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## New epiphytic bryophyte communities from Turkey

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### ABSTRACT:

The epiphytic bryophyte vegetation of the Kümbet Plateau (Dereli-Giresun) was investigated. A total of 40 relevés taken from tree trunks in different vegetation periods of the year 2019 were analysed using multivariate analysis methods such as detrended correspondence analysis (DECORANA) and two-way indicator species analysis (TWINSPAN), and the Braun-Blanquet method was also applied. As a result, *Frullanio tamarisci-Neckeretum pumilae* Alataş, Ezer, Batan & Erata ass. nov. and *Frullanio tamarisci-Neckeretum pumilae-isothecietosum alopecuroidis* Alataş, Ezer, Batan & Erata subass. nov. were described as new syntaxa from Turkey. In addition, *Ulotetum crispae-sanionietosum uncinatae* was recorded for the first time from Turkey, while *Ulotetum crispae* was recorded for the second time from Turkey. These syntaxa were analysed in terms of their ecological and floristic aspects.

### Keywords:

bryophyte, epiphytic vegetation, Kümbet Plateau, Turkey

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## INTRODUCTION

Vegetation is the form of accumulation of plants, wherever, in response to living conditions. The more diverse the environmental conditions in a region are, the more diverse the vegetation types will be (KILINÇ 2005). Humidity, light, acidity, climate and substrate types are the most important factors which affect the formation and diversity of the environmental conditions of bryophytes. Bryophytes with similar ecological preferences associate to form bryo-sociological groups.

In studies on the epiphytic bryophyte vegetation of Turkey, a total of 49 syntaxa have been reported to date. Of these, 42 are at the level of associations and sub-associations, and 7 are at the community level of undefined taxonomic categories (ALATAŞ 2018; ALATAŞ *et al.* 2019a, b).

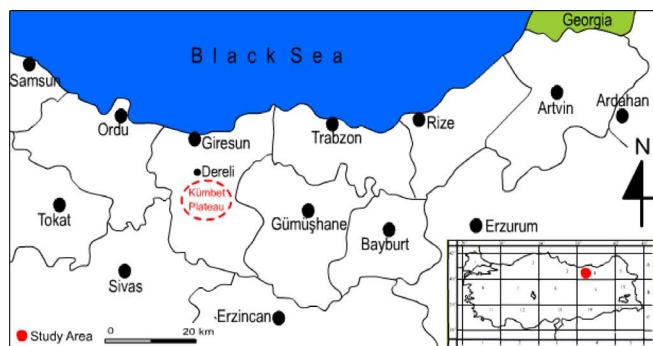
Considering Turkey's rich floristic structure and habitat diversity resulting from its location in three phytogeographic regions (Euro-Siberian, Mediterranean, and Irano-Turanian), this number is rather small. Since

many areas remain unknown, more extensive explorations of the epiphytic vegetation in more regions of Turkey are urgently needed.

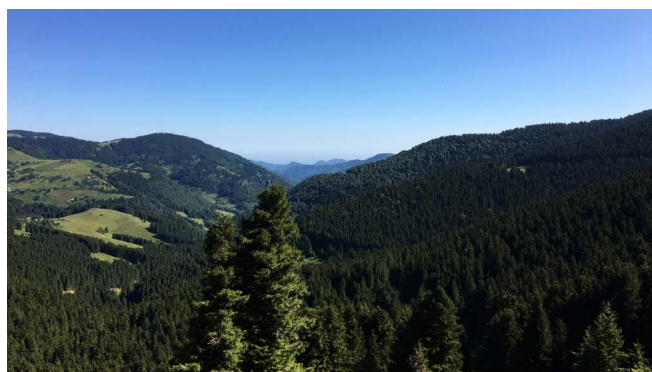
In order to contribute to the knowledge of Turkey's epiphytic bryosociological richness, we conducted a study in the Kümbet Plateau in the Giresun province (the north of Turkey). A total of 4 syntaxa (two are new to science; one of them was recorded for the first time from Turkey, and one of them was recorded for the second time from Turkey) were determined.

