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The Vjosa catchment – a natural heritage

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The paper provides an overview of the existing knowledge on biodiversity of the whole Vjosa catchment. Besides major gaps in knowledge, the Vjosa catchment is one of the richest in Albania, sheltering a high diversity of habitats and species, most of them of international significance. A variety of protected areas is connected by the River Vjosa and its tributaries and serve as important ecological corridor.
Around 150 species of the already known flora and fauna species are listed in the Appendices of the Bern Convention. More than 15 priority habitat types of European interest have been identified (Habitat directive – NATURA 2000), as well as 7 habitat priority types (EUNIS, IPA) of high floristic value.
Many habitats of the Vjosa area are included in the Directive 92/42/EEC adopted in May 1992: the woody riparian vegetation along river floodplains, with the dominant species *Platanus orientalis, Populus alba, Salix* spp.*, Alnus glutinosa, Fraxinus angustifolia, Quercus robur,* and *Ulmus minor*; moreover, chasmophytic vegetation is documented in the area,; coastal sandy dunes with *Ammophila arenaria* and other rare plant species; The Vjosa Delta-Narta wetland area is mentioned as the second most important site for birds in Albania, with about 80 species recorded. The area is known as the main wintering site for many water bird species including the Greater Flamingo (*Phoenicopterus roseus*) and Audouini's Gull (*Ichthyaetus audouinii*). The Dalmatian Pelican (*Pelecanus crispus*) frequently occurs in the Vjosa Delta zone. Therefore, a special attention must be paid to future hydropower development plans. Conservation actions must address threats to water quantity and quality over wide areas upstream of threatened habitats and species. Based on the presented data the floodplains of the Vjosa River from Tepelena to Mifoli are considered as a potential protected area, specifically a proposed riverscape National Park.

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Die Arbeit gibt einen Überblick über die Biodiversität des Vjosa-Einzugsgebiets im Lichte der Bedrohung durch die großräumig geplante Staudamm-Entwicklung. Trotz großer Wissenslücken kann festgestellt werden, dass das Vjosa-Einzugsgebiet eine der artenreichsten Regionen in Albanien ist mit einer großen Vielfalt an Lebensräumen und Arten von internationaler Bedeutung. Mehrere Schutzgebiete sind durch die Vjosa und ihre Zuflüsse als ökologische Korridore verbunden.
Viele Lebensräume stehen auf der Liste der FFH-Richtlinie der EU: z.B. die bewaldete Ufervegetation entlang der Flüsse mit den dominanten Arten *Platanus orientalis, Populus alba, Salix* spp., *Alnus glutinosa, Fraxinus angustifolia, Quercus robur*, und *Ulmus minor*; überdies wurde chasmophytische Vegetation nachgewiesen sowie küstennahe Sanddünen mit *Ammophila arenaria* und anderen seltenen Pflanzenarten; Das Vjosa Delta-Narta Feuchtgebiet wird mit etwa 80 Arten als zweitwichtigster Standort für Vögel in Albanien angeführt. Dieses Gebiet ist als Hauptüberwinterungsquartier für viele Wasservogelarten bekannt, darunter der Große Flamingo (*Phoenicopterus roseus*) und die Audouini-Möve (*Ichthyaetus audouinii*). Der Krauskopfpelikan (*Pelecanus crispus*) nutzt häufig das Vjosa-Delta.
Die hohe Schutzwürdigkeit erfordert daher besondere Aufmerksamkeit im Hinblick auf die Pläne für Wasserkraftentwicklung. Vor allem Die Überschwemmungsgebiete von Tepelena bis Mifoli gelten als potenzielle Gebiete für einen künftigen Nationalpark.

Keywords: Albanian rivers, Vjosa catchment, biodiversity data, protected areas, endangered habitats and species, HPP development.

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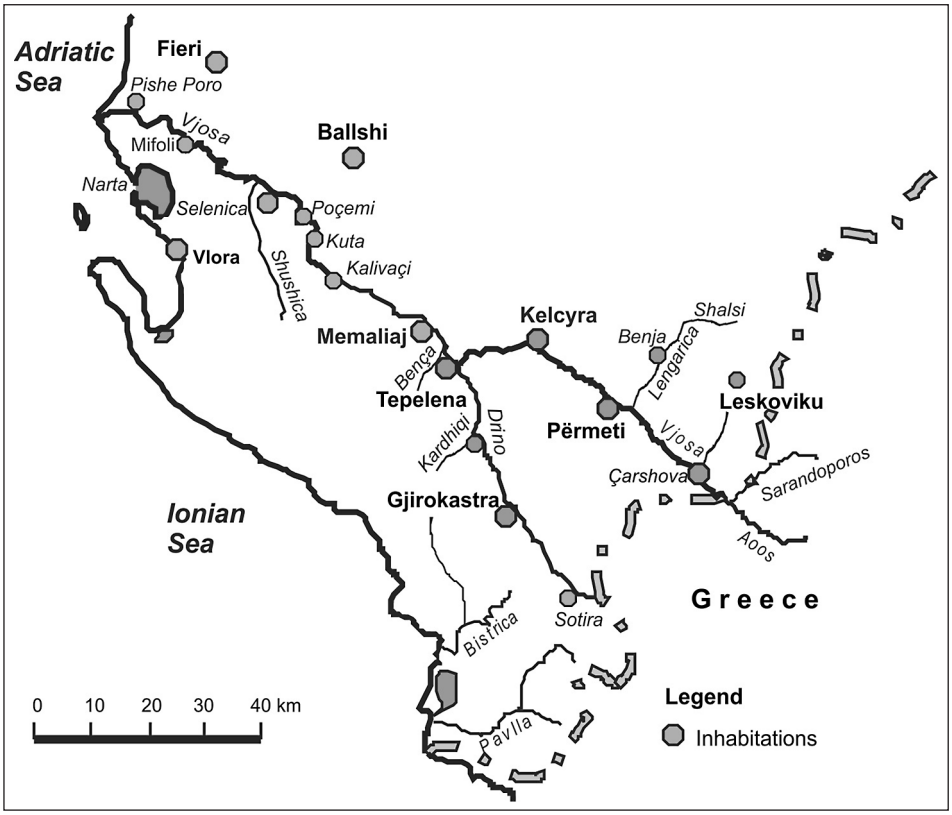

Fig. 1: Vjosa river network with the most important inhabited centers. – Abb. 1: Vjosa Flussnetz mit den wichtigsten bewohnten Zentren.

Introduction

Knowledge regarding biodiversity is very limited within the whole Vjosa catchment. However, the geographic, climatic, and landscape characteristics are quite diverse (see Durmishi et al. (2018 this volume), Schiemer et al. (2018 this volume), and Daja et al. (2018 this volume); hence, the catchment area shelters a high diversity of habitats and species from its delta in the Adriatic Sea to the uppermost mountainous parts in Albania and Greece. The Vjosa River and its tributaries are at risk of destruction by a chain of planned hydropower dams; there are about 38 small and big hydropower plants that are either already constructed, under construction or planned: e.g.in the Vjosa tributaries Langarica river (within the National Park Hotova Fir), Bença river, Kardhiqi river, Shushica river. The most severe impacts are the dams in Poçemi and Kalivaçi, in the Vjosa River itself (Fig. 1), which have already been tendered for construction by the Albanian government.

The paper provides an overview of the existing knowledge regarding biodiversity. The primary aim is to evidence the already-known natural values and to provide a critical view on large-scale Hydropower Plant (HPP) development plans, which are often closely relat-

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ed with habitat loss and species extinction – see discussion by Schiemer et al. (2018 this volume, introductory chapter), Miho et al. (2018), Miho et al. (2017), Diku et al. (2016), Shumka et al. (2010).

New aspects of the biodiversity of the Vjosa River are reported by various groups in this volume; based on material collected during several joint field trips between 2014 and 2018 by different working groups (Albania, Austria, Germany, etc. especially on the river floodplain system of the middle part of the Vjosa near Kut and Poçemi (Fig. 1.) For an overview of the ecological conditions and conservation, value of the Vjosa-Aoos river system see Schiemer et al. 2018 this volume).

