2nd WORKSHOP ON SPATFALL AND RECRUITMENT OF MUSSELS AND COCKLES

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Recruitment of mussels in the Pertuis Breton (France) in these last years. A preliminary analysis on the influence of temperature and sunshine.

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INTRODUCTION

Since 1979, the IFREMER Laboratory follows mussel recruitement in the Pertuis Breton. Gametogenesis generally begins in September or October and ends in Décember. Spawning may begin in Februrary and continues up to the end of April, but it usually occurs in the second fortnigh of March. The most important settlement generaly runs after the middle of May up to the middle of June.

During the study period, four years are noticeable by lack of settlement : 1982, 1989, 1990 and 1991 (fig. 1). This failure throughout these three last years resulted in a breakdown of the cultivated biomass (fig. 2)

The present paper outlines a preliminary analysis on the influence of temperature and sunshine.

TEMPERATURE

In order to test temperature effect on recruitment, the number of spat per meter of coconut rope is considered as an index of annual spatfall success.Air temperature is chosen as the independant variable because of its good agreement with water temperature in shallows bays.

Correlations between spat numbers and weekly temperatures show a negative effect of temperature on spat numbers (fig. 3). This result is comforted by the distribution of these correlation coefficients compared to a normal distribution. It shows clearly negative effect of temperature.

Over such a long period (October to June), temperature plays a major role in gametogenesis. The day – degrees method used in many studies on plants to predict flowering could be also available for molluscs. For instance, date of spawning of *C. gigas* shows good agreement between sum of temperature above a minimum and over the period of gametogenesis until spawning.

Instead of fixing temperature, the method used here, consists in calculating correlations between spat number and all combinations of cumulative temperatures between the supposed beginning of gametogenesis (October) and spatfall (June).

Thus, the 3 isolated periods where correlations are the highest are 2nd week of October to 3rd week of January, 3rd week of February to 1 st week of March, 2 nd week of May to 1 st week of June (Table 1).

Each of these 3 periods shows strong correlations with spat number.

Cumulated temperature over		R Correlation with spat number
Oct. 2	Janv 3	– 0,88
Feb. 3	Mar 1	– 0,84
May 2	June 1	– 0,92

Table 1. Correlations between temperature and spat number.

A multilinear model could be built up to predict spatfall success.

$$SS = -98.9 \sum_{oct2}^{Jan3} T^{\bullet} - 131.2 \sum_{Feb3}^{Mar1} T^{\bullet} - 357.4 \sum_{May2}^{Jun1} T^{\bullet} + 43413$$

This predictive model explains 91 % of the variance of the dependant variable.

This high value shows clearly the negative effect of cumulated temperature expressed as a maximum temperature wich could not be overstep.

Furthermore, strong correlations between cumulated temperatures show that only one period has to be taken into account for explaining spatfall success. (tabl. 2)

	Oct. 2 – Jan. 3	Feb. 3 – Mar. 1	May 2 – June 1
Oct. 2 – Jan. 3	1		
Feb. 3 – Mar. 1	0,77	1	
May 2 – June 1	0,82	0,78	1

Tab. 2 – Correlation Matrix between cumulated temperatures

The choice of one period could be based on further knowledges .

SUNSHINE

Let us remember that in the Pertuis Breton the mussel seed is collected on coco–fiber ropes which are out of water during the low waters of spring tide (fig. 4). The seed is known to be very weak just as it sets on the rope. If at this moment a spring tide getting the ropes out of the water coincides with a very sunny weather, seed can die.

Table 3 gives the monthly averages of sunshine in May since 1979. It shows a very important sunshine in May 1989 and May 1990. The same occurs in 1992, when the recruitment was normal and, on the contrary, sunshine was normal in 1991 when the recruitment was deficient.

However, looking at in details these two years, we can observe that :

- In 1991, if the average of sunshine in May was near the standard, it appears that it was in excess between the 18 th and the 30 th of the month (fig.5). In addition, the last days of May coincided with spring tides and if seed has settled at this moment it can have died.

- In 1992 we have watched for the larvae, so we know that settlement began after the 19 th of May. But at this moment, if sunshine was important, it was neap tides and ropes did not get out of the water.

CONCLUSION

It has been shown that temperature is related inversely to spatfall success. Between October and June three periods seem to be of special importance but only one of them has to be choosen. Further research has to be made for making this choice.

On the other hand, owing to the technique used in Pertuis Breton, an important sunshine coinciding with a spring tide just as seed is setting on ropes appears to be a major factor in spatfall success. This hypothesis is strenghtened by the fact that, during the period of study, a recruitement failure was not observed on the long lines where ropes are never out of water.

