

Potential Impact of Jordan Cove LNG Terminal construction on the Nursery Habitat of the Dungeness crab.

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The **Dungeness crab** (*Cancer magister*) supports an important commercial and sport fishery from Alaska to California. Total annual landings in recent years exceeded 25,000 tons (55 million pounds) (FAO statistics, 2012). In Oregon, the 2014 Dungeness fishing season yielded 14.4 million pounds, \$50 million to crabbers and an estimated \$100 million to the Oregon economy (Oregon Dungeness Crab Commission in Fisherman's News On line). *The Dungeness fishery is the most valuable commercial fishery in Oregon (Rasmusen 2013).*

The life cycle of Dungeness crab is complex, depending on both estuarine and near-shore habitats. Typically, mating occurs in shallow water, and females migrate offshore to brood and hatch their eggs. The early larval stages feed and rear in the near-shore water column, after which the final larval stage rides tidal currents back to shore and settles out in shallow estuarine habitats. The final larval stage molts into a ~5 -7 mm wide first crab stage. *The highest densities of juvenile Dungeness crabs are found in estuaries, which provide warm water, high biological productivity and protection from predators. Sand substrate and eelgrass beds are preferred habitat for these young crabs, which bury in the sand and hide in the eelgrass to escape predators.* Size measurements of crabs trapped at Russell Point in Coos Bay (below the Highway 101 McCullough Bridge) show that Dungeness crabs in their first two years of life (100 mm carapace width and smaller) are extremely abundant in the mid-to low intertidal areas such as pools and eelgrass beds (Figure 1).

In my research documenting the status of the non-native European Green crab in Coos Bay, I encounter young Dungeness crabs in all my study sites. I selected a sub-set of my sites closest to the proposed Jordan Cove Energy Project: the north and south sides of Trans Pacific Lane and the beach adjacent to the Roseburg Forest Product watchman's booth. The results from over 600 trap-days, show that young Dungeness crabs are consistently abundant from 2002 to 2014 at all sites, with an average catch of 15 per trap (Table 1). *These trapping results confirm the findings by Emmett and Durkin (1985) that estuaries are important nursery habitats for Dungeness crabs. This fact has to be kept in mind when a trench is dug In Haynes Inlet, the Trans Pacific Parkway is to be expanded and an upland area is cut out to create a berth for ocean-going vessels. Not only will the turbidity during the construction phase be of concern to the ecological community, the on-going dredging to maintain the berth and shipping channels will continue to be a disturbance to the ecosystem. It will result in habitat loss for native species, including the valuable Dungeness crab. In one study between 45 to 85 % of the Dungeness crabs died during a simulated dredging operation (Chang and Levings, 1978).*

Sylvia Yamada is a marine ecologist who has studied native crabs and the invasive European green crab in Oregon and Washington for over 20 years.

References:

Chang, B., Levings, C. 1978. Effects of burial on the heart cockle *Clinocardium nuttallii* and the Dungeness crab *Cancer magister*. *Estuarine, Coastal and Shelf Science*. 7, 4009-412.

Emmett, R.L. and Durkin, J.T. 1985. The Columbia River Estuary: An Important Nursery for Dungeness Crabs, *Cancer magister*. *Marine Fisheries Review*. 47(3), 21-25.

Fisherman's News On line Sept 24, 2014 <http://fnonlinenews.blogspot.com/2014/09/oregons-crabbers-riding-market-value.html>

Rasmuson, L.K. 2013. The Biology, Ecology and Fishery of the Dungeness crab, *Cancer magister*. In Michael Lesser, editor: *Advances in Marine Biology*, Vol 65, Burlington: Academic Press, pp. 95-148. ISBN: 978-0-12-410498-3 Elsevier Ltd. Academic Press.

