



Migration directions and paths of *Heracleum mantegazzianum* in the Ruhr area (Northrhine-Westphalia, Germany)

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Heracleum mantegazzianum is one of the invasive neophytes with a centre of abundance at the riparian area of river Ruhr, its next vicinities and its side valleys. It was first detected at Hagen-Dahl in the Ruhr tributary valley of river Volme in 1954 [1, 2]. While it was found at several locations in Westphalia in the following years (with a centre in the northern Sauerland low mountain ranges and adjacent areas), no long distance dispersal of populations was indicated. Dispersal was neglected, because after some years without any indication, in 1968 extended populations were investigated in the Volme valley [2]. Probably, dispersal in this valley was caused mainly by the mentioned founder population. But in general there are additional effects of populations based on locally escaped individuals and more or less coherent line migrations.

The nowadays present distribution along the Ruhr and its tributary waters seems to be a consequence of unidirectional line migration. But it is prevalently founded by a lot of local escapes that built up local populations which were extended by spreading in one or several directions and fused at last. For example: In Mülheim an der Ruhr, where the species is abundant in the Ruhr range for at least 15 years, it was first detected in 1971 and a conspicuous spreading along the Ruhr river began appr. in 1980 [3; J. Pieper, unpubl. data] (see fig. 1).

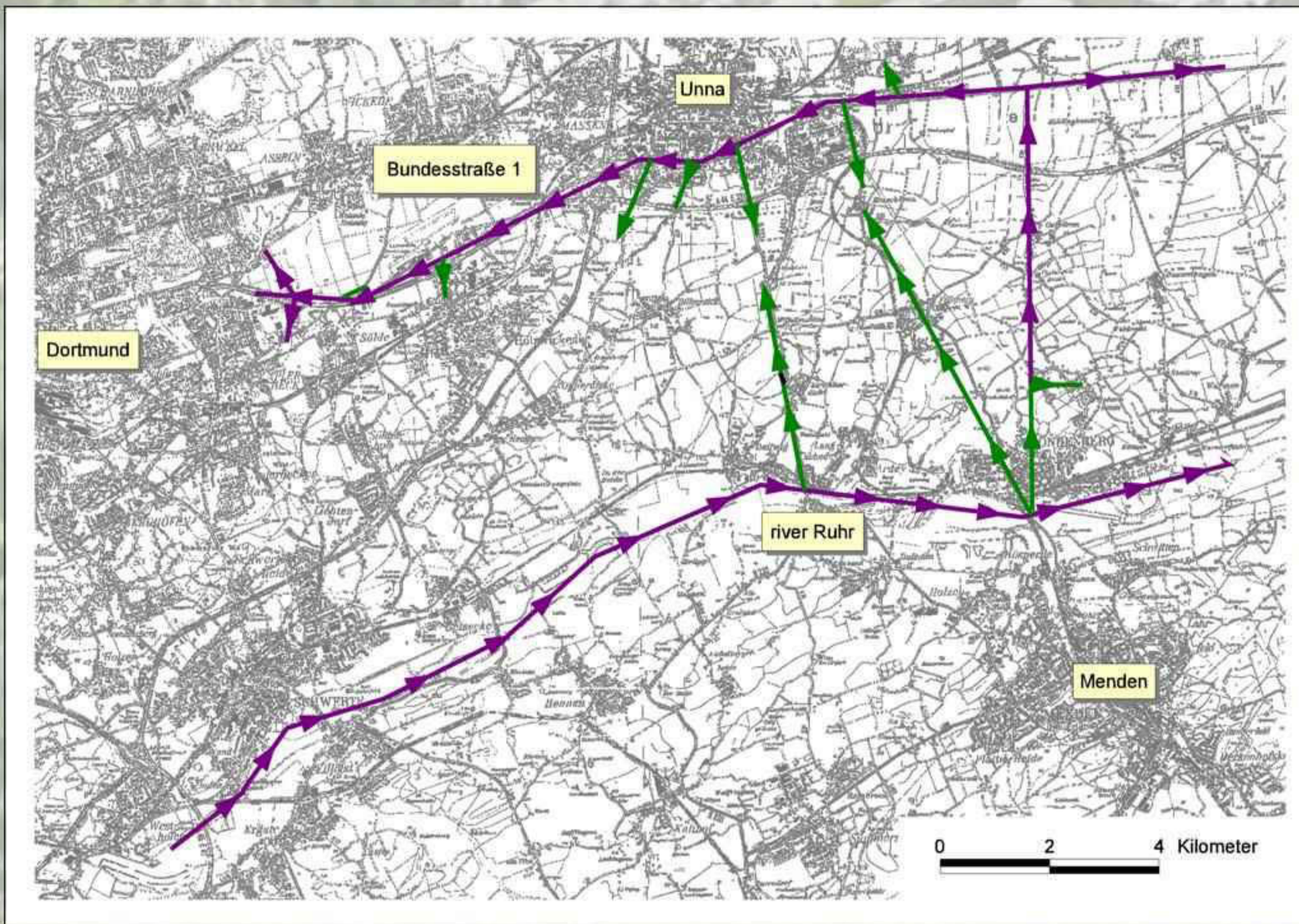


Fig. 2: Spread of *H. m.* in the southern Unna district (east periphery of the Ruhr area), starting at river Ruhr and ongoing along roadsides via line migration (—> nearly coherent spreading; —> very scattered occurrences)

