

Dendrochronology of *Atriplex portulacoides* and *Artemisia maritima* in Wadden Sea salt marshes

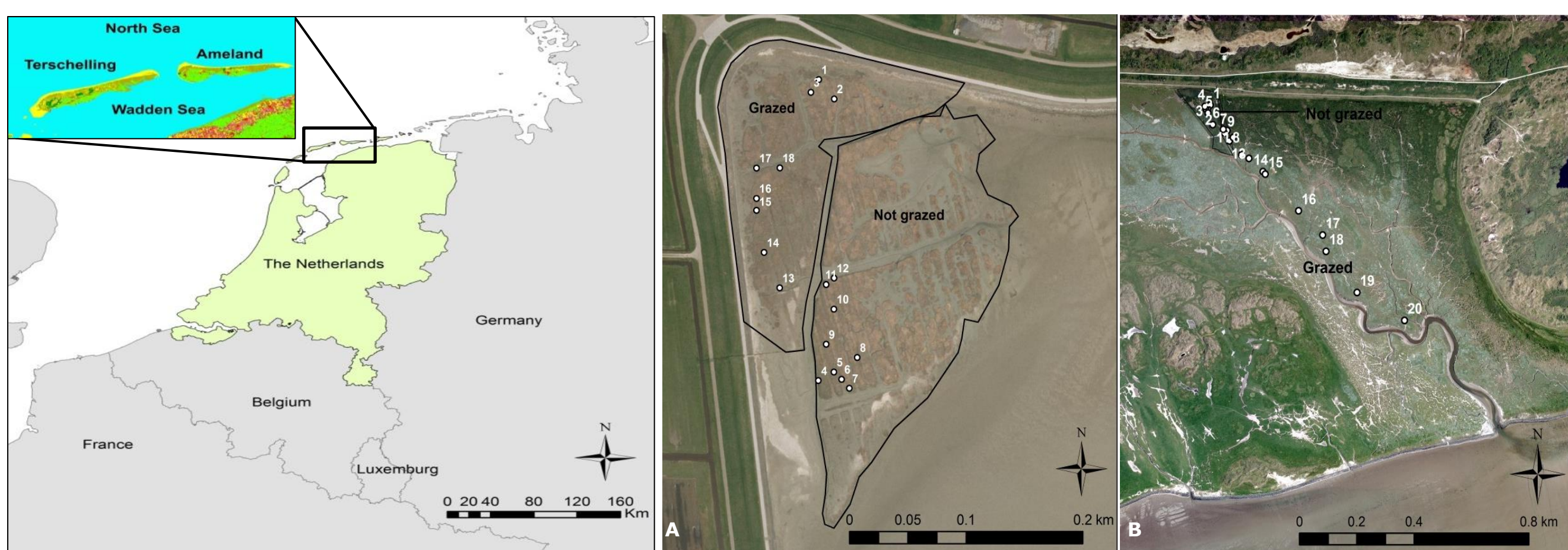
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Background

- Salt marshes** are a **unique ecosystem** in the upper intertidal coastal zone of Europe's temperate regions. They are **protected** by the European Habitats Directive and are Natura 2000 sites. Their **diminishment** is a continuing concern in the northern Netherlands.
- The salt marshes contribute to **coastal protection**, as they dampen incoming waves.
- The two shrub species that are studied, ***A. portulacoides*** and ***A. maritima***, are common to salt marshes. With their extensive roots and branches, they facilitate sedimentation and stabilize salt marshes.
- The study aims to provide information on **growth and survival** of these typical salt-marsh shrubs by using **dendrochronology**. This technique offers an indirect way to investigate the influence of **management** – grazing in this case – on **marsh quality and areal extent**.

Materials and methods

- Location:** Salt marshes at two field sites on the Dutch North Sea barrier islands of **Terschelling** and **Ameland**. Both sites had grazed and non-grazed parts.



