



# Regional importance of the fauna of the cross-border River Buna

Sajmir Beqiraj

Department of Biology, Faculty of Natural Sciences,  
University of Tirana, Albania

Dhimiter Dhora

Department of Biology-Chemistry, Faculty of Natural Sciences,  
University of Shkodra, Albania.

**Abstract** This paper presents some compiled data on the values of the River Buna, mostly in terms of its fauna. These values are presented here together with the geographical, hydrological and ecological characteristics of the Buna area, emphasizing the regional importance of this area as a migration corridor and biodiversity reserve. Data on several animal groups (molluscs, amphibians, reptiles, fishes, birds and mammals) are given, focusing on the most significant species of regional importance (migratory, rare, endangered) and their most important habitats.

**Introduction** The River Buna runs along the Albanian – Montenegrin border. It springs from Lake Shkodra, between the hill of “Rozafa” Castle and Mount Taraboshi and flows towards the Adriatic Sea, with its delta lying between Velipoja (Albania) and Shtoj (Montenegro). The Buna is the only emissary of Lake Shkodra and has a length of 44 km.

The Buna area, including its delta, marshes and Lake Shkodra on both sides, Albanian and Montenegrin, has been evaluated as an important area in terms of biodiversity, due especially to the avifauna and ichthyofauna. These groups have been the subject of several studies, inventories and monitoring. Less is known about the situation of the other animal groups, especially invertebrates.

This paper highlights the importance of the fauna of the area in a regional context, based on the analysis of existing data on biodiversity assessments.

**Material and methods** The data on flora, fauna, hydrology and geography were taken from publications and technical reports. The data on invertebrates and the ecological interpretations are the work of the authors.

As well as the publications, data collected from several pro-

Figure 1 - Watershed of the River Buna



Figure 2 - Photo of the Buna-Drin connection site (Photo Euronature)



jects on the Buna area were investigated (Fig. 1). The main sources of information on the Buna and its surrounding area were the "Report on biodiversity of the River Buna" (Dhora and Beqiraj, 2001), a publication in the framework of the project called "Restoration of regional faunistic role of transboundary River Buna" (APAWA, Kalimera, REC Hungary), implemented in 2000 – 2001, and the project called "Rapid assessment of the ecological value of the Bojana-Buna Delta (Albania/Montenegro)" (EURONATURE, APAWA), implemented in 2003 – 2005 (Fig. 2).

## Results and discussion

### Hydrological importance of the River Buna

The Buna plays an important role within the hydrographic network of Lake Shkodra – River Buna – River Drin – Velipoja Coast. The connection between Lake Shkodra, the Buna and the Drin plays a very important role in terms of hydrological values. This connection determines the hydrologic regime of Lake Shkodra, the River Buna itself, and their tributaries in the catchment area. It also has an important impact on the morphology of the Buna delta in Albania and Montenegro (Dhora *et al.*, 2001). Lake Shkodra serves as a retention basin for surplus waters coming from its mountainous catchment area. On its south-eastern edge, the Buna acts as a drainage channel, evacuating the surplus waters from the lake. In this way the Buna prevents and reduces the risks of heavy flooding of the

area around the lake (Dhora and Sokoli, 2000). The Buna plays the same role for the Drin and its catchment area, at least in its lower stretches. Alluvial forests in the Velipoja area, with their marshes and the surface and underground communication of the Buna with a system of marshes and the Viluni Lagoon serve as discharging basins for Buna waters, keeping the water balance and reducing flooding.

### **Regional importance of the River Buna as a migration corridor**

The connection between Lake Shkodra, the River Buna, the River Drin and the river mouth of the combined Buna and Drin rivers in the Adriatic Sea plays a very important role as a migration corridor for aquatic species on a regional scale. So, the Buna-Lake Shkodra connection and the Buna-Drin connection, with one branch of the Drin (Black Drin) from Lake Ohrid and the other branch (White Drin) from Kosova, play the role of a “bridge” between the Adriatic Sea and the hydrographic network of the South-western Balkans (Dhora *et al.*, 2001). This network includes four cross-border lakes: Shkodra, Ohrid, Macro Prespa and Micro Prespa (the Prespa lakes provide water for Lake Ohrid), involving 5 countries: Albania, Montenegro, Kosova, FYROM of Macedonia and Greece. The Buna is thus a very important migration corridor to and from the sea for migratory aquatic animal species of the hydrographic network mentioned above.

