Live preys in shrimp culture : nutritional and sanitary considerations on the use of *Artemia* in New Caledonia.

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Introduction

Up to now, live preys are still widely used in larviculture. In shrimp culture, even if partial replacement of live food with artificial one is more and more praticed, *Artemia* is still essential to obtain good growth and survival rates in the early life of shrimp. However (i) the availability of the brine shrimp can be highly variable from one year to another and only 20 % of the aquaculture demand could be satisfied in the late 90'S and (ii) their sanitary status is of concern as *Artemia* can be a pathogen carrier (Lopez-Torres et al., 2001) and can affect larval survival rates.
In these conditions, the production cost of the juveniles greatly depends on the disponibility and the quality of the live preys.

The use of *Artemia* in shrimp industry in New Caledonia

In penaeid larviculture in New Caledonia, *Artemia* is given as the main food and in excess from zoea 3 to P10 (ten days old post-larvae). The amount of live preys increases during the rearing as shown in table 1.

Table 1 : *Artemia* quantity depending on the larval stage in shrimp culture in New Caledonia (initial rearing density: 180 larvae per liter).

Larval stage	Zoea 3	Mysis 1 and 2	Mysis 3	From P1 to P3	From P4 to P10
Artemia per day (number/animal)	40	55	65	70	75

Artemia cysts are incubated for 24 hours at 28°C and 28 ppt before being used in larviculture. These conditions promote the development of bacteria and 10^3 to 10^5 cfu/ml of *Vibrio* can be detected in hatched artemia tank (table 2). Considering that 40 to 70 g of artemia (i.e. 8 to 14 million of artemia) are added every day per cubic meter of larval rearing water, a *Vibrio* quantity of $8 . 10^4$ to $14 . 10^4$ per ml is introduced daily in the tank.

Table 2 : *Vibrio* concentration in *Artemia* incubation tank.

Day of sampling	*Vibrio* concentration (CFU per artemia)
D5	5.10^3
D6	$3,9. 10^4$
D8	$7,3. 10^4$

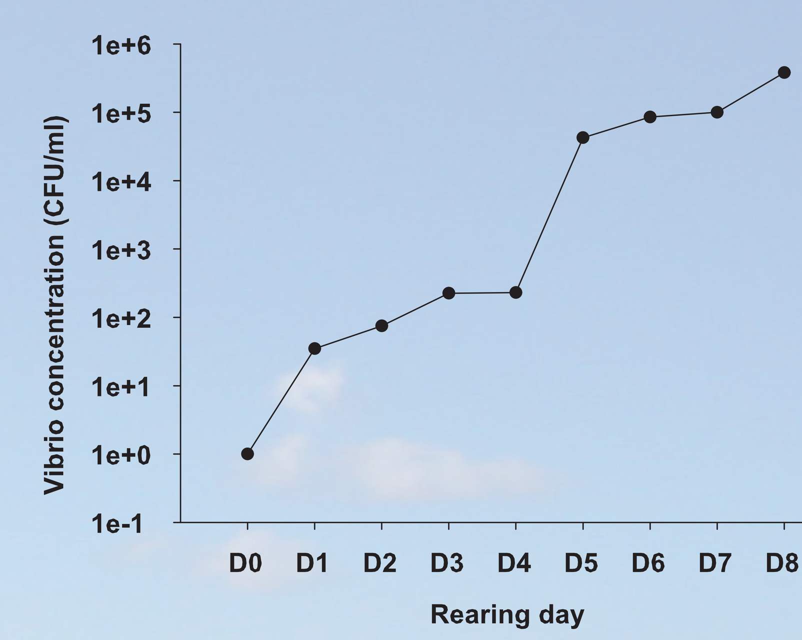


Figure 1: Evolution of the *Vibrio* concentration (CFU/ml) in the water of a shrimp larval rearing tank in New Caledonia.

An assessment of the bacterial load in the larval tank according to the day of rearing has shown that a *Vibrio* peak could be observed at day 4, after the first feeding with *Artemia* (Pham *et al.* 2008, see figure 1). And antibiotics are used to control the bacterial growth.

