NOAA TECNICAL MEMORANDUM NWS AR-26

ICE EDGE PROBABILITIES FOR THE EASTERN BERING SEA

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National Weather Service, Regional Headquarters
Anchorage, Alaska
October 1979

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ABSTRACT. The probabilities of the location of the ice edge in the eastern Bering Sea are graphically depicted for the 1st and 15th of each month from November through June. The ice edge data were taken from U.S. Navy ice analyses (1972-1979) and corroborated with available satellite, ship, shore, and aerial observations. The probabilities were calculated using a cumulative frequency method. The chart series shows the seasonal expansion and recession of the Bering Sea ice pack and the wide variability of the ice edge on any of the given dates.

1. INTRODUCTION

This publication provides a climatological treatment of the ice growth cycle in the eastern Bering Sea in terms of semimonthly probabilities of the ice edge position from November through June. This information is primarily aimed toward fishermen whose scope of operations is slowly expanding in the Bering Sea. They may find knowledge of the seasonal ice edge expansion and recession of some use in long-range planning.

2. DATA AND PROCEDURES

The ice edge information was extracted from U.S. Navy Fleet Weather Facility ice analyses prepared weekly (1972-1979) and corroborated with satellite imagery, aerial ice reconnaissance, pilot reports and coastal and shipboard observations when available. The ice edge was taken to be the boundary between sea ice of any development stage (and in any concentration) and waters free of ice. The coordinates of the ice edges were treated statistically (cumulative frequency method) to arrive at isolines of probability in 25% increments from 0% to 100%, the 0% and 100% probability lines delineating the most southern and northern ice edge positions, respectively, while the 50% line represents a median ice edge position. In addition to the probability charts (Figures 2-17), average ice conditions during the initial stages of development (latter half of October) and during the final stages of decay (late June to early July) are shown in Figures 1 and 18, respectively.

3. RESULTS AND CONCLUSIONS

The series of charts show the seasonal expansion and recession of the ice edge in the eastern Bering Sea. On the average, ice initially forms in the inner reaches of Norton Sound and in the fresher outflow waters of the Yukon River during the latter half of October (Figure 1). As the ice growth season progresses, ice forms along the west coast and spreads southwestward while it is also developing in the northern latitudes of the Bering Sea and expanding southward. By mid-April (Figure 13) the ice cover has attained its maximum areal extent. The curving of the probability lines toward the northwest during the ice growth months indicates the influence of cold air flowing off the Alaskan mainland which expands the ice cover farther southward than to the west where the expansion of the ice cover is checked by warm north-setting ocean currents. The ice edge, which begins a slow northward movement during the latter half of April, accelerates northward during May and by late June sea ice is usually confined to an area between St. Lawrence Island and Norton Sound (Figure 18). This area is comprised of strips and belts of remnant pressure ridges and rotting first-year ice floes which disappear, on the average, shortly after July 1.

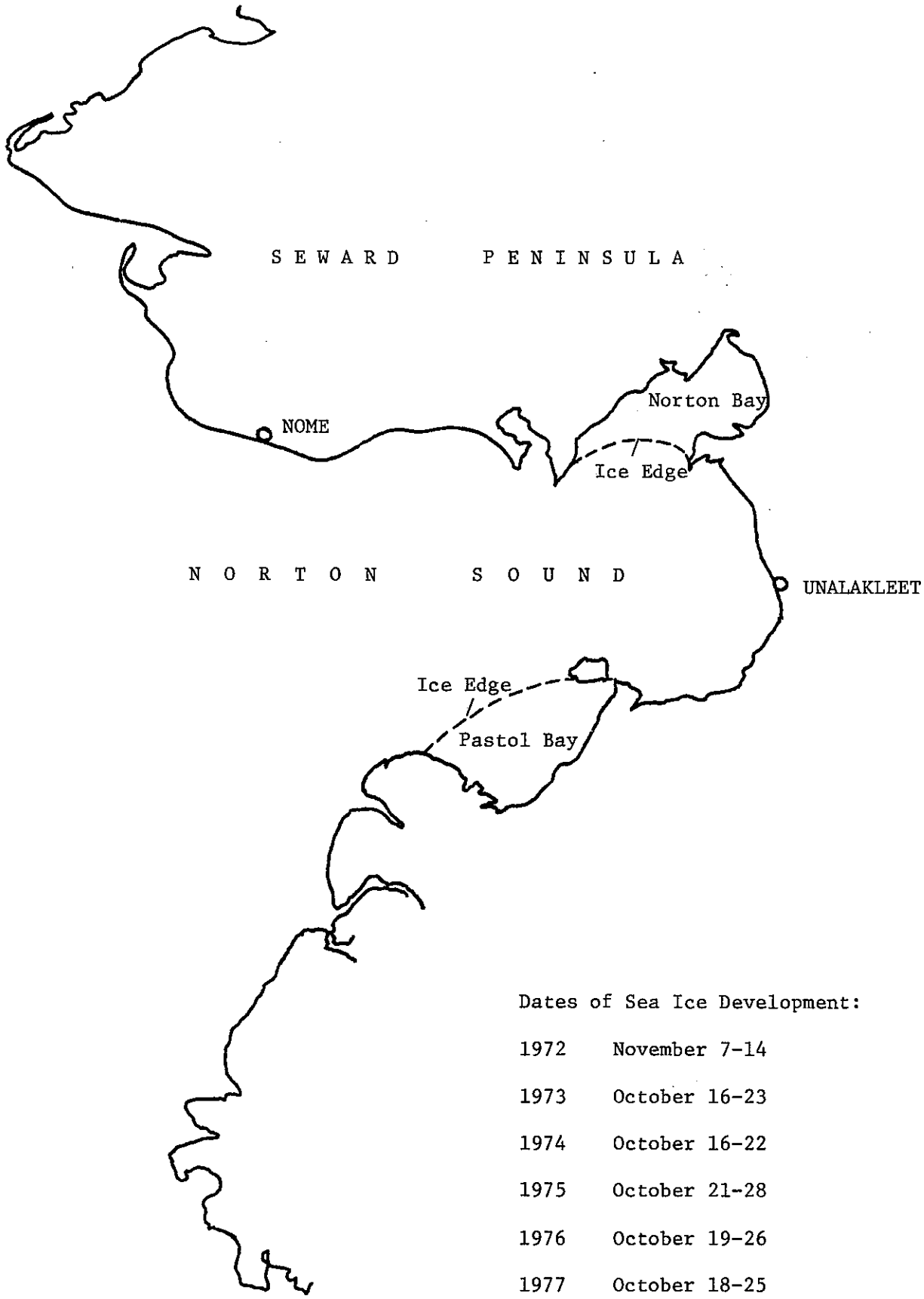
The wide variability which exists between the 0% and 100% probability line, particularly during April and May, deserves some explanation. This variability is due to the nature of the ice years examined. That is, heavy ice years occurred in the eastern Bering Sea from 1972 to 1976, while progressively lighter ice years have occurred since then. According to the Institute of North America, 1979 was the lightest ice year observed in the eastern Bering Sea since records began in 1953. Hence, the 100% probability line on virtually all of the charts depicts the ice edge which existed during 1979, while the 0% and 25% probability lines are representative of the ice edges which occurred prior to 1977.

4. ACKNOWLEDGEMENTS

My thanks to my colleague, Robert W. Kelly, who suggested the statistical method and assisted in the computations, and to Judy Smith for typing the final copy.

5. REFERENCE

Arctic Institute of North America, May 1979; Long Range Outlook For 1979 Navigation Season in the Beaufort and Chukchi Seas, 11 pp. (contract report).



Dates of Sea Ice Development:

1972	November 7-14
1973	October 16-23
1974	October 16-22
1975	October 21-28
1976	October 19-26
1977	October 18-25
1978	October 10-17
1979	November 1 (Estimation)

Figure 1. Average ice conditions during initial sea ice development.