### **Faunistic values of the River Buna**

*Molluscs (Mollusca)*- Data on molluscs are based on Dhora *et al.*, 2001 and Beqiraj and Dhora 2001. Molluscs are the most well-known group among the invertebrates of the Buna. The Prosobranchia Theodoxus, Viviparus, Valvata, Bithynia, Holandriana and other species, such as *Dreissena blanci*, *Planorbis planorbis*, and *Stagnicola palustris* are often found among submerged macrophytes. In the marshes and ponds of the Buna, the most common are

*Viviparus mamillatus*, *Planorbarius corneus*, *Lymnaea stagnalis*, *Stagnicola palustris*, *Radix auricularia* etc. In the shallow waters with little vegetation, *Radix ovata*, *Galba truncatula*, *Physella acuta*, *Planorbis planorbis* etc are more common. Bivalves of the Unionidae family are found mostly in sandy-silt substrates and in the marshes. *Theodoxus fluviatilis* and *Dreissena blanci* are also found on hard objects in water or rocks. It is important to emphasize the fact that three species *Unio crassus*, *Unio elongatus* and *Microcondylaea compressa* are considered to be globally endangered. The Buna estuary is also rich in molluscs. Particularly the malacofauna of the estuary is dominated by bivalves, a result of the abundance of phytoplankton in this area.

*Fish (Pisces)* - Data and assessment of fish populations are taken from Dhora *et al.*, 2001, Beqiraj and Dhora 2001, Rakaj 1996 and Schneider-Jacoby *et al.*, 2005. It is rare for the Mediterranean sub-region, but also on a large scale, that a field river, very short, in the temperate climatic belt, has such a rich ichthyofauna. The Buna is an ideal case, which connects not only the waters, but also the ichthyofauna of some ecosystems of regional importance. Through the Buna 13 species and subspecies of migratory fish pass from Shkodra Lake to the Adriatic Sea and vice-versa: *Lampetra fluviatilis*, *Lampetra planeri*, *Petromyzon marinus*, *Acipenser sturio*, *Acipenser naccarii*, *Acipenser stellatus*, *Alosa falax nilotica*, *Anguilla anguilla*, *Dicentrarchus labrax*, *Mugil cephalus*, *Liza ramada*, *Platichthys flesus luscus* and *Citharus linguatula*. Among these is the sturgeon *Acipenser sturio*, which is a globally endangered species. Another group, with at least 30 species of freshwater fish, populates the Buna. Almost all these species are also found in Lake Shkodra. Almost 70% of the fish species of the river belong to the Cyprinidae family. This fact shows the Mediterranean character of the ichthyofauna of the Buna. Among the most important fish are the carp [*Cyprinus carpio*], the most characteristic fish of the Shkodra area, *Carassius*

*auratus gibelio*, imported from Asia to the lake three decades ago, which has already occupied many European waters, *Alburnus alburnus alborella*, *Scardinius erythrophthalmus scardafa*, *Leuciscus cephalus albus* and *Perca fluviatilis*, which entered the Buna through the Drin. Also of particular interests is *Pachychilon pictum*, as a local endemic species. In the Buna, there are also fish species which entered through the Drin from the Ohrid and Prespa lakes, such as *Barbus meridionalis petenyi*, *Alburnoides bipunctatus ohridanus*, *Chondrostoma nasus ohridanus*, *Rutilus rubilio rubilio*, *Rutilus prespensis vukovici*, *Gobitis taenia ohridana* etc. Another interesting group of fish is that of marine species found in the mouth of the Buna. A huge amount of alluviums is discharged at the river mouth. Substances rich in nitrogen and phosphorus, transported by the Drin and Buna, make the Buna estuary the most productive estuary in the Eastern Adriatic. This is the reason for the abundance of fish, about 50 species, in the river mouth. The most common fish of the Buna estuary are *Lichia amia*, *Thunnus thynnus thynnus*, *Argyrosomus regius*, *Engraulis encrasicolus*, *Aphanius fasciatus*, *Syngnathus tenuirostris*, *Sciaena umbra*, *Umbrina cirrosa*, *Diplodus sargus sargus*, *Lithognathus mormyrus*, *Symphodus cinereus*, *Gobius niger*, *Atherina hepsetus* and *Solea vulgaris*. When assessing the ichthyofauna of the Buna, consideration should also be made of the waters connected to the Buna, such as the Lagoon of Viluni, Lake Shas, Porta Milena, the Marshes of Domën, Murtemza etc.