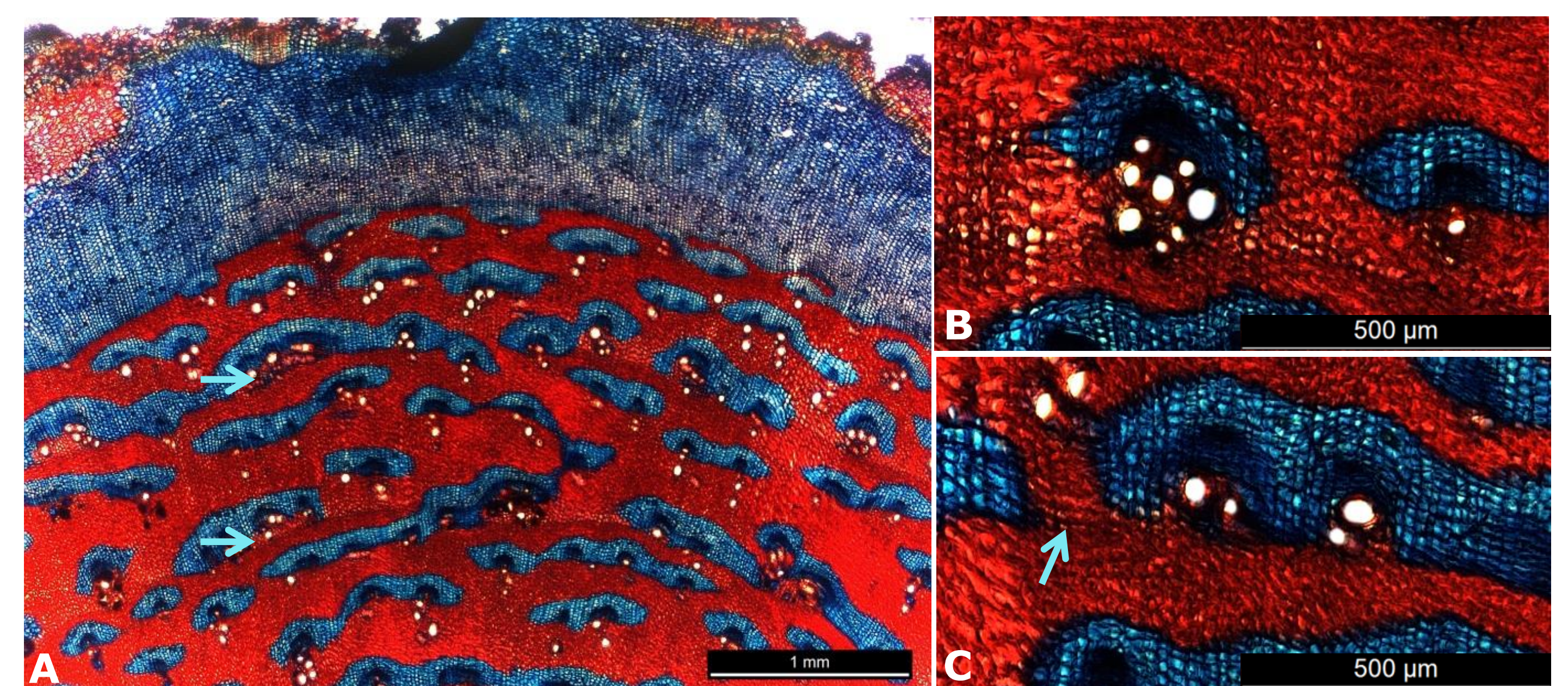
- Several **stem sections** at different heights were sampled to assure correct age determination (sedimentation could cover the stem base)



