BIOLOGICAL INTEGRATED POTENTIALS IN THE COMPLEX ADRIATIC SEA – BUNA RIVER – SHKODRA LAKE

Dr. Violeta Alushi  Prof. Dr. Dhimitër Dhora
Department of Biology-Chemistry, University of Shkodra “Luigj Gurakuqi”, Shkoder, Albania,

Abstract

Adriatic Sea, Buna River and Shkodra Lake make up a unique complex of integrated ecosystems. The Adriatic Sea is known by some special characteristics as compared to the Mediterranean Sea. Buna River and Shkodra Lake are contributors to the stability and biodiversity of the marine ecosystem. The influence of Buna River is felt diagonally in the sea, up to the shores of Italy. On the other side, Buna River regime depends from marine factors. 66 species of fish, caught in estuary of Buna river up to a distance of 40 m in the sea, have been listed. This bentic resource of fish is one of the biggest in the Western Balkans, particularly for Mullus barbatus, Merluccius merluccius, Spicara smaris, Citharus linguatula, Lepidotrigla cavillone, Solea solea, Torpedo torpedo. The details about 9 species of Buna River and Shkodra Lake that migrate to sea, have been given. Sturgeons (Acipenser) and flounder (Platichthys flesus) are already rarely seen. Interest is shown for the commercial migrants such as Mugil cephalus, Liza ramada, Dicentrarchus labrax, Anguilla anguilla, Alosa agone (migrant). Marine species of other fish, entering Buna River, are also shown. Data is given about the finding cases of the bottlenose dolphin (Tursiops truncatus) and the sea turtle (Caretta caretta) up to the upper flow of Buna River.

Key words: integrated ecosystems, migrant species, Adriatic sea, River Buna, Shkodra Lake

Introduction

The Adriatic Sea, Buna River and Shkodra Lake are situated on the border line of Albania and Montenegro (Fig. 1) and make up a unique complex of integrated ecosystems. Buna River has an average annual flow of 320m3/sec and both with Drini River flow 680m3/sec, which makes it second in rank in the Adriatic Basin, after Po river. As a result of major flows, Buna River has a great impact on the Adriatic Sea. Marini et.al (2004) explained that the fresh waters of Buna River are felt diagonally in the sea towards South West, up to the shores of Italy, caused by the combination of marine streams which arrive at our shores with the water flowed by Buna River. The solid organic flows of Buna River are an important factor for the development of a rich community of fish and other organisms of Buna estuary which go even to great depths. Conversely, the complex regime of Buna River is affected by some marine factors such as: the blocking of Buna estuary from the high waves formed as a result of strong winds from the West and North-West and from the tides. Also this regime is influenced by other factors taking place in the continent as for example the flows of Drini River, particularly during plots; narrowing processes, meandrins and the river shallowness; regulatory effects of Shkodra Lake etc. Buna
is considered a lowland short navigable river, generally flowing unobstructed to the sea, clearly proved by the features of its fauna.

![Fig 1. Adriatic Sea, Buna River and Shkodra Lake](image)

All these are related to integrated biotic and biotopic of the three ecosystems. This study presents some of the biological values that reflect the integrated development in the complex of ecosystems: Adriatic Sea – Buna River – Shkodra Lake.

**Method**

The examples of the integrated biological potentials of the complex of Adriatic Sea – Buna River – Shkodra Lake ecosystems have been drawn from the scientific bibliography of the latest decades. The cases identified and treated in this study belong to the publications showed in the references used by topics and listed at the bottom.

The information given on fish includes also the data ‘provided by authors and collected in decades from the study of ichthyic staff caught by trawl - net in the estuary of Buna River. *Caretta caretta* is found by the residents of the area. The basic information is taken from prof. M. Rakaj and from a video sequence aired by local media.

The full data on *Tursiops truncatus* in Buna River are drawn from Schneider - Jacoby et al. (2006).

