

Ecological engineering for San Pedro harbor infrastructure





Ecocean

Who are we?

▶ 18 years of experience

- ▶ Ecological engineering
- ▶ Marine ecology
- ▶ Conception of solutions

▶ 16 collaborators

- ▶ Marine biologists and ecologists
- ▶ Engineers
- ▶ Headquarters in Montpellier (FR)
- ▶ A representative in The Hague (NL)

▶ Ecological engineering?

Transposing results from scientific research into operational tools and solutions for a more sustainable and inclusive compatibility of human activities with marine biodiversity.

Member of AIVP





Regular partners

- Scientific partners: UPVD CNRS, IFREMER, CREM, Chorus Acoustic, EXETER/BRISTOL



Recherches
Sous-Marines
et Océanographiques



- Governmental partners: French Sea Cluster, Agence de l'eau, ADEME, Région SUD, Département de l'Hérault, Ministère de l'écologie, AIVP, CDC Biodiversité...



National awards of Ecocean approach



2016



2018



2019

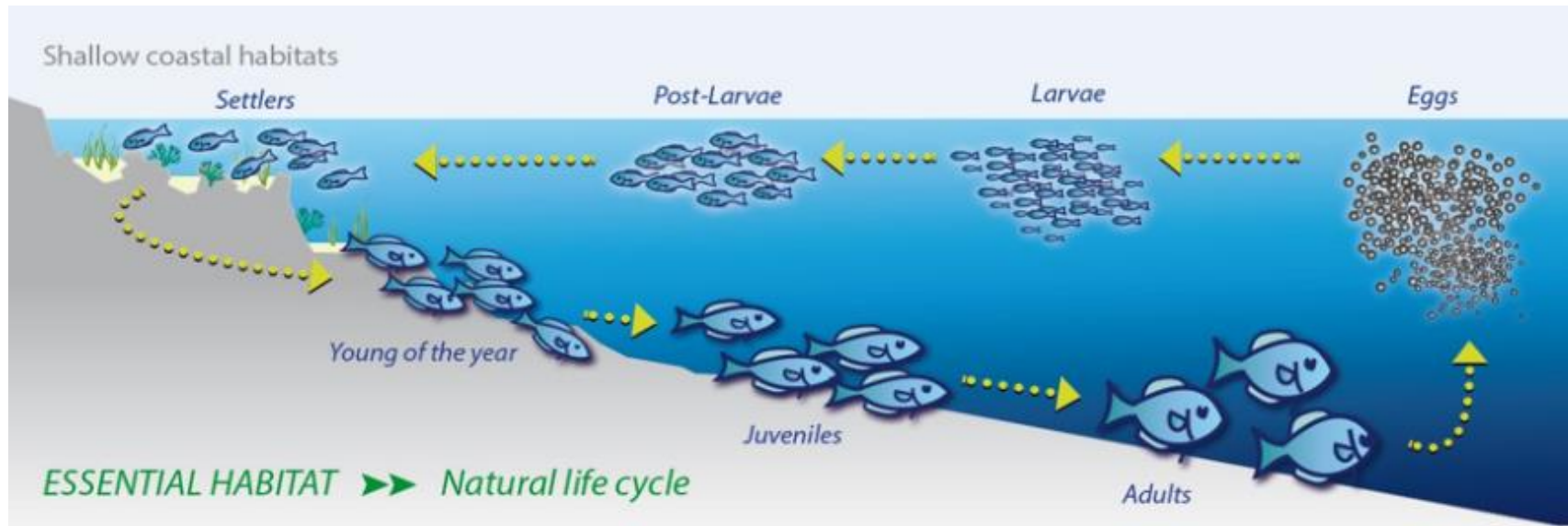


Janvier 2020

The importance of nursery habitats



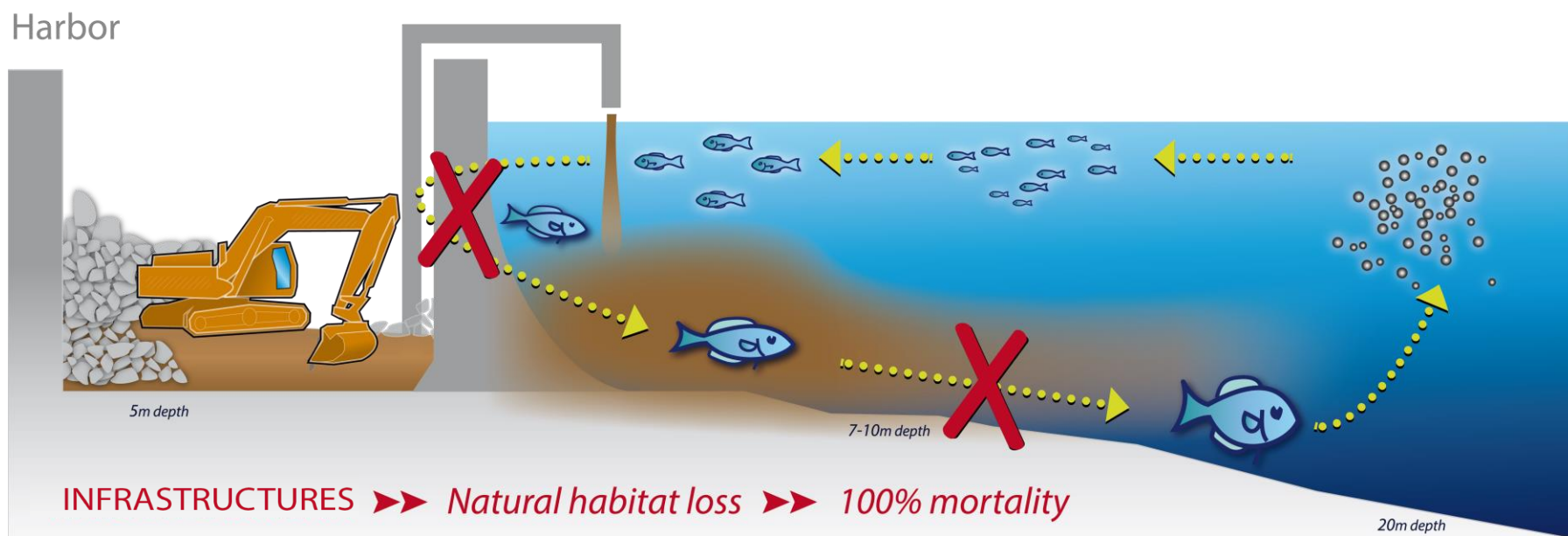
A complex marine life cycle



⇒ Shallow coastal areas (0-10m) are essential habitat for a good functioning of the ecosystem

- Fish larvae, crustaceans and mollusks come from the open sea
- All these small animals seek for habitat where to settle and grow (nursery habitat)

