KNOWN OCEAN RANGES OF STOCKS OF PACIFIC SALMON AND STEELHEAD AS SHOWN BY TAGGING EXPERIMENTS, 1956-1995

by

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ABSTRACT

This document presents maps of known ocean ranges of major stocks of Pacific salmon and steelhead (*Oncorhynchus* spp.) as shown by recoveries of tagged fish reported to the former International North Pacific Fisheries Commission (INPFC) and to the North Pacific Anadromous Fish Commission (NPAFC). Distribution plots were prepared for all coastal recoveries (1956-1995) of salmonids tagged with external (high-seas) tags during INPFC- and NPAFC-related tagging experiments in the North Pacific Ocean and ocean recoveries (1980-1995) of coded-wire tagged salmonids released from North American streams.

INTRODUCTION

The former International North Pacific Fisheries Commission (INPFC) reported annually on new information on the extent of ocean ranges of stocks of Pacific salmon and steelhead (*Oncorhynchus* spp.) as determined by tagging experiments. Myers et al. (1990) summarized this information (1956-1989) in maps showing known ocean ranges of major Asian and North American stocks of Pacific salmon (*Oncorhynchus* spp.). In this document, we present updated maps with information reported to the North Pacific Anadromous Fish Commission (NPAFC) through 1995.

METHODS AND RESULTS

We prepared distribution plots for all coastal recoveries (1956-1995) of salmonids tagged with external (high-seas) tags during INPFC- and NPAFC- related tagging experiments in the North Pacific Ocean (INPFC-NPAFC tag recovery database) and ocean recoveries (1980-1995) of coded-wire tagged (CWT) salmonids released from North American streams (CWT database). A Canadian scientist created the INPFC tag recovery database, and these data, containing recoveries reported in INPFC documents through 1979, were provided to the Fisheries Research Institute (FRI), University of Washington. FRI has added data reported in INPFC documents through 1992 and in NPAFC documents from 1993 through 1995 to the database. The Fisheries Agency of Japan assisted FRI in corrections to the 1956-1985 INPFC tag recovery database. INPFC (1980-1992) and NPAFC (1993-1995) have coordinated efforts to examine salmonids in convention waters for coded-wire tags. Recoveries of coded-wire tagged salmonids in catches by the Japanese high seas salmon fisheries, by salmon research vessels, by foreign and domestic groundfish vessels, and by Canadian experimental fishing operations have been reported in

documents submitted to INPFC and NPAFC. The INPFC-NPAFC tag recovery database is archived on magnetic tape at FRI, and the CWT database is archived at the U.S. National Marine Fisheries Service, Alaska Fisheries Science Center, Auke Bay Laboratory.

Ocean ranges are depicted for six species: sockeye salmon (*O. nerka*), chum salmon (*O. keta*), pink salmon (*O. gorbuscha*), coho salmon (*O. kisutch*), chinook salmon (*O. tshawytscha*), and steelhead (*O. mykiss*). The ocean location of each tagged fish was plotted within 1′ latitude X 1′ longitude. The month of release of high-seas tagged fish and the month of recovery of CWT fish is indicated at each release or recovery location (from 1 = January to 12 = December; Figs. 1-155). Because of the small size of the maps and overlap in release or recovery locations, individual points cannot always be discerned. Therefore, each figure caption includes information on total sample size (n). Duplicate locations were not indicated in the figures, as this provides no additional information on ocean ranges.

For high-seas tags, recoveries of all species were subdivided into immature (recovered in the second year or subsequent years after tagging; denoted by open circles and release month number) and maturing (recovered in the same year as tagging; denoted only by release month number) fish. For each species-maturity group, we prepared summary maps of release locations for all high-seas tagged Asian (regions 1-8, Table 1) and North American (regions 9-15, Table 1) fish, as well as individual maps for each of the general areas commonly used to report ocean ranges (Table 1; Figs. 1-132). The absence of a map means that there are no recoveries in the high-seas tag database for this species, maturity group, or region. The number of releases of high-seas tagged salmonids from 1954-1995 are shown by species, month, and 2°-latitude X 5°-longitude INPFC area in Appendix A (Figs. A1-A60).

The CWT recoveries were plotted on a separate series of maps because the CWT database does not include information on maturity of fish or latitude and longitude of release location. For each species, we prepared summary maps of high-seas recovery locations of CWT fish released from eight regions in North America (California, Oregon, Washington, Idaho, British Columbia, southeast Alaska, central Alaska, and Canadian Yukon; Figs. 133-155; denoted by open diamonds and recovery month number). The absence of a map means that there are no recoveries in the CWT database for this species or region.

Table 1. General areas and codes used to report ocean ranges for external, high-seas tags.

No.	General Areas	INPFC Codes[1]
1	Japan	01, 02
2	Kuril Islands	03
3	Amur R., Primore	04, 05
4	Sakhalin Island	06
5	North Okhotsk coast, Shelekova	07, 08
6	W. Kamchatka Peninsula	09
7	E. Kamchatka and Karaginsky area to Cape Olyutorsky	10, 11, 12
8	Siberian coast north of Cape Olyutorsky	13, 14
9	Arctic coast of Alaska, Yukon R., Kuskokwim R.	40-44
10	Bristol Bay, Aleutian Is.	45-52
11	Central Alaska	53-60
12	Southeast Alaska	61-67
13	Alaska - others, unknown	68, 69
14	British Columbia	70-79
15	Washington, Oregon, California	80-91

[1] Refer to Appendix B, Figs. 1-3 for maps of general areas and INPFC codes.

The reader is cautioned against misinterpretation of the results presented in Figs. 1-155. There are additional tag recovery data not shown in these figures, particularly in coastal areas, from experiments not reported to INPFC and NPAFC. For all species, the known limits of ocean distribution are wider than the known ocean ranges of Asian and North American stocks as shown by tagging experiments. Geographic distribution of salmonids in the North Pacific Ocean varies widely with season, and is influenced by temperature, salinity, food availability, and many other physical, chemical, and biological factors that have not been examined in this document. Because of differences between stocks in the intensity of fishing effort, in tag recovery effort, in the reporting of recovered tags, and in mortality rates from tagging, the use of recoveries of tagged fish to make "quantitative determinations of the extent of intermingling or the degree of dominance regarding specific stocks that are present together in ocean areas" is difficult (Margolis et al. 1966). As noted by French et al. (1975), "for many of the minor stocks the recoveries of tagged fish simply reveal their occurrence at certain locations in offshore waters." Despite

these limitations, tagging experiments continue to provide significant new information on ocean ranges of Asian and North American salmonids, as well as a basis for the evaluation of the results of other stock identification techniques (e.g., parasites, scale patterns, and genetics).

ACKNOWLEDGMENTS

A Canadian scientist, K.V. Aro, created the high-seas tag recovery database, and these data, through recoveries reported in 1979 documents, were provided to the Fisheries Research Institute (FRI) by the Canadian Department of Fisheries and Oceans (DFO). Dr. Colin K. Harris, FRI, spent many hours correcting the high-seas tag recovery database and created the original all-agency tag release database. Kenji Takagi and Jun Ito, Fisheries Agency of Japan (FAJ), assisted in corrections to the 1956-1985 INPFC tag recovery database. The Pacific Biological Station, DFO, the National Research Institute of Far Seas Fisheries, FAJ, the Pacific Research Institute of Fisheries and Oceanography (TINRO), and the Kamchatka Research Institute of Fisheries and Oceanography (KamchatNIRO) are acknowledged for their cooperation in reporting high-seas tag release and recovery information. Funding for this project was provided by the U.S. National Oceanic and Atmospheric Administration (NOAA, Contract No. 50-ABNF-4-00001).

LITERATURE CITED

French, R.R., R. Bakkala, and D.F. Sutherland. 1975. Ocean distribution of stocks of Pacific salmon, *Oncorhynchus* spp., and steelhead trout, *Salmo gairdnerii*, as shown by tagging experiments: charts of tag recoveries by Canada, Japan, and the United States, 1956-69. NOAA Tech. Rep. NMFS SSRF-689. 89 pp.

Margolis, L., F.C. Cleaver, Y. Fukuda, and H. Godfrey. 1966. Sockeye salmon in offshore waters. INPFC Bull. 20. 70 pp.

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Figures 1-132.

Maps showing high-seas release locations of externally (high-seas) tagged salmonids by species, maturity group, and region of origin. The numbers indicate the month of release from 1 (January) through 12 (December). n = sample size.

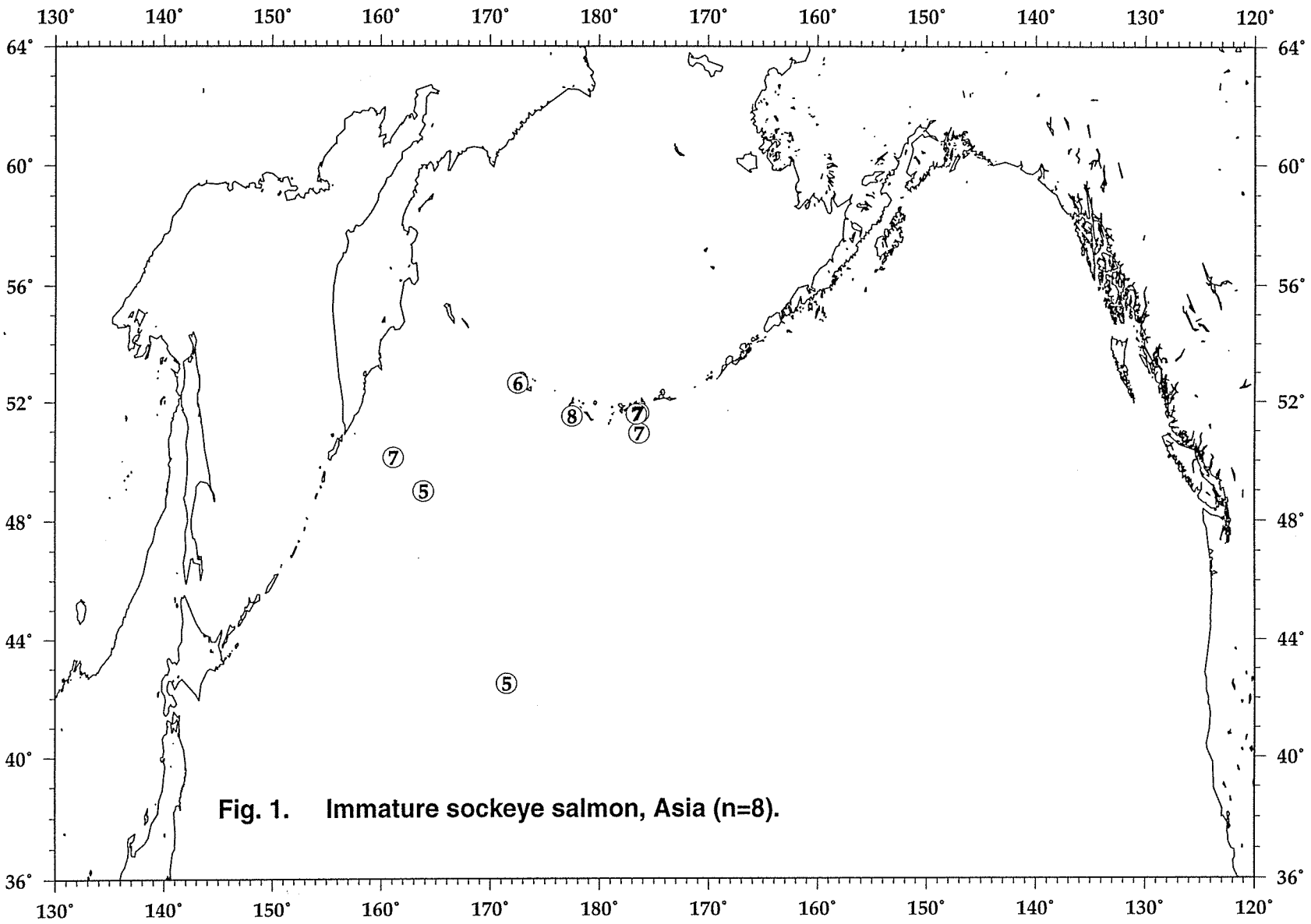


Fig. 1. Immature sockeye salmon, Asia (n=8).

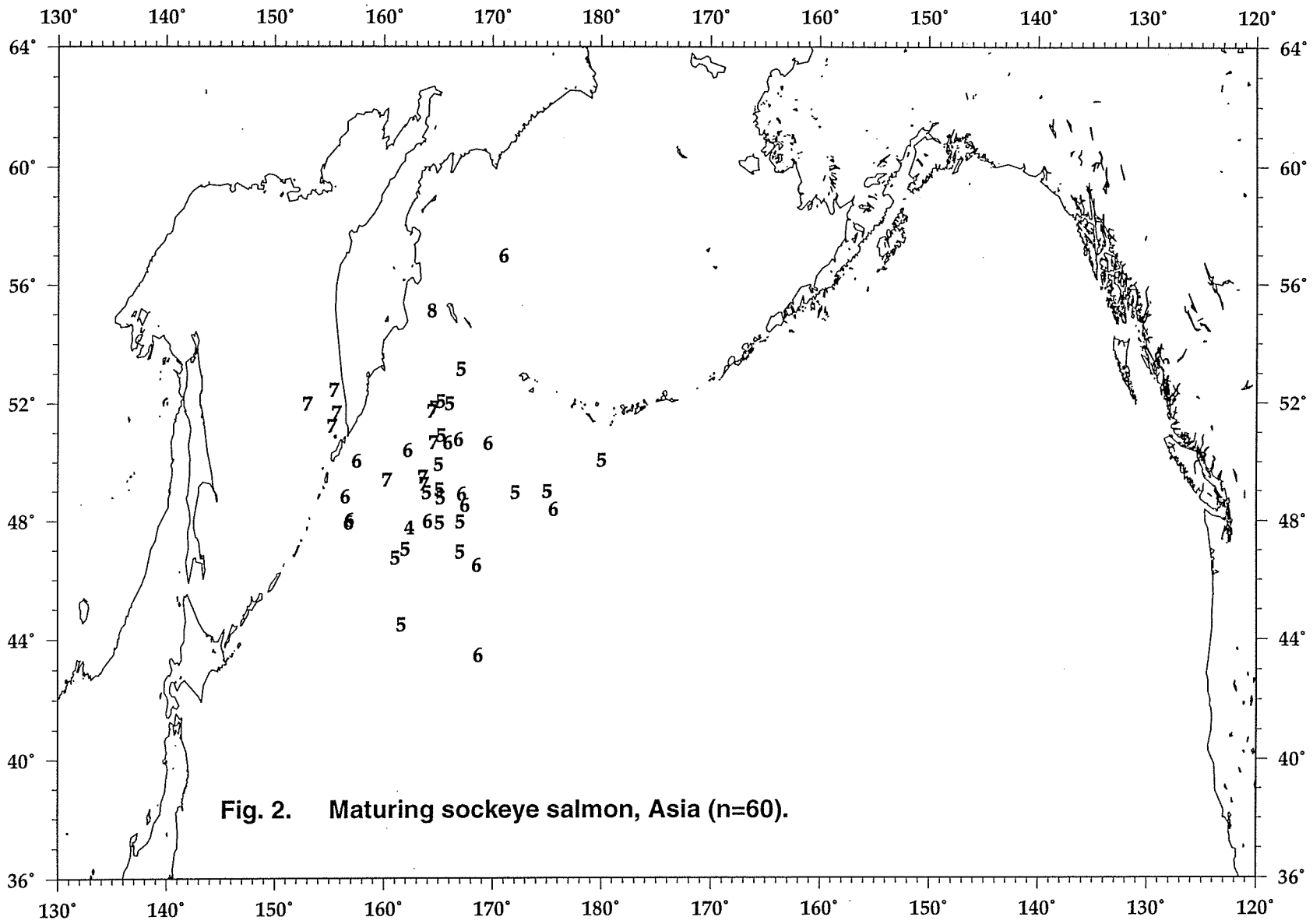


Fig. 2. Maturing sockeye salmon, Asia (n=60).

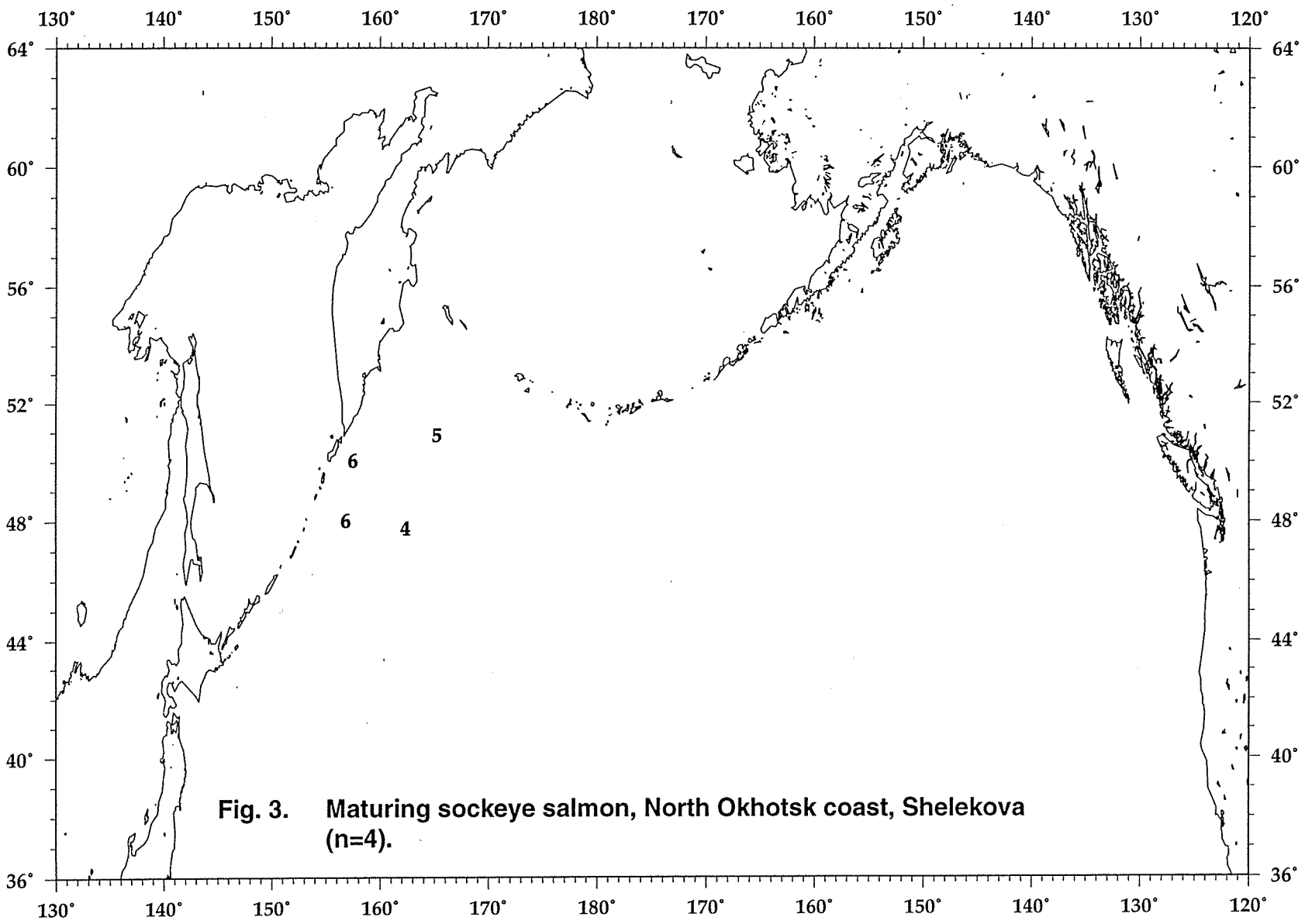


Fig. 3. Maturing sockeye salmon, North Okhotsk coast, Shelekova (n=4).

