Roczniki Akademii Rolniczej w Poznaniu CCCLXXXVII

Botanika – Steciana

12, 2008, 79-85

www.au.poznan.pl/steciana

ISSN 1896-1908

MATERIALS CONCERNING THE DISTRIBUTION OF INVASIVE SPECIES IN CENTRAL POMERANIA

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(Received: July 14, 2008. Accepted: September 1, 2008)

ABSTRACT. Investigations on the distribution of invasive plants in Central Pomerania were conducted in the vegetation seasons of the years 2006-2008. The incidence was recorded of the following species considered to be invasive plants: *Echinocystis lobata* (Michx.) Torr. & A. Gray, *Impatiens glandulifera* Royle, *Impatiens parviflora* DC., *Heracleum mantegazzianum* – Sommier & Levier, *Heracleum sosnovskyi* Manden., *Rosa rugosa* Thunb., *Myrrhis odorata* (L.) Scop., *Reynoutria japonica* Houtt., *Reynoutria sachalinensis* (F. Schmidt) Nakai.

KEY WORDS: invasive plants, neophytes, Central Pomerania

INTRODUCTION

Spreading species outside their natural limit, very often from other countries, results in plants adapting completely to new environmental conditions and producing reproducible successive generations. Some of such species are highly expansive, winning in their competition with indigenous species and replacing them. Frequently they do not have natural enemies and are capable of transforming entire ecosystems. They are referred to as invasive plants.

A considerable proportion of alien species, which succeeded greatly and becoming naturalized in their new homeland in natural communities, had been introduced by man as ornamental plants, less frequently as crops or medicinal plants. Few were imported with no conscious human effort (Tokarska-Guzik and Dajdok 2004, Tokarska-Guzik 2005).

From the point of view of nature conservation we need to focus especially on these invasive plants, which exhibit a high degree of competitiveness towards native species and aggressively penetrate natural or seminatural habitats (Tokarska-Guzik 2002).

The flora of vascular plants in Poland is at present assessed at over 3500 species, of which 30% are comprised by alien plants. There are approx. 460 alien species permanently naturalized in Poland, of which 30 are considered invasive species. Some of them pose a threat only on the regional scale, while others constitute a serious problem on a much larger scale.

In the objects of greatest natural value, i.e. national parks, nature reserves, landscape parks, nature and landscape complexes, protected landscape areas and ecological agricultural areas, it is necessary first of all to apply countermeasures preventing the spread of invasive plants (Dajdok et al. 2007).

The aim of the study was to inventory species considered invasive in Central Pomerania.

MATERIAL AND METHODS

Investigations on the distribution of invasive species were conducted in the years 2004-2008. Central Pomerania in this study refers to the area between the river Łeba to the east and the river Parsęta to the west. According to Kondracki (1998) it is the eastern part of Western Pomerania. Nomenclature of plant species was adopted after Mirek et al. (2002). For each position the name of the commune, in which it is located, is given together with the number of the square in the ATPOL system (Zając 1978). Locations of positions are given in Figs 1, 2 and 3.

INVASIVE SPECIES IN CENTRAL POMERANIA

***Echinocystis lobata* (Michx.) Torr. & A. Gray – wild cucumber** is a representative of the gourd family. It is an annual plant, originating from the eastern part of North America. In Europe, including Poland, it appeared in the first half of the 20th century (Zając et al. 1998). At present it is one of the most dynamically spreading alien species, primarily in river valleys. In Poland its positions are distributed mainly in the south-eastern and central part (Tokarska-Guzik 2001 a). The stem of wild

