

Results of the SEAFOODplus project

Animal welfare in aquaculture increases product quality

Many consumers have reservations towards aquaculture because they believe that fish farming does not take ethical issues and animal welfare sufficiently into account. It is true that in working environments less attention is sometimes paid to such issues than to other aspects of production. This is wrong, as results of the research project SEAFOODplus revealed in June 2007 at the fourth annual conference in Bilbao: low stress levels during farming lead to better growth and ultimately enhanced quality!

Do fish in aquaculture really have a harder time than their “wild” counterparts? Ole Torrissen (Institute of Marine Research, Norway) posed this rather provocative question at the beginning of his lecture which discussed aquaculture from an animal welfare perspective. He then let a farmed fish give the answer: “Only 0,01% of my wild sisters survive, we aquaculture fish have a 30,000-fold higher survival rate! I get food 3 times per day; my wild sisters only seldom fill their bellies. My sisters fight for life every day, I have a veterinary. He knows what’s best for me!” Arguments of this kind may be plausible and illustrative but they don’t answer all of the questions, nor do they expel all doubts.

In contrast to animal husbandry where farmers have influenced the breeding of cattle, pigs and poultry for years, the domestication of fish in aquaculture has only just begun. Irrespective of whether we are talking about salmon, sea bass, sea bream or cod, fish have hardly been

cultivated for longer than ten generations. For that reason, aquaculture can today still be compared to keeping wild fish in captivity, said Ole Torrissen. By no means were all technologies, systems and farming methods sufficiently geared to meeting the vital basic conditions of the fish. Aquaculture had developed so quickly that the growth in knowledge in this area had been unable to keep up with the technical possibilities. Fish were special creatures and so it was not possible to simply transfer the experiences from agriculture to aquaculture.

Measurement and evaluation of animal welfare possible

Most people are basically in agreement that fish in aquaculture should have the possibility to live out their elementary needs and instincts. Pain and stress are inevitable in some situations (e.g. during sorting or harvesting) but should be kept at a minimum level. What is feasible is decided not only by the biological demands of

the fish but also by profitability and sustainability aspects of the farming processes. And it is here that opinions differ: opinions on what is feasible and necessary, what is just acceptable, and what should preferably be avoided. Consumers frequently discuss animal welfare from an emotional point of view, thereby exaggerating their criticism. But scientists, too, face the problem of how animal welfare can be measured and judged objectively.

According to Ole Torrissen there are both direct and indirect indicators of an animal’s state of well-being. The direct indicators include behaviour and responses, and also physiological stress or pain responses. Indirect indicators, on the other hand, include the relative growth rate, survival, disease resistance or product quality. Put plainly, fish that feel well and are not subject to constant stress are healthier, grow much better and ultimately have a higher meat quality. There is thus a direct connection between animal welfare and aquaculture productivity.

In aquaculture it is impossible to avoid some process stages that cause stress or “pain” to the fish. Ole Torrissen reminded his audience that such processes always have two dimensions: on the one hand the intensity of the stress or pain and on the other hand the duration of its impact. It is particularly occurrences of high intensity such as sorting and harvesting, the labelling of the fish, or transport that are criticised. However, it is often the less striking occurrences which afflict the fish much more strongly. Examples of this are suboptimal conditions during farming (insufficient water values, poor feed quality, parasites, etc.) that are of longer duration.

Fish produced at low stress levels have better meat quality

In the context of the ETHICOD project (“Testing ethical cod in a full chain approach”) the SEAFOODplus researchers examined how farming and slaughtering conditions have an impact on the quality of the fish. As Hilde Toften (Fiskeriforskning Norway) said in her lecture the participating scientists began by assuming that fish which are farmed and slaughtered under consideration of animal welfare also had a higher meat quality. The project included a whole complex of interconnected tests whose results complemented each other. They chose cod as the model species. The labelling of individual fish enabled the researchers to collect data on the whole production chain from the farm to the consumer.

