

# Grazing effects on the growth of the coastal furoid *Ascophyllum nodosum* in a climate change context

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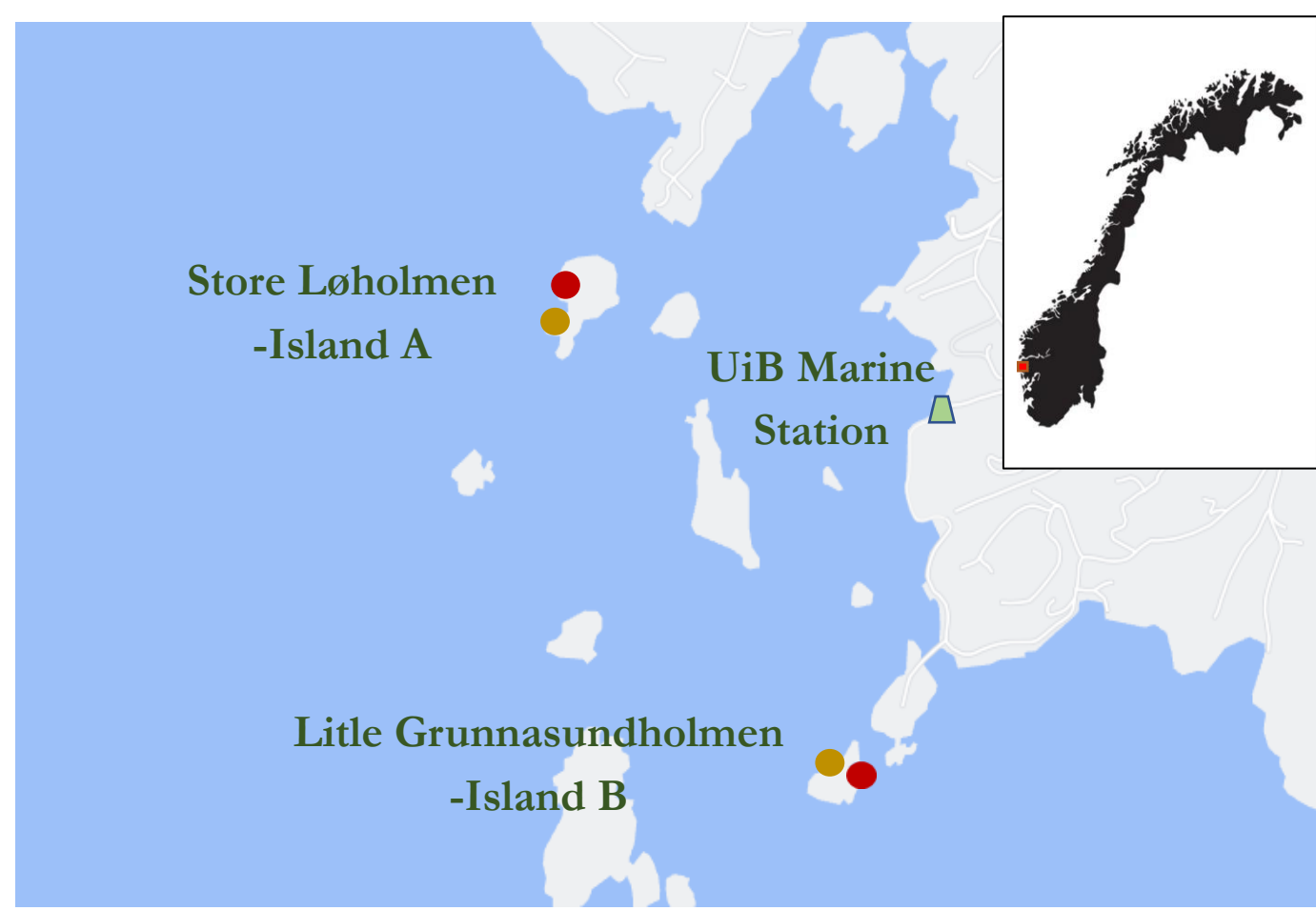
## Let's talk about the intertidal

> *Ascophyllum nodosum* provides important ecosystem services in rocky intertidal zones, produces a bladder yearly for flotation and grows mostly during summer after the spring reproduction period<sup>1</sup>.

> Grazers on macroalgae such as *Patella vulgata* or *Littorina obtusata* also grow most extensively during summer, increasing their feeding activity during these periods<sup>2</sup>.

