



Floral display affects functional gender in the hermaphroditic herb *Primula farinosa*

Camille Madec^{1*}, Johan Ehrlén² and Jon Ågren¹



* camille.madec@ebc.uu.se, Tel: +46 18471 2852; ¹ Plant Ecology and Evolution, Dept. of Ecology and Genetics, EBC, Uppsala University, Sweden; ² Dpt. of Ecology, Environment and Plant Sciences, Stockholm University, Sweden.

Introduction

A prominent floral display may be favoured by selection because it increases attractiveness to pollinators, but may be associated with a cost in terms of an increased risk of damage from seed predators and grazers. The benefits of a large display may be expressed through both male and female function, while the negative effects of herbivore attack may often appear only after pollen dispersal, and thus predominantly influence female reproductive success. Interactions with antagonists are therefore expected to influence plant functional gender.

The short-lived, hermaphroditic herb *Primula farinosa* is dimorphic for scape length and occurs as a long-scaped and a short-scaped morph. The long-scaped morph displays its flowers well above the ground, whereas the short-scaped morph displays its flowers close to the ground (Fig. 1). In southern Sweden, the plant is grazed by ungulates and attacked by an insect seed predator, the tortricid moth *Falseuncaria ruficiliana*.

Long-scaped morph



Short-scaped morph

- Bird's eye primrose (*Primula farinosa*)
- Perennial herb
- Hermaphroditic
- Self-incompatible
- Distylous

Figure 1. Floral display of the two scape morphs of *Primula farinosa*.

Methods

We conducted a field experiment with genotyped plants at two sites in SE Sweden. Female reproductive success was assessed by quantifying seed production and male siring success by genotyping offspring (Fig. 2).

