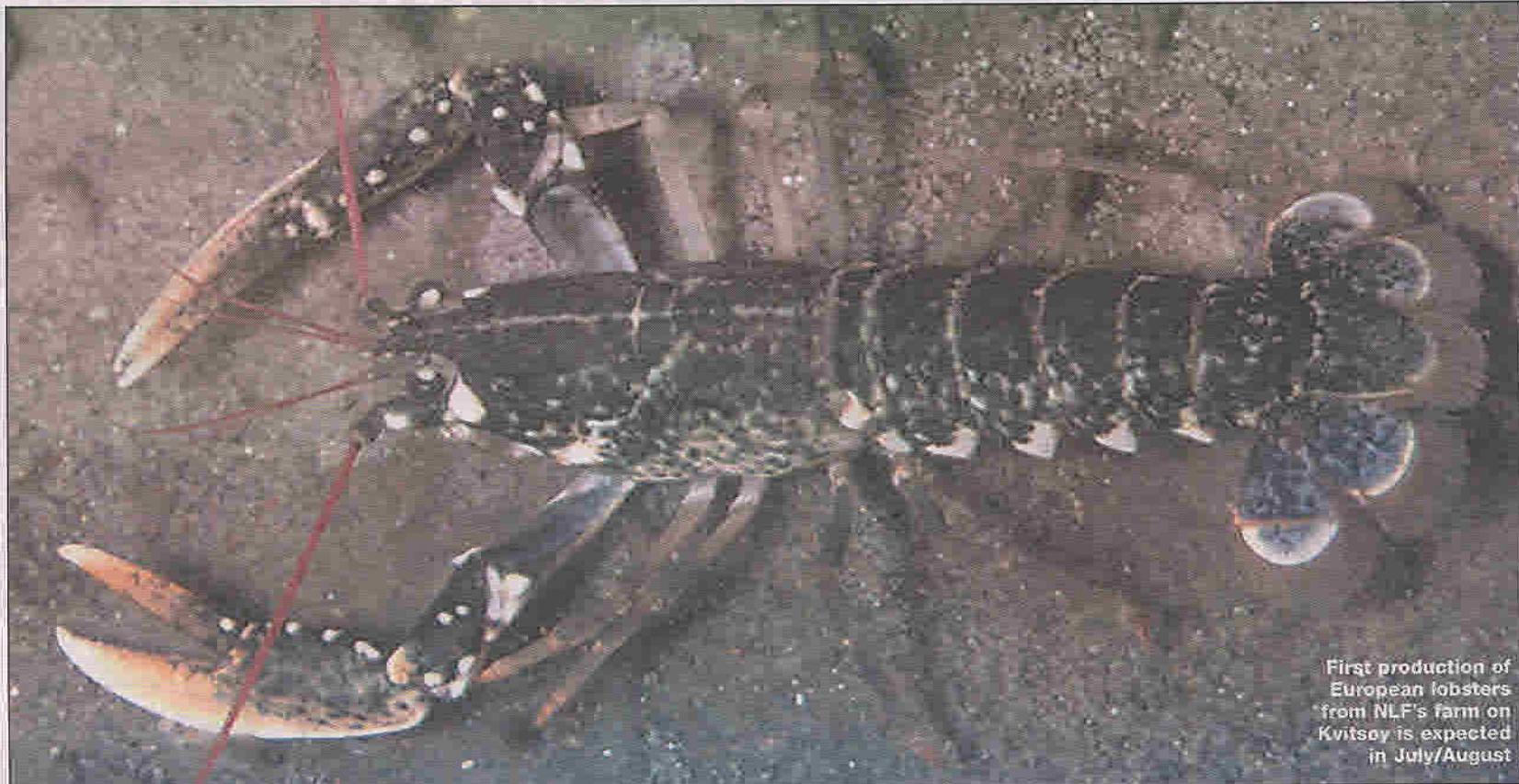


# MOLLUSCS, LOBSTER

Such is the level of development in the farming of crab and lobster species that we've added them to our annual mollusc feature. Technical editor **TOM WRAY** kicks off this year's review of developments in this increasingly dynamic range of crustaceans with a report on a ground-breaking lobster farm in Norway



First production of European lobsters from NLF's farm on Kvitsøy is expected in July/August

## Lobster farming start-up

LOBSTERS and similar cannibalistic crustaceans can now be farmed cost-effectively, claims Norwegian Lobster Farm AS (NLF) which is now applying its new technology to a commercial-scale pilot farm on the island of Kvitsøy, near Stavanger.

