mixed by white transparent quartz with medium round grain. The heavy fraction is 1,8%. The carbonate content is over 55%. This fact can be explain by presence of optimum conditions for mussels living on underwater cliffs. Parallel with sea beach, as a

result of coastal wind activity, dune sandy bank is formed that is 7,90 m high and is in 165° directed. Main factor determining the present relief is predominant strong East and East-North wind which takes 60% of all attack wind. The wind's velocity can reach up to 15 m/s causes the moving of dune sand and reforming of dunes that are on smaller size.

**Natural sights "Sand dunes in Perla locality"**

The sand beach strip built of close fine sand is formed to the East of Stamopolu lagoon. The fraction 0,5-0,25 mm takes 74%. Towards the South direction, the sand became in component predominates (carbonate content reaches 60%). The contents of heavy minerals is too limited - 0,8-1,0%. The coefficient of sedimentation for the bay and the beach are correspondingly 1,30 and 1,12. The strong North-East wind has moved the sand towards the inside of the dry land more than 600 m. The zone between the lagoon and beach strip is characteristic dune landscape. In some places the dunes are lie on calciferous sandstones.

The crests of the highest dunes are 19 m in height above sea-level and in 35° directed. They are formed by South- East wind which velocity sometimes is over 15 m/s in December.

The dunes in the region of Stamopolu lagoon obviously are not connected with the Ropotamo river

#### ***1.4.4. HYDROGRAPHY, HYDROGEOLOGY AND HYDROLOGY***

##### **Hydrography**

The surface run off in the considered region is as result of many factors influence first of all are physic-geographical and geologo-lithological.

The absence of any supported hydrometric system makes difficult the explaining of the stream's regime.

##### ***The Ropotamo reserve***

##### **A) The Ropotamo river**

The only one larger river, that is 48,5 km long, and its water-catch area is 248,7 km<sup>2</sup>. IT springs at about 300 km far from Bosna peak. In its upper part it is called Tserovska. The water-catcher is characterized with low sea-level. The Peak of Bosna is 454 m high and the highest peak of Meden rid is Bakarlaka. That is 384 m high.

The Ropotamo river collects a lot of water from the slopes of South-West Bakarlaka peak.

The main discharge is formed at a height of 100-300 m. The water-catcher is characterized by good afforestation - 60-65%. The module of annual surface run off is within the framework of 3-5 (l/s)/km<sup>2</sup>. The internal annual distribution of the run off is: Winter 1,0-1,5 (l/s)/km<sup>2</sup>; Spring 1,0-2,5 (l/s)/km<sup>2</sup>; Summer - below 0,4 (l/s)/km<sup>2</sup>; Autumn - 0,5-1,0 (l/s)/km<sup>2</sup>.

The main discharge flows in Winter- Spring half year.

With regard to coefficient of variation of the annual run off region belong to areas having the highest value of this index - over 1. In the same time the run off coefficient is the lowest in our country - below 0,1. In same time run off coefficient is the lowest in our country - below 0,1.

High water period lasts about 4 months. The middle date for beginning of high water period is in January-February and the middle date for its ending - in April-May.

At all the region has unstable high water period. 60-70% of the annual run off flows during the high water period. The low water level lasts 2-3 months. It starts in July and ends in September. Only 3-5% of the annual run off flows during this period. The average duration of the drying up is 75-100 days and highest in the year in natural conditions.

With regard to coefficient of variation of absolute minimal run off, the region has the highest in Bulgaria value - above 1,5. The middle date this absolute minimum being appeared is the earliest in Bulgaria - from August 1st to August 10<sup>th</sup>.

The average annual temperature of rivers' water is the warmest in Bulgaria - above 12<sup>0</sup>C. In April the temperature of rivers' water is 8-10<sup>0</sup>C, in July - above 22<sup>0</sup>C in October - above 14<sup>0</sup>C. The average annual turbidity of rivers' water is from 100 to 500 g/m<sup>3</sup>. The module of the floating silt is below 100 t/km for 1 year.

All the rest rivers in the region flowing in Black Sea directly are up to 10 km long and have water-catch areas below 50 km<sup>2</sup>. They are of drying up run off regime in their near-mouth areas. In the same time they have important contribution to water balance forming in the damp areas of Complex because entering into Quaternary-Neogenic sediments these rivers lose their underground run off and feed them undergroundly.

## General Meteorological information on months

### *The Ropotamo river, discharge on months -qm<sup>2</sup>/sec*

Jan.	Feb.	March	APRIL	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average annual
2.25	3.34	2.53	1.37	0,9	0.45	0.11	0,095	0,104	0.37	0.8	1.86	1.18

### *The Ropotamo river - average -monthly water level.1961-1970*

Jan.	Feb.	March	APRIL	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average annual
101	112	108	96	92	77	79	107	81	78	83	92	91.8

Average-monthly level elevation to 0 is 23 cm under main leveling according to the Black Sea system.

#### **A) Arkutino marsh**

Total area of the firth - 1,16 km<sup>2</sup>. Water area - 0,03 km<sup>2</sup>. Minimal as the water depth of the marsh - about 0,5 m.

The water stand is considerably lower in periods of absolute minimums as the water mirror is nearly disappears when too long dry periods have set in.

In water high-level water from the marsh flows towards the sea on channel located in the South- East. Because of the remoteness of the marsh from the sea, the higher elevation of water level in it, its specific oval shape and considerably higher underground tributary, the sea water cannot penetrate into the water basin and to has influence on the salt regime of the damp zone. That is why Arkutino's water is always fresh.

**2.The Vodni lilies reserve** - not researched specially.

#### **3. The Natural sights of "Alepu marsh"**

In essence these are two connected one by another water areas Alepu - North and Alepu - South. Their depth rarely exceed 1 m. The maximal depth that can be reached in water low-level periods is 0,8 m since the depth is about 1,5-2,0 m in water high-level periods.

The connection between Alepu - North and Alepu - South is embarrassed and two separated water basins are formed in the periods of absolute minimums. The two marshes are separated from the sea shore by sandy strip that is 50-200 wide.

The water area of Alepu is 10-12 km<sup>2</sup>. In the near past the marshy area was larger in its North- West part. According to Popov (1974) there were two small marshes overgrown by reed on 0,35 km<sup>2</sup> total area. These marshy areas don't exist now because of building the draining system that reduces sea area. This system is not maintained now but the equipment goes on draining the North- East part of the region.

This area is an integral part of the damp area and its eliminating has changed the ecological balance of water system.

Now the natural connection between the sea water and the water basin is realized by engineer equipment with valve, built under the Bourgas-Achtopol road. The fresh water is allowed to flow away towards the sea by this equipment when the water stand is high in the marsh but the feed back is nearly impossible. The penetration of the sea towards the dry land is impossible only cross the sandy strip if there is low or reversed hydraulic gradients.

#### **4. The Natural sights of "Stamopolu marsh"**

The water area is about 0,6 km<sup>2</sup> in natural conditions. The marsh is separated from the sea by sand strip and dunes taking considerably area. The remoteness of the damp area from the sea is 200 m. The fluctuation of water level in the marsh is 0,7 m as the average values corresponds with sea level. The surface water-catcher area is 6 km<sup>2</sup>. It is possible that the surface water-catcher area and underground water-catcher area do not coincide.

The natural water regime of the damp area has endured deeply anthropogenical disturbances in the last 30 years.

Dike dividing the damp area into two parts - Stamopolu- North and Stamopolu-South is piled across the marsh near its North part.

The hydraulic connection between the two parts is possible the popes laid on the basis of the dike.

In the past when there was water high-level, the marshy water flowed away towards the sea on channel laid in the North part of marsh. This natural surface connection is disturbed by frequent sandy clogging.

In 1983-1985 the drainage was over dug up and a line of twelve pipes on ø 200 mm and one pipe on ø 400 mm were put in it. And one pipe on ø 1000 mm were laid under them.

The channel is equipped by gate. The pipe capacity of the equipment is too high and it is possible all the water to be drained for a short time. The whole capacity is not used till now. When there is high water level, the upper pipes line open only.

### **Hydrogeology and Hydrology**

The variety of the lithological compound and structural conditions in the region of the Ropotamo Complex determines the presence of various types of underground water with respect to character of leaks where the water is accumulated and with respect to hydraulic conditions.

Two types of underground water are met in the region depending on lithological characteristic and physical condition of collector leaky and pore.

The characteristic of the hydrological conditions is done on information given by hydrological mapping (1960, 1982, 1984, 1996), geoelectric research (1996), drilling (1962, 1987), laboratory researches (1962, 1982, 1984, 1987, 1996) and field filtration tests (1962, 1987, 1996).

#### **Leaky water**

Leaky water are widely spread in the territory of Ropotamo Complex. They are related to deeply fissured and failure rocks of upper cretaceous and Neogen age. There are ascertained two kinds of water depending on depth of bedding - water with shallow circulation and water with deeper circulation.

**Leaky water with shallow circulation.** It is accumulated in zone of regional fissuration and rock's weathering (up to 20-25 m on depth). The high heterogeneous and anisotropy of leaks in the rocky massif hinder forming of general water-bearing stratum.

Moving of underground water is realized on isolated leaks and zones. It is drained on different elevations in the form of many descending springs underground - in sands of Cretaceous age, underwater - in the area of Black Sea. The springs are of low flowrate - 0,01 - 0,025 l/s, and rarely - above these values. The feeding is done by the filtration of rainfall. During the dry period some from the small springs dry up. Larger springs (over 0,1 l/s) are caught as a fountains used for watering-places or for potable water (These are the springs as Kapacliata, Golemiyat vriz, Blagiyat vriz and etc.)

The low flow rate of the springs determines the low water, saturation of the water-bearing structure and limited natural resources. The module of the underground water is below 1 (l/s)/km<sup>3</sup>. The coefficient of filtration is within the frame of 1-3 m/d.

The leaky water is of changeable regime following the season's climatic changes. The water is fresh, general mineralization is up to 0,3-0,4 g/l, hydrocarbonatic-calcium, soft to mean hard (by Kluf classification), on 10-15<sup>0</sup>C temperature.

**Leaky water with deeply circulation.** A part from Bourgas water pressure system. They are attached to upper cretaceous structural level of Voden's synclinal. Underground water accumulated in tectonical disturbance zones, have slower water interchange. Which is on different speed depending on the hydraulic conceitedness of the different zones and levels. The water is from weakly up to Strongly metamorphosed from hydrocarbonatic - sodium up to chloride-sodium on type with general mineralization from 0,7 to 6 g/l reaching on extremum values - 12,0 g/l. The water varies from soft to very hard with considerable low content of Calcium (from several to 70 mg/l) and pH>8,5 and carbonate aggressive. This kind of water is ascertained by deep hole in the region of Maslen nos.

The researches done to this stage show that the leaky water on the area of Ropotamo Complex of low water saturation and unperspective for different water supplies. It is of great significance as an optimum regime where local flora and fauna live as well as an income element from the water balance of Alepu, Arkutino, Stamopolu marshes.

#### **Pore water**

In the region of the Complex main collector for the pore water are the disconnected deposits ( sand and gravel). They are ascertained in all types of Quaternary formations Depending on the specific steric relations and hydraulic connection of the disconnected deposits of various genesis we distinguish underground water in the alluvium and underground water in the lagoons sea deposits.. On the territory of the Complex one satisfactory alluvial water-bearing stratum is formed in the deposits of the Ropotamo river but in lagoon and sea formations - several coastal water-bearing strata are formed.

#### **Alluvial water-bearing stratum**

It is to the west of the Ropotamo gorge (near the sea) about 10 km upstream and it is 0,5-1,0 km wide. This stratum is formed in alluvial gravel and sand (3-5 m in thickness) that are recovered by silted sand, sandy clay and clay and by peaty and sludge - near quay.

It occurs on variegated, deeply fissured rocky bed of Upper Cretaceous and Neogen age. The general thickness of the alluvium varies from 12 m in Velyov vir section (Vodny lilies reserve) to 21 m in the furthest East parts of water-bearing stratum. The underground flow varies from free flow to semifree flow and is hydraulically connected by the river. The river feeds underground water in the West parts of the stratum but in the last ones (in the gorge) - the river drains the underground water. The feeding up is realized not only by river water but by rainfall, peaky water drained by the bed and the slopes. Semifree character of underground flow in the zone of draining causes local marshes.

The conduction of the alluvial water-bearing stratum is about 200-500 m<sup>2</sup>/d. The minimal dynamic underground flow rate is about 90-100 l/s. The underground water is

fresh, 0,5-0,9 g/l general mineralization. The water varies from mean hard to hard. hydrocarbonatic-calcium.

### **Coastal water-bearing strata**

They are formed in lagoon and beach deposits in the area of Alepu, Arkutino, Stamopolu marshes and belonging to them regions as well as sediments (alluvial, lagoon and beach) of drowned in Halocen valley of Ropotamo river.

On the basis of existing information and according the data given by hydrogeological mapping and geoelectric researches (1996) 9 hydrogeological profiles are compiled all together (fig 4-6 and fig 8-9). The location of each one is shown in fig.

### **Section of "Mouth part of the Ropotamo river"**

The coastal water-bearing stratum laid on this territory, covers accumulated levelness from the two banks of the Ropotamo river - the area from the quay to running of the river into the sea. The geological sections of sediments, filling the drowned in Halocen river valley is presented by valunes gravel and sand that 3-8 thick and above which gravel, clay peat, sludge, sandy sludge with interlayer of slimy sludge are laid.

The alluvial marshy complex 20-25 m in general thickness is laid on fissured up to Quaternary rocky bed. The rocky bed is a part from water-bearing structure described above. This rocky bed builds the slopes surrounded the river terrace. Larger springs (on flow rate over 0,1 l/s) draining the water-bearing structure in the water-catcher of the Ropotamo river, are Tsarskoto kladenche, Golemiya vriz, Blagiya vriz, Kapacliyata and etc.

The alluvial- marshy facies gradually turn into sea facies on the left bank of the river when it flows into the sea, in the region of beach and dunes.

The sea deposits are presented by close sand with shells of mussels and they are over 10-15 m thick.

Main collectors of underground water in this section are alluvial valunic-gravel and sea sandy deposits. Because of the relative hydrogeological determination of the two collectors, two water-bearing beds are defined - alluvial and sea within the framework of coastal water-bearing stratum.

The alluvial water-bearing bed is laid on the area of whole river valley. It is built by valunes gravel sand that are highly silted and turn into sandy and gravel clay in some places.

The percent of clay component increases in an sea direction. The conduction of the bed is about 100 m<sup>2</sup>/d. The underground water are fed by the Ropotamo river and by leaky water drained by bed and slopes.

The absolute elevation of ground water level varies from 0,3-0,8 m.

**The sea water-bearing** bed covers the area of the beach and dunes. It is built of close sand on coefficient of filtration 10-15 m/d. The accumulated underground water in sand is unpower water. It forms fresh water lens which parameters are not determined.

This kind of water is feed by infiltration of rainfall, slope water and leaky water.

The absolute elevation of free water level varies from 0,3- to 1,0 m.

The hydraulic connection between the river and water-bearing beds is considerably complicated by alternation of sludge, sandy sludge and slimy sand building the river bed and the terrace of the Ropotamo river.

The results done to this stage and given by the hydrogeological mapping (1996) show that there is connection even so in difficulties between the alluvial bed and the river.

The connection between the underground water accumulated in sea deposits and river water is undetermined.

The scanty archive information and researches done in 1996 (Stoyanov, Spassov, Gurov) in combination with the more complicated geological structure reduce the possibility for detailed studying of hydrogeological conditions in this section.

### Section of Arkutino

The coastal water-bearing stratum covers the area located among the place of Kabite in the South, place of Burhana - in the West, place Andrea bair - in the North, Black Sea - in the North- West.

Main collector for underground water is beach and lagoon medium to close sand, slimy sand and sludge (fig 5). To the North of the marsh the beach sand are well flushed and are of low clay component (5-7%), yellow to gray-white in colour. It is ascertained at a depth of 15-17 m. The section lying under the bottom of the marsh at depth of 3-5 m is presented by high colmataged mixed by rotting matter gray-black and black slimy sand and black sludge. They cause weak hydraulic connection between the underground water and the water in Arkutino marsh. The mean coefficient of the beach sand is 40 m/d and of the slimy sand - 0,05 m/d.

The conduction of the water-bearing stratum in the close of the sea is 500 m<sup>2</sup>/d.

The West half of the coastal water-bearing beds on layer of clay with gravel, 2-3 m and the East half - on rocky bed of down Cretaceous age. The rocks that are part of leaky water-bearing system build the slopes surrounding the coastal water-bearing stratum. The flow rate of springs draining the leaky system is low - about 0,01-0,02 l/s.

The North- East frontier of the coastal water-bearing stratum is Black Sea. The Ropotamo river running at about 500 m away from the researched region, is separated by rocky apron (low eminence at maximal elevation of about 50 m), recovered by lolic sand.

That is why the river doesn't participate in the water balance of Arkutino section. The underground flow formed in the sand is free flow. The absolute elevation of free water level varies from 0,3 to 2,8 m. The general direction of moving is to North East - towards the sea. The feeding is done by rainfall, slope water, leaky water from the up to Quaternary complex.

The main part of the underground water accumulated in the coastal water-bearing stratum is drained in Black Sea. Another drained element in the balance is the water (3-5 l/s) got by Arkutino Pumping station. This system has been used since 1962. The water is got by three tube wells located on 200-300 m from the sea, to the East of the lake. They are at depth of 10 m. Obtained underground water is used for drinking - domestic water supply as the regime of usage is in conformity with the consumption. It can accept that the Pumping station works about 6 months in a year or the annual yield is 4,5-7,5.104 m<sup>3</sup>.

On the North- West end of the marsh in the yard of the State Forestry two shaft basins are built for needs of liquidated already "Perla" camping (Czechoslovak camping).

These two basins are of different depth water-level and one of them is of highly conductivity noted in its depth.

These basins covers the whole thickness of the lagoon sediments, reach to the cracked rocky bed and probably cut through at least two isolated each of other water-bearing beds. There is no information about the crossed geological section because the Czechoslovak organization has not given any documentation. The position of the basins is of considerably importance for the water regime of the damp area. The basins not used for operating until now.

### Section of "Alepu"

The coastal water-bearing stratum in Alepu area covers territory lying to the South of Vacational village of "Duni", to the North - North-West of "Humata" cape, to the East of "Byalata prast" land and to the South West of Black Sea. The underground water in the section is accumulated in beach and lagoon sandy and sandy-slimy deposits.

The sand, peat, slimy sand and sandy sludge are unified in common coastal water-bearing stratum although different genesis and related to it difference in the facies and in filtration properties of the sand.

Because the scanty geological information the steric parameters of the stratum are determined on the basis of the results given by geological researches done in the Summer of 1996 and on archive data for isolated drills in the periphery of the structure.

The coastal water-bearing stratum lies on cracked up-to-Quaternary rocky bed of deeply indented relief (fig 4)

The risen rocky shaft sinking to West- East direction of 5-8 m. This shaft divided the coastal water-bearing stratum into two parts.

In the surface part there is a connection between this two divided parts. Weak-power up to power leaky water that are the part of the leaky water-bearing structure is accumulated in up-to Quaternary bed. The North- East frontier of the water-bearing stratum is Black Sea. This stratum is limited by the leaky water-bearing system from the side of dry land and in depth. The general thickness of the coastal water-bearing system is about 20-30 m. In its upper part it is built of from coarse sand to medium sand that turn into close sand in depth. The sand have all over disclosure in the coastal strip, and sludge and slimy sand 2-4 m thick. The mean coefficient of filtration of sand is about 50 m/d, and of slimy sand - 0,1 m/d. The colmataged bottom of Alepu marsh and the bed built by sandy sludge and slimy sand make difficult the hydraulic connection between the fresh water basin and underground water as a result of additional filtration resistance that are formed.

This colmatation supports higher level in the marsh than in the sea from another hand and some fresh underground water is allowed to be drained directly in the sea area.

From the other hand these modern deposits make difficult the draining of the surface marshy water in the sea.

The absolute elevation of free water level varies from 0,03 to 2.0 m. (The absolute elevation of the sea level on Baltic system)

Free flow that draining in the sea, is formed in the coastal water-bearing stratum.

The main underground water feeding is done by the infiltration of the rainfall and slope water. The leaky water draining by the border water-bearing stratum is another income element from the balance of the coastal stratum.

### **The Stamopolu section**

The coastal water-bearing stratum in Stamopolu section is formed in Quaternary deposits (fig. 6) taking the area on the North of Primorsko, on the South of "Perla" Complex, on the East of "Kachkata" place, on the West of Black Sea.

The fissured rocky bed on which the Quaternary sand is deposited, is collector of leaky water power by character, that is underground drained in the coastal sand stratum. In the place of "Kachkata" the leaky water is of Primorsko level on the terrain. It goes out on overflow in the shaft basin, that is built near the West frontier of Stamopolu North marsh. The thick of the coastal water-bearing stratum in the proximity of the sea is 10-12 m and it reduces gradually in an marsh direction. Free flow is formed in the sand. The main source for feeding of the stratum are the rainfall, temporary streams, leaky water being drained by the bed. The underground flow is drained by in the sea on front about 1 km wide. The absolute elevation of free water level varies from 0,3 to 1 m. The hydraulic connection between the water in marsh and underground water is embarrassed by the additional filtration resistances by bed of slimy sand, sandy sludge, sludge, overcovering the beach sand.

### **Status and dynamics of the underground and surface water. Sea, brackish and freshwater systems**

In the coastal water-bearing strata, the fresh underground water is in direct contact with sea water. The frail balance existing between them is often disturbed as result of considerable changes is the filtration field (speeds and gradients) under the influence of natural and/or technogenical factors. The disturbed balance causes intrusion: salt sea water penetrates in the coastal water-bearing strata and moves the frontier between salt and fresh water towards the dry land.

Rising and development of this process cause progressing of the fresh underground water and fresh water basins connected with them. This has negative influence on water ecosystems. Main factor determines the brackish regime of the damp zones in Ropotamo Complex is the direct hydraulic connection between Black Sea, coastal water-bearing strata and the freshwater basins - marshes and the Ropotamo river.

This connection gives possibility for active water exchange between the fresh and sea water that finds expression in intrusion (penetrating) of salt sea water into fresh underground water or the reverse process (extrusion) can be settled. The intrusion of salt sea water causes deeply changes in the composition of fresh surface and underground water. In the course of time if the frontier conditions of the system are changed the situation becomes complicated by the reverse process of extrusion. At that except conservative mixing of Na-Cl type water with Ca-HCO<sub>3</sub> type, there are attendant process of cationic exchanging between the solid and liquid phase. As a result of this Ca-Cl and Na-HCO<sub>3</sub> types of water are formed as well as other types. Determination of steric distribution of underground and surface water is of utmost importance when the valuation about sea's influence on the damp areas is done. On this basis the model about the process, generating qualitative changes of the water recourse is possible to be done. Creating of such model requires hydrochemical test and analysis of composition of the underground and surface water in many places from the region ( a great number of drills, test in different depth and etc.) as well as financial providing for.

These problems limited the research done in 1996. (only 25 water samples were taken during the mapping of the Complex in 1996). That is why the valuation about sea's influence on the brackish regime in the damp areas of Ropotamo Complex is relative to a certain degree. But this valuation gives a basis for organizing and usage of local net for monitoring on the underground and surface water in Ropotamo Complex.

Specific hydrochemical criteria determining sea - underground water - fresh water basins connection, were used for the purpose of the research. Classificational scheme using elements from several systems for classification types of natural water (Matthess, 1982; Engelen & all, 1986, Stuyfsand, 1991 and etc.) was used as a criteria basis.

At that the specific conditions in the sandy water-bearing strata of Bulgarian shore were reported.

Defining the classification water-type requires the main type, subtype, the class of the water sample to be determined gradually. The scheme defines 6 main types, 10 subtypes and 3 classes. The concentration of Cl<sup>-</sup> in the water sample determines the corresponding main type. According to the main type the water is fresh, salt up to weakly salt, weakly salt up to salt, salt, oversalt. The combining of macro- and mezo-components determines the subdivision into subtypes. According to subtypes, the water is: Na-Cl, Na-So<sub>4</sub>, Na-HCO<sub>3</sub>, Na-Mix, Ca-Cl, CaSo<sub>4</sub>, Ca-HCO<sub>3</sub>, Ca-Mix, Mg-Cl, Mg-Mix. Each subtype is subdivided into three classes determining excess deficit or equilibrium of Na<sup>+</sup>, K<sup>+</sup>, Mg<sup>2+</sup> ions in the natural solutions.

The excess is direct indication that shows the penetrating (extrusion) of fresh water but the deficit is direct indication for of sea - water (intrusion).

N. Stoyanov has worked computer programme called ANALYSE to determine water type and to process easily data about chemical composition of the water samples. In information from the chemical analysis of water samples for region of Alepu, Arkutino, Stamopolu and North part of the Ropotamo river is used for evaluation of sea influence on the brackish regime of damp areas to be done. The exactly position of the sampling water points is given on fig. 7. The results that are processed by ANALYSE are given in the text Appendix 1 and the reports from the chemical analysis - in text Appendix N 2

## **1. The Ropotamo reserve**

### **A) Section of "Mouth part of the Ropotamo river"**

9 water tests were done - 3 from Ropotamo river; 1 - from "Tsarsko kladenche" spring; 1 - from the shaft well in "Ribarskoto selishte" on the left bank of the mouth; 2 -

from the well on the right bank of the mouth; 3 - from the well on the right bank terrace near the quay for research purposes in the Summer of 1996 (fig. 7). The results given by the processing the data by ANALYSE are in the text Appendix 1. These result opportunity the sea influence on the river water and underground water in the section to be evaluated.

Two samples are done from Ropotamo river - 1 - from the quay (P17) and 1 in the proximity of "Tsarskoto kladenche" spring (P18). The analysis of these two samples determined the river water as weakly salt up to salt, Na-Cl, very hard, the general mineralization is 18 g/l, the content of  $O_2$  - 7,9 mg/l, excess of  $Na^+$ ,  $K^+$ ,  $Mg^{2+}$ . This shows that intrusion of the sea water has affected the Ropotamo river in its whole stream in the damp area, in the borders of "drown" valley.

On salt content, the river water does not differ nearly from the sea water although the flowing of fresh river water. The water in the marshy sections located in the bay terrace are fed in the river flooded areas and this kind of water is brackish too. The brackish water in the Ropotamo river is one of the main recourses that feed the underground water in bed's deposits. Thus the indirect intrusion is realized, i.e. penetrating of the sea into the alluvial water-bearing stratum.

Water samples from two tube wells and one shaft well located on the right bank terrace in the proximity of quay, are done to ascertain the presence and the eventual bounders of brackishness in the underground water.

The analysis of the result from the chemical analysis shows that the annual water-bearing stratum in the proximity of the Ropotamo river is highly brackish. This can be exemplified from the water type of the sample (P16) taken from the well in place of "Lambrinova niva". The well was built in 1987, 40-50 m away from river. It is 22 m (to bed) deep and takes in the whole thickness of the alluvium. Its water is weakly salt up to salt, Na-Cl, very hard, cold ( $t=16,8^{\circ}C$ ), general mineralization 3,2 g/l content of  $O_2$  - 0,8 mg/l. Consequently there is sea water (over 15%) in the alluvial water-bearing stratum. The excess of  $Na^+$ ,  $K^+$ ,  $Mg^{2+}$  and lower mineralization from this in the river can be explained by the fresh water feeding by the South frontier of the river valley (by the leaky water-bearing zone and gravel-valune deposits in the gullies). Desalinating tendency is deeply expressed about 100-150 m. Southerly of the Ropotamo river.

The results received by the water samples from the tube and shaft wells are indicative (P14, P15). The wells are located on the area of farmyard (behind the quay).

They are built in gravel-valune deposits and rocks from up to Quaternary bed at a depth of 10-12 m. The water accumulated in them is fresh, Ca- $HCO_3$ , up to Ca-Mix, very hard, cold ( $t=12,8^{\circ}$ ), general mineralization 0,35-0,85 g/l, content of  $O_2$  - 1,2-3,3 mg/l, excess of  $Na^+$ ,  $K^+$ ,  $Mg^{2+}$ . Obviously the sea influence is weakly or absences out of the bay terrace's bounders. This phenomena can be explained that the wells in the farmyard that are more shallow than this, located in "Lambrinova niva".

The intrusion of the sea water has affected the leaky water too, that are accumulated in the rocks, building the tight-bank of the river, when the Ropotamo river is running into the sea. The brackishness is ascertained in shaft and in tube wells, built in up-to-Quaternary rocky massif ( in the proximity of the monument near the cape ).

The analysis of the samples (P20, P13) shows that the salt water reaches in dry land 60-70 m.

There the underground water in the fissured massif is so hard, cold ( $t=14^{\circ}C$ ), the content of  $O_2$  - 1,1 mg/l. The deficit of  $Na^+$ ,  $K^+$ ,  $Mg^{2+}$  proves that the intrusion of sea water is the leading process when the Brackish balance of the underground water is formed. The brackishness is more deeply expressed in the shaft well locating near the bank, where the water is weakly salt, up to salt, Na-Cl, general mineralization 4,4 g/l. 30 m in dry land (sample 13) the percent of the sea water that is containing in the fresh water, decreases highly. Here the underground water is weakly salt, Ca-Cl general mineralization 2,2 g/l.

The inflow containing fresh underground water and running the river and bay terraces (marshy sections) is ascertained also on the left bank of the river, in the region of "Kabite" place.

Evidence for this is not only desalinating of river- water (P18) but the water type of the underground water drained by dunes and rocky massif. This is realized underground by scattered springs and by "Tsarskoto kladenche" spring.

The sample taken from this spring (P19) characterizes the water as fresh, CaHCO<sub>3</sub>, mean hard, general mineralization 0,31 g/l, excess of Na, K, Mg. Most of this water is drained underground and together with rainfall feed the beach water-bearing stratum located on the area of beach and dunes in the near-mouth part.

The hydraulic connection between the river water and the underground water in the sea deposits and dunes, is strongly differed and that fact finders the penetrating of sea water from the river. The evident for this is the water sample from the shaft well built in the sea sand on the area of "Ribnoto selishte". The well is several meters in depth and is located 20 m far from the river. The water is fresh Ca-HCO<sub>3</sub>, rather hard, general mineralization 0,74 g/l, excess of Na, K, Mg.

Having in mind concrete hydrogeological condition, brackishness is beach water-bearing stratum is possible from the North-East frontier - Black Sea.

In the near-mouth part of the Ropotamo river, fresh underground water lie on the beach water (fig 9). Freshwater lenses formed that is 2-5 m thick and its area is about 0,1 km<sup>2</sup>.

This interest phenomena should be deeply studied and clearing its role up on the species variety.

#### A) Section of Arkutino

7 water samples: 4 -from the two shaft wells; 1 - from Arkutino marsh, 2 - from the leakager of the marsh (one - in the proximity of the marsh, the other - 50-60 m far from the sea, 1- from the Pumping station of "Arkutino" are done in the Summer of 1996. Data from the chemical analysis, processing by ANALYSE programme are in the text Appendix 11. The water samples (P<sub>22</sub>, P<sub>23</sub>, P<sub>24</sub>, P<sub>25</sub>) taken from the surface and bottom of the shaft wells, show that the underground water is fresh, Ca-CHO<sub>3</sub>, rather hard, general mineralization - about 0,5 g/l, excess of Na, K, Mg to the North-West from the marsh along the whole section. This is not entirely unjustified to suppose that the underground flow forming the income part in the balance of the marsh on the North- West frontier, is favorable factor for optimum brackish regime in sweet basin to be supported.

Content of arsenium which is correspondingly 0,153 mg/l - 0,012 mg/l is ascertained both in the two water samples of the shaft well 12. This arsenium content considerably excess the allowable one and is toxic. Probably the copper and polymetallic ore in the area of Rosen's pluton is the source of these toxic ingredients. The spreading of arsenium can be explained by the following mechanism: in zones as a result of natural leaching, the arsenium turn into soluble form after that is migrates together with the underground flow in the fissured water-bearing system that feed the coastal water-bearing stratum.

There is no a big danger for historically settled ecosystems if it is corroborated that the presence of the arsenium is a result of natural advance of the processes and it is not related to anthropogenical participation for working out of polimetal deposits.

It is possible however the high arsenium concentration to be as a result of wide pollution that is ascertained in a large region from the South Black Sea shore because of the mining-production workings. It is necessary further research and control be done.

The sample taken from Arkutino marsh (P11) shows that the water is fresh, Ca-HCO<sub>3</sub>, mean hard, general mineralization about 0,43 g/l, excess of Na, K, Mg.

The water of composition is similar to underground water in the region. The surface connection between the marsh and the sea is realized by small canal formed in the North- East part of section. According to literature information the water from the lake flows away to the sea on this canal when there is heavy rain (once in one-two years) and the rest of time the surface connection absences. The water samples done in the Summer of 1996 show that it is possible the underground water which is in the close proximally of the marsh to be brackish by the sea water penetrating on the canal and under it when there is low water in the drier periods. The water type of the sample taken in this place

(P9) is similar to the type of the sea water - salt, Na-Cl, very hard with equilibrium of  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{2+}$ . The general mineralization is too higher than this ones of the sea water - 29,77 g/l because there is not surface connection between the canal (leakager) and the sea. The canal is filled with sea water when there is a rising tide or a heavy sea. The electroconduction of the water 300-400 m away from the sea is the running down from the marsh sea and the sea water. In the proximity of the marsh (40-50 m), the water in the leakager is similar on composition to this in the marsh. The analysis of the water sample (P10) shows that the water is fresh, mean hard, general mineralization is 0,33 g/l. Although the low mineralization of the water, the subtype Ca-Mix probably shows certain influence of the sea water in this part of canal too.

This shown information and its interpretation point an opportunity for directly penetrating (on canal) of salt water into the underground hydrosphere in the proximity of the marsh.

Another indirect indication for sea water penetrating into the coastal water-bearing stratum is the water type of the sample from the Pumping station "Arkutino" (P8). The underground water is fresh, Ca- $\text{HCO}_3$ , too hard, general mineralization about 0,44 g/l at depth of 4-8 m and 200-300 m away from the sea. The deficit of  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{2+}$  and the high hardness indicates for past intrusion of the sea water in this part of the water-bearing stratum. This and other facts give the reason to be supposed that the zone of rhythmical changing of the interface's position - salt water - fresh water, takes the shore strip that is marked in the borders of 100-400 m away from the sea.

The depth of the "salt wedge" changes within the borders of 30-450 m in natural conditions.

In dry periods (seasonal or of many years) the sea water penetrates into the coastal water-bearing stratum, 400-450 m in dry land. The water covers the whole beach and dunes but it is too away from the Arkutino marsh to has directly influence on its brackish composition.