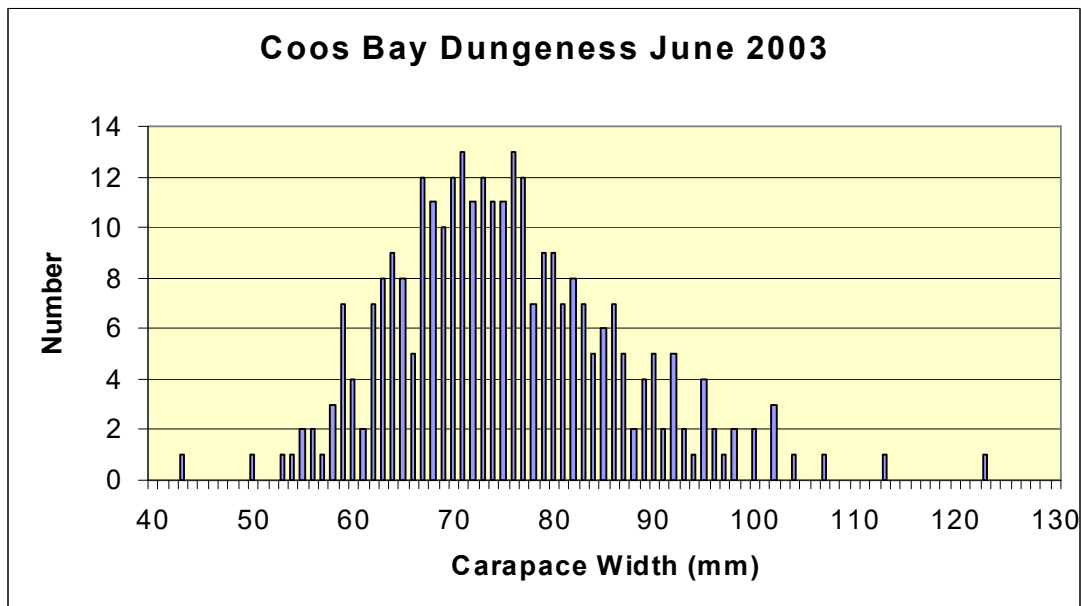


Figure 1. Size frequency distribution of Dungeness crabs trapped in pools and eelgrass at Russell Point, below the Highway 101 McCullough Bridge, in June 2003. Adult crabs are greater than 100 mm in carapace width. It is estimated that the first 2 year classes are represented.

Table 1. Trapping Data for study sites along Trans Pacific Lane and Roseburg Forest Product causeway from 2002-2014.

	Date	Trap Type	Zone	European green crab <i>Carcinus maenas</i>	Hairy shore crab <i>Hemigrapsus oregonensis</i>	Purple shore crab <i>Hemigrapsus nudus</i>	Dungeness crab <i>Cancer magister</i>	<i>Cancer magister</i> (Recruits <50mm)	Red rock crab <i>Cancer productus</i>	stag-horn sculpin	# Traps
Roseburg Lumber	6/25/2002	Fish	Site	0	0	0	45	0.5	0.1	0	10
Roseburg Lumber	6/16/2003	Fish	low	0	0	0	12.2	0	0.7	1.5	10
TransPacific S	7/10/2005	Fish	low	0	0	0	6.14	1.14	0	1.86	7
North	7/10/2005	Fish	low	0	0	0	0	5.7	0	1.1	10
South	3/25/2005	minnow	Mid	0	0	0	0	0	0	2.4	10
North	7/10/2005	minnow	mid	0	0.2	0	0	0.6	0	0.8	5
South	7/10/2005	minnow	mid	0	0	0	0	0.4	0	0.6	5
Trans-Pacific Bridge	9/1/2005	Fish	Low	0	0	0	6.6	0	3	1	5
	9/1/2005	Minnow	high	0	0	0	0.2	0	0	0.4	4
Trans-Pacific Ln.	6/8/2006	Fish	Low	0	0	0	4.9	0	0	2.6	10
	9/13/2006	Fish		0	0.4	0	0.2	0	0	0.2	5
	6/8/2006	Minnow	high	0	0	0	0.7	0	0	2.3	10
Trans Pacific Br.	9/13/2006	Minnow		0.2	0	0	0	0	0	0.2	5
TransPacific Ln. N	5/25/2007	Fish	Mid	0.5	0.2	0	1	0.1	0	0.8	10
	7/14/2007	Fish		0.4	1.47	0	23.53	0	0	0.2	15
	9/26/2007	Fish		0	0	0	4.75	0	0	0	8
TransPacific Ln. S	5/25/2007	Fish	Mid	0.09	0	0	0.82	0	0	0.36	11
	7/14/2007	Fish		0.27	0.07	0	9	0	0.07	1	15
	9/26/2007	Fish		0	0	0	2.71	0	0	0.14	7
TransPacific Bridge	5/25/2007	Fish	Mid	0	0	0	1.33	0	0	0	6
	9/25/2007	minnow	high	0	0	0	1.6	0	0	0.4	5
TransPacific Ln. N	6/18/2008	Fish	Mid	0.1	0.2	0	7.4	0	0	7.8	10
	6/19/2008	Fish		0	0	0	1.75	0	0	3.25	8
	9/18/2008	Fish		0	0.1	0	23.4	0	0	0.7	10
TransPacific Ln. S	6/18/2008	Fish	Mid	0.5	0	0	17.2	0	0	2.2	10
	6/19/2008	Fish		0.37	0	0	17.63	0	0	1.37	8
	9/18/2008	Fish		0.1	0	0	22.6	0	0	0.3	10
TransPacific Ln. N	7/8/2009	Fish	Mid	0.13	0	0	9.88	0	0	0.38	8

