

## Preliminary attempts to start feed huchen (*Hucho hucho*)

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Received – 05 February 2013/Accepted – 15 July 2013. Published online: 30 September 2013; ©Inland Fisheries Institute in Olsztyn, Poland  
Citation: Grudniewska J., Przybył A., Goryczko K., Andrzejewski W. 2013 – Preliminary attempts to start feed huchen (*Hucho hucho*) – Arch. Pol. Fish. 21: 225-227.

**Abstract.** Simple methods for huchen start feeding and rearing fry using live, fresh, and dry feeds were tested. Aggressive behavior was observed when live zooplankton was used as feed. Cannibalism can be controlled easily with frequent or continuous, automatic feeding. These methods can be used easily by non-professional enthusiasts involved in active protection activities for huchen.

**Keywords:** huchen, start feeding, mortality

The active protection of some endangered fish species is based on stocking material obtained from farmed broodstocks (Goryczko and Witkowski 2009). This system has been used effectively in huchen, *Hucho hucho* (L.) protection and propagation in Poland; however, some issues in this developing farming technology should be resolved. Generally, salmon, *Salmo salar* L. and rainbow trout *Oncorhynchus mykiss* (Walbaum) production methods are used (Goryczko 2012), but huchen fry start

feed must contain exogenous enzymes that facilitate digestion processes (Verga and Bohm 1992). Traditionally, this has been accomplished with live, frozen, or dried zooplankton (Jungwirth et al. 1989, Verga and Bohm 1992). Recently, the development of new starter feeds that contain these indispensable enzymes that stimulate digestive processes in the fry of some salmonids has permitted eliminating natural, unprocessed components from initial feeding (Craig and Helfrich 2009).

Good survival and growth rates obtained using Futura commercial salmonid starter with hucho fry and Artex with whitefish, *Coregonus lavaretus* (L.) (J. Grudniewska unpublished data) and grayling, *Thymallus thymallus* (L.) were obtained by Kowalewska-Hryc et al. (2005) and Grudniewska et al. (2006). This brief presentation of traditional activities aimed at finding a practical solution for huchen fry start feeding without the necessity of purchasing high quality commercial feeds (Przybył et al. 1992, 1993, Madziar et al. 1993) is addressed to enthusiasts and non-professionals who would like to take a part in the active protection of the endangered *Hucho* species (Witkowski 2003).

The experiments began with swim-up fry hatched from eggs obtained from farmed huchen broodfish. In Łopuszna in 1989, the fish were reared in plastic troughs in two replications per experimental group, while in Rutki in 1992, plastic circular tanks in three replications per experimental group

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**Table 1**Results of huchen (*Hucho hucho*) fry experimental feeding at Łopuszna and Rutki farms

Experiment/parameter	Control feed	Experimental feed 1	Experimental feed 2
Łopuszna			
Duration of experiment (day)	81	81	81
Final mean weight (g)	0.63	0.58	0.71
Survival (%)	65.2	48.0	76.4
Rutki			
Duration of experiment (day)	76	76	76
Final mean weight (g)	2.60	2.18	1.86
Survival (%)	40.6	59.9	82.0
Final biomass g	105.6	136.2	152.3

were used with an initial stocking density of 12 and 13 fish  $\text{dm}^{-3}$ , respectively. The duration of the experiment in Łopuszna was 81 days, while that in Rutki was 76 days. The fish were fed *ad libitum* 12-15 times daily. The tanks were cleaned each morning. At both farms, standard prophylactic bath treatments in a formaldehyde 1:6000 solution (weekly) and either copper sulphate 1:2000 (Łopuszna) and chloramine 10 ppm monthly (Rutki) were applied (Terech-Majewska et al. 2010). At Łopuszna, two experimental dry feeds and a control wet mixture of finely minced beef spleen, herring roe, skimmed milk, and yeast were used, while at Rutki two other experimental dry feeds and live zooplankton as the control were used.

The results are presented in Table 1. In the Łopuszna experiment, the fish fed feed number 2 were significantly heavier than those in the other groups. At Rutki, the best results, which were expressed in weight increases, were obtained by the fish in group fed feed 2; however, ANOVA analysis did not detect significant differences among experimental groups. The slower growth rate at Łopuszna than in Rutki probably stemmed from water temperatures that ranged from 8 to 16°C compared to 15 to 20°C, respectively, which concurs with results obtained by Jungwirth et al. (1989). Additionally, this suggests that huchen is more tolerant of high water temperatures than are char *Salvelinus* sp., brown trout, *Salmo trutta* L., or salmon. The survival rate of

40.6 to 82% indicated that rainbow trout fry and fingerling rearing technology can be applied successfully to huchen. However, the aggressive behavior of young huchen can be a real problem, and it is likely exacerbated when live food such as zooplankton or other fish fry is used. This phenomenon in the Rutki control group was observed directly in the presence of “two tail” and suffocated predator fish“, and indirectly by the discrepancy between the recorded and real final mortality rates. Additionally, the highest mean weight and the lowest final biomass observed in this group probably stemmed from predator-prey natural selection. Aggression among young huchen can be controlled easily with continuous feeding with an automatic feeder or frequent *ad libitum* feeding. Low stocking rates also appear to stimulate aggressiveness.

**Author contributions.** J.G., K.G., A.P., and W.A. designed the research; J.G. and W.A. performed the research; J.G. and K.G. wrote the paper.

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