

**PARTICIPATION OF TAXA OF *REYNOUTRIA* GENUS
IN FRINGE COMMUNITIES OF SELECTED MIDFIELD BIOTOPES
OF THE SŁOWIŃSKIE COAST**

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Abstract

The paper presents results of the research study into fringe communities with participation of the species of the genus *Reynoutria* at the Słowińskie Coast (Central Pomerania). *Reynoutria japonica* and *R. sachalinensis* were introduced from East Asia at the turn of the 19th and the 20th century. Sakhalin knotweed was described at the Słowińskie Coast in 1921 in Darłowo, while *Reynoutria japonica* in 1937 in Ustka. Their hybrid – *Reynoutria xbohemica* was described for the first time in 1980s at the territory of the Czech Republic. The Polish stands *Reynoutria xbohemica* were mentioned at the end of the 20th century. In this paper, the stands of *Reynoutria xbohemica* are the new ones in the Northern Poland, not mentioned so far. Nowadays, *Reynoutria* taxa cause much economic and natural loss. They are especially hazardous in manor parks, gutters and ditches, meadows and pastures.

During the research tests conducted in the period 2008-2012, 105 phytosociological relevés were taken with the application of the Braun-Blanquet's method generally used in Poland. Phytocenoses with participation of the taxa of *Reynoutria* genus were found in fringe communities from the of *Artemisietea vulgaris* class and from *Petasition officinalis* alliance: *Aegopodio-Petasitetum hybridi*, *Heracleeteum mantegazziani*, *Aegopodio-Reynoutrietum sachalinensis* and from *Senecion fluviatile* alliance: *Polygonetum cuspidati*, *Impatienti glanduliferae-Convulvuletum sepium*, *Rudbeckio-Solidaginetum*.

Key words: *Reynoutria* taxa, kenophytes, fringe communities, midfield biotopes, the Słowińskie Coast

INTRODUCTION

Reynoutria species: *Reynoutria japonica*, *Reynoutria sachalinensis* were introduced to Europe from East Asia at the beginning of the 20th century as decorative plants. In 1847, *Reynoutria japonica* was awarded a medal by Society of Agriculture and Horticulture in Utrecht as an interesting decorative plant (Bailey and Conolly 2000). Those taxa were carried to Poland at the turn of the 19th and the 20th century. *Reynoutria sachalinensis* has dispersed into stands at the Słowińskie Coast. Undoubtedly, it was introduced at the territory of Pomerania as a decorative plant (Späth 1930). It was planted in a castle garden in Darłowo at the beginning of the 1930s (Marquardt 1948). Its feral stand was discovered at the Słowińskie Coast in 1932 in Iwęcino at the bank of the Bukowo Lake (Holzfuss 1937). *Reynoutria japonica* was planted in the cities of Pomerania as a decorative plant which is documented by herbarium charts from Ustka (leg. Karl, *Stolpmünde* [Ustka – ed. note], 1937, SLTC). Contemporary stands of communities with *Reynoutria japonica* originated at the Słowińskie Coast from the timber stock yards in the ports of Łeba and Kołobrzeg (Misiewicz 1976).

Reynoutria xbohemica is a hybrid of *R. japonica* and *R. sachalinensis*, which was described for the first time in 1980s at the territory of the Czech Republic (Chrtěk and Chrtková 1983). *Reynoutria xbohemica* was reported for the first time at the territory of Poland at the end of the 20th century (Fojcik and Tokarska-Guzik 2000). In this paper, the stands of *Reynoutria xbohemica* are the new ones, not reported so far in Northern Poland.

In Poland and Central Pomerania *Reynoutria japonica* appears more frequently than *Reynoutria sachalinensis* (Atlas rozmieszczenia... 2001). The present distribution of *Reynoutria xbohemica* at the Słowińskie Coast is represented by Fig. 1.

