Effect of diluent osmolality on the fertilizing ability of spermatozoa in atlantic salmon Salmo salar kept in sea water or transferred to fresh water

Florence Le Gac, Pierrick Haffray, Maurice Loir, Alexis Fostier, Gérard Maisse

WORKSHOP ON GAMETE AND EMBRYO STORAGE AND CRYOPRESERVATION IN AQUATIC ORGANISMS;

INJEP

Institut National de la Jeunesse et de l'Education populaire
Parc du Val Flory, 11 rue Paul Leplat
Tel : 33 (1) 39 68 49 11 : - : **Fax** : 33 (1) 39 16 57 79
78160 **MARLY le ROY/FRANCE**

(West of PARIS) 30/3 to 2/4 1992, sponsored by the CEC, Directorate for fisheries, IFREMER, Societé IMV, Société l'AIR LIQUIDE and included in the "Reproductive Biology in Aquaculture" network.

-:-:-:-:-

Address for correspondance
R. BILLARD. Ichtyologie Museum d'Histoire Naturelle, 43, rue Cuvier F. 75231 PARIS cédex 05.

Tel : 33 (1) 40.79.37.45 - **Fax** : 33 (1) 40.79.37.71

-:-:-:-:-

PROGRAMME

-:-:-:-:-

ABSTRACTS

-:-:-:-:-

LIST OF PARTICIPANTS

WORKSHOP ON GAMETE AND EMBRYO STORAGE AND CRYOPRESERVATION IN AQUATIC ORGANISMS ; MARLY LE ROI/FRANCE.
30 March - 2 April 1992

General organization : R. BILLARD, J. COSSON, C. FAUVEL, M. LOIR, G. MAISSE.

Secretariat assistance and documentation : F. ANDRE, J. BARTHELEMY, J. FAURILLON, F. NADOT (Museum of Natural History), J. C. HUREAU (European Ichthyological Union).

We gratefully acknowledge the financial support we received from :

- The Commission of the European Community (DG 14) (Programme FAR)
200, rue de la Loi Bruxelles BELGIQUE. Tel : 3222351111

- IFREMER (Institut Français pour l'Etude de la Mer) rue J. J. Rousseau 92 Issy les Moulineaux FRANCE. Tel : 46 48 21 00

- Le Ministère de la Recherche et de la Technologie DAI (Bourses ACCES) 1, rue Descartes 75231 PARIS. Tel : 46 34 35 35

- La Société IMV (B. CASSOU) 10, rue Clémenceau 61302 L'AIGLE Cédex FRANCE. Tel : 33 34 64 64 Fax : 33 34 11 98

- La Société L'AIR LIQUIDE (P. COFFRE et E. DELPOULLE) Parc G. Eiffel 8, rue Gutemberg Bussy St Georges 77607 Marne La Vallée FRANCE. Tel : 64 76 15 29

- Sepia International (A. BRUNEL) 14, rue G. Eiffel 78182 St Quentin en Yvelines FRANCE. Tel : 64 76 15 29

EFFECT OF DILUENT OSMOLALITY ON THE FERTILIZING ABILITY OF SPERMATOZOA IN ATLANTIC SALMON *Salmo salar* KEPT IN SEA WATER OR TRANSFERRED TO FRESH WATER.

F. LE GAC, P. HAFFRAY, M. LOIR, A. FOSTIER and G.MAISSE.
Laboratoire de physiologie des poissons INRA, RENNES,FRANCE.
These experiments were supported by SEMII (Camaret).

Breeding management of Atlantic salmon in France requires transfer of spawners to fresh water prior to final sexual maturation, in order to avoid poor fertilization rate.

- 1) In a first experiment we studied the impact of the sea water environment during gonadal maturation on sperm quality.

Prespawners were either kept in sea cages (salinity: 3.5%) **(SW)** or transferred to fresh water tanks in June or at the beginning of October **(FW)**. Fertility was tested by inseminating batches of approximately 200 freshly collected FW eggs, using DIA-532 insemination diluent (250 mOsm/kg, pH 9, sperm dilution: 10^{-3}) and assessing the eyed egg rate.

FW males show normal spermiation profiles; fertilizing ability of **FW** sperm was good and varied slightly between males. Data obtained with both groups of FW fish (June and October transfers) were similar.

100% of the **SW** mature **males** produced milt in normal amounts and presented spermiation profiles similar to FW fish. However, their semen had a **mean fertility** significantly lower (64±33 % eyed eggs; $x \pm \sigma$) than FW semen (88±18 % eyed eggs), with individual eyed egg rate varying from 0% to 80%.

Seminal plasma osmolality of the males kept in sea water was significantly higher (347 ± 27 mOsm/kg, X ± SE) than that of the FW fish (265 ± 30 mOsm/kg).

- 2) In a second experiment we studied: a) the relationship between **seminal plasma osmolality** and semen fertility and b) the effect of the **insemination diluent osmolality (OSM)** on the fertilizing ability of sperm from SW and FW salmons.

The sperm (8 SW and 8 FW) were centrifuged and the osmolality of each seminal plasma measured. Seven aliquots of each sperm-cell pellet were tested for fertility as described above but using 7 different insemination diluents with OSM varying between 150 and 450 mOsm/kg.

Optimal diluent OSM for **FW** spermatozoa were 250 and 300 mOsm/kg, while for the **SW** spermatozoa the most favorable OSM values extended from 250 to 350 mOsm/kg. Extreme values (150 and 450 mOsm/kg) were deleterious to all sperm performances. However, sea water sperm were significantly more "resistant" to high osmolalities (350 mOsm/kg: 36±4 % eyed eggs; 400 mOsm/kg: 15±5 %; 450 mOsm/kg: 4±1 %) than were the fresh water sperm (350 mOsm/kg: 24.5±5 %; 400 mOsm/kg: 2.8±1.3 %; 450 mOsm/kg: 1±0.2 %; X±SE). Those of the sea water sperm that show very low fertilizing capacity (0 to 5% fertilization at 250 mOsm/kg) gave similarly poor results at all tested diluent OSM. No relation could be established within individuals between **seminal plasma osmolality** and this low fertility.

In terms of breeding management, seminal plasma osmolality cannot be retained as a criteria to select "good" SW males; the use of insemination diluent with OSM similar to the seminal plasma osmolality does not improve significantly the fertility of Atlantic salmon males kept in sea water until reproduction.