



PATTERNS OF RECRUITMENT AND DEVELOPMENT OF BIOFOULING AT EUROPEAN AQUACULTURE FACILITIES

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CRAB

- **CRAB: Collective Research in Aquaculture Biofouling**
 - Objective: non-toxic antifouling strategies for the European Aquaculture Industry



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Pan-European Fouling Baseline at Aquaculture Facilities

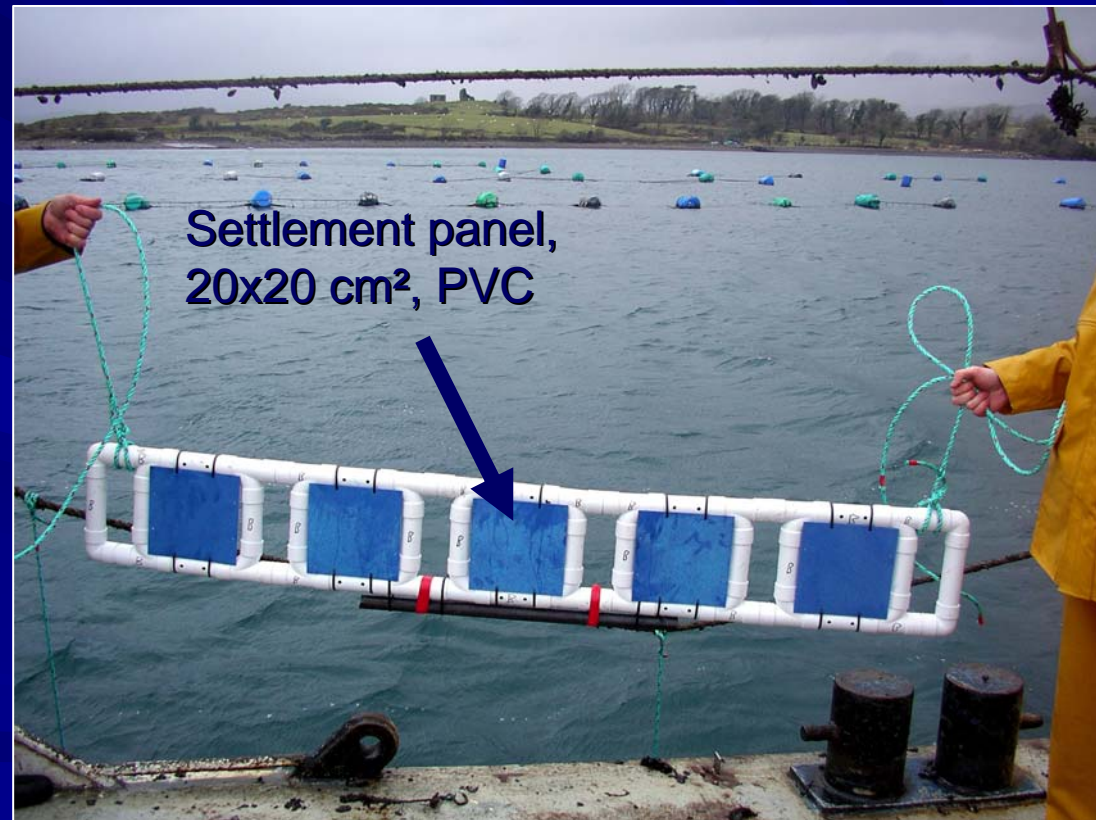
- Biofouling Pressure:
 - Defining the problem: Type, Extent, Timing of Biofouling at European Aquaculture Sites
- Benchmark antifouling strategy performance
- Prediction for applicability of CRAB tested antifouling strategies at other sites

