

SKIPPER SCIENCE PARTNERSHIP • 2024 REPORT •





MISSION

Skipper Science aims to center communities in fisheries management by connecting fishermen and scientists to support resilient fisheries.

Table of Contents

Acknowledgements	6
------------------	---

Partner Statements	7
--------------------	---

Executive Summary 2024 Highlights	9
--------------------------------------	---

Program Staff and Team Members	10
--------------------------------	----

Data Inclusion in NOAA Report	12
-------------------------------	----

2024 Data Summary	13
Marine Mammals	
Fish	
Marine Invertebrates	
Birds	
Other	

Table of Contents

Targeted Research	24
Freezing Spray	

Appendices	
Appendix A: Outreach and Presentations	
Appendix B: Observation Map Statewide	
Appendix C: Observation Maps by Region	
Appendix D: Observation Maps by Species Category	26
Appendix E: Freezing Spray Protocol	

Suggested Citation:

K. Drummond, M. Reda-Williams, H.M. Garcia, B.W. Robson,
L.M.Divine, H. Bauscher. 2024. Skipper Science Annual Report: 2024
Season. Accessible from: www.skipperscience.org/reports

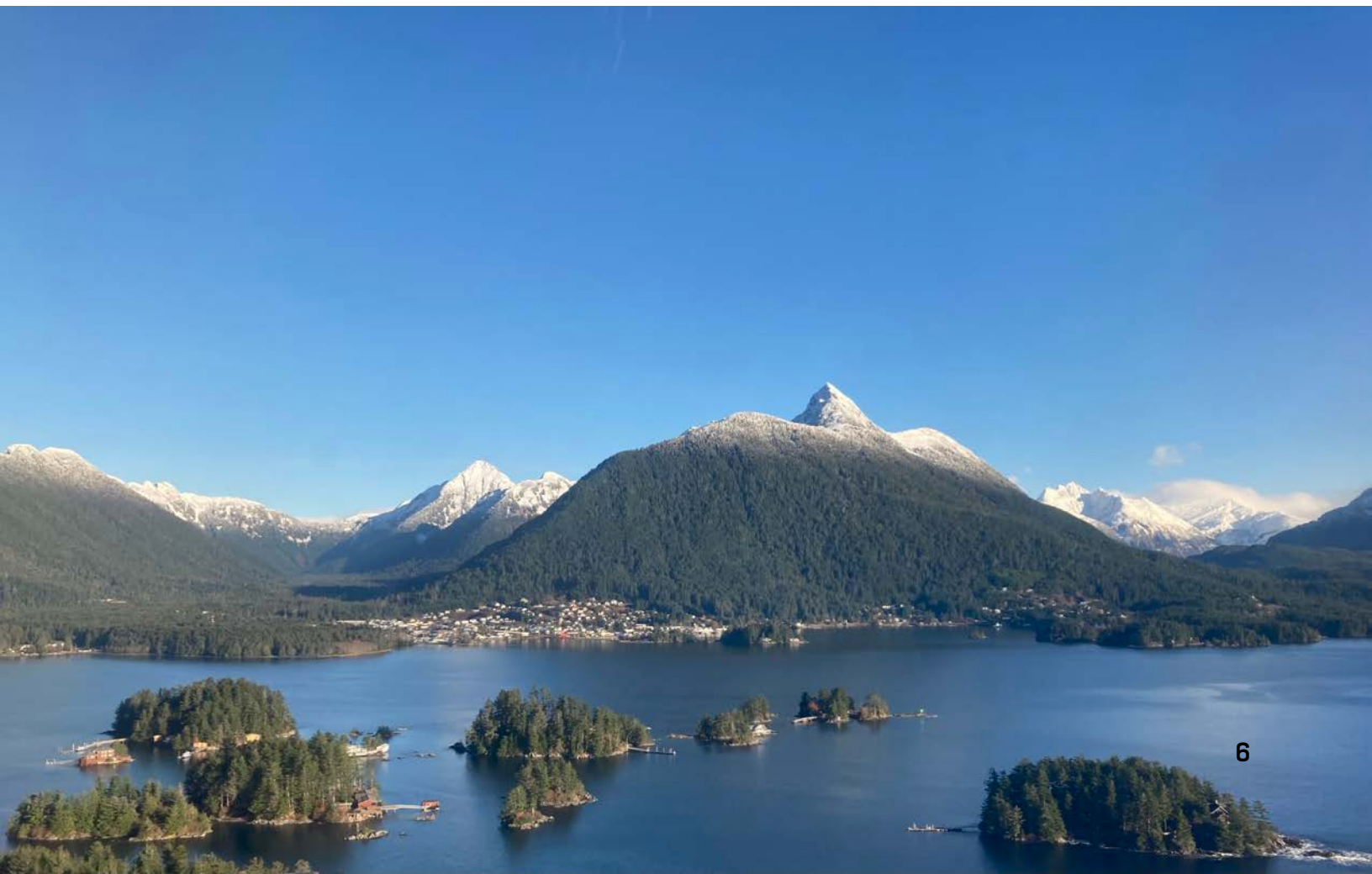


Acknowledgements

The Skipper Science Partnership operates on the lands and waters of Alaska Native People who have and continue to practice Indigenous Science specific to their Peoples that inform their continued stewardship of their Lands and Waters. As a data collection program, we aim to do work that is complementary to Indigenous Science and healthy sustaining fisheries for all.

It is the responsibility of us all to operate with respect and care for the environments that sustain us. As a program focused on fisheries and environmental health, we hope that our data collection efforts can be one piece of fulfilling that responsibility.

We would like to express our deepest appreciation and gratitude to the Skipper Science Partnership community of fishers, individuals, and supportive organizations for making the Skipper Science Partnership what it has become. Without your participation and support, Skipper Science would not exist today.



Partner Statements

Aleut Community of St. Paul Island (ACSPI)

The Aleut Community of St. Paul Island (ACSPI) is a founding partner of Skipper Science. The Skipper Science Partnership is critical to us as an organization because it is an effective way to facilitate the bridging of science, fishermen, and policy-making. We aspire to see Skipper Science have a critically important role in strengthening local voices in ways that facilitate the sustainable management of federal fisheries and achieving equitable conservation of marine ecosystems. Through the Skipper Science Partnership, we implement activities that leverage knowledge and data to enhance collective understanding of the ecological changes occurring in Alaska's waters and develop actionable strategies and policies that prioritize the long-term well-being of communities and vibrant fishing industries. Specifically, we own and operate mobile and web-based apps for data collection; participate in ongoing training and communications with participants; partnership development and developing targeted research programs; fundraising for the sustainability of the program; and conducting outreach and education activities for a variety of audiences. We aspire to create mutually beneficial relationships where all voices are heard, respected, and integrated into the decision-making processes surrounding the management of marine resources. Ultimately, ACSPI's involvement in Skipper Science is driven by our unwavering commitment to the well-being of Alaska Native and fishing-dependent communities, the preservation of cultural connections to fisheries and the sea, and the responsible stewardship of Alaska's marine ecosystems.

Alaska Ocean Observing Systems (AOOS)

The Alaska Ocean Observing System (AOOS) is a pivotal partner in the Skipper Science Partnership, dedicated to providing accurate and reliable coastal and ocean data and information products to the public through collaborative networks and services. AOOS's mission aligns closely with Skipper Science's goal of fostering sustainable management practices and enhancing understanding of ecological changes in Alaska's waters. AOOS actively supports Skipper Science by supporting fundraising efforts, leveraging its expertise in data analysis to provide valuable insights on project outcomes, and playing a crucial role in partnership development. Furthermore, AOOS fosters collaboration by partnering with Skipper Science on planning workshops and educational events, ensuring the dissemination of scientific knowledge and local community perspectives with diverse stakeholders. Through their shared values of environmental stewardship and scientific integrity, AOOS and Skipper Science work together to address the challenges facing Alaska's fisheries and marine ecosystems, striving towards a future of sustainable resource management and thriving coastal communities.

Partner Statements

Aleutian Bering Sea Initiative with the Northern Latitudes Partnerships

The Aleutian Bering Sea Initiative (ABSI) is one of three partnerships comprising the Northern Latitudes Partnerships (NLP), which seeks to sustain Northern lands, waters, and ways of life for generations to come. ABSI's collaborative efforts to support the stewardship of our lands and waters involve various partners, including federal, state, and Tribal governments, and academia, all working towards the common goal of advancing equitable relationships, improving research, and fostering unique solutions to environmental challenges. Through Skipper Science, we support fundraising initiatives, outreach, and education, as well as assisting with partnership development and relationship building between maritime communities and researchers. ABSI's efforts focus on developing science, providing knowledge-sharing opportunities, and crafting partnerships that can address unprecedented environmental changes affecting the Bering Sea and Aleutian Islands. ABSI supports Skipper Science's commitment to the stewardship of our fisheries, guiding our efforts to ensure the sustainable management of natural resources and the preservation of cultural heritage in coastal communities.

SalmonState - Salmon Habitat Information Program (SHIP)

Salmon State's Salmon Habitat Information Program (SHIP) deeply values its role within the Skipper Science Partnership. As a key collaborator, SHIP recognizes Skipper Science as an instrumental platform for centering maritime community voices in scientific research, fisheries management, and policy formulation. Our commitment stems from the belief that Skipper Science is a significant strategy for amplifying local perspectives, thereby fostering sustainable management practices for federal fisheries and ensuring equitable conservation measures for marine ecosystems in Alaska. Our involvement in Skipper Science spans various activities, including assisting in communication strategies, supporting training efforts, fundraising initiatives, and extensive outreach and educational events across coastal communities. By advocating for inclusive decision-making processes, SHIP endeavors to establish mutually beneficial relationships where every voice is valued, contributing to the responsible management of marine resources. Our dedication to the Skipper Science Partnership reflects our commitment to the well-being of Alaska's Native and fishing-dependent communities and the sustainable stewardship of Alaska's marine ecosystems.

Executive Summary

At the start of 2024 the Skipper Science Partnership had three successful years of piloting the Skipper Science Partnership's unique methods of citizen science engagement and data collection within Alaska's fishing communities. In 2024, the program's focuses were to build internal capacity, intentionally grow the direction and vision of that program without losing the momentum of the success of the previous three years, and mobilize the Skipper Science data from 2023 and 2024 for publication and inclusion in management reports. 2024 can be seen as a transitional year and jumping off point for Skipper Science that will inform our evolving focus and direction as a program. The year included internal programmatic work such as; the hiring of a dedicated Skipper Science Program Manager, identifying program areas of focus, strategic visioning, deep data analysis, data collection form review, and further development of an improved software for the Skipper Science app to launch in 2025.