Material and methods

Data provided here are based on the field surveys and long-term observations of the authors, monitoring data available at the University of Tirana, the Agricultural University of Tirana; additional information was collected during several joint field trips of various groups between 2014 and 2018 There is also additional information published from various sources, i.e. Buzo 2000, Misja 2006, MoE 2009, 2013, Miho et al. 2013, 2017, 2018, Miho 2018, Malo 2010, Malo & Shuka 2008a, 2008b, 2009, 2013, Shuka 2008, Shuka & Malo 2010, Shuka et al. 2011a, 2011b; Miho & Shuka 2017, Mahmutaj et al. 2014, Tan et al. 2011, Allen & Khalea 2017, Delipetrou 2011, Shumka et al. 2010, 2014, Diku et al. 2016, Amirault et al. 2016, Paparisto 2001, Shkëmbi et al. 2015, 2017, Cuvelier et al. 2018, Paspali & Bego 2008,Dhora 2002, Markova et al. 2010, Snoj et al. 2009, Korsós et al. 2008, Bego et al. 2014, Slomka et al. 2015 and 2018, Zakkak et al. 2018.

Results and discussion

The Vjosa River and its tributaries represent a highly dynamic but stable and continuous freshwater ecosystem. Based on our limited knowledge we conclude that it is one of the richest areas in the country in terms of biodiversity, which is, therefore, in need of special attention regarding future development plans. As an example of all aspects of biodiversity known to date, about 150 species living in this area belong to the Appendices of the Bern Convention (https://www.coe.int), which focus on the conservation of European wildlife and natural habitats: precisely 3 species of higher plants, 9 insects, 5 amphibians and reptiles, 107 birds and 17 mammals (Annex I).

Conservation values

Protected areas

Diverse protected areas are distributed throughout the whole catchment, most of them closely connected to watercourses and affected by HPP development plans. Albania has 799 protected areas covering about 16 % (4,600 km²) of its territory. The protected areas are proclaimed and governed following the IUCN protected area definition, management categories and governance types (http://www.akzm.gov.al).

The National Park Fir of Hotova-Dangellia near Permeti (34,361 ha; IInd IUCN category) is known for its fir forests mixed with oak and, in some parts, with Mediterrane-

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an shrubs, and sheltering rare and endangered plants and animals. **Germenji-Shelegura** (430 ha; Erseka) is an area of Habitat/Species Management (IVth category), known for its high mountains and deep valleys, wetlands, and torrents, and especially for its dense mixed forests of fir and oak, dominated by black pine; the area is also considered among the Areas of Special Conservation Interest (ASCIs) in Albania, as a NATURA 2000 site. Both areas are situated in the upper part of Vjosa catchment, and are ecologically connected with the upper part of Vjosa River, as well as with its tributaries Shalsi, Lengarica, and Çarshova, which in turn are under pressure from HPP development plans. **The Strict Nature Reserve of Kardhiqi** (1800 ha; Ist category) (Gjirokastra) is also ecologically connected with tributaries of the Kardhiqi river (Drino tributary) (Fig. 1), and is also under direct HPP pressure.

Fig. 2: Above: coastal dunes (nature monument) with European beach grass (*Ammophila arenaria*) in Poro (Narta) are ecologically connected and under direct pressure of VJosa dams. Below: Sea daffodil (*Pancratium maritimum*), an endangered species from the coastal dunes of Poro (© M. Xhulaj). – Abb. 2: Oben: Küstendünen (Naturdenkmal) mit europäischem Strandhafer (*Ammophila arenaria*) in Poro (Narta) sind ökologisch verbunden und unter direktem Druck von Vjosa Staudämmen. Unten: Narzisse (*Pancratium maritimum*), eine vom Aussterben bedrohte Art aus den Küstendünen von Poro.

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More than 110 natural monuments (IIIrd category) are spread throughout the Vjosa catchment; some are close to river courses or the Vjosa Delta, and are thus under HPP pressure: i.e. Benja thermal springs and Lengarica canyon (in Lengarica river, Permeti), Çarshova canyon horizons and olistolith (Çarshova river, Permeti), Piksi canyon (in Kardhiqi river, Gjirokastra), Nivica canyon and erosive terrace of Bença (both in Bença river, Tepelena), Buronja, Kuçi (Shushica river, Vlora), Poro black pine and Poro dunes (in Vjosa delta, in Fieri and Vlora, respectively), etc. Moreover, the Fir of Sotira (1,740 ha; Gjirokastra) represents a nearly virgin forest with scientific and natural values; the Fir of Zheji (1,500 ha Gjirokastra) is known for its natural values, biodiversity, and landscape (data from http://akzm.gov.al/).

The wetland complex of the **Vjosa delta-Narta lagoon** (19,738 ha), the southern part of the Vjosa Delta (Vlora) (Fig: 1), represents a Landscape Protected Area (IVth category); it is also listed as an Important Bird Area (IBA) in Albania and is recently being considered among potential NATURA 2000 sites as well. **Pishe Poro** (1,500 ha), the northern part of the Vjosa Delta (Fieri), is also protected as a Habitat/Species Management Area (IVth category); moreover, the area between Semani river delta-Pishe Poro is a CORINE Biotope and is proposed as a Managed Nature Reserve as well. Both parts of the Vjosa Delta represent an important transitional area, with psammophytes, hygrophytes, halophytes, typical vegetation of coastal wetlands, and with Mediterranean pine forests (Miho et al. 2013). The narrow littoral belt of coastal dunes in Poro (Vlora), 5–6 m high and 20–30 m wide, is considered a Natural Monument (Fig. 2), with *Ammophila arenaria, Elymus farctus, Sporobolus pungens,* etc. Of special interest are rare species, such as *Anacamptis morio* ssp. *caucasica* and *Orchis albanica* × *O. coriophora* or the sea daffodil (*Pancratium maritimum*). Small populations of true alluvial forests with willows and white poplar still exist in some limited areas. The zone is rich in wetlands and aquatic birds (Fig. 3); it is the second most important place in Albania for waterfowl, being a very important IBA (20,000 wintering birds and over 40 species); Dalmatian Pelican (*Pelicanus crispus*) forages here, and flamingos (*Phenicopterus ruber*) are regularly encountered. Nevertheless, the whole area is directly connected to and under pressure from Vjosa dams (Poçemi and Kalivaçi) (Fig. 1).

Last but not the least, just beyond the Vjosa estuary, Karaburuni-Sazani (Vlora; 12,600 ha; IInd category) was declared a Marine National Park in 2010, the only one in Albania. The area from the Vjosa estuary to Sazani and Karaburuni (the entire Vlora Bay) is proposed as a Marine and Coastal Protected Area in the Strategic Plan for Marine and Coastal Protected Areas (SPMCPAs) – Plan Design & Development (2013) (Anonymous 2014); the zone is important for submerged meadows of *Posidonia oceanica* (Miho et al. 2013), with close ecological connections to the Vjosa Delta; hydropower development and damming of the Vjosa would have additional harmful effects on the ecological values and biodiversity of this sea Delta, especially in the *Posidonia* meadows.

The biodiversity of the floodplains of the Vjosa River in its middle part, from Tepelena to Mifoli (Fig. 1) is one of the most magnificent riparian ecosystems of the Balkan peninsula, standing out due to its natural hydromorphodynamic fluvial processes (Rössler et al. 2018 this volume). A broad main stream with anabranches, open gravel bars and islands and pioneer vegetation as well as bushes of willows, poplars and tamarisks give Vjosa's floodplain an extraordinary distinction. Combined with large grasslands and small-area softwood forests, they build the vegetation mosaic along the river. Results of other research

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Fig. 3: Ornitofauna in Vjosa catchment: 1, Greater flamingo (*Phoenicopterus roseus*); 2, Pied Avocet (*Recurvirostra avosetta*); 3, Common Snipe (*Gallinago gallinago*); 4, Dunlin (*Calidris alpina*); 5, Egyptian Vulture (*Neophron percnopterus*); (1–4, © F. Bego; 5, © M. Topi). – Abb. 3: Ornitofauna in Vjosa Einzugsgebiet: 1, Flamingos (*Phoenicopterus roseus*); 2, Pied Avocet (*Recurvirostra avosetta*); 3, Bekassine *(Gallinago gallinago*); 4, Dunlin (*Calidris alpina*); 5, Ägyptischer Geier (*Neophron percnopterus*); (1–4, © F. Bego; 5, © M. Topi).

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groups in this volume reveal additional biodiversity data underlining the conservational value of this area. This part of the Vjosa River highlights **the potential values of a protected area, of a future riverscape National Park** that would be the first protected area of this category in Albania. The Vjosa region is well known for its cultural and historic values, as well (Serjani et al. 2010).

