



Sponges regeneration and reaggregation of cells experiment

Summer course in embryology of marine invertebrates
WSBS, Russia

Embryology of Marine Invertebrates



The White Sea Biological Station, 2016

CONTENT

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INTRODUCTION

❖ Regeneration in marine invertebrates

- Is the response to an external amputation (Bely, 2006)
- Is a process by which many animals can replace lost body parts (Bely & Sikes, 2010)
- Ability to regenerate is widespread in the animal kingdom. To understand the evolutionary history of the diverse regeneration mechanism, the regeneration processes must be studied in early-development metazoans (Borisenko *et al.*, 2015)

INTRODUCTION

❖ Why study regeneration and reaggregation in sponges?

- Sponges - Basal metazoans
- No true tissue grade organisation
- High regenerative capacity
- High plasticity of cells / ability to transdifferentiate
- Continuous cell movements and rearrangement of anatomical structure

METHODS

❖ Selected species

Sycon sp.



Calcareous sponge.
Small size, and are
tube-shaped and
often white to cream
in colour

Leucosolenia complicata

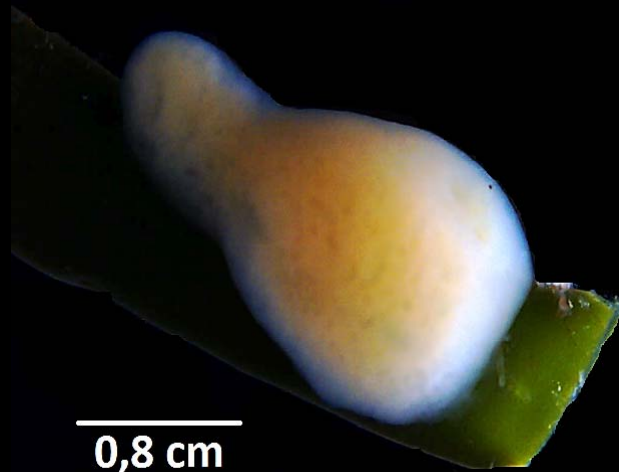


Shallow sublittoral
along most rocky
coasts of Europe

METHODS

❖ Selected species

Halisarca dujardini



Common species in littoral habitats along the european coasts

Clathrina cf. blanca



Comprises anastomosed tubes .
Asconoid aquiferous system

METHOD

Field work sampling



White sea

Intertidal zone low tide 16:30

Collection of *Sycon* sp. and *Leucosolenia complicata*

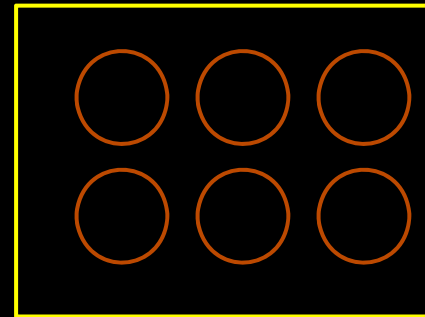
Underwater, never let the organisms touch the air

METHOD

S

❖ Lab Materials

Medium size Petri dishes
Tissue culture plates
Forceps
Blades
Pasteur pipette
Microscope
Filtered sea water
Fridge 10C
Needles

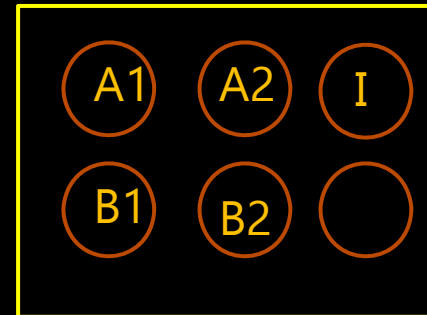
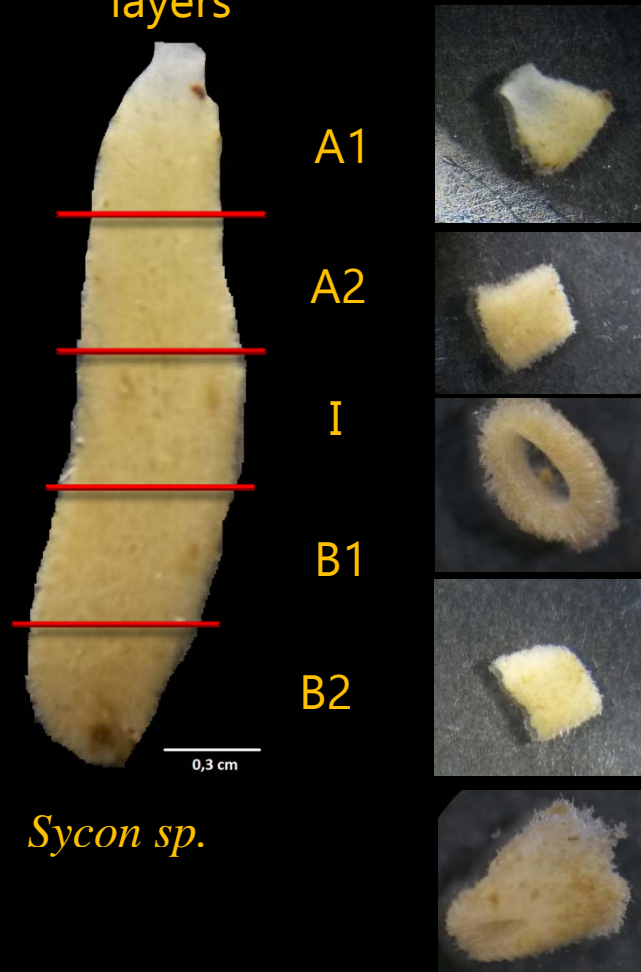