> Inhabiting different parts of the vertical slope<sup>3</sup>, the grazing pressure<sup>2</sup> and the length of the branches during high tides<sup>4</sup> might affect the growth of *A. nodosum*. Before exploring climate change scenarios, we should study first what happens during a normal summer period.

## How was it done?

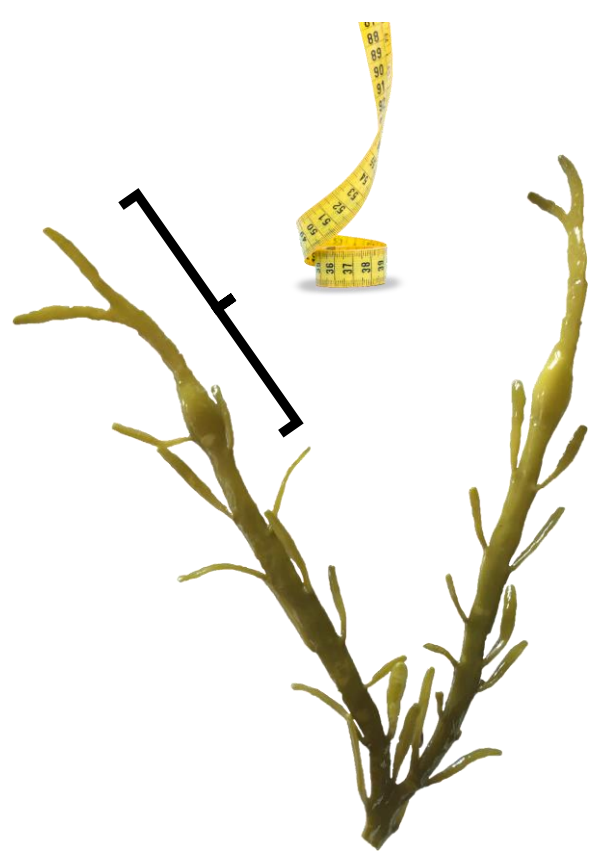


**Location:** Two islands near the UiB marine station were chosen and two areas were defined per island: **Controls (C)** and **Grazer Removal areas (GR)**.

**Preparation:** The grazers were removed from the GR weekly, and the Control areas surveyed to count grazers per zone (Upper, Medium and Lower intertidal).



**Growth:** Length measured weekly during July and August of 2022. From the base of the last air bladder to the tip<sup>5</sup> of long and short branches from 5 individuals in each zone.

