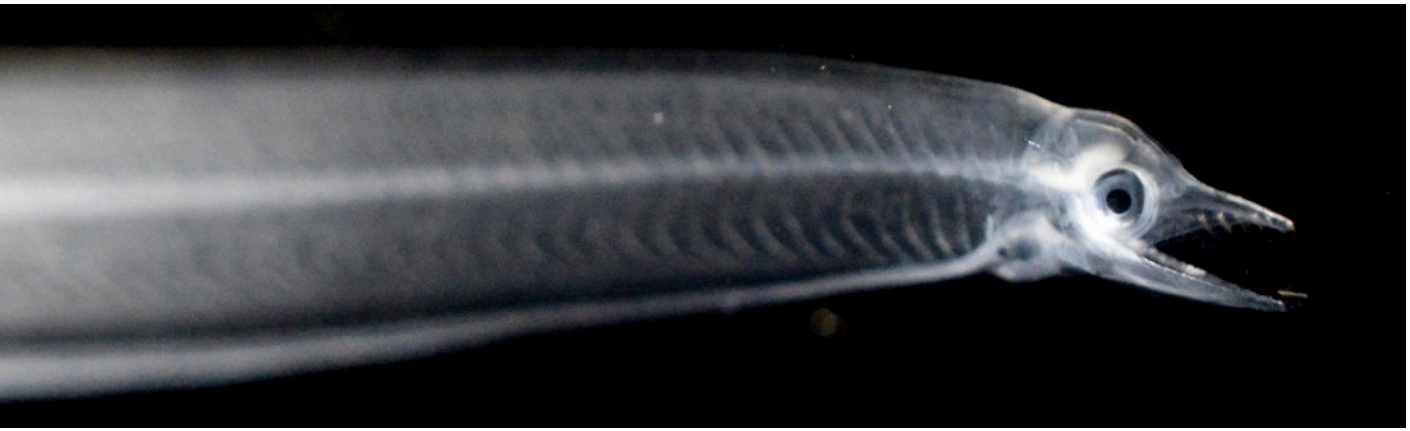
The leptocephalus larvae/marine snow food-web paradigm: pros, cons and uncertainties

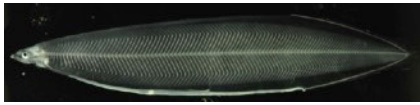
Eric Feunteun, Michael J. Miller, Christine Dupuy

Alexandre Carpentier, Anthony Acou, Mari Kuroki, Aurélie Dessier, Shun Watanabe, Jun Aoyama,

Tsuguo Otake , Katsumi Tsukamoto



Coast, 2017



How to feed glass eel larvae?

50 years research history
4 generations of J eels in culture

Repeated hormone injections

Low egg quality

Fertilized eggs

Photo: : Yamada

Photo: Hideki Tanaka et al.
@ Fisheries Research Agency

Food for larvae

Need improvement of rearing techniques

GOAL
1 Euro
Healthy fish

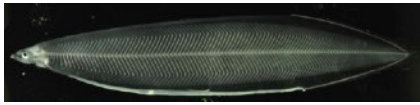
Metamorphosing larvae

2010
100 Euro
Deformity

Glass eel

Leptocephali larvae: so widespread and so poorly known

- Anguilliform start their life as leptocephalus larvae.
- They share a comon morphology, with a leaf-like shape, transparent body and a small head.
- They are common in all intertropical oceans.
- Found usually at depths ranging from the surface to about 300 m and from coastal zones to offshore.
- Live from 2 months to > 2 years or more according to species.
- Sizes at metamorphosis from ~50 mm to >30 cm.



Diets still poorly understood

- Diet & feeding ecology of leptocephali are still debated and poorly documented. Most studies focus on anguillid eels

1. Digestive tracts appear empty
2. Larvacean houses and faecal pellets are occasionally observed
3. An environmental DNA study suggests occurrence of broad diversity of materials ranging from fungi to gelatinous zooplankton in guts of small *Anguilla* larvae (Riemann et al. 2010)
4. Isotope and amino-acid studies show low trophic positions in anguillid eels and a few other anguilliform leptocephali taxa (Miller et al. 2008)
5. **The current hypothesis is that leptocephali consume POM including Marine Snow**

