Status of the European Green Crab, *Carcinus maenas*, in Oregon and Washington Estuaries in 2016

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Executive Summary

The European green crab (*Carcinus maenas*) has persisted in Oregon and Washington coastal estuaries since the late 1990's. After the arrival of a strong year class in 1998, significant recruitment to the populations occurred only in 2003, 2005, 2006, 2010, 2015 and 2016. Warm winter water temperatures, high Pacific Decadal Oscillation (PDO) and Multivariate ENSO (El Niño Southern Oscillation) Indices, weak southward shelf currents in March and April and a high abundance of southern copepods are all correlated with strong year classes and vice versa (Behrens Yamada Peterson and Kosro 2015). Prior to 2015, green crabs were too rare to exert measurable effects on the native benthic community and on shellfish culture in Oregon and Washington. Following the recent strong El Niño, however, we documented the arrival of two strong year classes in 2015 and 2016. Catch rates in 2016 averaged 79 crabs per 100 traps, much higher than in any previous years since 1998. Since green crabs live for 6 years, these two consecutive year classes will provide larvae until 2022. A switch to cooler ocean conditions in the coming years will result in poor recruitment, but a return to high PDO and strong El Niño patterns would signal good recruitment and higher green crab densities. For example, green crabs were first documented in New England in 1817, but it took warm ocean conditions during the 1950's for their numbers to build to a level at which they decimated the soft-shelled clam industry in Maine. With the recent warm trend on the East Coast, green crabs are again abundant. Not only are they preying on shellfish, they are also damaging valuable eelgrass habitat by ripping up the plants in search of food (Neckles 2015).

Even though green crab abundance in Oregon and Washington is still low when compared to Europe, eastern North America, Tasmania, California and the west coast of Vancouver Island, it is imperative to continue monitoring efforts for two reasons:

1) to elucidate the process of range expansion and population persistence of this model non-indigenous marine species with planktonic larvae, and
2) to predict the arrival of strong year classes from ocean conditions and alert managers and shellfish growers of possible increases in predation pressure from this invader.

Professional and Outreach Activities by Sylvia Behrens Yamada in 2016

Date	Talks / Outreach Activities	Location
March 1-4, 2016	Attended Oregon Chapter of the American Fisheries Society meeting. Presented talk "Biological and Physical Ocean Indicators Predict the Success of the European Green Crab".	Seaside Conference Center, Sea Seaside, Oregon
March 10-12, 2016	Attended Pacific Estuarine Research Society Meeting. Presented talk followed by a discussion: "Biological and Physical Ocean Indicators Predict the Success of the European Green Crab". Networked with students.	Cheakamus Center, Squamish, British Columbia, Canada
April 4-5, 2016	Set traps and checked them with Sally Hacker's Marine Biology (Bi 450) students. Gave guest lecture on the invasion history, biology and status of the European Green crab in Oregon and Washington.	Hatfield Marine Science Center, Newport, Oregon
April 29-30, 2016	Set traps with Bree Yedknock and Christina Geierman, a summer scholar with South Slough Estuarine Research Reserve	Coos Bay, Oregon Institute of Marine Biology
June 23-24, 2016	Set traps and checked them with John Chapman's Marine Biological Invasion (FW 421) students. Gave guest lecture on the invasion history, biology and status of the European Green crab in Oregon and Washington.	Hatfield Marine Science Center, Newport, Oregon
August 15-19, 2016	Participated in a simultaneous sampling effort of green crabs with over 6 biologists in 5 coastal Washington and Oregon estuaries.	Willapa, Tillamook, Netarts, Yaquina and Coos Bay
August 29-30 2016	Trapped at 2 sites on San Juan Island. Coordinated trapping effort with Washington Sea Grant Crab Team volunteers in Westcott Bay. I was present when they caught the first green crab in the Washington Salish Sea.	Argyle Lagoon Westcott Bay Sea Farms Westcott Bay Sculpture Park,
October 2016	Wrote newsletter article with Craig Staude about first green crab found in Salish Sea for Friday Harbor Laboratories newsletter: Tide Bites #38 http://depts.washington.edu/fhl/tidebites/Vol38/index.html	
December 2016	Wrote manuscript with Richard Thomson, Graham Gillespie and Tammy Norgard on ocean and meteorological conditions that made it possible for Green Crabs to enter the Salish Sea between Vancouver Island and the mainland in recent years.	Paper tentatively accepted by Journal of Shellfish Research after revisions are made.

Introduction

European green crabs (*Carcinus maenas)* made their way to the east coast of North America in sailing ships in the early 1800's (Say 1817). They arrived in San Francisco Bay during the 1980's, most likely via aerial shipment of Atlantic seafood or baitworms. From there, green crabs spread naturally via larvae carried in ocean currents, and by 2000, had dispersed as far north as Port Eliza on the northern west coast of Vancouver Island, British Columbia. Presently, green crabs are found around the Bella Bella area on the Central British Columbia coast. It is estimated that their potential range could include Southeast Alaska (Behrens Yamada 2001, Carlton & Cohen 2003).

The green crab is a voracious predator that feeds on many types of organisms, including commercially valuable bivalve mollusks (e.g., clams, oysters, and mussels), polychaetes, and small crustaceans (Cohen et al. 1995). It also competes with native juvenile Dungeness crabs and shore crabs for food and shelter (McDonald et al. 2001, Jensen et al. 2002, Behrens Yamada et al. 2010). Larger, more aggressive native crab species such as the red rock crab (*Cancer productus*) and the Pacific brown rock crab (*Cancer antennarius*), have been shown to offer biotic resistance to this invader, but only in the cooler and more saline lower parts of estuaries (Hunt and Behrens Yamada 2003; Jensen, McDonald and Armstrong 2007). Scientists, managers and shellfish growers are concerned that increases in the abundance and distribution of this efficient predator and competitor could permanently alter native communities and threaten commercial species such as juvenile Dungeness crab, juvenile flatfish and bivalves (Lafferty and Kuris 1996, Jamieson et al. 1998, Behrens Yamada et al. 2010).

On the West Coast, the northward range expansion of green crabs during the 1990's is linked to favorable ocean conditions for larval transport during El Niño events (Behrens Yamada et al. 2005, Behrens Yamada and Kosro 2010, Behrens Yamada et al. 2015). Warm temperatures and strong northward moving coastal currents (>50 km/day) during the 1997/1998 El Niño were correlated with the appearance of a strong cohort of young green crabs in Pacific NW estuaries in the summer of 1998 (Behrens Yamada and Hunt 2000, Behrens Yamada et al. 2005). Recruitment has occurred in embayments from Coos Bay to the Central Coast of British Columbia. Year classes were more abundant following the warm winters and springs of 2003, 2005, 2006, 2010 and 2015. (Behrens Yamada & Gillespie 2008; Behrens Yamada & Kosro 2010, BehrensYamada et al. 2015).

Goals

The goal of this study is to document the present, and predict the future status of the European green crab in the Pacific Northwest. This is accomplished by:

1. Estimating the size/age structure and relative abundance of green crabs in Oregon and Washington estuaries during the summer by using baited Fukui fish traps (Tables 2 and 4).
2. Collaborating with scientists from Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, and Fisheries and Oceans Canada as well

as with shellfish growers and sports fishers in order to compile all existing green crab data for the Pacific Northwest.

3. Estimating year-class strength of 0-age (young-of-the-year) green crabs at the end of their first growing season by setting minnow and pit-fall traps in the high intertidal zone at the end of summer and fall (Figure 2).
4. Comparing patterns in the recruitment strength of 0-age crabs over time and correlating them to ocean conditions: such as the Pacific Decadal Oscillation Index for March (Appendix 4). For a complete list of correlations see Behrens Yamada et al. 2015.

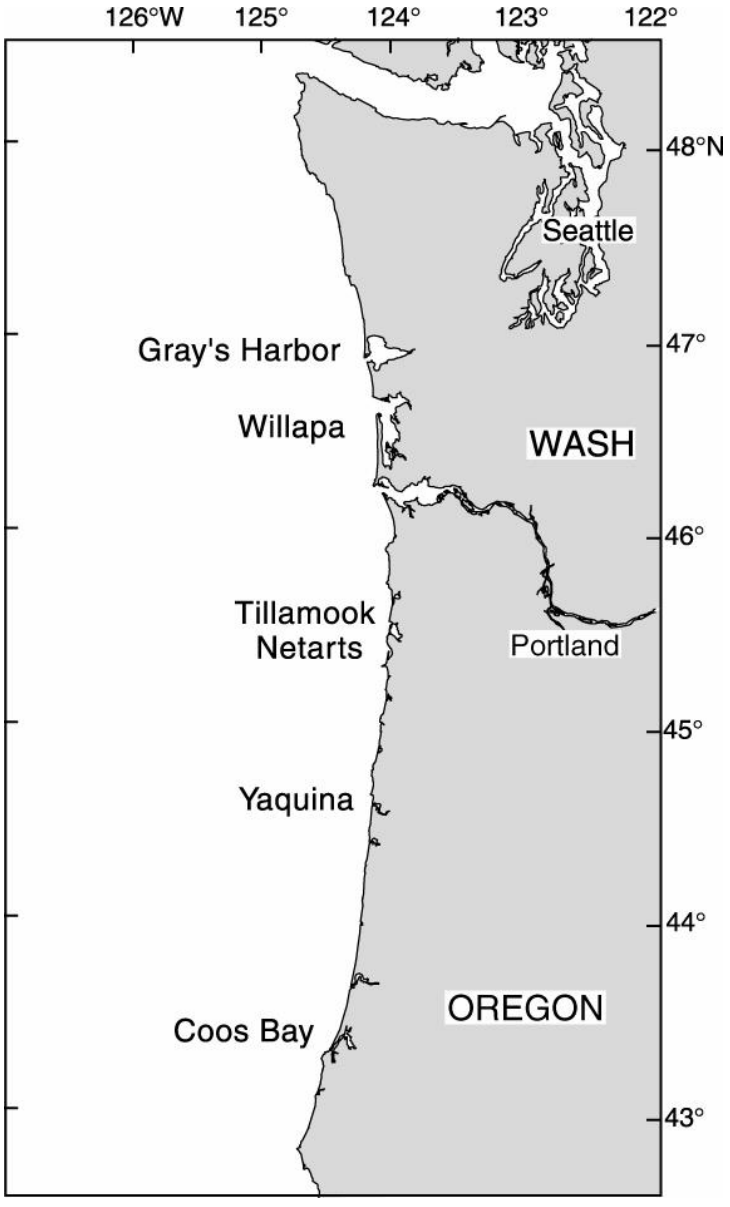

Figure 1. Major sampling sites in Oregon and Washington

Sampling Methods for Green Crabs

Our sampling effort in 2016 included one Washington and four Oregon estuaries: Willapa, Tillamook, Netarts, Yaquina and Coos Bay (Figure 1). All estuaries were sampled at least twice during the 2016 trapping season, withYaquina and Coos receiving additional sampling by Oregon State University students and by biologists from the South Slough National Estuarine Research Reserve. In each estuary, we selected study sites within various habitat types and tidal levels. Since green crabs are rare and patchily distributed, we did not choose our sites randomly. Instead, we preferentially sampled sites that have harbored green crabs in the past such as tidal marshes, gradually sloping mudflats and tidal channels where salinities remain above 15 ‰ and water temperatures range between 12^{o}-22^{o} C in the summer (Behrens Yamada and Davidson 2002). Green crabs are noticeably absent from the cooler, more saline mouths of estuaries, which are dominated by the larger and more aggressive red rock crab, *Cancer productus* (Hunt and Behrens Yamada 2003).

Since *C. maenas* larvae settle high on the shore (Zeng et al. 1999), and crabs move into deeper water as they age (Crothers 1968), we adapted our collecting methods and locations to effectively sample all age classes of *C. maenas.* Since traps differ in their sampling efficiency for different sizes of crabs, we used two trap types (Table 1). Folding Fukui fish traps, with their wide slit-like openings, work well for adult crabs larger than 40 mm carapace width (CW), while crayfish traps with their small mesh size (0.5 cm) retain 0-age green crabs. Green crabs start entering these baited traps when they are around 30 mm in carapace width. Typically, we would trap larger adult crabs in the mid to low intertidal zones with folding Fukui fish traps and 0-age green crabs in the high intertidal with crayfish traps at the end of their first growing season (Appendix 1).

Table 1. Types of traps used for sampling *C. maenas* in Oregon and Washington estuaries. Size selectivity is given in carapace width (CW).

Trap Type	**Description**	**Dimensions**	**Tidal Height**	**Size Selectivity**
Fukui Fish trap	Plastic mesh (2 cm) with two slit openings (45 cm)	63 x 46 x 23 cm	Low to subtidal	>40 mm
Frabill Minnow trap	Wire mesh (0.5 cm) cylinder with two openings expanded to 5 cm	21 cm diameter 37 cm long	Medium to high	30-70 mm

On gravel shores, we added rocks to the crayfish and fish traps to weigh them down and to provide shelter for the crabs. On soft sediment, we pinned the traps down with thin metal stakes. We cut fish carcasses into sections and placed them into egg-shaped commercial bait containers (15 x 8 mm). Holes (0.5 cm) in the sides and lids of the containers allow bait odors to diffuse. One bait container with fresh bait was placed in a trap and left for one tidal cycle (typically 24 hours). We retrieved the traps at low tide, identified all crabs and other by-catch to species and noted the sex, carapace widths (CW) and molt stage of all green crabs (Appendix 2). Green crabs were measured between the tips of their fifth anterio-lateral spines using digital calipers.

Native crabs and other by-catch were released while green crabs were removed from the ecosystem and destroyed.

Table 2. Relative Green Crab abundances (# crabs per 100 trap-days) for study sites in Oregon and Washington estuaries. Data for Grays Harbor 2002 and Willapa Bay 2002-2003 and 2013 were kindly supplied by Washington Department of Fish and Wildlife. Supplemental data for Willapa Bay were supplied in 2004, by P. Sean McDonald and in 2016 by Washington Sea Grant- sponsored biologists: Sean McDonald, Emily Grason and Jeff Adams. Funding constraints did not allow us to sample Grays Harbor every year.

