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SEA ICE CONDITIONS IN THE COOK INLET, ALASKA DURING THE 1971-72 WINTER

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ALASKA REGION

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Outbound from the Dock Port of Anchorage, February 11, 1971

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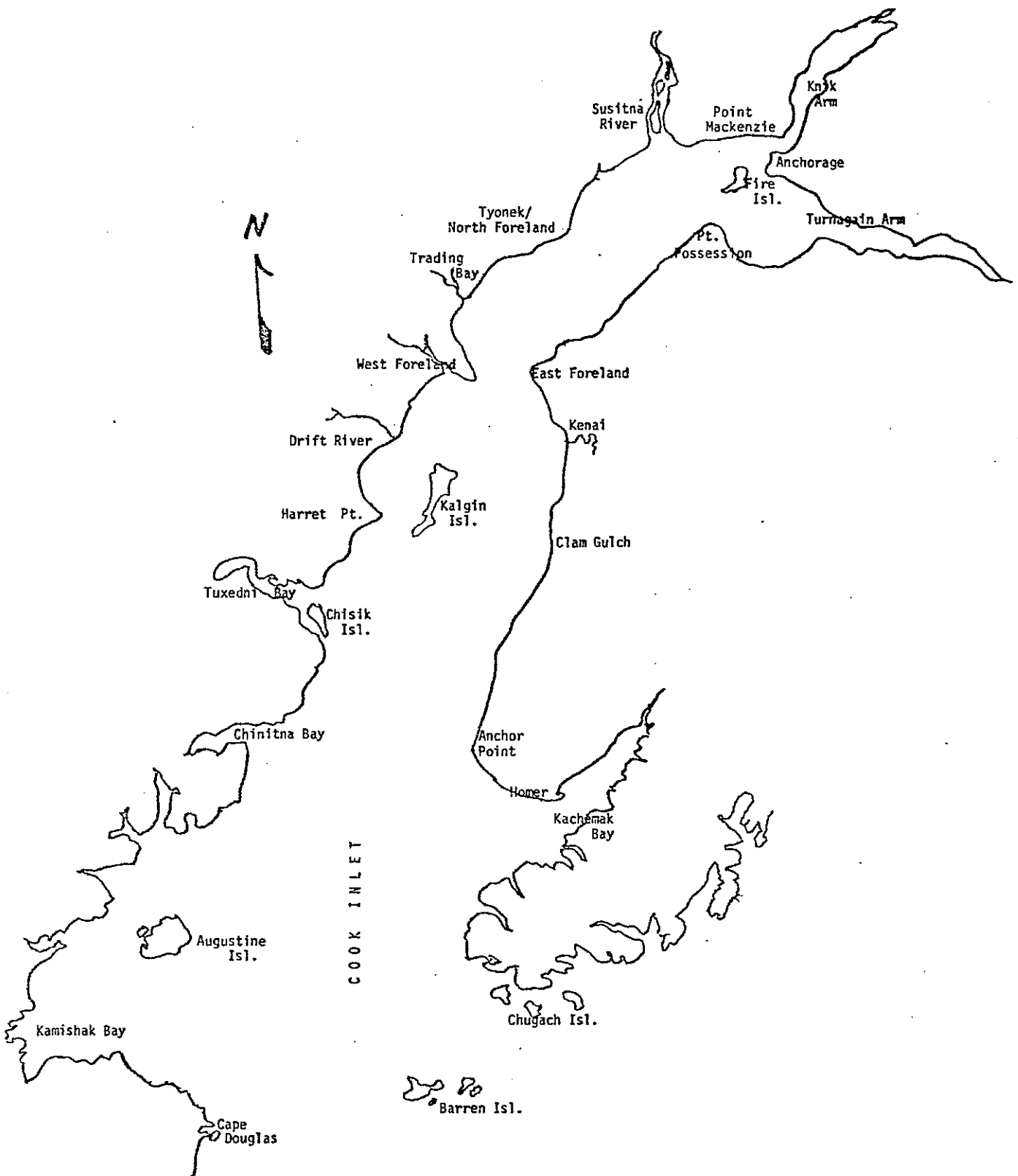
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Meteorologist

ALASKA REGION

ANCHORAGE, ALASKA
APRIL 1973

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SEA ICE CONDITIONS IN COOK INLET, ALASKA DURING THE
1971-72 WINTER

The development of ice began slowly during the late fall of 1971, but persistent below normal temperatures during January, February, and March of 1972, resulted in a long and rough ice year. Figure 2, showing the cumulative degree days (base 32°F) for the winter, indicates a near normal accumulation of frost degree days during November and December, and a steady increase in the accumulated frost degree days¹ through January, February, and March.

