

Fidalgo Bay Seining Report 2015-2019

**Samish Indian Nation
Department of Natural Resources**

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Introduction

Historical Information

In 2003, the Samish Tribe purchased property including forty-five acres of tidelands on Weaverling Spit, adjacent to Fidalgo Bay, in Anacortes, Washington. This area is biologically rich with expansive areas of eelgrass, other marine plants and shellfish growing areas. This estuary supports spawning and rearing of Pacific herring, surf smelt and sand lance. It is home to salmon, peregrine falcon, bald eagle, migratory waterfowl, harbor seals, river otters and abundant marine organisms. Tribal, recreational, and commercial harvest of clams, oysters and crab occur throughout the bay.

Ecological conditions throughout Fidalgo Bay have been altered by shoreline armoring and development, dredging, and filling. Since 1891, approximately 47 acres of Fidalgo Bay have been filled, and navigational channels are also maintained in Fidalgo Bay by periodic dredging. These filling and dredging activities have altered bay floor elevations as well as tidal regimes at various locations around the bay. As a result of these changes some intertidal habitats have become impaired, which has in turn impacted aquatic species.

Fidalgo Bay once was one of the nation's largest timber distribution points. The island's first mill began operating in 1878, eventually expanding to 13 Fidalgo mills. In 1992 the last mill, Custom Plywood caught fire and burned down (Friends of Skagit Beaches, 2010-2020). Today there are no mills or log booms left in Fidalgo Bay.

Due to wood waste and chemical contaminants found in the upland soil, groundwater, and sediment on the site. Washington Department of Ecology began a cleanup effort at the former Custom Plywood site (Department of Ecology, 2020). This involved removal of 2,500 creosote-soaked piles and 2,600 tons of construction debris; excavation of more than 75,000 tons of toxic soil and sediment; construction of 12,000 square feet of new wetlands and habitat; and restoration of 4,400 feet of beachfront (HartCrowser, 2020). These restored areas will stabilize and expand over time, creating new habitat for fish, shellfish, aquatic plants, and land-based birds and mammals.

Two oil refineries were developed on March's Point in the mid and late 1950's. Their construction included docks and roadways north from March's Point to deep navigable water, for delivery and shipping of raw materials and oil products. Refinery wastewater treatment plants have outfalls in the deep water north of the Point. Drifts cells have been analyzed showing tide circulation patterns around Fidalgo Bay and March Point.

In April of 2008, 650 acres in Fidalgo Bay was signed into Aquatic Reserve status by the Washington State Department of Natural Resources. It was recognized that Fidalgo Bay contains diverse habitats essential contributors to the reproductive, foraging, and rearing success of many fish and bird species (WADNR Aquatic Resources Division, 2019).



Figure 1: Fidalgo Bay seining site locations Skagit County, Washington

Study Area

Fidalgo Bay is a shallow U-shaped bay located in northern Puget Sound, northwestern Skagit County, Washington. It encompasses approximately 1,575 acres of tide flats, salt marsh, mudflats and sand and gravel beaches which includes the Fidalgo Bay Aquatic Reserve which covers approximately 650 acres of state-owned tidelands and beds. It is bordered by the City of Anacortes to the west and March's Point to the east. The reserve boundaries extend from the southern end of Fidalgo Bay north to a line drawn east and west from Crandall Spit. Much of the shoreline is modified with riprap and other development including the City of Anacortes, March's Point oil refineries, a tribally owned RV park and private residences located near the shoreline. A former railroad grade that has been converted into a public walking path is also armored along the southern and western shorelines.

Weaverling Spit and the entirety of Fidalgo Bay were and continue to be, important areas to the Samish Indian Nation. The area has been utilized for camps and more permanent living long before contact and settlement by Europeans. One of the state's oldest Coast Salish archaeological sites is located near the study area. The Samish Indian Nation owns 67 acres located on Weaverling Spit southeast of the City of Anacortes and within the city limits. The Fidalgo Bay Resort is located on the southwest side of Fidalgo Bay included on this property are 45 acres of tidelands.

Project Purpose

Beach seine surveys are conducted to learn more about the diversity and abundance of nearshore fish use throughout the bay. The data collected from this project is helping Samish DNR to evaluate the success of our beach restorations in improving habitat for forage fish and juvenile salmon. Locations include three sites each at Custom Plywood cleanup, Fidalgo Bay RV Park and NW March's Point. These sites represent natural, nourished, restored, and unrestored beaches and will be explained in detail in the Results section. Because we sampled at roughly the same time each day, we may not have caught all of the species that use each site. Surveys were planned on days with a +3-foot incoming tide to ensure we could launch and retrieve our boat at the RV park ramp during high tide.

Funding for the project is provided by a Puget Sound Partnership grant through the Environmental Protection Agency (EPA) to restore and protect Puget Sound. Samish Indian Nation Department of Natural Resources (Samish DNR) in collaboration with the Northwest Straits Foundation (NWSF) began beach seine surveys in March of 2015 in Fidalgo Bay.

Methods

Beach seining surveys are conducted by the Samish Department of Natural Resources and volunteers. There are 9 beach seining sites monitored by Samish DNR within Fidalgo Bay up to 18 times a year. Seining was conducted twice a month from February – June to target juvenile salmon, and once a month from July – January. We utilize small net beach seine methods tested and developed by NOAA scientists and are consistent with those used by Washington State Department of Fish and Wildlife, Washington State Department of Natural Resources, Salish Sea Stewards, Skagit River Systems Cooperative and others studying demersal fishes in the Puget Sound Nearshore.

A scientific collection permit is required from Washington Department of Fish and Wildlife (WDFW) to beach seine, as well as an Environmentally Sensitive Area (ESA) permit from NOAA. Beach seining

data is shared with our partners at NWSF, NOAA, and WDFW. Samish DNR and volunteers catch and release fish under restrictions outlined in both federal (NOAA) and state (WDFW) permits. Copies of our permits are on site at each sampling event.

The area seined is typically less than 4 feet deep and each site has relatively similar habitat features such as substrate, water depth, current velocity, and vegetation. The small beach seine net measures 80 feet long by 6 feet deep and has 1/8-inch mesh knotless nylon net. The upper side of the net is lined with flotation buoys and the lower side of the net is connected to a leaded line. The net is deployed by two persons holding one end each of the cork line and lead line on the shore, and a person in waders walking the net into the current (if present), by hauling the net in a floating tote and then returning to shore in a semi-circle. The ends of the net are then pulled to shore by the crew, with corks coming in slightly faster than the lead line, until one large pocket forms yielding a catch. The pocket remains in the water while volunteers and staff hold up the cork line so that no fish can escape.

The fish caught in the set are scooped up with small nets or wetted bare hands and placed into buckets or carefully poured into a large tote of seawater if the catch is large. Small pumps that aerate the water (aerators) are attached to the bucket and/or tote to maintain dissolved oxygen levels.

From the buckets and tote, fish are placed a few at a time on a wet measuring board where the species name and fork length are measured then called out to the data recorder. The first 20 fish of each species and their length are recorded on a waterproof data sheet. After the first 20 fish of a species is reached counting continues without measuring the fish.

We are careful during identification that fish are not in contact with bare earth and handled with wetted hands as to not jeopardize survival. After identifying and counting the fish, they are released into the same water that they were captured in.

For quality control measures a random number card is drawn before the survey and written on the data sheet. In the field photographs are taken of the random numbered fish and any others that cannot be identified by a species guide. (Lamb and Edgell, 1986). The quality control photos are taken using a plexiglass “photarium” (a clear plastic viewing box filled with seawater) for identification and photos (Wild Fish Conservancy Northwest, 2011). These photos are then sent to NOAA for quality assurance checks.

