

# Átl'ka7tsem/Howe Sound Slhawt'/Herring Survey Report

Winter & Spring 2023

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Tem Lhawt': the time of herring and herring spawns in Skwxwú7mesh territory



Written by Matthew Van Oostdam

Átl'ka7tsem/Howe Sound Marine Stewardship Initiative (MSI)  
[www.howesoundguide.ca](http://www.howesoundguide.ca)



Átl'ka7tsem/Howe Sound  
**Marine  
Stewardship  
Initiative**



A project of

**MakeWay**

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Photos are by Kieran Brownie, Matthew Van Oostdam, and Brian Hockenstein.



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# 1. Preface

This project took place on the unceded territory of the Skw̓wú7mesh Úxwumixw (Squamish Nation). Skw̓wú7mesh territory spans from the village of Xwáýxway in the south, to Ch'kw'elhp in the west, up into the Tantalus Mountain Range. The territory expands north to Whistler, east to the drainage of the Pitt River, and south again toward Indian Arm and the villages of the north shore, Eslhan and Xwmélt'stn.

Átl'ka7tsem is one of three Skw̓wú7mesh place names for the deep glacial fjord that the town of Squamish is found at the end of. Large rivers such as the Squamish, Ch'iyákmesh, Mámxwem, Cheekeye, Sawá7elt all flow past town and into the estuary. On the west side of Átl'ka7tsem/Howe Sound, past towering granite cliffs that lean into the ocean, is the old village of Swiyát, also known as the Woodfibre Mill and Townsite, where three notable creeks flow straight into Átl'ka7tsem/Howe Sound.

In recent years, throughout this region, there has been a growing recognition that slhawt'/Pacific herring (*Clupea pallasii*) are present and play a vital role in this large ecosystem of relationships. Traditionally, slhawt'/herring have represented the first flush of protein to return after a long winter. During this period, known as Tem Lhawt'/Time of the Herring, it is possible to witness the shores of Átl'ka7tsem/Howe Sound spring to life as the entire food chain, including birds, salmon, seals, whales, and humans, share in the celebration.

This report documents the results of the 2023 Átl'ka7tsem/Howe Sound herring spawn surveys, which took place between the dates of February 16, 2023 to April 16, 2023. All data has been made publicly available in the Marine Reference Guide, available at [howesoundguide.ca/map](https://howesoundguide.ca/map).

## 2. Background

In the winter of 2019, Kiyowil Elder Bob Baker and several other Skw̓wú7mesh Elders asked that the students of Aya7ayulh Chet/Cultural Journeys program (St'a7mes School) hatch a plan to bring the community back into relation with the herring of Átl'ka7tsem/Howe Sound. For the first time in many generations, the community gathered to celebrate the return of the herring, known as Tem Slhawt' in the Skw̓wú7mesh sníchim. The students hung cedar and hemlock bows in the intertidal zone off a beach near St'a7mes Village, and within a week the herring came to release their eggs, coating the bows in ch'em'esh. This same year, local community scientist John Buchanan began passing on local knowledge about herring spawns and how to search for their tiny translucent eggs.

The following year, in 2020, the students of Aya7ayulh Chet began receiving letters from 'Harriet the Herring'. This magnificent little fish teaches the youth about her fish family and the Salish Sea that they call home. As winter drew to a close, the students prepared bows to be



placed in the water once again. The winds howled and the tides were large, and by the time the herring had come and gone, so had the hemlock bows planted by the students. It was a tough lesson to see and feel the strength of the ocean. However, this was the first year that the Search for Slhawt': Herring Spawn Survey team was formed. Guided by Fiona Beaty, the team included Matthew Van Oostdam, Jonny Williams, Nolan Rudkowsky, Myia Antone, Bridget John, and Kieran Brownie. They began snorkeling and searching for the eggs of herring and the habitats they use. This was the first year that John Buchanan formally passed on these responsibilities and the team began mapping and sharing the story of herring in Átl'ka7tsem/Howe Sound.

In 2021, the students of Aya7ayulh Chet prepared for another ch'em'esh harvest and the Searching for Slhawt' team took to the water by boat and snorkel to understand how the herring were navigating Átl'ka7tsem/Howe Sound. John Buchanan provided a framework for the team to document Tem Slhawt' over its entire duration, and this year they were putting it into practice. While the surveys were underway, the students of Aya7ayulh Chet studied the moon and tides to predict the arrival of the herring in Skwxwú7mesh. Following the students' recommendations, the community gathered on the beach to welcome the herring through ceremony. With their best energy, they dropped the bows for the third time, hoping the herring would bless their work. To everyone's delight, the herring not only returned, but we even got to witness the spawn take place. Children and elders alike grinned from ear to ear, trying to make out the flashes of silver in the water.

In 2022, the survey team grew to include Courtney Smaha (MSI) and Vivian Joseph. The survey team expanded to cover a larger region of Átl'ka7tsem/Howe Sound, and documented herring spawns using a standardized protocol. This was the first year where [a formal report](#) was created to share the survey findings.

This year, in 2023, the Searching for Slhawt' team welcomed Matty Moore from the Squamish Nation Rights and Title Department and Addison Farr of Seadog Expeditions. This past season the students from St'a7mes School marked the return of the herring with one of the biggest celebrations since our work began, and the survey team witnessed the power and life of Átl'ka7tsem/Howe Sound as they swam its shores alongside orcas, sea lions, anchovy and herring.

### 3. 2023 survey team expansion

The partnership with Squamish Nation Rights and Title Department was further developed for the 2023 season, which enabled two Squamish Nation Archaeological, Cultural, Environment (ACE) Technicians to participate in each boat based survey day. ACE Technicians provide architectural, cultural, and environmental oversight through surveying and monitoring



throughout the Squamish Nation's territory. Through participating in the surveys, the ACE Technicians developed snorkel surveying skills, recorded herring spawn distribution data, and supported other snorkel surveyors during their swims. This experience builds on the existing relationship of this work while also building capacity for this work to continue in a way that reflects two ways of seeing in this world: *Skw̓wú7mesh* and western science.

MSI also partnered with Sea Dog Expeditions, who provide a chartered research vessel and licensed skipper. Addison Farr, the owner and operator, brought forth a strong knowledge of these waters and experience navigating them. His personal passion was an asset to the team as he was always eager to survey regardless of the cold rain or snow.

## 4. Survey methods

The Slhawt' Survey Program was first initiated in January 2021. That winter and spring was the first time a consistent weekly survey was conducted to monitor for herring spawning activity in Átl'ka7tsem/Howe Sound since the DFO studies were completed in the 1970s.

The Slhawt' Survey Program: Searching for Slhawt' is a partnership between the Squamish Nation - Ta na wa Yúus ta Stitúyntsam' (Rights and Title Department), the Átl'ka7tsem/Howe Sound Marine Stewardship Initiative (a project on MakeWay's Shared Platform), the Átl'ka7tsem/Howe Sound Biosphere Region Initiative (HSBRIS), Squamish Streamkeepers, and St'a7mes School of School District 48.

### 4.1 Survey objectives

1. Survey, monitor, and document slhawt'/Pacific herring presence in Átl'ka7tsem/Howe Sound from late winter into spring, on an annual basis.
2. Establish and maintain an adaptive program structure that is sustainable, shares capacity within the community, and contributes to the understanding that herring are our relations.
3. Collect data that will be useful and credible for informing decision-making processes in the region.

The goal with this data is to establish a long term dataset that tracks the status and trends of slhawt'/herring spawn distribution, abundance, and timing. Such a dataset will be useful for future studies of slhawt'/herring in this region and provide a baseline to understand ecosystem responses to human impacts (e.g., development, resource extraction, and climate change). All monitoring data is shared openly and uploaded into the MSI [Marine Reference Guide](#), a publicly accessible online interactive map that informs regional decision-making and marine spatial planning. Sharing the data within this map helps to close the loop between knowledge and action, and ensures monitoring data can directly inform regional education and decision-making processes.



