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A Little Known Vegetation Class of the Former USSR – Flood-Plain Ephemeretum (Isoëto-Nanojuncetea Br.-Bl. et Tx. 43)

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ABSTRACT

The position of the class in the A.P. Shennikov ecological-phytocoenotic classification and in the R.V. Kamelin florocoenotype system is considered. Ecological attachment of communities, their seasonal dynamics, life form composition, predominant ways of pollination and dissemination are characterized. Remarks on the method of description of flood-plain ephemetum communities are made. For the former USSR territory, a complete prodromus of the class syntaxa comprising by now nine associations and one community that are briefly defined is given. For West Siberia, the subassociations Cypero-Limoselletum (Oberd. 57) Korneck 60 scirpetosum lateriflori subass.nov. and Eleocharito-Caricetum bohemicae Klika 35 gnaphalietosum rossici subass.nov., as Androsace filiformis-Juncus bufonius community are described. A review of literature of the former USSR is given, and the most important foreign references are indicated.

The class Isoëto-Nanojuncetea Br.-Bl. et Tx. 43 comprises communities of short-lived annual plants developing in habitats with sharply varying level of surface-underground waters within the Holarctic floristic kingdom. There is a large list of publications [1] on description and study at length of the communities of this class in Central Europe and Mediterranean area. A special work [2] was dedicated to the review of its syntaxonomic structure. A number of syntaxa belonging to this class have been described in North America [3]. Similar groups of syntaxa in the rank of special classes or orders have been described in South America [4], South-West and West Africa [5-7], and Australia [8].

The present paper concerns the order Cyperetalia fusci Pietsch 63, the only one that comprises, according to the available data, communities in the territory of the former USSR. These communities are the most common in river flood-plains. According to the ecological-phytocoenotic classification traditional for the USSR [9], the communities of stenotopic bank annual plants can be assigned to a special type of vegetation - ephemeretum as a separate class of formations. Nevertheless, having designated the pioneer groups with a high proportion of annual plants diffused on river alluvia as flood-plain ephemereta (l.c., p. 546), A.P. Shennikov has not reflected them in his classification.

The absence of an appropriate classification cell resulted in such communities being ignored. Single observations [10-19] have not given rise to a detailed study of this vegetation class and have not contributed to its inclusion into classifications existing in the former USSR. This is the more curious if one takes into account that simultaneously with the first version of the ecological-phytocoenotic classification of grassy vegetation [20], characteristic species of the alliance Nanocyperion flavescentis Koch 26 and three associations belonging to it were described [21]. Even the term "flood-plain ephemeretum" proposed for the second time [22] remained long without use. A progress in this field has become evident only recently [23-30], although the first data on communities from the middle Dnieper flood-plain, including the description of a new association, appeared more then a quarter of century ago [31].

Valuable data are contained in some floristic works [32-39]. Flood-plain ephemers form a special floristic complex to which florocoenogenetic complexes of

psammoephemeretum and liman ephemeretum seem to correspond most of all [40]. In this aspect, the flood-plain ephemeretum may be assumed as a special florocoenotype whose description, because of lack of appropriate geobotanical data, is absent in the system of florocenotypes of Middle Asia and Mongolia [41-42]. Ecologically, the flood-plain ephemeretum is close to the florocoenotype of hygrophilic grass and forbs thickets (Hygrocoryphiopoion asiaticum). However, while the latter florocoenotype is represented by tall perennial, less often annual, plant species, the former one consists of short-living short grass communities whose height is often as small as a few centimeters.

The ecological originality of stenotopic flood-plain annual plants has made the researchers detach them as a special group of obligatory ephemers of a low water bank strip [33], or hydroponic ephemers [34]. A part of ephemers, due to zoo- and anthropochoric migrations, spread also beyond the flood-plains where they form derivative communities in supermoisty sites of country roads, quarries, plough lands, etc.

Ephemer meadows occupy habitats with sharp gradients of the water surface level which are not fit for a sustainable settlement of perennial macrophytes and aerohydrophytes. The capacity of bank ephemers to populate such habitats is determined by the short duration of their ontogenesis. At low latitudes (48º north), its duration is 4-6 weeks [28, 33-34]. In the southern regions of Middle Asia, it is probably still shorter. In this respect, stenotopic bank therophytes quite fit the classical definition of ephemers as species that complete their development for 2-6 weeks [43] (cited by [44]). Northwards, the duration of their ontogenesis is gradually prolonged from 6-7 weeks at 49-50º north [45, 46] to 10-11 weeks at 60-61º north [30, 32]. The latter does not make it impossible to consider the high-latitude communities of stenotopic bank therophytes in the ephemeretum composition as a northern rhythmological variant. On the average, hygrophilic ephemer meadows exceed considerably in the rate of development the communities of Turkestan desert ephemeretum whose vegetation lasts, depending on weather conditions of the concrete year, 7-23 weeks [44].

