

Floc Culture System applied for intensive broodstock farming of the blue shrimp *Litopenaeus stylirostris*: first trial carried out in New Caledonia

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Introduction

Extensive rearing method in earthen ponds of shrimp broodstock [1] (Picture 1) raises several issues :

- poor control of the water quality (T°C, S‰, O₂, phytoplankton...);
- poor natural productivity;
- low level of bio-security : use of fresh food (Squid), high water renewal rate (Up to 30% daily), huge open culture area and high risk of diseases contamination (proximity of the grow-out ponds for commercial shrimp production).

Solution studied : Floc Culture System (FCS) [2] [3] (Picture 2) :

- water quality ease to manage : T°C (Green house, shade cloth, heater), S‰ (Sea and fresh water inlets), toxic nitrogenous species removed or transformed to non-toxic species by the floc (algal uptake and bacterial nitrification).
- High natural productivity (Organic material + bacteria, phyto and zoo-plankton) consumed by the shrimps.
- High level of bio-security : no use of fresh food, small culture area easy to master and minimum water renewal (1% daily).

Materials and Methods

1. Experimental protocol (Fig 3&4)

2. Oxidative Stress bio-indicators in digestive gland :

- Superoxide dismutase (SOD) [4]
- Catalase (CAT) [5]
- Glutathione peroxidase (GPx) [6]
- Total and oxidized Glutathiones (GSHT, GSSH) [7]
- Malondialdehyde (MDA) [8]
- Protein carbonyl [9]

Star plots were used to display results for the panel of biomarkers [10] (Fig 1)

Results

- Growing phase (Fig 3; Table 1)
- No evidence of oxidative stress whatever the rearing system (Fig 1)
- Reproductive performance (Fig 4; Table 2&3)

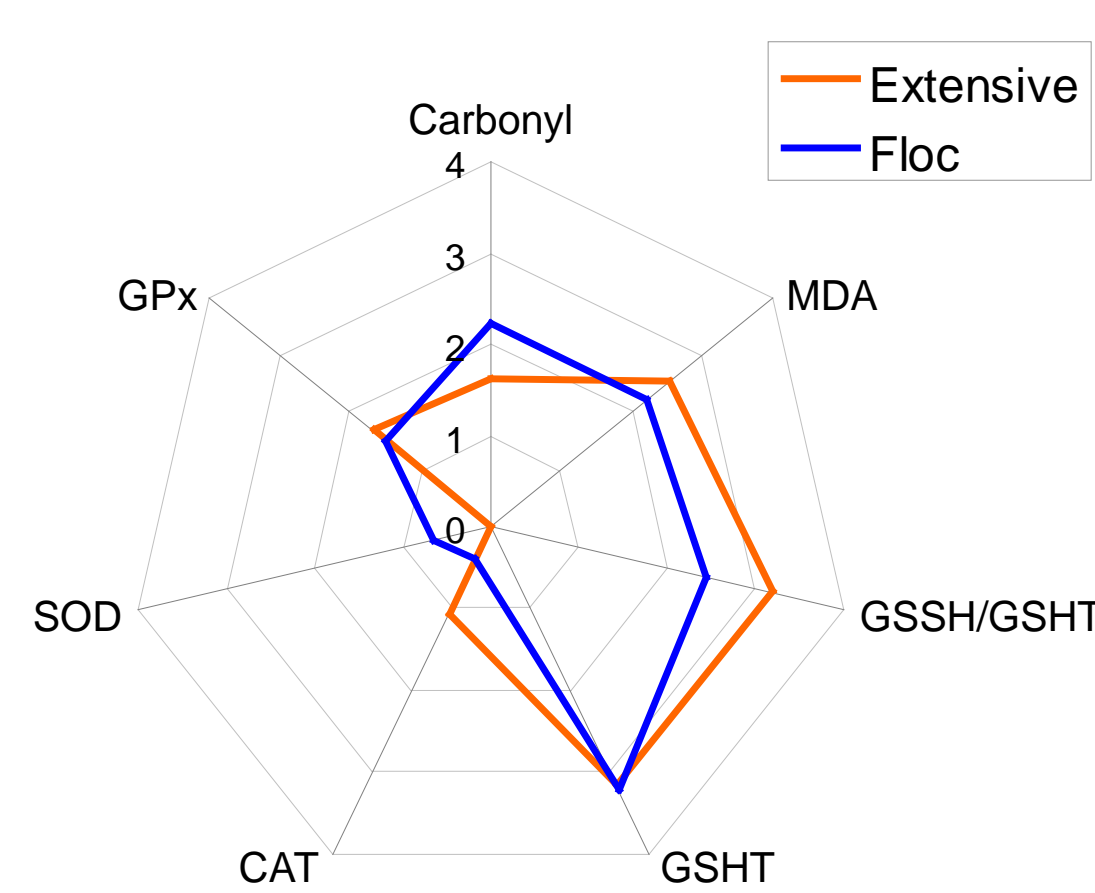


Fig 1 : Oxidative stress status according treatments

Conclusion

Rearing conditions in **FCS** lead to broodstock with better reproductive performance : higher spawning rate, higher number of eggs and nauplii produced.

Although **FCS** is a very intensive rearing system the welfare of the shrimp was not affected compare with extensive farming method : Indeed, oxidative stress status was similar for shrimps from both rearing methods and the survival rate was higher in **FCS**. Stressless environment and endogenous natural food (organic matter, bacteria and plankton) contribution to shrimp nutrition are two main hypothesis to explain the better broodstock quality from **FCS**.