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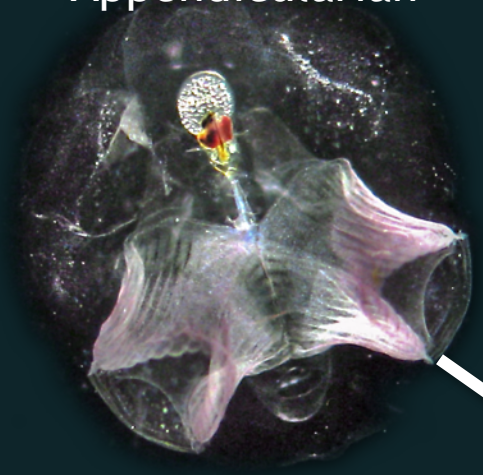
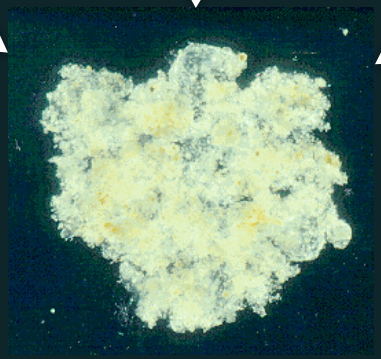
POM is a mixture of living and decaying organisms

Appendicularian



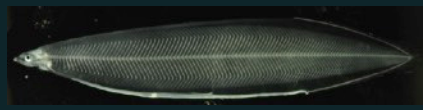
microzooplancton

Micrp phytoplancton



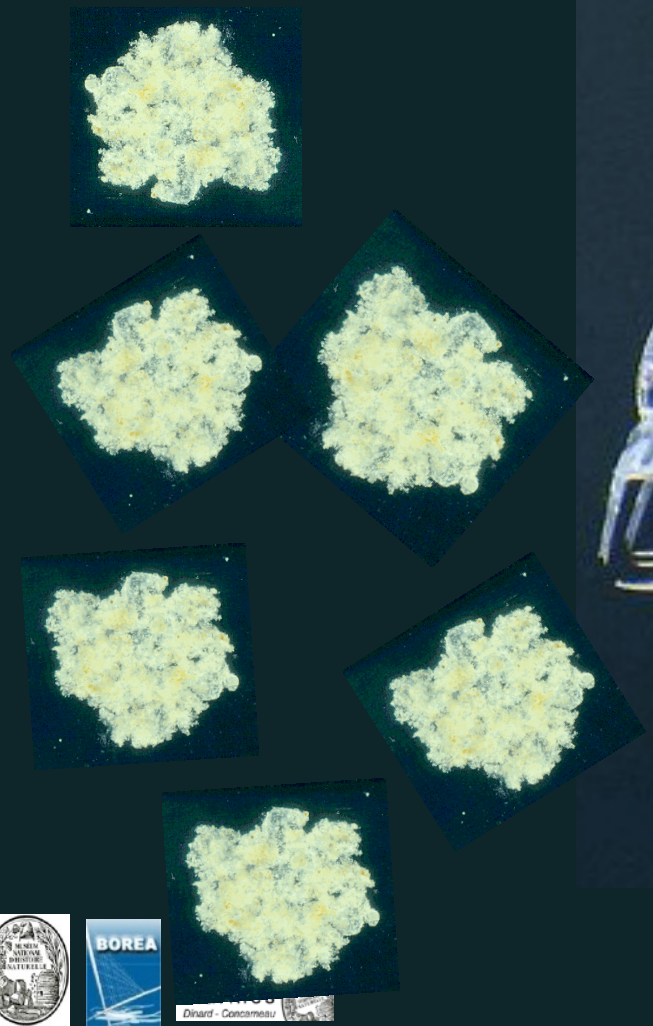
Marine snow is formed by organic and inorganic suspended material, colonised by bacteria, fungi and microalgae agregated by TEPS