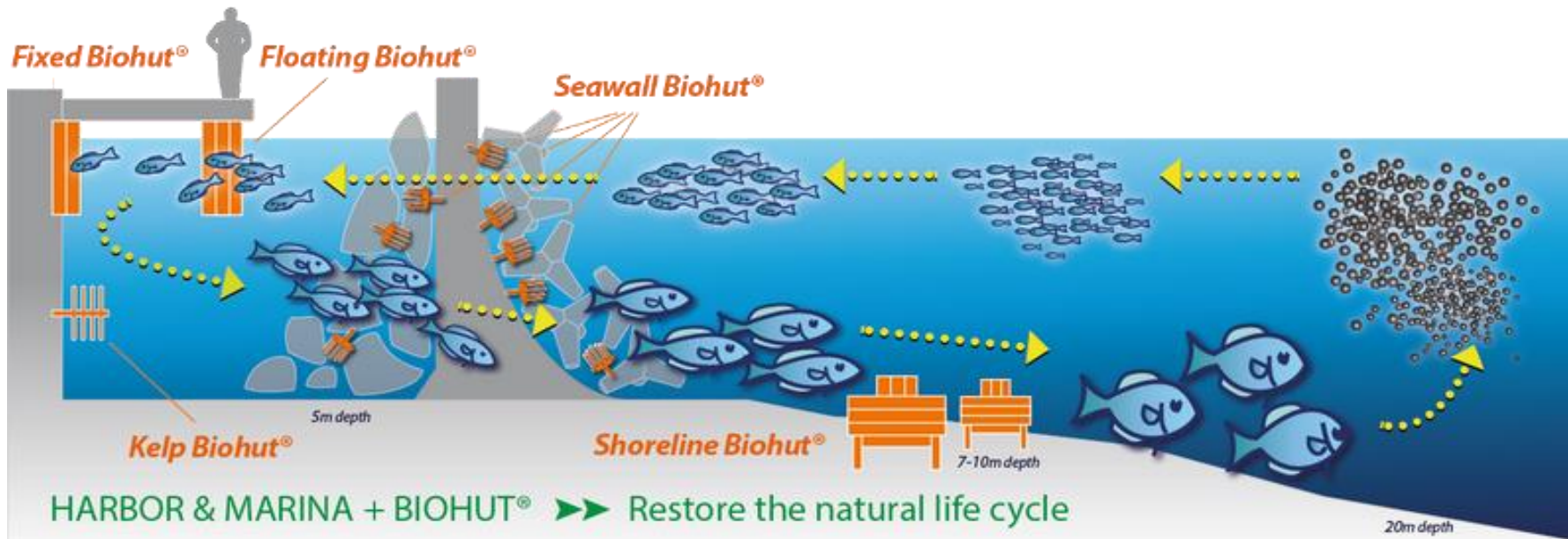
Artificialisation



⇒ High impacts on life cycle and on coastal nursery functions

➤ Huge change of habitat complexification

Ecocean solutions

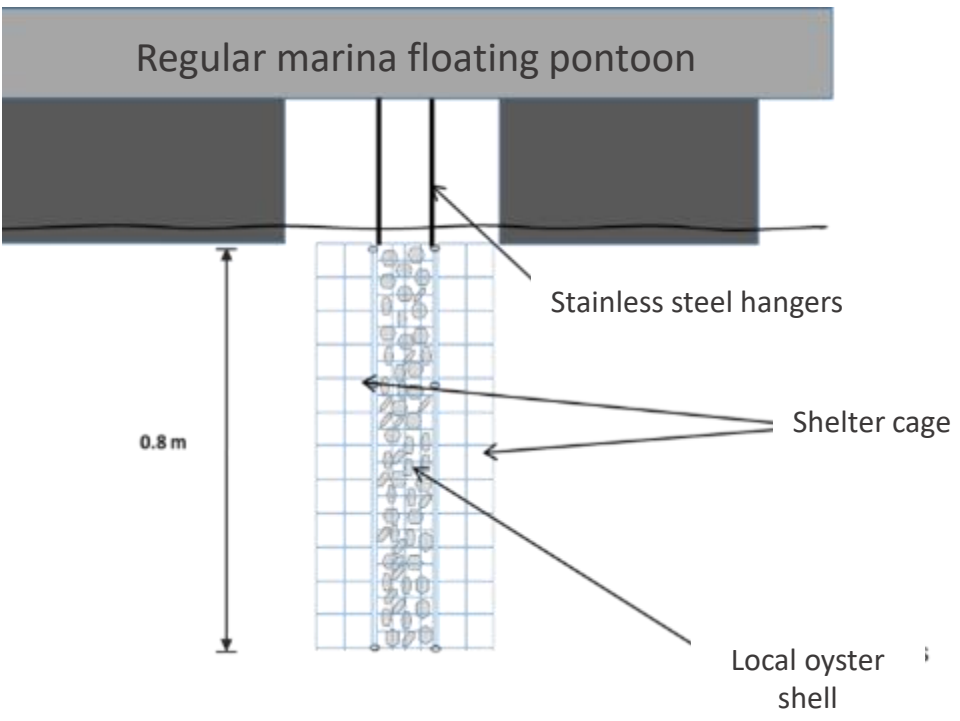


⇒ Biohut Artificial habitats can have a positive impact on the surrounding environment

- Biohut habitats provide complete food resource and shelter to early life history stage animals

What are an artificial Biohut[®] habitat?

- An operational **tools** that gives back nursery functions to artificial coastal area.
- 28 marinas & 4 commercial harbor;
- 8 countries
- **Scientifically validated (9 publications)**
