2018-19 WDFW Puget Sound Dungeness Crab Fishery Report

Prepared for the Fish and Wildlife Commission

Metacarcinus magister

Washington Department of FISH and WILDLIFE

June 14, 2019

Purpose of this Report

This report fulfills Fish and Wildlife Commission Policy C-3609 by providing an annual summary describing the performance and harvest of commercial and recreational crab fisheries. Regulation compliance data collected by enforcement and fishery management staff is also provided to meet the policy reporting mandate.

Introduction

Dungeness crab (*Metacarcinus magister*) is a native species to the Pacific Northwest and it is reportedly named after a small fishing village on the Strait of Juan de Fuca. They have been harvested commercially along the Pacific coast since the late 1800's and aboriginal harvests of Dungeness crab precede the discovery of North America by Europeans. Dungeness crab range from central California to the Gulf of Alaska. The range of distribution in Washington State includes the waters of Puget Sound; Strait of Juan de Fuca, San Juan Archipelago, Hood Canal and inside waters of Central and South Puget Sound. Dungeness crab are generally more abundant in the northern areas of Puget Sound. These crab occupy nearshore waters ranging from the intertidal zone to depths of 600 feet and greater. The Puget Sound Dungeness crab fishery is managed separately from the Washington coastal fishery. Further, smaller harvest units have been established within Puget Sound to facilitate management by region and to align with established Tribal usual and accustomed areas.

In Washington, Dungeness crab are highly valued and are exploited in State commercial, State recreational, and Tribal fisheries. The basic fisheries management has been consistent over time, using a minimum size limit and protection of female and softshell crab to promote natural reproduction. In addition to basic management principles, current management strategies include assessment of recreational and commercial regional harvest, catch per unit effort (CPUE) in commercial and recreational fisheries, annual test fisheries in each region to assess relative abundance and age distribution, and beginning in 2019 a crab larvae monitoring network to potentially gain predictive information regarding recruitment and to inform population health by region. Crab traps are the only gear type allowed in State and Tribal fisheries. Crab traps must have escape hatches and rot cord to allow for crab escapement, have weighted line to reduce vessel conflicts and trap loss, and marked to identify gear type and ownership. A catch record card (CRC) is used to estimate harvest in the recreational fishery. A two card system is used to estimate summer and winter catch.

This report provides information about fishery policy, current management practices, and compares fishery performance between regions and over time with an emphasis on the recent 2018-19 crab season. Recent Dungeness crab abundance appears to have peaked in several management regions in 2015. Low abundance at the edge of their southern range in Puget Sound has changed management in those areas through closures and shortened seasons, until the population in those areas shows signs of recovery. The population appears to remain strong in the San Juan Islands and Strait of Juan de Fuca. To maintain orderly fisheries, the State and Tribes enter into annual harvest agreements pursuant to *U.S. v. Washington*. There is also significant education and outreach and enforcement effort to ensure regulatory compliance. The legislature has dedicated funding from crab endorsement sales to support management, enforcement and derelict shellfish gear recovery efforts in Puget Sound.

Crab Policy

A revised crab policy (C-3609) was adopted by the Fish and Wildlife Commission on October 1, 2010. This policy protects and conserves Puget Sound Dungeness crab resource, while providing for recreational and commercial fishing opportunities. A base summer recreational season begins in July and extends through Labor Day; 5 days per week, Thursday through Monday. When quota remains following the base summer season, a winter recreational season can be conducted beginning in October and extending through December 31; 7 days per week. The daily recreational limit for Dungeness crab is 5 per day.

The policy also directs the agency to use a "3-S" management strategy, which refers to **size**, **sex** and **season**. A minimum harvest size of 6 ¼ inch carapace (shell) width is measured at widest part of the carapace between the notches in front of the largest lateral spines. This size limit allows smaller crabs to mature and spawn several times before being vulnerable to exploitation in the fishery. Only the male sex is allowed to be taken and retained in the Dungeness crab fishery to protect females carrying gametes, eggs and sperm packets (following copulation). The harvest season is structured to avoid softshell crab handling, thereby reducing handling mortality and enhancing the reproductive potential of the population.

The revised crab policy also provides direction to minimize Dungeness crab bycatch mortalities, improve harvest estimates, enhance enforcement strategies, develop programs to promote regulatory compliance and catch accounting, provide easily accessible fishery rules to the public, reduce and remove derelict crab pots, and structure a region based sharing strategy with Treaty Tribes under *U.S. v. Washington*. In the San Juan Islands, Strait of Juan de Fuca and northern Whidbey Island areas recreational seasons are prescribed with commercial harvest opportunity designated to begin each year in the early fall. The State share of quota in Hood Canal, Central Puget Sound and South Puget Sound are allocated for the exclusive benefit of the recreational fishery.

Harvest Management Regions

Ten crab harvest management units have been established in Puget Sound. These harvest units, or regions, are used to co-manage the crab fisheries with Treaty Tribes as well as allocating harvest opportunity between State commercial and recreational fisheries. Policy C-3609 provides for recreational and commercial harvest opportunity in Regions 1, 2E, 2W, and Sub-regions 3-1, 3-2, and 3-3. The State share of quota in Crab Regions 4, 5, 6 and 7 are reserved for recreational harvest opportunity (Figure 1). Dungeness crab harvest opportunity in Region 7 has only been identified in recent years and this region is not specifically designated in the F&W Commission policy C-3609. Region 7 allocation is reserved for recreational opportunity to conform to the intent of the policy.