## MATERIALS AND METHODS

**Study area.** The Kümbet Plateau, situated within the borders of the Dereli district of the Giresun province, is located on the slopes of the Giresun Mountains facing the Black Sea. It is located in the Colchic zone of the Euro-Siberian phytogeographical region. According to Henderson's grid-square system for Turkey (HENDERSON 1961), the plateau lies in the A4 square (ANŞIN 1983; Fig. 1).



**Fig. 1.** The study area and grid system of Turkey adopted by HENDERSON (1961).



**Fig. 2.** The forest vegetation of the study area.

The northern border of the plateau, reaching an average elevation of 1640 m, consists of hills, mountains, and streams, including the Calba, Kaçkayas and Cımbırtılık streams. The western border is located in the Aymaç, Çin, Kertboğazı and Düdlek hills, and the southern border on Katankaya hill, while the eastern border is situated in the Tingirik and Taşbaşı hills.

The topography of the Kümbet Plateau, situated in the Giresun Mountains of the Eastern Black Sea mountain range, has the appearance of a high plateau split by deep and narrow valleys. The plateau and its surrounding area are covered with a thick layer of andesite-basalt lava and tuff (ARDEL 1963).

In terms of vegetation, mixed forests of *Picea orientalis* (L.) Link, *Fagus orientalis* Lipsky., *Carpinus betulus* L., *Acer platanoides* L., *Alnus glutinosa* L., *Corylus avellana* L., and various *Quercus* species are located between 1000–1500 m of the area. Pure spruce forests also cover a large area starting from 1500 m along the valley slopes of Çamkotu Creek. A very rich flora with numerous flowering species is located in the Alpine belt above 2000 m (Fig. 2).

Although the climate of the region, foggy in all seasons, is affected by the Black Sea climate, this effect is weakened due to its distance from the coast, and the transitional climate type prevails over the continental climate and the Black Sea climate (AYDINÖZÜ & SOLMAZ

2003). The average annual rainfall is 867 mm, and the average annual temperature is 12.7°C. The hottest month of the year is August, whereas the coldest month is January (URL 1 2019).

According to the cover density of epiphytic bryophytes in different localities of the Kümbet Plateau, 40 relevés were taken from the lower (0–0.5 m) and middle (0.5–2 m) parts of *Acer platanoides*, *Alnus glutinosa*, *Fagus orientalis* and *Picea orientalis* trunks and 317 bryophyte specimens were collected.

#### List of localities:

1. *Alnus glutinosa*, *Picea orientalis* and *Fagus orientalis* (Phorophytes); 1–22, 34–38 (relevés); 1250–1270 m; N 40°35'28" E 38°26'59"; 28–30.05.2019, 08.07.2019.
2. *Alnus glutinosa* (Phorophyte); 23–24 (relevés); 1300–1340 m; N 40°35'08" E 38°26'43"; 08.07.2019.
3. *Alnus glutinosa*, *Acer platanoides* and *Fagus orientalis* (Phorophytes); 25–33 (relevés); 1283 m; N 40°35'19" E 38°27'14"; 10–11.09.2019.
4. *Alnus glutinosa* (Phorophyte); 39–40 (relevés); 1420–1450 m; N 40°34'56" E 38°26'54"; 12–13.10.2019.

The relevés were selected according to the minimum area concept. The abundance-coverage scale of Frey and Kürschner was used (FREY & KÜRSCHNER 1991; Table 1).

These relevés were evaluated using the Braun-Blanquet method (BRAUN-BLANQUET 1964) as well as multivariate ordination techniques such as detrended correspondence analysis (DECORANA) and two-way indicator species analysis (TWINSPAN) (SEABY *et al.* 2004).

The phytosociological data obtained from the 40 relevés were analysed with TWINSPAN (two-way indicator species analysis) and DECORANA (detrended correspondence analysis), and Community Analysis Package III in order to classify and ordinate the epiphytic bryophyte communities of the study area. The modification of the TWINSPAN classification was performed by the application of the Braun-Blanquet method.