Surveys collected the following information, according to methods developed by John Buchanan:

1. Location of slhawt'/herring spawn, marked using GPS points delineating the start and end horizontally across the shoreline. If a spawn event was less than 3 meters long, it was documented as 'point spawn'.
2. Temperature of water (in degrees Celsius)

## 4.2 Survey sites

Surveys were conducted at 14 locations (Figures 1 & 2). Sites were selected based on Sk̓w̓w̓ú7mesh Traditional Ecological Knowledge, past findings by community scientist John Buchanan, studies and restoration work done by Squamish Streamkeepers, and community observations and feedback. Adjustments to survey areas were made based on shoreline health, accessibility, and results from the previous 3 years of slhawt'/herring surveys. Community consultation was conducted in January 2023, during a volunteer information session held by Squamish Streamkeepers and MSI. Survey results were presented in Spring 2023 by Matthew Van Oostdam, the Project Coordinator.

Two structured survey programs were implemented to collect slhawt'/herring spawn data:

**a. Land based estuary surveys, February 16 to April 16, 2023**

6 sites were monitored in the Squamish Estuary (Figure 1). Land based surveys were conducted by 20 volunteers, based on visual inspection of the shoreline. Volunteers were recruited and trained by MSI staff. In addition, opportunistic survey sites were visited, when convenient, outside of the planned sites.

**b. Boat/Ocean based snorkel surveys, February 16 to April 16, 2023**

Boat based surveys covered 8 sites throughout Átl'ka7tsem/Howe Sound (Figure 2). The ocean based sites were consistently surveyed 2 to 3 times per week by a team of 4; see Appendix 1 for a list of surveyors. The boat survey team identified spawn through snorkel surveys, accessing remote sites through the use of a 25 ft center console Zodiac hurricane vessel, contracted through Addison Farr and Seadog Expeditions.



