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THE BRYOPHYTE FLORA OF THE SAMANLI MOUNTAINS (SAKARYA, KOCAELI, YALOVA, BURSA) IN NORTH-WEST TURKEY

ФЛОРА МХОВ ГОР САМАНЛИ (ОБЛАСТИ САКАРЬЯ, КОДЖАЭЛИ, ЯЛОВА И БУРСА) НА СЕВЕРО-ЗАПАДЕ ТУРЦИИ

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Abstract

The present study was performed on the Samanlı Mountains, which is extending from Sakarya province to Yalova province, in North-West Turkey. During this study, eight field trips were organized to the research area at different seasons between the years 2013 and 2016. Throughout these studies, with an examination of 3630 bryophyte specimens collected from 189 stations, together with 2 from Anthocerotophyta (hornworts), 61 from Marchantiophyta (liverworts), 306 from Bryophyta (mosses), in total 369 specific and infraspecific taxa, belonging to 70 families and 156 genera, have been identified. According to grid square system of Turkey which was adopted by Henderson, 68 taxa for A1 square and 24 taxa for A2 square are new records. Among them, *Fissidens curvatus* Hornsch., *Thamnobryum neckeroides* (Hook.) E.Lawton, *Plagiothecium neckeroideum* Schimp. and *Riccia beyrichiana* Hampe were recorded for the second time in Turkey. In addition, the present paper reports the first records of *Cephaloziella massalongi* (Spruce) Müll.Frib, which has been classified as rare (R) in the Red data book of European bryophytes, and *Scapania scandica* (Arnell et H.Buch) Macvicar in Turkey. Some morphological features, the ecological characteristics and the distribution map of the species are given, along with photographs of diagnostic details.

Резюме

Изучена флора мохообразных в горах Саманли, простирающихся от области Сакарья до области Ялова на северо-западе Турции. Материал был собран в 2013-2016 гг., в ходе 8 экспедиций, проведенных в разные сезоны. Было собрано 3630 образцов из 189 местонахождений, при определении которых выявлено 2 вида антоцеротовых, 61 вид печеночников и 306 видов мхов, всего 369 видов и внутривидовых таксонов, относящихся к 70 семействам и 156 родам. Согласно принятой в Турции системе сеточного картирования, предложенной Хендерсоном, 68 таксонов впервые приводятся для квадрата A1 и 24 таксона для квадрата A2. Среди них, *Fissidens curvatus* Hornsch., *Thamnobryum neckeroides* (Hook.) E.Lawton, *Plagiothecium neckeroideum* Schimp. и *Riccia beyrichiana* Hampe приводятся во второй раз для территории Турции. Кроме того, впервые в Турции найдены *Cephaloziella massalongi* (Spruce) Müll.Frib, которая является редким видом (R) в Красной книге Европы, и *Scapania scandica* (Arnell et H.Buch) Macvicar. Даны сведения о некоторых морфологических особенностях и экологии этих видов, карты их распространения и таблицы фотографий, иллюстрирующие их диагностические признаки.

KEYWORDS: hornworts, liverworts, mosses, new record, red-list, Turkey

INTRODUCTION

Investigations on bryophytes flora in Turkey is a discipline that has been neglected for a long time. However, the important scientific gap under this topic had been trying to fill by a series of successful field studies and many new data. Moreover, new bryophyte records have been added constantly with each new research (Uyar & Ören, 2013; Kara *et al*., 2014; Özçelik *et al*., 2015; Batan *et al*., 2016; Kara *et al*., 2017; Ezer & Zander, 2017; Yücel & Ezer, 2017; Batan *et al*., 2018; Ursavaş & Keçeli, 2018). It seems that the bryophyte flora of Turkey still needs more detailed investigations. Thus, in our opinions, Turkey's natural forest areas should be chosen as priority areas for bryofloristic studies. That's why the

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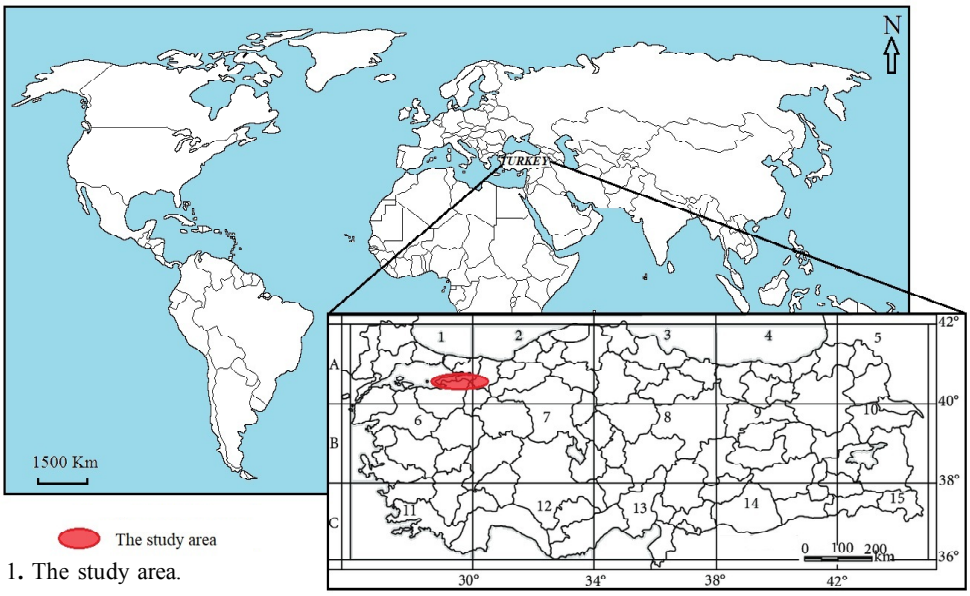

Fig. 1. The study area.

Samanlı Mountains were selected as the study area for the present research. This mountain chain is located in between Sakarya and Yalova provinces in Marmara region of Turkey, has rich plant cover and represent a very special region for the ecology of Turkey (Fig. 1, 2). Moreover, no previous information about bryophyte flora in this area except for few local new records has been published (Uyar *et al.*, 2018; Ören *et al.*, 2017; Ezer *et al.*, 2017). Besides, this mountain range is a transitional region between the Black Sea and the Mediterranean climatic conditions in Turkey. This situation is seen clearly on the vegetation structure of the region. So that, this mountain range is particularly covered with deciduous forests at northern slopes and with conifers and maquis vegetation in the southern slopes and higher parts of the area. In the area, the mean annual temperature changes between 13.1 and 15.4°C. The highest monthly mean temperature is 29.4°C in July or August, and the lowest is 2.5°C in January. The average annual precipitation is between 480.5 and 801.3 mm. When the climatic data of the region is taken into consideration, it is apparent that as the amount of precipitation increases and temperatures decreases towards the higher part of the mountain. According to bioclimatic synthesis; the study area has a semiarid and humid Mediterranean climate (Akman, 1999; Tsms, 2016).

MATHERIALS AND METHODS

The study was carried out between the years 2013-2016. The bryophyte specimens were collected from 189 locations in different habitat types (Table 1). The specimens were identified by using relevant literature sources (Lewinsky, 1993; Zander, 1993; Smith, 2004; Paton, 1999; Cortini-Pedrotti, 2001, 2006; Greven, 2003; Heyn & Herrnstadt, 2004; Frey *et al.*, 2006; Guerra *et al.*, 2006; Guerra & Cros, 2007; Casas *et al.*, 2009). Newly recorded taxa for Turkey were determined by reviewing the latest checklists (Uyar & Çetin, 2004; Kürschner & Erdağ, 2005; Ros *et al.*, 2007; Özenoğlu Kiremit & Keçeli, 2009; Ros *et al.*, 2013; Erdağ & Kürschner, 2017). In the bryofloristic list, for each taxon, only one herbarium number (e.g., *AHBV 150*) is given in order to avoid repetition. All collected specimens are kept in the bryophyte herbarium (*AHBV)* at Biology Department, Polatlı Faculty of Science and Arts, Ankara Hacı Bayram Veli University.

The species list is arranged according to the system proposed by Goffinet and Shaw (2009). In addition, the new records for A1 and A2 grid-square and Turkey were determined by reviewing the related literature (Özenoğlu Kiremit & Keçeli, 2009; Ursavaş & Abay, 2009; Ursavaş *et al.*, 2009; Ören *et al.*, 2012).

The new records for the A1 grid square are indicated with ($^{+}$), for the A2 grid square with (^{x}), taxa recorded from Turkey for the second time with (*) and the new record for Turkish bryophyte flora with (**) in the list of bryophytes presented in the Table 2.

RESULTS AND DISCUSSION

In this study, 2 families, 2 genera and 2 taxa from Anthocerotophyta, 26 families, 32 genera and 61 taxa from Marchantiophyta, 42 families, 122 genera and 306 taxa from Bryophyta, which is totally 369 specific and infraspecific taxa were identified from 3630 bryophyte specimens collected in the Samanlı Mountains. In addition, according to the grid-square system of Turkey which was adopted by Henderson (1961), 68 taxa for A1 grid square and 24 taxa for A2 grid square are new records. *Cephaloziella massalongi* (Spruce) Müll.Frib and *Scapania scandica* (Arnell et H.Buch) Macvicar are recorded for the first time in Turkey. Furthermore, *Fissidens curvatus* Hornsch., *Thamnobryum neckeroides* (Hook.) E. Lawton, *Plagiothecium neckeroideum* Schimp. and *Riccia beyrichiana* Hampe are second records for Turkey. According to the

Table 1. Details of study sites (LN: Locality number, Alt: Altitude (m), Ac: *Acacia* Mill., Ag: *Alnus glutinosa* L., An: *Abies nordmanniana* subsp. *equi-trojani* (Asch. & Sint. ex Boiss.) Coode & Cullen, Cb: *Carpinus betulus* L., Cs: *Castenea sativa* Mill., Cm: *Cornus mas* L., Ea: *Erica arborea* L., Fc: *Ficus carica* Linnaeus, Fo: *Fagus orientalis* Lipsky, Fr: *Fraxinus* L., Jr: *Juglans regia* L., Ju: *Juniperus* L., Pi: *Pinus* L., Pl: *Prunus laurocerasus* L., Pn: *Pinus nigra* J.F.Arnold, Po: *Platanus orientalis* L., Pp: *Pinus pinea* L., Pt: *Populus tremula* L., Qu: *Quercus* L., Rh: *Rhododendron* L., Sa: *Salix alba* L., Tt: *Tilia tomentosa* Moench).