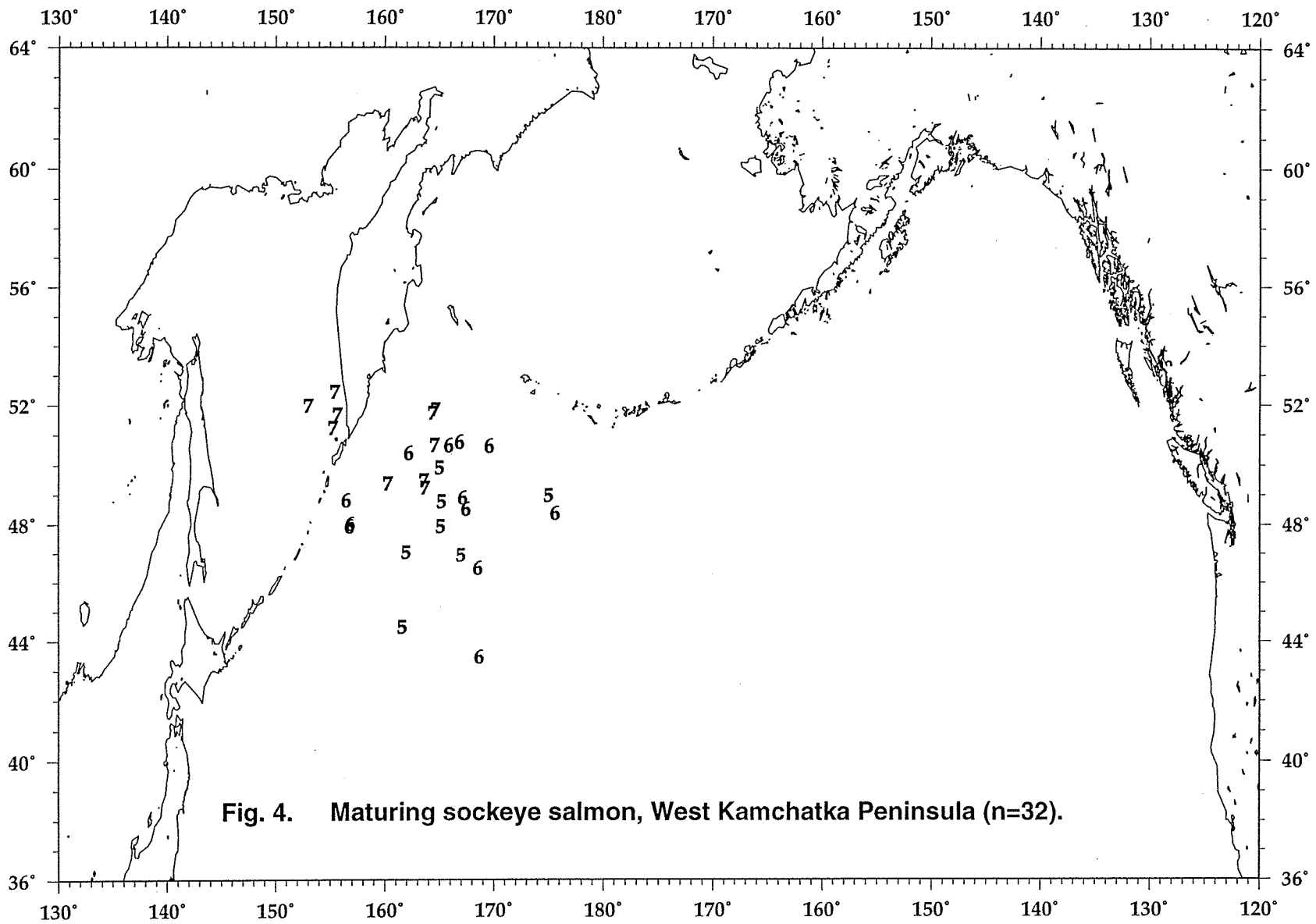


Fig. 4. Maturing sockeye salmon, West Kamchatka Peninsula (n=32).

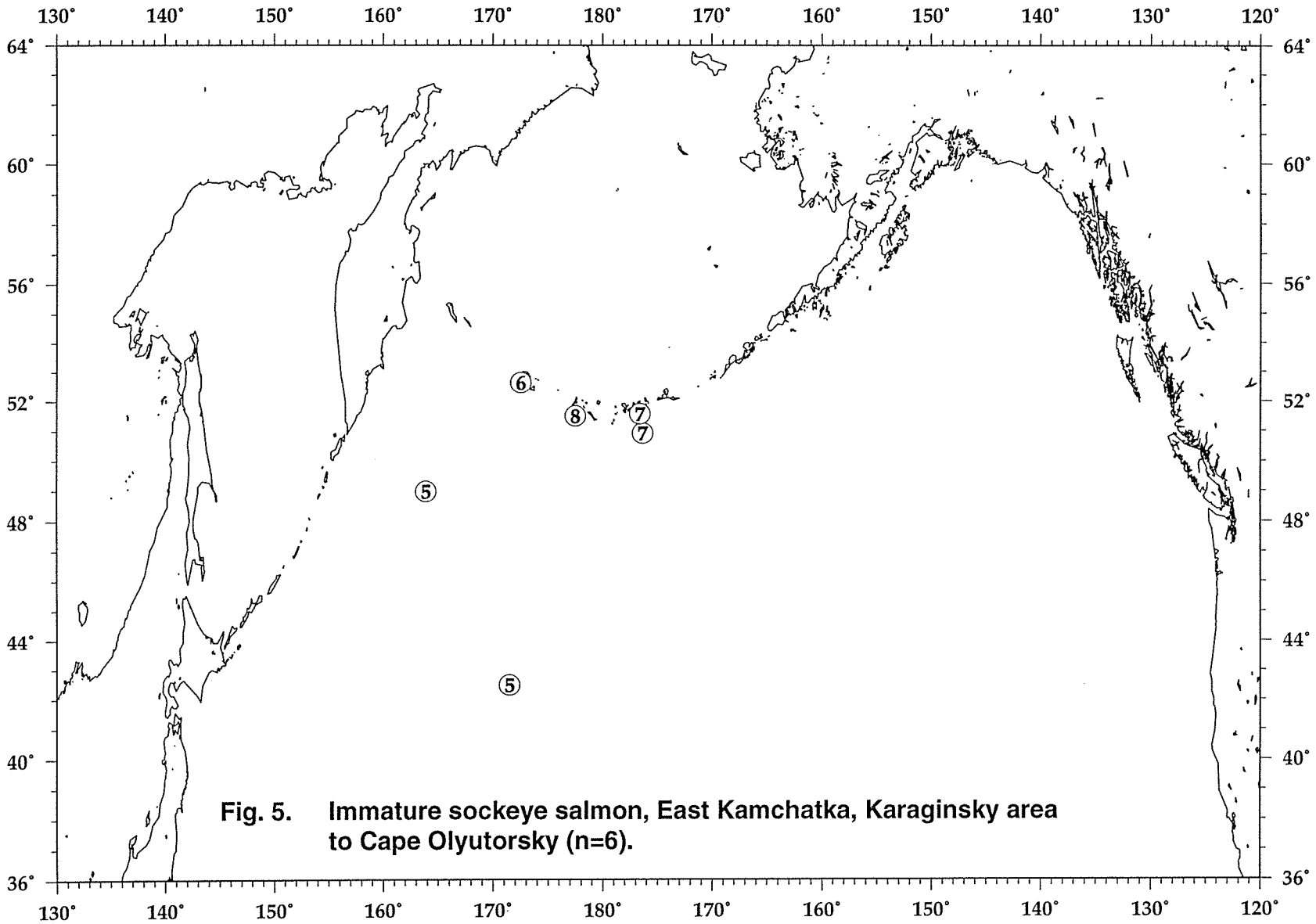


Fig. 5. Immature sockeye salmon, East Kamchatka, Karaginsky area to Cape Olyutorsky (n=6).

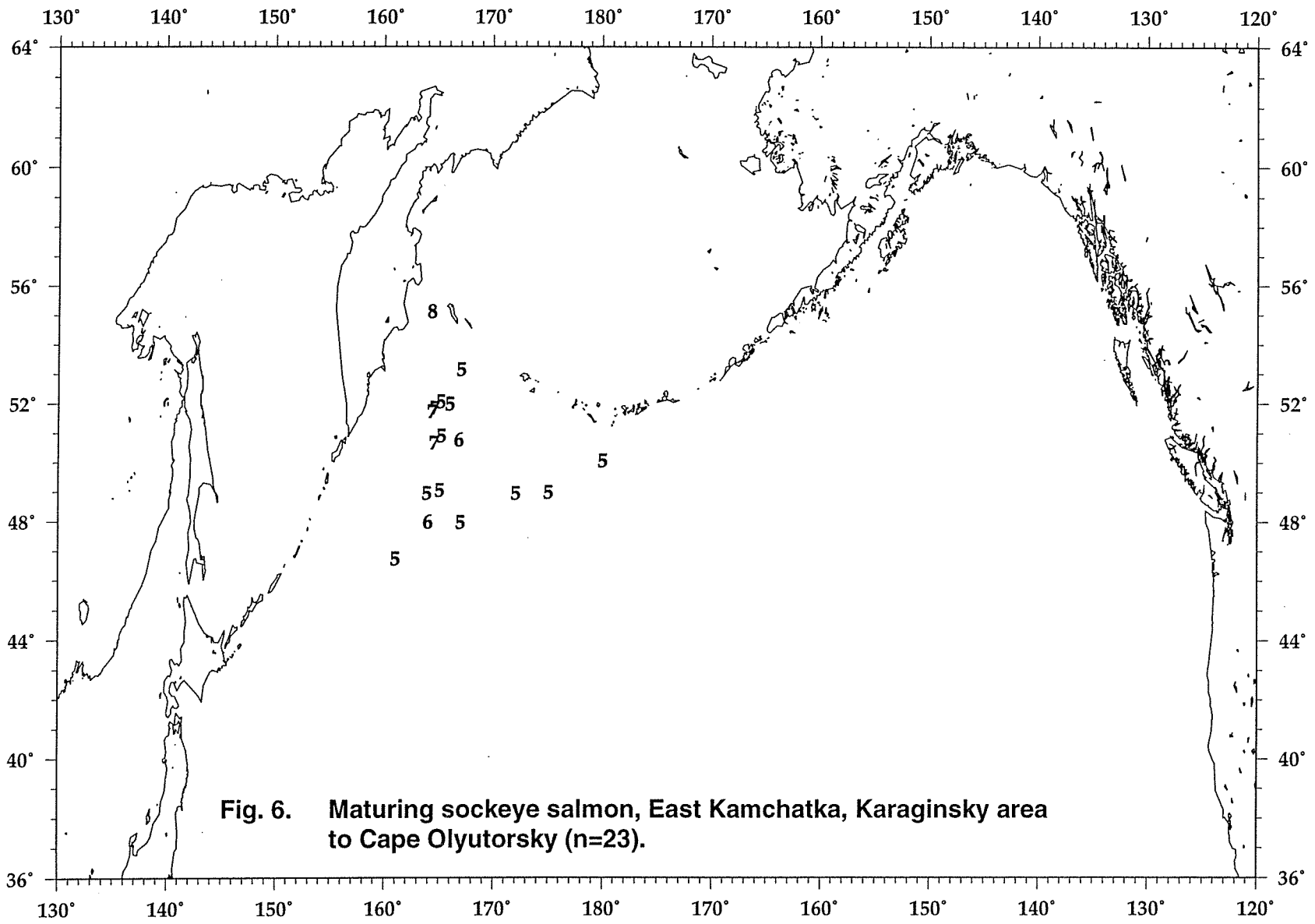


Fig. 6. Maturing sockeye salmon, East Kamchatka, Karaginsky area to Cape Olyutorsky (n=23).

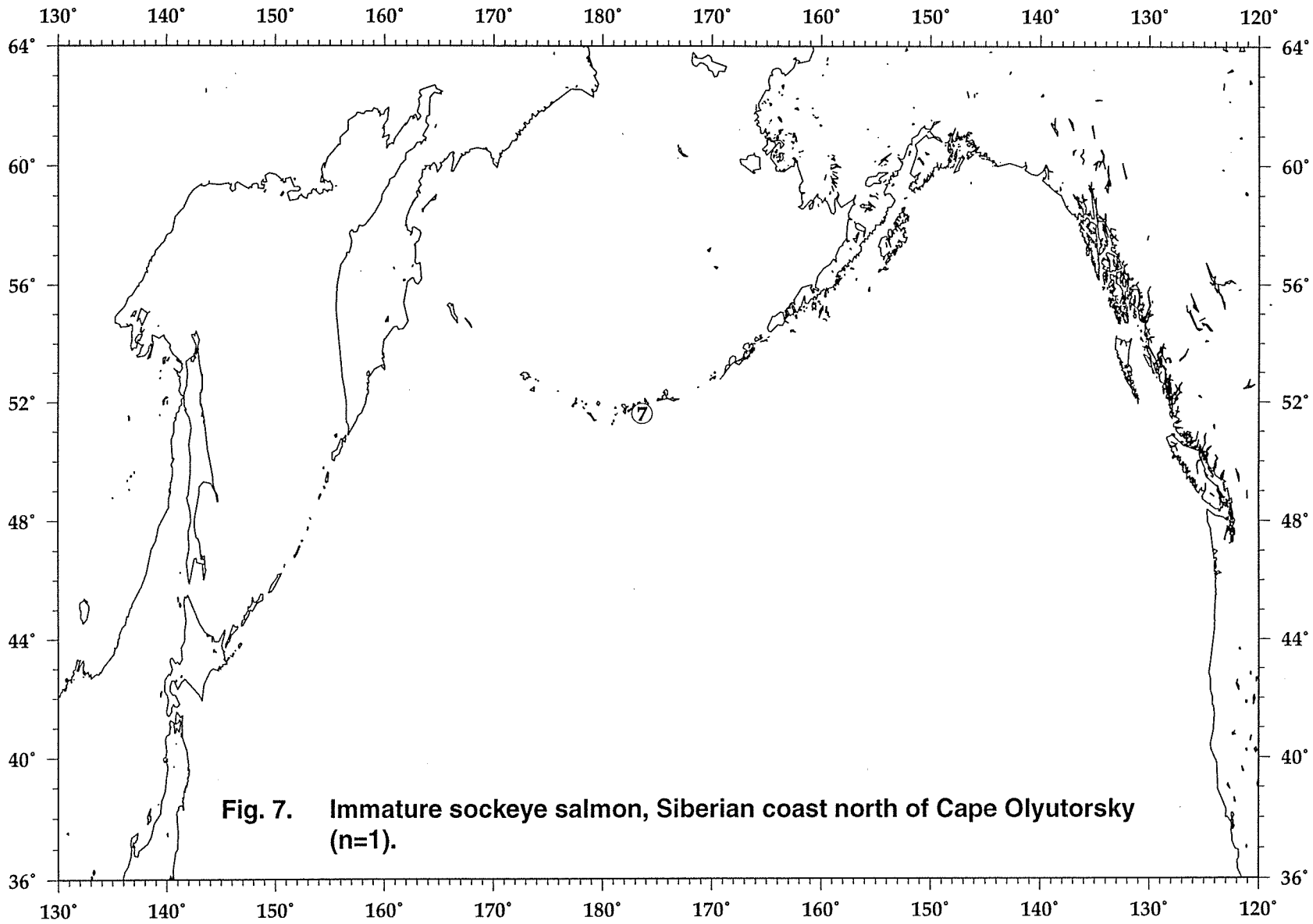


Fig. 7. Immature sockeye salmon, Siberian coast north of Cape Olyutorsky (n=1).

