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A Survey of Ruderal Vegetation in Poland: Phytocenoses with *Reynoutria sachalinensis* (Friedrich Schmidt Petrop.) Nakai in Mori and *R. japonica* Houtt.

Przegląd roślinności ruderalnej na obszarze Polski: fitocenozy z *Reynoutria sachalinensis* (Friedrich Schmidt Petrop.) Nakai in Mori i z *R. japonica* Houtt.

SCOPE AND METHODS OF INVESTIGATION

Communities with *Reynoutria sachalinensis* (= *Polygonum sachalinense* Schm.) and with *Reynoutria japonica* (= *Polygonum cuspidatum* Sieb. et Zucc.) investigated in Europe for several dozen years have so far lacked a strictly defined structure and syntaxonomic position. The present study is therefore concerned with the syntaxonomic and ecological characteristics of the two substituting phytocenoses formed in the area of Poland. The investigations were based on phytosociological records found only in published or forthcoming studies. The phytosociological records used were ordered in a working table* according to their successive similarity with respect to species composition and their degree of coverage in particular syntaxonomic and ecological groups. The location of record stations was presented in Figure 1. Table 4 illustrates the assignment of successively ordered phytosociological records to all the currently distinguished primary and subordinate phytocenoses with *Reynoutria sachalinensis* and *R. japonica*. The two substituting plant associations with *Reynoutria sachalinensis* and *R. japonica* were compared for their floristic, syntaxonomic and ecological properties (Tables 1–3 and 5). The appended photographs present the most characteristic expanses of a particular development stage of the investigated plant communities (Figs 2–5). Statistical elaborations of the studied communities were carried out after Pawłowski (28). The naming of pteridophytes and vascular plants was given after Jasiewicz (12) and of bryophytes, after Ochyra and Szmajda (27). These plants were assigned to particular nine syntaxonomic groups after Matuszkiewicz (20) and other phytosociologists (10, 24–26). The statistical-floristic data on phytocenoses with *Reynoutria sachalinensis* and *R. japonica* were presented only

* The table was not included on account of its size.

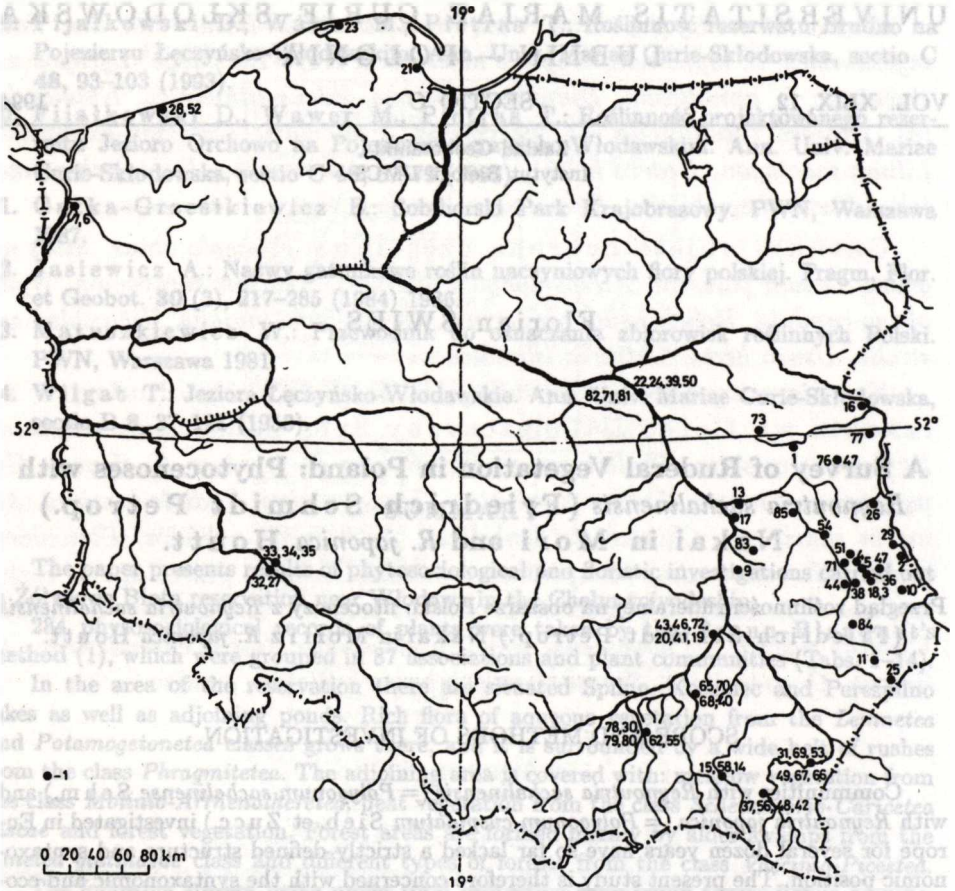

Fig. 1. Map of the examined stations of 85 phytosociological records of associations: *Reynoutrietum sachalinensis* (records 1–10) and *R. japonicae* (records 11–85); Nos. of records taken according to their order of succession in Table 4

with such accuracy as to be easily supplemented with new materials of phytosociological records if necessary.

SURVEY OF COMMUNITIES WITH *REYNOUTRIA SACHALINENSIS* AND *R. JAPONICA*

General Distribution

Reynoutria japonica grows in a natural state in South-East Asia while *Reynoutria sachalinensis* only in the northern part of Sakhalin (9, 21). Currently the two species, as cultivated and gone wild park plants and fodder crops, occur through bringing in as ergasioepecophytes in the large areas of Eurasia and North America (21).

The first brought-in stands of the two species were recorded in Western Europe, including Poland in 1825–1869 (9, 17). These are abundant rhizomatous perennial plants, 3–4 m high, of nitrophilous habitats, mesophilous with high dynamics of vegetative propagation. That is why they can quickly overrun their located initial habitats and form denser and larger concentrations. In Poland, planted communities going wild with *Reynoutria japonica* or *R. sachalinensis* are probably quite commonly found. In the Carpathians and the Sudety Mountains the two plants were recorded at the maximum of 480–930 m above sea level (1, 7, 16, 38 and op. cit.).

State of Investigation in Poland

The phytosociological characteristics of communities with *Reynoutria sachalinensis* and *R. japonica* was based on 85 phytosociological records, 10 covering the former community and 75, the latter (Table 4). The first stations of phytosociological phytocenoses with *Reynoutria japonica* were published by Misiewicz (22) and those concerning both phytocenoses with *Reynoutria japonica* and *R. sachalinensis* were also first given by Misiewicz (22) followed by Fijałkowski (4). In other Polish publications there are phytosociological materials concerning either both phytocenoses (13, 35) with *Reynoutria sachalinensis* and *R. japonica* or only the latter with *R. japonica* (2, 8, 11, 18, 19, 29, 32–34, 36, 37). Phytosociological documentation records of phytocenoses with *Reynoutria sachalinensis* and with *R. japonica* come from the following regions of Poland (Fig. 1):

Littoral Plains: the Szczecin Lowland, the Baltic Coast, the Vistula Marshland (after Misiewicz (22), records 6, 7, 21, 23, 28, 52.

Great Lowlands: Mazovia (after Janecki (11), records 22, 24, 39, 50, 75, 81, 82), Podlasie (after Święs and Kwiatkowska (37) records 61, 73), the Lublin Polesie (after Kędzierawska (13) records 2, 26, 29 and Fijałkowski (4), records 1, 16, 47, 76, 77).

Central Uplands: the Lublin Upland and Roztocze (after Fijałkowski (4), records 1, 4, 9–13, 83, 84) and Harasim (8), record 54.

Piedmont Basins: the Silesian Basin (after Rostański and Gutte (29), records 27, 32, and after Brzeg (2) records 33–35), the Sandomierz Basin (after H. and M. Kucharczyk (19), records 19, 20, 41, 43, 46, 72 and after Kucharczyk (18), records 40, 65, 68, 70).

The borderline between the Sandomierz Basin and the Carpathian Foothills (after Święs and Piórecki (35), records 8, 60, 64, after Święs and Witkowska (37), records 31, 49, 53, 66, 67, 69, Święs (34), records 45, 57, 59, 63 and after Święs (33), records 30, 55, 67, 78–80).

West Carpathian Flysch: the Jasło-Sanok Trenches (after Święs (32), records 37, 42, 48, 56 and Święs (31), records 14, 15, 58).

The investigated stations of 85 phytosociological records come from the following natural environments:

1) typically synanthropic areas of towns and settlements (records 5–8, 14–17, 19–25, 28, 30–32, 35, 37, 39–43, 46, 48–50, 52–70, 72–75, 78–82, 85).

2) rims of cemeteries and sacral monuments (records 2, 3, 18, 26, 29, 36, 38, 44, 51, 71).

3) indeterminate seminatural and ruderal habitats in towns and in the country (records 1, 4, 9–13, 47, 76, 77, 83, 84).

4) shrub rims of riparian forests (record 35) and artificial pine forest (records 33–34).