Another difference between desert and bank ephemers consists in the diametrical opposition of limiting factors. While the former are limited by moisture deficit, the latter are so by inundation by deep waters. The beginning of sprouting of flood-plain ephemers is determined by the date of the bank denudation, whereas the end of vegetation depends on the zonal position of the flood-plain fragment and on the hydrological regime of the river. If low water occurs in summer, the ephemer meadows would die out due to the autumn rise of the water levels caused by rains (the Irtysh and Ob flood-plains in the steppe zone). With low water in winter, the duration of development is determined either by the substrate desiccation rate that depends on the dynamics of the water level decline in the river bed (the Black Irtysh flood-plain in the semidesert zone), or by the date of termination of the vegetation season (the Ob flood-plain in the middle taiga subzone).

Perennial plants in the composition of ephemer meadows are represented by juvenile and immature specimens which are normally wetted out in the next year and in this sense are annual plants "under constraint". The wetting-out phenomenon determines the relative successional isolation of the ephemer meadows from the communities of higher ecological levels. The fact is that the water surface level oscillation regime which is favorable for ephemers comprises a definite altitudinal range which we call ephemer belt [47]. While the bank, in the process of its alluvial growth, is within this altitudinal range, only ephemer meadows can develop on it. The length of this period may be as large as 12-16 years [22].

In bank ephemer communities, the specific weight of self-pollinating plants is high. Small-flower riparian plants, e.g., *Limosella aquatica*, can be pollinated in air bubbles even under water; frequently, transition to cleistogamy is observed [48]. Probably *Callitriche*

verna, *Elatine* spp., *Lindernia procumbens*[*], annual Lythraceae, and other small-flower species of the class of dwarf rush communities can be classified with autogamic species.

Dissemination of flood-plain ephemers is characterized by prevalence of hydro- and ornithochory, although for some species of no smaller importance may be other ways, e.g., anemochory for *Gnaphalium uliginosum*. An auxiliary role is played by the diaspore dissemination by ungulates and by transport means, which has helped the most plastic species to spread almost cosmopolitanly (*Limosella aquatica*). Carrying the seeds away by river waters helps the ephemers to spread to new flood-plain territories. They populate preferentially low water banks where during floods there are strong streams. This means that over one or other period of time all the seeds can be carried away downstream beyond the climatically favorable area, which could result in disappearance of the species. And here, the decisive role is played by circumaquatic fowl to whose feet the seeds shed by the autumn stick together with mud. The birds fly in southern directions, orienting to river valleys, and transfer the seeds from the lower part upstream. In this way it is just the flowing waters and circumaquatic birds that realize the circulation of seeds of flood-plain ephemers within river basins.

The peculiarities of the flood-plain ephemeretum add a number of special features to the methods of its studies. In dry years, ephemers are frequent, but form distinct stands most often in small areas. In accordance with this, the test plots must be also small. In our opinion, the optimal size of a test plot when working in new regions is 10 m². Using plots of larger size is labor consuming, since many species of flood-plain ephemers are miniature. Besides, larger plots may comprise parts of ecologically adjacent communities belonging to different vegetation classes. Possibly, it is just this that explains why the syntaxa described in Canada [3] in plots of 225 m² have features similar to those of the class Bidentetea.

Of great interest are the peculiarities of seasonal and yearly dynamics of communities. They can be identified with the data obtained by hydrological stations. For this, near a station, the altitudinal position of ephemer communities is determined with respect to the water level in the river bed, and then also with respect to the zero of the water meter post graph. By the graph of the water level change in the river bed, the date of denudation of some or other plot in the given season is determined, and the age of the community attached to it is calculated. Since at the period of denudation of the upper border of the ephemer belt the rates of water level decrease in river beds of the forest zone are rather high, even with the use of the simplest measuring instruments (a string, goniometer, measuring reel) the error of determination of phenophase change does not exceed 2-3 days.

Since in the existing Prodromi for the territory of the former USSR only two associations of the class Isoëto-Nanojuncetea are indicated [25, 52], we are giving here a list of syntaxa of the class which have been discovered in the territory of the former USSR for the last quarter of the century and identified by us as well using the bibliographical data.