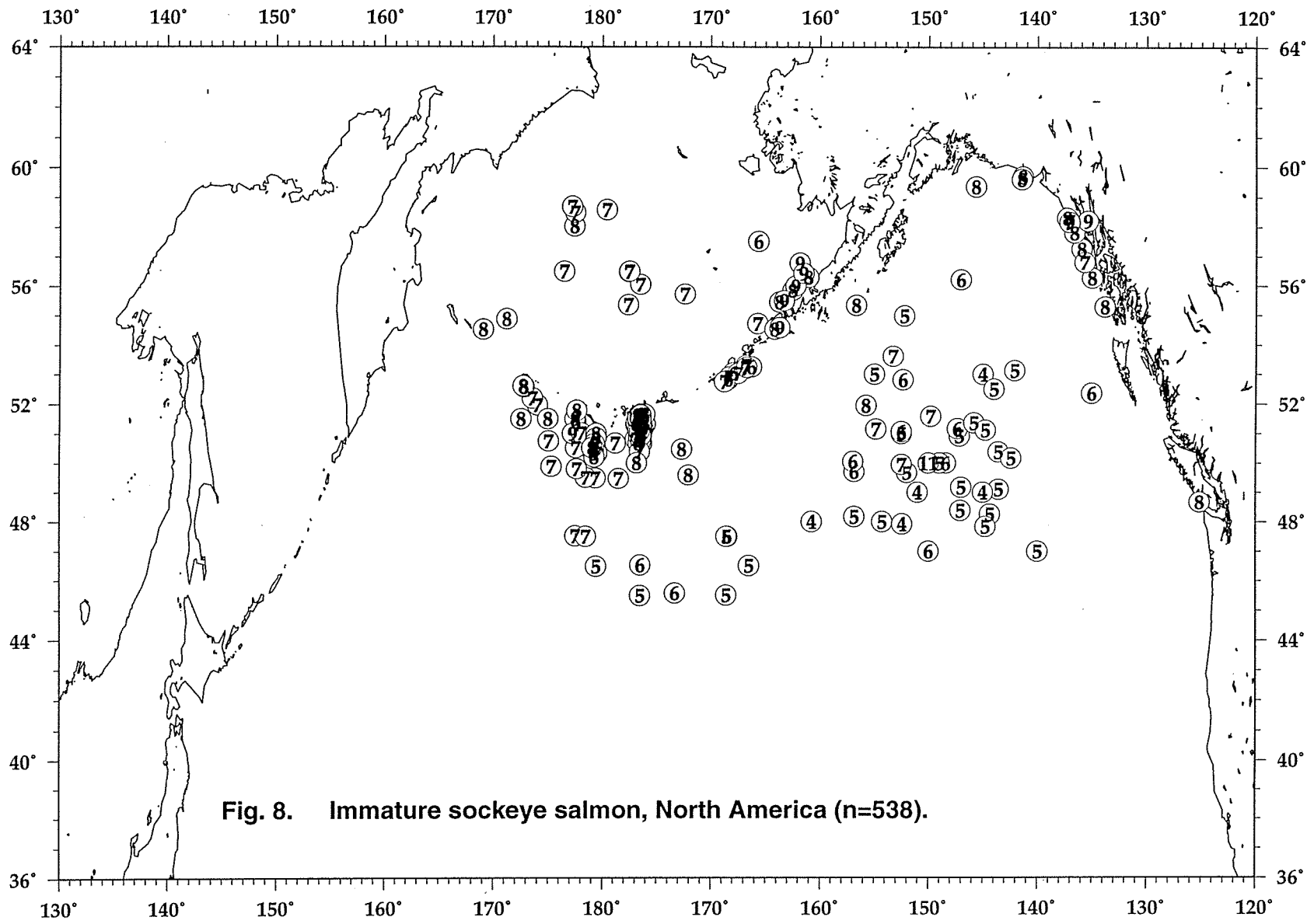


Fig. 8. Immature sockeye salmon, North America (n=538).

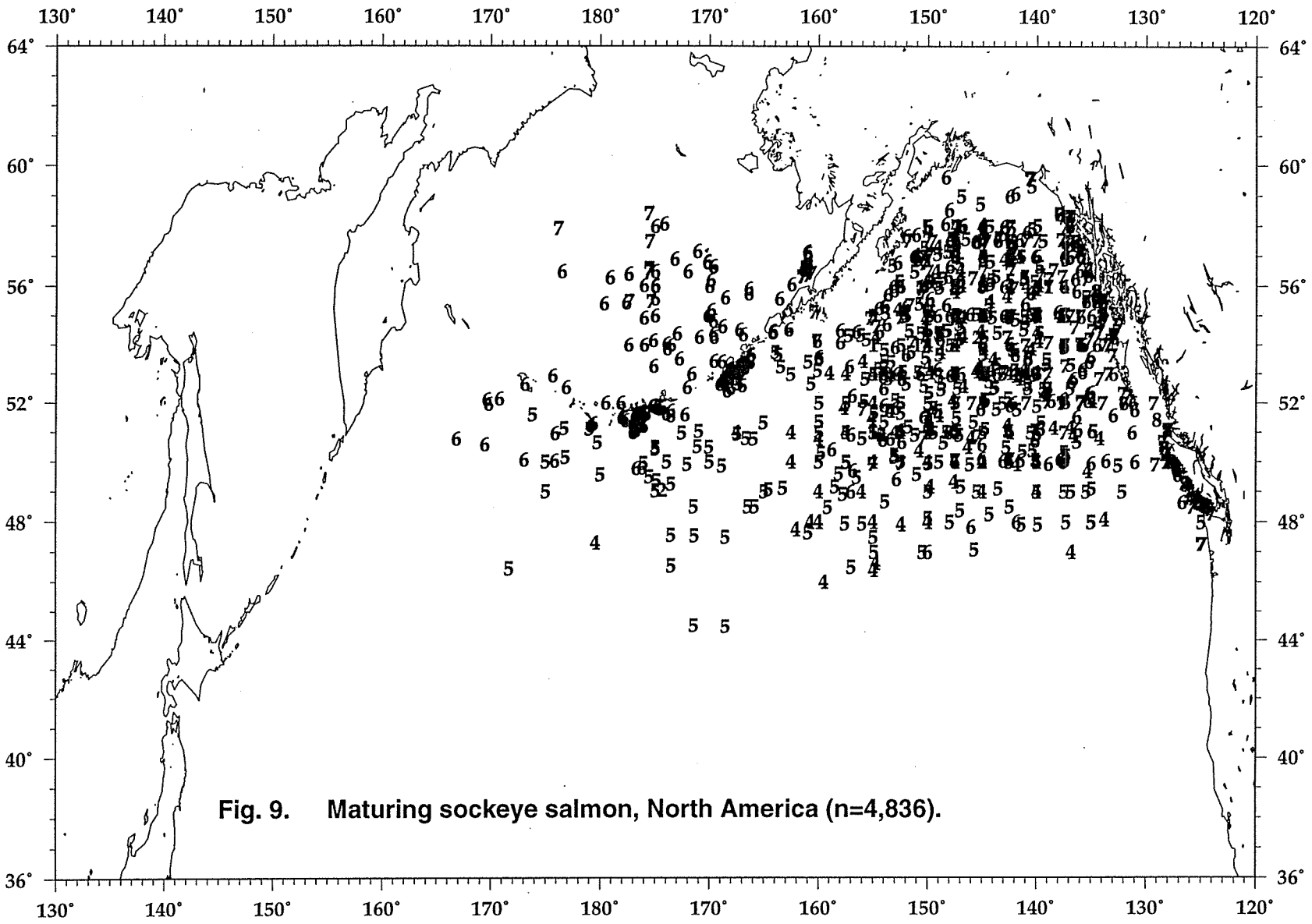


Fig. 9. Maturing sockeye salmon, North America (n=4,836).

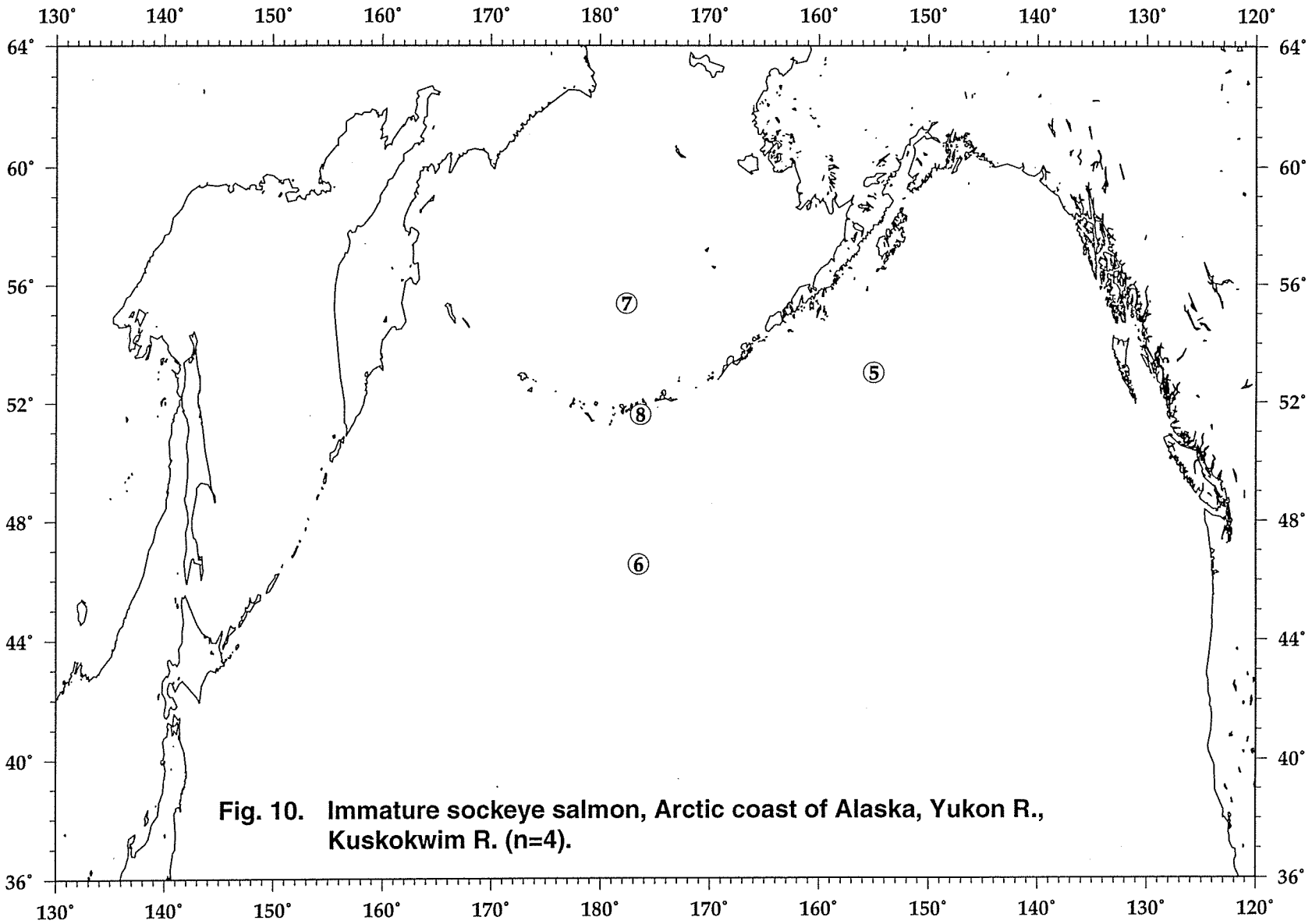


Fig. 10. Immature sockeye salmon, Arctic coast of Alaska, Yukon R., Kuskokwim R. (n=4).

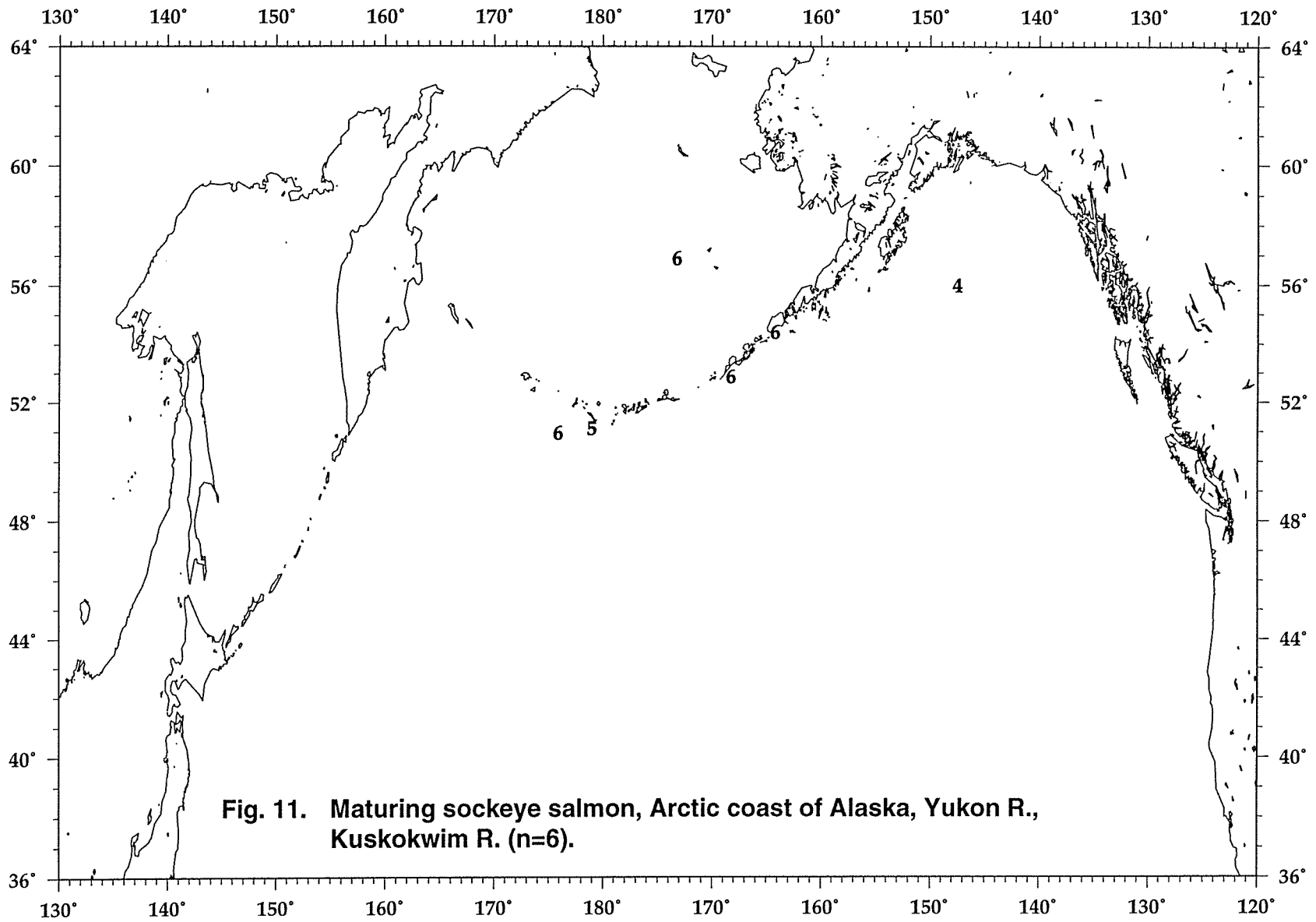


Fig. 11. Maturing sockeye salmon, Arctic coast of Alaska, Yukon R., Kuskokwim R. (n=6).

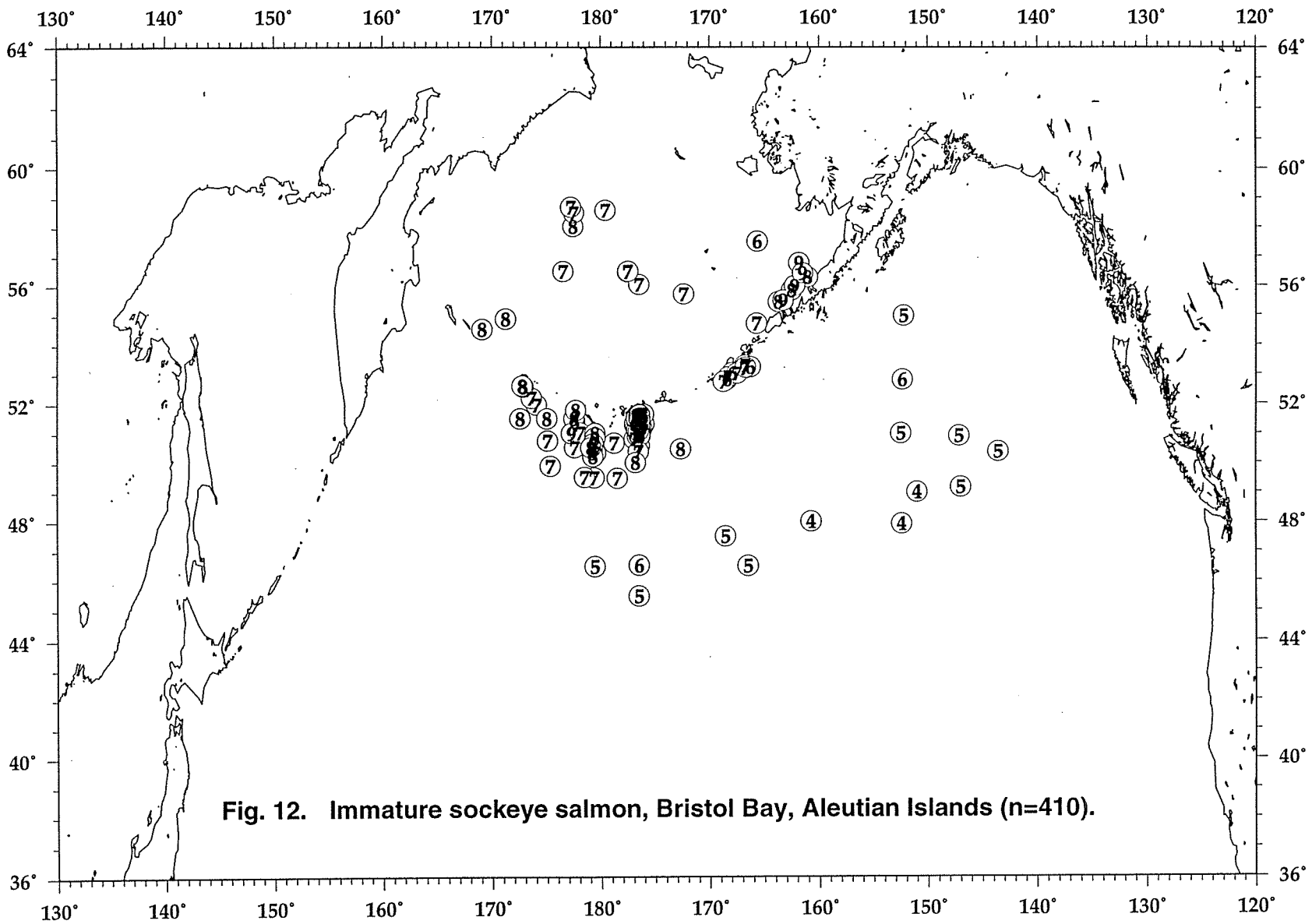


Fig. 12. Immature sockeye salmon, Bristol Bay, Aleutian Islands (n=410).

