

Deep-sea: Vulnerable Marine Ecosystems in the North Atlantic Ocean:

NEREIDA & ECOVUL/ARPA projects



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Programa de Pesquerías Lejanas
Centro Oceanográfico de Vigo
ESPAÑA



*“Deep-sea: Vulnerable Marine Ecosystems in the North Atlantic Ocean”
18th March 2014. Brussels*

Identification of VMEs in the High Seas

-Since 2004, discussions on VME have been taking place at the United Nations General Assembly (UNGA). This process culminated in 2006 with the adoption of the UNGA Resolution 61/105.

-In 2009, FAO published the *“International Guidelines for the Management of Deep-Sea Fisheries in the High Seas”*

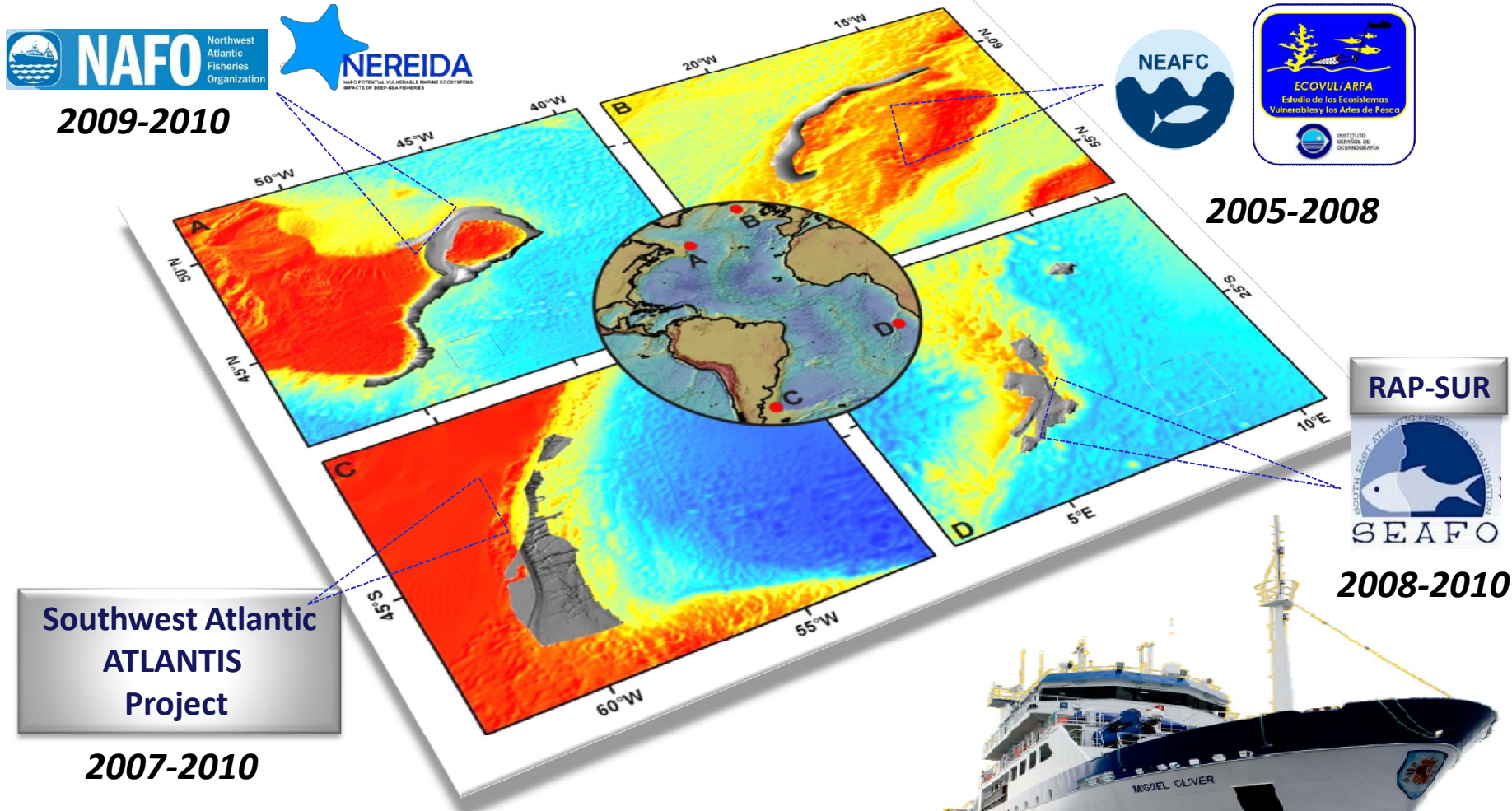


Biological characteristics used as criteria in VME identification:

- Uniqueness or rarity
- Functional significance of the habitat
- Fragility
- Life-history traits of component species that may recovery difficult
- Structural complexity

Identification of VMEs in the High Seas

Spain has undertaken, since 2005, an ambitious and costly program of scientific mapping of the seabed in different parts of the oceans:



VME Case Studies



	<i>Ecovul-Arpa</i>	<i>Nereida</i>	<i>Atlantis</i>	<i>Rap-Sur</i>
RFMO	NEAFC	NAFO		SEAFO
Multibeam (km²)	18.760	68.900	59.100	15.823
Seismic (km)	1.121	18.600	91.900	1.455
Box Corer	13	341	209	
Rock Dredges	22	104	102	15
CTD		414	519	136
Trawls	38		413	63
Commercial Hauls	3.675	SLB-NAFO	12.788	1.267
Cooperative Surveys	+		+	+
Photos/video		+	+	

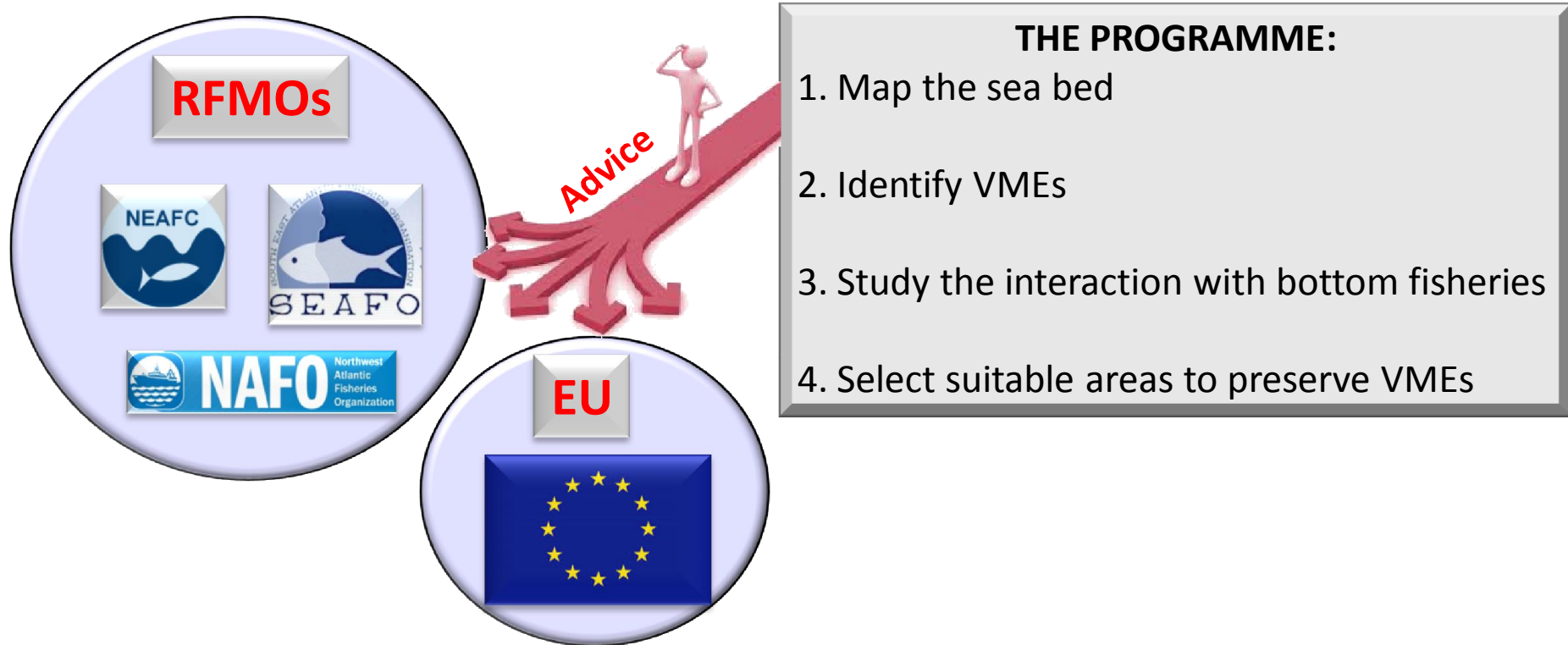
**Surveyed
area ~ 19.000 km²**

[~22.500 km²]

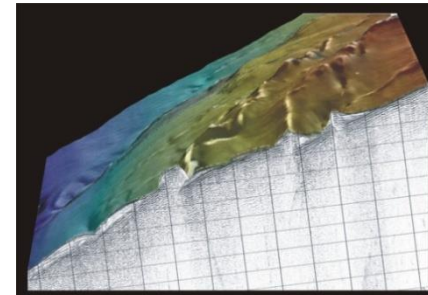
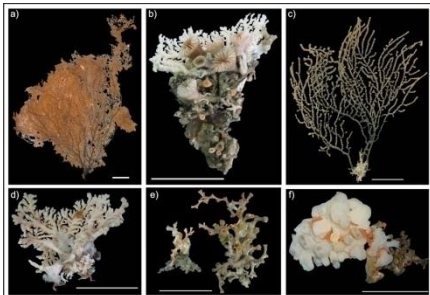
**Surveyed
area ~ 69.000 km²**

[~8.500 km²]

Research program in the Atlantic Ocean: Objectives

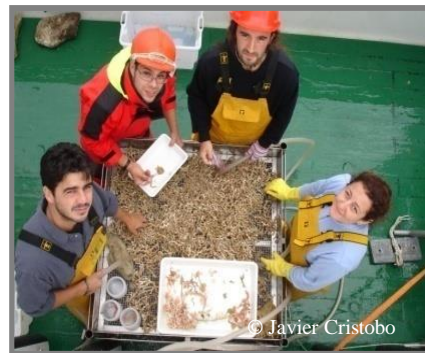
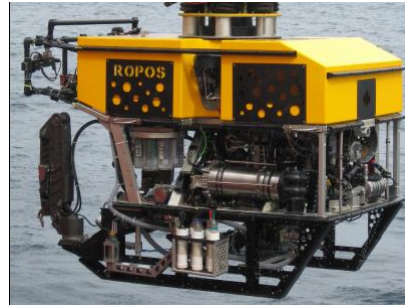


UNGA Resolution 61/105 on protecting VMEs on the High Seas



Research programme: Multidisciplinary Approach

- “ Conventional Fisheries Science
- “ Geomorphology
- “ Benthic Ecology
- “ Sedimentology
- “ Oceanography



Northwest Atlantic: **NEREIDA project**



Main Researcher: **Dra. M^a Mar Sacau Cuadrado**

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NW Atlantic: NEREIDA Project

Nafo potEncial vulneRable marine Ecosystems.
Impacts of Deep-seA fisheries

INTERNATIONAL PROGRAMME LEAD BY SPAIN

Spain

SGM-SGP Secretaría General del Mar. Ministerio de Medio Ambiente y Medio Rural Marino
IEO-Instituto Español de Oceanografía. Ministerio de Economía y Competitividad

Canada

Geological Survey of Canada. Natural Resources
Canadian Hydrographic Service. Fisheries and Oceans
Ecosystem Research Division. Fisheries and Oceans

UK

CEFAS-Centre for Environment Fisheries and Aquaculture Science

Russia

Russian Academy of Sciences. P.P. Shirshov Institute of Oceanology.



R/V Miguel Oliver

Main Researcher: **Dra. Mar Sacau Cuadrado**

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NEREIDA project: Objectives

GENERAL OBJETIVE

NEREIDA SURVEYS HAVE AS MAIN OBJETIVE THE MULTIDISCIPLINARY RESEARCH OF THE SENSITIVE HABITATS AND FISHING ACTIVITIES AS WELL AS ANALYSIS OF THE FISHING RESOURCES FOR THE STUDY AND PROTECTION OF THE VULNERABLE ECOSYSTEMS

SPECIFIC OBJETIVES

TO IDENTIFY THE PRESENCE AND DISTRIBUTION OF THE ORGANIMS THAT CONSTITUTE VULNERABLE MARINE ECOSYSTEMS (COLD WATER CORALS, LARGE SPONGES ...)

