



# Aquatic macrophytes in the Lake Shkodra - River Buna wetlands complex

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**Abstract** The Lake Shkodra - River Buna wetlands complex is rich in aquatic flora. 145 macrophytes have been found. Of these, 12 species are stoneworts (Charophyceae), while the others are vascular plants. Four basic formations of plant assemblage are described.

Nineteen taxa of aquatic and other hydrophilous macrophytes found in this area which are rare or threatened within Albania are enumerated. Some of these species, i.e. *Trapa natans*, *Nymphoides peltata*, *Sagittaria sagittifolia*, *Hydrocotyle vulgaris*, *Hydrocharis morsus-ranae*, *Baldellia ranunculoides* and *Marsilea quadrifolia* are found only in 2 or 3 localities in Albania.

*Spirodella polyrhiza* and *Caldesia parnassifolia*, are found only in Lake Shkodra. Comments on some of the taxa are given.

**Introduction** Lake Shkodra is the largest lake in the Balkans, shared with Montenegro. The River Buna runs along the south-west segment of the Albanian-Montenegrin border. This river springs from Lake Shkodra, quite close to the city, between the hill of "Rozafa" Castle and Mount Taraboshi. The river has a length of 44 km and flows through the fields of Bregu i Bunës towards the Adriatic Sea. Buna is the only river with a real natural delta in Albania. 1.3 km from its source in Lake Shkodra, the Buna joins the River Drin.

The Lake is geographically and ecologically connected with other aquatic habitats (River Buna, Velipoja Reserve and Domni marshes, Buna Delta and Viluni Lagoon), thus creating an ecological complex of wetlands.

It is the most important wetland system along the Adriatic Sea and one of the best preserved in the Mediterranean (Stumberger *et al.*, 2005).

Aquatic macrophytes are one of the essential ecologi-

cal components wherever they occur in lakes and watercourses

Taking into account the importance of protecting rare and endangered plants, recently their distribution in the Lake Shkodra - River Buna wetlands complex has been studied.

## Material and methods

The material was collected in several localities along the shore of Lake Shkodra, along the Buna and in the marshes connected with it (Domni marsh and marshes of Velipoja).

Data on the number of rare and endangered species for each of the localities in the area are represented in the map below. Information as to whether the plants are known to be threatened was taken from Red Data Book of Albania (Vangjeli *et al.*, 1995); categories and abbreviations taken from this book are: Ex (extinct), E (endangered), V (vulnerable).

## Results

The Lake Shkodra - River Buna wetlands complex is rich in aquatic flora. 145 macrophytes are found. Of these, 12 species are algae (fam. Characeae), while the others are vascular plants.

Four basic formations of plant assemblage can be distinguished in the different habitats of the area:

### Floating plants

This vegetation is composed of freely floating macrophytes of small size, floating on the water surface. This community is represented by plants of the genus *Lemna* (*L. minor* and *L. gibba*) and *Spirodela polyrhiza*, which grow in small summer ponds near the banks of the Buna and the Domni Marsh. This group also includes larger hydrophytes such as *Hydrocharis morsus-ranae* which grow in marshes (Domni and Velipoja) as well as in channels and ditches near the lake.

### **Floating leaved macrophytes**

This includes macrophytes with floating leaves such as *Nymphaea alba*, *Nuphar lutea*, *Trapa natans*, *Caldesia parnassifolia* and *Nymphoides peltata* (Fig. 1). These communities are present in shallower water, in the north-eastern shore of the lake and the upper stretches of the Buna, Domni Marsh, Velipoja Reserve and some channels connected to the Buna. Of this group, *Caldesia parnassifolia* grows only in a small area in the lake.

Very interesting is the community of *Trapa natans* in the part of the river near its outflow from Lake Shkodra, below the Castle (Fig. 2). It covers the whole surface and represents the only typical association of *Trapetum natantis* in Albania. In some parts of the lake it is accompanied by *Nuphar lutea*, *Potamogeton lucens*, *Ceratophyllum demersum* and *Polygonum amphibium*.

### **Submerged macrophytes**

The group of submerged macrophytes includes mainly species of the genus *Potamogeton* (*P. perfoliatus*, *P. lucens*, *P. crispus*), *Myriophyllum verticillatum*, *M. spicatum*, *Ceratophyllum demersum*, *Najas marina*, *N. minor*, *Vallisneria spiralis* etc. These are plant associations found in deeper water, most abundant in the north-eastern part of the lake and the upper stretches of the Buna.