Baseline Study in CRAB

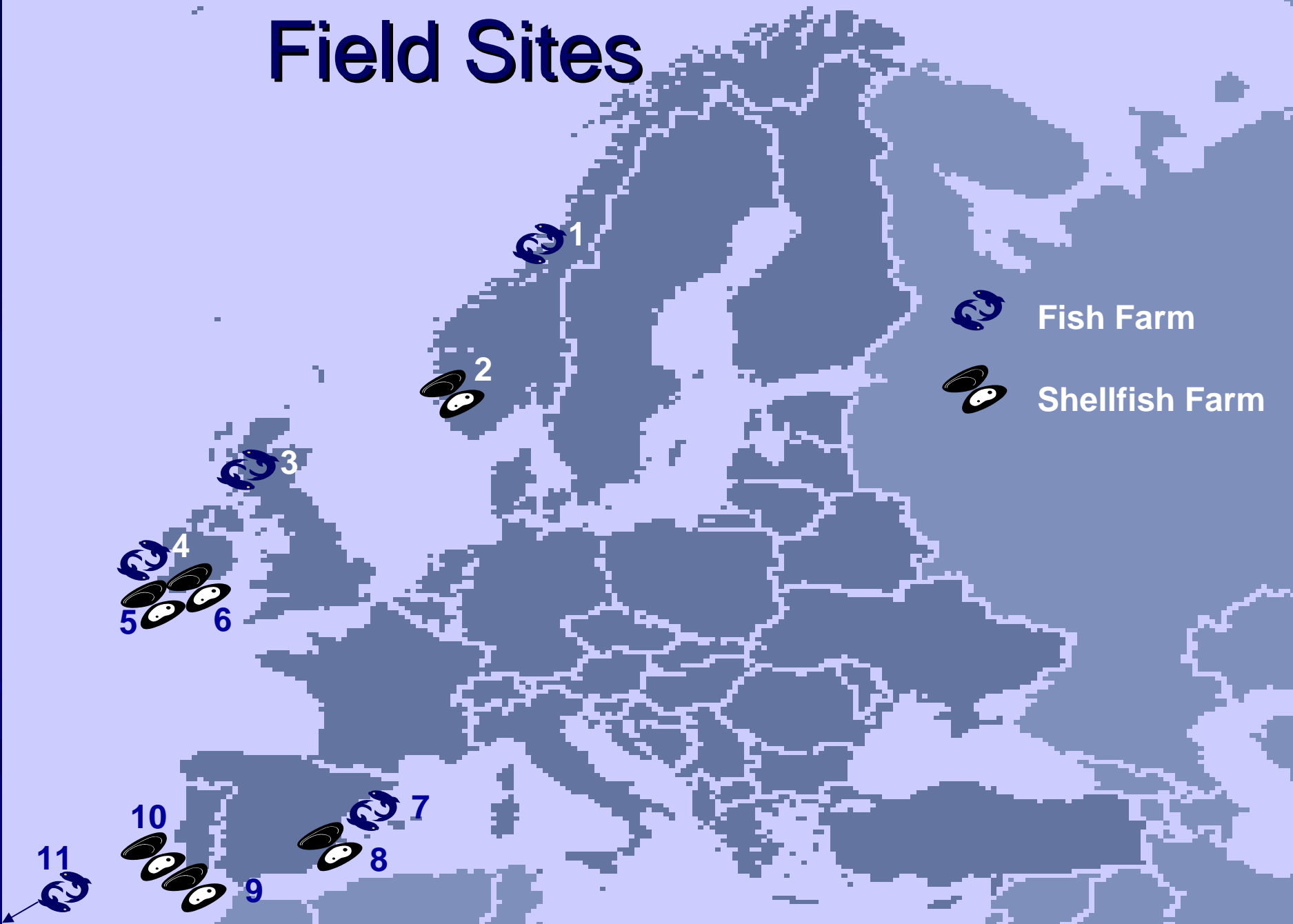
- 2 Experiments conducted directly at farm sites
 - Recruitment
 - Succession
- Start of experiments at 11 aquaculture sites in Europe in Feb '05
- Ongoing work
- Preliminary results presented
- End of experiments in May '07

Experimental Set-up (centrally, Newcastle University)

- Recruitment:
n=10
- Succession:
n=50, reduction
by 10 every 6
months
- Depth 2 m



Field Sites



Baseline Assessment (industry workers)

- Monthly
- Digital photography
- Wet weight
- Height of fouling



Image and Data analysis (centrally, Newcastle University)

- Image analysis of digital photos using ImageJ and stereological principles (Stereology Poster 2nd poster session, Thursday)
- Calculation of total cover, diversity H' (Shannon Index), number of species S
- Statistical analysis:
 - ANOVA
 - ANOSIM
 - SIMPER

