

Larval development of yelloweye rockfish, *Sebastes ruberrimus*

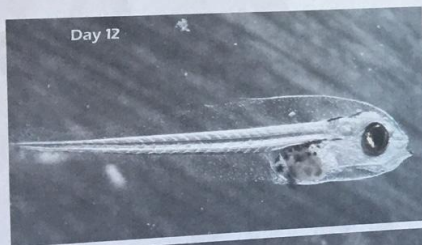
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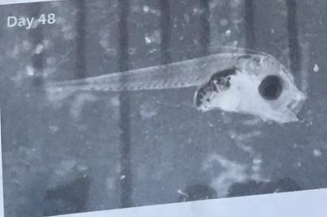
Days 1 and 2
Birth size is 4.2 to 5.5mm total length. Larvae gather in lighted areas of tank. Feeding is apparent, forming an 'S' shape before striking at rotifers. They are not strong swimmers.



Adult yelloweye rockfish



Days 12 thru 15 (above)
Size is 5.0 to 5.7mm total length. Larvae feed on new "small" type Artemia, actively coming to food and returning to favored area when done.



Days 44 thru 48 (below)
Size is 6.8 to 6.3mm total length. Pectoral fins are formed and used for swimming. Pigment is evident on skin overlaying the gut. Larvae now feed on 48 hr. enriched Artemia, rotifers and plankton. Flexion has started.

INTRODUCTION

Rockfish (*Sebastes* sp.) have long been the target of commercial and recreational fisheries. Particularly lucrative is the fishery for small rockfish for the live fish market where high prices (up to \$20/kg) are paid. A large number of rockfish stocks are depleted. Low natural productivity and slow growth lead to natural rebuilding times (to MSY) on the order of 40-100 years for many of these stocks.

Yelloweye rockfish is one of the more severely depleted populations on the west coast. The amount of fish caught in by-catch from otherwise healthy fisheries may exceed MSY, potentially resulting in the closure of several high value fisheries (whiting, sablefish and halibut).

As described in the NOAA Fisheries Stock Assessment Improvement Plan (Mace et al., 2001), there is a need for more data on the life history characteristics for all rockfish species. An overall aim of our rockfish studies is to obtain enough numbers of larval and juvenile fish to improve our knowledge of growth potential, energetics, swimming speeds, and maturity rates, among other factors. Photo-documentation of rockfish larval development of known ages, as described here, may help species identification of larvae collected in marine surveys. This study documents larval development and the first successful rearing of yelloweye rockfish using techniques adapted from the marine fish culture industry.

MATERIALS AND METHODS

- Pregnant *Sebastes ruberrimus* were collected from the Seattle Aquarium and transported to the Mukilteo Field facility and held in 2m diameter tanks with low light levels until larvae were extruded. At this time the female was removed and the flow of water into the tank was reduced.
- Groups of larvae were then moved into smaller circular tanks (d=122 cm x h=61 cm) for intensive rearing or transported to the Manchester Field Station for rearing in the FISH system.
- Larvae are reared under filtered natural sunlight (28 to 182 lux) at 33 ± 1ppt salinity seawater.
- Rotifers were raised in a greenhouse on live algae, *Nannochloropsis* sp. They were harvested 24 hours in advance of feeding to larval fish, and enriched with either *Nannochloropsis* paste concentrate, live *Nannochloropsis*, Aquagrow DHA or Algalmac-2000 in 90L tanks under heavy aeration and constant light from fluorescent bulbs. Rotifers were then fed to the larvae on a daily enrichment-rotating basis.
- Artemia were hatched from cysts in hatching cones and enriched in a similar fashion as the rotifers. Enriched Artemia were two-days-old when fed to the fish larvae.

Days 66 thru 77 (below)

Size is 12 to 15cm total length. The tail is almost formed along with many head spines. Rays are developing for dorsal and anal fins. Dorsal, caudal and pelvic fin are well-defined by Day 77.



- Wild zooplankton was harvested with a plankton separator and fractionated into size ranges. Size fraction of similar size to Artemia nauplii was fed to the larval rockfish. No enrichment was done to wild zooplankton.
- Larvae were fed 4 times a day, seven days a week.
- Fish were photographed every 2-5 days with a Kodak DC-290 digital camera though a Nikon SMZ1000 microscope.