LN	Localities	GPS–Lat (N)	GPS–Long (E)	Alt	Date	List of forest trees
1	Yalova-Merkez	40°37’18”	29°14’52”	60	3.07.13	Fo, Cb
2	Yalova-Merkez	40°33’14”	29°13’11”	218	3.07.13	Po, Cb, Fo
3	Bursa-Gemlik	40°34’25”	29°08’34”	200	3.07.13	Po, Fo, Cb, Qu
4	Yalova-Merkez	40°35’58”	29°18’44”	399	25.09.13	Fo, Cb, Qu
5	Yalova-Merkez	40°34’02”	29°20’29”	724	25.09.13	Fo, Qu
6	Yalova-Merkez	40°33’39”	29°17’11”	387	25.09.13	Ea, Qu
7	Yalova-Merkez	40°33’23”	29°16’50”	375	25.09.13	Cb, Qu
8	Yalova-Merkez	40°33’23”	29°16’15”	355	25.09.13	Fo, Cb
9	Yalova-Merkez	40°33’55”	29°15’05”	487	25.09.13	Fo, Cb
10	Yalova-Merkez	40°34’02”	29°13’11”	206	25.09.13	Po, Sa
11	Yalova-Merkez	40°33’14”	29°13’12”	247	25.09.13	Po, Fo, Cb, Qu
12	Yalova-Merkez	40°38’05”	29°13’29”	78	10.10.13	Po
13	Yalova-Merkez	40°37’05”	29°13’03”	59	10.10.13	Po
14	Yalova-Termal	40°36’04”	29°11’02”	120	10.10.13	Po, Cb, Qu, Ea
15	Yalova-Termal	40°35’33”	29°10’03”	340	10.10.13	Qu, Fo, Cb
16	Yalova-Termal	40°35’23”	29°09’56”	322	10.10.13	Maquis
17	Yalova-Termal	40°34’47”	29°09’08”	235	10.10.13	Maquis
18	Yalova-Termal	40°34’27”	29°08’52”	248	10.10.13	Po, Cb, Fo
19	Yalova-Termal	40°34’25”	29°08’32”	293	10.10.13	Po, Fo, Cb, Qu
20	Bursa-Gemlik	40°31’48”	29°06’54”	392	10.10.13	Open land
21	Yalova-Termal	40°36’08”	29°10’28”	154	10.10.13	Qu, Tt, Cs
22	Yalova-Termal	40°36’11”	29°10’20”	167	10.10.13	Qu, Tt, Cs
23	Yalova-Termal	40°36’12”	29°10’13”	157	10.10.13	Qu, Tt, Cs
24	Yalova-Çınarcık	40°37’43”	29°08’35”	79	13.10.13	Qu
25	Yalova-Termal	40°36’38”	29°10’02”	200	13.10.13	Qu, Fo, Ea
26	Yalova-Çınarcık	40°36’41”	29°08’09”	216	13.10.13	Open land
27	Yalova-Çınarcık	40°37’35”	29°07’24”	300	13.10.13	Qu
28	Yalova-Çınarcık	40°36’41”	29°04’18”	130	13.10.13	Qu
29	Yalova-Çınarcık	40°35’49”	29°02’07”	510	13.10.13	Fo, Cb
30	Yalova-Çınarcık	40°35’25”	29°01’48”	490	13.10.13	Pi, Cb
31	Yalova-Çınarcık	40°35’18”	29°01’37”	458	13.10.13	Po, Cb, Fo
32	Yalova-Çınarcık	40°35’07”	29°01’18”	504	13.10.13	Po, Cb, Fo
33	Yalova-Çınarcık	40°35’21”	29°00’45”	578	13.10.13	Cb, Fo
34	Yalova-Çınarcık	40°35’22”	29°00’18”	614	13.10.13	Cb, Fo
35	Yalova-Çınarcık	40°33’49”	29°00’46”	812	13.10.13	Cb, Fo
36	Yalova-Armutlu	40°33’05”	29°00’22”	759	13.10.13	Cb, Fo
37	Yalova-Çınarcık	40°33’25”	29°00’21”	754	13.10.13	Open land
38	Yalova-Çınarcık	40°34’51”	28°59’24”	867	13.10.13	Open land
39	Yalova-Çınarcık	40°37’53”	29°01’35”	70	23.04.14	Po, Fo
40	Yalova-Çınarcık	40°36’57”	29°00’19”	132	23.04.14	Cb, Fo
41	Yalova-Çınarcık	40°36’57”	28°58’39”	80	23.04.14	Po, Cb, Fo
42	Yalova-Armutlu	40°35’14”	28°54’06”	63	23.04.14	Cb, Fo
43	Yalova-Armutlu	40°33’53”	28°50’47”	260	23.04.14	Pi, Maquis
44	Yalova-Armutlu	40°31’59”	28°50’20”	139	23.04.14	Open land
45	Yalova-Armutlu	40°31’03”	28°53’32”	427	23.04.14	Pp
46	Yalova-Armutlu	40°30’04”	28°55’12”	400	23.04.14	Pp
47	Yalova-Armutlu	40°31’35”	28°57’30”	521	23.04.14	Maquis
48	Yalova-Armutlu	40°29’47”	28°58’43”	451	23.04.14	Qu
49	Yalova-Armutlu	40°31’39”	28°59’49”	754	23.04.14	Qu
50	Bursa-Gemlik	40°27’45”	29°09’54”	627	26.04.14	Po
51	Bursa-Gemlik	40°29’31”	29°06’53”	422	26.04.14	Open land
52	Bursa-Gemlik	40°31’03”	29°07’35”	425	26.04.14	Open land
53	Bursa-Gemlik	40°33’20”	29°07’29”	387	26.04.14	Qu, Fo, Cb
54	Bursa-Gemlik	40°28’47”	29°00’22”	313	26.04.14	Maquis
55	Yalova-Armutlu	40°29’38”	28°54’07”	416	26.04.14	Qu
56	Yalova-Armutlu	40°30’50”	28°54’52”	574	26.04.14	Maquis
57	Kocaeli-Kartepe	40°39’38”	30°08’26”	917	25.05.15	Fo, Cb, Rh
58	Kocaeli-Kartepe	40°39’04”	30°07’16”	1180	25.05.15	Fo, Sa, Rh
59	Kocaeli-Kartepe	40°39’31”	30°05’56”	1222	25.05.15	An, Cb
60	Kocaeli-Kartepe	40°40’10”	30°07’21”	645	26.05.15	Cs, Fo, Sa, Rh
61	Kocaeli-Kartepe	40°39’25”	30°07’09”	900	26.05.15	Fo, Cb, Tt, Pl
62	Kocaeli-Kartepe	40°39’24”	30°07’25”	965	26.05.15	Sa, Rh
63	Kocaeli-Kartepe	40°39’03”	30°03’29”	1000	26.05.15	Open land
64	Kocaeli-Kartepe	40°39’06”	30°02’55”	810	26.05.15	Qu
65	Kocaeli-Kartepe	40°38’50”	30°02’20”	685	26.05.15	Qu
66	Kocaeli-Kartepe	40°38’09”	30°02’28”	610	26.05.15	Qu
67	Kocaeli-Kartepe	40°37’21”	30°03’02”	445	26.05.15	Qu
68	Sakarya-Pamukova	40°31’50”	30°04’31”	600	27.05.15	Qu, Pb