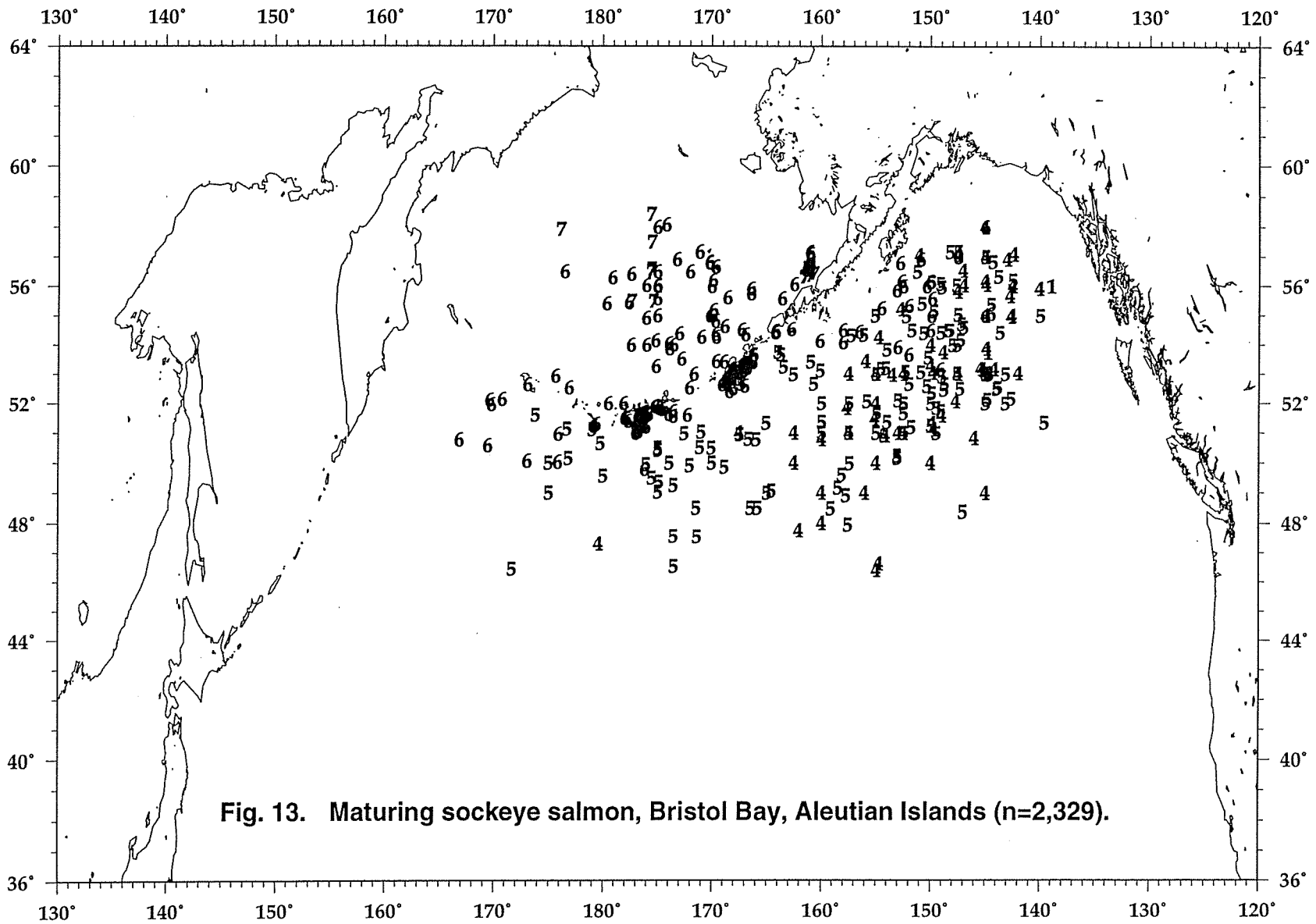


Fig. 13. Maturing sockeye salmon, Bristol Bay, Aleutian Islands (n=2,329).

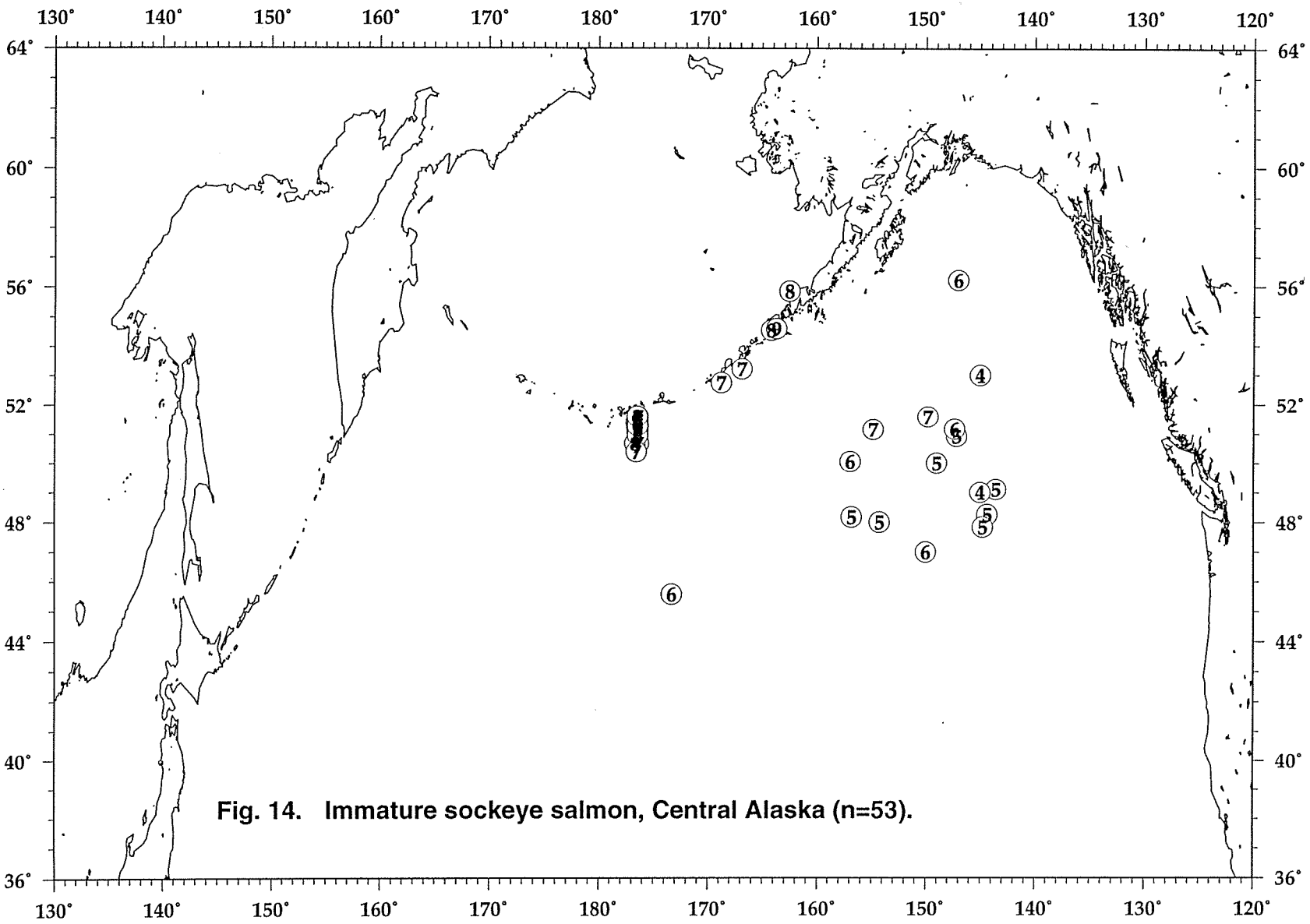


Fig. 14. Immature sockeye salmon, Central Alaska (n=53).

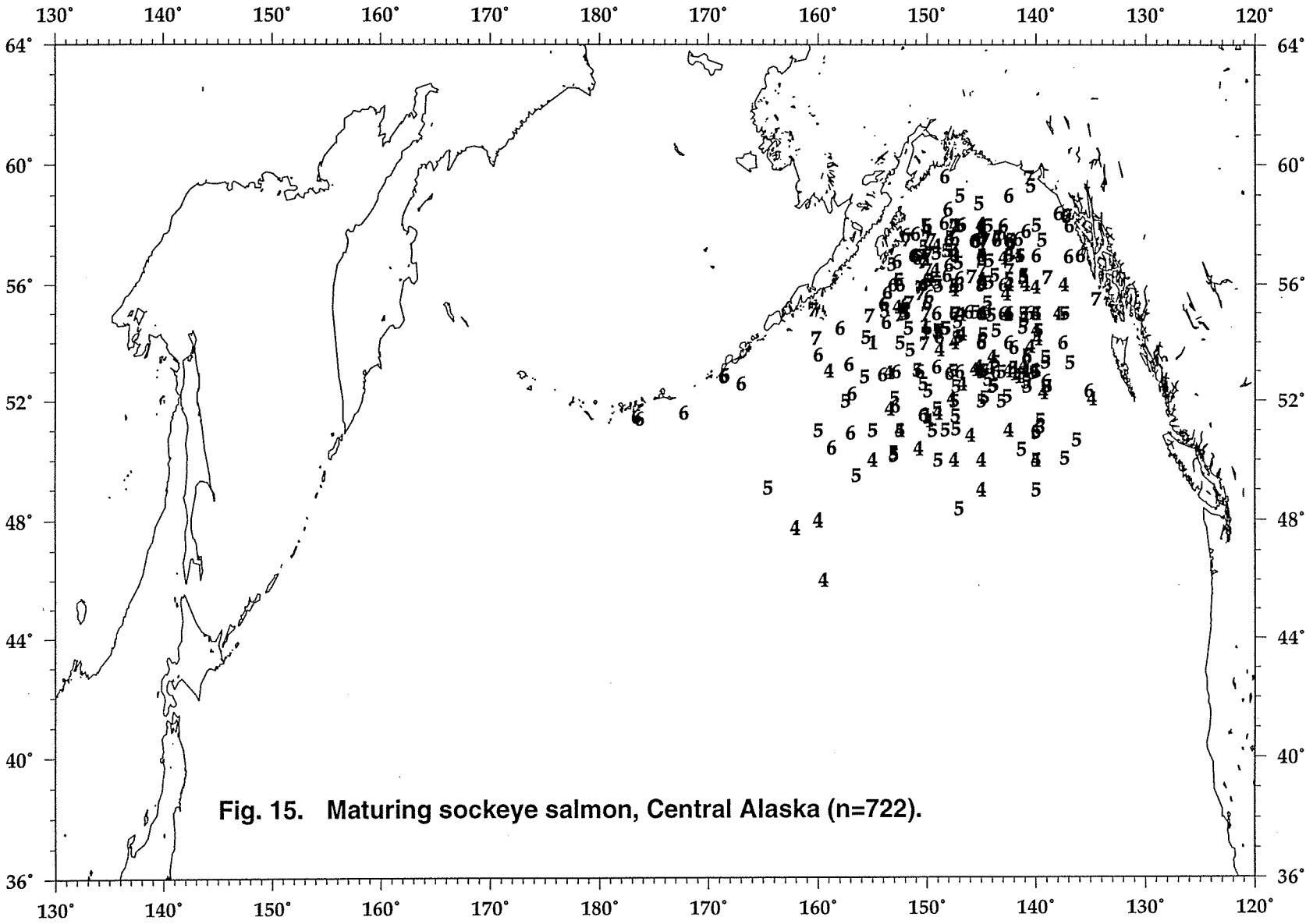


Fig. 15. Maturing sockeye salmon, Central Alaska (n=722).

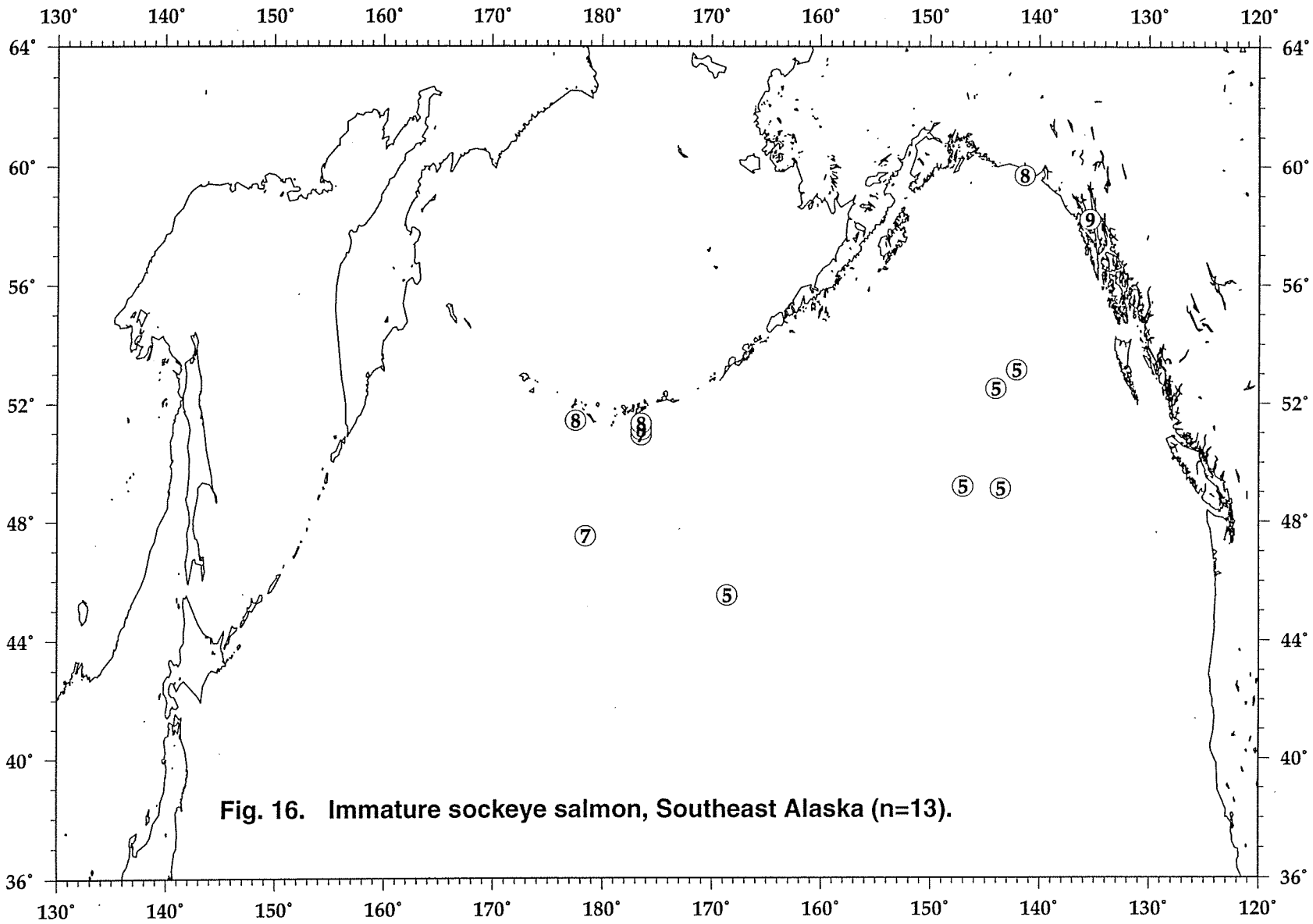


Fig. 16. Immature sockeye salmon, Southeast Alaska (n=13).