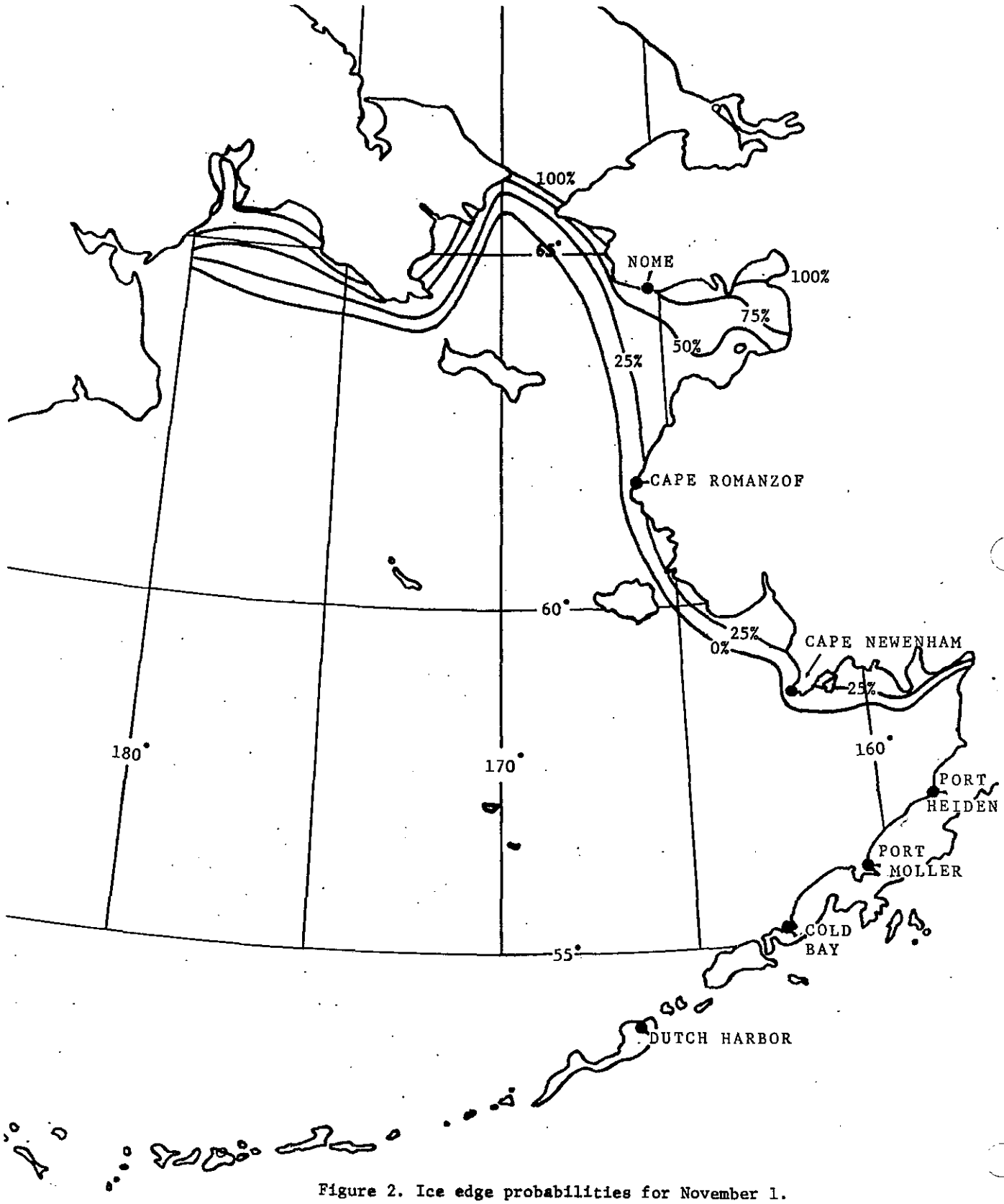


Figure 2. Ice edge probabilities for November 1.

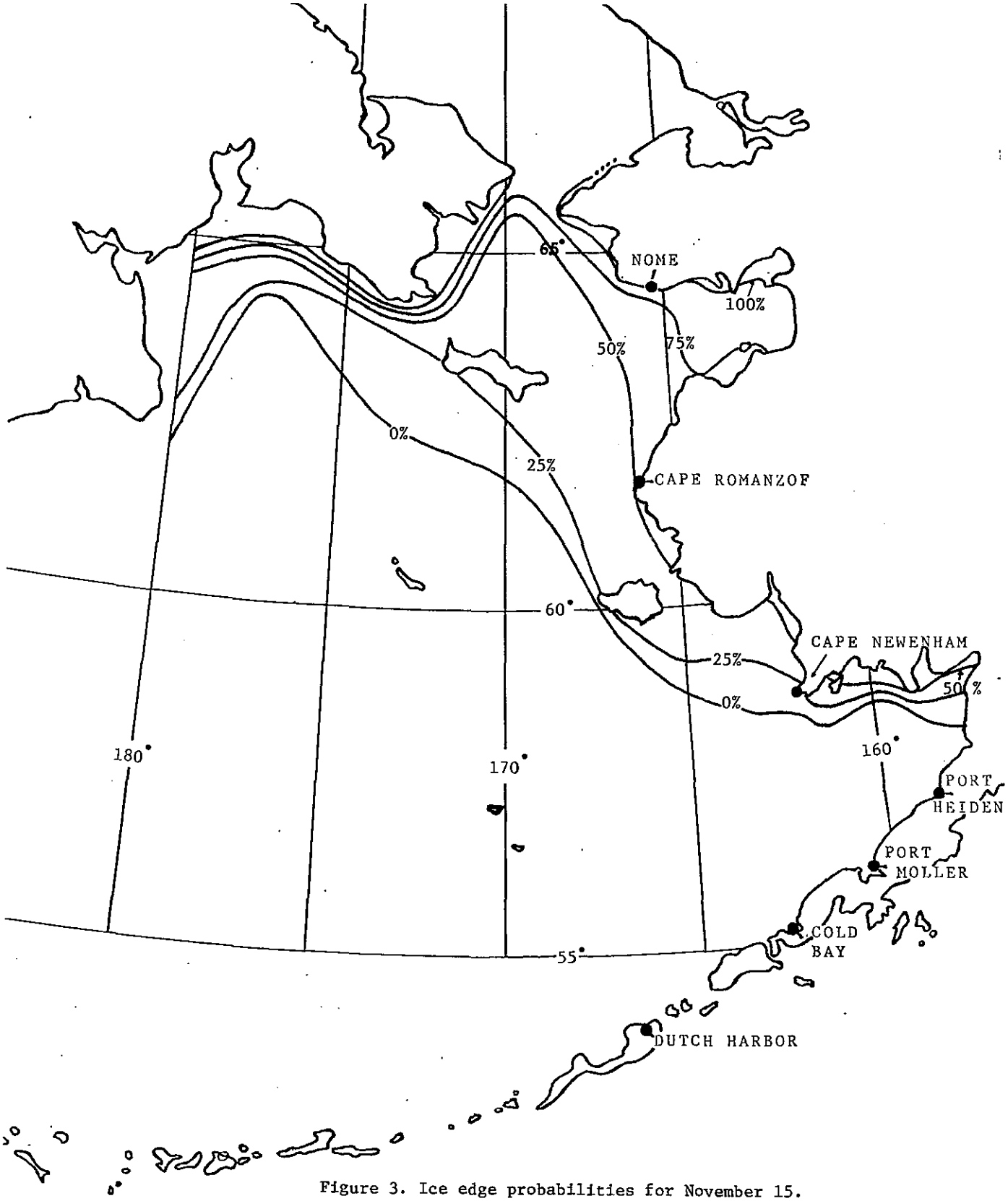


Figure 3. Ice edge probabilities for November 15.

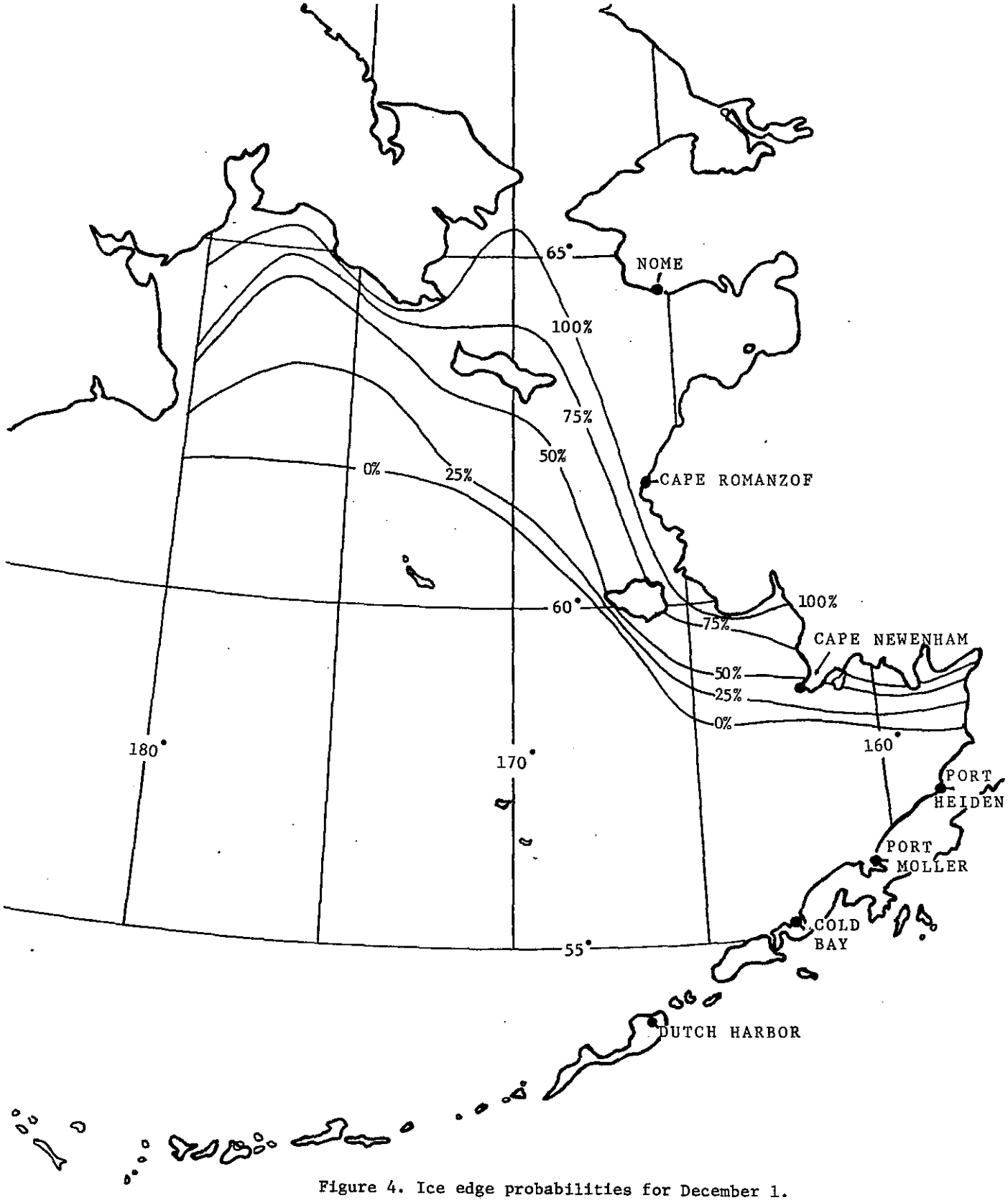


Figure 4. Ice edge probabilities for December 1.