Class Isoëto-Nanojuncetea Br.-Bl. et Tx. 43
Order Cyperetalia fusci Pietsch 63

Alliance Elatini-Eleocharition ovatae Pietsch 65
Ass. Cypero-Limoselletum (Oberd. 57) Korneck 60
Subass. C.-L. typicum
Subass. C.-L. rumicetosum ucranici Taran 94
Subass. C.-L. coleanthetosum Taran 94
Subass. C.-L. scirpetosum lateriflori subass. nov.

[*] Nomenclature: [49-51].

Ass. Eleocharito-Caricetum bohemicae Klika 35
Subass. E.-C.b. gnaphalietosum rossici subass. nov.

Alliance Radiolion linoidis (Rivas Goday 61) Pietsch 65
Ass. Peplido alternifoliae-Juncetum tenageiae Vicherek 68
Androsace filiformis-Juncus bufonius community

Alliance Eu-Nanocyperion flavescentis (Koch 26 s.str.) Rivas Goday 61
Ass. Cyperetum flavescentis Koch 26
Ass. Androsaco filiformis-Peplidetum alternifoliae Solm. et al. 94

Alliance Heleochloo-Cyperion (micheliani) (Br.-Bl. 52) Pietsch 61
Ass. Cyperetum fusci-pannonici (Slavnic 40) Pietsch 65
Ass. Marisco hamulosi-Crypsidetum schoenoidis Taran 93
Ass. Eragrostietum suaveolentis Golub et Kuzmina 92
Ass. Damasonio-Marsileetum strigosae nom. nud.

Alliance **Elatini-Eleocharition ovatae** Pietsch 65

In the order Cyperetalia fusci, this alliance holds the central position, since the communities representing it are widespread and occupy the largest areas. They are attached to river banks, pond muds, and rice fields [2]. Within the forest zone of Russia, the most widespread is the association **Cypero-Limoselletum** whose outline was made earlier [30]. Hereinbelow we are characterizing its rare subassociation which was first described in the flood-plain of the upper Ob in a deposited paper [29].

C.-L. scirpetosum lateriflori subass.nov.

The nomenclature type of the subassociation - Relevé 6 in Table 1. The diagnostic species of the subassociation: *Scirpus lateriflorus*. Communities of the subassociation appear in the years of especially strong floods in unused sites of country roads that pass through the birch and poplar stand massifs. The subassociation is represented by two facies: limosellosum aquaticae and callitrichosum vernae. The stagnant character of moistening at the period of development of ephemers causes the prevalence of the latter. The height of the main storey of communities varies from 0.5-2 (water-starwort) to 3-4 cm (mudwort). Besides, tall species (*Alisma plantago-aquatica, A. gramineum*) which can sometimes form their own storey with a projective covering of up to 15 % are present to some or other degree (Relevé 3). The occurence of photophilic ephemers and the abundance of mudwort are directly proportional to the habitat insolation.

The diagnostic species of the side-flowered club-rush subassociation are rare for Siberia (*Peplis alternifolia*) and Russia (*Scirpus lateriflorus*), and are found on the north-eastern and northern borders of their areals, respectively [53-54]. According to collectors' indications for specimens of these species stored at the Herbarium of the Tomsk University, *Peplis alternifolia* has been collected in West Siberia twice: in the vicinities of the settlement Meret (Suzun Region of Novosibirsk Oblast, E. Rodd, 11.08.1898) and in the vicinities of the settlement Lebyazhye (Yegoryevsk Region of the Altai Krai, I.Yu. Mesoyed, 1931). *Scirpus lateriflorus* has been collected thrice: in the vicinities of Meret (E. Rodd, 10.08.1898) and Barnaul (P.N. Krylov, 02.07.1915; V.I. Vereshchagin, 03.08.1922). Out of these three years, 1898 was a normal year on the Ob River, and 1915 and 1922 were wet ones [55]. One may

suppose that communities of the side-flowered club-rush subassociation develop in wet or normal but rainy years in eroded, temporarily flooded depressions of only high flood-plain, since a thorough study of the Ob bank ephemeretum somewhat to the south of Barnaul carried out by us in summer 1992 did not result in finding *Scirpus lateriflorus* or *Peplis alternifolia*.

In this respect, the side-flowered club-rush subassociation is similar to the Central European association Stellario uliginosae-Scirpetum setacei (Koch 26) Libbert 32, whose communities are now found on temporarily flooded country roads, pasture paths, near cattle watering places, and can have developed in the wild on deer paths [56].

