

## Solutions for shellfish stakeholders and the aquaculture industry



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# SHELLFISH AQUACULTURE

## LOGLINE ENVIRONMENT CONTEXT & EXPERIENCE

Longline Environment was incorporated in 2005, to provide marine environmental products and services based on 20 years of research and technology development experience. The company offers a range of consultancy services and solutions to shellfish farmers/stakeholders

The team has carried out projects all over the world and worked with many of the major institutes (PML, UOS, IFREMER, NOAA, EPA, SOA). Longline's team track record include projects carried out in the United States, Europe, Asia and Africa. Projects have been executed in ecological modelling, sustainable carrying capacity, fisheries management and eutrophication management.

## SHELLFISH FARMING: HOW CAN WE HELP YOUR SHELLFISH?

Longline applies shellfish simulation models that use science as well as a socio-economics. We apply models for established shellfish aquaculture operations and for prospective farms located in estuaries/bays/lochs/ coastal areas as well as offshore. We are able to determine what size your shellfish will grow to, determine your profit maximising output and provide other practical recommendations including risk management and mitigation strategies.

We are able to assist your farm with the following issues:

- Production analysis for shellfish farms determining maximum animal growth, optimal harvest size, profit maximising output, duration to maturity, allowing for different parameters such as seed cost.
- Scenario analysis for different outcomes such as (a) climate change (b) prospective growing locations, etc.
- Risk management and best management practices. We can advise on optimal growing structures and other measures including regulatory requirements and certification issues.
- Aquaculture Insurance assistance and information for shellfish farms, including types of coverage, indication of terms and other issues.

## ACCESS MARKETS

The level of profitability of a farm will also depend on the ability of shellfish farmers to sell their product.

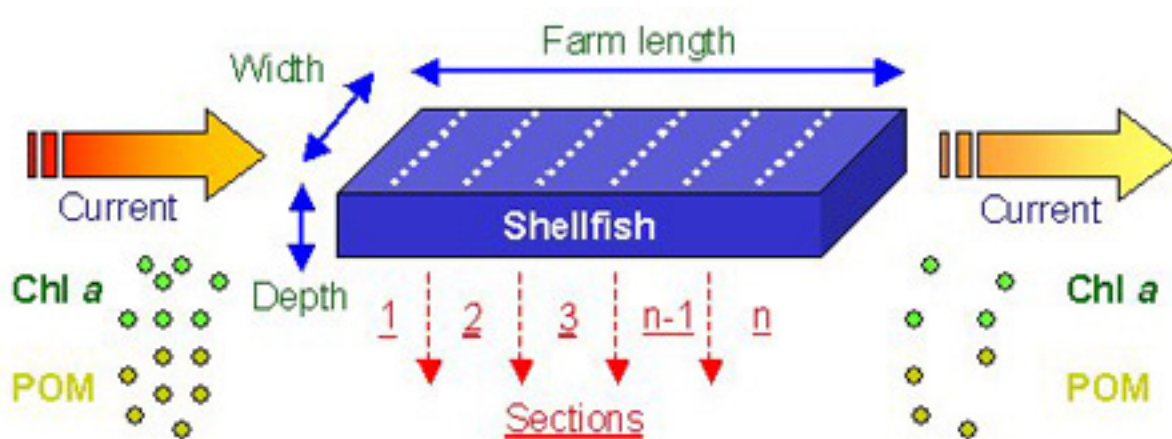
The ability to target export markets is essential and is related to factors such as the quality of product, production costs, competition, transport issues and accessibility to distributors. Farms with a high level of concern for environmental factors, best management practices and traceability can achieve certification, increasing their chances of reaching export markets.

## FARM™ MODELLING FOR SHELLFISH FARMS

FARM™ (Farm Aquaculture Resource Management) can assist shellfish farms in assessing production according to the farm dimensions, location, and other data. FARM™ determines shellfish growth and provides economic analysis allowing you to make informed decisions about optimal production parameters, seeding density and other strategies.