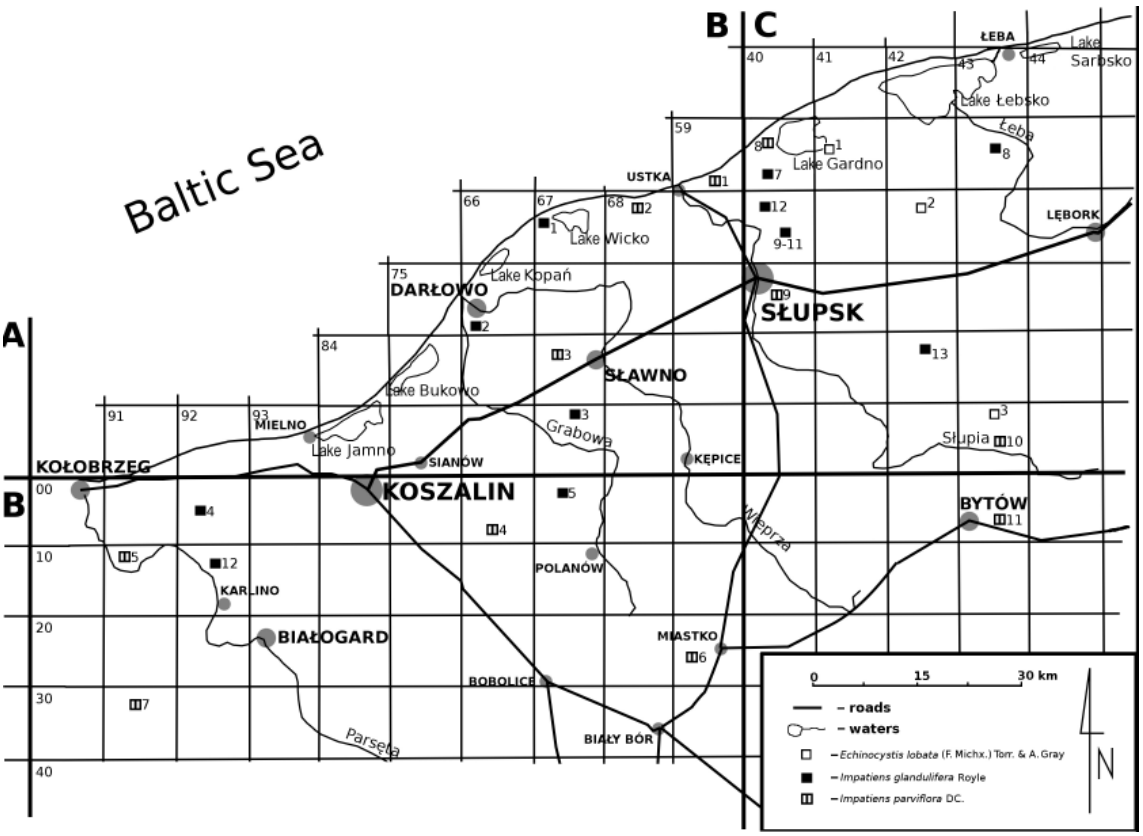

FIG. 1. Localities of *Echinocystis lobata*, *Impatiens glandulifera* and *Impatiens parviflora* on Central Pomerania