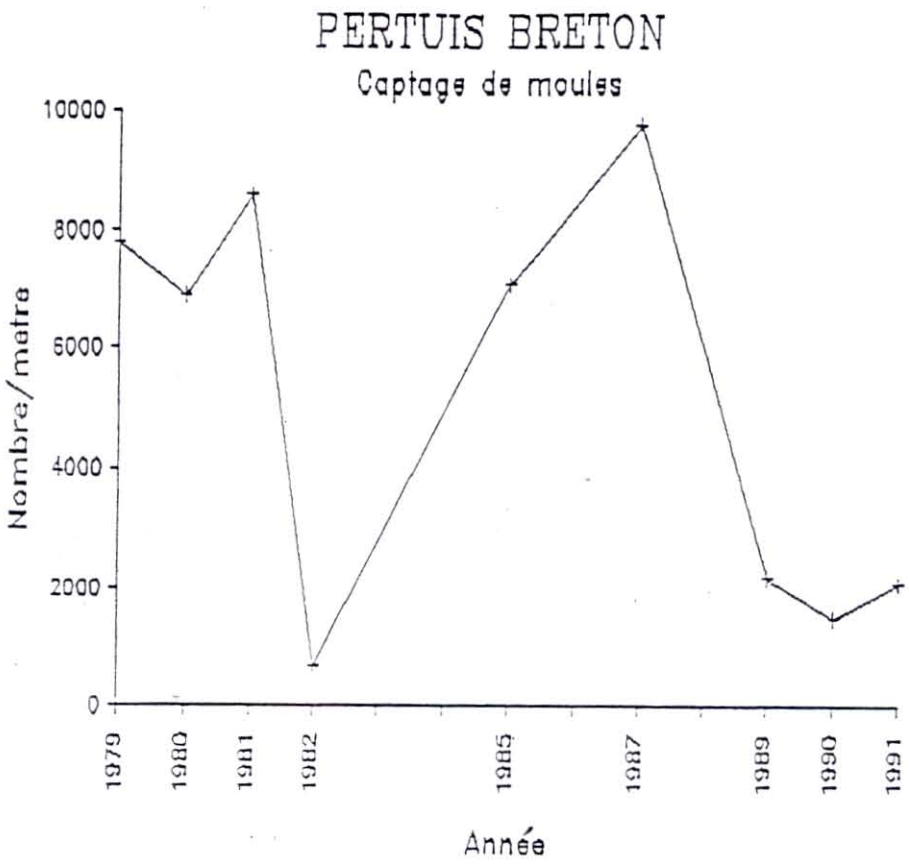

Figure 1. Recruitment of mussels since 1979 in the Pertuis Breton (number of spat per meter of rope).