Determination of the optimum amount of artemia according to the *Litopenaeus stylirostris* larval stage.

Materials & methods

For the experiment, larvae were reared in the same tank until they reached the desired stage. 18 x 100 larvae were then transfered from the larval tank in 800 ml vials (*ie.* 125 per liter). Three development periods were tested: Mysis 2 to P2, P1 to P4, and P5 to P8 on 6 treatments (increasing *Artemia* doses) and three replicates each. The temperature was maintained at 29°C. All the water and uneaten *Artemia* of each container were removed every day to be replaced with new water and freshly hatched *Artemia*. During this operation, survival rate was estimated.
At the end of the 3 days experiment, all survivors were collected and the final dry weight was measured for each replicate and compared to the initial dry weight.

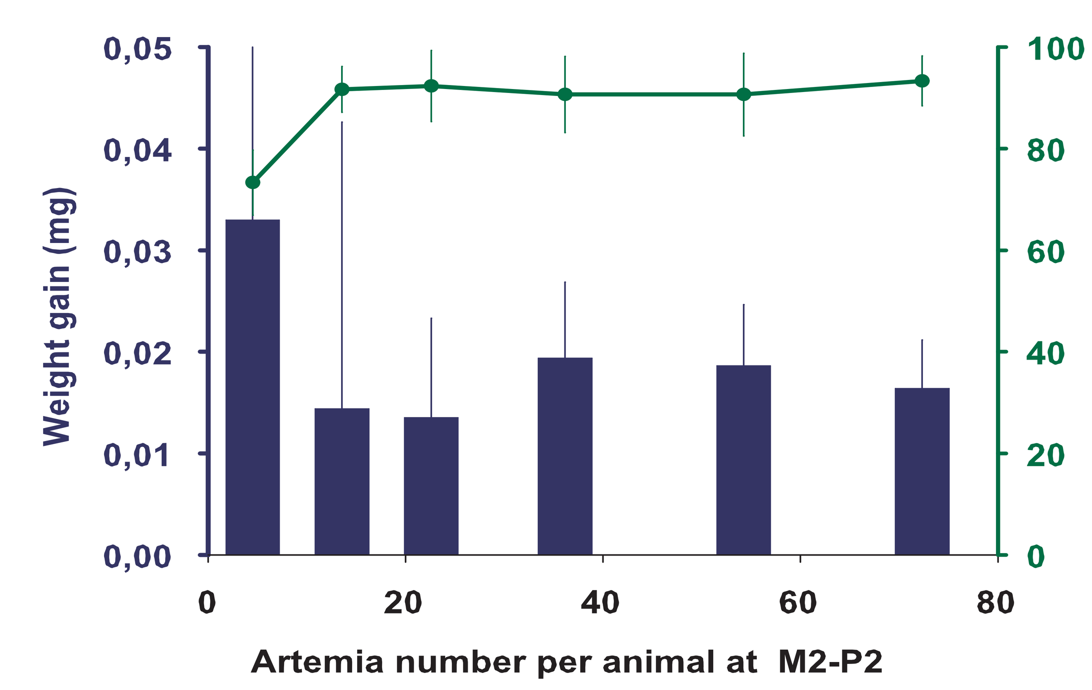
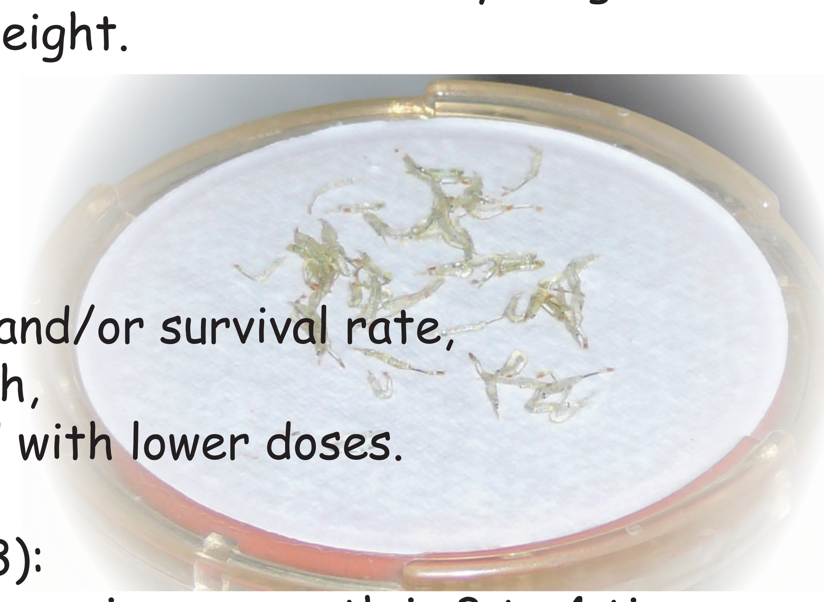