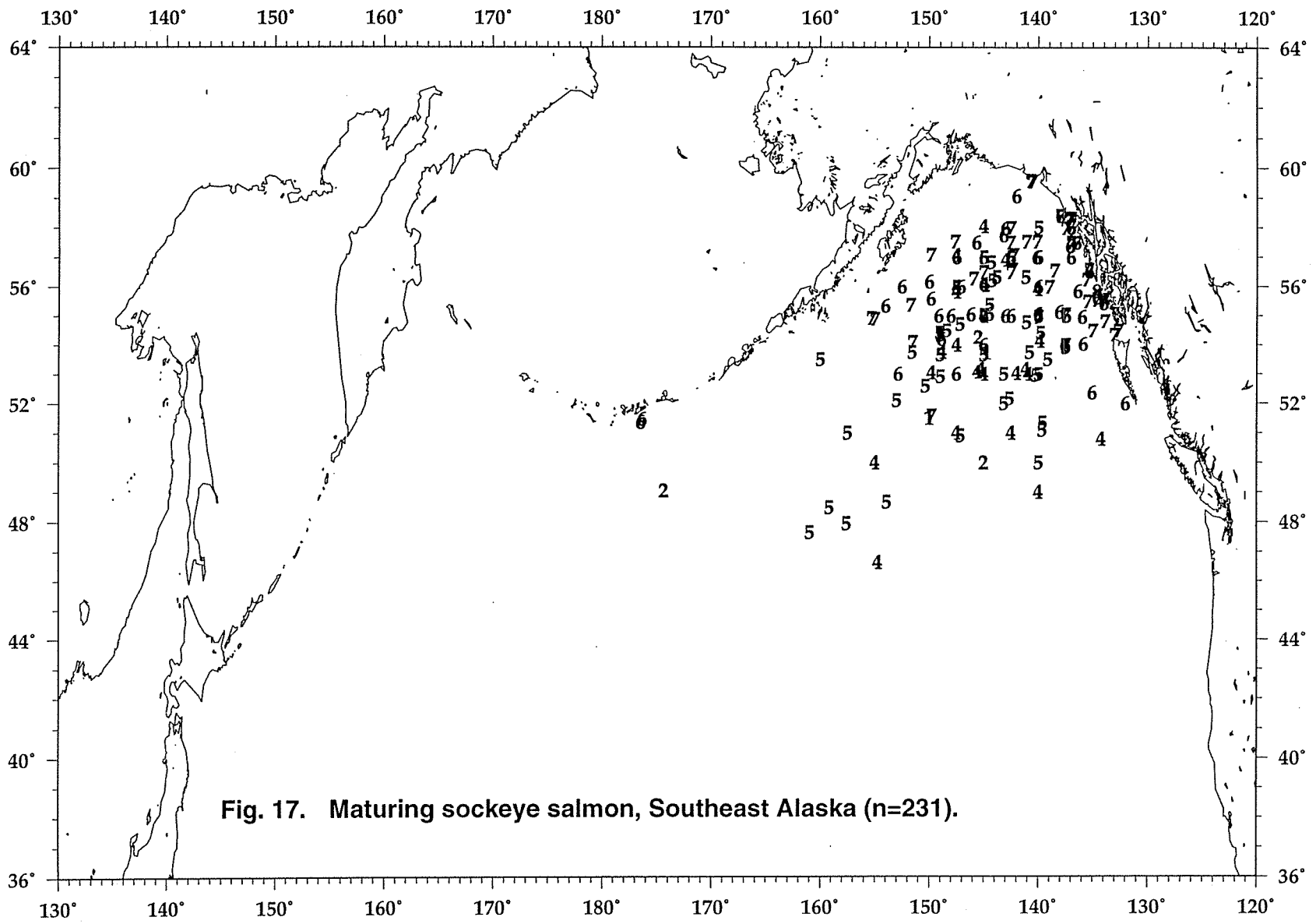


Fig. 17. Maturing sockeye salmon, Southeast Alaska (n=231).

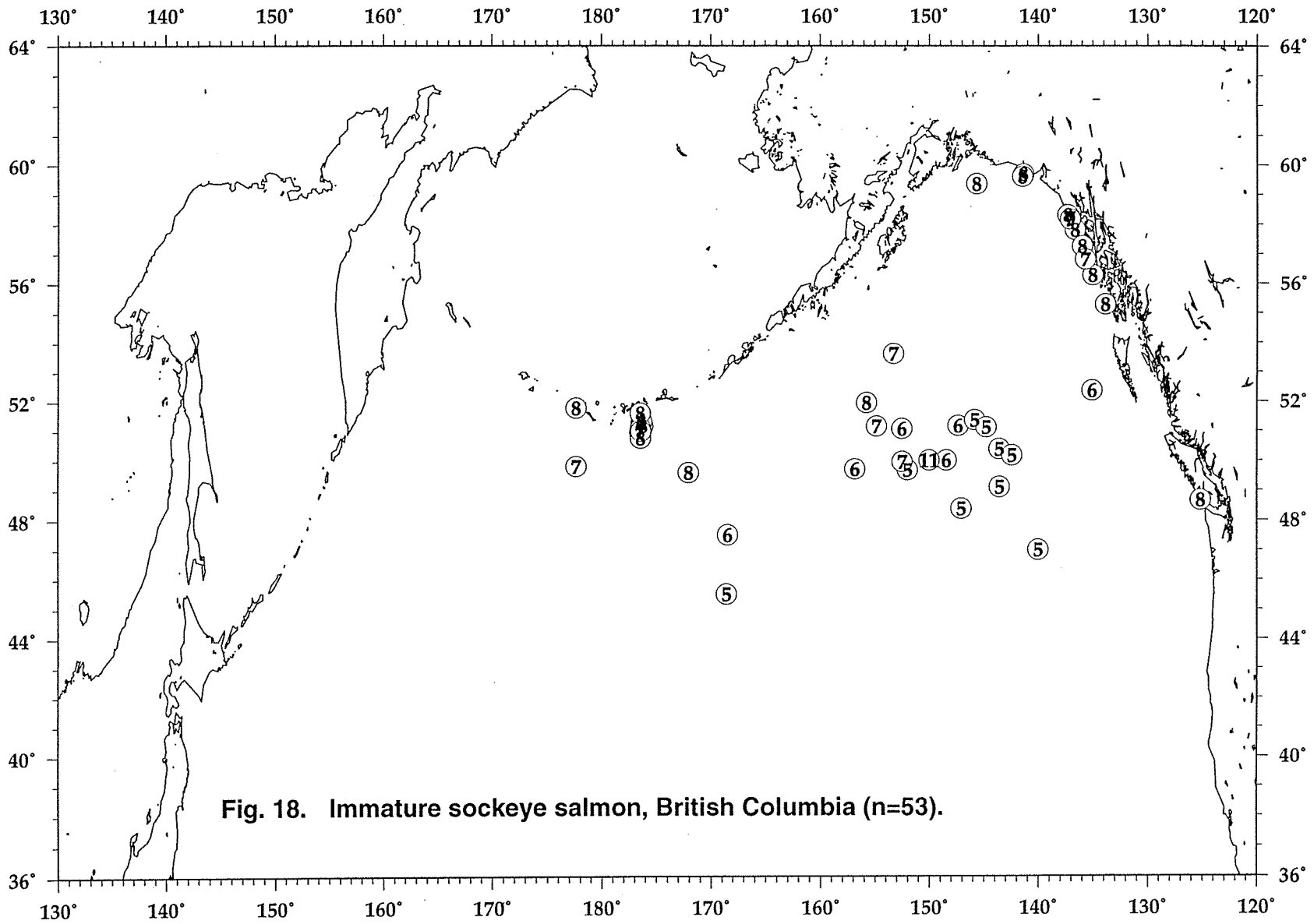


Fig. 18. Immature sockeye salmon, British Columbia (n=53).

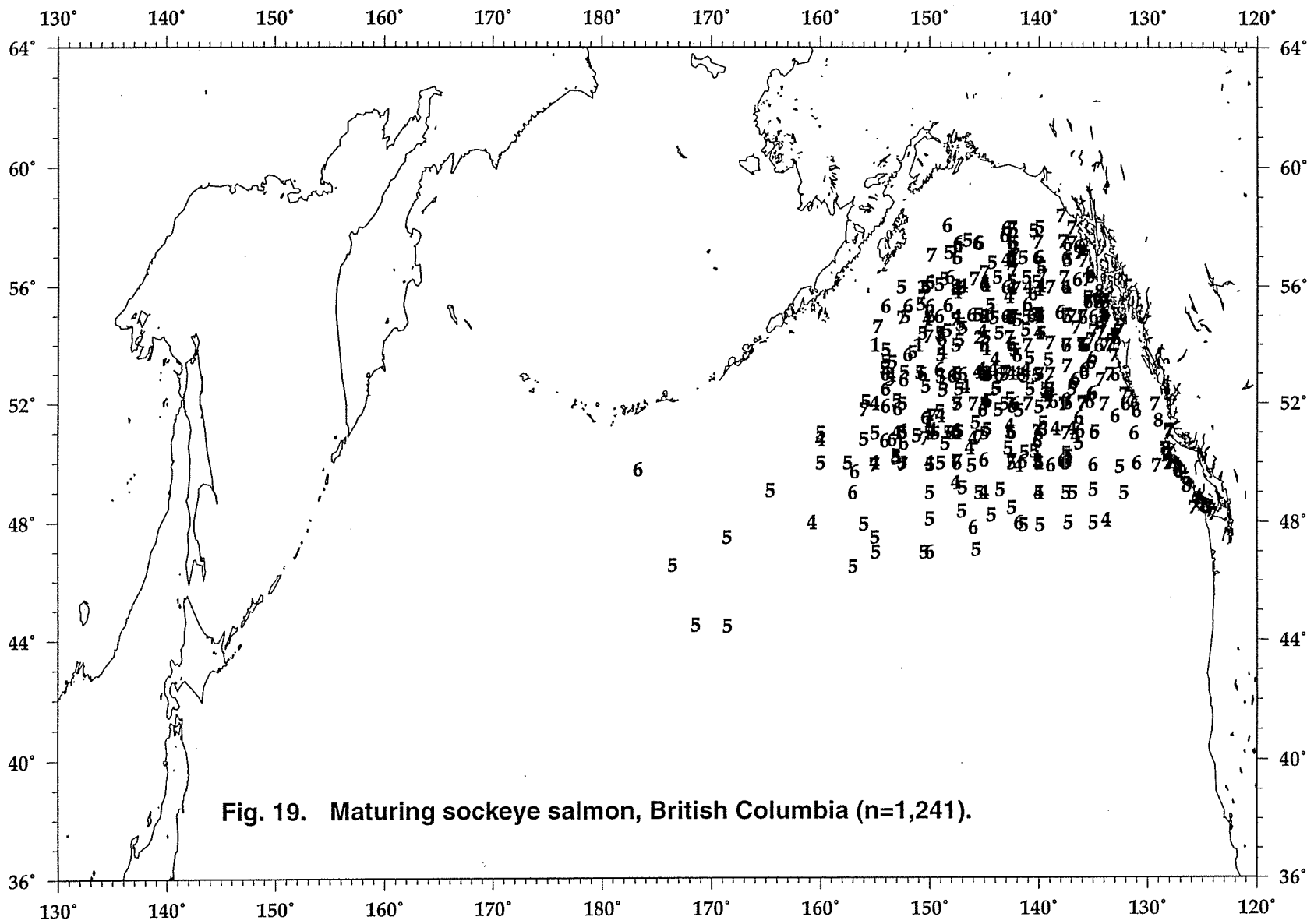


Fig. 19. Maturing sockeye salmon, British Columbia (n=1,241).

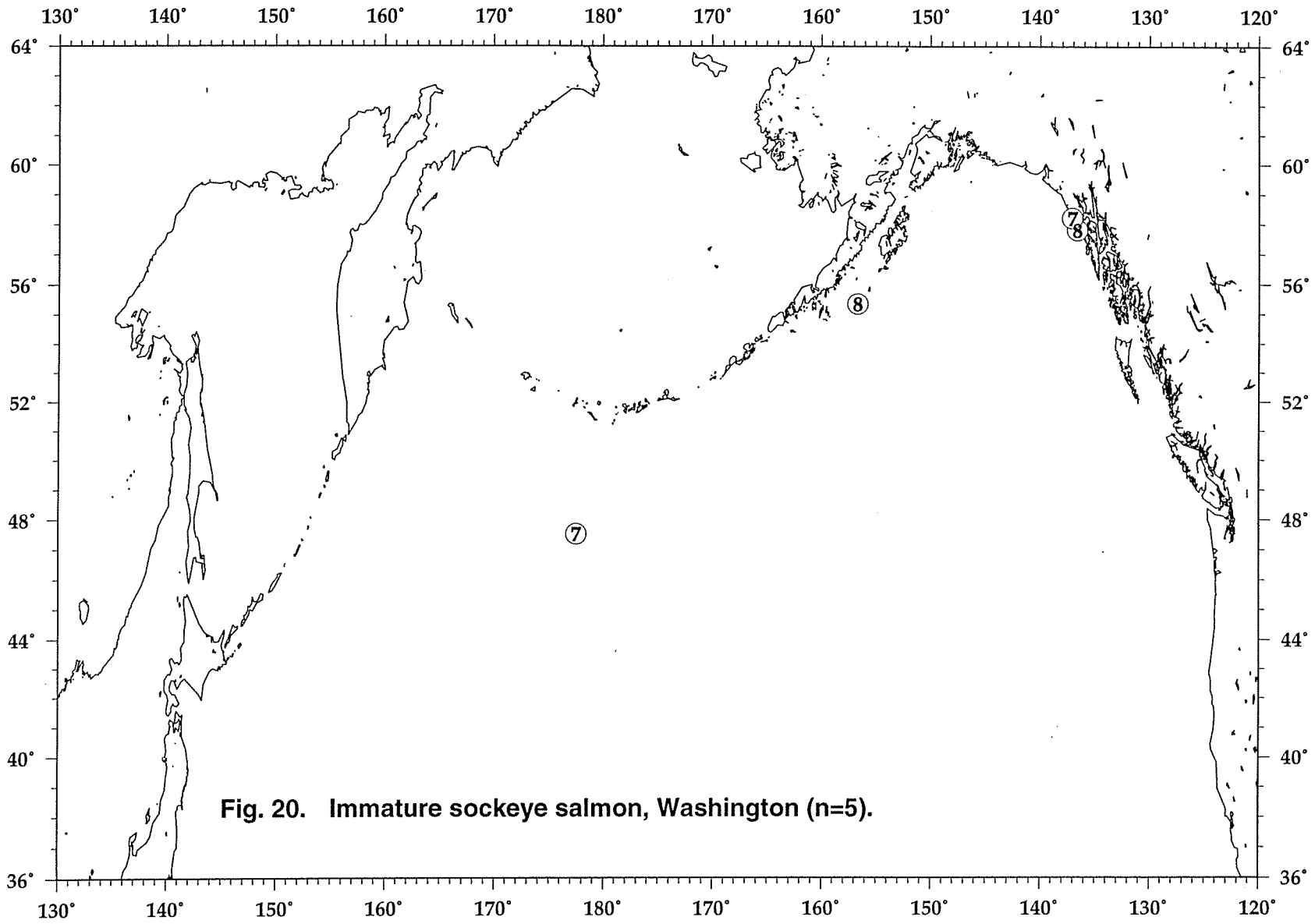


Fig. 20. Immature sockeye salmon, Washington (n=5).

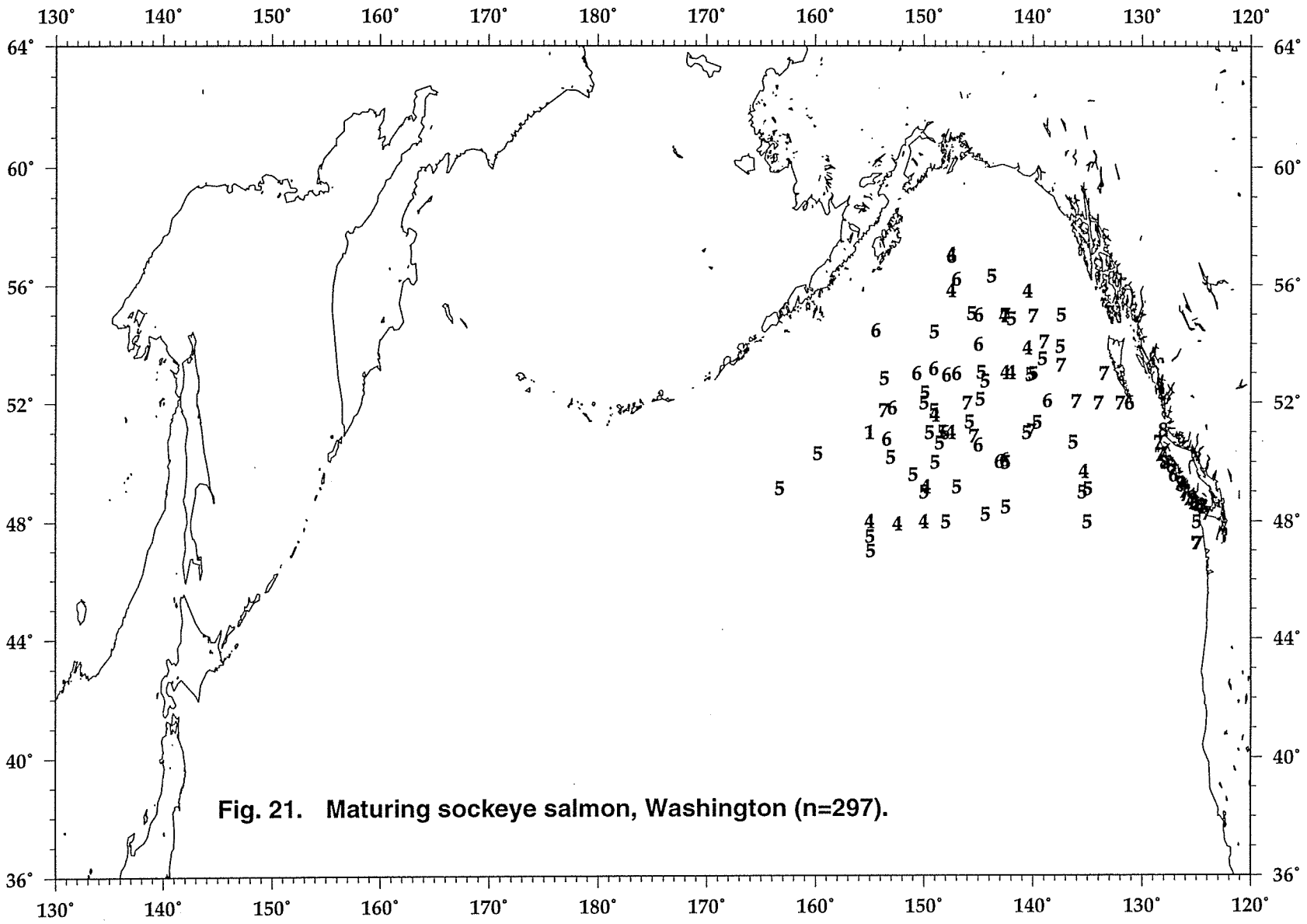


Fig. 21. Maturing sockeye salmon, Washington (n=297).

