Research Considering Embryonic Development of Pikeperch (*Sander lucioperca*) under Artificial-Controlled Spawning Conditions

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Abstract
The experiments made in order to study the embryonic development of pikeperch were take place at the Fish Culture Research and Development Station Nucet, within 02.04–17.04.2012. For artificial-controlled spawning of pikeperch were used 4 years old breeders reared in ponds, at Nucet Station in policulture with older cyprinids. The experiment was accomplished in two experimental variants, wherein the fertilized eggs have been hatched at two different intervals of temperatures. The technological parameters of incubation were as follow, variant V_1: fertilized rate 92%, embryo rate 76% and hatching rate 65%; variant V_2: fertilized rate 93%, embryo rate 82% and hatching rate 71%. The Nucet type incubators seem to offer good conditions for embryonic development of pikeperch.

Keywords: controlled spawning, embryonic development, pikeperch, water temperature.

1. Introduction

Belonging to the family of *Percidae*, pikeperch are, after pike, the most typical voracious fish leaving in the cyprinids waters of Europe. However, at the size equal to those of pike, they are only able to swallow smaller prey because the mouth is small [1]. Concurrently, is a highly valuable commercial fish species due to its rapid growth rate and appetizing taste [2]. These characteristics make the pikeperch more suitable for aquaculture then pike. For these reasons, attempts have been made for decades to stabilize the production of this species through controlled propagation and the cultivation of stocking material [3].
In view of the existing interest in the species and the increasing demand for fry, equally for repopulating free waters such as lakes and slow flowing streams as for the restocking of farm ponds, efforts are naturally afoot to increase the supply and meet that demand.
For successful spawning technology of pikeperch, should well know the biological features of the species. In this paper we proposed a detailed study of the embryonic development on pikeperch, spawn by artificial-controlled technology under technological conditions from Fish Culture Research and Development Station Nucet, Romania.

2. Materials and methods

Pikeperch are typically warm and calm water fish. They prefer sandy or sandy-muddy rather then muddy-clay bottoms and accommodate well in turbid waters. But they need water with normal oxygen content. Further, they do not endure handling, and this is one of the principal difficulties met with in culture them.
The experiments made in order to study the embryonic development of pikeperch were take place at the Fish Culture Research and

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Development Station Nucet, within 02.04-17.04.2012. Initiating the technology works at this early date was determined by sudden worming.

The experiment was accomplished in two experimental variants, in the first variant (V_1), fertilized eggs were incubated at a water temperature of 9–13°C (2.04–11.04.2012), in the second variant (V_2), eggs were harvest from spawning pond and incubated at 13–16°C (11.04-17.04.2012).

For artificial-controlled spawning of pikeperch were used 4 years old breeders reared in ponds, at Nucet Station in policulture with older cyprinids. After selection, breeders were stoked in two spawning ponds of 0.4 ha each (BR_1N and BR_2N), at a density of 24 breeders/pond, the male/female ratio was 1:1. Each pond was fitted with 12 nests, one for each brace of breeders. The nests are made by willow roots fixed on frames (Figure 1). The pond BR_1 was stocked with breeders on 31 March and BR_2N on 09 April in order to obtain fertilized eggs at different temperatures of water.

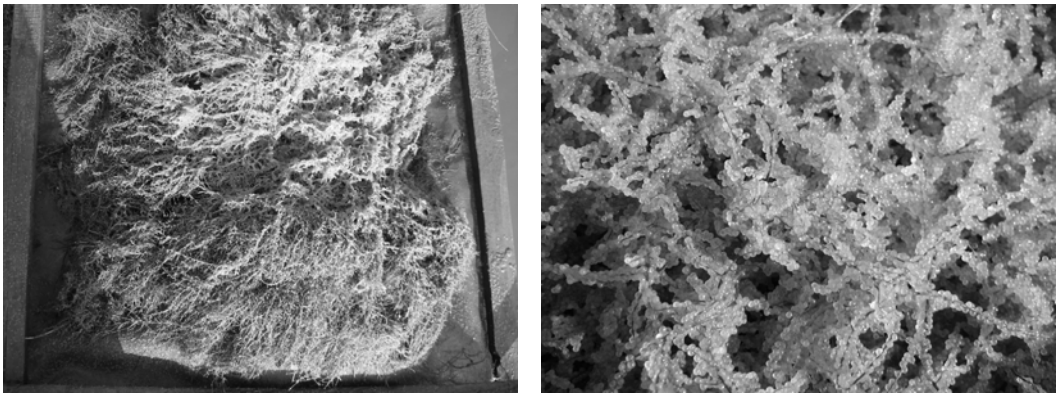

Figure 1. Nest for artificial-controlled spawning of pikeperch

After spawn, that usually, is at the sunset or early in the morning, the willow roots were carefully sampled without frames and transfer in Nucet type incubators from hatchery (Figure 2).