*Amphibians (Amphibia)* - Data on amphibians are taken from Crnobrnja-Isailovic and Dzukic, 1997; Dhora *et al.*, 2001 and Haxhiu, 2003. The Buna and its surrounding marshes, ponds and channels are ideal habitats for amphibian fauna. This area is characterized by an abundance of amphibians, taking into account the catchment area, too. The predominant species are *Bufo viridis*, *Rana lessonae* and *Rana balcanica*. The list of amphibians of the Buna includes 11 species, but the actual number

might be higher. Here there are 3 species of tailed amphibian (Caudata) and 8 tailless species (Anura). Of particular biogeographical importance is the presence of three endemic taxa in the Buna and its drainage basin: *Rana balcanica* is endemic to the Balkans; *Bombina variegata scabra* is endemic subspecies of the Balkans and *Triturus vulgaris graecus* is a sub-endemic subspecies of the Balkans.

*Reptilians (Reptilia)* - Data on reptiles are based on Crnobrnja-Isailovic and Dzukic, 1997; Dhora *et al.*, 2001; Haxhiu, 1998 and Haxhiu, 2003. Three aquatic species of reptile have been reported for the River Buna: *Emys orbicularis*, *Natrix natrix persa* and *Natrix tessellata*. Most reptiles in the Buna and its catchment area are terrestrial. 18 reptile species have been reported in the drainage basin of the Buna. The highest density belongs to the genera *Lacerta*, *Elaphe* and *Coluber*. The high diversity of reptiles is favoured by the hot summer temperatures, the diversity of habitats, structural formations of the ground, vegetation which shelters them and the abundance of food. The regional importance of the Buna area for reptiles is evident when evaluations are made on a larger taxonomical and zoogeographical scale. This area is an important reserve for endemic Balkan species: *Podarcis muralis albanica* is a subendemic form of the Balkans; *Telescopus fallax fallax* is an endemic species of the Balkans; *Elaphe quatuorlineata quatuorlineata* is a subendemic subspecies of the Balkans; *Elaphe situla* is also a subendemic species of the Balkans; *Coluber najadum dahli* represents a subspecies of *Coluber najadum*, which is endemic to the Balkans.

*Birds (Aves)* - Data and assessment of birds are based on Beqiraj and Dhora, 2001; Bino, 2003; Dhora *et al.*, 1998; Dhora *et al.*, 2001; Hagemeyer *et al.*, 1994; Kayser *et al.*, 1995; Schneider-Jacoby *et al.*, 2005. Assessment of the avifauna of the Buna should take into consideration the avifauna of the wetland areas around the river and the habitats where birds nest and take shelter. Along the banks of the Buna there is a forest belt, which is an impor-



tant habitat for birds. Especially in its lower stretches, the Buna is connected to a water complex, including the marshes of the Velipoja Reserve, Murtemza, Domën, Shtoj i Poshtëm, Lake Shas, the Saltpan of Ulcinj and many connecting channels. These areas are rich in trees, reed beds and large-leaf floating plants. These habitats are very rich in wintering, nesting and migratory waterfowl. The total number of individuals counted in winter along the river banks is 8,000, but a much larger area should be considered. In Velipoja, quite close to the Buna, 5,000 individuals were counted. At its other extreme, the Buna is connected to Lake Shkodra. The Buna is an interesting migration corridor through which the avifauna of the wetlands around the lower stretches of the Buna communicate with the avifauna of Lake Shkodra. This lake has a significant capacity as a shelter and nesting site for birds. In its Albanian part about 24,000 individuals were counted and in its Montenegrin part 224,000 individuals. The avifauna of this area communicates with that of the Viluni Lagoon, the wetland Complex of Kune-Vain and also with many wetlands connected to the River Drin.

