

Bryophytes of the Karavasta Lagoon area, with new reports for Albania

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Abstract. The Karavasta Lagoon area and the Divjaka National Park (Central Albania) are almost unexplored bryologically. The lagoon, with its environs, is one of the most important coastal ecosystems in Albania and includes diverse habitats: coastal sand dunes, pine forests, maquis, shibliak, and marshlands. The number of bryophyte species reported for the area has substantially increased (from 11 to 60), in addition to a few findings in the Orikum Lagoon area (previously bryologically unexplored). Twenty-one entities are new for Albania.

Key words: Albania, Balkans, bryophytes, flora, Karavasta, liverworts, mosses, Orikum

Introduction

The Karavasta area – seldom visited by bryologists in the past, as it is the case for most of Albania – was explored bryologically only once, in 1959-1960, by Kárpáti & Vajda (1961), who reported 10 species of mosses, and one liverwort. Other contemporary expeditions to Albania by Bischler and her coworkers (Bischler & al. 1980), who explored the coastal areas of Albania for liverworts, in 1971 and 1972, and by Petrov, who visited Albania in 1958 (Petrov 1960, 1962) did not visit Karavasta and the Forest of Divjaka. Only recently the first checklist of the bryophytes of Albania has been published (Colacino & Sabovljević 2006). since then two new records from the Albanian Alps (Region of Skodër) were recently published by Erzberger (Blockeel & al. 2007). for more information on the bryological exploration of Albania see also Colacino (2005).

Materials and methods

The specimens were collected during field work in the Karavasta area (March 2001), within the framework

of the INTERREG II program, whose aim was to assess endemics and their conservation (Regione Puglia 2002), as well as in 2005 and 2007. Vouchers are deposited in the bryological collection at HLUC (C. Colacino collections), and at the University of Tirana (J. Marka collections). In the species list the collection numbers for the specimens considered are indicated in parenthesis, after locality and substrate, and prefixed by the letters **C** (Colacino) or **M** (Marka).

Localities and habitats

Karavasta Lagoon is one of the several environmentally sensitive areas along the coasts of Albania, and is located in the central part of the country, near the town of Divjaka (region of Fier, district of Lushnjë). The coastal lagoon, and the forested areas (Forest of Divjaka) on the northwestern side of the lagoon, have been a National Park, and therefore a protected area since 1966. The habitats are varied, including coastal sand dunes, pine forests, maquis, shibliak, and marshlands. For a more detailed description refer to Leone & al. (2003). Climatologically, the area belongs to the *Mediterranean Zone – Flat Coastal Belt*. **IVb** characterized by average annual temperatures of 15–16°C, average temperatures in January

of 6.5–7.5°C, absolute minima variable between -5°C and 7°C (exceptionally -15°C), and 1500–1700 mm of annual rainfall (Paparisto & al. 1988; Vangjeli & al. 1997; Colacino 2005).

Collection sites

- A** – Left bank of river Shkumbin, near mouth, *Populus alba* L. reforestation (with *Rubus caesius* L., *Hedera helix* L., *Crataegus monogyna* Jacq., *Cornus sanguinea* L., and sporadically *Platanus orientalis* L., and willows): 41°00'01.90" N, 19°26'39.38" E.
- D** – Sand dunes (with *Juniperus oxycedrus* L. subsp. *macrocarpa* (Sm.) Ball., with xerophytes and psammophytes such as *Cyperus kalli* (Forssk.) Murb., *Pancratium maritimum* L., and further inland areas with burned-out pine forests, *Pinus pinea* L. with maquis: *Pistacia lentiscus* L., *Myrtus communis* L., etc., plus *Juncus acutus* L., *Schoenus nigricans* L., *Saccharum ravennae* (L.) Murray, etc. in areas with brackish water afflorations), between 40°55'–40°56' N and 19°27'–19°28' E.
- G** – Near canal (N side), on a small hill with *Euphorbia* sp., *Geranium* spp., etc., ca. 25 m., 40°55'22" N, 19°27'37" E.
- H** – Divjaka hills, clay soil, esp. W, ca. 121 m, 40°53'45.7" N, 19°33'11.3" E.
- K** – Karavasta area (in the absence of more precise data) 40°59'24" N, 19°29'08" E. (arbitrarily determined as the coordinates of the central part of the lagoon area).
- N** – Northern part of a pine forest (OAZ–Reservat), 41°00'05" N, 19°29'46" E.
- P** – Pine wood reforestation in the maquis (*Pinus pinea*, *P. halepensis* Mill., *Rhamnus alaternus* L., *Myrtus communis*, *Juniperus oxycedrus* subsp. *macrocarpa*, *Pistacia lentiscus*, etc.), often on pine-needle litter, 40°56' N, 19°28' E.
- S** – Sandy area with *Juniperus oxycedrus* subsp. *macrocarpa*, 40°59'16.9" N, 19°28'29.7" E.
- T** – 50 m westwards of the locality "S", in *P. halepensis* wood, 40°59'17" N, 19°28'32" E.