- + 3500 installed in 6 years ; **various shape designs**
- **Patented solution made with recycled and recyclable material**



- ▶ **Essential fish nursery functions**

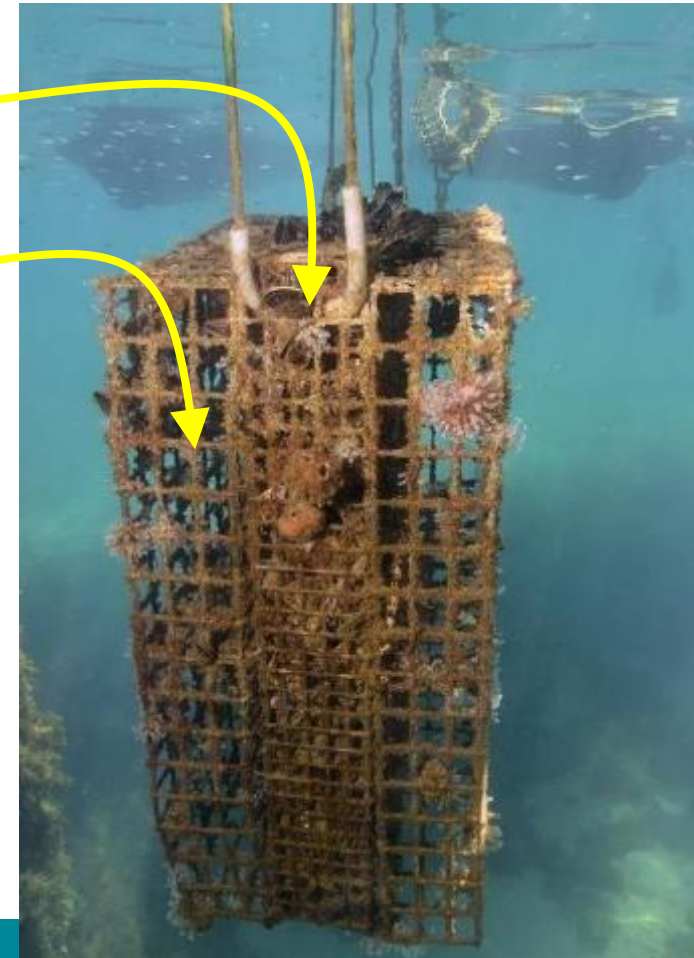
- ▶ A natural substrate: a complex habitat where invertebrates and algae grow, providing a natural source of food
- ▶ A shelter against predators: in the Biohut, juvenile fish are protected from predators

- ▶ **Patented solution**

- ▶ **Recycled and recyclable materials**

- ▶ **Ecological functions validated by 6 scientific publications**

- ▶ **Application for marine and freshwater**



Biohut

How does it reproduces nursery functions?