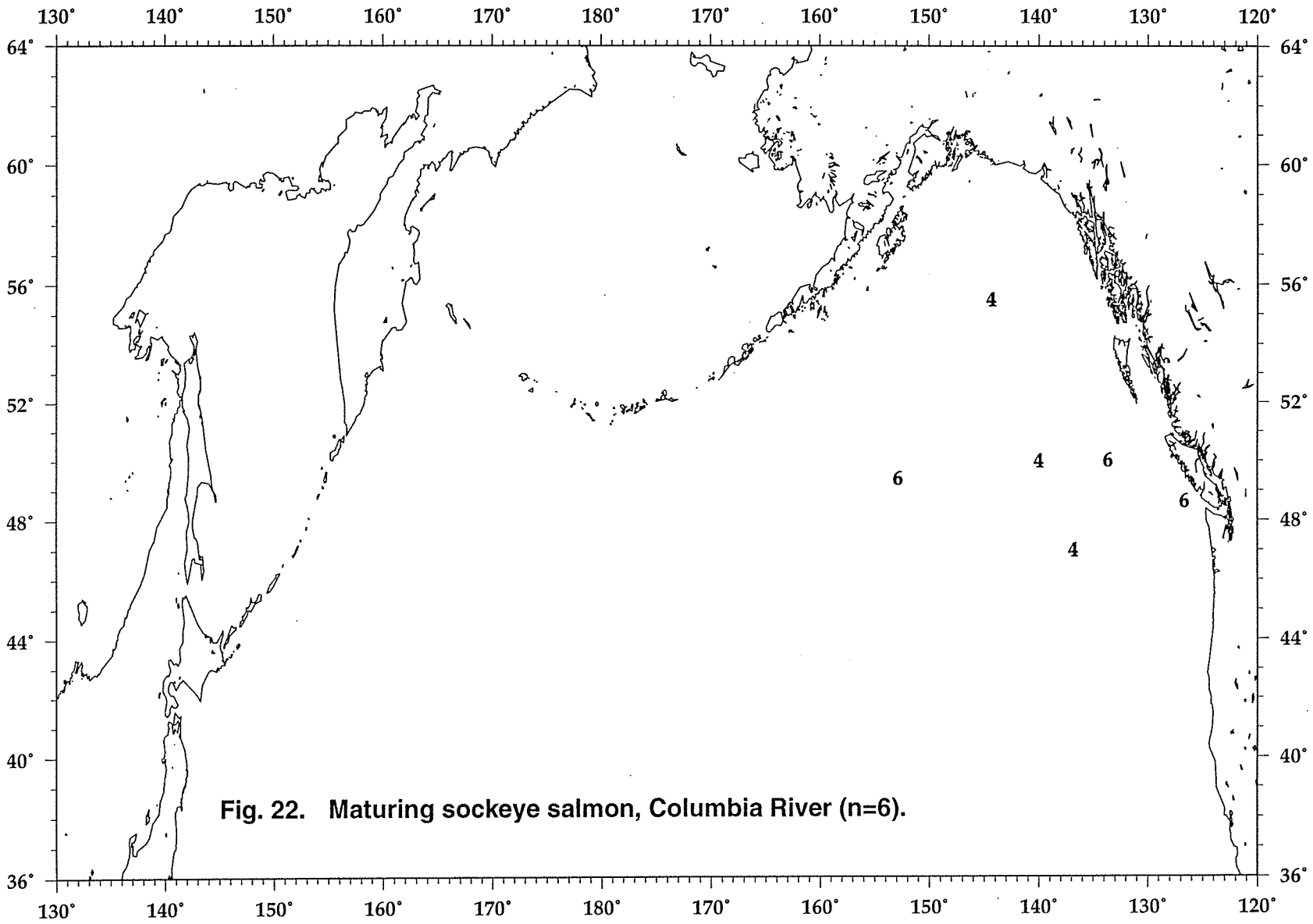


Fig. 22. Maturing sockeye salmon, Columbia River (n=6).

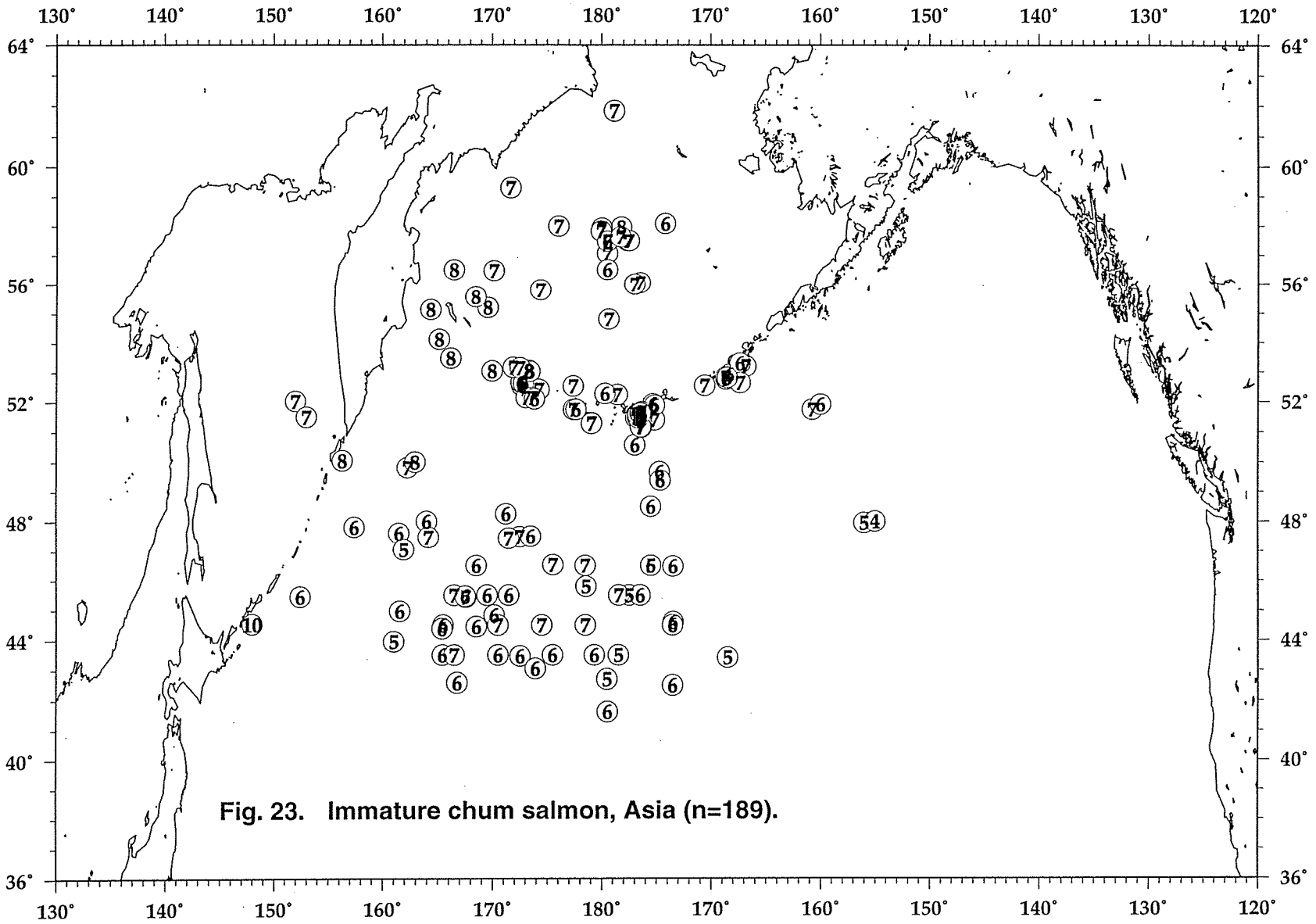


Fig. 23. Immature chum salmon, Asia (n=189).

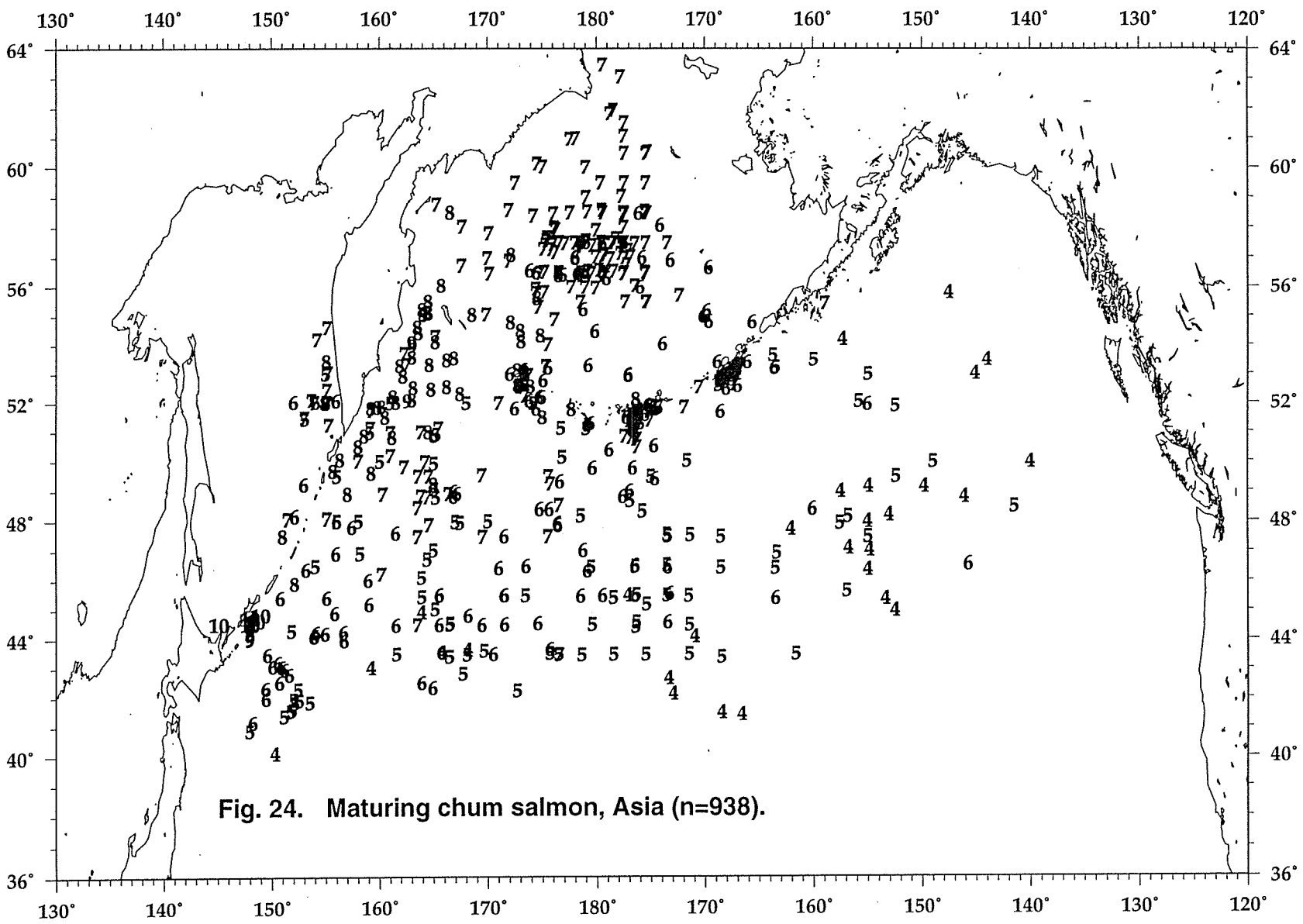


Fig. 24. Maturing chum salmon, Asia (n=938).

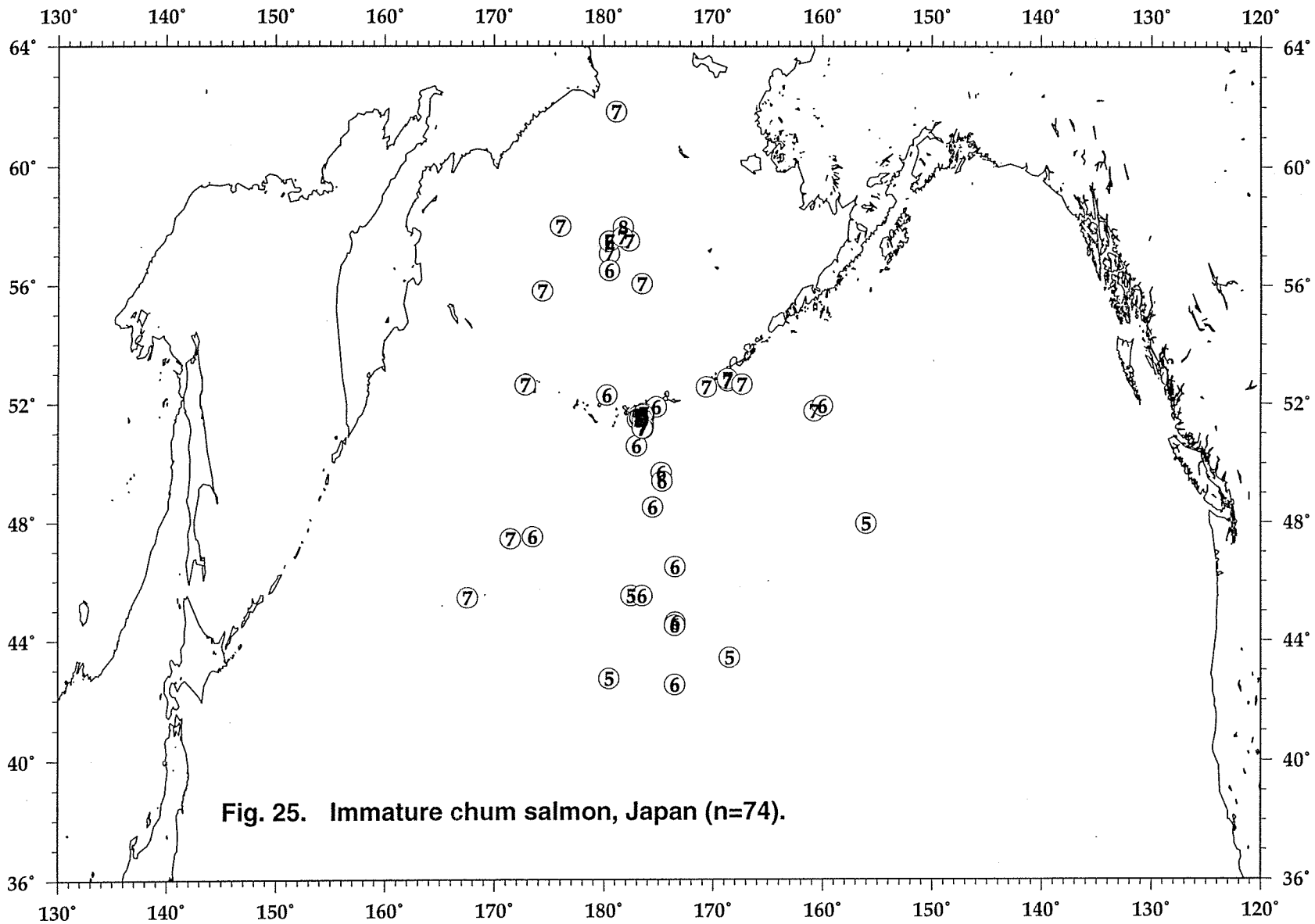


Fig. 25. Immature chum salmon, Japan (n=74).

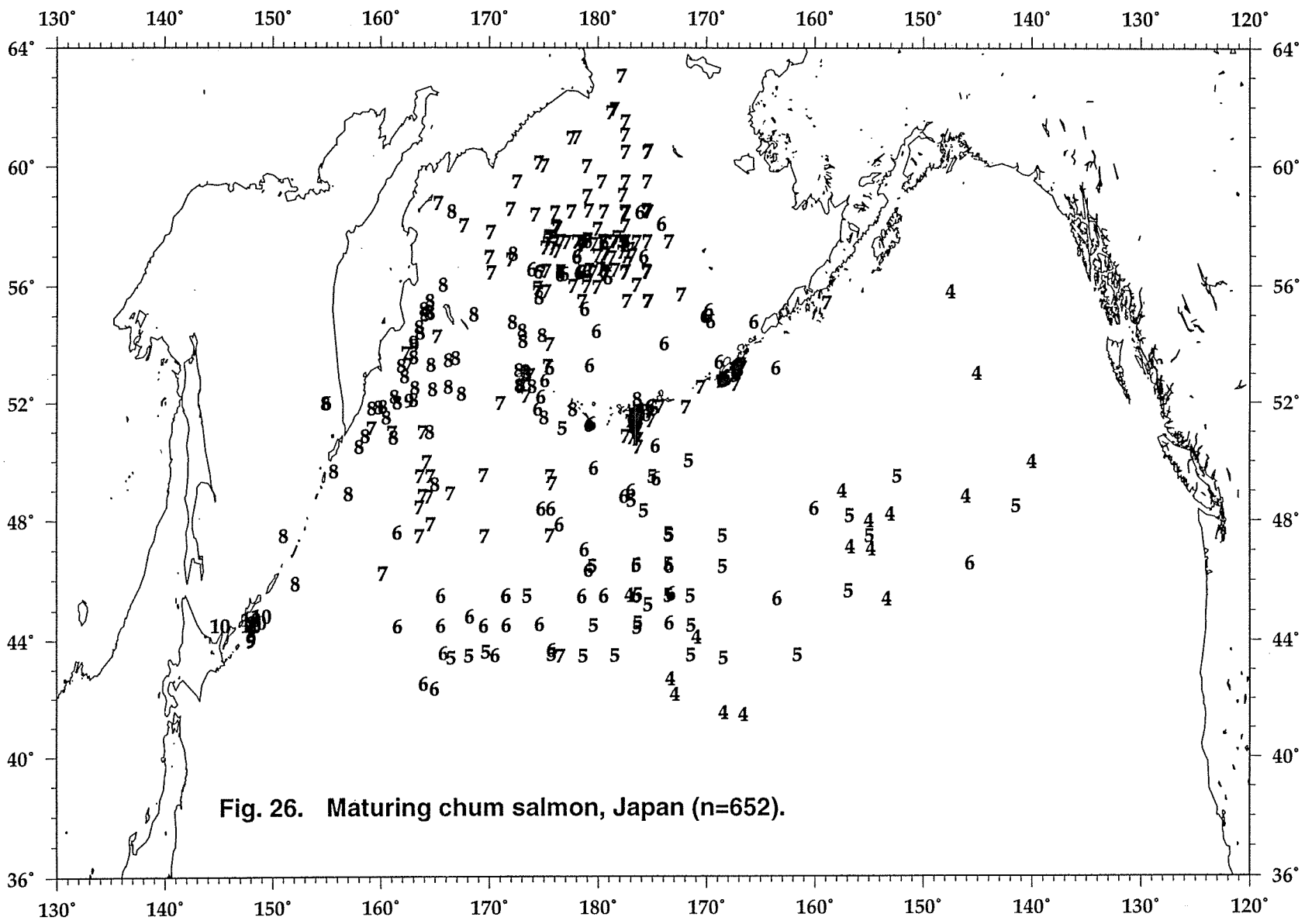


Fig. 26. Maturing chum salmon, Japan (n=652).

