The Bay of Biscay case study

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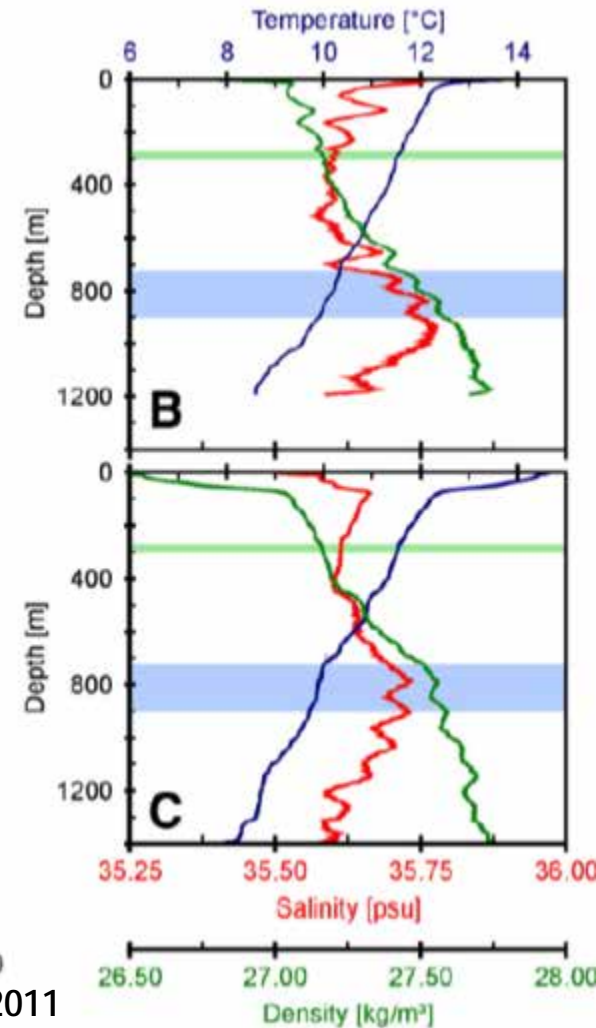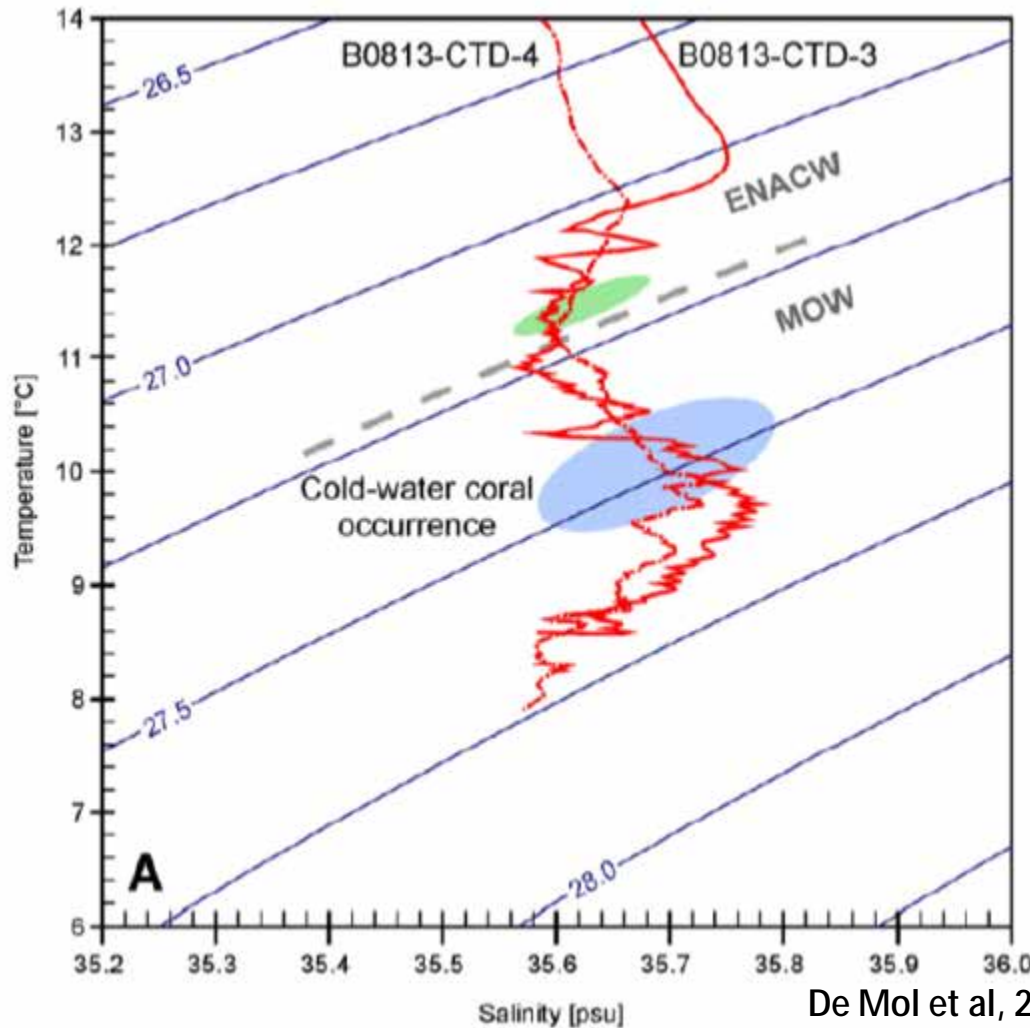
Fig. 1 a The continental margin of the Bay of Biscay with the geographic names used in the text. The shelf edge is on average at 250 m (*dashed line*) and the foot of the continental margin is at 4,000 