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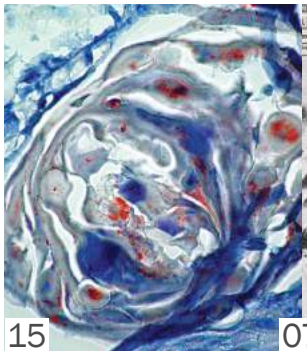
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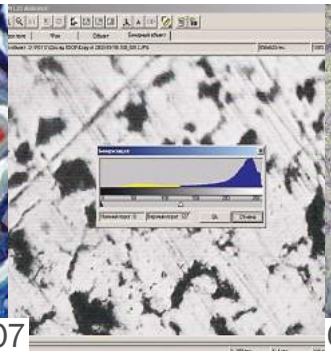
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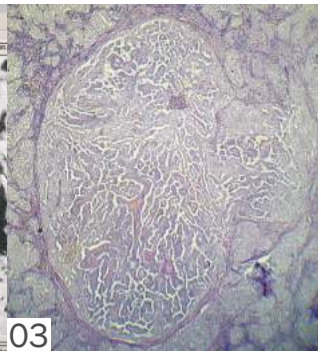
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Influence of the non-biological parameters of water (water temperature) on the paddlefish larvae (Polyodon spathula) ongrowing in the conditions of the south of Ukraine

Grudko Natalya*, Kornienko Vladimir

Kherson State Agrarian University, Kherson, Ukraine Ukraine

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ABSTRACT

Techonology of propagation and cultivation of paddlefish (Polyodon spathula (Walbaum)) in terms of Southern Ukraine has some features different from such in native region. Authors studied relationship between water temperature and ongrowing results. Attention payed to such markers as average individual mass, survival rate and fish productivity. Special investigations to set up relationship between water temperature and results of ongrowing paddlefish (Polyodon spathula) larvae were carried out at the base of Dneprovsky sturgeon fishplant which located in the Kherson region (Southern part of Ukraine, Eastern v) at 2004-2006, 2013. Received data shows that most efficient is to grow paddlefish larvae at the early stages of postembryogenesis keeping water temperature near 20oC. It allow larvae to realize their growing potential and more effective using of the food items. This in turn boosts up fish productivity. Ongrowing larvae with such temperature allowed receiving in short terms fish with average individual mass of 1.4-1.8g while survival rate was up to 62.2%. Instead, decreasing water temperature to 16oC led to slower growth.

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1. Introduction

Growing technologies used to receive sturgeons in artificial conditions are based on fundamentals, both technological and ecological ones. Furthermore, ecological parameters of water have significant effect on the results of ongrowing (Vinogradov et al., 2003; Milstein, 1982).

* Corresponding author at: Kherson State Agrarian University, 23, Rozy Luksemburg st, Kherson, 73000, Ukraine
Tel.: +38095 642 59 79; Fax.: +380552319113
E-mail addresses: ngrudko@mail.ru (N. Grudko)

Sturgeons are poikilothermal animals like other fish and the temperature of water is the main factor of the environment which determines organism resistance rate. It has effect on growing rate of larvae, their intensity of food intake and its indigestion, metabolic activity. At the same time as for growing technologies of paddlefish this problem is studied insufficiently in conditions of south of Ukraine and may have important effect on the growing technology (Kornienko, Shevchenko, 1999). Taking into account the mentioned above, there is an urgent need for special investigation aimed at examining such temperature mode of water which allows receiving maximum amount of viable fish stock of paddlefish.

2. Materials and Methods

Special investigations were carried out on the base of Dneprovsky sturgeon fish plant located in Kherson region (southern part of Ukraine, Eastern Europe). Paddlefish larvae were held in the circular concrete basins (total square 5m2) and square plastic basins (total square 2m2). Larvae of paddlefish were the objects of this investigation. Different alternatives were formed using the analogue method. In attempt to determine the influence of water temperature we formed 4 alternatives with triple replication (each replication with different stocking density – 600, 1000 and 2000 fish/m2). Different years of growing were used as alternatives while other technology and non-bilogical parameters were the same. Feeding of fish in experimental basins was made using only natural food (Daphnia sp.) 6 times a day in amount of 40% of larva's mass per day. Once per 5 days we took samples to analyze the growth rate of larvae. Average individual mass of larvae at the beginning of experiment was almost the same in all alternatives and ranged from 10.4 to 10.9 mg. The main goal was to evaluate the results of research by primary fishery indexes, such as average individual mass, survival rate and fish capacity. Water sampling and its physic-chemical analysis was made using well-known recommendations (Alyokin, 1970).

