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Preliminary account of ergasiophygophytic and xenophytic trees, shrubs and subshrubs in the Central Ruhrgebiet (Germany)[1]

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Abstract

A list of woody plant taxa found in the central part of the Ruhrgebiet (Germany, Northrhine-Westphalia; cities of Duisburg, Mülheim an der Ruhr, Oberhausen, Essen, Gelsenkirchen, Bochum, Herne), which are escaped from cultivation or include xenophytic occurrences, is given. The predominant part of these taxa is represented by ergasiophygophytes, many species are ambiguous in their floristic status. Altogether 179 taxa were found (within the period 1980-2002), in most cases originally grown for ornament in gardens, parks and cemeteries.
Keywords: Ergasiophygophytes, Xenophytes, floristic status, naturalisation, casual, spontaneosynanthropic, vegetative spread, ornamental plants, fruit, Ruhrgebiet, Northrhine-Westfalia

Vorläufige Übersicht der ergasiophygophytischen und xenophytischen Bäume, Sträucher und Halbsträucher im zentralen Ruhrgebiet (Deutschland)

Eine tabellarische Liste gibt einen Überblick über die im zentralen Ruhrgebiet (Städte Duisburg, Mülheim an der Ruhr, Oberhausen, Essen, Gelsenkirchen, Bochum, Herne) nachgewiesenen aus Kultur verwilderten oder eingeschleppten Holzgewächse. Der überwiegende Anteil dieser Sippen wird von Ergasiophygophyten gestellt, wobei viele Arten hinsichtlich ihres Status mehrdeutig sind. Insgesamt wurden 179 Sippen (Zeitraum 1980-2002) nachgewiesen, die ursprünglich überwiegend als Zierpflanzen in Gärten, Parks und auf Friedhöfen kultiviert werden.
Schlüsselworte: Ergasiophygophyten, Xenophyten, Status, eingebürgert, unbeständig, spontaneosynanthrop, vegetative Ausbreitung, Zierpflanzen, Obst, Ruhrgebiet, Nordrhein-Westfalen

Introduction

A tradition of investigation of alien plant taxa in the Ruhrgebiet (Ruhr area, Northrhine-Westphalia), formerly Germany´s largest industrial region, was founded

[1] Draft of a lecture on the International Conference „Biological Invasions – Challenges for Science“ in Halle/Saale (Germany) 2002.

120 years ago and is still continued. More than 1000 adventive plant species have been detected within this area (a detailed outline is given by KEIL & LOOS 2002).

Within the investigation period, the origin of herbal aliens changed significantly from mainly xenophytic to ergasiophygophytic occurrences due to changes in media of transportation. Within alien trees and shrubs ergasiophygophytic occurrences are traditionally predominant, while xenophytic occurrences were restricted to some species introduced by fruit transport, i.e. fruit from central Europe like *Malus* (×)*domestica, Prunus avium* etc., but also citrus and tropical fruit. Xenophytic occurrences of this type were found at railway stations, especially at goods depots. But most xenophytic occurrences of woody fruit species were detected at waste disposal sites and other waste places. Tainted and non-salable fruit (sometimes in large proportions) and fruit parts remaining after consumption (including diaspores) were disposed here. Exotic fruit species like *Phoenix dactylifera* have been found at waste disposal sites in the Ruhrgebiet for several times (see HÖPPNER & PREUß 1926, BONTE 1930, HERBST 1936, RUNGE 1990).

Because of changes in transportation modes, paths and routes, xenophytic occurrences of woody fruit species are not of significant floristic importance. Only origins from fruit diaspores remaining from consumption could be found regularly in the Ruhrgebiet, most frequently in *Malus* (×)*domestica*. Ergasiophygophytic occurrences (escaped from cultivation, predominantly through dispersal by birds and mammals, wind or autochory) mainly originated from ornamental cultivation in gardens, cemeteries and parks and roadside plantings – in past and present. Trees and shrubs grown for fruit in gardens do not play as important of a role as ornamental plants.

