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Monitoring Manual

for Lake-bound Species and Habitats of Lakes Prespa, Ohrid and Shkodra/Skadar

Implementing the EU Nature Conservation Directives in South-Eastern Europe

AKZM NATIONAL AGENCY OF PROTECTED AREAS

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Conservation and Sustainable Use of Biodiversity at Lakes Prespa, Ohrid and Shkodra/Skadar (CSBL)

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Monitoring Manual

for Lake-bound Species and Habitats

Conservation and Sustainable Use of Biodiversity at Lakes Prespa, Ohrid and Shkodra/Skadar (CSBL) – Biodiversity Conservation Component

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Disclaimer

The present Manual was prepared from original reports and chapters submitted by the authors. Every effort was made to ensure that it remains faithful to that material while responsibility for the accuracy of information presented therein remains solely with the authors. The same holds for the use of third-party textual or artistic material. Further, the information and views set out in the Manual are those of the authors and do not necessarily reflect those of GIZ, the Governments of Albania, Montenegro and North Macedonia, nor of the national Competent Authorities in charge of biodiversity monitoring.

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Foreword

In 2017, the Natura 2000 (N2000) network of the European Union contained about 27,000 sites, covering an area of more than 1.1 million km², or nearly 20 % of the total area of the EU-28. In fact, N2000 is considered the largest protected area network worldwide. So can our countries add value to this already impressive network once we have become EU members? The answer is straightforward: We may be small in surface, but we are *biodiversity giants*, as individual countries and even more so as a region. Many species of Community importance have strongholds in our countries. If they are to be protected, they are best protected here. Moreover, we are extremely rich in endemic species, most of them unheard of in the wider EU, let alone being listed in any of the annexes of the Birds or Habitats Directive. So yes, what we intend to bring with us will add significant value to the network. And it will, of course, enrich the annexes. This holds particularly true for the three lakes, each of them rich in endemic species and unique in cultural, landscape and biological diversity.

What troubles us, however, is our limited capacity to properly inventory, monitor and manage our shared biodiversity resources. On the other hand, our future and even our economic prospects depend heavily on the wellbeing of our natural resource base. In the Western Balkans, nature is an asset. Those who do not believe this should at least be aware that N2000 will pop up the very latest when opening Chapter 27 during accession negotiations. By then, our answers should be predicated on reliable data.

Some of these data have been or will be collected using sampling methods compiled in the present Monitoring Manual. This is why we really welcome its publication. We wish to express our appreciation to CSBL for having taken the initiative to bring together experts from the Western Balkans and Germany to share experiences and give practical guidance on the monitoring of flora and fauna. We are also pleased to see that – despite limitations at the national level – our countries are capable to mobilize the human resources and expertise needed through transboundary cooperation. Cooperation pays off – in ecological monitoring as well as in overall transboundary water and natural resources management!

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Foreword of GIZ

The Western Balkans are a biodiversity hotspot of global importance. The area covered by Albania, Montenegro and North Macedonia alone is believed to be home to more than 30 % of Europe's flora and fauna – though occupying only about 0.6 % of the continent. The biodiversity hotspot is even more impressive with regards to river and lake ecosystems where a plethora of endemics add to an already striking stock of species of EU Community interest – such as Eurasian Otter or Dalmatian Pelican – under the EU Birds and Habitats Directives, which together govern the Natura 2000 (N2000) network. For example, ancient Lake Ohrid hosts more than 200 endemic species – most of them invertebrates – and even the less isolated and geologically younger Lake Shkodra/Skadar [16] basin is home to endemics such as Albanian Water Frog or Skadar Oak.

Literally all biodiversity resources in the Wester Balkans are shared by several countries. Their effective management and conservation therefore requires close transboundary collaboration. The regional program CSBL (Conservation and Sustainable Use of Biodiversity at Lakes Prespa, Ohrid and Shkodra/Skadar) on behalf of the German *Ministry of Economic Cooperation and Development* (BMZ) has been supporting the conservation process since 2012, allowing partner countries Albania, Montenegro and North Macedonia to foster EU integration. Important requirements under the corresponding EU legislation are to establish the conservation status of species and habitats of Community interest, to devise actions to improve their status, and to put into practice adequate and harmonized monitoring methods.

The EU does not prescribe specific methods for the monitoring of N2000 species. It rather invites countries to set up their own surveillance systems and even to apply different methods, as long as they are technically feasible and scientifically credible. However, similar to the EU Water Framework Directive, which also involves the monitoring of certain fauna and flora, methods need to be calibrated among countries in order to deliver comparable information and derive similar management conclusions.

Within the framework of the CSBL program, this inter-calibration process was gone through under the auspices of the regional *Technical Working Group* (TWG) – *Biodiversity Conservation*. The objective of this TWG is to coordinate and steer transboundary collaboration and biodiversity conservation among lake riparian countries. It consists of permanent members from line ministries and competent authorities as well as non-permanent members from academia, *Non-Governmental Organizations* (NGOs) and *Local Government Units* (LGUs) involved in project implementation and/or providing expertise in biodiversity monitoring.

In a first series of meetings and workshops, the TWG agreed on species and habitats of conservation interest for all riparian countries. Following further revision and expert consultations, the initially quite extensive list was reduced to include two lake-bound habitats and 21 species, of which 14 species listed in the Birds or Habitats Directive. For these habitats and species, experts from the three countries and the German NGO EuroNatur agreed upon and field-tested the monitoring methods compiled in the present Monitoring Manual.

Some of the methods derive from international best practices and others from long-proven local practices, adapted to specific traits of the selected monitoring subjects. Irrespective of their origin, the methods represent common judgement from key experts and practitioners from the three countries and, therefore, rightfully claim some authority regarding their future use within the lake sub-basins and similar basins elsewhere in the region. More importantly, the methods used, and data collected – however limited in terms of quantity and spatial and temporal coverage – support the countries' reporting efforts under both N2000 and the Convention on Biological Diversity and provide evidence of trustful collaboration among governmental and non-governmental conservation actors within and across countries.

Authors are acknowledged not only for the practicality of the Manual but also for their straightforward collaboration with local stakeholders, notably staff from protected area administrations, rangers and LGUs. In the end of the day, the engagement and knowledge of these actors will be decisive to the success of biodiversity conservation at the three lakes and beyond.

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Program Manager CSBL

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GIZ Advisor – Forests, Biodiversity, Agriculture

[16] The names Shkodra and Skadar are used together or interchangeably.

Introduction

Biodiversity conservation is a huge undertaking. It requires political will, legal frameworks, financial arrangements, and professional capacities of both institutions and individuals involved in the monitoring and management of fauna and flora and their habitats. In practical terms, species and habitats are monitored in their own right to establish – and maintain through appropriate action – their conservation status, or they serve as indicators and sentinels of the ecological state of ecosystems. For aquatic and wetland habitats in the EU, the former is governed by the Birds and Habitats Directives (Natura 2000 or N2000) and the latter by the Water Framework Directive (WFD).

Both legal frameworks are relevant to biodiversity conservation, and there are in fact many interlinkages among them. N2000 aims to protect, maintain or restore at favorable conservation status species and habitats of Community importance (incl. all species of naturally occurring birds in the wild state) while the WFD aims to reach at least good ecological – and chemical – status of water bodies. Concerning lake-bound species[17] and habitats, N2000 focuses on *Sites of Community Importance* (Habitats Directive, HD), *Special Protection Areas* (Birds Directive, BD) as well as selected bird (Annex I BD) or other animal and plant species (Annex II HD) whose conservation is of Community interest. The WFD in turn focuses on aquatic animal and plant species as indicators of ecological status, including phytoplankton, benthic aquatic flora, benthic invertebrates and fish, though excluding zooplankton, amphibians and birds. While the WFD makes no explicit reference to biodiversity conservation, it is *de facto* geared towards it. Furthermore, measures to improve ecological status under the WFD generally benefit the objectives of N2000.

Unfortunately, no permanent scheme has been put into place yet for the monitoring of lake-bound flora and fauna in any of the countries. The reasons are manifold, but certainly include lack of finance – or rather reluctance to invest in environmental monitoring – and lack of capacity in terms of available personnel and technical expertise. As a result, knowledge about the conservation status of species and habitats of Community or national importance in the three sub-basins is limited. This in turn hampers, or at least delays, the countries' prospects of fulfilling requirements of the environmental *Aquis communautaire*, and hence of becoming EU members. The only regular monitoring that has been going on for quite some time is the transboundary winter census of overwintering birds at Lake Prespa, conducted on a voluntary basis by birders, NGOs and some *Protected Area Administrations* from Albania, Greece and North Macedonia. Similar censuses were also conducted at Lakes Ohrid and Shkodra/Skadar, while pelicans are regularly monitored at Lakes Prespa and Shkodra/Skadar. These efforts set nice precedents, of course, yet voluntarism is an important pillar (see chapter 7) but cannot be the only one. Firm commitment and allocation of financial and human resources are required on the part of governments and competent authorities to ensure that adequate monitoring schemes will be operational in due time.

Another challenge particularly to transboundary monitoring relates to the fact that different countries and institutions use different monitoring methods which makes it difficult to compare results. Some kind of intercalibration such as already foreseen in WFD monitoring must therefore also be done for N2000 monitoring. A most effective and efficient way to address this challenge would be to agree on common protocols and methodologies beforehand. This is exactly the rationale on which the cooperation strategy of CSBL is based.

Since 2013, CSBL has supported a wide range of monitoring activities at the three lakes. National partners collected ample data on aquatic flora (macrophytes and phytoplankton) and fauna (macroinvertebrates) during the so-called initial characterization[18] of the lakes (PEVELING et al. 2015). The fish fauna was monitored for

[17] Aquatic or wetland species using the lake sub-basins as temporary or permanent habitats.

[18] The initial characterization is an important step in river basin management according to the WFD. It involves collecting data on typology, ecological and chemical status, pressures and other features of water bodies, as a baseline for setting environmental objectives and devising measures to improve status.

up to three consecutive years, applying a sampling standard set by the European Committee for Standardization and yielding the most comprehensive information on the status of fish assemblages in more than three decades (ILIK-BOEVA et al. 2017, MRDAK et al. 2017, SPIRKOVSKI et al. 2017). Selected N2000 species and species of national conservation interest were first investigated at Lake Skadar in Montenegro (EPA 2014), followed by an inventory of bats in the Montenegrin and Albanian part of the sub-basin (THÉOU & ĐUROVIĆ 2015). CSBL also enabled an exchange of partner institutions and experts with Italian and Slovenian authorities and managers of lake and wetland N2000 sites and facilitated a forum for trilateral exchange by establishing the *Technical Working Group* (TWG) – *Biodiversity Conservation*. Together with its sister TWGs – *Water Framework Directive* and *Fish and Fisheries*, the Group played a vital role in devising and coordinating transboundary monitoring campaigns, and in agreeing on joint ecological monitoring methods, a collection of which is compiled in the present Monitoring Manual.

The selection of subjects covered by the Monitoring Manual was the outcome of a lengthy process during which an initially large list of nearly 100 subjects of interest was narrowed down to two lake-bound habitats and twenty-one species, of which fourteen listed in the Birds or Habitats Directives. This does not mean that other species and habitats matter less. To the contrary, by establishing the conservation status of sensitive or even vulnerable taxa, indicative conclusions can be drawn on the overall conservation status of the lakes' flora and fauna. Furthermore, the Manual covers a fairly wide and representative taxonomic spectrum, ranging from floating aquatic plants to floodplain trees and from dragonflies to Eurasian Otter. If all these subjects were to be monitored regularly in the future, riparian states would definitely have a solid foundation for nature conservation.

All monitoring methods were jointly developed and field-tested by national and regional experts. As such, they can be considered as best practices. However, this does not mean that they are without flaws and pitfalls. Practice will tell whether they are workable as they are, or whether they need to be revised and adapted. In this case, authors of the Monitoring Manual will be ready to discuss and bring about the necessary changes.

Moreover, it must be borne in mind that establishing the baseline conservation status of biota and habitats is the very starting point of any meaningful monitoring. Subsequent investigations will then assess temporal and spatial changes in abundance and/or occurrence against the baseline, which in turn is key to devising appropriate management and conservation strategies and measures. This is certainly a challenge in view of limited financial and human resources, a challenge that needs to be addressed during the planning phase of monitoring programs and that requires flexibility in terms of affordable and manageable monitoring frequencies and scale. Hence, allowances may have to be made to meet such realities when applying the monitoring recommendations put forward in the Manual. This does not diminish the significance of the work as long as riparian countries agree – and follow – upon common procedures.

Study Area

Figure 1: Location of Ohrid and Prespa Lakes within the Drin basin and flow of water from Prespa to Ohrid Lake (Map designed by the Map Design Unit of the World Bank).

Drin River Basin

The Drin River is the connecting body of the extended Drin Basin, linking the lakes, wetlands, rivers and other aquatic habitats with a system of groundwater bodies into a single, yet complex, hydrological ecosystem.

Setting out from the two Prespa Lakes, linked to each other by a small channel, water flows through underground karst cavities to Lake Ohrid, the largest lake in terms of water volume in Southeastern Europe. The only surface outflow (22 m^3/s), the Black Drin River, flows north through North Macedonia and enters Albania. The White Drin River rises in Kosovo and meets the Black Drin in Albania to form the Drin River.

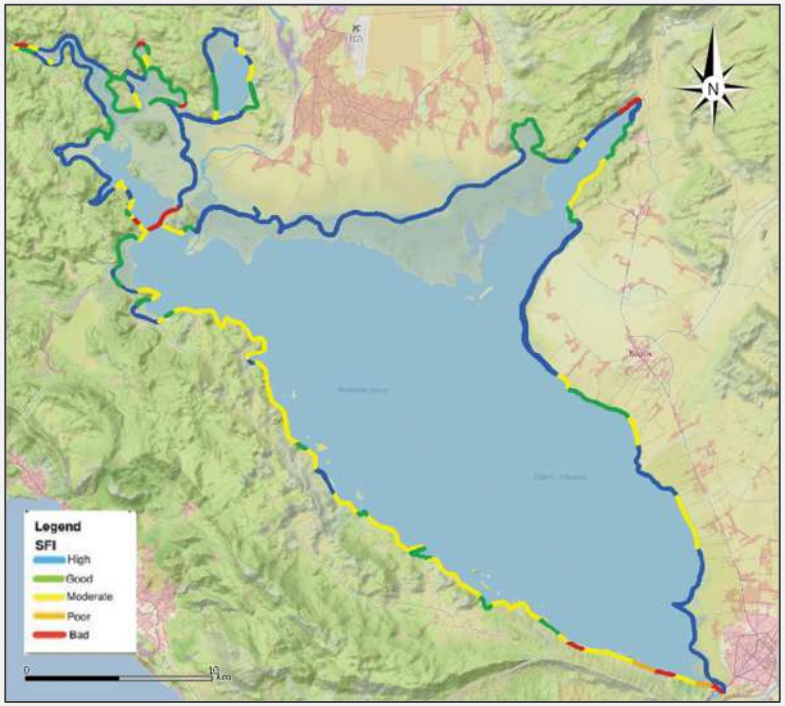
Flowing westward through Albania, the Drin River meets the Buna/Bojana River, closely behind the outflow of the latter from Lake Shkodra/Skadar, the largest lake in terms of surface in Southeastern Europe. The Buna/Bojana River directly discharges into the Adriatic Sea (GWP-MED 2016).

The Drin River Basin is characterized by mountainous relief, with a mean elevation of 971 m a.s.l. (the highest peaks are over 2,500 m) and flat land in the coastal area. The significance of the Drin River and its main tributaries in terms of hydropower production is major, especially for Albania, where plants installed produce 85 % of hydropower, representing 70 % of the total hydro and thermal capacity installed in the country. In Albania, there are 44 dams (4 for energy production and 40 for irrigation purposes). Two major dams, Globochica and Spilja, exist on the Black Drin in North Macedonia, with the main purpose of hydropower production. The alteration of the hydrological characteristics of the Drin, due to dam construction, has had an impact on the distribution of sediments and caused disturbances to the ecosystems. Biological corridors that enable migration have been interrupted, exerting major pressure on biodiversity (TWRM 2018).

Shkodra/Skadar Lake

Lake Shkodra/Skadar is the largest lake by surface in the Balkan Peninsula. The lake discharges through the 44 km long Buna/Bojana River (shared by Albania and Montenegro) into the Adriatic Sea. The connection between Drin River, Buna/Bojana River and Shkodra/Skadar Lake determines seasonal variations in the state and characteristics of the lake, as well as the Buna/Bojana and the tributaries in their catchment area, and has an important impact on the morphology of the Delta. The Buna/Bojana bed is lower than sea level ("crypto depression"), resulting in salt-water intruding into the lake's outlet (Figure 2; GWP-MED 2016). According to morphological, structural and biotic parameters of the **S**horezone **F**unctionality **I**ndex, 46.0 % of the total perimeter of the lakes' shoreline falls into the "High" category, 23.4 % into "Good", 24.8 % into "Moderate", 0.9 % into "Poor", and 4.9 % into "Bad" (Figure 3).

◄ *Figure 2:* Topography of the Shkodra/Skadar Lake drainage basin (Map designed by the Map Design Unit of the World Bank).



▲ *Figure 3:* Overview of the different shoreline stretches of Lake Shkodra/Skadar and their respective SFI-value according to the calculations of ZENNARO et al. (2016).

Background Information: Shorezone Functionality Index

The SFI is a semeiotic index integrating morphological, structural and biotic features of the shorezone of lakes. It basically assesses the capacity of riparian zones to intercept nutrient and pollutant run-off, thereby reducing chemical burden.

Ohrid Lake

Three quarters of the perimeter of the Ohrid Lake drainage basin comprise ridges of high mountains. The remaining quarter on the Northern side of the basin is open and contains the outlet that constitutes the source of the Drin River (Figure 4). Ohrid Lake's drainage basin covers an area of 1,057 km², some 80 % of which falls within North Macedonian and 20 % within Albanian territory.

The shoreline of Ohrid Lake was subdivided by ZENNARO et al. (2016) into 64 homogeneous stretches of the 56 km-long North Macedonian side and another 23 in Albania along its 31.8 km of shoreline. According to their calculation, around 75 % of the whole perimeter of the lake falls into the "Moderate", "Poor" or "Bad" SFI category (Figure 5). This means that most of the shoreline cannot perform ecological functions such as nutrient removal, shore stabilization or provision of habitats to aquatic, wetland or terrestrial species. The lake is therefore highly vulnerable to both diffuse and point source pollution from urban, industrial, agricultural and other installations and activities.

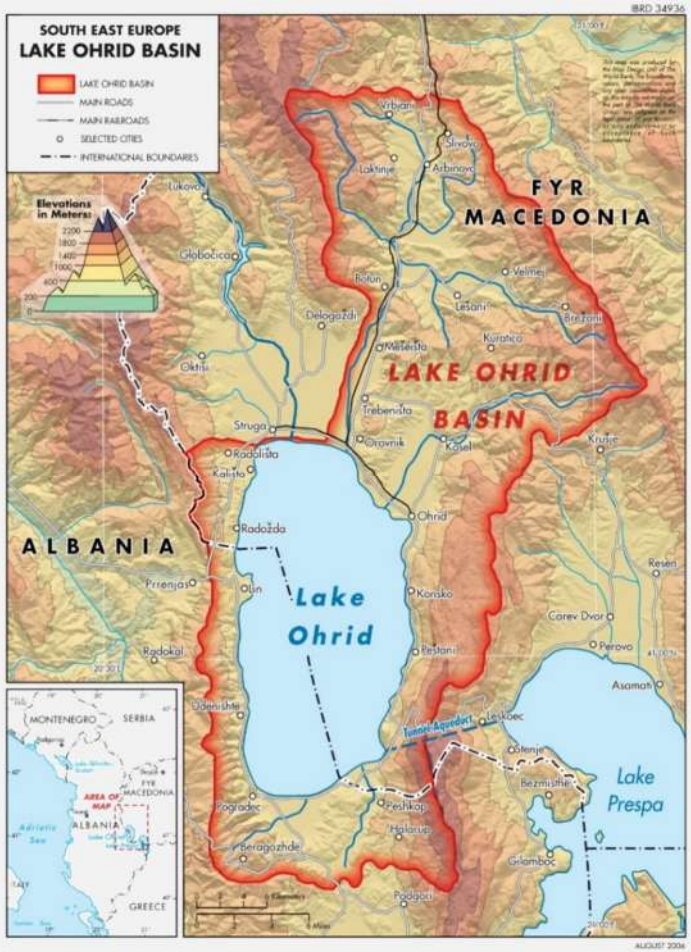


Figure 4: Topography of the Ohrid Lake drainage basin (Map designed by the Map Design Unit of the World Bank).

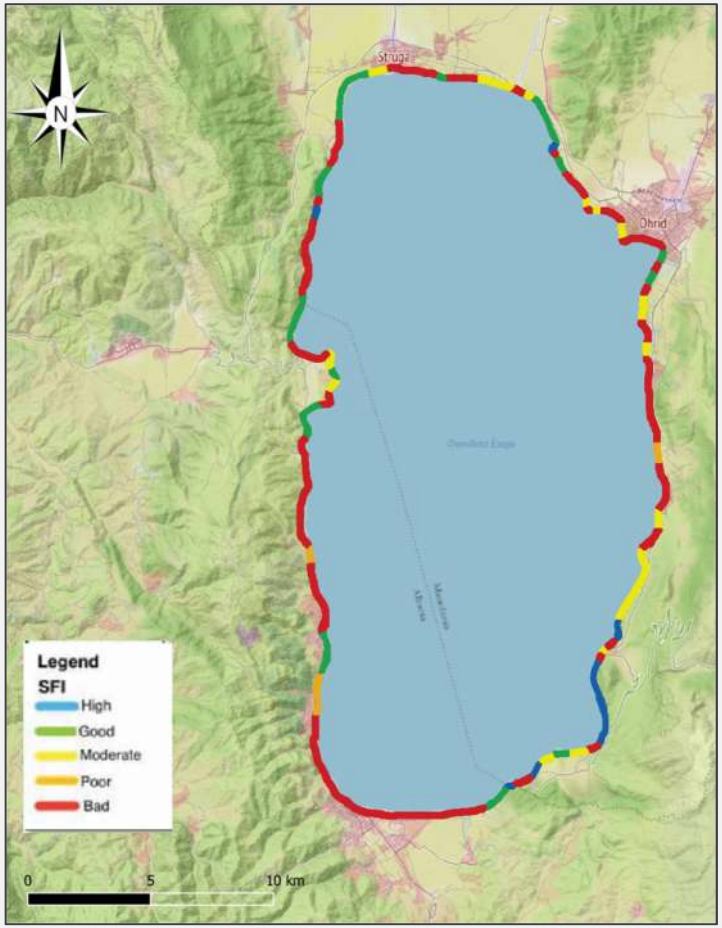


Figure 5: Overview of the different shoreline stretches of Lake Ohrid and their respective SFI value according to the calculations of ZENNARO et al. (2016).

Prespa Lake

Prespa Lake is shared by Albania, North Macedonia and Greece. The Lake Basin, situated at a mean elevation of 850 m a.s.l., has no surface outflow; its waters drain into Lake Ohrid, which sits 150 m below, through the Mali Thate-Galicica karst massive (Figure 6). Lake and basin include important freshwater and shoreline ecosystems, including riverine forests and shrub formations that gradually lead up to mountain oak, beech and beech-fir forests, as well as pseudo-Alpine meadows located above the forest limit. The lake ecosystem and the surrounding area support rich biodiversity, with a large number of endemic and threatened species, as well as natural habitats of European interest. Prespa Lake's whole shoreline is 106.4 km long. However, a study on its Shorezone Functionality conducted by ZENNARO et al. (2016) only considered the Albanian (36.8 km) and North Macedonian (47.6 km) shorelines, omitting the Greek shores (19.8 km – 20.4 % not surveyed). 56 % of the examined shore area fell into the categories "High" and "Good", 38.8 % into "Moderate" and 4.2 % into "Poor" and "Bad" (Figure 7).

Figure 6: Topography of the Prespa Lake drainage basin (Map designed by the Map Design Unit of the World Bank).

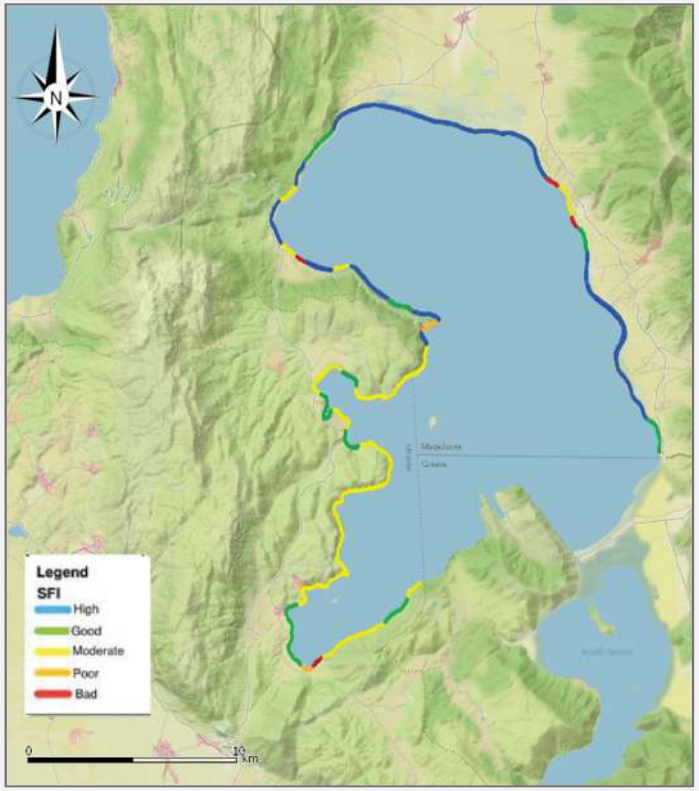


Figure 7: Overview of the different shoreline stretches of the evaluated (Albanian and North Macedonian) sides of Lake Prespa and their respective SFI-value according to the calculations of ZENNARO et al. (2016).

Monitoring methodology

The monitoring of the state of conservation and sustainable use of biodiversity at Lakes Prespa, Ohrid and Shkodra/Skadar is conducted on the base of preselected indicator species, which are depicted in Table 1 (for animal and plant species) and Table 2 (for habitat types according to the EUNIS-classification).

As this project is based on transboundary cooperation of Albania, Montenegro and North Macedonia it was of particular importance to find a common ground in the slightly to strongly varying methodological approaches. Therefore, for each species or higher taxonomic groups (e.g. order Odonata or class Amphibia), a uniform method was developed in cooperation with experienced local field experts, and a pre-selection of monitoring locations was made. The following chapters provide an exact description of the respective methodology for each species, general background information as well as an overview and detailed maps of the locations.

Table 1: List of animal and plant species for monitoring in the area as major part of the CSBL Project. Red marked dragonfly species are to be determined after pilot field studies.

Animal Species

Taxon	Scientific name	Common name	IUCN Red List (Europe)	EU Habitats Directive	EU Birds Directive	Lake		
						Ohrid	Prespa	Skadar
Mammalia	*Lutra lutra*	Eurasian Otter	NT	Annex II + IV	n.a.	yes	yes	yes
Amphibia	*Rana shqiperica*	Albanian water frog	EN	n.a.	n.a.			yes
Amphibia	*Bombina variegata*	Yellow–bellied Toad	LC	Annex II + IV	n.a.	yes	yes	
Amphibia	*Triturus carnifex (macedonicus)*	Italian (Macedonian) Crested Newt	LC	Annex IV	n.a.	yes	yes	
Aves	*Chlidonias hybridus*	Whiskered Tern	LC	n.a.	Annex I			yes
Aves	*Phalacrocorax carbo*	Great Cormorant	LC	n.a.	n.a.		yes	
Aves	*Microcarbo pygmeus*	Pygmy Cormorant	LC	n.a.	Annex I	yes	yes	yes
Aves	*Pelecanus crispus*	Dalmatian Pelican	LC	n.a.	Annex I		yes	yes
Aves	*Pelecanus onocrotalus*	Great White Pelican	LC	n.a.	Annex I		yes	
Aves	*Podiceps cristatus*	Great Crested Grebe	LC	n.a.	n.a.	yes	yes	yes
Aves	*Ardea cinerea*	Grey Heron	LC	n.a.	n.a.		yes	
Aves	*Aythya ferina*	Common Pochard	VU	n.a.	Annexes IIa and IIIb			yes
Aves	*Aythya nyroca*	Ferruginous Duck	LC	n.a.	Annex I			yes
Aves	*Mergus merganser*	Goosander	LC	n.a.	Annex IIb	yes	yes	
Aves	*Netta rufina*	Red Crested Pochard	LC	n.a.	Annex IIb	yes		
Odonata	*Leucorrhinia pectoralis*	Large white-faced Darter	LC	Annex II + IV	n.a.	(yes)	(yes)	
Odonata	*Cordulia aenea*	Downy Emerald	LC	n.a.	n.a.	(yes)	(yes)	
Odonata	*Brachytron pratense*	Hairy Dragonfly	LC	n.a.	n.a.	(yes)	(yes)	
Odonata	*Erythromma najas*	Red-eyed Damselfly	LC	n.a.	n.a.	(yes)	(yes)	

Plant Species

Family	Scientific name	Common name	IUCN Red List (Europe)	EU Habitats Directive	EU Birds Directive	Lake		
						Ohrid	Prespa	Skadar
	Quercus robur scutariensis	Skadar Oak	not evaluated	n.a.	-			yes
	Nuphar lutea	Yello Water-lily	LC	n.a.	n.a.	yes		

Table 2: List of representative habitats for monitoring as part of the CSBL-Project

Habitats

Code	Name	Description	Additional info	EU Habitats Directive	Habitat type	Lake Ohrid	Lake Prespa	Lake Skadar
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation	Lakes and ponds with mostly dirty grey to blue-green, more or less turbid, waters, particularly rich in dissolved bases (pH usually > 7), with free-floating surface communities of the Hydrocharition or, in deep, open waters, with associations of large pondweeds (Magnopotamion).	Very diverse habitat that includes various floating or submersed plant communities present in Prespa Lake littoral. EUNIS code: C1.222 Floating Hydrocharis morsus-ranae rafts EUNIS code: C1.224 Floating Utricularia australis and Utricularia vulgaris colonies EUNIS code: C1.225 Floating Salvinia natans mats EUNIS code: C1.226 Floating Aldrovanda vesiculosa communities EUNIS code: C1.32 Free-floating vegetation of eutrophic waterbodies EUNIS code: C1.33 Rooted submerged vegetation of eutrophic waterbodies	Annex I	No priority		yes	
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	*Cladium mariscus* beds of the emergent-plant zones of lakes, fallow lands or succession stage of extensively farmed wet meadows in contact with the vegetation of the *Caricion davallianae* or other *Phragmition* species *Cladietum marisci* (Allorge 1922) Zobrist 1935.	Diverse habitat that includes various marshland plant communities present in marshes associated with Ohrid Lake. EUNIS code: D5.2 Beds of large sedges normally without free-standing water	Annex I	Priority	yes		

Background Information: EUNIS Habitat Classification:

The EUNIS habitat classification is a comprehensive pan-European system to facilitate the harmonized description and collection of data across Europe through the use of criteria for habitat identification. It is hierarchical and covers all types of habitat from natural to artificial, from terrestrial to freshwater and marine. For level 3 habitat types (third hierarchy, see image on the right side) indicator species are identified.

1. Amphibia

Amphibians are especially abundant in tropical, sub-tropical and warm temperate climates such as the Mediterranean. They are considered the most endangered class of vertebrates worldwide (STUART et al. 2004, HOF et al. 2011). According to the International Union for Conservation of Nature (IUCN) *Red List of Threatened Species*, 41 % of all known species are threatened with extinction, primarily due to habitat loss, pollution, fires, climate change, disease and over-exploitation (IUCN 2019). The IUCN Red List Index[19] (RLI), which indicates the threat status of taxa, reveals a continuous downward trend since 1980 (Figure 8). In absolute terms, the RLI for amphibians is lower than the one for mammals and birds, and the decline distinctly sharper.

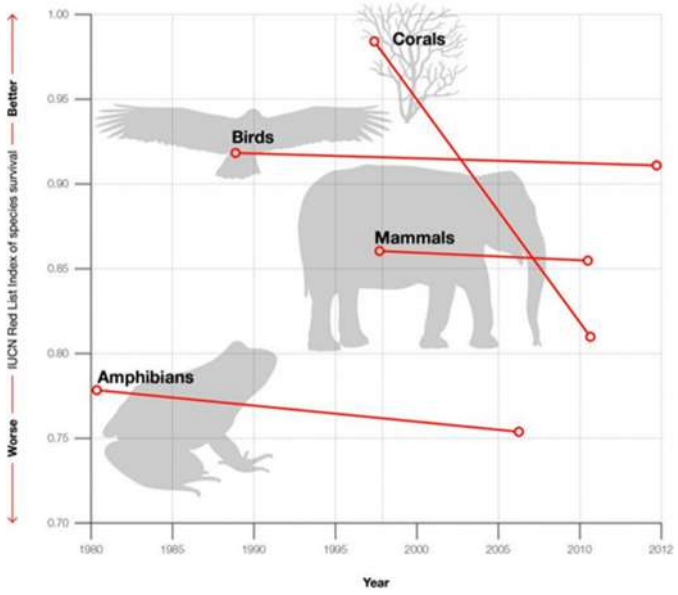


Figure 8: Red List Index for corals and three vertebrate classes, based on IUCN's global *Red List of Threatened Species* (IUCN 2019)

In view of these alarming developments, efforts have been stepped up to improve the monitoring of amphibians, as a basis for their conservation. In the United States, for example, an Amphibian Research Monitoring Initiative (ARMI) was launched in the early 2000s, whose overall goal was, among others, to monitor the status and changes in the distribution and abundance of amphibian species and to provide information to managers, policymakers, and the general public in support of amphibian conservation (USGS 2006). ARMI may serve as a blueprint and inspiration for similar initiatives elsewhere, including the Wester Balkans. ARMI monitoring essentially involves establishing monitoring networks (sites), assessing species richness and occupancy, collecting basic environmental data and screening for potential causes of decline.

Contrary to birds and mammals, amphibians have limited capacity for emigration and recolonization (LAMBERT 2002). They are, therefore, not only good indicators of the quality of habitats, but are also relatively easy to monitor. The monitoring should focus on selected locations within the lake sub-basins, yielding information not only on the relative abundance of species in relation to environmental factors, but also on life history traits. To date, such kind of research has rarely been undertaken in North Macedonia and the wider region (STERIJOVSKI 2014). The monitoring also offers an opportunity to assess the prevalence of infections with the fungal pathogen *Batrachochytrium dendrobatidis* which poses a major threat to amphibian populations in Europe and must be taken into account when devising and implementing conservation measures at the three lakes.

[19] Values vary between 0 (worst case: all species "extinct")) and 1 (best case: all species "least concern").

1.1 Species

1.1.1 Albanian Water Frog *(Pelophylax shqipericus)*

Description: Albanian Water Frog is a small to medium-sized frog up to 7.5 cm long (SPEYBROECK et al. 2016). The dorsal color is light to dark green or light brown, often with a thin mid-dorsal stripe (Figure 9). The male's upper body and head are yellow during the breeding season. Vocal sacs of males are grey to olive-green. Juveniles and females are occasionally largely brown. Large round dark brown or black spots are usually present on the back, legs and flanks. Legs are barred with dark patches and thighs are often yellow. The yellow coloration can continue onto the flanks. From the co-existing Marsh Frog (*Pelophylax ridibundus*) Albanian Water Frog (*Pelophylax shqipericus*) is distinguished by the following characters (Table 3):

Table 3: Distinguishing characteristics of Marsh Frog and Albanian Water Frog

Character	***Pelophylax shqipericus***	***Pelophylax ridibundus***
General body size	Small to medium (~ 7 cm)	Large (10 – 16 cm)
Skin	Smooth	Rough with warts and ridges
Thigh color (breeding period)	Yellow	Grey to white spotted, rarely yellow
Eardrum color	Green to greenish-brown, sometimes bronze	Brown
Vocal sacs of males	Grey to olive	dark grey to black
Male advertisement call	A long, loud rattling call	Loud, distinctly separated calls in each series, metallic, squeaking sounds

It is advisable to identify individuals using a combination of features and their strikingly different advertisement calls that males give during the lengthy breeding season. Field personnel should be familiar with the recorded breeding calls.

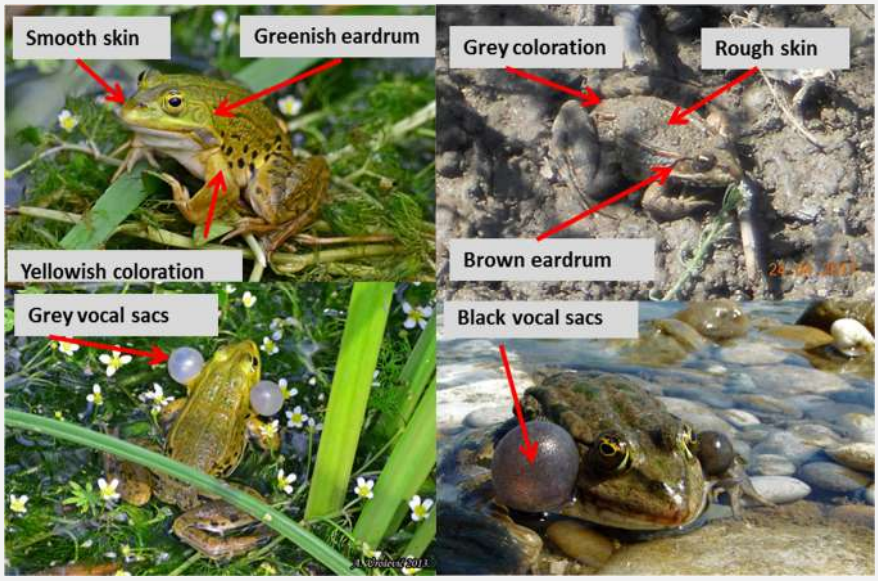


Figure 9: Morphological characteristics of the Albanian Water Frog (*Pelophylax shqipericus*, left) compared to the co-existing Marsh Frog (*Pelophylax ridibundus*, right) (© M. Samardžić, K. Ljubisavljević, A. Urošević)

Distribution: The Albanian Water Frog shows a fragmentary distribution in lowlands of coastal Southeastern Montenegro and coastal Northern and central Albania (SPEYBROECK et al. 2016).

Habitat: This highly aquatic species inhabits well-vegetated canals, ditches, ponds, marshes, and vegetated shores of large lakes. It is often observed basking and calling on partially submerged vegetation close to the shore (SPEYBROECK et al. 2016).

IUCN Status: Endangered: A continuing decline of mature individuals is recorded. Species is threatened through (among other causes) natural system modifications (dams, water use & management) and pollution (domestic & urban wastewater, industrial & agricultural effluents). The major threat is drainage of wetland habitats and aquatic pollution of waterways caused by agrochemical and industrial (including mining) contaminants. In the Northern parts of its range (e.g. Lake Shkodra/Skadar), it is significantly threatened by over collection for commercial purposes. An additional threat is the accidental introduction of commercially transported non-native water frogs (IUCN 2018).

1.1.2 Yellow-bellied Toad *(Bombina variegata)*

Description: The identification of the species should be based mainly on the morphology. Yellow-bellied Toad (*Bombina variegata*) is a small aquatic toad with a flattened, round body and a bright colored underside: typically yellow or orange with blue-grey or blackish marking. The back is grey, brown, yellowish or even olive, with prominent warts, often ending in black spiny points (ARNOLD & OVEDEN 2002) (Figure 10).

Figure 10: Yellow-bellied Toad (*Bombina variegata*) top view (left) and bottom side (right) (© E. Saçdanaku)

Distribution: The Yellow-bellied Toad is widely distributed and relatively common in central and Eastern Europe, however most populations in Western Europe are small, highly fragmented, and thus threatened by local extinction.