For all localities above: *region*: **Fier**; *district*: **Lushnjë**; *com.*: **Divjakë**, except **H** (*Com.*: **Remas**). Collection dates (if not indicated otherwise: April 12–15, 2001).

The other explored area, Orikum, is smaller and located near Valona (S of Vlorë), the area is very disturbed and only one collection site is reported:

- O** – Sea level – 40°19'20.7" N, 19°27'15.4" E – grazed area with *Juncus acutus*, *Cirsium* spp., *Erodium ci-*

cutarium (L.) L'Hér., *Medicago* spp., *Lupulina* spp., *Plantago* spp. – April 25, 2003 – *Region Vlorë*; *District*: **Vlorë**; *Com.*: **Orikum**.

Results

Checklist

(*New for Albania, †Confirmation of pre-1950 record for Albania, °New for the region of Fier; § New for the region of Vlorë):

Bryophyta

- **Aloina aloides* (Schultz) Kindb. – **A**, loamy soil (C 010313-3-14); **H**, on clay (C010314-A-1).
- °*Amblystegium serpens* (Hedw.) Schimp. – **A**, loamy soil (C 010313-3-13); **N**, on soil (C 010315-1-2).
- °*Barbula convoluta* Hedw. – **A**, loamy soil (C010313-3-18); **K**, on sand dunes (M 13/667), on sand dunes (M 5,1/667), on soil (M 4/2365), on soil (M 20/667).
- °*Barbula unguiculata* Hedw. – **K**, on sandy soil (M 2/2365).
- °*Brachythecium albicans* (Hedw.) Bruch & al. – **K**, on soil (M 2/2187).
- °*Brachythecium rutabulum* (Hedw.) Bruch & al. – **D**, on sandy soil in a burned-out open area (C 010314-4-5); **K**, on soil (M 15/667); **T**, sandy soil (C 010312-5-2).
- **Brachythecium rutabulum* var. *flavescens* Bruch & al. – **K**, at base of trunk on bark (M 23/667).
- °*Brachythecium salebrosum* (Weber & D. Mohr) Bruch. & al. – **A**, poplar bark, base (C 010313-3-6); **N**, on soil (C 010315-2-3).
- **Bryum badium* (Brid.) Schimp. – **K**, on sand dunes (M 5/667).
- °§*Bryum caespiticium* Hedw. – **K**, on sand dunes (M 9/667), (M 2,2/667); **O**, on soil (C 030425-1-2).
- °*Bryum capillare* Hedw. – **D**, on sandy soil, in burned-out area (C 010314-4-3), sandy soil in *Juniperetum* (C 010312-V-1); **P**, on decaying log w/ soil (C 010314-5-1), on sand dune, under *P. lentiscus*, incline > 45°, esp. S (C 010314-2-3 & 010314-3-1), sand dune (C 010314-3-1), sandy soil (C 010312-2-1), on decaying log w/ soil (C 010314-1-4); **N**, on soil (C 010315-2-6); **S** – on sand (C 010312-4-2); **T**, sandy soil (C 010312-5-5); **K**, on pine bark (M 1/2365).
- *°*Bryum dunense* A.J.E. Sm. & Whitehouse – **G**, sandy soil (C 010312-3-1); **N**, soil (C 010315-4-1); **S**, on sand (010312-4-1); **T**, sandy soil (C 010312-5-4),