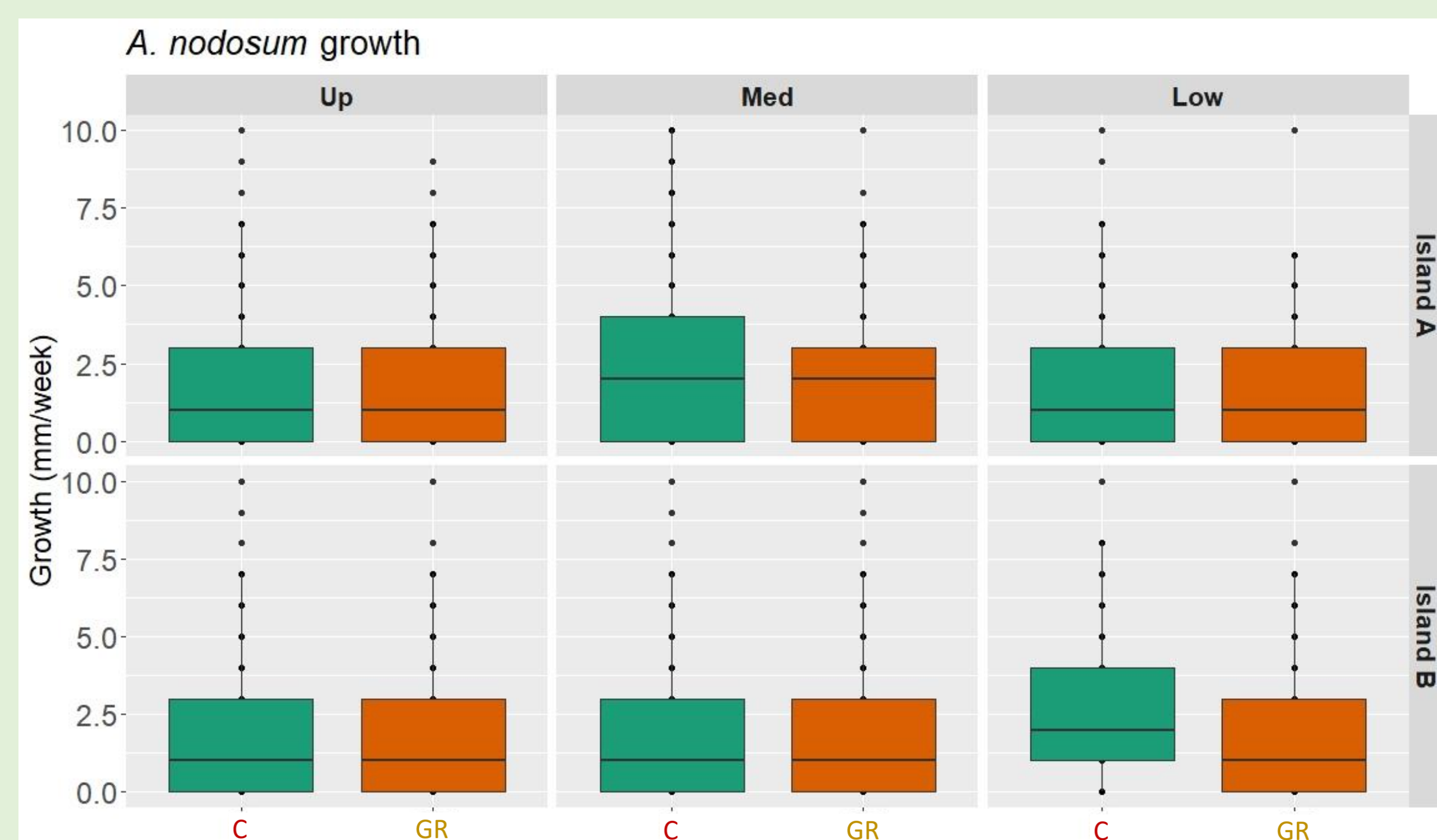


## Which factors affect growth?

Source	Sum of Squares	Df	Mean Square	F	Pr(>F)
Zone	1.03	2	0.5159	5.053	<b>0.00646</b>
Branch	0.02	1	0.0232	0.227	0.63375
Treatment	0.72	1	0.7194	7.046	<b>0.008</b>
Zone x Branch	0.09	2	0.0447	0.437	0.64579
Zone x Treatment	0.58	2	0.289	2.831	0.05916
Branch x Treatment	0.12	1	0.1183	1.159	0.28178
Zone x Branch x Treatment	0.39	2	0.1951	1.911	0.14821
Residuals	256.07	2508	0.1021		



Growth in *Ascophyllum* is affected by the zone in the intertidal in which they reside and whether they are grazed or not. No interactions are significant.

