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Lake Skadar-Shkoder Integrated Ecosystem Management Project (LSIEMP)

DEVELOPMENT OF SKADAR-SHKODER LAKE MANAGEMENT STRATEGY AND
NATIONAL FISHERY MANAGEMENT PLANS

Fishery Management Plan – Albania

-Skadar/Shkodra Lake-

DRAFT FINAL REPORT

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This is the Final Report Draft for the project “Development of Skadar-Shkoder Lake Management Strategy and National Fishery Management Plans (part Fishery Management Plans – Montenegro & Albania)” for the period from October 15 to December 15, 2011.

The implementation of the project implies:

There are two **Joint Visions** for Skadar – Shkodra Lake area at this moment:

1. Joint Vision of Joint/Transboundary Skadar – Shkodra Forum presented in the Declaration on Skadar / Shkodra Lake (2nd February 2006) that *fosters **Protection and Management of Lake’s Natural Resources** and Sustainable Development* at local level.
2. Joint Vision Statement given in the Joint Strategic Action Plan (2007) presented in the following formulation: *Skadar/Shkodra Lake is a **Trans-boundary equally Protected Area**. The level of protection is in accordance with high environmental standards, high water quality and rich biological diversity. Skadar/Shkodra Lake is an area for **sustainable activities** and it offers authenticable ecological, historical, cultural, rural and educational experience with a lot of unique places to see and visit. The environment is smartly integrated in regional economy as regards sustainable tourism, fishery, safety food production, medical plants, clean water use, etc. The lake is used in sustainable manner, with cross-border cooperation and management and high ecosystem protection.*

Sustainable development and Protection of Skadar – Shkodra Lake Natural Resources and Protected Areas are common key issues in both Joint Visions (from: Lake Skadar-Shkoder Integrated Ecosystem Management Project (LSIEMP) - Skadar-Shkoder Lake Management Strategy, 2012).

In accordance with the Joint Visions for Skadar – Shkodra Lake key words: trans-boundary protected area, high environmental standards, high water quality, rich biological diversity, sustainable activities as a tourism, fishery, safety food production, medical plants, clean water use, etc., used in sustainable manner, cross-border cooperation and management and high ecosystem protection, the General Objective of this project could be determined as adoption of national FMPs for the Lake Skadar (in Albania and Montenegro), which would back up the integrity of the lake ecosystem and fish resource and also sustainable fishing development, through the implementation activities and recommendations, and which would be accommodated with the possibilities for multipurpose of the fish resources, and harmonized with the relevant national and international legislation and plans.

Deriving from the general objective, it is possible to define some specific objectives

1. Pursuing Skadar Lake fish stocks and ecosystem sustainable usage in commercial and ecological terms, to the benefit of the local communities (currently and for the future) in Albania and Montenegro. This usage should be referred to commercial and recreational fishing, and fishing ecotourism as well.



2. Setting out and expanding fishery management system, which would include all important stakeholders in Albania and Montenegro, so as to ensure the optimal usage of the fish resources, within commercial and ecological sustainability framework.

3. Establishment of the co-management system in both countries, based on the regulations which would assure reliable information on the fishery stock status, fishery characteristics and social and commercial fishery indicators.

Some of the expected outputs could be determined as:

- Raising awareness on the importance and the role of the fish resources sustainable utilization by various beneficiaries on the Lake Skadar, which is considered as natural resource capacity;
- Setting out the fish resources utilization framework, in line with the principles of the Precaution and Protection of the fish diversity and their natural habitat;
- Setting out the monitoring system regarding fish resources of the Lake Skadar by making beneficiaries its integral component.

1. BASIC DATA ON SKADAR LAKE

Skadar Lake is located in the south-eastern part of Montenegro (E 19°15 'N 40°10'). Being a flooded limestone field emerged due to tectonic disturbances, its water capacity discharges a great part of the Zeta-Skadar limestone depression, forming a unique geotectonic and geomorphologic complex. The lake has an elliptical shape, approximately 162 km in size, and extends about 50 km towards the north-east; its maximum wideness is about 14 km. The surface of the lake varies in the range from 350 km² to 530 km², depending on precipitation and water flow, while its depth varies from 1 to 5 m in its north-eastern part, and from 3 to 9 m in its south-western part, about 7 m in average. Skadar Lake is charged with water through a great number of subterranean sub-lacustric wells (so-called "oko"), up to 60 m deep springs, such as "Radusko oko". Skadar Lake is the confluence of various rivers: Moraca Kratun, Rijeka Crnojevica, Plavnica, Crmnica, Zetica, Pjavnik, in Montenegro and Proni Tat, Rijola and Vraka, in Albania. The river that flows out of the Skadar Lake in its south-eastern part is the River Bojana. In terms of climate, the main features of Skadar Lake are aridity, varying precipitation and winds, mostly those blasting from the southwest, that differ in directions and intensities.

Approximately two thirds of the Skadar lake is located in Montenegro, one-third in Albania. Population of smaller and larger settlements on its banks in Montenegro and Albania is mostly engaged in the commercial fishing, which is the main economic activity.

2. ENVIRONMENTAL AND BIOLOGICAL DATA ON SKADAR LAKE

2.1 Water quality and its environmental requirements

The Skadar Lake water quality is best described in the scientific study „RAPORT PER GJENDJEN E MJEDISIT – 2009”. It is stated, in Chapter 2.1.2. *Lake Water Quality* that the depth of the lake is 3.5 m, in its Albanian part, and transparency of the lake varies from 2.35 to 3.5 m, depending on the season of the year and the phytoplankton bursting.



Due to the low depth and continuous water mixing, the stratification of physical and chemical parameters in the lake water column is missing. Lake water is saturated with dissolved oxygen. During the warmer part of the season, due to the dense development of aquatic vegetation, the level of oxygen decreases. In any case, the relevant indicators of water quality for fish and assessment of the status of the lake are ranged within the following limits (RAPORT PER GJENDJEN E MJEDISIT – 2009):

- dissolved oxygen amount: 6.4 – 9 mg/l,
- BOD level: 0.95 - 1.0 mg/l O₂
- ammonia nitrite (as NO₃ and NH₄): 0.01 to 0.012 mg/l,
- nitrate: 0.015 to 0.018 mg/l,
- P_{total} concentration is 0.008 to 0.009 mg/l.

Based on the transparency, dissolved oxygen, N and P concentration, Shkodra lake waters are mesotrophic (RAPORT PER GJENDJEN E MJEDISIT – 2009).

2.2. Phytoplankton, zooplankton, macro invertebrates, macrophytes

Phytoplankton, zooplankton, macro invertebrates, macrophytes carry on an important part in the use of fishing resources as a key component of trophic ecosystem Structure of Lake. Phytoplankton, zooplankton and invertebrates have a direct part as a food resource for all fish species, in different development stages, and macrophytes represent a complex habitat for both fish spawn and for the fish in “older” stages of their development. Unfortunately, only a few scientific studies examine the interrelationship between these communities and fish in Lake Skadar. On the other hand, the overview of species richness and composition of plankton communities, benthic invertebrates and macrophyte vegetation can be found in “old” scientific papers (The Biota and Limnology of Lake Skadar, 1981) and literature on fishery (Fishery-economic basis of the Skadar Lake, I and Part II, 1978), although recent reports (FISHERIES ASSESSMENT IN LAKE SHKODRA - SHKODER, ALBANIA & MONTENEGRO. Progress Report, May 2011), contain more updated scientific references.

Phytoplankton in Skadar Lake comprises rich, diverse and heterogeneous communities' β -mezosaprobic type, in general. Particularly, the composition of phytoplankton includes sea-plants from the category of *Chlorophyta* (308 types and varieties), *Pyrrophyta* (9), *Cyanophyta* (49), *Chrysophyta* (110) and *Euglenophyta* (65, The Biota and limnology of Lake Skadar, 1981), *Microalgae* (1100, “Shkodra Lake”, Dhora, 2005), more than 500 types and varieties are being identified in total. Composite seasons' dynamics and various spacing in the pelagic zone of the lake as well as in the macrophytes vegetation zone are phytoplankton communities' most important features (The Biota and Limnology of Lake Skadar, 1981; Fishery-economic basis of the Skadar Lake, I and Part II, 1978).

