International Council for the
Exploration of the Sea

CM/ 1977/M:11
Anadromus and Catadromus Fish Cttee
Ref. Fisheries Improvement
Committee

INFLUENCE OF DIFFERENT SEA WATER SALINITIES ON RAINBOW TROUT /SALMO GAIRDNERI RICH.1836/ AND SEA TROUT /SALMO TRUTTA TRUTTA L. 1758/ SPERMATOZOONS AND EGGS

M.Szymelfenig
Sea Fisheries Institute
Gdynia -Poland

In the last years, there have been carried out series of works in regard to the acclimatization of the rainbow trout in the sea water. It was settled the possibility of the rainbow trout's breeding in brackish water, without relatively high difficulties and acheaving quite good results.

At present, there are also conducted researches upon feesibility of the bringing-in and breeding in brackish water the sea trout in this phase of her life, which normally takes place in fresh water.

Bringing- in these species into the brackish water had caused question of eggs' incubation in these circumstances , thus setting- up the response for a question how do the spermatozoons and eggs of both fishes species behave under influence of sea water.

This work was aimed to determine influence of sea water upon spermatozoons' ability to fertilize and on spawn's grains swelling, two important processes initiating the embryo's development.

The two significiant elements have been choosen as the indicators of above processes in the researches;

- determination of spermatozoons' vitality, and
- determination of swelling ability of the eggs in contact with a sea water.

The observations have been performed at Department of Biological Oceanography in Gdynia.

Material under investivigation

As the experimental material, reproductive cells from two species of the salmon fishes were used

- rainbow trout /Salmo gairdneri Rich,1836/
- sea trout /Salmo trutta trutta L.1758/

Material has been taken off an alive individuals as a result of the artifical spawning on March 1975 and April 1976 /rainbow trout/ and on November and December 1975/sea trout/. Four males of a rainbow trout and four males of a sea trout were used in the observations; it was totally examined 4 females of both species and exercised totally about 600 eggs of a rainbow trout and about 2200 eggs of a sea trout.

A following sorts of water were used in the experiments:

- natural atlantic sea water of salinity 35,0 °/oo
- natural baltic sea water of salinity 7,4 °/oo
- distilled water
- water from municipal water- pipe network.

A water of salinity 2,0; 4,0; 6,0; 7,4 °/oo was obtained by diluting baltic sea water by distilled water.
A water of salinity 10,0; 15,0; 20,0; 35,0 °/oo was obtained having used the dilutting of a atlantic sea water.
Material /eggs and spermatozoons/ and water were held in the refriegerator in positive temperatures approaching 0°C /0-5°C/.

Spermatozoons tolerances on varions water salinities.

As a criteria for spermatozoons vitality and hence it's potential ability to fertilize, it's motion ability in the water was assumed.

Spermatozoons' translatory motion has been observed in visual field of the light mierscope increase 12,5 x10.

Observations carried out in this work had shown that spermatozoons of both species are active salinity interval through 15 °/oo inclusive /Tab.1/

It has been determined that longest time of spermatozoons motion is observed at salinities from 4,0°/oo through 7,4°/oo /Tab.I, fig.1,2/. The time is normally longer than motion time in water- pipe network/fresh water/ /Tab.I fig.1,2/.

Obtained results showed that period's lenght of sperm storing has not an essential influence on vitality preservation in contact with fresh water/they loss a motion ability in sea water only few hours earlier than in fresh water//Tab.I/.

It has been also settled that spermatozoons'motion time /irrospective of salinity value/ is decreasing as a interval length of sperm storing grows /Tab.I/.

Influence of different sea water salinities a on rainbow trout and sea trout eggs.

The results earlier observations carried out by various authors showed that there are existing possibilities of brackish water's imbibition by eggs of rainbow trout and sea trout and that it is possible a incubation of these species in Baltic sea water.

Determination of water's imbibition ability by eggs in this paper was assumed upon assumption that grain of spawn increases it's volume directly propertionaly to quantity of imbibitioned water and becames more resistive to force applied to it.

Measurements of the volume and resistance to clamp expressed under term "diameter" of the spawn's grain were measured upon specially designed instrument, based upon proffesor Wiktor's idea.

Experiences with rainbow trout's eggs have been treated as primary researches examing instrument's usability and approach considerations of the experience.