Table 1. Syntaxonomic groups, frequency and number of plant species

Number of associations (1, 2)	1.		2.			1.				2.			
				A						B			
Presence (Aa-c) and cover (Ba-d) of species:	a	b	c	a	b	c	a	b	c	d	a	b	c	d
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A,B. Trees and shrubs														
I. Ch: a - Sambuco-Salicion, b - Querco-Fagetea (total), c - Alnetea glutinosae, d - other forest species, e - other synanthropic species														
a Sambucus nigra B	-	-	-	9	12	I	-	-	-	-	28,1	37,47	0,375	r
d Quercus robur B	-	-	-	2	3	r	-	-	-	-	5,1	6,80	0,068	s
d Sorbus aucuparia B	-	-	-	3	4	r	-	-	-	-	17,7	23,60	0,236	r
e Syringa vulgaris B	-	-	-	3	4	r	-	-	-	-	5,2	6,93	0,069	s
e Parthenocissus quinquefolia B	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
e Acer negundo B	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
C. Herbaceous plants														
II. Ch: a - Phragmitetea (total), b - Cyperetalia fusci, c - Bidentetea tripartiti (total)														
a Phalaris arundinacea	-	-	-	2	3	r	-	-	-	-	5,1	6,80	0,068	s
a Poa palustris	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
c Bidens tripartita	2	20	II	-	-	-	0,2	2	0,02	s	-	-	-	-
III. Ch: a - Molinio-Arrhenatheretea, b - Molinietalia coeruleae, c - Arrhenatheretalia, d - Arrhenatherion elatioris, e - Cynosurion														
a Cerastium holosteoides	2	20	II	2	3	r	0,2	2	0,02	s	0,2	0,27	0,003	s
a Poa pratensis	4	40	III	11	15	I	5,3	53	0,53	+	38,1	50,80	0,508	+
a Phleum pratense	1	10	I	3	4	r	0,1	1	0,01	s	0,3	0,40	0,004	s
a Festuca pratensis	3	30	II	2	3	r	0,3	3	0,03	s	0,2	0,27	0,003	s
a Achillea millefolium	3	30	II	16	21	II	0,3	3	0,03	s	6,5	8,67	0,087	s
a Trifolium pratense	2	20	II	5	7	+	0,2	2	0,02	s	0,5	0,67	0,007	s
a Rumex acetosa	1	10	I	3	4	r	0,1	1	0,01	s	0,3	0,40	0,004	s
a Plantago lanceolata	-	-	-	5	7	+	-	-	-	-	10,3	13,73	0,137	r
a Poa trivialis	-	-	-	3	4	r	-	-	-	-	5,2	6,93	0,069	s
a Vicia cracca	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
b Deschampsia caespitosa	1	10	I	2	3	r	0,1	1	0,01	s	0,2	0,27	0,003	s
c Bromus hordeaceus	2	20	II	-	-	-	0,2	2	0,02	s	-	-	-	-
c Anthriscus sylvestris	3	30	II	8	11	I	0,3	3	0,03	s	18,2	24,27	0,243	r
c Dactylis glomerata	3	30	II	22	29	II	0,3	3	0,03	s	2,2	2,93	0,029	s
c Taraxacum officinale	4	40	III	31	41	III	0,4	4	0,04	s	12,9	17,20	0,172	r
c Heracleum sphondylium ssp. sphondyl.	1	10	I	10	13	I	0,1	1	0,01	s	1,0	1,33	0,013	s
c Heracleum sphondylium ssp. sibiricum	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
d Pastinaca sativa	1	10	I	4	5	+	0,1	1	0,01	s	42,7	56,93	0,569	+
d Geranium pratense	1	10	I	4	5	+	0,1	1	0,01	s	0,4	0,53	0,005	s
d Arrhenatherum elatius	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
e Cynosurus cristatus	3	30	II	-	-	-	5,2	52	0,52	+	-	-	-	-
e Leontodon autumnalis	1	10	I	4	5	+	5,0	50	0,50	+	5,3	7,07	0,071	s
e Trifolium repens	2	20	II	3	4	r	0,2	2	0,02	s	0,3	0,40	0,004	s
IV. Ch: f - Trifolio fragiferi-Agrostietalia, g - Plantaginetalia majoris, h - Lolio-Plantaginetum, i - Polygono-Poëtea annuae														
f Potentilla anserina	2	20	II	5	7	+	0,2	2	0,02	s	0,5	0,67	0,007	s
f Ranunculus repens	2	20	II	12	16	I	10,0	100	1,00	1	18,6	24,80	0,248	r
g Lolium perenne	3	30	II	14	19	I	5,2	52	0,52	+	1,4	1,87	0,019	s
g Plantago major	1	10	I	15	20	II	0,1	1	0,01	s	6,4	8,53	0,085	s
i Capsella bursa-pastoris	1	10	I	7	9	I	0,1	1	0,01	s	0,7	0,93	0,009	s
i Polygonum aviculare	2	20	II	8	10	I	0,2	2	0,02	s	28,0	37,33	0,373	r
i Chamomilla suaveolens	-	-	-	7	9	I	-	-	-	-	0,7	0,93	0,009	s
i Poa annua	-	-	-	6	8	I	-	-	-	-	0,6	0,80	0,008	s
V. Ch: a - Secalietea, b - Secalietalia, c - Aperetalia, d - Aphanion														
a Papaver rhoeas	1	10	I	1	1	s	0,1	1	0,01	s	0,1	0,13	0,001	s
b Aethusa cynapium	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
c Apera spica-venti	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
d Matricaria perforata	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
d Chamomilla recutita	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
VI. Ch: a - Chenopodietea, b - Polygono-Chenopodietalia, c - Eu-Polygono-Chenopodion, d - Sisymbrietalia-Sisymbrion														
a Chenopodium album	1	10	I	24	32	II	0,1	1	0,01	s	51,9	69,20	0,692	+
a Atriplex patula	-	-	-	4	5	+	-	-	-	-	0,4	0,53	0,005	s
b Polygonum lapathifolium ssp. incanum	-	-	-	4	5	+	-	-	-	-	0,4	0,53	0,005	s
b Polygonum lapath. ssp. lapathifolium	1	10	I	-	-	-	0,1	1	0,01	s	-	-	-	-
c Lamium purpureum	1	10	I	3	4	r	0,1	1	0,01	s	0,3	0,40	0,004	s
c Oxalis stricta	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
c Sonchus oleraceus	-	-	-	4	5	+	-	-	-	-	0,4	0,53	0,005	s
c Chenopodium polyspermum	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
d Sisymbrium loeselii	3	30	II	2	3	r	0,3	3	0,03	s	0,2	0,27	0,003	s
d Sisymbrium officinale	-	-	-	9	12	I	-	-	-	-	0,9	1,20	0,012	s
d Malva neglecta	1	10	I	2	3	r	0,1	1	0,01	s	0,2	0,27	0,003	s
d Descurainia sophia	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
d Lactuca serriola	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
d Malva sylvestris	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s

Table 1 continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VII. Ch: a - Artemisietea vulgaris, b - Onopordetalia acanthii, c - Onopordion acanthii, d - Eu-Arction, d - Alliarion, f - Convolvuletalia sepium, g - Senecion fluviatilis, h - other synanthropic species														
a Artemisia vulgaris	6	60	IV	38	51	III	5,5	55	0,55	+	87,6	116,80	1,168	1
a Urtica dioica	5	50	III	54	72	IV	22,8	228	2,28	1	106,6	142,13	1,421	1
a Daucus carota	2	20	II	3	4	r	0,2	2	0,02	s	0,3	0,40	0,004	s
a Tanacetum vulgare	-	-	-	5	7	+	-	-	-	-	0,5	0,67	0,007	s
b Silene alba	-	-	-	14	19	I	-	-	-	-	6,3	8,40	0,084	s
c Reseda lutea	2	20	II	-	-	-	5,1	51	0,51	+	-	-	-	-
c Berteroa incana	1	10	I	4	5	+	0,1	1	0,01	s	0,4	0,53	0,005	s
c Carduus acanthoides	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
c Melilotus officinalis	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
c Melilotus alba	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
d Rumex obtusifolius	2	20	II	6	8	I	10,0	100	1,00	1	0,6	0,80	0,008	s
d Lamium album	1	10	I	11	15	I	0,1	1	0,01	s	1,1	1,47	0,015	s
d Ballota nigra ssp. nigra	2	20	II	16	21	II	0,2	2	0,02	s	23,9	31,87	0,319	r
d Arctium lappa	1	10	I	9	12	I	0,1	1	0,01	s	5,8	7,73	0,077	s
d Arctium tomentosum	1	10	I	13	17	I	0,1	1	0,01	s	18,7	24,93	0,249	r
d Leonurus cardiaca	-	-	-	4	5	+	-	-	-	-	0,4	0,53	0,005	s
d Armoracia rusticana	-	-	-	4	5	+	-	-	-	-	0,4	0,53	0,005	s
d Impatiens glandulifera	1	10	I	1	1	s	0,1	1	0,01	s	0,1	0,13	0,001	s
e Impatiens parviflora	2	20	II	9	12	I	37,6	376	3,76	1	33,0	44,00	0,440	r
e Chaerophyllum aromaticum	1	10	I	2	3	r	17,5	175	1,75	1	0,2	0,27	0,003	s
e Chelidonium majus	1	10	I	19	25	II	0,1	1	0,01	s	46,5	62,00	0,620	+
e Reynoutria sachalinensis	10	100	V	1	1	s	700,0	7000	70,00	4	0,1	0,13	0,001	s
e Reynoutria japonica	-	-	-	75	100	V	-	-	-	-	5867,5	7823,30	78,233	5
e Chaerophyllum temulentum	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
e Myosoton aquaticum	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
e Alliaria petiolata	-	-	-	4	5	+	-	-	-	-	0,4	0,53	0,005	s
f Calystegia sepium	2	20	II	13	17	I	5,1	51	0,51	+	18,7	24,93	0,249	r
g Saponaria officinalis	1	10	I	4	5	+	0,1	1	0,01	s	5,3	7,07	0,071	s
g Solidago gigantea	1	10	I	13	17	I	0,1	1	0,01	s	11,2	14,93	0,149	r
g Aster salignus	-	-	-	2	3	r	-	-	-	-	17,6	23,47	0,235	r
h Briza media	2	20	II	-	-	-	5,1	51	0,51	+	-	-	-	-
h Anthoxanthum odoratum	2	20	II	-	-	-	5,1	51	0,51	+	-	-	-	-
h Festuca rubra	4	40	XII	6	8	I	10,2	102	1,02	1	18,0	24,00	0,240	r
h Vicia odorata	1	10	I	1	1	s	0,1	1	0,01	s	0,1	0,13	0,001	s
h Veronica chamaedrys	3	30	II	6	8	I	0,3	3	0,03	s	0,6	0,80	0,008	s
h Hypericum perforatum	1	10	I	2	3	r	0,1	1	0,01	s	0,2	0,27	0,003	s
h Polygonum persicaria	1	10	I	2	3	r	0,1	1	0,01	s	0,2	0,27	0,003	s
h Lapsana communis ssp. communis	1	10	I	3	4	r	0,1	1	0,01	s	0,3	0,40	0,004	s
h Glechoma hederacea	1	10	I	4	5	+	0,1	1	0,01	s	17,8	23,73	0,237	r
h Rudbeckia laciniata	1	10	I	3	4	r	0,1	1	0,01	s	5,2	6,93	0,069	s
h Lupinus polyphyllus	1	10	I	4	5	+	5,0	50	0,50	+	0,4	0,53	0,005	s
h Geum urbanum	1	10	I	5	7	+	0,1	1	0,01	s	0,5	0,67	0,007	s
h Erigeron annuus	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Senecio vulgaris	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Vicia sepium	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Lathyrus tuberosus	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Linaria vulgaris	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Galeopsis tetrahit	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Medicago lupulina	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Senecio viscosus	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Stellaria media	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
h Sinapis arvensis	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Picris hieracioides	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
h Galeopsis pubescens	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
h Agrostis tenuis	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
h Conyza canadensis	-	-	-	5	7	+	-	-	-	-	0,5	0,67	0,007	s
h Bilderdykia convolvulus	-	-	-	12	16	I	-	-	-	-	1,2	1,60	0,016	s
h Galium aparine	-	-	-	17	27	II	-	-	-	-	6,6	8,80	0,088	s
VIII. Ch: a - Agropyretea intermedi-repentis (total); b - Sedo-Scleranthetea; c - Festuco-Brometea														
a Poa compressa	1	10	I	2	3	r	0,1	1	0,01	s	0,2	0,27	0,003	s
a Elymus repens	2	20	II	36	48	III	5,1	51	0,51	+	77,6	103,47	1,035	1
a Convolvulus arvensis	1	10	I	17	23	II	0,1	1	0,01	s	1,7	2,27	0,023	s
a Carex hirta	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
a Equisetum arvense	-	-	-	10	13	I	-	-	-	-	10,8	14,40	0,144	r
a Cirsium arvense	-	-	-	13	17	I	-	-	-	-	6,2	8,27	0,083	s
b Rumex acetosella	1	10	I	1	1	s	0,1	1	0,01	s	0,1	0,13	0,001	s
b Calamagrostis epigeios	1	10	I	4	5	+	0,1	1	0,01	s	5,3	7,07	0,071	s
b Hieracium pilosella	-	-	-	3	4	r	-	-	-	-	0,3	0,40	0,004	s
c Artemisia campestris	1	10	I	4	5	+	0,1	1	0,01	s	10,2	13,60	0,136	r
c Asparagus officinalis	1	10	I	1	1	s	0,1	1	0,01	s	0,1	0,13	0,001	s
IX. Ch: a - Epilobietea angustifolii, b - Querco-Fagetea (total), c - Alnetea glutinosae, d - other forest species														
a Rubus caesius	-	-	-	12	16	I	-	-	-	-	75,6	100,80	1,008	1
a Torilis japonica	-	-	-	2	3	r	-	-	-	-	0,2	0,27	0,003	s
b Aegopodium podagraria	2	20	II	24	32	II	0,2	2	0,02	s	106,7	142,27	1,423	1
b Ranunculus ficaria	-	-	-	3	4	r	-	-	-	-	27,5	36,67	0,367	r
d Convallaria majalis	1	10	I	1	1	s	0,1	1	0,01	s	0,1	0,13	0,001	s