m water depth (*crossed line*). Spacing of contour lines is 500 m. b Findings of cold-water scleractinians cluster along the continental margin in the Bay of Biscay. The map is modified from Sibuet et al. (2004)
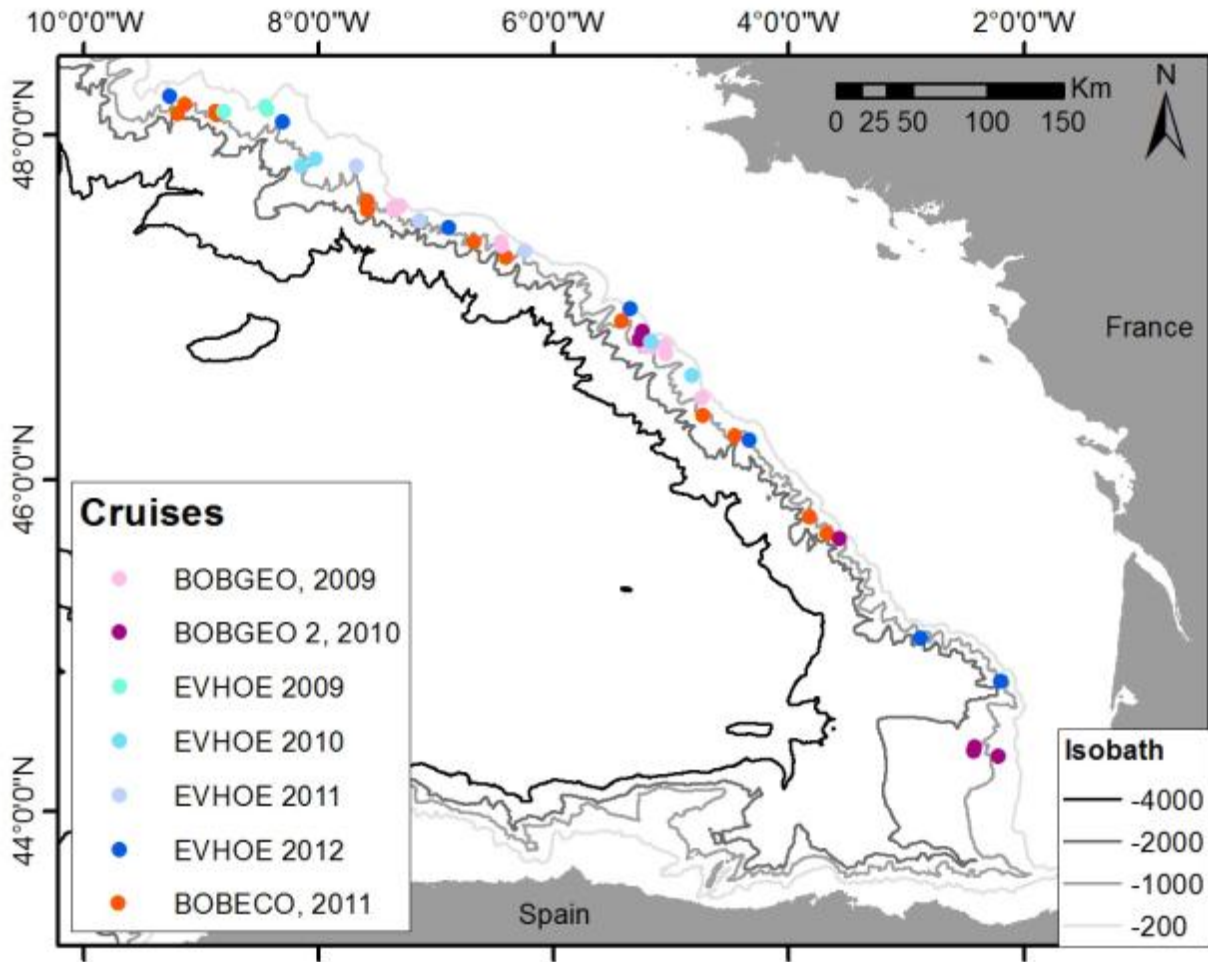
Reveillaud et al. 2008
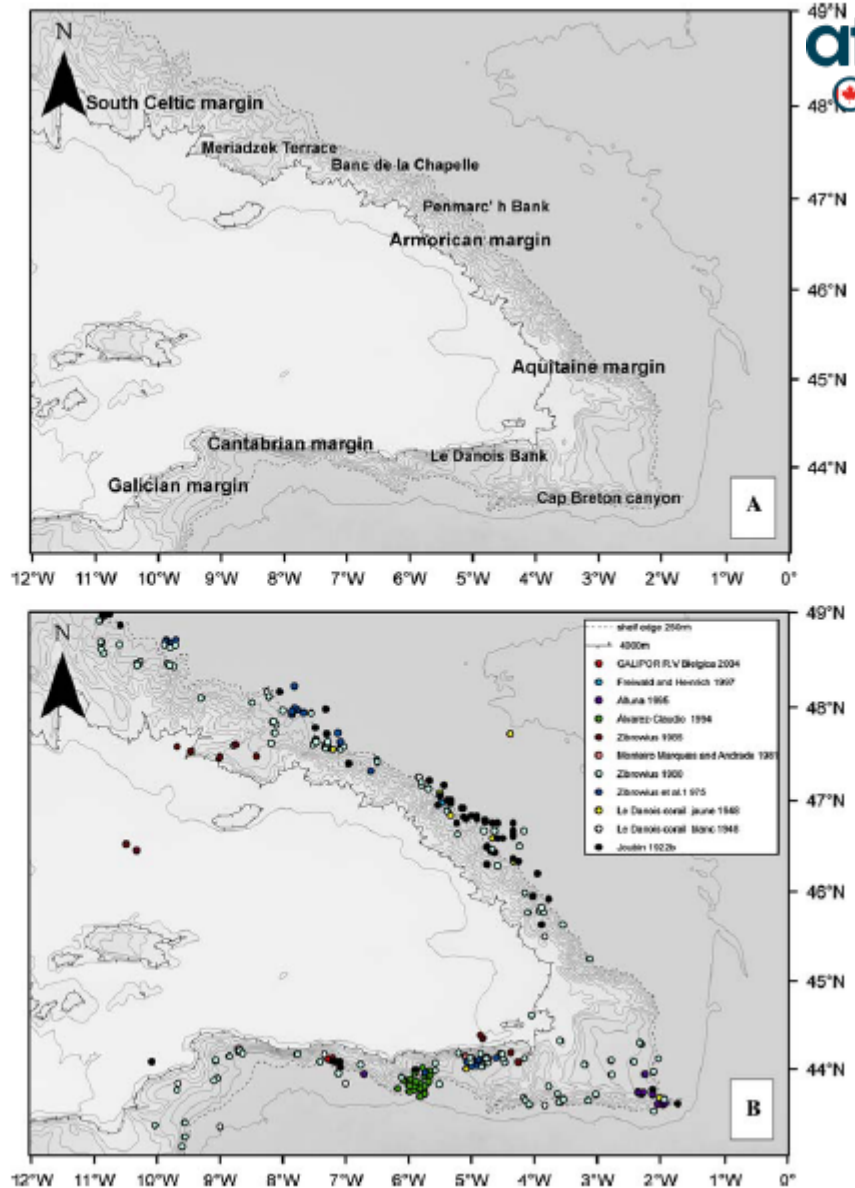
What do we know: The influence of water masses