The aim of this study is to give an overview (as table 1) of the woody plant species with ergasiophygophytic and xenophytic occurrences in the central Ruhrgebiet (a subregion of the Ruhrgebiet defined by the city areas of Duisburg, Mülheim an der Ruhr, Oberhausen Essen, Gelsenkirchen, Bochum and Herne) that found between 1980 and May 2004. Table 1 contains at first a list of the trees, shrubs and subshrubs with such occurrences, followed by the floristic status (in species with different status categories – usually found in different locations - all status categories are named; the most important status in the area is mentioned first), their dispersal behaviour if they show tendencies to become expansive, a list of the towns where they were found

and the sources of their occurrences. In the following passages, some aspects concerning categories and results of the table are discussed.

Tab. 1: Overview of woody taxa in central Ruhrgebiet escaped from cultivations (1980-2002). Including data from DÜLL & KUTZELNIGG 1987, REIDL 1989 & DETTMAR 1992. I = indigenous, E = established, U = casuals, S = spontaneosynanthropics (i.e. casual or established); * = predominantly spread vegetatively; L# = locally expansive taxon.

Taxon	Status		research-area							sources						
		expansive	Oberhausen	Duisburg	Mülheim a.d. Ruhr	Essen	Gelsenkirchen	Bochum	Herne	Forestry	Gardening (ornamental plants, herbs)	Cemeteries and Parks	Flower beds at public places	Hedging and Roadside plantings, railway and channelside plants	Botanical Gardens (outside)	Xenophytic
Acer campestre	S; E; I		x	x	x	x	x	x	x	x	x	x		x	x	
Acer ginnala	S				x			x						x		
Acer negundo	S	#	x	x	x	x	x	x	x			x		x		
Acer platanoides	S; E	#	x	x	x	x	x	x	x	x	x	x		x	x	
Acer pseudoplatanus	S; E; I?	#	x	x	x	x	x	x	x	x	x	x		x	x	
Acer saccharinum	S			x		x		x				x		x		
Acer tataricum	S							x			x	x		x		
Aesculus hippocastanum	S	#	x	x	x	x	x	x	x		x	x		x	x	
Ailanthus altissima	E; S	#	x	x	x	x	x	x	x		x	x		x	x	
Alnus cordata	S	L#				x		x						x		
Alnus incana	S		x	x	x	x	x	x	x	x	x			x	x	
Amelanchier lamarckii	S	L#	x	x	x	x	x	x	x		x			x		
Aucuba japonica	S					x					x					
Berberis julianae	S	L#		x	x	x	x	x	x		x	x		x	x	
Berberis (*Mahonia*) *aquifolium* s.l.	S; E	#	x	x	x	x	x	x	x		x	x		x	x	
Berberis thunbergii	S			x	x	x	x	x	x		x	x		x	x	
Berberis xottawensis	S				x							x		x		
Betula papyrifera (incl. hybrids with *B. pendula*)	S							x	x		x			x		
Betula pendula	I; S; E		x	x	x	x	x	x	x	x	x	x		x	x	
Betula xaurata	I; S		x	x	x		x	x				x				
Buddleja davidii	E; S	#	x	x	x	x	x	x	x		x	x			x	
Caragana arborescens	S	L#				x	x					x		x		
Castanea sativa	S				x		x	x	x	x				x		
Catalpa bignonioides	S				x	x	x	x			x	x		x		
Cercidiphyllum japonicum	S							x							x	
Chamaecyparis lawsoniana	S					x	x	x			x	x				
Colutea arborescens	S						x					x		x		
Cornus mas	S				x	x		x			x	x		x		
Cornus sanguinea s. lat.	S; I; E		x	x	x	x	x	x	x		x	x		x	x	
Cornus sericea	S; E		x	x	x	x	x	x	x		x	x		x	x	
Corylus avellana	I; S		x	x	x	x	x	x	x		x	x		x	x	
Corylus colurna	S					x								x		
Corylus maxima (incl. hybrids with *C. avellana*)	S				x	x	x	x	x		x	x		x	x	