TO DESCRIBE THE ECOLOGY OF THE DEEP SEA HABITATS IDENTIFIED

TO MAP THE DISTRIBUTION OF VMEs AND OTHER TOPOGRAPHICALLY DISTINCT FEATURES IN THE AREA OF STUDY

TO CREATE AND MAINTAIN A GEOGRAPHIC INFORMATION SYSTEM DATABASE OF ALL INFORMATION COLLECTED DURING THE PROYECT



R/V Miguel Oliver

MULTIDISCIPLINARY SURVEYS (2009-2010)

Cartography
Benthic ecology
Hydrography



R/V Hudson

NEREIDA: Study area & surveys

6 MULTIDISCIPLINARY SURVEYS

68,900 km² Multibeam bathymetry
18,606 km Sub-bottom profiles
341 BoxCorer
104 dredges
414 CTD

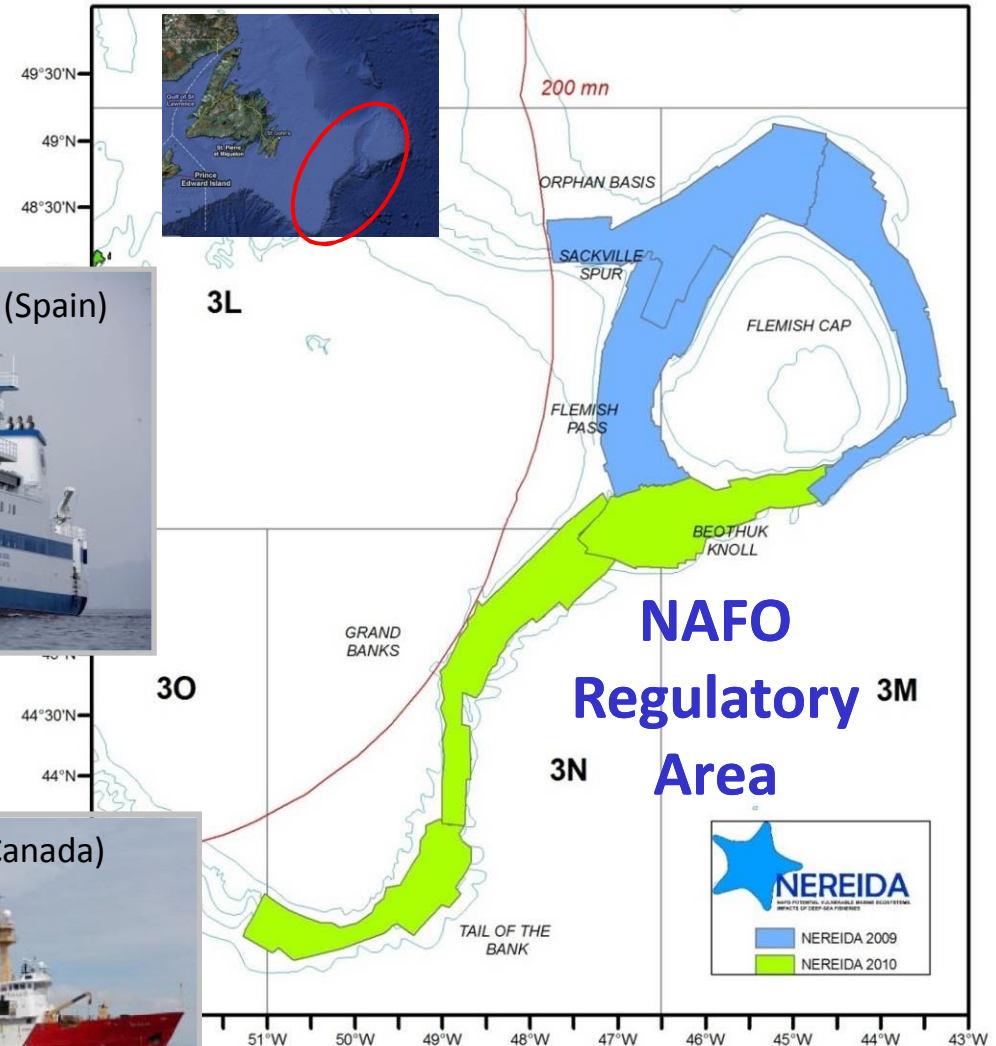
RV Miguel Oliver - SGM (Spain)



2 VISUAL SURVEYS

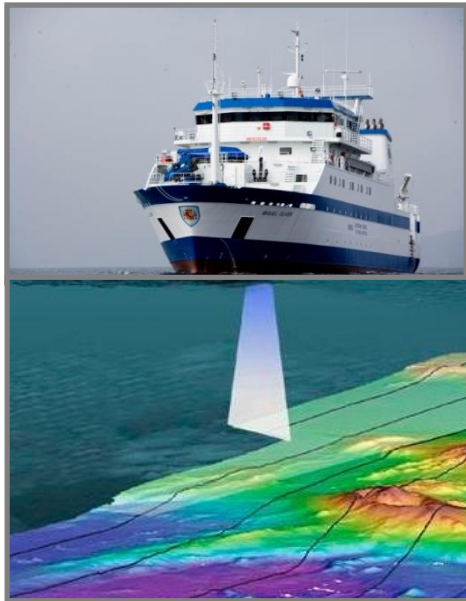
2,143 photos
116 hr video footage

RV Hudson - DFO (Canada)

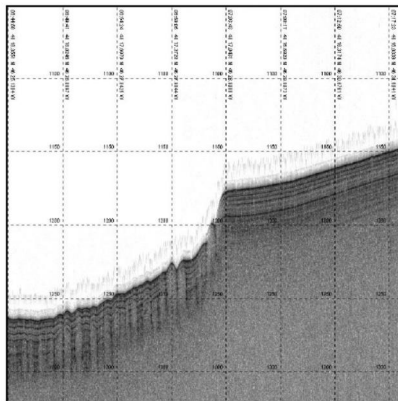


Surveyed area: ~69,000 km²
(High-seas)

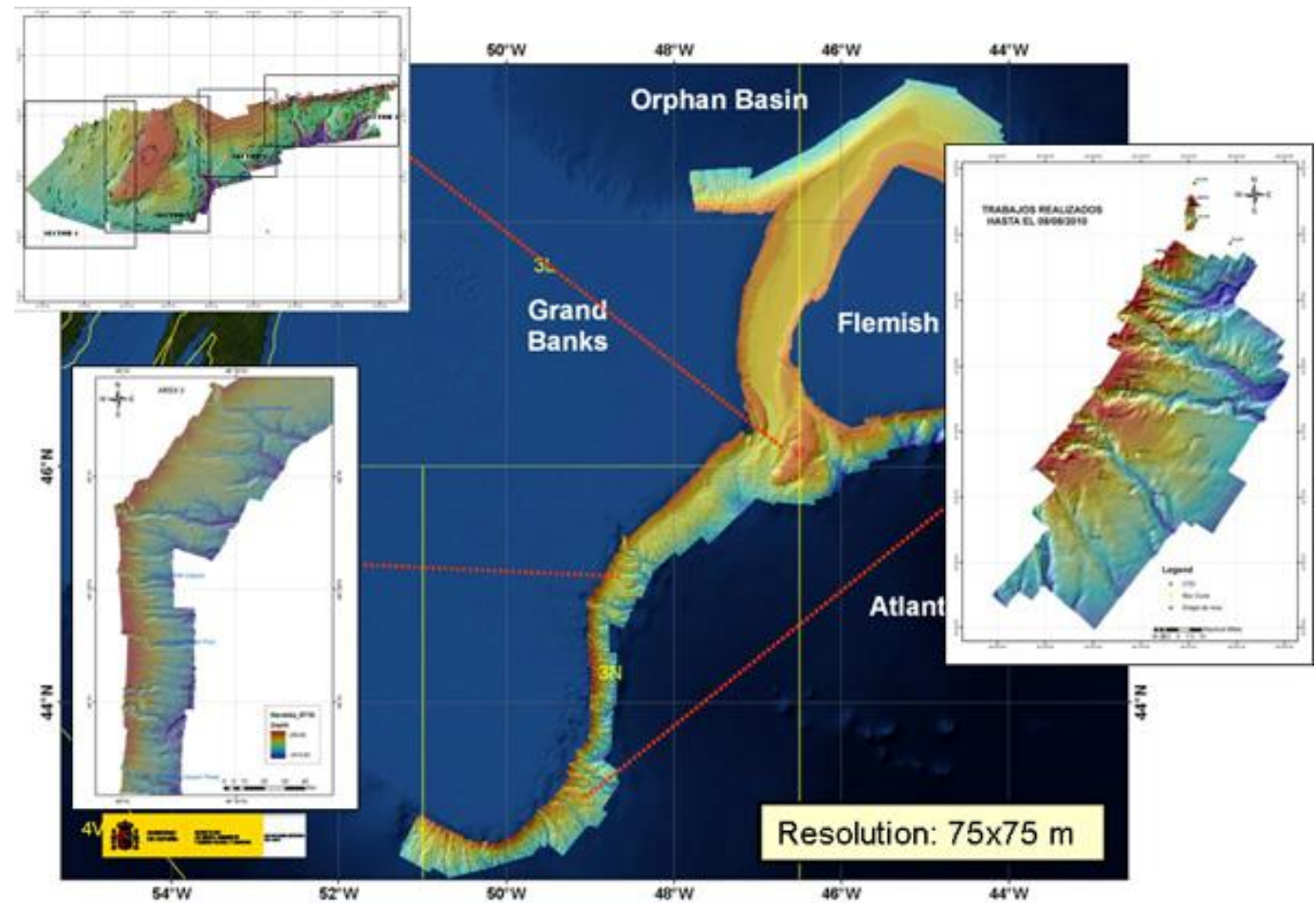
NEREIDA project: Cartography



Multibeam echosounder
Parametric sub bottom
profiler (TOPAS)