By the end of March, the total winter's accumulation is near the point above which only the coldest 10% of the winters have fallen. (See table 3.) The cumulative frost degree days indicate ice growth. The frost degree days for the winter of 1971-72 in Figure 2, shows near normal growth of the ice during the late fall and early part of the winter, with a more rapid growth and heavier than normal concentration in January and February, persisting through March. Below normal temperatures throughout April and during the first part of May resulted in a slow decrease in the ice during the spring. (See Figure 1.) The Inlet was not ice free until the middle of May. The Inlet, during the winter of 1970-71, was clear of ice about this same date, but during the winter of 1969-70, the Inlet was ice free nearly 2 months earlier.

¹A frost degree day is defined as a mean temperature 1°F below an arbitrary base of 32°F.

Until the 20th of November, the Inlet was under the influence of relatively warm air and the only ice to form was fresh water ice near the mouths of rivers in the northern part of the Inlet. On the 20th, a strong high pressure area developed along the west coast of Alaska. The resulting northwesterly flow over the Cook Inlet lowered temperatures rapidly. The average temperature at Anchorage on the 23rd was 6 above, 13 degrees below the normal for that date.

Ice in the Inlet formed rapidly on the 23rd and 24th. In the previous 2 years the "ice that came to stay" generally formed during the last half of November. However, during the winter of 1970-71, some ice formed briefly during the middle of October in the northern part of the Inlet.

The movement in the northern sections of the Inlet was halted on the 24th with the development of close pack of brash and floes up to 8 inches thick north and east of Fire Island. By the end of November, close to very close pack up to 10 inches thick was reported from Anchorage Port to Fire Island, and very open pack from Fire Island to the Forelands.

Ice in the Inlet continued to grow during the first half of December and by the 13th, concentrations had increased to open to close pack from Fire Island to the Forelands and close to very close pack north

of Fire Island. Isolated chunks of ice up to 12 feet thick were reported grounded on the tidal flats.¹

On the 13th of December, a very large complex low pressure area moved from the northwest Pacific over the Bering Sea resulting in a southerly flow of warm air over the Inlet. Temperatures in the Inlet rose into the upper teens and 20's, up to 16 degrees above normal, between the 13th and the 19th. These warmer temperatures halted most of the ice growth in the Inlet.

However, this halt was only temporary. On the 19th, the low over the Bering Sea moved eastward and was replaced by a strong high pressure ridge. This synoptic pattern resulted in a moderate northerly flow of cold air over the Inlet. Temperatures at Anchorage averaged 2 below on the 21st, 14 degrees below normal. Ice began developing again with these colder temperatures. By the 25th, close to very close pack existed south to the Forelands. Open to close pack had developed from the Forelands to Anchor Point with a few strips and patches of brash and floes from Kalgin Island to Anchor Point. A few patches of brash had developed east of Coal Point in Kachemak Bay.

The growth of ice was halted again by warm temperatures during the last

¹These large chunks, called stamukhas, result from beach ice which has broken free, been deposited higher on the mud flats and frozen to the underlying mud. Ice floes floating toward the beach are caught on top

of the higher piece of ice and, as the tide recedes, the overhanging pieces break off leaving a stack of layered ice with nearly straight sides. This process is repeated many times, being limited only by the height of the tides and the strength with which the original beach ice is frozen into the mud.

part of December. On the 28th, the average temperature at Anchorage reached 35 degrees, 23 degrees above normal. Considerable softening of the ice occurred with the warmer temperatures as well as breaking up of the larger floes. However, the overall concentration decreased only a little.