For each seine set, the date, time of set, tidal stage, haul time, substrate, vegetation type and fish catch records by species are recorded on the data sheet. After the fish are returned to the water, a member of the crew wades out into the water to measure the deepest point that the net reached. Water temperature, pH, specific conductance, dissolved oxygen, and salinity both at the surface and .5-1.0 meters from the bottom of the area seined are measured with a model YSI Pro Plus using a Quatro Cable with a multi probe system.

The Quality Assurance Project Plan (QAPP) for this project was reviewed and approved by US EPA. Project data is housed in a Microsoft Access database on the Samish server, and are submitted annually to EPA’s STORET online data storage system.

Results

Dungeness crab and shore crab were added to our species count at the request of WDFW in 2017. We did not include these species numbers in our species totals for each of the above sites. Although, numbers of Dungeness crab appear in the graphs.

Juvenile flatfish, sculpins and gunnels can be tricky to identify when they are very small, and it is hard to see their identifying marks.

Juvenile flatfish that could not be identified were labeled as flatfish sp. Juvenile sculpins that could not be identified were called sculpin sp. and gunnels that were unidentifiable were called gunnel sp.

March's Point Survey Sites

March's Point beach seining sites are located on the northwest portion of March's Point, there are 3 sites total in all on oil refinery property which face northwest.

MPS3 beach seining site is the most northern site on March's point



Figure 2: MPS3 located on Northwest March's Point, Skagit County, Washington

March's Point Site 3 (MPS3) is located between two very large docks that stretch far out into the deeper water on March's Point. This site is a natural beach and has not been modified with substrate, we use this as a control site. The upper beach is made up of large woody debris and driftwood, the intertidal area includes cobble, gravel, mixed fine particles with sand and mud visible at low tide. Free floating

Sea lettuce (*Ulva* spp.) and seagrass species (*Zostera marina*) are present at this site in the warmer months.

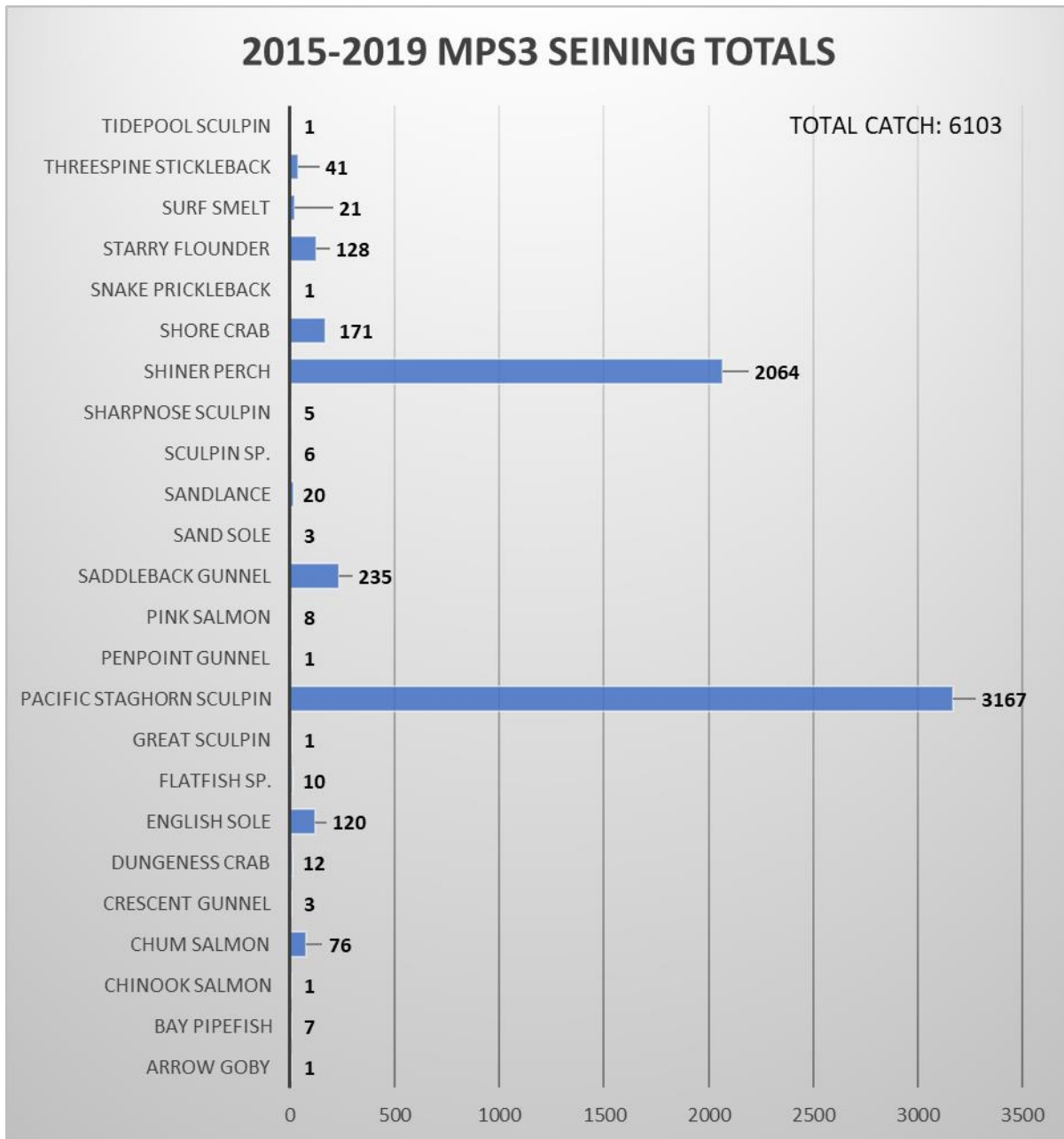


Figure 3. MPS3 total fish and crab populations by species 2015-2019

Between 2015-2019 MPS3 had the highest overall total catch of all 9 beach seining sites with 6,103 fish recorded. This site had 22 different species of fish present. Pacific Staghorn sculpin numbering 3,167 were the species most frequently caught. Shiner Perch made up a significant amount of the total with 2,064 fish. There were 235 Saddleback gunnels recorded which was the most out of all 9 seining sites. A relatively high number of juvenile Chum salmon were caught at this site 76, in comparison to our other

sites. 8 Juvenile Pink salmon were also observed in low numbers along with a single juvenile Chinook. Forage fish caught at this site were 21 adult and post-larval Surf smelt and 20 adult Pacific sandlance.

MPS2 beach seining site is located on northwest March's Point and southwest of MPS3



Figure 4: MPS2 is located on the northwest portion of March's Point, Skagit County, Washington

March's Point Site 2 (MPS2) is located just southwest of the oil refinery boat launch. The upper part of the beach is directly adjacent to March's Point Road and consists of rip rap armoring. The middle beach has been nourished with blown in mixed gravel and sand substrate, but no planting of vegetation has occurred. The intertidal beach substrate is made up of mostly cobble, with some gravel, mixed fine particles, and sand. It is a relatively clean and easy site to seine at higher tides. At lower tide there are more boulders present and very shallow water makes it hard to retrieve fish and get clean water for our buckets.