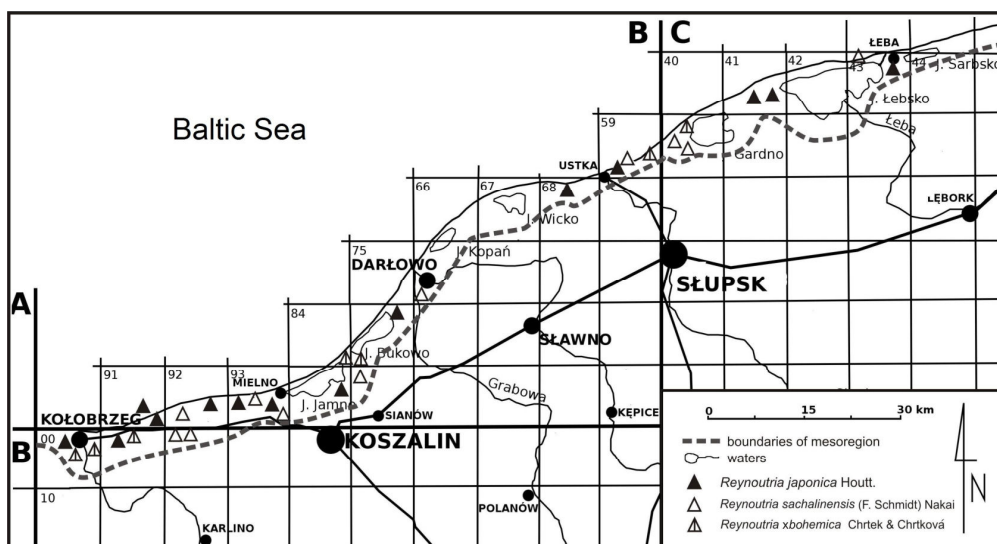


Fig. 1. Current distribution of *Reynoutria japonica*, *Reynoutria sachalinensis* and *Reynoutria xbohemica* on Słowińskie Coast

MATERIALS AND METHODS

The studies of chorology of fringe phytocenoses of selected midfield biotopes with participation of taxa of *Reynoutria* genus were carried at the Słowińskie Coast in the years 2008-2012. That area is situated over the proglacial stream valley of the Łeba River in the East and the Parsęta River in the West, constitutes a northern part of the Koszalin Coastland (Kondracki 2004). The 105 phytosociological relevés were taken with of Braun-Blanquet's method, widely used in Poland. The classification and nomenclature of syntaxa was adopted after Ratyńska et al. (2010) and the nomenclature of the vascular plants after Mirek et al. (2002).

Each stand was identified in a network of ATPOL squares (Zajac 1978).

The collection data of the investigated taxa:

Reynoutria japonica – Ustka (BA59), Duninowo (BA68), Bukowo Morskie (BA85), Ustronie Morskie-Stęszyce, Wieniotowo (BA91), Łopienica (BA92), Kazimierz Pomorski, Strzeżenice Zachodnie (BA93), Dobiesławiec, Osieki Koszalińskie (BA94), Kołobrzeg, Kądzierzno (BB00), Bagicz (BB01), Szczecurze, Ulinia (CA41), Łeba (CA43);

Reynoutria sachalinensis – Ustka (BA59), Darłowo (BA76), Borkowice (BA92), Mielno, Sarbinowo (BA93), Rzepkowo (BA95), Dobrzyca, Miłogoszcz (BB02), Rąbka (CA43), Dębina, Objazda (CA50);

Reynoutria xbohemica – Ustka (BA59), Rzepkowo (BA95), Kołobrzeg (BB00), Dobrzyca (BB02), Dębina (CA50).