Coast, 2017



A body and head shape adapted to drift and grasp particulate material

https://cflas.org/wp-content/uploads/moray-larvae.jpg



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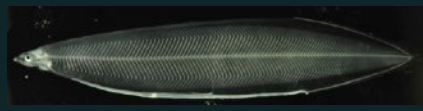
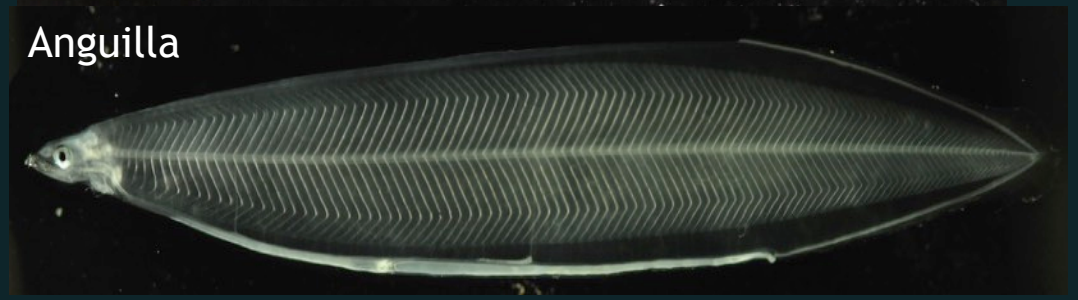


A diversity of body and head morphologies suggest a diversity of feeding behaviours and diets



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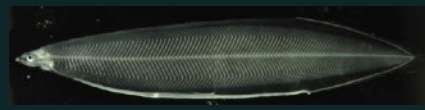
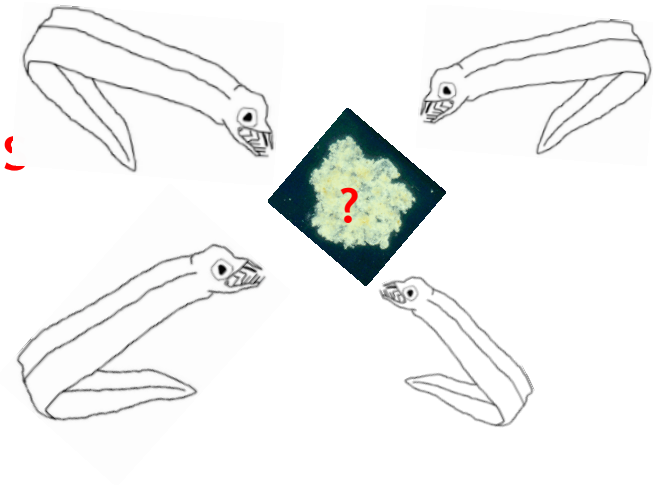
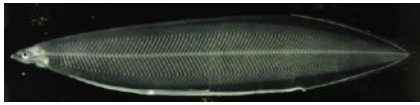


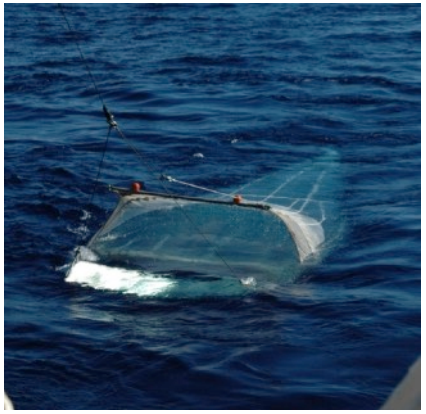
Objectives

- During research cruises in the South West Indian and Pacific oceans aiming to:
  - Discover spawning places of anguillid eels
  - Study the larval ecology of freshwater eels
- Study the trophic ecology of leptocephali species inferred from environmental tracers
  - δ13C and δ15N
  - Fatty acids
- Analyse intra and interspecific variations
- Compare relative trophic position with:
  - POM
  - Zooplankton / competitors
  - Other fish species

