Crabs

Dungeness Crab (*Cancer magister*)

Status of the Population:

Dungeness crab populations in California have been fully exploited for at least 40 years and fishing intensity is extreme (Leet et al. 2001). In most years, between 80 to 90 percent of all available legal-sized male crabs are taken (Leet et al. 2001). Although such high exploitation rates on adult males might give rise to concerns that female mating success might be reduced as a consequence, recent studies have shown that essentially all molting females receive attention from males in northern California (Leet et al. 2001). Usually one, and no more than two year-classes of male crabs dominate annual landings. Thus, since about 1960, annual landings provide a reasonable notion of abundance of legal-sized males and also provide a strong signal of variation in year class strength of recruited crabs (Leet et al. 2001).

The dramatic decline in Dungeness crab catches in the central California fishery during the late 1950s focused considerable research attention on this resource during the 1970s. No definitive cause for the decline in the central California fishery has been established although researchers have assessed the possible effects of changes in ocean climate on survival and development of crabs eggs and larvae, the role of nemertean worm predation on egg survival, the effects of pollution on survival of juvenile crabs in San Francisco Bay, and possibly unstable internal population dynamics (Leet et al. 2001). Of these possible causes, a shift to warmer waters during and following the decline during the late 1950s seems the most plausible (Leet et al. 2001). If correct, the abundance of crabs in the central California fishery may improve over the next two decades if California coastal water temperatures remain cooler as a consequence of apparent ocean regime shifts (Leet et al. 2001). There seems little doubt that crab populations, with their extremely fecundities and vulnerable early larvae stages, are prone to large natural fluctuations in abundance. Variable oceanographic factors (temperature, wind, currents) have important impacts on survival (Leet et al. 2000)

Home Range/Migratory Patterns:

Dungeness crabs range from the Aleutian Islands to Point Conception. They prefer sandy to sandy-mud bottoms and can be found from the intertidal zone to depths of at least 750 feet but are most abundant in depths less than 300 feet. The resource off California consists of five subpopulations in the following areas: Avila-Morro Bay, Monterey, San Francisco, Fort Bragg and Eureka-Crescent City. Movement patterns by individuals of both sexes appear to be random with males moving more than

females. At times, inshore or offshore migrations have been noted. Most movements are less than 10 miles, but some individuals have moved up to 100 miles. Dungeness crab larvae are planktonic for up to 125 days and go through six larval stages, first being transported offshore then onshore before transforming to the benthic adult stage. Estuaries such as San Francisco and Humboldt Bays are important nursery areas for young crabs but, given the limited availability of such habitats, most Dungeness crabs develop and grow in nearshore coastal waters.

Current Regulations:

The commercial fishery is managed under a restrictive permit system which is generally open only to prior Dungeness crab permit holders and designed to eventually reduce the number of fishery participants. In 2001 there were 586 resident and 66 non-resident permittees which represents a decrease of 46 permits since the system was implemented in 1995. The fishery is closed from July 16 through November 30 north of Sonoma County and from July 1 through November 14 elsewhere. In addition, certain estuaries and areas near river mouths are closed to commercial take. Only male crabs with a minimum size of 6¼ inches carapace width may be taken. Traps must have at least two 4¼ inch diameter escape openings to allow females and undersize males to leave the trap. Traps must also be fitted with a destruct devise to allow them to open and crabs to escape if the trap is lost or not retrieved. Incidental take by trawl vessels is prohibited south of Point Reyes and limited to 500 pounds north of that point. No vessel may take crabs for commercial and recreational purposes on the same day.

Recreational closed seasons are from August 1 to the Saturday before December 1 north of Sonoma County and from July 1 to the Saturday before the second Tuesday in November elsewhere. The general daily bag limit is 10 crabs per person with a minimum size limit of 5 ¾ inches carapace width. In Sonoma, Marin, San Francisco, San Mateo, Santa Cruz and Monterey counties when onboard a commercial passenger fishing vessel (CPFV), the daily bag limit is six crabs per person with a minimum size of 6 inches carapace width. In addition, no more than a total of 60 traps may be used by a CPFV to take crabs. San Francisco and San Pablo Bays from the Golden Gate Bridge to the Carquinez Bridge are closed to crab fishing.

