

Incorporating oysters in nature enhancement projects

This document provides insights into what to consider when incorporating oysters in your nature enhancement project. It describes the several ways oysters can be obtained and includes a list of sources as well as a list of relevant suppliers. The information in this document is based on research by Kamermans et al. (2020).

Contents

1.1 The importance of oysters.....	1
1.2 Types of oyster material.....	2
1.3 Types of production.....	2
1.4 Quality requirements.....	3
1.5 Free from pathogens.....	3
1.6 Quantity of oysters.....	4
1.7 Suppliers.....	4

1.1 The importance of oysters

The flat oyster, once abundant in the North Sea and surrounding waters, saw a drastic decline by the end of the 19th century due to overfishing and pathogens. Restoration efforts are crucial as oyster beds are an endangered habitat. These oysters are more than just shells; they can create their own reef. Providing a solid foundation in a soft sediment environment, they foster biodiversity, strengthen connections between different ecosystems, regulate water quality, and promote fish production.

Given the current scarcity of flat oysters in the North Sea, restoration efforts rely on importation from elsewhere. This species reproduces by producing larvae and has a complex life cycle, posing a challenge for large-scale breeding programs. In the Netherlands and Europe, nature restoration projects have already commenced that hope to establish self-sustaining banks of flat oysters. These projects hold immeasurable value for the restoration of critical marine ecosystems

1.2 Types of oyster material

Flat oysters are available as larvae, spat or adults. The process from larva to oyster can vary depending on different factors, including environmental conditions, the species of oyster, and the availability of food. Generally, an oyster goes through the following stages.

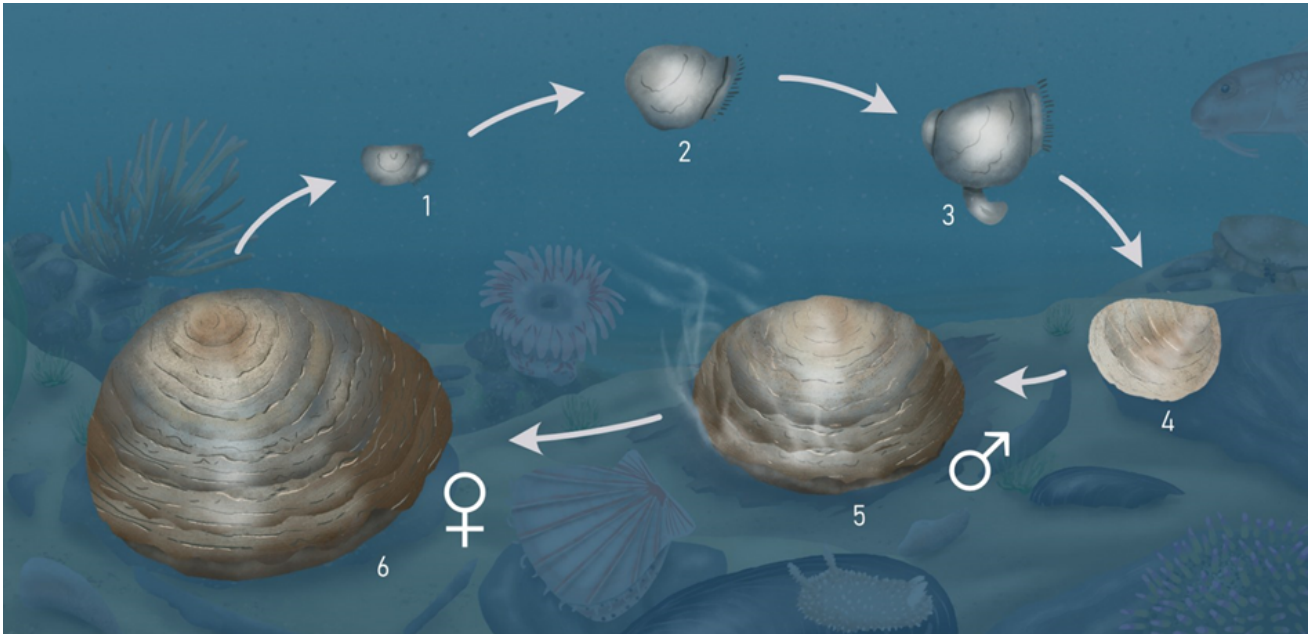


Figure 1. Life cycle of an oyster by Niels Kerstes.

Larval stage

This is when the oyster develops from a fertilized egg into a free-swimming larva. This phase can last from several weeks to several months, but usually around 2-6 weeks, depending on the conditions.

Attachment as spat

Once the larva attaches to a suitable surface and starts growing, it's called spat. This happens after the larva finds a suitable place to attach to. The time it takes for a spat to grow into an adult oyster varies by species.

