



Cold-water corals research in the lab and in the field:
(1) growth rates of four CWC species maintained in aquaria,
(2) new research areas: the Galicia Bank and the Avilés canyon (Atlantic and Cantabrian Sea), a scientific and methodological approach

Covadonga Orejas, Christine Ferrier-Pagès, Stephanie Reynaud, Andrea Gori, Georgios Tsounis, Denis Allemand, Josep Maria Gili, Francisco Sánchez, Alberto Serrano, César González-Pola, Manuel Ruiz, María Druet, María Gómez-Ballesteros



Growth rates of 4 CWC species from the Mediterranean

- Study of the growth rates of

Madrepora oculata

Lophelia pertusa

Desmophyllum cristagalli

Dendrophyllia cornigera

- Comparison between two different methods
- Comparison with tropical species



New research areas: Galicia Bank and Avilés canyon

- Study of new research areas in order to enlarge the Natura 2000 net and accomplish the compromise with Europe
- Base line research. Characterisation of the research areas
- Biological information. Mapping biological communities (epibenthos and demersal)
- Identification of vulnerable ecosystems and essential fish habitats



Studied species

Madrepora oculata



Lophelia pertusa



Desmophyllum cristagalli



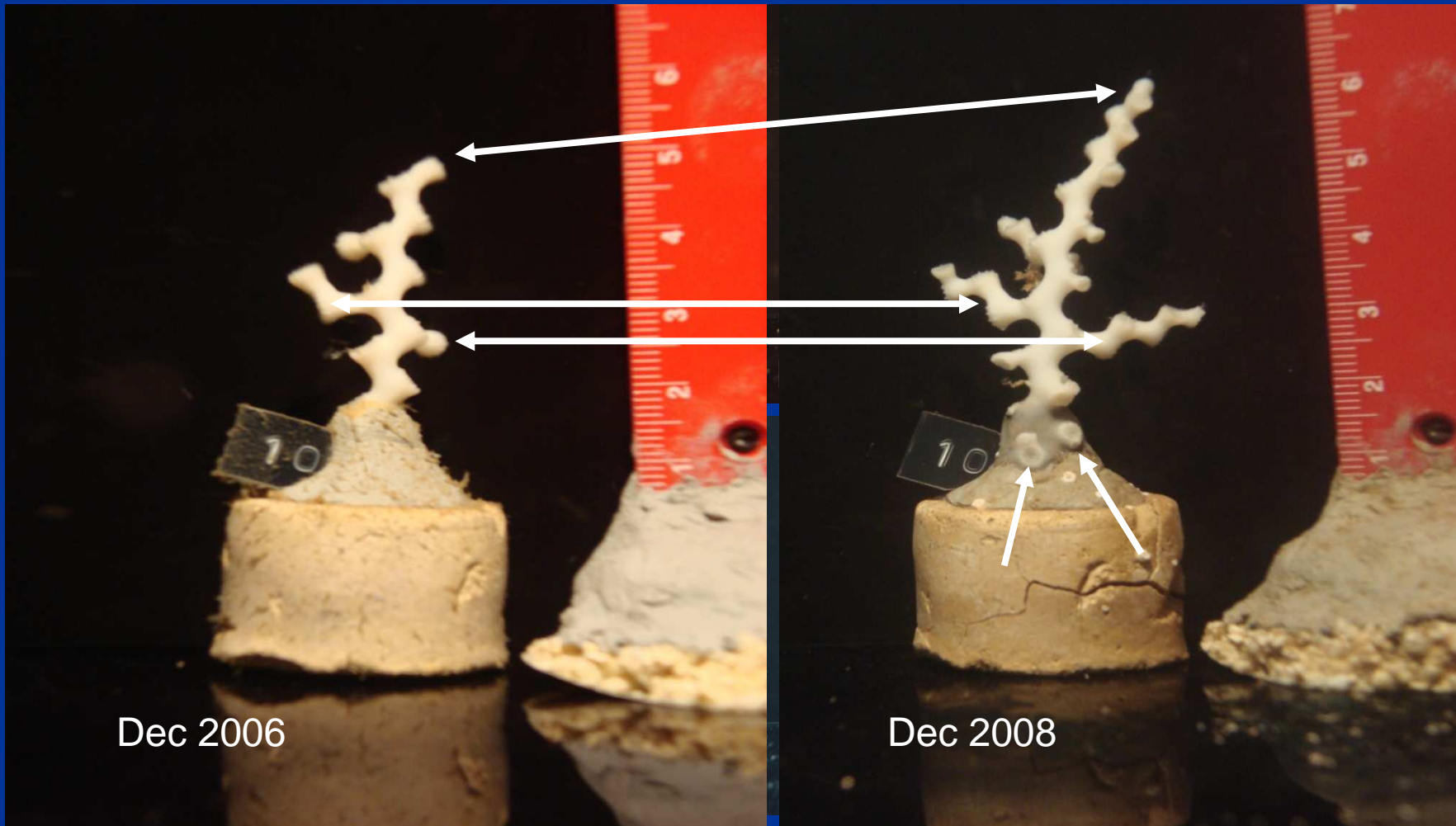
Dendrophyllia cornigera



- NW and Central Mediterranean
- ~ 12°C
- 200-300 m depth
- three branched species, one solitary
- aquaria (same conditions, water temperature, current regime, feeding)

Growth rates of 4 CWC species from the Mediterranean

Linear growth



Some conclusions

- *Madrepora oculata* had a significantly higher growth rate (buoyant weight) than the other 3 CWC species analysed
- *Madrepora oculata* had similar growth rates than the tropical coral *Galaxea fascicularis* in spite of high temperature difference and food regime (fed and in starvation!)

