

# Combined effects of food quality, food quantity and temperature on somatic growth, asexual reproduction and fatty acid composition of *Aurelia aurita* polyps

Xupeng Chi<sup>1</sup>, Jamileh Javidpour<sup>1</sup>

<sup>1</sup>GEOMAR Helmholtz Centre for Ocean Research, Kiel, Germany

## Introduction and Objectives

Summer blooms of scyphomedusae are dependent to the proliferation of sessile-overwintered polyps (strobilation). So far temperature was defined as the main abiotic factor driving presence/absence of some jellyfish outbreaks. However, little is known about combined effects of biotic vs. abiotic factors on strobilation rates. To investigate the phase transition ecology of *Aurelia aurita*, we designed a factorial experiment on polyps manipulating food quality (in four levels), food quantity (in three levels) and temperature (in three levels). We aimed to study the four responses (Diameter, Budding, Strobilation and Fatty acid composition) under different food and temperature treatments.

## Material and methods

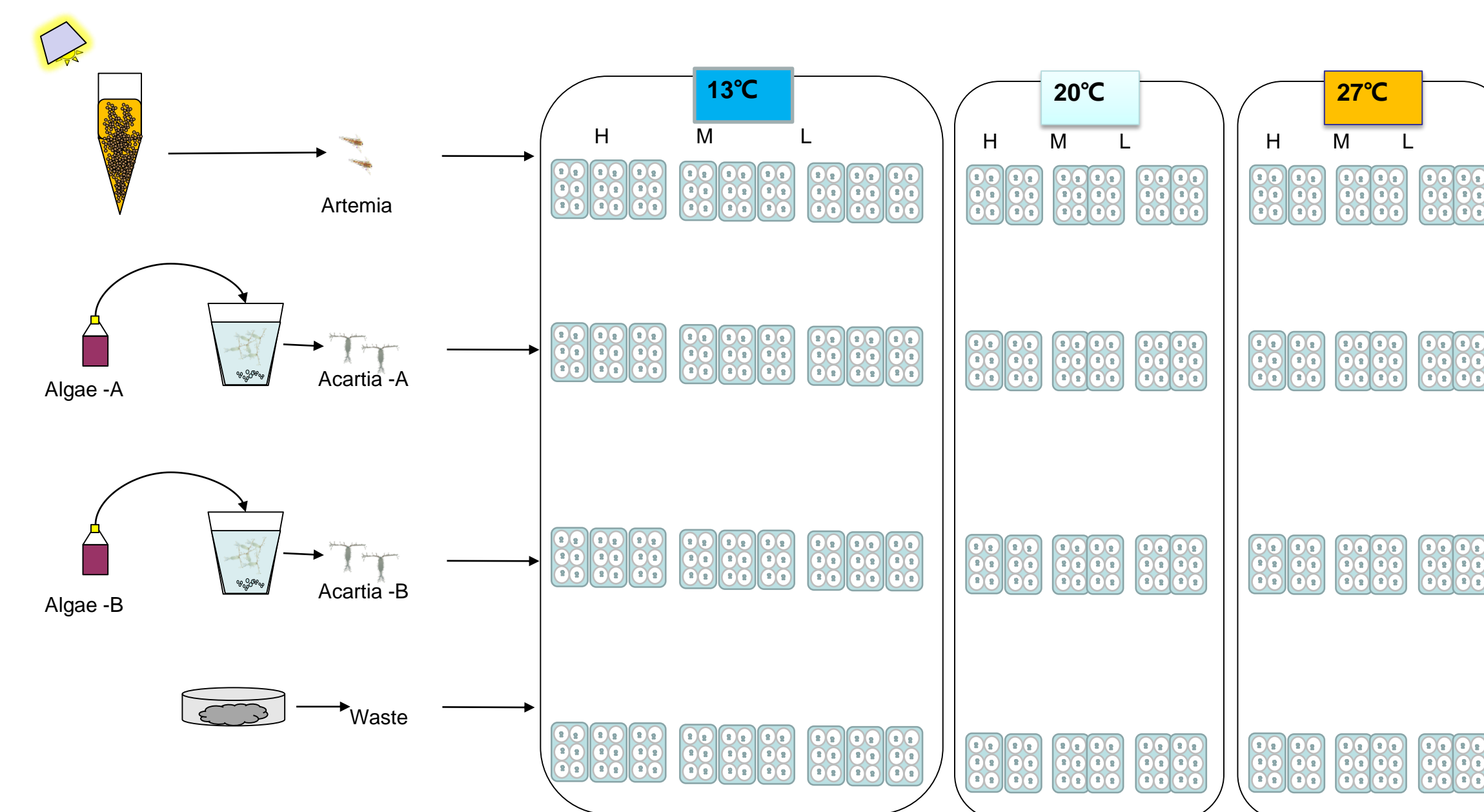


Fig.1 Material and methods of this experiment

- Polyps were cultured in filtered seawater in 18°C, they were adapted to three temperature levels (13 °C, 20 °C 27 °C) prior to the experiment. Polyps were fed with four food types of Artemia, Waste, and two different treatment of *Acartia tonsa* with four quantity levels (40 µg C, 10µg C and 2.5µg C)
- Polyps were fed and water was changed every 2days
- The size of polyps was measured every 6 days
- New buds were counted and removed from polyps
- Samples were Freeze-dried for fatty acid analysis
- Diameter, Budding, Strobilation and fatty acid composition considered as response variables.

