PAME II-2019- Agenda Item 6.7(c)
Joint PAME-EPPR Project to Produce a
Compendium of Arctic Ship Accidents (CASA) Report

References and Related Documents

- PAME, Arctic Marine Shipping Assessment (AMSA) Report 2009
- PAME (II)/16.5.7/d (USA, CAN), Proposed Project for PAME Work Plan 2017-2019: Joint PAME-EPPR Project to Produce a Compendium of Arctic Ship Accidents Since 2005
- Senior Arctic Officials' Report to Ministers, Fairbanks, Alaska, United States (11 May 2017), pp. 50, 55
- PAME 2017-2019 Work Plan ("*Develop a compendium of shipping accidents in the Arctic for the period 2005-2017 to update the database of shipping accidents in the Arctic contained in the 2009 Arctic Marine Shipping Assessment (AMSA) Report and provide information useful to considering measures that might be pursued to reduce the risk of accidents*." [USA lead])
- EPPR, Record of Decisions, June 27-29, 2017, Vologda, Russian Federation ("*EPPR decided to support participation of the working group in the joint PAME/EPPR project titled the Compendium of Arctic Shipping Accidents. The United States will prepare a project proposal and submit to EPPR for approval intersessionally.*")
- PAME I-2018 ROD ("*PAME invites all members to submit by 1 April any available information on ship accidents in the Arctic since 2005 to the joint PAME/EPPR Compendium of Arctic Ship Accidents (CASA) project. PAME invites the US to provide an update of the project to the PAME SEG at PAME II-2018.*")
- PAME I-2019 ROD ("PAME notes with appreciation the submission by Arctic States of Arctic ship accident information to the joint PAME-EPPR Compendium of Arctic Ship Accidents (CASA) Project. PAME invites the USA to consolidate all data received and submit in advance of PAME II-2019 a revised draft compendium for review. PAME also invites the USA to submit a paper providing a high-level overview of the data to PAME II-2019.")

Background

As previously noted in the PAME II-2016 paper submitted by the USA and Canada, the shipping accident information in the 2009 AMSA Report is more than 10 years old. Since then, human and economic maritime activity, including shipping traffic, in the Arctic region has increased and diversified with the reduction of seasonal sea ice. As such, the USA and Canada proposed the pursuit of a joint project with EPPR to develop a compendium of Arctic ship accidents covering the period 2005-2018. PAME I-2017 included the proposed project in PAME's 2017-2019 Work Plan, which Senior Arctic Officials subsequently approved in May 2017. At EPPR I-2017, EPPR adopted a Record of Decision in which it supported participation in the joint PAME/EPPR project titled the Compendium of Arctic Shipping Accidents (CASA).

Pursuant to the PAME I-2019 ROD, the USA has prepared this high-level overview of the CASA data and the revised draft CASA compendium.

Discussion and Summary

To develop the CASA, member governments submitted data in a readily available form and format. The USA formatted and structured the data in a consistent fashion, addressed anomalies in the data (such as duplicate records or incomplete data fields), and made changes to the data in response to comments from members. After this was done, 2348 unique accidents remained in the data set, attached as Annex A. As with the original CASA, which was part of the 2009 AMSA report, the data are summarized in tables, graphs, and maps. The data also exists in electronic format and is available for use in other PAME projects.

The joint PAME/EPPR project proposal contemplated that the project would cover accidents from 2005 to 2018. Recognizing the time it takes to conduct an investigation, enter the relevant data into the respective databases, and compile the data, the period of the report was adjusted to 2005 to 2017. Any data submitted outside this period was preserved for future use.

The geographic scope of this project is inclusive of all ship accidents occurring north of 58 degrees North latitude, which is the southernmost boundary for applicability of the IMO Polar Code. Any data submitted outside this geographic boundary was preserved for future use.

As noted previously, data submitted by some PAME member governments was incomplete.[1] Many reported accidents provided only a general location of the event or reported no location data at all. Reported accidents that did not include the location of the accident were omitted from the graphical representation. Where a general location was provided, we retained those accidents in the mapping data so that we could graphically represent as many of the accidents as possible.

Recommendation

We thank PAME member governments for submitting the data for this compendium. We recommend that PAME II-2019 adopt a ROD that requests:

- PAME members to inform the USA by 15 December 2019 of any errors or omissions in this report or the attached data spreadsheet;
- PAME members to submit to the USA by 15 December 2019 any relevant supplemental ship accident data for calendar year 2018;
- Norway, the Kingdom of Denmark, and Iceland to submit to the USA by 15 December 2019 data to fill the gaps in the incomplete ship accident information they previously provided;

[1] Norway submitted ship accident data for the period 2007-2017. Data for the 2005 and 2006 is missing. The Kingdom of Denmark submitted ship accident data for the period 2010-2017. Data for 2005 – 2009 is missing. Iceland submitted information on one ship accident but failed to indicate the year of the accident.

- The USA to continue to coordinate with EPPR on this joint project as necessary and appropriate; and
- The USA to submit a status report to PAME I-2020 summarizing any submissions received from PAME members in response to this ROD.

Part 1: Accident Reports and Locations

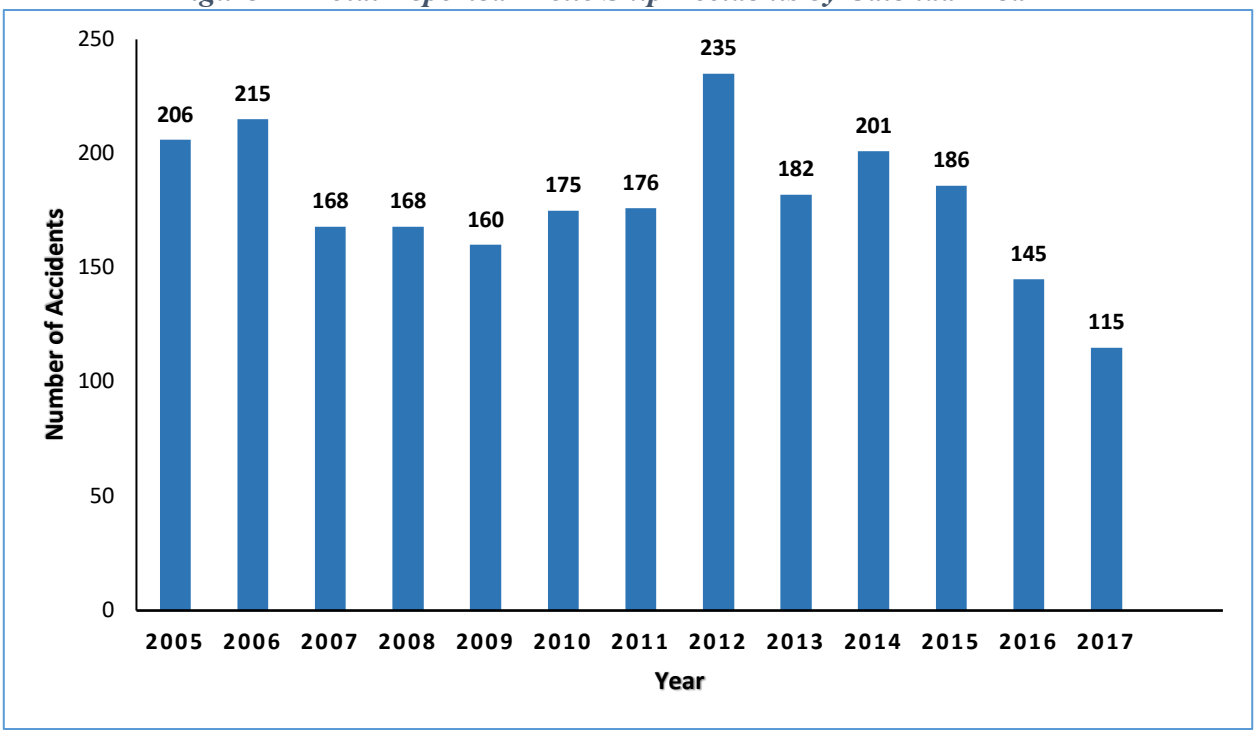
This report provides a high-level overview of Arctic ship accident data submitted by Arctic States for the CASA project. The raw data is contained in the annex to this report. This report presents the data in a similar fashion to the 2009 AMSA Report and includes graphical representations of the data. Note that reported accidents with incomplete information were omitted from the graphical representations. Accordingly, there is not a 1:1 representation of data between the tables and the graphical representations provided.

