

# QENTOL, YEN / W̱SÁNEĆ Marine Guardians

## 2022-2023 Report



QENTOL, YEN / W̱SÁNEĆ Marine Guardians Program  
is an initiative of the W̱SÁNEĆ LEADERSHIP COUNCIL

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# 1. Letter from the Southern Resident Killer Whale Senior Manager

My name is David Dick, also known as SUMÉ, t from the Songhees Nation. I began my work in May of 2021 with the WSÁNEĆ Leadership Council as the Southern Resident Killer Whale Senior Manager. The WSÁNEĆ Leadership Council was able to secure funding for a multi-year initiative for me to begin building a foundation of a Southern Resident Killer Whale Monitoring Program. The first year (2021-2022) of the Southern Resident Killer Whale Monitoring Program was securing a building for the program to grow, along with the purchase of a suitable vessel for monitoring throughout the Salish Sea. From there it was building a strong vision that ensures WSÁNEĆ involvement in the protection and monitoring of the endangered Southern Resident Killer Whales. In 2022, the QENTOL, YEN / WSÁNEĆ Marine Guardians Program was formed by late March with the hiring of three WSÁNEĆ Marine Guardians who are from Tsartlip First Nation and Tsawout First Nation. By October of 2022, three additional staff were hired: Marine Office Clerk, Marine Biologist, and a Marine Data Analyst. The overall goals of the QENTOL, YEN / WSÁNEĆ Guardians Program are to find various ways to monitor the impacts of marine traffic and noise, food competitors and the baseline health of food source areas around the Salish Sea. The vision of our QENTOL, YEN / WSÁNEĆ Marine Guardians program is to revive A NEW BEGINNING of monitoring which our ancestors did throughout the Salish Sea since time immemorial.

The Southern Resident Killer Whale Program has established four goals:

- Find ways to ensure SRKWs have access to prey.
- Evaluate marine vessel impacts and monitor vessel activity around SRKWs.
- Collaborate with like-minded allies who also are working to protect SRKWs.
- Restore the relationship between the KELLOLEMEĆEN and WSÁNEĆ people.

In closing, the establishment of our program is to adequately support our specific needs as WSÁNEĆ Marine Guardians by creating a structure and tailored program that increases WSÁNEĆ presence in the Salish Sea. Furthermore, the WSÁNEĆ Leadership Council will have better information to advocate for our relatives of the deep, the KELLOLEMEĆEN. Lastly, the Southern Resident Killer Whale Monitoring Program will act as a knowledge hub for any First Nations group that may not have their own monitoring program. This report will provide detailed information gathered by our QENTOL, YEN / WSÁNEĆ Marine Guardians Program over a short span from November 2022-March 2023.

Sincerely,

David Dick

SRKW Senior Manager



## 2. QENTOL, YEN S,ELEKTEĒ Goldstream River Habitat Monitoring



*Photo captured using our M30T DRONE over the mouth of Goldstream River*

### 2.1. Background

Salmon are a keystone species to life in in the Salish Sea. They not only feed the people of this coast but also the plants, bears, birds, and the critically endangered Southern Resident Killer Whales (SRKW). Salmon populations in the Salish Sea are threatened by climate change, urbanization, and overfishing. Understanding salmon population trends and salmon habitat changes in the Goldstream River are critical components of our investigation into the health and population of SRKW. By working closely with the Goldstream Volunteer Salmon Enhancement Association and gathering our own data, we are creating a basis to advocate for change and increase protection of salmon in the Salish Sea. In 2023, the QENTOL, YEN Marine Guardians completed 17 monitoring trips to Goldstream river between January 1 and March 31, totaling 55 hours in the field.



*Salmon run at Goldstream in November, 2022*



## 2.2. Habitat Assessment

Physical habitat conditions are observed at 4 benchmark locations along the lower Goldstream River (figure 1). Physical conditions observed include the presence of rooted cut banks and large woody debris (LWD) which provide habitat for juvenile salmon, stream depth and width, crown cover, and sediment compositions. These factors are key components of salmon spawning and juvenile salmon habitat.



**Figure 1.** S,ELEKTEE Monitoring Benchmark Locations  
Goldstream River, BC

Table 1 shows our findings for the physical properties at each Benchmark location. This does not include the depth and width as we report on these changes weekly with fluctuations in water levels and the tide.

**Table 1.** Benchmark Characteristics: Physical properties and corresponding benchmark locations

Benchmark	LWD	Rooted Cutbank	Crown Cover	Bedrock	Boulder	Cobble	Gravel	Fine	Erosion Sites
1	2	1	10	0	0	30%	35%	35%	Both
2	2	0	15	0	0	20	70	20	Right Side
3	3	1	15	0	0	0	80	20	Left
4	1	0	5	0	0	0	60	40	Both

## 2.3. S,ELEKTEL Water Quality Analysis

Water quality measurements are taken from our four benchmark locations on the lower Goldstream River each week. Water quality is affected by a variety of factors including shading from trees, water surface area, volume, turbidity, stream bed colour, and orientation to the sun. Therefore, measurements must be made at specific locations, and changes to the physical characteristics of those benchmark locations must be tracked overtime. Water conductivity, temperature, pH, salinity, total dissolved solids (TDS), and oxidation-reduction potential (ORP) measurements are collected using a handheld multi parameter sensor to monitor stream health, identify risks to aquatic life, and establish a baseline to identify long-term trends. Water quality is critical for aquatic life in the Goldstream River, particularly for spawning and Juvenile salmon.



*QENTOL, YEN Guardian team member taking water quality measurements*

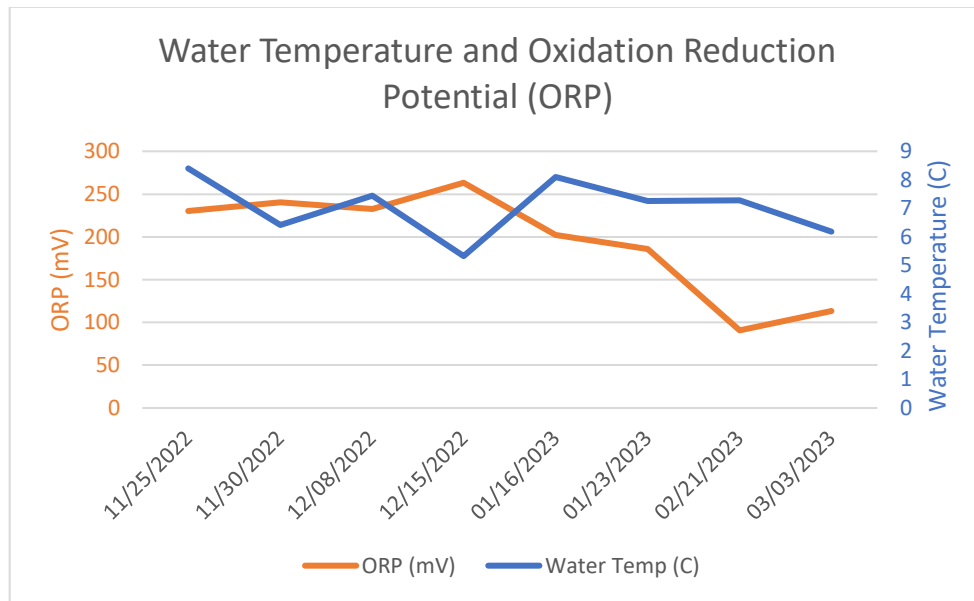
### 2.3.1. Water Quality Background and Results: November 2022 to March 2023

#### *Temperature and Oxygen*

Temperature is a highly important variable for juvenile and spawning salmon survival. Due to Climate Change, in many rivers in the Salish sea including Goldstream River, water temperatures may exceed 25°C during the summer, and often in combination with low water levels. Increased water temperature poses a risk to aquatic ecosystems as increased water temperature causes animals to become stressed and are more likely to succumb to contaminants, parasites, and disease. For Chum and Coho salmon, preferred temperatures for spawning and incubation are between 4.4°C to 14°C. High temperature events cause stress and mortality in both spawning and juvenile salmon. Temperature tolerance is species and life-stage specific, with adult salmon being less tolerant than juveniles. In the summer of 2022, a high temperature event caused high mortality and delayed spawning across many major rivers in British Columbia including Goldstream River.

Water temperature also affects other water quality parameters including oxygen, as warm water contains less oxygen than cold water. When the water temperature increases, the concentration of dissolved oxygen decreases, and water molecules gain energy which allows more oxygen to escape into the atmosphere. Additionally, as the temperature rises, animals use oxygen at a faster rate. While plants grow faster and product more oxygen, their decomposition consumes more oxygen.

The Oxidation Reduction Potential (ORP) is correlated to the oxygen content of water and measures the ability of water to breakdown waste and contaminants. When ORP is high, oxygen content is also high which allows bacteria to decompose dead tissue and contaminants more efficiently. Juvenile salmon are highly sensitive to oxygen concentrations. Both adult and juvenile Salmon require greater than 100 mV ORP for optimal survival. Data collected in the lower Goldstream displays this relationship where warmer water temperatures recorded in January to March are correlated to lower recorded ORP levels (figure 2).



**Figure 2.** Water Temperature and Oxygen monitoring in Goldstream River November 2022 – March 2023

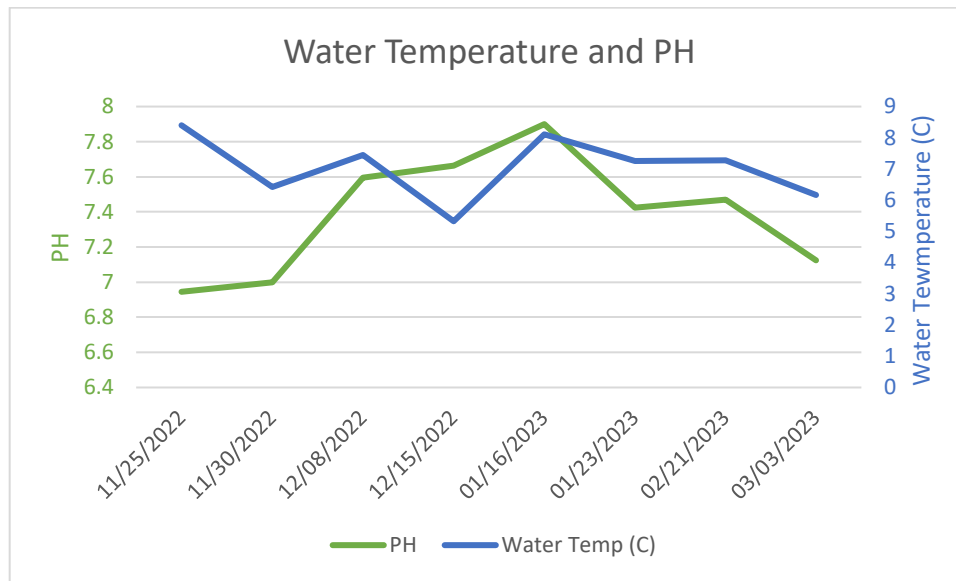
### Temperature and pH

The pH scale measures the relative acidity or alkalinity of any substance. The scale ranges from very strong acid (pH 0) to very strong base (pH 14). Pure water has a neutral pH of 7, with an equal concentration of hydrogen (H<sup>+</sup>) and hydroxyl (OH<sup>-</sup>) ions. Acidic water has a high concentration of hydrogen ions and a low concentration of hydroxyl ions. The reverse occurs in alkaline water. The scale is logarithmic, so a one-unit difference in pH reflects a tenfold change in acid or alkaline concentration. For example, vinegar (pH 3) is ten thousand times more acidic than distilled water (pH 7).

