INVESTIGATE THE SENSITIVITY OF THE PEARL OYSTER *PINCTADA MARGARITIFERA* TO ENVIRONMENTAL CONDITIONS
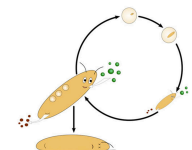
IN THE CONTEXT OF BLACK PEARL FARMING

Nathanael Sangare*, Alain Lo-Yat, Gilles Le Moullac, Romain Legendre, Yoann Thomas, Laure Pecquerie, Benoit Beliaeff, and Serge Andréfouët
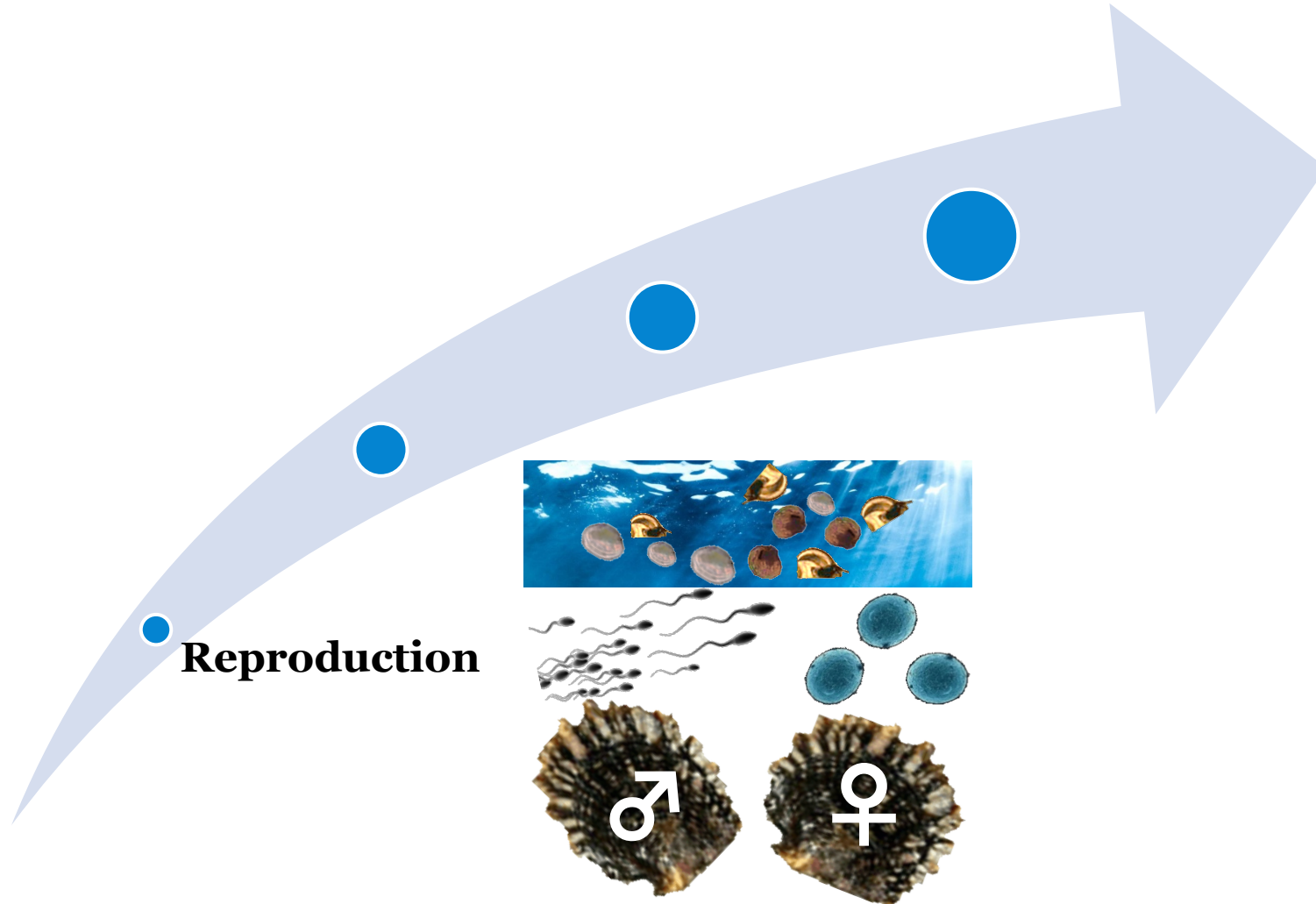
*nathanael.sangare@ifremer.fr

DEB2019

1-12 April 2019 / Brest (France)

Context

Key figures of pearl farming:

- 26 atolls and 4 islands

- 80 M$ per year

- 5000 jobs
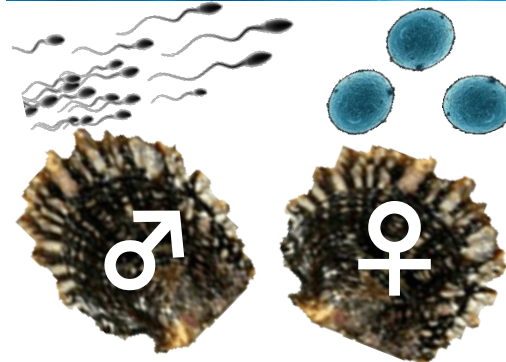

©IRD / B.Bourgeois; Station de greffage, Indigo 48812

Key steps of black pearl farming

Reproduction
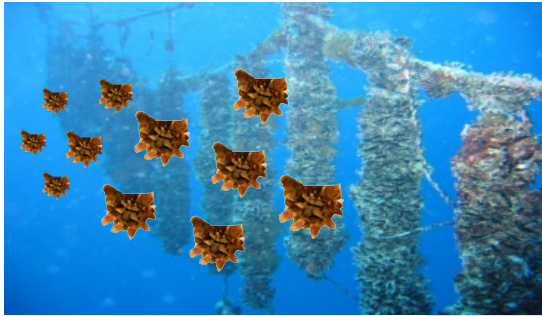
Key steps of black pearl farming

