

Hungry? Chronically stressed? Aggressive? Changes in fish behaviour may be the first signals that something is wrong.



What is life like for a farmed fish?

TRYGVE GYTRE

“Has this fish had a good life?” is the question that aquaculture customers are asking more frequently than before. In the future, the well-being of the fish during production may need documentation or there will be no sale.

Norway is already a major producer of salmon, and in the future, probably also of cod, halibut and other species of fish, crustaceans, mollusks and sea urchins. If we wish to maintain and strengthen Norway's position in aquaculture, it is not enough to simply produce high-quality meat. We also have to be able to document that the production of aquatic organisms observes recognised fish welfare and ethical norms. In other words: animal welfare will be part of the quality concept.

LOW STANDARDS OF WELFARE REDUCE PRODUCTION

Every animal is adapted by nature to a particular ecological niche in which the total physical, chemical, biological, social and nutritional environment enables it to function efficiently. Any changes in one or more of the species' preferred environmental factors may lead to stress, because the animal must tap its energy reserves in order to compensate for the changes. Constant stress means reduced welfare and lower production. If the deviations from optimal conditions become too great, normal development, health and life of the animal may be in danger.

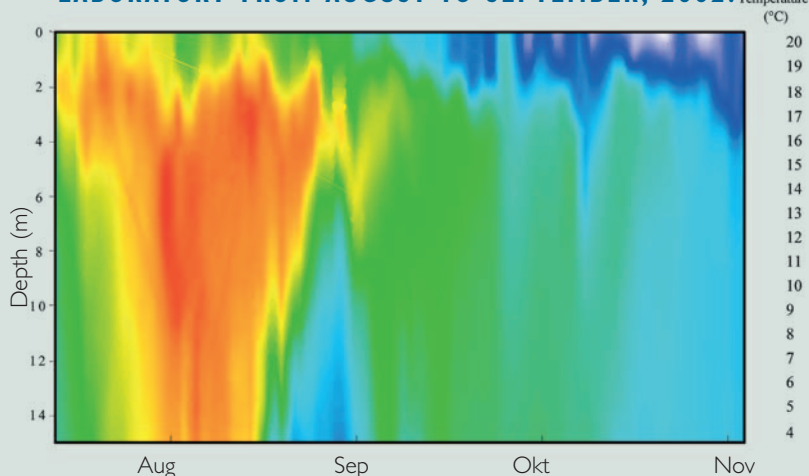
Life in a fish farm is really an artificial existence, to which the fish has to adapt. In fact, a well-adapted fish can enjoy a perfectly good life in a fish farm, while a fish that has not adapted well can have a hard time. But how can a fish farmer know whether a fish is enjoying life or not? And anyway, how good or bad is it really? One way of finding out is to read the “body language” of fish by studying their behaviour.

THE ENVIRONMENT A DECISIVE FACTOR

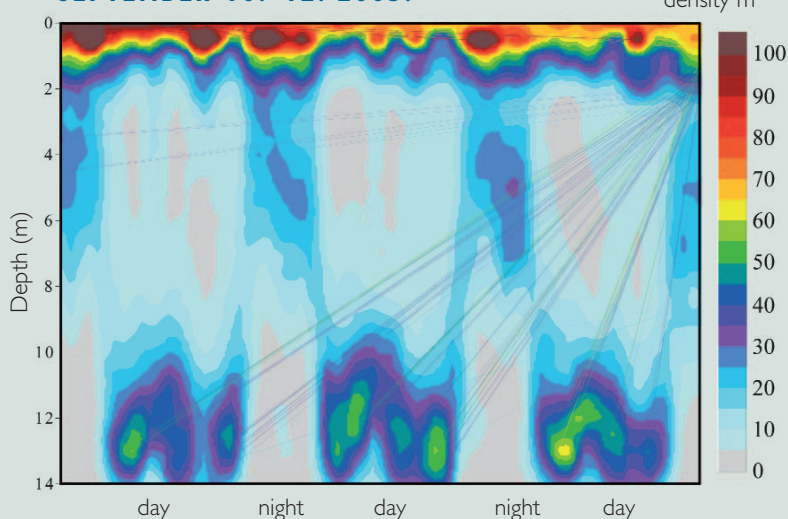
The environment of the fish, i.e. the totality of environmental components such as the physical and chemical properties of the water, the shape of the fish-cage, concentration of parasites, availability of food, how much space each fish has etc. is of decisive importance for its welfare.