Table 1 continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D. Mosses														
X. Ch: a - Polygono-Poëtea annuae, b - Corynephoretalia, c - Fagetalia silvaticae, d - other forest, meadow species														
a Ceratodon purpureus	2	20	II	5	7	+	0,2	2	0,02	s	0,5	0,67	0,007	s
b Tortula ruralis	2	20	II	2	3	r	0,2	2	0,02	s	0,2	0,27	0,003	s
d Anthoceros sp.	1	10	I	2	3	r	0,1	1	0,01	s	0,2	0,27	0,003	s
d Barbula unguiculata	1	10	I	2	3	r	0,1	1	0,01	s	0,2	0,27	0,003	s
d Leptobryum pyriforme	1	10	I	1	1	s	0,1	1	0,01	s	0,1	0,13	0,001	s

Species occurring in 1 record: Ib: 2. Acer platanoides b +, Corylus avellana b 1, Evonymus europaeus b 1. Ic: 2. Ribes nigrum b +. Id: 2. Frangula alnus b 1, Populus tremula b 1. Ie: 2. Symphoricarpos albus b 1, Prunus domestica b +. IIa: 2. Phragmites australis +, Scrophularia umbrosa +. IIb: 2. Gypsophila muralis +. IIIb: 2. Cirsium oleraceum +, Petasites hybridus +. IIId: 2. Crepis biennis +, Knautia arvensis +. IVf: 2. Agrostis alba +, Mentha longifolia +, Rorippa sylvestris +, Rumex crispus +. IVh: 2. Sagina procumbens +. IVi: 1. Lepidium ruderale +. Va: 2. Agrostemma githago +. Vb: 2. Geranium dissectum +. Vd: 2. Arabidopsis thaliana +, Veronica hederifolia +. VIb: 1. Polygonum lapathifolium ssp. lapathifolium +. VIc: 2. Euphorbia peplus +, Galinsoga ciliata +, G. parviflora +, Sonchus asper +, S. arvensis +. VId: 1. Bromus tectorum +, Bunias orientalis 1, Corispermum hyssopifolium +; 2. Iva xanthiifolia 1, Sisymbrium altissimum +, Urtica urens +. VIIb: 2. Artemisia absinthium +. VIIc: 1. Echium vulgare +; 2. Oenothera biennis +. VIId: 2. Arctium minus +, Echinocystis lobata +, Helianthus tuberosus +. VIIg: 2. Cucubalus braccifer +, Cuscuta europaea +, Solidago canadensis +. VIIh: 1. Bilderdykia dumetorum +, Pimpinella saxifraga +, Vinca minor 1; 2. Cichorium intybus +, Malva alcea +, Lamium maculatum +, Lapsana communis ssp. intermedia +, Phaseolus vulgaris +, Senecio vernalis 1. VIIIb: 1. Myosotis stricta +; 2. Galium vernum +. VIIIc: 1. Plantago media +; 2. Bromus inermis +, Euphorbia cyparissias +. IXa: 2. Epilobium angustifolium +, Rubus idaeus +. IXb: 1. Dryopteris filix-mas +; 2. Dactylis glomerata ssp. aschersoniana +, Impatiens noli-tangere +, Poa nemoralis +, IXc: 2. Solanum dulcamara +. IXd: 1. Dryopteris carthusiana +; 2. Glechoma hirsuta +, Humulus lupulus +, Myosotis sparsiflora +. Xa: 2. Bryum argenteum +, B. caespiticium +. Xc: 2. Atrichum undulatum +. Xd: 2. Brachythecium salebrosum +, Eurhynchium swartzii +, Funaria hygrometrica 3, Marchantia polymorpha 3.

Explanation: Nos. of association: 1 — *Reynoutrietum sachalinensis* (10 phytosiociological records), 2 — *R. japonicae* (75 phytosociological records), A — species frequency: a — number of occurrences, b — per cent frequency, c – class of per cent frequency (s, r, +, I–V), B — per cent species coverage: a — summary coverage (after calculation -r, + – as 0.1, 1–5, 2–17.5, 3–37,5, 4–62,5, 5–87,5), b — species coverage coefficient (calculated by dividing the number of summary species coverage by the number of phytosociological records in the table and by multiplying this number by 100), c — median per cent species coverage, d — class of median per cent species coverage (s, r, 1–5). In the list of species occurring only in one phytosociological record of both associations the following were successively given: No. of syntaxonomic plant group, association No. and after the named species — only its per cent coverage in the 5-degree scale (here grades +, 1, 3 only) X = syntaxonomic group containing only occasional species listed at the bottom of the Table.

Phytocenoses with *Reynoutria sachalinensis* and with *R. japonica* occur on habitats with mesophilous surfaces, weakly turfed or newly-loosened, dusty-loamy, abundant to a different degree with dust, gravel, rock and concrete crumbs and with various garbage, industrial and communal waste and others. On the average like in other typical ruderal communities, these are soils that are strongly alkaline and with differing content of humus and $CaCO_3$, K_2, $N\text{-}NO_2^-$ and $N\text{-}NH_4^+$. An exceptionally high content of P_2O_5 was reported only in the soils of single expanses of the two phytocenoses (Tab. 5).

PHYTOSOCIOLOGICAL STRUCTURE

The proposed phytosociological taxonomy of the differentiated syntaxons with *Reynoutria sachalinensis* and with *R. japonica* is as follows (Tab. 4):

Class: *Artemisietea vulgaris* Lohm., Prsg. et Tx. 1950
Order: *Onopordetalia acanthii* Br.-Bl. ex Tx. em Görs 1966
Alliance: *Alliarion* Oberd. (1957) 1962

Table 2. Distribution of frequency classes (a) and classes of median per cent species coverage (b) those taken from trees and shrubs (A, B), herbaceous plants (C), bryophytes (D) and their total (A–D) in associations (after Table 1): 1 – *Reynoutrietum sachalinensis*, 2 — *Reynoutrietum japonicae*

Number of community		1.								2.							
Layer of phytocenosis		A-D		A,B		C		D		A-D		A,B		C		D	
Classes of presence (a) and cover species (b)		a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b
a	b																
a	a	-	67	-	-	-	62	-	5	73	166	8	12	57	144	8	10
r	r	-	-	-	-	-	-	-	-	62	18	5	2	54	16	3	-
+	+	-	13	-	-	-	13	-	-	22	6	-	-	21	4	1	2
I	1	53	6	-	-	50	6	3	-	25	5	1	-	24	5	-	-
II	2	28	-	-	-	26	-	2	-	9	-	-	-	9	-	-	-
III	3	4	-	-	-	4	-	-	-	3	-	-	-	3	-	-	-
IV	4	1	1	-	-	1	1	-	-	1	-	-	-	1	-	-	-
V	5	1	-	-	-	1	-	-	-	1	1	-	-	1	1	-	-
a-V	a-5	87		-		82		5		196		14		170		12	

1. Association: *Reynoutrietum sachalinensis* (Misiewicz 1976, Fijałk. 1978, 1991), em. n. nomen
   1.1. Initial stage (of final phase)
      1.1.1. form: turf (meadow)
      1.1.2. form: shrub
      1.1.3. form: ruderal
   1.2. Optimal stage
      1.2.1. form: turf-shrub-ruderal
      1.2.2. form: ruderal
2. Association: *Reynoutrietum japonicae* (Moor 1958, Görs 1975 et al.) em. n. nomen
   2.1. Initial stage (of final phase)
      2.1.1. form: turf (meadow)
      2.1.2. form: shrub
      2.1.3. form: ruderal
   2.2. Optimal stage
      2.2.1. form: turf-shrub-ruderal
      2.2.2. form: ruderal

