

THE WORLDWIDE NETWORK OF PORT CITIES



# The AiVP Days

Dublin - Ireland  
28 - 30 May 2015

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General Assembly  
and the AiVP Days

**“Working Waterfront”:  
a City-Port mix  
in progress**

In partnership with:



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PANEL 4: WORKING WATERFRONT, A SPACE FOR GREEN INNOVATIONS

Friday, 29 May 2015 - 11:30 - 13:00

Gilles Lecaillon is the founder and current CEO of ECOCEAN. He is a marine biologist, oceanographer and conservationist specializing in the study and use of post-larval fish for ecosystem conservation and rehabilitation. He has over 15 years' experience in the PCC technology (Post-larval Capture and Culture) used for prevention and/or mitigation of over-exploited tropical and temperate reef fishes. He has worked on tropical reef conservation and rehabilitation projects in various seas (Indian Ocean, Caribbean Sea, South East Asia and Pacific Ocean) and has recently been more focused on temperate waters (Mediterranean Sea). Gilles has acquired a strong technical experience in marine ecological engineering with the development and implementation of pioneering processes that aim to preserve and enhance biodiversity in coastal urban areas.



**Gilles LECAILLON**

Président / CEO  
Ecocéan, Montpellier, France



**UN PORT COMMERCIAL PEUT-IL ACCUEILLIR UNE NURSERIE A POISSONS PERFORMANTE ?**

La contribution des infrastructures portuaires à la protection de l'environnement est traditionnellement très faible parce qu'elles ont toujours été conçues et construites sans prendre en compte les écosystèmes marins existants, ou en leur accordant un intérêt moindre. Comme la majeure partie de la faune et de la flore marines se concentre dans les zones côtières, les modifications du littoral dues à l'activité humaine sont responsables de la perte des habitats et, partant, du déclin de la biodiversité marine. GIREL-3R est un programme de recherche et de développement piloté par l'autorité portuaire de Marseille Fos. En réalisant ce projet, le Port est à la recherche de solutions d'ingénierie écologique innovantes destinées à compenser les dommages causés aux écosystèmes marins par l'exploitation et le développement portuaires. ECOCEAN s'est lancé dans deux démarches novatrices dans le but d'abriter les alevins de la forte prédation qu'ils subiraient en zone portuaire si leur habitat continuait à se dégrader. La présentation met en lumière des résultats prometteurs et montre comment le port peut sensiblement contribuer à la protection et au renforcement de la biodiversité marine.



**CAN A COMMERCIAL HARBOR BECOME AN EFFICIENT FISH NURSERY?**

Ports infrastructures traditionally have extremely low ecological contribution because they have been designed and built with minor or no consideration to the existing marine ecosystems. As most marine flora and fauna reside in coastal areas, anthropogenic changes to shorelines are one of the key reasons for habitats losses and thus decline in marine biodiversity. GIREL-3R is a research and development program led by the Port Authorities of Marseille Fos. With this project, the Port is looking for innovative engineering ecological solutions to compensate damages on marine ecosystems caused by its operation and future development operations. ECOCEAN has implemented two pioneering processes with the objectives to save young fishes from high predation that would occur within the port area by lack of habitat. The presentation will highlight the promising results for these two solutions and show how the port can significantly contribute to protect and enhance marine biodiversity.



**¿UN PUERTO COMERCIAL PUEDE ACOGER UN NURSERIE A PESCADOS POTENTE?**

Tradicionalmente, las infraestructuras portuarias poseen una contribución ecológica muy reducida porque han sido diseñadas y construidas tomando poco o nada en consideración los ecosistemas marinos existentes. Dado que la mayoría de la flora y fauna marina reside en áreas costeras, los cambios en las costas producidos por la actividad humana son solo una de las razones claves de las pérdidas de hábitat y, en consecuencia, de la decadencia de la biodiversidad marina. GIREL-3R es un programa de investigación y desarrollo encabezado por las autoridades portuarias de Marsella-Fos. Con este proyecto, el Puerto busca soluciones ecológicas innovadoras en materia de ingeniería para compensar los daños causados por su operación y las futuras operaciones de desarrollo. ECOCEAN ha implementado dos procesos pioneros con el objetivo de proteger a los peces jóvenes de la elevada depredación que se produciría dentro del área portuaria por la escasez de hábitat. La presentación destaca los prometedores resultados de estas dos soluciones y demuestra cómo el puerto puede contribuir de manera considerable para proteger y mejorar la biodiversidad marina.

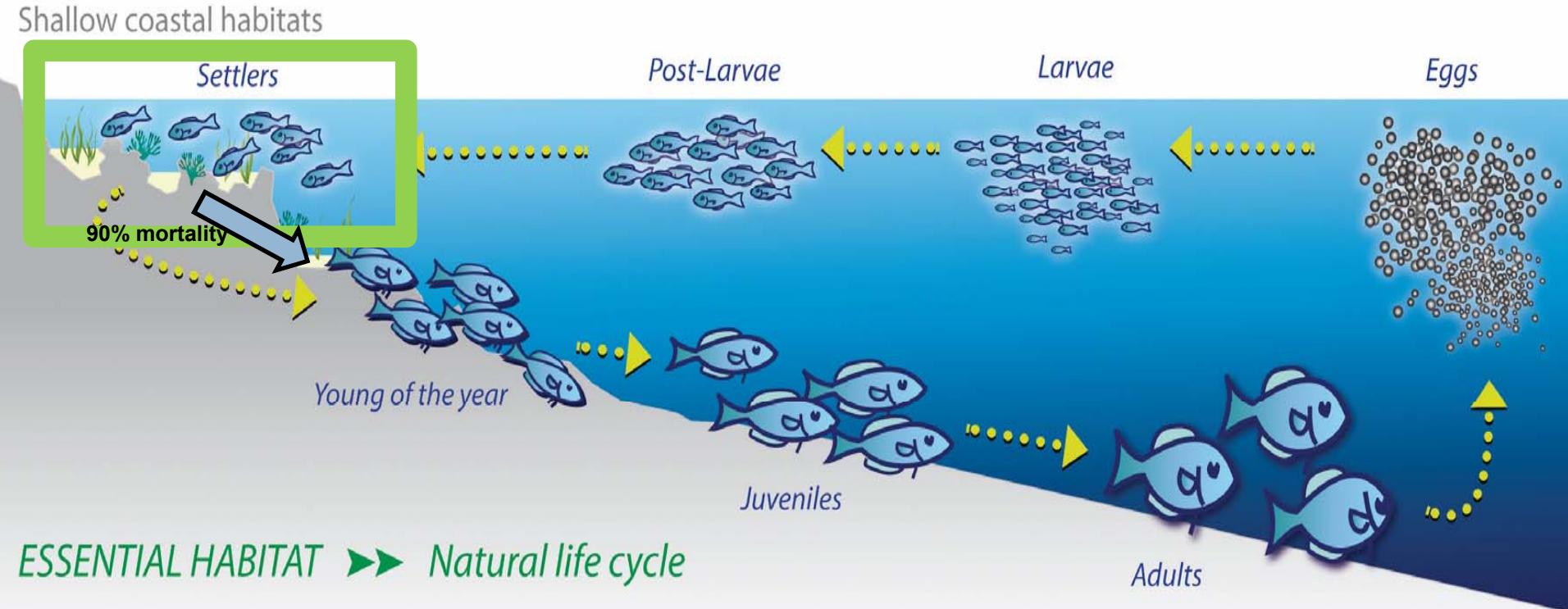
Rencontre 4 : « Working waterfront » : un espace d'innovations vertes