Ph is a critical factor affecting juvenile salmon development. Low pH ranging from 4.8 – 6.8 is not lethal but chronic exposure to low pH conditions affects freshwater growth, stress physiology, and seawater tolerance of juvenile salmon. Temperature plays a key role in moderating pH. Warm temperatures allow water to ionise and as result, water pH will decrease. This process occurs over time and therefore there will be a lag between temperature and pH fluctuations. Warmer temperature occurring in the fall of 2022 likely resulted in slightly lower pH levels (6.9 pH) and pH levels have since increased from November to January, as the stream



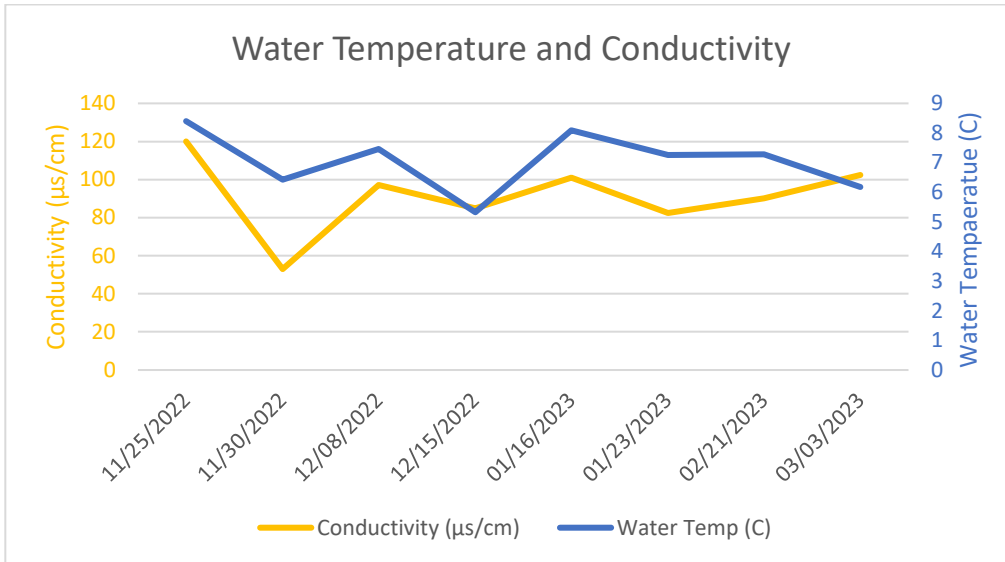
temperatures decreased (figure 3). The pH levels recorded in the Goldstream river during the winter of 2022-2023 remain at levels optimal for juvenile salmon survival.



**Figure 3.** Water Temperature and pH monitoring in Goldstream River November 2022 – March 2023

### ***Temperature and Conductivity***

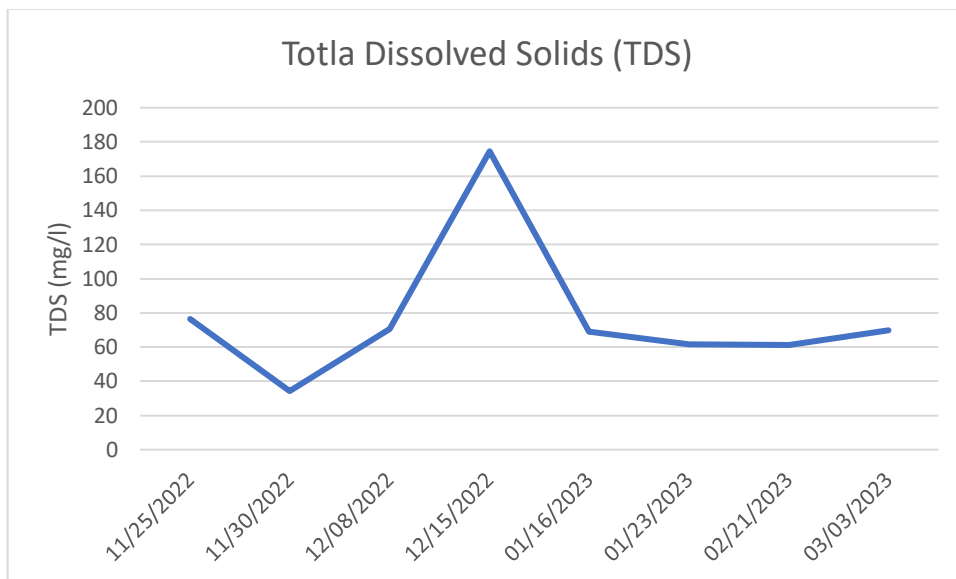
Conductivity is a measure of the ability of water to pass an electrical current. Since salts and inorganic chemicals conduct electricity, conductivity increases as salinity increases. Conductivity is also affected by water temperature, the warmer the water, the higher the conductivity. Highly saline conditions are lethal to juvenile salmon; a salinity gradient from stream to ocean is required for juvenile salmon to survive the transition to the ocean. Recorded Conductivity in Goldstream between November and March (figure 4) is at the low end of the average for freshwater streams which can range from range between 100- 2000  $\mu\text{s/cm}$  Average Sea water conductivity ranges from 50,000 – 55,000  $\mu\text{s/cm}$ . Salinity in the Goldstream river is expected to increase during the summer months as precipitation decreases and water temperature increases.



**Figure 4.** Water Temperature and Conductivity monitoring in Goldstream River November 2022 – March 202

**Total Dissolved Solids**

Total Dissolved Solids or TDS is the measurement of inorganic salts and small amounts of organic matter that are dissolved in water. While TDS does not directly measure water turbidity, turbidity and TDS are correlated and therefore TDS will rise after rainfall events or periods of increased stream flow. Concentration of TDS in the range of 750 mg/L significantly reduces fertilization and hatching rates in coho and chum salmon and extends the developmental time to epiboly and the eyed-egg stage. 4. After egg hardening, fish do not appear to be affected by elevated concentrations of TDS up to 2000 mg/L. Between November and March TDS levels remained within the tolerance for juvenile salmon survival, peaking at 174 mg/l during a series rain event in December (figure 5).



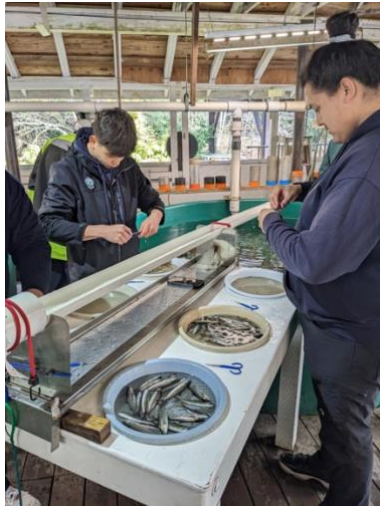
**Figure 5:** Dissolved Solids Monitoring in Goldstream River November 2022 – March 2023

## 2.4. Goldstream Hatchery



*QENTOL, YEN Guardian team counting live and dead eggs at the Goldstream Hatchery.*

As part of our habitat monitoring work at S,ELEKTEL Goldstream River, we have been working with the Goldstream Volunteer Salmonid Enhancement Society at Goldstream Hatchery. Each week before monitoring the Goldstream River, the QENTOL, YEN Marine Guardians have visited the Goldstream Hatchery to help with their conservation work. This includes counting salmon eggs, feeding fish, fin clipping, PIT tagging, salmon fry outplanting, and moving fish within the hatchery.



*Image left: QENTOL, YEN Guardian team clipping adipose fins on juvenile salmon.*



*Image right: QENTOL, YEN Guardian team moving fish within the hatchery.*

## 2.5. Goldstream River Estuary Drone Survey

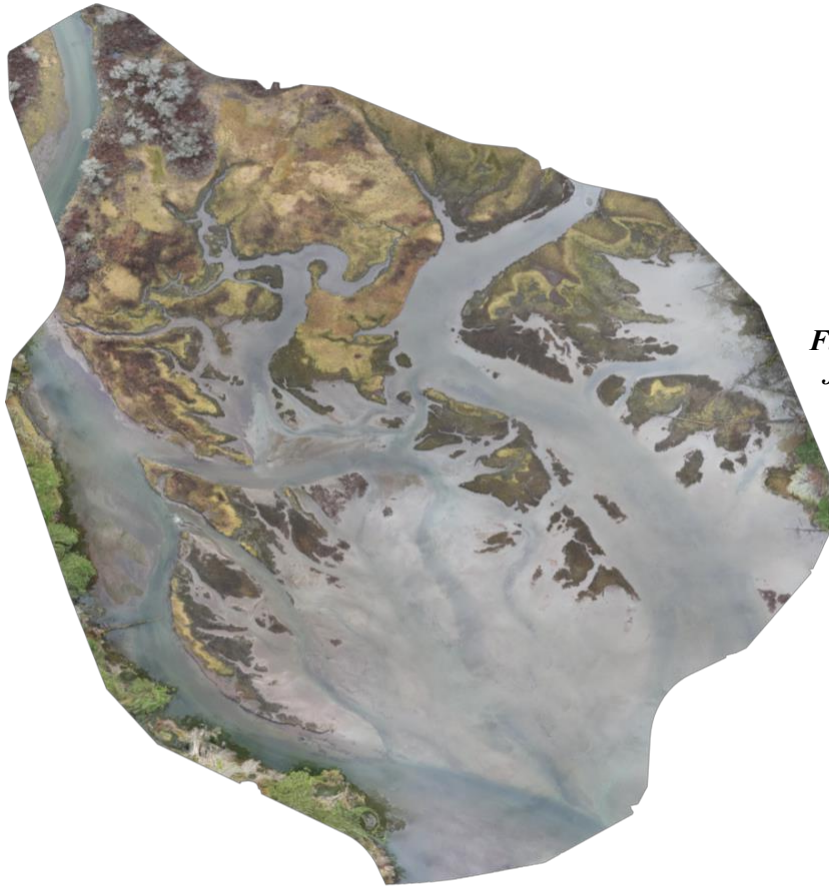


*QENTOL, YEN Guardian flying MT30 Drone*

Beginning in January, the MT30 Drone has been utilized to map the Goldstream River mouth to detect stream flow changes over time. The MT30 uses a high resolution visible light sensor which can detect sub meter changes to the estuary. As the team becomes more comfortable using this high-tech drone, our program will be able to provide high quality imagery tracking changes to the Goldstream River estuary over multiple years. Our drone has an integrated zoom camera and a wide camera, that will enable our team to quickly switch to a highly magnified zoom view for detailed



observation after recognizing a target in the wide-angle camera view. Our is also equipped with a long-wave infrared thermal imaging camera, which can shoot thermal image. Once our guardians obtain their full drone Pilot Certificate – Advanced Operations the drones will also be used to monitor whale watchers.