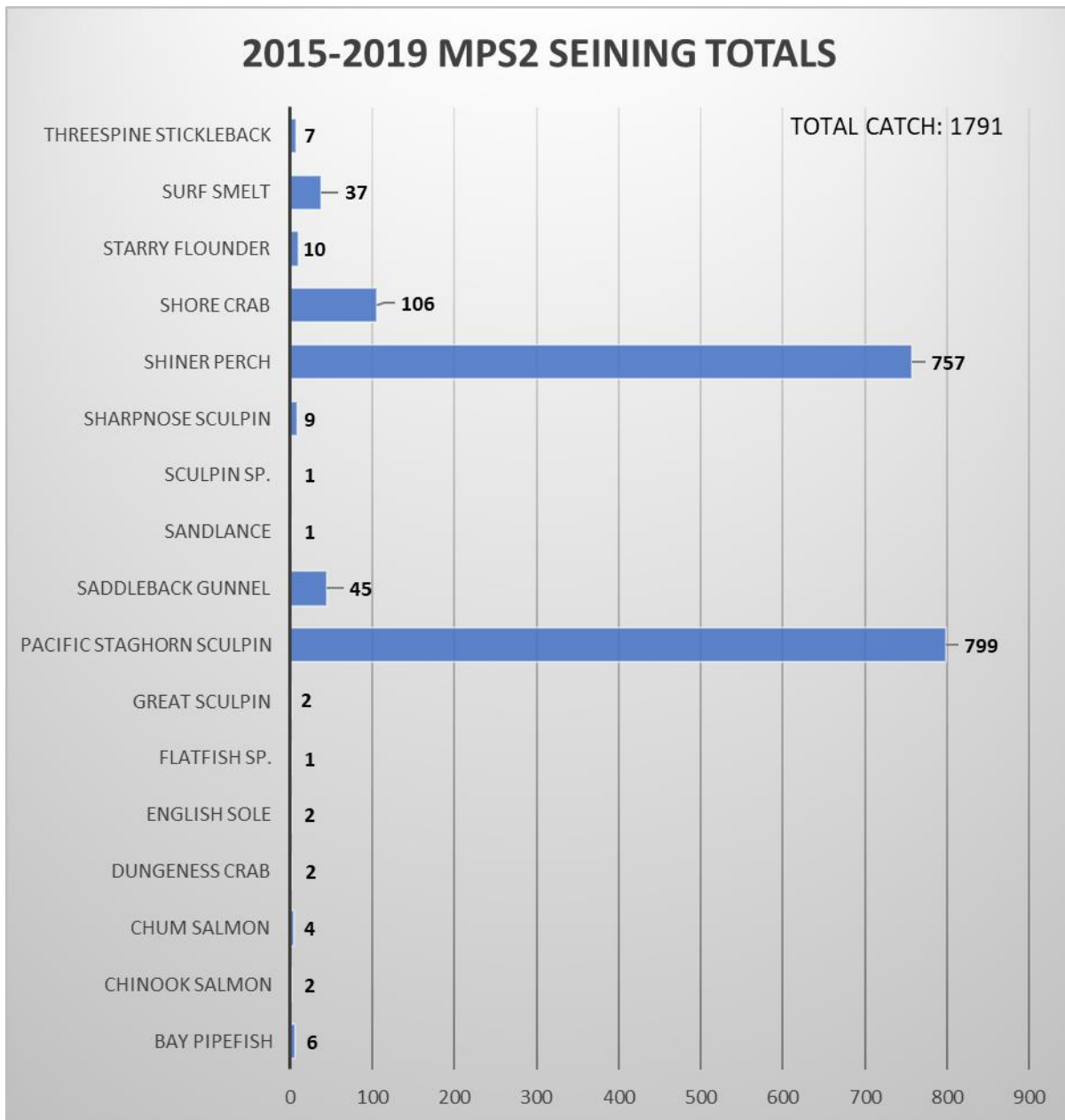


Figure 5: MPS2 total fish and crab populations by species 2015-2019

From 2015-2019 at beach seine site MPS2 1,971 total fish were caught. There were 15 different species of fish recorded for this site. Pacific Staghorn sculpin numbered 799 and Shiner perch at 757 were the most frequently caught fish. Salmon species caught at this site and released were 4 juvenile Chum salmon and 2 Chinook salmon. The forage fish present were 37 adult and post-larval Surf smelt with only one adult Pacific sandlance caught.

MPS1 is located to the southwest of MPS2 and is the most southern site



Figure 6: MPS1 is located on the northwest side of March' Point, Skagit County, Washington

March's Point Site 1 (MPS1) is located to the southwest of MPS2. The upper beach is also directly adjacent to March's Point Road and is made up of driftwood below with rip rap above, the site has been nourished with blown in gravel and sand substrate with no planting of trees or vegetation. The intertidal is made up of cobble substrate with some gravel, mixed fine particles and boulders present in the lower tidal area. It is the most challenging set to make of the three sites because of several boulders hidden under the surface of the water that our net gets caught on. A member of our crew gently lifts the lead line over each boulder, as needed, to continue net hauling, during this time it is possible that fish can escape.

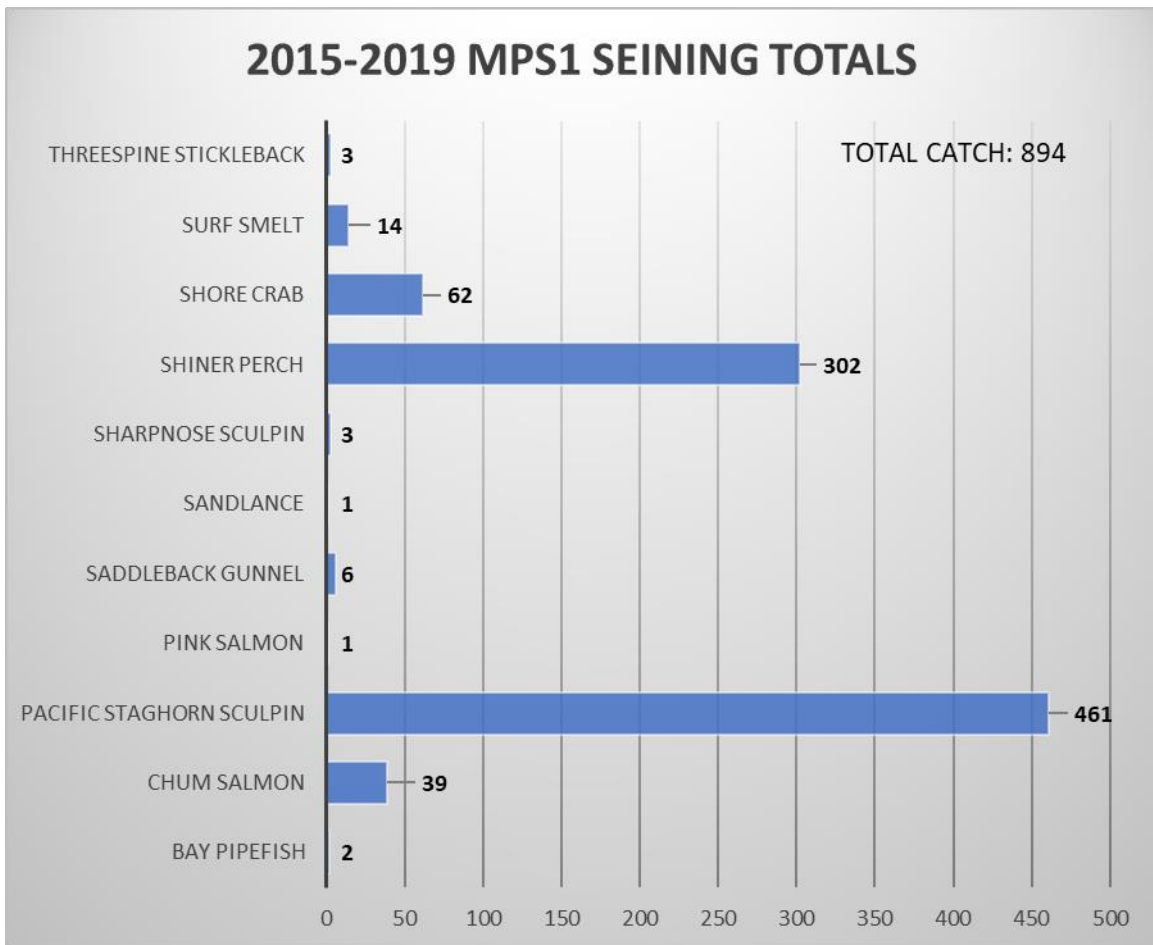


Figure 7: MPS1 total fish and crab populations by species 2015-2019

From 2015-2019 there were 894 total number of fish caught at MPS1 which is the least number of total fish of all the March's Point sites. There was also less variety in species of fish in general. A total of 10 different species of fish were recorded for this site. Pacific Staghorn sculpin were caught most frequently with a total of 461. 39 Juvenile Chum salmon were caught at this site and only 1 juvenile Pink salmon recorded in five years of data. Forage fish caught at MPS1 were 14 adult and post-larval Surf smelt and a single adult Pacific sandlance.

