Chromatic harmony in symbiosis: Acquisition and characterization of pigments in *Zenopontonia soror*, associated with *Culcita novaeguineae*

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1. Introduction

Zenopontonia soror is a symbiotic shrimp associated with 23 species of Asteridae. In this project, the symbiosis between *Zenopontonia* soror and *Culcita novaeguineae* living in French Polynesia on the island of Moorea is studied. Both species have different morphotypes, in *Z.soror* it is possible to distinguish 3 main ones: (i) the colored morphotype (ii) the morphotype called "mustang" with a white line on the back and (iii) the transparent morphotype. When the host and the symbiont are separated, the symbiont will undergo a stress which will cause a discoloration. The hypothesis is that the symbiont obtains its pigments from its host and once separated from the latter dies of starvation and loses its pigmentation.

Figure 1: a) *Z.soror* colorate morphotype b) *Z.soror* transparent morphotype c) *Z.soror* »mustang » morphotype d) *Culcita novaeguineae*

2. Materials and methods

Pigment extraction

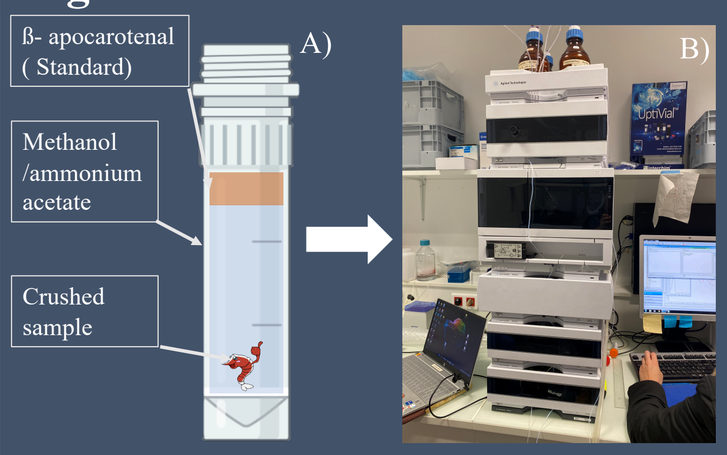


Figure 1: a) Schema of a collection tube that was used for the pigment extraction b) HPLC machine from the marine station of Concarneau.

Stable isotopes analysis

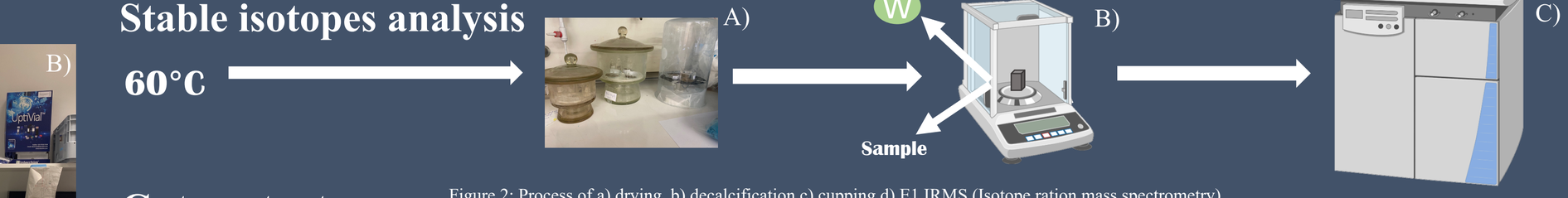


Figure 2: Process of a) drying, b) decalcification c) cupping d) E1 IRMS (Isotope ration mass spectrometry)

