"PHENOTYPING & GENOTYPING OF ULVA"

Report on Training School on "Phenotyping and genotyping of *Ulva*" in Kavala, Greece

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The COST Action SeaWheat (https://seawheatcost.haifa.ac.il/) organized a 4-days Training School, from April 25-28, 2023, at the Fisheries Research Institute (ELGO-DIMITRA; www.inale.gr), in Nea Peramos, Kavala, Greece.

Rational and objectives

Seaweed mariculture is often considered the most environmentally friendly form of aquaculture. Among the different seaweed genera currently cultivated, *Ulva* is likely one of the most suitable candidates for large biomass production in European mariculture. However, not all *Ulva* species and strains have equal commercially exploitable attributes. A careful selection of the strains to be cultivated should be performed, depending upon the final use of the biomass and the geographical location of the farms. State-of-the-art genotyping and phenotyping methodologies provide the tools for such a selection. Hence, they could support the development of innovative approaches to speed up the genetic improvement of economically important traits, and ultimately their integration into breeding programs, which will make European farms more competitive.

The objective of this training school is to provide the participants with the skills required for genotyping and phenotyping *Ulva* strains. Training will include sampling specimens, DNA extraction for Next Generation Sequencing, PCR amplification, CAPS assays, and computer-based analyses using genetic data for genotyping. For phenotyping, participants will be introduced to chlorophyll-a fluorescence and oxygen release analyses, and become introduced to automated phenotyping platforms.

Trainers

Five (5) trainers with their assistants have been participated (alphabetically): Prof. Olivier De Clerck, University of Ghent, Belgium, Prof. Félix Figueroa, University of Malaga, Spain, Dr. Chrysoula Gubili, ELGO-DIMITRA, Greece, Dr. Sotiris Orfanidis, ELGO-DIMITRA, Greece, Dr. Ronan Sulpice, University of NUI Galway, Ireland. The event is also attended by the Action Chair and Scientific representative of the COST Action "SeaWheat", Prof. Muki Shpigel, University of Haifa (Israel).

Trainees

From thirty-two (32) early Career Investigators, SMEs, and PhD-students of Network members currently / previously working in seaweed ecology and aquaculture fields applied, fourteen (14) participants have been selected by an internal committee. The trainees, seven males and seven females were masters or postdoctoral students from various countries such as Belgium, Greece, Estonia, United Kingdom, Italy, Spain, Israel, Latvia, Portugal, and Slovenia. All trainees have been funded with a maximum of 980 € (up to 500 € air-ticket; 80 € D.A.-incl. 44 € for the Hotel) grant per participant.

Host

The meeting has been organized locally by Dr. Sotiris Orfanidis (sorfanid@inale.gr) and members of Benthic Ecology and Technology Laboratory, Fisheries Research Institute (ELGO-DIMITRA): (https://www.google.gr/maps/@40.8559347,24.3156409,84m/data=!3m1!1e3).

Figure 1. Group photo of Training School.

Course design and training material

The design of the course was established during three teleconferences between the trainers. It was anticipated that the educational level of the trainees would be variable and that their experience in dealing with seaweed phenotypes and genotypes, interpreting responses, and in analyzing data would be limited and would require strengthening. The training materials, such as protocols and acclimated *Ulva* unialgal cultivated material prepared specifically for the workshop, were based on knowledge and procedures used in advanced courses of Universities and Institutes in Europe. Also, state-of-the-art scientific instruments such as different chlorophyll-a fluorometers, a spectrophotometer with an integrated sphere, and a growth phenotyping platform of "Benthic Ecology and Technology Laboratory" were given to trainees for practice.

Seven training Units were made available to the participants, from 09.00 to 18.30 every day, covering the following topics: Sampling *Ulva* strains from Nea Peramos coasts; Study of *Ulva* material under stereo- and microscope (use of Lugol); Samples sporulation and preparation for analysis in silica gel; Labelling and preparation of herbarium specimens; Genotyping: DNA extraction, PCR amplification, CAPS; Phenotyping: Growth rates estimation using conventional and automated methods; Phenotyping: Chlorophyll-a fluorescence and oxygen evolution cardinal variables of sun vs shade acclimated *Ulva* (P-I curves). Computer-based analyses using genetic data and computer-based analyses using Chlorophyll-a fluorescence (ETRmax, alpha, Ik) and oxygen evolution (Pmax, alpha, Ik) data (Excel) were discussed.

Before the closing, all achievements during TS were presented by representatives of three groups of trainees and discussed with trainers.

Conclusion

The Training School in Kavala, Greece, was an enriching experience for all involved trainers, trainees, and hosts. In addition, this Training School helped "SeaWheat" COST Actions to share knowledge and support collaboration.