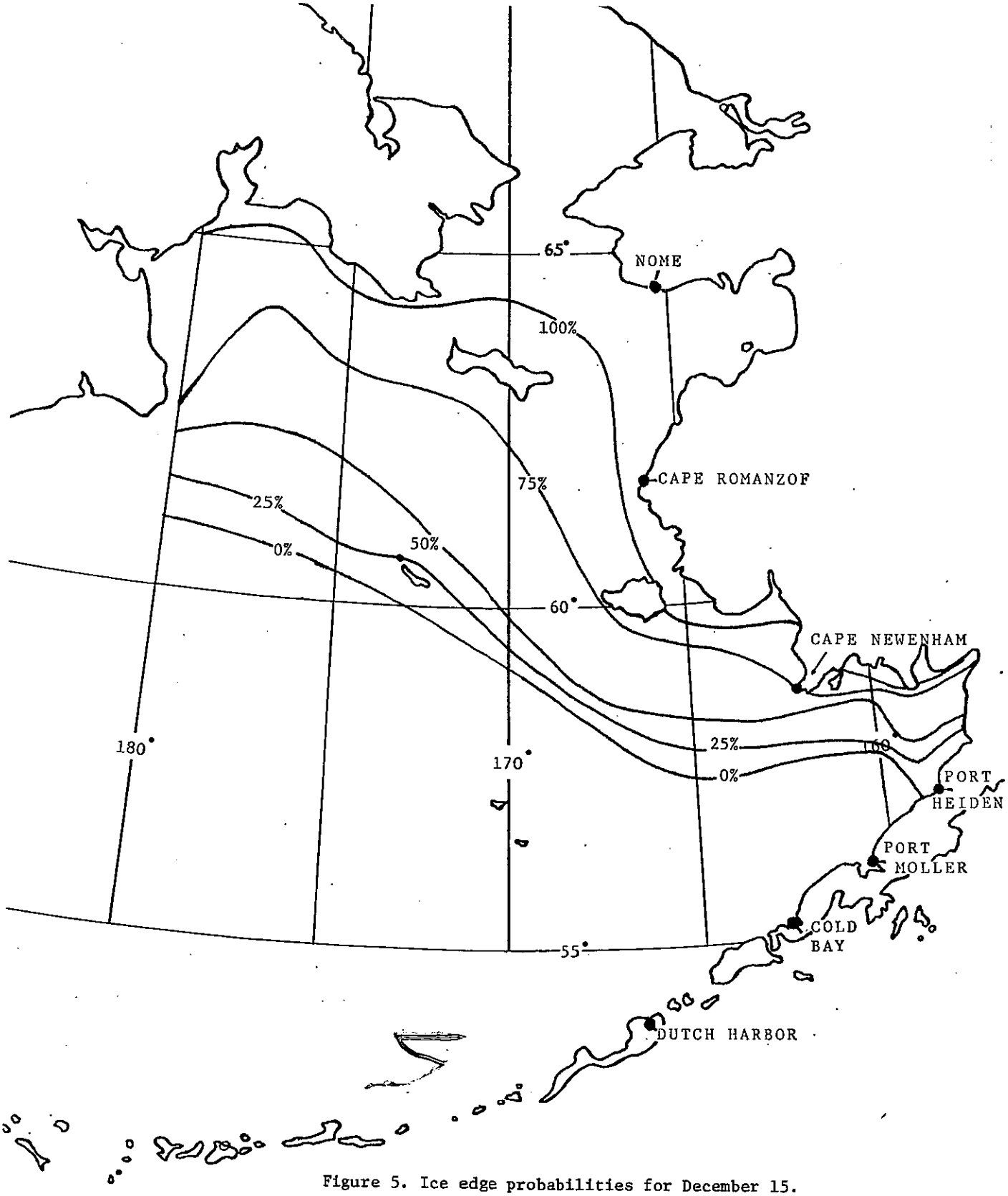


Figure 5. Ice edge probabilities for December 15.

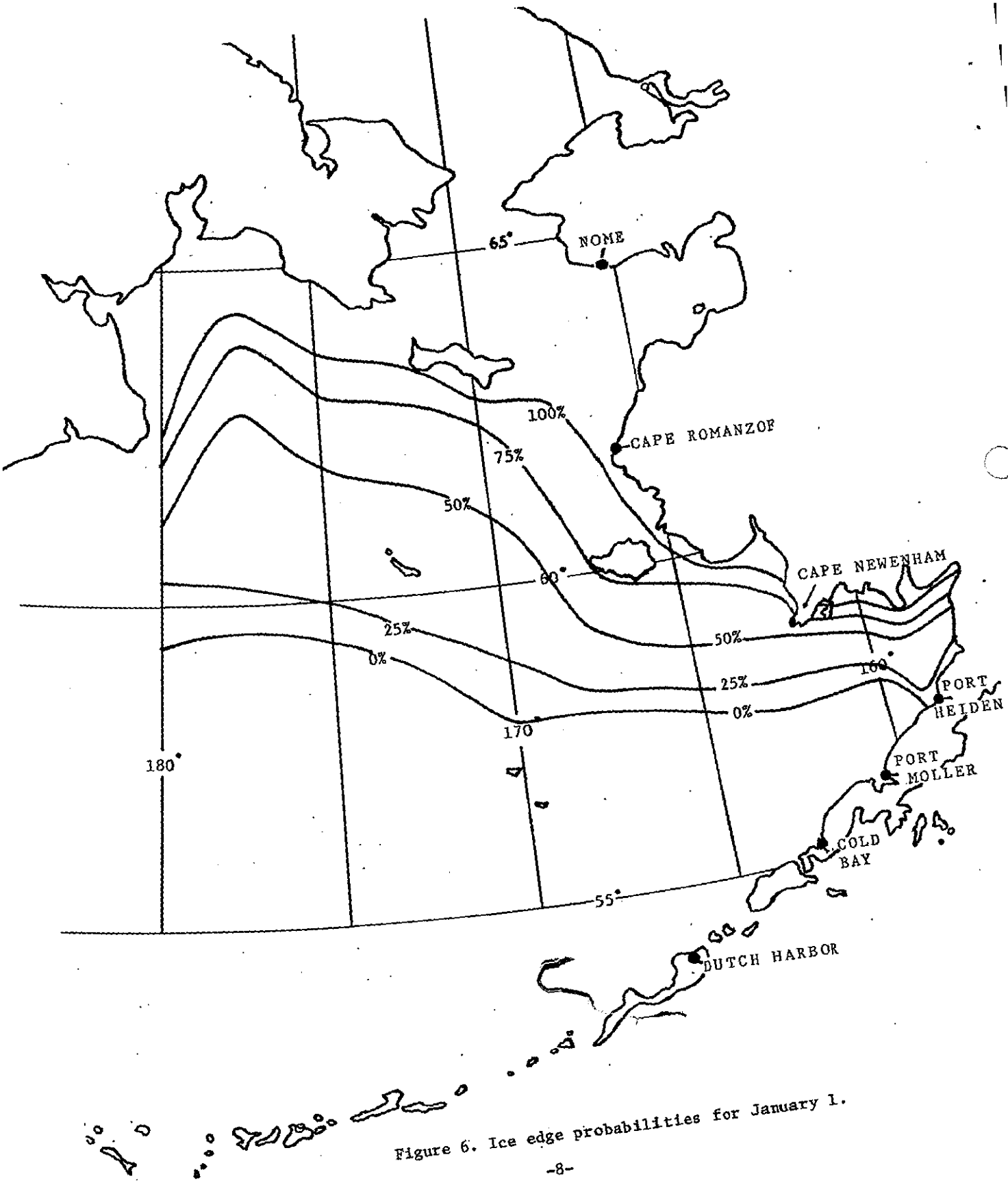


Figure 6. Ice edge probabilities for January 1.