Habitat: The species is highly water bound and sociable (several animals being found together in small water bodies). It can be found in open, often sunny, shallow and often temporary waters that may have little vegetation: small ponds, drainage ditches, pools near and around the lakes, clay pits, drinking troughs, flooded tire tracks, streams, etc. It is a lively, active toad, often seen floating with legs spread on the water surface (ARNOLD & OVEDEN 2002).

IUCN-Status: Least Concern. Population is decreasing. Populations of this species might be locally threatened by the loss of suitable habitat to urbanization, road construction, industry (including oil extraction and transportation) and discharge of pollutants into wetlands. Additionally, it is reported that it is collected as bait by fishers in certain regions and that it is occasionally collected in large numbers for pet trade and scientific use. The impact of collection on this species needs further research. Some artificial habitats where the species occurs (e.g. gravel and clay pits) are threatened by succession (IUCN 2018).

1.1.3 Macedonian Crested Newt *(Triturus macedonicus)*

Description: Triturus macedonicus used to be treated as a subspecies of *Triturus carnifex* (Laurenti 1768), occupying the Eastern part of the distribution range, but was recently elevated to species status (ARNTZEN et al. 2007). *T. macedonicus* is dark brown with black spots, and an orange to orange-yellow belly with large rounded dark

spots (a dense pattern of small, irregular spots; Figure 11). A broader tail base, larger legs, and smoother skin can distinguish *T. macedonicus* and *T. carnifex*. As in other crested newt species, *T. macedonicus* males develop a pronounced dorsal crest during the breeding season, while adult females may have a bright yellow vertebral stripe (ARNTZEN 2003).

Distribution: The distribution area of the Macedonian Crested Newt covers Southern Serbia and Montenegro, Eastern Bosnia-Herzegovina, Albania, North Macedonia and Northern Greece.

Habitat: *T. macedonicus* is usually found in still waters near and around the lakeshore for breeding, either temporary or permanent, but will use pools within streams, or rivers with slow flow if necessary. Artificial water bodies may also be used, such as garden ponds and water-filled gravel pits (EDGAR & BIRD 2006).

IUCN-Status: As it is treated as a subspecies of *T. carnifex* there is no IUCN entry for *T. macedonicus*.

Figure 11: Macedonian Crested Newt *(Triturus macedonicus*): Dorsal (top) and ventral view (bottom) (© Bogoljub Sterijovski*)*

1.2 Monitoring Locations

The three selected amphibian species are observed at different locations along the shore zone of the three transboundary Lakes Shkodra/Skadar, Prespa and Ohrid. The Albanian Water Frog (*P. shqipericus*) can only be observed at **Lake Shkodra/Skadar** with four monitoring sites on the Montenegrin part of the Lake (Figure 12) and two more on the Albanian side (Figure 13).

The other two species – the Macedonian Crested Newt (*Triturus macedonicus*) and the Yellow-bellied Toad (*Bombina variegata*) are going to be monitored at two sites each on the North Macedonian (Figure 14) and Albanian side (Figure 15) of **Lake Prespa**. Both species are further studied on the North Macedonian side of **Lake Ohrid** (Figure 16), *Bombina variegata* additionally on the Albanian side (Figure 17).

Lake Shkodra/Skadar

▲ *Figure 13:* Geographical positions of monitoring locations for the Albanian Water Frog *(P. shqipericus)* in the Montenegrin part of Lake Skadar.

◀ *Figure 12:* Geographical positions of monitoring locations for the Albanian Water Frog *(P. shqipericus)* in the Albanian part of Lake Shkodra.

Lake Prespa

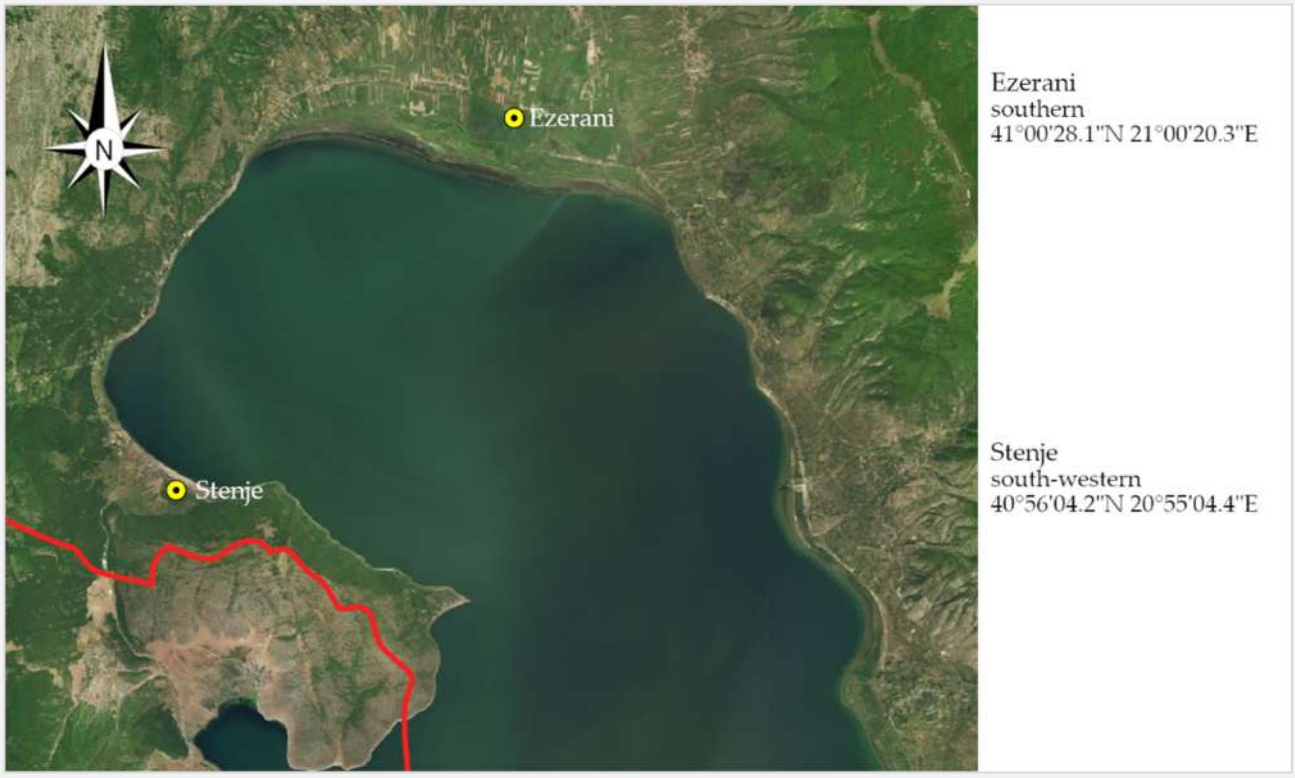


Figure 14: Geographical Positions of monitoring locations for Yellow-bellied Toad (*Bombina variegata*) and Macedonian Crested Newt (*Triturus macedonicus*) at Lake Prespa in North Macedonia.

Figure 15: Geographical Positions of monitoring locations for Yellow-bellied Toad (*Bombina variegata*) and Macedonian Crested Newt (*Triturus macedonicus*) at Lake Prespa in Albania.

Lake Ohrid

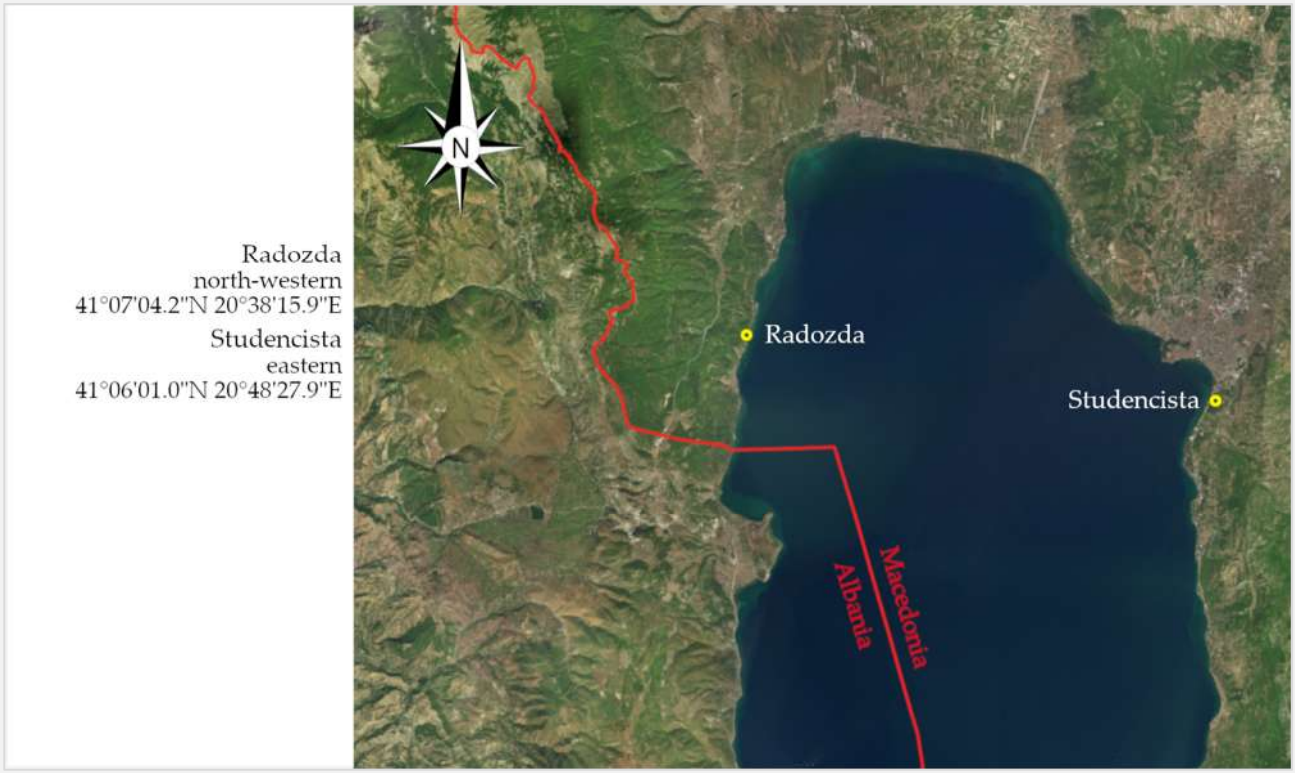


Figure 16: Geographical Positions of monitoring locations for Yellow-bellied Toad *(Bombina variegata)* and Macedonian Crested Newt *(Triturus macedonicus)* at Lake Ohrid in North Macedonia.

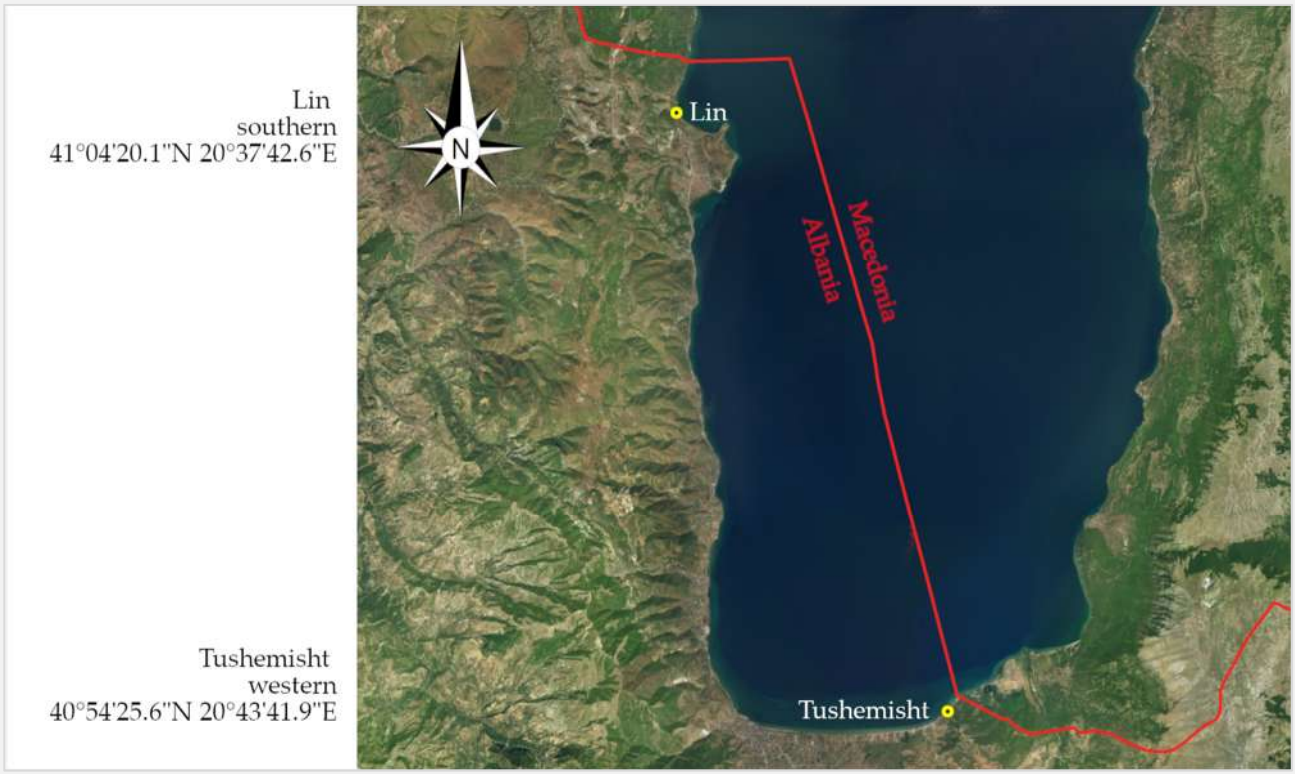


Figure 17: Geographical Positions of monitoring locations **ONLY** for Yellow-bellied Toad *(Bombina variegata)* at Lake Ohrid in Albania.

1.3 Methodology

Objective: To observe changes in relative abundance in selected known subpopulations

The present chapter proposes an operational monitoring scheme for selected key species of amphibians, as a basis for long-term implementation. The species selection is based on criteria that species should occur in at least two countries involved in this process and be of national importance regarding conservation. In this manner, the transboundary approach and cooperation is encouraged and a better understanding on regional species population biology achieved.

Therefore, the key species for the amphibian monitoring are:

- Macedonian Crested Newt (*Triturus macedonicus*)
- Yellow-bellied Toad (*Bombina variegata*)
- Albanian Water Frog (*Pelophylax shqipericus*)

1.3.1 Monitoring Techniques – Transect Survey

The transect survey technique is used to measure the relative abundance of selected species and known sub-populations. Regular surveys are the basis for assessing the impact of threats to amphibian populations.

A transect consists of a person walking from point A to point B along a defined path. Transects are positioned at the shore or embankment close to the water. A person counts the number of individuals seen and/or heard within approximately 2 m distance from the path (at the side facing the water). Two-sided transects are not applicable at the selected locations. Surveying relies upon detecting amphibians with the naked eye or with the aid of binoculars. If identification from the distance is not possible, a simple hand net can be used to catch and identify specimens, and to release them again.

Regarding *Pelophylax shqipericus*, multiple transects are performed at each locality. The length of each transect is 50 m (e.g. WETLANDCARE, s.a.). For *Triturus macedonicus* and *Bombina variegata*, the length depends on the surface area (several transects can be included over a total distance of 500 meters) (KENNETH DODD 2010). The number of transects also depends on the surface area. Transects should be randomly placed within the location, but clearly defined so they can be repeated during subsequent surveys. Adjacent transects along the shore should be separated from each other by at least 10 m. Observers need to move along the transect at an average pace of approximately 50 m per 10 minutes, measuring time using a stopwatch, and stopping the stopwatch when extra time is needed for identification, writing down records or moving around obstacles (MANLY et al. 2006). At localities where ponds are also present (such as Vitoja in Montenegro), the survey will be performed by walking around the pond. The entire perimeter of the pond is surveyed (MANLY et al. 2006). The length of the perimeter should be recorded to allow comparisons between different populations and express counts as number of animals per length of bank.

1.3.2 Description of the Sampling Unit

All individuals seen have to be recorded. Note whether it is an adult (if you cannot determine whether it is male or female adult), juvenile, amplexus (female and male in mating embrace), or just an individual without determination (depending on the monitored species). The total number of individuals per transect line could be used to calculate a relative index of abundance as the ratio between individuals observed and length of transect. This simple index allows between-site comparison of abundances (BUCKLAND et al. 1993).

The following should be noted: whether it is a calling male (in case of *P. shqipericus* and *B. variegata*), adult individual (if the sex cannot be distinguished), juvenile individual, amplexus, or just an individual without determination. For example, when disturbed, frogs tend to flee into the water, making it difficult to determine whether it is a male, female or juvenile. On marshy shores such as those of Lakes Prespa, Ohrid and Skadar, tadpoles or clumps of eggs are hard to see or determine by non-experts.

Regarding *T. macedonicus*, the sampling unit depends on the size of the pond. The monitoring involves catching and counting of individuals, determination of gender and age status (adult and juvenile) as well as mating status (amplexus), or just the recording of individuals without describing those biological traits.

1.3.3 Monitoring Season and Number of Visits

Albanian Water Frog is monitored four times during the breeding season at a regular monthly interval, during spring from mid-March to mid-June. *Bombina variegata* and *Triturus macedonicus* are monitored four times during the breeding season at regular monthly intervals, from the end of March to the end of June.

All selected species can be monitored four times during the breeding season at regular monthly intervals, from end-March to end-June. The monitoring is performed during one to four consecutive days, depending on weather conditions during the day, logistic support and the number of persons involved.

1.3.4 Time of Day and Weather

It is logistically reasonable to conduct surveys during the day. Surveys should be performed during warm, clear days, with little or no wind, generally between 10 am and 6 pm, targeting times of day when ectotherms are expected to be active and visible (MANLY et al. 2006). Preferably, suitable weather conditions include warm, wet days following rain. It is recommended that nighttime air temperature should be more than 5 °C for the first spring survey. The calls of *P. shqipericus* can be heard during the day and at night, but daytime surveys are more feasible.

The decision on when to monitor is made based on weather forecasts. If air temperature is not approaching the suggested minimum, the survey should be postponed until it does, even if it is past the recommended date. Although the water temperature is a better indicator of amphibian calling activity, measuring water temperature is something that can only be done upon arrival at the location and cannot be done at all if there is no access to the shoreline.

1.3.5 Manual and Needed Equipment

Equipment: *Necessary*: Data Sheets, pencils, GPS, binoculars, rubber boots, hand net, safety clothes, first aid kit.

Optional: photo camera, air and water thermometers.

Manual

- Choose the day for the survey based on the weather forecast (see above).
- Before starting the survey at the selected location, fill in the information required in the top section of the Data Sheet. Record locality name, observer name, date, and the number of visit.
- A separate Data Sheet is used for each transect.
- If possible, carry an air thermometer and record the air temperature at the start of your survey. If you do not have a thermometer, record the air temperature from a reliable source (e.g., the local weather station or an outdoor thermometer at your home).
- If possible and accessible, record the water temperature (at 10 cm depth).
- Determine the wind speed and cloud cover according to the scales on the Data Sheet.
- Record the type of habitat.
- Place a transect within the monitoring location.
- Mark the starting point. It is best to start the transect at some existing visible mark (e.g. beginning of embankment, or beginning of stone paths in Tushemisht and Lin localities) for easier orientation during following visits. Write the transect name if applicable and/or take a photo for better orientation in subsequent visits.
- Record the starting coordinates of a transect with the GPS.
- Record the starting time of the survey at each transect.

- Then set your stopwatch of the GPS (measure distance and time) and stop after 50 m. Record distance, ending time and coordinates.
- While walking slowly, record any observed individual in the corresponding table. Also, record activity of individuals and possible threats to amphibians (littering, presence of wastewater, urbanization, touristic facilities, etc.).
- Use the remarks section to record any problems encountered and other comments you might think may be useful, such as notes on recent flooding, water or wetland habitats drying up, etc.
- Optionally, you can take photos of anything deemed important or useful.

1.3.6 Data Sheet Amphibia

Data sheet for: Species: Date: Run 1, Run 2, Run 3, Run 4 (circle)

Region:	Location:	Observer:

Sky code (circle)	Sky condition	Temperature:
0	Clear or few clouds	Air
1	Partly cloudy	Water (if applicable)
2	Cloudy (overcast)	

Wind code (circle)	Indicators of wind speed
0	Calm, smoke rises vertically
1	Light air movement, smoke drifts
2	Slight breeze, wind felt on face
3	Gentle breeze, leaves and small twigs in constant motion
4	Moderate breeze, wind raises dust and loose paper, small branches moved

Transect name (if applicable)	

Coordinates of transect	
Starting point:	Endpoint:

Time of survey	
Starting time:	Ending time:

Transect length:	

Number of adults (♂, ♀ and sex undetermined)	Number of calling males*	Number of amplexus	Number of juveniles	Number of individuals of unknown age*

Specific habitat (circle)	Activity of specimens (circle several activities if seen)
1 Temporal pond	1 Feeding
2 Permanent pond	2 Resting (basking) at shore, fleeing upon approach
3 Marsh	3 Resting (basking) on water vegetation
4 Other (specify):	4 Mating
	5 Calling**
	6 Other
Vegetation type (circle): a) Emerging	b) Floating

Threats:	
Ex. litter, waste water, urbanization, touristic facilities, etc.	

Remarks:	
Ex. water level fluctuations during repeated visits	

* Adult and juvenile stage not distinguished
** Only for *P. shqipericus* and *B. variegata*
For future monitoring, anthropogenic disturbances may as well be recorded. Such data should be ranked/coded/quantified for subsequent statistical analysis.

2. Aves

Birds are one of the easiest groups of animals to census, popular to study and are undoubtedly one of the most frequently observed and monitored of all taxa (DOUTHWAITE & DEWHURST 2002). Surprisingly, this does not seem to be the case for the three Western Balkan lakes, despite their outstanding importance as overwintering sites for many migratory birds and their designation as protected areas and/or Ramsar sites of *Wetlands of International Importance*.

Exceptions are winter censuses of water birds at the three lakes, and spring assessments of breeding populations of the Dalmatian Pelican, a flagship species, at Lakes Prespa and Shkodra/Skadar. Even these censuses, however, do not automatically translate into concrete conservation actions.

The present Monitoring Manual covers both breeding and overwintering water and marsh birds. Breeding birds are particularly vulnerable to human disturbances and suffer from the decline of suitable breeding habitats. Their well-being in turn indicates that overall ecological conditions are favorable. The presence of large numbers of overwintering water birds, particularly ducks, is not so much linked to the ecological quality of wetland habitats but to the moderate climate, the availability of food and the absence of human disturbances, which are at their low during the tourism off-season. Owing to strong seasonal patterns and inter-annual fluctuation in population densities of birds, monitoring must be executed for many years to yield viable results on which to base conservation actions.

2.1 Ferruginous Duck *(Aythya nyroca)*

2.1.1 General Information

Description: The Ferruginous Duck (Figure 18) is a brown, medium sized (38 – 42 cm) diving duck with a conspicuous white undertail. Sexes differ slightly: males are reddish-chestnut in color with white eyes, females are dull-brown with dark eyes. In silhouette, the duck appears short-bodied with a long bill and neck and a flat forehead. In flight, it has a visible white wing bar running to the tip of the wing and a silky white belly. Juveniles are similar to females with a dark eye but even more dull-brown colored (ENCYCLOPEDIA OF LIFE 2017).

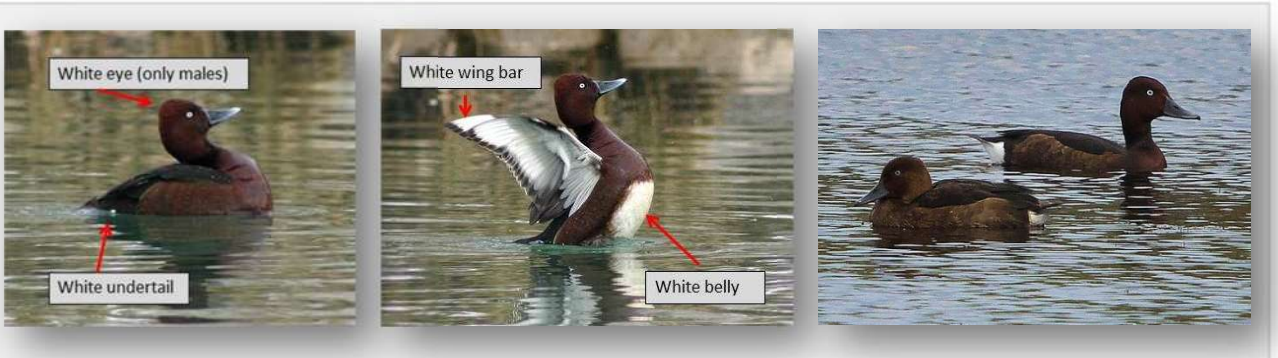


Figure 18: Male Ferruginous Duck swimming (left picture, the white undertail almost completely submerged; © Borut Rubinić) and flapping its wings (middle picture; © Borut Rubinić). The male (right picture, back) can be distinguished from a female (right picture, front) by the color of the eyes (© Frank Philip Gröhl, naturgucker.de/euronatur).

Distribution: The Ferruginous Duck breeds mainly in Central and Eastern Europe, Southwestern Asia and North Africa and sporadically in Western Europe. The wintering range overlaps with the breeding range and extends to the Middle East, Northeastern and Western Africa. The range may fluctuate considerably from year to year, owing to changing water levels (BIRDLIFE INTERNATIONAL 2017).

Habitat: The Ferruginous Duck prefers fresh standing water, especially shallow pools and marshes with abundant emergent and shoreline vegetation. Typical breeding sites show a well-structured vegetation mosaic and

a diversity of microhabitats. It is rarely found on flowing streams or rivers with dense vegetation (PETKOV 2006). It requires shallow water 30 – 100 cm deep close to littoral vegetation for feeding (DEL HOYO et al. 1992, KEAR 2005). Outside the breeding season, it also occurs on larger lakes, lagoons and coastal marshes (BIRDLIFE INTERNATIONAl 2017).

IUCN-Status: Near Threatened. The overall population trend is precautionarily suspected to be declining at a moderate rate over several generations (IUCN 2018) which goes along with a reduction of range (WETLANDS INTERNATIONAL 2018). The species is threatened by the degradation and destruction of well-vegetated shallow pools and other wetland habitats (VINICOMBE 2000, DEL HOYO et al. 1992, KEAR 2005, ROBINSON & HUGHES 2006). Changing land management practices such as reed cutting and burning during the breeding season (PETKOV 2006), over-grazing (ROBINSON & HUGHES 2006) as well as intensification (causing reversion to open water) of extensively managed fishponds (VINICOMBE 2000, KEAR 2005, PETKOV 2006, ROBINSON & HUGHES 2006) also threaten the species. Hunting is another serious threat to the species. Large numbers are shot on passage in the autumn (e.g. through the Volga delta) and at overwintering grounds (IUCN 2018).

2.1.2 Methodology

Objective: To determine the size and trends of the breeding population and its fledgling success

The monitoring of this species is to be carried out on Lake Shkodra/Skadar. It can be combined with the monitoring of the Common Pochard (*Aythya ferina*; see the respective chapter 2.2 for more details).

General method description: The breeding bird monitoring sites are pre-identified according to spring migration data and suitable breeding habitat. In the first year, a spring survey should be carried out to detect suitable breeding habitats mainly in the Northern part of Lake Shkodra/Skadar. Observation transects and points are selected using GIS terrain data and aerial photography to maximize the field of view on the reed edge. In the early breeding season (i.e. in May), sites are visited with a boat to detect the number of isolated males/females and pairs and then in the late breeding season (end of June to beginning of August) to detect females with ducklings. Transects should be performed along existing boat passages, particularly during low water level. In such a way, the transects should be more readily repeatable and no further fragmentation would occur.

Field method: Line transects are visited with boats (motorboat or sea-kayak). The driving speed should be slow (2 – 4 km/h) with regular short stops (3 – 5 min) at viewpoints where a stretch of more than 200 meters of reed edge is visible.

Breeding population assessment: The confirmed minimum number of breeding pairs is indicated by the number of females with ducklings while the maximum number of breeding pairs is indicated by the number of males in breeding plumage.

Description of the sampling unit: In the early breeding season (May), counts are made of:

- isolated, residential pairs
- isolated, residential guarding males
- isolated, residential shy females

In the late breeding season (late-June to early-August), counts are made of:

- females with ducklings (no. of ducklings in each family group)

Monitoring season and number of visits: The breeding season lasts from April or May (DEL HOYO et al. 1992) until late June (MADGE & BURN 1988). Adults undergo a wing-moulting period during the breeding season between July and August (ROBINSON & HUGHES 2006). Departure from the breeding grounds starts in mid- to late-August (PETKOV 2006).

Therefore, a minimum of three visits should be conducted per breeding season to monitor *A. nyroca:*

- 1st visit: May
- 2nd visit: ≈ 15.6. – 15.7.
- 3rd visit: ≈ 15.7. – 15.8.
  (Allow a minimum of 10 days between the 2nd and 3rd visit!)

Time of the day and weather: There are two time slots for the monitoring: one in the morning (from dawn until 9 am) and/or a second one in the evening (from 5 pm until dusk). As the survey is conducted from the boat, dry and calm weather is important.

Equipment: This manual plus aerial-photo maps depicting the marked transect, Data Sheet, pencil, binocular, camera, boat (motor boat or sea-kayak), GPS, lifejacket and first aid kit.

Manual

- Choose the day for the survey based on weather forecast and preferred dates (see above).
- Before you start the survey check all equipment and information needed. Fill in the information required in the top section of the Data Sheet. Record locality name, observer name, date, and the number of visit.
- A separate Data Sheet is used for each visit.
- Record the starting time of the survey at each transect.
- Record a GPS track and store it with the name of transect and date.
- Record all observations of Ferruginous Duck as specified in the form.
- Place all these observations on the map using "x" for location and the same ID as in the field form (e.g. "x1", "x2", etc.).
- Also, record the activity of individuals in the notes or general remarks section as well as possible threats to birds (hunting fishing, etc.).
- Use casual observation section for other important bird species (especially Natura 2000 species) seen on the transect route.
- Use the remarks section to record any conditions and issues encountered and other comments you might think may be useful.
- Take photos of habitats and individuals during the survey.
- Write down the end time of the survey.

2.1.3 Locations

The monitoring of Ferruginous Duck will take place at Lake Shkodra/Skadar and can be combined with the monitoring of the Common Pochard (*Aythya ferina*). The survey transects are placed in the Northern part of Lake Shkodra/Skadar between Humsko blato, Grabovnica and Jabuka (see maps below; Figs. 19 & 20).

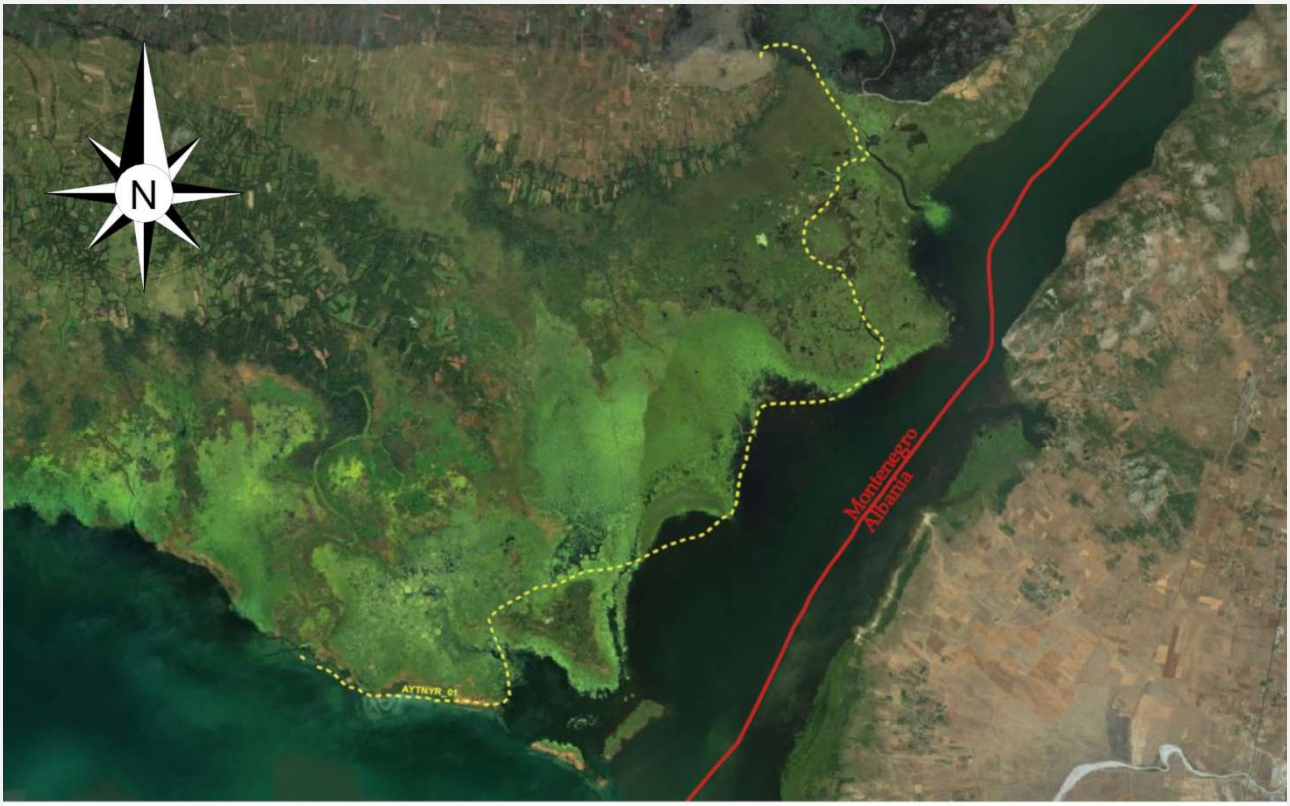


Figure 19: Transect 1 for the sampling of Ferruginous Duck *(Aythya nyroca)* and Common Pochard *(Aythya ferina)* at the Northern part of Lake Shkodra/Skadar.

Figure 20: Transect 2 for the sampling of Ferruginous Duck *(Aythya nyroca)* and Common Pochard *(Aythya ferina)* at the Northern part of Lake Shkodra/Skadar.

2.1.4 Data Sheet *A. nyroca (& A. ferina)*

Circle species monitored using this form.

Field Data Monitoring Sheet for the Breeding Season

Ferruginous Duck *Aythya nyroca* & Common Pochard *Aythya ferina*

Observer:		**Contact:**	Tel.:
			E-Mail:
Location:		**Date:**	

Weather conditions	
Cloud cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

Coordinates of transect (WGS UTM)	
Starting point:	Endpoint:

Time of survey and temperature	
Starting time:	Ending time:
Temperature at start (°C):	Temperature at end (°C):

Location No.	Coordinates** WGS UTM (N)	WGS UTM (E)	Single Adults ♂	Single Adults ♀	Pairs	Female with Ducklings***
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

Remarks	

* See Beaufort Wind Scale

** All observations should be mapped (mark with X and location no.) contributing to an exact (adapted) transect line (as needed) compared to the preselected monitoring transect.

*** Write N of ducklings in brackets [e.g. 1(7)]. For different females, write: 1(6), 1(5)…

2.2 Common Pochard *(Aythya ferina)*

2.2.1 General Information

Description: The Common Pochard is a medium-sized diving duck. The adult male has a long dark bill with a grey band, a red head and neck, a black breast, red eyes and a grey back. The adult female has a brown head and body and a narrower grey bill-band. The triangular head shape is distinctive (ENCYCLOPEDIA OF LIFE 2017).

Figure 21: Common Pochard, male (left; © René Bürgisser, naturgucker.de/euronatur) and female (right; © Reinhold Ix, naturgucker.de/euronatur).

Distribution: The Common Pochard breeds from Western Europe through central Asia to South-central Siberia and Northern China. It is present throughout the year but may make within-winter movements. European migratory populations winter mostly in Northwestern and Western Europe, the Eastern Mediterranean, Black Sea and the Caspian Sea, as well as in Turkey, the Middle East and as far south as sub-Saharan Africa (BIRDLIFE INTERNATIONAL 2017).

Habitat: The Common Pochard requires well-vegetated eutrophic to neutral swamps, marshes, lakes and slow-flowing rivers with areas of open water and abundant emergent fringing vegetation. It also breeds on saline, brackish and soda lakes and occasionally even in sheltered coastal bays. During the winter, the species frequents similar habitats to those it breeds in, including large lakes, slow-flowing rivers, reservoirs, brackish waters, marshes, weirs and flooded gravel pits (BIRDLIFE INTERNATIONAL 2017).

IUCN-Status: Vulnerable. The population has declined rapidly across the majority of its range. Significant factors that have led to the decline are most likely a combination of loss of breeding habitat in Eastern Europe, and changes in water chemistry (especially from hyper-eutrophication caused by agricultural runoff). The loss of habitat is thought to result primarily from changes in land management. The species suffers from predation and nest predation by several introduced and native mammals including American Mink (*Neovison vison*) (BARTOSZEWICZ & ZALEWSKI 2003), Raccoon Dog (*Nyctereutes procyonoides*), Raccoon (*Procyon lotor*), Red Fox (*Vulpes vulpes*) and Wild Boar (*Sus scrofa*). Increased predation levels may be partly related to declines in Black-headed Gull (*Chroicocephalus ridibundus*) colonies, with which Pochard often associate for the benefit of predator deterrence (FOX et al. 2016).

2.2.2 Methodology

Objective: To determine the size and trends of the breeding population and its fledgling success*

The monitoring of this species is to be carried out on Lake Shkodra/Skadar, and it can be combined with the monitoring of Ferruginous Duck *Aythya nyroca*. Details of the monitoring methodology and the maps of pre-selected monitoring locations on Lake Shkodra/Skadar are given in chapter 2.1.2 describing the monitoring protocol for Ferruginous Duck (*Aythya nyroca*).

2.3 Goosander *(Mergus merganser)*

2.3.1 General Information

Description: The male Goosander (Figures 22 & 23) is easily identified by its dark green head, pale body, and thin red bill. The female Goosander (Figure 22) is grey above and pale below with a rusty head and crest. In flight and at a distance, both sexes may be distinguished from the related Red-breasted Merganser (*Mergus serrator*) by the former species' larger size and paler overall body pattern.

Figure 22: Male (left) and female (right) Goosander swimming (© Roland Tichai, naturgucker.de/euronatur)

Figure 23: Male Goosander in Flight (© Hermann Daum, naturgucker.de/euronatur)

Distribution: The Goosander has a wide distribution across North America and Eurasia. In the Old World, it breeds across Northern Europe, Scandinavia, and Russia, and winters south to North Africa, India, and South-east Asia.

Habitat: As Goosanders generally nest in tree or rock cavities, they primarily breed on bodies of water surrounded by woodland and/or cliffs. In winter, the species may be found on large bodies of freshwater, including lakes, rivers, bays, and freshwater portions of large estuaries.

IUCN-Status: Least Concern. Even if the general population trend is unknown, in Europe the population size is estimated to be stable (BIRDLIFE INTERNATIONAL 2015).

* For future work, monitoring should cover the non-breeding population as well, in order to estimate the importance of the site for species during the non-breeding period. The same goes for *A. nyroca.*

2.3.2 Methodology

Objective: To determine the breeding success of populations

Census of breeding pairs of Goosander is carried out on rocky shorelines of Lakes Ohrid and Prespa. Two boat transects, one per lake, have been previously defined (CATSADORAKIS et al. 2016). One is on the Southwestern part of Great Prespa Lake (Stenje-Konjsko) and around the Golem Grad Island and the second one follows the Southeastern rocky shoreline of Ohrid Lake. One team of two observers scans the shoreline by boat, taking note of breeding pairs and breeding behavior. These transect surveys are conducted twice in a breeding season per lake (a total of four for the two lakes), following the early breeding season (courting pairs and prenuptial concentrations) and the late breeding season (counting females with young). It is recommended that the Goosander survey on Great Prespa Lake be conducted simultaneously with Albanian and Greek partners, since Common Goosander breeding populations extend to the Albanian and Greek parts of Great Prespa Lake.