Taxon	Status		research-area							sources						
		expansive	Oberhausen	Duisburg	Mülheim a.d. Ruhr	Essen	Gelsenkirchen	Bochum	Herne	Forestry	Gardening (ornamental plants, herbs)	Cemeteries and Parks	Flower beds at public places	Hedging and Roadside plantings, railway and channelside plants	Botanical Gardens (outside)	Xenophytic
Cotoneaster bullatus	S			x		x	x	x	x		x	x		x	x	
Cotoneaster dielsianus	S			x	x	x	x	x	x		x	x	x	x	x	
Cotoneaster divaricatus	S	#		x	x	x	x	x	x		x	x	x	x	x	
Cotoneaster franchetii	S					x		x	x		x	x	x	x		
Cotoneaster hjelmquistii	S							x			x	x	x	x		
Cotoneaster horizontalis	S		x	x	x	x	x	x	x		x	x	x	x		
Cotoneaster integrifolius	S			x		x	x	x			x	x		x		
Cotoneaster lucidus	S			x		x		x			x	x		x		
Cotoneaster rehderi	S			x		x	x	x	x		x	x		x		
Cotoneaster rotundifolius	S			x		x		x			x	x	x	x	x	
Cotoneaster salicifolius	S		x	x		x	x	x	x		x	x		x		
Cotoneaster xsuecicus	S			x		x	x	x	x		x	x	x	x		
Crataegus monogyna	S; E; I?			x	x	x	x	x	x		x	x		x	x	
Crataegus pedicellata	S		x				x	x						x		
Crataegus persimilis	S		x		x	x		x						x		
Crataegus xsubsphaericea	S; E; I?		x	x	x	x	x	x	x		x	x		x	x	
Cytisus multiflorus	S							x						x		
Cytisus scoparius	S; I; E?		x		x	x		x	x		x			x	x	
Deutzia scabra	S					x		x	x		x			x		
Eriobotrya japonica	S					x										x
Euonymus europaeus	S, I		x	x	x	x	x	x	x		x	x		x	x	
Euonymus fortunei	S*		x					x	x		x	x				
Fagus sylvatica	I; S		x		x	x	x	x	x	x		x			x	
Ficus carica	S		x	x	x	x		?								x
Forsythia xintermedia	S		x	x	x	x	x	x	x		x			x		
Fraxinus angustifolia	S							x						x		
Fraxinus excelsior	I;S; E		x	x	x	x	x	x	x	x	x	x		x	x	
Fraxinus ornus	S							x				x		x		
Hedera colchica	S*							x							x	
Hedera helix	I; E*		x	x	x	x	x	x	x		x	x	x	x	x	
Hippophae rhamnoides	S; S*; E*; U		x	x	x	x	x	x	x		x	x		x	x	
Hyssopus officinalis	S					x		x			x					
Iberis sempervirens	U				x		x	x			x				x	
Ilex aquifolium	I; S		x	x	x	x	x	x	x		x	x			x	
Juglans regia	S	#	x	x	x	x	x	x	x		x					
Kerria japonica	S*; U*						x	x	x		x	x				
Laburnum spec.	S; U			x	x	x	x	x	x		x	x			x	
Ligustrum ovalifolium	S			x		x	x	x	x		x	x		x		
Ligustrum vulgare	S	#	x	x	x	x	x	x	x		x	x		x		
Lonicera nitida	S			x	x	x	x	x	x		x		x	x	x	
Lonicera pileata	S				x			x			x		x	x	x	
Lonicera tatarica	S			x	x	x	x	x			x			x	x	
Lonicera xylosteum	S	L#	x	x	x	x	x	x	x		x	x		x	x	
Malus toringo	S							x			x	x			?	

