



THE ANOMODONTO-LEUCODONTETUM SCIUROIDIS WIŚN. 1930 – AN EPIPHYTIC BRYOPHYTE COMMUNITY NEW FOR TURKEY

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ABSTRACT. Based on 38 relevés, the *Anomodonto-Leucodontetum sciuroidis typicum* and *A.-L. palamocladietosum euchloronis* subass. nov. (*Neckerion complanatae* alliance) is described and characterised as a new epiphytic subassociation from the Amanos range (East Mediterranean Turkey). In addition life form and life strategy analysis is carried out reflecting a distinct correlation between life forms, strategies and ecological site conditions. More hygrophytic subassociation *Anomodonto-Leucodontetum sciuroidis* and *A.-L. palamocladietosum euchloronis* is dominated by tail, fan and mat forming perennial stayers with high asexual reproductive effort.

KEY WORDS: Amanos Mts., bryophyte vegetation, epiphytes, life forms, life strategies, Turkey

INTRODUCTION

The phytosociological studies were initiated by Walther and Leblebici with the bryophyte vegetation of Yamanlar Mts. in Turkey (WALTHER and LEBLEBICI 1969). The study was followed by the bryophytic vegetation of the *Liquidambar orientalis* alluvial forests (WALTHER 1975). Further bryosociological studies were carried out by WALTHER (1979), BRULLO et AL. (1991), KÜRSCHNER et AL. (1998), KÜRSCHNER (1999), KÜRSCHNER and PAROLLY (1999 a, b), and KÜRSCHNER et AL. (2006, 2007). All these studies, however, concentrate on the western region of Turkey and majority of other parts of Turkey remain unstudied till today.

Several studies of bryophyte communities have shown that there is a strong correlation between the life forms and life strategies of species and the ecological factors that affect the habitats (MÄGDEFRAU 1982, FREY and KÜRSCHNER 1991 b, KÜRSCHNER 1994, KÜRSCHNER et AL. 1998, KÜRSCHNER and PAROLLY 1999 a, b). The leading ecological factors are light regime, light intensity, drought and humid period. The analysis of life forms and life strategies give strong evidence to the establishment of species and communities as well as to morphological, anatomical and functional adaptations (KÜRSCHNER et AL. 1998).

The present paper, for the first time, describes and characterises a new epiphytic subassociation from the Amanos range of East Mediterranean Turkey and contributes to the knowledge of the bryophyte vegetation of Turkey.

MATERIAL AND METHODS

Study area

The Amanos range, known also as Nur range, is an extension of the Antitaurus Mountains into the south-western part of the East Mediterranean Region. They rise from Kahramanmaraş, streams out to south and draw to close at Samandağ Delta where Orontes flows into the Mediterranean Sea (Fig. 1). The Amanos range is a geographical and a biological bridge that interlinks the Black Sea Mts. with the Mediterranean and steppe areas. Its length is 175 km and its culminating point is Miğir Tepe (2240 m) which stands at the eastern part of Dörtöyl. With its climate and topography, culminating in very steep peaks rising sharply from the sea level, and deep and humid valleys; it is one of the most diverse ecosystems of Anatolia, harbouring a flora which belongs to the Black Sea a heritage from the Ice Ages. Due to its rich endemic flora, the Amanos range has a particular place among all of the Mediterranean Region. It is an important plant area that harbours 1580 taxa, among them 251 endemic for Turkey. Especially the humid forests that are at the western part of the mountains embrace the relic populations that represent the most southern stands of Euxinian and Euro-Siberian floristic elements. Examples are *Fagus orientalis*, *Carpinus orientalis*, *Quercus cerris*, *Taxus baccata*, *Ilex colchica*, *Tilia argentea*, and *Buxus sempervirens* which have their main distribution centre in the Eastern Black Sea Region and Central Europe (AKMAN 1973, TURKMEN and DÜZENLİ 1998, DÜZENLİ and ÇAKAN 2001).