Figure 2. Nucet type incubators

After transferring, from each nest were sampled eggs in order to check for fertilization by observing them on the microscope. The fertilized eggs are yellowish, translucent and glassily whilst those unfertilized are whitish and crizzly [4].

In order to prevent infection with the fungus *Saprolegnia sp.*, the fertilized eggs were treated daily with formalin solution. Concentration of the solution and treatment length were determined daily according to the stage of embryonic development and water temperature [5]. The study of embryonic development of *Sander lucioperca* species was made by daily sampling of 50 eggs that were observed on the electronic microscope Carl Zeiss on the 4+lens.

The embryonic stages were captured with a photo camera model Canon A640-10 mega pixels, connected to the electronic microscope.

During the experiment, every two days have been taken water samples from source ($BPrm_3$) as from

the incubators inside the hatchery, in order to perform chemistry analysis; water temperature was also recorded three times a day. Chemical analyses of water were conducted in laboratory of FCRDS Nucet by analytical methods.
The statistic analysis of data was made using the program Office Excel 2003, MS Windows.

3. Results and discussion

Duration of embryonic development process was influenced especially by the water temperature wherein the incubation takes place, 10 days on 9-13°C (V_1) and 7 days on 13–16°C (V_2) respectively.
Stage 1: after 24 hours (V_2)–28 hours (V_1) from fertilization, in the eggs are observed 1–8 cells (Figure 3).

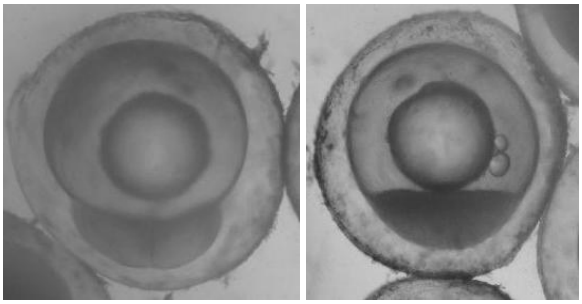

Figure 3. Pikeperch eggs after 24–28 hours of incubation

Stage 2: after 43 hours (V_2)–52 hours (V_1), the embryo is taking shape and indwell a half of the egg content (Figure 4). At this stage, the head of embryo is not formed yet.

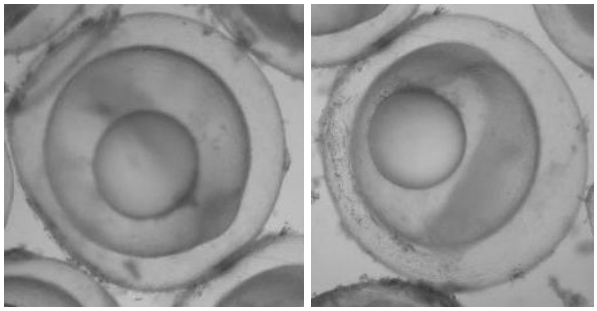

Figure 4. Pikeperch eggs after 43–52 hours of incubation

Stage 3: after 74 hours (V_2)–96 hours (V_1), the embryo covers up to 2/3 of the yolk (Figure 5), at this moment, the primordial segmentation of the embryo are visible and the eyes are configured.

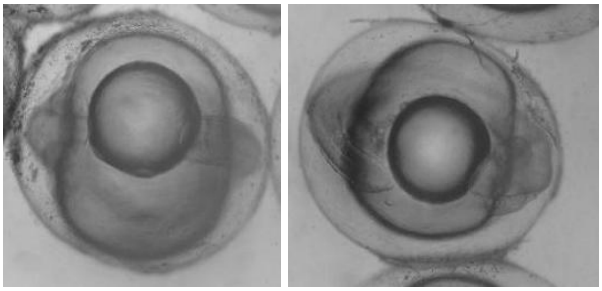

Figure 5. Pikeperch eggs after 74–96 hours of incubation

Stage 4: after 100 hours (V_2)–142 hours (V_1), the embryo cover the yolk completely, the tail almost touch the head (Figure 6). At this stage, the embryo is already moving.

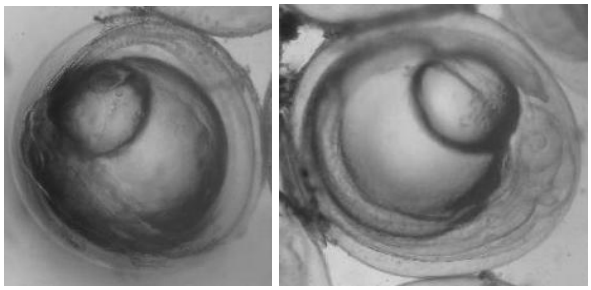

Figure 6. Pikeperch eggs after 100–142 hours of incubation

Stage 5: after 128 hours (V_2)–184 hours (V_1), tail of the embryo gain on the eyes, the head is defined and the eyes are well relieved (Figure 7). The movements of embryo became stronger.

