FUTURE STRATEGIES FOR A NORWEGIAN PRODUCTION OF SEED OYSTER, *Ostrea edulis* FOR EXPORT

PART REPORT, as an input on the closing of the project “Norske setteskjell av flatøsters (*Ostrea edulis*) til et internasjonalt marked“ (Norwegian seed oysters (*Ostrea edulis*) for the international market), NUMARIO project K32-3025/00

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BACKGROUND

“Norske setteskjell av flatøsters (Ostrea edulis) til et internasjonalt marked” (Norwegian seed oysters (Ostrea edulis) for the international market), NUMARIO project K32-3025/00 was granted in 2000, in order to support Norwegian oyster producers in their effort to establish production of, and a market for seed flat oysters, Ostrea edulis, in the EU. By this time Norwegian flat oysters had been surveyed by the Veterinary services for 5 years, and were found to be free from serious pests and parasites. Companies in Norway re-established and modernised the traditional “poll-production” and started a hatchery production of 4 mm seed.

During the project, several links have been made between the Norwegian companies involved in the project and French companies growing flat oysters, both on the Mediterranean and Atlantic coasts.

Export of Norwegian oyster seed was tested, and spat were reseeded in the Thau lagoon. The initial survival and growth performance of these seed batches were satisfactory, but after some months, the oysters were infected by the parasitic protozoans Marteilia refringens and Bonamia ostreae, already causing severe problems in French flat oyster growing areas. The Marteilia problem is particularly important in the Thau lagoon. Finally, mortalities of the Norwegian oysters were high.

By the end of the project, it is crucial to outline a strategy, based upon the results from the export done during the project, and our experience with the oyster industry in Norway and France respectively. Institute of Marine Research (IMR) in Norway and Institut Français de Recherche pour L’exploitation de la Mer (IFREMER) in France involved in this part of the project.

A project meeting was held at IFREMER, La Tremblade, France, in June 2001. The meeting discussed different sides of the project, and focused on the identification of risk factors associated with an export of seed oysters. It was later agreed to close the project and draw up conclusions, advice and recommendations in a short report, which should be distributed through Norwegian and French reporting channels, respectively.

A closing meeting was held in at IFREMER, La Tremblade, France, July 2001. The following document summarises the conclusions. This information will be communicated to the competent authorities in France, like the Direction de Peche Maritime et aquaculture (DPMA) and the shellfish growers associations (CNC) in France, The Directorate of Fisheries, Veterinary authorities in Norway and through the Norwegian Shellfish Programme (Skjellprosjket), fish farming journal (Norsk Fiskeoppdrett) to ensure a wide dissemination of our recommendations.
AIM

The aim of this report is to use the results from the seed oyster export project to outline a strategy for the oyster trade with a minimal level of identified risk factors for both importers and exporters, and in compliance with national and international regulations.

This report contains compiled advice from collaborating scientists at the IMR and IFREMER on the strategy for the Norwegian flat oyster seed production and export.

MINIMISING THE RISK

In all movements of live animals, there will be risks of adverse, unwanted effects like disease, environmental changes etc. In order to minimise the risk, competent professionals and producers should collaborate to compile both the known and identified “official” as well as the “non official” risk factors. In this project an effort has been made in order to identify all relevant risks associated with the transport of live oysters.

Risk factors

The following risk factors were drawn up during the 2001 meeting;

1. Pathological risk. Introduction of unknown parasites
2. Pathological risk. Increasing local prevalence of Bonamia and/or Marteilia.
3. Ecological risk. Introduction of fouling organisms
4. Ecological risk. Introduction of microfauna or microflora (like toxin producing algae)
5. Problems with physiological adaptation (different population growth performances)
6. Genetical risk. Mixing of genetically different strains
7. Commercial risk. If poor growth or mortalities; bad publicity or need for refunding.

Comments on the risk factors
The pathological risks are considered the most important. The risk of introducing unknown parasites into French waters is considered relatively low, as long as Norwegian production sites are surveyed by the competent authorities. Based on experience with previous introductions of flat oysters from non-infected into infected zones, the risk of high infection rated resulting in an increased local prevalence of *Bonamia* and/or *Marteilia* is considered the most critical factor in the project.