Habitat types

Different habitat types make the Vjosa catchment an important area for conservation (MoE 2009, Mullaj et al. 2017, see also Rössler et al. (2018 this volume) and Drescher (2018 this volume). More than 15 priority habitat types of European interest have been identified (Commission European 2013), such as: *Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientalis*) (Habitat Directive code 92C0) (Fig. 4); *Olea* and *Ceratonia* forests (9320); Constantly flowing Mediterranean rivers with *Paspalo-Agrostidion* species and hanging curtains of *Salix* and *Populus alba* (3280)*;* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (91E0*); *Quercus ilex* and *Quercus rotundifolia forest*s (9340); Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*) (92D0); Calcareous rocky slopes with chasmophytic vegetation (8210) (Figs. 4 and 7), four of which are priority habitat types with great conservation interest; the habitat includes thermo- and meso-Mediterranean communities (e.g.*Onosmetalia*) with *Campanula versicolor, Silene* spp., *Saxifraga* spp., *Ramonda serbica, Pinguicula hirtiflora*, etc.); Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (6210* important orchid sites); Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (2120) (Fig. 2); Coastal dunes with *Juniperus* spp. (2250), habitat of community interest; Wooded dunes with *Pinus pinea* and/or *P. pinaster* (2270); Mediterranean salt meadows (*Juncetalia maritimi*) (1410); Mediterranean salt steppes (*Limonietalia*) (1510*); etc. Moreover, seven habitat priority types (European Commission, 1992), all of which are endangered and with high floristic values, are recorded in this zone.

Poorly stabilised alluvial deposits along the river courses, streams, and sediment cones of the Vjosa catchment are colonised by riparian Mediterranean vegetation (Fig. 4), largely dominated by oriental plane (*Platanus orientalis*); they can form species-rich communities with the accompanying flora, including *Populus alba, Salix alba, S. purpurea, S. amplexicaulis, S. elaeagnos, Alnus glutinosa, Fraxinus angustifolia, Quercus robur, Ulmus minor, Tamarix parviflora, Vitex agnus-castus, Rubus* spp.*, Hedera helix, Clematis vitalba, Vitis vinifera* ssp. *sylvestris,* etc. (Mullaj et al. 2017, Schiemer et al. 2018 this volume, Drescher 2018 this volume). The alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) form arborescent galleries of tall *Salix alba*, which is an important habitat for orchid species (Fig. 8). The riparian vegetation fulfills a protective function (protecting riverbanks and streams, and strengthening soft land slopes near the watercourses), and serves, to a considerable extent, as a "water filter" for water purification, etc. These related habitat types are under continuous human pressure from gravel mining in riverbeds or from dam construction, tunneling, or flow change through HPP development. They are even affected by diseases: e.g. canker stain of plane is widespread along the Vjosa and Drino river courses; hence, the plane population has declined by more than 40 %. The oriental plane is also an IUCN red list species (Data Deficient, DD).

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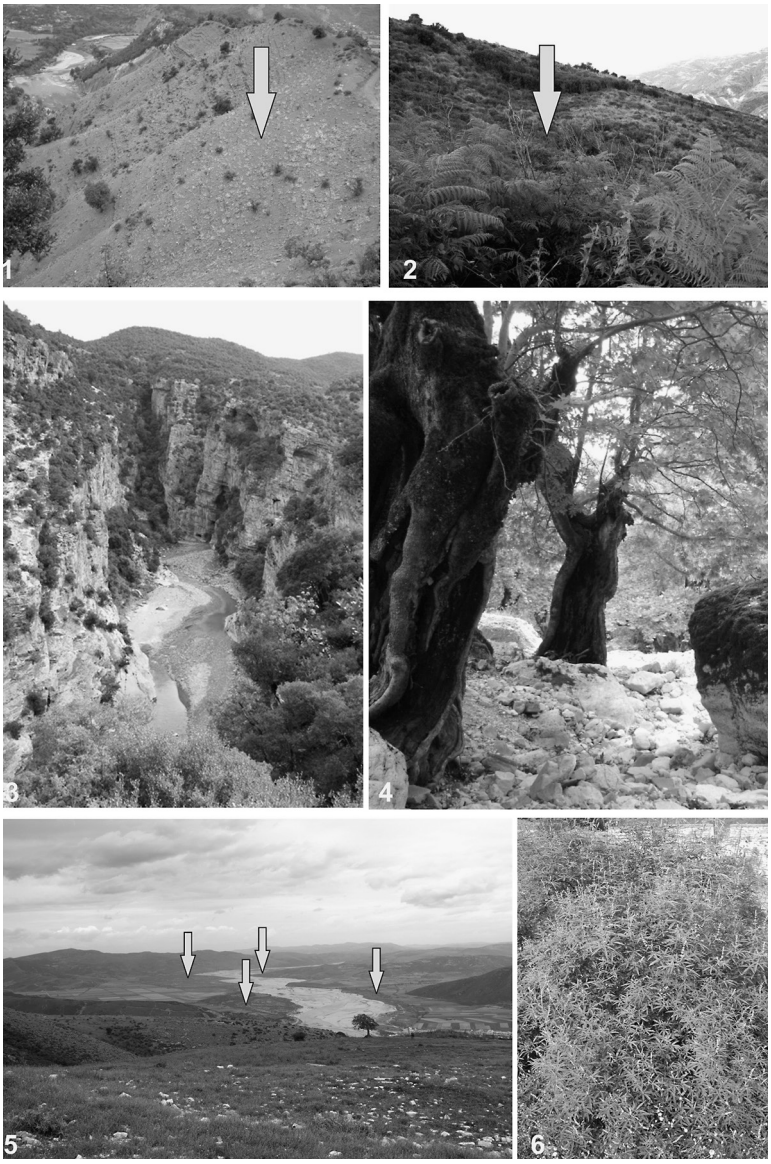

Fig. 4: Main threats facing the native Riparian Vegetation in Vjosa: 1, Clearing, logging and Erosion; 2, Burning and uncontrolled grazing. Different habitat types make Vjosa an Important Ecosystem for Biodiversity Conservation: 3, Calcareous rocky slopes with chasmophytic vegetation; 4, *Platanus orientalis* and *Liquidambar orientalis* woods; 5, Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*; 6, Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*) (© L. Shuka). – Abb. 4: Die wichtigsten Bedrohungen für die einheimische Ufervegetation in Vjosa: 1, Clearing, Holzeinschlag und Erosion; 2, Brennen und unkontrolliertes Weiden. Verschiedene Lebensräume machen Vjosa zu einem wichtigen Ökosystem für die Erhaltung der Artenvielfalt: 3, Kalkhaltige Felshänge mit chasmophytischer Vegetation; 4, *Platanus orientalis* und *Liquidambar orientalis*; 5, Auenwälder mit *Alnus glutinosa* und *Fraxinus excelsior*; 6, Südliche Ufergalerien und Dickichte (*Nerio-Tamaricetea* und *Securinegion tinctoriae*) (© L. Shuka).

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Fig. 5: Greek Strawberry Tree (*Arbutus andrachne – Ericaceae*), with fruits ripen in autumn; upper part of Vjosa (from Permeti to Leskoviku) represents the only area of its natural occurrence in Albania (© L. Kashta). – Abb. 5: Griechischer Erdbeerbaum (*Arbutus andrachne – Ericaceae*), mit reifen Früchten im Herbst; Der obere Teil von Vjosa (von Permeti bis Leskoviku) stellt das einzige Gebiet seiner natürlichen Vorkommen in Albanien dar (© L. Kashta).

Moreover, chasmophytic vegetation is documented in the area (Fig. 4 and 7), consisting of plant species like *Campanula versicolor, Silene* spp., *Athamntha macedonica* ssp. *albanica* that colonises the cracks and fissures of rock faces; it is found sparsely almost everywhere along the river and its tributaries. These habitat types represent a great diversity, with many endemic and sub-endemic plant species, some of which are also indicators of habitat quality, e.g. *Hypericum haplophylloides, Cymbalaria microcalyx* ssp. *microcalyx, Alkanna corcyrensis, Lilium candidum, Silene cephallenia*. The shrub association dominated by *Arbutus andrachne* (*Andrachno-Quercetum ilicis*) (Fig. 5) from Permeti to Leskoviku is unique in Albania.

Mediterranean coniferous forest on coastal dunes on both sides of the Vjosa Delta (Pishe Poro, Fieri and Poro, Vlora), dominated by *Pinus halepensis, P. pinaster* and *P. pinea*, is partly natural and was partly planted 50–60 years ago. It plays a very important role in stabilising sand dunes and protecting arable land. Therefore, it currently represents a habitat with a priority status, included in Annex I of Directive 92/43/EEC. The dams in the Vjosa River, as well as the continuing urbanisation with tourist infrastructure, will also impact the stability of the dunes and the coastline, and the integrity of habitats and biodiversity. There are already examples of negative effects in Albania, e.g. in the Buna Delta (Velipoja reserve), in Drini of Lezha Delta (Lezha lagoons), Erzeni delta, etc. Measures to protect the coast and the related dunes are very costly!