By ensuring that physical parameters such as current speed, oxygen concentration, temperature, volume of water per fish etc., lie within accepted limits, the fish farmer can do a great deal to ensure a high standard of welfare for his fish. However, whether the fishes are really content in the sea-cage is something that only they can tell us. ➡➡

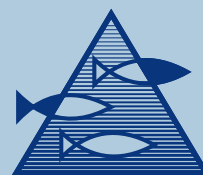
TEMPERATURES IN THE SEA-CAGE ENVIRONMENT LABORATORY FROM AUGUST TO SEPTEMBER, 2002.



OBSERVED FISH DENSITY (KG/M³) ON SEPTEMBER 10.-12, 2003.



Calculated fish density: 19 kg per m³



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RESEARCH GROUP:

Fish Welfare in Aquatic Production

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In the sea-cage environment laboratory scientists can vary such factors as fish density, light conditions, availability of food etc. while we observe how these influence the fishes' special body signals, general behaviour and biological condition. At the same time, we can also measure currents and other environmental factors, take water samples, analyse samples of fish etc., in order to identify repeatable connections between changes in the environment and changes in fish behaviour.

AVOID HIGH TEMPERATURES

The figures illustrate one important behavioural result from the sea-cage environment laboratory. In 2002, we measured large differences in water temperature in sea-cages all over western Norway, at different depths and different times. Temperatures in September were unusually high, and the salmon in the sea-cage environment laboratory displayed obvious tendencies to avoid the warmest water.

During the observation period shown the stocking density of the fish in the sea-cage environment laboratory was 19 kg/m³, although the observed density was sometimes abnormally high, at up to 100 kg/m³.

The figures explain how this could happen. Observations from the sea-cage environment laboratory show that during the day, the salmon crowded together in the uppermost layers of the water or stayed in the deepest part of the sea-cage, where the water was a couple of degrees cooler. At night, when lower light levels usually bring salmon in sea-cages to the surface, there was not sufficient room for all the fish in the relatively cool upper layer, which meant that some of the fish were forced to remain in the warm water.

The abnormal behaviour of the fish was an indication of a stressful condition, and growth and feeding data from this period showed that this stress condition resulted in lower production.



The Institute of Marine Research's sea-cage environment laboratory at Matre, north of Bergen, consists of a full-scale aquaculture plant and a laboratory building (foreground). From the laboratory, scientists can monitor environmental conditions and the general and special behaviour of individuals or groups of fish.



The most important language of a fish is its body language. As long as the general behaviour of a fish is stable, it is probably content. If its behaviour suddenly starts to change, it is time to sound a warning, since alterations in behaviour are its front-line defence against poor environmental conditions.

BEHAVIOURAL RESEARCH

But how can the fish farmer know what the fish is really trying to tell him via changes in its behaviour? This is where research comes into the picture. Studies of behaviour under various environmental conditions are an important component of the research profile of the Institute of Marine Research's research group Fish Welfare in Aquatic Production. Two of the most important aims of this group are to identify indicators and to develop methods for documenting fish welfare. The sea-cage environment laboratory is an important tool for performing this sort of research.

ADVANCED SEA-CAGE ENVIRONMENT LABORATORY

The Institute of Marine Research's sea-cage environment laboratory at Matre, north of Bergen, is a full-scale aquaculture plant which is equipped with advanced acoustic and optical measuring systems for registering fish behaviour. We also continuously measure vertical profiles of the salinity, temperature, oxygen concentration, and light levels in water.