69	Sakarya-Pamukova	40°31'51''	30°03'45''	735	27.05.15	Open land
70	Sakarya-Pamukova	40°33'16''	30°00'17''	985	27.05.15	Pn, Qu, Ju
71	Kocaeli-Başiskele	40°33'16''	30°00'17''	985	27.05.15	Ps, Fo, An
72	Kocaeli-Başiskele	40°33'34''	29°59'29''	1110	27.05.15	Open land
73	Kocaeli-Başiskele	40°34'07''	30°00'14''	1060	27.05.15	Open land
74	Sakarya-Sapanca	40°40'32''	30°14'49''	129	28.05.15	Po, Cu, Cs
75	Sakarya-Geyve	40°36'21''	30°11'27''	1075	28.05.15	Peatlands
76	Sakarya-Sapanca	40°37'19''	30°12'08''	1108	28.05.15	Fo, Cs
77	Sakarya-Sapanca	40°38'40''	30°13'04''	715	28.05.15	Fo, Cs, Rh
78	Sakarya-Sapanca	40°39'31''	30°13'41''	570	28.05.15	Fo, Cs, Pn
79	Sakarya-Sapanca	40°38'33''	30°13'59''	360	28.05.15	Po, Jr, Ag
80	Kocaeli-Kartepe	40°42'37''	30°06'24''	50	29.05.15	Ac
81	Sakarya-Sapanca	40°40'03''	30°18'28''	115	29.05.15	Po
82	Kocaeli-Kartepe	40°41'02''	30°05'17''	226	05.09.15	Cb, Tt, Fc
83	Kocaeli-Kartepe	40°40'37''	30°03'46''	427	05.09.15	Cs, Rh
84	Kocaeli-Kartepe	40°40'38''	30°03'27''	270	05.09.15	Po, Cs
85	Kocaeli-Kartepe	40°41'00''	30°07'34''	273	06.09.15	Po, Cs
86	Kocaeli-Kartepe	40°39'36''	30°09'06''	615	06.09.15	Fo, Cb, Pt, Rh
87	Kocaeli-Kartepe	40°39'36''	30°09'06''	650	06.09.15	Fo, Cb, Pt, Rh
88	Kocaeli-Kartepe	40°38'48''	30°07'01''	1375	06.09.15	Fo, Cb
89	Kocaeli-Kartepe	40°38'21''	30°06'52''	1305	06.09.15	Fo, Cs, Cb, Rh
90	Sakarya-Pamukova	40°36'54''	30°07'19''	1230	06.09.15	An, Fo, Cb
91	Kocaeli-Başiskele	40°38'22''	29°56'15''	190	07.09.15	Ag, Po, Fc
92	Kocaeli-Başiskele	40°36'29''	30°01'10''	795	07.09.15	Fo, Cs, Cb
93	Kocaeli-Başiskele	40°35'55''	30°01'25''	773	07.09.15	An, Fo, Rh
94	Kocaeli-Başiskele	40°34'11''	30°00'31''	1040	07.09.15	An, Pn, Cb
95	Kocaeli-Başiskele	40°35'41''	30°00'18''	1105	07.09.15	Open land
96	Kocaeli-Başiskele	40°34'08''	30°00'15''	1069	08.09.15	An, Ps
97	Sakarya-Pamukova	40°34'57''	30°06'09''	651	08.09.15	Po, Cb, Sa, Ag
98	Kocaeli-Kartepe	40°37'34''	30°03'38''	780	08.09.15	Qu
99	Kocaeli-Başiskele	40°40'01''	29°58'42''	182	08.09.15	Cb, Cm, Jr, Ea
100	Kocaeli-Başiskele	40°39'28''	29°57'14''	435	08.09.15	Pn, Cb, Tt, Ea
101	Kocaeli-Başiskele	40°37'48''	29°54'11''	770	09.09.15	Fo, Cb, Cs
102	Kocaeli-Gölcük	40°35'24''	29°53'03''	761	09.09.15	Fo, Cb, Cs
103	Kocaeli-Başiskele	40°35'01''	29°54'25''	910	09.09.15	Pn, Cb
104	Kocaeli-Başiskele	40°34'33''	29°54'52''	870	09.09.15	Cb, Tt, Sa
105	Kocaeli-Başiskele	40°34'33''	29°54'52''	902	09.09.15	Qu, Fo, Cb, Ea
106	Kocaeli-Başiskele	40°34'30''	29°56'24''	966	09.09.15	Fo, Cb, Rh
107	Kocaeli-Başiskele	40°35'55''	29°56'32''	1006	09.09.15	Fo, Cb
108	Kocaeli-Başiskele	40°37'47''	29°57'17''	595	09.09.15	Qu, Fo, Cb
109	Kocaeli-Gölcük	40°37'15''	29°50'36''	620	10.09.15	Fo, Cs, Cb
110	Kocaeli-Gölcük	40°36'50''	29°50'58''	850	10.09.15	Fo, Cs, Cb, Rh
111	Kocaeli-Gölcük	40°35'49''	29°50'26''	1030	10.09.15	An, Fo, Cb
112	Kocaeli-Gölcük	40°35'32''	29°48'47''	1050	10.09.15	Fo, Cb
113	Kocaeli-Gölcük	40°36'07''	29°47'40''	940	10.09.15	Fo, Cb
114	Kocaeli-Gölcük	40°38'22''	29°45'38''	666	10.09.15	Qu, Fo
115	Kocaeli-Gölcük	40°39'13''	29°47'39''	540	10.09.15	Cs, Fo, Cb
116	Bursa-Iznik	40°30'37''	29°45'49''	550	11.09.15	Qu, Cu, Ps
117	Bursa-Iznik	40°31'50''	29°49'40''	833	11.09.15	Ps, Cb
118	Bursa-Iznik	40°31'41''	29°50'43''	825	11.09.15	Qu
119	Bursa-Iznik	40°31'24''	29°55'25''	1016	11.09.15	Fo, Cb
120	Bursa-Iznik	40°32'29''	29°51'59''	775	11.09.15	Fo, Cb
121	Bursa-Iznik	40°32'46''	29°54'05''	935	11.09.15	Fo, Cb, Pt, Rh
122	Bursa-Iznik	40°32'21''	29°54'24''	1130	11.09.15	Fo, Cb, An
123	Bursa-Iznik	40°32'17''	29°54'12''	1125	11.09.15	Fo, Cb, An
124	Bursa-Iznik	40°32'52''	29°53'42''	850	11.09.15	Fo, Cb, Rh
125	Bursa-Iznik	40°33'44''	29°45'43''	392	12.09.15	Qu, Po, Cb
126	Bursa-Iznik	40°34'53''	29°45'02''	635	12.09.15	Qu, Cb, Pn, Ea
127	Kocaeli-Gölcük	40°36'16''	29°45'37''	945	12.09.15	Fo, Cb
128	Kocaeli-Karamürsel	40°34'37''	29°39'52''	715	12.09.15	Open land
129	Kocaeli-Karamürsel	40°35'54''	29°36'41''	687	12.09.15	Qu, Pi
130	Sakarya-Sapanca	40°38'13''	30°16'29''	298	25.10.15	Po, Ac, Pn, Cb
131	Sakarya-Sapanca	40°36'36''	30°15'52''	652	25.10.15	Cb, Cs, Rh
132	Sakarya-Geyve	40°36'14''	30°15'13''	783	25.10.15	Cb, Cs, Pt, Rh
133	Sakarya-Geyve	40°35'36''	30°14'29''	850	25.10.15	Cb, Pi, An
134	Sakarya-Geyve	40°35'34''	30°13'16''	1000	25.10.15	An, Pi, Cb
135	Sakarya-Geyve	40°35'16''	30°12'09''	1010	25.10.15	Pn, Qu
136	Sakarya-Pamukova	40°34'44''	30°11'16''	970	25.10.15	Cb, An, Pt
137	Sakarya-Pamukova	40°34'30''	30°09'46''	1138	25.10.15	An, Cb, Fo
138	Sakarya-Pamukova	40°34'09''	30°09'28''	1047	25.10.15	Pn, An, Fo
139	Sakarya-Pamukova	40°34'10''	30°10'25''	960	25.10.15	Qu
140	Sakarya-Pamukova	40°33'42''	30°11'23''	820	25.10.15	Pn, Qu
141	Kocaeli-Karamürsel	40°39'09''	29°36'24''	375	26.10.15	Po, Cu, Qu, Ea
142	Kocaeli-Karamürsel	40°38'33''	29°36'18''	235	26.10.15	Po, Ag,
143	Kocaeli-Karamürsel	40°38'58''	29°41'13''	870	26.10.15	Cs, Cb, Rh

144	Kocaeli-Karamürsel	40°38’25”	29°41’16”	710	26.10.15	Cb, Qu, Ea
145	Kocaeli-Karamürsel	40°39’41”	29°40’52”	790	26.10.15	Cb, Cs, Pt
146	Kocaeli-Karamürsel	40°38’49”	29°39’21”	650	26.10.15	Qu, Cb, Cs
147	Kocaeli-Karamürsel	40°38’59”	29°39’25”	630	26.10.15	Cb, Cs, Ea
148	Yalova-Çiftlikköy	40°37’26”	29°27’51”	150	27.10.15	Fr
149	Yalova-Altınova	40°34’30”	29°27’17”	225	27.10.15	Qu, Cb, Cs, Rh
150	Yalova-Altınova	40°35’18”	29°27’15”	203	27.10.15	Qu, Cb, Pt, Ea
151	Yalova-Çiftlikköy	40°36’52”	29°26’44”	285	27.10.15	Qu
152	Yalova-Çiftlikköy	40°36’39”	29°25’31”	245	27.10.15	Qu
153	Yalova-Çiftlikköy	40°35’30”	29°25’32”	215	27.10.15	Po, Cb, Cs
154	Yalova-Çınarcık	40°34’17”	29°01’21”	700	28.10.15	Cb, Fo, Cs
155	Yalova-Çınarcık	40°34’33”	29°02’57”	753	28.10.15	Cb, Fo, Cs, Pl
156	Yalova-Çınarcık	40°34’13”	29°03’54”	660	28.10.15	Cb, Fo, Cs
157	Yalova-Çınarcık	40°35’09”	29°05’09”	755	28.10.15	Cb, Fo, Cs
158	Yalova-Çınarcık	40°35’55”	29°06’47”	560	28.10.15	Cb, Fo, Cs, Tt
159	Yalova-Çınarcık	40°36’13”	29°06’02”	640	28.10.15	Cb, Fo, Cs, Tt
160	Yalova-Çınarcık	40°36’35”	29°06’51”	495	28.10.15	Cb, Fo, Cs, Tt
161	Yalova-Çınarcık	40°36’44”	29°07’27”	405	28.10.15	Qu
162	Yalova-Çınarcık	40°37’12”	29°07’25”	270	28.10.15	Qu
163	Yalova-Armutlu	40°34’44”	28°53’04”	85	29.10.15	Qu, Cb, Cs, Au
164	Yalova-Armutlu	40°32’38”	28°55’06”	920	29.10.15	Qu, Pi, Cb, Au
165	Yalova-Armutlu	40°32’31”	28°56’45”	550	29.10.15	Pn, Qu
166	Yalova-Armutlu	40°32’48”	28°58’08”	565	29.10.15	Pn, Qu
167	Yalova-Armutlu	40°31’37”	28°59’02”	600	29.10.15	Pn, Qu
168	Yalova-Çınarcık	40°32’16”	29°00’23”	725	29.10.15	Cb, Fo
169	Bursa-Gemlik	40°27’51”	29°12’28”	770	30.10.15	Open land
170	Bursa-Gemlik	40°28’42”	29°11’30”	650	30.10.15	Fo
171	Bursa-Gemlik	40°29’38”	29°12’27”	525	30.10.15	Open land
172	Bursa-Gemlik	40°31’19”	29°12’10”	420	30.10.15	Fo, Cb
173	Bursa-Gemlik	40°29’51”	29°08’57”	630	30.10.15	Qu, Ea
174	Bursa-Gemlik	40°30’58”	29°08’49”	600	30.10.15	Qu
175	Yalova-Merkez	40°35’38”	29°12’47”	137	21.04.16	Tt, Cs, Ea
176	Yalova-Merkez	40°33’04”	29°13’42”	471	21.04.16	Cb, Fo, Tt
177	Yalova-Merkez	40°32’40”	29°13’06”	530	21.04.16	Cb, Fo, Tt
178	Yalova-Merkez	40°32’02”	29°12’40”	485	21.04.16	Cb, Fo, Tt
179	Yalova-Merkez	40°32’39”	29°13’59”	460	21.04.16	Cb, Fo, Cs
180	Yalova-Çınarcık	40°36’36”	28°58’31”	450	21.04.16	Cb, Fo, Cs
181	Yalova-Çınarcık	40°35’01”	28°57’26”	607	21.04.16	Cb, Fo, Cs
182	Yalova-Armutlu	40°32’23”	28°53’02”	400	21.04.16	Qu, Pl
183	Yalova-Armutlu	40°33’15”	28°53’00”	350	21.04.16	Cb, Po, Qu
184	Yalova-Armutlu	40°32’13”	28°54’07”	460	22.04.16	Cb, Po
185	Yalova-Armutlu	40°30’13”	28°57’31”	466	22.04.16	Cu, Qu
186	Bursa-Gemlik	40°30’20”	29°03’09”	361	22.04.16	Po, Sa, Pn
187	Bursa-Gemlik	40°31’28”	29°03’52”	510	22.04.16	Qu, Po, Ea
188	Bursa-Gemlik	40°32’20”	29°04’20”	742	23.04.16	Fo, Cb
189	Bursa-Gemlik	40°32’36”	29°03’47”	750	23.04.16	Fo, Cb

