Environmental variables for SEAK Pink Salmon Preseason Forecast

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Contents

1 Objective

The overall objective is to optimize temperature variables by testing a variety of reasonable options using Southeast Alaska Coastal Monitoring project (SECM) data and satellite data within the forecast model framework. This would allow us to better evaluate our options and decide whether or not a variable change in the model is warranted. This write-up is a summary of available sea surface temperature (SST) variables based on satellite data (average of May or the average over the months of May, June, and July from 1997 through 2020) in four regions of northern Southeast Alaska (NSEAK); Icy Strait, Chatham Strait, NSEAK as a whole, and a region that is in close proximity to the Icy Strait transect from the SECM survey.

2 Methods

Satellite-derived sea surface temperature (SST) data were pulled from the 'NOAA Coral Reef Watch Operational Daily Near-Real-Time Global 5-km Satellite Coral Bleaching Monitoring Products daily 1985 to present sea surface temperature (Celsius) time series' (https://coastwatch.pfeg.noaa.gov/erddap/griddap/NOAA_DHW_monthly.html).

This SST data set was then matched to pre-determined coordinates from four regions of interest,

1. 'Icy_Strait' region (Figure 1);
2. 'Chatham_Strait' region (Figure 2);
3. northern Southeast Alaska (NSEAK) region (Figure 3); and
4. close proximity to the Icy Strait transect from the SECM survey ('ISTI_Jordan' region; Figure 4),

to determine the May, and May through July sea surface temperature data from 1997 to 2020 for each region.

The four regions are defined as:

Icy_Strait: This region is similar to the Icy Strait Temperature Index (i.e., ISTI_MJJ and ISTI_May) and is meant to replicate sampling that occurs from vessels in Icy Strait during the SECM surveys (Icy Strait and Upper Chatham transects; stations ISA, ISB, ISC, ISD, UCA, UCB, UCC, UCD), a migration pinch point for salmon in Southeast Alaska (Piston et al., 2021; Figure 1).

Chatham_Strait: This region encompasses waters of Chatham Strait from the northern tip of Admiralty Island (approximately 58.425 degrees latitude north) to the approximate latitude of 56.025 degrees north (roughly Cape Decision off Kuiu Island) (Figure 2).

NSEAK: This region encompasses northern Southeast Alaska from 59.475 to 56.075 degrees north latitude (Figure 3).

ISTI_Jordan: This region is meant to replicate sampling of the Icy Strait transect (stations ISA, ISB, ISC, ISD) during the SECM survey (Figure 4).

3 Results

Satellite sea surface temperature data was summarized by region and year for the month of May or over the months of May, June, and July from 1997 to 2020.

Table 1: Satellite sea temperature data from the Icy_Strait region from 1997 to 2020. The variable SST_MJJ is the sea surface temperature averaged over the entire Icy Strait region for the months May, June, and July. The variable SST_May is the sea surface temperature averaged over the entire Icy strait region for the month of May. There were 42 satellite stations (latitude/longitude combinations) in the Icy strait region.

region	year	SST_MJJ	SST_May
Icy_Strait	1997	10.43	7.17
Icy_Strait	1998	10.15	7.40
Icy_Strait	1999	9.30	6.33
Icy_Strait	2000	10.08	7.10
Icy_Strait	2001	9.67	6.54
Icy_Strait	2002	9.44	6.31
Icy_Strait	2003	10.20	7.42
Icy_Strait	2004	10.87	7.75
Icy_Strait	2005	11.30	8.58
Icy_Strait	2006	10.36	6.90
Icy_Strait	2007	9.62	6.73
Icy_Strait	2008	9.01	6.50
Icy_Strait	2009	10.31	7.45
Icy_Strait	2010	10.13	7.93
Icy_Strait	2011	10.08	7.02
Icy_Strait	2012	9.40	7.01
Icy_Strait	2013	10.12	6.41
Icy_Strait	2014	10.45	8.14
Icy_Strait	2015	10.97	8.54
Icy_Strait	2016	11.84	8.96
Icy_Strait	2017	10.03	7.42
Icy_Strait	2018	10.30	7.09

region	year	SST_MJJ	SST_May
Icy_Strait	2019	11.10	8.00
Icy_Strait	2020	10.73	8.19

region	year	SST_MJJ	SST_May

Table 2: Satellite sea temperature data from the Chatham_Strait region from 1997 to 2020. The variable SST_MJJ is the sea surface temperature averaged over the entire Chatham Strait region for the months May, June, and July. The variable SST_May is the sea surface temperature averaged over the entire Chatham Strait region for the month of May. There were 266 satellite stations (latitude/longitude combinations) in the Chatham Strait region.

