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KOLKHETI PEATLAND RELICT FOREST BODIVERSITY, POSSIBILITIES DEGRSADED FOREST REHABILITATION AND CONSERVATIO

A B S T R A C T

of the thesis presented to obtain academic degree in Natural Sciences

Specialty-Biodiversity

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Content

Introduction

Actuality of the Research Topic. The Caucasus region was recently designated as one of twenty-five global "biodiversity hotspots" (Myers et al. 2000). The Caucasus biodiversity hotspot spans 500,000 square kilometres of mountains in Eurasia between the Black and Caspian seas, including Armenia Azerbaijan and Georgia, and small portions of Russia, Iran and Turkey (Fig. 1). The unique location of the Caucasus region and the presence of high mountains are the main causes of the concentration highly diverse flora and fauna in this small place. The region is influenced from arid Irano-Turanian bio-province from the east and arid East Anatolian sub-bio-province from the south. Consequently, many droughts resistant plant and animal taxa migrate from these bio-provinces towards the Caucasus. Wet and warm winds, blowing from the Black Sea supply western Caucasus (Kolkheti) with high amounts of precipitation and thus promote development of diverse plant and animal taxa. This humid and warm region is included into Kolkheti bio-province. Additionally, high mountains of the Caucasus (over 5000 m) with their differently oriented ranges, deep gorges and valleys increase landscape variation and therefore, plant and animal diversity. As a result, the Caucasus is characterized by a unique flora and fauna. many endemic plant species (approximately 25 %) and five endemic plant genera are known for the region. Additionally, the Caucasus region represents one of the main Ice Age refugia of the Northern hemisphere.

Kolkheti – a global Ice Age refugium. Kolkheti is situated in western Caucasus. During the Tertiary climate in the northern hemisphere was warm and wet and rich subtropical and tropical woody plants were distributed here. Global cooling which started approximately 15 million years ago (Moran et al. 2006) culminated into Ice Ages, therefore woody plants migrated southwards and survived only in refugia – places, which remained warm and wet climates during the Ice Age. Such refugia are situated in eastern Asia, south-eastern North America, south-western North America and western Asia. Western Caucasus and especially Kolkheti lowland, as a part of western Asia, represents one of the global Ice Age refugia. Kolkheti lowland harbours relict woody plants, e.g., plants which were widespread in Europe many millions of years ago and became extinct there during the Ice Ages. Many of these woody plants e.g., Zelkova, wing-nut, pontian oak, several species of evergreen Rhododendrons, megrelian birch tree, have their closest relatives only in eastern Asia and North America. Relict plants distributed in Kolkheti lowland refugium are rare, have isolated distribution and many of them are endangered.

Such uniqueness of the relict forests of the Colchis lowlands is due to the fact that it is represented by relict and endemic species: Quercus hartwissiana, Pterocarya fraxinifolia, Imereti oak. Many of them are found only in Colchis: such as: e.g. Hartvis Oak. Some of them are found only in Colchis and Hyrcanus, while their closest relatives are found only in East Asia and North America. This relic of plants survived the glacial period in the Colchis lowlands.

Along with the Hyrcanian Forest, relict forests of the southwestern Caspian Sea and the Colchis Plain are ancient forests in Western Eurasia with their origins, evolution, and biodiversity as a special evolutionary phenomenon. In addition, the Colchis lowland forest is the best-preserved forest and is associated with biota in Eurasia. They are especially valuable for migratory, migratory and nesting birds. These sites have been protected by the Ramsar Convention since 1997 as a wetland habitat of significant international importance for migratory birds.

The relict forests of Colchis are of the mixed type, where Laphan or Hartvis oak do not form sacred groves. The development and distribution of vegetation in the Colchis Plain is closely related to the groundwater regime.

In swampy areas, where peat soils are developed, trees are almost non-existent. There are swampy, reed and Sphagnum swamps here. Where swamps are less common, low-quality, heavily swampy, swamp-type alders are common.

In relatively improved terrain, swampy alluvial soils grow high-quality trees, which are often interfered with by such vulnerable and rare relicts as *Pterocarya fraxinifolia*. Prior to human impact, oligodominant (dominated by several species) forests were common here. Polydominant forests were even rarer and occupied a much smaller area. Monodominant forests were an even rarer occurrence and they are mostly alder. Hornbeam-alder was most widespread in the border zone of alder forests, and in the northern part of the region.

Habitats of Kolkheti lowland. Kolkheti lowland is internationally recognized as an area of species richness, endemism, taxonomic uniqueness, and globally rare major habitat types. Following habitats are to be found here:Sand dunes**;** Mires**,** Wetlands**,** Forests.

The topicality of the topic is highlighted by the project nominated by the Organization for Education, Science and Culture (UNESCO) for the World Natural Heritage Site: "Colchis Peatlands and Relic Forests". A special place in this scientific dossier is occupied by the relict forest of the Kolkheti lowland.

Research Aim and Objectives. Study of vegetation and flora of peatland relict forest of Kolkheti lowland and create management and working plan of degraded forest.

Task 1. To study: past of Kollkheti relict fores literature observe;Recent situation of relict forest, theates and anthropogenic impacts;

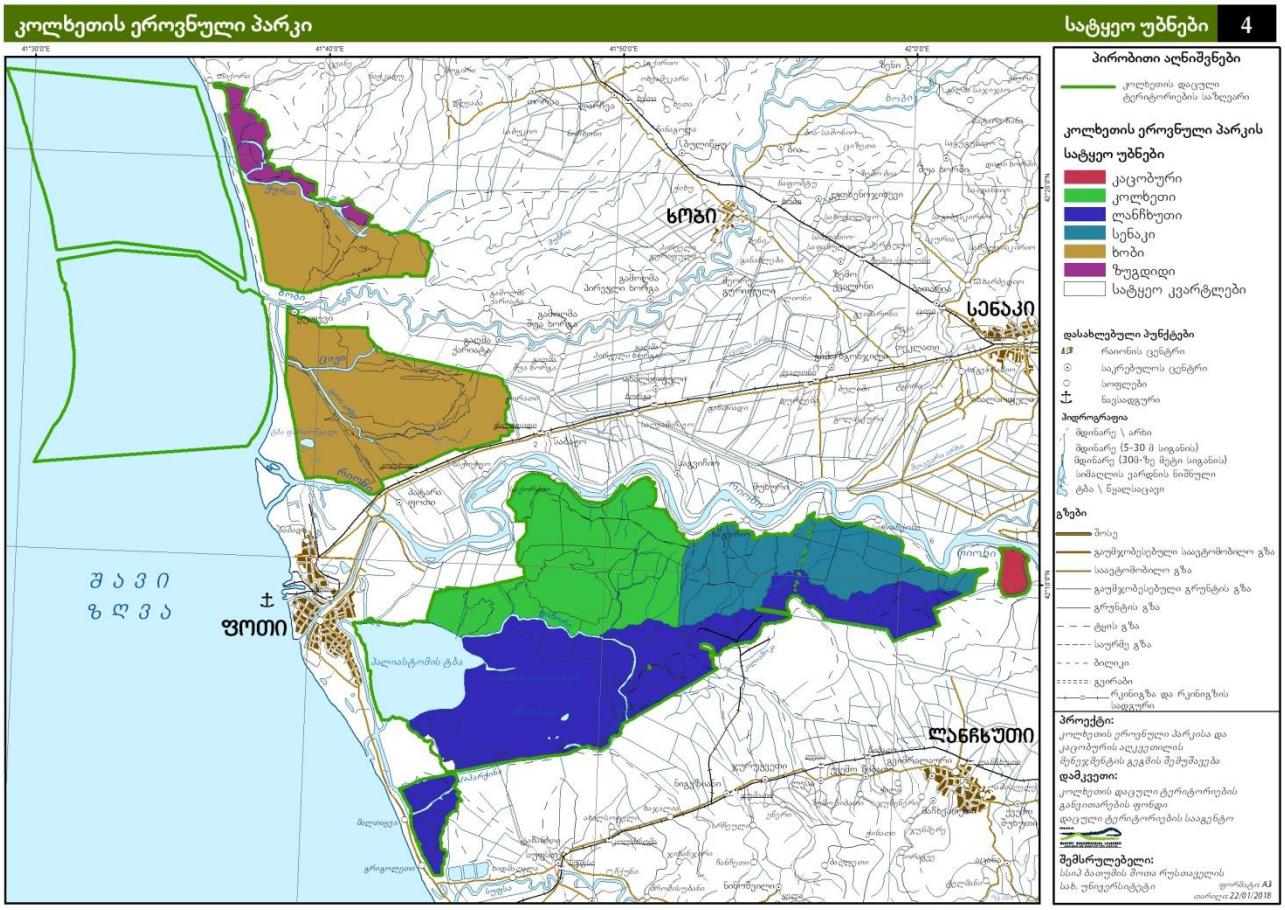
Task 2. flora and vegetation of telict forest; peat straigraphy;

Task 3.identify degraded forest

Task 4. create management plan and strategy of degraded dorest rehabilitation;

Task 5.give recommendation on *ex-situ* conservation

Objet of study. The study area of thesis is peatland relict forest of Kolkheti lowland from Kobuleti till Anaklia (see map).