Table 2. The floristic list (Sub: Subtstrate, S: Soil, R: Rock, T: Tree trunk, Sm: Submerged, LN: Locality number)

TAXA	SUB				LN	*AHBV*
	S	R	T	Sm		
ANTHOCEROTOPHYTA						
Anthocerotaceae Dumort.						
+*Anthoceros caucasicus* Steph.	+				66, 111, 175	*986*
Notothyladaceae Müll.Frib. ex Prosk.						
Phaeoceros laevis (L.) Prosk.	+				41, 170	*665*
MARCHANTIOPHYTA						
Cephaloziaceae Mig.						
Cephalozia bicuspidata (L.) Dumort.	+				42, 92, 86, 124	*708*
×*Cephalozia catenulata* (Huebener) Lindb.	+	+			85, 92, 89, 101	*324*
Cephaloziellaceae Douin						
Cephaloziella baumgartneri Schiffn.	+	+	+		88, 101, 102	*3249*
Cephaloziella divaricata (Sm.) Schiffn.	+	+	+		6, 57, 101, 107, 164	*1169*
**Cephaloziella massalongi* (Spruce) Müll.Frib.	+				124	*3627*
Cephaloziella stellulifera (Taylor ex Carrington et Pearson) Croz.	+				56, 101, 126	*1069*
Cephaloziella turneri (Hook.) Müll.Frib.	+				92, 124	*3253*
Scapaniaceae Mig.						
+*Diplophyllum albicans* (L.) Dumort.	+				Common	*842*

TAXA	SUB				LN	*AHBV*
	S	R	T	Sm		
Scapania compacta (Roth) Dumort.	+	+			31, 87, 90, 186	*833*
Scapania irrigua (Nees) Nees	+	+			87, 90, 94	*1333*
[+]*Scapania nemorea* (L.) Grolle	+	+			Common	*918*
***Scapania scandica* (Arnell et H.Buch) Macvicar		+			87	*1269*
Scapania undulata (L.) Dumort.	+			+	75	*1270*
Calypogeiaceae Arnell						
Calypogeia arguta Nees et Mont.	+				75, 176	*1182*
Calypogeia fissa (L.) Raddi	+	+			Common	*3496*
Calypogeia sphagnicola (Arnell et J.Perss.) Warnst. et Loeske	+				168	*168*
Gymnomitriaceae H.Klinggr.						
Marsupella funckii (F.Weber et D.Mohr) Dumort.	+				75	*1115*
Jungermanniaceae Rchb.						
Jungermannia atrovirens Dumort.	+	+			96, 183	*3269*
Jungermannia gracillima Sm.					86, 92	*3271*
[×]*Mesoptychia bantriensis* (Hook.) L.Söderstr. et Váňa		+			62	*898*
[×]*Mesoptychia collaris* (Nees) L.Söderstr. et Váňa		+			99	*3274*
Mesoptychia turbinata (Raddi) L.Söderstr. et Váňa		+			99	3613
Southbyaceae Vana						
[+]*Southbya nigrella* (De Not.) Henriq.	+				99	*1266*
Blepharostomataceae W.Frey et M.Stech						
[+]*Blepharostoma trichophyllum* (L.) Dumort	+	+			89, 121	*1112*
Lophocoleaceae Vanden Berghen						
Chiloscyphus polyanthos (L.) Corda	+	+			Common	*467*
Lophocolea bidentata (L.) Dumort.	+	+	+		Common	*466*
Lophocolea heterophylla (Schrad.) Dumort.	+	+	+		Common	*266*
Lophocolea minor Nees -	+				99, 131	*1108*
Plagiochilaceae Müll. Frib.						
[+]*Pedinophyllum interruptum* (Nees) Kaal.	+	+			19, 58, 61, 102, 173	*382*
Plagiochila porelloides (Torr. ex Nees) Lindenb.	+	+	+		Common	*1302*
Frullaniaceae Lorch						
Frullania dilatata (L.) Dumort.	+	+	+		Common	*240*
[+]*Frullania fragilifolia* (Taylor) Gottsche			+		31	*1214*
Frullania tamarisci (L.) Dumort.		+	+		102, 120, 188	*1024*
Jubulaceae H.Klinggr.						
[+]*Jubula hutchinsiae* (Hook.) Dumort. subsp. *caucasica* Konstant. et Vilnet		+			58, 93, 110	*902*
Lejeuneaceae Cavers						
[+]*Cololejeunea rossettiana* (C.Massal.) Schiffn		+	+		2, 18, 85, 91	*369*
Lejeunea cavifolia (Ehrh.) Lindb.	+	+	+		Common	*21*
Porellaceae Cavers						
[+]*Porella arboris-vitae* (With.) Grolle		+	+		Common	*3379*
Porella platyphylla (L.) Pfeiff.	+	+	+		Common	*3585*
Radulaceae Müll.Frib.						
Radula complanata (L.) Dumort.	+		+		Common	*3405*
Radula lindenbergiana Gottsche ex C.Hartm.		+	+		Common	*330*
Aneuraceae H.Klinggr.						
Aneura pinguis (L.) Dumort.	+				60	*1088*
[×]*Riccardia chamedryfolia* (With.) Grolle	+				82	*3418*
[+×]*Riccardia multifida* (L.) Gray	+	+			57, 99, 121	*849*
Metzgeriaceae H.Klinggr.						
Metzgeria conjugata Lindb.	+	+			57, 58, 61, 93	*1344*
Metzgeria furcata (L.) Corda	+	+	+		Common	*22*
Fossombroniaceae Hazsl.						
Fossombronia angulosa (Dicks.) Raddi	+				15, 42, 141, 163	*282*
Fossombronia caespitiformis (Raddi) De Not. ex Rabenh.	+				183	*1365*
Fossombronia pusilla (L.) Nees	+				99	*3229*
Pelliaceae H.Klinggr.						
Pellia endiviifolia (Dicks.) Dumort.	+	+			Common	*383*
Pellia epiphylla (L.) Corda	+				29, 31, 61, 84, 87	*3320*

TAXA	SUB S	R	T	Sm	LN	*AHBV*
Blasiaceae H.Klinggr.						
[+]*Blasia pusilla* L.	+	+			61, 66, 86, 186	*3214*
Lunulariaceae H.Klinggr.						
Lunularia cruciata (L.) Dumort. ex Lindb.	+	+			28, 42, 67, 93, 162	*701*
Aytoniaceae Cavers						
Reboulia hemisphaerica (L.) Raddi	+	+			28, 150, 171, 188	*827*
Conocephalaceae Müll.Frib. ex Grolle						
Conocephalum conicum (L.) Dumort.	+	+			Common	*3264*
Marchantiaceae Lindl.						
Marchantia polymorpha L. subsp. *polymorpha*	+	+	+		61, 84, 90, 93, 102	*1161*
[+]*Marchantia polymorpha* L. subsp. *montivagans* Bischl. et Boissel.	+				93	*1264*
Ricciaceae Rchb.						
[×]**Riccia beyrichiana* Hampe	+				135	*1105*
Riccia ciliifera Link	+				183	*1366*
[×]*Riccia sorocarpa* Bisch.	+				135	*1855*
[+]*Riccia subbifurca* Warnst. ex Croz.	+				165	*1107*
Targioniaceae Dumort.						
Targionia hypophylla L.	+				150, 177, 178, 188	*1236*
BRYOPHYTA						
Sphagnaceae Dumort.						
[×]***Sphagnum auriculatum*** Schimp.	+				75	*1516*
Sphagnum inundatum Russow	+				75	*983*
[×]***Sphagnum palustre*** L.	+				75	*982*
[+]***Sphagnum subsecundum*** Nees	+				168	*1123*
[×]***Sphagnum fuscum*** (Schimp.) H. Klinggr.	+				75	*1167*
Polytrichaceae Schwägr.						
Atrichum angustatum (Brid.) Bruch & Schimp.	+				162	*1640*
[×]***Atrichum tenellum*** (Röhl.) Bruch & Schimp.	+				82, 83	*3195*
Atrichum undulatum (Hedw.) P.Beauv.	+	+			Common	*520*
Pogonatum aloides (Hedw.) P.Beauv.	+	+			Common	*3583*
Pogonatum urnigerum (Hedw.) P.Beauv.	+	+			18, 58, 60, 62, 101	*332*
Polytrichastrum alpinum (Hedw.) G.L.Sm.	+				88	*3372*
Polytrichum commune Hedw.	+				90	*1039*
Polytrichum formosum Hedw.	+	+			Common	*314*
Polytrichum juniperinum Hedw.	+	+			Common	*508*
Polytrichum piliferum Hedw.	+				75, 103	*1322*
[+]***Polytrichum strictum*** Menzies ex Brid.		+			186	*1231*
Tetraphidaceae Schimp.						
Tetraphis pellucida Hedw.		+			62	*923*
Buxbaumiaceae Schimp.						
[+]***Buxbaumia viridis*** (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl.	+				111	*1029*
Diphysciaceae M.Fleisch.						
[+]***Diphyscium foliosum*** (Hedw.) D.Mohr	+				105	*1050*
Timmiaceae Schimp.						
[+]***Timmia norvegica*** J.E.Zetterst.	+				149, 111	*140*
Encalyptaceae Schimp.						
Encalypta streptocarpa Hedw.	+	+			59, 61, 87	*3298*
Encalypta vulgaris Hedw.	+	+			54, 61	*800*
Funariaceae Schwägr**.**						
[+]***Entosthodon attenuatus*** (Dicks.) Bryhn	+				10, 186	*140*
[+]***Entosthodon fascicularis*** (Hedw.) Müll. Hal.		+			187	*1364*
Funaria hygrometrica Hedw.	+	+			Common	*216*
Grimmiaceae Arn.						
Grimmia dissimulata E.Maier		+			70	*1018*
Grimmia donniana Sm.		+			115, 157	*3529*
Grimmia laevigata (Brid.) Brid.		+			169	*1195*
[+]***Grimmia lisae*** De Not.		+			2, 125, 164	*28*
Grimmia ovalis (Hedw.) Lindb.		+	+		125, 139	*1584*
Grimmia pulvinata (Hedw.) Sm	+	+	+		Common	*105*