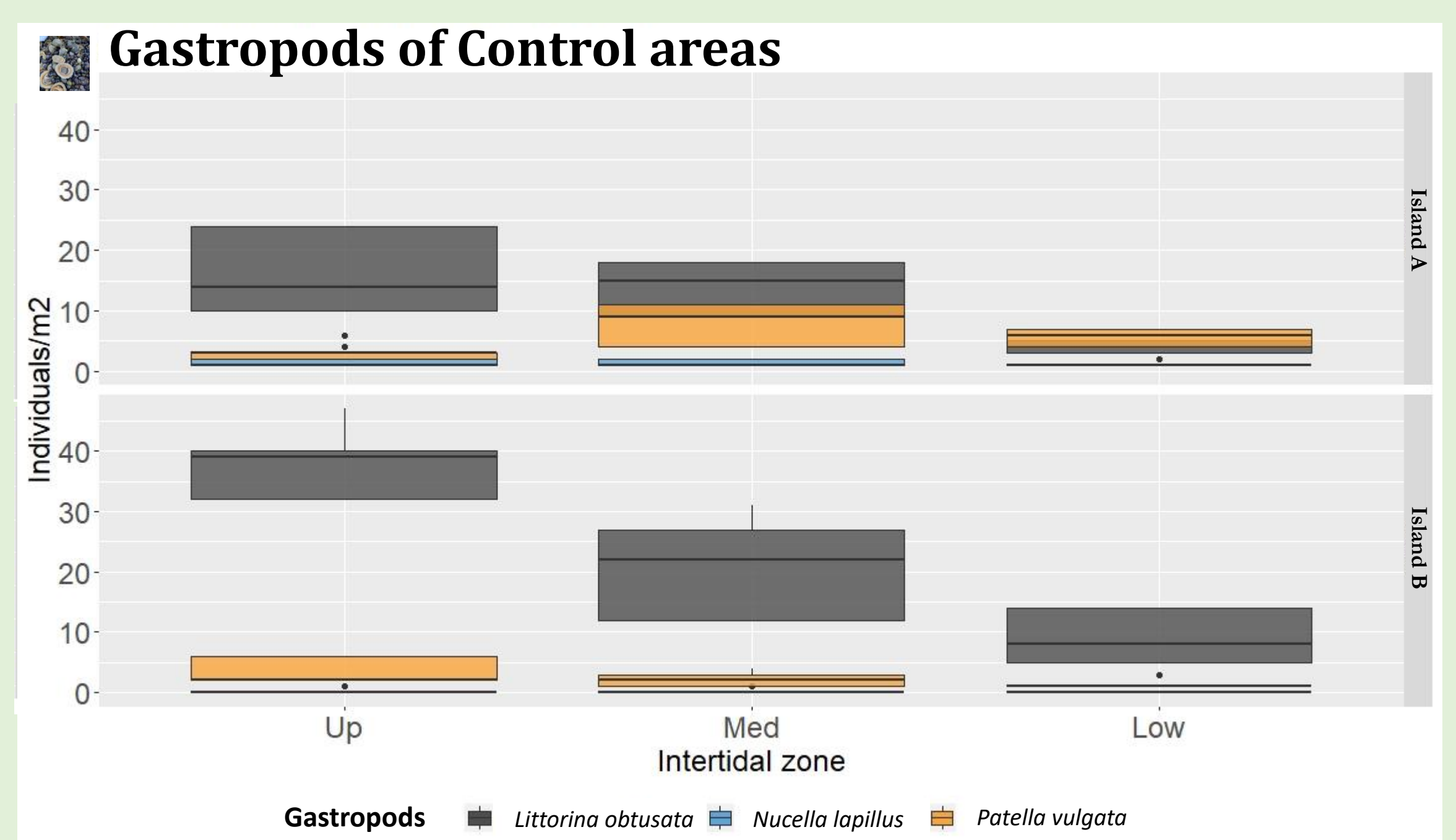


Mean growth in Control locations differs depending on island.

Growth is higher in the medium zone in Island A and the lower zone of the intertidal in Island B.

> Mean abundance of *Littorina* is higher in the upper parts of the intertidal of both islands.

> *Patella* is more abundant in the medium and lower zones of Island A and the upper zone of the intertidal in Island B.



## Take-home messages

- > *A. nodosum* growth is higher in medium or lower zones with grazers.
- > Grazing seems to stimulate growth in medium and lower intertidal zones of control sites.
- > The removal of epiphytes by grazers might explain the difference in growth<sup>6</sup>.

> **Climate change context:** The growth as well as the grazing period might increase in the future. Ongoing experiments in controlled lab-conditions, under expected climate change temperature increases, will expand our understanding.

## Literature cited:

- <sup>1</sup>Pereira *et al.* (2020). A concise review of the brown macroalga *Ascophyllum nodosum* (Linnaeus) Le Jolis. *J. Appl. Phycol.*, 32, 3561-3584.
- <sup>2</sup>Jenkins & Hartnoll (2001). Food supply, grazing activity and growth rate in the limpet *Patella vulgata* L.: a comparison between exposed and sheltered shores. *J. Exp. Mar. Biol. Ecol.*, 258, 123-139.
- <sup>3</sup>Stengel & Dring (1997). Morphology and in situ growth rates of plants of *Ascophyllum nodosum* (Phaeophyta) from different shore levels and responses of plants to vertical transplantation. *Eur. J. Phycol.*, 32, 193-202.
- <sup>4</sup>Strömberg (1981). Individual variation in apical growth rate in *Ascophyllum nodosum*. *Aquatic Bot.*, 10, 377-382.
- <sup>5</sup>Marbà *et al.* (2017). Climate change stimulates the growth of the intertidal macroalgae *Ascophyllum nodosum* near the northern distribution limit. *Ambio*, 46, 119-131.
- <sup>6</sup>Viejo & Åberg (2003). Temporal and spatial variation in the density of mobile epifauna and grazing damage on the seaweed *Ascophyllum nodosum*. *Mar. Biol.* 142, 1229-1241.

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