

Predictions of response to selection for increased return rate in salmon ranching based on the estimated heritabilities show large response. Realized response where six males selected from six families with average return rate of 1.74% were selected in fall 1990 and mated to 28 randomly selected females of one salmon ranching stock with average return of all families of 0.51% of the broodstock year-class. As a control a random mating of 16 males to 45 females was carried out. All together 16 286 tagged smolts of the selected families were released at four different release sites along with 20 070 tagged smolts of the control families. The returns of the selected families was 2.8% compared to 2.2% for control, a difference of 27%. The selected families had the highest returns at all four release sites. Higher response could have expected if females from the best families had been available.

Effects of artificial selection on body size and its reaction norm in guppy fish

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Abstract

Many studies have been carried out on the inheritance of body size by means of direct selection at certain ages and some authors observed that this selection might alter the height and/or the shape of the growth curve suggesting that the size and the path followed could be to some degree under separate genetic control. The aim of our experiment was to investigate the possible effects of bidirectional selection for body length at 2 months on the size and the growth pattern in a laboratory population of *Poecilia reticulata*. Selecting for increased and decreased length at 2 months, we observed that the selected trait increased in the "up" selected line, H line, whereas in the line selected in the "down" direction, L line, the length at 2 months did not show a decrease. The same trend was noted for the unselected trait length at 1 month. The response to selection only to the "up" direction was confirmed by the estimated regression coefficients of the generation means on the generation number. The divergence between the two selected lines estimated on length at 2 months was about twice of that estimated on length at 1 month. This suggested that the "up" selection produced an increase in the growth rate that could be or could not be matched with an independent increase in the body size. To investigate this possibility, the length at 1 month, as indicative of size, and the length's increment from 1 to 2 months, as indicative of the growth rate, were measured on progeny from the two selected lines and from their reciprocal crosses. Moreover, with the aim to evidence possible effects of the artificial selection on the reaction norm of the analysed traits, the progeny from the selected lines, crosses and also from the base population were reared with two different diets, i.e. partially with dry standard food, the same used during selection, and partially with live food, represented by newly hatched *Artemia salina*. Comparing the means of the crosses fed with dry standard food to those of the parental lines fed with the same diet, it was evident that the values of the increment were similar to that of the H line whereas the values of the length at 1 month were similar to that of L line. A different behaviour in the two traits was detectable considering their reaction norm. The mean value

of the increment did not change when the fish were fed either with dry standard food or with live food. This was true in the selected lines, in both crosses and in the base population. On the contrary, the mean value of length at 1 month increased when the fish were fed with the live diet and this occurred in the base population, the L line and both crosses but not in the H line. The absence of increase in the H line might be explained as a reduction of sensitivity due to the antagonistic applied selection. In conclusion, the selection applied for increased length at 2 months produced an increase in body size and growth rate. The different sensitivity showed by the length at 1 month and by the length increment from 1 to 2 months in the lines and crosses, and the different behaviour of these two traits observed when the crosses were compared to the parental lines, seems to support the possibility of a separate genetic control for size and growth rate in the population *Poecilia reticulata*.

Selection of hybrids between crucian carp (*Carassius auratus Gibelio* Bloch.) and common carp (*Cyprinus carpio* L.) for improvement of reproductive ability: successes and problems

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Abstract

The males of hybrids between bisexual crucian carp and common carp has been shown to be sterile with some females producing unreduced diploid eggs. Induced gynogenesis was used to reproduce these hybrids for four gynogenetic generations (G1-G4). Backcrossing the hybrid females with the parent species males results in sterile triploid progenies. Owing to valuable fish culture traits inherited from the parent species (fast growth rate of common carp and high resistance to hypoxia and against diseases of crucian carp) as well as sterility, triploid hybrids are of great interest for fish culture. As reproductive ability of F1 females was very low, mass selection was performed to increase the yield of backcross triploid hybrids. The results of selection being performed through four subsequent generations of diploid hybrids (F1 - G3) are presented in this work. Some reproductive traits have been improved as a result of selection. The number of fish without cytological and morphological abnormalities of gonadal structure has significantly increased (from 11.8% in F1 to 96.3% in G3). The frequency of females giving eggs after pituitary injection has risen from 26 to 91% and female fecundity has risen from 39 to 117 g per kg body weight, respectively. The selection success has allowed us to obtain tens of millions of triploid hybrid larvae for industrial rearing.

At the same time we have faced a specific problem. The eggs produced by hybrid females consist of both exact diploid (100 chromosomes) and aneuploid (38-90 chromosomes) gametes. The survival of gynogenetic and backcross embryos depends on the proportion of diploid gametes which varies