Gut content

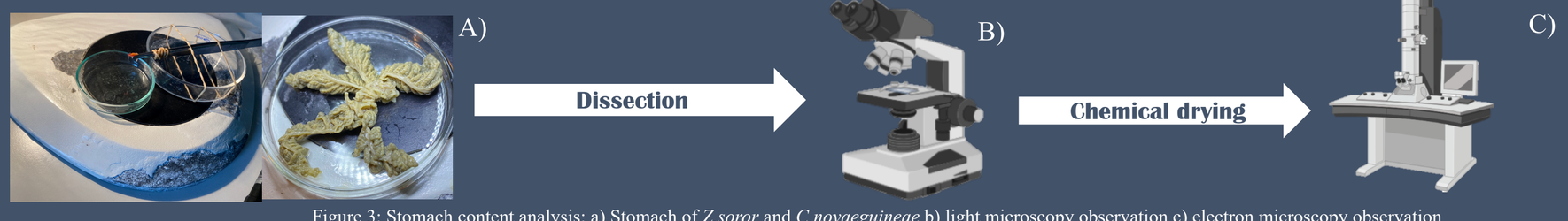
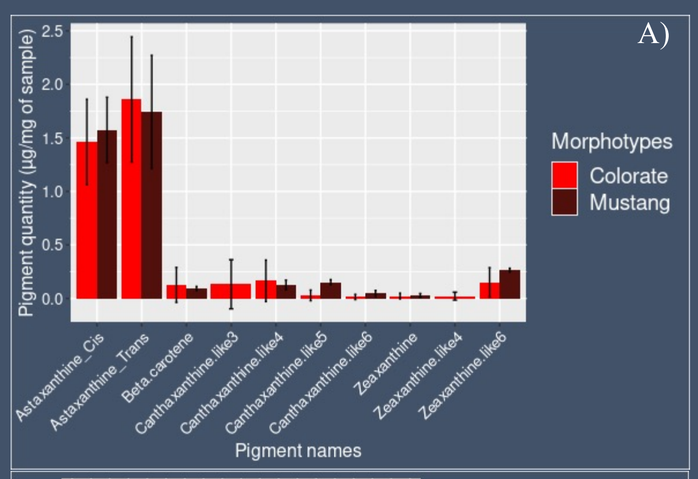
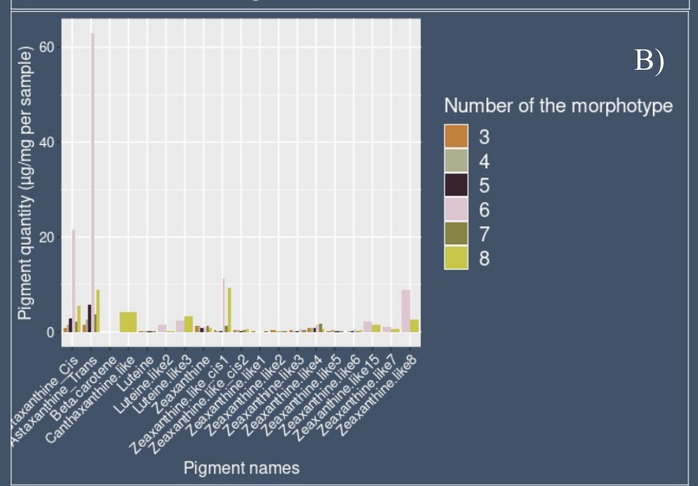


Figure 3: Stomach content analysis: a) Stomach of *Z.soror* and *C.novaeguineae* b) light microscopy observation c) electron microscopy observation

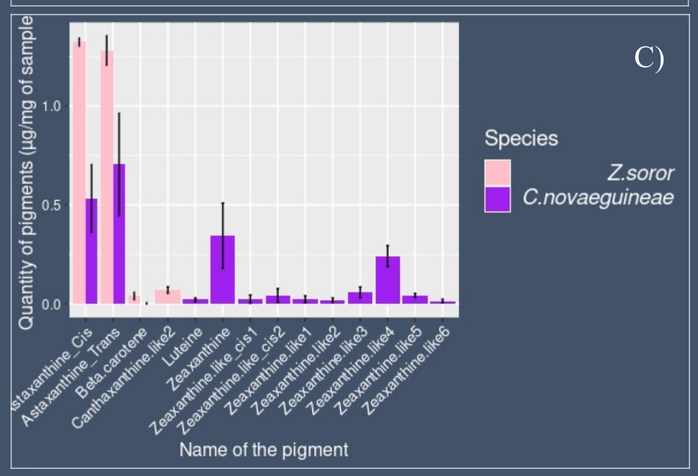
3. Pigment extraction



There is no significant difference in the amount and type of pigment between the "colored" morphotype and the "mustang" morphotype. The transparent morphotype does not appear because it has no pigment.



The amount and type of pigments differ between the different morphotypes of *C.novaeguineae*



Pigments present in the symbiont (*i.e. Z.soror*) are also present in the host (*i.e. C.novaeguineae*) such as the two forms of astaxanthin.