Skadar lake zooplankton (with microfauna) is being represented by more than 355 registered types from the category of *Rotatoria*, *Cladocera*, *Copepoda*, *Protozoa*, *Lamellibranchiata*, *Ostracoda*, *Bryozoa*, *Gastrotricha*, *Hydrozoa* and *Spongia*. As phytoplankton, zooplankton communities are also being featured with composite seasons' dynamics and various spacing. The shrimps from the category *Cladocera*, *Copepoda* and *Ostracoda*, being the natural food for the spawn of the most of the fishes in Skadar Lake, are the most important in these terms (The Biota and Limnology of Lake Skadar, 1981; Fishery-economic basis of the Skadar Lake, I and Part II, 1978).

The Lake Skadar Macroinvertebrates are very heterogeneous (*Gastropoda*, *Bivalvia*, *Oligochaeta*, *Isopoda*, *Amphipoda*, *Decapoda*, *Diptera*, *Ephemeroptera*,



Trichoptera groups etc.). Species, such as those of *Oligochaeta* and *Chironomidae* group (*Diptera*), are prevailing in the zoobenthos. These are widely spread on the lake bottom surface and have an important role in the fish nourishment. In the shallow coastal zones and in the macrophyte vegetation area, the clamshells from the genera *Dreissena*, *Anodonta* and *Unio* are being predominated in the zoobenthos. A significant quantity of the crabs can also be encountered in those lake areas. In general, macroinvertebrates of the Skadar Lake comprises of the freshwater species, with certain marine and brackish elements (The Biota and Limnology of Lake Skadar, 1981; Fishery-economic basis of the Skadar Lake, I and Part II, 1978).

Being vigorously originated macrophytes vegetation in the Lake Skadar is distinguished by the species of the genera *Phragmites*, *Scirpus* forming the Emerged aquatic vegetation, *Nuphar*, *Nymphaea*, *Trapa* forming the Floatant aquatic vegetation and *Myriophyllum*, *Ceratophyllum*, *Potamogeton*, *Ranunculus* forming the submerged aquatic vegetation (The Biota and Limnology of Lake Skadar, 1981; Fishery-economic basis of the Skadar Lake, I and Part II, 1978).

Macrophytes vegetation is particularly lush in the shallow parts of the lake and it is an important part of the fish community life cycles, since those lake areas represent the environment suitable for spawning, nourishment and hidden habitat for spawn and juvenile fish. The Skadar Lake is the combination of two limnology types: the deeper and more open part is oligotrophic, while the shallow part, overgrown by vegetation is eutrophic, in terms of the trophic status (The Biota and Limnology of Lake Skadar, 1981; Fishery-economic basis of the Skadar Lake, I and Part II, 1978).

2.3. Basic data on the species of fish in Lake Skadar

Based on several literature sources (Maric i Milosevic 2009, Maric, 2010, Mrdak 2009, FISHERIES ASSESSMENT IN LAKE SHKODRA - SHKODER, ALBANIA & MONTENEGRO. Draft Final Report, 2011, Talevski *et al.*, 2009) Lake Skadar is being inhabited by 49 species from 17 families, and 3 species of lamprey (*Lampetra planeri*, *Lampetra fluviatilis*, *Petromyzon marinus*), with no fishing importance, and therefore omitted in the Table 1.

Table 1. Fish species in Skadar Lake

Family	Scientific name	Name in English	Albanian name	Montenegrin name
1. Acipenseridae	1. <i>Acipenser sturio</i> Linnaeus, 1758	Sturgeon	Blini	Atlanska jesetra
	2. <i>Acipenser naccarii</i> Bonaparte, 1834 -1841	Adriatic sturgeon	Blini i Adriatikut	Jadranska jesetra
2. Clupeidae	3. <i>Alosa fallax</i> (La Cepède, 1803)	Twaite shad	Kubla	Kubla, Morska fraga
	3a. <i>Alosa sp. (A. agone)</i>	Twaite shad	Kubla e Ligenit	Zimska fraga, Kublica
3. Moronidae	4. <i>Dicentrarchus labrax</i> (Linnaeus, 1758)	European sea bass	Levreku	Lubin
4. Mugilidae	5. <i>Mugil cephalus</i> Linnaeus, 1758	Flathead grey mullet	Qefulli i gushtit	Cipal
	6. <i>Lisa ramada</i> Risso, 1826	Thinlip mullet	Qefulli i vjeshtës	Skocac balavac
5. Anguillidae	7. <i>Anguilla anguilla</i> (Linnaeus, 1758)	European eel	Ngjala	Jegulja
6. Citharidae	8. <i>Citharus linguatus</i> (Linnaeus, 1758)	Spotted flounder		pljosnatica, pataraca
7. Pleuronectidae	9. <i>Pleuronectes flessus</i> Pallas, 1811	European flounder	Shojza	Iverak
	10. <i>Cyprinus carpio</i> Linnaeus, 1758*	Carp	Krapi	Krap, Saran
	11. <i>Squalius platyceps</i> Zupancic, Maric, Naseka & Bogutskaya, 2010	White chub	Klen	Klen
	12. <i>Telestes montenegrinus</i> (Vukovic, 1965)	Montenegrus chub	Skorti me vizë	Moracka jelsovka



8. Cyprinidae	13. <i>Phoxinus lumaireul</i> Schinz, 1840	Minnow	Cigani italian	gaovica, gagica, zelenak,
	14. <i>Rutilus albus</i> Maric, 2010	White roach	Skorti i Shkodrës	Bijeli brcak
	15. <i>Pachychilon pictum</i> (Heckel et Kner, 1858)	Sharadon	Skorti shqiptar Skorti i zi	Saradan
	16. <i>Scardinius knezevici</i> (Bianco & Kottelat, 2005)	Rudd	Gërmuqi Lloska e Shkodrës	Lola
	17. <i>Rutilus prespensis</i> (Karaman, 1924)	Yellow roach	Skorti i Prespës	Sutalj, Brona
	18. <i>Alburnus scoranza</i> (Heckel et Kner, 1858)	Bleak	Gjuca	Ukljeva
	19. <i>Alburnoides ohridanus</i> (Karaman, 1928)	Ohridia schneider	Cironka (Gjuca e Ohrit)	Ohridska ukljevica
	20. <i>Chondrostoma ohridanus</i> Karaman, 1924	Beak carp	Skobuzi Njila Ohrit	Ohridski skobalj
	21. <i>Chondrostoma scodrensis</i> Elvira, 1987	Scadar's beak carp	Njila	Skadarski skobalj
	22. <i>Barbus rebelii</i> Köller, 1925	Rebel barbell	Mrena e Fanit	Jadranska mrena
	27. <i>Pelagus minutus</i> Karaman, 1924	Montenegrin minnow carp	Gurnec Grunci i Ohrit	Ohridska gaovica
	23. <i>Gobio skadarensis</i> Karaman, 1936	Skadar gudgeon	Mrena njëmustakore e Shkodrës	Skadarska mrenica
	24. <i>Rhodeus amarus</i> (Bloch, 1782)	Bitterling	Idhtaku	Gavcica
9. Balitoridae	25. <i>Barbatula zetensis</i> (Soric, 2000)	Bearded stone loach	Tufëza e Shkodrës Mrena e egër	Zetska brkica
	26. <i>Cobitis ohridana</i> Karaman, 1928	Ohrid Loach	Mrena e egër e Ohrit	Vijun
10. Gasterosteide	27. <i>Gasterosteus gymnurus</i> Cuvier, 1829	Three-spined stickleback	Gjëmbaçi	Bodonja
11. Gobiidae	28. <i>Knipowitschia montenegina</i> Kovacic & Sanda, 2007	Pamzzo goby	Barburiqi malazez	Moracki vodenjak
	29. <i>Pomatoschistus montenegrensis</i> Miler & Sanda, 2008	Montenegrin sand goby	Burdullaku i Shkodrës	Moracki vodenjak
	30. <i>Pomatoschistius marmoratus</i>	Tube-nose goby	Burdullaku i mermertë	Mramorasti glavoc
12. Salmonidae	31. <i>Salmo farioides</i> Karaman, 1937		Trofta e Drinit	Primorska potocna pastrmka
	32. <i>Salmo marmoratus</i> Cuvier, 1817	Bighead trout	Trofta e mermertë Troftë njile	Glavatica
	33. <i>Salmo zetensis</i> Hadzisce, 1962	Adriatic trout	Trofta buzëbutë	Zetska mekousna
13. Bleniidae	34. <i>Salaria fluviatilis</i> Asso, 1801	Sharibrack	Barburiqi	Rijecna slingurica
Allochthonous fish				
Cyprinidae	35. <i>Ctenopharingodon idella</i> (Valenciennes, 1844)	Grass carp	Amuri i bardhë	Bijeli amur
	36. <i>Megalobrama terminalis</i> (Richardson, 1844)	Black amur bream	Pëllëmbëza e zezë	Amurska deverika
	37. <i>Tinca tinca</i> (Linnaeus, 1758)	Tench	Tinka	Linjak
	38. <i>Carassius gibelio</i> (Bloch, 1783)	Prussian carp	Karasi prusian	Srebrni karas
	39. <i>Hypophthalmichthys molitrix</i> (Valenciennes, 1844)	Silver carp	Ballëgjeri i bardhë	Bijeli tostolobik
	40. <i>Hypophthalmichthys nobilis</i> (Richardson, 1844)	Bighead carp	Ballëgjeri laraman	Sivi tostolobik
	41. <i>Mylopharingodon piceus</i> (Richardson, 1845)	Dark carp		crni amur, kineska plotica
42. <i>Pseudorasbora parva</i> (Schlegel, 1842)	Amurian minnow	Notaku	Amurski cebacok	
14. Poeciliidae	43. <i>Gambusia holbrooki</i> (Girard, 1859)	Eastern mosquitofish	Barkaleci pikalosh	Gambuzija
Salmonidae	44. <i>Salvelinus fontinalis</i> (Mitchill, 1815)	Brook trout	Troftë e përrenjve	potocna zlatovcica
	45. <i>Oncorhynchus mykiss</i> (Walbaum, 1792)	Rainbow trout		
15. Percidae	46. <i>Perca fluviatilis</i> Linnaeus, 1758	Perch	Perka	Grgec