Plant associations were arranged by diagnostic species (BRAUN-BLANQUET 1964) and named according to WEBER *et al.* (2000). The determination of the associations was carried out via comparison with related associations in MARSTALLER (2006) and classified with the aid of published studies. Other floras, monographs and revisions were used for the identification of the bryophyte samples (ZANDER 1993; PATON 1999; CORTINI PEDROTTI 2001, 2006; HEYN & HERRNSTADT 2004; SMITH 2004; FREY *et al.* 2006; GUERRA *et al.* 2006, 2010, 2014, 2018; BRUGUÉS *et al.* 2007; CASAS *et al.* 2009; KÜRSCHNER & FREY 2011; PLÁŠEK *et al.* 2015; LARA *et al.* 2016). The ecological preferences of the species were taken from DIERSSEN (2001). The habitat affinities of the taxa were determined according to DRAPER *et al.* (2003). The nomenclature of the taxa followed HODGETTS *et al.* (2020).

## RESULTS

In the study area, the relevés taken from the tree trunks were analysed by using multivariate analysis methods such as DECORANA and TWINSpan as well as the Braun-Blanquet method. Consequently, *Frullanio tamarisci-Neckeretum pumilae* Alataş, Ezer, Batan & Erata ass. nov. and *Frullanio tamarisci-Neckeretum pumilae-isothecietosum alopecuroidis* Alataş, Ezer, Batan & Erata subass. nov. were identified as novel syntaxa. Also, *Ulotetum crispae-sanionietosum uncinatae* was recorded for the first time from Turkey, while *Ulotetum crispae* was reported for the second time (Fig. 3).

The floristic and ecological features of these syntaxa are given below in accordance with MARSTALLER'S (2006) sequence.

**Class:** Neckeretea complanatae Marst. 1986  
**Order:** Neckeretalia complanatae Jez & Vondr. 1962  
**Alliance:** Neckerion complanatae Sm. & Had. ex Kl. 1948  
**Association:** *Frullanio tamarisci-Neckeretum pumilae* ass. nova  
**Subassociation:** *-isothecietosum alopecuroidis* subass. nova  
**Class:** Frullanio dilatatae-Leucodontetea sciuroididis Mo-  
han 1978  
**Order:** Orthotrichetalia Had. in Kl. & Had. 1944  
**Alliance:** Ulotion crispae Barkm. 1958  
**Association:** *Ulotetum crispae* Ochs. 1928  
**Subassociation:** *-sanionietosum uncinatae* Schlüss. 2001

## DISCUSSION

### Description of the syntaxa

***Frullanio tamarisci-Neckeretum pumilae*** Alataş, Ezer, Batan & Erata ass. nova (Table 2)

Holotypus: Prov. Giresun, Kümbet Plateau, 1270 m, *Picea orientalis* forest, Table 2, no. 21.

Differential species: *Frullania tamarisci*, *Neckera pumila*.

*Frullanio tamarisci-Neckeretum pumilae* is represented by a total of 12 relevés. The association is mainly found on the trunks of *Picea orientalis*, growing between 1250–1270 meters in the northern part of the study area. The cover percentage of the association ranges from 90% to 100%, while the canopy cover at the site is almost 100%. The number of taxa within the relevés varies between 6 and 9. A total of 18 taxa were determined within the association, of which 7 are liverworts and 11 are mosses (7 pleurocarpous and 4 acrocarpous). Both coverage percentages and the high proportion of pleurocarpous mosses indicate the humidity of the habitats.

The most characteristic species of the association are the mesophytes *Frullania tamarisci* and *Neckera pumila*. They have the highest recurrence within the association

**Table 1.** The abundance-coverage scale used for bryophytes.

+	< 1%	3	12.1–25.0%
1	1.1–6.0%	4	25.1–50.0%
2	6.1–12.0%	5	50.1–100%

and their permanency in the relevés is 100%. *Frullania tamarisci* and *N. pumila* generally grow on tree trunks as epiphytes, and also on epilithic environments such as rock surfaces. Both of them prefer semi-arid and semi-neutral habitats.

