Turnover rates of carbon and nitrogen stable isotopes in the amphipod *Gammarus aequicauda:* insights for trophic studies of Mediterranean macrophytodetritus accumulation.

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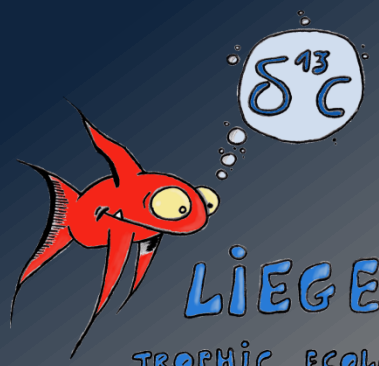


1. « Framework » : Why doing this?

Posidonia oceanica

seagrass

Macro-algae

P.oceanica dead leaves

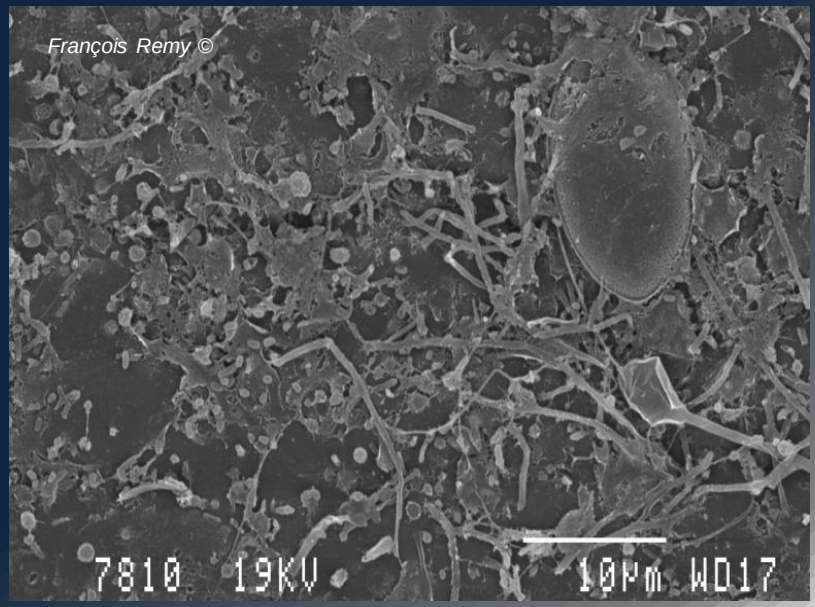
Micro-organisms

P.oceanica living leaves

« Dead leaves litter »

50-90 %

exported



Vagile Macrofauna ➔ trophic importance

- More than 120 species
- Up to 6000 id.m^{-2}
- Dominated by amphipods
- Prey for fishes

1. « Framework » : Why doing this?

Aim of the experiment :

Determine the turnover speed of C & N stable isotopes and determine impact of food quality on the **T**rophic **E**nrichment **F**actors, **TEF**$_s$. (Links with physiology)

1. « Framework » : Why doing this?

Gammarus aequicauda

François Remy ©

2. « Experimental design » : What, when, where?

G. aequicauda is an appropriate choice. Why?

François Remy ©

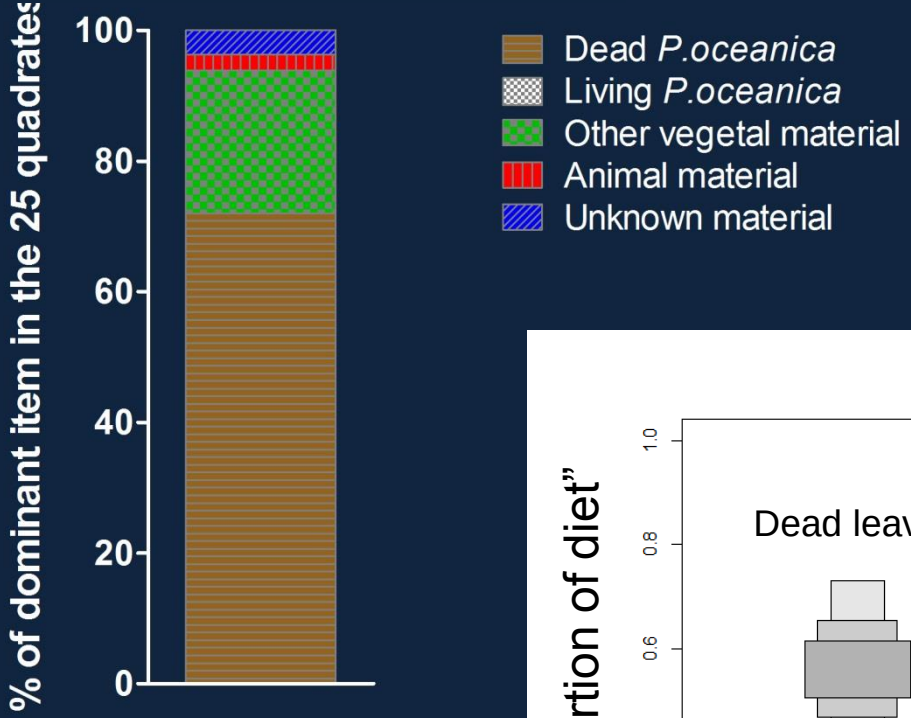
- 2nd most dominant
- « Big » (up to 15 mm)
- Resistant
- Males VS females

- Important dead leaves consumer (Lepoint *et al* 2006, Michel *et al*. 2014 and personal unpublished data).