Spat collection
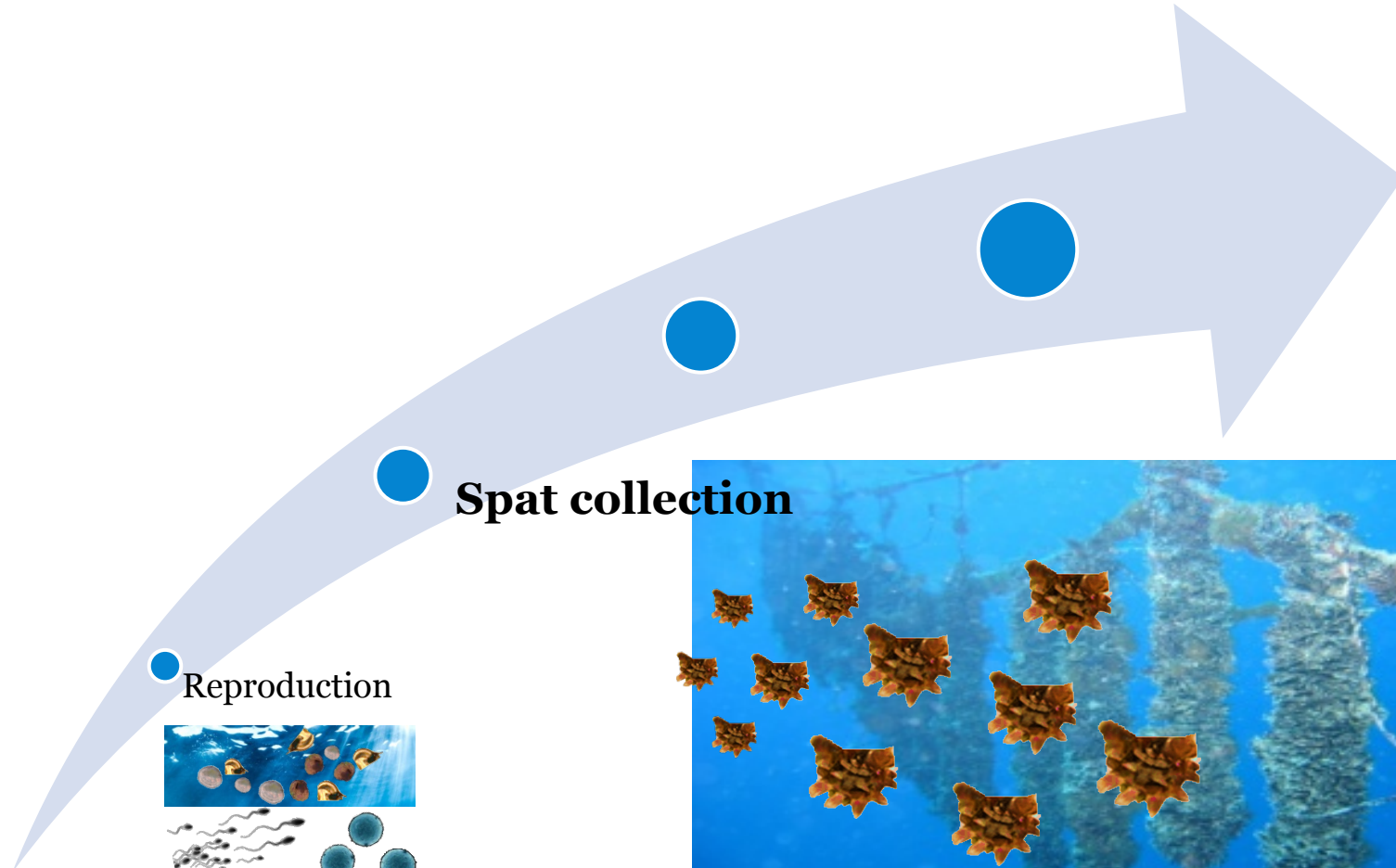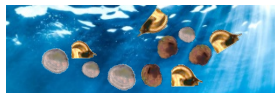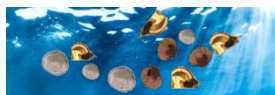
Reproduction

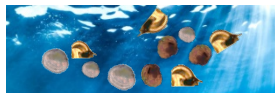# Key steps of black pearl farming
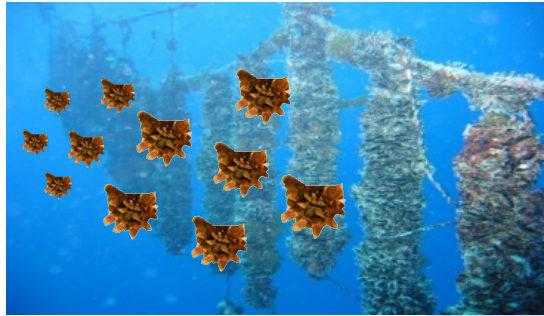

Graft

Spat collection

Reproduction

©Gauguin's Pearl 2019

Key steps of black pearl farming

Livestock farming

Graft

Spat collection

Reproduction

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Key steps of black pearl farming

Harvest

Livestock farming

Graft

Spat collection

Reproduction

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Key steps of black pearl farming
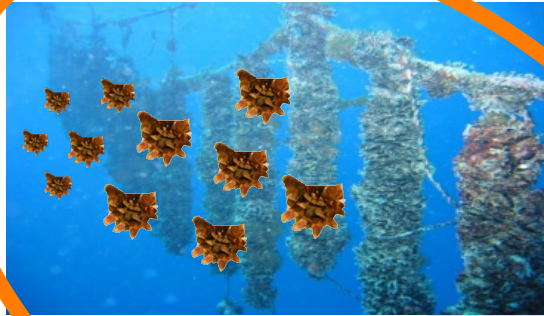
Harvest