region	year	SST_MJJ	SST_May
Chatham_Strait	1997	10.05	7.58
Chatham_Strait	1998	9.86	7.92
Chatham_Strait	1999	8.90	6.99
Chatham_Strait	2000	9.68	7.41
Chatham_Strait	2001	9.10	6.80
Chatham_Strait	2002	8.92	6.41
Chatham_Strait	2003	9.91	7.81
Chatham_Strait	2004	10.42	8.06
Chatham_Strait	2005	10.59	8.54
Chatham_Strait	2006	9.74	7.23
Chatham_Strait	2007	9.55	7.17
Chatham_Strait	2008	8.65	6.86
Chatham_Strait	2009	9.79	7.36
Chatham_Strait	2010	9.66	8.06
Chatham_Strait	2011	9.61	7.46
Chatham_Strait	2012	9.20	7.12
Chatham_Strait	2013	9.66	6.80
Chatham_Strait	2014	9.98	8.27
Chatham_Strait	2015	10.66	9.02
Chatham_Strait	2016	10.97	8.97
Chatham_Strait	2017	9.67	7.77
Chatham_Strait	2018	9.91	7.53
Chatham_Strait	2019	10.50	8.37
Chatham_Strait	2020	9.98	8.19

Table 3: Satellite sea temperature from the northern Southeast Alaska (NSEAK) region from 1997 to 2020. The variable SST_MJJ is the sea surface temperature averaged over the entire NSEAK region for the months May, June, and July. The variable SST_May is the sea surface temperature averaged over the entire NSEAK region for the month of May. There were 1,732 satellite stations (latitude/longitude combinations) in the NSEAK region.

region	year	SST_MJJ	SST_May
NSEAK	1997	10.03	7.43
NSEAK	1998	9.92	7.78
NSEAK	1999	8.94	6.80
NSEAK	2000	9.69	7.30
NSEAK	2001	9.19	6.73
NSEAK	2002	9.07	6.50
NSEAK	2003	9.87	7.64
NSEAK	2004	10.40	7.98
NSEAK	2005	10.61	8.43
NSEAK	2006	9.72	7.10
NSEAK	2007	9.52	7.04
NSEAK	2008	8.72	6.76
NSEAK	2009	9.79	7.37
NSEAK	2010	9.67	7.83
NSEAK	2011	9.66	7.33
NSEAK	2012	9.20	7.05
NSEAK	2013	9.76	6.79
NSEAK	2014	10.04	8.23
NSEAK	2015	10.83	9.05
NSEAK	2016	11.21	9.04
NSEAK	2017	9.87	7.84
NSEAK	2018	10.19	7.70
NSEAK	2019	10.94	8.56
NSEAK	2020	10.27	8.42

Table 4: Satellite sea temperature from the Icy Strait transect of the SECM project from 1997 to 2020. The variable SST_MJJ is the sea surface temperature averaged over the entire Icy Strait transect for the months May, June, and July. The variable SST_May is the sea surface temperature averaged over the entire Icy strait transect for the month of May. There were 4 satellite stations (latitude/longitude combinations) in the ISTI_Jordan region.

region	year	SST_MJJ	SST_May
ISTI_Jordan	1997	10.43	7.14
ISTI_Jordan	1998	10.07	7.35
ISTI_Jordan	1999	9.18	6.13
ISTI_Jordan	2000	10.05	7.09
ISTI_Jordan	2001	9.65	6.49
ISTI_Jordan	2002	9.41	6.32
ISTI_Jordan	2003	10.17	7.42
ISTI_Jordan	2004	10.84	7.71
ISTI_Jordan	2005	11.32	8.59
ISTI_Jordan	2006	10.28	6.88
ISTI_Jordan	2007	9.59	6.60
ISTI_Jordan	2008	8.90	6.44
ISTI_Jordan	2009	10.11	7.35
ISTI_Jordan	2010	9.99	7.82
ISTI_Jordan	2011	9.93	6.86
ISTI_Jordan	2012	9.29	6.96
ISTI_Jordan	2013	10.02	6.49
ISTI_Jordan	2014	10.33	8.01
ISTI_Jordan	2015	10.82	8.44
ISTI_Jordan	2016	11.76	8.92
ISTI_Jordan	2017	9.92	7.34
ISTI_Jordan	2018	10.16	7.03
ISTI_Jordan	2019	10.92	7.92
ISTI_Jordan	2020	10.63	8.08

