PE-5

Compensatory growth in juvenile olive flounder (*Paralichthys olivaceus*) in the spring

Sung Hwoan Cho and Jong Kwan Lee
Uljin Marine Hatchery, National Fisheries Research and Development Institute, Uljin, Kyungbook 767-863, Korea

Introduction

Compensatory growth in fish, a rapid growth or faster than normal growth rate resulted from followed refeeding of fish after starvation during a certain period of time, has been observed in some of coldwater fish, such as Arctic charr *Salvelinus alpinus* (Miglavs and Jobling, 1989), rainbow trout *Oncorhynchus mykiss* (Dobson and Holmes, 1984; Jobling and Koskela, 1996), sockeye salmon *Oncorhynchus nerka* (Bilton and Robins, 1973) and coho salmon *Oncorhynchus kisutch* (Damsgaard and Dill, 1998) as well as warmwater fish, such as channel catfish *Ictalurus punctatus* (Gaylord and Gatlin, 2000, 2001), hybrid tilapia (Wang et al., 2000) and gibel carp *Carassius auratus gibelio* (Qian et al., 2000; Xie et al., 2001). Achieving compensatory growth in fish after starvation has the several positive potential for aquaculture in terms of saving personnel time, probably producing less pollution during starvation and improving fish-feeding activity, and it can eventually reduce fish production cost. Therefore, many fish farmers are probably very interested in compensatory growth of fish. The objective of this study was to investigate compensatory growth of juvenile olive flounder and determine possible duration of feed deprivation in flounder recovering from starvation to achieve compensatory growth in the spring

Materials and method

Twenty juveniles fish (Mean weight±S.D.: 53.9±0.24 g) were stocked into the fifteen of 200 L circular flow-through tanks (water volume: 160 L). Fish were acclimated for a week before the initiation of the experiment. During the acclimation period, flounder were fed the commercial sinking flounder feed (Jeilfeed Co.) containing 52.0% protein and 7.0% lipid twice daily at 3% of body weight of fish. Fish were fed for 6 days a week. Since the feeding trial performed during the spring, mean water temperature was 15.0±1.57℃. Five treatments of fish with 3 replicates were prepared for this study. Fish in the control group (C) was fed to satiation twice daily throughout the feeding trial. Fish in the S1, S2, S3 and S4 experienced 1, 2, 3 and 4 weeks of starvation, respectively, before being fed to satiation twice daily during the remainder of the experiment. The experiment lasted for 8 weeks. At the end of the feeding trial, fish were collectively harvested and totally weighed. Five randomly chosen fish at the beginning and 3 fish from each tank at the end of the feeding trial were sacrificed for proximate analysis based on standard method (AOAC, 1990). One-way ANOVA test was applied to test the significance of treatments. And if the significance was observed, Duncans multiple range test (Duncan 1955) was applied to detect the difference among treatments by using SAS.

Results

Survival of olive flounder was not significantly different among treatments. Weight gain of flounder in S2 was significantly ($P<0.05$) higher than that of fish in S3 or S4, but not significantly different from that of fish in C or S1. The poorest weight gain was observed in fish of S4 treatment. Specific growth rate (SGR) for flounder in S2 was significantly ($P<0.05$) higher than that for fish in C or S4, but not significantly different from that of fish in S1 or S3. Feed intake (g/fish) was proportional to duration of days of feeding except for flounder in S2, but not significantly different among C, S1 or S2. Feed efficiency ratio (FER) and protein efficiency ratio (PER) for flounder in S2 were significantly ($P<0.05$) higher than for fish in C, but not significantly different from those for fish in S1, S3 or S4. Proximate composition of the body of flounder was not significantly different among treatments. In considering results of the experiment, juvenile olive flounder achieved compensatory growth when properly fed after starved up to 2 weeks in the spring. Compensatory growth of fish was supported by improvement in SGR, FER and PER in fish starved.

References

AOAC (Association of Official Analytical Chemists). 1990. Official Methods of Analysis. 15th edition. Association of Official Analytical Chemists. Arlington, Virginia. 1298 pp.

Bilton, H.T. and G.L. Robins. 1973. The effects of starvation and subsequent feeding on survival and growth of fulton channel sockeye salmon fry. J. Fish. Res. Board Can., 30(1), 1~5.

Dobson, S.H. and R.M. Holmes. 1984. Compensatory growth in the rainbow trout, *Salmo gairdneri* Richardson. J. Fish Biol., 25, 649~656.

Duncan, D.B. 1955. Multiple range and multiple F tests. Biometrics 11, 1~42.

Damsgaard, B. and L.M. Dill. 1998. Risk-taking behavior in weight-compensating coho salmon, *Oncorhynchus kisutch*. Behav. Ecol., 9(1), 26~32.

Gaylord, T.G. and D.M. Gatlin. 2000. Assessment of compensatory growth in channel catfish *Ictalurus punctatus* R. and associated changes in body condition indices. J. World Aqua. Soc., 31(3), 326~336.

Gaylord, T.G. and D.M. Gatlin. 2001. Dietary protein and energy modifications to maximize compensatory growth of channel catfish (*Ictalurus punctatus*). Aquaculture 194(3-4), 337~348.

Jobling, M. and J. Koskela. 1996. Interindividual variations in feeding and growth in rainbow trout during restricted feeding and in a subsequent period of compensatory growth. J. Fish Biol., 49(4), 658~667.

Miglavs, I. and M. Jobling. 1989. Effects of feeding regime on food consumption, growth rates and tissue nucleic acids in juvenile Arctic charr, *Salvelinus alpinus*, with particular respect to compensatory growth. J. Fish Biol., 34(6), 947~957

Qian, X., Y. Cui, B. Xiong and Y. Yang. 2000. Compensatory growth, feed utilization and activity in gibel carp, following feed deprivation. J. Fish Biol., 56, 228~232.

Wang, Y., Y. Cui, Y. Yang and F. Cai. 2000. Compensatory growth in hybrid tilapia, *Oreochromis mossambicus* ×*O. niloticus*, reared in seawater. Aquaculture 189, 101~108.