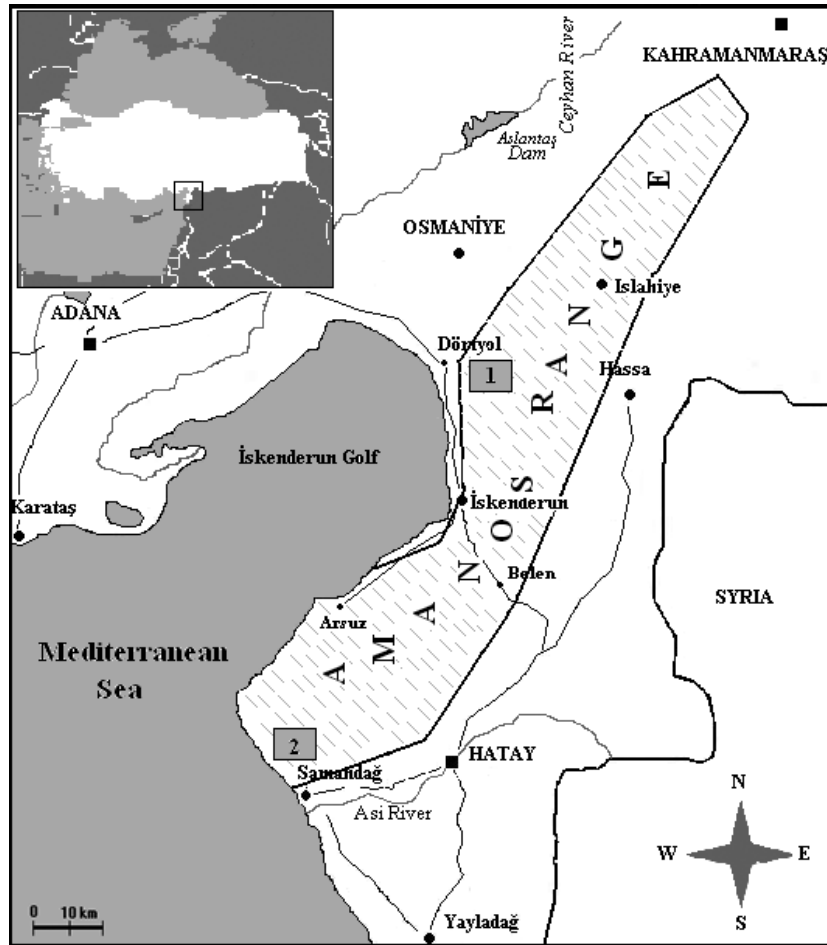


FIG. 1. Topographic map of the study area

Despite the fact that the Amanos range is situated in the Mediterranean Region, its climate is relatively oceanic and highly humid due to a high annual rainfall of 937-1124 mm.

Lithologically the mountains of the Amanos range consist of paleozoic clastic-carbonate rocks which are particularly magmatic and metamorphic. Most of the metamorphic rocks are ophiolitic (YILMAZ et AL. 1984). There are five types of soils described from the Amanos range: erosion soils, red Mediterranean soils, brown calcareous soils, brown forest soils and brown washed soils (AKMAN 1973).

Data source

The epiphytic bryophyte vegetation was studied using the method of BRAUN-BLANQUET (1964) with the modified scale of Frey (1933, in KLEMENT 1955) for the valuation of cover. The cover of the epiphytic taxa was estimated according to the following scale:

+	< 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%

The materials of the study were collected from Amanos range during field trips between 2005 and 2006. The epiphytic vegetation had been sampled by 38 relevés, which were arranged in one community table (Table 1). The taxonomy and nomenclature of the bryophytes accord with the system proposed by CORLEY et AL. (1981). In addition, the status of species for Turkey

was determined by reviewing the recent literature (KÜRSCHNER and ERDAG 2005). Nomenclature of syntaxa follows MARSTALLER (2006). The classification of the life forms follows MÄGDEFRAU (1982), the life strategies DURING (1979) and FREY and KÜRSCHNER (1991 b). The quantitative calculation of the spectra presented is based on the mean percentage cover value of each species and category within the syntaxa (FREY and KÜRSCHNER 1991 b).

Specimens are deposited in the herbarium of the Çukurova Üniversitesi, Adana, Turkey (ADA).

RESULTS AND DISCUSSION

Epiphytic communities

Anomodonto-Leucodontetum sciuroidis Wiśn. 1930 (Table 1).

The *Anomodonto-Leucodontetum sciuroidis* was first defined by WIŚNIEWSKI (1930) in Poland; later on it was recorded in East Prussia, Estonia, Sweden and the Netherlands respectively (BARKMAN 1958). This association which is also the type association of *Anomodonto-Leucodontetum sciuroidis* Bark. 1958 suballiance is seen on tree trunks found in shady, basic and very humid areas (BARKMAN 1958, MARSTALLER 2006).

It is reported here, for the first time from the Amanos range of Turkey, where it grows frequently on *Carpinus*

orientalis, *Buxus sempervirens*, *Quercus cerris*, *Platanus orientalis*, *Laurus nobilis* and *Tilia argentea*.

The typical subassociation occurs on the trunks at northern, north-east and north-west slope of both two localities while new subassociation occurs on the tree base frequently north slope where moist and shade of both Mount Musa and Dörtyol Province epiphytically.

The character species with the highest cover and constancy is the humicolous *Anomodon viticulosus*, which at the same time is a character species of the phanerophytic *Fagetalia* order (DIERSSEN 2001). It is often also dominant on rocks where the association is detected. The same holds true for the *Neckerion complanatae* Sm. & Had. ex Kl. 1948 alliance, where the association can be classified. The occurrence of *Leucodon sciuroides*, a further character species of the association, is low because of the higher cover of *Anomodon viticulosus*.