## Results

### 1. Somatic growth

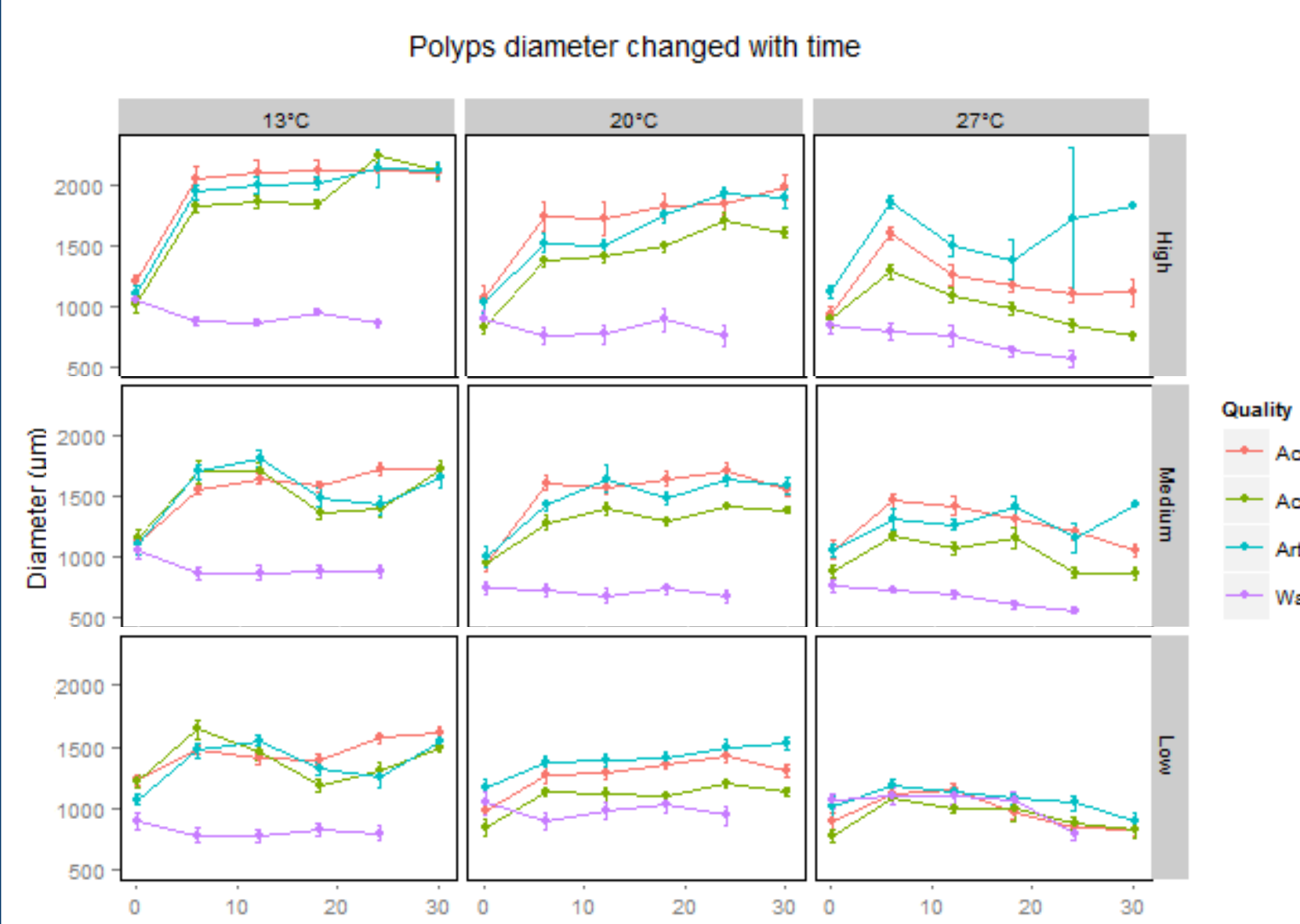


Fig.2 Polyps' diameter changed with time

- Polyps can grow up to the maximum diameter in short time (within one week).
- Polyps fed with different food quantity had different maximum diameter, while food quality had no significant effect on their growth, except for the waste food cannot contribute polyps' growth

### 2. Asexual reproduction\_Budding



Fig.3 Budding types observed in this experiment