	47. <i>Sander lucioperca</i> (Linnaeus, 1758)	Pike-perch	Luçiperkë Sharmaku i egër	Smud
16. Thymalidae	48. <i>Thymalus thymalus</i> (Linnaeus, 1758)	Grayling	Freskori Losa	Lipljen
17. Ictaluridae	49. <i>Ameiurus nebulosus</i> (Lesueur, 1819)	Brown bullhead	Peshk mace kafe	Patuljasti ameri clisomic

* Since it was introduced into the lake during the Roman Empire, carp should not be considered as allochthonous invasive species, as it represents the symbol of the lake and the main fishing species.

In the above table, species from 1 to 9 are being referred as Adriatic migrants; some of them seasonally occur in Lake Skadar. Species like *Twaite shad* (marked as 3 and 3a) and *Eel* (7), also being referred as migratory fish species, have great economic importance in terms of commercial fishing. Native cyprinid species, carp and bleak, have great importance in commercial fisheries and they represent the main fishermen catch in Lake Skadar. Salmonid fish species can be found in Lake Skadar seasonally. They do not have greater importance for commercial fishing, being very scarce in the full-scale fish catch. Nevertheless, there are several endemic forms, among listed species, that might be of interest in terms of biological and conservation aspect.

In terms of commercial fishing, the most interesting types of the allochthonous fish species are those marked as 38 and 46 in the table (primarily because of their high level of the relative representation). However, having in mind certain characteristics, these species do not have high market price, and therefore are mainly used in the diet of the local population.

So, based on the before mentioned, it can be said that referring to the fish fauna of Lake Skadar these are the species with the most important economic significance (Table 2.):

Table 2. Fish species with the most important economic significance.

1. <i>Alosa fallax</i>	Twaite shad
1a. <i>Allosa sp.</i>	Twaite shad
3. <i>Anguilla anguilla</i>	European eel
4. <i>Cyprinus carpio</i>	Carp
5. <i>Alburnus scoranza</i>	Bleak
6. <i>Carassius gibelio</i>	Prussian carp
7. <i>Perca fluviatilis</i>	Perch
8. <i>Rutilus prespensis</i>	Yellow roach
9. "Scrap fish" (<i>Scardinius and Pachyphilon</i>)*	rudd and spotted roach
*	

In addition to these species, here follows the list of species with minor economic importance:

1. White chub (*Squalius platyceps*),
2. Beak carp and Scadar's beak carp (*Chondrostoma ohridanus* and *Chondrostoma scodrense*),

On the other hand, prussian carp and perch, which were introduced into the Skadar lake, present almost one third of the total fish catch in the lake (Mrdak 2009). As invasive fish types, due to their population explosion, predatory feature (perch), strong competitive characteristics (prussian carp) these fish types significantly suppressed some



native species. Apart from the commercial importance acquired in the past 30-40 years, these two fish species should be addressed to in the specific manner in terms of monitoring, because of their impact on the native fish fauna, especially having in mind the high level of endemism among the fishes of Lake Skadar (Mrdak 2009).

3. STAKEHOLDERS

The Fishery Management Organisation (FMO) is the only competent organization for fishery management in the Albanian part of the Lake. FMO is not competent for the construction of the infrastructure on the river Bojana, capacities for migratory fish species fishing, but private company controlled by the Ministry is the competent organization. FMO submits its reports to the Fishery Directorate of Ministry of Environment, Forestry and Water Management of Albania on the monthly basis. Fish marketing is performed by FMO. FMO is licensed for the processing, transportation and storing; also being determined as fish selling and collection point on the Albanian part of the lake. FMO has its own managing body - Administrative Council: selects fisherman and respects tradition. Since being licensed for fish marketing, FMO shall set out the market prices for the fish species. FMO is also responsible to look after the interests of its members. The membership in FMO is paid more or less 100 EUR/year (50% fund is for various permit issuing and 50% for membership fee). FMO acts in line with the Law and its Statute. FMO shall forward the relevant fisheries data to the Ministry. FMO income and investments need to be approved by its General Assembly.

The rangers have the key role in the survey of the fishing resources of the Skadar Lake; there are 5 rangers in service. The greatest issue that rangers encounter is illicit fishing, mostly in eastern part of the lake (use of generators, explosives, fixed nets, etc). The lake is also surveyed by two fishery inspectors. According to the Law they should be armed and wear uniform.

The Ministry of Environment, Forestry and Water Management of Albania - Directorate of Fisheries, shall set out basic criteria for election of fisherman. The Fishery Inspectorate is also a part of the Ministry. FMO is being determined, by the Ministry act, as the focal point, where all the fish catch should be submitted. The Ministry is also responsible for the enterprise that manages River Bojana. The respective enterprise is elected through public bidding (for the period of 10 years, acting in accordance with the Law, there is open and closed season).

In terms of water quality, respective national monitoring program is in force, but it is implemented by different national institutions (Institute for Public Health, Geology Institute, Hydrological and Metrological Institute).

In the last few years, there is certain number of the projects regarding fish resources usage such as Lake Shkodra Integrated Ecosystem Management Project (LSIEMP), Fisheries Assessment In Lake Shkodra – Skadar. The organizations in charge of their implementation (LSIEMP Shkodra Office; “HYDRA” N.G.O. - Fishery and Aquaculture Research Centre) can also be referred to as the stakeholders.

4. STATISTICAL DATA

Statistical data on commercial fishing

In the Albanian part of Skadar Lake, there are 410 commercial fishermen (Table 3.). All existing boats are registered, there are about 210 (2-3 persons per boat). Only one fishing permit is issued by one boat.



Table 3. Census of fishermen for Shkodra FMO (last update March 2011). From: Fisheries Assessment In Lake Shkodra – Skadar, Albania & Montenegro. (Draft Final Report, December, 2011)

No.	Fishing Ground	Number of boats	Number of fishermen
	Zogaj	32	66
	Shiroke	39	78
	Buna	9	18
	Rrethinat	8	16
	Vraka	10	20
	Grizha	15	30
	Dobre	2	4
	Culaj	5	10
	Kalldruni	12	24
	Palvar	4	8
	Sterbeq	9	18
	Jubice	24	48
	Kamice	14	28
	Flake	11	22
	Shegan	12	24
	Hoti	2	4
	Zusi	2	4
	Total	210	410

In addition to the number of fishermen and the number of the boats, there are records on the fishing tools, allowed to be used: each boat may use up 2000 m of nets, trammel nets 1000 m and 1000 meters of gillnets allowed. For each 500 meters Trammel net has 80 mm mesh size and 500 meters has 35-40 mm of mesh size. Meanwhile the same length (500 meters each) and the same mesh sizes are respectively used for gillnets In 2011, FMO introduced the logs on the catches. The respective data will be available by the end of 2011. The number of hooks used, for each boat, has not been determined yet.

Maximum of 120-130 days per year is the number of days when fishermen fish. It is common for one boat to use 800 to 1000 m of nets, while daily catch ranges from 5 to 20 kg. Previously obtained data, interviewing stakeholders, correspond to the results obtained by benchmarking of 20 fishermen. According to the Questionnaire 80% of fishermen have 200 fishing days in one year, and only 20% of them claim to have between 200 and 250 fishing days. About 85% of fishermen use standing nets while fishing, approximately 15% of them use gillnets. Annual catch per fisherman is ranged from 600 to 1700 kg, an average of 1116 kg. The average catch varies by season, the highest in the last quarter of year (about 370 kg per fisherman) and the lowest during the spawning seasons prohibitions (about 185 kg per fisherman).