Obtained results allow however for completing of unique computations and putting forward the corollaries.

Measurements performed in this work have shown possibility of brackish water imbibition by trout's eggs, at salinity lower than 4,0 °/oo /fig.3/. This process is observed already after running out of about 0,5 h from the moment of contact with a water. It was settled, that for salinities higher than 2 °/oo, eggs "shrank", lowering its volume, and mainly resistance to clamp in regard to "dry"*/ eggs /fig.3/. Decreasing of the egg's diameter was constant and irrespectively of water salinity magnitude.

It is possible that in circumstances of the salinity higher than 2,0 °/oo, the process of eggs dewatering will follow .

Process of fresh water imbibition by eggs of both fishes species is better than sea water.

After replacing into sea water, it was not settled that eggs would have swelled in sea water /about 0,5 h for sea trout and about 1 h for rainbow trout and regardles on salinity magnitude/ underwent dewatering/ fig.4/.

Observations identical to above , which were performed after running out of about 0,5 h, for sea trout and about 1 h for

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*/ "dry" reproductive cells - cells which affer falling off the gonads didn't contact with a water.

rainbow trout , have been repeated 24 hours past /from the moment of bringing into the water/.
Significant changes connected with this time interval were not noticed.
One can allow to state that water imbibition by eggs is to be finished after about 0,5 h, for a sea trout and about 1 h for a rainbow trout.
It should be underscored that there have not been noted differences in water imbibitioning by fertilized and infertilized eggs.

On the background of observations performed herein it seems that bettest effects of fertilization might be achieved by placement mixtured "dry" spermatozoons and eggs for a period of 1-2 minute in the water of salinity 6,0 - 7,4 °/oo /longest motion time of spermatozoons/ and then removing them into the fresh water for 1 -1,5 hour /bettest eggs' swelling/. After that time has passed, fertized and swelled eggs can be replaced into the brackish water.
Proposed procedure has been not exercised experimentaly yet and it's real worth may be said until having performed further appropriate observations.

Conclusions

1. Spermatozoons motion time in salinity range 4,0 - 7,4 °/oo is longer than in fresh water, thus it seems to be profitable the fertilization process should be carried out in sea water of this salinity range.
2. Sea water imbibition by eggs of a rainbow trout and sea trout is possible for salinities lower than 4,0 °/oo.
3. Fresh wather is more better imbibitioned by spawn's grains than brackish water.

3. Eggs, which imbibitioned fresh water following replacing them into the brackish water are not undergoing to dewatering.

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Table I. Spermatozoons' motion time as a funktion of spermatozoons storing period and water salinity.

