Who refills my tank?

Coelenterazine as fuel for *Amphiura filiformis* luminescence

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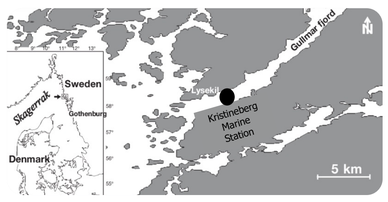
INTRODUCTION

Bioluminescence is the capability to emit visible light thanks to a biochemical reaction. This reaction implies the oxidation of a substrate called luciferin by the catalytic action of a luciferase [2]. The brittle star, *Amphiura filiformis*, is a suspensive feeder known to depend on coelenterazine supply to maintain its bioluminescence. To date, the coelenterazine source in *A. filiformis* remains unknown therefore this study aims (*i*) to identify luminous species within the plankton community (*ii*) to isolate the one that used coelenterazine as luminous substrate (*iii*) to link the species abundance with the amount of coelenterazine in the plankton mixture.

MATERIEL & METHODS

LUMINOMETRIC ASSAY

SEASONNAL SAMPLING

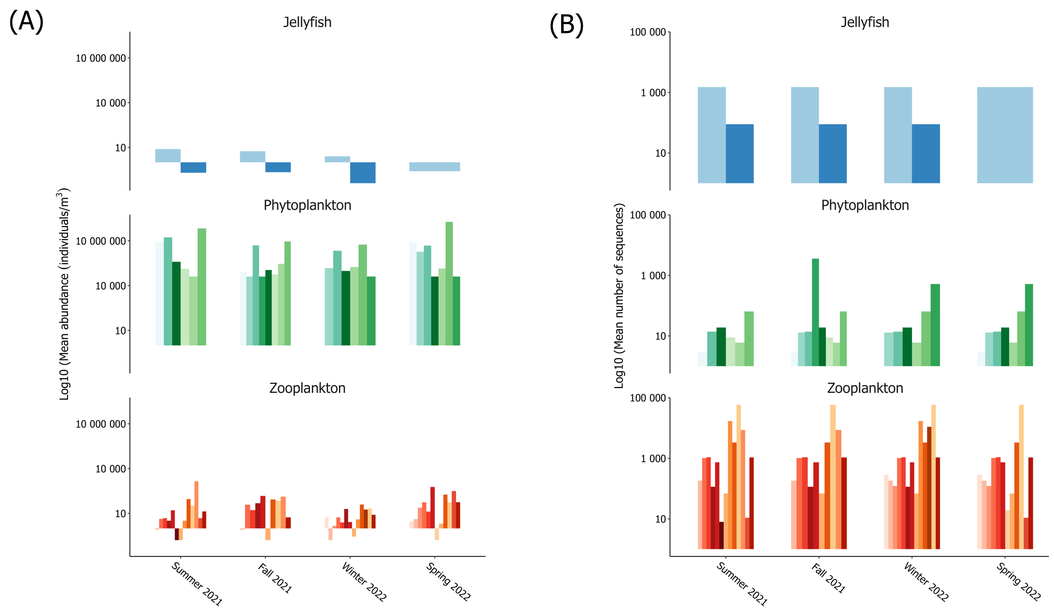


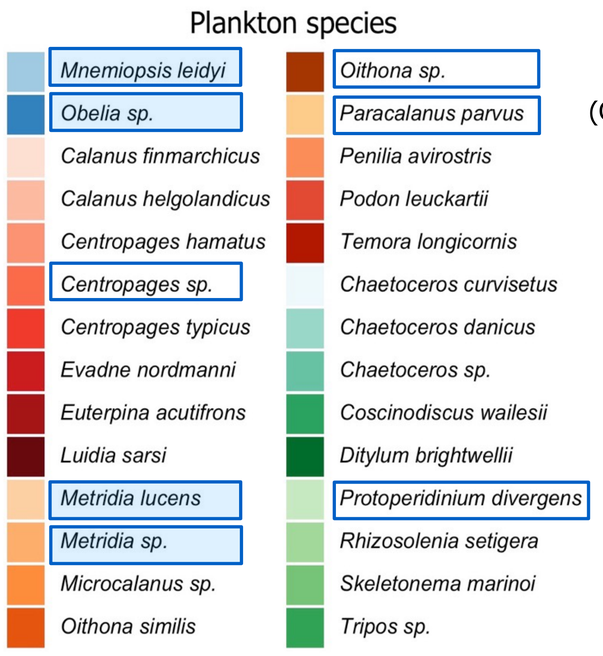
METABARCODING

Figure 1: The bioluminescent ophiuroid, *A. filiformis,* feeds by extending arms into the surrounding water.