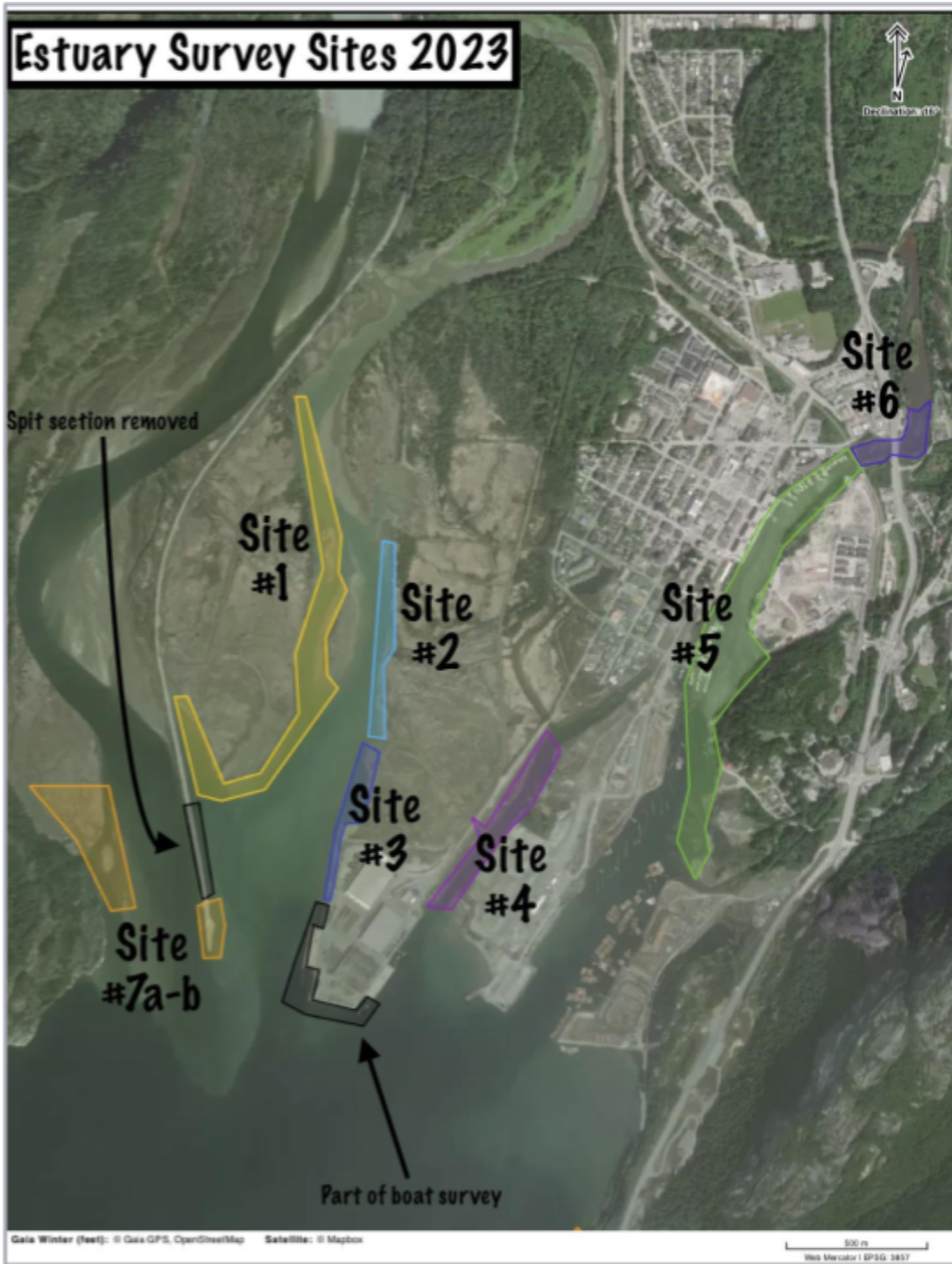


Figure 1. Land based estuary survey sites





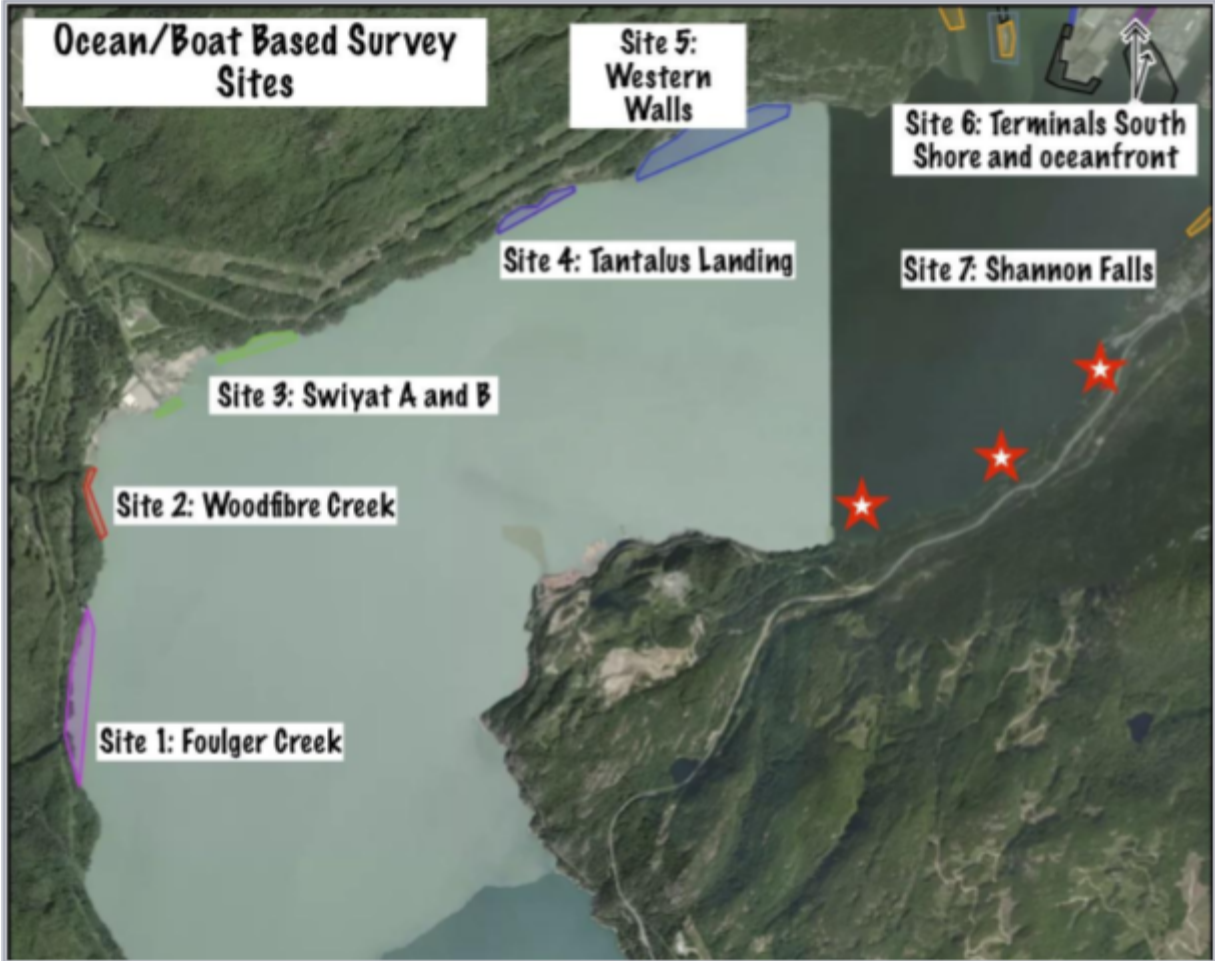


Figure 2. Ocean/boat based snorkel survey sites



## 5. Results

In 2023, the documented slhawt'/herring spawn season spanned from February 26 to April 7. Spawning activity occurred throughout the sampling areas and several new spawning locations were identified. Results are shared in chronological order, with elaboration on the first and last spawning events. Maps and aerial photographs show approximate spawning sites and are accompanied by a description of spawning events.

### 5.1 First major spawn event: February 26, 2023

The first spawn event was documented on February 26, 2023 in Cattermole Slough (Figure 5). Two volunteers, Marina and Patrick observed eggs on sedges, bladderwrack, and rocky shorelines in the slough. Spawn was present on both the east and west side of the slough and scales were seen floating in the water column.

Following this discovery, on February 26, the boat survey team shoveled snow off of the boat ramp and went out to survey sites near Cattermole slough (Figures 4-6). In an effort to document the full extent of spawn, they found eggs on the intertidal of the Oceanfront Development as well as the Squamish Terminals Port. Spawn was laid directly on rip rap, bladderwrack, and logs left on the Habitat Bench Beach (the furthest north-west beach) at the Oceanfront site. Spawn was also observed on this date along the southern rip rap wall of the Squamish Terminals Port.



