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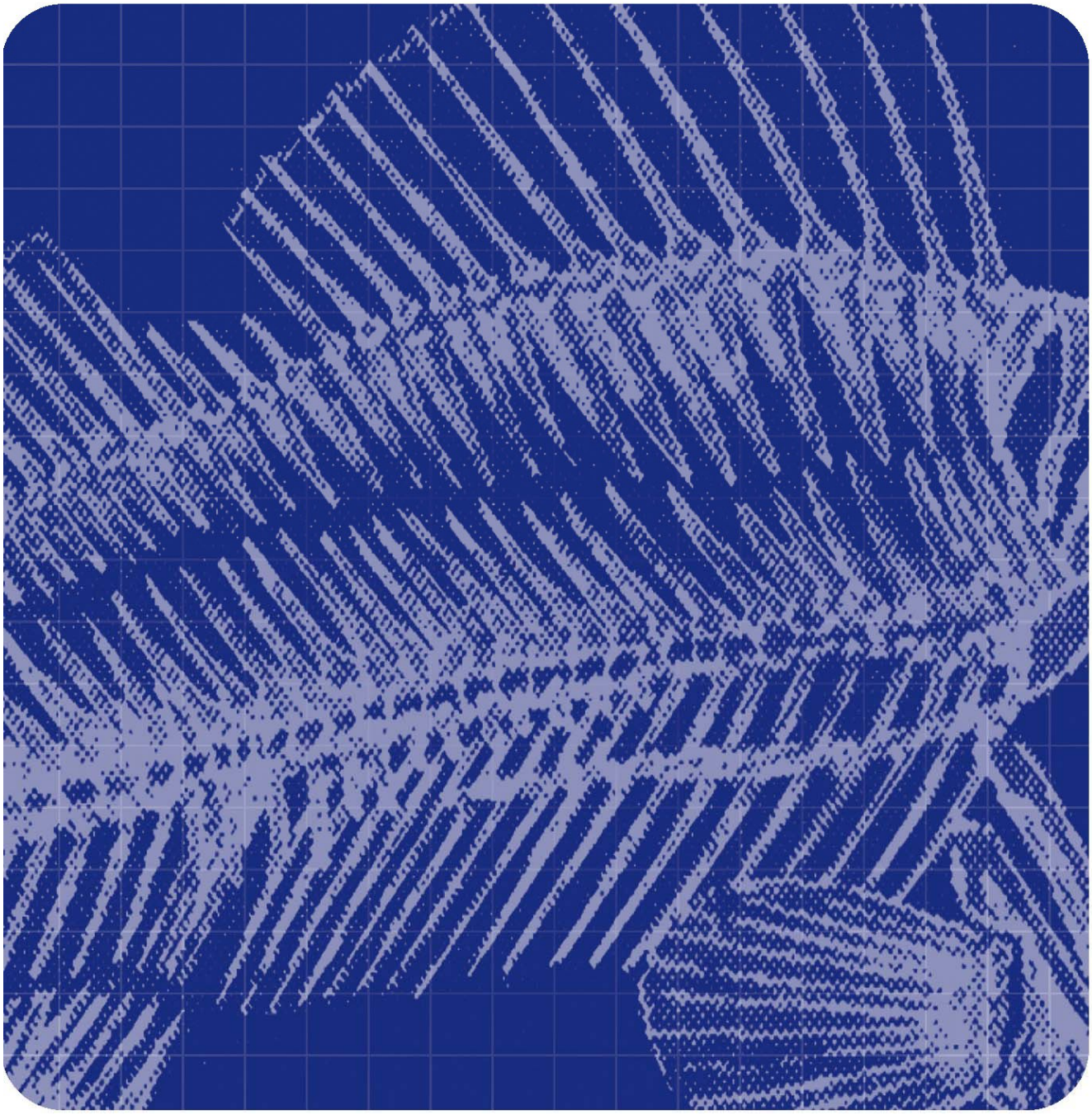
The opportunities in the catfish surplus market in Vietnam

Ragnar Nortvedt



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The current information is collected during two visits to Ho Chi Minh City and Long Xuyen in Vietnam (Figure 1) in June and October 2007, and was also presented at the Biomarine Industry Seminar, arranged by Fiskeriforskning, Bergen Dep. in December 2007. The production of catfish (*Pangasius sp.*) in 2007 was estimated to reach 1 million tons. Most of the freshwater catfish production is carried out in earth ponds in the Mekong Delta. Based on information from one of the biggest catfish producers, the fillet yield is on average 34 %, leaving the rest of the body available for surplus added value products.