A wide biodiversity

Fish :

150.000 observations
>95 different species



Vagile fauna :

50.000 observations
200 different species



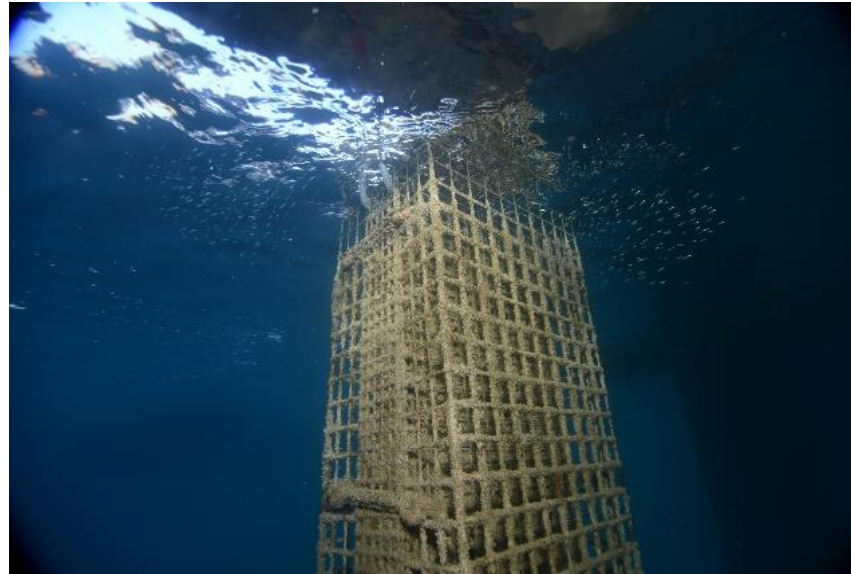
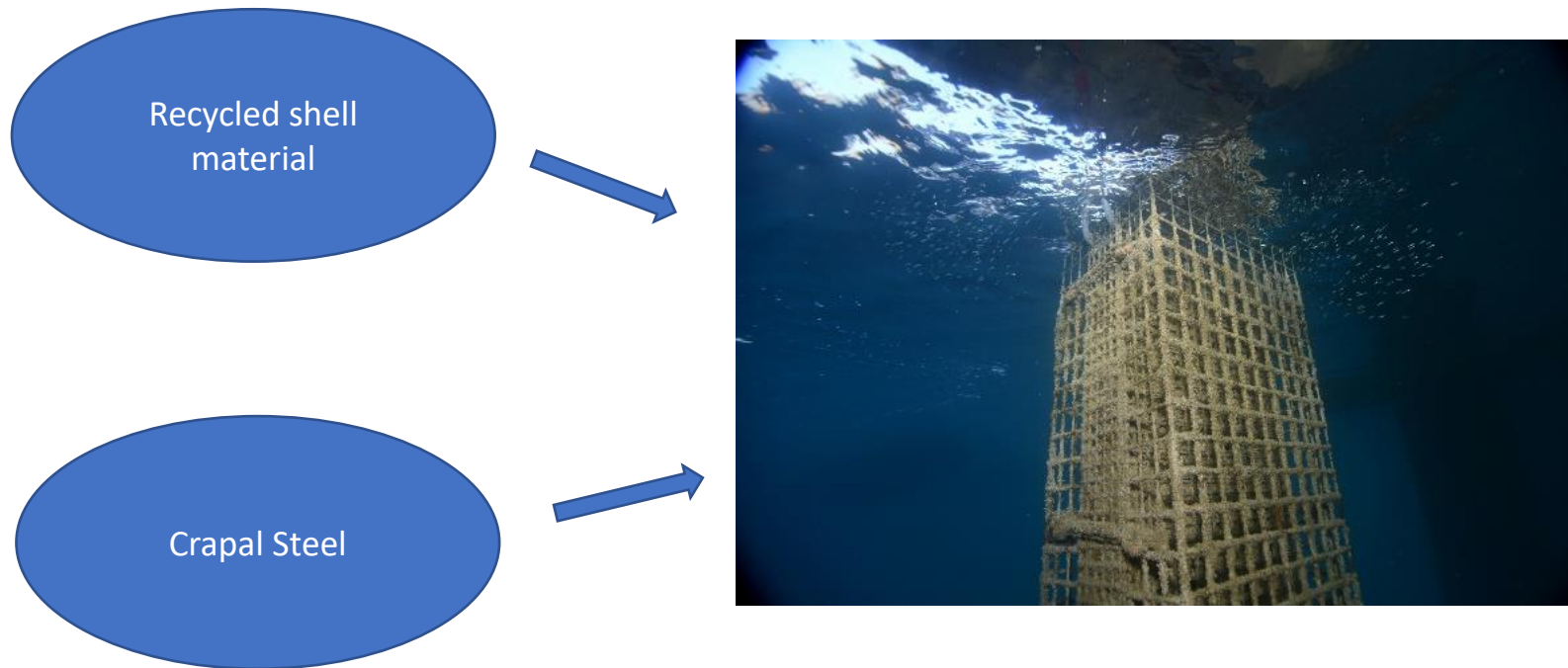
Fixed fauna & flora :

2.500 observations
63 different species



- ⇒ Patrimonial species : Groupers, Seahorses, Eels..
- ⇒ Economical species : Cod, Pollack, Saithe, Horse mackerel, seabream, seabass, lobster, sea urchins, clams..





After the lifespan of the Biohut (5-10 years), the structure can be 100% recycled.