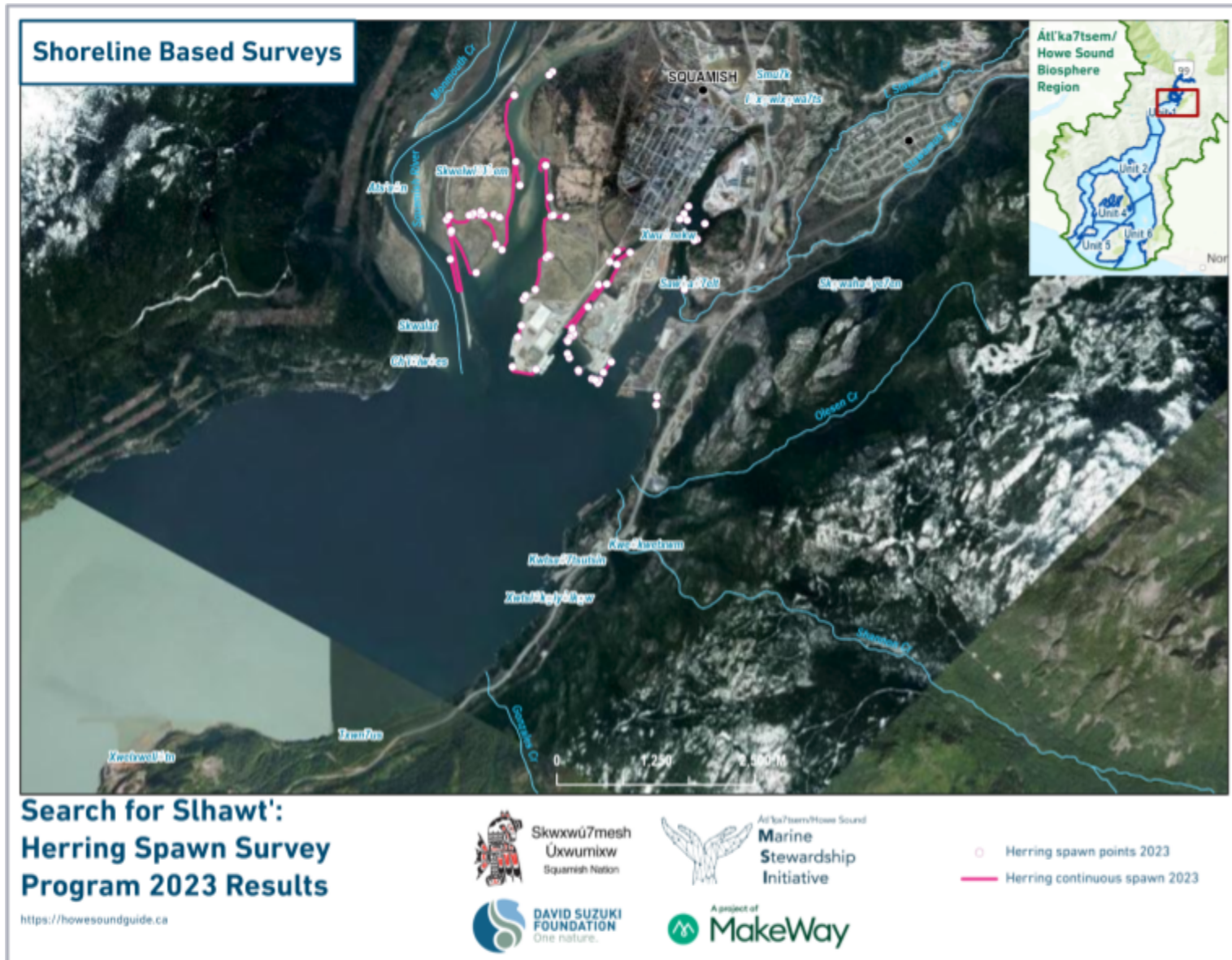


Figure 3. 2023 Shoreline based surveys results



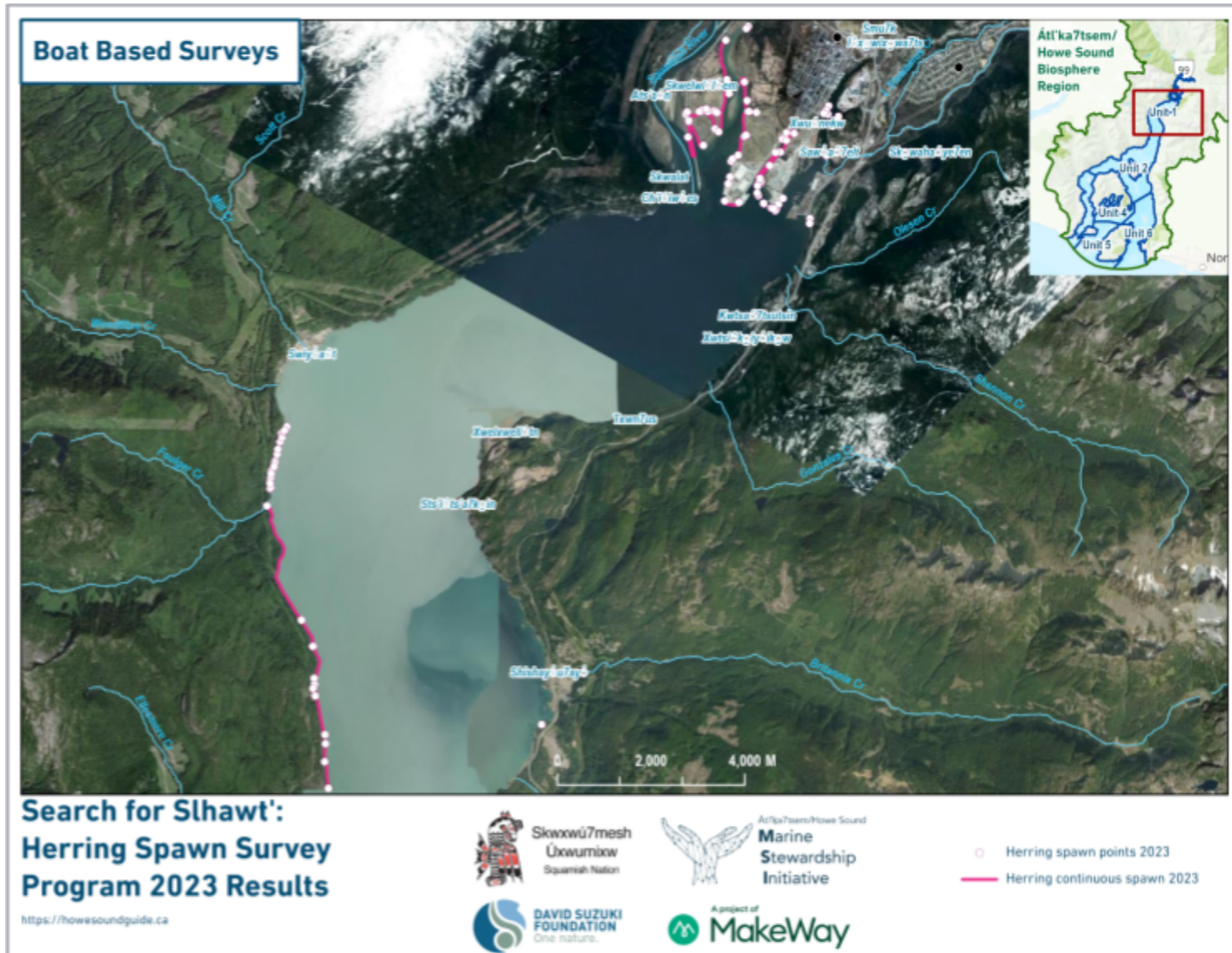


Figure 4. 2023 Boat based survey results



**Searching for Slhawt - Herring Surveys  
Spawn event document Feb 26, 2023**

Likely ocured in past 24hrs. Eggs are clear and herring scales still floating around in water column.

Congratulations to Marina and Patrick for locating the first estuary spawn in Cattermole slough!

M.Van Oostdam

**Red = Spawn Documented on this survey**

**Aerial Photo: John Buchanan**

Figure 5. The first spawn event on February 26, 2023 in Cattermole Slough





Figure 6. Slhawt'/herring spawning on rock weed.



Figure 7 & 8. Shoveling snow from the boat ramp and snorkel surveying the south shore of Terminals with containership and snow in the background. Slhawt'/herring scales were observed in the water column on this survey.



## 5.2 Second Major Spawn Event: March 6, 2023 in the Central Estuary

The second documented spawn event in 2023 took place sometime between the evening of March 6 and afternoon of March 7 (Figure 9). This is based on the knowledge that there were environmental monitors (for the Spit removal) in the area on March 6, as well as the first reported sighting of spawn on March 7 around 12pm by two survey volunteers. Spawn was eventually found even further north than shown in Figure 9, on the east side of the channel near the shoreline close to the estuary trail.

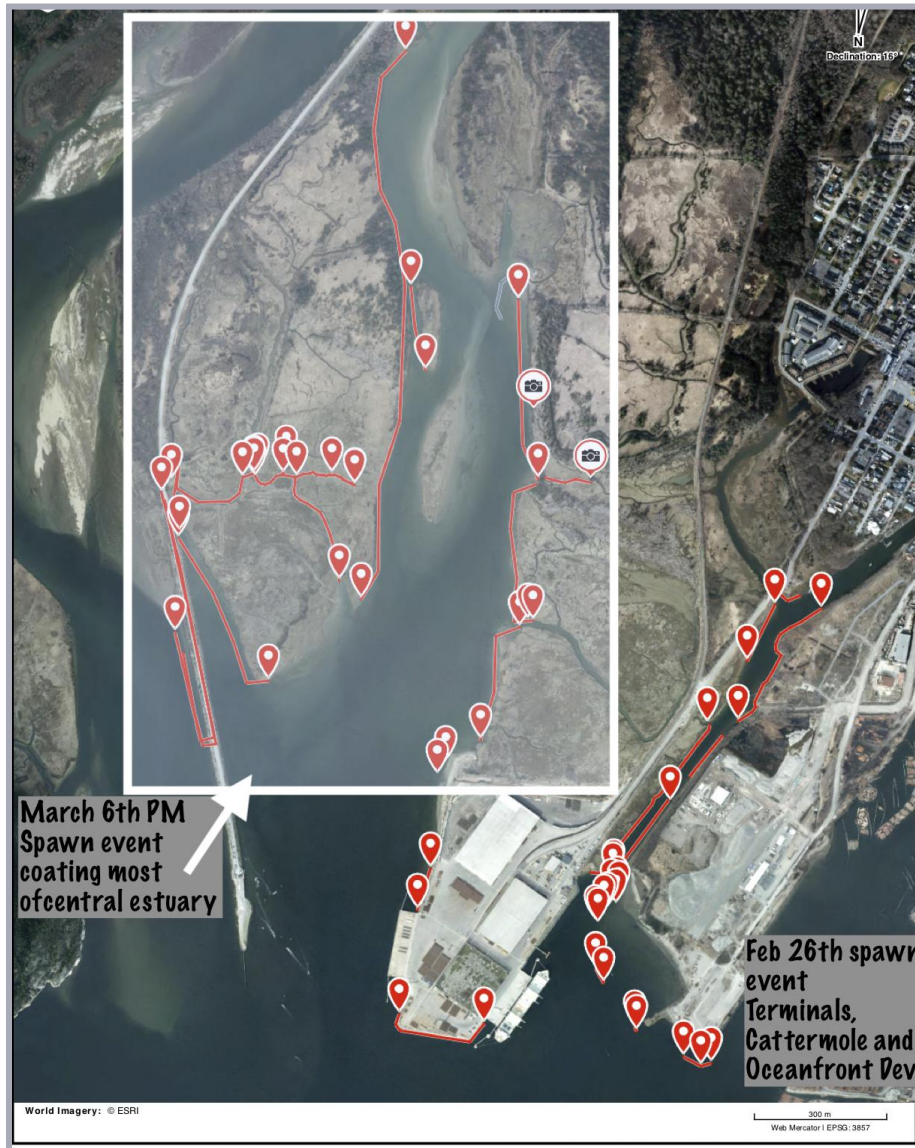


Figure 9. Silhawt'/herring spawn sightings from March 7-10, 2023 are marked within the white box. Outside the box is spawning from Feb 26th





Figure 10. Herring spawn on sedges in the estuary.

During this early March spawn event, Matthew Van Oostdam conducted an opportunistic survey (not part of the regular survey program, due to environmental impact and capacity restraints) into the estuary channels to the east of the Spit (Figures 10-16). Spawn was found extensively throughout these small channels ranging in 3m to less than 1m wide channels. At high tides, these channels fill to approximately 1-2m deep. There was spawn present throughout.

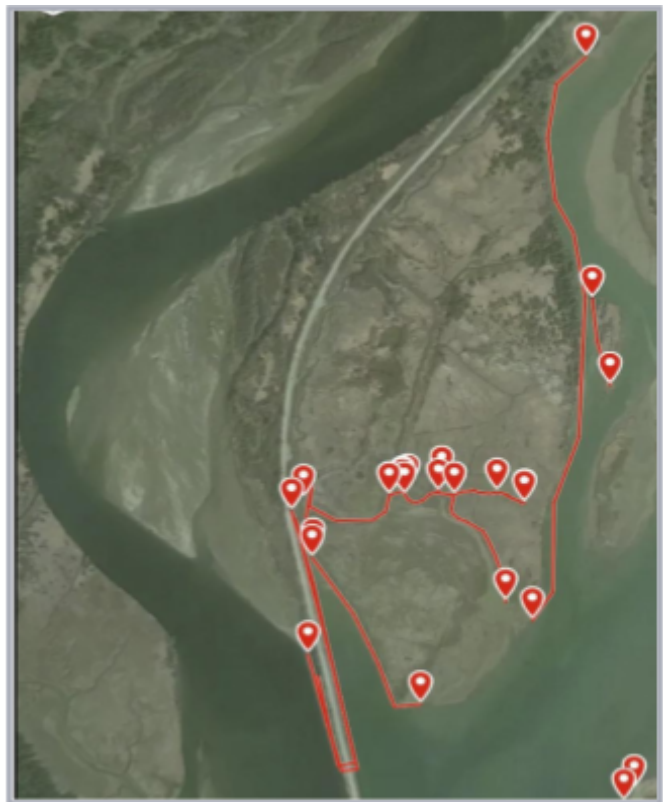


Figure 11. Opportunistic survey sites during early March spawn event. Red lines and points mark areas with slhawt'/herring spawn. Points marked higher densities than those found along red lines.







