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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Work Package:	WP4 – CB enhancing measures: Pilot actions to enhance nursery areas and reduce aquaculture impact
Activity	Activity n.3 - Implementation of pilot actions to enhance cuttlefish nursery areas and improve biodiversity
Partner in charge (author)	PP3 – Friuli Venezia Giulia Region
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INTRODUCTION

Short description of the project (overview on the concerning results from the EcoSea project); Scope and objectives

In Friuli Venezia Giulia the main object of the project DORY was to carry out a pilot action with the support of the local cooperative for small-scale fishery (CO.GE.PA.), with the aim to protect and increase the cuttlefish (*Sepia officinalis*) stock. This activity represents a capitalisation of a pilot action carried out within the project ECOSEA "Protection, improvement and integrated management of the sea environment and of cross border natural resources", as the cuttlefish is a very important fish resource for both the small-scale fishery and fishing trawls in the marine area of Friuli Venezia Giulia region. The general goal has been declined in specific objects as i) to collect and preserve the cuttlefish eggs, ii) to protect the eggs in a nursery area, iii) the control and the evaluation of egg development and hatching success.

PREPARATORY PHASE OF THE PILOT ACTIVITY

Preparatory meetings, Planning of the pilot activities and Preparation of project tasks, Subcontracting of the project tasks

The first preparatory meetings with fishermen took place in April 2017.

Planning of the pilot activities and Preparation of project tasks has been developed between February and April 2018.

The public procurement procedure for the selection of the subject in charge of implementing the pilot action has been developed between April and July 2018.

PROJECT IMPLEMENTATION

Material and methods - Duration of the project; Description of the field area where the project was conducted; The use of purchased equipment; Data collection; Analysis methods,

Methods of cuttlefish egg collection involved both fish traps (fyke nets) commonly used by small-scale fishermen and specific experimental devices hand-made by fishermen, consisting in longlines of different lengths (250-500 meters) carrying floating ropes (about 1 rope/meter) acting as a sea grass bed. Given the generally flat and sandy bottom of Friuli Venezia Giulia marine area, both devices represent important substrates for cuttlefish egg laying. During the 2018 and 2019 fishing seasons, from April to June, 10 fishermen collected all the available eggs, which have been subsequently moved to a dedicated nursery area. Eggs were collected in 4 different fishing grounds of Friuli Venezia Giulia marine study area, within a depth range of 3 to 7 meters, while the nursery area was localised in the Marano lagoon, near a mouth connecting the lagoon with the sea. The experimental area was set up during ECOSEA project within a water area off the coast of Lignano Sabbiadoro (UD), given by Public Property Office of the Friuli Venezia Giulia Region to the Hunting and Fishing Resources Office. It was specifically designed for this pilot action of restocking. This area is near the lagoon between the island of Sant'Andrea and the island of Marinetta and at a depth of about 2 m, enough to keep the structures submerged also during low tide and keeping them protected from direct exposure to waves. It has a good salinity for the physiological needs of cuttlefish eggs, with a good water exchange due to the proximity of the harbor entrance.

The nursery area hosted the eggs inside specific hand-made hatcheries until the hatching, 20 easy-to-use floating hatcheries were built (cm 30x42x57) and positioned in the nursery area. Chemical-physical parameters of the water were recorded as well as the different phases of egg development and the hatching success. Chemical-Physical monitoring was carried out by measurement of temperature, salinity and dissolved oxygen with multi-parameter probe (on site 2 monthly checks) in the nursery area (1,5m depth) and in the eggs collection areas (1m, 3m, 6-7m depth). Biological monitoring was carried out by evaluation of egg development, hatching success and evaluation of egg collection by artificial long line (on site 2 monthly checks by scientific expert - weekly check by fishermen). Moreover, in the surroundings of the nursery area it was investigated the efficacy of the pilot action in terms of presence of cuttlefish juveniles and possible pressures as predatory fish abundance. All the activities have been planned within the project DORY

preparatory phases and have been optimised and concretised with the contribution of the fishermen.

PROJECT MONITORING

Activities related to the following of the project progress

These operations will be performed in three phases:

Phase A) preparation of the equipment of the experimental nursery, and operating protocols (30 September 2018);

Phase B) installation of the equipment in the sea, collection of the eggs and incubation, biological monitoring and verification of the results – season 2018 (15 November 2018);

Phase C) collection of the eggs and incubation, biological monitoring and verification of the results – season 2019 (30 August 2019).