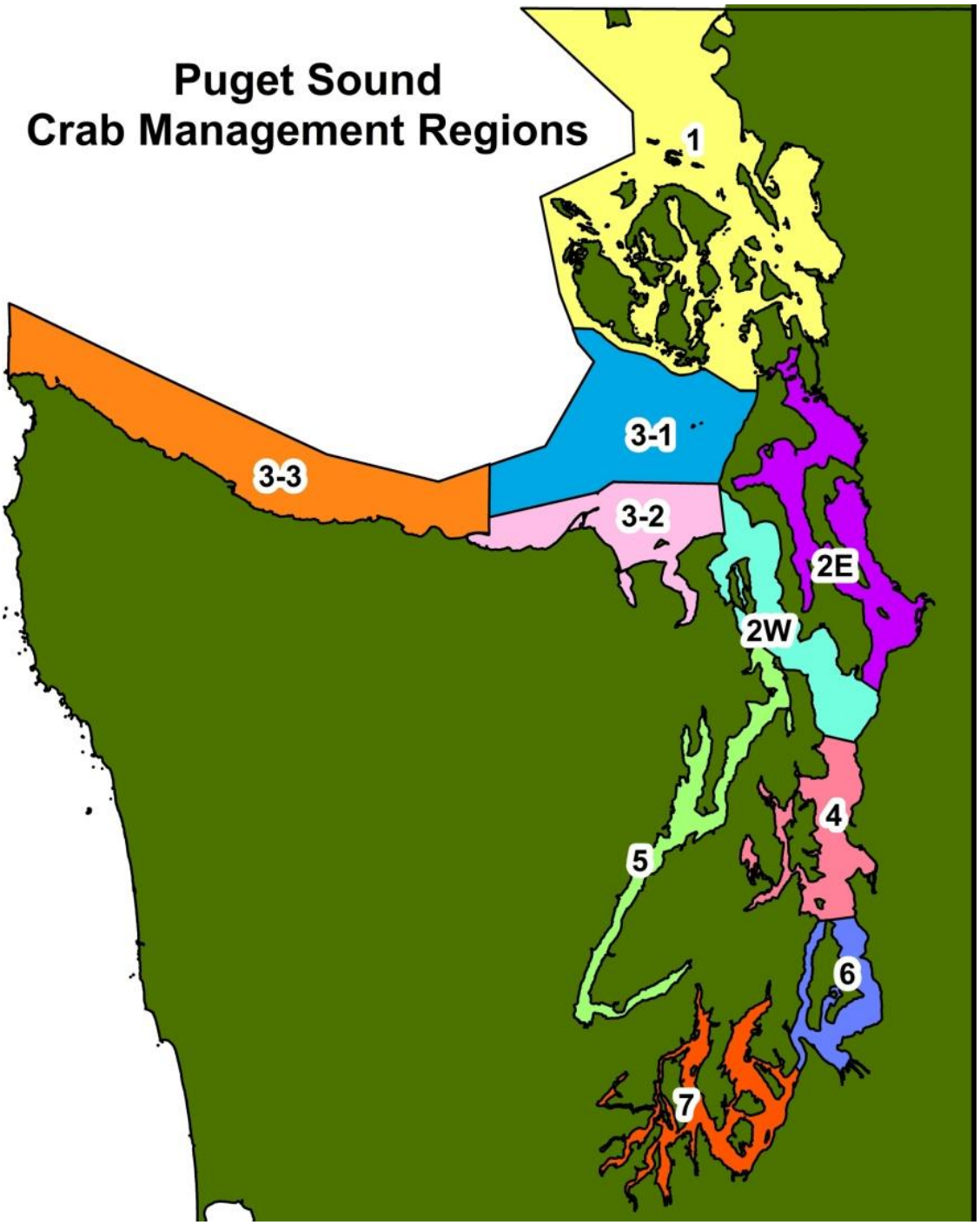

Figure 1. Crab harvest regions and sub-regions in Puget Sound.

Crab management region boundary lines take into consideration historic WDFW Marine Areas, WDFW Marine Fish – Shellfish Catch Areas (MF/SF), and tribal usual and accustomed areas at the time when shellfish harvest management plans were first negotiated, circa 1995. Table 1 (below) shows defined crab regions and sub-regions and associated WDFW Marine Areas and WDFW Marine Fish/Shellfish Catch Areas.

TABLE 1.
The relationship between Crab Regions, WDFW Marine Areas and WDFW MF/SF Catch Areas

Crab Regions/Sub-regions	WDFW Marine Areas	WDFW MF/SF Catch Areas
1	7	20A, 20B, 21A, 21B, 22A, 22B, 23A
2E	8-1, 8-2	24A, 24C, 26A
2W	9	25B, 26A
3-1	7	23A, 23B
3-2	6	23D, 25A, 25E
3-3	4, 5, 6	23C, 29
4	10	26B, 26C
5	12	25C, 27A, 27B, 27C
6	11	26D
7	13	28A, 28B, 28C, 28D

Co-management harvest plans

Federal Sub-proceeding 89-3 of *US v. Washington* provides a framework for Treaty Tribe harvest of shellfish in Washington. Sub-proceeding 89-3 decisions are sometimes collectively referred to as the Rafeedie Decision. The first implementation order regarding Treaty Tribe shellfishing occurred in 1995. Implementation orders mandate that harvest must occur under harvest management plans developed by affected parties. Annual co-management harvest plans provide more detailed conditions and responsibilities of parties when conducting their respective fisheries including management principles, annual shares of quota, timing of fisheries, and harvest reporting. 15 Treaty Tribes participate in developing agreements to 7 crab harvest management plans in Puget Sound.

Fishery Performance

Total harvests

Over the last 10 years, Dungeness crab landings in the State and Tribal fisheries combined has ranged from 8.75 to 11.86 million pounds in Puget Sound (Figure 2). Catch trended upward between 2012 to a peak in 2015. Total catch has trended downward since 2015. Quotas are fully utilized, and State and Tribal catch trends have been equitable and moved in tandem from year to year. In 2018-19, the total State catch was 4.60 million pounds and Treaty Tribe harvest was 4.63 million pounds, a less than 1% difference.

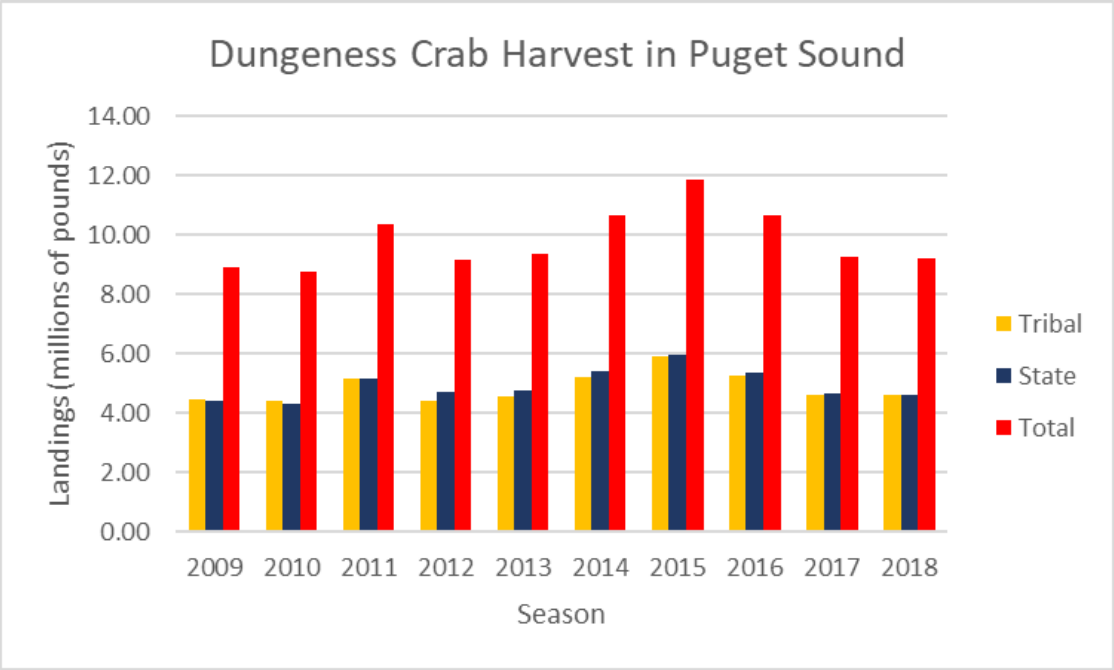

Figure 2. State, tribal and total Dungeness crab landings in Puget Sound over last 10 years.

State commercial and recreational harvests

The State commercial Dungeness crab fishery landings have ranged from a low of 2.32 million pounds in 2012 to a high of 3.10 million pounds in 2015 (Figure 3), over the last ten years. Commercial landings have been within a narrow range of 2.84 and 3.10 million pounds, since the decadal peak in 2015. However, recreational landings have trended lower since 2015, declining from 2.80 to 1.59 million pounds in 2018. This is attributable in part to lower Dungeness crab abundance in the southern reaches of Puget Sound and South Hood Canal, where the State share of quota is reserved for recreational harvest. In 2018, crab harvest was closed in Crab Regions 6 and 7. Low abundance also lead to closure of winter recreational crab fisheries in Crab Regions 4, 5, 6 and 7 (areas designated by policy for recreational harvest exclusively).