Figure 2: Survival rate and weight gain from Mysis 2 (M2) to two days old postlarvae (P2) depending on the quantity of *Artemia*.

Results & Discussion



From Mysis 2 to two days old postlarvae (Fig. 2):
- less than 20 *Artemia* per animal negatively affects growth and/or survival rate,
- 30 to 40 Artemia seem enough to ensure a maximum growth,
- more than 40 Artemia do not improve the growth compared with lower doses.

From one day old postlarvae to four days old postlarvae (Fig. 3):
- the Artemia quantity (120 Artemia per animal) to reach the maximum growth is 3 to 4 times as big compare to the previous stage,
- lower doses affect the growth but not the survival rate of the shrimp during the experiment.

From five days old postlarvae to eight days old postlarvae (Fig. 4):
- less than 50 artemia per animal impairs both growth and survival,
- a high quantity of Artemia must be available to the postlarvae (around 150 Artemia per animal) to obtain the best growth,
- but with a higher amount, the growth rate declines.

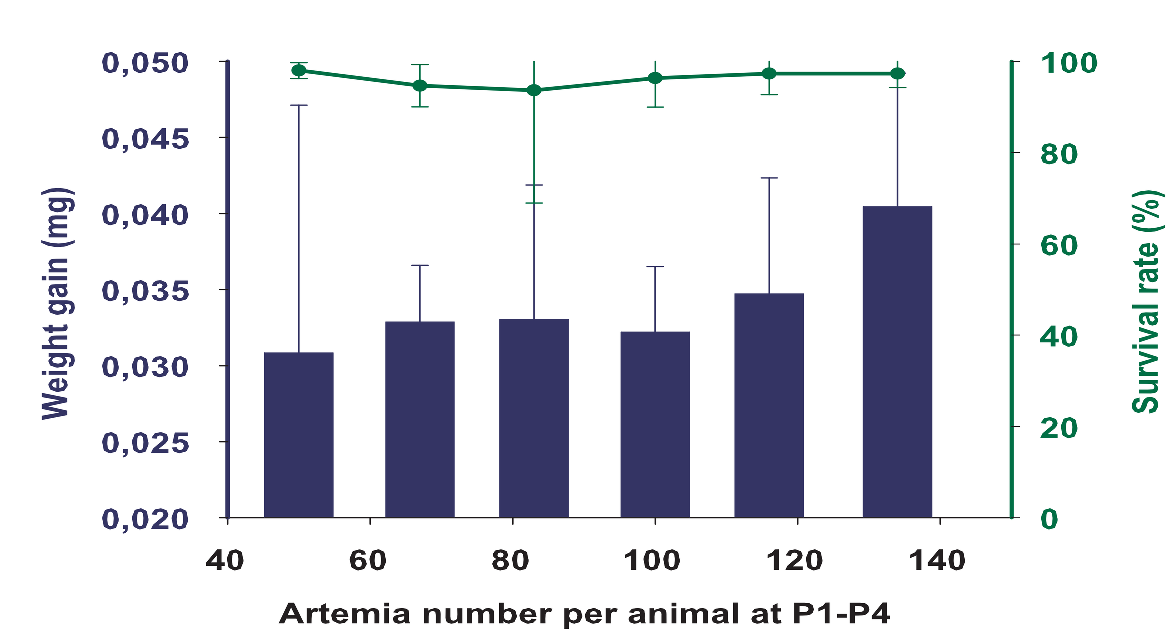


Figure 3: Survival rate and weight gain from one day old postlarvae (P1) to four days old postlarvae (P4) depending on the quantity of *Artemia* .