Description of the sampling unit: During the breeding season, counts are made of individuals (females and males), pairs and juveniles.

Monitoring season and number of visits: The monitoring season for Goosander lasts from about 20th of April to 20th of June. Within this period, two visits to each lake should be conducted, allowing a minimum of 20 days between the two visits per lake:

- *1st visit:* ≈ *20.4. – 20.5.*
- *2nd visit:* ≈ *20.5. – 20.6.*

Time of the day and weather: The monitoring should be conducted during daytime. Dry and calm weather is preferred for boat trips.

Equipment: Boat, binoculars, this manual and maps, Data Sheet, pencil, camera, GPS.

Manual

- Check the weather forecast before starting a survey.
- Contact the boatman to make an appointment and provide info on lake conditions.
- Before the boat survey starts, fill in all the general paperwork (name of observers, name of locality, weather conditions, etc.).
- A separate Data Sheet is used for each visit.
- Start marking the survey route on the GPS.
- Write down the starting time of the survey.
- Write down all bird data (per sampling unit) and bird activities that are monitored. In addition, take note of all possible issues that may occur, as well as all personal observation that may be useful (in sections notes and additional notes).
- Take photos of habitats, nesting sites and individuals during the survey.
- Write down the end time of the survey.

2.3.3 Locations

The Goosander is monitored at Lake Ohrid and Great Prespa Lake. The following pages provide overview maps of transects to be travelled by boat (larger scale), as well as detailed locations of sub-sections of these transects (smaller scale), separately for Albanian and North Macedonian territories (Figures 25 – 35).

Lake Ohrid

Figure 25: Monitoring transect for the Goosander in the **Albanian** part of Ohrid Lake. (Note that the Goosander has not been found breeding in this area, but frequently uses it for foraging.)

Figure 24: Overview of the complete monitoring transect for the Goosander in the **North Macedonian** part of Ohrid Lake (see the following maps for detailed maps on subsections of this transect).

Figure 26: Detailed map of the 1st subsection of the monitoring transect for the Goosander in the North Macedonian part of Ohrid Lake.

Figure 27: Detailed map of the 2nd subsection of the monitoring transect for the Goosander in the North Macedonian part of Ohrid Lake.

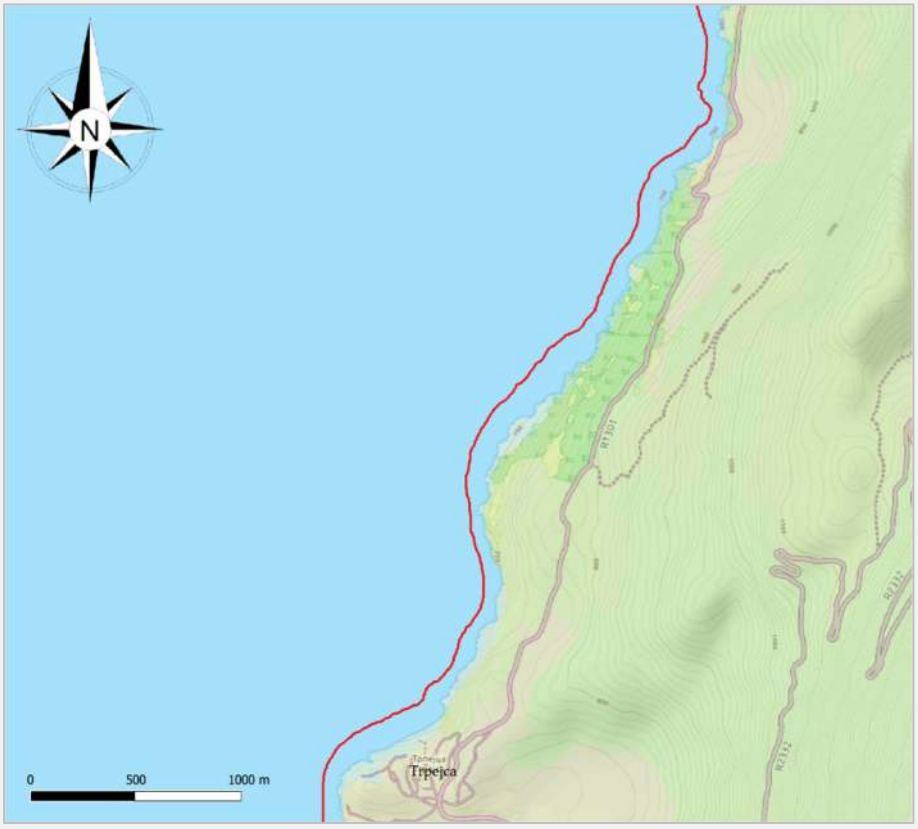


Figure 28: Detailed map of the 3rd subsection of the monitoring transect for the Goosander in the North Macedonian part of Ohrid Lake.

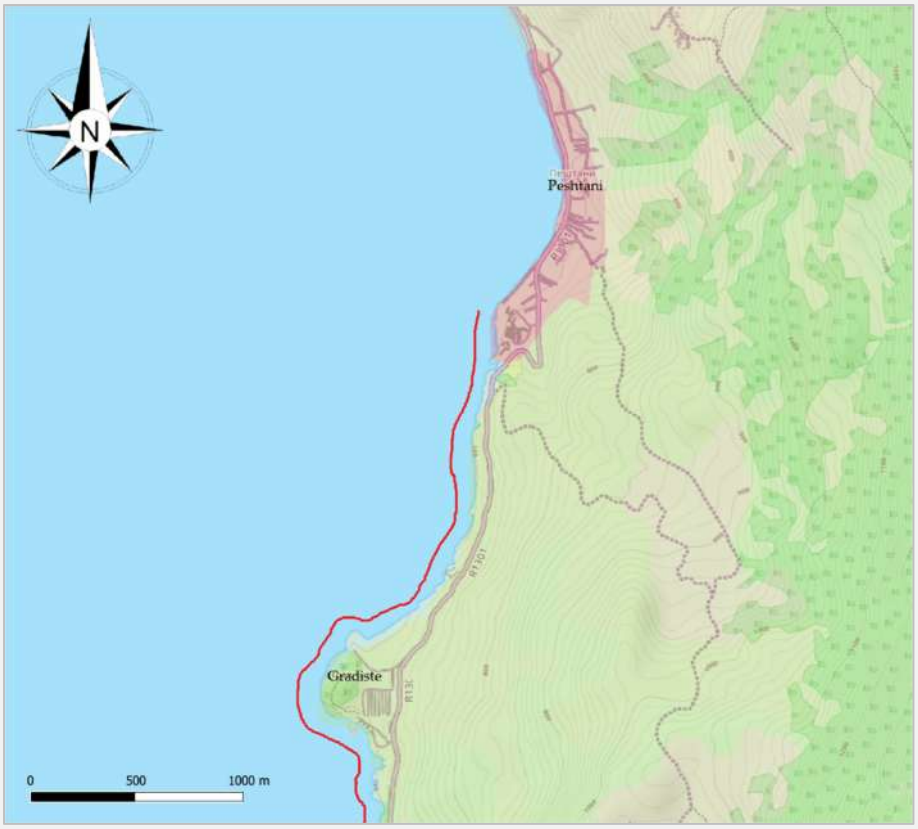


Figure 29: Detailed map of the 4th subsection of the monitoring transect for the Goosander in the North Macedonian part of Ohrid Lake.

Lake Prespa

Figure 30: Monitoring transect for the Goosander in the **Albanian** part of Great Prespa Lake.

Figure 31: Overview of the two monitoring transects for the Goosander in the **North Macedonian** part of Great Prespa Lake (see the following maps for detailed maps on subsections of those transects).

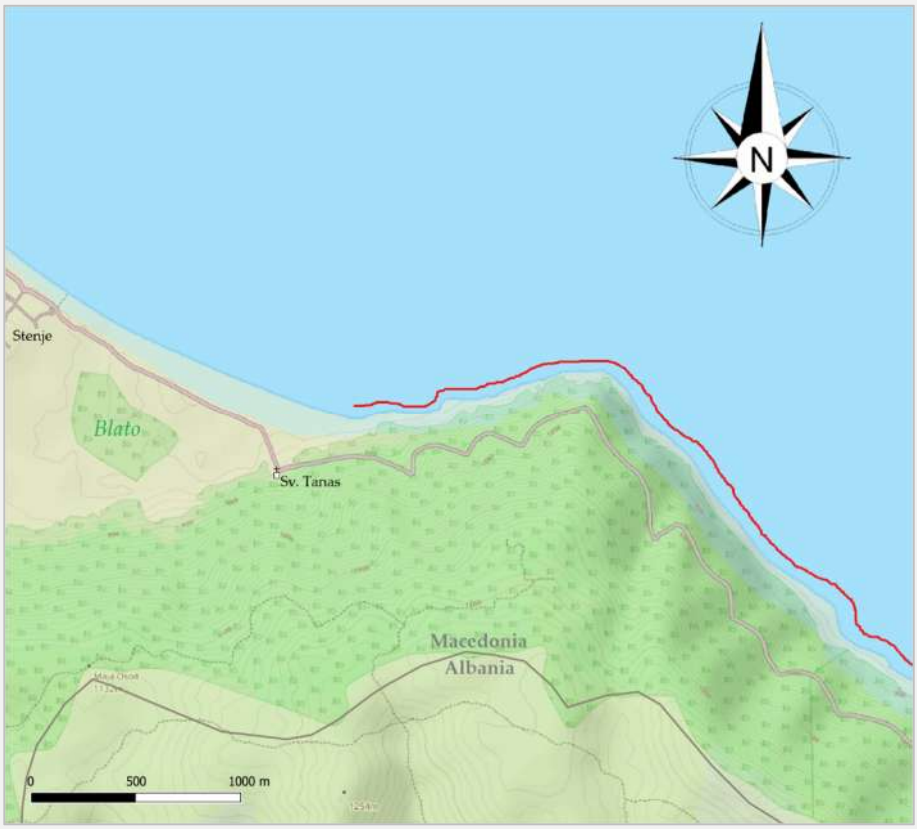


Figure 32: Detailed map of the 1st subsection of the monitoring transect for the Goosander along the shoreline in the North Macedonian part of Great Prespa Lake.

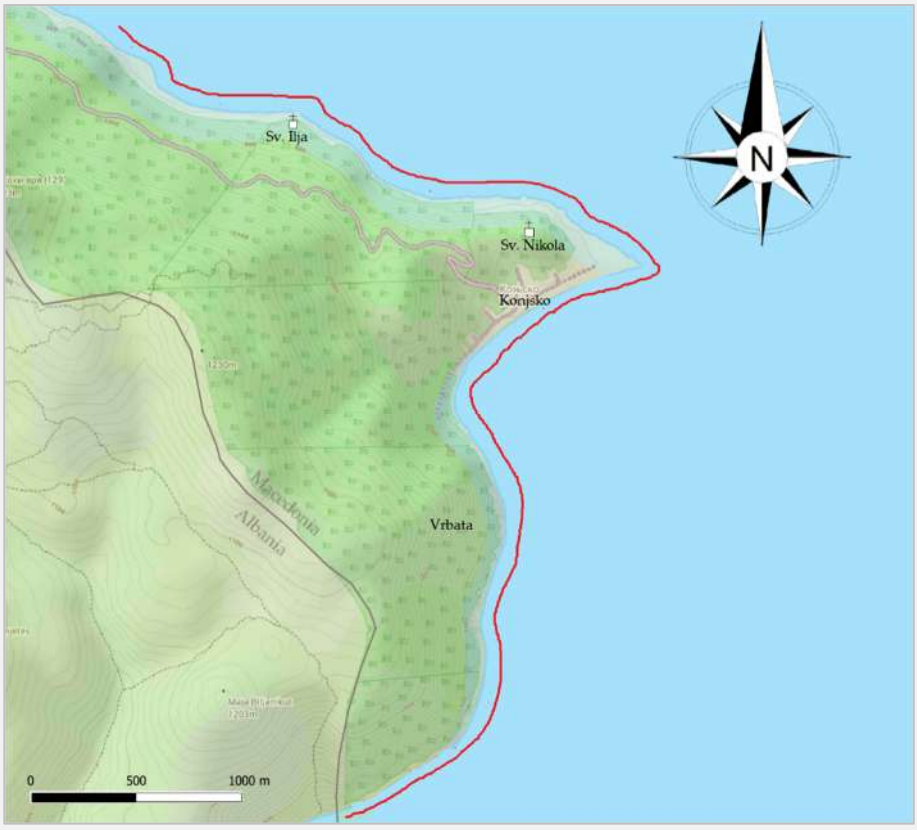


Figure 33: Detailed map of the 2nd subsection of the monitoring transect for the Goosander along the shoreline in the North Macedonian part of Great Prespa Lake.

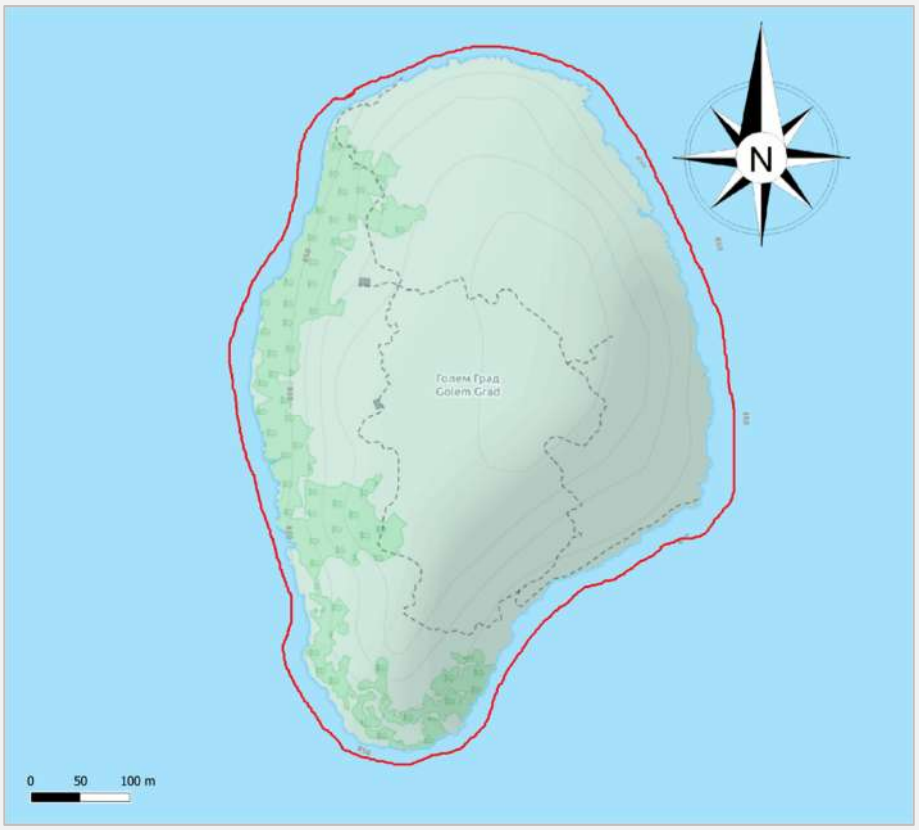


Figure 34: Detailed map of the monitoring transect for the Goosander around Golem Grad Island in the North Macedonian part of the Great Prespa Lake.

2.3.4 Data Sheet *(Mergus merganser)*

Field Data Monitoring Sheet for the Breeding Season

Goosander
Mergus merganser

Observer:		**Contact:**	Tel.:
			E-Mail:

Location:		**Date:**	

Weather Conditions	
Cloud cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

Coordinates of transect (WGS UTM)	
Starting point:	Endpoint:

Time of survey and temperature	
Starting time:	Ending time:
Temperature at start (°C):	Temperature at end (°C):

Location No.	Coordinates WGS UTM (N)	Coordinates WGS UTM (E)	Single adults ♂	Single adults ♀	Pairs	Juveniles	Notes
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Remarks	

* See Beaufort Wind Scale

2.4 Great Crested Grebe (*Podiceps cristatus*)

2.4.1 General Information

Description: The Great Crested Grebe ((*Podiceps cristatus*; Figures 35 & 36) is the largest grebe in Europe. It has a long neck, long bill and slender outline. In summer, the adults of both sexes wear reddish-orange head-plumes with black tips and an erectile black crown. The sexes are similar in appearance, but juveniles can be distinguished by the blackish stripes on the cheeks (ENCYCLOPEDIA OF LIFE 2017).

Figure 35: Male (left) and female (right) Great Crested Grebe swimming (© Armin Teichmann, naturgucker.de/ euronatur).

Figure 36: Male Great Crested Grebe in flight (© Thomas Schwarzbach, naturgucker.de/euronatur).

Distribution: The Great Crested Grebe is found across most of Europe and Central Asia, though it also winters in parts of Southern Asia (e.g. Northern India). Colonies can also be found in Africa, from Tunisia and Egypt in the North through scattered colonies in Central Africa to South Africa. Nesting colonies are also found in Southern Australia and New Zealand, with individuals wintering in Eastern and Northern Australia (ENCYCLOPEDIA OF LIFE 2017).

Habitat: The Great Crested Grebe breeds on fresh or brackish waters with abundant emergent and submerged vegetation, showing a preference for non-acidic eutrophic waterbodies with flat or sloping banks and muddy or sandy substrates, usually 0.5 – 5 m deep and with large areas of open water. Suitable habitats include small pools or lakes, backwaters of slow-flowing rivers and artificial waterbodies. It overwinters on large ice-free lakes and reservoirs, moving to sheltered coastal inshore waters less than 10 m deep such as brackish estuaries, deltas, tidal channels and tidal lagoons during cold spells (BIRDLIFE INTERNATIONAL 2016).

IUCN-Status: Least Concern. The population trend is not known, but the population is not believed to be decreasing (IUCN 2018).

2.4.2 Methodology

Objective: To determine the breeding success of resident populations

The monitoring of the Great Crested Grebe can be combined with the monitoring of the Red-crested Pochard (*Netta rufina*) and roosting Pygmy Cormorant (*Microcarbo pygmaeus*) at Ohrid Lake (see chapter 2.5 and 2.6 for further details of respective species), but only if very experienced observers are included in the team (as this is logistically challenging). If such experienced observers are not present, the monitoring of *Microcarbo pygmaeus* should be done separately.

Monitoring breeding populations of the Great Crested Grebe at Ohrid and Prespa Lakes is best implemented with two field visits during the breeding season. The first visit should be completed ideally within the 2nd and the 3rd week of April (could be earlier) in order to count the total number of adult birds present in the area and

pairs attempting to breed. The second visit should ideally be done within the 2nd and the 3rd week of July, in order to count the number of families (adults with chicks), chicks and again adults (singles and pairs).

Monitoring of grebes takes place along predefined areas that have been determined in accordance with the presence of suitable breeding habitat along the lakes' shorelines (refer to the following maps). These are the sites which should be observed every year/time when monitoring the breeding population of this species in the respective lakes.

Counts should be organized from the shoreline, using binoculars and spotting scope from the best vantage point (for North Macedonia) and from the best location in the seven transects (for the Albanian part of the count[20]), as depicted in the maps below. Counting from the boat is not suitable for this species, as it creates disturbance and makes the birds hide in the reeds where they cannot be observed. In addition, the rocking of the boat makes observations through the spotting scope difficult. However, in circumstances where observations from the shore are not possible, a boat can be used. It is advisable that the boat stays in one spot for at least 30 minutes, at a sufficient distance to allow birds to emerge from the reeds.

In order to decrease the risk of duplication (double counts), it is best to try and achieve coverage of all waters over the shortest period possible, especially in North Macedonia where two teams will be needed to complete the count on time. Since this is a transboundary count, and the risk for double counts increases, it is best advised to establish simultaneous counts between the organizations/individuals conducting the survey on the North Macedonian and Albanian sides of the lakes, respectively.

Monitoring season and number of visits: As the majority of the species is fully migratory, it breeds between April and September in the European part of its distribution. Therefore, two visits should be done to cover the relevant phases of the breeding season:

- 1st visit: 2nd and 3rd week of April
- 2nd visit: 2nd and 3rd week of July

Description of the sampling unit

- 1st visit: single adults and pairs
- 2nd visit: number of families, number of chicks, single adults and pairs

Time of the day and weather: The monitoring should start at sunrise and last until 5 pm. Family groups can be observed during the whole day. Weather should be dry and calm.

Equipment: Binoculars and spotting scopes. Depending on the need also a boat (lifejacket and first aid kit). Data Sheets, maps, pencils, camera, GPS.

Manual

- Check weather forecast before starting a survey.
- Check if the survey date can coincide with the count date for the Pygmy Cormorant and/or the Red Crested Pochard.
- Attempt to coordinate the work from both the Albanian and North Macedonian side of the lakes, prior to conducting the counts.
- Check for the availability of two teams to conduct the survey (if only one team is available, then be prepared for longer fieldwork).
- Before the survey starts, do all the necessary paperwork per vantage point (name of observers, name of locality, weather conditions, etc.).
- A separate Data Sheet is used for each visit and vantage point.
- Start marking the survey route on the GPS.
- Write down the starting time of the survey.

[20] The vantage points for Albania will be precisely identified in the first visit of the next monitoring period.

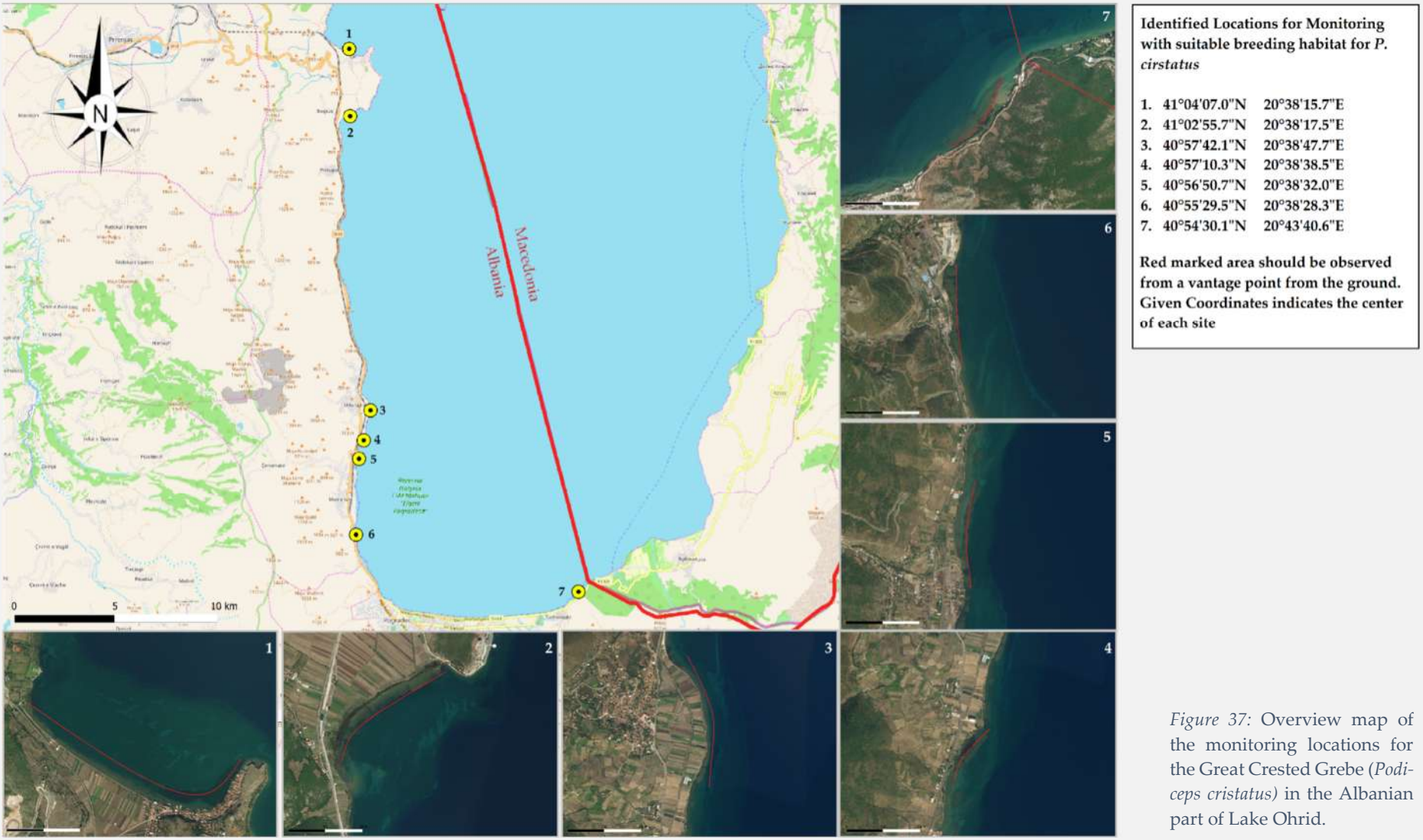
- Write down all bird data (per sampling unit) and bird activities that are monitored. Also take note of all possible perturbations that may occur, as well as all personal observations that may be useful (in section Notes).
- Take photos of habitats, nesting sites and individuals during the survey.
- Write down the end time of the survey.

2.4.3 Locations

The Great Crested Grebe is monitored at Lakes Ohrid and Prespa. The following pages provide overview maps of vantage points, as well as detailed locations of groups of vantage points, separately for the Albanian and the North Macedonian parts of both lakes (Figures 37 – 50).

Monitoring of Great Crested Grebe had not initially been foreseen for Lake Shkodra/Skadar, hence no monitoring sites are being proposed in this Manual. However, since it is also a breeding bird there, it is advised to include this species in monitoring schemes for all three lakes. This recommendation is already reflected in Table 1 (Page 21) which is an updated version of the original scheme agreed upon by competent authorities and experts.

Lake Ohrid



Identified Locations for Monitoring with suitable breeding habitat for *P. cirstatus*

1. 41°04'07.0"N 20°38'15.7"E
2. 41°02'55.7"N 20°38'17.5"E
3. 40°57'42.1"N 20°38'47.7"E
4. 40°57'10.3"N 20°38'38.5"E
5. 40°56'50.7"N 20°38'32.0"E
6. 40°55'29.5"N 20°38'28.3"E
7. 40°54'30.1"N 20°43'40.6"E

Red marked area should be observed from a vantage point from the ground. Given Coordinates indicates the center of each site

Figure 37: Overview map of the monitoring locations for the Great Crested Grebe (*Podiceps cristatus)* in the Albanian part of Lake Ohrid.

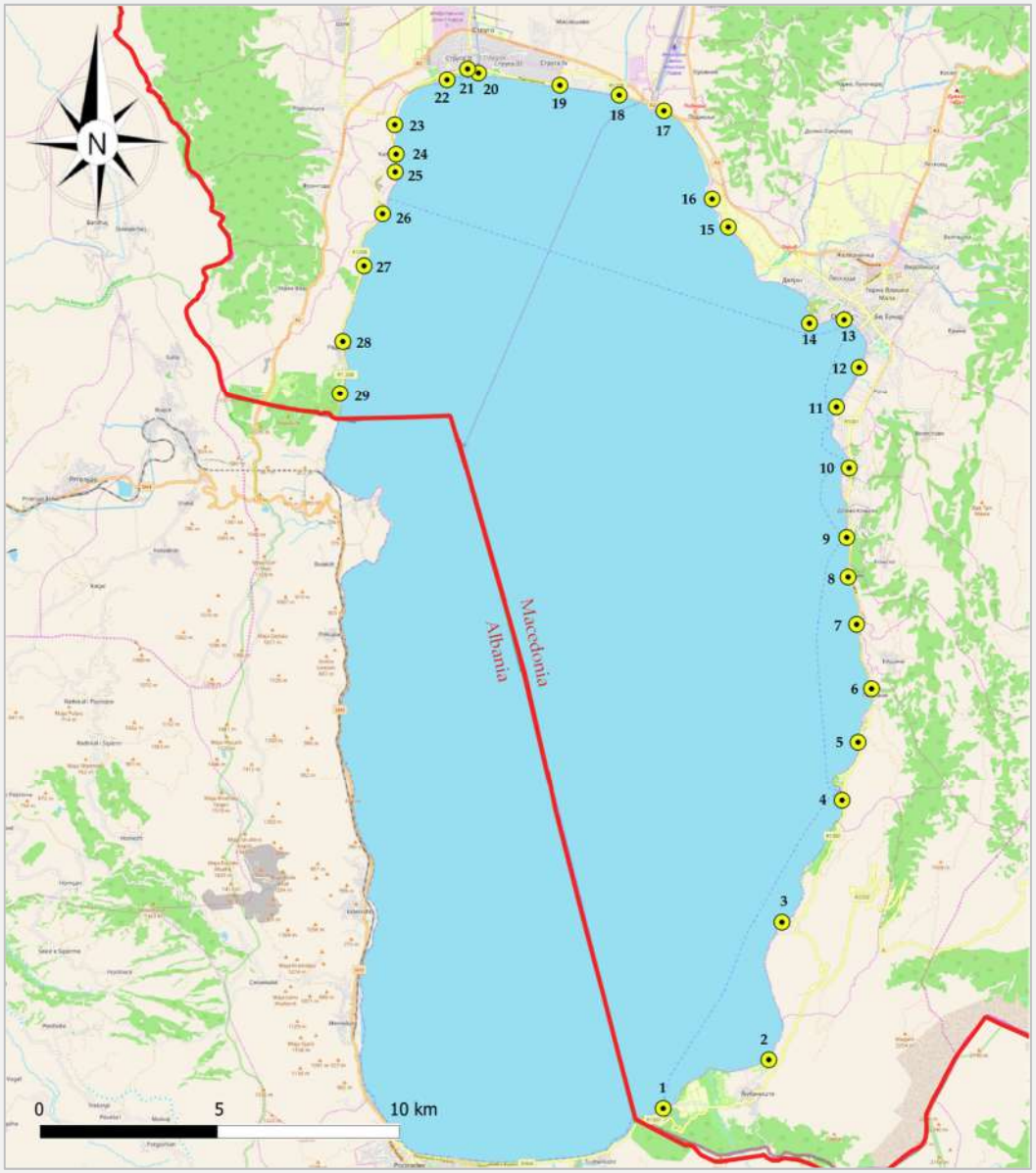


Table 4: Coordinates of the monitoring Vantage Points for *Podiceps cristatus, Microcarbo pygmaeus & Netta rufina* in the North Macedonian Part of Lake Ohrid:

No.	Name	WGS UTM **N**	WGS UTM **E**
1	St. Naum	40°54'51.4"N	20°44'27.1"E
2	Ljubanishta	40°55'35.4"N	20°46'32.4"E
3	Trpejca	40°57'39.1"N	20°46'47.5"E
4	Karpa	40°59'28.9"N	20°47'58.6"E
5	Antena	41°00'21.8"N	20°48'17.5"E
6	Atlantik 1	41°01'10.0"N	20°48'33.5"E
7	Atlantik 2	41°02'07.8"N	20°48'15.4"E
8	Lagadin	41°02'50.3"N	20°48'05.2"E
9	Metropol	41°03'25.9"N	20°48'03.4"E
10	Hotel Sileks	41°04'28.3"N	20°48'06.1"E
11	Hotel Park	41°05'23.2"N	20°47'50.9"E
12	Kadmo	41°05'59.6"N	20°48'17.7"E
13	Gradsko Pristanishte	41°06'42.6"N	20°47'59.7"E
14	Izvidnichki Kamp	41°06'39.3"N	20°47'18.4"E
15	Erazmo	41°08'05.8"N	20°45'41.4"E
16	Andon Dukov	41°08'31.1"N	20°45'22.2"E
17	Podmolje	41°09'50.4"N	20°44'24.3"E
18	Sateska	41°10'04.4"N	20°43'31.0"E
19	Eurotel	41°10'13.1"N	20°42'20.4"E
20	Drim	41°10'23.9"N	20°40'43.2"E
21	Plazha	41°10'27.5"N	20°40'30.3"E
22	Aquarius	41°10'17.7"N	20°40'05.8"E
23	Blata Sunrise Kamp	41°09'37.0"N	20°39'03.7"E
24	Kalishta	41°09'10.5"N	20°39'05.4"E
25	St. Bogorodica	41°08'54.5"N	20°39'04.5"E
26	Elen Kamen	41°08'16.8"N	20°38'49.7"E
27	Livadishte	41°07'29.8"N	20°38'27.7"E
28	Radozhda	41°06'21.5"N	20°38'02.9"E
29	Kamp Treska	41°05'34.2"N	20°37'59.8"E

Figure 38: Overview map of all monitoring vantage points for *Podiceps cristatus, Microcarbo pygmaeus & Netta rufina* in the North Macedonian part of Lake Ohrid (see the following pages for detailed maps of groups of vantage points).

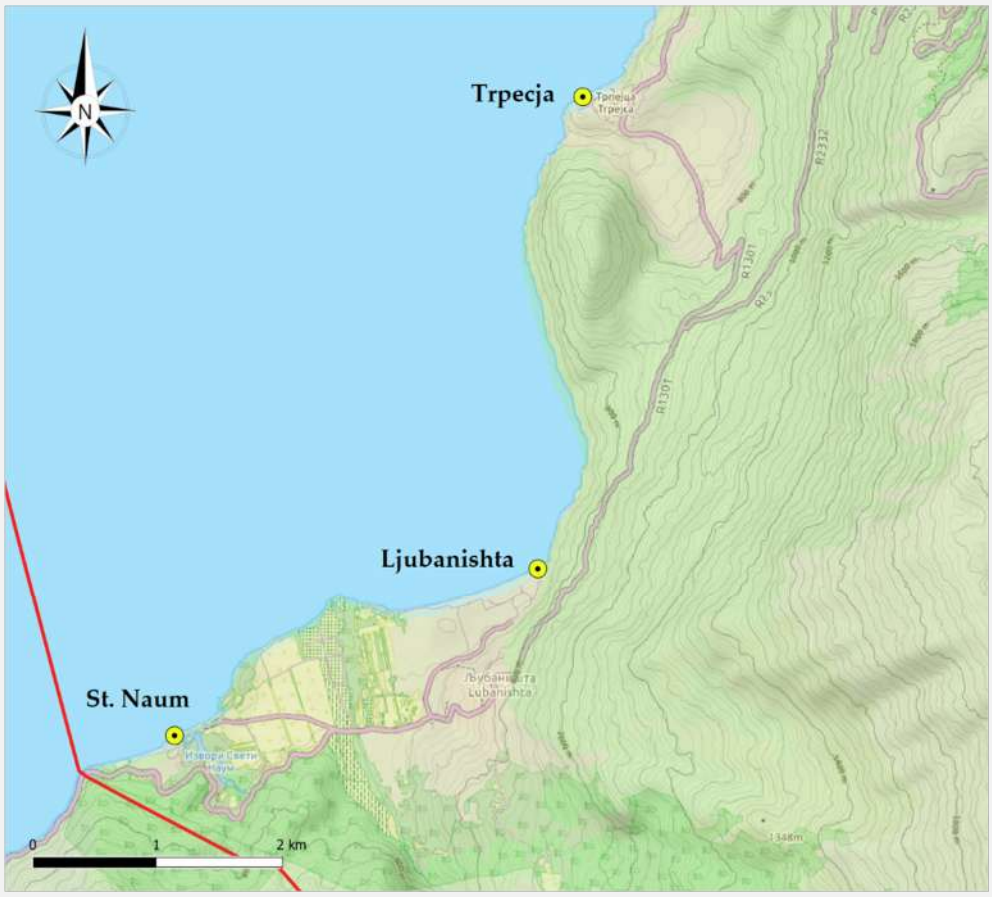


Figure 39: Detailed map of the 1st group of vantage points for the monitoring of *Podiceps cristatus, Microcarbo pygmaeus & Netta rufina* in the North Macedonian part of Ohrid Lake.

Figure 40: Detailed map of the 2nd group of vantage points for the monitoring of *Podiceps cristatus, Microcarbo pygmaeus & Netta rufina* in the North Macedonian part of Ohrid Lake.

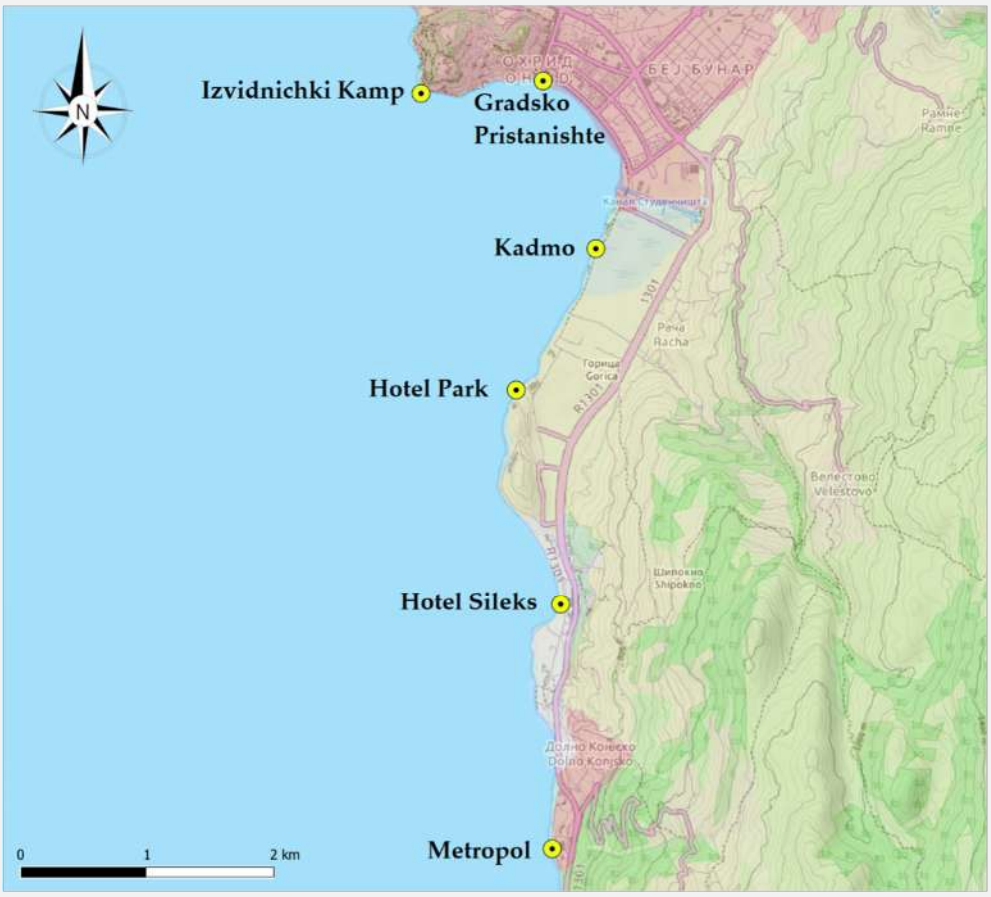


Figure 41: Detailed map of the 3rd group of vantage points for the monitoring of *Podiceps cristatus, Microcarbo pygmaeus & Netta rufina* in the North Macedonian part of Ohrid Lake.

Figure 42: Detailed map of the 4th group of vantage points for the monitoring of *Podiceps cristatus, Microcarbo pygmaeus & Netta rufina* in the North Macedonian part of Ohrid Lake.