The prevailing mat life form is closely linked with the dominance of pleurocarpous species in the association. Up to now seven subassociations have been described (MARSTALLER 2006) *Anomodonto viticulosi-Leucodontetum sciuroidis* Wiśn. 1930, *thamnobryetosum alopecuri* Marst. 1985, *leucodontetosum sciuroidis* Wiśn. 1930, *isothecietosum myosuroidis* (Barkm. 1958) Marst. 2006, *neckeretosum crispae* (Phil. 1965) Drehw. 1991, *anomodontetosum attenuati* Phil. ex Drehw. 1991, *homalietosum trichomanoidis* (Phil. 1965) Drehw. 1991. The eighth one, typical of the Amanos range is added.

***Anomodonto-Leucodontetum sciuroidis palamocladietosum euchloronis* Kürschner & Düzenli subass. nov.** (Table 1)

Holotypus: Prov. Hatay, Mount Musa, 688m, *Quercus cerris* forest, tab. 1, no. 50. Differential species: *Palamocladium euchloron*.

The genus *Palamocladium* C. Müll. was first ascertained as *Pleuropus* Griff. by GRIFFITH (1842).

But when it was realised that the name *Pleuropus* had also been used for Fungi it was replaced by *Palamocladium* by MULLER (1986) and was introduced into the Brachytheciaceae family by BROTHERUS (1893-1909). *Palamocladium euchloron* which is the most characteristic species of the new subassociation is endemic to the forests of the Black Sea and Caspian Sea coasts (HOFMANN 1997) (Fig. 2). While the floristic studies of bryophytes are proceeding rapidly the bryosociological studies are left behind.

The new subassociation frequently occurs on the more humid lower part of the trunks of trees epiphytically. Physiognomically, this subassociation is dominated by pleurocarpous species, mixed with small pads of acrocarpous species. It is reported for the first time from the Amanos range (Mount Musa and Dörtyol province). This new subassociation especially occurs epiphytically on the trees of shady and humid valley of Mount Musa and Dörtyol. Differential species is *Palamocladium euchloron*, which shows basiphytic and mesophytic characteristics and has a wide distribution on Mount Musa (200-1100 m). It is distributed at Pekmezci province in Dörtyol. It shows both epiphytic, epilithic and epigaeic distribution on both localities. The subassociation is typical of the *Primulo sibthorpii-Quercetum cerridis* Düzenli and Cakan 1997, *Taxo baccatae-Buxetum*

sempervirendis Düzenli and Cakan 1997, *Violo cilicicae-Fagetum orientalis* Düzenli and Cakan 1997 and *Euphorbio macrostegiae-Carpinetum orientalis* Düzenli and Cakan 1997 vascular syntaxa in Mount Musa and *Carpinus orientalis*, *Quercus cerris*, *Fagus orientalis* and *Laurus-Tilia* communities in Dörtyol.

The mesophytic and hygrotolerant characteristics of the species composing the association makes it possible to find them on more humid habitats and generally at the base part of the trees. For this reason the cover of the species is relatively high (55-100%) and the constancy of *Palamocladium euchloron* reaches 100%. Co-dominant in the subassociation are the mesophytic *Anomodon viticulosus*, *Leucodon sciuroides* and *Homalia trichomanoides*.

Syntaxonomically, the association and new subassociation can be classified within the *Neckerion complanatae* alliance of the *Neckeretalia complanatae* Jez. & Vondr. 1962 order.

Higher-ranked character species, such as *Porella platyphylla*, *Neckera complanata*, *Homalothecium sericeum* and *Lejeunea cavifolia* support the classification within the *Neckereta complanatae* Marst. 1986 class (Table 1). This class generally includes epilithic bryophyte communities of vertical rock surfaces and communities of tree roots, tree bases and lower tree trunks. It is characterised by basiphytic, aérohyphytic and sciotolerant species.

Life forms and life strategies

In this study the life form and life strategy analysis of the *Anomodonto viticulosi-Leucodontetum sciuroides typicum* and *A.-L. palamocladietosum euchloronis* are studied (Table 2, 3; Figs 3-6).

The characters of the species of the association and subassociation (e.g. life form, life span, sexual and asexual reproduction, dispersal strategy and life strategy) are given in Table 2.

Life forms (Table 3, Figs 3, 4)

Generally short turf (sT) and cushion (Cu) life forms are plentiful among acrocarpous mosses that grow under xerophytic, sunny conditions. By contrast, mat, weft, tail and fan life forms are proportionally more among pleurocarpous mosses that grow under more humid, shady and hygrophytic conditions (KÜRSCHNER 2004). Because of the high cover of pleurocarpous mosses such as *Anomodon viticulosus*, *A. attenuatus*, *Leucodon sciuroides* and *Palamocladium euchloron*, tail life form is dominant in both, the typical association and the subassociation (Table 3). This dominance is more obvious especially in the subassociation, reaching here a proportion of 68.3%.