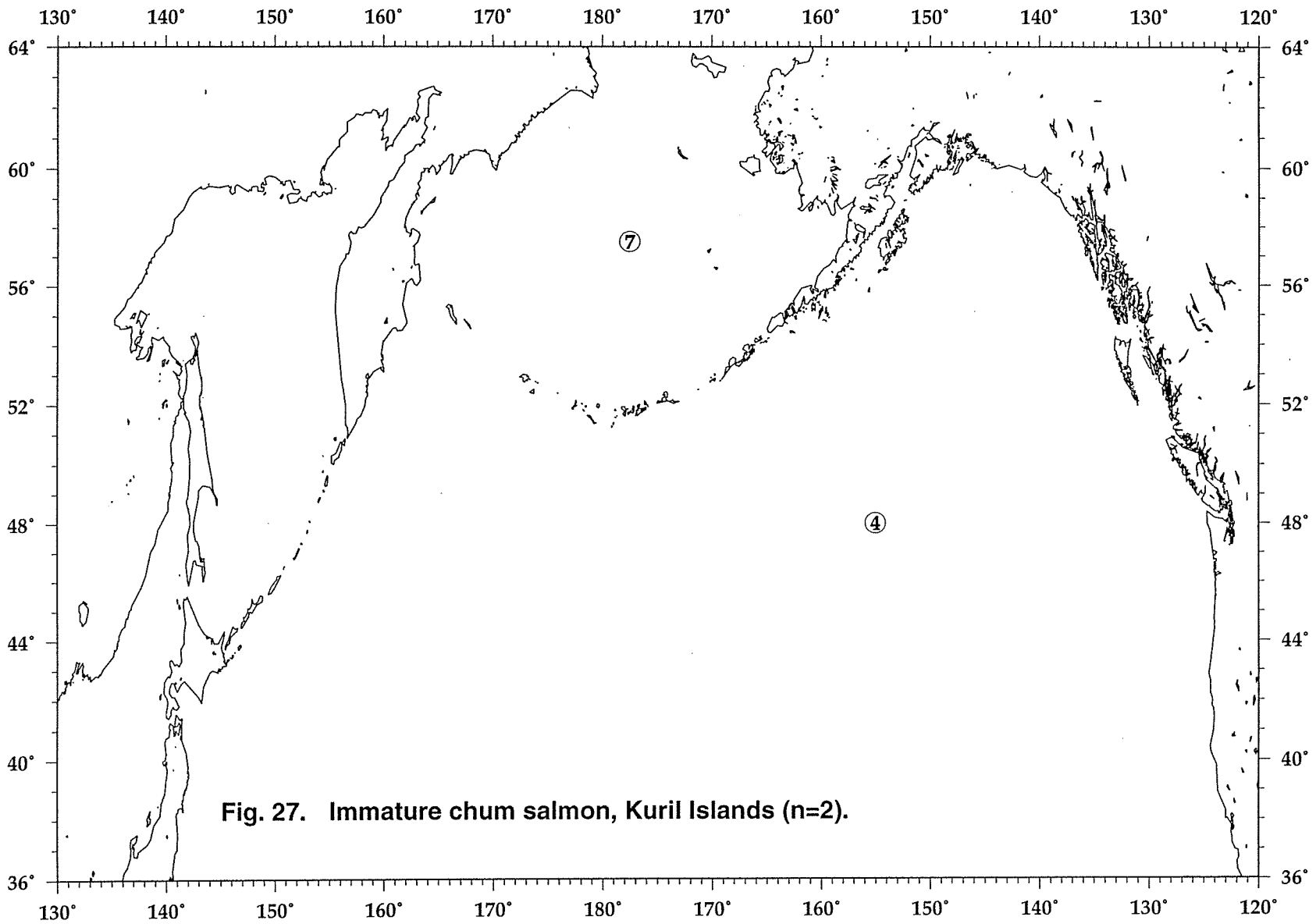


Fig. 27. Immature chum salmon, Kuril Islands (n=2).

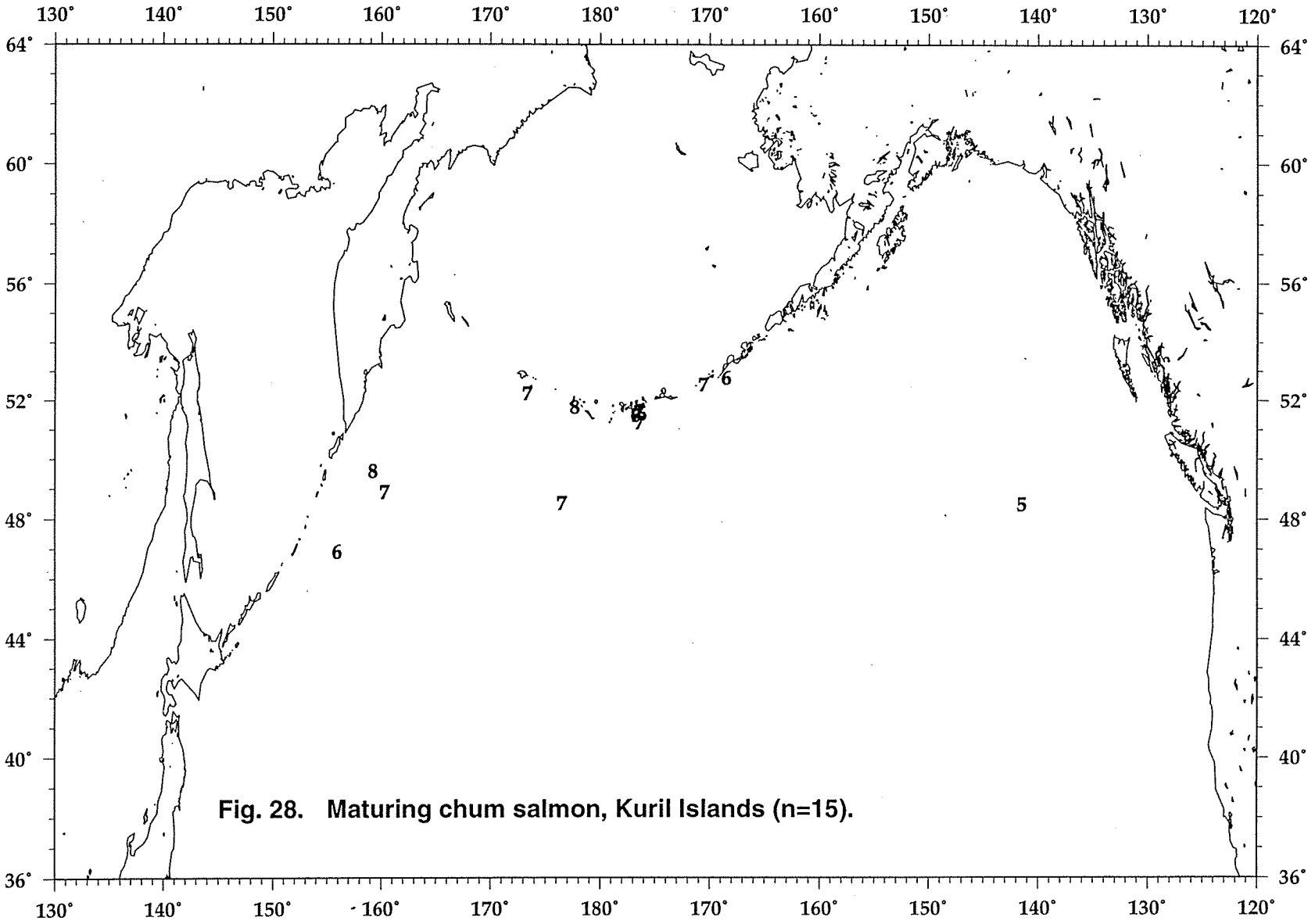


Fig. 28. Maturing chum salmon, Kuril Islands (n=15).

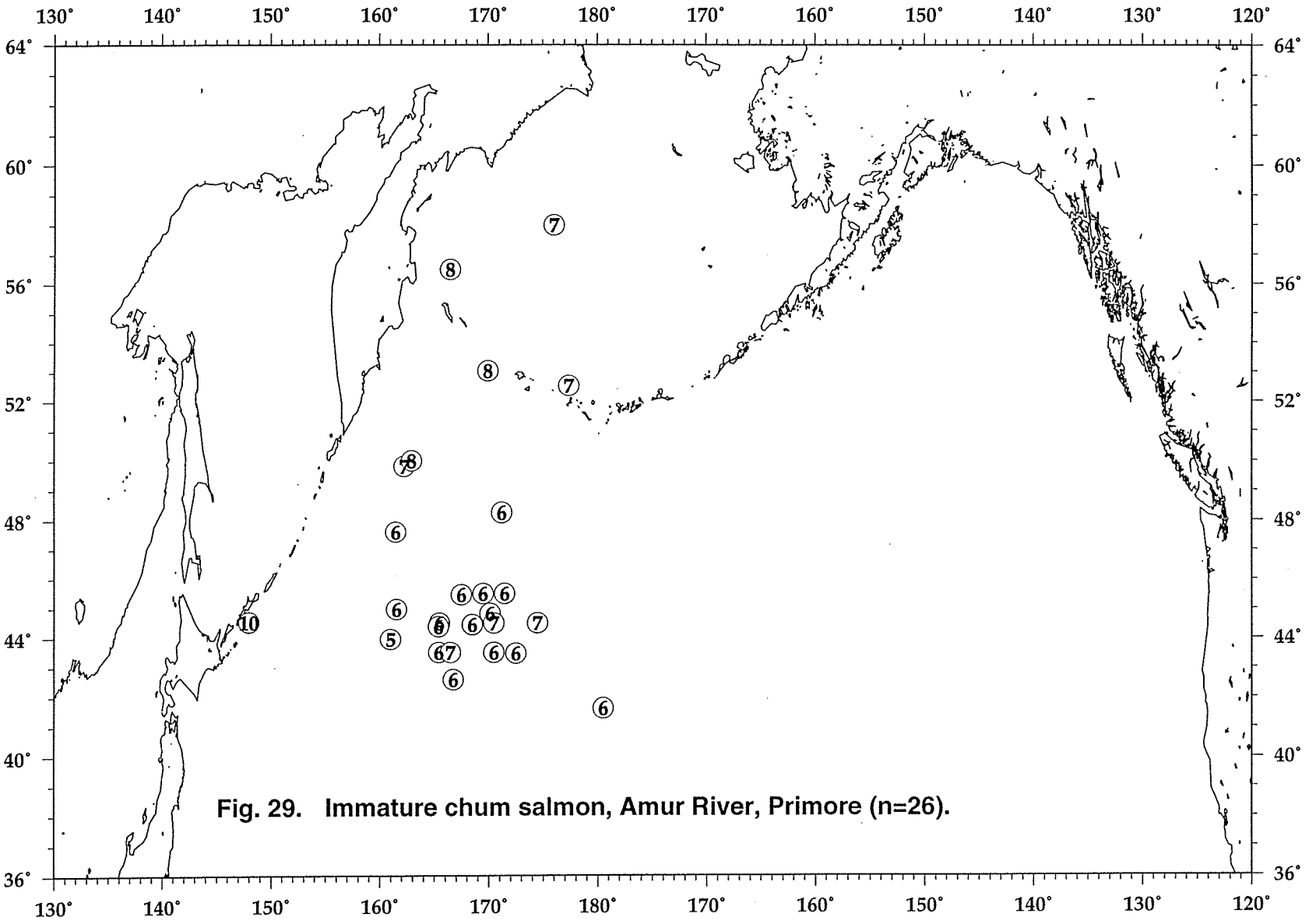


Fig. 29. Immature chum salmon, Amur River, Primore (n=26).

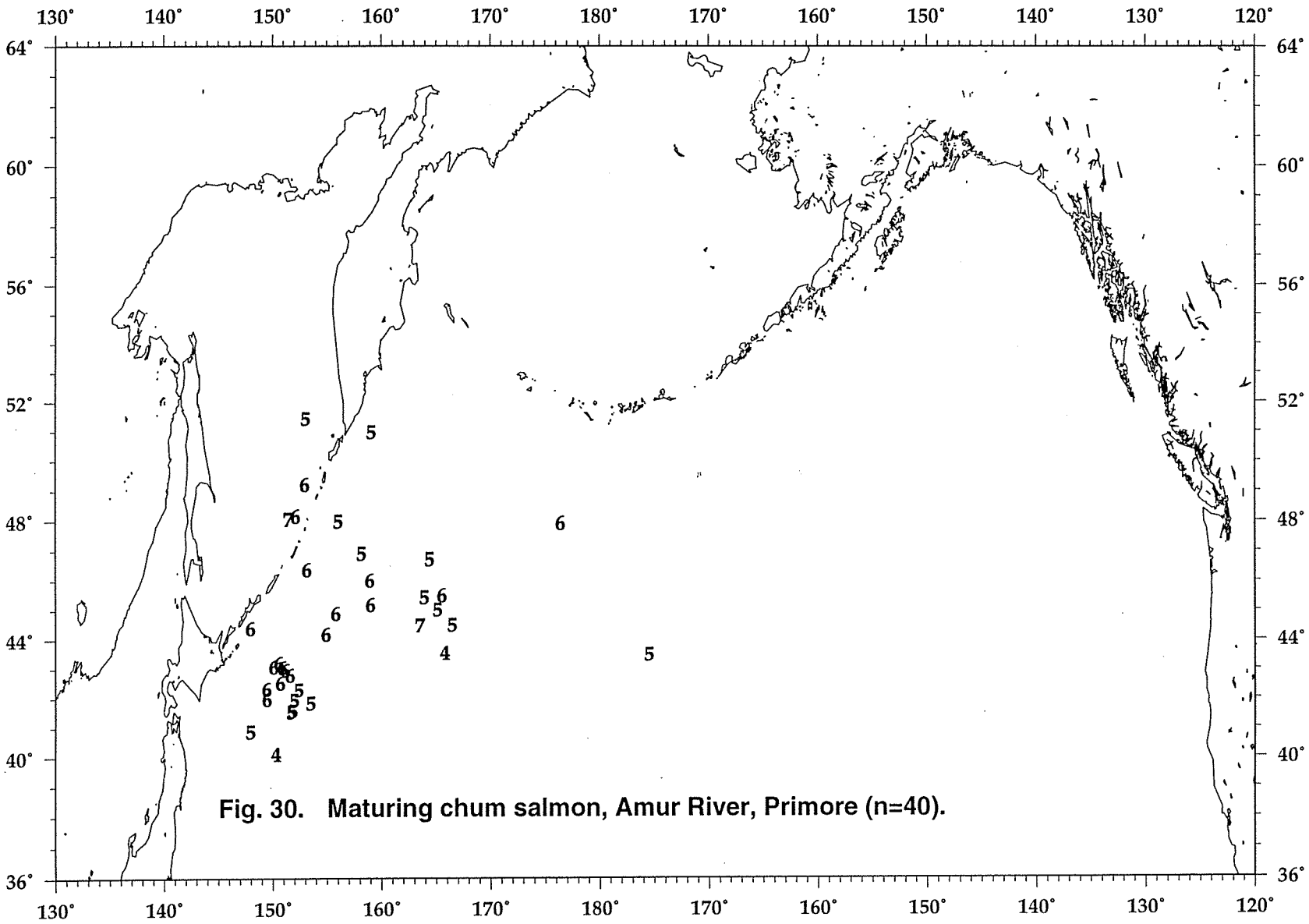


Fig. 30. Maturing chum salmon, Amur River, Primore (n=40).