Livestock farming

Graft

©Gauguin's Pearl 2019

Spat collection

Reproduction

Aims

Investigate **environnemental factors** underlying **recruitment variability**

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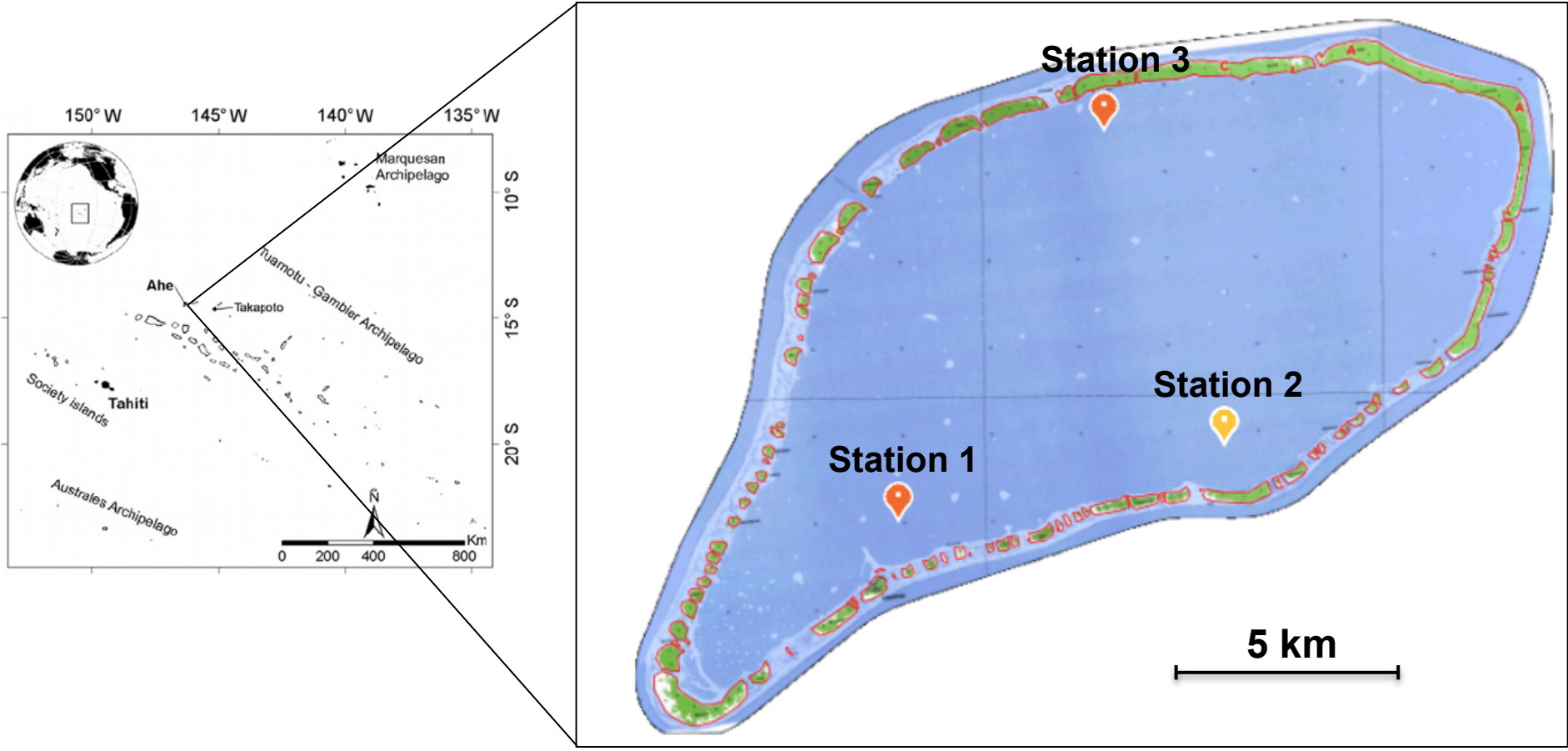
Develop a **spat collection forecasting system** for optimization of professional practices and spatial zoning planning
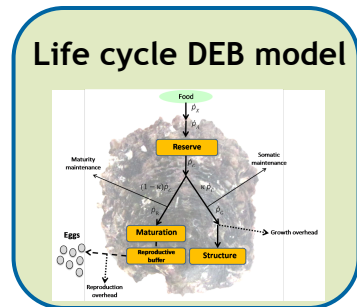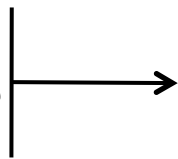
Study site, the Ahe lagoon
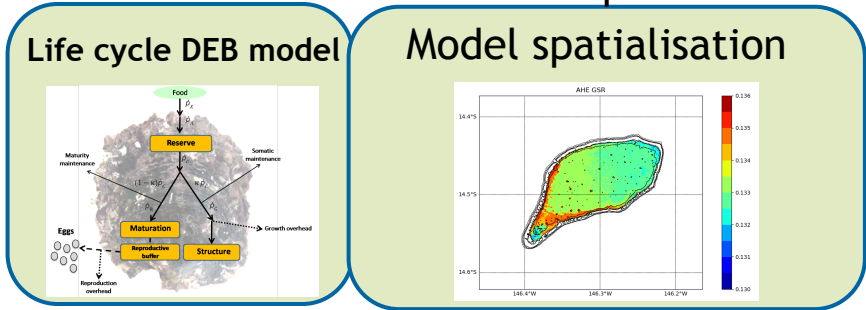
3 sampling stations

Modeling Framework

•Food
•Temperature

Life cycle DEB model

Modeling Framework

•Sources & quantity of larvae
•Larval development
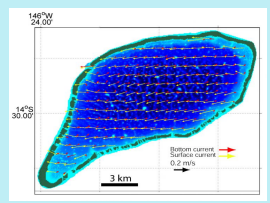
Life cycle DEB model

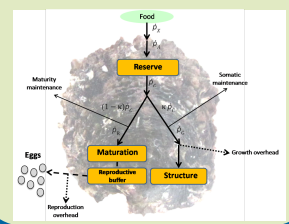Model spatialisation

•Food
•Temperature

Modeling Framework

Hydrodynamic (MARS-3D)
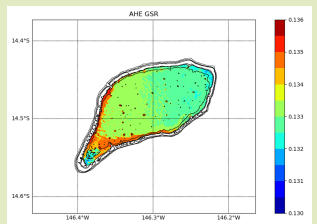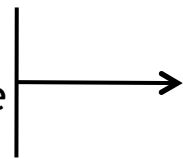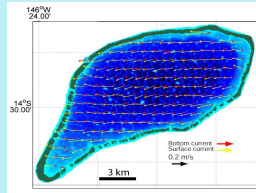
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Life cycle DEB model