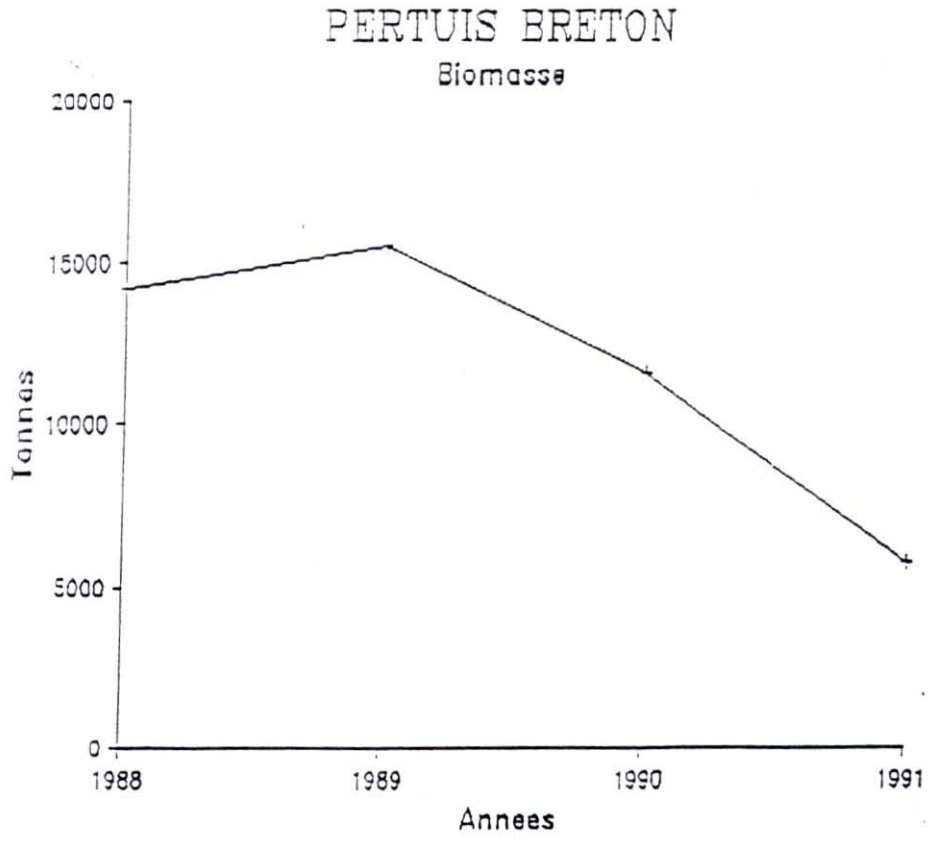

Figure 2. Biomass of mussels cultivated in the Pertuis Breton.

Fig. 3 - Correlation between spat number and weekly temperatures

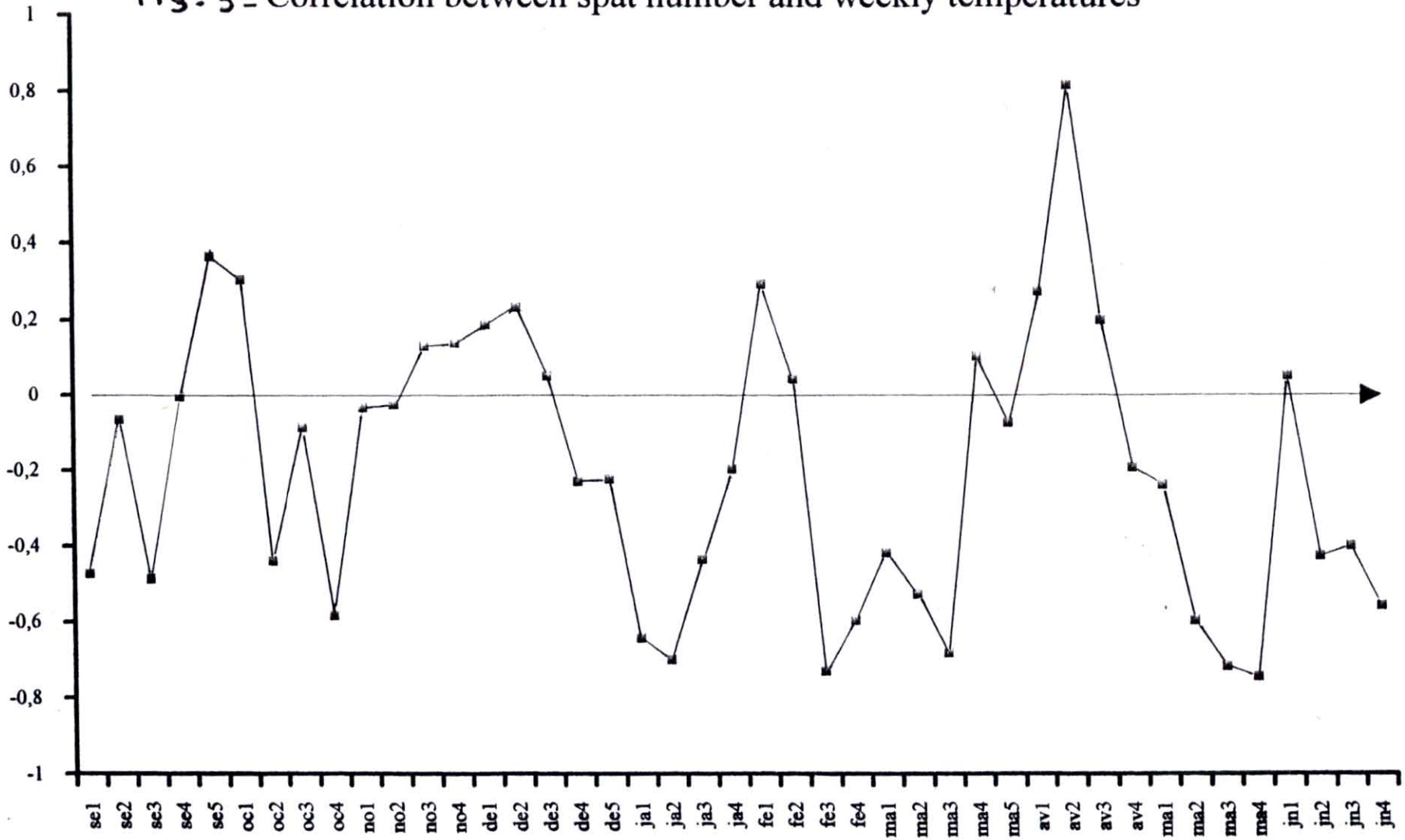

Figure 4. In the Pertuis Breton spat of mussels is collected on ropes.