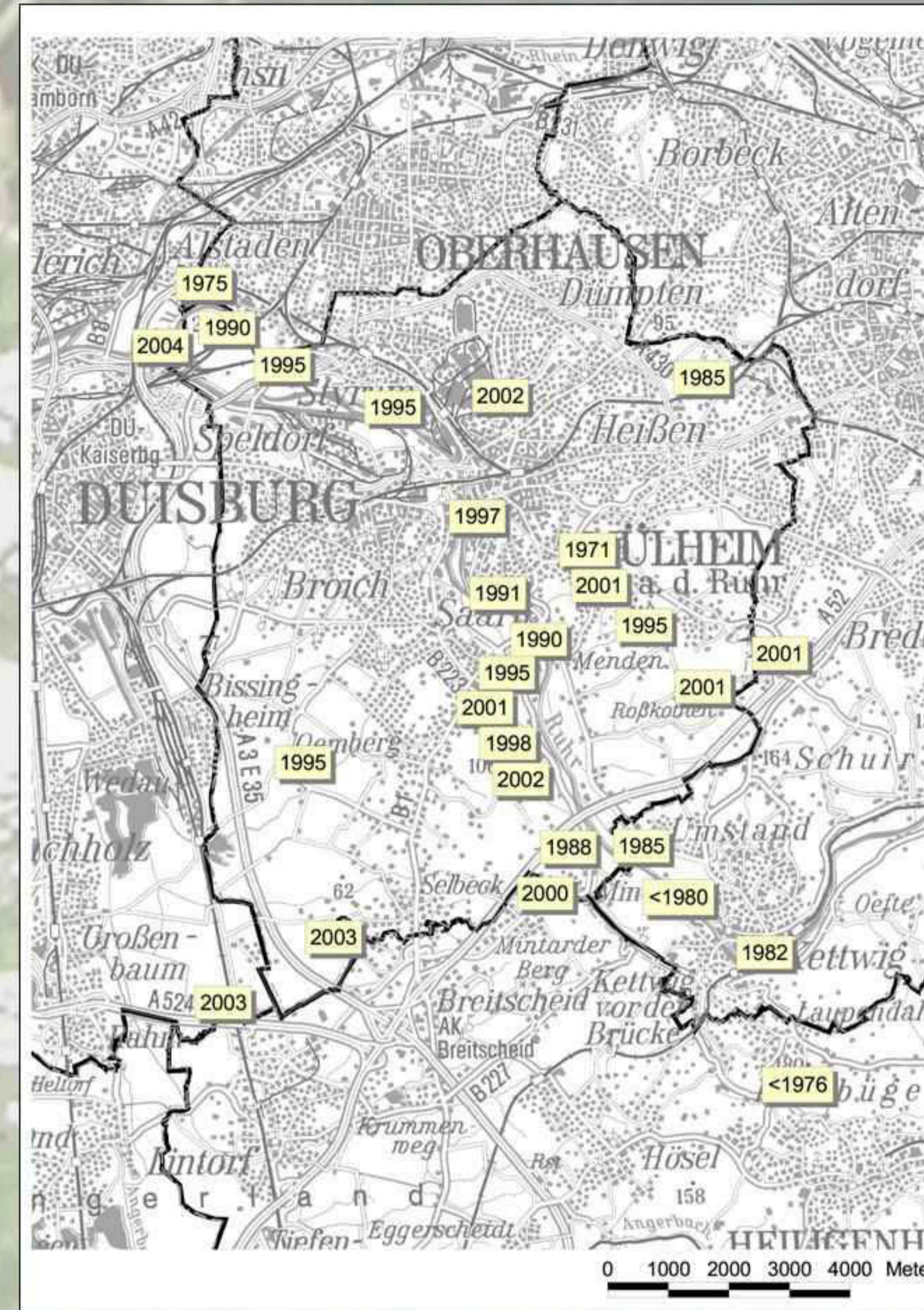


Fig. 1: Localities and year of first occurrences of *Heracleum mantegazzianum* in the vicinity of the city Mülheim an der Ruhr (data from: J. Pieper, H. Real, Th. vom Berg and own investigations).

Also in other parts of the valley and side waters the increase and extension of populations started around the early 1970s. Nowadays *H. m.* is present within the whole extension of the Ruhr area, but not always represented by occurrences of high density. The *H. m.* community is somewhat heterogeneous in this habitat, often containing typical species of Aegopodion and also some of Seneccionion (Galio-Urticetea; see tab. 1) [4]. As the rivers are accompanied by roads, the line migration of *H. m.* also extends to the road sides, from which the dispersal of the species trespasses upon roads to other directions. See fig. 2 for a typical example of this spreading pattern from southeast periphery of the Ruhr area: the species migrated from the West-East directed Ruhr valley northwards along roads and trespassed upon Bundesstraße 1, a West-East directed road axis, where the populations increased within the last years via line migration. In the western Ruhr area there are many locations from which the species started to spread; fig. 3 indicates the increase of occurrences and shows tendencies of spreading, but the pattern is very complex.

In inner urban areas of the Ruhr area occurrences of *H. m.* are less frequent and in most cases their extensions are very local with few tendencies to extended dispersal. Probably, habitats necessary for extensive migration are too isolated, i.e. continuous structures at roads are missing because road embankments are concreted, green areas are mown and treasured too often, and sometimes *H. m.* is controlled by municipal offices. The most important factor may be the decrease of fallow areas in urban regions. Additionally, it seems that concerning the spread of *H. m.* in the lower Ruhr valley a stagnation phase has been obtained.