	TEST DATE	S [‰]	SPERMATOZOONS' STORING PERIOD [h] / SPERMATOZOONS' MOTION TIME [s]											
SALMO GAIRDNERI			4	7	9	11	31	34	45					
	15.03.75	fresh water	58.3	47.0	49.3	23.3	17.6	18.0	–					
		2.0	47.7	63.3	28.3	30.3	36.0	21.7	–					
		4.0	73.3	91.3	37.3	27.3	40.0	24.3	–					
		6.0	111.7	101.7	66.0	55.0	48.0	25.7	–					
		7.4	120.3	49.3	47.3	46.3	64.0	37.3	–					
		10.0	48.0	35.7	57.3	36.3	34.0	17.7	–					
		15.0	42.3	30.0	36.3	30.3	29.0	–	–					
	TEST DATE	S [‰]	SPERMATOZOONS' STORING PERIOD [h] / SPERMATOZOONS' MOTION TIME [s]											
			3	7	10	23	28	48	51	64				
	22.03.75	fresh water	32.0	45.0	51.3	55.3	48.0	34.7	27.3	–				
		2.0	25.3	27.3	30.3	42.7	33.7	34.3	23.3	–				
		4.0	26.3	28.0	33.3	44.3	35.7	30.0	20.0	–				
		6.0	38.3	34.7	38.3	49.7	56.3	29.0	27.0	–				
		7.4	44.3	35.3	52.0	47.3	39.3	27.0	26.3	–				
		10.0	30.0	32.3	39.0	35.3	33.7	24.3	15.0	–				
		15.0	25.3	23.6	30.0	25.3	20.7	–	–	–				
SALMO TRUTTA TRUTTA	TEST DATE	S [‰]	SPERMATOZOONS' STORING PERIOD [h] / SPERMATOZOONS' MOTION TIME [s]											
			2	8	12	24	30	34	49	55	73	78	81	97
	11.11.75	0.0	22.3	22.7	25.3	23.3	28.3	13.3	15.0	10.3	12.0	15.0	12.3	6.3
		fresh water	41.7	32.7	31.3	38.0	35.0	31.0	23.3	22.7	20.3	17.0	20.7	12.7
		2.0	25.0	36.3	29.3	29.3	26.3	25.3	23.7	25.3	25.7	19.0	19.0	–
		4.0	36.7	49.3	35.0	39.0	35.0	37.0	25.7	31.0	25.7	25.3	22.0	–
		6.0	51.0	54.3	66.0	44.0	34.0	36.0	30.0	36.7	27.3	17.0	24.0	–
		7.4	61.0	39.0	78.0	38.7	28.3	35.3	26.0	36.7	25.0	21.0	16.0	–
		10.0	26.0	28.3	29.7	27.0	26.0	24.3	21.3	23.3	22.7	13.3	12.0	–
		15.0	8.0	8.3	7.3	7.3	–	–	–	–	–	–	–	–
	TEST DATE	S [‰]	SPERMATOZOONS' STORING PERIOD [h] / SPERMATOZOONS MOTION TIME [s]											
			6	14	25	31	50	60	78	96	106	121	145	
	11.12.75	0.0	27.3	20.7	28.3	36.7	24.0	13.3	15.0	8.3	–	–	–	
		fresh water	39.3	43.7	52.3	46.7	44.7	34.7	33.0	34.7	25.3	17.3	–	
		2.0	29.7	26.3	38.7	38.3	33.7	26.0	24.3	35.7	20.7	16.0	–	
		4.0	55.0	41.0	36.7	47.3	36.3	30.3	31.3	37.7	29.0	27.7	–	
		6.0	38.0	75.0	47.3	44.7	37.3	22.7	31.0	41.3	30.7	28.0	–	
		7.4	38.3	36.7	49.3	39.0	34.0	29.0	32.0	33.3	28.3	27.0	–	
		10.0	30.0	25.0	32.0	25.3	23.3	21.0	23.3	27.3	21.0	21.0	–	
		15.0	13.7	5.7	–	–	–	–	–	–	–	–	–	