The two associations of *Reynoutrietum sachalinense* and *R. japonicae* are characterized by absolute single domination of *Reynoutria sachalinensis* or *R. japonica* over other cooccurrent plants. Moreover, these are phytocenoses characterized on the one hand by a very rich, and on the other, exceptionally heterogeneous composition of species (Tabs 1, 2). The former phytocenosis is composed of 87 species, the latter of 196 species. In one expanse of either, 2–25 species from all plant layers were reported. Beside the dominants, *Reynoutria sachalinensis* and *R. japonica*, the comparatively most frequent

Table 3. Taxonomic values of plant species in particular syntaxonomic groups (after Table 1)

Number of associations[x]			1.	2.	1.	2.	1.	2.	1.	2.	1.	2.
Syntaxonomical units and systematic value[xx]			z		g		$G = \frac{g \cdot 100}{t\ (=87)}$		$S = \frac{g \cdot 100}{z \cdot n\ (=10)}$		$S = \frac{g \cdot 100}{z \cdot n\ (=75)}$		$D = \frac{G \cdot S}{100}$	
		A,B. Trees and shrubs												
I.	Al.	Sambuco-Salicion	-	1	-	9	-	4,57	-	12,00	-	0,55		
	Cl.	Querco-Fagetea /total/	-	3	-	3	-	1,52	-	1,33	-	0,02		
	Cl.	Alnetea glutinosae	-	1	-	1	-	0,51	-	1,33	-	0,07		
	/d/.	other forest	-	4	-	7	-	3,55	-	2,33	-	0,08		
	/e/.	other synanthropic	-	5	-	9	-	4,57	-	2,40	-	0,11		
		C. Herbaceous plants												
II.	Cl.	Phragmitetea /total/	-	4	-	7	-	3,55	-	2,33	-	0,08		
	O.	Cyperetalia fusci	-	1	-	1	-	0,51	-	1,33	-	0,01		
	Cl.	Bidentetea tripartiti /total/	1	-	2	-	2,30	-	20,00	-	0,46	-		
III.	Cl.	Molinio-Arrhenatheretea	7	10	16	52	18,40	26,40	22,86	6,93	4,20	1,83		
	O.	Molinietalia coerulea	1	3	1	5	1,15	2,54	10,00	2,22	0,11	0,06		
	O.	Arrhenatheretalia	5	5	13	74	14,94	37,56	26,00	19,73	3,88	7,41		
	Al.	Arrhenatherion elatioris	2	5	2	12	2,30	6,09	10,00	3,20	0,23	0,19		
	Al.	Cynosurion	3	2	6	7	6,90	3,55	20,00	4,67	1,38	0,17		
IV.	O.	Trifolio fragiferi-Agrostietalia	2	6	4	21	4,60	10,66	20,00	4,67	0,92	0,50		
	O.	Plantaginetalia majoris	2	2	4	29	4,60	14,72	20,00	19,33	0,92	2,85		
	Al.	Lolio-Plantaginetum	-	1	-	1	-	0,51	-	1,33	-	0,01		
	Cl.	Polygono-Poëtalia annuae	3	4	4	28	4,60	14,21	13,33	9,33	0,61	1,33		
V.	Cl.	Secalietea	1	2	1	2	1,15	1,02	10,00	1,33	0,11	0,01		
	O.	Secalietalia	-	2	-	4	-	2,03	-	2,67	-	0,05		
	O.	Aperetalia	-	1	-	2	-	1,02	-	2,67	-	0,03		
	Al.	Aphanion	-	4	-	7	-	3,55	-	2,33	-	0,08		
VI.	Cl.	Chenopodietea	1	2	1	28	1,15	14,21	10,00	18,67	0,11	2,65		
	O.	Polygono-Chenopodietalia	1	1	1	4	1,15	2,03	10,00	5,33	0,11	0,11		
	Al.	Eu-Polygono-Chenopodion	1	9	1	16	1,15	8,12	10,00	2,37	0,11	0,19		
	O,Al.	Sisymbrietalia, Sisymbrion	5	9	7	23	8,05	11,68	14,00	3,41	1,13	0,40		
VII.	Cl.	Artemisietea vulgaris	3	4	13	100	14,94	50,76	43,33	33,33	6,47	16,92		
	O.	Onopordetalia acanthii	-	2	-	15	-	7,61	-	10,00	-	0,76		
	Al.	Onopordion acanthii	3	5	4	13	4,60	6,60	13,33	3,47	0,61	0,23		
	Al.	Eu-Arction	6	11	8	67	9,20	34,01	13,33	8,12	1,23	2,76		
	Al.	Alliarion	4	8	14	115	16,09	58,38	35,00	19,17	5,63	11,19		
	O.	Convolvuletalia sepium	1	1	2	13	2,30	6,60	20,00	17,33	0,46	1,14		
	Al.	Senecion fluviatilis	2	6	2	22	2,30	11,17	10,00	4,89	0,23	0,55		
	/h/.	other synanthropic	15	32	22	111	25,29	56,35	14,67	4,63	3,71	2,61		
VIII.	Cl.	Agropyretea intermedii-repentis	3	6	4	80	4,60	40,61	13,33	17,78	0,61	7,22		
	Cl.	Sedo-Scleranthetea	3	4	3	9	3,45	4,57	10,00	3,00	0,34	0,14		
	Cl.	Festuco-Brometea	3	4	3	7	3,45	3,55	10,00	2,33	0,34	0,08		
	Cl.	Epilobietea angustifolii /total/	-	4	-	16	-	8,12	-	5,33	-	0,43		
	Cl.	Querco-Fagetea /total/	2	5	3	30	3,45	15,23	15,00	8,00	0,52	1,22		
	Cl.	Alnetea glutinosae /total/	-	1	-	1	-	0,51	-	1,33	-	0,01		
	/d/.	other forest	2	4	2	4	2,30	2,03	10,00	1,33	0,23	0,03		
		D. Mosses												
IX.	Cl.	Polygono-Poëtea annuae /total/	1	3	2	7	2,30	3,55	20,00	3,11	0,46	0,11		
	O.	Corynophoretalia	1	2	2	2	2,30	1,02	20,00	1,33	0,46	0,01		
	O.	Fagetalia silvatica	-	1	-	1	-	0,51	-	1,33	-	0,01		
	/d/.	other forest	3	7	3	9	3,45	4,57	10,00	1,71	0,34	0,08		

Explanation: Nos. of associations: 1 — *Reynoutrietum sachalinensis*, 2 — *R. japonicae*; z – number of species, g — sum total of species occurrences, t — sum total of species of all syntaxonomic groups (I–IX), G — collective species percentage, S — mean species frequency, D — taxonomic values of species.

plants (II and III) in the two phytocenoses include: *Urtica dioica*, *Artemisia vulgaris*, *Ballota nigra*, *Arctium tomentosum*, *Lamium album*, *Chenopodium album*, *Galium aparine*, *Elymus repens*, *Aegopodium podagraria*, *Chelidonium majus*, *Taraxacum officinale*, *Plantago major*, *Achillea millefolium*, *Lolium perenne* and *Dactylis glomerata*.

Table 4. Membership of the 85 phytosociological documentation records in particular plant communities

Authors / Number of records	Number of community: 1. 1.1. 1.1.1.	1.1.2.	1.1.3.	1.2. 1.2.1.	1.2.2.	2. 2.1. 2.1.1.	2.1.2.	2.1.3.	2.2. 2.2.1.	2.2.2.
Fijałkowski (1978)	1 686			9 687	10 688	11 12 13 677, 681, 679, 16 17 25 625, 676, 683		47 682	76 77 674, 680	83 84 85 684, 685, 678
Kędzierawska (1984)		2 3 229, 231, 4 5 230 232				18 221	26 29 228, 226, 36 38 225, 227	44 51 224, 223	71 222	
Misiewicz (1976)			6 7 2, 1			21 23 5, 6	28 3	52 4		
Święs, Piórecki (1986)				8 138					60 74 140, 139	
Święs (1983)						14 15 99, 97			58 98	
Kucharczyk H. i M. (1983)						19 20 93, 91		41 43 46 92, 88, 89	72 90	
Janecki (1983)						22 24 1, 2		39 50 3, 4	75 6	81 82 7, 5
Rostański, Gutte (1971)							27 32 6, 5			
Brzeg (1993)							33 34 35 1, 2, 3			
Święs (1985)							37 107	42 48 110 109	56 108	
Święs, Witkowska (1988)							31 372	49 53 375, 374	66 67 69 377, 376, 373	
Święs (1989)							30 276		55 62 280, 279	78 79 80 275, 277, 278
Kucharczyk (1985)								40 82	65 68 70 79, 81, 80	
Święs (1993)								45 272	57 59 63 64 271, 270, 268, 269	
Harasim (1978)									54 52	
Święs, Kwiatkowska (1996)									61 73 228, 229	

Explanation: Nos. of communities: 1 — *Reynoutrietum sachalinensis* association, 1.1. — initial stage (final phase), 1.1.1. — turf (meadow) form, 1.1.2. — shrub form, 1.1.3. — ruderal form; 1.2. — optimal stage, 1.2.1. — turf-shrub-ruderal form, 1.2.2. — ruderal form; 2. — *Reynoutrietum japonicae* association, 2.1. — initial stage (final phase), 2.1.1. — turf (meadow) form, 2.1.2. — shrub form, 2.1..3. — ruderal form, 2.2. — optimal stage, 2.2.1. — turf-shrub-ruderal form, 2.2.2. — ruderal form. Nos. of phytosociological records denote: the upper No. — consecutive order of succession in the working table (not included) the lower No. — after the cited authors.

