

## DUNGENESS CRAB REPORT

Dungeness crabs range from the eastern Aleutian Islands, Alaska, to perhaps Santa Barbara; however, the species is considered rare south of Point Conception. Temperature apparently determines the distribution, and the 38° to 65° F surface isotherms are considered the limits of the range. The geographic range of the species probably depends more on the restricted thermal tolerance range of larvae than of adults. Optimal temperatures for larval growth and development are 50° to 57° F.

This species has a preference for sandy to sandy-mud bottoms but may be found on almost any bottom type. Dungeness crabs may range from the intertidal zone to a depth of at least 750 feet, but are not abundant beyond 300 feet.

The resource off California has been demonstrated by the tagging experiments to consist of five subpopulations: one each in the areas around Avila-Morro Bay, Monterey, San Francisco, Fort Bragg, and Eureka-Crescent City. *As noted above, only the latter three are of commercial importance.* CDFG surveys indicate the combined San Francisco and Fort Bragg populations are not as large as the population extending from Eureka into Oregon. Little or no intermixing occurs. Tagging studies have also demonstrated random movement by both sexes. At times, an inshore or offshore migration is observed, but most movement is restricted to less than 10 miles. Travel up to 100 miles has been noted for individual males, but female movements seem much more limited.

Female molting and mating occur from February through June. Male crabs are able to sense when females are about to molt (presumably through detection of pheromones released by females) and carry such females in a protective pre-mating embrace for several days until the molt. Hard-shelled males then mate with the freshly molted, soft-shelled females. Sperm deposited by males are stored in a spermatheca inside the female. Fertilization of eggs takes place when internally-developing eggs are extruded between October and December.

Thereafter, they are carried beneath the abdominal flap of the female. The smallest females carry about 500,000 eggs and the largest from 1.5 to 2.0 million. Freshly molted females carry larger numbers of eggs than do gravid females that have missed a molt. "Skip-molt" females that have extruded eggs but have not molted recently must rely on stored sperm for fertilization of their eggs. Females may store viable sperm for at least 2.5 years. The eggs range in diameter from 0.016 to 0.024 inches and are bright orange after extrusion, becoming progressively darker as they develop. Hatching occurs between November and February.

The newly hatched larvae pass through five zoeal and one megalops stage before metamorphosing into the adult form. Larval development is inversely related to water temperature, and in central California 105 to 125 days are required to complete the larval stages. Zoeae are hypothesized to complete the larval stages. Zoeae are hypothesized to have an offshore movement regulated by factors such as depth, temperature, salinity and ocean currents. They are found near the surface at night and as deep as 80 feet in daytime. Megalopae are transported to nearshore waters beginning in April. Metamorphosis occurs from April to June.

Growth is accomplished in steps through a series of discrete molts. Dungeness crabs of both sexes molt an average of six times during their first year and attain an average width of one inch. Six more molts

## Dungeness Crab Report

are required to reach sexual maturity at the end of their second year, when they are approximately four inches across. Once maturity is reached, growth of females then slows as compared to males. Females molt at most once per year after reaching maturity and rarely exceed the legal size of males. Maximum female size is about seven inches. Male crabs usually molt twice during their third year and once per year thereafter. The average size of males three, four and five years of age is about six, seven and eight inches, respectively. Males may undergo a total of 16 molts during a lifetime, reaching a maximum size of nine inches and age of six to eight years.

Dungeness crabs are opportunistic feeders not limited by abundance or scarcity of a particular prey. Clams, fish, isopods and amphipods are preferred, and cannibalism is prevalent among all age groups. Predators on the various life stages of Dungeness crabs, especially pelagic larvae and small juveniles, include octopuses, larger crabs and as many as 28 species of fish, including Coho and Chinook salmon, flatfishes, lingcod, cabezon and various rockfishes.

Although many crustacean fisheries throughout the world have been overexploited and are now at low abundance levels compared to historic levels, Dungeness crab populations off northern California, Oregon and Washington have produced landings that have fluctuated around a fairly stable long-term mean for more than 30 years.