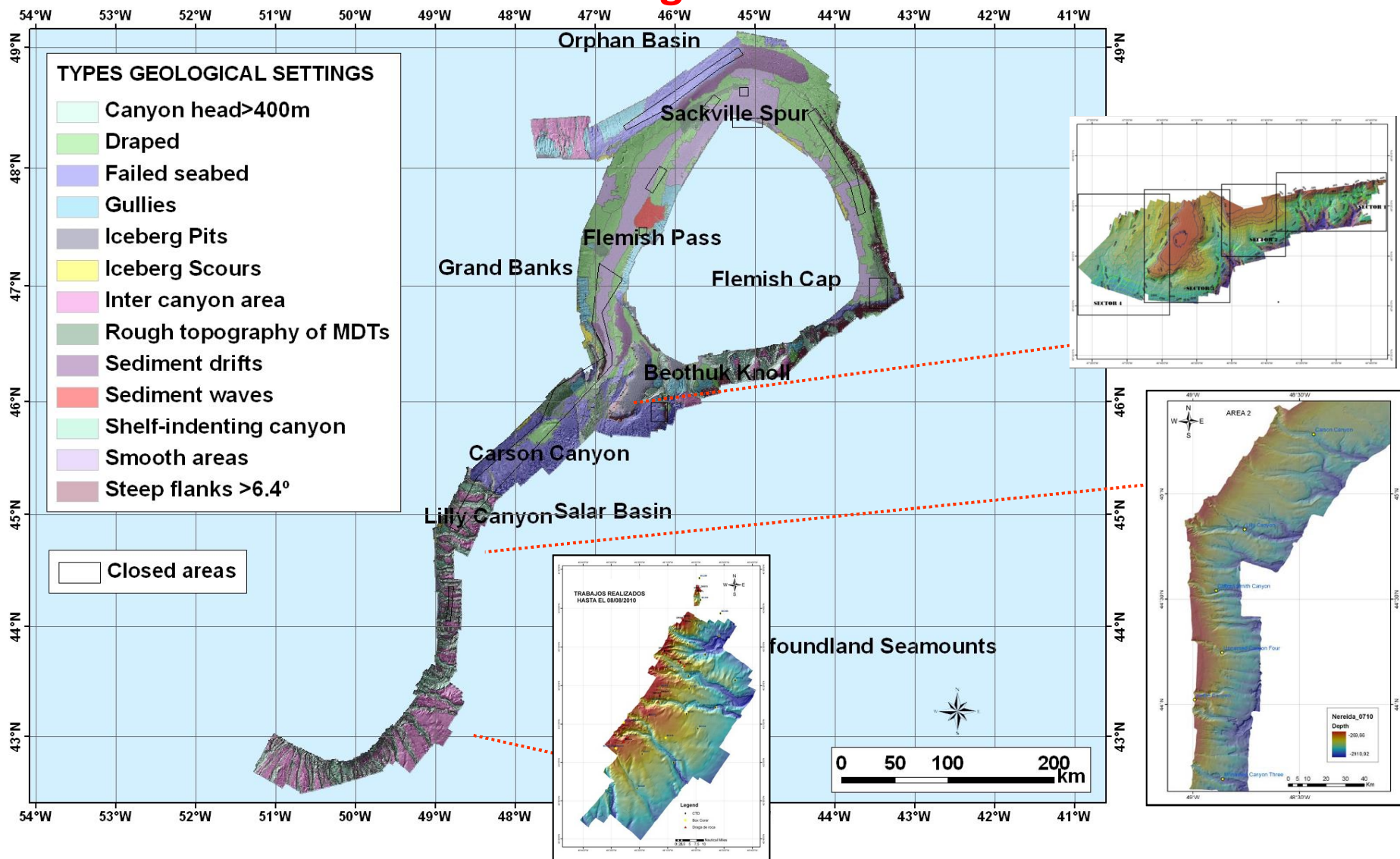


Multibeam prospected area: 68,950 km²
TOPAS lines: 28,113 km



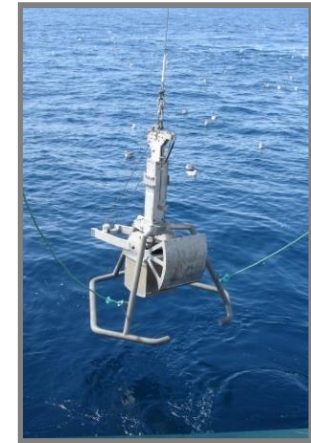
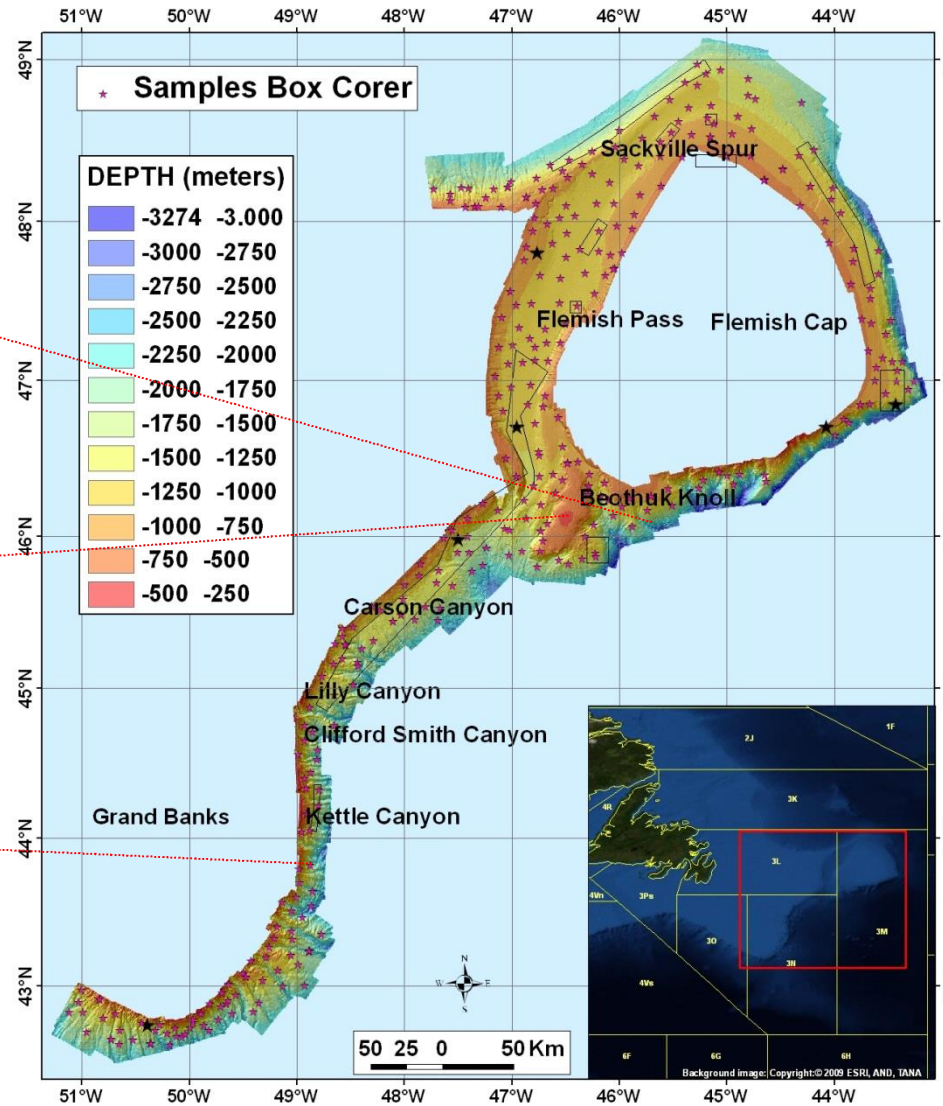
NEREIDA: Seabed features

13 Geological features



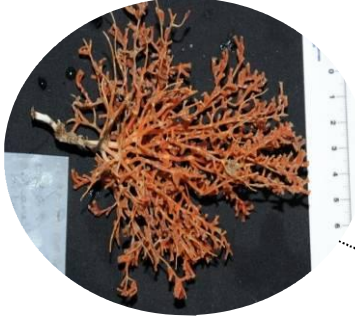
RV Miguel Oliver - SGM (Spain)

NEREIDA BENTHIC STUDIES: BOX CORERS



NEREIDA BENTHIC STUDIES: Rock Dredges

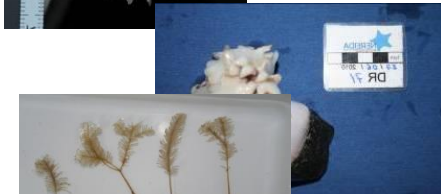
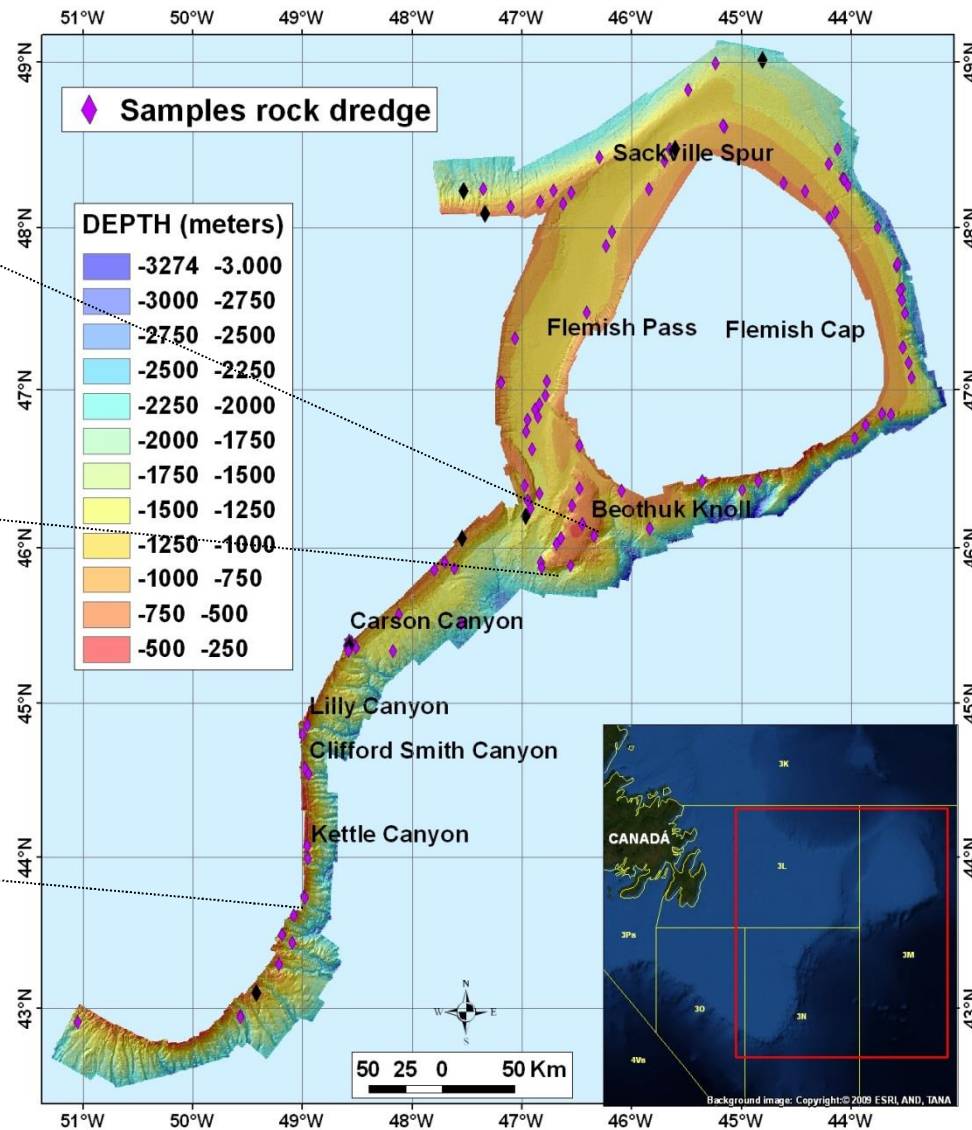
Acanella arbuscula



Geodia macandrewi



Mediaster bairdi



NEREIDA: Management measures

2009 - 2010

NAFO closed 11 areas identified by groundfish surveys (UE, Spain and Canada)

Protection of concentrations of corals - sponges ("significant catches")

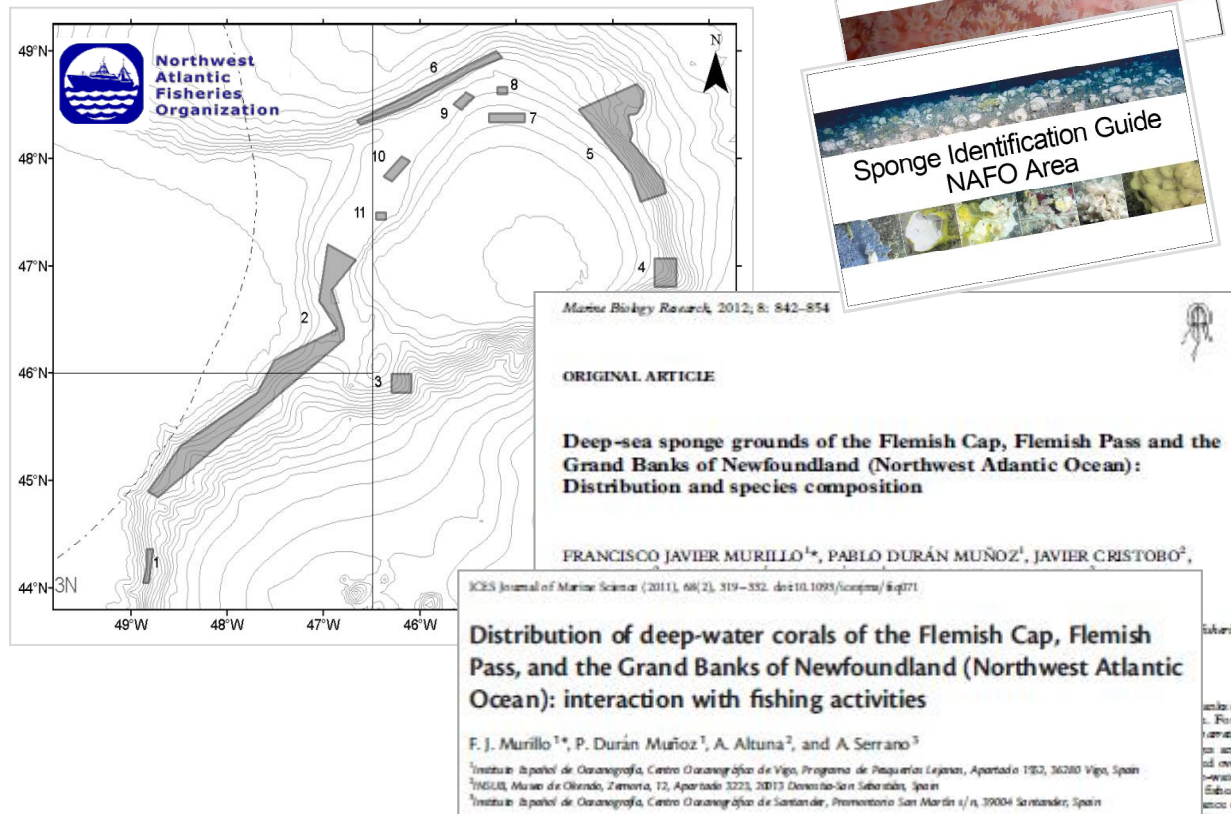


CURRENT SITUATION

11 closed areas

~ 8,500 km²

(Review: December 2014)



UTILITY

- " VME Database
- " Suitability of the current closed areas?
- " Refine the boundaries?
- " New areas?