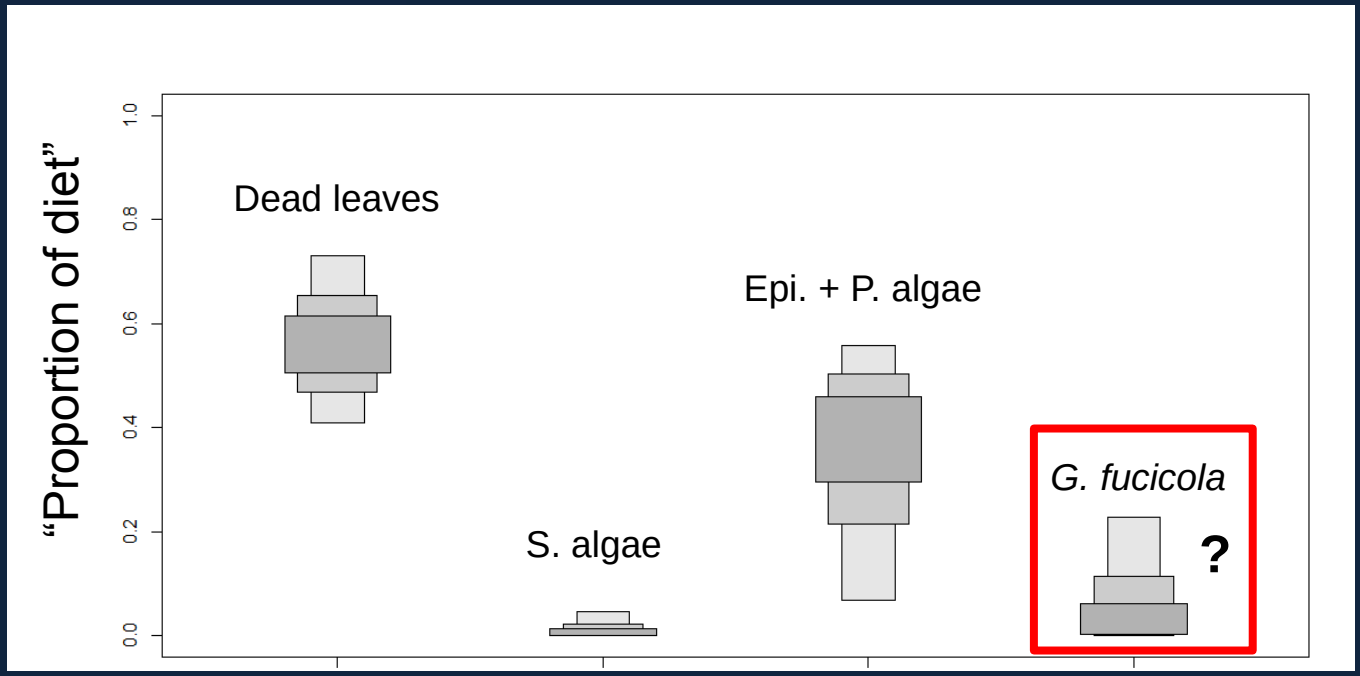
2. « Experimental design » : What, when, where?

In natural conditions :

Gut contents



SIAR model



2. « Experimental design » : What, when, where?

3 different treatments :

- Freshwater amphipod powder
- Green algae powder
- Dead *P. oceanica* powder

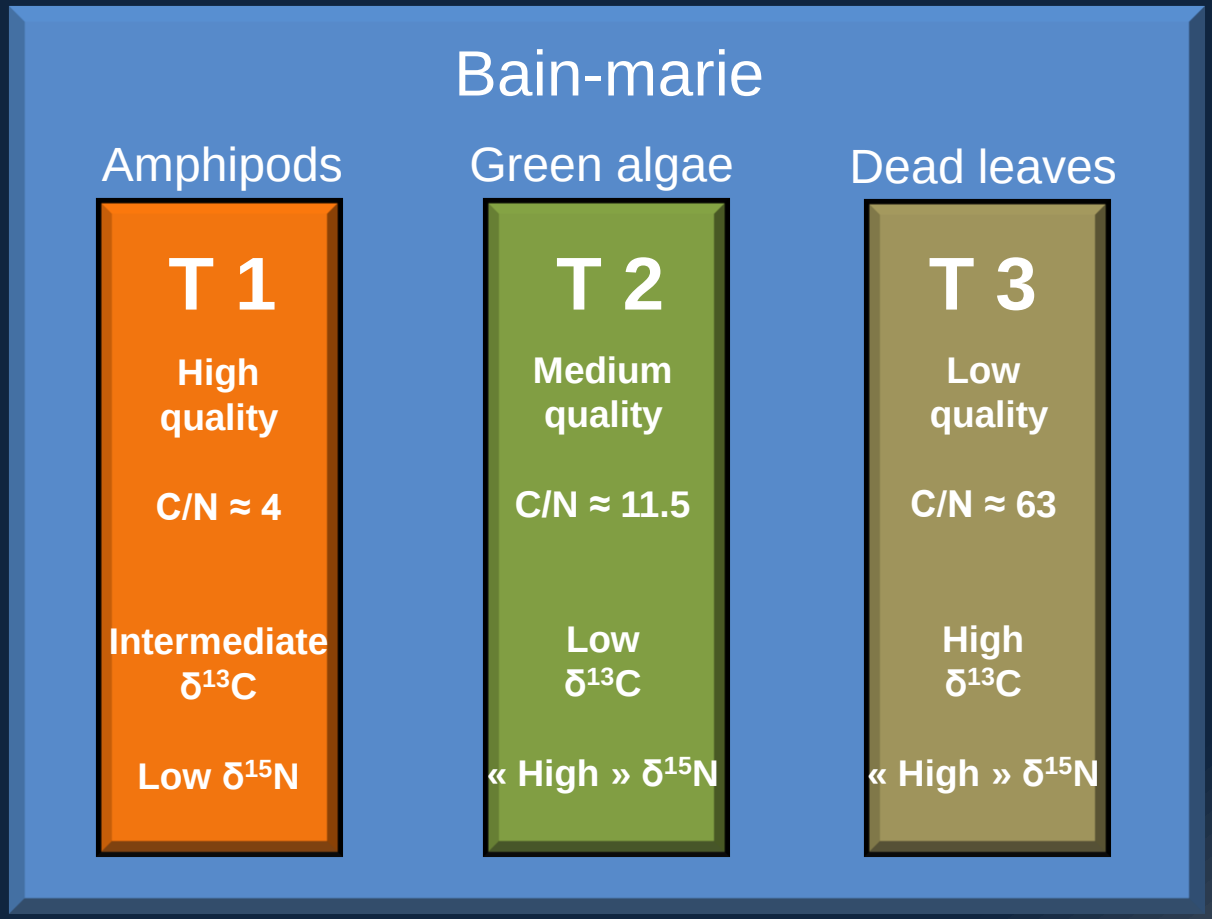
(1-2 mm powder)



Different carbon isotopic compositions
Different quality (C/N)
All potentially ingestible by *G. aequicauda*

2. « Experimental design » : What, when, where?