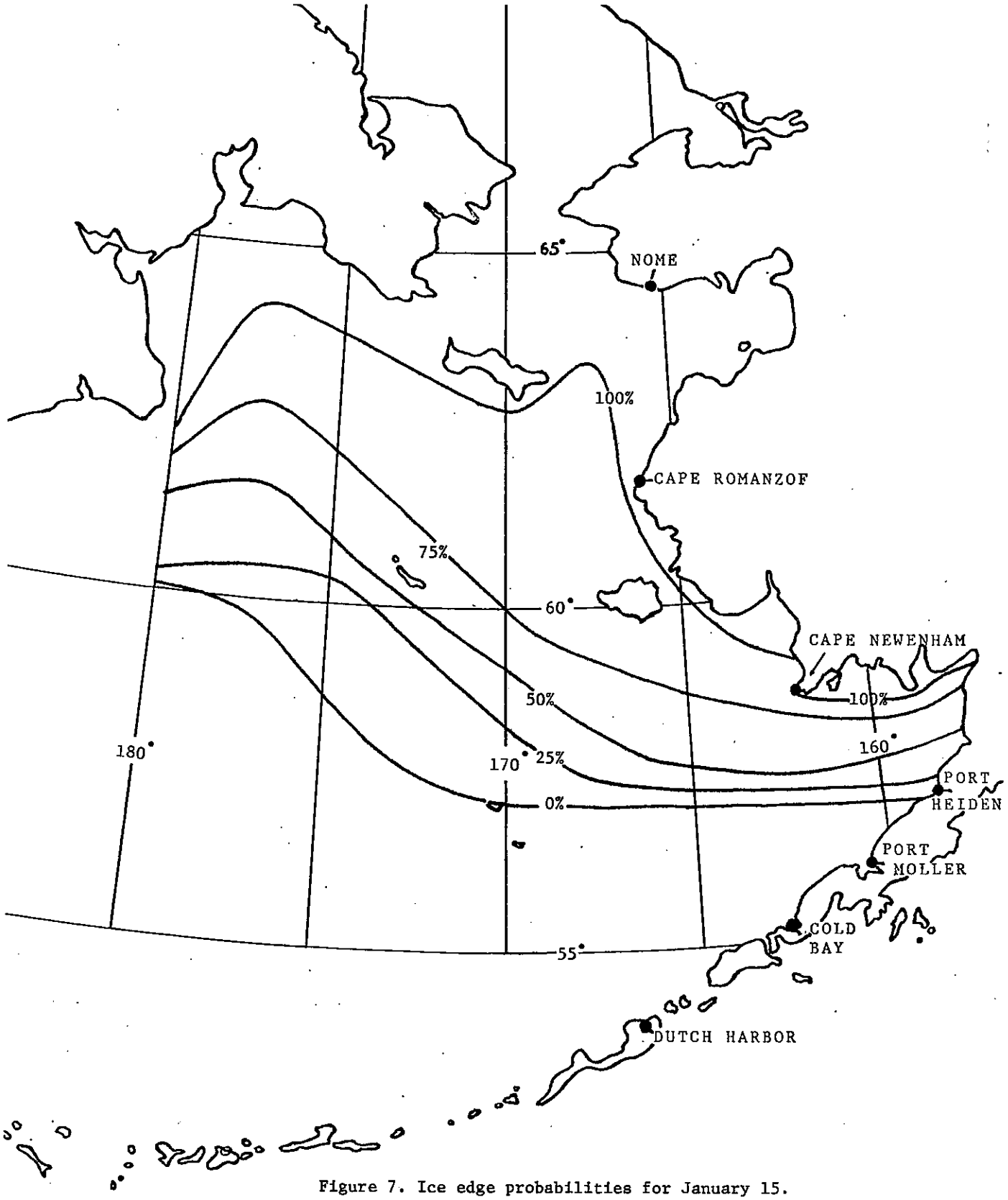


Figure 7. Ice edge probabilities for January 15.

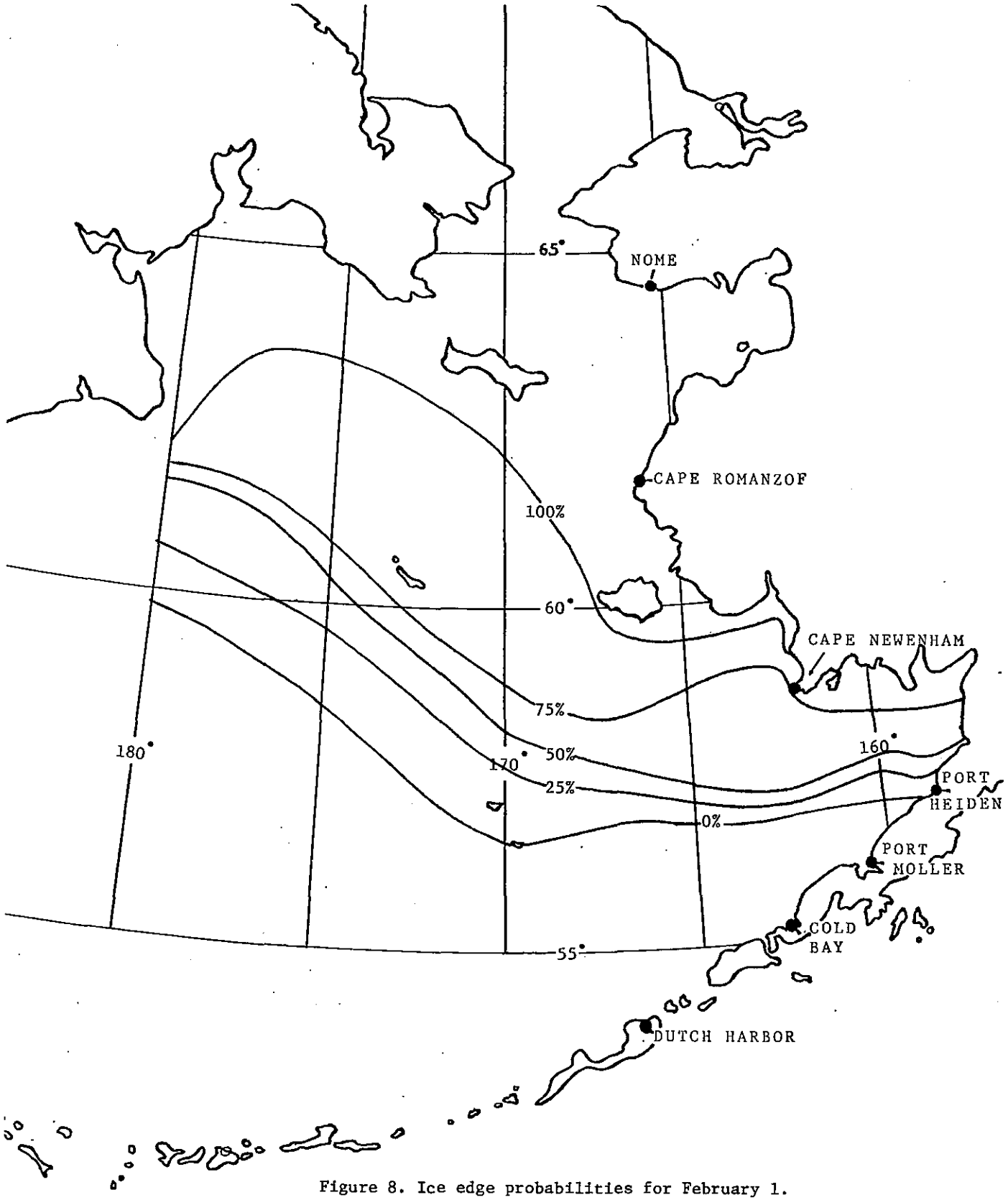


Figure 8. Ice edge probabilities for February 1.