Why? ...Still many question marks...

- Possible reasons for this “faster growth” of *Madrepora*....more “feeding effectivity”, different energy allocation, different skeletal structure, better tolerance for the current environmental conditions in the Mediterranean Sea...
- Methodological discussion: need of real density values for the studied CWC species, need to take into account number and extension of polyps when using linear growth measurements, differences in food supply (type and frequency)

New research areas: Galicia Bank and Avilés canyon

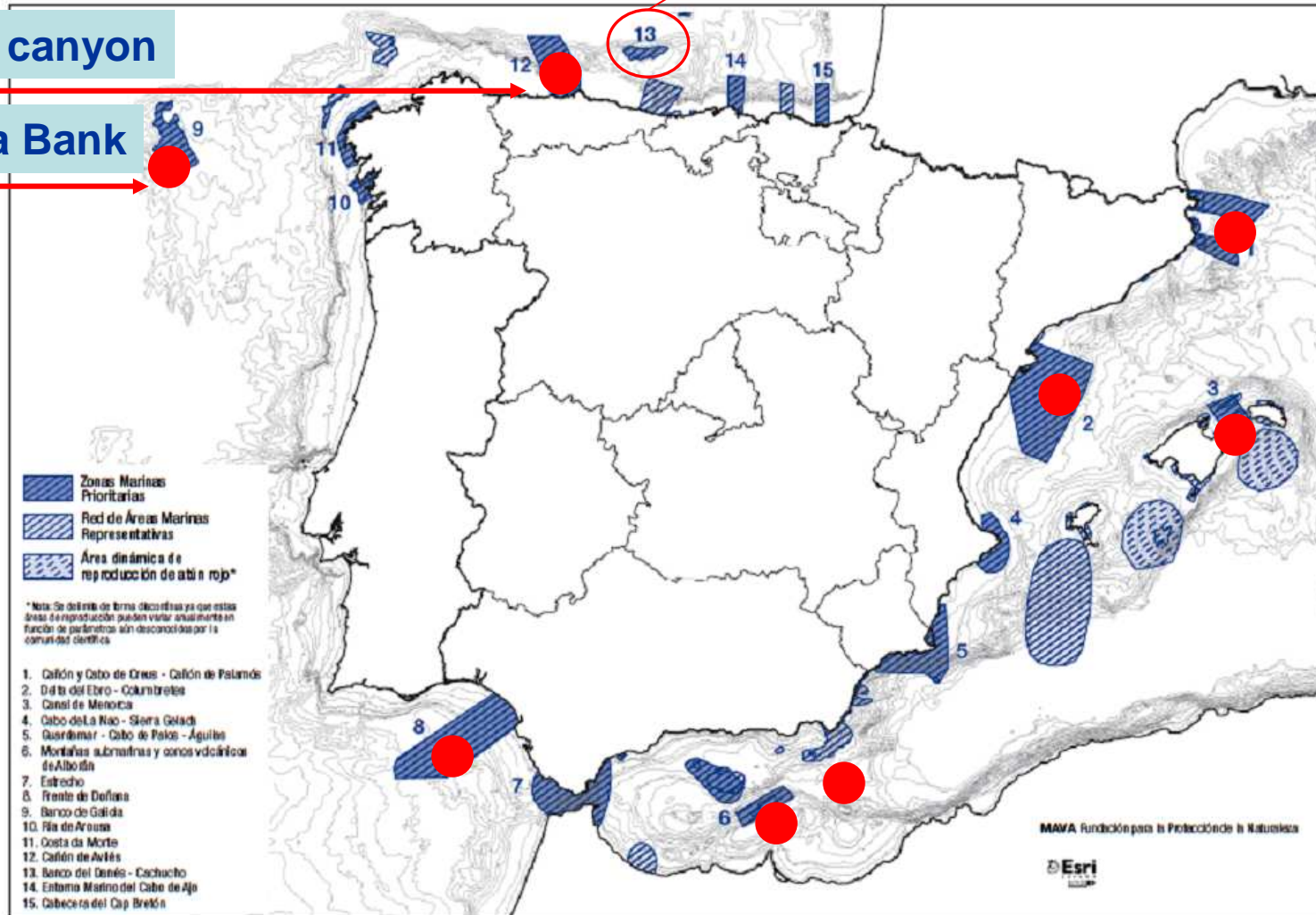


INDEMARES (LIFE project 2009-2014)

MPA

Avilés canyon

Galicia Bank



+ ● South Fuerteventura and ● Banco de la Concepción

Source: WWF



INDEMARES

- Ecosystem approach
 - Integrated study of the physical scenario (hydrography, geomorphology)
 - Ecosystem compartments (fish, endo-, epi-, and suprabenthic and benthopelagic fauna)
 - Study of the impact of the fisheries working in the areas