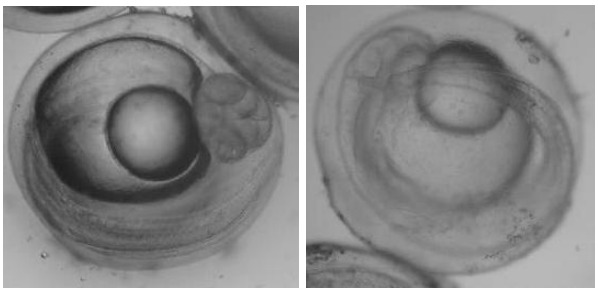

Figure 7. Pikeperch eggs after 128–184 hours of incubation

Stage 6: after 154 hours (V_2)–214 hours (V_1), embryo's head is passed by the end of tail (Figure 8); the movements of embryos are very intense. In this stage, the embryos are very sensitive to environmental conditions, especially to concentration of solved oxygen and fluctuation of water temperature.

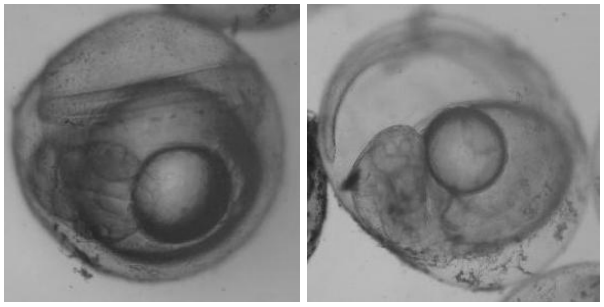

Figure 8. Pikeperch eggs after 154–214 hours of incubation

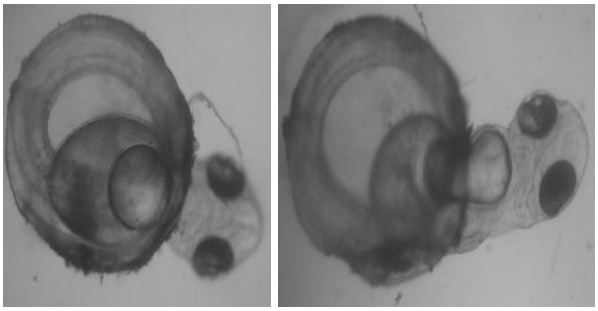

Figure 9. Hatching time after 168–240 hours from fertilization

Stage 7: after 168 hours (V_2)–240 hours (V_1), the embryos are developed completely and begin to hatch. The time for hatch also depend on oxygen content and water temperature.

The physical-chemical analyses of water indicated some differences between the hatchery and the settling pond that feeding hatchery (Table 1).

Table 1. Mean value of physical-chemical parameters of water

Parameter	Hatchery	Source
pH	8.1	7.8
Dissolved oxygen (mg/l)	7.5	11.3
Hardness (dGH)	5.1	5.37
CO_3^-	6.2	6.0
HCO_3^-	155.0	150.0
Organic matter (mg O_2/l)	11.2	9.82
NO_3^-	0.28	0.21
NO_2^-	0.09	0.08

As can be see the differences between water parameters from source ($BPrm_3$) and from hatchery are low, but the quality of water was acceptable for embryonic development of pikeperch. During the incubation of eggs from both experimental variants, water temperature represented the main factor that affected the embryonic development of pikeperch. Evolution of water temperature in the experimental time is presented in Table 2.

Table 2. Evolution of water temperature

Date	Water temperature (^oC)			Daily average
	8^{oo}	12^{oo}	16^{oo}	
02.04	8.5	9	9.5	8.8
03.04	8.5	9	10	9.2
04.04	10	11	12	11
05.04	12	14	14.5	13.5
06.04	14	14	14.5	14.2
07.04	13.5	14	14	13.8
08.04	13	13.5	14	13.5
09.04	13	13	12.5	12.8
10.04	12	12.5	13	12.5
11.04	12.5	13	13.5	13
12.04	13	14	15	14
13.04	13	14	15	14
14.04	13.5	14	15	14.2
15.04	14	14.5	15	14.5
16.04	14	14.5	15	14.5
17.04	15	16	16.5	15.8

Water temperature did not recorded large fluctuations, but evolved differently in the two experimental variants, V_1 (02.04–11.04) and V_2 (11.04–17.04) respectively.

