

# CONTRASTING EFFECTS BY TWO MAJOR HERBACEOUS INVASIVE SPECIES ON COMMUNITY AND ECOSYSTEM PROCESSES

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## INTRODUCTION

**Plant invasions** can have a long-term impact on

- plant communities, altering the standing vegetation and soil seed bank
- ecosystems functions and services, through changes in carbon and nutrient cycling

If an invasion negatively affects **both the vegetation and the soil properties**, then its impact can be detrimental and irreversible, with regards to:

- **regeneration potential** of the invaded communities
- their capacity to respond to environmental changes, including those promoted by the invader
- secondary invasions

## METHODS

### Study Species (Union of Concern, EU 1143/2014)



*Gunnera tinctoria* (Molina) Mirbel



*Impatiens glandulifera* Royle

### Sampling Design

Three **invaded vs adjacent uninverted** sites per species:

- Five random plots per site/invasion status
- Five 5-cm diameter soil cores from two depths (0-5 cm; and 5-10 cm) per plot for seedbank
- Five quadrats for soil sampling



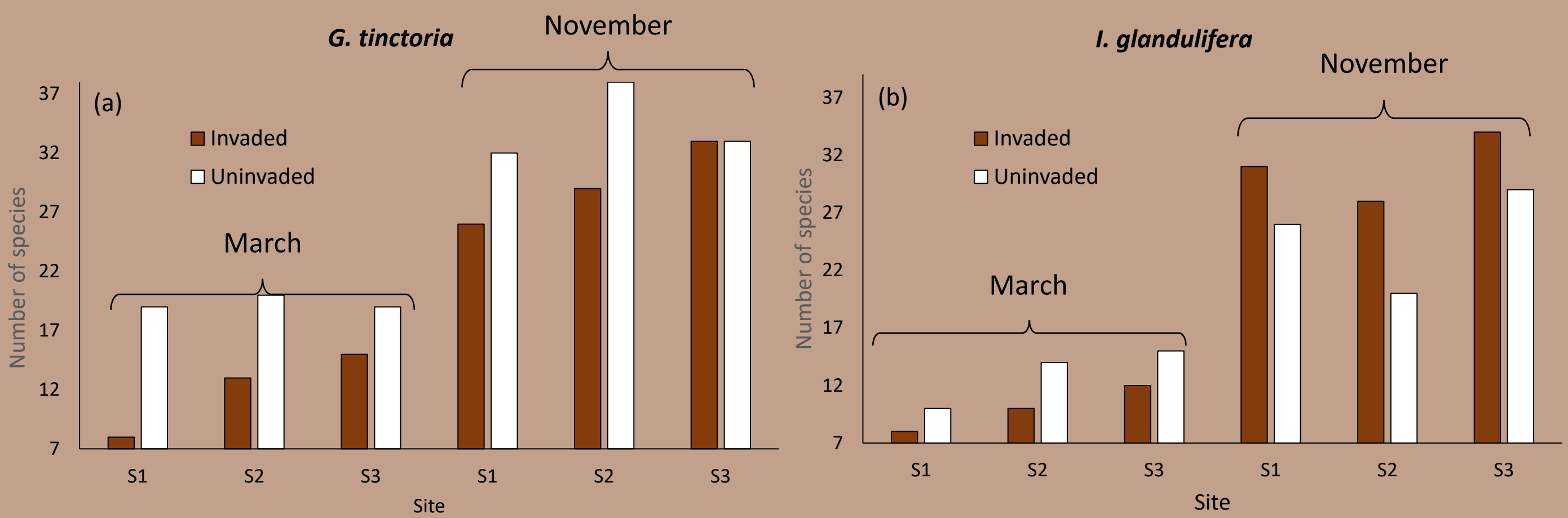
### Seedbank Assessment

- More **persistent** component: Samples collected at end of March 2018
- More transient component: Samples collected at November 2018, after the seed rain
- **Seedling emergence approach** in glasshouse for a year