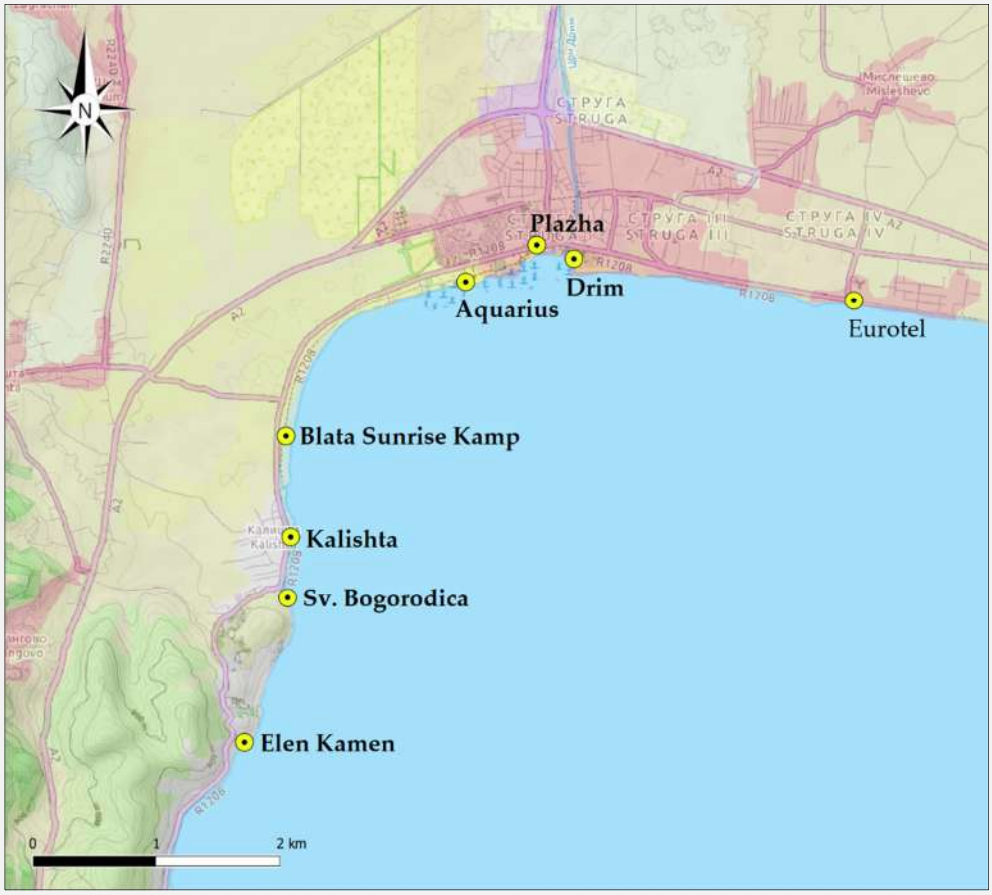


Figure 43: Detailed map of the 5th group of vantage points for the monitoring of *Podiceps cristatus, Microcarbo pygmaeus & Netta rufina* in the North Macedonian part of Ohrid Lake.

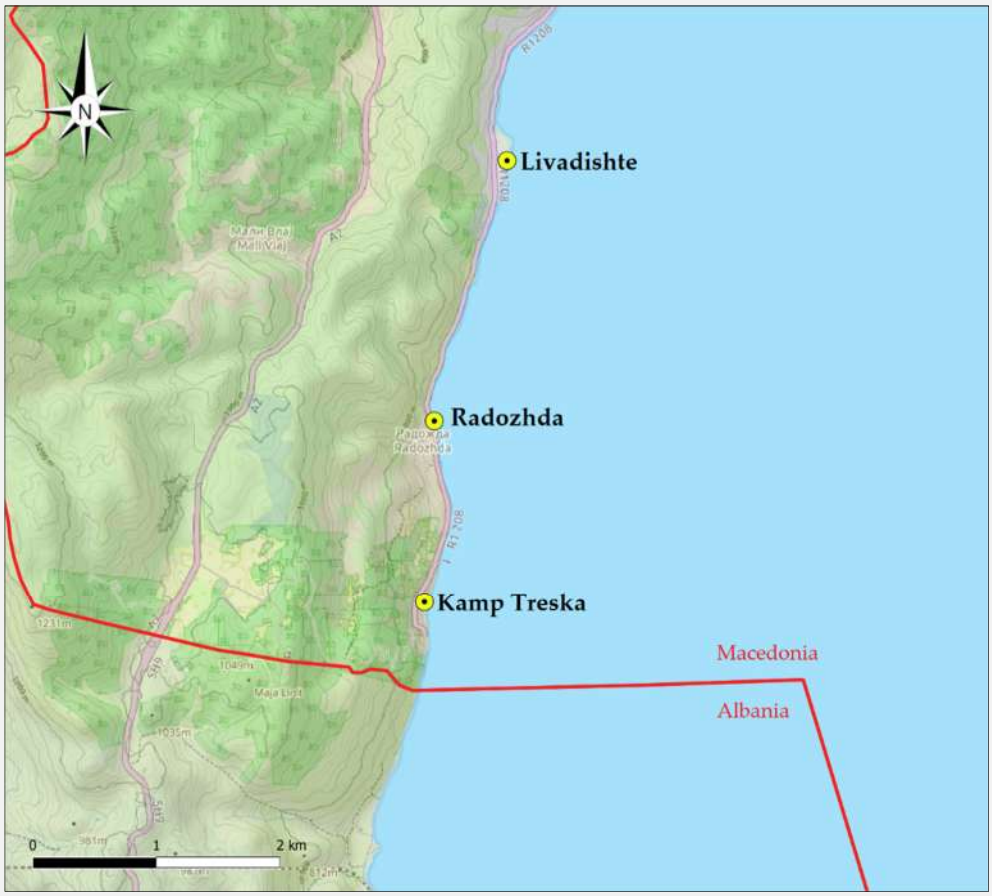


Figure 44: Detailed map of the 6th group of vantage points for the monitoring of *Podiceps cristatus, Microcarbo pygmaeus & Netta rufina* in the North Macedonian part of Ohrid Lake.

Lake Prespa

Figure 45: Monitoring transects for the Great Crested Grebe in the Albanian part of Prespa Lake.

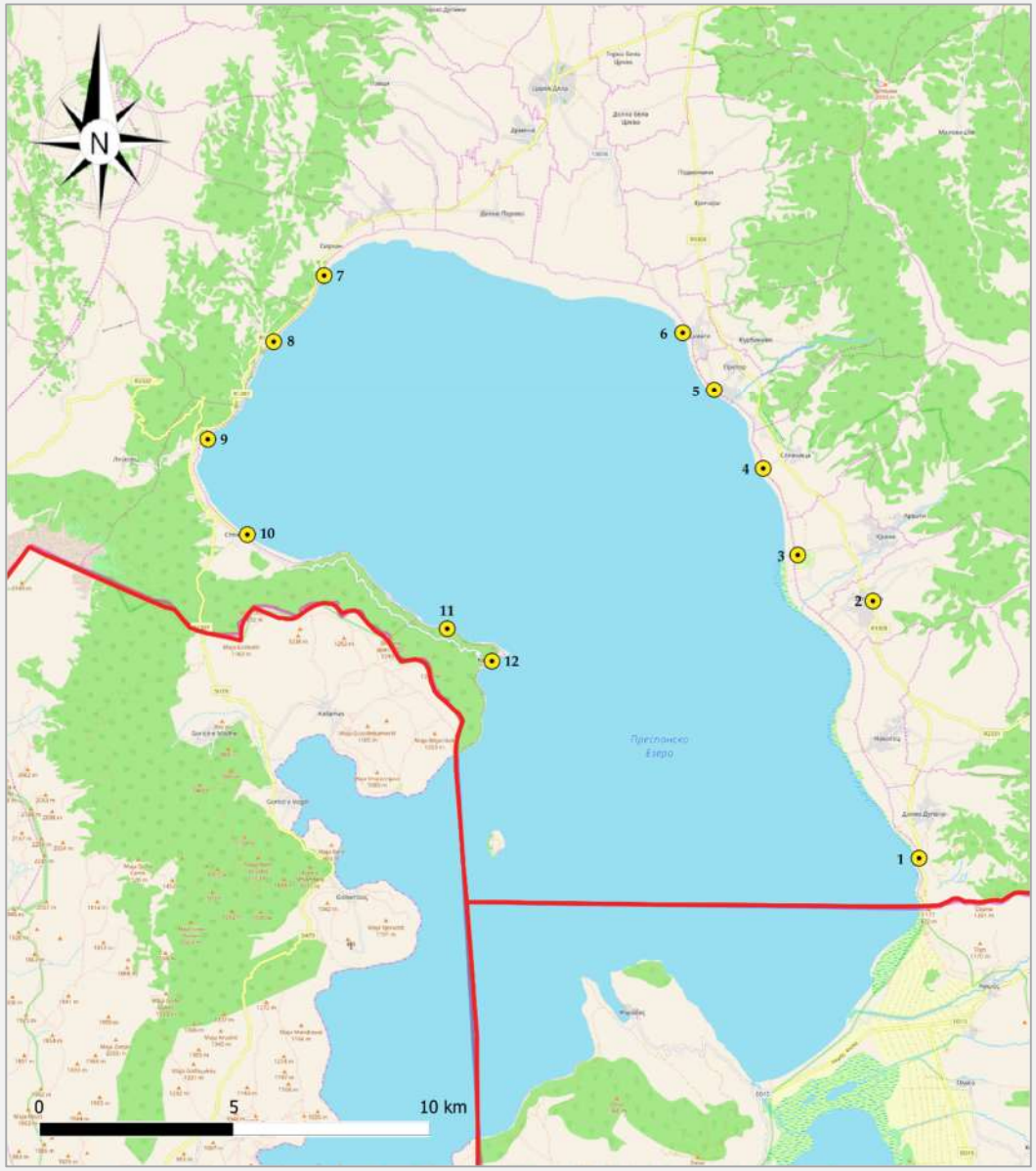


Table 5: Coordinates of the monitoring Vantage Points for *Podiceps cristatus & Microcarbo pygmaeus* in the North Macedonian Part of Lake Prespa:

No.	Name	WGS UTM **N**	WGS UTM **E**
1	St. Ana	40°51'55.1"N	21°07'05.7"E
2	Shtrbovo	40°55'29.6"N	21°06'15.5"E
3	Kamp Krani	40°56'07.9"N	21°04'53.1"E
4	Silvnica	40°57'19.9"N	21°04'15.2"E
5	Pretor	40°58'25.7"N	21°03'21.5"E
6	Asamati	40°59'13.4"N	21°02'47.0"E
7	Sirhan	41°00'00.8"N	20°56'13.2"E
8	Hotel Evropa	40°59'06.0"N	20°55'17.8"E
9	Tsarina	40°57'44.1"N	20°54'05.6"E
10	Stenje	40°56'24.9"N	20°54'49.2"E
11	Svllija	40°55'06.7"N	20°58'28.5"E
12	Konjsko	40°54'39.8"N	20°59'17.6"E

Figure 46: Overview map of all Monitoring vantage points for *Podiceps cristatus & Microcarbo pygmaeus* in the North Macedonian part of Lake Prespa (see the following pages for detailed maps of groups of vantage points).

Figure 47: Detailed map of the 1st group of vantage points for the monitoring of *Podiceps cristatus & Microcarbo pygmaeus* in the North Macedonian part of Prespa Lake.

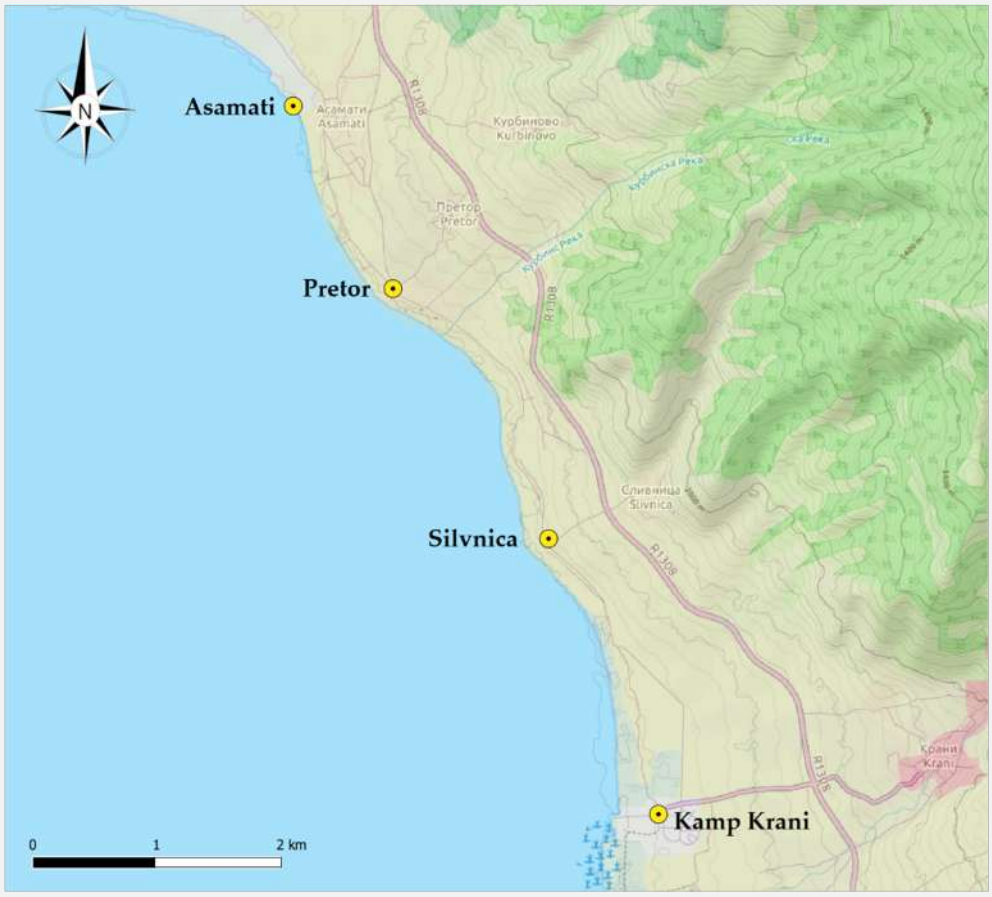


Figure 48: Detailed map of the 2nd group of vantage points for the monitoring of *Podiceps cristatus & Microcarbo pygmaeus* in the North Macedonian part of Prespa Lake.

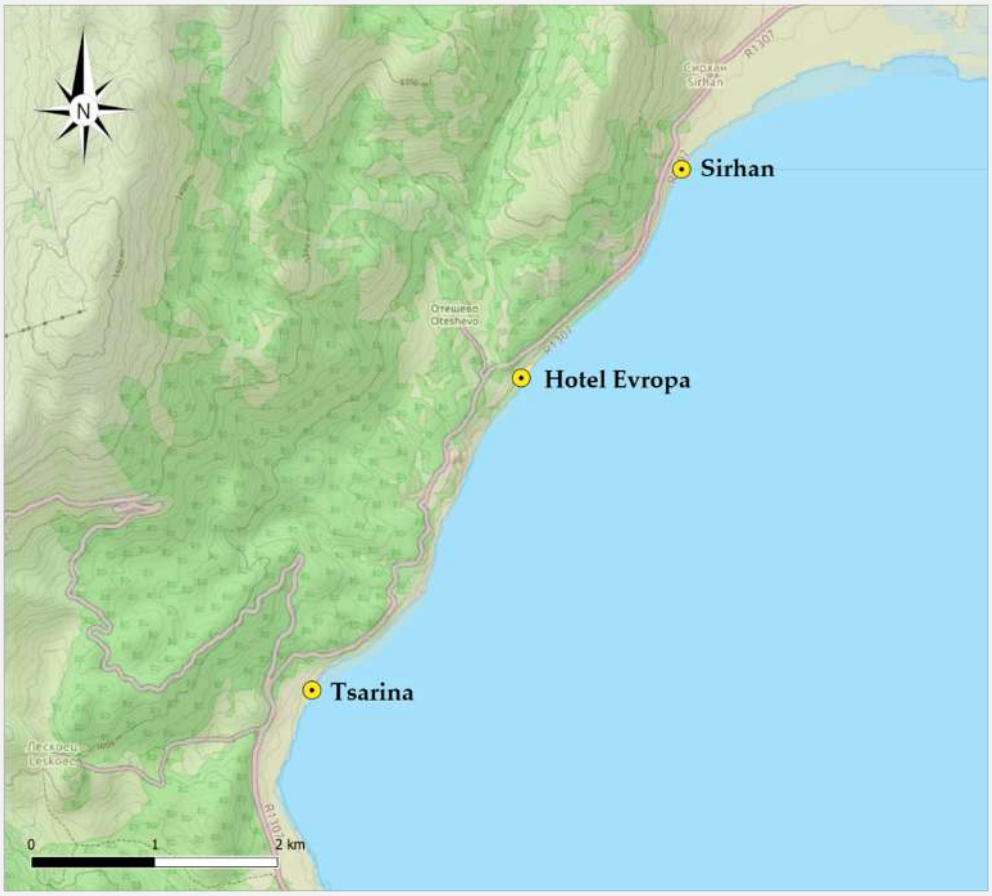


Figure 49: Detailed map of the 3rd group of vantage points for the monitoring of *Podiceps cristatus & Microcarbo pygmaeus* in the North Macedonian part of Prespa Lake.

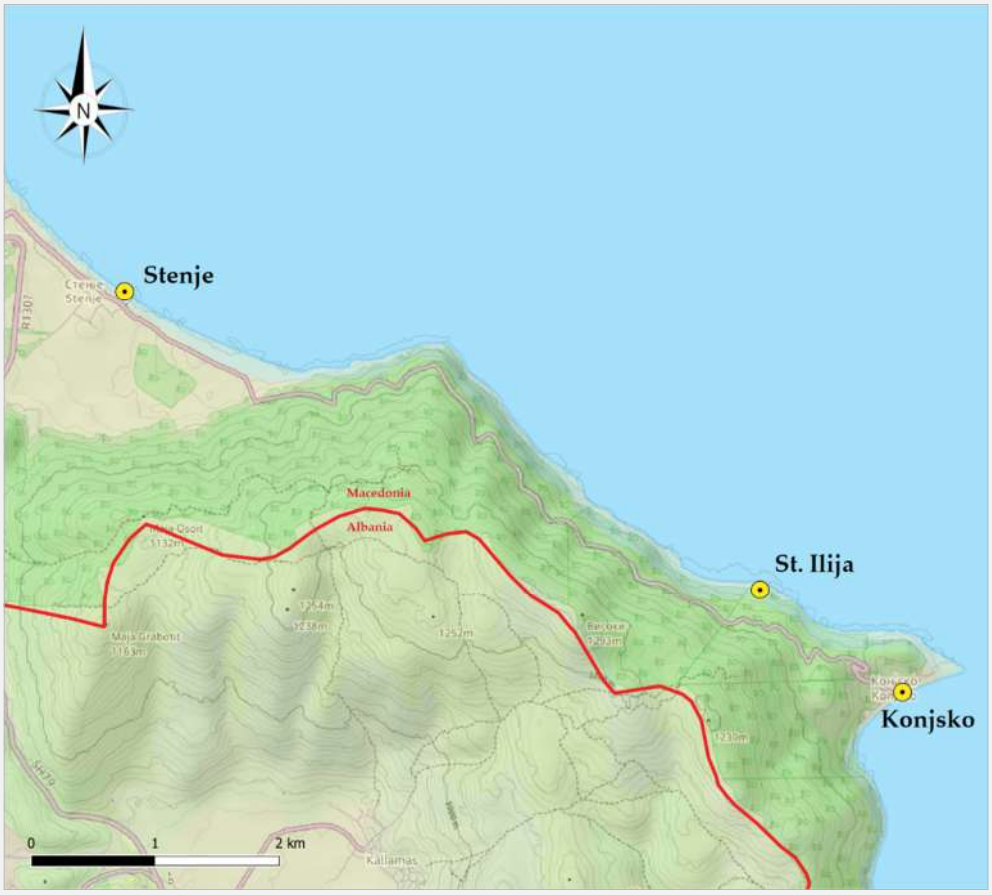


Figure 50: Detailed map of the 4th group of vantage points for the monitoring of *Podiceps cristatus & Microcarbo pygmaeus* in the North Macedonian part of Prespa Lake.

2.4.4 Data Sheet *(Podiceps cristatus)*

Field Data Monitoring Sheet for the Breeding Season

Great Crested Grebe
Podiceps cristatus

Observer:		**Contact:**	Tel.:
			E-Mail:

Location:	Lake	**Date:**	
	Country		

Weather Conditions	
Cloud cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

Time of survey and temperature	
Starting time:	Ending time:
Temperature at start (°C):	Temperature at end (°C):

Name of vantage point	Coordinates WGS UTM (N)	Coordinates WGS UTM (E)	Single adults ♂	Single adults ♀	Pairs	Families [No. chicks]	Notes

Remarks	

* See Beaufort Wind Scale

2.5 Red-crested Pochard *(Netta rufina)*

2.5.1 General Information

Description: The adult male Red-crested Pochard (Figures 51 & 52) has a rounded orange head, a red bill and a black breast. The flanks are white, the back brown, and the tail black. The female is mainly pale brown, with a darker back and crown and a whitish face below the eye. Eclipse males are similar to females but retain their red bills and red iris (ENCYCLOPEDIA OF LIFE 2017).

Figure 52: Male and female Red-crested Pochard with male (back) in breeding plumage (© Nadine Röhnert, natur-gucker.de/euronatur)

Figure 51: Male and female Red-crested Pochard with male (front) in eclipse plumage (© Christian Talarek, natur-gucker.de/euronatur)

Distribution: The Red-crested Pochard breeds locally from Europe to Central Asia and winters in Europe, Africa and the Indian Subcontinent. It is somewhat migratory and Northern birds winter further south into North Africa (ENCYCLOPEDIA OF LIFE 2017).

Habitat: The Red-crested Pochard inhabits inland deep fresh or brackish reed-fringed lakes, rivers, or saline and alkaline lagoons in open country, also occurring (less often) on estuaries, river deltas and other sheltered coastal habitats on passage or during the winter. The nest is constructed of roots, twigs and leaves near water on the ground in dense vegetation or on floating mats of vegetation amidst reed beds. Although the species usually breeds well-dispersed, neighboring pairs may sometimes nest as close as 30 m apart (BIRDLIFE INTERNATIONAL 2016).

IUCN-Status: Least Concern. The overall population trend is uncertain, as some populations are increasing or have unknown trends (WETLANDS INTERNATIONAL 2015). The two main threats to this species are habitat degradation (DEFOS DU RAU 2002) (e.g. through land-use changes) and hunting (KEAR 2005).

2.5.2 Methodology

Objective: To determine the size and fledgling success of the Ohrid Lake population

The monitoring of the Red-crested Pochard *Netta rufina* at Ohrid Lake can be combined with the monitoring of the Great Crested Grebe (*Podiceps cristatus*) and the Pygmy Cormorant (*Microcarbo pygmaeus*) (see the respective chapters 2.4 and 2.6 for further details), but only if very experienced observers are included in the team (as this is logistically challenging). If such experienced observers are not present, the monitoring of *Microcarbo pygmaeus* should be done separately.

As suggested by GILBERT et al. (1998), the monitoring methodology for diving and dabbling ducks (including Red-crested Pochard) should be implemented from vantage points, in early morning (by 10 am the latest). In addition, given the large surface of Ohrid Lake to be monitored and the limited counting period per monitoring day, simultaneous, parallel counts should be conducted (involving two teams per visit). If there are no

options for two teams, then the survey can be conducted until later in the afternoon. Optional boat surveys and walks to small ditches and reed bed edges not accessible in any other manner might be needed, again keeping a minimum distance in order to reduce disturbances. At all vantage points, it is essential to record all individuals of the species observed, their sex, assemblages (groups or individuals), number of single adults, number of young birds (fledglings) and number of broods attended by adults. Spotting scope and binoculars are used in both vantage point counts and on access paths.

Description of the sampling unit: Counts are made of individual birds (number of single adults), assemblages (groups of individuals), number of young birds (fledglings) and number of broods attended by adults.

Monitoring season and number of visits: The monitoring season lasts from mid-March to mid-July. The monitoring should be conducted once per month during the breeding period and encompass a total of five visits. The suggested dates[21] are:

- 1st visit: ≈ 20 – 25th March
- 2nd visit: ≈ 15 – 20th April
- 3rd visit: ≈ 12 – 17th May
- 4th visit: ≈ 10 – 15th June
- 5th visit: ≈ 5 – 10th July

Time of the day and weather: From early morning until 10 am. If there are no opportunities for two teams to do simultaneous counts, the monitoring period can be prolonged until the afternoon.

Equipment: Binoculars and spotting scopes. Depending on need also a boat (lifejacket and first aid kit). Data Sheets, maps, pencils, camera, GPS.

Manual

- Check the weather forecast before starting the survey.
- Check for availability of two teams to conduct the survey (if only one team is available, be prepared for longer fieldwork).
- Before the survey starts, fill in all paper work per vantage point (name of observers, name of locality, weather conditions, etc.).
- A separate Data Sheet should be used for each visit and vantage point.
- Mark the survey route on the GPS.
- Note the starting time of the survey.
- Note all bird data (per sampling unit) and bird activities that are monitored. Also take note of all possible perturbations encountered, as well as all personal observations that may be useful (in section Notes).
- Take photos of habitats, nesting sites and individuals during the survey.
- Record the end time of the survey.

2.5.3 Locations

The monitoring of the Red-crested Pochard takes place at Lake Ohrid. Locations of vantage points at Lake Ohrid are given in the chapter on Great Crested Grebe *Podiceps cristatus* (see 2.4.3).

[21] Fewer visits up to a minimum of 3 are acceptable in view of time or cost constraints.

2.5.4 Data Sheet (*Netta rufina*)

Field Data Monitoring Sheet for the Breeding Season

Red Crested Pochard
Netta rufina

Observer:		**Contact:**	Tel.:
			E-Mail:

Location:	Lake	**Date:**	
	Country		

Weather Conditions	
Cloud cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; Movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

Time of survey and temperature	
Starting time:	Ending time:
Temperature at start (°C):	Temperature at end (°C):

Name of vantage point	Coordinates WGS UTM (N)	Coordinates WGS UTM (E)	Single adults ♂	Single adults ♀	Adults with brood	Juveniles (fledglings)	Assemblages

Remarks	

* See Beaufort Wind Scale

2.6 Pygmy Cormorant *(Microcarbo pygmaeus)*

2.6.1 General Information

Description: The Pygmy Cormorant (Figure 53) is a medium-sized green-glossed black bird. It has a long tail and short, thick bill. Adults have small white feather tufts on the head, neck and underparts in the breeding season. Non-breeding birds have a white throat. The sexes are similar, but juveniles are duller and browner. It is distinguished from the Great Cormorant and the Common Shag by its much smaller size, lighter build, and proportionally longer tail (ENCYCLOPEDIA OF LIFE 2017).

Figure 53: Pygmy Cormorant, perching (left) and flying (middle, © both photos: Alexander Wirth, naturgucker.de/euronatur) and swimming (right, © Frank Philip Gröhl, naturgucker.de/euronatur).

Distribution: The Pygmy Cormorant breeds in Southeast Europe and Southwest Asia. It is a partial migrant, with Northern populations wintering further south, but mostly still within its breeding range. It is a rare vagrant to Western Europe (ENCYCLOPEDIA OF LIFE 2017).

Habitat: The Pygmy Cormorant breeds colonially in wetlands with still or slowly-flowing fresh water in coastal deltas and well-vegetated freshwater lakes (ENCYCLOPEDIA OF LIFE 2017). The species occurs in reed beds, transition zones between reed beds and open waters, extensively grazed or mowed shores and wet meadows and, in winter, in coastal wetlands, along rivers, and sometimes on inland lakes. The preferred nesting habitat is willow *Salix* trees (BIRDLIFE INTERNATIONAL 2016; Figure 54).

Figure 54: Typical nesting tree (left) with active nest (zoom, right) of Pygmy Cormorant (© Tomaž Mihelič).

IUCN-Status: Least Concern with an increasing large global population. Major threat for the species is the degradation of wetlands through drainage for agriculture (DEL HOYO et al. 1992) and changes in hydrological regimes (EKEN & MAGNIN 1999, KAZANTZIDIS & NAZIRIDES 1999, CRIVELLI et al. 2000).

2.6.2 Methodology

Objective 1: To determine the nesting success of the colony on Lake Shkodra/Skadar

Objective 2: To determine the size of roosting populations on lakes Prespa and Ohrid

The methodology for monitoring this species[22] differs between monitoring of breeding birds (Lake Shkodra/ Skadar and potentially also Prespa and Ohrid, but so far no breeding confirmed[23]) and monitoring of roosting, non-breeding birds (Lakes Prespa and Ohrid).

The monitoring of roosting Pygmy Cormorant (*Microcarbo pygmaeus*) at Ohrid Lake can be combined with the monitoring of Great Crested Grebe (*Podiceps cristatus*) and Red-crested Pochard (*Netta rufina*) (see respective chapters 2.4 and 2.5 for further details), but only if very experienced observers are included in the team (as this is logistically challenging). If such experienced observers are not present, the monitoring of *Microcarbo pygmaeus* should be done separately. In case of combined assessments, note that Great Crested Grebe and Red-Crested Pochard counts are done first between early morning and afternoon, while Pygmy Cormorant counts follow afterwards.

For monitoring breeding birds:

The monitoring sites are pre-identified according to the known locations of breeding sites/colonies. The first visit is therefore mainly focused on detecting the general location and extent, as those might shift annually, as well as estimating the size of the colony and the ratio of apparently occupied and empty nests. This estimation should be done from a distance in order not to disturb the colony during the early stage of breeding, while the exact number of nests should only be counted from within the colony after the breeding season (see info second and third visit below). Three methods might be used for the first visit:

1) It is best to select one (or more) vantage point(s) from which the colony can be observed from a safe distance without disturbing it. The vantage point(s) need(s) to be marked on the field map. All the nests in the colony are counted using binoculars and/or spotting scopes. The count is repeated at least three times and the highest and lowest number of nests counted is noted in the field form.
2) The use of a drone may be an alternative for colonies that cannot be directly observed at a safe distance, but note that this method is focused mostly to detect the extent of the colony and can hardly assess multiple nest layers in dense tree canopies.
3) If neither the observation of the colony from a distance nor the use of a drone is possible, one visit to a restricted part of the colony might be conducted to estimate the proportion of apparently occupied to empty nests (and their respective densities). It is important to use a precise GPS to record every counting spot with the number of nests. In this case, the observer should also estimate the extent of the colony and indicate its borders on the map.

The actual, precise count of all nests in the colony should then be conducted after the breeding season at the second and optional third visit. The method is focused on detecting all apparently occupied and empty nests in each colony by directly visiting the colony. Binoculars are used for identifying apparently occupied and

[22] Different Data Monitoring Sheets are proposed for Pygmy and Great Cormorant. While the former is in line with the general format developed by authors for this Manual, the latter derives from an international monitoring initiative. For practical reasons and consistency, the Data Sheet for Pygmy Cormorant can also be used for Great Cormorant. Users are recommended to get back to authors for clarification if needed.

[23] The breeding population of Pygmy Cormorant in North Macedonia has been estimated to comprise 150 pairs, mainly at Lakes Ohrid and Macro-Prespa (BirdLife International 2004). However, breeding has not been confirmed so far. Historic data from Lake Ohrid as well as the proximity to an existing breeding colony at Lake Micro-Prespa suggest that further monitoring would likely confirm the status of the Pygmy Cormorant as a breeding bird in North Macedonian territories of Lakes Prespa and Ohrid.

empty nests, and spray paint to mark counted trees. If not all nests are visible, an estimation of unseen nests can be made. This should be indicated clearly in the field form.

For monitoring roosting birds:

The traditional roost count method is conducted from vantage points and entails counting Pygmy Cormorant individuals before dusk (from 5 pm onwards) as they gather on their established roosting sites in small numbers (this way they are easier to count). A spotting scope and binoculars are used. The use of a boat is essential for otherwise inaccessible roosts. At least two teams of two surveyors per count are required, due to the limited counting period per monitoring day.

Description of the sampling unit: For monitoring breeding birds: Apparently occupied nests and empty nests.
For monitoring roosting birds: Individuals in roosts.

Monitoring season and number of visits:

For monitoring breeding birds:

- 1st visit between the 1st of May and 31st of May
- 2nd visit between the 1st June and 30th of June
- 3rd visit – end of July or beginning of August (only necessary, if counting of all nests in the colony was impossible during the breeding season).

Allow at least 20 days between individual visits.

For monitoring roosting birds:
Monitoring season of roosting Pygmy Cormorants is from April – July. Recommended count frequency is twice in the period April – July, per lake, with a minimum of two weeks between individual counts. Suggested dates are:

- 1st visit 20th of April to 10th of May
- 2nd visit 20th of May to 10th of June

Time of the day and weather: For monitoring breeding birds: The nests in the colony can be counted throughout the day but morning hours are preferred. It is important that the viewpoint be selected such that the observer is not facing the sun. The weather should be dry and calm.
For monitoring roosting birds: Each team should be on their first vantage point and ready for the count by 5 pm at latest and finish by dusk. If only one team is performing the counts, it should start earlier (ca. 3.30 pm) from a direction where facing the sun is avoided.

Equipment: Binoculars and spotting scopes. Depending on need also a boat (lifejacket and first aid kit) and/or a drone. Data Sheets, maps, pencils, camera, precise GPS are required, too.

For monitoring breeding birds:

Manual

- Choose the day for the survey based on the weather forecast and the preferred dates (see above).
- Before starting the survey check all equipment and information needed. Fill in the information required in the top section of the Data Sheet. Record locality name, observer name, date, and the number of visit.
- A separate Data Sheet is used for every visit.
- Record the starting time of the survey at each site.

- At the first visit, focus mainly on detecting all colonies. To detect the specific voice of the colony, it is important to stop the boat every 500 meters and turn off the engine – or to use sea-kayak, as this allows you to listen while moving silently.
- Record the observation point (with GPS) and place this point and the extent of the colony on the map. Use the same method also for more detailed assessments (e.g. position of each individual nesting tree).
- Record all nests from each marked point. Repeat the count at least three times and record the max number of apparently occupied and empty nests.
- Use the notes section to record the activity of individuals and possible threats to birds (hunting, fishing, etc.).
- Use the casual observations section for other important bird species (especially Natura 2000 species) seen during the colony visit.
- Use the remarks section to record any conditions and problems encountered and other comments you might think useful.
- Take photos of the colony and individuals during the survey.
- Record the end time of the survey.

For monitoring roosting birds:

Manual

- Check weather forecast before starting the survey.
- Check if the survey date coincides with the count date for Great Crested Grebe and/or Red Crested Pochard.
- Check for the availability of two teams to conduct the survey (if only one team is available, be prepared for longer fieldwork).
- Before starting the survey, finish all the paper work per vantage point (name of observers, locality, weather conditions, etc.).
- A separate Data Sheet is used for each visit and vantage point.
- Mark the survey route on the GPS.
- Write down the starting time of the survey.
- Write down all bird data (per sampling unit) and bird activities monitored. Also note possible perturbations encountered, as well as personal observations that may be useful (in section notes).
- Take photos of habitats, nesting sites and individuals during the survey.
- Record the end time of the survey.

2.6.3 Locations

The monitoring of Pygmy Cormorant takes place at Lake Shkodra/Skadar (breeding birds) and at Lakes Prespa and Ohrid (roosting birds, so far no breeding confirmed).

For Lakes Prespa and Ohrid:
See the maps for Lakes Prespa and Ohrid in the chapter for Great Crested Grebe *Podiceps cristatus (2.4.3)*.

For Lake Shkodra/Skadar:
See the maps on the following pages (Figures 55 – 57). Please note that the colony site of pygmy cormorants at Lake Shkodra/Skadar is constantly shifting, which makes it hard to adopt strict points and transects.

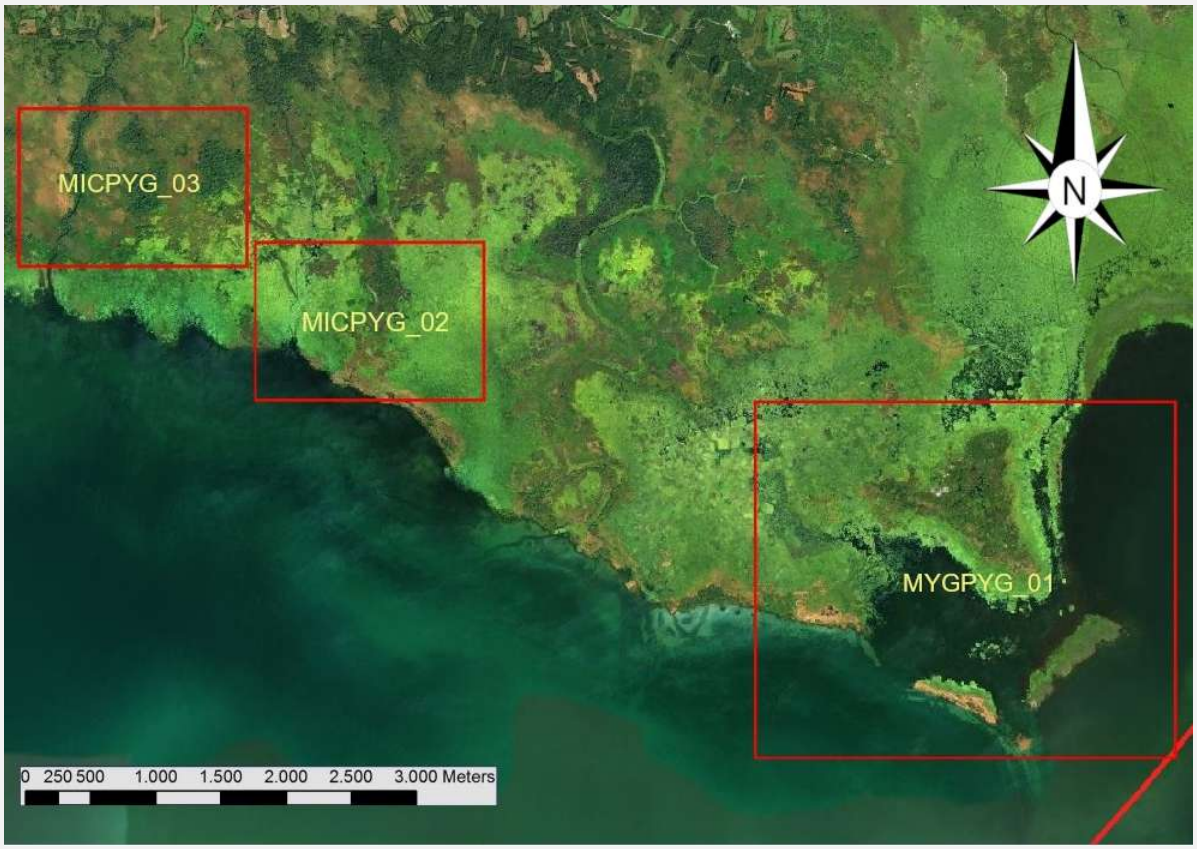


Figure 55: Overview map of all monitoring sites in the Northern part of Lake Shkodra/Skadar at low water level.

Figure 56: Overview map of all monitoring sites in the Northern part of Lake Shkodra/Skadar at high water level.