Figures 12-16. Channels in the estuary with vegetation covered in slhawt'/herring spawn.



### 5.3 First documented spawning event in the Ocean/Boat Survey Sites: March 24, 2023

On March 24, the boat survey crew observed the first herring spawn during a snorkel survey along the shoreline south of the Woodfibre site, within 500m of Woodfibre Creek (Figure 17). Initially, the eggs were recorded as 'point spawns', which are areas of spawn not exceeding 3m laterally along the shoreline. As the snorkel survey continued, the presence of slhawt'/herring eggs was observed to be more consistent along the shoreline. Spawning density was light until past Foulger Creek. On this day, the survey crew documented 5.5kms of shoreline with slhawt'/herring spawn of varying densities. At the end of the survey track, they found slhawt'/herring actively spawning, and were able to document some of this activity on video and photo (Figures 18-20). Eggs were deposited on vertical granite rock, bladderwrack, mussels, and barnacles throughout the intertidal, to a depth of 8m.

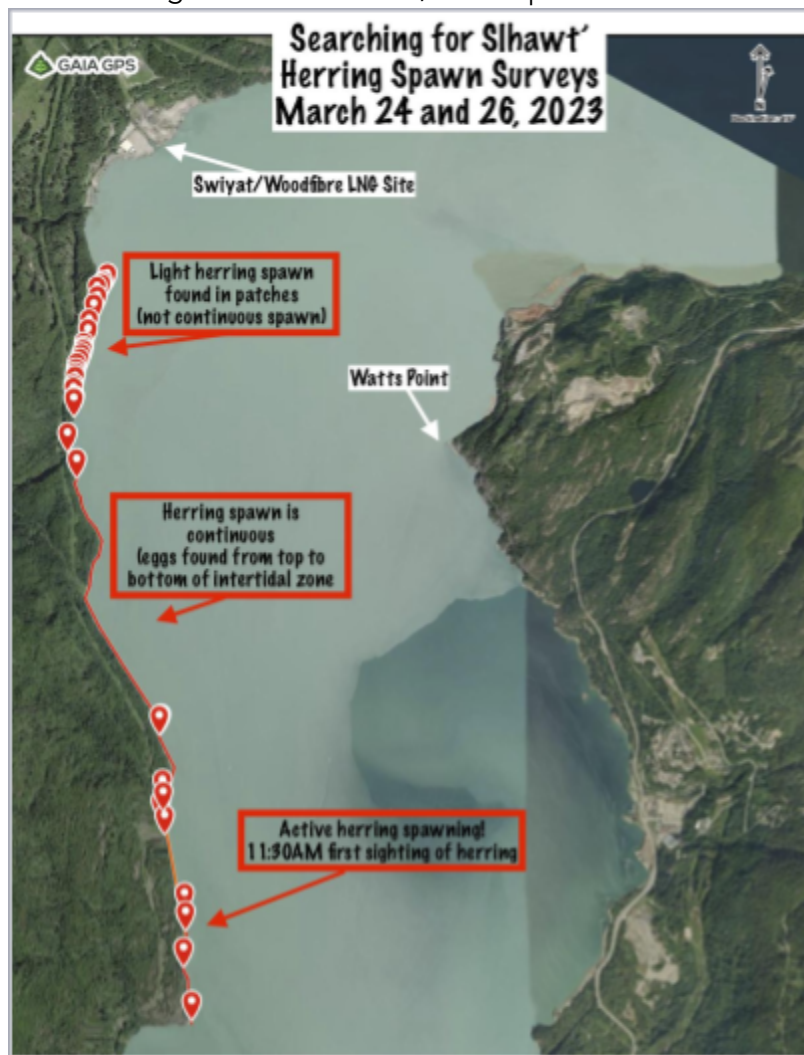


Figure 17. Slhawt'/herring Spawn documented on March 24, 2023





Figure 18. Slhawt'/herring actively spawning. Note the gray-blue water colouration from slhawt'/herring milt.



Figure 19 & 20. Slhawt'/herring spawn at low tide. Eggs covered everything from vertical granite rock, to bladderwrack, to mussels, to barnacles.

## 5.4 Last documented spawn event of 2023: April 7, 2023

The last documented slhawt'/herring spawn event occurred in the Mám̓xwem Blind Channel on April 7, 2023 (Figure 21). Spawn was noted on pilings throughout the Squamish Harbour Authority docks as well as the Squamish Yacht Club docks. Approximately 2-3 ft below the high tide mark, many pilings had eggs on them, and within a week all appeared to be drying out and dying (Figures 22 & 23). Spawn was also noted across in small concentrated areas on the east side of the channel and can be seen in Figure 17.

