2025 LUMMI BAY & SEMIAHMOO Clam Survey & Harvest Limit Report
with updates for PORTAGE BAY & BIRCH BAY



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Executive Summary

Lummi Natural Resources conducted a stock assessment survey of harvestable Manila clams at Semiahmoo (Drayton Harbor, BIDN 200104) over four days between April 28th – 30th & July 8th, 2025, and at Lummi Bay over 17 days between May 15th – August 21st, 2025. A total of 31 acres was covered at Semiahmoo and 1,285 acres was covered at Lummi Bay. The average legal size Manila clam density at Semiahmoo was 0.13 lbs/ft^2, this was an order of magnitude increase from the previous survey conducted in 2023. The average legal size Manila clam density within Lummi Bay management areas ranged from 0.2 – 0.05 lbs/ft^2 with decreases for both S1B and S1C and an increase for S1D&E.

The Washington State Department of Fish and Wildlife (WDFW) surveyed Birch Bay State Park (BIDN 200060) in May 2025. A total of 20 acres were covered with a total harvestable biomass of 114,303 lbs of Manila clams and 9,337 lbs of native littleneck clams. Lummi does not commercially harvest native littleneck clams and is therefore not discussed further within the report.

The total harvestable biomass for Semiahmoo was 57,032 lbs, the Lummi harvest share is 43,516 lbs. The total harvestable biomass for Lummi Bay was 418,192 lbs. See table for management area breakdown. The Lummi harvest share for Birch Bay SP is 15,176 lbs. Lummi and WDFW have swapped shares between Birch Bay SP and Semiahmoo for several years. A 15,000 lbs swap occurred for the 2025 – 2026 harvest year between Birch Bay SP and Semiahmoo.

Sustainable harvest recommendations for the 2025 – 2026 Manila clam fishery was 33% of the surveyed harvestable biomass for Semiahmoo and Birch Bay SP and between 10% - 20% of the surveyed harvestable biomass for Lummi Bay.

Table: Summary of Manila clam stock assessment survey results conducted biennially. Lummi TAC is noted in parentheses for co-managed beaches Semiahmoo and Birch Bay SP.

General area	Management area	Acres	Weighted mean density (lbs / ft^2)	Mean biomass estimate (lbs)	TAC (lbs)	Year surveyed	Next Survey
Birch Bay SP	20A - 200060	**20**	Wdfw	Wdfw	37,720 (**15,176**)	2025	2027
Semiahmoo (Drayton Harbor)	20A - 200104	**31**	0.1289	**172,824**	57,032 **(43,516)**	2025	2027
Lummi Bay	20A - S1B	234	0.0414	422,125	84,425	2025	2027
	20A - S1C (Elder bed)	254	0.0190	211,036	31,655	2025	2027
	20A - S1D&E	688	0.0504	1,510,557	302,111	2025	2027
	Closed	108	0.0032	14,884	N/A	2025	2027
	Total	**1,285**		**2,158,602**	**418,192**		
Portage Bay	21A - S4 (Elder Bed)	40	0.1648	287,124	71,781	2024	2026
	21A - S5	31	0.1331	179,147	33,541	2024	2026
	21A - S6	-	-	-	-	2021	2026
	21A - S7D	57	0.0993	246,625	61,656	2024	2026
	21A - S7E	62	0.0428	115,196	28,799	2024	2026

	Total	**190**		**828,092**	**195,777**		
	SUM Beaches						

File location & Relevant Supplementary Reports:

1. 2025 Clam Survey & Harvest_Summary_1 page.docx (SharePoint > Natural Resources > Harvest Management > Tech Reports > Survey > 1-page Summary).
2. 2024 Clam Survey & Harvest_Tech Report.docx (SharePoint > Natural Resources > Harvest Management > Tech Reports > Survey > Full Report).

Survey Objectives

The 2025 Manila clam survey provides critical data for the management of the commercial Manila clam fishery. This work estimates the harvestable biomass of Manila clams on beaches within Lummi Nations Usual and Accustom area (U & A). Beaches are surveyed biennially, during the summer of 2025, Lummi Natural Resources (LNR) surveyed Semiahmoo (Drayton Harbor) and Lummi Bay while the State surveyed Birch Bay. Portage Bay was surveyed between June – August 2024 and will be re-surveyed in 2026. The current report focuses on Semiahmoo and Lummi Bay with updates for Birch Bay and Portage Bay.