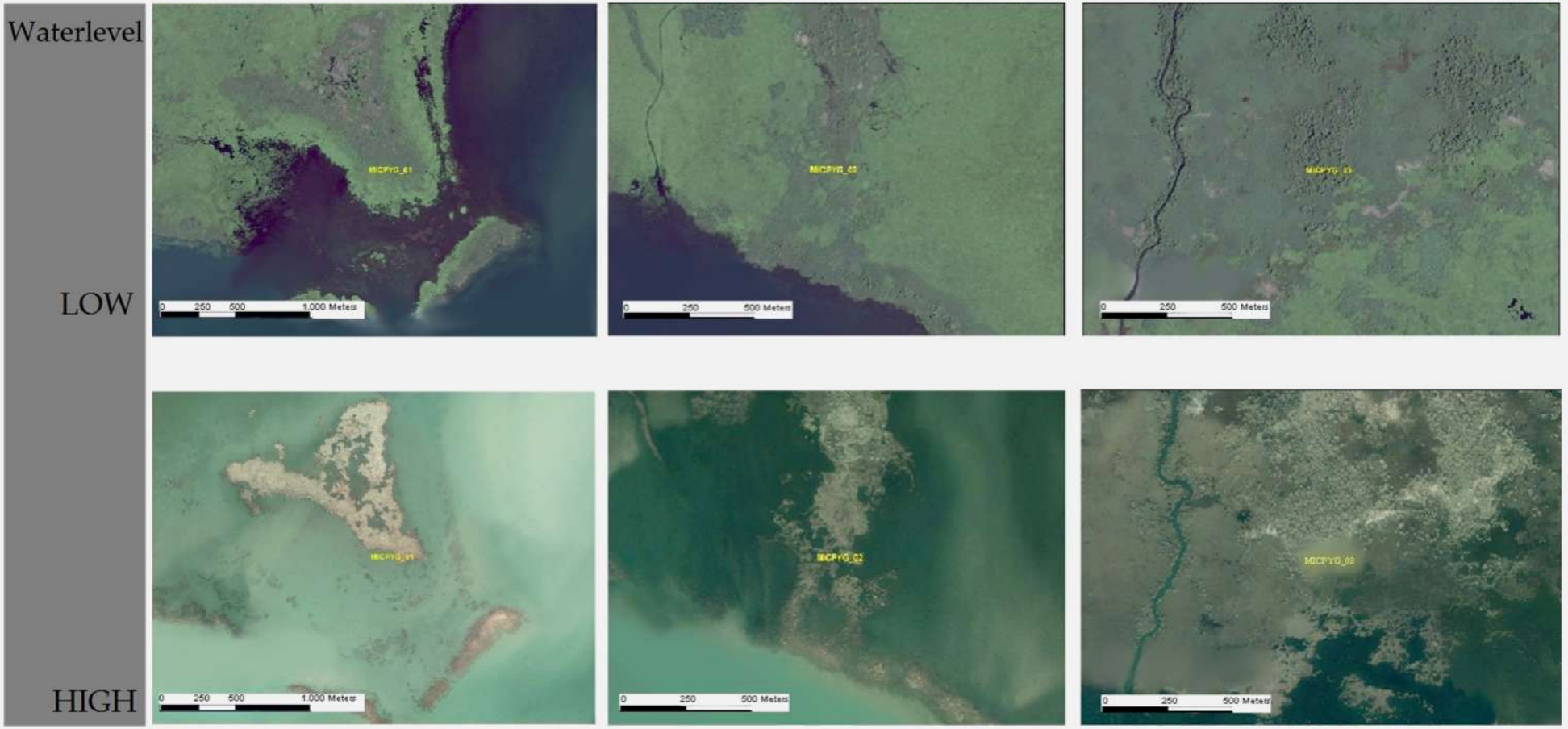


Figure 57: Detailed maps of the three monitoring sites (left: Site 1; middle: Site 2; right: Site 3) in the Northern part of Lake Shkodra/Skadar at low (upper row) and high (lower row) tide.

2.6.4 Data Sheets (*Microcarbo pygmaeus*)

Field Data Monitoring Sheet for BREEDING Birds

Pygmy Cormorant
Microcarbo pygmeus

Observer:		**Contact:**	Tel.: E-Mail:
Location:		**Date:**	
Colony: (short description)	*Size, main nesting trees, remarks*		

Weather Conditions	
Cloud cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

Time of survey and temperature	
Starting time:	Ending time:
Temperature at start (°C):	Temperature at end (°C):

All observations should be marked on the map with x for location and ID

ID_GPS	**Coordinates** WGS UTM (N)	WGS UTM (E)	**Number of nests** active (with eggs or nestlings	empty**	**Notes**

Occurrence of other important species	
General remarks	

* See Beaufort Wind Scale
** Completely built and from current breeding season

Field Data Monitoring Sheet for ROOSTING Birds

Pygmy Cormorant
Microcarbo pygmeus

Observer:		Contact:	Tel.:
			E-Mail:

Location:	Lake	**Date:**	
	Country		

Weather Conditions	
Cloud cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

Time of survey and temperature	
Starting time:	Ending time:
Temperature at start (°C):	Temperature at end (°C):

Name of vantage point	Coordinates WGS UTM (N)	WGS UTM (E)	Adults	Juveniles	Behaviour	Notes

Remarks	

* See Beaufort Wind Scale

2.7 Great Cormorant *(Phalacrocorax carbo)*

2.7.1 General Information

Description: Great Cormorant adults are black with a bluish or green sheen (Figure 58). At the base of the bill is an area of bare, yellow skin surrounded by white. During the breeding season, there is a white patch on the thigh, and throughout the year, a variable amount of white occurs on the crown and back of the neck. Juveniles are dark brown and have a white area on the underparts (ENCYCLOPEDIA OF LIFE 2017).

Figure 58: Great Cormorant resting (left) and in flight (right, pictures: © Sigrun Brüggenthies, naturgucker.de/euronatur).

Distribution: Great Cormorants are one of the most widespread of cormorant species, with a cosmopolitan distribution. Great Cormorants are found throughout Europe, Asia, Africa, Australia, and in north-Eastern coastal North America (ENCYCLOPEDIA OF LIFE 2017).

Habitat: The Great Cormorant is a habitat generalist that frequents a wide variety of both coastal and inland wetlands. On the coast, the species nests on inshore islands, cliffs, stacks, amongst boulders and occasionally on artificial structures. Inland it nests on trees or bushes, in reed beds or on bare ground, usually in mixed-species colonies, often re-using sites and nests from year to year (BIRDLIFE INTERNATIONAL 2017).

IUCN-Status: Least Concern. Number of mature individuals is increasing. Due to the species' foraging behavior (shallow diving) and habit of hunting, the species is particularly susceptible to bycatch. However, these unintentional effects of fishing activities are not currently found to be driving colony declines, though they could present problems on both local and global scales if populations were to decline (BREGNBALLE & FREDERIKSEN 2006).

2.7.2 Methodology

Objective: To determine the breeding success of the nesting colony on Golem Grad Island

Monitoring pertains to the breeding colony at Golem Grad Island in Prespa Lake.[24]

A minimum of three and maximum of five teams consisting of two surveyors will survey different parts of the island, covering as much of the colony on the island's territory as possible. This is a tree-nesting colony, with Greek Juniper as a predominant tree species. Data gathering protocols follow recommendations for counting cormorant colonies by the Cormorant Research Group. Binoculars are used to distinguish occupied from abandoned nests, and spray paint to mark counted trees. Most of the breeding trees have already been marked by

[24] See Footnote 23 for the use of Monitoring Data Sheets

the National Park Authorities. Where needed, additional markings can be made in order to follow changes in colony extent and in the number of nests per individual tree.

Description of the sampling unit: Monitor and record apparently occupied and empty nests. The way to distinguish between these two types of nests is by bird activity (adult birds flying in, moving while staying in the nest or breeding) and by examining the ground surrounding the nest (look for fresh guano, feathers and remnants of food).

Monitoring season and number of visits: The monitoring should be conducted once per month in the mid-breeding season (April – May), i.e. consist of two visits, with a minimum of three weeks between them. The suggested dates are:

- 1st visit: ≈ 10 – 15th April
- 2nd visit: ≈ 15 – 20th May

Time of the day and weather: Time of the day for the nest count is from 9 am earliest (start of the survey) until finished.

Equipment: Binoculars and spotting scopes. Depending on the need also a boat (lifejacket and first aid kit) and/or a drone. Data Sheets, maps, pencils, camera, GPS. Spray paint is optional (to mark trees on which nests have been counted).

Manual

- Check weather forecast before starting a survey.
- Before the survey, fill in all the paperwork per part of the colony (name of observers, name of locality, weather conditions, etc.).
- A separate Data Sheet is used for every visit.
- Mark the survey route on the GPS.
- Note the starting time of the survey.
- Note all bird and nest data and bird activities to be monitored. Also take note of possible incidences, as well as all personal observations that may be useful (in section remarks).
- Take photos of habitats, nesting sites and individuals during the survey.
- Record the end time of the survey.

2.7.3 Locations

The Great Cormorant is monitored at its breeding colony on Golem Grad Island in Great Prespa Lake (refer to the following map; Figure 59).

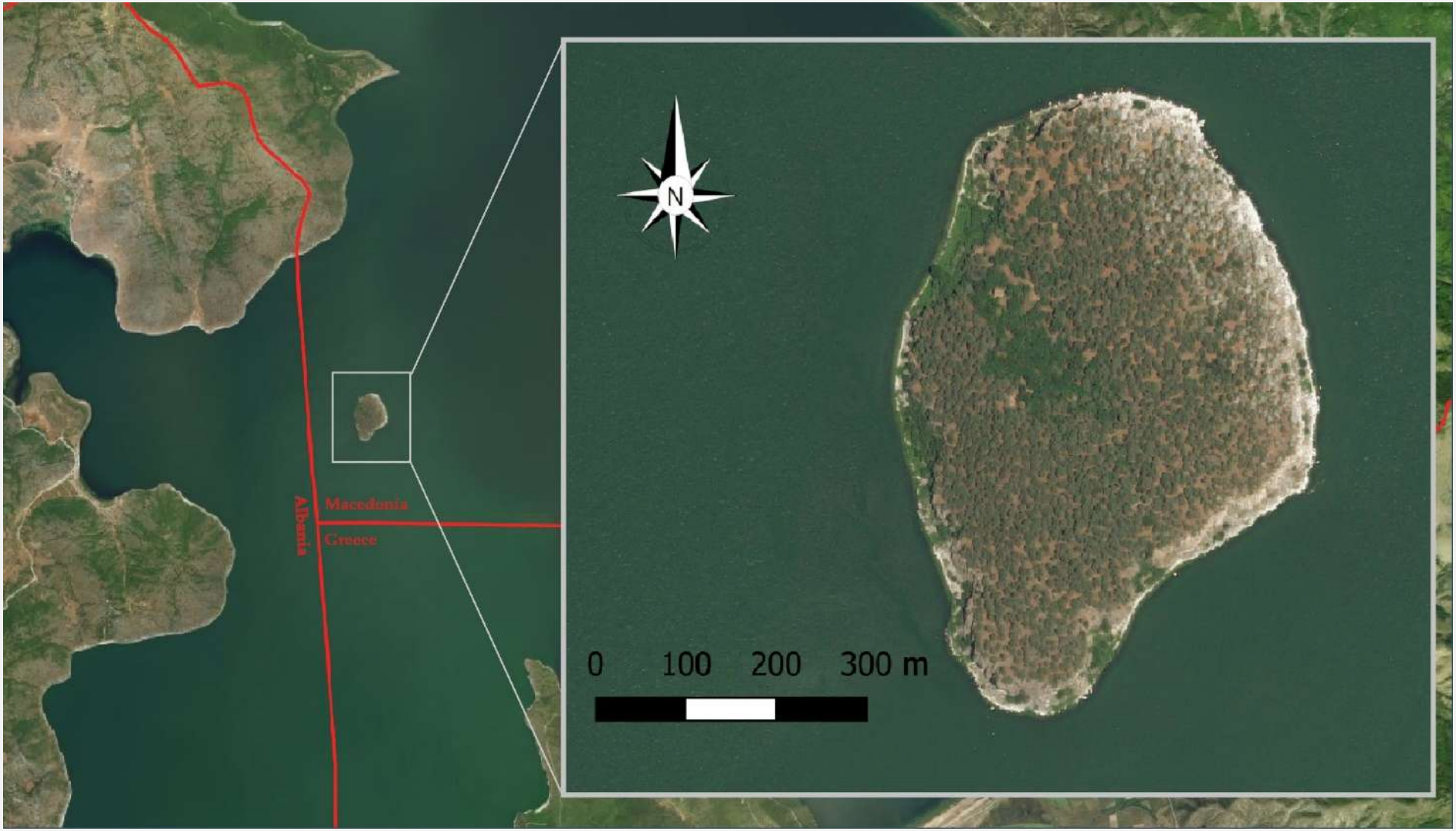


Figure 59: Detailed Map of Golem Island in Great Prespa Lake. Note the tree-nesting bird colony along the Northeastern and Eastern shoreline of the island, indicated by the white color of the birds' guano on the nesting trees and ground.

2.7.4 Data Sheet *(Phalacrocorax carbo)*

Great Cormorants in the Western Palearctic

Breeding colony census 2012

Organised by

IUCN/Wetlands International Cormorant Research Group (**CRG**)

& The European Commission project **CorMan**

* **NAME - Person that filled this form**	
* **E-MAIL ADDRESS - for correspondence**	
* **NAME OF OBSERVER(s)**	
E-MAIL ADDRESS OF MAIN OBSERVER	
* **COUNTRY**	

Issue (* = obligatory)	**DATA**
Colony	
* **COLONY NAME**	
AREA / REGION	
COLONY NUMBER (if known)	
* **LATITUDE**, decimal degrees	
* **LONGITUDE**, decimal degrees	
Latitude - In another coordinate system	
Longitude - In another coordinate system	
What other coordinate system is used	
MAIN HABITAT TYPE COLONY	
COLONY EXPOSED TO MANAGEMENT	
Count	
DATE OF COUNT (dd-mm-yr)	
COUNTING METHOD	
* **NUMBER OF NESTS (best estimate)**	
MINIMUM NUMBER OF NESTS	
MAXIMUM NUMBER OF NESTS	
% BREEDING ON GROUND	
Remarks	
REMARKS - The count	
REMARKS - Nest distribution	
REMARKS - Management	
REMARKS - Disturbance	
REMARKS - Predation	
REMARKS - Clutch size / Brood size / Breeding success	
REMARKS - Other topics	

2.8 Whiskered Tern *(Chlidonias hybrida)*

2.8.1 General Information

Description: The Whiskered Tern is a small marsh tern, with an overall length of 23 – 25 cm and a wingspan of about 55 cm (Figure 60). The tail is rather short and forked. The wings are dark grey-colored above, as is the back and the belly. Adults have a black crown, white cheeks, red legs and a red bill in summer plumage. The rump is pale grey throughout the year. The black crown fades during the winter. Males and females are alike.

Figure 60: Whiskered Terns in flight (© Andreas Schäfferling, naturgucker.de/euronatur).

Distribution: The Whiskered Tern is distributed across the Old World in Eurasia, Africa and Australia. The European breeding birds are long-distance migrants with breeding populations scattered through Central, Eastern and Southern Europe, which winter in Africa. At Lake Shkodra/Skadar, the Whiskered Tern is present from the end of April and mating begins normally in mid-May. The population at Lake Shkodra/Skadar is increasing rapidly. Since 1974, when the first 15 nests were found, the population reached 800 breeding pairs in nine colonies in 2015 (DUBAK, personal communication).

Habitat: The Whiskered Tern uses a variety of wetland habitats but shows a preference for freshwater marshland with scattered pools, particularly where the surrounding vegetation is grazed by large herbivores. It frequents inland lakes, rivers, marshes, temporary pans, artificial fishponds and drainage-ponds covered with water lilies, swamps, river pools, reservoirs, large dams, sewage-ponds, flooded saltmarshes, arable fields and rice-fields (BIRDLIFE INTERNATIONAL 2017). At Lake Shkodra/Skadar, the Whiskered Tern nests in colonies in the swamp zone and in the zone of floating vegetation consisting mainly of white and yellow water lilies.

IUCN-Status: Least Concern. Overall population trend is stable. Within its European range it suffers from the loss of natural wetlands to land reclamation, dry seasons and an increase in drainage schemes (HAGEMEIJER & BLAIR 1997), as well as the canalization of rivers (TUCKER & HEATH 1994).

2.8.2 Methodology

Objective: To determine the population trend on Lake Shkodra/Skadar

The colonies of Whiskered Terns at Lake Shkodra/Skadar are distributed mainly along the Northern part of the lake (Figures 61 & 62).[25] The annual monitoring does not sample the whole population due to various restrictions, but it covers a representative sample in order to estimate a trend in colony size. However, full surveys should be conducted at regular intervals, e.g. every five years.

[25] Monitoring of Whiskered Tern had not initially been foreseen for the Albanian part of the lake, hence no monitoring sites are being proposed. However, since it is also a breeding bird there, it is recommended to monitor this species also in Albania.

The monitoring of Whiskered Tern is conducted along a transect traversing the north shore where several colonies are expected to be found. The first visit serves to determine the exact location of the colonies (as they may shift from year to year) by using both vision and sound (therefore the engine of the boat needs to be switched off regularly). After the colonies along the transect have been mapped, the second visit aims to estimate the number of breeding pairs in each colony. During the second visit, adult individuals flying above and besides the colony are counted (when birds are flushed from their nests by the presence of observers they may be circling in the vicinity). The observer should not enter the colonies; instead, he or she should stay in the border zone besides them. Adult birds are counted repeatedly to acquire the correct number. The final number is entered into the field form and later multiplied with a correction factor of 0.7. The resulting product represents the absolute number of pairs for that species (BIBBY et al. 1992).

While the focus is on the method described above, additional data can be obtained if time and resources allow. Direct counting of active nests with incubating birds, eggs and/or chicks can often be done during visits of the colony border zone. The aim of this method is to detect breeding success and not just presence of presumably breeding adults. However, to avoid disturbances, observers should only count active nests visible from the edge of the colonies and must not enter the colony to count all active nests. Instead, they should estimate the percentage of the total colony area checked for nests. Under the assumption of heterogeneous distribution of nests across the colony, one can later extrapolate the number of active nests per colony. The number of active nests per colony will provide a qualitative measure to assess breeding success.

Description of the sampling unit:

- Adult birds flying above the colony
- Active nests

Monitoring season and number of visits: The colonies should be visited at least 2 times during the breeding season.

- 1st visit: end of May to mid-June
- 2nd visit: mid-June to mid-July (but at least 7 days after the 1st visit)

Time of the day and weather: Monitoring can be done during the whole day but for the first visit (colony detection) afternoon to evening (from 4 hours before sunset to sunset) is recommended as the feeding frequency is increased during this time. As the survey is conducted from the boat, dry and calm weather is important.

Equipment: Boat (life jackets and first aid kit), binoculars, spotting scope, this manual and maps, Data Sheet and pencil, camera, GPS.

Manual

- Choose the day for the survey based on weather forecast and preferred dates.
- Before you start the survey check all equipment and information needed. Fill in the information required in the top section of the Data Sheet. Record the locality name, observer name, date, and the number of visit.
- A separate Data Sheet is used for each visit.
- Record the starting time of the survey for each transect.
- Record a GPS track and store it with the name of transect and date.
- Record all observations of Whiskered Tern colonies.
- Place all observations on the map using "x" for location, using the same ID as in the field form (e.g. "x1", "x2", etc.).
- Record the number of individuals present at the colony visit. Repeat the count at least 3 times and enter matching numbers.
- Record the number of active nests (visible eggs, fledglings or breeding birds).
- Use the Casual observation section for other important bird species (especially Natura 2000 species) seen on the transect route.
- Use the remarks section to report any conditions and problems encountered and other comments you might think are useful.
- Take photos of habitats and individuals during the survey.
- Record the end time of the survey.

2.8.3 Locations

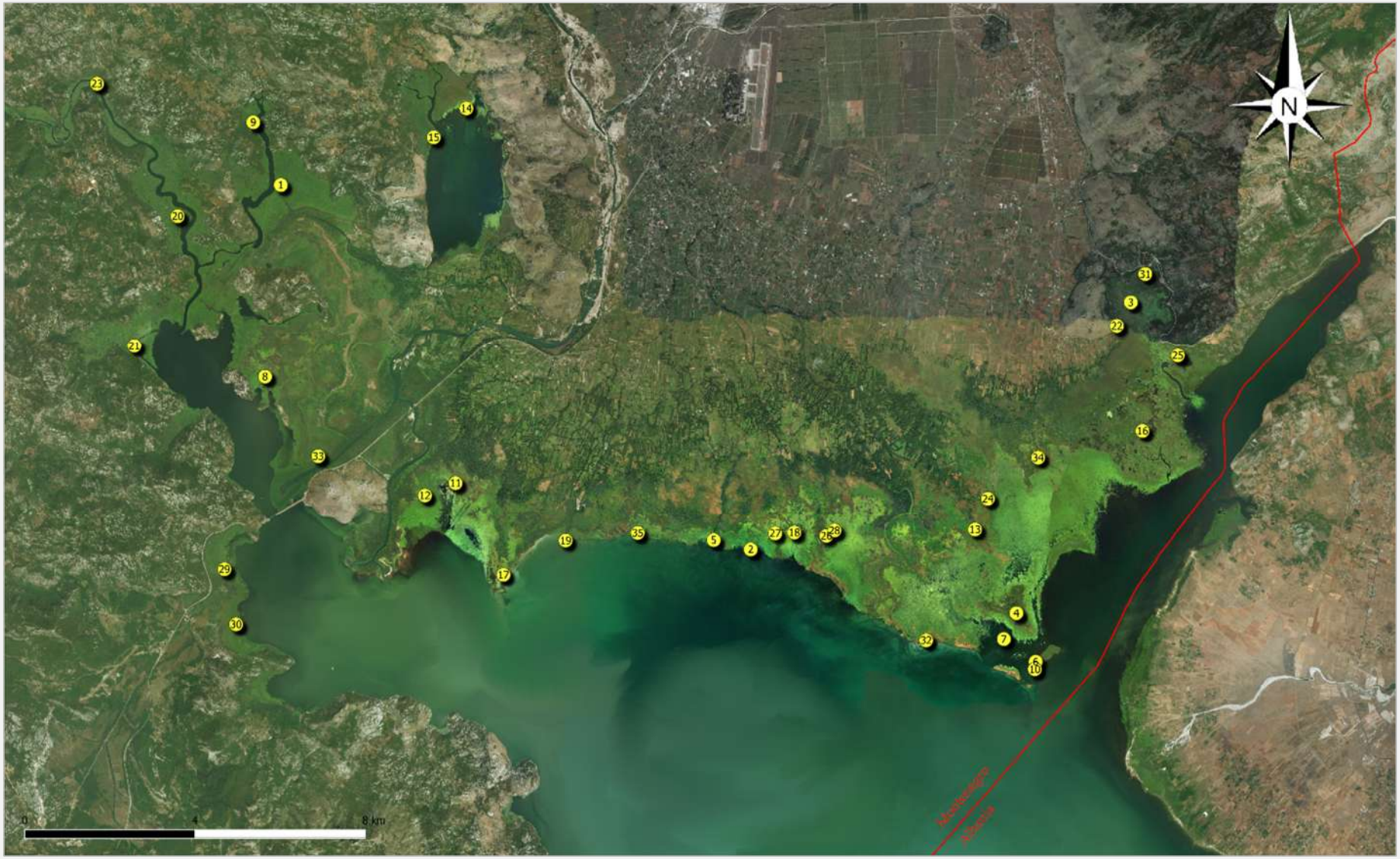


Figure 61: Overview of the locations of known colonies of Whiskered Tern *(Chlidonias hybrida)* at Lake Shkodra/Skadar (note that not all colonies are active every year and exact locations may shift depending on water and disturbance level). See the table below for coordinates of individual locations.

No.	Place/WP name	WGS UTM **N**	WGS UTM **E**
1	Bazagur	42°20'18.9"N	19°06'52.4"E
2	Chlhy	42°15'48.6"N	19°15'02.3"E
3	Chlhy2	42°19'03.4"N	19°21'27.0"E
4	Crni zar	42°15'04.1"N	19°19'35.9"E
5	Gostiljska rij	42°15'55.1"N	19°14'24.2"E
6	Hyb& NIG	42°14'27.4"N	19°19'56.7"E
7	Jendek	42°14'44.2"N	19°19'23.6"E
8	Kamenik	42°17'52.8"N	19°06'40.7"E
9	Karuc	42°21'06.7"N	19°06'22.7"E
10	Koracica	42°14'21.7"N	19°19'55.9"E
11	Kornjaca1	42°16'34.9"N	19°09'58.3"E
12	Kornjaca2	42°16'24.9"N	19°09'27.2"E
13	Kujov brijeg	42°16'07.2"N	19°18'51.8"E
14	Malo Blato 1	42°21'20.8"N	19°10'01.1"E
15	Malo Blato 2	42°20'58.3"N	19°09'28.3"E
16	Panceva oka	42°17'25.2"N	19°21'41.5"E
17	Pijesci	42°15'25.3"N	19°10'49.5"E
18	Pjavnik	42°16'02.1"N	19°15'46.7"E
19	Plavnica	42°15'52.5"N	19°11'52.4"E
20	Ploce	42°19'53.5"N	19°05'07.3"E
21	Poseljani	42°18'14.3"N	19°04'25.9"E
22	Pothum	42°18'45.3"N	19°21'13.2"E
23	Rijeka Crnojevica	42°21'33.4"N	19°03'41.5"E
24	Sarove topole	42°16'31.3"N	19°19'04.3"E
25	Stanaj	42°18'23.3"N	19°22'16.2"E
26	Stehi1	42°16'00.2"N	19°16'19.7"E
27	Stehi2	42°16'01.2"N	19°15'27.1"E
28	Stehi3	42°16'04.3"N	19°16'27.7"E
29	Virpazar1	42°15'24.9"N	19°06'03.4"E
30	Virpazar2	42°14'43.2"N	19°06'16.5"E
31	Vitoja	42°19'25.1"N	19°21'41.3"E
32	Vrbovec	42°14'42.0"N	19°18'03.9"E
33	Zabljacke livade	42°16'53.1"N	19°07'37.0"E
34	Zbeljska rijeka	42°17'03.4"N	19°19'55.0"E
35	Zetica	42°15'59.4"N	19°13'06.1"E

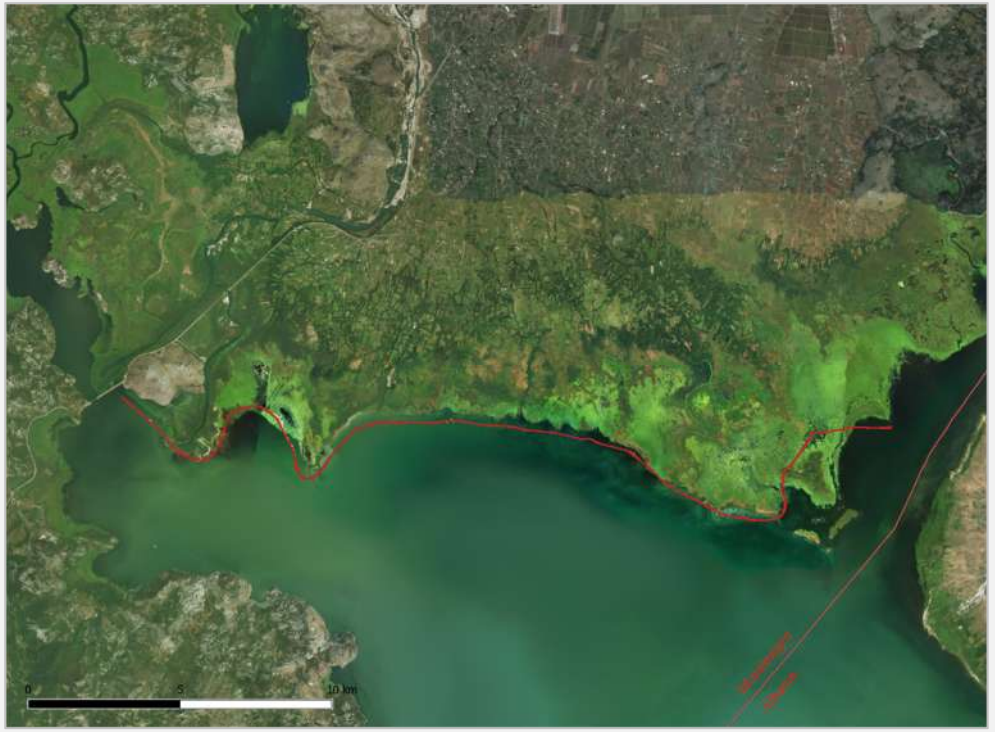


Figure 62: Transect for the sampling of Whiskered Tern *(Chlidonias hybrida*) at the Northern part of Lake Shkodra/Skadar.

Table 6: Coordinates and location names of colonies of Whiskered Tern (*Chlidonias hybrida)* at the Northern part of Lake Shkodra/Skadar at the beginning of previous monitoring sessions. Since the colonies shift each season, the coordinates given are to be used as guidance only and have to be revised every year.

2.8.4 Data Sheet *(Chlidonias hybrida)*

Field Data Monitoring Sheet for the Breeding Season

Whiskered Tern
Chlidonias hybrida

Observer:		**Contact:**	Tel.:
			E-Mail:
Location:	Lake	**Date:**	
	Country		
Transect (short description)	*Starting point, ending point*		

Weather Conditions	
Cloud cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

Time of survey and temperature	
Starting time:	Ending time:
Temperature at start (°C):	Temperature at end (°C):

All observations should be marked on the map with x for location and ID

ID_ GPS	**Coordinates** WGS UTM (N)	WGS UTM (E)	**Number of individuals****	**Number of active nests*****	**% of colony area checked for nests**	**Notes**

General remarks	

* See Beaufort Wind Scale
** Number of all adult individuals present at colony visit (min. 3 counts)
*** Active nests: with eggs, birds incubating or fledglings

2.9 Grey Heron *(Ardea cinerea)*

2.9.1 General Information

Description: The Grey Heron is the largest heron in Europe (Figure 63). It has a long neck, a strong, dagger-like bill and long yellow legs. In flight, the neck is folded back, and the wings are bowed. In adults, the forehead, sides of the head and the center of the crown are white, whereas in juveniles these are greyish. The sexes are similar in appearance (ENCYCLOPEDIA OF LIFE 2017).

Figure 63: Grey Heron standing (left, © Roland Tichai, naturgucker.de/euronatur) and in flight (right, © Sigrun Brüggenthies, naturgucker.de/euronatur).

Distribution: Grey Herons are found throughout Eurasia and Africa. The Northernmost extent of their range is restricted to regions that provide at least four months of warm weather. As the Grey Heron is considered only partially migratory, its range does not diminish significantly during winter or breeding seasons (BIRDLIFE INTERNATIONAL 2016).

Habitat: The Grey Heron is a habitat generalist, inhabiting any kind of shallow water, either fresh, brackish or saline, either standing or flowing, and shows a preference for areas with trees as it is commonly an arboreal rooster and nester. Some degree of isolation and protection are also typical of places chosen for roosting and nesting (BIRDLIFE INTERNATIONAL 2016).

IUCN-Status: Least Concern. The overall population trend is uncertain, as some populations are decreasing, while others are stable, increasing or have unknown trends (WETLANDS INTERNATIONAL 2015). A moderate increase between 1980 and 2013 has been estimated for the European population. However, the European breeding population is thought to have undergone a short-term decline between 2000 and 2012 (BIRDLIFE INTERNATIONAL 2015). Tree cutting is a threat throughout much of the species' range, either because of direct removal of nesting trees or disturbance of nearby colonies (KUSHLAN & HANCOCK 2005).

2.9.2 Methodology

Objective: To determine the nesting success of the nesting colony at Golem Grad Island

Grey Herons are proposed to be monitored only at Great Prespa Lake. The proposed methodology is therefore specific for this lake.

Grey Herons are monitored by conducting a nest count of the entire breeding colony on Golem Grad Island in Great Prespa Lake. Both occupied and abandoned nests are included in the count. Binoculars are used to observe the colony by boat from a safe distance in order to reduce disturbances during the incubation period. Once the fledglings are feathered, approaching and entering the colony is also possible. This disturbance does not normally cause nest abandonment or influence breeding success. A minimum of one team consisting of two surveyors is required.

Description of the sampling unit: Both occupied and abandoned nests in the colony are counted. The way to distinguish between them is by recording activity (e.g., adult birds flying in or moving while staying in the nest or breeding) and by examining the ground surrounding the nest (traces of fresh guano, feathers and remnants of food).

Monitoring season and number of visits: Nest counts should be conducted once per month in the mid-breeding season, which lasts from early April to the end of May, i.e. a total of two visits, with at least 30 days in between.

- 1st visit: during the incubation period, i.e. in April; to be conducted by boat (not entering the colony)
- 2nd visit: when the juveniles have fledged, i.e. in May, but at least 30 days after the 1st visit; the 2nd visit can be done on foot in order to enter the colony

Time of the day and weather: The time of day to conduct the count is from noon until 5 pm. Rain, cold and strong solar radiation should be avoided.

Equipment: Boat (life jackets and first aid kit), binoculars, this manual and maps, Data Sheet and pencil, camera, GPS, thermometer.

Manual

- Check the weather forecast before starting the survey (especially in April, the lake can still be wavy).
- Contact the boatman to make an appointment and provide info on the lake conditions.
- Before starting the observation, do all the necessary paperwork (name of observers, name of locality, etc.).
- A separate Data Sheet should be used for each visit.
- Record temperature and weather conditions on the Data Sheet.
- Mark the survey route on the GPS.
- After arrival close to/on the island, wait for the birds to calm down and get accustomed to human presence.
- Record the starting time of the survey.
- Note all bird data (per sampling unit) and activities monitored. Also, take note of all possible issues encountered, as well as personal observations that may be useful (in the sections notes and additional notes).
- Take photos of habitat, nesting site and individuals during the survey.
- Record the end time of the survey.

2.9.3 Locations

Grey Herons are monitored by conducting a nest count of the entire breeding colony on Golem Grad Island (40°52'10.2"N 20°59'24.4"E) in Great Prespa Lake. Find an overview map on the following page (Figure 64).

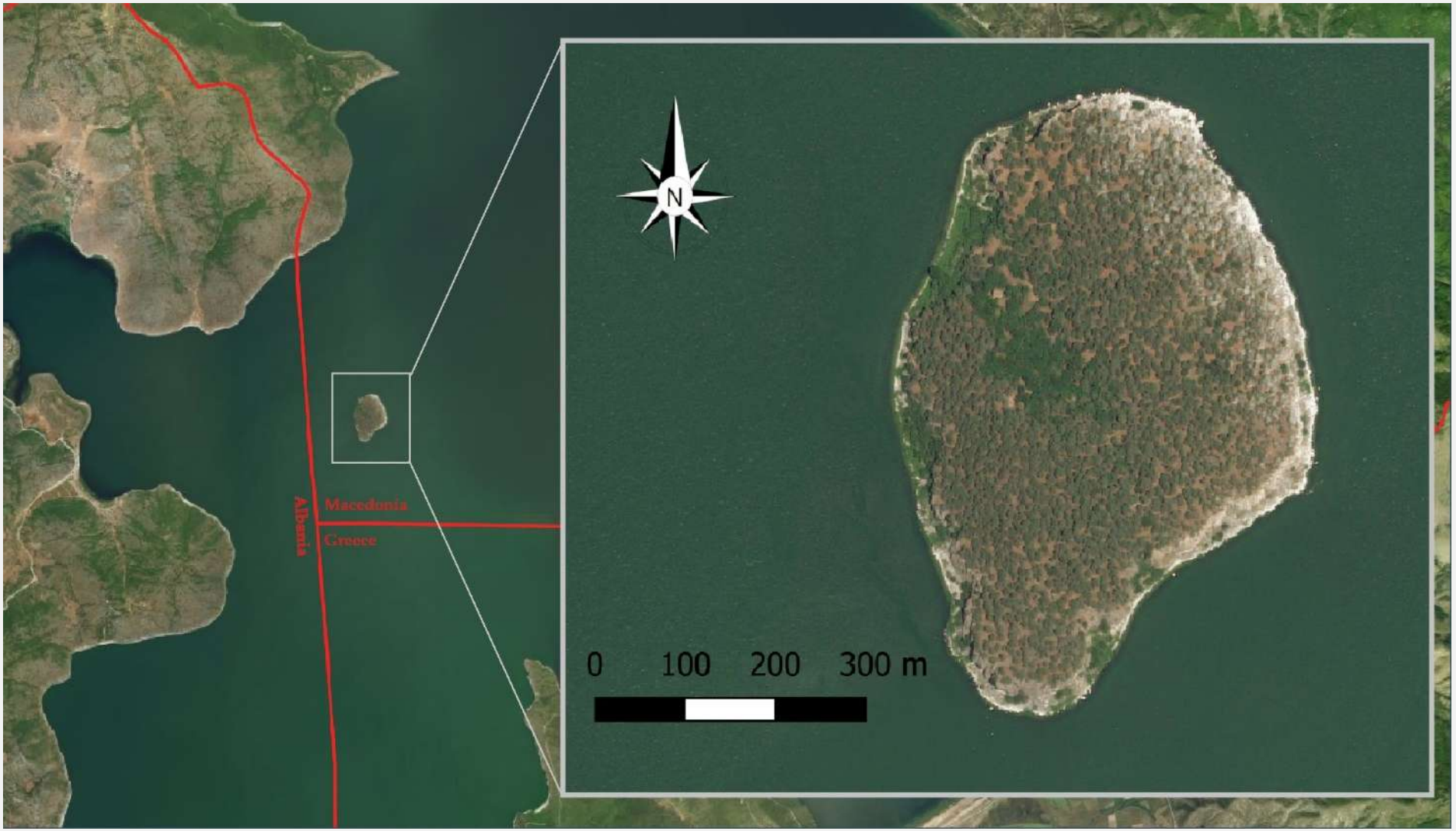


Figure 64: Detailed Map of Golem Grad Island in Great Prespa Lake. Note the nesting bird colonies along the Northeastern and Eastern shoreline, indicated by the white color of the birds' guano on the nesting trees and ground.

2.9.4 Data Sheet *(Ardea cinerea)*

Field Data Monitoring Sheet for the Breeding Season

Grey Heron
Ardea cinerea

Observer:		**Contact:**	Tel.:
			E-Mail:

Location:	Side of island:	**Date:**	
	Coordinates:		

Weather Conditions	
Cloud Cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

Time of survey and temperature	
Starting time:	Ending time:
Temperature at start (°C):	Temperature at end (°C):

All observations should be marked on the map with x for location and ID

Nest no.	**Nest state** active/abandoned	**Eggs**	**Juveniles**	**Adults**	**Pairs** yes/no	**Notes**
1						
2						
3						
4						
5						
6						
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25						

General Remarks	

* See Beaufort Wind Scale

2.10 Dalmatian Pelican *(Pelecanus crispus)*

2.10.1 General Information

Description: The Dalmatian Pelican is a very conspicuous bird (Figures 65 & 66). During the breeding season the silvery-white plumage contrasts with the orange-red pouch beneath the bill and the yellow to purple bare skin around the eyes. On the nape it has a thick crest of silver feathers. The undersides of the wings are pale grey, darkening towards the ends. As the breeding season progresses, the pouch fades to yellow, and during the winter the plumage loses its silvery sheen, appearing whitish or grey (ENCYCLOPEDIA OF LIFE 2017).

Figure 65: Swimming Dalmatian Pelican during breeding season recognizable by the reddish coloration of the pouch (© Alexander Wirth, naturgucker.de/euronatur)

Figure 66: Dalmatian Pelican in flight during the non-breeding season (© Alexander Wirth, naturgucker.de/ euronatur)

Distribution: The Dalmatian Pelican breeds in Eastern and Southeastern Europe and East-Central Asia. European breeders winter in the Eastern Mediterranean countries, Russian and Central Asian breeders in Iran, Iraq and the Indian subcontinent, and Mongolian birds along the East coast of China (ENCYCLOPEDIA OF LIFE 2017).

Habitat: The Dalmatian Pelican occurs mainly at inland, freshwater wetlands but also at coastal lagoons, river deltas and estuaries. It breeds on small islands in freshwater lakes or in dense aquatic vegetation such as reed beds of *Typha* and *Phragmites*. A few breed in Mediterranean coastal lagoons. When migrating, large lakes form important stopover sites (BIRDLIFE INTERNATIONAL 2016).

IUCN-Status: Near Threatened. Of the nine countries where the species breeds regularly, four populations are fluctuating (Russia, Bulgaria, Ukraine and Montenegro), three are increasing (Greece, Turkey and Albania) and one is stable (Romania) (CATSADORAKIS & PORTOLOU 2017). Additionally, the species in Southeast Europe is entirely management-dependent and so the removal of conservation measures could lead to future population declines. Former declines were primarily caused by wetland drainage, shooting and persecution by fishers (CRIVELLI 1994, CRIVELLI et al. 1997, MIX & BRÄUNLICH 2000).

2.10.2 Methodology

Objective: To determine the size and demographic structure of the resident population

Great Prespa Lake: The monitoring methodology consists of two parts. The first entails counting the mixed pelican roost on Golem Grad Island (number and age of individuals) from the boat. The second part consists of counting foraging individuals on the entire lake surface from counting points on the North Macedonian and Albanian part of the lake[26]. All individuals are counted, discerning the two sympatric species of pelicans

[26] Albanian counting points remain to be determined.

(Dalmatian Pelican and Great White Pelican), taking notes in regards to age class (adult and immature), activity (fishing, roosting, and flying) and other important features and observations (e.g. communal fishing with cormorants, ringed individuals, etc.). Counts are carried out as part of the regular Prespa pelican census implemented by the Society for the Protection of Prespa (SPP), the North Macedonian Ecological Society (MES) and Protection and Preservation of Natural Environment in Albania (PPNEA).