At the three March's Point sites combined, there were 22 different species of fish caught. Of these, there were 3 juvenile salmon species present, Pink, Chum and Chinook salmon, respectively. The forage fish species caught were Surf smelt and Sandlance.

Fidalgo Bay RV Park Survey Sites

The RV park sites are located on Weaverling Spit in the southwest corner of Fidalgo Bay, there are 3 sites total in this area.

The RVS1 seining site is on the Samish owned Fidalgo Bay Resort property



Figure 8:RVS1 located in the southwest part of Fidalgo Bay, Skagit County, Washington

RV Park Site 1 (RVS1) is a natural beach that has not been modified and has trees with shade over the high tide area of the beach. This site is used as our control site. The substrate is mostly made up of cobble with gravel, mixed fine particles, and sand at lower tide. It is a relatively easy site to seine with little change in elevation. It can be tricky to seine at low tide here because the substrate turns to mud and is very shallow water.

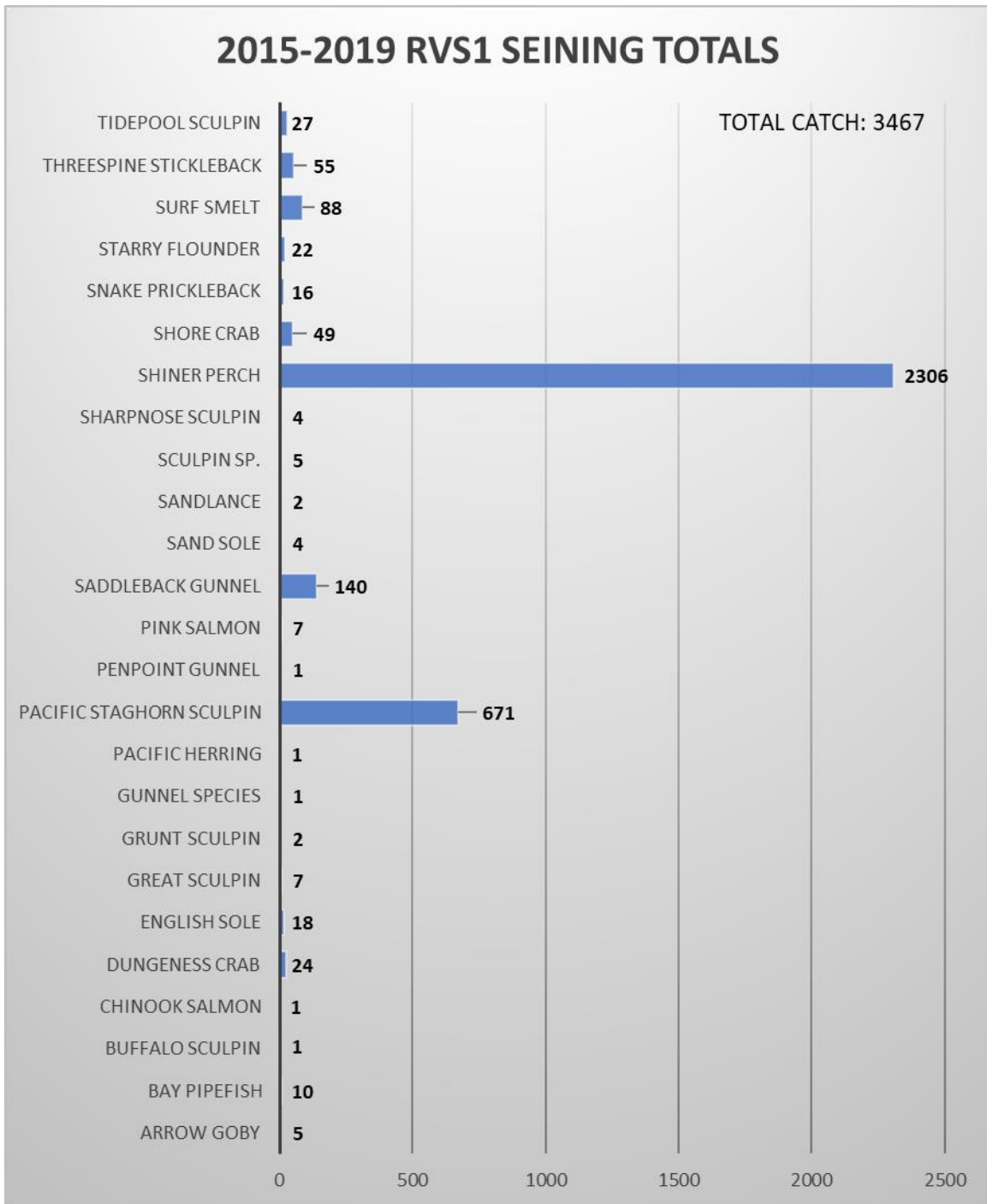


Figure 9: RVS1 total fish and crab populations by species 2015-2019

From 2015-2019 at seine site RVS1 Samish DNR and volunteers caught and recorded 3,467 fish which was just slightly less than site RVS3. There were 23 different species of fish caught at RVS1. Shiner perch were the most caught species numbering 2,306. At RVS1 7 Juvenile Pink salmon and 1 Chinook salmon were caught. 88 adult and post-larval Surf smelt were caught at this site over five years.

RVS2 seining site is at the Samish owned Fidalgo Bay Resort property and northwest of RVS1



Figure 10: RVS2 located in the southwest part of Fidalgo Bay, Skagit County, Washington

The RV Park site 2 (RVS2) seining site is just west of the Fidalgo Bay Resort boat ramp. This beach has undergone a major beach restoration and removal of rip rap in 2017 which was called *Phase 3*. There was a change in the beach profile after restoration with a significant incline on the beach. The restored substrate is made up of cobble, gravel, mixed fine particles, and sand, the latter being ideal for smelt spawning substrate. At this site there is opportunity for public outreach/education with the RV Park guests and families especially in the summer months.