288 individuals
96 id / treatment



Controled conditions :

- Water pH (8,2)
- Water t° (15°c)
- Water salinity (~30)
- Food quantity

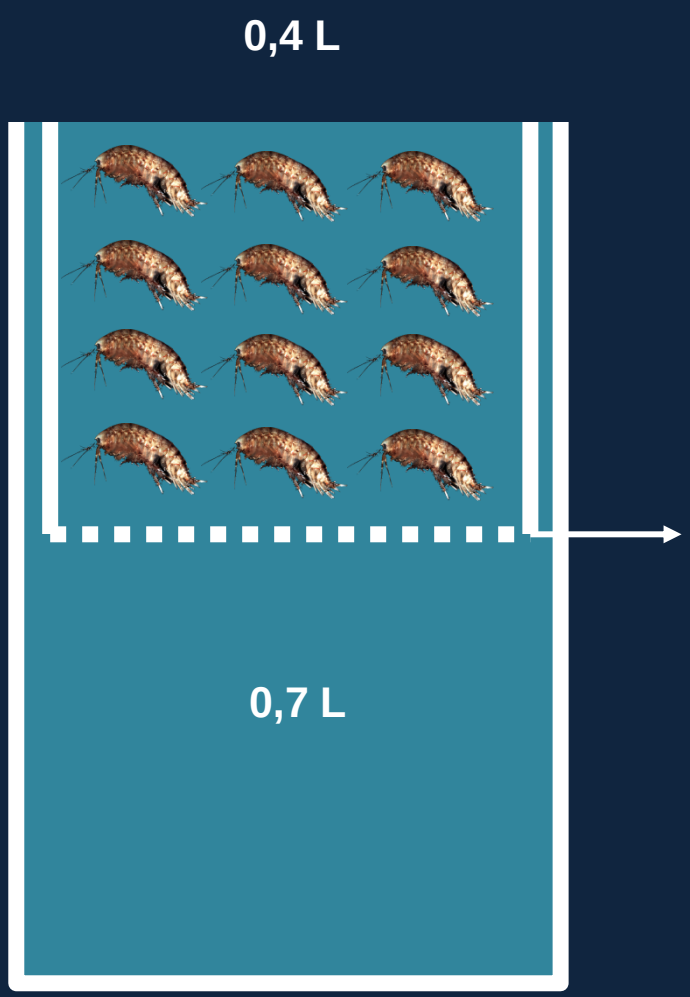
<u>In each treatment:</u>

- 8 mesocosms
- 12 id/ meso.
  (< max natural abunance)


Amphipods
Green algae
Dead leaves
1
2
3
4
5
6
7
8
1
2
3
4
5
6
7
8
1
2
3
4
5
6
7
8

2. « Experimental design » : What, when, where?

- Constant t°, pH, salinity…
- Limit cannibalism
- Limit faeces consumption
- Limit hypoxia
- Easy to clean



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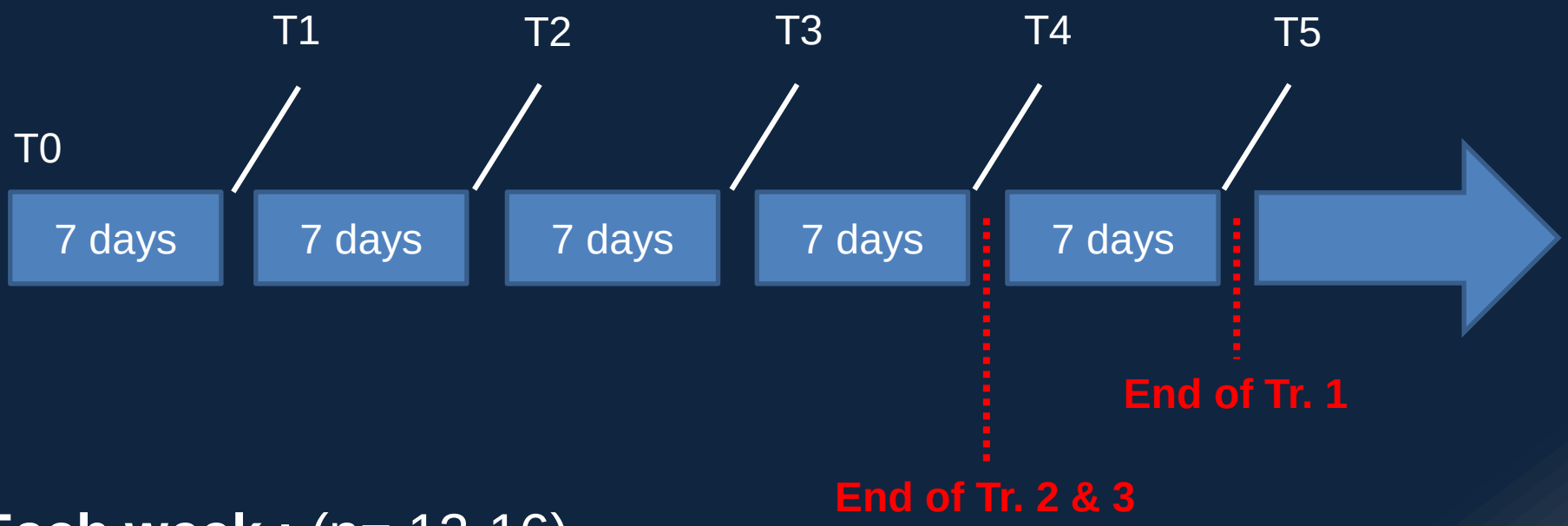
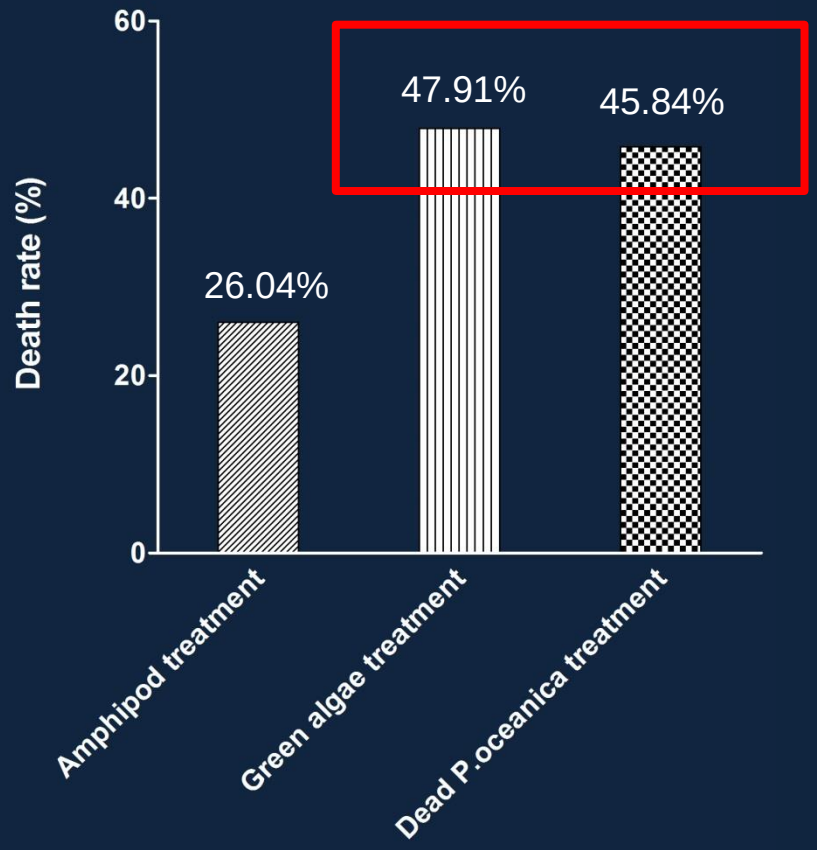