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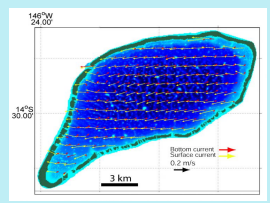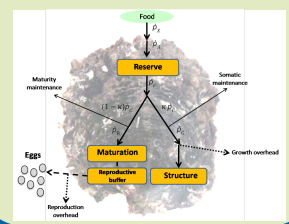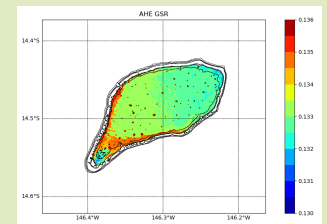# Modeling Framework

Modeling Framework

Larvae stage and fixation process

➤ <u>Larval rearing under controlled conditions</u>

For **4** different **trophic levels** (2,5 ; 7,5 ; 15 ; 30 cell.μL^{-1})

Maquette Claude Soyez / Ifremer
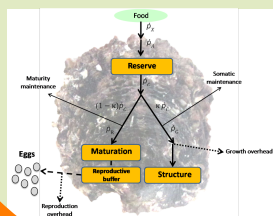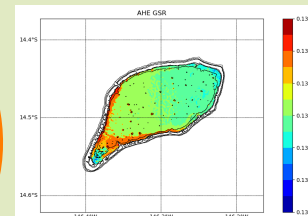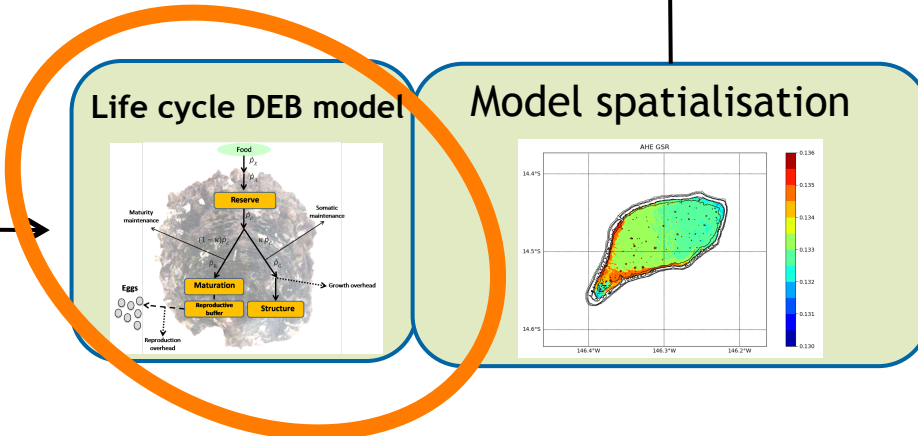
Larvae stage and fixation process

➤ <u>Larval rearing under controlled conditions</u>

For **4** different **trophic levels** (2,5 ; 7,5 ; 15 ; 30 cell.μL^{-1})

Assessment of the **food availability** on the rates of:

➤ **Development**

➤ **Growth**

➤ **Feeding**

➤ **Survivorship**

➤ **Respiration**

Characteristics at settlement

Sangare, N., Lo-Yat, A., Le Moullac, G., Pecquerie, L., Thomas, Y., Beliaeff, B., & Andréfouët, S. (2019). Estimation of physical and physiological performances of blacklip pearl oyster larvae in view of DEB modeling and recruitment assessment. *Journal of Experimental Marine Biology and Ecology*, *512*, 42-50.

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Metabolic shifts associated with changes in life stages