Methods

Field Protocol

Beaches were surveyed following the Lummi Survey Protocol (Dolphin 2013), a modification of the standard Washington State adopted protocol (Campbell 1996), consistent with past survey methods. Surveys were carried out using a systematic random design with a series of parallel transects to determine the legal pounds per square foot of Manila clams. The sample clam densities are spatially weighted and the weighted average for each management area is then multiplied by the total surveyed area to estimate the total biomass of legal-size Manila clams.

Table 1. Beach specific survey design

Survey Area	Steps between Transect Lines	Steps between Quadrats	Quadrat Area
Lummi Bay – S1C, S1D&E	200	60	9 ft^2
Lummi Bay – S1B	100	60	9 ft^2
Semiahmoo – Drayton West - 200104	45	10	2.25 ft^2

The 2025 Semiahmoo clam survey was conducted over four days between April 28th – 30th & July 8th, 2025. The 2025 Lummi Bay clam survey was conducted over 17 days between May 13th – August 21st, 2025. All survey days took place between -1.00 ft to -2.88 ft at Semiahmoo and -0.88 ft to -3.66 ft at Lummi Bay. A total of 285 quadrats were sampled at Semiahmoo coving 31 acre and 817 quadrats were sampled at Lummi Bay covering 1,285 acres.

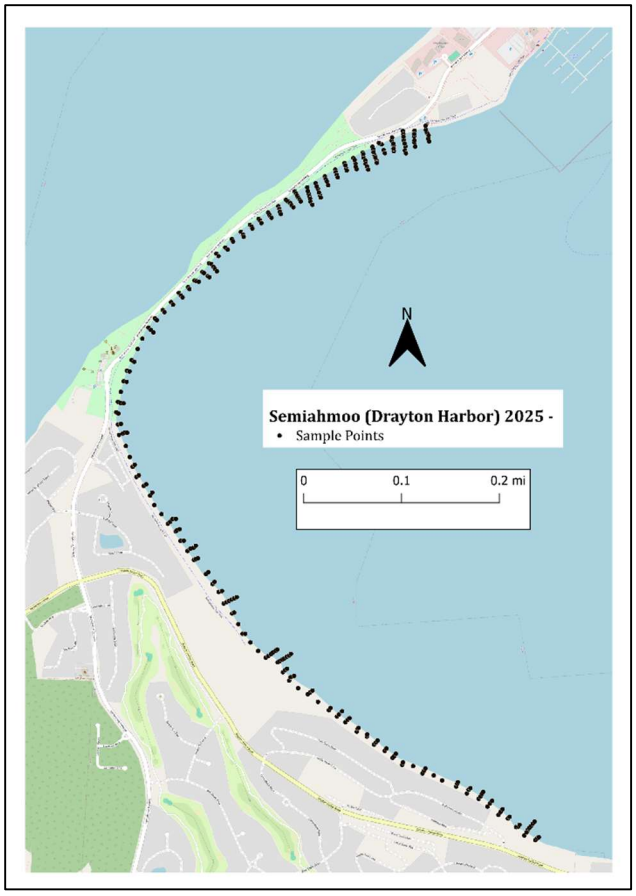

Figure 1. Clam stock assessment sample collection points (black dot) in Semiahmoo

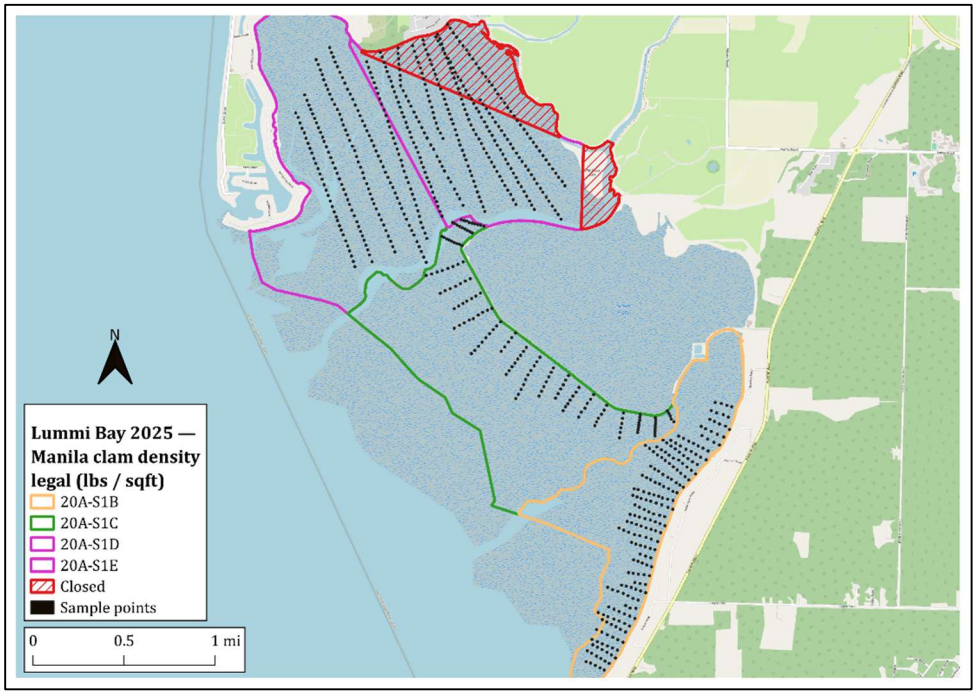

Figure 2. Clam stock assessment sample collection points (black dot) in Lummi Bay against management area (colored lines)