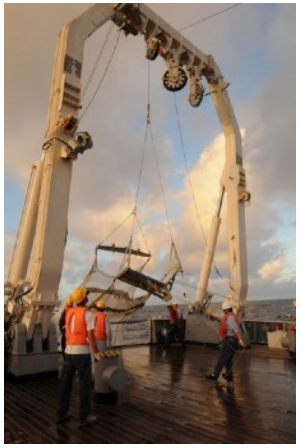


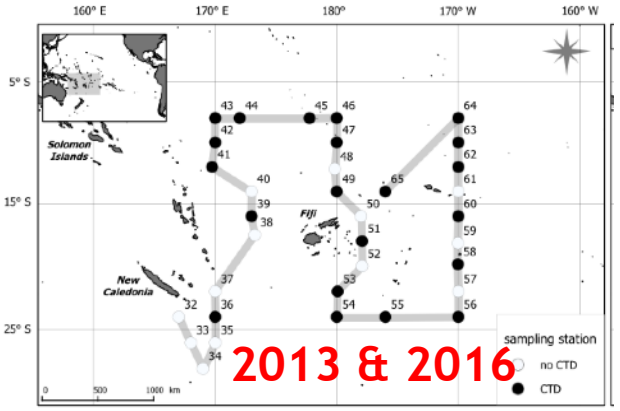


Material and Methods



2006 & 2010





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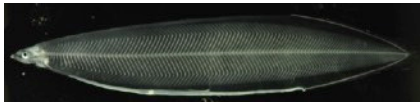
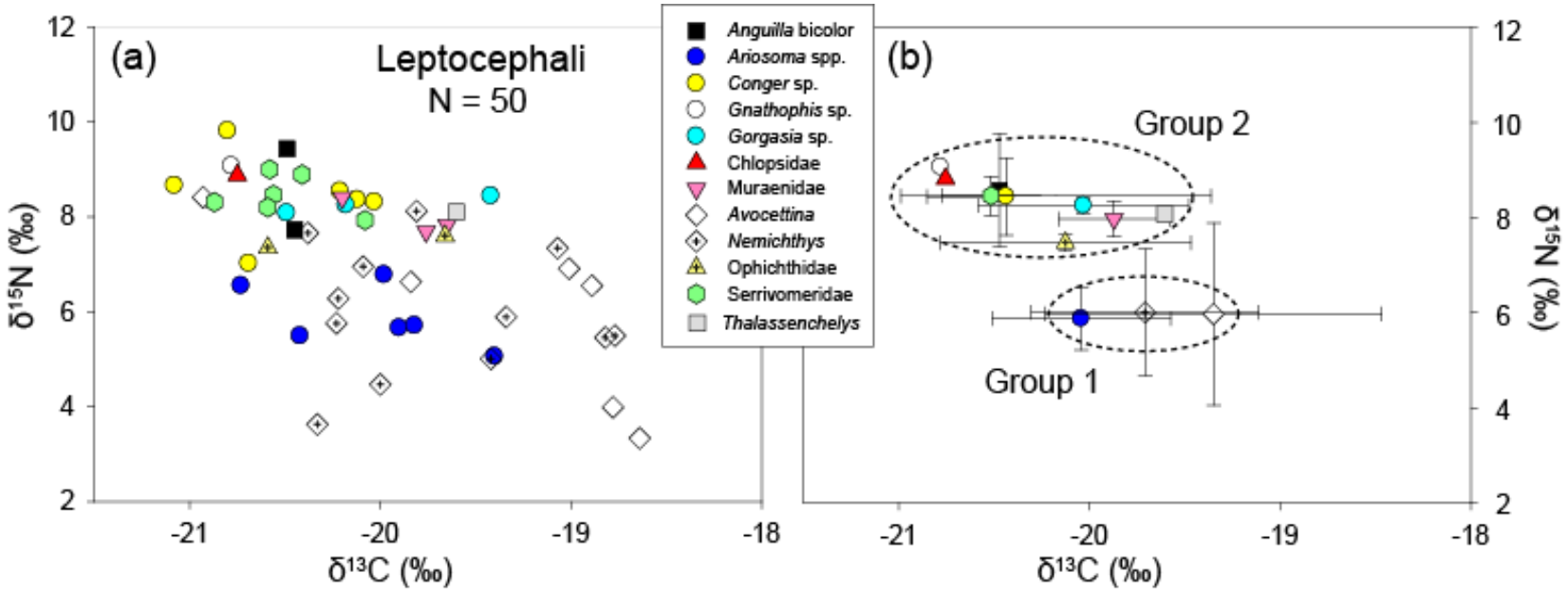