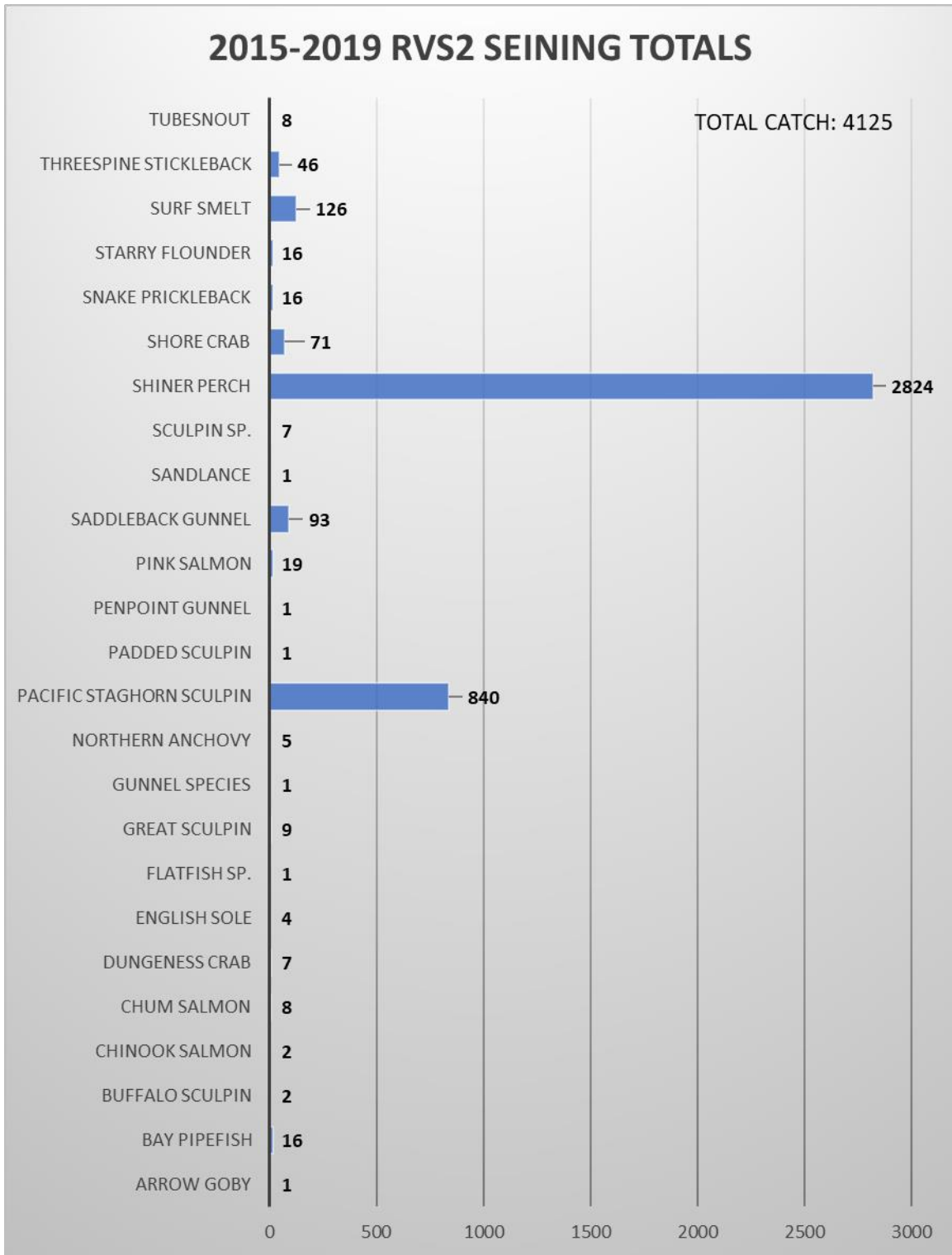


Figure 11: RVS2 total fish and crab population by species 2015-2019

From 2015-2019 the RVS2 seine site showed the highest total of individual fish caught and released out of all 3 RV park sites at 4,125. There were 23 different species of fish recorded for this site matching RVS1 in diversity of fish. RVS2 had the greatest amount of Shiner perch caught of all 9 sites with 2,824. 126 post-larval and adult Surf smelt were recorded. Three species of salmon were caught at RVS2: 2 juvenile Chinook, 8 Chum salmon, and 19 Pink salmon. Two rarely caught species that were caught at this site are 8 Tubesnout and 5 Northern anchovies.

RVS3 seining site is on the Samish owned Fidalgo Bay Resort property and northwest of RVS2



Figure 12:RVS3 located in southwest Fidalgo Bay, Skagit County, Washington

RV Park Site 3 (RVS3) is the western most RV park seine site. This area has undergone a beach stabilization and nourishment restoration project in 2012 called *Phase 2*. The project restored the shoreline along the Tommy Thompson trail that was being impacted by erosion. Native plants and trees were planted in seven beds to provide future shading for the beach and possible habitat for forage fish. Root wads are anchored to the beach at this site, also driftwood has migrated to the upper high-water mark. The intertidal substrate at this site is made up of cobble, gravel, mixed fine particles, and sand.

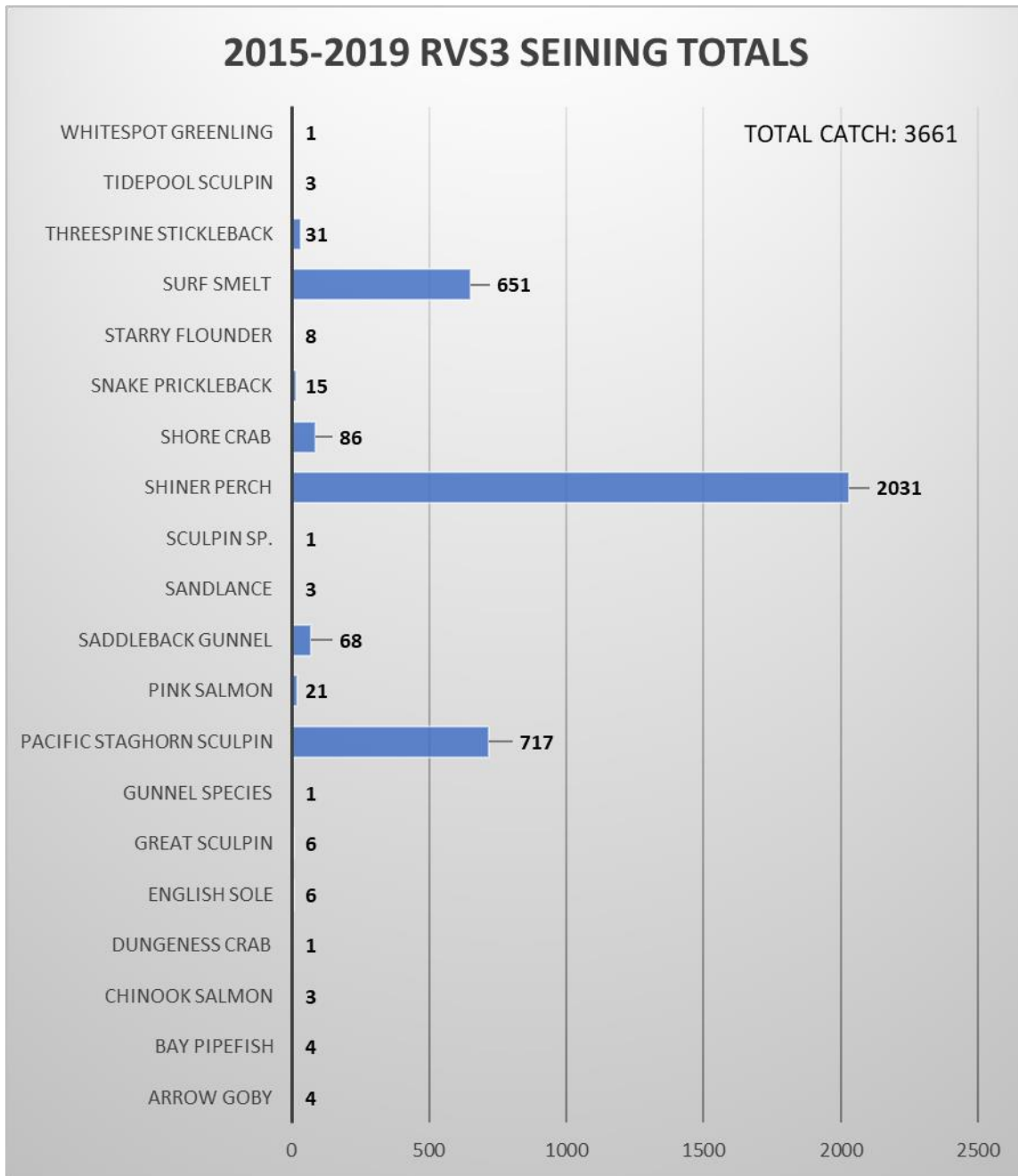


Figure 13: RVS3 total fish and crab population by species 2015-2019

From 2015-2019 RVS3 was in the middle of the three RV park seine sites in terms of overall catch and release at 3,661 fish caught. There were 18 different species of fish caught at this site. Shiner perch were the species most frequently caught in our seining net with 2,031, almost four times as many as the next species. 651 adult and post-larval Surf smelt were recorded in much higher volume than any of the 3 RV

park sites and the most of all 9 seining sites. The rarely caught Pacific Sandlance were present at this site. There were 21 juvenile Pink salmon and 3 Chinook salmon counted here.