- sandy soil (C 010312-5-1); **K**, on sand dunes (M 11/667), on soil (M 22/667), on pine bark at base (M 17/667).
- †°*Bryum pallens* Sw. – **P**, on sandy soil (C 010314-3-3).
- †°*Bryum torquescens* Bruch & Schimp. – **D**, sandy soil, in burned-out open area (C 010314-4-6).
- *°*Bryum versicolor* A. Braun – **K**, on sand dunes (M 2.1/667).
- *°*Dicranella howei* Renault & Cardot – **A**, loamy soil (C 010313-3-16).
- *°*Didymodon luridus* Hornsch. – **D**, sandy soil in *Juniperetum* (C 010312-V-4); **K**, on sand dunes (M 1/667); **H**, clay (C 010315-A-3).
- *°*Didymodon tophaceus* (Brid.) Lisa – **A**, loamy soil (C 010313-3-15); **D**, sandy soil in *Juniperetum* (C 010312-V-3).
- *°*Didymodon vinealis* (Brid.) R.H. Zander – **P**, on sandy soil (C 010314-3-4); **A**, loamy soil (C 010313-3-20); **H**, clay (C 010315-A-2); **K**, on soil (M 6.2/2365).
- *°*Ditrichum heteromallum* (Hedw.) E. Britton – **A**, loamy soil (C 010313-3-19).
- †°*Eurhynchium pumilum* (Wilson) Schimp. – **N**, on decaying bark (C 010315-2-4)
- *°*Fissidens dubius* P. Beauv. – **P**, on wet sandy soil (C 010314-1-2); **K**, on soil (in shadow) (M 5/2187).
- Fissidens taxifolius* Hedw. – **N**, on soil (C 010315-2-2).
- *°*Funaria hygrometrica* Hedw. – **D**, sandy soil, burned open area (C 010314-4-2); **K**, on sand dunes (M 2/667); **N** – soil (C 010315-4-4).
- *°*Hypnum cupressiforme* Hedw. – **P**, on wet sandy soil (C 010314-1-1); **K**, decaying wood (M 15/2187 8-21-07), on bark (M 8/2365), on pine bark (M 9/2187).
- *°*Leptodon smithii* (Hedw.) Weber & D. Mohr – **A**, poplar bark, base (C 010313-3-3); **K**, on pine bark (M 7/2365).
- †°*Orthotrichum diaphanum* Brid. – **A**, poplar bark, base (C 010313-3-1); **K**, on *Cupressus* bark (M 31/2187), on pine bark (M 13/2365).
- *°*Orthotrichum lyelli* Hook. & Tayl. – **A**, poplar bark, base (C 010313-3-2).
- *°*Orthotrichum pallens* Bruch ex Brid. – **A**, poplar bark, base (C 010313-3-4).
- *°*Orthotrichum tenellum* Bruch ex Brid. – **K**, on pine bark (M 12/2365).
- *§*Physcomitrium pyriforme* (Hedw.) Brid. – **O**, on soil (C 030425-1-1).
- Pleurochaete squarrosa* (Brid.) Lindb. – **K**, on soil (M 6/2365); **T**, on sandy soil (C 010312-6-1).
- *°*Pohlia melanodon* (Brid.) A.J.Shaw – **A**, loamy soil (C 010313-3-17).
- *°*Pseudoleskea incurvata* (Hedw.) Loeske – **A**, poplar bark, base (C 010313-3-5).
- *°*Pseudoleskeella nervosa* (Brid.) Nyholm – **A**, poplar bark, base (C 010313-3-9).
- *°*Pylaisia polyantha* (Hedw.) Schimp. – **K**, on decaying bark (M 16/2187).
- *°*Rhynchostegiella curviseta* (Brid.) Limpr. – **N**, on decaying bark (C 010315-2-1).
- *°*Rhynchostegiella litorea* (De Not.) Limpr. – **A**, poplar bark, base (C 010313-3-10).
- *°*Rhynchostegiella tenella* (Docks.) Limpr. – **N**, on soil (C 010315-2-5).
- *°*Rhynchostegium megapolitanum* (Weber & D. Mohr) Bruch & al. – **P**, on wet sandy soil (C 010314-1-5), on sand dune, under *P. lentiscus*, incline > 45°, esp. S (C 010314-2-1).
- *°*Rhynchostegium megapolitanum* var. *meridionale* Schimp. – **K**, on soil (M 4/2187).
- *°*Scleropodium purum* (Hedw.) Limpr. – **K**, on soil (M 1/2187).
- *°*Scleropodium tourretii* (Brid.) L.F. Koch – **K**, on soil (M 27/2187).
- *°*Sematophyllum substrumulosum* (Hampe) E. Britton – **N**, on bark (C 010315-1-1).
- *°*Syntrichia laevipila* var. *laevipiliformis* (De Not.) Limpr. – **K**, on *Cupressus* bark (M 31/2187).
- Tortella flavovirens* (Bruch) Broth. – **P**, on decaying log w/ soil (C 010314-5-2), on sand dune, under *P. lentiscus*, incline > 45°, esp. S (C 010314-2-2), on decaying log w/ soil and on wet sandy soil (C 010314-1-3b); **D**, on sandy soil in a burned-out open area (010314-4-1), on sand under *P. lentiscus* (C 010314-3-2), sandy soil in *Juniperetum* (C 010312-V-2); **S**, on sand (010312-4-3); **T**, sandy soil (C 010312-5-3).
- *°*Tortella humilis* (Hedw.) Jenn. – **K**, on pine bark (M 11/2365); **P**, on sandy soil (C 010315-8-1).
- *°*Tortella inclinata* (R.Hedw.) Limpr. – **N**, on soil (C 010315-4-2).
- †°*Tortella tortuosa* var. *fragilifolia* (Jur.) Limpr. – **K**, on soil (M 5/2365)
- *°*Trichostomum crispulum* Bruch – **A**, loamy soil, (C 010313-3-12).
- *°*Weissia controversa* var. *crispata* (Nees & Hornsch.) Nyholm – **A**, loamy soil (C 010313-3-11).
- *°*Weissia longifolia* Mitt. – **N**, soil (C 010315-4-3).
- *°*Zygodon rupestris* Schimp. ex Lorentz – **K**, on *Cupressus* bark (M 31/2187).