Among the freshwater macroalgae found along the Vjosa river catchment we can mention *Chara aspera*, on retrodunal depressions close to Narta lagoon, *Chara vulgaris* var. *vulgaris* and C. *vulgaris* var. *longibracteata*, in slow-flowing waters of Drino River (Tepelena) (Fig. 6) and *Chara gymnophylla*, found in the thermal springs of Benja, Lengarica River (Kashta & Miho 2016).

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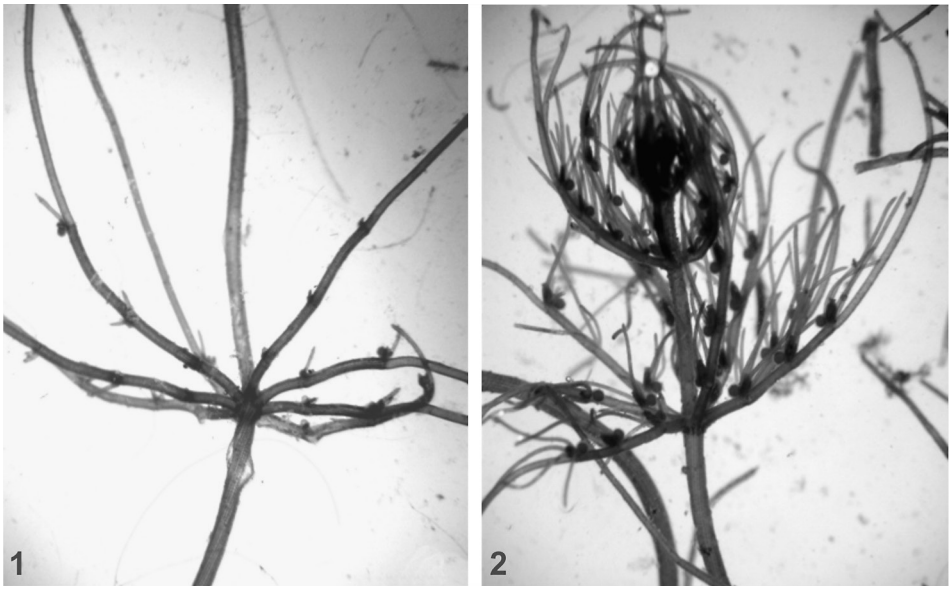

Fig. 6: Charophyta from Drino River: *Chara vulgaris* (left) and *Chara vulgaris* f. *longibracteata* with red reproductive organs (right) (© L. Kashta). – Abb. 6: Charophyta vom Fluss Drino: *Chara vulgaris* (links) und *Chara vulgaris* f. *longibracteata* mit Fortpflanzungsorganen (rechts) (© L. Kashta).

Flora and vegetation types

Flora and vegetation of the Vjosa catchment have scarcely been studied, and almost only in the last ten years. It is difficult to ascertain a total number of higher plants for the whole Vjosa catchment; however, experts confirm that it could be more than 1500 taxa (Shuka *pers. comm.*). More than 570 species of higher plants have been recorded in coastal habitats of the Vjosa delta-Narta lagoon; furthermore, some 68 higher mushrooms are recorded there as well (MoE 2009). More than 700 higher plant taxa were reported by Malo (2010) in his PhD about flora and vegetation of Gjirokastra district; about 12 taxa were new for Albania, 40 taxa were sub-endemics, and 30 taxa were rare or endangered (Malo & Shuka 2008a, 2009, 2013); *Viola acrocerauniensis* and *Stachys sericophylla* (Malo & Shuka 2008b, Shuka & Malo 2009), for example, are endemics of the region. Other endemic species have been reported recently, e.g. *Campanula longipetiolata*, *Gymnospermium maloi*, and *Hypericum haplophylloides*, recorded in the canyon of Luzati and in the subalpine grasslands of the Drino valley (Tan et al. 2011).

The river banks and rocky faces along the tributaries and the alpine limestone grasslands of the watershed are home to three other threatened species on the IUCN red list: *Aesculus hippocastanum* (Allen & Khalea 2017), *Galanthus reginae-olgae* (Davis 2011), and *Solenanthus albanicus* (Delipetrou 2011), listed as Vulnerable C2a(i), Vulnerable B2ab(iii,v), and Endangered B1ab(v)+2ab(v), respectively. Some of these places are currently under pressure from hydropower development.

Rare, or relict species are present in sandy dunes or wetlands (Fig. 8), like *Anacamptis morio* ssp. *caucasica*, *Ephedra distachya, Narcissus tazetta, Nymphaea alba, Nuphar lutea, Nymphoides peltata,* different species of the genera *Orchis, Ophrys, Limonium,* and *Scilla*;

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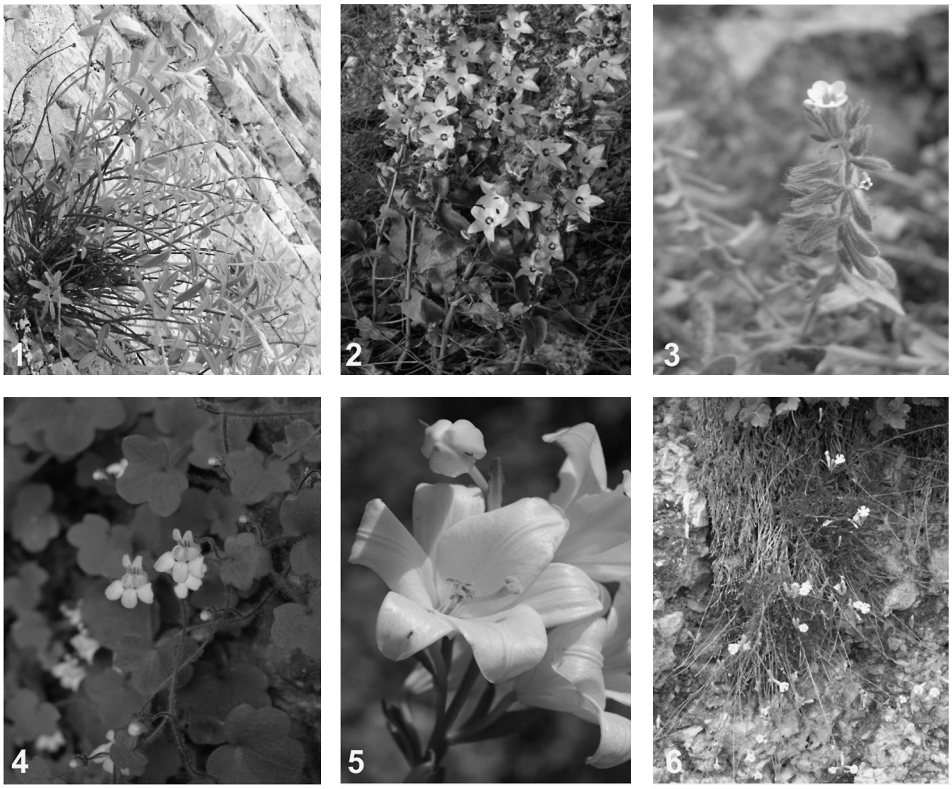

Fig. 7: Rare plants from the calcareous rocky slopes with chasmophytic vegetation: 1, *Hypericum haplophylloides*; 2, *Campanula longipetiolata*; 3, *Alkanna corcyrensis*; 4, *Cymbalaria microcalyx* subsp. *microcalyx*; 5, *Lilium candidum*; 6, *Silene cephallenia*. This habitat type occurs almost everywhere, along the river and its tributaries (© L. Shuka). – Abb. 7: Seltene Pflanzen von kalkhaltigen Felshängen mit chasmophytischer Vegetation: 1, *Hypericum haplophloides*; 2, *Campanula longipetiolata*; 3, *Alkanna corcyrensis*; 4, *Cymbalaria microcalyx* subsp. *mikrokalyx*; 5, *Lilium candidum*; 6, *Silene cephallenia*. Dieser Lebensraumtyp kommt fast überall entlang des Flusses und seiner Nebenflüsse vor (© L. Shuka).

species with rather limited distribution are also present, such as *Petrosimonia oppositifolia, Senecio vernalis, Tamarix hampeana, Peucedanum arenarium, Pholiurus panonicus*, etc. The relict aquatic fir *Marsilea quadrifolia* was verbally confirmed for the Vjosa Delta by the late botanist Kozma Buzo; however, it was not found recently during botanic field trips in the region.