Results

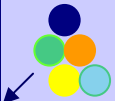
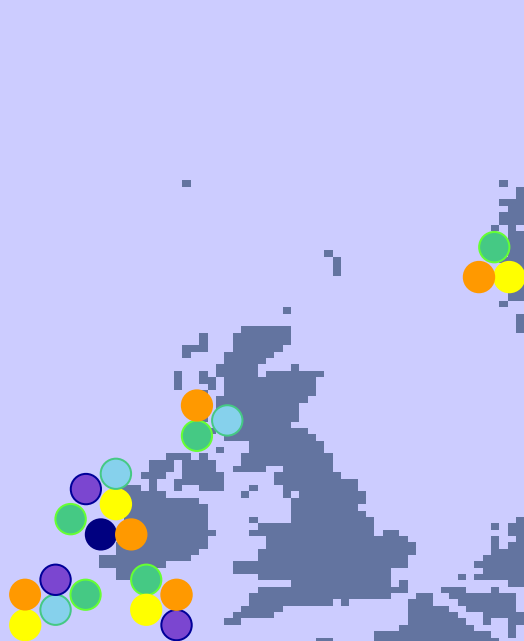
■ Presented here

- Recruitment: Present/Absent data of the major fouling groups for 11 sites for 1 year
- Succession: community pattern of all sites for 3 representative assessment dates
- Wet weight: beginning of the new fouling season in April '06

Recruitment

September 2005

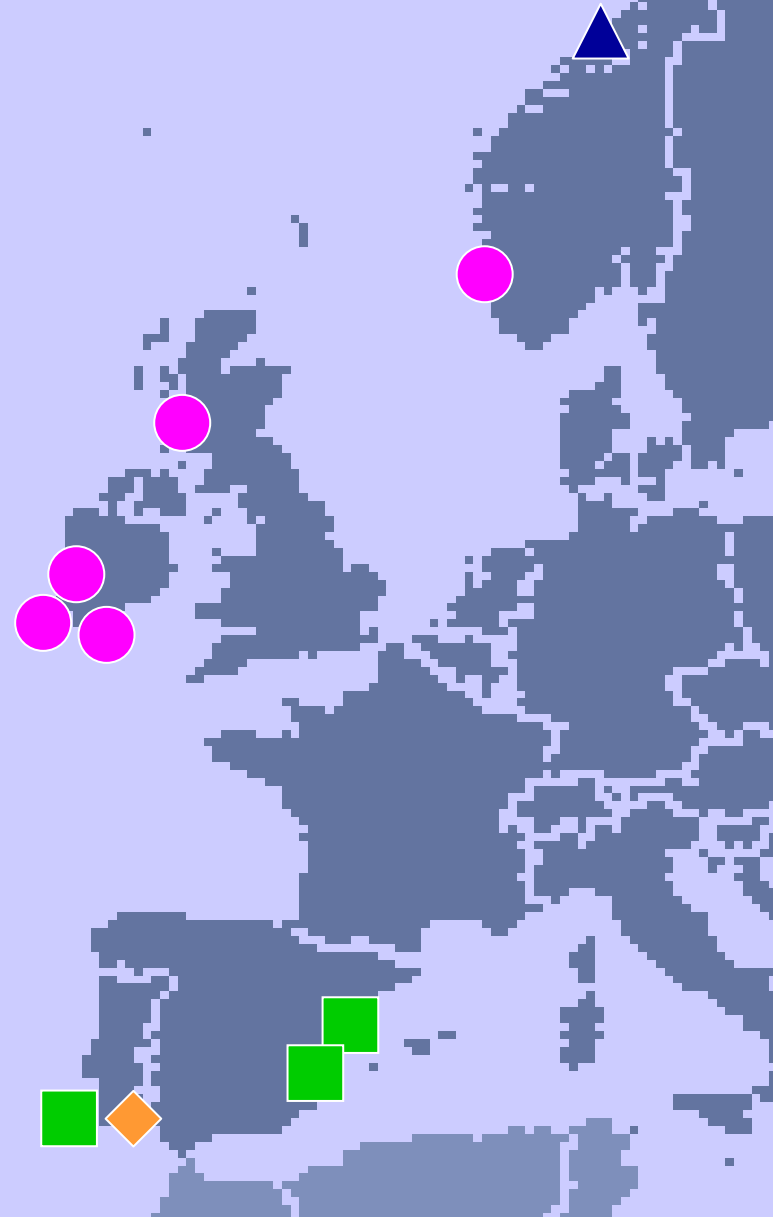
- Algae
- Barnacles
- Mussels
- Tubeworms
- Ascidians
- Hydroids



Succession Communities in May '05

- △ : brown alga *Alaria esculenta*
- : brown alga *Ectocarpus spp.*
- : soft tube forming polychaetes and amphipods
- ◆ : diatoms

ANOSIM Global R: 0.802



Developing Communities in August '05

▲ : blue mussel *Mytilus edulis*

● : brown alga *Ectocarpus*
spp.