METHOD

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❖ Experiment one: Regeneration

Cut the sponge in 5 layers



10°C

3 h 6h 12h 24h 48h



METHOD

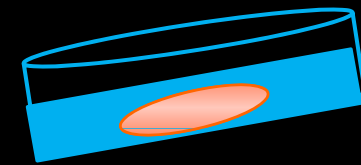
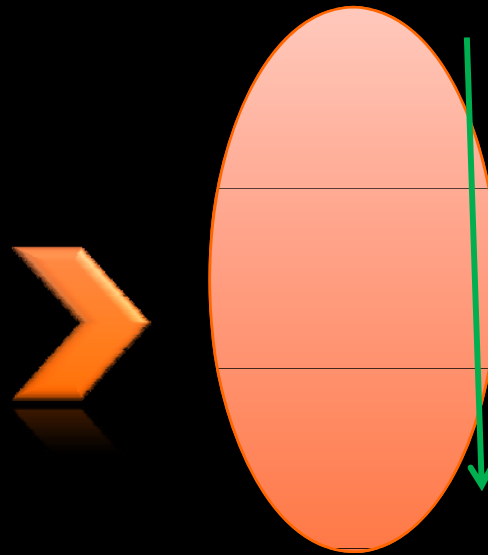
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❖ Experiment one: Regeneration

Halisarca dujardini



Superficial cut to the sponge



10°C

3 h 6h 12h 24h 48h



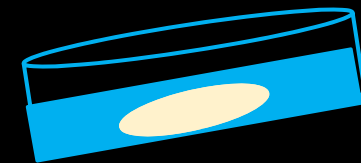
METHOD

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❖ Experiment one: Regeneration

Leucosolenia complicata

Small cut to the sponge



10°C

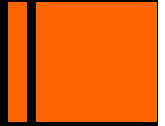
3 h 6h 12h 24h 48h



METHOD

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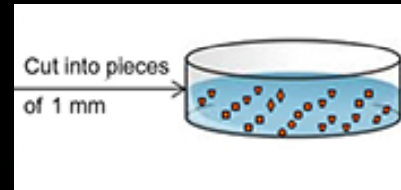
❖ Experiment two: aggregation



Halisarca dujardini



Leucosolenia complicata



10°C

3 h 6h 12h 24h 48h

RESULTS AND DISCUSSION

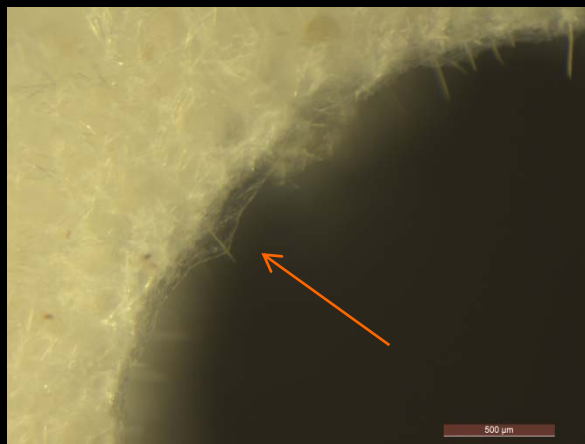
❖ Experiment one: Regeneration

Specie	Time period				
<i>Sycon</i> sp.	3 h	6h	12h	24h	48h
	NO	NO	Small membrane formation	Membrane covering 50% of the opening	Full regeneration membrane covering the opening

RESULTS AND DISCUSSION

❖ Experiment one: Regeneration

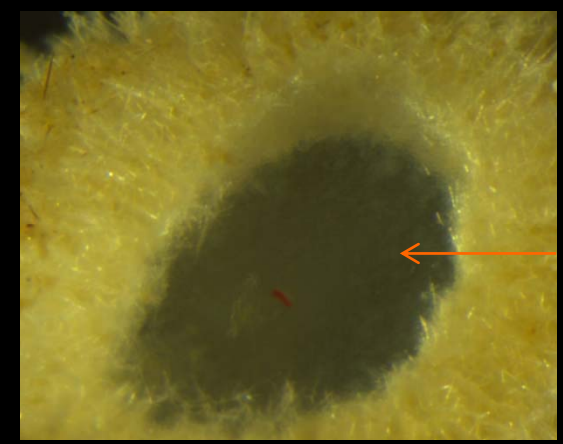
Sycon sp. A2



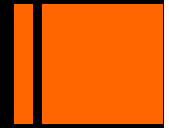
12h



24h



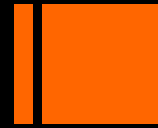
48h



RESULTS AND DISCUSSION

❖ Experiment one: Regeneration

Sycon sp.