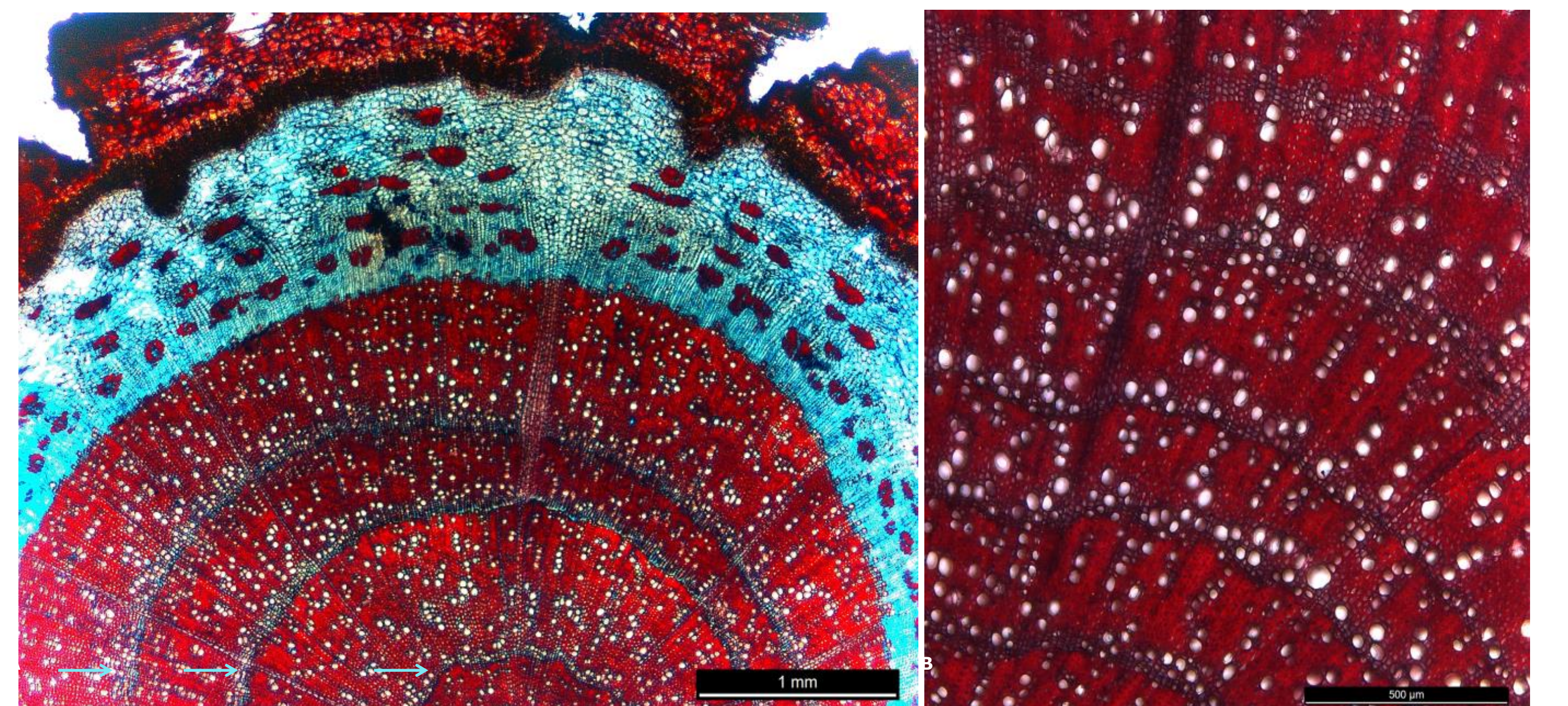
- Via dendrochronology annual **growth rings** could be identified to determine shrub age and growth. In *A. portulacoides* these rings took the form of a **narrow band of terminal parenchyma**. In *A. maritima* they were made up of **unlignified marginal parenchyma** together with higher vessel density at the beginning of the growing season.