Table 5. List of published chemical properties of soil samples after the cited authors taken from particular expanses of plant communities in Table 4

Authors	Number of community	Number of records	pH in H_2O	pH in 1n KCl	Content in % $CaCO_3$	Content in % numus	Content in mg/100g of soil P_2O_5	K_2O	Mg	$N\text{-}NO_3^-$	$N\text{-}NH_4^+$
Święs, Piórecki (1983/84)	1.2.1.	8/138	7,5	6,9	0,26	3,55	118,8	28,0	13,0	-	11,55
Święs, Witkowska (1988)	2.1.2.	31/372	7,6	8,3	7,47	2,15	14,5	17,3	9,6	3,50	-
Święs (1993)	2.1.3.	45/272	8,5	7,8	1,05	1,62	13,8	9,3	8,2	2,20	-
Święs (1985)	2.1.3.	48/109	7,7	7,2	2,29	3,87	20,4	20,0	13,0	-	6,80
Święs (1983)	2.2.1.	58/98	7,4	7,0	0,11	-	10,0	7,0	2,3	0,15	0,01
Kucharczyk (1985)	2.2.1.	68/81	7,4	6,9	0,18	3,04	30,0	13,3	10,6	-	0,39
Kucharczyk H. i M. (1983)	2.2.1.	72/90	7,7	7,4	1,00	-	6,8	24,0	20,7	1,75	0,26
Święs, Kwiatkowska (mscr.)	2.2.1.	73/229	7,2	7,1	4,00	5,93	14,0	20,0	42,0	0,47	-
Święs (1989)	2.2.2.	78/275	8,3	7,3	5,26	10,97	125,4	45,3	6,0	8,40	-
Święs (1989)	2.2.2.	80/278	6,9	6,4	2,37	3,22	14,8	14,0	10,0	0,80	-

The two phytocenoses with *Reynoutria sachalinensis* and with *R. japonica* do not have a distinct specific combination of characteristic and accompanying species (20). If we take into account in both phytocenoses for example the absolute quantitive dominance of occasional species with low classes of frequency and low degrees of coverage over more frequent and numerous species (Tab. 2), it is difficult to regard these phytocenoses as classically formed associations according to the accepted phytosociological definition (20, 28).

The essential floristic differences between the studied associations are fairly evident. These associations have definite, almost exclusively dominant species: *Reynoutria sachalinensis* in one association and *R. japonica* in the other. The coefficient of floristic similarity between the two associations, calculated according to the Kulczyński formula (28) is as little as 44.9%. It should be noted that so high differences in the species composition between those associations are largely due to a disproportion in the number of representative physiological records: 10 and 75 (Tab. 4).

With respect to the general floristic composition both associations decidedly belong to the *Artemisietea vulgaris* class (Tabs 1, 3). However, the question of definitively assigning the two associations to a proper order or an aliance of *Artemisietea vulgaris* class associations appears to be very problematic. In the two associations a greater role is played by the species characteristic of the *Convolvuletalia sepium* order rather than of the *Onopordetalia acanthii*. On the other hand it should be noted that the two substituting associations of the *Artemisietea vulgaris* class

syntaxonomically represent intermediate communities between *Eu-Arction* and *Alliarion* alliances (Tabs 1, 3). Moreover, the two associations can be assigned either to the *Eu-Arction* or the *Alliarion* alliance. This is demonstrated by very different percentages, in those associations, of species characteristic of the *Eu-Arction* and *Alliarion* alliances with respect to their systematic group value (Tab. 3) and the degree of species coverage (Tab. 1). In practice, the assignment of *Reynoutrietum sachalinensis* and *R. japonicae* to the *Alliarion* alliance can only by justified by very high frequency and the high number of *Reynoutria sachalinensis* and *R. japonica*. The two species should be regarded as characteristic both of the *Reynoutrietum sachalinensis* and *R. japonicae* associations, and of the *Alliarion* alliance, to which these associations should be assigned.

In the two studied associations the main role falls to characteristic species of the *Molinio-Arrhenatheretea* class, of the *Plantaginetalia* order, of the *Artemisietea vulgaris* class, of the *Eu-Arction* and *Alliarion* alliances and to the species of the separate group of synanthropic cosmopolitan plants (Tabs 1, 3). Furthermore, the essential differences between the two associations are evident with respect to their uneven group values of definite syntaxonomic plant groups. In the *Reynoutrietum sachalinensis* association there are more plants of the *Cynosurion* alliance, of the *Trifolio fragiferi-Agrostietalia* and *Sisymbrietalia* orders, and more bryophytes and herbaceous forest plants than in the *Reynoutrietum japonicae* association. However, *Reynoutrietum japonicae* as compared with *Reynoutrietum sachalinensis* exhibits more group values for plants of the *Polygono-Poëtea annuae* and *Chenopodietea* classes and of the *Convolvuletalia sepium* order.

It turns out that the *Reynoutrietum sachalinensis* and *R. japonicae* associations in Poland do not exhibit any distinct differentiation into permanent smaller phytosociological units. In each association only 2 analogous, successively developed stages in the final phase were distinguished, and in each of them 3 and 2 successive forms.

1–2.1. The initial stage (final phase of development). It presents different phases of the development of associations and is formed through planting or accidental settling down of *Reynoutria sachalinensis* or *R. japonica* chiefly among seminatural or typically ruderal plants. The initial stage practically refers to comparatively the youngest, smallest and least dense expanses with *Reynoutria sachalinensis* or with *R. japonica*. In the successively formed, full initial stages of the two associations, depending on the dominant type of their initial habitat and plant community, 3 analogous floristic-ecological forms of communities were distinguished in each:

1–2.1.1. The turf (meadow) form. It is formed on different seminatural grassy turfs. That is why this community is characterized by the comparatively frequent and numerically strong occurrence of gramineous plants characteristic of the *Molinio-Arrhenatheretea* and *Polygono-Poëtea annuae*, classes, the *Plantaginetalia majoris* order and of other syntaxonomic groups.

1–2.1.2. The shrub form. It presents an ecological group of plants in the two associations, genetically formed in shrubs on rims or in clearings. Floristically it is characterized by a comparatively large number of species, mostly from seminatural habitat communities and generally common plants of natural habitats. These are characteristic species mostly of the *Epilobietea angustifolii* and *Agropyretea intermedi-repentis* classes and cosmopolitan shrub-forest plants, less frequently of the *Artemisietea vulgaris* and *Molinio-Arrhenatheretea* classes.

1–2.1.3. The ruderal form. It represents analogous expanses of both associations, formed in the environment of typically ruderal communities. That is why this form of community is floristically characterized by a comparatively high percentage of nitrophilous plants characteristic of various syntaxonomic units of the *Artemisietea vulgaris* class.

1–2.2. The optimal stage (final phase). With time, under the highly dense canopy of *Reynoutria sachalinensis* or *R. japonica* shoots intense overshadowing occurs and weakly decomposing litter accumulates, made up of leaves and shoots of the two species. In those new, specific biotopic conditions of the two associations there successively recede, except *Reynoutria sachalinensis* or *R. japonica*, all other original plants until they entirely disappear. In the expanses of the optimal development stage of *Reynoutrietum sachalinensis* and *R. japonicae* 2 forms of communities were distinguished depending on their degree of floristic connection with the 3 stages of communities of the initial stage.

1–2.2.1. The turf-shrub-ruderal form. Most frequently it covers dense and medium-sized agglomerations of *Reynoutria sachalinensis* or *R. japonica*. This form of community is characterized by the occurrence of numerous but sparsely-growing species. Most often these are plants with weak vegetation and occurring mainly on the loose rims of the expanses of those communities. Apart from *Reynoutria sachalinensis* or *R. japonica*, they are mostly common species of ruderal and shrub plants of *Artemisietea vulgaris*, *Molinio-Arrhenatheretea*, *Polygono-Poëtea annuae* and *Agropyretea intermedi-repentis* classes and plants with a high edaphic tolerance and with indeterminate phytosociological fidelity.

1–2.2.2. The ruderal form. It presents the optimal but often also the final development stage of the two associations. In the oldest and largest expanses of those associations, due to extensive overshadowing of the substratum and accumulation of raw humus, there eventually occurs a very large reduction, except for the dominant species of knotgrass, of most of the earlier plants with a delicate structure. Apart from *Reynoutria sachalinensis* or *R. japonica* only the most solid and dynamic ruderal perennial plants settle down permanently. These are: *Sambucus nigra*, *Artemisia vulgaris*, *Arctium lappa*, *Solidago gigantea* and *Calystegia sepium*.

The solid, dynamic and fast-growing specimens of *Reynoutria sachalinensis* and *R. japonica* require always fertile, nitrophilous habitats. That is why the two species can survive only in habitats that are constantly intensively, randomly manured with refuse and town garbage. It should thus be noted that dense and high agglomerations with *Reynoutria sachalinensis* or with *R. japonica* are found in the much sought-after, hidden illegal local dumps of various refuse and garbage.

The two species, *Reynoutria sachalinensis* and *R. japonica* lose their growth dynamics with impoverishment of the substratum and eventually recede from their initial sites. The dying stations of the phytocenoses with *Reynoutria sachalinensis* or *R. japonica* are successively taken over by some other, less demanding ruderal vegetation. In that case the expanses with *Reynoutrietum sachalinensis* and *R. japonicae* seem to pass from the optimal, dense development stage into the secondary, loose and pioneering initial stage.

GENERAL STATE OF INVESTIGATION OF *REYNOUTRIETUM SACHALINENSIS* AND *R. JAPONICAE* AND THE PROBLEMS OF THEIR NAMING AND SYNTAXONOMIC CLASSIFICATION

No phytosociological data have so far been published on the communities with *Reynoutria sachalinensis* and with *R. japonica* occurring outside Central and Western Europe. In Europe phytocenoses with *Reynoutria japonica* were first characterized in Bohemia, Germany and Switzerland (10, 15, 23–26) and somewhat later in Poland (Fig. 1, Tab. 4). However, the communities with *Reynoutria sachalinensis* have so far been known in Europe only from Poland (Tab. 4).

The phytocenoses with *Reynoutria sachalinensis* and *R. japonica* described so far in Poland have been treated both as indeterminate ruderal rim-type communities (11, 22, 29) or as separate ruderal associations (4, 5, 8, 31–37). They were either assigned to the *Artemisietea vulgaris* class,

the *Onopordetalia acanthii* order, the *Alliarion* (18, 32, 33, 37) and *Eu-Arction* (11, 22, 29) alliances, the *Galio-Calystegietalia* order and the *Lapsano-Geranion robertiani* alliance (2, 3), or to the *Epilobietea angustifolii* class, *Sambuco-Salicion* (4, 13, 19, 34–36) or *Epilobion angustifolii* alliances (31).