Figure 4: A) Graph representing the average amount of pigment for the 2 morphotypes of *Zenoponotonia soror* B) Graph representing the amount of pigment for 6 different morphotypes of *Culcita novaeguineae*. C) Graph representing the amount of pigment between a symbiont associated with its host

4. Gut content and stable isotopes analysis

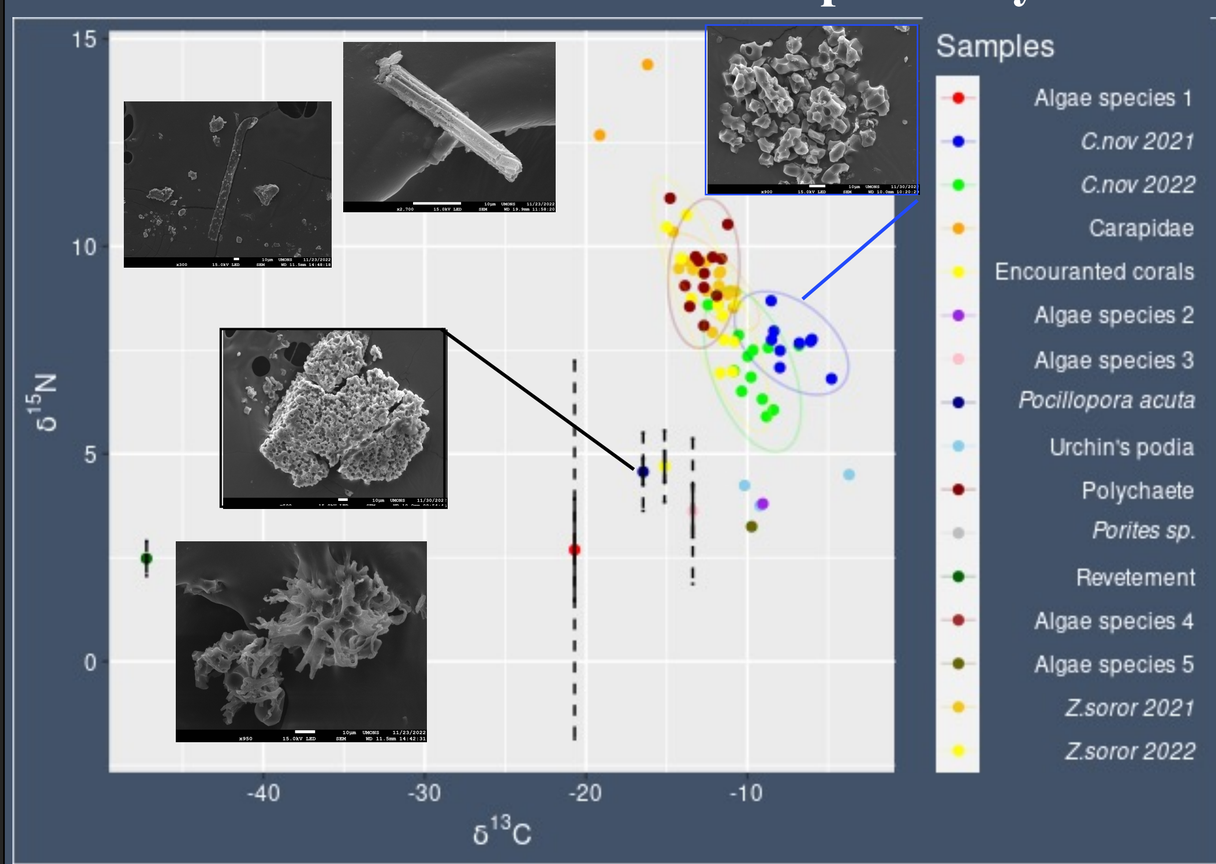


Figure 5: Graph representing the C^{13}/C^{14} ratio and the N^{14}/N^{15} ratio of *Z. soror*, *C.novaeguineae* and their potential food sources with some elements found during the analysis of stomach contents

5. Conclusion and discussion

In conclusion, pigment analysis in the symbiont shows that the transparent morphotype is devoid of pigments, while pigment similarities are observed between the colored, "mustang" morphotype and the host. Stable isotopes suggest a diversify alimentation, a possible sharing of food source between the host and the symbiont, but also the possibility that the symbiont feeds on its host to obtain its pigments. Future experiments will be done to confirm these hypothesis.