For more than 75% of the Albanian fishermen, fishing is the only profession that provides livelihood, ranging from 150 to 200 EUR per month.

The market price of the most important fish species in economic terms, are as follows:

- mullet: 3-4 EUR/kg,
- carp above 4 kg: 7-8 EUR /kg,
- eel: from 5 EUR /kg to 8-10 EUR /kg depending on the season,
- bleak (in winter): 1 EUR /kg,

These are the data published by FMO in Albania, based on benchmarking only 20 of fishermen. Therefore, these data can not reflect the actual status, nor can be used for further calculations with the adequate level of certainty. Nevertheless, due to their uniformity, these data could indicate the commercial fishing limits and its main features. Still, the further and precise analysis is certainly needed.

Statistical data on recreational fishing

Data on recreational fishery in the Albanian part of the lake are currently lacking.

5. PROGRAMME AND LEGISLATIVE DOCUMENTS

5.1 RELEVANT LEGISLATION

There are significant number of documents and legislation on fisheries and other activities on Lake Skadar. The most important, in terms of fishery resources use are as follows:

- **Law No. 7908**, April 5, 1995 “On Fishery and Aquaculture”,
- **Law No. 8870** “On amendments of the Law No. 7908 dated April 5, 1995, “On fishery and Aquaculture” dated March 21, 2002 and
- **Regulation No. 1** dated March 29, 2005 “For application of the legislation on fishery and aquaculture”.

The respective documents are being analyzed in the document FISHERIES ASSESSMENT IN LAKE SHKODRA – SKADAR, ALBANIA & MONTENEGRO, Final Report Draft, December 2011.

“The Law No. 7908 sets out the basis for the proper management of the fishery sector defining many of the terms and concepts related to the fishery sector.

It should be stressed that the main intention of the legislator are:

- to ensure a rational and accountable exploitation of aquatic biological resources and development of aquaculture;
- to provide protective conservation measures in order to ensure the protection of biological water resources, and
- to support the sustainable development of fishery and aquaculture sectors, as well as create better social and economic conditions for producers.



The Law No. 8870 should not be simply considered as amendments over the main law but it is an addition to the Law 7908 featuring the new concept “**Fishery Management Organization**”.

The Fishery Management Organizations are independent legal entities, with private ownership. These are non-profitable organizations and all their income is used for the functioning of organization and the fulfilment of their objectives.

The main objectives of an FMO are:

1. to manage a fishing site according to the law, and
2. to participate in the co-management of the fishing resource.

The main bodies of the organization are:

1. Administrative Council
2. General Assembly

Another important aspect introduced by this law is the **Co-Management Plan**, which should be a reference to the FMO, jointly prepared with the DFP, and will aim at:

- promoting the utilization of fishery resources based on the sustainable development;
- maintaining the quality and biological diversity of fisheries resources;
- usage of appropriate fisheries technology;
- avoiding the creation of excess fishing capacity.

The Regulation No. 1, dated March 29, 2005 sets out the rules and regulations related to the two previously mentioned statutes. It is an extensive package of regulations but more important concerning the management of Skadar/Shkodra Lake is:

- a) To achieve sustainable fish exploitation, the Directory of Fishery Policy shall prepare an administrative and development plan for the fishery and aquaculture sector;
- b) To have a booking right in Professionals Fisherman Register, the requested person should, practice professional or seasonal fishing within a Fishery Management Organization.
- c) In inland waters, the license may be issued to one or several boats, whereas the number of the boats, on which the license is applied, has to be specified in the respective document.
- d) The interruption of the fishing license is a competency of the fishing inspectors etc.
- e) Catches by nets and hooks in Shkodra Lake have to be landed and traded first in centres approved by competent veterinarian authorities.

Based on the above regulations, on the Albanian side, fishery sector in Shkodra Lake is regulated as follow:

- Each boat is permitted to have 2000 meters of entangling nets (of which 1000 meters of trammel nets and 1000 meters of gillnets). For each trammel net 500 meters have 80 mm mesh size and 500 meters with 35-40 mm of mesh size.



Meanwhile the same length (500 meters each) and the same mesh sizes respectively are used for gillnets.

- The number of hooks for each boat has not been established yet.
- There are two seiners with 28 mm of mesh size for the bleak fishery in winter situated one in Shirokë and one in Zogaj.
- Three other seiners are for carp and crucian carp used in Shirokë, Zogaj and Kamicë.”

Other relevant legal documents, more or less related to the usage of fishing resources are, as follows:

- *Law On the Land (1991);*
- *Law On Forests and Forestry Police (1992);*
- *Law On Protection of Wild Fauna and Hunting (1994);*
- *Law On Water Reserves (1996);*
- *Law On the Regulatory Framework of the Water Supply Sector and of Disposal and Treatment of Waste Water (1996);*
- *Law On Environment Protection (2011);*
- *Law On Protected Areas (2002);*
- *Law On Protection of Marine Environment from Pollution and Damage (2002);*
- *Law On Protection of Trans-border Lakes (2003);*
- *Law On Environmental Impact Assessment (2011).*

5.2 „LONG-STANDING“ PROGRAMME DOCUMENTS

"Fisheries Management Plan for Lake Shkodra (November 2004)", referring to the Albanian part of the Skadar, outlined the range of current issues and activities. There is a quote from Chapter 3.3 *Management Tools*:

“The most basic element of a fisheries management plan is a stock assessment. This is lacking in the case of Lake Shkodra. Moreover, no catch and effort statistics has been collected since the transition, and even though the number of licensed fishermen is known, there appears to be at least twice as many unlicensed fishermen. The gear types and effort applied by the unlicensed fishermen is unknown, and no recent census data on the gear use by licensed fishermen are available. The immediate action elements to develop a co-management regime for Lake Shkodra are therefore aimed at generating the data to support and monitor proposed basic management tools.

- There is an **urgent need for a proper stock assessment for bleak and carp** in Lake Shkodra. A preliminary proposal for a stock assessment is attached (Annex 5.3). This should preferably be implemented in collaboration with Montenegro, possibly under the auspices of the upcoming GEF project “Shkodra Lake Integrated Ecosystem Management”. The Fisheries Research Institute (FRI) should be involved, and possibly use this case to recruit and develop competence on this type of fishery.
- The stock assessment should also include a **mapping of spawning grounds and other essential localised habitats in the fishes’ life cycle**, and include the seasonal importance of these habitats. This mapping of habitats will form the basis for the location and timing of possible no-fishing zones.



- **A census to establish the present fishing effort on Lake Shkodra** (number of fishermen, boats, and number and types of fishing gear) should be performed. The census should include all groups of fishermen. This may also possibly be done under the GEF project.
- With the suspicion that industrial and agricultural runoff from the watershed may cause pollution by heavy metals, pesticides and other non-biodegradable organic pollutants, in particular through bioaccumulation in fish, the **actual situation as regards pollution must be documented to ensure that consumption of fish from the lake does not pose a health risk**. Albanian stakeholders should seek to gain access to the data from the ongoing monitoring programme in Montenegro. If satisfactory data are available through this programme, the effort need not be repeated by Albania.
- The input of untreated sewage and solid waste to the lake and Buna River is of great concern. The FMO and DoF should encourage the relevant national and local institutions and organisations to develop an **environmental action plan for the co-management area**.
- **A social economical survey of fisher households (both legal and illegal) should be performed in order to determine the real importance of the fishery to the food and cash security in riparian communities**. This information would assist in the future decision making process related to proper management of lake resources and reduction in illegal fishing. It would provide some indications on the importance of other food and cash generators in the households that could be enhanced to compensate for the reduction in income from illegal fishing and fish consumption.”

5.2.1 RECENT PROGRAMME DOCUMENTS

There are two important documents set out during the 2011. Those documents refer to the future sustainable use of Lake Skadar, and the protection of the fishery stocks in both countries.