### **About the Dungeness Crab Fishery:**

Dungeness crab have been landed commercially on the west coast of the United States since 1848 when San Francisco fishermen began the fishery. The current foundation for regulation in the fishery, size, sex, and season was established 100 years ago. Crabbers of the early 1900's were limited to 6 inch and larger male crabs with a closed season in the fall. Flash forward to present day and west coast Dungeness crab landings are stronger than anytime in history with regulations nearly identical to those in place in 1905. Since the fishery was established the west coast crab fishery is one of the few remaining 'state managed' fisheries in the country. While more complicated fisheries are regulated under Federal Fisheries Management Plans (FMPs) by regional management councils, the Dungeness crab fishery on the West Coast is managed by the Oregon Department of Fish & Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW) and the California Department of Fish and Game (CDFG).

### **Harvest Methods:**

Crab pots are used for most commercial crabbing. They are very similar to those used in the recreational fishery, but these pots are not just simple traps. Pots must conform to construction guidelines that efficiently minimize their impact.

Multiple crab pots are set in rows, each on an individual line. Pots are retrieved using hydraulic "crab blocks" which is essentially a power driven wench. An efficient crew can hoist and re-bait as many as 400 pots per day. Pots are predominantly set between 10 and 50 fathoms (60-300 feet) although Dungeness crab commonly occur from intertidal areas to 200 fathoms (1200 feet). Crabs are stored live in holds on boats that are filled with re-circulating sea water and are delivered every few days to fish processing plants.

**Biology of Harvest:**

Fishing seasons are built around Size, Sex and Season (the “3 Ss”).

**Size:** Crabs can be harvested commercially only when they reach a size of 6 ¼” carapace width. This assures that the crab will have at least one year of reproduction. Recreational harvest is legal at 5 ¾” carapace width.

**Sex:** Only male crabs are harvested. All females must be immediately released and are left to reproduce throughout their life spans.

**Season:** The Commercial crab season generally starts December 1 when crabs shells have hardened, indicating that they have filled out with firm meat. Testing takes place each year before the season to assure crabs harvested average at least 25% meat content (23% North of Cascade head). Generally the range of meat content of Dungeness crab is 13-30%, depending on a combination of molt and reproductive timing which relate to environmental factors such as ocean conditions and food availability.

**The Market:**

The Dungeness Crab Fishery for 2010-2011 was very strong. As the table below shows, the total harvest of coastal Dungeness crab hit 70.5 million pounds this past season, a 23.9% increase over the previous season.

Despite the strong increase in landings, the demand for the product as so strong that the total ex-vessel value increased at an even faster rate than did supply. The three West Coast states saw their coastal fishery generate \$167.3 million in ex-vessel value, a 43.7% increase over the previous season and the highest value in at least the last five years. The average price to the fishermen last season was \$2.37/lb. a gain of 16.2% for the 2009-2010 season though still down from the \$2.85/lb. average price in 2007-2009. At the wholesale level, the strong demand resulted in frozen whole cooked crabs nearly reaching \$5/lb., while section prices nudged up against \$7/lb., and meat prices stayed around \$15/lb.

<b>West Coast Dungeness Crab</b>						
		<b>2006-2007</b>	<b>2007-2008</b>	<b>2008-2009</b>	<b>2009-2010</b>	<b>2010-2011</b>
<b>Washington</b>	Landings	14.3	15.3	10.3	16.6	21.8
	Value	\$32.60	\$40.60	\$21.90	\$37.60	\$61.30
	\$/lb.	\$2.28	\$2.65	\$2.12	\$2.27	\$2.81
<b>Oregon</b>	Landings	15.1	12.3	13.0	23.1	21.2
	Value	\$32.90	\$29.40	\$26.10	\$44.60	\$49.00
	\$/lb.	\$2.18	\$2.38	\$2.00	\$1.93	\$2.30
<b>California</b>	Landings	42.9	36.0	29.5	56.9	70.5
	Value	\$95.90	\$93.00	\$62.70	\$116.4	\$167.30
	\$/lb.	\$2.23	\$2.58	\$2.12	\$2.04	\$2.37

Source: WDFW, ODFW, CDFG, millions lbs. & except \$/lb., ex-vessel value; Washington is coastal only, tribal & non-tribal.