The FARM™ model is a tool for assessment of coastal and offshore shellfish aquaculture at the farm-scale level and address four primary issues:

1. Prospective analyses of culture location and species selection
2. Ecological and economic optimisation of culture practice, such as timing and sizes for seeding and harvesting, densities and spatial distributions
3. Environmental assessment of farm-related eutrophication effects
4. Determination of the value of ecosystem goods and services with respect to the reduction of eutrophication, as a substitute of land-based nutrient removal



To experience the look and feel of FARM™ please visit our Winshell site at <http://www.longline.co.uk>.

## SHELLFISH AQUACULTURE INSURANCE

Why is aquaculture insurance important for a shellfish farm?

Aquaculture is a volatile industry and insurance can help mitigate adverse financial effects as the result of the mortality of animals, due to storms, structural failures and other unforeseen events.

Aquaculture Insurance for shellfish farms is available through the London insurance market.

At an initial stage shellfish farms usually obtain an indication of terms, which provides an idea of the premium, deductibles and types of perils available for insurance. Underwriters have developed a range of techniques for identifying and analysing the risks at the farm level, and for quantifying their importance. Fundamental to the insurance process is the requirement for proposal forms to be completed for aqua farms if the indication of terms is satisfactory.

### Processes involved in arranging cover

Insurance brokers - Aquaculture is a specialist insurance class. Aquaculture insurance brokers assist farmers with the process of arranging of insurance.

Completing application forms - If the indication of terms provided is acceptable for the farm, then aquaculture farms have to complete a insurance proposal form detailing the farm attributes for analysis by the insurance company. Often additional material such as photographs, equipment used on farm, water supply, etc, are required.

The types of offshore perils covered for shellfish farms include:

1. Pollution from external sources
2. Aircraft and other aerial devices or articles dropped from the sky
3. Malicious acts
4. Predation or physical damage by predators or other aquatic organisms
5. Storm, lightning, tidal waves and collision
6. Sudden and unforeseen structural failure of equipment
7. Freezing, super-cooling, ice damage
8. De-oxygenation due to competing biological activity or to changes in the physical or chemical conditions of the water, including upwelling and high water temperatures
9. Changes in the concentration of the normal chemical constituents of the water, e.g. pH or salinity.

## NITROGEN CREDITS

Longline has been exploring ways for shellfish aquaculture operations to improve the environment and profitability. Reducing pollution and improving water quality through the use shellfish as a means to reduce nitrogen impacts in coastal waters could mean shellfish farmers can potentially:

- receive subsidies for nitrogen removal or
- sell nitrogen credits to water treatment facilities

Nitrogen reduction in coastal waters can be achieved using a bottom up approach through shellfish farms that remove nitrogen from the system, as opposed to removing nitrogen from the source, i.e. farms reducing fertiliser on farms.

### How do shellfish reduce nitrogen in a water body?

Shellfish consume the by-products of nitrification to grow, namely algae and phytoplankton.

According to Wilcox 2009<sup>1</sup>, shellfish reduce nitrogen in a water body in two ways:

1. Shellfish eat food containing nutrients including nitrogen, phosphorus, carbon and other chemicals. The shell and tissues of the oyster contain nitrogen, and when they are harvested, nitrogen is removed from the water column.
2. The rejected shellfish food, pseudofaeces and faeces are an even more important source of nitrogen removal. The nitrogen removal is performed by denitrifying bacteria which use the nitrogen released from faeces for their energy and convert some of the nitrogen into nitrogen gas that leaves the water system.