Marchantiophyta

Frullania dilatata (L.) Dumort. – **P**, on bark (C 010314-1-3); **A**, poplar bark, base (C 010313-3-8).

Radula complanata (L.) Dumort. – **A**, poplar bark base (C 010313-3-7).

°*Riccia bifurca* Hoffm. – **D**, on sandy soil, in burned-out open area (C 010314-4-4).

Discussion

Albania is still one of the less studied countries in Europe as far as her bryophyte flora is concerned. Following the cited surveys (Kárpáti & Vajda 1961; Petrov 1960, 1962; Bischler & al. 1980), no other bryological studies have been published.

The knowledge of the bryophyte flora of the Karavasta area is greatly expanded with this work, mainly because of the scarce previous information. The number of entities has now substantially increased from 11 to 60, with the addition of 49 new taxa (84 new records) for the region of Fier (where moss taxa have increased from 10 to 59, and liverwort taxa from 19 to 20). Two new moss taxa are also reported for the region of Vlorë (now totaling 38 moss taxa). Overall, 21 new entities are reported as new for Albania. Some of the records confirm pre-1950 records (*Bryum pallens*, *B. torquescens*, *Eurhynchium pumilum*, *Orthotrichum diaphanum*, *Tortella tortuosa* var. *fragilifolia*), while others confirm some of the taxa previously known only from a single record (*Brachythecium albicans*, *Bryum pallens*, *Eurhynchium pumilum*, *Orthotrichum diaphanum*, *Rhynchostegiella curviseta*, *Rhynchostegium megapolitanum* var. *meridionale*, *Tortella inclinata*, *Tortella tortuosa* var. *fragilifolia*). Regarding *Dicranella howei*, it would be necessary to check the voucher of *Dicranella heteromalla* collected by Kárpáti & Vajda and to determine if this is indeed a distinct species. With the addition of the two taxa new for Albania reported recently by Erzberger (Blockeel & al. 2007) for the region of Shkodër, the total number of moss taxa for Albania is presently 261, and the total of bryophyte taxa 350. From a conservation point of view, none of the reported species is included in the red listing of

European bryophytes of the European Committee for Conservation of Bryophytes (ECCB 1995).

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