NAFO Management measures

Area Closures & Protection Zones

Actions and decisions taken by NAFO

2007

Four seamounts closed to bottom fishing

2008

A *Coral Protection Zone* declared in Division 30

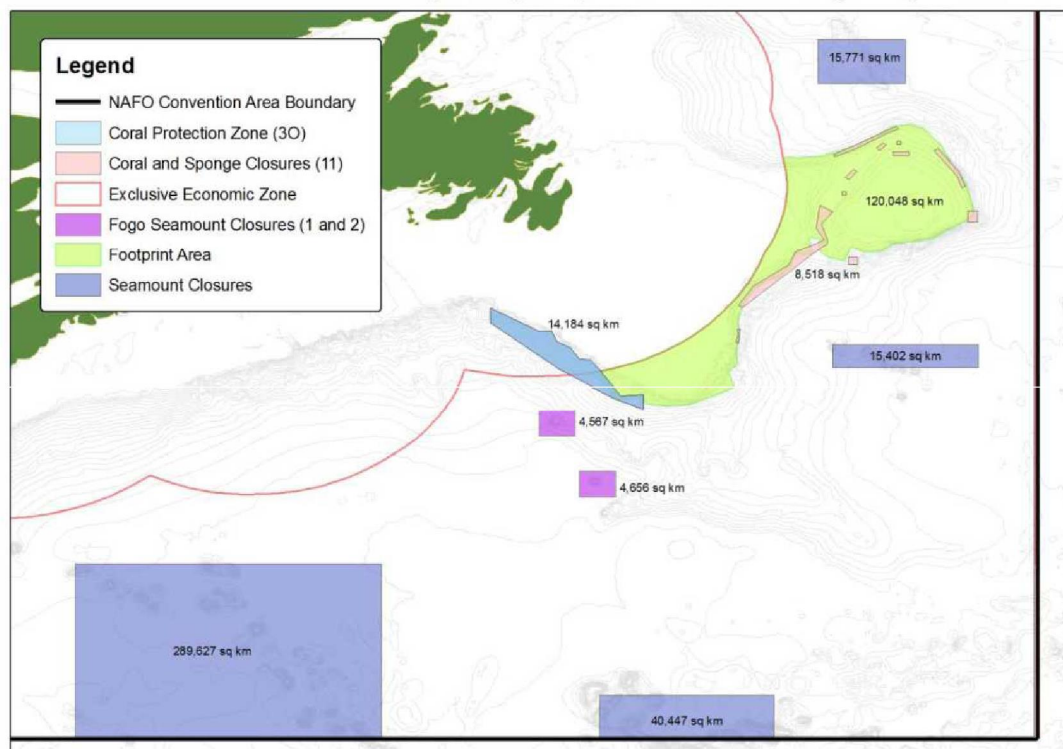
2009

Two more seamounts closed

2010

Eleven areas were closed to bottom fishing to protect significant concentration of corals and sponges

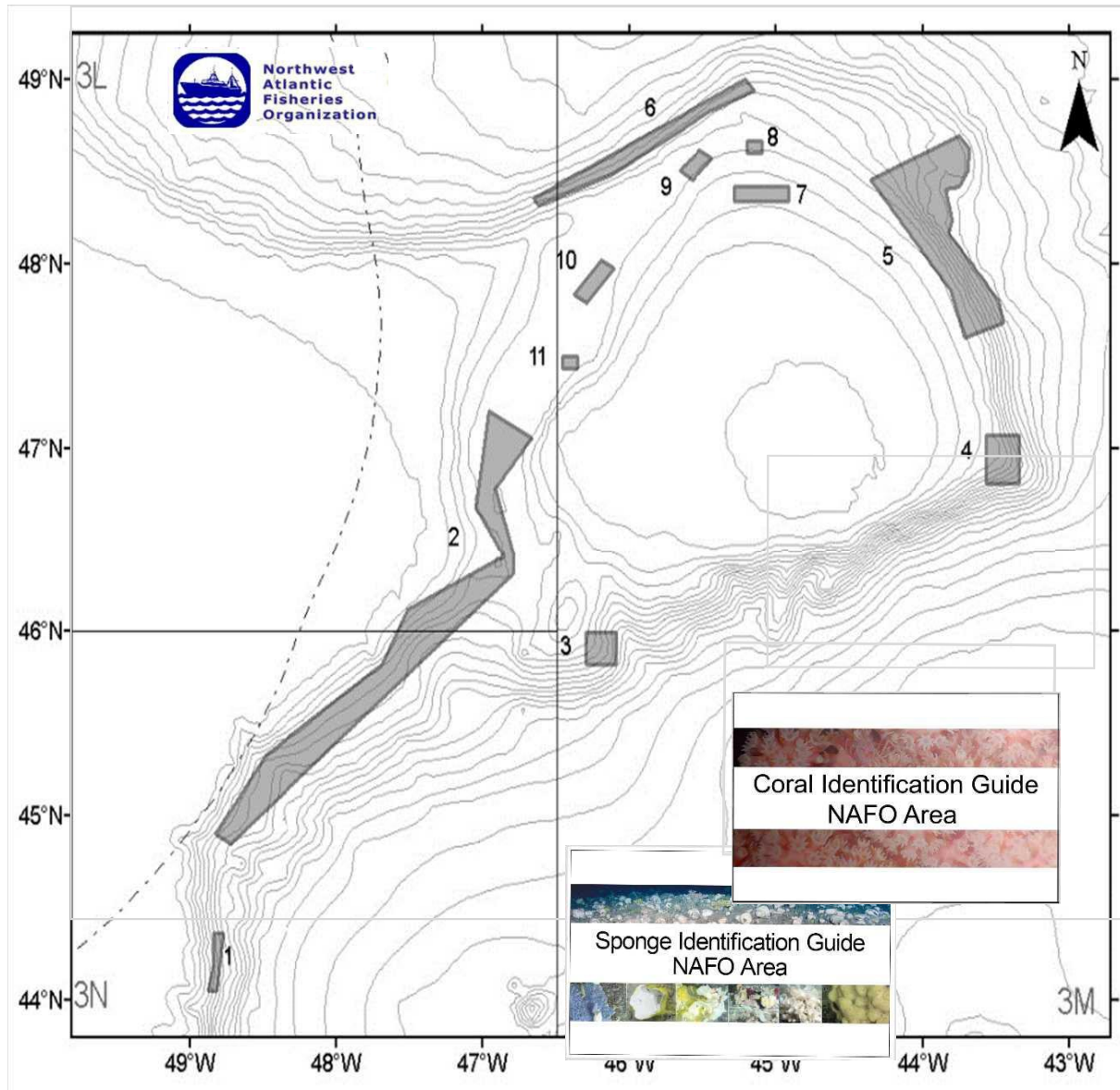
NAFO's Vulnerable Marine Ecosystem (VME) Closures and Fishing Footprint Area



NAFO Convention Area (Area 21) 6,551,289 sq km
NAFO Regulatory Area 2,707,895 sq km

In total **18** areas in NAFO RA have been **closed to bottom fishing**

NEREIDA: NAFO Management measures



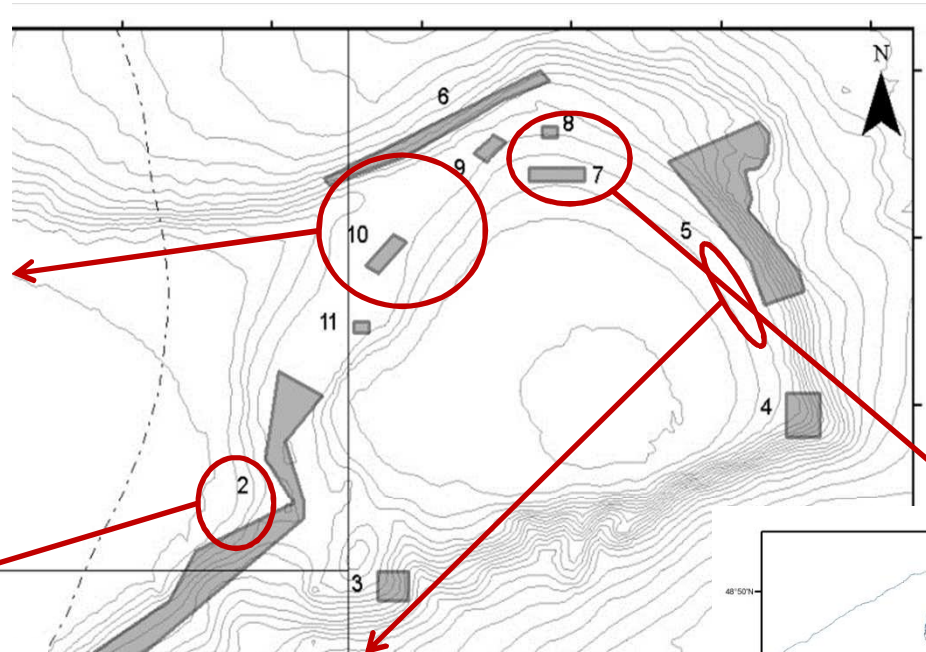
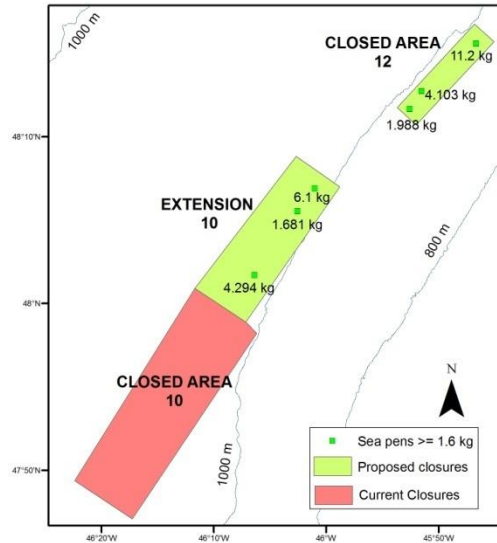
CURRENT SITUATION

11 closed areas
identified by
groundfish surveys
(UE, Spain and Canada).
**Protection of corals and
sponges**
~ 8,500 km²

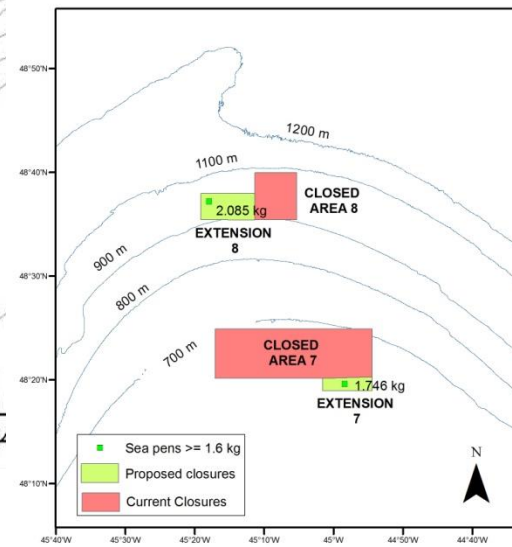
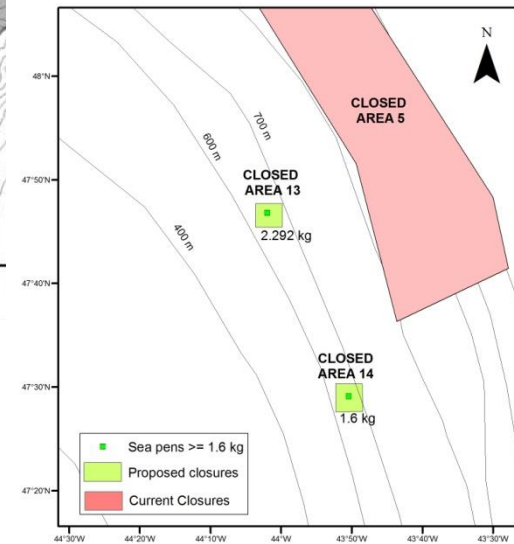
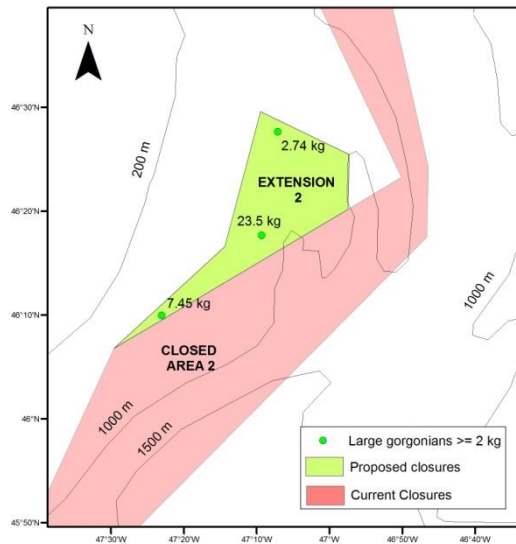
These areas are being
REFINED in light of
the information
collected through
NEREIDA.