In terms of the evaluated acidity requirement of the taxa which form the association, the acidophyte (pH < 5.7) taxa rank first with 56%, and the sub-neutrophyte (pH = 5.7–7) taxa rank second with 39% (Fig. 4). Regarding the moisture requirements, the total rate of mesophyte and hygrophyte taxa is 95% (Fig. 5). With regard to light preference, the taxa within the association are sciophytes (78%), preferring shady environments (Fig. 6). These data show that the association, preferring acid- or semi-neutral shady habitats, is meso-hygrophitic.

In terms of habitat affinity, epiphytic taxa rank first comprising 50%, followed by cortico-saxicolous taxa at 39%, and indifferent taxa at 11% (Fig. 7). The climatic, habitat and ecological characteristics of the study area and the ecological characteristics of the taxa within the association are strongly compatible. This is one of the important factors in terms of the stability of the epiphytic bryophyte community.

Synhierarchically, the association is classified within the class *Neckeretea complanatae*, the order *Neckeretalia complanatae*, and the alliance *Neckerion complanatae* (Table 2).

***Frullanio tamarisci-Neckeretum pumilae-isothecietosum alopecuroidis*** Alataş, Ezer, Batan & Erata subass. nova (Table 2)

Holotypus: Prov. Giresun, Kümbet Plateau, 1270 m, *Picea orientalis* forest, Table 2, no. 19.

Differential species: *Isothecium alopecuroides*.

The new sub-association was determined by a total of 11 relevés taken from tree trunks growing between 1250–1270 m of the study area. The syntaxon was found on the north exposed side of the trunks mainly of *Picea orientalis*. The coverage of the association ranges from 90% to 100%, and the canopy cover of the spruce forest is almost 100%. The association is represented by a total of 20 taxa. Among them, 6 taxa are liverworts, while 14 taxa are mosses (9 pleurocarpous and 5 acrocarpous). The average number of taxa in the new sub-association is 7. Both coverage percentages and the proportion of acrocarpous and pleurocarpous mosses show that the study site has humid and semi-arid habitats.

Table 2. *Frullania tamarisci*-*Neckeretum pumilae* Alataş, Ezer, Batan & Erata ass. nova. (a) and *-isothectetosum alopecuroidis* Alataş, Ezer, Batan & Erata subass. nova. (b).