De Mol et al, 2011

What do we know: CWC habitat and species

7 cruises
43 dives
24 canyons

Cruises
- BOBGEO, 2009
- BOBGEO 2, 2010
- EVHOE 2009
- EVHOE 2010
- EVHOE 2011
- EVHOE 2012
- BOBECO, 2011

Isobath
- −4000
- −2000
- −1000
- −200

What do we know: CWC habitat classification

| BIOTOPE - LEVEL 1 (Dominant group of taxa, structure)	BIOTOPE - LEVEL 2 (Dominant group of taxa, structure & substrate)	BIOTOPE - LEVEL 3 (Dominant subgroup of taxa and substrate)	FINAL CODE
1. Coral Reef	1. CW Scleractinian Reef	1. *Lophelia pertusa* Reef	1.1.1
		2. *Madrepora oculata* Reef	1.1.2
		3. Mixed *Madrepora oculata* and *Lophelia pertusa* Reef	1.1.3
		4. *Lophelia pertusa* and/or *Madrepora oculata* Reef with dense *Aphrocallistes*	1.1.4
		5. *Lophelia pertusa* and/or *Madrepora oculata* Reef with dense free living Crinoids	1.1.5
	2. Colonised CW Scleractinian Reef	1. *Lophelia pertusa* Reef Colonised by *Primnoa* and Plexauridae	1.2.1
		2. CW Scleractinian Reef Colonised by Antipatharians and/or Gorgonians	1.2.2
	3. Loosely-packed CW Scleractinian Framework with Soft Substrate	1. Loosely-packed *Lophelia pertusa* and/or *Madrepora oculata* Framework with Soft Substrate	1.3.1
	4. Colonised Loosely-packed CW Scleractinian Framework with Soft Substrate	1. Loosely-packed *Lophelia pertusa* Framework Colonised by *Primnoa* and Plexauridae	1.4.1
		2. Loosely-packed *Lophelia pertusa* and/or *Madrepora oculata* Framework with Soft Substrate Colonised by Antipatharians	1.4.2
		3. Loosely-packed *Solenosmilia variabilis* Framework with Soft Substrate Colonised by Gorgonians	1.4.3
	5. Mainly dead CW Scleractinian Reef	Isolated *Madrepora oculata-Lophelia pertusa* colonies on Framestones/Rudstones	1.5.1.
		Isolated *Madrepora oculata-Lophelia pertusa* colonies on mainly dead and low coral framework	1.5.2
	6. Dead CW Scleractinian Reef	1.Dead *Lophelia pertusa* and/or *Madrepora oculata* Framework with Brisingids	1.6.1
2. Coral Rubble	CW Scleractinian Rubble		2.1.1