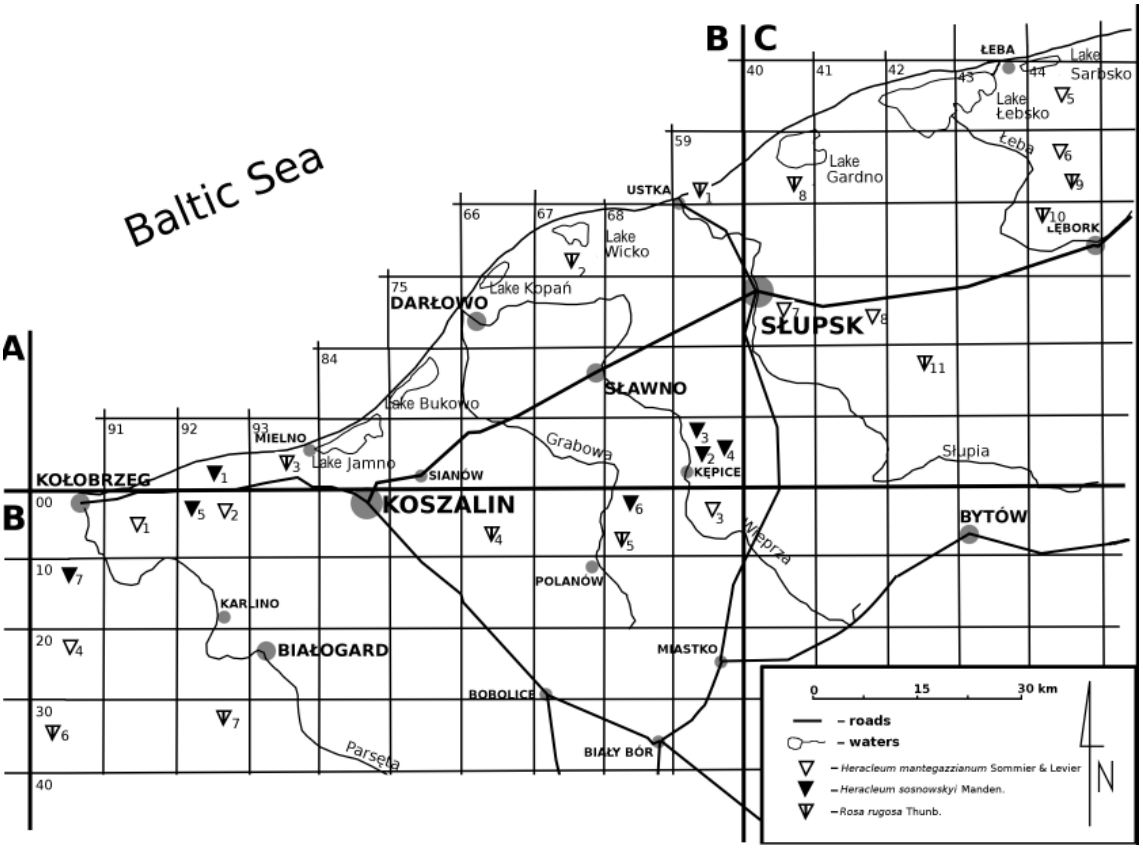

FIG. 2. Localities of *Heracleum mantegazzianum*, *Heracleum sosnowskyi* and *Rosa rugosa* on Central Pomerania