**Results and discussions**

**FISH IN THE ESTUARY AREA OF BUNA RIVER**

Buna River is famous for its diversity and abundance of fish in its estuary and in Adriatic Sea, in the diagonal line towards South west to long distances at sea, as a result of large water flows and organic solid staff of the river. Mainly with reference to Merker & Nincic (1973) and Dhora (2003), 66 species of fish have been found in an area from the eastuary of Buna River up to a distance of 40 m in the sea and they are listed as follows: *Acipenser naccarii, Acipenser sturio, Alosa agone, Anguilla anguilla, Aphanius dispar, Aphanius fasciatus, Argentina sphyraena, Argyrosomus regius, Aspitrigla cuculus, Atherina boyeri, Atherina hepsetus, Blennius ocellaris, Boops boops, Chelidonichthys lucernus, Citharus linguatula, Conger conger, Dasyatis pustinaca, Dicentrarcus labrax, Dicentrarcus punctatus, Diplodus annularis, Diplodus sargus, Diplodus vulgaris, Engraulis encrasicholus, Gnathophis mystax, Gobius niger, Gobius paganellus, Huso huso, Lepidotrigla cavillone, Lichia amia, Lithognathus mormyrus, Liza ramada, Lophius piscatorius, Merluccius merluccius, Microchirus variegatus, Mugil cephalus, Mullus barbatus, Mustelus mustelus, Myliobatis aquila, Pagellus erythrinus, Platichthys flesus,*
Poecilia reticulata, Raja asteris, Raja miraletus, Salaria pavo, Sardina pilchardus, Sciaena umbra, Scomber scombrus, Scophthalmus rhombus, Scorpaena notata, Scyliorhinus canicula, Scyliorhinus stellaris, Serranus hepatus, Solea solea, Sphyraena sphyraena, Spicarasmaris, Squalus blainvillei, Symphodus cinereus, Synapturichthys kleinii, Syngnathus abaster, Syngnathus tenuirostris, Thunnus thynnus, Torpedo torpedo, Trachinus draco, Trachurus trachurus, Trisopterus minutus, Umbrina cirrosa.

The considerable biomass of these fish is of great importance for the development of a sustainable fishing. Out of this community, we can distinguish the more dominant species which are: Mullus barbatus, Merluccius merluccius, Spicara smaris, Citharus linguatula, Lepidotrigla cavillone, Solea solea, Torpedo torpedo.

A number of the above species enter from the lower paths of Buna River. We can point out the following ones: Aphanius dispar, Aphanius fasciatus, Atherina boyeri, Dicentrarcus punctatus, Gobius paganellus, Poecilia reticulata, Salaria pavo, Syngnathus abaster (Dhoro 2009).

MIGRATORY FISH (ADRIATIC SEA ↔ BUNA RIVER + SHKODRA LAKE)

There are already acknowledged 8 species of fish that develop biological migrations in the gateways of Adriatic Sea ↔ Buna River + Shkodra Lake (Dhoro 2012). Scientific and Albanian names of these species, and qualifications of their migration are presented in the following table. *Mugil cephalus*, *Liza ramado*, *Anguilla anguilla* and *Alosa agone* are species of fishing importance in Shkodra Lake as well as for the fish market of the city.

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Name in Albanian</th>
<th>Specification of migration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acipenser naccarii</td>
<td>blini i Drinit</td>
<td>anadrom</td>
</tr>
<tr>
<td>Acipenser sturio</td>
<td>blini</td>
<td>anadrom</td>
</tr>
<tr>
<td>Alosa agone</td>
<td>ngjala (migruese)</td>
<td>anadrom</td>
</tr>
<tr>
<td>Anguilla anguilla</td>
<td>ngjala</td>
<td>katadrom</td>
</tr>
<tr>
<td>Dicentrarcus labrax</td>
<td>levreku</td>
<td>katadrom</td>
</tr>
<tr>
<td>Liza ramado</td>
<td>qefulli i vjeshtës</td>
<td>katadrom</td>
</tr>
<tr>
<td>Mugil cephalus</td>
<td>qefulli i verës</td>
<td>katadrom</td>
</tr>
<tr>
<td>Platichthys flesus</td>
<td>shojza</td>
<td>katadrom</td>
</tr>
</tbody>
</table>

Recent decades, for various reasons, this migration has fallen. The two species of *Acipenser* and *Platichthys flesus* genus are barely or not at all seen. The sturgeons, *Acipenser*, are key indicators for the high values of this river corridor. Based on several year fishing, it’s evaluated that even the migration of *Dicentrarcus labrax* and *Alosa agone* has fallen considerably. Probably, this has to do with the spoil of the migration gateway, particularly of that of Buna estuary.