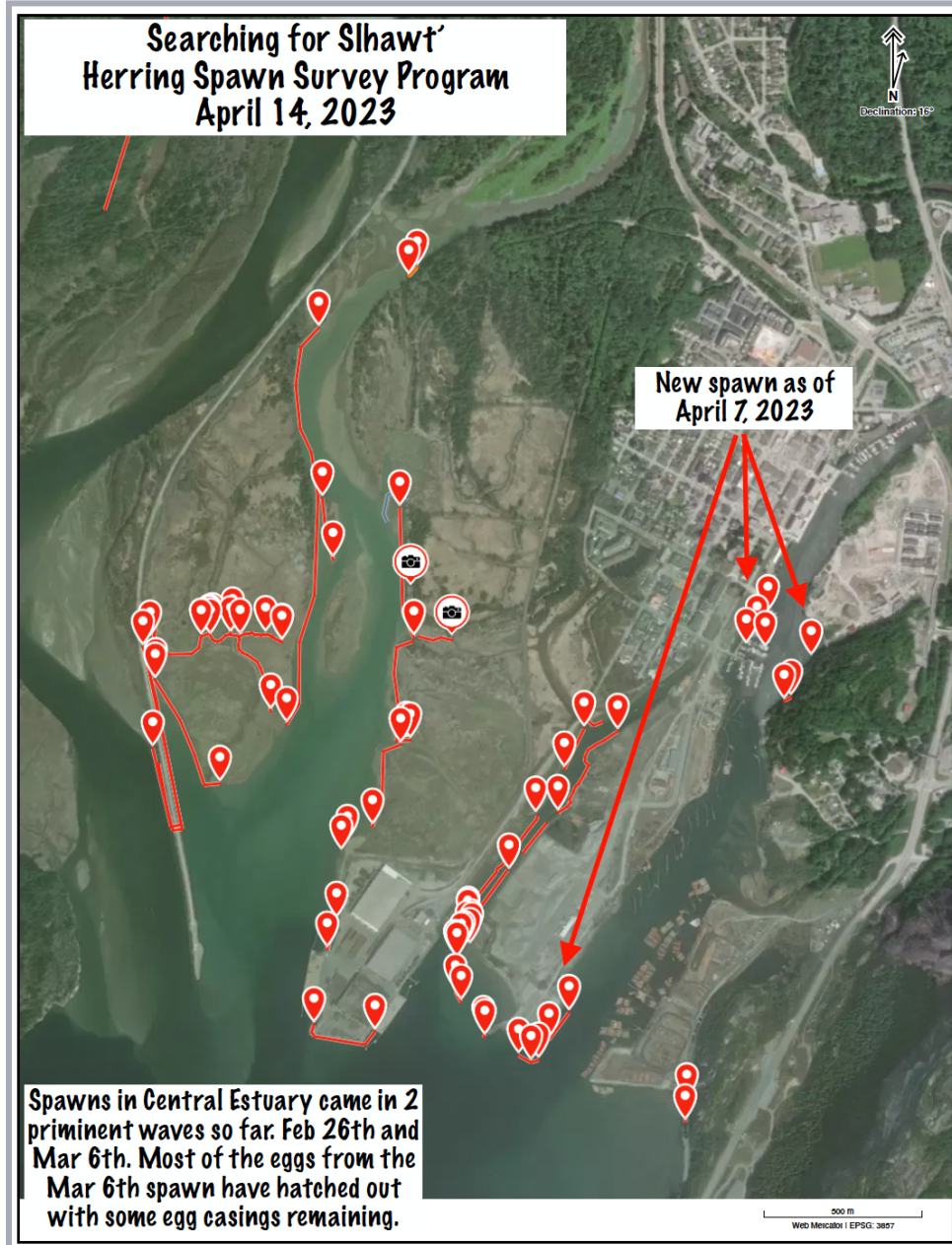


Figure 21. The last slhawt'/herring spawn event documented in 2023 in Átl'ka7tsem/Howe Sound was on April 7, 2023. The last survey was on April 14, 2023.





Figure 22. Slhawt'/herring spawn dried out and dead on pilings.



Figure 23. Eggs casings that have caved in but not discolored.



## 6. Comparing 2021, 2022, and 2023

This was MSI's third year conducting the slhawt'/herring surveys; MSI began supporting survey efforts in 2021 (Figure 24). Changes over time can be observed by looking at the maps depicting spatial distribution of spawning activities from 2021-2023 (Figures 25-27). These maps show that certain areas in northern Átl'ka7tsem/Howe Sound have been used by spawning slhawt'/herring repeatedly over the past 3 years, while other sites are visited by spawning slhawt'/herring only during specific years. This data set is based on an extremely limited time period and should not be used as a basis for larger time scale assumptions or patterns. This work notably highlights the need for more consistent, long term monitoring that identifies the intertidal zones that are potential and active sites for herring spawning.

The following section provides an in-depth discussion of 3 spawning sites that were consistently used by herring during 2021, 2022, and 2023 surveys: Catermole Slough, Central Estuary and the ocean based sites visited by surveyors on a vessel.



Figure 24. Photo of the 2021 survey team from left to right: Nolan Rudkowsky, Jonny Williams, Fiona Beaty, Matthew Van Oostdam, Kelvin Johnston.

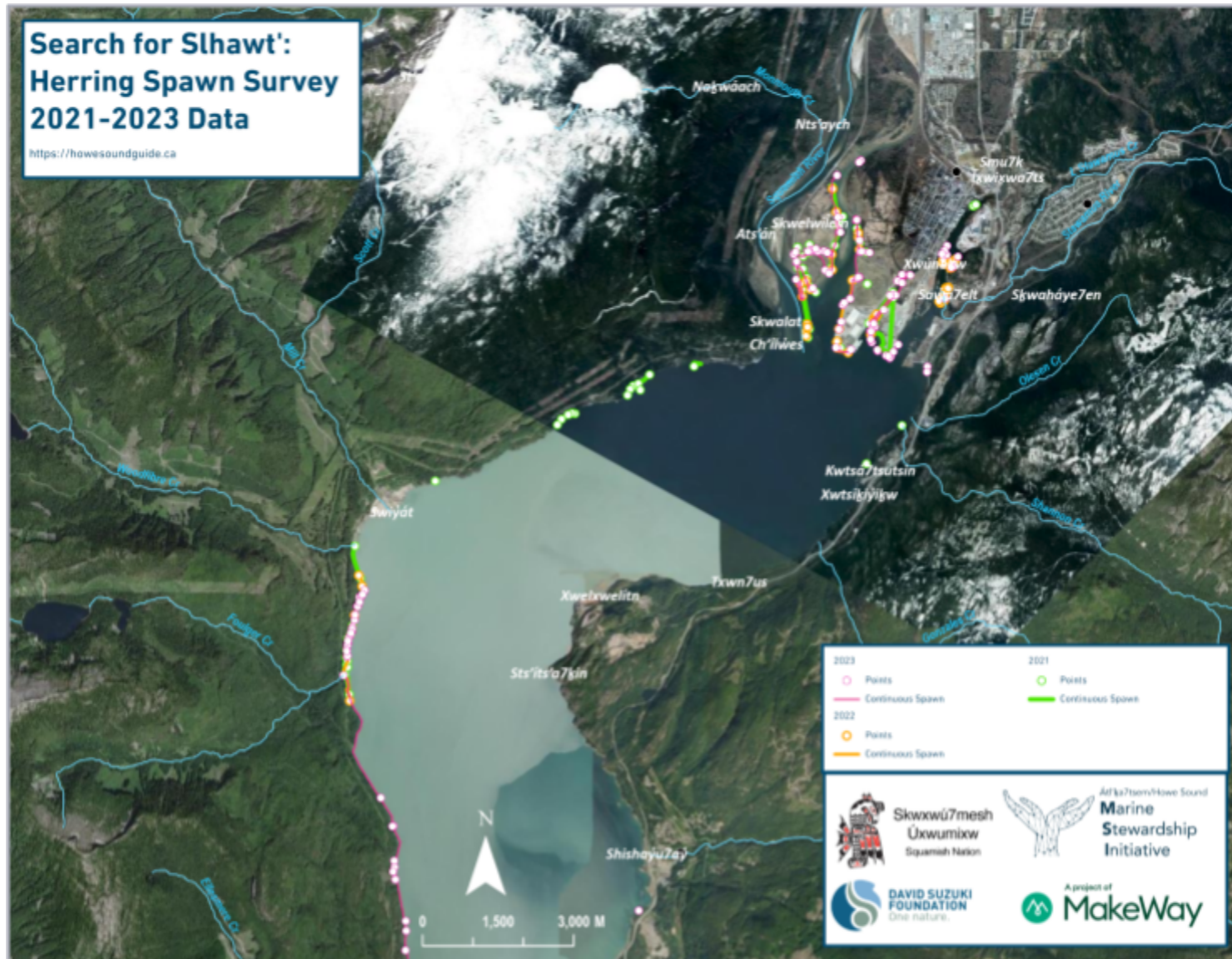


Figure 25. Slhawt'/herring spawn survey data from 2021 (green), 2022 (orange), and 2023 (pink)