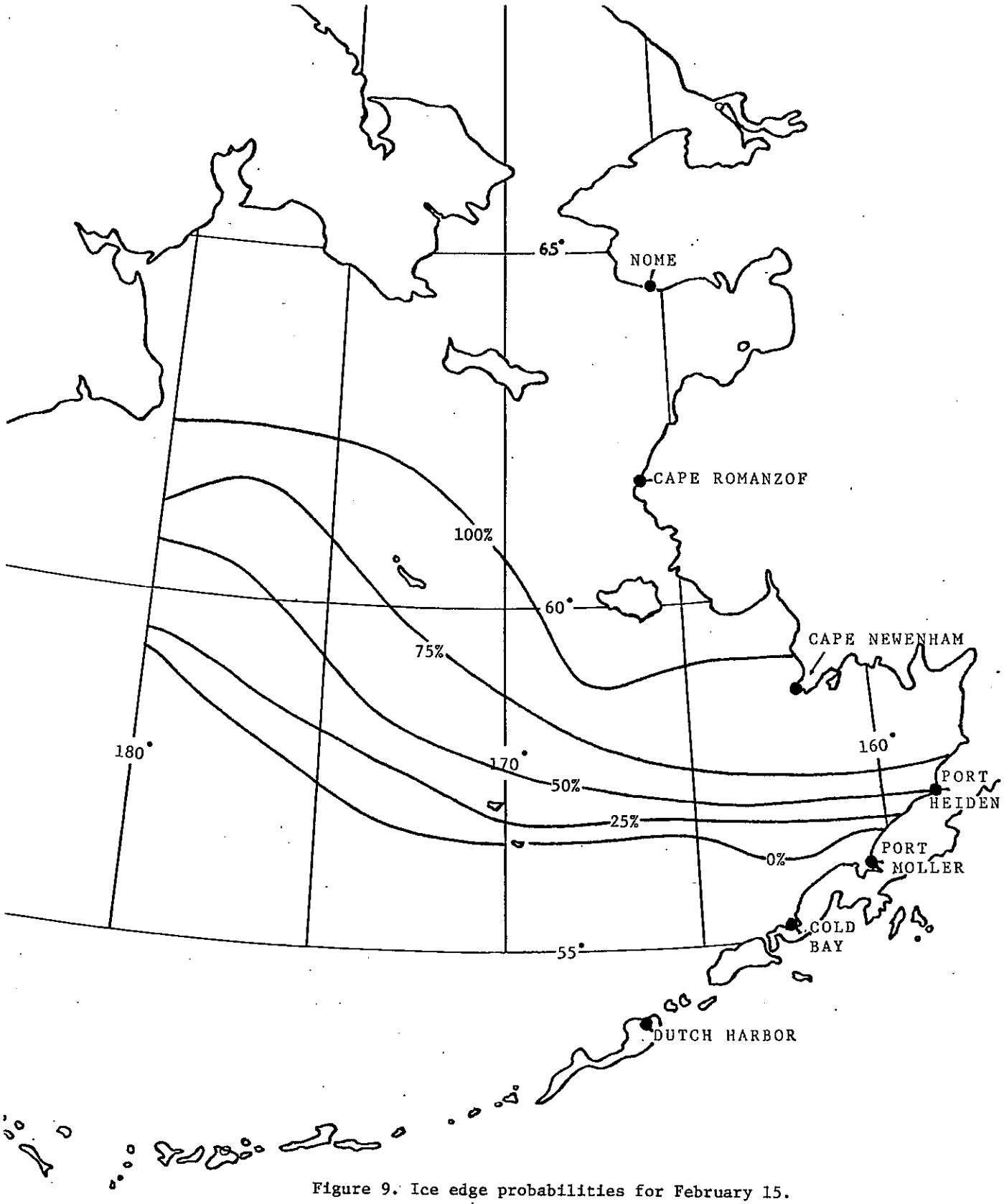


Figure 9. Ice edge probabilities for February 15.

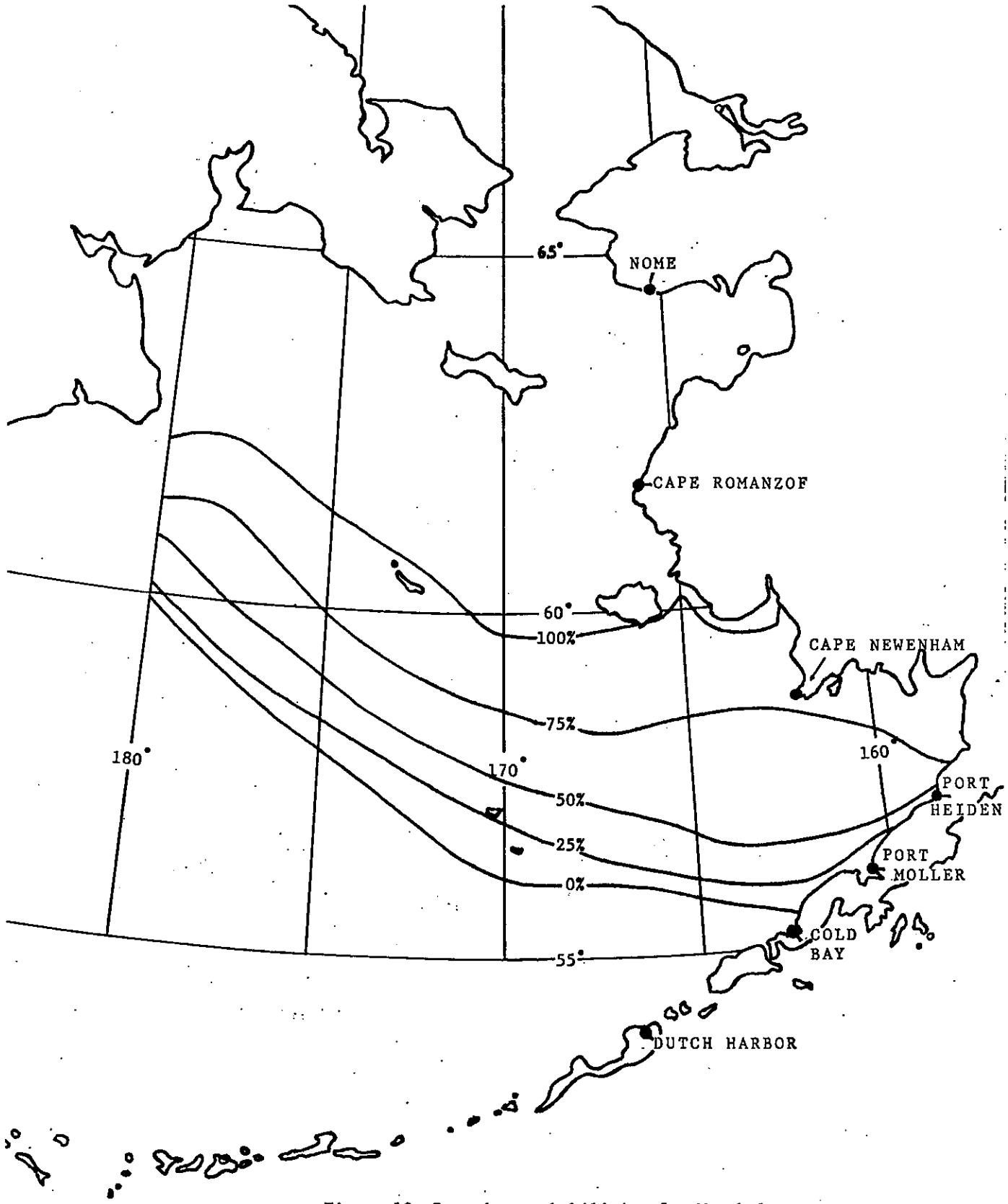


Figure 10. Ice edge probabilities for March 1.

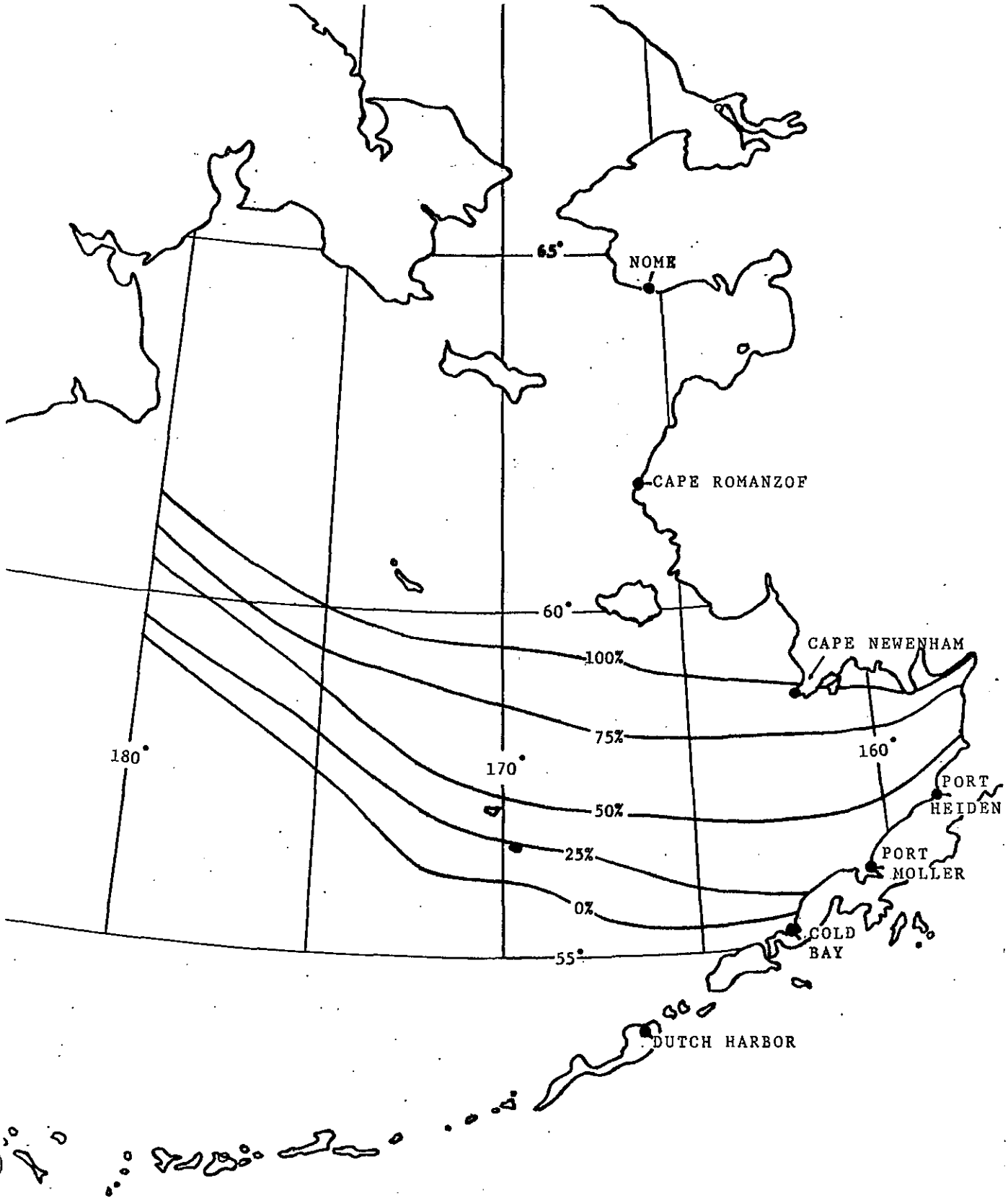


Figure 11. Ice edge probabilities for March 15.