Data Processing

Semiahmoo and Lummi Bay survey data including GPS coordinates, quadrat size, Manila clam individual shell widths, and all other species count data were entered into the LNR WebApp Clam Database built by Craig Dolphin in 2023. GPS coordinates are spatially verified and manually amended when necessary.

Beach-specific shell-width-weight relationships for Manila clams were used to estimate individual clam weights based on the shell-width data that is collected in the field (unpublished data, Dolphin 2005), which is automatically calculated by the WebApp Clam Database.

The legal-size threshold shell width was estimated to be 20mm at Semiahmoo and 21mm at Lummi Bay (or 1.5 in / 38 mm length). All threshold weights are counted as half.

Data Analysis

Clam distributions along beaches vary spatially. Therefore, Voronoi polygons (Dolphin, 2004) were used to analyze the survey data to remove potential spatial bias using ArcGIS or QGIS. The current analysis was conducted in QGIS. The survey points are uploaded into QGIS, using NAD83/Washinton North (ftUS) + NAV88 height (EPSG:8790). A triangulated irregular network (TIN) mesh layer was created from the survey points to delimit the Voronoi analysis area. The TIN mesh layers were buffered according to spacing between quadrats and internal triangles dissolved. Vector processing, V.Voronoi was then conducted on the survey data set within the extent of the buffered and dissolved TIN mesh layer to calculate legal size Manila clam densities. The square footage and legal biomass of individual sample polygons is calculated using the Field calculator.

Note – GIS spatial analysis methods were updated in this report, 2025, in conjunction with Gerry Gabrish, GIS Manager. GIS methods were updates due to lack of clear step by step process and to ensure analysis is replicable for subsequent reports.

Full QGIS methods (Natural Resources > Harvest Management > SHELLFISH > Clams > Clam Survey > 8. QGIS - Voronoi instructions.docx).

<u>Calculate total biomass and accuracy</u>

From the Voronoi polygon output data, the total surveyed area, spatially weighted average clam density, precision of the density estimate, total clam biomass estimates by management area, and 95% confidence intervals for the biomass estimates are calculated. The estimations of error around the spatially weighted mean need to be calculated based on a weighted variance. All calculations were performed in R programming, software for statistical computing. The Hmisc package was used to calculate the weighted mean and variance.

For full method description, see Hintz (2018) (Natural Resources > Harvest Management > SHELLFISH > Clams > Clam Survey > 1. SOP_ClamBiomassSurvey.docx).

Results

Semiahmoo

The average density of legal-size Manila clams within Semiahmoo beach, discrete management area 20A-200104, area was 0.13 lbs / ft^2. The highest densities of Manila clams were concentrated within the northern and southern extents of the survey area (Figure 3). Low densities of Manila clams were concentrated within the most western portion of the survey area (Figure 3). A total of 285 sample locations were surveyed covering 31 acres. The estimated harvestable biomass of Manila clams within Semiahmoo was 172,824 lbs (Table 2). The precision estimate (20.7%) was within the accepted limit of 30% as determined by Campbell (1996).