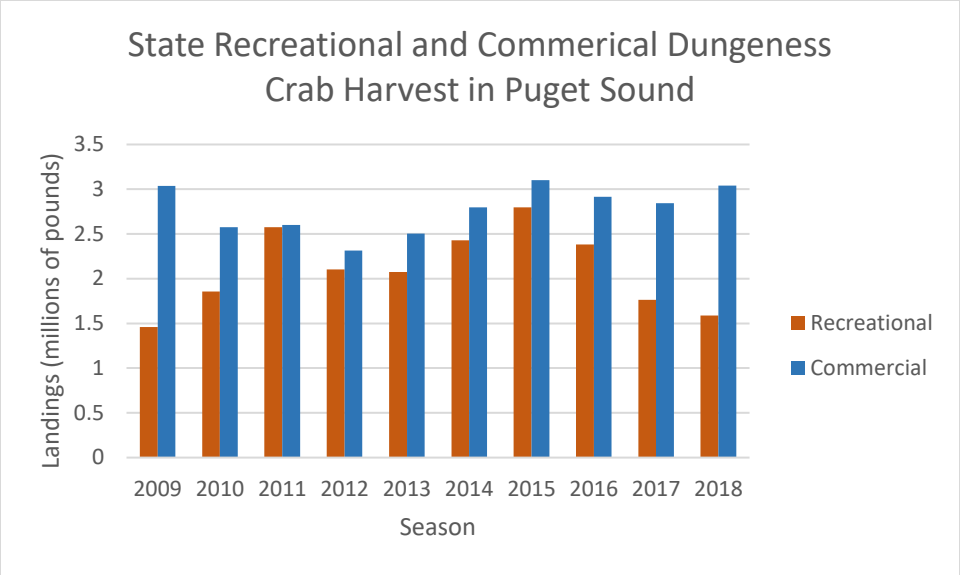

Figure 3. State recreational and commercial Dungeness crab landings in Puget Sound over last 10 years.

Differences in the 2018-19 catch among crab regions is illustrated in Figure 4 (below). 97.1% of the total Puget Sound State crab catch comes from the northern crab regions; 1, 2E, 2W and 3. In Region 1 (San Juan Islands) commercial catch (2.28 million pounds) greatly exceeds recreational catch (0.54 million pounds). Of the regions where commercial harvest is allowed, Crab Region 2E is the only region where recreational harvest (0.70 million pounds) exceeds commercial harvest (0.39 million pounds). Low abundance has limited harvest opportunity in Crab Regions 4-7.

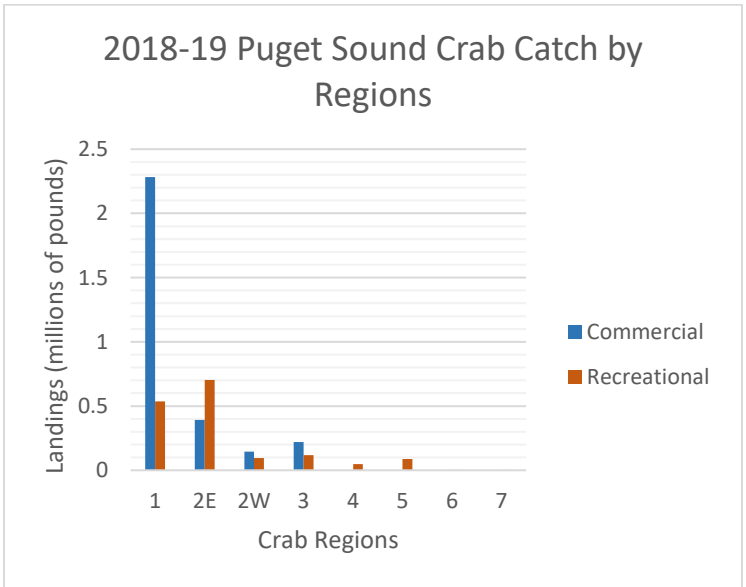

Figure 4. State recreational and commercial Dungeness crab landings in Puget Sound during the 2018-19 season by region.

Low abundance and crab harvest closures around Vashon Island and in South Puget Sound

The Dungeness crab fishery in the Vashon Island area (Marine Area 11, Crab Region 6) and South Puget Sound (Marine Area 13, Crab Region 7) has grown in popularity since 2002. Interest in these fisheries increased after it became well-known that Dungeness crab were available for exploitation; specifically information was revealed in 2002 following a WDFW investigation into illegal geoduck and Dungeness crab harvest in these areas. State and Tribal fisheries gradually increased and the population supported harvests ranging from 180,434 to 222,792 pounds per season in the Vashon Island area between 2010 and 2015 (Figure 5). 2015 is known as an anomalous weather year with an extended period of higher-than normal summer temperatures. A similar weather pattern followed in 2016. Coincidentally, Dungeness crab harvest plummeted to 54,862 pounds in 2016 and 26,148 pounds in 2017 in the Vashon Island area.

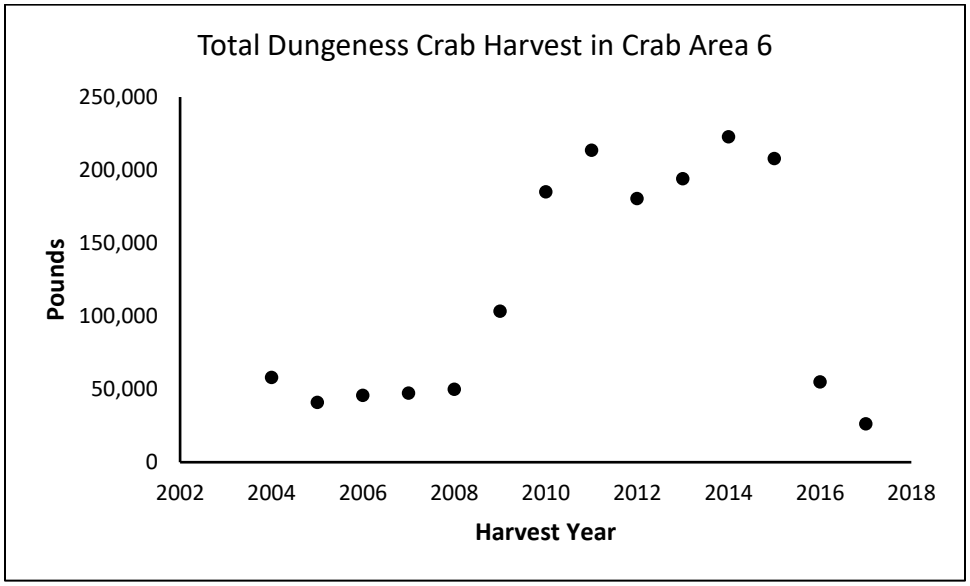

Figure 5. State recreational and Tribal Dungeness crab harvests in Crab Region 6 (Marine Area 11 - Vashon Island) from 2004 through 2018.

The peak harvest occurred earlier in Crab Region 7 (South Puget Sound – Marine Area 13) than Crab Region 6 (Vashon Island – Marine Area 11) and was shorter in duration, lasting about one season instead of hitting a plateau for several seasons. Peak landings (State and Tribes) in South Puget Sound was 289,505 pounds in 2012 (Figure 6). From this point forward, landings declined each season reaching a low of 9,457 pounds in 2017.