These results demonstrated that **FCS** is an effective bio-secure culture method to enhance broodstock yield and reproductive performance of the blue shrimp *Litopenaeus stylirostris* farmed in New Caledonia.

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Grow-out (Fig 3)

Extensive culture



Picture 1 : earthen ponds for extensive culture

Floc culture



Picture 2 : tanks for floc culture

Table 1 : zootechnical results (mean ± SD)

	Culture systems	
	Extensive (n=2)	Floc (n=4)
Survivale rate (%)	64.0 ± 11.5	74.7 ± 8.2
Growth rate (g.day ⁻¹)	0.17 ± 0.01	0.13 ± 0.01
Finale biomasse (g.m ⁻³)	13.6 ± 1.5	600.0 ± 97.0



Picture 3 : shrimps harvested from pond

TRANSFER



Picture 4 : shrimps harvested from tanks

Hatchery (Fig 4)

Table 2 : Average weight of broodstock

	Average weight (g.± SD)	
	Extensive	Floc
Males	43.37 ± 3.13	43.05 ± 4.09
Females	57.93 ± 5.11	52.29 ± 5.56

REPRODUCTION

4 tanks - 100 females



Picture 5 : artificial insemination



Picture 6 : maturation circular tanks

4 tanks - 100 females



Picture 7 : eggs and nauplius

Table 3 : Eggs and nauplii produced according rearing system (mean ± SD)

	Broodstock rearing systems				
	Extensive		Floc		p value
	n	Mean (SD)	n	Mean (SD)	
Eggs/spawn	60	151639 (60492)	87	173099 (80315)	0.081
Nauplii/spawn	34	92765 (40770)	34	121215 (62457)	0.029

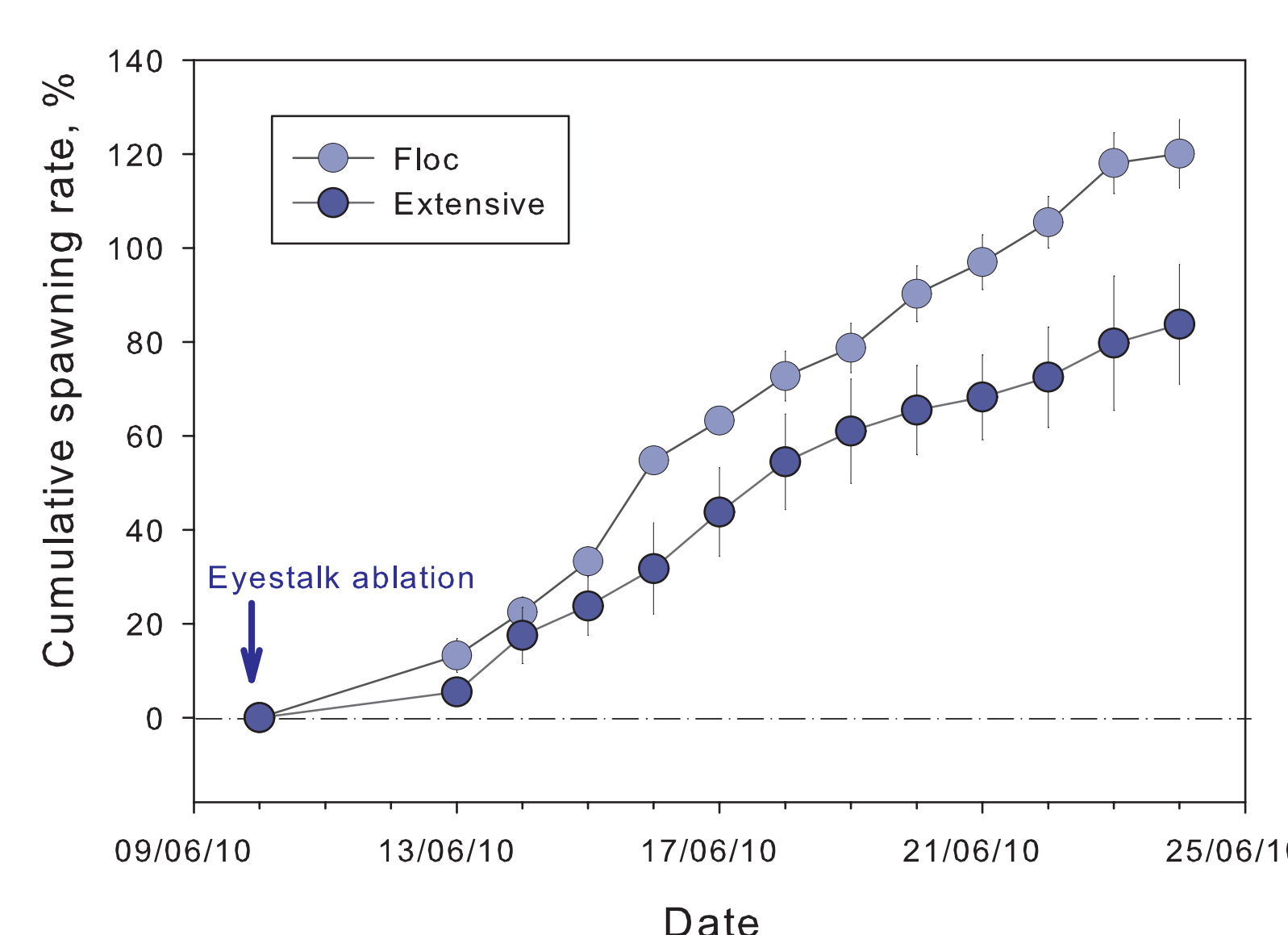


Fig 2 : Cumulative spawning rate according treatments

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