INTRODUCTION

Age-0 walleye pollock (Theragra chalcogramma) collected in the region around Sutwik Island and approximately 300 km farther downstream near the Shumagin Islands are believed to originate from the Shelikof Strait spawning aggregation that begins to release eggs in late March. If these juvenile fish are all from the same spawning cohort, then what accounts for the mean size difference of 20 mm standard length between areas that is repeatedly seen in September surveys? We examined the origins of the larval and age-0 life stages of walleye pollock from the Shumagin Islands and Sutwik Island areas in 2000 and 2001 to determine if hatch date, growth rate, or environmental factors may have influenced the size of the fish sampled in September. We also explored the potential contribution of larvae from another upstream spawning group on the overall abundance of larval walleye pollock.

METHODS

Otoliths were examined from three areas in 2000 and 2001 during the larval life stage: Shumagin Islands, Sutwik Island, and Shelikof Strait. Otoliths from age-0 fish were only available from the Shumagin Islands and Sutwik Island for both years. Age and growth equations were constructed and analyzed by life stage and area/year combinations. Hatch date distributions were calculated and adjusted for mortality.

A Scalbird SEACAT unit was attached to the gear to collect depth, temperature, and salinity data. ERSI’s ArcGIS was used to create the maps of temperature at 40 m. SEACAT data resulting from the four cruises were processed, de-spiked, error checked, and output as ESRI shapefiles.

RESULTS

Growth

Larval Life Stage

There were no significant differences in larval growth rates between areas for 2000. In 2001, the growth rates in Shelikof Strait were significantly different from all other areas/year (P<0.05).

Age-0 Life Stage

No significant differences in age-0 growth rates were found between the Shumagin Islands and Sutwik Island for 2000, but the growth rate for the two areas was significantly different in 2001 (P<0.05).

Temperature

The Sutwik area was warmer than the Shumagin area for both the larval and age-0 sampling periods in 2000 and 2001. In general, 2000 was cooler than 2001.

Hatch Date Distributions

Shumagin Islands

Hatch date distributions confirm that the Shumagin Islands fish are from the Shelikof Strait spawning cohort. The hatch date distributions seen in the age-0 life stage of walleye pollock sampled in this area suggests that the early hatched larvae in 2000 had enhanced mortality or emigration.

Sutwik Island

We found a mix of the Shelikof Strait spawned individuals and larger/older larvae that are advected down Shelikof Strait from another spawning area. The addition of these older larvae contributes to the overall hatch date distribution seen in the surviving age-0 walleye pollock sampled in September (especially in 2001).

Larval Size and Abundance Comparisons

Larval abundance from the Shelikof Strait spawning group has declined over time. The abundance of the early hatch larvae has remained fairly constant in and below Shelikof Strait. This contribution of larger early hatching larvae from an upstream spawning group, as a percentage of the total, has increased over time.

CONCLUSIONS

Growth rate differences, in part due to the differences in the temperature field at 40 m, do not appear to be significant enough to account for the 20 mm mean size difference in age-0 walleye pollock seen in September between the Shumagin Islands and Sutwik Island.

The hatch date distributions suggest that the age-0 population of walleye pollock sampled in the Sutwik Island area is influenced by older larval fish from an upstream spawning source. The age-0 hatch date distributions for 2000 and 2001 in this area are more similar to distributions calculated from the Shelikof Strait larvae than the Sutwik larvae. We conclude that the addition and retention of these larger/older larval in the Sutwik Island area resulted in larger fish sampled in September.

The abundance of early hatched larvae plotted over time suggests that as the Shelikof Strait spawning population has declined, the influence from an upstream spawning area (potentially Prince William Sound or Multhouse Island) has become more important to the overall abundance of larvae.