2024 HIGHLIGHTS

- Number of participants/observers signed up: 26
- 1 Targeted Research Project collaborating with industry, scientists, government agencies, and fishermen as partners that provided payment to participating fishermen
- 66 general observation data entries completed in the Skipper Science app
- 9 outreach events and presentations across Alaska and Washington

Program Staff and Team Members



Kelly Drummond

Skipper Science Program Manager
*Aleut Community of St. Paul Island
Tribal Government*



Maya Reda-Williams

Vision and Strategy Lead
*Aleut Community of St. Paul
Island Tribal Government*



Lauren Divine, PhD

Science and Program Advisor
*Aleut Community of St. Paul
Island Tribal Government*



Heather Bauscher

Fisheries Community
Engagement Specialist
*Sitka Conservation Society
& Salmon Habitat
Information Program*



Hannah-Marie Ladd

Administrative and Program Advisor
*Aleut Community of St. Paul
Island Tribal Government*



Bruce Robson

Technical and Science Advisor
*Aleut Community of St. Paul
Island Tribal Government*



Nadine Kochuten

Aleutian Bering Sea Initiative (ABSI)
Coordinator
*Northern Latitudes Partnership &
Alaska Conservation Foundation*

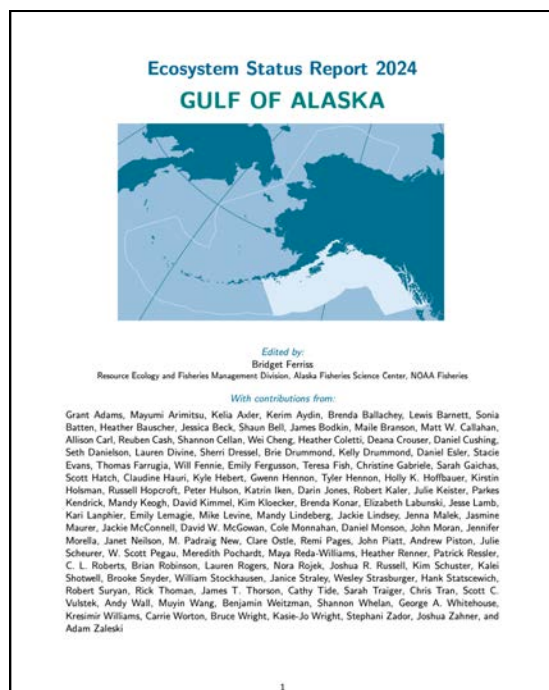


Rachel Lekanoff

Aleutian Bering Sea Initiative (ABSI)
Research Coordinator
*Northern Latitudes Partnership &
Alaska Conservation Foundation*

Skipper Science Data published in the NOAA 2024 Gulf of Alaska Ecosystem Status Report

The Skipper Science team analyzed the citizen science data collected in 2024 and wrote a report based on two themes identified from the data relevant to the Ecosystem Status Report for the Gulf of Alaska: Forage Fish observations and Predator/Prey interactions. Ecosystem Status Reports are produced annually by NOAA Fisheries in each region including Gulf of Alaska, Eastern Bering Sea, and Aleutian Islands and provide climate and ecosystem information to the North Pacific Fishery Management Council (NPFMC), and connect ecosystem research and fishery management. This report was shared with the NPFMC in the December 2024 meeting and signifies a milestone for citizen science recognition in Federal reports and processes.



READ THE FULL REPORT LINKED ON THE SKIPPER SCIENCE WEBSITE.

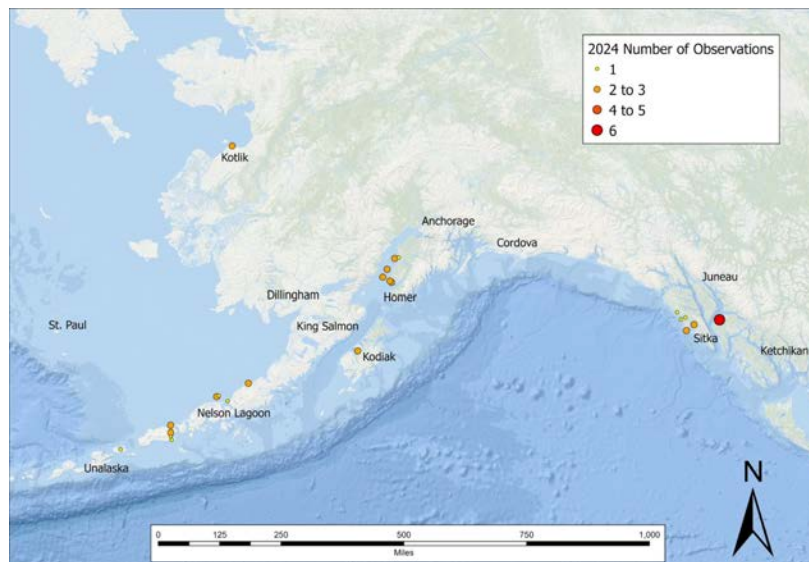
2024 Data Summary

In 2024 there were observations submitted across regions in Alaska including in the Gulf of Alaska, Southeast, and the Aleutian Islands. In total, there were 66 observations submitted through the app. The following sections are organized by larger categories denoting specific species under each category. Some observations hold data on multiple species, which are all counted to make up our total species observations.

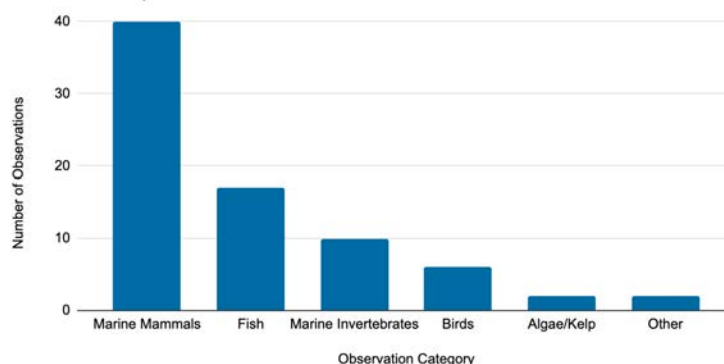
All observations that include photos will be noted with an asterisk. Photos attached to observations are linked [here](#).

Prevalent themes arising from the 2024 data include:

- walrus mortality in the Aleutians
- sea otter numbers and range expansion in Southeast
- interactions between trollers, longliners, and marine mammals (orcas, sea lions, and seals) with comments noting predator prey interactions and fishing interactions
- chinook and chum salmon stomach contents noting forage fish presence
- increase of jellyfish blooms and interactions with gear



2024 Total Species Observations



Marine Mammals

Observation Code	Species	Comments
SSC-47640	Walrus	No Comment
SSC-47641*	Walrus	"2 walruses out in 3-4 foot waves. They dove as boat got near"
SSC-47651	Walrus	"Big ole male just bobbing around alone"
SSC-47652*	Walrus	"...Seeing them from isonaski straight to port haiden."
SSC-47697	Walrus	"Dead beached walrus about .25 miles down the beach another one."
SSC-47709*	Walrus	No Comment

Observation Code	Species	Comments
SSC-47594*	Humpback Whale, Brown Bear	"Dead whale about 7 grizzlies munching on it west side on Dora Harbor south east side of Unimak island . (hard to get a good picture little white thing in the distance)"
SSC-47604*	Humpback Whale	"Seemed smaller. By itself also saw the same killer whale too. Two single whales from different species."
SSC-47653	Humpback Whale	No Comment

SSC-47784	Humpback Whale	The time the whales return to Kake is shifting 2 weeks or so later year after year it seems. Not sure if it's water temperature or the feed they are after. Noticing shifts in their timing
-----------	----------------	---

Observation Code	Species	Comments
SSC-47655	Sea Otter	"General Observation that over time Sea otters are moving in and wiping out all the crab in Sumner strait."
SSC-47696	Sea Otter	"About twelve of them together."
SSC-47737	Sea Otter	"Multiple otters sighted in this observation"
SSC-47740*	Sea Otter	No Comment
SSC-47785	Sea Otter	"Expanding numbers of them around particularly in nearby bays (around Kake), they have really impacted the cockles around. The otters like to eat them and wherever the otters are the cockles get wiped out. Starting to impact places close to town where people would get cockles."
SSC-47817*	Sea Otter	"Dead sea otter on the Magic Island beach in Sitka"

Observation Code	Species	Comments
SSC-47533	Orca	"Killer whales, chasing longline gear."
SSC-47659*	Orca	"Fishing off shore outer coast. Pod of 12-20 killer whales in amongst the troll fleet and then moving towards Salisbury Sound, 2-3 miles offshore from Klokachef. No interactions with the boats. They did some tail slaps though. Adults and young ones, at least 5-7 young."

Observation Code	Species	Comments
SSC-47628	Steller sea lion	"First day of salmon trolling in the Goddard spring troll area. From the moment we put gear in we were being followed at a distance of 50-100 yards by at least one Stellar sea lion. We never caught a fish or had a bite until the sea lions lost interest. I could see them on the depth finder and in our gear waiting to snatch a fish. I've seen this before many times. Certain Stellars have developed a skill set of predating salmon as soon as they strike our gear, before we can run the line the fish is gone...They will either eat the fish under water or surface several hundred yards behind the boat to tear the fish up into bite size pieces or some will surface in front of the bow of the boat... This never happened when I first started trolling back in the early 1980s. In the mid to late 1990s we started having rare instances of this. It got steadily worse since 2000 and is now a daily occurrence."

SSC-47681*	Steller sea lion	“Summer troll season opened on July 1 for all salmon species on the ocean. We observed over 8 days of Chinook trolling a notable number of Stellar sea lions who have developed a skill set for targeting Chinook salmon...we observed daily occurrences of Stellers targeting Chinook...In order to find the Chinook this year we had to go deeper and out further (3-6mi) to 50-60 fa in order to catch. We still had Stellers in our gear every day...Traveling along the beach from Puffin Bay to Cape Ommaney on the south end of Baranof Island we saw 1000s of Stellers. We even witnessed a band of at least Stellers 20 jump into the water and follow us (we didn't put gear in for obvious reasons). We used to fish in this area but it is now impossible...”
SSC-47708	Steller sea lions	“Very good king salmon fishing near the hazy islands. Severe harassment from Steller sea lions on the fleet fishing there. I watched numerous trollers gear get raided. We were constantly running gear and didn't lose any fish to the local mob of sea lions but got checked out by them so many times we lost track. They were obviously running our lines to check for hooked king salmon. This problem has truly gotten worse this year.”

Observation Code	Species	Comments
SSC-47654	Harbor seal	"Seal was picking fish out of my net as soon as they hit. It was probably in the water as I set the net."
SSC-47679	Harbor seal	"2 seals working my net taking salmon out for lunch. One seal removed 4-6 salmon that I could see from the boat."
SSC-47736	Harbor seal	"Two seals working in tandem to pick salmon out of the net. They've been working the net for an hour."
SSC-47513*	Spotted Seal	No Comment

Fish

Observation Code	Species	Comments
SSC-47656*	King Salmon, Herring	Fishing in St John the Baptist Bay. One King Salmon with Herring in its belly.
SSC-47657*	King Salmon, Capelin, Marbled Murrelets	Stomachs of King Salmon full of Capelin. Lots of marbled murrelets around as well in groups of 10 to 20 birds in places. Also saw a group of ancient murrelets with young and an adult diving frequently to get fish. They also are feeding on the capelin. Saw marbled murrelets with capelin hanging from the beaks. Fishing in general vicinity Salisbury Sound to St John the Baptist Bay.
SSC-47658*	King Salmon, Capelin, Herring	One King Salmon with caplin and herring in its stomach. Most had capelin very few with herring. St John the Baptist Bay near Sitka.

SSC-47660	salmon shark	Problems with sharks biting through gear, stealing fish, and taking the whole spread. Sometimes only the snap or part of the line is left. Also had marks from sharks on fish. May have seen a shark fin and movement just under the surface of the water. But uncertain, it was at some distance- don't know what else it could have been. Off shore about 2 to 3 miles out in front of Georgiana (headland-Kruzof Island)
SSC-47661*	salmon shark	Shark predation on the King Salmon we are catching. Hitting the ones on the bottom spread. Just got the tail of this one. Lost two lower spreads of gear too fully taken. Fishing in deep water so wasn't lost to bottom contact.
SSC-47662	Coho Salmon, Krill, Humpback Whale	Coho we caught had krill in its stomach. Also humpback whales around and cloud like band of feed visible on the sounder. Krill present in the area.
SSC-47663	King salmon, salmon, krill, Coho salmon, humpback whale	King Salmon bellies are full of krill. Coho too. At least 3 humpback whales also working the krill near by as we are fishing.
SSC-47762	Rockfish	Rockfish unidentified caught just out front of town
Mobile-47778	Pomfret	Caught two pomfret yesterday. HOT out here!