Table 1 - Number of Accidents Reported by Arctic States by Calendar Year

Calendar Year	Canada	Kingdom of Denmark	Iceland	Norway	Russian Federation	United States	Total
2005	3	-	-	-	23	180	**206**
2006	10	-	-	-	19	186	**215**
2007	11	-	-	1	8	148	**168**
2008	8	-	-	3	17	140	**168**
2009	13	-	-	4	13	130	**160**
2010	8	6	-	1	18	142	**175**
2011	3	8	-	3	19	143	**176**
2012	13	10	-	3	10	199	**235**
2013	7	7	-	2	20	146	**182**
2014	12	7	-	2	10	170	**201**
2015	14	13	-	4	15	140	**186**
2016	15	5	-	5	17	103	**145**
2017	2	10	-	3	12	88	**115**
2018	-	-	-	-	15	-	**15**
Date not Provided	-	-	1	-	-	-	**1**
Total	**119**	**66**	**1**	**31**	**216**	**1915**	**2348**

Notes on Table 1:
1. The Russian Federation was the only member government to provide 2018 accident data.
2. The Kingdom of Denmark provided no data for 2005-2009.
3. Norway provided no data for 2005 and 2006.
4. Iceland reported one accident but did not provide the date of the accident.
5. Sweden and Finland had no accidents to report for the scope of this project.
6. The USA provided data for 1915 accidents (81.6% of the data for the CASA)

Figure 1 - Total Reported Arctic Ship Accidents by Calendar Year



As noted previously, the data set is incomplete for the years 2005-2009. Notwithstanding this gap, Figure 1 shows a modest downward trend in accidents from 2012-2017.

Table 2 - Flag State and Accident Location Information Provided by Data Source

Data Source	Accidents Reported A	Reports with Flag State of Involved Vessel B (B / A, %)	Reports with Accident Location C (C / A, %)
Canada	119	118 (99.16%)	119 (100%)
Kingdom of Denmark	66	66 (100%)	45 (68.2%)
Iceland	1	1 (100%)	1 (100%)
Norway	31	31 (100%)	31 (100%)
Russian Federation	216	158 (73.15%)	188 (87.0%)*
United States	1915	1894 (98.9%)	1909 (99.7%)*
Total	**2348**	**2268 (96.59%)**	**2293 (97.7%)**

* See note in next paragraph.

Table 2 depicts the total number of accidents reported by Arctic States, the number of reported accidents which contained the flag state of the involved vessel(s), and the number of accidents which contained the accident location. There is an asterisk (*) next to the data in column C because a high percentage of accident reports contained location data that was concentrated in the same location (latitude/longitude). This anomaly is looked at more closely in Table 3.

Table 3 – Reports with Similar Accident Locations (more than 5 at the same location)

Data Source	Latitude	Longitude	Accidents	Port/Area
USA	58. 10502	-135.3311 (W)	7	Spasski Bay
USA	58.1517	-135.0416	21	Icy Strait/Hoonah
USA	58.17833	-136.5117	20	Cross Sound
USA	58.18417	-134.2078	38	Stephens Passage
USA	58.19136	-136.4952	11	Cross Sound
USA	58.2111	-135.3786	11	Icy Strait/Hoonah
USA	58.29639	-134.4329	11	West Juneau
USA	58.3157	-134.3518	70	Granite Creek/Juneau
USA	58.550163	-135.02759	12	Favorite Channel/Juneau
USA	58.550164	-135.027598	98	Favorite Channel/Juneau
USA	58.69667	-156.6761	15	King Salmon
USA	58.8961	-152.8625	7	Kamishak Bay
USA	59.0444	-177.725	52	Bering Sea
USA	59.187578	-135.29979	15	Chilkoot Inlet, Mud Bay
USA	59.2361	-135.4344	8	Portage Cove, Port Chilkoot
USA	59.255655	-135.077118	10	Katzehin River/Chilkoot Inlet
USA	59.30025	-148.9427	9	Gulf of Alaska/South of Kenai Fjords
USA	59.43668	-151.7178	6	Seldovia Bay
USA	59.45473	-135.3189	15	Skagway
USA	59.52869	-152.335	14	Kamishak Bay
USA	59.54916	-139.7567	13	Yakutat
USA	59.6325	-151.5328	157	Homer/ Kachemak Bay
USA	60.0911	-149.3983	9	Resurrection Bay/Seward
USA	60.11666	-149.433	15	Seward
USA	60.11945	-149.4344	14	Seward
USA	60.14389	-146.7694	11	Gulf of Alaska/ Off Montague Island
USA	60.5414	-145.7644	35	Cordova
USA	60.54778	-151.2644	11	Kenai River
USA	60.74949	-146.949405	15	Prince William Sound
USA	60.77858	-148.31053	13	Cochrane Bay
USA	60.7802	-148.6736	6	Passage Canal/Whittier
USA	60.780201	-148.6736	8	Passage Canal/Whittier
USA	61.12473	-146.3464	112	Valdez
USA	61.23778	-149.895	8	Anchorage
Russia	64.51666	40.51666 (E)	76	Archangelsk
USA	66.18806	-145.3958	8	Birch Creek
Russia	68.985833	33.04055	11	Murmansk
USA	70.31416	-148.3186	9	Prudhoe Bay/Beaufort Sea

As noted in Table 2, there were a significant number of accident reports from the USA and Russian Federation with the same accident locations. Table 3 highlights the instances where this phenomenon was observed. As a result of this, data points may be obscured in the geographical presentation of this data, and this may skew any analysis by geographic position.

Part 2: Vessel Data

In instances where general vessel data was not provided, publicly available information was used to add ship gross tonnage, length, and age where possible.

Table 4 -Accident by Flag State of Involved Vessel

Flag State on Involved Vessel	Number of Accidents
Antigua & Barbuda	3
Bahamas	22
Barbados	1
Belgium	1
Belize	3
Bermuda	27
Canada	113
Cayman Islands	1
Cyprus	1
Denmark	15
Dominica	1
Dominican Republic	1
KOD- Faroe Islands	26
Finland	2
Germany	4
KOD - Greenland	23
Hong Kong	1
Iceland	1
Liberia	16
Malta	15
Marshall Islands	6
Mexico	1
Netherlands	17
Norway	20
Panama	13
Portugal	1
Russia	145
Singapore	1
St. Vincent & the Grenadines	3
Sweden	1
Switzerland	1
Trinidad & Tobago	2
Tuvalu	3
United Kingdom	2
United States	1775
Flag State not provided	80
Total	**2348**

Table 4 shows 35 reported flag states for vessels involved in accidents in Arctic waters covered by the project. US flag vessels were involved in 1775 (75.6%) of the accidents reported. As the U.S provided data for 1915 (81.6%) accidents, this number correlates with that figure.

