

BIOLOGICAL SCIENCES

INVESTIGATION OF PHYTOSOCIOLOGICAL CHARACTERISTICS OF PLANT ASSOCIATIONS OF GREEN GRASS HABITATS (AZERBAIJAN)

Atamov V.

Recep Tayyip Erdoğan University, Faculty of Arts and Sciences, Department of Biology, 53100, Rize, Türkiye

Musayev M.

Ministry of Defense Industry, Aerospace Research Agency, Ecological Institute, Baku Azerbaijan
<https://doi.org/10.5281/zenodo.14236897>

Abstract

This study was carried out to determine the plant associations distributed in the water-swamp vegetation of Azerbaijan between 2007 and 2018. Ninety-five plant associations belonging to 5 types were determined according to their habitat and phytosociological characteristics. Of these, in-water units constitute 33, coastal swamp associations constitute 24, wet grass associations constitute 13, aquatic forest associations constitute 8, and hydrohalophytes constitute 17 plant associations. In the formation of vegetation, *Pragmites australis*, *Juncus litoralis*, *J. acutus*, *Typha latifolia*, *T. angustifolia*, *Schoenoplectus maritimus*, *Potamogeton salicifolius*, *P. pectinatus*, *Najas minor* ssp. *intermedia*, *N. minor* ssp. *armata*, *N. minor* ssp. *marina*, *Ceratophyllum submersum*, *C. demersum*, *Polygonum amphibium* are the taxa with dense populations. *Nymphetum albae*, *Nelumbo caspici-Nymphetum albae*, *Trapaetum hyrcanae*, *Butometum umbellati*, *Sparganietum trifoliatae* associations are among the associations that are exposed to extreme anthropogenic effects, narrowing their area, are under threat and need to be protected.

From fresh grass associations; *Carici-Menyantetum trifoliatae*, *Paspalietum paspalodesi* ass. nova *Juncetum lampolodesi* ass. nova, *Juncetum inflexusi* ass. nova, *Cyperetum longusiae* ass. nova *Sparganietum trifoliatae* ass. nova were described phytocenologically for the first time in the vegetation of Azerbaijan.

Keywords: Habitat, plant associations, vegetation, Water-Swamp, Azerbaijan

INTRODUCTION

In the investigation of the phytocenological properties of the water-swamp plants of Azerbaijan; Əliyev (1969), Babayev (1974), Əfəndiyeva (1989), Musayev (2010) etc. is necessary to record. According to these researchers; aquatic and swamp plants of Azerbaijan are as follows:

1. Genuine aquatic plant formation class

2. Formal class of aquatic and dry plants

It is divided into three formation classes: swamp and riparian vegetation.

I-True aquatic plant formation class

This class is divided into 3 uniform groups (orders):

1. A group of plants that develop under turbulent water.

This group is divided into 2 half groups;

a) half a group of plants whose roots are not rooted in the substrate and grow freely in water layers.

b) a semi-group of forms consisting of completely submerged plants with roots resting on the substrate.

2. A group of plants completely submerged in water consists of plants that flower and bear fruit above the water.

It is divided into 2 halves;

a) The semi-group of submerged, rootless plants whose flowering and fruiting occur above water.

b) Formation of a half group of plants whose flowering and fruiting occur above the water and whose roots are attached to the substrate.

3. Formation group of plants whose leaves extend above the water surface.

This is divided into 2 half groups;

a) The semi-formal group of plants whose leaves extend above the water surface and whose roots do not rest on the substrate,

b) A semi-formal group of plants with a portion of the leaves lying on the water surface and their roots resting on the substrate.

II. A group of plant formations on the banks of streams (streams, lakes, reservoirs, canals) and in swamps.

This group is divided into 2 half groups;

a) half group of large-bodied plants

b) half group of small-stemmed plants

According to habitat diversity in this study, plant diversity in habitats around rivers, streams, and water channels (312 taxa) is richer than in swamps (160), calm, slow-flowing waters (127), and salty lakes and seashores (114 taxa). Table 1). In his research on the water-swamp vegetation of Azerbaijan, Aliyev (1966, 1967, 1969, 1971) recorded 94 plant associations, 20 in water and 46 in both water and land. Babayev (1974) revealed that 51 plant associations exist in the water-swamp vegetation of the high mountain regions of the Lesser Caucasus within the borders of Azerbaijan: 20 in water and 31 in both water and land. Efendiyeva (1989) determined that 41 plant associations exist in the water-swamp vegetation of the Absheron peninsula, 11 in water and 30 in both water and land. Musayev (2010) determined that 32 plant associations exist in the water-swamp vegetation of the Kur-Araz plain: 12 in water and 20 in water and on land. Atamov (2008) showed that Hydrohalophytes are common in the coastal areas of the Caspian Sea. In water-marsh vegetation, crypto-

phytes, hemicryptophytes, and therophytes are dominant in number and are among the characteristic features of this vegetation. These plants adapt easily to the water-swamp environment and can easily reproduce in this environment. Some aquatic plants with rhizomes and perennial herbaceous stems grow easily in salty lakes and swamps, while others grow easily in freshwater lakes and swamps. The distinctive and dominant species of these types of plants sometimes form plain and sometimes mixed associations.

Aliyev (1969), in his study on the water-swamp vegetation of Azerbaijan, detected a total of 94 plant associations, 46 of which are both in water and on land, Babayev (1974), in the water-swamp vegetation in the high mountainous regions of the Lesser Caucasus found: 20 associations in water, 31 in both water and land, in total 51. Efendiyeva (1989 and Musayev 2010), in Absheron peninsula waters, determined that there are a total of 32 plant associations in the water-swamp vegetation of the Kur-Araz plain, 12 of which are in water and 20 of which are found both in water and on land.

Floristic and phytosociological characteristics, including aquatic plant associations, aquatic forest associations, and plant associations of halophytic aquatic areas, were investigated (Musayev, Atamov, 2015; Atamov, Musayev, 2017; Musayev, Atamov, 2018). Furthermore, studies carried out to date have shown that coastal water-swamp ecosystems have been extensively investigated. However, the methods valid worldwide have not been used in classifying vegetation, especially based on the principle of dominance, without considering habitats, the phytocenological structure of vegetation, and ecological conditions.

Our aim in this study was to investigate the floristic and phytosociological characteristics of plant associations belonging to coastal water marsh habitats.

MATERIAL and METHODS

Field studies were carried out between 2007 and 2018 in lakes and swamps located in the plain and mountainous regions of Azerbaijan, in seaside areas, especially in Lankaran (Great and Small Kızılağaç Gulf), Samur Deveçi Plain (Devechi Port), Candar Lake and plains of Nakhchivan in the mountainous parts (Batabat Lake, Araz deryçası, Göy-gol Lake in Ordubad land), Kür Araz plain (Hacıgabal, Sarısu), and Absheron peninsula (Masazır salt lake, Lökbatan, and Kanlıgöl). Plant samples were collected at different vegetation periods. The samples were identified using the 8-volume work "Flora of Azerbaijan" (Karyagin, 1961). These samples were kept in the Herbarium Laboratory of the Botany Institute of the Azerbaijan National Academy of Sciences. Plant life forms were given according to the Raunkier (1934) system. The phytosociological characteristics of plant associations and the creation of vegetation tables were given according to the Braun-Blanquet method (Mirkin, & Naumov,

1987) and the "smallest area" principle, and the syntaxonomic naming of the associations was given according to Weber et al., (2000).

RESULTS

For the first time, this research investigated and syntaxonically evaluated plant associations distributed in wet grass habitats of Azerbaijan's water-swamp vegetation according to the Braun-Blanquet (1964) method. There were eight plant associations in swamp oak associations (Atamov, Musayev, Cabbarov 2017), 19 in aquatic habitats (Musayev, Atamov 2020), and 16 in aquatic hydrohalophyte habitats (Atamov, Musayev, 2020). In these studies, plant associations distributed in the coastal marsh habitats of Azerbaijan were classified for the first time according to the Braun-Blanquet method. Their phytosociological characteristics were classified, and new plant associations were determined. These associations were distributed in rivers, lakes, swamps, and places with low water depth.