Estuary	***Number of crabs trapped over (number of traps deployed)***														
	2002	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***
Coos	9 (180)	14 (203)	18 (137)	9 (242)	22 (273)	52 (246)	65 (276)	18 (292)	6 (259)	18 (244)	41 (213)	12 (173)	3 (224)	26 (108)	445 (489)
Yaquina	26 (168)	63 (1084)	12 (461)	39 (290)	48 (211)	48 (231)	35 (227)	19 (162)	17 (211)	8 (110)	19 (149)	7 (65)	7 (147)	49 (78)	220 (200)
Netarts	0 (44)	11 (44)	12 (39)	52 (106)	47 (82)	35 (103)	17 (89)	13 (86)	14 (95)	19 (80)	5 (35)	0 (22)	31 (115)	49 (59)	62 (77)
Tillamoook	2 (71)	6 (70)	4 (51)	12 (102)	41 (147)	15 (93)	1 (100)	0 (113)	2 (90)	0 (60)	5 (35)	0 (13)	20 (105)	28 (70)	66 (65)
Willapa	57 (1640)	13 (409)	6 (195)	113 (449)	19 (245)	4 (318)	0 (98)	0 (35)	2 (17)	0 (37)	0 (42)	0 (15)	0 (43)	8 (20)	7 (122)
Grays Harbor	5 (1203)	--	--	2 (94)	3 (175)	0 (30)	--	0 (20)	--	--	-	-	-		present
Total	99 (3306)	107 (1810)	52 (883)	228 (1283)	180 (1133)	154 (1021)	118 (692)	50 (708)	41 (672)	45 (530)	70 (453)	19 (288)	61 (634)	160 (335)	800 (963)

Estuary	***Number of crabs trapped per 100 traps per day***														
	2002	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***	***2016***
Coos Bay	5	7	13	4	8	**21**	**24**	6	2	7	**19**	7	1	**24**	**91**
Yaquina	**15**	6	3	13	**23**	**21**	**15**	12	8	7	13	11	5	**63**	**110**
Netarts	0	**25**	**31**	**49**	**57**	**34**	**19**	**15**	**15**	**24**	14	0	**27**	**83**	**81**
Tillamook	3	9	8	11	**28**	**16**	1	0	2	0	14	0	13	**40**	**102**
Willapa	3.5	3	3	**25**	8	1	0	0	12	0	0	0	0	**40**	6
Grays Harbor	0.4	--	--	2	2	0	--	0	--	--	--				present
Total	3	6	6	**18**	**16**	**15**	**17**	7	6	8	**15**	7	10	**48**	**83**

Results

***Carcinus maenas* Abundance in the Pacific Northwest**

The relative abundances of green crabs trapped in Oregon and Washington estuaries in 2016 are tabulated in Appendix 1 and summarized in Table 2. Catches of green crabs in Oregon and Washington estuaries decreased after the 1998 colonization event when catch per unit effort (CPUE) ranged from 28 to 192 green crabs per 100 traps. Between 2002 and 2014 average catches had dropped below 20 per 100 traps (Table 2). Slight increases in catches reflect recruitment events in 2003, 2005, 2006, 2010 (Figure 2). The increase of catches in catches in 2015 and 2016 (48 and 79 per 100 traps respectively) can be attributed to the arrival of two strong 0-age year classes (2015 and 2016) in Oregon and, the 2015 year class in Willapa Bay.

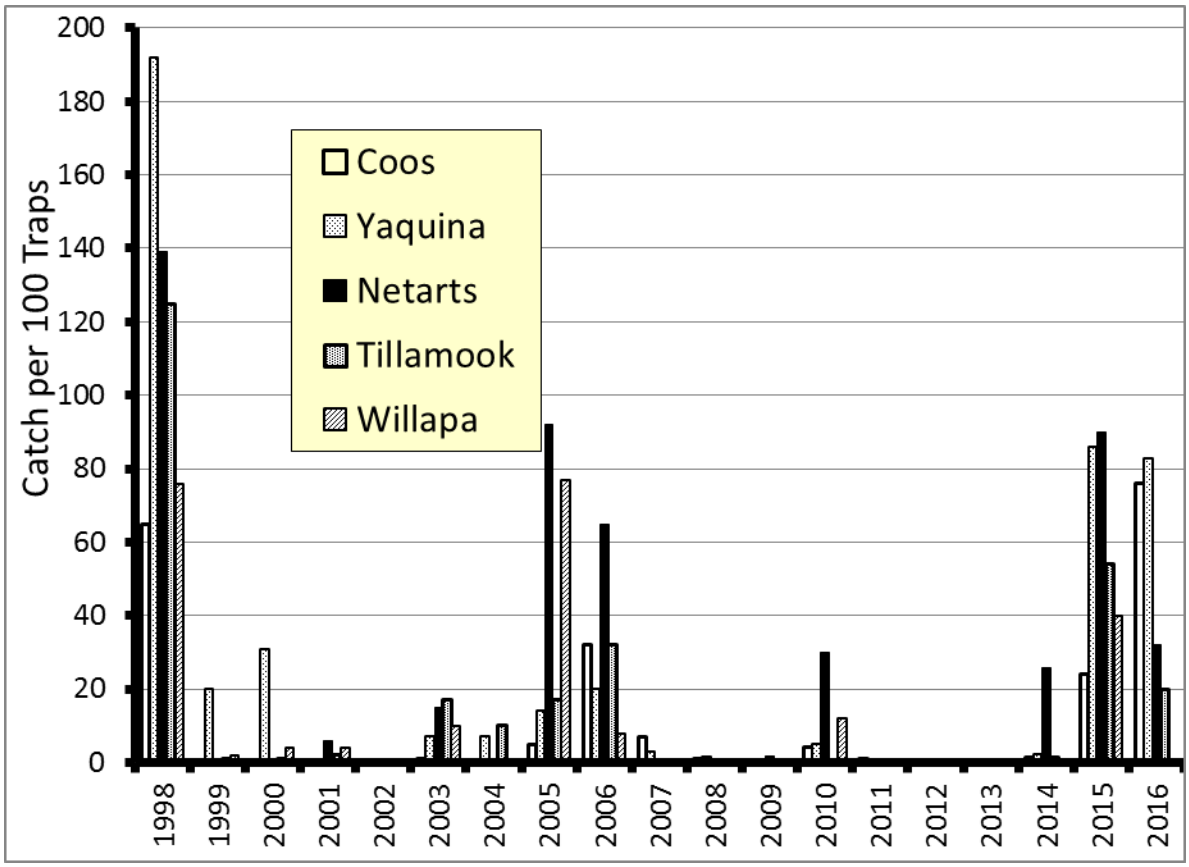

Figure 2. Relative Year Class Strength of 0-age *Carcinus maenas* in Oregon and Washington estuaries. *(Files/Papers/Papers/Ocean Conditions/Data files 2016recruits)*

Recruitment strength of Young-of-the-Year Carcinus maenas

Young-of-the-year (YOTY), or 0-age, green crabs typically enter minnow traps once they reach 30 mm in carapace width. Most years, crabs of this size, and larger, entered our minnow traps by late September. As can be seen from Figure 2 and Appendix 3, the appearance of 0-age green crabs is synchronous between estuaries. A good year, (or a poor year) in one estuary is a good (poor) year in all the others. 0-age green crabs were most abundant in 1998 with average catches for the Oregon and Washington estuaries of over 100 per 100 traps. In the fall of 2015, we caught between 24 and 90 young green crabs per 100 traps, making 2015 the best recruitment year since 1998. In 2016 catches of 0-age class was also strong in Oregon, but not in Washington (Figure 2).

Age Structure of Carcinus maenas in Oregon and Washington Estuaries

From previous mark and recapture studies, and from shifts in size frequency distributions over time (Behrens Yamada et al. 2005), we estimated the age of green crabs retrieved from Oregon and Washington estuaries in 2016. We assigned crabs to age classes based on their size and coloration (Table 3; Appendix 2). For example, at the beginning of the trapping season, male crabs between 50 and 70 mm, with green or yellow carapaces would represent the 2015 year class, and green crabs > 75 mm and >100 g , the 2014 year class. Crabs caught in the fall of 2016, ranging from 30 to 55 mm, were assigned to the 2016 year class. While the 2014 year class was present, the 2015 year class was the dominant one, comprising 80% of all crabs caught. The 2016 year class was detected as early as mid-August and catch rates in Oregon suggest that it is as strong as the 2015 one (Figure 2). This could be an underestimate as abundant molts collected in Coos Bay in mid-September averaged 22 mm and ranged from 16-34 mm. This observation suggests that many small crabs were present, but were too small (<30 mm) to enter our traps.

Table 3. Estimated age structure of *Carcinus maenas* retrieved from Oregon and Washington estuaries in 2016. Totals for each estuary include crabs caught using standard trapping protocol (Table 2), as well as those retrieved by other methods.

Estuary	2016	2015	2014		Total
Coos Bay	58	383	33		474
Yaquina	36	208	11		255
Netarts	17	38	9		64
Tillamook	8	57	2		67
Willapa		10			10
Grays Harbor	1 molt	present			
Total	119	696	55		870
Percent	13.7	80	6.3		100%

Ocean Conditions and Recruitment Strength of 0-age Carcinus maenas

The European green crab (*Carcinus maenas*) has a six-year life span and has persisted at low densities in Oregon and Washington coastal estuaries for the past 19 years. After the arrival of the strong founding year class of 1998, significant recruitment to the Oregon and Washington populations occurred only in 2003, 2005, 2006, 2010, 2014, 2015 and 2016. Warm winter water temperatures, high Pacific Decadal Oscillation and Multivariate, ENSO (El Niño Southern Oscillation Indices, weak southward shelf currents in March and April are all correlated with the these stronger year classes (Behrens Yamada and Kosro 2010, Behrens Yamada et al. 2015). Pacific Oscillation index for March turned out to be one of the best predictor of year class strength, explaining 76% of the annual variation (Appendix 4). Cold winter water temperatures, low Pacific Decadal Oscillation Indices, and strong southward (and offshore) currents in March and April are linked to year class failure. Recently, we found that biological indices used in salmon forecasting also work for predicting green crab year class strength. Southern copepod abundance and the day when the plankton community shifts from being dominated by southern species to, northern species (day of biological transition) are especially good predictors (Behrens Yamada, Peterson and Kosro 2015).

Discussion

Eight hundred European green crabs were caught with 1019 traps, yielding an average catch rate of 79 crabs per 100 traps for Oregon and Washington estuaries. This catch rate is of the same order of magnitude as the one observed in 1998.

While green crabs in Oregon and Washington are still rare, they are thriving in some inlets on the west coast of Vancouver. Average catches of over 20 crabs per trap are not unusual (Behrens Yamada and Gillespie 2008 and Gillespie et al. 2015). While these densities are surprisingly high, it should be noted that these hot spots are confined to wave-protected shellfish beaches with freshwater outfall. Hunt and Behrens Yamada (2003), Jensen et al. (2007) and Claudio DiBacco (pers. com.) found that high densities of green crabs occur primarily in microhabitats where larger native crabs are rare or absent. In Oregon and Washington estuaries and in the inlets of the west coast of Vancouver Island green crabs occur higher on the shore and in more marginal habitat than larger native crabs: *Cancer magister* (Dungeness), *Cancer productus* (red rock), *Cancer antennarius* (brown rock crab) and *Cancer gracilis* (graceful crab). These larger native crabs of the genus *Cancer* are less tolerant of low salinity and high temperatures than green crabs and thus avoid these shallow, warm, low saline microhabitats. In the absence of competition and predation from these larger crabs, green appear to flourish.

Since green crabs live up to 6 years, a recruitment event is needed at least once every 6 years to keep the population from going extinct. Unfortunately, they have managed to persist (Figure 2). While we have observed virtual recruitment failure in 2007, 2008, 2009, 2011, 2012 and 2013

the 2010, 2015 and 2016 year classes broke the cycle. The 2015 and 2016 cohorts will be a potential larval source until 2022.

Right now, green crabs are still too rare to exert a measurable effect on the native benthic community and on shellfish culture in Oregon and Washington. The next few years are critical in determining whether green crabs can persist in Oregon and Washington coastal estuaries. Luckily the 2015 El Niño has dissipated with weak La Niña or ENSO neutral conditions predicted for the early part of 2017 (http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/?enso_tab=enso-cpc_plume).

Outreach efforts to educate the general public, boaters and shellfish growers about the dangers of transporting non-native Aquatic Nuisance Species (ANS) should continue. Such efforts could delay the spread of ANS in general, and could prevent the establishment of green crabs in the inland sea between Vancouver Island and the mainland, including Puget Sound and Hood Canal. While recently 5 live green crabs from the 2015 and 2016 year classes were discovered near Anacortes, Washington (Grason et al. in press, Behrens Yamada et al. in press), these few individuals myust likely do not not represent a breeding population. Once green crabs get established in this inland sea, they would spread very quickly as many suitable habitats, devoid of larger crabs and other predators, exist in shallow, warm bays near freshwater outfalls. Other non-native species such as the Japanese oyster, the manila clam and the purple varnish clam spread very rapidly throughout the inland sea as their larvae were retained and not carried out to sea, as appears to be the case on the open Oregon and Washington coasts once the summer upwelling pattern starts (Behrens Yamada Peterson and Kosro 2015).

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Appendix 1. Relative abundance of crab species and sculpins (Numbers/trap/day) in Oregon and Washington estuaries during 2016.