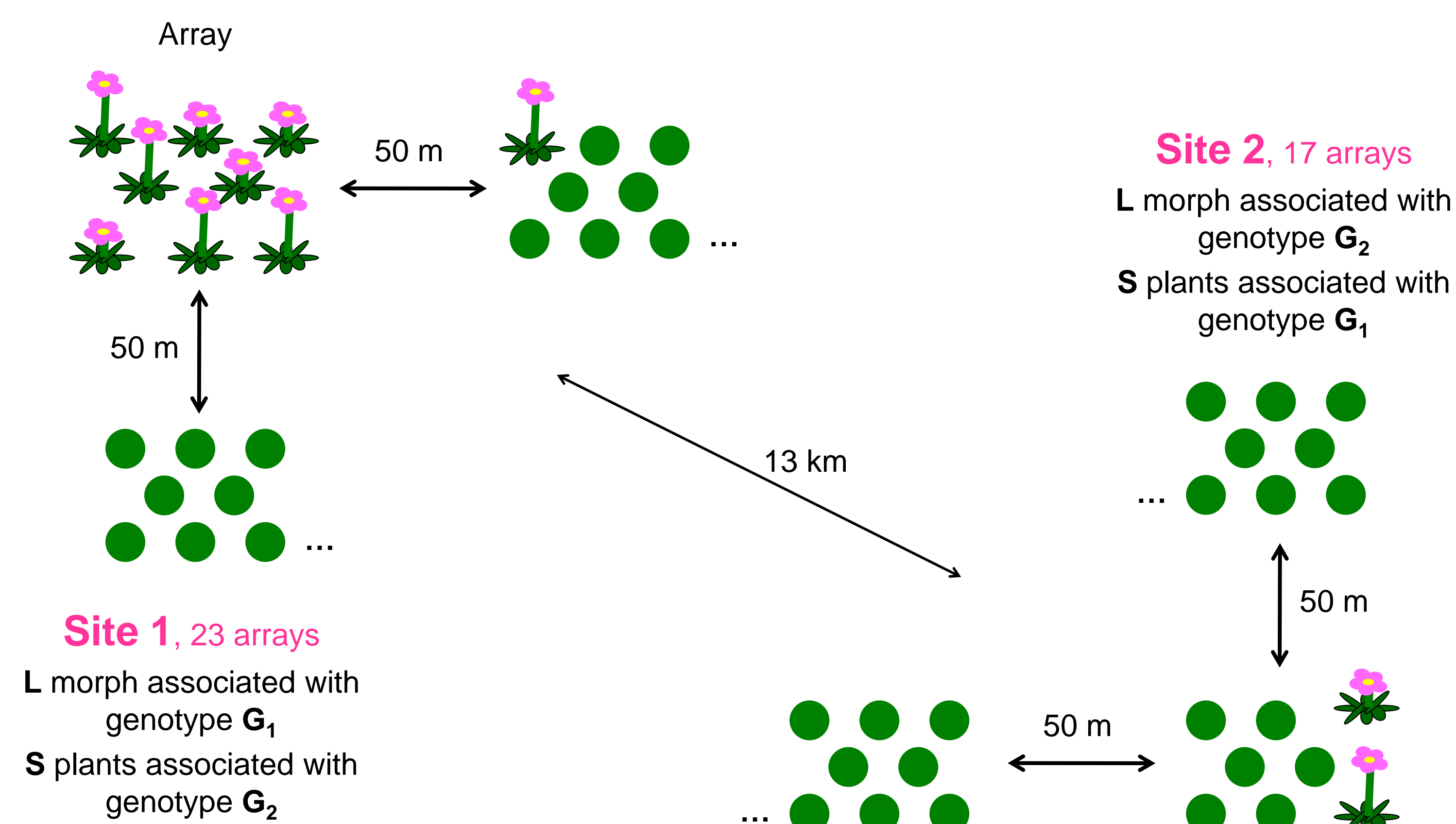


Figure 2. Experimental design. Each array included 4 long- and 4 short-scaped plants. Scape morph was associated with a distinct microsatellite genotype, and half of the plants of each morph in each array were of the thrum and half of the plants of the pin style morph.

Questions

- (1) Is male reproductive success of the long-scaped morph greater than that of the short-scaped morph?
- (2) Does this compensate for a higher risk of reduced seed production caused by interactions with seed predators and grazers?
- (3) Is the long-scaped morph functionally more male than is the short-scaped morph?

Results

At the first site, where grazing pressure and seed predation were high (Fig. 3), the long-scaped morph produced fewer seeds than did the short-scaped morph, but tended to sire more seeds than did the short morph (Fig. 4). As a result, no significant difference in overall reproductive success was recorded between scape morphs (Fig. 4), but the functional gender of the long-scaped morph was more male than that of the short-scaped morph (Fig. 5). At the second site, the two morphs did not differ significantly in seed production, siring success, or functional gender.