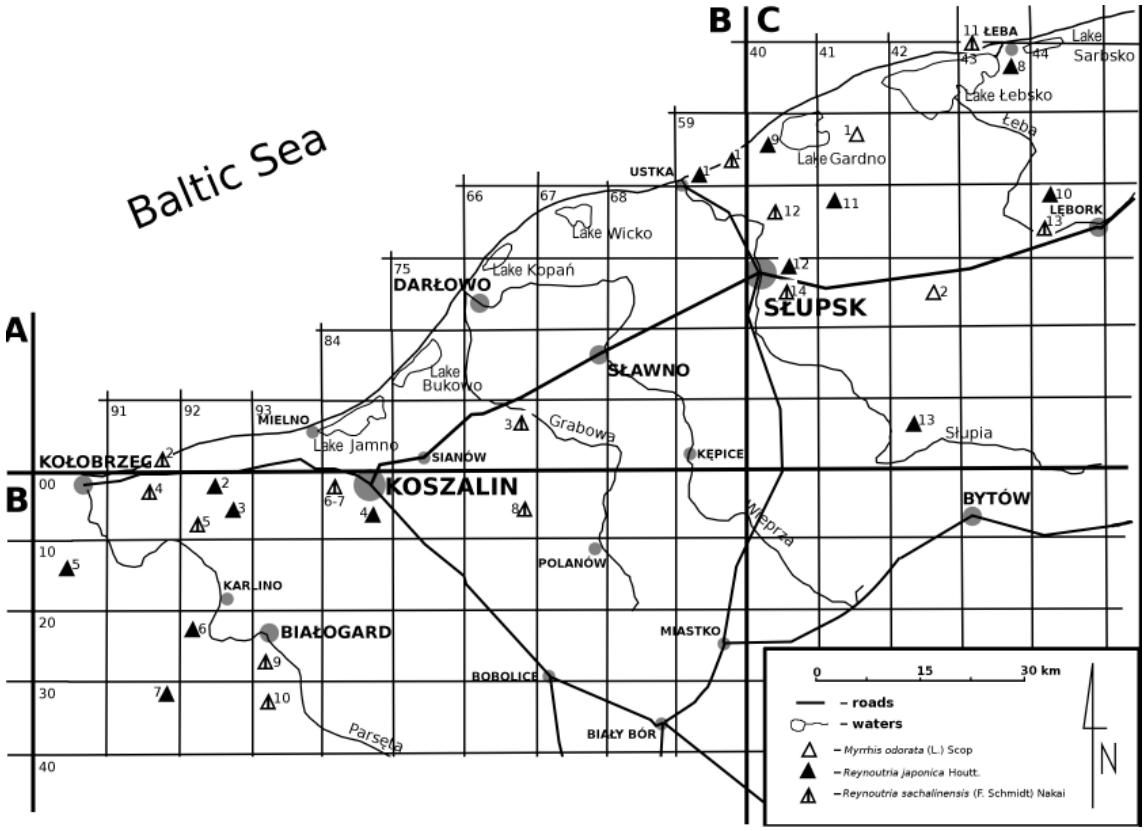

FIG. 3. Localities of *Myrrhis odorata*, *Reynoutria japonica* and *Reynoutria sachalinensis* on Central Pomerania

cucumber reaches up to 5-6 m in length. Tendrils extending from the stem make it possible for the plant to climb over supports, thus it is willingly grown. It is most frequently planted along fences, wire fences and under trees, in home gardens and garden plots. Thus together with waste and rubbish it is transported to unauthorized dumping grounds, e.g. nears rivers along which it spreads. This is confirmed, among other things, by studies in the Opolskie province, where numerous positions of giant hogweed were recorded along the banks of the river Odra (DAJDOK and KĄCKI 2003).

In Central Pomerania the following positions of *Echinocystis lobata* were found:

1. Gardna Wielka – the Smołdzino commune (CA 51). At the road to the Lake Gardno on pasture fences.

2. Łojewo – the Bobrowniki commune (CA 62). In the park, along the watercourse flowing in cascades, on *Sambucus nigra* L. and *Prunus spinosa* L. shrubs.

3. Nożyno – the Czarna Dąbrówka commune (CA 93). In the manor park along the river Skotawa in *Salix viminalis* L. and *Sambucus nigra* L. thickets.

***Impatiens glandulifera* Royle – Royle's balsam** is a representative of the balsam family. It originates from the Himalayas and India. It was brought to Europe as an ornamental plant in 1839 (PODBIELKOWSKI 1995). The first information on the cultivation of this plant comes from 1839 from Kew Gardens in Great Britain (ZAJĄC and ZAJĄC 1973). The first data on its occurrence in Poland come from 1935. In time it ran wild from cultivation and was naturalized in riparian forests (PODBIELKOWSKI 1995). At present it is recorded in positions scattered throughout Poland, although the plant is found more frequently in the south, where in many positions it is observed in large numbers, especially in river valleys (TOKARSKA-GUZIK 2001 c).

In Central Pomerania the following positions were recorded:

1. Jarosławiec – the Postomino commune (BA 67). On cliff slopes at sites of water seepage.

2. Dobiesław – the Darłowo commune (BA 85). At the Protestant cemetery.

3. Paprotki – the Malechowo commune (BA 97). In a park located within a forest, along a watercourse.

4. Wrzosowo – the Dygowo commune (BB 02). In a land depression, on a wet meadow a phytocenosis of 4 m wide and 70 m long.

5. Laski Koszalińskie – the Malechowo commune (BB 07). In the manor park at the bottom of a ravine.

6. Kłopotowo – the Dygowo commune (BB 12). In the manor park at pond shores.

7. Objazda – the Ustka commune (CA 50). On wet meadows, along drainage ditches.

8. Poraj – the Wicko commune (CA 53). Along a drainage ditch adjacent to the manor park.

9, 10, 11. Wrzeście – the Słupsk commune (CA 60). In the Wrzeście Forest District, the Ustka Forest Division in forest subcompartments 408j at an area of 3 ha (**9**), 431f of 0.89 ha (**10**) – over the entire subcompartment, and in 431g of 0.45 ha in area (**11**) – throughout the entire subcompartment.