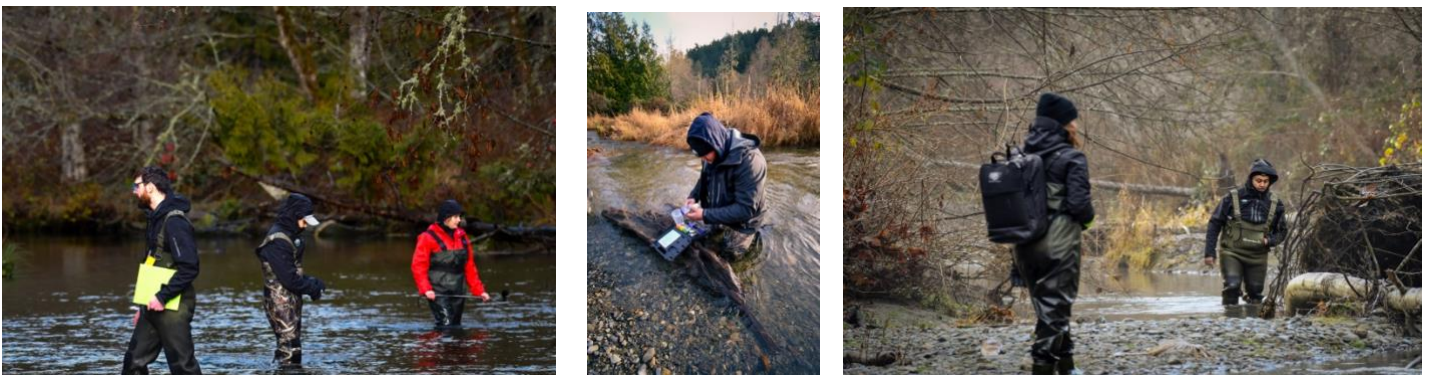
*Figure 6: Goldstream River Mouth Imagery: January 23, 2023, MT30 DRONE.*

## 2.6. Future Monitoring Goals for S,ELEKTEL / Goldstream River

- Establish methodology for monitoring Beaver activity in the Goldstream River.
- Utilize drone processing software to detect seasonal stream changes.
- Establish methodology for utilizing Drone technology for salmon counts during the spawning season.
- Access past satellite imagery to identify changes in the Lower Goldstream River over the past 10 years.
- Access past stream flow data to help establish baseline measurements.
- Identify indicator species to monitor marine influence dynamics in the Lower Goldstream River.
- Measure Salinity at a benchmark location in the Saanich Inlet.
- Use minnow traps to monitor juvenile salmon emergence.
- Directly measure dissolved oxygen.



*Salmon run at Goldstream*



*QENTOL, YEN Guardians conducting field work in Goldstream*

### **3. Baseline Monitoring Data Report**

The QENTOL, YEN marine guardians are taking a comprehensive approach to reporting on marine ecosystems by including research on marine mammals across multiple trophic levels. All marine mammal species are observed, identified, counted, and recorded. By focusing on multiple species across the marine trophic web, the QENTOL, YEN marine guardians will identify inter-species dynamics, population trends, and seasonal distribution of marine mammals across the Southern Gulf islands and Saanich Inlet. This work is highly important as only 73 Southern resident killer whales remain at the time of writing and population trends continue to shift as ocean temperatures rise, prey availability becomes scarce, and vessel traffic increases. The data collected will be leveraged to advocate for change to ensure the highest level of protection for the KELLÖLEMEĆEN.



The baseline monitoring report provides detailed information on the QENTOL, YEN team’s monitoring work throughout the southern Gulf Islands and Saanich Inlet. The monitoring area is divided into three zones: Saanich Inlet, Haro Strait, and the Southern Gulf Islands (figure 6). Each Zone is covered by at least one monitoring transect that covers rich habitat areas and migration pathways. Every week, each of the three zones is surveyed to establish a long-term baseline of mammal populations and their movement (figure 7).

The 33ft landing craft, QENTOL,YEN1, is used to carry out the transects year-round. While completing a transect, at least two observers scan the horizon to create a 360-degree scope while the vessel travels between 4-8 knots. During the transect, the team records the location and time of any marine mammals observed, species, number of individuals present, mammal behaviour, direction of travel, sea state, and photos taken of the marine mammals, and notes any surrounding vessels. All observations are recorded through the Trailmark webapp as well as on Microsoft excel. Additionally, the Whale Report Alert System is used to monitor cetacean sightings within a 10 nautical mile radius and EMSA (Enhanced Maritime Situational Awareness) is used to monitor whale watching fleet activity.



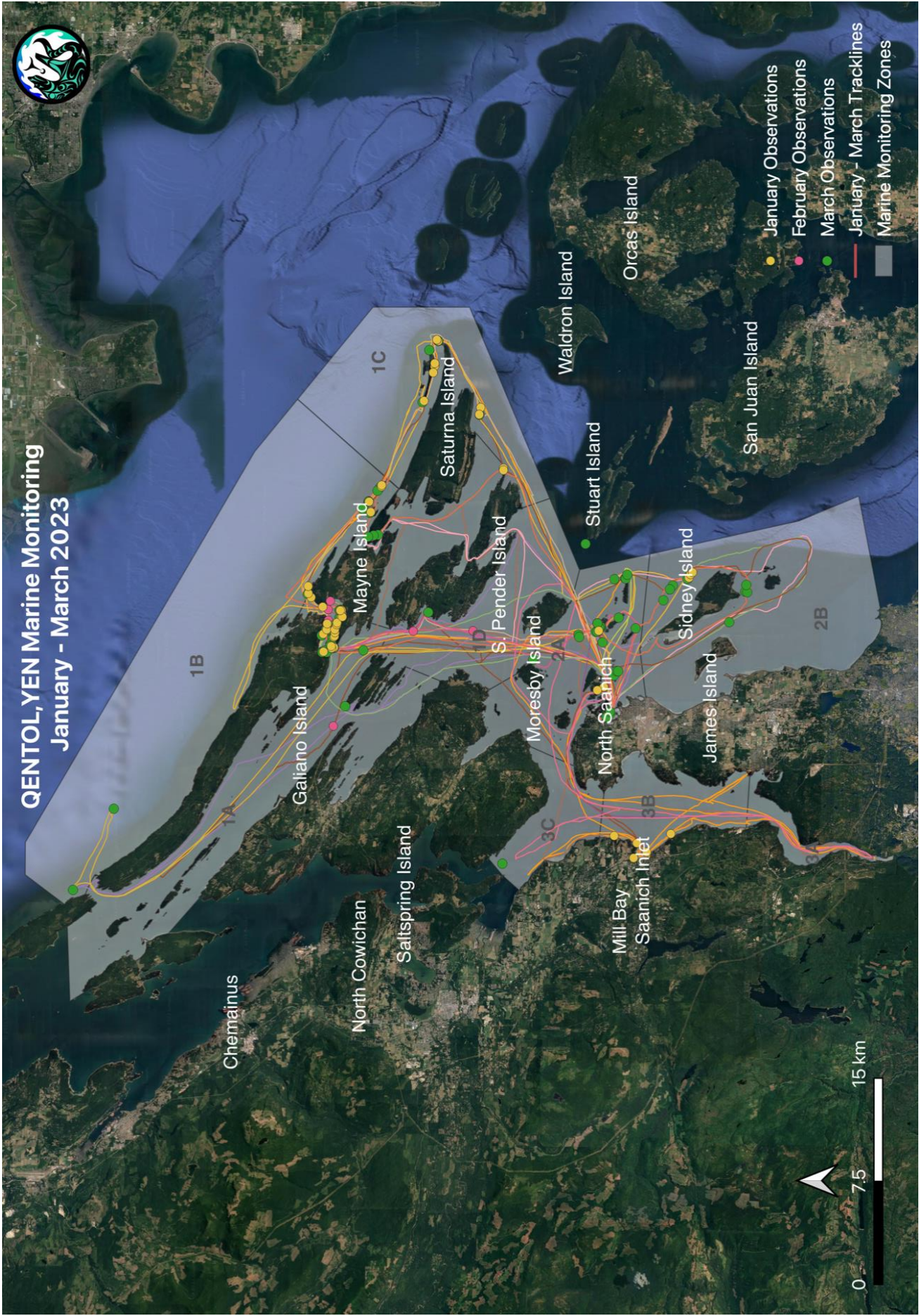
*QENTOL, YEN Guardian team conducting baseline monitoring aboard QENTOLYEN1*





Figure 7. QENTOL, YEN Marine Mammal Monitoring Zones and Transects





**Figure 8. Marine Monitoring Effort Map – January to March 2022**

### 3.1. Baseline Monitoring Data Summary

Tables 2 shows the summary collection data for the QENTOL, YEN/ WSÁNEĆ Marine Guardians from November 2022 to March 2023. Data include the number of monitoring trips, total hours spent monitoring, number of boat and Goldstream trips, monitoring effort by boat zone, and marine mammal observations during this time period.

**Table 2.** Monitoring efforts and marine mammal observations for the QENTOL, YEN WSÁNEĆ Marine Guardians from November 2022 to March 2023.