## Un port commercial peut-il accueillir une nurserie à poissons performante?

Gilles Lecaillon ; Yann Guais ; Fabien Dubas – ECOCEAN  
Pr Philippe Lenfant – CEFREM-UPVD-CNRS



## The Natural Life Cycle of Coastal Fish

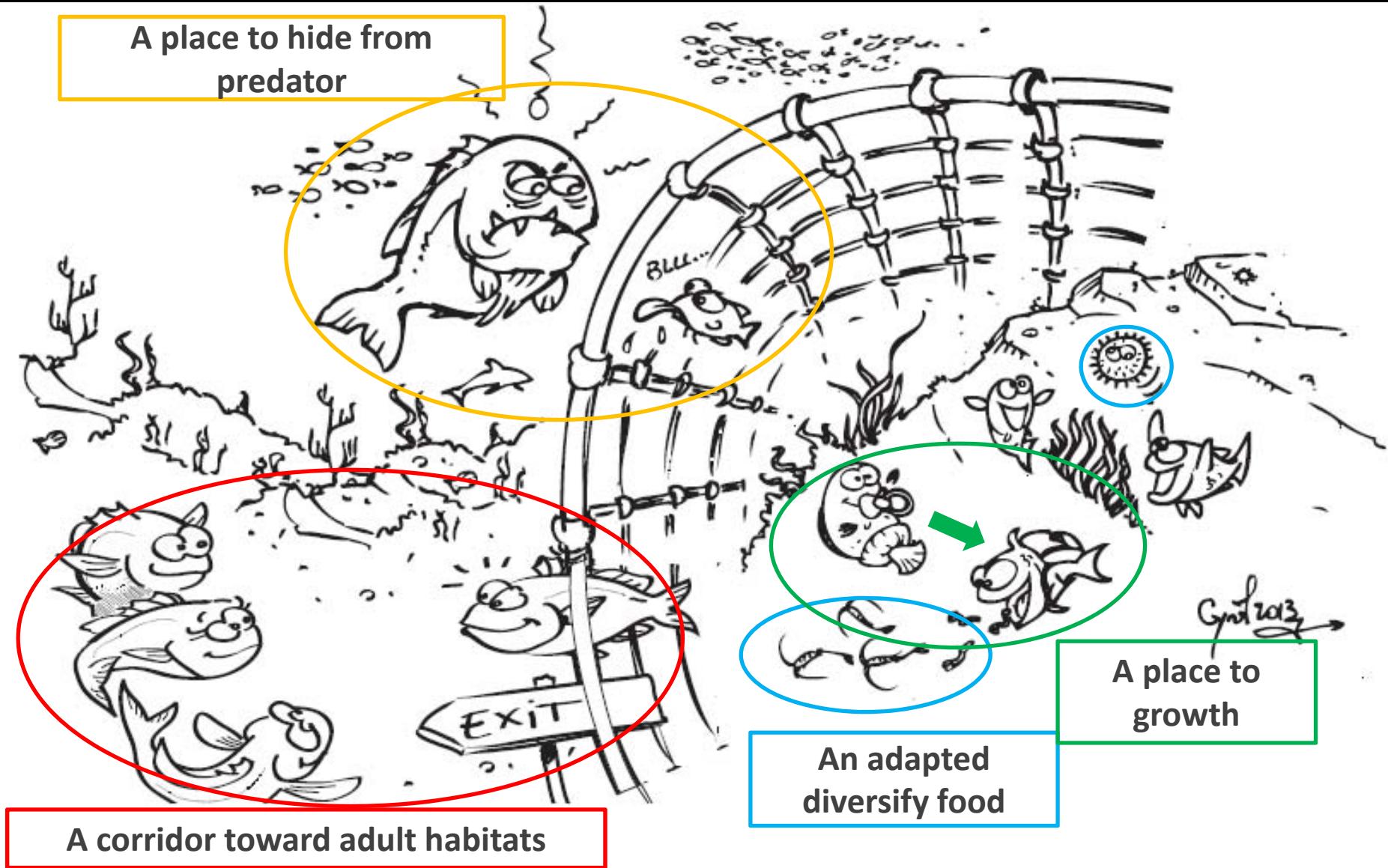


=> Spatial and temporal habitat partitioning for fish Stage

→ Shallow coastal habitat are essential habitat for fish nursery

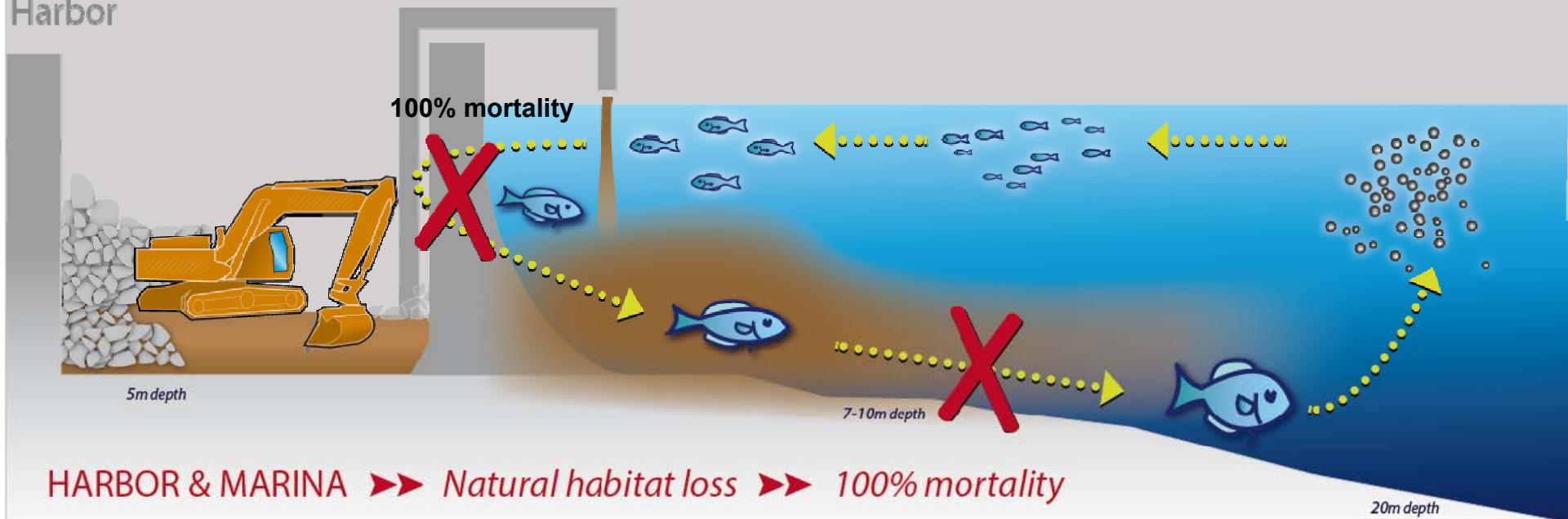
=> High Natural mortality in healthy ecosystem

# FISH NURSERY DEFINITION (Beck et al, 2001)



## Coastal construction disturbs ecosystems

Harbor



- => Coastal development causes habitat loss & bad coastal quality water
