Introduction

- In France, more than 80% of farmed blue mussel seed collection is based on larval 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) or as spat placed in net stockings 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.

Materials and Methods

A- Making the spat "bucket" device: Using small piece of rolled polypropylene net (21×12 cm, 2.5mm mesh, Internas, 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 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 0 and t=2 months.

C- Field test: Our approach is based on little repeated pieces of rope put in semi-closed conditions with 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 offshore 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.

Results

A- Estimated initial mortality rates and spat density on ropes at T0: Mussel spat density was higher for Saumonards rope, almost double the other 2 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 observed effect 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.

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.