Temperatures in the teens prevailed over the Inlet during the first part of January, with the accompanying slow increase in ice. However, on the 8th, a cold northerly flow developed over the Inlet and temperatures fell. At Anchorage, on the 11th, the average temperature was 21 below zero, 33 degrees below normal. The cold northerly flow persisted through the 24th of January, resulting in a steady ice growth. Thicknesses of ice floes increased at a rate of an inch or two a day with the Anchorage Dock reporting a thickness of 3 to 4 feet on the 24th. From the dock to Moose Point, very close pack existed with close to very close pack south of Moose Point to Kalgin Island. From Kalgin Island south to Anchor Point and along the west side of the Inlet to southern Kamishak Bay, open to close pack had developed, with heaviest concentration along the edges of the Inlet. As in the previous two winters, the maximum extent of the ice occurred during the last half of January.

Temperatures began warming some on the 25th, and rose to 32 degrees at Anchorage on the 28th. Relatively warm temperatures continued throughout the end of January. The warm temperatures during the last 6 days of the month resulted in a decrease in ice thickness and concentration, and considerable softening of the ice.

The combination of below normal temperatures, but increased sunshine, during the month of February, resulted in little change in the ice conditions in the Inlet. By the end of the month close to very close pack persisted south to Cape Kasilof and Chisik Island. Variable amounts of floes and brash existed south to Anchor Point and Kamishak Bay.

During the early part of March a strong high pressure area developed over the northern half of Alaska in combination with a low in the Gulf of Alaska and resulted in a persistent northerly flow of cold air over the Inlet. Temperatures at Anchorage during the first 19 days of the month averaged from zero to 15 above, 10 to 25 degrees below normal. The persistent cold temperatures allowed little decrease in ice concentrations despite 10 to 11 hours of sunshine nearly every day. Close to very close pack of brash and floes 6 to 18 inches thick remained from Anchorage to southern Kalgin Island. From the southern part of Kalgin Island to Anchor Point on the east side of the Inlet and Chinitna Point on the west, open pack up to 6 inches thick existed.

A break in the cold finally came on the 20th of March, when a low pres-

sure area moved over Prince William Sound into the Copper River Basin resulting in a light southwesterly flow over the Inlet. Temperatures rose to 27 degrees at Anchorage on the 19th, above normal for the first time during the month. The combination of warmer temperatures and 13 or more hours of sunshine daily resulted in a steady decrease in the ice concentration. By the end of March, variable conditions from open pack to very close pack existed from Anchorage to Clam Gulch. Ice thickness ranged up to 18 inches with a few grounded chunks on the mud flats near 20 feet thick. Open to very open pack frequently existed near the shores.

A strong ridge of high pressure developed over the eastern Bering Sea during the first part of April and persisted through the 15th. The resultant northerly flow kept temperatures below normal, generally in the upper teens and low 20's. Only a slow decrease occurred in the ice during the first half of the month.

Somewhat warmer temperatures occurred on the 17th, with the temperatures in Anchorage rising to 33 degrees, above freezing for the first time during the month, but still 5 degrees below normal.

A slow but steady decrease occurred in the ice concentration during the last half of the month and by the end of the month mostly open water existed in the Inlet except for scattered patches of brash generally north of Kalgin Island with the heaviest concentrations near the Forelands.

Temperatures over the Inlet continued to average below normal during the

first half of May, but 5 to 10 degrees above freezing. The slowly warming water, caused by increased sunshine, fresh water runoff, and increasing air temperatures, resulted in ice free conditions by the 15th of May.