- => Post-larvae (PL) up to young of the year (YOY) survival rate decrease and can get close to 0% (100% mortality)
- => The need to restore, repair or at least, reconnect life cycle**

# The BioRestore® solution



- ⇒ During the works, we physically avoids the PL & YOY fishes to be in damaged areas!
- ⇒ 3 steps process

# The BioRestore®, a 3 step process

Capture PL with  
fishermen



Culture in controlled  
wet lab



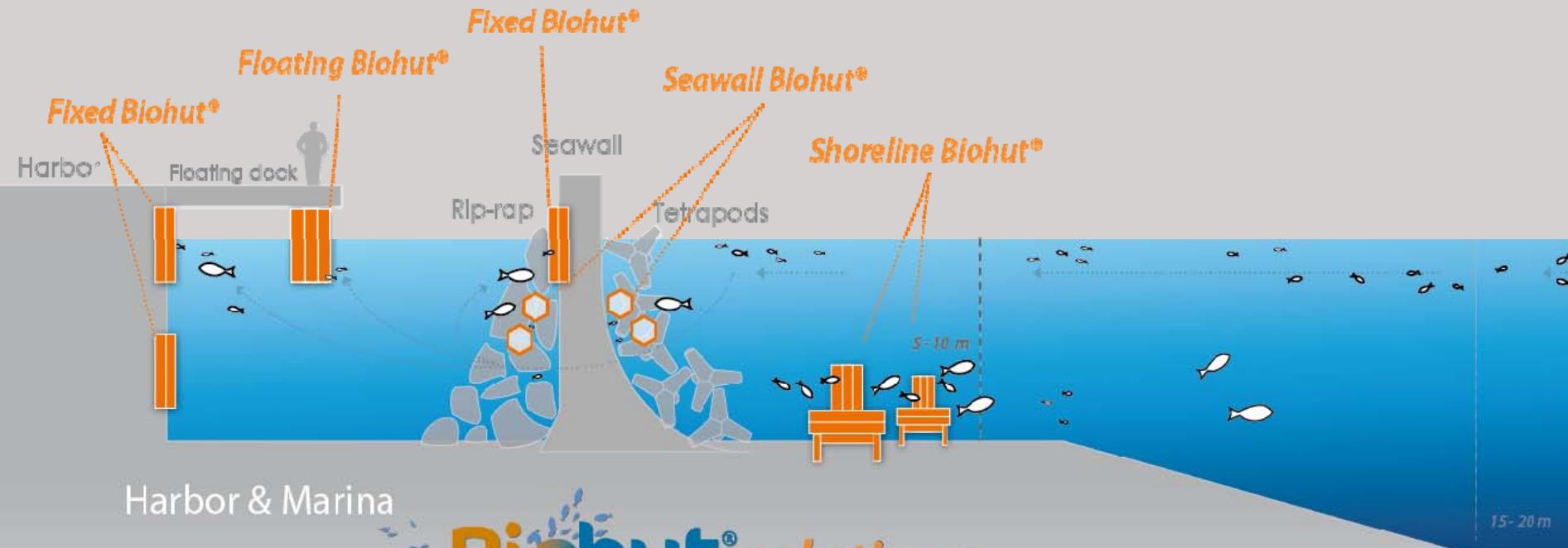
Release juveniles on  
Shoreline Biohut



- ⇒ Involves local fishermen
- ⇒ All collected coastal species are concerned and can be released
- ⇒ No DNA modification

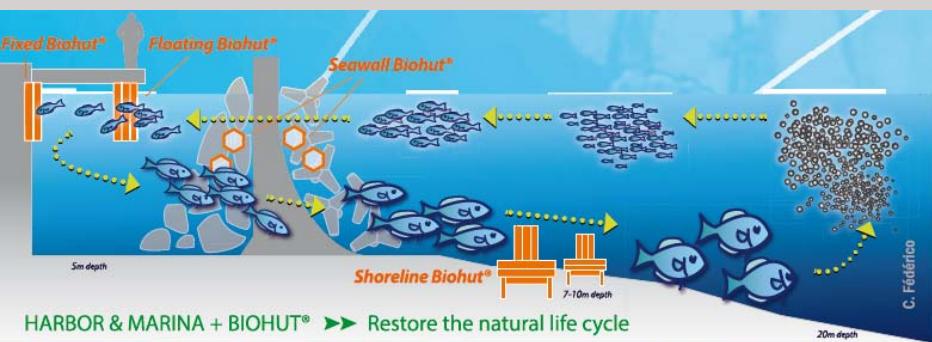
=> We artificially give back the 4 nursery criteria