3. Results

After analyzing non-biological conditions of water we established that main chemical markers of water were almost constant, varied little in the range, which was optimal for growth of paddlefish larvae in basins. Concentration of dissolved oxygen in the water was favorable and ranged from 5.8 to 8.0g O2/m3. pH of the water was the weakly alkaline and ranged within 7.8-8.4. The main attention in our research was focused on the dynamics of water temperature and dissolved oxygen. In the first alternative the temperature was rather low and ranged from 13.3 to 18.2oC (56-65 oF) with average 16.0 oC (60.8 oF) (Figure 1).

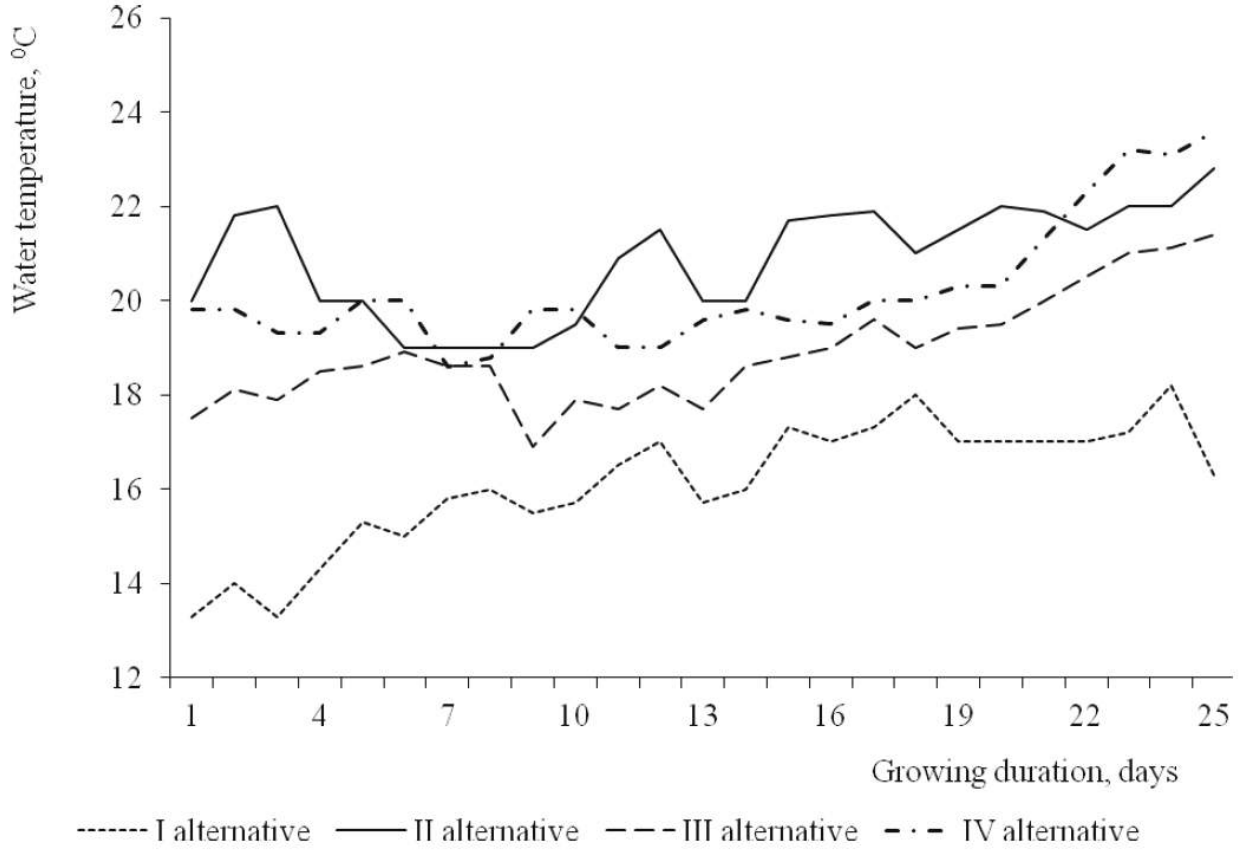

Figure 1. Dynamics of water temperature in experimental basins in the process of paddlefish larvae ongrowing.

In second alternative the water temperature was more favorable and ranged from 19.0 to 22.8oC with average 20.9oC, though at the beginning (till 4th day) it reached 22oC, than decreased to 19oC and systematically increased to 22.8oC at the end of ongrowing. Such dynamics allowed paddlefish larvae to shift to mixed feeding on the 5-6 day, which is 3-5 days earlier than in other alternatives. Third alternative the water temperature was a bit lower for the preceding year and ranged from 16.0 to 21.4oC with average 18.9oC. The last fourth alternative, unlike others, had minor water temperature fluctuations during growing process. At the beginning it reached 19.8oC, on 20th day it increased up to 20.3oC. Only last 5 days were marked with sudden warming of water up to 23.6oC. Average water temperature in this alternative was 20.2oC. After analyzing the obtained data we have discovered that the highest individual mass of paddlefish larvae was received in 2nd and 4th alternatives (average water temperature – near 20oC) (Table.1)

Table 1. Relationship between water temperature and results of paddlefish larvae ongrowing

Alternative	Water temperature, °C average (min-max)	Stocked		Produced		Survival rate, %	Fish capacity, g/m^2