Larger size of the "salt wedges" can be expected in the South- West part of the section, in the proximity of Pumping station "Arkutino". The role not only of the natural factor, but the role of the technogenical factor - mining of underground water should be taken into consideration. Because of the considerable small quality of the mining underground water, season working regime and the considerably small lowering the technogenical intrusion is probably limited and covers just the strip between the sea and water-mining equipment.

The length of the "salt wedges" is too small in the rainy periods - up to 100 m but these periods are considerably of short duration, accordingly low security (up to 10-15%). The reckoning and limited observation show that usual length of the "salt wedges" is in borders of 140-220 m. This determines the considerable week influence of the sea on brackish composition of the underground water, accumulated in the coastal water-bearing stratum.

## 2. The Section of "Alepu"

5 water sample - 1 - from the microartificial lake built in the North- West part of the region; 2 - from Alepu marsh (1 - from Alepu North; 1 - from Alepu South) 2 - from two drilled wells built in "Duni" Complex (fig 7) were taken from Alepu section during the hydrogeological mapping in the Summer of 1996. The information from the chemical analysis, processed by ANALYSE programme are given in the text Appendix 11. The interpretation of the results shows that; the micro-artificial lake collects some of the water that forms income part from the water balance on the marsh and of the coastal water-bearing of the stratum. This is slope water, temporary streams, respectively, rain water and some water, that is drained by the fissured water-bearing system. The sample from the micro-artificial lake (P7) shows that accumulated water in it is fresh, Ca- $\text{HCO}_3$ , soft, general mineralization 0,259 g/l. Excess of  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{2+}$  ascertained in the micro-artificial lake determines inflow from fresh water to the basin.

Two connected each other basins are formed (Alepu - North and Alepu - South). The connection between them is hindered during the Summer months and two separated

basins are formed. The samples (P<sub>4</sub>, P<sub>21</sub>) taken from them show considerable difference in their brackish composition and in conditions forming the composition in the two basins. The water in Alepu-North is fresh, Ca-HCO<sub>3</sub>, soft, general mineralization 0,286 g/l, excess of Na<sup>+</sup>, K<sup>+</sup>, Mg<sup>2+</sup>.

On water type and general hydrochemical characteristic, the water in Alepu- North is very similar to the water from the artificial lake. Obviously there is not good hydraulic connection between Alepu- North and the sea. In contrast to it, the water of Alepu- South mixes with the sea. As a proof of this is that the weak salt, rather hard, general mineralization - 0,823 g/l. The excess of Na<sup>+</sup>, K<sup>+</sup>, Mg<sup>2+</sup> show that when sampling is done the fresh water inflow is considerable in this area of the marsh and compensates partly previous intrusion of sea water. It is possible more fresh-slope and underground water to run in the North part of the marsh.

The anthropogenical interference connected with artificial lake building as well as drainage system that is not being maintained now, have determinate effect too.

The influence of the sea on the underground water in the coastal water-bearing stratum can be evaluated directly only in the North part of bank zone, using information from the hydrochemical sampling of drill well 1 and drill well 2. These drill wells are 200-500 m far from the Black Sea. There is deficit of Na<sup>+</sup>, K<sup>+</sup>, Mg<sup>2+</sup> in the two drill wells. There for a proven sea water intrusion that is 200 m far from the sea is present. The difference in the main type, subtype, hardness and general mineralization show the degree of development of the intrusion process (brackishness). This process is advances in stage in the proximity of drill well 2, where the subtype of the water is similar to the sea water - Na-Cl, very weak salt, hard, general mineralization 0,62 g/l.

Brackishing of the underground water in sand is an opening stage near drill well 1. There underground water is fresh up to weak salt, Ca-Cl, hard, general mineralization 0,62 g/l.

Brackishing of the marsh from the North can be expected because of the development of the intrusion process in that place.

The wells had not been well cleaned up when had been building and that is why the connection between the water in the stem of drill wells and the layer water is difficult.

The size of the "salt wedge" varies in wide borders from 50-750 m in natural conditions.

This is determinated mainly by the gradient of the underground flow to the sea, respectively by the size of the main income component in water balance - rainfall.

**In dried periods** (seasonal or of many years) the sea water penetrates into the coastal water-bearing stratum in "Alepu" section and envelopes its down part (reach over 700 m in dry land). During these periods the water of the marsh brackish composition of the marsh.

More wide size of the intrusion of sea water in the water-bearing stratum can not be expected because of its small size (maximal wide up to 1000 m), and because the length of the wedge is about 653 m when the rainfall availability is 95%.

**During rainy periods** -the penetrating of the sea water into underground hydrosphere is too limited 5-100 m.

It is obviously that in this period fresh underground water is fundamental when the brackish composition is formed. These periods are of short duration in conformity with low available (up to 10-15%) of their main generator - rainfall.

The reckonings as well as the limited observations show that the usual length of the salt wedge is in borders of 150-300 m. This fact causes limited influence of the sea on the brackish composition of the marsh. The variations of the sea bottom have the greatest influence on the length of the salt wedge. According to information given by Stoyanov, Gurov (1996) and literature information these variations often exceed 1 m.

The variations of the sea bottom are too main factor when the water-bearing regime is formed and when optimum conditions for development of ecosystem are determined.

### 3. The Section of "Stamopolu"

3 water samples were taken from section of "Stamopolu" in the Summer of 1996.

These are: 2 - from the marsh and 1 - from the shaft well in the place of "Kachkata" (fig 7). The results given by the ANALYSE programme presented in the text Appendix 11.

The shaft well in "Kachkata" place drains the water from the fissured water-bearing stratum which is important element from the income part of the water balance of the damp zone, respectively of the "Stamopolu" marsh. The taken sample (P1) shows that the water is fresh, sodium Na-HCO<sub>3</sub>, PH=8,5, very soft, general mineralization 0,69 mg/l, excess of Na, K, Mg. The genesis of this type of water with a view to its importance in the water balance of the marsh. It can be supposed that forming of sodium water is a result of:

A) Exchange of calcium ions in the underground water with sodium ions, adsorbed on the aqueous getting medium in past period when the collector have been filled in sea water.

B) Sorption exchange of calcium in the underground water and of sodium in water-getting rocks (sandstones and alkaline vulcanites).

C) Desulphatization of the organic substance in the lagoon sediments.

The available information is not enough for exact evaluation. The analysis of the sample taken from the drill well in the proximly of the shaft well in 1987 characterizes the water as weakly salt, Na-Mix, mean hard, general mineralization 1,17 g/l, excess of Na, K, Mg. This supposes that the most likely hypothesis about the genesis of the sodium water is the combination of A and B process.

Stamopolu marsh is divided into two parts - North part and South part by artificial dike.

These two parts are connected each other by pipes under the dike. The North part of the marsh is in contact by the sea by canal equipped by gate. It is most likely the connection between two parts of the marsh to be broken. The different composition, respectively the type of the water in these two parts is not similar. The analysis of the water sample (P3) taken from Stamopolu North characterized as fresh up to weakly salt, mean hard, general mineralization 0,79 mg/l. Na-Cl subtype indicates that the marshy water is mixed with sea water. On the other hand the low mineralization and mostly the excess of Na, K, Mg are proof that the fresh water - rainfall, slope water, underground water are of predominantly importance for the water balance.

In Stamopolu South (P2) the water is fresh, Ca-HCO<sub>3</sub>, very hard, general mineralization 0,7 g/l. Obviously the sea does not have influence directly on the brackish regime in this part of the marsh. The basin is typically water fresh but organic pollution, which is a result of flowing of some sewage from Primorsko to the marsh, is ascertained.

In dried periods (seasonal and of many years) the length of the wedge theoretically reaches over than 500 m. in dry land, i.e. the brackishness entirely envelopes the coastal water-bearing stratum. In this period the sea water often penetrates into the marsh and through the canal connecting the North part of the marsh with the sea. Thus the sea is main factor when the brackish composition of the marshy water is formed as this process is strangely expressed in the North part of the marsh.

In rainy periods the penetrating of the sea into the coastal water-bearing stratum is too limited. The length of the wedge is about 65 m. The fresh underground water from the rocky bed of the rainfall are fundamental when the brackish composition is formed.

The reckonings and limited observations show that usual length of the salt wedge is 250-260 m.

Having in mind that the marsh is 200 m far from the sea, it is obviously the sea has continuously influence on the brackish composition of the marshy water (hydrogeological profile is represented in the Appendix ).

## 1.5. SOIL AND SOIL PROCESS

On the Ropotamo Complex area there are cinnamon - forest soil which is formed under the influence of following soil-formation factors: sea climate, hilly relief, broad-leaved forest vegetation and etc.

This kind soil is widely spread. The place of overflow Ropotamo bank, the long holding of water and the available marshes give sand massifs and diluvial deposits are formed because of the nearness of the sea.

### 1.5.1. TYPES OF SOIL

#### *Cinnamon-forest soil*

It is represented by subtype of leached cinnamon forest soil which circumstance is connected with Mediterranean and subtropic influence. The leached cinnamon-forest soil is met on Cretaceous-intrusive-new-plutonics, represented by andesites, granites, syenites and other which deposits are tuff by nature.

#### *Marshy-soil*

It is represented by three subtypes: meadow-marshy, peatic- marshy and peaty - marshy. Meadow - marshy soil is met on the marsh periphery. Peatic - marshy soil is intermediate link between meadow - marshy and peaty - marshy soil. It is formed by peatic and clay horizon.

#### *Alluvial-diluvial soil*

It is formed by alternation of clay and sand beds on variety power and properties.

#### *Coastal sand and dunes*

The sand strip has no grass. The dunes with grass vegetation and sand dunes on which there is grass vegetation.

### 1.5.2. THE RICH OF SOIL

*Leached cinnamon-forest soil* located on leveled concave ridges or on confluence places are more powerful.

Generally the power of soil can be reach 25-65-100 cm. The content of clay is 30-40 % in the up of profile.

The soil reaction varies from weakly acid to natural. pH - factor reaches 5,3-6,45. The humus content changes from mean quantity to low quantity. The humus content is concentrated in humus-accumolative horizon. The top 15-20 cm of it contain 50% from the total content. For example: for "A" horizon, the humus content changes between 0,76%-3,35% but in the alluvial horizon this content is 0,38%-1,16%. The Nitrogen quantity follows the humus changing. It is higher in the humus-accumulative horizon (0,248-0,084%) and lower in the bottom horizons (0,143-0,036%).

The content of phosphorus is low (1,25-9,0 mg/100g soil), and combining of phosphorus into Iron and Aluminum Phosphates makes it unassimilated for plants. Potassium content is sufficient. It is in the borders between 10,5-25 mg/100g soil. This fact describes soil as moderate to good preserved.

The water regime of leached cinnamon-forest soil is not very favorable because of their specific rainfall regime and their heavy mechanical composition.

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The leached cinnamon-forest soil in Ropotamo Complex is the soil of xerotherm forests and undergrowths. Forest of durmasts, cerris oaks, thorns, horneteams grow there. These kinds of soil satisfy the requirements of the tree species live on them.

***Marshy soil***

There are two main horizons humus and clay in meadow - marshy soil. The humus horizon is rich of organic substances, dark-gray to black on colour, unstructured and contains undecayed vegetable refuses. Its powerful vary from 20 cm to 60 cm and on some places - 60 cm. The humus content is between 2% and 6%.

The clay horizon is lighter on colour on a great number of clay spots, which are gray on colour.

***Peatic - marshy soil***

It is formed by peatic and clay horizon. It is spread on the most dampness areas. This kind of soil is formed on the centers of the marshes. Peatic - marshy soil is distinguished for a rich potential fertility. The soil contains unassimilated food matters and is very rich of moisture. Its fertility cannot realize because of air missing. It is not necessary for the matters being assimilated on the conditions of Ropotamo Complex.

***Alluvial-diluvial soil***

The clay beds are richer of food matters than the sand ones. The humus content is between 0,13% - 3,80% which means that alluvial diluvial soil doesn't contain many organic substances. For a profile generally, the mechanical composition is light - clay - sandy but it can be find sandy - clay on composition too. There are ash - elm forests living on them. The favorable water-regime determines a rich productivity of the vegetation on them.

***1.5.3. WATER PERMEABILITY***

The forests, with the exception of dense ones grow on well-drain soil. Dense forests are described with high underground water.

During the last fifteen years, Arkutino marsh run dry twice. This lead to lowering of the underground water layer, connected with dry and rainless period.

There were heavy rainfalls in 1995 and in 1996. As a result of this the water of Alepu marsh run over its banks and out the sea.

## BIOLOGICAL AND ECOLOGICAL CHARACTERISTICS

### 1.6. PLANT ASSOCIATIONS (ASSOCIATIONS), ECOSYSTEMS OR BIOTOPES (CORINE-BIOTOPES)

The climate, the rocks, the soil and the relief determine the forming of the vegetation and the biodiversity in the region of the Ropotamo Complex.

The areas of the ex-reserves-Arkutino, Vodni lilies, Zmiisky ostrov included in the Ropotamo Reserve, are Zones with high concentration of plant and animal associations and some of them are unique for Europe, complexes of dense type-such as the complex in the Kaisheva shuma in Arkutino.

The modern distribution of the habitats is represented on the map N

A/ Table of the Habitats in the Ropotamo reserve, Arkutino Marsh- 1996 ã. Total area - 23,3 hà		
Classification of the habitats	CORINE BIOTOPES code	% covering`
<b>Non sea water</b>		
<i>Freshwater lake deeply eutrophicated</i>	22,13	-
à/ Associations of <i>Nymphaea alba</i>	22.43112	48
b Associations of <i>Typha angustifolia</i>	53.132	12
d Associations of <i>Phragmites australis</i>	53,11111	5
e/ Associations of <i>Carex riparia</i>	53,213	1 - 2
f/ Associations of <i>Salvinia natans</i>	22,415	1 - 2
g/ Associations of <i>Sparganium erectum</i>	53,143	<1
h Associations of <i>Hydrocharis morsus ranae</i>	22,412	1
i/ Associations <i>Lemna, Wolffia, Riccia</i>	22,411	>1
<b>Forests</b>		
c/ Associations of <i>Salix cinerea</i>	44,162	10
k/ Dense forests	44,4322	12
<b>Marshes</b>		
J/ Open water surface	-	8

B/ Table of the Habitats , Ropotamo Reserve-Mouth Area of the Ropotamo River - 1996. Total area - 66,9 hà

Classification of the habitats	CORINE BIOTOPES code	% covering`
<b>Non sea water</b>		
<i>Bracish near the mouth</i>	13,11 / 13,21 /	
Associations of <i>Phragmites australis</i>	53,1112	58
Associations of <i>Typha angustifolia</i>	53,132	8
Associations of <i>Elymus elongatus</i>	15.À 212773	10
Associations of <i>Salicornia europaea</i>	15.115211	6
Associations of <i>Puccinella distans</i>	15.À 2131	2
Associations of <i>Artemisia maritima</i>	15.À. 21112	4

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Associations of <i>Beckmania eruciformis</i>	15.À 2122	3
Associations of <i>Juncus maritimus</i>	15.À 21271	3
Associations of <i>Salix cinerea</i>	44,162	1
Associations of <i>Tamaris pallasii</i>	44.162	2
Associations of <i>Zostera noltii</i>	11,333	>1

D/ The Ropotamo Reserve-**Zmiisky ostrov**(Island)- 1996 . Total area 1 ha 1996

Classification of the habitats	CORINE BIOTOPES code	% cover ring`
Mediterranean tall grasses and wormwood steppes	34,6	
Greek-Balkan andropogonic grass steppes	34.6344	

E/ The Ropotamo Reserve – **The rest Part (forests, dunes, rocky coast ) of the Reserve-** 1996. Total area - 905.1 ha/

Classification of the habitats	CORINE BIOTOPES code	% cover ring`
Bulgarian coastal dense forests	44,4322	20%of the reserve area
Associations of <i>Fraxinus oxycarpa</i> with <i>Uimus minor</i> and <i>Acer campestre</i> , <i>Acer tataricum</i> , <i>Quercus pedunculiflora</i> , <i>Carpinus betulus</i> and lianas <i>Smilas excelsa</i> , <i>Periploca graeca</i> , <i>Clematis vitalba</i> , <i>Vitis silvestris</i> , <i>Calystegia sepium</i> , <i>Humulus lupulus</i> , <i>Hedera helix</i>	47,76À	
Thracians subcontinental thermophyl oak forests	47,76À	
Euxine- Thracians forests of <i>Quercus Frainetto</i> and <i>Quercus cerris</i> together <i>Carpinus orientalis</i> , <i>Acer campestre</i> , <i>Acer tataricum</i> . <i>Crataegus monogyna</i> , <i>Cornus mas</i> , <i>Poa nemoralis</i> <i>Dactilis glomerata</i>	47 76 A 1	18% of the reserve area
Thraciana forests with predominating of <i>Quercus frainetto</i> together with <i>Carpinus orientalis</i> monogyna and <i>Submediterranean elements-</i> <i>Physospermum cornubiense</i> , <i>Lathyrus niger</i> , <i>Lychnis coronaria</i> , <i>Keptaptera triquetra</i>	47,76 À 11	27% of the reserve area
Eastern undergrowths / thickets/ of <i>Phillyrea</i> – Associations of <i>Phillyrea latifolia</i>	32,21 À 4	4% of the reserve area
Static dunes	16,22 Â	
Western Static dunes	16,22 Â1	

**F/ Table of the habitats in the Ropotamo Reserve – the rest damp areas, 1996 , Total area – 905.1 ha**

Classification of the habitats	CORINE BIOTOPES code	% covering`
South-Western static dunes: the habitat covers static dunes on the shore between Bosphorous and Kaliacra cape With associations of <i>Ammophyla arenaria</i> , <i>Secale sylvestris</i> , <i>Peucedanum arenarium</i> , <i>Jurinea kilae</i> , <i>Silene thymifolia</i> , <i>Medicago marina</i> , <i>Pancratium maritimum</i> , <i>Cionura erecta</i> , <i>Aurinia uechtrizianum</i> .	16,22 Â 11	
Rocky associations	11,29	
Fiords, pubescent	12,5	
Sea caves	12,7	
Mediterranean-static	18,16	
Rock and rocky beaches, static rock associations	18,222	
Western static grass-rock associations. Composition of <i>Crthhmum maritimum</i> , <i>Ephedra distachya</i> , <i>Limonium gmelinii</i> , <i>Convoivulus lineatus</i> , <i>Lactuca tatarica</i> etc.	18,22212	
Western-static rock India-rubber plant –frutex. Composition of frutex of <i>Eicus carica</i> , <i>Osyris alba</i> , <i>Jasminium fructicans</i> , <i>Paliurus spina Christi</i> and the grasses of <i>Melica ciliata</i> , <i>Melica albus</i> .	18,22212	

**The “Vodny lilies “ Reserve- 1996 , total area - 13.6 ha**

Classification of the habitats	corine biotopes	% covering`
Water fresh lake	22,1	
Associations of <i>Nuphar luteum</i>	22,43111	47
Associations of <i>Nymphaea alba</i>	22,43112	33
Associations of <i>Sparganium erectum</i>	53,143	7
Coastal Bulgarian dense forests. Associations of <i>Ulmus minor</i> , and <i>Acer campestre</i> , <i>Acer tataricum</i> , <i>Quercus pedunculitiora</i> , <i>Carpinus betulus lianas</i> – <i>Smilax excelsa</i> , <i>Periploca graeca</i> ,. <i>Clematis vitalba</i> , <i>Vitis silvestris</i> , <i>Calystegia sepium</i> , <i>Humulus lupulus</i> , <i>Hedera helix</i>	44,4322	4
Open water area		9

**The Natural sights of “Alepu” Marsh - North Part - 1996 . Total area- 166.7**

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<b>Classification of the habitats</b>	<b>CORINE BIOTOPES -code</b>	<b>% covering</b>
Marsh with a canal to the sea	21,1	
Associations of <i>Phragmites australis</i>	53,1112	36
Associations of <i>Typha angustifolia</i>	53,132	27
Associations of <i>Trapa natans</i>	22,4312	7
Associations of <i>Salvinia natans</i>	22,415	>1
Open water area	29	

**The Natural sights of “Alepu” Marsh - South Part - 1996 . Total area- 166.7**

<b>Classification of the habitats</b>	<b>CORINE BIOTOPES – code</b>	<b>% covering</b>
Marsh connected with the sea	21,1	
Associations of <i>Phragmites australis</i>	53.1112	48
Associations of <i>Typha angustifolia</i>	53.132	18
Associations of <i>Typha latifolia</i>	53,131	>1
Associations of <i>Trapa natans</i>	22,4312	5
Associations of <i>Juncus gerardi</i>	22,321	>1
Associations of <i>Ceratophyllum demersum</i>	22,422	>1
Associations of <i>Salix cinerea</i>	44.162	>1
Open water area	0	

**The Protected locality of “Stamopolu” Marsh - North Part-1996. Total area 40.0 ha**

<b>Classification of the habitats</b>	<b>CORINE BIOTOPES- code</b>	<b>% covering</b>
Marsh connected with the sea	21,1	
Associations of <i>Phragmites</i>	53,1112	48
Associations of <i>Typha angustifolia</i>	53,132	26
Associations of <i>Typha latifolia</i>	53,131	>1
Associations of <i>Salvinia natans</i>	22,415	>1
Open water area taken by the Associations of <i>Ceratophyllum demersum</i>	22,422	25

**The Protected locality of “Stamopolu” Marsh - South Part-1996. Total are 40.0 ha**

Classification of the habitats	CORINE BIOTOPES-code	% covering
Marsh / lagoon/separated from the sea	21,2	
Associations of <i>Phragmites australis</i>	53,1112	48
Associations of <i>Typha angustifolia</i>	53,132	33
Associations of <i>Typha latifolia</i>	53,131	1
Associations of <i>Salvinia natans</i>	22,415	>1
Associations of <i>Sparganium erectum</i>	53,143	>1
Open water area taken by:	22,422	25
• Associations of <i>Ceratophyllum demersum</i>	22q422	14
• Associations of <i>Utricularia australis</i>	22,414	2
• Associations of <i>wolffia arrhiza</i> and <i>Lemna trisuca</i>	22,411	1

**The Natural Sights of “Sand dunes in Alepu Locality”- 1996, Total area**

- 12 ha

-

Classification of the habitats	CORINE BIOTOPES-code	% covering
Black sea static dunes	16,228	
Western –Black sea static dunes	16,227 Â1	
South- Western Black sea dunes: This habitat covers static dunes on the coast between Bosphorus and Kaliacra cape with Associations of <i>Ammophyla arenaria</i> , <i>Secale sylvestris</i> , <i>Peucedanum arenarium</i> , <i>Jurinea albicaulis</i> ssp. <i>kilaea</i> , <i>Silene thymifolia</i> , <i>Medicago marina</i> , <i>Pancratium maritimum</i> , <i>Cionura arecta</i> , <i>Aurinia uechtrizianum</i> .	16,228 Â 11	

**The Natural Sights of “Sand dunes in Perla Locality”- 1996, Total area**

- 24 ha

Classification of the habitats	CORINE BIOTOPES -code	% covering
Black sea static dunes	16,22 Â	
Western –Black sea static dunes	16,22 Â 1	
South- Western Black sea dunes This habitat covers static dunes on the coast between Bosphorus and Kaliacra cape with Associations of <i>Ammophyla arenaria</i> , <i>Secale sylvestris</i> , <i>Peucedanum arenarium</i> , <i>Jurinea albicaulis</i> , ssp. <i>Kiiaea</i> , <i>Silene thymifolia</i> , <i>Medicago marina</i> , <i>Pancratium maritimum</i> . <i>Cionura erecta</i> , <i>Aurinia uechtrizianum</i> .	16,22Â 11	

**The Natural Sights of “Rocky formations, fiords. Seal cave in Maslen nos locality”. Total area - 17.6 ha**

ROPOTAMO PROJECT Management Plan

Classification of the habitats	CORINE BIOTOPES -code	% covering
Coastal rocky Associations	11,29	
Fiords ant sea bays	12,5	
Mediterranean Black sea coastal rocks and rocky beaches	12,7	
Black sea coastal rocky Associations	18,222	
Black sea grass coastal rocky Associations .They consist of <i>Crithmum maritimum</i> , <i>Ephedra distachya</i> , <i>Limonium gmelinii</i> , <i>Convolvulus lineatus</i> , <i>Lactuca tatarica</i> and etc.	18,22212	
Black sea coastal rocks with thickets of <i>Ficus carina</i> , <i>Osyris alba</i> , <i>Tasminium fructicans</i> , <i>Paliurus spina christi</i> and the grass <i>Melica ciliata</i> , <i>Melica albus</i>	18,22212	

## 1.7. STRUCTURE OF THE PLANTS

### 1.7.1. SOIL COVER / PUBESCENCES, LICHENS AND ETC. /

Researching is not done

### 1.7.2- 1.7.4. GRASS COVER, FRUTEX, FOREST STANDS

#### 1. The Ropotamo Reserve

##### A. The mouth part of the Ropotamo River

The following associations

- Ass. *Phragmitetium australi*
- Ass. *Typhetum angustifoli*
- Ass. *Bolboshoenetum maritimi*
- Ass. *Beckmannietum eruciformi*
- Ass. *Atropetum distani*
- Ass. *Salicornietum europe*
- Ass. *Juncetum maritimi*
- Ass. *Artemisitum maritimi*
- Ass. *Agropiretum elongati*
- Ass. *Tamaricetum tetrande*

The edificators such as *Pragmites australis* and *Typha angustifolia* are the most widely spread..

Some halophytes typical for salt -marshy soil such as : *Salicornia europea*, *Juncus maritimus*, *Agropurum elongatum* fragment are on limited areas.

*Statice latifolia* is met.

Extremely limited by territory cenoses of the psamophite species such as *Tamarix teytranda*.

The file condition of the hydrophytes, halophytes and psamophytes is good and their life cycle is completed.

##### B. Arkutino marsh

The marsh territory in larger part is covered by the hydrophyte - macrophyte plants. The following associations are met there:

- Ass. *Phragmitetim australi*
- Ass. *Typhetum angustifoli*
- Ass. *Shoenoplectetum facustri*
- Ass. *Salvinetum natani*
- Ass. *Nymphaetum albi*
- Ass. *Salicetum cinerei*
- Ass. *Alnetum glutinosi*
- Ass. *Fraxinetum oxycarpi*
- Ass. *Caricetum ripari*
- Ass. *Salvinetum demersosum*
- Ass. *Fraxinetum riparosum*

The phytocenoses of the nelophytes and neystophytes *Typha angustifolia*, *Nymphaea alba* are considerably widely spread.

Cenoses of the *Phragmites australis*, *Typha angustifolia*, *Nymphaea alba*, *Ceraotophillum demersum*, *Hydrochacharis morsus-ranae*, *Sparganium erectum* and etc. take composition of the grass cover. In the furthest parts of the marsh, the fragments of phytocenoses in which *Lemna minor* predominates, are met.

Growing of typical wood / clear and mixed/ phytocenoses that are dense type in neighboring on the marsh. The associations that are more characteristic : Ass. *Salicetum*

*cinerei*, Ass. *Fraxinetum diversiherbosum*, Ass. *Fraxineto-Uimetum diversiherbosum* and etc. Main building species- *Salix cinerea*, *Fraxinus oxycarpa*, *Uimus minor*

**C/ Bay terrace and over-Damp** areas on the Ropotamo river valley in “Kaisheva shuma”- locality and in “Arkutino” locality and in the rest part of the reserve.

Growing of unique dense forests in leaf, in Summer-green forests with a plenty of lianas are met in Bulgaria only.

The plant associations have mixed stand forests of the *Fraxinus oxycarpa* and *Ulmus minor* with great number of lianas.

**Ass. *Fraxinus oxycarpa* + *Uimus minor* - *Crataegus monogyna* - lianas / mappable unit N4/**

On dense forests living in the reserve, the phytocenoses of mentioned above associations are most widely spread.

Except the edipicators *Fraxinus oxycarpa* and *Ulmus minor*, the *Carpinus batulus* and *Alnus glutinosa* take in the forest stand. The height of the trees is 25 m.

Subforest presented by *Crataegus monogyna* and *Cornus mass*, Cover 25 %. The lianas are presented by 10 species - *Smilax exelsa*, *Periploca graeca*, *Humulus lupulus*, *Clematic vitalba* and etc. / General projective cover 0,9/. The grass stand has not too rich composition of species,. High projective cover. Except characteristic sciophysical plant the ruder species have penetrated by overflowing.

**Ass. *Fraxinus oxycarpa* + *Sylvicola- Deschampsia caespitosa* and Ass. *Fraxinus oxycarpa* - *Cornus mass-Agrostis stolonifera* ( mappable unit N 5 )**

The phytocenoses of these two associations are similar to the previous described one but there some difference on the composition of species because of the lower lianas participation.

**Ass. *Quercus frainetto* + *Quercus cerris* + - *Acer tataricum-Cornus mass* - *Brachypodium sylvaticum* / to mappable unit N6 /**

On fresh to damp terrains, located near the dense forests to the South of Arkutino marsh.

The vegetation consists of forests belonging to *Quercus frainetto* and *Quercus cerris*.

*Quercus frainetto*, *Quercus cerris* . *Fraxinus oxycarpa* as well as *Uimus minor* and *Quercus polycarpa* participate in the first floor of the forests stand. Height of trees- 18-20 cm/. diameter of the trunks 16, maximum to 30 cm.

The *Acer tataricum* predominates in the second floor of the forest stand where *Acer campestre* and *Carpinus orientalis* participate. Cover - 25%.

Subforest presented by *Cornus mass* and *Crataegus monogyna*. Cover 30%. General projective cover 0,9.

The forest stand is built by the *Brachypodium sylvaticum* and *Biglossoides purpurocoerula*. Species widely met-*Viola kitaibeliana*. *Carex sylvatica*., *Dactylis glomerata*, *Latthyrus laxiflorus* and etc. Before coming into leaf, *Primula acaulis* ssp. rubra do pink colored aspect. Specific for the region *Asphodeline lutea*, *Scilla bithynica*, *Fritilaria ponica* and etc. Projective cover - 65 - 70 %.

**Ass. *Quercus frainetto* + *Quercus cerris* - *Crataegus monogyna*- *Brachypodium sylvaticum* / to mappable unit N 7/**

On fresh to damp terrains located next to dense forests, to the South of Arkutino marsh. Sprouting stand forest, the correlation between *Quercus frainetto* and *Quercus cerris* is 6:4. The height of trees is 14-16 m.

Subforest presented by *Cornus mass* and *Crataegus monoguna*. The cover varies from 10% to 40%.

Over 40 species participate in the forest stand. The *Brachypodium sylvaticum* predominates. High projective cover - 65%.

**Ass. *Quercus frainetto* + *Quercus cerris* -*Carpinus orientalis-Ruscus aculeatus-Brachypodium pinnatum* /mappable unit N 8/.**

On dry terrains. Upland such as Andrea bair / in buffer area/ and Kaleto as well as slopes in the west part of the reserve. Sprouting forest stand that consists of *Quercus frainetto* and *Quercus cerris* with participation of *Quercus pubescens*. Height of the trees- 6- 8 m, diameters of the trunks - 8 - 10 /15/ cm. The second floor with frutescent habitus / 4 - 6 m/, consists of *Carpinus orientalis* and participation of *Fraxinus ornus*, *Celtis australis*. The Associations near the shore have highly deformed heads of tree because of the sea wind. Projective cover 0.6-0.8.

The *Ruscus aculeatus* predominates among the ground plants. Cover 70-80% . Secondary forest stand consisting of the *Brachypodium pinnatum*. Projective cover - 20-25%. The *Dactylis glomerata*, the *Oryzopsis virescens*, the *Poa sylvicola*, the *Carex remota*, the *Carex glauca*, the *Lathyrus laxiflorus*, the *Genista ovata* and etc. are more rare spread species.

The species, characteristic of the region are the *Huetia cynapioides*, the *Opopanax bulgarica* . the *Vicia bithynica*, the *Phalaris bulbosa* / Maslen nos/, the *Cicer montbretii*, the *Colladonia friquetra* and etc.

**Ass. Quercus frainetto - Carpinus orientalis - Ruscus aculeatus / mappable unit N 9/**

The phytocenoses of the association are widely spread on the area of the Ropotamo reserve on dry terrains. They are described on the slopes of Andrea bair / in buffer zone/ and on upland of :Kaleto”. Sprouting stand forest. The first floor consists of *Quercus frainetto* as well as well as *Quercus cerris*, *Quercus pubescens*. Its height is 7 - 8 m.

The second floor consists of *Carpinus orientalis* with participation of *Paliurus spina shrusti*, *Jasminum fruticans*. *Asphodeline lutea*. *Iris sintenisii*, *Oenanthe pimpineloides* and etc.

**Ass. Chrysopogon gryllus- Cistus incanus / mappable unit N 10/** On dry terrains. The Associations of these associations are described for the slopes of Andrea bair and Kaleto.

Secondary forest stand consists of *Chrysopogon gryllus* and the semi-frutex of *Cistus incanus*. The *Achnatherum bromoides*, the *Anthoxanthum odoratum*, the *Festuca valesiana* and etc. are most rare spread in its composition.

Projective cover - up to 95%. Uneven horizontal structure.

The frutexes such as the *Hordeum bulbosum* , the *Avena barbata*, the *Chondrilla junceum* and etc. participate singly.

**Complex of associations. Ass. Paliurus spina christi - Brachypodium pinnatum, Ass. Chrysopogon gryllus / mappable unit N11 /.** On the limited areas, on places that are influenced highly by man’s presence.

The frutex component consists of *Paliurus spina shrusti* and *Crataegus monogyna*. Height up to 2 m. Cover 60-70%.

The grass floor is not too rich on species. It consists only of *Brachypodium pinnatum*. The grass component in the Complex of associations consists of well grown grass forest built of tufts of *Chrysopogon gryllus*. The *Hordeum bulbosum*, the *Avena barbata*, the *Chondrilla junceum* and etc.

**Ass. Phyllirea latifolia - Achnatherum bormoides / mappable unit N12 /.** It is described for upland of Kaleto in Maslen nos region / in the buffer area/ and locality of “Lavskata glava”.

The forest stand consists of *Phyllirea latifolia*. Some trees, and remains of destroyed forests of the *Quercus frainetto*, *Quercus polucarpa*, *Pistacia terebinthus* and etc. Participate in forest stand too.

The *Carpinus orientalis*, *Celtis australis*, *Fraxinus ornus* participate singly. The height of the saplings is 4-5 m/ not often - up to 7m/. The thickness of the trunks 8-12 cm / maximum 16 cm/. The frutexes do not from floor. The *Paliurus spina christi*. *Ruscus aculeatus*, *Asparagus acutifolius*, *Jasminum fruticans* are more rare spread. The *Osyris alba*, *Rosa canina* participate singly. Highly presence of lianas such as the

*Hedera helix*, *Smilax exelsa*, *Tamus communis* of grass - the *Asphodeline lutea*, the *Diplachne serotina*, *Briza maxima*, *Iris sintensii* and etc.