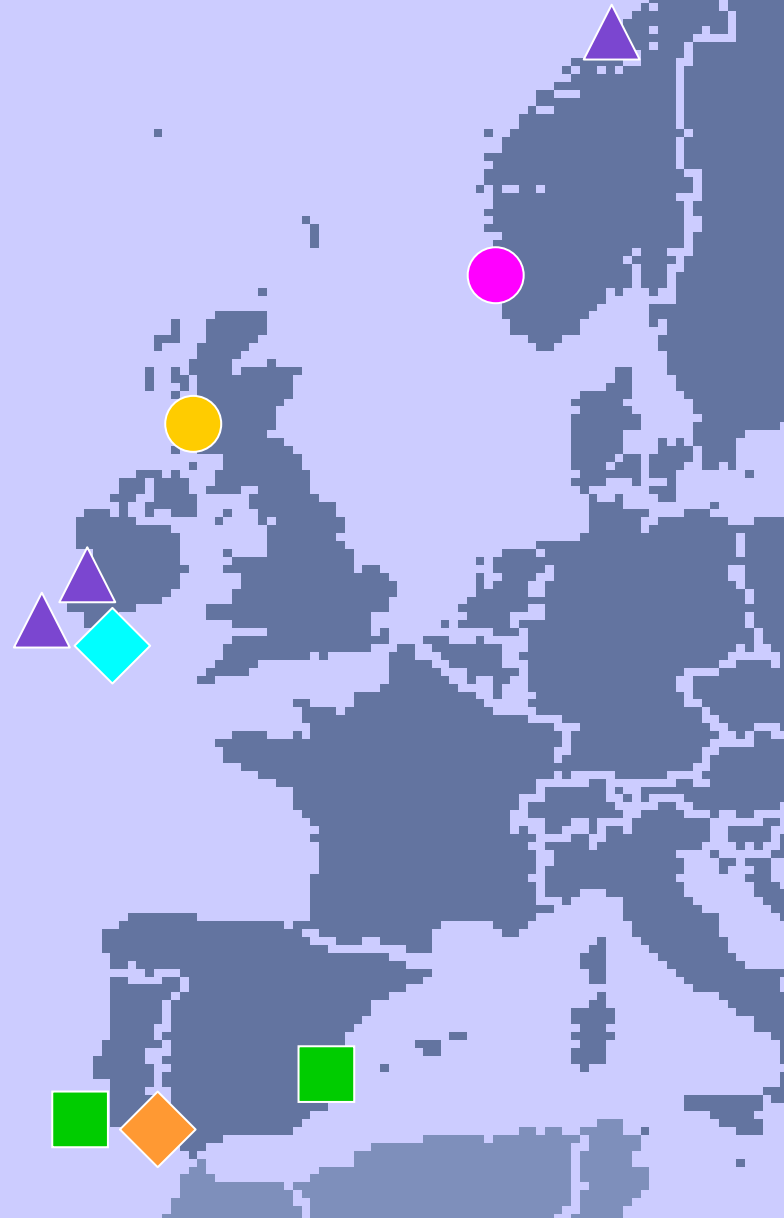
● : solitary ascidian *Ciona*
intestinalis

