FOOD SOURCES DRIVE ELEMENTAL STOICHIOMETRY OF BENTHIC CONSUMERS

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WHAT WE LEARNED

Benthic consumers store and recycle carbon, nitrogen and phosphorus at theoretically homeostatic rates.

Instead, we found that benthic faunal C:N:P content and excretion showed strong seasonal variation in response to changes in food availability.

Species ability to adapt to imbalances in resources is critical for understanding their role in maintaining ecosystem processes.

BACKGROUND

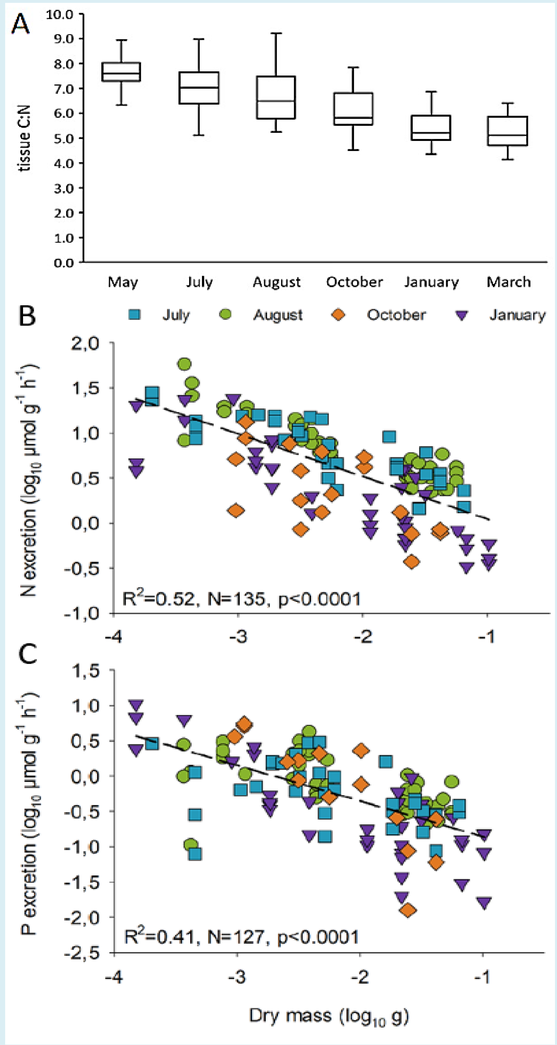
Stoichiometric balance between organisms and their habitat is critical for ecosystem functioning. Benthic fauna mediates biogeochemical cycles in coastal areas by storing carbon and nutrients in their body tissues, and by recycling nutrients via excretion. It is generally assumed that consumers regulate their inner elemental content to keep their body composition stable. However, changes in environmental conditions and available food sources could alter the physiology of the benthic species, and consequently affect processes such as respiration and excretion. Such alterations will shift the overall contribution of benthic faunal communities to turnover rates of carbon and nutrients in coastal Baltic Sea.




METHODS

By monitoring two sites over a year, we quantified the size and temporal stability of benthic faunal carbon and nutrient pools in coastal soft sediment habitats. We measured faunal excretion rates by incubating the animals at *in situ* conditions. C, N and P content was measured for the most dominant species.

RESULTS



Benthic faunal C:N:P ratios showed strong seasonal variation in response to food sources. For instance, C:N of *Macoma balthica* decreased from May to March (Fig. A). In the Baltic Sea, benthic fauna are exposed to imbalances in food availability due to seasonality in primary production. Hence, the feeding dynamics of benthic fauna also varies seasonally from high activity in summer to starvation in winter.

Benthic faunal excretion rates also showed seasonal variation. Both N (Fig. B) and P (Fig. C) excretion decreased from summer to winter due to decreasing temperatures and changes in food availability. Biomass was also a strong predictor for faunal excretion rates, as small individuals excreted higher amount of nutrients compared to large ones.

CONCLUSION

The ability to adapt to varying stoichiometric conditions is essential in face of the current imbalances in resources caused by anthropogenic activities. Thus, it is critical to identify the stoichiometric tolerance of different species, before environmental change causes a shift in the benthic community composition that will alter functions on an ecosystem level. Understanding the contribution of benthic consumers to the carbon and nutrient cycling is especially valuable in areas such as the Baltic Sea, where eutrophication has significantly altered the biogeochemical cycles in the coastal zone.

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