**Ass. Ammoophila arenaria - Artemisia campestris / mappable unit No 13/**

Most widely spread on front small dunes of the East slopes and top places. Rich composition of species. The *Leymus racemosus* ssp. *sabulosus*, *Secale sylvestris*, *Silene thymoffilia*, *Allyssum desertorum* and etc. are most widely spread.

**Ass. Ammoophila arenaria - Pancracium maritimum / mappable unit N 14/**

On the South slopes of the dunes, limited spreading. Rich composition of species of species that is similar to the previous association.

**Ass. Artemisia campestris + Pancracium maritimum and Ass. Pancracium maritimum + . Artemisia campestris - Secale sylvestris/ mappable unit N15/**

The plant Associations from the two associations are spread near the mouth of the Ropotamo river. They take low and plain terrain among dunes. Projective cover - 40 - 80%.

The *Ammoophila arenaria*, *Fectuca vaginata*, *Peucedanum arenarium*, *Silene euxina* and etc. are spread more frequently.

**Ass. Artemisia campestris - Fectuca vaginata / mappable unit N 16/**

It is spread on high dunes, on plain areas with static sandy substrate. Rich composition of species. The *Galilea mucronata*, *Scabiosa ucrainica*, *Aurinia uechtriziana*, *Teucrium polium*, *Anchusa leptophylla* and etc. participate in this association. In the lowering of coastal the plentiful and the finding of the *Jurinea albicaulis* which is met in Associations increase and from purple aspect when is in mass blossom.

**Complex Ass. Paliurus spina christi, Artemisia campestris - Fectuca vaginata/ mappable unit N 16/.**

It takes static sand inside of the bay on slopes and plain areas among the dunes.

The frutex component takes 40- 55 % from the area. The *Osyres alba*, the *Crataegus monogyna*, the *Lygustrum vulgare*, the *Ruscus aculeatus*, the *Asparagus acutifolius* participate in the composition of the association. The described previous association is the grass component.

**Ass. Chrysopogon gryllus - Artemisia campestris/ mappable unit N16/**

It takes the same terrains as the previous described one.

The cover of lichen - 10 - 15%, the cover of pubescentes -10%.

The grass stand is thin, consists of the *Chrysopogon gryllus* and *Artemisia campestris*, Projective cover - 30%.

The *Fectuca vaginata*, *Silene euxina*, *Scabiosa ucrainica*, *Teucrium polium* and etc. participate in this association.

**Ass. Quercus frainetto + Quercus cerris - Ruscus aculeatus/ mappable unit N 17/**

Plant Associations of the association. and their fragments are met in the South-East part of Arkutino locality, on high inside dunes with static sand substrate. Series sciophytes and some typical for the region species.

Association with sprouting forest stand and height 6-7 m. Except edipicators, participation on the *Celtis australis*, *Fraxinus ornus*, *Carpinus orientalis*. *Quercus polucarpa*. / Projective cover 0.8-0.9/

The *Ruscus aculeatus* predominates in ground plants. Cover up to %. Participation of the *Cotinus coggygria* and *Asparagus acutifolius*.

Series of sciophytic and typical for the region species - the *Dactulis glomerata*, the *Oryzopsis virescens*, the *Carex glauca*, the *Lathyrus laxiflorus*, the *Colladonia friquetra*, the *Huetia cynapioides*, the *Cicer montbretii*, the *Opopanax bulgarica*, the *Genista ovata* and etc. - in the grass floor.

**D/ Zmiisky ostrov**

Interest plant Association with participation of *Opuntia stricta* / map N / .  
Cactuses were cropped in 1932.

**Ass. Ligustrum vulgare - Opuntia stricta - Tanacetum millefolium / mappable unit N 18 /**. It takes the West part of the island.

The frutex cover 40% of the island. The *Ligustrum vulgare* and the *Osyris alba* predominate.

The *Opuntia stricta* and the *Tanacetum millefolium* are the edificators in the grass floor. The *Calamogrostis epigeios*, the *Psilurus incurvus*, the *Opopanax bulgarica* are more plentiful and are met more frequently.

Except of the *Opuntia stricta*, other alien to Bulgarian flora plant species such as the *Jucca filamentosa*, the *Iris germanica*, the *Ailanthus glandulosa* are met.

**Ass. Senecio maritima - Opuntia stricta - Cionura erecta / mappable unit N 19/**

It takes the central stony part of the island . Grass stand - uneven horizontal structure. Projective cover - up to 55%. Species more frequently spread - the *Opopanax bulgaricum*, the *Asphodeline lutea* and etc.

**Ass. Elymus farfarcus - Dactylis glomerata - Osyris alba / mappable unit N20/**

It covers the East part of the island . Grass stand -thin. Cover 45 %. Except of dominants , the *Phleum tenue*, the *Psilurus incurvus*, the *Trifolium campestris*, the *Goniolimon tataricum* and etc. participate more widely.

The *Senecio maritima* and *Diotis candidissima* are very limited spread in the South shore.

The isolated plants such as the *Crithmum maritimum*, the *Ephedra vilgaris*, the *Limoneum gmelini*, the *Convolvulus lineatus*, the *Lactuca tatarica* and etc. / map No / are spread sparsely on the coastal cliffs / located on the vertical shore of the sea/.

There are plant groups of species belonging to neighbor plant Associations and some ruder plant on the sporadic areas /from the top of the cliffs towards the beginning of the small forests / map N /.

Representatives from the Plubaginaceae - species from genus of the *Goniolimonum* and genus of the *Limoneum* - 8 species all together, the *Crithmum maritimum* , *Trachomitum venetum*, *Crambe maritima*, *Lactuca tatarica* and etc. . The plants are under the direct influence of the wind and sea waves to a certain extend.

## 2. Vodny lilies reserve

The following types of associations are spread there / map N /

*Ass. Sparganetum erecti*

*Ass. Nymphaetum luteosum*

*Ass. Almetum glutinosae*

The species from the neystophites group are the most widely spread. Cenoses where the *Nymphaea alba* and *Nymphaea lutea* predominate. Participation of *Ceratophyllum demersum*, *Lemna minor*, *Lemna trisulca*, *Salvinia natans* and etc. General projective cover - 70-80% . The halophytes are represented by small number of species. Limited on area phytocenoses where *Sparganium erectum* predominate in the East and North-East part of the water basin. Cover of the species - 70-75%. Participation of *Iris pseudocorus*, *Lemna trisulca*, *Salvinia natans*. The species are alive.

The grouping of *Alnus glutinosa* is spread in the furthest West part.

## 3. Natural sights of Alepu marsh

The following types of associations are spread there /map No /

*Ass. Phragmitetium australi*

*Ass. Typhetum angustifoli*

*Ass. Shoenoplectetum lacustri*

*Ass. Bolboshoenetum maritimi*

*Ass. Trapaetum natani*

*Ass. Salvinetum natani*

*Ass. Juncetum gerardi*

*Ass. Typhetum latifoli*

From the halophytes the phytocenoses presented by the edificators such as the *Phragmites australis* and *Typha angustifolia* are most widely spread. The *Phragmites australis* are met more frequently. They form pure Associations for the most part. Mix phytocenoses of the *Phragmites australis* and *Typha angustifolia* on too limited areas / rather fragmentary/ in the South part of the marsh.

General projective cover 70-80% / 90%/.

The *Trapa natans* is presentatives of the neystophytes and is more widely spread. It is met in the open water areas on limited room, on some places - fragmentary. Projective cover 20-30 / 40%/ . Spreading of the *Salvinia natans* on quite limited areas, neighboring on reed cenoses mainly.

Projective cover 15 - 30 % . The groups are nearly monofominant.

The deposit of the *Trapa natans* is the only one that is located in the marshes on the South Black Sea shore.

## 1. Protected locality Stamopolu marsh

1.

*Ass. Phragmitetium australi*

*Ass. Typhetum angustifoli*

*Ass. Ceratophylletum demersi*

*Ass. Typhetum latifoli*

*Ass. Salvinetum natani*

*Ass. . Bolboshoenetum maritimi*

*Ass. Sparganetum erecti*

*Ass. Shoenoplectetum triqueti*

*Ass. Shoenoplectetum lacustri*

The halophytes taking the most part of the marsh-about 30%, are most widely spread. More of them from large Associations. The *Phragmites australis* and *Typha angustifolia* are most widely spread.

The group of the neystophytes is on limited spreading-fragmentary or small groups by several specimen.

Of the sidatophytes, the *Ceratophyllum demersum* forming phytocenoses in open water area, is most widely spread.

To the North and to the West of the marsh-sprouting wood of phytocenoses where *Quercus frainetto* predominates

#### **5. The Natural sights of the Sand dunes in Alepu locality**

It is not researched.

#### **6. The Natural sights of the Sand dunes in Perla locality**

It is not researched.

#### **7. The Natural sights of Rocky formation, fiords and seal cave in Maslenos locality**

It is not researched.

### **1.8 FLORA**

#### **1.8.1. LOWER PLANTS**

##### **Algae Flora**

Research works up to this stage are not systematic and complete enough. Survey and summary of the existing information is given by K. Ivanov, A. Sotirov, A. Rozhdestvenski and D. Vodenicharov (1964) and Ch. Kochev and D. Yordanov (1981). In July and September 1995 terrain study was made in the marshes of Alepu, Arkutino, Stamopolu, in the firth of Ropotamo river and old bed Velyov vir by Prof. Dimitar Vodenicharov. Laboratory researches on composition of the kinds are in progress. During the field season of 1996, the research works on the phytoplankton in the damp areas of the Complex were made by Maya Stoyneva.

In the studied water basins are ascertained 195 taxa of algae altogether. They refer to the following sections: Cyanophyta (19), Euglenophyta (18), Pyrrhophyta (9), Chrysophyta - Chrysophytina (20), Euchlorophytina (73), Zygnemaphytina (3) - see Appendix 1.

All received information shows the different character of the researched station even in the cases when they belong to or have belonged to the same water basin (stations 1 and 2, 9 and 10) the phytoplankton has different composition of species and different course of the season changes. Thus for example in the South Part of Alepu the phytoplankton is represented by smaller number of species and shows clear tendency for quantity increase from spring towards autumn and the florescence is not reached. In the

north part of Alepu, the phytoplankton has always been richer on species and has characterized by floescence that is typical for plain shallow eutrophic lakes.

All research damp areas are eutrophicated. It is difficult to make conclusions when three samples are done. But it is possible to say that the eutrophication process is expressed more deeply in the North part of Alepu and in the North part of Stamopolu than in their South parts. Arkutino that is eutrophicated water basin has more stable algae biomass. The value of biomass that is lower than it is expected, is due to the overshadowing of the higher plants.

The eutrophication is lower expressed in Vodny lilies reserve.

The situation in the Ropotamo river is not typical for the plain rivers. It is not easy to make any conclusions when three samples are done. It is most likely that the taking of the samples has coincided with mixing of the sea water and the river water which is explain the very poor in qualitative and quantitative respect phytoplankton.

### **Ropotamo reserve**

#### **A) Ropotamo River**

There are 51 taxa of algae ascertained altogether. They refer to the following sections: Cyanophyta (2), Euglenophyta (2), Pyrrhophyta (3), Chrysophyta - Chrysophytina (2), Bacillariophytina (21), Cryptophyta (3), Chlorophyta - Euchlorophytina (17), Rhaphidophyta (1) - see Appendix 1.

The number of the kinds reduce although this is slight from the upper waters to the outflow all through the periods. This effect is not typical of flat country rivers and it may be explained with the specific character of the interaction of water and the influence of the Black Sea salt water.

The Algae flora is represented by compound complexes of freshwater, brackish and sea kinds. *Prorocentrum jordatium* sp. and *Chaetoceros* sp. are the most typical sorts among the sea kinds. In September *Prorocentrum* causes floescence of water. In May there were ascertained more freshwater representatives than in any other investigated periods while in September the number of the freshwater representatives in the upper waters is larger than near the bridge or in the outflow.

Apparent tendency toward increasing of the total number of phytoplankton downstream was ascertained in September only. The total number of phytoplankton changes from  $1.25 \times 10^6$  stocks/l (station 7 in September) to  $2.9 \times 10^7$  stocks/l (station 4 in May).

Apparent tendency toward increasing of total biomass of phytoplankton downstream was ascertained in September only. The total biomass of phytoplankton changes from 1.35 mg/l (station 4 in July) to 119 mg/l (station 6 in July).

In May the flint algae predominate both by number and biomass.

In July more groups contribute to the building of the quantity structure of phytoplankton which is predominated by Pyrrhophyta and Cryptophyta algae mainly by biomass. The green algae predominate by number at one of the investigated stations. In September phytoplankton is represented by various groups - Pyrrhophyta algae predominate in the outflow and the upper waters but are represented by different sorts. The station near the bridge is with phytoplankton predominated by centric flint algae.

In May the centric flint algae (*Aulacoseira* sp. + *Stepahnodiscus* sp.) predominate in phytoplankton groups and in the three investigated stations. In July *Chaetoceros* sp. and *Cryptomonas* sp. predominate in the outflow while *Perdinium* sp. predominate in phytoplankton near the bridge.

The trophic status of the river changes during the investigated period, if it is evaluated by the biomass of the algae. In May and in September conditions are oligotrophic, and in July - eutrophic. Most of the kinds are mordant for the zooplankton.

There is floescence of *Prorocentrum cordatum*.

#### **A) Floods of Ropotamo River**

They are investigated in May only when they are full of water. In July and September they are dried up. In May there are 24 taxa of algae ascertained in them (see Appendix 1). Florescence of greenish-blue algae is also ascertained. Phytoplankton is formed by kinds that are mordant for the zooplankton. The trophic conditions in the floods may be evaluated as eutrophic

#### **A) Arkutino Marsh**

There are 34 taxa of algae ascertained altogether. They refer to the following sections: Cyanophyta (1), Euglenophyta (8), Pyrrhophyta (1), Chrysophyta - Chrysophytina (8), Bacillariophytina (9), Cryptophyta (2), Chlorophyta - Euchlorophytina (3), Zygnemaphytina (1) and one undetermined colorless flagellate algae- see Appendix 1.

The number of the specified in phytoplankton test samples slightly but obviously increases from spring towards autumn: 6 in May, 13 in July and 17 in September. The group of the flint algae is the richest one by sorts (7 taxa in July). The summer period is the richest one of groups when in the phytoplankton groups 6 algae groups participate.

All ascertained kinds refer to the group of the typical freshwater algae and are plankton representatives.

The total number of phytoplankton reduces from spring towards autumn - from  $8.5 \times 10^7$  stocks/l in May to  $2 \times 10^7$  stocks/l in July and  $1.88 \times 10^7$  stocks/l in September.

The total biomass of phytoplankton is 28.9 mg/l in May, it reaches the greatest values in July (38.4 mg/l) and reduces in September to 14.2 mg/l.

The quantity structure of phytoplankton is formed by various groups of algae during the different periods. In May phytoplankton is represented by four groups where the greenish-blue algae (Cyanophyta) have the greatest number and Cryptophyta are predominating by biomass. In July the golden algae (Chrysophytina) are the most plentiful group by number and Euglenophyta - by biomass. In September Cryptophyta predominate both by number and biomass.

In May *Microcystis reinboldii* predominate by number and *Cryptomonas obovata* - by biomass. In July *Dinobryon* sp. div. (*D. sertularia* + *D. sociale*) predominate by number while the representatives of *Euglena* sp. predominate by biomass. In September Chrysophyta algae from the type of *Uroglena* are the most plentiful.

According to the information for the abundance of phytoplankton (mainly for biomass), it may be claimed that the Arkutino marsh has eutrophic type. It may be assumed that the conditions are beta-mesosaprobic. Phytoplankton is represented mainly by mordant kinds with high alimentary value.

#### **Vodny lilies reserve**

There are 30 taxa of algae ascertained altogether. They refer to the following sections: Cyanophyta (1), Euglenophyta (5), Pyrrhophyta (2), Chrysophyta - Chrysophytina (2), Bacillariophytina (7), Cryptophyta (2), Chlorophyta - Euchlorophytina (10) and one undetermined golden bone algae - see Appendix 1.

The number of the kinds reduces from spring (16) towards summer (4) and increases again in autumn (15). During all the investigated periods the green algae are represented by the greatest number of kinds - 7 in spring, 2 in summer and 5 in autumn.

All the kinds ascertained in phytoplankton refer to the group of the typical freshwater algae. Most of them are representatives of plankton.

The total number of phytoplankton reduces from spring ( $2.75 \times 10^7$  stocks/l) towards summer ( $7.5 \times 10^6$  stocks/l) and drastically increases in early autumn - to  $3.38 \times 10^8$  stocks/l.

The total biomass of phytoplankton reduces from spring (4.44 mg/l) and increases in early autumn to 12.55 mg/l.

Phytoplankton is represented by the greatest number of algae groups (5) in early autumn. In spring it is represented by 3 groups and in summer - by 2. A certain quantity

part in phytoplankton groups is taken by the green (Euchlorophytina) and the flint algae (Bacillariophytina). In May the most plentifully represented group is the one of the green algae. In July they still predominate by biomass and in September florescence of small Chrysophytina is ascertained.

In May Monoraphidium irregulare predominate in phytoplankton. In July they are displaced by Monoraphidium contortium, and in September small undetermined Chrysophyta cause florescence of water.

In accordance with the information for the biomass of the algae, the marsh may be characterized as eutrophic in September only. Most of the ascertained kinds are mordant for the zooplankton and fish. Concerning saprobility, the marsh is beta-mesosaprobic.

### **The Natural sights of Alepu marsh**

#### ***A) North Part of Alepu marsh***

There are 66 taxa of algae ascertained altogether. They refer to the following sections: Cyanophyta (7), Euglenophyta (9), Pyrrhophyta (3), Chrysophyta - Chrysophytina (4), Xanthophytina (3), Bacillariophytina (8), Cryptophyta (4), Chlorophyta - Euchlorophytina (27), Zygnemaphytina (1) - see Appendix 1.

The number of the kinds increases from spring (27) towards summer (35) when the number of algae groups increases as well, and reduces in autumn (14) when florescence of greenish-blue algae is ascertained. During all studied periods, the green algae is have the greatest number - 12 in spring, 15 in summer and 7 in autumn.

All kinds ascertained in phytoplankton are referred to the group of typical freshwater algae. Most of them are representatives of plankton.

The total number of phytoplankton is almost equal in spring and summer ( $3.5 \times 10^7$  and  $3 \times 10^7$  stocks/l, respectively, 1996) and drastically increases in early autumn - up to  $8.3 \times 10^9$  stocks/l during florescence of Microcystis.

**The general biomass** of phytoplankton increases from spring towards autumn - from 11.8 mg/l in May and 14 mg/l in July to 437 mg/l in September. Because of the shallow type of the marsh, during the florescence in September algae are even distributed in the water layer.

**Quantitative structure** of phytoplankton is formed by various algae groups during the different periods. In May phytoplankton is mainly formed by Bacillariophytina, in July they are substituted by Euglenophyta mainly regarding biomass, and in September phytoplankton is represented mainly by Cyanophyta. In May four algae groups form quantity composition of phytoplankton, in July their number increases to 5 and in September it reduces to 2 only.

In May Fragillidrid sp. *predominates* both number and biomass, in July Closterium acutum predominates by number, and Trachelomonas intermedia - by biomass. In September florescence of Microcystis is ascertained when most of the stocks are of Microcystis aeruginisa.

The trophic conditions in the northern part of Alepu vary from eutrophic in May and July to hypertrophic in September. In May phytoplankton consists mainly of mordant sorts while in September the tolerant-to-stress and non-mordant sorts predominate.

#### ***A) South Part of Alepu marsh***

There are 54 taxa of algae ascertained altogether. They refer to following sections: Cyanophyta (7), Pyrrhophyta (1), Chrysophyta - Chrysophytina (4), Xanthophytina (3), Bacillariophytina (13), Cryptophyta (4), Chlorophyta - Euchlorophytina (22) - see Appendix

The number of the sorts apparently increases from spring (6 in May) towards summer (11 in July) and autumn (45 in September).

This concerns both the sorts of each taxonomic group and the number of the groups represented in phytoplankton. The green algae (Euchlorophytina) have the greatest number (25) but they were only once ascertained in the phytoplankton test samples in September. Bacillariophytina are in the second place - 9 sorts in September. The last group together with Chrysophytina and Cyanophyta represents phytoplankton all through the investigated periods.

All kinds ascertained in phytoplankton at station 2 refer to the group of the typical freshwater algae. Most of them are representatives of plancton, and some of them as the undetermined hormogons of the greenish-blue algae from the type of Phormidium and the bigger representatives of the pinnated flint algae such as Gyrosigma sp. may be qualified as diking. Their appearance in phytoplankton test samples may be explained with the shallow type of the marsh.

The total number of phytoplankton is extremely high and almost equal in May and September ( $1.98 \times 10^8$  and  $1.58 \times 10^8$  stocks/l, respectively), and it reduces in July ( $2.5 \times 10^7$  stocks/l).

The total biomass of phytoplankton increases considerably from spring towards autumn as this is 0.16 mg/l in May, 2.53 mg/l in July and 20.07 mg/l in September.

The quantity structure of phytoplankton is formed by various groups of algae. In May the golden algae (Chrysophytina) slightly predominate by number ( $2.5 \times 10^6$  stocks/l) over the greenish-blue ones (Cyanophyta -  $1.95 \times 10^6$  stocks/l) as both of the groups have equal biomass (0.1 mg/l). In July four groups from the quantity structure of phytoplankton.

The group of the green algae has the greatest number among those four (Euchlorophytina) -  $12.5 \times 10^6$  stocks/l, and the greatest biomass belongs to Cryptophyta - 0.48 mg/l which are followed by almost equally represented flint (Bacillariophytina), green and greenish-blue algae - each of them with about 0.4 mg/l. In September phytoplankton quantities are formed by six groups. The greenish-blue algae predominate among those six both by number and biomass ( $128.25 \times 10^6$  stocks/l and 9.62 mg/l). The flint algae are in the second place according to the number, and Euglenophyta are in the second place by biomass.

In May the bone greenish-blue algae from the type of Aphanocapsa predominate in phytoplankton. In July small green flagellates predominate by number while Cryptomonas erosa predominate by biomass. In September Anabaena spiroides predominate in phytoplankton both by number and biomass.

In accordance with the information for the biomass, the trophic conditions may be qualified as eutrophic in September only. In May and July the situation according to the biomass is oligotrophic which corresponds to the availability of golden algae (Chrysophytina) in phytoplankton. During the investigated period the number of the algae is extremely high and expansion of bone greenish-blue algae shows availability of eutrophic processes in the marsh. Saprobic conditions change from oligo-beta towards beta-mesosaprobic. Most of the kinds are mordant for the zooplankton.

### **Protected locality of "Stamopolu Marsh"**

#### ***A) North Part of Stamopolu marsh***

There are 37 taxa of algae ascertained altogether. They refer to the following sections: Cyanophyta (4), Euglenophyta (3), Pyrrhophyta (3), Chrysophyta - Chrysophytina (2), Bacillariophytina (5), Cryptophyta (7), Chlorophyta - Euchlorophytina (10), Zygnemaphytina (1) and Rhaphidophyta (2).

The number of the kinds increases from spring (8) towards summer (19) and autumn (18). In spring and autumn most of the kinds are of Bacillariophytina - 3 and 5, respectively, while in summer only one sort from this group is ascertained. The green algae (Euchlorophytina) are the richest group in summer (5 sorts). In spring they are represented by 2 kinds, and in autumn - by 3. Concerning quantity, the spring

phytoplankton is represented by 4 groups of algae while the summer and autumn phytoplankton consist of 7 groups.

Most of the kinds refer to the group of the typical freshwater algae. Most of them are plankton representatives. In the test samples from July were ascertained two interesting kinds of *Vacuolaria virescens* and *Gonyostomum ovatum*.

The total number of phytoplankton increases from spring towards summer - from  $2.75 \times 10^7$  stocks/l in May to  $3.5 \times 10^7$  stocks/l in July and reduces to  $1.58 \times 10^7$  stocks/l in September.

The total biomass of phytoplankton is 0.66 mg/l in May, increases to 118.79 mg/l in July and reduces to 5.92 mg/l in September.

In May 2 groups take part in quantity constructing of phytoplankton - Chrysophytina and the green algae (Euchlorophytina) where Chrysophytina are the most plentiful. In July 6 groups from quantity structure of phytoplankton. According to the number, the green algae, Cryptophyta and Pyrrhophyta are equally represented but the latter predominate by biomass. In September only 2 groups take quantitative part in phytoplankton groups where the green algae have the greatest number and flint algae (Bacillariophytina) predominate by biomass.

In May Dinobryon sertularia predominate in phytoplankton. In July it is displaced by *Peridinium* sp. In September *Micractinium pusillum* predominate by number and *Navicula* cf. *gastrum* predominate by biomass.

Only in July, according to the information for the biomass, the marsh may be characterized as highly eutrophic. In May conditions are oligotrophic, and saprobic status - oligo-beta-mesosaprobic. The kinds structure ascertained is typical of lakes and marshes submitted to eutrophication. Most of the kinds are mordant for zooplankton especially in May and July

#### **A) South Part of Stamopolu Marsh**

There are 46 taxa of algae ascertained altogether. They refer to the following sections: Cyanophyta (5), Euglenophyta (3), Pyrrhophyta (3), Chrysophyta - Chrysophytina (1), Bacillariophytina (5), Cryptophyta (4), Chlorophyta - Euchlorophytina (24), Zygnemaphytina (1) - see Appendix 1.

The number of the kinds increases from spring (2) towards summer (31) and reduces again towards autumn (19). During the summer and autumn periods Euchlorophytina is the richest group - 19 and 9 sorts, respectively, while in spring phytoplankton consists of only Euglenophyta and one sort of Cyanophyta. In summer and autumn the number of algae groups are equal (6).

Most of the kinds ascertained refer to the group of the typical freshwater algae. Most of them are plankton representatives.

The total number of phytoplankton increases from spring ( $2.5 \times 10^6$  stocks/l) towards summer ( $1.85 \times 10^8$  stocks/l) and reduces again to  $1.38 \times 10^7$  stocks/l in autumn.

The total biomass of phytoplankton increases from spring (7.64 mg/l) towards summer (34.4 mg/l) and reduces again in autumn (29.5).

In May only Euglenophyta have quantitative participation in phytoplankton groups. In July 3 groups from the quantity structure of phytoplankton. The green algae (Euchlorophytina) predominate by number over the other groups while Pyrrhophyta predominate by biomass. In September 3 groups again from phytoplankton quantity and again the green algae predominate by number and Cryptophyta predominate by biomass.

In May *Euglena* sp. predominate in phytoplankton groups. In July cells that are similar to *Chlorella* predominate by number and *Peridinium* cf. *cinctum* predominate by biomass. In September *Micractinium pusillum* predominate by number and *Cryptomonas* sp. - by biomass.

In July and September the conditions in the south part of Alepu marsh may be characterized as eutrophic and beta-mesosaprobic. It may be assumed that in May conditions are alpha-mesosaprobic. Most of the kinds are mordant for zooplankton and they have high alimentary value.

**Pubescentes and lichen**

They are not (not enough) studied.

The population of the *Riccia fluitans* that is considerably on number is ascertained in the North-East part of Arkutino marsh in 1995. This species is announced for first time in the Black Sea shore

## 1.8.2. HIGHER PLANTS

### 1. Ropotamo reserve

There are between 500 and 600 kinds altogether existing within the present borders of the reserve which is about 18% of the whole flora of the country. From the point of view of florogenetic the species from these category are of utmost significance.

<b>Bulgarian endemites</b>	<b>Balkan endemites</b>	<b>Relicts</b>
Tulipa hageri	Asphodeline liburnica	Acer campestris
Verbascum glanduligerum	Aurinia uechtriziana	Acer tataricum
Silene frivaldskyana	Comandra elegans	Alnus glutinosa
Opopanax bulgaricum	Crocus biflorus	Carpinus betulus
Pyrus eleagrifolia, Ssp .bulgarica	Genista rumelica	Carpinus orientalis
Carpinus orientalis	Hypecoum ponticum	Celtis austriaca
	Orobanche esulae	Celtis caucasica
	Silene thymifolia	Clematis vitalba
	Trifolium dalmaticum	Cotinus coggygia
		Fagus orientalis
		Fraxinus ornus
		Hedera helix
		Lonicera etrusca
		Pyracantha coccinea
		Quercus dalechampii
		Salix alba
		Salix caprea
		Smilax excelsa
		Trapa natans
		Ulmus laevis
		Viscum album
<b>Total: 6 ssp.</b>	<b>9 ssp</b>	<b>22 ssp</b>

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Although it has comparatively small territory - 1174 ha together with the buffer zone, in Ropotamo reserve is ascertained a considerable part of the vegetable kinds included in the Red Book of the Republic of Bulgaria - about 11%(71-rare, 11-threatened, 1 extinct ,total 83 species.)

Key species	Red book of Bulgaria		
	Rare	Threatened	Extinct
Anagallis minimus	*		
Anchusa stylosa	*		
Anethum graveolens	*		
Anthemis rumelica	*		
Aurinia uechtixiana	*		
Calystegia soldanella	*		
Carduus uncinatus	*		
Celtis caucasica	*		
Centaurea arenaria	*		
Centaureum turcicum	*		
Cirsium bulgaricum	*		
Corispemum nitidum	*		
Crepis nicaeensis	*		
Crithmum maritimum	*		
Crocus olivieri	*		
Cyclamen coum	*		
Echium plantagineum	*		
Erodium hoefftianum	*		
Eryngium maritimum	*		
Euphorbia paralias	*		
Euphorbia peplis	*		
Ferula orientalis	*		
Festuca vaginata	*		
Ficus carica	*		
Fritillaria graeca	*		
Fritillaria pontica	*		
Geranium tuberosum	*		
Groenlandia densa	*		
Gypsophila tecirae	*		
Halimione pendunculata	*		
Heptaptera triquetra	*		
Hymenocarpus circinatus	*		
Hypocoum ponticum	*		
Lactuca tatarica	*		
Limonium vulgare	*		
Linum tauricum subsp. bulgaricum	*		
Logfia gallica	*		
Maresia nana	*		
Nepeta ucranica	*		
Nonnea obtusifolia	*		
Opopanax bulgaricum	*		
Otanthus maritimus	*		
Parapholis incurva	*		
Polygala supina	*		
Prangos ferulacea	*		
Primula acaulis, subsp. rubra	*		
Samolus valerandii	*		
Scabiosa atropurpurea	*		

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Scandix australis	*		
Scilla bithynica	*		
Scorpiurus subvillosus	*		
Secale sylvestre	*		
Serapias vomeracea	*		
Silene cretica	*		
Silene euxina	*		
Sison amomum	*		
Sonchus palustris	*		
Stachys maritima	*		
Stachys thracica	*		
Symphytum tauricum	*		
Trapa natans	*		
Trifolium constantinopolitanum	*		
Trifolium spumosum	*		
Utricularia vulgaris	*		
Valeriana discoridis	*		
Verbascum glanduligerum	*		
Vicia insica	*		
Wolffia arrhiza	*		
Centaureum maritimum		**	
Cressa cretica		**	
Elymus pycnathus		**	
Leucojum aestivum		**	
Nuphar lutea		**	
Nymphaea alba		**	
Pancreatum maritimum		**	
Pyracantha coccinea		**	
Trachomitum venetum		**	
Tulipa hageri		**	
Utricularia minor		**	
Halimione portulacoides			***
<b>Total .</b>	<b>71 spp.</b>	<b>11 spp.</b>	<b>1 spp</b>

*a) Zmiisky ostrov (island)*

Key species	Red book of Bulgaria
	Rare Threatened Extinct
Opopanax bulgaricum	
Senetio maritima	
Diotis candidissima	

The Cactus *Opuntia stricta* that grows successfully is introduced here

### Damp Areas in the Complex

The flora of water and marsh plants in the damp areas of Ropotamo Complex is considerably better investigated than the algae flora though systematic research works have never done. Therefore, it is expected that more kinds should be found. Up to this moment are ascertained 39 kinds from 27 genres - it is about 20 % of the water and marsh plants that are known in Bulgaria (187 kinds altogether - Kochev H. and D. Yordanov, 1981; Vodenicharov etc., 1993). The greatest number of kinds are registered in the Stamopolu marsh - 29, Arkutino marsh - 28, the Vodny lilies reserve - 23, Alepu marsh - 19, and the less number of kinds - in the outflow of the Ropotamo river - 10.

#### A) *Mouth part of the Ropotamo river*

10 species of higher plants are ascertained (The full list of the species is given in the Appendix)

Key species	Red book of Bulgaria
	Rare Threatened Extinct
Zostera noltii	
Artemisia maritima	

The small sea grass (*Zostera noltii*) is pointed for the mouth of the Varna's bay and in Obzor, Bourgas. This species was ascertained in the mouth of Ropotamo river in 1995.

#### B) *Arkutino marsh*

The flora of the water basin is rich 28 species of higher plants are ascertained. (There is a full list of the plants in the Appendix). 3 species are included in the Red Book of Bulgaria, two of them are "rare" and the other "extinct".

Key species	Red book of Bulgaria
	Rare Threatened Extinct
Wolffia arrhiza	*
Nymphaea alba	**
Potamogeton acutifolius	
Utricularia australis	*

The *Utricularia australis* is rare species in Bulgaria. It is ascertained in "Trakiiska nizina" and Varna land but it is not marked after 1955. This species was determined in Alepu, Arkutino and Stamopolu marshes in 1995. It is threatened with extinction.

The *Potamogeton acutifolius* has only several deposits in Bulgaria. It was determined in Arkutino marsh in 1955. Its find can ensure the preservation of the species

of Bulgarian flora. The more so as when the Dragoman marsh was dried up, the species in this deposit has disappeared may be in this deposit.

## 2. Vodny lilies reserve

The flora in the water basins is rich. 23 species higher plants are ascertained there. ascertained (The full list of the species is given in the Appendix). Three species are enlisted in the Red Book Of Bulgaria - "rare"; two species - "threatened"

Key species	Red book of Bulgaria		
	Rare	Threatened	Extinct
Wolffia arrhiza	*		
Nuphar lutea		**	
Nymphaea alba		**	

## 3. The Natural sights of "Alepu marsh"

19 species of higher plants are ascertained (The full list of the species is given in the Appendix). 1 species are enlisted in the Red Book Of Bulgaria in the category of "rare"; 1 species - "threatened".