In Polish phytociological literature only in the study by Brzeg (3) there is preliminary information on the naming and phytosociological classification of the studied phytocenoses with *Reynoutria sachalinensis* and with *R. japonica*. According to Brzeg (3), the phytosociological classification of the two phytocenoses is as follows:

Class: *Artemisietea vulgaris* Lohm., Prsg. et Tx. 1950
Order: *Galio-Calystegietalia sepium* (Tx. 1950) Oberd. 1967
Alliance: *Convolvulion sepium* Tx. (1947) 1950
Suballiance: *Humulo-Fallopion dumetorum* Pass. 1965 em. Brzeg et Demb. 1983
1) Association: *Polygonetum cuspidati* [(Moor 1958) Lohm. ep. Oberd. 1967 (= *Polygonetum cuspidatae* (Moor 1958), Görs 1975, *Impatienti-Solidaginetum* Moor 1958 p.p., non *Polygonetum cuspidati* Fijałkowski 1978]
Alliance: *Lapsano-Geranion robertiani* (Tx. 1967) Siss. 1973 [(= *Alliarion* Oberd. 1957), 1962 p.p., *Galio-Alliarion* (Oberd. 1957) Lohm. et Oberd. 1966 p.p.)]
Suballiance: *Eu-Lapsano-Geranion* Tx. et Brun-Holl 1975
2) Community: with *Reynoutria japonica* (e.g. Brzeg 1983)
3) Community: with *Reynoutria sachalinensis* (Brzeg 1984 msc.)

Almost at the same time as Brzeg (3), a comprehensive phytosociological characteristics of communities with *Reynoutria japonica* (= *Polygonum cuspidatum*) was given by Oberdorfer (26)./ He managed to do that using only 27 phytosociological records that came from the river valleys of the submontane regions of Germany and Switzerland. Those were phytosociological records both already published (6, 23–26 and others) and unpublished, made available by Th. Müller. According to Oberdorfer (26) the syntaxonomic question of the communities with *Reynoutria japonica* (= *Polygonum cuspidatum*) that come from Germany and Switzerland is as follows:

Class: *Artemisietea vulgaris* Lohm., Prsg. et Tx. 1950
Subclass: *Galio-Urticetea* (Pass. 1967) em. Oberd. 1983
Order: *Convolvuletalia (Calystegietalia) sepium* Tx. 1950
Alliance: *Convolvulion (Calystegion) sepium* Tx. 1947 em. Oberd. 1983
1) Community: *Polygonum cuspidatum-Convolvuletalia* (=facies with *Polygonum cuspidatum* of the *Urtica-Convolvulus* community)
Order: *Glechometalia hederacea* Tx. in Tx. et Brun-Hool 1975
Alliance: *Aegopodion podagrariae* Tx. 1967
2) Community: *Polygonum cuspidatum-Aegopodion* (=facies with *Polygonum cuspidatum* in the *Urtico-Aegiopodietum* association)
Order: *Artemisietalia vulgaris* Lohm. in Tx. 1947 em. Oberd. 1983

Alliance: *Arction lappae* Tx. 1937 em. Tx. 1950

3) Community: *Polygonum cuspidatum* (= facies with *Polygonum cuspidatum* in the *Arctio-Artemisietum* association)

Order: *Onopordetalia acanthii* Br.-Bl. et Tx. em Görs 1966

Alliance: *Dauco-Melition* Görs 1966

4) Community: *Polygonum cuspidatum-Dauco-Melilotetum* (= facies with *Polygonum cuspidatum* in the *Dauco-Picridetum* association)

According to Hejny et al. (10) and Kopècky (15), in the submontane river valleys in Bohemia there are widespread expanses of the *Impatienti-Solidaginetum* association, characterized by a scanty percentage of *Reynoutria japonica*.

From the foregoing data on the state of phytosociological investigation of the communities with *Reynoutria sachalinensis* and *R. japonica* (3, 10, 15, 26) it follows that their syntaxonomic positon has so far been classified in many different ways. It thus turns out that the two substituting plant communities were assigned to 2 classes, including 2 different subclasses, 6 orders, 7 alliances and 2 suballiances of associations. It must also be noted that in the phytocenoses with different percentages of *Reynoutria sachalinensis* or *R. japonica* as many as 8 separate syntaxones were distinguished: by Oberdorfer (26) — at the level of 4 communities, three others were distinguished by Brzeg (3) as 2 different communities and 1 association, and by Kopecký (15) — at the level of 1 association.

We believe that the syntaxonomic classification of phytocenoses composed both of *Reynoutria sachalinensis* and *R. japonica* should be fundamentally and critically re-examined. It must be explained first of all that the communities with *Polygonum cuspidatum* (= *Reynoutria japonica*) distinguished by Oberdorfer (26) and Kopecký (15) most likely represent either the initial (or receding) stage of one association composed mainly of *Reynoutria japonica* or they are smaller syntaxonomic units of 5 different plant associations.

It also appears that we cannot accept Brzeg's proposition (3) that the synonyms of species' names (*Reynoutria* — *Polygonum*) can be used to form names concerning two allegedly different associations belonging within one class and one order to two different alliances and two suballiances of associations. For example: the *Polygonetum cuspidati* association of the *Convolvulion sepium* alliance and the *Humulo-Fallopion dumetorum* suballiance and the communities with *Reynoutria japonica* and with *R. sachalinensis* of the *Lapsano-Geranion robertiani* (= *Alliarion*) alliance and the *Eu-Lapsano-Geranion* suballiance.

Although the collected phytosociological records of associations with *Reynoutria sachalinensis* and *R. japonica* in Poland come from different starting area sites for those habitats and their plant communities, but not all of those phytosociological records have a proper biotopic characteristics (4, 13, 29). The lack of detailed biotopic documentation of phytosociological records does not permit to find all the phytosociological differences that obtain between the expanses of the studied communities occurring in different biocenotic conditions. A detailed biotopic location of phytosociological records would be especially valuable while comparing the floristic composition of the two phytocenoses formed either in the edge zone of forest and parks or among turfs and typically ruderal herbage.

It turns out that in the whole of the studied corpus of phytosociological records of phytocenoses with *Reynoutria sachalinensis* or *R. japonica* that come from the territory of Poland it is practically impossible to distinguish any permanent floristic-biotopic group. Among all the studied phytosociological records taken in the expanses of communities with *Reynoutria sachalinensis* and with *R. japonica* from the domestic stations in evidently different habitats it is possible to distinguish only similar pairs of their successive development stage: initial and optimal, with 2–3 short-lived biotopic-floristic forms (Tab. 4). The floristic differences between the distinguished successive stages and forms in the two phytocenoses are mostly fluid and blurred. It must also be stressed that in the optimal stage of the two phytocenoses floristic differences between the expanses coming from very different habitat types are successively entirely obliterated. With time, under the more and more extensive, dense and overshadowed canopy of the upper shoot of *Reynoutria sachalinensis* or *R. japonica*, in sites covered with a thicker and thicker layer of raw humus all plants with a delicate structure die out.

It would be interesting to make a more detailed comparison for their general floristic composition between phytocenoses with *Reynoutria japonica* characterized in Czechoslovakia, Germany and Switzerland and those in Poland. In general, they are phytocenoses that are far more complex floristically and taxonomically in South-Western Europe than in Poland. In this country they are usually in the optimal development stage of the turf-herbage-ruderal type whereas in South-Western Europe they are almost exclusively in the initial development stage of the rim and shrub types.

It is therefore most practical to adopt the following syntaxonomic solution. All the described well-developed forms of communities, at home and abroad, both with *Reynoutria sachalinensis* and with *R. japonica*, should be assigned to separate associations but grouped only in one alliance of associations. Particular expanses of each association can subsequently repre-

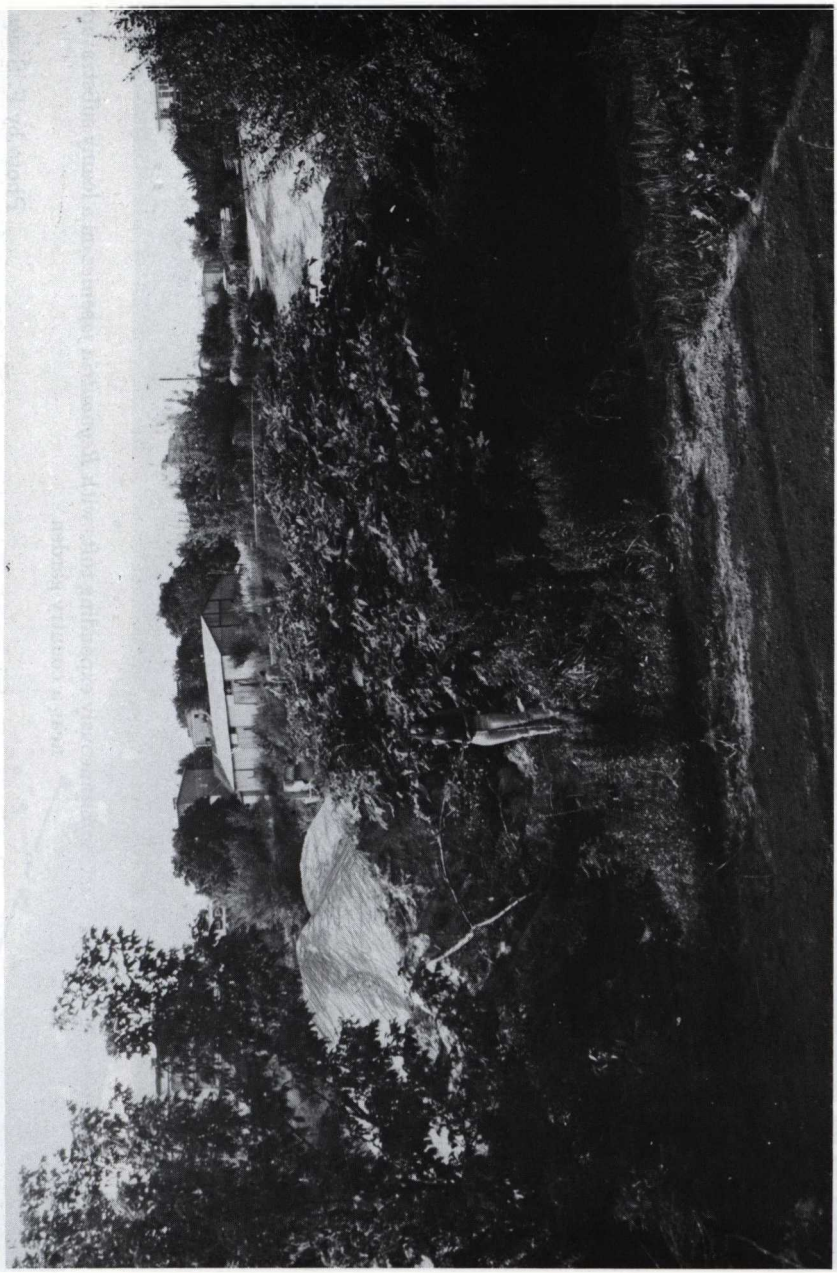

Fig. 2. Lublin, the LSM housing estate, the corner of Nadbystrzycka and Nowomiejska streets: a spontaneously forming association of *Reynoutrietum sachalinensis* on a ruderal loess square

