

Rock Scallop

History of the Fishery

Purple-hinge rock scallops (*Crassadoma gigantea*, referred to in earlier literature as *Hinnites multirugosus*) are very popular among sport divers and shore collectors in California, Mexico, and the Pacific Northwest. The shellfish is prized for its flavorful, almost sweet, meat (adductor muscle). No commercial taking of rock scallops has been allowed in California. The California Department of Fish and Game (DFG) determined several decades ago that these mollusks were patchy in distribution and commercial exploitation would endanger their survival. Thus, rock scallops have remained in the domain of the non-commercial collector. Large numbers of rock scallops are taken by collectors at low tides and by divers near shore or aboard sport diving vessels in southern California.

It is difficult to estimate landings of rock scallops since many are taken incidentally. However, records of the DFG 1978-1987 indicate an average of 928 were taken per year by divers from commercial passenger sport diving boats operating largely at the Channel Islands.

The scallops are usually pried from their attachment surfaces with an "abalone iron." The large adductor muscle is easily shucked from the opened shells and separated from mantle and viscera. Divers often eat the scallops fresh from the shell, either underwater or above! As part of a research program at San Diego State University, rock scallop adductor muscle samples were analyzed by a professional taste panel, compared to common brands of commercial scallops. By almost all criteria, rock scallops ranked superior to others.

Status of Biological Knowledge

The purple-hinge rock scallop is distinctive, typically having an irregular oval outline, a rather rugose upper free shell (left valve) and a tentacle-bearing mantle, usually orange or gray. The interior aspect of the hinge line on both valves bears a zone of purple pigment. Adults typically are firmly attached to the substratum, in contrast to most other scallops that live free on sand or mud bottom. After passing a free-living juvenile life, attachment is achieved by temporary byssal threads. Permanent attachment occurs once the young scallop reaches a size of about one-inch through deposition of shell material by the right valve in conformity to the microrelief of the substratum.

Throughout its range from Sitka, Alaska, to Magdalena Bay, Baja California, Mexico, the rock scallop is generally found from the lower intertidal to depths as great as 100 feet. Offshore reefs are typically populated, but concrete pier pilings and jetty rock at entrances to bays in southern California have become favored habitats. Commonly this

shellfish measures five to six inches in shell diameter, but occasionally individuals exceeding eight inches are found.

Sexes are separate although cases of hermaphroditism have been reported. An increase in number of females relative to males among larger adults has suggested protandry (functioning early as males, but later becoming females). Other possible explanations for this finding include differential growth rates and/or survival. Southern California rock scallops exhibit a bimodal annual reproductive cycle with spawning periods in late spring-early summer and again in mid-fall.

Rock scallops are filter feeders deriving the bulk of their nutrition from phytoplankton. Dinoflagellates appear to dominate the diet. Detritus may also be utilized as food. Predation may limit numbers of rock scallops chiefly due to losses of early free-living and newly cemented juveniles to sea stars and crabs, but adults enjoy a high degree of immunity to such activity by virtue of their ability to close sharp margined valves quickly. However, sea otters may succeed in breaking the shells of adult rock scallops using their favored tools, cobble stones.

An intensive study of the biology and aquaculture potential of the rock scallop was undertaken in the mid-1970s by researchers at San Diego State University, supported by the UC Sea Grant Program. Basic biological information was gained concerning reproduction, culture, foods, and environmental requirements. Under the most favorable conditions, growth rate of juveniles and young adults held in the sea in suspended culture exceeded two inches per year. It was established that the rock scallop could be reared from the microscopic egg to marketable size (four to five inches) in about two and a half years.

Rock scallops proved intolerant of salinity reduction greater than 30 percent. Thus, the species is not found in estuaries and bays where freshwater dilutes the saline water to levels below 25 parts per thousand. In areas with well-circulated oceanic water, adults proved amazingly hardy; survival from juvenile to adult stages was usually close to 100 percent.

For many years, oyster farmers at Point Reyes have reared rock scallops in pens for sale at a local retail market. Juveniles set naturally among the oysters under cultivation in Drakes Estero are recovered and placed in submerged mesh cages for rearing to a size of about five inches (about two years). These scallops are sold for about \$1 each. The adductor muscle in scallops of that size weighs about a tenth of a pound. Rock scallop meats, therefore, were valued (1982) at \$10 per pound.

While rock scallops in southern California show two spawning peaks during the year, some northern populations spawn only once a year. Year-round spawning can be achieved in the hatchery. Larvae are reared through their

planktonic stages (about five weeks) and fed unicellular algae until settlement and the onset of metamorphosis. Early juvenile stages at 1/16- to 1/8-inch cling to the substrate by byssal threads. These anchoring filaments may be detached by the young scallop, allowing swimming for brief periods and relocation if necessary. When the juvenile scallop reaches one-half to one inch (about six months), attachment becomes permanent through cementation. Usually firm substrates such as rock and shell are preferred in nature. Specially formed plastic surfaces are provided for cementation in aquaculture.

Through experiments conducted at San Diego State University, it was found that metamorphosing young rock scallops may be collected from the plankton using "spat collectors" developed in Japan for the Japanese sea scallop. The spat collectors, onion bags packed with monofilament gillnetting, are now known to be attractive to larvae of many species of scallops, regardless of adult habitat. As an alternative to production of young in a hatchery system, the simple placement of spat collectors at intermediate depths in the ocean for several months' time is an economic advantage. Several aquaculture groups in California, Washington state, and British Columbia, have tested the concept of rock scallop spat collection. The principal difficulties encountered so far are coincident collection of pink and spiny scallops and in northern waters, and kelp scallops in southern waters, making separations tedious. Typically, a single spat collection bag, approximately one cubic foot, immersed at a depth of 20 feet for two months, will yield between 100 and 500 juvenile scallops, perhaps 25 percent being rock scallops. Until commercial hatcheries are developed to produce substantial numbers of juvenile stock available to growers at a few cents each, the use of spat collectors seems a preferred practice. In addition, commercial hatcheries in Washington state and Alaska have produced commercial quantities of seed for their own use. The seed is available to other shellfish growers for purchase at reasonable prices.

Generally, rock scallops have not been subject to problems associated with pollutants. The adductor muscle is usually all that is consumed. That tissue is not a storage organ for metabolites or toxins. A single case of paralytic shellfish poisoning was reported in 1980 during a red tide off northern California. In this instance, which was fatal, a diver consumed viscera in addition to the adductor muscle from several scallops. This unique case is thought to have been exacerbated by alcohol consumed by the victim at the same time.

Status of the Population

This shellfish is locally common, especially on offshore reefs, but in no case is it numerous. Heaviest take of rock scallops occurs at spots frequented by sport diving vessels. Larger adults are becoming rare in these locations and individuals as small as two inches are being taken in large numbers. The present bag limit is 10, but rock scallops may benefit from some size, bag, and seasonal limitation.

Management Considerations

See the Management Considerations Appendix A for further information.

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References

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