The lower parts of the stems of these plants, known as helophyte plants, were located in soil that is always permanently or seasonally under water (swamps). Since they have a developed root system, they become located in soil that is permanently easier for them to grow together.

Various unions belonging to this class, spread over large areas, were found in the target regions. It is not possible to set an exact boundary between these units because although most of the species that participate in the union's functioning are common species, it is possible to see that there are taxa common to other associations.

Water-swamp plant associations were found everywhere in Azerbaijan, starting from sea level to high mountain areas (Grossheym, 1936, 1948, Gulusaşvili 1975, Prilipko, 19670, Prilipko et al. 1961; Aliyev, Halilov, 1976; Hacıyev 1970, Hacıyev et al. 1979, 1990, 1992a, 1992b; Sultanov, 2000; Ibrahimov, 2005; Talibov, İbrahimov, 2008; Mamedov, 2011).

In larger areas, especially in the Absheron peninsula, Samur-Devechi, Kür-Araz plain, Alazan-Eyriçay, Mil-Muğun, Ceyrançol, Qobustan plains, and the regular parts of Nakhchivan, the areas covered by water-swamp vegetation in regular areas were larger and poorer in terms of plant diversity compared to mountainous areas.

When we evaluated according to habitat diversity, the plant diversity in habitats around rivers, streams, streams, and water channels (312 taxa) was richer than habitats such as swamps (160), calm, slow-flowing, pleasant waters (127). The plant diversity in habitats around rivers, streams, and water channels (312 taxa) was richer than that in habitats such as swamps (160), slow-flowing waters (127), and salty lakes and sea shores (114 taxa) (Table 1).

Table 1.

Distribution of Azerbaijan water-swamp flora according to ecosystems

The spreaded environment	Total / (%)
According to height	
Plain	401 / 79,8
Mountainous	200 / 39,8
According to habitat	
Around Stream, Stream, Water Channel	312 / 62,1
Swamp	160 / 31,8
Slow Flowing Water, Quaint Watery Lake	127 / 25,3
Salt Lake, Sea Shore	114 / 22,7
Total	502 / 100

In his research on the water-swamp vegetation of Azerbaijan, C. Aliyev (1969) recorded 94 plant associations, 20 in water and 46 in both water and land (Table 2).

Babayev (1974) revealed that 51 plant associations exist in the water-swamp vegetation of the high mountain areas of the Lesser Caucasus within the borders of Azerbaijan: 20 in water and 31 in both water and land (Table 2).

Table 2.

Comparison of water-swamp vegetation in different regions of Azerbaijan

Systematic categories and habitats	In the territory of Azerbaijan (Əliyev, 1969) Number/%	Minor Caucasian high mountain lakes (Babayev, 1974) Number/%	Absheron peninsula (Əfəndiyeva, 1989) Number/%	Kur-Araz plain (Musayev, 2010) Number/%	According to this research Number/%
Vegetation					
Type	1	1	1	1	1
Formation class/Class	2	2	2	2	12
Formation group/Ordo	12	8	9	8	16
Formation subgroup	-	8	2	4	-
Formation/Wedding Ring	46	33	18	13	26
Association	94	62	37	30	101
Coastal water-swamp	-	-	-	-	24
Wet grass	-	-	-	-	10
Water-swamp forest	-	-	-	-	9
Salt Lake and marsh	-	-	-	-	17
In water	20	22	11	12	33
In water and on land	31	73	30	20	68

Musayev (2010) determined that there are 32 plant associations in the water-swamp vegetation of the Kur-Araz plain, 12 in water and 20 both in water and on land (Table 2). Our syntaxonomic classifications have shown that the water-swamp vegetation of Azerbaijan consists of 101 plant associations: 12 classes, 16 orders, and 26 alliances (Table 2).

Our vegetation studies have shown that water-swamp ecosystems have been extensively investigated in the studies carried out to date. However, the methods

valid worldwide have not been used in the classification of vegetation, especially habitats, phytocenological structure of vegetation, and ecological conditions, carried out only based on the principle of dominance without consideration.

Fresh grass associations:

These and canal units are regularly seen in the pine groves of lakes, swamps, and streams, where water spreads in winter and summer and retreats in the spring.



Figure 1. Some common taxa found in green grass type habitats: a.Kızılağaç Bay, Lenkeran, 12.07.2012, a view from the vegetation, b) *Lithrum salicaria* (Çuxuryurt lake, Şamaxı, 13.07.2012) c) *Phragmites communis* (Deveçi Harbour, 15.07.2012, d) *Potamogeton pectinatus*, 15.07.2012), 15.07.2012), e) *Najas marina* (15.07.2012, Deveçi Port), f) *Ceratophyllum demersum* (Deveçi Port, 15.07.2012), g) *Potamogeton densus* L. 13.07.2012, Çuxuryurt lake, Şamaxı)

1. *Carici-Menyantetum trifoliatæ* Behçet 1994.

The water depth varies between 5-15 cm, the cover degree varies between 100%, and the cover size varies between 60-100 cm. In its flora; *Phragmites communis*,

Schoenoplectus lacustris, *Juncus articulatus* is an association with a high probability of encountering species. It is mainly found in the mountainous areas of Naxchivan (around Lake Batabat), swampy meadows, and lake shores (Table 3).

Table 3.

Phytocenological characteristics of the association *Carici-Menyantetum trifoliatæ* Behçet 1994.

Sample area No	331	332	333	334	335	336	337	338	339	340	Life form	Occurrence class
Field width (m2)	4	4	10	10	10	8	8	16	16	10		
Altitude (m)	1140	1160	1170	1280	1230	1370	1375	1420	1430	1435		
Inclination (%)	5	7	7	8	7	6	6	5	4	4		
Weed height (cm)	Ş	Ş	Ş	Ş	Ş	ŞQ	ŞQ	ŞQ	ŞQ	ŞQ		
Soil type	60	90	90	95	97	90	100	60	80	80		
Number of species	BÇ*	BÇ	BÇ	BÇ	ÇB*	ÇB	ÇB	BÇ	BÇ	BÇ		
Covering degree %	4	3	4	3	3	2	3	4	4	3		
Sample area No	80	90	85	90	80	85	95	90	90	85		
Character taxa of the association:												
Carex riparia	33	33	32	33	43	43	34	34	32	32	H _k	V
Menyantes trifoliata	+1	.	+1	.	.	.	+	+	+	+	H _k	III
Associates												
Phragmites communis	+	+	+	+	+	.	.	+	+	.	H _k	IV
Schoenoplectus lacustiis	.	.	.	.	.	+	+	+	.	+	H _k	II
Juncus acutus	+	+	+	+	+	.	.	.	+	.	H _k	III
BÇ*-Boggy grass, ÇB*- Grassy swamp												

In Fig. 2 (a), the life form of this union and the results of the evaluations showing the frequency of occurrence of the types in the sample areas are given. In the phytocenological structure of this association, in which hydrophytes and hemicryptophytes participate,

species with a very different frequency of occurrence are encountered according to the sample areas, and this might be related to the chemical composition of the soil and water environment in which the association spreads.