Taxon	Status		research-area							sources						
		expansive	Oberhausen	Duisburg	Mülheim a.d. Ruhr	Essen	Gelsenkirchen	Bochum	Herne	Forestry	Gardening (ornamental plants, herbs)	Cemeteries and Parks	Flower beds at public places	Hedging and Roadside plantings, railway and channelside plants	Botanical Gardens (outside)	Xenophytic
Malus xdomestica s.l.	S		x	x	x	x	x	x	x		x				x	x
Malus xpurpurea	S							x				x				
Pachysandra terminalis	E*; S*				x	x		x	x		x	x			x	
Parthenocissus inserta	S*; E*	#	x	x	x	x	x	x	x		x	x		x		
Paulownia tomentosa	S			x	x	?	x							x		
Philadelphus spp.	S		x	x	x	x								x		
Physocarpus opulifolius	S; S*				x		x	x				x		x		
Picea abies	S		x	x	x	x	x	x	x	x						
Pinus nigra	S							x				x				
Pinus strobus	S			x	x					x						
Pinus sylvestris	S		x	x	x	x	x	x	x	x		x				
Platanus (x)*hispanica*	S	#	x	x	x	x	x	x						x		
Populus alba	S*, S		x	x	x	x	x	x	x					x		
Populus nigra	S; I?						x							x		
Populus tremula	I; S		x	x	x	x	x	x	x	x		x		x		
Populus trichocarpa	S*							x						x		
Populus xcanadensis	S		x	x	x	x	x	x	x	x				x		
Populus xberolinensis	S*							x	x			x		x		
Populus xcanescens	S*		x				x	x	x	x		x		x		
Potentilla fruticosa	S					x		x			x	x		x		
Prunus avium	I; S		x	x	x	x	x	x	x	x	x	x		x	x	x
Prunus cerasifera	S			x	x	x	x	x	x		x	x		x	x	
Prunus cerasus	S							x			x					
Prunus domestica	S					x		x	x		x					x
Prunus laurocerasus	S	#	x	x	x	x	x	x	x		x	x		x	x	
Prunus mahaleb	S	#		x		x	x	x	x					x	x	
Prunus padus	I; S; E		x	x	x	x	x	x	x	x	x	x		x	x	
Prunus persica	S			x		x		x			x			x		x
Prunus serotina	E; S	#	x	x	x	x	x	x	x	x	x	x		x	x	
Prunus spinosa s. lat.	I; S; E		x	x	x	x	x	x	x			x		x	x	
Pyracantha cf. coccinea	S		x	x		x		x			x	x		x		
Pyrus xcommunis s.lat.	S		x	x	x	x	x	x	x		x					
Quercus cerris	S			x										x	x	
Quercus petraea	I; S		x	x	x		x	x		x		x		x		
Quercus robur	I; S		x	x	x	x	x	x	x	x	x	x		x	x	
Quercus rubra	S		x	x	x	x	x	x	x	x		x		x	x	
Quercus xrosacea	I; S						x		x					x		
Rhamnus cathartica	S; I?						x	x						x	x	
Rhamnus frangula	I; S						x	x						x		
Rhus typhina	S*; E*	L#		x	x	x	x	x	x		x	x			x	
Ribes alpinum	S			x	x	x		x	x		x	x		x	x	
Ribes aureum	S			x		x		x			x			x	x	
Ribes nigrum	E; S; I?					x	x	x	x		x					
Ribes rubrum s. lat.	E; S; I			x	x	x	x	x	x		x					

Taxon	Status		research-area							sources						
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Ribes sanguineum	S	#		x	x	x	x	x	x		x	x			x	
Ribes uva-crispa	E; S?			x	x	x	x	x	x		x					x
Robinia pseudoacacia	S; E	#	x	x	x	x	x	x	x	x	x	x		x	x	
Rosa corymbifera s. lat.	I; S			x	x	x	x	x	x			x		x		
Rosa dumalis s. lat.	S						x	x						x		
Rosa glauca	S			x		x						x		x		
Rosa micrantha	S					x						x				
Rosa multiflora	S; E			x		x		x				x		x		
Rosa nitida-virginiana complex	S			x				x			x	x		x		
Rosa rubiginosa	S; E	L#		x	x	x	x	x	x		x	x		x	x	
Rosa rugosa	S			x	x	x	x	x			x	x		x		
Rosa spinosissima s. lat.	S							x						x		
Rosa subcanina s. lat.	S; I?					x	x	x						x		
Rubus allegheniensis	S							x			x					
Rubus armeniacus	E	#	x	x	x	x	x	x	x		x			x		?
Rubus cockburnianus	S			x							x					?
Rubus fabrimontanus	E							x								x
Rubus idaeus	I; E; S		x	x	x	x	x	x	x		x					
Rubus laciniatus	S; E			x	x	x	x	x	x		x					
Rubus odoratus	S*; S							x						x		
Rubus sciocharis	E							x								x
Rubus ulmifolius	E	L#		x		x		x						?		x
Salix alba	I; S; E		x	x	x	x	x	x	x			x		x	x	
Salix arenaria	S*						x	x						x		
Salix aurita	I; S							x	x			x		x		
Salix caprea	I; S		x	x	x	x	x	x	x		x	x		x	x	
Salix purpurea s. lat.	S; I		x	x	x	x	x	x	x			x		x		
Salix viminalis	S; I; E		x	x	x	x	x	x	x			x		x	x	
Salix xbasfordiana	S							x	x					x		
Salix xchrysocoma	S*							x				x				
Salix xreichardtii	S; E; I		x	x	x	x	x	x	x			x		x		
Salix xrubens	I; S; E		x	x	x	x	x	x	x			x		x		
Salix xsmithiana	S; I		x	x	x	x	x	x	x			x		x	x	
Sorbaria sorbifolia	S*			x	x			x				x		x		
Sorbus aucuparia	I; S		x	x	x	x	x	x	x	x	x	x		x	x	
Sorbus intermedia	S		x	x	x	x	x	x	x					x	x	
Spiraea douglasii	S							x			x	x		x		
Spiraea japonica s.lat.	S				x	x	x	x	x		x	x		x	x	
Spiraea pseudosalicifolia	S*; E*; E?				x		x	x	x		x	x				
Symphoricarpos laevigatus	S; E; S*		x	x	x	x	x	x	x		x	x	x	x	x	
Syringa cf. vulgaris	S*							x			x	x				
Taxus baccata	S	#	x		x	x	x	x	x		x	x		x		
Thuja occidentalis	S					x		x				x		x		
Thymus pulegioides s. lat.	I; S							x		sowing plant						