Established in 2000 by Ivar Kollsgård, Asbjørn Drengstig, Rudolf Svensen and Dr Tormod Drengstig, NLF has managed a major R&D project

on Kvitsøy, to reveal the lobster's preferences for feed, substrate, shelter, water quality and cage-rearing space in intensive systems.

NLF now manufactures and distributes the technology for farming the crustaceans in land based systems, including:

containing a large number of lobsters in small volumes;

- Technology for rearing juveniles only;
- Feeding systems specially suited for the patented technology;
- An automatic juvenile sorting machine; and
- An automatic harvesting machine.

NLF says the technology is also well suited for other marine crustaceans such as langoustine, crayfish and king crab.

The system is also said to be suitable for rearing freshwater crustaceans.

The technology that NLF has developed, patented and tested:

- Operates with a water temperature of 20degC;
- Recirculates water through a biofilter with a minimum use of fresh seawater;
- Features automated feeding and self-cleaning cages and tanks;
- Has easy access to and automated inspection of every individual;
- Is equipped with automated sorting and classification of juveniles; and
- Features automatic determination of harvesting.

A prototype has been under testing, and construction of the larger commercial farm on Kvitsøy starts next month – with production set to begin in

July/August.

"Total investment in the new farm is around NOK15 million [US\$2.4m]," NLF's Asbjørn Drengstig, a marine biologist, tells *FFI*.

"We are working on finding partners, and hope to manage a realisation within three to four months. The total yearly production capacity will initially be 23 tonnes and increase to 70 tonnes after five years.

"The new farm will have two circular tanks comprising units with [patented] single rearing cages. We are holding our own broodstock, and will also have two large tanks for juvenile production, as well as hatchery facilities.

"We will therefore control the whole life cycle to produce IV-stage lobster larvae from February/March to October."

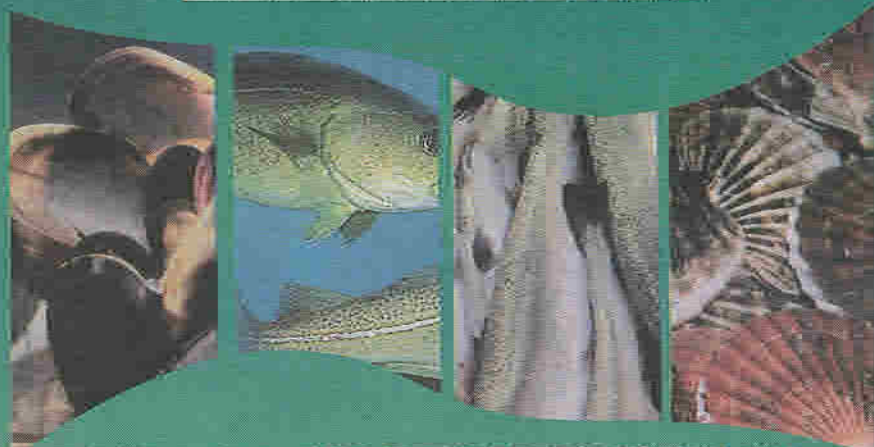
Results from the R&D programme showed that recirculation of seawater is highly suited for intensive production of the European lobster, *Homarus gammarus*. The technology is also claimed to have lower demand for land area and lower investment costs than other known technologies.

In addition, a new, specially developed diet has been tested. It is said to give lobsters natural pigmentation, and give low feed conversion ratios (FCRs), plus high survival and growth rates.

NLF has produced the first plate-sized lobsters on solely a formulated diet, with testing

## new technology piloted in Norway

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# & CRAB



**Lobster larval mortality is primarily due to cannibalism**

**Left: Lobster from same cage, but different environment**

**Below: Hatchery section at NLF's farm**



Norwegian Institute of Fisheries and Aquaculture Ltd.

Several private companies also contributed to the project.

Drengstig points out that through this project NLF became Norway's first commercial producer of plate-sized lobster, and the first in the world to have produced lobsters from hatching to plate-size solely on a formulated feed.

He claims that the project results have generated an exceptional opportunity to establish a new niche in the Norwegian aquaculture industry, and to commercialise land-based lobster farming abroad.

Market research shows that portion-sized lobster has a substantial sales potential, Drengstig says, the summarised as:

- Frozen plate-sized lobster: 50,000 tonnes a year;
- Fresh, bigger lobster: 1000 tonnes a year; and
- Live lobster: 70,000 tonnes a year.

The Culinary Institute tests are said to have given good results.

New tests are being conducted on taste, texture and pigmentation after using NLF's new lobster feed.

www.norwegian-lobster-farm.com

carried out at the Culinary Institute in Stavanger.

