

Methodological Approach to the Study of Marine Sciences on the Field and through Tele-Education

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Abstract:

We are firmly convinced that a large part of Marine Science studies (Biology, Ecology, Ethology, etc.) cannot be learnt only in the classroom, even at University level, but it must be done “in the field” and in equipped laboratories where students can use and adopt instruments and techniques currently employed for research in the different study areas. In this light, our Institute has organized for thirty years courses and other research activities for students from schools of all orders and grades, including Universities, based on lessons and the sampling of materials directly along the shores of our coastline. The material collected by the students is then studied and analysed in the Institute own laboratories and aquariums. Our photographic library provides an educational aid, covering a variety of subjects including systematics of marine plant and animal life, ethology, comparative anatomy, physiology. A series of slides explains the different types of coastline, waves and tides, food chains, and the chemical-physical properties of sea water etc. The students can photograph the study material under the stereomicroscopes themselves, or record observations through a videocamera set on the microscope, which transmits the images directly to a maxiscreen in the classroom. The Regione Toscana has linked our structure to INTERNET so that it will be possible to send Marine Science tele-educational programmes to schools of which, not being near the sea, wish to interact with us for any lessons and practical activities on the various aspects of Marine Science research.

Key Word: *lessons, exercises, methods*

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I. Material And Methods

The study and consequent knowledge of Marine Biology needs to be able to use tools, specific textbooks, practical work and experiences carried out in first person by students with the help of highly specialized personnel on the various activities chosen by their professors who lead them to do internships in our Biology and Marine Ecology Institute (photo 1). The activities are organized according to whether they are middle schools, high schools or universities with these methods and equipment.

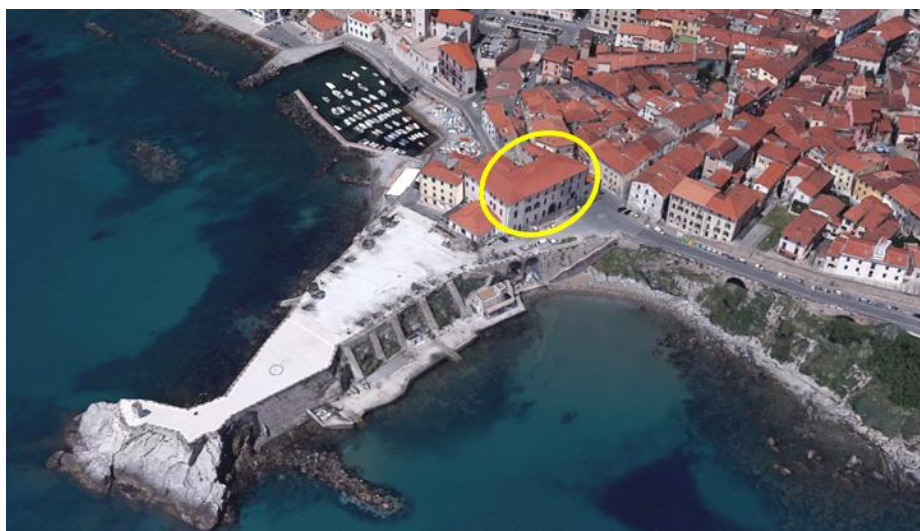


Photo no 1: Location of the Institute of Marine Biology and Ecology in Piombino (Italy).

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1) On their arrival the students are shown the lessons and practical exercises and a written test with questions and answers is done among which they must choose the right ones to evaluate the initial knowledge about the topics concerning the marine environment to be compared with the answers to the final intership test.

2) Projection of 110-120 images relating to the topic chosen by the teachers who received the titles of 80 lessons at school. The projection room has 55 chairs with folding desks (photo 2).



Photo no 2: Projection room.

3) Students sample phyto and zoobenthos little species with the method of scratching on the walls of the marina below our institute. The sampled species are brought to the laboratories in refrigerated containers for taxonomic determination (photo 3).



Photo no 3: Sampling of species along the walls of marina.

4) The laboratory for the taxonomic determination has 16 stereomicroscopes which are combined with two books: one with 500 photos of already determined species and one with many hundreds of drawings of taxonomized benthic species that helps students to name the observed species (photo 4).



Photo no 4: Observation and taxonomic determination of the species under stereomicroscopes.

