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
Due date of deliverable: November 2007
Actual submission date: May 25, 2007

Start date of project: 1 February 2004
Duration: 60 months

Experimental Biology Course on Marine Invertebrates
30 April - 12 May 2007
Station Biologique de Roscoff

Framework Programme (2002-2006)

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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 30th of April to the 12th 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)

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<tr>
<th>NAME</th>
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PAULA
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
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

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 + phalloidin-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

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 litoral (exact time to be defined according to tide tables)

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

**Tuesday, 01.5.07**

**Phylum: Porifera**

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

10.30 **P:** Identification of the sponge material

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

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

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

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**

Prof. Stefano Piraino – University of Lecce – Dipartimento di Scienze e Biotecnologie Biologiche ed Ambientali (DISTEBA) – Via per Monteroni, complesso ECOTEKNE - 73100 LECCE

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**Tentative audience of the training corse:**

16-20 diploma/doctoral students in Biology.