Map 1. Location of Peatlandrelict forest of Kolkheti lowland

Scientific Novelty. It is the wild surviving forests of the relict Colchian forest species (Hartvis oak, lapani, maple, fig, hornbeam, elm, etc.) that have entered the scientific dossier prepared for the World Natural Heritage nomination.

Theoretical and Practical Significance. One of the practical ecological and economic value of the dissertation is the areas identified for the restoration of degraded relict forests.

Establishment of native fast growing tree species like alder in part of the area to satisfy the demand for fuel and timber of local stakeholders.

– Re-establishment of the former Kolkheti forest to support this globally unique forest ecosystem in combination with the recreation for tourists (see Ecotourism).

– Carbon sequestration and sales of carbon credits on the Kyoto Protocol compliance market (Clean Development Mechanism) and the Voluntary Carbon Market. There is a large interest in afforestation and reforestation projects for climate mitigation. Reforestation of the (buffer) zone areas (certainly with the substantial ecological and social benefits involved) would make a very attractive carbon project that could yield several thousands of euros (gross) per ha.

The reforestation areas would allow a promising combination of immission (buffer) zone, hydrological (buffer) zone and economic income in a synergetic way.

Approbation of Work. Batumi Shota Rustaveli State University, Institute of Phytopathology and biodiversity, department of Kolkheti mire and water ecosystem conservation;Society of wild nature conservation “tchaobi”;Administrations of Kolkheti national park and Kobuleti protected areas; “Kolkheti relict forest rehabilitation project” of University of Friburg Switserland.

The Structure of the Thesis. The work consists of the following sections: Introduction, Literature Review, Materials and Methods, Results, Discussion, Conclusions, Recommendations, References. The thesis consisted of computer-printed 130 pages in Georgian language, 15 tables, 5 diagrams and 25 figures. The bibliography of the PhD thesis is consisting of 104 sources in Georgian, Russian and English languages.

ResearchMaterial and Methodology

Research Methods: The basic field research manual methodology of the dissertation is a terrestrial plant ecology guide, which includes:

Transect A transect is a linear line drawn to study plant communities in a given habitat, where plant descriptions are made using fixed intervals and squares. Such studies and data are necessary for further monitoring of plant communities;

Quadrate The quadratic method. The transect is directed in the longest direction of a given habitat. Here the distance between the squares depends on the length of the transect and the diversity of the habitat. Initially, habitat research is a descriptive "intelligence" of how phytocenological research should be conducted under which "transect".

The transect method is necessary to study how plant communities' change.It is of great importance for further monitoring

Plant commutoties PC r ropgram

Soil stratigraphic incision method. The method proposed by the Faculty of Landscape Ecology, University of Greifswald, Germany, is used in the study of soil stratigraphy of relict peatlands. By means of a special drill.

Data capture is performed every 0.5 m depth. Determination of macrofossil flora.

Literature Review

I. Why are forests of Kolkheti lowland important ecosystems?

Forests are composed of many relict and endemic taxa. Forests of Kolkheti lowland are composed of many relict woody taxa e.g. Imeretian oak, Hartwisi oak, mulberry tree, wing-nut, Kolkhic box, Pontic and Ungerni´s rhododendrons, laurel-cherry etc. Many of these woody plants are restricted only to Kolkheti region (e.g. Colchic box, Pontic and Ungerni´s rhododendrons, Hartwisi oak), some of them are distributed only in Kolkheti and Hirkan (surroundings of Elburs mountains) regions (e.g. wing-nut, *Zelkova*) and their closest relatives are found only in eastern Asia and North America. These relic plants have survived Ice Age in Kolkheti lowland, but now they are highly endangered.

Forests are home of many relict and endemic birds, reptiles and amphibians. Forests of Kolkheti lowland are favourite nesting place for the relict bird Colchic pheasant (*Phasianus colchicus*). Many endemic amphibians (*Pelodytes caucasicus*, *Bufo verucossissimus*, *Hyla arborea*) and reptiles (*Lacerta agilis grusinica*, *Darevskia derjugini barani*) etc.

Forests of Kolkheti lowland are the unique ecosystems restricted only to small part of the Black Sea coast. Forests of Kolkheti lowland are restricted only to humid regions of the Black Sea coast. In the past the natural area of distribution of forests covered lowlands of the western Caucasus (see Fig. 2). Forest was present till the end of XIX century. Famous writer Alexandre Dumas in his "The Caucasus" has also mentioned about spectacular and mysterious forests of the Kolkheti lowland. Unfortunately, the actual distribution of forests is significantly smaller.

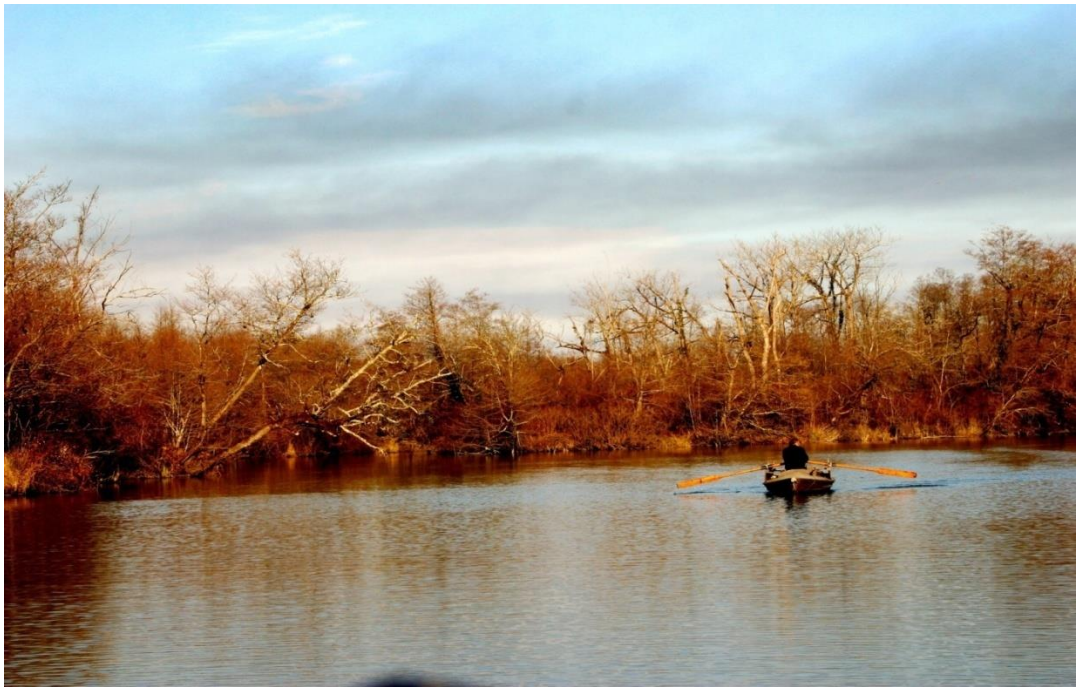


Fig. Fichora relict forest

Chapter 2Actual situation of forests of Kolkheti lowland

The Kolkheti National Park faces many challenges, such as the impact of mass tourism which affects coastal areas, or the socio-economic conditions of the indigenous population. The human pressure and impact on river ecosystems are very significant since many small villages nestle in the vicinity of the Kolkheti NP. The natural habitats provide extremely important ecosystem services for local people (e.g. pasture, charcoal, food, drinking water) Furthermore, many Kolkheti lowland areas are already highly fragmented and degraded, especially along the riverbanks within the national park. In many places, pure *Alnus* stands can be observed with very little plant diversity.

In the vicinity of the Pichori River, for example, *Alnus glutinosa subsp. barbata* dominates over a large proportion of the forests. It forms dense monospecific stands with evidence of very few species. Moreover, the tree layer looks even-aged, indicating that light conditions in the understory are unsuitable for regeneration or that a sudden event (probably floods or repeated short-rotation clearcutting) occurred in the past and affected a large area.