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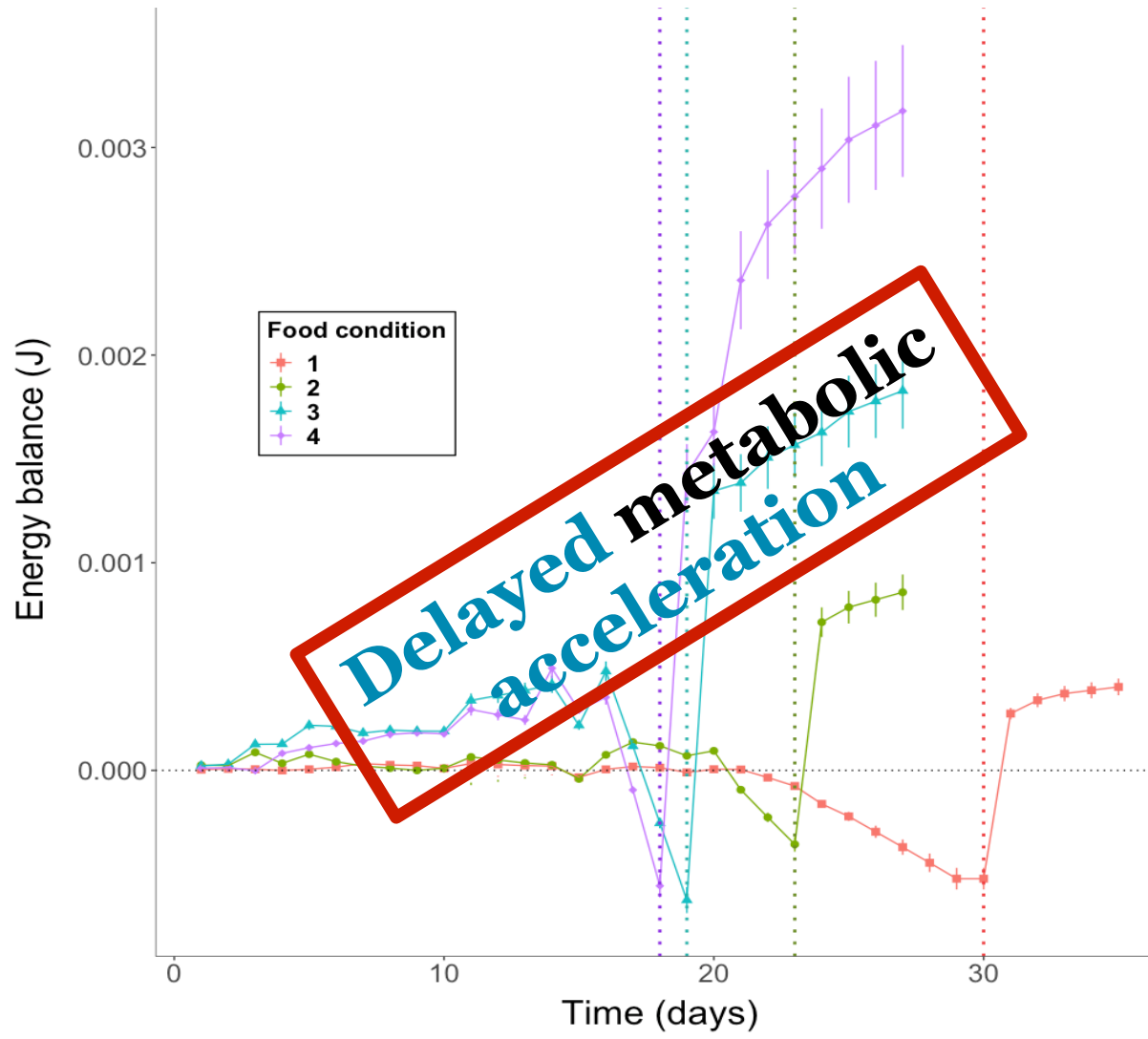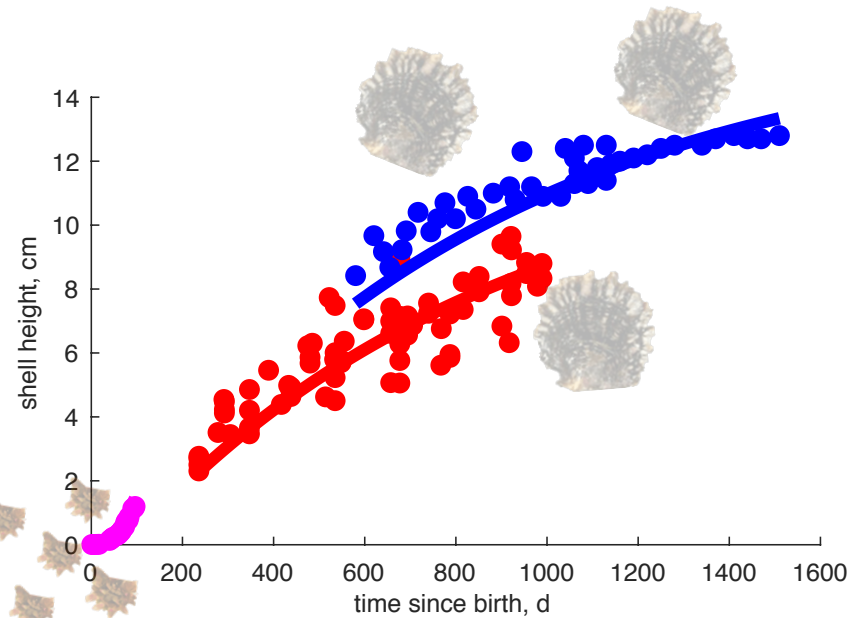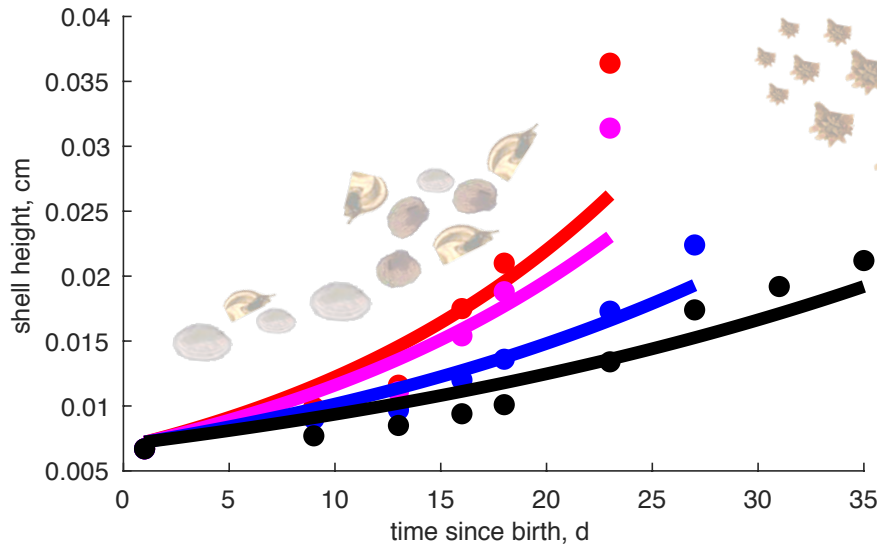
Metabolic shifts associated with changes in life stages

