



## PREVENT ESCAPE

**Assessing the causes and developing measures to prevent the escape of fish from sea-cage aquaculture**

### The Challenge

The escape of fish from sea-cage aquaculture is perceived as a serious threat to natural biodiversity in Europe's marine waters. Escaped fish may cause undesirable genetic effects in native populations through interbreeding, and ecological effects through predation, competition and the transfer of diseases to wild fish.

Technical and operational failures of fish farming technology cause escapes. Cages break down in storms, wear and tear of the netting causes holes, and operational accidents lead to spills of fish. Sea-cage equipment is marketed and used across Europe, thus knowledge relevant to the culture of numerous species in diverse environments is required to produce robust equipment and implement risk adverse operations.

Solving technical and operational problems related to escapes is dependent on a combination of research into several technological disciplines and biological knowledge related to the behaviour of fish in sea-cages.

### Project Objective

- To develop better culture technologies and techniques to prevent escape of fish from sea-based aquaculture
- To develop knowledge on the behaviour of fish pre-escape and post-escape and integrate this into species- and site-specific risk assessments for sea-based farms

The Prevent Escape project will conduct and integrate biological and technological research on a pan-European scale to improve recommendations and guidelines for aquaculture technologies and operational strategies that reduce escape events.

### Key Points

Through research focused on sea-cages and their immediate surrounds, the project will:

- Assess technical and operational causes of escape incidents,
- Assess the extent of escapes of reproductive gametes and fish,
- Determine the inherent behaviours that pre-dispose certain species of fish towards a higher probability of escaping, and
- Document the dispersal of escapees to develop and test recapture strategies.



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### EATiP *Thematic Area of Relevance*

**TA1:** Product Quality, Consumer Safety and Health

**TA2:** Technology and Systems

**TA3:** Managing the Biological Lifecycle

**TA4:** Sustainable Feed Production

**TA5:** Integration with the Environment

**TA6:** Knowledge Management

**TA7:** Aquatic Animal Health and Welfare

**TA8:** Socio-Economics and Management

### Key Words

Escapees, sea-cage, biodiversity, reproductive gametes, fish, competition, wild stocks, aquaculture equipment

### Project Information

**Contract number:**  
226885

**Contract type:**  
Small or medium-scale focused research project

**Research area:**  
KBBE - Assessment and mitigation of the impact of aquaculture on wild populations

**Duration:**  
36 months (2009/04/01 - 2012/03/31)

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## Key New Knowledge Expected

- Assessment of the extent, technical and operational causes and cost of escape events
- Assessment of escape motivation and escape-related fish behaviour in European aquaculture
- Identification of escapees, their post-escape distribution, ecological risk and potential for recapture
- Assessment of the extent and ecological consequences of escape of fertilised eggs from sea-cages
- Recommendations and guidelines for the design of fish farms, management and operation of equipment to prevent escape

## Potential Impacts

Specifically, we can identify six main user groups that Prevent Escape will benefit: the sea-cage fish farming industry, aquaculture equipment producers and suppliers, standards organisations, regulatory bodies and governmental organisations, research marine scientists and engineers, and the members of the public.



### **SME**

- Sea-cage fish farming industry: The dissemination of results to fish farmers via training in escape prevention techniques will lead to better operational procedures, minimizing the probability and consequences of human errors. This will lead consequently to a reduction of escapees and to the enhancement of the industry's competitiveness. Moreover, this could lead to an amelioration of the industry's image, which is often perceived as negative by the public in relation to escapees and the related environmental impact.
- Aquaculture equipment producers and suppliers: Information generated by the project will feed into research specifically aimed at benchmarking the performance of equipment under farming conditions and thereby improving the design and production of sea-cage equipment components. The improvement of the containment technology could lead to the reduction of escapes of fish caused by failure of individual pieces of equipment.



### **Environment**

- The new information generated, when added to existing knowledge, will allow determination of practical, implementable measures to prevent escapes and mitigate the effects of escapees. If prevention and mitigation are more successful, genetic and ecological impacts should diminish.



### **Policy**

- Disseminating the results to regulatory bodies and governmental organisations will help these to carry out proper risk assessments and implement effective regulations and strategies to minimise escape events.



### **Knowledge Transfer**

- Results of Prevent Escape may be directly used to train fish farmers in escape prevention techniques.
- Results from the Prevent Escape project disseminated directly to standard organisations will significantly broaden the information base available for formulation and implementation of improved national and international standards for the design, construction and use of aquaculture equipment.

## Related Publications/Projects

Jensen Ø, Dempster T, Thorstad EB, Uglem I, Fredheim A (2010) Escapes of fishes from Norwegian sea-cage aquaculture: causes, consequences and prevention. *Aquaculture Environment Interactions* 1: 71-83.

Uglem I, Bjørn PA, Mitamura H, Nilsen R (2010) Spatiotemporal distribution of coastal and oceanic Atlantic cod *Gadus morhua* sub-groups after escape from a farm. *Aquaculture Environment Interactions* 1:11-19.