Binoculars and spotting scopes are needed to distinguish pelican species in mixed roosts. Pelicans are well adapted to boats at the lake surface (they benefit from approaching the fishers), and therefore the disturbance is not considered a threatening factor.

Lake Shkodra/Skadar: Dalmatian Pelican at Lake Skadar is at present exclusively breeding on man-made rafts (Great White Pelican is not breeding on the lake). Rafts have been installed in Pančeva oka area in the North-eastern part of the lake with support from a pelican conservation consortium led by Noé Conservation, as well as CSBL (one raft). Monitoring of the colony is ongoing and has also been supported by CSBL. The monitoring is done by boat (by the Natural History Museum of Montenegro) and from Hum Hill, a vantage point located north of the colony (by the Montenegrin NGO CZIP). As for the lake-specific monitoring scheme, it is recommended to closely collaborate with these organizations, as well as with the administration of Skadar Lake National Park.

Description of the sampling unit: Counts are made of individuals and potential nesting pairs.

Monitoring season and number of visits: The monitoring season lasts from the time of return of the migratory birds to their breeding grounds in February until the end of July. Counts should be performed twice a month, so during the six month breeding season the total number of visits is 12 (in accordance with the regular pelican census conducted at Prespa mentioned above).[27]

Time of the day and weather: Vantage (sector) count starting time should be early in the morning, finishing at 11 am at the latest. The timing of boat counts depends on the season. Early in the season, boat counts start between noon and 1 pm while later in the season they can commence as late as 5 pm.

Equipment: Binoculars and telescopes (spotting scope). Depending on need also a boat (lifejacket and first aid kit) and/or a drone. Data Sheets, maps, pencils, camera, GPS.

Manual

- Check weather forecast before starting the survey.
- Before the survey starts, enter all general information into the form (name of observers, locality, weather conditions, etc.).
- A separate Data Sheet is used for each visit, vantage point or boat survey.
- Mark the survey route on the GPS.
- Record the starting time of the survey.
- Enter all bird data (per sampling unit) and activities to be monitored.
- Take note of all possible issues considered relevant and personal observations that may be useful (in section remarks).
- Take photos of habitats, nesting site and individuals during the survey.
- Record the end time of the survey.

2.10.3 Locations

The Dalmatian Pelican is monitored at Lakes Shkodra/Skadar and Prespa. The Great White Pelican is monitored only at Lake Prespa (as it does not breed at Lake Shkodra/Skadar). The following maps indicate the proposed vantage points (Figures 67 – 70).

[27] Fewer visits up to a minimum of 6 (i.e., one visit per month) are acceptable in view of time or cost constraints.

Lake Prespa

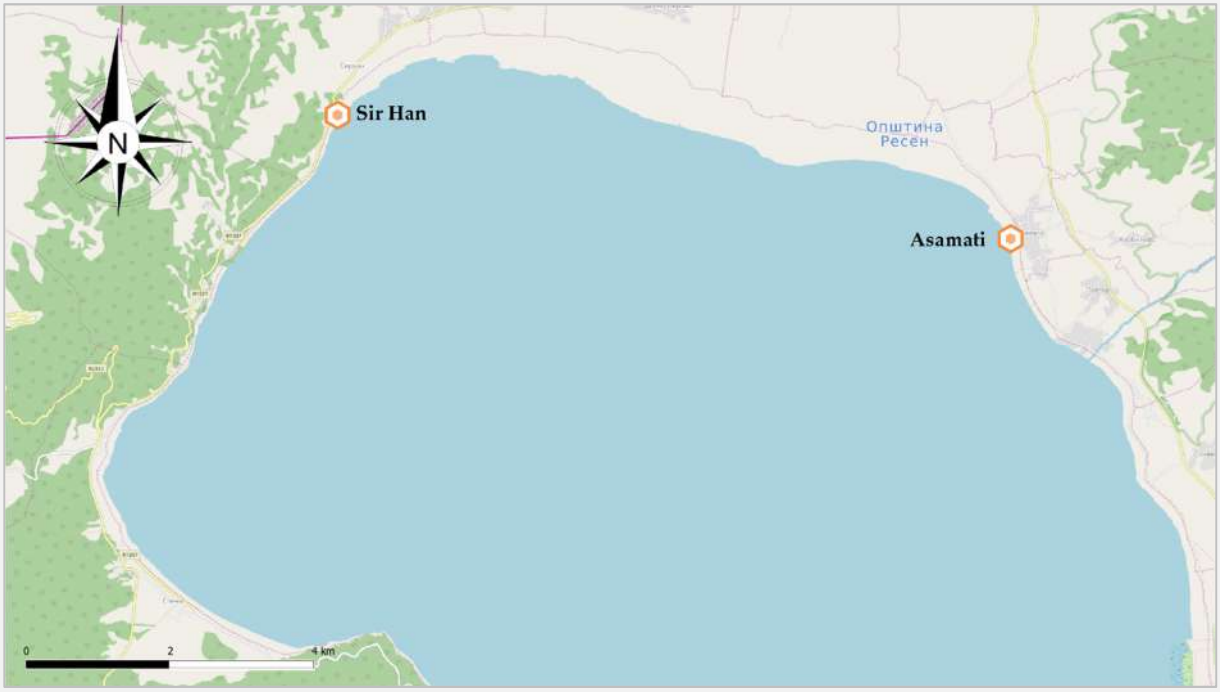

Figure 67: Detailed map of the 1st group of vantage points for the pelican monitoring in the North Macedonian part of Great Prespa Lake.

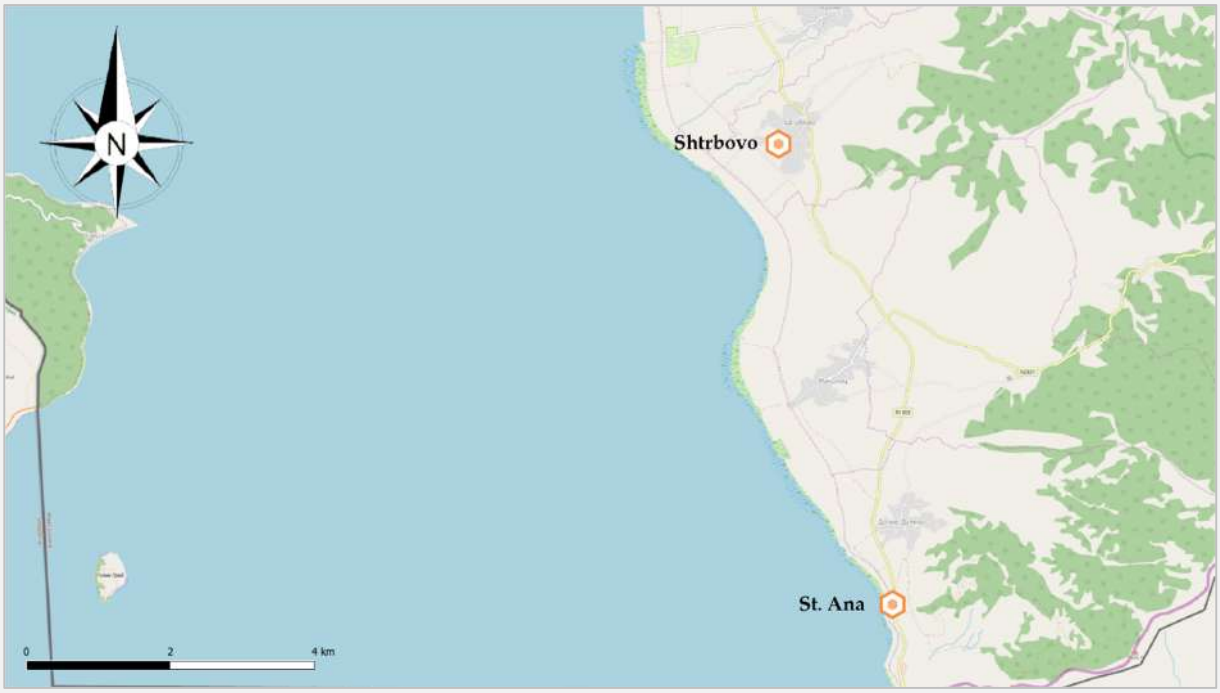

Figure 68: Detailed map of the 2nd group of vantage points for the pelican monitoring in the North Macedonian part of Great Prespa Lake.

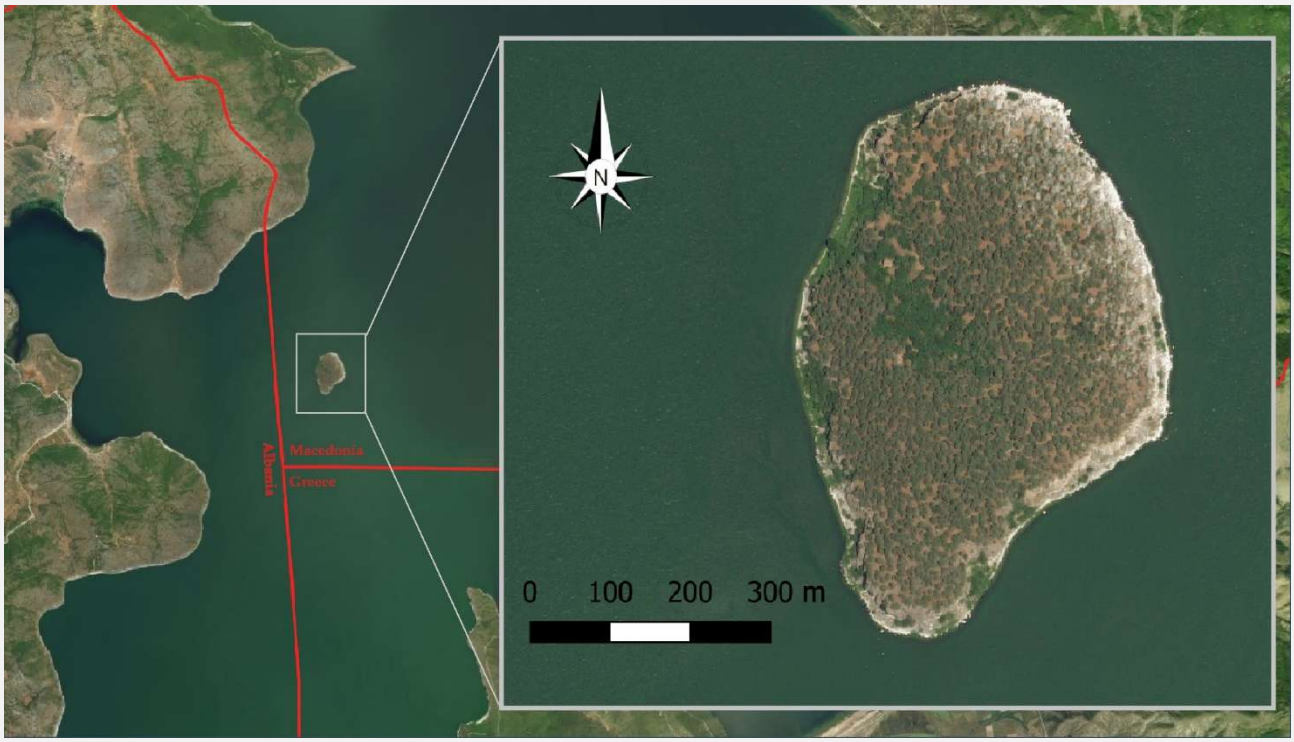

Figure 69: Detailed map of Golem Grad Island for the pelican monitoring in the North Macedonian part of Great Prespa Lake.

Lake Shkodra/Skadar

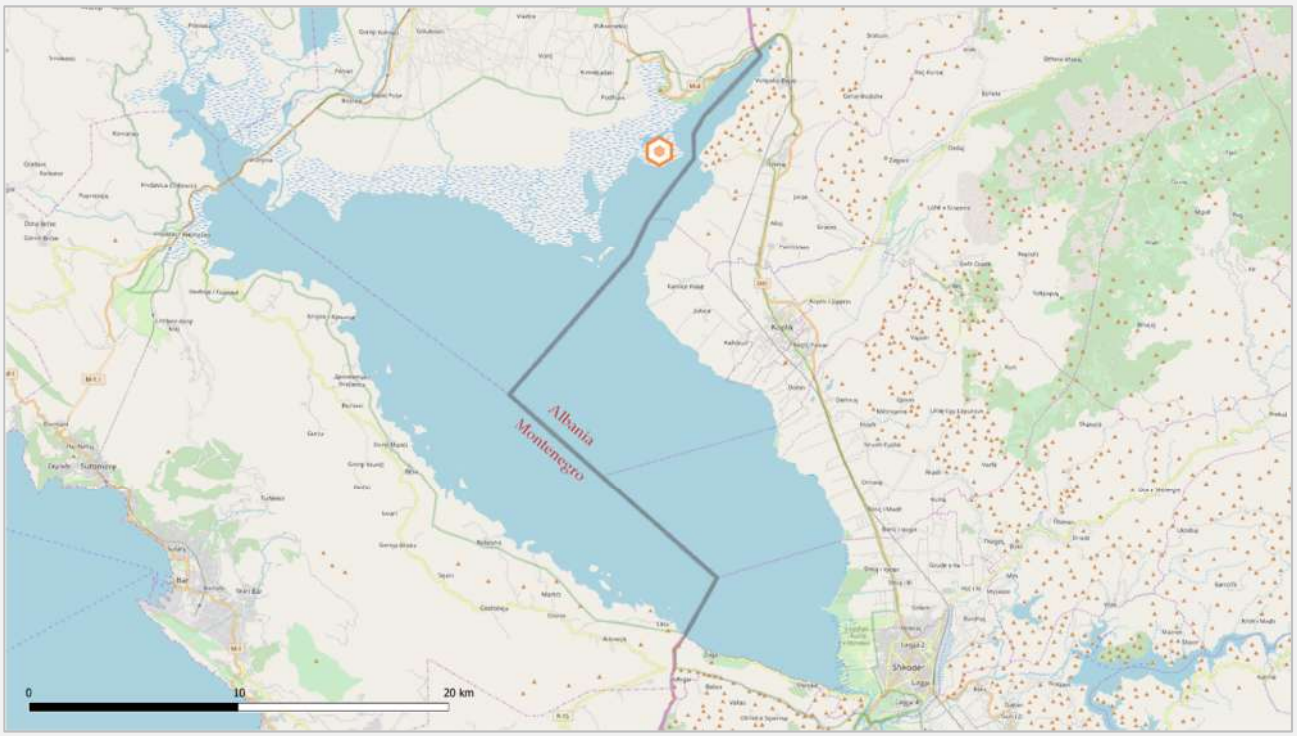

Figure 70: Breeding colony of Dalmatian Pelican at Pančeva oka in the Northeastern part of Lake Shkodra/Skadar. The vantage point is located at Hum Hill north of the colony.

2.10.4 Data Sheet Pelicans

Field Data Monitoring Sheet for the Breeding Season

Dalmatian Pelican (*Pelecanus crispus*) and Great White Pelican *(Pelecanus onocrotalus*)

This is the standard protocol of the regular pelican census at Lakes Micro and Macro Prespa, conducted by the Society for the Protection of Prespa (SPP) and the Macedonian Ecological Society (MES).

Observer:	**Contact:**	Tel.:	**Location:** Lake:
		E-Mail:	Coordinates:

Time of survey and temperature
Starting time:
Temperature at start (°C):
Ending time:
Temperature at end (°C):

Date:	
Weather Conditions:	
Cloud cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

S/N Serial no.	Sector name	Species	No. of individuals	Adult	Immature*	Juvenile	Unspecified age	Activity type**	Remarks***

* Immature: from June onwards *P. crispus* juveniles (youngs) may mix with immatures. Please take special notes using the juveniles column.

** Activity type: **F** = fishing/ foraging/ swimming, **R** = roosting, **FL** = flying

*** a) From Feb-Mar also note number/proportion of individuals displaying a red pouch
b) Note the number of pelicans foraging/swimming together with cormorants
c) Note any other observation deemed useful, e.g. marked/ringed individuals

	Total Number				
Species	No. of indiv.	Adults	Immat.	Juv.	Unspecif. age
P. crispus					
P. onocrotalus					
Unidentified					

2.11 Great White Pelican *(Pelecanus onocrotalus)*

2.11.1 General Information

Description: The Great White Pelican (Figure 71) can be identified by its azure blue bill with a central red stripe which ends in a small, red hook. Beneath the lower jaw, and extending to the base of the throat, is a bright yellow, elastic pouch that can hold a large volume of fish. The area of the face from the eye up to the bill is bare and fleshy pink. The head has a white crest of long, bushy feathers. The body feathers are creamy white with black tips to the wings. The feet are yellow and strongly webbed (ENCYCLOPEDIA OF LIFE 2017).

Figure 71: Great White Pelican swimming (left) and in flight (right, © Andreas Schäfferling, naturgucker.de/euronatur).

Distribution: The Great White Pelican is distributed from Eastern Europe to Western Mongolia. It occurs also at single sites in Northwestern India and South Vietnam. It migrates to winter in Northeastern Africa and Iraq to Northern India. In Africa, south of the Sahara Desert, some populations do not migrate (ENCYCLOPEDIA OF LIFE 2017).

Habitat: The Great White Pelican is associated with relatively large, warm, shallow fresh, brackish, alkaline or saline lakes, lagoons, marshes, broad rivers, deltas, estuaries and coasts of landlocked seas. The species requires secure areas of extensive reed beds, wet swamps, mudflats and sandbanks or gravel and rocky substrates for nesting. It nests on the ground either on a pile of sticks and vegetation or in a simple shallow scrape in single- or mixed-species colonies (e.g. with Dalmatian Pelican, *Pelecanus crispus*) (BIRDLIFE INTERNATIONAL 2016).

IUCN-Status: Least Concern. The overall population trend is uncertain, as some populations are decreasing, while others are increasing, stable, or have unknown trends (WETLANDS INTERNATIONAL 2015). The European population is estimated to be increasing (BIRDLIFE INTERNATIONAL 2015). Draining of wetland sites and divergence of rivers to provide irrigation for agriculture has caused declines in populations across the Palearctic and parts of Africa. This has been shown to be responsible for declines in many colonies throughout the species' range (CRIVELLI et al. 1991, JOHNSGARD 1993, NELSON 2005, ELLIOTT et al. 2018).

2.11.2 Methodology

Objective: To determine the size and demographic structure of the resident population

The monitoring method of this species is the same as for the Dalmatian Pelican (see 2.10.2). However, the Great White Pelican is monitored only at Lake Prespa. Please refer to the chapter on the Dalmatian Pelican (2.10.3) for maps with corresponding vantage points at Lake Prespa.

3. Mammalia

Contrary to birds, relatively few mammals live at the lakes. Bats are the most species-rich group (THÉOU & ĐUROVIĆ 2015), many of them feeding over open water or adjacent wetland. Other groups such as rats, mice, voles and shrews may occur at high densities within the shore zone, but their mainly secretive or nocturnal lifestyles means that they are not readily amenable to monitoring by observation but require trapping or specialized techniques for detection (MCWILLIAM A.N. 2012). Such techniques comprise camera traps as well as the sampling of fur, dung, footprints or other indirect signs of the presence of small mammals. The Eurasian otter is the only mammal covered by the present Monitoring Manual. The Otter is not only a species of Community importance but – being a top predator – also an indicator of food chain functionality.

3.1 Eurasian Otter (*Lutra lutra*)

3.1.1 General Information

Description: The Eurasian or European Otter is a semi-aquatic carnivorous mammal that is easily recognized, but rarely observed. Head and body length may be up to 95 cm (not including tail) and male specimens may weigh as much as 17 kg. The fur is brownish while the throat is often of a lighter, creamy color (Figure 72).

Depending on availability, the diet is diverse and can be composed of fish, amphibians, crustaceans, snails, snakes, birds, small mammals and insects. The otter is a solitary territorial species and uses feces as well as mucus secretion for intra-species communication. Those marking sites are frequently located at landmarks, such as bridges, estuaries, stones or other prominent landscape features.

Figure 72: Eurasian Otter caught in camera trap (© Aleksandar Stojanov).

Distribution: The Eurasian Otter is a widespread species and occurs in parts of Asia and Africa, also spreading across Europe. Being rather common in parts of its range, the species has suffered from local extinctions mainly due to habitat loss and direct persecution. Currently, the population trend is assumed to be decreasing, however, data is lacking in many parts of the distribution range.

Habitat: Lutra can be found in a variety of both natural and man-made aquatic habitats, such as lakes, water reservoirs, rivers, marshes, drainage channels and ditches, swamps, fish farms as well as coastal areas. They are strongly dependent on riparian vegetation and availability of denning sites such as holes in the riverbanks or cavities under trees, rocks etc. The species is surprisingly tolerant towards certain anthropogenic pressures and may be found even in highly polluted environments.

IUCN-Status: Near Threatened with a continuing decline of mature individuals. The aquatic habitats of otters are extremely vulnerable to man-made changes. Canalization of rivers, removal of bank side vegetation, dam construction, draining of wetlands, aquaculture activities and associated man-made impacts on aquatic systems are all unfavorable to otter populations (REUTHER & HILTON-TAYLOR 2004). Historically, pollution used to be a major threat to otters in Western and Central Europe. The main pollutants posing a danger to otter are the organochlorines dieldrin (HEOD) and DDT/DDE, PCBs and the heavy metal mercury (IUCN 2018).

3.1.2 Methodology

Objective: To determine the geographic distribution and general trends of otter populations

Due to its distinct marking behavior, otters can be monitored relatively easily by visiting sampling points along the waterbody and searching for spraints (feces) or other signs of the animal such as footprints, dens, food remains or mucus (Figure 73).

Approximately 60 sampling points that are 2 – 5 km apart from each other have been identified at each lake by using maps and/or existing data. The position of sampling points were determined in relation to the size of otter territory. Those locations will be visited and searched for otter signs, along 300 m-long transects extending from the sampling point next to the shoreline into any direction. The monitoring of one sampling point is considered complete when any signs are found (search to be ended) or when the whole transect has been examined. Sampling points can also be visited by boat to avoid time-consuming access to shoreline from land.

Remark: The method is not suitable to evaluate population numbers, due to overlaps between territories as well as variation in size. Nevertheless, it allows the sound monitoring of population trends and distribution since the distance between starting point and first encounter of otter traits can be used as a proxy for relative abundance. Alternatively, fixed transects of only 200 m instead of 300 m can be walked to derive trait per transect length densities.

Figure 73: Signs of otter presence: Footprints with five toes (above), typical marking stone with spraints (below left, © Aleksandër Trajce,), dry spraints (below right, © Hajdana Ilic Bozovic)

Description of the sampling unit: Occupation of a potential territory is assessed by the presence/absence of otter traits such as spraints, mucus, footprints, dens, and food remains (Figure 73).

Monitoring season and number of visits: Monitoring should be carried out when detection likelihood is high. Thus, periods with dense vegetation or snow cover should be avoided. Surveys should also not be carried at heavy rainfall and/or large fluctuations in water level. Therefore, the most suitable seasons are from April to May and from September to October. Each sampling point should be examined once per season (i.e., twice per year).

Time of the day and weather: Time of the day does not have a significant effect on recordings. However, light conditions should allow a reliable detection if traits of otter are present. Monitoring within 5 days after heavy rainfall should be avoided since traces might have been washed away.

Equipment: Necessary: Data Sheet, pen, GPS, wading boots, boat
Optional: Lifevest, camera, binoculars, maps

Manual

- Choose the date for the survey according to the above-mentioned factors (season, precipitation, vegetation cover, etc.).
- Before starting the survey at a selected location, fill in the information required in the top section of the Data Sheet. Record date, ID of the site, your name, name of the locality and the GPS coordinates of the sampling point.
- A separate Data Sheet is used for each sampling point.
- Record water level, density of vegetation and the type of lake/river bank at the sampling spot.

- Thoroughly search for signs of otter presence first at the sampling point and – if no traits have been found – further along a 300 m transect along the shoreline (direction to be chosen based on site-specific features).
- While walking the transect, look out for prominent landscape features such as big rocks, tree trunks, estuaries, bridges, concrete blocks, etc. to search for spraints.
- Look for den holes and search sandy stretches for footprints.
- Also use your sense of smell – fresh spraints may have an intense smell of fish.
- Walk until you have found otter traits or the 300 m transect ends. If you have found a sign you do not have to walk the whole transect.
- Whenever you find otter traits, record them in the Data Sheet and take pictures if suitable.
- Clean location from spraints in order to avoid double counts.

3.1.3 Locations

Monitoring points are located at a distance of 2 – 5 km along the entire shoreline of Lakes Shkodra/Skadar (Figure 74 & 75), Ohrid (Figure 76 & 77) and Prespa (Figure 78 & 79), respectively, as well as along inflowing streams.

Lake Shkodra/Skadar

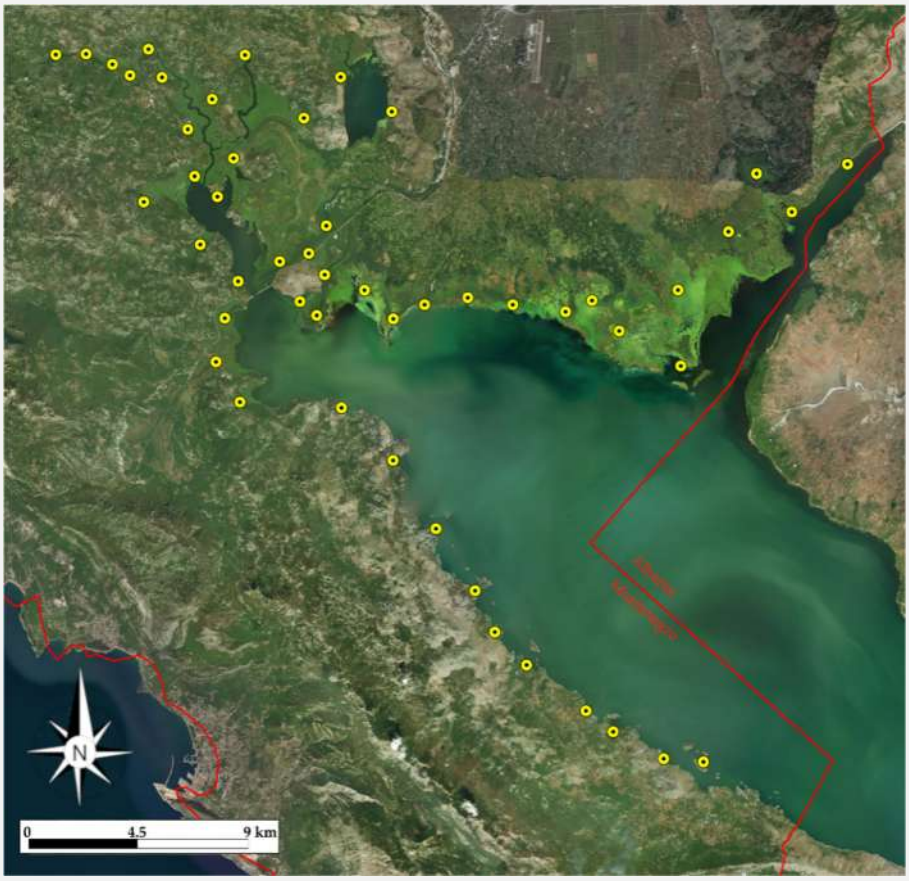

Figure 74: Selected monitoring sites for the Eurasian Otter *(Lutra lutra)* at the Montenegrin side of Lake Skadar (51 sites).

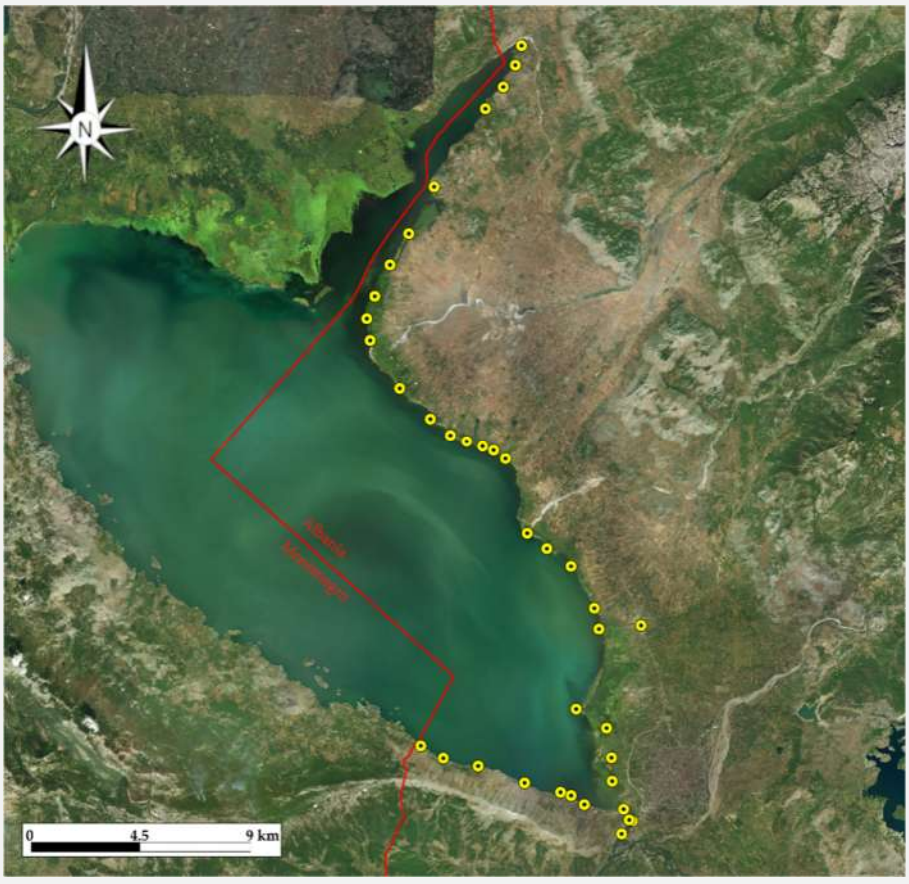

Figure 75: Selected monitoring sites for the Eurasian Otter *(Lutra lutra)* at the Albanian side of Lake Shkodra (38 sites).

Lake Ohrid

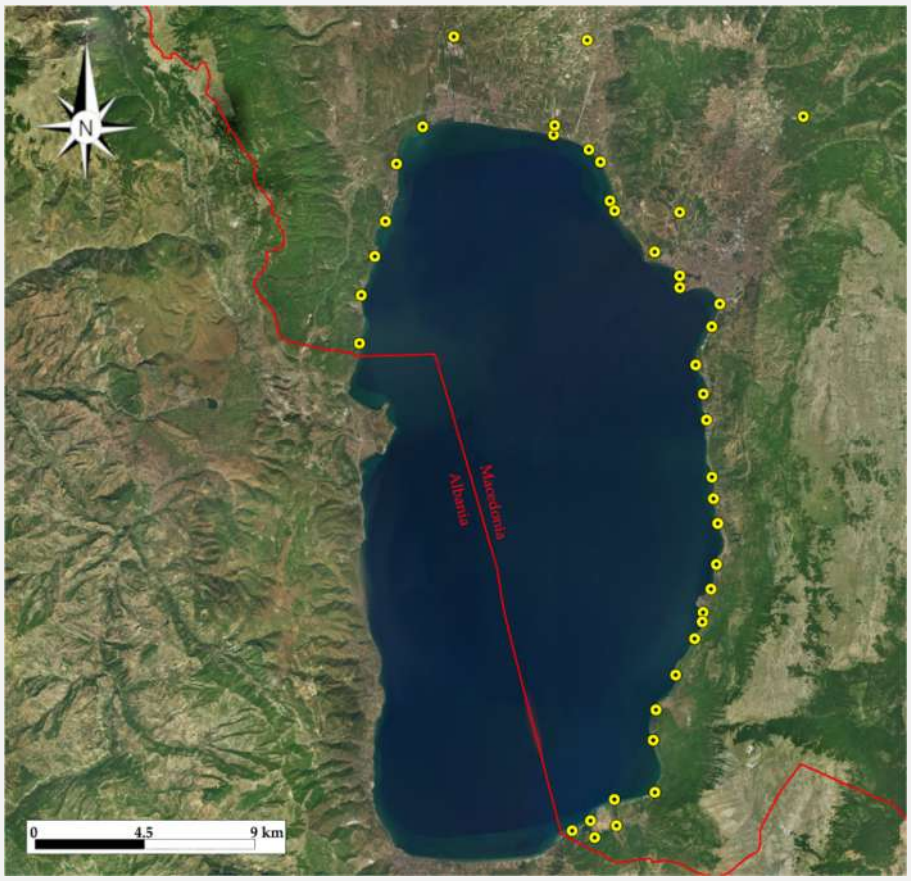

Figure 76: Selected monitoring sites for the Eurasian Otter *(Lutra lutra)* at the North Macedonian side of Lake Ohrid (41 sites).

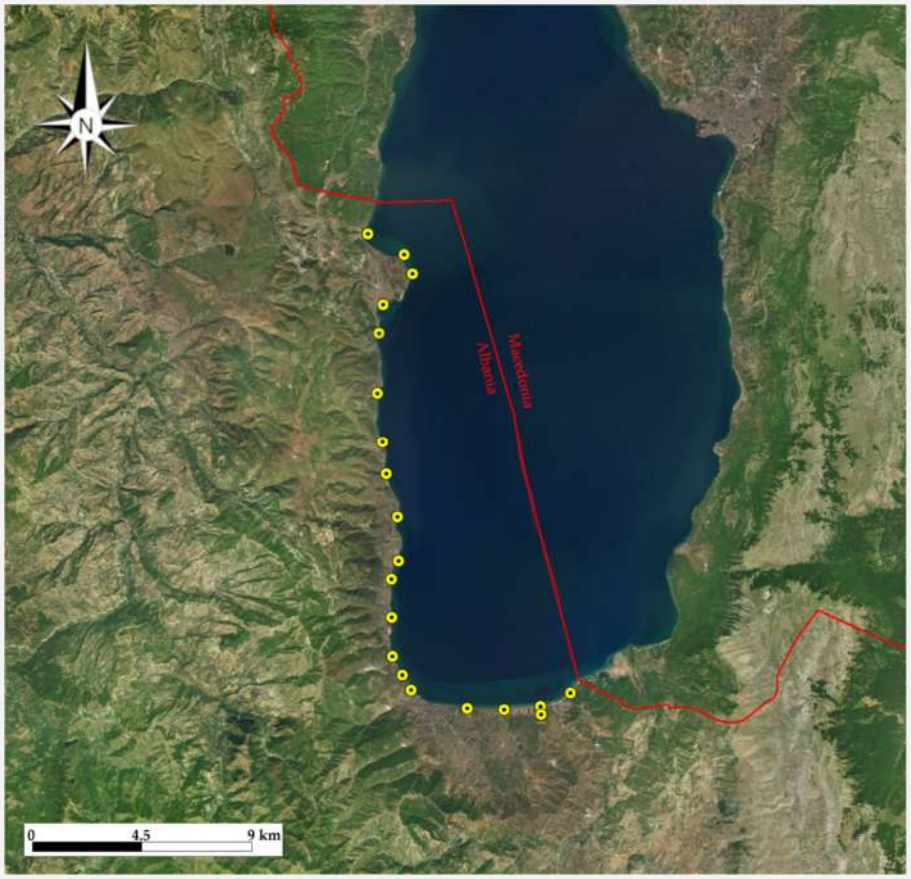

Figure 77: Selected monitoring sites for the Eurasian Otter *(Lutra lutra)* at the Albanian side of Lake Ohrid (20 sites).

Lake Prespa

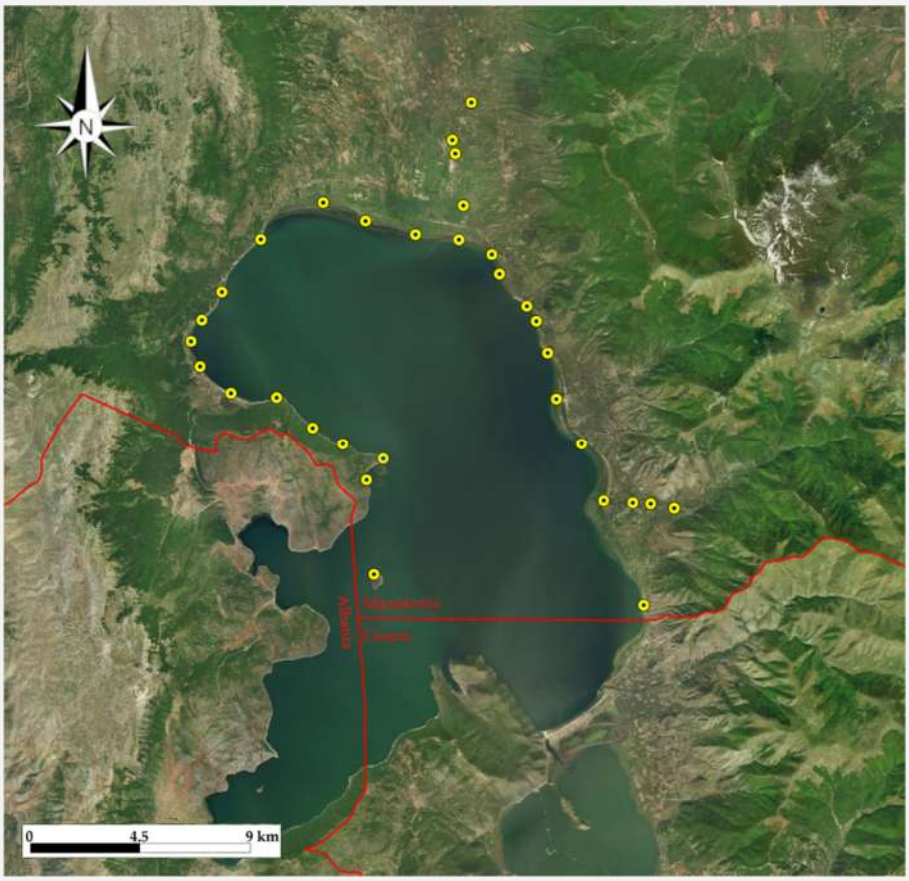

Figure 78: Selected monitoring sites for the Eurasian Otter *(Lutra lutra)* at the North Macedonian side of Lake Prespa (32 sites).

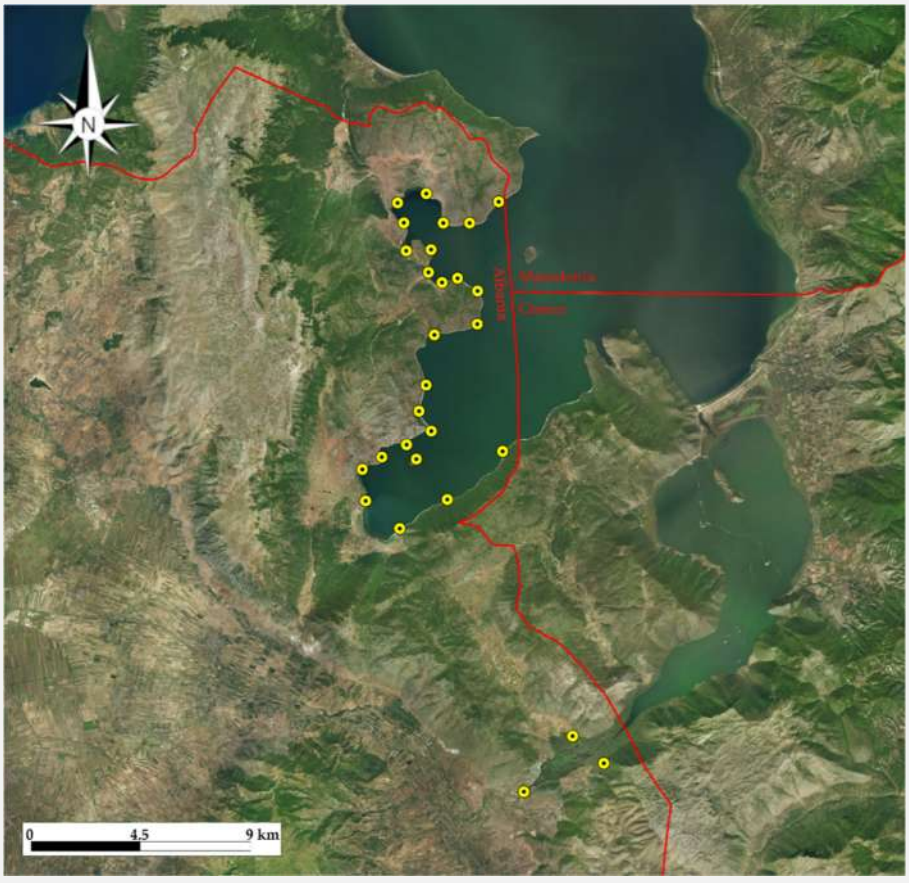

Figure 79: Selected monitoring sites for the Eurasian Otter *(Lutra lutra)* at the Albanian side of Lake Prespa (28 sites).