November 2022 – March 2023										
		Monitoring Effort by Boat Zone								
Number of Monitoring Trips: 53 / 89.5 working days	36 Boat trips Distance: 1954.3 Km Total Time: 162:19 hours	Zone	Number of trips	Zone Description						
		1A	13	Active Pass						
		1B	8	Mayne Island						
		1C	9	Saturna Island						
		1D	6	Pender Island						
Total hours spent monitoring: 230:04 hours	17 Goldstream Trips Total Time: 55:15 hours	2A	20	Moresby Island						
		2B	10	Sidney Island						
		3A	10	Finlayson Arm						
		3B	7	Mill Bay						
		3C	5	Satellite Channel						
Marine Mammal Observations										
	Harbor Seal	Stellar Sea Lion	California Sea Lion	Dall's Porpoise	Harbour Porpoise	Orca	Humpback Whale	Minke Whale	River Otter	Total
# of Encounters	284	113	2	9	6	8	2	1	7	<b>284</b>
# of Individuals	4332	2189	6	24	13	64	2	1	10	<b>6641</b>



### 3.1.1. Monthly Monitoring Highlights for each month from November 2022 – March 2023

*Table 3. Baseline Monitoring Summary, November 2022*

November 2022									
Monitoring Effort by Boat Zone									
Number of Monitoring Trips:	10 Boat trips		Zone	Number of trips	Zone Description				
			16 / 21 working days	36:41 hours	1A	1	Active Pass		
Total hours spent monitoring:	6 Goldstream Trips		1B	1	Mayne Island				
			1C	3	Saturna Island				
			1D	2	Pender Island				
			2A	3	Moresby Island				
			2B	3	Sidney Island				
			3A	4	Finlayson Arm				
49:11:00	22:30 hours		3B	2	Mill Bay				
			3C	1	Satellite Channel				
Marine Mammal Observations									
	Harbor Seal	Stellar Sea Lion	California Sea Lion	Dall's Porpoise	Harbour Porpoise	Orca	Humpback Whale	Minke Whale	Total
# of Encounters	79	43	2	8	3	3	1	1	140
# of Individuals	535	146	6	23	8	19	1	1	739



*California Sea lion During the Salmon Run*

Table 4. Baseline Monitoring Summary, December 2022

December 2022						
Monitoring Effort by Boat Zone						
Number of Monitoring Trips:  6/ 11.5 working days*	4 Boat trips  20:53 hours	Zone	Number of trips	Zone Description		
		1A	2	Active Pass		
		1B	1	Mayne Island		
		1C	1	Saturna Island		
		1D	1	Pender Island		
Total hours spent monitoring:  28:23:00	2 Goldstream Trips  7:30 hours	2A	3	Moresby Island		
		2B	1	Sidney Island		
		3A	2	Finlayson Arm		
		3B	2	Mill Bay		
		3C	1	Satellite Channel		
Marine Mammal Observations						
	Harbor Seal	Stellar Sea Lion	Dall's Porpoise	Orca	River Otter	Total
# of Encounters	38	13	1	1	2	55
# of Individuals	394	157	1	3	5	560

\*Holidays as of December 16 (half day).

Table 5. Baseline Monitoring Summary, January 2023

January 2023						
Monitoring Effort by Boat Zone						
Number of Monitoring Trips:  12 / 20 working days*	9 Boat trips  43:39 hours	Zone	Number of trips	Zone Description		
		1A	5	Active Pass		
		1B	3	Mayne Island		
		1C	4	Saturna Island		
		1D	1	Pender Island		
Total hours spent monitoring:  61:59:00	3 Goldstream Trips**  18:20 hours	2A	5	Moresby Island		
		2B	1	Sidney Island		
		3A	2	Finlayson Arm		
		3B	2	Mill Bay		
		3C	2	Satellite Channel		
Marine Mammal Observations						
	Harbor Seal	Stellar Sea Lion	Harbour Porpoise	River Otter	Total	
# of Encounters	93	32	2	2	129	
# of Individuals	1687	1013	4	2	2706	

\*Preparation for IMPAC5

\*\*Beginning of work at Goldstream Hatchery

Table 6. Baseline Monitoring Summary, February 2023

February 2023					
Monitoring Effort by Boat Zone					
Number of Monitoring Trips:	4 Boat trips	Zone	Number of trips	Zone Description	
5 / 14 working days*		16:46 hours	1A	2	Active Pass
	1B			Mayne Island	
	1C			Saturna Island	
	1D		2	Pender Island	
Total hours spent monitoring:	1 Goldstream Trip**	2A	2	Moresby Island	
21:01:00		4:15 hours	2B	1	Sidney Island
			3A		Finlayson Arm
			3B		Mill Bay
			3C		Satellite Channel
	<b>Marine Mammal Observations</b>				
	<i>Humpback Whale</i>	<i>Harbor Seal</i>	<i>Stellar Sea Lion</i>	<b>Total</b>	
<b># of Encounters</b>	1	5	7	<b>13</b>	
<b># of Individuals</b>	1	43	83	<b>127</b>	

\*IMPAC5 Feb 2-9 followed by staff holidays until February 21, snow day Feb 28

\*\*Week of Feb 28 – snowy conditions, Goldstream cancelled

Table 7. Baseline Monitoring Summary, March 2023

March 2023							
Monitoring Effort by Boat Zone							
Number of Monitoring Trips:	9 Boat trips	Zone	Number of trips	Zone Description			
14 / 23 working days		44:20 hours	1A	3	Active Pass		
	1B		3	Mayne Island			
	1C		1	Saturna Island			
	1D			Pender Island			
Total hours spent monitoring:	5 Goldstream Trips	2A	7	Moresby Island			
69:30:00		25:10 hours	2B	4	Sidney Island		
			3A	2	Finlayson Arm		
			3B	1	Mill Bay		
			3C	1	Satellite Channel		
	<b>Marine Mammal Observations</b>						
	<i>Orca</i>	<i>Harbor Seal</i>	<i>Stellar Sea Lion</i>	<i>Harbour Porpoise</i>	River Otter	<b>Total</b>	
<b># of Encounters</b>	4	69	18	1	3	<b>95</b>	
<b># of Individuals</b>	42	1673	790	1	8	<b>2514</b>	



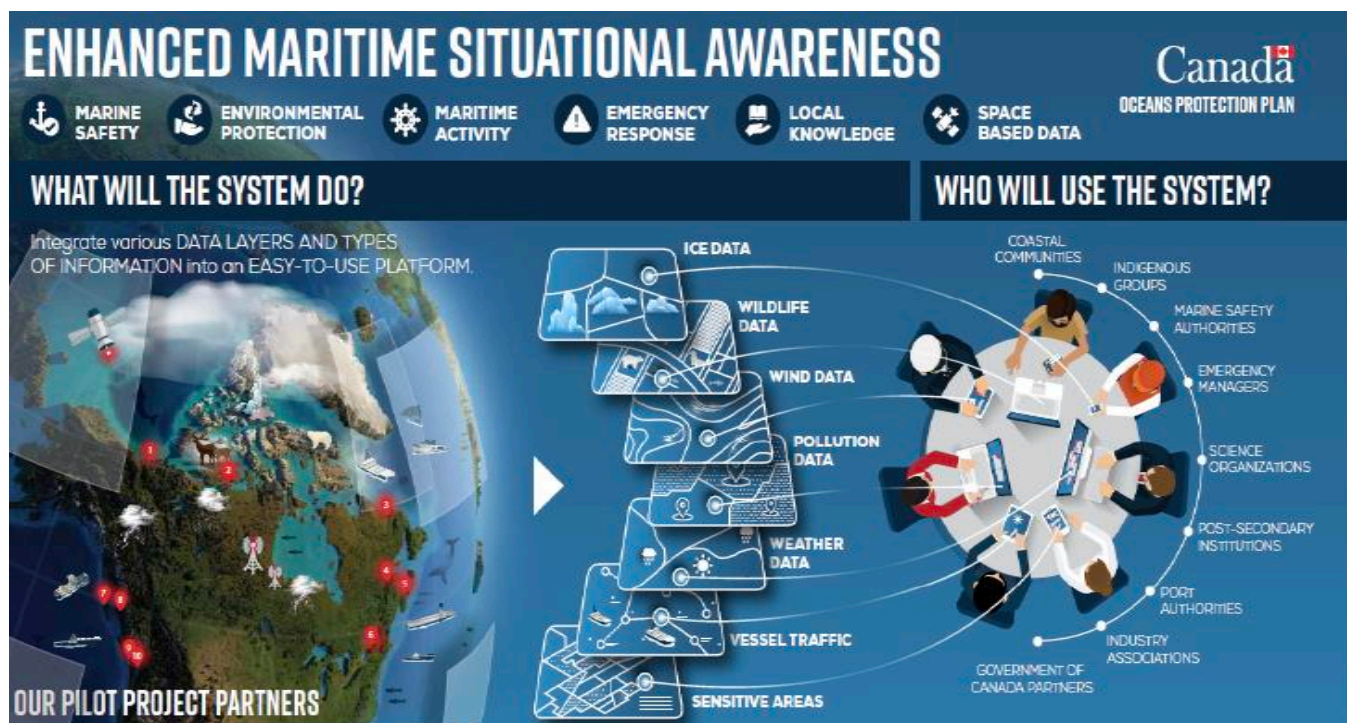
## 4. Compliance Monitoring Data Report

### 4.1. Enhanced Maritime Situational Awareness (EMSA) Background

Through Canada's Oceans Protection Plan, the Enhanced Maritime Situational Awareness (EMSA) initiative was co-developed with Indigenous communities and industry to provide near real-time vessel activity and other marine environmental information in local waters through a user-friendly web platform.

Since the launch of the EMSA system in 2019, many Indigenous and coastal communities across Canada have adopted the technology, improving their situational awareness on the water.

Through the next phase of the Oceans Protection Plan, EMSA will continue to grow the number of Indigenous community partnerships and be integrated into other Oceans Protection Plan initiatives. The system itself will also be enhanced to further improve marine safety, environmental monitoring, and protection.<sup>1</sup> The QENTOL, YEN marine guardians have leveraged EMSA to support compliance motioning work.



*EMSA Pilot Summary*

<sup>1</sup> Enhanced Maritime Situational Awareness (EMSA) <https://tc.canada.ca/en/campaigns/protecting-our-coasts-oceans-protection-plan/stronger-partnerships-indigenous-coastal-communities/expanding-enhanced-maritime-situational-awareness-program#about-enhanced>

Marine shipping has been identified as a key threat to the critically endangered Southern Resident Killer Whale population. Marine shipping impacts Southern Resident Killer Whale (SRKW) habitat by increasing underwater noise pollution, increasing risk of ship strikes and oil spills, and damaging the benthic environment in anchorage areas. With the recent approval of large port expansion projects including Westridge Terminal, Roberts Bank Terminal 2 and the Centerm Expansion project, vessel traffic through Haro and Boundary Strait is expected to increase in coming years. The Enhanced Maritime Situational Awareness program (EMSA) is being leveraged by the QENTOL, YEN Marine Guardians to collect the data necessary to advocate for changes in marine shipping regulations within the Salish Sea to enhance the protection of the SRKW.