Although Dungeness crab populations have produce landings that have fluctuated around a fairly stable long term mean for more than thirty years, current fishery regulations generally appear effective in maintaining the population at productive levels and the resource might be considered healthy. However, no formal fishery management plan or stock assessments have been produced for west coast population.

How MPAs May Help:

Establishing relatively large reserves in Dungeness crab habitat might result in higher overall abundances, larger individuals and the presence of more age classes, primarily for male crabs, as a result of the elimination of fishing pressure within those areas. Since crabs move randomly over moderate distances, some would be expected to become available to the fishery outside the reserves. Because crab larvae are planktonic and transported over large distances, most of those produced inside the reserves are expected to be exported to other areas. Whether more larvae would be produced in the reserves is questionable since female crabs are already protected from take and more of the reserve population is likely to be composed of males. Since such reserves would protect other exploited species as well, the ecosystem functions of crabs might be altered as a result of more intense competition and predator/prey interactions. Similarly, reserves would also protect habitats valuable to Dungeness crabs from a variety of potential fishing activity related impacts.

Rock crabs: Brown rock crab (*Cancer antennarius*), yellow rock crab (*C. anthonyi*), and red rock crab (*C. productus*)

Status of the Population:

Information is not available on stock sizes, recruitment and mortality rates, the effects of different oceanographic regimes, or potential yield of rock crab populations (Leet et al. 2001). The commercial fishery, however, has had a localized effect on crab abundance and size (Leet et al. 2001). Fishing areas intensively exploited over an extended period show a lower catch-per-trap and a reduced size-frequency distribution compared to lightly exploited areas (Leet et al. 2001). In Santa Monica Bay, an area closed to commercial crab fishing for decades, experimental catch rates were higher, crab sizes larger and size-frequencies broader than in adjacent areas open to commercial trapping (Leet et al. 2001). Future research should be aimed at a better understanding of fishery-related rock crab population parameters.

Home Range/Migratory Patterns:

These three species have overlapping distributions with the yellow rock crab ranging from Humboldt Bay into southern Baja California, the brown rock crab from northern Washington to central Baja California and the red rock crab from Kodiak Island to central Baja California. All three species occur in depths from the low intertidal zone to over 300 feet. Yellow rock crabs prefer sandy or soft bottom habitat, while brown and red rock crabs appear to prefer rockier or reef type substrates. These species do not appear to migrate or undertake large-scale movements. Tagged crabs have

moved several miles, but with no apparent patterns. The planktonic larvae undergo at least seven developmental stages before transforming to the adult stage and settling to the bottom.

Current Regulations:

A general trap permit is required to take rock crabs commercially. All crabs must be at least 4¼ inches in carapace width. Traps must have at least one 3¼ inch diameter escape opening to allow undersize crabs to leave the trap. Certain areas, primarily portions of Humboldt Bay, Santa Monica Bay, Catalina Island and San Pedro Bay, are closed to commercial rock crab fishing.

The recreational rock crab daily bag limit is 35 crabs, in combination of species, per person with a minimum size limit of 4 inches carapace width.

How MPAs May Help:

Establishing relatively large reserves in rock crab habitats could be expected to result in higher overall abundances, larger individuals and the presence of more age classes as a result of the elimination of fishing pressure within those areas. A large area closed to the commercial fishery has shown these characteristics. Since crabs may move randomly over moderate distances, some would be expected to become available to the fishery outside the reserves. Because crab larvae are planktonic and transported over relatively large distances, most of those produced inside the reserves are expected to be exported to other areas. More rock crab larvae may be produced in these reserves since both sexes of rock crabs are subject to take and are expected to be in higher abundance inside reserves. Since such reserves would protect other exploited species as well, the ecosystem functions of crabs might be altered as a result of more intense competition and predator/prey interactions. Similarly, reserves would also protect habitats valuable to rock crabs from a variety of potential impacts related to fishing activity.