Davies et al., submitted

What do we know: CWC habitat distribution

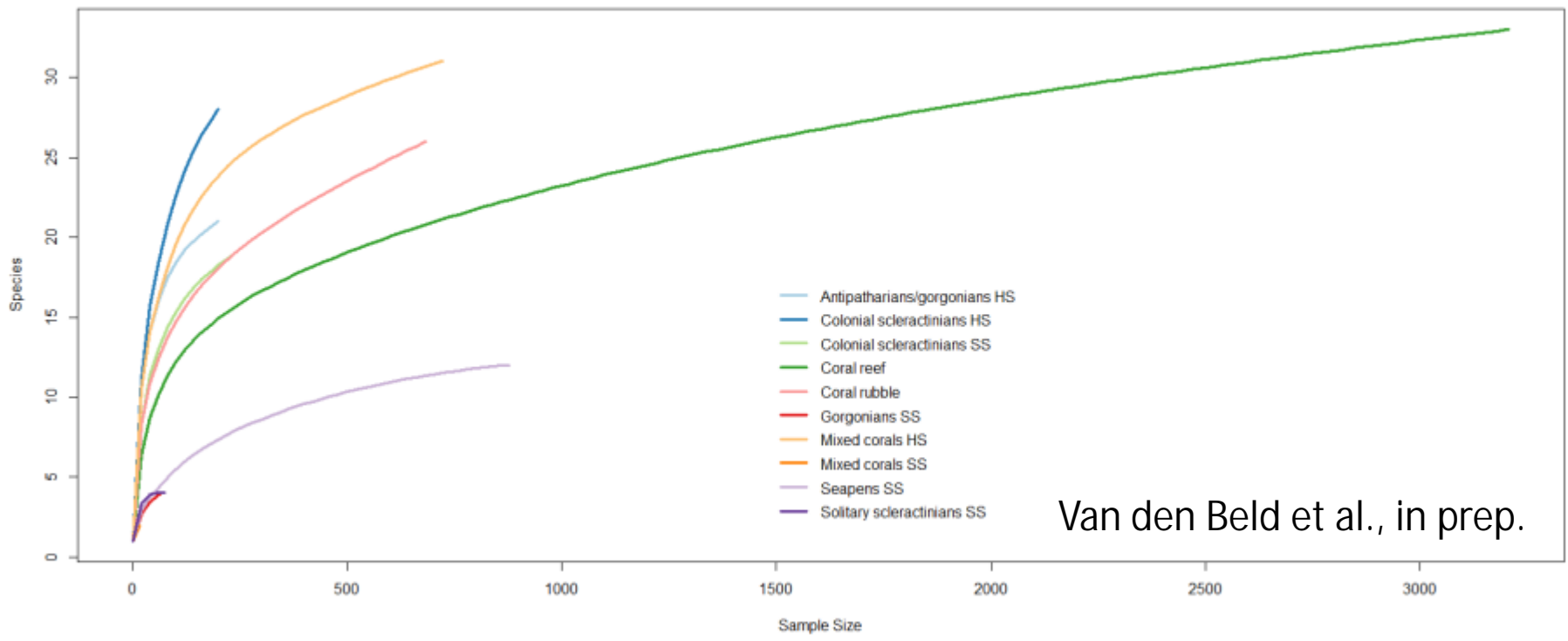48 km linear transects of CWC

60% of coral reefs and coral rubbles
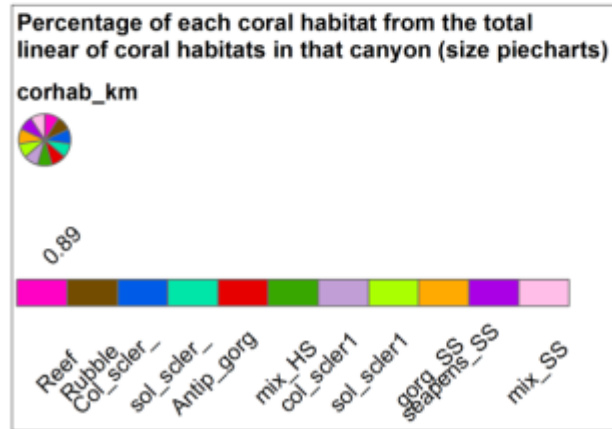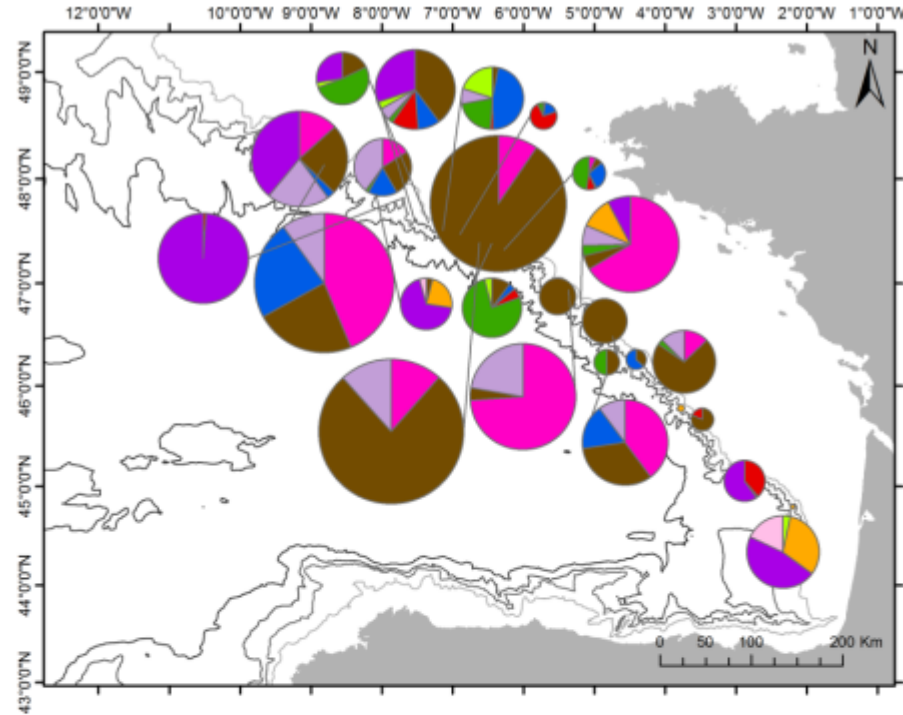
Van den Beld et al., in prep.
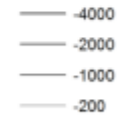
What do we know: CWC species diversity

60 coral morpho-types

Van den Beld et al., in prep.

Habitat species: global picture of the distribution of genetic polymorphism at the Northern Atlantic and Mediterranean scales

PAST:
-Systematic co-occurrence of M. oculata and L. pertusa from Bay of Biscay to Iceland
-Coherent with a recolonization of Atlantic by the Mediterranean for *L. pertusa*
-Coherent with two putative sources for *M. oculata*

PRESENT:
-Unexpectedly distinct patterns of genetic differentiation for both reef forming Scleractinians.

-Large scale pattern: standardization of µsatellites with Cheryl Morrison (& Jonathan Gardner NZ for Madrepora)

4 distinct genetic regions for *M. oculata*

Genetic homogeneity of *L. pertusa*
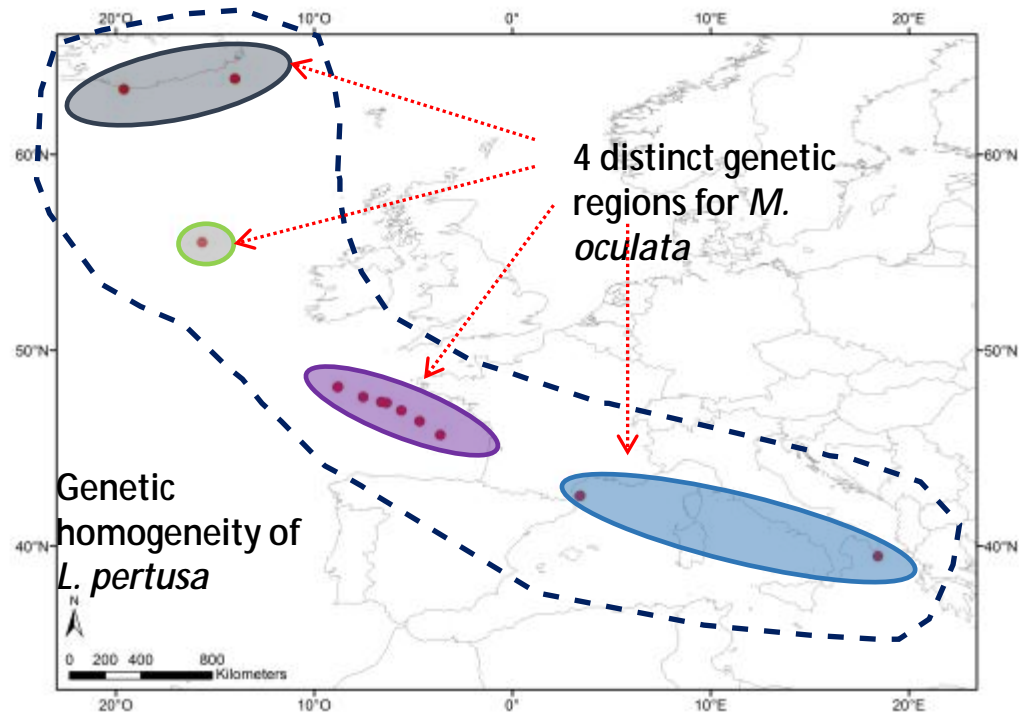
Ongoing RADSeq pilote on those samples

What do we know: Regional management measures (200-2000m)

- Some species regulation rules for fishing:
  - Interdiction
    - *e.g.* Orange roughy (2010), various sharks (*Centroscymnus coelolepis, Centrophorus squamosus, Dalatias licha, Etmopterus spinax, Galeus melastomus) ...*
  - TAC
    - *e.g. Lophius spp., Merluccius merluccius, Molva molva, Phycis blennoides, Pagellus bogaraveo, Coryphaenoides rupestris, Brosme brosme*
  - Various Rules:
    - *e.g.* Molva (min. length:35cm) ...