RESULTS & DISCUSSION

- Planktonic population analysis





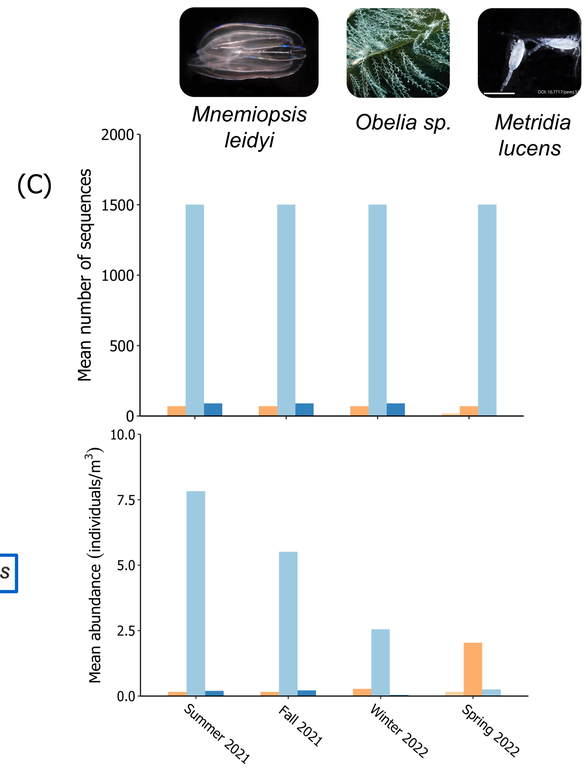
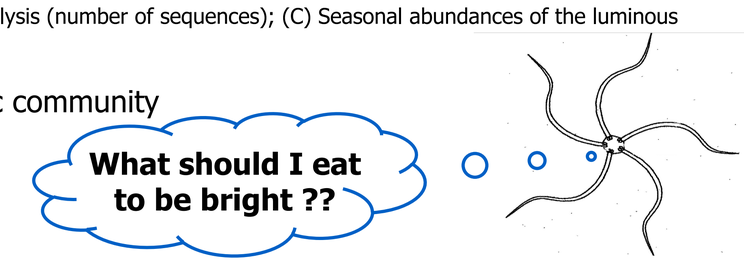


Figure 2: Seasonal analysis of the planktonic communities in the Gullmar fjord (A) abundance (individual/m³) from the planktonologist and (B) metabarcoding analysis (number of sequences); (C) Seasonal abundances of the luminous species using coelenterazine as luciferin.

⟹ Data analysis from planktonologist (286 species) and metabarcoding (88 species) datasets spots in the fjörd planktonic community

i. 7 luminous species (names with blue boxes) [1, 4, 5]

ii. 3 species known to use coelenterazine as luciferin (names with blue background boxes) [1, 3]



- Luminometric assay

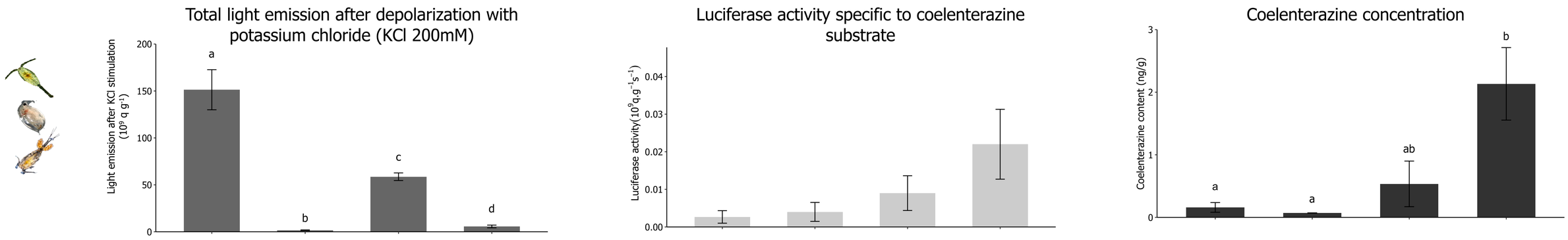


Figure 3: Seasonal measurements of the luminous capabilities of plankton mixture in the Gullmar fjörd. Values are expressed as means±s.e.m (n=3). Letters above bars indicate a statistical difference between season.

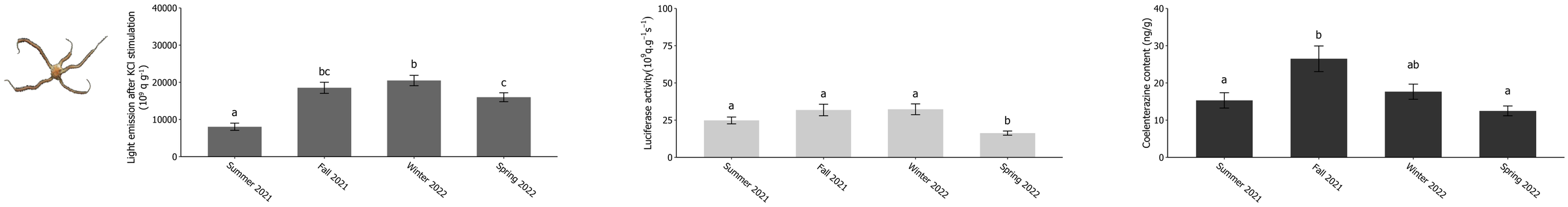


Figure 4: Seasonal measurements of *A. filiformis* luminous capabilities of the arm tissue in the Gullmar fjörd. Values are expressed as means±s.e.m (n=30). Letters above bars indicate a statistical difference between season.

⟹ Seasonal luminometric assays show

i. Coelenterazine is detected all year in plankton mixture

ii. A. filiformis luminous capabilities are lower in summer 2021 and higher in winter 2022

CONCLUSION

- Presence of luminous planktonic species in the Gullmar fjörd.
- Detection of coelenterazine in the planktonic communities.

Screening luminous plankton does not mean the presence of coelenterazine and vice versa [6].

Perspectives

- Stomach content analysis to confirm the presence of these species in the *A. filiformis* diet's.

Reference

[1] Shimomura, 2012. World Scientific. [2] Mallefet et al., 2020. *J. Exp. Biol.* [3] Oba et al., 2009. *BBRC.* [4] Lapota & Losee, 1984. *J. Exp. Mar. Biol. Ecol.* [5] Temnykh et al., 2022. *Russ. J. Mar. Biol.* [6] Shimomura, 1987. *Comp. Biochem. Physiol. B.*

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