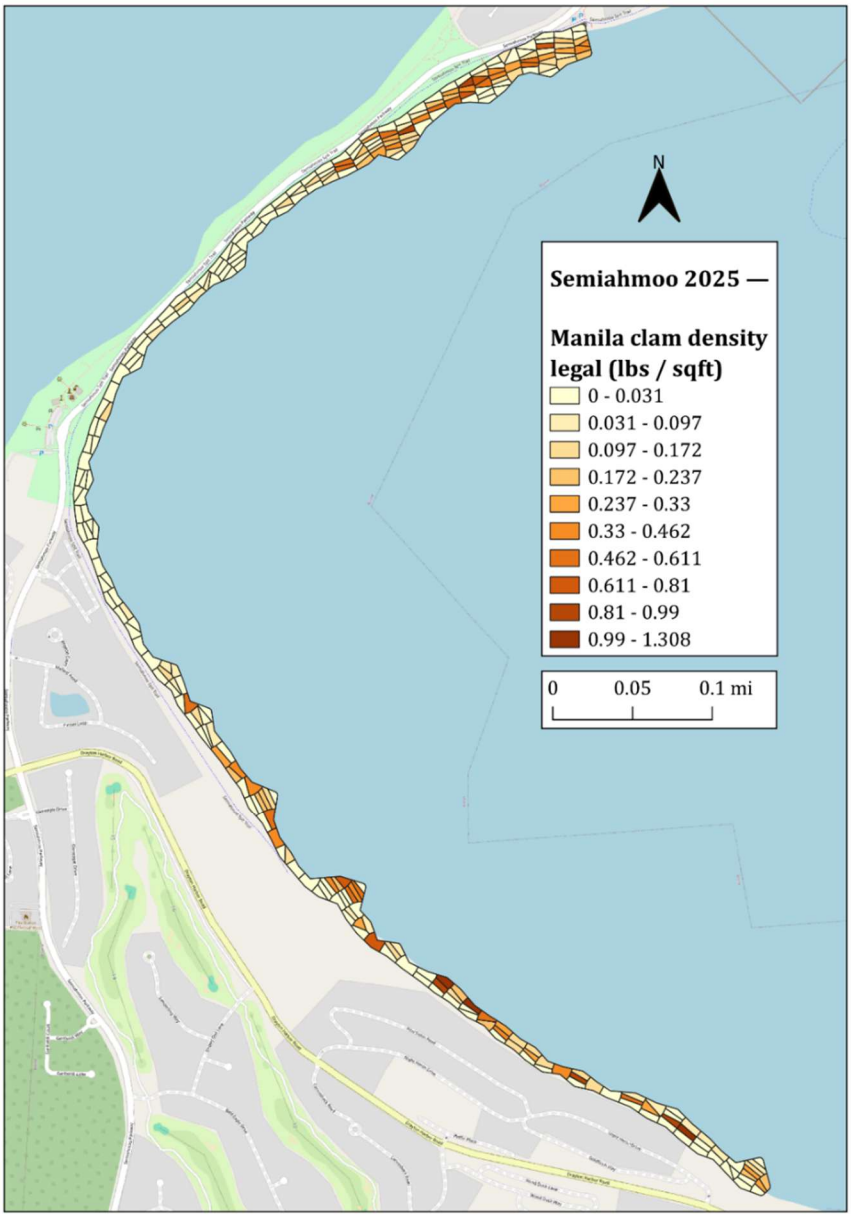

Figure 3. Legal Manila clam densities within Semiahmoo, 20A - 200104 based on the 2025 clam survey represented within Voronoi polygons.

Lummi Bay

The average density of Manila clams within discrete harvestable management areas ranged from 0.02 – 0.05 lbs/ft^2 (Figure 4, Table 2). The highest density of legal-size Manila clams was recorded in S1D&E while the lowest density was recorded in S1C (Senior bed) (Figure 4). Manila clam densities were concentrated within the center portion of S1D&E, on the NW and SE sides of S1C and within the northern half of S1B (Figure 3).