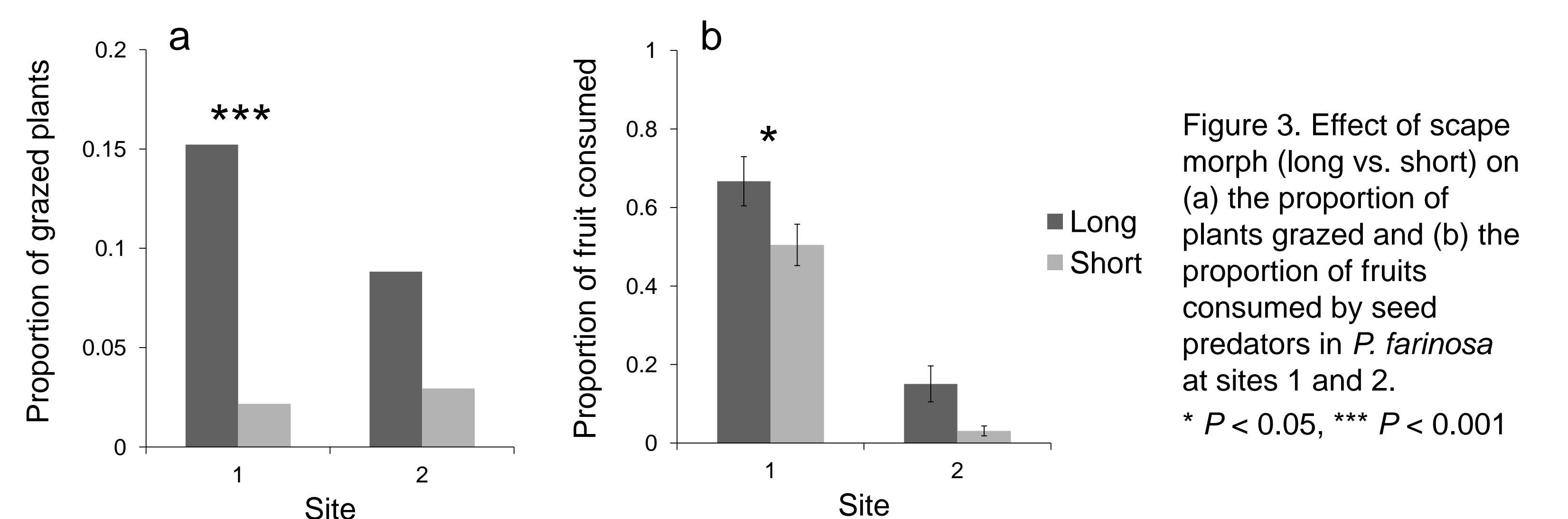


Figure 3. Effect of scape morph (long vs. short) on (a) the proportion of plants grazed and (b) the proportion of fruits consumed by seed predators in *P. farinosa* at sites 1 and 2. * $P < 0.05$, *** $P < 0.001$

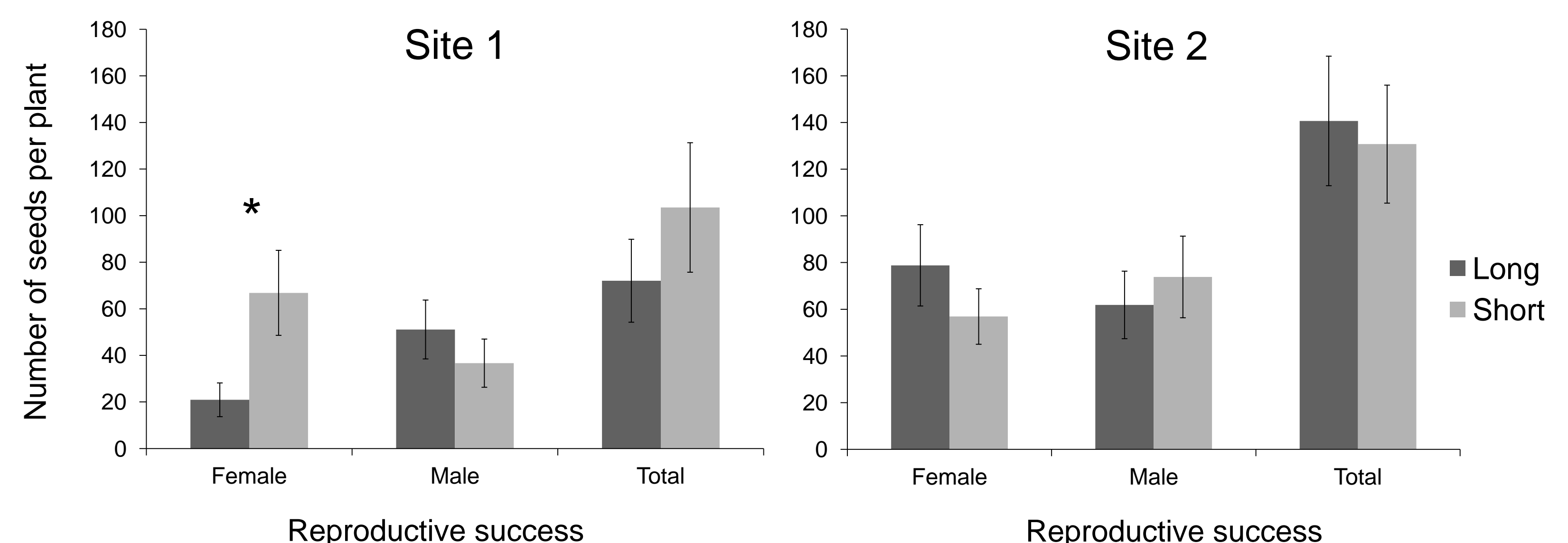


Figure 4. Effect of scape morph (long vs. short) on female, male and total reproductive successes of *P. farinosa* at sites 1 and 2. Mean \pm SE. * $P < 0.05$