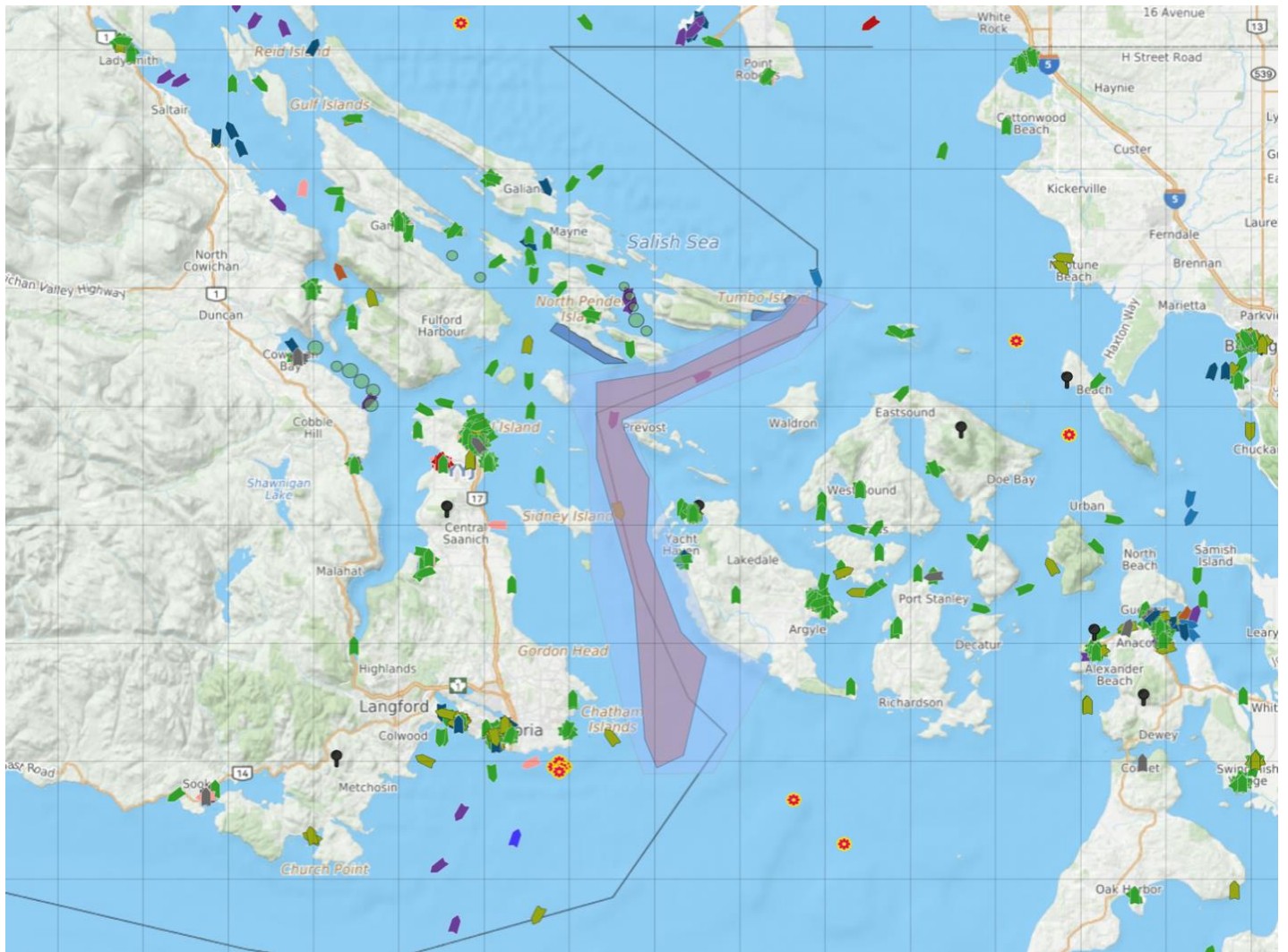
Apart from large commercial vessels, the underwater disturbance caused by smaller vessels including pleasure craft and commercial whale watching vessels have been shown to significantly impact the foraging behavior of the SRKW. Alongside field monitoring, EMSA is being used to monitor the Interim Sanctuary Zones (ISZ) on North Pender Island and Saturna Island and the commercial whale watching fleet at large. Data gathered on commercial vessels from EMSA is being used to support the enforcement of the SRKW management measures including approach distance and ISZ compliance.

Between November 2022 and March EMSA has been utilized in three ways:

- To monitor large vessel speed through the Haro and Boundary Strait traffic separation scheme while voluntary slowdown measures were in effect.
- To monitor vessel entry into the Southern Resident Killer Whale sanctuary areas on North Pender Island and Saturna Island while Interim Sanctuary zone measures were in effect.
- To monitor anchorage utilization in Cowichan Bay, Captains Pass and Plumper sound.



*Oil tanker transiting through Haro Strait*



*EMSA Display Example*

## 4.2. Vessel Speed Monitoring Background

In 2014 the Vancouver Fraser Port Authority launched the ECHO (Enhancing Cetacean Habitat and Observation) program to reduce impacts associated with marine shipping through the Salish Sea with a primary focus on reducing acoustic disturbance. In 2017 a trial voluntary slowdown area was implemented in Haro Strait where all commercial vessels were asked to reduce their speed to 11 knots. Currently the voluntary slowdown area is implemented from June 1<sup>st</sup> to October 30<sup>th</sup> and asks bulk carriers and tankers to reduce speed to 11knts and Container ships to reduce speed to 14.5 knots. Commercial vessels contribute significantly to underwater noise that can reduce the ability of whales to detect prey, navigate, communicate, rest, and avoid danger.

AIS data made available by EMSA from January 2022 to March 2023 has been analyzed by the QENTOL, YEN Marine Guardians to monitor the speed trends of commercial vessels utilizing Haro and Boundary Strait.



Initial analysis indicates that while the voluntary slowdown measures were in effect the average speed of transiting vessels was reduced by 10%, while the maximum speed remains relatively consistent. The maximum speed recorded through Haro and Boundary Strait was 22.7 knots, exceeding the voluntary measures by 60%. While relatively infrequent, instances of excessive speed through the traffic separation area are a threat to SRKW and other cetaceans in the area, as well as other commercial vessels.

In the winter months when the voluntary slowdown measures are not in effect almost half of the vessels transiting Haro and Boundary Strait are traveling faster than 1.5 knots. It was found that the majority of speeding vessels by far was Cargo vessels which include bulk carriers, roll on/roll off ships, and container ships.

Over the voluntary slowdowns 6-year history the Pacific Pilotage Authority has gathered and reported the participation rate data by asking operator whether they intend to slowdown. The reported participation rate and the EMSA analysis compliance rate may differ due to GPS error, tidal influence and unreported speeding events. The discrepancy between reported participation rate and the compliance rate indicates why compulsory measures would be suitable to reduce excessive speeding events and further reduce average vessel speed.

Speed zone data will continue to be compiled and analyzed every four months to establish a long-term baseline of vessel speeds.



*Bulk Carrier transiting through Boundary Pass*

#### 4.2.1. Vessel Speed Monitoring January 1, 2022 – March 31, 2023

The figures below show the voluntary slowdown area speed statistics for November to March 2023 (figure 9), June to October 2022 (figure 10), and January to May 2022 (figure 11).