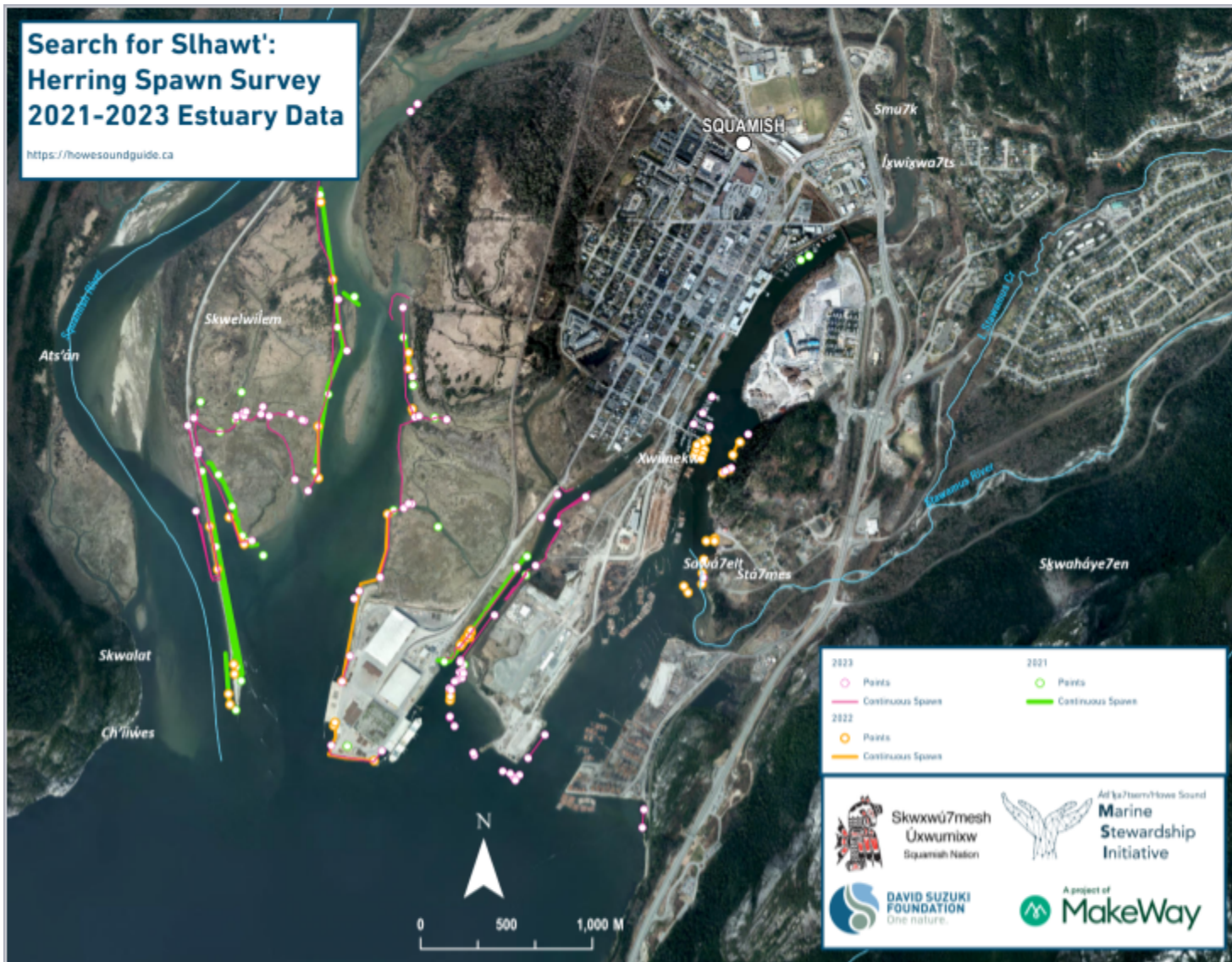


Figure 26. Slhawt'/herring spawn survey estuary data from shoreline based surveys from 2021-2023





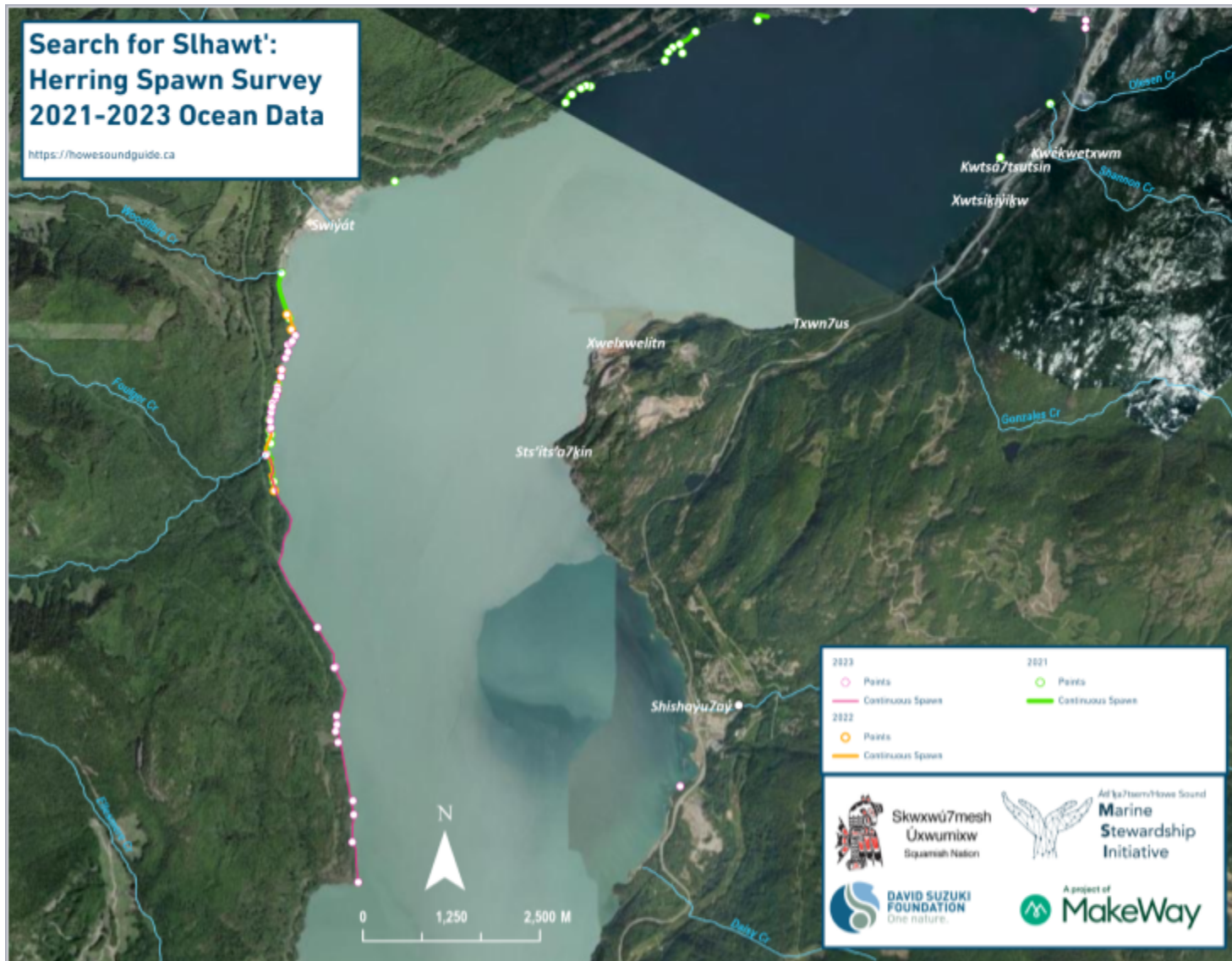


Figure 27. Slhawt'/herring survey results from ocean based surveys from 2021-2023



## 6.1 Cattermole Slough

Cattermole Slough has been used by spawning slhawt'/herring from 2021-2023 (Figure 28). In 2022 and 2023, this was the site of the first documented slhawt'/herring spawns and was typically preceded by spawns around the Squamish Terminals. This difference may be due to the availability and timing of surveying. In 2023, slhawt'/herring spawn was documented extensively on both the east and west side of the Cattermole Slough, on rocks, bladderwrack, and logs. Spawn was also found on the north and south side of the District of Squamish water level gates at the north end of the Cattermole Slough.



Figure 28. First spawn site in Cattermole Slough in 2022 and 2023

## 6.2 Central Estuary

The vast majority of the intertidal zones in the Central Estuary have been used by spawning slhawt'/herring in the past 3 years (Figure 29). In 2021 and 2023, slhawt'/herring spawn was documented in thin but deep channels throughout the grassland of the estuary. In 2023, slhawt'/herring eggs were also documented at their furthest northern extent up the central channel near the estuary trail on the east side. In future years, it could be worthwhile to look further up the central channel when we document large spawns at the south end. The results from all 3 years show consistent use of the shorelines on the east side of the estuary near the Squamish Terminals and the mudflat shoreline to the north.