Key species	Red book of Bulgaria		
	Rare	Threatened	Extinct
Trapa natans		**	
Utricularia australis	*		

## 4. Protected locality of "Stamopolu marsh"

29 species of higher plants are ascertained (The full list of the species is given in the Appendix). 2 species are enlisted in the Red Book Of Bulgaria in the category of "rare"; 1 species - "extinct".

Key species	Red book of Bulgaria		
	Rare	Threatened	Extinct
Wolffia arrhiza	*		
Nymphaea alba			**
Utricularia australis	*		
Frankenia pulverulenta			

**5. The Natural sights of “Sand dunes in Alepu locality”**

It is not researched.

**6. The Natural sights of “Sand dunes in Perla locality”**

It is not researched.

**7. The Natural sights of “Rock formations, fiords and seal cave in Maslen nos locality”**

It is not researched.

## 1. 9. FAUNA

### 1.9.1. INVERTEBRATES

#### 1.9.1.1. Zooplankton and zoobenthos.

The scientific publications about the water biotas in the Ropotamo Complex are scanty, rare and outdated in generally. In 1939 Valkanov mentioned three of damp areas in the Complex. Alepu - there he indicated seven representatives of the zooplankton and zoobenthos and scanty fauna, Ropotamo river - with thirty species, one half of them are plankton - sea mainly, and several freshwater species only, Stamopolu marsh - with five brackish species of zooplankton and zoobenthos. In 1964 Vodenicharov pointed three species of invertebrates (two of them are Protozoa) in Alepu, in Stamopolu four species of Protozoa and low worms. He noted that the two parts of the marsh are biological different. The same working out did not point any animals in Arkutino. In 1967 Naidenov published the list of 21 species Copepods and 25 species water fleas for the whole region. The species are probably as a result of transient floods and puddles and they are of fauna importance only. The same working mentioned the following information about the water basins: in Alepu- 5 species of Copepods, 4 species of Water fleas; in Arkutino - 5 species of Copepods, 4 species of Water fleas; in Ropotamo river - 1 species of Copepods, 1 species of Water fleas; in Stamopolu - 4 species of Copepods, 5 species of Water fleas. In 1997 Grancharova announced 12 species Pubescent animalcules: In 1979 Tsvetkov and Grancharova described the Associations of Hydroid zoophytes, Pubescent animalcules and Bristle worms with absolute dominant species - *Mercierella enigmatica*. New list (manuscript) that contains 10 freely living species of Round worms and 20 species of midges, is made by Georgiev. The quantitative and the qualitative characteristics of the zooplankton and of the zoobenthos Associations in the damp zones of the Complex and in the places where the birds pile up, were researched in summer, in spring of 1995 and in spring, summer, autumn, 1996 by Senior Research Associate Stanoy Kovachev. The results are shown on the table and on table of the Appendix. Two years' time (1995, 1996) researches of the zooplankton determined 60 species generally: 28 species of Rotifers; 19 species of Water fleas; 13 species of Copepods (table ). This wide variety changes very quickly. The plankton fauna is more various in the freshwater basins as Alepu marsh, Vodny lilies reserve, South part of Stamopolu marsh.

Inspire of its fresh water, the number of the species in the west part of Ropotamo river, is not great because of the stream that is not optimum for the plankton growth. On the other land the near mouth area of Ropotamo river is on the direct influence of the sea water. In principle the sail water exerts influence some kilometers along up to firth.

The spreading of the species in the different water basins shows that every water tank is differentiated to a considerable extend. The two parts of Alepu marsh are seemed to be quite different. The difference between the two parts of Stamopolu marsh is greater.

The degree of fauna congruence for the zooplankton shown on table is not usually too high. The highest degree of congruence is determined for the marshes that are the same degree of eutrophication (i.e. Alepu, Vodny lilies reserve, Stamopolu) but it is seldom above 50%. The plankton fauna in mixohalinic basins (point 6,7,8) is different from these in other basins. The zoobenthos is presented by the 39 species and more permanent composition, but the zoobenthos is not the same in the different water basins.

Most of the water reservoirs have not too rich composition of species (both two parts of Alepu marsh, Vodny lilies reserve, the forest area of the Ropotamo river). In the firth of the Ropotamo river, the zoobenthos is well presented by various animals in contrast to plankton. A great number of species are determined in Stamopolu marsh where south part is richer. The Medical leech which is lump threatened species is determined there. The difference in the degree of congruence between Alepu and Stamopolu marshes is highest, but it is considerably low for other freshwater basins.

There is no fauna congruence between the benthos organisms living in freshwater basins and these ones living in brackish water. Many of species published by other authors are not confirmed now. The plankton Associations is comparatively rich but it is not the same for the different basins in the Complex.

The quantitative characteristics of the zooplankton show that it is comparatively rich but there is some considerable difference for the different water basins. Big and dynamic changes are observed for the different water basins and in different seasons. The increase of the quantity from the spring towards the autumn is determined by points 1, 4, 5, 9, 10 while the points 2, 3, 6 show the reverse process. The zooplankton is not too rich in the freshwater western part of the river.

There is weak stream and well growth plankton Associations can not be expected. The quantity of the zooplankton in the mouth of Ropotamo river is considerably low both in summer and autumn, because of the seawater influence. In Arkutino marsh there is no plentiful because of the dense water lilies covering the lake surface. The sun light cannot get below the water surface which causes low biological productivity.

The conditions of Vodny lilies reserve is similar to the conditions described above. The most number of zooplankton is determined in the south part of Stamopolu marsh. In the north part of Stamopolu marsh the quantity of zooplankton is under the powerful effect of the Holbrooki topminnow.

The plenty and the biomass of the zoobenthos Associations in the different water basins is shown on table ... (to the Appendix). It can be described as not too rich, especially in some water basins where the bottom consist of rough substance that is not suitable for benthos invertebrates (both parts of Alepu marsh) while the slimy bottom of the south part of Stamopolu marsh offers suitable conditions for zoobenthos.

The huge quantitative characteristics of the zoobenthos in the firth of Ropotamo river are unapproachable because the dominant species have heavy shells (*Cardium*) and hard pipes (*Mercierella*) and the *Hydrobia* increases their numbers no having any importance as a trophic source.

### ***1.9.1.2. OTHER INVERTEBRATES***

The South Eastern part of Bulgaria and the South Black Sea shore of Stranja are researched.

The information about the Millipedes is found on publications of Strasser (1966, 1969, 1973). Centipede are studied by Ribarov (1986A, 1986B, 1987). The spiders are studied by Delchev (Araneal, 1976). The Insect fauna is quite well studied. The Dragonflies (Odonata) are studied by Beshkov (1974), the Heteroptera - by Yossifov (1961, 1974), the Beetles (Coleoptera) - by Gruev (1980, 1988) and by Popov (1977) and the Hymenoptera (Hymenoptera) - by Vasileva-Samnalieva (1977). The Dipterans (Diptera) are the most deeply studied by Beshkovski (1971A, 1972A, 1972B, 1973, 1975, 1976), Lavchiev (1969) and Lavchiev & all (1974). The Butterflies (Lepidoptera) have been researched by Karnozitski (1954) and Slivov (1976).

More generalized publication about the Invertebrates in all Bulgarian Black Sea shore are made by Beshovski (1978, 1982), Delchev & all (1993). Researches about the Invertebrates according to plan are not made until now.

### **Species of important conservation significance:**

#### **Rare**

This category includes the species found in Bulgaria in few deposits or in the only one limited region.

Bulgarian fauna consists of 2500 rare Invertebrates, 61 of which are met in the area of Complex. The species from this category mentioned below are well studied and their limited spreading can be reckoned to be reliable

### **Relicts**

9 relicts terrestrial invertebrates are determined in the damp areas of Ropotamo Complex until now. Of them 6 species are terrestrial Mollusks, 1 species – Odonata, flies, 1 species - Orthoptera, 1 species - Coleoptera. Most of them (7 species) are spread in the whole discussed area, and the rest ones are found near the mouth of the Ropotamo river or near Arkutino marsh until now.

The present data about the numerous of the population of these 9 species are scanty.

Because the quaternary relicts are typical for the mountain fauna, we can assume that the discussed relicts are Tertiary by birth. These "alive fossils" from the ancient fauna are more rare than a number of endemites and more threatened of extinction.

### **Endemites**

The endemites from the Bulgarian fauna are: Balkan (They are spread in the different areas on the area of Bulgaria only).

41 endemites species are determined in the damp areas of the Ropotamo river until now. Of them 18 species are Balkan and 23 - Bulgarian. The most of them are the representatives of the Beetles (25 species) and Mollusks (9 species). The number of the endemites species Butterflies is too small - just 1 species. Two of the endemites are found in this region only, and other 15 species are spread on the whole area of the Complex. The area of Bulgarian Black Sea shore is one of the seven independent zoogeographical regions in Bulgaria (Georgiev, 1982). In this area 204 endemites invertebrates of all 1135 species in Bulgaria are determined. 119 species of them are living on the territory of the Black Sea shore. Most of the representatives from the Mollusks, the Centipede, the Beetles are found in (biotopes) which is fact for their rarity. The endemites that are met in the whole region in more numerous populations are not too many.

The exact and reliable reporting about the numerous of the individual endemites requires prolonged and systematic researches.

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Key species	Deposits in the Complex / season/	Evaluation of the Population
<i>Rare</i>		
<i>Mollusks (Mollusca)</i>		
<i>Pisidium suprum</i>	It is known in Bulgaria from Maslen nos	In so limited Population
<i>Ferrissia wautieri</i>	It had been found near Arkutino marsh	
<i>Oxyloma elegans</i>	Near the mouth of the Ropotamo river	
<i>Spiders (Araneae)</i>		
<i>Dysdera westringi</i>	Near the mouth of the Ropotamo river. The only one deposit in Bulgaria, May	Just 1 specimen was caught
<i>Pardosa pseudostrigillata</i>	Near the mouth of the Ropotamo river. Only in Bulgaria and Italy, May only	Isolated specimen are Found
<i>Menemerus laeniatus</i>	Near the mouth of the Ropotamo river, May	Just 1 specimen
<i>Ticks (Acari)</i>		
<i>Neoacarus hibernicus</i>	Near the mouth of the Ropotamo river	
<i>Scutacarus lineatus</i>	In Bulgaria - near Arkutino marsh only	
<i>Asca aphidiotes</i>	In Bulgaria - on Maslen nos only	
<i>Dragonflies (Odonata)</i>		
<i>Chalcolestes viridis</i>	In the whole Complex- in the transient puddles only	Larvae are caught only

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Cercion lindeni	In the whole Complex- In Bulgaria - on the Black Sea - shore only June, July -	In small population
Cordulegaster picta	In the whole Complex. In Bulgaria - on the Black Sea shore only, June	As imago
Cinsignis charpentieri	In the whole Complex, near small brooklets, June	So rare
Somatochlora metallica Meridionalis	In the whole Complex. In Bulgaria - on the Black Sea shore. July - August	
<b>Mayflies (Ephemeroptera)</b>		
Metreletus balcanicus	Near the mouth of Ropotamo river in spring months	In not too large Populations
<b>Homoptera insects (Homoptera)</b>		
Phlogotettix cyclops	In Bulgaria - near Arkutino marsh only. In summer	Isolated specimen
<b>Bugs (Heteroptera)</b>		
Tetratocoris antennatus	In Bulgaria - near the mouth of Ropotamo river only	The condition of its population depends on the spreading of Scriptus maritima
Cymodema tabidium	In Bulgaria - near the mouth of Ropotamo river	Small number Populations
Xanthochilus saturnius	Throughout the Complex	Rarely
<b>Beetles (Coleoptera)</b>		
<i>Paussus turcucus</i>	Near Maslen nos	In so limited populations

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<i>Notiophilus danieli</i>	In Bulgaria - near the mouth of Ropotamo river only Only once	
<i>Apotomus testaceus</i>	In Bulgaria - near Maslen nos only	So limited population
<i>Bembidion niloticum</i>	In Bulgaria - near the mouth of Ropotamo river only, and Maslen nos. June	Not so rarely
<i>Anisodactylus intermedius</i>	In Alepu. In Bulgaria on the Black Sea shore only. Summer	So rare
<i>Acritus nigricornis</i>	Near the mouth of Ropotamo river	
<i>Epineuchinus caucasicola</i>	In Bulgaria - in Arkutino marsh only. In Summer	In small population
<i>Hypocacculus praecox</i>	Near the mouth of Ropotamo river and Arkutino marsh	Isolated specimen
<i>Anthaxia hackeri</i>	In Arkutino marsh only. In Summer	Isolated specimen
<i>Aphannisticus elongatus</i>	In Arkutino marsh	
<i>Kisanthodia ariasi</i>	Near Arkutino marsh	
<i>Melanimon inermis</i>	In Bulgaria - near mouth of Ropotamo river	In small population
<i>Scaphidema metallicum</i>	In Bulgaria - in the mouth of Ropotamo river only	Rather limited
<i>Metaclisa azurea</i>	In Bulgaria - in the mouth of Ropotamo river only	Only isolated specimen
<i>Tribilium destrucor</i>	In Bulgaria - in the mouth of Ropotamo river	
<i>Eutagenia smyrnensis</i>	In Bulgaria - in the mouth of Ropotamo river	Isolated specimen

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Donacia carssipes	In Bulgaria in the Arkutino marsh only	Too rarely, on the aquatic plants
Psylloides reitteri	In Bulgaria in the Arkutino marsh only	Isolated specimen
Otiorrhynchus simulans	In Bulgaria - in the mouth of Ropotamo river. In Summer	Too rarely
Sitona puberulus	In Bulgaria - in the Mouth of Ropotamo river	In small population, Too rarely
Ceuthorrhynchus Canaliculatus	In Bulgaria - in the mouth of Ropotamo river only	
Tuchius sharpi	In Bulgaria - in the mouth of Ropotamo river	
Orchestes quederifeldti	In Bulgaria - in the mouth of Ropotamo river	Spread in very small population
<b>Webspinners (Embioptera)</b>		
Haploembia solieri	Near sea slopes on Maslen nos	Isolated specimen, too rarely
<b>Lacewings (Neuroptera)</b>		
Deleproctophylla australis	In Bulgaria - in the mouth of the Ropotamo river.	Too rare species with Limited populations
Chrsopa phyllochroma	It was found near Arkutino marsh	
<b>Orthoptera (Orthoptera)</b>		
Platypygius crassus	In Bulgaria - it is found in the north of the Ropotamo river only. Only in June-July August	
Modicogryllus geticus	Near the mouth of the Ropotamo river	
<b>Butterflies (Lepidoptera)</b>		

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Pelosia obtusa	Near Arkutino marsh	Too rare
Lasiocampa grandis	Near Maslen nos only	Too rare
Hypenodes orientalis	Near mouth of the Ropotamo river and near Arkutino marsh	In limited on number population
Dolbina elegans steffensi	In Arkutino marsh. In Summer - Autumn	Not very rarely
<b><i>Dipterans (Diptera)</i></b>		
Limnophora maritima	In Bulgaria - it was found in the mouth of the Ropotamo river in June	Exclusively rare
Limnophora obsignata	In the mouth of the Ropotamo river	
Nemotelus bipunctatus	Near the mouth of the Ropotamo river	On soil with Salicornia
Merodon clunipes	In Bulgaria - it is found only in the mouth of the Ropotamo river	
Syritta flaviventris	In Bulgaria - it is found near Arkutino marsh only	
Calozenilla tamarae	In Bulgaria - it is found near Arkutino only. In warmer Summer days	Too rarely
Micromorphus albopilosus	In Bulgaria - it is found in Alepu marsh only in June	It is found only once
Malacomyia sciomyzina	In Bulgaria - on the Black Sea shore. Maslen nos. In October only	
Epithalassius stackelbergi	In Bulgaria - on the Black Sea shore only	Among the tufts of the salt vegetation
<b><i>Hymenoptera (Hymenoptera – Formicidae)</i></b>		
Tetramorium Taurocausicum	Near Maslen nos. In June	One stock only once

<b>relicts</b>		
<i>Mollusks (Mollusca)</i>		
Lauria cylindracea	In Bulgaria - near the South Black Sea shore only. Ever where in the Complex	
Euxina circumdata	Like the previous species	
Serrulina serrulata	Everywhere throughout the region	
Helix pomacella	In South-East Bulgaria. Near the mouth of the Ropotamo river and in Arkutino marsh	
Krunickillus urbanskii	Near the mouth of the Ropotamo river	To rare everywhere
Oxychiius urbanskii		
<i>Drogonflies (Odonata)</i>		
Calopteryx virgo Meridionalis	Throughout the region	
<i>Orthoptera (Orthoptera)</i>		
Paranocarodes straubei	Only on the Black Sea shore and in Stranja. Throughout the Complex. June – October	
<i>Beetles (Coleoptera)</i>		
Anthaxiq tuerki	Throughout the region	Too rare
<b>endemites</b>		
<i>Molluska (Molluska)</i>		
Bulgarica varnensis BgE	Near Arkutino marsh	Considerably rare

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Euxina persica paulhessei BgE	Near the mouth of the Ropotamo river, Arkutino Marsh	
Helix lucorum onixiomicro BgE	Near the mouth of the Ropotamo river	
Helicella spiruloides BgE	Near Arkutino marsh	
Monacha pilosa BgE	Near the mouth of the Ropotamo river	Too rare. It was found only several times
Orcula zilchi BgE	South Black Sea shore. Throughout the Complex	
Carpatica bielawskii BgE	South-East Bulgaria. Throughout the Complex	
Trichia erjavecii BE	Near the mouth of the Ropotamo river	
Limax macedonicus BE	Near the mouth of the Ropotamo river	It was found several Times

***Ticks (Acari)***

Pelethiphis anoxiae BgE	In Bulgaria - near Arkutino marsh	Too rare species
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***Chilopoda (Chilopoda)***

Harpalolithobius Folkmanovae BgE	South-West Bulgaria. In the Complex - near the mouth of the Ropotamo river. Only in May- June	
Lithobius bulgaricus BgE	It is more widely spread near the mouth of the Ropotamo river in the Complex	

***Millipedes (Diplopoda)***

Cylindroiulus vitosae BE	Near the mouth of the Ropotamo river	It was found only once (2 specimen)
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***Mayflies (Ephemeroptera)***

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Paraleptophlebia lacustris BE	Throughout the Complex	Sometimes in numerous population
<i>Beetles (Coleoptera)</i>		
Cicindela hybrida rumalica BgE	Throughout the Complex	Not too rarely
Carabus montivagus Bulgaricus BE	Near Arkutino marsh. In Summer	Not too rarely
Carabus wiedemanni Vaitoini BE	Near Arkutino marsh and Maslen nos	Not too rarely
Carabus violaceus Azurescene BE	Near Maslen nos	Rarely
Procerus scabrosus BgE	Near Arkutino marsh	It was found only Once
Bembidon rivulare Euxinum BE	In Bulgaria - near Maslen nos only	Only 3 specimen are Found
Calathus metallicus aeneus	Pterostichus merkli subsp. nov. BgE Widely spread in Bulgaria. In Maslen nos and Ropotamo Complexes	
Laemostenus cimmerius Weiratheri BE	Widely spread in Bulgaria . In the Complex it is met near Arkutino marsh	Rare
Microlestes apterus BE	Throughout the Complex	
Quedius pontoeuximum BgE	Near the mouth of the Ropotamo river and near Arkutino marsh	Too rarely
Medon Bulgaricus BgE	It is found together with the mentioned above species	Rare
Medon umbilicatus BgE	Near the mouth of the Ropotamo river and near Arkutino marsh	Too rarely

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Cardiophorus hinkei BE	Near the mouth of the Ropotamo river and near Arkutino marsh	
Sphaenoptera sceptrifera BE	Near the mouth of the Ropotamo river and near Arkutino marsh. During the warmest days	
Melanomon inetmus BgE	In Bulgaria - near the mouth of the Ropotamo river only	
Laena schwarzi BE	Throughout the Complex	Not too rarely
Psammodius bulgaricus BgE	In the area of the Complex. Without fixed deposits	Rarely
Vadinia moesiaca BE	Near the mouth of the Ropotamo river and near Arkutino	Rarely
Psyloides magnificus BgE	Near the mouth of the Ropotamo	Rare
Apion graecum BE	In the Complex	Not too rare
Ftiorrhynchis verrucipes BE	In the whole region of the Complex	
Tychius consputus BE	Near the mouth of the Ropotamo river and near Arkutino marsh	

***Butterflies  
(Lepidoptera)***

Paradrymonia vittata Bulgarica BgE	In Bulgaria - near the mouth of the Ropotamo river only	
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***Dipterans (Diptera)***

Chlorops quercophilus BgE	In Bulgaria - near the mouth of the Ropotamo river and near Arkutino marsh	
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**BgE** - Bulgarian endemites

**BE** - Balkan endemites

**KEY Biotopes/ ASSOCIATIONS /**

The exclusive variety and rich of the plants in Ropotamo Complex has formed the animal associations from invertebrates. A great number of endemites, rare and relict species have been preserved in these associations..

The researches received up to now prove that several interest associations in the different parts of the Complex, particularly in its damp zones have been differentiated. The Associations of utmost scientific and nature-protective significance are:

**Meadows and dense forests near Arkutino marsh**

The following species living on the damp lots, among the undergrowths and grass plants are: **rare** - *Calcolestes viridis*, *Somatochlora metallica meridionalis*, *Epineuchinus caucasicola*, *Aphannisticus elongatus*, *Donacia crassipes*, *Psylloides reitteri*, *Chrsopa phyllochroma*, *Limnophora maritima* and *Limnophora obsignata*; **endemites** - *Bulgarica varnensis*, *Helicella spiruloides*, *Orcula zilchi*, *Pelethiphis anoxiae*, *Paraleptophlebia lacustris*, *Bembidon rivulare euxinum*, *Laemostenus cimmerius weiratheri* and *Microlestes apterus*; **relicts** - *Lauria cylindracea* and *Oxychilus urbanskii*

**Forest glades near Arkutino marsh**

This biotope takes the small glades in the hardwood forests, more or less damp, located on the shady places. The following species inhabit this area: **rare** - *Xanthochilus saturnius*, *Kisanthodia ariasi* and *Psylloides reitteri*; **endemites** - *Helicella spiruloides*, *Orcula zilchi*, *Calathus metallicus* and *Laemostenus cimmerius weiratheri* ; **relicts** - *Krunickillus urbanskii*, *Oxychilus urbanskii* and *Paranocarodes straubei*

**Old Oak trees forests near Arkutino marsh**

Too typical biotope where the Oak Associations are combined whit *Quercus frainetto*, *Adriatic Oak* and hornbeam. The following dendrophyl species inhabit this area: **rare** - *Xanthochilus saturnius*, *Epineuchinus caucasicola*, *Anthaxia hackeri*, *Pelosia obtusa*, *Hypenodes orientalis* and *Dolbina elegans steffensi*; **endemites** - *Carabus montivagus*, *Procerus scabrosus*, *Laemostenus cimmerius weiratheri*, *Cardiophorus hinkei*, *Vadinia moesiaca* and *Chlorops quercophilus*; **relicts** - *Paranocarodes straubei*

**Sand dunes near the mouth of the Ropotamo river and Arkutino bay**

So typical biotope taking the floods located the mouth of the river, or its inlet which is overgrown by tuff of different salt-love plants. The soil is overflowed by the sea periodically and that is why it is deeply salt. The salt soil is ecological barrier for the most of the invertebrates living on the inside of the land and on the other hand this explains the adaptation of a number of plants to the salt factor. The associations of the following species are met here: **rare** - *Oxyloma elegans*, *Pardosa pseudostrigillata*, *Tetracoris antennatus*, *Platypygus crassus*, *Nemotelus bipunctatus* and *Epithalassius stackelbergi*; **endemites** - *Cicindela hybrida* and *Pterostichus merkli* subsp. nov.

The sand dunes locating on the inside of Arkutino bay, have differentiated associations of the following species: **rare** - *Neoacarus hibernicus*, *Xanthochilus*

*saturnius* and *Anthaxia hackeri*; **endemites** - *Cicindela hybrida rumalica*, *Calathus metallicus aeneus*, *Melanomon inermis* and *Laena schwarzi*

### **Lots located near the bridge, the mouth and the quay of the Ropotamo river**

The associations of the following invertebrates are differentiated on small damp glades, meadows and heterogeneous hardwood forest: **rare** - *Dysdera westringi*, *Menemerus laeniatus*, *Chalcolestes viridis*, *Cercion lindeni*, *Cordulegaster picta*, *Cordulegaster insignis charpentier*, *Somatochlora metallica* *Tribilium destructor*, *Deleproctophylla australis*, *Limnophora maritima*, *Limnophora obsignata* and *Merodon clunipes*; **endemites** - *Helix laucorum onixiomicra*, *Monacha pilosa*, *Orcula zilchi*, *Carpatica bielawskii*, *Trichia erjavecii*, *Limax macedonicus*, *Harpalolithobius folkmanovae*, *Lithobius bulgaricus*, *Cylindroiulus vitosae*, *Paraleptophlebia lacustris*, *Bembidon rivulare euxinum*, *Sphaenoptera sceptrafer*, *Melanomon inernus*, *Psylloides magnificus*; **relicts** - *Lauria cylindracea*, *Euxina circumdata*, *Serrulina serrulata*, *Krynickillus urbanskii* and *Oxychilus urabanskii*.

### **Sand dunes and dry sand lots near Alepu marsh**

Very typical biotope with several species differentiated in small associations as: **rare** - *Anisodactylus intermedius*, *Micromorphus albopiiosus* and *Epithalassius stackelbergi*; **endemites** - *Cicindela hybrida rumalica* and *Bembidon rivulare euxinum*.

### **Rock lots and pubescentgrown or overgrown with salt-love plants lots on Maslen nos**

This limited area is original and too severe (from biology point of view) biotope. There can be found the following species: **rare** - *Asca aphidiotes*, *Paussus tucucus*, *Haploembia solieri*, *Malacomyia sciomyzina*, and *Tetramorium tau-rocaucasicum*; **endemites** - *Cicindela hybrida rumalica*, *Carabus violaceus azurescence*, *Bembidon rivulare euxinum*, *Pterostichus merkli* subsp. nov. and *Calathus metallicus aeneus*.

The mentioned below biotopes do not include all specific places of inhabit of the terrestrial invertebrates in Ropotamo Complex. The interstecial and the subterranean fauna are not included too. These two kinds of fauna inhabit some biotopes that are of scientific importance and not are of great practical significance. By the same token they are not studied enough.

### 1.9.2. FISHES

The rivers and the lakes belonging to the Black Sea watercatching basin are inhabited by freshwater species - Pontho-Caspian relicts (sea autochthonous species, Caspian relicts) boreal-Atlantic relicts and Mediterranean immigrants.

The Danube kinds can be met also there. Their numbers reduce from North towards the South.

The species diversity of Bulgarian fauna is specific for every watercatching or type of basin.

The ichthyofauna of Bulgarian Black Sea rivers includes 77 species and subspecies all together. They are distributed on two complexes: 39 taxa are living permanently and 38 taxa are getting out of the Black Sea or the lakes temporary.

The number of the species visiting the rivers temporary, is present in the firth zone of the Ropotamo river.

The researches of the ichthyofauna are in the work of Karapetcova and Peshev, 1973.

The ichthyofauna of the coastal Bulgarian lakes consist of 79 species and subspecies all together. 43 of them inhabit lake water constantly and the rest of 36 species get out to the water accidentally to breed, bring up or to spend the Winter.

**The Ropotamo reserve**

**Ropotamo river**

**Table 1.** The species compound of the ichthyofauna in the Ropotamo river (by Karapetcova, 1973, 1976)

Species	Origin	Permanent Inhabitant	Temporary Inhabitant	Evaluation
<i>Chalcalburnus chalcoides</i> 3	F	+	-	Not numerous
<i>Vimba vimba tenella</i>	F	+	-	Mass
<i>Scardinius erythrophthalmus</i>	F	+	-	
<i>Carassius auratus gibelio</i>	F	+	-	Numerous
<i>Cyprinus carpio</i>	F	+	-	Rare
<i>Leuciscus caphalus</i>	F	+	-	Comparatively
<i>Leuciscus boristhenicus</i>	F	+	-	Rare
<i>Gobio gobio</i>	F	+	-	Rare, not numerous
<i>Rhodeus sericeus amarus</i>	F	+	-	Comparatively, not numerous
<i>Gasterosteus aculeatus</i> 3	SBR	+	-	Comparatively, not numerous
<i>Gambusia affinis holbrooki</i>	F	+	-	Comparatively, not numerous`
<i>Stizostedion lucioperca</i>	F	+	-	Rare
<i>Mugil (Liza) cephalus</i>	MI		+	
<i>Mugil (Liza) auratus</i>	MI	-	+	Mass
<i>Mugil (Liza) saliens</i>	MI	-	+	Mass

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Mugil (Liza) ramada	MI	-	+	Mass
Atherina mochon pontica 3	MI	-	+	Mass
Alosa ponticai pontica	SA	-	+	Mass
Alosa caspia bulgarica E	SA	-	+	Moderate
Engraulis encrasicolus Ponticus	MI	-	+	Rare
Pomatomus saltatrix	MI	-	+	
Trachurus mediterraneus ponticus	MI	-	+	
Morone labrax	MI	-	+	
Diplodus annularis	MI MI	-	+	
Sciaena umbra	MI MI	-	+	
Spicara snaris	MI MI	-	+	
Symphodus ocellatus	MI MI	-	+	
Symphodus griseus	MI	-	+	
Symphodus tinca	MI	-	+	
Symphodus roissalis	MI	-	+	
Blennius sanguinolentus	MI	-	+	
Blennius pavo	MI	-	+	
Neogobius melanostomus E	SA	+	-	Numerous
Mesogobius gymnotrachelus	SA	+	-	
Proteorhinus marmoratus	SA	+	-	
Gobius ophiocephalus	MI	-	+	

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Gobius niger	MI	-	+	
Neogobius cephalarges	SA	-	+	
Mesogobius batrachocephalus E	SA	-	+	
Trachinus draco	MI	-		
Ophidion rochei	MI	-	+	
Mullus barbatus ponticus	MI	-	+	
Syngnathus nigrolineatus	MI	-	+	Rare
Syngnathus thyphle aregentatus	MI	-	+	
Nerophis ophidion	MI	-	+	
Gaidropsarus mediterraneus	MI	-	+	
Anguilla anguilla 3	SBR	-	+	Rare
Uranoscopus scaber	MI	-	+	
Psetta maxima maeotica E	MI	-	+	Verare
Solea nasuta	MI	-	+	Moderate
Platichthys flesus luscus	SBR	-	+	

**Legend:**

- F** - Freshwater species
- SBR** - Sea boreal relicts
- SA** - Sea autochthonous species (Caspian relicts)
- MI** - Mediterranean immigrant
- 3** - Threatened with extinction
- E** - Endemites

According to the information of Karapetcova (1973) 14 fish species inhabit the first zone of the river permanently. Of them the primary freshwater species which are representatives of the Carp's family predominate. The most numerous and widely spread species are: Caspian shemaya (*Chalcalburnus chalcoides*) and Vimba (*Vimba vimba tenella*).

The chub (*Leuciscus caphalus*) and the Rudd (*Scardinius erythrophthalmus*) are considerably widely spread species. The Carp (*Cyprinus carpio*) and the Gold fish (*Carassius auratus gibelio*) feeling well in brackish water, are met near the mouth of the Ropotamo river but most frequently - in the area covering the site of "Lilies" to the bridge on Sozopol-Primorsko road.

The Chub (*Leuciscus boristhenicus*) and the Pike-perch (*Styzpstedion lucioperca*) which are rare species in this river, can be found in this water area too (from the lilies site to the bridge on Sozopol-Primorsko road). The Butterling (*Rhodeus sericeus amarus*) is met toward the middle part of the firth zone. Of the primary sea species living in the firth zone of the Ropotamo river permanently, the family of the Goby is represented by the greatest number. The Weed goby (*Neogobius melanostomus*) is the most widely Spread.

The black stripe pipefish (*Syngnathus nigrolineatus*) is too numerous in the down half of the firth in Summer. The rest species are mentioned as comparatively rare for that part of the river. (Karapetcova, 1973)

Many more of the species (34) are registered to be temporary inhabitants of the protected zone of the Ropotamo river (Karapetcova, 1973, 1976). All of them are primary sea by birth as the Mediterranean immigrants predominate (table). The number of the species getting out to the river periodically or accidentally and their stay duration are dependent on the hydrological and hydrochemical conditions as well as their biological characteristics.

A great number of the Grey mullets (*Mugilidae*) and the Silverside (*Atherina mochon pontica*) can be met in the firth from early spring to late Autumn.

These species often get out to freshwater place that is located above "Lilies" site.

The Grey mullets stay in the river to spend the Winter. The species such as (*Mullus barbatus ponticus*) Greater Weever (*Trachinus draco*) and the representatives of the Wrasses (*Labridae*), Blennies (*Blenidae*) and etc. appear in the area near the mouth of the firth. The results of Karapetcova's researches (1973) point that isolated specimen of (*Alosa pontica*), (*Alosa caspia bulgarica*) and the Eel (*Anguilla anguilla*) get out to the river from April to September. The same publication (Karapetcova, 1973) says that only three of the ascertained species - the chub, the rudd and the gold-fish are not found in the river before and. This author says that the number of some species (such as

*Chalcalburnus chalcoides* is reducing.

The vertical water interchange is shown and there is an oxygen deficit in the bottom salt layers. This deficit can be removed by intensive getting out of the seawater (Rozdenstvenski). Thus the bottom layers are supplanted towards the surface and shores, where the oxygen quantity reduces suddenly. By the same token the bottom layers contain hydrogen sulfide produced from rotten process in the slime. This has negative effect on the water fauna and can cause fish extinction in large numbers.

The ascertained by 1976 five fish species (*Alosa caspia bulgarica*, *Chalcalburnus chalcoides*, *Atherina mochon pontica*, *Anguilla anguilla*, Three spined stickleback) are registered to be threatened with extinction in the Bulgarian red book.(Karapetcova, Pomacov, 1985; Karapetcova, Zivkov, 1995). The rest species have not official nature-protective status. National Strategy for preserve the biological diversity determines these species to be rare or species with limited spreading (Karapetcova & all, 1995). The *Alosa caspia bulgarica* can be met near the Black Sea shore only and in Black Sea flows. The *Psetta maximum maeotica* is endemites.

Black Sea subspecies, some species of *Gobidae* such as *Neogobius melanostomus* are Caspian relicts. that are spread only in Black Sea and Sea of Azov (Karapetcova, Zivkov, 1995).

The result of researches done in 1996 points that the species compound of the permanent inhabitants has not changed. The *Chalcalburnus chalcoides* and the *Vimba vimba tenella* are widely spread in this water area species. A great number of the Rudd can be met towards the up-part of the firth zone. In the same time the *Leuciscus caphalus* has obviously lost its meaning as widely spread. This is reported by Karapetcova (1973).