Marine Invertebrates

Observation Code	Species	Comments
SSC-47608	Sunflower Seastar	"No photo cause we were fishing, but had 2 sunflower sea stars on the line when we pulled up our set line from ocean floor... safely removed them and returned them to water."
SSC-47662	Krill	"Coho we caught had krill in its stomach. Also humpback whales around and cloud like band of feed visible on the sounder. Krill present in the area."
SSC-47663	Krill	"King Salmon bellies are full of krill. Coho too. At least 3 humpback whales also working the krill near by as we are fishing."
SSC-47674	Jellyfish	"Large clouds "smacks" of moon jellyfish around the Baird islands."
SSC-47684	Jellyfish	"The year of 2023 was INTENSE with jelly Fish from cross sound to redfish for certain. It seems to be roughly the same 2024. MAYBE slightly less only time will tell but for certain 40fm to 80fm the jelly fish is so thick a guy has to run gear constantly to keep jelly off the hooks. Seems if you go shallower than 40fm it isn't so bad. Mostly red jelly. I can't say for certain if 100 fm
SSC-47735	Jellyfish	"Large red jellyfish plague from icy point to Cape Ommaney. Jellyfish were so thick in Cross Sound that it made trolling almost impossible. Same of Kruzof Island and Whale Bay. There have always been jellies but the last two years have been noticeably different. The abundance is higher than any of us trollers have ever seen on the ocean."
Mobile-47777	Jellyfish	"Crazy abundance of jellyfish along 50 fathom contour northern SE."
SSC-47818*	Ochre Seastar	"Orange ochre sea star with wasting. Purple ochre sea stars unaffected."

Birds

Observation Code	Species	Comments
SSC-47526	Pacific Loon	A number of loons 20 or more all congregated together with a bunch of murrelets (maybe 50 or so, mostly paired up throughout Fredrick Sound) also large rafts of common murre and both Bonaparte and gracious winged gulls present. Must be forage fish of some kind. From the Sukoi Islands all along horned cliffs towards LeConte glacier.
SSC-47605	Common Murre	Two of them together floating on top of the water. As I came by they dove under.
SSC-47657*	Marbled Murrelets	Stomachs of King Salmon full of Capelin. Lots of marbled murrelets around as well in groups of 10 to 20 birds in places. Also saw a group of ancient murrelets with young and an adult diving frequently to get fish. They also are feeding on the capelin. Saw marbled murrelets with capelin hanging from the beaks. Fishing in general vicinity Salisbury Sound to St John the Baptist Bay.
SSC-47771*	Horned Puffin	Lots and lots, hundreds!

Miscellaneous

Observation Code	Species	Comments
SSC-47607*	Algae - unspecified	New, not usually seen pink/white growth in the rocks along shore. Heavily present in tide pools. Pink when wet, dries to white.
SSC-47738	Bull kelp	No Comment
SSC-47573	Surface Temperature	Water is 37.2 F. Device is under the boat so could be not the surface temp. (6/5/24)
SSC-47739	Surface Temperature	49.9°F (7/28/24)

Youth Engagement: Kake Kids Fishing Derby



For the second year Skipper Science has had the honor and opportunity to be part of an event in Kake called the Kids Fishing Derby. This event is facilitated by the USFS Petersburg Ranger district and both sponsored and supported by a variety of businesses and organizations from Petersburg and Juneau as well as locally, including the Organized Village of Kake. The event is focused on fishing, fun, environmental education, passing on generational knowledge, and encouraging families to spend time together in community with their relatives and neighbors while connecting to the land and resources. Families go out fishing and then bring their catch in to be weighed, identified, and documented. There are multiple categories including most interesting fish. Prizes are given to the winners and all of the participants.

Youth Engagement: Kake Kids' Fishing Derby

The Skipper Science Partnership booth was set up next to the Forest Service Weigh-in Station allowing youth participants to practice logging their catch in Skipper Science. The variety of fish and sea creatures the kids find near town and under the dock can be quite diverse. Our presence in that space also gave us the opportunity to talk to many community members and families about what they have been witnessing around the vicinity of Kake. Many of them shared stories from the past or more recent observations and spoke of trends they have noticed or concerns they have for the future. Opportunities like this one to work directly with youth, listen to what communities members have to share, and build relationships while expanding the reach of this program are invaluable.

A few of the observations logged by youth at the event are included below, as well as a few notes about trends the community has been seeing. These observations can also be seen under sea otter observations and humpback whale observations.

Observation Code	Species	Comments
SSC-47783*	Anemone/Sculpin	Anemone attached to a cockle shell and a sculpin caught over in portage harbor
SSC-47782*	Rockfish	Rockfish unidentified caught just out front of town
SSC-47761*	Dolly Varden/Bullhead	Caught 2 dollys and a big "bullhead" under the dock fishing from shore
SSC-47784	Humpback Whale	The time the whales return to Kake is shifting 2 weeks or so later year after year it seems. Not sure if it's water temperature or the feed they are after. Noticing shifts in their timing
SSC-47785	Sea Otter	Expanding numbers of them around particularly in nearby bays (around Kake), they have really impacted the cockles around. The otters like to eat them and wherever the otters are the cockles get wiped out. Starting to impact places close to town where people would get cockles.

Targeted Research Projects



PROJECT PARTNERS:

- **National Weather Service**
 - Role/Responsibility: Forecasting improvements, ground truthing models, guidance
- **Marine Exchange of Alaska**
 - Role/Responsibility: Outreach, communication with vessels, electronic monitoring
- **Northern Latitudes Partnerships**
 - Role/Responsibility: Outreach, coordination support, funding strategies
- **Alaska Ocean Observing Systems Axiom Data Science**
 - Role/Responsibility: Coordination support, data transfer, data visualization and forecast model support
- **Axiom Data Science**
 - Role/Responsibility: Data visualization and forecast model support
- **Skipper Science Partnership, The Aleut Community of St. Paul Island Tribal Government**
 - Role/Responsibility: Data collection, outreach, community engagement, training

National Weather Service: Freezing Spray

PROJECT HIGHLIGHTS:

- **Two full time participants who were offered \$500 honorarium for contributions.**
- **25 Data points collected including photos, commentary, and quantitative measurements for freezing spray accumulation rates and freezing conditions.**
- **Data uploaded to AOOS Ocean Data Explorer data portal found here: [LINK](#).**
 - **URL: <https://portal.aos.org/?ls=UTpkwo0j#map>**
- **The project will continue for at least another season in 2025.**

PROJECT SUMMARY:

The NWS Alaska and the NCEP Ocean Prediction Center (OPC) are working to improve Freezing Spray Guidance for higher latitude marine areas. Vessel sinkings due to vessel ice accumulation is the leading cause of marine fatalities in Alaska waters. Current techniques used by the Alaska Region NWS and OPC use the Modified Overland and Stallabrass methods or a combination of both to estimate vessel ice accumulation rate per hour. Based upon the forecasted rate, Freezing Spray Advisories are issued in impacted areas. The NWS has received feedback from Mariners that the Overland algorithm may be over-predicting freezing spray in light events, and possibly under-predicting in the most extreme events. The method assumes that the ship is at sea and exposed to freezing spray conditions for a long time without escape.

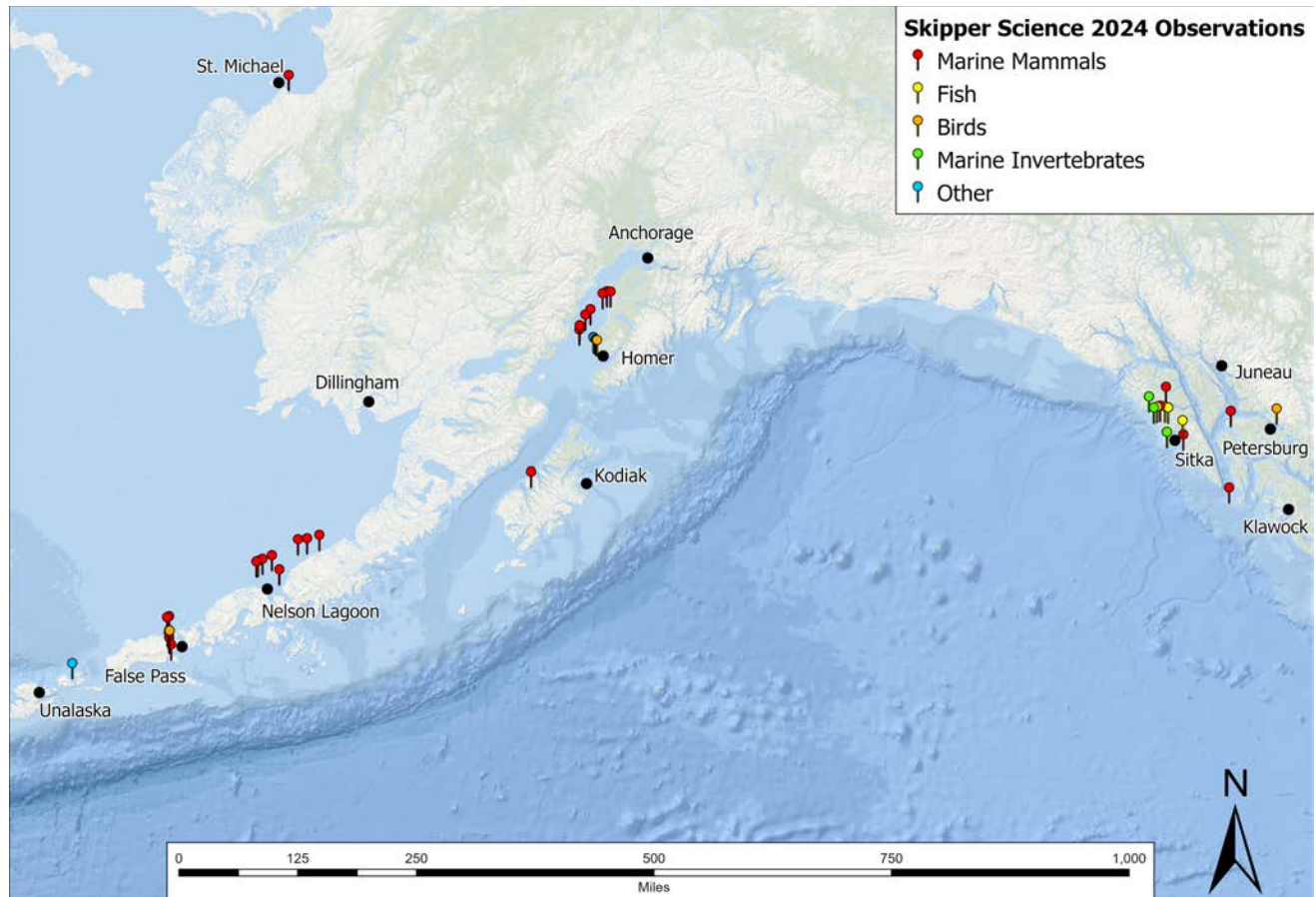
To correct for this a Fetch Factor was developed by Serge Desjardins at Environment Canada, “Fetch Factor applied to Overland freezing spray algorithm” (pdf), to compensate for the fact that Overland does not account for the spray flux availability which, in fact, can be limited near the coast or near the ice edge. Another factor is, the method was largely based on data from the Bering Sea Region. It is unclear how this method works in warmer water areas, such as the Gulf of Alaska. Due to these limitations and the anecdotal evidence from mariners, the freezing spray guidance produced by the NWS may need adjustments and improvements to the algorithms are desired. This project attempts to use observational data collected through the Skipper Science Partnership program for algorithm validation in order to identify possible biases with the main goal of identifying opportunities to improve freezing spray guidance.