The market for juvenile lobsters for restocking is already established through Norway's law on sea ranching, and the market for plate-sized lobsters is said to be large, both at home and internationally.

On biology, Drengstig says that the growth curve has been documented and biological protocols developed.

Trials have been conducted with different rearing environments (substrate, shelters, single cages, communal rearing) and with different feed (artemia, krill, mysids, lobster larvae, cod feed) for comparison among six different families.

Farming trials on European

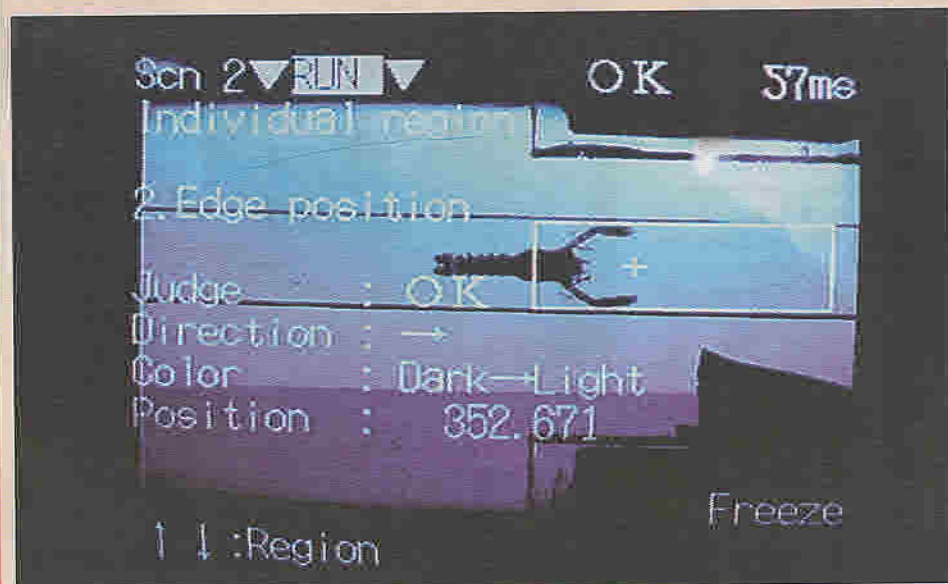
lobster have shown that:

- The species grows to 22cm and 300g in about two years;
- It is a robust species to rear;
- There are no problems during the larval phase - mortality is primarily due to cannibalism; and
- The weaning phase is simple.

NLF's work has also shown that the European lobster requires a proper environment (water quality) and high quality feed.

The R&D project was carried out in close cooperation with Norway's Institute of Marine Research, Stavanger University College, RF-Rogaland Research, and the

## Automatic sorting ... and harvesting



**SORTING** juveniles is one of the key activities on a lobster farm. After hatching, all are transferred to an upstream incubator where they spend their 'pelagic' phase and moult three times to become IV-stage larvae.

After reaching the fourth stage they become benthic and settle on the bottom substrate.

Here, it is crucial to provide sufficient substrate for the lobsters to develop normal morphology with one crusher claw and one scissor claw.

In Norwegian Lobster Farm's system, VI-stage juveniles are transferred to single-cell compartments for on-growing.

In the past, transferring large numbers of juveniles has been very labour intensive, the costs cutting into business profitability.

But in highly intensive rearing conditions, transferring large numbers of juveniles requires automatic transfer and recognition of IV-stage larvae.

A project was therefore initiated to develop a robot for juvenile selection and classification.

"Those that have reached the IV-stage have a size and characteristics that clearly separate them from the earlier stages,"



Prototype harvesting robot

Top: NLF has developed image processing for lobster juvenile selection

explains Drengstig. "Intuitively, this yields the length as a discriminating feature. Likewise, the area covered by a juvenile in the acquired images is another discriminating feature."

Each juvenile is siphoned out of the incubator and into a small transparent rectangular chamber, where a camera captures the image. This is then analysed, and if it is IV-stage the juvenile is transferred to farm's next unit.

Another important aspect of intensive farming of plate-sized lobsters in land-based systems is to

harvest the animal efficiently and gently from the cages to the packing station.

Because they will be sold live, it is important not to stress the lobsters and to keep them in perfect shape, with no loss of any extremities. Harvesting should also be carried out year-round, as this will increase the average farm-gate price.

NLF therefore started a project last year in cooperation with Stavanger University College to develop a harvesting robot suitable for industrial conditions.

It is now included in NLF's patented single-cage system.

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