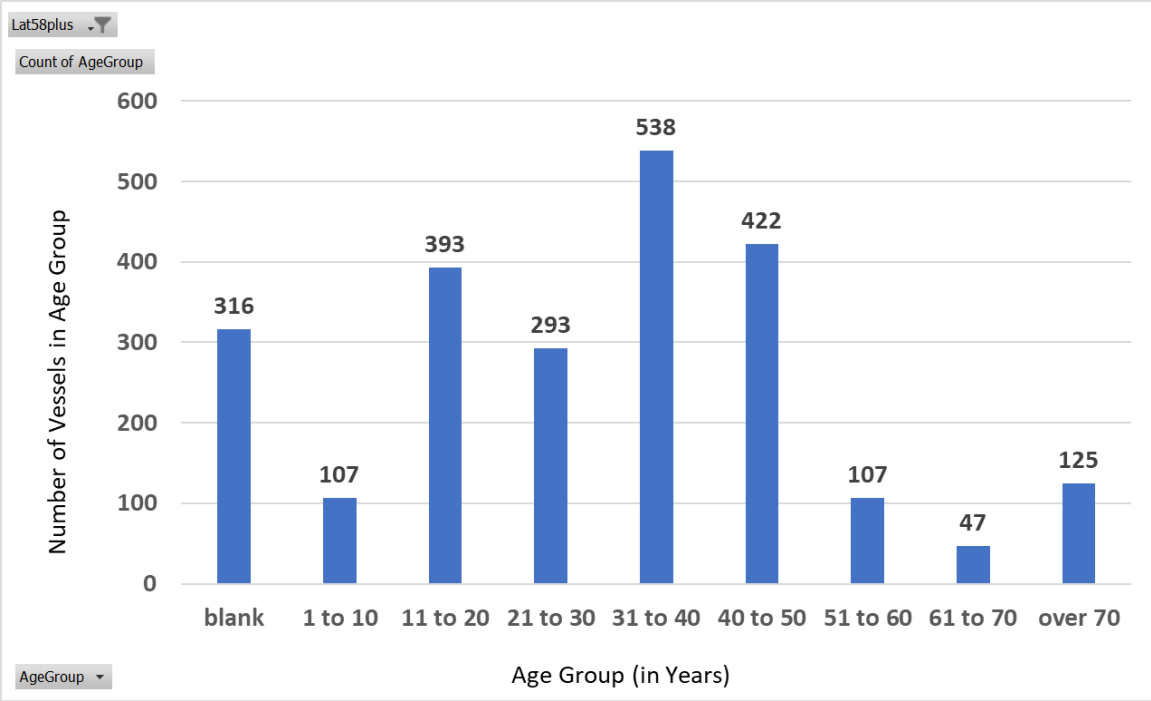
Table 5 provide the type and sub-type of the vessels involved in accidents.

Table 5 - Types of Vessels Involved in Accidents

Type	Sub-Type	Number of Vessels of Type/Sub-type Involved in Accidents
Fishing Vessel	Fishing Vessel	753
Passenger Ship	Passenger Ship	577
Motor Vessel	Motor Vessel; Recreational; Other	295
Towing Vessel	Towing Vessel; Tug	228
Cargo Ship	Cargo Ship; Cargo Ship (Refrigerated); Refrigerated Cargo Ship; General Cargo Ship; Refrigerator	115
Barge	Barge; Barge (Deck); Barge (General); Barge (Liquid); Barge (Other); Barge (Passenger); Barge (unspecified); Barge (self-propelled)	97
Tanker	Tanker Ship; Chemical Tanker	86
<Null>		46
Icebreaker	Icebreaker	24
Research	Research; Research/Survey	23
Government Vessel	Government Vessel	23
Carrier	Bulk Carrier; Heavy Load Carrier	8
Patrol Boat	Patrol Boat; Pilot; Port Boat	5
Ro-Ro	Ro-Ro	5
Pontoon	Pontoon	3
Service Ship	Service Ship; Serving Ship	2
Crane	Floating Crane; Rotary Crane	2
Dredger	Dredger	1
Diesel Electric Ship	Diesel Electric Ship	1
Warship	Warship*	1

* The *Sound Developer* was an ex-US Navy landing craft that was 132 feet long overall, with a beam of 29 feet and a draft of 5 feet. The vessel was sold at a government auction in approximately 2004, and the ship passed through several owners before falling into neglect. Ultimately, the derelict vessel sank at her moorings in the harbor at Cordova, Alaska in August 2009.

Figure 2- Age of Vessel Involved in Accident



2032 accident reports included the age of the vessel involved in the accident. Figure 2 is a bar graph which depicts the age of vessels involved in the accidents (compiled in groups).

Part 3: Date of Accidents

The pie chart in Figure 3 provides the percentage of accidents occurring per month of the year. Almost half of all reported accidents take place in the months of June, July, and August.

Table 6 provides the data for reported accidents by month and year of occurrence.

Figure 3 - Accidents by Month (CY 2005 – 2017)

