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MarBEF



# Marine Biodiversity and Ecosystem Functioning

*EU Network of Excellence*  
*Sustainable development, global change and ecosystems*

## D-7-CSP-4.1 Report on training course Marine invertebrates

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Organisation name of lead contractor for this deliverable

Framework Programme (2002-2006)		
<b>Dissemination Level</b>		
<b>PU</b>	Public	X
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	

**Report: MarBEF Training Course 2007**

TITLE: Experimental Biology on Marine Invertebrates

THE MarBEF-endorsed training course “Experimental Biology on Marine Invertebrates” was held in Roscoff (France) at the Station Biologique from the 30<sup>th</sup> of April to the 12<sup>th</sup> of May. There was a total of 32 applications for this course, but only 20 students were selected according to the following criteria: 1) affiliation to organizing Universities or to MarBEF institutions, 2) priority of registration, 3) affinity of CV. Students (see Tab.1) from nine countries, namely Austria (1), France (3), Italy (8), Russia (1) Scotland (1), Spain (1), Switzerland (2), Tunisia (1), Ukraine (1), attended the course. The MarBEF endorsement supported the course with €3000, from where two fellowships (€750 each) were assigned to the two students from the MarBEF associated partners institute (SIO-RAS, Russia, and IBSS, Ukraine).

The topics covered by lectures and/or practical sessions during the two weeks included:

- 1) Evolution of multicellularity and phylogeny of Metazoa
- 2) Introduction to sponges and self-recognition systems in invertebrates. The Eumetazoan sponges: basal position of the Haploscleromorpha
- 3) Introduction to evolutionary developmental biology of marine invertebrates, conservation of common genetic toolkit, analysis of the UrMetazoa and the Urbilateria ancestor.
- 4) Introduction to cnidaria and to the evolution of triploblasty and bilateral organization in basal animals (ancestral genomic complexity in cnidarians, levels of conservation of regulatory genes), life cycle reversal, cnidaria and metamorphosis, regeneration in cnidaria.
- 5) Introduction to acoelomorph flatworm: *Symsagittifera roscoffensis*.
- 6) Embryology of different invertebrate groups: cnidarians, ctenophorans, annelids, echinoderms, tunicates
- 7) Investigation on cell cycle and oocyte maturation in sea urchin.
- 8) Immunostaining protocols, localization of microtubules of mitotic spindle in sea urchin, immunostaining of nerve cells in cnidarians and acoela flatworms, stem cells (BrdU incorporation).
- 9) Regeneration in cnidaria and echinoderms
- 10) Localization of cell lineages by histochemical and immunological protocols: the myoplasm determinants in ascidian development by localization of AChE
- 11) Evolution of the nervous system
- 12) Journal club session: 20 scientific articles from recent (2005-2007) literature were presented and discussed by the students (powerpoint presentations).

Organizers and main lecturers of the training course:

Prof. Stefano Piraino – University of Lecce, (MarBEF member), Italy

Prof. Patrick Cormier – CNRS/UPMC Paris VI - Station Biologique de Roscoff, France

Prof. Daniela Candia Carnevali – Università di Milano, Italy

Dr. Bertrand Cosson - CNRS/UPMC Paris VI - Station Biologique de Roscoff, France

Dr. Nathalie Ouhlen - CNRS/UPMC Paris VI - Station Biologique de Roscoff, France

Invited Lecturers:

Dr Bernard Kloareg, Director Station Biologique Roscoff

Prof. Heinrich Reichert – University of Basel

Dr Xavier Bailly – University of Copenhagen, Denmark



Table I. List of participant students (Roscoff Course 2007)