Forests of Kolkheti lowland are degraded. The areas which still remain endemic and relic taxa and structure of Kolkheti relic forests are small and degraded. The principal reasons for degradation of forest ecosystems are:

- Drainage – Kolkheti relic forests were badly affected by large scale drainage activities performed since 1920-1930;
- Forest harvesting – Kolkheti lowland forests have been widespread till the beginning of the 20th century (Flerov 1951, Radde 1899). Since the XX century uncontrolled cut of valuable timber plants such as wing-nut, oak, beech and hornbeam led to the degradation of Kolkheti relic forests and dominance of fast-growing alder (*Alnus barbata*). Nowadays, large thickets of monodominante alder have almost outcompeted other woody plants. Oak, beech, hornbeam, and wing nut therefore have become rare forest elements and survived only in places that are far from settlements and are difficult to access;
- Plantation of non-native woody plants – in the beginning of 1930th native forest of Kolkheti lowland has been replaced by plantations of non-native plants especially *Eucalyptus* ssp. and *Cryptomeria japonica*;

Alien plants – at present, degraded Kolkheti lowland forests harbour only a few native plants, whereas, number of alien species is rapidly increasing; The spread of invasive alien species near and within the Kolkheti NP poses another very serious issue. The precious riparian ecosystem warrants urgent action and special attention. On the banks of the Pichori River, invasive species have already modified completely the general physiognomy of the riparian vegetation. *Amorpha fructicosa,* a shrub originating from the USA, is the main threat to vegetation along the river banks. This species, which belongs to the Fabaceae family, severely modifies soil fertility by fixing nitrogen in the soil. It also occupies the river banks instead of several native woody species of high conservation value such as *Pterocaryafraxinifolia and Quercus hartwissiana.* The situation further inland also gives cause for concern as the ground is sometimes completely covered by another invasive alien species, namely *Polygonum thunbergii,* which proliferates unrestrained in the understory. In addition to the very thick, natural canopy, it can hamper seed germination and the seedling establishment of tree species to considerable extent, thus preventing potential forest regeneration. Moreover, the high proportion of other invasive species on the periphery of the Kolkheti NP (*Gleditsia triacanthos and Ambrosia artemisiifolia)* must also be mentioned. These will continue to advance right at the heart of the protected area if nothing is done to halt their progression.

Forests of Kolkheti lowland are fragmented. At present only a few small fragmented woody patches are distributed in the Kolkheti lowland (Fig. 3). These are small rests of once large and continuously distributed forest ecosystem. The main causes of fragmentation are:

- Development of infrastructure – natural area of distribution of forests of Kolkheti lowland are fragmented because of development of settlements and infrastructure;
- Industrialisation – recently Supsa and Kulevi oil Terminals Anaklia Sea Port were built in Kolkheti lowland;

- Conversion of land for agriculture – large area of former continuous forest has been transformed into plantations of maize and tee, or converted into pastures. Subsequently it became evident, that the idea to establish a well-developed agriculture in the region was a complete failure since the soils of Kolkheti lowland are very poor.

Problems in conservation of Forests of Kolkheti lowland

Poor socio-economic situation of the region. The present-day socio-economic hardship with its high population pressure and the increasing demand for timber causes even more damage to the forest. Local population uses timber for heating. Additionally, illegal trade of timber is often the only income for many local farmers. Fortunately, recent restructuring of the Ministry of Environment of Georgia, has significantly improved controlling process of forest resources in the country. But alternative income to non-profitable maize trade and illegal logging has not been offered to farmers.

Incorrect **forest management.** Kolkheti National park was recently established to protect forests and other unique habitats of Kolkheti lowland. However, most of the territory of KNP is dominated by degraded forest, composing mostly of alder and invasive species (Denk et al. 2001). Former dominant taxa such as wing-nut, Hartwissi oak, Imeretian oak, hornbeam are rare and without habitat management these trees can become extinct. Unfortunately, plan of restoration of the forest has not yet been established.

Absence of conservation status of Tikeri and Khobi Forests. There are only a few forest patches in the Kolkheti lowland, which still remain structure and biodiversity of Kolkheti lowland forest, but their conservation status has not yet been evaluated. Good example is a small patch of Tikeri Forest near Kobuleti (Fig. 3), which is characterized by higher biodiversity than the forests from KNP.

Lack of qualified scientific personnel. In general, Georgia is short of well qualified forest ecologists. Modern methods and scientific approaches in management of natural resources and especially of forest resources are lacking. Therefore, inclusion in the project of well-qualified forest ecologists is urgently necessary.

Chapter 3 . Vegetation of Kolkheti relict peatland forest

The plant community has three / four tiers:

The first tier is represented by woody species forming the Kolkheti lowland forest:

Pterocarya fraxinifolia, Alnusglutinosa subsp. *barbata, Acer orthodocampestre, Carpinus betulus).*

The second tiers: *Viburnum opulus, Crataegus microphylla, Ilex colchica, Ruscus ponticus, Buxus colchica*

The thirf tier:*Asplenimfilix mas, Juncus acutus., Typha angustifolia, Polygonum thunbergii, Glehoma hederaceae,Carex sylvatica, Microstegium japonicum, Duchesne indica.*

Four tiers: mosses

3.1. relict forest of Kobuleti lowland (South Kolkheti)

Plant communities of *Alder* forest of Kobuleti lowland Table 1

Species	Species composition after Braun-Blanquetia																								
Quercus hartwissiana																								1a	1
Alnus glutinosa subsp.*Barbata*	3	3	2a	3	3	.	3	2a	3	3	2q	2a	3	3	2a	3	3	2b	3	3	3	3			
Rubus discolor	1	1	.	1	1	1	.	1	1	1	1	1	.	1	1	1	1	1	1	1	1	.			
Hedera helix	1	1	1	1				1							1		2a								
Crataegus macrophylla							1							2a											
Smilax excelsa	.2a	2a.	.	.	.	.	2a.	.	.	.	1a	1	.	.	.	2a.	.	.	.	.	.	.			
Viburnum opulus	2a									2a				2a					3a						
Rhamnus frangula	3						1	3			1	2a				1		2a			3				
Carex lasiocarpa	2m	2m	2a	.	.	.	.1	.	.1	.	.	.	.	.1	.	.	.1	.	.	.	.	.			
Polygonum hydropiper		2a					2b				3		3b			2a									
Iris pseudacorus																		2b							
Lonicera caprifolia	.	2a	.	3	.	5	.	.	.	.	.	.	.	.	.	.	.	.	.1	.	.1	.			
Carpinus betulus											.	.	.	.	.	.	.	.	1.	.	.2a	.			
Salix caprea	.	.	.	.															1		2b	2a			
Salix cinerea																			1		2b	2a			
Lythrum salicaria	2m	.	.	3	2m	.	.	.	.	1	2a	2a	1	2a	2m	2m	2a	2a	2a	1	2m	2a			
Solidago virgaurea	.	.	1	.	.	.	.	.	2a	.	.	.	.	.	.	.	.	.	.	.	.	.			
Juncus effuses		2b		2a			2b			2b			2a		1	1	1	1	1						
Carex pendula	.	.	1	.	.	.2a	.	.2a	.	.	.	.	.	.	.	.	.	.	.	.2a	.	.			
Sparganium neglectum	.	2m	.	.	.	.	.	.	.	.	3	2b	2a	2b	2a	2a	2a	2b	2b	3	.	2b			
Epilobium palustre	.	.	.	.	.	.	.	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.			

Osmunda regalis	.	.	.	.	.	.	.	2m	.	.	1	1	1	1	1	1	1	.	2m	.	1	2m									
Pteridium aquilinum												3	2b	2a	2b	2a	2a	2a	2b	2b	3	.									
Molinia litoralis	.	.	.	.	.	.	.2a	.	.	2b.	.	.	.	1	1	.	1	1	1	2b	2a	2a									
Euonimus europeae	.	.	.	.																1a											
Bidens cernua	2a	2a	2a.	.	.	2a.	.	.	.	2a.	.	.	.	2b.	.2b	2b.2b	.	.	.	.	.	.									
Galium palustre	.	.	.	.	1	1	.	.	.	.	.	1	1	.	1	1	.	1	1	.	.	.									
Mentha pulegium	2a.	2a.	.	.	.	.	2a.	.	.	.	1	.	1	.	.	.	.	.	.	.	1	.									
Polygonum thunbergii	3	.3	1	.	.	.	2b.	.	3.	.3	.3	3.	.3a	.	2b.	.2b	.	.	1	.2b	.	.									

Figure. Profile diagram of Kobuleti *Alder* forest

Table 2.