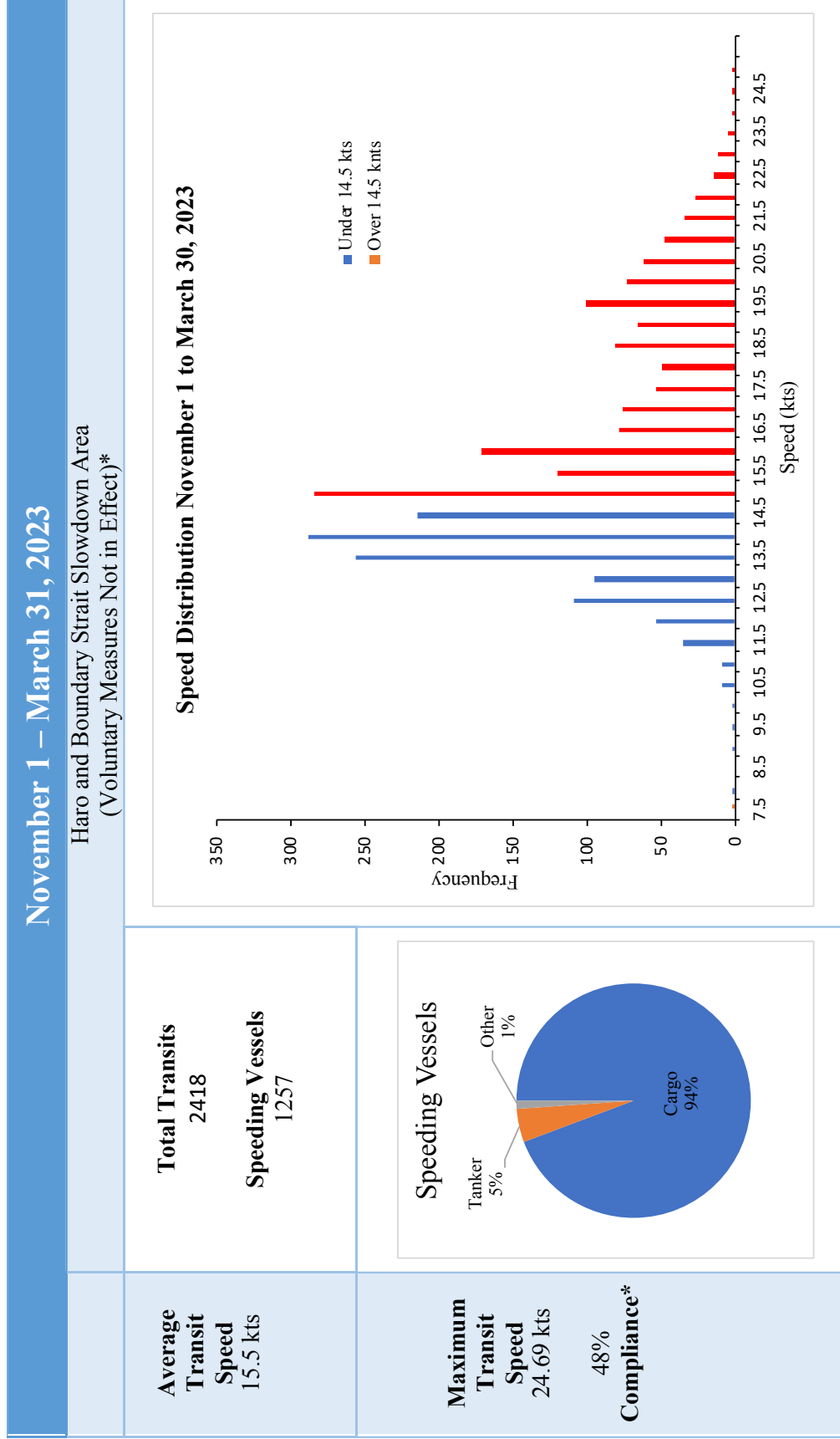
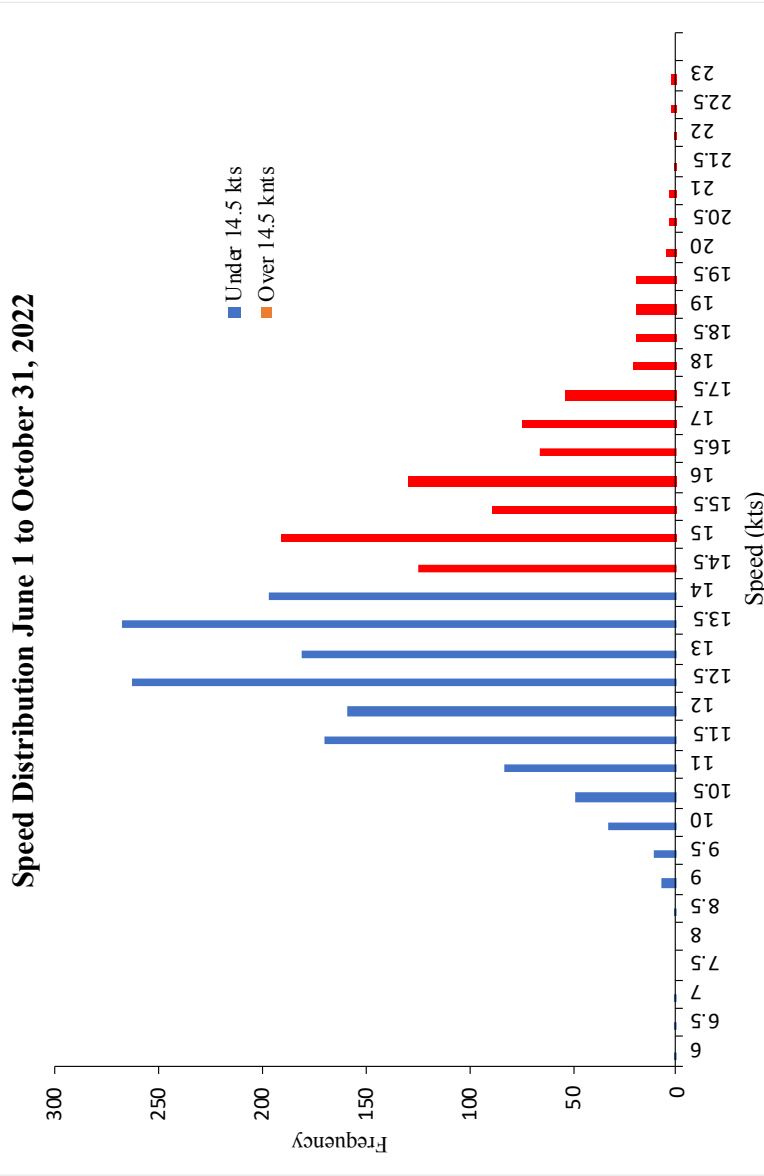


Figure 9. Voluntary Slowdown Area Speed Statistics, November – March 2023

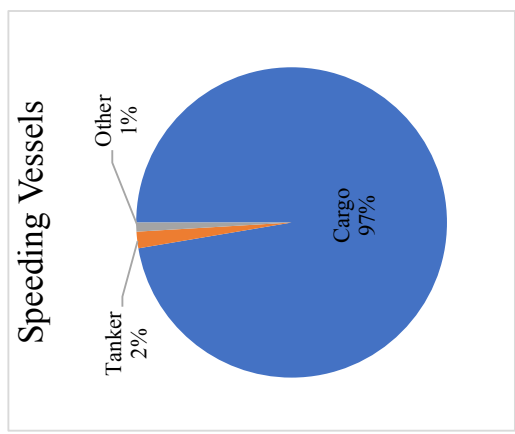
# June 1 – October 31, 2022

Haro and Boundary Strait Slowdown Area  
(Voluntary Measures in Effect)



**Total Transits**  
2258

**Speeding Vessels**  
625



**Average Transit Speed**  
13.6 kts

**Maximum Transit Speed**  
22.74 kts

**73% Compliance**

Figure 10. Voluntary Slowdown Area Speed Statistics, June –October 2022



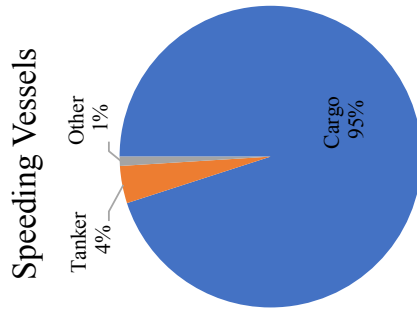
## January 1 – May 31, 2022

Haro and Boundary Strait Slowdown Area  
(Voluntary Measures Not in Effect)

**Average Transit Speed**  
14.6 kts

**Total Transits**  
980

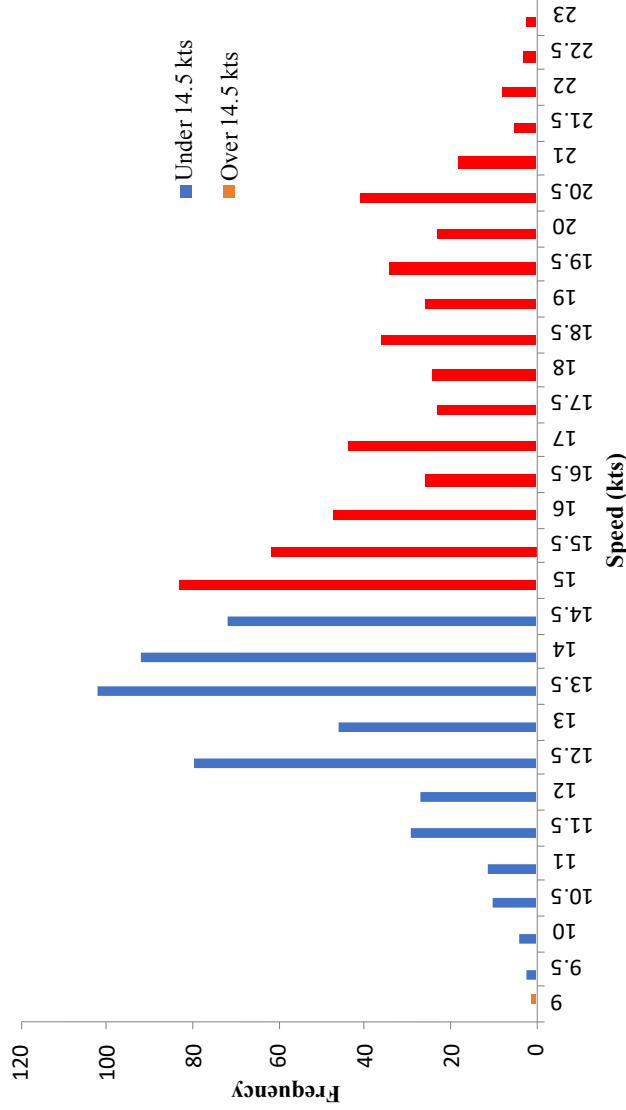
**Speeding Vessels**  
482



**Maximum Transit Speed**  
22.5 kts

**50.8% Compliance**

**Speed Distribution January 1 - April 30, 2022**



**Figure 11. Voluntary Slowdown Area Speed Statistics, January – May 2022**

### 4.3. Interim Sanctuary Zone Monitoring

Two areas in the Southern Gulf Islands have been designated as Interim Sanctuary Zones (ISZ) to minimize vessel noise disturbance in key foraging areas for the Southern Resident Killer Whales. The ISZ are located on North Pender Island and Saturna Island within the Southern Gulf Islands. The Interim Sanctuary Zones are in effect from May 27 – October 31 following the first confirmed presence of Southern Resident Killer Whales during their monitoring phase. While the ISZ is in effect no commercial or recreational vessels are allowed entry except for in emergency situations.