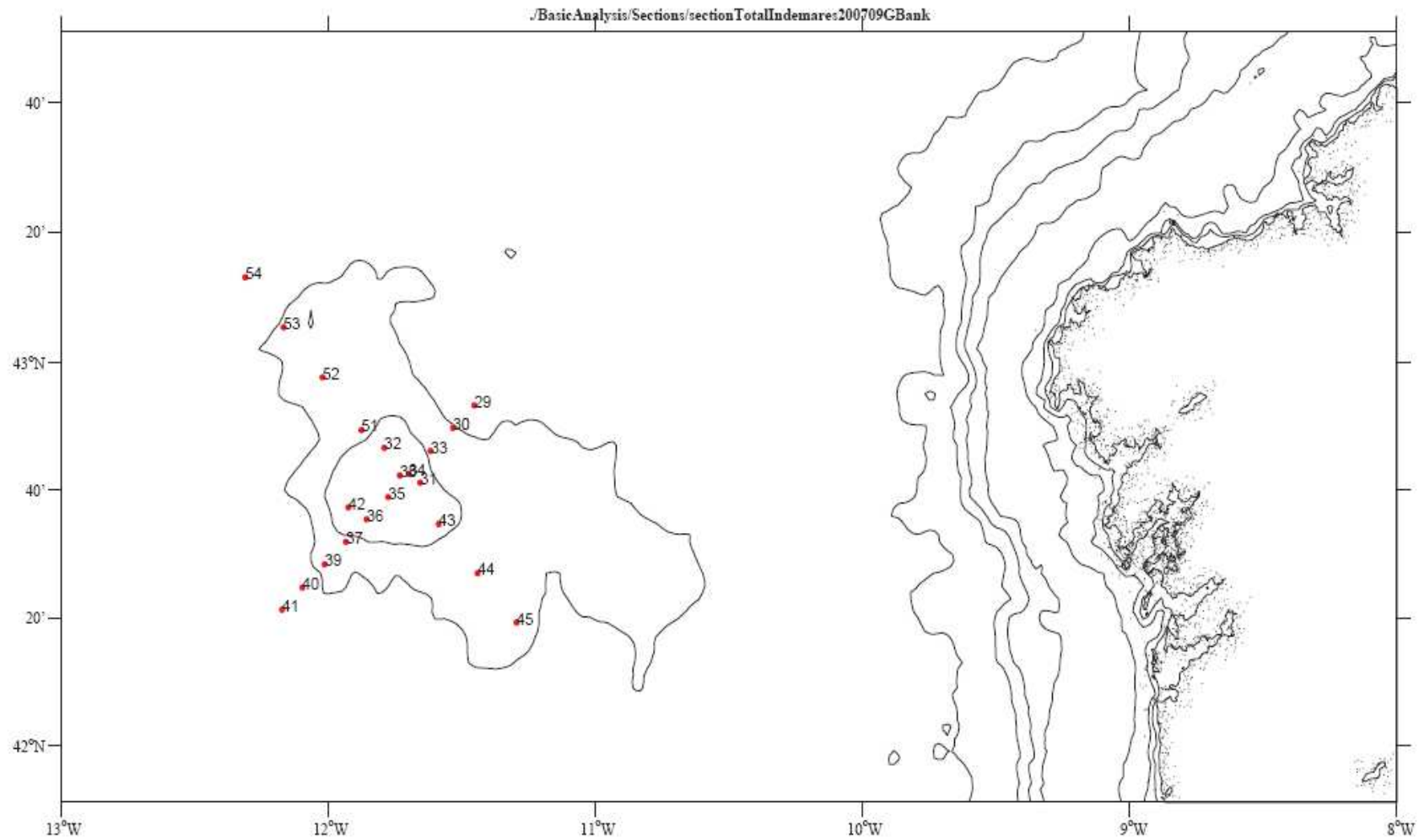


Trophodynamic mass-balance model

**Identification of vulnerable ecosystems (VE) (as the CWC habitats are)
and
Essential Fish Habitats (EFH)**



Oceanographic data





From October 1998 to October 1999 (ICES Divisions IXb)

- The community of species in the area prospected presented high species richness.

Total of 106 species

70 teleosts (*H. mediterraneus*, *M. moro*, *L. eques*, *A. bairdii*, *E. telescopus*, *T. cristulata*, *L. piscatorius*)

11 sharks (*D. licha*, *D. calceus*)

3 rays

2 chimaeras

Invertebrates (11 crustacea, 6 molluscs and 3 equinoderms)

- Results indicated

no differences in depth distribution of the species

seasonal variation in the abundance of the most important caught



Natura 2000

OSPAR

Environments

- Carbonate mounds
- Coral gardens
- Deep Sea sponges aggregations
- *Lophelia pertusa* "reefs"
- Seamounts
- Sea pens and burrowing fauna

Species

- Deep Sea sharks
 - Centroscymnus coelolepis*
 - Centrophorus granulatus*
 - Centrophorus squamosus*
 - Squalus acanthias*
- Rayas
 - Dipturus batis*
 - Raja clavata*
- Other fish /sharks species
 - Hoplostethus atlanticus*
 - Alosa alosa*
 - Cetorhinus maximus*
 - Thunnus thynnus*