Species	Species composition of Alneta&Pterocaryeat forest after Braun-Blanquetia																					
Quercus hartwissiana																					1a	1
Alnus glutinosa subsp. *barbata*	2	3	2	2a	2a	3	3	3	2b	3	2b	2	2a	3	3	3	3a	2	2b	3	3	
Pterocarya fraxinifolia	3	3	2a	3	3	.	3	2a	3	3	2b	2a	3	3	2a	3	3	2b	3	3	3	3
Rubus discolor	1	1	.	1	1		.					1	.	1	1	1				1	1	.
Hedera helix	1	1	1	1				1							1		2a					
Crataegus macrophylla							1							1a								
Smilax excelsa	.2a	2.	.	.	.	.	2.	.	.	.	1a	1	.	.	.	2.	.	.	.	.	.	.
Viburnum opulus	2a									2				2a					3a			
Frangula alnus	3						1	3			1					1		2a				
Polygonum hydropiper		2a					2b				3		3b			2a						
Buxus colchicus																		2b				
Lonicera caprifolia	.				.	5	.	.	.	.	.	.	.	.	.	.	.	.	.1	.	.1	.
Salix caprea	.	.	.	.															1		2b	2a
Amorpha fruticosa																			1		2b	2a
Lythrum salicaria	2m	.	.	3	2m	.	.	.	.	1	1	2a	1	2a	2m	1	1	1		1	2m	2a

Solidago virgaurea	.	.	1	.	.	.	.	.	2a	.	.	.	.	.	.	.	.	.	.	.	.	.
Juncus effuses		2b		2a			2b			2b			2a		1	1	1	1	1			
Carex pendula	.	.	1	.	.	.2a	.	.2a	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Sparganium neglectum	.	2m	.	.	.	.	.	.	.	.	3	2b	2a	2b	2a	2a	2a	2b	2b	3	.	2b
Euonimus europeae	.	.	.	.																1a		
Bidens cernua	2a	2a	2a.	.	.	2a.	.	.	.	2a.	.	.	.	2b.	.2b	2b.2b	.	.	.	.	.	.
Galium palustre	.	.	.	.	1	1	.	.	.	.	.	1	1	.	1	1	.	1	1	.	.	.
Mentha pulegium	2a.	2a.	.	.	.	.	2a.	.	.	.	1	.	1	.	.	.	.	.	.	.	1	.
Polygonum thunbergii	3	.3	1	.	.	.	2b.	.	3.	.3	.3	3.	.3a	.	2b.	.2b	.	.	1	.2b	.	.

Tchuria forest (Kolkheti National Park)

The floristic composition of the Churia forest district formed the basis for the inclusion of these areas in the UNESCO World Natural Heritage nomination dossier "Colchis Forests and Wetlands".

Table

Tchuria	Species composition of polydominant deciduous relict forest of Trchuria after Braun-blanquetia																														
Transect N.		9	20	21	22	23	24	25	26	27	28	15	16	17	14	18	19	3	4	5	11	13	10	12	7	6		2			
Transect	MT		FT	FT	FT	FT	FT	FT	FT	FT	FT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT	MT				
Record	9		1	2	3	4	5	6	7	8	9	15	16	17	14	18	19	3	4	5	11	13	10	12	7	6		2			
Date	22		25	25	25	25	25	26	26	26	26	24	24	24	24	24	24	21	21	21	22	22	22	22	21	21		21			
Size of quadrate	15		15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15		15			
High of trees (m)	15		19	20	19	20	19	20	19	20	19	17	17	21	20	25	20	18	20	20	15	20	20	15	15	15		20			
Herbs&grasses (sm	90		105	100	105	100	95	85	95	95	90	90	105	95	100	110	150	90	80	110	100	90	85	120	70	85		100			
Quercus hartwissiana	2a	1a		2m	2a	2a	1a	2a	2a	2a	2m	1a	1a		1	1	1a			4	2b	2a	2m	2a	2m	2m	2a		3			
Pterocarya fraxinifolia	2b	2q		2a	3	3	2a	3	3	2b	3	3	3	3	3	3	3			3	3	3	3	3	2a	2a		3			
Acer orthocampestre		1	1	1			1	1	1	1	1	1	1	1		1			2a		1	1	1	1			1		1		
Ulmus glabra		1			1	1	1		1	1	1	1	1	1	1	1	1	1				1	1	1		2m		1		1		
Carpinus betulus				1	2m	2b		5	4	5	5	5	5	4	5	3	4											5				
Fagus orientalis			1a		1																										
Ilex colchica	1																								1			1			
Alnusglutinosa subsp. barbata																				2m	2m		2a								
Ficus colchica															1			2m	2m	2m											

Mors nigra																		3		2a						
Zelkova carpinifolia																						4	2a	2m		3
Rhamus frangula	2a		2a		2a			1	2a		2m		2m		2a		2a		2a			1	2m		2a	
Populus nigra																										
Salix alba				3	2b		2a		2b		2a		2a		2a		2b		2b			3			2b	
Salix cinerea	2m																						2m			
Pyrus balansae				1								1		1				1		1		1				
Malus sylvatica	+							1						1												
Crataegus microphylla																							2b			3
Viburnum opulus										1		1				1		1		1		1		1		1
Cornus mas				1		1		1		1		1		1		1			2m					1	2m	
Ilex colchica						1		1				1		1				1		1						
Humulus lupulus				1				1																1		
Periplica graeca																				1						
Smilax excels																										
Vitis sylvestris				1		1		1		1		1		1				1		1		1		1		
Clematis vitalba				1		1				1																
Rubus discolor																			2m			1				1
Rubus anatolicus										1																
Hedera colchica	2m			1		1		1		1		1		1		1		1		1		1				
Hedera helix						1																				
Lonicera caprifolium		1				1		1		1				1		1		1		1		1		1		1
Hydrocotyle vulgaris				1		1		1		1		1	2m		2m		2m		2m		2m			1		1
Solidago canadensis																								1		1
Lycopus europaeus	2a													1		1										
Holcus lanatus	2b																									
Calystegia sepium								1										1								
Solidago virgaurea																										
Mentha pulegium																										
Salvinia natans				1																						
Stachys palustre																										
Veronica becca-bunga																										
Aster laevis																										
Hibiscus ponticus																										
Ludwigia palustris						1		1				1		1		1		1		1		1		1		1

Hypericum mutilum																					
Osmunda regalis		1		1					1		1		1		1	1		1	1		1
Polygonum thunbergii																					
Duchesnea indica																					
Potentila reptans		1		1		1		1			1								1		1
Galium palustre	2m		2m		2m		2m		1		1	2m			1						1
Hypnum cupressiforme		1							1	1a			1	2m		1	1a		1		1
Lophocolea bidentata								1					1		1	1	1a		1	2m	

Figure. Profile diagram of Tchuria Polidominant deciduous forest

Fig. *Quercus hartwissiana*

Fig. *Viburnum opulus*

Fig. *Pterocarya fraxinifolia*

Fig. *Carpinus betulus*

3.2. Flora of Kolkheti peatland relict forest

	Bryophyta
Bartramiaceae	
1	***Philonotis****marchica (Hedw.) Brid.*
Cephaloziaceae**Mig.**	
2	***Cephalozia****connivens* (Dicks.) Lindb
3	***Odontoschisma****denudatum* (Nees) Dumort.
4	***Atrichum*** *undulatum* (Hedw.) P. Beauv.
5	***Calliergonella*** *cuspidata* (Hedw.) Loeske
Dicranaceae	
6	*Campylopus filifolius* (Hornsch.) Mitt.
7	*Campylopus fragilis* (Brid.) Bruch & Schimp.
Hypnaceae	
8	*Hypnum cupressiforme* Hedw.
Polytrichaceae	
9	*Polytrichum strictum* Menzies ex Brid.
Sphagnaceae	
10	*Sphagnum cuspidatum* Ehrh. ex Hoffm.
11	*Sphagnum palustre* L.
12	*Sphagnum papillosum* Lindb.
DicranaceaeSchimp.	
13	***Campylopus*** *pyriformis (Schultz) Brid.*
14	*C. fragilis* (Brid.) Bruch &Schimp.
15	***Paraleucobryum****longifolium* (Ehrh. ex Hedw.) Loeske
Fagaceae	
16	***Quercus*** *hartwissiana* Steven
17	***Fagus*** *orientalis* L.
Betulaceae	
18	***Alnus*** *glutinosa subsp. barbata* (C.A.Mey.) Yalt.
19	***Carpinus*** *betulus*L.
Aceraceae	
20	***Acer*** *campestre*L.
Ulmaceae	