The rest primary freshwater species are met considerably rarely and their numbers depend on the salt of the water.

The Weed goby is the most numerous of all primary sea species that inhabit the river permanently

The Black striped pipeship is widely spread too but in the down part of the firth zone.

The three spined stickleback is met in the whole studied area and in the old bed inclusive but its number is low in all place. The Caspian shemaya predominates in the old bed of the Ropotamo river (Vodny lilies reserve). Its larvae testify to successful reproduction there. The Rudd is comparatively not numerous although it is mentioned to be main species in the past researches. (Karapetcova, 1973)

The species composition, the number and the distribution of the fish that inhabit the river temporary are quit changeable . According to the received information considerable changes (in comparison the Karapetcova's information of 1973) have not occurred for this group of fish during the last twenty years. The results of the research in the Summer, 1996 show that the Grey mullet, the Silver side, are the most widely spread in the firth zone as a whole. The Grey mullet has lost its leading role (Karapetcova, 1973) and the Little mullet is presented to be considerable most numerous. This change is obviously connected with the common tendentious that are seemed in Black Sea during the last years.

The Thin-lipped mullet (*Mugil ramada*) which is new for Black Sea (and more numerous) species is caught in the bay in front of the mouth. It can be expected that this species get out in the river too.

The rest fish species that inhabit the river temporary are concentrated in near-mouth zone where the species diversity is the greatest. The families of the Gobidae, the Labridae, the Blenidae and the syngnathidae are the most numerous in the mouth of the river. The *Alosa pontica pontica*, the *Alosa caspia bulgarica* and the *Anguilla anguilla* get out in the firth zone and stay there for a long time. But these species are met rarely. Before they were met rarely too.

**Arkutino marsh**

The species compound of the ichthyofauna - Summer 1996

Species	Evaluation of the population	Endanger status
<i>Gasterosteus aculeatus</i>	Numerous	Endangered-Red List book of Bulgaria
<i>Gambusia affinis holbrooki</i>	Numerous	Endangered-Red List book of Bulgaria

The ichthyofauna is quite scanty both quantitatively and qualitatively. This can be explained by drying the marsh up in 1995. The two species ascertained in 1996, are describe as high adaptable and having a great powers of endurance to unsuitable conditions. The three spined stickleback inhabits the bottom layers and it is concentrated in shallows. The Holbrooki topminnow prefers places located near surface horizon or places overflown whit water lilies.

**Vodny lilies reserve**

Species	Evaluation of the population	Endanger status
Chacalburnus chalcoides	Numerous	endangered-Red List book of Bulgaria
Gasterosteus aculeatus gibelo	Unknown	
Scardinius erythrophthalmus	Considerably scanty	endangered-Red List book of Bulgaria

In the old bed of the Ropotamo river /Vodny lilies / Caspian shemaya dominates. Comparatively low on number is Rudd. Both of the two species are in the Red List Book of Bulgaria in the “endangered” category.

**Alepu marsh**

The species compound of the ichthyofauna

Species	Evaluation of the population	Endanger status
Scardinius erythrophthalmus	Numerous	
Carassius auratus gibelo	numerous	
Cuprinus carpio	Moderate by number	Endangered
Gasterosteus aculeatus <sup>3</sup>	Moderate by number	Endangered
Gambusia affinis holbrooki	Numerous	
Perca fluviatilis	Moderate by number	

The received information shows that ichthyofauna consists almost entirely of freshwater species of which the Carp fish predominate. The Rudd and the fish that belong to the Carp family, are the most widely spread in the both parts of Alepu marsh. The Carp can be met too. Its presence is a result of a past stocking a pond with fish but now it is rare species. Probably its low number can be explained by missing of suitable conditions to be reproduced.

The marsh is inhabited by freshwater species belonging to other families, i e : the Poeciliidae is presented by the Holbrooki topminnow that is one of the most widely spread species. It is widely spread in most coastal lakes and marsh too; the Percidae family - it is presented by one species Perch (Perca fluviatilis) that is not too numerous. The three spined stickleback of sea origin is ascertained in Alepu marsh.

The sea species living in the marsh temporarily in summer have dropped of the marshes ichthyofauna out because of the breaking connection between the marsh and the sea. This marsh is the largest and one of the three researched marshes.

Other species of fishes that are rare and not too numerous can be found if further researches be done.

**Stamopolu marsh**

Species	Evaluation of the population	Endanger status
Cyprinus carpio	Moderate by number/ by numerous	
Tinca tinca	Moderate by number/ by numerous	
Pseudorasbora	Moderate by number/ by numerous	

Gombusia affinis holbrooki	Moderate by number/ by numerous	
Lepomis gibbosus	Moderate by number/ by numerous	

The marsh is being used for economic and sports fishing. According to the information given by the leaseholder of Stamopolu marsh it was stocked a pond with 40 thousand babies of the Carpa and Tench, individually weighting 60-80 g. 5 species of fishes were ascertained as a result of the researches in 1996 *Cyprinus carpio*, *Tinca tinca*, *Gombusia affinis holbrooki*, *Lepomis gibbosus*, *Pseudorasbora parva*. The last two species are often spread together with breeding material of the Carp fish. As it seems the most wide spread species of fishes, being the basis of the ichthyofauna in the marsh, are of anthropogenical origin, i.e. the modern ichthyocenoses is formed under the active man's influence. These five species are met both in the two parts of the marsh but the numbers of the Carp and the Tench are greater in the South part.

As a whole the small fishes have considerable numerical superiority in the marshes. This fact concerns not only the fauna representatives that have species determined size but the Tench and the Carp too.

From the received information and eutrophic nature of the marsh we can conclude that the food resources are not limiting factor for the species richness and for the numbers of the fish inhabitants. It has also bearing on the other water basins in the region.

About the researched damp areas in the Ropotamo Complex we can generalize that they are inhabited by 55 fish species of which : one species is new for the Black Sea (*Mugil ramada*) ; three - Stone moroko, Opan, Tech are new for the region; Five – registered in the Red List Book of Bulgaria with “endangered of extinction” status. All of them are presented in the river and just one of them- Three-spined stickle back is found in the marsh / with exception of Stamopolu/. The Ropotamo river is inhabited by four fish species with various endemic degree.

### 1.9.3. REPTILES AND AMPHIBIANS

The area of Ropotamo Complex is one of the three most various and numerous of species regions in Bulgaria.

32 species of a considered group are ascertained there: 9 species Amphibians; 23 species - Reptiles. Of all ascertained species, 6 species are enlisted by Order of the Ministry of the Environment N 729/1986; 15 species - enlisted in the Bern Convention; 2 species are enlisted in the European Red list; 6 species - in the World Red book.

The most Northerly for Europe deposits of the *Coluber rubriceps* are met in the territory of the Complex. They live on the narrow strip of the Black Sea Coast, in the South of Sozopol.

#### Inventory list and conservational status of the Amphibians and Reptiles species ascertained in the researched region

**Amphibians**

Species	Work Red List	IUCN	Red List Book of Bulgaria	Protected by Order 729/1986 of the MoE	Include in Bern Convention	European Red List
Triturus vulgaris	+	conservationally dependent		+		
Triturus cristatus	+	conservationally dependent		+		
Bombina bombina	+	conservationally dependent			+	
Bufo bufo				+		
Bufo viridis				+	+	
Hylia arborea	+	endangered		+	+	
Pelobates syriacus balcanicus			**	++		
Rana ridibunda						
Rana dalmatina					+	

## Reptiles

Species	Work Red List	IUCN	Red List Book of Bulgaria	Protecte d by Order 729/1986 of the MoE	Included in Bern Conventio
<i>Testudo graeca graeca</i>	+	vulnerable		++	+
<i>Testudo hermanni boettgeri</i>	+	almost endangered		++	+
<i>Emys orbicularis</i>	+	almost endangered		+	+
<i>Caretta caretta</i>	+	vulnerable			
<i>Cyrtodactylus kotschy</i>				+	+
<i>Anguis fragilis</i>					
<i>Ophisaurus apodus thracicus</i>			**		+
<i>Lacerta (Podarcis) taurica</i>					
<i>Lacerta viridis</i>					+
<i>Lacerta (Zootoca) praticola</i>					
<i>Lacerta trilineata</i>					
<i>Ablepharus kitaibelii</i>					+
<i>Typhlops vermicularis</i>			*	+	
<i>Natrix natrix</i>					
<i>Natrix tessellata</i>					
<i>Coluber jugularis</i>				+	?
<i>Coluber rubriceps thracicus</i>			**	++	+
<i>Elaphe longissima lingissima</i>			*	++	+

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Elaphe quatuorlineata sauromates				++	+
Elaphe situla			*	++	
Malpolon monspessulanus		no enough data		++	
Vipera ammodytes #					+

++ - This symbol means that not only the destroying but also the collecting of the living specimen from this species is determined as unremovable harm.

- The Common loggerhead (*Caretta caretta*) is caught in the water in front of Maslen nos only once. It is a chance quest from Mediterranean sea. It is written here to complete the information.

? - The species is suggested to be enlisted in the Bern Convention in 1994. The Standing Committee has not given its attitude yet.

# - The Western sad viper is on the regime of limited using according to Order by the Ministry of the Environment N 107/1991.

\*\* - Threatened

**Amphibians - evaluation of the populations**

Species	Alepu	Arkutino	The Ropotamo river	Stamopolu	The Ropotamo Complex
<i>Triturus vulgaris</i>		Thick population			
<i>Triturus cristatus</i>	Considerably thick population			Considerably thick population	
<i>Bombina bombina</i>		Considerably thick population	great number of micropopulations		
<i>Bufo bufo</i>		sporadically located populations	Sporadically located populations		
<i>Bufo viridis</i>		Thick population	Thick population		
<i>Hyla arborea</i>					

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Pelobates syriacus balcanicus	Sporadic populations between Alepu and the Sea	sporadic populations between Arkutino and the Sea	Sporadic populations between the Ropotamo river and Sea	sporadic populations between Stamopolu and the Sea	
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. Rana ridibunda

Very thick populations near the water basins

. Rana dalmatina

In the Complex, sporadically located near the damp areas in the Complex

**Reptiles**

1. Testudo graeca graeca

Very thin population in comparison with the 50ies years.

2. Testudo hermanni boettgeri

Very thin population in comparison with the 50ies years.

3. Emys orbicularis

Thick population in all freshwater and not too saltwater basins.

4. Caretta caretta

It is ascertained only once (Black Sea)

5. Cyrtdactylus kotschy

The only ones wild populations in Bulgaria not too numerous, sparsely located, Condros, Maslenos, mouth of the Ropotamo river, near Arkutino, on Zmiisky ostrov - reducing

6. Anguis fragilis

Sparsely located in the whole region

7. Ophisaurus apodus thracicus

Thin but stable populations, in the whole region

8. Lacerta (Podarcis) taurica

Very thick populations, in dry places and dunes

9. Lacerta (Podarcis) muralis

Sparsely located population having mean thickness, on places whit cliffs

10.Lacerta viridis

Thick population in the whole region except of beaches and dense forests.

11.Lacerta (Zootoca) praticola

Isolated specimen are ascertained in the forests to the west of the road Primorsko-Ropotamo.

12.Lacerta trilineata

A single deposit is known "Duni" Vacation village. The most rare species in the region.

13.Ablepharus kitaibelii

Everywhere in the Oak-tree forests except dunes, on some places - too numerous

14.Typhlops vermicularis vermicularis

Sparsley located, too numerous in the exactly determined deposits

15.Natrix natrix

Thick population in all freshwater basins

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16. <i>Natrix tessellata</i>	There are plenty of them on the Black Sea shore and all water basins
17. <i>Coluber jugularis</i>	Everywhere in the region except the dunes. Considerably thick populations
18. <i>Coluber rubriceps thracicus</i>	Sparsley located populations, not too numerous, in exactly determined deposits
19. <i>Elaphe longissima lingissima</i>	Considerably rare, on the damp areas
20. <i>Elaphe quatuorlineata sauromates</i>	Too rare, deeply thin population sparsley located probable
21. <i>Elaphe situla</i>	Isolated specimen are found near Arkutino and to the North of it.
22. <i>Malpolon monspessulanus</i>	Everywhere in the region, on dry and basked places, sparsley located probable
23. <i>Vipera ammodytes</i> #	Everywhere spread, on normal thickness.

++ - This symbol means that not only the destroying but also the collecting of the living specimen from this species is determined as unremovable harm.

- The Common loggerhead (*Caretta caretta*) is caught in the water in front of Maslen nos only once. It is a chance quest from Mediterranean sea. It is written here to complete the information.

? - The species is suggested to be enlisted in the Bern Convention in 1994. The Standing Committee has not given its attitude yet.

# - The Western sad viper is on the regime of limited using according to Order by the Ministry of the Environment N 107/1991.

\*\* - Threatened9012a940 003

The population of the *Elaphe situla situla* - the species included in the Red List Book of Bulgaria as "endangered" is found of the Complex territory, in the South of Sozopol.

### **Damp areas in the Ropotamo Complex**

**Amphibians**

**Evaluation of the populations**

<b>Species</b>	<b>Alepu</b>	<b>Arkutino</b>	<b>The Ropotamo river</b>	<b>Stamopolu</b>
Triturus vulgaris		relatively numerous		
Triturus cristatus	relatively numerous			Relatively numerous
Bombina		relatively		
bombina		numerous		
Bufo bufo		population sporadically located	population sporadically located	
Bufo viridis		thin population	relatively numerous	
Hyla arborea				
Pelobates balcanicus	populations, sporadic between Alepu and the Sea	populations, sporadic between Arkutino and the Sea	Populations, sporadic between the river and the sea	populations, sporadic between Stamopolu and the sea

Rana ridibunda- numerous population near the water area throughout the Complex

Rana dalmatina- sporadic, located near water areas in the Complex

**Reptiles**

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<b>Species</b>	<b>Evaluation of the populations</b>
<i>Testudo graeca graeca</i>	Very thin population with comparison 50 <sup>ies</sup> years
<i>Testudo hermanni boettgeri</i>	Very thin population with comparison 50 <sup>ies</sup> years
<i>Emys orbicularis</i>	Thick population in all fresh water and not very salt water
<i>Caretta caretta</i>	Ascertained once in the Black Sea
<i>Cyrtodactylus kotschy</i>	The only one wild population in Bulgaria, not numerous, sporadic, “Condros” Cape, near Arkutino, on Zmiisky ostrov-reduces
<i>Anguis fragilis</i>	Sporadic ally located. Throughout region
<i>Ophisaurus apodus thracicus</i>	Thin but stable population. Throughout region.
<i>Lacerta (Podarcis) taurica</i>	Numerous population, in dry places and dunes
<i>Lacerta (Podarcis) muralis</i>	Sporadic population numerous in rocky places
<i>Lacerta viridis</i>	Numerous population throughout region except on the coast and dense forests.
<i>Lacerta (Zootoca) praticola</i>	Individual specimen are found in the forests in the East of Primorsko-Ropotamo road.
<i>Lacerta trilineata</i>	The only one deposit in Duni Village. The rarest species in the region.
<i>Ablepharus kitaibelii</i>	Everywhere in oak - forests, except dunes, numerous on some places.
<i>Typhlops vermicularis</i> <i>vermicularis</i>	Sporadic – numerous on exact places
<i>Natrix natrix</i>	Numerous in all water - fresh basins
<i>Natrix tessellata</i>	A great number is met in the Black Sea and in all water basins
<i>Coluber jugularis</i>	Everywhere in the region, except dunes Comparatively numerous population

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Coluber rubriceps thracius	Sporadic population , on some places-not numerous
Elaphe longissima lingissima	Relatively, in marshy areas
Elaphe quatuorlineata	Quite thin, extremely low by number population sporadic
Elaphe situla	Individual specimen are found near Arkutino and in the North of it
Malpolon monspessulanus	Everywhere in the region, on dry places
Vipera ammodytes	It is met everywhere, normal thickness

#### **1.9.4.Birds**

There are a few articles on the birds in the explored area "Waterfowls of the Ropotamo River Mouth" by G. Petrova, Orn. Inf. Bull., 6/1979, "Zoogeographical characteristic and trophical stations of the birds of the Ropotamo River Mouth" Orn. Inf. Bull., 708/1980; Vatev. I, "Late autumn counting of some waterfowls on the Bulgarian Black sea coast ( 18-25.02.1978 ).Orn. Inf., Bull.,

7-8/ 1980; Nankinov, D. "An Attempt to ornithological estimate of the biotopes on the Black sea coast ( waterfowls - autumn)", Orn, Inf., Bull, 10/1981. There are some data on the birds of Ropotamo Complex in the works of Proffirov and Georgiev. The check ( table mp5.doc-in the Appendix ) is made on the basis of data of Proffirov's and Georgiev work. The check-list ( table mp5.doc- in the Appendix ) is made on the basis of data works of Proffirov and Georgiev. The check-list ( tablemp5.doc-in the Appendix) is made on the basis of data of:

- The above-mentioned works
- Data collected by people watching the birds; led by L. Proffirov and M. Dimitrov
- Unpublished information of M. Dimitrov, K. Nyagolov and L. Proffirov
- Midwinter counts of the waterfowls( co-ordinated by T. Michev and L. Proffirov

Scientific names are by BWP ( Cramp & Simmons )

67 species of birds are included in the Red List Bulgarian Book . OF them:

21 - rare including 6 breeding species

46 - endangered - including 22 breeding

226 are protected by Order No729/ 1986 of the MoE

Of them: 123 species are breeding, 84 species are included in the CORINE BIOTOPES MANUAL.

Migrating species, enlisted in Bon Convention

138 species - Appendix II

62 species - Appendix III

The species in the CPES special category.

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CPES 1 - species of global conservation importance, classified as globally endangered - 7 species, 2 of them are breeding.

CPES 2 - species whose world population is concentrated in Europe and have unfavorable nature- protective status - 67 species

CPES 3 - species whose population is not concentrated in Europe but their Nature protective status in Europe is unfavorable - 67 species

CPES 4 - species whose world population is concentrated in Europe and have favorable nature - protective status.

- **ETS** - *degree of endangerness of the European birds species according to Birds of Europe*
- *Their Nature -protective status / Tucker, Heat, 1994/*
- *Degree of endangering of the species:*
- **E** - *endangered -7 species, 3 species, status*
- **V** - *vulnerable - 28 species, 7 species, status*
- **R** - *rare - 11 species, 1 species, status*
- **D** - *decreasing - 25 species, 7 species, status*
- **L** - *localized - 4 species,*
- **S** - *stable-119 species, 40 species, status*
- **O** - *temporary status*

The Key migrating / wintering/ birds in the damp areas of the Ropotamo Complex are 22 species.

The Key migrating / wintering/ birds in the Ropotamo Complex but not in the damp areas are 58 species.

The total list of the birds in the Ropotamo Complex includes 255 species.

**CONSERVATIONAL STATUS OF THE BIRDS IN THE ROPOTAMO COMPLEX**

Ni		Bulgaria Red Book	Law	CO RI NE	Bern Ap pendix	Ramsar number	Alepu, Arkutino, Stamopolu	Bon Ap pen dix	Spe cial con vent ion	Europ ean Status
1.	<i>Gavia stelata</i>		+	#	II			II	Ç	V
1.	<i>Gavia arctica</i>	R	+	#	II		5. 16.2.	II	Ç	V
1.	<i>Tachybaptus ruficollis</i> *		+		II		79. 8.4.			S
1.	<i>Podiceps cristatus</i>		+		III		17. 52.7.			S
1.	<i>Podiceps grisegena</i> *	R	+		II		- 3.6.	II		S
1.	<i>Podiceps auritus</i>		+	#	II		- 1.-	II		(S)
1.	<i>Podiceps nigricollis</i>	V	+		II		130. 30.52			S
1.	<i>Puffinus yelkouan</i>		+		II		- 1.45		4	S
1.	<i>Phalacrocorax carbo</i>	V	+		III	(100) 1000	25.25.33			S
1.	<i>Phalacrocorax aristotelis</i>	V	+		III				4	S
1.	<i>Phalacrocorax pygmeus</i>	V	+	#	II	(50) 250	75.24.1.	II	2	V
1.	<i>Pelecanus onocrotatus</i>	E	+	#	II	200		II	3	R
1.	<i>Pelecanus crispus</i>	V	+	#	II	(ÅII) 25		I	1	V
1.	<i>Botaurus stellaris</i>	V	+	#	II	(25)	1. - -	II	3	(V)
1.	<i>Ixobrychus minutus</i> *		+	#	II		1. 1.4.	II	3	(V)
1.	<i>Nycticorax nycticorax</i>		+	#	II	(200) 600	8.7.-		3	D
1.	<i>Ardeola ralloides</i>		+	#	II	120	15. - 6.		3	V
1.	<i>Egretta garzetta</i> *		+	#	II	(130) 400	22.2.3.			S
1.	<i>Egretta alba</i>	V	+	#	II	(5) 120	12.13.1.	II		S
1.	<i>Ardea cinerea</i> *		+		III		7. 7.11			S
1.	<i>Ardea purpurea</i> *	V	+	#	II	(65) 200	2.5.. 3.	II	3	V
1.	<i>Ciconia nigra</i> *	V	+	#	II	350	- 4.	II	3	R
1.	<i>Ciconia ciconia</i> *		+	#	II	4000	500 1600 200	II	2	V
1.	<i>Plegadis falcinellus</i>	V	+	#	II	(35) 100	-- 1 7	II	3	D
1.	<i>Platalea leucoroda</i>	V	+	#	II	(20) 60	133 81 -	II	2	Å
1.	<i>Cygnus olor</i> *	V	+		III	200	149 29 172	II		S
1.	<i>Cygnus</i>		+	#	II	170	2. - -	II	4"	S
1.	<i>Anser albifrons</i>				III	2500	9.- -	II		S
1.	<i>Anser abser</i> / * in the past/		+		III	250	3.- -	II		S
1.	<i>B'anta ruficollis</i>	V	+	#	II	650	3.- -	II	1	L"
1.	<i>Tadorna tadorna</i>	V	+		II	750	- 40.-	II		S
1.	<i>Anas penelope</i>				III	6000	36.. -	II		S
1.	<i>Anas stepera</i> *	V	+		III	750	110.28.3.	II	3	V
1.	<i>Anas crecca</i>				III	10000	500.43.23.	II		S
1.	<i>Anas platyrhynchos</i> *				III	20000	127.83.24.	II		S
1.	<i>Anas acuta</i>				III	3000	1.70.-	II	3	V
1.	<i>Anas quequedula</i> *				III	2500	12.37.46.	II	3	V
1.	<i>Anas clypeata</i>				III	2200	17.6.3.	II		S
1.	<i>M.dngustirostris</i>	R	+	#	II	20	.1.-	II	1	Å
1.	<i>Netta rufina</i>	R	+		III	500	28.41.47	II	3	D
1.	<i>Aythya ferina</i> *	V	+		III	12500	3970.76.1200	II	4	S
1.	<i>Aythya nyroca</i> *	V	+	#	III	750	4.6.2.	II	1	V
1.	<i>Aythya fuligyla</i>				III	6000	2365.1252.1002	II		S
1.	<i>Aythya marila</i>		+		III	500	2.. -	II	3"	L"
1.	<i>Clangula hyemalis</i>		+		III	-	2. . -	II		S
1.	<i>Melanitta nigra</i>		+		III	100000	1.- -	II		S
1.	<i>Melanitta fusca</i>		+		III	15	1.- -	II	3"	L"
1.	<i>Bucephala ilangula</i>				III	200	5.9.-	II		S
1.	<i>Mergus albelus</i>		+		II	650	5.58.2.	II	3	V
1.	<i>Mergus serrator</i>		+		III	500	16.15.12	II		S
1.	<i>Mergus merganser</i>		+		III	100	1.. -	II		S
1.	<i>Pemis apivorus</i> *	V	+	#	II			II	4	S
1.	<i>Milvus migrans</i>	V	+	#	II			II	3	V
1.	<i>Haliaeetus albicilla</i> *	V	+	#	III			I	3	R
1.	<i>N. percnopterus</i>	V	+	#	II			II	3	Å
1.	<i>Gyps fulvus</i>	V	+	#	II			II	3	R
1.	<i>Circaetus gallicus</i> *	V	+	#	II			II	3	R
1.	<i>Circus aeruginosus</i> *	V	+	#	II			II		S
1.	<i>Circus cyaneus</i> δ	R	+	#	II			II	3	v

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1.	Circus macrourus	R	+	#	II			II	3	Å
1.	Circus pygargusø	R	+	#	II			II	4	S
1.	Accipiter gentilis*	V	+	#	II			II		S
1.	Accipiter nisus *	V	+	#	II			II		S
1.	Accipiter brevipes*	V	+	#	II			II	2	R
1.	Buteo buteo *		+		II			II		S
1.	Buteo rufinus	V	+	#	II			II	3	(Å)
1.	Aquila pomarina*	V	+	#	II			II	3	R
1.	Aquila clanga	R	+	#	II			II	1	Å
1.	Aquila heliaca	V	+	#	II			II	1	Å
1.	Aquila chrysaetos	R	+	#	II			II	3	R
1.	Hieraetus pennatus	V	+	#	II			II	3	R
1.	Pandion haliaetus	V	+	#	II			II	3	R
1.	Falco tinnunculus*		+		II			II		
1.	Falco vespertinus	R	+		II			II	3	V
1.	Falco subbuteo *	V	+		II			II		S
1.	Falco peregrinus	V	+	#	II			II	3	R
1.	Perdix perdix*				III				3	V
1.	Cotumix cotumix*				III			II	3	V
1.	Phasianus colchicus *	V			III					V
1.	Rallus aquaticus *		+		III	7. 6.5.				(s)
1.	Porzana porzana*		+	#	II	4. -		II	4	S
1.	Porzana parva*		+	#	II	- 3.		II	4	(s)
1.	Crex crex*	V	+	#	II				1	(V)
1.	Gallinula chloropus*		+		III	12. 15.10				S
1.	Fulica atra*				III	20000	2250.950.2165	II		S
1.	Grus	E	+	#	II			II	3	V
1.	Haematopus ostralegus*	V	+		III	7500	32.4.			S
1.	Himantopus himantopus	V	+	#	II	(50) 150				S
1.	Recurvirostra avosetta*	R	+	#	II	(100) 250	2.	II	4/3"	L"
1.	Glareola pratincola	V	+	#	II	(30) 100		II	3	Å
1.	Charadrius dubius*		+		II		7. 21.7.	II		(s)
1.	Charadrius alexandrinus*	R	+		II	(100) 250		II	3	D
1.	Pluvialis squatarola		+		III			II		(S)
1.	Vanellus vanellus		+		III			II		(S)
1.	Calidris alba		+		II		5.	II		S
1.	Calidris minuta		+		II			II		(S)
1.	Calidris alpina		+		II			II	3"	V"
1.	Philomachus pugnax		+	#	III			II	4	S
1.	Gallinago	E	+		III			II		S
1.	Scolopax rusticola	R			III			II	3"	V"
1.	Numenius arquata		+		III			II	3"	D"
1.	Tringa erythropus		+		III			II		S
1.	Tringa totanus	V	+		III			II	2	D
1.	Tringa ochropus	V	+		II			II		(S)
1.	Tringa glareola		+	#	II			II	3	D
1.	Actitis hypoleucos		+		II			II		S
1.	Stercorarius pomarinus		+		III					(S)
1.	Larus melanocephalus	R	+	#	II			II	4	S
1.	Larus minutus		+		II		29. 42.26		3	D
1.	Larus ridibundus *	R	+		III		100. 24.26.			S
1.	Larus genei	R	+	#	II			II		(S)
1.	Larus canus		+		III				2	D
1.	Larus fuscus		+						4	B
1.	Larus argentatus									S
1.	Larus cachinans*									S
1.	Larus marinus		+						4	S
1.	Sterna caspia	R	+	#	II			II	3	(E)
1.	Sterna sandvicensis		+	#	II	(400) 1300		II	2	D
1.	Sterna hirundo*		+	#	II	(700)		II		S
1.	Sterna albifrons*	V	+	#	II	(100)		II	3	D
1.	Chlidonias hybridus	V	+	#	II	(750)	-- 3.			D
1.	Chlidonias niger*	V	+	#	II	(200) 600		II	3	D
1.	Chlidonias leucopterus		+	#	II			II		S
1.	Columba livia*		+		III					S
1.	Columbaenas*	V	+		III				4	S
1.	Columba palumbus*								4	S
1.	Streptopelia decaocto*				III					(S)
1.	Streptopelia turtut*				III				3	D
1.	Cuculus canorus*		+		II					S
1.	Otus scops*	R	+		II				2	(D)

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1.	Bubo bubo*	V	+	#	II		3	V
1.	Athene noctua*		+		II		3	D
1.	Strix aluco*		+		II		4	S
1.	Asio otus*		+		II			S
1.	Aegolius funereus*?	P	+	#	1. I			(S)
					I			
1.	Caprimulgus europaeus*		+	#	II		2	(D)
1.	Apus apus*		+		III			S
1.	Apus melba		+		II			S
1.	Alcedo atthis*		+	#	II		3	D
1.	Merops apiaster*		+		II	II	3	D
1.	Coracias garrulus*		+	#	II	II	2	(D)
1.	Upupa epops*		+		II			S
1.	Jynx torquilla*		+		II		3	D
1.	Picus canus*		+	#	II		3	D
1.	Picus vinidis*		+		II		2	D
1.	Dryocopus martius*		+	#	II			S
1.	Dendrocopos major*		+		II			S
1.	Dendrocopos syriacus*		+	#	II		4	(S)
1.	Dendrocopos medius*		+	#	II		4	S
1.	Dendrocopos leucotoc*	R	+	#	II			S
1.	Dendrocopos minor*		+		II			S
1.	Melanocorypha calandra		+	#	II		3	(D)
1.	Calandrella brachydactyla		+	#	II		3	V
1.	Galerida cristata*		+		III		3	(D)
1.	Lullula arborea*		+	#	III		2	V
1.	Alauda arvensis*		+		III		3	V
1.	Riparia riparia		+		II		3	D
1.	Hirundo rustica*		+		II		3	D
1.	Hirundo daurica*		+		II			S
1.	Delichon urbica*		+		II			S
1.	Anthus campestris*		+	#	II		3	V
1.	Anthus trivialis*		+		II			S
1.	Anthus pratensis		+		II		4	S
1.	Anthus cervinus		+		II			(S)
1.	Anthus spinoletta		+		II			S
1.	Motacilla flava*		+		II			S
1.	Motacilla cinerea		+		II			(S)
1.	Motacilla alba*		+		II			(S)
1.	Bombicilla garrulus		+		II			(S)
1.	Troglodytes troglodytes*		+		II			S
1.	Prunella modularis		+		II		4	S
1.	Cercotrichas galactotes		+		II			S
1.	Erithacus rubecula*		+		II	II	4	S
1.	Luscinia luscinia		+		II	II	4	S
1.	Luscinia megarhynchos*		+		II	II	4	(S)
1.	Phoenicurus ochrurus		+		II	II		S
1.	Phoenicurus		+		II	II	2	V
1.	Saxicola rubetra		+		II	II	4	S
1.	Saxicola torquata*		+		II	II	3	(D)
1.	Oenanthe oenanthe*		+		II	II		S
1.	Oenanthe hispanica		+		II	II	2	V
1.	Monticola solitarius		+		II	II	3	V
1.	Turdus torquatus		+		II	II	4	S
1.	Turdus merula*		+		III	II	4	S
1.	Turdus pilaris		+		III	II	4''	S
1.	Turdus philomelos*		+		III	II	4	S
1.	Turdus viscivorus*		+		III	II	4	S
1.	Cettia cetti*		+		II	II		S
1.	Locustella naevia		+		II	II	4	S
1.	Locustella rluviatilis*		+		II	II	4	S
1.	Locustella lusciniodes*		+		II	II	4	(S)
1.	Acroc melanopogon		+	#	II	II		(s)
1.	Acroc. Schoenobaenus*		+		II	II	4	S
1.	Acrocephalus palustris		+		II	II	4	S
1.	Acrocephalus scirpaceus*		+		II	II	4	S
1.	Airoc. Arundinaceus*		+		II	II		(S)
1.	Hippolais pallida*		+		II	II	3	V
1.	Hippolais olivetorum		+	#	II	II	2	®
1.	Sylvia nisoria*		+	#	II	II	4	(S)
1.	Sylvia curruca		+		II	II		S

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1.	<i>Sylvia communis*</i>	+		II	II	4	S
1.	<i>Sylvia borin</i>						
1.	<i>Sylvia atricapilla*</i>	+		II	II	4	S
1.	<i>Phylloscopus bonelli*</i>	+		II	II	4	S
1.	<i>Phylloscopus sibilatrix`</i>	+		II	II	4	(S)
1.	<i>Phylloscopus collybita*</i>	+		II	II		(S)
1.	<i>Phylloscopus trochilus</i>	+		II	II		S
1.	<i>Regulus regulus</i>	+		II	II	4	(S)
1.	<i>1. Muscicapa striata*</i>	+		II	II	3	D
1.	<i>Ficedula parva</i>	+	#	II	II		(S)
1.	<i>Ficedula albicollis*</i>	+	#	II	II	4	S
1.	<i>Ficedula semitorquata*</i>	+	#	II	II	2	(E)
1.	<i>ficedula hypoleuca</i>	+		II	II	4	S
1.	<i>Panurus biarmicus*</i>	P	+	II	II		(S)
1.	<i>Aegithalos caudatus*</i>	+		II			S
1.	<i>Parus palustris*</i>	+		II			S
1.	<i>Parus lugubris*</i>	+		II		4	(S)
1.	<i>Parus montanus</i>	+		II			(S)
1.	<i>Parus ater</i>	+		II			S
1.	<i>Parus caeruleus*</i>	+		II		4	S
1.	<i>Parus major*</i>	+		II			S
1.	<i>Sitta europaea*</i>	+		II			(S)
1.	<i>Certhia familiaris</i>	+		II			S
1.	<i>Certhia brachydactyla*</i>	+		II		4	S
1.	<i>Remiz pendulinus*</i>	+					(S)
1.	<i>Oriolus oriolus*</i>	+		II			S
1.	<i>Lanius collurio*</i>	+	#	II		3	(D)
1.	<i>Lanius minor</i>	+	#	II		2	(D)
1.	<i>Lanius senator*</i>	+		II		2	V
1.	<i>Lanius excubitor</i>						
1.	<i>Garrulus glandarius*</i>						(S)
1.	<i>Pica pica*</i>						S
1.	<i>Corvus moneadula*</i>					4	S
1.	<i>Corvus frugilegus</i>						S
1.	<i>Corvus corone cornis*</i>						S
1.	<i>Corvus corax*</i>	+		III			(S)
1.	<i>Sturnus vulgaris*</i>						S
1.	<i>Passer domesticus</i>						S
1.	<i>Passer hispaniolensis*</i>			III			(S)
1.	<i>Passer montanus*</i>			III			S
1.	<i>Fringilla coelebs*</i>	+		III		4	S
1.	<i>Fringilla montifringilla</i>	+		III			S
1.	<i>Serinus serinus</i>	+		II		4	S
1.	<i>Carduelis chioris*</i>	+		II		4	S
1.	<i>Carduelis carduelis*</i>	+		II			(S)
1.	<i>Carduelis spinus</i>	+		II		4	S
1.	<i>Carduelis cannabina*</i>	+		II		4	S
1.	<i>Coccotr. Coccotraustes*</i>	+		II			S
1.	<i>Emberiza citrinella*</i>	+		II		4	(S)
1.	<i>Emberiza cirLus*</i>	+		II		4	(S)
1.	<i>Emberiza cia</i>	+		II		3	V
1.	<i>Emberiza hortulana*</i>	+	#	III		2	(V)
1.	<i>Emberiza schoeniclus</i>	+		II			S
1.	<i>Emberiza melanocephala*</i>	+		II		2	(V)
1.	<i>Miliaria calandra*</i>	+		III		4	(S)

*LEGEND:*

- **BRB** - species written in the Bulgarian List Red Book. They are put in the following three categories.
- **R** - rare
- **EN** - endangered
- **EX** - extinct
- **OPB** - Order by N 342/ 21.04.1986 of the Committee for Environment Protection for preserving of birds that are endangered of extinction, the state Gazette 42/ 30.05.1986
- **CORINE** - endangered bird species according CORINE BIOTOPES
- **BERN CONVENTION**
  - Appendix II - strictly conserved fauna species
  - Appendix III - conserved fauna species
- **Ramsar** convention
- Numerical criterion for choice of water birds in Europe
- \*\* - the breeding populations are given in number of pairs
- \*\* - the migrating / wintering/ populations are given in number of specimen
- **Data** - the maximal number of migrating and wintering water-fowls, written in the Ropotamo Complex, during 1990 - 1997
- **Bon** - Species enlisted in the Convention for migrating species of wild animals conservation.
  - Appendix I - Species that are endangered of extinction in the whole or in the big part of their area.
  - Appendix II - Species need of International cooperation to be conserved and Managed
- **SPEC** -Special category. They are divided into four categories
- **SPEC 1** - .Species in Europe of world natural - conservative importance
- **SPEC 2** - Species whose world population is concentrated in Europe and are of unfavorable nature-protective status is in Europe
- **SPEC 3** - Species whose population is not concentrated in Europe and are of unfavorable Nature - protective status in Europe
- **SPES 4** - Species whose world population is concentrated in Europe and are of favorable nature-protective Status.
  - Two number are given to the SPEC categories / example "4/2"/. The first number determines the breeding, and the second one - the wintering population of the species.
  - The Mark " - show that the SPEC category determines only the wintering population of the species.
- **ETS** - degree of endangerness for the European bird species according to the European birds.
- **E** - endangered species whose European population is smaller than 10000 pairs, and greatly decreases or is stable but smaller than 2500 pairs and decreases moderately or is smaller than 250 pairs
- **V** - Vulnerable: species whose population is over 10000 pairs but greatly decreases or is under 1000 pairs and decreases Moderately or is smaller than 2500 pairs.