		quantity, fishes/m^2	individual mass, mg	quantity, fishes/m^2	individual mass, mg		
1	16,01 (13,3-18,2)	600	10,9	378,0	397,9	63,1	149,7
		1000	10,5	402,5	386,7	40,2	151,5
		2000	10,7	468,7	358,8	23,4	160,6
2	20,9 (19,0-22,8)	600	10,4	373,0	1866,7	62,2	695,4
		1000	10,4	374,7	1780,0	38,2	662,2
		2000	10,5	407,3	1461,1	20,4	588,1
3	18,9 (16,0-21,4)	600	10,7	393,0	895,3	65,5	346,6
		1000	10,5	407,0	856,7	41,0	344,6
		2000	10,9	494,3	742,0	24,7	358,0
4	20,2 (18,6-23,6)	600	10,0	359,0	1750,0	59,8	623,6
		1000	10,2	435,3	1440,0	43,5	619,0
		2000	10,2	489,3	990,0	24,5	461,6

Similar to the individual mass, the highest fish capacity was marked in 2nd (from 588.1 to 695.4 g/m2) and 4th (from 461.6 to 623.6 g/m2) alternatives. The lowest productivity was noticed in 1st alternative (from 151.6 to 160.6 g/m2)

Average individual mass of paddlefish larvae in 2nd alternative was 4.1-4.6 times bigger than 1st one and 1.7-2.1 times bigger than in 3rd one. It is remarkable that survival rate had low relationship with water temperature and revealed minor fluctuations. Instead, stocking density was effected directly.

Thus, in series with stocking density of 600 fishes/m2 the survival rate was about 62.2-65.5%. The lowest survival rate was registered in series with highest stocking density (2000 fishes/m2) and it ranged from 20.4 to 24.7% in different alternatives.

4. Conclusions

As we can see, it is more efficient to grow paddlefish larvae at the early stages of postembryogenesis keeping water temperature around 20oC. It allows larvae to realize their growth potential on the basis of more effective usage of fish food. In turns, this boosts up the fish capacity. Larvae ongrowing at such

temperature allows receiving fish with average individual mass of 1.4-1.8g in short terms at the survival rate up to 62.2%. On the contrary, water temperature decreasing to 16oC led to slower growth; consequently it did not allow obtaining high mass indexes.

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