**CARETTA CARETTA** (Linnaeus 1758)

On 17 June 2007, in Buna River close to the Muriqani village of Shkodra, specifically in the place named “Lisi mbi Vorr”, a sea turtoise, *Caretta caretta* (Linnaeus 1758) with a weight of 56 kg and length 87 cm, was caught by the fisherman Mahir Hasa (Fig 2). This turtoise, *Caretta caretta* (Linnaeus 1758) is known to deposited its eggs in the sand, at the sea shores. At Schneider - Jacoby et al. (2006), it’s written that such turtoises were seen to save their eggs in Ada Island (Fig.3). It’s also known that this specie can enter at short distances inside the rivers. The case shown above , made known earlier at a local television station (TV Rozafa), “Shekulli” newspaper (Dushi 2007), as well as Rakaj & Dhoro (2009), is quite interesting for the science and at the same time it has an ecological value as well as about the Adriatic Sea – Buna River complex.
WINTER BIRDS IN THE ESTUARY OF BUNA RIVER
At Schneider – Jacoby et al. (2006), it’s written that in the area of Ulqin – Vilun – Shkoder, during the cold seasons of 2003 and 2004, were counted a total of 18 000 birds. Around 85 % of the overall number were counted in the Saline and in the Zogaj Lake of Ulqin (both 64 %) and in Vilun, Paratuk and Shasi Lake (21 %). The rest of 15 % belongs to Velipoja rezervat, Domni marsh, Murtemps Lake and others. In the estuary area, 245 bird individuals were counted, mainly Phalacrocoracidae, Scolopacidae, Anatidae, a number which we assess as considerable.

TURSIOPS TRUNCATUS (Montagu 1821)
Tursiops truncatus (Montagu 1821) is common in the marine waters of Albania as well. This specie prefers the sea shores and the estuaries of the rivers, because referred to Hussenot & Robineau (1994) these habitats offer a great asset for fishing.
In the prodelta of Buna River, dolphins have been seen during the whole year, whereas inside the river, they have been noticed only during the warm seasons. The findings of dolphins in
Buna River during 2003 are published at Schneider - Jacoby et al. (2006) (Fig 3) and Stumberger et al. (2009), Rakaj & Dhora (2011). The finding were as shown below:

<table>
<thead>
<tr>
<th>Finding Place</th>
<th>Number of Individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buna River and the Sea (Prodelta)</td>
<td>.................................................. 20</td>
</tr>
<tr>
<td>A. In the sea, in the eastuary of the Buna River</td>
<td>.................................................. 8</td>
</tr>
<tr>
<td>B. In 5 finding places along Buna River</td>
<td>.................................................. 12</td>
</tr>
<tr>
<td>a) In Franz Joseph island</td>
<td>.................................................. 1</td>
</tr>
<tr>
<td>b) In the level of velipoja village</td>
<td>.................................................. 2</td>
</tr>
<tr>
<td>c) Close to Paratuk island</td>
<td>.................................................. 6</td>
</tr>
<tr>
<td>d) Close to Shasi Lake (17 km away from the estuary)</td>
<td>........ 2</td>
</tr>
<tr>
<td>e) In Daragjat (35 km away from the estuary or 8-9 km from Shkodra Lake)</td>
<td>.................................................. 1</td>
</tr>
</tbody>
</table>

Fig 3. *Tursiops truncatus* in Buna River (Photo H. Göthel)

The large number of findings of *Tursiops truncatus*, mostly in flock of two or with more individuals, upwards the whole Buna River up near of Shkodra Lake, is considered as a very interesting occurrence and unique in the Western Balkans and beyond. For the above reasons, we can say that Buna River is a “river of dolphins”.

**Conclusions**

The diversity and abundance of fish in the area of estuary of Buna River, the abundance of winter birds in the estuary of the River, 8 species of migrant fish, the anadrom and katodrom, the ecosystems of the Adriatic Sea, Buna River, Shkodra Lake; *Caretta caretta* and *Tursiops truncates* species found in Buna River up to the front flow, represent distinguished cases of integrated biological potentials of the complex of ecosystems. The estuary of Buna River can be considered as the most important part of this ecosystem complex. It represents a unical site, nutritionally rich, with a high fish and bird diversity and abundance, an entry port of migratory fish, *Caretta caretta* and *Tursiops truncates* through the gateway of Buna towards Shkodra Lake.
The presence of *Caretta caretta* and *Tursiops truncates* further upwards up to the front flow shows that Buna River represents a relatively quiet environment, serving as a really interesting shelter for these two species. These potentials with scientific and practical value will be valued and protected under a special status. We think that this can be carried out better through locating and managing of habitats based on the concept of biosphere reserve.

**References**