Each week : (n= 12-16)

- Individual C&N and $\delta^{13}C$ & $\delta^{15}N$ (Isoprime 100 - VarioMicroCube)
- Individual size and wet/dry weight

(• Individual respiration rate (Unisense O2 MicroRespiration sensor))

3. « Results & Discussion» : What did (not) work?



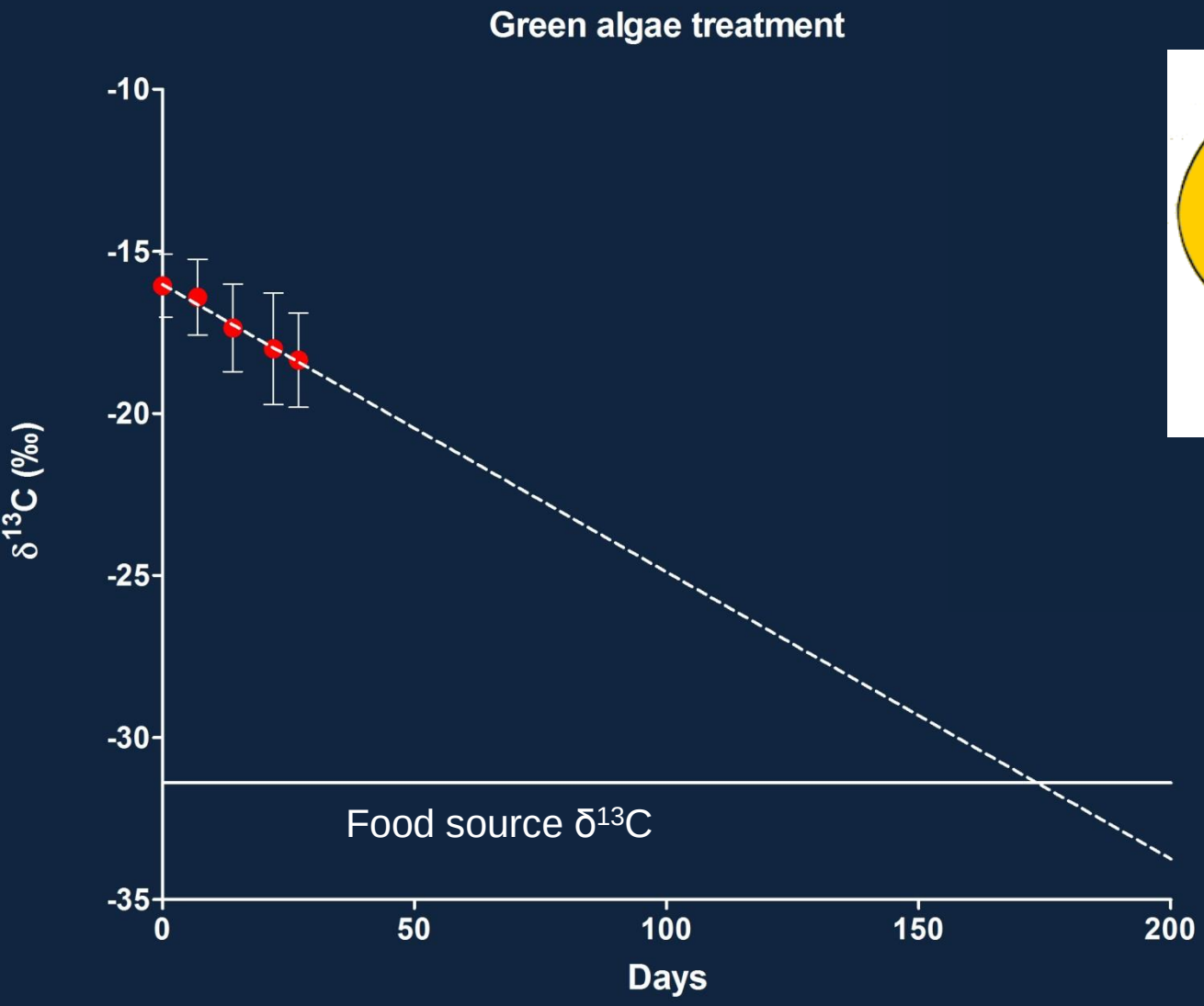
2 worst food qualities : OK

“Problem” for *P. oceanica* !

Massively ingested in natural conditions

→ Why so many deaths?

3. « Results & Discussion» : What did not work?