# The Biohut®, an artificial fish nursery from settlers to YOY



=> Biohut habitats enhances ecosystem functions and services provided before by the natural shallow habitat

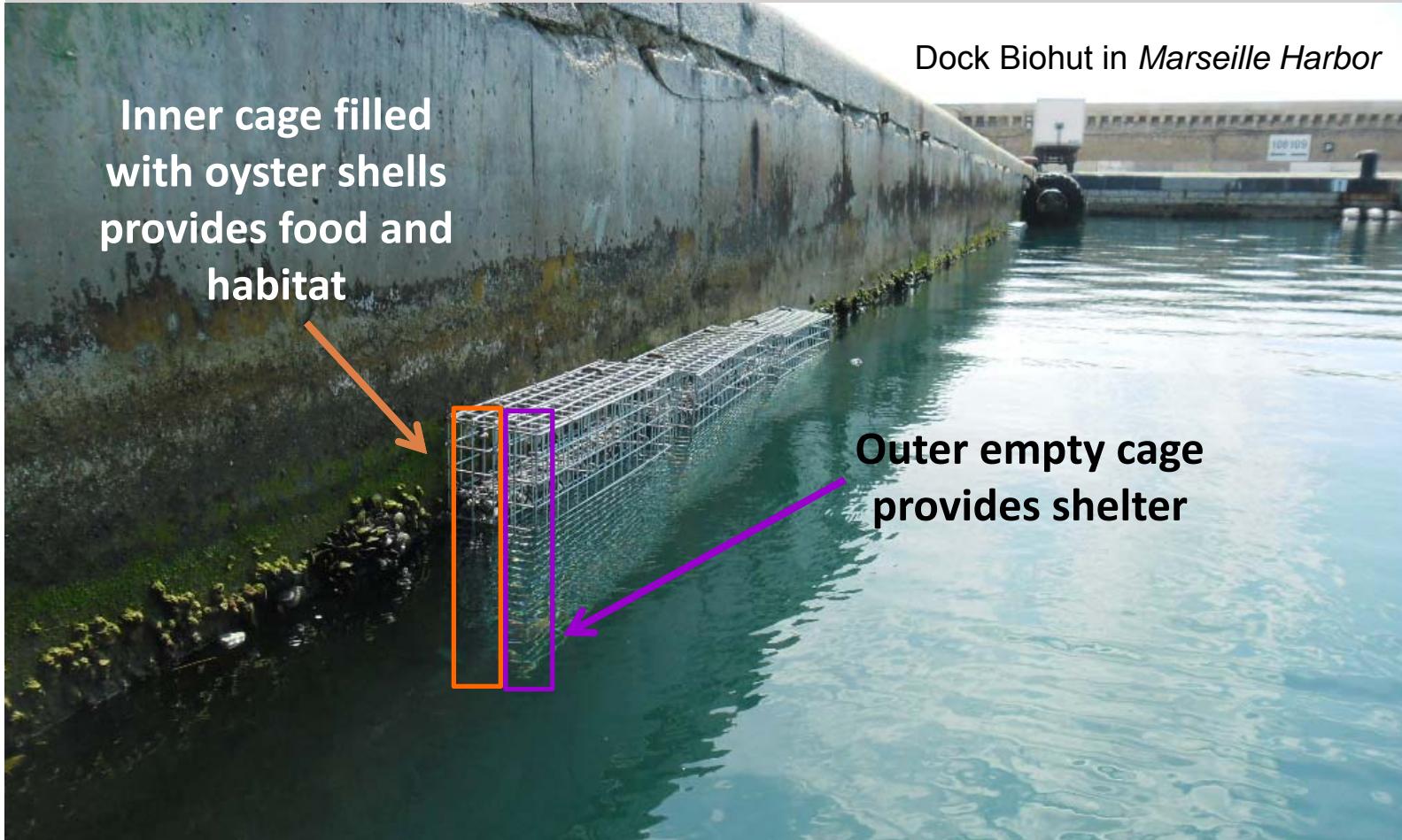
=> A range of habitats  
authorizes the life cycle to close