The other life forms of the life form spectrum have lower percentage in both syntaxonomic units (Table 3). While weft life form is taking the second place (24.5%) because of the higher cover of *Hypnum cupressiforme* and *Homalothecium sericeum* within *Anomodonto-Leucodontetum typicum*, which has a more xerophytic-mesophytic character than subassociation *A.-L. palamocladietosum euchloronis*; it takes the fourth place within subassociation *A.-L. palamocladietosum euchloronis*.

TABLE 1. *Anomodonto viticulosi-Leucodontetum sciuroidis* Wiśn. 1930; a – *typicum*, b – *A.-L. palamocladietosum euchloronis* Kürschner and Düzenli subass. nov.

Number of relevé	a														Constancy	50 16	
	97	71	17	95	81	41	127	105	111	30	7	37	122	98		Q.c	B.s
Locality (Fig. 1)	2	2	2	2	2	1	1	1	1	1	1	1	1	1	2	2	
Altitude (m)	585	713	718	585	729	978	1120	220	207	1118	775	1077	900	870	688	672	
Size of relevé (cm ²)	450	2500	900	1400	4900	4550	6000	2800	5000	6000	3150	2500	400	1200	5000	3600	
Phorophyte	C.o	C.o	B.s	Q.c	Q.c	C.o	P.o	P.o	P.o	C.o	P.o	C.o	L.n	T.a	Q.c	B.s	
Ø trunk (cm)	20	70	30	30	127	90	2000	2500	2000	100	600	150	40	80	75	32	
Position of relevé	L	L	T	T	T	L	T	T	L	T	T	L	L	T	T	L	
Exposition	N	N	W	N	NW	NE	N	SE	NW	S	NE	NW	NE	N	N	N	
Covering (%)	73	100	90	87	76	98	80	82	95	97	100	100	98	80	100	95	
Number of species	3	5	3	3	7	6	6	8	7	8	8	7	5	4	6	6	
Ch et DAss.																	
<i>Anomodon viticulosus</i>	1	4	.	5	2	2	2	2	5	2	5	5	5	4	V	5	1
<i>Leucodon sciuroides</i>	.	.	.	.	4	.	.	.	1	5	.	.	.	.	II	1	.
<i>Palamocladium euchloron</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.		3	3
<i>Homalia trichomanoides</i>	5	5	5	1	.	1	.	.	.	.	.	.	.	.	II	.	.
ChAll. Neckerion complanatae																	
<i>Anomodon attenuatus</i>	3	1	.	.	.	.	.	.	.	.	.	.	.	.	I	1	2
<i>Neckera crispa</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.		2	5
ChCl. et ChO. Neckeretalia complanatae and Neckeretea complanatae																	
<i>Porella platyphylla</i>	.	1	.	.	.	5	.	.	2	1	.	2	.	1	III	.	1
<i>Neckera complanata</i>	.	.	.	4	2	1	1	1	.	1	3	1	3	3	IV	.	.
<i>Homalothecium sericeum</i>	.	.	.	.	.	4	4	4	.	1	.	2	.	3	III	.	.
<i>Metzgeria furcata</i>	.	.	.	.	.	1	.	.	.	.	1	1	.	.	II	.	.
<i>Lejeunea cavifolia</i>	.	.	.	.	.	.	.	.	.	.	.	.	2	.	I	.	.
Others																	
<i>Radula complanata</i>	.	2	2	.	1	.	.	.	.	.	1	1	1	.	III	+	.
<i>Hypnum cupressiforme</i>	.	.	.	.	3	.	3	3	3	.	.	.	.	.	II	.	.
<i>Isothecium myosuroides</i>	.	.	.	.	.	.	.	.	.	.	.	3	1	.		.	.
<i>Leptodon smithii</i>	.	.	.	.	.	.	.	.	1	3	.	.	.	.	I	.	.
<i>Frullania tamarisci</i>	.	.	.	.	+	.	.	.	.	1	.	.	.	.	I	.	.
<i>Frullania dilatata</i>	.	.	.	.	.	.	.	.	2	.	.	.	.	.	I	.	.
<i>Pterogonium gracile</i>	.	.	.	.	.	1	.	.	.	+	.	.	.	.	I	.	.
<i>Isothecium alopecuroides</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.		.	.
<i>Leptodictyum riparium</i>	.	.	3	.	.	.	.	.	.	.	.	.	.	.	I	.	.
<i>Scorpiurium circinatum</i>	.	.	.	.	.	.	.	1	.	.	.	.	.	.	I	.	.
<i>Scorpiurium sendtneri</i>	.	.	.	.	.	.	.	.	2	.	.	.	.	.	I	.	.
<i>Eurhynchium sitriatum</i>	.	.	.	.	.	.	.	.	.	.	2	.	.	.	I	.	.
<i>Rhynchostegium confertum</i>	.	.	.	.	.	.	.	1	.	.	.	.	.	.	I	.	.
<i>Orthotrichum lyellii</i>	.	.	.	.	.	1	.	.	.	.	.	.	.	.	I	.	.
<i>Orthotrichum affine</i>	.	.	.	.	.	.	.	.	.	.	+	.	.	.	I	.	.
<i>Zygodon rupestris</i>	.	.	.	.	.	.	.	1	.	.	.	.	.	.	I	.	.
<i>Syntrichia subulata</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.		.	.
<i>Dialytrichia mucronata</i>	.	.	.	.	.	.	.	1	.	.	.	.	.	.	I	.	.
<i>Cololejeunea rosettiana</i>	.	.	.	.	.	.	.	.	.	.	.	.	.	.		.	+
Lichenes																	
<i>Parmotrema chinense</i>	.	.	.	.	1	.	.	.	.	.	.	.	.	.	I	.	.