The richness in plant species is important for the medicinal and aromatic plant industry. About 380 species of MAPs (Medical and Aromatic Plants) have been recorded within the watershed, 330 of which are wild species (Miho & Shuka, 2017). About 46 species are endangered, threatened, or protected to varying degrees, but are still harvested in the wild, e.g. *Salvia officinalis, Origanum vulgare, Hypericum perforatum, Orchis* spp., *Sideritis raeseri, Laurus nobilis, Juglans regia, Juniperus* spp., *Sambucus nigra, Tilia* spp., etc. There appears to be little correlation between the HPP development and MAP species, other than isolated flooding; however, about 70 species grow near water courses and are therefore po-

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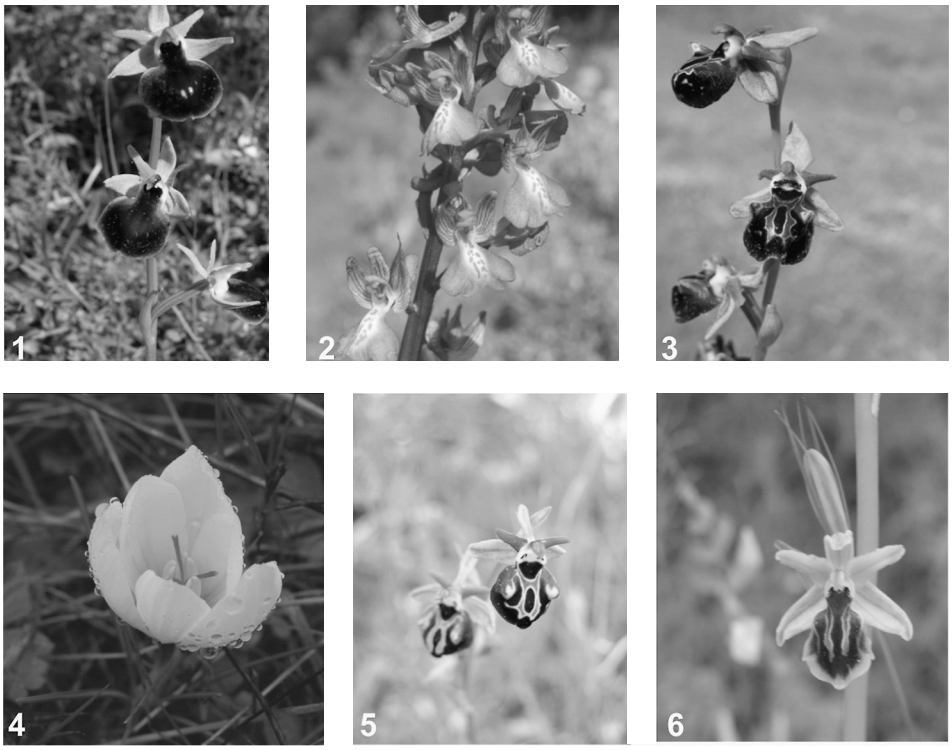

Fig. 8: Rare plants from the alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*. They forms arborescent galleries of tall *Salix alba* and are important sites for orchid species: 1, *Ophrys helenea*; 2, *A. morio* ssp. *caucasica*; 3, *Ophrys sphegodes*; 4, *Crocus hadriaticus*; 5, *Ophrys mammosa*; 6, *Ophrys epirotica* (© L. Shuka). – Abb. 8: Seltene Pflanzen aus den Auwäldern mit *Alnus glutinosa* und *Fraxinus excelsior*. Sie bilden baumartige Galerien hoher *Salix alba* und sind wichtige Standorte für Orchideenarten: 1, *Ophrys helenea*; 2, *A. morio* ssp. *caucasica*; 3, *Ophrys sphegodes*; 4, *Crocus hadriaticus*; 5, *Ophrys mammosa*; 6, *Ophrys epirotica* (© L. Shuka).

tentially at risk from HPP activities (Miho & Shuka 2017, Amirault et al. 2016); some of them belong to the Albanian Red List of species (MoE 2013), e.g. *Adiantum capillus-veneris* (VU A1b), *Dryopteris filix-mas* (LC), *Alnus glutinosa* (Vu), *Capparis spinosa* (VU A1b), *Galanthus reginae-olgae* (CR B1), *Populus alba* (VU A2b), *Quercus robur* (VU A1b), *Salix fragilis* (VU A1b), *Sambucus nigra* (VU Alb), *Symphytum officinale* (VU A1b), *Ulmus minor* (VU A2b), *Anacamptis morio* (EN A1b), *A. pyramidalis* (EN A1b), *Colchicum autumnale* (EN A1b), etc.

Fauna

Insects: More than 150 species of winged insects (*Pterygota*) have been collected from different aquatic and terrestrial habitats in the IUCN category V (protected landscape/seascape) Vjosa-Narta zone (Paparisto 2001, Shkëmbi et al. 2015, Shkëmbi et al. 2018 this volume, Cuvelier et al. 2018) (Fig. 9). They are spread among *Lepidoptera* (63 species), *Coleoptera* (43), *Odonata* (28), *Orthoptera* (7), and others. Massive blooms, even of endangered species with polyvoltine life-cycle, such as the moths *Thaumetopoea pit-*

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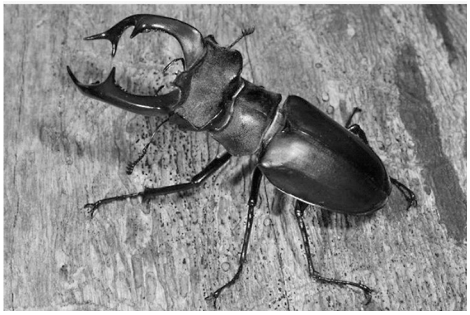

Fig. 9: Winged insects (*Pterygota*) from Vjosa: *Lucanus cervus* (left) and *Malcosoma neustria* (right) (© S. Shumka). – Abb. 9: Geflügelte Insekten (Pterygota) aus Vjosa: *Lucanus cervus* (links) und *Malcosoma neustria* (rechts) (© S. Shumka).

yocampa, *Hyphantria cunea*, and *Malacosoma neustria* have been reported. A total of 28 Odonata species known so far for the Vjosa catchment, all are listed in Annex II (IUCN, 2010).

Following Albanian Red Lid list (MoE 2013), important endangered species deserving mention are: the Dingy Skipper (*Erynnis tages*), the Inky Skipper (*Erynnis marloyi*), the Alexanor (*Papilio alexanor*), the African Monarch (*Danaus chrysippus*), the Dryad (*Minois dryas*), the Hermit (*Chazara briseis*), the Tree Grayling (*Hipparchia statilinus*), the Southern White Admiral (*Limenitis reducta*), the Cinnabar Moth (*Tyria jacobaeae*), etc. Aquatic invertebrates endangered on a national scale (MoE 2009) have also been recorded from marine and brackish waters of the Vjosa delta, including a large number of gastropods, bivalves and crustaceans (more than 40 species altogether). Additional information about different invertebrate groups of the Vjosa River is reported by Degasperi (2018 this volume), Komnenov (2018 this volume), Bauernfeind (2018 this volume), Paill et al. (2018 this volume), Graf et al. (2018 this volume), Rabitsch (2018 this volume), Rabl & Kunz (2018 this volume), Wagner et al. (2018 this volume) and Beqiraj et al. (2018 this volume).

Molluscs: Important continental (terrestrial and freshwater) mollusc species in this area are Cochlostomatidae: *Cochlostoma tessellatum tepelenum;* Hydrobiidae: *Orientalina lbanica*, *Radomaniola albanica* (from karstic springs), *Grossuana euxina*; Ellobiidae: *Myosotella myosotis*; Argnidae: *Agardhiella truncatella*, *Albinaria senilis inconstans, Oxychilus inopinatus;* Hygromiidae: *Monacha emigrata senitshika*, *Hiltrudia kusmici, Metafruticicola occidentalis;* Helicidae: *Liburnica albanograeca;* Sphaeriidae: *Pisidium personatum* (Dhora 2002, Feher & Eross 2009). Duda et al. (2018 this volume) report additional data on the terrestrial molluscs of the Poçemi floodplains.