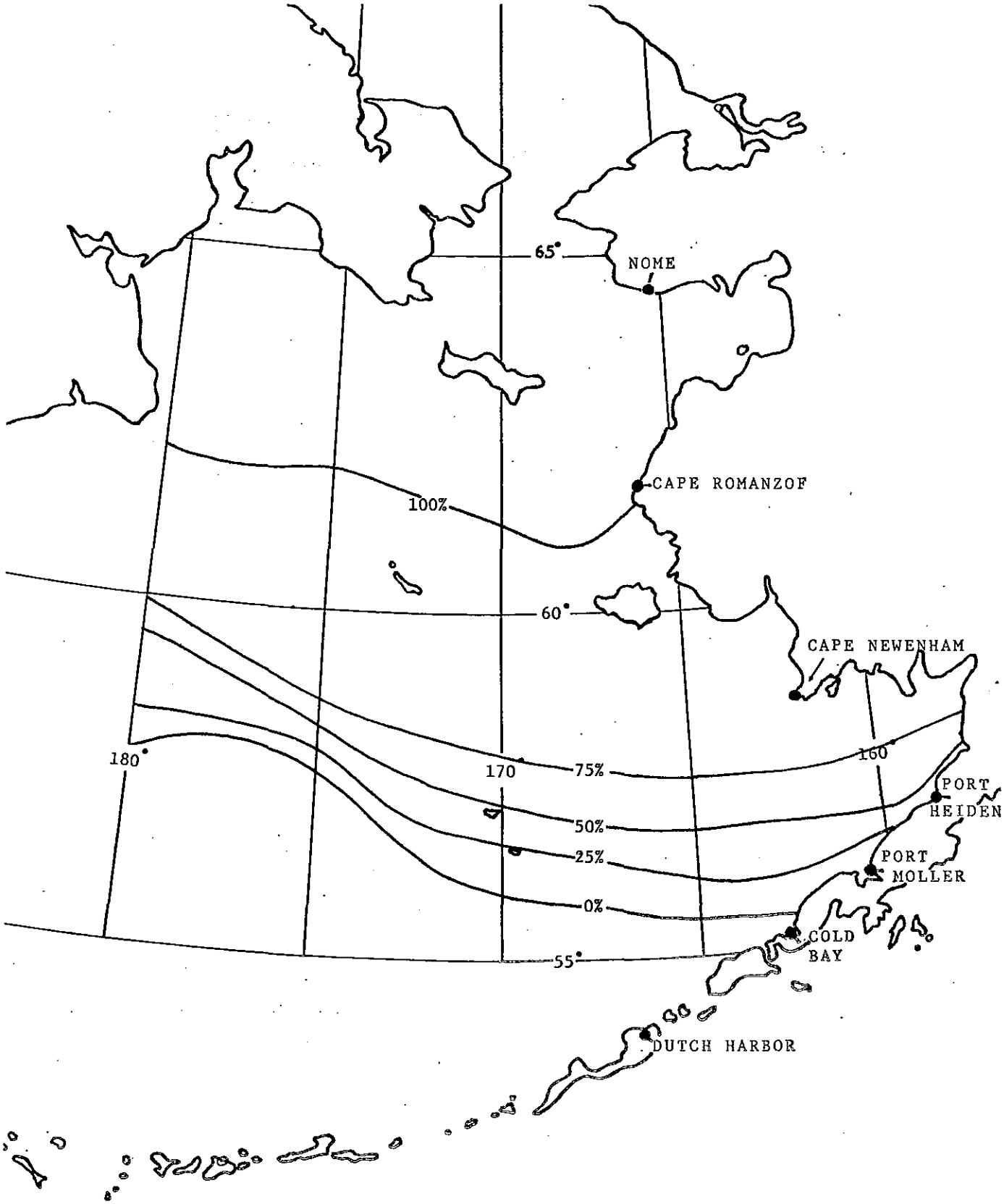


Figure 12. Ice edge probabilities for April 1.

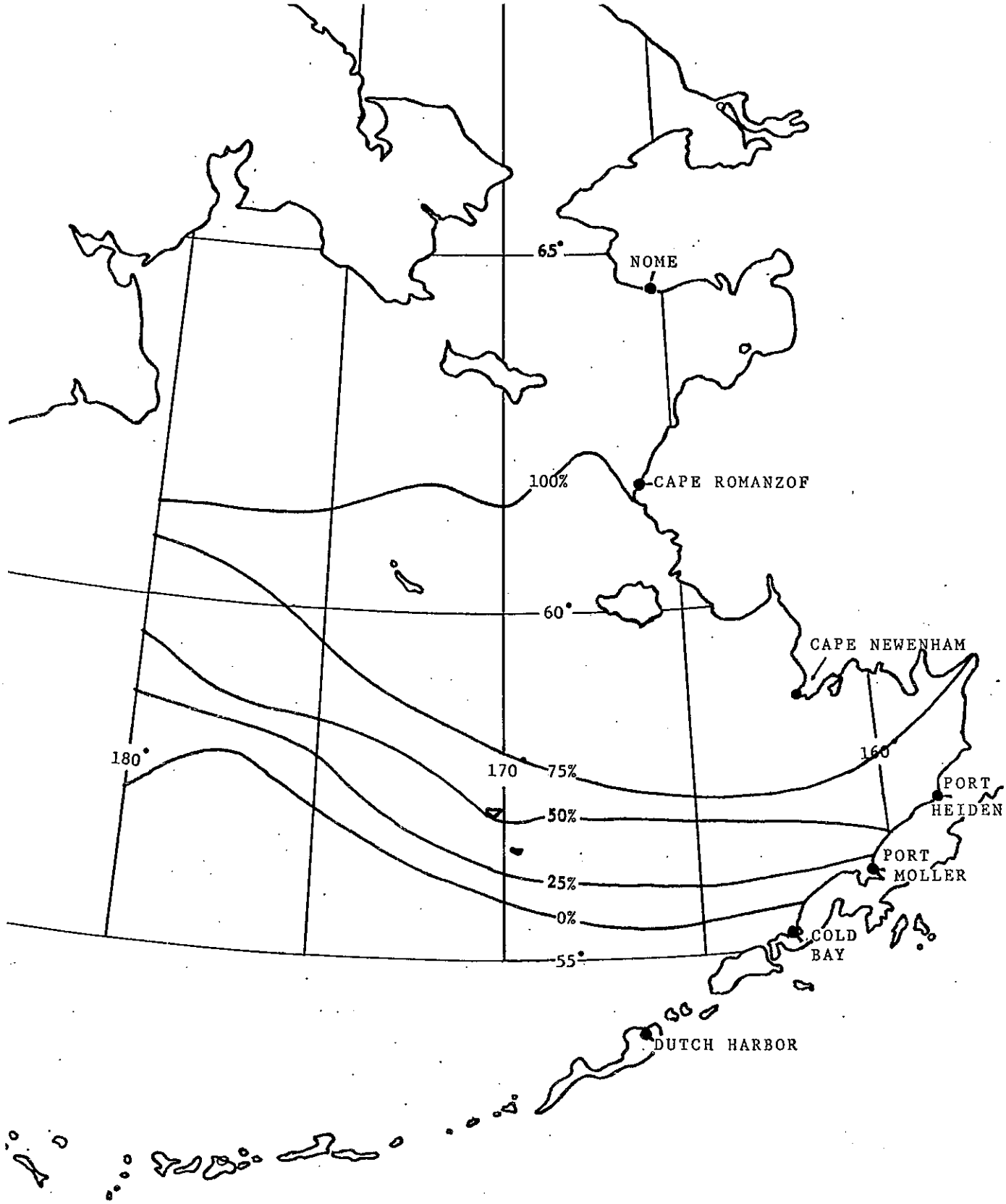


Figure 13. Ice edge probabilities for April 15.