	NAME	E-mail	Address	UNIVERSITY/ INSTITUTE	Gender
1	ABASSI AZZA	<a href="mailto:meriazza2006@yahoo.fr">meriazza2006@yahoo.fr</a>	Dépt de biologie Campus universitaire El Manar- 1060, Tunis- Tunisie	TUNIS	F
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3	BALMER Jasmin	<a href="mailto:Jasmin.Balmer@stud.unibas.ch">Jasmin.Balmer@stud.unibas.ch</a>	UNIBASEL	BASEL	F
4	BERY Amandine	<a href="mailto:amandinebery@yahoo.fr">amandinebery@yahoo.fr</a>	Dept Genetica, Fac Biologia	BARCELONA	F
5	BILOTTO Stefania	<a href="mailto:sbilotto@libero.it">sbilotto@libero.it</a>	Via Provinciale n° 204, Manocalzati (Avellino), Italy	NAPOLI	F
6	BUISSON Johanna	<a href="mailto:johanna.buisson@wanadoo.fr">johanna.buisson@wanadoo.fr</a>	16, rue de Vintimille 75009 Paris	PARIS VI	F
7	DI BENEDETTO Cristiano	<a href="mailto:cristiano.dibenedetto@unimi.it">cristiano.dibenedetto@unimi.it</a>	Dip Biologia	MILANO	M
8	FASSINI Dario	<a href="mailto:darfass@libero.it">darfass@libero.it</a>	Dip Biologia	MILANO	M
9	GIRARD Anne- Claire	<a href="mailto:girard@sb-roscoff.fr">girard@sb-roscoff.fr</a>	Station Biologique, Equipe CCD, BP 74, 29682 Roscoff	PARIS VI	F
10	KRAMER Annemarie	<a href="mailto:annemariekramer@yahoo.com">annemariekramer@yahoo.com</a>	Team Patzner/Marine, Department Organismic Biology,Helbrunnerstr. 34	SALZBURG	F
11	LICCIANO MARGHERITA	<a href="mailto:margherita.licciano@unile.it">margherita.licciano@unile.it</a>	DISTEBA	LECCE	F
12	LOUPPOVA Nora	<a href="mailto:oltem@yahoo.com">oltem@yahoo.com</a>	P.P.Shirshov Institute of Oceanology of the Russian	SIO-RAS RUSSIA	F
13	MARKANTONATOU Vasiliki	<a href="mailto:vmarkantonatou@edu.biology.uoc.gr">vmarkantonatou@edu.biology.uoc.gr</a>	Hellenic Centre for Marine Research, CRETE Former American Base of Gournes	HCMR- CRETE	F
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20	ZAPATA RAMÍREZ PAULA	<a href="mailto:paula.zapata.r@gmail.com">paula.zapata.r@gmail.com</a>	161 Rose Street, 1F1, EH2 4LS Edinburgh, Scotland	EDINBURGH	F

Course participants were given a questionnaire with six questions to which we received the following feedbacks:

1) How satisfied are you with the course content?

Very satisfied (**90%**)                      satisfied (**10 %**)                      not satisfied

2) How satisfied are you with the course organization?

Very satisfied (**60 %**)                      satisfied (**40%**)                      not satisfied

3) Do you think that attending the course will be useful for your future work/studies?

Yes (**92%**)                      Maybe (**8%**)                      No

4) Would you recommend attending this course to your colleagues?

Yes (**100 %**)                      Maybe                      No

5) Is there something you would recommend to improve the organization of future courses?

***Shorter lunch, flexibility in lunch times, circulation of scientific literature before starting the course, less participant students, more time for team projects***

6) How did you know about this course?