All phytosociological relevés were recorded in TURBOVEG data base, and subsequently were grouped, making introductory evaluation of similarities by means of TWINSpan software (Hennekens and Schaminée 2001). The set of 184 was analyzed to the 6th level after previous transformation of 7 degree Braun-Blanquet's scale into the order scale, adopting the following values: r-1, +-2, 1-3, 2-5, 3-7, 4-8, 5-9. Plant communities were classified by means of NCLAS software from SYNTAX 5.0 package (Podani 1993). Similarities between the phytosociological relevés were calculated by means of Jaccard's formula on a basis of presence or lack of compared species. In the group the phytosociological relevés, the method of unweighted pair group method was used with application of the arithmetic mean (Sneath and Sokal 1973).

The analytic charts were prepared by application JUICE software (Tichý 2002). For each relevé a few biocentotic indices were calculated: a general Shannon-Wiener diversity index, Pielou evenness index, Simpson's species abundance index and Simpson's species diversity index. For calculation of cover index, the quantity degrees were recalculated into cover percentage according to the following list: r = 0.1%, + = 0.5%, 1 = 5%, 2 = 17.5%, 3 = 37.5%, 4 = 62.5%, 5 = 87.5% (Pawłowski 1977).

The evaluation of habitat conditions of specified syntaxa was presented on a basis of bio-indicative properties of plants (Ellenberg et al. 1991). For each phytosociological relevé, average figures of: light conditions (L), moisture (M), soil reaction (R), nitrogen level (N), and continentalism (K) were calculated.

The objective of the study comprises inventory of fringe communities of selected midfield biotopes with participation of taxa of *Reynoutria* genus at the Słowińskie Coast.

RESULTS AND DISCUSSION

Reynoutria taxa expansively penetrate midfield biotopes: manor parks, road sides, fringes of meadows and pastures, gutters and melioration canals, small water mid-field ponds, fallow and idle land as well as arable land. *Reynoutria* taxa are connected with river valleys, and their expansion is connected with them, too. It drew attention of many authors, among others, in the Czech Republic (Pyšek et al. 2002), Slovakia (Zaliberová and Jarolimek 2003), Hungary (Török et al. 2003) and in Poland (Tokarska-Guzik et al. 2009). Their presence at ruderal stands was described by, among others, Anioł-Kwiatkowska (1974), Śliwiński (2008) Dajdok and Śliwiński (2009), Olszewski (2009), Konopska (2011).

Numerical classification of synanthropic communities at the Central Pomerania is shown at the dendrogram representing floristic diversity of the tested plant patches. The results of the numerical classification proved that ruderal communities are clearly divided into separate syntaxa groups depending on the habitat variability (Fig. 2). Phytocenoses with participation of *Reynoutria* genus were analysed phytosociologically and consequently, the following syntax from *Artemisietea vulgaris* L. class were separated by Lohmeyer et al. in R. Tx. 1950: *Aegopodio-Petasitetum hybridii* R. Tx (1937) 1947, *Heracleeteum mantegazziani* Klačuk 1988, *Aegopodio-Reynoutrietum sachalinensis* Brzeg in Brzeg and Wojterska 2001 belonging to the association *Petasition officinalis* Sillinger 1933 and *Polygonetum cuspidati* (Moor 1958) Th. Müller et Görs 1969 ex Görs 1974, *Impatienti glanduliferae-Convolvuletum sepium* (Moor 1958) Hilbig 1972, *Rudbeckio-Solidaginetum* R. Tx. et Raabe in R. Tx 1950 ex Anioł-Kwiatkowska 1974 from the association *Senecionion fluviatile* R. Tx. 1950 ex Lohmeyer 1953.