- Three budding types observed in this experiment (Stolon budding, side buds and buds hatched from podocysts). However, podocysts only observed in high temperature group.

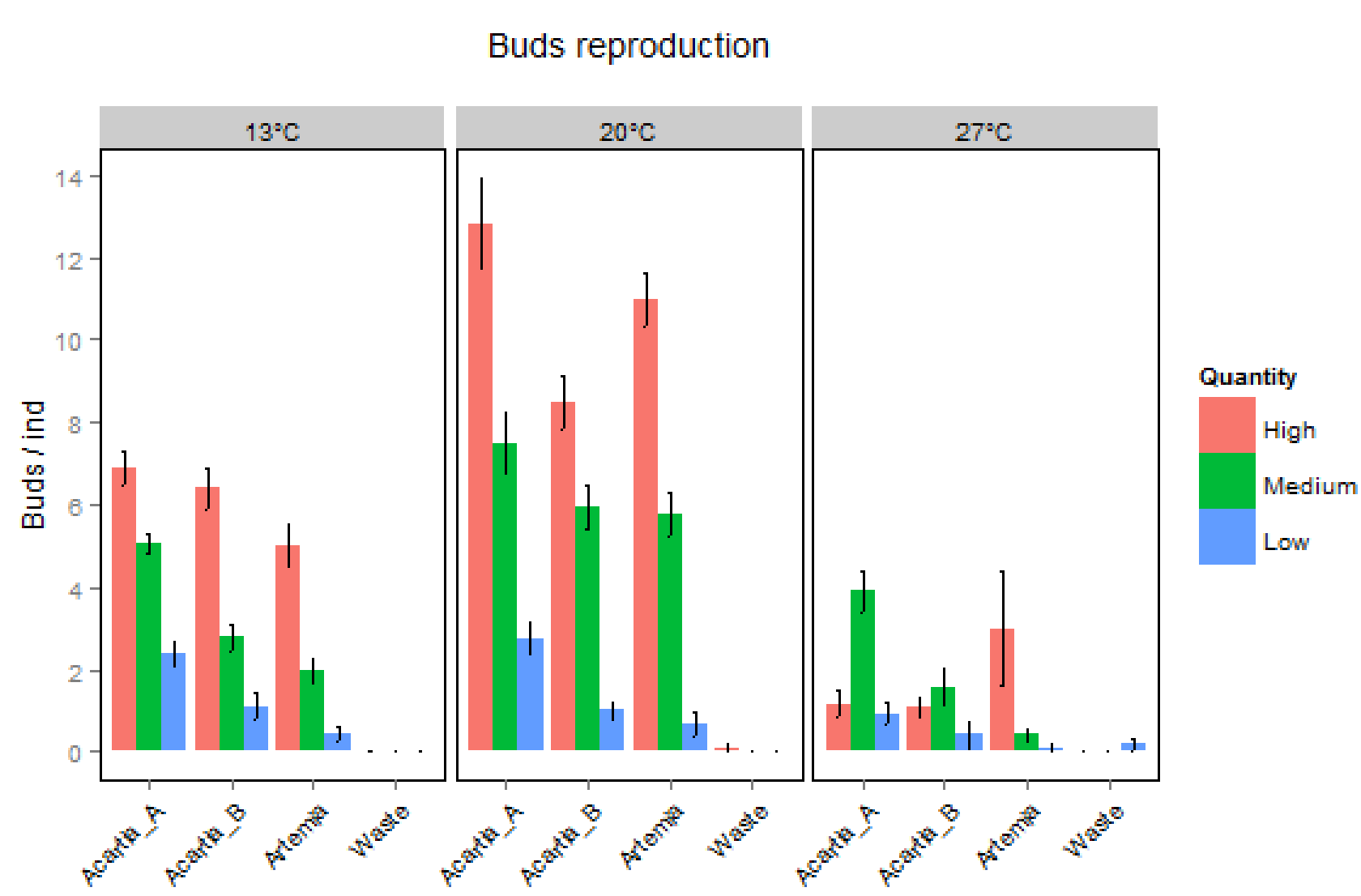


Fig.4 Buds reproduction in different treatments

- Temperature affected the number of buds significantly in all groups
- The medium food quantity showed no significant different from high food quantity group. Low food quantity and high food quantity showed significant results on budding.