Coos Bay **Mean CPUE (Catch/trap/day)**

Site	Date	Trap Type	Zone	*Carcinus maenas*	*Hemigrapsus oregonensis*	*Hemigrapsus nudus*	*Cancer magister*	*Cancer magister* (Recruits)	*Cancer productus*	Sculpin	Number Traps
Jordan Cove *N 43º 25.971' W 124º 14.981'*	9/17/2016	minnow	*High*	0.74	*0.23*		0.03			0.36	39
Kentuck *N 43º 25.299' W 124º 11.522'*	4/30/2016	minnow			6.3					0.3	10
	8/02/2016	Fish		0.67	3.5		2.83				6
	9/18/2016	minnow		1.0	1.06		0.31			0.81	16
Transpacific Lane South *N 43º 26'34" W 124º 13'23"*	4/30/2016	Fish	*Medium*	4			0.07			0.07	14
	5/01/2016	Fish	*Medium*	5.53	0.3		0.9			0.6	13
	7/06/2016	Fish					1.83		0.16	0.67	6
	7/22/2016	Fish		0.5			11.83				6
Transpacific North	7/22/2016	Fish		0.17			6.83				6
Under 101 bridge *N 43º 25'58" W 124º 13'15"*	4/30/2016	Fish	*Medium*	3.5	0.17		0.33		0.5		6
	5/1/2016	Fish	*Medium*	2.67			3.67		0.5	0.83	6
	7/31/2016	Fish		1.17	1.17		6.17				6
BLM boat ramp	7/06/2016	Fish					2.67				6
Boxcar Beach	7/07/2016	Fish				0.17	2			0.33	6
North Bay St. Park	7/08/2016	Fish			0.62		1.67			0.67	6
Empire Docks	7/19/16	Fish					4.67		7.67		6

Old Hatchery	7/26/2016	Fish					20.25		1.75		4
Strawberry Is.	7/26/2016	Fish					31		5.5		4
Clam Island	7/26/2016	Fish					33.3		3.67		3
Fossil Point	7/19/2016	Fish					1.67		6		6
Pony Slough	7/20/2016	Fish			0.33		0.5				6
N. Bend Boardwark	7/21/2016	Fish		0.17			2.33				6
Ferry Rd. Park	7/21/2016	Fish		0.33			11		3.67		6
Coos History Museum	8/03/2016	Fish		3.17	0.17		1.67	0.17		0.5	6
	8/17/2016	Both		1.3							10
	8/18/2016	Both		0.6							10
Coos Bay Boardwalk	8/03/2016	Fish		1.17	0.17		1.00			0.17	6
	8/17/2016	Fish		1.33							3
											8
Coal Bank Slough	8/04/2016	Fish		2.33	3.5		1.17	0.5			6
Isthmus Slough	8/04/2016	Fish		1.0	0.17		2.17	1.5			6
Millicoma Boat Ramp	8/05/2016	Fish		0.5	0.17		13	3.33			6
Catching Slough	8/05/2016	Fish			2.83		4.17	1.5		0.5	6
Willanch Creek	8/19/2016	Fish		4.33	0.67		0.83				6
Across from Somar	8/19/2016	Fish		0.5	24		1	0.17			6

Hayne's Inlet *N 43º 27' 01" W 124º 13'28"*	5/1/2016	Fish	*Medium*		15.5	0.2				0.1	10
	July/2016	Fish			0.33		4.33				6
	9/182016	minnow	*High*	0.56	0.63		0.25			1.19	16
Pony Point	8/2/2016	Fish		0.33			12.5		0.33		6
South Slough sites *Collin Williams*	6/29/16 to 8/02/16	All traps		0.54							160
Metcalf marsh	8/17/2016	Fish		0.92	5		7.77				14
Joe Ney Slough	8/18/2016	Fish		2.46	2.61		11.61	0.15	0.77	0.31	13
Total Number				445							489

Yaquina Bay

Mean CPUE (Catch/trap/day)

Site	Date	Trap Type	Zone	*Carcinus maenas*	*Hemigrapsus oregonensis*	*Hemigrapsus nudus*	*Cancer magister*	*Cancer magister* (Recruits)	*Cancer productus*	Sculpins	Number Traps
Johnson Slough *N 44º 34.692' W123º 59.333'*	9/19/2016	minnow	*High*	1.4	0.2		0.1			0.1	10
Sally's Bend A *N 44º 37.699' W124º 01.482'*	5/18-22	Fish		0.211		0.053	2.316				19
	9/19/2016	minnow		0.75	3.75	0.4	0.05			0.35	20
Sally's Bend C gate *N 44º 37.419' W124º 01.463'*	8/15/2016	Fish		1.5	0.1		1.4			1.4	10

Sawyer's Landing	5/18-22			0.75						2.75	12
HMSC Pumphouse *N 44º 37.408'* *W124º 02.576'*	4/2016	Fish		1.25	0.13		3.25	0.13	0.5		8
	5/21-23	Fish		0.523	0.575		3.24		2.248		19
	5/26-27	Fish		0.375			0.75		3.0		8
	6/24/2016	Fish		0.71	0.28	0.14	1.71		0.57	1.28	7
Oregon Coast Aquarium Mudflat *N 44º 37.108'* *W124º 02.165'*	4/4/2016	fish		2	0.6		9.6				5
	4/4/2016	minnow		0.1	3.8	0.1					10
	5/16-23	Fish		1.935	1.48	0.032	2.81				31
	6/24/2016	Fish		3.28	6.71	0.14				1.8	7
	6/24/2016	minnow		0.2	6.6	0.4					10
	7/16/2016	Fish		1.25							4
	8/15/2016	Minnow		0.4	4.1					0.4	10
	9/19/2016	minnow		0.4	3.3					0.3	10
Idaho Point *N 44º 36.818'* *W 124º 01.582'*	8/16/2016	Fish		3.2	0.9		4.1			1.8	10
Total Number				220							200

Tillamook Bay

Mean CPUE (Catch/trap/day)

Site											
View Point *N 45º 32.623'* *W 123º 54.183'*	7/6/2016	Fish		1.2	0.1		*3.7*			3.4	10
	8/18/2016	Fish		1.7	0.3		4.0			0.5	10
	9/16/2016	Fish		5.6			14.4			1.0	5
Tillamook Spit B *N 45º 30.456'* *W 123º 56.615'*	9/21/2016	minnow		0.3	1.4						10
	9/22/2016	minnow		0.1	2.0						10

Pitcher Point	9/21/2016	minnow		0.4	0.5					0.1	10
N 45º 30.365' *W 123º 56.508'*	9/22/2016	minnow		0.1	2.14					0.2	10
Total Number				66							65

Netarts Bay **Mean CPUE (Catch/trap/day)**

Site		Trap Type	Zone	*Carcinus maenas*	*Hemigrapsus oregonensis*	*Hemigrapsus nudus*	*Cancer magister*	*Cancer magister* (Recruits)	*Cancer productus*	Sculpin	Number Traps
Boat Ramp	9/21/2016	minnow		0		0.4				0.2	10
Intersection	7/6/2016	fish		1.67	0.17		0.1			0.5	6
N 45º 24.865'	8/18/2016	fish		3.38	0.13		5.13	0.13	0.63	0.88	6
W 123º 56.064'	9/17/2016	Fish		1.6	0.6	0.4	6.4		1.38	0.4	5
Whiskey Creek Salmon Hatchery	7/6/2016	Fish		1.5	1.0		1.0			2.5	2
	7/6/2016	minnow		0	3.5	0.5				0.63	8
N 45º 23.670'	8/18/2016	minnow		1.0	1.4					0.3	10
W 123º 56.214'	9/21/16	minnow		0.2	4.3	0.1					10
	9/22/2016	minnow		0.2	5.45	0.05					20
Total Number				62							77

Willapa Bay **Mean CPUE (Catch/trap/day)**

Site		Trap Type	Zone	*Carcinus maenas*	*Hemigrapsus oregonensis*	*Hemigrapsus nudus*	*Cancer magister*	*Cancer magister* (Recruits)	*Cancer productus*	Sculpins	Number Traps
Tokeland	8/16/2016	Fish		0							20
	8/16/2106	minnow		0							20
Stackpole	8/15-19/16	Fish		0.06							20
	8/15-19/16	minnow		0							20
N 46º 35.848'	9/21/2016	Pit-fall		0.167	3.5		1.5			0	6

W 124º 02.195'	9/22/2016	Pit-fall		0							6
	9/21/2016	minnow		0	2.27		0.4			0.13	15
	9/22/2016	minnow		0							15
Total Number				7							122

Appendix 2. *Carcinus maenas.* Catches and Sightings from Oregon and Washington Estuaries in 2016. Crabs were assigned to year classes based on the size and condition attained by tagged crabs of known age (Behrens Yamada et al. 2005). Crabs that are green have molted recently, while red crabs have not molted for a long time, in some case well over a year. Missing limbs are numbered in sequence: R1= Right claw; R5= last leg on right side, L1= left claw, L5=last leg on left side.

Estuary	Site	Date	Sex	Carapace Width (mm)	Weight (g)	color	Year classt	Missing limbs	comments
COOS	Transpacific Highway	4/30/2016	F	48.36	23.5		2015		
COOS	Transpacific Highway	4/30/2016	F	55.14	26.2		2015		
COOS	Transpacific Highway	5/1/2016	F	50.1	28.2		2015		
COOS	Transpacific Highway	5/1/2016	F	53.74	29.1		2015		
COOS	Transpacific Highway	5/1/2016	M	53.84	29.7		2015		
COOS	Transpacific Highway	5/1/2016	F	53.45	30.9		2015		
COOS	Transpacific Highway	4/30/2016	M	53.45	31.3		2015		
COOS	Transpacific Highway	4/30/2016	M	54.3	33.5		2015		
COOS	Transpacific Highway	5/1/2016	F	57.49	35.3		2015		
COOS	Transpacific Highway	4/30/2016	M	55.97	35.4		2015		
COOS	Transpacific Highway	4/30/2016	M	57.1	36.6		2015		
COOS	Transpacific Highway	5/1/2016	M	61.38	37.8		2015		
COOS	Transpacific Highway	4/30/2016	F	59.44	38		2015		
COOS	Transpacific Highway	4/30/2016	F	57.43	38.2		2015		
COOS	Transpacific Highway	4/30/2016	F	62.51	38.6		2015		
COOS	Transpacific Highway	5/1/2016	M	59.92	38.8		2015		
COOS	Transpacific Highway	4/30/2016	M	54.9	38.9		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	56.27	39.9		2015		
COOS	Transpacific Highway	4/30/2016	F	59.71	40.1		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	56.86	40.8		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	48.72	42.1		2015		
COOS	Transpacific Highway	5/1/2016	F	58.34	43		2015		
COOS	Transpacific Highway	4/30/2016	M	61.67	45.3		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	60.33	47.2	orange	2015		

COOS	McCullough Bridge (N)	5/1/2016	M	59.35	47.4		2015		
COOS	Transpacific Highway	5/1/2016	M	58.59	48		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	60.94	48.1		2015		
COOS	Transpacific Highway	5/1/2016	M	59.93	49.5		2015		
COOS	Transpacific Highway	5/1/2016	M	65.86	50.4		2015		
COOS	Transpacific Highway	5/1/2016	M	61.87	52.1		2015		
COOS	Transpacific Highway	5/1/2016	M	60.43	52.2		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	62.69	52.7		2015		
COOS	Transpacific Highway	4/30/2016	M	63.49	54.2		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	61.19	54.2		2015		
COOS	Transpacific Highway	5/1/2016	M	62.25	54.3		2015		
COOS	Transpacific Highway	5/1/2016	M	62.88	54.4		2015		
COOS	Transpacific Highway	5/1/2016	M	60.85	54.4		2015		
COOS	Transpacific Highway	4/30/2016	M	65.74	55		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	62.61	56.7		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	63.49	57		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	64.66	57.3	orange	2015		
COOS	McCullough Bridge (N)	5/1/2016	M	61.85	57.7		2015		
COOS	Transpacific Highway	4/30/2016	M	64.83	58		2015		
COOS	Transpacific Highway	5/1/2016	M	63.11	58.3		2015		
COOS	Transpacific Highway	5/1/2016	M	69.08	58.5		2015		
COOS	Transpacific Highway	5/1/2016	F	57.18	60.1		2015		
COOS	Transpacific Highway	5/1/2016	M	66.19	60.5		2015		
COOS	Transpacific Highway	4/30/2016	M	66.45	61		2015		
COOS	Transpacific Highway	5/1/2016	M	64.19	61.4		2015		
COOS	Transpacific Highway	5/1/2016	M	65.05	62.6		2015		
COOS	Transpacific Highway	5/1/2016	M	64.73	63		2015		
COOS	Transpacific Highway	4/30/2016	M	68.2	63		2015		
COOS	Transpacific Highway	5/1/2016	M	69.43	63.3		2015		
COOS	Transpacific Highway	5/1/2016	M	69.03	63.33		2015		
COOS	Transpacific Highway	5/1/2016	M	65.02	64		2015		

COOS	Transpacific Highway	5/1/2016	M	64.71	65.1		2015		
COOS	Transpacific Highway	5/1/2016	M	64.92	65.1		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	66.7	65.1		2015		
COOS	Transpacific Highway	5/1/2016	M	64.44	65.4		2015		
COOS	Transpacific Highway	5/1/2016	M	65.76	65.5		2015		
COOS	Transpacific Highway	5/1/2016	M	70.87	66		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	66.2	66.3		2015		
COOS	Transpacific Highway	4/30/2016	M	67.88	66.4		2015		
COOS	Transpacific Highway	5/1/2016	M	66.26	66.5		2015		
COOS	Transpacific Highway	5/1/2016	M	65.66	67.2		2015		
COOS	Transpacific Highway	5/1/2016	M	68.44	67.3		2015		
COOS	Transpacific Highway	5/1/2016	M	63.53	67.4		2015		
COOS	Transpacific Highway	4/30/2016	M	66.68	67.7		2015		
COOS	Transpacific Highway	5/1/2016	M	67.41	67.9		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	68.88	68.1		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	65.5	68.7		2015		
COOS	Transpacific Highway	5/1/2016	M	65.74	69.3		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	66.09	69.4		2015		
COOS	Transpacific Highway	4/30/2016	M	70.46	69.5		2015		
COOS	Transpacific Highway	5/1/2016	M	67.22	69.8		2015		
COOS	Transpacific Highway	4/30/2016	M	71.08	69.9		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	68.04	70.2		2015		
COOS	Transpacific Highway	4/30/2016	M	71.2	70.3		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	69.31	70.5		2015		
COOS	Transpacific Highway	4/30/2016	M	74.94	71		2015		
COOS	Transpacific Highway	4/30/2016	M	65.76	71		2015		
COOS	Transpacific Highway	5/1/2016	M	65.93	71.6		2015		
COOS	Transpacific Highway	4/30/2016	M	71.3	71.9		2015		
COOS	Transpacific Highway	4/30/2016	M	68.53	71.9		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	70.27	72.1		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	67.42	72.2		2015		

COOS	Transpacific Highway	4/30/2016	M	72.41	72.7		2015		
COOS	Transpacific Highway	5/1/2016	M	67.25	72.8		2015		
COOS	Transpacific Highway	5/1/2016	M	69.53	73.4		2015		
COOS	Transpacific Highway	5/1/2016	M	68.45	73.4		2015		
COOS	Transpacific Highway	5/1/2016	M	68.48	73.8		2015		
COOS	Transpacific Highway	5/1/2016	M	67.33	73.9		2015		
COOS	Transpacific Highway	4/30/2016	M	68.85	73.9		2015		
COOS	Transpacific Highway	4/30/2016	M	71.13	74.9		2015		
COOS	Transpacific Highway	4/30/2016	M	69.77	75		2015		
COOS	Transpacific Highway	5/1/2016	M	71.18	75.8		2015		
COOS	Transpacific Highway	5/1/2016	M	68.47	76.1		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	68.87	76.4		2015		
COOS	Transpacific Highway	5/1/2016	M	70.54	76.6		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	71.12	76.6		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	69.39	76.8		2015		
COOS	Transpacific Highway	4/30/2016	M	70.85	78		2015		
COOS	Transpacific Highway	5/1/2016	M	69.45	79.4		2015		
COOS	Transpacific Highway	4/30/2016	M	71.49	79.5		2015		
COOS	Transpacific Highway	5/1/2016	M	72.86	79.7		2015		
COOS	Transpacific Highway	5/1/2016	M	70.52	80.2		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	72.16	80.4		2015		
COOS	Transpacific Highway	5/1/2016	M	69.45	80.5		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	69.95	80.6		2015		
COOS	Transpacific Highway	5/1/2016	M	73.1	81.2		2015		
COOS	Transpacific Highway	4/30/2016	M	72.73	81.2		2015		
COOS	Transpacific Highway	4/30/2016	M	72.52	81.3		2015		
COOS	Transpacific Highway	5/1/2016	M	70.45	81.5		2015		
COOS	Transpacific Highway	4/30/2016	M	72.86	81.9		2015		
COOS	Transpacific Highway	5/1/2016	M	70.77	82.1		2015		
COOS	Transpacific Highway	4/30/2016	M	71.44	82.9		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	71.66	83.1		2015		