Taxon	Status		research-area							sources						
		expansive	Oberhausen	Duisburg	Mülheim a.d. Ruhr	Essen	Gelsenkirchen	Bochum	Herne	Forestry	Gardening (ornamental plants, herbs)	Cemeteries and Parks	Flower beds at public places	Hedging and Roadside plantings, railway and channelside plants	Botanical Gardens (outside)	Xenophytic
Thymus vulgaris	S							x	x		x					
Tilia cordata	S		x	x				x	x	x		x		x		
Tilia platyphyllos s. lat.	S; I?		x	x			x	x	x	x		x		x		
Tilia tomentosa	S							x				x		x		
Tilia xeuropaea	S		x	x	x	x	x	x	x	x		x		x		
Ulmus glabra	S		x	x	x	x	x	x	x			x		x		
Ulmus xhollandica	S; S*, E*				x	x		x	x			x		x		
Viburnum lantana	S	#		x	x	x	x	x	x		x	x		x		
Viburnum opulus	S; I		x	x	x	x	x	x	x			x		x	x	
Viburnum rhytidophyllum	S				x	?		x			x	x		x		
Vitis vinifera	S; E?				x						x					?

Problems concerning floristic status within woody plants

As woody plants, especially phanerophytes, reach stadiums of generative reproduction often after longer periods of time, it can be very problematic to categorize them with regard to their degree of naturalisation. A lot of occurrences seem to become naturalisations but the investigation period is too short to be sure about them. Such occurrences are named „spontaneosynanthropic“, i.e. it is not clear whether they will become naturalised nor it is sure that they will remain casual (KEIL & LOOS, in prep.).

Other species are idiochorophytes in the first degree, but nearly all indigenous occurrences are extinct and the source of their occurrences today is cultivation for ornament (ergasiophytes which became ergasiophygophytes, following the terminology of SCHROEDER 1969). Some other species are naturally limited to small areas, but after extensive cultivations and escaping even in non-urban areas, it is difficult to recognize where the species is an idiochorophyte and where it is a neoergasiophygophyte (following the terminology of LOOS 1999), e.g. *Euonymus europaeus*. Another typical example is *Carpinus betulus*, which is widely cultivated for garden hedging in towns and escapes from gardens, but also occurs in urban areas, where it originate from diaspores from the adjacent forests. Many species – even trees and shrubs – are

ambiguous concerning their floristic status in the investigation areas (LOOS 1997, KEIL & LOOS 2002), even trees and shrubs, and the idiochorophytic status of some species remains uncertain at all.