The areal of the subassociation C.-L. scirpetosum lateriflori comprises a piece of the upper Ob flood-plain between Barnaul and the settlements Meret and Verkhniy Suzun in the vicinities of which the known findings of *Scirpus lateriflorus* were made. Further study of the communities concerning their localization in the landscape, periodicity of appearance, synchorology, conditions of preservation of the seed bank for rare species is required. *Scirpus lateriflorus* known to be found in Russia only in the flood-plain of the upper Ob must be in the Red Data Book of Russia. *Peplis alternifolia* should be in the Red Data Book of Siberia.

Table 1

Subass. C.-L. scirpetosum lateriflori subass. nov. (1-8)
Androsace filiformis-Juncus bufonius community (9-10)

Relevé number	1	2	3	4	5	6	7	8	Constancy	9	10
Relevé area, m²	6	5	6	2	2	2	3	4	3.8	5	2
Projective cover, %	40	60	60	30	40	40	50	80	50 %	20	40
Number of species	26	23	15	24	23	31	16	15	21.6	22	19
D. s. of ass. Cypero-Limoselletum											
Limosella aquatica	1	4	1	1	3	2	1	1	V 1-2	.	.
Physcomitrella patens	+	.	.	+	+	+	.	.	III	r	+
Riccia cavernosa	r	.	.	r	+	r	.	.	III	.	.
D. s. of subass. C.-L. scirpetosum lateriflori											
Scirpus lateriflorus	+	+	r	r	r	r	r	r	V	.	.
D. s. of Androsace filiformis-Juncus bufonius community											
Androsace filiformis	.	.	.	.	.	.	.	.		2	3
Gnaphalium sibiricum	.	.	.	.	.	.	.	.		+	1
Blasia pusilla	.	.	.	.	.	.	.	.		r	1
D. s. of Isoëto-Nanojuncetea, Cyperetalia fusci, Elatini-Eleocharition ovatae											
Alisma gramineum	1	1	2	+	1	+	+	1	V +-1	.	.
Riccia cf. huebeneriana	.	r	.	+	1	+	.	.	III	.	.
Cyperus fuscus	r	.	.	.	r	+	.	.	II	.	.
Peplis alternifolia	.	r	.	.	.	r	.	.	II	.	.
Juncus bufonius	.	.	.	.	.	.	.	.		2	2
cf. *Physcomitrella patens*	.	.	.	.	.	.	.	.		r	+
D. s. of Bidentetea											
Polygonum minus	+	+	r	r	r	+	r	.	V	.	.
Rorippa palustris	+	+	.	.	1	+	+	r	IV	r	r
Bidens tripartita	+	+	.	+	.	r	+	.	IV	1	1
Ranunculus sceleratus	r	.	.	.	+	r	r	.	III	.	.
Polygonum hydropiper	.	+	.	.	.	.	.	.	I	1	1
Polygonum scabrum	.	.	.	.	.	.	.	.		+	r

Relevé number	1	2	3	4	5	6	7	8	Constancy	9	10
D. s. of Plantaginetea											
Polygonum propinquum	+	1	+	1	1	1	+	+	V +-1	.	.
Agrostis stolonifera	+	1	+	+	+	+	+	+	V	.	.
Plantago major	r	.	.	+	r	+	r	r	IV	+	1
Polygonum aviculare s.l.	.	.	.	.	.	.	.	.		+	r
Chamomilla suaveolens	.	.	.	.	.	.	.	.		+	+
D. s. of Phragmito-Magnocaricetea											
Alisma plantago-aquatica	1	1	1	+	1	+	1	1	V 1-1	+	.
Veronica anagallis-aquatica	1	+	+	1	1	1	1	1	V 1-1	.	.
Eleocharis palustris	+	+	+	+	+	+	+	+	V	.	.
Typha angustifolia (juv.)	+	+	.	.	+	+	.	r	IV	.	.
Lythrum salicaria	r	r	+	.	+	r	.	.	IV	.	.
Other species											
Callitriche verna	4	1	4	3	2	3	4	5	V 3-4	r	.
Echinochloa crusgalli	+	.	r	+	1	1	+	+	V +-1	+	r
Juncus compressus	+	+	+	+	1	+	.	.	IV	.	.
Populus nigra (juv.)	+	.	.	+	+	r	r	r	IV	.	.
Salix alba (juv.)	r	.	.	r	r	r	.	.	III	.	.
Potentilla anserina	.	+	.	+	.	r	.	.	II	.	1
Achillea cartilaginea	+	r	.	.	.	r	.	.	II	.	.
Elytrigia repens	.	+	r	+	.	.	.	.	II	.	.
Equisetum arvense	.	r	.	+	.	.	.	.	II	r	.
Beckmannia syzigachne	.	.	.	.	.	.	.	.		+	+
Trifolium repens	.	.	.	.	.	.	.	.		+	r
Ranunculus repens	.	.	.	.	.	.	.	.		r	r

