The Search for Weed Biological Control Agents: When to Move On?

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"Classical" biological control of an exotic weed requires time consuming and expensive surveys for natural enemies in the weed's native range. We advocate the use of rarefaction curves to improve survey efficiency; i.e. to determine the minimum sampling effort for discovering most of the potential control agents actually occurring in the weed's native range. Rarefaction (dilution) curves can be used to estimate the number of herbivore species expected on a given number of plants, at sampling sites or regions, using presence/absence data and species frequencies. An analysis of the shape of the rarefaction curves will therefore indicate: a) whether more herbivore species can be expected to be found at each site; b) which sites possibly contain more undiscovered herbivore species; and c) whether sampling new sites is more likely to reveal further herbivores. This approach is illustrated with 2 case studies of insect surveys, of root- and flower-head-feeders on Centaurea maculosa (Asteraceae) in Europe and for flower-head feeders of various Asteraceae in Brazil. Finally we consider consequences of combining this approach with focused searches in the centre of endemism and propose a general survey protocol for natural enemies associated with a host plant in its native range.

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