Review by the
Fisheries Commission
in
2014

NEREIDA: NAFO Management measures



WG -> REVISION
 New scientific information
 +
 VMS data



Recommendations -> FC
 Extensions/Addition

Northeast Atlantic, Hatton Bank: **ECOVUL/ARPA project**



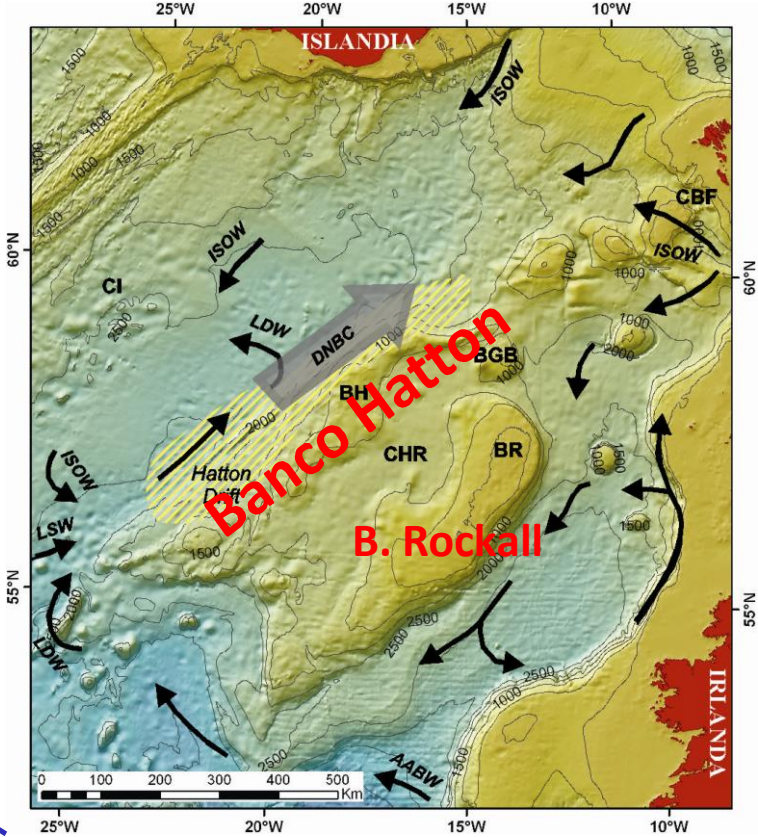
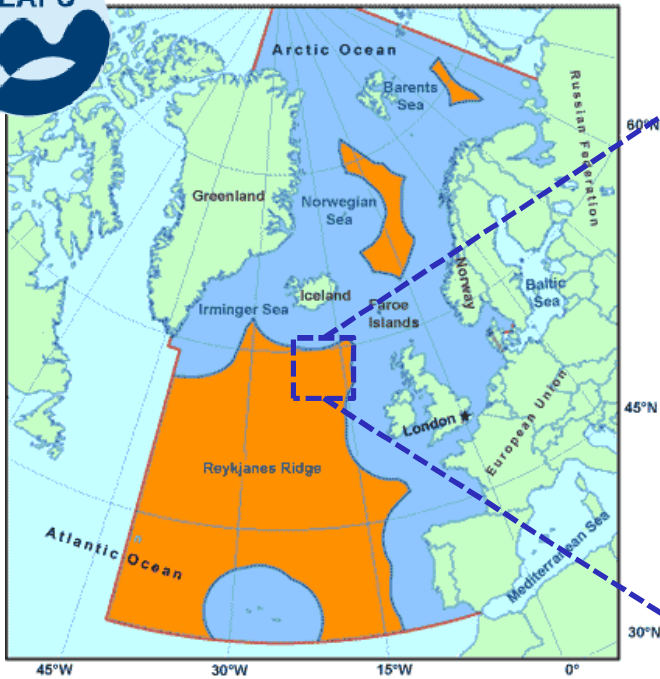
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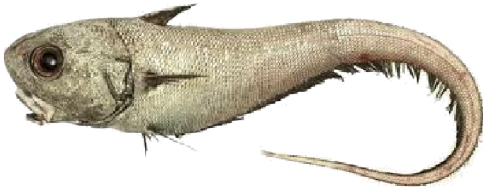
 pablo.duran@vi.ieo.es

Study area: Hatton Bank (NE Atlantic)

Source: Sayago-Gil *et al.*, 2010



Roundnose Grenadier

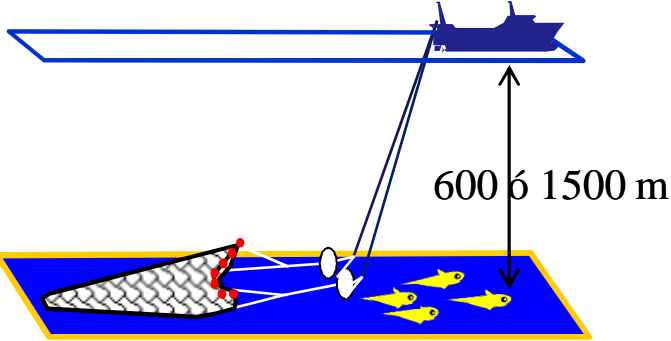


(Coryphaenoides rupestris)

Smoothheads

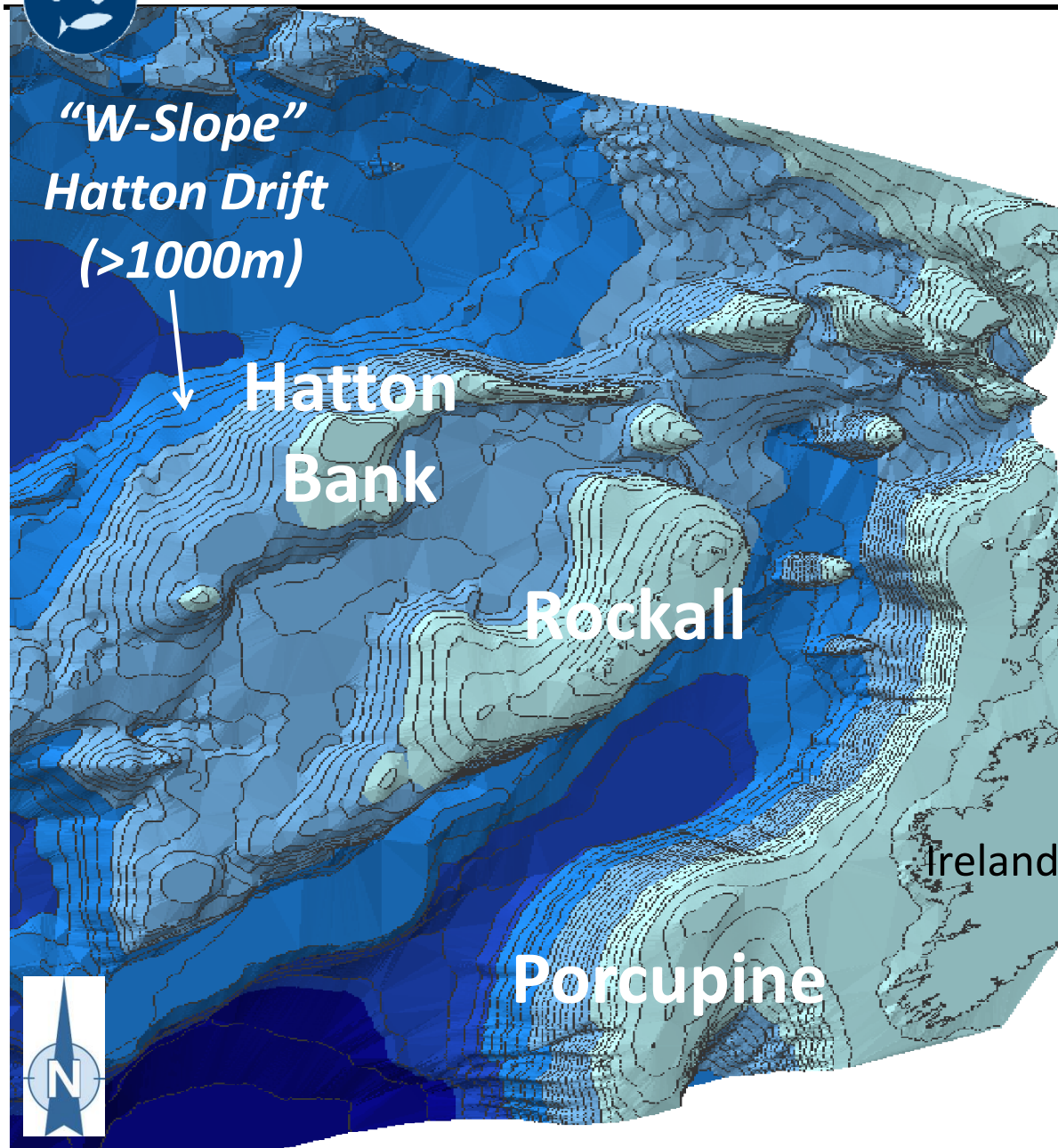


(Alepocephalus bairdii)





Study area: Hatton Bank (NE Atlantic)



Hatton Bank:
Bed rock surface
(flood basalts)

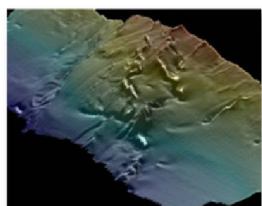
"W-slope"
Hatton Drift
(sand and mud)



Spanish fleet operates since 1996

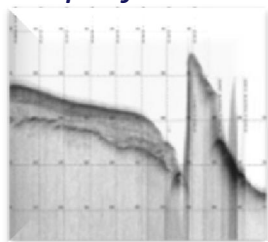
ECOVUL/ARPA: A multidisciplinary pilot study

Three multidisciplinary surveys (2005-2007)



18,760 km²
Multibeam
bathymetry

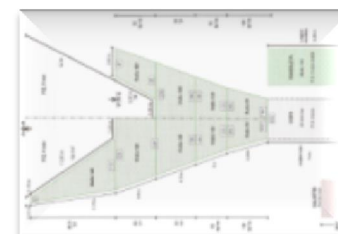
1,112 km
Sub-bottom
profiles



13 Boxcorer



22 Dredges



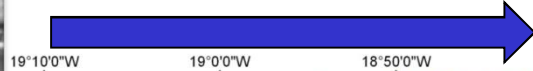
38 Scientific
trawls

ECOVUL/ARPA: Identification of the footprint

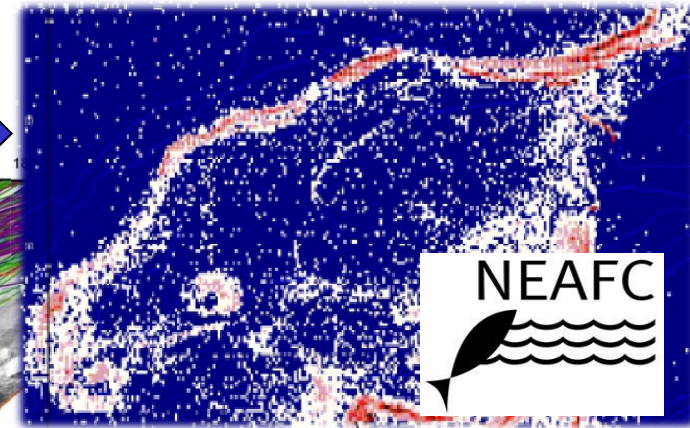
Effort data (Observers)
1996-2006



CONSISTENT



Map from VMS



58°40'0"N
58°30'0"N

19°10'0"W 19°0'0"W 18°50'0"W

58°40'0"N

Study:

- “ Impacts of bottom fishing
- “ Distribution of VMEs

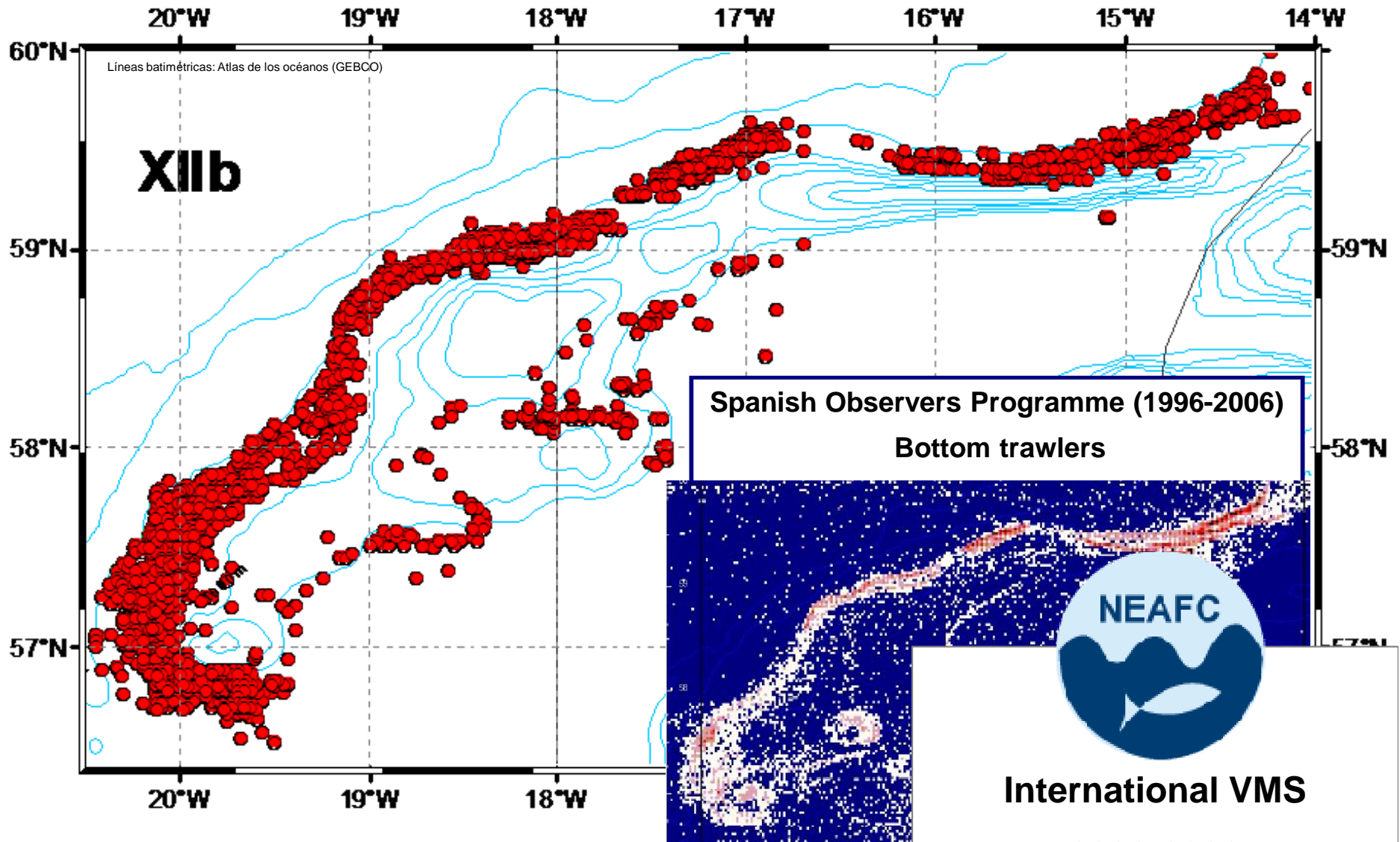
Commercial longline



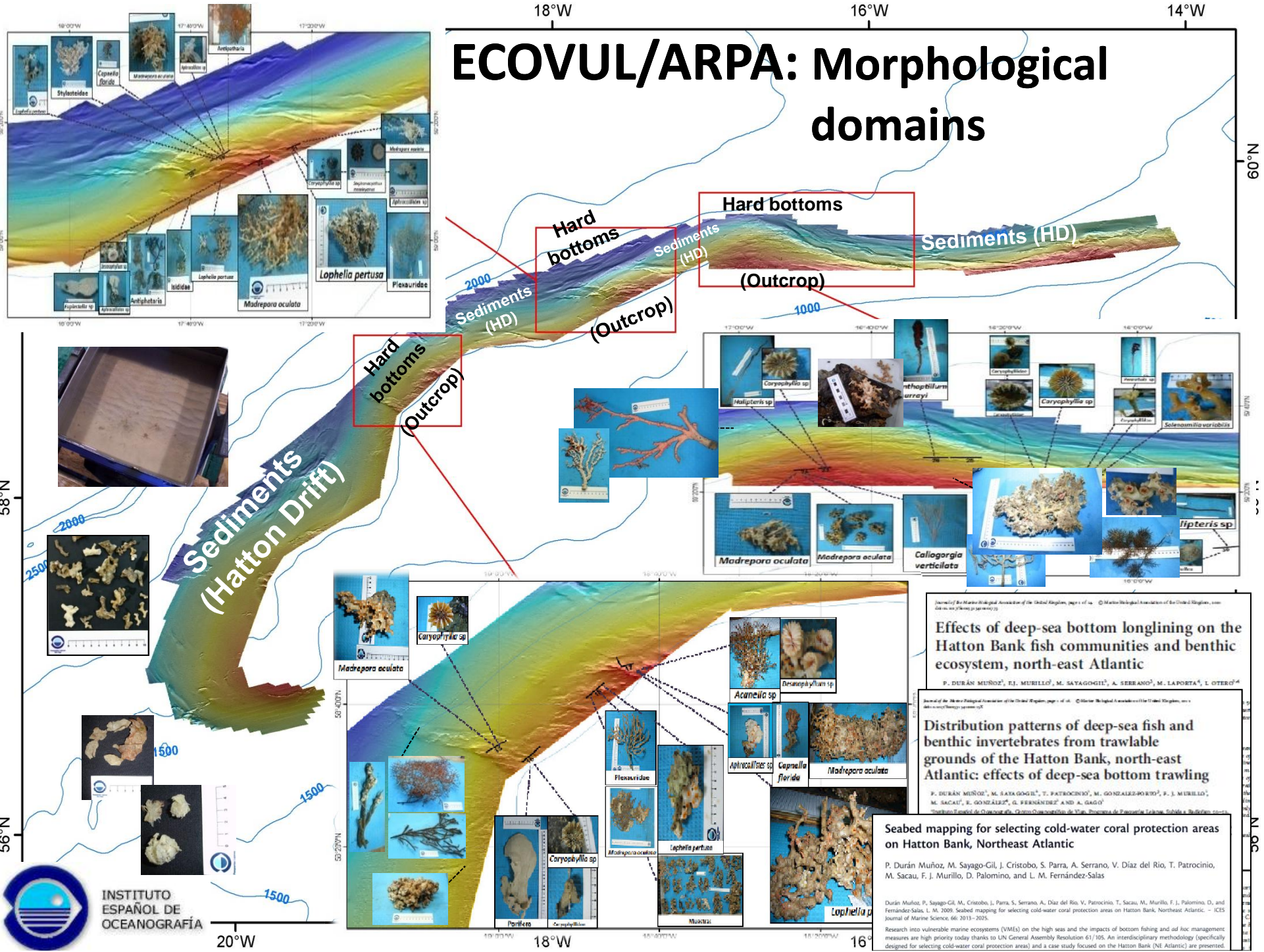
19°0'0"W

**Three cooperative surveys
(IEO-commercial fisheries)
(2005-2008)**

ECOVUL/ARPA: Spanish Bottom Trawl Fishing Effort



ECOVUL/ARPA: Morphological domains



Effects of deep-sea bottom longlining on the Hatton Bank fish communities and benthic ecosystem, north-east Atlantic
 P. DURÁN MUÑOZ¹, E. MURILLO², M. SAYAGO-GIL¹, A. SERRANO³, M. LAPORTA⁴, I. OTERO⁵

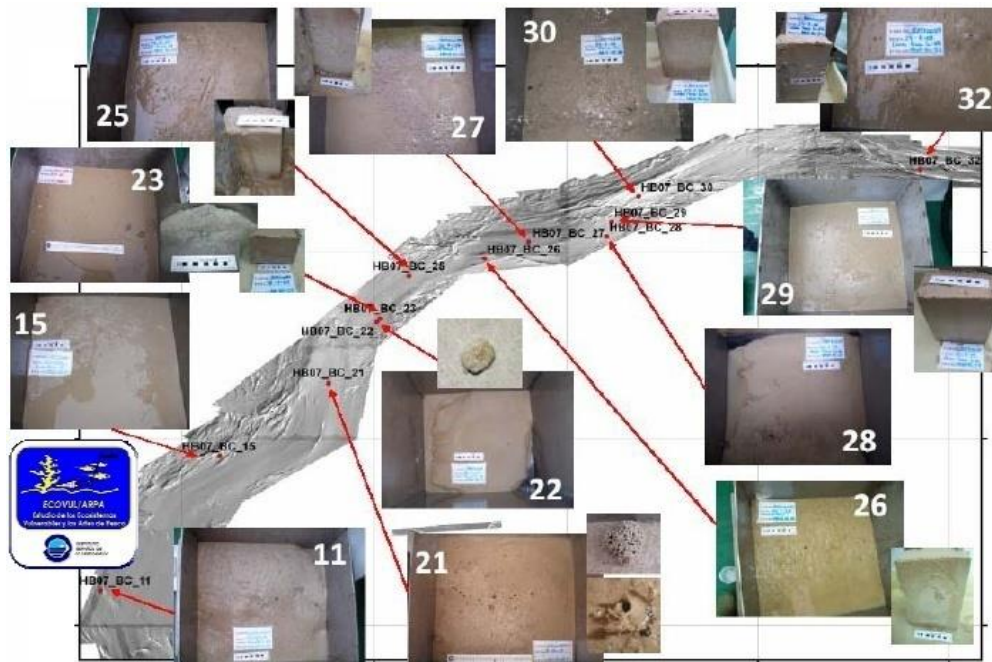
Distribution patterns of deep-sea fish and benthic invertebrates from trawlable grounds of the Hatton Bank, north-east Atlantic: effects of deep-sea bottom trawling
 P. DURÁN MUÑOZ¹, M. SAYAGO-GIL¹, T. PATROCINIO², M. GONZÁLEZ-PORTO², P. J. MURILLO², M. SACAU¹, E. GONZÁLEZ¹, G. FERNÁNDEZ¹ AND A. GAGO¹

Seabed mapping for selecting cold-water coral protection areas on Hatton Bank, Northeast Atlantic

P. Durán Muñoz, M. Sayago-Gil, J. Cristóbal, S. Parra, A. Serrano, V. Díaz del Río, T. Patrocínio, M. Sacau, F. J. Murillo, D. Palomino, and L. M. Fernández-Salas

Durán Muñoz, P., Sayago-Gil, M., Cristóbal, J., Parra, S., Serrano, A., Díaz del Río, V., Patrocínio, T., Sacau, M., Murillo, F. J., Palomino, D., and Fernández-Salas, L. M. 2009. Seabed mapping for selecting cold-water coral protection areas on Hatton Bank, Northeast Atlantic. – ICES Journal of Marine Science, 66: 2013–2025.
 Research into vulnerable marine ecosystems (VMEs) on the high seas and the impacts of bottom fishing and ad hoc management measures are high priority today thanks to UN General Assembly Resolution 61/105. An interdisciplinary methodology (specifically designed for selecting cold-water coral protection areas) and a case study focused on the Hatton Bank (NE Atlantic) are presented.

ECOVUL/ARPA: Habitats Western Slope Hatton Bank

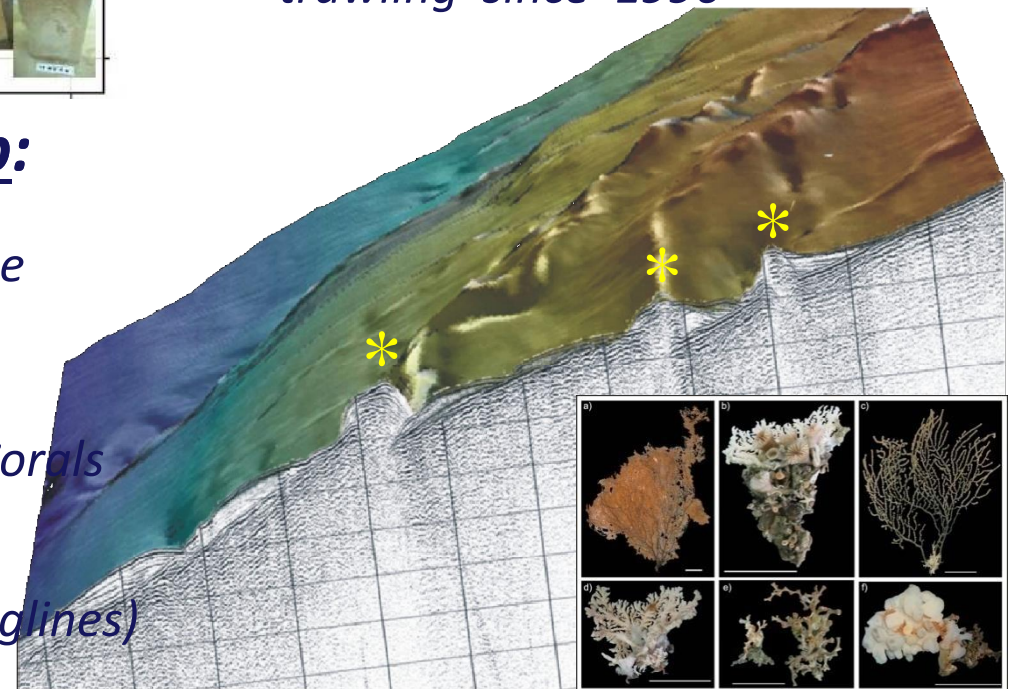


Hatton Drift:

- “ *Western flank of Hatton Bank*
- “ *Fine/very fine sediments*
- “ *Nowadays extensive coral reef structures are unlikely to occur*
- “ *Easy to trawl: Intensive trawling since 1990’*

Hatton Outcrop:

- “ *Top of the Bank with a bedrock surface*
- “ *Not / slightly covered by sediments*
- “ *Suitable substratum for settlement of Corals*
- “ *Irregular relief: Difficult to trawl*
Feasible to static fishing gears (e.g. longlines)