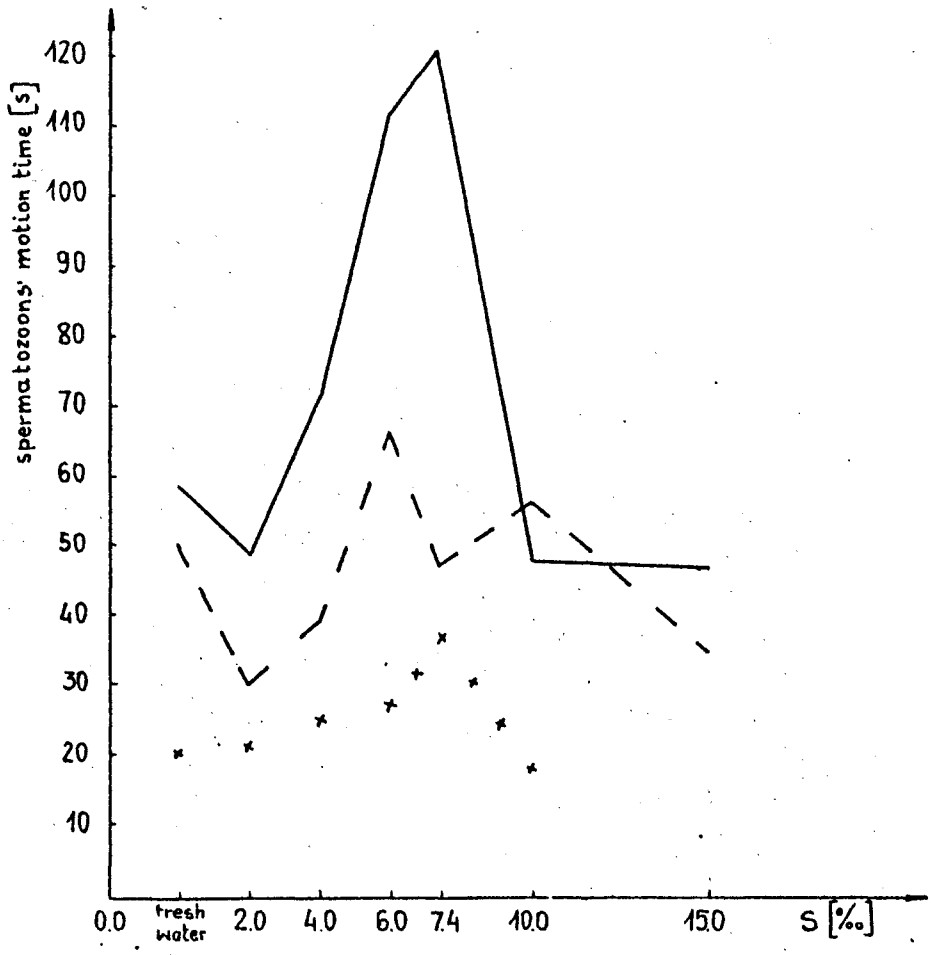

Fig 1. Salmo gairdneri. The test from 15.03.75. Spermatozoons' motion time as a function of water salinity.

spermatozoons' storing period: 4h ——, 9h – – –, 34h ×××.

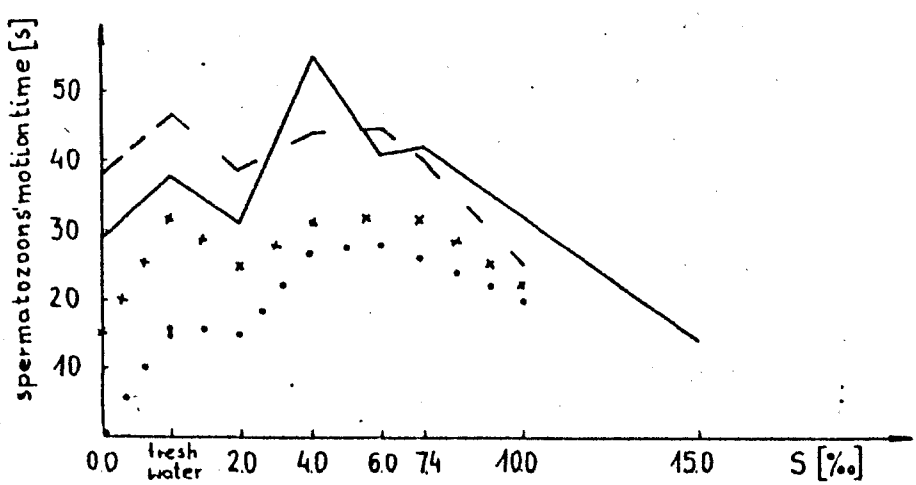

Fig 2. Salmo trutta trutta. The test from 11.12.75. Spermatozoons' motion time as a function of water salinity.

spermatozoons' storing period: 6h ——, 31h – – –, 78h ×××, 121h • • •.