2010 - Southwest Indian Ocean

Feunteun et al. 2015, progress in oceanography

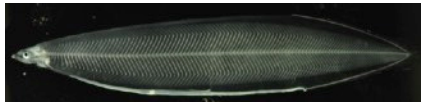
Leptocephali Isotope Ratios



Two distinct feeding groups

c.a. 1 trophic level appart

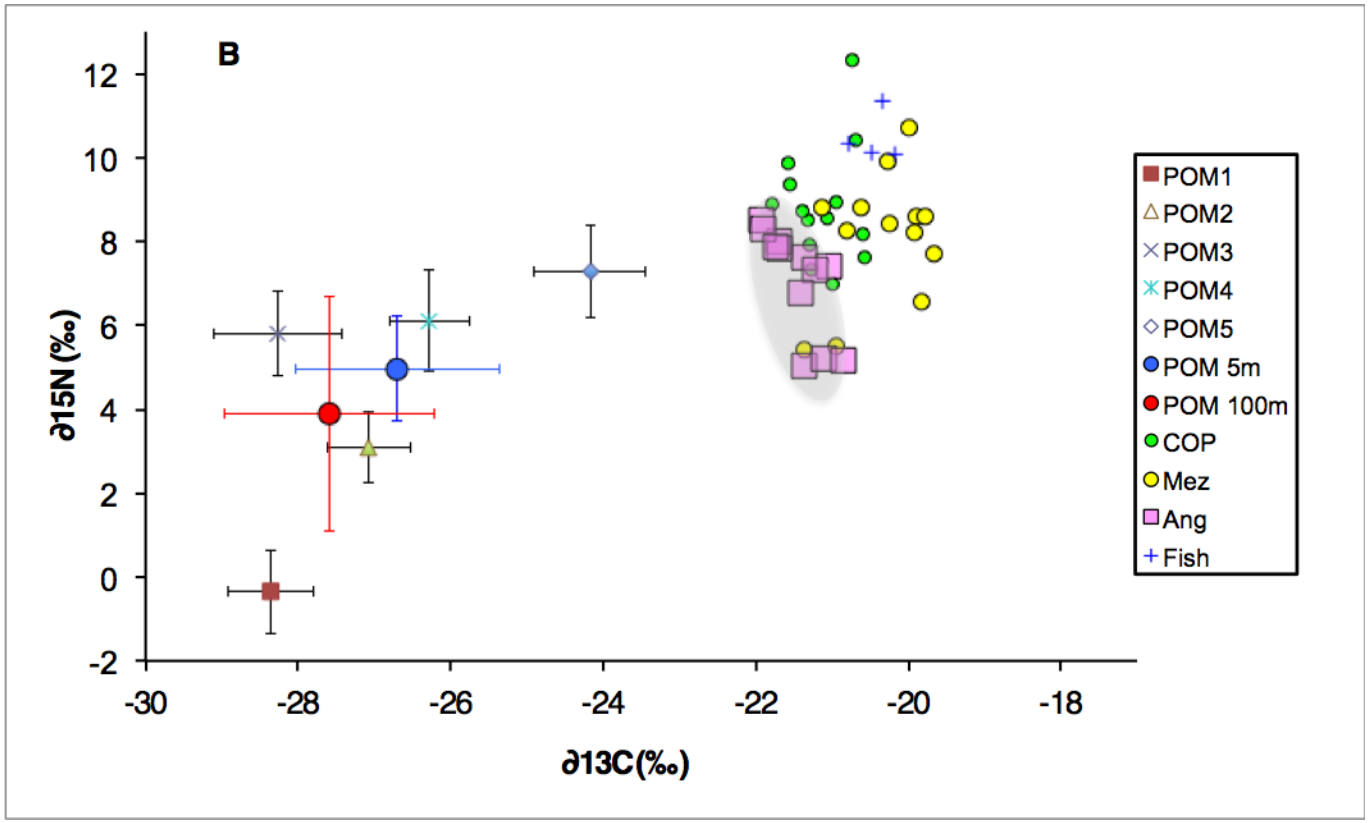
Dont feed on the same carbon sources



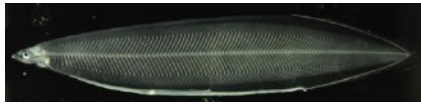
2010 – Indian Ocean

Feunteun et al. 2015 prog. Ocean., Liénart et al. 2016 MEPS

Overall picture of the food web

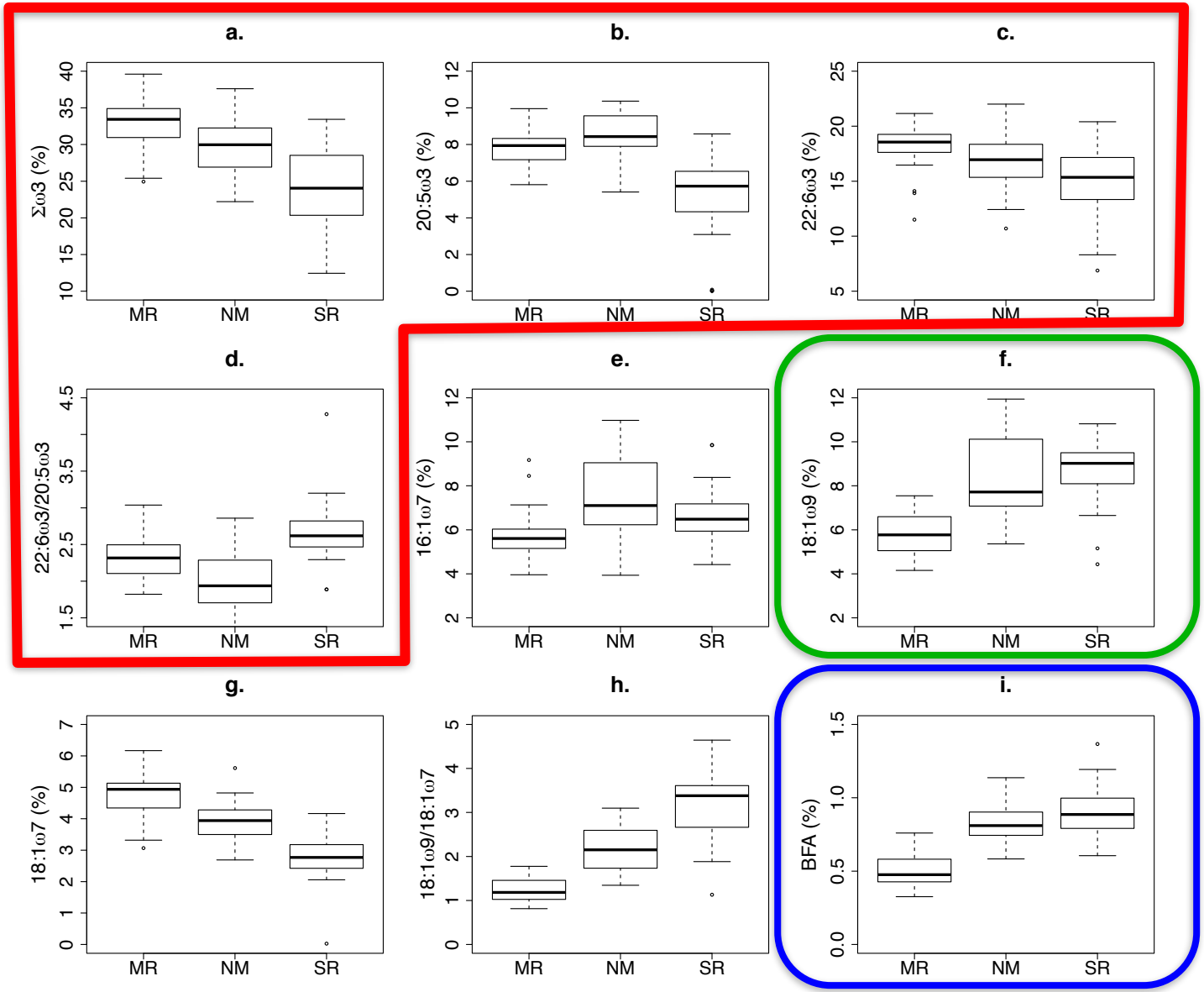


- Trophic mismatch: no apparent source for leptos
- Do leptos sort & assimilate fractions of the POM?



2013 - 2016 - Southwest Pacific Ocean. Liénart et al. 2016 MEPS

Fatty acids of POM & 3 taxa of leptocephali larvae



I - Living organisms

A high proportion of ω3 FA that marine consumers cannot synthesize.

II - Zoopk

18:1ω9 FA indicate that (micro)zoopk is part of the diet.

III - Bacteria

Branched FA at low percentages suggest a low contribution of Bacteria

Conclusion - perspectives

- Leptocephali Select and Swallow Marine Snow and Assimilate Associated Living Material
- We fail to sample marine snow !
- Need to Focus on TEPS.
- **Who can make artificial Marine Snow???**