TAXA	SUB				LN	*AHBV*
	S	R	T	Sm		
Racomitrium aciculare (Hedw.) Brid.	+	+			18, 161, 186	*342*
[+]***Racomitrium affine*** (F.Weber & D.Mohr) Lindb.		+			18	*2857*
[+]***Racomitrium aquaticum*** (Brid. ex Schrad.) Brid.		+			156	*333*
Racomitrium canescens (Hedw.) Brid.	+	+			67, 70, 75, 76	*854*
Racomitrium elongatum Ehrh. ex Frisvoll	+				70, 75, 136	*973*
Racomitrium heterostichum (Hedw.) Brid.		+			18	*310*
[+]***Racomitrium sudeticum*** (Funck) Bruch & Schimp.	+				157	*1483*
Schistidium apocarpum (Hedw.) Bruch & Schimp.	+	+			Common	*111*
[+]***Schistidium brunnescens*** subsp. ***griseum*** (Nees, Hornsch. & Sturm) H.H.Blom	+	+			177, 178	*1394*
Schistidium confertum (Funck) Brunch & Schimp		+			27	*493*
Schistidium crassipilum H.H.Blom		+			67, 97, 171	*3549*
[×]***Schistidium dupretii*** (Thér.) W.A.Weber		+			85	*3550*
Schistidium helveticum (Schkuhr) Deguch		+			31, 67, 97	*550*
Schistidium platyphyllum (Mitt.) H.Perss.		+			109	*3432*
[×]***Schistidium rivulare*** (Brid.) Podp.		+			152	*3551*
Seligeriaceae Schimp.						
[+]***Seligeria pusilla*** (Hedw.) Bruch & Schimp		+			61, 120	*839*
Fissidentaceae Schimp.						
Fissidens adianthoides Hedw.		+			72	*981*
Fissidens bryoides Hedw.	+				Common	*3519*
Fissidens crassipes Wilson ex Brunch & Schimp.		+		+	87, 97	*3520*
[+×]****Fissidens curvatus*** Hornsch.	+				99, 162, 178	*1082*
Fissidens dubius P.Beauv.	+	+			Common	*564*
Fissidens exilis Hedw.	+				82, 84, 183	*1381*
Fissidens pusillus (Wilson) Milde	+	+		+	49, 111	*768*
Fissidens rivularis (Spruce) Schimp.		+		+	110	*1354*
Fissidens taxifolius Hedw.	+	+			Common	*1524*
Fissidens viridulus (Sw. Ex anon.) Wahlenb.	+	+			Common	*573*
Ditrichaceae Limpr.						
Ceratodon purpureus (Hedw.) Brid.	+	+			Common	*3500*
Ditrichum heteromallum (Hedw.) E.Britton	+				88	*3297*
Ditrichum pallidum (Hedw.) Hampe	+				33, 53, 173	*590*
Ditrichum pusillum (Hedw.) Hampe	+				10	*167*
Pleuridium acuminatum Lindb.	+	+			Common	*879*
Pleuridium subulatum (Hedw.) Rabenh.	+				Common	*1472*
[+]***Trichodon cylindricus*** (Hedw.) Schimp.	+	+			41, 67, 178	*669*
Rhabdoweisiaceae Limpr.						
[+]***Cynodontium bruntonii*** (Sm.) Bruch & Schimp.		+			164, 183, 188	*1233*
Dicranoweisia cirrata (Hedw.) Lindb.	+		+		5, 142, 162, 165	*96*
Dicranoweisia crispula (Hedw.) Milde		+			93	*3283*
Dichodontium pellucidum (Hedw.) Schimp.		+			87	*3506*
Dicranaceae Schimp.						
Dicranella heteromalla (Hedw.) Schimp.	+	+	+		Common	*3291*
Dicranella howei Renauld & Cardot	+				14, 15, 33, 41, 46, 51	*778*
[×]***Dicranella rufescens*** (Dicks.) Schimp.	+	+			Common	*3511*
Dicranella varia (Hedw.) Schimp.	+				59, 65, 131	*886*
Dicranum scoparium Hedw.	+	+	+		Common	*1131*
Dicranum tauricum Sapjegin	+	+	+		72, 73, 94, 102, 119	*1113*
[+]***Paraleucobryum longifolium*** (Hedw.) Loeske			+		88, 111	*1222*
Leucobryaceae Schimp.						
Leucobryum juniperoideum (Brid.) Müll. Hal.	+		+		57, 93	*838*
Pottiaceae Schimp.						
Acaulon muticum (Hedw.) Müll.Hal	+				166	*1119*
[×]***Anoectangium aestivum*** (Hedw.) Mitt.	+				75	*996*
Barbula convoluta Hedw. var. ***convoluta***	+	+			Common	*492*
Barbula convoluta Hedw. var. ***sardoa*** Schimp.		+			27	*490*
Barbula unguiculata Hedw.	+	+	+		Common	*108*
Cinclidotus aquaticus (Hedw.) Bruch & Schimp.	+	+		+	93	*1051*
Cinclidotus fontinaloides (Hedw.) P.Beauv.	+			+	183, 186	*1251*

TAXA	SUB				LN	*AHBV*
	S	R	T	Sm		
Cinclidotus riparius (Host ex Brid.) Arn.	+	+		+	125, 186	*1065*
[+]***Cinclidotus vardaranus*** Erdağ & Kürschner		+		+	125	*1268*
Crossidium squamiferum (Viv.) Jur.	+				141	*1187*
[+]***Dialytrichia mucronata*** (Brid.) Broth.		+	+	+	12, 21, 28, 148	*407*
Didymodon acutus (Brid.) K.Saito	+	+			1, 23, 100, 103	*14*
[+]***Didymodon cordatus*** Jur.		+			12, 23	*205*
Didymodon fallax (Hedw.) R.H.Zander	+				41, 46, 44	*666*
Didymodon insulanus (De Not.) M.O.Hill.	+	+	+		Common	*2865*
Didymodon luridus Hornsch.	+	+			1, 13, 22, 42, 60, 74	*2867*
Didymodon nicholsonii Culm.		+			91	*3289*
Didymodon rigidulus Hedw.	+				5	*76*
Didymodon sinuosus (Mitt.) Delogne	+	+	+		12, 21, 60	*408*
[+]***Didymodon spadiceus*** (Mitt.) Limpr.		+			23, 32	*461*
Didymodon tophaceus (Brid.) Lisa	+				10, 34	*168*
Didymodon vinealis (Brid.) R.H.Zander	+	+			61, 99	*1000*
[+]*[*]***Ephemerum crassinervium*** (Schwägr.) Hampe subsp. ***sessile*** (Bruch) Holyoak	+				166, 168	*1165*
[+]***Ephemerum minutissimum*** Lindb.	+				161, 162, 165-168	*1188*
Eucladium verticillatum (With.) Bruch & Schimp		+			125	*1037*
Gymnostomum aeruginosum Sm.		+			61, 84	*840*
Gymnostomum calcareum Nees & Hornsch		+			61	*1303*
Gyroweisia tenuis (Hedw.) Schimp.		+			84	*3240*
Hymenostylium recurvirostrum (Hedw.) Dixon	+				178	*1363*
[+]***Microbryum floerkeanum*** (F.Weber & D.Mohr) Schimp.	+				169	*1272*
Microbryum starckeanum (Hedw.) R.H.Zander	+				81	*972*
Oxystegus tenuirostris (Hook. & Taylor) A.J.E.Sm.	+				41	*677*
Syntrichia calcicola J.J.Aman	+	+			68, 24	*1020*
[×]***Syntrichia handelii*** (Schiffn.) S. Agnew & Vondr.		+			123	*3622*
Syntrichia laevipila Brid.	+		+		Common	*2891*
Syntrichia latifolia (Bruch ex Hartm.) Huebener			+		12	*1121*
Syntrichia papillosa (Wilson) Jur.			+		12, 80, 151	*2894*
Syntrichia papillosissima (Copp.) Loeske		+			123	*3554*
Syntrichia ruralis (Hedw.) F.Weber & D.Mohr var. ***ruralis***	+		+		Common	*2904*
Syntrichia ruralis (Hedw.) F.Weber & D.Mohr var. ***ruraliformis*** (Besch.) Delogne	+	+			169	*1655*
[×]***Tortella inflexa*** (Bruch) Broth.		+			85	*3442*
Tortella squarrosa (Brid.) Limpr.	+	+			28, 99, 183	*3360*
Tortella tortuosa (Hedw.) Limpr.	+	+			Common	*775*
Tortula acaulon (With.) R.H.Zander	+				88, 81	*808*
Tortula inermis (Brid.) Mont.	+				1	*8*
Tortula marginata (Bruch & Schimp.) Spruce	+	+			3, 5	*39*
Tortula muralis Hedw.	+	+	+		Common	*780*
Tortula schimperi M.J.Cano, O.Werner & J.Guerr	+	+			37, 70, 131, 173	*1528*
Tortula solmsii (Schimp.) Limpr.			+		8	*127*
Tortula subulata Hedw.	+	+	+		Common	*1293*
Tortula truncata (Hedw.) Mitt.	+				69, 161	*1189*
Trichostomum brachydontium Bruch	+	+			Common	*254*
Weissia brachycarpa (Nees & Hornsch.) Jur.	+	+			26, 45, 49, 51, 99	*3452*
Weissia condensa (Voit) Lindb.	+	+			15, 100, 132, 178	*3562*
Weissia controversa Hedw.	+	+			Common	*3626*
Weissia longifolia Mitt.	+				128	*1052*
Bryaceae Schwägr.						
Bryum argenteum Hedw.	+	+	+		Common	*73*
Bryum dichotomum Hedw.	+	+			Common	*3487*
Bryum gemmilucens R.Wilczek & Demaret	+				135	*1104*
Bryum radiculosum Brid.	+				14, 56	*268*
Bryum subapiculatum Hampe	+	+			3, 34	*602*
Imbribryum alpinum (Huds. ex With.) N.Pedersen	+	+			75, 126, 168	*1070*
Imbribryum mildeanum (Jur.) J.R.Spence	+				13, 45, 46, 54	*247*

