EVALUATION OF MUSSELS SEED SURVIVAL *Mytilus edulis* DURING EARLY PERIOD OF COLLECTION, DEVELOPMENT OF A NEW TOOL AND METHOD - # 554

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Introduction

-In France, more than 80% of farmed blue mussel seed collection is based on larvae fixation on collector ropes. Mussels are traditionally grown on off-bottom “bouchots”, which are rows of wooden poles. Mussels are transferred either as seed attached on collecting ropes (Fig.2-3-4) or as spat placed in net sockings and then wound up around the poles (Fig.5).

-In order to optimize seed collection, number of mussel seed collected on rope per meter is estimated to establish initial reference data of « quality recruitment » according origin site (CREAA-, 2017). In Charente Maritime-Vendée (Fig.1), first shellfish-producing region, monitoring of seed collection over the last ten years showed that more than 50% of mussel seed collected on rope disappeared within May to July. The main deficiency of this method is that these high losses, from seeding to thinning, cannot be clearly attributed to mortalities, stalling, predation, spatial competition,…?

-Here, we present the development of an original tool and method to assess precisely level of survival of mussel seed (2-5mm) collected on rope. This work took place in 2016, in the context of massive mortality events of blue mussels in France since 2014, as a part of a specific project (MORBLEU, Travers *et al.,* 2016) dedicated to identify the factors favoring the development of massive mortalities in farmed adult mussels.

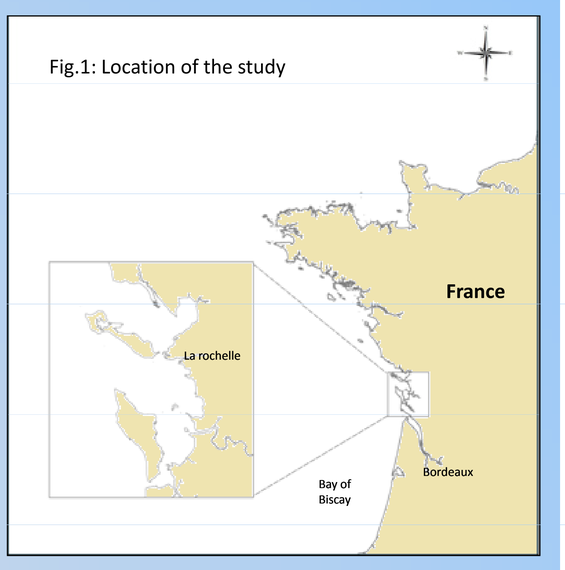


Fig.2: Feb.-March: spat density ~0

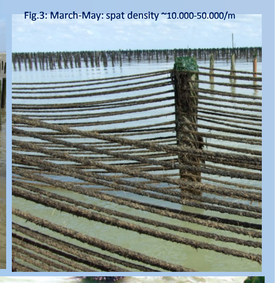
Fig.3: March-May: spat density ~10.000-50.000/m

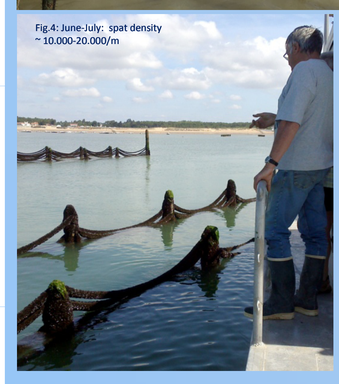
Fig.4: June-July: spat density ~ 10.000-20.000/m


Fig.5: Sept.-Oct.: spat density= ?

Objectives

-1°, Study the feasibility of creating an “experimental chamber” to contain a section of rope with small mussel seed (>2mm) that allows the animals present in it to survive for at least 2 months: it should allow sufficient circulation of water for respiration and nutrition of spat as well as evacuation of faeces. In addition, it should allow easy opening and closing for checks or sampling.

-2°, Device should allow to estimate the survival over this period by counting at the time of the survey, the empty shells, open or free shells; this, experimenting with a method to estimate mortality from frozen spat after field harvest.

-3°, Looking for difference in spat survival regarding possible effects of “source/site of recruitment on rope” and “growth sites”.

Materials and Methods

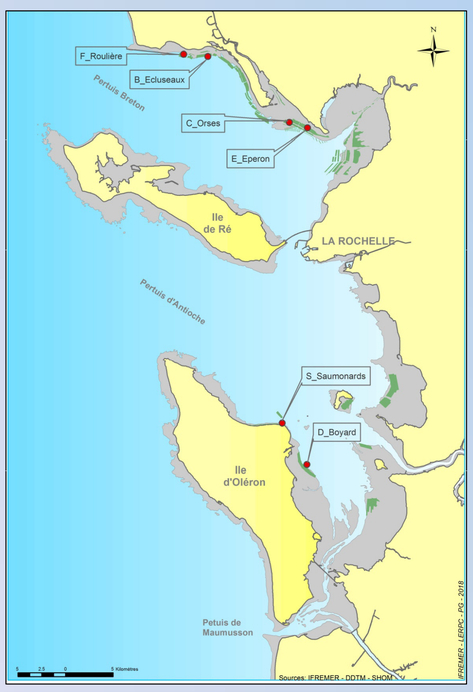

Fig.7: Location of field test sites in Pertuis Charentais

➢A- **Making the spat "bucket" device:** Using small piece of rolled polypropylene net (21x12cm, 2.5mm mesh, Intermas, Spain) we made Tubular net forming a bucket sealed at both sides by a piece of Lycra® tight knotted by a simple knot (Fig.6). 3 elastics made with bicycle tire inner tube are used to removably attach the pieces of cloth (tights).