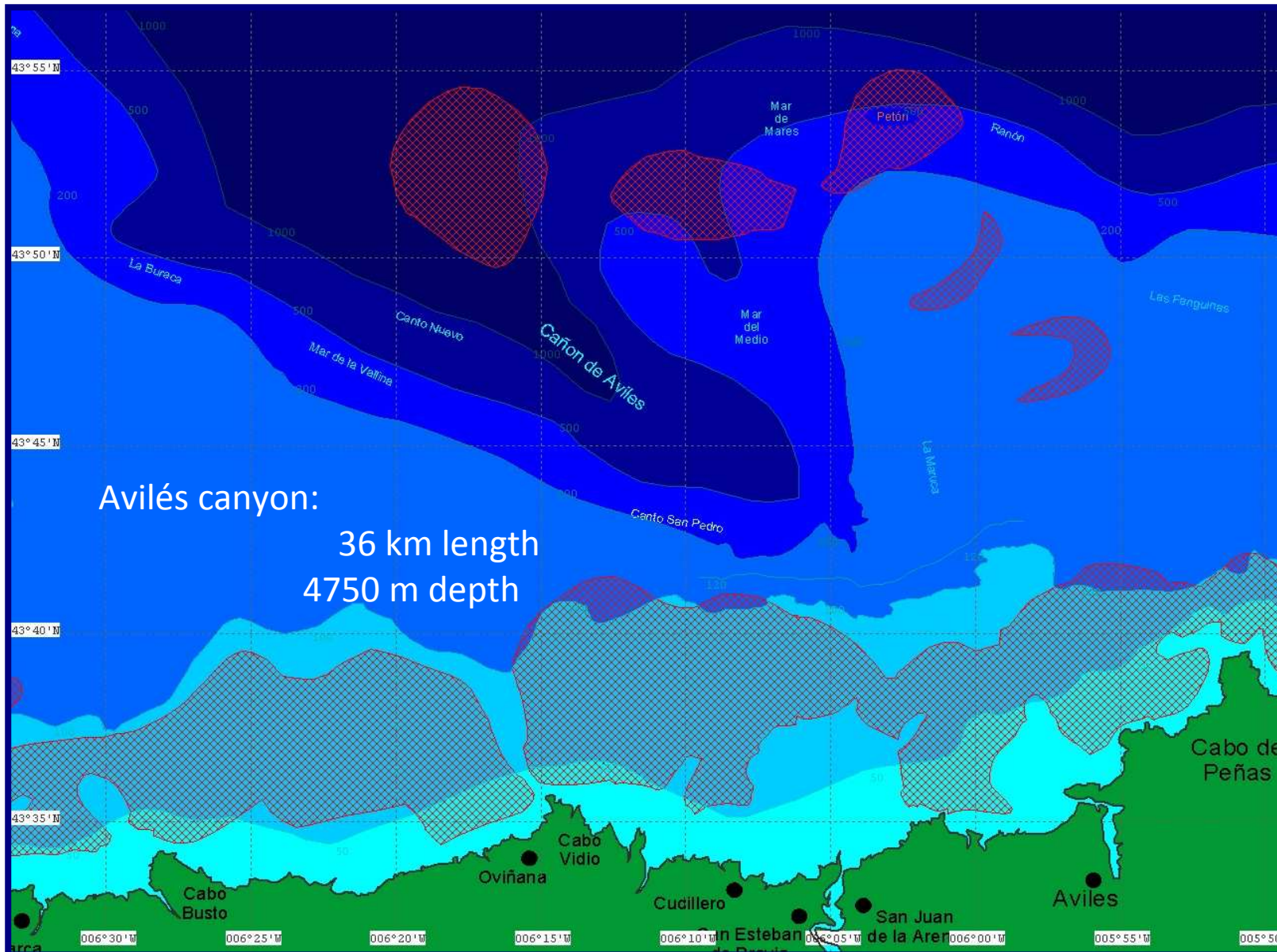
Previous informations

- Surveys IIM Vigo (CSIC)- Pérez-Gándaras (1981)
- Piñeiro CG, Casas M, Bañón R (2001) The deep-water fisheries exploited by Spanish fleets in the Northeast Atlantic: a review of the current status. Fish Res 51: 311-320
- *Chaceon affinis* (King crab) fisheries (from 1988 to 1997)

Nowadays

- Occasional fisheries
- After log-books (2004) some *Brama brama* fisheries

Avilés canyon: abiotic data





Previous knowledge

- Good knowledge on pelagic communities (PELACUS anual cruises, since 1983)
- Long time series for demersal fauna (sedimentary seafloor and until 500 m depth) (DEMERSALES anual cruises, since 1983)
- Some previous information on the benthic communities (Louzao et al. 2010, project COCACE)