Photo by F. Święs

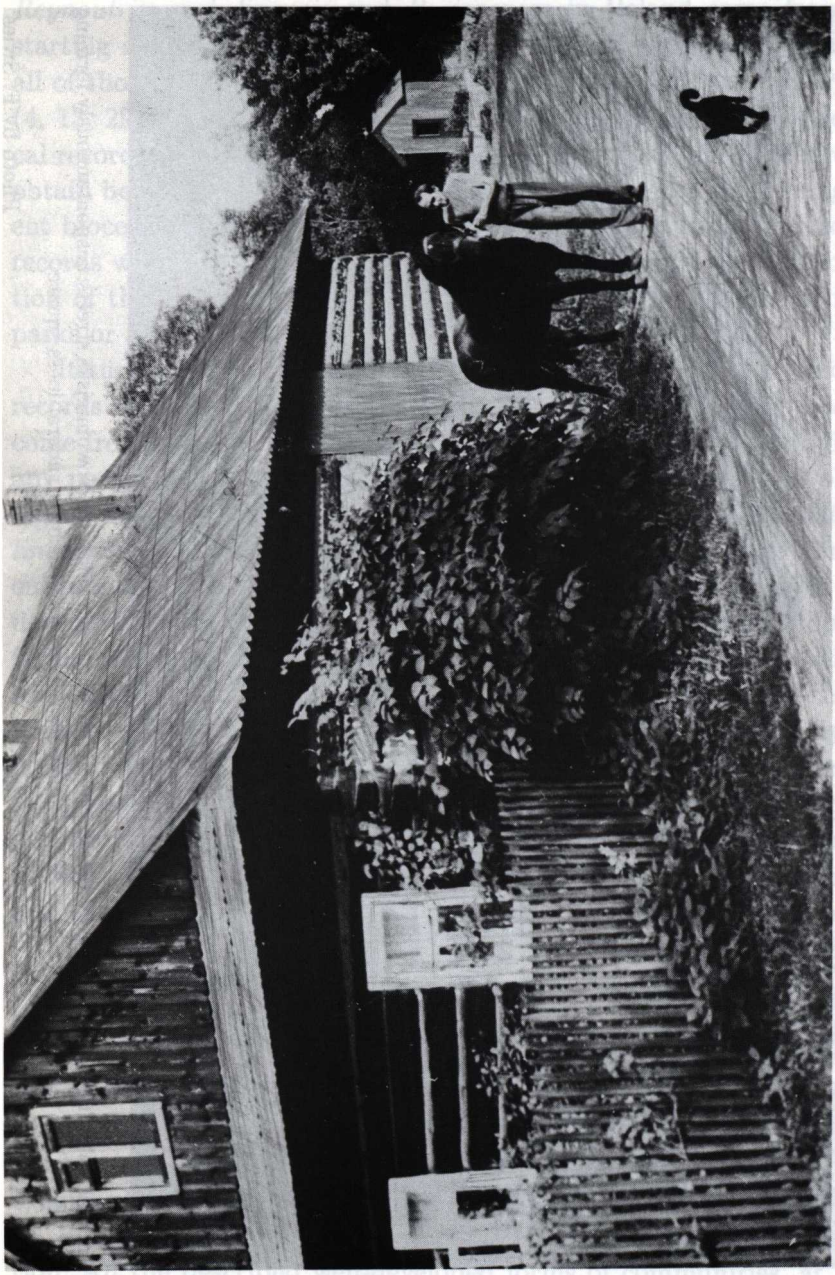

Fig. 3. Kąclowa near Grybów, SE part: spontaneously expanding tufts with *Reynoutria japonica* on a loamy substratum near a country garden

Photo by F. Święs

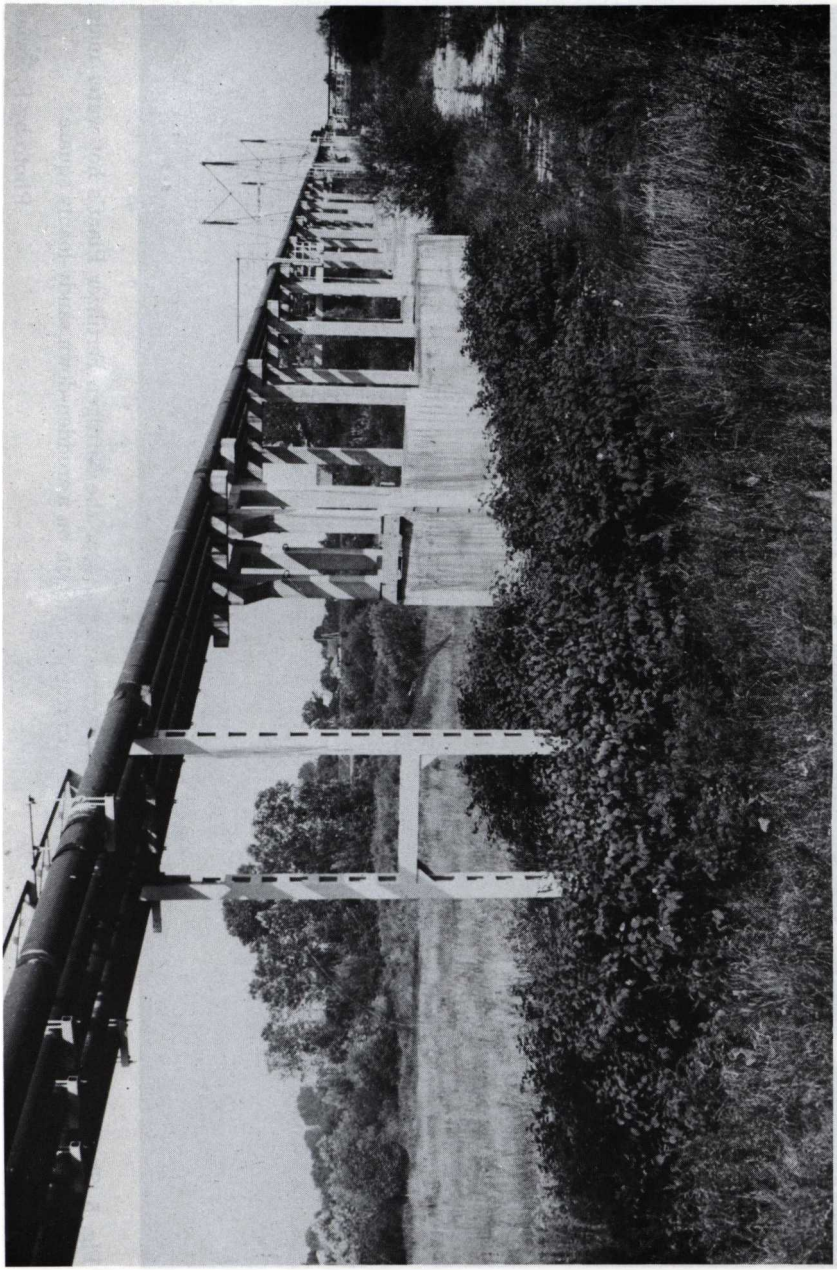

Fig. 4. Tarnów, the Mościce housing estate, between the Biała Dunajcowa river and the fence of Nitrogen Fertilizers Plant below the elevated hot water main: expansion of the association of *Reynoutrietum japonicae* on a loamy substratum with a loosened surface

Photo by F. Święs

Fig. 5. Tarnów, the Świerczków district, in Chemiczna street, near the Nitrogen Fertilizer Plant's hot water main: a succession of the *Reynoutrietum japonicae* association on a trodden-down sandy-loamy square