FISHERIES ASSESSMENT IN LAKE SHKODRA - SKADAR, ALBANIA & MONTENEGRO, Final Report Draft, December 2011

While outputting FMP, the setting out of another document very important for the fishery management was brought to an end. Some data from the above document were being used for the preparation of the FMP. The document comprises five chapters and annexes. The Chapter ***Aquatic Habitat Conditions*** provides an overview of the basic characteristics of Lake Skadar, which includes information on geology, climate, water characteristics (physical-chemical conditions), phytoplankton, zooplankton, macrophytes, endangered plant associations and species, benthic invertebrates, amphibian and reptiles, mammals, birds and endangered animal species. The Chapter ***Fish and Fisheries Parameters*** provides an overview of the fish fauna of Lake Skadar (Species check-list) and an overview of the parameters for the four fisheries target species (bleak, carp, shad, prussian carp). The analysis of existing data on heavy metals in fish tissue was also presented in the mentioned chapter. The Fishery Management was mapped out in the Chapter ***Monitoring Program***. It refers to the issues such as: the purpose and the legal framework, the past and the current status, the monitoring plan and its alterations, parameters/indicators, location, sampling (multimesh gillnet, fyke net, commercial beach seine, electro-fishing, fish sampling weir, beach seine, logbooks, measurement), timetable, the fishery community involvement (compiling data on the fish catch,



involvement in the monitoring program), budgetary framework (initial investment, running cost) and its implementation. The Monitoring Programme was deployed in details.

The Chapter ***Census of the Fishermen*** brings out currently available statistics on the fish catch (in Albania, only). Certain aspects of the Fishery Management were elaborated throughout the document, taking into account: management measures (in Montenegro and in Albania, separately considered), indigenous fish species protection method(s), essential habitats protection measures, restocking programme assessment necessity.

SKADAR-SHKODER LAKE MONITORING PROGRAM DEVELOPMENT, September 2011

In this very extensive and detailed document, the chapter "Current status of the Skadar/Shkoder ecosystem and its surrounding area" introduces the analysis of trends based on recent monitoring data which includes all elements of biodiversity, including fishes. After analyzing characteristics of the 19 species of fishes in the chapter "Recommendation for joint monitoring program of Lake Skadar/Shkoder", 11 of them are being designated as indicator species: three of them are significant in terms of economic importance - eel, perch and prussian carp. The other eight species are migratory, endemic or subendemic species. The sampling locations are mapped out in the same chapter: two sites for salmonid fish species, two sites for migratory sturgeon species, five locations for *Telestes montenegrinus*, *Anguilla anguilla* and *Barbatula zetensis*, four sites for *Scardinius Knezevici* and three for invasive species (perch, prussian carp and *Ameiurus nebulosus*) sampling. It is recommended that sampling should be performed according to the CEN standards:

- Water quality: Guidance on the scope and selections of fish sampling methods (EN 14962),
- Water quality: Sampling of fish with electricity (EN 14011),
- Water quality: Sampling of fish with multi-mesh gill nets (EN 14757).

Nevertheless, in the chapter "Framework prioritised annual monitoring program" designated indicators are:

- Species composition, distribution and abundance of fish,
- *Scardinius knezevici*;
- *Acipenser nacacarii*;
- *Acipenser sturio*;
- *Perca fluviatilis*.

In addition to this, the number of sampling locations, as well as the number of parameters, is being reduced.

6. PROPOSED ACTIVITIES FOR FURTHER STRENGTHENING OF FISHERY SECTOR

Based on the review and processing of all available data so far, following activities should be carried out:



6.1. STOCK ASSESSMENT (THE MOST BASIC ELEMENT OF A FISHERIES MANAGEMENT PLAN)

While setting out FISHERIES ASSESSMENT IN LAKE SHKODRA – SKADAR, ALBANIA & MONTENEGRO (Final Report Draft, December 2011), certain fishery parameters for bleak, carp, shad and prussian carp have been gathered. According to the respective data, the bleak populations, in 2011 were attributed with “good status”. The populations are being dominated by reproductively mature individuals 3+ and 4+, present on each marked location and in all the periods of the year. It has been concluded, to limit the number of issued permits for bleak during the winter season in Montenegro and in Albania, as well (FISHERIES ASSESSMENT IN LAKE SHKODRA - SHKODER, ALBANIA & MONTENEGRO, Draft Final Report, 2011).

On the other hand, the carp population status was assessed as poor, but in recovery. Measures for the recovery of populations of carp, which include the enforcement of the closing season, stronger control in IUU fishery (especially the complete eradication of fishing with generators) and some protection of spawning areas, are being proposed. In addition, measure regarding the extensive cultivation of carp in the lake, as well as the harmonization of the closed season for carp between Albania and Montenegro, have also been suggested (FISHERIES ASSESSMENT IN LAKE SHKODRA - SHKODER, ALBANIA & MONTENEGRO, Draft Final Report, 2011).

As for twaite shad population, its status was assessed as critical requiring immediate protection measures. Introducing measures such as prohibition of twaite shad juveniles fishing (during the summer period) is being proposed. The fishing in the River Bojana/Buna, during the migration period in April (even using generators), represents another particular issue that worsens the twaite shad population status. It has been considered to cease the permits issuing for fishing on the River Bojana/Buna, regardless the fish species. Furthermore, the closing season in April should be applied not only to the Skadar Lake but also for the River Bojana. And at last, a moratorium for twaite shad fishing may be taken in consideration, if the results fail (FISHERIES ASSESSMENT IN LAKE SHKODRA - SHKODER, ALBANIA & MONTENEGRO. Draft Final Report, 2011).

The Prussian Carp is still the dominant specie in terms of fish catch. Comparing to the other cyprinidae, the economic importance of the Prussian carp is increasing, while still considered dangerous invasive species. In this regard, "A joint Action Plan" including measures for the control/reduction of this specie is probably needed in the near future. In our opinion, this also applies for perch (FISHERIES ASSESSMENT IN LAKE SHKODRA - SHKODER, ALBANIA & MONTENEGRO, Draft Final Report, 2011).

Within the next two years, the Stock Assessment Programme should be implemented, setting out the special addressing to the carp, bleak and shad, as natural species and also to some allochthonous species and commercially significant ones, such as perch and prussian carp, as well as endangered fish species. The Stock Assessment Programme objectives are defined as determination of:

- species diversity and abundance;
- size, age structure and biomass of key commercial species;
- occurrence of allochthonous fish species;
- status of the endangered elements of the ichthyofauna.

The data on the length, gender and age are crucial for the respective key commercial species. The Stock Assessment Programme should also include spawning grounds mapping and other important habitats in the life cycle of fishes, and seasonal importance of these habitats (Fisheries Management Plan - Lake Shkodra (2004)).



For further defining and harmonizing of the methodology, it is necessary for the programme to be developed in cooperation with Albanian partners, taking into account CEN standards for electro fishing, multi-mesh gill nets and choosing location for sampling.

Annex 1 comprises Draft proposal for the stock assessment in Skadar - Shkodra Lake, based on Fisheries Management Plan - Lake Shkodra (2004), with significant modifications.

6.2. CAPACITY BUILDING FOR REFFERAL TO THE FISHING STATISTICS

Statistic records and familiarity on fish stock characteristics are the most important components for the permanent and sustainable fishery management of Lake Skadar. The period of one year is quite enough for the protocols to be developed and implemented by FMO and Fishery Associations. Basic statistics, obtained on the regular and factual basic, should refer to:

- fishery data (number of boats, number of fisherman, etc);
- data on fishing effort,
- data on the catch.

6.3. FISHERY MONITORING PROGRAMMES DEVELOPMENT

The elements for the fish species monitoring programmes are being set out in the “Skadar-Shkoder Lake Monitoring Programme Development” document, in terms of biodiversity. This document is applicable in Montenegro and Albania. Suggested number of sampling locations for certain fish species is as follows: 2 locations for sampling salmonid fish species, 2 for sturgeon species, 5 for eel and 2 endemic species (one *Cyprinidae* and one *Cobitididae*), 4 for *Scardinius knezevici*, 4 for invasive species (*Perca*, *Carassius* and *Ameiurus*). In addition to fish species composition and abundance (parameters: composition, abundance, biomass and age structure), these are the species proposed to be indicators: *Scardinius knezevici* (parameters: length/weight ratio, population structure, relative abundance, mortality, maturity, fecundity), *Acipenser sturio* (parameters: length/weight ratio, population structure), *Acipenser naccari* (parameters: length/weight ratio, population structure) and *Perca fluviatilis* (parameters: length/weight ratio, population structure, relative abundance, mortality, maturity, fecundity). The dynamics of monitoring provides an annual sampling in certain seasons and on certain locations. The sampling methodology should be carried out in the line with CEN standards for electro fishing (EN 14 011), multi-mesh gillnets (EN 14757) and location mapping (EN 14962). It is estimated that such monitoring programme could cost € 10,800, per year, in Montenegro, and in Albania.