COOS	Transpacific Highway	4/30/2016	M	72.06	83.8		2015		
COOS	Transpacific Highway	5/1/2016	M	70.98	84.5		2015		
COOS	Transpacific Highway	4/30/2016	M	72.57	85.6		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	72.3	87		2015		
COOS	Transpacific Highway	4/30/2016	M	75.25	87.5		2015		
COOS	Transpacific Highway	4/30/2016	M	73.72	87.7		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	74.04	87.9		2015		
COOS	Transpacific Highway	5/1/2016	M	71.16	88.5		2015		
COOS	Transpacific Highway	4/30/2016	M	75.48	88.6		2015		
COOS	Transpacific Highway	4/30/2016	M	78.19	89.6		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	74.36	90.4		2015		
COOS	McCullough Bridge (N)	5/1/2016	M	74.68	90.5		2015		
COOS	Transpacific Highway	4/30/2016	M	72.46	91.3		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	70.48	91.3		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	71.99	92.1		2015		
COOS	Transpacific Highway	4/30/2016	M	74.03	92.2		2015		
COOS	Transpacific Highway	5/1/2016	M	73.8	92.7		2015		
COOS	Transpacific Highway	4/30/2016	M	71.02	93.3		2015		
COOS	Transpacific Highway	4/30/2016	M	74.79	93.7		2015		
COOS	Transpacific Highway	5/1/2016	M	71.48	94		2015		
COOS	McCullough Bridge (N)	4/30/2016	M	74.49	95.2		2015		
		Mean		**66.2**	**65.6**				
COOS	Transpacific Highway	4/30/2016	M	76.07	95.6	red	2014		
COOS	McCullough Bridge (N)	4/30/2016	M	75.68	95.6		2014		
COOS	Transpacific Highway	5/1/2016	M	76.75	96.5		2014		
COOS	Transpacific Highway	5/1/2016	M	75.1	97		2014		
COOS	Transpacific Highway	5/1/2016	M	78.76	97.1		2014		
COOS	McCullough Bridge (N)	4/30/2016	M	76.03	97.4		2014		
COOS	Transpacific Highway	5/1/2016	M	75.17	97.7		2014		
COOS	Transpacific Highway	5/1/2016	M	74.49	98.7		2014		
COOS	Transpacific Highway	4/30/2016	M	76.4	100.1		2014		

COOS	Transpacific Highway	4/30/2016	M	78.22	102.2		2014		
COOS	Transpacific Highway	4/30/2016	M	77.49	102.6	red	2014		
COOS	Transpacific Highway	5/1/2016	M	75.81	103.6		2014		
COOS	Transpacific Highway	4/30/2016	M	75.93	104.3		2014		
COOS	Transpacific Highway	5/1/2016	M	67.88	104.4		2014		
COOS	Transpacific Highway	4/30/2016	M	82.92	104.4		2014		
COOS	Transpacific Highway	4/30/2016	M	78.22	105.4		2014		
COOS	Transpacific Highway	5/1/2016	M	78.52	112.7		2014		
COOS	Transpacific Highway	5/1/2016	M	77.94	113.4		2014		
COOS	Transpacific Highway	4/30/2016	M	81.94	113.6		2014		
COOS	McCullough Bridge (N)	4/30/2016	M	77.08	114.2		2014		
COOS	Transpacific Highway	5/1/2016	M	79.14	116.5		2014		
COOS	Transpacific Highway	5/1/2016	M	81.2	117.1		2014		
COOS	Transpacific Highway	5/1/2016	M	77.86	119.7		2014		
COOS	Transpacific Highway	5/1/2016	M	82.98	121.2		2014		
COOS	Transpacific Highway	5/1/2016	M	82.58	123.9		2014		
COOS	Transpacific Highway	4/30/2016	M	86.48	127.8		2014		
		MEAN		**77.9**	**107.0**				
COOS	Transpacific South	7/18/2016	male	76.93	86.1	yellow	2014		Christina Geierman
COOS	Coalbank Slough	8/4/2016	female	63.52	63.1	green	2015		Christina Geierman
COOS	Coalbank Slough	8/4/2016	male	66.72	71.9	orange	2015		Cristina Geierman
COOS	Coalbank Slough	8/4/2016	male	68.93	57.8	yellow	2015		Christina Geierman
COOS	Coalbank Slough	8/4/2016	male	70.05	88.6	orange	2015		Cristina Geierman
COOS	Coalbank Slough	8/4/2016	male	73.14	80.5	orange	2015		Christina Geierman
COOS	Coalbank Slough	8/4/2016	male	73.55	98.8	yellow	2015		Cristina Geierman
COOS	Coalbank Slough	8/4/2016	male	74.08	98.5	orange	2015		Christina Geierman
COOS	Coalbank Slough	8/4/2016	male	74.08	106.4	yellow	2015		Cristina Geierman
COOS	Coalbank Slough	8/4/2016	male	74.39	106.4	yellow	2015		Christina Geierman
COOS	Coalbank Slough	8/4/2016	male	77.89	111.2	yellow	2015		Cristina Geierman
COOS	Coalbank Slough	8/4/2016	male	78.4	115.3	yellow	2015		Christina Geierman

COOS	Coalbank Slough	8/4/2016	male	78.97	119.2	orange	2015		Cristina Geierman
COOS	Coalbank Slough	8/4/2016	male	82.45	151	yellow	2014		Christina Geierman
COOS	Coos Bay Boardwalk	8/3/2016	male	66.59	76.3	orange	2015		Cristina Geierman
COOS	Coos Bay Boardwalk	8/3/2016	male	67.69	79.2	yellow	2015		Christina Geierman
COOS	Coos Bay Boardwalk	8/3/2016	male	68.38	79.8	yellow	2015		Cristina Geierman
COOS	Coos Bay Boardwalk	8/3/2016	male	71.26	100.9	yellow	2015		Christina Geierman
COOS	Coos Bay Boardwalk	8/3/2016	male	75.03	87.4	yellow	2015		Cristina Geierman
COOS	Coos Bay Boardwalk	8/3/2016	male	78.86	113.4	yellow	2015		Christina Geierman
COOS	Coos Bay Boardwalk	8/3/2016	male	79.61	105.1	yellow	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	female	63.24	47.7	green	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	female	65.18	57	green	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	male	65.87	73	orange	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	male	66.56	61.6	red	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	male	68.13	74	yellow	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	male	68.74	54.4	yellow	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	male	69.3	90.1	orange	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	male	69.45	78.1	yellow	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	male	70.21	81.4	orange	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	male	71.68	102.5	yellow	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	male	72.43	95.7	yellow	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	male	74.42	112.3	yellow	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	male	75.23	112.9	orange	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	male	75.38	124.4	orange	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	male	75.79	99.4	yellow	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	male	75.93	102.1	yellow	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	male	76.58	105.2	yellow	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	male	76.71	100.3	yellow	2015		Cristina Geierman
COOS	Coos History Museum	8/3/2016	male	78.22	123.7	orange	2015		Christina Geierman
COOS	Coos History Museum	8/3/2016	male	80.25	99.9	orange-red	2015		Cristina Geierman
COOS	Ferry Road	7/21/16	male	71.19	96.4	yellow	2015		Christina Geierman
COOS	Ferry Road	7/21/2016	female	74.65	109.7	yellow	2015		Cristina Geierman

COOS	Isthmus Slough	8/4/16	female	54.42	30.6	green	2015		Christina Geierman
COOS	Isthmus Slough	8/4/16	female	59.25	46.3	red	2015		Cristina Geierman
COOS	Isthmus Slough	8/4/16	male	65.1	67.8	orange	2015		Christina Geierman
COOS	Isthmus Slough	8/4/16	male	65.73	68.6	orange	2015		Cristina Geierman
COOS	Isthmus Slough	8/4/16	male	69.7	87.3	orange	2015		Christina Geierman
COOS	Isthmus Slough	8/4/16	male	70.59	81.9	yellow-orange	2015		Cristina Geierman
COOS	Isthmus Slough	8/4/16	male	70.87	64.1	orange	2015		Christina Geierman
COOS	Isthmus Slough	8/4/16	male	82.82	144.3	yellow-orange	2014		Cristina Geierman
COOS	Kentuck	8/2/16	female	64.84	52.7	green	2015		Christina Geierman
COOS	Kentuck	8/2/16	male	69.86	79.2	yellow	2015		Cristina Geierman
COOS	Kentuck	8/2/16	female	69.87	68.1	green	2015		Christina Geierman
COOS	Kentuck	8/2/16-	male	80.25	100	yellow	2015		Cristina Geierman
COOS	McCullough Bridge	7/30/16	male	66.85	69.1	red	2015		Christina Geierman
COOS	McCullough Bridge	7/30/16	female	67.93	78.7	red	2015		Cristina Geierman
COOS	McCullough Bridge	7/30/16	male	71.53	99.9	yellow	2015		Christina Geierman
COOS	McCullough Bridge	7/30/16	male	73.37	115.4	orange	2015		Cristina Geierman
COOS	McCullough Bridge	7/30/16	male	74.53	107.5	yellow	2015		Christina Geierman
COOS	McCullough Bridge	7/30/16	male	76.6	121.5	yellow	2015		Cristina Geierman
COOS	McCullough Bridge	7/30/16	male	77.39	89.4	yellow	2015		Christina Geierman
COOS	McCullough Bridge	7/30/16	male	79.42	115.5	yellow	2015		Cristina Geierman
COOS	Millicoma Boat Ramp	8/5/2016	male	70.07	80.4	orange	2015		Christina Geierman
COOS	Millicoma Boat Ramp	8/5/2016	male	76.23	109.1	yellow	2015		Cristina Geierman
COOS	Millicoma Boat Ramp	8/5/2016	male	76.81	106.6	yellow	2015		Christina Geierman
COOS	NB Boardwalk	7/21/16	male	71.13	91.6	yellow	2015		Cristina Geierman
COOS	Pony Pt	8/2/2016	male	62.78	63.8	orange	2015		Christina Geierman
COOS	Pony Pt	8/2/2016	male	64.58	59.3	yellow	2015		Cristina Geierman
COOS	Pony Pt	8/2/2016	male	65.48	67.2	orange	2015		Christina Geierman
COOS	Transpacific North	7/22/2016	male	71.67	89.01	yellow	2015		Cristina Geierman
COOS	Transpacific South	7/22/2016	female	49.55	84.9	red	2015		Christina Geierman
COOS	Transpacific South	7/22/2016	male	72.7		orange	2015		Cristina Geierman
COOS	Transpacific South	7/22/2016	male	76.93	86.1	Yellow	2015		Christina Geierman

COOS	Transpacific South	7/22/2016	male	77.09	110.9	yellow	2015		Cristina Geierman
COOS	Transpacific South	7/22/2016	male	81	126.3	yellow	2015		Christina Geierman
		Mean		**71.6756**	**90.2**				
COOS	Coos Historical Museum	8/17/2016	female	58.33	39.5	red	2015		Cristina Geierman
COOS	Coos Historical Museum	8/17/2016	males	59.31	48.7	yellow	2015		Christina Geierman
COOS	Coos Historical Museum	8/17/2016	males	59.98	44.2	orange	2015		Cristina Geierman
COOS	Coos Historical Museum	8/17/2016	female	62.13	57.2	green	2015		Christina Geierman
COOS	Coos Historical Museum	8/17/2016	female	66.44	62.3	green	2015		Cristina Geierman
COOS	Coos Historical Museum	8/17/2016	male	72.43	97.3	orange	2015		Christina Geierman
COOS	Coos Historical Museum	8/17/2016	male	72.61	98.8	orange	2015		Cristina Geierman
COOS	Coos Historical Museum	8/17/2016	male	73.24	84.8	yellow-green	2015		Christina Geierman
COOS	Coos Historical Museum	8/17/2016	male	73.41	96.5	orange	2015		Cristina Geierman
COOS	Coos Historical Museum	8/17/2016	male	74.41	119.5	yellow	2015		Christina Geierman
COOS	Coos Historical Museum	8/17/2016	male	76.56	114.6	orange	2015		Cristina Geierman
COOS	Coos Historical Museum	8/17/2016	male	78.81	136.4	orange	2014		Christina Geierman
COOS	Coos Historical Museum	8/17/2016	male	80.14	119.3	yellow	2015		Cristina Geierman
COOS	Coos Historical Museum	8/18/2016	juvenile	15.73	0.7	green/tan	**2016**		Christina Geierman
COOS	Coos Historical Museum	8/18/2016	male	52.9	30.7	yellow	2015/16		Cristina Geierman
COOS	Coos Historical Museum	8/18/2016	male	72.14	99.3	yellow	2015		Christina Geierman
COOS	Coos Historical Museum	8/18/2016	male	73.65	94.9	yellow	2015		Cristina Geierman
COOS	Coos Historical Museum	8/18/2016	male	79.9	122.9	yellow	2015		Christina Geierman
COOS	Coos Historical Museum	8/18/2016	male	80.15	129.8	orange	2014		Cristina Geierman
COOS	Across from SOMAR	8/19/2016	female	28.91	5.5	green	**2016**		Christina Geierman
COOS	Across from SOMAR	8/19/2016	male	39.44	12.4	green	**2016**		Cristina Geierman
COOS	Across from SOMAR	8/19/2016	male	42.42	15.3	green	**2016**		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	61.56	61.8	orange	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	64.57	70.3	green	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	65.11	71.8	yellow	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	female	67.24	72	green	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	67.35	67.2	yellow	2015		Cristina Geierman

