Reply to Matos: Maternal effects cannot explain documented patterns of reproductive success

Matos (1) suggests that maternal effects could also explain the results we presented in a recent paper (2). However, from the outset of our study, we were aware that environmental maternal effects could be a competing explanation for the reduced fitness of hatchery-origin fish. In figure 4 of ref. 2, for example, we presented the results for male and female broodstock separately. The broodstock were either wild-born or hatchery-born individuals (0 and 1 generations in captivity, respectively). As described in the paper, each hatchery-born broodstock fish was mated with only a wild-born partner. Thus, the male hatchery broodstock were mated with wild female broodstock. As such, there is no way that the results presented for males could be attributable to an environmental maternal effect.

In our paper, we also documented a tradeoff between the reproductive success of broodstock and the subsequent reproductive success of their offspring in the wild. As stated in the paper, we only examined wild-born broodstock for these analyses. Again, we analyzed these data separately for male and female broodstock and found no differences between the sexes (figures S1 and S2 of ref. 2). It is difficult to envision a mechanism whereby maternal effects could explain this pattern for both the male and female broodstock (particularly because the male

broodstock were mated to multiple females and because the fish experienced a common environment).

Lastly, Matos (1) states that “it might be that the environmental quality of bigger clutches affects later performance.” However, we presented data on egg counts for 4 y and found no evidence for a relationship between the number of eggs produced by a mating and the number of returning adult offspring (table S5 of ref. 2).

The classic life history tradeoff between egg size and egg number could indeed be one proximate mechanism of adaptation to the hatchery, as was demonstrated almost a decade ago by Heath et al. (3). However, in that case, it was a genetic maternal effect (egg size variation among females can be highly heritable in salmon). Although we found no evidence for maternal effects in this study, we agree with Matos (1) that one should always consider the possibility when interpreting data on the fitness of captive-bred individuals.

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The authors declare no conflict of interest.

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