12. Kępno – the Słupsk commune (CA 60). Along drainage ditches.

13. Budowo – the Dębnica Kaszubska commune (CA 82). Along the road leading from the former manor farm to the Protestant cemetery.

***Impatiens parviflora* DC. – small balsam** is a representative of the balsam family. It is one of the few neophytes, which managed to penetrate closed dense forest communities, forming large populations in their forest floor vegetation cover. This species originates from Central Asia, where it is found in mesophytic broad-leaved forests as well as flood plain forests. The first small balsam specimens which ran wild in Europe were found in the 1830's in the botanical garden in Geneva. In time it appeared around some cities in Central Europe, expanding its range in the northerly and north-easterly directions. At present it occupies almost all Central Europe. Initially balsam, running wild, settled as a garden weed and as a nitrophilous ruderal plant. Only after several decades, at the end of the 19th century, it started to penetrate forest communities. Presently it spreads in these communities, it is found in alder, flood plain, beech and oak-hornbeam forests, but also in different ruderal communities rich in nitrogen compounds. In many places where it settles it does not face any competition (e.g. parks, gardens). Strong anthropopressure is observed in areas where it spreads. Thus diaspores may be transported far through hemeroby. In forests it generally occupies open spaces – forest edges, clearings and felling sites, although at reduced vigour it is also capable of existing under rather limited lighting conditions (Podbielkowski 1995). A rapid invasion of *Impatiens parviflora* throughout the entire country started in the 1960's. At present it is popular over the entire area of Poland. It is common in the southern part of the country, being found less often in north-eastern Poland (Tokarska-Guzik 2002).

Small balsam may frequently completely predominate in the forest floor cover, although opinions on its effect on native plants vary – it is considered to be anything from harmful to reductive, e.g. in relation to *Urtica dioica* L. (Piskorz and Klimko 2002).

Control of *Impatiens parviflora* consisting in the removal of individual specimens from the forest floor vegetation cover prior to fruit setting, is a long-term process and brings desirable effects only in those places where its populations are still small in size (Adamowski and Keczyński 1998).

In Central Pomerania the following positions of *Impatiens parviflora* were recorded:

1. Orzechowo – the Ustka commune (BA 59). In the Orzechowska Wydma Natural and Landscape Complex. It is found in large numbers along the tract leading through alder swamp forest and at beech forest on a slope.

2. Zalesin – the Ustka commune (BA 68). In a forest felling area.

3. Boleszewo – the Sławno commune (BA 87). In a forest at the river Moszczenica, in a sub-Atlantic oak-hornbeam forest *Stellario-Carpinetum*.

4. Sowno – the Sianów commune (BB 06). In a manor park in a beech stand on a slope.

5. Piotrowice – the Dygowo commune (BB 11). In a manor park, in the forest floor cover which consists of: *Acer pseudoplatanus* L., *Fraxinus excelsior* L., *Salix alba* L., *Tilia cordata* Mill., *Cerasus avium* (L.) Moench.

6. Kamnica – the Miastko commune (BB 12). In large numbers in a manor park.

7. Sławoborze – the Sławoborze commune (BB 31). In large numbers in a felling site.

8. Dębina – the Ustka commune (CA 50). In large numbers on the Protestant cemetery.

9. Słupsk – the Słupsk Town Office (CA 70). In the floor vegetation cover in a municipal wood in a mixed stand with a large proportion of *Fagus sylvatica* L., in well-lighted positions after tree felling and in a presently unused gravel pit.

10. Sarniak – the Bytów commune (CA 93). In the Gołębia Góra reserve in the forest floor cover of a pine stand on a slope declining towards the river Słupia.

11. Gostkowo – the Bytów commune (CB 03). On felling sites.

***Heracleum mantegazzianum* Sommier & Levier – giant hogweed** is a representative of the *Apiaceae* family. It originates from the Caucasus and Central Asia. In the past it was grown and spread in the natural environment as a species which escaped from cultivation. It was first reported in Poland in the second half of the 20th century. It was frequently mistaken with *Heracleum sosnowskyi,* which is much more common. In Poland this species is found most often in the Małopolska region and in the Carpathian Foothills (Tokarska-Guzik 2001 b).

