Grunion

History of the Fishery

The commercial use of grunion (*Leuresthes tenuis*) is very limited, this species forming a minor portion of the commercial "smelt" catch. Grunion are taken incidentally in bait nets and other round haul nets, and limited quantities are used as live bait. In recent years, no commercial landings have been reported. However, since grunion usually are taken with other small fish and are not separated out, catch records would not show any landings.

The grunion's principal value is as the object of a unique recreational fishery. These fish are famous for their spawning habits, which are so remarkable as to arouse an "I don't believe it" response from a person hearing about them for the first time. They are the only species of fish in California to actually leave the water to spawn in wet sand on beaches. They are subjects of widespread popular interest, bringing thousands of people to beaches during night high tides in spring and summer months to catch the fish or just to observe them. Grunion hunting has become one of the famous sports of southern California. As the fish leave the water to deposit their eggs, they may be picked up while they are briefly stranded. Racing for fish spotted far down the beach and clutching for the small bits of slippery, wriggling energy provide an exhilarating time for young and old alike. The attraction provided by grunion can only be realized when one sees the numbers of people lining the more popular beaches in the Los Angeles area on the night of a predicted run. Often there seem to be more people than fish, but at other times, everyone catches fish.

In the 1920s, the recreational fishery was showing definite signs of depletion, and a regulation was passed in 1927 establishing a closed season of three months, April through June. The fishery improved, and in 1947, the closure was shortened to April through May. Grunion may be taken by sport fishermen using their hands only. No appliances of any kind may be used to catch grunion, and no holes may be dug in the beach to entrap them. Anglers sixteen years of age and older must posses a valid sport fishing license. Grunion may be taken June 1 through March 31. There is no bag limit for grunion.

Grunion, *Leuresthes tenuis*
Credit: Mike Brock

Status of Biological Knowledge

The grunion is now classified in the family of New World silversides, Atherinopsidae, along with the jacksmelt and topsmelt in California. They are small, slender fish with bluish green backs, silvery sides and bellies. Silversides differ from true smelts, family Osmeridae, in that they lack the trout-like adipose fin. They normally occur from Point Conception, California, to Point Abreojos, Baja California. They are rarely found from San Francisco on the north to San Juanico Bay, Baja California, on the south. They inhabit the nearshore waters from the surf to a depth of 60 feet. A description of their essential habitat would be the surf zone off sandy beaches. Marking experiments indicate that they are nonmigratory.

Young grunion grow very rapidly and are about five inches long by the time they are one year old and ready to spawn. Grunion adults normally range in size from five to six inches with a maximum size recorded at 7.5 inches. Average body lengths for males and females respectively are 4.5 and 5.0 inches at the end of one year, 5.5 and 5.8 inches at the end of two years, and 5.9 to 6.3 inches at the end of three years. The normal life span is two or three years, but individuals four years old have been found. The growth rate slows after the first spawning and stops completely during the spawning season. Consequently, adult fish grow only during the fall and winter. This growth rate variation causes annuli to form on the scales, which have been used for aging purposes.

Grunion spawn at night on the beach, from two to six nights after the full and new moon, beginning a little after high tide and continuing for several hours. As a wave breaks on the beach, the grunion swim as far up the slope as possible. The female arches her body, keeping her head up, and excavates the semi-fluid sand with her tail. As her tail sinks, the female twists her body and digs tail first until she is buried up to her pectoral fins. After the female is in the nest, up to eight males attempt to mate with her by curving around the female and releasing their milt as she deposits her eggs about four inches below the surface. After spawning, the males immediately retreat toward the ocean. The milt flows down the female's body until it reaches the eggs and fertilizes them. The female twists free and returns to the sea with the next wave. The whole event can happen in 30 seconds, but some fish remain on the beach for several minutes.

Spawning may continue from March through August, with possibly an occasional extension into February and September. However, peak spawning is from late March through early June. Once mature, an individual may spawn during successive spawning periods at about 15-day intervals. Most females spawn about six times during the season. Counts of maturing ova to be laid at one spawning ranged from about 1,600 to about 3,600, with the larger females producing more eggs.

The eggs incubate a few inches deep in the sand above the level of subsequent waves. They are not immersed in seawater, but are kept moist by the residual water in the sand. While incubating, they are subject to predation by shore birds and sand-dwelling invertebrates. Under normal conditions, they do not have an opportunity to hatch until the next tide series high enough to reach them, in 10 or more days. Grunion eggs can extend incubation and delay hatching if tides do not reach them, for an additional four weeks after this initial hatching time. Most of the eggs will hatch in 10 days if provided with the seawater and agitation of the rising surf. The mechanical action of the waves is the environmental trigger for hatching, and the rapidity of hatch, in less than one minute, indicates that it is probably not an enzymatic function of softening the chorion, as in some other fishes. One can witness the spectacle of grunion eggs hatching. If you gather a cluster of eggs after a grunion run, keep them in a loosely covered container of damp sand in a cool spot. After 10 to 15 days, place some in a jar of seawater shaken briefly, and they will hatch before your eyes in a few minutes.

Grunion food habits are not known. They have no teeth, and feed on very small organisms, such as plankton. In a laboratory setting, grunion eat live brine shrimp. Humans, larger fish, and other animals prey upon grunion. An isopod, two species of flies, sandworms, and a beetle have been found preying on the eggs. Some shorebirds such as egrets and herons prey on grunion when the fish are on shore during spawning. The reduction of spawning habitat, due to beach erosion, harbor construction, and pollution is probably the most critical problem facing the grunion resource.

Status of the Population

Despite local concentrations, the grunion is not an abundant species. While the population size is not known, all research points to a rather restricted resource that is adequately maintained at current harvest rates under existing regulations.

Management Considerations

See the Management Considerations Appendix A for further information.

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References

Clark, F.N. 1925. The life history of *Leuresthes tenuis*, an atherine fish with tide controlled spawning habits. Calif. Div. Fish and Game, Fish Bull. 10. 51 p.

Darken, R. S., K. L. M. Martin, and M. C. Fisher. 1998. Metabolism during delayed hatching in terrestrial eggs of a marine fish, the grunion Leuresthes tenuis. Physiological Zoology 71: 400-406.

Dyer, B. S. and B. Chernoff. 1996. Phylogenetic relationships among atheriniform fishes (Teleostei: Atherinomorpha).Zoological Journal of the Linnaean Society 117: 1-69.

Griem, J. N. and K. L. M. Martin. 2000. Wave action: The environmental trigger for hatching in the California grunion, Leuresthes tenuis (Teleostei: Atherinopsidae). Marine Biology 137:177-181.

Spratt, Jerome D. 1971. The Amazing Grunion. Marine Resources Leaflet No. 3. Calif. Dept. Fish and Game.

Thompson, W.F. 1919. The spawning of the grunion (Leuresthes tenuis). Calif. Fish and Game Comm., Fish Bull. 3. 27 p.

Walker, B. 1952. A guide to the grunion. California Fish and Game 38: 409-420.