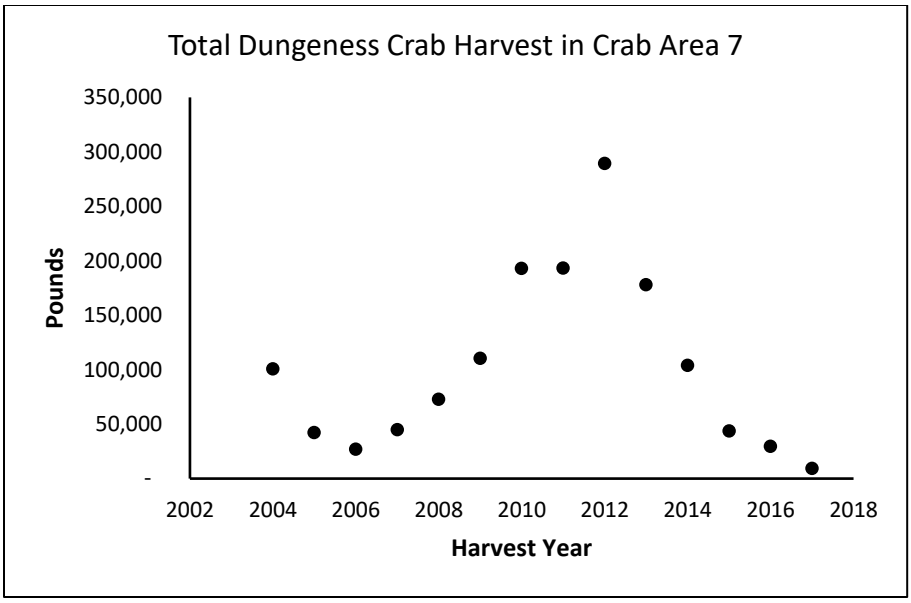

Figure 6. State recreational and Tribal Dungeness crab harvests in Crab Region 7 (Marine Area 13 – South Puget Sound) from 2004 through 2018.

In addition to declining Dungeness harvest in the Vashon Island and South Puget Sound areas, test fishing conducted prior to the summer harvest seasons in 2014 through 2018 show declines in abundance in both of these areas. The Vashon Island area test fishing has been done by the Puyallup Tribe and since 2014. The Vashon Island area abundance based on test fishing has declined from an average of 10.5 legal size males (LSM) per trap in 2014 to 1.0 LSM in 2018 (Figure 7). The South Puget Sound test fishing has been done by WDFW and the Nisqually Tribe. The WDFW sampling effort in South Puget Sound uses more crab traps, therefore only WDFW data for South Puget Sound (Crab Area 7) is summarized in Figure 7. The South Puget Sound average LSM density has been very low since sampling began in 2015 with an average of 1.1 LSM per trap in 2015, declining to an average of 0.28 LSM per trap in 2018. In contrast, Crab Region 2E (inside waters of Whidbey Island, Marine Areas 8-1 & 8-2) is more centrally located within the distribution of the Puget Sound Dungeness crab population and may be more representative of an open crab population receiving consistent recruitment. The average abundance of LSM per trap in Crab Area 2E averages 17.0 to 34.2 LSM per trap in pre-season test fishing between 2014 and 2018 (Figure 7).

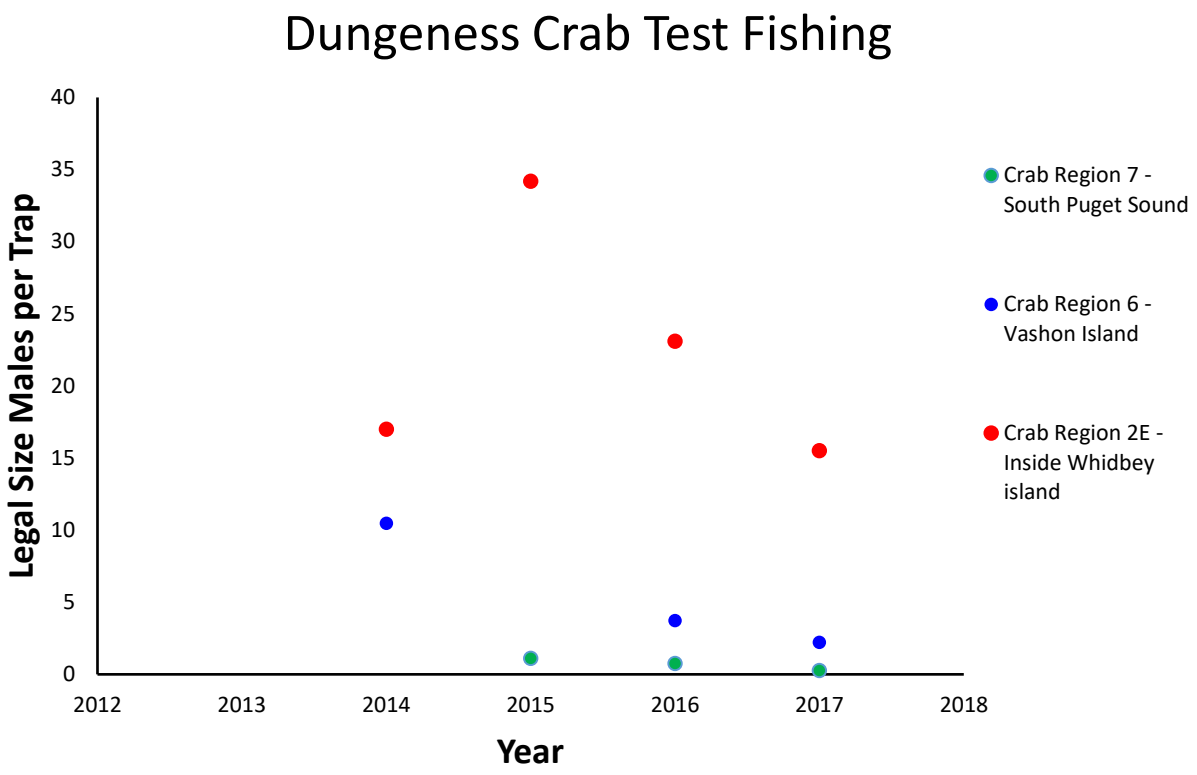

Figure 7. Average size of Legal Size Males observed during test fishing in Crab Regions 2E, 6 and 7 from 2014 to 2018.

In addition to harvest and test fishing abundance and trends, the size structure of Dungeness crabs can provide information to help elucidate the mechanisms for population decline in South Puget Sound. To sustain a Dungeness crab fishery, abundant recruitment into the legal size range is necessary. The legal size for harvest of male Dungeness crab is 159 mm in Puget Sound, shown as a black line on the chart below (Figure 8). There is only a very small proportion of Dungeness crab below the legal size limit in South Puget Sound, 10.8% observed during test fishing. In addition to few sub-legal males observed, it appears that entire year classes of juvenile and sub-legal Dungeness crab are missing from the size distribution. There were no Dungeness crab below 146 mm observed and several year classes in the "trappable" size range (120+ mm) may be missing. Test fishing uses commercial traps with escape rings closed. Test fishing traps are expected to capture most, if not all, Dungeness crab greater than 120 mm.