### 3. Asexual reproduction\_Strobilation



Fig.5 Procedure of *Aurelia aurita* polyp strobilation

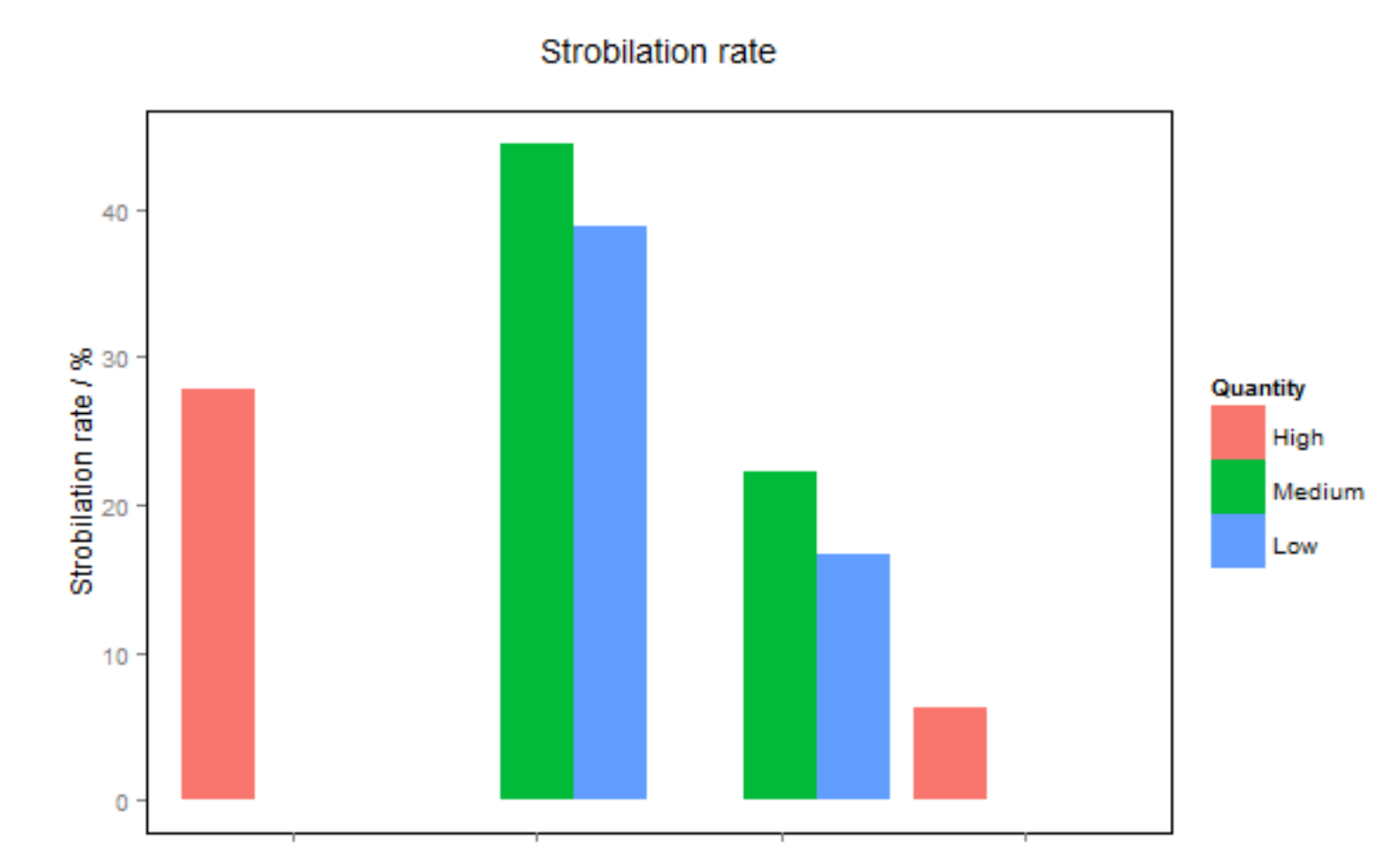


Fig.6 Polyps strobilation rate in different food treatment

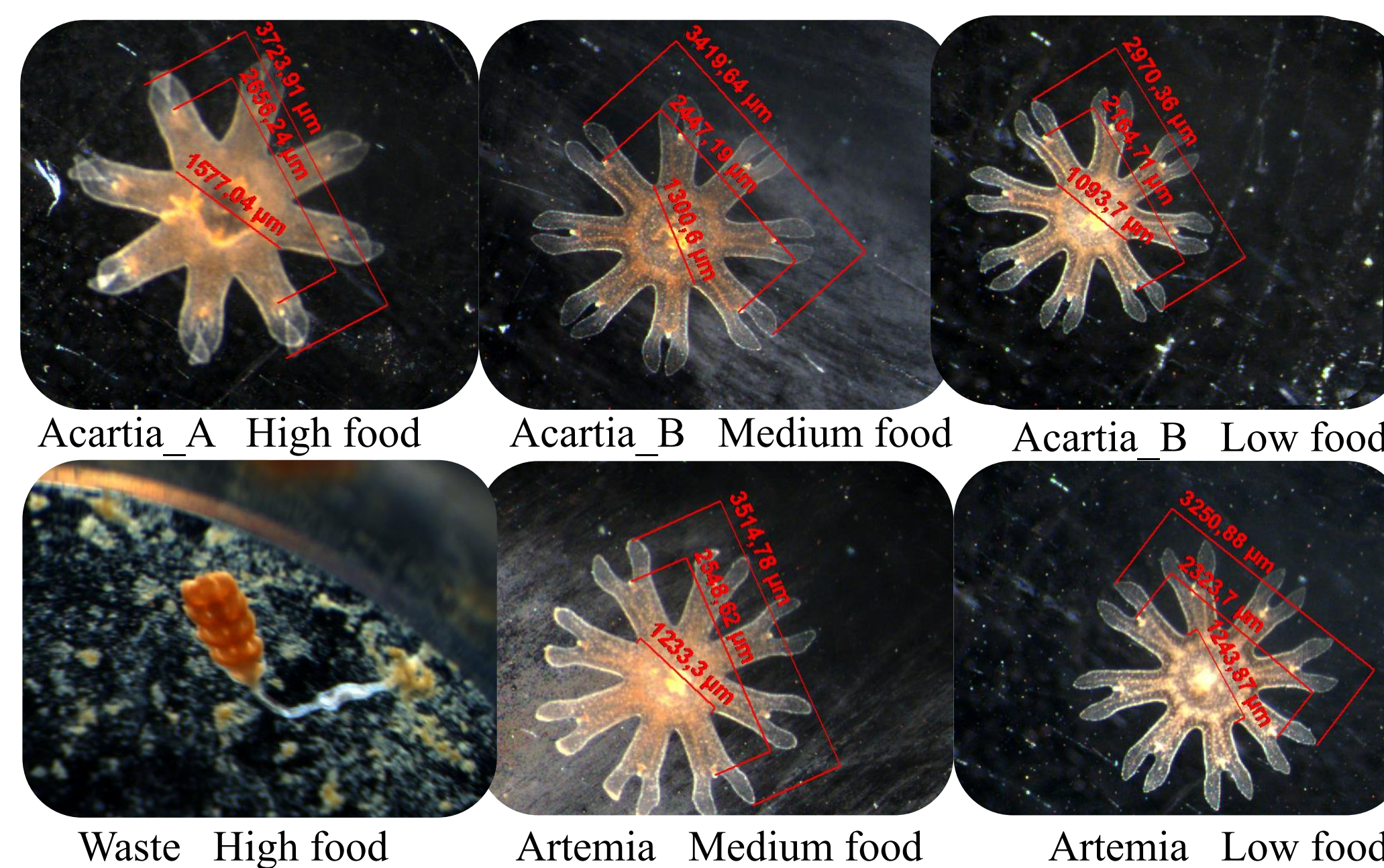


Fig.7 Quality of ephyrae released from polyps fed with different food quality and quantity

- Strobilation reproduction occurred only in low temperature group
- Polyps fed with Acartia\_B had a significant different results from the other group
- Strobilation in polyps fed with Acartia\_A and Waste only occurred in high food quantity group, while strobilation in polyps fed with Acartia\_B and Artemia occurred in Medium and Low food quantity group.