Appendix A: Outreach and Presentations

2024 Outreach Activities			
Event	Date	Location	Engagement Type
Marine Resources Education Program	February 26-March 1	Kodiak	Presentation
Western Alaska Interdisciplinary Science Conference	April 2-4	Nome	Presentation
ComFish	April 11-13	Kodiak	Panel Discussion
AOOS Board Meeting - Reporting on Freezing Spray Forecasting Project	April 25, 2024	Anchorage	Presentation
MayFest	May 16-19	Petersburg	Booth
Kake Kids Fishing Derby	August 2	Kake	Booth
Pacific Marine Expo	November 20-22	Seattle	Expo Attendance and Networking
NOAA Alaska Fisheries Science Center	November 21	Seattle	Presentation
Alaska Sea Grant All Hands Meeting	December 18	Virtual	Presentation

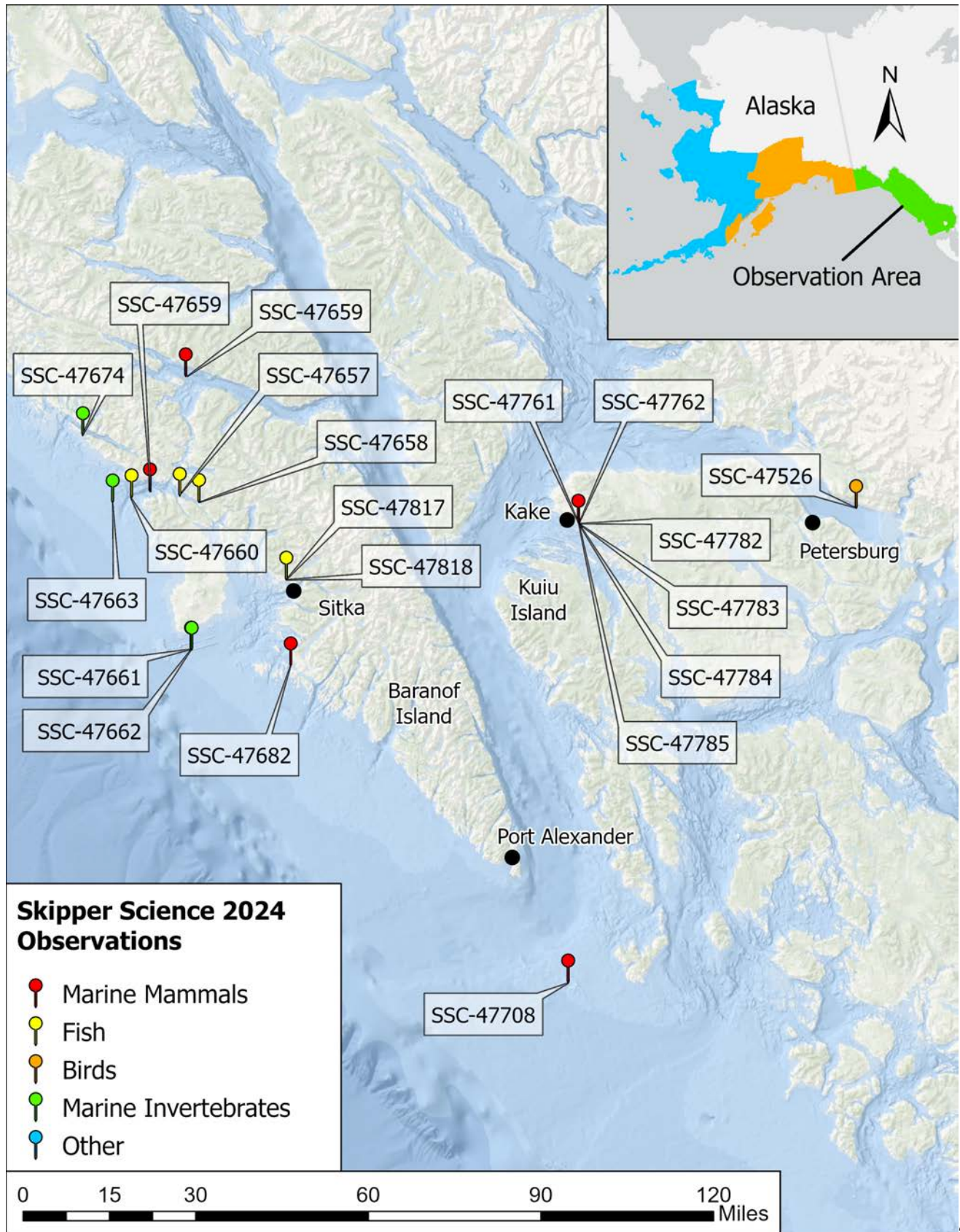
Appendix B: Observation Map Statewide

2024 Statewide map all observations



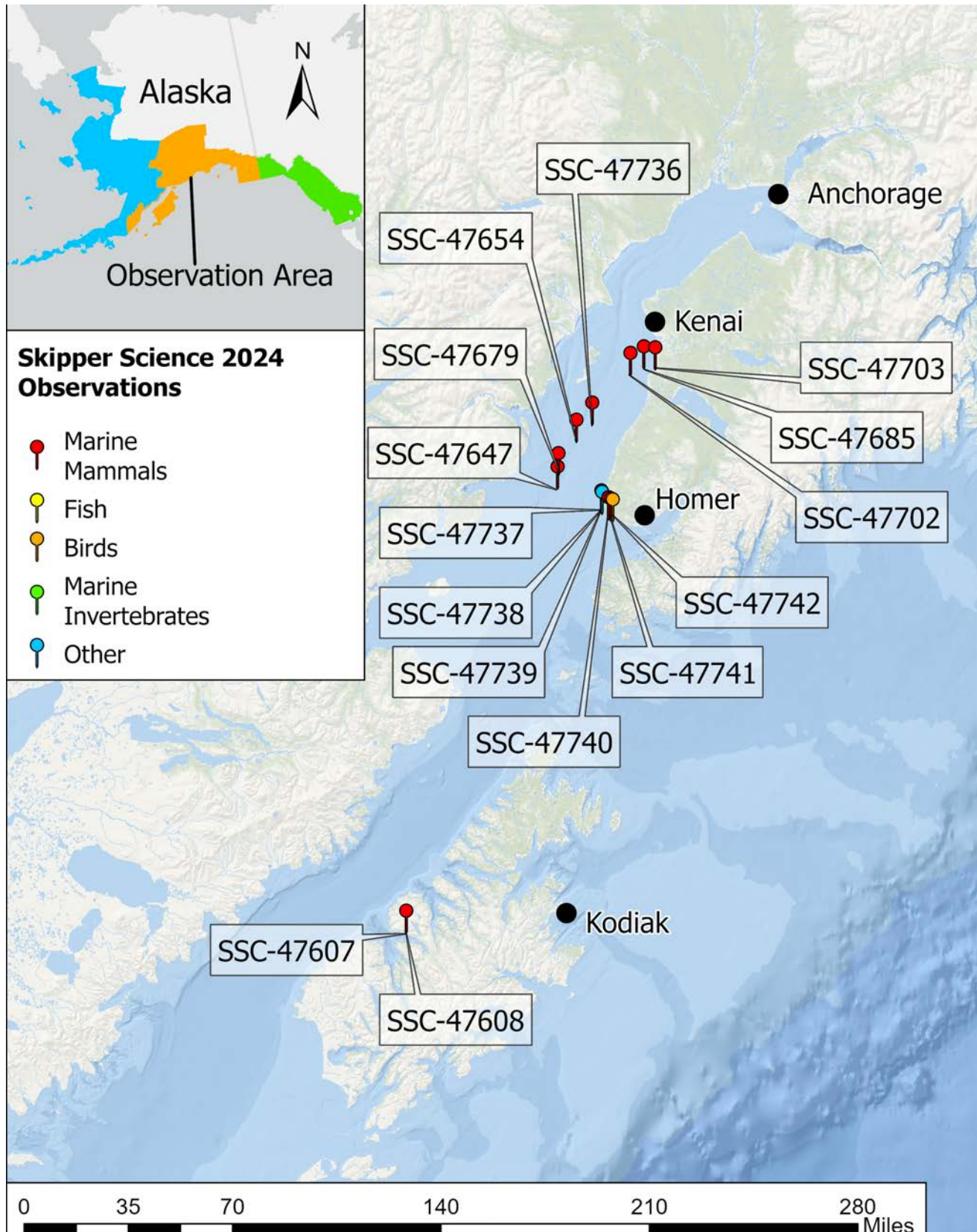
Appendix C: Observation Maps By Region

Total regional observations: Southeast



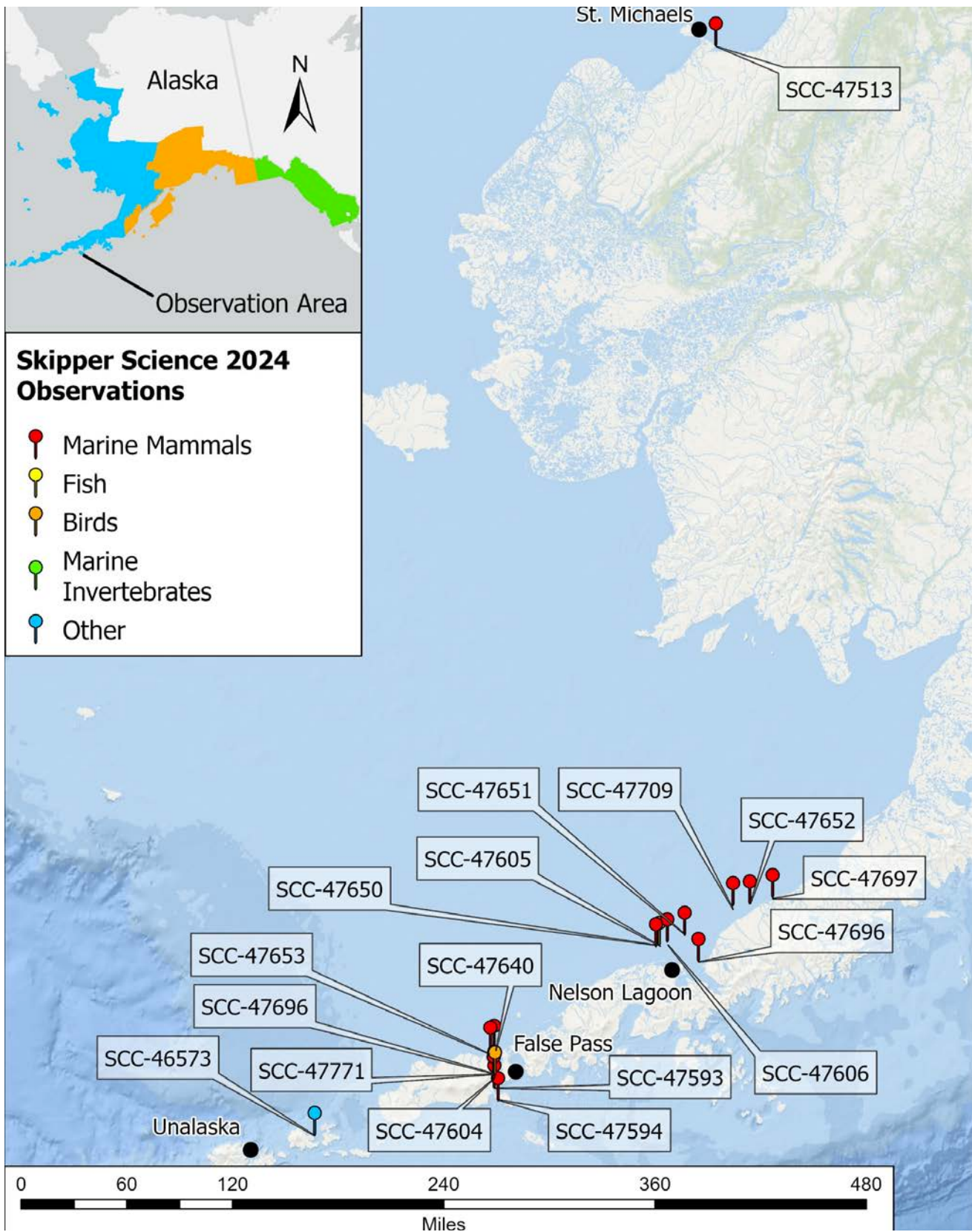
Appendix C: Observation Maps By Region

Total regional observations: Gulf of Alaska



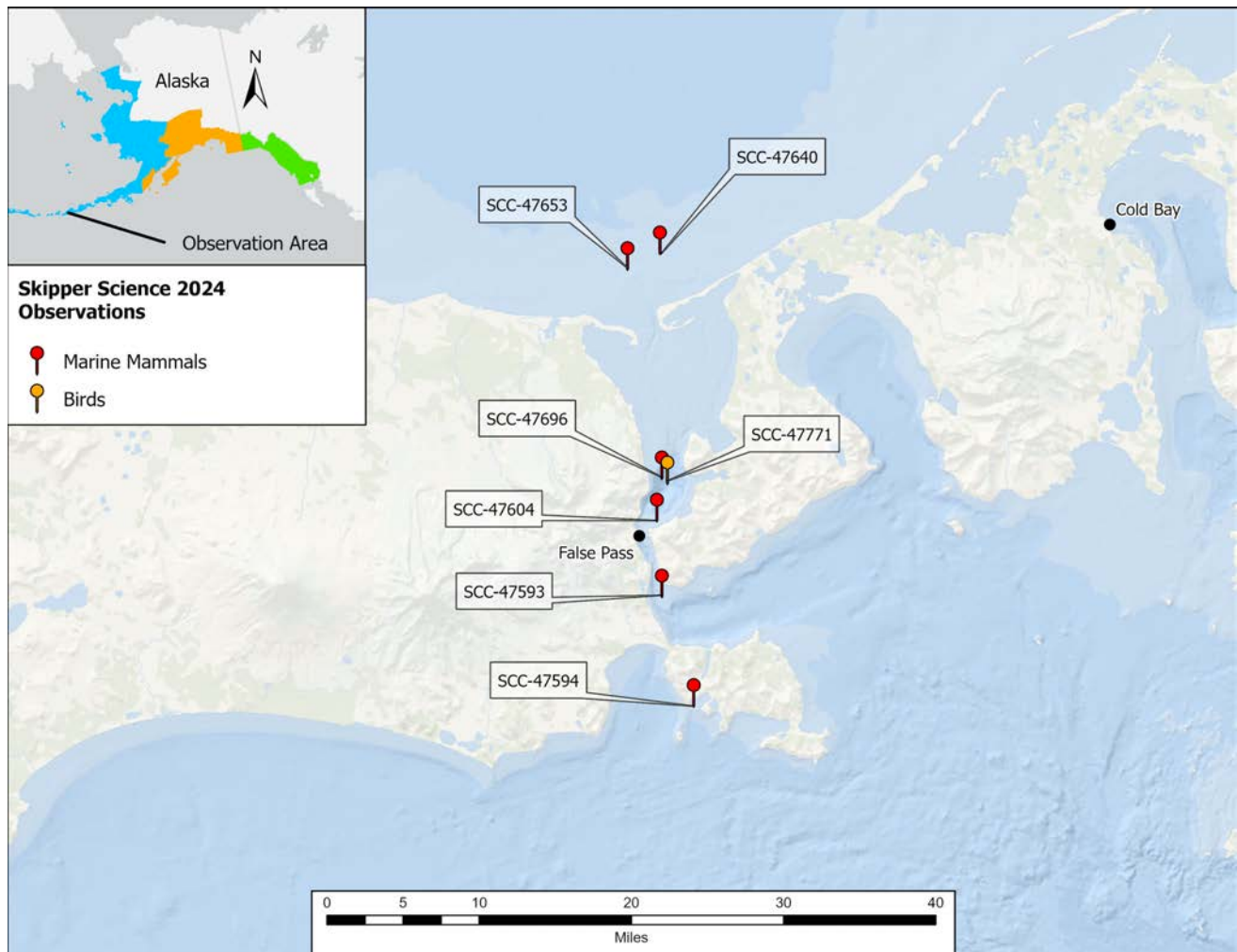
Appendix C: Observation Maps By Region

Total regional observations: Aleutians/Bering Sea



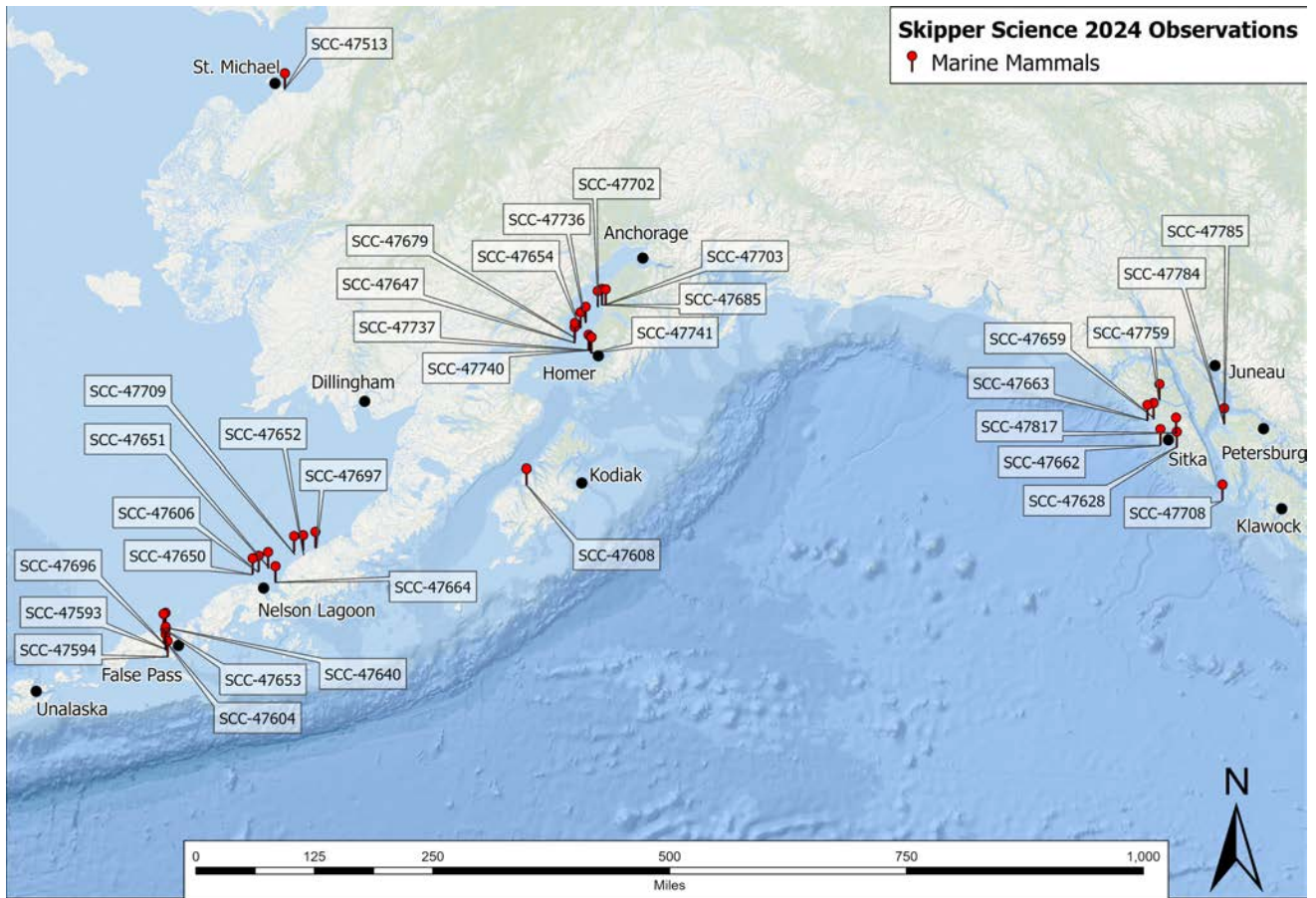
Appendix C: Observation Maps By Region

Aleutians zoom in: False Pass



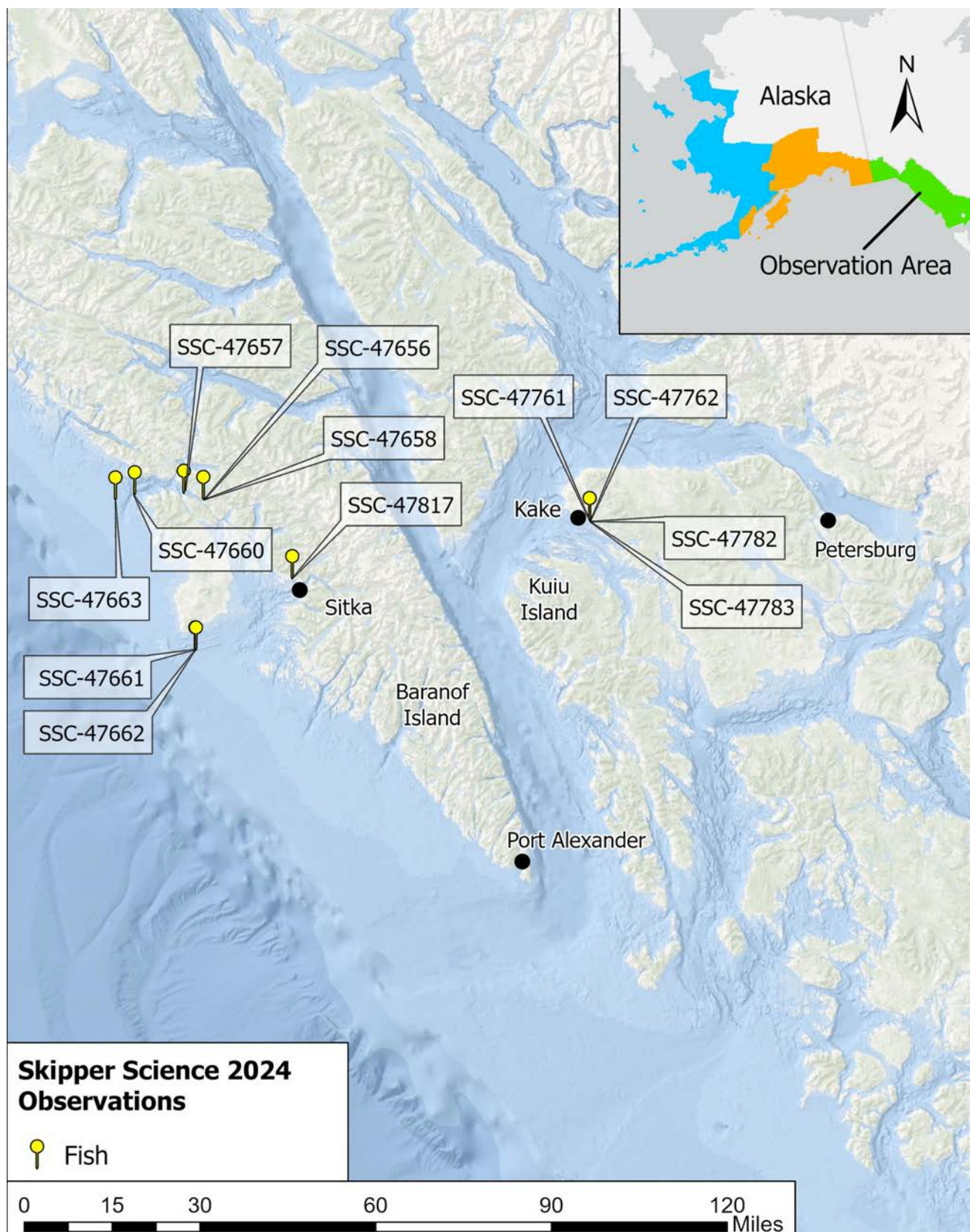
Appendix D: Observation Maps by Species Category