Preface

The project behind the present report was financed by the Royal Norwegian Embassy in Hanoi under the NPR (Nærings- og profileringsmidler) funding scheme. The NPR program is funded by the Ministry of Industry to promote businesses and profile Norway and Norwegian companies abroad. The work was carried out as part of my adjunct position in Fiskeriforskning during the autumn 2007.

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Ragnar Nortvedt

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1 Abstract

The current information is collected during two visits to Ho Chi Minh City and Long Xuyen in Vietnam (Figure 1) in June and October 2007, and was also presented at the Biomarine Industry Seminar, arranged by Fiskeriforskning, Bergen Dep. in December 2007. The production of catfish (*Pangasius sp.*) in 2007 was estimated to reach 1 million tons. Most of the freshwater catfish production is carried out in earth ponds in the Mekong Delta. Based on information from one of the biggest catfish producers, the fillet yield is on average 34 %, leaving the rest of the body available for surplus added value products.

The byproducts are carefully sorted some places and thus available for further processing. Today some of these byproducts are exported, like catfish skin to Italy, UK and India and fishmeal to Japan, whereas other parts are processed locally to bio-diesel. In the future there should be opportunities for further processing the byproducts into more added value products, like gelatin from fish skin, more purely refined fat extracts, amino acids and peptides from purified protein and mineral rich bone meal, which in turn might be utilized by the feed and food ingredient industries. The steady increasing production of other farmed species in Vietnam like shrimp, lobster, grouper and cobia will also need raw materials for feed production that partly might be supplied from the catfish surplus products in combination with local marine and vegetable resources. Catfish farming expertise are found in the Research Instiute of Aquaculture #2 (RIA2) in HoChiMinh City and marine farming expertise in RIA3 in NhaTrang in the southern parts of Vietnam and in RIA1 in the north. Waste water treatment from both fish ponds and from fish processing factories is also an area with a huge developmental potential.

All these potential new products and processes demand investments, know-how and processing equipment, which all together represent opportunities also for foreign investors and companies. International investments into joint companies might also open the access to a global market for the new added value products.

Figure 1 Long Xuyen in the Mekong Delta, HoChiMinh City and NhaTrang in the Southern parts of Vietnam (encircled).

2 The catfish production

About 95 % of the freshwater catfish production in Vietnam is based on the fastest growing *Pangasius hypothalamus*, called 'tra', whereas the other species, *P. bocourti* is called 'basa'. The production increased rapidly from 600.000 tons in 2006 to about 1 million tons in 2007 and the catfish is reaching more than 60 world markets, including Norway. It has, however, been warned that uneaten residues and faeces from two millions tons of feed and 300.000 tons of byproducts and wastewater from factories are threatening the potential expansion of the fish farming industry. If quality and environmental challenges can be handled, it is predicted that 2 million tons of pangasius catfish can be produced within a few years from now.

Compared to the Norwegian salmon production that took about 20 years to grow from 25.000 tons in 1985 to about 700.000 tons today, the Vietnamese catfish production increased from 22.500 tons in 1997 to about 1 million tons in 10 years. Huge traditional rice production areas have been converted into catfish ponds, following the increase in price to 20.000 VND per kg (6,80 NOK / kg) in the early 2007.

The dominating part of the production is based on manual work, both during feeding, harvesting, internal transport, filleting and sorting of by-products. Following transport in well boats from the farms to the more centralized slaughter houses, the fish is e.g. carried in baskets and trays on the back of the workers, and just recently the first fish pump in the Mekong Delta was delivered from Canada (Figure 2) and simplified the internal fish transport in one of the Agifish Ltd. company landing sites.

Figure 2 The first fish pump in the Mekong Delta has made the internal fish transport significantly more efficient. Photo: Ragnar Nortvedt.