Phorophytes: C.o – *Carpinus orientalis*, B.s – *Buxus sempervirens*, Q.c – *Quercus cerris*, P.o – *Platanus orientalis*, L.n – *Laurus nobilis*, T.a – *Tilia argentea*, F.o – *Fagus orientalis*, J.r – *Juglans regia*, Q.p – *Quercus petrae*, S.o – *Styrax officinalis*, S.t – *Sorbus torminalis*, L – lower base, T – trunk.

TABLE 2. Characters and life strategies of the taxa of the *Anomodont-Neurocladaceae sciuroideae*

Syntaxonomy	Species	Life form	Life cycle			Sexual reproduction			Spores (Ø in µm)		Asexual re-production		Innovation shoots	Dispersal strategy	Seta	Peristome	Life strategy
			annual/biannual	paucennial/perennial	frequent within the 1st year	frequent within the 2nd-4th year	rare	monoecious/dioecious	large (>25 µm)	small (<25 µm)	lacking or rare	rare () or frequent					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Character and differential species	<i>Anomodon viticulosus</i>	Ta	-	+	-	-	+	D	-	+	fd	bf	-	st, lr	l	red	Pv
	<i>Leucodon sciuroides</i>	Ta	-	+	-	-	+	D	-	+	fd	-	sc	st, lr, ac	l	l	Pv
	<i>Palamocladum euchloron</i>	Ta	-	+	-	-	-	D	+	-	-	fd	sc	st, lr, ac	l	l	Av
Character species of the alliance <i>Neckerion complanatae</i>	<i>Homalia trichomanoides</i>	Fa	-	+	-	-	-	A	+	-	-	fd	-	st, lr	l	l	Ag
	<i>Anomodon attenuatus</i>	Ta	-	+	-	-	+	D	-	+	fd	bf	-	st, lr	l	red	Pv
	<i>Neckera crispa</i>	Fa	-	+	-	-	+	D	-	+	+	-	-	st, lr	s	l	Av
Character species of the order <i>Neckeretalia complanatae</i> and the class <i>Neckeretea complanatae</i>	<i>Porella platyphylla</i>	Ma	-	+	-	-	+	D	+	-	-	-	-	st, lr	s	-	Ap
	<i>Neckera complanata</i>	Fa	-	+	-	-	+	D	+	-	-	fd	-	st, lr	s	l	Av
	<i>Homalothecium sericeum</i>	We	-	+	-	(+)	+	D	-	+	-	bs, ge	-	st, lr	l	l	Ap
Others	<i>Metzgeria furcata</i>	Ma	-	+	-	-	+	D	+	-	-	ge	-	st, lr	s	-	Pv
	<i>Lejeunea cavifolia</i>	Ma	-	+	-	-	-	M	-	-	-	-	-	st, lr, ac	s	-	Pp
	<i>Radula complanata</i>	Ma	-	+	-	-	-	P	+	-	-	ge	-	st, lr	s	-	Pv
	<i>Hypnum cupressiforme</i>	We	-	+	-	+	+	D	-	+	+	-	-	st, lr	l	l	Ag
	<i>Isoetecium myosuroides</i>	We	-	+	-	+	+	D	-	-	-	-	sc	st, lr	l	l	Ag
	<i>Leptodon smithii</i>	Fa	-	+	-	-	-	D	-	+	+	-	sc	st, lr	s	red	Av
	<i>Frullania tamarisci</i>	Ma	-	+	-	-	-	D	-	-	-	-	-	st, lr, ac	s	-	Pg
	<i>Frullania dilatata</i>	Ma	-	+	-	-	-	D	+	+	-	-	-	st, lr, ac	s	-	Pg
	<i>Pterogonium gracile</i>	We/i	-	+	-	-	+	D	+	+	-	fd	-	st, lr, ac	l	l	Pp
	<i>Isoetecium alopecuroides</i>	We	-	+	-	-	-	D	-	+	-	-	sc	st, lr	l	l	Ag
	<i>Leptodictyum riparium</i>	We	-	+	-	-	-	A	-	+	-	+	-	st, lr	l	l	Ag
	<i>Scorpiurium circinatum</i>	We/i	-	+	-	-	-	D	-	-	-	fd	sc	st, lr	l	l	Ag
	<i>Scorpiurium sendtneri</i>	We/i	-	+	-	-	-	D	-	-	-	fd	sc	st, lr	l	l	Ag
	<i>Eurhynchium sitratum</i>	We	-	+	-	-	+	D	-	+	+	-	-	st, lr	l	l	Ag
	<i>Rhynchostegium confertum</i>	We	-	+	-	-	+	A	-	-	-	-	sc	st, lr	s	l	Ag
<i>Orthotrichum lyellii</i>	Cu	-	+	-	-	+	D	-	-	-	ge	-	st, lr	s	l	Av	
<i>Orthotrichum affine</i>	Cu	-	+	-	-	-	A	-	-	+	-	-	st, lr	s	l	Ag	
<i>Zygodon rupestris</i>	Cu	-	+	-	-	-	D	-	-	+	ge	-	st, lr	l	red	Av	
<i>Syntrichia subulata</i>	sT	-	+	+	-	-	A	-	-	+	-	-	st, lr	l	l	Ag	
<i>Diatrychia mucronata</i>	We	-	+	-	-	-	D	-	-	+	-	-	st, lr	l	l	Ap	
<i>Cololejeunea rossettiana</i>	Ma	-	+	-	-	-	A	-	-	-	ge	-	st, lr, ac	s	-	Pp	