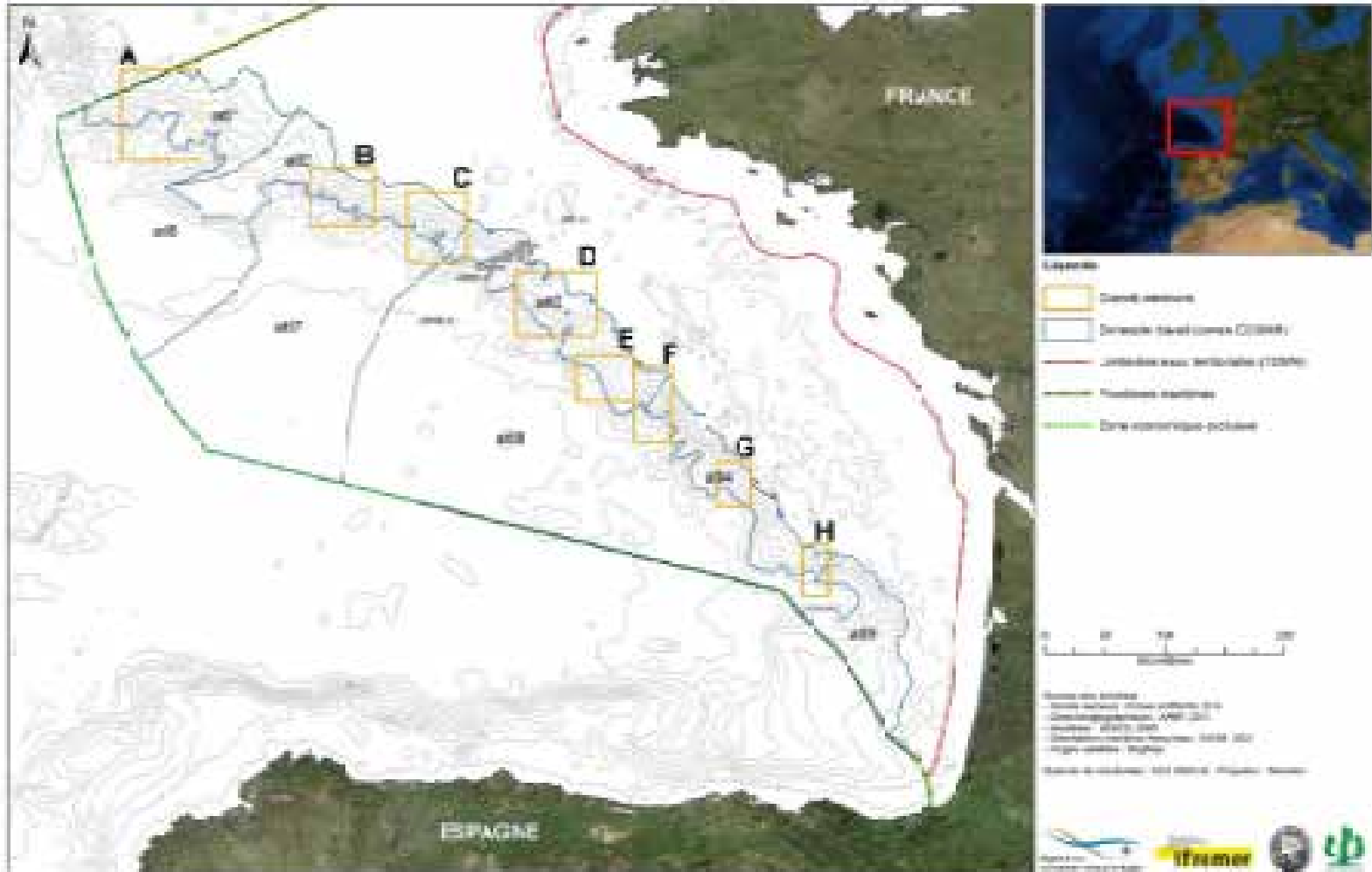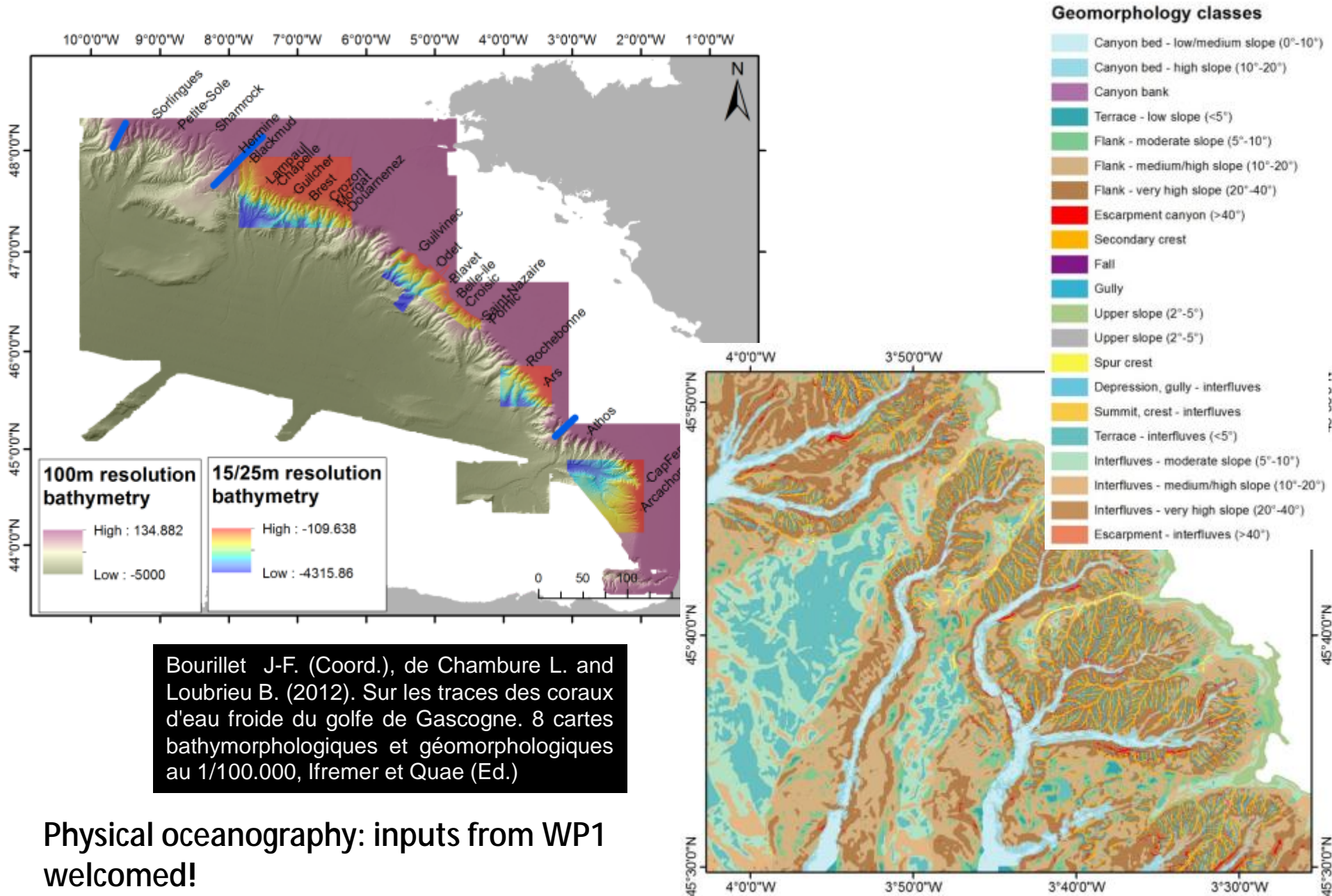# What do we know: A Natura 2000 network for reef habitats