Adult

An oyster is generally considered as an adult when it is sexually mature and capable of reproducing. This may take several years, depending on the species. Some oysters may reach maturity within 2-3 years, while others might take 4-5 years or even longer.

1.3 Types of production

There are different methods for obtaining flat oysters: collection of adults from the wild, spat collection in ponds or in field and hatchery production.

For restoration projects, hatchery production is advised. Production of spat in hatcheries has the lowest risk to the environment. There are several hatcheries in Europe capable of producing disease-free flat oyster spat. Hatcheries produce spat for further cultivation until reaching the right size for restoration. Some entities opt to not use a hatchery but rely on wild fishery. However, we do not recommend this approach because it is not as sustainable for nature as a hatchery.

1.4 Quality requirements

The quality requirements for flat oysters in nature restoration projects are:

- Free from pathogens
- If possible, tolerance or resistance to diseases
- Absence of non-native species
- Good survival, growth, and reproduction
- Adapted to the local environment.
- Highest possible genetic diversity (also applicable to cultured oysters)

1.5 Free from pathogens

For restoration projects, it is crucial that the restoration area is free from parasitic pathogens and that the oysters possess the appropriate certification confirming their pathogen-free status. There are two significant parasitic pathogens for *O. edulis*: *Marteilia refringens* and *Bonamia ostreae*. *Bonamia* occurs in lake Grevelingen and the Eastern Scheldt in the Netherlands, as well as in oyster areas in France, Ireland, the United Kingdom, and Spain, although some bays are disease-free. *Marteilia* is found along the Atlantic coast of France, Spain, and Portugal, in the Mediterranean Sea, and the Adriatic Sea.

In the Netherlands, regulations are in place to prevent disease spread among oysters. The Dutch Food and Consumer Product Safety Authority (NVWA) has established guidelines for the placement and movement of oysters, aimed at combatting diseases like *Bonamia*.

Oyster cultivators must meet specific requirements and adhere to protocols to ensure oyster health, such as disease testing before relocation and compliance with hygiene measures. As laws and regulations may change, it is advisable to always refer to the most recent NVWA guidelines or other relevant authorities for current information on oyster placement and disease prevention in the Netherlands.

1.6 Quantity of oysters

The quantity of oysters to be restored for a restoration project to be successful varies depending on whether it is an offshore or an nearshore project. The more oysters, the better. The goal of these natural restoration projects is to establish self-sustaining beds. The critical mass required for this is defined as the number of flat oysters capable of producing enough larvae to ensure the successful establishment and survival of a bed's offspring. Estimates of this number vary, but a minimum of 20,000 oysters seems plausible.

1.7 Suppliers

Disclaimer: the information on the following page was collected with care, but mistakes could occur. If anything seems wrong, please contact info@derijkenoordzee.nl.

Country	Company	Type of production	Potential capacity per year	Bonamia status
Norway	Storestraumen østers Innerøyen	Unknown	500.000 adults	Free
Norway	North Sea Shell AS	Hatchery on land	200 million spat	Free
Sweden	Havstenssunds Ostron AB	Hatchery, collects spat at sea	± 300.000 to 500.000 spat. No spat-on shell.	Free
Denmark	Aquamind and Danish Oysters	Spatting pond	Up to 10 million spat on shell. Can also deliver adults.	Positive
Denmark	National Institute of Aquatic Resources (DTU Aqua)	Hatchery producing spat. Trying spat on shell.	>1 million spat on shell	Positive area, no certificate yet

Table continues on next page.

Country	Company	Type of production	Potential capacity per year	Bonamia status
Netherlands	Roem van Yerseke B.V.	Hatchery	1-7 million spat on shell	Free, no certificate yet.
Netherlands	Stichting Zeeschelp	Hatchery	5 million spat on shell, 10 million single spat	Free, no certificate yet.
United Kingdom	Sesalter Walney Ltd.	Hatchery	Millions, but based on definite orders.	Free
United Kingdom	Northbay Innovations Ltd	Hatchery	Unknown, due to change in production method.	Free, no certificate yet.
United Kingdom	Orosay Idulis	Not a hatchery	50.000	Bonamia negative area (no wild native population)
United Kingdom	The Oyster Restoration Company	Hatchery	150 million spat (Ostrea edulis)	Free
Ireland	Cartron Point Shellfish	Spatting ponds	40.000 - 10 million spat per pond	Bonamia positive area, possibly immune.

Table continues on next page.

Country	Company	Type of production	Potential capacity per year	Bonamia status
France	Novostrea Bretagne SAS	Hatchery (June-October)	Up to 5 million spat T2 per year (if requested early)	Free
Portugal	AquaNostra	Hatchery. First only spat, later also adults.	Up to 300.000 kg, 1.5 million adults	Free
Spain	A Ostreira S.L.	Hatchery	Up to 2 million spat	Free