

# Science Foundation Chapter 3

## Appendix 3.1 – Case Study

### Dungeness Crab (*Metacarcinus magister*)

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#### DESCRIPTION OF THE SPECIES

Dungeness crab, *Metacarcinus magister*, is a part-time resident of the Bay, and juveniles in particular are abundant in shallow to intertidal areas and eelgrass beds.

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#### CRITERIA FOR SELECTION OF THE SPECIES

Dungeness crabs may use marshes during development and molting, and abundance varies with ocean climate.

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#### OTHER INFORMATION ABOUT THE SPECIES

General information about the life cycle of Dungeness crabs is available from Emmett et al. (1991), and data on the abundance of age-0 and age-1 juveniles in open waters of the estuary are available from the otter trawl samples in the San Francisco Bay Study.

Dungeness crabs spawn in the coastal ocean and carry their eggs until they hatch. The planktonic larvae go through six stages before molting to the demersal juvenile stage, in which stage they move into nearshore waters and estuaries. The movement is correlated with onshore transport of near-bottom waters during upwelling (Hobbs et al. 1992).

Estuaries appear to be nursery habitats and juveniles can grow faster in estuaries than on the open coast, either because of higher summer temperature or better food resources. They use a variety of habitats including eelgrass beds. Intertidal habitat is important to young Dungeness crab in Willapa Bay, WA (Holsman et al. 2003, 2006). After a year or two in estuaries the crabs move into more saline reaches of estuaries or into the coastal ocean.

Dungeness crabs are found year-round in San Francisco Bay but they are most abundant as age-0 juveniles from May to December. Their distribution in the Bay is broad but they are most abundant at salinity > 30, and rare at salinity < 8. The abundance of adults increases with increasing depth. There is relatively little information about their use of marshes, although they are common in eelgrass beds in the Bay.

## **REVIEW OF LONG-TERM EFFECTS**

Catches in the Dungeness crab fisheries along California fluctuate cyclically and they may respond to ENSO cycles (Botsford et al. 1982). This may or may not translate to a similar response to any long-term shifts in the frequency or intensity of upwelling.

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## **OTHER STRESSORS**

Robust sport and commercial fisheries. The commercial fishery is controlled through limited entry.

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## **FACTORS THAT MAY AFFECT SPECIES RESILIENCE**

Probably high, since the crabs are opportunistic and live in a variety of habitats.

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## **LIKELY CLIMATE CHANGE IMPACTS AND RISKS**

Dungeness crab abundance is associated with low temperatures in the California Current, and therefore they are more abundant during the cool phases of climate cycles. To the extent that these cycles will change in frequency or duration, there may be changes in the recruitment of crabs to the Bay. Risks to climate effects within the Bay are low, with a possible increase in response to greater penetration of salinity.

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## **MANAGEMENT ACTIONS TO BE CONSIDERED**

Encourage continuation of San Francisco Bay Study monitoring.

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## **UNCERTAINTY AND KNOWLEDGE GAPS**

The importance of the estuary to Dungeness crab is unknown.

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## **LITERATURE CITED AND RESOURCES**

Botsford, L. W., R. D. J. Methot, and J. E. Wilen. 1982. Cyclic covariation in the California king salmon, *Oncorhynchus tshawytscha*, silver salmon, *O. kisutch*, and dungeness crab, *Cancer magister*, fisheries. *Fish. Bull.* 80: 791-801.

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Hobbs, R. C., L. W. Botsford, and A. Thomas. 1992. Influence of Hydrographic Conditions and Wind Forcing on the Distribution and Abundance of Dungeness Crab, *Cancer magister*, Larvae. *Can. J. Fish. Aquat. Sci.* **49**: 1379-1388.

Holsman, K. K., D. A. Armstrong, D. A. Beauchamp, and J. L. Ruesink. 2003. The necessity for intertidal foraging by estuarine populations of subadult Dungeness crab, *Cancer magister*: Evidence from a bioenergetics model. *Estuaries* **26**: 1155-1173.

Holsman, K. K., P. S. McDonald, and D. A. Armstrong. 2006. Intertidal migration and habitat use by subadult Dungeness crab *Cancer magister* in a NE Pacific estuary. *Mar. Ecol. Progr. Ser.* **308**: 183-195.