TAXA	SUB				LN	*AHBV*
	S	R	T	Sm		
Ptychostomum archangelicum (Bruch & Schimp.) J.R. Spence	+	+			58, 100	*3392*
Ptychostomum bornholmense (Wink. & R.Ruthe) Holyoak & N.Pedersen	+				33	*596*
Ptychostomum capillare (Hedw.) Holyoak & N.Pedersen	+	+	+		Common	*3486*
[+]***Ptychostomum creberrimum*** (Taylor) J.R.Spence+ & H.P.Ramsay				72	*991*	
Ptychostomum donianum (Grev.) Holyoak & N.Pedersen	+	+			Common	*1480*
Ptychostomum imbricatulum (Müll. Hal.) Holyoak & N.Pedersen	+	+			5, 82, 187	*94*
Ptychostomum moravicum (Podp.) Ros & Mazimpaka	+	+	+		Common	*56*
Ptychostomum pseudotriquetrum (Hedw.) J.R.Spence & H.P.Ramsay	+	+			Common	*3399*
Ptychostomum torquescens (Bruch & Schimp.) Ros & Mazimpaka	+	+			1, 84, 96, 102, 104	*3493*
Rhodobryum roseum (Hedw.) Limpr.	+				134	*1433*
Mniaceae Schwägr.						
Epipterygium tozeri (Grev.) Lindb.	+				Common	*3514*
Mnium hornum Hedw.	+	+	+		Common	*2919*
Mnium marginatum (Dicks.) P.Beauv.		+			61	*1265*
[+]***Mnium spinosum*** (Voit) Schwägr.	+				176	*1375*
Mnium stellare Hedw.	+	+	+		Common	*3300*
Mnium thomsonii Schimp.	+				58	*998*
Plagiomnium affine (Blandow ex Funck) T.J.Kop.	+	+			2, 72, 132	*865*
Plagiomnium cuspidatum (Hedw.) T.J.Kop.	+				131	*1312*
Plagiomnium elatum (Bruch & Schimp.) T.J.Kop	+	+	+		2, 94, 122	*2923*
Plagiomnium ellipticum (Brid.) T.J.Kop.	+	+			3, 57, 168	*44*
Plagiomnium rostratum (Schrad.) T.J.Kop.	+				96, 183	*1677*
Plagiomnium undulatum (Hedw.) T.J.Kop.	+	+	+		Common	*3577*
Pohlia cruda (Hedw.) Lindb.	+				180	*1445*
Pohlia melanodon (Brid.) A.J.Shaw	+	+			10, 57, 87, 181	*1460*
Pohlia wahlenbergü (F. Weber & D. Mohr) A.L. Andrews	+				61	*1287*
Rhizomnium punctatum (Hedw.) T.J.Kop.	+	+	+		Common	*3589*
Bartramiaceae Schwägr.						
Bartramia halleriana Hedw.		+			120	*3209*
Bartramia ithyphylla Brid.	+				93	*3629*
Bartramia pomiformis Hedw.	+	+			Common	*579*
Bartramia stricta Brid.	+				182	*1234*
Philonotis arnelli Husn.	+	+			Common	*3322*
[×]***Philonotis caespitosa*** Jur.	+	+		+	57, 61, 168	*890*
Philonotis calcarea (Bruch & Schimp.) Schimp.	+				121	*3328*
Philonotis capillaris Lindb.	+	+			145, 166, 176	*1308*
Philonotis fontana (Hedw.) Brid.	+	+		+	61, 75	*980*
Philonotis tomentella Molendo	+			+	58, 108	*1498*
Philonotis seriata Mitt.	+			+	87	*3329*
[+]***Plagiopus oederianus*** (Sw.) H.A.Crum & L.E.Anderson	+			120	*1093*	
Orthotrichaceae Arn.						
[+]***Lewinskya acuminata*** (H.Philib.) F.Lara, Garilleti & Goffinet			+		148, 155 164	*1225*
Lewinskya affinis (Schrad. ex Brid.) F.Lara, Garilleti & Goffinet		+	+		Common	*3567*
Lewinskya rupestris (Schleich. Ex Schwägr.) F.Lara, Garilleti & Goffinet		+	+		Common	*2944*
Lewinskya speciosa (Nees) F.Lara, Garilleti & Goffinet			+		Common	*3308*
Lewinskya striata (Hedw.) F.Lara, Garilleti & Goffinet			+		Common	*3312*
Orthotrichum anomalum Hedw.		+	+		Common	*3568*
Orthotrichum cupulatum Hoffm. ex Brid. var. ***cupulatum***	+	++			Common	*3570*
[+]***Orthotrichum cupulatum*** Hoffm. ex Brid. var. ***riparium*** Huebener			+		12, 44, 72	*3031*

TAXA	SUB				LN	*AHBV*
	S	R	T	Sm		
Orthotrichum cupulatum Hoffm. ex Brid. var. ***bistratosum*** Schiffn.		+			97	*3304*
Orthotrichum diaphanum Schrad. ex Brid.			+		Common	*3050*
Orthotrichum pallens Bruch ex Brid.			+		9, 12, 79	*3055*
Orthotrichum pumilum Sw. ex anon.			+		Common	*3060*
+***Orthotrichum scanicum*** Gronvall			+		10, 151	*1226*
+×***Orthotrichum stellatum*** Brid.			+		Common	*3066*
Orthotrichum stramineum Hornsch. ex Brid.			+		Common	*3309*
Orthotrichum tenellum Bruch ex Brid.			+		Common	*3309*
Pulvigera lyellii (Hook. & Taylor) Plášek, Sawicki & Ochyra			+		Common	*3573*
+***Ulota crispa*** (Hedw.) Brid			+		Common	*3623*
Zygodon rupestris Schimp. ex Lorentz			+		Common	*3169*
Hedwigiaceae Schimp.						
Hedwigia ciliata (Hedw.) P.Beauv. var. ***ciliata***		+	+		70, 125, 139, 186	*3242*
+***Hedwigia ciliata*** (Hedw.) P.Beauv. var. ***leucophaea*** Bruch & Schimp.		+			2, 28, 70	*495*
Hedwigia stellata Hedenäs		+			Common	*1648*
Aulacomniaceae Schimp.						
Aulacomnium androgynum (Hedw.) Schwägr.		+			87, 93, 101	*3204*
+***Aulacomnium palustre*** (Hedw.) Schwägr.	+				75, 90, 168	*3206*
Hookeriaceae Schimp.						
+***Hookeria lucens*** (Hedw.) Sm.	+				57	*850*
Fontinalaceae Schimp.						
Fontinalis antipyretica Hedw. subsp. ***antipyretica***	+	+		+	Common	*3228*
Fontinalis antipyretica Hedw. subsp. ***gracilis*** (Lindb.) Kindb.		+		+	125	*1049*
Climaciaceae Kindb.						
+***Climacium dendroides*** (Hedw.) F.Weber & D.Mohr	+				168	*1194*
Amblystegiaceae G. Roth.						
Amblystegium serpens (Hedw.) Schimp. Mohr	+				Common	*3465*
+***Amblystegium subtile*** (Hedw.) Schimp.	+	+			21, 112	*1492*
+***Campyliadelphus chrysophyllus*** (Brid.) R.S.Chopra	+	+			41, 87, 102, 104	*3499*
+***Campyliadelphus elodes*** (Lindb.) Kanda	+	+	+		9, 10, 42, 58	*3499*
Cratoneuron filicinum (Hedw.) Spruce	+	+	+		Common	*3504*
Hygroamblystegium fluviatile (Hedw.) Loeske	+	+	+	+	61, 69	*908*
Hygroamblystegium tenax (Hedw.) Jenn.		+			19, 125	*1066*
Hygroamblystegium varium (Hedw.) Mönk. var. ***humile*** (P.Beauv.) Vanderp. & Hedenäs			+		2	*1215*
Hygrohypnum luridum (Hedw.) Jenn		+		+	61, 67	*1822*
Leptodictyum riparium (Hedw.) Warnst	+	+			104, 108, 156	*1500*
Palustriella commutata (Hedw.) Ochyra		+			62, 135, 145	*1314*
Calliergonaceae Vanderpoorten, Hedenäs,						
Calliergon cordifolium (Hedw.) Kindb C.J. Cox & A.J.Shaw	+				95	*1316*
Pseudoleskeaceae Schimp.						
Lescuraea incurvata (Hedw.) E.Lawton	+	+			59, 72, 75, 94, 109	*3389*
Leskeaceae Schimp.						
Pseudoleskeella catenulata (Brid. ex Schrad.) Kindb.		+			59	*920*
Pseudoleskeella nervosa (Brid.) Nyholm	+		+		59, 88	*3179*
Thuidiaceae Schimp.						
Thuidium delicatulum (Hedw.) Schimp.	+				87	*1102*
+***Thuidium tamariscinum*** (Hedw.) Schimp.		+			18	*323*
Brachytheciaceae G.Roth.						
Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen var. ***velutinum***		+			Common	*3472*
Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen var. ***salicinum*** (Schimp.) Ochyra & Zamowiec		+		155	*1634*	
Brachythecium albicans (Hedw.) Schimp.	+				69, 145	*1610*
×***Brachythecium geheebii*** Milde	+				104	*3219*
+***Brachythecium glareosum*** (Bruch ex Spruce) Schimp.	+	+	+		Common	*3476*

