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SHORT PAPER

Preliminary Results on Siberian Sterlet Fry Rearing and their Comparison with some Production Performance Parameters of "European" Sterlet

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Abstract

Larvae of the "European" (ARR) and "Siberian" (ARM) sterlets were fed initially with *Tubifex*, and further were gradually weaned to dry diet. Additionally two other feeding strategies were tested in ARM: feeding exclusively with dry diet, and sudden weaning from 10 day post-hatch (dph). Survival and yield at 30 dph of the ARM was significantly higher than that of ARR. Significant differences were found within ARM groups with different weaning strategies. We suppose that ARM has at least same potential for aquaculture than the ARR. Also we suggest that the initial use of live foods for ARM would be preferable

Keywords: Acipenser *ruthenus marsiglii, Acipenser ruthenus ruthenus*, production performances, weaning strategy.

Introduction

Sterlet (*Acipenser ruthenus* L) is one of the commercially important sturgeon species both in economic and environmental terms. Its commercial relevance is related to an international trade in its flesh and live juveniles for stocking, as well as for ornamental purposes (Arndt *et al*., 2002). Sturgeon aquaculture may take advantage in cultured sterlet for diversification in appearance and taste (Williot *et al*., 2001). Additionally, an early maturation and a small size are very advantageous with regard to caviar production because of difficulties in handling of big spawners. Due to these favorable features a total of all export quotas for live specimens (fertilized eggs, larvae, fingerlings, etc.) of sterlet related to aquaculture increased from 50 thousands in 2003 to 170 thousands in 2006 (Raymakers, 2006). Sterlet is the third most widely cultured sturgeon species, being farmed in 15 countries including such traditionally caviar producers as Russia or Iran (Bronzi *et al*., 2011).

Based on our unpublished previous observations in recirculation aquaculture system the growth potential of the Siberian sterlet (*Acipenser ruthenus marsiglii*) possibly could be higher than that of the European subspecies (*A. r. ruthenus*).

Our study aimed 1) to compare the production performances of the "European" sterlet (*A. r. ruthenus* -further: ARR) and "Siberian" sterlet (*A. r. marsiglii*-further: ARM) as well as 2) to examine the effectiveness of different weaning strategies in fry rearing of the latter one.

Materials and Methods

At 5 day post-hatch (dph) larvae of ARR (12.55±1.26 mg; 11.25±0.85 mm) and ARM (16.05±1.30 mg; 12.85±0.81 mm) were stocked into 3-3 plastic tanks (with 40L volume) at a stocking density of 100 larvae/tank. Between 5 and 10 dph fish were fed with finely chopped *Tubifex* at *ad libitum* level. Further, during 4 days fish were gradually weaned to dry diet (Fry crumbs 000 with particle size: 0.3-0.5 mm; crude protein: 58%, crude fat: 12%; Joosen-Luycxk Aqua Bio, Turnhout, Belgium). Additionally two other feeding strategies were tested in ARM: 1) exclusively dry diet from 5 dph, and 2) sudden weaning at 10 dph (Figure 1). During the trial water temperature was fluctuated between 20.5-21.4 ^{o}C and the dissolved oxygen saturation was maintained above 90%.

The overall production performance of the two fishes and the success of the different weaning strategies were evaluated by the harvested yield (*Y*) at 30 dph and were expressed as fish production per unit of water volume (g.L^{-1}). Final weight (w_t), specific growth rate /$SGR = 100$ (ln w_t - ln w_0) t^{-1}/, condition factor /CF = 100 $w.L^{-3}$/, survival rate /S = 100 (final number. initial number^{-1})/ and Y were compared by one-way analysis of variance and subsequently the Tukey-test was used.

Results

At 30 dph the survival rate of the ARM was significantly higher than that of ARR, meanwhile the final weights statistically were not differed (Table 1). These resulted in significantly higher Y in ARM.

There were not statistically significant differences in survival, final weight, length, condition factor, daily growth rate and yield in ARM weaned at 10 dph either gradually (see above), or suddenly. However these values were significantly lower in fish fed on exclusively dry diet (Table 2).