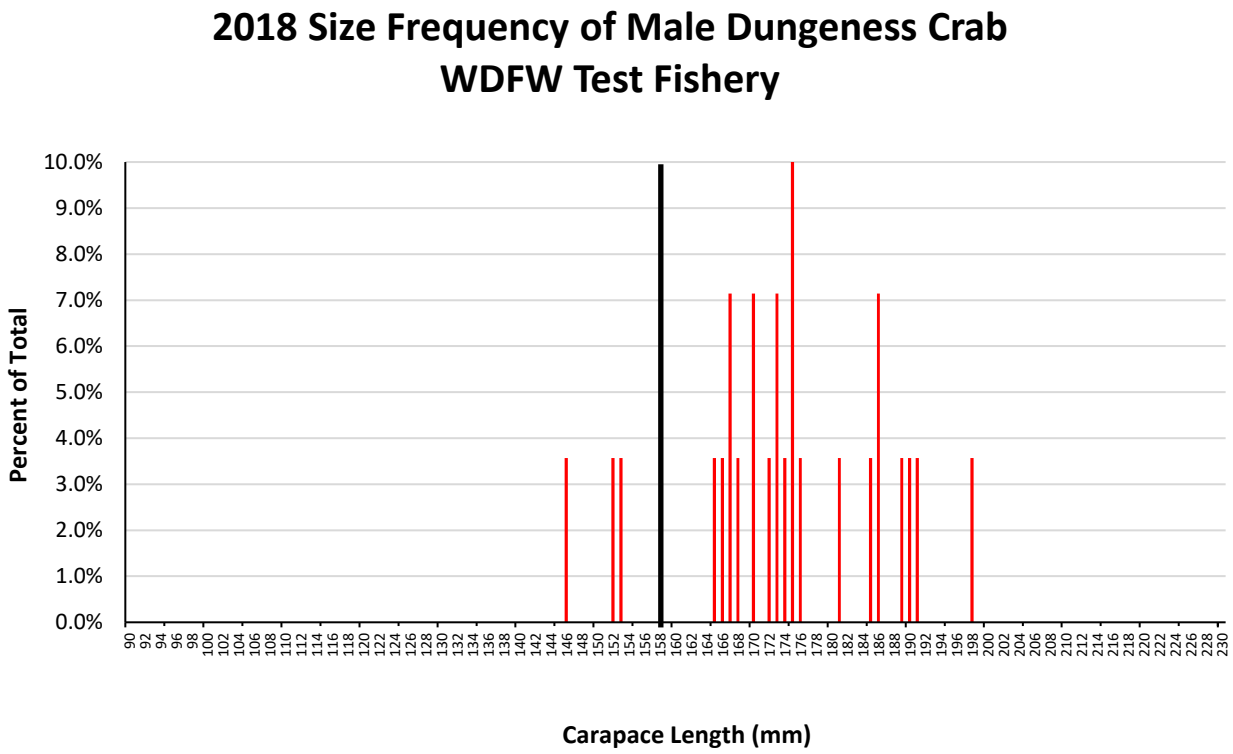

Figure 8. Size distribution by percentage of total, using standard carapace width measurement, of Dungeness crab caught in Crab Region 7 test fishery in 2018 (n=28).

State and Treaty Tribe crab managers have considered this information regarding harvest trends, test fishing catch per unit effort and size distribution and have concluded that the best option for fostering local recruitment in the South Puget Sound and Vashon Island areas is to close the recreational and treaty commercial fisheries until there are signs of recovery. The State recreational crab fishery was closed in the Vashon Island and South Puget Sound areas in 2018. In 2019, the information from test fishing, including very low CPUE and no sign of significant recruitment into the fishery, has informed the management recommendation to close these same areas to crab harvest in 2019.

Catch Record Cards (CRCs) are used to estimate recreational catch

Recreational harvest is estimated using catch data reported on catch record cards (CRCs). This is a two card system where summer and winter catch is reported separately (Figure 9). Summer catch is used to determine remaining quota share available for winter recreational fisheries and the State commercial fishery, which begins in October each year.

The number of summer CRCs issued has decreased from a peak of 232,621 cards in 2015 to 200,962 in 2018, or a decrease of about 13.6% from the high (Table 2). In spite of winter fishery closures in South Puget Sound, Central Sound and Hood Canal, there was a slight increase of CRCs issued year over year. The introduction of CRC internet reporting and a rule implementing a $10.00 fee for failure to report was intended to increase CRC reporting compliance. Return rates in 2018 average 52% for the summer fishery, a modest increase in the return rate percentage from 2017, and 56% in the winter fishery, a significant decrease from 2017. Note that crab endorsements issued can be lower than catch record cards issued, since there is a potential to issue multiple cards for each endorsement (CRCs are issued for summer fishery, winter fishery, and when crab landings fill a card and a new card is requested).


Report Crab Catch

OPTION 1

Return card to address below by 10/01/2018

Return To: WDFW CRC Unit
PO Box 43142
Olympia, WA 98504-3142

OPTION 2

Report catch card information online between 09/04/2018-10/01/2018 at
fishhunt.dfw.wa.gov

Season opening dates, closures, and restrictions are available in the Sport Fishing Rules pamphlet, on the toll-free shellfish rule change hotline 1(866)880-5431, and on the internet at wdfw.wa.gov

Use ballpoint pen only.
Do not use a felt tipped pen.

Immediately upon retaining a Dungeness crab, you are required to record your catch by completing the record below. Failure to do so is a violation of WAC 220-310-020.

SUMMER

2018 DOC#: D000000000000

	Catch Area	Month	Day	Check (X) one box for each crab kept					Crab Kept Per Day
EX	8-2	7	5	X	X	X	X	X	5
EX	12	8	7	X	X	X			3
1									
2									
3									
4									
5									
6									
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11									
12									
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16									
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18									
19									
20									

EXAMPLE

Figure 9. Summer Catch Record Card (CRC).

TABLE 2.
CRCs issued by season and reported by category, 2009-2018.

Summer	CRCs Issued	CRCs Reported Mail	CRCs Reported Online	CRCs Reported	CRCs Unreported	Endorsements Entire Year
2009	236,665	37,128 (16%)	72,172 (30%)	107,300 (45%)	129,365 (55%)	241,226
2010	208,462	29,406 (14%)	77,472 (37%)	107,418 (52%)	101,044 (48%)	213,013
2011	230,355	31,222 (14%)	89,095 (39%)	120,317 (52%)	110,038 (48%)	237,129
2012	200,711	26,504 (13%)	79,895 (40%)	106,399 (53%)	94,312 (47%)	209,957
2013	214,692	26,236 (12%)	90,379 (42%)	116,615 (54%)	98,077 (46%)	222,050
2014	213,741	25,296 (12%)	91,270 (43%)	116,566 (55%)	97,175 (45%)	223,184
2015	232,621	25,685 (11%)	94,336 (41%)	120,021 (52%)	112,600 (48%)	243,934
2016	216,977	23,734 (11%)	90,262 (42%)	113,996 (53%)	102,981 (47%)	223,443
2017	215,929	33,252 (15%)	72,601 (34%)	105,853 (49%)	110,076 (51%)	222,222
2018	200,962	31,316 (16%)	72,790 (36%)	104,106 (52%)	96,856 (48%)	207,557
Winter						
2009	89,259	11,909 (13%)	27,382 (31%)	39,291 (44%)	49,968 (56%)	241,226
2010	70,763	9,633 (14%)	27,346 (39%)	36,979 (52%)	33,784 (48%)	213,013
2011	28,514	4,675 (16%)	13,899 (49%)	18,574 (65%)	9,940 (35%)	237,129
2012	27,711	4,508 (16%)	13,357 (48%)	17,865 (65%)	9,846 (35%)	209,957
2013	29,638	4,419 (15%)	15,223 (51%)	19,642 (66%)	9,996 (34%)	222,050
2014	35,371	5,040 (14%)	17,401 (49%)	22,441 (63%)	12,930 (37%)	223,184
2015	36,398	5,039 (14%)	18,284 (50%)	23,323 (64%)	13,075 (36%)	243,934
2016	26,591	5,777 (22%)	10,577 (40%)	16,534 (62%)	10,057 (38%)	223,443
2017	23,277	4,431 (19%)	9,746 (42%)	14,177 (61%)	9,100 (39%)	222,222
2018	24,620	3,906 (16%)	9,896 (40%)	13,802 (56%)	10,818 (44%)	207,557