◆ : red algae

■ : soft tube forming
polychaetes and amphipods

◆ : crustose coralline red
algae

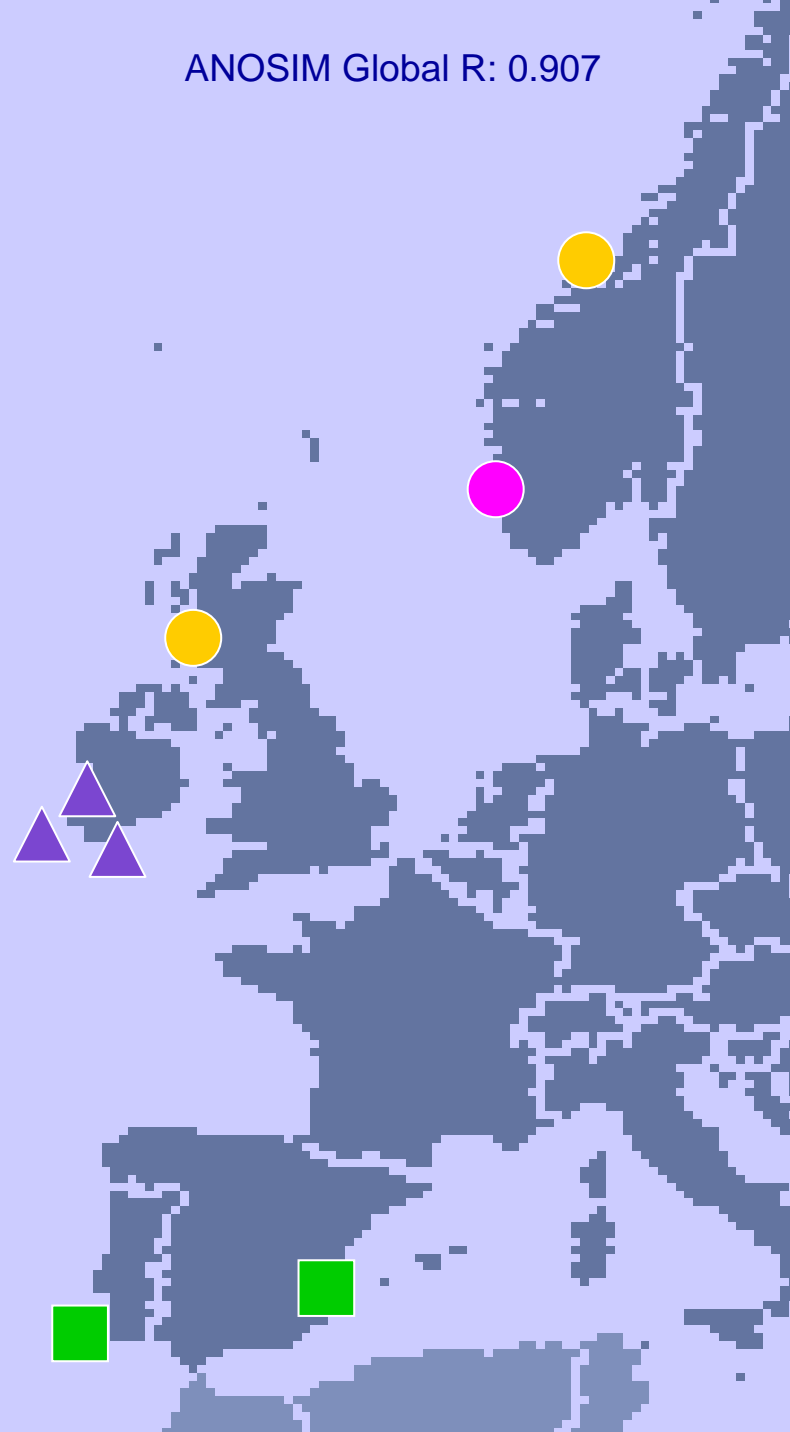
ANOSIM Global R: 0.993



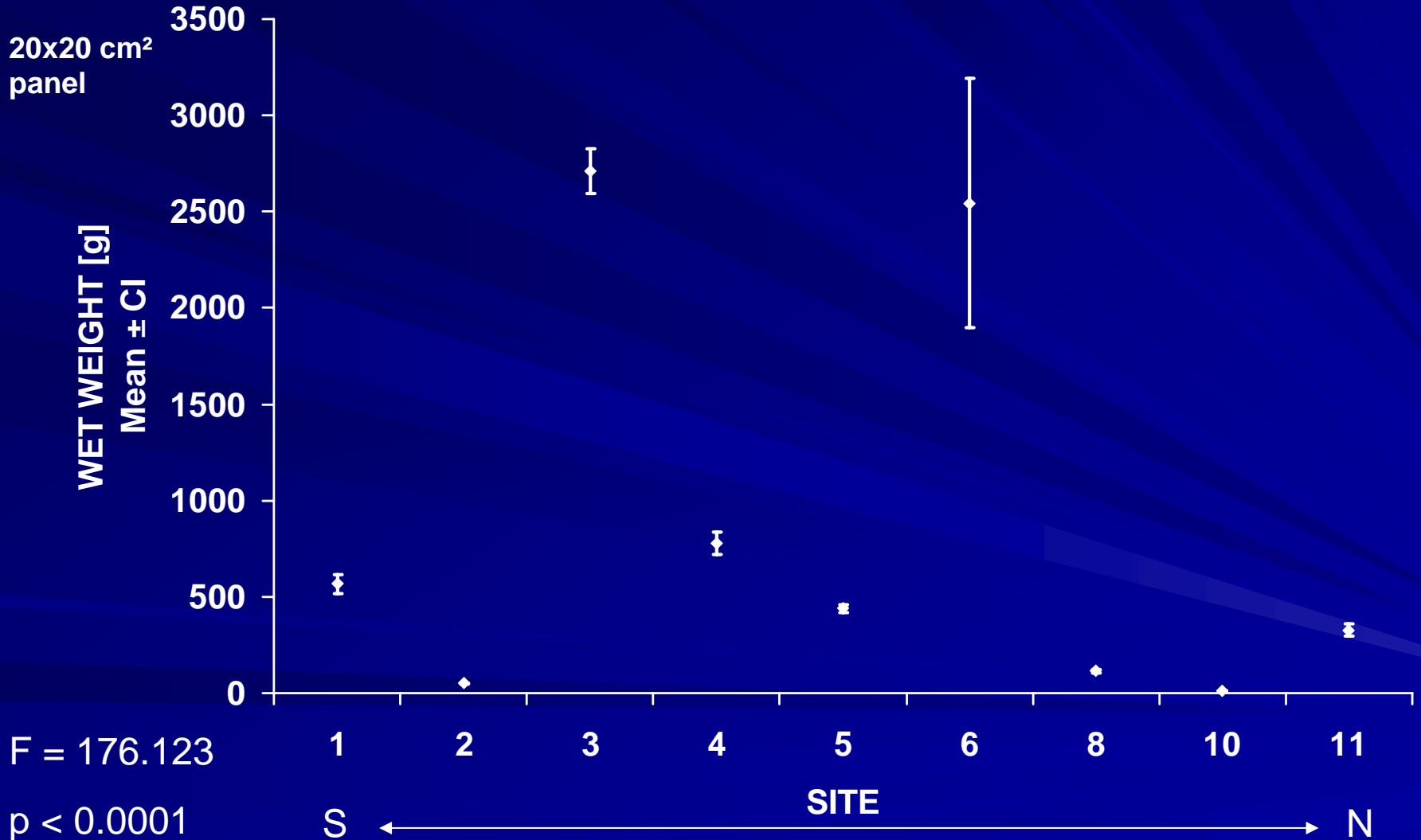
Developing Communities in November '05

- : brown alga *Ectocarpus spp.*
- : solitary ascidian *Ciona intestinalis*
- ▲ : blue mussel *Mytilus edulis*
- : soft tube forming polychaetes and amphipods