2024 observations: marine mammals



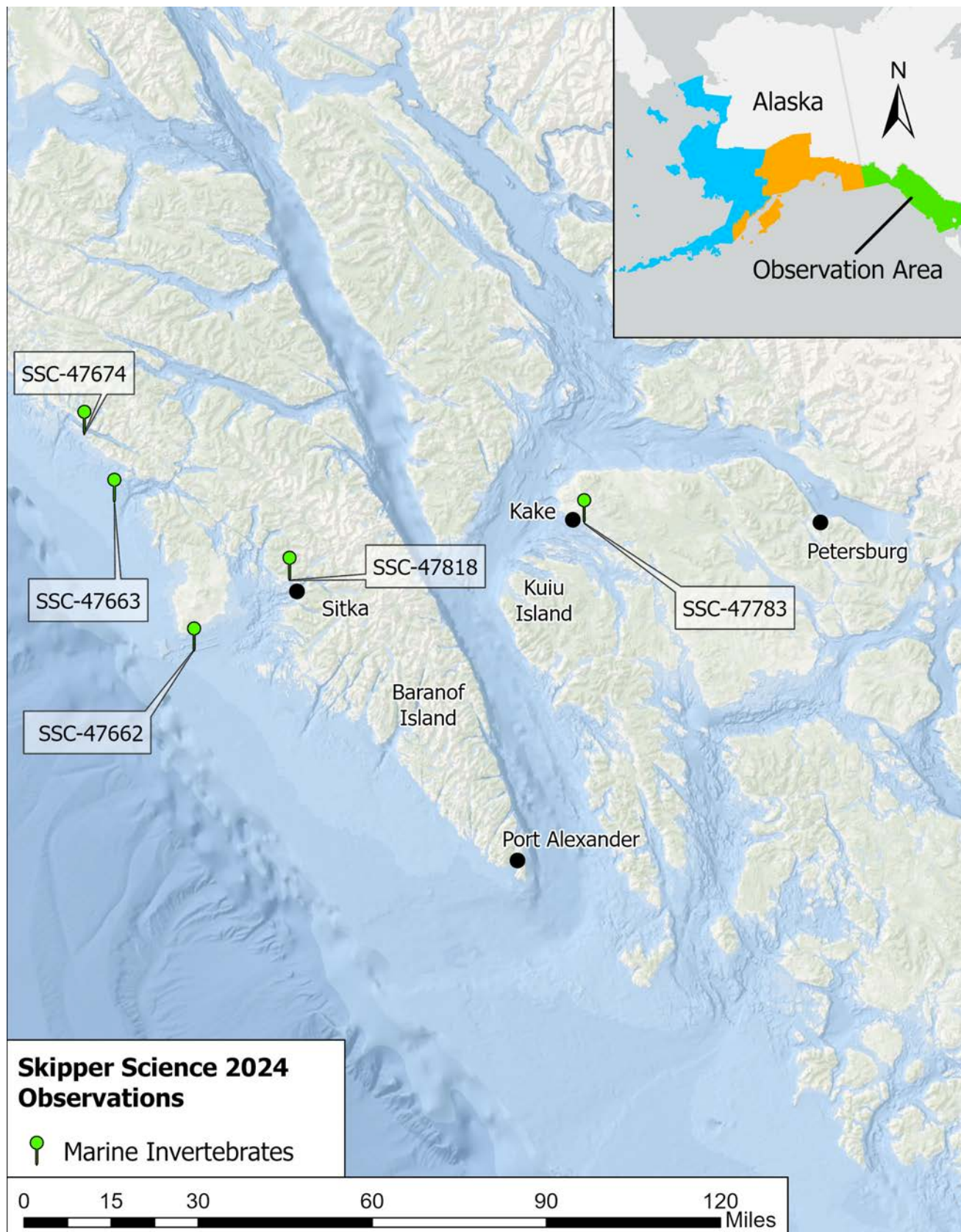
Appendix D: Observation Maps by Species Category

2024 observations: fish



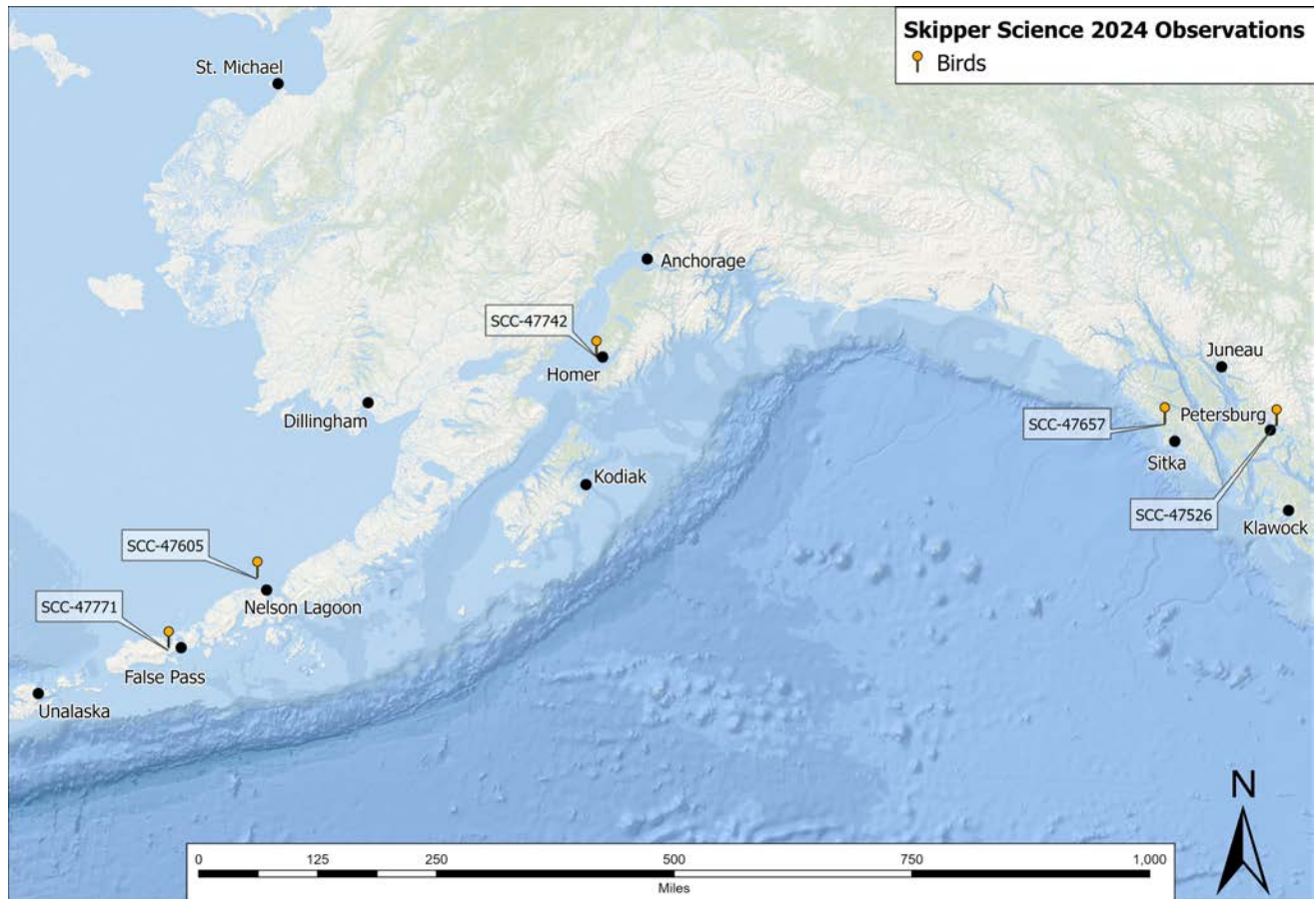
Appendix D: Observation Maps by Species Category

2024 observations: marine invertebrates



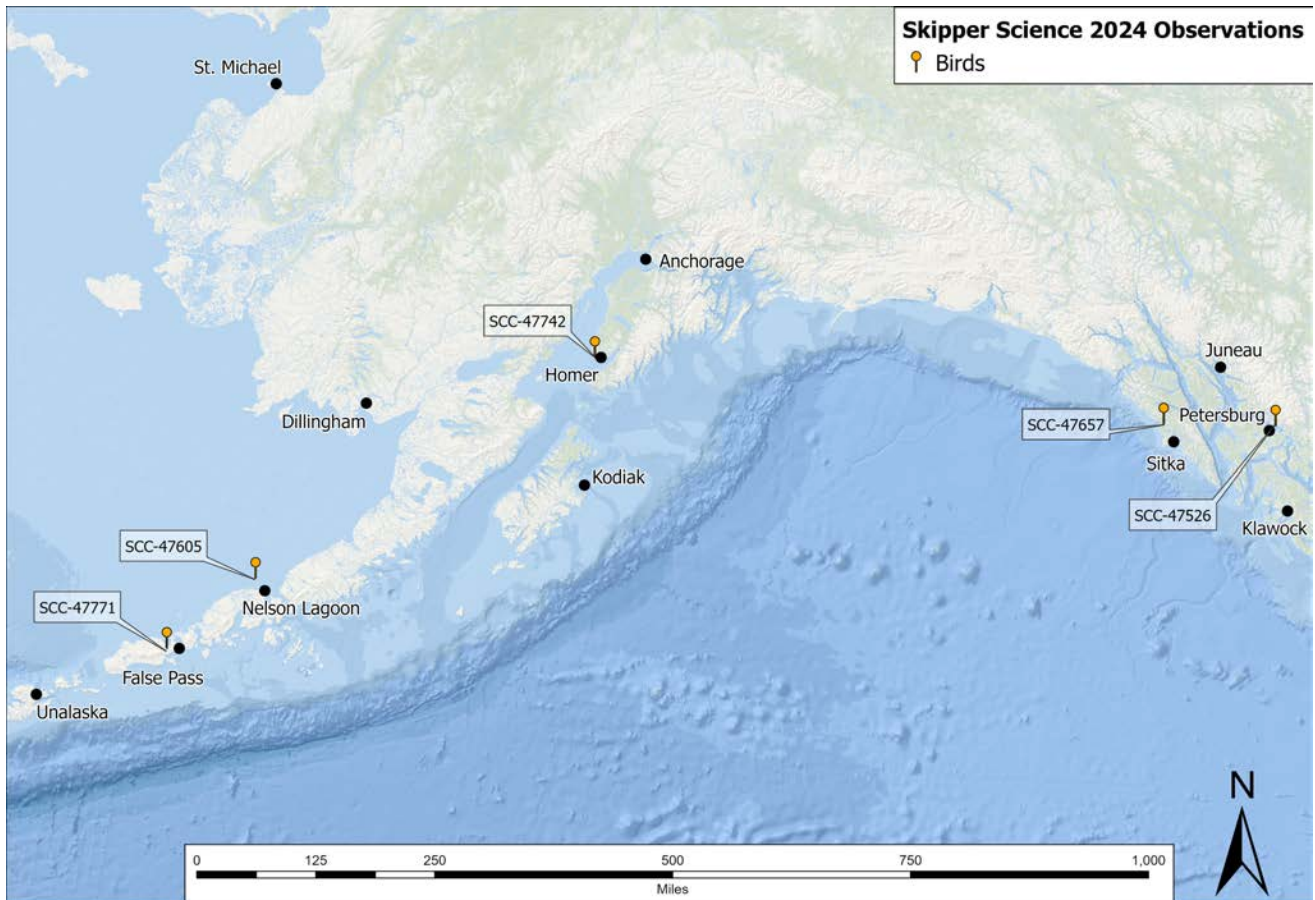
Appendix D: Observation Maps by Species Category

2024 observations: birds



Appendix D: Observation Maps by Species Category

2024 observations: other



Appendix E: Freezing Spray 1-Pager

FREEZING SPRAY FORECASTING PROJECT

PROJECT COLLABORATORS:

- Skipper Science Partnership via Aleut Community of St. Paul Island Tribal Gov.
 - Role/Responsibility: Data collection, outreach, community engagement, training
- National Weather Service
 - Role/Responsibility: Forecasting improvements, groundtruthing models, guidance
- Marine Exchange of Alaska
 - Role/Responsibility: Outreach, communication with vessels, electronic monitoring
- Northern Latitudes Partnerships
 - Role/Responsibility: Outreach, coordination support, funding strategies
- Alaska Ocean Observing Systems // Axiom Data Science
 - Role/Responsibility: Coordination support, data transfer, data visualization and forecast model support (?)