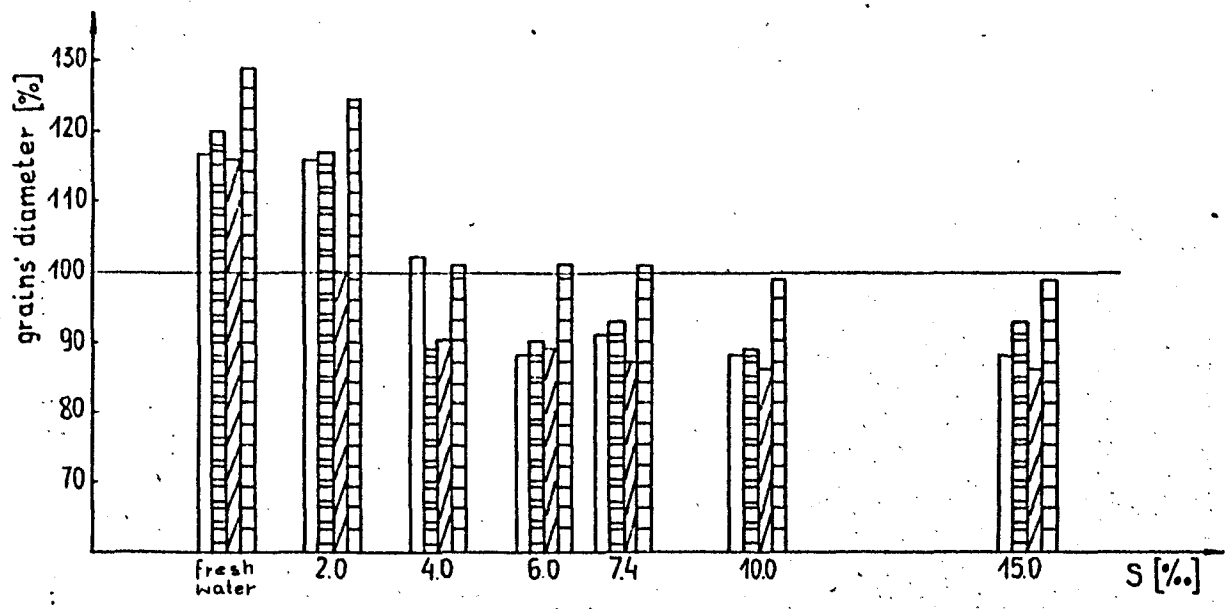

Fig. 3. Salmo trutta trutta. Diameter (%) of spawn grains placed for about 0,5 h in the water of various salinities in refference to grain's diameter of „dry" spawn biased as 100%. Fertilized spawn.

tests from: 11.11.75, 21.11.75, 02.12.75, 11.12.75.

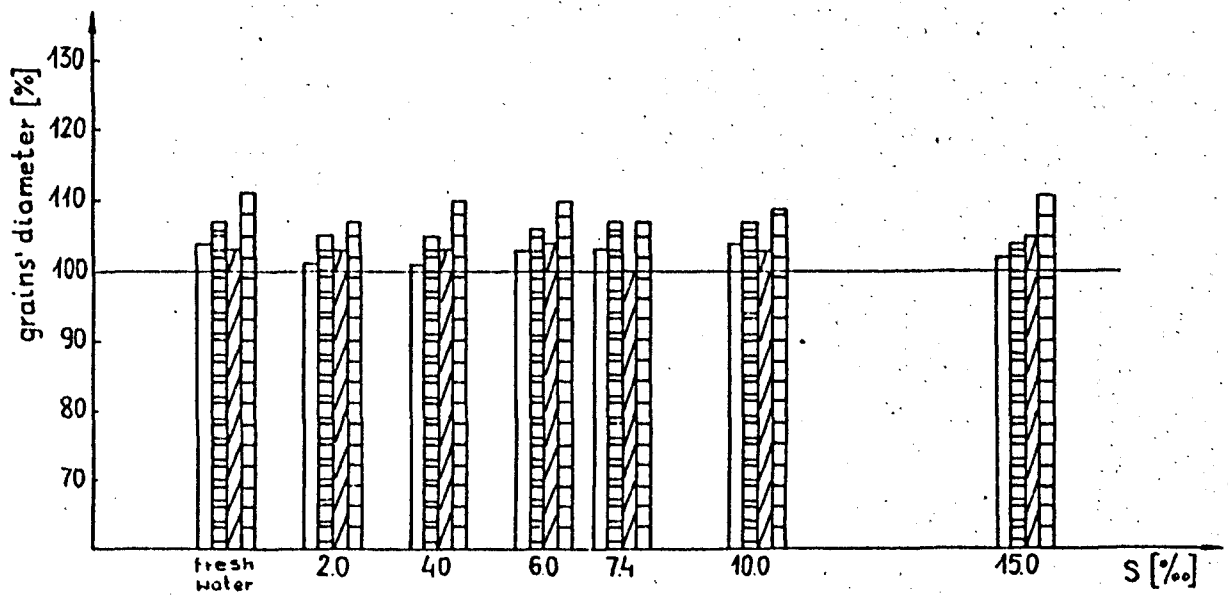

Fig 4. Salmo trutta trutta. Diameter (%) of spawn grains placed for about 0,5 h in the fresh water and then replaced for about 0,5 h into the water of different salinities biased to diameter of spawn grains placed for about 0,5 h in the fresh water assumed as 100%. Fertilized spawn.

tests from: 11.11.75, 21.11.75, 02.12.75, 11.12.75.