21	***Ulmus*** *glabra Huds*
22	***Zelkova*** *carpinifolia* (Pall.) K. Koch
Juglandaceae **A.Rich.ex Kunth**	
23	***Pterocaria*** *fraxinifolia* (*pterocarpa*) (Michx.)Kunth ex J.Jljinsk.
Moraceae	
24	***Ficus*** *carica* L.
25	***Morus*** *nigra* L.
26	*Morus alba* L.
Rhamnaceae	
27	***Frangula*** *alnus* L.
Salicaceae **Mirb.**	
28	***Populus*** *nigra* L.
29	***Salix*** *alba* L.; *S.micans* Anderss.[*A.albasubsp.micans* (Anderss.)Reich.fil.
30	*S.cinerea* L.
31	*S.caprea* L.
Fabaceae	
32	***Gleditsia*** *triacanthos* L.
33	***Amorpha*** *fruticosa* L.
Rosaceae	
34	***Malus*** *sylvestris (L.) Mill.*
35	***Crataegus*** *microphylla K.Koch*
36	***Rubus*** *anatolicus* Focke
37	*R.discolor* Boiss.
38	*R.hirtus* Waldst.& Kit.
39	***Duchesnea*** *indica* (Andr.) Focke
40	***Potentilla*** *erecta* (L.) Raeusch.
41	*P.reptans* L.
42	***Pyrus balansae*** Focke
Adoxaceae	
43	***Viburnum opulus*** **L.**
Cornaceae	
44	***Cornus*** *mas* L.
Ruscaceae	
45	***Ruscus*** *ponticus* Woronow
Aquifoliaceae	
46	***Ilex*** *colchica* Pojark.
Buxaceaea	
47	***Buxus*** *colchica* L.
Cannabaceaea	
48	***Humulus*** *lupulus* L.
Apocynaceae	

49	***Periploca*** *graeca*L.
Smilacaceae	
50	***Smilax*** *exelsa*L.
Vitaceae	
51	***Vitis*** *vinifera* subsp. *sativa* Hegi
Ranunculaceae	
52	***Clematis*** *vitalba*L.
Araliaceae**Juss.**	
53	***Hedera*** *colchica* (C.Koch) C.Koch.
54	*H.helix* L.*(H.caucasigena* Pojark.)
Caprifoliacea**Juss.**	
55	***Lonicera****caprifolium* L.
56	*L. japonic*a Thunb.
Apiaceae**Lindl. *(Umbelliferae* Juss.)**	
57	***Daucus****carota*L.
58	***Hydrocotyle****ranunculoide*sL.
59	*H. ramiflora* Maxim.
60	*H. vulgaris* L.
61	***Oenanthe****aquatica*(L.) Poir.
Asteracea**Dumort. (CompositaeGiseke.)**	
62	***Achillea****beibersteinii*Afan.
63	*A. filipendulina*Lam.
64	*A. nobili*s L.
65	***Ambrosia****artemisiifolia* L.
66	***Antennaria****caucasica*Boiss.
67	***A.*** *absinthium* L.
68	*A. vulgaris* L.
69	***Aster****salicifolius* Lam.
70	***Bidens****cernua* L.
71	*B.tripartita* L. (*B.orientalis*Velen.)
71	***Carpesium****abrotanoides*L.
72	*C. cernuum* L.
73	***Pulicaria****dysenterica*(L.) Gaertn.
74	***Cirsium*** *incanum* (S.G.Gmel.) Fisch.
75	***Conyzanthus****graminifolius*(Spreng) Tamamsch.
76	***Dichrocephala*** *integrifolia* (L.f.) Kuntze
77	***Echinops****colchicus*Sosn.
78	***Erigeron*** *annus* (L.) Pers. (*Stenactisannua* (L.) Cass.
79	*E. canadensis* L.
80	***Filago****gallica* (L.) L.
81	***Galinsoga****ciliata*(Rafin) Blake
82	*G. parviflo*ra Cav.
83	***Gnaphalium****affine* D.Don.

84	*G. luteoalbum* L.
85	***Grossheimia*** *polyphylla* (Ledeb.) Holub. *(G.ossica* (C.Koch) Sosn. &Takht.)
86	***Gymnaster****savatieri*(Makino) Kitam.
87	***Helianthus****tuberosus* L.
88	***Leontodon****danubialis*Jacq.
89	***Leucanthemum*** *vulgare* Lam.; *(L.vulgareLam.*subsp.*multicaule*A.Khokhr.)
90	***Santolina****chamaecyparissus* L.
91	***Senecio*** *erraticus* Bertol. *(Jacobaea erratica* (Bertol.) Fourr.)
92	*S. sylvatic*us L.
93	*S.vernalis*Waldst.& Kit.
94	*S.vulgaris*L.
95	***Sigesbeckia****orientalis* L.
96	***Silybum****marianum* (L.) Gaertn.
97	***Sonchus****arvensis*L.
98	***Solidago****canadensis* L.
99	***Tagetes****minuta*L.
***Boraginaceae*Juss.**	
100	***Myosotis****palustris*(L.) Nathh.
101	***Cardamine****hirsute* L.
102	***Rorippa****palustris*(L.) Besser
***Caryophyllaceae*Juss.**	
103	***Stellaria****media* (L.) Vill.(*Alsinula media* (L.) Dostal, comb.invalid.)
***Convolvulaceae*Juss.**	
104	***Calystegia*** *sepium* (L.) R.Br.
105	*C. soldanella* (L.) R. Br.
106	*Convolvulus arvensis*L.
***Euphorbiaceae*Juss.**	
107	***Euphorbia****palustris* L.
***Fabaceae*Lindl. (*Leguminosae*Juss.)**	
108	***Amoria*** *ambigua* (Bieb.) Sojak *(Trifolium ambiguum*Bieb.)
109	***L.****palustris*Willd.
110	***Medicago****arabica* (L.) Huds.
111	*M. denticulate* Willd.
112	***Ononis****arvensis* L.
113	***Psoralea****acaulis*Stev.
114	***Securigera*** *varia* (L.) Lassen *(Coronilla varia* L.)
115	***Trifolium****campestr*eSchreb.
116	*T. fragiferum* L.
117	*T. resupinatum* L.
118	*T. subterraneum* L.
119	*T. tumens*M.Bieb.
120	***Vicia*** *sativa* L.
***Geraniaceae*Juss.**	

121	***Geranium****palustre* L.
122	*G.rotundifolium*L.
***Hypericaceae*uss.**	
123	***Hypericum****perforatum* L.
***Lamiaceae*Lindl. (*Labiatae*Juss.)**	
124	***Galeopsis****tetrahit*L.
125	***Glechoma****hederacea*L.
126	***Lamium****album* L.
127	***Lycopus****europaeus* L.
128	***Mentha****pulegium* L.
129	***Perilla****nankinensis*Wender.
***Lythraceae* St.-Hil**	
130	***Lythrum****salicari*a L.
***Malvaceae*Juss.**	
131	***Hibiscus****ponticus*Rupr.
132	***Kosteletzkya*** *pentacarpos* (L.) Ledeb. (*Hibiscus pentacarpos*L.)
Onagraceaea	
133	***Epilobium****palustre* L.
134	***Ludwigia****palustris*(L.) Elliott
***Oxalidaceae*R.Br.**	
135	***Oxalis*** *acetosella* L.
136	***Xanthoxalis*** *corniculata* (L.) Small (*Oxalis corniculata*L.)
***Phytolaccaceae*R.Br.**	
137	***Phytolacca****Americana* L.
Plantaginaceae	
138	***Plantago****lanceolata*L.
139	*P.major* L.
***Polygonaceae*Juss.**	
140	***Persicaria*** *amphibia* (L.) Delarb*re (Polygonum amphibium* L
141	P. *hydropiper* (L.) Spach (*Polygonum hydropiper* L.)
142	*P.aviculare* L.
143	***Polygonum****perfoliatum*L.
144	*P. posumbu* Buch.-Ham. ex D. Don
145	*P. thunbergii*Siebold&Zucc.
146	***Rumex****acetosella*L.
***Primulaceae*Vent.**	
147	***Lysimachia*** *vulgaris*L.
***Ranunculaceae*Juss.**	
148	***Ficaria****calthifolia*Reichenb.
149	***Ranunculus****bulbosus*L.
150	*R. muricatus* L.
151	*R.oreophilus* Bieb. (*R.acutilobus*Ledeb., *R.makaschwilii* Kem.-Nath.)
152	*R. sceleratus* L.

