Population dynamics of juvenile snapper (*Pagrus auratus*) in the Hauraki Gulf

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"While many fish increase in weight by more than five orders of magnitude over their life span, three orders of magnitude of this change may occur in the first year of life. If one were to allocate research effort scaled by weight stanzas (physiological time) rather than by years (calendar time), one would spend much less time on large adults and would concentrate on dynamics in the first year of life."

Miller *et al.* (1988)

Abstract

The population dynamics of juvenile snapper, *Pagrus auratus*, were investigated in the Hauraki Gulf, north-eastern New Zealand, between 1982 and 1990. Attention focused on age and growth, temporal and spatial variation in abundance, and recruitment.

Daily increment formation was validated in the sagittae of snapper up to about 160 days old. Increment width varied with time of year, and snapper age, and increments were not resolvable with a light microscope during winter. Increment counts inside a prominent metamorphic mark showed that larval duration was 18-32 days, and was inversely related to water temperature. Spawning dates were back-calculated from increment counts in settled juveniles, and ranged from September to March with a peak in November-January. The onset of spawning was temperature dependent. Fast-growing snapper had smaller sagittae than slow-growing snapper, indicating an uncoupling of otolith and somatic growth.

Snapper gonads differentiated first as ovaries during the second year of life, and then some juveniles changed sex to become males during their third year. Sex change occurred before maturity, so snapper are functionally gonochoristic. Growth was slow during the larval phase, but increased rapidly after metamorphosis to about 0.6-0.9 $mm.day^{-1}$. From the first winter, growth followed a well-defined annual cycle, with little or no growth during winter, and linear growth of 0.16-0.43 $mm.day^{-1}$ during spring-autumn for 0+/1+ and 1+/2+ snapper. Snapper grew faster at higher temperatures.

Trawl catch rates were affected by numerous gear and environmental factors, but probably provided reasonable estimates of snapper relative abundance. Recommendations are made for improving snapper trawl survey procedures. There was a strong annual abundance cycle in the Kawau region, peaking in spring, and declining to a minimum in winter. Snapper were patchily distributed at a spatial scale of 1-2 km, probably because of preference for specific micro-habitats. Year class strength of 1+ snapper varied 17-fold over seven years, and was strongly positively correlated with autumn sea surface temperature during the 0+ year. The strengths of the 1991 and 1992 year classes are predicted to be below average, and extremely weak, respectively.

Acknowledgments

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