PROJECT SUMMARY

The NWS Alaska and the NCEP Ocean Prediction Center (OPC) are working to improve Freezing Spray Guidance for higher latitude marine areas. Vessel sinkings due to vessel ice accumulation is the leading cause of marine fatalities in Alaska waters. Current techniques used by the Alaska Region NWS and OPC use the Modified Overland and Stallabrass methods or a combination of both to estimate vessel ice accumulation rate per hour. Based upon the forecasted rate, Freezing Spray Advisories are issued in impacted areas. The NWS has received feedback from Mariners that the Overland algorithm may be *overpredicting* freezing spray in light events, and possibly underpredicting in the most extreme events. The method assumes that the ship is at sea and exposed to freezing spray conditions for a long time without escape.

To correct for this a Fetch Factor was developed by Serge Desjardins at Environment Canada, [Fetch Factor applied to Overland freezing spray algorithm \(pdf\)](#), to compensate for the fact that Overland does not account for the spray flux availability which, in fact, can be limited near the

Appendix E: Freezing Spray 1-Pager

coast or near the ice edge. Another factor is, the method was largely based on data from the Bering Sea Region. It is unclear how this method works in warmer water areas, such as the Gulf of Alaska. Due to these limitations and the anecdotal evidence from mariners, the freezing spray guidance produced by the NWS may need adjustments and improvements to the algorithms are desired. This project attempts to use observational data collected through the [Skipper Science Partnership](#) program for algorithm validation in order to identify possible biases with the main goal of identifying opportunities to improve freezing spray guidance.

SCOPE AND OBJECTIVES

Focus will be on ground-truthing and gathering data to improve forecasting of freezing spray events in the Bering Sea and Gulf of Alaska.

Building from the Indigenous Sentinels Network (ISN) platform and its catalog of smartphone apps, Skipper Science program will deliver much-needed observational data from remote locations relative to rapid changes in ecosystems, fisheries, and species of concern. Alaska Marine Exchange will also support in the coordination and communication with vessels out at sea, and advise on the use of electronic monitoring equipment for data collection. Importantly, the data collection tools and programs will also build relationships and trust between the fishing industry and scientists/managers to address weather forecasting challenges driven by rapid and accelerating climate change in Alaska. Specifically, our objectives are to:

1. Establish a community-based monitoring program that helps determine, gather, and deliver relevant existing environmental and ice observation datasets to NWS to improve their Freezing Spray Guidance.
2. Systematically leverage the unique expertise and observations of individuals working within commercial fisheries across remote regions to enhance the understanding of the rapid climate-driven changes occurring in this region; specifically related to freezing spray
3. Demonstrate a model of collaborative science that shows how industry can work in mutually beneficial cooperation with managers and scientists on environmental issues challenging Alaska.
4. Assist scientists with identifying adjustments and improvements to the algorithms that predict freezing spray events and enhance safety during maritime operations.

Appendix E: Freezing Spray Protocol

The protocol was shared with participants as part of their training and onboarding to the project.

Skipper Science Freezing Spray Protocol

Draft 5 November 2024

How to download the app?

Use this QR code to find the app at the Google Play or Apple App Store:

Apple App Store



Google Play Store



- Go to the Google Play store or the Apple App Store on your phone and search for "ISN Skipper Science". The app is available for download on both iOS and Android devices.
- IF you have already signed up online or you already have an account then sign into the app with your username and password, and start recording data!
- IF you don't have an account, then walk through the steps to "Create a new account" and create a username and password to log in.

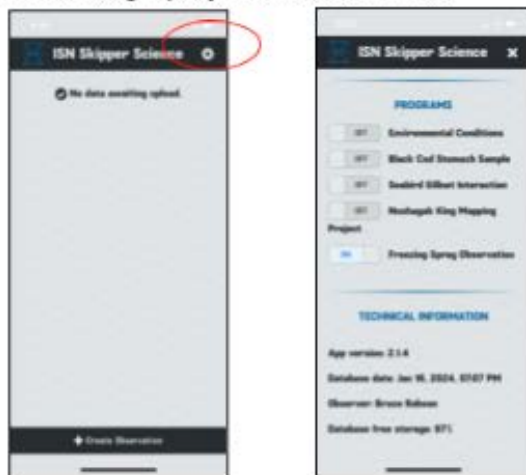
How do you register for the program?

Step One: Create an account or log in to your account in the ISN Skipper Science app.

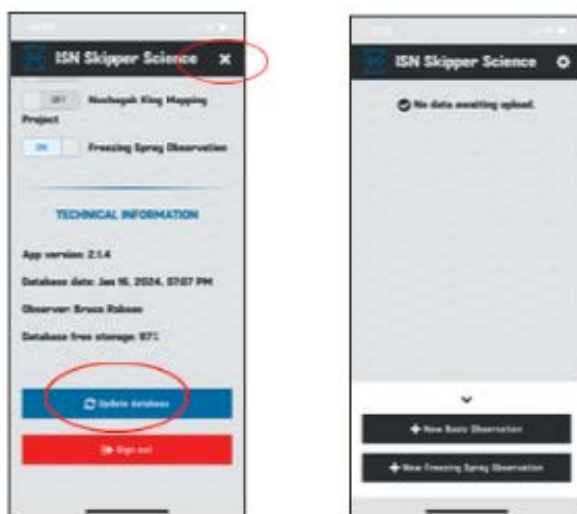
1. Simply download the "ISN Skipper Science" app and walk through the open-sign-up process. **This is the best option.**
 - Once you download the app you will have the option to create a new account by walking through guided steps to set up your account.
 - If you have any issues email info@skipperscience.org

Step Two: Activate the "Freezing Spray" Program to begin to log observations.

- Once logged into the Skipper Science App, go to "Settings" by clicking the gear wheel in the upper right hand corner. Scroll down to the "PROGRAMS" section and toggle on the Freezing Spray Observation form:



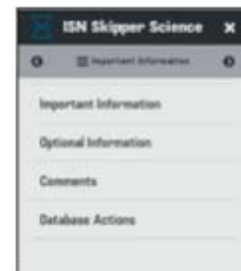
- If you do not see the option for the **Freezing Spray Observation** form please scroll down to the **TECHNICAL INFORMATION** and click the **Update Database** button:



- Then go back to the home page by clicking the "X" in the upper right hand corner. When you click **Create Observation** at the bottom you should now see the option to add a **New Freezing Spray Observation**.

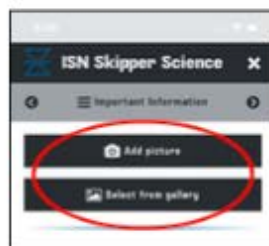
When to log a Freezing Spray Observation?

- The primary goal of the Freezing Spray pilot project is to evaluate and improve the algorithms used by the NWS to make freezing spray forecasts. This means that it is important to **log freezing spray observations when you are experiencing freezing spray conditions during the period covered by an NWS weather alert**. It is also important to note that observations related to freezing spray are also valuable if observed outside of the time window of an NWS alert.
- When you go to record your first observation, click “+ Create Observation” and select the “+ Freezing Spray Observation” button:
- When you go to record data, the first page will be the “Important Information” page. You can navigate between pages using the middle bar or the right and left arrows in the top gray bar. There are four pages you use to record and save data:
 - “Important Information”
 - “Optional Information”
 - “Comments”
 - “Database Actions” aka **SAVE** file page

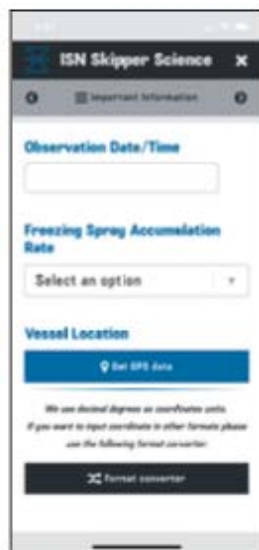


Important Information

- For the “Important Information” page you should fill out the following fields at a *minimum* if possible. These are the important information for the success of the project:
 - Observation Date/Time
 - Freezing Spray Accumulation Rate
 - Vessel Location
 - Add a picture or Select from the Gallery



Appendix E: Freezing Spray Protocol



The screenshot shows the 'ISN Skipper Science' app interface. It has a title bar with a close button. Below the title bar is a section labeled 'Important Information'. The main form has three sections: 'Observation Date/Time' with a date/time picker, 'Freezing Spray Accumulation Rate' with a dropdown menu labeled 'Select an option', and 'Vessel Location' with a blue button labeled 'Get GPS data'. At the bottom, there is a note about decimal degrees and a button labeled 'Format coordinates'.

Example photo from
2024 data collection



- The **Observation Date/Time** field uses a date picker widget where you can record the current date and time. You can also use the widget to enter a previous date and time if you are recording the information after the event. Crew safety and consideration of the limited time that mariners have to collect data are taken seriously by Skipper Science and the Freezing Spray project team. Logging observations after the event is appreciated and respected.



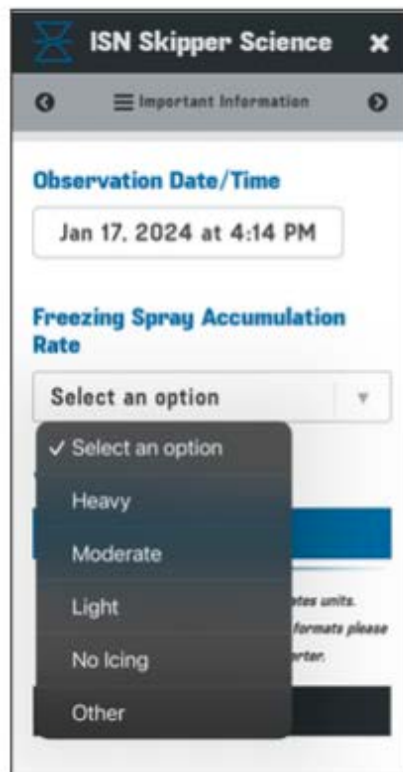
The screenshot shows the 'Observation Date/Time' date picker widget. It displays 'Jan 17, 2024 at 8:40 AM'. Below this is a calendar for 'January 2024' with days of the week (SUN, MON, TUE, WED, THU, FRI, SAT) and dates 1 through 31. The date '17' is highlighted. At the bottom, there is a 'Time' field showing '8:40 AM' and buttons for 'Cancel' and 'Done'.