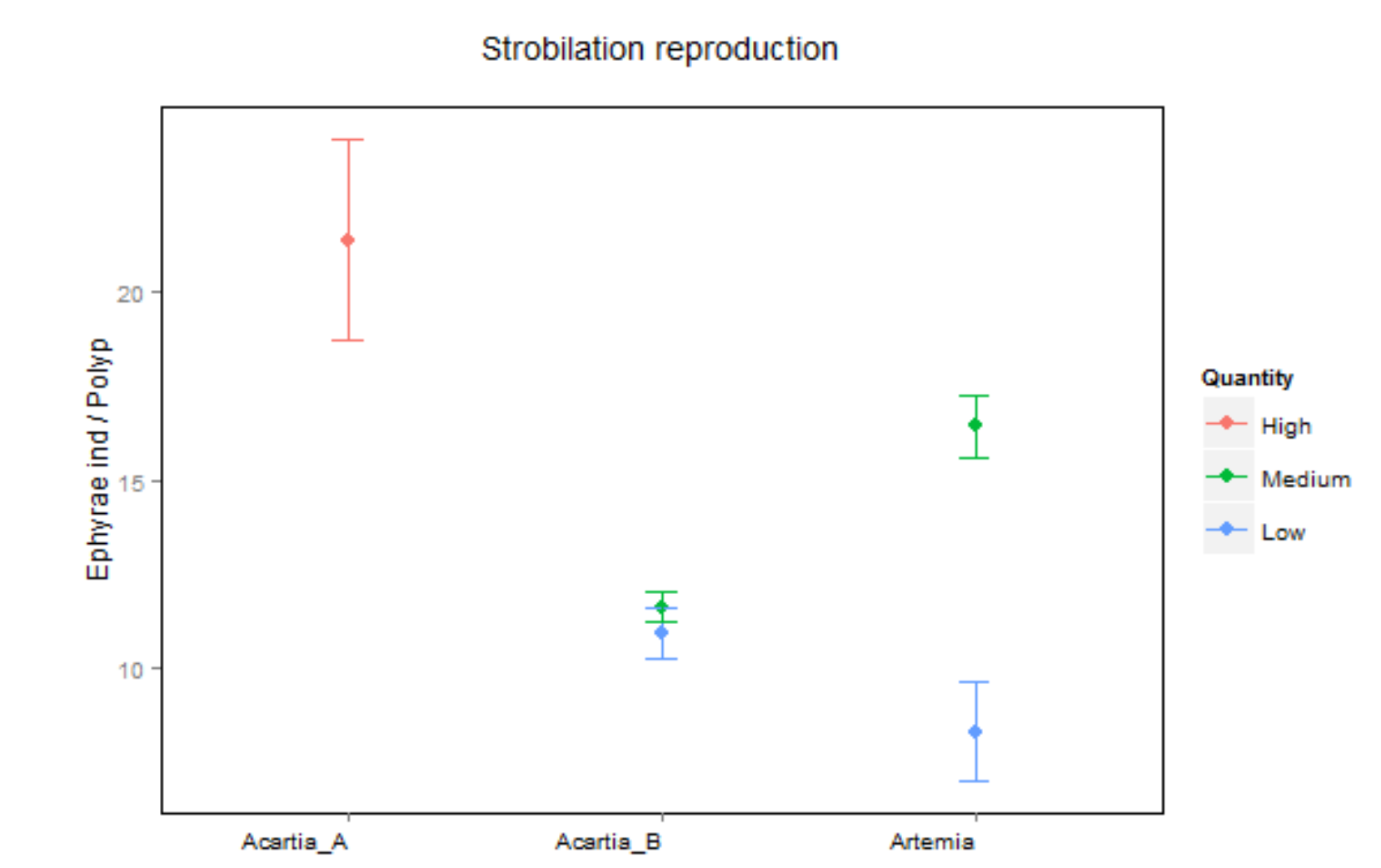


Fig.8 Number of ephyrae released from one polyp in different food treatment

- Food quality and quantity both can affect the number of ephyrae released from each polyp
- Food quality and quantity also can affect the quality of ephyra individuals