The largest concentrations of the patches with participation of *Reynoutria* spp. were found within the administrative limits of the municipality of Kołobrzeg, between Bagicz and Mielno, in the vicinity of Ustka and Łeba. In the land depressions along the Łeba River and the Parsęta River *Reynoutria japonica* appeared facially in the communities: *Impatienti glanduliferae-Convolvuletum sepium* and *Rudbeckio-Solidaginetum* (Table 1), where in the herbal layer there were frequent instances of *Convolvuletalia sepium* order. Along the banks of the Słupia and the Wieprza rivers, at the ruderal habitats in the community *Polygonetum cuspidati* there were frequent species of *Phragmitetea* class. There were found the species characteristic for *Artemisietea* class: *Artemisia vulgaris*, *Galium aparine*, *Cirsium arvense*. In the association *Impatienti glanduliferae-Convolvuletum sepium*, *Urtica dioica* was a frequent co-dominant, which proves high nitrogen supply of the substratum. They are accompanied by other nitrophyllic taxa: *Anthriscus sylvestris*, *Aegopodium podagraria*, *Alliaria petiolata* and *Geum urbanum*. Their participation in the phytocenoses with *Reynoutria japonica* was described by Brzeg (1988) and Pender (1990). Identical ecological relations were found in the community *Polygonetum cuspidati* from Lower Saxony (Dengler et al. 2007). It is interesting, that *Impatiens glandulifera* is found in fifty percent of the analyzed patches. *Reynoutria* taxa and *Impatiens glandulifera* were classified in Poland as invasive species (Tokarska-Guzik 2005a, b, Tokarska-Guzik et al. 2012)

In addition to *Reynoutria* spp. other neophytes were found in the phytosociological