**Percentages shown are rounded to nearest full percent*.

Commercial value

The ex-vessel commercial value is recorded at the time the first receiver takes possession and completes a shellfish receiving ticket. The ex-vessel commercial fishery value trend has increased over time. Between the 1990-91 and 2018-19 seasons, the ex-vessel value of the State commercial fishery has ranged from $2.04 million (1991-92 season) to $14.23 million (2015-16 season), Figure 10. There was a sharp decline in fishery value of about 17% between the 2015-16 and 2016-17 seasons. Landings decreased from 3.1 to 2.9 million pounds between 2015 and 2016, about a 6% decline. Average ex-vessel price per pound (weighted average) was $4.58 in 2015 and $4.05 in 2016, a decline of about 11.6%. In 2017 and 2018 the average ex-vessel price per pound was $4.40 and $4.32 respectively. The late opening of the coastal commercial crab fishery may have contributed to higher ex-vessel values in both 2017 and 2018. The Puget Sound State commercial fishery value for the 2017-18 season was $13.0 million.

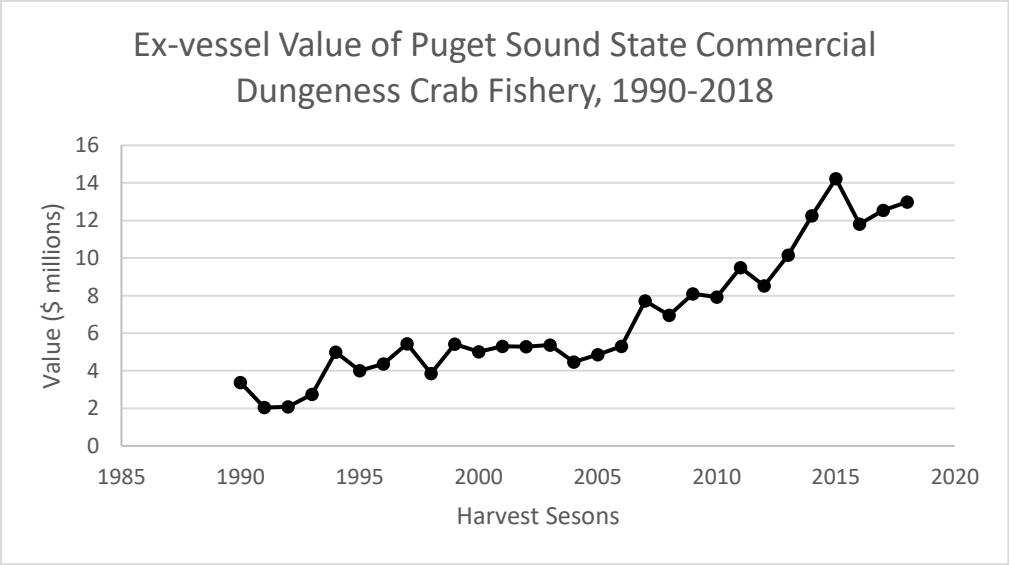

Figure 10. Puget Sound State commercial Dungeness crab fishery values (in $US millions) between the 1990-91 and 2018-19 seasons. Commercial ex-vessel values have not been adjusted for inflation.

Education and outreach

The focus of crab education and outreach is to reduce closed season crabbing, prevent loss of shellfish gear, reduce possession of undersized and female crab, promote rot cord use that allows crab escapement from derelict pots, reinforce daily limits, and promote catch reporting. The target audience is all recreational crabbers with an extra emphasis on crabbers who are new to the fishery. The percentage of new crabbers each season has have varied little since 2011. In 2018, about 27% of crabbers were new to the fishery (Table 3). Still, this is a large number of crabbers (over 54,000) who are targeted for education and outreach efforts.

TABLE 3.
Crab endorsements issued each year and the number and percentage of new entrants to the fishery.

Season	Crab Endorsements Issued	New Recreational Crabbers	New Recreational Crabbers (%)
2010	213,013	73,845	35
2011	237,129	82,944	35
2012	209,957	57,548	27
2013	222,050	62,291	28
2014	223,184	64,133	29
2015	243,934	70,613	29
2016	223,443	59,187	26
2017	222,222	61,994	28
2018	207,557	55,488	27

WDFW web pages are a good source to find information related to recreational crab harvest. These pages have practical information about crab fishing including licensing, harvest regulations, summer and winter catch reporting cards, and on-line reporting of catch. A WDFW webpage link to a 14 minute YouTube video titled “The Recreational Crab Fishery in Puget Sound, Washington” provides very useful information from agency staff about crabbing including marking buoys with name and address, providing sufficient line to reduce the risk of trap loss, escape rings and cords, bait to use, gauging for legal size, checking for soft shell, checking sex, releasing crab, and recording crab retained on catch record card (Figure 11). The agency has also produced a crabbing pamphlet entitled “Crabbing in Puget Sound” with similar information (Figure 12).

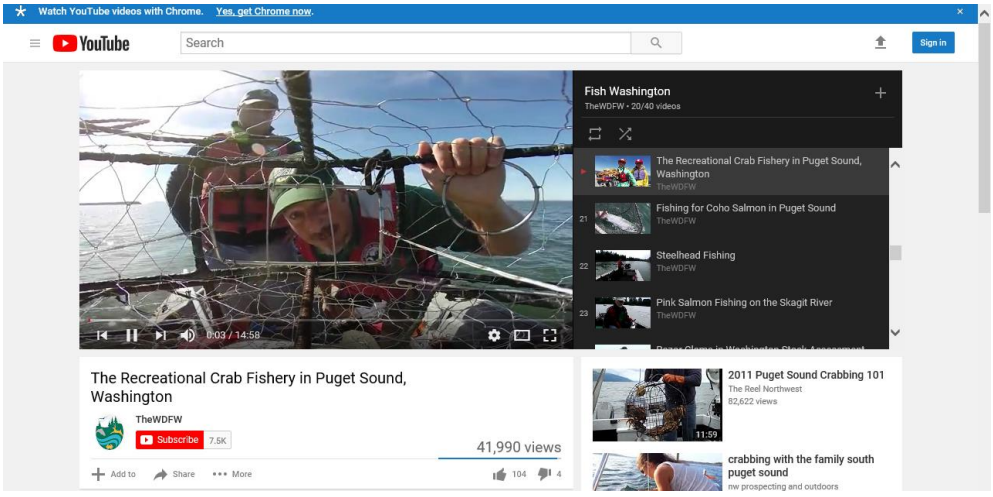

Figure 11. Instructional video on how to crab in Puget Sound.