Additionally, a lot of occurrences developed from plants that show predominant vegetative propagation. The inclusion of species with such spreading behaviour was discussed many times (cf. LOOS 1997, KEIL & LOOS 2002); in a list of naturalised woody plants, such taxa ought to be mentioned because various occurrences, especially most or all established ones of some species (e.g. *Hippophae rhamnoides, Parthenocissus inserta*) are founded on vegetative dispersal. In many cases, occurrences based on vegetative dispersal include larger populations with higher abundances than populations founded on generative dispersal.

Aspects concerning origin, dispersal and frequency

Typical and frequently found escaped woody species of the Ruhrgebiet are *Robinia pseudoacacia, Buddleja davidii, Acer negundo, Platanus* (×)*hispanica, Prunus mahaleb, Rubus armeniacus* and *Ailanthus altissima*. Most of them can be easily recognized while riding by train or car because of their typical morphological characters in combination with extended occurrences, often mixed with *Betula pendula, Salix caprea* and some other shrub and tree species, as well as with anecophytic (sensu SUKOPP & SCHOLZ 1997) *Populus* hybrids. The only species that could be problematic from a environmental protectional point of view seems to be *Rubus armeniacus* which is able to spread rapidly within short periods of time and build up extensive thickets. On the other hand, especially *Buddleja davidii, Robinia pseudoacacia* and *Rubus armeniacus* are integral components of the Ruhrgebiet vegetation within the whole region today and provide evidence of warmer urban thermic conditions compared to the adjacent rural areas (cf. e.g. BRANDES 1987, KEIL & LOOS 2004).

As can be seen in table 2, only 19 of the 179 found ergasiophygophytic taxa (11 %) show an expansive dispersal over the whole investigation area. The frequent species mentioned above belong to this category, and furthermore, *Acer platanoides, Acer pseudoplatanus, Aesculus hippocastanum, Cotoneaster divaricatus, Juglans regia, Ligustrum vulgare, Berberis (Mahonia) aquifolium* (including probable hybrid derivative types from crosses with *B. repens*), *Parthenocissus inserta, Prunus laurocera-*

sus, Prunus serotina, Ribes sanguineum, Taxus baccata and *Viburnum lantana*. There are 8 species (4.5%) which point out local expansions, namely *Alnus cordata, Amelanchier lamarckii, Berberis julianae, Lonicera nitida, Lonicera xylosteum, Rhus typhina* and *Rosa rubiginosa*. Another species, *Rubus ulmifolius*, which is classified as locally expansive, is a pure xenophytic species in the Ruhrgebiet.

Tab. 2: Overview of expansive woody taxa in central Ruhrgebiet escaped from cultivations (1980-2002). Abbreviations etc. as in Tab. 1.

Taxon	Status		research-area							Sources						
		expansive	Oberhausen	Duisburg	Mülheim a.d. Ruhr	Essen	Gelsenkirchen	Bochum	Herne	Forestry	Gardening (ornamental plants, herbs)	Cemeteries and Parks	Flower beds at public places	Hedging and Roadside plantings, railway and channelside plants	Botanical Gardens (outside)	Xenophytic
Acer negundo	S	#	x	x	x	x	x	x	x			x		x		
Acer platanoides	S; E	#	x	x	x	x	x	x	x	x	x	x		x	x	
Acer pseudoplatanus	S; E; I?	#	x	x	x	x	x	x	x	x	x	x		x	x	
Aesculus hippocastanum	S	#	x	x	x	x	x	x	x		x	x		x	x	
Ailanthus altissima	E; S	#	x	x	x	x	x	x	x		x	x		x	x	
Alnus cordata	S	L#				x		x						x		
Amelanchier lamarckii	S	L#	x	x	x	x	x	x	x		x			x		
Berberis aquifolium s.l.	S; E	#	x	x	x	x	x	x	x		x	x		x	x	
Berberis julianae	S	L#		x	x	x	x	x	x		x	x		x	x	
Buddleja davidii	E; S	#	x	x	x	x	x	x	x		x	x			x	
Caragana arborescens	S	L#				x	x					x		x		
Cotoneaster divaricatus	S	#		x	x	x	x	x	x		x	x	x	x	x	
Juglans regia	S	#	x	x	x	x	x	x	x		x					
Ligustrum vulgare	S	#	x	x	x	x	x	x	x		x	x		x		
Lonicera xylosteum	S	L#	x	x	x	x	x	x	x		x	x		x	x	
Parthenocissus inserta	S*; E*	#	x	x	x	x	x	x	x		x	x		x		
Platanus (x)hispanica	S	#	x	x	x	x	x	x						x		
Prunus laurocerasus	S	#	x	x	x	x	x	x	x		x	x		x	x	
Prunus mahaleb	S	#		x		x	x	x	x					x	x	
Prunus serotina	E; S	#	x	x	x	x	x	x	x	x	x	x		x	x	
Rhus typhina	S*; E*	L#		x	x	x	x	x	x		x	x			x	
Ribes sanguineum	S	#		x	x	x	x	x	x		x	x			x	
Robinia pseudoacacia	S; E	#	x	x	x	x	x	x	x	x	x	x		x	x	
Rosa rubiginosa	S; E	L#		x	x	x	x	x	x		x	x		x	x	
Rubus armeniacus	E	#	x	x	x	x	x	x	x		x			x		?
Rubus ulmifolius	E	L#		x		x		x						?		x
Taxus baccata	S	#	x		x	x	x	x	x		x	x		x		
Viburnum lantana	S	#		x	x	x	x	x	x		x	x		x		