On the river banks and in the surrounding wetlands about 170 bird species have been counted. Half of these are Passeriformes, the rest being mainly Falconiformes and Anseriformes. In the wetland area of Buna over 50 species of waterfowl have been counted, the most abundant being *Tachybaptus ruficollis*, *Phalacrocorax pygmaeus*, *Anas penelope*, *Anas platyrhynchos*, *Anas clypeata*, *Anas crecca*, *Aythya ferina*, *Bucephala clangula*, *Fulica atra*, *Vanellus vanellus*, and *Larus ridibundus*. Referring to the bird counts for the years 1993 and 1995 in the Albanian part of the river, some species are of great importance on the regional scale, despite the low number of individuals. For example, the 19 individuals of *Larus miotus* counted in the Buna area represent 11% of the total number of this species in the whole Mediterranean. The 51 individuals of *Sterna sandvicensis* represent 85% of the total number of this species in Albania. For other species, such as *Anas*

*penelope*, *Anas clypeata*, *Bucephala clangula* and *Phalacrocorax pygmeus*, comparing the small area of the Buna valley with the total distribution area of these species, it can be assumed that the individuals counted in Buna represent a high percentage on the global or regional scale. Over 76% of bird species in the Buna valley are migratory. This area has an important biogeographical position. It is an important site in one of the three migratory roads of the birds of Europe, the flyway passing over the Balkans. About 29% of bird species in the Buna valley are nesting species. Nearly half the waterfowl species are included in the lists of birds that are endangered on the local, regional and international scale. Of these, *Aythya nyroca* and *Phalacrocorax pygmeus* are globally threatened species. With its wetland areas, the Buna represents a rare case in Europe in terms of bird biodiversity values, high dynamics and high generative potential.

*Mammals (Mammalia)* - Data on mammals are based on Bego, 2003, Dhora *et al.*, 1998, Dhora *et al.*, 2001, Schneider-Jacoby *et al.*, 2005. The otter (*Lutra lutra*) is a rare aquatic mammal of the Buna River. This globally threatened species has been recorded several times in the Buna over the last few decades. On the two sides of the river, large terrestrial mammals include *Lepus capensis*, *Vulpes vulpes*, *Canis aureus*, *Meles meles*, *Mustela nivalis*, *Mustela putorius*, *Sus scrofa*, the insectivorous *Crocidura leucodon*, *Crocidura suaveolens*, *Suncus etruscus*, and *Erinaceus concolor*, as well as the rodents *Apodemus*, *Mus*, *Pitymys* and *Microtus*. It is interesting to mention the presence of the dolphin *Delphinus delphis* in the mouth of Buna and bottlenose dolphin *Tursiops truncatus*, which has been recorded even in the middle stretches of the river, chasing schools of fish. As well as *Lutra lutra*, other endangered mammals of the Buna area are *Mustela putorius*, *Delphinus delphis* and *Tursiops truncatus*.

*Diversity of habitats in the Buna area* - Description of the habitats is mostly based on Dhora *et al.*, 2001, Schneider-

Jacoby *et al.*, 2005. The Buna area, including the wetland areas connected with the river (Note: Shkodra Lake is excluded from this description) contains a wide variety of habitats, communities and landscapes. They consist of cross-border freshwater ecosystems (lake and river), the Buna delta, the coast (Velipoja), sand dunes, a coastal lagoon (Viluni), floodplain and alluvial forests, alluvial islands, freshwater marshlands, calcareous and karst formations, subterranean waters, artificial ponds, irrigated lands, pastures, arable lands, etc. All these habitats shelter a high diversity of flora and fauna and make the relevant area one of the most diverse and abundant sites in the South Balkans and Adriatic coast.