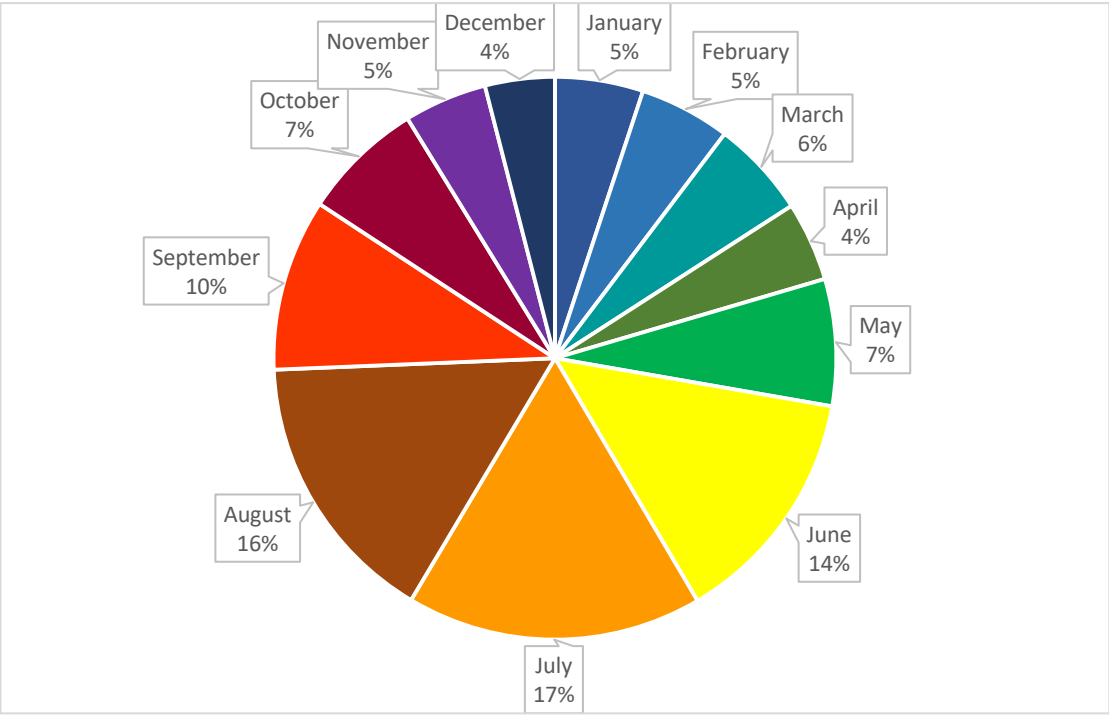


Table 6 - Reported Accidents by Month and Calendar Year

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Total
2005	10	13	11	11	14	20	32	38	22	14	8	13	206
2006	9	13	16	9	14	25	32	36	23	16	13	9	215
2007	10	4	16	9	9	24	37	22	15	10	7	5	168
2008	8	7	15	11	9	26	23	20	15	12	12	10	168
2009	16	9	8	6	12	16	22	28	18	10	11	4	160
2010	8	12	14	6	13	17	37	31	9	13	8	7	175
2011	8	11	10	7	14	27	25	27	20	11	7	9	176
2012	14	18	10	11	17	43	33	34	21	19	8	7	235
2013	10	6	0	8	23	19	38	28	15	18	10	7	182
2014	4	12	3	7	14	42	36	29	26	14	6	8	201
2015	7	5	6	10	12	30	37	39	21	11	5	3	186
2016	11	9	7	9	7	20	23	17	17	8	9	8	145
2017	4	4	13	2	13	15	23	20	9	5	6	1	115
2018	0	0	2	1	0	0	1	2	1	3	2	3	15
Total	119	123	131	107	171	324	399	371	232	164	112	94	2347*

*Iceland reported one accident but did not provide the date of the accident.

Part 4: Types of Accidents

Table 7 depicts all accidents by the reported type of accident, if available.

Table 7 - Types of Reported Accidents

Accident Type	Number of Accidents
Discharge/Release of Pollution	618
Equipment failure/ Hazard to navigation	367
Equipment failure	263
Grounding	244
Collision	118
Loss of electrical power	96
Sinking	90
Flooding	71
Allision	64
Fire	59
Fouling/Equipment failure/Hazard to navigation	27
Capsize	19
Set Adrift	15
Bottom Contact	14
N/A salvage	13
Explosion	7
Contact	6
Fire/Explosion	6
Risk of Sinking	5
Other	5
Dangerous goods released	4
Vessel Maneuver	3
Wave Strikes/Impacts	2
Fouling	2
Abandonment	1
Loss of control	1
Damage to ship or equipment	1
Vessel Yawl/Pitch/Roll/Heel	1
Risk of Allision	1
Damage to Cargo	1
Well Blowout	1
Loss of Cargo	1
GRAND TOTAL	**2126**