# HOW DOES Biohut® WORKS?



=> A double cage system fixed along docks and under floating pontoons

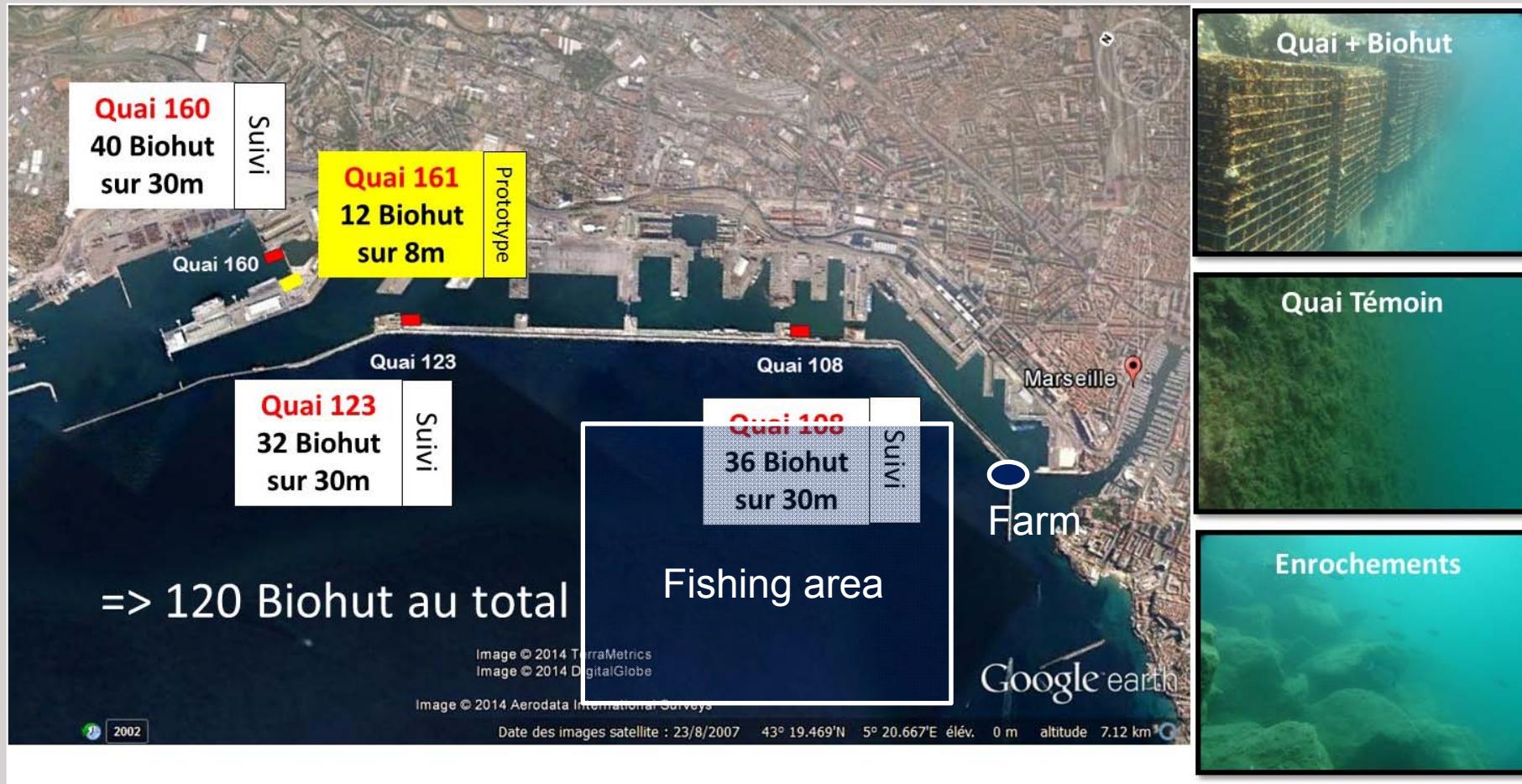


=> Biohut brings: food, refuge, an area to growth and corridor to exit from the harbor => Beck et al (2001 ) fish nursery criteria!

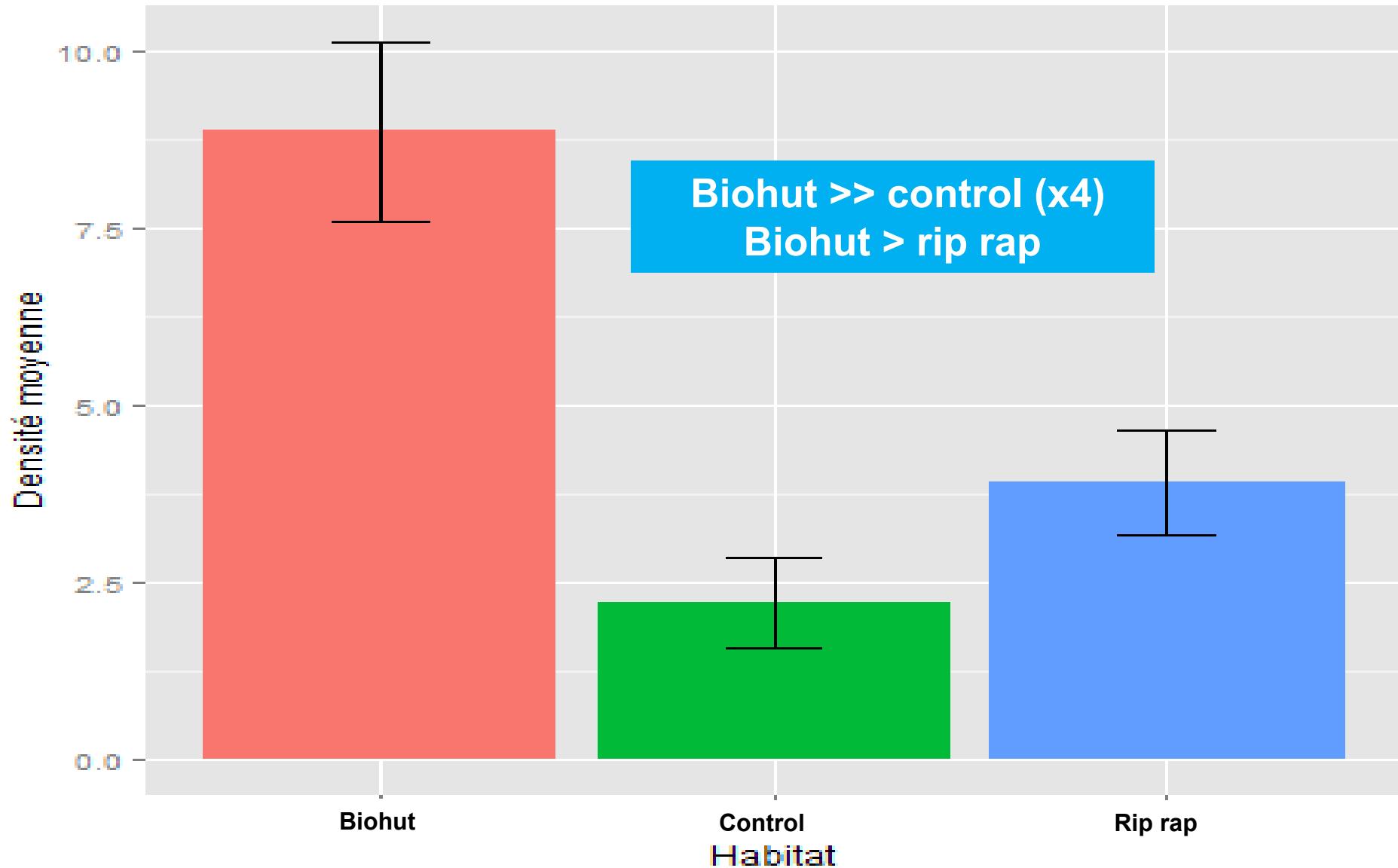
# GIREL-3R Project



- ⇒ 2012-2013 = prototype phase ; 2014 = monitoring phase
- ⇒ 3 zones equipped with Biohut = 120 Biohut total
- ⇒ 60 nights of collection from April to august 2014