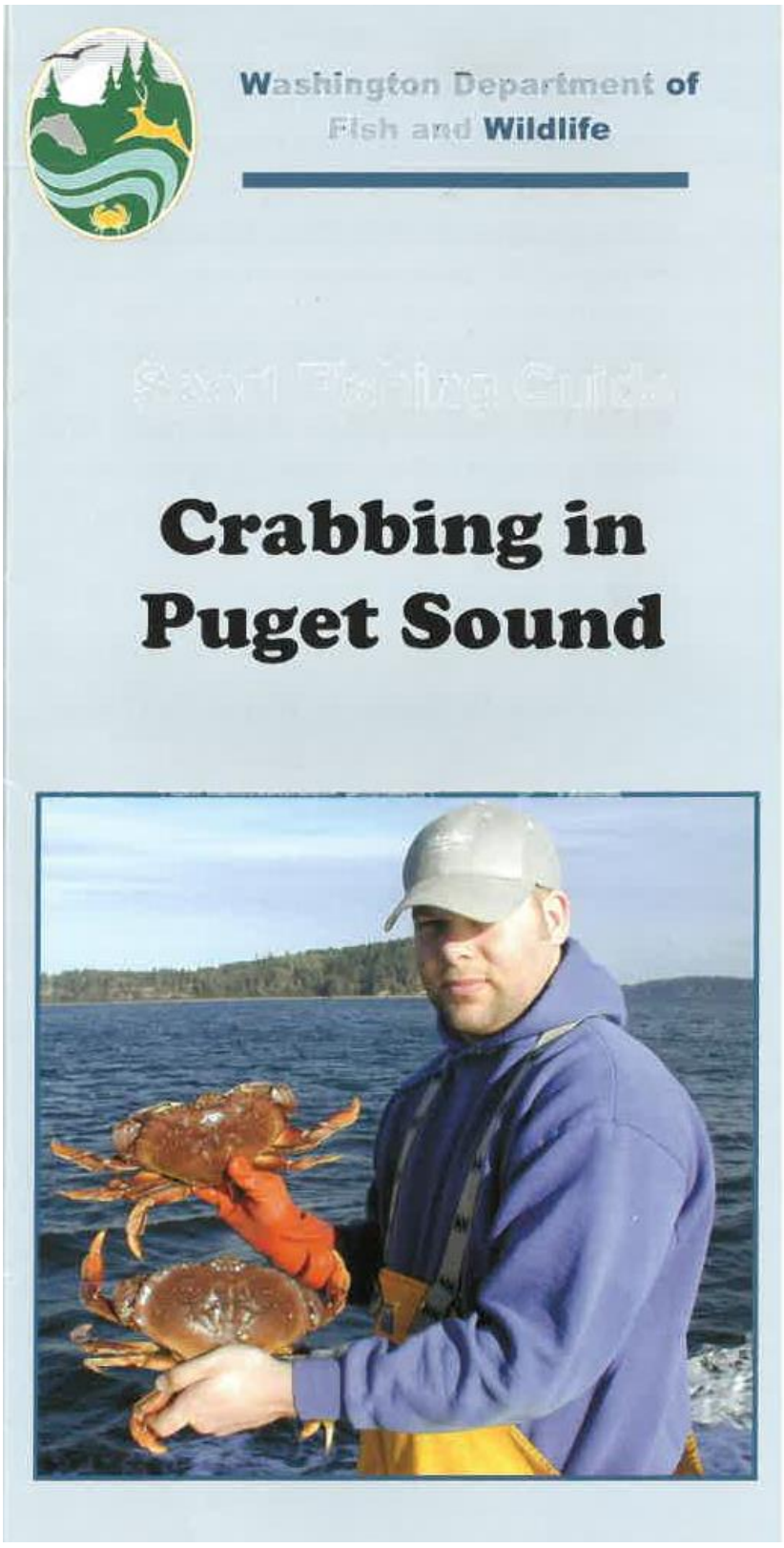

Figure 12. Cover of instructional pamphlet on how to crab in Puget Sound.

Marine Resource Committee volunteers, WDFW shellfish biologists and enforcement staff inform harvesters of crab regulations at boat ramps, during boat shows, outdoor sporting events, and during emphasis patrols. About 4000 pamphlets were packaged with rot cords, crab guides and crab gauges (~1000 packages) and distributed to harvesters to provide more incentive to comply with rules. A Marine Resource Committee volunteer is shown in Figure 13 distributing packets at a boat launch. Additional outreach includes pre-season newspaper coverage and "report your catch" reminder cards distributed to purchasers of crab endorsements at the end of the summer and winter crab seasons. In 2018, WDFW implemented email reminders to harvesters to return Catch record Cards (CRCs) to make compliance more efficient and effective. Efficiencies were realized and the slight increase of returned CRCs in the summer fishery may be a sign of improved effectiveness.

Figure 13. A Marine Resource Committee volunteer distributing crab packets that include information brochures, rot cords, and crab calipers.

The Northwest Straits Initiative assisted with outreach by conducting a "catch more crab" campaign several years ago, which was geared toward educating new entrants to the crab fishery about derelict shellfish gear (Figure 14). Educational information developed included a brochure describing the problems associated with gear loss and ways to prevent gear loss.

Figure 14. "Catch More Crab" brochure produced and distributed by the Northwest Straits Initiative.
Informing harvesters of ways to prevent crab gear loss is a cost effective way to improve the fishery.

Closed season shellfish gear sweeps

By policy, the summer recreational crab fishery is open 5 days per week, Thursday through Monday. In spite of efforts to inform the public about configuring shellfish harvest gear and practices that can be employed to prevent gear loss, there is inevitably some gear that gets swept away by currents and are presumed lost or stolen by harvesters. The 5 day fishery provides an opportunity to detect and retrieve lost pots on closed days, Tuesdays and Wednesdays, before these pots become derelict and create resource impacts by continuing to fish. In 2018, WDFW Enforcement Program and Fish Program staff made a concerted effort to detect and retrieve lost shellfish pots during and following the summer crab fishery. An example of lost pots recovered and transported to the Mill Creek District Office is shown in Figure 15, below.

Figure 15. One trailer and three truckloads of gear recovered during sweeps arrives at the Mill Creek storage area.

Several common themes were identified over the last two years of conducting this herculean effort:

- Secure storage and staff time is required to process the large volume of gear recovered
- Not able to identify fishers due to improperly marked buoys
- Fishers often assume gear was stolen
- Removing gear does provide an educational opportunity when owner are contacted
- Removing gear prevents continuous fishing by derelict pots and reduces unintended crab mortalities

The following is a summary of the data from derelict gear sweeps involving WDFW Enforcement Program and Fish Program staff from January 1, 2018 to December 31, 2018 (see also Figures 16 and 17):

- Total # of individual gear sweeps = **59**
- Total # of WDFW Officers participating = **29**
- Total # of pots processed by Crustacean staff = **1,607**
- **Recreational pots recovered = 1,498**
    - 937 were identifiable to an individual
        - 573 have been returned to owner
        - 244 stripped and scrapped
        - 108 saved for donation
        - 12 remain in our return inventory
    - 561 were either incompletely labeled, illegible or unmarked (37.5%)
        - 440 stripped and scrapped
        - 121 saved for donation
    - 9,260 pounds of metal was taken to the local scrap yard
- **Tribal pots recovered = 100**
    - 80 have been returned to the appropriate Tribe
    - These pots came from nine different Tribes
- **State commercial pots recovered = 9**
    - One of these pots has been returned to the appropriate fisher
    - These pots came from seven different fishers
- **Additional Highlights**
    - This season we have reunited 654 crabbers with their lost gear (41.7%).
    - **176** additional Canadian pots fishing illegally in US waters were recovered on October 16, 2018.