This situation led to a different evolution of embryonic development of pikeperch in both experimental variants (Figure 10).

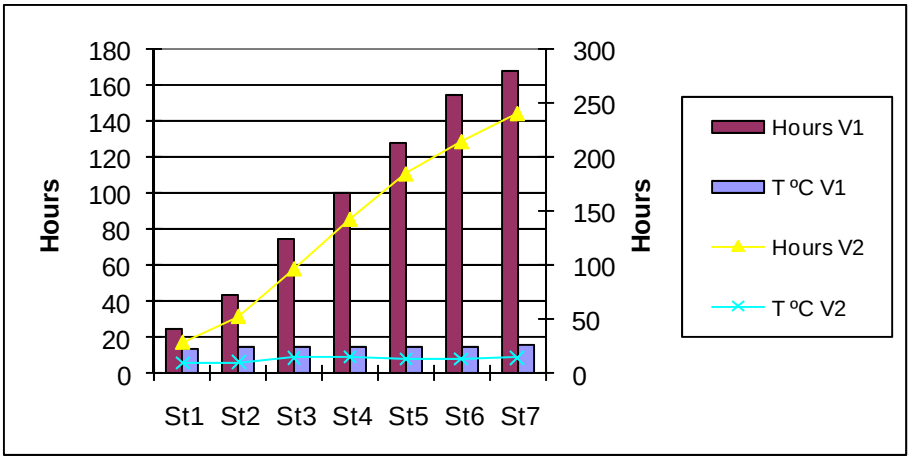

Figure 10. Embryonic development of pikeperch depending on water temperature

According to Figure 10, temperature of water evolved without large fluctuations in both experimental variants and that contributed to achieving good results on incubation of pikeperch eggs. The smaller temperature of water during the incubation in the first variant (V_1) conducted to a delay of hatch with almost 3 days comparatively with the second variant (V_2). The technological parameters of incubation (Figure 11) were as follow, in variant V_1: fertilized rate 92%, embryo rate 76% and hatching rate 65%; in variant V_2: fertilized rate 93%, embryonic rate 82% and hatching rate 71%.

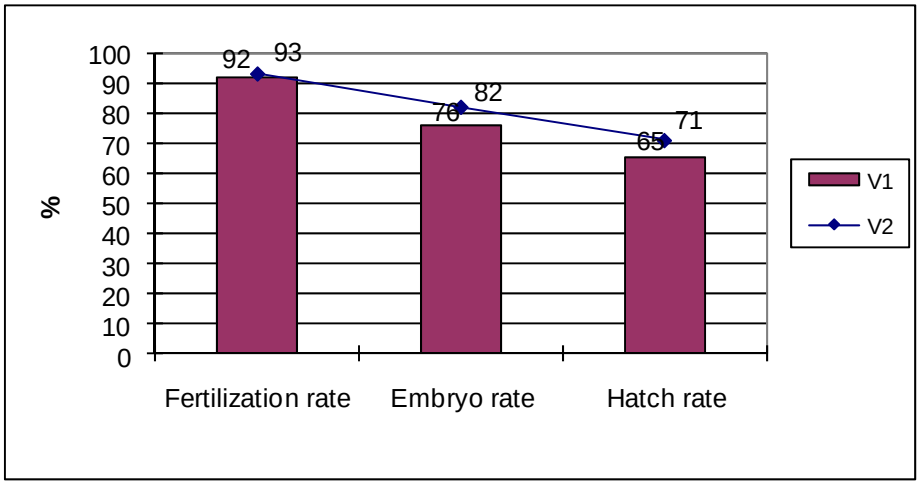

Figure 11. Technological parameters of incubation

Technological indices showed that embryonic development ensured well in both experimental variants, with better results in variant V_2, where water temperature was higher. This means that the pikeperch eggs can be incubated with good results in the range of temperatures from 9°C to 16°C with an optimum within 13–16°C.

4. Conclusions

Incubation of pikeperch eggs in Nucet type incubators using pond water accomplished with good results in both ranges of temperatures registered in V_1 and V_2.

The physical-chemical parameters of water maintained between optimal limits for incubation of pikeperch eggs in both experimental variants.

Temperature of water evolved without large fluctuations in both experimental variants and that contributed to achieving good results on incubation of pikeperch eggs.

The small differences between hatching indices from the two experimental variants show that incubation in the range of temperatures from 13 to 15.8^{o}C (V_2) have the best results.

In the range of temperatures from 8.8 to 13^{o}C (V_1), although the results were smaller, there values are still high. That means that in case of using more batches of breeders, the range of spawning time can be enlarged.

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