First Commercial Lobster Culture Module Established in Norway

Summary:

A new scalable modular concept for lobster culture developed in Norway relies on automation to perform most production procedures. Its compartmentalized design segregates individual lobsters and uses robots to classify larval stages, distribute feed, and harvest. Image-processing software identifies molting and mortality. Plate-sized lobsters can be raised solely on a formulated diet in the modules.

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The European lobster, *Homarus gammarus*, is one of the most valued seafoods in the world and enjoys worldwide market demand. However, lobster aquaculture has previously been hampered by high production costs due to the demand for 18-22° C water to get acceptable growth rates and the need for individual rearing compartments to avoid cannibalism. The lack of high-quality formulated feed has also been a limiting factor.

Norwegian Lobster Farm currently operates the only year-round lobster hatchery in Europe on the island of Kvitsøy in southwestern Norway. In 2000, the company began a project to develop land-based production of 300-g, plate-sized lobsters. Small- and medium-scale trials have been completed to address the main bottlenecks.

Automated Technology

The ideal system for rearing lobsters individually should be relatively simple and inexpensive to construct, operate, and maintain. It should use space efficiently and allow ready access to every animal for inspection and feeding. Lobster production should be based on automatic feeding and self-cleaning tanks and cages in systems that maintain ideal water quality and temperature, and support adequate survival at high production densities.

Through research over the last seven years, the Norwegian Lobster Farm has successfully developed a cost-effective farming solution that uses recirculation of heated seawater. Patented in 23 countries worldwide, the new farming technology includes automated solutions to most of the procedures that previously were dependent on manual labor.

The concept includes the use of robots to classify larval stages, distribute feed, and harvest; and image-processing software to identify molting, mortality, and the time for harvesting. The farming system was successfully tested at medium scale over the last two years, and the first full-scale lobster production module was put into operation in 2006.

Norwegian Lobster Farm has also patented a new formulated feed especially engineered for the European lobster. It is being used from hatching to market size, so commercial production of plate-sized lobsters can be solely based on the formulated diet.

Water Quality

Desirable levels of water quality for clawed lobsters reflect temperatures of 18-22° C, 28-35 ppt salinity, dissolved oxygen above 6 mg/l, pH of 7.8-8.2, and less than 14 µg nitrogen/l as un-ionized ammonia. For short periods, lobsters tolerate considerably lower oxygen and higher ammonia concentrations.

Ammonia concentration is the most limiting parameter in recirculation systems for seawater. At Kvitsøy, the biofilter efficiently removes total ammonia ni-

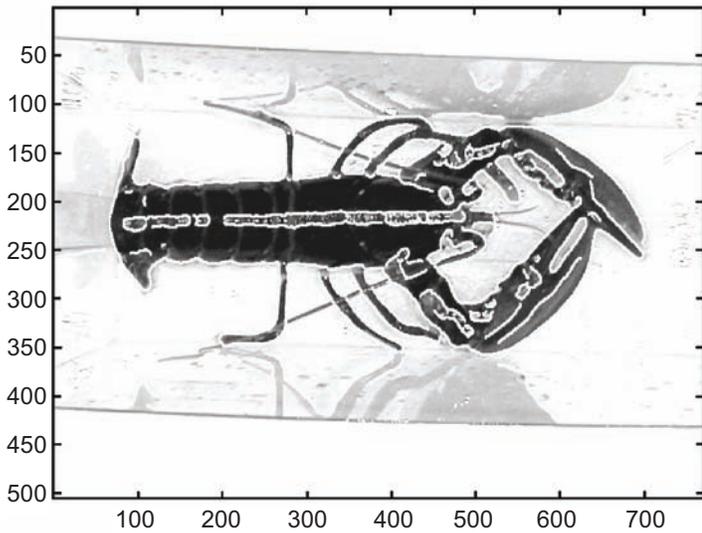*The new modular production units utilize robotic feeding and monitoring.*

Image-processing software identifies lobster life stages and defines the harvest schedule.

within a few years. Since the system is modular, larger units have also been designed, with the potential for one farm to produce up to 2,000 mt/year of live lobsters.

Lobsters from Norwegian Lobster Farm have been tested several times at the Culinary Institute in Stavanger, Norway. In these culinary tests, the farmed product was rated higher in taste, freshness, texture, and meat color in both boiled and fried forms than wild-caught lobsters, which showed promise for introducing the farmed animals to high-end market segments.

trogen (TAN) at rates of 50-70%. Lobster feed is high in protein, and ammonia excretion rates in the animals are correspondingly high, with average rates of 0.1-0.5 g TAN/kg/day for adult lobsters. Current knowledge on respiration and excretion rates for lobsters at all stages is limited, and research is addressing this.

Capacity, Market Potential

The commercial-scale lobster module at Kvitsøy has the capacity to produce around 3 mt/year. Plans are to increase the annual production capacity to around 70 mt

To help control costs, Norwegian Lobster Farm's modules recirculate heated seawater.