The main portion of the ergasiophygophytic trees and shrubs consists of well-known ornamental species grown in gardens, parks and cemetaries. The number of localities of most expansive species increased within the last years. Some other taxa became also more frequent, e.g. *Paulownia tomentosa, Chamaecyparis lawsoniana, Crataegus persimilis* and *Cornus sanguinea* subsp. *australis*. Reasons for this phenomenon could be seen in more frequent cultivations at the last time (e.g. *Cornus sanguinea* subsp. *australis*), in other cases the cultivated individuals have reached the time to build up generative diaspores (like *Paulownia tomentosa*).

A great portion of escaped taxa belongs to species with evergreen leaves which are possibly supported by Global Change phenomena. Frequently escaped species of this group are *Berberis (Mahonia) aquifolium, Berberis julianae, Prunus laurocerasus, Lonicera nitida* and *Cotoneaster* species and hybrids, especially *Cotoneaster divaricatus*, but even in the last years, many occurrences of other taxa were found and the density of occurrences is increasing.

As shown above, xenophytic occurrences do not have a great importance among all of the adventive woody species. Ten (plus 3 probable) species include xenophytic occurrences in the central Ruhrgebiet today (cf. table 4). Most of these occurrences are based on fruit parts which are left after consumption. *Eriobotrya japonica* (see KEIL, FUCHS & LOOS 2003) and *Ficus carica* seem to be originated from fruits which got lost near sales stands. *Rubus ulmifolius, R. fabrimontanus* and *R. sciocharis* were spread with roadside plantings, some occurrences of *Rubus armeniacus* may have appeared the same way. Among the xenophytes only the *Rubus* species are at least locally expansive.

Tab. 3: Number of Ergasiophygophytic and Xenophytic Trees, Shrubs and Subshrubs in the Central Ruhrgebiet (excluding Oberhausen, where the data up to now do not appear to be not highly representative).

Cities	Number of woody taxa
Duisburg	107
Mülheim an der Ruhr	105
Essen	121
Gelsenkirchen	112
Bochum	163
Herne	106
Total number in the research-area	179

KOWARIK (1995) pointed out that local phenomena ought to be taken into consideration if the importance of ergasiophygophytic woody species with regard to nature conservation (potential or real danger for endangered plant species or communities) is discussed. So it is possible that the same species shows different dispersal behaviours at different places (ecological niches or physiogeographic area categories). Such cases could be studied in the central Ruhrgebiet regularly. A prediction of these phenomena is difficult or impossible. Some of the expansive species did not indicate this dispersal behaviour some years ago. Only through intensive monitoring – recording of all occurrences and investigation of the places from year to year – is it possible to recognize the point of time when a species become frequent and in which ways the species begin to spread.

Tab. 4: Sources of woody taxa in central Ruhrgebiet.

Sources	Number of woody taxa
Forestry	27
Gardening (ornamental plants, herbs)	101
Cemeteries and Parks	113
Flower beds (at public places)	11
Hedging and Roadside plantings, railway and channelside plants	134
Botanical Gardens (outside)	69
Xenophytic	10 (+ 3?)

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