At the three RV Park sites, the total number of different fish species was 29. There were 3 salmon species present, juvenile Pink, Chum, and Chinook. Forage fish included Surf smelt, Sandlance, and Pacific herring.

Custom Plywood Survey Sites

The 3 Custom Plywood beach seine sites are located on the west side of Fidalgo Bay.

CPS1 is to the south of the Custom Plywood cleanup area.

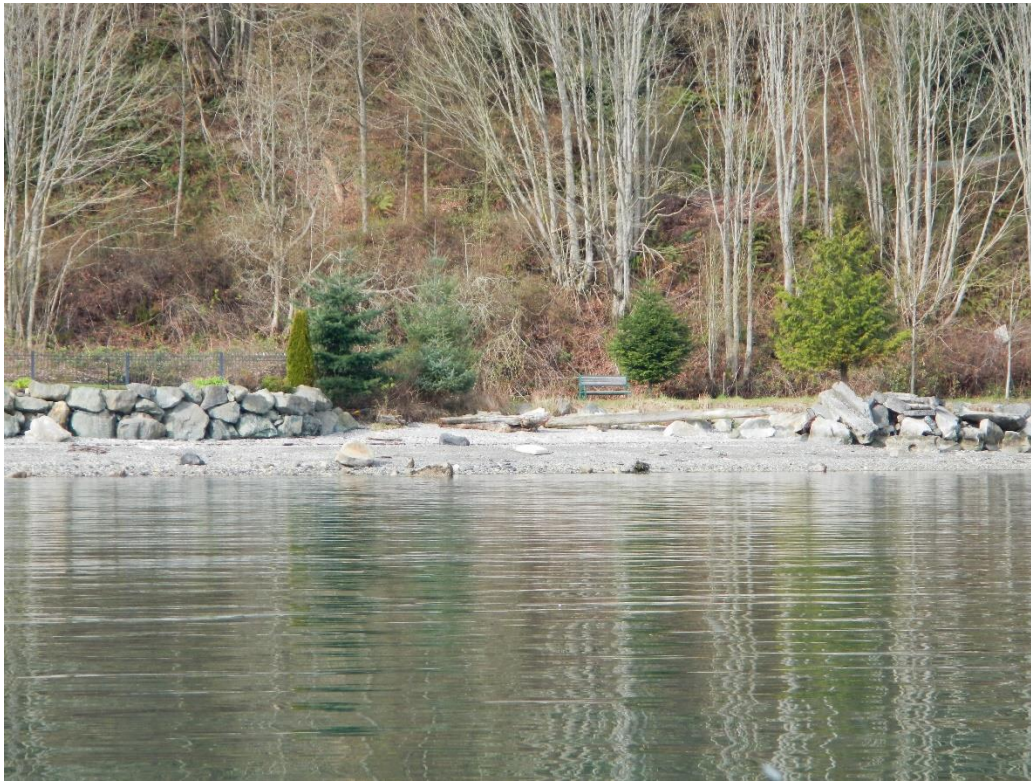


Figure 14: CPS1 located on the west side of Fidalgo Bay, Skagit County, Washington

Custom Plywood Site 1(CPS1) is our control beach for the Custom Plywood beach seine sites and has not been nourished or restored. There is extensive shoreline armoring from a nearby residence and rip rap put in by the city to protect the Tommy Thompson walking trail. The beach is very small with many boulders, the substrate is made up of cobble, gravel, mixed fine particles, and sand. This site is the hardest area to beach seine in Fidalgo Bay, because of the large number of boulders in the water that hang up our net and how little beach area is available to make the seine set at higher tides. This site has opportunity for outreach and education because of the close proximity to the City of Anacortes Tommy Thompson public trail.

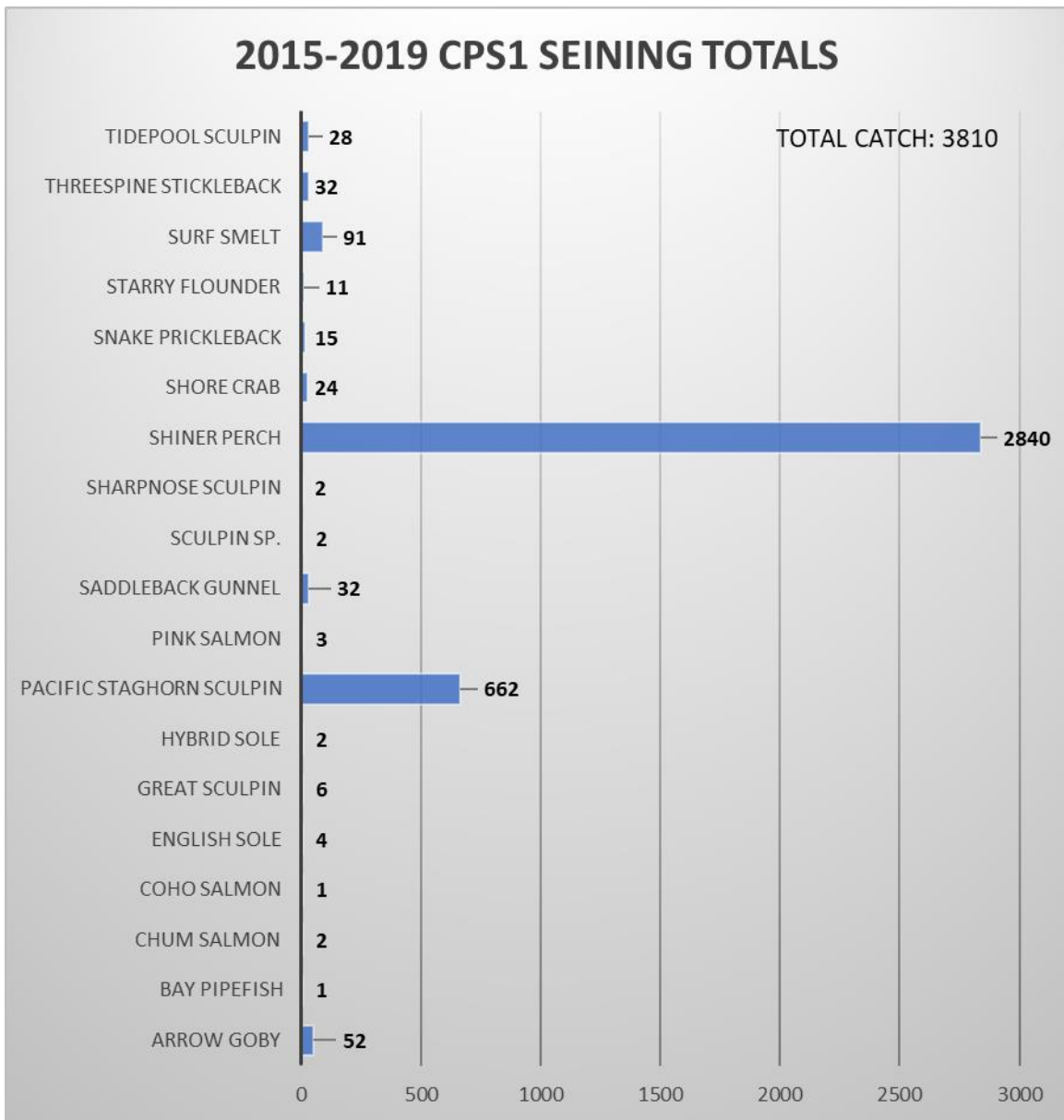


Figure 15: CPS1 total population of fish and crab by species 2015-2019

From 2015-2019 the CPS1 seine site had the highest total catch and release in total fish of the 3 Custom Plywood sites. 3,810 total fish were caught and released at CPS1. There were 18 different fish species present at this site over five years. The most frequently caught species by a wide margin were Shiner perch at 2,840. Juvenile Pink, Coho, and Chum salmon were also present, but caught in very low numbers. A total of 91 post-larval and adult Surf smelt were caught at this site. 52 Arrow goby were also caught. 2 Hybrid sole were caught at this site. A Hybrid sole is an intergeneric hybrid between English sole and Starry flounder.