4 Acknowledgements

Jordan Watson (NOAA) helped with the code to process the satellite data into a usable format.

5 References

Piston, A. W., J. Murphy, J. Moss, W. Strasburger, S. C. Heinl, E. Fergusson, S. Miller, A. Gray, and C. Waters. 2021. Operational Plan: Southeast coastal monitoring, 2021. Alaska Department of Fish and Game, Regional Operational Plan No. ROP.CF.1J.2021.02, Douglas.

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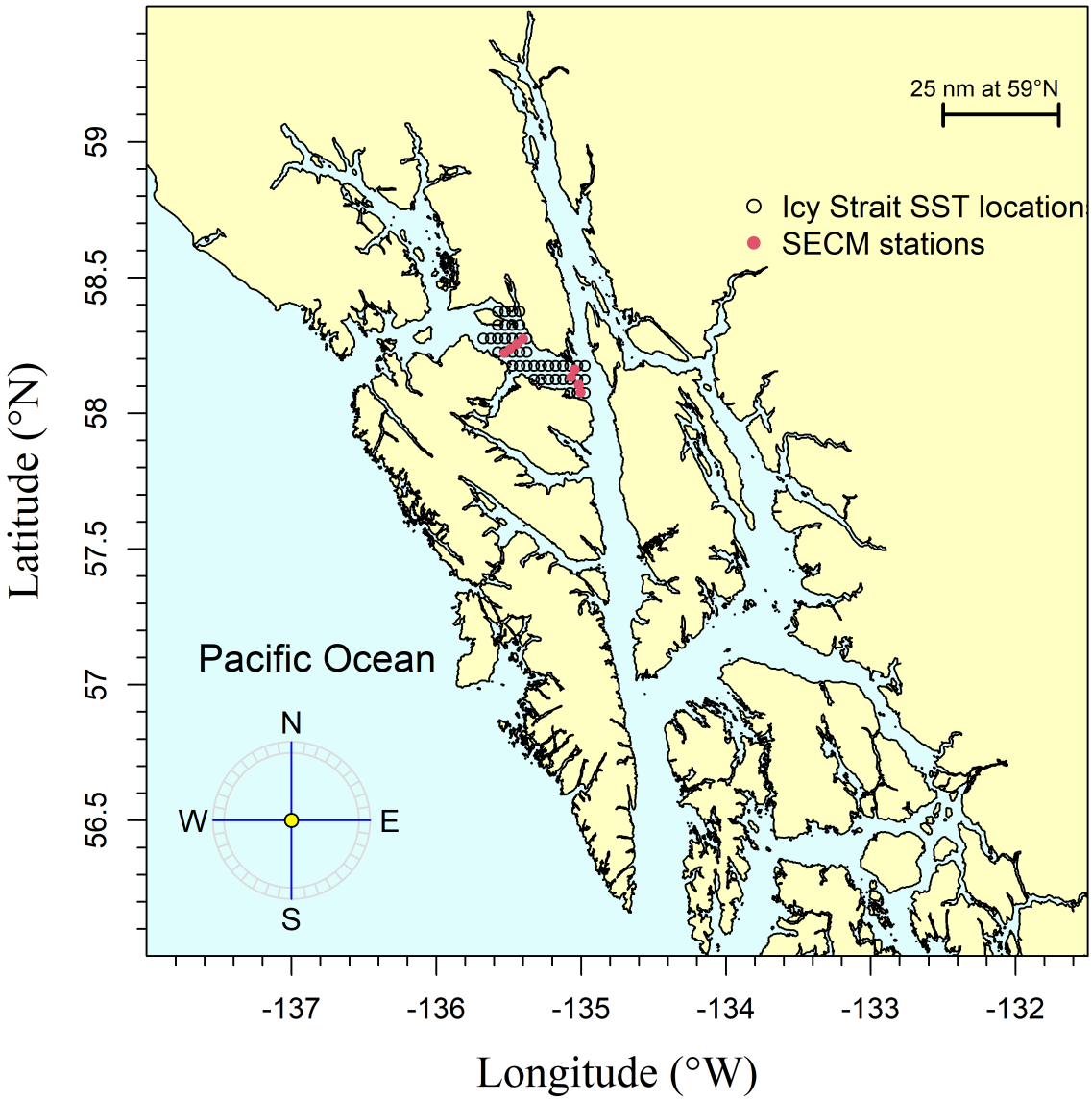