What do we plan to do: CWC Habitat Suitability Models (WP3)

Geomorphology classes

- Canyon bed - low/medium slope (0°-10°)
- Canyon bed - high slope (10°-20°)
- Canyon bank
- Terrace - low slope (<5°)
- Flank - moderate slope (5°-10°)
- Flank - medium/high slope (10°-20°)
- Flank - very high slope (20°-40°)
- Escarpment canyon (>40°)
- Secondary crest
- Fall
- Gully
- Upper slope (2°-5°)
- Upper slope (2°-5°)
- Spur crest
- Depression, gully - interfluves
- Summit, crest - interfluves
- Terrace - interfluves (<5°)
- Interfluves - moderate slope (5°-10°)
- Interfluves - medium/high slope (10°-20°)
- Interfluves - very high slope (20°-40°)
- Escarpment - interfluves (>40°)

Bourillet J-F. (Coord.), de Chambure L. and Loubrieu B. (2012). Sur les traces des coraux d'eau froide du golfe de Gascogne. 8 cartes bathymorphologiques et géomorphologiques au 1/100.000, Ifremer et Quae (Ed.)

**Physical oceanography: inputs from WP1 welcomed!**

What do we plan to do: Fish Habitat Suitability Models and interaction with fisheries (WP3)

- SDM and HSM for fish combining survey, VMS/Logbook and environnemental data
- Explore fine scale interaction between fishing vessel swept area tracks and VME habitats

- Ubiquist species: occurring in both deep and shallower habitats
  - Merluccius, Lophius, ...
- Deep-waters ("potential CWC related") species
  - Aphanopus, Phycis, Coryphanoides, Hoplosthetus, Mora ...

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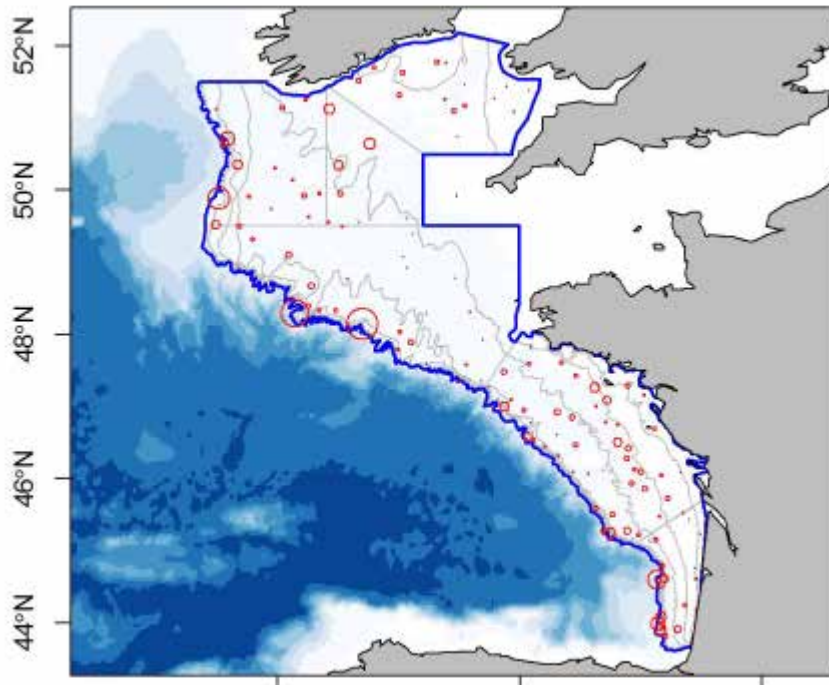
Hake densities from survey data
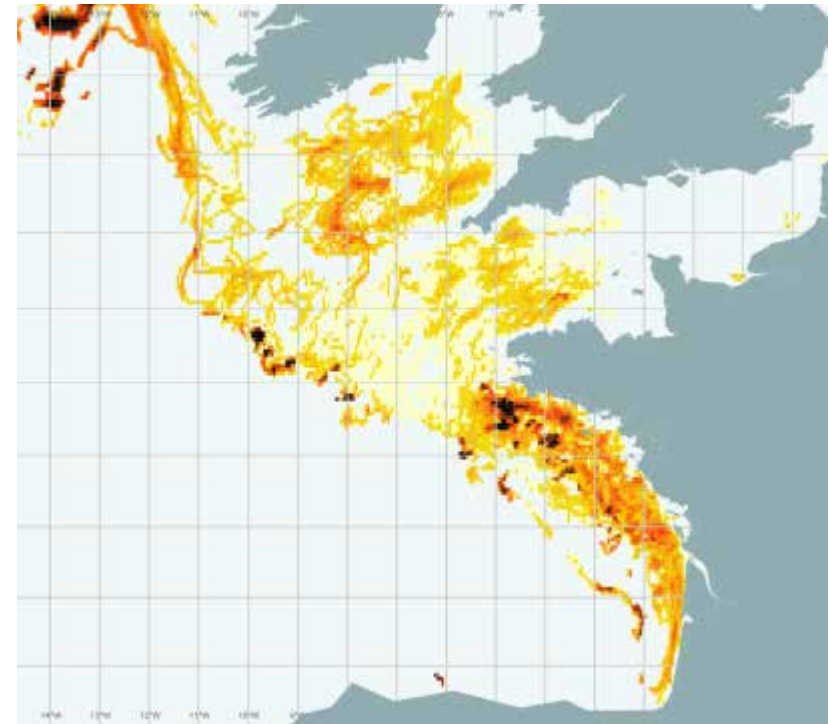
Hake catch from VMS/Logbook data

What do we plan to do: Population genetics and Seascape genome of selected key species (WP4)

Candidate key species:

Sebastes sp.