24h

A1



A2



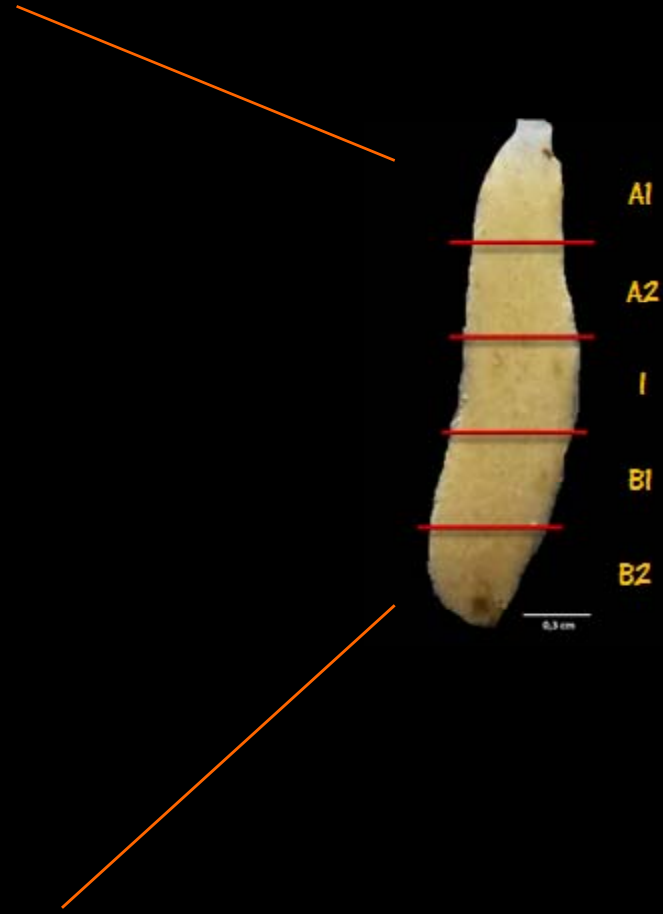
I



B1



B2



A1

A2

I

B1

B2

0.3 cm

RESULTS AND DISCUSSION

❖ Experiment one: Regeneration

Specie	Time period				
<i>Halisarca dujardini</i>	3 h	6h	12h	24h	48h
	NO	NO	Wound surface completely recovered	Archeocytes accumulate under the wound surface	New differentiated exopinacoderm



RESULTS AND DISCUSSION

❖ Experiment one: Regeneration

Specie	Time period				
<i>Leucosolenia complicata</i>	3 h	6h	12h	24h	48h
	NO	NO	Body wall contraction	Membrane covering 50% of the opening	Full regeneration membrane covering the opening

RESULTS AND DISCUSSION

❖ Experiment one: Regeneration

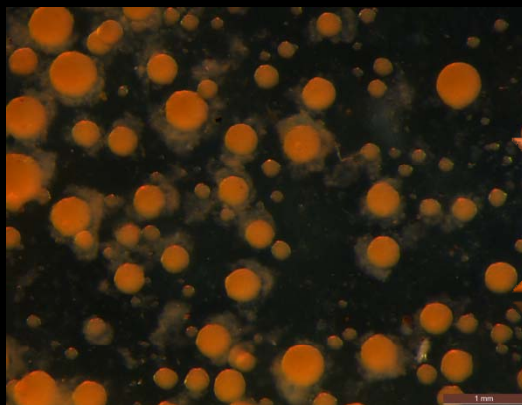
Leucosolenia complicata



RESULTS AND DISCUSSION

❖ Experiment two: Reaggregation

Halisarca dujardinii



RESULTS AND DISCUSSION

❖ Experiment two: Reaggregation

Leucosolenia complicata



CONCLUSIONS



- ❖ Regeneration and aggregation experiments in sponges seems to be a good model to assess that capability due to can be measured in short time and also comprises many processes that can be followed in laboratory.
- ❖ *H. dujardinii* experiment was which showed that reaggregation of cells have the capability to end in regeneration of a functional sponge.
- ❖ There are many direct and indirect factors that contribute to regeneration and reaggregation in sponges and they should be taken into account in further studies.