***Supervisors, Internet, University, MarBEF.***

**Posted by Stefano Piraino**

## Original training course PROPOSAL

Title and scientific content of the training course

### **EXPERIMENTAL BIOLOGY COURSE ON MARINE INVERTEBRATES**

Time and location of the training course

**30 April – 12 May 2007**

**STATION BIOLOGIQUE DE ROSCOFF (F)**

**[www.sb-roscoff.fr](http://www.sb-roscoff.fr)**

### **Description and program of the training course**

This international course, which associate 4 universities from 3 different european countries (Basel, Switzerland ; Lecce and Milano, Italy ; Paris VI, France), is open to 18-20 graduate students having successfully achieved their first three years in Biology. The course is also accessible for doctoral students. It will be given in English. The scientific themes will cover comparative analysis of basic developmental processes in a variety of invertebrate taxa (sponges, cnidarians, ctenophores, annelids, echinoderms, tunicates). The organizers expect that the course will raise interest in developmental biology, life cycles, and evolution. During the course, students will make observations on invertebrate anatomy and reproductive patterns, larval ecology and life cycles, do experimental bench work on topics ranging from cell cycle analysis, fertilisation, embryogenesis and larval development, tissue differentiation and morphogenesis, regeneration, reverse development. Active participation in the course will be requested. A Journal Club session will be devoted to discussion of relevant breakthrough articles in the field to promote critical reading of the scientific literature and to open discussion for broader interpretation. The participant students will lead the journal club. Communication skills will be developed, including informal interactions with instructors, collaborative work with other participants, oral presentation of their current interests, written report describing the performed experiments and analysing their results, debriefing of the course. Finally, this international interuniversity

course will provide the framework for exchanges between students of different european universities. Upon agreement between the 4 partner Universities, this course will be credited as a « Master Course Program » and provide 6 ECTS credits.

**EXPERIMENTAL BENCH WORK** is organized as follows :

- *Common experiments* will be performed by each student individually or in small groups.

Those are described in the handout and concern developmental processes of species from selected phyla (sponges, cnidarians, ctenophores, echinoderms, tunicates, annelids). New experiments will be started almost every day.

- In parallel more specific *team projects* will be performed by groups of 2 students. The projects will cover descriptive and experimental work, often with research character and undetermined result. Own initiative is required/encouraged. Organizers will advise where necessary. These groups will be formed on the 1st day and the selected projects proposed by the organizers will be carried out over the course. All participants will be informed by email not later than end of March about the envisaged projects. Participants are asked to read carefully the projects and name their 1st, 2nd and 3rd priorities to the organizers. They will form the groups of two and beforehand prepare the equipment for the projects. At the end of the course each team will prepare a poster about their work and give a short oral presentation.

PROPOSED EXPERIMENTS (tentative list):

- Observations of feeding, gametogenesis, fertilisation, embryogenesis, larval development and metamorphosis in a large variety of species
- Cnidarian dissociation, regeneration experiments, cellular determination (DAPI + phalloïdin-FITC staining)
- Chemical induction/inhibition of metamorphosis of larvae
- Grafting experiments on medusae, depending on available material
- Body axis and tissue differentiation: peroxidase, phosphatase, acetylcholinesterase stainings
- Cell cycle analysis: BrdU staining, anti-phosphoHistone H3, inhibition of DNA synthesis (aphidicolin)
- Nerve cell analysis: Immunohistochemistry with neuronal-specific antibodies
- Sea urchins: polyspermy experiments, induction of animalised and vegetalised eggs, protein

**Provisional Work Program**

**P: Practical Work, T: Theory, S: Seminar, D: Discussion**

**Monday, 30.4.07**

**Plankton**

09.00 **T:** Introduction to the course

**T:** Presentation of the Marine Station of Roscoff

**T:** Introduction to the plankton

10.30 **P:** Analysis of the plankton

13.30 **P:** Plankton, discussion of group work (group work will be done besides the general work program)

14.00 **T:** Introduction to Roscoff littoral ecology: biological zonation, tides and currents

15.00 **Excursion/collection** at low tide into the littoral (exact time to be defined according to tide tables)

16.30 **P:** Discussion and start of the group work

20.15 **T:** Metazoan evolution

**Tuesday, 01.5.07**

**Phylum: Porifera**

09.00 **T:** Introduction to Porifera, basic anatomy and functional biology

**P:** Identification of the sponge material

10.30 **P:** Screening of plankton for medusae and ctenophores

11.00 **S:** Development and evolution of sponge (2 students)

14.00 **T:** Introduction to the cell adhesion experiments

**P:** Starting experiments in groups of 2

17.00 **S:** Participants (presentation of own work)

20.00 **T:** Evolution of the brain – I

**Wednesday, 02.5.07**

**Phylum: Cnidaria**

09.00 **P:** Handling of sponge experiments

**S:** Sorting out in sponge and vertebrates (2 students)

10.00 **T:** Introduction to Cnidaria: basic anatomy, functional biology and life cycles