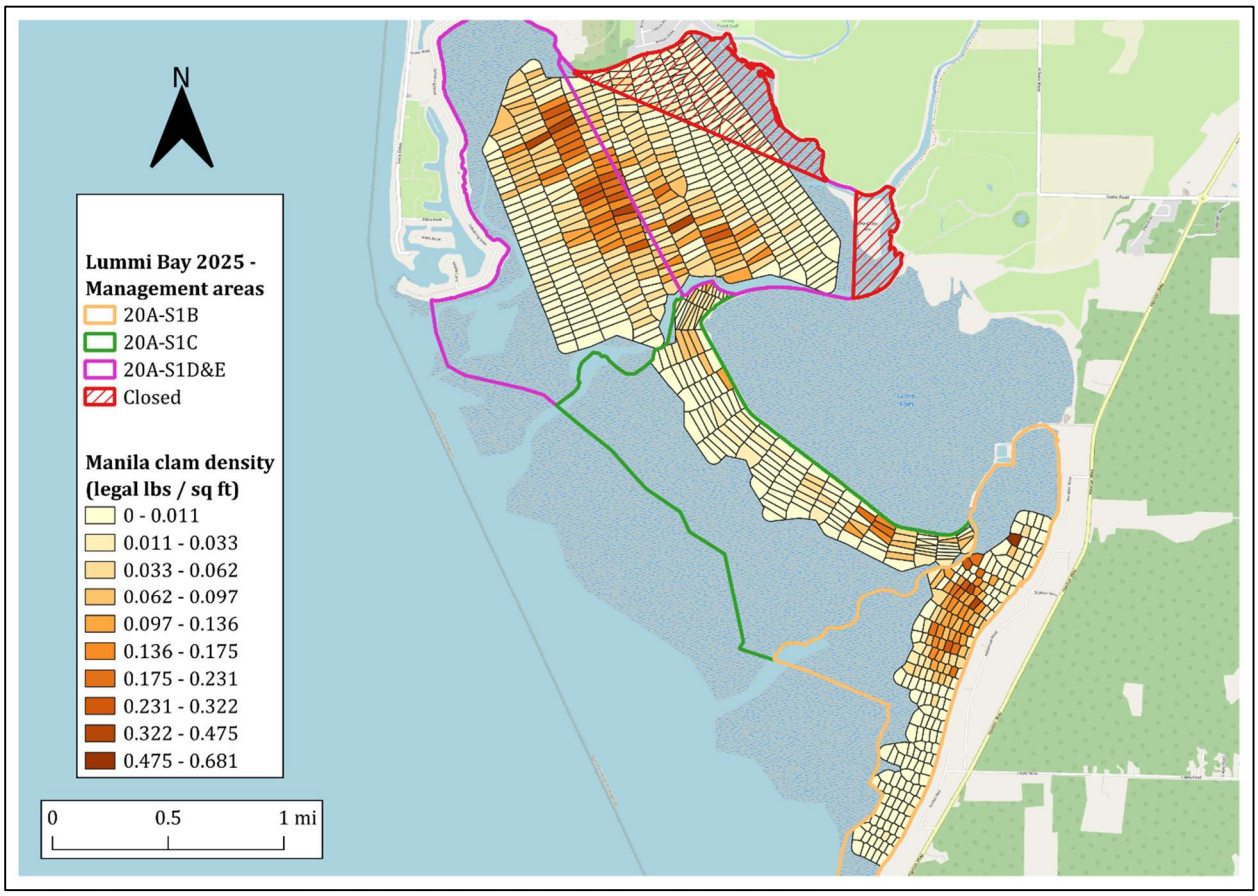

Figure 3. Legal Manila clam densities within Lummi Bay, 20A-S1B (yellow line), S1C (green line), S1D&E (purple line) and CLOSED (red hashed) based on the 2025 clam survey represented within Voronoi polygons.

Table 2. Summary of the estimated Manila clam biomass determined from the 2025 Manila clam survey at Semiahmoo and Lummi Bay.

MGMT area	Poly	Acres	Weighted mean density (lbs / ft^2)	Precision	Biomass estimate		
					Lower	**Mean**	Upper
20A - 200104	285	31	0.13	0.21	136,964	**172,824**	208,683
20A – S1B	221	234	0.0414	0.28	305,982	**422,125**	538,268
20A – S1C	149	254	0.0190	0.30	146,757	**211,036**	275,314
20A – S1D&E	361	688	0.0504	0.15	1,285,312	**1,510,557**	1,735,802
Lummi Bay Total					1,743,254	**2,158,602**	2,573,950
Cumulative Total					1,880,218	**2,331,426**	2,782,633

Discussion

Comparison with previous surveys at Semiahmoo

The average density of legal-size Manila clams within Semiahmoo beach, discrete management area 20A-200104, area was an order of magnitude higher than the 2023 surveyed and comparable to the overall average density among surveys conducted at Semiahmoo (Figure 5, Table 3). The reduction in adult Manla clam biomass recorded during the 2023 survey was attributed in part to the heat dome of 2021. The increase in adult Manila clam density compared with the 2023 survey indicates the Manila clam population is rebounding following the stressors which contributed to the decline recorded in 2023.