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- **R** - Rare: Species, whose European population is not greatly decreases or moderately but is smaller than 1000 pairs.
- **D** - decreasing: species whose European population is over 10000 and decreases moderately.
- **L** - located: species whose European population is over 10000 pairs, or 4 000 wintering specimen and is not decreasing, but 90% of it is met on 10 places.
- **S** - Stable: species whose European population is over 10000 pairs or 40000 wintering specimen and is not decreasing, not located, i.e. it is of favorable nature-protective Status
- **O** - temporary status
- The “ Symbol shows that the endangerness degree determines only the wintering population.

**Key breeding birds - 1995/ 96 ( Damp areas )**

Key breeding birds	Alepu pairs 1995	Alepu pairs 1996	Arkuti no pairs 1995	Arkuti no pairs 1996	Ropot amo pairs 1995	Ropot amo pairs 1996	Stamo polu pairs 1995	Stamo polu pairs 1996
Tachipabtes ruficollis	3	3-5	2-3	3-4	3-5	3-5	2-3	4
Podiceps cristatus	2	2					2	1
Podiceps grisegena							2	1
Ixobrychus minutus	3	5			2-3	2-3	2-3	2-3
Nycticorax nycticorax		4						
Egretta garzetta		12						
Ardea cinerea	13	4					12	5
Ardea purpurea	3-5						5	
Cygnus olor	1		1	1				1
Anas querquedula								1
Aythya nyroca	1	1					1	1
Aythya nyroca	1	1					1	1
Circus aeruginosus	2					1	1	1
Porzana parva							5	5-6
Porzana parva								1-2
Panurus biarmicus					3-4	3-4		
Alcedo atthis					1			

The species of the Ardea cinerea from Arkutino, Trinda totanus from the Ropotamo river , Anser anser from Alepu and Chlidonias nigra from St. Toma island have been extinct as breeding birds during 20 last years.

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<b>Key migrating / wintering/</b>	<b>All damp areas average</b>
Phalacrocorax pygmaeus	50- 80
Pelecanus onocrotalus	100
Pelecanus crispus	20
Botaurus stellaris	3
Ixobrychus minutus	20
Ardeola ralloides	20
Egretta garzetta	30
Egretta alba	20
Plegadis falcinellus	30
Platalea leucorodia	100
Anas querquedula	100
Anas strepera	20
Netta ruffina	20
Aythya ferina	600
Aythya fuligula	400
Mergus abbellus	40
Haliaeetus albicilla	3
Haematopus ostralegus	40
Charadrius dubius	25
Charadrius alexandrinus	10
Chlidonias niger	15
Chlidonias leucopterus	60

**The Ropotamo Complex / Not damp areas/ Key breeding**

**Key breeding**

1. Ciconia nigra\*
1. Pernis apivorus\*
1. Haliaeetus albicilla\*
1. Circaetus gallicus\*
1. Accipiter gentilis\*
1. Accipiter brevipes\*
1. Aquila pomarina\*
1. Falco subbuteo\*
1. Crex crex\*
1. Columba oenas\*
1. Bubo bubo\*
1. Strix aluco\*
1. Aegolius funereus\*
1. Caprimuius europaeus\*
1. Picus canus\*
1. Dryocopus martius\*
1. Dendrocopos medius\*
1. Dendrocopos leucotos\*
1. Dendrocopos minor\*
1. Calandrella brachydactyla\*
1. Hippolais pallida\*

1. Hippolais olivetorum\*
1. Sylvia nisoria\*
1. Phylloscopus bonelli\*
1. Ficedula albicollis\*
1. Ficedula semitorquata\*
1. Parus lugubris\*
1. Lanius minor\*
1. Lanius senator\*
1. Emberiza melanocephala\*
1. Emberiza hortulana\*

**Key migrating / Wintering //**

1. Cicinia nigra
1. Cicinia ciconia
1. Pernis apivorus
1. Milvus migrans
1. Haliaeetus albicilla
1. Neophron percnopterus
1. Circus cyaneus
1. Circus macrourus
1. Circus pygargus
1. Accipiter gentilis
1. Accipiter brevipes
1. Buteo buteo
1. Buteo rufinus
1. Aquila pomarina
1. Aquila clanga
1. Aquila heliaca
1. Aquila chrysaetos
1. Hieraaetus pennatus
1. Pandion haliaetus
1. Falco vespertinus
1. Crex crex
1. Grus grus
1. Scolopax ruxticola
1. Columba oenas
1. Bubo bubo
1. Strix aluco
1. Dryocopus martius
1. Alauda arvensis
1. Riparia riparia
1. Hirundo daurica
1. Anthus cervinus
1. Bombicilla garrulus
1. Luscinia luscinia
1. Oenanthe hispanica
1. Locustella fluviatilis
1. melanopodon
1. Sylvia borin

1. Ficedula parva

**1.9.5. MAMMALS**

Species researchings on the mammal compound is not done. Only the bats' fauna is studied more widely / Beshkov/. The List for the species compound is on the basis of literary data and on data of some researchers.

***LIST OF THE MAMMALS FOUND IN THE ROPOTAMO COMOLEX***

<b>Species</b>	<b>Evaluation of the population</b>
1. Erinaceus concolor	
1. Talpa europaea	
1. Sorex araneus	
1. Neomys anomalus	
1. Crocidura leucodon	
1. Rhinolophus hipposideros	Very thin. One specimen is caught
1. Rhinolophus euryale	One numerous, stock is known-Karaul tash
1. Rhinolophus blasii	One numerous, stock is known-Karaul tash
1. Rhinolophus ferrumquinum	Individual specimen are found and small stocks on some places. Not rare.
1. Myotis myotis	One stock in "Zname na mira" is known
1. Myotis blythi	Enormous stock - in the South abrasive cave-Karaul tach.
1. Myotis emarginatus	One summer, probably mother stock is known in -Karaul tach
1. Myotis capaccini	Probably numerous stock-Maslen nos.
1. Myotis bechsteini	Too rare. Not numerous.
1. Nyctalus lasiopterus	One species is watched near Primorsko.
1. Nyctalus noctula	Probably quite numerous
1. Vespertilio kuhli	It is the second and the last, found in Bulgaria until now.
1. Vespertilio pipistrellus	Two small stock are known, not rare
1. Miniopterus schreibersi	Enormous, of National importance- Maslen nos
1. Lepus europaeus	
1. Sciurus vulgaris	
1. Dryomys nitedula	
1. Glis glis	
1. Apodemus sylvaticus	
1. Apodemus flavicollis	
1. Mus musculus	
1. Rattus norvegicus	
1. Rattus rattus	

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1. Microtus arvalis /epiroticus/	
1. Microtus guentheri	
1. Nauospalax leucodon	
1. Canis lupus	Rarely found in the region
1. Canus aureus	Quite thick population Numerous.
1. Nyctereutes procyonoides	
1. Nyctereutes procyonoides	
1. Vulpes vulpes	Frequently met, in good population
1. Mustela nivalis	Frequently met.
1. Mustela putorius	Rare
1. Martes foina	Frequently met.
1. Martes martes	Very rare
1. Meles meles	Frequently met.
1. Lutra lutra	Good population near the Ropotamo River
1. Felis silvestris	Rare
1. Sus scrofa	In very good population
1. Ovis musimon	Artificially settled in various places-limited population in the region of Maslen nos.
1. Cervus elaphus	Very high thickness of the population. above admissible norms
1. Cervus dama	Very high thickness of the population. above admissible norms
1. Capreolos capreolos	Uniformly spread population, under admissible norms.
1. Delphinus delphis	Good population
1. Phocoena phocoena relicta	Rare
1. Tursiops truncatus ponticus	Rare
<b><i>Extinct species</i></b>	
52. Ursus arctos	
53. Felis lynx	In was seen for the last time in 1952 on Zubernovo lands
54. Monachus monachus	It appears near Maslen nos sporadicly

**CONSERVATIONAL STATUS OF THE MAMMALS IN THE ROPOTAMO COMPLEX**

Species	World Red List	IUCN category	European Red Book	Bern convention	Bulgaria List Red Book	Order 729/1986, MoE
Erinaceus concolor						+
Rhinolophus hipposideros	+			+		+
Rhinolophus euryale	+	vulnerable	Rare	+		+
Rhinolophus blasii	+	rare	Rare	+		+
Rhinolophus ferrumequinum		almost endangered		+		+
Glis glis		almost endangered				
Sciurus vulgaris						
Myotis myotis		almost endangered	Unknown	+		+
Microtus guentheri		endangered				+
Myotis blythi		endangered		+		+
Myotis emarginatus		vulnerable		+	+	+
Myotis capaccini		vulnerable	vulnerable	+	+	+
Myotis bechsteini	+	vulnerable		+		+
Nyctalus lasiopterus		almost endangered	rare	+		+
Nyctalus noctula				+		+
Vespertilio kuhli				+		+
Vespertilio pipistrellus						+
Miniopterus schreibersi		almost endangered		+		+
Nanospalax leucodon	+	vulnerable	undetermined			
Canis lupus		small risk			**	
Mustea nivalis						+
Martes martes					**	+
Lutra lutra			vulnerable		**	+
Felis silvestris				+		
Delphinus delphis						+
Phocoena phocoena relicta		endangered			**	+
Tursiops truncatus ponticus					*	+
Ursus arctos		extinct			***	+
Felis lynx		extinct			***	+
Monachus monachus	stopped to reproduce	endangered			**	+

The two habitats of bats on the territory of the Complex are included in the list of the caves and places of historical importance.

South Abrasive cave in Maslen nos. It is inhabited by 5000 - 8000 Lesser Mouse-eared bats and Schreiber's bats.

We can get in the cave by swimming or boat.

Karaul tash-rock pilings 1.8 km far away from Maslen nos. It is inhabited by 500 Geoffroy's bats and Lesser horseshoe bats in the summer. The bats reproduce in semilight and windy room among the enormous rock blocks.

## **Cultural and Social-Economical characteristics**

### **1.10. Using and Activities in the protected area**

The Ropotamo Complex is located on the area of municipalities of Primorsko and Sozopol.

The region of the Ropotamo Complex doesn't include any built up area but this protected area is conterminous with town of Primorsko and "Duni" Vacation Village.

#### **1.10.1. Agriculture**

The Ropotamo Complex covers dca agricultural lands 3400 dca of them 1750 are cultivable and 1650 dca are pastures. 164 dca of the arable lands only are included in the protected area. The agricultural lands are optimum for a great numbers of crops because the soil is deep and comparatively light and the humus content of the top layers is from 2 to 2,5%

Corn field are sowed mainly and the first place is taken by the wheat crops. The forage plants can be also met. Not one dca of agricultural land of the Ropotamo Complex has been not cultivated for the last five years.

All lands are desolated and are used as pastures only.

There was a real opportunity of full value using of agricultural lands after the restoration of ownership of land in 1997 and tourism development. This will lead for using of artificial fertilizers and pesticides. That is why we must keep the balance between the agricultural activities and the preserving of the biovariety in these protected areas.

The stock-breeding including sheep-breeding mainly, goat-breeding and pig-breeding took priority place in the past. This is explained with opportunities for pasture throughout the year and with the plenty of wood fruits.

The animals graze in allowed forest places, desolated agricultural lands and pastures all the year long.

In recent years, the growth of tourist stream increases the demand of agricultural products. This determines the development of diary and meat producing.

Having in mind the advance of the Agriculture in would be useful to work out an educational programme for the local landlords. It can help them to choose the optimum crops accordingly the conditions which are existing there the requirements of the protected areas and not to use a great number of chemical preparations

### 1.10.2. Forestry

The forests in Ropotamo Complex state wood fund. They are kept, guarded and used by "Ropotamo" Forestry Enterprise. There is a small part of area overgrown with forests. This area is not reckoned to the state wood fund. The forests in the area are not arranged and there is not an evaluation survey for them.

On their function the forests are:

forests having economic function and forests having special function. In "Ropotamo" Complex the forests with economic function cover 268,4 ha and this is 13,22%. The forests from the second group take 1912,0 ha and this is 86,78%. The total timber volume is 190 533 m<sup>3</sup>, 9885 m<sup>3</sup> are provided for to be cut in this decade according to the forest-managed project.

The felling in "Ropotamo" reserve is forbidden by law. 1055 m<sup>3</sup> are provided for to be cut in buffer area according to the forest-managed project and 3420 m<sup>3</sup> are provided to be cut in unprotected area. The distribution of the afforested area belonging to the state wood fund on the kinds of the forests is presented on the following table:

Species of forest	The Ropotamo Reserve -ha	Buffer area-ha	Vodny lilies Reserve-ha	Inprotected area by the Law for Nature Conservation, ha	Total-ha
1. Coniferous forests	-	-	-	257,3	257,3
1. Hardwood high forests	63,2	46,5	10,7	10,8	131,2
1. For reconstructions	258,5	234,5		222,5	715,5
1. Coppice for converting	263,1	219,4	-	277,9	760,4
1. Coppice for growing	52,4	52,1	-	211,5	316,0
<b>Total</b>	<b>637,2</b>	<b>552,5</b>	<b>10,7</b>	<b>980,0</b>	<b>2180,4</b>

The afforested wood area is distributed in Ropotamo Complex on this way: Ropotamo reserve covers 637,2 ha; the buffer area - 552,5 ha, Vodni lilies reserve- 10.7 ha, and the rest of the 980 ha are located among the protected areas.

The distribution of the unforested wood area in the Ropotamo Complex is shown on the following table:

Kind of the area	Ropotamo Reserve, ha	Buffer area-ha	Vodny lilies Reserve-ha	Inprotected area by the Law for Nature Conservation, ha	Total-ha
Unforested wood area liable to afforestation					
1. Barren	11,0			4,3	15,3
1. Felling areas		2,3			2,3
<b>Total unforested wood area</b>	<b>11,0</b>	<b>2,3</b>		<b>4,3</b>	<b>17,6</b>

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II Unwood –productive forest area					
1. Meadows	74,6	33,5	1,8	43,4	153,3
1. Parkings	0,2				0,2
1. Cutting in a forest	0,5	2,3		11,3	14,1
1. Roads	2,3		0,6		2,9
1. Road for lorries		1,1		2,0	3,1
1. Zmiisky ostrov	1,0				1,0
1. Unforest productive barrens	13,8	15,8		16,1	45,7
1. Rocks	28,7	17,6		6,1	52,4
1. Road		3,9		7,2	11,1
1. Game’s fields		10,2		22,0	32,2
1. Game’s meadows		10,4		48,4	58,8
1. Marshes	27,8		0,5		28,3
1. Quarries		0,3			0,3
1. Sloughs	55,2	0,7			55,9
1. Yard place		6,3		3,7	10,0
1. Buildings				0,4	0,4
Total unforest productive wood area	<b>204,1</b>	<b>102,1</b>	<b>2,9</b>	<b>160,6</b>	<b>469,7</b>
<b>I + II Total wood area</b>	<b>215,1</b>	<b>104,4</b>	<b>2,9</b>	<b>164,9</b>	<b>487,3</b>

From the above mentioned table It is obvious that there are some natural formations such as rocky massifs, fiords, bogs, glades, barrens and etc. located among the hundred years old forests in Ropotamo Complex.

The distribution of the afforested area in the Ropotamo Complex on kinds of trees is shown in the following table

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Tree species	Ropotamo Reserve, ha	Buffer area-ha	Inprotected area by the Law for Nature Conservation, ha	Total-ha	% participation
1. Quercus frainetto	429,7	390,6	584,6	1404,9	64,76
1. Adriatic oak	56,4	51,6	87,5	195,5	9,01
1. European ash	37,5	26,0	31,4	94,9	4,37
1. Maple	2,3	1,2	2,4	5,9	0,27
1. Oriental hornbeam	34,3	28,7	26,4	89,0	4,12
1. Manna-ash	44,9	43,2	33,5	121,6	5,6
1. Oak	11,2	8,3	19,7	39,2	1,81
1. Common oak	20,4			20,4	0,94
1. Elm-tree	0,5	2,9	0,7	4,1	0,19
1. Pine			188,6	188,6	8,69
1. Ailanthus glanulosa			2,8	2,8	0,13
1. Silver linden			2,4	2,4	0,11
<b>Total</b>	<b>637,2</b>	<b>552,5</b>	<b>980,0</b>	<b>2169,7</b>	<b>100,0</b>

The Quercus frainetto is the main wood species that takes more than 60% from the afforested forest area. The Adriatic oak takes 9% and the European ash - 4,37%. The Pine which taking 8,69% from the afforested area lives on the areas out of the reserve and buffer area. The Pine is out of condition because of its withering in large numbers. We look on its drying on a mass scale that will changes it with other tree species . That is logical nature process.

The distribution of the afforested wood area in the Ropotamo

Complex on kinds of trees , age and timber volume is shown in the following table

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Species	Area-ha	Age 50-60	Age 60-80 ã	Age 80-100	Age 100-120	Age over 120	Timber volume
1. Quercus frainetto	429,7	281,6	60,9	68,1	3,3	15,8	35420
1. Adriatic oak	56,4	19,5	16,7	8,6	4,9	6,7	6047
1. European ash	37,5	8,5	0,5	1,9	0,8	25,8	6777
1. Maple	2,3		2,0	0,3			255
1. Oriental hornbeam	34,3	11,3	20,4	2,6			1447
1. Manna –ash	44,9	40,0	4,2	0,7			2418
1. Oak	11,2	0,9	1,4	8,9			235
1. Common oak	20,4	20,4					1975
1. Elm-tree	0,5			0,5			68
<b>Total :</b>	<b>637,2</b>	<b>382,2</b>	<b>106,1</b>	<b>91,6</b>	<b>9,0</b>	<b>48,3</b>	<b>54642</b>

The following tables shows the distribution of the afforested area in Ropotamo reserve on the kinds of trees, , height, diameter, stand density

Species	Stand density 01-03	Stand density 04-07	Stand density over 07	up to 15 m height	height 16-20m	height 21-30m	height over 30m	up to 15m tree diameter	diameter 16-20cm	diameter 21-30cm	Diameter over 30cm
1. Quercus frainetto	31,0	338,9	59,8	370,2	48,2	11,3		<b>101,3</b>	236,3	73,0	19,1
1. Adriatic oak	1,0	46,8	8,6	36,9	15,7	3,8		4,1	27,6	18,4	6,3
1. European ash		29,0	8,5	0,5	11,9	2,8	22,3		10,0	2,4	25,1
1. Maple		0,8	1,5	2,0		0,3			2,0	0,3	
1. Oriental hornbeam	2,6	20,4	11,3	31,7	2,6			17,0		14,7	2,6
1. Manna –ask		39,7	5,2	44,9				16,9	15,3	12,7	
1. Oak	8,3	2,9		11,2				3,8	7,4		
1. Common oak		20,4		20,4				6,5	13,9		
1. Elm – tree		0,5			0,5					0,5	
<b>Total</b>	<b>42,9</b>	<b>499,4</b>	<b>94,9</b>	<b>517,8</b>	<b>78,9</b>	<b>18,2</b>	<b>22,3</b>	<b>149,6</b>	<b>312,5</b>	<b>122,0</b>	<b>53,1</b>

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From the above -shown table it is obvious that *Quercus frainetto* is main wood species. It is 60-80 years old with 07 stand density, 16 m average height and 20 cm - average diameter. European ash and Adriatic oak have similar to *Quercus frainetto* indexes.

The distribution of the afforested area in buffer area on the kinds of trees, age, stand density and timber volume is presented in the following table:

Species	Area-ha	Age 50-60	Age 60-80	Age 80-100.	Age 100-120.	Age over 120.	timber volume	up to 04 stand density	stand density 04-07	stand density over 07
1. <i>Quercus frainetto</i>	390,6	364,0	3,1	17,2	6,3		28396	20,0	303,8	66,8
1. Adriatic oak	51,6	45,1	0,3	3,9	2,3		5816	0,8	27,8	23,0
1. European ash	26,0	1,7	17,9		6,4		1830		25,0	1,0
1. Oriental hornbeam	28,7	28,7					1049	0,8	26,3	1,6
1. Oak	8,3	7,6	0,7				480	0,7	7,6	
1. Maple	1,2	0,2			1,0		150		1,2	
1. Elm-tree	2,9			2,9			400		2,9	
1. Manna-ash	43,2	43,2					2009	1,2	38,8	3,2
<b>Total</b>	<b>552,5</b>	<b>490,5</b>	<b>22,0</b>	<b>24,0</b>	<b>16,0</b>		<b>40130</b>	<b>23,5</b>	<b>433,4</b>	<b>95,6</b>

The distribution of the afforested area in buffer area on the kinds of trees, height and diameter is presented in the following table:

Species	up to 15 m height	from 16 to 20 m height	from 20 to 30 m height	height over 30m	up to 15 cm tree diameter	diameter 15-20 cm	Diameter 20-30 cm	Diameter over 30 cm
1. <i>Quercus frainetto</i>	359,9	20,4	10,3		159,9	201,2	8,0	21,5
1. Adriatic oak	42,1	5,2		4,3	25,6	21,3	2,4	2,3
1. European ash		19,6	6,4			14,0	5,0	7,0
1. Oriental hornbeam	28,7				13,0	15,7		
1. Oak	0,7	7,6			1,6	6,0	0,7	
1. Maple		0,2		1,0		0,2		1,0
1. Elm -tree		2,9				1,4	1,5	
1. Manna-ash	43,2				15,9	26,1	1,2	
<b>Total</b>	<b>474,6</b>	<b>55,9</b>	<b>16,7</b>	<b>5,3</b>	<b>216,0</b>	<b>285,9</b>	<b>18,8</b>	<b>31,8</b>

From the above -shown table it is obvious that main wood species are *Quercus frainetto* and Adriatic oak. Their age is about 60 years, the average height is 15-18 m and average diameter is 20 cm.

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The distribution of the afforest wood area located among the protected areas, on the kinds of trees, age, stand density is presented in this table:

Species	Are-ha	age up to 20	age from 20 to 40	are from 40 to 50	are from 50 to 60	are from 60 to 80	stand density up to 03	stand density from 04 to 07	stand density over 07
1. Quercus frainetto	584,6	30,7	73,3	302,3		178,3	20,8	415,5	148,3
1. Adriatic oak	87,5		16,0	20,3	41,2	10,0	5,2	64,6	17,7
1. European ash	188,6		186,6		2,0			84,1	104,5
1. European ash	31,4		16,5	10,6	4,3			22,1	9,3
1. Oak	19,7		1,2		17,7	1,8	0,2	19,5	
1. Maple	2,4		2,0		0,4			0,9	1,5
1. Manna –ash	33,5		9,5	2,4	21,6		2,9	28,1	2,5
1. Ailanthus glanulosa	2,8		2,8				2,8		
1. Silver linden	2,4	,	2,4					2,4	
1. Oriental hornbeam	26,4				26,4		2,1	24,3	
1. Elm-tree	0,7				0,7			0,7	
<b>Total</b>	<b>980,0</b>	<b>30,7</b>	<b>309,3</b>	<b>335,6</b>	<b>114,3</b>	<b>190,1</b>	<b>34,0</b>	<b>662,2</b>	<b>283,8</b>

The distribution of the afforest wood area located among the protected areas, on the kinds of trees, age, stand density is presented in this table:

Species	Are – ha	up to 15 m height	height 16-20 m	up to 15 tree diameter -cm	Tree diameter 16-20 cm	tree diameter 20-30 cm	timber volume
1. Quercous frainetto	584,6	513,2	71,4	154,5	405,5	24,6	54451
1. Adriatic oak	87,5	80,4	7,1	34,7	48,1	4,7	8226
1. Pine	188,6	188,6		135,9	35,0	17,7	25187
1. European ash	31,4	20,8	10,6	14,4	2,2	14,8	3035
1. Oak	19,7	19,7		12,4	5,5	1,8	839
1. Maple	2,4	2,4		2,0		0,4	153
1. Manna -ash	33,5	33,5		24,1	9,4		1483
1. Ailanthus glanulosa	2,8	2,8		2,8			97
1. Solver linden	2,4	2,4		2,4			158
1. Oriental hornbeam	26,4	26,4		14,0	12,4		1162
1. Elm –tree	0,7	0,7				0,7	60

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<b>Total</b>	<b>980,0</b>	<b>890,9</b>	<b>89,1</b>	<b>397,2</b>	<b>518,8</b>	<b>64,0</b>	<b>95761</b>
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From the above - shown table it obvious that the average age is about 45 years, when average height is under 15 m and the average diameters is about 18 cm.

The distribution of the timber volume and the prognostic yield in "Ropotamo" Complex on kinds of forest is shown on this table:

**DISTRIBUTION OF THE TIMBER VOLUME AND PROGNOSTIC YIELD ON THE KINDS OF FORESTS**

Species of forest	m <sup>2</sup>	The Ropotamo Reserve	The Ropotamo Reserve	Buffer area	Buffer area	Inprotected areas	Inprotected areas
	M <sup>3</sup>	<i>Timber volume</i>	<i>prognostic yield</i>	<i>Timber volume</i>	<i>Prognostic yield</i>	<i>Timber volume</i>	<i>prognostic yield</i>
1. Coniferous forest	“	11450		6550		34530	4870
1. Hardwood high – boled forest	“	11450		6550		595	65
1. For reconstructions	“	11580		12480		10895	1790
1. Coppice for converting	“	24020		16890	405	23810	1180
1. Coppice for growing	“	8050		6840	650	26420	990
<b>Total</b>	“	<b>55100</b>		<b>42760</b>	<b>1055</b>	<b>96250</b>	<b>8893</b>

The following fellings are provided for according to the forest-managed project of 1991 for ten years time in Ropotamo Complex.

***Any kind of fellings are forbidden by law in Ropotamo reserve  
In buffer area:***

- -thinning - on 23,1 ha area with cutting down of 335 m<sup>3</sup> wood.
- -(picking) selecting - on 23,5 ha area whit cutting down of 320 m<sup>3</sup> wood.
- -gradual felling - on 179 ha area with cutting down of 380 m<sup>3</sup> wood.
- 

***In the unprotected area:***

- -cleaning - on 19,2 ha area and production of 125 m<sup>3</sup> wood.
- -thinning - on 190,6 ha area and production of 4625 m<sup>3</sup> wood.
- -selecting (picking) - on 103.8 ha area and production of 1370 m<sup>3</sup> wood.
- -formation of cauldrons - on 30.6 ha area and production of 175 m<sup>3</sup> wood.
- -gradual felling - on 21.8 ha area and production of 2025 m<sup>3</sup> wood.
- -reconstruction - on 40.9 ha area and production of 2025 m<sup>3</sup> wood.

The cleaning will be done on 19,2 ha area, thinning - on 213,7 ha area, selecting (picking) - on 127,3 ha area, formation of cauldrons - on 30,6 ha area, gradual felling - on 39,7 ha area and reconstruction - on 40,9 ha area and reconstruction - on 40,9 ha area.

From all 2169,7 ha area, the felling will be done on 470,8 ha which are 21,85%.

The realization of the activities provided by the forest-manager project requires the observing of the following rules:

Using of differential approach, technique and operational method when the clearing area is being determined.

This will preserve the optimum ecological conditions for the native plant and animal species.

The areas intended for pastures must be re-examined and this will preserve the natural ecosystems.

The pasture causes both directed damages on the plants and indirect damages on the fauna changing the places of inhabit and disturbing the wild animals.

Converting the sprouting into seed kind of forests requires effective methods. The dense type formation are need of a special approach.

### 1.10.3. Recreation (Tourism)

The conditions in the Ropotamo Complex are suitable for the development of the tourism.

The tourist's searching of "recreation in the open" increases more and more.

The main priority of this region is that it is still able to satisfy this searching and the economic effect we can expect by the development of that form, which is providing the preserve of the "natural capital", will be more cumulative and more durable.

The tourists being on their holidays on the South-black shore, are visiting the following sights of the Ropotamo reserve:

- **Arkutino marsh.** This sight is opened for sightseeing after May 20th when the flowering of water lilies starts. The first visitors are usually school groups formed by 350-400 people from the all country.

The peak of the tourist season is in August. The main stream of tourists is represented by the large Complex like Albena, Sunny Beach, Golden Sands. The number of tourists can be up 600-800 per a day and the maximum is 1200.

The average number of tourist is 12000 in June, 1800 in July, 26000 in August and 10000 in the middle of September when the season has been closed.

- **The Ropotamo river.** The organized travelling by boats along the river give chance to the thousands tourists for seeing of the beautiful pictures from the low course of Ropotamo river. This activity realized Forestry with five motor boats. Three of them have capacity of 20 seats. All these boats are shallow-waded cutters. Four of them are made of wood and the last one is made of plastic.

### 1.10.4. Hunting

Hunt-economy activity is one of the main activity done by "Ropotamo" Forestry.

The presence of suitable conditions, the right organization and the economic avail determine the development of this activity in region of "Ropotamo" Complex out of the protected areas.

The object of hunting are these kinds of game"

- **red deer.** It has been inhabited the region for a long time. The Stranja deer can weigh to 350 kg, its massive antlers are covered with great number of "perls", the trophies can weigh to 14 kg.
- **fallow deer.** It is acclimatized in 1951. It is from Krichim by birth. It was brought two times at twenty. Today its population is described by its quality trophies which weigh up to 4,5 kg. The trophy shot in 1997 non 212 points this is the republican record.
- **doe.** It lives in the whole region but its number is fell off because of the depressed effect of the red deer and the fallow deer.
- **wild boar.** There was a plague epidemic which caused the death of many wild boars in 1990. Today their number is restoring gradually.
- **mouflon.** Eighteen mouflons were brought from Czechoslovakia after successful acclimatization 1997. Today they inhabit the places near Ropotamo river and Maslen nos.
- **jackal** - causes big damages for the reserve.

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- **woodcock** - It is spread on the whole Complex. Its population density is higher in Spring and in Autumn migration. When the woodcock is object of shooting.

There are two main ways of hunting:

- **by awaiting**

The game stocks are represented on that table on the base of spring taxation done every year.

<b>Year</b>	<b>Red deer</b>	<b>Fallow deer</b>	<b>Doe</b>	<b>Wild boar</b>	<b>Mouflon</b>
1992	320	140	60	100	60
1993	310	150	55	110	65
1994	320	145	60	120	60
1995	300	140	55	110	70
1996	310	150	60	130	75

The game population density is considerably higher than the admissible stocks of game.

This fact can be explained by:

- the presence of 980 ha enclosed area in which the real stock of game exceeds the admissible stock of game.
- the Ropotamo Complex includes the formerly reserves - "Stranja" and "Maslen nos" where much money and power were put in to rich the game-variety.

*The real stocks of game are represented in this table:*

<b>Game species</b>	<b>Site class</b>	<b>Admissible stock 100 ha-specimen</b>	<b>Real stock 100 ha specimen</b>
Red deer	II	1,5	6
Fallow deer	II	2,5	3
Doe	II	8,5	1,5
Mouflon	I	7	1,5
Wild boar	I	1,0	2,5

All kinds of games are even spread on the whole area with the exception of the mouflon concentration in the region between Ropotamo river and Maslen nos.

The fallow deer inhabits lower places by the Meadows and dense forests. The wild boar prefers higher and drier regions which are overgrown with thorns and the red deer likes places which takes intermediate position between fallow deer's habitats and wild boar's habitats. More serious migrating processes can be done by the red deer. The males walk away 30-40 km to the inside of Stranja in winter.

*The shot in the last five years is represented on this table:*

<b>Year</b>	<b>Red deer</b>	<b>Fallow deer</b>	<b>Doe</b>	<b>Wild boar</b>	<b>Mouflon</b>
1992	31	18	6	21	2
1993	26	16	4	25	3

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1994	38	14		28	5
1995	33	15	2	31	4
1996	29	14		26	1

The shoot has been done on the line of the International Hunt Tourism.

