DORY - Capitalization actions for aDriatic marine envirOnment pRotection and ecosYstem

PA 3 – Environment and cultural heritage
Specific Objective 3.2 - Contribute to protect and restore biodiversity
Application ID – 10041641

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Activity	Implementation of pilot actions for sustainable aquaculture
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Pilot Action: *Implementation of Pilot actions for sustainable aquaculture*

ZADAR COUNTY
FINAL REPORT

INTRODUCTION

Zadar County is implementing a project in an area where mussels are already cultivated with the "classic technology" of floating parks, in tubular nets (in Croatian they are also called "socks" or "pergolas"). Production growth in this area is not sufficient and the available agricultural capacities have not been utilized. Zadar County is undertaking a series of activities to improve, such as conducting development studies, how to reduce environmental impact and how to use degradable, environmentally friendly materials for economic use.

The cornerstone of the project proposal is one of the existing holdings, which can meet the criteria for pilot project implementation. One of the key steps in the implementation of this pilot project is the transfer of acquired knowledge, experience and skills from the Veneto region to Zadar County.

It is important to emphasize that it is not possible to transfer this type of technology by simply "copying" from one farm to another. Each agricultural area has its own specific environmental conditions, specific infrastructure, different market or different market access, so existing technology needs to be adapted.

The equipment needed to implement the project was defined and put into operation during the project. Part of the equipment was transferred from the ECO SEA project. Selected farm owners and experts have been appointed to evaluate the biological, technological and economic results involved in the project.

PREPARATORY PHASE OF THE PILOT ACTIVITY

At the preparatory meetings of the Zadar County project team, a plan for the implementation of the pilot activities was agreed. Progress of the project continues with the project activities required to achieve the specific project objectives. Including administrative activities, exploration and market research, preparation and implementation of a pilot project, preparation for research, data collection and evaluation.

- Pilot project start in March with Guidelines for the implementation of CB enhancing measures.
- The large procurement of equipment for conducting the pilot project has been completed.
- The procurement of "Know how" for conducting the New Zealand method of shellfish farming has been completed
- The procurement of biologist for conducting the pilot project has been completed.
- Services of shellfish farming on the farm was selected.

In April 2018, we ordered Provision of services (know-how) of an expert in shellfish farming using the continuous line farming technique for the DORY project.

In April 2018, VELE MARE doo firm of shellfish farming, located on Seline, Starigrad paklenica in Zadar county area was selected.

In September 2018, we ordered equipment for shellfish farming with the New Zealand method for DORY project.

In November 2018, University of Zadar was selected for the Services of biology experts for the DORY project.

PROJECT IMPLEMENTATION

A part of the line is selected to compare the classical method and New Zealand method of shellfish farming.

Seed collection equipment was purchased and set up.

An expert on the New Zealand method, who conducted the method in the Veneto region on the ECOSEA project, submitted a farm status report and provided instructions on how to implement the method.

Pilot project start in March with Guidelines for the implementation of CB enhancing measures.

Transport and installation of equipment required for the implementation of the project that have been transferred from the ECOSEA project have been initiated (Figure 1).

Figure 1: The boat set for the mussel farm

Location: A concessionar is selected on whose farm a pilot project is being implemented. Position on the farm to implement the project was selected. Cordinate: 44°16'2.62"S, 15°31'20.35"I, Figure 2.

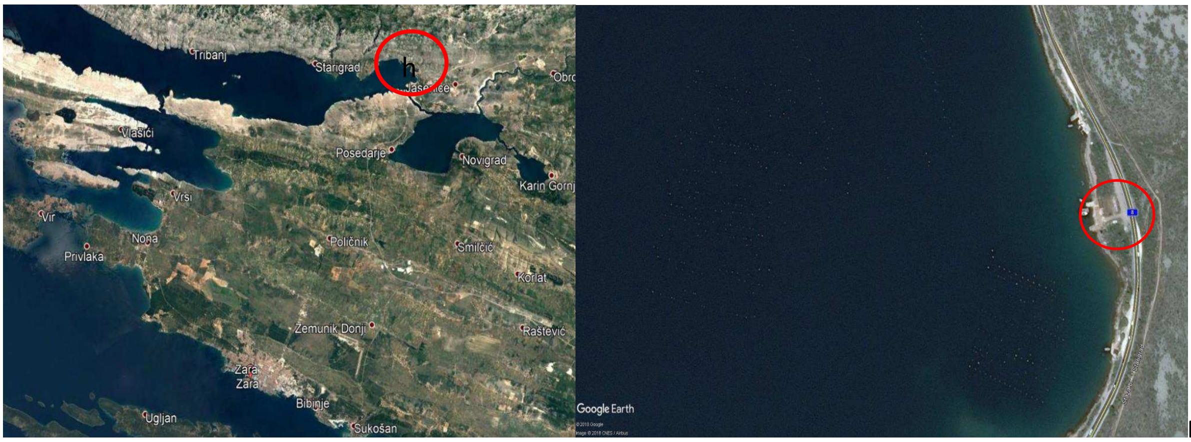

Figure 2: The location of selected mussel farm in the Zadar County

Figure 3: The location of selected mussel farm in the Zadar County

The pilot project activities began in October by setting up a rope for seed shell. Due to the delays in procurement and equipment arrival the timing of the project had a different development.