- The **Freezing Spray Accumulation Rate** is a qualitative assessment of the rate of accretion of ice on the deck or rigging of the vessel. For this Freezing Spray pilot project we do not expect mariners to directly measure ice accumulation, but

we are open to ideas on how this can be done. However, for reference, the 1990 Overland algorithm defines the Icing Class categories:

- No Icing
- Light Accumulation (<0.7 cm/hr)
- Moderate Accumulation (0.7–2.0 cm/hr)
- Heavy Accumulation (>2.0 cm/hr)
- Other (Please describe in a Comments)

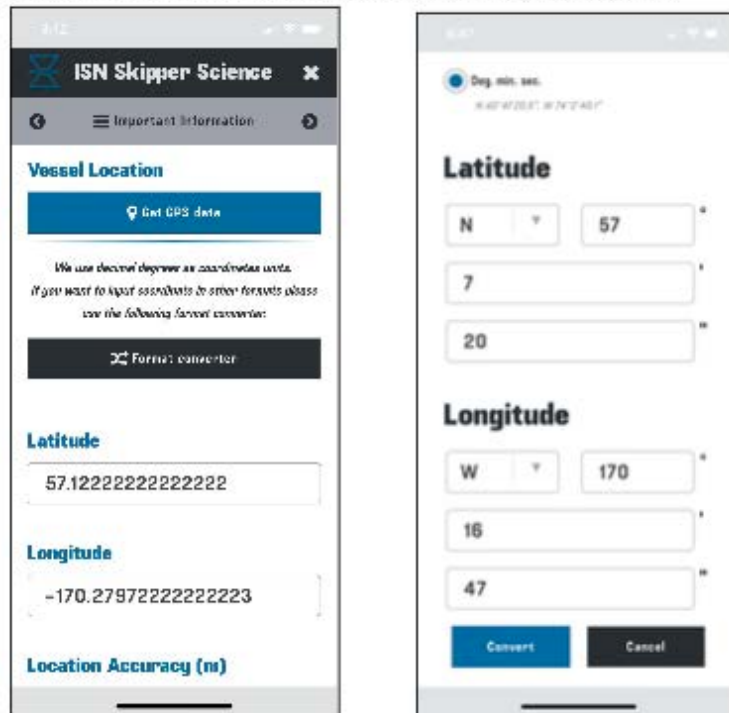
For the purpose of this project, a qualitative estimate using these categories as a reference point is sufficient.



- The **Vessel Location** is your GPS location at the time you experienced the Freezing Spray event.
 - It is important to record the location where the event occurred, if possible. You can pull the GPS location in real-time by clicking the blue "**Get GPS data**" button within the app.
 - Alternatively, if you are unable to record the location during the actual event for safety, technical, or logistical reasons, you can manually enter your GPS information from your logbook records.

Appendix E: Freezing Spray Protocol

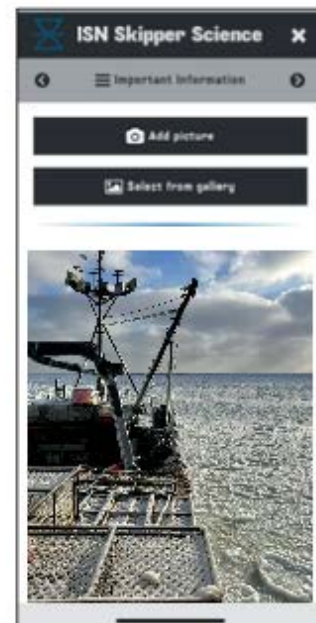
- By using the Skipper Science format converter you can convert locations from Degrees, minutes, seconds format, or Degrees.decimal minutes format if that is what is recorded in your vessel logbook.



The left screenshot shows the 'ISN Skipper Science' app interface. At the top is a header with the app name and a close button. Below it is a navigation bar with 'Important Information'. The main section is titled 'Vessel Location' and contains a 'Get GPS data' button. Below this is a note: 'We use decimal degrees as coordinates units. If you want to input coordinates in other formats please use the following format converter:'. A 'Format converter' button is located below the note. The 'Latitude' field contains the value '57.12222222222222' and the 'Longitude' field contains '-170.27972222222223'. At the bottom, there is a 'Location Accuracy (m)' field.

The right screenshot shows the 'Format converter' screen. It has a title 'Deg. min. sec.' and a subtitle 'N 40° 47' 20.87\"

- When it is possible to take a photo during a freezing spray event, you can use the **Photos Add picture** or **Select from the Gallery** buttons to take a photo directly from the mobile device, or upload photos from the gallery on your device. If possible, it may be useful to take photos of the same area of the deck at different stages during a single event and across different events. If there are parts of the vessel structure that could be measured at a later date, it may be possible to estimate ice accretion using digital imaging technology.



Optional Information

For the "Optional Information" page you can fill out the following fields when the information is available and time and safety allow:

- **Air Temperature**

- The ambient air temperature can be entered in either degrees Celsius or degrees Fahrenheit depending on preference and shipboard instruments. Please indicate the measurement units using the toggle buttons next to the data entry field.
- If possible, please add a comment in the first observation for your vessel indicating the height above the water at which the temperature is measured.

- **Sea State**

- The approximate sea state or wave height can be estimated using the ranges in the dropdown menu. These values are given as ranges in feet, and also by the Beaufort sea state scale.

- **Wind Speed**

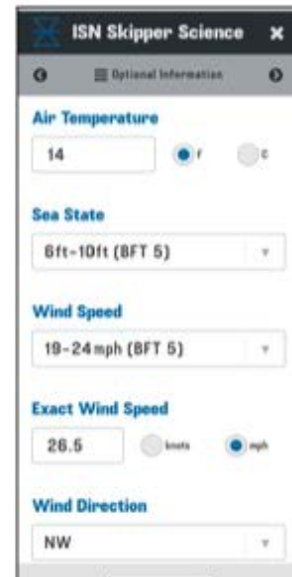
- The wind speed can be estimated using the ranges in the dropdown menu. These values are given as ranges in mph, and also by the Beaufort wind speed scale.

- **Exact Wind Speed**

- If available, an exact wind speed can be entered in either knots or mph depending on preference and access to shipboard instruments. Please indicate the measurement units using the toggle buttons next to the data entry field.
- If possible, please add a comment in the first observation for your vessel indicating the height above the water at which the wind speed is measured.

- **Wind Direction**

- The wind direction can be recorded using the cardinal directions in the dropdown list for this field.

A screenshot of a mobile application interface titled "ISN Skipper Science" with a sub-header "Optional Information". The form contains several sections: "Air Temperature" with a text input field showing "14" and toggle buttons for "F" (selected) and "C"; "Sea State" with a dropdown menu showing "6 ft - 10 ft (BFT 5)"; "Wind Speed" with a dropdown menu showing "19 - 24 mph (BFT 5)"; "Exact Wind Speed" with a text input field showing "26.5" and toggle buttons for "knots" and "mph" (selected); and "Wind Direction" with a dropdown menu showing "NW".

- **Weather Condition**

- The weather condition can be recorded using the checkboxes for this field. Multiple selections can be entered for this field by checking more than one box. If the **Other** field is checked please add a description in the **Comments** field if possible.

- **Sea Surface Temperature**

- The sea surface temperature can be entered in either degrees Celsius or degrees Fahrenheit depending on preference and shipboard instruments. Please indicate the measurement units using the toggle buttons next to the data entry field.

- **Relative Humidity (%)**

- If the data is available, the relative humidity can be recorded as percent humidity.

- **Visibility**

- The visibility field is used to record a qualitative estimate of the horizon visibility.

- **Vessel Direction**

- The vessel direction can be recorded using the cardinal directions in the dropdown list for this field. This field should be used to record the vessel's direction of travel during the freezing spray event being logged.

- **Vessel Speed**

- The vessel speed should record the speed of travel during the freezing spray event. The vessel speed can be entered in either knots or mph depending on preference and shipboard instruments. Please indicate the measurement units using the toggle buttons next to the data entry field.

Comments

- Comments can be recorded using the **Comments** text field on the third page of the app, or as voice recordings using the **Audio comments** button. Comments can be used to provide:
 - Insights that you may have regarding the nature of freezing spray events

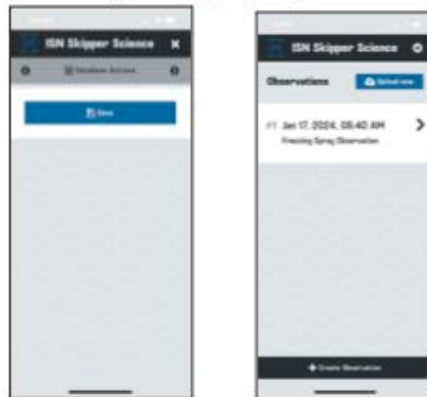
The screenshot shows the 'Optional Information' section of the ISN Skipper Science app. Under 'Weather Condition', there are checkboxes for 'Fog/Mist', 'Freezing Rain', 'Freezing Spray' (which is checked), 'Other', 'Rain', and 'Snow'. Below this, the 'Sea Surface Temperature' field has a text input with '43' and toggle buttons for 'F' (Fahrenheit) and 'C' (Celsius). The 'Relative Humidity (%)' field has a text input with '90'.

The screenshot shows the 'Optional Information' section of the ISN Skipper Science app. The 'Visibility' field is a dropdown menu with 'poor' selected. The 'Vessel Direction' field is a dropdown menu with 'NW' selected. The 'Vessel Speed' field has a text input with '2.5' and toggle buttons for 'knots' and 'mph'.

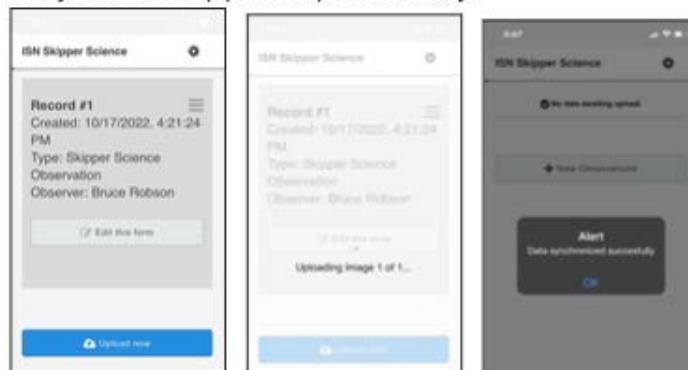
The screenshot shows the 'Comments' section of the ISN Skipper Science app. The 'Comments' field is a text area containing the text 'Ice accumulation variable on deck - see photo'. Below this is the 'Audio comments' section, which includes a play button, a volume slider, and a microphone icon for recording.

Appendix E: Freezing Spray Protocol

- Clarifications on data entered in the Freezing Spray form
 - Ways to improve the project in the future
 - Improvements to the Freezing Spray app
 - Other notable observations or historical information on Freezing Spray
- **IMPORTANT - When you are finished recording the information for a sample be sure to hit the blue Save button on the Database Actions page of the app to save your observation. After you save the observation, it should be listed on the Landing Page of the SS app. The observation will be saved on your mobile device until you can upload it to the Skipper Science database. When you have a stable WiFi connection, you can upload your observation(s) to the ISN Skipper Science database by clicking the “Upload now” button.**



- **When you are back WiFi range and have a stable internet connection, hit the Upload now button on the SS app landing page to upload your observation(s). You should see a scroll bar showing that the observation(s) are uploading. When all data is uploaded you should receive an Alert that all data has been synchronized (uploaded) successfully.**



Appendix E: Freezing Spray Protocol

Troubleshooting:

- If you receive an error message that the data was not uploaded successfully when you are back on the SS app landing page, go to Settings for the app (the small gear wheel in the upper right corner of the landing page). Scroll down to the button that says copy data to the clipboard. Once you have copied the data to the clipboard you can simply paste the data into an email and send it to your Skipper Science program manager (kdrummond@aleut.com) and/or SS app Administrator (bwrobson@aleut.com).

