



Tropentag, October 6-8, 2009, Hamburg

“Biophysical and Socio-economic Frame Conditions
for the Sustainable Management
of Natural Resources”

Utilisation of By-catch and Processing Wastes from a Marine Fishery in Feeds for the Organic Aquaculture of *Litopenaeus vannamei* in Costa Rica

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Abstract

In shrimp aquaculture one feasible way to reduce shrimp production costs and increase producers' profitability is the use of feeds with low fish meal levels or alternative protein sources with the aim of an organic certification. The main problem in realising organic shrimp aquaculture is often the lack of suitable protein sources. Our protein source derives from deep-sea shrimp fishery in Costa Rica certified as sustainable. Also important is the trading of the produced organic shrimps. In our case certifier for organic aquaculture of marine shrimp the German certifier “Naturland” guarantees the selling of every organic produced shrimp. Regarding their guidelines fish meal content of the experimental diets is limited to a maximum of 20% of the total mass.

This study was carried out on a marine shrimp farm in Jicaral, Costa Rica and had the goal to test the possibility of using a locally available resource that is currently being wasted. A 48-day feeding trial was carried out to compare two test diets to one commercial control diet (Nicovita 35% protein). The two experimental feeds were prepared with fish meal of *Physiculus talarae*, *Pontinus cf sierra* and *Hippoglossina bollmani*, three common species that form part of the normal by-catch of the deepwater shrimp fishery in Costa Rica as well as shrimp head meal from *Heterocarpus vicarius*, integral wheat meal, sunflower oil and a vitamin and mineral premix.

Pacific white shrimp, *Litopenaeus vannamei*, were used to test both diets in comparison to the above mentioned commercial feed.

Test diets were fed to shrimp with an initial weight of $10.8 \text{ g} \pm 0.56$ to evaluate their growth and feed utilisation parameters: size and weight gain, feed consumption, Feed Conversion Ratio (FCR), survival, Protein Efficiency Ratio (PER), Body Weight Gain (BWG) and Specific Growth Rate (SGR). At the end of the experiment, average weight was $16.7 \text{ g} \pm 0.7$ in the control diet, $16.6 \text{ g} \pm 1.6$ and $16.7 \text{ g} \pm 0.4$ in the two experimental diets, suggesting that by-products and processing wastes from marine shrimp fisheries can efficiently be used in feeds for *Litopenaeus vannamei*.

Keywords: Costa Rica, *Litopenaeus vannamei*, organic aquaculture, protein sources