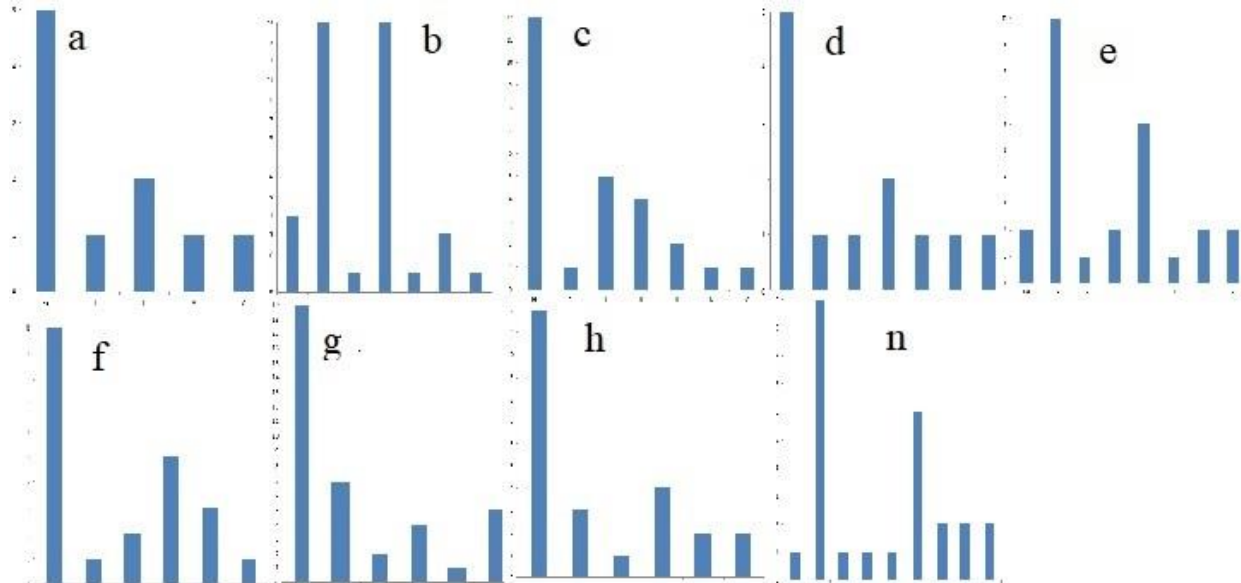


Figure. 2. Ranking of the taxa participating in the fresh grass plant association according to life forms and coincidence class: a. *Carici-Menyantetum trifoliatæ* Behçet 1994, b. *Paspalietum digitariae* ass.nova, c. *Juncetum lampocarpi* ass.nova d. *Juncetum inflexusi* ass.nova, e. *Cyperetum longusiae* ass. nova, f. *Sparganieto-Typhetum latifolia* ass. nova, g. *Veronico-Calthetum polypetalae* Adıgüzel et al. 2009, h. *Mentho-Caricetum pseudocyperus* ass. Nova, n. *Mentho-Caricetum pseudocyperus* ass. nova.

2. *Paspalietum digitaliae* ass.nova.

Water depth is 50-100 cm, cover is 40-80%, cover size is 10-50 cm, species number varies between 2-8, and its flora includes *Rorippa sylvestre*, *R. amphibia*, *Heleocharis palustris*, *Lemna minor*, *Potamogeton pectinatus*, *P. trichoides*, *P. crispus*, *P. perfoliatus*, *Ranunculus saniculifolius*, *Polygonum amphibium*,

Cyperus serotinus, *Mentha aquatica*, *M. pulegium*, *Salix alba*, *Echinochloa crus-galli*, *Rumex pulchra*, *Najas minor*, *Bolboschoenus maritimus*, *Cyperus longus*, *Myriophyllum spicatum*, *Rumex pulcher* species are included (Table 4).

Table 4.

Phytocenological characteristics of the *Paspalietum digitaliae* ass.nova association.

Sample area No	491	492	493	494	495	496	497	498	499	500	Life for m	Oc- cur- re nc e clas s
Field width (m2)	10	10	16	16	16	25	25	25	16	16		
Altitude (m)	60	60	80	80	105	150	110 0	130 0	135 0	140 0		
Inclination (%)	2	3	3	3	5	4	4	3	3	3		
Weed height (cm)	Ş	Ş	Ş	ŞQ	ŞQ	ŞQ	ŞQ	Ş	Ş	Ş		
Soil type	80	95	70	75	70	85	80	60	60	65		
Number of species	BÇ	BÇ	BÇ	BÇ	ÇB	ÇB	ÇB	BÇ	BÇ	BÇ		
Covering degree %	4	5	5	5	5	4	5	5	5	5		
Character taxa of the association:												
<i>Paspalum digitalia</i>	33	34	33	32	44	44	34	32	33	23	Hk	V
Associates												
<i>Rorippa prostrata</i>	+	+	.	.	.	.	.	+	.	+	Hk	III
<i>Rorippa amphibia</i>	.	.	.	.	+	.	.	.	.	.	Hk	I
<i>Heleocharis palustris</i>	.	.	+	.	.	.	+	.	+	.	Hk	II
<i>Potamogeton pectrinatas</i>	.	.	.	+	.	+	.	.	.	.	Hd	I
<i>Potamogeton trichoides</i>	.	.	.	+	.	.	.	.	.	.	Hd	I
<i>Ranunculus sleratus</i>	.	+	.	.	.	.	.	+	.	.	Hk	I
<i>Polygonum amphiliium</i>	+	.	.	.	.	.	.	.	.	.	Hk	I
<i>Cyperus longus</i>	.	.	.	.	+	.	.	.	.	+	Hk	I
<i>Mentha aquatica</i>	.	.	+	.	.	.	+	.	.	.	Hk	I
<i>Mentha pulegium</i>	.	.	.	.	.	+	.	.	+	.	Hk	I
<i>Salix alba</i>	.	.	.	+	.	.	.	.	.	.	Ph	I
<i>Echinochloa erus-var.mutica</i>	.	+	.	.	.	.	.	+	.	.	Hk	I
<i>Rumex pulchra</i>	+	.	.	.	+	+	.	.	.	+	Hk	III
<i>Cyperus longus</i>	.	.	+	+	.	.	+	.	+	+	Hk	III
<i>Bolboschoenus maritimus</i>	.	.	.	.	.	.	+	+	.	.	Hk	I
<i>Rumex puleher</i>	.	+	.	.	.	.	.	.	.	.	Hk	I
<i>Najas minor</i>	+	.	.	.	+	.	.	.	.	.	Hd	I
<i>Myriophyllum sploatum</i>	.	.	+	.	.	.	.	.	+	.	Hd	I

In the Fig. 2 (b), this association's life form and the evaluations' results showing the frequency of occurrence of the types in the sample areas are given. It was concluded that in the phytocenology structure of this association, in which panerophytes, hydrophytes and hemicryptophytes participate, species with very different frequency of occurrence were encountered according to the sample areas, and that this was related to the chemical composition of the soil and water environment in which the association spread.

3. *Juncetum lampocarpi* ass. nova.

In all parts of Azerbaijan, from plains to subalpa, in areas bordering streams and swamps and areas with a water level of 20-40 cm, the degree of cover is 80-100%, the cover structure is 80-100%. 100 cm, taxon number varies between 12-15 and its flora; *Carex paniculata*, *Elymus compressus*, *Lysimachia vulgaris*, *Menyanthes trifoliata*, *Orchis palustris*, *Potentilla recta*, *Thalictrum lucidum*, *Euphrasia pectinata*, *Epipactis palustris*, *Plantago major*, *Lotus corniculatus*, *Triglochin polyustris* are found in dominant species (Table 5).

Table 5.

Phytocenology characteristics of *Juncetum lampocarp* ass.nova association.