TAXA	SUB				LN	*AHBV*
	S	R	T	Sm		
Brachythecium mildeanum (Schimp.) Schimp.		+	+		2, 18, 57, 61	*2111*
Brachythecium rivulare Schimp.	+	+		+	Common	*2111*
Brachythecium rutabulum (Hedw.) Schimp.	+	+			Common	*3482*
Brachythecium salebrosum (F.Weber & D.Mohr) Schimp.	+				104	*3483*
Cirriphyllum crassinervium (Taylor) Loeske & M.Fleisch.	+				Common	*3503*
Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen	+	+			82, 91, 183	*3516*
[+]***Eurhynchium angustirete*** (Broth.) T.J.Kop.		+			3	*47*
Eurhynchium striatum (Hedw.) Schimp.	+	+	+		Common	*1576*
Homalothecium lutescens (Hedw.) H.Rob.	+	+	+		10, 50, 69, 94, 123	*3536*
Homalothecium philippeanum (Spruce) Schimp.		+	+		2, 32, 48	*2223*
Homalothecium sericeum (Hedw.) Schimp.	+	+	+		Common	*3243*
Kindbergia praelonga (Hedw.) Ochyra	+	+	+		Common	*2293*
Microeurhynchium pumilum (Wilson) Ignatov & Vanderp.	+	+			22, 27, 79, 149, 188	*1996*
Oxyrrhynchium hians (Hedw.) Loeske	+	+			Common	*3574*
Oxyrrhynchium schleicheri (R.Hedw.) Röll	+	+			Common	*3314*
Oxyrrhynchium speciosum (Brid.) Warnst.	+				23, 82, 93, 121	*3518*
[+]***Palamocladium euchloron*** (Müll.Hal.) Wijk & Margad.	+	+	+		2, 85, 91, 104, 120	*3318*
Plasteurhynchium meridionale (Schimp.) M.Fleisch.	+	++			9, 87 93	*3515*
Plasteurhynchium striatulum (Spruce) M. Fleisch.	+	+	+		2-6, 13, 18, 67, 88	*3310*
Pseudoscleropodium purum (Hedw.) M.Fleisch.	+	+			Common	*3552*
Rhynchostegiella litorea (De Not.) Limpr.	+	+	+		Common	*3590*
Rhynchostegiella tenella (Dicks.) Limpr.			+		Common	*3182*
Rhynchostegiella teneriffae (Mont.) Dirkse & Bouman		+			19	*386*
Rhynchostegium confertum (Dicks.) Schimp.	+	+	+		Common	*2300*
Rhynchostegium megapolitanum (Blandow ex F.Weber & D.Mohr) Schimp.	+	+			15, 130, 140	*1525*
Rhynchostegium murale (Hedw.) Schimp.	+	+			47, 60, 97	*1012*
Rhynchostegium riparioides (Hedw.) Cardot	+	+	+	+	Common	*3595*
[*]***Rhynchostegium rotundifolium*** (Scop. ex Brid.) Schimp.		+			102	*3596*
[+]***Sciuro-hypnum flotowianum*** (Sendtn.) Ignatov & Huttunen			+		31	*544*
Sciuro-hypnum populeum (Hedw.) Ignatov & Huttunen	+	+			84, 87, 88, 130	*3479*
Sciuro-hypnum reflexum (Starke) Ignatov & Huttunen		+			58, 98	*1121*
Sciuro-hypnum starkei (Brid.) Ignatov & Huttunen		+	+		4, 82	*757*
Scleropodium touretii (Brid.) L.F. Koch	+	+	+		Common	*3553*
Scorpiurium circinatum (Bruch) M.Fleisch. & Loeske		+	+		18, 21, 88, 163, 171	*2301*
Hypnaceae Schimp.						
Calliergonella cuspidata (Hedw.) Loeske	+	+			75, 90, 104	*3494*
[+]***Campylophyllum calcareum*** (Crundw. & Nyholm) Hedenäs	+	+			22, 97	*3241*
[+]***Herzogiella seligeri*** (Brid.) Z.Iwats	+	+	+		18, 94, 119, 134	*1947*
Homomallium incurvatum (Schrad. ex Brid.) Loeske		+			59, 60, 98, 109	*905*
Hyocomium armoricum (Brid.) Wijk & Margad.		+			57	*874*
[+]***Hypnum andoi*** A.J.E.Sm.	+	+	+		Common	*3183*
Hypnum cupressiforme Hedw. var. ***cupressiforme***	+	+	+		Common	*3544*
Hypnum cupressiforme Hedw. var. ***lacunosum*** Brid.	+	+	+		Common	*3546*
Hypnum cupressiforme Hedw. var. ***resupinatum*** (Taylor) Schimp.	+	+	+		Common	*3547*
Hypnum cupressiforme Hedw. var. ***filiforme*** Brid.		+			120	*1326*
[+]***Hypnum jutlandicum*** Holmen & E.Warncke	+				117	*3628*
[+]***Pseudotaxiphyllum elegans*** (Brid.) Z.Iwats.	+	+	+		59, 96	*790*
Taxiphyllum wissgrillii (Garov.) Wijk & Margad.	+	+			18, 34, 58, 144	*903*
Pterigynandraceae Schimp.						
Habrodon perpusillus (De Not.) Lindb.			+		5, 28, 71, 100	*3241*
Heterocladium heteropterum (Brid.) Schimp	+				29	*517*
Pterigynandrum filiforme Hedw	+		+		Common	*3586*
Hylocomiaceae M. Fleisch.						
Ctenidium molluscum (Hedw.) Mitt.	+	+			Common	*3505*
Pleurozium schreberi (Willd. ex Brid.) Mitt.	+				75	*935*
Plagiotheciaceae (Broth.) M.Fleisch.						
Plagiothecium cavifolium (Brid.) Z.Iwats.	+				160	*1177*

TAXA	SUB S	R	T	Sm	LN	*AHBV*
Plagiothecium denticulatum (Hedw.) Schimp.		+	+		88, 102	*1121*
Plagiothecium laetum Schimp	+	+			62, 96	*922*
[+]***Plagiothecium latebricola*** Schimp.		+			102	*1242*
Plagiothecium nemorale (Mitt.) A.Jaeger	+	+	+		Common	*1027*
[×]****Plagiothecium neckeroideum*** Schimp.	+	+	+		93, 96, 101	*3350*
Plagiothecium succulentum (Wilson) Lindb.	+	+			57, 61, 144, 154	*1967*
Pylaisiadelphaceae Goffinet & W.R.Buck						
Platygyrium repens (Brid.) Schimp.		+			117	*3630*
Cryphaeaceae Schimp.						
Cryphaea heteromalla (Hedw.) D.Mohr			+		28, 31	*2490*
Leucodontaceae Schimp.						
Antitrichia curtipendula (Hedw.) Brid.		+	+		Common	*2104*
Leucodon immersus Lind.			+		59, 65, 88	*2500*
Leucodon sciuroides var. ***sciuroides*** (Hedw.) Schwägr.			+		Common	*3617*
Leucodon sciuroides var. ***morensis*** (Schwägr.) Kindb.		+			188	*1678*
Nogopterium gracile (Hedw.) Crosby & W.R.Buck		+	+		21, 28, 61, 125	*2537*
Neckeraceae Schimp.						
Alleniella besseri (Lobarz.) S.Olsson, Enroth & D.Quandt			+		2, 31, 60, 67	*2053*
Alleniella complanata (Hedw.) S.Olsson, Enroth & D.Quandt	+	+	+		Common	*3458*
[+]***Exsertotheca crispa*** (Hedw.) S.Olsson, Enroth & D.Quandt			+		2, 102	*3302*
Neckera menziesii Drumm.	+	+			94, 102, 125	*3565*
Neckera pumila Hedw.			+		61	*1138*
Thamnobryum alopecurum (Hedw.) Gangulee		+	+		Common	*3556*
[+×]****Thamnobryum neckeroides*** (Hook.) E.Lawto					58, 102	*900*
Leptodontaceae Schimp.						
[+]***Leptodon smithii*** (Hedw.) F.Weber & D.Mohr			+		2, 18, 21, 28, 60, 61	*2544*
Lembophyllaceae Broth.						
Isothecium alopecuroides (Lam. ex Dubois) Isov.			+		Common	*3612*
Isothecium holtii Kindb.			+		2	*30*
Isothecium myosuroides Brid.	+	+	+		Common	*3548*
Anomodontaceae Kindb.						
[+]***Anomodon attenuatus*** (Hedw.) Huebene	+	+	+		Common	*3466*
Anomodon viticulosus (Hedw.) Hook. & Taylor	+	+	+		Common	*3194*

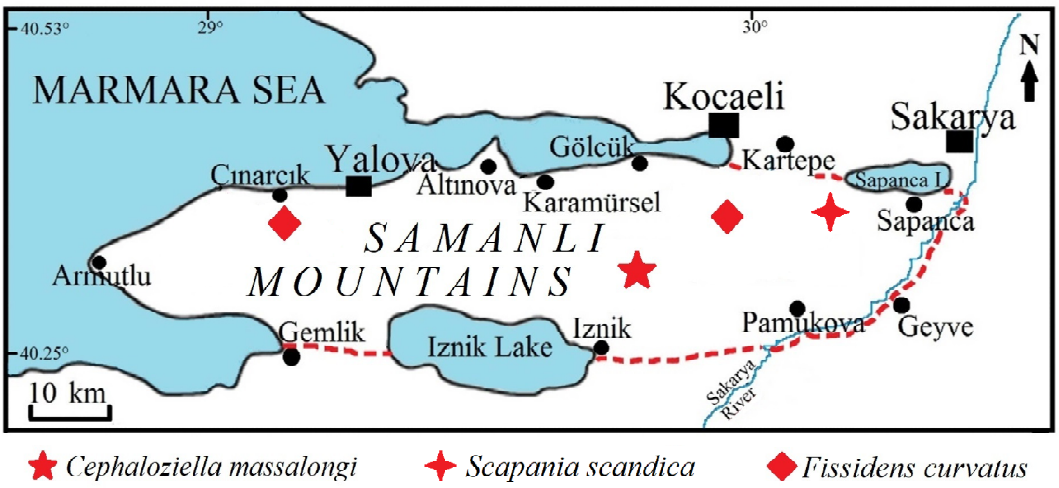

Fig. 2. Locations of *Cephaloziella massalongi*, *Scapania scandica* and *Fissidens curvatus* in the study area

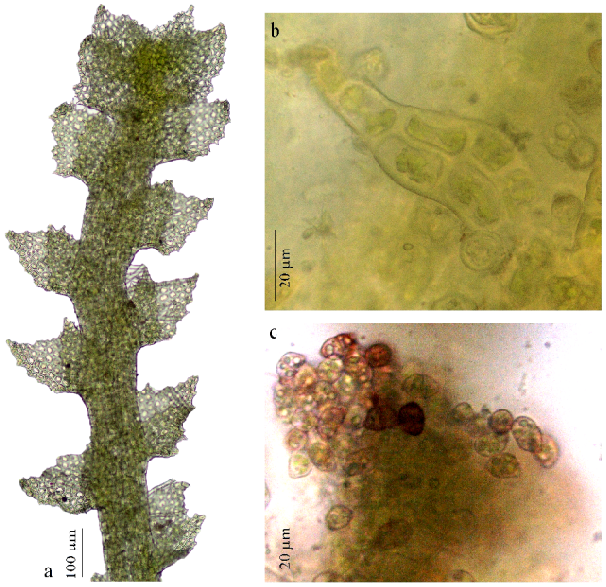

Fig. 3. *Cephaloziella massalongi*: a – shoot with leaves, b – underleaf, c – gemmae.

number of taxon, richest families in the research area for the mosses are respectively Pottiaceae (56 taxa), Brachytheciaceae (39 taxa), Grimmiaceae (21 taxa), Orthotrichaceae (19 taxa), Bryaceae (17 taxa), Mniaceae (16 taxa), Hypnaceae (13 taxa), Amblystegiaceae (11 taxa) and Fissidentaceae (10 taxa), for the liverworts are as follow Scapaniaceae (6 taxa), Jungermanniaceae (5 taxa), Cephalloziellaceae (5 taxa), Lophocoleaceae (4 taxa) and Ricciaceae (4 taxa). These predominant 14 families compose 61% of the total taxa in the study area and other 56 families represent 39%. Therefore, it is not a surprise that Pottiaceae, Brachytheciaceae, Grimmiaceae and Orthotrichaceae have great species richness in this area. An acrocarpous mosses were found to constitute be 64% of the whole bryoflora in the study area may be explained by transitional zone and mediterrenean climate in the south of the area. In addition, since forests are widespread in the western and northern parts of this region; the hight rate of pleurocarpous found in these areas is meaningful. These values indicate that the investigated area is sometimes semiarid in southern regions but it is relatively humid in western and northern zones.

