

## Supplementary File 2. Demographic survey of reference populations

We used specific standardized protocols developed for a coordinated European-wide demographic study of unmanaged populations of *A. artemisiifolia* across Europe (full protocol available on protocols.io, <https://doi.org/10.17504/protocols.io.mmyc47w>), started in 2014 in the framework of the EU COST Action FA1203 'Sustainable management of *Ambrosia artemisiifolia* in Europe (SMARTER)' (Müller-Schärer and Lommen 2014). We here only describe the part of the data collection that is relevant to the current study, including 4 populations (details in Table S2).

Within each population, 14 permanent plots of 0.5x0.5m were placed semi-randomly to capture local variation in *A. artemisiifolia* densities, at a minimum distance of 1m between plots. Observations started every year once most new ragweed plants were expected to have established, but were still in an early vegetative stage (10 June - 5 July for our populations). The total number of *A. artemisiifolia* was counted in each plot, and a random selection of these (ideally 10 per plot) were individually tagged, and their maximum height in up-held position measured. All tagged plants were re-assessed at seed set (i.e. before seed dispersal, 6-27 September), so this assessment coincided with the time plants in the mowing experiment were assessed just before the last cut in September. Of the surviving tagged plants maturation (possession of any reproductive tissue) and maximum height were assessed.

To quantify size-specific seed production without disturbing the dynamics in the plots, 21 mature alive *A. artemisiifolia* with sizes representative for the population were sampled in between the plots. Their maximum height was measured, and the total number of female structures counted, either by summing all individual seeds formed (in PL14, IT 14 and IT15) or by summing the number of female flower heads formed (AT14, HU14 and PL15). In PL15 we additionally determined the number of seeds per flower head for ca. 10 flower heads per sampled plant. For each of these plants, the average number of seeds per flower head was used to estimate total number of seeds per plant by multiplication with the observed number of flower heads. The mean average number of seeds per flower head across all 21 sampled plants of PL15 (2.8) was used as a constant to similarly estimate total numbers of seeds per sampled plant for AT14 and HU14. As a proxy for the size of the soil seed bank of *A. artemisiifolia*, eight cores of 100 ml were taken from the upper 5 cm of soil (from which germinated seeds can establish, Kazinczi et al. 2008) within 20 cm around every second plot, after which the *A. artemisiifolia* seeds were extracted and tested for their viability by a crush-test. The total number of viable seeds per plot was estimated by correcting for the surface sampled compared to the surface of the plot. Supplementary File 4 reports how the data were used to parameterise the demographic models.

### References:

Kazinczi G, Béres I, Novák R et al (2008) Common ragweed (*Ambrosia artemisiifolia*): a review with special regards to the results in Hungary. I. Taxonomy, origin and distribution, morphology, life cycle and reproduction strategy. *Herbologia* 9:55–92

Müller-Schärer H, Lommen S (2014) EU-COST Action on „Sustainable management of *Ambrosia artemisiifolia* in Europe“ (COST FA1203-SMARTER): opportunities and challenges. *Julius-Kühn-Archiv* 445 148-155. doi:10.5073/jka.2013.445.018

**Table S2. Overview of selected reference populations of *Ambrosia artemisiifolia* used for parameterisation of the demographic model.** Note that after the start of the demographic survey, no vegetation management took place between the first and the second measuring moment, such that *A. artemisiifolia* plants were not managed. Data set code is a combination of the country and the year that the population was assessed. In 2015 all new plants of the Austrian and Hungarian population died before the second measure due to harsh competition by grasses, so these data sets could not be used for the current study.

Country	GPS (DD)	Site description	Data set code	Year	Date measuring new plants	Number new plants labelled	Date measuring adult plants
Austria	N 47.99336 E 16.73684	Unmanaged former dry meadow	AT14	2014	05.07	157	20.09
Hungary	N 47.32813 E 19.73099	Grassland between arable land and a farm, yearly cut (in years of survey before <i>Ambrosia artemisiifolia</i> appearance)	HU14	2014	25.06	144	22.09
Italy	N 45.57073 E 8.78546	Meadow, mown or grazed (in years of survey before <i>Ambrosia artemisiifolia</i> appearance). Insecticides applied against the abundantly present herbivore <i>Ophraella communa</i> , a candidate biocontrol agent of ragweed	IT14	2014	13.06	142	16.09
			IT15	2015	10.06	147	15.09
Poland	N 49.86850 E 23.01180	Meadow, yearly mown (in years of survey before <i>Ambrosia artemisiifolia</i> appearance)	PL14	2014	14.06	121	27.09
			PL15	2015	21.06	106	06.09