Part 5: Geospatial Views of Accident Data

Figure 4 - Allisions/Contacts

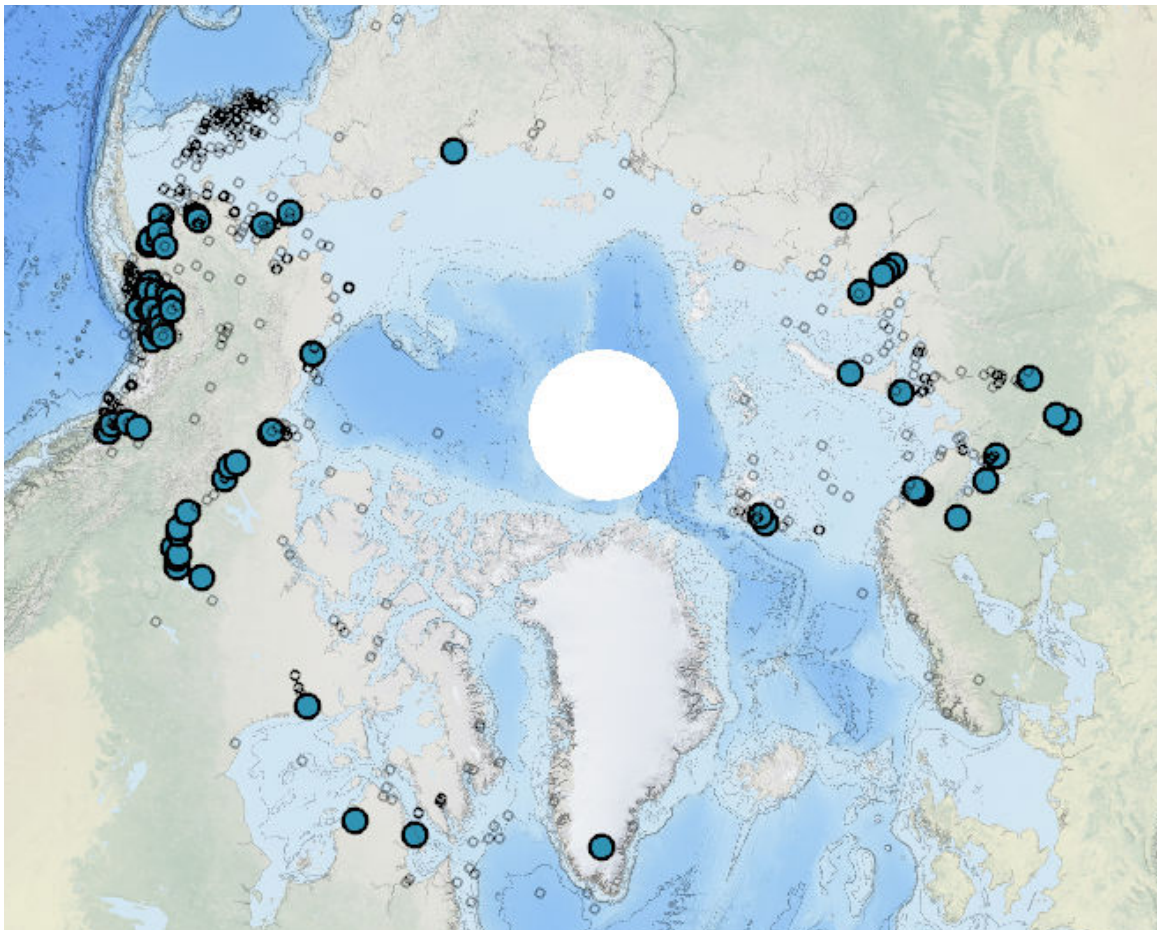


Figure 5 - Capsizing and Sinking

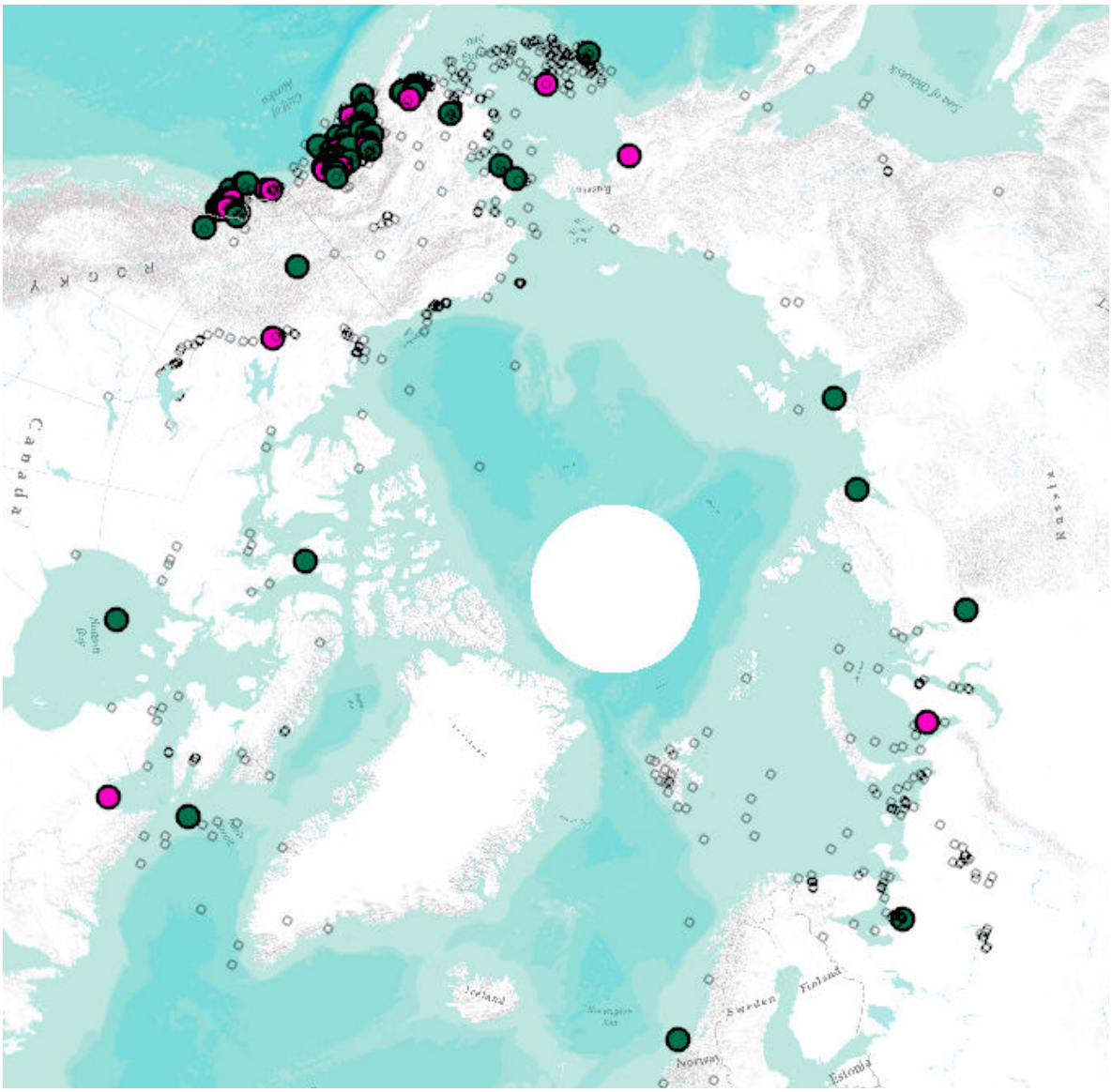
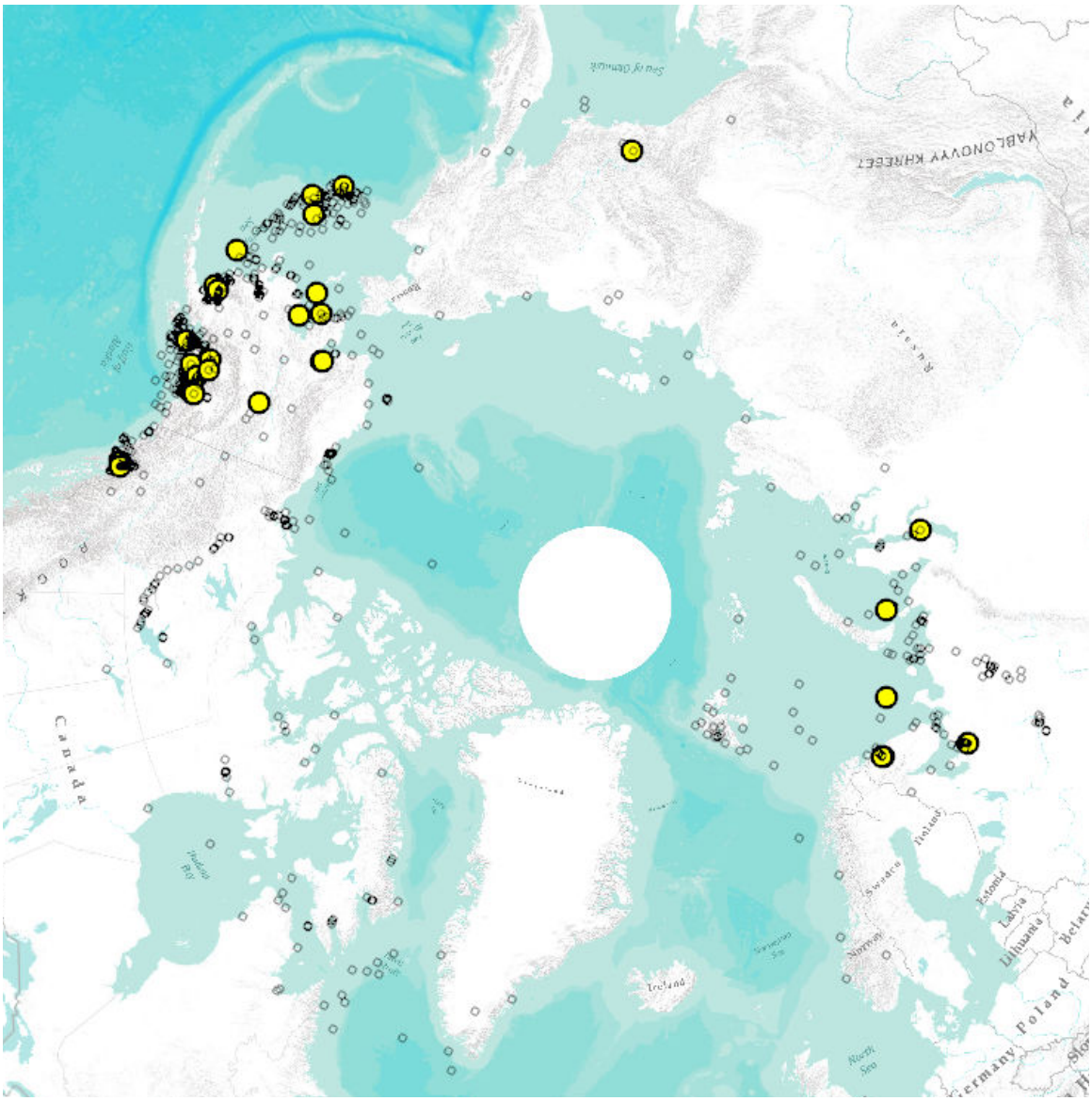


Figure 5 illustrates that globally, the accidents of capsizing (pink) and sinking (green) are relatively un-concentrated. There is a high density of both types of accidents in Alaskan waters.

Figure 6 – Fouling



Fouling occurs when cables, lines, or anchors become entangled or jammed. Fouling appears to be a problem across the Arctic and does not immediately present any pattern. However, some types of ships seem to be responsible for the majority of the fouling accidents in some locations.

In Figure 6, the fouling accidents are again represented by the large yellow blazes. Within each blaze is a point designating the type of ship. The types of ships which seem to suffer fouling accidents off the coasts of Alaska are fishing vessels (blue) and towing vessels (yellow).

