Red sea urchin (*Strongylocentrotus fransicanus*) growth and mortality rates in Southeast Alaska

Background. Southeast Alaska's red sea urchin fishery developed rapidly in 1994 when declining west coast harvest generated interest in Alaska. Urchin populations are assessed for biomass triennially and quotas are set at 6% of surveyed biomass. Harvest rate is based on an instantaneous natural mortality rate (*M*) of 0.16.

Purpose. *M*=0.16 was derived from size distribution data of limited sample size requiring assumptions of growth rate. The goal is to derive from individual growth rates more realistic estimates of mortality rate and potential for annual yield.

Method. *In situ* growth rates are estimated by measuring test diameter of urchins marked with passive integrated transponder (PIT) tags, which are unique identifiers. Red urchins are tagged at five sites of variable marine conditions and located near areas supporting commercial harvest. Annually 250 urchins are tagged per site, measured and replaced by hand using SCUBA. Urchins recaptured one year later are re-measured and returned to site. Growth, size-at-age and mortality rate is modeled using variations of Bertalanffy's growth equation (Gulland 1983) and Van Sickle's (1977) mortality equation.

Results. During 1994-2000 4,146 PIT-tagged urchins were released. Including multiple recaptures, 962 (23%) tags were recaptured. Natural and fishing mortality is assumed minimal or non-existent, however, mortality from handling is unknown. Growth rate is generally greatest among urchins between 30 and 40 millimeters, with large variation among locations. Slower growth occurs in areas exposed to open ocean conditions. By age ten urchins reach 90% of asymptotic diameter, after which growth slows considerably. Instantaneous natural mortality rate is also variable among sites.

Conclusions. Currently quotas for all Southeast Alaska red urchins targeted for harvest are calculated using *M*=0.16, which assumes little difference in dynamics among populations

occupying different marine environments or locales. These results indicate there may be large differences among populations or habitats that should be considered when applying harvest rates.

LITERATURE CITED

Gulland, J.A. 1983. Fish Stock Assessment. Wiley, Chichester, UK.

Van Sickle, J. 1977. Mortality rates from size distributions: the application of a conservation law. Oecologia 27: 311-318.