The following positions were recorded in Central Pomerania:

1. Bardy – the Dygowo commune (BB 01). On the castle embankment.

2. Syrkowice – the Karlino commune (BB 12). At the edge of the manor park.

3. Tursko – the Dretyń commune (BB 19). In the manor park.

4. Trzynik – the Siemyśl commune (BB 20). In the manor park.

5. Komoszewo – the Wicko commune (CA 44). A phytocenosis of approx. 80 m^2 at a distillery in the former manor park.

6. Lędziechowo – the Nowa Wieś Lęborska commune (CA 54). In the park along a stream.

7. Głobino – the Słupsk commune (CA 70). At deep wells.

8. Domaradz – the Damnica commune (CA 71). At manor farm buildings in the former park.

***Heracleum sosnowskyi* Manden** is a representative of the *Apiaceae* family.

Natural positions of this species are found in the Caucasus (Mandenova 1951). To Poland *Heracleum sosnowskyi* it was brought in the early 1970's to many experimental stations of different agricultural research institutions, where studies were initiated on the feeding value and potential for cultivation of this species (Lutyńska 1980, Pasieka 1984). Results of investigations on the utilization of *Heracleum sosnowskyi* were very promising. The species turned out to be a high-yielding plant rich in nutrients. It was used to produce silage or *Heracleum sosnowskyi* was used when ensiling other plants (Bochniarz and Bochniarz 1986). Recorded feeding value was the justification for the introduction of this plant in cultivation trials in many locations.

However, in further breeding practice problems were observed with ensiling and feeding *Heracleum sosnowskyi* and first of all with harvesting such tall

plants (in the Caucasus its fertile shoots reach 1.0-1.5 m in height; however, in Poland it found especially advantageous conditions as here it is over two times taller than in its native range). Harvest could be performed only by hand using sickles, scythes, machetes, etc. Skin inflammations or even dangerous burns were observed in workers employed at the harvesting, transport and processing of this plant. They were caused by furocoumarins contained in this plant, which cause photoallergies. For this reason it was decided to with draw this plant from cultivation.

At present *Heracleum sosnowskyi* is found as a species which run wild most frequently in places of former cultivation and has spread to neighbouring areas within a radius of several kilometers. *Heracleum sosnowskyi* is a component of many anthropogenic communities formed on fields, baulks, pastures, meadows, in ditches, gardens, parks and around buildings. It also enters natural forest communities. It frequently exhibits high expansiveness and is found in large numbers, changing the original character of phytocenoses (Korniak and Środa 1996).

In Central Pomerania studies on the distribution of *Heracleum sosnowskyi* were conducted by Sobisz (2007), who reported 61 positions of this species. The list below presents new, previously unpublished positions of *Heracleum sosnowskyi* in Central Pomerania:

1. Łopienica – the Będzino commune (BA 92). On the roadside at manor farm buildings.

2. Barcino – the Kępice commune (BA 99). In the manor park.

3. Kotłowo – the Kępice commune (BA 99). In the manor park.

4. Osieki – the Kępice commune (BA 99). In the manor park.

5. Gwizd – the Ustronie Morskie commune (BB 02). Along the Koszalin–Kołobrzeg road above the drainage ditch at a length of approx. 800 m.

6. Podgóry – the Kępice commune (BB 08). At an old mill.

7. Siemyśl – the Siemyśl commune (BB 10). At the edge of a field.

***Rosa rugosa* Thunb. – hedge-row rose** is a representative of the family *Rosaceae*. It originates from East Asia, from which it was imported to Europe in the 19th century as an ornamental and fruit shrub. It is often planted at roads and highways, as well as edges of forests and on dunes. It was naturalized in many locations (Podbielkowski 1995).

In Central Pomerania the following positions were recorded:

1. Ustka – the Ustka commune (BA 59). On forest dunes, in the vicinity of the port canal and in the grey dune belt, separating the beach from the promenade.

2. Królewo – the Postomino commune (BA 67). It is growing in a wide belt at the boundary of former manor farm buildings and Lake Wicko.