Photo by F. Święs

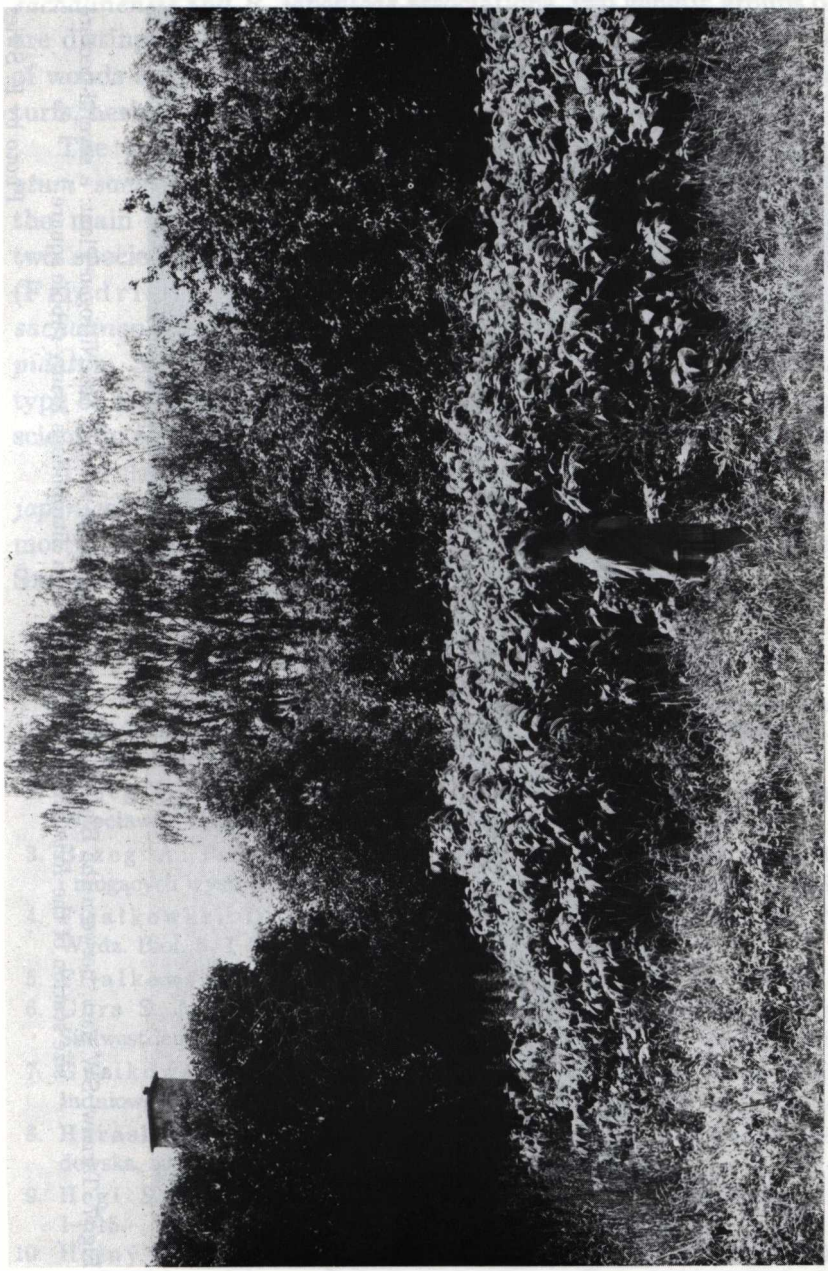

Fig. 6. Łuków, the Łapiguz district, in Strzelnicza street: a spontaneously forming association of *Reynoutrietum japonicae* on the edge of the neglected park on a loamy-sandy substratum

Photo by F. Święs

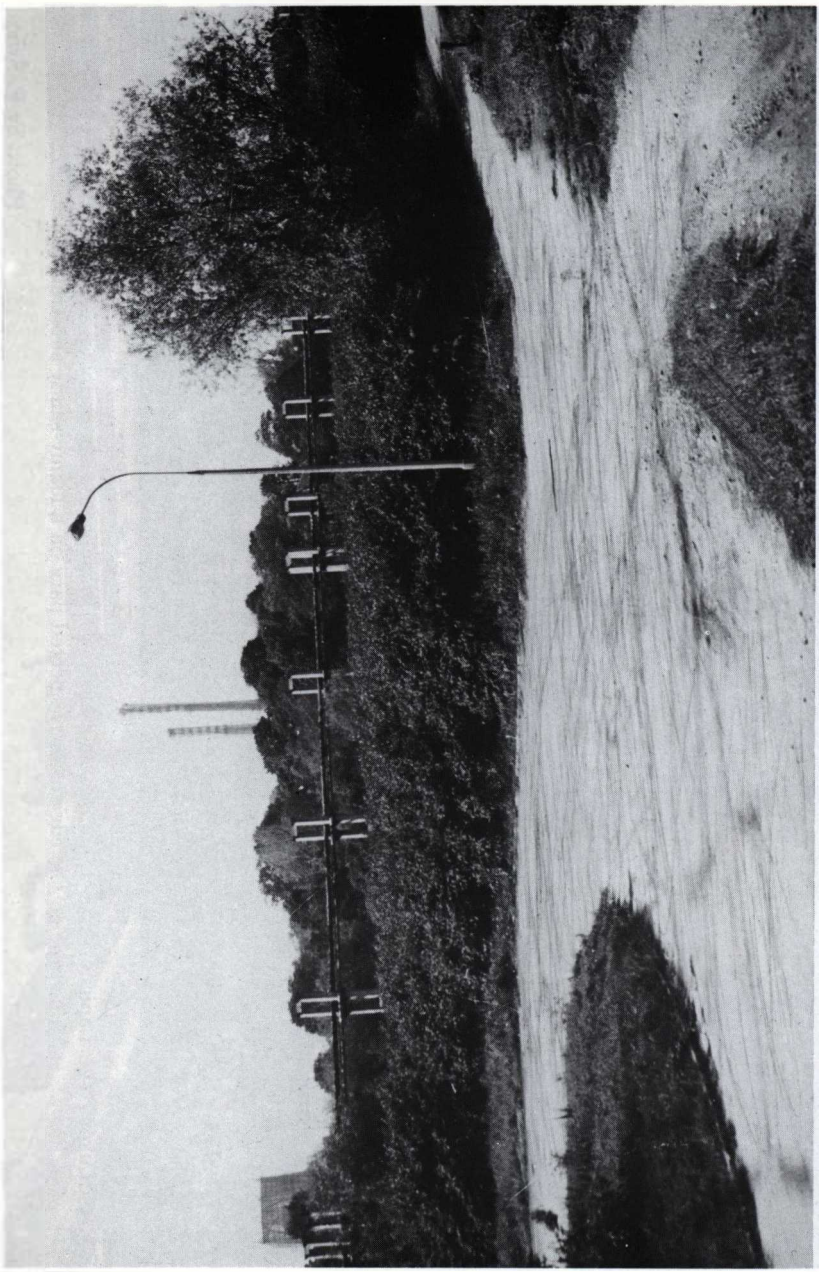

Fig. 7. Tarnów, SW part, between the Biała Dunajcowa river and the fence of the Nitrogen Plant: a several-hectare size station of the *Reynoutrietum japonicae* on a nitrophilous loamy-rubble square

Photo by F. Święs

sent their proper genetic ecological-floristic group. With the *Reynoutrietum sachalinensis* and *R. japonicae* associations, two genetic groups of that type are distinguished for each: a) seminatural habitats (in shrubs, on the rims of woods and parks, in wood clearings etc.), b) typical ruderal habitats (in turfs, herbage etc.).

The scientific names for the distinguished associations, *Reynoutrietum sachalinensis* and *R. japonicae*, were derived from the names of the main dominant and most characteristic species. This concerns the two species with their current and old names: *Reynoutria sachalinensis* (Friedrich Schmidt Petrop.) Nakai in Mori (= *Polygonum sachalinense* Schm.) and *Reynoutria japonica* Houtt. (= *Polygonum cuspidatum* Sieb. et Zucc. Those who first gave the characteristics of that type of associations, regardless of their phytosociological rank and the then scientific name, were regarded as the authors of those associations.

The classical model phytocenoses of *Reynoutrietum sachalinensis* and *R. japonicae* were declared their published stations only in the area of Poland, mostly by Misiewicz (22), Kucharczyk (18, 19), Święs (31–34), Święs et al. (35–37).

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STRESZCZENIE

Badane od kilkudziesięciu lat w Polsce i innych krajach Europy zachodniej zbiorowiska z *Reynoutria japonica* (*Polygonum cuspidatum*) i z *R. sachalinensis* (*Polygonum sachalinense*) nie mają dotąd ściśle zdefiniowanej pozycji w systemie fitosjocjologicznym. Stąd też obecnie przedstawiono charakterystykę syntaksonomiczną i ekologiczną zbiorowisk z *Reynoutria sachalinensis* i z *R. japonica* uformowanych na obszarze Polski. Do tych badań wykorzystano zdjęcia fitosocjologiczne zawarte tylko w pracach publikowanych i przygotowywanych do druku. W sumie 10 z nich dotyczy fitocenoz z *Reynoutria sachalinensis*, a 75 — fitocenoz z *R. japonica*.

Syntetyczne dane o strukturze syntaksonomicznej i ekologicznej charakteryzowanych fitocenoz z rdestami szerokolistnymi zestawiono w tab. 1–3 i 5.

Wykazano, że rozpatrywane wikaryzujące fitocenozy z *Reynoutria sachalinensis* i z *R. japonica* winny być zaliczone do odrębnych zespołów: *Reynoutrietum sachalinensis* i *R. japonicae*. Obydwa zespoły zaliczono do klasy *Artemisietea vulgaris*, rzędu *Onopordetalia acanthii* i związku *Alliarion*. Obecnie uściślone nazwy naukowe dla wymienionych dwóch zespołów utworzono od nazw dominujących w nich i zarazem najbardziej charakterystycznych dla nich gatunków roślin: *Reynoutria sachalinensis* i *R. japonica*.

Za klasycznie wzorcowe fitocenozy obydwu zespołów uznano jedynie scharakteryzowane na stanowiskach z obszaru Polski. Autorstwo naukowych nazw dla tych dwóch wyodrębnionych zespołów przypisano tylko tym fitosocjologom, którzy najwcześniej opisali te zbiorowiska niezależnie od nadawanej im rangi fitosocjologicznej. Okazało się, że o wiele jest trudniej ustalić autorów dla zespołu *Reynoutrietum japonicae* (S. Görs i Th. Müller, K. Kopecký, E. Oberdorfer, J. Misiewicz, D. Fijałkowski) niż dla zespołu *Reynoutrietum sachalinensis* (J. Misiewicz, D. Fijałkowski, A. Brzeg).

Zdefiniowane zespoły — *Reynoutrietum sachalinensis* i *R. japonicae* — mają wprawdzie dość bogaty, ale jednocześnie wyjątkowo niejednorodny skład florystyczny. Zasadniczo zespoły te cechuje występowanie tylko bezwzględnie dominujących, a zarazem jedynie dla nich charakterystycznych gatunków roślin. Odnosi się to do gatunków: *Reynoutria sachalinensis* i *R. japonica*.

Stwierdzono również, że zespoły *Reynoutrietum sachalinensis* i *R. japonicae* nie wykazują na obszarze Polski prawie żadnego zróżnicowania na trwałe jednostki fitosocjologiczne niższego rzędu, mimo że płaty tych zespołów wywodzą się sukcesyjnie z różnych typów siedlisk. W obydwu tych zespołach wydzielono tylko po dwa analogiczne stadia sukcesyjnego rozwoju: inicjalne (fazy końcowej) i optymalne. W pierwszym stadium wyodrębniono po trzy, a w drugim — po dwie postacie florystyczno-ekologiczne. Kolejno określono je jako: murawowe (łąkowe), zaroślowe i ruderalne, a następnie jako murawowo-zaroślowo-ruderalne i ruderalne (tab. 4).