## Appendix 1 Detailed methods for data search

Google Scholar: with the exact phrase "keyword", in the title of the article, search articles in any language, patents excluded, citations excluded. The following keywords have been independently and extensively sought: Ostrea edulis, European flat oyster, and European oyster. The following keywords were crossed in pairs: Ostrea edulis, European flat oyster, European oyster with Oyster ponds, Oyster polls, Spat collection, Collectors, Hatchery, Mesocosms, Remote setting, Breeding: “Ostrea edulis” AND “Oyster ponds” OR “Ostrea edulis” AND “Oyster polls” OR “Ostrea edulis” AND “Spat collection” OR “Ostrea edulis” AND “Collectors” OR “Ostrea edulis” AND “Hatchery” OR “Ostrea edulis” AND “Mesocosms” OR “Ostrea edulis” AND “Remote setting” OR “Ostrea edulis” AND “Breeding” OR “European flat oyster” AND “Oyster ponds” OR “European flat oyster” AND “Oyster polls” OR “European flat oyster” AND “Spat collection” OR “European flat oyster” AND “Collectors” OR “European flat oyster” AND “Hatchery” OR “European flat oyster” AND “Mesocosms” OR “European flat oyster” AND “Remote setting” OR “European flat oyster” AND “Breeding” OR “European oyster” AND “Oyster ponds” OR “European oyster” AND “Oyster polls” OR “European oyster” AND “Spat collection” OR “European oyster” AND “Collectors” OR “European oyster” AND “Hatchery” OR “European oyster” AND “Mesocosms” OR “European oyster” AND “Remote setting” OR “European oyster” AND “Breeding”.

ISI Web of Science: basic search of “keyword”, all years, all databases (Web of Science Core Collection; KCI-Korean Journal Database, Russian Science Citation Index; SciELO Citation Index), search field 1 topic (title). The search process and keywords were the same as for Scholar Google.

Scopus Document Search: advanced search, limit to English language, all sources type (journals, books, book series, conference proceedings), search in the title, abstracts, or keywords (TITLE-ABS-KEY (“keyword”). The search process and keywords were the same as for Scholar Google.

Google Scholar: all languages, all document types, anywhere in the article exact phrase "keyword"; ISI Web of Science: all languages, all document types, anywhere in the article; Scopus Document Search: all fields, exact phrase "keyword".

## Appendix 2 List of the 602 publications selected and analysed (Update 12.2019)

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## Appendix 3 Table of the breeding programme and production records from 1987 at Rossmore Breeding Ponds. Production is shown in weight of marketable *O. edulis* (>75 g per oyster) actually sold. Data provided from Tristan Hugh-Jones.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Origin of the *O. edulis* spat production** | **Generation F1** | **Generation F2** | **Generation F3** | **Generation F4** | **Generation F5** | **Generation F6** |
| 1987  | Survivors  | F1 spat  | - | - | - | - | - |
| 1988  | Survivors  | F1 spat  | - | - | - | - | - |
| 1989  | Survivors  | F1 spat  | - | - | - | - | - |
| 1990  | Survivors  | F1 spat  | - | - | - | - | - |
| 1991  | F1 survivors  | - | F2 spat  | - | - | - | - |
| 1992  | F1 survivors  | - | F2 spat  | - | - | - | - |
| 1993  | F1 survivors  | 31,793 kg  | F2 spat  | - | - | - | - |
| 1994  | F1 survivors  | 34,207 kg  | F2 spat  | - | - | - | - |
| 1995  | F2 survivors  | - | 133,788 kg  | F3 spat  | - | - | - |
| 1996  | F2 survivors  | - | 119,765 kg  | F3 spat  | - | - | - |
| 1997  | F2 survivors  | - | 68,405 kg  | F3 spat  | - | - | - |
| 1998  | F2 survivors  | - | 64,617 kg  | F3 spat  | - | - | - |
| 1999  | F3 survivors  | - | - | 48,887 kg  | F4 spat  | - | - |
| 2000  | F3 survivors  | - | - | 72,420 kg  | F4 spat  | - | - |
| 2001  | F3 survivors  | for 6 years | - | 84,647 kg  | F4 spat  | - |   - |
| 2002  | F3 survivors  | Fishery closed  | - | 84,647 kg  | F4 spat  | - |   - |
| 2003  | F4 survivors  | Fishery closed  | - | Stock survey  | 127,500 kg  | F5 spat  |   - |
| 2004  | F4 survivors  | Fishery closed  | - | - | 2nd F4 sale  | F5 spat  |  -  |
| 2005  | F4 survivors  | Fishery closed  | - | - | 3rd F4 sale  | F5 spat  |   - |
| 2006  | F4 survivors  | Fishery closed  | - | - | 4th F4 sale  | F5 spat  |   - |
| 2007  | F4 survivors  | Fishery closed  | - | - | 5th F4 sale  | F5 spat  |   - |
| 2008  | F5 survivors  | Fishery closed  | - | - | - | 1st F5 sale  |   - |
| 2009  | F5 survivors  | Fishery closed  | - | - | - | 2ndF5 sale  |   - |
| 2010  | F5 survivors  | Fishery closed  | - | - | - | 3rdF5 sale  |   - |
| 2011  | F5 survivors  | Fishery closed  | - | - | - | 4thF5 sale  | F6 spat  |

