

# Size does matter: morphology, sexual expression and sex ratios in *Pseudoscleropodium purum* across Europe

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## INTRODUCTION

Sex-specific traits determine ecological performance of individual sexes within species. **In bryophytes, more than 60% of species present separate sexes (i.e. dioecy), and females often outnumber males in natural populations** (McLetchie et al., 2002), as opposed to seed plants (4 – 6% dioecy, male-biased populations). However, the causes that determine these characteristics in bryophytes have not been elucidated yet.

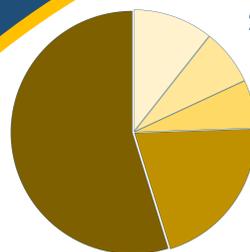
## SCOPE

Identify **spatial patterns of variation of sexual expression levels (SE), sex ratios, morphology, and the putative environmental factors driving this variation in mosses**

## METHODS

We selected *Pseudoscleropodium purum*, a dioecious pleurocarpous moss, as a model. We collected samples at 188 locations in eight European countries spanning its distributional range along a latitudinal gradient (from Canary Islands to Sweden). Sexual (SE and sex ratios) and morphological traits (plant weight and length) were measured in ca. 100 gametophores per population. Spearman rank correlations between traits and bioclimatic variables (from <http://www.worldclim.org/bioclim>) were evaluated.

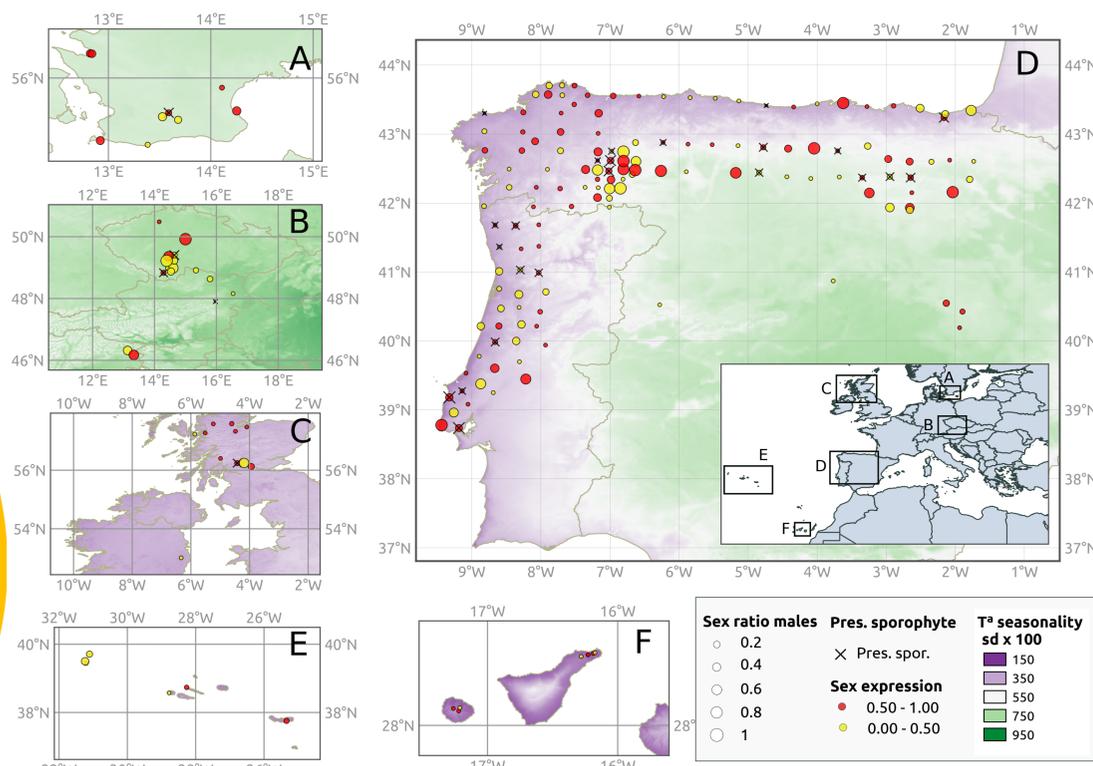
## MAIN RESULTS



Sexual expression  
 0 to 10%  
 11 to 20%  
 21 to 30%  
 31 to 50%  
 > 50%

We found high levels of SE (> 30%) in 76% of populations

Female and male biased populations constituted 77 and 12% of the populations respectively (considering sex-biased populations those in which the (fe)male ratio deviated more than 25% from the theoretical 1:1 expectation)



70% and 56% of the male and female biased populations respectively showed SE levels greater than 50%

We found significant site dependent differences in size between expressed and non expressed plants, and between females and males in terms of biomass per cm of shoot

We did not find any latitudinal nor altitudinal patterns for any of the variables studied, but we found some significant correlations between SE and sex ratios and several temperature variables, suggesting that temperatures may determine sexual traits to some extent in *P. purum*

Bioclimatic Variable	Sex ratio female
annual mean t <sup>a</sup>	0.178*
isothermality	0.233**
t <sup>a</sup> seasonality	-0.321***
min t <sup>a</sup> of coldest month	0.278***
t <sup>a</sup> annual range	-0.300***
mean t <sup>a</sup> of coldest quarter	0.228***

Bioclimatic Variable	SE
max t <sup>a</sup> of warmest month	-0.179*
mean t <sup>a</sup> of driest quarter	-0.146*
mean t <sup>a</sup> of warmest quarter	-0.183*

## CONCLUSIONS

**Sexual expression is favoured** in populations exposed to **less extreme temperatures during the warmest months** of the year.

The amount of females of *P. purum* decreases in populations inhabiting areas with lower temperatures during the coldest months of the year.

**Males, however, are less affected by colder temperatures and tend to dominate in areas with greater t<sup>a</sup> variation.**

Future molecular work will help us to further investigate the mechanisms responsible for the variation of sexual characters in this species



## REFERENCES:

McLetchie et al., 2002. *Evol. Ecol.*, 15:231-254

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