Habitat formers (e.g. *Lophelia pertusa***)**

Commercial fish species (e.g. *Sebastes sp.)*

Anticipated results: A framework will be given to develop seascape genomics models for habitat structuring species, including CWC and sponges that provide habitat for higher trophic levels such as commercial fisheries targets

What do we plan to do: Mapping sectorial activities (WP6)

- Collate VMS data
  - Pressure indicators: effort, intensity, frequency

Down to high resolution scale to be utilized as pressure indicators into CWC habitat modelling
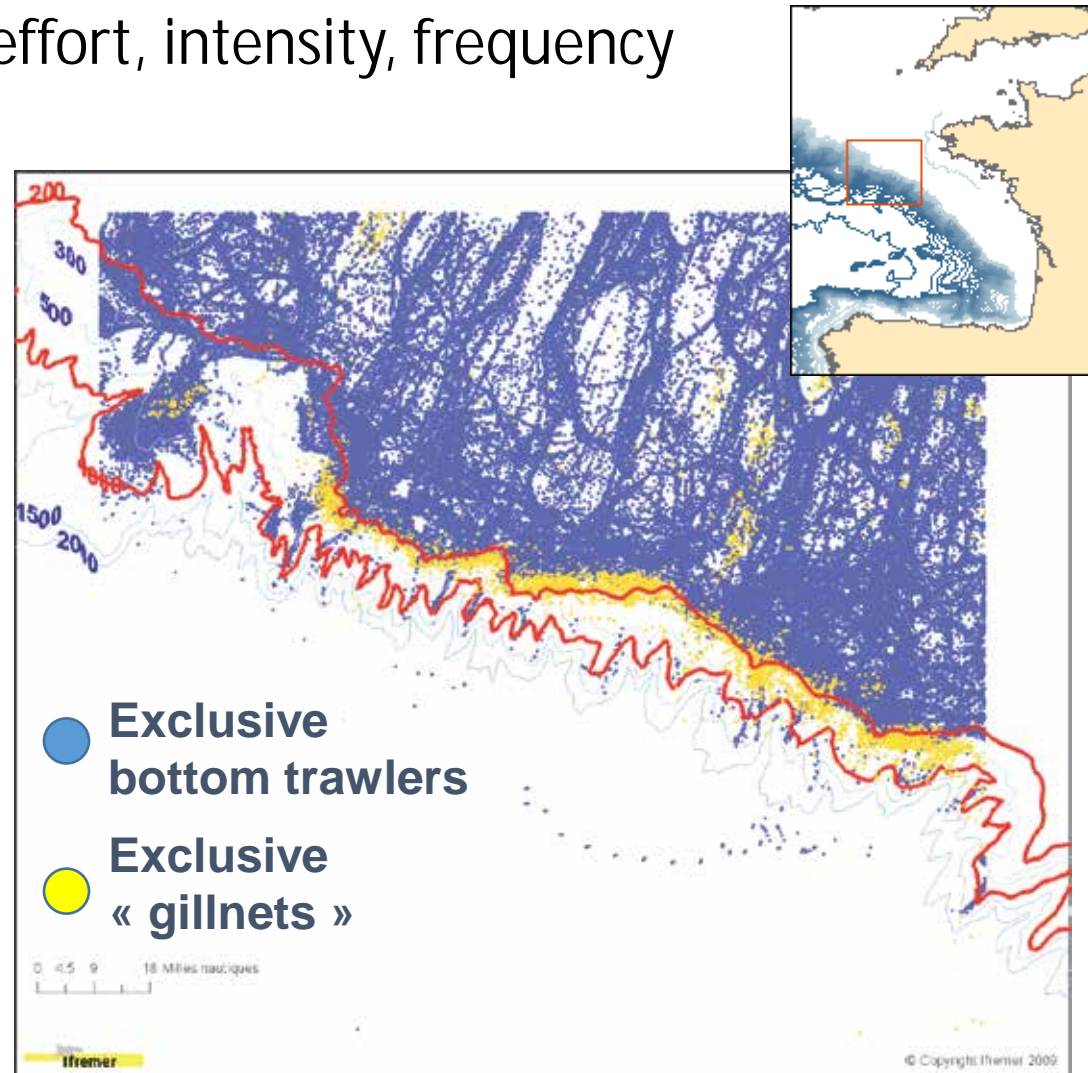
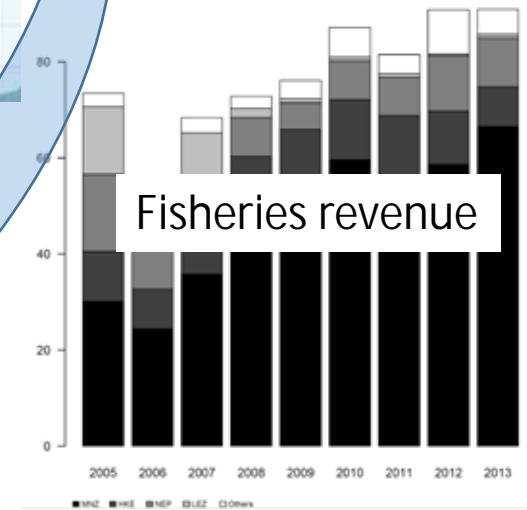# What do we plan to do: Mapping sectorial activities (WP5/WP6)
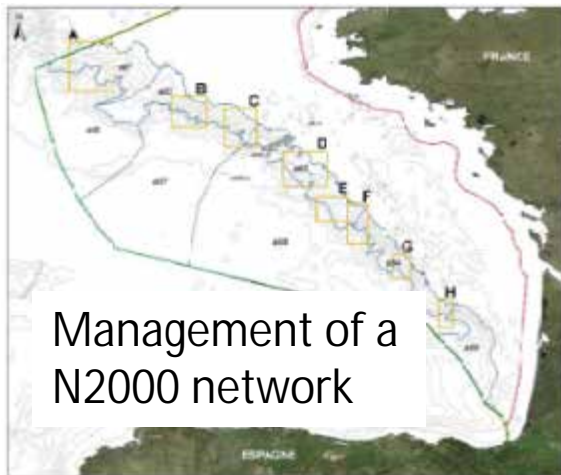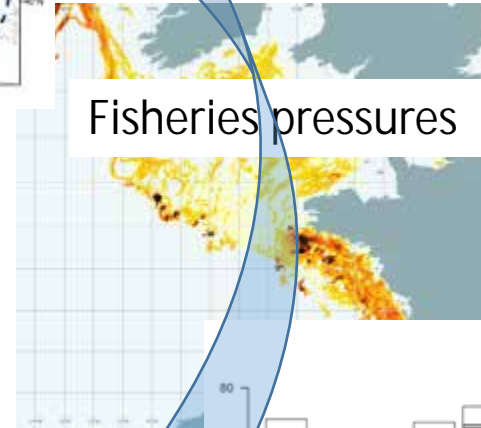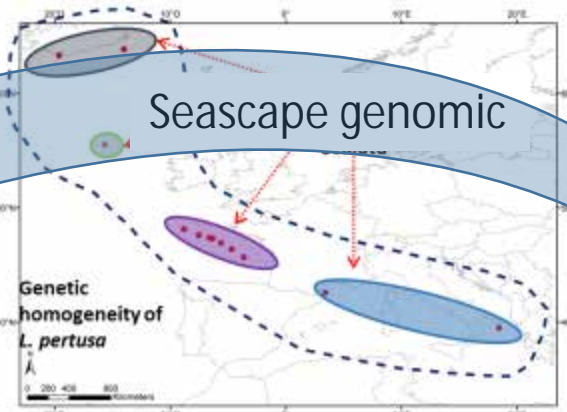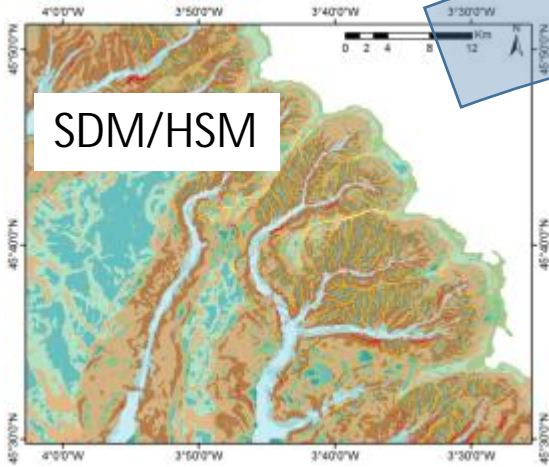
- Collate VMS data
  - Service indicators: production, gross revenue