Figure 4: machine calibration

The farmers had to understand how this machine works, and even if the operator of mashine maker taught them some information, the field tests are those that allow to better understand how to operate it (Figure 4).

Figure 5: finismachine calibration is complete

After several days of practice on the machine, the calibration of the machine is complete (Figure 5).

Figure 6: finismachine calibration is complete

The problem with machine calibrations was that the speed and amount of seed filling on the continuous rope that had to be wrapped with a cotton net were not properly used at the same speed. The cotton net often broke and needed to reduce tension. The shells tore the cotton net because of the softness of the cotton net

After this first step, assisted by University of Zadar (Department od Ecology, Agronomy and Aquaculture), on the mussel farm some different situations were tested:

• Common technology with plastic pergolari at 2m and 6m of depth with density of 3, 5 and 7 kg for 1 meter of pergolari (Figure 7).

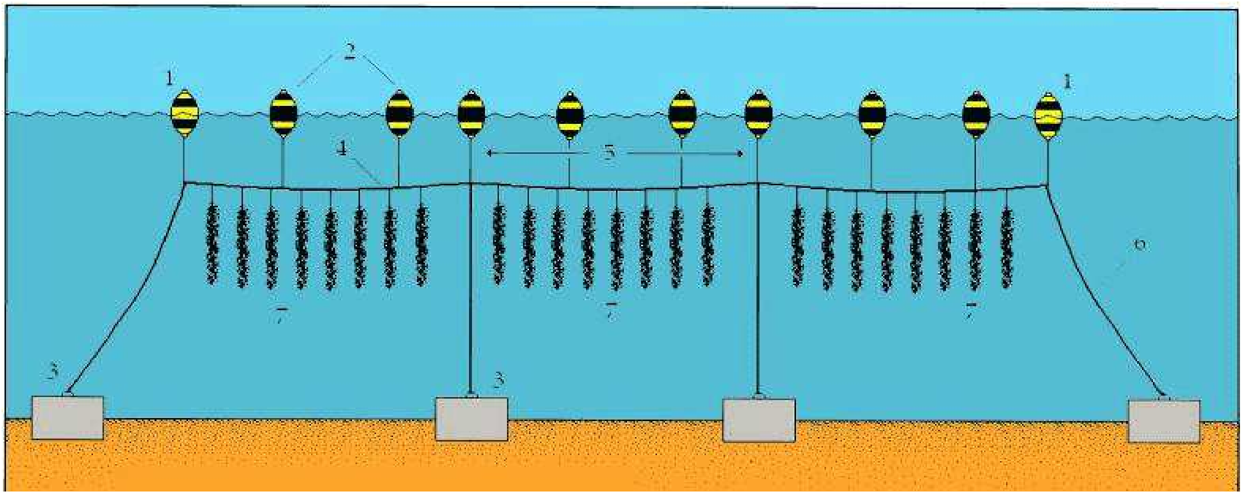

Figure 7: Traditional long-line mussel farm with plastic socks

- New Zealand technology with three continuous ropes between 2 and 6 meter of depth with a density of 3, 5 and 7 kg for linear meter with cotton net (Figure 8).