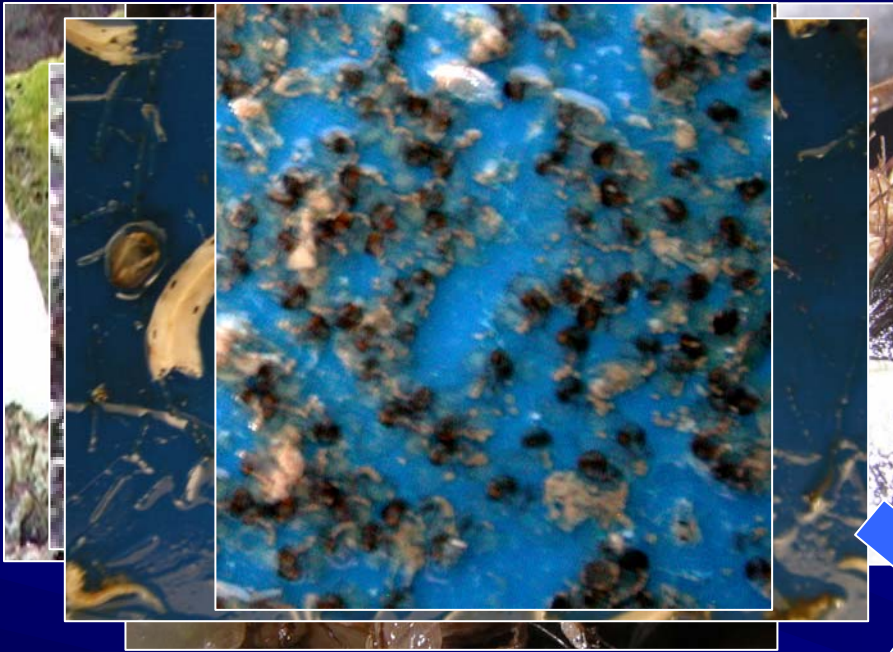
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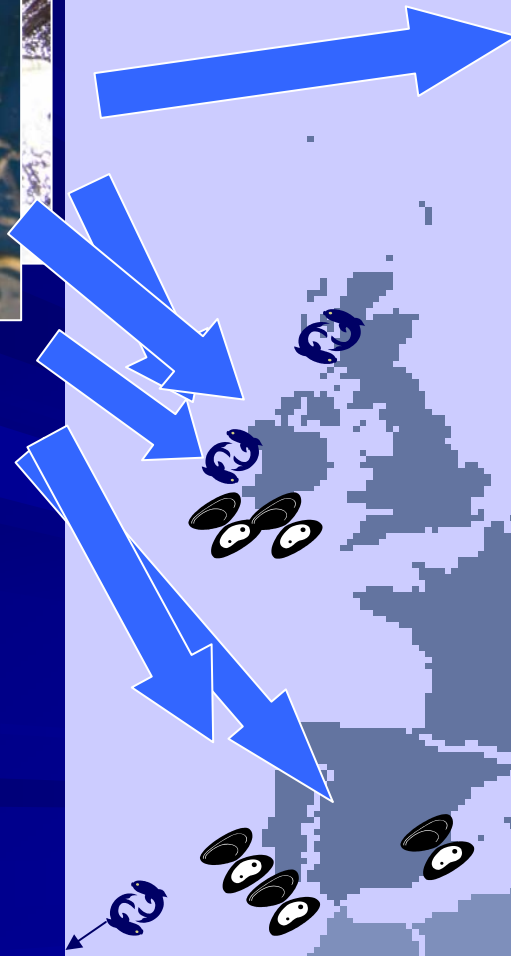
Developing Communities Wet Weight April '06



Conclusions Recruitment



- Diatoms/algae recruiting
- Ascidians at southern sites
- all vouchers recruited almost at sites from April, some in north years, and at intertidal and high tides in late winter
- Spacing and summer sites
- 1 At British Isles sites in summer to autumn
- 2 spatial in N-Norway

