

# Sheltered or suppressed? Tree regeneration in unmanaged European forests

Yannek Käber<sup>1</sup>, Christof Bigler<sup>2</sup>, Janneke Hillerislambers<sup>1</sup>, Martina Hobi<sup>3</sup>, Tom Nagel<sup>4</sup>, Tuomas Aakala<sup>5</sup>, Markus Blaschke<sup>6</sup>, Peter Brang<sup>3</sup>, Bogdan Brzeziecki<sup>7</sup>, Marco Carrer<sup>8</sup>, Eugenie Cateau<sup>9</sup>, Georg Frank<sup>10</sup>, Shawn Fraver<sup>11</sup>, Jokin Idoate-Lacasia<sup>3</sup>, Jan Holik<sup>12</sup>, Stanislav Kucbel<sup>13</sup>, Anja Leyman<sup>14</sup>, Peter Meyer<sup>15</sup>, Renzo Motta<sup>16</sup>, Pavel Šamonil<sup>12</sup>, Lucia Seebach<sup>17</sup>, Jonas Stillhard<sup>3</sup>, Miroslav Svoboda<sup>18</sup>, Jerzy Szwagrzyk<sup>19</sup>, Kris Vandekerckhove<sup>14</sup>, Ondřej Vostarek<sup>18</sup>, Tzvetan Zlatanov<sup>20</sup>, and Harald Bugmann<sup>2</sup>

<sup>1</sup>ETH Zurich

<sup>2</sup>ETH Zürich

<sup>3</sup>Swiss Federal Institute for Forest Snow and Landscape Research WSL

<sup>4</sup>University of Ljubljana

<sup>5</sup>University of Eastern Finland

<sup>6</sup>Bavarian State Institute of Forestry

<sup>7</sup>Warsaw University of Life Sciences

<sup>8</sup>University of Padua

<sup>9</sup>Reserves Naturelles de France

<sup>10</sup>Austrian Research Centre for Forests

<sup>11</sup>The University of Maine

<sup>12</sup>Silva Tarouca Research Institute for Landscape and Ornamental Gardening

<sup>13</sup>Technical University of Zvolen

<sup>14</sup>Research Institute for Nature and Forest

<sup>15</sup>Northwest German Forest Research Institute

<sup>16</sup>University of Turin

<sup>17</sup>Forest Research Institute Baden-Wuerttemberg

<sup>18</sup>Czech University of Life Sciences Prague

<sup>19</sup>University of Agriculture in Krakow

<sup>20</sup>Bulgarian Academy of Sciences

November 3, 2022

## Abstract

Tree regeneration is a key demographic process influencing long-term forest dynamics. It is driven by many biotic and abiotic factors. Thus, predictions of tree regeneration are challenging because of complex feedbacks along climatic gradients. The stress gradient hypothesis (SGH) and life-history strategies (LHS) provide a framework for assessing such feedbacks across different species ranges. To address these topics, we analyzed regeneration for 24 tree species in 6,540 plots from 299 unmanaged European forests. Negative interactions predominated, with their intensity decreasing under stressful conditions for most species, as predicted by the SGH. However, positive interactions were only evident for a few species. Our study indicates that SGH and LHS can be combined to partially explain within- and between-species differences in tree recruitment. Moreover, our

findings imply that projections of forest dynamics along wide climatic gradients must accommodate both negative and positive biotic interactions, as they strongly affect rates of community turnover.

### Hosted file

main\_kaeberetal\_euforia\_regeneration\_final.docx available at <https://authorea.com/users/519850/articles/593404-sheltered-or-suppressed-tree-regeneration-in-unmanaged-european-forests>