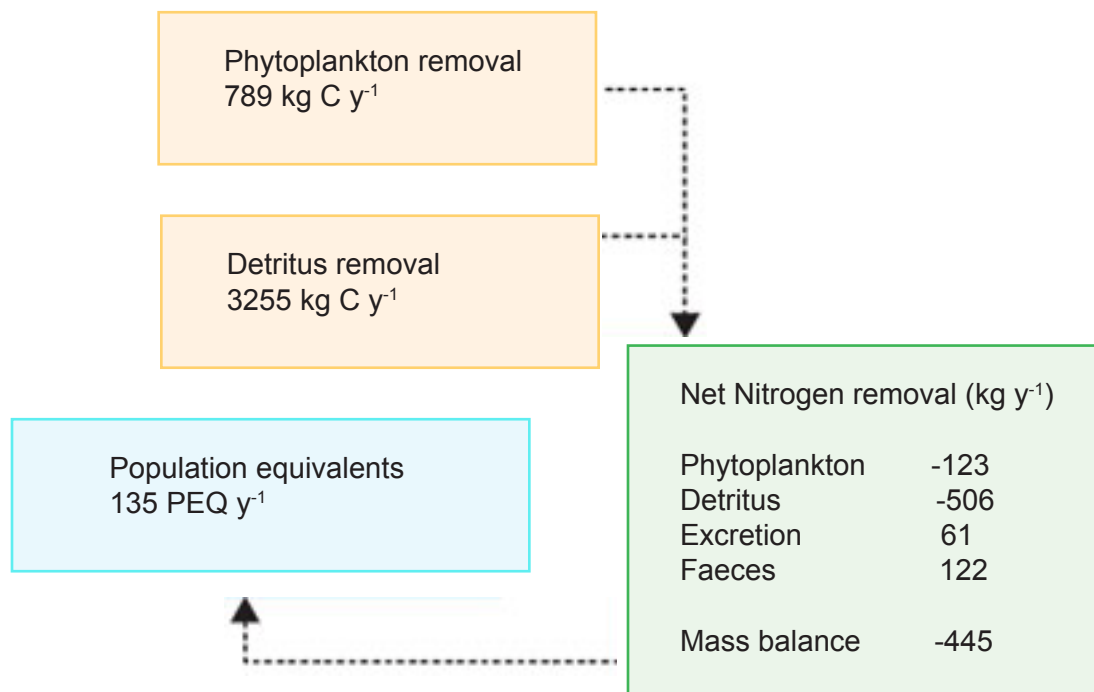
<sup>1</sup>Wilcox, 2009. Shellfish as a Means to Reduce Nitrogen Impacts in Coastal Waters

## Case study: nitrogen removal analysis for Irish Lough

The diagram below shows an annualised mass balance carried out with FARM™ for a 6000 m<sup>2</sup> mussel bottom lease in Carlingford Lough. This analysis was carried out in the SMILE project.

The mussels are responsible for the removal of 445 kg of nitrogen, equivalent to the sewage discharge of 135 population equivalents. The substitution costs for land-based nitrogen treatment are estimated to be around £25,000 pounds sterling per year. The 6000 m<sup>2</sup> provides a substantial environmental contribution, combining ecological services to help achieve multiple environmental and economic benefits. Such contributions could constitute an additional source of revenue to shellfish aquaculture farmers.

Find out how much nitrogen your shellfish farm is currently removing.



### ASSETS

■	Chl a	■
■	O <sub>2</sub>	■
■	Score	■

### ANNUAL INCOME

Shellfish farming: 5.8 k£ y <sup>-1</sup>
Sewage treatment: 27 k£ y <sup>-1</sup>
Total income: 32.8 k£ y <sup>-1</sup>

### PARAMETRES

Density of 100 mussels m <sup>3</sup>
1200 day cultivation period
70% mortality
3.3 Kg N y <sup>-1</sup> PEQ

## FURTHER INFORMATION

Further information about how we can assist your shellfish farm needs can be found at our website:

<http://www.longline.co.uk>

- FARM™ model
- Aquaculture Insurance
- Nitrogen Credits

## KEY CONTACT

If you have any enquiries please do not hesitate to contact us:

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