The shooting of the trophies is done during their wedding period: for red deer this period is in September, for fallow deer - in October, for wild boar - in December. The hunters are from Germany mainly and from Austria - in the second place, from France, Sweden, Spain and West Europe.

The hunting of the woodcock is priority for Italians shooters mainly. The number of hunters who visit the region is from 50 to 70.

The reserve uses by 14 men. People constantly occupied are : six egers, one cook, two game-breeders, cleaner, waitress, two drivers and one chief-district. The hunting has been done out of the protected areas but it has influence on the populations which are object of shooting.

### **1.10.5. Fishing**

Fishing is not allowed in the Ropotamo river and in Alepu-marsh. Breeding with native fish and sports fishing from the shore of the lake by fishing rod from June 30<sup>th</sup> to March 1st is not allowed.

Trying of breeding the Stamopolu marsh with native fish were unsuccessful. It is necessary breeding and fishing by boat in Alepu marsh should be forbidden.

### **1.10.6 Education (Teaching)**

The plan for management of "Ropotamo" Complex provides building of Information Center in Arkutino. The following educational activities will be worked out in this Center:

- Scheme of the educational routes and drawing the paths which are of botanical and ornithological interest, as well as detailed mapping for the visitors. The realization of this activity feasible by the representative of the Ministry of Environment (Bulgarian Academy of Sciences, Sofia University) together with representatives of the District Specialized Inspection in Primorsko town.
- Plan for outing places which is conformable to sensibility of the inhabitable places. Collaboration with the team who worked out the scheme of the educational routes. The number of places for outing must be limited.
- Organizing of visiting the guides and acquainting with the bio-variety.
- Studying of the local tourist stream on purpose, its development, depending on the natural sights and the bio-variety in Ropotamo Complex.
- Working out of educational programme on topic: Hotel-keeping and tourist service in private lagging and giving the priority to ecotourism and to tourist service instead of building of the hotel objects.
- Working out of educational programme on topic: Together with the nature protection, economic effective agricultural using.
- Realizing of close contact with the students (twenty in number) coming in motel "Arkutino" for two weeks in June every year. These students have been thought in "green school" where they "get the knowledge about the species variety in Ropotamo Complex. They have been brought up to love and protect the nature on purposely its conservation.

The new build "Stranja" Inspection to the National service in the Ministry of the Environment controls and coordinates the landowners in Ropotamo Complex.

### **1.10.7. Scientific Researches**

At the present moment the scientific researches are not done in Ropotamo Complex. It is necessary some researches should be started to help for realizing for the tasks.

Evaluation of the conditions of sea habitats in the water area of Ropotamo Complex.

1. Describing the habitats in the researched area.
  2. Determine the composition of the flora and fauna, plant and animal creatures (on habitats) in this region.
- bottom fauna

- higher seaweed, phyto- and zoo-plankton
- ichthyofauna
  - 3. Decree of damage of the bottom biocenosis.
  - 4. Abiotic factors characterizing the sea area.  
Analysis of the habitats rarity should be done.  
The kinds of the pollution, the degree of the pollution, the threats for the species composition should be described.  
The fishing be researched  
Detailed researches about the small mammals should be done.  
Further scientific researches should be done in Arkutino marsh and near the mouth of Ropotamo river.  
Monitoring should be organized.

#### ***1.10.8. Showing management of the area***

There is built structure for management of Ropotamo Complex. The functions of the local power given to the town councils, mayors and local administrations are determined by the Law of local administration. The forests in Committee in the Council of ministry. The functions of the forestries are to use and to preserve the natural resources. These functions are determined by the Law of the reserve and the Law of the Fish Industry.

The Ministry of the Environment is authorized to carry out the state policy and underdepartmental control on preserving of the environment.

In fact Ropotamo reserve has been managed and preserved by "Ropotamo" reserve. Stamopolu-marsh and Alepu-marsh must be managed and preserved by the structures of the Ministry of the Agriculture and "Alepu"-sand dunes and "Perla"-sand dunes by Ministry of the Building. The last two structures do not execute their functions.

#### ***1.10.9. Residential building***

There are some residential building on the area of Ropotamo Complex. They are: the motel, the massive two-storied building (formerly roadman's lodge of the Road Control) and other buildings near the roadman's lodge. All of them are located in place of Arkutino in the buffer area of Ropotamo reserve.

There is a massive building which is used as a house near Stamopolu-marsh to the west of him.

#### ***1.10.10 Industry***

There are not any industry factories on the protected areas of Ropotamo Complex.

#### ***1.10.11. Others***

In the unprotected area of Ropotamo Complex there are lands under crop use as game fields, pasture for domestic animals and hay producing. A part of "Maslen nos" unprotected area is used for military aims.

## **1.11. USING AND ACTIVITIES IN ADJACENT AREAS**

### ***1.11.1. Using of land***

The stockbreeding (mainly sheepbreeding, goatbreeding and pigbreeding) has been taken priority place. This is explained by possibility to pasture throughout the year, because of the open winter and plenty of wood fruit and acorn. The animals graze in the forest and they use the desolated lands, fields and meadows as well. A small part of agricultural lands are cultivated in this region because of the reorganization of Bulgarian Agriculture.

Cereals and forage plants are grown mainly and the desolated lands are used for pasture. Ropotamo Forestry covering 10592 ha area and 964820 timber volume, realizes the following activities:

- logging - the forest management project provides for 964820 m<sup>3</sup> timber volume felling of wood every year 8326 m<sup>3</sup> wood was produced in 1994, 1995 - 7766 m<sup>3</sup>, 1996 - 12090 m<sup>3</sup>.

The Forestry realizes hunt-economic activity, side-line and forest cultural activity. The logging takes 15 people, hunt economic - 22 people side-line - 8 people, forest cultural - 6 people.

The wood unafforested area is used for sowing of game fields, hay - producing, producing of forest - agricultural fruit and herbs.

There are some poundnet in the sea area near Ropotamo Complex.

The Spring poundnet: Chechru, Kondros, Maslen nos. Spart, Danube herring and Scad are caught mainly.

The Autumn poundnet: Kendenar, Kombolistroz catch belted bonito, blue-fish and Scad. The tourist object on 30,0 ha area is provided to be build near "Duni" Vacation Village and by pass road, to the West of Alepu marsh. Some conversation are being conducted for completing of the two big tourist objects - in Arkutino, opposite "Zmiisky ostrov" (island) and on "Perla" Residence area. The building of these objects will have negative influence on the Ropotamo Complex.

### ***1.11.2. Enterprises and Equipment***

These are:

- Concrete assembly - near Primorsko town
- Gravel pit - near Primorsko town
- Woodworking Enterprise - near Primorsko town
- Private stockbreeding farms - near Primorsko town
- Microartificial lake - to the North of Alepu marsh.
- Electric power-line and water supply route.

### ***1.11.3. Planning***

The territorial-arrangement plans were worked out in 1997. They were financed by the World Bank. These workings as well as the Plan for management of Ropotamo Complex concern one and the same area and some of the specialist take part both in two project. This will strengthen the protection of Ropotamo Complex.

Project for building of Alepu Tourist Complex and by passroad on the west part of Alepu marsh is being worked out. This will have negative effect on the protected area.

### ***1.11.4. Economic Aspects***

The combination of variety favorable factors (geographical position, the presence of indispensable infrastructures, diversity of places of inhabit) describes protection Center can be build

## **1.12. USING AND ACTIVITIES IN THE PAST**

### ***1.12.1. Ancient history (Archeological finds)***

The Thracians are the most ancient inhabitants of Stranja Black-sea-shore. The first information from archeological exavation "Malkoto kale" near Sozopol, uncovers the Thracians civilization of IV, III, II Centuries B. C. It was confirmed by studying of the some tombs, build of stone pieces (3,35 m) where determined as a part of the megalit Thracians civilization which had been lived in the North-East part of Greece and in the North shore of Black Sea.

### ***1.12.2. Historical (Pre-Industrial) period***

The thread of the historical development connects the Thracians religion and the spiritual world of Thracians with the First Bulgarian Country. Because of the nearness off Stranja Black Sea shore from the old Byzantium capital - Constantinopol, it had been separated from Bulgaria in 969. The Stranja Black Sea shore had been on Byzantium yoke for 220 years.

The archeological finds uncovered in the Ropotamo Complex are:

- Stronghold "Vulchanovo" - on the land of Primorsko town, 5 km to the North - archeological monument of international importance (published in State Gazette , Copy 35, 1965)
- Stone tomb "Zmeyova kushta" - on the land of Primorsko town, 4 km to the North - archeological monument (published in State Gazette , Copy 35, 1965)

### ***1.12.3. Post-Industrial Period***

A part of area along the South bank of Ropotamo river covering Korakya cape, Maslen nos and the bank near Stamopolu marsh, belong to the Ex- Residention area of the formerly regime. It is being used for tourism needs now.

The forestry does forest-economic and hunt-economic activity in the region situated to the North of Ropotamo.

The bead strip used during all summer season . The complex Colleges were built in the North of Arkutino and after sometime this building was stopped. Both of Arkutino and Lilies camps worked in the past.

#### ***1.12.4. National monuments and other sights***

The monuments situated on Ropotamo Complex area are:  
-"Zmeyova kushta" - stone tomb - located 4 km to the North of Primorsko town. It is archeological cultural monument of National significance (published in State Gazette , Copy 35, 1965)

- Series of stone tombs which are halfdestroyed now.

#### **1.13.LANDSCAPE AND AESTHETIC QUALITIES**

The nature has collected picturesque and landscape - virgin nature, dense forests with beautiful plants, rocky formation, marshes rich plant animal world.

#### **1.14.ADDITIONAL DESCRIPTIVE INFORMATION**

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***1.14.3. Available information***

- List of the higher plants
- Species composition of the zooplancton
- Species composition of the zoobenthos
- List of the species of amphibians and reptiles
- Species composition of the ichthyofauna in the researched damp areas
- Species composition of the ichthyofauna in the Ropotamo river.
- List of the birds in the Ropotamo Complex
- List of the mammal species that are determined in the Ropotamo Complex.
- Analysis certificates

***1.14.4. Cartographical materials***

37 maps are done

***1.14.5. Photomaterials***

The Plan for management is followed by pictures of plant and animal species.

***1.14.6. Providing for air and satellite pictures***

Air pictures of some protected territories in the Ropotamo Complex are taken.

### 1.16.2. IMPORTANCE – INTERNATIONAL, NATIONAL, LOCAL

The analysis of the conservation importance of the biota, habitats and the biological groups in the Ropotamo Complex shows its international significance as a protected area. The Arkutino marsh is announced for Ramsar's object. The Ropotamo reserve and the protected damp area of Alepu are announced for objects of international importance to Bulgarian legislation / Order N 988/ 04.11.1993 of the Ministry of the Environment/ and the damp area of Stamopolu, the Natural sights of Maslen nos., sand dunes of Alepu and Perla are determined as protected areas of National significance by the same Order.

The European conservational importance of the complex is determined also on CORINE BIOTOPES.

The Ropotamo Complex has unique biodiversity – 60% of the species of to Bulgarian cherpetafauna, 57% of the mammal species, 60% of the water fresh ichthyofauna, 50% of the breeding ornitofauna. Higher flora which is not completely researched, includes 15% of all species, established in the country.

The complex is of utmost importance for conservation of endangered and rare species. From the Bulgarian Data Red Book 21 mammal species of which 7 species are vulnerable, 1 species critically endangered, range in the Complex.

7 species of birds are classified as globally endangered of which: 2 species of breeding birds in the Ropotamo Complex, according to CPES special category. 180 bird species are included in the Bern Convention, 138 migrating species are included in Bon Convention 2 species of which are breeding in the Complex, 84 species are included in CORINE BIOTOPES, 67 species are included in the Bulgarian Data Red Book, 28 species are breeding and 226 species are conserved by Order N 729/1986 of the Ministry of the Environment.

Of amphibians and reptiles in the Ropotamo Complex, 6 species are established. They are written in the World Red List, 2 species – in European Red List, 15 – in Bern Convention, 6 – in Bern Convention, Bulgarian Data Red Book and 19 species are conserved by Order N 729/1986.

Of the invertebrate fauna in the damp zones of the Ropotamo Complex 41 endemite species are established until now. 18 species of them are Balkan, and 23-Bulgarian.

About 11 % of the plant species, written in , Bulgarian Red Book are kept in the Ropotamo reserve. It means 83 species- 71 – rare, 11 – endangered, 1 -extincted.

16 species higher plants are endemites and 23 tree and frutex species are tertiary relicts.

The diversity of habitat types is unique for the country and probably for Europe.

The importance for every species is on Appendix.

***1.0.0. Available information and history***

From the beginning of the present century there are information in the afforestation literature about the dense forests along the river valley of the Ropotamo river.

Having in mind their utmost significance 500 ha are announced with reserve status in 1940 . Information about scientific researches on that territory exists from that period of time.

These researches continue.

## 2.2. RESTRICTION

### 2.2.1. *Natural tendencies in the protected territories in the complex.*

#### The “Ropotamo” reserve

- **The Ropotamo river**

2.2.1.1. Hydraulic connection between the watering –beds is considerably complicated because of the alternation of slime, sandy slimes and miry sands which form the river-bed and the baying terrace on Ropotamo river. The connection between the alluvial bed and the river is embarrassed.

2.2.1.2. The half-head character of the underground stream in the alluvial horizon is a cause for the local bogging in the drain area.

2.2.1.3. Springs are with the small capacity – of 0.01 to 0.25 l/s, seldom is more intense. The feeding up is from rain-falling waters infiltration. During dry periods the part of the small springs dries up.

2.2.1.4. The small spring capacity shows the low water-abundance of the watering structure and the limited natural resources.

2.2.1.5. Cleft-waters are with the uncertain system depending on the season climatic changes.

2.2.1.6. Periodically damming of the mouth of Ropotamo river with sand, and as a result of that-the lack of normal river current.

2.2.1.7. Mixing of freshwater and saltwater, as well as the frequent motion in the river mouth lead to small taxonomic diversity of phyto-plancton which is in the base of the alimentary chain.

2.2.1.8. Considerable amounts of organic substances penetrate into the lagoon (from rotting branches and coast plants), making worse the sapro-biological conditions. That is clear from the fact that in the head section of the lagoon there are observed water “flowerings”, caused by the species *Perdifinium*, *Dunaliela*, *Chlamidomonas*.

2.2.1.9. There is an expansion of *Phragmites australis* association on the both riversides.

2.2.1.10. Due to the slow upright water-exchange there is an oxygen deficit on the more salt by-bed stratums, which may be eliminated only by the intensive penetrating of sea-water. In such cases the by-bed water stratums are pushed out to the surface and to the coasts, where the oxygen amount may be sharply reduced. Besides, the by-bed water stratums contain hydrogen sulfide, which arrives as a result of the rotting processes in the ooze. That is unfavorably reflected over the water fauna and may cause the doom of fish in large numbers.

- **The Arkutino marsh**

2.2.1.11. Under the marsh bed on the depth of 3 – 5 m the section is presented by the violently collimated, mixed with rotten matter the red-gray and black slime-sands and black slimes. They are the cause of the feeble hydraulic connection between the underground waters and the marsh Arkutino.

2.2.1.12. The river Ropotamo running nearby at the distance of 500 m is separated from the rock-threshold (the low eminence with the maximum elevation of about 50 m ), lightly covered with eolith sands. On account of that it does not take part in the water-balance of the place Arkutino.( fig.....).

2.2.1.13. The main part of the underground waters, accumulated in the coast watering horizon, is naturally drained in the Black Sea.

2.2.1.14. The data of the chemical analysis of the test ( P 10) and their interpretation view a possibility for the indirect ( by the canal ) penetration of the salt waters in the underground hydrosphere near the marsh ( the fact is to be taken into consideration while organizing the monitoring system).

2.2.1.15. The other indirect sign of sea-waters penetration in the coast watering horizon is the water-type of the ( P8) from the-center “Arkutino”. The deficit of  $Na^+$ ,  $K^+$  and  $Mg^{2+}$  and more –high solididity are the symptom of realized somewhere in the past previous intrusion of sea –waters in that section of the watering horizon.

2.2.1.16. Periodical drying up during the summer season is the dangerous factor for *Riccia fluitans*, *Utricularia australis* , rootless wolffia ( *Wolffia arrhiza*), including in the Bulgarian Red Book, *Potamogeton acutifolius*.

2.2.1.17. Before more than 30 years the bio-indicators among the settled species were nearly without an exception the indicators of mesosaprophyte, in 1995 they were about 75%. That shows the certain deterioration of the sapro-biological condition.

2.2.1.18. Comparatively rapid processes of the natural damming and overgrowing as a result of the fast advancing of the coast marsh vegetation to the free water-surfaces and to the more large areas where the water-lily is growing and the subsequent increasing of the decay, lead to deterioration of the supro-biological conditions and the reducing of the free water surface and these facts are the threatening factors for the developing of the south mechorka (*Utricularia australis* ) rootless wolffia ( *Wolffia arrhiza*), including in the Bulgarian Red Book, rajdavetz with pointed leaves ( *Potamogeton acutifolius*).

2.2.1.19. The ichtio-fauna species diversity is comparatively low, which is mainly due to the extramal biotic conditions, on the first place- the very unstable hydrological system.

2.2.1.20. Deterioration of the supro-biological conditions during summer and autumn, in compare with spring, is a result of the change in the water amount in the marsh.

2.2.1.21. The advancing and penetrating of undesired vegetation of alder and copse of willows in Arkutino and spreading of the water-lily ia a possible cause for its drying up.

2.2.1.22. Reducing of the free water – surface leads to the disappearance of *Trapa natans*.

- **he “Water Lillies” reserve**

□□□□ Natural drying up during the summer season is the dangerous factors for the development of the following representatives of the Bulgarian flora being in danger: *Nyphar lutea*, *Wolffia arrhiza* and *Utricularia australis* including in the Bulgarian Red Book.

□□□□ Comparatively rapid processes of the natural damming and overgrowing as a result of the fast advancing of the coast marsh vegetation to the free water-surfaces and to the more large areas where the water-lily is growing and the subsequent increasing of the decay, lead to deterioration of the supro-biological condition and the reducing of the free water surface and these facts are the threatening factors for the development of the next representatives of the Bulgarian flora being in danger *Nuphar lutea* , *Nymphaea alba* , *Wolffia arrhiza* and *Utricularia australis* including in the Bulgarian Red Book

The ichtio-fauna species diversity is comparatively low, which is mainly due to the extremal biotic conditions, on the first place-the very unstable hydrological system.

- **The narural sights of” The Alepu marsh”**

2.2.1.26. The collimated bed of the marsh Alepu and the stratum of sandy slimes and silty sands considerably hamper the hydraulic connection between the fresh-water reservoir and the underground waters, as a result of formed additional filltering resistance. That colmatation from one hand holds up more high level in the marsh than in sea and lets the part of the fresh underground waters to drain directly into the sea-aquatory. From the other hand these modern layers make difficult the drain of the surface marsh-water in the sea.

2.2.1.27. During the dry periods ( seasonal or of many years) the sea-waters enter to the cost watering horizon in the section “Alepu” while covering nearly whole its lower part ( penetrate up to more than 700 m inside the mainland). During these periods marsh-waters are often in the direct contact with sea-waters, which changes the salt composition of the marsh. ( that means-more wide sizes of the sea-waters intrusion into the watering horizon).

2.2.1.28. Periodical water “Flowering” (mainly during September)- showing the contaminating and the aggravated sapro-biological conditions.

2.2.1.29.The large sections under the water-surface of the marsh Alepu are occupied by underwater overgrowing (“underwater meadows”) of *Ceratophyllum demersum*, showingg the increased contamination.

1.2.1.30. Progressive damming been followed up by the increasing of the rush belt and *Typha spp.*, leads to reducing of the free water-surface and is a dangerous factor for such populations as the *Trapa natans*, the *Utricularia australius*

1.2.1.31. 2.2.1.31. Variosly large groups of *Phragmites australis* penetrate inside and among the free water-surface, as “a vanguard” of the extending rush belt.(lat.).

2.2.1.32. The presence of the small groups of *Salix sp.* near the west side of the marsh is the sign of the advanced damming of the reservoir.

2.2.1.33. During Gambouzia in the marsh Alepu there is observed popular contaminating with parasitic worms, probably of *Cestoda*-class, localized in the intestines, and as well with the parasitic crustaceans (*Corpepoda*, *Lernea sp.* ) situating on the body surface.

- **Protected place of “The Stamopolu marsh”**

2.2.1.34. The underground stream is drained into the sea. Hydraulic connection between the marsh-water and the underground waters is complicated because of the additional filtering resistance, which are made by lightly covering the sea-sands layer(with the thickness of about 4 – 5 m ) of miry, sands, sandy slimes and slimes.

2.2.1.35.During the dry period (seasonal or of many years) theoretically the length of the wedge penetrates up to more than 500 m inside the mainland, so that the saltiness wholly covers the coast watering horizon. During these periods sea-waters are often directly pass into the marsh by the channel connecting the north part of the marsh with the sea. By that means the sea is the main factor in the forming of the salty

composition of marsh-waters, while the process is mainly expressed in the northern section of the marsh.

The usual length of the salty wedge is about of 250-260 m. Considering the fact that the marsh is situated on 200 m, it is evident that sea continuously influences the salty composition of marsh-waters.

2.2.1.36. Comparatively fast overgrowings, reducing of the water surface and damming –are the dangerous factor for the development of water-lily(*Nymphaea alba*), *Utricularia australis*, *Wolffia arrhiza* including in the Bulgarian Red Book, as well as the rare for Bulgaria, *Shoenoplectus triquetet*.

2.2.1.37. The ichthyo-fauna species diversity is comparatively low, which is mainly due to the extremal biotic conditions, on the first place-the very unstable hydrological system.

2.2.1.38. In the past, during the period of high-water the marsh-water was drained away into the sea through the natural channel on the north part of the marsh. Mostly this natural connection has been disturbed by the frequent clogging with sand.

- **Sands-dune complexes**

The most characteristics are negative and partially positive movements of the crust of the Earth and connected with them abrasive-advance activity of the sea –waters.

The opening of the beach spit on the east-north-east make them accessible for heavy north, north-east and east winds. That's why their middle and south sections are with dune relief.

***In the “Ropotam0” reserve***

2.2.1.39. Sands-dune stripe, separating the lagoon Arkutino. The predominant winter winds ( 1650), not only have formass media the dune banks and their direction, but also they have moved up the sand from the sand-split over the abrasive terraces in the senon volcanogenus-sediment complex.

***The natural sights of “Sand-dunes in the Alepu place”***

2.2.1.40. During December, January, February and March wind velocity is up to 15 m/s. At these conditions there starts the drawing of the dune-sands and the transforming of dunes in those with the small size.

***The natural sights of “Sand-dunes in the Perla place”***

2.2.1.41. The strong north-east winds have moved the sands up to 600 m inside in the mainland. The crests of the highest dunes are on the height of 19 m over the sea-bed and are oriented towards 350. They are formed by the south-cast winds, whose strength during December sometimes is over 15 m/s.

- ***The natural sight of “Rock formations, the fjords and the SEAL cave in the place of “Maslen nos”***

2.2.1.42. The most characteristics are negative and partially positive movements of the crust of the Earth and connected with them abrasive –advance activity of the sea-waters.

***2.2.2.The natural tendencies out of the protected territories in the complex of the Ropotamo river***

2.2.2.1.Drying up of the upper current of the river Ropotamo during summer season.

2.2.2.2. Wasting away of *Pinus nigra* cultures.

## 1.2.2. Anthropogenic influence in the protected territories of the complex of the Ropotamo river

### A. THE “ROPOTAMO” RESERVE

2.2.3.1. Using the part of the territory for tourism. The sand-dunes lie behind the motel in the place Arkutino and along the mouth of the river Ropotamo. During summer season a large number of tourists passes through the sand-dunes and use it as a beach.

2.2.3.2. The tourists from the “Dunes” vocational village arriving by boats at the pier on the mouth of the river Ropotamo enter the reserve territory.

2.2.3.3. From the sand-dunes near the main road against the marsh Arkutino there is taken away the sand, which is made illegally, for building.

2.2.3.4. During 1962 the part of the reserve territory passed into the category “Peoples’ park”. That allows the building up the camping “Arkutino” and the camping “Lilies” and resulted the increasing of tourists number, which from its hand led to the considerable increasing of the anthropogenetic amount in the protected territory.

2.2.3.5. With the changing of the part of the reserve territory in the shooting enterprise, ten times there has been increased the admissible reserve of noble deer, elk and wild-boar; in Order to facilitate the shooting activity there has been covered with asphalt the road “Perla”-the mouth of “Ropotamo”-river, passed through the reserve territory, which led to increasing of the degree of anthropogenetic influence.

2.2.3.6. The part of the reserve territory, including the largest sand-dunes in Bulgaria and the part of the buffer zone with the total area of 2 305 dca are presented for the building up of the creative-ecological complex “The Flag of Peace”.

2.2.3.7. The part of the dune complex near the motel in Arkutino where there are the main populations of large number of the rare plant and animal species included in the Bulgarian Red Book, is excluded from the territory of the “Ropotamo”-reserve.

2.2.3.8. The rests of the destroyed building of the former boundary point, as well as the half –destroyed building of Fishing Cooperation-Sozopol deform the landscape.

2.2.3.9. The place where in 1979 the Red-headed whip snake has set up for the first time, repeatedly has been visited, rummaged through and changed after that and now nobody knows if the spide is also existing there.

2.2.3.10. In the past there have been destroyed the forests of *Quercus frainetta*, *Quercus pubescens*, *Quercus polycarpa*, *Pistacia terebinthus* and so in the place “Lavskata glava” .The rests of that are the remaining separate trees in *Ass. Phyllirea latifolia – Achnatherum bromoides*. - the card unit N 12.

2.2.3.11. “Zmiisky ostrov” is frequently visited by the collectors of cherpetafauna, which is the real danger the gecon population.

2.2.3.12. Collectors and investigators every year collect a great number of reptiles, as it is the rough violation of the normative acts of the Ministry of the Environment and the international agreements.

2.2.3.13. The great number of specimens of all the groups of amphibious and reptiles perish being forded on reserve high- ways, mainly in Arkutino-Ropotamo district.

2.2.3.14. Frequent visits of the rock-places on the right-side of the river Ropotamo (because of the built up haven) lead to the serious threat to the deposit of the rare motley grass-snake and snaky-lizard.

- **The Ropotamo river**

2.2.3.15. The mouth part of the river is used illegally for fishing. During the months X-XII the number of fishers is increasing up to dozens of, and that's the intensity of the movement on the river is also increases.

2.2.3.16. During the haunting period fishers visit "the "Zmiisky ostrov" collecting eggs of the birds nesting there with the aim of their consumption.

2.2.3.17. During the summer tourist season some boats travel along the river, with the route from the haven to the sea and in the opposite direction.

2.2.3.18. Some tourists make irregular visits on the island-which is the threat for the haunting period.

2.2.3.19. The more large springs(with capacity over 0.1 l/s) are capped in the faucets, using for the watering-place or for drinking. These are the springs Kapakliata, Golemiat vriz. Blagiat vriz, etc.

2.2.3.20. The speeded detertment of the large amount of sands just in the mouth of the river as the result of the destroying of "Tzarska bouna" and the dragging made in 1985-1986 when the extracting materials have been deposited just near the coast, right on the mouth.

2.2.3.21. There are 8 illegally built up fishing-houses in the mouth of Ropotamo river.

2.2.3.22. There is the contamination of the waters of the river Ropotamo near the bridge and the haven made by the illegally built up restaurants, serving the tourists.

2.2.3.23. The walks on boats along the river Ropotamo with the speed more that 5 miles hour, lead to the noising contamination.

2.2.3.24. Year the haven there are some illegally built up buildings and warehouses.

2.2.3.25. The partial contamination of the water as the result of activity of the people living in the illegally built up fishing-houses in the mouth of Ropotamo river is the dangerous factor for the condition of the small seal-grass ( *Zostera noltii* ) rare for Bulgaria.

2.2.3.26. Setting up of the fence along the right side of the river Ropotamo and the forming of the shooting enterprise on the south side of the river make impossible for the game to reach the river-waters, it stops the game and leads to the systematically destruction of the *Artemisia maritima* and it's baring.

- **The Arkutino marsh**

2.2.3.27. The output water amount of 3-5 l/s from the rest centre "Arkutino" .which have been in the exploitation since 1962, is the consumption element in the marsh water-balance. The production is carrying out through the three pipe-wells, built up on the east-side of the lake, about 200-300 m from the sea. They are with the depth of about 10 m. The output underground water is using for the drinking-daily water-supplying, while the exploitation system is in accordance with the consumption. It may be taken up that the pumping station works during about 6 months a year or the annual output is about  $4,5 - 7 \times 104m^3$

2.2.3.28. On the north-west side of the marsh in the yard of the State forestry enterprise ( SFE ) there are built up two shaft-wells for the needs of the liquidated now camping “Perla” ( The Czech camping).The both wells are with the different depth, they have the different level of the water, and in one of them in the deepness there was observed the more high electrical conductivity. They cover the whole thickness of the lagoon sediments, reach the cracked rock mat and eventually cut through at least two isolated one from another watering stratum. There is lack of the additional information for the crossing geological section because from the Czech organization they have not left the documentation, about the realizing of the building. Their position is of a great value for the water system of the damp area. Up to now the wells have not been used.

2.2.3.29. During dry period (seasonal or of many years) more wide sizes of the “salty wedge” we may expect in the south-east part of the section, near to the rest centre “Arkutino”. Due to the comparatively small amounts of the draining underground waters, the seasonal system of work and relatively small reductions, technogenic intrusion is probably with the limited sizes and covers only the stripe among the sea and the water-pumping constructions.

2.2.3.30. There is illegally built up restaurant on the territory of the reserve “Ropotamo” right to the marsh Arkutino, where they sell foods and alcoholic drinks. The object is without the corresponding sanitary center and the organized collecting of the waste products.

- **The “Vodny lilies” reserve**

2.2.3.31. Forestry enterprise “Ropotamo” managing and protecting the reserve, disposes with the necessary financial resources for the effective administration on the protected territory.

The reserve “Water Lilies” has been artificially separated from the reserve “Ropotamo” excluding the department 467 and the part of the department 466, while these territories are of one the same biotic complex.

Forestry enterprise “Ropotamo” disposes with the specialists and has the possibilities for management of the forestry ecosystems, but does not disposes with qualified specialists for management of the damp area-the staritza on the river Ropotamo.

With the Act and the Order pronouncing the territory as the protected one, there is forbidden to use natural resources.

- **The natural sight of “Alepu marsh”**

2.2.3.32. About 200 dca of the protected territory are the fields and the one part of them at the moment is cultivated. Approximately so many are the pasture-lands. With the Order pronouncing the territory as the protected the way of using the lands there has been regulated.

2.2.3.33. They catch fish illegally on the marsh as well as from the coast with fishing rods.

2.2.3.34. The territory is strict the State property according to the Bulgarian Constitution. Managing, protecting and securing the means are the obligation of the Regional Manager. Up to the moment there have not been secured any means and are not considered.

With the act and the Order pronouncing the territory as the protected one, there is forbidden to use the natural resources. With the exception of cultivating of the lands included in the boundaries of the protected area.

2.2.3.35. The asphalt road passing between the marsh and the sand dunes as well as increasing of the “Duni” Vacational Village influence negatively on the development of the marsh ecosystem.

2.2.3.36. The forth coming of the building “Agalina” Village boundarying with the natural sights creates conditions for negative influence on the protected area.

2.2.3.37. The performing of the building itself can influence negatively on the hydrological regime of the marsh.

2.2.3.38. Micro damlake is built in the water catcher of the marsh and it brakes the natural surface feeding.

2.2.3.39. The waste water from the waste-water purification plant of “Duni” Vacational Village have been got to mouth in the built damlake .If there is any spillway the water will flow away to the marsh and will cause its pollution.

2.2.3.40. In the near past the marshy area was larder. According to Popov(1974),. There were two small marshes overgrown with reed with total area of 0.35 km<sup>2</sup> . These marshy areas do not exist because of building of drain system which reduces the aquatory.

2.2.3.41. The drain system is not being used now but the equipment goes on to drain the north-eastern part of the region. This area is an integral part of the damp area and its liquidation caused large change in the ecological balance of the water system.

2.2.3.42. Because the connection with the sea is broken, the sea species of Grey mullets and silvers de that inhabit the marsh temporary in the summer, have been out of its ichthyofauna.

2.2.3.43. There is pollution from tourists and illegal fishermen in the narrow north-astern part of the marsh near “Duni” Vacational Village where is the connection with the sea .

2.2.3.44. There is the lack of Manager and guard in the protected area.

- **The protected place of “The Stamopolu marsh”**

The territory between the two sections of the marsh in that of its south-west part is a pasture-land and is used as the same. With the Order there is allowed the sheep and caws pasturing but is forbidden the pasturing of swine.

2.2.3.45. There is an illegal fishing from boats ( which trouble the nesting birds populations ).

2.2.3.46. The artificial stocking with fish is done

2.2.3.47. The territory is strictly State property, according to the Bulgarian Constitution. Managing, protecting and securing the means are the obligation of the Regional manager. Up to the moment there have not been secured any means and they are not considered.

2.2.3.48. There is the lack of managing organization.

With the Act and the Order pronouncing the territory as the protected one, the use of the natural resources is forbidden .That is the cause for any technologies to be not used.

2.2.3.50. During the last 30 years the natural water system have been standing the considerable anthropogenic changes . All over the marsh near to its north side there is a

embankment of dike, which actually separated the damp area in two parts-the Stamopolu-north and the Stamopolu-south.

2.2.3.51. In 1983-1985 the drainage channel connecting the marsh in its north-east section with the sea have been extended and in it has been put in a row of 12 pipes with Q 200 mm and one with Q 400 mm, under them-a pipe with Q 1000 mm. The channel is constructed with gate. The leaking ability of the construction is so much large and it is impossible in a short period of time the whole to be drawn off.

2.2.3.52. The marsh ichtio-fauna is hardly influenced from human intervention. Purposeful or accidentally there have been introduced three fish species (Tench, the Sun-fish and the Pseudorasbora) which are foreign for the ichtio-fauna of the damp areas in the whole region south from Bourgas lack. Also the Sun-fish and the Pseudorasbora are strongly undesired in the water-reservoirs which are inhabited by more valuable species, to the fishing-enterprise and natural protection points of view, mainly because they may compete with that inhabitants for food and also they consume roe.

2.2.3.53. The fishing from boats leads to contamination (PVC bottles, waste products in the marsh-waters).

2.2.3.54. The channel waste-waters getting into the mouth on the Stamopolu – south from Primorsko lead to the strong eutrophication (almost all the bioindicators are the sign of the aggravated eutrophication) and the development of *Nymphaea alba*, *Utricularia australis* and *Wolffia arrhiza* including in the Bulgarian Red Book, as well as rare for Bulgaria *Shoenoplectus triquetra*.