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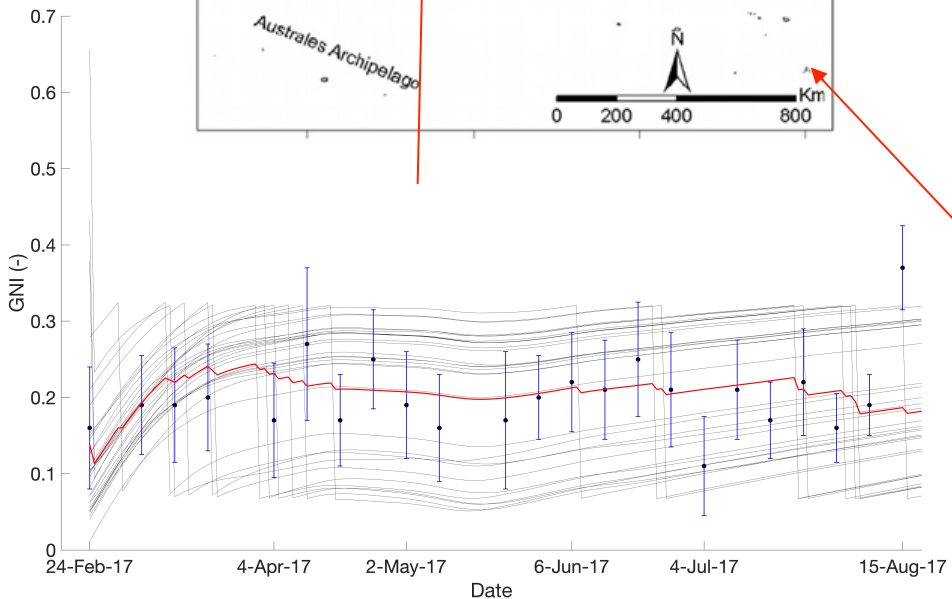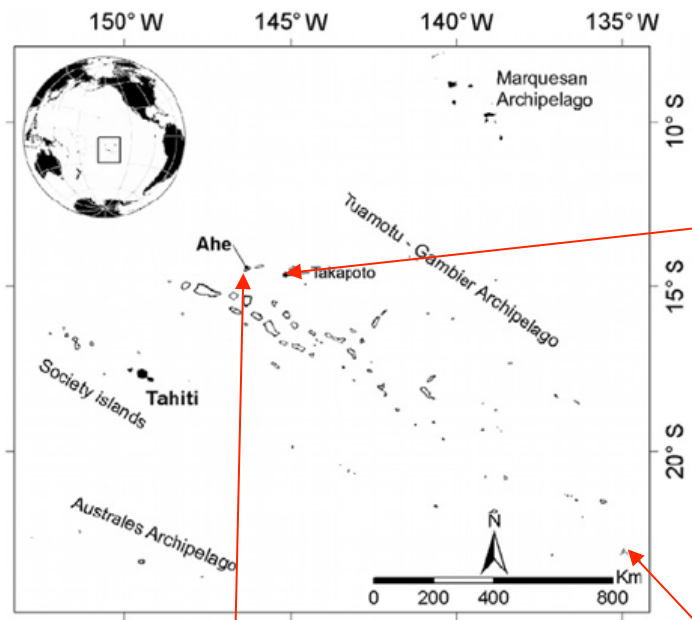
DEB model calibration

Model: asj
Complete: 3.4
MRE = 0.282
SMSE = 0.299

Model validation
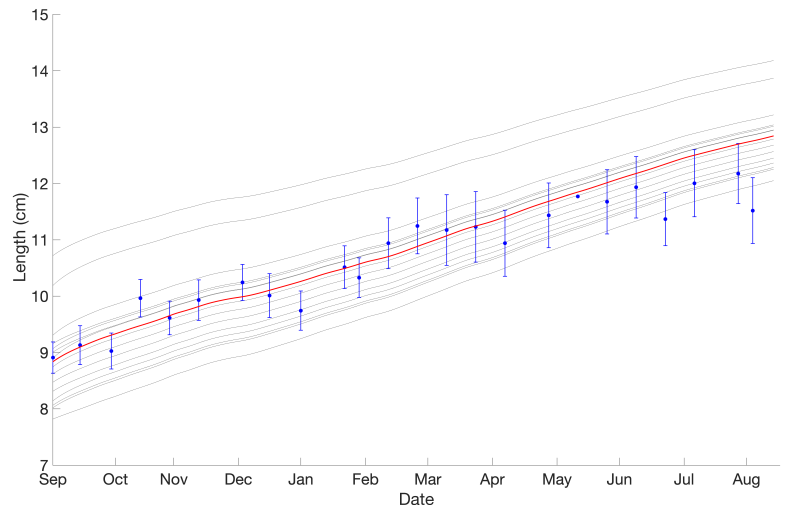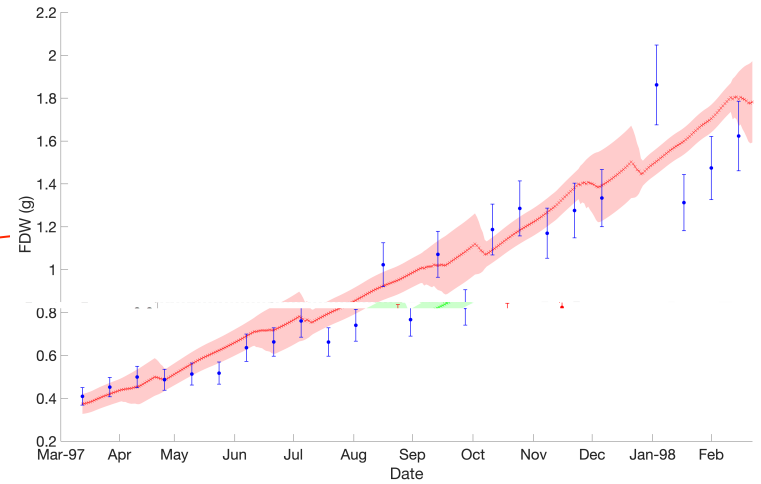
Environmental influence on reproduction

Yearly Reproductive effort for a 13 cm shell length individual
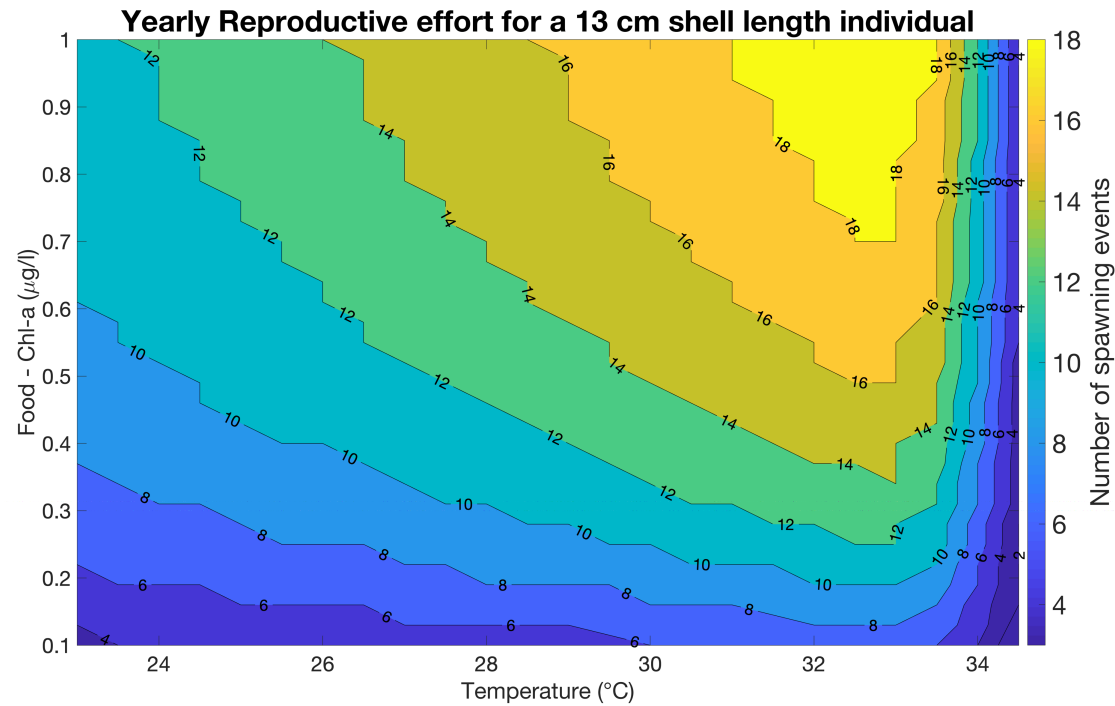
4 to 10 spawning events per year