+ present; - absent; () data uncertain; A - autoecious; ac - achorous strategy; bf - fragmentation of leaves; bs - breaking-off of shoots; Cu - cushion; D - dioecious; Fa - fan; fd - flagelliform diaspores; ge - gemma; l - long; lr - long-range dispersal; M - monoecious; Ma - mat; P - paroecious; red - reduced; s - short; sc - shoots creeping, rhizome-like; sr - short-range dispersal; sT - short turf; Ta - tail; We - weft; We/i - weft, primary stems often stoloniferous, secondary stems erect, frequently incurved when dry; Ag-Pv - life strategies, cf. Table 3.

TABLE 3. Life forms and life strategies (mean percentage cover values) of the species of syntaxa

		<i>Anomodonto viticulosi-Leucodontetum sciuroidis typicum</i>	<i>Anomodonto viticulosi-Leucodontetum palamocladietosum euchloronis</i>		
Life forms	tail	40.7	68.3	Ta	
	fan	23.9	13.7	Fa	
	mat	8.9	10.3	Ma	
	weft (plants irregularly branched)	24.5	7.6	We	
	weft/i (primary stems often stoloniferous, seconder stems erect, frequently incurved when dry)	1.4	–	We/i	
	cushion	0.6	–	Cu	
	short turf	–	0.04	sT	
Life strategies	perennial shuttle species	perennial shuttle species with high sexual reproductive effort	0.79	1.44	Pg
		perennial shuttle species with high asexual reproductive effort	44.5	38.3	Pv
		perennial shuttle species with moderately or low sexual and asexual reproductive effort	0.87	0.04	Pp
	perennial stayers	perennial stayers with high sexual reproductive effort	23.7	9.03	Ag
		perennial stayers with high asexual reproductive effort	10.03	44.7	Av
		perennial stayers with moderately or low sexual and asexual reproductive effort	20.1	6.4	Ap