Discussion

Based on our results it can be supposed that the ARM has at least same or even higher potential for aquaculture production than the ARR at the applied water temperature. According to Zadelenov (2010) growth of ARM highly depends on water temperature: about 34% better SGR can be achieved at 21°C than at 18°C. Additionally, Vdovchenko and Rozhdestvenskiy (2009) published that the optimal water temperature for ARR is around 25 °C and that for the ARM is around 21 °C. Thus it seems that in our study the applied 20.5-21.4°C temperature range was nearly optimal for ARM, but was under the optimal values for the ARR, which could hamper the achievement of its full growth potential. Further investigations are needed for the determination of temperature dependent production performance parameters in these fishes.

Based on our results continuous or sudden weaning of ARM from/at 10 dph can be recommended. This suggestion is in agreement with the results of Rónyai and Feledi (2012) who described the same finding in feeding of ARR. Our results on exclusive feeding with dry diet vs. applying live food and those of Napora-Rutkowski *et al.* (2009) demonstrate that the survival rate of sterlet larvae can be improved using live food from the beginning of feeding, even though sterlet larvae are potentially able to ingest and adsorb nutrients from artificial feed (Wegner *et al.*, 2008). Noori *et al.* (2012) supposed that live food may provide factors that stimulate pancreatic secretions, food intake and may improve the digestion efficiency of dry feed in Persian sturgeon (*Acipenser persicus*).

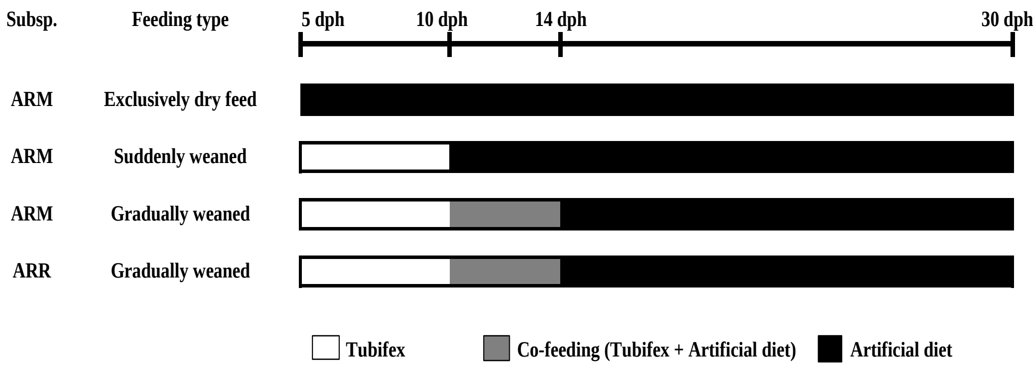

Figure1 Diagram of the applied feeding strategies.

Table 1 Production performance data of the sterlet "subspecies"

	S (%)	w_t (g)	l_t (mm)	CF (%)	SGR (%/day)	Y (g.L^{-1})
European subspecies (ARR)	35.4 ± 11.2^a	0.65 ± 0.02^a	54.1 ± 4.0^a	0.47 ± 0.03^a	15.8 ± 0.1^a	0.54 ± 0.18^a
Siberian subspecies (ARM)	66.7 ± 14.9^b	0.61 ± 0.12^a	50.6 ± 4.7^a	0.47 ± 0.03^a	14.5 ± 0.7^b	0.90 ± 0.08^b

Values within columns with different superscripts are significantly different (P<0.05).

Table 2 Effect of different weaning strategies on production performance parameters of Siberian starlet

	S (%)	w_t (g)	l_t (mm)	CF (%)	SGR (%/day)	Y (g.L^{-1})
Gradually weaned fish	66.7 ± 17.9^a	0.61 ± 0.12^a	50.6 ± 4.7^a	0.47 ± 0.03^a	14.5 ± 0.7^a	0.90 ± 0.08^a
Suddenly weaned fish	59.6 ± 11.1^a	0.58 ± 0.07^a	49.1 ± 2.0^a	0.48 ± 0.02^a	14.3 ± 0.5^a	0.82 ± 0.13^a
Fish fed on exclusively dry diet	48.1 ±5.8^a	0.20 ± 0.01^b	35.3 ± 2.0^b	0.49 ± 0.01^a	10.1 ± 0.1^b	0.23 ± 0.03^b

Values within columns with different superscripts are significantly different (P<0.05).

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