[illegible]

HEARLEY Henry O

From: Sylvia Yamada <yamadas@science.oregonstate.edu>
Sent: March 20, 2019 8:27 AM
To: HEARLEY Henry O
Subject: RE: Impact of dredging on Dungeness crabs

Henry,
Thanks.
Sylvia

From: HEARLEY Henry O <HHEARLEY@Lcog.org>
Sent: Wednesday, March 20, 2019 8:22 AM
To: Sylvia Yamada <yamadas@science.oregonstate.edu>
Subject: RE: Impact of dredging on Dungeness crabs

Sylvia,

Thank you for your comments. We will add it to the record. We'll bring a copy of your testimony to the hearing tomorrow. Following the hearing we'll incorporate comments received after the staff report was first published last week in preparation for the next hearing in front of City Council.

Thank you.

Respectfully,
Henry

From: Sylvia Yamada <yamadas@science.oregonstate.edu>
Sent: March 20, 2019 7:59 AM
To: HEARLEY Henry O <HHEARLEY@Lcog.org>
Subject: Impact of dredging on Dungeness crabs

Dear Mr. Hearley

I have been studying crabs in Oregon estuaries, including Coos Bay, for over 20 years. My study sites include Jordan Cove and Russell Point, below McCullough Bridge (see size graph of sub-market size Dungeness crabs in attached document). I am concerned that the construction of the Jordan Cove Energy Project could impact important habitats for native species, including the Dungeness crab. The Dungeness crab fishery is the most valuable commercial fishery in Oregon. In a good year, landings yield \$100 million to the Oregon economy. The highest numbers of juvenile crabs are found in soft sediments and eel grass beds of estuaries. This is where the young crabs find food and shelter from predators. In my study site along Trans Pacific Parkway, I have consistently

trapped an average of 15 young Dungeness crabs per trap. The importance of this nursery habitats has to be kept in mind when 1) a trench is dug In Haynes Inlet, 2) the Trans Pacific Parkway is expanded and 3) an upland area is cut out to create a berth for ocean-going vessels.

Not only will the turbidity during the construction phase be of concern to the ecological community, the on-going dredging to maintain the berth and shipping channels will continue to be a disturbance to the ecosystem. In a study, designed to simulated a dredging operation, between 45 to 85 % of the Dungeness crabs died. In summary, construction and maintenance of the Jordan Cove LNG Terminal will result in habitat loss for native species, including nursery habitat for the valuable Dungeness crab.

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