California Marine Life Protection Act Initiative
Responses to Questions Received at the November 18-19, 2008 South Coast Regional Stakeholder Group Meeting

Revised February 24, 2009

The questions listed below were received at the November 18-19, 2008 meeting of the MLPA South Coast Regional Stakeholder Group (SCRSG). MLPA staff and the MLPA Master Plan Science Advisory Team (SAT) co-chairs have reviewed the questions and determined that some questions are policy or management-based, while others are science-based or may have both policy and science components.

This document contains responses to all of these questions. I-Team staff will/has provide(d) responses to the policy/management questions, while the SAT will/has provide(d) responses to the science questions. Some questions contain both policy and science responses.

1. **Where does California halibut *Paralichthys californicus*, fall on the scale of dispersal distance for both adult and larval stages?**

   SAT Response – Approved January 27, 2009: California halibut (*Paralichthys californicus*) are multiple broadcast spawners, typically releasing egg and sperm in shallow water (9-20 m) (Allen 1988, Moser and Watson 1990, Kramer and Sunada 1992). Spawning occurs predominantly in shallow, nearshore waters between February and July from the Baja Peninsula, Mexico to Point Conception, California, although spawning can occur year round (Lavenberg et al. 1986, Moser and Watson 1990). Fertilized eggs generally float in the upper 30 m of the water column shoreward of the 75 m isobath (Lavenberg et al. 1986, Moser and Watson 1990, Moser and Pommeranz 1999), but they have been collected near the sea surface down to depths of 75 m (Barnett et al. 1984). Newly hatched larvae remain in the plankton for a relatively short period of approximately 20-29 days and are distributed across the continental shelf in surface waters prior to onshore transport (Allen 1988, Moser and Pommeranz 1999). Spawning coincides with a weakening of offshore winds in winter-spring and the strengthening of onshore winds, followed by an increase zooplankton production (Petersen et al. 1986, Moser and Watson 1990). The prevailing onshore winds are thought to be one mechanism for transporting halibut larvae shoreward to where high concentrations of zooplankton are known to occur between April and June (Petersen et al. 1986).

   California halibut larvae transform into juveniles when they are approximately one month old (~8 mm) and settle to the bottom (Allen 1988, Gadomski and Petersen 1988). Juvenile halibut (10-200 mm) settle in both protected inshore areas (i.e., bays, estuaries, and lagoons) and shallow, exposed open coast areas because they provide an optimal habitat for growth and survival (Allen 1988, Kramer 1991, Valle et al. 1999, Forrester and Swearer 2002, Fodrie and Mendoza 2006, Fodrie and Levin 2008). Not as well understood, however, is the geographically separated distribution and habitat usage by larger juvenile and sub-adult California halibut (1+ year old) migrating from nursery habitats to deeper open coast areas to join adult populations (Allen et al. 1990, Swearer et al. 2003).

   A recent study utilizing elemental fingerprinting demonstrated that juvenile halibut (50-250 mm) do not migrate far from their nursery origins (<10 km) along the San Diego coastline (Fodrie and Levin 2008). Domeier and Chun (1995) suggested that the first significant movement of juvenile California halibut occurs when they migrate to open coast waters at a size of at least 200 mm (approximately eight inches). Tagging studies conducted by the California Department of Fish and Game indicate that young (mostly sub-legal sized) California halibut are only moderately mobile and most stay within 2-5 km of their release site for months or years although some move hundreds of km within that same time period (Tupen 1990, Domeier and Chun 1995, Posner and Lavenberg 1999).

Adult California halibut live in open coastal waters and are associated with a variety of habitats, including soft bottom, sand dollar beds, kelp beds, and areas of rocky relief ranging in depths from the surf zone to 183 m (Feder et al. 1974, Eschmeyer et al. 1983), but they are more abundant in waters < 30 m (Kramer and Sunada 1992). Any distinctions between adult and juvenile patterns of movement are still unclear, as few of the halibut in the tagging studies were larger than 500 mm. However, there is information to suggest that larger halibut may be more mobile than small halibut. For example, Domeier and Chun (1995) found that halibut larger than 500 mm (~30% of sample size) tended to travel markedly greater distances (~10's of kilometers) than halibut smaller than 500 mm.