➢B- **Estimate of spat number from rope sections**: Spat number from rope sections (5cm) was based on the number of empty or open shells observed on the frozen samples. Enumeration was carried out using a binocular loupe and sharp forceps. This method enabled to estimate mortality and survival at time t0 and t+2 months.

➢C- **Field test:** Our approach is based on little repeated pieces of rope put in semi-closed conditions witch prevent loss of animals or shells. We designed a field test using our "buckets" to assess and compare survival level of mussel seed from three different origins, placed in three stations from Pertuis Charentais (Table1; Fig.7). Core samples (~300 cm) were taken from mussel spat rope-collection in off-bottom farms at end of June 2016. From each origin rope sample, at least twelve 5cm sections were cut (Fig.8); 3 sections were frozen in sealed bags back to the lab for subsequent counting, corresponding to initial survival status and initial density at time T0. 3 sections of each rope were placed in “buckets” then put in bag to be transfer and attach to the poles of 3 different growth sites until September.

Fig.6: Tubular net forming the spat «bucket»

Table1: Sites location for spat collection ropes and pre-fattening during field test 2016

ref. Sites	Name	Use	° N	° E
A	Saumonards	spat collect.	45.99121	-1.24894
B	Ecluseaux	spat collect.	46.335099	-1.378846
C	Orses	spat collect.	46.27443	-1.26193
D	Boyard	growth	45.958536	-1.223344
E	Eperon	growth	46.263479	-1.24376
F	Roulières	growth	46.314635	-1.323828


Fig.8: mussel spat-catching rope sections

Results

A-**Estimated initial mortality rates and spat density on ropes at T0**: Mussel spat density was higher for Saumonards rope, almost double the 2 other sites from the North which is consistent with the data sets observed by CREAA. A similar weak mortality level (<5%) was observed for all origins of ropes (table2).

B- **Estimated spat survival rates based on cumulative mortality after 2 months in buckets:** whatever the conditions, it seemed that the bucket device did not induce over-mortality of spat (for 2-4 months test). **No significant mortality occurred** (table3).

C- Based on the calculation of the confidence intervals for survival rates, we tried to evaluate possible effects "seed origin" and "growth sites" on spat survival (data not shown). **Is there an effect "source of spat collection" on survival** in our experimental conditions? There was no significant effect observed on the survival rate according to the 3 origins of spat collection in our conditions. **Is there an observable "growth site effect" on survival** in our experimental conditions? At the Boyard site, overall survival (all spat origin combined) appeared to be significantly higher compared with the two other sites located in the Breton sound in the North.

Table2: **Estimated initial mortality rates and spat density on rope at T0**

Origin sites of ropes	Ref. replicates of rope sections	Number of live mussels	Number of dead mussels (shell)	Estimated initial mortality (%)	Average mortality % (Mt0)	SD (%)	Average spat density per meter at T0
A-Saumonards	1	580	18	3,10	4,24	1,01	9553
	2	435	22	5,06			
	3	418	19	4,55			
B- Ecluseaux	1	240	26	10,83	6,22	4,00	5360
	2	265	11	4,15			
	3	299	11	3,68			
C- Orses	1	262	11	4,20	3,56	0,58	5247
	2	264	9	3,41			
	3	261	8	3,07			

Table3: **Estimated survival rates after 2months in buckets (% +/- SD)**

	Growth sites observations		
Origin sites of ropes	D-Boyard	E-Eperon	F-Roulières
A-Saumonards	95.49 +/-0.6	89.85 +/-5.3	93.53 +/-1.0
B- Ecluseaux	95.06 +/-0.7	93.53 +/-4.5	91.95 +/-2.4
C- Orses	94.96 +/-1.5	88.15 +/-1.4	92.49 +/-1.5

Conclusions

Our study allowed to validate such a device (**tubular net bucket easy to make), to observe small spat (>2mm) in field without troubles** during at least 2 months (4 months, additional data not shown). Whatever the conditions, it seemed to us **that the device did not induce over-mortality of spat**. However, this conditioning greatly limits growth. Although light**, the structure of the bucket has resisted more than 4 months at sea**. It therefore seems to us **that this device can be relevant for short in situ tests with very small spats.** Method to estimate survival of mussel spat from rope sections frozen for subsequent counting appeared efficient in our conditions.

Contact: J.F.Pepin: jfpepin@ifremer.fr, *- Some References:* *Bouquet A.L. et A. Geay (2014). Suivi de la reproduction et du captage de la moule *Mytilus edulis* dans le bassin de Marennes-Oleron en 2014. Rapport CREAA 4pp. *CREAA – CRC-Pays de la Loire (2016). Bulletin d’information année 2016, sept. Observatoire Mytilicole des Pertuis Charentais. *Robert Stéphane, Soletchnik Patrick (2016). Réseau national d’observation de la moule bleue Mytilus edulis, MYTILOBS / Campagne 2015. *Normand J. (2017). Réseau national d’observation de la moule bleue *Mytilus edulis*, MYTILOBS / Campagne 2016. *Travers etal. (2016). Mortalités de moules bleues dans les Pertuis Charentais: description et facteurs liés – MORBLEU.