Avilés canyon: anthropogenic activities



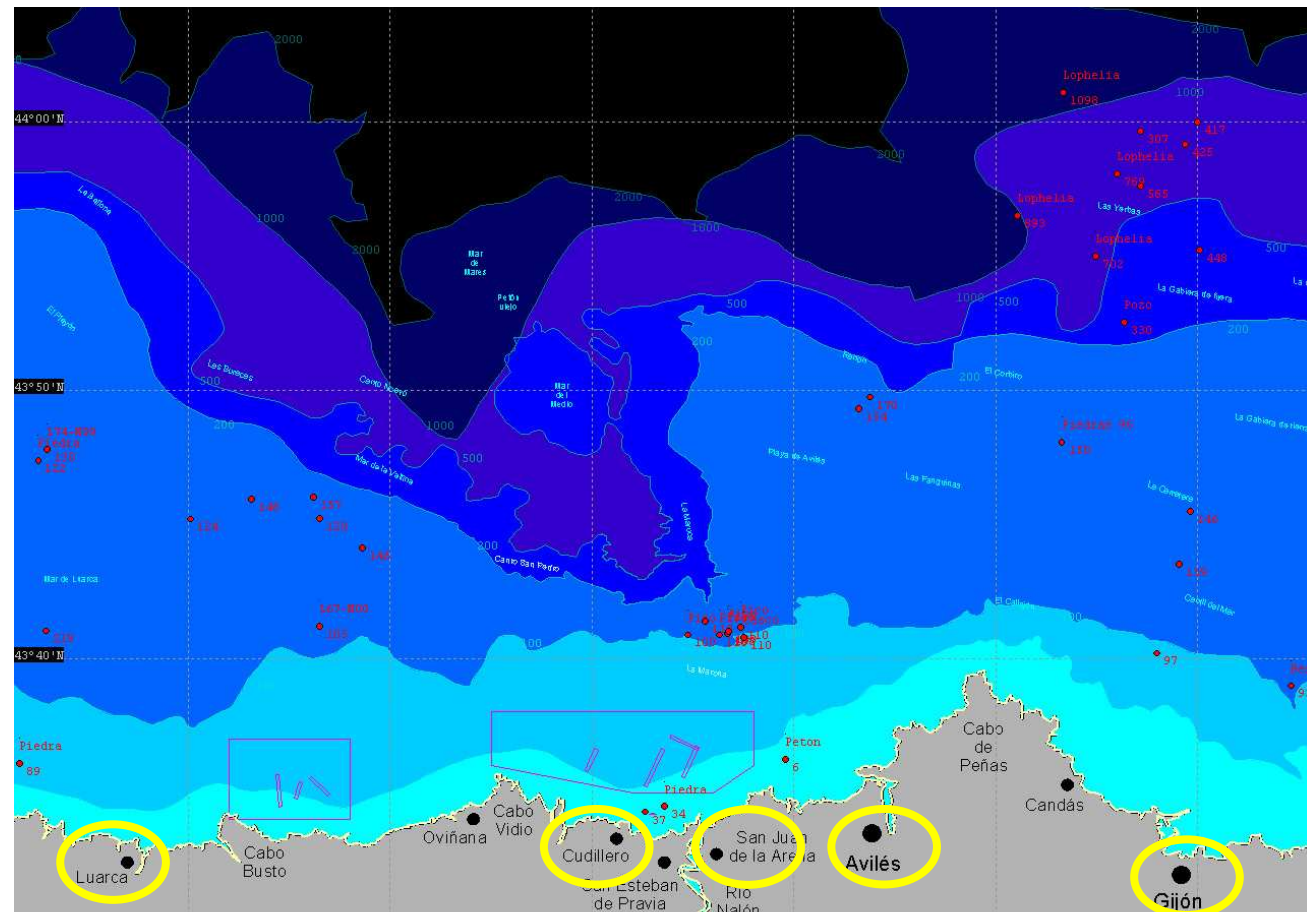
Previous informations

- very poor data on captures
- no geo referenciated information

• Around 250 fishing boats in the area of influence of the Avilés canyon

~ 225 artisanal

~ 25 trawlers





Sampling in frame of INDEMARES (Vulnerable Ecosystems)



Photogrammetric sledge

Quantitative studies:

Community

population

distribution studies

ROV

Quantitative studies:

Community

population

distribution studies

Demography

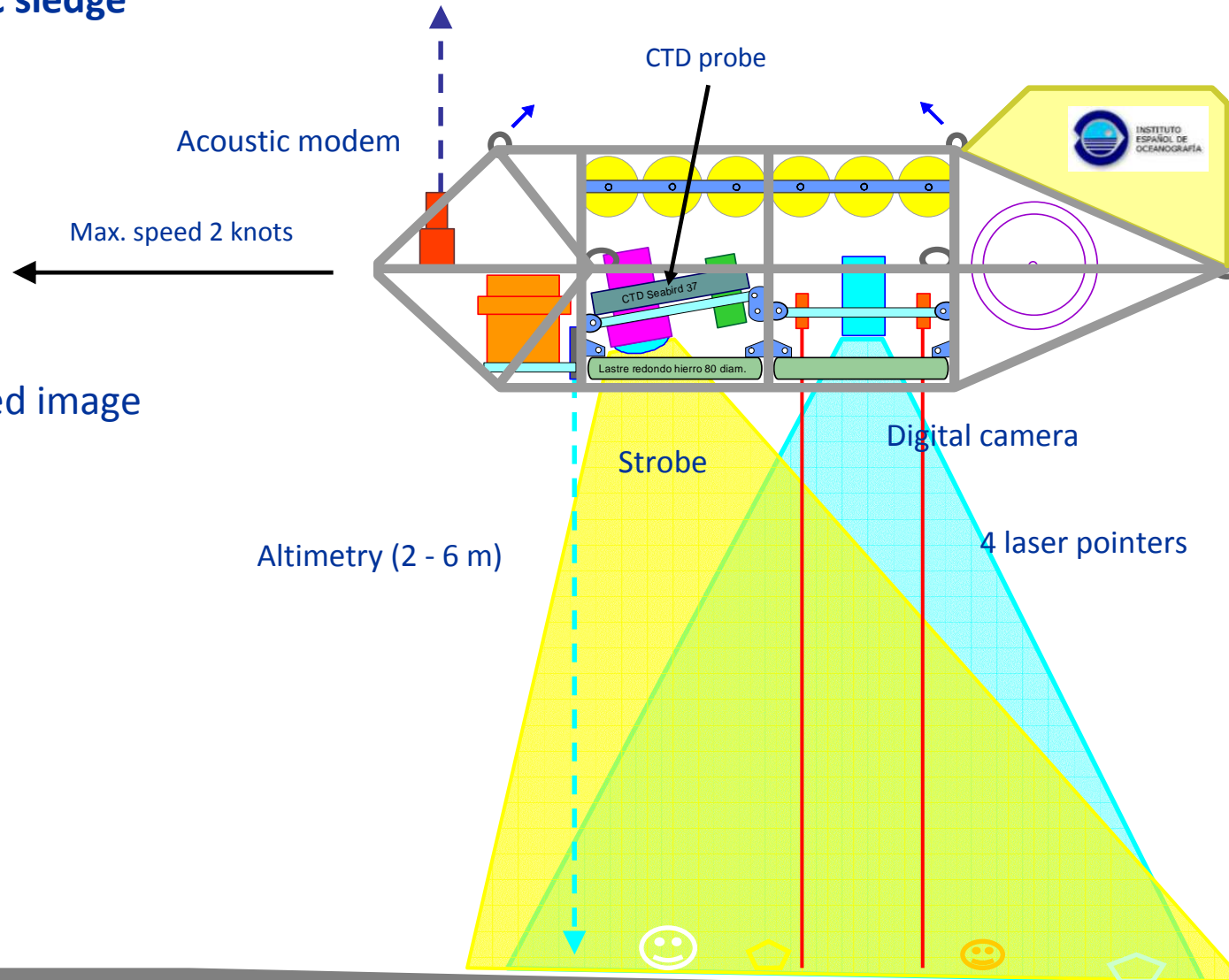


Current and future studies in Galicia Bank and Avilés canyon



Photogrammetric sledge

SEE POSTER!