Core findings

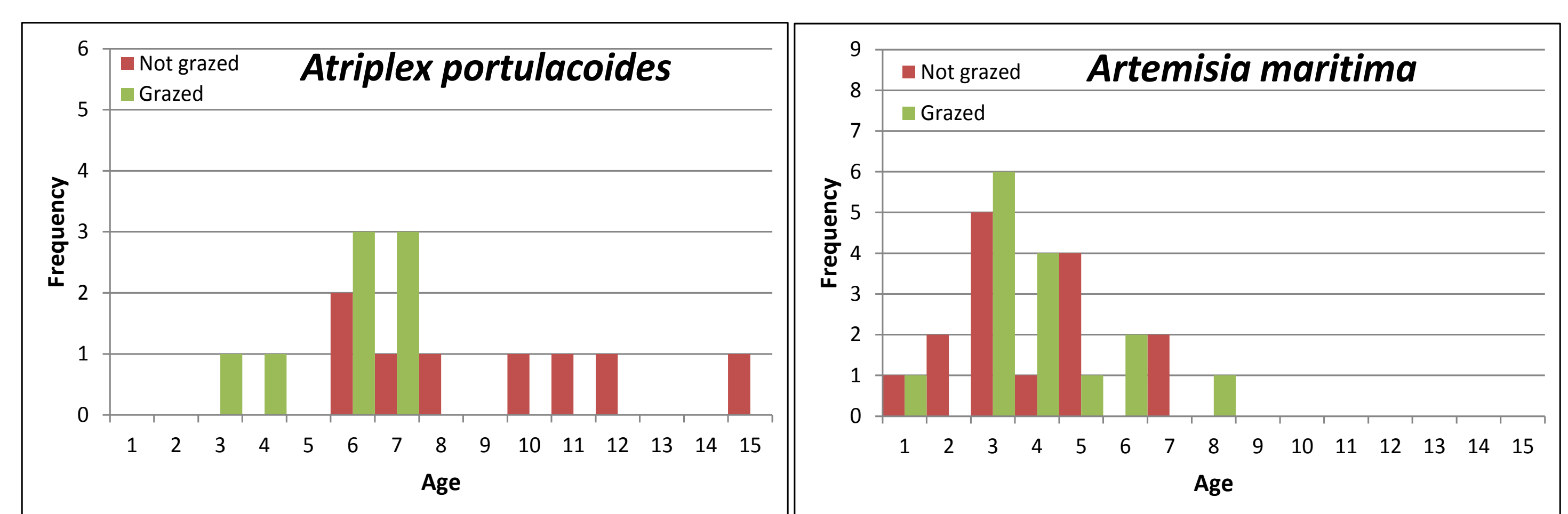
- Growth rings indicated that intense **grazing was clearly detrimental to the survival of *A. portulacoides*** at the Terschelling site.
- Grazing facilitated survival of *A. maritima*** at the Ameland site by reducing light and nutrient competition from grasses.
- Maximum ages found: 15 years for *A. portulacoides* and 8 years for *A. maritima*
- No growth trends** could be found, however, as the lifespan for both species is short and many other influences on shrub growth could be identified.



(A) Transverse section of *Atriplex portulacoides* L. Annual ring boundaries are defined by a narrow band of terminal parenchyma (indicated by blue arrows). (B) Clouds of branch with cap- and arc-like, unlignified tangential parenchyma. (C) Partially obscured annual ring boundary by the cap- and arc-like, unlignified tangential parenchyma.



(A) Transverse section of *Artemisia maritima* L. Annual ring boundaries are clearly defined by a narrow band of terminal parenchyma (indicated by blue arrows) and larger vessel density at the beginning of the growing season. Vessels are diffuse-porous, meaning that they are evenly distributed throughout the growth ring. (B) A detailed section of A.



(A) Absence of older specimens of *A. portulacoides* L. in the grazed zone of the salt marsh at Stryp, while in the non-grazed zone shrubs up to age 15 were found. (B) No effect of grazing found on establishment of *A. maritima* L. on the salt marsh at Neerlands Reid. Sample specimens were age 8 at maximum.

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Acknowledgements: This study is part of the strategic KBIV research program Sustainable Spatial Development of Ecosystems, Landscapes, Seas and Regions, funded by the Dutch Ministry of Economic Affairs, Agriculture and Innovation and carried out by Wageningen University Research Center. Special thanks to Johan Krol from the Nature Center (Ameland) for his support during the fieldwork. We are also grateful for the permission granted by 'De Vennoot' (Neerlands Reid) to undertake our research on their property.