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2. Is the survivorship of larvae within a marine protected area reduced due to increased biomass and therefore increased numbers of predators?

SAT Response – Approved February 24, 2009: The answer to this question depends on the stage of larvae. In most benthic marine ecosystems targeted for protection by marine protected areas (MPAs), such as shallow or deep rocky reefs, larvae are first exposed to predators when they are initially released from benthic egg masses (e.g., cabezon, ling cod, kelp greenling) or extruded from females (e.g., rockfishes), and again when late stages of larvae are delivered by currents to settle in habitats within an MPA. Very little is known about predation by predatory fishes on the early, recently released, stage of larval fishes. Predators on these small larvae are planktivorous fishes such as senoritas, blacksmith, and topsmelt. Because many of these planktivorous species are eaten by piscivorous fishes that are protected by MPAs (e.g., kelp bass, barred sand bass), their abundances in MPAs may actually decline, thereby reducing predation rates on these early larval stages. However, the net effect of this change in survival of early stage larvae is unclear, because the vast majority of these larvae likely die in the plankton.

Predation on later stage larvae that settle to benthic habitats in MPAs is more likely to increase within MPAs because of increases in the abundance of piscivorous fishes, such as kelp bass and barred sand bass. A growing number of studies on the relationship between predators and survival of young fish indicate that the rate of predation on these juvenile fishes (and conversely, their survival) is based on several factors, including the abundance of predators, the abundance of young fish, and the abundance of refuge from predators (Carr and Syms 2006, Steele and Anderson 2006). Generally, rates of predation on these juvenile fishes during and just after settlement are high and the rate of growth, survival and reproduction of many piscivorous fishes is influenced by the delivery of young fish to a site. Predation rates increase with predator density, but the magnitude of increase depends on the number of young fish that settle to an area and the availability of refuge (reviewed by Steele and Anderson 2006). This relationship is density-dependent, such that, for a given number (density) of predators, the rate of predation increases with increasing number (density) of young fish. High numbers of young settling to a habitat will experience disproportionately higher mortality than when few numbers of young settle to a habitat. One key reason for this relationship is the effect of refuge from predation (crevices in rocky bottom, physical structure created by many species of algae) on predation rates. The effect of increased predator abundance is heightened when refuge availability is low (many of the young are exposed to predators) and diminished when refuge availability is high (many of the young are protected from predators). Thus, the net effect of increased predators in an MPA will very much depend on how many young fishes are delivered to a site each year and how much refuge is available for those young fish. Especially when settlement rates are high and refuge availability is relatively limited, increasing predator abundance will decrease juvenile survival. The literature supporting these general conclusions is summarized in recent reviews (Carr and Syms 2006, Steele and Anderson 2006) and relevant studies published subsequent to those reviews (Johnson 2006a,b, 2007).

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3. How will spacing guidelines be applied between the Channel Islands?

Status: A response to this question is being developed.

4. What information on hooking mortality and bycatch is available for catch and release fisheries in the MLPA South Coast Study Region?

SAT Response – Approved February 24, 2009: "Catch and release" fishing is a recreational fishing practice in which the intent is to unhook and release fish alive and uninjured after capture. There are currently no marine fisheries that are regulated as or strictly practiced as "catch and release" in the study region. However, catch and release is practiced by some recreational anglers.

Creel surveys provide some statistical data on catch and release rates of target species and associated catch species fished in the MLPA South Coast Study Region. Recreational marine fishery catch statistics have been collected on southern California fisheries from 1981 through 2003 by the Marine Recreational Fisheries Statistics Survey (MRFSS) and the California Recreational Fishery Survey (CRFS) from 2004 through the present. CRFS and MRFSS produce estimates of numbers of fish caught and released alive or discarded dead by species for shore and boat based angler trips. However, these creel surveys do not provide statistics specific to catch and release fishing trips, and data from these surveys have limited application in examining effects of catch and release fishing practices on target species and associated catch species.

Various issues have been identified in association with catch and release angling. Effects of catch and release angling may impact reproductive success and increase susceptibility to predation and disease for released individuals (Bartholomew and Bohnsack, 2005). Other sub-lethal effects may include increased levels of stress hormones, decreased gamete quality in fish (Cooke et al., 2006). Lethal effects have also been identified for both target and associated species, such as post release and handling mortality (Bartholomew and Bohnsack, 2005; Cooke *et al.*, 2006).