Figure 1: The Icy Strait region is meant to replicate sampling that occurs from vessels in Icy Strait (Icy Strait and Upper Chatham transects), a migration pinch point for salmon in southeast Alaska. The Southeast Coastal Monitoring (SECM) project transects (Upper Chatham Strait and Icy Strait) are shown as red points for comparison to the satellite stations (i.e., data points; black circles).

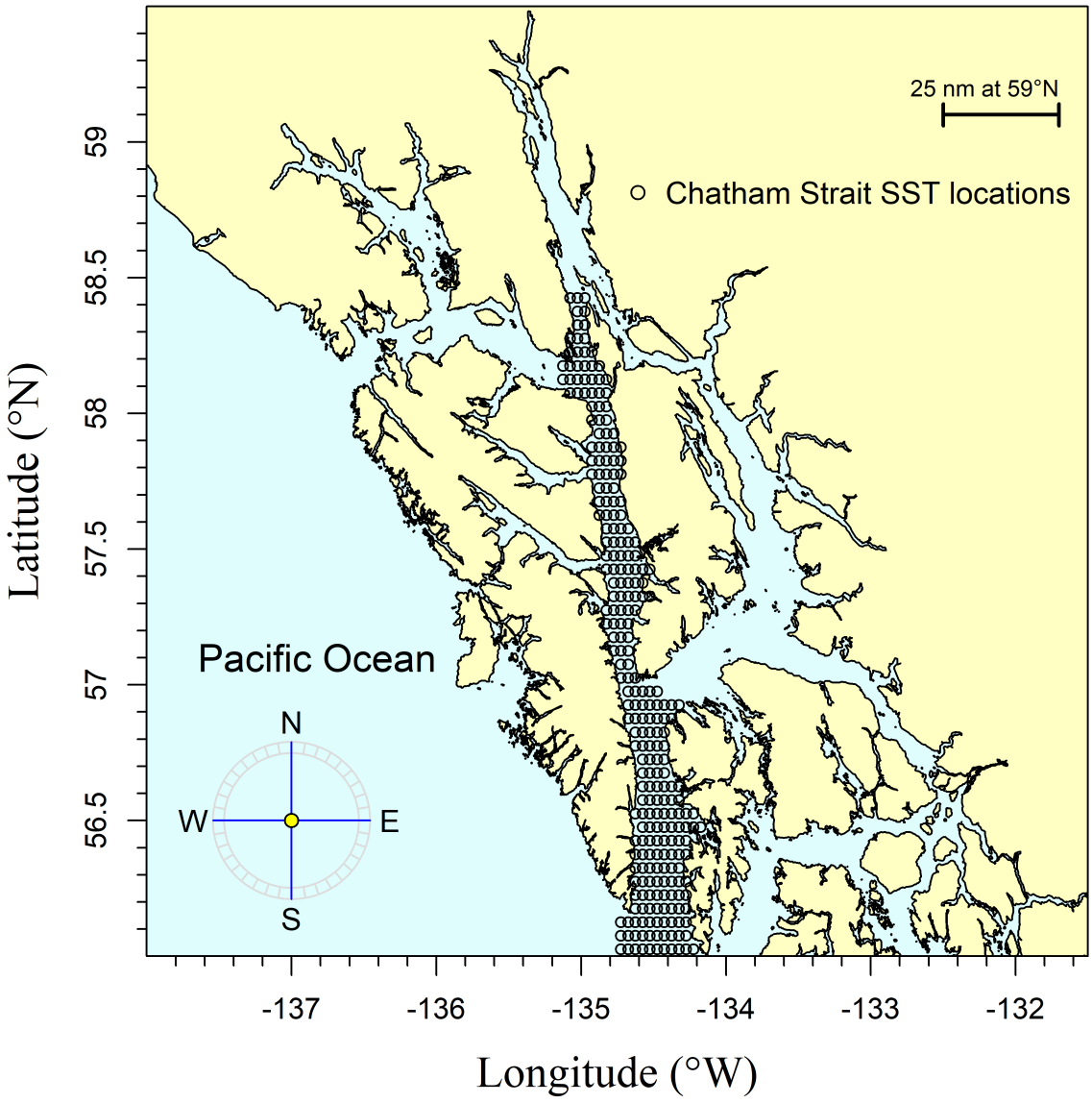

Figure 2: The Chatham Strait region encompasses waters of Chatham Strait from approximately the northern tip of Admiralty Island at Point Retreat (Point Retreat; 58.4115 degrees north latitude and -134.955 degrees west longitude) to the approximate latitude of 56.025 degrees north (roughly Cape Decision off Kuiu Island). The black circles are the satellite stations (i.e., data points).