COOS	Willanch Creek	8/19/2016	male	67.74	79.3	yellow	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	68.63	92.3	yellow	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	69.7	84.8	yellow	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	70.12	101.5	yellow	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	70.8	84.7	yellow	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	71.14	101	orange	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	71.22	93.3	orange	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	72.39	96.7	orange	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	72.72	106.6	orange	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	73.51	109.3	orange	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	73.62	103.5	yellow	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	73.99	94.4	yellow	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	74.21	113.8	yellow	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	74.4	107.7	orange	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	74.45	110.36	yellow	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	74.98	109.2	yellow	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	75.23	108.3	yellow	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	76.4	106.4	yellow	2015		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	78.35	125.6	orange	2015		Christina Geierman
COOS	Willanch Creek	8/19/2016	male	80.24	124.1	orange	2014		Cristina Geierman
COOS	Willanch Creek	8/19/2016	male	81.15	109.6	yellow	2015		Christina Geierman
		Mean		**68.9**	**86.2**				
COOS	Metcalf	29-Jun-16	Female	64.9	57.9	Green	2015		Collin Williams
COOS	Metcalf	29-Jun-16	Male	73.25	80.5	Yellow/Green	2015		Collin Williams
COOS	Metcalf	29-Jun-16	Female	64.6	60.1	Green	2015		Collin Williams
COOS	Metcalf	29-Jun-16	Female	68.14	67.2	Green	2015		Collin Williams
COOS	Metcalf	29-Jun-16	Male	63.5	53.4	Yellow/Orange	2015		Collin Williams
COOS	Metcalf	29-Jun-16	Female	55	32.1	Green	2015/16		Collin Williams
COOS	Metcalf	29-Jun-16	Female	50.9	29.5	Red	2015/16		Collin Williams
COOS	Metcalf	30-Jun-16	Male	65.61	63	Yellow/Green	2015		Collin Williams

COOS	Metcalf	30-Jun-16	Male	74.1	89.2	Yellow/Green	2015		Collin Williams
COOS	Metcalf	30-Jun-16	Male	65.43	65.2	Yellow/Green	2015		Collin Williams
COOS	Metcalf	30-Jun-16	Male	63.03	55.5	Yellow/Green	2015		Collin Williams
COOS	Metcalf	30-Jun-16	Male	66.26	61.3	Yellow/Green	2015	Broken abdomen	Collin Williams
COOS	Metcalf	30-Jun-16	Male	65.34	64.2	Yellow/Green	2015		Collin Williams
COOS	Metcalf	30-Jun-16	Male	66.44	68.8	Green	2015		Collin Williams
COOS	Metcalf	30-Jun-16	Male	62.38	59.2	Yellow/Green	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	71.58	89.2	Green	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	70.55	75.8	Orange	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	66.41	72.3	Yellow/Green	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	63.07	67.2	Yellow/Orange	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	64.84	65.8	Orange	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	66.41	72.3	Yellow/Orange	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	63.07	67.2	Yellow/Green	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	62.47	57.5	Yellow	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Female	52.15	30.4	Yellow/Orange	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	70.89	86.2	Yellow	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Male	70.45	81.7	Yellow/Orange	2015		Collin Williams
COOS	Joe Ney	12-Jul-16	Female	55.43	37.5	Red/Orange	2015		Collin Williams
COOS	Valino	12-Jul-16	Male	68.74	80.3	Yellow	2015		Collin Williams
COOS	Valino	12-Jul-16	Male	70.68	74.5	Yellow/Orange	2015	L1	Collin Williams
COOS	Joe Ney	13-Jul-16	Male	65.44	65.7	Orange	2015		Collin Williams
COOS	Joe Ney	13-Jul-16	Male	71.36	89.8	Yellow	2015		Collin Williams
COOS	Joe Ney	13-Jul-16	Male	68.95	73.5	Yellow/Green	2015	L1 reg.	Collin Williams
COOS	Joe Ney	13-Jul-16	Male	68.23	69.2	Yellow	2015		Collin Williams
COOS	Joe Ney	13-Jul-16	Male	70.28	74.2	Yellow	2015		Collin Williams
COOS	Joe Ney	13-Jul-16	Female	53.04	33	Orange	2015		Collin Williams
COOS	Joe Ney	13-Jul-16	Female	48.82	24.2	Orange	2015		Collin Williams
COOS	Joe Ney	13-Jul-16	Male	54.19	34.6	Yellow	2015		Collin Williams
COOS	Joe Ney	13-Jul-16	Male	70.46	77.6	Yellow	2015		Collin Williams
COOS	Joe Ney	13-Jul-16	Female	68.38	69.3	Green	2015		Collin Williams

COOS	Indian Point	13-Jul-16	Male	73.56	84.7	Yellow/Green	2015		Collin Williams
COOS	Metcalf	20-Jul-16	Male	69.93	74.1	Yellow	2015	L1 reg.	Collin Williams
COOS	Metcalf	20-Jul-16	Male	72.6	88.9	Yellow/Green	2015		Collin Williams
COOS	Metcalf	20-Jul-16	Male	71	82.2	Yellow/Orange	2015		Collin Williams
COOS	Metcalf	20-Jul-16	Female	52.48	27.8	Yellow/Orange	2015	L1	Collin Williams
COOS	Metcalf	20-Jul-16	Male	60.1	36	Yellow/Orange	2015		Collin Williams
COOS	Metcalf	20-Jul-16	Male	69.79	81.2	Yellow	2015		Collin Williams
COOS	Metcalf	20-Jul-16	Male	75.62	90.3	Orange	2015	R1	Collin Williams
COOS	Metcalf	20-Jul-16	Male	71.87	97.8	Yellow	2015	Barnacle	Collin Williams
COOS	Metcalf	20-Jul-16	Female	58.47	44.2	Orange	2015		Collin Williams
COOS	Metcalf	20-Jul-16	Female	55.86	34	Green	2015	R1 reg.	Collin Williams
COOS	Hinch	20-Jul-16	Male	67.21	66.1	Yellow	2015	L3,L4	Collin Williams
COOS	Metcalf	21-Jul-16	Female	54.96	36.4	Orange	2015	Egg case	Collin Williams
COOS	Metcalf	21-Jul-16	Male	61.09	42.2	Yellow	2015	R1 reg.	Collin Williams
COOS	Metcalf	21-Jul-16	Male	72.77	73.6	Yellow/Orange	2015	R1, L1	Collin Williams
COOS	Joe Ney	26-Jul-16	Male	62.01	59.8	Yellow/Orange	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	72.71	90.6	Red	2015	Barnacles	Collin Williams
COOS	Joe Ney	26-Jul-16	Male	63.08	60.7	Yellow/Green	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	70.96	87.3	Yellow	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	69.27	86.1	Yellow	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	72.17	89.1	Yellow/Green	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	69.59	81.5	Yellow	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	68.22	77.3	Yellow	2015	Abdomen injured	Collin Williams
COOS	Joe Ney	26-Jul-16	Male	72.32	99.7	Orange	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	72.63	94.4	Yellow/Green	2015	L5	Collin Williams
COOS	Joe Ney	26-Jul-16	Male	67.94	72.3	Yellow	2015	R1 reg.	Collin Williams
COOS	Joe Ney	26-Jul-16	Male	77.33	105.9	Orange	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	71.2	81.2	Yellow	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	70.36	77.1	Yellow/Orange	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Male	69.76	79.8	Yellow	2015		Collin Williams
COOS	Joe Ney	26-Jul-16	Female	48.2	25	Red	2015/16		Collin Williams

COOS	Joe Ney	27-Jul-16	Female	64.42	56.3	Green	2015		Collin Williams
COOS	Joe Ney	27-Jul-16	Male	63.86	60.2	Yellow/Orange	2015	R1 reg.	Collin Williams
COOS	Joe Ney	27-Jul-16	Male	69.66	71.6	Yellow	2015	L1 reg.	Collin Williams
COOS	Joe Ney	27-Jul-16	Male	71.99	71.5	Yellow	2015	R1, L1 damaged	Collin Williams
COOS	Joe Ney	27-Jul-16	Male	73.15	97.9	Yellow	2015		Collin Williams
COOS	Joe Ney	27-Jul-16	Male	67.45	66.6	Yellow	2015	Small left claw	Collin Williams
COOS	Joe Ney	27-Jul-16	Male	74.32	96.5	Yellow	2015		Collin Williams
COOS	Joe Ney	27-Jul-16	Male	70.63	87	Yellow	2015		Collin Williams
COOS	Joe Ney	27-Jul-16	Male	71.41	86.8	Yellow	2015		Collin Williams
COOS	Joe Ney	27-Jul-16	Female	51.5	31.9	Orange	2015		Collin Williams
COOS	Joe Ney	27-Jul-16	Female	72.57	72.9	Green	2015	L1	Collin Williams
COOS	Joe Ney	27-Jul-16	Male	59.85	48.3	Yellow	2015		Collin Williams
COOS	Joe Ney	27-Jul-16	Female	60.75	49.2	Green	2015		Collin Williams
COOS	Joe Ney	27-Jul-16	Female	75.54	86.3	Green	2015		Collin Williams
COOS	Valino	02-Aug-16	Male	73.4	97.3	Yellow	2015		Collin Williams
COOS	Valino	02-Aug-16	Male	63.27	62.7	Yellow/Orange	2015	2 legs	Collin Williams
		Mean		**65.9**	**68.3**				
COOS	Joe Ney	8/17/2016	M	66.86		orange	2015	hand captured	Collin Williams
COOS	Medcalf	8/17/2016	F	79.68		orange	2014	lg egg case	Collin Williams
COOS	Medcalf	8/17/2016	F	50.76		orange	2015	R1, L1	Collin Williams
COOS	Medcalf	8/17/2016	F	59.65		orange	2015		Collin Williams
COOS	Medcalf	8/17/2016	F	67.47		green	2015		Collin Williams
COOS	Medcalf	8/17/2016	F	64.78		green	2015		Collin Williams
COOS	Medcalf	8/17/2016	M	72.47		orange	2015		Collin Williams
COOS	Medcalf	8/17/2016	M	72.03		orange	2015		Collin Williams
COOS	Medcalf	8/17/2016	F	64.18		green	2015		Collin Williams
COOS	Medcalf	8/17/2016	F	61.89		green	2015		Collin Williams
COOS	Medcalf	8/17/2016	M	78.31		yellow	2015		Collin Williams
COOS	Medcalf	8/17/2016	F	62.32		green	2015		Collin Williams
COOS	Medcalf	8/17/2016	M	67.65		orange	2015		Collin Williams

COOS	Medcalf	8/17/2016	M	69.26		orange	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	68.15		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	63.39		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	72.01		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	60.5		orange	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	67.35		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	74.34		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	74.74		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	75.61		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	72.67		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	76.73		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	64.12		yellow/orange	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	69.01		orange	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	69.12		yellow/orange	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	78.71		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	56.99		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	63.8		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	70.95		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	64.24		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	59.19		orange	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	61.08		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	77.86		orange	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	77.27		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	F	57.92		green	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	59.88		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	80.29		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	65.28		orange	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	67.05		orange	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	74.01		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	79.84		yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	69.64		orange	2015		Collin Williams

COOS	Joe Ney	8/18/2016	F	58.08		orange/yellow	2015		Collin Williams
COOS	Joe Ney	8/18/2016	M	67.09		orange	2015		Collin Williams
		Mean		**68.1**					
COOS	Jordan Cove	9/17/2016	M	42.49	15.9		**2016**		
COOS	Jordan Cove	9/17/2016	M	36.7	10		**2016**		
COOS	Jordan Cove	9/17/2016	F	43	13.6		**2016**		
COOS	Jordan Cove	9/17/2016	M	46.6	20.5		**2016**		
COOS	Jordan Cove	9/17/2016	M	39.6	12.4		**2016**		
COOS	Jordan Cove	9/17/2016	M	42.3	15.9		**2016**		
COOS	Jordan Cove	9/17/2016	F	38.6	11		**2016**		
COOS	Jordan Cove	9/17/2016	M	35.2	8.2		**2016**		
COOS	Jordan Cove	9/17/2016	F	38.1	10.5		**2016**		
COOS	Jordan Cove	9/17/2016	M	37.6	11.2		**2016**		
COOS	Jordan Cove	9/17/2016	M	39.3	11.8		**2016**		
COOS	Jordan Cove	9/17/2016	M	39	12		**2016**		
COOS	Jordan Cove	9/17/2016	M	41.5	13.6		**2016**	R1	
COOS	Jordan Cove	9/17/2016	M	36.7	9.9		**2016**		
COOS	Jordan Cove	9/17/2016	F	39.6	11.1		**2016**		
COOS	Jordan Cove	9/17/2016	F	38.9	12.1		**2016**		
COOS	Jordan Cove	9/17/2016	F	39.1	10.8		**2016**	L2	
COOS	Jordan Cove	9/17/2016	M	34.4	8.7		**2016**		
COOS	Jordan Cove	9/17/2016	M	35.6	8.2		**2016**		
COOS	Jordan Cove	9/17/2016	M	36	9.1		**2016**		
COOS	Jordan Cove	9/17/2016	F	38.2	10.9		**2016**		
COOS	Jordan Cove	9/17/2016	F	35.3	8.5		**2016**		
COOS	Jordan Cove	9/17/2016	F	36.5	9.7		**2016**		
COOS	Jordan Cove	9/17/2016	M	33.7	8.1		**2016**		
COOS	Jordan Cove	9/17/2016	M	35.1	8.5		**2016**		
COOS	Jordan Cove	9/17/2016	F	32.8	8.7		**2016**		
COOS	Jordan Cove	9/17/2016	M	30.8	6.1		**2016**		

COOS	Jordan Cove	9/17/2016	F	29.4	5.3		**2016**		
COOS	Jordan Cove	9/17/2016	F	25.6	3.6		**2016**		
		Mean		**37.2**	**10.5**				
COOS	Haynes Inlet	9/18/2016	F	33.9	8.5		**2016**		
COOS	Haynes Inlet	9/18/2016	M	34.5	9.6		**2016**		
COOS	Haynes Inlet	9/18/2016	F	40.9	15.4		**2016**		
COOS	Haynes Inlet	9/18/2016	M	39	14.1		**2016**		
COOS	Haynes Inlet	9/18/2016	M	42.6	17.1		**2016**		
COOS	Haynes Inlet	9/18/2016	M	27.5	4.7		**2016**		
COOS	Haynes Inlet	9/18/2016	M	32.7	10.5		**2016**		
		Mean		**35.9**	**11.4**				
COOS	Kentuck	9/18/2016	M	36.3			**2016**		
COOS	Kentuck	9/18/2016	M	52.2	31.9		**2016**		
COOS	Kentuck	9/18/2016	M	47.2	20.6		**2016**		
COOS	Kentuck	9/18/2016	M	44.18	18.3		**2016**		
COOS	Kentuck	9/18/2016	M	38.35	14		**2016**		
COOS	Kentuck	9/18/2016	F	36	10.4		**2016**		
COOS	Kentuck	9/18/2016	M	35.6	9.5		**2016**		
COOS	Kentuck	9/18/2016	M	34.2	9.8		**2016**		
COOS	Kentuck	9/18/2016	F	37.6	12.6		**2016**		
COOS	Kentuck	9/18/2016	F	34.3	9		**2016**		
COOS	Kentuck	9/18/2016	M	34	9.2		**2016**		
COOS	Kentuck	9/18/2016	F	32.8	9.2		**2016**		
COOS	Kentuck	9/18/2016	F	34.5	9.6		**2016**		
COOS	Kentuck	9/18/2016	F	33.2	9.5		**2016**		
COOS	Kentuck	9/18/2016	F	28	4.5		**2016**		
COOS	Kentuck	9/18/2016	F	39.7	14.1		**2016**		
		Mean		**37.4**	**12.8**				