	9	10	11	13	14	16	17	18	20	21	34	37	38	2	3	4	5	7	8	15	19	35	36																						
<b>Number of relevés:</b>	1250	1250	1260	1260	1260	1260	1270	1270	1270	1270	1270	1270	1270	1250	1250	1250	1250	1250	1260	1270	1270	1270	1270																						
<b>Altitude (m)</b>	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12																						
<b>Size of relevés(dm<sup>2</sup>)</b>	Po.	Po.	Co.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.	Po.																						
<b>Phorophyte</b>	1.1	1.7	2.6	1.7	1.6	1.6	1.8	2.4	1.9	2.2	2.1	2.1	2.9	2.2	2.4	2.2	1.7	2.6	2.6	1.8	1.7	1.9	1.8																						
<b>Trunk (m)</b>	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N																						
<b>Position of relevés</b>	N	N	N	N	NE	N	N	N	NE	N	NE	N	N	N	N	N	N	NE	NE	N	N	N	N																						
<b>Position of relevés</b>	90	98	100	95	90	95	95	100	97	95	100	98	95	90	93	95	95	98	93	95	100	90	95																						
<b>Covering (%)</b>	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100																						
<b>Canopy closure of vegetation (%)</b>	B	T	B	T	T	T	T	T	T	T	T	T	T	T	T	T	B	T	T	B	T	T	T																						
<b>Base (B)/Trunk (T)</b>	6	7	9	7	7	8	6	9	7	8	8	8	8	5	5	7	7	9	7	7	10	8	8																						
<b>Number of species</b>	<b>a</b>																																												
<b>ChAss. and Subass.</b>	<b>b</b>																																												
<i>Frullania tamarisci</i> (L.) Dumort.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3																						
<i>Neckera pumila</i> Hedw.	3	4	3	4	2	3	3	3	2	3	3	3	3	3	2	3	2	3	2	2	2	2	2																						
<i>Isothecium alopecuroides</i> (Lam. ex Dubois) Isov.																																													
<b>ChAll. Neckerion complanatae</b>																																													
<i>Metzgeria furcata</i> (L.) Dumort.	2																						2	1	2	1																			
<i>Anomodon viticulosus</i> (Hedw.) Hook. & Taylor.	2																																												
<i>Pterigynandrum filiforme</i> Hedw.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2																						
<b>Ch.Cl. Neckeretea complanatae and ChO. Neckeratalia complanatae</b>																																													
<i>Allenella complanata</i> (Hedw.) S. Olsson, Emroth & D. Quandt.	4	3	4	3	3	3	2	3	3	4	4	4	4	4	4	4	4	4	4	4	4	3	3																						
<i>Radula complanata</i> (L.) Dumort.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1																						
<i>Radula lindenbergiana</i> Gottsche ex C. Hartm.	1																						1	1	1	1																			
<i>Lejeunea cavifolia</i> (Ehrh.) Lindb.	1																																												
<b>Others</b>																																													
<i>Brachythecium velutinum</i> (Hedw.) Ignatov & Huittunen.	2																																												
<i>Ptychostomum moravicum</i> (Podp.) Ros & Mazimpaka.	1																																												
<i>Paraleucobryum longifolium</i> (Hedw.) Loeske.	1																						1	2																					
<i>Dicranum tauricum</i> Sapegin	1																																												
<i>Frullania dilatata</i> (L.) Dumort.	1																																												
<i>Hypnum andoi</i> A.J.E.Sm.	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2																						
<i>Leucodon sciuroides</i> (Hedw.) Schwägr.	3	2	3	4	4	4	4	3	4	3	2	2	3	3	3	3	2	2	2	2	2	2	3																						
<i>Lophocolea heterophylla</i> (Schrad.) Dumort.	1																																												
<i>Plagiochila porolloides</i> (Torrey ex Nees) Lindenb.	1																						2	2																					
<i>Plagiothecium denticulatum</i> (Hedw.) Schimp.	2																																												
<i>Pseudoskeella nervosa</i> (Brid.) Nyholm	2																						1	2	2	2																			
<i>Syntrichia ruralis</i> (Hedw.) F.Weber & D.Mohr.	1																																												
<i>Tortella tortuosa</i> (Hedw.) Limpr.	1																						1	1																					
<i>Ulota crispa</i> (Hedw.) Brid.	1																																												



**Fig. 3.** The epiphytic syntaxa of the study area (a) *Alnus glutinosa*, (b) *Picea orientalis*, (c) *Fagus orientalis*.

*Isothecium alopecuroides*, which is the differential species of the new sub-association, is the species with the highest recurrence and its permanency is 100% within the relevés (Table 3). The species prefers semi-neutral and shady environments where it grows on tree trunks as epiphytes and on rock surfaces as epiliths. The ecological characteristics of *Isothecium alopecuroides* are highly compatible with the ecological characteristics of the species forming the sub-association. Mesophytes, acidophytes, subneutrophytes and sciophytes are dominant within the new sub-association (Figs. 4–6).

In terms of the habitat affinities of the taxa in the new sub-association, the proportion of obligate epiphytes and indifferent taxa is 35%, while that of cortico-saxicolous (facultative epiphytes) is 30% (Fig. 7). Consequently, it was observed that the new sub-association grew in the all habitats in the study area.

The new sub-association was classified within the class *Neckereta complanatae* characterised by species which are mainly epilithic on the vertical surfaces of rocks and also epiphytic on tree trunks, the order *Neckeretalia complanatae*, and the alliance *Neckerion complanatae* (Table 2).