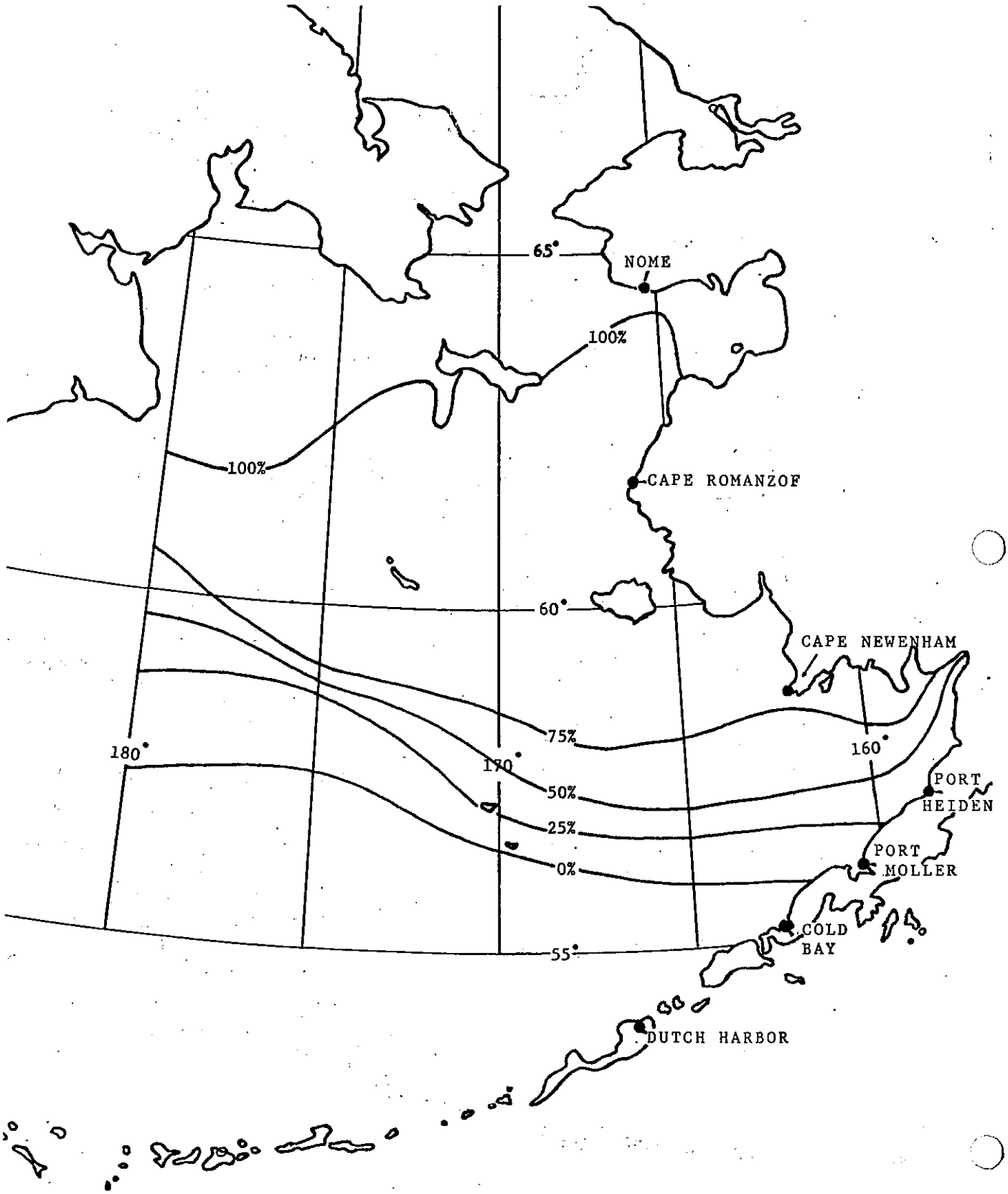


Figure 14. Ice edge probabilities for May 1.

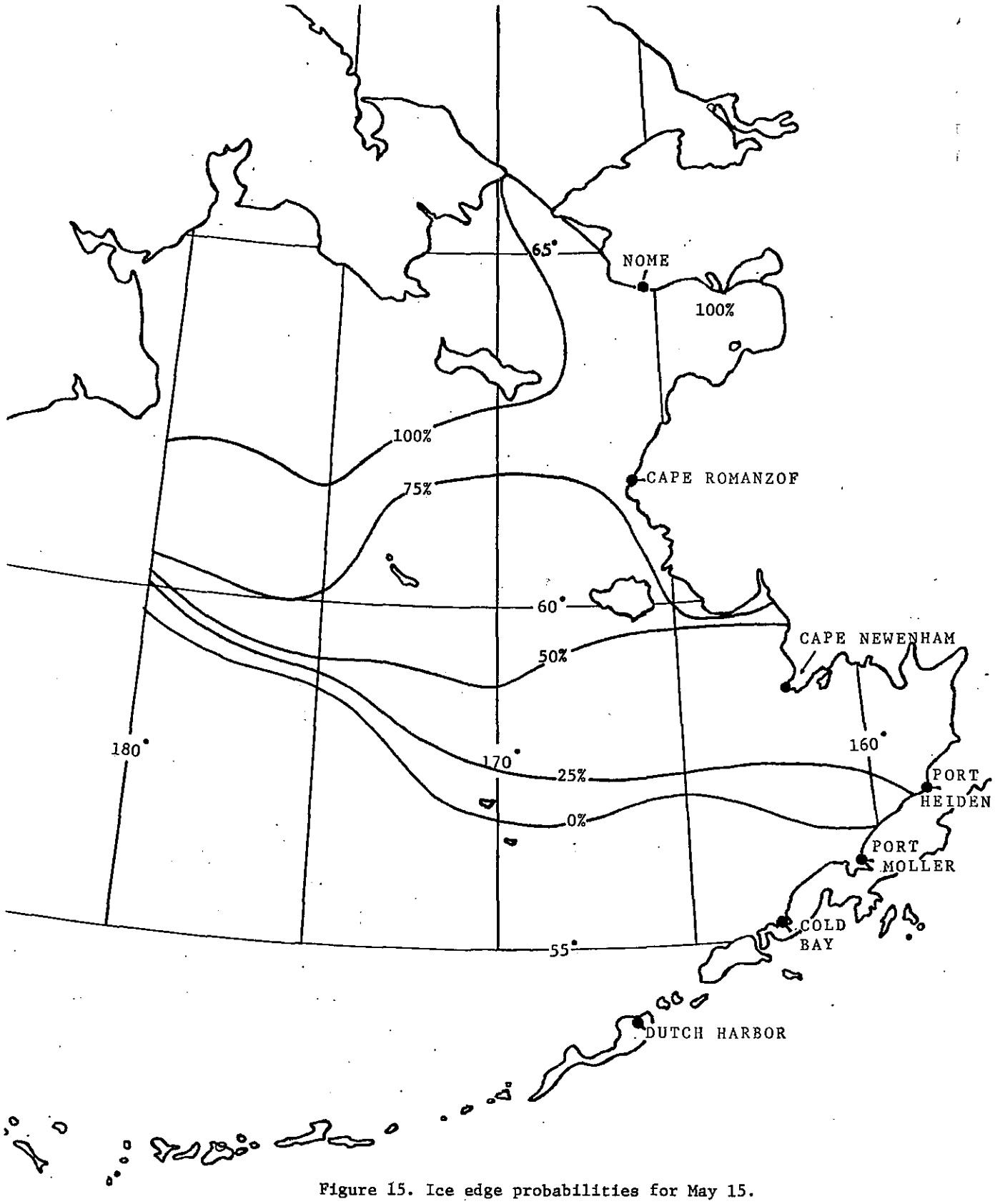


Figure 15. Ice edge probabilities for May 15.