CPS2 beach seining site is located on the western side of Fidalgo Bay North of CPS1



Figure 16: CPS2 is located on the west side of Fidalgo Bay, Skagit County, Washington

Custom Plywood Site 2 (CPS2) is at the former Custom Plywood cleanup site. This beach has been restored by the Washington Department of Ecology, planting was done, and a jetty built leading out to the east. The substrate is mainly made up of cobble with gravel, mixed fine particles, and sand only at lower tide. Large cobble and some boulders are present on the south side of the beach. There is a lagoon on the north part of the beach that is connected to the ocean at higher tides. This site has a slight elevation profile and there are no boulders in the middle section of beach. The site is extremely exposed to the prevailing southeast wind which can on occasion cancel our beach seine surveys.

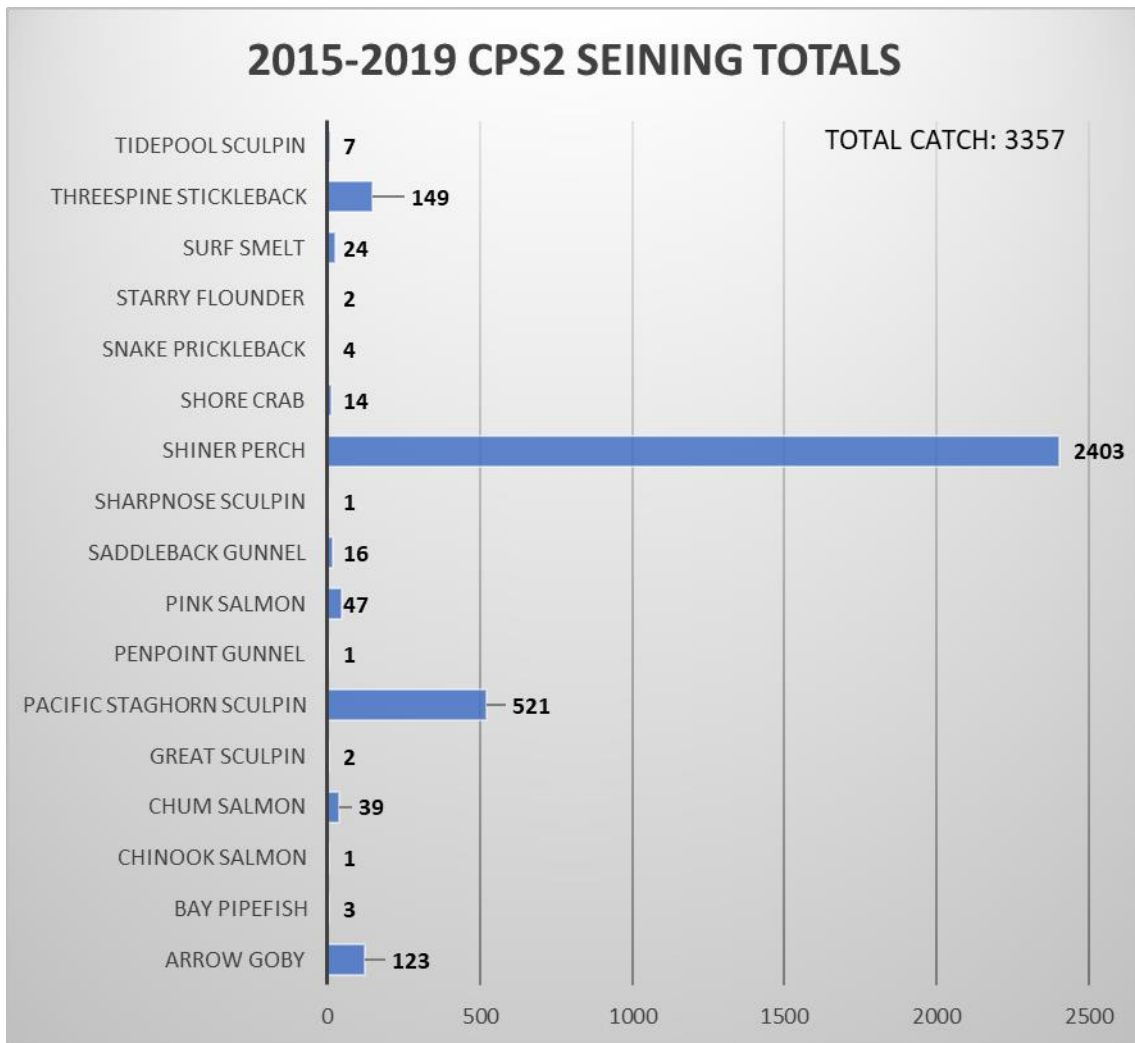


Figure 17: CPS2 total population of fish and crab species 2015-2019

From 2015-2019 the CPS2 site total catch results were 3,357. There were 16 different species of fish caught at this site. The most frequently caught species was Shiner perch at 2,403. 123 Arrow goby were present at this site, which is more than any other beach seine site. A single juvenile Chinook salmon was caught at CPS2, with 39 juvenile Chum salmon, and 47 juvenile Pink salmon. There were 24 Post-larval and adult Surf smelt.

CPS3 beach seining site is the most western site in Fidalgo Bay



Figure 18: CPS3 is located on the west side of Fidalgo Bay, Skagit County, Washington

Custom Plywood Site 3 is a short walk to the north of site CPS2. It is part of the former Custom Plywood site where extensive cleanup and beach restoration occurred by the Washington Department of Ecology. The substrate mainly consists of cobble with gravel, and mixed fine particles. It is a very clean site to beach seine with no boulders and a nice slight elevation profile. This site is also exposed to prevailing southeast wind.