3. Kładno – the Będzino commune (BA 92). It is found in large numbers in the manor park.

4. Sowieński Młyn – the Sianów commune (BB 06). At the roadside at a distance of approx. 250 m.

5. Pustowo – the Kępice commune (BB 08). Large phytocenoses approx. 6 m wide separating stables from the distillery in the former manor park.

6. Kamień Rymański – the Rymań commune (BB 30). At the roadside in the form of a belt approx. 3 m wide and approx. 450 m long.

7. Rąbino – the Rąbino commune (BB 32). At railway tracks.

8. Retowo – the Smołdzino commune (CA 50). It is found on a gentle slope leading to Lake Gardno, where it forms a phytocenosis approx. 8 m wide and approx. 350 m long.

9. Kopaniewo – the Wicko commune (CA 54). At farm buildings.

10. Pogorszewo – the Nowa Wieś Lęborska commune (CA 64). At the manor farm at the edges of the park it forms a phytocenosis of approx. 120 m^2.

11. Gogolewo – the Dębnica Kaszubska commune (CA 82). At the edges of the manor park.

***Myrrhis odorata* (L.) Scop. – sweetcicely** is a representative of the family *Apiaceae*. It is found in the wild in the western and southern Alps. The whole plant contains anethole, a volatile oil yielding a very intensive anise aroma. For this reason sweetcicely was used in folk medicine to treat chronic diseases of the upper airways and externally to reduce joint pain. This species was also used in animal husbandry to increase milk production in cows (Kopecký 1974, Nowiński 1980). It was reported in the Sudeten Mountains, in the Sudeten Foothills and in the Eagle Mountains (in the Czech part of the Sudeten), mainly near streams and in meadows. Most probably sweetcicely was brought to the Eagle Mountains by fellers who came from Tyrol in the second half of the 16th century during the so-called Alp colonization. Probably either this species was brought in an analogous way to the Polish part of the Sudeten or it penetrated from the area of the Eagle Mountains (Lhotska 1975).

1. Witkowo – the Smołdzino commune (CA 51). At abandoned farm buildings in the northern part of the village.

2. Łupawa – the Łupawa commune (CA 72). At the edges of the former manor park a phytocenosis of 150 m^2 was recorded. This position was previously given by Misiewicz and Jehlik (1982).

***Reynoutria japonica* Houtt.) – Japanese fleece-flower** is a representative of the *Polygonaceae* family. It originates from East Asia (Japan), where it is found as a pioneer species on volcanic slopes and in the mountains. In Europe it appeared as an ornamental plant in mid-1840's. It was brought to Poland also in the 19th century. In many locations it escaped from cultivation. It is found most frequently in different ruderal habitats (roadsides, wasteland, landfill sites, screes), but it is also observed on edges of thickets and riparian forests as well as forests located in the vicinity of human settlements (Podbielkowski 1995). *Reynoutria japonica* and other taxa from this genus create problems, especially in river valleys, where they form dense, single-species phytocenoses, frequently occupying vast areas in habitats of former riparian forests and willow thickets. While effectively competing with native vegetation they considerably reduce and in case of many species even prevent their regeneration. Moreover, dense *Reynoutria* thickets reduce access to watersides, frequently destroy flood protection facilities and make agricultural use of

land impossible (Tokarska-Guzik 2002). These plants, despite observed threats, are characterized by much value, which had been the reason for their introduction in many countries worldwide. In the urban environment these plants may constitute an attractive ornamental element, frequently shielding and giving some aesthetic value to rubble heaps, landfill sites and different types of wasteland. Due to their rapid growth and small habitat requirements they may be used as screening plants. They offer shelter to many invertebrate species and small rodents. As late-flowering plants they constitute a source of nectar for numerous insect species (Tokarska-Guzik 2002).

1. Ustka – the Ustka commune (BA 59). On a grey dune at a promenade.

2. Miłogoszcz – the Będzino commune (BB 02). In the former manor park, along the avenue leading to the historical blacksmith's shop.

3. Rusowo – the Dygowo commune (BB 02). A 12 m long belt along the stone wall around the church.

4. Mierzym – the Świeszyno commune (BB 04). Along the fence behind the manor farm buildings next to the manor park. A belt of Japanese fleeceflower is up to 3 m wide.