ANNEE	TEMPERATURE	PLUVIOMETRIE	ENSOLEILLEMENT
1979	- 1.4	+ 118 %	- 15 %
1980	- 1.1	- 24 %	- 22 %
1981	- 0.8	+ 164 %	- 44 %
1982	0	- 33 %	- 15 %
1985	- 0.8	+ 111 %	- 10 %
1987	- 0.9	- 51 %	+ 19 %
1989	+ 4.0	- 79 %	+ 44 %
1990	+ 3.3	- 37 %	27 %
1991	+ 2.0	+ 3 %	0
1992	+ 2.7	- 52 %	+29 %

Table 3. Monthly averages of temperature, rain and sunshine in May since 1979.

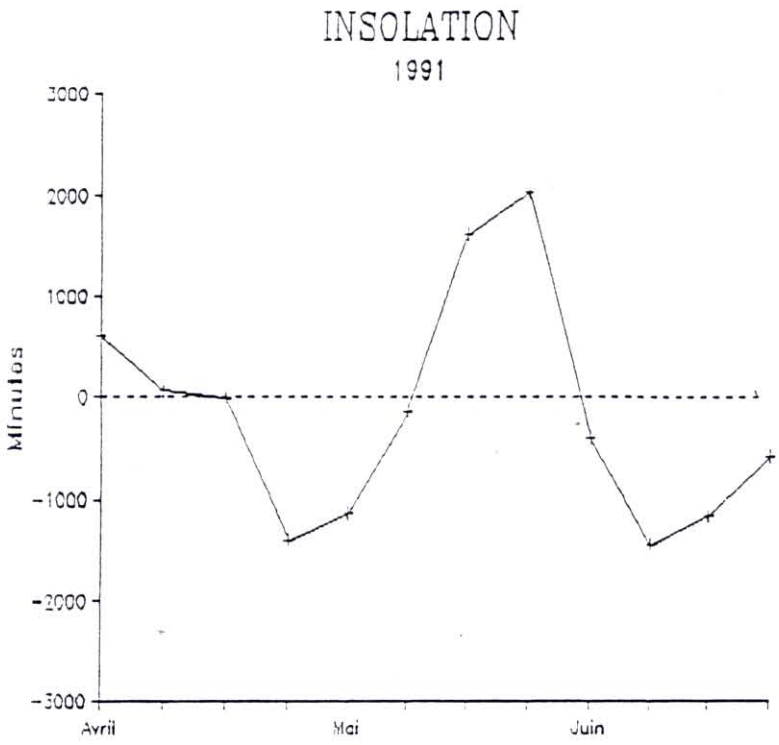

Figure 5. Sunshine in May 1991.

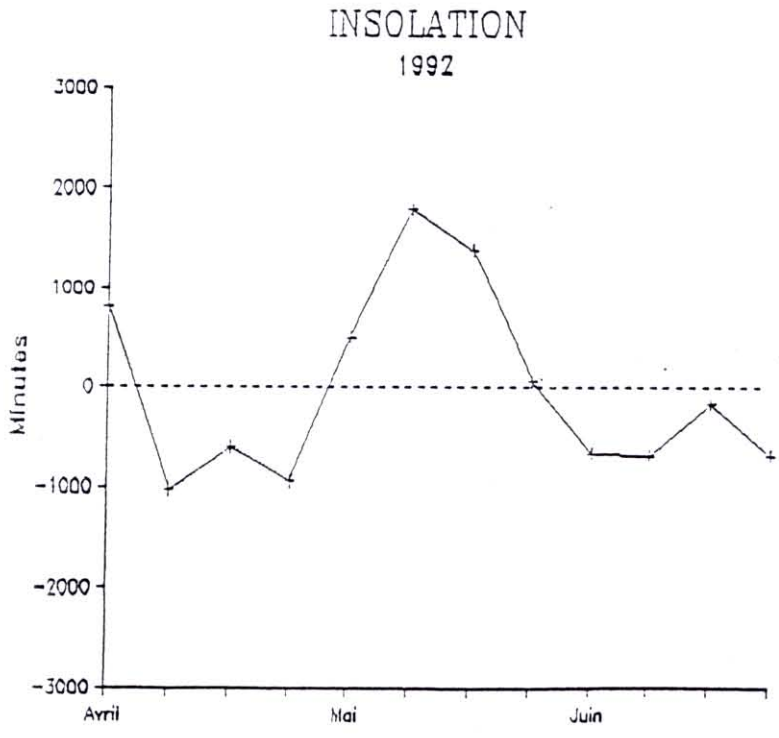

Figure 6. Sunshine in May 1992.