The elements for the fish species monitoring programmes are being set out in the FISHERIES ASSESSMENT IN LAKE SHKODRA – SKADAR, ALBANIA & MONTENEGRO, in terms of fisheries management. There are 4 sampling locations in Montenegro and in Albania. The review of the proposed indicators, sampling methodology and frequency is presented in the following table (Table 4.).

Table 4. List of indicators for the monitoring of fish and fisheries (From: FISHERIES ASSESSMENT IN LAKE SHKODRA - SHKODER, ALBANIA & MONTENEGRO. Draft Final Report, 2011).



Proposed indicator	Sampling approach	Sampling and frequency
Main endemic or sub-endemic species status	Multimesh-Gillnet + Fyke-Net	With Multimesh Gillnet during the spring season three times per year (mid April, May and June), Fyke-Net used in combination with the Multimesh Gillnet in the same period
Bleak Status	Commercial Beach Seine + Catch Data	With Commercial Beach Seine two samplings during the winter season (one at the end of December and one in Mid-January and if needed on at the beginning of February), Catch Data all year round to have the total quantity of bleak caught in the lake
Status of other commercial species	Multimesh-Gillnet + Catch Data + Electro-Fishing	With Commercial Beach Seine two samplings during the winter season (one at the end of December and one in Mid-January), Catch Data all year round to have the total quantity of bleak caught in the lake, Electro-Fish samplings will be carried out in three campaigns (mid-May, end-May and mid-June)
Status of salmonids in the lake and tributaries	Electro-Fishing	With Electro Fishing it will be carried in the streams entering the lake in one campaign at the beginning of September or in the winter
Status of migrate species	Fish-Weir + Fyke-Net + Catch Data	Fish Weir collection of sampling during their migration toward sea (November) Catch Data all year round to have the total quantity of eel caught in the lake (including the quantity caught in the fish weir), Fyke Nets to see the presence of the eels all year round, Twaite shad & Mullet - Fish Weir collection of sampling during their migration toward the lake (April) and toward the sea (November) Catch Data all year round to have the total quantity of twaite shad caught in the lake (including the quantity caught in the fish weir).
Fishing Effort	Logbook	The collection of data will be year round by distributing the logbooks to the fishermen. Where not applicable, sampling of the effort will be carried out.
Status of juveniles	Beach Seine + Sampling	The sampling with beach seine will be carried out in October once every two years (one year for the Albanian part and one year for the Montenegrin part).

In our opinion, it is possible to develop the monitoring, referring only to the commercially most important fish species (such as carp, bleak, eel, shad, perch and prussian carp), including the smaller number of indicators and sample volume, which would only facilitate its implementation and sustainability within the specified time framework.

The setting out and the implementation of the fishery monitoring programmes should be effective in the next two year period. The respective programmes should refer to the main natural and, in commercial terms, the most important species (carp, bleak, eel, shad), economically significant allochthonous species (perch and prussian carp), as well



as habitats and areas significant for the fish population (spawning areas and areas important for the growth of the spawn). Monitoring programmes should be referred to:

- a. species abundance and biomass of commercial species: carp, bleak, eel, shad, perch and prussian carp;
- b. age and size structure of commercial species;
- c. Important habitats and status of juveniles of commercial species (spawning and nursery area).

Sampling locations and methodology should be determined on the experiences presented in the document “FISHERIES ASSESSMENT IN LAKE SHKODRA – SKADAR, ALBANIA & MONTENEGRO”. In short, it would be as presented in Tables 5, 6 and 7.

Table 5. Fishery Monitoring Programme - List of indicators for the fisheries monitoring

Proposed indicator	Sampling approach	Sampling and frequency
Bleak Status	Commercial Beach Seine + Catch Data	With Commercial Beach Seine two samplings during the winter season (one at the end of December and one at the beginning of February). Catch Data all year round to have the total quantity of bleak caught in the lake.
Status of carp, perch and prussian carp	Multimesh-Gillnet + Catch Data + Electro-Fishing	With Commercial Beach Seine two samplings during the winter season (one at the end of December and one in mid-January). Catch Data all year round to have the total quantity of bleak caught in the lake. Electro-Fish samplings will be carried out in two campaigns (mid-May and mid-June)
Status of migrate species (shad, eel)	Fish-Weir + Fyke-Net + Catch Data	Eel - Fish Weir collection of sampling during their migration toward sea (November). Catch Data all year round to have the total quantity of eel caught in the lake (including the quantity caught in the fish weir). Fyke Nets to see the presence of the eels all year round. Shad - Fish Weir collection of sampling during their migration toward the lake (April) and toward the sea (November). Catch Data all year round to have the total quantity of shad caught in the lake (including the quantity caught in the fish weir).
Important habitats and status of juveniles	Beach Seine + Sampling	The sampling with beach seine will be carried out in October once every two years (one year for the Albanian part and one year for the Montenegrin part).



From: "FISHERIES ASSESSMENT IN LAKE SHKODRA – SKADAR, ALBANIA & MONTENEGRO - Draft Final Report, 2011" – modified

Table 6. Fishery Monitoring Programme - Initial investment

Nr.	Item	Nr. of unit	Price per Unit	Total Cost EUR	Replacement period
1	Multimesh gillnet (total length 50 m) mesh sizes 33, 38, 45, 55 and 60 mm (10 m each)	2	150	300	Every 3 years
2	Multimesh gillnet (total length 50 m) mesh sizes 10, 14, 18, 23 and 27 mm (10 m each)	2	150	300	Every 3 years
3	Fyke-Net (mesh size 3 or 5 mm)	4	500	2000	Every 6 years
4	Portable balance 3000 gr max.weight (precision 0.1 gr.)	2	500	1000	Every 6 years
5	Waders	4	75	300	Every 6 years
6	Boots	4	50	200	Every 6 years
7	Ruler 50 cm (for fish measurement)	2	50	100	Every 6 years
8	Hand nets (3 mm and 10 mm mesh size)	2 (3mm) + 2 (10 mm)	50	200	Every 6 years
9	Plastic tanks	2	50	100	Every 6 years
10	Plastic buckets	2	25	50	Every 6 years
Total				4550	

From: "FISHERIES ASSESSMENT IN LAKE SHKODRA – SKADAR, ALBANIA & MONTENEGRO - Draft Final Report, 2011"

Table 7. Fishery Monitoring Programme - Running cost

Nr.	Description	Nr. of unit	Price per Unit EUR	Total Cost EUR
1	Travelling costs for 5 trips Tirana-Shkodër (175 km)	875 km	0.4	350
2	Lodging for 2 nights for 5 trips for 2 persons	20 nights	25	500
3	Diems for 2 days for 5 trips for 2 persons	20 days	40	800
4	Renting boat + fuel + 2 fishermen	20 days	50	1000
5	Miscellaneous (printing, communication costs etc.)	1	350	350
Total				3000

From: "FISHERIES ASSESSMENT IN LAKE SHKODRA – SKADAR, ALBANIA & MONTENEGRO - Draft Final Report, 2011"

THE SPECIAL HABITATS PROTECTION MEASURES should refer to the spawning area of the economically most significant fish species (carp, bleak, (twaité) shad), as well as to the areas important to the migratory species. In the document „Fisheries Assessment in Lake Shkodra – Skadar - Albania & Montenegro (Progress Report May 2011)”, in chapter “Mapping of spawning areas and other essential habitats”, the main spawning and commercial fishing areas for carp, bleak and shad are being designated. In addition to this, the basic pattern of the seasonal distribution of main species of fishes is also being provided. While the mentioned document from May 2011 was being in progress, Final Report Draft of the same document, from December 2011, presented the overview of the



spawning and commercial fishing areas by analyzing the status of the four commercially most important fish species population: bleak, carp, shad and twaite and prussian carp.

Comparative review of the spawning and commercial fishing areas for bleak (1, 2), carp (3, 4) and twaite shad (5, 6) is illustrated in fig. 1, and it is based on "Fisheries Assessment in Lake Shkodra - Scutari - Albania & Montenegro (Progress report, May 2011 and Final Report Draft, December, 2011)". It is clearly noticeable that the spawning and the commercial fishing areas almost entirely overlap (Fig.1). Having in mind that the spawning fishing prohibitions for the certain fish species differ, previously mentioned overlapping may lead in enhancement of the fishing pressure and interference of spawning on the locations where it occurs, during the spawning periods. The main consequence may be reduced natural spawning effectiveness, and on the long term basis, the decline of fishing stocks. To avoid this situation, it is necessary to:

- harmonize the periods, in spring, of the spawning fishing prohibitions;
- determine the areas with permanent fishing prohibition (one in Montenegro, and one in Albania).