- Steel is processed back to the recycling chain
- shells material can be left on site (if allowed) or recycled (animal food, fertilizer)



San Pedro Project

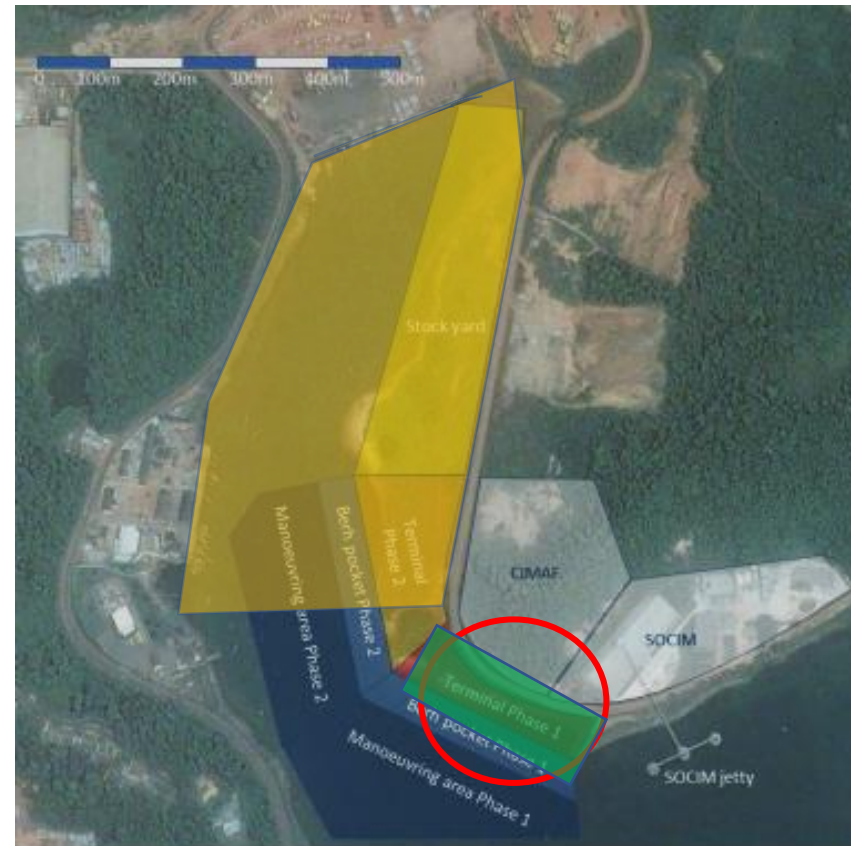
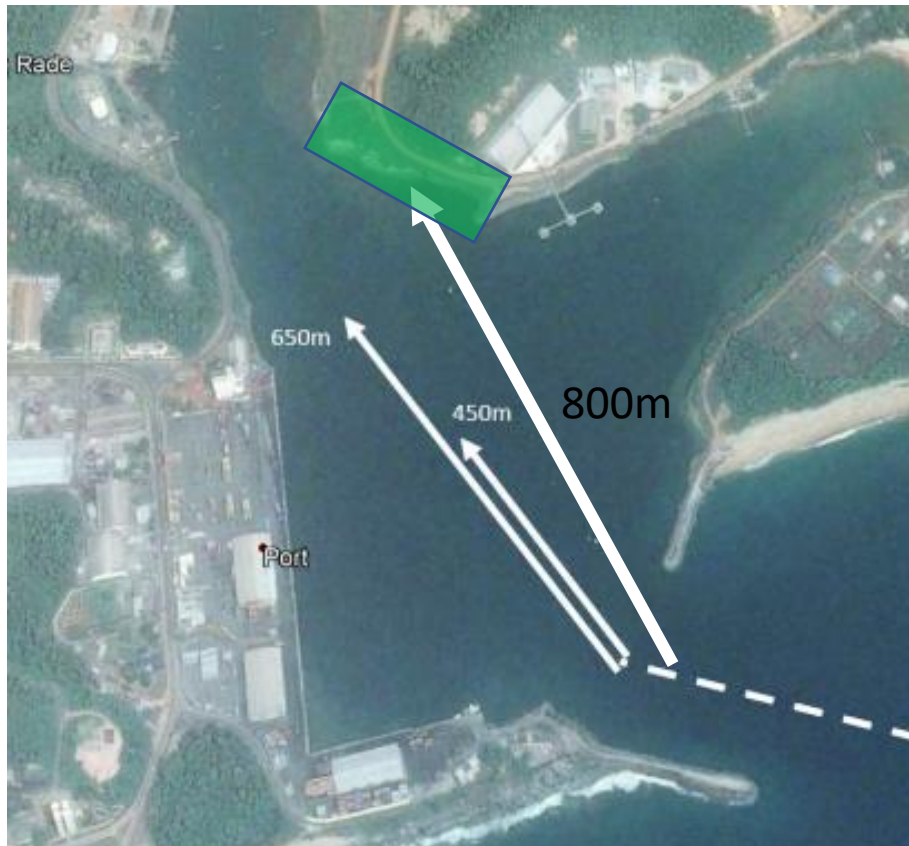


Context for San Pedro harbor



Some areas within the San Pedro port are better for an ecological restoration project (green zone)