Sample area No	501	502	503	504	505	506	507	508	509	600	Life form	Occurrence class
Field width (m2)	16	16	16	16	16	16	10	10	16	16		
Altitude (m)	50	60	70	75	80	80	90	95	120	130		
Inclination (%)	2	2	2	2	3	3	3	3	2	2		
Weed height (cm)	-	-	-	-	-	-	-	-	-	-		
Soil type	80	70	70	75	60	65	60	65	75	80		
Number of species	BÇ	BÇ	BÇ	BÇ	BÇ	BÇ	ÇB	ÇB	ÇB	ÇB		
Covering degree %	4	4	4	6	5	7	5	4	5	5		
Character taxa of the association:												
<i>Juncus lampocargus</i>	34	44	44	33	33	32	33	33	43	43	Hk	V
Associates												
<i>Carex vesicaria</i>	11	+	.	+	.	+	+	+	.	.	Hk	IV
<i>Blymus compresus</i>	.	.	+	+	+	.	.	.	+	+	Hk	III
<i>Lysimachia vertisilaris</i>	.	.	.	.	.	+	+	.	.	+	Hk	II
<i>Orchis palustris</i>	+	+	.	.	+	.	.	.	.	.	Ge	II
<i>Potentilla anseriana</i>	.	.	+	+	+	+	.	.	+1	11	Hk	III
<i>Tordylium maximum</i>	.	.	.	.	.	+	+	.	.	.	Hk	I
<i>Genista paluta</i>	.	.	.	+	.	.	.	+	.	.	Hk	I
<i>Epipactis veratriifolia</i>	+	+	.	.	.	.	.	.	.	+	Hk	II
<i>Plantago major</i>	.	.	+	.	+	.	.	.	+	.	Hk	II
<i>Lothus corniculatus</i>	.	.	.	.	.	+	+	.	.	.	Hk	I
<i>Triglochin palustris</i>	.	.	.	+	.	+	.	.	.	.	Hk	I
<i>Menyanthes trifoliata</i>	.	.	.	.	.	.	.	+	+	.	Hk	I

In the Fig. 2 (c), this association's life form and the evaluations' results showing the frequency of occurrence of the types in the sample areas are given. It has been concluded that in the phytocenology structure of this association, in which geophytes and hemicryptophytes participate, species with very different frequency of occurrence are encountered according to the sample areas, and that this is related to

the chemical composition of the soil and water environment in which the association spreads.

4. *Juncetum inflexusi* ass. nova.

The swamps that dry out in the spring months have a cover degree of 80%, a cover size of 60-100 cm, and a number of taxa between 4 and 5. They are found everywhere in Azerbaijan, from the plains to the subalpine zone, in swampy pine forests on the banks of rivers and streams (Table 6).

Table 6.

Phytocenological characteristics of *Juncetum inflexusi* ass.nova association.

Sample area No	89	90	91	92	93	94	95	96	97	98	Life form	Occurrence class
Field width (m2)	10	10	10	10	10	10	10	10	10	10		
Altitude (m)	85	85	75	90	95	110	115	120	200	250		
Inclination (%)	0	2	2	3	3	3	3	3	3	2		
Weed height (cm)	70	75	70	60	65	65	70	70	60	75		
Soil type	ÇB	ÇB	ÇB	ÇB	ÇB	ÇB	ÇB	ÇB	ÇB	ÇB		
Number of species	4	4	3	3	3	3	3	3	4	3		
Covering degree %	80	90	90	85	85	90	85	100	90	85		
Character taxa of the association::												
<i>Juncus inflexus</i>	33	33	34	32	32	33	33	44	33	32	Hk	V
Associates												
<i>Junus gerardi</i>	11	+	+	.	.	+	.	.	+	+	Hk	III
<i>Lotus corniculatus</i>	+	+	.	+	+	.	+	+	+	.	Hk	IV
<i>Iris acuriloba</i>	.	.	+	.	+	.	.	+	.	+	G	II
<i>Alisma lanceolatum</i>	.	.	.	+	.	+	.	.	.	.	Hk	I
<i>Carex inflata</i>	+	+	.	.	.	.	+	.	+	.	Hk	II

In the Fig. 2 (d), the life form of this union and the results of the evaluations showing the frequency of occurrence of the types in the sample areas are given. In the phytocenology structure of this association, in which geophytes and hemicryptophytes participate, species with a very different frequency of occurrence were encountered according to the sampling areas, and

that this might be related to the chemical composition of the soil and water environment in which the association spreads.

5. *Cyperetum longusiae* ass. nova

The water depth is 20-40 cm, the cover degree is 90-100%, the cover size is 80-100 cm, the number of taxa varies between 12-15 and its flora; *Phalaris*

arundinacea, *Iris pseudocorus*, *Lycopus europaeus*, *Bolboschoenus maritimus*, *Lythrum salicaria*, *Althea officinalis*, *Barbarea verna*, *Potentilla reptans*, *Rumex palustris*, *Polygonum lapatifolium*, *Oenanthe aquatica*. *O. fistulosa* dominant species participate together in the

phytoceneological structure of the association. It is spread in swampy areas in the plains of Samur-Deveçi, Kür-Araz and Kür Düzü, Bozdağ, Kiçik Qafqaz, Nahçıvan and Lankara, and in famous pine meadows along the canal (Table 7).

Table 7.

Phytocenological characteristics of the *Cyperetum longusiae* ass. nova association.

Sample area No	511	512	513	514	515	516	517	518	519	520	Life form	Occurrence class
Field width (m2)	16	16	16	25	25	16	16	16	4	4		
Altitude (m)	1300	1350	1325	1375	1320	1325	1335	1340	1350			
Inclination (%)	3	3	4	5	5	4	5	4	3	3		
Weed height (cm)	Ş	Ş	Ş	ŞŞ	ŞŞ	ŞQ	ŞQ	ŞŞ	ŞQ	ŞQ		
Soil type	40	45	55	55	60	55	50	50	40	45		
Number of species	BÇ	BÇ	BÇ	BÇ	BÇ	ÇB	ÇB	ÇB	BÇ	BÇ		
Covering degree %	5	6	6	7	7	6	9	11	9	8		
Character taxa of the association:												
<i>Cyperus longus</i>	53	33	34	33	32	32	11	11	+	33	Hk	V
Associates												
<i>Phleum paniculatum</i>	.	+	.	+	+	.	11	+	11	+	Hk	I V
<i>Iris cartholinae</i>	.	.	+	+	.	+	.	.	.	.	G	II
<i>Lycopus europaeus</i>	+	.	.	.	.	.	.	+	+	+	Hk	II
<i>Bolboschoenus maritimus</i>	+	+	.	.	.	.	+	+	+	+	Hk	III
<i>Lythrum salicaria</i>	.	.	+	+	+	.	.	.	.	.	Hk	II
<i>Althea officinalis</i>	.	.	.	.	.	+	+	+	+	.	Hk	II
<i>Barbarea minor</i>	.	.	+	.	.	.	.	+	.	+	Hk	II
<i>Potentilla anseriana</i>	+	+	.	.	.	+	+	+	+	+	Hk	I V
<i>Rumex pulcher</i>	+	+	+	+	+	+	+	+	+	+	Hk	V
<i>Polygonum amphibium</i>	.	.	.	.	.	.	+	+	+	.	Hk	II
<i>Oenanthe silaifolia</i>	.	.	.	.	+	.	.	+	.	.	Hd	I
<i>Oenanthe fistulosa</i>	.	.	.	+	.	.	+	.	.	.	Hd	I

In the Fig. 2 (e), the life form of this union and the results of the evaluations showing the frequency of occurrence of the types in the sample areas are given. In the phytocenological structure of this association, in which hydrophytes, geophytes and hemicryptophytes participate, species with a very different frequency of occurrence according to the sampling areas were encountered, and that this might be related to the chemical composition of the soil and water environment in which the association spreads.

6. *Sparganieta-Typhetum latifoliae* ass. nova.

Water depth 0-20 cm, cover degree 70-100%, cover size 10-50 cm, taxon number varying between 2-8, spread with dominant species in its flora, *Carex pseudocyperus*, *Juncus sparganifolius*, *Alisma platago-aquatica*, *Lythrum salicaria*, *Mentha aquatica*, *Lycopus europaeus*, *Myosotis laxa*, *Galium palustre* were the most common species. It is spread across the Kür-Araz Plain, Lənkəran Plain, Kiçik Qafqaz, and especially the Samux-Dəvəçi Plain (Table 8).

Table 8.

Phytocenological characteristics of the *Sparganieto-Typhetum latifolia* ass. nova association.