YAQUINA	Pumphouse	4/4/2016	F	55	33.1	orange	2015	both claws	
YAQUINA			M	54.9	38.2	orange	2015		
YAQUINA			F	53.8	34.8	orange	2015	one claw	
YAQUINA			F	55.7	38.8	red	2015		
YAQUINA			F	43.8	20.4	red	2015	one claw	
YAQUINA			M	57.4	43.2	green	2015		
YAQUINA			F	51.5	30.3	orange	2015		
YAQUINA			F	45	19	orange	2015	one claw	
YAQUINA			F	50.6	25.5	green	2015		
YAQUINA			F	44.7	19.5	orange	2015		
		Mean		**53.15**	**33.62**				
YAQUINA	Pumphouse	6/24/2016	M	71.3	81	green	2015		
YAQUINA			F	59.9	42.8	green	2015	both claws	
YAQUINA			M	66.7	70	green	2015		
YAQUINA			M	68.6	74	green	2015		
YAQUINA			F	53.1	26.7	green	2015	1,4,5,6,8,9	
		Mean		**63.92**	**58.9**				
YAQUINA	OCA mudflat	4/4/2016	M	67.5	69.6	yellow	2015		
YAQUINA			M	59.3	45.1	yellow	2015		
YAQUINA			M	59.3	44	yellow-green	2015		
YAQUINA			M	57.6	40	yellow-green	2015		
YAQUINA			M	54.5	33.3	yellow-green	2015		
YAQUINA			M	50.8	28.8	red	2015	Carrying eggs	
YAQUINA			M	51.1	26.7	green	2015		
YAQUINA			M	48.9	27.8	orange	2015		
YAQUINA			M	50.3	27.7	orange	2015		
YAQUINA			M	49.5	23.6	orange	2015	one claw	
		Mean		**54.88**	**36.66**				
YAQUINA	OCA mudflat	6/24/2016	M	71.9	73	green	2015		
YAQUINA			M	65.8	68.5	yellow	2015		
YAQUINA			M	70.5	80	green	2015		

YAQUINA			M	62.4	59.3	green	2015		
YAQUINA			M	67.8	?	green	2015	2	
YAQUINA			M	63.8	59.5	green	2015		
YAQUINA			F	45.6	19.8	green	2015	abdomen missing	
YAQUINA			M	71.5	83	green	2015		
YAQUINA			M	63.2	57.6	yellow	2015		
YAQUINA			M	68.3	70.4	green	2015		
YAQUINA			M	74.8	104.1	green	2015		
YAQUINA			M	65.8	65.9	yellow	2015		
YAQUINA			M	68.5	85.2	green	2015		
YAQUINA			M	68.6	71.8	yellow	2015	7	
YAQUINA			M	65.7	65.2	yellow	2015		
YAQUINA			M	64.1	66	yellow-orange	2015		
YAQUINA			M	66.9	?	yellow-orange	2015		
YAQUINA			F	51.8	31.8	orange	2015		
YAQUINA			M	62.6	52.4	yellow	2015	L1	
YAQUINA			M	72.7	94	yellow	2015		
YAQUINA			M	58	46.1	yellow	2015		
YAQUINA			M	66.1	68.9	yellow	2015		
YAQUINA			M	74.7	105.5	yellow	2015		
YAQUINA			M	61.8	57.7	yellow	2015		
		MEAN		**65.5375**	**65.2**				
YAQUINA	HMSC	5/16/2016	F	45.11	21.1	Orange	2015	L1, L3	Weldon/Lundeburg
YAQUINA	HMSC	5/16/2016	M	57.17	40.2		2015	R1, L2	Weldon/Lundeburg
YAQUINA	HMSC	5/16/2016	M	65.34	64.8		2015		Weldon/Lundeburg
YAQUINA	Aquarium mudflat (OCA)	5/16/2016	F	54.73	40.2	green	2015		Weldon/Lundeburg
YAQUINA	OCA	5/16/2016	M	57.69	44.8		2015		Weldon/Lundeburg
YAQUINA	OCA	5/16/2016	M	60.71	53.2		2015		Weldon/Lundeburg
YAQUINA	OCA	5/16/2016	M	60.76	64.4		2015		Weldon/Lundeburg
YAQUINA	OCA	5/16/2016	M	63.99	62.5		2015	L3, R1, R2	Weldon/Lundeburg

YAQUINA	OCA	5/16/2016	M	64.46	71.5		2015		Weldon/Lundeburg
YAQUINA	OCA	5/16/2016	M	69.81	78.6		2015		Weldon/Lundeburg
YAQUINA	OCA	5/16/2016	M	80.8	128.4		2014		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	55.42	40.7		2015	L1 regen.	Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	56.51	46.0		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	56.79	50.5		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	60.17	51.3		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	60.28	49.6		2015	L1, L3	Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	61.11	51.0		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	61.25	55.9		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	62.85	64.2		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	63.78	63.3		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	65.03	68.0		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	65.26	69.0		2015	L1 reg	Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	65.54	66.0		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	65.93	68.5		2015	L1,L3	Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	F	68.17		orange abd	2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	68.67	80.7		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	69.23	71.6		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	69.4	83.4		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	69.83	85.0		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	71.8	90.0		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	72.22	83.2		2015	L1,L3,L4	Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	72.88	84.8		2015	L1	Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	73.61	95.8		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	74	98.2		2015		Weldon/Lundeburg
YAQUINA	OCA	5/17/2016	M	74.63	115.9		2014		Weldon/Lundeburg
YAQUINA	HMSC	5/18/2016	M	68	72.2		2015	L1	Weldon/Lundeburg
YAQUINA	OCA	5/18/2016	F	46.59	26.8	green	2015		Weldon/Lundeburg
YAQUINA	OCA	5/18/2016	M	56.79	39.7		2015		Weldon/Lundeburg
YAQUINA	OCA	5/18/2016	M	58.85	50.0		2015		Weldon/Lundeburg

YAQUINA	OCA	5/18/2016	M	63.21	68.6		2015	L4, L5	Weldon/Lundeburg
YAQUINA	SB	5/18/2016	M	52.81	33.9		2015	L5	Weldon/Lundeburg
YAQUINA	HMSC	5/19/2016	F	52.68	23.8	green	2015	L1	Weldon/Lundeburg
YAQUINA	HMSC	5/19/2016	F	58.21	36.6		2015	L1 /eggs	Weldon/Lundeburg
YAQUINA	HMSC	5/19/2016	F	76.56	90.3		2014	eggs	Weldon/Lundeburg
YAQUINA	OCA	5/19/2016	M	62.13	40.8		2015		Weldon/Lundeburg
YAQUINA	OCA	5/19/2016	M	62.47	45.2		2015		Weldon/Lundeburg
YAQUINA	OCA	5/19/2016	M	74.32	86.3		2015	R1 reg	Weldon/Lundeburg
YAQUINA	OCA	5/19/2016	F	76.57	79.3	Green	2015		Weldon/Lundeburg
YAQUINA	OCA	5/19/2016	M	79.59	96.8		2015		Weldon/Lundeburg
YAQUINA	HMSC	5/20/2016	M	73.58	77.1		2015	R1, L1	Weldon/Lundeburg
YAQUINA	OCA	5/20/2016	M	47.19	24.3		2015		Weldon/Lundeburg
YAQUINA	OCA	5/20/2016	M	57.23	38.3		2015		Weldon/Lundeburg
YAQUINA	OCA	5/20/2016	M	59.12	46.8		2015		Weldon/Lundeburg
YAQUINA	OCA	5/20/2016	M	63.88	55.6		2015		Weldon/Lundeburg
YAQUINA	OCA	5/20/2016	M	66.66	69.5		2015		Weldon/Lundeburg
YAQUINA	OCA	5/20/2016	M	73.1	89.9		2015		Weldon/Lundeburg
YAQUINA	OCA	5/20/2016	M	76.74	108.6		2014		Weldon/Lundeburg
YAQUINA	OCA	5/20/2016	M	78.81	115.2		2014		Weldon/Lundeburg
YAQUINA	HMSC	5/21/2016	M	66.58	75.1		2015		Weldon/Lundeburg
YAQUINA	HMSC	5/21/2016	M	70.66	81.3		2015	R2	Weldon/Lundeburg
YAQUINA	OCA	5/21/2016	M	59.74	38.8		2015	L1,L2,L4,L5	Weldon/Lundeburg
YAQUINA	OCA	5/21/2016	M	64.61	61.0		2015	L1 reg	Weldon/Lundeburg
YAQUINA	OCA	5/21/2016	M	64.8	63.0		2015		Weldon/Lundeburg
YAQUINA	OCA	5/21/2016	M	67.63	72.0		2015		Weldon/Lundeburg
YAQUINA	SB	5/21/2016	M	51.19	27.9		2015		Weldon/Lundeburg
YAQUINA	SB	5/21/2016	M	56.14	34.7		2015		Weldon/Lundeburg
YAQUINA	OCA	5/22/2016	M	56.79	39.7		2015		Weldon/Lundeburg
YAQUINA	OCA	5/22/2016	M	60.56	49.6		2015		Weldon/Lundeburg
YAQUINA	OCA	5/22/2016	M	64.02	59.3		2015		Weldon/Lundeburg
YAQUINA	OCA	5/22/2016	M	65.29	61.8		2015		Weldon/Lundeburg

YAQUINA	OCA	5/22/2016	M	66.15	44.8		2015	R1,L1,R2, L3	Weldon/Lundeburg
YAQUINA	OCA	5/22/2016	M	72.08	67.3		2015	R1, L1	Weldon/Lundeburg
YAQUINA	OCA	5/22/2016	M	74.9	99.8		2015		Weldon/Lundeburg
YAQUINA	SB	5/22/2016	M	56.86	44.9		2015		Weldon/Lundeburg
YAQUINA	OCA	5/23/2016	F	54.42	35.3		2015		Weldon/Lundeburg
YAQUINA	SL	5/25/2016	M	69.71	80.3	orange	2015		Weldon/Lundeburg
YAQUINA	HMSC-V	5/26/2016	M	78.8	122.0		2014		Weldon/Lundeburg
YAQUINA	SL	5/26/2016	F	61.11	48.2		2015		Weldon/Lundeburg
YAQUINA	SL	5/26/2016	M	65.78	64.6		2015		Weldon/Lundeburg
YAQUINA	SL	5/26/2016	M	75.99	70.3		2015	R1, L1, R2, L4,L5	Weldon/Lundeburg
YAQUINA	SL	5/26/2016	M	76.41	106.1		2014		Weldon/Lundeburg
YAQUINA	HMSC-V	5/27/2016	F	59.23	41.1		2015		Weldon/Lundeburg
YAQUINA	HMSC-V	5/27/2016	M	68.92	76.9		2015		Weldon/Lundeburg
YAQUINA	SL	5/27/2016	F	59.33	50.9		2015	Orange eggs	Weldon/Lundeburg
YAQUINA	SL	5/27/2016	M	65.96	71.8		2015		Weldon/Lundeburg
YAQUINA	SL	5/27/2016	M	68.01	65.1		2015	R1	Weldon/Lundeburg
YAQUINA	SL	5/27/2016	M	73.78	101.6		2015		Weldon/Lundeburg
		MEAN		**64.89**	**64.3**				Weldon/Lundeburg
YAQUINA	Pumphouse	6/24/2016	M	71.3	81	green	2015		
YAQUINA		6/24/2016	F	59.9	42.8	green	2015	both claws	
YAQUINA		6/24/2016	M	66.7	70	green	2015		
YAQUINA		6/24/2016	M	68.6	74	green	2015		
YAQUINA		6/24/2016	F	53.1	26.7	green	2015	1,4,5,6,8,9	
		Mean		**63.92**	**58.9**				
YAQUINA	Aquarium mudflat	6/24/2016	M	71.9	73	green	2015		
YAQUINA		6/24/2016	M	65.8	68.5	yellow	2015		
YAQUINA		6/24/2016	M	70.5	80	green	2015		
YAQUINA		6/24/2016	M	62.4	59.3	green	2015		
YAQUINA		6/24/2016	M	67.8	?	green	2015	2	
YAQUINA		6/24/2016	M	63.8	59.5	green	2015		

YAQUINA		6/24/2016	F	45.6	19.8	green	2015	abdomen missing	
YAQUINA		6/24/2016	M	71.5	83	green	2015		
YAQUINA		6/24/2016	M	63.2	57.6	yellow	2015		
YAQUINA		6/24/2016	M	68.3	70.4	green	2015		
YAQUINA		6/24/2016	M	74.8	104.1	green	2015		
YAQUINA		6/24/2016	M	65.8	65.9	yellow	2015		
YAQUINA		6/24/2016	M	68.5	85.2	green	2015		
YAQUINA		6/24/2016	M	68.6	71.8	yellow	2015	L2	
YAQUINA		6/24/2016	M	65.7	65.2	yellow	2015		
YAQUINA		6/24/2016	M	64.1	66	yellow-orange	2015		
YAQUINA		6/24/2016	M	66.9	?	yellow-orange	2015		
YAQUINA		6/24/2016	F	51.8	31.8	orange	2015		
YAQUINA		6/24/2016	M	62.6	52.4	yellow	2015	6=left claw	
YAQUINA		6/24/2016	M	72.7	94	yellow	2015		
YAQUINA		6/24/2016	M	58	46.1	yellow	2015		
YAQUINA		6/24/2016	M	66.1	68.9	yellow	2015		
YAQUINA		6/24/2016	M	74.7	105.5	yellow	2015		
YAQUINA		6/24/2016	M	61.8	57.7	yellow	2015		
		MEAN		**65.54**	**65.2**				
YAQUINA	Aquarium mudflat	7/12/2016	M	52			2015	L1,2,3	Aiden Westrope
YAQUINA		7/12/2016	M	70			2015		Aiden Westrope
YAQUINA		7/12/2016	M	78			2015	R1	Aiden Westrope
YAQUINA		7/12/2016	M	68			2015		Aiden Westrope
YAQUINA		7/12/2016	M	71			2015		Aiden Westrope
		MEAN		**67.8**					
YAQUINA	Aquarium mudflat	Date	Sex	CW	WT	color	year class	Condition	
YAQUINA	minnow traps	8/16/2016	F	55.44	32.8	green-yellow	2015		
YAQUINA	Aquarium mudflat	8/16/2016	F	44.62	18.7	green-yellow	**2016**		