#### *Ulotetum crispae* Ochn. 1928 (Table 3)

The association which spreads in the northern part of the study area was reported here for the second time from Turkey with a total of 10 relevés collected from tree trunks spread between 1250–1283 m of the study site. The coverage of the association ranges from 93% to almost 100%, while the canopy cover in the study site is 100%. *Ulotetum crispae*, determined at the study site, consists of a total of 25 taxa, of which 8 taxa are liverworts, and 17 are mosses (9 pleurocarpous, 8 acrocarpous). The average number of taxa within the association is 7. The proximity in number of the pleurocarpous and acrocarpous species reveals that both humid and semi-arid habitats co-exist in the study site where the association spreads. The acrocarp members indicate the presence of arid habitats, while the pleurocarp members indicate the presence of moist and shaded habitats.

Regarding the habitat affinities of the taxa within the association, the ratio of cortico-saxicolous members and obligate epiphytes is equal (40%), whereas the ratio of indifferent taxa is 20% (Fig. 7).

In terms of ecological properties such as acidity, humidity, and light, the association has a meso-hygrophytic character, and spreads in acidic or semi-neutral shady habitats (Figs. 4–6). In terms of ecological characteristics, the association shows a high similarity with that in the Kamilet Valley where it was first reported from Turkey (ALATAŞ et al. 2019a).

*Frullania dilatata*, *Hypnum andoi*, *Leucodon sciurooides*, *Radula complanata*, *Frullania tamarisci*, *Metzgeria furcata*, *Lewinskya speciosa* and *Zygodon viridissimus* are distinctively present within the association. Therefore, *Ulotetum crispae* was classified within the Holarctic class *Frullanio dilatatae-Leucodontetea sciurooidis*, the order *Orthotrichetalia* and the alliance *Ulotion crispae* (Table 3).

In terms of floristic composition and ecological characteristics the determined association in the study area also showed a high degree of similarity with ALATAŞ et al. (2019a) in Turkey, the descriptions of MARSTALLER (1993, 2006, 2010) in Germany, and ANISHCHENKO (2016) in Russia. Moreover, the association in the present study is more comprehensive than the other studies in terms of both floristic composition and the number of relevés.

#### *Ulotetum crispae* Ochn. 1928 -*sanionietosum uncinatae* Schlüss. 2001 (Table 3)

The sub-association was recorded for the first time from Turkey. It is represented by 7 relevés taken from the trunks of *Alnus glutinosa* (L.) Gaertner in the study site between 1283–1450 m. Aged *Alnus glutinosa* trunks have a dark grey and cracked bark (MAMIKOĞLU 2007). These characteristics of *Alnus glutinosa* trunks are one of the important factors for the colonisation and spatial distribution of bryophytes.

The coverage of the bryophytes varies between 88% and 97%, while the canopy cover is almost 100%. *Ulotetum crispae-sanionietosum uncinatae* is represented by a total of 15 taxa. Among them, 5 taxa are liverworts, and 10 are mosses (6 acrocarpous and 4 pleurocarpous). The number of taxa within the relevés varies between 6 and 9.

The mesophyte *Sanionia uncinata*, a diagnostic species of the sub-association, has the highest recurrence and its permanency is 100% in the relevés (Table 3). The species grows as epiphytes or epiliths in semi-neutral, humid and shady habitats.

Regarding the ecological characteristics, such as acidity, humidity, and light, the sub-association is meso-hygrophytic and spreads in acidic and semi-neutral shaded areas (Figs. 4–6).



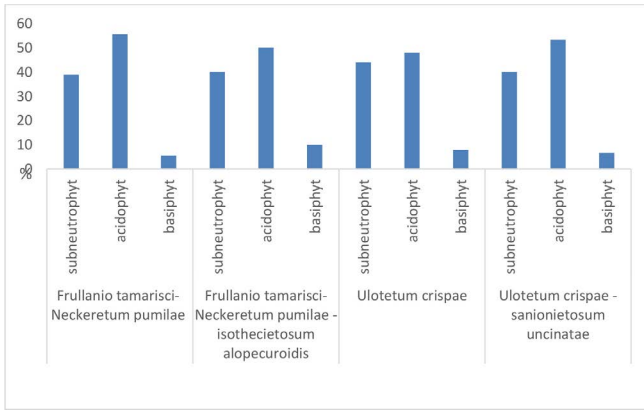


Fig. 4. The acidity spectrum of the species in the examined syntaxa.