Conclusion

With this protocol, *Artemia* quantity can be half reduced during the larval stage (from Z3 to M3). It is particularly important as no water exchange is practiced during this period which can favours opportunistic pathogens.
However, feed requirements seem to be higher in the next postlarval stages, and the optimum amounts recorded in these experiments are higher than those previously advised. In the fact, artificial diets are used to partially replace live preys in the commercial hatcheries and daily water exchange is operated to maintain a low bacterial level in the rearing tank.

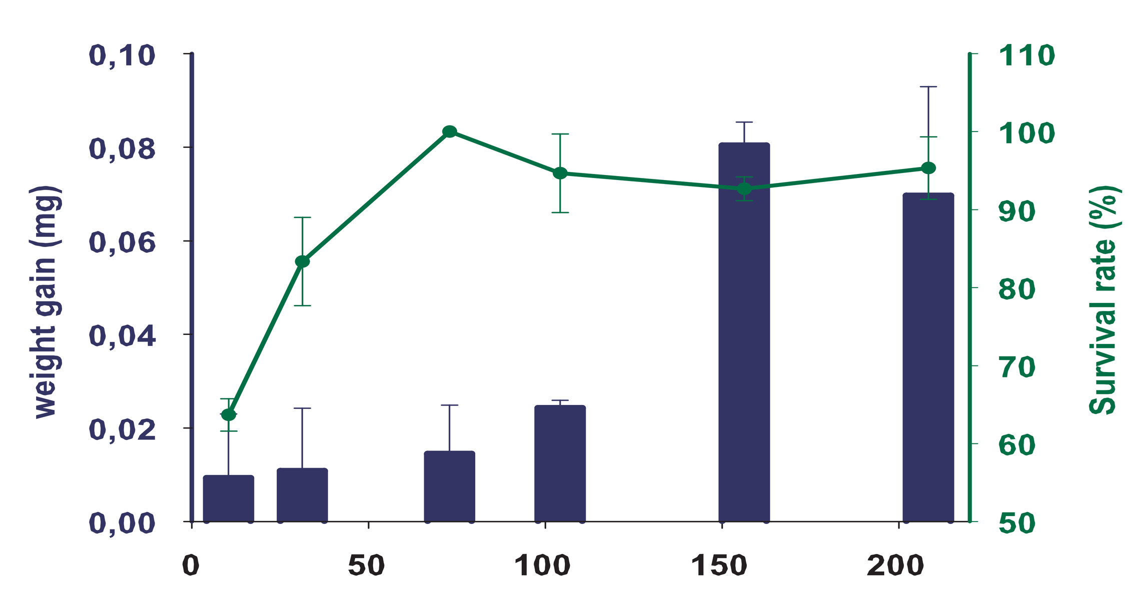


Figure 4: Survival rate and weight gain from five days old postlarvae (P5) to eight days old postlarvae (P8) depending on the quantity of Artemia .

Bibliographie

Lopez-Torres. M. A. and Lizarraga Partida M;L., 2001 : Bacteria isolated on TCBS media associated with hatched *Artemia* cysts of commercial brand. Aquaculture 194 :11-20.
Pham D., Vourey E., Ansquer D., Walling E., 2008 : Le rinçage des *Artemia* en écloserie: une mesure simple de biosécurité. Fiche biotechnique 2008-02. 4 pages.

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