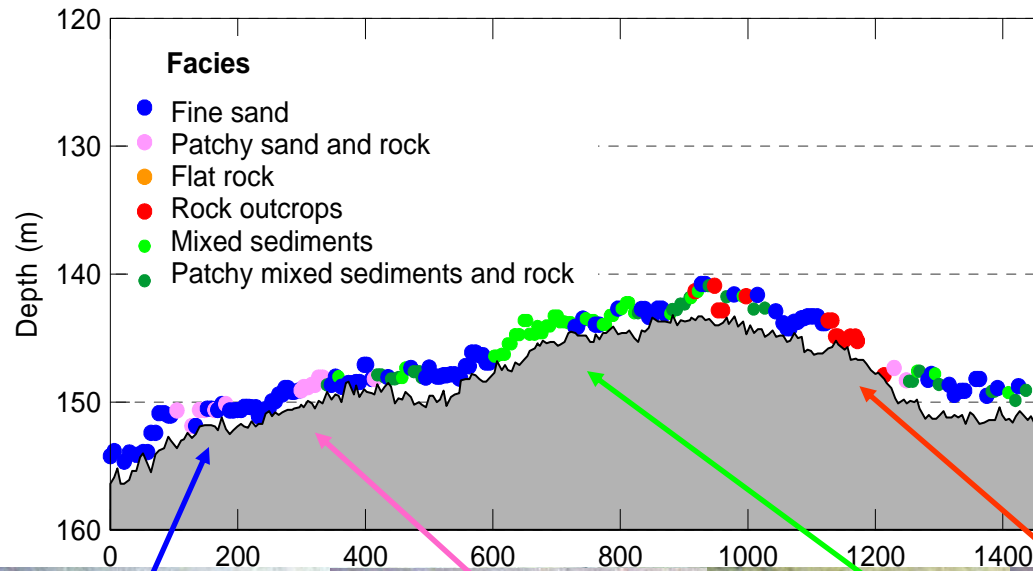


Georeferenced image
CTD data

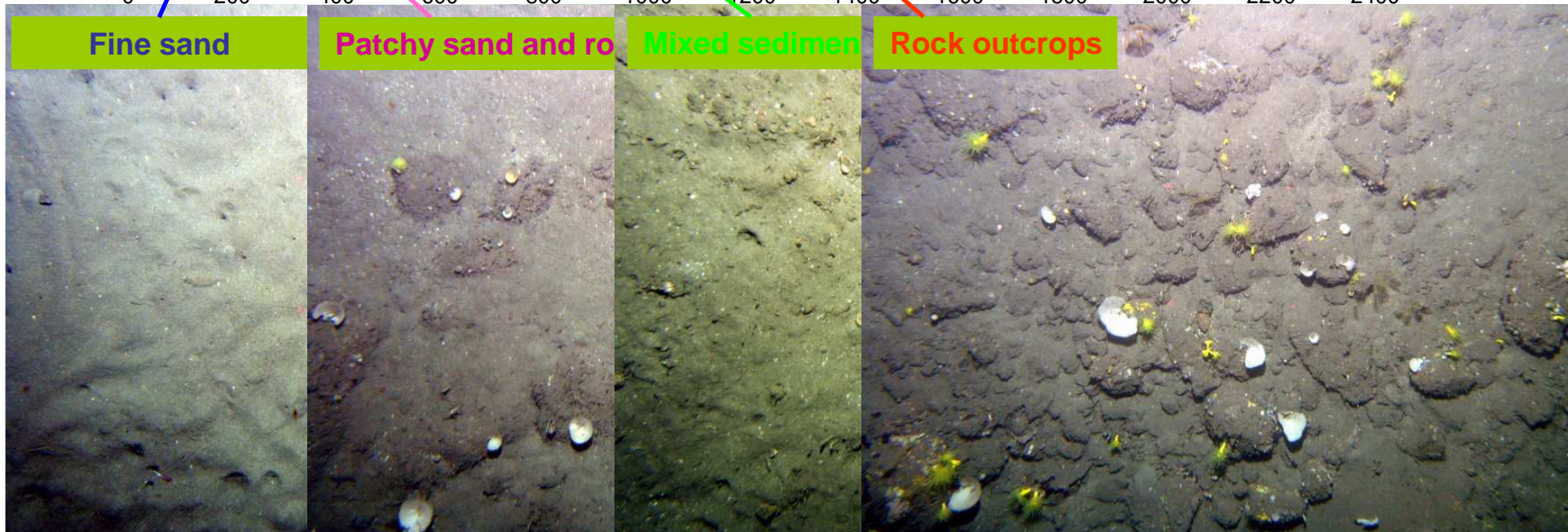
Altimetry (2 - 6 m)

Seafloor

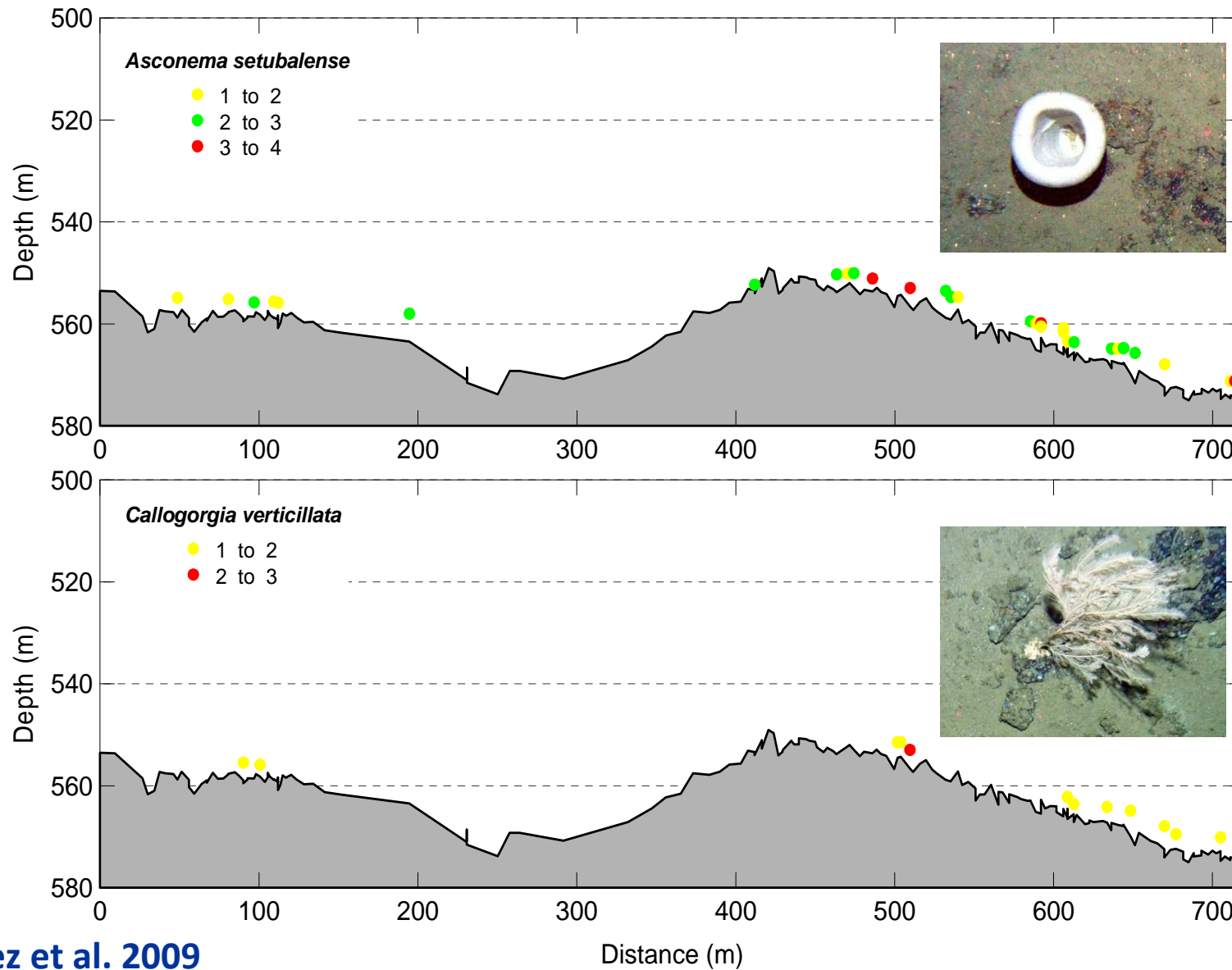
Future studies in Galicia Bank and Avilés canyon