In addition to the pathological risk - negatively influencing the zoosanitary status in the grow-out areas - there are potentially risks of introduction fouling organisms and microfauna or -flora not present in the recipient area. Cleaning and quarantining may minimise this risk, and should therefore be applied. There should be a special focus on the risk of introducing cysts of certain toxin producing microalgae, like *Alexandrium* spp, causing paralytic shellfish poisoning.

We are not considering physiological adaptation as a significant problem. Presumably different Norwegian populations may exhibit different growth performances in French waters. This can only be tested by surveyed growth trials.

The genetical risk is an open question, as the population genetics of the European flat oyster is not fully known. We consider some of the wild Norwegian populations to be purely native, and some of the farmed ones to be a result of mixing of different Norwegian populations and Dutch oysters introduced in the 1930’s. If mixing of potentially genetically different strains may be a risk, this should be considered when drawing up the strategy. French studies have demonstrated a genetic variability among natural populations along the European coastline. This supports a concern for preserving the genetic diversity of this species.

**RESULTS FROM RESEEDINGS OF NORWEGIAN OYSTERS IN FRANCE**

Batches of Norwegian oyster seed immersed on production sites in the Thau lagoon during spring exhibited good growth and survival during the first 6 months. Thereafter controls showed an increasing infection by *Marteilia*. After 10 months in the lagoon, the survival rate was approximately 50%, due to mortalities caused by marteiliosis. Bonamiosis was also detected.

The results show that the Norwegian flat oyster seed are highly susceptible to marteiliosis and bonamiosis, like oysters from other disease free zones previously tested. The tested production strategy in the Thau lagoon is not feasible. As the results will be known among French oyster growers, further exports of seed to this area is not advisable. It is also not wanted from a strategic point of view, as any batch of highly infected oysters may contribute
to an increased pool of disease agents - thus increased infection pressure in the area.

ADVICE AND RECOMMENDATIONS

Based on the results from the project, and the discussions in order to establish a common strategy in an Institute of Marine Research/IFREMER collaboration, we wish to outline the following:

A surveyed production link

Oysters for export should only be produced in areas where surveys are carried out. The production chain should be based on the use of a defined broodstock, use of sites holding oysters with a defined zoosanitary status, and do not have any introduction of oysters from other areas. The product chain should be drawn up in collaboration with Institute of Marine Research / Veterinary Institute / IFREMER experts.

Production sites should collect data on the presence of cyst forming toxic algae (Alexandrium spp.).

Hatchery seed production is a crucial part of the chain, and should be based on the use of one broodstock population, which should be under surveillance. The hatchery should report any abnormal mortality to the veterinary authorities.

All grow-out sites in the production chain should also be under surveillance. Regular inspections should be performed, and reports made on any abnormal mortalities.

All oyster growers involved in the production, as well as Institute of Marine Research / Veterinary Institute / IFREMER experts should receive adequate information on the production and its strategy.

Strategy 1; A Scandinavian model. Export to areas free from serious oyster diseases

As Norwegian flat oysters will be infected with Marteilia and Bonamia when immersed in infected areas, a preferred strategy is to establish a production and export based on trading between non-infected zones. This requires contact between producers in these areas, and the establishment of a “Scandinavian model”, possibly including the Northern part of the British Isles and Ireland.

Strategy 2; Export to areas with oyster disease problems
There is a time lag between the moment of infection and mortalities due to the oyster diseases. By practical means, any grow-out of flat oysters in an infected zone must be performed during a period shorter than this lag. The project has shown that an export of small oyster seed into an area with severe disease problem does not work. The producers may thus consider a modified strategy based on seeding of half-grown oysters in areas with less disease problems. It must then be emphasised that the Norwegian seed are native and highly susceptible to infection.

**Closing remarks**

We wish to emphasise the importance of a common, long-term strategy for the oyster trade, being beneficial for the entire industry on both sides of the European border. By choosing such a common strategy, we may collaborate in order to minimise risks, both due to communicable diseases and other identified risk factors. We also wish to point out this project as an example of linking industry and scientific partners in a constructive network.

Although there is no present project activity on this subject, we will endeavour to follow the activity with advice and recommendations. The oyster producers should on their side communicate both results and strategies to the Institute of Marine Research and IFREMER.