### **Emergent macrophytes**

This group includes halophytes, half-submerged, with roots and a part of the stalk in the water, but most part of the plant above water. Among the main species of this group are *Phragmites australis*, *Schoenoplectus lacustris*, *Typha angustifolia* and *Sparganium erectum*. These plants are abundant on the north-eastern shore of the lake and along the banks of the Buna, especially in the marshy areas.

There is also a dense community of helophytes at the

outfall of the river there, including especially *Phragmites australis*, *Typha angustifolia* and in some places *Vallisneria spiralis*, *Potamogeton crispus*, *Groenlandia densa* and *Myriophyllum spicatum*, as well as a dense bed of stoneworts (Characeae).

Along the Buna, above the junction with the River Drini, the aquatic vegetation is poorer. The most common species in this part are *Potamogeton nodosus*, *Potamogeton pectinatus*, *Potamogeton perfoliatus* and *Groenlandia densa*.

On a small island there is an association of *Leucojum aestivum*, which is one of the most important populations of this species in Albania.

Figure 1 - Floating leaved vegetation in northeastern part of Lake Shkodra



Figure 2 -The locality of *Trapa natantis* association in the upper stretch of the Buna



Data on 19 rare and endangered species found in the Lake Shkodra - River Buna wetlands complex are given below. 12 of these species are included in the Red Data Book with different status. Some species (\*) have a limited distribution.

## List of species **MARSILEACEAE**

### *\*Marsilea quadrifolia* L.

Reported for Lake Shkodra (Shütt, 1945). According to the Red Data Book distribution map, this species grows in Shkodra and Lezha, although for many years it has not been found in the reported areas. Its presence is thus considered doubtful.

## **POTAMOGETONACEAE**

### *Groenlandia densa* (L.) Foureau

Found along the River Buna and in some localities of Lake Shkodra. In Albania it is mentioned in relation to Lake Prespa (Paparisto and Qosja, 1981; Mersinllari, 1997). Not mentioned in the Red Data Book.

### *\*Potamogeton gramineus* L.

This species is found only in the north-eastern part of the lake. Not mentioned in the Red Data Book.

## **ALISMATACEAE**

### *\*Caldesia parnassifolia* (Bassi) Parlato

The presence of *Caldesia parnassifolia* is reported only for the northeastern shore of Lake Shkodra as a new species for Albanian flora (Kashta and Rakaj, 2003).

### *\*Baldellia ranunculoides* (L.) Parlato

Found in Velipoja. According to Paparisto and Qosja (1981) and Vangjeli *et al.*, (1995), it has been found only in Lake Prespa. Later it is also reported in Vlora (Mullaj *et al.*, 1998). *Baldellia ranunculoides* is a European paleoendemic plant species. Vulnerable (V) according to the Red Data Book.

### *\*Sagittaria sagittifolia* L.

Found in some localities in Lake Shkodra and Domni marsh. Rare species in Albania: Lake Prespa and Lake Shkodra (Vangjeli *et al.*, 1995). In the Red Data Book it is considered as vulnerable (V).

**BUTOMACEAE***Butomus umbellatus* L.

The species is distributed throughout Lake Shkodra, the Buna and the channels of the area; widespread in the Lowlands of West Albania, in channels and wetlands. Vulnerable (V) according to the Red Data Book.

**HYDROCHARITACEAE***\*Hydrocharis morsus-ranae* L.

Found in the Domni and Velipoja marshes as well as in channels and ditches near the lake. According to the Red Data Book (V), it is found only in Lake Prespa.

*\*Hydrocotyle vulgaris* L.

Found in the delta of the Buna River and along the northeastern shore of the lake. It is considered extinct (Ex) in the Red Data Book. According to Buzo et al. (1997) it is rarely found in several localities of the low coastal area, while according to Mullaj (1988) it is found in the Lagoon of Kune-Vain.

**LEMNACEAE***Lemna trisulca* L.

Found in the Domni marsh, accompanied by *Spirodela polyrhiza*, *Hydrocharis morsus-ranae*, *Nymphaea alba*, etc. Paparisto and Qosja (1981), report that it has been found in Korça and Maliqi, in wetlands and ponds. It is not mentioned in the Red Data Book.

*\*Spirodela polyrhiza* (L.) Schleiden

Found in the Buna and the Domni marsh accompanied by *Trapa natans* and *Hydrocharis morsus-ranae* (Kashta and Rakaj, 1999a). Not included in Flora of Albania.

