ECOLOGICAL IMPACT OF SEA-RANCHING LOBSTERS: CURRENT RESEARCH AND FUTURE PERSPECTIVES

Ann-L. Agnalt*, K.E. Jørstad and E. Farestveit
Institute of Marine Research
PB 1870 Nordnes, N-5817 Bergen, Norway
ann-lisbeth.agnalt@imr.no

Sea ranching and stock enhancement have been studied at Norway's Institute of Marine Research for the last 20 years. A turning point was reached in 2002 when a new law, the Act on Sea Ranching, was approved. The law is restricted to sedentary species such as mollusks, crustaceans, or echinoderms, and the species attracting the highest interest are European lobster (*Homarus gammarus*) and great scallop (*Pecten maximus*). The implementation of the Act is a prerequisite for the sustainable development of sea ranching. Beginning 1 January 2006, the activities are regulated under the Act on Aquaculture (joined with previous Act on farming marine species). So far there has only been one round of applications, for which 24 applications were submitted for 31 localities, 11 for European lobster and 20 for scallop. The licences extended from Tysfjord in the north to Risør in the south, and varied from 0.001 to 21 km^2. An unalterable condition set by the Act is that no licenses are issued if harmful environmental effects will occur.

Current research

The Institute of Marine Research has long-term experience with research on European lobster, and based on a previous research program with large-scale releases of hatchery-produced lobster juveniles at Kvitsøy off southwestern Norway (1990 to 2001), the foundation for evaluating long-term effects with respect to genetics and ecological impact has been laid. Regular surveys have been conducted in the release areas and in areas with no previous releases. We here present the species composition at Kvitsøy, Bjørnafjorden and Tysfjord in various years to elucidate year-to-year variations. Bjørnafjorden is slightly south of Bergen and has been used as a "control site" to Kvitsøy, i.e. no releases of lobster have been made. Tysfjord has one of the northernmost lobster populations in Norway, and the area is of great interest for commercial lobster sea-ranching. There have been no previous releases of hatchery-reared lobster in Tysfjord. The main purpose is not only to describe the species and size composition in each area, but also to attempt to identify key species that can be regarded as early warning signs. Early warning signs can be used to start further and detailed analysis to identify negative or positive changes from the ranching activities. Genetic samples have been collected at several areas through time, and will be analysed for possible long-term effects.

Future research priorities

To realize the potential in sea ranching, environmental matters must be resolved. This paper will present ongoing as well as future research requirements for lobster ranching in Norway. Increased knowledge on the effect of the sea ranching activity on the environment i.e. carrying capacity, genetic interaction with the wild con-species, risk of disease outbreak, and ecological effects are necessary.

In general, intensive seed production requires technological development and access to brood stock. Criteria for the selection of brood stock must be evaluated based on release

purposes and environmental requirements. Health and disease conditions in the hatchery are important to ensure that all produced and thus released animals hold a “health certificate”. Appropriate release methods are crucial to ensure high survival in the wild, and for most species, the phase just after release is the most vulnerable, due to high predation. The selection of suitable release locations, times and predator control might be decisive for the outcome of sea ranching.

Understanding how the carrying capacity relates to release density and subsequent survival and growth of the released animals is important. The health status of the ranched organisms needs monitoring as part of development of disease control models (with emphasis on the spat/juvenile production phase). To evaluate genetic interactions between released animals and its wild con-species, genetic information of the brood stock used and the wild animals in the release area is required. Knowledge of factors (biological and physical) that influences the quality (genetics, behaviour, predation, morphology) of the released animal is also important. One aspect is production of juveniles “born to be wild”.

References

Agnalt, A.-L., van der Meeren, G.I., Jørstad, K.E., Næss, H., Farestveit, E., Nøstvold, E., Svåsand, T., Korsøen, E., Ydstebø, L., 1999. Stock enhancement of European lobster (*Homarus gammarus*); A large-scale experiment off south-western Norway (Kvitsøy). In Stock Enhancement and Sea Ranching. Edited by B. Howell, E. Moksness and T. Svåsand. Oxford, Fishing News Books, Blackwell Science. pp. 401-419.

Agnalt, A-L, Strand, Ø., Jørstad, K.E., van der Meeren, G.I., Kristiansen, T.S., 2001. Havbeiteloven – Kunnskapsstatus og strategier (The Sea Ranching Act – Status of knowledge and strategies). Institute of Marine Research, June 2001. A report to the Ministry of Fisheries and Directorate of Fisheries. 66 p.

Agnalt, A.-L., Jørstad, K.E., Kristiansen, T., Nøstvold, E., Farestveit, E., Næss, H., Paulsen, O.I, and Svåsand, T. 2004. Enhancing the European lobster (*Homarus gammarus*) stock at Kvitsøy Islands; Perspectives of rebuilding Norwegian stocks, In Stock Enhancement and Sea Ranching. Developments, pitfalls and opportunities. Edited by K M. Leber., S. Kitada, H.L. Blankenship and T. Svåsand. Blackwell Publishing Ltd, Oxford. pp. 415-426.

Bergh, Ø., and Strand, Ø. 2001. Great Scallop, *Pecten maximus*, research and cultivation strategies in Norway: a review. Aquaculture International, 9(4): 305-317.

Strohmeier, T., Strand, Ø., Jørstad, K.E., Mortensen, S., Agnalt, A.-L., 2002. Potensielle miljøkonsekvenser ved havbeite, kamskjell og hummer (Potential environmental consequences related to sea-ranching scallop and lobster). Institute of Marine Research, May 2002. A report to the Ministry of Fisheries and Directorate of Fisheries. 30 p.

Strohmeier, T., Jørstad, K.E, Farestveit, E., Agnalt, A.-L., Strand, Ø., 2002. Mulige begrensninger i allemannsretten ved havbeite, kamskjell og hummer (Possible limitations in the common property or free access related to sea-ranching scallop and lobster). Institute of Marine Research, June 2002. A report to the Ministry of Fisheries and Directorate of Fisheries. 14 p.