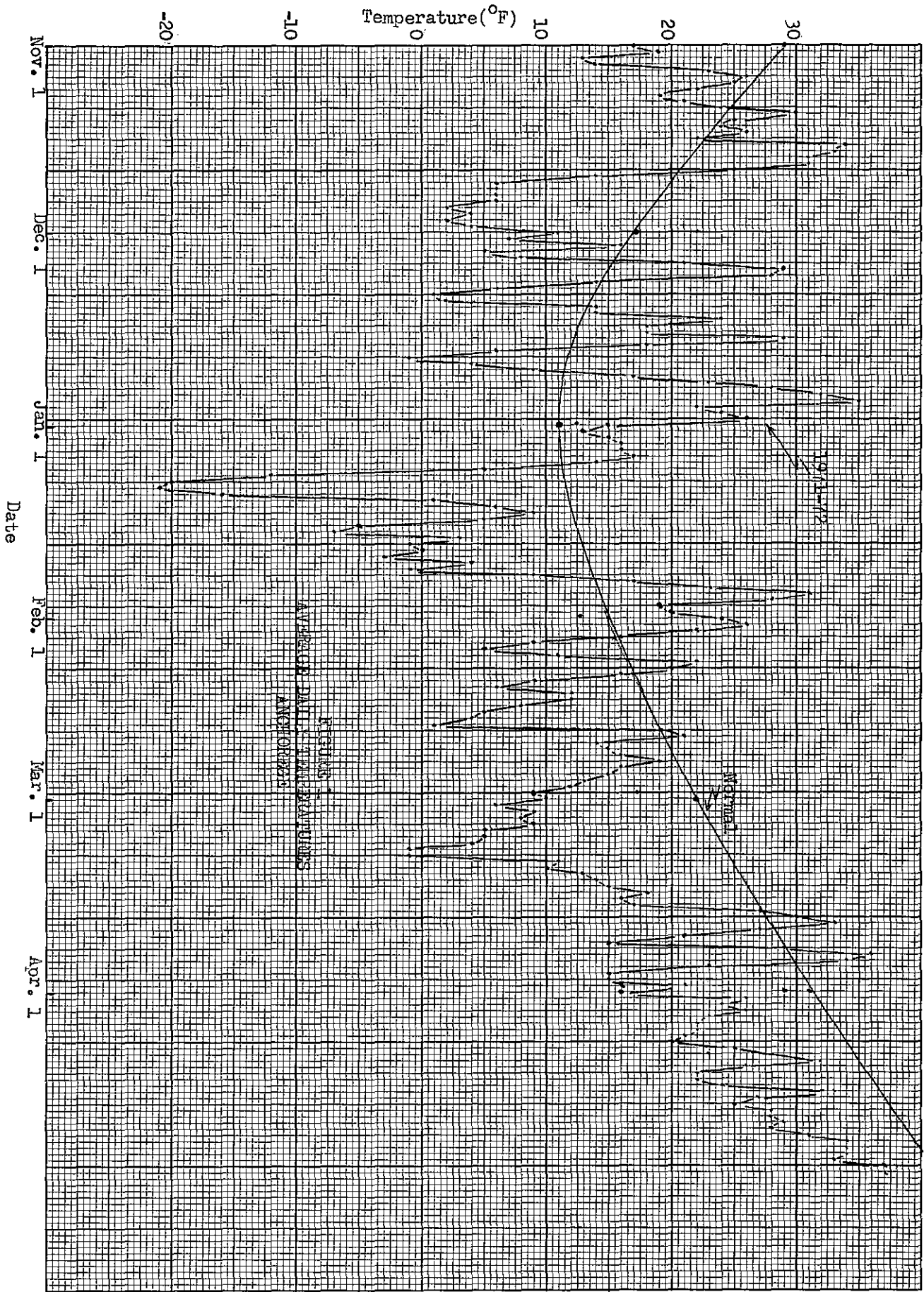


FIGURE 2

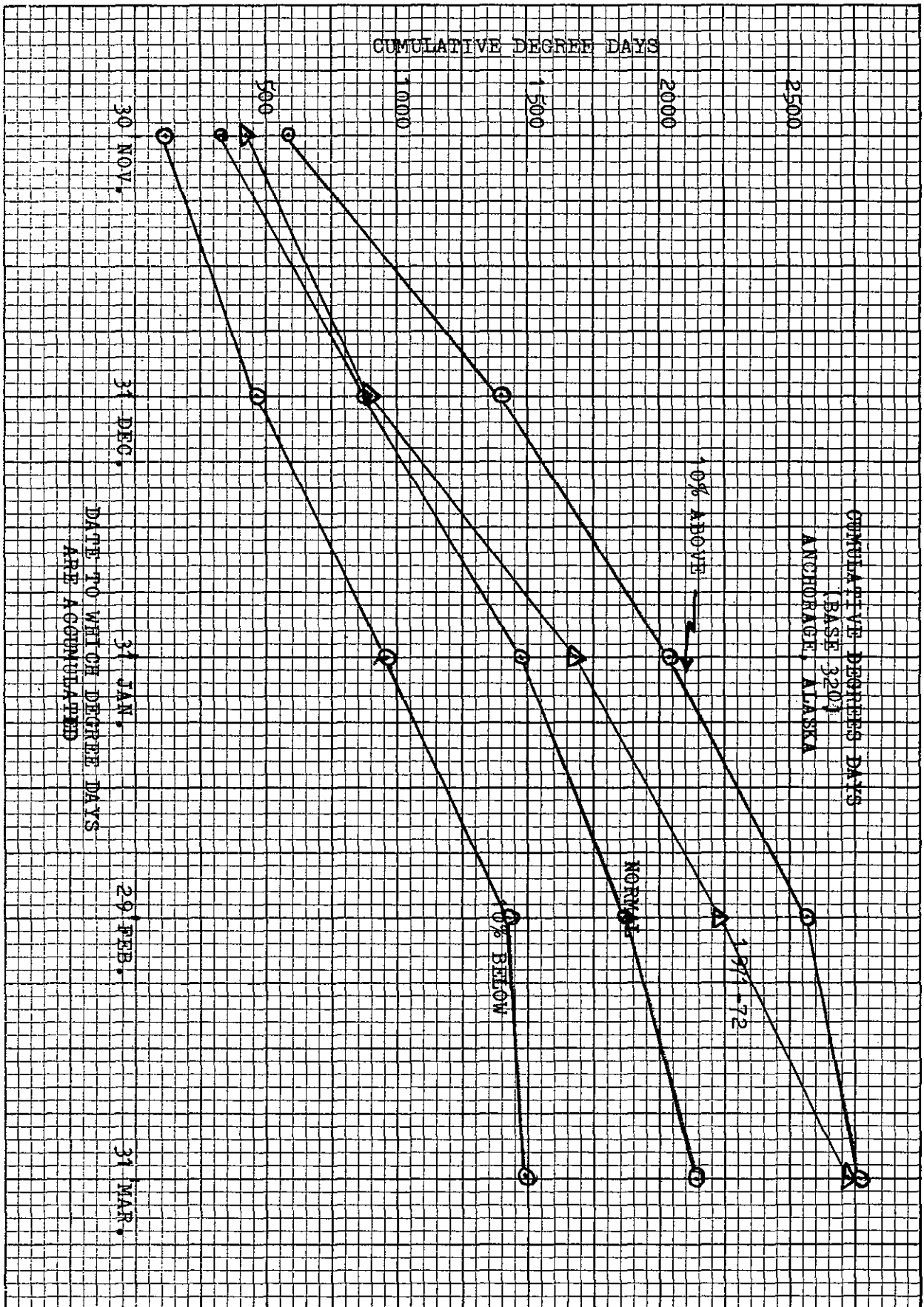


TABLE 1

CUMULATIVE DEGREE DAYS (BASE 32°F) FOR THE WINTER 1971-72
ANCHORAGE, ALASKA

	<u>By Nov. 30</u>	<u>By Dec. 31</u>	<u>By Jan. 31</u>	<u>By Feb. 29</u>	<u>By Mar. 31</u>
MONTHLY	409	488	791	537	500
CUMULATIVE	409	897	1688	2225	2725

TABLE 2

CUMULATIVE DEGREE DAYS (BASE 32°F) FOR EACH OF THE PAST 7 WINTERS
AT ANCHORAGE, ALASKA

YEAR	<u>By Nov. 30</u>	<u>By Dec. 31</u>	<u>By Jan. 31</u>	<u>By Feb. 28</u>
1964-65	313	1270	1948	2554
1965-66	338	918	1608	2086
1966-67	429	1080	1848	2335
1967-68	133	626	1228	1480
1968-69	290	1083	1929	2317
1969-70	265	369	1078	1157
1970-71	362	895	1814	2153