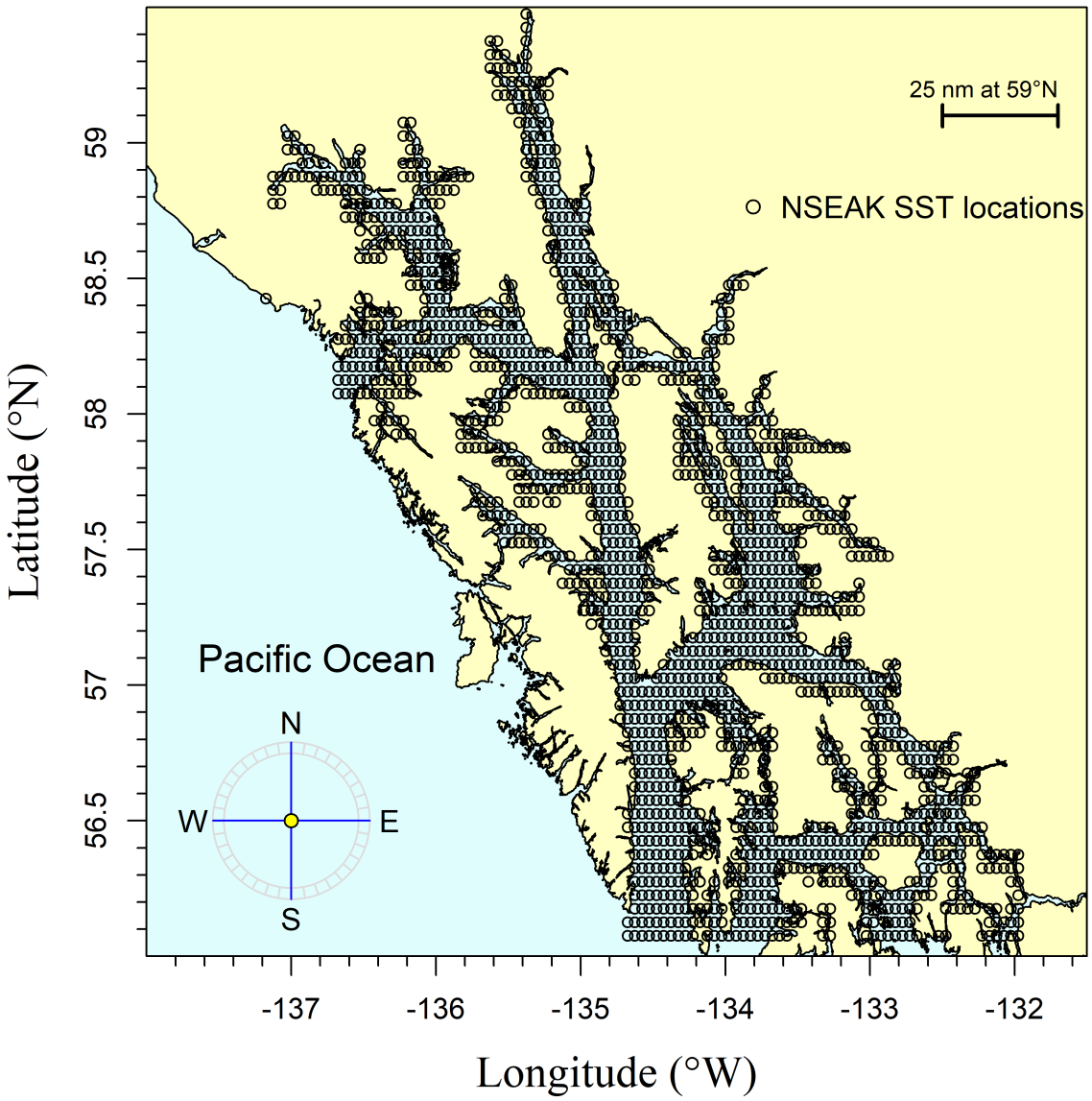

Figure 3: The northern Southeast Alaska (NSEAK region) region encompasses northern Southeast Alaska from 59.475 to 56.075 degrees north latitude and from -137.175 to -131.975 degrees west longitude. The black circles are the satellite stations (i.e., data points).