RESULTS

Informal results – description and foto-documentation;
Formal results – Numerical/Statistical analysis

Informal results suggest a huge number of cuttlefish eggs collected by fishermen in both years, despite the delay in cuttlefish arrival within the coastal waters during spring 2018 and the adverse sea weather conditions that occurred in May 2019. About the 96% of eggs collected in 2018 successfully hatched. Very interestingly, it was found that higher the depth, higher the number of cuttlefish eggs deposed in the longlines. Unlike project ECOSEA pilot activity results, we found demersal mollusc predators (*Murex* spp.) on the longlines. The monitoring activity confirmed the spill over of young cuttlefishes from the nursery area in 2018. Grass gobies (*Zosterisessor ophiocephalus*) have been recognised as the possible main predator of young cuttlefishes: however, no unusual presence of this fish have been recorded in the surroundings of the nursery area in 2018. About the 91% of eggs collected in 2019

successfully hatched. Unfortunately, we recorded unusual high water temperature and huge fouling processes in the second half of June 2019, probably affecting the vitality of the eggs both on the longlines and in the nursery area. The monitoring activity confirmed the spill over of young cuttlefishes from the nursery area also in 2019, 50 specimens have been captured around the area with small meshes traps. Some specimens of grass gobies, sea bass (*Dicentrarchus labrax*) and European flounder (*Platichthys flesus*) have been captured around the area in 2019 with large meshes traps, these species represent potential predators of young cuttlefishes.

Formal results

Min/max parameters – Nursery area

Depth	Temperature °C	Salinity ‰	Dissolved oxygen mg/l	Saturation %
-1m	21,4 -29,8	32,1 - 36,2	6,1 - 7,7	101 -121

Min/max parameters – Longlines area

Depth	Temperature °C	Salinity ‰	Dissolved oxygen mg/l	Saturation %
-1 m	19,1 – 29,5	28,2 - 34,6	7,1 - 8,5	103 - 121
-3 m	17,3 – 29,1	33,2 – 36,0	7,6 - 8,4	105 - 120
-7 m	15,2 – 27,8	34,7 - 36,9	6,4 - 8,0	94 - 123

Hatching rate sub-samples 100 eggs

Sub-sample	N. eggs day 0	N. eggs day 15	N. eggs day 30	Hatching rate %
1	100	38	9	91
2	100	32	11	89

3	100	41	7	93

Predatory fish presence

Date	Trap 1	Trap 2	Trap 3	Trap 4
17.06.19	3 Crabs	3 Gobies	2 Gobies	1 Sea bass
20.06.19	-	5 Gobies – 2 Crabs	3 Mullet 3 Crabs	-
24.06.19	2 Gobies 1 Flounder	1 Goby - 2 Mullet	-	-
28.06.19	-	-	4 Gobies	3 Flounder
29.06.19	-	2 Gobies -2 Crabs	3 Mullet - 2 Flounder	-
01.07.19	2 Gobies - 3 Mullet	-	2 Gobies	-
03.07.19	3 Mullet - 1 Sea bass	1 Goby - 2 Mullet	-	4 Gobies
05.07.19	4 Gobies – 2 Mullet	-	3 Gobies -2 Crabs	1 Goby - 2 Flounder

Cuttlefish juvenile presence

Date	Trap 1	Trap 2	Trap 3	Trap 4	Comparison Trap
17.06.19	-	-	-	-	-
20.06.19	3	1	-	2	-
24.06.19	3	4	3	2	-
28.06.19	-	-	2	3	-
29.06.19	2	5	-	-	-

01.07.19	4	-	2	2	-
03.07.19	-	-	3	-	-
05.07.19	5	2	2	-	-

FINAL CONSIDERATIONS

Conclusions and Recommendations

Talking about capitalisation, we can conclude that one of the most important results from both ECOSEA and DORY projects is that the local consortium of small-scale fishery adopted the collection of the eggs and the relocating to the nursery area as a usual fishery practice, steadily recognised as a sustainable scheme to enhance and possibly increase the cuttlefish stock.