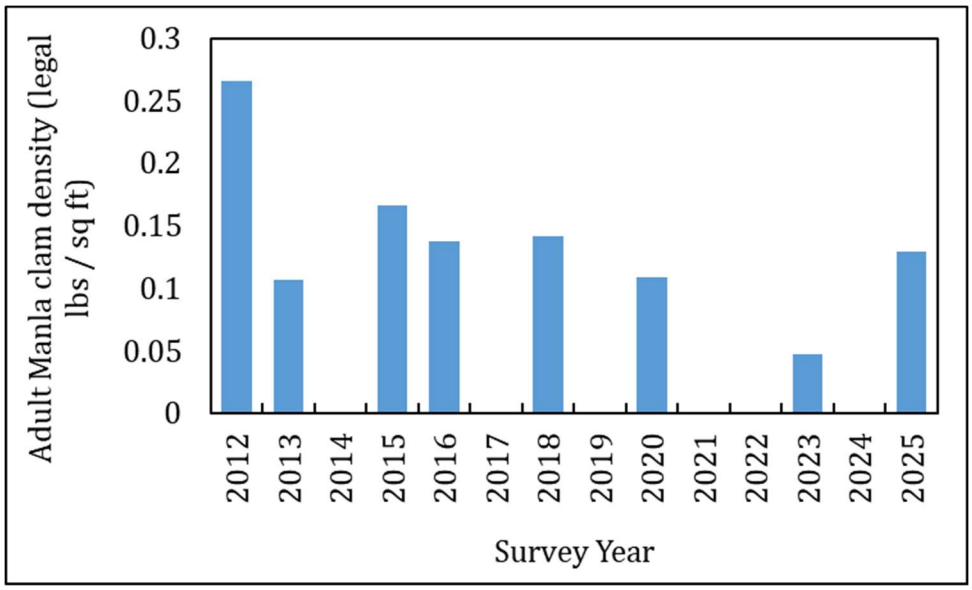

Figure 5. Semiahmoo average adult Manila clam density for survey years 2012 – 2025.

Table 3. Summary of Semiahmoo clam survey results for survey years 2015 – 2025.

	2025	2023	2020	2018	2016	2015
Survey area	30.78	34.28	36.94	33.06	36.8	18.25
Average legal size Manila clam density	0.1289	0.0474	0.1084	0.1412	0.1379	0.166
Estimated biomass	172,824	70,826	174,371	203,266	221,047	131,956

Comparison with previous surveys at Lummi Bay

Lummi Bay is divided into three discreet management areas (Figure 3). Clam surveys have been recorded in Lummi Bay since 2006 where there is an overall positive trend in Manila clam density for S1B and S1D&E while S1C is overall variable (Figure 6).

While S1B displays an overall positive trend in Manila clam biomass, notable declines are apparent in 2014 and 2018, and a slight decline was observed during the current survey (Figure 6). A mortality event was documented in 2024; however, the scale of the event is unknown. A summary of the motility events is in 2024 Clam Survey report. The mortality event alongside natural mortality and

production rates likely contribute to the variability in Manila clam biomass. However, studies to identify natural mortality and production rates have not been comprehensively documented within the Lummi Reservation tidelands. Clam harvest, which occurs within S1B, likely impacts the observed variability Manila clam densities.

Adult Manila clam density within S1C is generally lower than neighboring management areas. The highest densities were recorded 2023, followed by a notable decline in most recent survey (Figure 6). The dead clams from the 2024 mortality event washed up within S1C. It is likely the mortality event contributed to the significant decline in adult Manila clams for S1C. The area is also a high energy site and has been documented to have a low recruitment success rate. Therefore, the observed declines in Manila clam density for S1C is likely the result of both the 2024 mortality event and overall low successful recruitment and. Commercial harvest by seniors takes place within S1C, however more conservative quotas are set compared to other management areas.

The Manila clam densities for S1D&E jumped between 2018 and 2023 and have continued to increase based on the current survey results (Figure 6). It is the only area where an increase in adult Manila clam biomass was observed this year. Recruitment within S1D&E appears to be fed by the Seapond with a distinct adult Manla clam band extending from the Seapond tide gate northwest ward (Figure 3). This is a pattern that is observed in several years of data.