Such measures are proposed in the "Fisheries Assessment in Lake Shkodra - Scutari - Albania & Montenegro (Final Report Draft, December, 2011)."



1 - Spawning areas of bleak



2 - Areas of commercial fishery for bleak



3 - Spawning areas of carp



4 – Areas of commercial fishery for carp

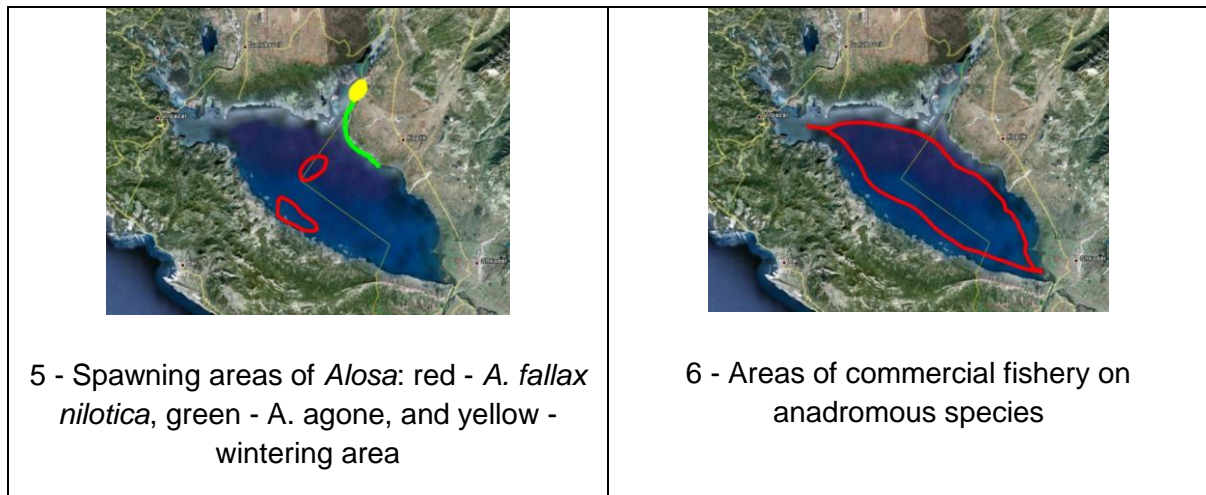


Fig.1. Comparative review of the spawning and commercial fishing areas for bleak (1, 2), carp (3, 4) and twaite shad (*A. fallax nilotica*, *A. agone*, 5, 6; Reference: "Fisheries Assessment In Lake Shkodra – Skadar - Albania & Montenegro, Progress report, May 2011 and Final Report Draft, December, 2011)".

6.4. EDUCATION

The former practice in fishery resources using, simply imposes the need for continuous education of local population in terms of perception of their role in the sustainable use and management of fishery stocks in Lake Skadar. In our experience, if expected to assume a more active role in summarizing fishery data, it is of the key importance to assure stakeholders and fishermen that there won't be any additional cost increase. In the next year, it would be necessary to develop educational programs concerning fisheries resource and its use and to start with their implementation.

Educational programs can be developed in several directions depending on whether they are intended for local people, stakeholders, commercial fishermen and recreational anglers. The general objectives of development of educational programs in the first phase should be defined as acquiring:

- basic awareness and understanding of the total ecosystem in which fishes live; the commercial and recreational fisheries supported by that ecosystem; the issues involved in managing these fisheries; and the effects people can and do have on the resource.
- positive attitudes and values toward fishes, fishing, fisheries, and the aquatic ecosystem in general, ensuring their protection, rehabilitation, and responsible management.
- social and technical skills to make decisions and solve problems associated with the management of fisheries and the motivation to personally act on those issues.

In the second phase, educational programs can be implemented through the elaboration of specific topics (subjected to modifications), such as:

- a. Commercial and recreational fisheries conflicts;
- b. Fisheries and biodiversity;
- c. Fisheries and critical habitats;
- d. Fisheries and watersheds;
- e. Global trends and fisheries issues;



- f. Harvest: effects of gear selection, techniques and effort, and bycatch (for commercial and recreational fisheries);
- g. Introduced species: boon and bane;
- h. Sharing the resource: fisheries and inter specific competition;
- i. Stocking: advantages and limits.

6.5. FISH QUALITY MONITORING PROGRAMME DEVELOPMENT

Skadar Lake is the recipient of pollutants from the surrounding industrial plants and agricultural areas, urban areas and smaller settlements. Pollutions often means introducing heavy metals, pesticides and other pollutants; elements and compounds which can be detected in the fishes intended for the human nutrition, due to the process of bioaccumulation.

Primarily, the fish meat quality monitoring is not elaborated within the fisheries management. But if being determined, the increased concentrations of hazardous substances in some fish, could lead to a significant impact on the usage of certain fish species, in terms of fishing.

For this reason, it is necessary within the next two years, to develop a programme to monitor the quality of commercial species fish meat in terms of its possible contamination by harmful and hazardous substances, particularly heavy metals and organic compounds contamination (PCBs, PAHs, etc.). Developing of such programme would be assumed by the institutions involved within the Lake Management (for example, Public Health Institute), while fishery stakeholders would take an important part in its implementation. Therefore, certain recommendations for the Fish quality monitoring programme development are being elaborated in this document.

While developing the fish quality monitoring program two-tiered approach for monitoring fish tissue contaminant concentrations is often being practiced. This strategy includes:

- initial screening program (primary studies),
- intensive monitoring study to determine the geographic extent and magnitude of contamination in edible tissues in various fish species (secondary studies).

The main objective of the primary study is to identify the fishing waters and areas where chemical pollutants presence may be expected in the fish meat, being used in human nutrition, in concentrations that may adversely affect human health. Recommended target species for the primary study are:

- 1 bottom-feeding species (carp), and
- 1 predator species (eel and/or perch).

Target species should meet several criteria:

- species are known to accumulate high concentrations of target contaminants in their tissues,
- they normally populate the freshwater systems,
- they are routinely caught and consumed by anglers,
- they are pollutant-tolerant, easily identified, abundant and easy to collect, and of sufficient size to provide adequate tissue samples for analyses of toxicants.



There are several requirements for the pollutants to be found in the list of target contaminants, for example contaminant's prevalence and persistence in the environment, its potential to bio-accumulate, its biochemical fate, toxicity, and availability/cost of analytical methods. These kinds of lists usually comprise 10-15 heavy metals, and about 30 different organic pesticides/PCBs.

One of the primary objectives of the study is to identify areas where fish meat contamination may pose health or environmental risk. The criteria for selecting sampling locations include:

- presence of municipal or industrial discharges and facilities;
- presence of intensive agricultural activities, and intensive urban land development;
- species and numbers of fish present;
- fishing pressure.

It is recommended that the sampling should be performed in the late summer (from the second half of August till mid November). This is the period which does not coincide the spawning season, the concentration of the fishes fatty tissue is high and permanent, and water levels are usually low, facilitating the sampling.

In regards to the type of samples, as a basis for estimating or predicting human health risks, composite samples can be used – flesh fillet of at least five individuals of the same type (skin and/or scales should be removed from the fillet) in the primary study. Composite samples reduce the analysis cost for the primary study. While sampling, it is necessary to take at least three composite samples. Size of fish used in the sample should be in the range typical for one of their prey.

In general, secondary study has the same design as the primary, while the number of analyzed species increases to cover all species of fishes that are consumed. On the other hand, the number of contaminants that are monitored can be less if some of them are absent in all samples and/or their concentrations in the fish flesh are below the level of significance.

6.6. THE RIVER BOJANA AS CO-MANAGEMENT AREA

The River Bojana, being a rout for migratory fish species, is of the great importance and impact on status and the quality of fish resources in Skadar Lake. The impact of construction for the migratory species fishing is very significant. FMO, Fishery Associations and other relevant national and local institutions, together with the corresponding Albanian organizations and institutions should initiate revision of the fishing manner and intensity of fishing in the river Bojana, as well as to initiate the procedure that the River Bojana obtains the co-management area status, taking into account its essential connection to the Lake Skadar water system. Similar recommendations could be found in the document “Fisheries Assessment in Lake Shkodra - Scutari - Albania & Montenegro” (Final Report Draft, December, 2011).