Sample area No	421	422	423	424	425	426	427	428	429	430	Life form	Occurrence class
Field width (m ²)	16	16	16	25	25	25	16	16	16	16		
Altitude (m)	110	85	90	95	95	110	115	115	110	120		
Inclination (%)	3	3	3	2	2	2	3	3	2	2		
Weed height (cm)	-	-	-	-	-	-	-	-	-	-		
Soil type	120	110	110	115	90	90	95	80	95	100		
Number of species	ÇB	ÇB	ÇB	ÇB	ÇB	ÇB	BÇ	BÇ	BÇ	BÇ		
Covering degree %	4	4	5	5	4	4	4	7	7	4		
Character taxa of the association:												
<i>Typha latifolia</i>	33	33	22	22	33	34	33	22	11	33	Hk	V
<i>Sparganium polyedrum</i>	+	.	11	+1	+	.	.	+1	11	+	Hk	III
Associates												
<i>Sparganium neglectum</i>	.	+	.	+	.	+	+	+	.	.	Hk	III
<i>Carex diandra</i>	+	.	+	+	.	.	.	.	+	.	Hk	II
<i>Juncus subulatus</i>	.	.	+	.	.	.	.	+	.	+	Hk	II
<i>Alisma plantago-aquatica</i>	.	.	.	.	+	.	.	.	+	.	Hk	I
<i>Lytherum salicaria</i>	.	+	.	+	.	+	.	.	+	.	Hk	II
<i>Mentha aquatic</i>	+	.	.	.	.	+	+	+	+	.	Hk	III
<i>Lycopus europaeus</i>	.	.	+	.	.	.	+	.	.	+	Hk	II
<i>Myosotis caespitosa</i>	.	.	.	.	.	.	.	+	+	.	Th	I
<i>Galium palustre</i>	.	+	.	.	+	.	.	+	.	.	Hk	II

In Fig. 2 (f), this association's life form and the evaluations' results showing the frequency of occurrence of the types in the sample areas are given. It has been concluded that in the phytocenological structure of this association, in which therophytes and hemicryptophytes participate, species with a very different frequency of occurrence according to the sampling areas were encountered, and that this is related to the chemical composition of the soil and water environment in which the association spreads.

7. *Geranio-Heraclietum trachylomae* Adıgüzel et. Al. 2009.

This union can be found in the mountainous areas of Azerbaijan at an altitude of 2000 m above sea level, on the banks of flowing waters. The *Geranio-Heraclietum trachylomae* association is more common in the mountainous parts of Kiçik Qafqaz, Naxçıvan and Lan-kara, in the upper mountain oaks and on the banks of

streams in the Subalp mountains. *Heracleum trachyloma* and *H.sosnovskii*, which spread upwards along the valleys at 2300 m above sea level and sometimes grow up to 2 m in height, easily withstand floods because their cover and abundance are sufficient. Because the alluvial substances brought by the water are collected in the upper parts of the unit, the soils that became productive have 90-100% vegetation cover.

Since plant associations have yet to be investigated according to the Braun-Blanke method in our region, this method has been used in the countries adjacent to our country with similar vegetation and ecological conditions, and topography to define the association in a syntaxonomic direction. The plant association was reviewed syntaxonomically based on the studies carried out. It is known that this association *Alchemillo retinervis- Şibbaldietea parviflorae* Vural 1996 class is the only syntaxon that represents this association (Table 9).

Table 9.

Phytocenology characteristics of *Geranio-Heracleetum trachylomae* Adıgüzel et al 2009 association.

Sample area No	551	552	553	554	555	556	557	558	559	560	Life for m	Oc- cur- renc e clas s
Field width (m2)	100	100	100	100	100	100	100	100	100	100		
Altitude (m)	210 0	210 0	190 0	190 0	200 0	200 0	210 0	210 0	210 0	210 0		
Inclination (%)	20	20	20	20	15	15	20	20	10	10		
Weed height (cm)	\$	\$Q	\$Q	\$\$	\$\$	\$\$	\$	\$	\$	\$		
Soil type	55	55	70	70	70	70	65	65	65	70		
Number of species	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ		
Covering degree %	90	90	85	85	90	90	90	90	85	85		
Sample area No	12	9	10	10	8	9	10	9	10	10		
Character taxa of the association:												
<i>Heracleum trachyloma</i>	33	33	33	44	44	33	33	44	43	43	Hk	V
<i>Geranium palustre</i>	+1	+2	+2	+1	+1	+1	12	+1	+1	+2	Hk	V
<i>Valeriana alliariifolia</i>	+1	.	+2	+1	.	.	.	+1	+1	+2	Hk	III
<i>Dryopteris thelypteris</i>	+2	+2	12	.	.	.	22	.	12	.	Hk	III
Character taxa of the <i>Alchemilla retinervis</i> – <i>Sibbaldieta parviflorae</i> classis												
<i>Polygonum hydropiper</i>	+1	+1	+1	+1	.	.	+1	+1	+1	.	Hk	IV
<i>Caltha polypetalla</i>	12	.	.	.	12	12	.	.	.	11	Hk	II
<i>Aconitum orientale</i>	12	22	12	12	22	+1	+1	12	+1	.	Hk	V
<i>Epilobium perviflorum</i>	+1	+1	+1	+1	+1	+1	+1	+1	+1	+	Hk	V
Associates												
<i>Rumex alpine</i>	+1	+1	+1	+1	+2	+1	+1	11	+1	.	Hk	V
<i>Geum rivale</i>	.	.	+1	+1	+1	+1	+1	.	.	+1	Hk	III
<i>Heracleum asperum</i>	.	+1	.	.	+1	+1	+1	+1	+1	.	Hk	III
<i>Mentha longifolia</i>	.	.	.	+1	.	.	.	.	.	+	Hk	I
<i>Heracleum pastinacifolium</i>	.	.	.	.	.	.	.	.	+2		Hk	I
<i>Alchemilla caucasica</i>	+	.	.	.	.	.	.	.	.	+1	Hk	I
<i>Silene compacta</i>	.	+	.	.	.	.	.	.	.	+1	Hk	I
<i>Cephalaria gigantea</i>	+1	.	.	+2	.	.	.	+1	.		Hk	II
<i>Doronicum macrophyllum</i>	.	.	.	.	.	+1	.	.	.		Hk	I
<i>Knautia montana</i>	+	.	.	.	.	.	.	.	.	11	Hk	I
<i>Cirsium incanum</i>	.	.	+1	.	.	.	+2	.	.		Hk	I

In Fig. 2 (g), the life form of this union and the results of the evaluations showing the frequency of occurrence of the types in the sample areas are given. In the phytocenology structure of this association, in which hemicryptophytes participate, species with a very different frequency of occurrence were encountered according to the sample areas, and this might be related to the chemical composition of the soil and water environment in which the association spreads.

8. *Veronico-Calthetum polypetalae* Adıgüzel et al. 2009.

This union is found in the mountainous parts of Azerbaijan, on the edges of water springs and streams at 1700-3200 m altitudes above sea level. It is spread in

Big and Small Qafqazin, Naxchivan, and Lankaran mountain regions. *Caltha polypetala*, the characteristic species, is a hydrophyte plant and spreads in cold areas. Another character type is *Veronica anagallis-aquatica*, which has a wide distribution amplitude and is more adaptable to the climate and water temperature, and only represents the permanent hydrophyte plant associations that the waters bring to life. It is a plant. This union has created a strong abundance and cover in the cold waters. It also controls the light of the habitat, as both characters form a tight unity. Plants with the low number of buds and that benefit less from light are more common in the flora of the union (Table 10).

Table 10.

Phytocenology characteristics of the *Veronico-Calthetum polypetalae* Adıgüzel et al. 2009 association.