The EU was the major market for pangasius exports in 2006 and 2007, followed by Russia. The EU accounted for over 48 % of the total Vietnamese catfish export revenue. Spain, the Netherlands, Poland, Germany and Italy show the strongest growth in Europe and accounted for about 85 % of the total export value in the EU. Both Poland and the Netherlands transfer pangasius to other neighbour markets. Ukraine is a growing pangasius market and has passed USA in volume. The current greatest market challenges that eventually restrict the estimated future growth in pangasius production are the unpredictable price fluctuations, the instable seasonal supply to the markets and the unclear ecological situation, based on local pollution. Quality control and safeguarding challenges have to come under control to avoid an environmental disaster in the Mekong Delta. At the same time this might also represent an interesting business area, including development of fish vaccines, waste water treatment, by-product utilization and environmental monitoring. Based on very low labour costs, more than 50.000 people are employed by the Vietnamese catfish industry (Figure 3).

Figure 3 Several hundreds of employees are working within each fillet factory. Almost all operations are carried out by manual work. The hygiene seems to be very good, but tri-polyphoshates are added to bind more water to the products. The customers in Europe and other markets may in the future demand that the products should be free of any chemicals. New fillet factories, fishmeal factories and factories for other byproducts have been planned and constructed in many areas. Photo: Ragnar Nortvedt.

Information about the production and market situation is available through the Vietnamese Association of Seafood Exporters and Producers (VASEP) and they are organizing an annual seafood exhibition in Ho Chi Minh City (HCMC). With more than 40.000 visitors from more than 130 countries, this has become an important meeting place in this region. Catfish farming expertise are found in the Research Instiute of Aquaculture #2 (RIA2) in HCMC. It takes about 45 minutes by plane from HCMC to Cam Ranh airport and another 45 minutes by car into Nha Trang, were you may find the marine farming expertise in RIA3. It takes about 5,5 hours by car from HCMC to Long Xuyen in the Mekong Delta, where the dominating catfish production takes place.

3 The byproducts

The catfish is naturally subdivided into fillet, head + backbone (frame), crush meat, skin, storage fat from anterior part of the belly area, swim bladder, stomach and viscera, kidney and blood. In order to utilize the byproducts, these have to be sorted carefully and processed directly or eventually, frozen or preserved directly, stored, transported and processed.

The fillet yield has increased from earlier 20 % up to around 34 % today, due to higher protein content (30 %) in the fish feed. The fillet has also become more whitish. Still, there is a great potential for improvement of the fish feed in terms of micronutrient composition. Even if most of the feed is floating (except during the cooler periods) there is a considerable amount of manual overfeeding in the rearing ponds. The remaining parts (66 %) of the fish are thus classified as by-products or surplus. The head + backbone are often gathered in the statistics and amounts to the biggest part (40,4 %) of the body (Table 1).

Table 1 Composition of the 'tra' catfish body.

Body parts of the catfish	**Amount (%)**
Fillet	33,9
Head + backbone	40,4
Scraped meat from the skin and other parts	11,7
Skin	4,4
Fat, separated from the anterior belly area	2,2
Swim bladder	0,9
Viscera and stomach	4,6
Kidney	0,2
Blood	1,7

From the total annual production of 1 million tons of catfish it is clear that each category of byproducts in Table 1 amounts to significant quantities of potential added value products if it is collected fresh and processed in proper way. Only 1,7 % of blood out of one million tons represents e.g. an annual amount of 17.000 tons of blood which could be converted into blood meal. This would imply drying technology. The estimated 2 million tons production of catfish in the near future would certainly double these amounts of byproducts.

It is thus clear that for those who have the knowledge of how to utilize these biological resources and have capital to eventually invest into joint venture companies in Vietnam, there seems to be huge opportunities. During our visits we had meetings with several serious companies that were interested in joint venture cooperation. The number of hands and working power are strong but the infrastructure for transport still has a long way to go. Further processing of byproducts should thus be carried out in the vicinity of the fish fillet production, eventually by licensed production from other nations.

4 The future opportunities

Today, quite huge amounts of the byproducts end as waste and local pollution in the Mekong Delta and its surroundings. This problem is further escalated by the waste effluent water from the factories. Both the Ministry of Fisheries (MOFI) in Vietnam, the regional authorities and the local companies have addressed this problem and a lot of effort will be focused to solve these challenges. Included in this problem complex is certainly also the use of too much antibiotics which is very easily available. Clearly, know-how of better fish feed development, waste water treatment, filter technology, silage production and vaccine development would be very welcome and represent business opportunities. Fish pumps have already been mentioned, and any type of modern but simple feeding technology, monitoring systems, IT-solutions, automatic filleting lines, scales and quality evaluation will be introduced sooner or later.