153	*R. trachycarpus*Fisch. &C.A.Mey. (*Ranunculus marginatus* d'Urv.)
Celastraceae	
154	***Euonimus** europaeus*
***Rubiaceae*Juss.**	
155	***Galium**palustre*L.
156	*G. tricornutum* Dandy
***Sambucaceae*Batsch ex Borkh.**	
157	***Sambucus**ebulus*L.
***Solanaceae*Juss.**	
158	***Datura**stramonium* L.
159	***Solanum**pseudocapsicum* L.
***Violaceae*Batsch.**	
200	***Viola**arvensis*Murr.
201	***V. odorata***
Amaryllidaceae J. ST.-Hil.	
202	***Leucojum**aestivum* L.
***Commelinaceae* R.Br.**	
203	***Commelina**communis* L.
204	***Tradescantia**virginiana* L.
***Cyperaceae*Juss.**	
205	***Bulbostylis** tenerrima* (Fisch. &C.A.Mey. exLedeb.) Palla
206	***Carex**pendula*
207	***C. lasiocarpa* L.**
208	***Eleocharis** palustris* (L.) Roem. &Schult.
209	***Fimbristylis** annua* (All.)Roem.et Schult.
210	***Juncellus** serotinus* (Rottb.) C.B.Clarke
211	***Kyllinga**gracillima*Miq.
212	***Pycreus**korshinsky*i (Meinsh.) V.I.Krecz.
213	***Scirpus**triqueter* Godr. (*Schoenoplectus litoralis* (Schrad.) Palla)
214	***Iris**pseudocorus L.*
215	***Sisyrinchium**angustifolium* Mill.
***Juncaceae* Juss.**	
216	***Juncus**acutus* L.
217	*J. bufonius* L.
218	*J.effusus*L.
219	*J. lampocarpus* Ehrh. ExHoffm. (*Juncus articulatus* L.)
220	***Luzula** forsteri* (Smith) DC.*(Juncus forsteri* Smith)
***Poaceae* Barnhart**	
221	***Aegilops**cylindrica Host*
222	***Agropyron** caninum* (L.) P.Beauv.
223	***Agrostis** alba* L. *Poa nemoralis* L.
224	*A. gigantea* Roth. [*A.alba s*ubsp.*gigantea* (Roth.) Jir.]

225	***Aira*** *elegans*Willd. ExGaudin.(*A.capillaris* Host.)
226	***Andropogon****virginicus* L
227	***Anthoxanthum****amarum*Brot.
228	*A. odoratum* L.
229	***Arthraxon****hispidus* (Thunb.) Makino
230	***Bromus****japonicas* Thunb.
231	*B. tectorum* L.
232	***Calamagrostis****arundinacea*(L.) Roth.
233	*C.epigeio*s (L.) Roth.
234	***Catabrosa*** *aquatic*a (L.) Beauv. (*Aira aquatica* L.)
235	***Digitaria*** *sanguinalis* (L.) Scop. [*D.vulgaris* (Schrad.) Bess.]
236	*D. ciliaris* (Retz.) Koeler
237	*D. ischaemum*(Schreb.) Muhl.
238	*D.violascen*s Link *[D.chinensis* (Retz.) A.Camus ;*Paspalum chinense* Nees]
239	***Echinochloa*** *crusgalli* (L.) Beauv.s.l.
240	***Eleusine****indica*(L.) Gaertn.
241	*E. tristachya*(Lam.) Lam.
242	***Eragrostis*** *minor*Host.
243	*E. pilosa* (L.) P.Beauv.
244	***Erianthus*** *ravennae* (L.) P.Beauv. (*Saccharum ravennae* (L.) L.)
245	***Leersia****oryzoides*(L.) Sw.
246	***Leymus****racemosus*(Lam.) Tzvelev
247	***Lolium*** *loliaceum* (Bory&Chaub.) Hand.-Mazz.
248	***Panicum****dichotomiflorum*Michx.
249	*P. lanuginosum* Elliott (*Panicum acuminatum* Sw.)
250	***Paspalum****dilatatum*Poir.
251	*P. paspalodes* (Michx.) Scribn. (*Paspalum distichum* L.)
252	*P. thunbergii* Kunth ex Steud.
253	***Phalaroides*** *arundinacea* (L.) Rauschert (*Phalaris arundinace*a L.)
254	***Phleum****paniculatum*Huds.
255	*Ph. Phleoides* (L.)Karst. (*P.boehmeri.*Wib.;*Phalarisphleoides* L.) .
256	***Poa****annua* L.
257	*P. bulbosa* L.;*P.crispa*Thuill. [*P.bulbosa* subsp.*vivipara* (Koel.) Arcang.]
258	*P. compressa* L.
259	*P.trivialis* L.
260	***Polypogon*** *semiverticillatus* (Forssk.) Hyl. *(Polypogon viridis* (Gouan) Breistr.)
261	***Rostraria****cristat*a (L.) Tzvel. (*Koeleriaphleoides* (Vill.) Pers.)
262	***Sorghum****halepense* (L.) Pers.
263	***Sporobolus****fertilis* (Steud.) Clayton
264	***Tragus****racemosus* (L.) All.
265	***Vulpia*** *myuros* (L.) C.C.Gmel.
Thyphacea**e Juss.**	

266	***Sparganium*** *neglectum* Beeby (*Sparganium erectum* subsp. *neglectum* (Beeby) K.Richt.)
267	***Typha****angustifolia* L.
268	*T. latifoli*a L

1. Flora of Kolkheti relict peatland forest presented: mosses- 6 family, 9 genera and 12 species; Trees-10 familys, 13 generis a and 16 species;scrubs-6 family, 7 genera, 7 species; Lianas: 8 Family, 8 Genera and 12 species; herbs-25 family, 79 genera, 166species, grasses: 6family, 46 genera, 63 species. Total Flora of Kolkheti relict peatland forest consista: 58family, 152genera 268species.

Chapter 4. Soil Stratigraphy of peatland forest

To confirm that there was once a forest in the forests adjacent to the Ispani mire in the forests surrounding the Kobuleti Protected Areas, stratigraphic incisions were made using a special drill to make a stratigraphic incision in the peat. The soil structure is studied. Stratigraphic incisions showed that the soil was of the peat type.

In stratigraphic cuts of peat, clay, gitia are often found in the cut, which indicates the presence of a river basin or sea level.

თავი 4. ტორფნარი ტყის ნიადაგის სტრატიგრაფიული ჭრილები

იმის დასადასტურებლად, რომ **ქობულეთის დაცული ტერიტორიების მიმდებარე ტყეებში** ისპანის ტორფნარების მომიჯნავე მდელოებზე ოდესღაც ტყე იყო, გაკეთდა ნიადაგის სტრატიგრაფიულიჭრილები ტორფის სტრატიგრაფიული ჭრილის გასაკეთებელი სპეციალური ბურღის საშუალებით. შესწავლილია ნიადაგის სტრუქტურა. სტრატიგრაფიულმა ჭრილებმა აჩვენა, რომ ნიადაგი ტორფნარი ტიპისაა.

ტორფის სტრატიგრაფიული ჭრილებისას ჭრილში ხშირად გვხვდება თიხა, გიტია, ეს კი მიუთითებს მდინარის აუზის არსებობას ან ზღვის დონეს.

Fig. Peat strathygraphy

Plant species Strathygraphy

Legend

I layer	Depth sm	Macrofossil flora	◡
Alnus barbata	0-50	▒▲¥	▲
Rhamnus frangula	50-100	▒▲¥	▼
Salix cinerea	100-150	▒▼▲▲	◄
II layer	150-200	===▼▼▒	►
Osmunda regalis	200-250	▒▲▲▼▼≠ѽѽ	□
Juncus acutus	250-300	===◄◄◄ѽѽѽ	◊
Polygonum thunbergii	300-350	◄◄◄≠≠===	=
Lisymachia vulgaris	350-400	===◄◄►►ѽѽ	¥
Epilobium palustre	400-425	==▼▼ѽѽ▲▲	▓
Liana	425-450	□□□●●●▼○○ѽ	▒
Hedera colchica	450-500	==□□○○▲▲	ѽ
Smilax excelsa	500-550	□□□▼▼◊◊●●ѽ	○
	550-600	‖‖ѽѽ●●●◊◊	◙
	600-650	▬¥¥	●
			ł
			■
			‖
			○