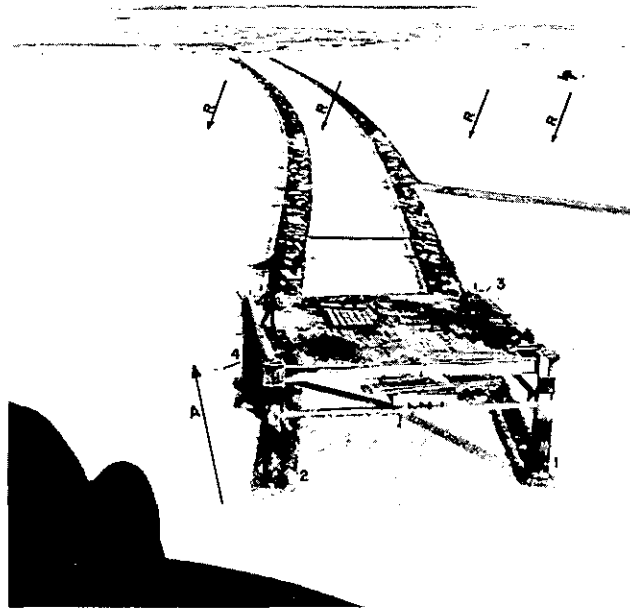
CLIMATOLOGICAL SUMMARY OF CUMULATIVE DEGREE DAYS (BASE 32°F)
 AT ANCHORAGE, ALASKA FOR OCTOBER THROUGH MARCH

(Period of record begins with 1923-24 winter*)

The winter of 1955-56 accumulated more degree days than anyother winter since the period of record began in 1923. The winter of 1930-31 accumulated the least. The percentage listed in the left hand column indicates the percent of years which have had a greater number of degree days accumulated by the end of a particular month. For example, 90% of the time more than 906 degree days have accumulated by Jan. 31.

	<u>By Nov. 30</u>	<u>By Dec. 31</u>	<u>By Jan. 31</u>	<u>By Feb. 28</u>	<u>By Mar 31</u>
1955-56	680	1415	2240	2873	3253
10% above	590	1400	2040	2560	2740
25%	500	1170	1930	2400	2580
Average	314	884	1479	1877	2146
75%	160	690	1130	1440	1690
90% above	120	460	906	1180	1490
1930-31	253	414	637	794	980

*1925-26, 1926-27, 1928-29 missing.