# Results : total abundance



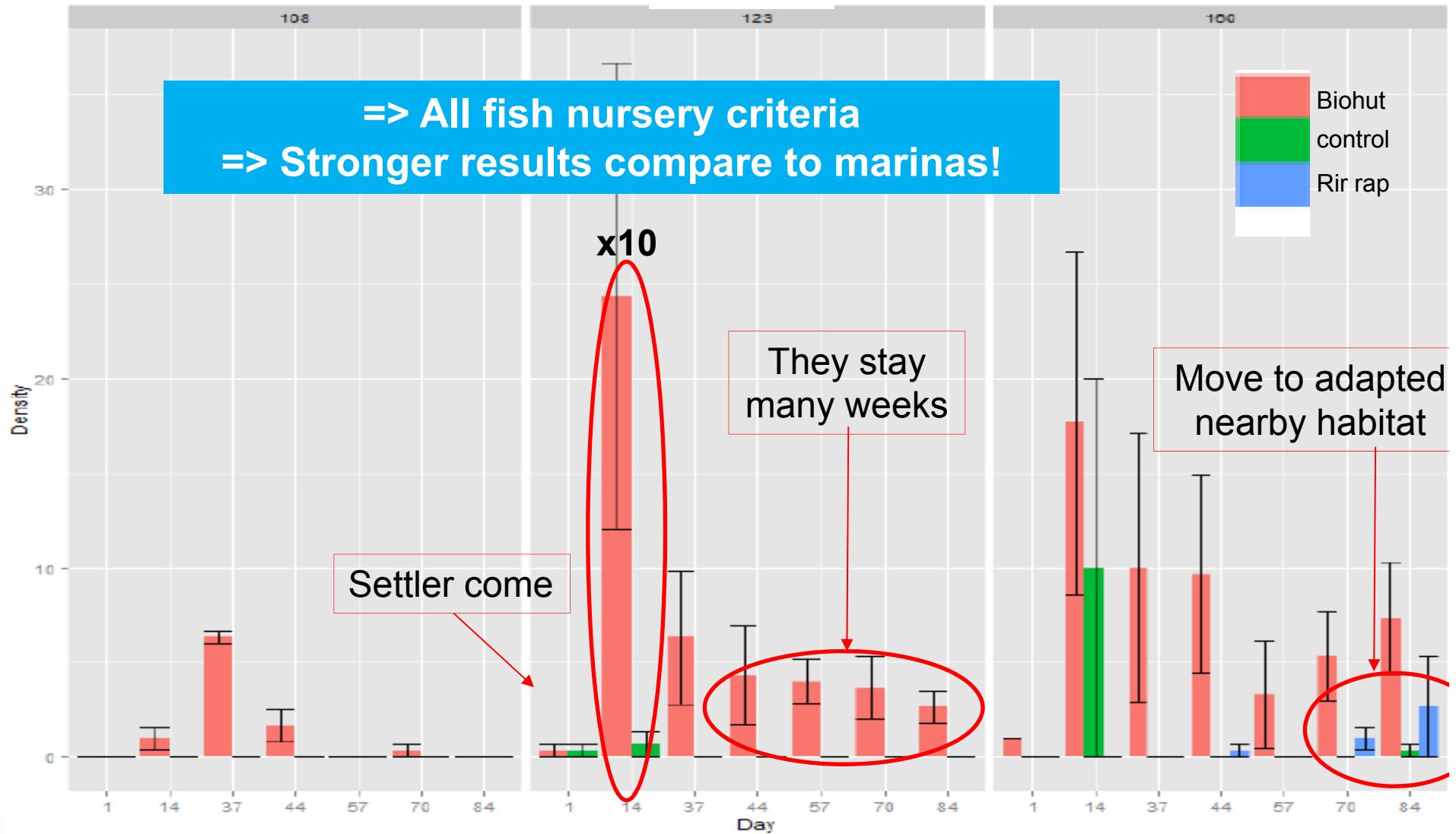
# Results : Grow? Movement?

=> Focus on one species *D.annularis*

Dock 108

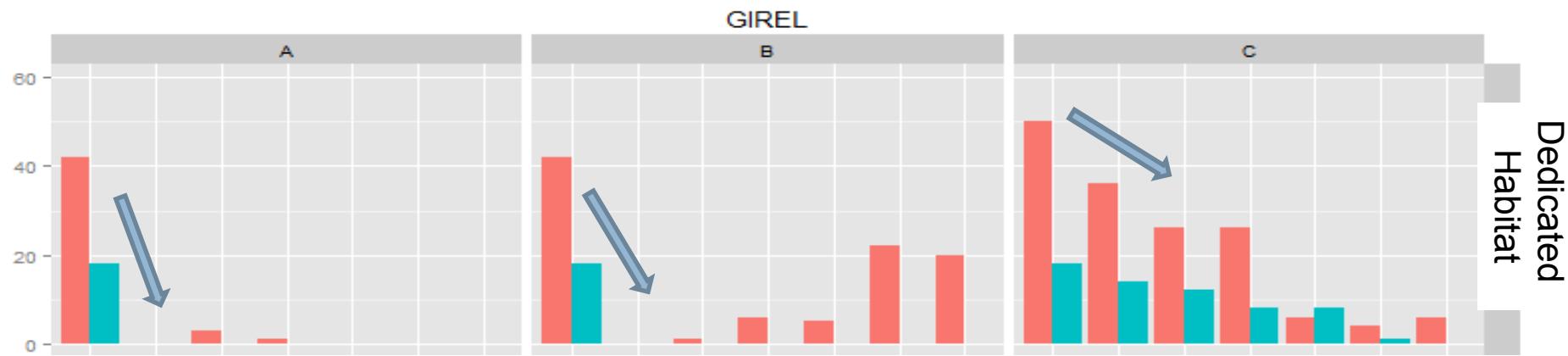
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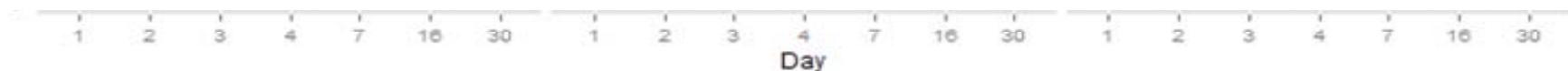


# Results : Restocking assessment

=> 450 tagged fishes released in 3 zones (50-70mm size)