Besides, the following species have been found: *Agrostis gigantea* – 6(r), *Alopecurus aequalis* – 9(r), *Bidens cernua* – 2(r), *Botrydium granulatum* – 2(+), *Butomus umbellatus* – 3(+), *Deschampsia cespitosa* – 9(r), *Eleocharis acicularis* – 8(r), *Equisetum sylvaticum* – 10(r), *Galium palustre* – 1(r), *Inula britannica* – 4(r), *Leucanthemum vulgare* – 10(r), *Lysimachia vulgaris* – 4(r), *Mentha arvensis* – 6(r), *Myosotis caespitosa* – 1(r), *Oenanthe aquatica* – 6(r), *Poa angustifolia* – 6(r), *Poa annua* – 9(r), *Poa palustris* – 8(r).

The species abundance is indicated in projective cover scores: **r** - << 1 %; **+** - < 1 %; **1** – 1-5 %; **2** – 6-15 %; **3** – 16-25 %; **4** – 26-50 %; **5** – > 50 %.

Addresses of the described phytocoenoses: **1-8** – rel. 649-656, 13.08.1993, 3.5 km to the south of settlement Verkhniy Suzun, Suzun region of Novosibirsk oblast; **9-10** – rel. 477-478, 15.08.1992, 1.5 km to the west-north-west of settlement Mirnyi, Toguchin region of Novosibirsk oblast.

The second association of the alliance, **Eleocharito-Caricetum bohemicae**, judging by the number of descriptions [2], is the most studied in Central Europe where it is attached to muds of drained fish ponds [57-65]. Floristic data make it possible to assert that it must not be too rare in East Europe either. In the Russian Far East, communities close to the subassociation E.-C.b. coleanthetosum Pietsch et Müller-Stoll 68 have been found [34]. However, in the literature no detailed characteristics of its communities in the territory of the former USSR is available. In West Siberia, we found isolated habitats of this association. The high constancy of *Cyperus fuscus* in composition of Siberian communities makes them close to the subassociation E.-C.b. cyperetosum fusci Pietsch 63 , and the presence of single specimens of *Lindernia procumbens* - to the Lindernio-Eleocharitetum ovatae (Simon 50) Pietsch 61 one. Nevertheless, the floristic differences of the Siberian communities make it possible to consider them as a syntaxon new to the science.

E.-C.b. gnaphalietosum rossici subass.nov.

Nomenclature type – Relevé 9 in Table 2.

Diagnostic species: *Gnaphalium rossicum, Eragrostis amurensis, Androsace filiformis, Physcomitrella patens*.

The subassociation unites communities spread on muddy and muddy-sandy banks in the flood-plain of the upper Ob and lower Biya Rivers. Attachment to streams is uncommon for communities of Eleocharito-Caricetum bohemicae. Probably, the existence of communities of this subassociation is favored by the presence of backwater phenomena in the flood-plain of the upper Ob. In the vicinities of Barnaul, the Ob waters are upthrust by the Novosibirsk Reservoir. The waters of the lower Biya are upthrust by the Katun during the high summer floods caused by the melting of glaciers.

The communities of the subassociation contain a number of species rare in Siberia: *Lindernia procumbens, Eleocharis ovata, Pulicaria vulgaris, Leersia oryzoides, Elatine hydropiper*.

Table 2

Subass. E.-C. b. gnaphalietosum rossici subass. nov.