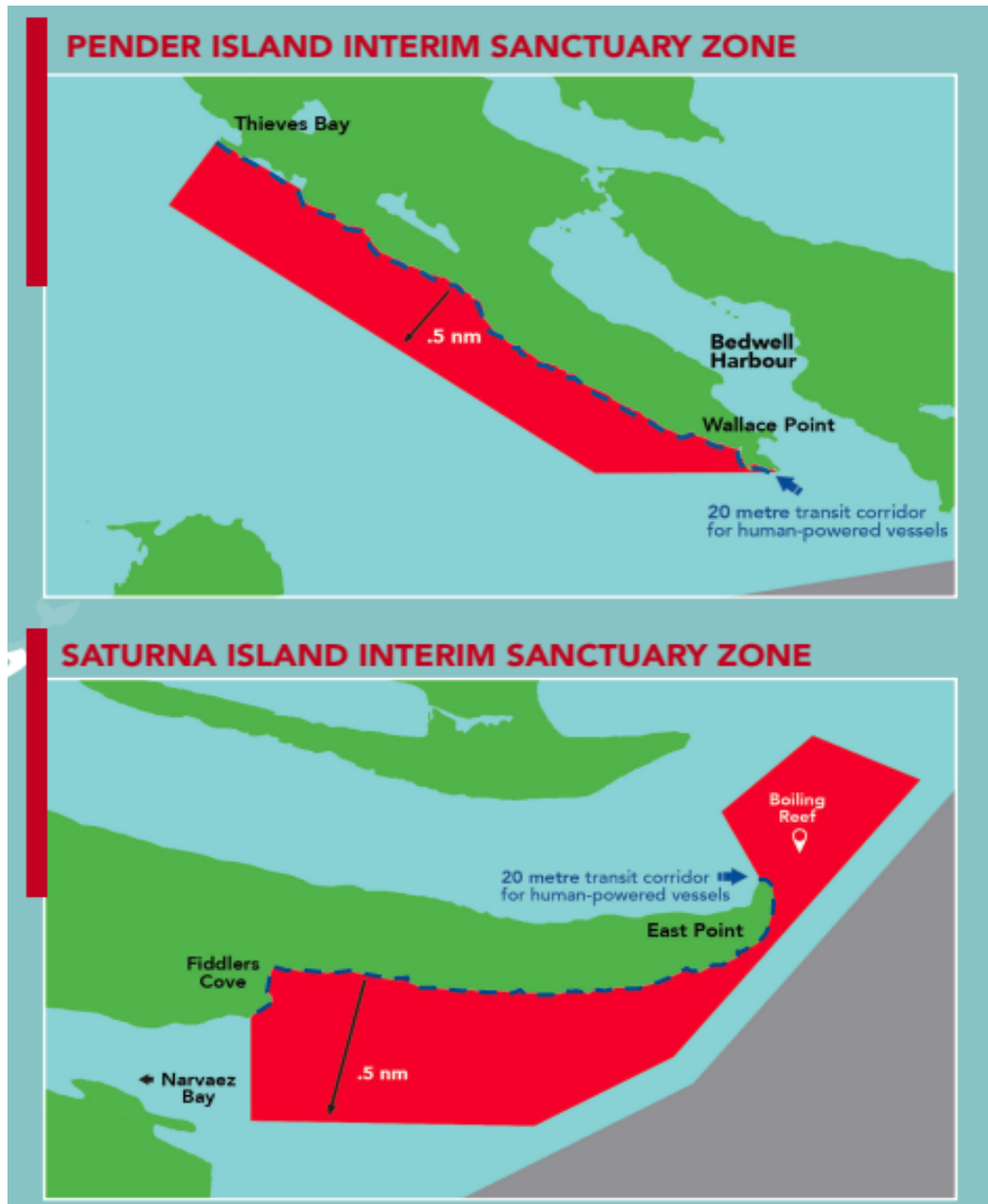


Figure 12. Interim Sanctuary Zones, Southern Gulf Islands, BC

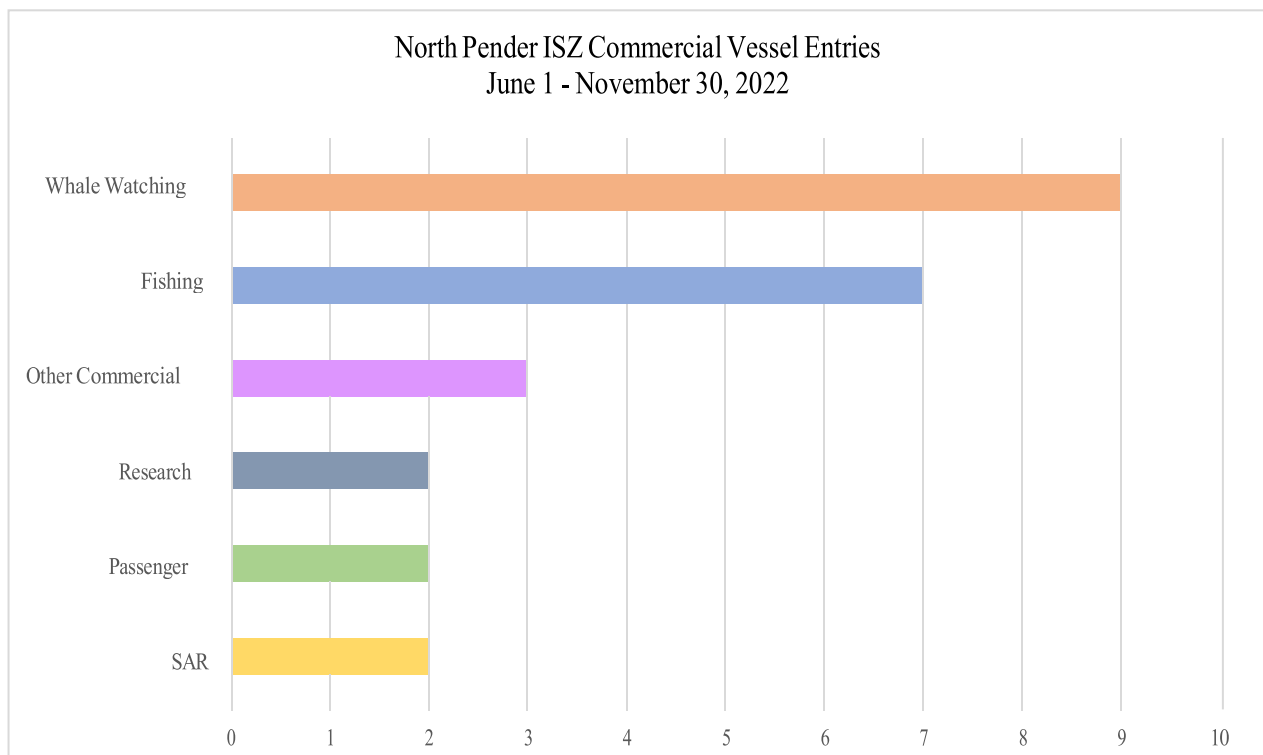
### 4.3.1. Interim Sanctuary Zone monitoring using EMSA

EMSA was utilized to monitor vessel entries into the IZS while they were in effect. Most vessel entries into the sanctuary zones on North Pender Island and Saturna Island were by pleasure crafts. While the ISZ measures were in effect, 9967 pleasure craft entries were recorded by EMSA. Most of these entries by recreational vessels were by American flagged vessels traveling to the border services office located on North Pender Island. Many more entries by vessels without AIS occurred; however, cannot be quantified using EMSA monitoring alone.

Thirty-eight commercial vessels were recorded entering the ISZ. The results of the EMSA analysis show that commercial whale watching vessels enter sanctuary zones and stay longer inside when compared to other commercial vessels. ISZ compliance using EMSA monitoring will commence when sanctuary zone come into effect on June 1<sup>st</sup>.

#### North Pender Island ISZ:

Between June 1 and November 30, 2022, the North Pender Bluff SRKW Interim Sanctuary Zone was entered 914 times with 889 entries by pleasure crafts and 25 entries by commercial vessels. Commercial Whale watching vessels entered the sanctuary zone 9 times, making up the majority of commercial vessel entries. Entries by whale watching vessels lasted 30 minutes on average and totaled almost 5 hours during the study period. 80% of whale watching vessels entering the Pender ISZ were Canadian flagged.



**Figure 13.** Interim Sanctuary Zone EMSA Data: North Pender Island, BC



### Saturna Island ISZ:

Between June 1 and November 30, 2022, the Saturna Island SRKW Interim Sanctuary Zone was entered 91 times with 78 entries by pleasure crafts and 13 entries by commercial vessels. Commercial Whale watching vessels entered the sanctuary zone 7 times. Entries by whale watching vessels lasted 48 minutes on average and totaled 3.5 hours during the study period. 70% of whale watching vessels entering the Pender ISZ were Canadian flagged.

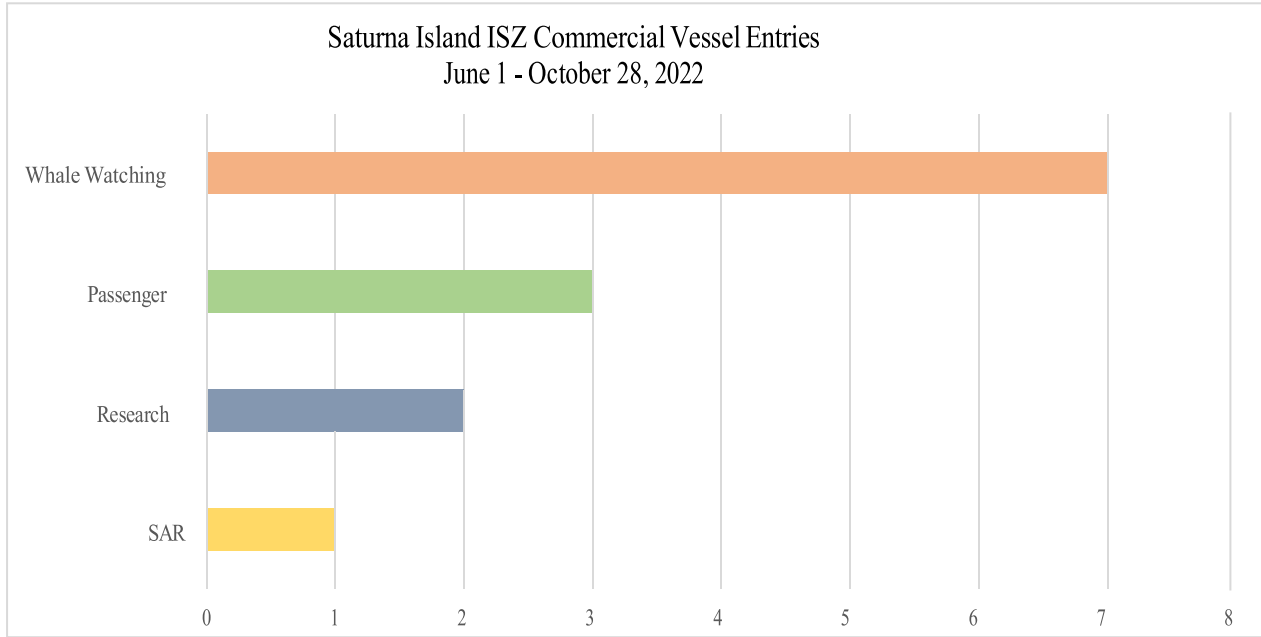


Figure 14. Interim Sanctuary Zone EMSA Data: Saturna Island, BC

### 4.4. Vessel-based Compliance Monitoring

Many more entries into the Pender and Saturna ISZ occurred by vessels without AIS; however, these cannot be quantified using EMSA monitoring alone. To address these limitations and to compliment the data acquired via EMSA, the QENTOL, YEN Marine Guardians also conduct compliance monitoring of our three monitoring zones while onboard the QENTOL, YEN1 vessel. This allows the team to monitor vessels without AIS and whether vessels are complying with the SRKW management measures and marine mammal distance regulations. During marine mammal and vessel interactions, the team documents both vessel and marine mammal ID notes to report to enforcement officers.