5) Physical chemistry, comparative anatomy on invertebrates species, fish and exercises on *Posidonia oceanica* (L.) Delile, 1813 seagrass (photos 5/6/7/11). In this laboratory a camera connected to a microscope sends the observed images into the projection room and two stereomicroscopes with connected cameras that allow students to photograph what they are observing (photos 8, 9).



Photo no 5: Exercises on the physical chemistry of Mechernich (GER) high school students.



Photo no 6: Dissection of marine invertebrates.



Photo no 7: Dissection of marine fish.



Photo no 8: Laboratories for high level scientific research



Photo no 9: Laboratories for high level scientific research.



Photo no 10: Biologist who captures small species on *Posidonia* leaves using a plankton net.

6) For the exercises on *P. oceanica*, the most important seagrass of the mediterranean marine ecosystem, a biologist samples plants in immersion and, with a hand-operated plankton net (photo 10) captures many individuals of a few cm which will be observed on stereomicroscopes. This is the only way to make students understand the very important nursery function of the prairies (photo 11) with juveniles species observable only by stereomicroscope (photo 12).



Photo no 11: Exercises on *Posidonia*.

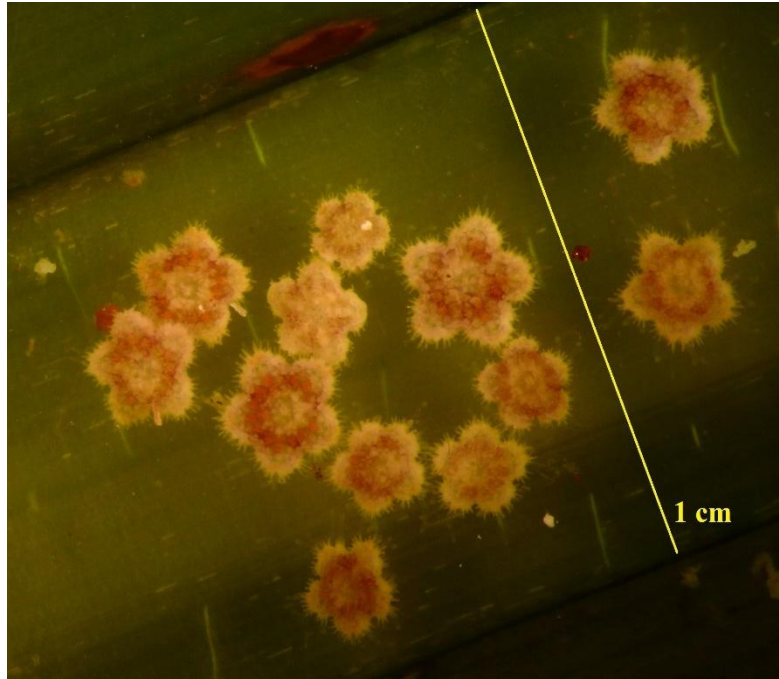


Photo no 12: Specimen even of 1 mm photographed under the stereomicroscope.

7) In the computers of the laboratory the taxonomic determination of the species, students can view over 8000 photos with their scientific name to verify the veracity of what they think they have determined.

8) The lessons can also be held directly at sea with our biologists (photo 13).



Photo no 13: Lesson on the characteristics of the seabed using mask and fins.

9) At the end of the training period students have to write their impressions on the activities carried out to evaluate observations and proposal to improve the activities.

10) The Institute also has a museum of Mediterranean marine species (photos 14-21). Students are taught the anatomical, physiological and ethological characteristics of the various observed species.



Photo no 14: Poriferons and Cnidarian section of the marine museum.



Photo no 15: Gastropod and bivalve molluscs.



Photo no 16: Cephalopods, Anellids, Crustacean and Echinoderms.



Photo no 17: Reptiles and Fish.



Photo no 18: Reptiles and Fish.



Photo no 19: Abissal fish.



Photo no 20: Sharks, Rays and sea eagles.



Photo no 21: Mammals, dolphins.

II. Conclusion

In over 30 years of these scientific activities carried out in our Institute most of students write that they did not think that the activities to be carried out were so interesting. Many students write that after this experience they think they will enroll in Biology at the University. Their considerations show that they are the activities carried out with high level scientific equipment, their use made in first person by the students, their location with the sea water being pumped directly from the sea below the Institute which allow the students to observe living species on stereomicroscopes, the high scientific level of our professors who help students to understand the beauty of science studies.

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