**Appendix 4** Synthesis of chronological cryopreservation operations of *O. edulis* sperm (spermatozeugmata) from Vitiello *et al.* (2011) and Horváth *et al.* (2012).

|  |
| --- |
| 1) Collection of biological material (e.g. gametes, embryos and larvae):Vitiello *et al.* (2011) and Horváth *et al.* (2012) both used the striping method to obtain male gametes, they observe 60% and 63%, respectively, of sperm motility after activation for control. |
| 2) Concentration of the biological material and addition of extender and cryoprotective agent:The extender solution and the cryoprotective agent are different in these studies: Vitiello *et al.* (2011) used seawater filtered with 15% ethylene glycol, while Horváth *et al.* (2012) used a Hank's balanced salt solution with 10% dimethyl sulfoxide. |
| 3) Freezing:Freezing at: Vitiello *et al.* (2011) induced by a temperature drop of about -3°C per minute to a temperature down to -70°C and finally immersing the samples into liquid nitrogen. Horváth *et al.* (2012) freezed in two steps: first vaporizing the samples in liquid nitrogen for three minutes and then immersing them in liquid nitrogen. |
| 4) Thawing:In both studies, thawing was conducted in a water bath: at 55°C up to a temperature increase of 18°C of the packages (Vitiello *et al.* 2011), at 40°C for 13 seconds (Horváth *et al.* 2012); 5) Cryopreservation resulted in 50% motility (Vitiello *et al.* 2011) and 8% motility for (Horváth *et al.* 2012). |

## Appendix 5 Summary of remote setting operations for *O. edulis* according (and translated in English) to Guesdon *et al.* (1989), Carbonnier *et al.* (1990) and Coatanea *et al.* (1992).

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| 1) Preparation of basins. Tanks must be clean and disinfected (e.g. chlorination). Paraffinization (liquefied wax) for a smooth rendering of the walls and bottom is recommended; |
| 2) Installation of collectors: arrangement must allow a complete water circulation to avoid stagnation areas; |
| 3) Water supply: after placing the collectors into the tanks, water at ambient temperatures and filtered to a minimum of 50 µm is added one day before receiving the larvae; |
| 4) Larval transport: in the hatchery, larvae are concentrated on a moistened paper filter and then surrounded by a cotton cloth, placed in a plastic bag to avoid drying out and dispatched in isothermal packages equipped with ice packs (arrival temperature must not exceed 15°C); |
| 5) Larvae quality control at reception: carried out under a binocular magnifier, larvae motility as well as the presence of the eyespot needs to be checked; |
| 6) Choice of larval density and number of collectors per basin: a minimum density of 0.5 larvae ml-1 is recommended but these choices are determined by the production objectives; |
| 7) Larval immersion: Larvae must be acclimatized in a small volume of seawater with a slightly increasing temperature up to the temperature of the setting tanks. When larvae are diluted, a good but gentle vortex must be applied in order to dissociate the larvae that are clumping together; |
| 8) Regulation of aeration in the basins: except for the settlement period when the bubbling is reduced to a minimum, the mixing must be sufficient enough for a good homogeneity of the water mass; |
| 9) Water renewal: a water renewal of about 50% of the total tank volume per day is recommended; |
| 10) Food supply: identical to any other culture of *O. edulis* larvae; |
| 11) Larvae observation and harvesting: observation of the settlement rate by sampling and visual analysis, the harvest is generally carried out six to eight days after the larvae are immersed; |
| 12) The transport of the young spat must be carried out in water or very quickly because it does not tolerate drying out. |

## Appendix 6 Glossary of some terms used in this review.

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| **Terms** | **Definition** |
| Oyster juveniles | Oyster spat larger than that. 2mm wide |
| Oyster seed | General term including all products resulting from reproduction, i.e. oyster larvae, oyster microspat, oyster spat, oyster juveniles. |
| Oyster spat | Settled larvae, also known as microspat (up to a size of ca. 2mm wide) |

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