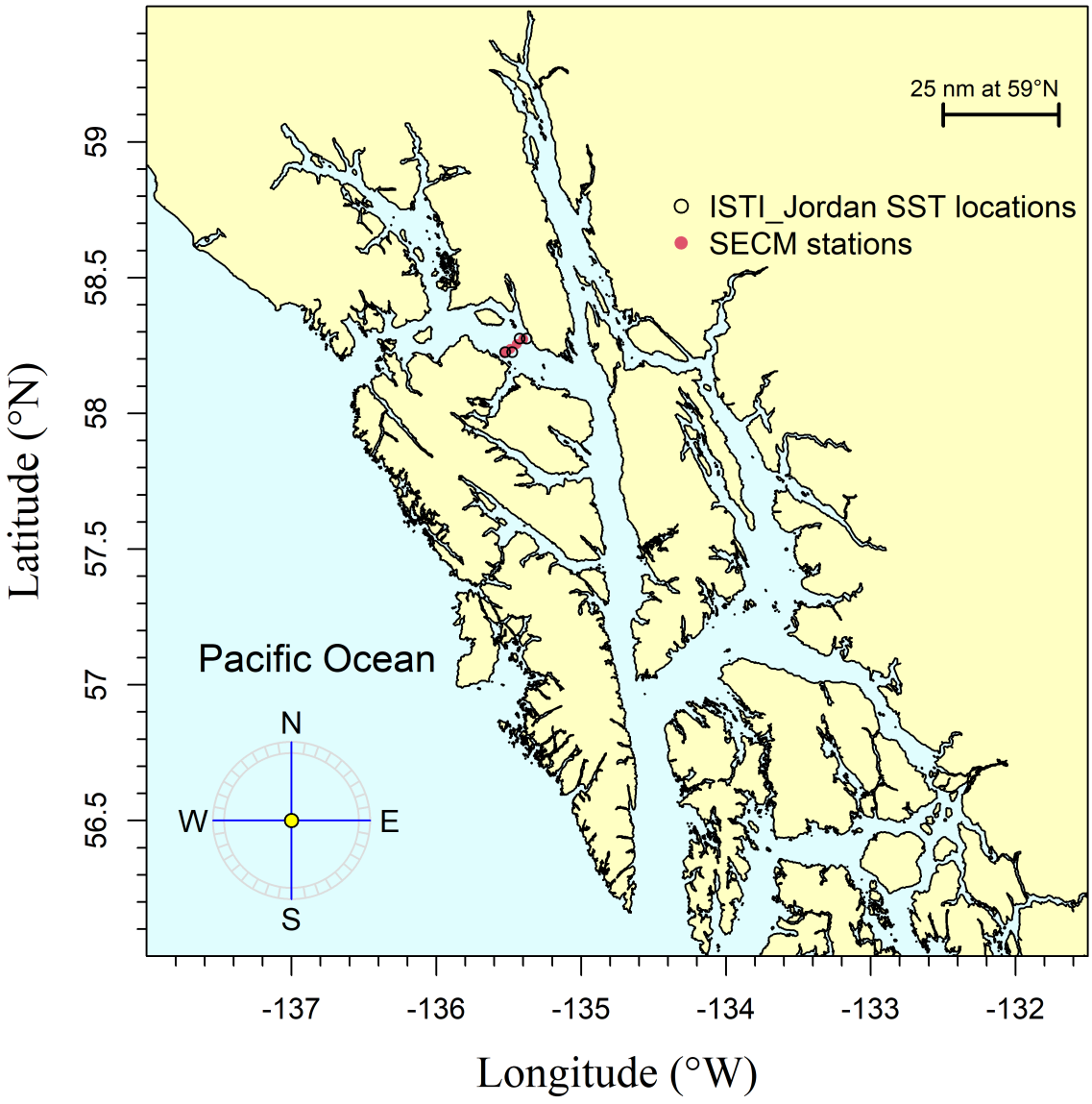

Figure 4: This region is meant to replicate sampling of the Icy Strait transect (stations ISA, ISB, ISC, ISD) during the SECM survey. The black circles are the satellite stations (i.e., data points).

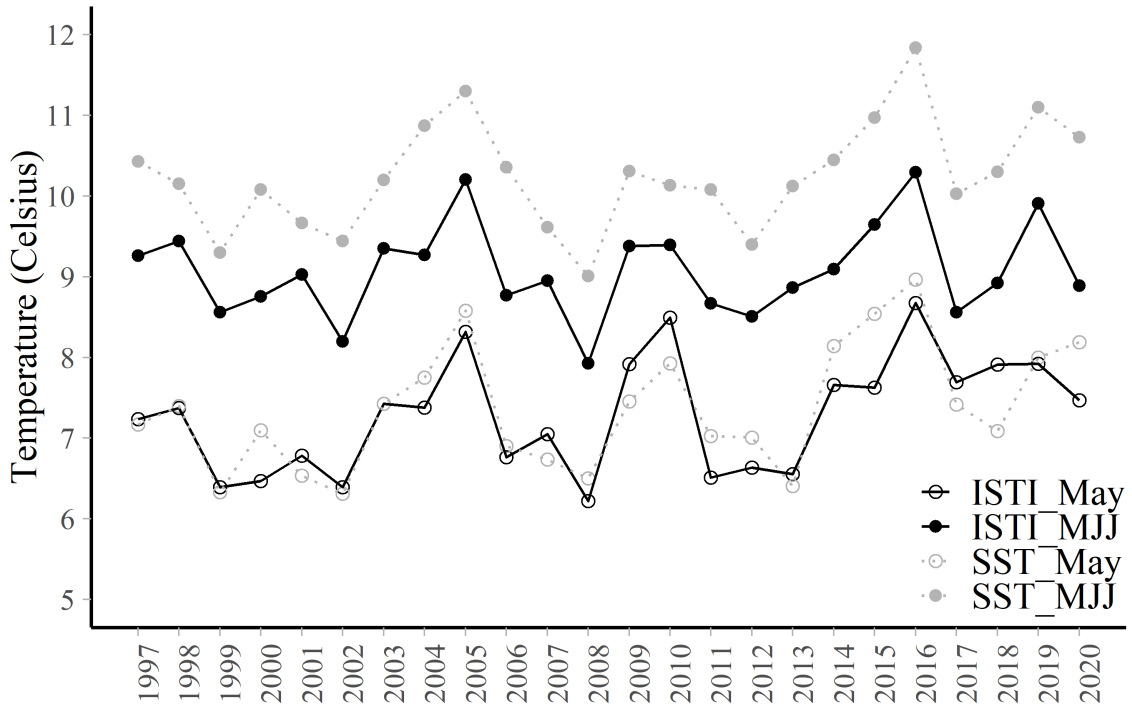

Figure 5: Mean temperature data (degrees Celsius) from 1997 through 2020 for the month of May and averaged over the months of May, June, and July for the Icy Strait area. The variable ISTI May is the May Icy Strait Temperature Index (average upper 20 meter temperature in the Icy Strait and Upper Chatham stations). The variable ISTI MJJ is the average May, June, and July Icy Strait Temperature Index (average upper 20 meter temperature in the Icy Strait and Upper Chatham stations). The variable SST May is the satellite sea surface temperature data averaged over the entire Icy Strait region for the month of May. The variable SST MJJ is the satellite sea surface temperature averaged over the entire Icy Strait region for the months of May, June, and July.