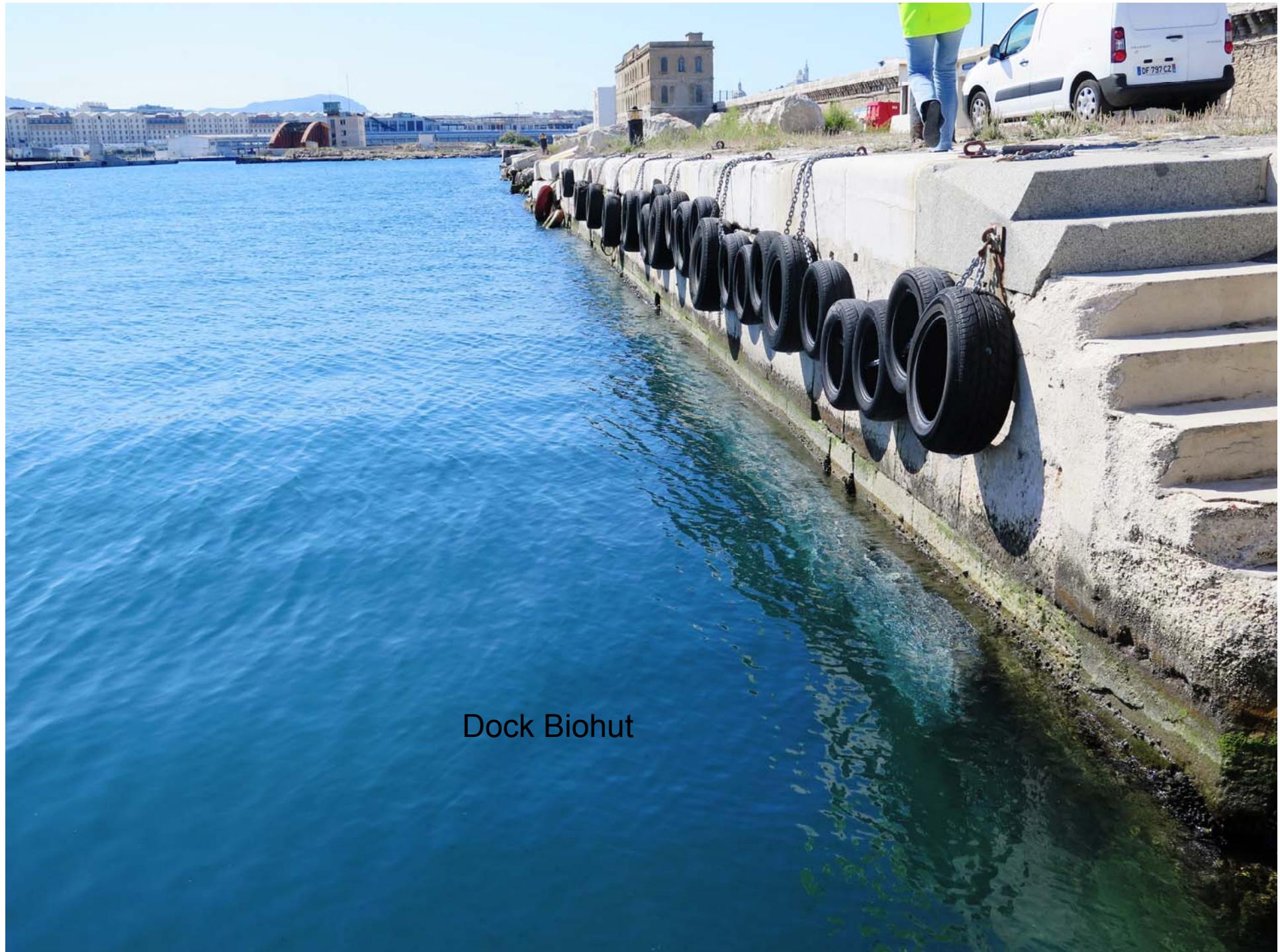
=> Survival >> compare to natural recruitment  
in the studied areas (compare to the control)



- Release OK ; high “decrease” the first night ;
- Fishes migrate to natural habitat => they are not all dead
- Tagged fishes seen 2 months after the release!!