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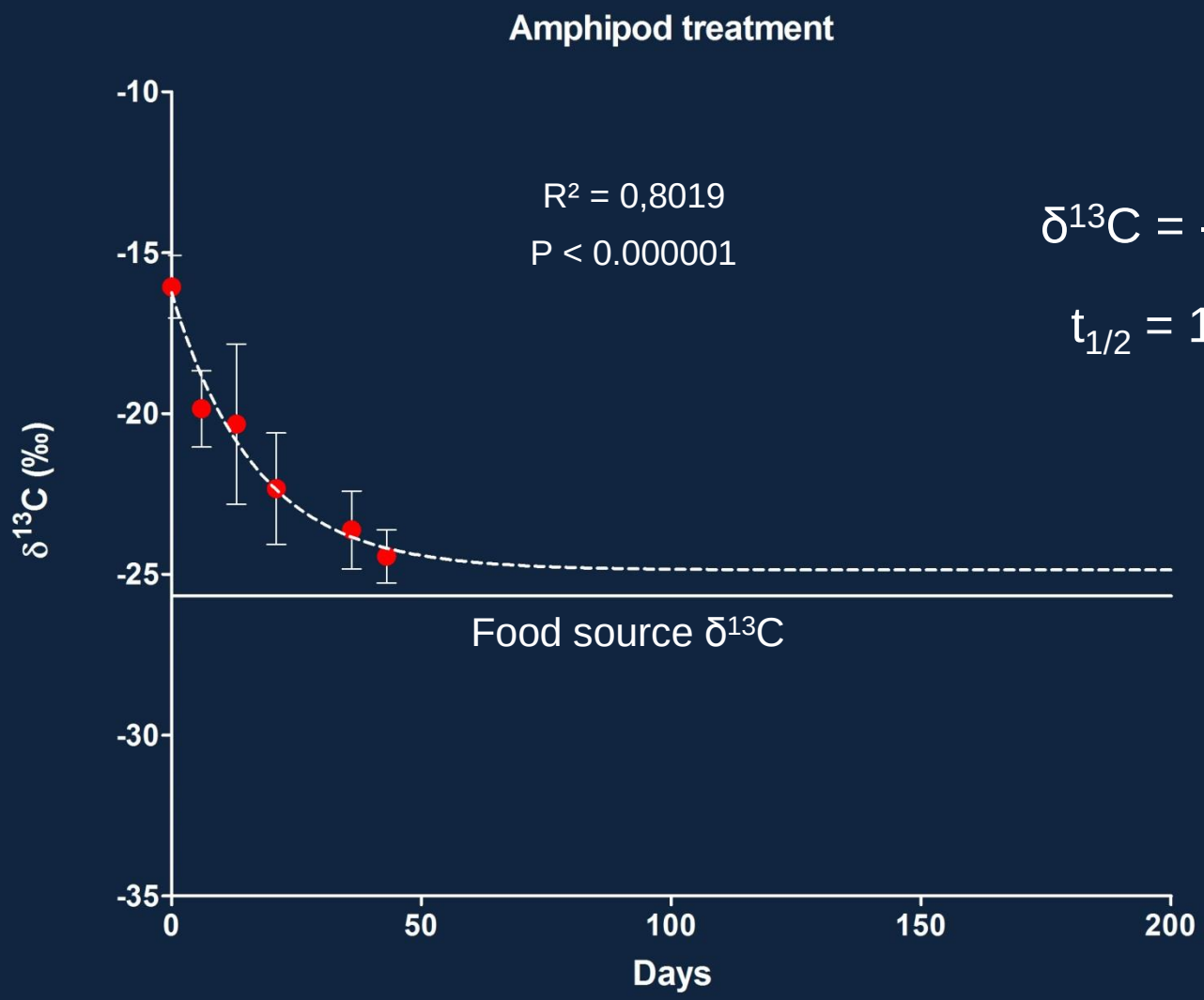
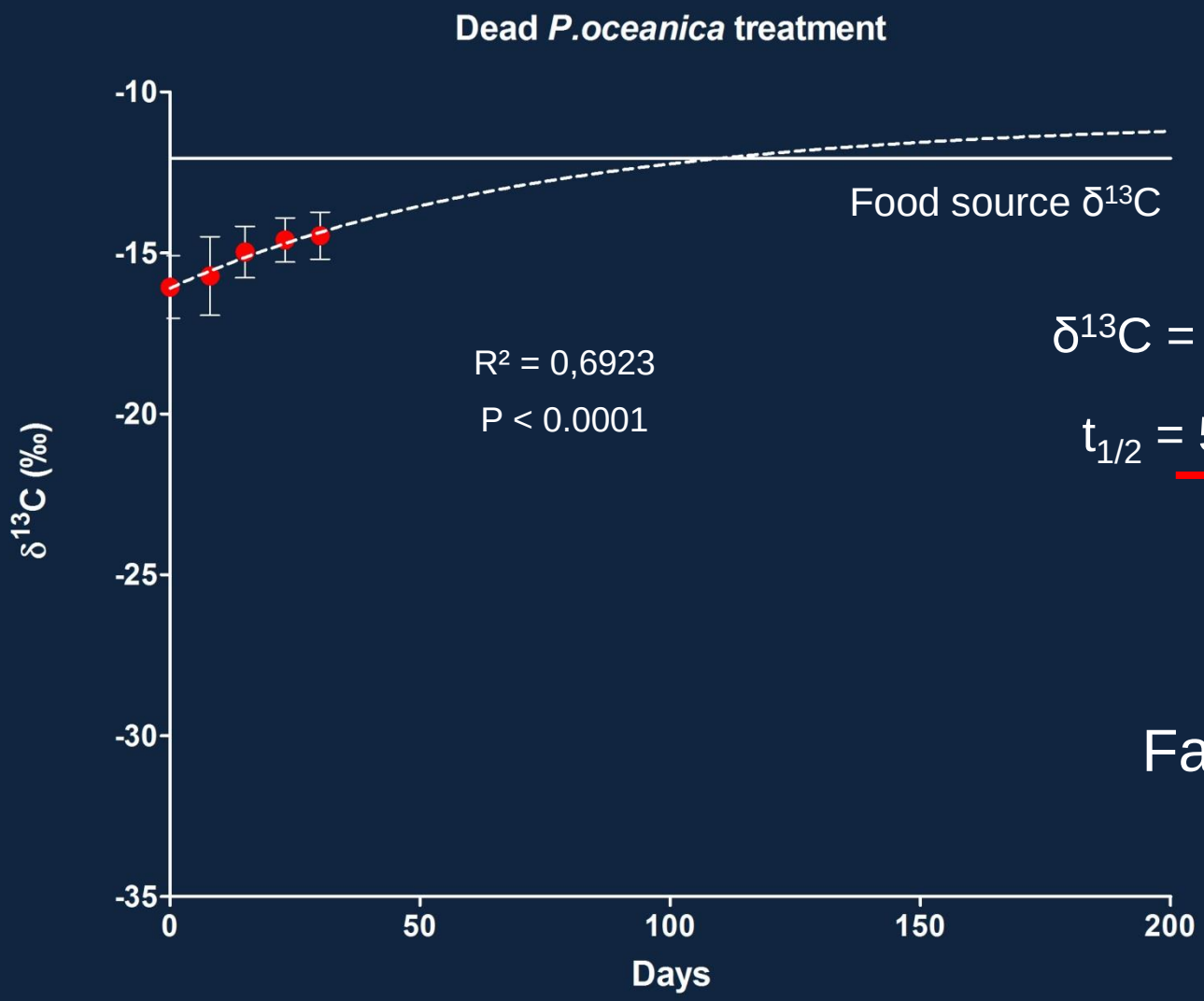