Sphagnum peat

sand

Alder

Quercus

Cornus

fire

water

Polytrichum

Gitja

Pteridium

Sphagnum&Phragmites peat

Phragites peat

leavs

Macrofossil

clay

Trapa natans

Mollinia

Detritus gitja

Organic

wood

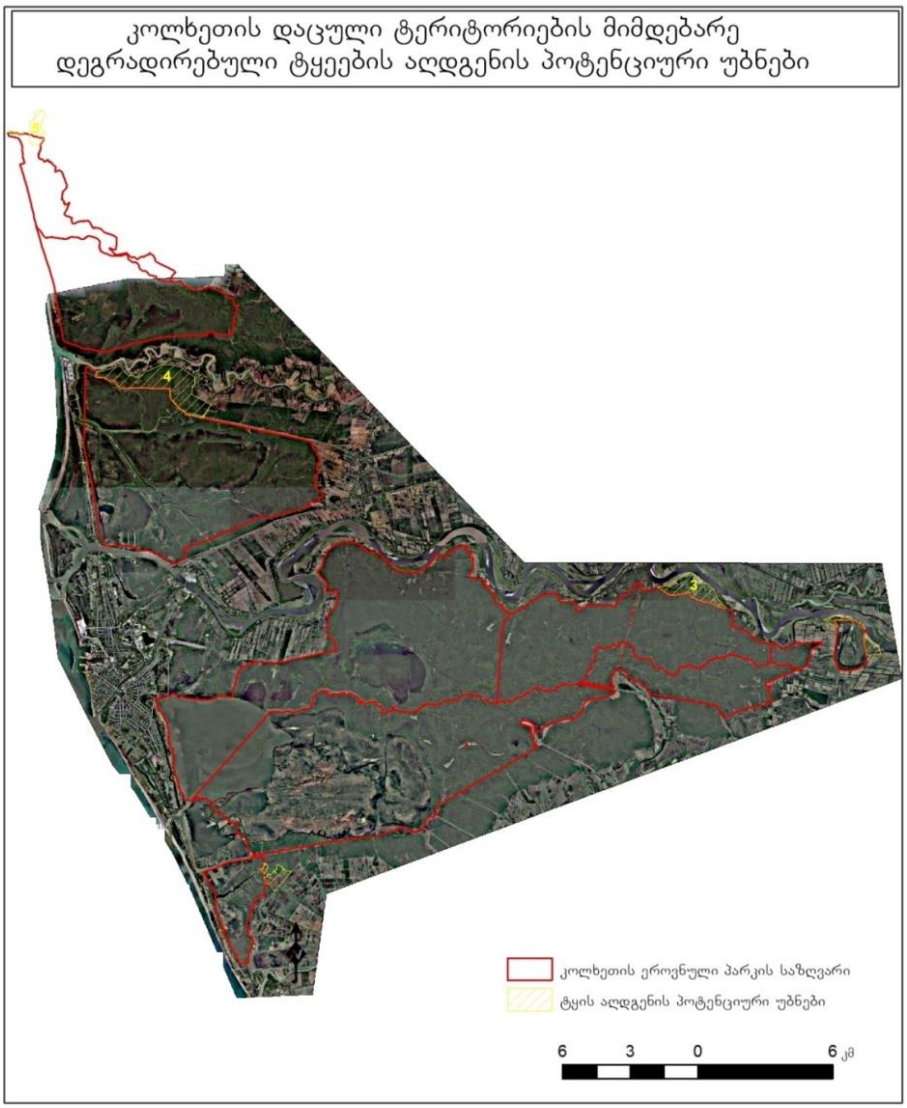
ლეგენდა (პირობითი აღნიშვნები)

- ▒ Sphagnum peat
- ˘ sand
- ▲ Alder
- ▼ Quercus
- ◄ Cornus
- ► fire
- □ water
- ◊ *Polytrichum*
- = Gitja
- ¥ *Pteridium*
- ▓ Sphagnum&Phragmites peat
- ▒ Phragites peat
- õ leavs
- ○ Macrofossil
- ◙ clay
- ● Trapa natans
- ł Mollinia
- ▬ Detritus gitja
- ‖ Organic
- ◌ wood

თავი 5. დეგრადირებული რელიქტური ტყეების აღდგენის პოტენციური ფართობები

მეთოდოლოგია. საველე გასვლებისას, პირველ რიგში განისაზღვრა კოლხეთის ეროვნული პარკის მიმდებარე დეგრადირებული რელიქტური ტყეების სავარაუდო ტერიტორია და ფართობი სენაკის, აბაშის, ზუგდიდისა და ხობის სატყეო უბნებზე შეირჩა გამეჩხერებული და დეგრადირებული ტყის უბნები, სადაც შესაძლებელი იქნებოდა ტყეების აღდგენა. აღნიშნულ აღსადგენ ფართობებში განისაზღვრა: ნაკვეთის მდებარეობა, ნაკვეთის მოკლე დახასიათება დეგრადირებულ ნაკვეთებზე დარჩენილი მერქნიანი მცენარეებია. აუცილებლობის შემთხვევაში იქ, სადაც დარღვეულია ჰიდროლოგიური რეჟიმი შესწავლილი იქნა ნიადაგის სტრუქტურა.

5.1. კოლხეთის დაცული ტერიტორიების მიმდებარე ტერიტორიებზე დეგრადირებული ტყის აღდგენის პოტენციური უბნები



Map 5. 1,2 –Lanchkhuti; 3 -Senaki; 4- Khobi; ; 5,6 - Zugdidi; 7- Abasha

Senaki Proposed Area

Dominant trees: *Alnus glutinosa* subsp. *barbata, Pterocaria fraxinifolia*

Lanchkhuti Proposed Area

Dominant species: *Pterocaria fraxinifoliawith many seddlings, Alnus barbata, Morus nigra, Ficus carica , Crataegus macrophylla*

Khobi proposed area

Dominant species*Pterocaria farxinifolia, Carpinus betulus*

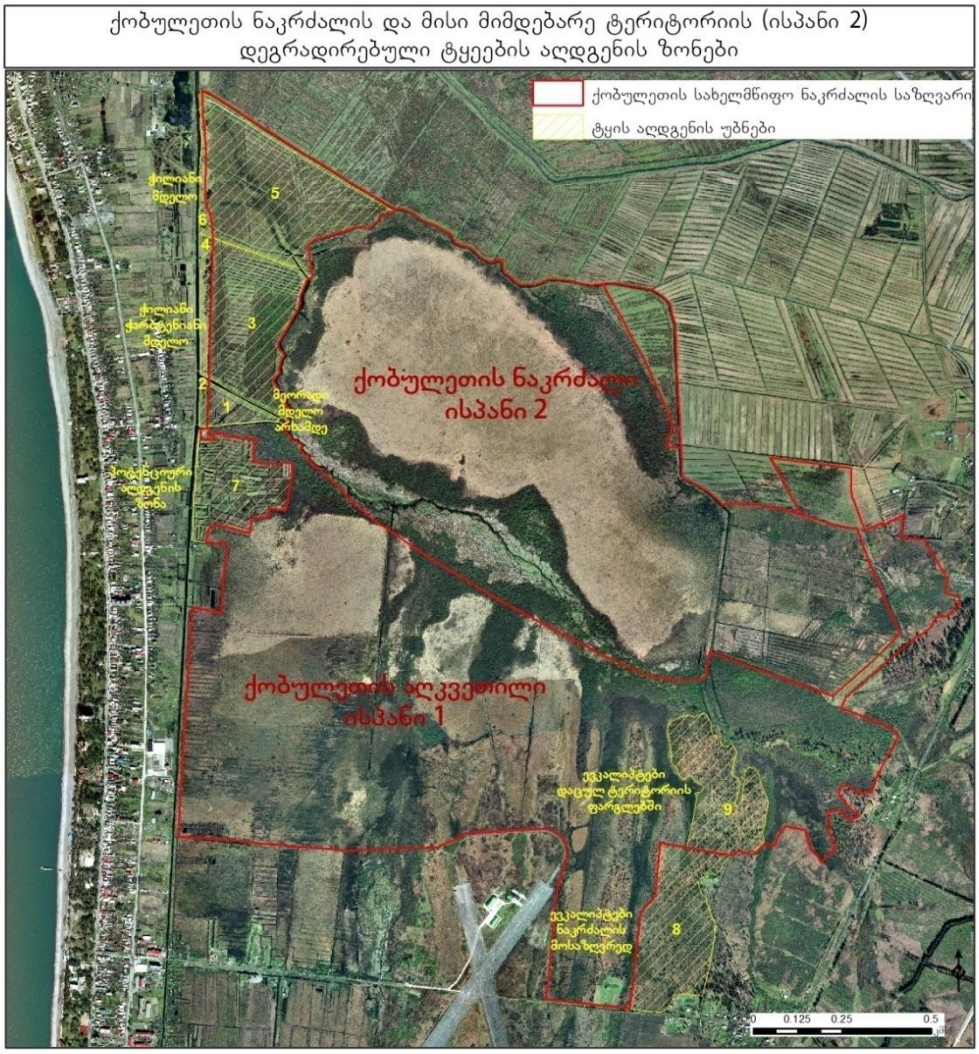
Zugdidi Proposed Area

Dominant species: *Alnus glutinosa* subsp. *barbata,*

Abasha Proposed Area

Dominant trees: *Alnus glutinosa* subsp.*barbata, Gleditsia triacanthus*

5.2. Proposed degraded rehabilitation areas in Kobuleti



Dominan species: *Alnus glutinosa* subsp. *barbata* , *Frangula alnus, Eucalyptus cinerea*