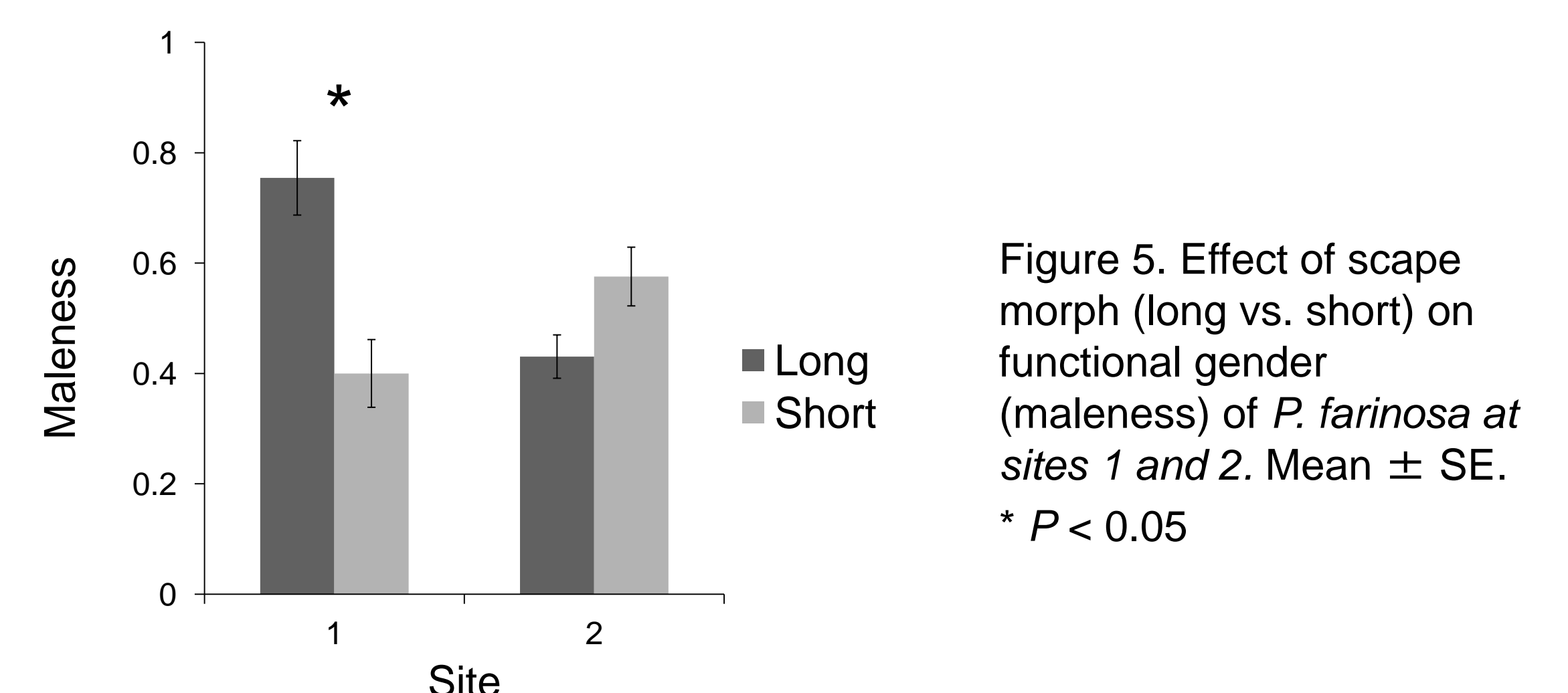


Figure 5. Effect of scape morph (long vs. short) on functional gender (maleness) of *P. farinosa* at sites 1 and 2. Mean \pm SE. * $P < 0.05$

Conclusions

Our results demonstrate that interaction with antagonists can differentially affect selection on floral display through female and male function and produce a relationship between floral display and plant functional gender. Positive effects of a large floral display on male reproductive success may at least partly compensate for an increased risk of herbivore-mediated reduction in seed production.