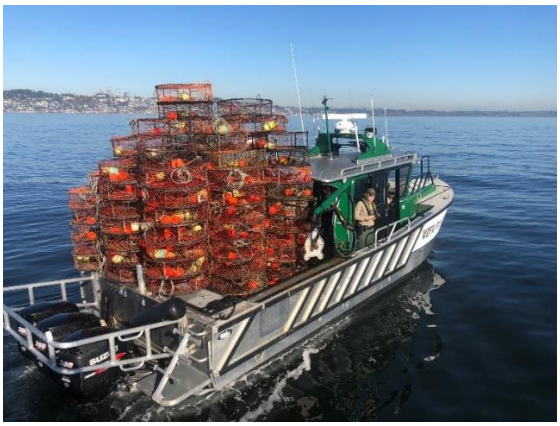

Figure 16. Canadian Border Sweep, October 2018.

Figure 17. "The Storage Yard" Late Summer 2018

Crab managers have analyzed the information from the recovered gear, and the most popular type of gear being used by the recreational fleet is the "Danielson Style" trap (Table 4 and Figure 18).

Recreational Pot Styles		
Type	**#**	**%**
Danielson Style	973	65.3%
Small Round	123	8.3%
Octagon	110	7.4%
Round	107	7.2%
Large Square	50	3.4%
Mini Commercial	43	2.9%
Ring Net	33	2.2%
Commercial	18	1.2%
Other	32	2.1%

Table 4 and Figure 18. 65.3 % of the recreational crab pots recovered were the Danielson style

Additional analysis reveals the common errors made by crabbers when setting up their gear. Almost 63% of the recreational gear recovered during the gear sweeps was not properly weighted. Seventy-two percent of the gear does not have the buoy installed correctly. Most notably, 78% of the recovered gear did not have their buoys labeled in a manner that met the legal requirements. On the positive side, most crabbers used leaded crab line (83.7%), had proper rot cord installed (90.1%) and used pots with escape rings that met the legal requirement (98.6%).

The consequence of not recovering derelict or lost crab gear in a timely manner is the potential for crab mortality. The gear sweeps revealed that on average, recovered recreational gear was found to hold 1.5 legal male crab per pot, Tribal gear was found to hold 6.5 legal male crab per pot and State Commercial gear was found to hold 2 legal male crab per pot (Table 5).

Number of Crab in Pots Recovered by WDFW Enforcement

	# of Pots Surveyed	**# of Crab**	**# of Crab/Pot**	**# of Legal Male Crab**	**# of Legal Male Crab/Pot**
Recreational	1401	3814	2.7	2170	1.5
Treaty	98	717	7.3	641	6.5
Commercial	5	16	3.2	10	2.0
TOTAL	1504	4547	3.0	2821	1.9

Table 5. Number of crab/pot and legal male crab/pot from the 2018 gear sweeps

Derelict shellfish gear recovery

In addition to WDFW pot sweeps, there is an effort to recover derelict shellfish pots under a contract with the NW Straits Foundation. The Foundation estimates that approximately 12,000 crab pots are lost every year in Puget Sound, costing the commercial fishery lost revenue and reducing opportunity for all crabbers. The recovery effort uses sidescan sonar to detect submerged gear and then divers use this information to retrieve abandoned pots. The Foundation reports that over the last 5 years, 723 recreational and 628 commercial pots have been recovered. In 2018 alone, the NW Straits Foundation was able to detect and recover 426 commercial and 265 recreational derelict pots. Trapped inside the recovered pots were 561 live and 269 dead Dungeness crab, illustrating the need to remove derelict pots, which continue to fish if left in place.

Natural Resources Consultants (NRC) with the assistance of WDFW also recently concluded a Crab Pot Escapement Study to learn more about the effectiveness of escape mechanisms used on common crab pots styles in Puget Sound. Many of the derelict pots retrieved are still fishing even after escape cord has disintegrated, theoretically disabling the pot. The purpose of this study was to identify the most effective escape mechanisms, working towards the goal of minimizing impacts from derelict crab pots in Puget Sound.

Enforcement

Enforcement officers make frequent compliance checks of crabbers and their catch. In 2018, 21 officers were involved in 21 compliance emphasis patrols. Over 94% of these contacts were made on-the-water. Several hundred to several thousand contacts and crab checks are made each season (Table 6). The number of contacts and crab checked declined in 2017 and 2018 when emphasis was shifted from on-the water contacts to shellfish gear sweeps.

TABLE 6.
Number of crabbers contacted and crab checked by WDFW Enforcement officers (2013 through 2018).

	2013	2014	2015	2016	2017	2018
Fishers Contacted	3,494	4,809	3,659	2,457	1,234	728
Number of Crab Checked	4,013	5,952	6,717	3,885	1,329	934

Four general categories of violations are tracked by enforcement officers from contacts made with recreational crabbers. Possession of under-sized Dungeness crab (less than 6 ¼ inches standard carapace width measurement), possession of female crab, exceeding daily limit, and failure to accurately record catch on a valid Catch Record Card (CRC). Possession of undersize crab is a persistent problem and is little changed from 2011 through 2018, ranging from 6.0% to 9% of contacts (Table 7). Possession of female crab does not appear to be a significant problem, and of the successful crabbers contacted, only 0.2% possessed female crab in 2018. Exceeding the daily limit of 5 crab per valid license also does not appear to be a significant problem, and the percent of successful crabbers contacted who exceeded

their daily limit has declined from 3.2% in 2011 to 1.0% in 2018. Failure to immediately record Dungeness crab catch on CRCs remains a significant problem during on-the-water enforcement contacts with crabbers. However, this category of violation has also declined from a high of 19.9% in 2012 to a low of 13.8% in 2018. It should also be noted that CRC compliance improves when crabbers are contacted by creelers at off-load site and further improvement has been observed when crabbers report at the end of the season. Overall, the improvements in compliance are potentially attributable to several factors including consistent enforcement presence, successful outreach and education, and crabbers growing accustomed to completing summer and winter CRCs.

Table 7.
Historic comparison of various violation types over the most recent eight year period.

	Enforcement Contacts (Successful Crabbers Only)							
Category	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Possession of undersize crab	8.0%	9.0%	8.0%	9.0%	7.0%	6.0%	7.0%	7.3%
Possession of female crab	0.9%	0.8%	1.0%	1.0%	1.2%	0.8%	0.4%	0.2%
Exceeding daily limit	3.2%	1.7%	1.4%	1.6%	2.6%	1.5%	1.2%	1.0%
CRC violation (fail to record)	19.4%	19.9%	16.5%	17.4%	17.2%	16.9%	16.7%	13.8%

In WDFW Region 4, Enforcement Officers issued 182 written warnings, 146 tickets, and made 13 referrals for crab violations. In Region 6, Enforcement Officers issued 16 written warnings, 405 tickets, and made 41 referrals for crab violations.

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