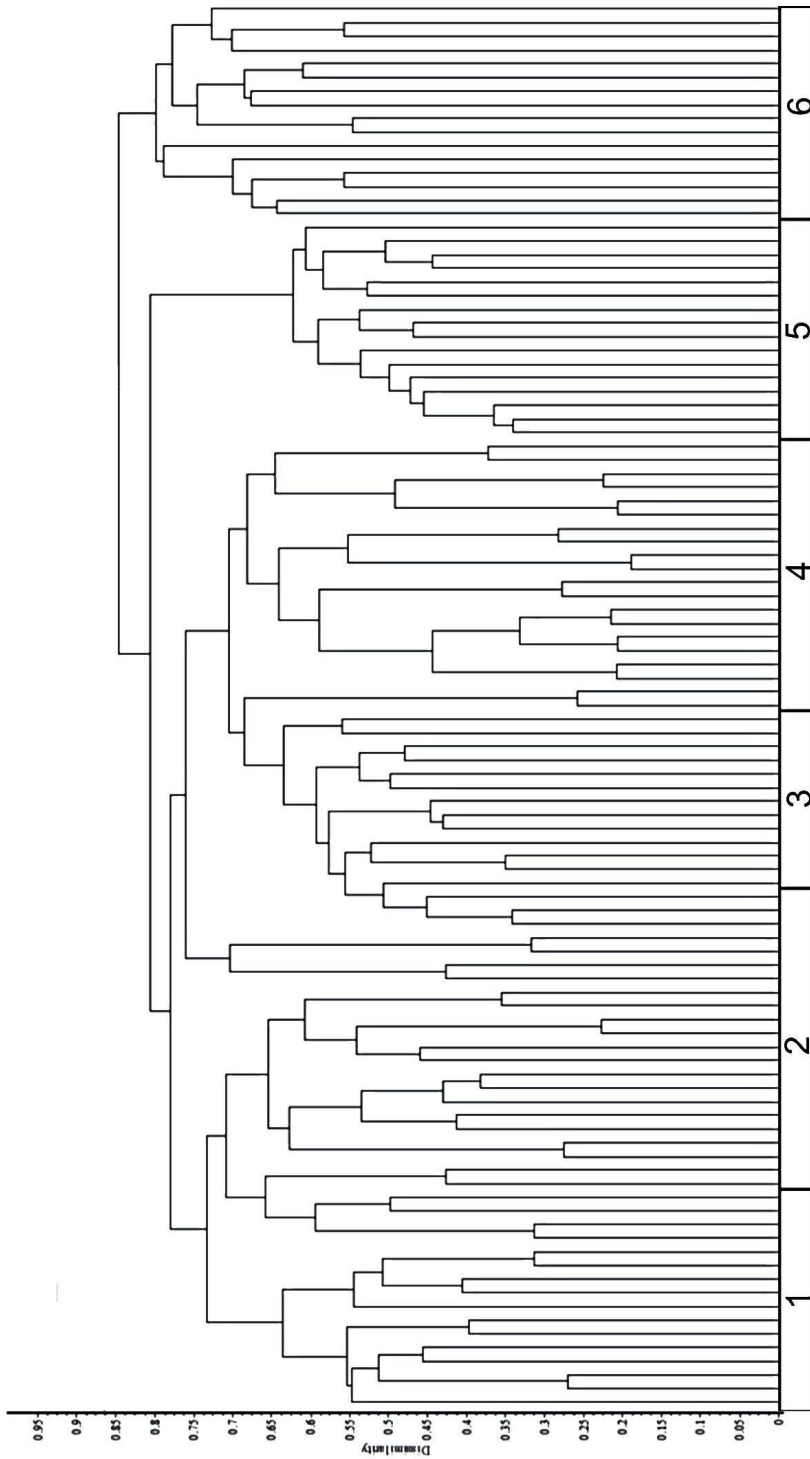


Fig. 2. Classification of plant communities* from *Artemisietea vulgaris* class based on species composition in accordance with Jaccard's formula using the NCLAS program

* Explanation: 1 – *Aegopodio-Petasitetum hybridi*, 2 – *Urtico-Heracleeteum mantegazziani*, 3 – *Aegopodio-Reynoutrietum sachalinensis*, 4 – *Polygonatum cuspidati*, 5 – *Impatienti glanduliferae-Convolutetum sepium*, 6 – *Rudbeckio-Solidaginetum*

Table 1

Floristic differentiation of plant communities from *Artemisietea vulgaris* class
with *Reynoutria* taxa on the Słowińskie Coast

Cl. *Artemisietea vulgaris* Lohmeyer et al. in R. Tx. 1950

O. *Convolvuletalia sepium* R. Tx. 1950 ex. Lohmeyer 1953 em. Oberd. in Oberd. et al. 1967

All. *Petasition officinalis* Sillinger 1933

A. Ass. *Aegopodio-Petasitetum hybridi* R. Tx. (1937) 1947

B. Ass. *Urtico-Heracleetum mantegazziani* Klauck 1988

C. Ass. *Aegopodio-Reynoutrietum sachalinensis* Brzeg in Brzeg et Wojterska 2001

All. *Senecionion fluviatilis* R. Tx. 1950 ex. Lohmeyer 1953

D. Ass. *Polygonetum cuspidati* (Moor 1958) Th. Müller et Görs 1969 ex Görs 1974

E. Ass. *Impatienti glanduliferae-Convolvuletum sepium* (Moor 1958) Hilbig 1972

F. Ass. *Rudbeckio-Solidaginetum* R. Tx. et Raabe in R. Tx. 1950 ex Anioł-Kwiatkowska 1974

Syntaxon	A		B		C		D		E		F	
Number of relevés in table	16		22		12		21		16		18	
Number of species in table	38		47		45		39		46		43	
Average number of species in a relevé	21		18		11		14		16		23	
Min.-max. number of species in a relevé	15-26		16-23		9-20		8-17		14-23		5-21	
Average plant coverage in community [%]	92		96		97		98		98		98	
Min.-max. average plant coverage in community [%]	80-100		90-100		90-100		90-100		90-100		95-100	
	S	D	S	D	S	D	S	D	S	D	S	D
1	2	3	4	5	6	7	8	9	10	11	12	13
ChAss. <i>Aegopodio-Petasitetum hybridi</i>												
<i>Petasites hybridus</i>	V 3965								I	46		
ChAss. <i>Urtico-Heracleetum mantegazziani</i>												
<i>Heracleum sosnowskyi</i>			V 4280								II	115
<i>Heracleum mantegazzianum</i>			IV 185									
ChAss. <i>Aegopodio-Reynoutrietum sachalinensis</i>												
<i>Reynoutria sachalinensis</i>			II	83	V 4594				II	108		
<i>Reynoutria xbohemica</i>					III 176							
ChAss. <i>Polygonetum cuspidati</i>												
<i>Reynoutria japonica</i>	III	81	II	25	II	34	V 5670				III	136
<i>Reynoutria xbohemica</i>							III 225					
ChAss. <i>Impatienti glanduliferae-Convolvuletum sepium</i>												
<i>Impatiens glandulifera</i>					II	259	III	94	V 4083			
ChAss. <i>Rudbeckio-Solidaginetum</i>												
<i>Solidago gigantea</i>	II	25	III	83			III	632	II	311	V	4759
<i>Solidago canadensis</i>					II	104					IV	386