Few studies have been published regarding catch and release angling issues for Southern California fish species that predominantly occur in state waters. A study by Aalbers et al. (2004) found a 10% post-release mortality rate for hatchery raised white seabass (*Atractoscion nobilis*) using both offset circle and J-type hooks, and a significant correlation between hook location and mortality. Jarvis and Lowe (2008) studied mortality rates for a variety of rockfish (*Sebastes*) species caught by hook and line. Holding times were the most significant factor reported, with a 32% mortality rate overall for both 10-minutes and two-days after capture. However, the rates reported varied greatly by species with 64% mortality for squarespot rockfish (*Sebastes hopkinsi*) and 18% mortality for starry rockfish (*Sebastes constellatus*) after two days post-release.

Bartholomew and Bohnsack (2005) conducted a meta-analysis of post-release mortality estimates, combining salmonids, marine and freshwater species (n= 274 mortality estimates). An overall mean mortality of 18%, with a median rate of 11%, was reported for catch and release angling, and mortality rates varied greatly by species and ranged from 0 to 95%. Seven statistically significant mortality factors were identified for catch and release angling:

- hook location,
- natural bait,
- removing hooks from deeply hooked fish,
- J-hooks,
- depth of capture,
- warm water temperatures, and
- extended playing and handling times.

References

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5. **Shouldn't the level of protection (LOP) for urchin harvest be higher, since this activity helps to maintain kelp forests which are important ecologically? Given that otters are not currently found in the southern California kelp ecosystem, can humans be considered a keystone predator to urchin (purple and red) because human harvest helps to maintain kelp forest health; and, if so, how would that affect SAT evaluations on urchin harvest including LOP?**

   SAT Response – Approved February 24, 2009: The LOP for urchin hand harvest has been designated as moderate low because of direct and indirect ecosystem effects. A thorough discussion of the rationale for this LOP can be found in an updated version of the *Draft Methods Used to Evaluate MPA Proposals in the MLPA South Coast Study Region*.

6. **Can more clarification be provided on creation of the minimum size guidelines that were created (especially the offshore component, since state waters is three nautical miles, not three statute miles)?**

   SAT Response – Approved February 24, 2009: MPA size guidelines are discussed in detail in the document, *Draft Methods Used to Evaluate MPA Proposals in the MLPA South Coast Study Region*. The following response is excerpted (page 47) from the February 18, 2009 version of that document:

   > In evaluating the size of MPAs, the SAT considers both the area of the individual MPAs and clusters of contiguous MPAs. The size guidelines in the *Master Plan* specify that MPAs should cover an alongshore span of at least three to six statute miles (preferably six to 12 statute miles) and extend from the coast to deep waters offshore. Because state waters extend only three nautical miles (3.45 statute miles) offshore, the SAT considers an MPA or cluster of MPAs that extend to the offshore limit of state waters to meet the offshore guideline. The SAT combines and simplifies alongshore and offshore guidelines from the *Master Plan* by using a minimum size threshold of nine square statute miles, while recognizing that the state waters extend three nautical miles offshore rather than three statute miles as used in the area calculations. No MPA that is smaller than nine square miles could meet both the alongshore and onshore-offshore size guidelines mentioned above. Thus, for the purpose of SAT analyses, MPA clusters with areas nine to 18 square miles are considered to fall within the minimum size range, and those 18 to 36 square miles fall within the preferred size range. The guidelines for minimum and preferred areas of proposed MPAs will receive priority above the individual guidelines for alongshore and offshore spans. Additionally, the SAT recommends consideration of the configuration of proposed MPAs. Configurations with maximum area-to-perimeter ratios (e.g. 3 x 3 statute miles) are more likely to achieve greater protection for a variety of adjacent habitats and associated species than particularly narrow or long MPAs (e.g.1 x 9 statute miles).

7. **How much scientific collection happens within the study region and what are the effects on marine ecosystems?**

Status: The SAT has requested more detail from the Department of Fish and Game on scientific collection. The following staff response will be revised.

Staff Response: Information on scientific collection will be available in the regional profile. However, California Department of Fish and Game data on scientific collecting activity is available at the statewide level only, and information on the permits issued specifically for the study region is not available.