The practical experiments began in spring 2005 and lasted until autumn 2006. In order to determine the influence of farm-



Ole Torrissen: "The species in intensive aquaculture, with exceptions, are wild fish kept in captivity, and their evolution as farm animals has just started."



Hilde Toften: "Fish welfare and ethical questions about rearing conditions and humane slaughter have been increasingly important as a quality trait of farmed fish."



Rian Schelvis: "The results show that the consumers in Iceland and in the Netherlands have similar high preferences for the cod products."

ing conditions on meat quality the juveniles were kept in different densities and important water values recorded regularly. It soon became apparent that the fish that were kept at higher densities grew less well. Under optimal conditions growth of juveniles was already one third better. This was to be expected, but even the experts were surprised that the different farming conditions also had an effect on physiological parameters and the blood count. In order to examine what impact these effects had on farming in net cages in the sea later on the fish were grown to about 1.6 kg in eighteen months and then slaughtered. To enable comparison of fish that had suffered stress with fish that had not the scientists took blood and tissue samples from the muscle. Both the direct quality analyses and sensory evaluation showed that stress during farming and slaughtering had a negative effect on the quality of the fish. Fillets from fish that had undergone lower stress levels during slaughtering and had been kept at densities of about 50 kg per cubic metre in the slaughterhouse got much better ratings in the sensory tests than

cod that had been slaughtered under industrial conditions (in which the fish are kept for about an hour at densities of over 500 kg per cubic metre).

Consumers prefer cod from low-stress farming

Are experiments like this just scientific games or are they of relevance to the consumer? Rian Schelvis (IMARES, The Netherlands) devoted herself to this question in her lecture "Do consumers like unstressed farmed cod better than stressed cod?" Together with other researchers she had done work to find out whether the "normal" average consumer could actually taste such differences at all or whether preferences for stressed or unstressed fish sooner depended on satisfaction of certain expectations. What effect does information on the farming and slaughtering of fish have on consumer behaviour and reactions? And what expectations do consumers have towards fish production in aquaculture and what information would they like to have?

These are difficult questions and to answer them the researchers

had conducted tests at different levels. The first level was a strongly scientific sensory analysis that was carried out in MATIS (Iceland), a facility which is specialised in such tests. The result was clear and left no doubts that there are verifiable differences between the three tested groups: (1) low-stress slaughtering using ethical methods, (2) increased stress during slaughtering using traditional techniques, and (3) commercially farmed cod. The commercially farmed cod got the poorest results. Their fillets were less succulent and had a soft texture. The meat seemed discoloured compared to the two other groups and sometimes stood out for its fishy smell.

In order to test whether consumers can perceive such differences and how they react to them the researchers carried out consumer tests in Iceland (with 156 participants) and The Netherlands (202 participants) parallel to the scientific analyses. Whilst some participants were given product samples without additional information on the farming and slaughtering of the fish, in other groups important additional information was printed on the

labels. For example: "Normal production, sea cage with standard amount of fish per cage, pumping of fish before slaughtering, slaughtering by bleeding" or "Production with special precaution to minimize stress and suffering for the fish, sea cages with lower amount of fish per cage, individual catching of fish prior to slaughter to reduce stress, quick painless slaughtering". Each participant had to evaluate the quality of the fish before and after preparation. A detailed questionnaire additionally enabled the researchers to draw conclusions on the expectations of consumers towards aquaculture and fish farming.

It was basically revealed that consumers in both countries had similar expectations with regard to aquaculture. Participants in Iceland clearly preferred stress-free farming and slaughtering; in the ratings of Dutch participants handling and stress did not play such an important role. The overall conclusion of the SEAFOODplus scientists is clear: ethical handling has no effect on product perception by consumers; ethical information has positive effects on product perception.

The SEAFOODplus project is coming to an end in 2008. At the Fifth Open SEAFOODplus Conference in Copenhagen 8-10 June all major achievements obtained over the 4½ years that the project has been running will be presented. It is expected that representatives from science and industry, as well as policy makers and government representatives, will use the opportunity to network and discuss avenues for continued efforts to further develop seafood research for the benefit of consumers and society. ►