### 4. Fatty acid composition

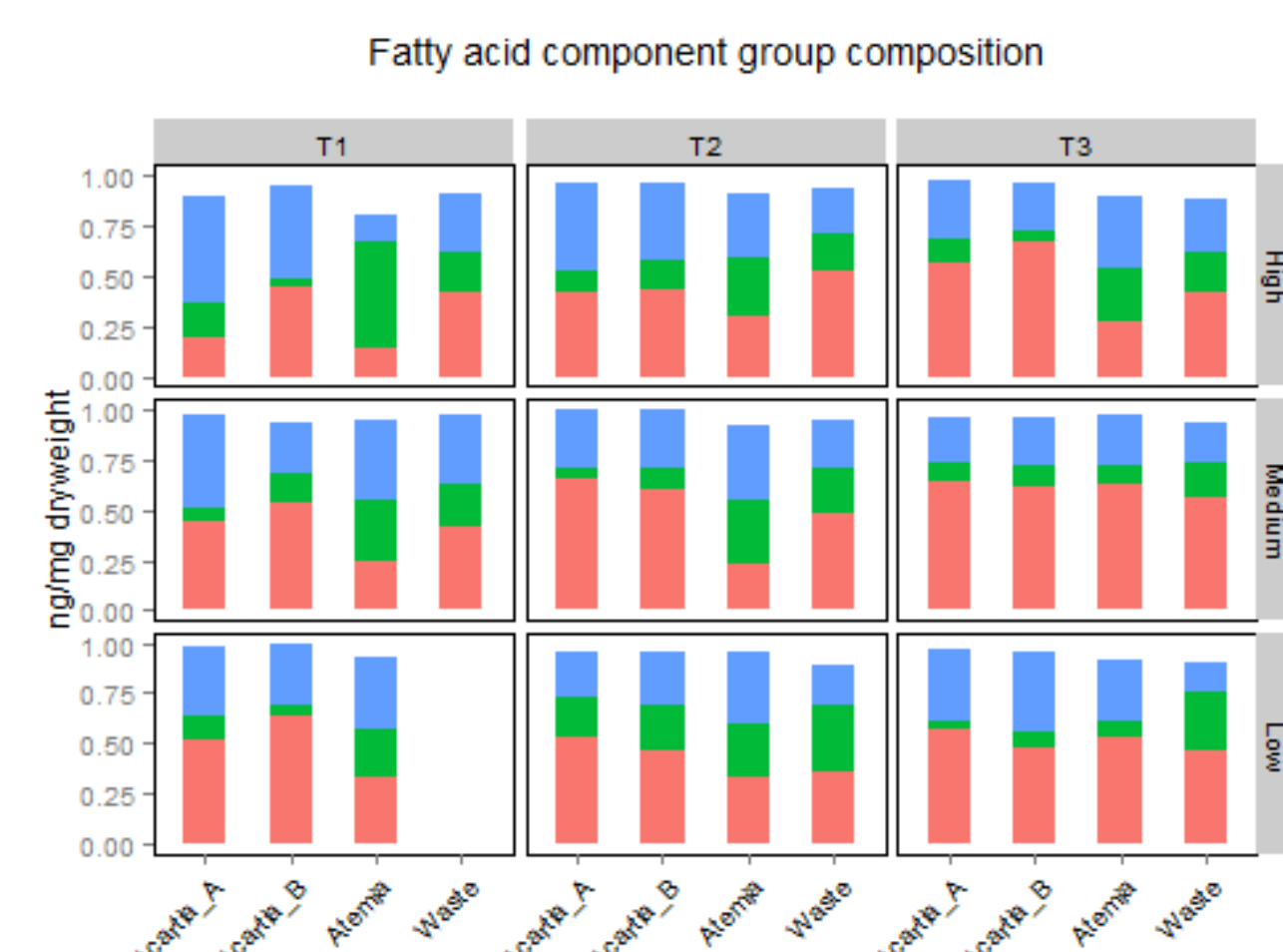


Fig.9 Group fatty acids composition of polyps in different treatments

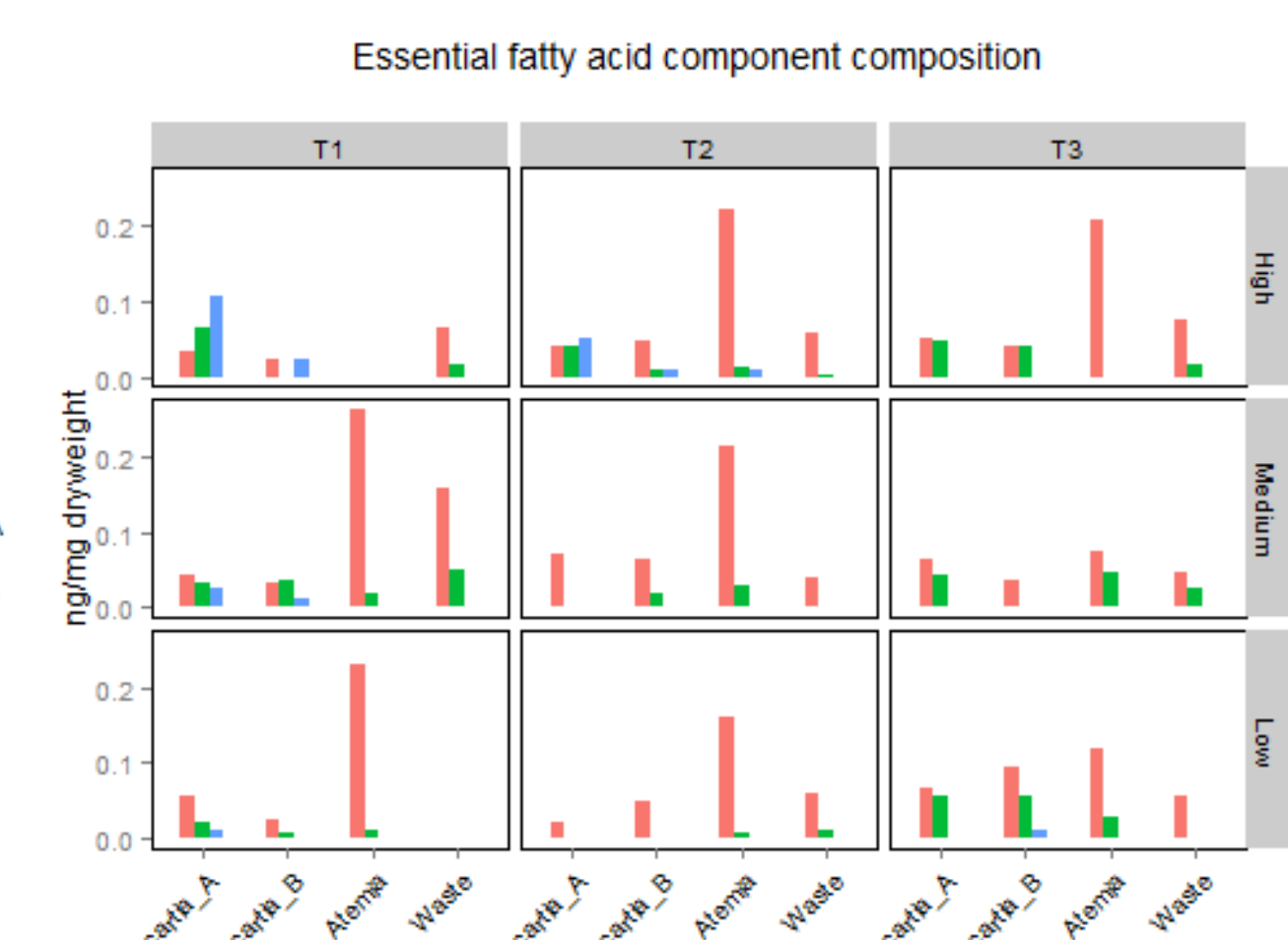


Fig.10 Essential fatty acids composition of polyps in different treatments

- Group fatty acids (SFA, MUFA, PUFA) didn't show significant difference in all treatments, even in polyps fed with waste food group
- Acartia\_A food group showed more DHA component which could be transformed from Acartia dietary
- Polyps fed with Artemia showed more ALA component.

## Conclusions

The somatic growth of *Aurelia aurita* affected by Food quantity and Temperature. in high food concentration and low temperature level, they trend to have larger size, however, in this experiment, polyps growth didn't affect by food quality significantly except for in Waste food level where their growth was limited. The budding reproduction of polyps affected by both food quality, quantity and temperature factors. Strobilation reproduction only observed in low temperature level. The number and quality of ephyrae released from each polyp also affected by food quality and quantity levels. Group fatty acid(SFA, MUFA,PUFA) showed significant different in different treatments. We conclude that polyps shift between different asexual reproduction types reflecting seasonal changes in either temperature, prey seasonality of prey quality.



**GEOMAR**  
Helmholtz Centre for Ocean Research Kiel



**Xupeng Chi** xchi@geomar.de  
PhD candidate  
Gelatinous zooplankton ecology  
Fatty acid Stable isotope