MONTE D'ORO  
BASTIA

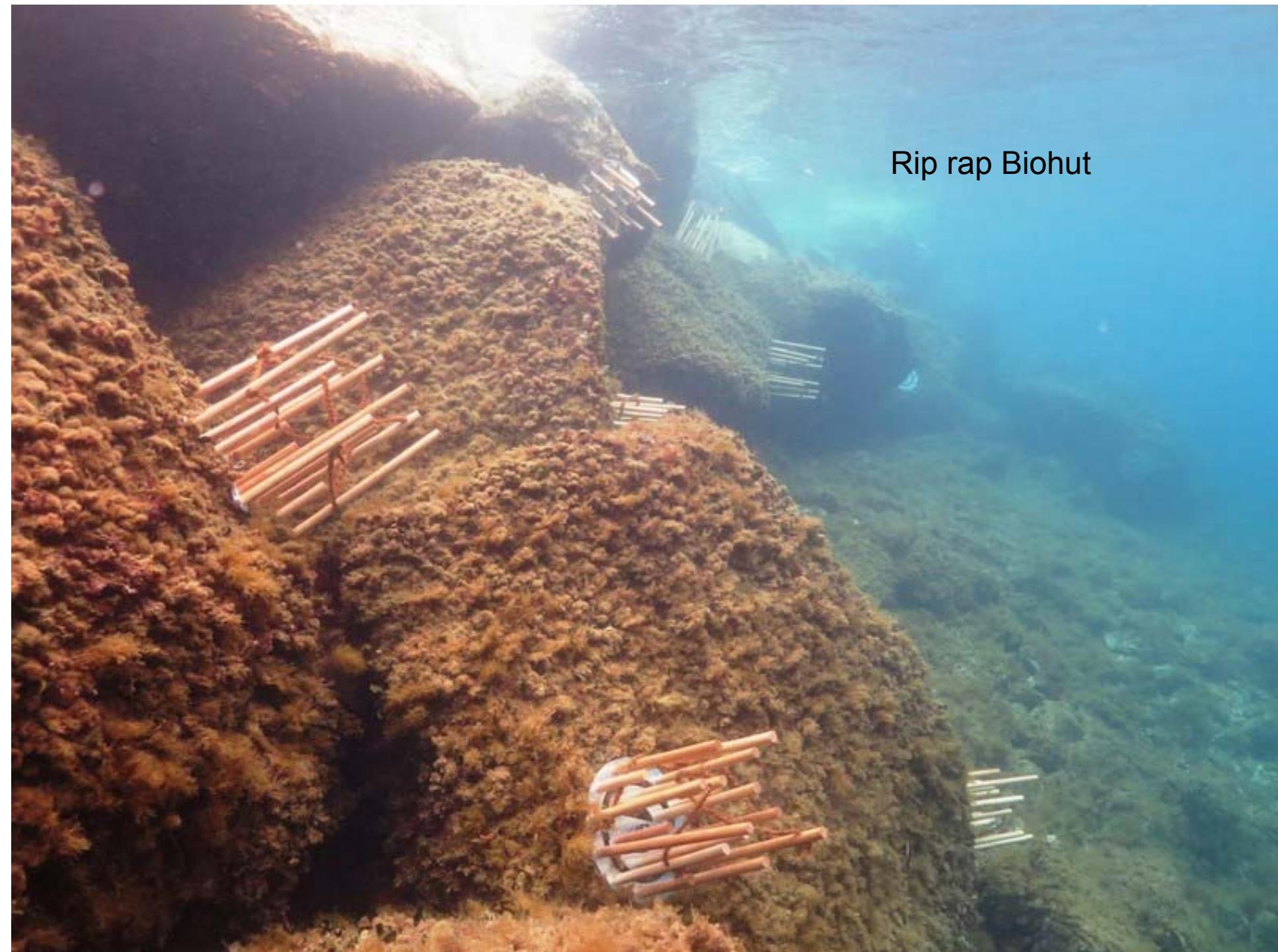
Dock Biohut



Dock Biohut

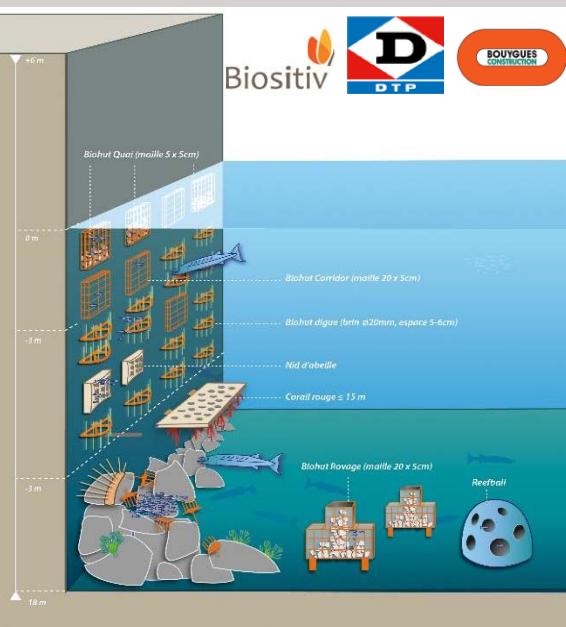
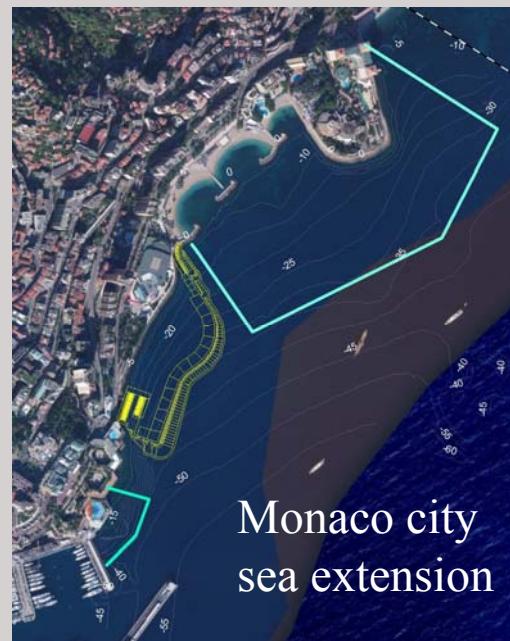
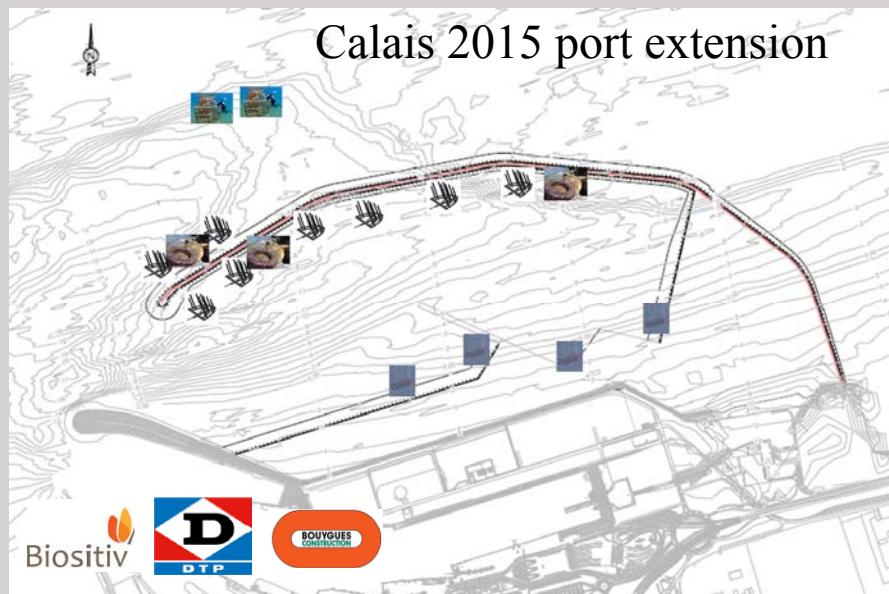
# Shoreline Biohut





Rip rap Biohut

# Others on going project



# Conclusions

- Boost natural recruitment for local species is feasible!
- Port facilities can serve the biodiversity or at least limit its impact on fish nursery.
- Those recent results are *in press* (ex: Bouchoucha *etal*, 2015, in MEPS).
- Port involves in fish biodiversity engagement can contribute to improve knowledge and help better managing fish stock.

⇒ **Port can produce fish (if quality of water is good)**

⇒ **Port can reinforce links between port & citizens**



Thank you for your attention

Learn more on [www.ecocean.fr](http://www.ecocean.fr)