**NYMPHAEACEAE***Nymphaea alba* L.

Found in Lake Shkodra and the Domni and Velipoja marshes. Vulnerable (V) according to the Red Data Book.



*Nuphar lutea* (L.) Sibth. Et Sm.

Widespread in Lake Shkodra, while rarely found in the Buna. Vulnerable (V) according to the Red Data Book.

#### **TRAPACEAE**

*Trapa natans* L.

Found in some localities in Lake Shkodra, often in dense communities or accompanied by *Nuphar lutea* and *Nymphaea alba*. It is also found in the upper stretches of the Buna, in the Domni marsh, and, less frequently, near the delta of the Buna. Vulnerable (V) according to the Red Data Book, it is found in Lake Shkodra and Lezha. Mersinllari (1997) reports it for Lake Prespa.

#### **HIPPURIDACEAE**

*Hippuris vulgaris* L.

Found in marshy areas of the northeastern part of the lake and in the Domni marsh. This species is also found in Lake Prespa. It is not mentioned in the Red Data Book.

#### **MENYANTHACEAE**

\**Nymphoides peltata* (S. Gmelin) Kuntze.

Found in several localities of Lake Shkodra as well as in the upper stretches of the Buna. Vulnerable (V) according to the Red Data Book, with sparse distribution in Lake Shkodra, Lezha and Lake Prespa.

#### **CYPERACEAE**

*Cladium mariscus* (L.) Pohl.

Sparsely found along the eastern shore of Lake Shkodra. Vulnerable (V) according to the Red Data Book.

#### **AMARYLLIDACEAE**

*Leucojum aestivum* L.

Found in wet meadows surrounding Lake Shkodra and the delta of the Buna. In Albania it is reported for a few other localities: Lake Ohrid (Markgraf, 1927;

1930), Mamurras (Markgraf, 1931) and near Korça, at 1300m a.s.l. (L. Shuka, personal communication). It is not mentioned in the Red Data Book.

#### **FAGACEAE**

*Quercus robur* L.

This hygrophilous species, previously widely distributed in the Velipoja area, is now limited to few individuals. Mentioned as nearly extinct (Ex ?) in the Red Data Book.

### **Discussions and conclusions**

The value of a given community or a given site is greater if it contains species that are lacking in other areas or are considered to be rare. From this point of view, the Lake Shkodra - River Buna wetlands complex, last year designated as a Ramsar Site, has special importance.

Aquatic plants, as an entire ecological group, are seriously endangered throughout Europe (Cook, 1983). According to the Red Data Book (Vangjeli *et al.*, 1995), 27 hydro- and hygrophilous plant species are rare or endangered in Albania. Some of these species have a very limited distribution: *Trapa natans* (Lake Shkodra, Lezha) *Nymphoides peltata* (Lake Shkodra, Lezha), *Sagittaria sagittifolia* (Lake Shkodra, Lake Prespa), *Hydrocotyle vulgaris* (Ex), *Hydrocharis morsus-ranae* (Lake Prespa), *Baldellia ranunculoides* Parlatore (Lake Prespa), *Marsilea quadrifolia* (Lake Shkodra).

The Lake Shkodra - River Buna wetlands complex represents one of the few refuges in Albania for many rare and endangered plant species. 19 rare or endangered aquatic and hygrophilous plant species of Albania are found in this area (Fig. 3).

Two of these species: *Caldesia parnassifolia* and *Spirodela polyrhiza* have not been found elsewhere in Albania up to now. In our opinion, *Spirodela polyrhiza* will also be distributed in other lakes and ponds of the country.

Five species (*Groenlandia densa*, *Potamogeton gramineus*, *Hippuris vulgaris*, *Lemna trisulca* and *Leucojum aestivum*) are not included in the Red Data Book, although they have been found in few localities in Albania.

Three species – *Trapa natans* L., *Marsilea quadrifolia* L. and *Caldesia parnassifolia* (Bassi) Parlato – are included in the Bern Convention as regionally endangered.

*Baldellia ranunculoides* is a European paleoendemic plant species.

*Marsilea quadrifolia*, reported for this area many years ago, has not been found for several years and its presence now is doubtful.

For the conservation of the rare and endangered species of the area, as well of the other groups of living organisms, a working plan should be implemented, including description of the biotopes, species demography and continuous monitoring.

Having acknowledged that wetlands provide many sorts of resources, their conservation should be considered a more complex issue rather than simply the protection of the species and habitats.



Figure 3 - Map of distribution and the number of rare and threatened macrophyte species for each locality in the Lake Shkodra - River Buna wetlands complex.

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