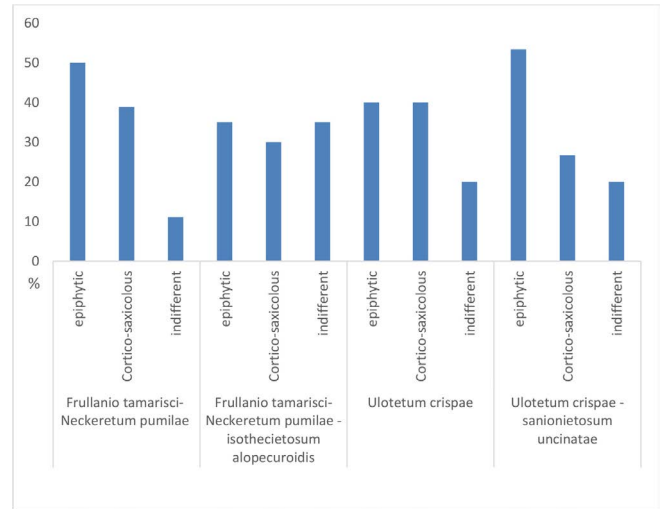


Fig. 7. The habitat affinities spectrum of the species of syntaxa.

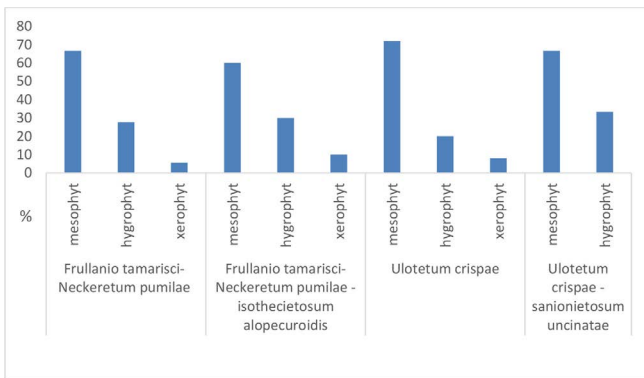


Fig. 5. The humidity spectrum of the species of syntaxa.

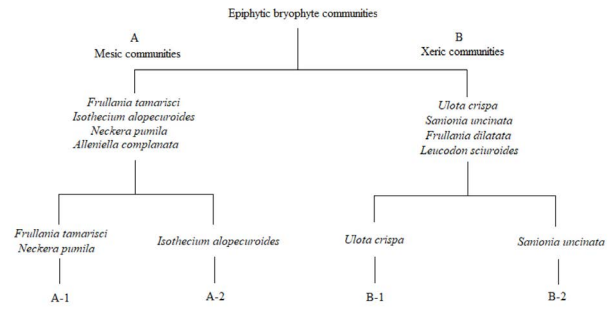


Fig. 8. The epiphytic bryophyte communities classified by TWINSPLAN

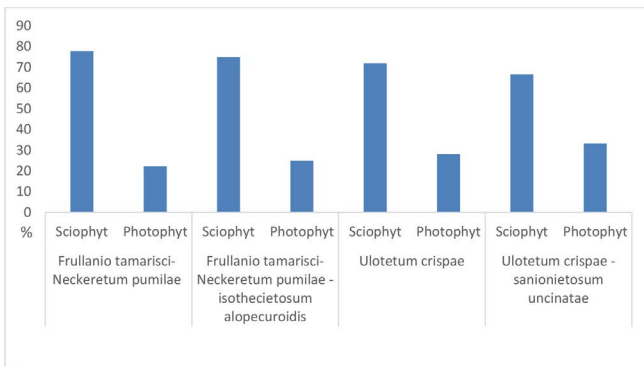


Fig. 6. The light spectrum of the species in the examined syntaxa.