$\delta^{13}C = -24.86 + 8.62e^{-0,0591t}$

$t_{1/2}$ = 11.72 days

3. « Results & Discussion» : What did (not) work?



$\delta^{13}C = -10.87 - 5.23e^{-0,0134t}$

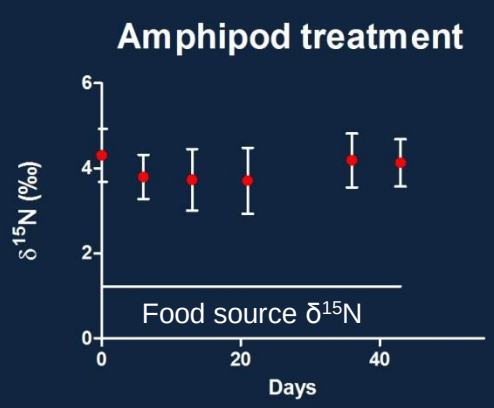
$t_{1/2}$ = 51.62 days

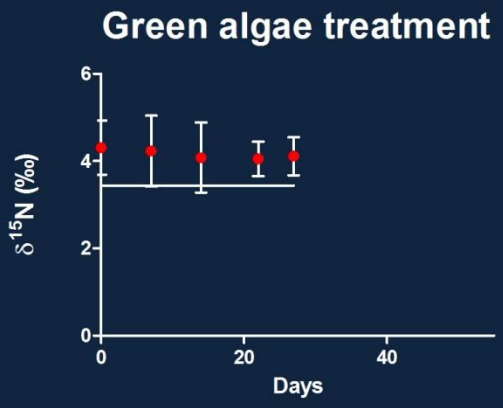
Far too long !

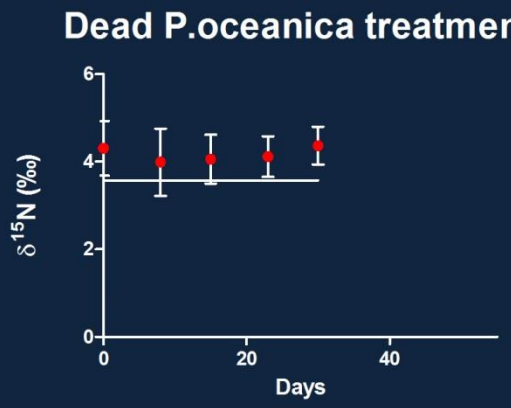
Impact of coprophagy ?

Mixing?

3. « Results & Discussion» : What did not work?







No significant change of isotopic composition

➔ No turnover rates calculation

Apparently…

3. « Results & Discussion» : What did (not) work?

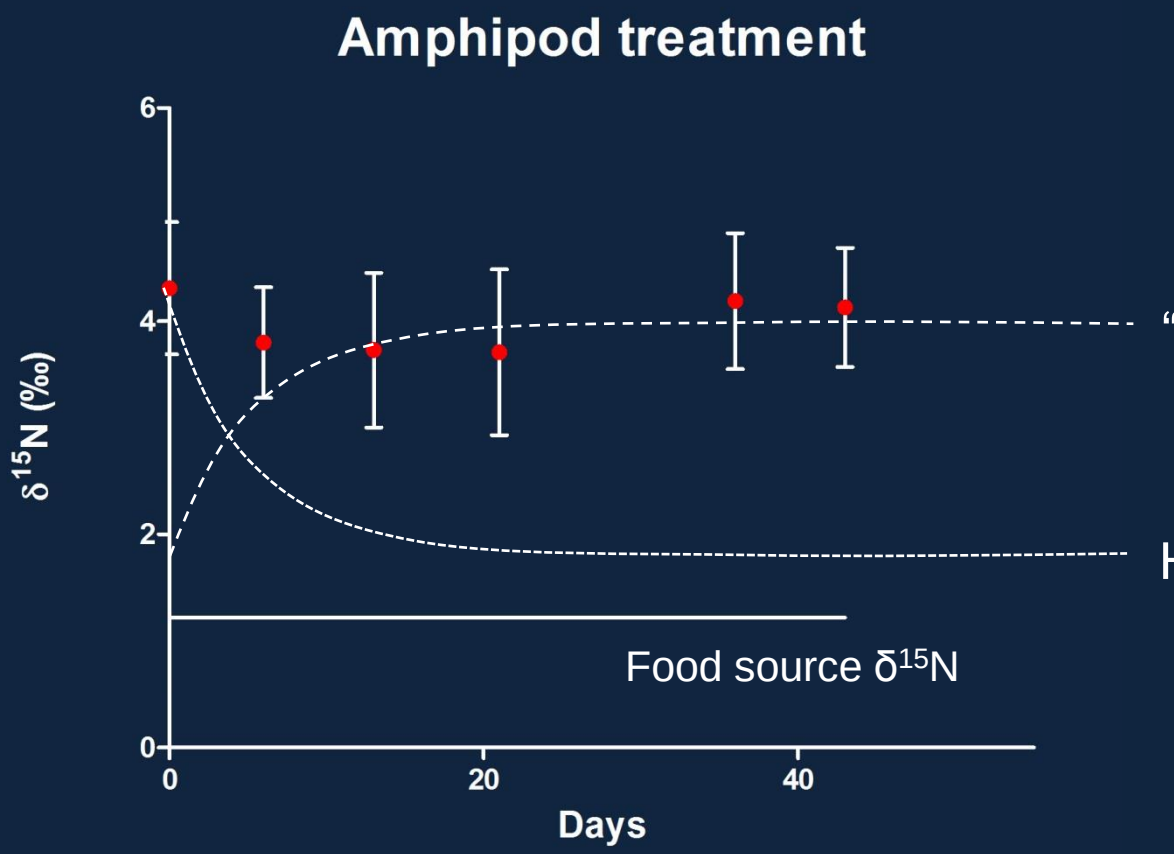
Trophic Enrichment Factors : TEFs or **Δ**