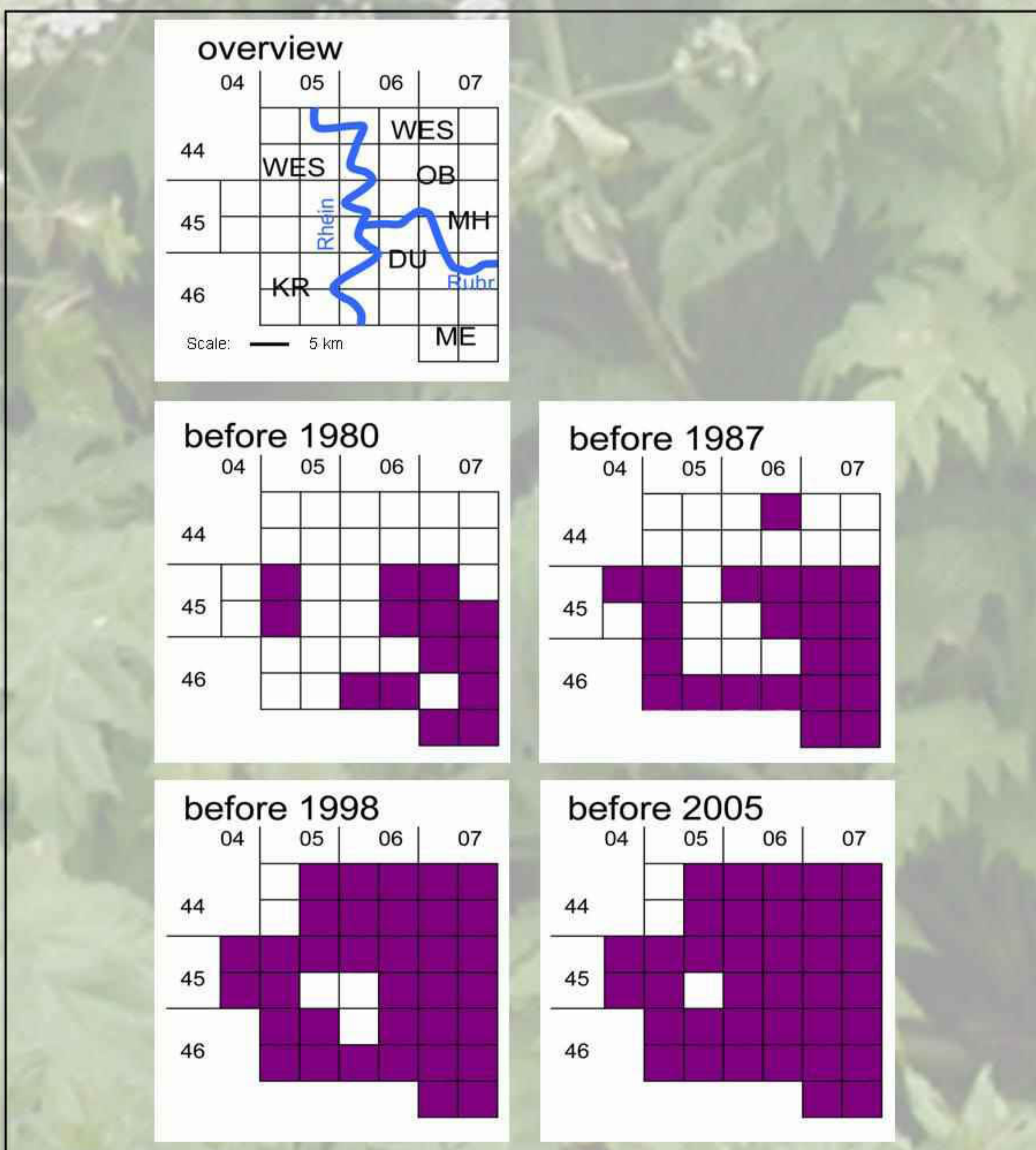


Fig. 3: Spread of *H. m.* in western Ruhrgebiet and the adjacent Lower Rhine area (data from Düll & Kutzelnigg 1980, 1987, Fuchs 2003, Haeupler & al. 2004, pers. comm. H. Kutzelnigg, J. Pieper and own investigations) (violet filled squares: occurrences; based on the topographic map system 1: 25.000; WES = district of Wesel, OB = Oberhausen, DU = Duisburg, MH = Mülheim an der Ruhr, ME = district of Mettmann, KR = Krefeld.)

Tab. 1: *Heracleum mantegazzianum* vegetation at river Ruhr within the city of Essen [4] (modified after Braun-Blanquet 1964)

Nr.	1	2	3
Area extension (m ²)	50	30	100
<i>Heracleum mantegazzianum</i>	5	4	2b
Character species of Galio-Urticetea			
<i>Urtica dioica</i>	+	2b	4
<i>Impatiens glandulifera</i>		1	1
<i>Galium aparine</i>	+		2
<i>Calystegia sepium</i>	+		+
<i>Fallopia japonica</i>			+
Accompanying species			
<i>Poa annua</i>	+	+	
<i>Carduus crispus</i> s. lat.	+	+	
<i>Artemisia vulgaris</i>		1	
<i>Rumex obtusifolius</i>	+		
<i>Dactylis glomerata</i>		+	
<i>Poa trivialis</i>			+
<i>Cirsium arvense</i>		+	

References
 [1] Runge F (1990) Die Flora Westfalens. Ed. 3. Münster.
 [2] Kersberg H, Horstmann H, Hestermann H (2004) Flora und Vegetation von Hagen und Umgebung. Nümbrecht-Elsenroth.
 [3] Keil P, vom Berg T (2002) Neubürger in der Flora von Mülheim an der Ruhr. Stadt Mülheim a. d. Ruhr, Jb. 2002: 221-229.
 [4] Keil P (1999) Ökologie der gewässerbegleitenden Agriophyten *Angelica archangelica* ssp. *litoralis*, *Bidens frondosa* und *Rorippa austriaca* im Ruhrgebiet. Diss. Bot. 321.