

HOW OLD ARE SPAWNING GRUNION (*LEURESTHES TENUIS*)?

Sonia Fang (08), Delsa Anderl¹, Dr. Daniel Kimura¹, Professor Nina Karnovsky*²,
¹National Oceanic and Atmospheric Administration, National Marine Fisheries Service,
Alaska Fisheries Science Center, Seattle, WA; ²Department of Biology, Pomona
College, Claremont, CA

Photo 1: Sonia Fang waiting to collect a clutch of grunion eggs. (Don Kelson, 2006)

Photo 2: Grunion spawning on a run night at Laguna Beach.

Introduction

- The California grunion (*Leuresthes tenuis*) is a teleost fish that spawns terrestrially from March through August during high tides (Clark, 1938)
- Previous age studies were based on reading scales (Clark, 1938)
- Scale reading can underage fish species (Sipe and Chittendon, 2001)
- Otoliths are calcium carbonate formations found in fish ears and form annual growth marks (annuli)
- Otoliths are a better measure for aging fish (Hining et al., 2000)

Hypothesis

- As spawning intensifies, older grunions will predominate
- Assuming older grunions are more experienced
- Assuming older grunions will spawn on nights with more potential spawning mates.

Materials and Methods

- Collected grunion by hand during runs from May through June 2006 at Laguna Beach
- Noted spawning intensities.
- Measured total length, standard length, sex
- Removed sagittal otoliths with scalpel and forceps
- Removed scales behind pectoral fin under lateral line
- Photographed otoliths submerged in water
- Photographed scales with transmitted light
- Aged otolith and several scales with ImagePro and Adobe Photoshop

Results

- Observed increase of spawning intensity as run proceeded
- Younger grunions arrived on spawning-intensive nights, but trend insignificant ($p > 0.05$) (Figure 1)
- Scale samples underage grunion (Figure 2)

Photo 3: Measuring standard and total length of a grunion

Results continued

- Grunions older than previously reported, with a mean age of 3.4 years and a maximum of 5 years of age.
- Female grunions were significantly larger than male grunions although not significantly older, corroborating previous studies ($p=0.003$)
- Ages significantly correlated with fish length, mass, and otolith length (Spearman's $Rho=0.246, 0.289, 0.244$, respectively)

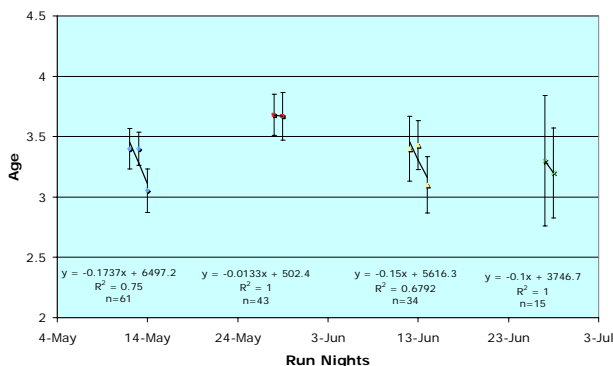


Figure 1: The average age of grunion per run night over the course of two months. Ages decrease as run intensity, but insignificantly ($p > 0.05$)

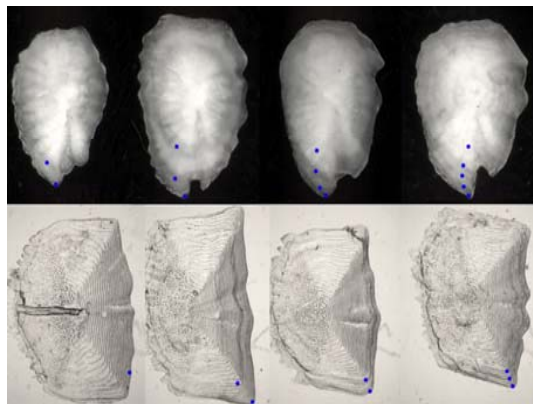


Figure 2: Comparing otoliths and scales. Blue dots represent annuli. Top row shows aged otoliths, fish ranging from 2-5 yrs. Bottom row shows corresponding scales that underage, ranging from 1-3 years

Discussion

- Hypothesis was not supported: Younger fish spawn on more intense nights
- Perhaps older fish spawn on earlier nights because the conditions are more favorable for successful hatching
- Tides are highest earlier in run: will deposit eggs higher up the beach and bury eggs deeper in sand (Clark, 1938)
- Eggs can survive up to 35 days after prime hatching time under sand (Darken et al., 1998) but not premature washing out (Clark, 1938)
- Perhaps younger predominate due to stronger cohort
- Runs erratic, only 2-3 nights of spawning

Acknowledgements

I thank Dr. Nina Karnovsky for advising my research. Thanks to Dr. Daniel Kimura and members of the Age and Growth Lab at the Alaska Fisheries Science Center. I would especially like to thank Delsa Anderl for ageing advise, and Craig Kastle and Charles Hutchinson for ageing techniques. Thanks to Caitlin Guthrie, Casey Williams, Max Kowal, Zachary Brown, and Caroline Townsend for their fieldwork help. Funded by Pomona College Summer Undergraduate Research Program.

Literature Cited

Clark, FN. 1938. Grunion in Southern California. *California Fish and Game*. 24(1):49-54.
Darken, RS.; KL Martin; MC Fisher. Metabolism during delayed hatching in terrestrial eggs of a marine fish, the grunion *Leuresthes tenuis*. 1998. *Physiological Zoology*. 71(4):400-6.
Hining, KJ; JL West; MA Kulp; and AD Neubauer. 2000. Validation of Scales and Otoliths for Estimating Age of Rainbow Trout from Southern Appalachian Streams. *North American Journal of Fisheries Management*. 20(4):978-985.
Sipe A. M.; M. E. Chittenden, Jr. 2001. A comparison of calcified structures for aging summer flounder, *Paralichthys dentatus*. *U.S. National Marine Fisheries Service Fishery Bulletin*. 99:628-640.

Photo 4: Laguna Main Beach