11.00 **P:** Identification of cnidarian material/anatomy

14.00 **T:** Introduction to embryonic development and metamorphoses of cnidarian larvae

15.00 **P:** Starting metamorphoses experiments

16.00 **S:** Participants (life cycle reversal, control of metamorphoses)

17.00 **S:** Evolution of the brain II

18.00 **P:** Changing medium, again after dinner

**P:** Starting fertilization experiments

20.30 **S:** Seminar invited lecturer

### **Thursday, 03.5. 07**

Low tide: 18.56, 3.96m

09.00 **P:** Protocol of metamorphoses and sponge experiments, follow-up

10.00 **T:** Introduction to antibody experiments

**P:** Start with Immunohistology and BrdU experiments

13.00 **P:** Continuation of staining and group work

**S:** Regeneration in Cnidaria

16.00 **P:** Protocol of immunohistology in groups of two

20.00 **P:** Protocol of immunohistology in groups of two

### **Friday, 04.5.07**

#### **Phylum: Annelida/Ctenophora**

09.00 **T:** Ctenophora embryology

Introduction to the Annelida and Sabellaria embryology/experiments

09.45 **P:** Fertilization experiment, protocol of early development, group work

11.00 **S:** Contribution of participants

14.00 **P:** Sabellaria development, group work

16.00 **P:** Plankton (isolation of Ctenophores), Sabellaria and group work

17.00 **T:** Functional biology of Echinoderms

20.00 **S:** The evolution of muscle

### **Saturday, 05.5.07**

Ending the week's work

9.00 Breakfast with all participants

9.45 **P + D:** Analysis of experiments, immunohistology

Group works

### **Sunday, 6.5. 07**

Free / Excursion to Ile de Batz?

### **Monday, 7.5.07**

#### **Phylum Echinodermata**

09.00 **T:** Introduction to echinoderm embryology

09.30 **P:** Handling animals, gametes and embryos of sea urchins

protocol of fertilisation, fertilization membrane and division cycles

11.00 **T:** Post transcriptional regulation analysis during first mitotic divisions in sea urchins, description of the experiment

14.00 **P:** Start of the experiment

15.00 **S:** Lecture: "Regulation of gene expression at the translational level. A lesson from the sea urchin early embryo

18.00 End of experiments

20.00 **S:** Seminar Invited lecturers (Lepage)

### **Tuesday, 8.5. 07**

#### **Phylum: Echinodermata - Mutability of connective tissues (MCT) and Regeneration**

9.00 **T:** MCT: Short introduction to the practical work

9.15 **P:** Handling animals and incubation with anaesthetics

9.25 **T:** Exploring the biomechanical potential of MCT

9.55 **P:** Practical work : Response/ recovery after different treatments (anaesthetics, etc.)

Afternoon session: (14.00-20.00)

14.00 **T**: MCT: discussion of experiments .

REGENERATION: BrdU Practical work

**Wednesday, 09.5. 07**

9.00 **T**: Introduction to the practical work

10.00 **P**: Arm and test regeneration (whole animal vs. explants) evaluated with microscopic and statistical analysis.

11.30 **P**: BrdU Practical work

14.30 **T**: REGENERATION: Discussion of the experiments

16.00 **T**: Introduction to tunicate anatomy and embryology

**P**: Tunicate fertilization

20.00 **S**: Regeneration in Echinoderms

**Thursday, 10.5. 07**

**Phylum: Tunicata**

09.00 **S**: Contributions of participants

10.00 **P**: Tunicate embryology – larval development/ muscle cell differentiation experiments

16.00 **S**: Contribution of students

Preparations of posters (group work)

**Friday, 11.5.07**

9.00 **T and P**: Metamorphoses of tunicate larvae

10.30 **S**: Annelid evolution at the black smokers

11.30 **S**: Why Acoelomorpha are useful model system in evo-devo investigations?

11.00 **P**: Finishing up experiments

14.00 **D**: Presentation of posters

Clean up

**Saturday, 13.5.04**

Conclusive discussion of the course

Good-bye and travel well

**Contact address with e-mail**

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**Tentative audience of the training course:**

16-20 diploma/doctoral students in Biology.