Relevé area, m²	20	20	14	6	3	5	5	4	4	3	8.4
Grass stand height, cm	10	10	6	6	7	2	8	6	6	4	6.5
Soil covering (%): by grasses	40	60	20	25	30	25	45	35	30	40	35
by mosses	3	3	1	+	0	r	+	+	1	r	0.8
Number of species: vascular	40	57	53	49	36	36	40	46	48	30	43.5
mosses	2	4	6	4	0	1	1	3	2	1	2.4
Mud thicknes, cm	20	4	1	3	6	8	11	9	13	?	36.5
Ground water level, cm	56	15	?	25	42	42	41	45	26	?	36.5
Relevé number	1	2	3	4	5	6	7	8	**9***	10	Constansy
D. s. of ass. Eleocharito-Caricetum bohemicae											
Eleocharis ovata	r	r	+	1	1	1	+	+	+	+	V +-1
Carex bohemica	r	r	.	.	.	.	.	.	.	.	I
D. s. of subass. E.-C. b. gnaphalietosum rossici											
Gnaphalium rossicum	+	+	+	+	+	+	1	1	+	r	V
Eragrostis amurensis Probat.	r	r	+	1	+	1	+	+	+	.	V
Physcomitrella patens	+	+	+	r	.	.	.	.	r	r	III
Androsace filiformis	.	.	+	+	r	.	.	.	r	+	III
D. s. of Elatini-Eleocharition ovatae											
Limosella aquatica	+	r	+	1	1	2	1	1	+	+	V +-1
Riccia cf. *sorocarpa*	.	.	.	+	.	r	+	+	1	.	III
Lindernia procumbens	r	.	r	.	.	.	.	r	r	.	II
Riccia cf. *huebeneriana*	1	1	.	.	.	.	.	.	.	.	I
Riccia cavernosa	.	.	.	r	.	.	.	r	.	.	I
Riccia sorocarpa	.	.	1	.	.	.	.	.	.	.	I
D. s. of Isoëto-Nanojuncetea, Cyperetalia fusci											
Cyperus fuscus	3	4	2	2	2	1	4	3	3	+	V 2-3
Juncus bufonius	r	+	+	+	+	+	+	+	+	r	V
Eleocharis acicularis f. *annua*	r	.	+	+	r	+	+	+	1	4	V
Botrydium granulatum	.	1	+	.	.	.	r	r	r	+	III
Psammophiliella muralis	.	.	+	r	.	.	.	r	r	.	II
Dichostylis micheliana	+	.	.	.	.	.	.	.	.	.	I

Relevé area, m²	20	20	14	6	3	5	5	4	4	3	8.4
Juncus nastanthus	.	.	r	.	.	.	.	.	.	.	I
Physcomitrium pyriforme	.	.	r	.	.	.	.	.	.	.	I
D. s. of Bidentetea											
Rorippa palustris	2	+	+	1	1	+	1	2	+	1	V +-1
Polygonum lapathifolium	r	+	+	1	1	1	1	1	1	+	V +-1
Chenopodium glaucum	r	+	+	+	+	+	+	+	1	+	V
Echinochloa crusgalli	.	1	r	1	+	+	+	+	+	+	V
Bidens tripartita	+	1	.	+	1	.	r	r	+	r	IV
Chenopodium rubrum f. *humile*	+	r	r	r	.	.	.	.	.	.	II
Ranunculus sceleratus	r	+	.	.	.	.	r	.	+	.	II
Polygoum hydropiper	.	+	.	.	+	.	.	.	+	1	II
Bidens cernua	1	1	.	.	.	.	+	.	.	.	II
D. s. of Salicetea purpureae											
Salix alba (juv.)	r	+	+	1	1	1	+	+	+	.	V +-1
Populus nigra (juv.)	.	r	r	+	+	+	+	+	+	+	V
Salix viminalis (juv.)	.	r	.	+	+	.	r	+	r	.	III
Salix triandra (juv.)	.	+	.	+	.	.	.	+	.	.	II
D. s. of Phragmito-Magnocaricetea											
Eleocharis palustris	r	r	.	+	+	+	+	+	+	+	V
Veronica anagallis-aquatica	.	+	+	+	+	r	+	1	+	+	V
Alisma plantago-aquatica	+	+	.	+	+	+	+	+	.	+	IV
Leersia oryzoides f. *inclusa*	.	+	.	+	+	+	1	+	1	.	IV
Butomus umbellatus	.	+	.	.	.	.	1	+	+	+	III
Veronica beccabunga	.	.	+	+	.	+	.	.	+	+	III
Carex cf. *acuta*	.	.	.	+	+	.	.	+	+	.	II
Glyceria maxima (juv.)	.	.	.	+	+	+	.	.	+	.	II
Typha angustifolia	r	r	r	.	.	.	.	.	.	.	II
Rorippa amphibia	+	.	+	.	.	+	.	.	.	.	II
Lycopus exaltatus	+	+	.	.	.	.	.	+	.	.	II
Sparganium emersum	.	+	.	.	+	.	.	.	rj	.	II
Other species											
Plantago major	1	1	1	1	1	+	1	2	1	+	V 1-1
Juncus articulatus	r	+	+	+	.	+	+	+	+	+	V
Juncus compressus	r	r	+	+	r	+	.	r	r	.	IV
Ranunculus repens	r	r	rj	1	+	+j	.	r	+	.	IV
Mentha arvensis	1	+	+	+	r	r	.	+	.	.	IV
Rorippa sylvestris	+	+	+	+	.	+	+	+	.	.	IV
Inula britannica	+	.	r	.	+	+	+	+	+	.	IV
Agrostis stolonifera	.	1	r	r	r	.	r	.	+	r	IV
Callitriche verna	.	.	.	+	1	+	+	+	+	+	IV
Potentilla paradoxa	rj	+	.	.	.	rj	+	+	+	.	III
Sonchus arvensis (juv.)	r	r	.	.	.	.	r	+	r	.	III
Matricaria perforata	.	.	.	+	.	r	+j	rj	+	.	III
Equisetum arvense f. *prostratum*	+	+	+	.	.	+	.	.	.	.	II
Trifolium repens	.	.	+	.	r	+	.	.	+j	.	II
Lythrum virgatum	.	.	.	.	.	.	+	+	+	rj	II
Cirsium setosum	r	r	.	.	.	rj	.	.	.	.	II
Tanacetum vulgare	.	+	r	r	.	.	.	.	.	.	II
Myosotis caespitosa	.	.	r	rj	.	.	+	.	.	.	II

