Genetic impact of intensive rearing practices in oyster hatcheries: selective processes and loss of genetic variability

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C. gigas life cycle

"elm-oyster model"
G. C. Williams 1975

<table>
<thead>
<tr>
<th>Stages</th>
<th>Survival</th>
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</thead>
<tbody>
<tr>
<td>Fertilization</td>
<td>++++++++</td>
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<tr>
<td>Settlement</td>
<td>++</td>
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<tr>
<td>Metamorphosis</td>
<td>+</td>
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(1) Natural recruitment in the wild

(2) Hatcheries

French production ~ 900 millions (2003)

Specific selective pressures in hatcheries (i.e. domestication)?
Different larval development strategies?

Two extreme “strategies“:

• High larval growth rate and larval size at settlement but low settlement success, growth and survival after settlement

• Lower larval growth rate and larval size at settlement but higher settlement success, growth and survival after settlement

Ernande et al., 2003
Main objective:

Evaluate the potential impact of common rearing practices in oyster hatcheries (culling, high temperature...) on genetic diversity at larval stage

Method:

Study the genetic components of larval growth and survival using a mixed-family approach and microsatellite-based parentage analysis
Studied effects

(1) Selective sieving (« culling »)

(2) Temperature

26°C  20°C
Mixed-family Approach

Microsatellites-based parentage analysis

Male  A1  A5  A1  A2  Female  A2  A9

femelle
mâle
descendant
(1) Effect of culling

Common practice in hatcheries: culling of the slow growing (i.e. small) larvae by sieving

![Graph showing C.V. of larval diameter and Settlement date](image-url)
(1) **Effect of culling**

Parentage analysis in the progeny of a 3 females x 10 males factorial cross.

**A**

- **Settlement dates**

**B**

- **Nb of larvae ready to settle**

**C**

- **Sieved population**
- **control**

**Males**
Effect of culling

Ne (as % of the initial maximal value)

Date de fixation

A

B

C
(2) **Effect of temperature**

![Graph showing the effect of temperature on diamètre maximum]
(2) Effect of temperature

**Survival**

Mean hatching % / males

(24h post fertilization)

Observed male reproductive success at D22 / expected at 24h
(2) Effect of temperature

Growth

Reaction norm larval diameter/temperature per family

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Male</th>
<th>Female</th>
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<tbody>
<tr>
<td>20°C</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>26°C</td>
<td>p&lt;0.05</td>
<td>p&lt;0.05</td>
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First conclusions

Selective pressures related to common hatchery practices:

- effect of culling on genetic diversity

- effect of temperature:
  Survival: GxE interaction
  Growth: GxE interaction