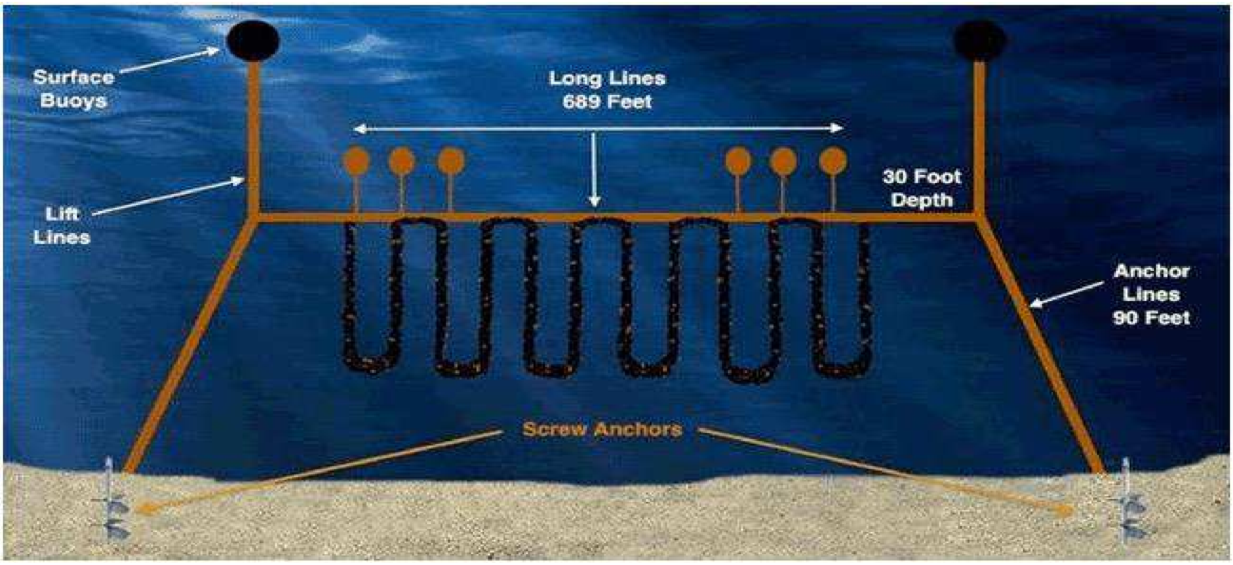

Figure 8: New Zealand long-line mussel farm with continuous rope

The mussel seeds were collected from the same origin and had similar size (average length at the start was around 3.5 mm), and initial conditions were measured and recorded to compare the growth and condition index in the laboratory of University of Zadar, to evaluate and compare the production of mussels in common technology (using the pergolari) with continuous longline production (New Zealand technology).

- Setting a 100m line for seed collection on a continuous rope. The rope is a specific shape that is designed to better capture the seed on the rope (Figure 9).

Figure 9: New continuous rope

PROJECT MONITORING

The project is continuously monitored. At this stage, the farm owner and biologist collaborate on measurements and outputs to collect samples.

- Monitoring of technological and biological parameters compared to classical and New Zealand technology on floating parks.
- Monitoring and analysis of production parameters of acceptance and growth in comparative farming of shells with Classical and New Zealand method of shellfarming technology.

Measurements are performed once a month and started in November.

Description of the task:

Biologist aim to evaluate and compare the production of mussels in common technology (using the pergolari) with continuous longline production (New Zealand technology).

Common technology:

Farmer placed mussels in common technology at 2 depths: 2 and 6 meters in three different densities: 3, 5 and 7 kg per 1 m of pergolari(Figure 10).

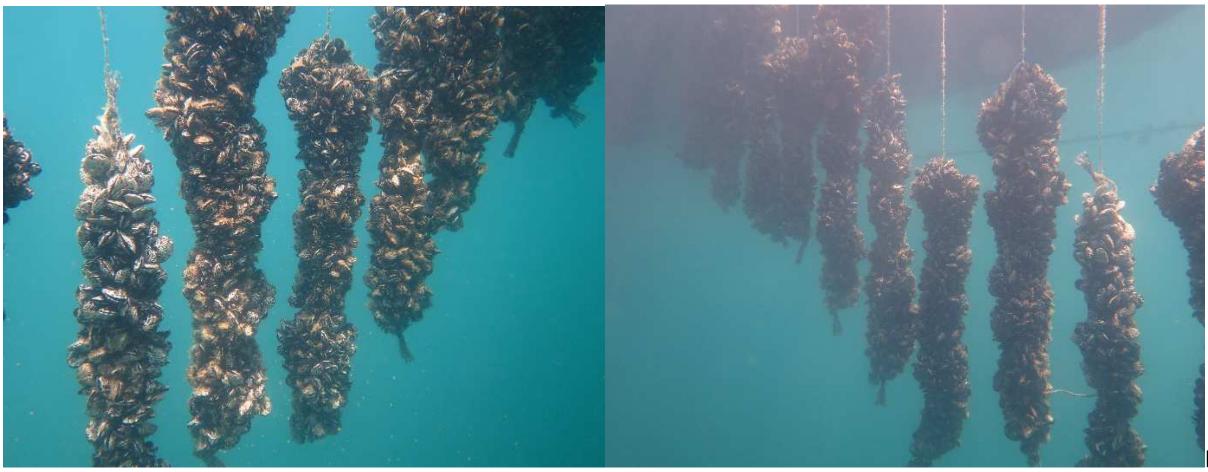

Figure 10: Traditional long-line mussel farm with plastic socks

New Zealand technology:

For the continuous technology farmer used 3 ropes of 100 m of length, deployed to cover the depths from 2 to 6 m. Each rope had a different stocking density: 3, 5 and 7 kg per 1 m of rope for linear meter with cotton net(Figure 11).