Relevé area, m²	20	20	14	6	3	5	5	4	4	3	8.4
Pohlia wahlenbergii	.	.	r	r	.	.	.	r	.	.	II
Potentilla norvegica (juv.)	.	.	r	.	r	.	.	r	.	.	II
Spergularia marina	.	.	+	+	.	.	.	.	r	.	II
Glechoma hederacea	.	.	+	.	.	.	.	.	rj	+	II
Batrachium rionii	.	.	.	r	r	.	.	.	+	.	II
Carduus crispus (juv.)	.	.	.	.	.	.	r	.	r	r	II

Besides, the following species have been found: *Acer negundo* – 2(rj); *Achillea millefolium* – 3(rj); *Agrostis gigantea* – 3(+), 10(+); *Alisma gramineum* – 7(+), 9(r); *Alopecurus aequalis* – 10(1); *Artemisia absinthium* – 7(rj); *A. sieversiana* – 2(r); *A. vulgaris* – 2(r), 4(+j); *Barbarea arcuata* – 4(+); *Bolboschoenus maritimus* – 2(+), 3(+); *Bryum argenteum* – 2(+), 3(+); *Calamagrostis epigeios* – 1(+); *Carex* cf. *rhynchophysa* – 4(+j), 6(+j); *Chenopodium acuminatum* – 5(r); *Ch. album* – 1(r); *Cicuta virosa* – 2(+); *Dracocephalum nutans* – 2(r); *Elatine hydropiper* – 7(r), 8(r); *Epilobium tetragonum* – 2(r), 6(r); *Erigeron canadensis* – 3(r), 7(r); *Erysimum cheiranthoides* – 2(+), 6(r); *Festuca* sp. – 3(r); *Galium palustre* – 2(r); *Halerpestes sarmentosa* – 2(r), 3(+); *Hypericum* cf. *perforatum* – 3(rj); cf. *Inula* sp. – 7(+); *Leucanthemum vulgare* – 4(r); *Lysimachia vulgaris* – 4(rj); *Lythrum salicaria* – 2(r); *Marchantia polymorpha* – 2(r), 3(r); *Myriophyllum spicatum* – 8(r); *Pedicularis karoi* – 2(r); *Poa* sp. – 3(r); *Polygonum aviculare* s.l. – 7(r), 9(r); *Populus laurifolia* – 3(rj), 10(+j); *Potamogeton perfoliatus* – 4(r), 8(r); *Potentilla anserina* – 2(r), 7(+); *Prunella vulgaris* – 4(rj); *Pulicaria vulgaris* – 1(r); *Rumex aquaticus* – 2(+), 9(r); *R. crispus* – 7(+), 8(r); *R. maritimus* – 1(+), 2(r); *Sagina procumbens* – 3(+); *Sagittaria natans* – 5(+), 8(+); *Salix* spp. (perjuv., indet.) – 10(+); *Scirpus radicans* – 1(+), 2(r); *Scrophularia nodosa* – 3(r), 8(rj); *Sedum hybridum* – 3(r); *Sparganium erectum* – 4(+); *Stachys palustris* – 2(+); *Stellaria* cf. *crassifolia* – 3(+); *Taraxacum officinale* – 3(rj); *Typha latifolia* – 4(+), 9(+); *Urtica dioica* – 3(rj); *Verbascum thapsus* – 3(+); *Veronica longifolia* – 1(r).

Note: mosses and liverworts for rel. 3 were identified by S.G. Kazanovsky, *Eragrostis amurensis* Probat. – by M.N. Lomonosova.