Context for San Pedro harbor

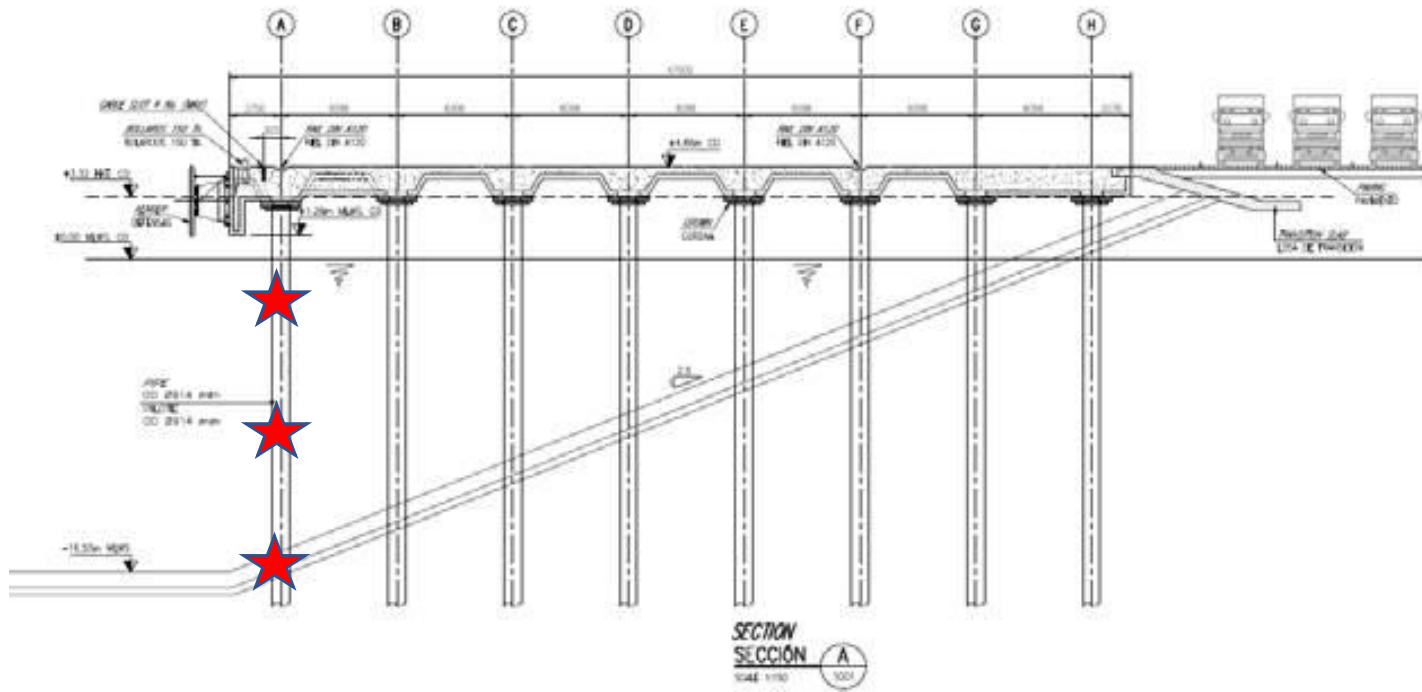


Terminal phase 1 is an interesting place for installing ecological habitat as it is facing the main entrance of the harbor (800meter from entrance).

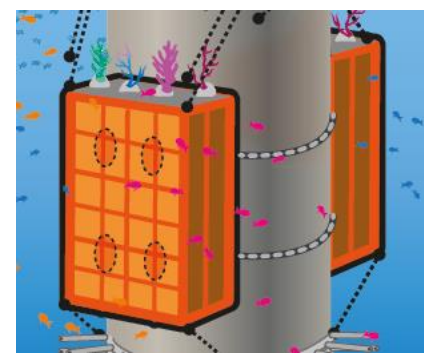


- Regarding this picture, seawater near Terminal 1 future working area seems to be good and transparent, with a good quality re expected
- Any existing Environmental Impact assessment (EIA) are welcome to better know the local fish and crustaceans assemblage.

Faesability



- Biohut can be easily strap with specified Kevlar Roblon Strap (made for oil&gas) around the external pile of the dock platform
- Ecological interest is to install Biohut from surface to bottom (3 or 4 stages) on different external pile (far from the lateral propellor of the tanker)