Facies	Surface m ²	%
Fine sand	1314.1	56.81
Patchy sand and rock	171.2	7.40
Flat rock	37.9	1.64
Rock outcrops	126.7	5.48
Mixed sediments	395.2	17.09
Patchy mixed sediments and rock	268.0	11.59
Total	2313.1	100.00



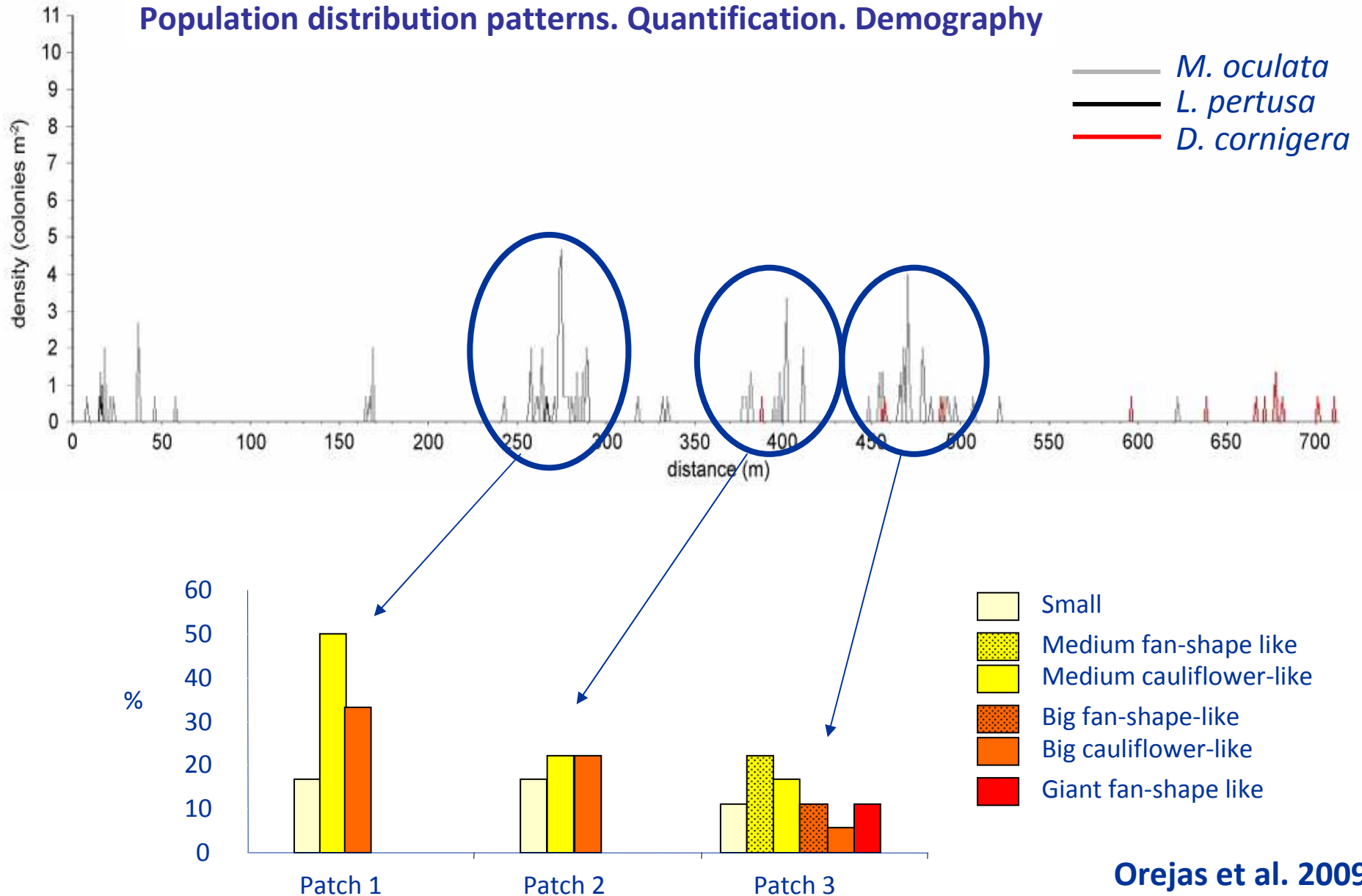
Future studies in Galicia Bank and Avilés canyon



Future studies in Galicia Bank and Avilés canyon



Population distribution patterns. Quantification. Demography



Orejas et al. 2009

THANKS TO...

- Alejandro Olariaga, Cécile Rottier for unvaluable technical support
- Marco Taviani, Paolo Montagna
- Karen Hissmann & Jürgen Schauer (the JAGO team) from IFM GEOMAR Kiel
- Crew from RVs García del Cid, Vizconde de Eza, Cornide de Saavedra, Urania
- Many colleagues and friends from different research institutes
- Projects HERMIONE, DEEP CORAL, ECOMARG, INDEMARES (LIFE)
- OCEANA, WWF
- Spanish Ministry (DEEP CORAL project and Acciones Integradas). I3 P contracts and PhD Grant
- Very special thanks to the engineers and technicians from UTM : the “McGivers” always resolving each problem!