Addresses of the described phytocoenoses: **1** – rel. 608, 29.08.1992. 3 km to the south-west of settlement Bobrovka, Pervomaisky Region of the Altai Krai, floodplain of the Ob, muddy bank of a channel; **2** – rel. 616, 03.09.1992, the same area, mouth of the Bobrovka River; **3-7** – rel. 714, 716-719, 26.08.1994, vicinities of settlement Stan-Bekhtemir, Biysk Region of the Altai Krai; **8-9** – rel. 720-721, 28.08.1994, ibid.; **10** – rel. 715, 26.08.1994, ibid.

Alliance **Heleochloo-Cyperion** (Br.-Bl. 52) Pietsch 61

The alliance Heleochloo-Cyperion replaces the previous one in halophilic and nitrophilic habitats and is spread from Portugal via Spain and South-East Europe to the Caucasus [2].

In the south of East Europe, one may expect to find already known associations of the alliance. Thus, in limans of the lower Kuban River the community Microcyperetum has been described which is surely identified with the ass. **Cyperetum fusci-pannonici** [13]. A related community has been described also in the Taman Peninsula [12].

At the same time, in the territory of Kazakhstan and Middle Asia, are spread communities which undoubtedly belong to new syntaxa. So, in the flood-plain of the Black Irtysh, ass. **Marisco hamulosi-Crypsidetum schoenoidis** [28] has been described. The availability of detailed floristic inventories makes it possible to forecast the presence of its communities in the flood-plains of the Ural [18, p. 144], Don, and Dnieper Rivers [66].

Communities close to Marisco-Crypsidetum are spread in river floodplains of the desert zone [67-69]. Communities described in the lower Volga as the ass. **Eragrostietum suaveolentis** [27] have, in our opinion, a fragmentary character and also belong to a still undescribed syntaxon which is close to Marisco-Crypsidetum. Similar fragmentary communities with codominance of *Eragrostis suaveolens* and *Crypsis schoenoides* have been observed by us in the lower Black Irtysh.

Finally, in Transvolga limans, original communities with codominance of *Marsilea strigosa, Damasonium constristum, Lythrum thymifolium, Middendorfia borysthenica* [19]

which we call provisionally the association **Damasonio-Marsileetum strigosae** are spread. The presence of the former three species makes these communities close to syntaxa of the order Isoëtetalia Br.-Bl. 31 s. str. Obviously, the areal of similar communities also comprises the steppe part of Central Kazakhstan [70].

Alliance **Radiolion linoidis** (Rivas Goday 61) Pietsch 65

The alliance includes the communities spread in habitats which are covered by stagnant water only for a short time. According to W. Pietsch [2], communities utilize in their development only atmospheric precipitation and thrive most of all in wet years rich in precipitation. Nevertheless, communities of the ass. **Peplido alternifoliae-Juncetum tenageiae** described in interdune depressions of the first above flood-plain terrace of the middle Dnieper [31] may undergo a short-time flooding in wet years. Similar habitats are occupied by communities in the flood-plains of the Khopior [36] and Vorskla [14]. The latter are probably close to the ass. Centunculo-Radioletum linoidis Krippel 59.

Phytocoenoses with abundance of *Centunculus minimus* have been also indicated for moist sandy areas of the coast of the Finnish Gulf within Leningrad Oblast [37].

We have also described **Androsace filiformis-Juncus bufonius** community of country roads for the transport of timber of the Salair Range (Relevé 9, 10 in Table 1). Its stands are attached to the belt of chern birch-fir mixed forests. The presence in the community composition of *Blasia pusilla* capable of dominating in shaded places permits to assign them reliably to the alliance Radiolion linoidis. Such roadside communities with dominance of *Juncus bufonius* and involvement or codominance of *Androsace filiformis* seem to be characteristic of the taiga zone of Siberia. We have also found them in the flood-plain of the middle Ob in Alexandrovskiy Region of Tomsk Oblast.

Alliance **Eu-Nanocyperion flavescentis** (Koch 26 s. str.) Rivas Goday 61

The alliance includes communities involving *Pycreus flavescens*. They prefer neutral and slightly salinized habitats and are characterized by the highest proportion of hemicryptophytes among the therophyte communities of the order [2]. Along the southern border of its areal, the alliance is adjacent to the alliance Heleochloo-Cyperion.

Communities of the ass. **Cyperetum flavescentis** have been found in Lithuania [25]. Close to this association are also communities found on the Oskol River, a left-hand tributary of the North Donetz [15]. This alliance is also joined by communities developing in sandy wet hollows of the high flood-plain of the Khopior River [36].

The road communities described in Bashkortostan as the association **Androsaco filiformis-Peplidetum alternifoliae** [24] may be assigned to this alliance with a high probability. These communities occupy an intermediate position between the above described Androsace filiformis-Juncus bufonius community and the road communities from the Khopior flood-plain [38].

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