ECOVUL/ARPA: Surface Sediments

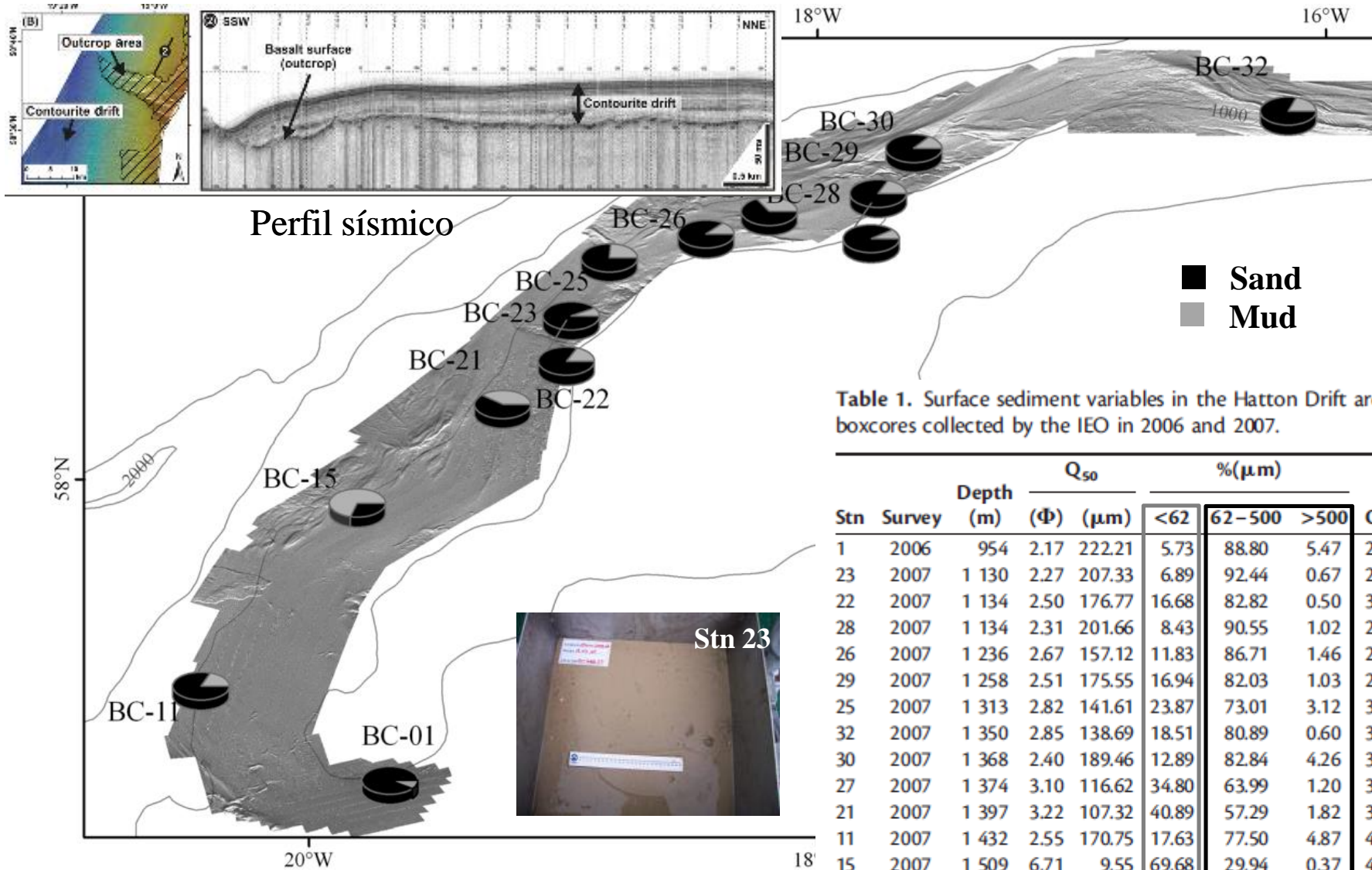


Table 1. Surface sediment variables in the Hatton Drift area from boxcores collected by the IEO in 2006 and 2007.

Stn	Survey	Depth (m)	Q ₅₀		% (μm)			OM	S ₀
			(Φ)	(μm)	<62	62–500	>500		
1	2006	954	2.17	222.21	5.73	88.80	5.47	2.05	1.42
23	2007	1 130	2.27	207.33	6.89	92.44	0.67	2.90	1.38
22	2007	1 134	2.50	176.77	16.68	82.82	0.50	3.43	1.49
28	2007	1 134	2.31	201.66	8.43	90.55	1.02	2.45	1.38
26	2007	1 236	2.67	157.12	11.83	86.71	1.46	2.33	1.47
29	2007	1 258	2.51	175.55	16.94	82.03	1.03	2.51	1.54
25	2007	1 313	2.82	141.61	23.87	73.01	3.12	3.03	1.80
32	2007	1 350	2.85	138.69	18.51	80.89	0.60	3.02	1.55
30	2007	1 368	2.40	189.46	12.89	82.84	4.26	3.29	1.49
27	2007	1 374	3.10	116.62	34.80	63.99	1.20	3.07	2.61
21	2007	1 397	3.22	107.32	40.89	57.29	1.82	3.05	5.84
11	2007	1 432	2.55	170.75	17.63	77.50	4.87	4.54	1.69
15	2007	1 509	6.71	9.55	69.68	29.94	0.37	4.53	11.96

Stations are listed by depth (m). Q₅₀ mean diameter (Φ units and μm); OM, organic content (%); S₀, sorting coefficient ($\sqrt{Q_{25}/Q_{75}}$); % (μm), sediment fraction percentage.

ECOVUL/ARPA: Seabed features

Geo-Mar Lett
DOI 10.1007/s00367-009-0163-5

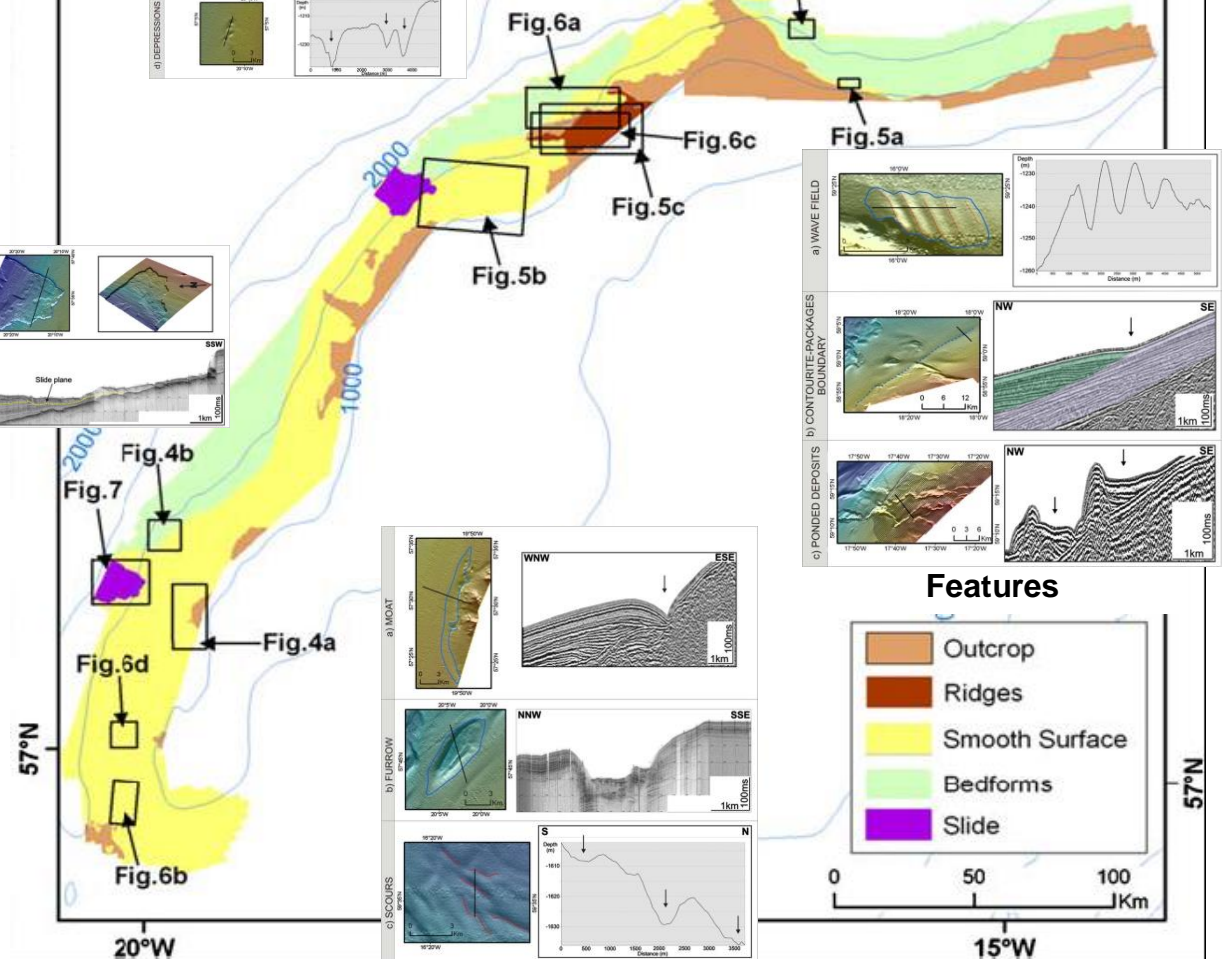
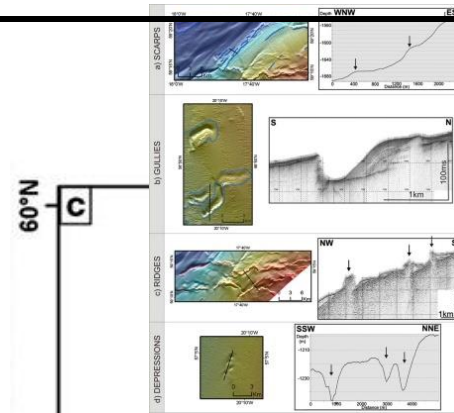
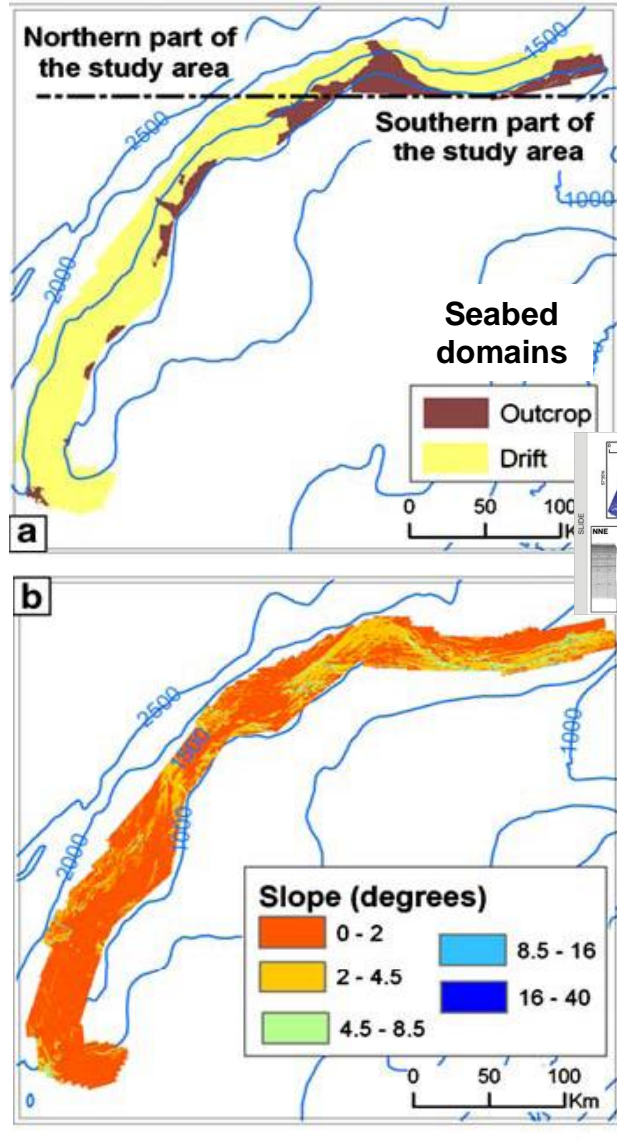
ORIGINAL

Evidence for current-controlled morphology along the western slope of Hatton Bank (Rockall Plateau, NE Atlantic Ocean)