	1 **Amphipod treatment**	2 **Algae treatment**	3 **Litter treatment**
$\Delta^{13}C$ (‰)	0.81 ± 0.39	/	1.19 ± 0.13
$\Delta^{15}N$ (‰)	2.91 ± 0.56	0.53 ± 0.44	0.96 ± 0.42

Treatment 1 ➔ typical of predator

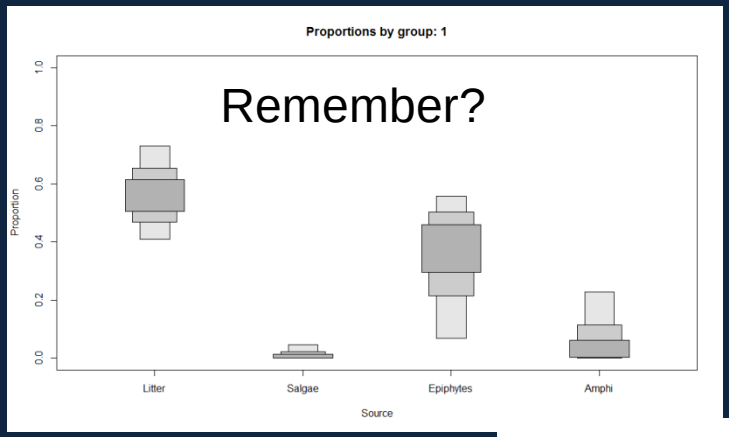
Treatments 2 & 3 ➔ typical of primary detritic-feeder

3. « Results & Discussion» : What did (not) work?

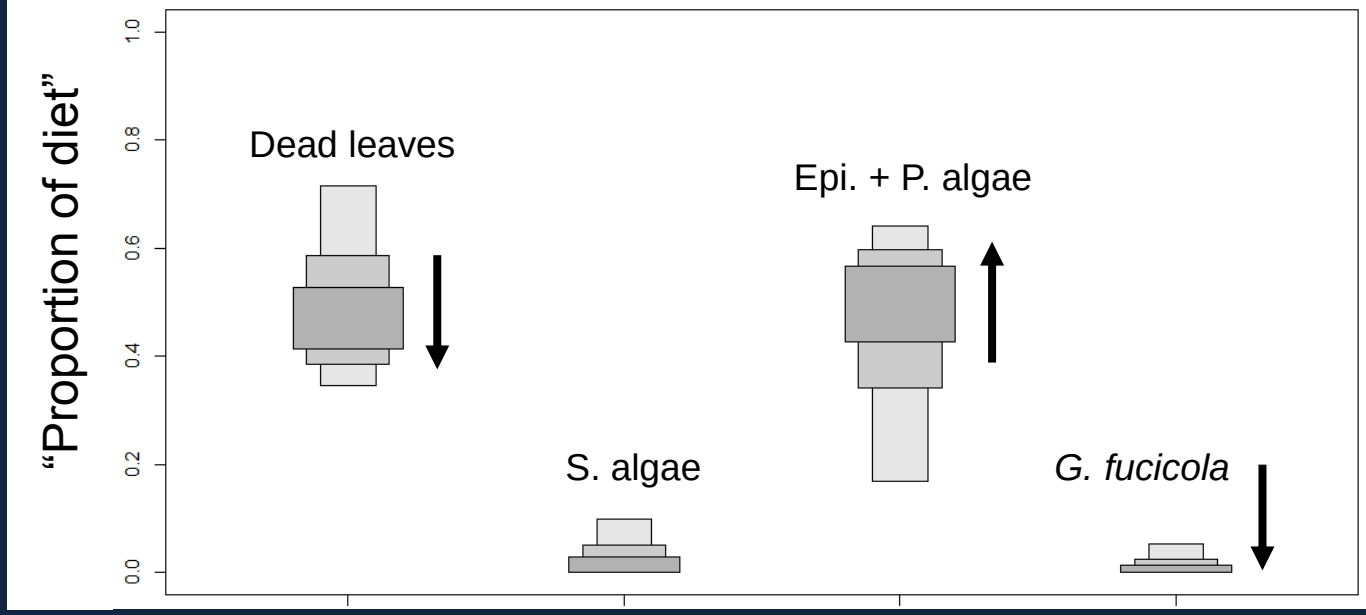


Two different events <u>at the same time</u>

3. « Results & Discussion» : What did (not) work?