5. Unieradz – the Siemyśl commune (BB 10). In the manor park around ruins of the manor. In a phytocenosis of 80 m^2 several dozen specimens of *Telekia speciosa* (Schreb.) Baumg. were recorded.

6. Nasutowo – the Białogard commune (BB 22). On slopes of the moat in the manor park.

7. Sidłowo – the Sławoborze commune (BB 31). Along a field road to Krzecko.

8. Łeba – the Łeba Town Office (CA 43). Wasteland at 10 marca street. A phytocenosis of 120 m^2.

9. Machowinko – the Ustka commune (CA 50). A belt of 4.5 m wide adjacent to the Protestant cemetery.

10. Łebień – the Nowa Wieś Lęborska commune (CA 54). Along the village road leading to the municipal cemetery.

11. Damnica – the Damnica commune (CA 61). Wasteland at Szkolna street. A phytocenosis of 80 m^2 located next to garden plots was recorded.

12. Redzikowo – the Słupsk commune (CA 70). In the former manor park, between two ponds. A phytocenosis of 100 m^2.

13. Łupawsko – the Czarna Dąbrówka commune (CA 93). At a camping site on Lake Jasień, at the field road to Brzezinka.

***Reynoutria sachalinensis* (F. Schmidt) Nakai – Sakhalin knotweed** is a representative of the *Polygonaceae* family. It originates from eastern Asia. It appeared in Europe recently, only in the years 1890-1940. It was imported by gardeners and next it spontaneously spread in the environment. In Poland it was recorded for the first time in the Warmia and Mazury region (Stypiński 1977). At present it is found throughout Poland, although the biggest number of positions has been recorded in the south-western part of the country (Tokarska-Guzik 2001 d). This species has been spreading, but it is still less common than the related species, Japanese fleeceflower.

1. Ustka – the Ustka commune (BA 59). At the railway tracks to Słupsk. A phytocenosis of 300 m^2 adjacent to a sewage treatment plant.

2. Ustronie Morskie – the Ustronie Morskie commune (BA 91). Along the road to Wieniotowo.

3. Niemica – the Malechowo commune (BA 96). In the former manor park along a hornbeam avenue leading to the river Bielawa.

4. Kukinia – the Dygowo commune (BB 01). Found in large numbers in the Protestant cemetery, at an avenue composed of great maples *Acer pseudoplatanus*.

5. Strachomino – the Będzino commune (BB 02). Around the manor farmyard several phytocenoses were observed, ranging in area from 40 to 120 m^2, adjacent to the granary and the stable.

6. Koszalin – the Koszalin City Office (BB 04). The slope of an escarpment at the Municipal Wood at Leśna street.

7. Koszalin – the Koszalin City Office (BB 04). Wasteland at Morska street.

8. Sierakowo Sławieńskie – the Sianów commune (BB 06). On a gently slope of a moraine hill next to the former manor park a phytocenosis of 90 m^2 was recorded.

9. Rogowo Białogardzkie – the Białogard commune (BB 23). On a railway embankment a phytocenosis of 250 m^2 was recorded.

10. Nawino – the Białogard commune (BB 33). Along the road leading to the manor park.

11. Rąbka – the Łeba Town Office (CA 43). Next to buildings of the Protection Zone Rąbka and along the red tourist trail leading to Wydma Łącka [the Łącka Dune].

12. Włynkowo – the Słupsk commune (CA 60). On the road shoulder of the Ustka road, along the drainage ditch a phytocenosis of 50 m^2 was recorded.

13. Nowa Wieś Lęborska – the Nowa Wieś Lęborska commune (CA 64). On the bank of the River Kisewa, at the building of the former post office a phytocenosis of 250 m^2 was recorded.

14. Słupsk – the Słupsk Town Office (CA 70). At the intersection of Banacha and Jana Kazimierza streets a phytocenosis of 60 m^2 was recorded.

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For citation: Sobisz Z., Truchan M. (2008): Materials concerning the distribution of invasive species in Central Pomerania. Rocz. AR Pozn. 387, Bot.-Stec. 12: 79-85.