1	2	3	4	5	6	7	8	9	10	11	12	13
II. ChO. Convolvuletalia sepium												
<i>Anthriscus sylvestris</i>	V	344	V	250	IV	287	V	231	V	233	III	145
<i>Geum urbanum</i>	III	119	IV	183	III	206	III	156	II	78	II	153
<i>Alliaria petiolata</i>	III	69	III	108	III	119	III	131	II	111	II	120
<i>Veronica chamaedrys</i>	II	81	III	141	IV	275	III	119	II	78	II	135
<i>Glechoma hederacea</i>	II	25	III	83	II	87	III	100	II	33	III	136
<i>Chelidonium majus</i>	III	165	III	117			I	56			II	75
<i>Myosoton aquaticum</i>	III	37	II	25					II	67	II	75
<i>Humulus lupulus</i>					II	34			II	25		
III. ChCl. Artemisietea												
<i>Urtica dioica</i>	IV	234	V	853	IV	187	V	231	V	987	V	160
<i>Galium aparine</i>	IV	169	V	216	IV	256	IV	162	IV	146	III	140
<i>Artemisia vulgaris</i>	III	218	III	192	III	181	III	94	III	100	V	415
<i>Melandrium album</i>	III	50	III	42	III	81	II	38	I	55	II	30
<i>Cirsium arvense</i>	III	150			III	178	II	75			II	80
<i>Calystegia sepium</i>					III	81			IV	156		
<i>Tanacetum vulgare</i>							II	87	I	38	II	75
<i>Rubus caesius</i>									II	72	II	37
<i>Rumex obtusifolius</i>									II	25	I	43
<i>Arctium tomentosum</i>											II	57
<i>Convolvulus arvensis</i>											II	28
IV. ChCl. Molinio-Arrhenatheretea												
<i>Ranunculus repens</i>	V	365	IV	175	III	181	IV	275	II	78	II	27
<i>Dactylis glomerata</i>	III	165	III	125	III	178	III	94	II	25	IV	327
<i>Poa trivialis</i>	III	156	III	108	II	106	III	94	III	108	III	46
<i>Achillea millefolium</i>	II	120	III	142	III	94	II	75	I	61	II	23
<i>Taraxacum officinale</i>	II	25	III	42	III	56	III	44	II	72		
<i>Heracleum sibiricum</i>	III	81	IV	75	I	63			I	55		
<i>Plantago lanceolata</i>	II	87	III	212			III	94	I	33	II	23
<i>Poa pratensis</i>	II	75					II	63			II	75
<i>Rumex acetosa</i>			II	25	II	112	II	75	II	25	III	46
<i>Daucus carota</i>			II	106	I	74						
<i>Caltha palustris</i>	II	25										
<i>Carex hirta</i>											II	21
V. ChCl. Phragmitetea												
<i>Phragmites australis</i>							IV	325				
<i>Carex acutiformis</i>							II	63				