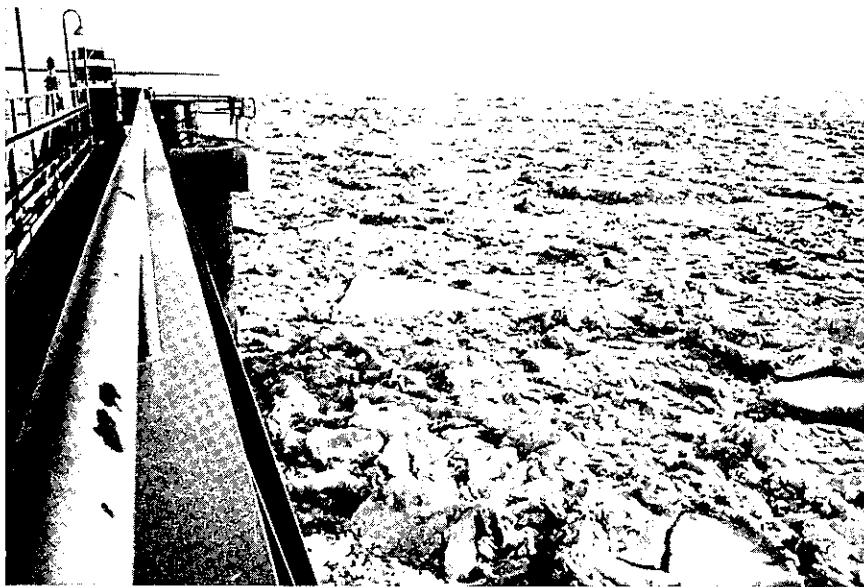
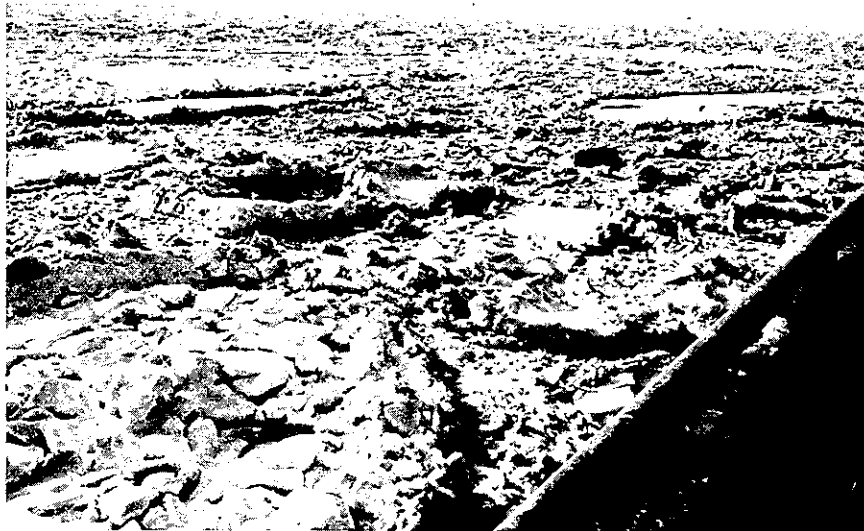
Test Platform at Middle Ground Shoal in Cook Inlet 1964-65 showing direction of ice movement A →, and rafted ice R → .

Pictures courtesy, Standard Oil of California



Floes with Rafted Ice 1964-65

Pictures Courtesy, Standard Oil of California



Dock near Nikiski, March 24, 1972,

Pictures Courtesy of Captain William L. Johnson, Alaska Marine Pilotage,
Inc.



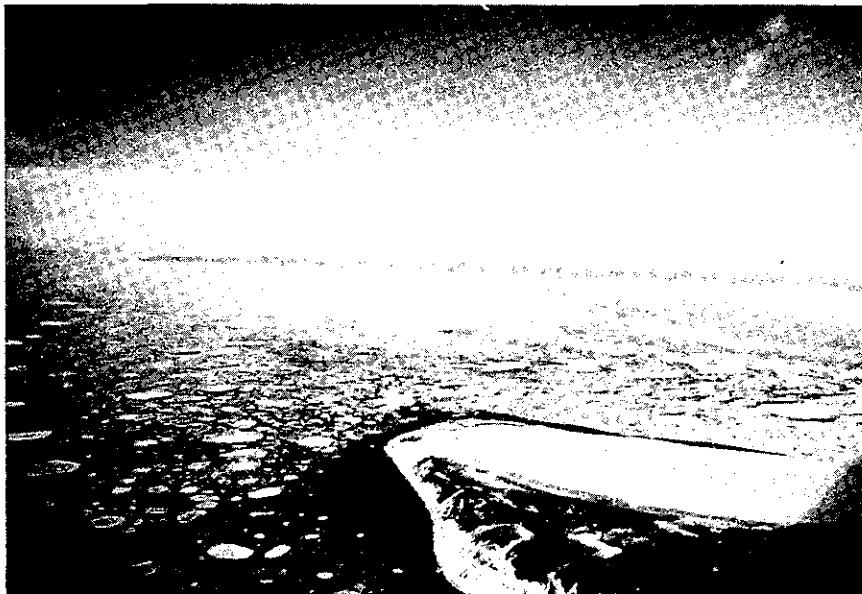
Dock near Nikiski, March 24, 1972, Picture courtesy
Captain William L. Johnson



Northwest across Cook Inlet 1971-72, Picture courtesy
Andy Wik, Marine Survey.



Near Nikiski from the Sealand Ship Philadelphia
Jan. 26, 1971



West across Cook Inlet from Fire Island February 1972
Pictures Courtesy Captain B.J. Logan
American Institute of Marine Underwriters