Whale Watching vessel getting too close and interfering with the path of a Killer Whale

## 4.5. Gulf Islands Large Vessel Anchorage Utilization

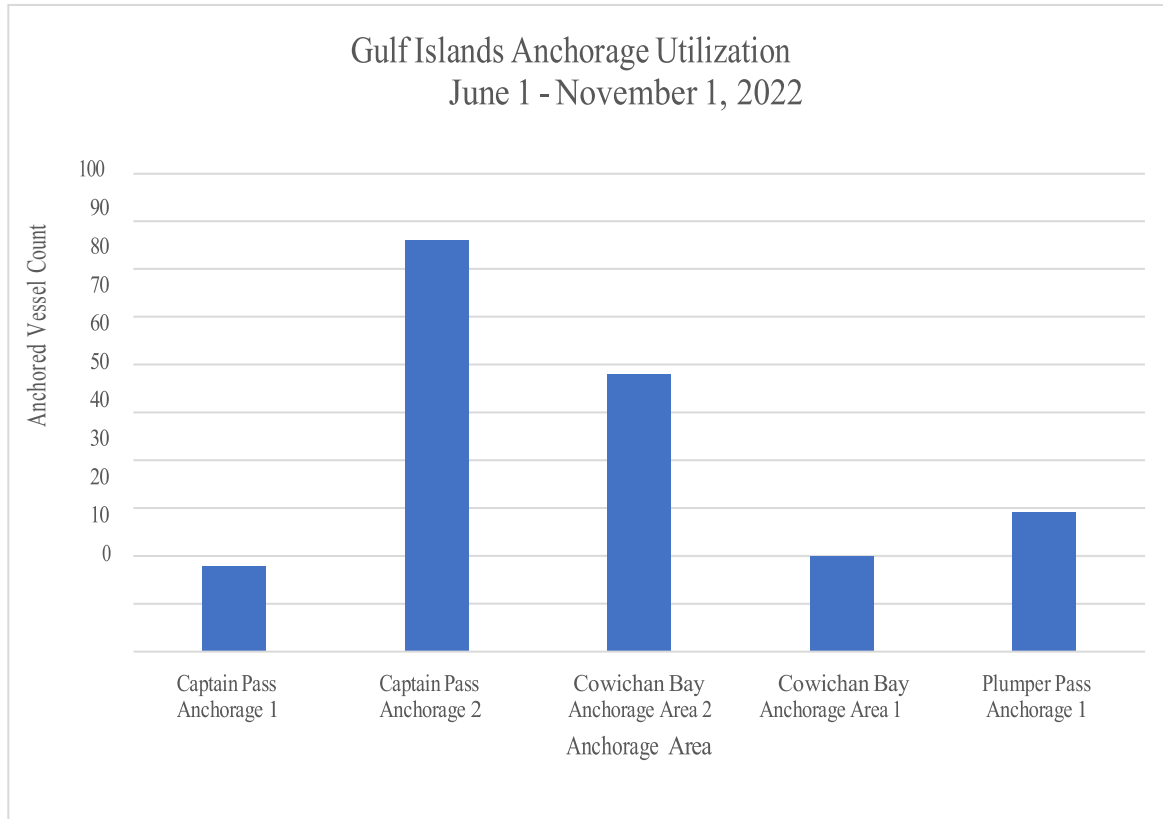
The Gulf Islands Anchorage Study is still in the early stages of our QENTOL, YEN / WSÁNEĆ Marine Guardians Program. With over 40 deep water anchorages in the Southern Gulf Islands, we have concerns regarding the vessels anchoring for long periods of time. We want to find out what impacts these vessels have on different prey migration such as the chinook salmon for the Southern Resident Killer Whales. In the QENTOL, YEN marine monitoring area there are thirteen large commercial vessel anchorages within Plumper Sound, Captain's Passage, and Cowichan Bay. Anchorages within the Southern Gulf islands were designated in the 1970's without prior consultation with First Nations or environmental assessment. The anchored vessels produce significant noise, air, and light pollution and impact benthic ecosystems through the continuous scouring of the seafloor by anchor tackle. With the recent approval of several large port expansion projects including Westridge Terminal, Roberts Bank Terminal 2 and the Centerm Expansion project, anchorage utilization is expected to increase in coming years. The QENTOL, YEN Marine Guardians has utilized EMSA to monitor trends in the Southern Gulf Island Anchorage use and to establish a baseline. Figure 15 below shows all the anchorages in the Salish Sea where the QENTOL, YEN team monitors.



*Figure 15. Locations of Large Commercial Southern Gulf Island Anchorage sites*

### 4.5.1. Southern Gulf Island Anchorage Analysis

The anchorage circles provided by the Canadian Hydrographic Service were used as geofences to track each anchorage on EMSA. Between June 1 and November 1, 211 large commercial vessels anchored totaling 24584 hours at anchor (figure 16).



**Figure 16.** Southern Gulf Islands Anchorage Statistics from EMSA

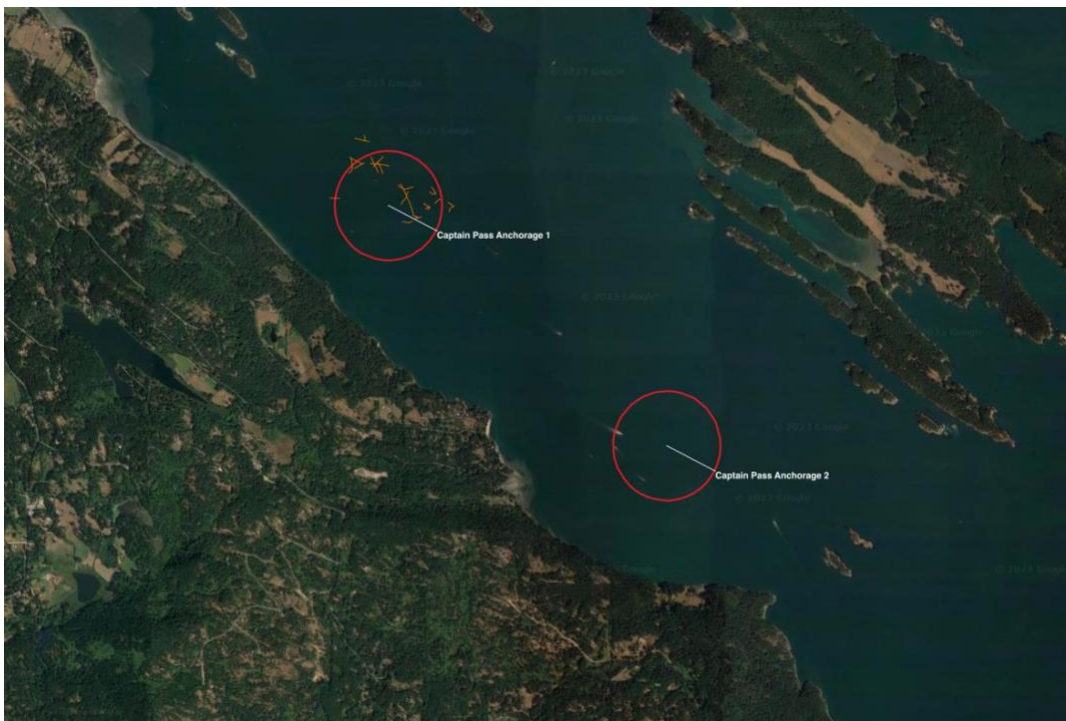
During the EMSA analysis it became clear that additional data is required as vessels often anchor outside CHS anchor circles and may drift outside of them while at anchor. Benthic scouring data provided by Natural Resources Canada (NRCAN) was used to map scouring marks that are created by the anchor tackle of large vessels. Within Plumper Sound, Cowichan Bay and Captains pass there is a total of 53 kilometers of scour marks with only 29 kilometers or 54% of scour marks within anchorage circles. The impact of heavy commercial vessel anchoring on the benthic substrate is not confined to anchor circles, particularly in Plumper Sound. Scour marks at each anchorage area indicate how heavily each anchorage is utilized however they cannot directly be compared with the EMSA results due to the differing nature of the data. Additional AIS track line data is being requested to better understand anchorage utilization in the QENTOL, YEN monitoring area.



## Benthic Anchor Scouring Marks



*Figure 17. Cowichan Bay Anchor Scouring Marks from NRCAN Data*



*Figure 18. Captain Pass Anchor Scouring Marks from NRCAN Data*



**Figure 19.** *Plumper Sound Anchor Scouring Marks from NRCAN Data*



## 5. Cultural Component



*WSÁNEĆ Youth participating in Salmon Ceremony*

Although science plays an important role with monitoring the Southern Resident Killer Whales, we can't forget about culture. Even though our QENTOL, YEN work is focused on preserving and monitoring various aspects of the habitat and food supply of the KELLOLEMEĆEN (Killer Whale), we also want to “raise awareness of the relationship between WSÁNEĆ people and KELLOLEMEĆEN” through various cultural initiatives. One way our program has done that has been talking with various knowledge holders to bring back the salmon ceremony to S,ELEKTEL / Goldstream River. The first salmon ceremony

took place in the summer of 2022 for the first time in over 30 years. WSÁNEĆ Elders, WSÁNEĆ Language group, the WSÁNEĆ Reef Net students, and LAU, WELNEW students were a part of the ceremony. The ceremony was carried out to restore the SCÁNEW to the WSÁNEĆ people.

Another way our program shares culture about the relatives of the deep was the creation of a new limited-edition storybook created by our QENTOL, YEN Team. This book is called “KELLOLEMEĆEN” and aims to restore the connection between KELLOLEMEĆEN and WSÁNEĆ people. The story draws in readers of all ages with fun facts about three types of KELLOLEMEĆEN presented using key terms in SENĆOFEN. This book is intended to be the first in a series of storybooks by the Marine Guardians.

Additionally, our goal is to work with LÁU, WELNEW Tribal School to share information about KELLOLEMEĆEN. Once our books were printed, each student in LÁU, WELNEW Tribal School was given a copy along with a water bottle and a stress reliever KELLOLEMEĆEN.

Our goal is to find unique ways in sharing information about KELLOLEMEĆEN using SENĆOFEN language. We are currently in talks with BC Ferries to sell our book onboard their vessels in their Passage Gift Shop. Furthermore, we are exploring the idea of making it an audiobook to sell online.

November 30  
Mr. David Dick  
IY SKÁĆELSIAM,  
HISKWE for giving us  
the book. How do you  
count the orcas?  
Do the KELLOLEMEĆEN  
eat any ocean plants?  
From, Keana-LYAN I loved your  
Book so much!!!

*Letter from a Grade 2 Student*







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