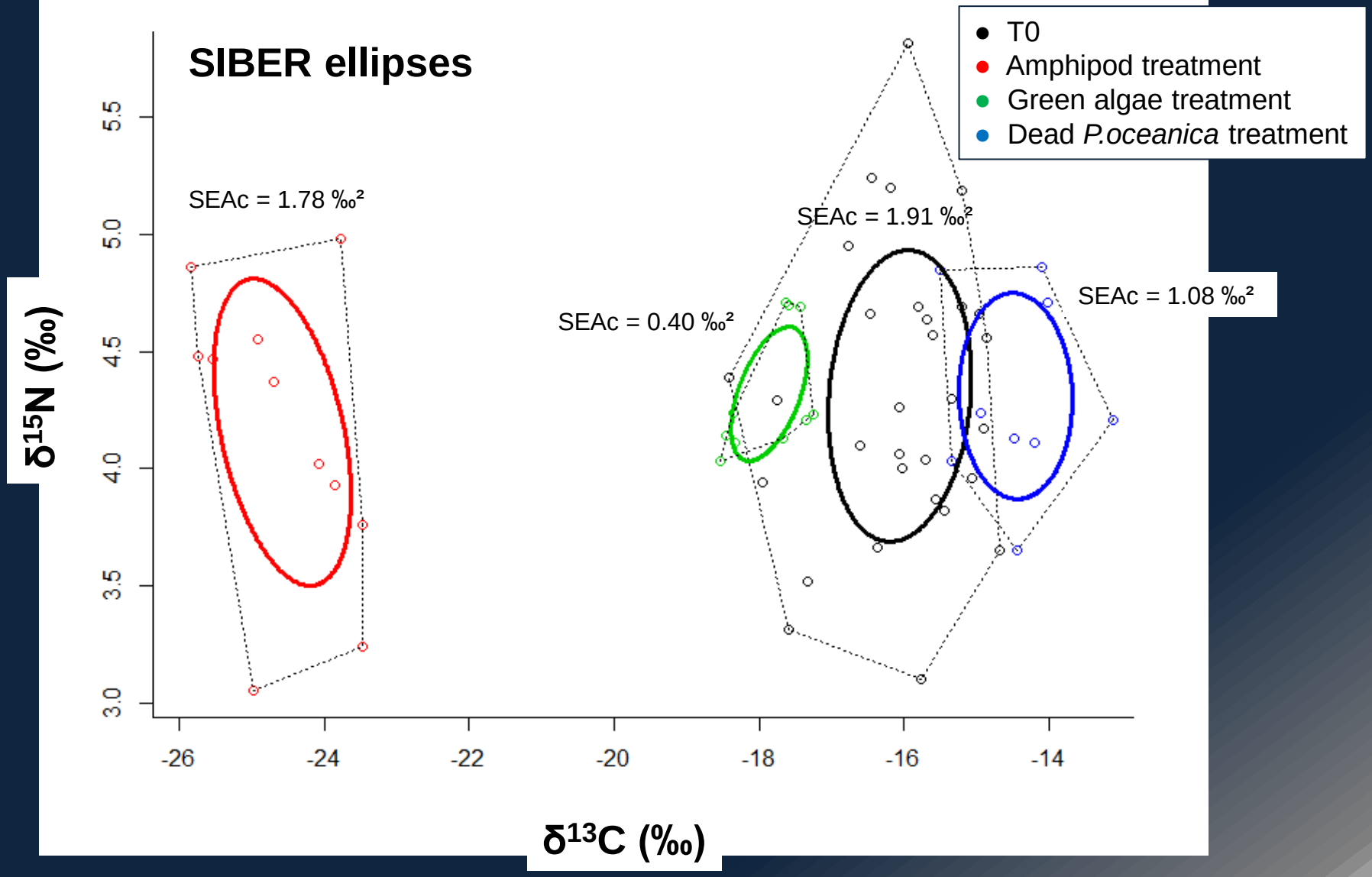


SIAR with our new **TEF$_s$**



3. « Results & Discussion» : What did (not) work?

Gammarus aequicauda



Take home message

- Experimental source must be carefully chosen
- Avoiding **bias** may induce unexpected new ones
- High quality food sources ➔ faster turnover
- TEF are very **specific** to each food source
- Isotope « **signature** » VS isotope **composition**
- Custom TEF ➔ **crucial** for mixing models

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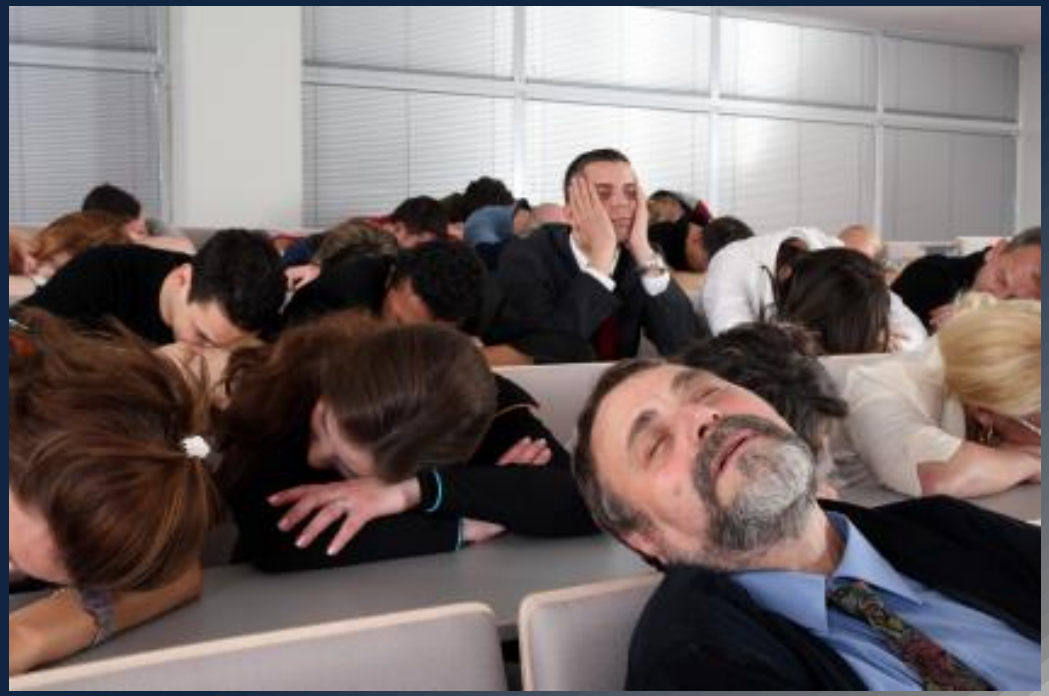
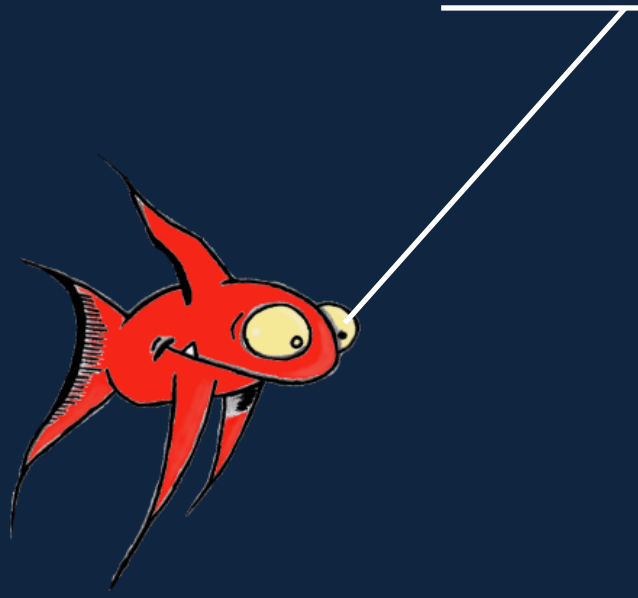
Thank you for your attention !



Any question?



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