3.1.4 Data Sheet *(Lutra lutra)*

Field Data Monitoring Sheet*

Eurasian Otter
Lutra lutra

Observer:		**Contact:**	

Location:	**Lake:**	**Date:**
	Site ID:	
	Name of Location:	
	Coordinates: N E	

Weather Conditions	
Cloud cover	(1) 0-25%; (2) 26-50%; (3) 51-75%; (4) 76-100%
Rain	(1) No rain; (2) soft; (3) moderate; (4) heavy
Wind*	(1) No wind; movement of (2) leaves; (3) branches; (4) trunks
Visibility	(1) Clear; (2) light fog; (3) moderate fog; (4) heavy fog

Water level	**Structure of the lake bank**		**Vegetation at location**	**SFI Code**
☐ very high	☐ rocks	☐ reeds	☐ no vegetation	
☐ high	☐ soil	☐ concrete structures	☐ medium vegetation	
☐ normal	☐ sand		☐ dense vegetation	
☐ low	☐ grass	☐ others		
☐ very low	☐ swamp			

Presence of signs: ☐ yes ☐ no Photo: ☐ yes ☐ no

Type of sign	**Number**	**Photo-ID**	**Notes**
☐ Dry fragmented spraint	□ > 10		
☐ Dry intact spraint	□ > 10		
☐ Fresh spraint	□ > 10		
☐ Mucus secretion			
☐ Footprints			
☐ Food remains			
☐ Dens			
☐ Direct observation			
☐ Dead individual			□ roadkill □ hunted □ other (explain)
☐ Other signs			

General remarks	

* Monitoring carried out in Montenegro covered additional data that is not part of this form. In the future, monitoring should be extended to also consider anthropogenic impact and disturbances.

4. Odonata

Odonata communities play an important role in ecological processes in aquatic ecosystems and are potential indicators of aquatic habitat quality and types. Therefore, Odonata are used as a test group for the establishment of monitoring of aquatic habitats in the Prespa-Ohrid region.

The main aim of the monitoring is to record the presence/absence and the abundance of species. In the long-term, monitoring results will show whether populations are increasing or decreasing. Trends may reflect changes in habitats or water quality and can help to develop appropriate conservation measures, if needed. Species were selected applying as many of the following criteria as possible:

- Verified presence in the region (pre-existing data)
- International or national conservation importance[28]
- Inclusion in management or species action plans
- Ease of identification
- Indicator of ecosystem health

Through a participatory process, four target species were selected for the establishment of the monitoring methodology, taking into consideration the above-mentioned criteria: Yellow-spotted Whiteface (*Leucorrhinia pectoralis*), Downy Emerald (*Cordulia aenea*) and Hairy Dragonfly (*Brachytron pretense*) from the Anisoptera suborder and Red-eyed Damselfly (*Erythromma najas*) from the Zygoptera suborder. Selection of locations for Odonata monitoring was carried out based on the following aspects: availability of data, knowledge of potential habitats, human and technical capacities, management setup, and accessibility.

4.1 Species

4.1.1 Yellow-spotted Whiteface (*Leucorrhinia pectoralis)*

Description: The largest of the European Leucorrhinia species is a mid-sized libellulid dragonfly. Adults are reddish-black (males) or yellowish/brownish-black (females). The name *Leucorrhinia* suggests that the face (labrum and clipeus) is whitish. At the base of each hindwing, there is a dark mark. Pterostigmas are black. Individuals of this species are easily distinguished from similar looking dragonflies by a large yellow spot on the dorsal side of the seventh abdominal segment (Figure 80).

Figure 80: Yellow-spotted Whiteface *(Leucorrhinia pectoralis)* © Christian Fischer, source Wikipedia (CC-BY-SA-3.0)

[28] Species of conservation interest listed in EU Habitats Directive, IUCN Red Data List, Bern Convention or National Lists

Distribution: L. pectoralis has a scattered distribution in Southeastern Europe. In the Balkans it is rare – a very illustrative example is the situation in North Macedonia where the species was recorded at only a single locality (Stenjsko Blato swamp).

Habitat: The species is found in a relatively wide array of habitat types such as borders of bogs, forest lakes and pools, fenlands, marshy ditches, oxbows and even sluggish rivers or canals. Its habitats are often largely unshaded, permanent, at most weakly eutrophic waters with rich vegetation, thus avoiding fish predation. Its optimal habitat varies highly from region to region.

IUCN-Status: Least Concern. *L. pectoralis* is common in Northern and Eastern Europe where populations are often large. The species experienced a decline in the 20th century at least in Western and Central parts of Europe. It is now rare in this part of its range and many populations are isolated and relatively small. However, it seems the species is recovering as it has shown an increase during this century (IUCN 2018). In parts of Europe, *L. pectoralis* has suffered from large-scale conversion of fenlands and peat systems for agricultural use and from eutrophication.

Methodological Details: In general, the method described in chapter 4.2 should be applied. Having in mind the poor accessibility of the shoreline at monitoring sites, the point count method can be applied. When using transect counts, these should be at least 200 m long.

The Yellow-spotted Whiteface (other name: Large White-faced Darter) will be monitored at Prespa Lake at Stenje Swamp in North Macedonia. Species presence is not known for other locations. However, special attention to possible new local populations should be given e.g. to Ezerani in North Macedonia and Ralnik Swamp in Albania, and at Lake Ohrid to Studenchishko Swamp in North Macedonia and Staroves Swamp in Albania.

4.1.2 **Downy Emerald** (*Cordulia aenea*)

Description: Metallic green dragonfly with hairy body of different tone. Large bright green eyes. Club-shaped abdomen of males is slightly raised compared to the rest of the body during flight. The first green corduliid species on the wing in springtime (Figure 81).

Figure 81: Downy Emerald (*Cordulia aenea*), © Christian Fischer, source Wikipedia, CC-BY-SA-3.0

Distribution: Cordulia aenea is common and locally abundant in Northern Eurasia, in the South it is found locally and mostly restricted to mountain lakes.

IUCN-Status: Least Concern. There is no detailed information about population trends. It is only stated that *Cordulia aenea* is common in its range. The major threat affecting this species is habitat destruction from agriculture and infrastructure development. Water pollution is also an ongoing threat (IUCN 2018).

Methodological Details: Transects, 100 m in length, should be established along homogenous parts of the shoreline, counting should be performed at slow walking speed.

4.1.3 Hairy Dragonfly (*Brachytron pratense*)

Description: The first aeshnid dragonfly on the wing in the springtime. Its hairy body easily distinguishes it from similar species. Greenish sides of the thorax are crossed with two black lines (Figure 82).

Figure 82: Male of the Hairy Dragonfly (*Brachytron pratense).* © Danny Chapman, source Wikipedia, CC-BY-2.0

Distribution: Brachytron pratense is largely confined to mid-latitudes of West and Central Europe. In Southeastern Europe, it is much scarcer than in Western and Central Europe. Regionally, it is generally rare, especially in the arid parts of the Balkans.

Habitat: The species is mostly found at standing or slow-flowing waters (lakes, pools, oxbows, canals, marshes, ponds, sometimes also in bogs, clay pits and dune ponds), generally with rich riparian vegetation.

IUCN-Status: Least Concern. Even though the population trend is stable now, a decline is expected to take place in the future due to climate change, rainfall deficiencies and increase in irrigation.

Methodological Details: Transects longer than 100 m should be established along homogenous parts of the shoreline, counting should be performed while walking slowly.

4.1.4 Red-eyed Damselfly *(Erythromma najas)*

Description: The larger of two blue, red-eyed damselflies in Europe. It is easily distinguished from its congeneric red-eyed species by short antehumeral stripes in females and the absence of antehumeral stripes in males (Figure 83).

Figure 83: Red-eyed Damselfly (*Erythromma najas*), © L.B. Tettenborn, source Wikipedia, CC-BY-SA-3.0

Distribution: Species is common in large parts of Europe. Going southwards it becomes scarcer so there are only local and scattered populations of this species on the Balkan Peninsula. It is assumed that *E. najas* is not very agile in colonizing new habitats.

Habitat: This species can be found at standing waters with dense vegetation and abundance of floating leaves (e.g. water lilies and pondweeds).

IUCN-Status: There is no entry in the IUCN Red List of Threatened Species for *E. najas.*

Methodological Details: Transects, 100 m long and made up of two 50 m-long sections, should be established along homogenous parts of the shoreline, counting should be performed during slow walk.

4.2 Methodology

Objective: To determine changes in relative abundance of species at selected locations

The proposed methodology for monitoring Odonata populations in Prespa-Ohrid region is based on counting individuals along transects. It was adopted (and slightly modified) from the British Dragonfly Monitoring Scheme (SMALLSHIRE & BENYON, 2010).

Transect lines are designed to follow homogenous lines along the shoreline. The length of a transect line may differ and needs to reflect the structure of a habitat. The transect line should be 100 m long and divided into two 50 m-long sections. Counting should be done in both sections separately. A transect of 100 m length is sufficient for the monitoring of less mobile species (Zygoptera, except *Calopteryx* spp., and *Sympetrum*). Other species need to be counted along longer transects – extra sections of 100 m should be added to perform reasonable counts. The maximum length of a transect should not exceed 500 m. The starting point of each section should be set at a prominent landmark (trees, rocks) and/or marked using conspicuous and stable markers.

Odonata are counted while walking slowly, recording all adult individuals that can be seen along the narrow strip, both inland (2 m away from water edge) and above the water (5 m from the water edge, i.e. where emergent plants are present). In case of poor shoreline accessibility, the counting can be performed by using multiple counting sessions at different locations – point counts – each lasting for 2 minutes. When using the point count methodology, all individuals within a circle of 5 m radius around the observer are recorded. Counting spots should be positioned at regular distances of 10 meters between spots, and the transect should be at least 200 m long.

Description of the sampling unit: Counts should be made of individual adults (including immatures that are able to fly) and copulas (count as two adults).

Monitoring season and number of visits: Visits should be done during the flight season (monthly visits in May, June, July). There should be three visits per season – one visit per month, the period between two visits should not be shorter than two weeks.

Time of the day and weather: Visits should be performed during the following weather conditions: no rain, no wind (or mild wind no stronger than 4 degrees on the Beaufort scale), cloud cover must not exceed 75 %; air temperature preferably 17 – 30 °C (not under 15 °C and during the warmest hours on days with temperature above 30 °C). Exceptionally, in sunny weather with practically no wind, counts can be made at slightly lower temperatures, but never below 15 °C. Counting should be performed during the peak of flying activity – between 11 am and 4 pm. When the temperature is above 22 °C, counts can be done between 10.30 am and 4.30 pm.

Equipment: Field guide for identification of species, thermometer, anemometer (or a pocket meteorological station), GPS, pencil, notebook, field monitoring forms (habitat form and species form), entomological net (aerial), close focus binoculars, 10x magnifying glass, paper envelopes for specimens, rubber boots, digital camera.

Manual

- Make the fieldwork plan according to the weather forecast following the methodology recommendations given for each of the species.
- Before starting the survey at a selected location, fill in the information required in the top sections of both transect details and Single Species Form. The name of the locality must be unique for each transect.
- Use a new recording sheet for each transect.
- Enter all relevant data into the transect details form.
- Record air temperature and cloud cover and enter the data in the Single Species Form. Temperature should preferably be recorded using an air thermometer but any other reliable source (e.g. the local weather station) is acceptable.
- Wind speed should be assessed according to a simple visual test – acceptable conditions include wind speeds that do not cause small trees in leaf to sway.
- Initial transect lines are already defined and geotagged. New ones will be available during subsequent stages of establishing monitoring. Download existing files (orientation points and tracks) and use them in your work.
- In case of creating a new transect, please record both orientation points, tracks, and include the data as attachments when transferring monitoring data to your national data manager.
- Distances between points and transect line length are defined following the rules given in the main body of this chapter.
- Once familiar with the transect, walk along and catch individuals that you are not able to identify using bare eyesight and/or binoculars. Identify and release but do not count those individuals. The purpose is to become familiar with target species and be able to recognise them for counting. Make a short pause (15 – 30 minutes) in order to let Odonata community return to unexcited state and then follow the methodology for Odonata monitoring (see introduction to this chapter and methodology details given for each of the species).
- Record and note the starting time of each transect.
- Counting should be performed during slow walk or as a sequence of point counts, depending on the accessibility of the water edge (see introduction to this chapter).
- Use the notes section to record any comment you find useful, such as an observation on management or any other change the habitat has undergone since your last visit.
- Take and share photos of everything you find important or useful.
- Completed forms as well as all attachments (including GIS data) should be sent to the national data manager after each field survey.

Useful field guides:

- DIJKSTRA, K.-D. & LEWINGRON, R. (2006): Field Guide to the Dragonflies of Britain and Europe. British Wildlife Publishing.
- ASKEW, R.R. (2004): Dragonflies of Europe. Second Revised Edition. Harley Books.
- MARINOV, M. (2000): Pocket field guide to dragonflies of Bulgaria. Eshna, Sofia.

4.3 Locations

Odonata species are to be monitored at the following locations at Ohrid and Prespa Lakes (Figures 84 – 89).

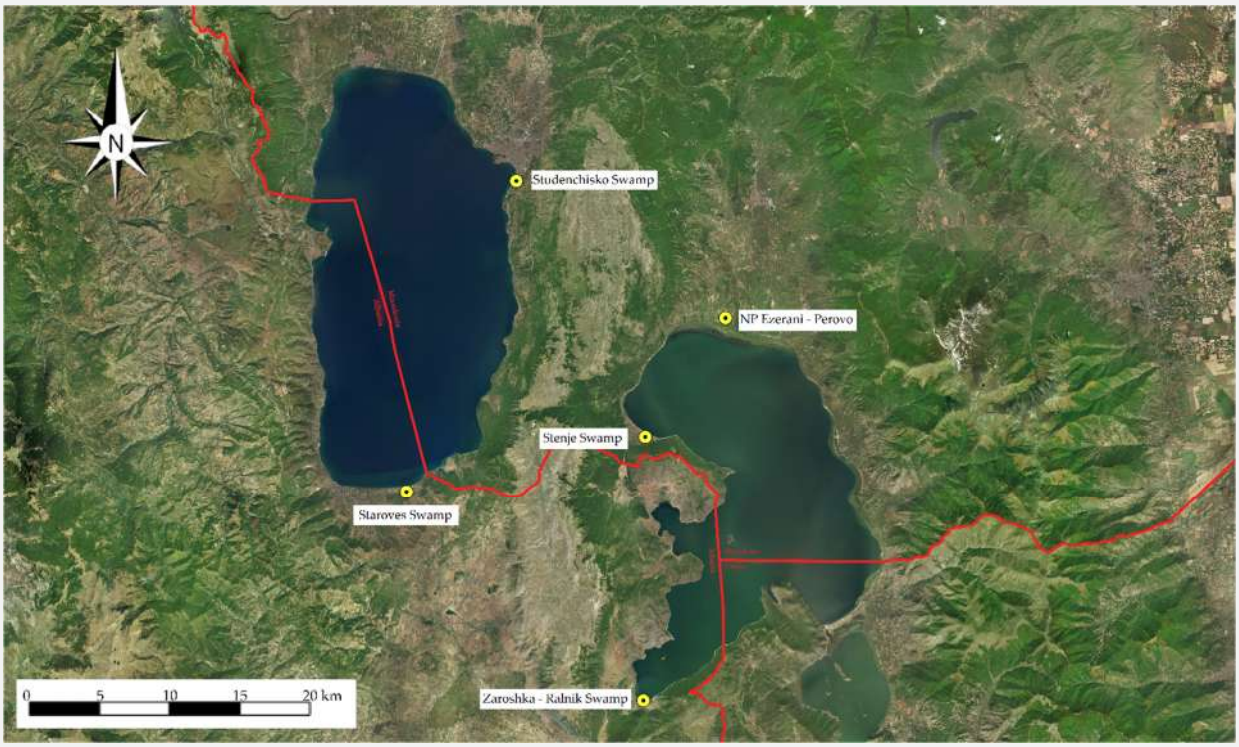

Figure 84: Overview map of Odonata monitoring sites at Lakes Ohrid and Prespa.

Table 7: Monitoring Locations for Odonata at Lake Ohrid.

Lake Ohrid			
Country	**Location**	**Coordinates**	**Justification**
North Macedonia	**Studenchishko Blato**, East shore, south of Ohrid City Supporting area – remnants of **Strushko Blato** below v. Radolishte; littoral area at v. Kalishte.	41°05'59.2"N 20°48'26.7"E	• Important site with key ecological function for the lake • Highly threatened by numerous activities and development plans of local and central government
Albania	**Starova** area, South shore, between Tushemisht village and Starova Village	40°53'57.5"N 20°42'53.3"E	• Suitable habitat for Odonata • Important ecological function for the lake • Threatened by anthropogenic influence

Lake Ohrid

Figure 85: Position of orientation points of Studenchishko blato transect line (Lake Ohrid/MK).

Figure 86: Position of orientation points of Tushemisht transect line (Lake Ohrid/AL).

Table 8: Monitoring Locations for Odonata at Lake Prespa

Lake Prespa			
Country	**Location**	**Coordinates**	**Justification**
North Macedonia	**Nature Park (NP) "Ezerani"** North shore of Prespa Lake, between village Sir Han to the West and Asamati to the East	41°00'40.8"N 20°59'08.0"E	• Protected area with an existing management plan that envisages monitoring of Odonata habitats • Lack of previous data on Odonata • Need to provide data for design of management measures • Human capacities available
	Stenjsko Blato West shore of Prespa Lake, southeast from the village Stenje	40°56'05.9"N 20°55'03.0"E	• Marshland undergoing succession and under anthropogenic pressure; monitoring needed for devising management measures • Only known site of target species *Leucorrhinia pectoralis* in North Macedonia
Albania	**South shore** of Prespa Lake **near Zaroshka** village	40°45'54.0"N 20°54'58.0"E	• Adequate habitat for Odonata • Presence of *Leucorrhinia pectoralis* in Albania

Lake Prespa

Figure 87: Position of orientation points of Asamati (Ezerani) transect line (Lake Prespa/MK)

Figure 88: Position of counting points of Stenjsko blato transect (Lake Prespa/MK)

Figure 89: Position of orientation points of Zaroshka transect line (Lake Prespa/AL).

4.4 **Data Sheet** (Odonata)

Field Data Monitoring Sheet - Single Species Form

Odonata

Observer:		**Contact:**	Tel.:
			E-Mail:

Location:	Locality name:	
	Must be specific for each transect	
	Coordinates of starting point:	Landmark:
	Transect length [m]:	
	Total surveyed length (maximum 500 m)	
	Land zone width [m]:	Water zone width [m]:
	These will normally be 5 m over the water (including emergent vegetation) and 2 m over the land (lake shore)	
	Land and water use:	
	Indicate natural (e.g. high density of wildfowl) or anthropogenic (e.g. fishing) factors that may influence dragonfly populations	
	Management status	
	Describe management actions that may influence dragonfly populations (e.g. modification of habitats owing to grazing, mowing, or weeding)	

Species name	

Monitoring survey

	No. of individuals in respective transect section									
	Min*		Further sections (each 100 m long)			Max.**			Cloud	
Date	1A	1B	2	3	4	5	Temp [°C]	Wind***	Cover [%]	Notes

Transect Details

Part	Length [m]	EUNIS code level 1 or 2 (Aquatic habitat)	EUNIS code level 2 or 3 (Terrestrial habitat)	Notes
1a				
1b				
2				
3				
4				
5				

Habitat photographs and file names	

GPS track file name	

* Minimum length is 100 m, divided into two stretches 1A and 1B each 50 m long. 100 m transects are usually enough for damselflies *(Zygoptera)* and darters (*Sympetrum*).

** Transects can be extended by sections of 100 m, up to a maximum length of 500 m, to record all Odonata species (requires technical and taxonomical proficiency) or only Anisoptera (except *Sympetrum)* and *Caopteryx* spp.

*** See Beaufort Wind Scale

5. Habitats

All European Member States are requested by the EUROPEAN ENVIRONMENT AGENCY to monitor habitat types and species considered to be of Community interest under the Habitats Directive (1992). The EUNIS habitat classification is a comprehensive pan-European system to facilitate the harmonized description and collection of data across Europe through the use of criteria for habitat identification. In preparation for the accession of the riparian countries to the EU, some of the relevant habitat types (as its biological diversity and high number of endemic species is a significant part of the European natural heritage) of the three large Lakes Shkodra/Skadar, Prespa and Ohrid of the Western Balkans will be recorded according to the European guidelines.

5.1 Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation (EU Habitat Directives Code 3150)

Description: The habitat typically occurs along natural mesotrophic to eutrophic lakes with high nutrient levels and high natural productivity. These lakes are typically rich in species. However, over-enrichment with nutrients can result in hypertrophic conditions and a reduction of species-richness.

This habitat type is very diverse and mostly fringed by reed mace – common reed Scirpo – Phragmitetum associations and includes various floating or submersed plant communities (Figure 90). It is present in the Prespa Lake littoral:

EUNIS code: C1.222 Floating *Hydrocharis morsus-ranae* rafts
EUNIS code: C1.224 Floating *Utricularia australis* and *Utricularia vulgaris* colonies
EUNIS code: C1.225 Floating *Salvinia natans* mats
EUNIS code: C1.226 Floating *Aldrovanda vesiculosa* communities
EUNIS code: C1.32 Free-floating vegetation of eutrophic waterbodies
EUNIS code: C1.33 Rooted submerged vegetation of eutrophic waterbodies

Figure 90: Natural eutrophic lakes with Magnopotamion or Hydrocharition habitat, Nature Park Ezerani, Prespa Lake (© D. Jovanovska)

The representative species differ in size, shape and color and are best distinguished by comparison to the following images (Figure 91).

Figure 91: Characteristic plant species of the target habitat (© D. Jovanovska & Lj. Melovski)

Distribution: The habitat shows a highly fragmented distribution at the natural mesotrophic to eutrophic lakes in North Macedonia and Albania.

5.1.1 Methodology

Objective: To determine the species composition and the extent of anthropogenic pressures

Preliminary study: Monitoring localities are selected using up-to-date information on habitat range and distribution (literature, field and GIS data). Indicative maps of the habitat distribution (Figure 92) are constructed based on the initial desk assessment. If the habitat type forms complexes with other habitats and cannot be mapped separately it is possible to indicate them together – reflecting their proportion – in absolute terms or as a percentage of the area of the polygon.

Since the habitats have a scattered distribution along the shoreline, the actual localities designated for monitoring and survey were identified in a field session prior to the actual monitoring. In the course of this preliminary study, the exact locations were recorded by walking along the shoreline. The actual site locations are marked with GPS. If the shoreline is not accessible, habitats should be assessed by boat.

Monitoring will be carried out at preselected locations within randomly appointed quadrats of 4x4m (see Manual). Field personnel should record the starting coordinates of the quadrat using a GPS. Where possible waypoints should be taken of each corner. As an alternative, a sketch can be drawn of the quadrat position. Boundaries of the site should be marked permanently during the monitoring period. The monitoring will be carried out using the provided Data Sheet. A separate sheet is used for each quadrat at each monitoring site. The number of quadrats along transects, and the number of transects per site can be increased with experience. The Data Sheet provides for a description of habitat by assessing the occurrence and dominance of typical species (descriptive and/or percentage). Each quadrat should be assessed with regard to species composition (typical species present or absent). Average water depth should be measured using a measuring pole or a measuring tape attached to a stick. The monitoring sheet also includes assessments of habitat impacts and threats or pressures, their severity being rated as high, medium or low. The monitoring should also include photo documentation. To this end, sequential shots should be taken from left to right, always from the same standing point. The entire area monitored should be photographed from a distant, elevated point for better orientation in subsequent visits. All photos should contain date and time information. If there are species that cannot be identified in the field, it is necessary to consult an expert. In that case, each unidentified species should be photographed and collected as a herbarium specimen.

Description of the sampling unit: The occurrence of all characteristic plant species of the habitat type is recorded, as well as their abundance within the quadrat.

Monitoring season and number of visits: The monitoring sites should be visited once per year during the summer season, preferably from June to August, depending on the water level and weather conditions. The monitoring visits of the selected sites in each of the localities should be consecutive in order to avoid discrepancies among sites (due to seasonal vegetation changes).

Time of the day and weather: Since this habitat monitoring records various plant species that do not show any day or weather-dependent behavior in its area usage, the time of day and weather conditions are not relevant.

Equipment: Necessary: Paper sheets, photo documentation of the representative plants, measuring tape with a length of 50 (100) m, GPS, tablet/portable computer, high boots and camera

Optional: Boat (for areas inaccessible by foot) and binoculars

Manual

- Preferably the monitoring should be done within the peak of the vegetation period (mid-June to mid-August). Make sure that the monitoring visits of the selected sites in each of the localities are consecutive in order to avoid discrepancies among sites.
- To avoid subjectivity in the habitat assessment it is recommendable that at least two people carry out the monitoring.
- Before starting the survey at a selected location, make sure to have the necessary equipment with you.
- Once in the locality, fill in the information required in the top section of the Data Sheet.
- A separate monitoring sheet is used for each quadrat at each monitoring site within the selected monitoring localities.
- The quadrat should be placed at a random spot within the monitoring location. To ensure unbiased positioning of the quadrat , stand opposed to the monitoring spot and with your eyes shut or while facing backwards throw a handy object that marks the quadrat starting location. Then, starting from the object used to mark the starting point, use the measuring tape while moving clockwise to form a quadrat shape.

- Record the starting coordinates (waypoint) of the quadrat with a GPS. Where possible record a GPS point at each of the corners of the monitored quadrat. As an alternative, sketch the quadrat position and take a photograph of the monitored site.
- The boundaries of the site should be marked and need to be visible throughout the monitoring period.
- Once everything is set, carefully observe the habitat and fill all the fields in the monitoring sheet.
- Visually assess the combination of species (typical species present or typical species absent) and where possible indicate the coverage of the most dominant species. Then recognize and record habitat impacts and threats as indicated in the Data Sheet.
- Take photographs of sites and representative species for documentation purposes and identification of communities.
- If there are species that cannot be identified in the field, it is necessary to consult an expert. In that case, each unidentified species should be photographed and collected as a herbarium specimen.
- While at the locality, look around and record indications of human activity and possible threats and take photos of everything you find important or useful.
- Use the comments section to record any problem encountered and other comments deemed useful. Also take photos of everything important.
- At the end of the monitoring season, make a final assessment of the monitoring sites for all monitoring localities (one locality can include a number of monitoring sites). For this purpose, a short final assessment table is included in the Data Sheet. Count the recorded representative plant species noticed in the sheet and count habitat threats while at the same time assessing their severity (low, medium or high).
- Report the final assessment of the habitat status of each monitoring locality by noting the ratio of all monitored sites within each monitoring locality.

5.1.2 Locations

Monitoring of Magnopotamion or Hydrocharition-type vegetation had not initially been foreseen for Lake Shkodra/Skadar, hence no monitoring sites are being proposed in this Manual. However, since it is known to be present there, its monitoring should be considered. In that case, *Caldesia parnassifolia*, which is listed on Annex II and IV of the Habitats Directive and under Appendix I of the Bern Convention., should also be included.

North Macedonia:

The target area for Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation in North Macedonia, distributed along the Prespa Lake shoreline, is Nature Park Ezerani including additional monitoring localities along the whole cost of Lake Prespa (Shtrbovsko Blato, Pretor, Stenjsko Blato).

Bearing in mind the limited distribution of the monitored habitats in North Macedonia, the monitoring will be carried out on a number of localities along the Prespa Lake shoreline where the habitat is known to be present (Figures 92). The coordinates of the exact sites within the localities were determined prior to the monitoring in a preliminary study (Table 9). The number of monitoring sites within one locality may vary. As the monitoring progresses and the field staff gains more experience, the list of monitoring sites should be upgraded in consultation with experts.

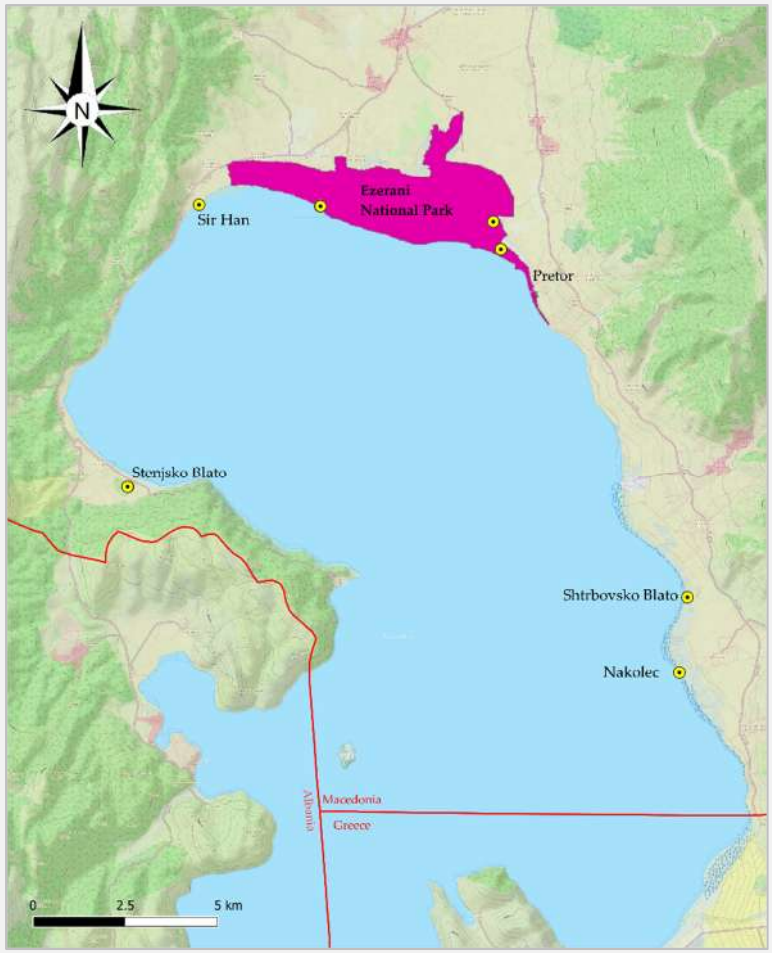

Figure 92: Monitoring localities at Lake Prespa with largest inland wetland site in Ezerani National Park for natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation in Macedonia (Map: Daniela Jovanovska)

Table 9: Selected monitoring sites for Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation along Prespa Lake in Macedonia.

Monitoring sites	**Comment**	WGS UTM **N**	WGS UTM **E**
Stenje	Easy to access. Watchtower available for the monitoring of threats and impacts in the area. Over time, as the monitoring progresses and field staff gains more experience, it is advised to increase the number of monitoring sites at this locality. Where feasible, the number of monitored quadrats along a transect (random direction of movement through the site) per site should also be increased	40°56'03.1"N	20°55'07.4"E
Ezerani (Sir Han)	Full monitoring	41°00'11.3"N	20°56'29.9"E
Ezerani (Dolno Perovo)	Full monitoring. Over time, as the monitoring progresses and field staff gains more experience, it is advised to increase the number of monitoring sites in Ezerani Nature Park. Where feasible, the number of monitored quadrats along a transect (random direction of movement through the site) per site should also be increased.	41°00'10.2"N	20°58'50.6"E
Ezerani	Site restoration in progress. It is advised that the locality be re-assessed in the following monitoring sessions.	40°59'56.5"N	21°02'10.6"E
Ezerani (Asamati)	Full monitoring	40°59'32.3"N	21°02'19.4"E
Shtrbovsko Blato	Habitat not representative. Difficult to approach. It is advised that the locality be re-assessed in the following monitoring sessions.	40°54'26.2"N	21°05'54.9"E
Nakolec	Full monitoring	40°53'20.4"N	21°05'45.5"E

Albania:

In Albania, this habitat type has a more scattered distribution and occupies a larger area. In addition, there is a lack of data on sites that host the target habitat. In fact, the potential distribution range has never been assessed. Therefore, sites in Albania were selected in consultation with RAPA, referring to indicative results of ZENNARO et al. (2016). The initial monitoring is to be performed at localities in the category "wide belt of reeds" (Figure 93).

The monitoring localities for the habitat "Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation" along Lake Prespa in Albania are presented Table 10.

There are no actual records of this habitat at Lake Ohrid. To identify potential sites, there is a need for a study of the lakeshore and of channels located in the area of Tushemisht and Voloroke.

Figure 93: Potential sites for Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation along Prespa Lake shoreline in Albania

Table 10: Selected monitoring sites for "Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation" along Prespa Lake in Albania

Monitoring sites	**Comment**	WGS UTM **N**	WGS UTM **E**
Pustec Beach	The site is located in the core zone of the park. It is easy to access and shows good presence of the target habitat. The site should be continuously monitored to assess habitat dynamics and changes as it is located close to Pustec village (source of potential pressures)	40°47′03.1′′ N	20°54′35.7′′ E
Zaver Bay	Full monitoring	40°51′57.8′′ N	20°56′29.7′′ E
Gorice e vogel	Full monitoring	40°53'3.96" N	20°55'25.46" E

5.1.3 Data Sheet (Habitat Code 3150)

Data Sheet for the Habitat Monitoring

Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation
(EU Habitat Directives Code 3150)

Observer:		**Contact:**	Tel.:
			E-Mail:
Location:	Lake:	**Date:**	
	Monitoring site:	**Time:**	Beginning:
	Coordinates:		End:

Water depth [m]

Typical plant species	Presence/absence indicate YES or NO	Indicative assessment of the coverage of dominant species*
Phragmites australis		
Typha sp.		
Scripus sp.		
Lemna spp.		
Salvinia natans		
Hydrocharis morsus-rane		
Nymphea alba		
Nurphar lutea		
Trapa natans		
Aldrovanda vesiculosa		
Utricularia neglecta		
Myriophyllum sp.		
Potamogeton sp.		
Ceratophyllum sp.		
Najas sp.		
Invasive / alien species		

Human impact and pressures	Presence/absence indicate YES or NO	Visual assessment of the severity of impact**
Extraction of sand and gravel		
Solid waste discharge		
Fishing		
Agriculture or organic waste		
Hydromorphological change		
Erosion		
Individual man-made construction(s)		
Urbanization		

General remarks

* All percentages must sum to 100 %
** Differentiate between low, medium, high

Final Assessment

Parameter	**Favourable**	**Adverse-poor**	**Unfavourable-bad**
Parameter / conservation status	**Typical plant species:** more than 2/3 of characteristic species present	Any other combination	**Typical plant species:** less than 1/3 of characteristic species present
	Evaluation of human impact and pressures: > 6 criteria scored **low**	Any other combination	**Evaluation of human impact and pressures**: > 6 criteria scored **high**

5.2 Calcareous fens with *Cladium mariscus* and species of Caricion davallianae (EU Habitat Directives Code 7210)

Description: This habitat is represented by calcium-rich fens often in association with other wetland habitats such as reed beds, fens and humid grasslands (Figures 94 & 95). It is widespread in Europe but its status in the Mediterranean region is assessed as "unfavorable-inadequate" (EUROPEAN ENVIRONMENT AGENCY 2012).

Figure 94: Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae, Studenchishko Blato, Ohrid Lake (© S. Hristovski)

The habitat is characterized by the Magnocaricion elatae (W. Koch) Br.-Bl. alliance with association Caricetum elatae (W. Koch 1926) that will be targeted for monitoring (Figure 94 + 95). Characteristic plant species are

Figure 95: Carex elata (left) and *Carex elata* turf (right, © Lj. Melovski)

Sparganium neglectum, *Myriophyllum verticillatum* and *Utricularia neglecta*. *Cyperetum longi* Mic is another typical association under the Magnocaricion elatae (W. Koch) Br.-Bl. alliance found in Studenchishko Blato.

This association is dominated by *Cyperus longus*. Its distribution in Studenchishko Blato is limited to 30 – 40 m², though the presence of other fragments is not excluded (DEKONS-EMA 2012).

Distribution: The habitat includes marshland plant communities present in marshes associated with Ohrid Lake. The distribution range of *Caricetum elatae* (W. Koch 1926) in North Macedonia is now limited to Studenchishko Blato. In Albania, the habitat's distribution is sparse. Therefore, further studies are needed to identify locations. Most of the current information is based on map of potential sites (ZENNARO et al. 2016).

5.2.1 Methodology

Objective: To determine the spatial distribution of the habitat

Monitoring localities are selected using up-to-date information on habitat range and distribution (literature, field and GIS data). Indicative maps of the habitat distribution are constructed based on an initial desk assessment. Since the habitat type forms complexes with other habitats and cannot be mapped separately it is presented as a whole wetland without reflecting the exact share (in absolute terms) of the target habitat.

Bearing in mind the scattered distribution of the monitored habitats along the shoreline, the actual localities designated for performing the continuous monitoring and survey process will be identified prior to the actual monitoring. The experts, through continuous movement along the shoreline of the sites hosting the habitat, will determine the exact locations. The actual site locations will be marked with a GPS. If the shoreline is not accessible to perform the monitoring, the habitats should be assessed by boat.

The monitoring will be carried out within randomly appointed quadrats of 4x4m. Field personnel should record the starting coordinates of the quadrat with a GPS. Where possible waypoints should be taken of each corner. As an alternative, a sketch can be drawn of the quadrat position. Boundaries of the site should be marked permanently during the monitoring period. The monitoring will be carried out using the provided Data Sheet. A separate sheet is used for each quadrat at each monitoring site. The number of quadrats along transects, and the number of transects per site can be increased with experience. The Data Sheet provides for a description of habitat by assessing the occurrence and dominance of typical species (descriptive and/or percentage). Each quadrat should be assessed with regard to species composition (typical species present or absent). Average water depth should be measured using a measuring pole or a measuring tape attached to a stick. The monitoring sheet also includes assessments of habitat impacts and threats or pressures, their severity being rated as high, medium or low. The monitoring should also include photo documentation. To this end, sequential shots should be taken from left to right, always from the same standing point. The entire area monitored should be photographed from a distant, elevated point for better orientation in subsequent visits. All photos should contain date and time information.

Description of the sampling unit: The occurrence of all characteristic plant species of the habitat type is recorded as well as the proportion of their abundance within the quadrat.

Monitoring season and number of visits: The monitoring sites should be visited once per year during the summer season, preferably from June to August, depending on water level and weather conditions. The monitoring visits of the selected sites at each of the localities should be consecutive in order to avoid discrepancies among sites (due to seasonal vegetation changes).

Time of the day and weather: Since this habitat monitoring records various plant species that do not show any day or weather-dependent behavior in its area usage, the time of day and weather conditions are not relevant.

Equipment: Necessary: Paper sheets, photo documentation of the representative plants, measuring tape of a length of 50 (100) m, GPS, tablet/portable computer, high boots and camera

Optional: Boat (for areas inaccessible by foot) and binoculars

Manual See 5.1.1 Natural eutrophic lakes with Magnopotamion or Hydrocharition.

5.2.2 Locations

Bearing in mind the limited distribution of the monitored habitats in North Macedonia, the monitoring will be carried out at all sites along the Ohrid Lake shoreline where the habitat is known to be present. The coordinates of the exact sites were determined prior the monitoring.