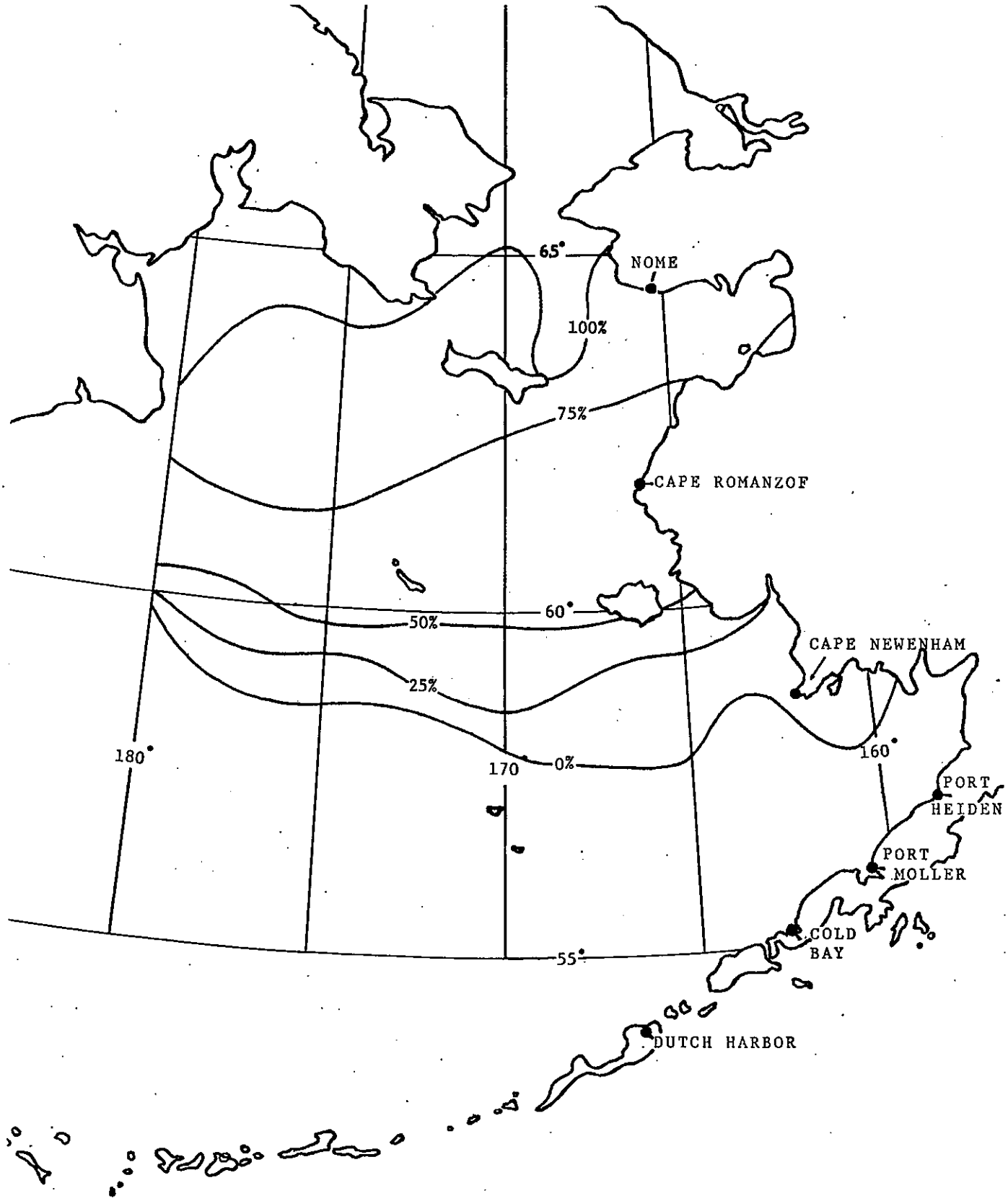


Figure 16. Ice edge probabilities for June 1.

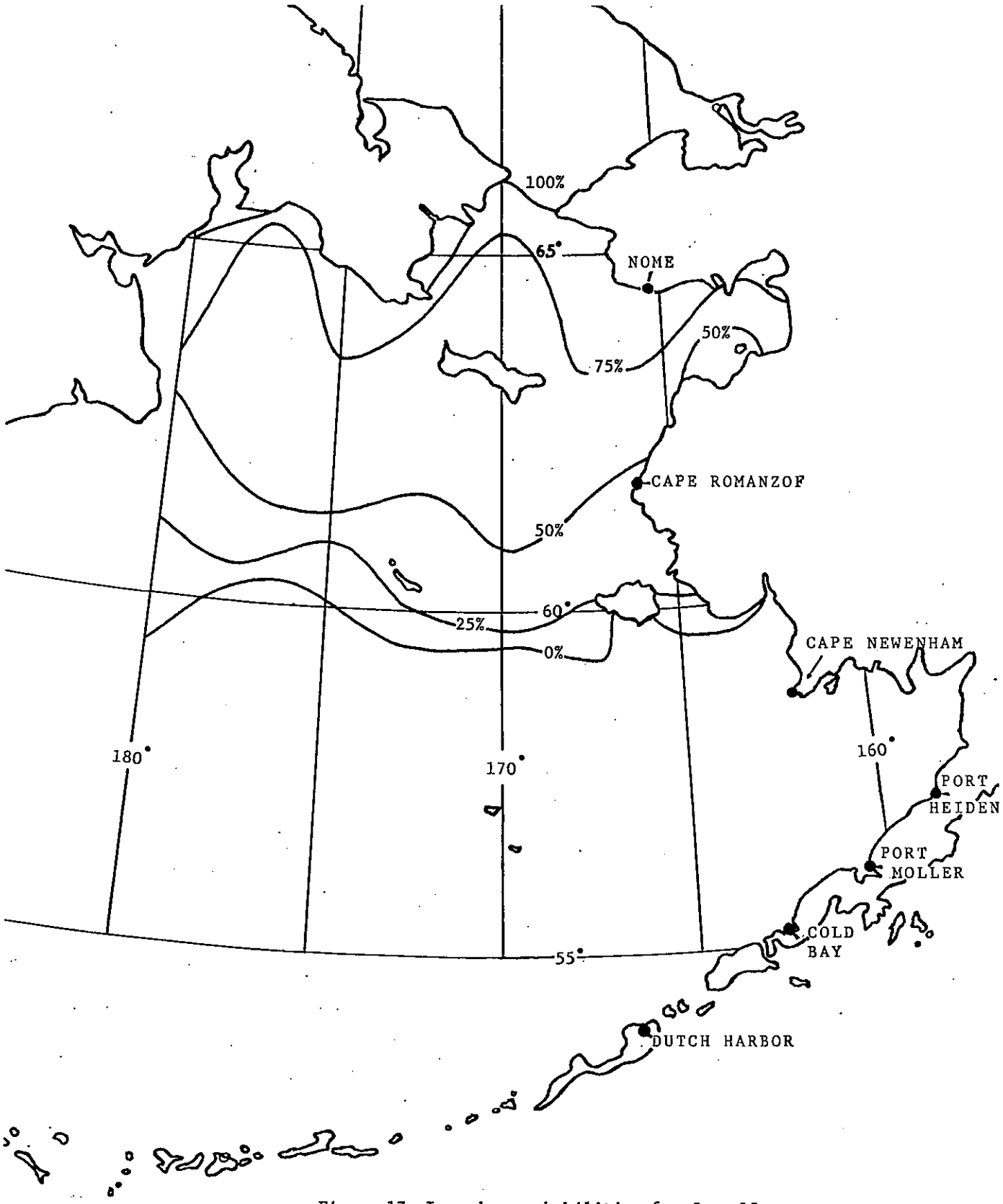


Figure 17. Ice edge probabilities for June 15.

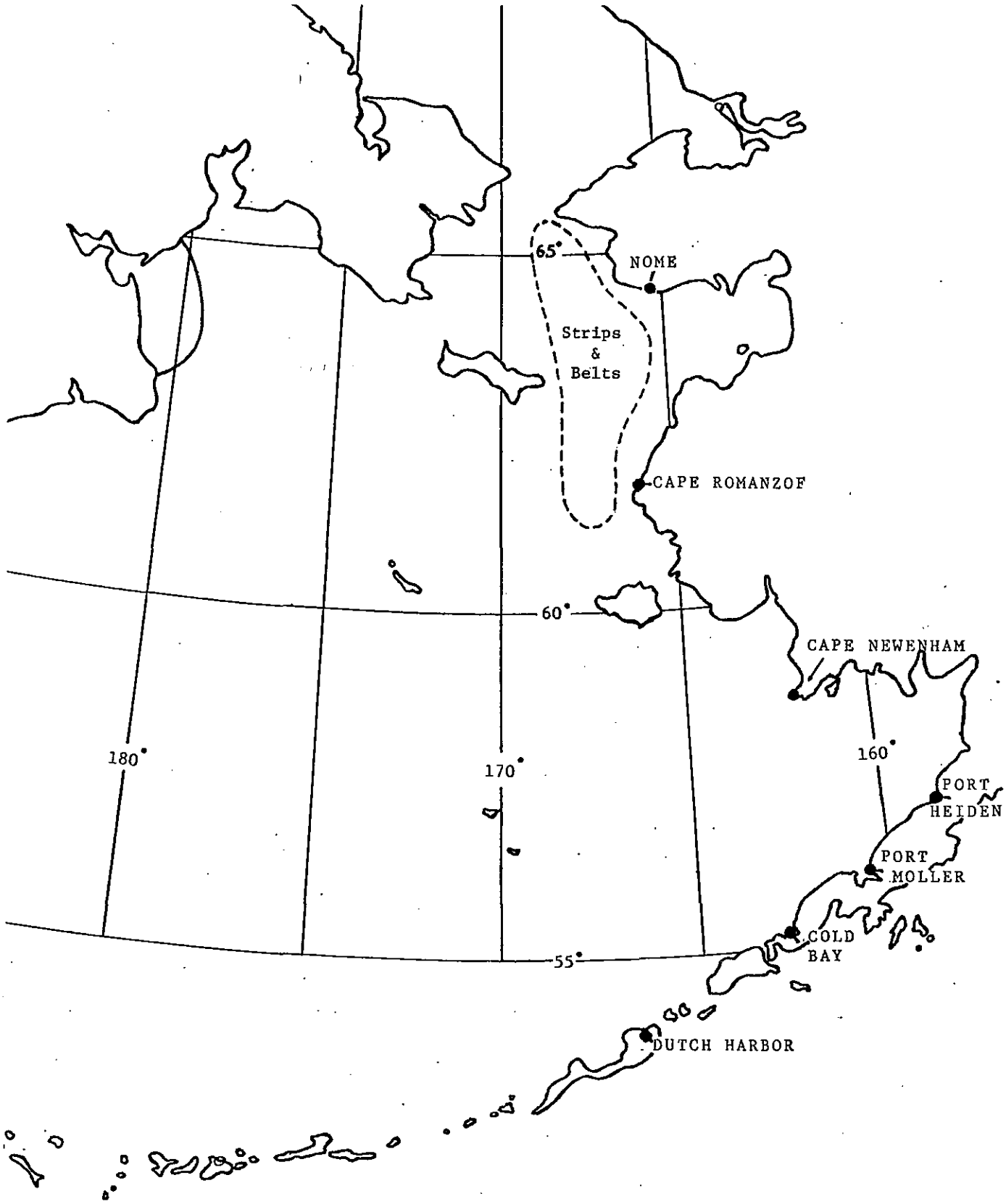


Figure 18. Average ice conditions June 25-July 5 (1972-1979)

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