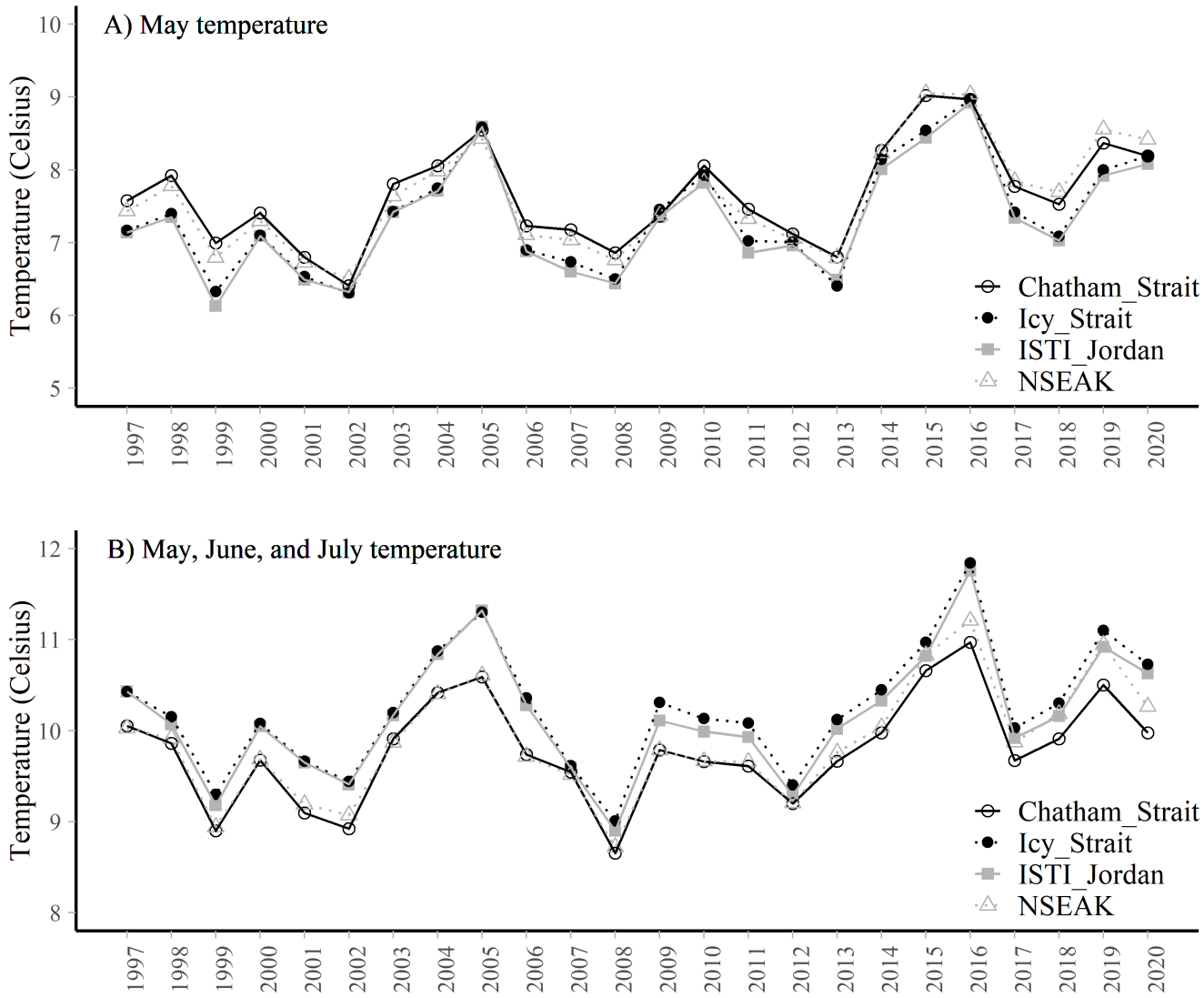

Figure 6: A. The May temperature averaged over each region (Chatham Strait, Icy strait, NSEAK, or ISIT Jordan) from 1997 through 2020. B. The May, June, and July temperature averaged over each region (Chatham Strait, Icy strait, NSEAK, or ISIT Jordan) from 1997 through 2020.

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