About 60 mollusc species have been reported for the coastal habitats of the Vjosa delta to the Narta wetlands; among them are 27 gastropods (snails), 29 bivalves (mussels) and 4 cephalopods (octopus, squids and cuttlefish). Out of these, 42 species originate from marine habitats, 12 from freshwater, and 6 from terrestrial sites (Beqiraj 2001, 2004, Beqiraj et al. 2002, Dhora 2002). 32 mollusc species are listed for Narta lagoon, where gastropods are widespread: *Hydrobia acuta, Ventrosia ventrosa, Pusillina marginata, Pirenella conica, Cyclope neritea* and the bivalves *Cerastoderma glaucum* and *Scrobicularia cottardi*

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Fig. 10: Fishes from Kelcyra, Vjosa: 1, *Oxynoemacheilus pindus* (VU); 2, *Misgurnus fossilis*; 3, *Anguilla anguilla*; 4, *Cobitis ohridana* (VU) (© S. Shumka). – Abb. 10: Fische aus Kelcyra, Vjosa: 1, *Oxynoemacheilus pindus* (VU); 2, *Misvurnus fossilis*; 3, *Anguilla anguilla*; 4, *Cobitis ohridana* (VU) (© S. Shumka).

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(Beqiraj 2001, 2004, Beqiraj et al. 2002); *Theodoxus fluviatilis* is recorded among the endangered IUCN species.

Fishes: Shumka et al. (2018 this volume), report an annotated checklist of the fishes of the Vjosa River; at least 31 species of fish inhabit the river system (Fig. 10), 27 of which are native, including eight species endemic to the Balkan and four non-native species. The Vjosa River, its delta, and the lagoon of Narta make the wider area important for fish diversity, fishing, and aquaculture (Shumka et al. 2010, 2014, Markova et al. 2010, Snoj et al. 2009).

At the riverine mountain tributaries and river bed itself, the most widespread native species or genera recorded are *Pachichilon pictum*, *Barbus prespensis*, *Alburnus scoranza*, *Cobitis ohridana*, *Oxynoemacheilus pindus, Anguilla anguilla*, and members of the genera *Alburnoides*, *Squalius*, *Chondrostoma, Pelasgus* and *Gobio.* Presence of *Salmo faroides* has been recorded for the major part of the river and its tributaries, but at a critical level regarding population size, due to a number of primarily human impacts as overfishing, use of non friendly fishing methods, etc.

The lowland riparian flows are populated with typical migratory species, such as *Mugil cephalus, Liza ramada,* and a considerable presence of freshwater species such as *Cobitis ohridana*, *Alburnus scoranza*, *Pelasgus thesproticus*, and *Pachichilon pictum.* Following old fish records, globally endangered species of the genus *Acipenser* are also found in the Vjosa river basin. This holds also good for *Lampetra fluviatils* and *Alosa* sp.

The Vjosa River represents a biodiversity hotspot of Albania, hosting ideal aquatic habitats for various migratory fish species. These include potamodromous species (*Barbus prespensis, Chondrostoma vardarense, Luciobarbus albanicus* etc.) that migrate within the river system, and long-distance migrants which also need access to the sea (*Anguilla anguilla, Alosa* sp.*, Mugil* sp.*, Dicentrarchus labrax* etc.) (Kottelat & Freyhof 2007, Zogaris et al. 2018). The high abundances of the critically endangered European eel (*Anguilla Anguilla*) highlight the importance of an undisturbed longitudinal river continuum at the Vjosa at an European scale (Jacoby & Gollock 2014).

Additionally, sub-endemic fish species like the Ohrid loach (*Cobitis ohridana*) and Pindus stone loach (*Oxynoemacheilus pindus*) occurring in the freshwater systems of Albania are present in river Vjosa. Through a considerable number of important tributaries (Voidomatis, Sarandoporo, Langarica, Drinos, Bença, Shushica, etc.), the Vjosa enables migration of anadromous and catadromous species for a large catchment area in Greece and Albania. Furthermore, the upper Vjosa valley, with its hill and mountain chains covered with shrub and forest vegetation, is also a migration corridor for large carnivores (mentioned below), not only within the Vjosa catchment, but also between the Vjosa and adjacent areas and other river catchments.

Amphibians and reptiles: The amphibians (13 out of 16 species reported from Albania) are a taxonomic group usually connected with aquatic habitats during their life-cycle, comprising both aquatic and terrestrial species (Fig. 11). Frank et al. (2018 this volume) report additional data on amphibians and reptiles of the Vjosa River, of which most are mentioned in international Red-lists.

Of the 37 reptile species reported from Albania, 32 are present in the Vjosa watershed (Fig. 7). Some of the most common reptiles are the Balkan whip snake (*Coluber gemonen-*

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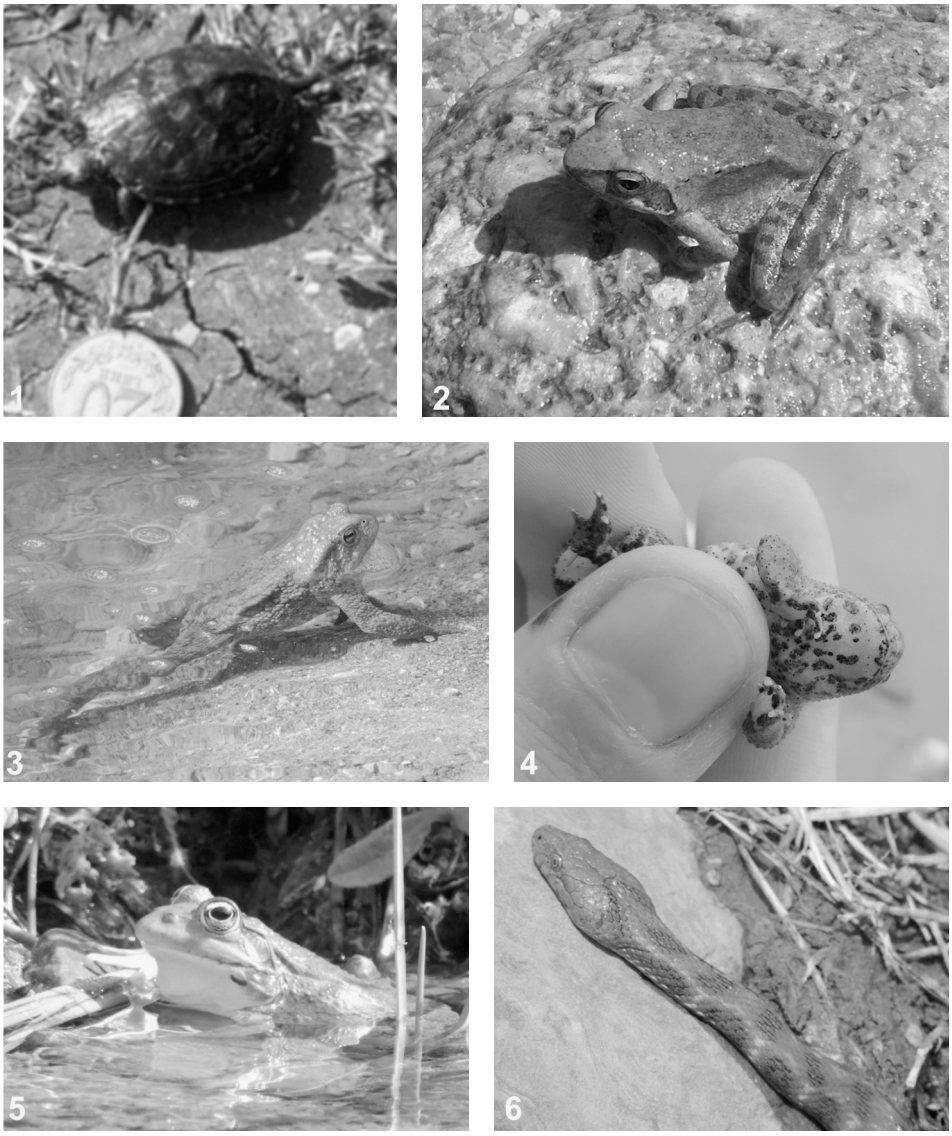

Fig. 11: Reptiles and amphibians from Vjosa: 1, *Emys orbicularis*; 2, *Rana graeca*; 3, *Bufo bufo*; 4, *Bombina variegata*; 5, *Pelophyllax ridibundus*; 6, *Natrix tessellata* (1, © S. Shumka; 2–6, © F. Bego). – Abb. 11: Reptilien und Amphibien aus Vjosa: 1, *Emys orbicularis*; 2, *Rana graeca*; 3, *Bufo bufo*; 4, *Bombina variegata*; 5, *Pelophyllax ridibundus*; 6, *Natrix tessellata* (1, © S. Shumka; 2–6, © F. Bego).

sis), Leopard snake *(Elaphe situla),* Four-lined snake *(Elaphe quatuorlineata),* Hermann's tortoise *(Testudo hermanni),* European pond turtle *(Emys orbicularis),* Erhard's wall lizard (*Podarcis erhardii*), Balkan green lizard (*Lacerta trilineata*) and the European green lizard *(Lacerta viridis).* The Vjosa catchment is also home to the meadow viper *Vipera ursinii* ssp. *graeca,* a species which was just recently found in Albania (Korsós et al. 2008).