## Dungeness Crab Report

Oregon was the only state to show a drop in landings. Last year, Oregon crabbers landed 21.2 million pounds of Dungeness, down 9% from the previous season. With the slightly lower supply, marketers paid fishermen an average of \$2.30/lb., an increase of 19.2% over the 2009-2010 season average. This resulted in total dockside value of \$49 million, up 10%. This was the second most valuable Dungeness fishery in Oregon's history, topped only by the \$52.9 million of the 2004-2005 season. Oregon's fishery is the only Dungeness crab fishery on the Pacific Coast to be certified as sustainable by the Marine Stewardship Council, a designation achieved in December 2010.

Washington had a very strong Dungeness fishery last season, both tribal and non-tribal fishermen seeing strong gains in landings. All told, Washington harvested 21.8 million pounds of Dungeness crab, up 31.3% from the 16.6 million pounds of the previous season. Non-tribal crabbers saw their catch move from 13 million pounds in 2009-2010 to 16.7 million pounds last season. Tribal crabbers saw landings go from 3.6 million pounds to 5.1 million pounds. The value of that crab was the highest of the three states at \$61.3 million, a gain of 63%. The average ex-vessel price saw a 23.8% gain, going from \$2.27/lb. to \$2.81/lb. Once again, Washington's January opening (for all but the very southern tip of the state) worked out well for fishermen because once they started fishing, demand was strong after the holiday landings. For the last couple of years, Washington crabbers have had the highest ex-vessel price on the coast. Washington crabbers have also benefited from the strong demand for live crab. As the season drew to a close in mid-September, live buyers were paying as much as \$5.10/lb. for Dungeness crab. Washington was the last coastal fishery to close and crab was wanted.

The California fishery for Dungeness crab was outstanding. Not only did the state see the biggest growth in landings of any of the three states, but it also saw the highest growth in dockside value of the fishery. Total landings for the California fishery hit 27.5 million pounds this past season, a gain of 59.9% over the 17.2 million pounds of the previous season. Central California saw landings jump from a normal 3.4 million pounds in 2009-2010 to 19 million pounds this past season. Early indications suggest that this season could see similar landings thanks to favorable ocean conditions. Previously, the central management area's peak catch was the 2004-2005 season when 6.1 million pounds were caught. The value of California's Dungeness harvest was \$56.7 million, a gain of 65.8% over the previous season. The huge volume did keep ex-vessel prices in check compared with Washington and Oregon, but even so last season's average of \$2.06/lb. was a gain of 3.5% over the previous season.

### **Oregon Dungeness Crab Fishery Receives Marine Stewardship Council Sustainability Certification:**

The Oregon Dungeness crab fishery operating off the west coast of the United States has earned Marine Stewardship Council (MSC) certification following independent assessment to the MSC standard for sustainable, well-managed fisheries. Products from the fishery will now be eligible to bear the blue MSC ecolabel.

In the course of the MSC assessment process, the fishery client worked with academic experts to produce improvements such as:

- An ongoing monitoring plan which includes measuring female fertilization and abundance rates to produce an estimate of an index of female abundance.
- An age-structured productivity model as a means to assess fishing effort and size limit, which is used to estimate potential Target Reference Points.
- A proposed Limit Reference Point based on declining catch over time in successive generations, adjusting from a California value to one specific to Oregon.

## Dungeness Crab Report

Scientific Certification Systems was the certifying entity for this assessment. During the assessment, the three principles of the MSC standard were evaluated in detail: the status of the fish stock, the impact of the fishery on the marine ecosystem and the management system overseeing the fishery.

Credit to:

California Department of Fish and Game, California's Living Marine Resources: A Status Report

Oregon Dungeness Crab Commission

ODFW Commercial Crab Fishing

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