Environmental influence on larval development

Larval duration period
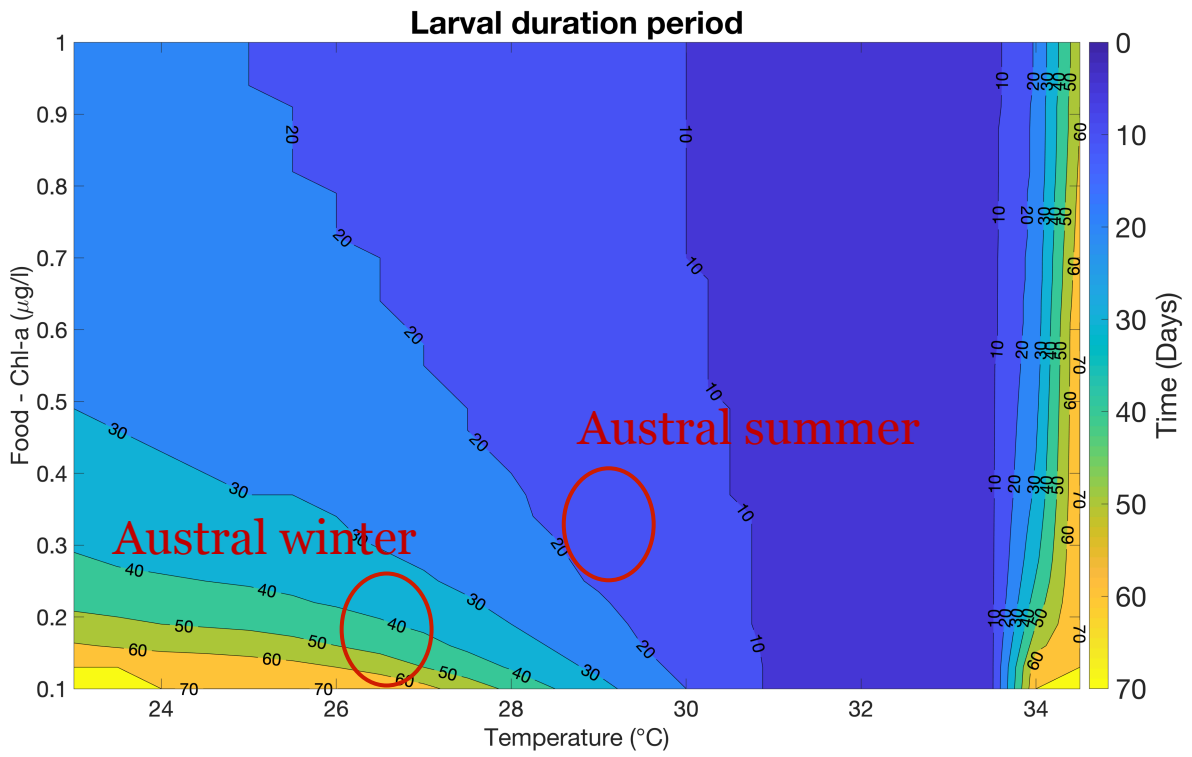
From 15 to 70 days before settlement

Environmental influence on time required before the first graft
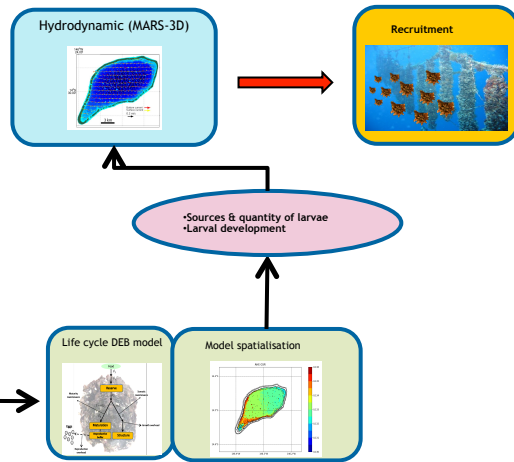
Time variation to reach a shell length of 9 cm (ref: 18 months)
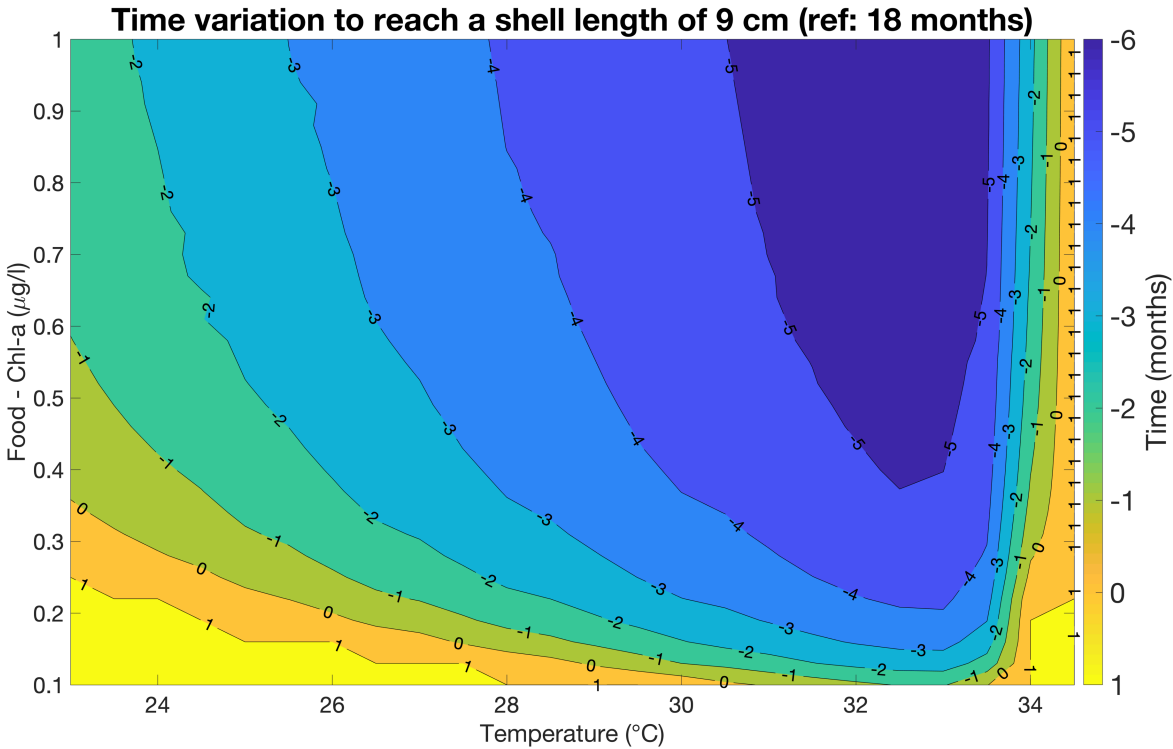
From **16** to **22** months to reach **9 cm** of shell length