Figure 7 - All Fires & Explosions

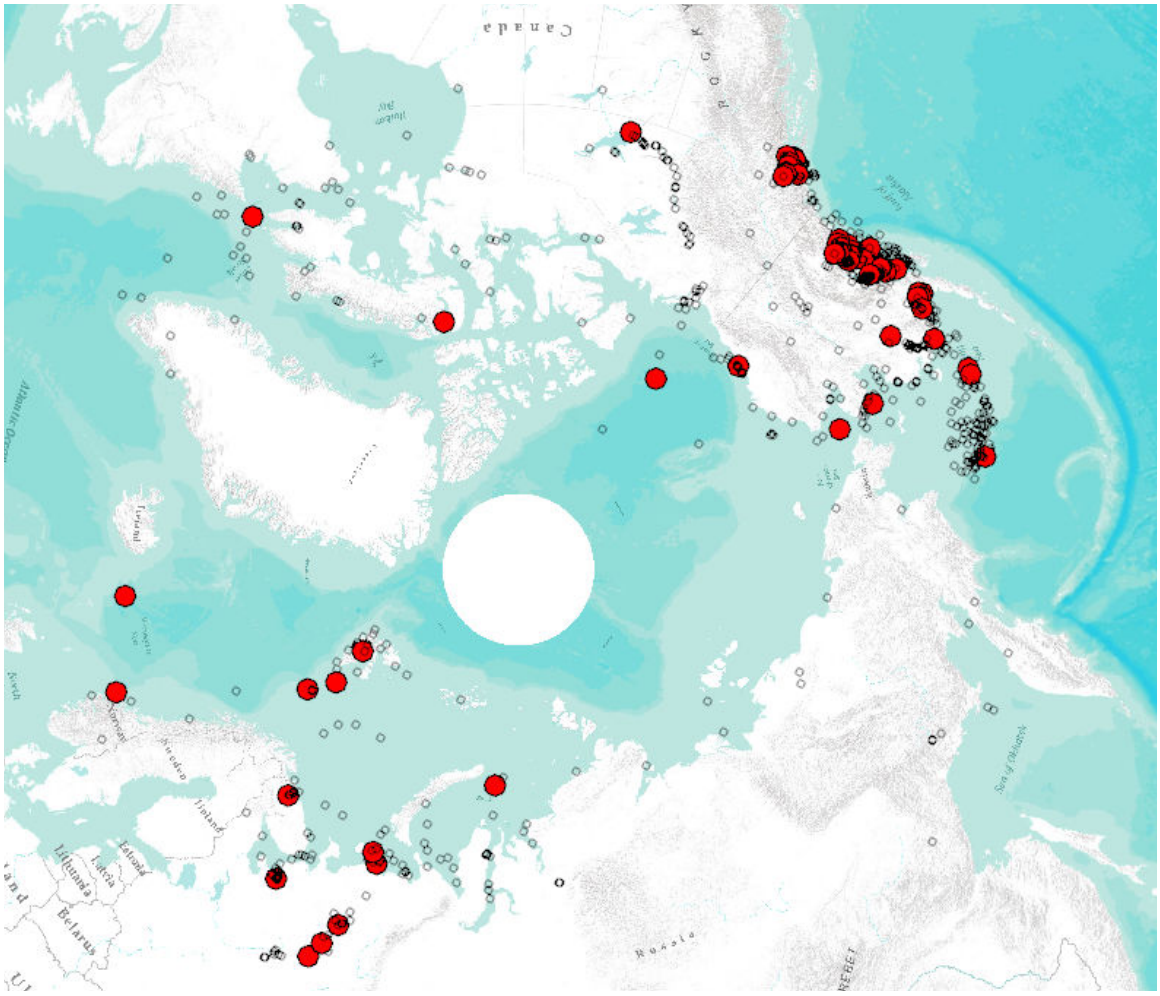


Figure 8 - Flooding

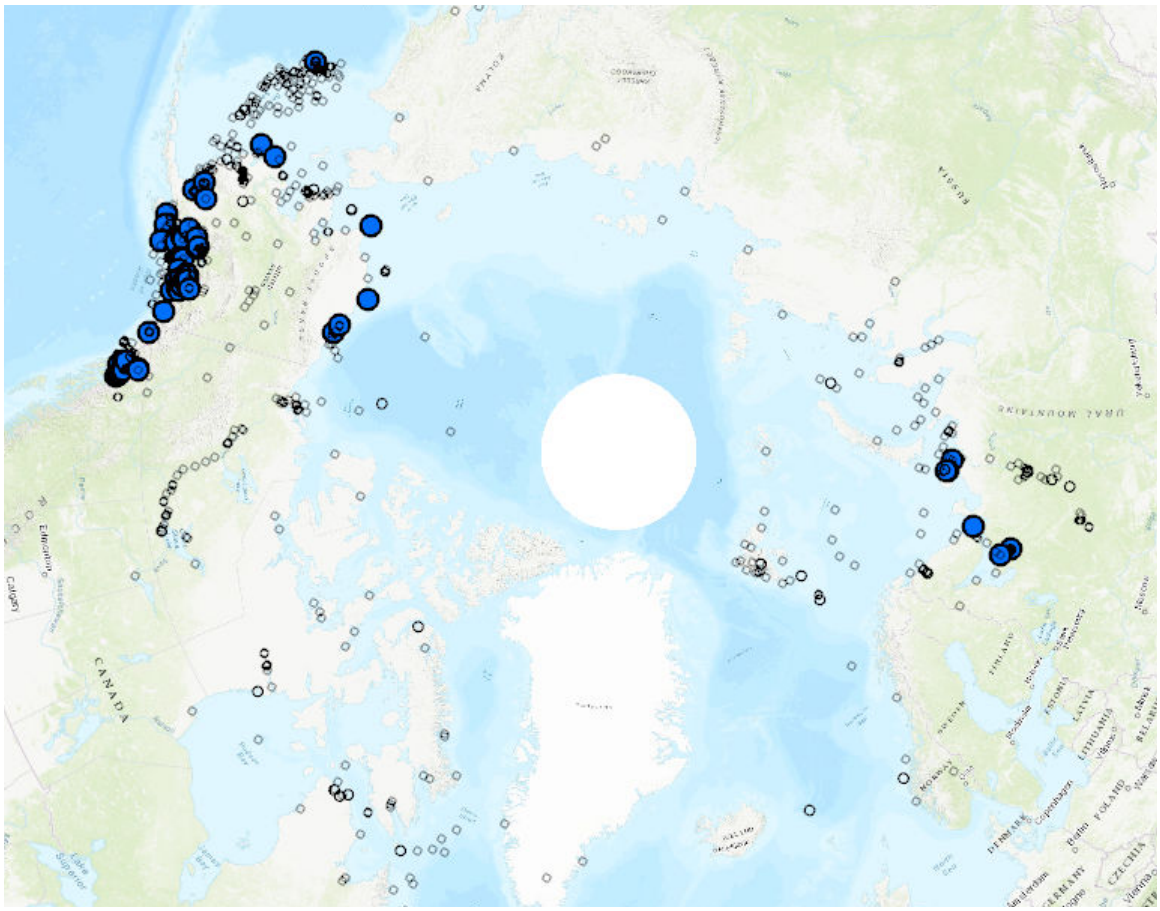