1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Phalaris arundinacea</i>							II	25				
<i>Galium palustre</i>							II	25				
<i>Poa palustris</i>									IV	78		
VI. ChCl. Stellarietea mediae												
<i>Stellaria media</i>	IV	175	IV	158	IV	275	IV	219	III	100	III	98
<i>Matricaria maritima subsp. inodora</i>	III	165	III	167	III	56	II	87	II	22	III	132
<i>Fallopia convolvulus</i>			III	117	IV	188	II	62	II	205	II	75
<i>Myosotis arvensis</i>					III	144	II	56				
<i>Lapsana communis</i>					III	75	II	25				
<i>Vicia hirsuta</i>					II	88						
<i>Galeopsis tetrahit</i>					II	21						
VII. Accompanying species												
<i>Senecio jacobaea</i>			III	125	III	94						
<i>Cardamine amara</i>	II	137										
<i>Helianthus tuberosus</i>	II	76										
<i>Echinocystis lobata</i>					II	69			III	144		
<i>Ajuga reptans</i>							III	94				

Sporadic taxa occurring only in I stability class (in bracket – community)

II. *Impatiens parviflora* (C, F), *Fallopia dumetorum* (D)

III. *Cuscuta europaea* (A, D), *Epilobium hirsutum* (B, C, E), *Hypericum perforatum* (C, D)

IV. *Galium mollugo* (A, B), *Cirsium oleraceum* (A, C, F), *Ranunculus acris* (A, C, F), *Epilobium palustre* (A, E), *Lolium perenne* (A, F), *Euphrasia rostkoviana* (B, E), *Holcus lanatus* (B, E, F), *Rumex crispus* (C, D), *Alopecurus pratensis* (C, E), *Lysimachia nummularia* (C, E), *Lythrum salicaria* (C, E), *Potentilla anserina* (E), *Stachys sylvatica* (F)

V. *Iris pseudacorus* (A, E), *Equisetum fluviatile* (C, F)

VI. *Chenopodium album* (A, B, C, E, F), *Erysimum cheiranthoides* (A, B, E), *Galeopsis speciosa* (A, F), *Geranium pusillum* (B, E, F), *Senecio vulgaris* (D, E), *Sonchus oleraceus* (E, F)

VII. *Epilobium palustre* (A, E), *Erigeron annuus* (B), *Polygonum persicaria* (C, E), *Bidens frondosa* (D), *Mentha aquatica* (D), *Sambucus nigra* c (F)

relevés: *Impatiens parviflora*, *Solidago gigantea* and *Echinocystis lobata*. In the community with the dominating *Impatiens glandulifera*, the lowest number of species were noted (46), while in the community with high participation of *Heracleum mantegazzianum*, there were 47 taxa in total. Altogether, in the communities from the class of *Artemisietea vulgaris* 89 species were found (Table 1).

An analysis of biocenotic indices (of Shannon–Wiener and Simpson’s diversity indices as well as the index of species abundance) represented their relative levels for the group of communities from *Convolvuletalia sepium* order, while habitat indices, especially the moisture index, the soil reaction index and the trophic state index are relatively higher for the communities of *Senecionion fluviatilis* order. Worth mentioning, are the highest indices of: Shannon–Wiener and Simpson’s diversity indices and light conditions calculated for the community of *Aegopodio-Petasitetm hybridi*. This community is an azonal community connected with fertile soils of the heavy or

Table 2
The biocoenotic and habitat indicators of communities with *Reynoutria* taxa from *Artemisietea vulgaris* class on the Słowińskie Coast

Syntaxon	1	2	3	4	5	6
Shannon-Wiener Index	2.52	1.63	1.22	2.07	1.92	2.11
Pielou Uniformity Index	0.57	0.71	0.79	0.78	0.67	0.64
Richness Index	21.80	18.59	11.43	14.26	16.72	23.31
Simpson Dominance Index	0.84	0.76	0.47	0.76	0.70	0.74
Light Index	6.47	6.49	5.71	6.35	6.50	6.56
Moisture	6.32	5.39	5.70	5.27	5.44	6.43
Soil reaction	6.82	6.63	6.90	6.90	6.53	6.86
Nutrients Index	6.92	7.02	6.70	6.63	7.10	7.08
Continentality	3.56	3.76	3.62	3.76	3.47	3.81