In the following there is a short description of the most important habitats of the Buna area in Albania and Montenegro.

**Forest of Velipoja (Albania)** - This is a natural reserve situated between the Buna delta and the Adriatic Sea. In the reserve there are four shallow marshes, provided with water from the Buna. Most of the vegetation of the water is made up of the associations of *Phragmites* and *Typha*. In deeper water there are also associations of *Nymphaea*, hosting the endangered plants *Baldelia ranunculoides*, *Hydrocharis morsus-ranae* and *Utricularia vulgaris*. The most prominent characteristic of the vegetation of this reserve is the forest. All over the reserve there are areas of *Tamarix* and various bushes. In the part of the reserve near Buna, there is a mixed, dense forest of *Alnus*, *Ulmus*, *Cornus*, *Fraxinus* etc. The reserve hosts many species of birds, of which the most abundant are those of genera *Aythya*, *Anas*, *Fulica*, *Podiceps*, *Phalacrocorax*, *Egretta* etc.

**Franz Joseph Island (Albania)** - This is a sandy island in the Albanian part of the Buna delta, of variable shape and size, about 4.5 ha. In recent years its surface has diminished because of erosion. Among the aquatic macrophy-

tes, the halophytes *Phragmites*, *Typha*, *Iris pseudocorus*, *Alisma plantago aquatica* predominate. The island is covered by forest vegetation dominated by *Populus* and *Alnus*. In the island several species of wetland birds feed and nest, but, because of the human impact of the last two decades, the former colonies of herons and cormorants have left the island and have moved to more suitable habitats on the Montenegrin side.

**Ada Island (Montenegro)** - Ada is an island of about 4 km<sup>2</sup>, in the Montenegrin part of the Buna delta. This island has some small marshes, whose vegetation is dominated by the associations of *Phragmites australis*, *Typha angustifolia*, the families Juncaceae and Cyperaceae, as well as species of the genus *Iris* and *Alisma*. The most interesting forest vegetation consists of *Fraxinus* and *Alnus*. On this island there are also *Pinus*, *Populus* and other decorative trees. Among the most abundant birds on the island are *Tachybaptus ruficollis*, *Aythya ferina*, *Fulica atra*, *Phalacrocorax pygmeus*, *Ardea cinerea*, *Egretta garzetta*, *Egretta alba* etc.

**Marsh of Domni (Albania)** - This marsh is provided with water by the Buna River. In this marsh 60% of the surface is covered by the associations of *Phragmites australis* and *Typha angustifolia*. The main accompanying species are *Sparganium erectum*, *Schoenoplectus lacustris*, *Myriophyllum spicatum*, *Ceratophyllum demersum*, *Utricularia vulgaris* etc. Here are present endangered and rare species for Albania, such as *Sagittaria sagittifolia*, *Hydrocharis morsus-ranae*, *Lemna trisulcata*, *Spirodella polyrhiza*, *Nymphaea alba*, and in the channels near this marsh, the association of *Trapa natans*. In the shallower water of the marsh are found several species of Charophyceae. There is no forest vegetation in the Domni Marsh. The most common birds of the marsh are *Tachybaptus ruficollis*, *Phalacrocorax pygmeus*, *Egretta garzetta*, *Egretta alba*, *Gallinago gallinago*, and *Larus*

*ridibundus*. The reed beds shelter many passeriformes and falconiformes, of which the most abundant are those of the genus *Circus*.

**Lake Shas (Montenegro)** - This is a small lake connected to the Buna through a channel. It is relatively well protected and has rich biodiversity, especially for birds and fish.  
**Saltpan of Ulcinj (Montenegro)** - Although some distance from Buna, this saltpan is connected to freshwater sources, which communicate with the Buna. It is important to emphasize that the ornithofauna of this saltpan communicate with the ornithofauna of all the wetland areas of the Buna and the waters connected to this river. The saltpan of Ulcinj is a very suitable nesting site for many bird species, some of them endangered on a regional scale.