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Birds: There is a wide variety of bird species present within the Vjosa watershed, with 257 recorded species connected to the different ecosystems and habitats (MoE 2009, Bego unpub. data) (Fig. 3). Species such as the Eagle Owl (*Bubo bubo*), Long-legged Buzzard (*Buteo rufinus*), Levant Sparrowhawk (*Accipiter brevipes*), Lanner Falcon (*Falco biarmicus*), Sparrowhawk (*Accipiter nisus*), Golden Eagle (*Aquila chrysaetos*), European Honey Buzzard (*Pernis apivorus*), Goshawk (*Accipiter gentilis*), Short-toed Eagle (*Circaetus gallicus*), Egyptian Vulture (*Neophron percnopterus*), Grey-headed Woodpecker (*Picus canus*), Barn Owl (*Tyto alba*), Lesser Kestrel (*Falco naumanni*), and Common Kestrel (*Falco tinnunculus*) are present and are good indicators of the Vjosa ecosystem's condition.

Old-growth tree stands provide suitable habitats for a number of woodpeckers (*Dendrocopos syriacus, D. major, D. medius, D. minor*) and diverse passerine species, such as tits (*Parus* spp., *Aegithalos caudatus*), finches (*Fringillidae*), warblers, and European Nuthatch (*Sitta europaea*). Of the more than 70 species of waterbirds of the Vjosa watershed, its Delta, and adjacent Narta lagoon, the most characteristic are the Dalmatian Pelican (*Pelecanus crispus*), Greater Flamingo (*Phenicopterus roseus*), Pied Avocet (*Recurvirostra avosetta*), Little Egret (*Egretta garzetta*), Grey Heron (*Ardea cinerea*), cormorants, gulls, and terns.

Fig. 12: The brown bear (*Ursus arctos*) from the National Park Fir of Hotova – Dangellia (Permeti) (© PPNEA). – Abb. 12: Der Braunbär (*Ursus arctos*) von der Nationalpark-Tanne von Hotova – Dangellia (Permeti) (© PPNEA).

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Mammals: The area harbours around 70 of the 86 registered terrestrial mammal species in Albania (MoE 2009, Bego unpublished data). The European otter (*Lutra lutra*) is one of the significant elements of the entire Vjosa river system (Bego et al. 2001, Bego et al. 2008, Hysaj & Bego 2008, Bego & Hysaj 2018 this volume). Large carnivores are also mentioned, such as the brown bear (*Ursus arctos*) (Fig. 12) and wolf (*Canis lupus*). Due to their mobility, the large carnivores can be found in different habitats within the valley. Large mammals in the Vjosa watershed also comprise the Chamois (*Rupicapra rupicapra balcanica*), the roe deer (*Capreolus capreolus*), and wild boar (*Sus scrofa*). The study area is rich in bats, both cave-dwelling and forest bats; 29 out of 32 bat species recorded from Albania are present within the Vjosa watershed. The most characteristic bats are *Rhinolophus euryale, R. blasii, R. hipossideros, R. ferrumequinum, Miniopterus schreibersi, Eptesicus serotinus, Myotis bechsteini,* and *M. capaccinii*). Other characteristic mammals are the red squirrel (*Sciurus vulgaris*), fat dormouse (*Glis glis*), hazel dormouse (*Muscardinus avellanarius*), beech marten (*Martes foina*), badger (*Meles meles*), red fox (*Vulpes vulpes*), and wild cat (*Felis silvestris*). The study area is the only known occurrence of the mole rat (*Spalax leucodon*) in Albania (Bego et al. 2014).

Annex I: Checklist of endangered and vulnerable species, including endangered and vulnerable migratory species living within Vjosa catchment, included in the appendices of the Bern Convention. – Anhang I: Checkliste gefährdeter und verwundbarer Arten, einschließlich gefährdeter und verwundbarer wandernder Arten, die im Vjosa-Einzugsgebiet leben und in den Anhängen des Berner Übereinkommens enthalten sind.

Scientific name	Family	Bern Convention Appendices
Plantae		
Salvinia natans	*Salviniaceae*	APPENDIX I
Typha minima	*Typhaceae*	APPENDIX I
Insecta		
Coenagrion mercuriale	*Odonata*	APPENDIX II
Leucorrhinia albifrons	*Odonata*	APPENDIX II
Lindenia tetraphylla	*Odonata*	APPENDIX II
Stylurus (= Gomphus) flavipes	*Odonata*	APPENDIX II
Lycaena dispar	*Lepidoptera*	APPENDIX II
Papilioa lexanor	*Lepidoptera*	APPENDIX II
Zerynthia polyxena	*Lepidoptera*	APPENDIX II
Lucanus cervus	*Coleoptera*	APPENDIX II
Cerambyx cerdo	*Coleoptera*	APPENDIX II
Amphibia & Reptilia		
Bufo viridis	*Bufonidae*	APPENDIX II
Emys orbicularis	*Emydidae*	APPENDIX II
Testudo hermanni	*Testudinidae*	APPENDIX II
Lacerta trilineata	*Lacertidae*	APPENDIX II
Lacerta viridis	*Lacertidae*	APPENDIX II
Fish		
Acipenser stellatus	*Acipenseridae*	APPENDIX III
Alburnoides bipunctatus	*Cyprinidae*	APPENDIX III
Chondrostoma nasus	*Cyprinidae*	APPENDIX III
Pachychilon pictum	*Cyprinidae*	APPENDIX III

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Annex 1 continued – Fortsetzung

Scientific name	Family	Bern Convention Appendices
Alosa alosa	*Clupeidae*	APPENDIX III
Alosa fallox	*Clupeidae*	APPENDIX III
Aphanius fasciatus	*Cyprinodontidae*	APPENDIX III
Aphanius iberus	*Cyprinodontidae*	APPENDIX III
Lampetra fluviatilis	*Petromyzonidae*	APPENDIX III
Petromyzon marinus	*Petromyzonidae*	APPENDIX III
Misgurnus fossilis	*Cobitidae*	APPENDIX III
Salaria (Blenius) fluviatilis	*Blenniidae*	APPENDIX III
Barbus prespensis	*Cyprinidae*	Albania Endemic
Cobitis ohridana	*Cobitidae*	Albania Endemic
Oxynoemacheilus pindus	*Nemacheilidae*	Albania Endemic
Anguilla anguilla	*Anguillidae*	Endangered (CR)
Salmo faroides	*Salmonidae*	Endangered (VU)
Aves		
Ardeola ralloides	*Ardeidae*	APPENDIX II
Bubulcus ibis	*Ardeidae*	APPENDIX II
Egretta alba	*Ardeidae*	APPENDIX II
Egretta garzetta	*Ardeidae*	APPENDIX II
Ixobrychus minutus	*Ardeidae*	APPENDIX II
Pandion haliaetus	*Pandionidae*	APPENDIX II
Pernisa pivorus	*Accipitridae*	APPENDIX II
Neophron percnopterus	*Accipitridae*	APPENDIX II
Circaetus gallicus	*Accipitridae*	APPENDIX II
Accipiter gentilis arrigonii	*Accipitridae*	APPENDIX II
Accipiter nisus granti	*Accipitridae*	APPENDIX II
Aquila chrysaetos	*Accipitridae*	APPENDIX II
Falco naumanni	*Falconidae*	APPENDIX II
Falco vespertinus	*Falconidae*	APPENDIX II
Falco columbarius	*Falconidae*	APPENDIX II
Falco peregrinus	*Falconidae*	APPENDIX II
Charadrius alexandrinus	*Charadriidae*	APPENDIX II
Charadrius dubius	*Charadriidae*	APPENDIX II
Tringa hypoleucos	*Scolopacidae*	APPENDIX II
Tyto alba	*Strigiformes*	APPENDIX II
Otus scops	*Strigiformes*	APPENDIX II
Bubo bubo	*Strigiformes*	APPENDIX II
Athene noctua	*Strigiformes*	APPENDIX II
Strix aluco	*Strigiformes*	APPENDIX II
Asio otus	*Strigiformes*	APPENDIX II
Asio flammeus	*Strigiformes*	APPENDIX II
caprimulgus europaeus	*Caprimulgidae*	APPENDIX II
Apus melba	*Apodidae*	APPENDIX II
Apus pallidus	*Apodidae*	APPENDIX II
Alcedo atthis	*Alcedinidae*	APPENDIX II
Merops apiaster	*Meropidae*	APPENDIX II