* Explanation: 1 – *Aegopodio-Petasitetum hybridi*, 2 – *Urtico-Heracleeteum mantegazziani*, 3 – *Aegopodio-Reynoutrietum sachalinensis*, 4 – *Polygonetum cuspidati*, 5 – *Impatiенти glanduliferae-Convolutetum sepium*, 6 – *Rudbeckio-Solidaginetum*

medium alluvial soil in the accumulation zone of river valleys. At the Słowińskie Coast, it is found in light alluvial soils of small tributaries of the Słupia and the Wieprza River.

CONCLUSIONS

1. Taxa of the *Reynoutria* genus are expansive neophytes and easily penetrate nitrophyllic fringe communities. They were found in midfield biotopes: manor parks, road sides, fringes of meadows and pastures, gutters, melioration canals and midfield water ponds, idle land and fallow land.
2. *Reynoutria* use the valleys of water courses as specific ecological corridors for their propagation. Within the area of the Słowińskie Coast at ruderal habitats in the river valleys of the Łeba, Słupia and Wieprza rivers, they constitute their own communities of *Aegopodio-Reynoutrietum sachalinensis* and *Polygonetum cuspidati*.
3. In the fringe communities of the order *Convolutetalia sepium* relatively higher biocoenotic indices were noted (Shannon–Wiener and Simpson's diversity indices and the species abundance index) than in syntaxa of the order *Senecionion fluviatilis*.
4. In the floristic composition of the communities, beside *Reynoutria* spp., other foreign species domesticated in Poland were found, such as: *Echinocystis lobata*, *Helianthus tuberosus*, *Heracleum mantegazzianum*, *H. sosnowskyi*, *Impatiens glandulifera* and *I. parviflora*.

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UDZIAŁ TAKSONÓW Z RODZAJU *REYNOUTRIA*
W ZBIOROWISKACH OKRAJKOWYCH WYBRANYCH BIOTOPÓW
ŚRÓDPOLNYCH WYBRZEŻA SŁOWIŃSKIEGO

Streszczenie

W pracy przedstawiono rezultaty badań nad zbiorowiskami okrajkowymi z udziałem gatunków z rodzaju *Reynoutria* na Wybrzeżu Słowińskim (Pomorze Środkowe). *Reynoutria japonica* i *R. sachalinensis* zostały introdukowane z Azji Wschodniej na przełomie XIX i XX wieku. Rdestowiec sachaliński był notowany na Wybrzeżu Słowińskim w 1921 roku w Darłowie, natomiast rdestowiec ostrokończysty w 1937 w Ustce. Występowanie ich utrwalonego mieszańca *Reynoutria xbohemica* zostało opisane po raz pierwszy w latach 80. XX wieku na terenie Czech, zaś na obszarze Polski rdestowiec pośredni odnotowano w końcu XX wieku. Stanowiska *Reynoutria xbohemica* w Polsce północnej podane w niniejszej pracy są nowe i dotąd nieopisywane. We współczesnej dobie rdestowce są przyczyną wielu strat gospodarczych i przyrodniczych. Zagrożenia dotyczą szczególnie parków dworskich, rowów i kanałów odwadniających, łąk i pastwisk.

Podczas badań w latach 2008-2012 wykonano 105 zdjęć powszechnie stosowaną w Polsce metodą Brauna-Blanqueta. Fitocenozy z udziałem taksonów z rodzaju *Reynoutria* notowano w zbiorowiskach okrajkowych z klasy *Artemisietea vulgaris* i związku *Petasition officinalis*: *Aegopodio-Petasitetum hybridii*, *Heracleeteum mantegazziani*, *Aegopodio-Reynoutrietum sachalinensis* oraz związku *Senecionion fluviatile*: *Polygonetum cuspidati*, *Impatienti glanduliferae-Convolvuletum sepium*, *Rudbeckio-Solidaginetum*.