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Spotted wolffish culture

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Species has many attractive characteristics for commercial aquaculture



Among their other positive production traits, spotted wolffish readily accept commercial feeds.

When the spotted wolffish (*Anarhichas minor*) emerged as a promising candidate for cold-water aquaculture in the late 1990s, it was looked upon with considerable interest in Norway, Iceland, Canada and Chile. The first artificially fertilized spotted wolffish eggs were hatched in the laboratories of the Norwegian College of Fishery Science in 1994. In the 10 years that followed, a complete production line was established, supplying the Norwegian and Swedish restaurant markets with more than 100 metric tons (MT) per year at prices ranging from €8 to 12 (about U.S. \$10.60-16.00)/kg for fish with harvest sizes of 3 to 5 kg.

Early on, the prospects for the spotted wolffish aquaculture industry were very promising indeed. The species has a range of attractive characteristics, including high specific growth rates in captivity at very high densities, a high yield of 0.7- to 1.1-kg fillets, nonaggressive behavior and few disease problems.

The nature of egg and larval development in the species, specifically the hatching of large, well-developed fry ready to be fed on formulated feed, has allowed most of the traditional bottlenecks experienced in production of marine larvae to be avoided. On the negative side, the long egg incubation period, which lasts for several months, is very labor-intensive and space-consuming.

Intensive production

Due to large temperature fluctuations throughout the year along the Norwegian coast, along with the narrow 6 to 10 degrees-C temperature range for the species, intensive land-based systems have been identified as the most appropriate production approach for spotted wolffish. As such facilities are associated with high construction and operational costs, effective utilization of pumped water is required.

Shallow raceways in racks could effectively reduce overall logistics needs with respect to building and water supply system size. Their compactness and extended automation simplify operations during the production process. In addition, shallow raceways can operate at far higher densities than those applied in traditional tanks.

During the 2000-2002 period, construction plans were made for three large-scale facilities in Norway, each aiming for a yearly production of 400 to 650 MT using shallow raceway technology. However, due to a lack of venture capital at the time, none were actually built.

In the same period, Tomma Marinfisk in Nordland County, Norway, became the first company to establish a fully integrated wolffish production line from broodfish to processed end product. From 2004 to 2006, this single company harvested 100 to 120 MT fish/year, with most production destined for the restaurant market.

Sea cage technology was tested in the northernmost county of Norway, Finnmark, from 2003 to 2005. A full production cycle lasting three years demonstrated that wolffish could be successfully cultured in flat-bottom cages with shelves, similar to the technology used for Atlantic halibut in Norway. The cage technology for wolffish will, however, require further development before it can be used commercially, and its use will be limited to specific fjords in northern Norway.

Wolffish markets

Unlike salmon and cod, spotted wolf-fish are not a commodity product that is readily available throughout the year and known on a global scale. Icelandic and Norwegian landings of wild wolffish – stable at 15,000 to 16,000 MT annually – are mainly exported to other Scandinavian countries, as well

as Germany and France. The species is completely unknown in several markets, but generally recognized as a high-quality product. This has opened the possibility of marketing the fish as a high-price niche species, especially during the introductory phase of production.

In 2001-2002, a market research study was performed in 32 Norwegian, German and French upper-segment restaurants. The product was evaluated favorably in all countries, but the characterization of the product varied.

In Norway, where the fish were already well known, chefs considered the cultured wolffish of better quality than wild-caught fish. The French chefs were not familiar with the species and rated cultured wolffish below wild-caught seabass and turbot. General remarks rated the taste of the fish mild and neutral, and said the fillets were somewhat compact or closed.

The latter suggested the fillets would be ideal for large-scale services such as banquets. However, the willingness of consumers to pay €7 to 8 (\$9.30 to 10.60) per kg for gutted fish with heads and €11 to 12 (\$14.50 to 15.75) per kg for fillets landed the species in a segment rating above that of mass-produced aquaculture species such as Atlantic salmon, but below that of established, exclusively wild-caught species such as turbot, sole and sea bass.

In the last year of production at Tomma Marinfisk, fillets were sold to wholesale dealers for €13 to 14 (\$17.25-18.60) per kg, and although distribution was limited to Norway and Sweden, new customers had to be turned away. This demonstrated a growing market potential for the species.

What went wrong?

Despite being an industry on the verge of commercial breakthrough only a few years ago, wolffish aquaculture is currently stalled, and cultured fish are now completely absent from the Nordic markets. How could this have happened?

The main reasons are considered to be a lack of venture capital in combination with a high “entrance ticket” cost to the business through land-based technology. During a period when all eyes turned to the fast-growing Norwegian cod aquaculture industry and available funds were redirected to that industry, it was difficult to entice potential investors to wolffish culture.

Facing high investments, the need to build up biomass from scratch and considerable research and development challenges, most players looked to the experiences at the first wolffish farm in operation, Tomma Marinfisk. Establishing an industry on the trials and errors of only one farm was of course not an ideal situation.

Tomma Marinfisk made a heroic effort to develop wolffish culture, but the challenges were overwhelming. On top of the general challenges outlined above, the company had problems with technical solutions to water and oxygen distribution, and management issues, as well, making the overall task insurmountable. In February 2007, all the broodfish and half the standing stock at the farm died following a pump failure, forcing the owners to terminate the company.



Despite their name, wolffish are not aggressive and grow well at high culture density.

Restart requires investment

After the shutdown of Tomma Marinfisk, former employees and one of the owners established a new company using the former Tomma Marinfisk facilities. Broodfish recruits from the fish that survived the above-mentioned accident were saved, and the company aims to build up a new stock of broodfish.

It is expected that in 2010, the company will produce enough juveniles to supply at least one new growout farm. Its success will depend on financing authorities' willingness to support development programs for wolffish and whether new long-term investors find these programs attractive.

The market value of the product is well proven, and the very favorable production characteristics are well documented. Furthermore, wolffish possess characteristics important for the establishment of an exclusive niche product, including a limited geographic area suitable for culture, together with a unique, high-quality end product. Thus, the main challenges to establishing farmed wolffish as a profitable seafood product for Norway are now on an infrastructural level.

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