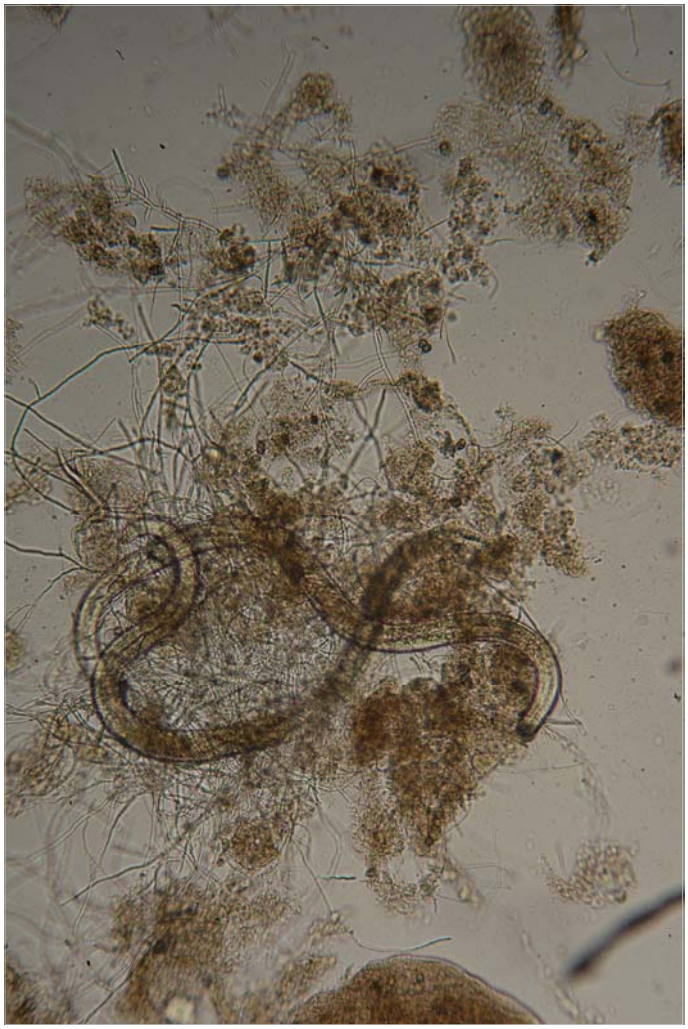
Production of shrimp (*Litopenaeus vannamei*) WITHOUT MARINE PROTEINS IN A BIOFLOC SYSTEM

BIOFLOC PRODUCTION

By Eric De Muylder, Leon Claessens & Mekki Herizi, Crevetope

Production of shrimp without water exchange with the utilization of bioflocs has gained a lot of interest recently. The presence of bioflocs in the shrimp farming system not only maintains a good water quality, but also provides essential and high quality nutrients to the shrimp. This additional feed makes it possible to obtain fast growth and low FCR. Avoiding water exchange also increases biosecurity since the water is often the source of pathogens.

Fish meal has become a valuable and expensive ingredient and its utilization should be minimized as much as possible. The future of aquaculture will depend on the possibility to produce seafood with a limited availability of this raw material.



Biofloc

Bioflocs

At intensive aeration the feces of shrimp are assimilated by bacteria. These bacteria form colonies. Also rest products (fibers etc) and micro-organisms are part of these bioflocs. These bacteria take pollutants out of the water (ammonia) and convert them into proteins. Shrimp consume these bioflocs actively or passively by filter feeding.

Goal of the experiment

The goals was to produce shrimp without the utilization of marine proteins (no fish meal, no squid meal, no shrimp meal) in the feeds and use the bioflocs to recycle waste protein and nitrogen in the shrimp tank to complement the pelleted feeds with live organisms.

Material & Methods

Two diets were formulated and pressed on a 2 mm die: a reference diet with 20 % fish meal (FM) and a diet without any marine protein (see table):

Table 1

	Reference	No FM
Danish fish meal	20	
Corn Gluten	11	12
DDGS		9.5
Soybean meal	16	16
Hemoglobin powder		6
Wheat flour	31	24.3
Canola	12	12
Fish oil & Lecitihn	6	6.8
Wheat gluten	2	2
Other		2
Amino acid mix		7.4
Premix	2	2
Composition:		
Crude Protein	37.74	38.43
Lipids	8.61	8.54
HUFA	0.89	0.76
Crude fibers	2.92	3.42
Ash content	6.44	5.66
Raw material cost (Euro/MT)	690	530

Shrimp were put in 12 nets of 150 L at the AFT—CreveTec Research center in Venray, Netherlands. The nets were submerged in a bigger tank, which was connected to a biofloc reactor. Water quality was maintained through bioflocs. Each net was stocked with 25 shrimp (*Litopenaeus vannamei*) of 13 g each. The shrimp trial lasted for six weeks.

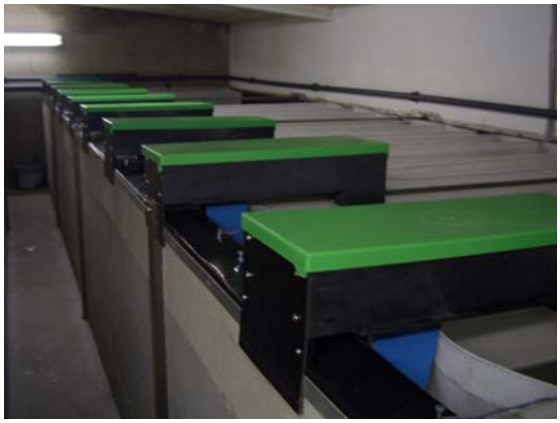
Table 2

	Reference	No FM
Initial individual weight (g)	13.05	12.85
Final individual weight (g)	22.44	22.63
Average growth (g/week)	1.565	1.629
FCR	1.81	1.44
Survival	77.00%	83.00%

Crevetope shrimp produced in a biofloc system

Results

Both diets enabled excellent growth (>1,5g/week), and the diet without marine proteins was at least as good as the diet with 20 % fish meal.



The AFT— CreveTec Research center in Venray, Netherlands

Conclusion

It is unknown but certainly doubtful if the same results would have been obtained in clear water without bioflocs. Research in the past has proven that the presence of bioflocs can increase growth by 15 % and decrease FCR by 40 %, which means that shrimp can benefit from the nutritional quality of bioflocs.

A good balanced feed can be produced without the utilization of marine proteins, as long as digestible protein sources are used and amino acids are balanced. The diet without marine proteins is about €160 per tonne cheaper in raw material cost.

The combination of such a diet and utilization of a biofloc system enables sustainable production of shrimp anywhere in the world:

- No water exchange during farming and recuperation of water for next cycle
- Recycling nutrient feces via bioflocs
- Limited utilization of natural resources

For more information or to obtain literature references, please contact Eric de Muylder or visit www.crevetope.be