The target area for **Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae** in North Macedonia, distributed along the Ohrid Lake shoreline, is Studenchishko Blato. During the first field assessment, Strushko Blato below v. Radolishte and the littoral area at v. Kalishte have also been searched for remnants of the habitat. However, only Studenchishko (41°05'56.3"N 20°48'19.7"E) was found suitable for a full habitat monitoring (Figure 96).

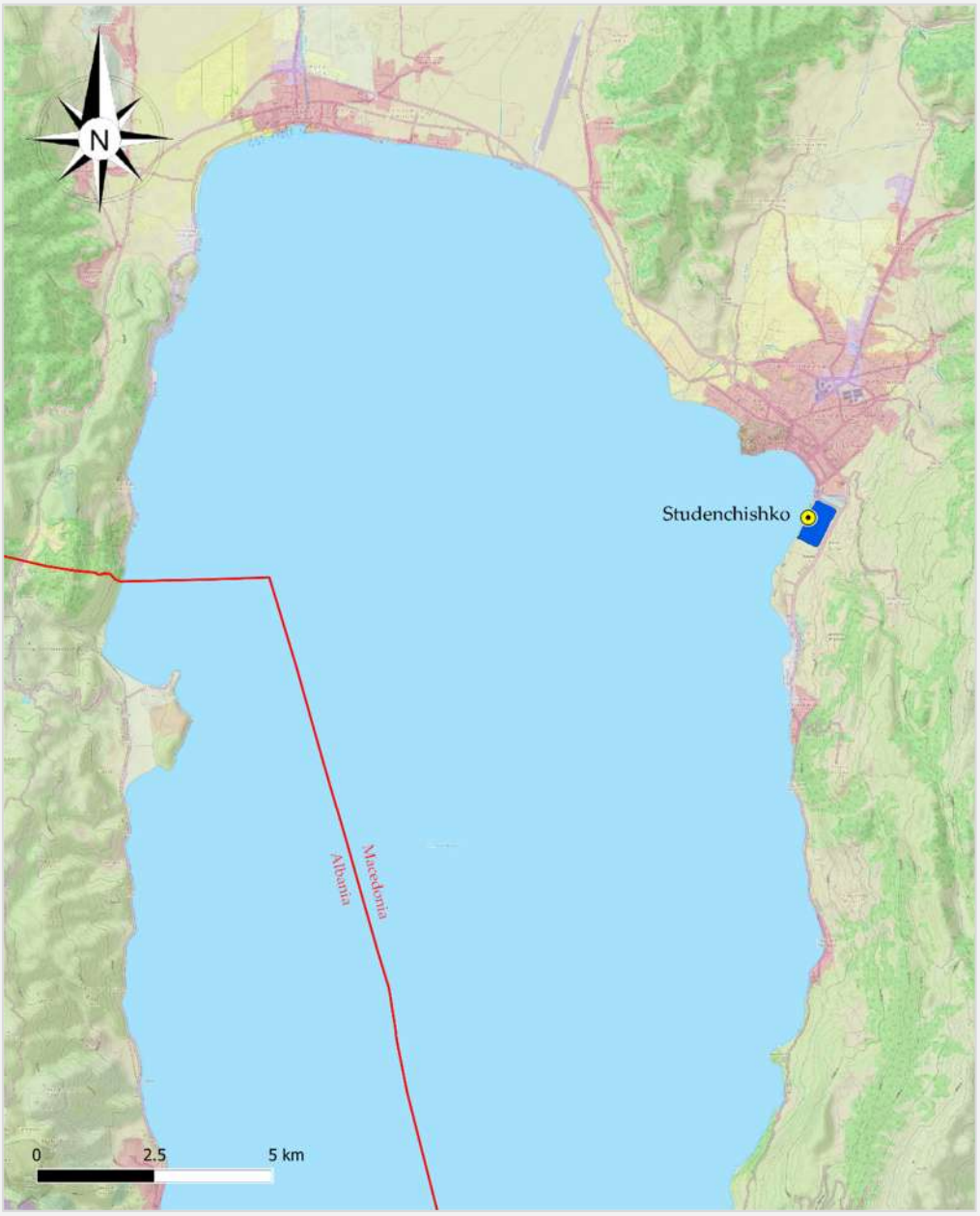

Figure 96: Selected locality for monitoring of Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae in North **Macedonia** along the Ohrid Lake shoreline.

In Albania, these habitat types have more scattered distribution and occupy a larger area. In addition, there is a lack of data on sites that host the target habitats and the potential distribution range has no yet been investigated. For this reason, site selection in Albania will be steered by indicative results presented by ZENNARO et al. (2016) and the initial monitoring performed at a few selected localities characterized by wide belts of reeds (Figure 97).

Based on monitoring sites identified within the CEMSA project (Consolidation of the Environmental Monitoring System in Albania) and the map of distribution localities at Ohrid Lake (ZENNARO et al. 2016), the monitoring and control sites should be located in Tushemisht (40°54'22.65"N, 20°43'35.53"E) and Lin (41°4'9.32"N, 20°38'49.12"E).

Figure 97: Selected locality for monitoring of Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae in **Albania** along the Ohrid Lake shoreline.

5.2.3 Data Sheet (Habitat Code 7210)

Data Sheet for the Habitat Monitoring

Calcareous fens with *Cladium mariscus* and species of Caricion davallianae (EU Habitat Directives Code 7210)

Observer:		**Contact:**	Tel.:
			E-Mail:
Location:	Lake:	**Date:**	
	Monitoring Site:	**Time:**	Beginning:
	Coordinates:		End:

Water depth [m]

Typical plant species	Presence/absence indicate YES or NO	Indicative assessment of the coverage of dominant species*
Carex elata		
Cyperus longus		
Polygonum amphibium		
Hydrocharis morsus-rane		
Nymphea alba		
Utricularia neglecta		
Myriophyllum verticillatum		
Ceratophyllum sp.		
Cladium mariscus		
Invasive / Alien species		

Human impact and pressures	Presence/absence indicate YES or NO	Visual assessment of the severity of impact**
Land conversion - Agriculture		
Land conversion - Urbanization/ industrialization		
Hydromorphological change		
Use of fertilizers and pesticides***		
Industrial and domestic pollution (eyesight range)		
Solid waste discharge		
Intensive grazing Urbanization		
Individual man-made construction(s)		

General remarks	

* All percentages must sum to 100 %
** Differentiate between low, medium, high
*** Within adjacent areas (eyesight range)

Final Assessment

Parameter	**Favorable**	**Adverse -poor**	**Unfavorable -bad**
Parameter / conservation status	**Typical plant species:** more than 2/3 of characteristic species present	Any other combination	**Typical plant species:** less than 1/3 of characteristic species present
	Evaluation of human impact and pressures: > 6 criteria scored **low**	Any other combination	**Evaluation of human impact and pressures**: > 6 criteria scored **high**

6. Plants

6.1 Yellow Water Lily (*Nuphar lutea*)

6.1.1 General Information

Description: The Yellow Water Lily grows in shallow waters along the shoreline. The roots are anchored in the sediment and its leaves are floating on the water surface (Figure 98).

Figure 98: Nuphar lutea (© S. Hristovski)

Distribution: In Albania, the Yellow Water Lily is commonly found as part of the monitored habitats. Widely distributed in the past, the Yellow Water Lily today has a limited distribution in North Macedonia and is only found along the Ohrid Lake shoreline where it inhabits the Podmolje and Kalishte areas.

Habitat: The Yellow Water Lily is often an associated species of the monitored habitat Calcareous Fens with *Cladium mariscus* and species of Caricion davallianae (EU Habitat Directives Code 7210) as well as natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation (EU Habitat Directives Code 3150). In North Macedonia, populations of Yellow Water Lily occur in narrow belts along the Lake Ohrid shoreline. Thus, it is more adequate to place this species under the habitat type of *Nuphar* beds (EUNIS code: C1.24111).

Nuphar lutea was not monitored in Albania within the pilot phase in 2017. However, there are some spots in the Small Prespa Lake where the species is present. These spots ought to be monitored in the future. The survey should be conducted starting from the survey point of the Regional Agency for Protected Areas (and others), since it is otherwise very difficult to approach (Figure 99).

Figure 99: View of *Nuphar lutea* at the Small Prespa Lake (© A. Mesiti, 2017)

IUCN-Status: Least Concern. There is no information on population trends in this species. It is widespread and abundant in Northwestern Europe but may be scarce towards the margins of its range. There are no known past, ongoing or future threats to this species (IUCN 2018).

6.1.2 Methodology

Objective: To determine the range and spatial distribution of Water Lily

The monitoring localities are selected using up-to-date information on species range and distribution (georeferenced field and literature data). Indicative maps of the species distribution are constructed based on the initial desk assessment. Currently, Yellow Water Lily occurs solely in narrow belts along the Ohrid lake shoreline. If it is also found to be present at target habitats (EU Habitat Directives Code 7210 and/or 3150), it should be assessed as part of these habitat types.

The monitoring of Water Lily is carried out inside randomly placed quadrats measuring 4x4m. Field personnel should record the coordinates (waypoints) of the site using a GPS. If possible, a sketch should be drawn of the quadrat position within the site. The attached monitoring sheet (Data Sheet) should be used, using separate sheets for different quadrats and localities. The information to be collected includes, among others, abundance or cover of Water Lily, as well as indications of pressures or threats and their severity, rated as high, medium or low. The monitoring should also include photo documentation. To this end, sequential shots should be taken from left to right, always from the same standing point. The entire area should be photographed from a more distant, elevated vantage point for better orientation at subsequent visits. Photos should contain information on the date and time.

Description of the sampling unit: The occurrence of *Nuphar lutea* is recorded as well as its abundance or cover within quadrats.

Monitoring season and number of visits: Monitoring sites should be visited once yearly during the summer season, preferably between June and August, depending on water level and weather conditions. To the extent possible, the same localities should be investigated each year to assess changes over time and avoid spatial biases.

Time of the day and weather: The presence of plants is largely independent from weather conditions; no data need to be collected.

Equipment: Necessary: Paper sheets, photo documentation of the representative plants, measuring tape of a length of 50 (100) m, GPS, tablet/portable computer, high boots and camera.

Optional: Boat (for areas inaccessible on foot) and binoculars.

Manual See 5.1.1 Natural eutrophic lakes with Magnopotamion or Hydrocharition

6.1.3 Locations

At Lake Ohrid, the monitoring of *Nuphar lutea* will be carried out only in Kalishte (Kalishta). The selected site (41°09'12.7"N 20°39'05.5"E) is easily accessible and allows full habitat monitoring. In contrast, the selected site in Podmolje (41°09'27.4"N 20°44'57.7"E) is difficult to access and it may be necessary to postpone the monitoring at times. Alternatively, only impacts and threats – if any – might be assessed (Figure 100).

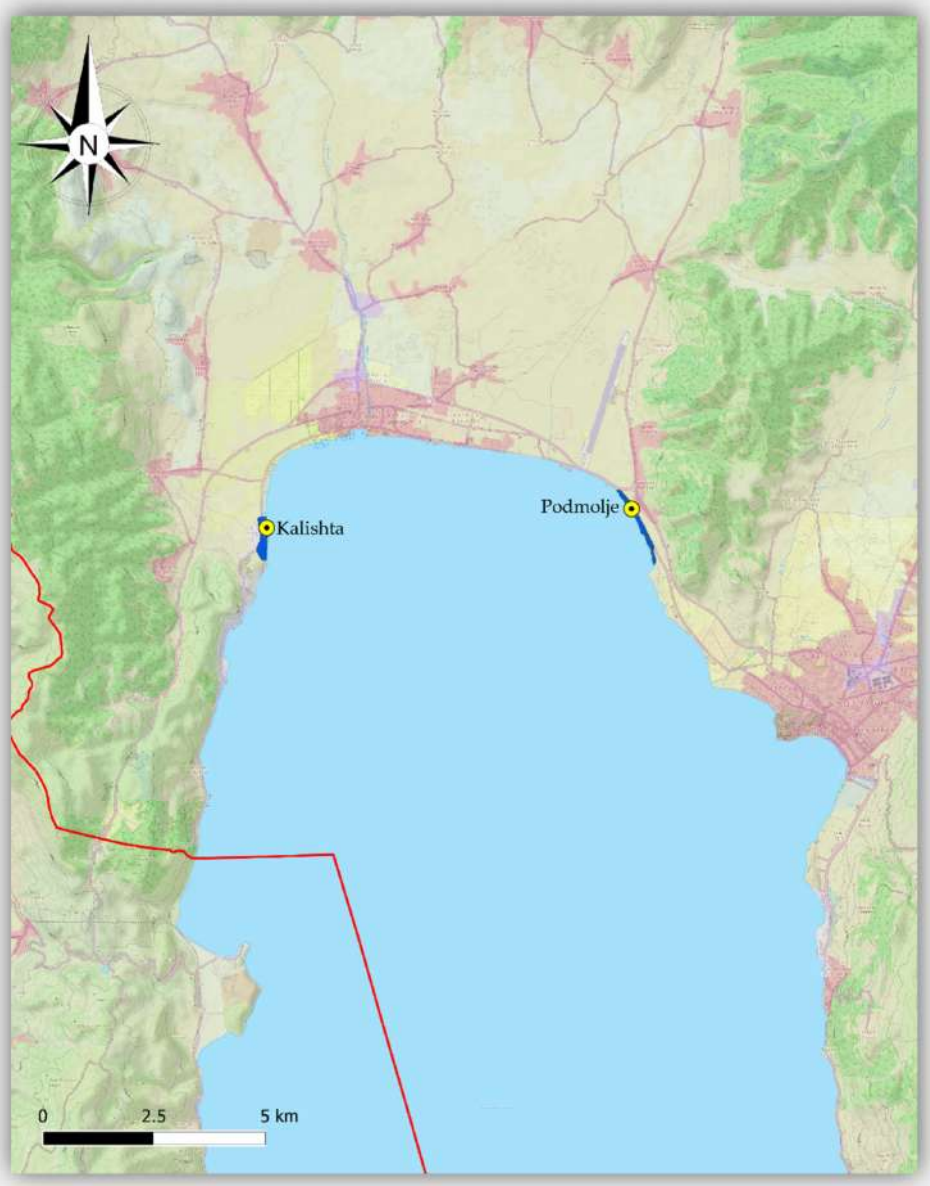

Figure 100: Selected localities for monitoring of *Nuphar lutea* in North Macedonia along the Ohrid Lake shoreline.

6.1.4 Data Sheet *(Nuphar lutea)*

Data Sheet for the Habitat Monitoring

Nuphar beds - Yellow Water Lily

Nuphar lutea

EUNIS code: C1.24111

Observer:		**Contact:**	Tel.:
			E-Mail:
Location:	Lake:	**Date:**	
	Monitoring site:	**Time:**	Beginning:
	Coordinates:		End:

Environment:	Lake	**Sediments**	
	Marsh	Sand	
	Other or unknown	Pebbles	
		Rocks and boulders	
Water depth [m]:		Mud	
Number of plant individuals:		Other or unknown	

Other aquatic vegetation		Other aquatic vegetation cover	< 10%
			10-75 %
			> 75%

Human impact and pressures	Presence/absence indicate YES or NO	Visual assessment of the severity of impact*	Notes
Land conversion: Agriculture			
Land conversion: Urbanization/ industrialization			
Hydromorphological change			
Use of fertilizers and pesticides**			
Industrial/domestic pollution (within			
Solid waste discharge			
Intensive grazing			
Urbanization			
Individual man-made construction			

General Remarks	

* Differentiate between low, medium, high

** Within adjacent areas (eyesight range)

6.2 Skadar Oak *(Quercus robur scutariensis)*

6.2.1 General Information

Description: The Skadar Oak (*Quercus robur* L. subsp. *scutariensis*) is most abundant in flood-prone habitats (Figures 101 & 102). It was first described by ČERNJAVSKI (1949) as a thermophile sub-species that grows in a community with narrow-leafed ash and silk vine in the area of the Gostiljska River. At the same time, these are the only data in literature about the Skadar Oak from this location. There are very few papers about this species and its abundance in Montenegro. It is also mentioned to exist in the Zeta River valley, at Špatula near Ulcinj, and along River Bojana.

The Skadar Oak, as a rare and endangered endemic sub-species, is listed as being of national relevance and as a protected plant species (Official Gazette of the Republic of Montenegro no 76/06).

Figure 101: Leaves of Skadar Oak (© Slavica Đurišić, Slobodan Stijepović)

Figure 102: Community of Skadar Oak in its natural habitat (© Slavica Đurišić, Slobodan Stijepović)

Distribution: Small forests or stands of Skadar Oak in community with Narrow-leafed Ash (*Fraxinus angustifolia*) and Silk Vine (*Periploca greacea*) are located in flood-prone areas north of Lake Skadar. Today, the habitats are highly degraded and fragmented, and are recognized as potential N2000 habitats: 92A0 (PETROVIC et al. 2012).

Small fragments of this community exist in Zeta valley, northwest of Podgorica. The northernmost region where the sub-species exists is Velika plaža near Ulcinj. Natural wet forests of Skadar Oak, together with Robureto-Carpinetum orientalis, are located along River Bojana, 200 – 300 m from the sea. Owing to the Mediterranean climate and seasonal flooding, these autochthonous forests also contain coniferous and deciduous species.

Habitat: The Skadar Oak occupies flood-prone areas along rivers and lakes in warm Mediterranean climate of Lake Shkodra/Skadar and Rivers Bojana, Zeta and Špatula.

Large tracts of the former habitat of Skadar Oak in the Northern part of the lake, on both banks of Gostiljska River, have been converted into cropland. Remnants of Skadar Oak together with Narrow-leafed Ash are preserved along rural roads and as boundaries around farms.

IUCN-Status: As a subspecies of the European Oak (*Quercus robur*), there is no separate IUCN entry. The European Oak itself is located in the category Least Concern – though populations are decreasing. The population is potentially at risk of decline as a result of climate change, which could result in higher disease risk, loss of suitable habitat and greater exposure to unsuitable weather conditions (JONSSON 2012).

6.2.2 Methodology

Objective: To determine the size, spatial distribution and demographic structure of the Skadar Oak population

The method combines line transects and quadrats, adapted to the conditions of current-day habitats modified by man. Fieldwork will be undertaken along both banks of Gostilj River, from the village Gostilj further to the borders of its distribution along Lake Skadar. Line transects will follow rural roads and village plots, whose lengths will determine transect lengths. The transect width is also determined by habitat features, viz. by the width of communities along roads or around the farms. All fully grown oak trees will be recorded.

The quadrats for determining the number of Skadar Oak seedlings or shoots and accompanying species will be applied for certain plots, where restoration potential is expected. The size of quadrats depends on the plot size, being smaller (defined during the fieldwork) or equal to the plot. Plots where the quadrat method will be applied are to be selected during the fieldwork wherever oak reproduction is evident.

Description of the sampling unit: Each tree along line transects will be recorded and the presence of offspring determined. Moreover, the presence of accompanying plant species will also be recorded. According to the monitoring protocol, representative samples of oak trees will be marked (GPS coordinates) and their dendrometric features measured. Selected representative trees are trees higher than 20 m and/or having a diameter above 60 cm or a circumference over 190 cm.

Oak offspring will be counted at selected plots that have restoration potential. Accompanying species will also be recorded.

Monitoring season and number of visits: Out of planned eight fieldwork sessions per year, the first four or five should be in spring/early summer (May-June) whilst the remaining three or four should be carried out in late summer/autumn (September). Autumn surveys should include areas flooded during springtime as well as areas already investigated in spring in order to assess the revitalization potential and to determine the extent and severity of anthropogenic impacts during summer (grass mowing, burning, etc.).

Time of the day and weather: Surveys are to be undertaken during warm and cloudless days, generally between 8 am and 7 pm.

Equipment: Data Sheets, pencils, camera, GPS, rubber boots, safety clothes

Manual

- Enter location, date and identification number of the form.
- Enter name and surname of person gathering data.
- Number of transects, GPS number and transect dimensions (length x width).
- Data about height and age structure of oak in respect to transects.
- Presence of characteristic species in the transect.
- Data on representative oak trees on certain transects.
- Number of squares with transect data, GPS and height.
- Data on the presence and number of oak offspring and accompanying species in squares.
- Data on pressures and other observations.

6.2.3 Locations

Selected Locations on the Montenegrin part of Lake Shkodra/Skadar (Figures 103 & 104):

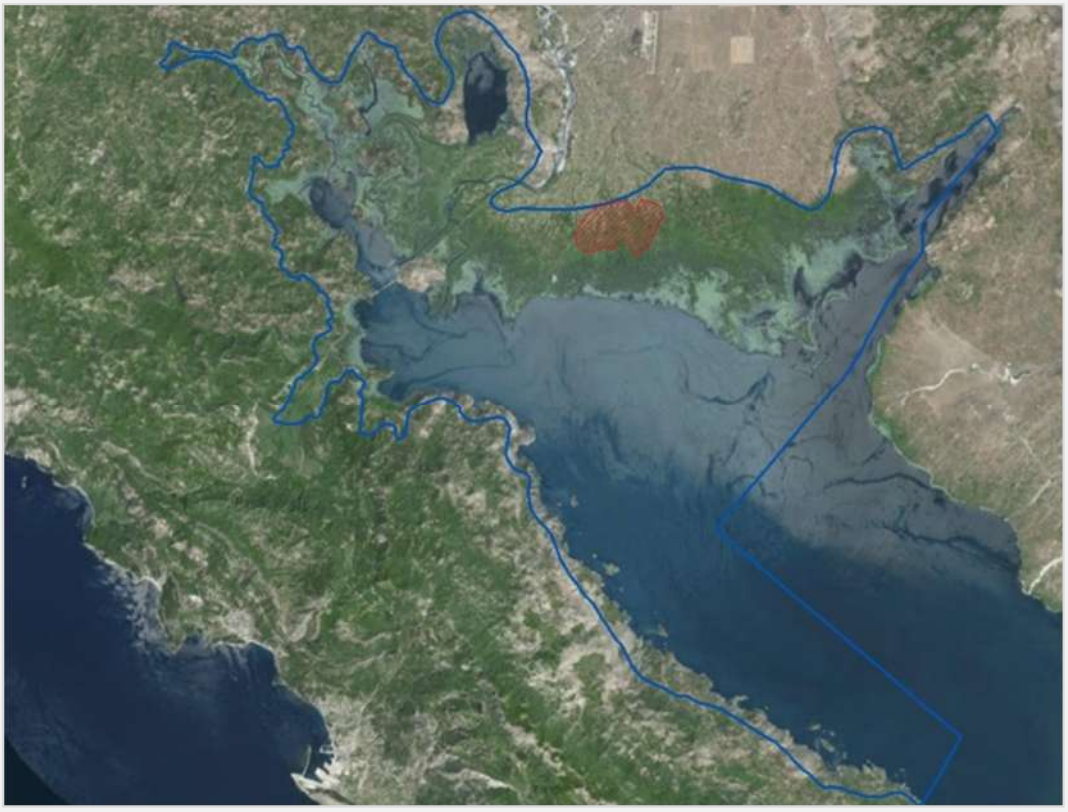

Figure 103: Overview of presence and monitoring location of Skadar Oak at Lake Shkodra/Skadar *(Quercus robur spp. scutariensis)* in the National Park Skadar Lake (blue boarder).

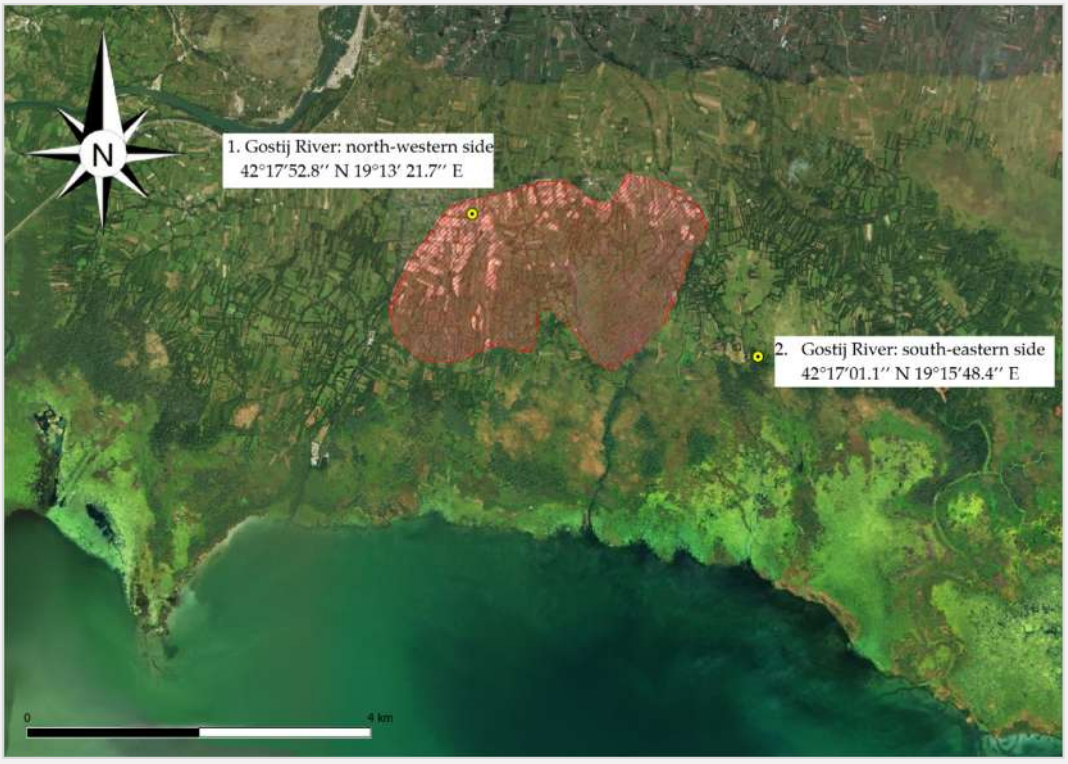

Figure 104: Detailed location of Skadar Oak at Lake Shkodra/Skadar *(Quercus robur spp. scutariensis)*

6.2.4 Data Sheet *(Quercus robur scutariensis)*

Data Sheet for the Habitat Monitoring

Skadar Oak (*Quercus robur scutariensis*)

Observer:		**Contact:**	Tel.: E-Mail:
Location:	Locality: ID:	**Date:** **Time:**	

Transect (Tr.)

Tr.	GPS point Start	GPS point End	Length of transect (m)	Tr.	GPS point Start	GPS point End	Length of transect (m)
1				6			
2				7			
3				8			
4				9			
5				10			

***Q. robur* ssp. *scutariensis* on transect**

	Tr. 1	Tr. 2	Tr. 3	Tr. 4	Tr. 5	Tr. 6	Tr. 7	Tr. 8	Tr. 9	Tr. 10
Offspring										
up to 5 m										
from 5 - 20 m										
over 20 m										
Healthy trees										
Degraded trees										

Characteristic species of community (record presence with X):

Species	Tr. 1	Tr. 2	Tr. 3	Tr. 4	Tr. 5	Tr. 6	Tr. 7	Tr. 8	Tr. 9	Tr. 10
Fraxinus angustifolia										
Periploca graeca										
Salix alba										
Salix fragilis										
Ulmus minor										
Ulmus laevis										
Carpinus orientalis										
Acer campestre										
Alnus glutinosa										
Crataegus monogyna										
Clematis vitalba										

Dendrometric table for representative trees (trees of the future):

No.	Transect No.	GPS No.	Height	Diameter	Physical damage	Pests	Pressures
1							
2							
3							
4							
5							
6							
7							
8							

Square 1:

Transect		*Pressures/observations*
GPS No.		
Dimension		

Characteristic species of communities:

Species	*Quercus robur* ssp. *scutariensis*	Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	

Square 1:

Transect		*Pressures/observations*
GPS No.		
Dimension		

Characteristic species of communities:

Species	*Quercus robur* ssp. *scutariensis*	Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	
Species		Count	

Sign

7. Biodiversity Information Systems

Collating and managing biodiversity information is as much of a challenge as collecting it. Meaningful assessments of the overall conservation status of species, habitats and protected areas – as well as appropriate management actions – can only be derived if representative data from various sources (e.g. surveys, museum collections) and countries (e.g. covering the natural range of species) are combined. It is, therefore, paramount that data collected and archived at the national level is eventually transferred to regional and global biodiversity information systems (BIS). And that data is publicly available that can be accessed and used by anyone. This requires agreement on common principles, procedures and formats which are also needed for standardized reporting purposes under international nature and biodiversity conservation conventions such as the United Nations Convention on Biological Diversity (CBD) or the EU Natura 2000 network.

For Southeastern Europe, *Biodiversity Information Management and Reporting Guidelines* have been published by GIZ in 2017 (GIZ – ORF 2017), in collaboration with IUCN and the Global Biodiversity Information Facility (GBIF). The data bank of the latter comprises about 1.1 billion entries (March 2019) on plant and animal species records (museum specimens) and occurrences (observations from authorized observers) worldwide. While GBIF's historical data are not a reference for the preparation of *National Biodiversity Strategy and Action Plans* (NBSAPs) as they relate to objectives agreed *after* the CBD was signed, current data is used as an important source of information for assessing the state and trends of global biodiversity as documented, among others, in the *Global Biodiversity Outlook* under the CBD Strategic Plan 2011 – 2020.

Other data banks such as the *Living Planet Index* (LPI), a measure of the state of global biological diversity based on population trends of vertebrate species from around the world, or *eBird*, the world's largest biodiversity-related *Citizen Science* platform, are also rapidly growing, thanks to the availability of digital applications that allow non-professionals to contribute biodiversity observations to global databases. For example, *eBird* alone receives 10 million entries on bird sightings per month (STEPHENSON et al. 2017).

For the purpose of the present Monitoring Manual it had been agreed among authors and competent authorities of riparian countries to ensure double data entry into national BIS, as far as operational, as well as *Observado*, a data platform widely used in Europe. In any case, users of the Manual are advised to consult with competent authorities of their countries in order to make sure that their data inform both national and regional biodiversity conservation efforts as well as national reporting towards EU and CBD. For further information on monitoring methods and data management, readers are referred to the authors of the Manual.

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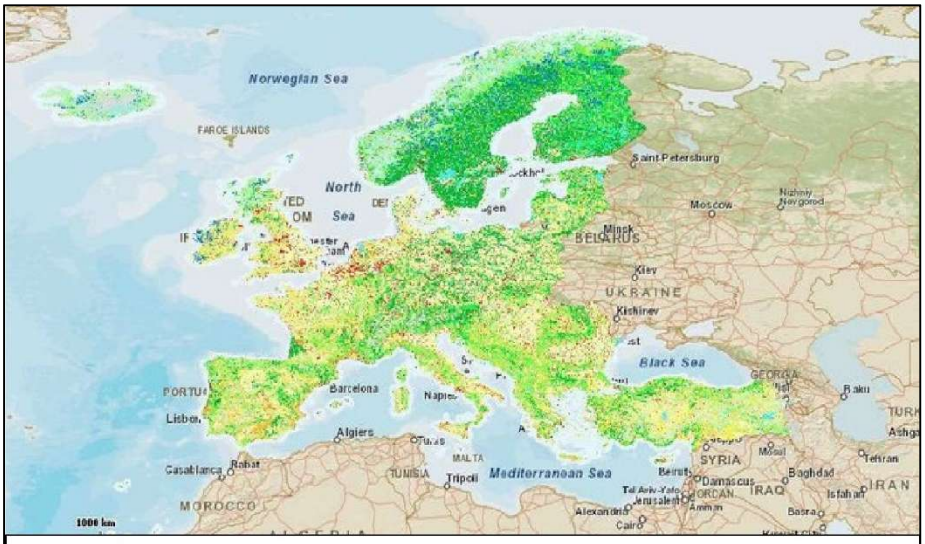
Annexes

Annex 1: Beaufort Wind Scale for the documentation of the weather conditions during the monitoring.

Beaufort number	Description	Wind speed	Land conditions	
0	Calm	< 1 km/h < 0.3 m/s	Calm. Smoke rises vertically.	
1	Light air	1.1–5.5 km/h 0.3–1.5 m/s	Smoke drift indicates wind direction and wind vanes cease moving.	
2	Light breeze	5.6–11 km/h 1.6–3.4 m/s	Wind felt on exposed skin. Leaves rustle and wind vanes begin to move.	
3	Gentle breeze	12–19 km/h 3.4–5.4 m/s	Leaves and small twigs constantly moving, light flags extended.	
4	Moderate breeze	20–28 km/h 5.5–7.9 m/s	Dust and loose paper raised. Small branches begin to move.	
5	Fresh breeze	29–38 km/h 8.0–10.7 m/s	Branches of a moderate size move. Small trees in leaf begin to sway.	
6	Strong breeze	39–49 km/h 10.8–13.8 m/s	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult. Empty plastic garbage cans tip over.	**Too bad Conditions - Irrelevant for Monitoring**
7	High wind, Moderate gale, Near gale	50–61 km/h 13.9–17.1 m/s	Whole trees in motion. Effort needed to walk against the wind.	
8	Gale, Fresh gale	62–74 km/h 17.2–20.7 m/s	Some twigs broken from trees. Cars veer on road. Progress on foot is seriously impeded.	
9	Strong gale	75–88 km/h 20.8–24.4 m/s	Some branches break off trees, and some small trees blow over. Construction/temporary signs and barricades blow over.	
10	Storm, Whole gale	89–102 km/h 24.5–28.4 m/s	Trees are broken off or uprooted, saplings bent and deformed. Poorly attached asphalt shingles and shingles in poor condition peel off roofs.	
11	Violent storm	103–117 km/h 28.5–32.6 m/s	Widespread damage to vegetation. Many roofing surfaces are damaged; asphalt tiles that have curled up and/or fractured due to age may break away completely.	
12	Hurricane	≥ 118 km/h	Very widespread damage to vegetation. Some windows may break; mobile homes and poorly constructed sheds and barns are damaged. Debris may be hurled about.	

Annex 2: Legend of the different CORINE Land Cover Data Classes.



Corine land cover classes

1. Artificial surfaces

1.1 Urban fabric

- 1.1.1. Continuous urban fabric
- 1.1.2. Discontinuous urban fabric

1.2 Industrial, commercial and transport units

- 1.2.1. Industrial or commercial units
- 1.2.2. Road and rail networks and associated land
- 1.2.3. Port areas
- 1.2.4. Airports

1.3 Mine, dump and construction sites

- 1.3.1. Mineral extraction sites
- 1.3.2. Dump sites
- 1.3.3. Construction sites

1.4 Artificial, non-agricultural vegetated areas

- 1.4.1. Green urban areas
- 1.4.2. Sport and leisure facilities

2. Agricultural areas

2.1 Arable land

- 2.1.1. Non-irrigated arable land
- 2.1.2. Permanently irrigated land
- 2.1.3. Rice fields

2.2 Permanent crops

- 2.2.1. Vineyards
- 2.2.2. Fruit trees and berry plantations
- 2.2.3. Olive groves

2.3 Pastures

- 2.3.1. Pastures

2.4 Heterogeneous agricultural areas

- 2.4.1. Annual crops associated with permanent crops
- 2.4.2. Complex cultivation patterns
- 2.4.3. Land principally occupied by agriculture
- 2.4.4. Agro-forestry areas

3. Forest and seminatural areas

3.1 Forests

- 3.1.1. Broad-leaved forest
- 3.1.2. Coniferous forest
- 3.1.3. Mixed forest

3.2 Shrub and/or herbaceous vegetation associations

- 3.2.1. Natural grassland
- 3.2.2. Moors and heathland
- 3.2.3. Sclerophyllous vegetation
- 3.2.4. Transitional woodland shrub

3.3 Open spaces with little or no vegetation

- 3.3.1. Beaches, dunes, and sand plains
- 3.3.2. Bare rock
- 3.3.3. Sparsely vegetated areas
- 3.3.4. Burnt areas
- 3.3.5. Glaciers and perpetual snow

4. Wetlands

4.1 Inland wetlands

- 4.1.1. Inland marshes
- 4.1.2. Peat bogs

4.2 Coastal wetlands

- 4.2.1. Salt marshes
- 4.2.2. Salines
- 4.2.3. Intertidal flats

5. Water bodies

5.1 Inland waters

- 5.1.1. Water courses
- 5.1.2. Water bodies

5.2 Marine waters

- 5.2.1. Coastal lagoons
- 5.2.2. Estuaries
- 5.2.3. Sea and ocean

Annex 3: Overview about the European Network of Natura 2000 sites and the location of the respective CSBL partner countries (red line) Montenegro (MNE), Albania (AL) and North Macedonia (MK) (adapted figure of the EEA 2018).

Annex 4: List of participants at the Training Workshop on Monitoring Methodologies of the Project Conservation and Sustainable Use of Biodiversity at Lakes Prespa, Ohrid and Shkodra/Skadar (CSBL) held on the 29th-30th of March 2017 in Tushemisht, Albania.

	Country	Organisation	Name and Surname	Position (in CSBL project)
1	Albania	PPNEA	Mirjan Topi	Trainer Aves
2	Albania	PPNEA	Aleksandër Trajçe	Trainer Mammalia
3	Albania	PPNEA	Bledi Hoxha	Trainer Mammalia
4	Albania	PPNEA	Ilir Shyti	Trainee Habitats
5	Albania	PPNEA	Nertila Mucollari	Trainee Amphibia
6	Albania	PPNEA	Dorina Topoviti	Trainee Odonata
7	Albania	Museum of Natural Sciences	Enerit Sacdanaku	Trainer Amphibia
8	Albania	University of Vlora	Bledar Pepa	Trainer Odonata
9	Albania	Botanical Garden	Ajola Mesiti	Trainer Habitats
10	Albania	GIZ CSBL	Ralf Peveling	Programme Manager
11	Albania	GIZ CSBL	Barbara Zennaro	Intern
12	Albania	National Environmental Agency (NEA), Albania	Bilena Hyseni	Expert
13	Albania	Regional Agency of Protected Areas Pogradec	Mihallaq Qirjo	Director
14	Albania	Regional Agency of Protected Areas Pogradec	Ernold Shaho	Secretary of watershed committee of Ohrid
15	Albania	Regional Agency of Protected Areas Pogradec	Gani Bego	expert
16	Albania	Prespa National Park	Olsi Duma	expert
17	Albania	INCA	Nihat Dragoti	Director
18	Albania	INCA	Goran Gugic	CIM expert
19	Albania	INCA	Ilirjan Qirjazi	expert
20	Germany	EuroNatur	Mareike Brix	Trainer Mammalia
21	Germany	EuroNatur	Stefan Ferger	Trainer Aves
22	Macedonia	MES	Aleksandar Stojanov	Trainer Mammalia
23	Macedonia	MES	Bogoljub Sterijovski	Trainer Amphibia
24	Macedonia	MES	Danka Uzunova	Trainer Aves
25	Macedonia	MES	Despina Kitanova	Trainer Odonata
26	Macedonia	MES	Robertina Brajanoska	Protected Areas
27	Macedonia	MES	Daniela Zaec	Project coordinator
28	Macedonia	NP Ezerani	Lazarevski Borche	
29	Macedonia	Stenje Monitoring Station	Monika Radevska	Trainee Aves
30	Macedonia	NP Galichica	Andon Bojadzi	Trainee Amphibia
31	Macedonia	NP Ezerani	Goran Stojanovski	Trainee Mammalia
32	Macedonia	Faculty of Natural Science and Mathematics	Ljupcho Melovski	Trainer Habitats
33	Macedonia	Faculty of Natural Science and Mathematics	Daniela Jovanovska	Trainer Habitats
34	Macedonia	MoEPP, sector for nature	Aleksandar Nastov	
35	Macedonia	MoEPP, sector for nature	Isuf Fetai	
36	Montenegro	Municipality of Danilovgrad	Katarina Ljubislavjević	Trainer Amphibia
37	Montenegro	National Parks of Montenegro	Hajdana Božović Ilić	Trainee Mammalia
38	Montenegro	National Park Skadar Lake	Ninoslav Đurović	Trainee Mammalia
39	Montenegro	CZIP	Bojan Zeković	Trainer Aves
40	Montenegro	GIZ CSBL	Jelena Perunicic	Focal Point
41	Montenegro	National Parks of Montenegro	Nela Vesovic Dubak	expert for ornithology
42	Slovenia	DOPPS	Tomaž Mihelič	Trainer Aves