2.2.3.55. Near the coast of the marsh there is the contamination with daily waste products.

2.2.3.56. The road between Primorsko and the former residence “Perla” has been built illegally.

2.2.3.57. The lack of manager and guard.

2.2.3.58. The possible unfavorable factors may be the heads in the water-collecting reservoir of the marsh.

- **Sand-dunes complexes**

- a) ***The natural sights of the “Sand-dunes in the Alepu place”***

During the tourist summer season a large number of tourists use the sand-dunes as a beaches.

2.2.3.59. During the tourist season they regular park cars and other motor-means near the sand-dunes.

2.2.3.60. Now a large amount of the sand is actively taken away for building.

2.2.3.61. The territory is strictly the State property, according to the Bulgarian Constitution. Managing, protecting and securing the means are the obligation of the Regional manager. Up to the moment there have not been secured any means and they are not considered. There is the lack of managing organization.

2.2.3.62. Contamination with daily and other waste products caused by tourists.

2.2.3.63. Near the coast side the drops between the dunes are full with anthropogenic waste products, thrown by storm waves.

2.2.3.64. There is lack of manager and guard.

- b) ***The natural sights “Sand-dunes in the Perla place”***

During the tourist summer season a large number of tourists use the sand-dunes as a beaches.

2.2.3.65. During the tourist season they regular park cars and other motor-means near the sand-dunes.

2.2.3.66. Now is actively taken away a large amount of the sand for building

2.2.3.67. The territory is strictly the State property, according to the Bulgarian Constitution. Managing, protecting and securing the means are the obligation of the Regional manager. Up to the moment there have not been secured any means and the are not considered. There is the lack of managing organization.

2.2.3.68. There has been built up a massive fence through the dunes with the purpose to defend the former government residence.

2.2.3.69. The parking on the dunes' territory in front of the ex-res: dention of Boyana is built.

2.2.3.70. Contamination with daily and other waste products caused by tourists.

2.2.3.71. There is lack of manager and guard.

***F) The natural sight of "Rock formations, the fjords and the SEAL cave in the" Maslen nos" place. The Ropotamo" forestry managing and protecting the reserve, disposes with the necessary financial resources for the effective administration on the defended territory.***

2.2.3.72. The coast between "Maslen nos" and Karaul-tash after the suppressing of the prohibition in 1990 is frequently visited by tourists and collectors, which is the real danger for the limited populations of Eastern spade foot, Geckon, European blind snake, Western Montpellier snake, Balkan glass-snake, Balkan whip snake, Aesculapian snake.

With the Act and the Order pronouncing the territory as the protected one the use of the natural resources is forbidden. That is the cause for any technologies to be not used.

***Anthropogenic influence in the non-protected territories of the complex of the Ropotamo river.***

***A) Near the Ropotamo reserve***

2.2.4.1. In the past there have been destroyed the woods of *Quercus frainetto*, *Quercus pubescen*, *Quercus polycarpa*, *Pistacia terebinthus*, etc. on the hill Kaletto in the Maslen nos district, in the buffer area ( the rest of which are the separate trees in Ass. *Phyllirea latifolia*-*Achnatherum bromoides*- the card unit N 12 ).

2.2.4.2. The changing of the fields and meadows into the game-fields and meadows leads the ten-times increasing of the reserve of elk, noble deer and wild-boar, which led to the corresponding excessive increasing of their populations in the reserve part.

***B) In the Ropotamo river***

2.2.4.3. The natural hydrologic system there has been violated as well as river water-balance, as a result of the water-taking and the regulating of the flow with the aim of water-supplying through the building of the lake "Novo Panicharevo".

2.2.4.4. The violated water-system as a result of the building up of the lake "Novo Panicharevo" and the building up of well near the "Zmiisky ostrov" are the cause for the fast deferment of the large number of sand in the mouth of the river.

2.2.4.5. In the area of the water-collecting reservoir on the river Ropotamo agricultural and forestry works are going on and lead to contamination of waters,

increasing of the overflowing of the water-reservoirs and to deterioration of its sapro-biological condition.

2.2.4.6. The restaurants illegally built in the buffer area, near the haven along the bridge on the river Ropotamo, serve tourists and contaminate waters of the river.

2.2.4.7. The building up of the creative-ecological complex in the buffer area of the reserve” Ropotamo”.

2.2.4.8. The tourists which are on the rest in the motel Arkutino, using the beach-stripe, cross the sand-dunes formations which are into the buffer area lines and that leads to destruction of the rare dune vegetation.

2.2.4.9. The stone haven which has been built up without any model studies and the well near “Zmiisky ostrov” result the destroying of the certain ecological recesses.

***D) Near the reserve of “Water lilies”***

2.2.4.10. The building up of the lake in the water-collecting reservoir on the river Ropotamo led to the serious violation of the natural water-balance, which from the other hang is one of the causes for more frequent drying up of the staritza

***E) Near the natural sights of Alepu marsh***

2.2.4.11. The building up of the vocational village “Agalina” bordering upon the marsh.

2.2.4.12. In the water-collecting area there has been built up a micro-reservoir, which violates the natural surface feeding. In the last past on its north-west part the marshy area was more large. To Popov (1974) there were two small marshes there overgrown with reed with the total area of 0.35 km<sup>2</sup>. Now these marshy territories are not exist due to the building up of the drainage system, and as the result of that the aquatory is violently reduced.

2.2.4.13. The drainage system is not in exploitation now, but the construction is still using for draining on the north-east side of the district. This area is the inseparable part of the damp area and its liquidating has certainly resulted the considerable change in the ecological balance of the water system.

2.2.4.14. There has been planned the building of the international road to the west from the marsh. But the High ecological Council of experts of the Ministry of environment took the consideration not to build up the road. The same is to be built up to connect the village Ravadinovo with the village Iasna Poliana and Primorsko.

***F) Near the protected area of Stamopolu marsh***

2.2.4.15. The functioning tourist center “Ecoterm” causes the contamination of the marsh waters.

2.2.4.16. The large storehouses near the road “Perla”-the mouth of the river Ropotamo makes the landscape look extremely ugly.

## SECOND EVALUATION

### ***PART3: OPERATIONAL OBJECTIVES AND MANAGEMENT PRESCRIPTIONS***

#### ***3.1. Habitat and Species Management***

##### ***A) The Ropotamo reserve***

3.1.1. Management of habitat, Coastal Bulgarian dense forests (CORINE BIOTOPES code 44.4322), without interference.

*Purpose:*

- The Coastal Bulgarian dense forests covering 20% from the reserve's area, of utmost international significance and the species of the invertebrates that are of utmost international and National importance living in the forests, such as: **rare** – *Chalolestes viridis*, *Cercion lindeni*, *Cordulegaster picta*, *Cordulegaster insignis charpentieri*, *Somatochlora metallica meridionalis*, *Epineuchinus caucasicola*, *Aphannisticus elongatus*, *Donacia crassipes*, *Psylloides reitteri*, *Chrysopa phyllochroma*, *Limnophora maritima*, and *Limnophora obsignata* **endemites** – *Bulgarica varnensis*, *Helicella spiruloides*, *Orcula zilchi*, *Pelethiphis anoxiae*, *Paraleptophlebia lacustris*, *Bembidon rivulare euxinum*, *Laemostenum cimmerius weiratheri* and *Microlestes apterus* and **relicts** – *Lauria cylindracea* and *Oxychilus urbansrii* to be protected.

3.1.2. Management of habitat, Thracian subcontinental thermophyl oak forests.(CORINE BIOTOPES code 47.76A).

*Purpose:*

- The condition of the Thracian subcontinental thermophyl oak forests without interference to be protected and kept.

3.1.3. Management of habitat, Euxino-Thracian forests.(CORINE BIOTOPES code 47.76A) without interference.

*Purpose:*

- The Euxino-Thracian forests taking 18% from the area of the reserve, such as: *Quercus frainetto*, and *Quercus cerris* together *Carpinus orientalis*, *Acer campestre*, *Acer tataricum*, *Crataegus monogyna*, *Cornus mass*, *Poa nemoralis*, *Dactylis glomerata* (CORINE BIOTOPES code 47.76A 1) and invertebrate fauna living in them – **rare** – *Xanthochilus saturnius*, *Kisanthodia arriasi* and *Psylloides reitteri*, **endemites:** *Helicella spiruloides*, *Orcula zilchi*, *Calathus metallicus aeneus* and *Laemostenum cimmerius weiratheri* and **relicts** – *Krymickillus urbanskii*, *Oxychilus urbansrii* and *Paramocarodes straubei* to be protected.

3.1.4. Management of habitat, Thracian forests (CORINE BIOTOPES code 47.76A 11) without interference.

*Purpose:*

- The condition of the Thracian forests taking 27% from the area of the reserve and the rare invertebrate fauna living in them, such as: **rare** – *Xanthochilus saturnius*, *Epineuchinus caucasicola*, *Anthaxia hackeri*, *Pelosia obtusa*, *Hypenodes orientalis* and *Dolbina elegans steffensi*, **endemites** – *Carabus montivagus bulgaricus*, *Procerus scabrosus*, *Laemostenus cimmerius*

*weiratheri*, *Cardiophorus hinkei*, *Vadinia moesiaca* and *Chlorops quercophhhilus* and **relicts** – *Paranocarodes straubei*, to be kept.

3.1.5. Management of habitat East undergrowth of the phillyrea ( CORINE BIOTOPES code 32.21.A4)

*Purpose:*

- The condition of the East undergrowth covering 4% from the area of the reserve, of the *Phillyrea latifolia*, without interference to be kept.

3.1.6. Management of habitat, Mass Mediterranean high grass and wormwood steppes (CORINE BIOTOPES code 34.6 ) Greek-Balkan andropogonic grass steppes (CORINE BIOTOPES code 34.6344 )-“Zmiisky ostrov”

*Purpose:*

- The condition of the Mass Mediterranean high grass and wormwood steppes and the Greek-Balkan andropogonic grass steppes to be kept.

3.1.7. Management of habitat Mass Mediterranean-Black Sea Coastal Rocks and beaches (CORINE BIOTOPES code 18.222).

*Purpose:*

- The condition of the Mass Mediterranean Black Sea Coastal Rocks and rocky beaches and Black Sea Coastal rocky Associations, without interference to be kept.

3.1.8. Management of habitat, Black Sea Static dunes( CORINE BIOTOPES code 16.22B), West Black Sea Static dunes ( CORINE BIOTOPES code 16.22B1), South-West- Black Sea Static dunes ( CORINE BIOTOPES code 16.22B11),sandy-dune strip to the South-West of the Ropotamo river, without interference.

*Purpose:2.4*

- The existing dune systems with the intent protection of rare plant Associations and connected with them invertebrate fauna of utmost international and National importance - **rare-** *Qxyloma elegans*, *Pardosa pseudostrigillata*, *Tetracoris antennatus*, *Platypyguis crassus*, *Nemotelus bipunctatus* and *Epithalassius stackelbergi*, **endemites-** *Cicindela hybrida* and *Pterostichus merkli subsp, nov,* , without interference to be kept.

3.1.9. Management of habitat, Black Sea Static dunes( CORINE BIOTOPES code16.22B), West-Black Sea Static dunes ( CORINE BIOTOPES code 16.22B1), South- West-Black Sea Static dunes ( CORINE BIOTOPES code 16.22B11),sandy-dune strip separating Arkutino lagoon, without interference.

*Purpose:2.4*

- The existing dunes systems, without interference with intent protection of rare plant Associations and the invertebrate fauna of utmost international and National importance – **rare** – *Neoacarus hibernicus* , *Xanthochilus saturnius* and *Anthaxia hackeri* and **endemites-***Cicindela hybrida rumalica*, *Calathus metallicus aenneus*, *Melanomon inermis* and *Laela schwarzi*.

3.1.10.Partolling in the region with the intent violations to be prevented in sandy dunes.

*Purpose:2.4*

- Warden for the region to be appointed, especially when the tourists season is, with the intent reducing of danger for the rare psamophite Associations and invertebrate fauna as well as Little ringed plover (*Charadrius dubius*) nesting there.

3.1.11. Management of habitat, rocky region, without interference.

*Purpose:*

- Existing rocky region to be protected in the intent the places of breeding of *Coluber rubriceps* to be conserved.

3.1.12. Management of fauna, protection without interference.

*Purpose:*

- Preserving the food base of the insectivorous species ( especially for the space foot), limiting the pesticide treating in the region.

3.1.13. Management of in habitat ,places of amphibians, reptiles.

*Purpose:*

- Increasing the number of the amphibians by creating the artificial basins out of the reserve.

#### **A) ROPOTAMO RIVER ESTUARY**

3.1.14. Management of habitat, Blackish water in the mouth of river, (CORINE BIOTOPES code 13.11./13.21.), associations of *Phragmites australis* ( CORINE BIOTOPES code 53.1112.)

*Purpose:2*

The diversity of the biotopes to be increased. The spreading of the *Phragmites australis* associations covering 52% to be limited and reduced with the intent new regions for feeding of nesting birds and wintering water-swimming animals to be provided.

3.1.15. Management of inhabitable place , conservation of endemic species of fishes and the species from the Red Book in the mouth of the Ropotamo river.

### 3.3. CHECK UP

#### For the funds for the realization of the Plan for Management

Activities	Funds-iv	Funds given by the MoE and BSPCP	Funds given by the MoFA & AL
1. Publishing folders for:			
• The Ropotamo Complex	500 000	500 000	
• The Ropotamo reserve	500 000	500 000	
• The Vodny lilies	500 000		500 000
• The Natural sights of Alepu marsh	500 000	500 000	
• The protected locality of Stamopolu marsh	500 000	500 000	
• The sand dunes of Alepu	500 000	500 000	
• The sand dunes of Perla	500 000	500 000	
2. Constructing of information boats for:			
• The Ropotamo reserve	300 000	300 000	
• The Vodny lilies	300 000		300 000
• The natural sights of Alepu marsh	300 000	300 000	
• The natural sights of Stamopolu marsh	300 000	300 000	
• The sand dunes of Alepu	300 000	300 000	
• The sand dunes of Perla	300 000	300 000	
3. Watching towers for:			
• The natural sights of Alepu marsh	150 000	150 000	
• The natural sights of Stamopolu marsh	150 000	150 000	
4. Construction of shelters for the birds			
• The sand dunes of Arkutino	150 000	150 000	
5. Building of paths through the dunes for the tourists:			
• The sand dunes of Alepu	200 000	200 000	
• The sand dunes of Perla	200 000	200 000	
6. Constructing and putting of two signs forbidding cars to park and stop on the road section crossing the Ropotamo reserve	100 000	100 000	
<b>Total:</b>	<b>6 250 000</b>	<b>5 450 000</b>	<b>800 000</b>

*Evaluation of the characteristics in the Ropotamo Complex*

Characterization of features		Importance		
Object	Feature	International	National	Local
<i>Soil</i>				
<i>Hydrology</i>				
<i>Plant associations</i>	Dense forest	high		
	Plant associations the sand dunes	high		
<i>Species High plants</i>	Anagallis minimus		Moderate	
	Anchusa stylosa		Moderate	
	Anethum graveolens		Moderate	
	Anthemis rumelica	rare - high		
	Aurinia uechtixiana	high		
	Calystegia soldanella		High	
	Carduus uncinatus		High	
	Celtis caucasica		Moderate	
	Centaurea arenaria		High	
	Centaureum turcicum		Moderate	
	Cirsium bulgaricum		Moderate	
	Corispermum nitidum		Moderate	
	Crepis nicaeensis		Moderate	
	Crithmum maritimum		Moderate	
	Crocus olivieri		High	
	Cyclamen coum		Moderate	
	Echium plantagineum		High	
	Erodium hoefftianum		High	
	Eryngium maritimum		Moderate	
	Euphorbia paralias		high	
	Euphorbia peplis		Moderate	
	Ferula orientalis		high	
	Festuca vaginata		Moderate	
	Ficus carica			
	Fritillaria graeca		Moderate	Moderate
	Fritillaria pontica			
	Geranium tuberosum		Moderate	
	Groenladia densa			

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	<i>Gypsophila tekirae</i>	rare-high		
	<i>Halimione pendunculata</i>		Moderate	
	<i>Heptaptera triquetra</i>			
	<i>Hymenocarpus circinatus</i>		High	
	<i>Hypecoum ponticum</i>		High	
	<i>Lactuca tatarica</i>			
	<i>Limonium vulgare</i>			
	<i>Linum tauricum</i> Willd. ssp. <i>bulgaricum</i>		Moderate	
	<i>Logfia gallica</i>			
	<i>Maresia nana</i>		High	
	<i>Nepeta ucranica</i>		Moderate	
	<i>Nonnea obtusifolia</i>		high	
	<i>Opopanax bulgaricum</i>	high		
	<i>Otanthus maritimus</i>			
	<i>Papapholis incurva</i>			
	<i>Polygala supina</i>		Moderate	
	<i>Prangos ferulacea</i>		high	high
	<i>Primula acaulis</i> , subsp. <i>rubra</i>		Moderate	Moderate
	<i>Samolus valerandil</i>		Moderate	Moderate
	<i>Scabiosa atropurpurea</i>			
	<i>Scandix australis</i>			
	<i>Scilla bithynica</i>			
	<i>Scorpiurus subvilosus</i>		high	
	<i>Secale sylvestre</i>		Moderate	
	<i>Serapias vomeracea</i>		high	
	<i>Silene cretica</i>		Moderate	
	<i>Silene euxina</i>			
	<i>Sison amomum</i>		Moderate	
	<i>Sonchus palustris</i>		Moderate	
	<i>Stachys maritima</i>		Moderate	
	<i>Stachys thracica</i>		Moderate	high
	<i>Symphytum tauricum</i>		Moderate	
	<i>Trapa natans</i>	high		
	<i>Trifolium constantinopolitanum</i>		high	
	<i>Trifolium spumosum</i>		high	
	<i>Utricularia vulgaris</i>		Moderate	

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	Valeriana discoridis			
	Verbascum glanduligerum			
	Vicia incisa		high	
	Wolffia arrhiza		Moderate	
	Centaurium maritimum		high	
	Cressa cretica		high	
	Elymus pycnathus		high	
	Leucojum aestivum		high	
	Nuphar lutea		high	
	Nymphaea alba		high	
	Pancreatium maritimum		high	
	Pyracantha coccinea		high	
	Trachomitum venetum		high	
	Tulipa hageri		high	
	Utricularia minor	high		
	Frankenia oulverulenta		Moderate	high
	Halimione portulacoides		high	
	Hirudo medicinalis	high		
<b>Fauna</b>				
<b>Invertebrate</b>	Mollusca			
	Pisidium supium		high	
	Ferrissia wautieri		high	
	Oxyioma elegans		high	
	Araneae			
	Dysdera westringi		high	
	Pardosa pseudostrigilata		high	
	Menemerus laeniatus		high	
	Acari			
	Neocarus hibernicus			high
	Scutacarus lineatus			high
	Asca aphidiotes			high
	Odonata			
	Chalcolestes viridis		high	
	Cercion lindeni		high	
	Cordulegaster picta		high	
	Cordulegaster insignis charpentieri		high	

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	Somatochlora metellica meridionalis		high	
	Ephemeroptera			
	Metreletus balcanicus	high		
	Homoptera			
	Phlogotettix cyclops		high	
	Heteroptera			
	Tetratocoris antennatus		high	
	Cymodema tabidium		high	
	Xanthochilus saturnius		high	
	Coleoptera			
	Paussus furcuccus		high	
	Notiophilus danieli		high	
	Apotomus testaceus			high
	Bembidion noticum			high
	Anisodactylus intermedius			high
	Acritus nigricornis			high
	Epineuchinus caucasicola			high
	Hypocacculus praecox			high
	Anthaxia hackeri			high
	Aphannisticus elongatus			high
	Kisanthodia ariasi			high
	Melanimom inermis			high
	Scaphidema metallicum			high
	Metalisa azurea			high
	Tribillum destrucor			high
	Eutagenia smyrnensis			high
	Donacia crassipes			high
	Psylloides reitteri			high
	Otiorrhynchus simulans			high
	Sitona puberulus			high
	Ceuthorrhyncus canaliculatus			high
	Tuchius sharpi			high
	Orchestes quedenfelodti			high
	Embioptera			
	Haploembia solieri		high	
	Neuroptera			

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	Deleproctophylla australis			high
	Chrsopa phyllochroma			high
	Orthoptera			
	Platypygius crassus			high
	Modicogrullus geticus			high
	Lepidoptera			
	Pelosia obtusa			high
	Lasiocampa grandis			high
	Hypenodes orientalisq			high
	Dolbina elegans steffensi			
	Diptera			
	Limnophora maritima			high
	Limnophora obsignata			high
	Nemotelus bipunctatus			high
	Merodon clunipes			high
	Syrta flaviventris			high
	Calozenilla tamarea			high
	Micromorphus albopilosus			high
	Malacomyia scimyzina		hihg	
	Epiithalassius stackelberdi		high	
	Hymenoptera-Formicidae			
	Tetramorium taurocausicum		high	
	<b>Relects</b>			
	Terrestrial Mollusca			
	Lauria cylinracea	high		
	Euxina circumdata	high		
	Serrulina serrulata	high		
	Helix pomacella	high		
	Krynickillus urbanskii	high		
	Oxychilus urbanskii	high		
	Odonata			
	Calopteryx virdo meridionalis		high	
	Orthoptera			
	Paranocarodes straubei		high	

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	Coleoptera			
	Anthaxia tuerki		high	
	<b>Endemits</b>			
	Mollusca			
	Bulgaria varnensis BgE	high		
	Euxina persica paulhessei BgE	high		
	Helix laucorum onixiomica BgE	high		
	Helicella spiruloides BgE	high		
	Monacha pilosa BgE	high		
	Orcula zichi BgE	high		
	Carpatia bielawskii BgE	high		
	Trichia erjavecii BE	high		
	Limax macedonicus BE	high		
	Acari			
	Pelethiphis anoxiae BgE			high
	Chilopoda			
	Harpalolithobius folkmanovae BgE		high	
	Lithobius bulgaricus BgE		high	
	Diplopoda			
	Cylindroiulus vitosae BE	high		
	Ephemeroptera			
	Paraleptophlebia lacustris BE	high		
	Coleoptera			
	Cicindela hybrida rumelica BgE		high	
	Carabus montivagus buigarius BE		high	
	Carabus wiedemanni vaiioiani BE		high	
	Carabus violaceus azureus BE		high	
	Procerus scabrosus BgE	high		
	Bembidon rivulare euxinum BgE		high	
	Pterostichus merkli subsp. nov. BgE			high

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	Calathus metallicus aeneus BE			high
	Laemostenus cimmerius weiratheri BE			high
	Microlestes apterus BE			high
	Quedius pontoeuximum BgE		high	
	Medon bulgaricus BgE		high	
	Medon umbilicatus BgE		high	
	Scopaeus bulgaricus BgE		high	
	Cardiophorus hinkei BE		high	
	Sphaenoptera sceptrifera BE		high	
	Melanomon inermis BgE		high	
	Laena scwarzi BE		high	
	Psammodius bulgaricus BgE		high	
	Vadinia moesiaca BE		high	
	Psylloides magnificus BgE		high	
	Apion graecum BE		high	
	Otiorrhyncis verrucipes BE		high	
	Phyllobius cupreo aureus BE		high	
	Tychius consputus BE		high	
	Lepidoptera			
	Paradrymonia vittata bulgarica BgE		high	
	Diptera			
	Chlorops quercophilus BgE		high	
<b>Fishes</b>				
<b>Ropotamo River</b>	Chalcalburnus chalcoides	moderate	moderate	
	Gasterosteus aculeatus		moderate	high
	Alosa caspia bulgarica	moderate		
	Anquila anquila	moderate		
	Atherina mochon pontica	moderate	high	
	Psetta maxima maeoticus	moderate	moderate	high

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<i>Arkutino marsh</i>				
<i>Vodni lilies Reserve</i>	Chalcalburnus chalcoides	moderate	moderate	moderate
	Gasterosteus aculeatus		moderate	high
<i>Alepu marsh</i>	Chaicalburnus chaicoides	moderate	moderate	moderate
	Gasterosteus aculeatus		moderate	high
<i>Stamopolu marsh</i>	No one species of conservating importance are found until now			
<i>Amphibians</i>				
<i>Ropotamo River</i>	Bombina bombina			moderate
	Bufo bufo		moderate	moderate
	Pelobates syriacus balcanicus	moderate	moderate	moderate
	Rana dalmarina			moderate
	Triturus vulgaris			
<i>Arkutino marsh</i>				
	Bombina bombina			moderate
	Pelobates syriacus balcanicus	moderate	moderate	moderate
	Rana dalmatina			moderate
<i>Vodny lilies Reserve</i>				
<i>Alepu marsh</i>	Triturus cristatus		moderate	moderate
	Pelobates syriacus balcanicus	moderate	moderate	moderate
	Rana dalmatina			moderate
<i>Stamopolu marsh</i>				
	Pelobates syriacus balcanicus	moderate	moderate	moderate
	Rana dalmatina			moderate
<i>Alepu sand dunes</i>				
	Pelobates syriacus balcanicus	moderate	moderate	high
<i>Perla sand dunes</i>	Pelobates syriacus balcanicus	moderate	moderate	high

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<b>Maslen nos</b>	Pelobates syriacus balcanicus	moderate	moderate	high
	Rana dalmatina			moderate
<b>Reptiles in the whole Complex</b>	Testudo graeca iberica	moderate	high	
	Testudo hermanni	moderate	high	
/	Emys orbicularis		moderate	
	Cyrtodactylus kotschui		moderate	
	Ophisaurus apodus thracius	moderate	high	high
	Lacerta/ Zootoca/ praticola		moderate	high
	Typhlops vermicularis vermicularis		moderate	high
	Natrix tessellata	moderate		
	Coluber rubriceps thracius	very high	high	high
	Elaphe longissima longissima	moderate	high	high
	Elaphe quatuorlineata sauromates	High	high	very high
	Elaphe monspessulanus	High		
	Elaphe sutula	very high		
	Malpolon monspessulanus	high		
<b>Birds/ Key breeding in wet zones</b>				
<b>Alepu</b>	Tachipabtes ruficollis		moderate	moderate
	Podiceps cristatus		moderate	high
	Ixobrychus munitus		moderate	high
	Nycticorax nycticorax		moderate	high
	Ardea cinerea		moderate	high
	Ardea purpurea		moderate	high
	Cygnus olor		High	
	Aythya nyroca	high		
	Circus aeruginisus		moderate	moderate
	Crex crex	high		

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<i>Arkutino</i>	Tachipabtes ruficollis		moderate	moderate
	Cygnus olor		high	
	Porzana porzana		moderate	moderate
<i>Ropotamo river</i>	Tachipabtes ruficollis		moderate	moderate
	Circus aeruginosus		moderate	moderate
	Porzana porzana		moderate	moderate
	Alcedo atthis		moderate	high
<i>Stamopolu</i>	Tachipabtes ruficollis		moderate	moderate
	Podiceps grisegena		high	
	Ixobrychus minutus		moderate	high
	Ardea cinerea		moderate	high
	Ardea purpurea		moderate	high
	Cygnus olor		high	
	Anas querquedula		Moderate	high
	Aythya nyroca	high		
	Curcus aeruginosus		moderate	moderate
	Porzana pavra		moderate	moderate
<i>Key migrating/wintering in wet zones</i>	Phalacrocorax pygmaeus	high		
	Pelecanus onocrotalus	high		
	Pelecanus crispus	high		
Moderate	Botaurus stellaris	moderate	High	
	Ixobrychus minutus	moderate	high	
	Ardeola ralloides	moderate	moderate	high
	Egretta garzetta	moderate	moderate	high
	Egretta alba	moderate	high	
	Plegadis falcinellus	high		
	Platalea leucorodia	high		
	Anas quequedula	moderate	moderate	high
	Anas strepera	moderate	high	
	Netta ruffina	moderate	high	
	Aythya ferina	Moderate	Moderate	Moderate
	Aythya fuligula	Moderate	Moderate	Moderate
	Mergus albellus	Moderate	Moderate	high
	Haliaeetus albicilla	high		
	Haematopus		high	

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	Charadrius alexandrinus		high	
	Chlidonias nuger	Moderate	high	
	Chlidonias leucopterus	Moderate	high	
<b>The Key migrating/wintering/ birds in the Ropotamo Complex but not in the damp zones</b>				
	Emberiza melanocephala*		Moderate	Moderate
	Emberiza hortulana*		Moderate	high
	Ciconia nigra			Moderate
<b>Key migrating/wintering</b>	Ciconia ciconia		Moderate	Moderate
	Pernis apivorus		Moderate	Moderate
	Milvus migrans		Moderate	Moderate
	Haliaeetus albicilla		high	high
	N. percnopterus		high	high
	Circaetus gallicus		Moderate	Moderate
	Circus cyaneus		Moderate	Moderate
	Circus macrourus		Moderate	Moderate
	Circus pygargus		Moderate	Moderate
	Accipiter gentilis		Moderate	Moderate
	Accipiter nisus		Moderate	Moderate
	Accipiter brevipes		high	
	Buteo buteo		Moderate	Moderate
	Buteo rufinus		Moderate	Moderate
	Aquila pomarina		Moderate	Moderate
	Aquila clanda	high	high	
	Aquila heliaca		high	
	Aquila chrysaetos		Moderate	Moderate
	Hieraaetus pennatus		Moderate	Moderate
	Pandion haliaetus		Moderate	Moderate
Falco vespertinus		Moderate	Moderate	
Falco subbuteo		Moderate	Moderate	
Falco peregrinus		Moderate	high	

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	Grus grus		high	
	Crex crex	high	high	
	Scolopax rusticola		high	
	Columba oenas		Moderate	Moderate
	Columba palumbus		Moderate	Moderate
	Bubo bubo		high	
	Strix aluco		Moderate	Moderate
	Merops apiaster		Moderate	Moderate
	Dryocopus martius		Moderate	Moderate
	Pycus canus		Moderate	Moderate
	Dendrocopos syriacus		Moderate	Moderate
	Dendrocopos medius		Moderate	Moderate
	Dendrocopos minor		Moderate	Moderate
	Melanocorypha calandra		Moderate	Moderate
	Alauda arvensis		Moderate	Moderate
	Riparia riparia		Moderate	Moderate
	Hirundo daurica		Moderate	Moderate
	Anthus pratensis		Moderate	Moderate
	Anthus cervinus		Moderate	Moderate
	Bombicilla garrulus		Moderate	Moderate
	Luscinia luscinia		Moderate	Moderate
	Phoenicurus ochruros		Moderate	Moderate
<b>Key breeding</b>	Ciconia nigra*		Moderate	high
	Pernis apivorus*		high	
	Haliaeetus albicilla*		high	
	Ciraetus gallicus*		high	
	Accipiter gentiis*		high	
	Accipiter nisus*		high	
	Accipiter brevipes		high	
	Aquila pomarina*		high	
	Falco subbuteo*		high	
	Crex crex*		high	
	Columba oenas*		high	
	Columba palumbus*		Moderate	Moderate
	Otus scops*		Moderate	Moderate
	Bubo bubo*		high	
	Athene noctua*		Moderate	Moderate
	Strix aluco*		Moderate	Moderate

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	Asio otus*		Moderate	Moderate
	Aegolius funereus*		high	
	Caprimulgus europaeus*		Moderate	high
	Merops apiaster*		Moderate	high
	Coracias garrulus*		Moderate	high
	Junx torquilla*		Moderate	Moderate
	Picus canus*		Moderate	Moderate
	Picus viridis*		Moderate	Moderate
	Dryocopus martius*		high	
	Dendrocopos major*		Moderate	Moderate
	Dendrocopos syriacus*		Moderate	high
	Dendrocopos medius*		Moderate	Moderate
	Dendrocopos minor*		Moderate	high
	Calandrella brachydactyla*		Moderate	high
	Lulula arborea*		Moderate	Moderate
	Alauda arvensis*		Moderate	Moderate
	Hirundo daurica*		Moderate	high
	Anthus trivialis*		Moderate	Moderate
	Saxicola torquata*		Moderate	Moderate
	Hippolais pallida*		Moderate	Moderate
	Hippolais olivetorum*		Moderate	high
	Sylvia nisoria*		Moderate	high
	Sylvia curruca*		Moderate	high
	Phylloscopus bonelli*		Moderate	high
	Ficedula albicollis*		Moderate	high
	Ficedula semitorquata*		high	
	Parus lugubris*		high	Moderate
	Sitta europaea*		Moderate	Moderate
	Cethia brachydactyla*		Moderate	high
	Lanius minor*		Moderate	high
	Lanius senator*		Moderate	Moderate
	Corvus corax*		Moderate	high
	Passer hispaniolensis*		Moderate	Moderate
<b>Key migrating/win tering</b>				
	Ph. Phoenicurus		Moderate	Moderate
	Saxicola rubetra		Moderate	Moderate

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	Oenanthe hispanica		Moderate	Moderate
	Locustslla fluvia tilis		high	
	A. melanopogon		Moderate	Moderate
	Sylvia borin		Moderate	Moderate
	Phylloscopus trochilus		Moderate	
	Ficedula parva		Moderate	high
	Ficedula semitorquata		high	
	Ficedula hypoleuca		Moderate	Moderate
	Serinus serinus		Moderate	
	Carduelis spinus		Moderate	
	Emberiza schoeniclus		Moderate	Moderate
<b>Mammals</b>				
	Rhinolophus hipposideros			high
	Rhinolophus euryaie	Moderate	Moderate	Moderate
	Rhinolophus biasii	Moderate	Moderate	Moderate
	Rhinolophus ferrumequinum	Moderate		
	Myotis myotis	Moderate		high
	Myotis blythi	Moderate		
	Myotis emarginatus	high	high	very high
	Myotis capaccini	high		
	Myotis bechsteini	high	high	
	Nyctalus lasiopterus	very high		
	Nyctalus noctula		Moderate	Moderate
	Vespertilio kunli	high		
	Vespertilio pipistrellis	Moderate	Moderate	Moderate/ high
	Miniopterus schreibersi	high	high	very high
	Canis lupus	high		
	Canus aureus			
	Vulpes vulpes			
	Mustela nivalis			
	Mustela putorius			
	Martes foina			
	Martes martes			
	Meles meles			
	Lutra lutra lutra		high	
	Felis lynx			

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	Felis silvestris			
	Monachus monachus		high	
	Sus scrofa			
	Ovis musimon			
	Cervus elaphus			
	Cervus dama			
	Capreolus capreolus			
	Delphinus delphis			
	Phocoena phocoena relicta	high		
	Tursiops truncatus ponticus			