salmon, we have circumvented some of these problems by developing a gene construct (pOnMTGH1) where all genetic elements were derived from sockeye salmon. This 'all-salmon' construct consists of the metallothionein-B promoter[8] fused to the full-length type-1 growth hormone gene[9], and is identical in concept to the construct first used to stimulate growth in transgenic mice[2].

We microinjected linear pOnMTGH1 DNA into the blastodisc region (animal pole) of coho salmon eggs that were developmentally arrested immediately after fertilization. From more than 3,000 eggs injected, we found that 6.2% of the individuals surviving to one year of age retained pOnMTGH1 DNA in their fin tissue. Control uninjected salmon displayed a uniform frequency distribution of weight classes (Fig. 1*a*). The group microinjected with pOnMTGH1 had the same modal weight as controls, but, in addition, contained many larger individuals that clearly lay outside the normal distribution (Fig. 1*b*). Most large individuals were transgenic in fin tissue, indicating that the presence of the pOnMTGH1 construct was responsible for the growth enhancement. Of the large fish that did not have pOnMTGH1 DNA in their fin tissue, 54 per cent were found to be positive in blood cells, confirming the mosaic nature of first-generation transgenic fish. On average, the transgenic salmon were more than 11-fold heavier than non-transgenic controls, with a range from no growth stimulation to one individual 37 times larger than controls.

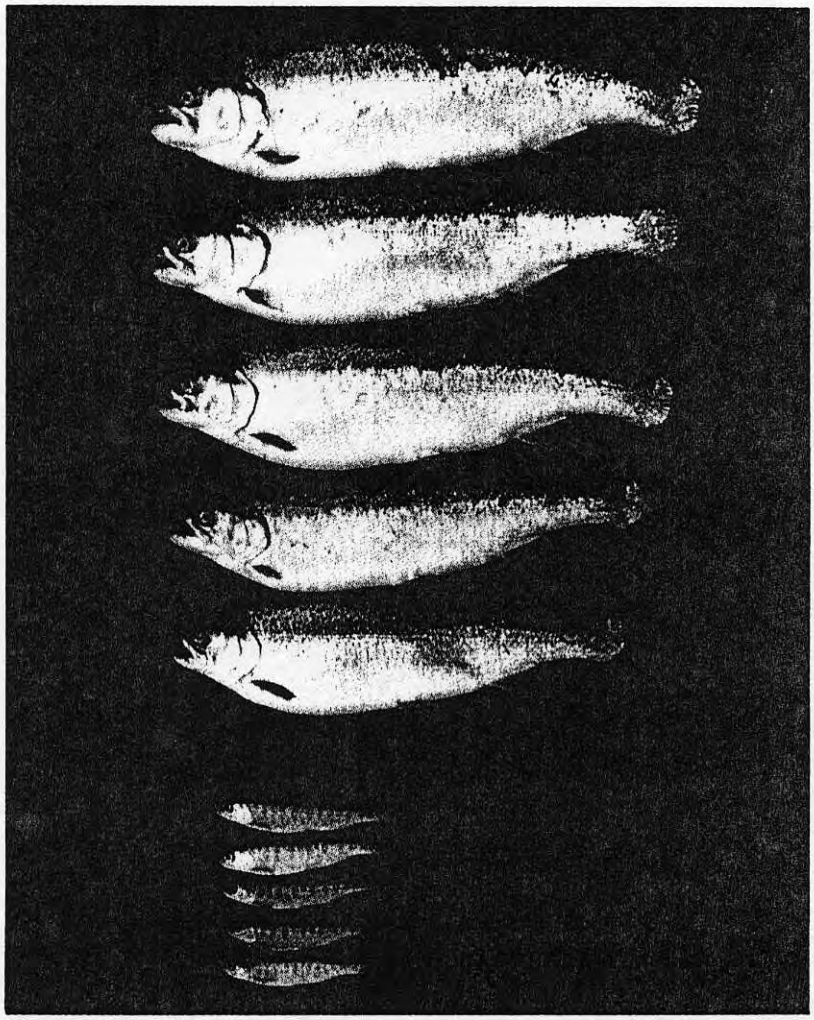

FIG. 2 Non-transgenic (bottom) and transgenic (top) coho salmon siblings at 14 months of age showing size difference and silver appearance of transgenic individuals indicative of transformation to seawater adaptability. Length of top large fish (fork length), 41.8 cm.

In addition to growth acceleration, most transgenic fish precociously developed a silver body coloration (Fig. 2) typical of salmon undergoing the physiological pre-adaptation (smoltification) necessary for the spring migration from fresh water to the marine environment. Levels of serum growth hormone in juvenile coho salmon are normally very low, then rise in the spring in correlation with smoltification[10]. In our experiments,