YAQUINA	Aquarium mudflat	8/16/2016	F	36.57	8.7	green-yellow	2016	L1	
YAQUINA	Aquarium mudflat	8/16/2016	M	43.82	18.1	green-yellow	2016		
		MEAN		41.67	15.16667				
YAQUINA	Sally's Bend	8/16/2016	M	76.44	94.2	orange	2015		
YAQUINA	Sally's Bend	8/16/2016	M	64.73	58.2	yellow-green	2015		
YAQUINA	Sally's Bend	8/16/2016	F	55.42	36.8	green	2015		
YAQUINA	Sally's Bend	8/16/2016	M	68.93	84.6	yellow-green	2015		
YAQUINA	Sally's Bend	8/16/2016	M	65.41	60.6	yellow-green	2015		
YAQUINA	Sally's Bend	8/16/2016	M	66.36	70.9	yellow-green	2015		
YAQUINA	Sally's Bend	8/16/2016	M	67.27	69.1	yellow-green	2015	L3	
YAQUINA	Sally's Bend	8/16/2016	F	58.15	41.7	green	2015		
YAQUINA	Sally's Bend	8/16/2016	F	58.13	34	green-orange	2015	L1, L4, R4	
YAQUINA	Sally's Bend	8/16/2016	M	72.88	89.9	yellow-orange	2015	R1	
YAQUINA	Sally's Bend	8/16/2016	M	68.41	79.8	yellow-green	2015		
YAQUINA	Sally's Bend	8/16/2016	F	53.67	37.5	green	2015		
YAQUINA	Sally's Bend	8/16/2016	M	51.11	22.7	yellow-green	2016	L1	
YAQUINA	Sally's Bend	8/16/2016	F	53.26	33.5	green-orange	2015	L1	
YAQUINA	Sally's Bend	8/16/2016	M	27.71	3.9	light green	2016	L2, L4, R3	
		Mean		60.52	54.49				
YAQUINA	Idaho Point	8/16/2016	M	92.01	187.3	yellow-orange	2014		
YAQUINA	Idaho Point	8/16/2016	M	70.05	71.8	yellow	2015	L1	
YAQUINA	Idaho Point	8/16/2016	M	89.76	175.8	yellow	2014		
YAQUINA	Idaho Point	8/16/2016	M	66.87	61.5	yellow	2015		
YAQUINA	Idaho Point	8/16/2016	M	78.9	97.7	yellow-orange	2015	R1	
YAQUINA	Idaho Point	8/16/2016	M	68.55	71.8	yellow-green	2015	R1	
YAQUINA	Idaho Point	8/16/2016	M	67.2	66.6	yellow-orange	2015	R1	
YAQUINA	Idaho Point	8/16/2016	M	64.39	58	yellow	2015	L4	
YAQUINA	Idaho Point	8/16/2016	M	65.05	65.3	yellow-orange	2015		
YAQUINA	Idaho Point	8/16/2016	F	68.89	66.3	yellow-green	2015		

YAQUINA	Idaho Point	8/16/2016	F	72.81	78.3	yellow-green	2015		
YAQUINA	Idaho Point	8/16/2016	M	77.8	112.5	yellow-green	2015		
YAQUINA	Idaho Point	8/16/2016	M	85.3	122.2	yellow-orange	2014	R1	
YAQUINA	Idaho Point	8/16/2016	M	66.3	64.9	yellow	2015		
YAQUINA	Idaho Point	8/16/2016	M	66.16	58.9	green	2015	R1	
YAQUINA	Idaho Point	8/16/2016	M	79.34	113.4	orange	2015	R5, L5	
YAQUINA	Idaho Point	8/16/2016	M	69.12	81.9	yellow	2015	R1, L1	
YAQUINA	Idaho Point	8/16/2016	M	79.4	98.3	yellow-orange	2015		
YAQUINA	Idaho Point	8/16/2016	M	80.4	108.2	orange	2015	R5, L5	
YAQUINA	Idaho Point	8/16/2016	F	84.9	124.9	green	2014		
YAQUINA	Idaho Point	8/16/2016	M	75.88	112.5	yellow	2015		
YAQUINA	Idaho Point	8/16/2016	M	77.18	103.1	yellow-green	2015		
YAQUINA	Idaho Point	8/16/2016	M	70.26	84.7	yellow-orange	2015		
YAQUINA	Idaho Point	8/16/2016	M	77.88	86.4	yellow-orange	2015		
YAQUINA	Idaho Point	8/16/2016	M	68	73.8	yellow-orange	2015		
YAQUINA	Idaho Point	8/16/2016	M	71.4	70.4	yellow-orange	2015	R1	
YAQUINA	Idaho Point	8/16/2016	M	71.86	89	green	2015		
YAQUINA	Idaho Point	8/16/2016	M	70	80.5	yellow-orange	2015		
YAQUINA	Idaho Point	8/16/2016	M	69.65	70.1	green	2015		
YAQUINA	Idaho Point	8/16/2016	F	64.58	54.8	green	2015		
YAQUINA	Idaho Point	8/16/2016	M	67.37		orange	2015	R1 reg.	
YAQUINA	Idaho Point	8/16/2016	F	55.54	41	green	2015		
		Mean		**72.9**	**88.8**				
YAQUINA	Sally's Bend	9/19/2016	M	50.2	23.7		**2016**		
YAQUINA	Sally's Bend	9/19/2016	M	43.6	17.7		**2016**		
YAQUINA	Sally's Bend	9/19/2016	M	39	11.9		**2016**		
YAQUINA	Sally's Bend	9/19/2016	M	32.9	7.1		**2016**		
YAQUINA	Sally's Bend	9/19/2016	M	34	8.1		**2016**		
YAQUINA	Sally's Bend	9/19/2016	M	34.8	8		**2016**		
YAQUINA	Sally's Bend	9/19/2016	M	32.2	6.8		**2016**		

YAQUINA	Sally's Bend	9/19/2016	F	31.1	6.3		**2016**		
YAQUINA	Sally's Bend	9/19/2016	M	29	5.5		**2016**		
YAQUINA	Sally's Bend	9/19/2016	F	30	5.3		**2016**		
YAQUINA	Sally's Bend	9/19/2016	M	24.6	2.8		**2016**		
YAQUINA	Sally's Bend	9/19/2016	F	25.5	3.2		**2016**		
YAQUINA	Sally's Bend	9/19/2016	F	26.6	3.6		**2016**		
YAQUINA	Sally's Bend	9/19/2016	M	26.3	3.8		**2016**		
		Mean		**32.8**	**8.1**				
YAQUINA	Aquarium Mudflat	9/19/2016	M	43.6	14.8		**2016**		
YAQUINA	Aquarium Mudflat	9/19/2016	M	37.9	12.2		**2016**		
YAQUINA	Aquarium Mudflat	9/19/2016	M	33.2	7		**2016**		
YAQUINA	Aquarium Mudflat	9/19/2016	M	29	5.1		**2016**		
		MEAN		**35.9**	**9.8**				
YAQUINA	Johnson Slough	9/19/2016	F	60.9	45.4		2015		
YAQUINA	Johnson Slough	9/19/2016	F	57.1	39.4		2015		
YAQUINA	Johnson Slough	9/19/2016	M	44.1	17.6		**2016**		
YAQUINA	Johnson Slough	9/19/2016	M	53	30.9		**2016**		
YAQUINA	Johnson Slough	9/19/2016	M	42.6	15.9		**2016**		
YAQUINA	Johnson Slough	9/19/2016	M	42.8	16.9		**2016**		
YAQUINA	Johnson Slough	9/19/2016	M	44	17.6		**2016**		
YAQUINA	Johnson Slough	9/19/2016	F	40.6	14.6		**2016**		
YAQUINA	Johnson Slough	9/19/2016	M	39.5	13.8		**2016**		
YAQUINA	Johnson Slough	9/19/2016	F	42.6	15.8		**2016**		
YAQUINA	Johnson Slough	9/19/2016	M	42.9	16.7		**2016**		
YAQUINA	Johnson Slough	9/19/2016	F	40.7	13.9		**2016**		
YAQUINA	Johnson Slough	9/19/2016	F	39.5	12.1		**2016**		
YAQUINA	Johnson Slough	9/19/2016	M	32	7.1		**2016**		
		MEAN		**42**	**16.1**				

Yaquina	Across from Sawyers	12/13/16	M	85		Orange	2014	Notch to notch	Mitch Vance
Yaquina	Across from Sawyers	12/13/16	M	57		green	2016	Notch to notch	Mitch Vance
NETARTS	Intersection	7/6/2016	F	62.1	49.3	green	2015	L1	
NETARTS			M	75	81.3	yellow	2015	L1, R1, R4	
NETARTS			M	66.8	62.2	green	2015	R1	
NETARTS			M	65.2	63.3	yellow	2015		
NETARTS			M	69.7	68.4	yellow-orange	2015	R1	
NETARTS			M	68.5	68	yellow-orange	2015	R1, R2	
NETARTS			M	80	130.5	yellow-orange	2014		
NETARTS			M	78.1	103.8	orange-red	2014		
NETARTS			M	76	112.5	yellow-green	2015		
NETARTS			M	71.2	78.7	yellow-orange	2015	R2	
NETARTS		**MEAN**		**71.26**	**81.8**				
NETARTS									
NETARTS	Intersection	8/18/2016	M	81	128.4	yellow	2014		
NETARTS		8/18/2016	M	81.9	122.3	yellow	2014		
NETARTS		8/18/2016	M	87	155	yellow-orange	2014		
NETARTS		8/18/2016	M	85.3	135.2	yellow-orange	2014	R1	
NETARTS		8/18/2016	M	84.4	146.3	yellow-orange	2014		
NETARTS		8/18/2016	M	73.8	89.2	yellow-orange	2015		
NETARTS		8/18/2016	M	71	79	yellow-green	2015	R1 reg.	
NETARTS		8/18/2016	M	78.8	103	yellow-orange	2015	R1	
NETARTS		8/18/2016	F	72.2	74.8	green	2014		
NETARTS		8/18/2016	M	73	88.8	yellow	2015		
NETARTS		8/18/2016	M	71.6	94.4	yellow-orange	2015		
NETARTS		8/18/2016	M	69	68.6	orange	2015	L1	
NETARTS		8/18/2016	M	68.6	68.3	yellow	2015	R1 reg.	
NETARTS		8/18/2016	F	75.6	84.4	green	2014	L1	
NETARTS		8/18/2016	M	68.76	85	orange	2015		
NETARTS		8/18/2016	M	72.3	92.2	yellow	2015		

NETARTS		8/18/2016	F	66.7	53.3	green	2015	R1 reg.	
NETARTS		8/18/2016	F	72.2	73.8	green	2015	R1 reg.	
NETARTS		8/18/2016	F	64.2	52.1	green	2015		
NETARTS		8/18/2016	M	71.2	86.3	yellow	2015		
NETARTS		8/18/2016	M	69.4	66.1	yellow	2015	R1	
NETARTS		8/18/2016	M	73.1	81.4	orange-yellow	2015	R1	
NETARTS		8/18/2016	F	58.5	43	orange	2015	R1 reg.	
NETARTS		8/18/2016	F	66.7	56.5	orange	2015	L1,4,5	
NETARTS		8/18/2016	F	**44.8**	**18.3**	green	**2016**		
NETARTS		8/18/2016	M	58.6	36	yellow-orange	2015	R1,4; L1,2	
NETARTS			M	62.3	59.6	yellow-orange	2015	L	
		Mean		**71.1837**	**83.01111**				
NETARTS	Intersection	9/17/2016	F	69		Yellow	2015	L1	Joel Prickett
NETARTS			M	72		Yellow	2015		Joel Prickett
NETARTS			F	70		Yellow	2015		Joel Prickett
NETARTS			M	72		Orange	2015		Joel Prickett
NETARTS			M	75		Orange	2015		Joel Prickett
NETARTS			M	75		Yellow	2015		Joel Prickett
NETARTS			M	72		Yellow	2015		Joel Prickett
NETARTS			M	73		Yellow	2015		Joel Prickett
NETARTS		**MEAN**		**72.3**					
NETARTS	Fish Hatchery	**7/6/2016**	**M**	**73.7**	70.7	yellow	2015	L1	
NETARTS			**M**	**70.93**	91.6	orange	2015	R1	
NETARTS			**M**	**70.8**	76.9	yellow	2015	L1 regenerating	
NETARTS		**MEAN**		**71.81**	**79.73**				
NETARTS	Fish hatcher;y	8/18/2016	F	24.2	3	green	**2016**		
NETARTS		8/18/2016	M	37.2	10.4	green	**2016**		
NETARTS		8/18/2016	M	39.8	12.7	green	**2016**		

NETARTS		8/18/2016	M	30.5	5.4	green	**2016**		
NETARTS		8/18/2016	F	28.3	4.2	green	**2016**		
NETARTS		8/18/2016	M	33.6	8.9	green	**2016**		
NETARTS		8/18/2016	M	33.8	7.5	green	**2016**		
NETARTS		8/18/2016	M	29.9	5.3	green	**2016**		
NETARTS		8/18/2016	F	30	5.8	green	**2016**		
NETARTS		8/18/2016	M	31.6	6.6	green	**2016**		
		Mean		**31.89**	**6.98**				
NETARTS	Fish hatchery	9/21/2016	F	43.6	17.2	green	**2016**		
NETARTS		9/21/2016	M	36.2	10.2	green	**2016**		
NETARTS		9/22/2016	F	36	9.8	green	**2016**		
NETARTS		9/22/2016	M	37.9	11	green	**2016**		
NETARTS		9/22/2016	M	41.7	14	green	**2016**		
NETARTS		9/22/2016	M	37.9	10.6	green	**2016**		
		Mean		**38.9**	**12.1**				
TILLAMOOK	Viewpoint	7/6/2016	M	65.35	68.7	yellow	2015		
TILLAMOOK			M	65.2	66.9	green	2015		
TILLAMOOK			F	72.4	81.1	orange	2015		
TILLAMOOK			M	62.2	54.3	yellow	2015		
TILLAMOOK			F	59.5	45.4	orange	2015		
TILLAMOOK			F	57.4	40.2	red	2015		
TILLAMOOK			F	53.9	35.6	red	2015		
TILLAMOOK			M	79.2	114.7	yellow	2014		
TILLAMOOK			M	81.2	107.9	orange	2014		
TILLAMOOK			M	60.6	43.8	yellow green	2015		
TILLAMOOK			M	71.3	90.3	yellow	2015		
TILLAMOOK			F	56	36.1	orange-red	2015	L1	
		MEAN		**65.35**	**64.41**				