თავი 6. დეგრადირებული ჰაბიტატების სტრატეგია და სამოქმედო გეგმა

ჩატარებული საველე კვლევების შედეგად გამოკვეთილი პოტენციური ტყის აღსადგენი ფართობების ანალიზის საფუძველზე შემუშავდა დეგრადირებული რელიქტური ტყის აღდგენის სამოქმედო გეგმა, რომელიც აისახა ორ პროექტში: „დეგრადირებული ტყის აღდგენის სამოქმედო გეგმა კოლხეთის ეროვნულ პარკში“ და „ქობულეთის დაცული ტერიტორიების მიმდებარე დეგრადირებული რელიქტური ტყეების აღდგენის სამოქმედო გეგმა:, ასევე კოლხეთის ეროვნული პარკისა და კაცობურის აღკვეთილის და ქობულეთის დცული ტერიტორიების განახლებულ მენეჯმენტის გეგმებში. **საერთო სარეკომენდაციო სტრატეგიული მიდგომები:**

კოლხეთის ეროვნული პარკის მიმდებარე კოლხეთის დაბლობის რელიქტური ტყეების აღრიცხვა და ტყეების მართვის გეგმის შედგენა; კოლხეთის დაბლობის ტყის აღსადგენი ტერიტორიების დადგენის შემდგომ სანერგეების მოწყობისა და არსებული სანერგეების გაფართოების შესაძლებლობის დადგენა და სათესლე უბნების შერჩევა.; დასახლებულ ადგილებთან არსებული მუნიციპალიტეტების მფლობელობაში არსებულ ტერიტორიებზე სატყეო პლანტაციების გაშენების მიზნით ტერიტორიების შესწავლა და საჭიროების შემთხვევაში, ადგილობრივი მოსახლეობის ინტერესების გათვალისწინებით, სატყეო პლანტაციების გაშენების პროექტის მომზადება; ლაფნისა და ბზის მდგომარეობის შესწავლა და მათი აღდგენის პროექტის მომზადება და აღდგენითი სამუშაოების განხორციელება; კოლხეთის დაბლობის ტყეებში საქონლის ძოვების რეგულირებისა და მართვის ეფექტური ღონისძიებების დაგეგმვა.; ადგილობრივი მოსახლეობის ინფორმირება რელიქტური ტყეების მნიშვნელობასთან დაკავშირებით; ადგილობრივი მოსახლეობის ჩართულობა და მონაწილეობა რელიქტური ტყეების დაცვის, აღდგენისა და შენარჩუნების ღონისძიებებში.

კოლხეთის დეგრადირებული რელიქტური კოლხური ტყის აღდგენის სამოქმედო გეგმა

N	Activities
1	To study hydrology and create project of degraded hydrology rejime
2	Forest rehabilitation with *Alnus, Salix* and *Pteroc*arya
	To create seedling nursery
3	To involve local people and cut all: -*Eucalyptus* in Kobuleti proposed rehabilitation area - *Gleditsia* and *Amorpha* in Abasha rehabilitation area gfor social purpose Start to plant *Quercus, Pterocarya, Carpinus*
4	სატყეო პლანტაციების გაშენების მიზნით ტერიტორიის შესწავლა და საჭიროების შემთხვევაში, ადგილობრივი მოსახლეობის ინტერესების გათვალისწინებით, სატყეო პლანტაციების გაშენების პროექტის მომზადება.

Results

2. კოლხეთისრელიქტურიტყეებიშერეულიატიპისაა, სადაცლაფანიანჰართვისისმუხაწმინდაკორომებსარქმნის;
3. კოლხეთის დაბლობის მცენარეულობის განვითარება და განაწილება მჭიდროდაა დაკავშირებული გრუნტული წყლის რეჟიმთან. დაჭაობებულ ადგილებზე, სადაც განვითარებულია ტორფნარი ნიადაგები, ხე-მცენარეები თითქმის არ გვხვდება. Sphagnum mire tipes;
4. იქ, სადაც დაჭაობება ნაკლებია, გავრცელებულია დაბალი ბონიტეტის, ძლიერ მეჩხერი, ჭაობის ტიპის ***Alder;***
5. ედაფური პირობების შედარებით გაუმჯობესებულ ადგილებში დაჭაობებულ ალუვიურ ნიადაგებზე იზრდება ***მაღალი ბონიტეტის ხეები, dominated with relict species*** *Pterocarya fraxinifolia,*enedmc species *Quercus hartwissiana, Acer campestre,* Lianas : *Hedera colchica, Smilax excelsa*

6. Before anthropogenic impact forest of Kolkheti lowland was *polidominant* such Tchuria forest;
7. Novadays are:*Alder, Alneta-Pterocaryeta; mixed polidominant decidios forest uderstroy with Ilex colchica, Buxus colchica,Ruscus pontica, with liana Smilax excels, Hedera colchica, Humulus lupulus, Periploca graeca;*
8. Flora of Kolkheti relict peatland forest presented: mosses- 2 family, 5 genera and 6 species; Trees-10 familys, 13 generis a and 16 species;scrubs- 6 family, 7 genera, 7 species; Lianas: 8 Family, ,8 Genera and 12 species; herbs-25 family, 79 genera, 113 species, grasses: 6 family, 46 genera, 66 species. Total Flora of Kolkheti relict peatland forest consista: 57 family, 158 genera 220 species.
9. IUCN Global Red list 4 species: *Ficus carica*-LC; *Pterocarya fraxinifolia*–LC; *Punica granatum*-LC; 4.*Buxus colchica* -CR; from Caucasus red list *Quercus hartwissiana, Ulmus glabra.*
10. *Relict forest habitat protected under* EMERALD network and EUNIS Habitat list
11. Polidominant relct forest of Tchuria forest under the "Forests and wetlands of Colchis" UNESCO WNH nomination scientific dossier;
12. It was determined degraded forest rehabilitation potencial area in Kolkheti National Park and in Kobuleti Proteced area;
13. It was created degraded forest renaturalisation strategy and working plan;
14. All summary of PhD work in updated Kolkheti National Park and Kobuleti Protected areas management plan;

Recommendation

1) Issues regarding invasive species: Inventory and mapping of the current status of invasive species within the Kolkheti NP as well as in the direct vicinity. An Action Plan must be drawn up to counteract invasive species throughout the entire area;

2) Forest renaturation: Establishment of an ex situ culture with the most symbolic native trees (e.g., *Pterocaryafraxinifolia, Quercus hartwissiana, Ficus carica)* for renaturation purposes;

3) Involvement of local people: The Kolkheti NP Management Plan should include a global strategy to share the resources and benefits of the national park with local stakeholders.

4) Improve socio-economic situation in the region

Develop alternative sources of energy (biogas plant). As it was mentioned above, forests of Kolkheti lowland are dominated by non-native woody taxa and alien species. *Eucalyptus* ssp., *Cryptomeria japonica*, as well as other non-native plants and fast-growing alder can be used for alternative sources of energy. Alternative source of energy will cover needs of heating in the region. Additionally, plantations of non-native woody plants can be replaced by native relic and endemic taxa.

Development of alternative sources of energy requires involvement of specialists from western countries which are familiar with functioning of biogas plant.

Rehabilitation of forests of Kolkheti lowland. Forest management requires following steps :

Assess in situ situation.Assessment of woody plant biodiversity, mapping (1:10 000 or 1: 5 000 scale) of rare woody taxa using software Arc GIS are the first steps of the improvement of land degradation and biodiversity loss in the Kolkheti lowland. Most attention should be paid to rare woody species: *Pterocarya pterocarpa, Quercus hartwissiana, Quercus imeretina, Carpinus betulus*. Additionally non-native taxa should be mapped.

Assist country in improvement of scientific approach for forest management.Georgia is short of well-qualified human resources in the field of habitat and forest management. In order to develop plan of forest rehabilitation in Kolkheti lowland it is necessary to involve forest ecologists from western countries.

Restoration of forests of Kolkheti lowland. Re-forestration should be carried out according to plan written by local and western scientists.

Increase of public awareness. Enhance communication among stakeholders and encourage public awareness and involvement in addressing the problems of the Kolkheti relic forest.

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