

**Potential Impacts of Sex- and  
Size-Selective Harvesting in Crab Populations**  
Prepared for the MLPA Master Plan Science Advisory Team  
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Several studies have shown there potentially can be negative population impacts through sex- and size-selective harvesting of large males (Hines et al. 2003). These studies have primarily been conducted using blue crabs (*Callinectes sapidus*) and snow crabs (*Chionoecetes opilio*), but it is conceivable that the changes in reproductive success and female survivorship could occur in commercially-harvested crab populations in the NCCSR as well.

Removing male crabs from populations can result in skewed sex ratios and reduced male size (Carver et al. 2005, Sainte-Marie & Lovrich 1994). These results can in turn lead to decreased copulation time (Rondeau & Sainte-Marie 2001), decreased sperm production (Kendall et al. 2002), fewer successful copulations due to exhausted sperm supplies (Carver et al. 2005), decreased female survivorship (Jivoff 1997, Sainte-Marie et al. 1999), and increased female injury (Shirley & Shirley 1988, Rondeau & Sainte-Marie 2001).

Additionally, Smith and Jaimeson (1991a) found that female Dungeness crabs (*Cancer magister*) preferentially mate with males that are larger than they are, leading to decreased mating opportunities for large (and more fecund) females in areas with male-biased fisheries. However, Hankin et al. (1997) found no correlation between male and female size in mating pairs in northern California. They also found females that were larger than the legal size limit that had been mated, presumably by large crabs, and that if large females remained unmated, population egg production was estimated to decrease by 2%-25%. In Alaska, though, areas with intense fishing pressure have virtually no large ovigerous females due to a lack of males large enough for copulation (T. Shirley, pers. comm.). Thus evidence that removing high numbers of large males from crab populations could cause significant reductions in reproductive output is mixed.

Recent evidence suggests that the negative impacts of removing male crabs from populations will not be tempered by the movement of crabs into and out of the fished area. Studies of *Cancer magister* in Alaska, British Columbia, and northern California have shown that adult crabs move much less than previously assumed, and could have significant site fidelity and little contact with neighboring populations (Diamond & Hankin 1985, Smith & Jaimeson 1991b, Stone & O'Clair 2001, Stone & O'Clair 2002). These studies are supported by evidence of dramatic increases in the size of male crabs in historically fished areas that are incorporated into marine protected areas (Taggart et al. 2004).

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