Other parts of the byproducts from several companies are already being utilized for fishmeal or bio-diesel production, and they have thus established manual sorting procedures to take care of the different types of byproducts, even though not yet optimally utilized (Figure 4). It has been estimated that the total fat content in the whole catfish is 27 %, but after trimming, the fillet is left with about 10 % fat content.

Figure 4 Manual sorting of byproducts. Photo: Ragnar Nortvedt.

Our general impression was that the most inventive companies were already looking for more added value products from e.g. the 404.000 tons of heads+backbones and the 117.000 tons of scraped meat from the skin and other residues. A potential opportunity for this huge and growing resource would be to run mechanical and enzymatic separation of the fat, the protein and the bones from this resource. A Norwegian company has already established such a method for this kind of process in Norway.

After separation, the bones might be grinded and converted into calcium and phosphorus rich powder that could enter fish feed for marine species. Fiskeriforskning in Norway has demonstrated that there is an increased growth potential for some species by adding this ingredient in fish feed for other fish species. MOFI in Vietnam has encouraged foreign companies or research institutions to develop new fish feed in Vietnam and to eventually take direct contact with MOFI to synchronize such an initiative. According to their plans, it is a goal to produce 200.000 tons of marine fish species in year 2010. Both the protein and the extracted fat from the byproducts could as well be added to produce fish feed to other species. An alternative process might be to make silage after adding a pH controlled mixture of formic acid, antifungi and antioxidants to the raw materials. One would then mix this with other local raw materials (e.g. vegetables or rice bran) to produce local fish feed. Both solutions would need input and advice from fish nutrition experts. The alternative to import feed from other countries might be more expensive.

Fat from the before mentioned separation and also the 22.000 tons of fat from the anterior belly region, that is simply separated by mechanical gravitation, might undergo more chemical and sophisticated extraction procedures, in order to get more refined oils. From these, it would further be possible to extract and concentrate interesting and added value long chain fatty acids. The actual fatty acid composition is dependent on the fish feed diet. Initial analyses have shown that palmitic acid and stearic acid can be relatively high in the fillet of freshwater catfish, whereas the interesting EPA and DHA were low. This has to be investigated further, especially when the opportunity will rise after feeding the catfish with tailoring diets, based on the future byproducts from the growing marine fish industry.

The purified bioactive peptides and free amino acids from enzyme hydrolyzed proteins also have a huge potential in functional food, in sports beverages, for clinical nutrition purpose and immune stimulating effects. By applying specific enzymes, tailor made peptides represent an interesting yield. Several patented processes have been developed. The amino acid taurine is also an interesting component from the stomach and intestines of fish, since it both has a cholesterol lowering effects in humans and also is essential for cats and these byproducts could thus be used in petfood.

The skin has partly been exported to Italy, UK and India, but there is another opportunity to utilize this potential resource of 44.000 tons to produce gelatin, which is well paid. Known processes, based on successive steps of leaching of fish skin to remove water soluble compounds, extraction of gelatin, cleansing, concentration and drying, might give a yield of 125 tons of gelatin / time unit per 1.000 tons of fish skin. Gelatin binds water and the food industry utilize gelatin in sauces, whereas pharmaceutical industry use gelatin to encapsulate medicine, vitamins or oils. Gelatin is also applied in cosmetics. The market would like to replace the animal based gelatin, due to the mad cow disease, with fish based gelatin, especially from warm water species, giving gelatin with higher melting points and stable gels in room temperature. The world production is estimated to be in the range of 1.000-1.500 tons / year with a price between 80-150 NOK/kg. One challenge could be to remove the fish aroma.

Conclusively, the opportunities are huge and investment is needed to grasp and upscale the added value products from catfish byproducts. Several Vietnamese companies have openly invited foreign investors to enter joint venture cooperation in this area. Innovation Norway, localized together with the Royal Norwegian Embassy in Hanoi, has established a Trade and Innovation Program (TIP) that might support common research and industry development initiatives from both partners in Vietnam and Norway.

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