Return of experience in commercial harbor

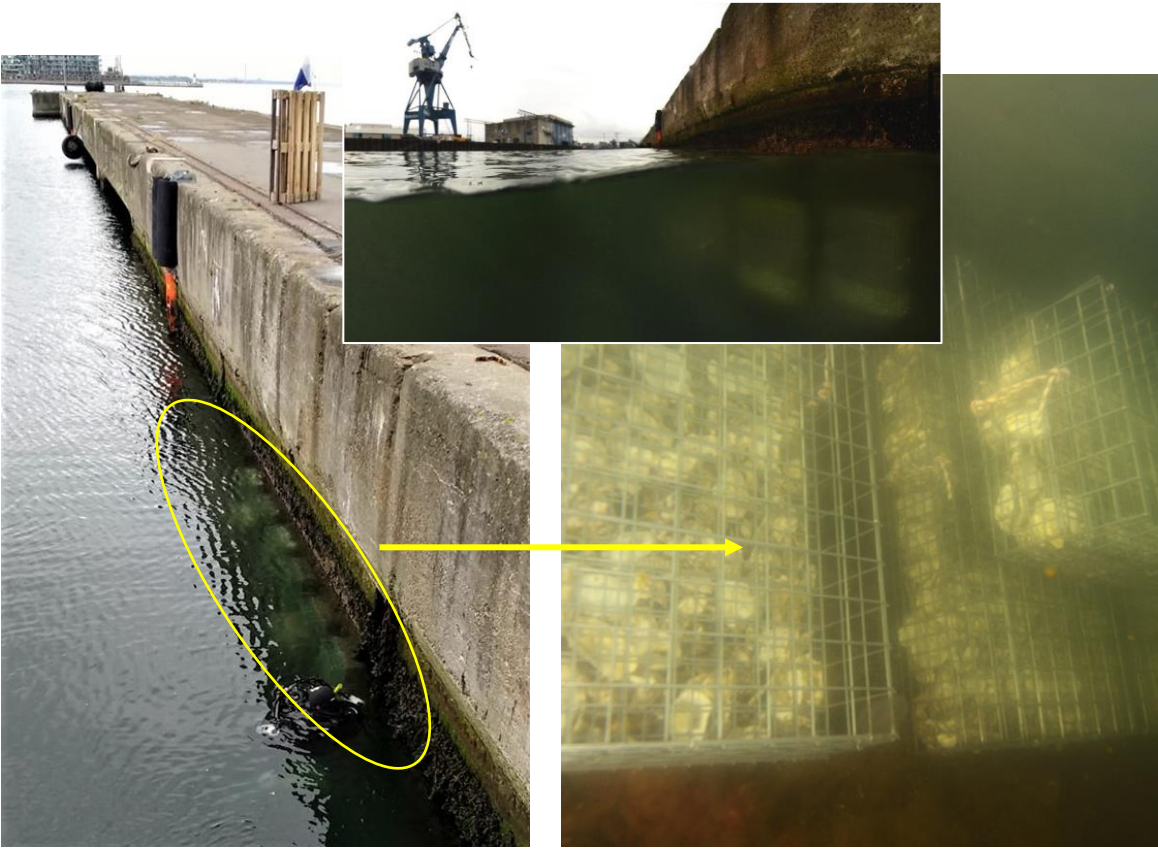


Marseille Harbor

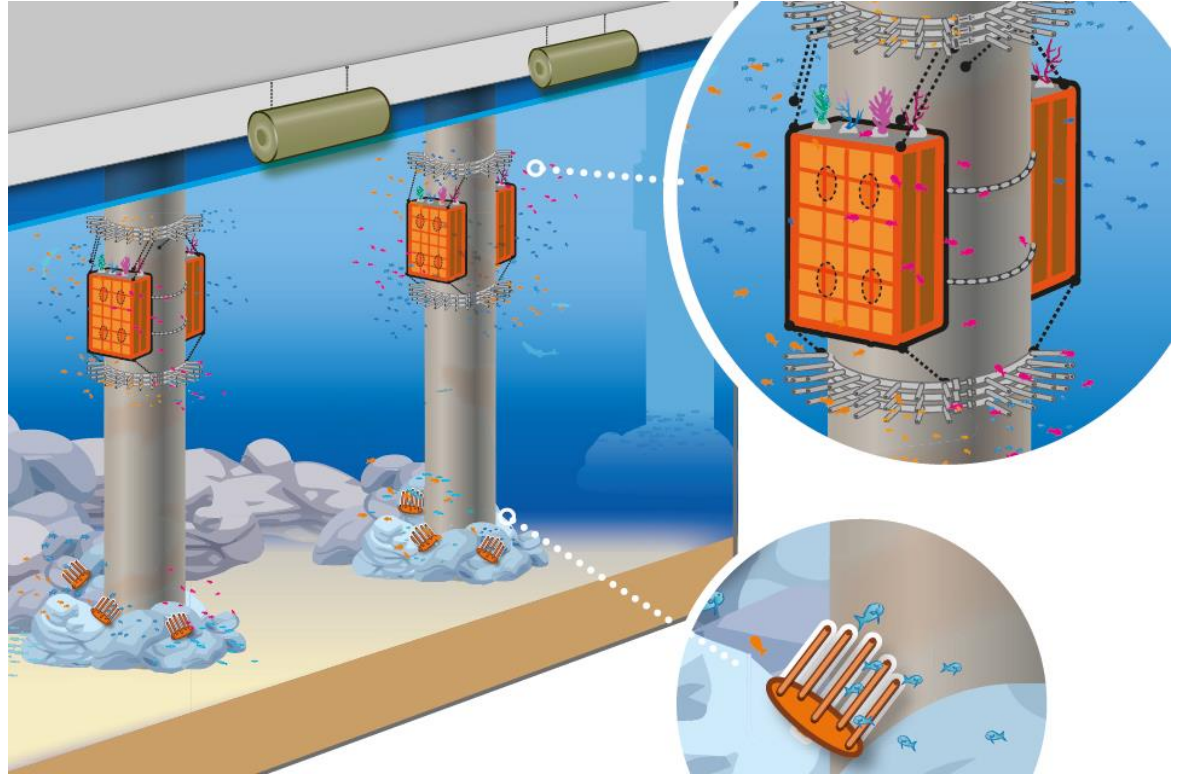


Calais harbor

Return of experience in commercial harbor



Aarhus harbor



Futuna island dock (on-going sea work)



Connecting cities to ports



Connecting cities to ports

Opportunities to raise public awareness

▶ Educational activities

- ▶ Work with local schools/youth
- ▶ Dedicated games
- ▶ Field activities to discover local biodiversity

▶ Communication support

- ▶ Panels, leaflets, events

▶ Involvement of local stakeholders

- ▶ Schools, fishermen, scientists, associations, etc.