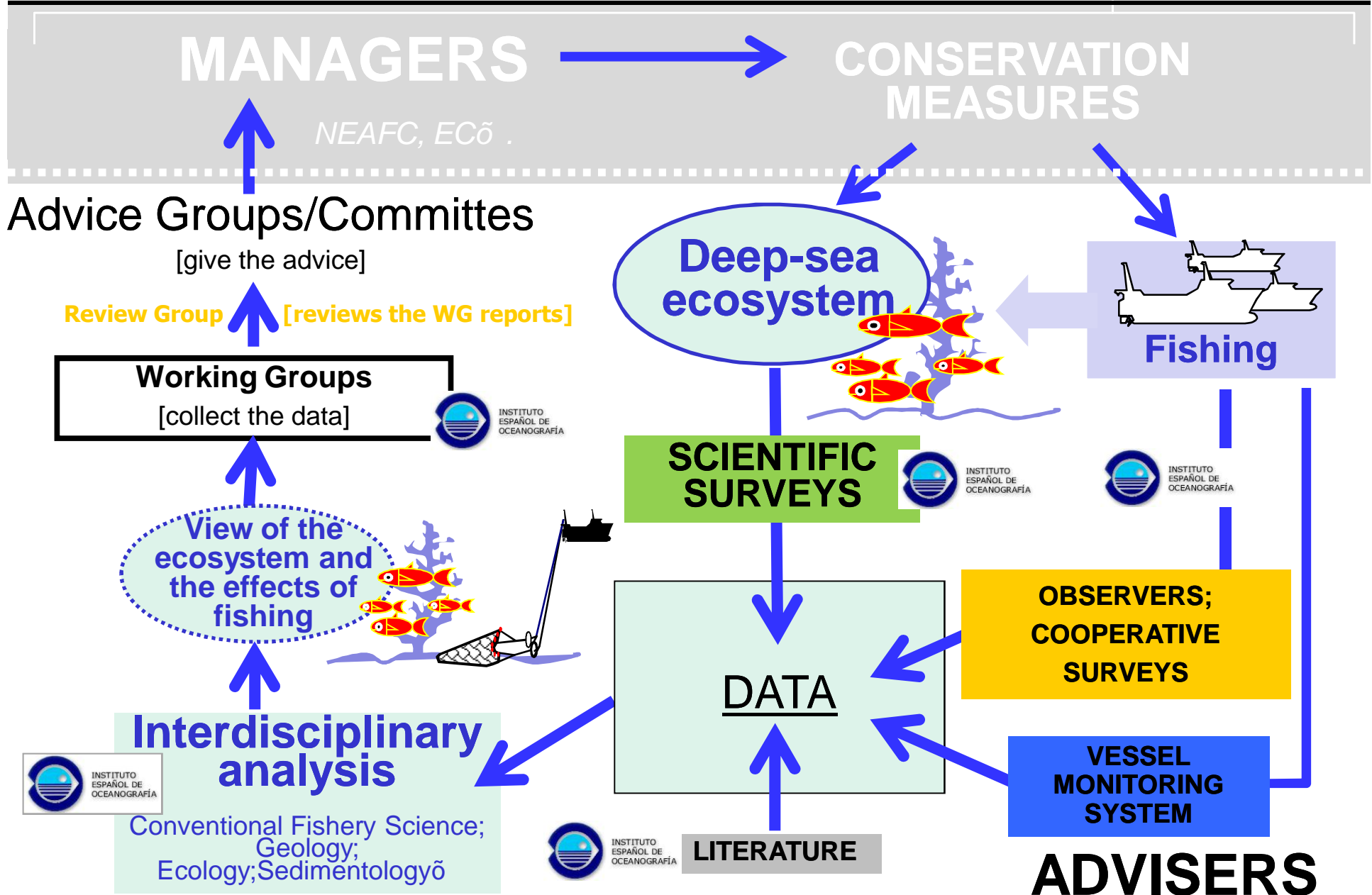
Miriam Sayago-Gil · David Long · Kenneth Hitchen · Victor Diaz-del-Río · Luis Miguel Fernández-Salas · Pablo Durán-Muñoz

Received: 20 March 2009 / Accepted: 26 August 2009
© Springer-Verlag 2009

Abstract A multibeam bathymetric and high- (airgun and sediment waves, edges of contourite deposits, p-sparker) to very high-resolution (Topas) seismic study of deposits, scarp, gullies, ridges, depressions, slides



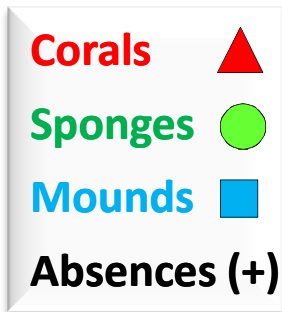
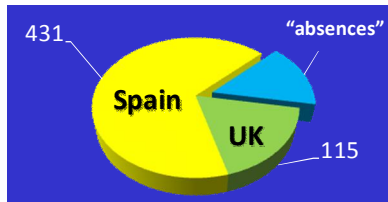
ECOVUL/ARPA: Utility



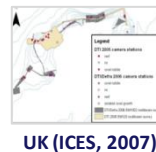
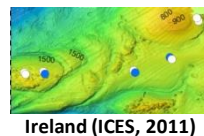
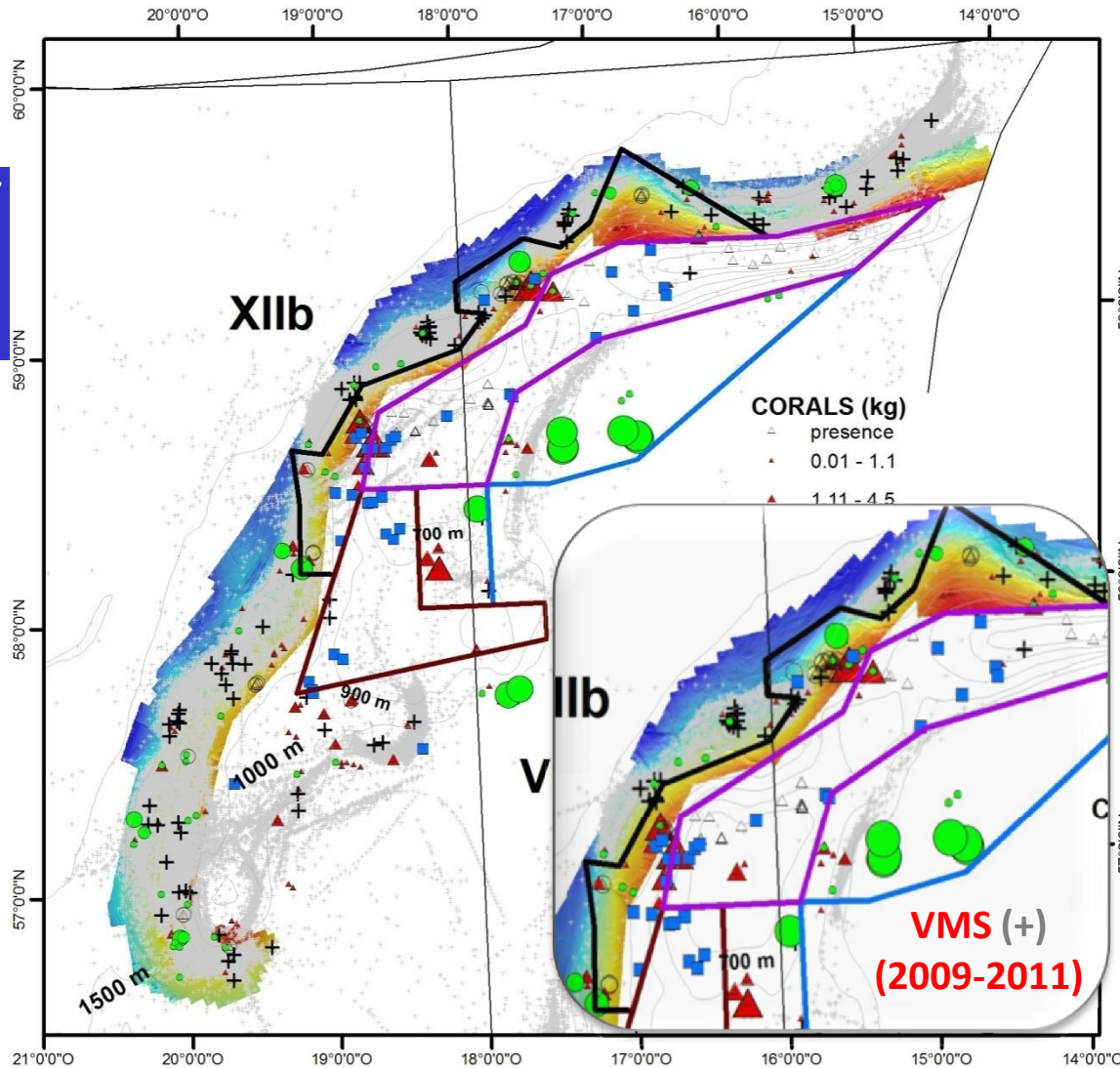
Source: Durán Muñoz & Sayago-Gil, 2011. An overview of cold-water coral protection on the High seas: The Hatton Bank (NE Atlantic) - a case study. *Marine Policy* 35, 615-622.

Current Situation: Data & Closed Areas

ICES DATABASE
[Established in 2012]



Spanish VMS (+)
Historic fishery footprint
(2000-2011)



Advice
ICES

Closed Areas
NEAFC

~ 7,100 km²
(2007)

+
~ 3,800 km²
(2008)

+
~ 4,700 km²
(2010)

+
~ 6,600 km²
(2013)

TOTAL
~ 22,500 km²

Vulnerable Marine Ecosystem (VME) databases

It is very important the implementation and development of an unified Global Database for VMEs to:

- 1- Identify and collate VME data.
- 2- Avoid inconsistent maps.
- 3- Create transparency in relation to VMEs.
- 4- Dissemination of relevant information.
- 5- Create a sustainable network of acquisition and exchange of VME data and information related.
- 6- Facilitate global compatibility and global distribution analyses.
- 7- Provide a platform for interconnectivity of scientific knowledge in support to decision-making.



Vulnerable Marine Ecosystem (VME) databases

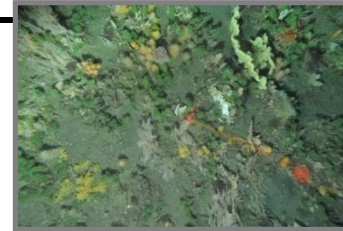
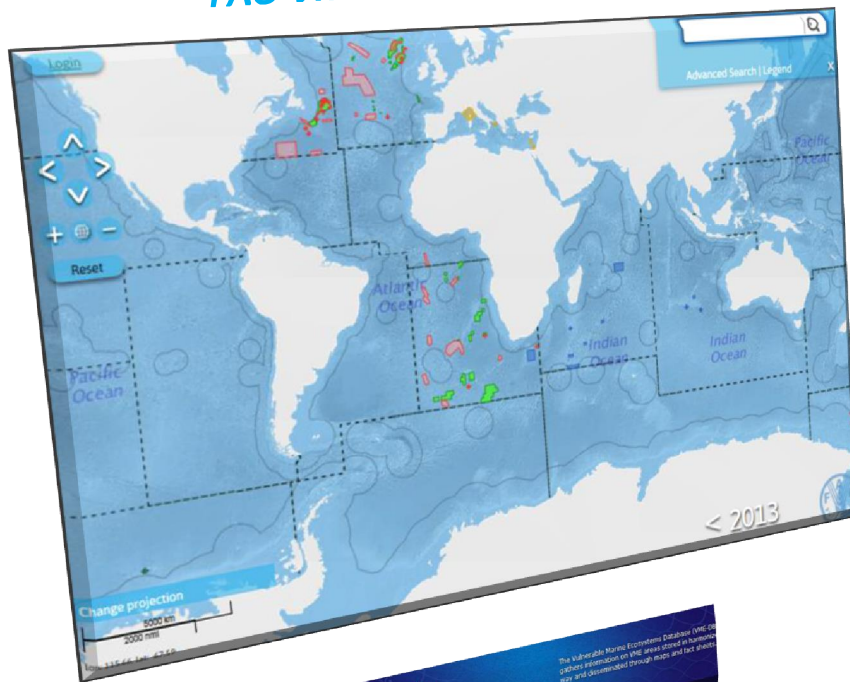
Currently in use:

OSPAR habitats database

GOBI (Global Ocean Biodiversity Initiative)

ICES WGDEC VME Database

FAO VME Database



In development:

Secretariat to the Convention on Biological Diversity (CBD)

FAO VME Database

Based on data from RFMOs fishery observers programmes and fishers knowledge

For each VME area:

- “ **Overview of the area**
- “ **Map**
- “ **Information on management**
- “ **Regional History**
- “ **Sources** (summaries of references to VMEs in the region)
- “ **Media** (any images or other media types from the VME area)

Conclusions

- “ UNGA resolution 66/68 adopted in 2011, has recognized the importance of global VME Databases (pa.135) and the utility of seabed mapping programmes (pa. 131) for the management of high seas fisheries;
- “ Fishing Nations are making efforts to compile information with the aim to feed the new international databases on VMEs indicators in the Atlantic Ocean (e.g.: 2012 ICES Database; NAFO Database);
- “ Moreover in recent years, several multidisciplinary mapping programmes have been developed;
- “ Such programmes have resulted in the identification of VMEs within the NEAFC & NAFO Regulatory Areas (as well as within SW Atlantic) and in the adoption of conservation and management measures (in accordance with pa. 119b of UNGA resolution 64/72):



NEAFC Recommendation 9:2013 - EC Regulation 1288/2009

Hatton Bank closed area (~ 22,500 km²)

NAFO Enforcement measures

Grand Banks, Flemish Pass & Flemish Cap closed areas (~ 8,500 km²)



Spanish regulations (Spanish vessels)

SW Atlantic closed area (~ 41,000 km²)



Thanks for your attention !

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