Figure 9 Groundings

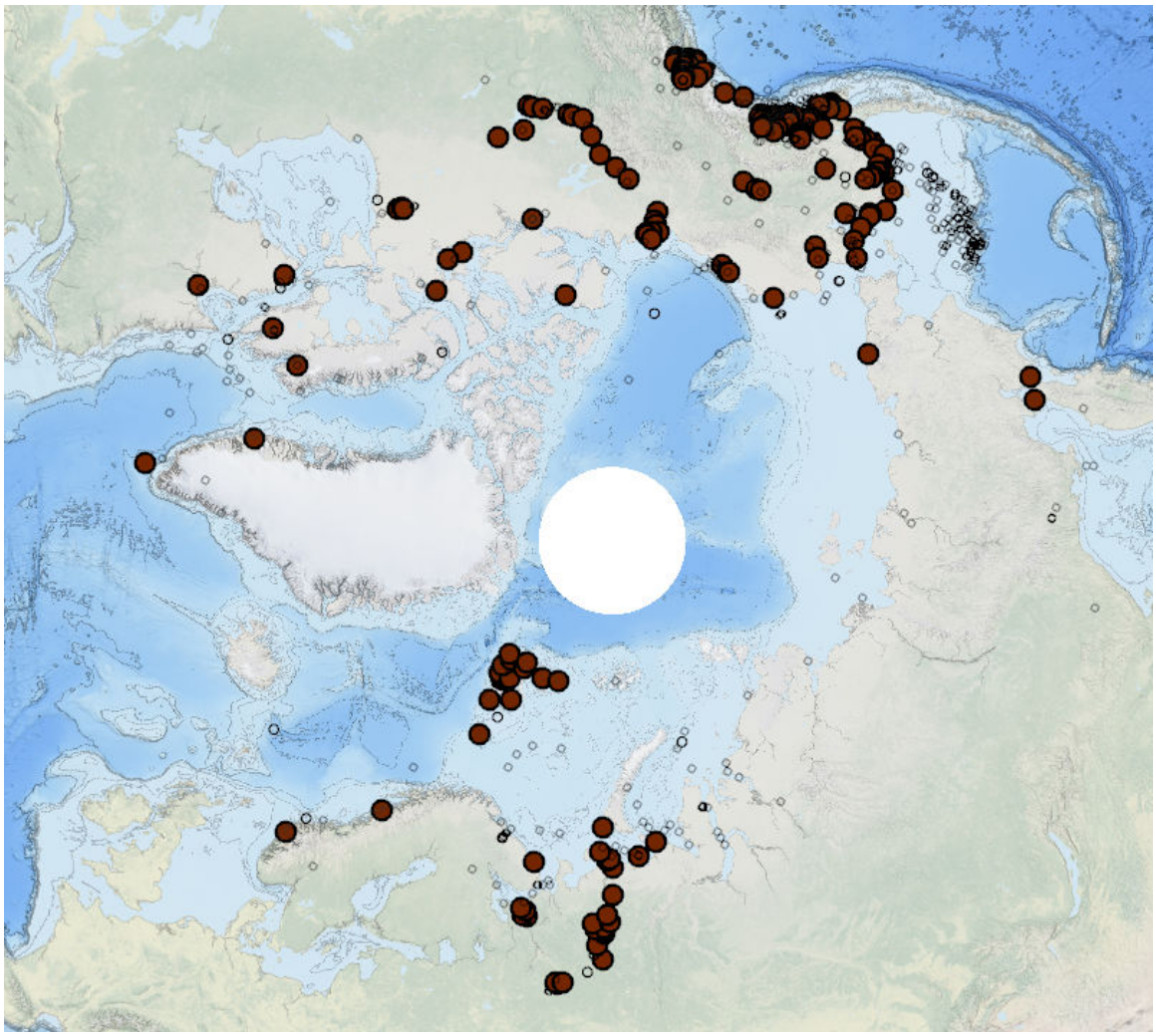
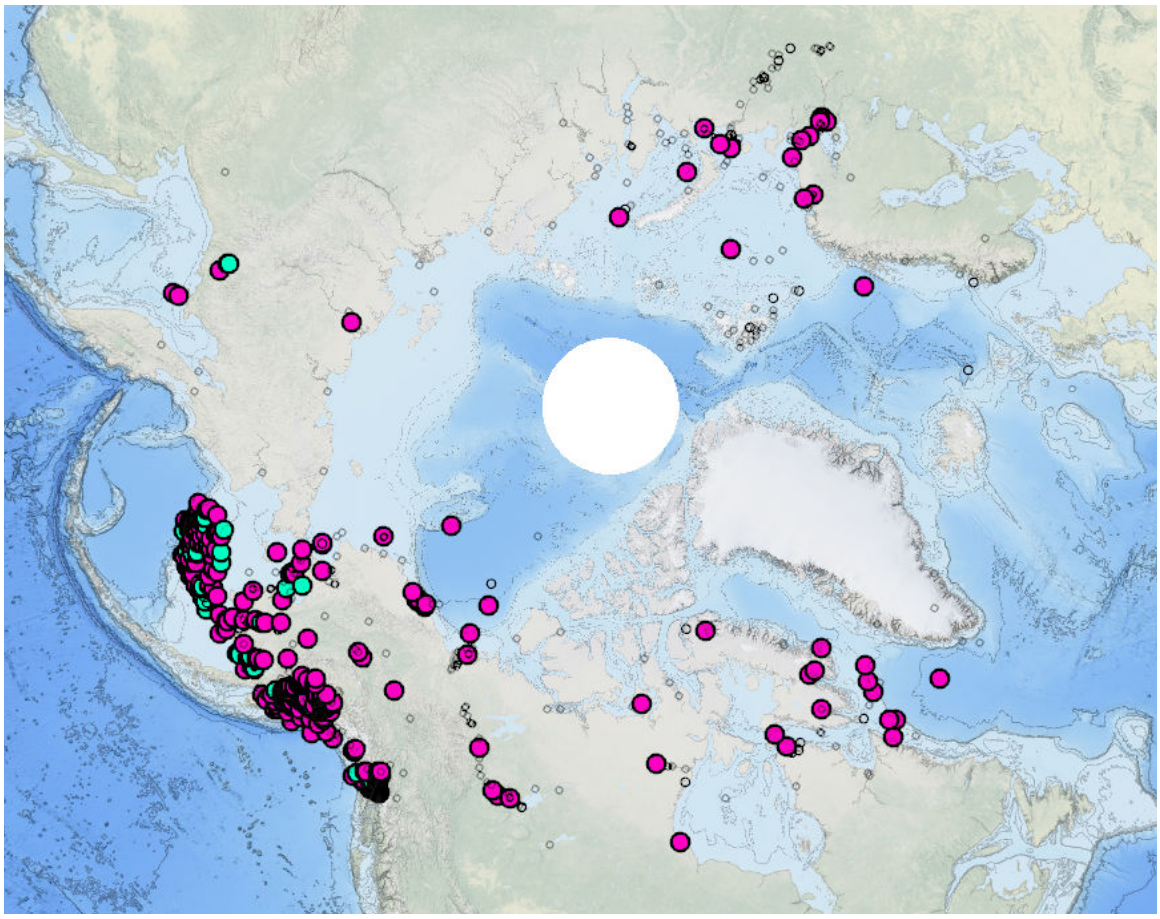
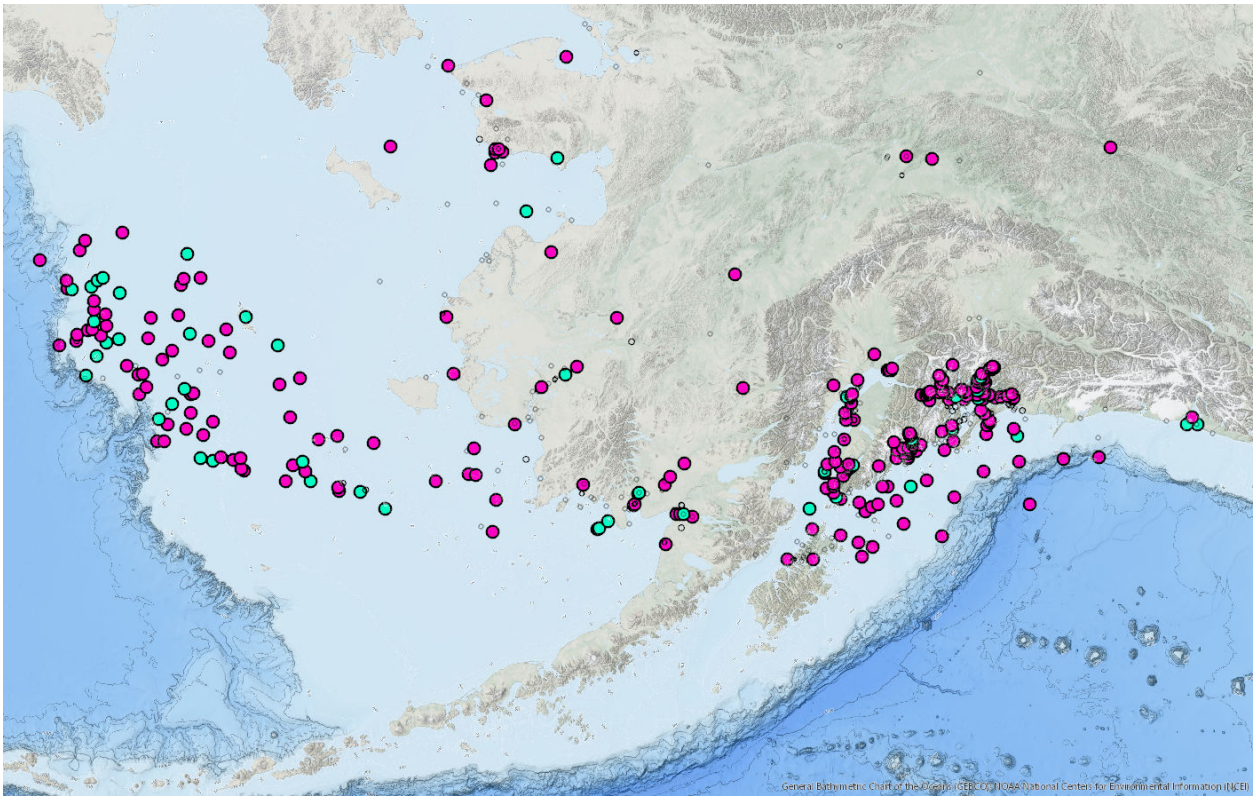