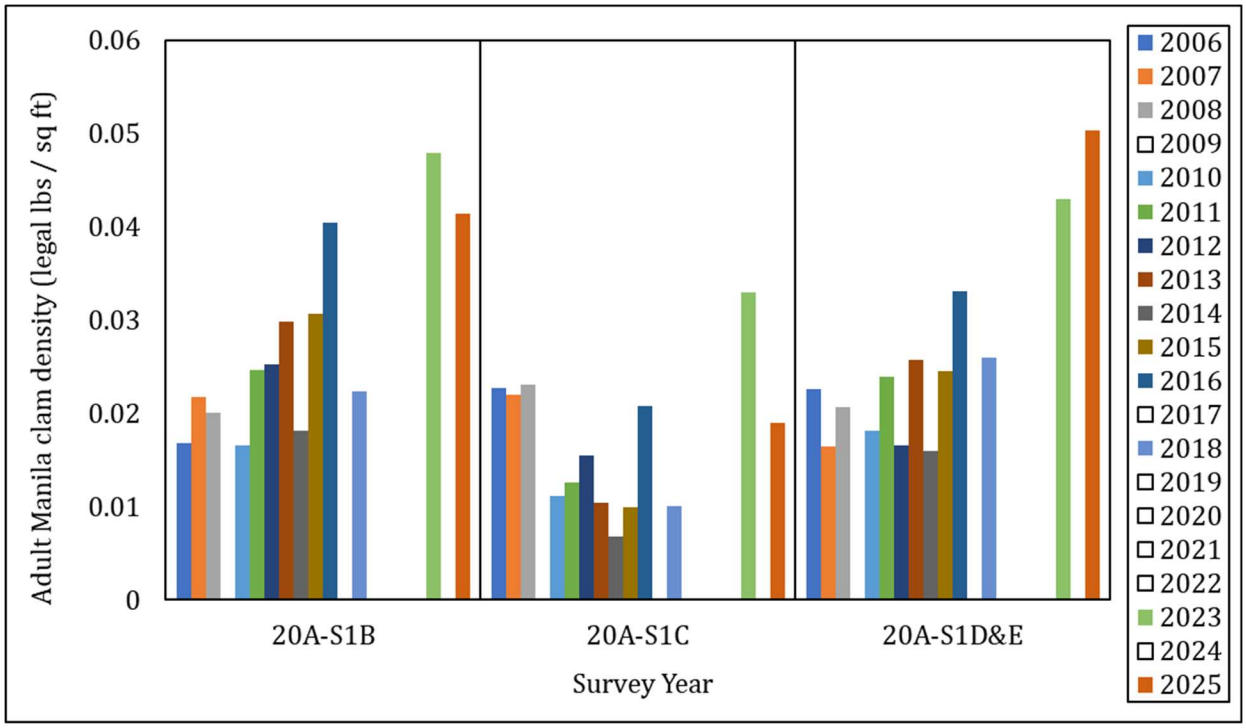

Figure 6. Average Manila clam density by management area within Lummi Bay for surveys conducted between 2006 - 2025. Legend years without color indicate no survey occurred.

Harvest Limits

Clam biomass surveys are conducted both on- and off-reservation to determine harvestable surplus. On-reservation beaches, Lummi and Portage Bays, have been surveyed since 1989, however survey data between 1989 – 2000 was not properly documented and is difficult to determine if method and area are comparable (Dolphin 2002). Documented clam surveys have

taken place annually since 2006, however, due largely to capacity the surveys have been conducted biennially following the 2018 survey. There is a gap in Lummi and Portage Bays clam survey data in 2019 likely due to capacity and again in 2022 due to Intertidal Shellfish Biologist staffing change over. Surveys were conducted in 2020 and 2021; however, the results have not been fully analyzed. In 2020 the methods were amended to accommodate COVID-19 work restrictions and has not been processed. Spatial resolution of the 2021 data was not conducted and is required before further analysis.

In North Puget Sounds, off-reservation clam biomass surveys have been conducted at Birch Bay State Park (BBSP) by LNR in 2003 – 2006 and by WDFW from 2006 onwards to determine Co-manager annual harvestable quotas (Dolphin 2011). The first survey at Semiahmoo (Drayton Harbor) was led by LNR in 2003 (Dolphin 2011). Consistent surveying at Semiahmoo appears to have begun in 2009 when Co-manager annual harvest quotas were documented. Currently, off-reservation surveys occur biennially with Washington Department of Fish and Wildlife (WDFW) leading BBSP surveys and LNR leading Semiahmoo surveys.

The commercial clam harvest season runs from October through mid-June. The commercial quota is generated for legal size Manila clams 1.5 in measured along the length. The LNR clam survey measures width, the equivalent measurement for legal size clams is 20mm width for Portage Bay and Semiahmoo and 21 mm width for Lummi Bay (Dolphin 2005). The commercial quota has historically been set based on expected production and the trends in the population (i.e. if the population is declining lower harvest rates were set and if the population was growing higher harvest rates were set). The long-term clam survey data allow clam biomass trends to be evaluated over time since the early 2006. A sustainable commercial quota should also consider environmental and anthropogenic impacts.

Lummi Bay & Semiahmoo

Commercial harvest rates increased for both Lummi Bay and Semiahmoo last season 2024 – 2025 compared with the previous two seasons. The increasing adult Manila clam density observed for Semiahmoo supports utilizing the full 33% of the surveyed biomass as the quota going into 2025-2026 commercial clam season. See Region 3 management plan for final division of quota between Lummi and the State.

Two of the three management areas within Lummi Bay revealed decreases in Manila clam densities while the commercial harvest rates from the 2024-2025 commercial season are up from the prior two seasons. A slightly more conservative harvest rate is recommended for S1B and S1D&E at 20%. A conservative quota of 10% adult surveyed biomass is recommended for S1C due to the significant reduction in density and low recruitment success.