6.7. SOCIO-ECONOMICAL SURVEY OF FISHERMEN HOUSEHOLDS

Socio-economic aspects of fisheries on Lake Skadar have not been the subject of the specific assessment yet. In the next three years, it would be advisable to review the socio-economic aspects of fishing households (legal and illegal), in order to determine the actual significance of this activity for the local population. Information of this kind should help in future decision-making process, not only regarding the proper fishery management but reduction of illegal fishing, as well.



The objectives of such a study include:

- description and analysis of the socio-demographic features (age structure, gender, marital status, family member number, level of education);
- description and analysis of the fishermen common problems on the Lake Skadar;
- description and analysis of socio-economic requirements of small-scale fishermen;
- economic and financial performance of small-scale fishing vessels assessment and evaluation of the viability of small-scale fishing as a commercial activity;
- description of the relations between cooperatives and fishermen, which indicate the effectiveness of cooperatives from its members, taking into account the social aspect of these relations;
- outlining the current social and economic status of fisheries and drafting fishery management plans to be implemented by decision makers in Albania and Montenegro.

6.8. MINIMAL SIZES, CLOSING SEASON AND FISHING TOOLS

One of the important priorities of Skadar Lake Commission (SLC), besides its organizational structure and the implementation of the above mentioned objectives, should be national legislation harmonization between Albania and Montenegro regarding protection measures such as: minimal sizes, closing season and spawning areas, and allowed fishing tools (types, nets length, minimal mesh size, etc). The following table (Table 8.) outlines the current spawning prohibitions in Albania and Montenegro: there is a significant difference in spawning prohibitions duration. The spawn characteristics and spawning areas marking for 4 most important species in commercial terms are stated in the document *Fisheries Assessment in Lake Shkodra – Skadar, Albania & Montenegro*. Therefore, there is no argument, as the same fishing area and fishing stock are involved, for the closing season to differ in Albania and Montenegro (7,5 months in Montenegro for bleak, while in Albania it lasts for 4 months, and 75 days for carp in Montenegro, in Albania 30 days).

Table 8. The current closing season in both countries by species (From: “Fisheries Assessment In Lake Shkodra – Skadar - Albania & Montenegro, Final Report Draft, December, 2011”).

Time period SPECIES	Montenegrin part		Albanian part	
	from	to	from	to
Carp	15 th March	1 st June	15 th April	15 th May
Chub	15 th March	1 st June	15 th April	15 th May
Nase	15 th March	1 st June	15 th April	15 th June



Roach	15 th March	1 st June	15 th April	15 th June
Bleak	15 th March	31 st October	1 st April	31 st July

Minimally allowed sizes for some fish species in Albania and Montenegro are presented in the following table (Table 9.). As in the closing season, there is significant discrepancy in terms of protection measures: for example, for carp, the minimally allowed size is 40 cm of length in Montenegro, in Albania 30cm, and for bleak, 16 cm in Montenegro and 10 in Albania. Nevertheless, although prussian carp and perch represent commercially important species, their negative impact as invasive species is enormous, so they do not require protection by prescribing minimally allowed size in terms of fishing.

Table 9. Minimal allowed dimensions for some commercial species (from "Fisheries Assessment in Lake Shkodra - Scutari - Albania & Montenegro, Final Report Draft, December, 2011").

Common name	Scientific name	Montenegro	Albania
Carp	<i>Cyprinus carpio</i>	40 cm	30 cm
Chub	<i>Squalius spp</i>	Not specified	15 cm
Gibel	<i>Carassius spp</i>	Not specified	15 cm
Nase (undermouth)	<i>Chondrostoma spp</i>	Not specified	15 cm
Roach	<i>Rutilus prespensis</i>	Not specified	12 cm
Bleak	<i>Alburnus belvica</i>	16 cm	10 cm
Perch	<i>Perca fluviatilis</i>	Not specified	15 cm
Brown trout	<i>Salmo farioides</i>	25 cm	Not Applicable
Mullet	<i>Mugil spp.</i>	25 cm	Not Specified
Marble trout	<i>Salmo marmoratus</i>	50 cm	Not Applicable
Lake trout	<i>Salmo sp.</i>	30 cm	Not Applicable

There is certain discrepancy in the characteristics of fishing tools (the length of the nets, minimal mesh size, etc.) in Albania and in Montenegro.

All the above mentioned examples clearly indicate the necessity of the national legislation harmonization between Albania and Montenegro, as well as its implementation. This should be one of the main operational tasks of the SLC.



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ANNEX 1

DRAFT PROPOSAL: STOCK ASSESSMENT, LAKE SKADAR - SHKODRA

From: Fisheries Management Plan - Lake Shkodra, 2004 – significantly modified

BACKGROUND

The most basic element of fisheries management plan for Skadar Lake is the stock assessment (Fisheries Management Plan - Lake Shkodra, 2004). The importance of data obtained through stock assessment necessary for administrating management in terms of respective measures and activities, as well as addressing to the issues due to inadequate data use, present the field of interest elaborated by many authors, such as Hindson *et al.*, 2005, Cadima 2003, Gayanilo and Pauly, 1997.

The fish stocks in Lake Shkodra have never been subjected to the stock assessment (Fisheries Management Plan - Lake Shkodra, 2004). Currently, around 400 licensed fishermen are engaged in fishing in Albanian (with about 200 boats), and 200-250 in Montenegrin part of the lake. It is estimated that the same number of fishermen is involved in illicit fishing (Fisheries Management Plan - Lake Shkodra, 2004). Furthermore, the total (legal and illegal) annual catch in the Albanian part of the lake is approximately 350 t, and 800 t in Montenegro, during the past few years.

As to achieve the ecologically sustainable yield or MSY (Maximum Sustainable Yield), in other words, to process adequate rules and regulations for the fishery and to implement adequate management measures, it is very important to be familiar with the fish stocks status.

The objectives of the stock assessment in Lake Skadar - Shkodra are as follows:

- obtain a good understanding of the status of the stocks of bleak, carp, prussian carp, perch, eel and shad in terms of abundance, age and length structure, biomass and other population characters,
- map the spawning areas and other habitats of essential significance in the life cycle of the commercial species,
- status of allochthonous fish species,
- status of the endangered elements of the ichthyofauna, especially species with potential commercial importance,
- initiate and establish a programme to monitor fishing effort and size and structure of catches (commercial species),
- provide advice to stakeholders of adequate revisions of the fisheries regulations for the lake,

APPROACH

Stock and catch structure

Material of bleak, carp, prussian carp, perch and shad will be collected by test fishing with bottom-set and pelagic multi-mesh survey nets, and by sampling fishermen gill net and seine catches. Material of eel will be collected by fyke-nets. Test fishing will be performed twice a year, in March and September. Catch per unit effort (CPUE, in numbers and weight) will be recorded, and fish will be weighed and their length measured. In a subsample of adequate size, the fish will also be sexed, and maturity stage will be recorded. Scales and otholits will be collected for ageing of the fish. Compared with age and size structure of catches, this will give a good indication of the level of exploitation, as too high exploitation rate will result in too few sexually mature fish (i.e. spawners) in the population. Data from fishermen catches will demonstrate the selectivity of fishing, and if revisions of fishing regulations in terms of mesh sizes, total effort, etc., are required.



Spawning sites

Mapping of spawning sites was conducted through FISHERIES ASSESSMENT IN LAKE SHKODRA - SHKODER, ALBANIA & MONTENEGRO. Draft Final Report, 2011. Information on local environmental conditions in spawning sites (depth, substrate, presence of subsurface springs, etc.) will form the basis for identification of possible no-fishing zones.

Monitoring programme

In order to provide biological data as part of the basis for an adaptive management, a routine programme for annual sampling of commercial fish species in fishermen's catches should be established. Measuring and weighing a specified number of fish according to a detailed sampling programme, and collecting scales and otoliths for ageing of a subset of fish will provide data on the development of the portion of the population subject to fishing. This will detect trends in the population structure.

Transboundary issues

If possible, the stock assessment should be developed referring to the whole lake, through collaboration between respective institutions in the two riparian countries.

Budget (in EUR)

Salaries

Activity	Time required	Unit price	Sum (EUR)	Total (EUR)
Field work survey net fishing	60 staff days	25	1500	
Field work mapping of spawning sites	30 staff days	25	750	
Hire of field assistants	90 days	10	900	
Scale reading & analysis of data	100 staff days	25	2500	
Report writing	30 staff days	25	750	
Per diems	90 days	20	1800	
				8200

Equipment etc

Survey gill nets	3000	
Consumables (ropes, buoys, CDs, notebooks, etc.)	500	
Computer	3000	
Hire of boat for field work	1000	
Fuel	500	
Safety equipment	500	
		8500
TOTAL (EUR)		16700