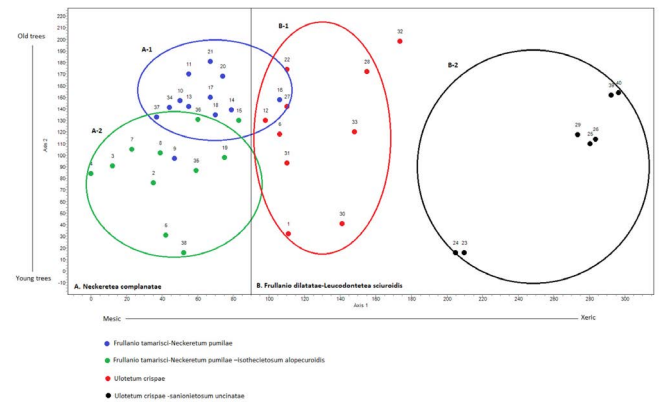


Fig. 9. DCA ordination of the epiphytic bryophyte communities for 40 relevés.

Considering the evaluation of the habitat affinities of the taxa within the sub-association, obligate epiphytes rank first at 53%, followed by facultative epiphytes (cortico-saxicolous) at 27% (Fig. 7). Consequently, the syn-taxon is obligate epiphytic in the study site.

The sub-association was classified within the class *Frullania dilatatae-Leucodontetea sciuroidis*, the order Orthotrichetalia, and the alliance *Ulotion crispae* as the sub-association includes characteristic species of higher syntaxonomic units such as *Frullania dilatata*, *Leucodon sciuroides*, *Radula complanata*, *Lewinskya speciosa*, *L. striata*, and *Metzgeria furcata* (Table 3).

Compared with MARSTALLER (2006), the determined sub-association in the present study shows a high degree of similarity with the class, order, alliance and association in terms of both floristic composition and ecological characteristics. *Ulota crista*, *Pulvigerella lyellii*, *Leucodon sciuroides*, *Hypnum andoi*, *Lewinskya speciosa*, *L. striata*, *Metzgeria furcata*, *Radula complanata*, *Frullania dilatata* and *F. tamarisci* are the mutual characteristic species.

### Classification and ordination using multivariate analysis techniques

TWINSPLAN divided the epiphytic bryophyte vegetation of the study area into 2 major communities (Community A and Community B), which were further divided into 4 sub-communities (Communities A-1, A-2, B-1, and B-2) (Fig. 8).

Figure 9 shows the distribution of the epiphytic bryophyte syntaxa based on 40 relevés along ordination axes 1 and 2. The epiphytic community gradient on axis 1 is probably associated with the moisture gradient on the epiphytic habitat types. The distribution of the epiphytic bryophyte communities on axis 2 is related to the gradient of the tree diameter.

The DECORANA ordination plot revealed that there was a strong correlation between the floristic composition and spatial distribution pattern of the epiphytic bryophyte communities and the specific ecological parameters of the epiphytic habitats (Fig. 9).

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**REZIME**

**Botanica**  
 SERBICA

## Nove zajednice epifitskih briofita iz Turske

Mevlüt ALATAŞ, Hüseyin ERATA, Nevzat BATAN i Tülay EZER

Istraživana je epifitska briofitska vegetacija Kümbet platoa (Dereli-Giresun). Ukupno 40 snimaka, uzetih sa stabala drveća u različitim vegetacionim periodima 2019. godine, analizirani su pomoću multivarijantnih analiza, kao što su detrendirana analiza korespondencije (DECORANA) i dvosmerna analiza indikatorskih vrsta (TWINSPAN), kao i pomoću klasičnih Braun-Blanquet metoda. Kao rezultat, *Frullanio tamarisci-Neckeretum pumilae* Alataş, Ezer, Batan & Erata ass. nov. i *Frullanio tamarisci-Neckeretum pumilae-isothecietosum alopecurooidis* Alataş, Ezer, Batan & Erata subass. nov. su opisane kao novi sintaksoni iz Turske. Dodatno, zajednica *Ulotetum crispae-sanionietosum uncinatae* je po prvi put zabeležena u Turskoj, dok je *Ulotetum crispae* zabeležena drugi put. Ovi sintaksoni su analizirani sa ekoloških i florističkih aspekata.

**Ključne reči:** briofite, epifitska vegetacija, Kümbet plato, Turska