Portage Bay & Birch Bay Updates

Portage Bay commercial quota will remain the same as determined from the 2024 Manila clams survey. The only change is that ~11k lbs will be subtracted from S5 due to an overage during the 2024-2025 commercial harvest season.
Birth Bay quota will remain the same as determined from WDFW's Manila clam survey in 2024, outlined in the Region 3 management plan.

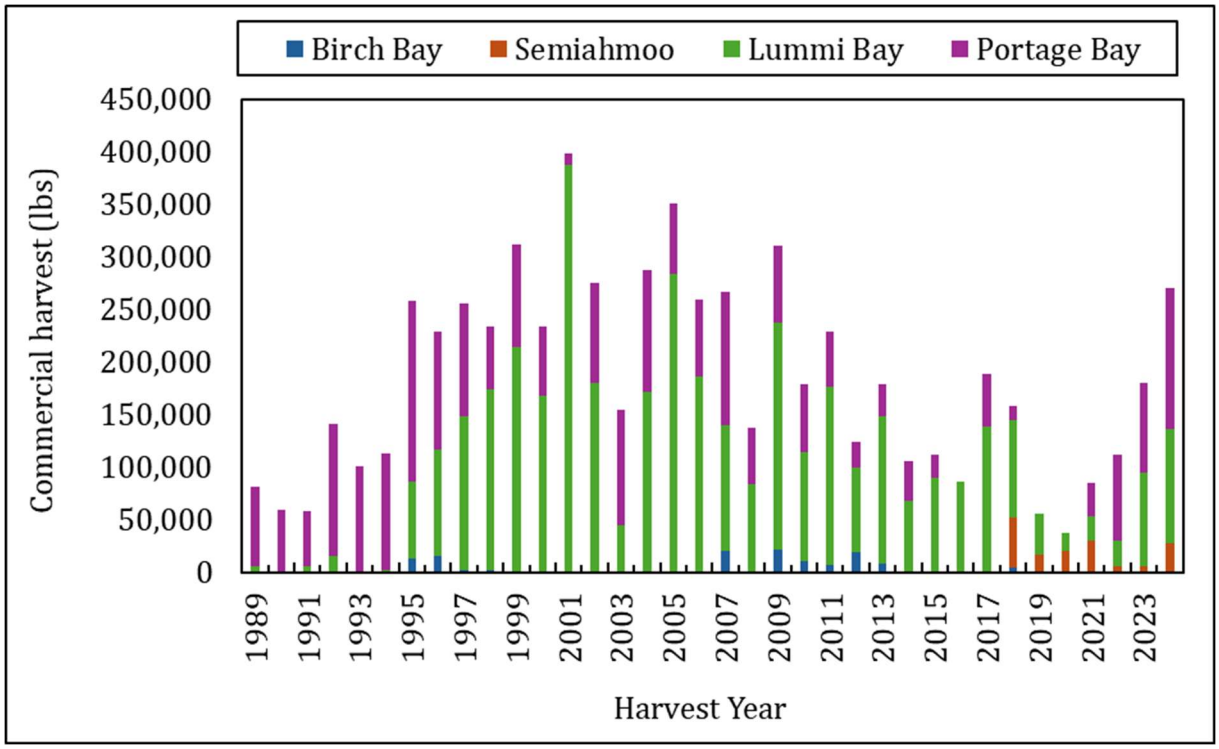

Figure 7. Commercial harvest by beach between 1989 and 2024.

Table 4: Summary of Manila clam stock assessment survey results conducted biennially. Lummi TAC is noted in parentheses for co-managed beaches Semiahmoo and Birch Bay SP.

General area	Management area	Acres	Weighted mean density (lbs / ft²)	Mean biomass estimate (lbs)	TAC (lbs)	Year surveyed	Next Survey
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	Total	**190**		**828,092**	**195,777**		
	SUM Beaches						

Notable Event(s)

NA.

On-Reservation Subsistence harvest

Some subsistence harvest takes place in Lummi and Portage Bays, however, there is currently no routine method to quantify subsistence harvest on-reservation beaches. Previous reports suggest subsistence harvest accounts for an estimated 14,906 lbs annually (Mueller and Starkhouse 2018) and more recently that subsistence harvest is around 12% of the harvestable biomass at Lummi Bay and 17% of the harvestable biomass at Portage Bay (Hintz 2018b). Furthermore, these estimates of subsistence harvest do not include harvest for ceremonial purposes and illegal poaching so the actual harvest of Manila clams from on-reservation beaches will likely be higher. Therefore, the proposed TAC provides a buffer to account for Manila clam harvest from subsistence, ceremonial, and illegal poaching.

References & Resources

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