Sample area No	611	612	613	614	615	616	617	618	619	620	Life form	Occurrence class
Field width (m2)	16	16	16	16	25	25	25	16	16	16		
Altitude (m)	1750	1790	1800	1800	1850	1850	1950	1900	1900	1800		
Inclination (%)	10	15	15	15	10	10	15	15	20	20		
Weed height (cm)	Q	Ş	Ş	Ş	Ş	Ş	Ş	Ş	Q	Q		
Soil type	70	60	70	70	80	80	80	70	70	65		
Number of species	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ	DÇ		
Covering degree %	7	7	8	6	4	3	7	8	7	6		
Sample area No	80	80	75	85	85	90	90	90	85	80		
Character taxa of the association:												
<i>Caltha polypetala</i>	43	55	44	45	55	55	33	33	44	55	Hk	V
<i>Veronica anagalis-aquatica</i>	12	12	22	11	11	12	12	12	22	11	Hk	V
Character taxa of the class <i>Alchemillo retinervis</i> – <i>Sibbaldieta parviflorae</i>												
<i>Polygonum persicaria</i>	.	+1	+1	11	+1	+1	+1	.	.	.	Hk	III
<i>Epilobium adnatum</i>	+1	.	.	.	.	.	+2	11	.	.	Hk	II
Associates												
<i>Poa trivialis</i>	.	+1	11	11	.	.	+1	11	11	+1	Hk	IV
<i>Geum rivale</i>	+1	+1	+1	.	.	.	+1	11	11	+1	Hk	IV
<i>Scrophularia olata</i>	+1	+1	.	.	.	.	.	33	+1	+1	Hk	III
<i>Ranunculus muricatus</i>	.	.	+1	+1	.	.	.	+1	+1	+1	Hk	III
<i>Cirsium incanum</i>	12	+1	+1	.	.	.	+1	+1	+1	.	Hk	III
<i>Geranium sylvaticum</i>	.	.	.	+1	.	.	.	.	.	.	Hk	I
<i>Lathyrus aphace</i>	+1	.	+1	.	.	.	.	.	.	.	Hk	I
<i>Mentha longifolia</i>	.	.	.	.	+1	.	.	.	.	.	Hk	I

In Fig. 2(h), the life form of this union and the results of the evaluations showing the frequency of occurrence of the types in the sample areas are given. In the phytocenology structure of this association, in which hemicryptophytes participate, species with a very different frequency of occurrence are encountered according to the sampling areas, and this might be related to the chemical composition of the soil and water environment in which the association spreads.

9. *Mentho-Carietum pseudocyperus* ass. nova.

These units can be found in the high mountain ranges of Azerbaijan, in irrigated areas, lakes, rivers and irrigated mountain meadows. These units are found in the Eastern regions of Turkey and Iran and the high

mountainous regions from the north of Iraq to the Qafqaz Mountains (Ocakverdi et al., 2009).

Since the majority of the plants in the flora of this association are European-Siberian elements, *Quercus-Fagetum* Akman, Quezel, Barbero 1978 and *Alchemillo retinervis-Sibbaldieta parviflorae* Vural 1996 class and its related *Swertio ibericae-Nardetalia strictae* Vural 1996 He was represented in the th army. This is concrete proof that the high mountainous regions of Azerbaijan remain under the influence of the Kolida subregion of the Euro-Siberian phytogeographical region. Accordingly, the region's research, which has a special place syntaxonically, should be continued (Table 11).

Table 11.

Phytocenology characteristics of the *Mentho-Caricetum pseudo-cyperus* ass. nova association.

Phytocenology characteristics of the <i>Mentha carinthiaca</i> - <i>Carex pseudo-cyperus</i> ass. nova association												
Sample area No	623	624	625	626	627	628	629	630	631	632	Li fe fo r m	Oc- cur- renc e clas s
Field width (m2)	50	50	50	50	25	25	16	16	25	50		
Altitude (m)	100	100	100	100	100	100	100	100	100	100		
Inclination (%)	2430	2430	2140	2200	2210	2235	2250	2270	2290	2350		
Weed height (cm)	35	35	30	30	30	35	35	35	30	25		
Soil type	Şa	Şa	Şa	Şa	Şa	Şa	Şa	Şa	Şa	Şa		
Number of species	75	75	70	70	75	60	65	75	75	80		
Covering degree %	NÇ	NÇ	NÇ	NÇ	NÇ	NÇ	NÇ	NÇ	BÇ	BÇ		
Sample area No	11	9	5	11	11	7	5	5	6	8		
Field width (m2)	85	90	90	75	75	90	90	90	90	85		
Character taxa of the association:												
<i>Carex pseudo-cyperus</i>	33	33	33	11	12	33	33	33	33	33	H k	V
<i>Mentha longifolia</i>	33	22	22	22	22	+1	+1	11	22	+1	H k	V
<i>Prunella vulgaris</i>	+1	+1	.	12	12	+1	.	.	.	+1	H k	III
Character taxa of the <i>Querco – Fagetea</i> classissinifinin												
<i>Salvia viridis</i>	12	+	+	22	11	+1	.	.	.	+1	H k	IV
<i>Rubus ideaus</i>	+1	.	.	.	+1	.	.	.	.	+1	C h	II
<i>Scrophularia ovate</i>	+1	.	.	+	+1	.	.	+1	.	.	H k	II
Character species of the class <i>Alchemillo retinervis-Sibbaldietae parviflorae</i>												
<i>Caltha polypetala</i>	+1	+1	.	+1	.	.	+	.	.	.	H d	II
<i>Trifolium micronatum</i>	.	+		+1	.	.	+	.	.	.	H k	II
Associates												
<i>Rumex crispus</i>	12	.	.	+1	+1	22	.	.	11	+1	H k	IV
<i>Epilobium adnatum</i>	.	+1	+1	11	11	.	.	+	.	.	H k	III
<i>Geranium sylvaticum</i>	+1	.	.	.	.	+1	.	.	.	.	T h	I
<i>Alchemilla sedelmeyeriana</i>	+2	.	.	+2	+1	.	+	.	.	.	H k	II
<i>Heracleum trachyloma</i>	.	+2	.	.	22	.	.	.	+1	+1	H k	II

In Fig. 2 (n), the life form of this union and the results of the evaluations showing the frequency of occurrence of the types in the sample areas are given. In the phytocenological structure of this association, in which hydrophytes and hemicryptophytes participate, species with a very different frequency of occurrence are encountered according to the sample areas, and this is related to the chemical composition of the soil and water environment in which the association spreads.

DISCUSSION AND CONCLUSION

Water-swamp vegetation has been studied in many regions of the world.

Many scientists worldwide have been working to classify plant types, and studies in this direction continue today.

Studies on the classification of aquatic habitats in the world in terms of vegetation diversity show that this

vegetation is very rich in terms of diversity. Mucina., Bültmann et al. (2016).

Water-swamp vegetation has been researched throughout the world and the European continent and classified floristically and phytosociologically at the community level (Dubnya., 2006; Rivaz-Martinez, Gonzales, et al., 2001; Mucina L, Bültmann H, Dierßen K et al., 2016).

In Turkey, wetlands (Behçet, 1994a, 1994b; Seçmen Ö. & Leblebici E. (1997); Çakan et al., 2003; Karaömeroğlu, 2007), saline wetlands (Aydoğdu et al., 2002; Hamzaoglu and Aksoy, 2009) and flooded areas (Kutbay et al., 1998) some phytosociological studies have been carried out on.

It was noted that in Turkey's wetlands, 23 plant associations are distributed in water, 31 in coastal meadows, 7 in wet meadows, 1 in wetland tree communities,

and 21 in saline associations (Seçmen and Leblebici, 1996).

In his studies on Bulgaria's aquatic plant associations, Hırvnak (2002a, 2002b) emphasized that similar plant associations exist in the vegetation classification of the Potametea, Lemnetea, and Charetea classes in the region.

Gecheva et al., (2013) investigated the aquatic macrophytes of the streams in Bulgaria. They stated in this floristic study that their composition was hydrophytes, halophytes, and amphiphytes in the region's aquatic ecosystems.

Yücel et al. (2010) examined the heavy metal biomonitor feature of the *Myriophyllum spicatum* species, which is distributed along the Porsuk River in Turkey. Ocakverdi et al. (2009) noted that water-swamp associations are common in the vegetation of Kısır Mountain and spread from the inner streams to the alpine zone. Some of these associations can be found in the water marsh plant associations of the high mountainous regions of Azerbaijan.

Korkmaz et al. (2012), in their research conducted in Samsun Province Goları Wildlife Protection Area, made a syntaxonomic evaluation of dune, saline, and forest-type vegetation.

In Turkey, wetlands (Behçet, 1994a, 1994b; Seçme and Leblebici, 1997; Çakan et al., 2003; saline wetlands (Aydoğdu et al., 2002; Hamzaoğlu and Aksoy, 2009) and flooded areas some phytosociological studies have been carried out on (et al., 1998).