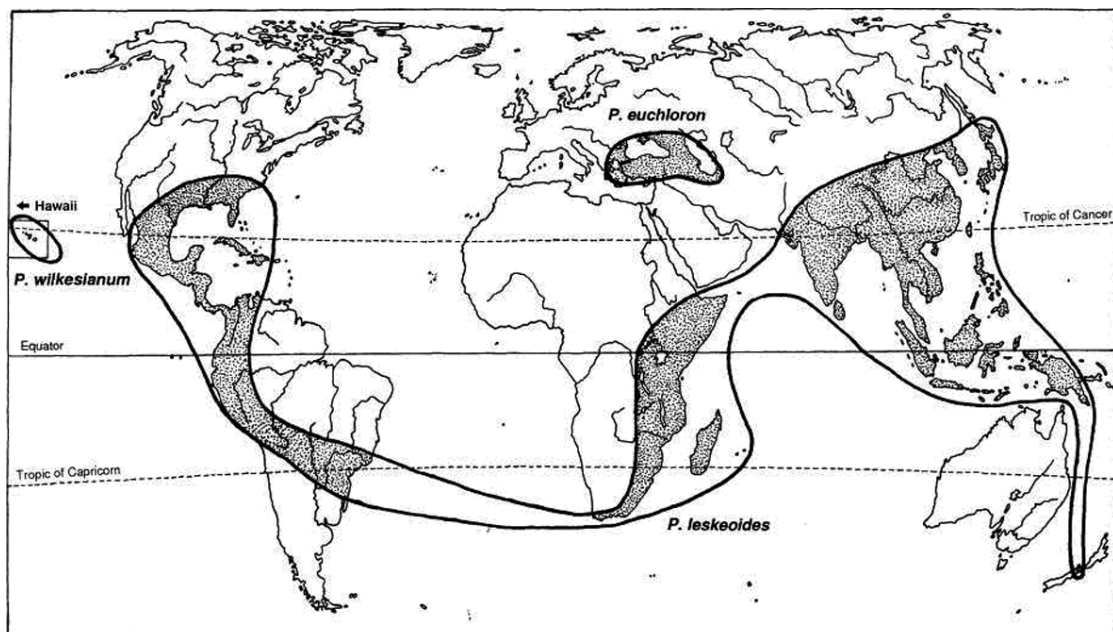


FIG. 2. Overview of world distribution of the genus *Palamocladium* (HOFFMAN 1997)

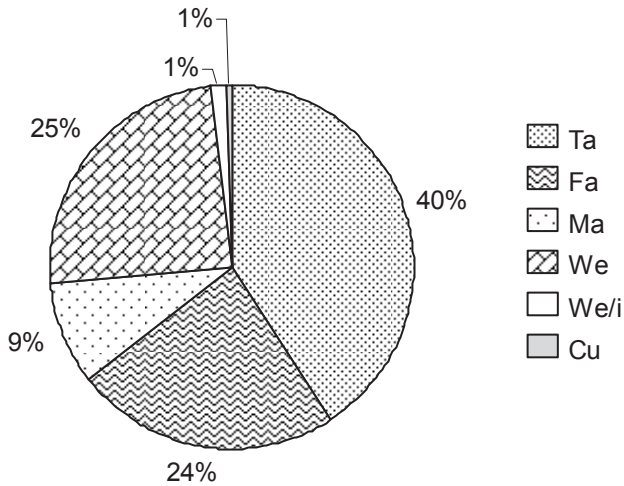


FIG. 3. Life form spectrum of the *Anomodonto viticulosi-Leucodontetum sciuroidis typicum* Wiśn. 1930

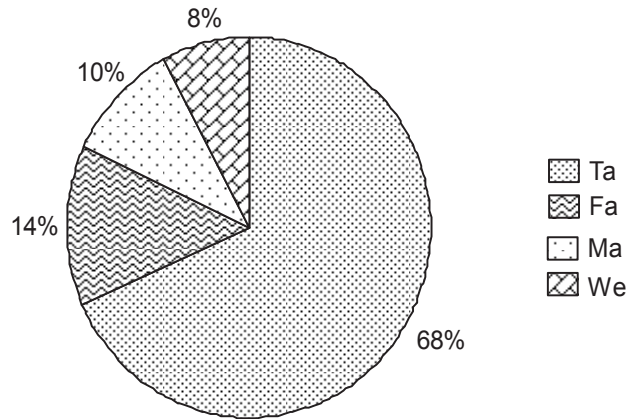


FIG. 4. Life form spectrum of the *Anomodonto viticulosi-Leucodontetum sciuroidis palamocladietosum euchloronis*

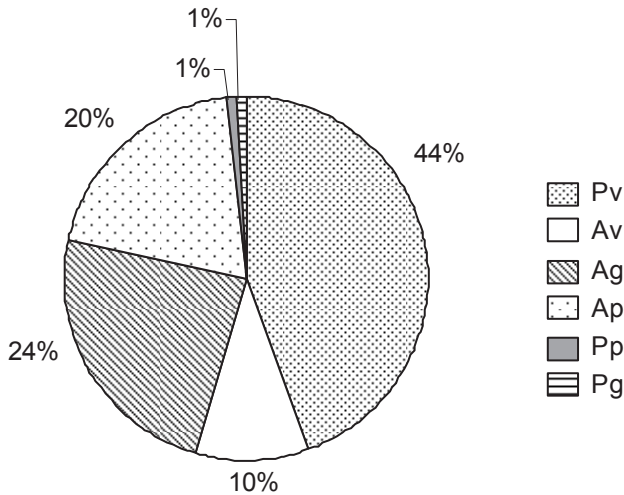


FIG. 5. Life strategy spectrum of the *Anomodonto viticulosi-Leucodontetum sciuroidis typicum* Wiśn. 1930

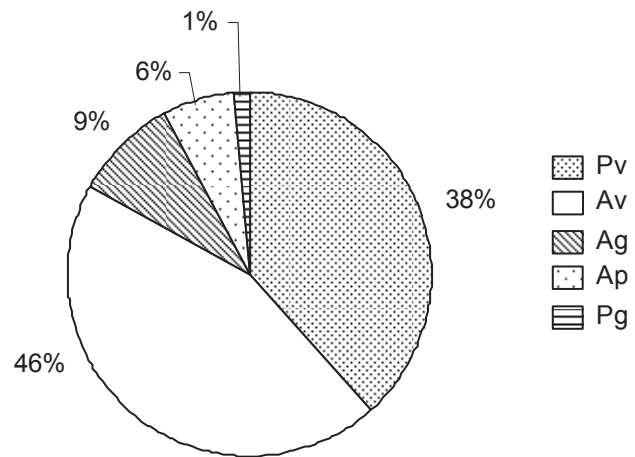


FIG. 6. Life strategy spectrum of the *Anomodonto viticulosi-Leucodontetum sciuroidis palamocladietosum euchloronis*

Within new subassociation fan life form takes the second place because of the species that show more mesophytic characteristics such as *Neckera complanata*, *N. crispa* and *Homalia trichomonoides* especially.