Besides, preferred ecological features of all bryophyte specimens in this area such as; moisture conditions, light requirements and the pH of the substrates were also evaluated by using the field observations and the literature reviews (Dierssen, 2001). As might be anticipated from climatic conditions of this area, hygrophytic mosses (50%) are dominat in especially western and northern parts of the investigated area. These are followed by mesophytic (28%), xerophytic (17%) and others (5%) occurred usually in eastern-southern parts and summits of the region. According to light preferences of bryophytes in this region, with a majority of rate are sciophytics (69%). The rest of taxa are photophytics (31%). The first preference for substrates of the bryophytes in this region is acidophytic (57%), in sequence subneutrophytic (31%) and basiphytic (12%) conditions. As a result of our efforts to determine the ecological habitats of bryophytes in research area, corticolous bryophyte species were found very common (47%) and others are respectively; terricolous (31%), saxicolous (21%), lignicolous (1%) and submerged (<1%).

Finally, the authors have compared all bryophytes in the floristic list with the checklist and country status of European bryophytes (Hodgetts *et al.*, 2015). As a result of this comparison, we have indicated that in our floristic list there are taxa listed from different European countries as follow: 54 taxa as regionally extinct (RE), 75 as critically endangered (CR), 151 as endangered (EN), 230 as vulnerable (VU), 37 taxa as rare (R) and 222 taxa as near threatened (NT). This situation shows us that our study region has a very important bryofloristic richness. In our opinions, this mountain chain that hosts a lot of sensitive taxa of bryophytes is necessary to be conserved by a legal status such as National park, Nature parks, National life development areas, etc. for maintaining bryophyte diversity of Turkey.

New records in Turkey

Cephaloziella massalongi (Spruce) Müll.Frib

Syn: *C. massalongi* var. *algarvica* Douin, *C. massalongi* var. *compacta* (Jörg.) Müll. Frib.

Specimen examined: Turkey, Samanlı Mountains, Bursa province, İznik District, Özekdere region (40°32'52"N, 29°53'42"E), on soil at humid slopes under the *Fagus orientalis* Lipsky and *Carpinus betulus* L. mixed forest, 850 m. a.s.l., 11.09.2015, *AHBV 3627*.

This leafy liverwort is characterized by deeply divided, small papillose celled leaves, conspicuous underleaves and usually abundant, 1–3 celled, mostly ovoid, green or brown to red gemmae (Fig. 3a-c). However, *C. massalongi* may be confused with *C. nicholsonii* and *C. divaricata,* both of which also occur on cupriferous substrates. On the other hand, *C. divaricata* differs from *C. massalongi* in more often bearing inflorescences and in less deeply divided leaves, sometimes with a distinctly recurved sinus, and also it has the less dense cuticular papillae on the leaves, and the more tapering cells on the abaxial projections. At the same time, in *C. nicholsonii* many of stem and leaf cells are broader than those of *C. massalongi,* and it usually carries large asymmetrical gemmae and also, it is much more often fertile than *C. massalongi.* In addition, *C. massalongi* is distinguished from *C. turneri* and *C. hampeana* by the presence of underleaves, and also, from *C. dentatata* and *C. stellulifera* by the smaller cells and the papillose cuticle (Paton, 1999).

This species often grows on wet or very moist copper-bearing rocks and sandy to clayish mineral soils in subalpine regions within the temperate areas (Paton,

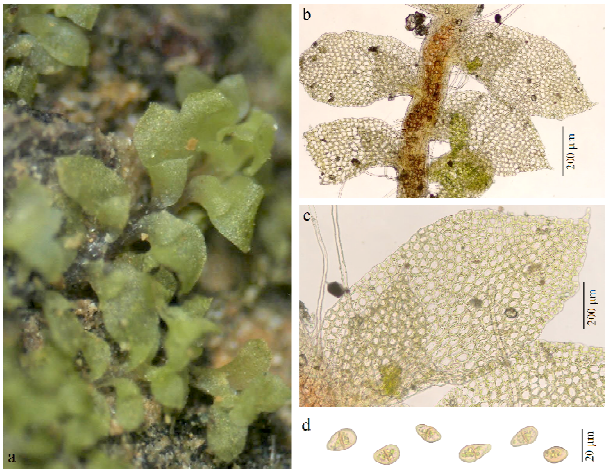

Fig. 4. *Scapania scandica*: a – shoot with leaves; b – leaf; c – mid-leaf cells; c – gemmae.

1999; Dierssen, 2001). In this study, it was found on very moist soil on a steep slope at 850 m altitude together with *Jungermannia gracillima* Sm., *Diplophyllum albicans* (L.) Dumort. and *Dicranella heteromalla* (Hedw.) Schimp (Fig. 2).

Although this liverwort is known from many European countries (Austria, Switzerland, Bulgaria, Corsica, Croatia, France, Italy, Germany, Portugal, Romania, Slovakia, Spain, Finland, Norway, Sweden, Iceland, Ireland and Britain), Far Eastern Asia (Japan and Nepal) and also North America (Canada and USA), (Söderström *et al*., 2002; Ros *et al*., 2007; Callaghan, 2011; Özenoğlu Kiremit & Keçeli, 2009), the present study the first record of this species from Southwest Asia is given. *Cephaloziella massalongi* is actually rare despite its distribution in many European countries. It was included into the red list of Red Lists of some European countries, for example it is considered as critically endangered (CR) in Finland, Slovakia and Romania, and as vulnerable (VU) in Great Britain, Ireland, Italy, Portugal, Spain, Austria and Switzerland (Hodgetts e*t al.*, 2015). That's why this new record in the Turkey is significant for filling its distributional gap between Europe and South-Western Asia.

Scapania scandica (Arnell et H.Buch) Macvicar

Specimen examined: Turkey, Samanlı Mountains, Kocaeli province, Kartepe District, Suyolu region (40°39'36''N, 30°09'06''E), on rock near the creek, 650 m. a.s.l., 06.09.2015, *AHBV 1269*.

Scapania scandica is characterized by the broadly rounded postical lobes, the collenchymatous or slightly thick-walled marginal leaf cells containing oil-bodies, the edentate or somewhat dentate perianth mouth, and the purplish red pigment often present at least on the base and margins of the leaves and bracts (Fig. 4a-c) (Paton, 1999). It produces abundant and pale green gemmae (Fig. 4d). *S. scandica* is similar to *Scapania irrigua*, as well as to *Diplophyllum obtusifolium*. On the other hand, *S. irrigua* has parallel-sided front lobes that rapidly contract to the base, and more pointed back lobes. In addition, *Diplophyllum obtusifolium* differs from *S. scandica* by having broadly rounded tips to the front lobes and creases on its perianth (Atherton *et al.*, 2010).

This species often grows on moist crumbling soil, gravelly ground or rocky slopes near streams (Dierssen 2001). In this study, it was found on moist rock near the creek at 650 m altitude (Fig. 2).

Scapania scandica is known from Europe (Estonia, France, Italy, Portugal, Luxembourg, Hungary, Austria, Bulgaria, Romania, Belgium, Serbia, Corsica, Germany, Poland, Slovakia, Croatia, Switzerland, Iceland, Norway, Finland, Denmark, Sweden, Ireland, Britain, Sicily, Crete, Nortwest Russia, North Caucasus, Azores, Faeroes) Macaronesia, Greenland, North America, Asia and North Africa (Paton, 1999; Söderström *et al*., 2002; Ros *et al.*, 2007). It was included in the red lists of some European countries for example; endangered (CR) in Luxembourg, Bulgaria and Hungary; vulnerable (VU) in Austria and Romania (Hodgetts e*t al.*, 2015).

THE SECOND RECORDS IN TURKEY

Fissidens curvatus Hornsch. was reported for the first time by Çetin (1988) without locality information and drawings in checklist of the mosses of Turkey by reference to the collection of Walter in the Botanical Museum Berlin-Dahlem (B). In this study, it is secondly recorded after thirty years, from both in A1 and A2 grid squares of Turkey.

F. curvatus is distinguished from other small *Fissidens* species by characteristic leaf borders in longly tapering leaves and elongate papillose laminal cells. Typical *F. curvatus* is usually dimorphic: the sterile stems have smaller, more numerous, ± uniform leaves with confluent costa at apex, while fertile shoots are shorter with terminal subperichaetial and perichaetial leaves much larger that the lower, ±uniform leaves (Smith, 2004; Bruggeman-Nannenga, 2013). In addition, its habitat preferences are usually fine textured muddy soils of shaded banks (Dierssen, 2001). We collected to this species from the forest zone at the edge of Yuvacýk Dam in Kocaeli province and on moist soil, on a steep slope in Çınarcık district of Yalova province in the research area.

Thamnobryum neckeroides (Hook.) E.Lawton and *Plagiothecium neckeroideum* Schimp. have been so far known in Turkey only from the Middle Black Sea region (Batan *et al.*, 2014). Now, second time records of these species in the Marmara region, extends distribution range to the northwestern part of Turkey.

Until now, *Riccia beyrichiana* Hampe has been known only from Aydýn and Muđla provinces in Turkey (Özenoğlu Kiremit *et al.*, 2016). Whereas, it was collected on moist soil on the pasture area of Sakarya Province in the Marmara region. This second record extends distribution range of this thalloid liverworth to the northwestern part of Turkey.

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