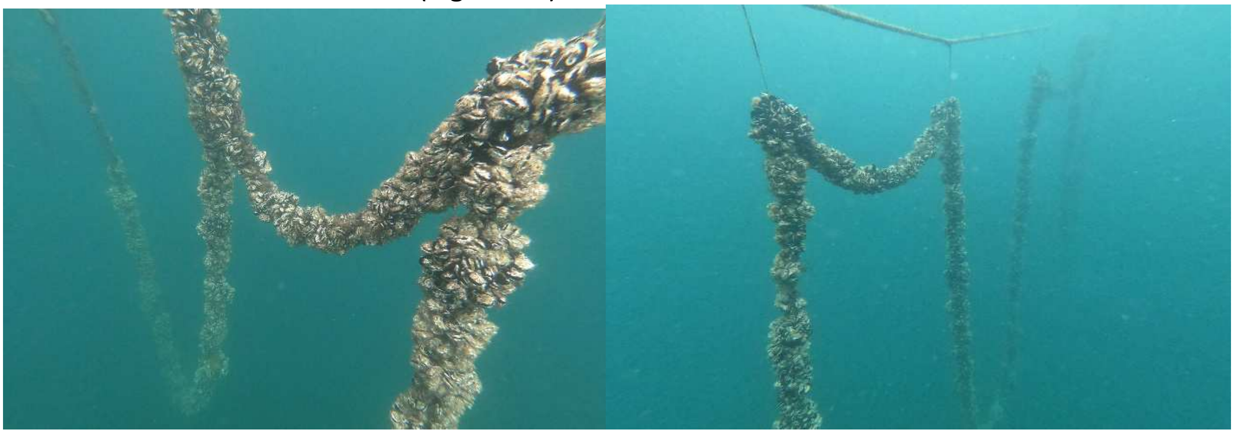

Figure 11: New Zealand long-line mussel farm with continuous rope

For stocking we used the mussel seed from the same origin and similar size (average length at the start was around 3.5mm)(Figure 12).

Figure 12: New Zealand long-line mussel farm with continuous rope

We measured the initial condition index of the mussels in January 2019. After that, each month we are sampling mussels from both types of farming methods, from the 2 different depths (2

and 6 m) and 3 different densities (3,5 and 7 kg). We are comparing the growth and condition index of the sampled mussels in the laboratory of University of Zadar.
Also, we are documenting the fouling of the mussels.

Monitoring and analysis of biological parameters in comparative farming with Classical and New Zealand method of shellfarming technology.

Figure 12: New Zealand long-line mussel farm with continuous rope

From the analysis of the acceptance of the seed to the collector rope should be assessed the efficiency of the collector and the area / depth where the best acceptance of younger mussels was observed.

Along with the statistical processing of the data mentioned above, estimates of the processing of the dominant species, the dynamics of acceptance and the rate of refining should be given.

RESULTS

From the initial information on the cost-effectiveness of the New Zealand method over the classical one, we learn that the new method is more useful at the beginning of planting. NZM requires less people and physical work using the machine, as opposed to manual work of the classic method.

Setting up is faster, making stay at sea are shorter and increasing productivity.

Environmental friendly acceptable, biodegradable materials are used in relation to plastics use. The results should indicate the effectiveness of the new method for mussel cultivation that has not been used in Croatia previously, compared to the common farming method. The results of the analyses performed should point on the appropriate stocking density for cultivation of mussels with continuous ropes in the conditions of the Adriatic Sea.

The scientific biologist will deliver a complete analysis of the measurements performed, which includes comparisons in the growth and the index of condition of shells.

Shellfish farm owner will report on the economic viability of the New Zealand method over the classical method.

FINAL CONSIDERATIONS

During the supervision of the mussel farm, together with the Zadar University, positive evidences and problems were found especially regarding the continuous rope.

The operators observed that both depth and density (kg/m) influence the production with New Zealand technology (as happens with classical pergolari). Moreover they evidenced problems with cotton socks; these specific cotton socks biodegrade too much quick so mussels were not able to attach to the rope falling down to the bottom.

Another problem concerns the fouling that grows over the mussels ant the rope that perhaps can create phenomena of anoxia, increasing of rope weight and problems during harvest. The research in progress by Zadar University might answer if there is a correlation between depth and fouling or between density and fouling.

The question, that cannot be solved in a short time, is to set the right density of mussels (kg/m) and the right depth to obtained the best performance by New Zealand method. Up to now the Italian farmers are still modifying some setting of farm and they believe that this should be a continuous in progress but as the Italian operators even the Croatia farmers realized that this new technology can help them with less working time, less strength use and more work safety.