

November, 4, 2005

From: Michael DeLapa, Central Coast Project Manager, MLPA Initiative
To: Central Coast Regional Stakeholder Group (CCRSG)
Re: Follow-up on Pismo clams

At the September meeting of the CCRSG, we provided responses to a number of information requests, including a request for information regarding factors depressing populations of Pismo clams and what might be done to increase the abundance of clams and other species. A follow-on question was posed to which we respond below.

Question:

Should the Pismo clam, *Tivela stultorum*, be on the list of species likely to benefit from MPAs because of its depleted status?

Response:

The Pismo clam has been included on the list only for MPAs where otters are not present because it is not likely to benefit from protection from fishing within the central coast study region where there is an established presence of a major predator species, the southern sea otter. Pismo clam populations were depleted in southern California in 1982-93 due to major winter storms. Between 1990 and 1994, sea otters re-established themselves within the area containing the three Pismo clam state marine conservation areas (SMCA) in San Luis Obispo County. They had previously occupied the area in the mid- to late 1980s but are believed to have moved offshore for several years. Foraging on the larger Pismo clams by otters reduced the availability of legal-sized clams (minimum 4.5 inches greatest shell diameter) to recreational harvesters. CDFG clam transects and interviews of recreational clam harvesters, conducted annually in the Pismo Beach to Morro Bay area, documented this event. For example, in 1990, 32 of 224 clammers were interviewed on Pismo Beach; those 32 clammers harvested 204 legal-sized clams (6.4 per person). In 1994 and in subsequent years, CDFG transects have yielded virtually no clams over 3 inches in diameter. For these reasons, the three state marine conservation areas designed to help sustain the harvest of legal-sized Pismo clams in adjacent areas no longer meet their original objective. The present Pismo clam population status is unknown, although there are insufficient numbers of legal-sized clams within the central coast study region to support a fishery.

Not all species can be expected to benefit from protection in MPAs. Effects of MPAs will depend on the level of fishing effort on that species prior to MPA establishment, interactions with other species, the population status of the species, and external environmental influences. Populations that were not fished before MPA establishment would not be expected to necessarily benefit from protection from fishing. Their response will depend on whether they interact with fished species affected by the MPA. For example, increases in their prey species could benefit unfished species. In contrast, increases in their predators could result in declines within MPAs. Both types of indirect effects have been observed in MPA studies.

This dependence on the context of species interactions also extends to fished species. For example, red sea urchins, *Strongylocentrotus franciscanus*, may respond to MPA protection differently in different regions of California. In the north, where urchins are fished and they have few predators, their numbers would likely increase in MPAs where urchin fishing was banned. In southern California, urchins are not fished, but California sheephead, *Semicossyphus pulcher*, one of their major predators is fished. Abundances of this predator would be expected to increase in MPAs, leading to decreased numbers of urchins. Finally, in central California, urchins are not fished, but they do have a strong predator – the sea otter, *Enhydra lutris*. Because neither species is harvested, densities of urchins should not be altered by MPAs because otter densities will be the same inside and outside of MPAs. Similarly, Pismo clams, which have been harvested, have not recovered in MPAs established for their protection because of strong predation by otters within their range. For this reason, Pismo clams, though depleted, are not listed as a species likely to benefit from MPAs.

As mentioned above, other factors such as the population status of the species and external environmental forcing factors may also affect whether a species is likely to benefit from spatial protection. Severely depleted species may experience what are known as Allee effects – when populations drop below a certain threshold, their population growth rate actually declines. This could be because individuals are too sparsely distributed to successfully reproduce, because they become more vulnerable to predation when at low densities or other mechanism. In such cases, (e.g. white abalone, *Haliotis sorenseni*, in southern California), restoration efforts such as captive breeding may be required to allow populations to recover. Finally, changing environmental conditions (e.g. ENSO or the Pacific Decadal Oscillation) can interact with MPA establishment and affect the outcome for populations in MPAs.