Effects of fluid preservation on sea star stable isotope compositions: How useful can museum collections be for trophic ecology studies?

1. Introduction

Stable isotope analyses of carbon (δ¹³C) and nitrogen (δ¹⁵N) are a common tool to investigate the trophic ecology of animals.

Animal stored in museums sampled during past periods with environmental conditions different from today

→ Possibility to use them for stable isotope analyses to study past food webs?

→ Does preservation method alter stable isotope ratios? No study on sea stars

Objective: To investigate the influence of preservation methods on C and N stable isotope ratios in sea stars

2. Material and methods

n = 20 sea stars (Marthasterias glacialis)

Analysis of stable isotope ratios in the tegument:
- One arm: control (dissection, immediate drying and grinding)
- Other arms: preservation treatments (freezing at –28°C, 3.7% formaldehyde, 99.8% alcohol, drying)
- Arms cut in sections: time effect (from 1 to 12 months)

Comparison to control of stable isotope ratios and Bayesian estimation of the isotopic niche (proxy of trophic niche) area

3. results

Formaldehyde: decrease and then stability of δ¹³C values (-0.8 ± 0.5 ‰, Fig. 1)

No δ¹³C values significantly different from the control for the other methods (Fig. 1)

No consistent pattern of changes of δ¹⁵N values (Fig. 2)

Higher variation of stable isotope values between individuals than between times of analyses: high signal-noise ratio

No significant change of isotopic niche area except at 6 months for samples preserved in alcohol (Fig. 3)

4. Discussion

Non-consistent pattern of changes of stable isotope values may result from variation of isotopic ratios in individual sea stars or analytical error

Formaldehyde: Possibility to use a same correction factor for δ¹³C no matter how long samples have been preserved

Conclusion: samples stored by museum in alcohol and formaldehyde (after using correction factor) may be used to study past trophic ecology of sea stars

Contact: baptiste.lebourg@doct.ulg.ac.be

Thanks are expressed to the Biological Station of Roscoff (France) for providing the samples. This work is part of vERSO (Ecosystem Response to global change: a multiscale approach in Southern Ocean) and RECTO (Refugia and Ecosystem Tolerance in the Southern Ocean) projects funded by BELSPO.