Connecting cities to ports

Opportunities to raise public awareness



Biohut functions can be completed by :

- ✓ **Informative panels**
- ✓ **Educational activities** about the role of ports in hosting biodiversity
- ✓ « Touch biodiversity » actions

Connecting cities to ports

Opportunities to raise public awareness



Connecting cities to ports

Opportunities to raise public awareness



Before : A parking for boats...

8 years old kids drawings
before and after education
activities about the Biohut



After : ...hosting a rich Biodiversity

Need a local partnership

PECES SAPO

Sapo boquiblanca

Opsanus beta

Habita en conchas de moluscos y en fondos rocosos, pero también en arrecifes. De ambientes marinos y costeros. Es carnívoro y se alimenta de crustáceos, peces, gusanos.

Coloración parda y moteada con blanco. Presenta muchas barbillas alrededor de la boca. Puede alcanzar una longitud total es de hasta 38 cm.



GOBIOS

Gobio Desnudo

Gobiosoma bosc

Es una especie costera, frecuentemente asociada a lechos de ostras, hierbas marinas y zonas rocosas.

Presenta una coloración de barras pálidas laterales.

Barbillas pequeñas arriba de la boca y frente a los ojos.

Su longitud total es de hasta 6cm.



Biohut®, con el fin de aumentar la conciencia pública sobre la vida subacuática; tanto de ambientes marinos, costeros y dulceacuicolas.



Sobre el Biohut®

El propósito central de Biohut® es replicar la función ecológica de "guarderías" para larvas de peces y crustáceos. Al mismo tiempo, es un sustrato para el desarrollo de fauna y flora sesil; como ostiones y algas.



Talleres de Educación Ambiental BIOOBS

Observación de la biodiversidad subacuática.



PROYECTO PILOTO DE REFUGIOS ARTIFICIALES PARA PECES

PLAN DE MANEJO CGG-TAURUS

REFUGIO PARA ESPECIES IMPORTANTES
Los Biohut, pueden brindar un refugio seguro para muchas especies de importancia comercial o en alguna categoría de peligro.

FUENTE DE ALIMENTO
Las algas y materia orgánica que se desarrollan entre los ostiones sirven de alimento para cangrejos y camarones.

SUSTRATO DE FIJACIÓN
Las conchas de ostiones vacías funcionan como sustrato para que otros bivalvos se desarrollen en él.

PROTECCIÓN CONTRA DEPREDADORES
El espacio que se encuentra dentro de las rejillas, provee a los peces y crustáceos, de una zona segura para que puedan nadar sin el riesgo de ser comidos por peces más grandes.

Este proyecto implementa unos dispositivos de restauración ecológica llamados **Biohut**, que proporciona un refugio seguro a larvas de peces y otros macroinvertebrados; lo cual, favorece el crecimiento de sus poblaciones.

See movie



Cost estimation

Designation		Qty	Unit €	Year1&2	year1	observation
Material			24 600 €	€	€	
Biohut fish nursery	Biohut (2 Biohut per floor x 3 floor depth = 6 per pile x 5 pile = 30)	30	455 €	13 650 €	13 650 €	
Fixing material	Roblon kevlar strap and wire	45	30 €	1 350 €	1 350 €	
Shipment cost	Freight to San Pedro, trunks etc	1	1 500 €	1 500 €	1 500 €	still to define
Monitoring kit material	dedicated 2000 microns net, aquariums, hand nets,	2	300 €	600 €	- €	
Game 1	Captain Game (see brochure)	1	5 000 €	5 000 €	- €	
Game 2	Fish Warrior (see brochure)	1	2 500 €	2 500 €	- €	
Export/import taxes	paid by final customer	1	- €	- €	- €	
Ecocean expertise			16 375 €			
Personnel costs		25	655 €	16 375 €	15	9 825 €
<i>Project management</i>	<i>brainstorming, planning, management, strategy</i>			4	4	
<i>fieldwork</i>	<i>prediag, meeting, etc</i>			3	3	
<i>fieldwork</i>	<i>installation with certified diver</i>			4	4	
<i>fieldwork</i>	<i>capacity building to local partner (monitoring & educational tool)</i>			12	2	
<i>Project management</i>	<i>Reporting</i>			2	2	
Ecocean Travel			10 500 €			
Fligh	MTP to San Pedro Intle airpor	6	1 000 €	6 000 €	3	3 000 €
Expenses	Housing (days & night spent on field)	30	150 €	4 500 €	10	1 500 €
local partner				20 000 €	- €	to check with you
Monitoring days						
educational days						
local expenses						
Total cost				71 500 €	/ /	30 840 €
				with monitoring and education		only material and installation



Sustainable rearing- Ecological restoration- Fishing and rearing devices- Diagnostic uses

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