**Lagoon of Viluni (Albania)** - This is a coastal lagoon with an area of 390 ha. In its eastern part it receives a large amount of freshwater from the marshes of the Buna River. This lagoon is known for its abundance of fish (*Anguilla*, *Mugil*, *Dicentrarcus* etc) and birds, especially *Anas*, *Fulica*, *Larus* and *Charadrius*.

**Marsh of Murtemza (Albania)**: this is a small water body, a remnant of the former wetland complex of Domni-Çasi-Pentari-Murtemza and is provided with water by the Buna River. Formerly this complex was well-known for fish, ducks and aquatic vegetation, especially *Nymphaea alba* and *Phragmites australis*. Of this system only one marsh remains, which can be still considered a small lake with interesting biodiversity.

## Conclusions

The River Buna plays an important role on the regional scale within the hydrographic network of Lake Shkodra-River Buna - Velipoja Coast. In terms of hydrology, the Buna plays a very important role in the regime of Lake Shkodra, the River Drin, their tributaries in the drainage basin and the Buna delta in Albania and Montenegro. In terms of biodiversity, the Buna and its surrounding

wetland area is an important natural reserve, as a site with high potential for nesting and sheltering of many animal groups.

The most important feature of the Buna River is its role as a migration corridor for aquatic animals between the Adriatic Sea and the hydrographic network of the south-western Balkans, as well as for the avifauna of the wetland areas around the river and Shkodra Lake. An inventory and continuous monitoring of the most important habitats of the Buna area and its wildlife is needed, in order to make a full assessment of their values and importance on a regional scale.

## References

- Bego, F. 2003. Gjitaret. In: *Monitorimi i faunes ne zonat Velipoje, Kune, Vain, Patok, Divjake e Sarande*. MSHN, MM. Tirane: 61-67, 38, 54.
- Beqiraj, S., Dhora, D. 2001. *Buna Bojana*. APAWA, Kalimera, REC. Tirane: 3-6.
- Bino, T. 2003. Shpendet. In: *Monitorimi i faunes ne zonat Velipoje, Kune, Vain, Patok, Divjake e Sarande*. MSHN, MM. Tirane: 36-38, 54.
- Crnobrnja-Isailovic, J. and Dzukic, G. 1997. Diversity of amphibian and reptile fauna in the Lake Skadar region and importance of its conservation. In: *Prirodne vrijednosti zastita Skadarskog jezera*. Crn. Akad. Nau. Umj. Podgorica: 42-51.
- Dhora, Dh., Imeraj, P. and Rakaj, M. 1998. Rezervati i Velipojës. *ShRMMNSh, REC. Shkodër: 6-14*.
- Dhora, Dh. and Sokoli, F. 2000. Liqeni i Shkodrës – Biodiversiteti. *ShRMMNSh, UNDP, GEF/SGP, Shkodër: 18-32*.
- Dhora, Dh., Beqiraj, S., Dhora, D. 2001. Report on Biodiversity of River Buna. APAWA, Kalimera, REC. Tirane: 3-21.
- Hagemeijer, V. J. M., Schepers, F. J. and Hallman, B. 1994. Wintering waterbirds in coastal wetlands of Albania. *Zeist: 12-17*.
- Haxhiu, I. 1998. The reptilia of Albania. Species composition, distribution, habitats. *Bonn. Zool. Beitr. Bonn: 12-21*.
- Haxhiu, I. 2003. Herpetofauna. In: *Monitorimi i faunes ne zonat Velipoje, Kune, Vain, Patok, Divjake e Sarande*. MSHN, MM. Tirane: 25-29.
- Kayser, Y., Bino, T. and Gauthier-Clerc, M. 1995. Recensement des oiseaux d'eau hivernants en Albanie. *Arles: 9-13*.
- Rakaj, N. 1996. Ihtiofauna e Shqipërisë. *ShBLSH. Tiranë: 38-54, 66-78*.
- Schneider-Jacoby, M., Sackl, P., Savelic, D., Schwarz, U., Stumberger, B., Dhora, D. 2005. Rapid assessment of the ecological value of the Bojana-Buna Delta (Albania/Montenegro). *EURONATURE: 6-87*.