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Annex 1 continued – Fortsetzung

Scientific name	Family	Bern Convention Appendices
Upupa epops	*Upopidae*	APPENDIX II
Jynx torquilla	*Piciformes*	APPENDIX II
Picus viridis	*Piciformes*	APPENDIX II
Dendrocopos major	*Piciformes*	APPENDIX II
Dendrocoposs yriacus	*Piciformes*	APPENDIX II
Dendrocopos medius	*Piciformes*	APPENDIX II
Dendrocopos minor	*Piciformes*	APPENDIX II
Calandrella brachydactyla	*Alaudidae*	APPENDIX II
Riparia riparia	*Hirundinidae*	APPENDIX II
Hirundo rupestris	*Hirundinidae*	APPENDIX II
Hirundo rustica	*Hirundinidae*	APPENDIX II
Hirundo daurica	*Hirundinidae*	APPENDIX II
Delichon urbica	*Hirundinidae*	APPENDIX II
Anthus campestris	*Motacillidae*	APPENDIX II
Anthus pratensis	*Motacillidae*	APPENDIX II
Anthus spinoletta	*Motacillidae*	APPENDIX II
Motacilla flava	*Motacillidae*	APPENDIX II
Motacilla cinerea	*Motacillidae*	APPENDIX II
Motacilla alba	*Motacillidae*	APPENDIX II
Lanius collurio	*Lanidae*	APPENDIX II
Lanius minor	*Lanidae*	APPENDIX II
Lanius excubitor	*Lanidae*	APPENDIX II
Lanius senator	*Lanidae*	APPENDIX II
Cinclus cinclus	*Cinclidae*	APPENDIX II
Troglodytes troglodytes	*Troglodytidae*	APPENDIX II
Prunella modularis	*Prunellidae*	APPENDIX II
Erithacus rubecula	*Turdinae*	APPENDIX II
Luscinia megarhynchos	*Turdinae*	APPENDIX II
Monticola solitarius	*Turdinae*	APPENDIX II
Monticola saxatilis	*Turdinae*	APPENDIX II
Oenanthe hispanica	*Turdinae*	APPENDIX II
Oenanthe oenanthe	*Turdinae*	APPENDIX II
Phoenicurus ochruros	*Turdinae*	APPENDIX II
Phoenicurus phoenicurus	*Turdinae*	APPENDIX II
Saxicola rubetra	*Turdinae*	APPENDIX II
Saxicola torquata	*Turdinae*	APPENDIX II
Cettia cetti	*Sylvinae*	APPENDIX II
Cisticola juncidis	*Sylvinae*	APPENDIX II
Acrocephalus scirpaceus	*Sylvinae*	APPENDIX II
Acrocephalus arundinaceus	*Sylvinae*	APPENDIX II
Hippolais olivetorum	*Sylvinae*	APPENDIX II
Hippolais pallida	*Sylvinae*	APPENDIX II
Sylvia hortensis	*Sylvinae*	APPENDIX II
Sylvia borin	*Sylvinae*	APPENDIX II

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Annex 1 continued – Fortsetzung

Scientific name	Family	Bern Convention Appendices
Sylvia atricapilla	*Sylvinae*	APPENDIX II
Sylvia communis	*Sylvinae*	APPENDIX II
Sylvia curruca	*Sylvinae*	APPENDIX II
Sylvia melanocephala	*Sylvinae*	APPENDIX II
Sylvia cantillans	*Sylvinae*	APPENDIX II
Sylvia conspicillat	*Sylvinae*	APPENDIX II
Sylvia undata	*Sylvinae*	APPENDIX II
Regulus regulus	*Regulinae*	APPENDIX II
Regulus ignicapilla	*Regulinae*	APPENDIX II
Muscicapa striata	*Muscicapinae*	APPENDIX II
Ficedula albicollis	*Muscicapinae*	APPENDIX II
Ficedula hypoleuca	*Muscicapinae*	APPENDIX II
Panurus biarmicus	*Timalinae*	APPENDIX II
Parus lugubris	*Paridae*	APPENDIX II
Parus cristatus	*Paridae*	APPENDIX II
Parus ater	*Paridae*	APPENDIX II
Parus caeruleus	*Paridae*	APPENDIX II
Parus major	*Paridae*	APPENDIX II
Remis pendulinus	*Paridae*	APPENDIX II
Sitta neumayer	*Sittidae*	APPENDIX II
Emberiza cia	*Emberizidae*	APPENDIX II
Emberiza cirlus	*Emberizidae*	APPENDIX II
Emberiza melanocephala	*Emberizidae*	APPENDIX II
Emberiza schoeniclus	*Emberizidae*	APPENDIX II
Carduelis cannabina	*Fringillidae*	APPENDIX II
Carduelis carduelis	*Fringillidae*	APPENDIX II
Carduelis chloris	*Fringillidae*	APPENDIX II
Carduelis spinus	*Fringillidae*	APPENDIX II
Coccothraustes coccothraustes	*Fringillidae*	APPENDIX II
Serinus serinus	*Fringillidae*	APPENDIX II
Oriolus oriolus	*Orolidae*	APPENDIX II
Pyrrhocorax graculus	*Corvidae*	APPENDIX II
Mammalia		
Hypsugo savii	*Vespertilionidae*	APPENDIX II
Myotis bechsteinii	*Vespertilionidae*	APPENDIX II
Pipistrellus kuhli	*Vespertilionidae*	APPENDIX II
Rhinolophus ferrumequinum	*Rhinolophidae*	APPENDIX II
Rhinolophus hipposideros	*Rhinolophidae*	APPENDIX II
Canis lupus	*Canidae*	APPENDIX II
Lutra lutra	*Mustelidae*	APPENDIX II
Ursus arctos	*Ursidae*	APPENDIX II
Felis silvestris	*Felidae*	APPENDIX II

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Conclusions

Even considering the gaps in our knowledge of the area's biodiversity, the whole Vjosa catchment and the River Vjosa itself shelter a high diversity of habitats and species – one that is relatively rich compared to other similar areas in Albania. Therefore, special attention must be paid to future hydropower development plans. From its delta in the Adriatic to the uppermost mountainous part in Albania and Greece, the riverine system represents a dynamic and continuous freshwater ecosystem which is a suitable habitat for various aquatic and terrestrial species.

Around 150 species of the already known flora and fauna species are listed in the Appendices of the Bern Convention. More than 15 priority habitat types of European interest have been identified (Habitat directive – NATURA 2000), as well as 7 habitat priority types (EUNIS, IPA) of high floristic value.

Among the fish-fauna worth mentioning here are the critically endangered European eel (*Anguilla anguilla*), mullet (*Mugil cephalus*), and sub-endemic fish species such as the Ohrid loach (*Cobitis ohridana*) and Pindus stone loach (*Oxynoemacheilus pindus*); the presence of *Salmo faroides* has been recorded at a critical population size for the major part of the river and its tributaries.

A very large proportion of Albanian amphibians (13 out of 16 species reported in Albania, or more than 80 %) and reptiles (32 out of 37 species reported in Albania or more than 86 %) are present in the Vjosa watershed, either in aquatic or terrestrial habitats, and are connected to riverine habitats for at least parts of their lifecycle. A wide variety of bird species is present (257 species or approx. 80 % of the species known in Albania) and connected to the different aquatic habitats. There are more than 70 species of waterbird, mostly in the wetlands of the Vjosa Delta. The area is home to around 70 of the 83 registered mammal species in Albania (approx. 84 %), e.g. the European otter (*Lutra lutra*), a globally endangered mammal. Around 150 species of the already known flora and fauna species are listed in the Appendices of the Bern Convention. Results of other research groups in this volume reveal additional biodiversity data underlining the conservational value of this area. The floodplains of the Vjosa River in its middle part highlight **the potential values of a protected area – of a future riverscape National Park** – that would be the first protected area of this category in Albania.

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