## RESULTS AND DISCUSSION

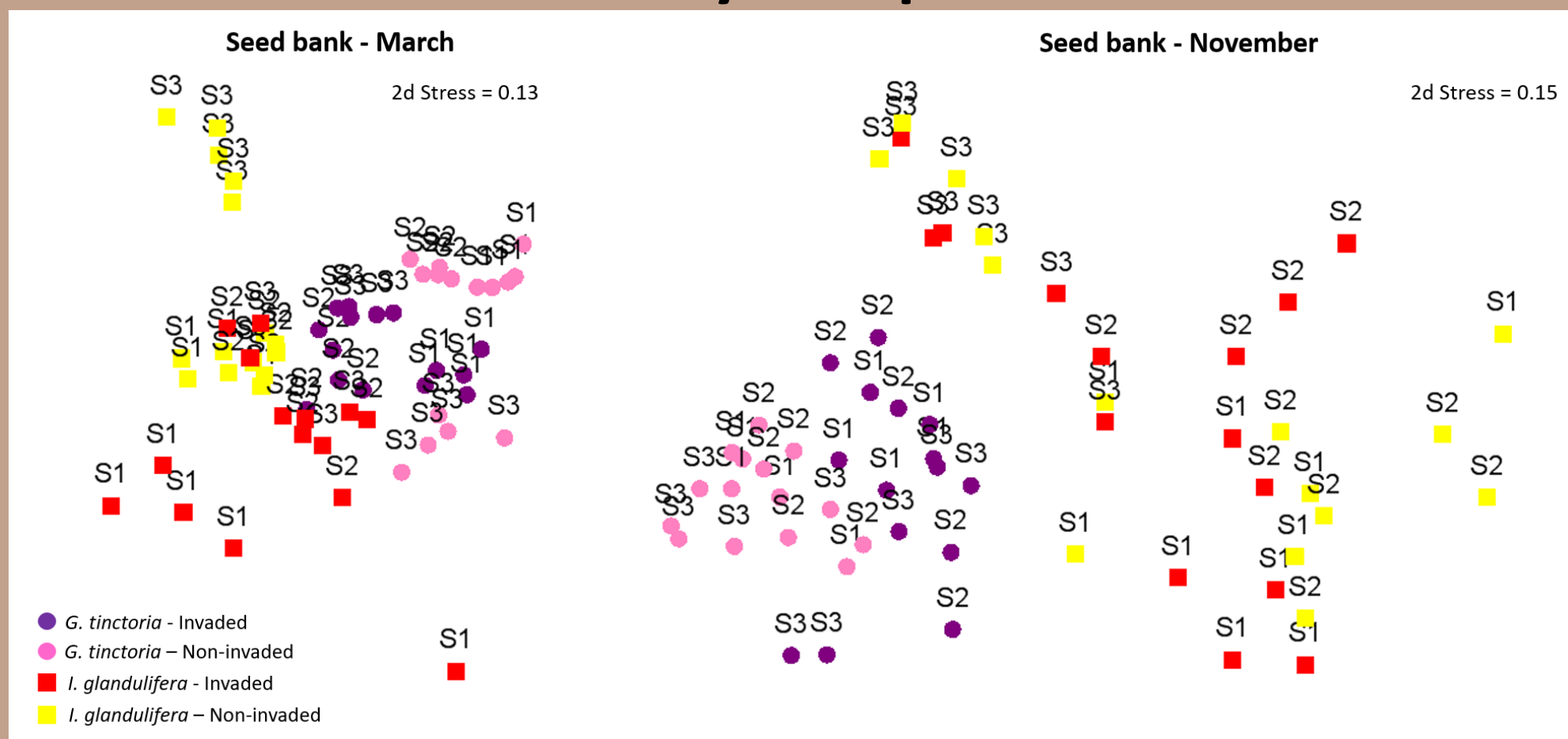
### Species Richness



**Fig. 1** Species richness at three sites invaded by *Gunnera tinctoria* (a) and *Impatiens glandulifera* (b) together with adjacent uninverted areas, based on samples collected at the end of March (persistent component of the seed bank) and in November (transient component).

- *G. tinctoria* decreased the number of species, in both the persistent and transient components reduced (Fig. 1a)
- In contrast, *I. glandulifera* had a **positive effect** the number of species in the **most transient component** of the seed bank, while the effect on the most persistent component of the seedbank was site-dependant (Fig. 1b).

### Community Composition



**Fig. 2** Non Dimensional MDS plots displaying the characteristics of plant communities invaded by *G. tinctoria* and *I. glandulifera* and uninverted adjacent communities based on samples collected in March 2018 and November 2018 .

Invasion impact on community composition varied (Fig. 2), depending on:

- Invader **identity**, with *G. tinctoria* having a stronger impact than *I. glandulifera*
- **Recipient community** (coastal vs. riparian grassland)
- **Site**, especially for *I. glandulifera*
- **Seedbank component**, with stronger impact of invasion being on the transient component, due to recent seed rain

**Tab. 1** Soil chemical, physical and biological properties in areas invaded by *G. tinctoria* and *I. glandulifera*, in comparison to adjacent uninverted sites

	Soil Properties							
	pH	Available P	C and N	NO <sub>3</sub>	NH <sub>4</sub>	BG enzyme activity	Microbial biomass	Microbial biomass C
<i>G. tinctoria</i>	Higher	NS	Lower	Higher	Lower	NS	NS	NS
<i>I. glandulifera</i>	NS	Lower	NS	Lower	NS	Higher	NS	NS

- Our findings suggest that soil ecosystem-level impacts will ultimately depend on the identity of the plant invasive species and its interaction with multiple environmental factors and the management history of the site that has been invaded

## CONCLUSION

- *G. tinctoria* and *I. glandulifera* had **distinct community and ecosystem impacts**.
- *G. tinctoria* caused long-term, **negative changes in both seedbank components** and greatly increased soil NO<sub>3</sub> levels, changes that can be irreversible in the absence of native seed sources from neighbouring communities.
- However, *I. glandulifera* had **only a small negative impact on persistent seedbank**, and it had a **positive effect** on native species richness in transient seedbank.