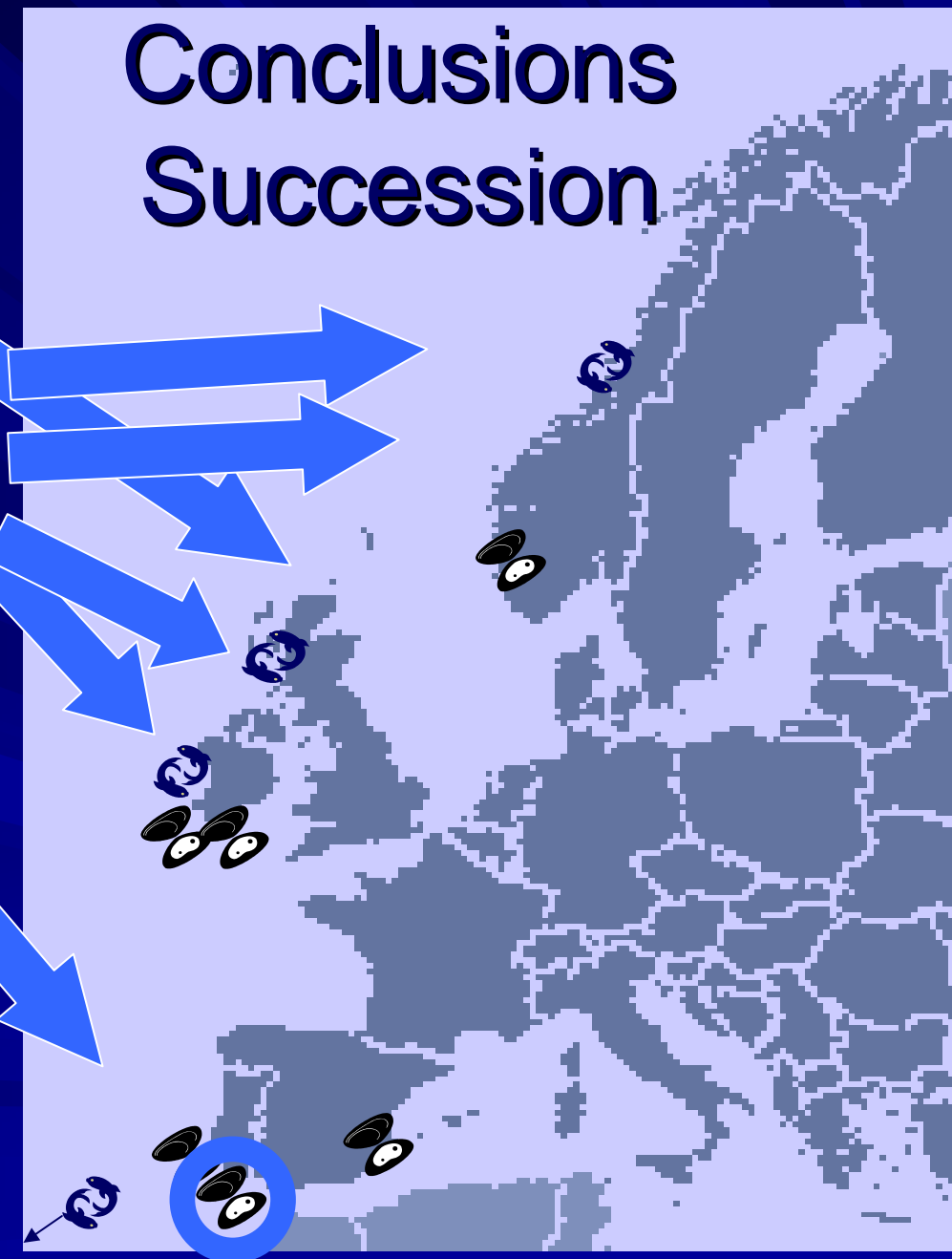
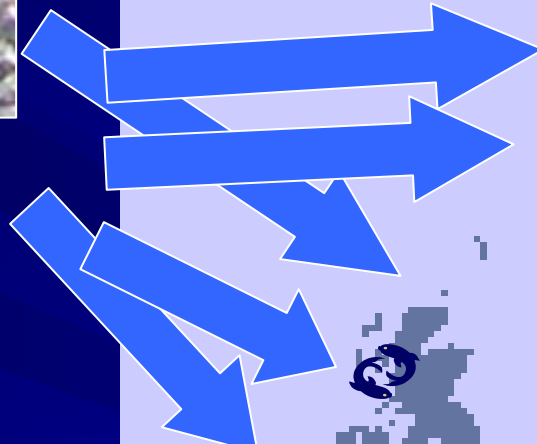


Conclusions Succession



Site - Blue mussels

9 months - all Irish sites - Blue mussels
After 6 months - first Scottish Site - all tubicolates, N-Norway
Brays orator first N-Norway and red pods
Norway, mussel and myxochytae
coralline red algae



Conclusions 1st year

- Site specific and seasonal differences in fouling
- Fouling on short-term immersed equipment, infrastructure or stock is different from long-term immersed
- Weight of fouling as problem for equipment and infrastructure depends on dominant fouling species at each site
- Site and duration of immersion is important when choosing an antifouling strategy
- Need 2nd year results for confirmation and to complete picture

Acknowledgements

- Thanks for the enthusiasm and effort of the CRAB SMEs; without their help this study would not be possible
- Financed by EC contract COLL-CT-2003-500536-CRAB (Collective Research, FP6)
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