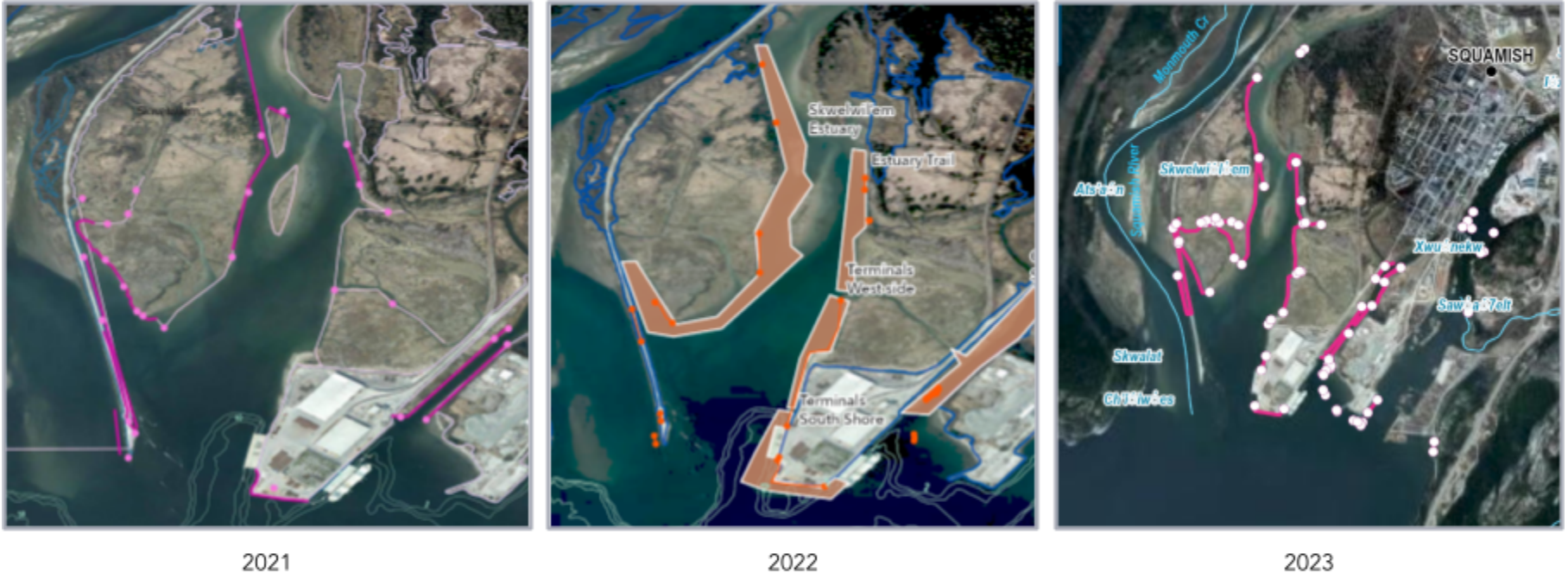


Figure 29. Observed spawn in the Central Estuary over the past three years

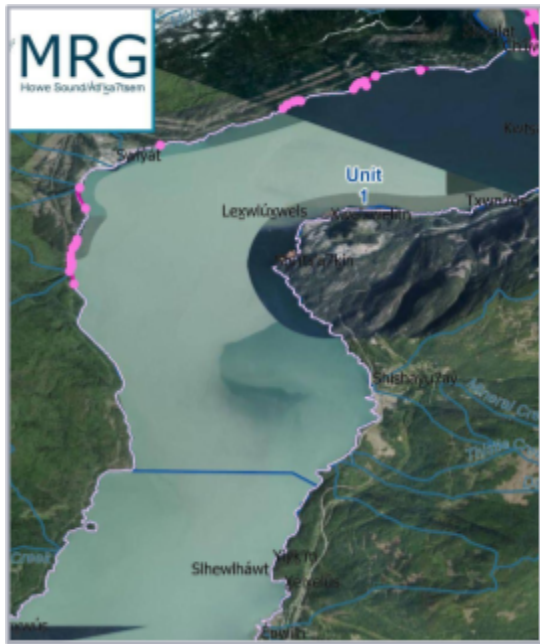


## 6.3 Ocean/Boat Sites

Slhawt'/herring spawn activity was recorded at Fougler creek in 2021, 2022 and 2023 (Figure 31). It has been the only area that the boat based survey team observed spawn in all 3 survey years. In 2021, there were several short sections of spawn found at the mouths of small creeks along the Western Walls shoreline (the shoreline from Woodfibre to the mouth of the Squamish River). In 2022, the lowest number of documented spawning events were observed throughout the boat based survey sites. However, in the same year, Squamish Nation surveyors and the MSI team planted hemlock boughs at the mouth of Foulger Creek, and slhawt'/herring spawned, covering the branches in ch'em'esh (slhawt'/herring eggs on hemlock that can be eaten) (Figure 30). In 2023, we did not document spawning along the Western Walls for the second year in a row; however, we did document 5.5km of shoreline south of Foulger Creek covered in eggs, as noted previously (Figure 17).



Figure 30. Hemlock boughs placed in the ocean to collect ch'em'esh.



2021



2022



2023

Figure 31. Spawn observed at boat/ocean sites from 2021-2023



## 7. Formidable observations from 2023: northern anchovy

On 3 separate occasions during the 2023 boat based surveys, northern anchovy (*Engraulis mordax*) were observed. The first sighting was on March 10, at the Woodfibre site. In the middle of the site is Mill Creek. As the team was completing a survey, we observed gulls hovering and diving on something in the creek. There were also sea lions in shallow water, showing aggressive feeding behaviors. As we approached, it was clear that there was something being targeted near the first pedestrian bridge that crosses the creek. As a surveyor swam up the clear, cold freshwater running out of the creek, they photographed a small school of northern anchovy that had been pushed up into the shallow water (Figure 32).



Figure 32. School of northern anchovy (*Engraulis mordax*) observed at the Woodfibre site on March 10, 2023





Figure 33. School of northern anchovy (*Engraulis Mordax*) observed near the Woodfibre site on April 14, 2023

On April 14 2023, northern anchovy were again observed, this time in much higher numbers and a few kilometers south of Woodfibre, near the 'Western Walls' survey site (Figure 33). Once again, a bird gave us the signal and suggested we pay attention. Eagles were gathered in high numbers standing right along the shoreline (Figure 34). They could be seen watching the water as waves rolled up on shore. As we neared, we also saw sealions again exhibiting feeding behavior as they dove and jumped (Figure 35). A dark shadow was being pushed along the shore and a snorkel surveyor immediately noted the small slender shape and overbite of the northern anchovy (Figure 36).





Figure 34. Eagle observed watching the shoreline







Figure 35. Northern anchovy observed near the shoreline during boat based surveys



Figure 36. Image from video footage of the school of northern anchovy (left) and sea lions (right)



During the next two days, schools of northern anchovy were documented at the mouth of the Mám̄xwem/Mamquam Blind Channel and Cattermole Slough. Anchovies were being flung into the air and pushed on shore as sea lions attacked (Figure 37). The final observations of northern anchovies were on May 1 2023, our last day of surveying. Sea lions pushed a school of anchovies into the bay on the north side of Kwum Kwum Island, and for several hours we watched them hunt (Figure 38).



Figure 37. Anchovies being flung into the air and pushed to shore as sea lions hunted





Figure 38. Sea lions pushed a school of anchovies into the bay on the north side of Kwum Kwum Island



## 8. Acknowledgements

### 8.1 Volunteer engagement

Our hands are raised in gratitude to all the volunteer surveyors and staff. This work would not be possible without the energy, time, and passion that you bring forth to caring for this land. Volunteers gathered in late January 2023 at the Brackendale Art Gallery (Figure 39). They listened to Matthew Van Oostdam and Squamish Nation survey team member Welweltannat Myia Antone speak about the impact that slhawt'/herring and surveying has had on their lives. Volunteer surveyors signed up for survey sites, and in the following weeks attended training sessions in all sorts of weather conditions.



Figure 39. 2023 volunteer training at the Brackendale Art Gallery

### 8.2 Surveys logged and estimated hours

There were 181 herring spawn surveys logged in 2023 as part of the Searching for Slhawt': Herring Spawn Survey Program. Surveys took somewhere between 1-8 hours, depending on location and distance of sites. If an average survey is around 4 hours, this would mean that an estimated 724 hours were spent searching for slhawt'/herring spawn.

We are immensely proud of this impactful work and look forward to working with many of these dedicated volunteers and surveyors again in future years.



### 8.3 The 2023 MSI survey and support team

The 2023 MSI survey and support team (Figures 40-45) included: Matthew Van Oostdam, Jonny Williams, Matty Moore, Kieran Brownie, Addison Farr, Courtney Smaha, Bridget John, Harriet the Herring, and John Buchanan (Rogue Herring Pirate and mentor to survey team).



Figures 40-45. Some of the 2023 MSI survey team members



## 8.4 Sponsors and supporters

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