The cushion life form is found in xerophytic species like *Orthotrichum lyellii*, *O. affine* and *Zygodon rupestris* that are distributed on the trunk generally within *Anomodonto-Leucodontetum typicum* (0.6%) but not found in subassociation *A.-L. palamocladietosum euchloronis* that grows on the base part.

Mats (*Porella platyphylla*, *Metzgeria furcata*, *Lejeunea cavifolia*, *Radula complanata*, *Frullania tamarisci*, *F. dilatata*, *Cololejeunea rossettiana*) are in both communities, reaching, however, a percentage of only 10.3% (Figs 3, 4).

Life strategies (Table 3, Figs 5, 6)

According to the life strategy analysis of the *Anomodonto-Leucodontetum typicum* and *A.-L. palamocladietosum euchloronis* two main categories, perennial shuttle species and perennial stayers were detected. Both categories were divided into sub-categories according to their reproduction strategies (Table 3, Figs 5, 6).

Further life strategies, such as annual shuttle species, short-lived shuttle species, fugitives and colonists were not found.

Perennial shuttle species. Perennial shuttle species are characterised by a long life span (pluriennial-perennial taxa); a moderate, low to absent or high sexual and asexual reproductive effort; large spores (> 25 µm); short-range dispersal strategy due to large spores and achorous tendency (DURING 1979, KÜRSCHNER 1999).

The perennial shuttle species are divided into three sub-categories according to their reproduction strategies (Pg, Pv, Pp, Table 3, Figs 5, 6).

Perennial shuttle strategy reaches a higher proportion (46.16%) within the *Anomodonto-Leucodontetum typicum* and proportion of 39.78% within the subassociation *A.-L. palamocladietosum euchloronis* due to the dominance of *Anomodon viticulosus*, *Leucodon sciuroides* and *Radula complanata*. The dominance of these species on the phorophytes is the result of a strong clonal growth, under the more humid site conditions (especially perennial shuttle species with high asexual reproductive effort; Pv).

Other perennial shuttle species (Pg, Pp) have lower percents on both communities.

Perennial stayers. Perennial stayers are typically characterised by a long life span (perennial taxa); small spores (< 25 µm); high sexual and asexual reproductive effort; facilitating long-range, as well as short-range dispersal strategy (chance dispersal). This strategy is clearly dominant (60.13%) in the subassociation *A.-L. palamocladietosum euchloronis* (Table 3, Figs 5, 6). Perennial stayers are divided into three main categories in both communities: passive perennial stayers (Ap), generative perennial stayers (Ag) and vegetative perennial stayers (Av). Passive perennial stayers such as *Porella platyphylla*, *Homalothecium sericeum* and *Dialytrichia mucronata* are characterised by rather low or low sexual and asexual reproduction effort. Generative perennial stayers (*Homalia trichomanoides*, *Hypnum cupressiforme*, *Isothecium alopecuroides*, *I. myosuroides*, *Leptodictyum riparium*, *Scorpiurium sendtneri*, *S. circinatum*, *Eurhynchium striatum*, *Rhynchostegium confertum*, *Orthotrichum affine* and *Syntrichia subulata*) show a regular and frequent sporophyt formation. The vegetative perennial stayers *Palamocladium euchloron*, *Neckera crispa*, *N. complanata*, *Leptodon smithii*, *Orthotrichum lyellii* and *Zygodon rupestris* have a high asexual reproduction effort (via gemma, leaf-like propagules and fragmentation of leaves). Within the subassociation *A.-L. palamocladietosum euchloronis* vegetative perennial stayers (Av) are dominant because of *Palamocladium euchloron*; the characteristic species of the subassociation while the generative perennial stayers (Ag) are dominant within the *Anomodonto-Leucodontetum typicum* because of the dominance of especially *Homalia trichomanoides*.

Summing up, as a result of the life form and life strategy analysis in this study, different functional types were determined that characterise the two epiphytic communities. The most important functional type of the hygrotolerant *Anomodonto-Leucodontetum palamocladietosum euchloronis* are perennial stayers with high asexual reproduction effort while within the more xero-tolerant *A.-L. typicum* perennial stayers with high sexual reproduction effort dominate.

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