e.g. Yearly evolution of landed species biomass (% of the total) in the BoB slope area (200-2000m)
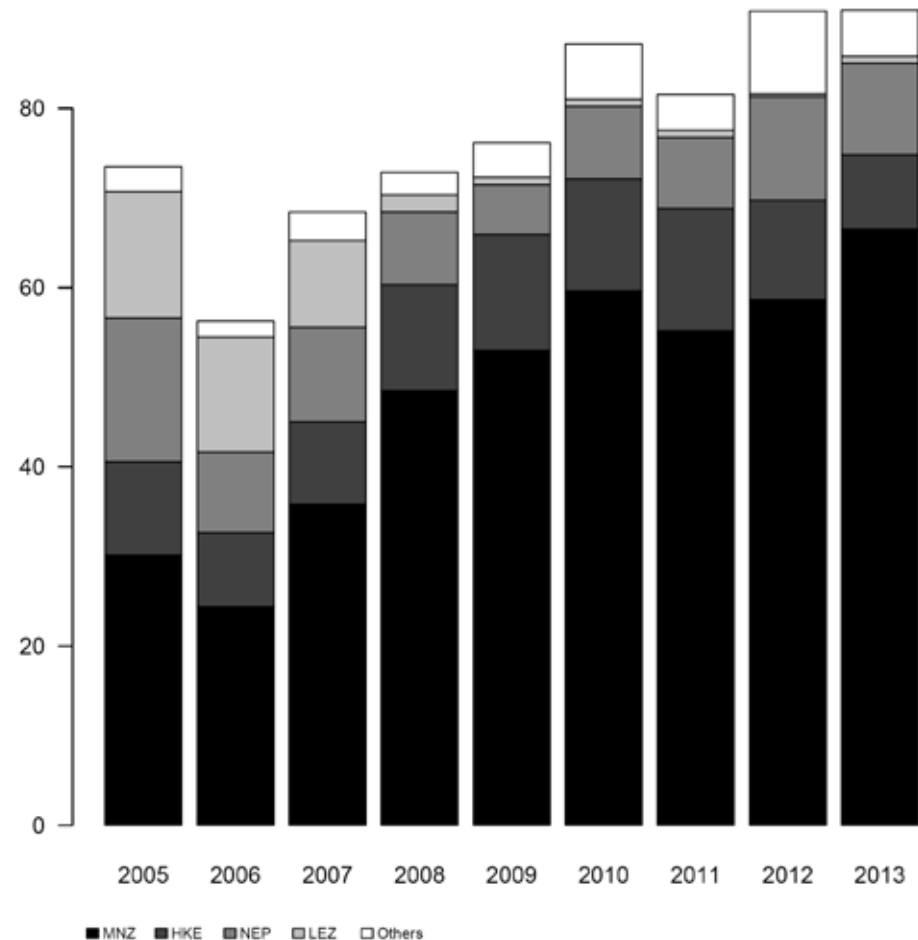
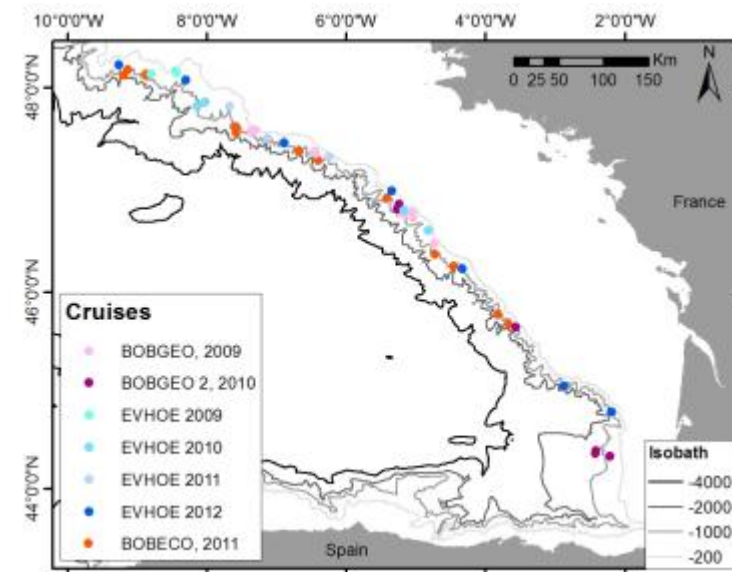# What do we plan to do: Marine Spatial Planning (WP6)

SDM/HSM

Seascape genomic

Genetic homogeneity of *L. pertusa*

Fisheries pressures

Fisheries revenue

Management of a N2000 network

What do we plan to do: Cruises

Trans-Atlantic cruise 2018
Cruise proposal (sept. 16)

Evhoe cruise
Yearly fish-stock
assessment cruises
+ towed camera

Acknowledgements