Global path advancement

Hydrodynamic (MARS 3D)

Recruitment

•Sources & quantity of larvae
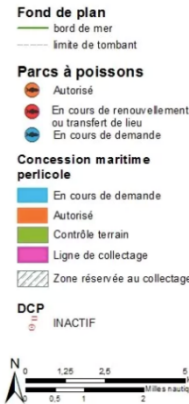•Larval development

Life cycle DEB model

Model spatialisation

•Food
•Temperature
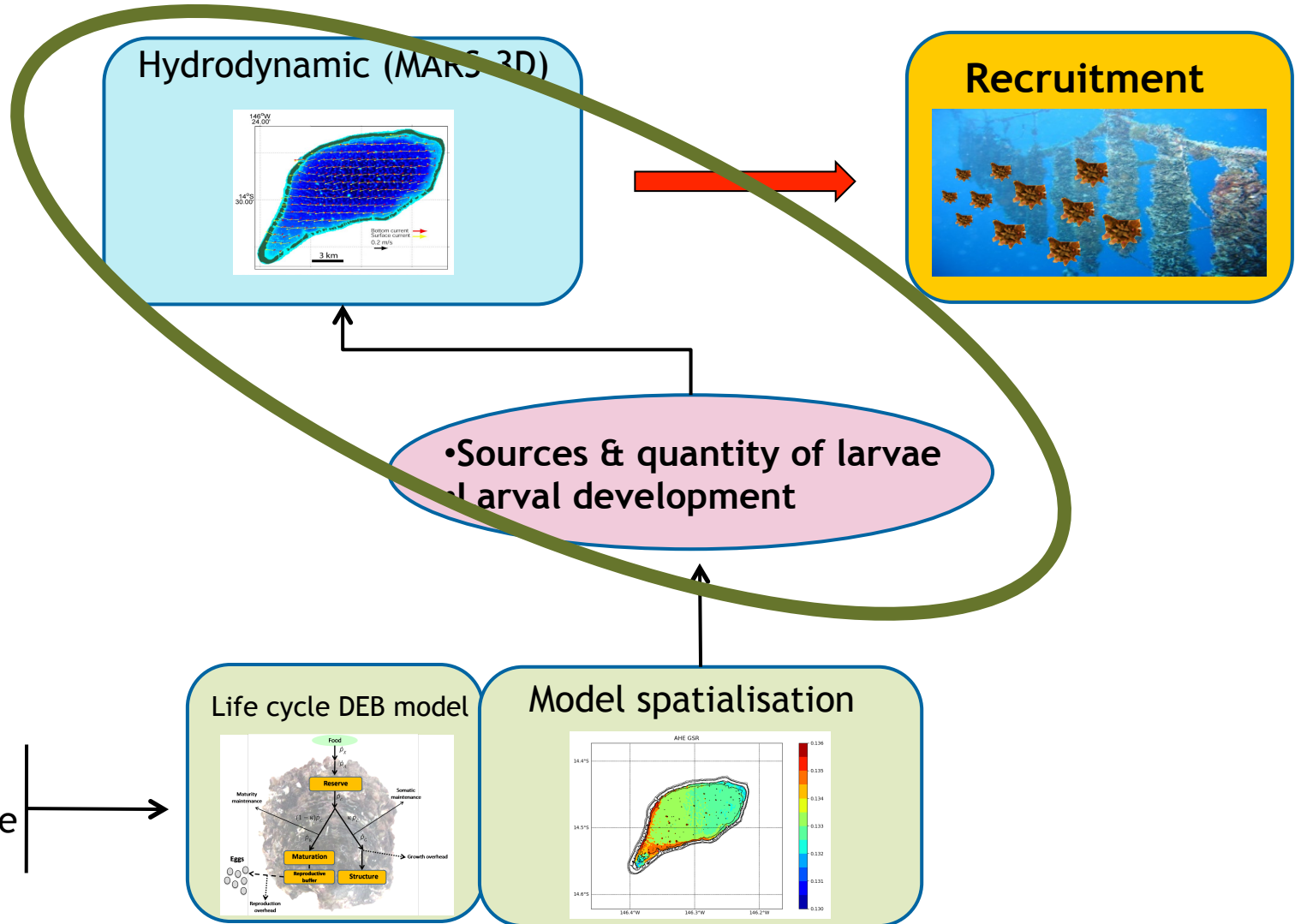
Pearl farming optimization and atoll management

Spatial zoning planning of:

- **Brood stock** areas
- **Rearing stock** areas
- **Spat collection** areas

Thank you for your attention