TILLAMOOK	Viewpoint	8/18/2016	M	71.4	76	green	2015		
TILLAMOOK			M	72.6	82	yellow	2015		
TILLAMOOK			M	76.7	106.9	green	2015		
TILLAMOOK			M	62.4	51.7	green	2015		
TILLAMOOK			F	71.5	73.2	green	2015		
TILLAMOOK			M	67.7	70.5	orange	2015		
TILLAMOOK			M	75.65	102.8	yellow-orange	2015		
TILLAMOOK			M	76.44	103.8	yellow	2015		
TILLAMOOK			M	71.4	72.6	yellow-green	2015	R1reg.	
TILLAMOOK			M	73	90.9	green	2015		
TILLAMOOK			M	73	88.3	yellow-orange	2015	L2 L2 reg.	
TILLAMOOK			M	74.2	94.2	yellow-orange	2015		
TILLAMOOK			M	72.9	95.8	yellow	2015		
TILLAMOOK			M	72.7	92.2	yellow-orange	2015		
TILLAMOOK			M	74.9	91	yellow-orange	2015		
TILLAMOOK			M	70.3	87.2	yellow-orange	2015		
TILLAMOOK			M	66.14	66.8	yellow	2015		
TILLAMOOK			F	66.92	60.4	yellow-green	2015		
TILLAMOOK			F	56.12	41	orange	2015		
		Mean		**70.84**	**81.44**				
TILLAMOOK	Viewpoint	9/16/2016	M	79		Orange	2015	R2Barnacles	Joel Prickett
TILLAMOOK			M	74		Yellow	2015	Barnacles	Joel Prickett
TILLAMOOK			F	62		Yellow	2015	L4	Joel Prickett
TILLAMOOK			M	77		Yellow	2015	Barnacles	Joel Prickett
TILLAMOOK			M	74		Yellow	2015	R15	Joel Prickett
TILLAMOOK			M	67		Red/Orange	2015	L5 Barnacles	Joel Prickett
TILLAMOOK			F	81		Orange	2015	Barnacles	Joel Prickett
TILLAMOOK			F	68		Yellow	2015	L3 Barnacles	Joel Prickett
TILLAMOOK			M	76		Yellow	2015		Joel Prickett
TILLAMOOK			M	69		Orange	2015	L1 Barnacles	Joel Prickett

TILLAMOOK			M	72		Orange	2015	L2 Barnacles	Joel Prickett
TILLAMOOK			F	56		Yellow	2015		Joel Prickett
TILLAMOOK			F	60		Yellow	2015	Barnacles	Joel Prickett
TILLAMOOK			F	62		Yellow	2015		Joel Prickett
TILLAMOOK			M	73		Yellow	2015	Barnacles	Joel Prickett
TILLAMOOK			F	64		Yellow	2015		Joel Prickett
TILLAMOOK			F	68		Green	2015		Joel Prickett
TILLAMOOK			F	57		Green	2015	R3	Joel Prickett
TILLAMOOK			M	72		Yellow	2015		Joel Prickett
TILLAMOOK			F	70		Orange	2015	Barnacles	Joel Prickett
TILLAMOOK			M	71		Orange	2015		Joel Prickett
TILLAMOOK			F	77		Orange	2015		Joel Prickett
TILLAMOOK			M	70		Yellow	2015		Joel Prickett
TILLAMOOK			F	67		Green	2015		Joel Prickett
TILLAMOOK			F	68		Yellow	2015		Joel Prickett
TILLAMOOK			F	59		Orange	2015		Joel Prickett
TILLAMOOK			M	67		Orange	2015		Joel Prickett
TILLAMOOK			F	88		Yellow	2015		Joel Prickett
		MEAN		**69.6**					
TILLAMOOK	base of spit	9/21/2016	M	72.2	84.5	yellow-orange	2015		
TILLAMOOK		9/21/2016	M	52.2	28	green	**2016**		
TILLAMOOK			M	45.4	17.8	green	**2016**		
TILLAMOOK			F	36	10	green	**2016**		
TILLAMOOK			M	51	24.9	green	**2016**		
TILLAMOOK			F	44.3	18.5	green	**2016**		
TILLAMOOK			M	45	17.7	green	**2016**		
TILLAMOOK		9/22/2016	M	40.6	12.9	green	**2016**		
TILLAMOOK		9/22/2016	F	48	21	green	**2016**		
		MEAN		**45.3125**	**18.85**				

WILLAPA	Tokeland	8/17/2016	M	66.4			2015		CRAB TEAM
WILLAPA	Tokeland		F	57.4			2015		CRAB TEAM
WILLAPA	Tokeland		F	59.2			2015		CRAB TEAM
WILLAPA	Tokeland		F	59.9			2015		CRAB TEAM
WILLAPA	Stackpole	8/16/2016	M	73.2			2015		CRAB TEAM
WILLAPA	Stackpole		F	64.2			2015		CRAB TEAM
		MEAN		63.4					
WILLAPA	Stackpole	10/19/2016	M	66.2			2015	Open pit trap	Andrea Randall
WILLAPA	Stackpole		M	64.3			2015	Open pit trap	Andrea Randall
WILLAPA	Stackpole		F	60.0			2015	Open Pit trap	Andrea Randall
WILLAPA	Stackpole		M	58.4			2015	R1, L1	Andrea Randall
		MEAN		**62.2**					

Appendix 3. Relative abundance (CPUE) and size of young-of-the-year *Carcinus maenas* at the end of their first growing season in Oregon and Washington estuaries. Crabs were typically caught between mid-August to early October. Catch per unit effort (CPUE) is reported as number of crabs per trap per day. N=number of young crabs sampled; SD=Standard Deviation, Water temperatures for December-March for the Hatfield Marine Science Center Pump Dock in Yaquina Bay were provided by David Specht of the Newport EPA; those for Willapa Bay, by Jan Newton and Judah Goldberg of the DOE.

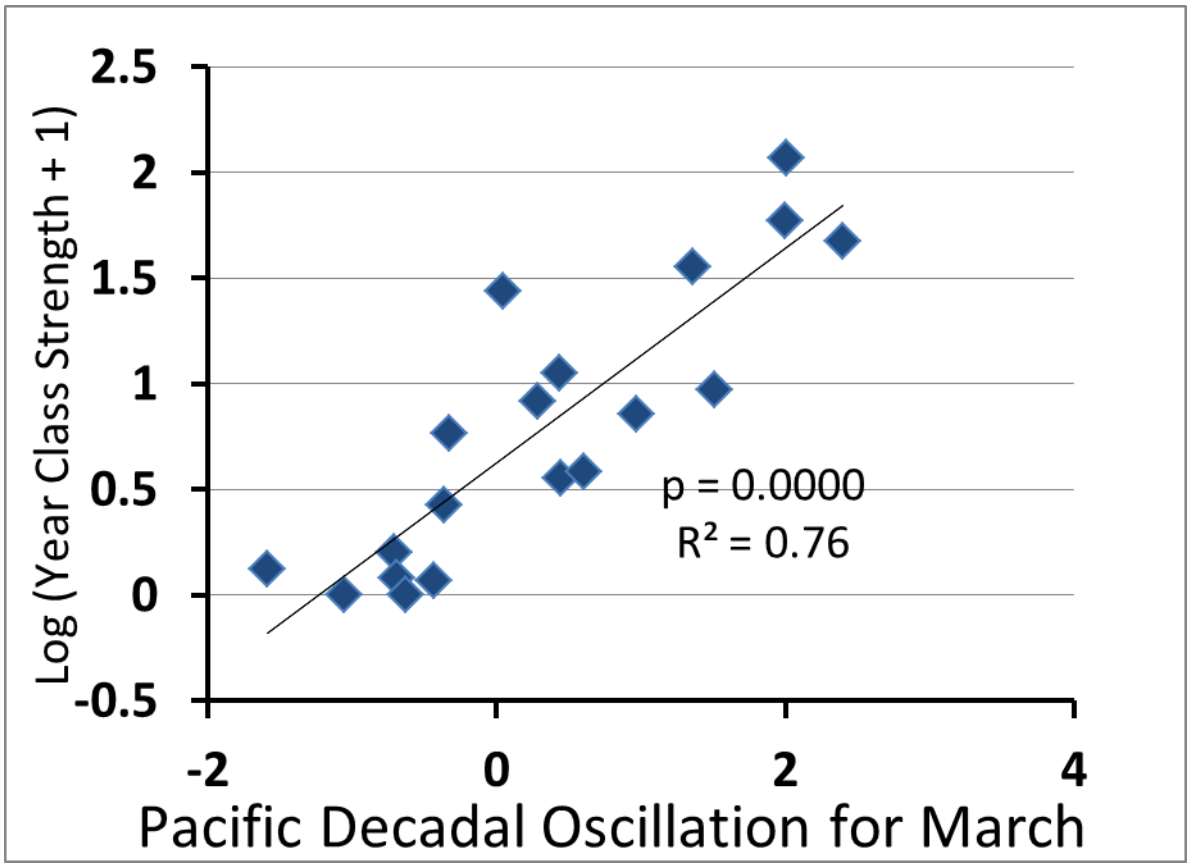
Year Class	Estuary	# Months <10°C	Mean Winter Temp. °C	N	CPUE Pitfall traps	CPUE Minnow traps	Mean Carapace Width (mm)	SD	Range
2002	Coos	4	9.6	0		0.00			
2003		**0**	**10.9**	1		0.01	59.4		
2004		**1**	**10.4**	0		0.00			
2005		**2**	**10.3**	2		0.05	45.0		44-46
2006		2	9.9	17		**0.32**	43.5	4.6	36-52
2007		3	9.8	5		0.08	45.4	4.0	43-52
2008		5	8.8	1		0.01	47.0		
2009		4	9.0	0		0.00			
2010		**1**	**10.0**	2		0.04	40.7		40-41
2011		1	9.8	1		0.01	35.5		
2012		4	8.7	0		0.00			
2013		3	9.6			Not Sampled			
2014				2		0.015	46.5		45-47
2015				26		**0.24**	47.9	4.9	32-54
2016				52		**0.76**	37.1	4.9	26-52
1998	Yaquina	**0**	**11.2**	201		**5.00**	46.9	5.0	32-60
1999		4	8.8	13	**0.20**		38.0	5.0	30-47
2000		3	9.7	14		**0.31**	37.5	5.0	30-45
2001		3	9.6	Not sampled					
2002		4	9.4	1		0.01	38.9		
2003		**0**	**11.0**	9		0.07	44.9	5.5	41-59
2004		**3**	**10.1**	4		0.07	35.3	5.1	32-43
2005		**2**	**10.1**	21	**0.75**	0.14	41.0	8.4	28-46

2006		3	9.8	18		**0.20**	42.6	5.9	34-51
2007		3	9.5	3		0.03	44.4	7.0	36-49
2008		5	8.4	1		0.02	44.3		
2009		5	8.9	0		0.00			
2010		**1**	**10.1**	8	0.05	0.05	40.8	6.7	30-50
2011		4	9.3	0		0.00			
2012		4	8.7	0		0.00			
2013			9.6	0		0.00			
2014			9.2	2		0.02	45.9		42-49.5
2015				43		**0.86**	44.6	4.8	35-54
2016				30		**0.83**	36.9	7.4	26-53
2002	Netarts			0		0.00			
2003				6		0.15	49.4	3.7	45-55
2004				0		0.00			
2005				25		**0.92**	42.9	5.3	30-53
2006				21		**0.65**	38.6	5.3	29-50
2007				0		0.00			
2008				0		0.00			
2009				1		0.02	47.7		
2010				6		**0.30**	44.7	5.6	37-51
2011				0		0.00			
2012				0		0.00			
2013				0		0.00			
2014				18		0.257	43.6	3.9	33-49.5
2015				36		**0.90**	46.3	5.4	38-56
2016				16		**0.32**	34.5	5.2	24-44
2002	Tillamook			0		0.00			
2003				5		0.17	50.0	3.1	46-55
2004				2		0.10	41.0		37-45
2005				10		0.17	47.8	4.5	42-56
2006				31		**0.32**	40.7	4.4	31-51
2007				0		0.00			

2008				0		0.00			
2009				0		0.00			
2010				0		0.00			
2011				0		0.00			
2012				0		0.00			
2013				0		0.00			
2014				1		0.015			
2015				26		**0.52**	49.2	4.1	44-60
2016				8		**0.20**	45.3	5.3	36-52
1998	Willapa	3	8.9	47	**0.778**	**0.74**	45.9	4.0	37-55
1999		4	7.6	3	0.023	0.00	38.2	7.5	32-47
2000		4	8.0	9	0.046	0.03	43.4	12.0	19-58
2001		5	8.0	7	0.046	0.02	51.3	2.7	48-56
2002		4	7.6	0	0.00	0.00			
2003		3	9.0	10	0.167	0.00	48.3	5.1	43-59
2004		5	8.6		Not sampled				
2005		3	9.0	106	**0.37**	**1.17**	46.1	3.3	34-52
2006		5	8.3	5	0.04	0.13	42.5	5.1	35-49
2007		5	8.4est	0	0.00	0.00			
2008		5	7.7est	0	0.00	0.00			
2009		5	7.2	0	0.00	0.00			
2010		3	8.9	2	**0.40**	0.00	43.8		43- 44
2011		5	7.8	0	0.00	0.00			
2012		5	7.7	0	0.00	0.00			
2013		5	8.1	0	0.00	0.00			
2014				0	0.00	0.00			
2015				8	**1.00**	0.20	43.1	4.5	35-47
2016					0	0			
1998	Grays Harbor			3		**1.00**	45.3	5.0	40-50
1999				24		0.02	37.4	7.7	34-51
2000				3		0.01	41.3	6.5	35-48

2001				1		0.01	47.9		
2002				0		0.00			
2003					Not Sampled				
2004					Not Sampled				
2005				2		0.03	47.3		44-50
2006				1		0.02	49.0		
2007				0		0.00			
2008					Not sampled				
2009				0		0.00			
2010					Not sampled				
2011					Not sampled				
2012					Not sampled				
2013					Not Samples				
2014					Not Sampled				
2015					Not Sampled				
2016					Not Samples				

Appendix 4. *Carcinus maenas* year class strength as a function of Pacific Decadal Oscillation for March. Average catch data for the five to six estuaries were log -transformed and regressed against Pacific Decadal Oscillation Index for March. The regression is significant at p< 0.0001 and explains 76% of the inter-annual variability in year class strength. (This figure is an up-date of Figure 2b in Behrens Yamada, Peterson and Kosro 2015**.)**



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