

Dietary supplementation of salmon roe phospholipid enhances the growth and survival of Pacific bluefin tuna *Thunnus orientalis* larvae and juveniles

Abstract

Previous studies have shown that feeding enriched *Artemia* induces growth failure in Pacific bluefin tuna (PBT) *Thunnus orientalis* larvae. This growth failure cannot be improved even if the docosahexaenoic acid (DHA) content in enriched *Artemia* is elevated to the same level as that in yolk-sac larvae, an ideal live feed for PBT larviculture. This might be caused by the differences in the DHA in the live feeds; i.e., yolk-sac larvae of marine fish have a high level of DHA in the larval phospholipids (PLs) but enriched *Artemia* store DHA in their neutral lipids (NLs). To test this hypothesis two experiments were conducted to evaluate the effect of dietary PL rich in DHA on growth and survival of PBT larvae (Experiment 1) and juveniles (Experiment 2). Three isoproteic and isolipidic artificial test diets (Diets 1, 2 and 3) and two reference live feeds (Diets 4 and 5) were prepared. Diets 1 and 3 were supplemented with NL and PL fractions of commercial salmon *Oncorhynchus gorbuscha* roe lipid (SRL) as the lipid source, respectively, whereas Diet 2 was supplemented with a mixture of both lipid fractions. Diets 4 and 5 were enriched *Artemia* and yolk-sac larvae of Japanese parrot fish *Oplegnathus fasciatus*, respectively. Diets 1, 3, 4 and 5 were given to PBT larvae for 10 days, whereas Diets 1, 2 and 3 were fed to PBT juveniles for 10 days. In Experiment 1, the growth and survival of PBT larvae fed Diet 3 (high PL fraction) were significantly improved when compared with larvae fed Diets 1 and 4, although the best growth and survival were obtained in larvae fed Diet 5. Similar results were obtained in Experiment 2; i.e., growth and survival were significantly improved in PBT juveniles fed Diets 2 and 3. In both experiments, fish fed Diets 2, 3 and/or 5 had higher total lipid contents, TAG levels, n-3 HUFA and/or DHA levels in NL fraction of the body when compared with fish fed Diets 1 or 4, while such a difference was not observed in the PL fraction. In juveniles over 90% of deaths were caused by collisions with the tank walls and the significant difference in mortality between treatments implies diet also affects behavior. SRL PL is concluded to enhance the growth and survival of PBT larvae and juveniles along with the accumulation of storage lipid and DHA in the body.