It was noted that in Turkey's wetlands, there are 23 plant associations distributed in water, 31 in coastal meadows, 7 in wet meadows, 1 in wetland tree communities, and 21 in saline associations (Seçmen and Leblebici, 1996). In his studies on the aquatic plant associations of Bulgaria, Hırvnak (2002a, 2002b) emphasized that there are similar plant associations in the vegetation classification of the Potametea, Lemnetea, and Charetea classes in the region. Gecheva et al., (2013) investigated the aquatic macrophytes of the streams in Bulgaria. They stated in this floristic study that their composition was hydrophytes, halophytes, and amphiphytes in the region's aquatic ecosystems.

Yücel et al., (2010) examined the heavy metal biomonitor feature of the *Myriophyllum spicatum* species, distributed along the Porsuk River in Turkey. Ocakverdi et al., (2009) noted that water-swamp associations are common in the vegetation of Kısır Mountain and that they spread from the inner streams to the alpine zone. Some of these associations can be found in the water marsh plant associations of the high mountainous regions of Azerbaijan. Korkmaz et al., (2012) in their research conducted in Samsun Province Goları Wildlife Protection Area. He made a syntaxonomic evaluation of dune, saline and forest-type vegetation.

Atamov (2008) showed that Hydrohalophytes are common in the coastal areas of the Caspian Sea. In water-marsh vegetation, cryptophytes, hemicryptophytes, and therophytes are dominant in number and are among the characteristic features of this vegetation. These plants adapt easily to the water-swamp environment and can easily reproduce in this environment. Some of

the aquatic plants with rhizomes and perennial herbaceous stems grow easily in salty lakes and swamps, while others grow easily in freshwater lakes and swamps. The distinctive and dominant species of these types of plants sometimes form pure and sometimes mixed associations.

In his study on the water-swamp vegetation of Azerbaijan, Aliyev (1969) found a total of 94 plant associations, 20 in water and 46 in both water and land. Babayev (1974) in the water-swamp vegetation in the high mountainous regions of the Lesser Caucasus: 20 in water, 51 in total, 31 in water and on land, Efendiyeva (1989) 11 in water in the water-swamp vegetation of the Absheron peninsula, 30 in total, 41 in water-swamp vegetation of the Kur-Araz plain. Musayev (2010) It was determined that there are a total of 32 plant associations, 12 in water and 20 in land.

Our yntaxonomic classifications have shown that the aquatic communities of Azerbaijan consist of a total of 101 plant associations: 12 classes, 16 orders, and 26 alliances. The vegetation studies in the region showed that the water-swamp ecosystems have been investigated to a great extent. Still, valid methods worldwide were not used in vegetation classification. It was performed only based on the principle of dominance, without considering habitat types, phytosociological structure, and ecological conditions. In the next stage, more detailed research in the large lakes and aquatic communities within Azerbaijan's borders will reveal new flora records and plant associations.

In conclusion; Water-swamp communities: Divided into 5 types according to habitat diversity: 1. In-water communities (33 plant communities in total); 2. Coast marsh troops (31); 3. Wet (moist) grass unions (13); 4. Aquatic forest associations (8), 5. Hydrohalophytes (17 plant associations). Belonging to aquatic associations: *Ruppium maritima*, *Lemnetum minoris*, *Lemnetum gibbae*, *Lemnetum trisulce*, *Potametum pectinati*, *Potametum lucentis*, *Potametum perfoliati*, *Potametum pectinato-perfoliati*, *Potameto Najadetum*, *Myriophylletum spicati*, *Ceratophylletum demersi*, *Nymphaetum albae*, *Nelimbio caspici Nymphaetum albae*, *Potametum natantis*, *Trapetum hycanae*, *Polygonetum amphibii*, *Najadetum marinae*, *Ceratophylletum submersum*, *Myriophylletum verticillati* associations have been defined. Population status: *Pragmites austuralis*, *Juncus litoralis*, *J. acutus*, *Typha latifolia*, *T. angustifolia*, *Schoenoplectus maritimus*, *Potomagetum salicifolius*, *P. pectinatus*, *Najas minor ssp. intermedia*, *N. minor ssp. armata*, *N. minor ssp. marina*, *Ceratophyllum submersum*, *C. demersum*, *Polygonum amphibium* are taxa that have formed associations in larger areas.

Nymphetum albae, *Nelimbio caspici-Nymphetum albae*, *Trapetum hycanae*, *Butometum umbellati*, *Spargenieta-Menyantetum trifoliataea* associations are among the associations that are exposed to extreme anthropogenic effects, narrowing their area, are under threat and need to be protected.

From fresh grass associations; *Carici-Menyantetum trifoliatae* Behçet 1994, *Paspalietum paspalodesi* ass. nova, *Juncetum lampolodesi* ass. nova, *Juncetum inflexusi* ass. nova, *Cyperetum longusiae* ass. nova

Sparganieto-Menyantetum trifoliata ass. nova was described phytocenologically for the first time in the vegetation of Azerbaijan.

References:

1. Aliyev C.A. (1966) Sovremennoe sostoyanie rastitelnosti ozera Sari-su. Uç. Zap. AGU, Ser.Biol. Nauk, 4, 11-16.
2. Aliyev C.A. (1967) Rastitelnost ozera Ak-göl. Uç. Zap. AGU, Ser.Biol. Nauk., 2, 24-27.
3. Aliyev C.A. (1969) Flora i rastitelnost vodoyomov Azerbaydjana i ik kozyaystvennoe znaçenie. Avtoref. diss.dokt.biol.nauk, Azerbaycan Bilimler Akad, Baku. 52.
4. Aliyev C.A. (1971) Geobotaniçeskaya karakteristika formasii trostnika obiknovennogo vodoyomov Azerbaidjana. Soobş. 2. Uç. Zap. AGU, Ser. Biol. Nauk., 3, 34-39.
5. Aliyev C.A. & Halilov M.Y. (1976) Prikurinskie tugaynie lesa Azerbaydjana. Elm, Baku, 134.
6. Atamov V.V. (2008). Phytosociological Characteristics the Vegetation of the Caspian's Shores in Azerbaijan. International Journal of Botany, 4(1), 1-13.
7. Atamov V., Musayev M. (2013), Hazar'ın Azerbaycan'a ait sahil vejetasyonu ve verimliliği MANAS Journal of Agriculture and Life Sciences , cilt.3, sa.1, ss.13-20
8. Atamov V. & Musayev, M. (2016) A new record for the Flora of Azerbaijan *Ranunculus trachophyllus* Chaix (Ranunculaceae). Bangladesh Journal of Botany, 45(3), 703-706.
9. Atamov V. & Musayev, M. (2017). Azerbaijan'ın Sucul Vejetasyonunun Coğrafik Özellikleri. Biyoloji Bilimleri Araştırma Dergisi, 10(1), 37-43.
10. Atamov V., Musayev, M. & Cabbarov, M. (2017). Azerbaijan'ın Sucul Orman Birlikleri. Journal of Anatolian Environmental and Animal Sciences, 2(2), 23-28.
11. Atamov V., Musayev M., Quluyeva T. (2018). Azerbaijan'ın Sucul Orman Birliklerine Katkılar Journal Of Anatolian Environmental And Animal Sciences , cilt.3, .2, .51-61
12. Aydoğdu M., Hamzaoglu E. & Kurt, L. (2002). Nev halophytic syntaxa from Central Anatolia (Turkey).
13. Babayev F. (1974) Flora i rastitelnost gornik ozer Malogo Kafkaza. Avtoref. diss. kand. biol.nauk. Azerbaycan Bilimler Akad, Baku. 31.
14. Behçet L. 1994a. Phytosociological Investigation of Van Lake Macrophyte Vegetation. Turkish Journal of Botany, 18, 229-243. (In Turkish)
15. Behçet L. 1994b. Vegetation of Erçek, Turna and Bostancı (Van) Lakes. Turkish Journal of Botany, 18, 305-312. (In Turkish)
16. Braun-Blanquet J, 1964. Pflanzensoziologie Grundzüge der Vegetationskunde. Springer Verlag, Wien and New York.
17. Dubyna D.V. (2006). Higher aquatic vegetation. Kiev, 412 P.
18. Efendiyeva S.M. (1989) Vodno-bolotnaya flora i rastitelnost Apşeronского poluoostrova i prilagayuşik ostrovov. Avtoref. diss. kandidat biol. nauk. Azerbaycan Bilimler Akad, Baku. 22.
19. Karyagin İ. İ. (1950-1961) Flora Azerbaydjana, (1-8. cilt). Izd.vo AN Azerb.SSR, Baku.
20. Grossheym A. A. (1936) Rastitelnyy resursı Kafkaza. M., MOİP, 435.
21. Grossheym A.A. (1948). Rastitelnyy pokrov Kavkaza. Izd. MOIP, M.-L., 248
22. Gulusaşvili B. Z. (1975) Rastitelnost Kavkaza. M., 232. Katanskaya, V.M. (1981). Vıssaya vodnaya rastitelnost kontinentalnik vodoyomov SSSR. "Nauka", L., 185.
23. Çakan H., Düzenli, A. & Karaömeroğlu, D. (2003). Çukurova Deltası (Yumurtalık lagünü, Akyatan, Agyatan ve Tuz Gölü) vejetasyonunun araştırılması. TUBİTAK, TBAG-1793, Proje sonuç raporu.
24. Gecheva G., Yurukova L. & Cheshmedjiev S. 2013. Patterns of aquatic macrophyte species composition and distribution in Bulgarian rivers. Turkish Journal of Botany, 37, 99-110.
25. Gulusaşvili 1975, Plats göver in Caucasus. M., 232. (in Russian).
26. Karyagin I. I. 1950-1961. Flora of azerbaijan, (vol.1-8.). Izd.vo AN Azerb.SSR, Baku. (in Russian).
27. Korkmaz H. & Mumcu Ü. (2014) Türkiye sulak alan vejetasyonunun genel floristik, ekolojik ve fitososyolojik özellikleri. 3. Sulak Alan Kongresi, 23-25 Ekim, Samsun, 2013, p. 3-15,
28. Ibrahimov E.Ş. (2005). Rastitelnost Nakçivanskoı Avtonomnoı Respubliki i yey narodnokozyaystvennoı znaçenie. Baku. 230 p.
29. Talibov T. & Ibrahimov E. (2008) Nakçivan muhtar respublikası florasının Nahçivan. 350 p. taksonomik spektri,
30. Seçmen Ö. & Leblebici E. (1997) Türkiye sulak alan bitkileri ve bitki örtüsü. Ege Üniversitesi basımevi, Bornova, İzmir. 404 s.
31. Sultanov E. G. 2000. Potential Ramsar Sites of Azerbaijan. Wetlands International AEME Publ., Baku. 152 p. (in Russian)
32. Memmedov V.A. 2011. Ecohydrological problems of Kura depression lakes and the basics of their regulation. Azerbaijan. MBA Geology Institute works. Bakı-Nafta Pres. 339 s. (in Azerbaijan)
33. Musayev M. K. (2010) Kür-Araz ovalığının şirin su hövzelerinin florası ve bitkiliğinin müasir ekoloji veziyyeti. Bakı. 138 s. 60
34. Musayev, M. K., Atamov, V. V. (2013) Useful plants of water-marsh flora of Azerbaijan. Biological Diversity and Conservation, 6(2): 150-180.
35. Musayev M., Atamov V. , Cabbarov M. (2015) Azerbaijan's water-marsh vegetation. Biological Diversity and Conservation ,8, ss.119-129
36. Musayev, M. & Atamov, V. (2020). Phytosociological Features of Aquatic Plant Communities of Azerbaijan. J. Anatolian Env. and Anim. Sciences, 5(4), 655-667.
37. Mucina L, Bültmann H, Dierßen K, Theurillat J.P , Raus T, Čarni A, (2016) Vegetation of Europe: hierarchical floristic classification system of vascular

plant, bryophyte, lichen, and algal communities...Applied vegetation science 19, 3-264

38. Mirkin B. M. & Naumov L. G. (1987) Метод классификации растительности по Braun-Blanquet в СССР. Усп.соврем.биол.,-104, вып. 1. p.145-160.

39. Prilipko L. I. (1939) Rastitelnie otnosheniya Nakiçev. ASSR. Iz-vo AN Az. FAN SSSR, T.VII, Baku. 196 p.

40. Prilipko L.I. (1965) Karta rastitelnosti Azerbaydjanskoy SSR, Moskov, M 1/1 000 000.

41. Prilipko L.I. (1970) Rastitelnyy pokrov Azerbaydjana. Baku. 168.

42. Prilipko L.I. & Agacanov S. D. (1972) Rastitelnost Azerbaydjanskogo poberejya Kaspiya i prognozy yey izmeneniya v svyazi s dinamiko y urovnya morya. V kn.: Baku. 5, p. 2-61.

43. Prilipko L.I., Aliyev R. A., Bogdanov M. P. & Mailov A. I. (1961) Perspektivy ispolzovaniya prirodnykh zapasov Trostnika i Arundo trostnikovogo dlya bumajno-selluloznoy promyshlennosti v Azerbaydjane. J. Izvestiya AN Azerb.SSR, Seriya Biol. i Med. Nauk, 7, 31-43.

44. Raunkier, C. 1934. The life forms of plants and statistical plant geography. Oxford. 48-51

45. Rivaz-Martinez S., Gonzales F. F., Izco, J., Loidi, J., Lousa M. & Penas, A. (2001) Syntaxonomical checklist of vascular Plant communities of Spain and Portugal to association level. Itineta Geobotanica, 14(5), 1-341.

46. Hacıyev V. D. (1970) Vysokogornaya rastitelnost Bol'shogo Kafkaza i ee hozyaystvennaya znacheniya. Baku., Elm, 280 p.

47. Hacıyev V.D., Kulieva K. G. & Vagabov Z. V., (1979) Flora i rastitelnost vysokogorii Talışha. Baku, Elm, 148p.

48. Hacıyev V.D., Aliev D.A., Kuliev V.Ş. & Vagabov Z.B. (1990). Vysokogornaya rastitelnost Malogo Kafkaza. Baku, Elm, 210 p.

49. Hacıyev, V.D. (1992a). Azerbaycan'ın bitki örtüsü haritası. Baku, M.1/600 000.

50. Hacıyev, V.C. (1992b). Rastitelnyy pokrov Azerbaydjana. GK geodezii i kartografii Azerb. Respubliki, Baku, 242 p.

51. Hacıyev, V.D., Mailov, A.I., Atamov, V.V. & Ponomarenko, L.I. (1991). Zapasy *Phragmites australis* (Cav.) Trin.ek. Steud. i *Arundo donax* L. v Azerbaydjane. J. Rastitelnyy Resursy, 3, 42-46

52. Hamzaoglu E. and Aksoy A. 2009. Phytosociological Study on the Halophytic Communities of Sultansazlığı (Inner Anatolia/Turkey). Ekoloji, 16(60), 8-15.

53. Hırıvnaç R.2002. Aquatic plant communities in the catchment area of the Ipeľ river in Slovakia and Hungary. Part II. Classes Potametea. Thaiszia Journal of Botany. Kosice. 12, 137-160.

54. Seçmen, Ö. & Leblebici E. 1996. Türkiye wetland plants and vegetation. Ege University Press, Bornova, İzmir.404 s. (In Turkish)

55. Weber H. E., Moravec J. & Theunillat J. P. (2000) International Code of Phytosociological Nomenclature, 3rd edition.

56. Yücel E., Edirnelioğlu, E., Soydam, S., Çelik, S. & Çolak, G. 2010. *Myriophyllum spicatum* (Spiked water-milfoil) as a biomonitor of heavy metal pollution in Porsuk Stream/Turkey. J. of Biological Diversity and Conservation, 3(2), 13