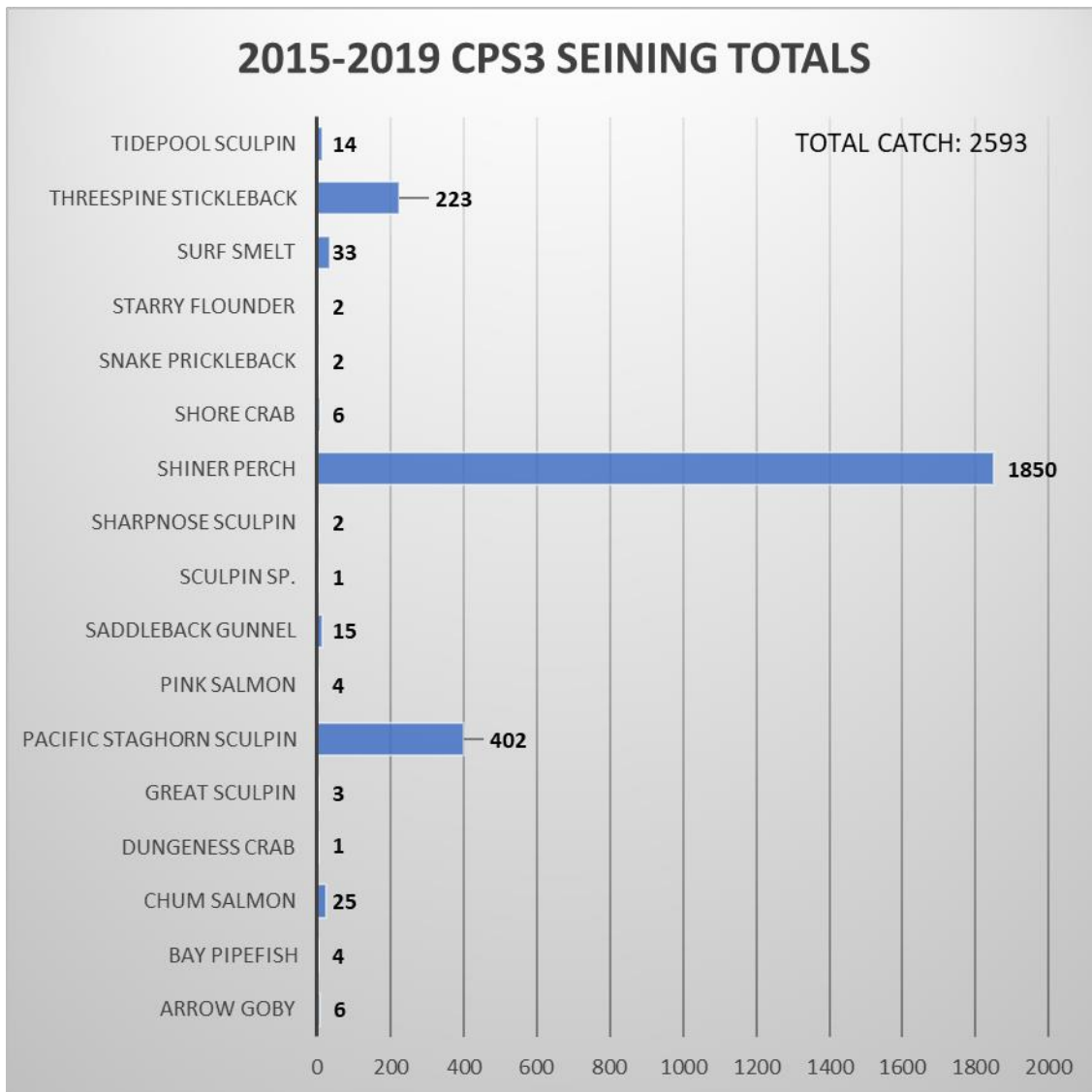


Figure 19: CPS3 total fish and crab population by species 2015-2019

From 2015-2019 there were 2,593 total fish caught at CPS3 seine site, the least amount of the three Custom Plywood sites. At CPS3 there were 15 different species of fish observed. The highest number of individual fish species caught at this site in the five-year period was Shiner perch at 1,850. There were 4 juvenile Pink salmon and 25 juvenile Chum salmon recorded at this site. There were 33 post-larval and adult Surf smelt caught here.

Surveys were not conducted at the three Custom Plywood sites on days where the southeast wind and wave action were too severe. We have found over the years of beach seining that when the wind is too strong, the net collapses from the wind and any fish that are left in the net are stressed and could be harmed by the waves crashing onto the beach. In 2019 we had to cancel two months of beach seine surveys due to weather, there is no data for those months.

The total number of fish species caught at all Custom Plywood beach seine sites was 19. There were 3 juvenile salmon species present, which were, Pink, Chum and Chinook salmon, with many more juvenile Chum caught at CPS2 and CPS3 than at the CPS1 site.

March's Point Site Discussion

March's Point Site 3 (MPS3) beach seine site, which has not been modified, continues to produce the highest total number of fish on March's Point as well as overall study wide. This is largely due to the massive number of juvenile Staghorn sculpin present. Adult Staghorn sculpins seem to love this area and use it as a nursery. Possible reasons for this are as follows: MPS3 is more protected than the other two sites and has more trees for shade. There is more sand substrate accumulating there and vegetation in the form of *Ulva* spp. is also present in the summer months for cover.

When making beach seine hauls at MPS1 lifting the lead line over boulders could be a reason for this site having caught less fish than the others or simply that the fish are just not using this rockier habitat. There is also very little shade at this beach site, and it is more open with less aquatic vegetation for protection.

RV Park Site Discussion

From 2015-2017 our data for the RV park suggested that fish abundance in the natural site without modification from people RVS1 was greater than the restored area. Three years later RVS2 which is a restoration site has surpassed RVS1 our natural beach to become the most productive site for total number of fish and species variety. RVS3 has also surpassed RVS1 in total number of fish. Part of the reason for this increase may be attributed to Surf smelt coming back to the restoration sites in greater numbers. Over the last 2 years the total numbers of fish have decreased at RVS2 post-restoration.

In the last 5 years there seems to be a positive effect on fish populations because of the RV Park beach restoration projects. Most species' totals may be increasing after restoration occurred. Adult Surf smelt catch totals at the three sites revealed that there are many more smelt returning at sites RVS2 and RVS3. Most of the adult Surf smelt were caught in one set in 2019 at each site when a large school of fish swam into the net as we were setting it out. Netting a single large school of fish can have a strong influence on the data, as we have also seen with large schools of Shiner perch. The slope of the beach and substrate created by the restoration provided gravel and small mixed fine particles that are ideal for Surf smelt spawning habitat. A healthy Surf smelt population is valuable as they are a keystone species for salmon recovery with long-term benefits to Southern Resident Orcas. In contrast, numbers of juvenile salmon recorded before and after restoration have remained low.

Additional data analysis is being done to fill data gaps and give a clearer picture of the effects these beach restorations have on fish. We will continue surveying these sites to determine the long-term effects from shoreline restoration.

Custom Plywood Site Discussion

Custom Plywood Site 1(CPS1) which is our control site, has been altered by people and is made up mostly of riprap onshore. It is actually more of an unrestored site which is close to big trees that provide shade. At CPS1 we continue to catch the highest total number of fish out of the 3 Custom Plywood sites. The restoration sites CPS2 and CPS3 are getting closer in total number of fish to the unrestored beach at CPS1. Given more time the Custom Plywood restoration sites could surpass the unrestored beach in number of fish with more growth of plant and animal material.

Surf smelt were the only forage fish present at the former Custom Plywood sites. Surf smelt are historically known to spawn in the rip rap to the south of Custom Plywood restoration site (Penttila, 2007). The substrate at CPS1 is a mix of sand and fine mixed gravel and shell that smelt like to spawn in. A fair amount of post-larval and adult smelt were caught at this site. In time, the restoration sites at Custom Plywood could have more spawning activity once there is more sand and mixed fine particle recruitment. Planting of shade trees could possibly help with the survival of the smelt eggs so they are not in direct sun at these beaches.

There seems to be a positive correlation between beaches that have been restored with an increase in fish abundance and diversity. Why are we not seeing that on the March's Point side? It could have to do with the two March's Point restoration sites being nourished with blown on substrate and not spread out on the beach compared to a full restoration with beach profile, grading, and planting of vegetation for shade and erosion.

Conclusion

Our data previously showed that overall fish abundance in the unrestored areas was greater than the restored beaches. Fish abundance at the RV Park restored beaches have now surpassed the natural beach in total numbers of fish. Custom Plywood restoration sites have passed the unrestored beach in terms of total numbers of fish. The natural beach at the March's Point sites still greatly surpasses the nourished sites in overall total numbers of fish. This trend may indicate that there is a time lag in a restored beach while fish populations repopulate the area. This may be an important consideration in effectiveness monitoring of restoration projects of this type. In the future, we will continue to monitor the restored beaches for changes in species abundance and diversity.

Acknowledgments

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All the many incredibly devoted volunteers and former Samish DNR Staff involved in this project.

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