Figure 10 - Loss of Electrical Power and Equipment Failure



Loss of electrical power was a type of accident only reported by the United States (aqua). However, equipment failure (pink) was reported in accidents across the Arctic and likely included accidents that could be designated as loss of electrical power.

Figure 13 -Loss of Electrical Power & Equipment Failure in Alaska



As seen in Figure 13, these two types of accidents represent many of the accidents reported by the United States in the Bering Sea and in the northern regions of the Gulf of Alaska.

Figure 14 - Set Adrift, Cast Adrift & Broken Anchor

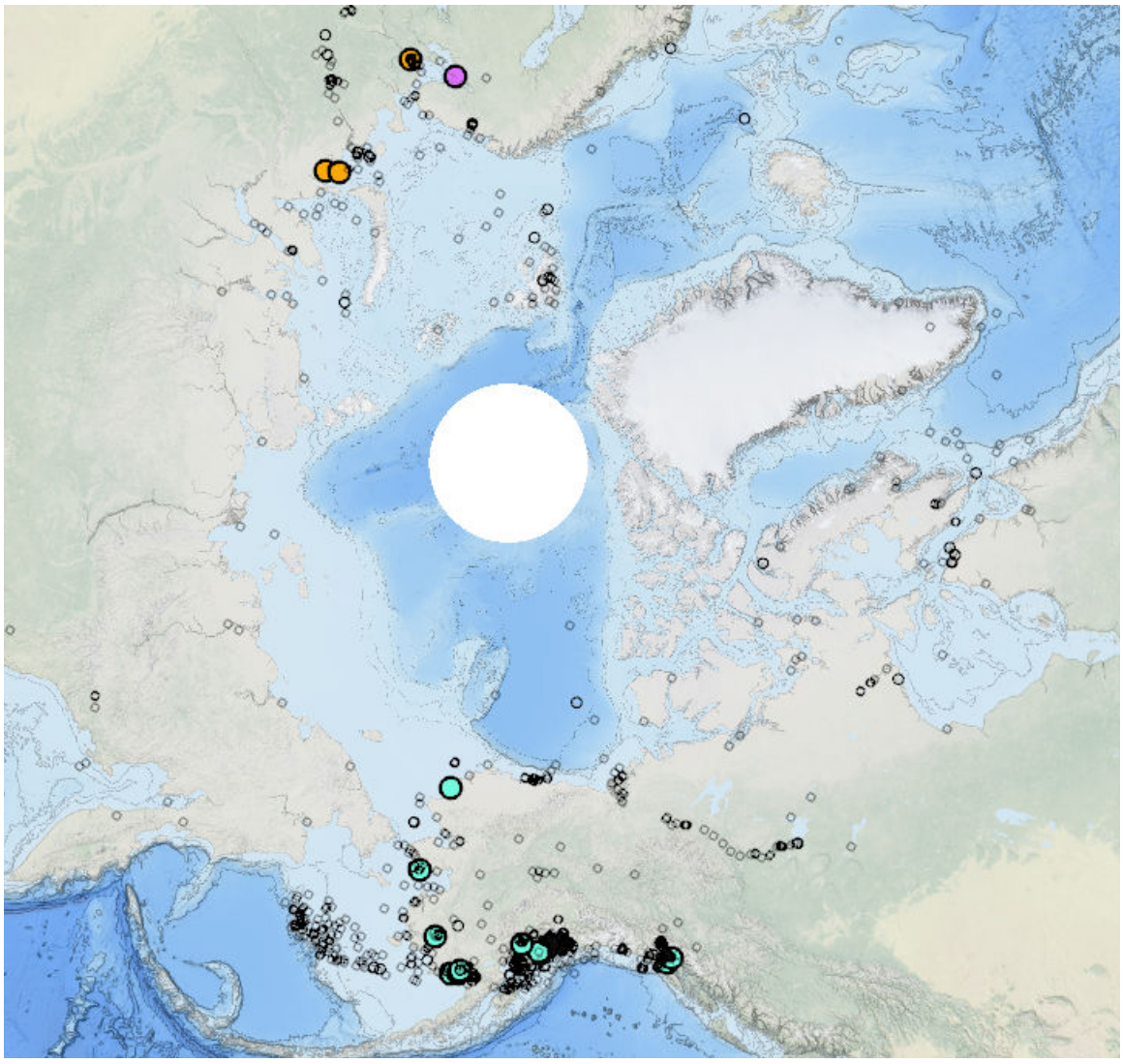


Figure 14 depicts vessels that were set adrift (aqua), cast adrift (pink), and those that broke anchor (orange). These types of accidents are very similar in nature and in a large-scale data project such as this, it may be helpful to set definitions for a limited number of types of accidents.