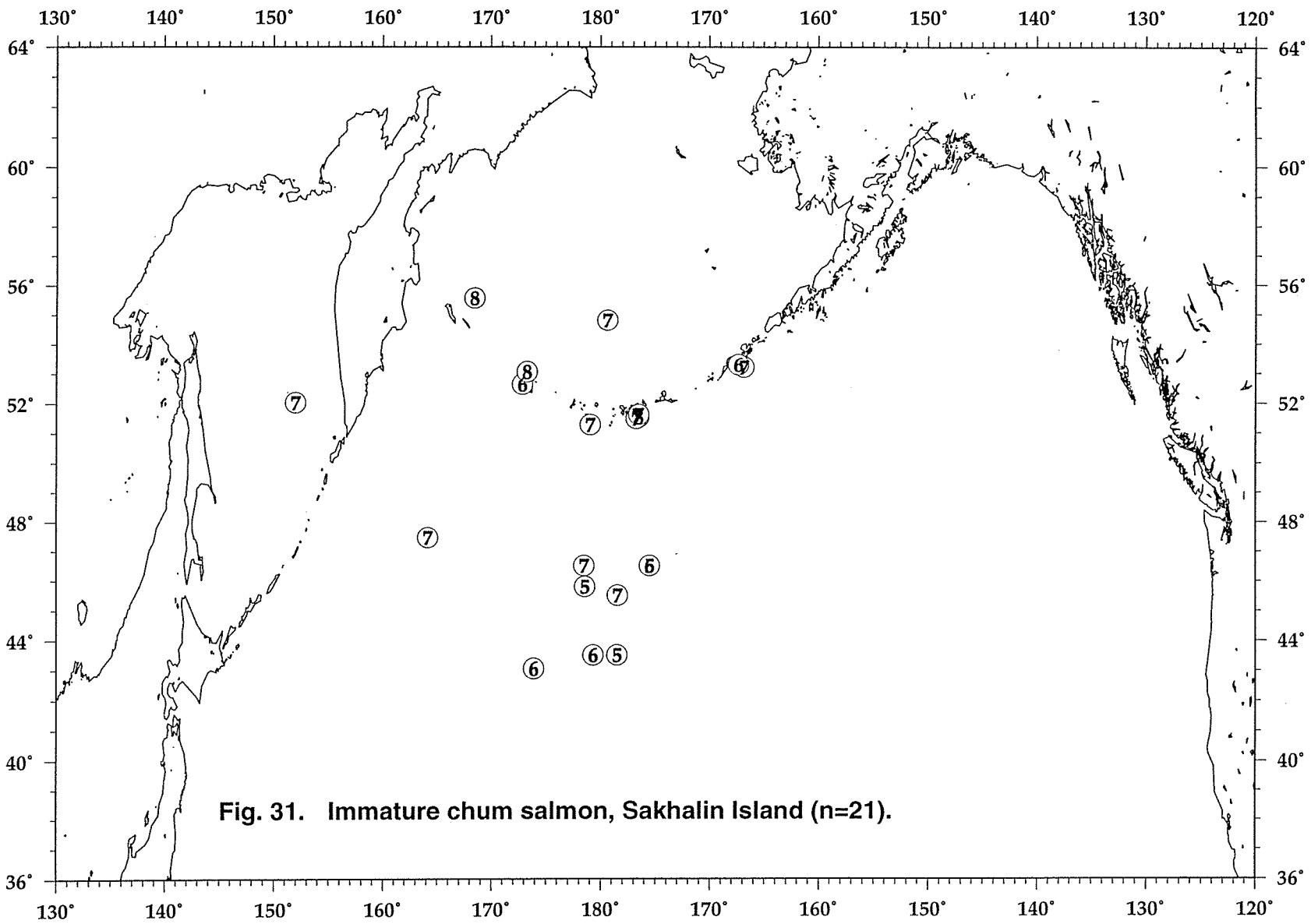


Fig. 31. Immature chum salmon, Sakhalin Island (n=21).

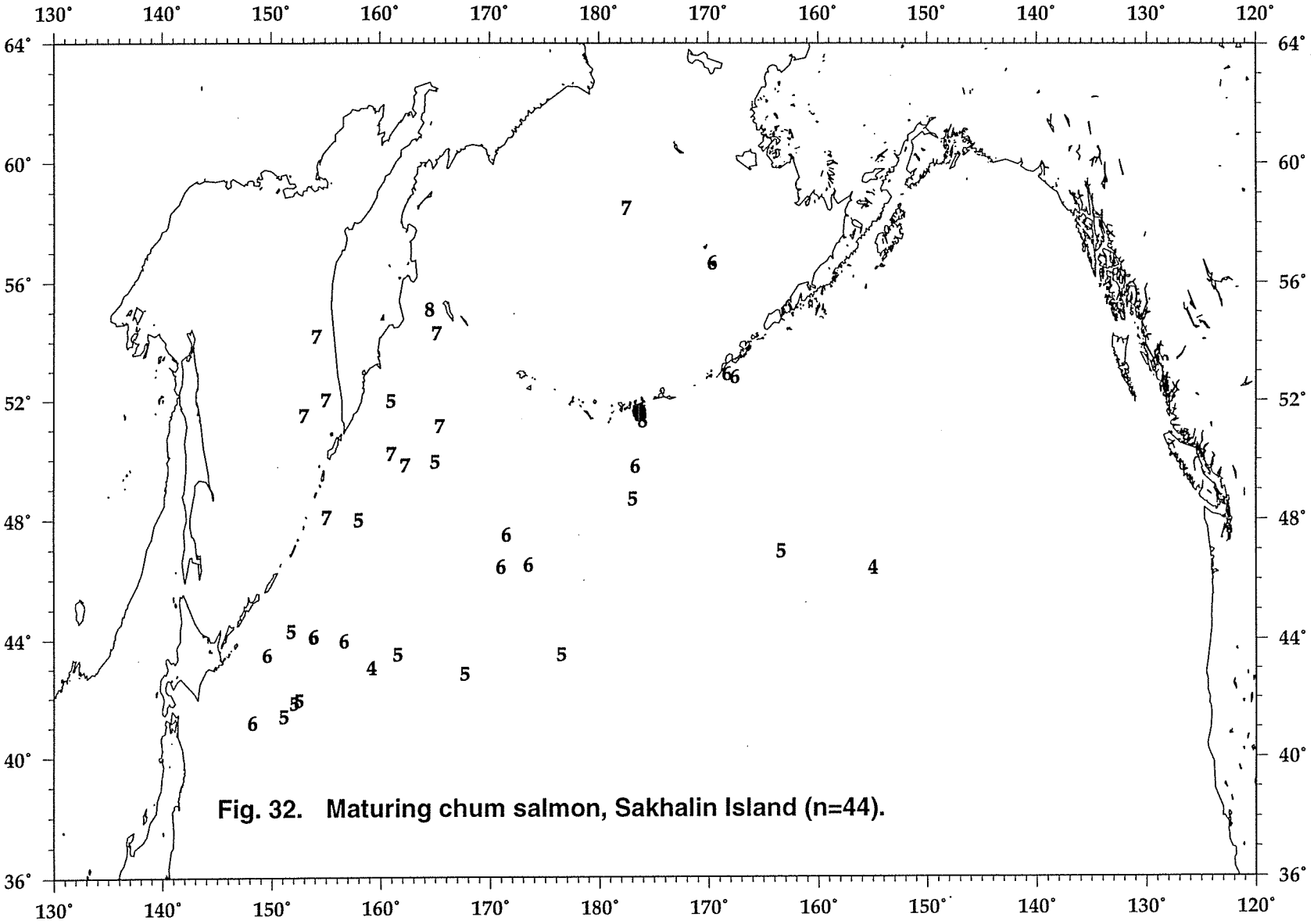


Fig. 32. Maturing chum salmon, Sakhalin Island (n=44).

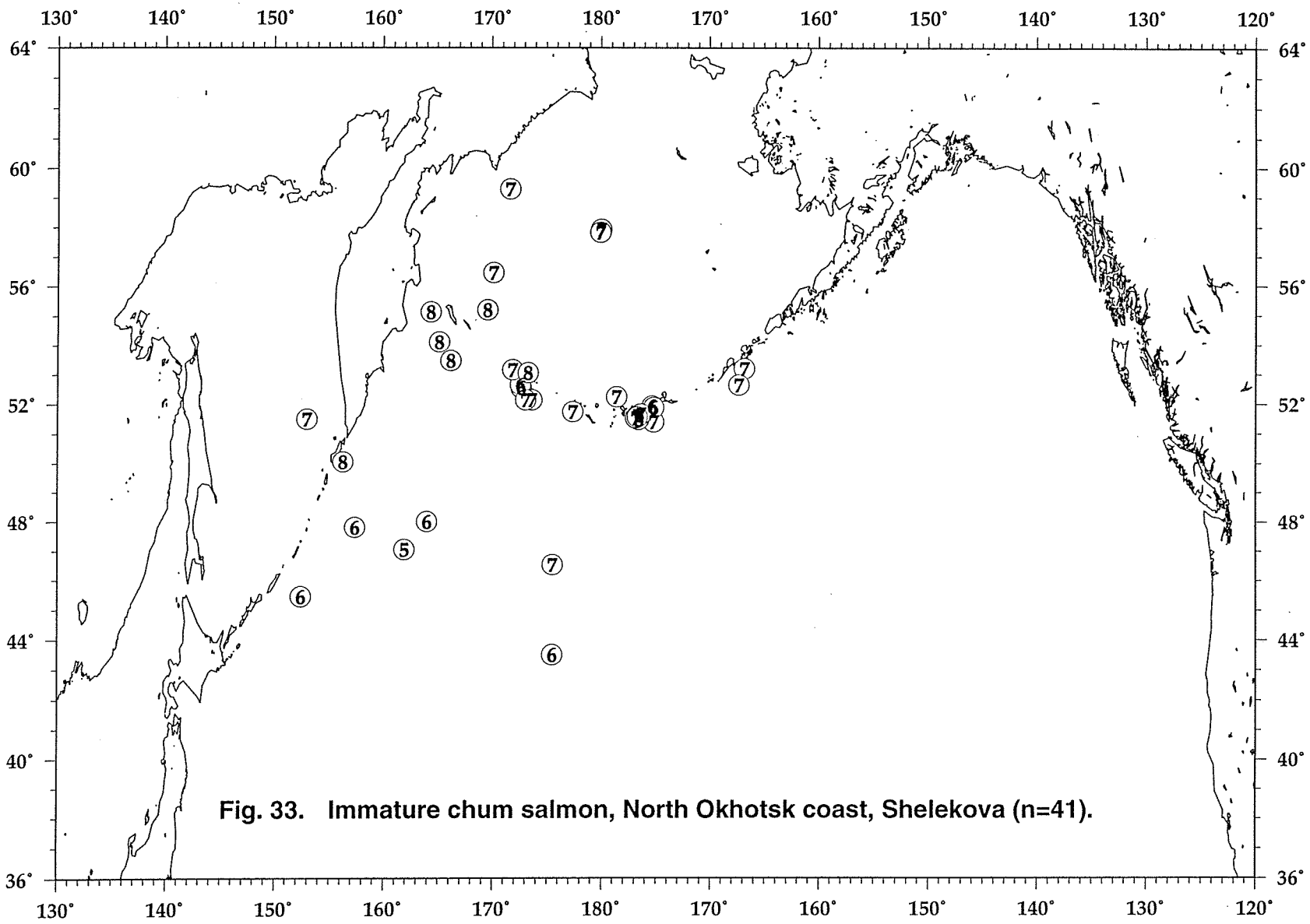


Fig. 33. Immature chum salmon, North Okhotsk coast, Shelekova (n=41).

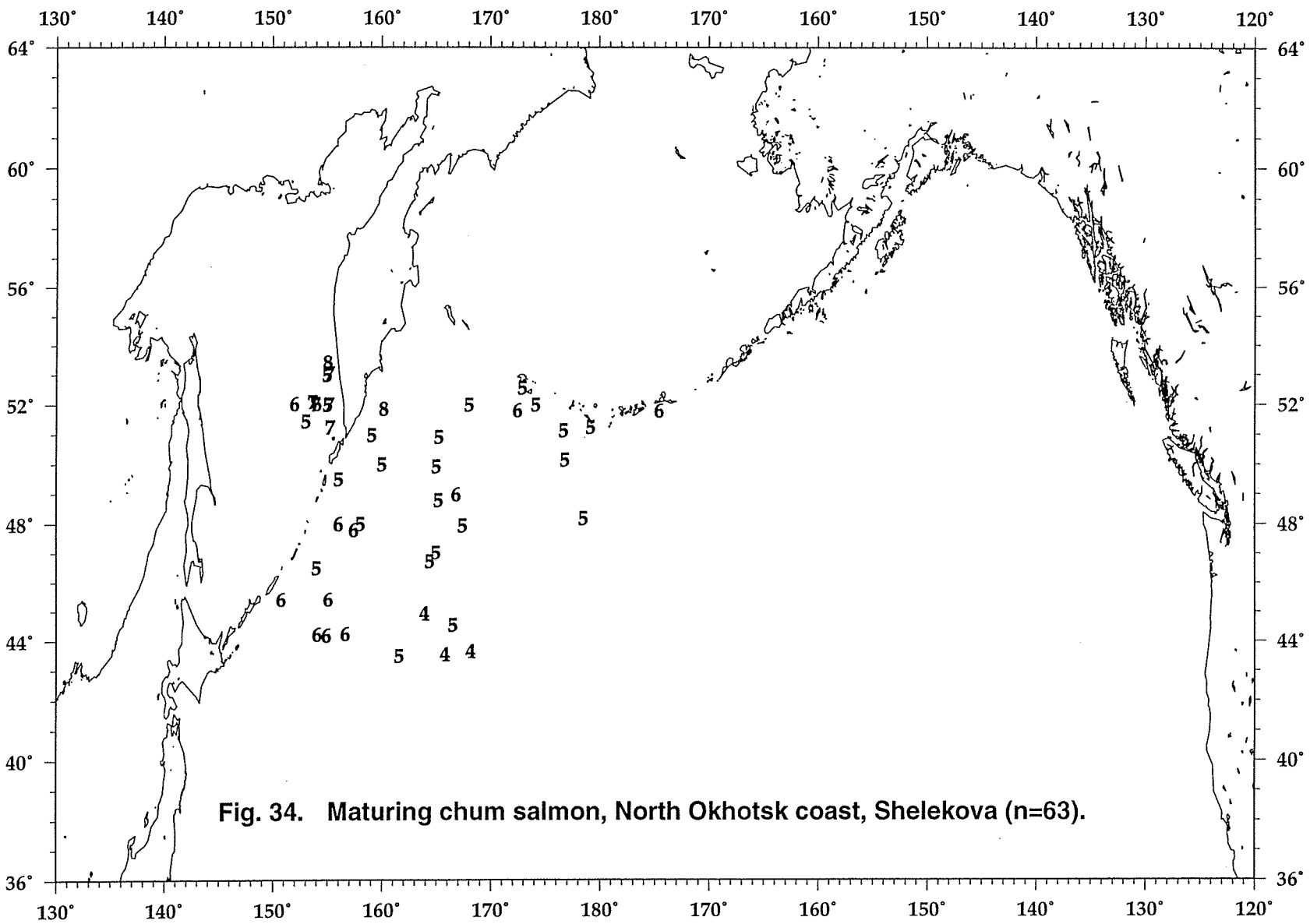


Fig. 34. Maturing chum salmon, North Okhotsk coast, Shelekova (n=63).

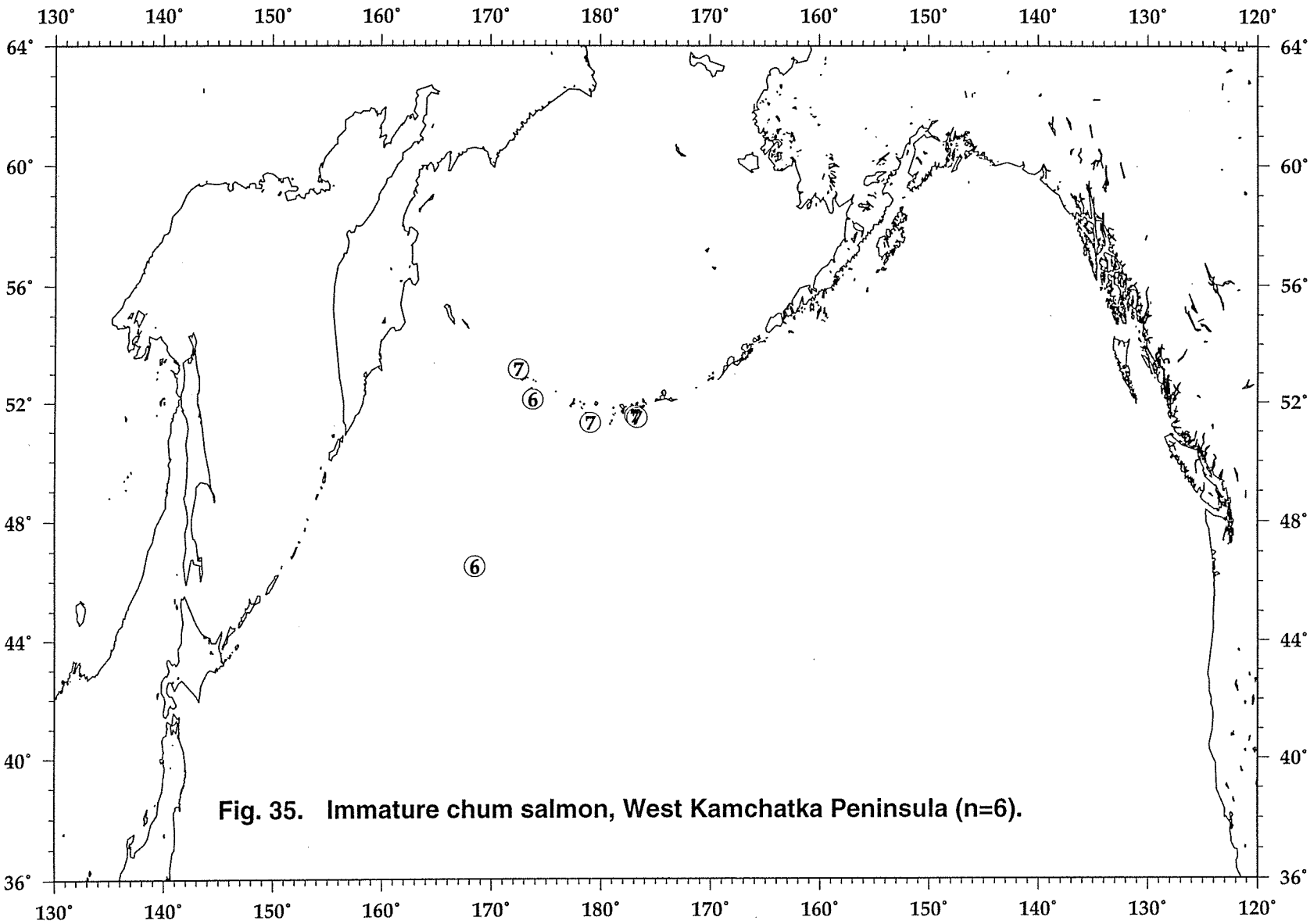


Fig. 35. Immature chum salmon, West Kamchatka Peninsula (n=6).

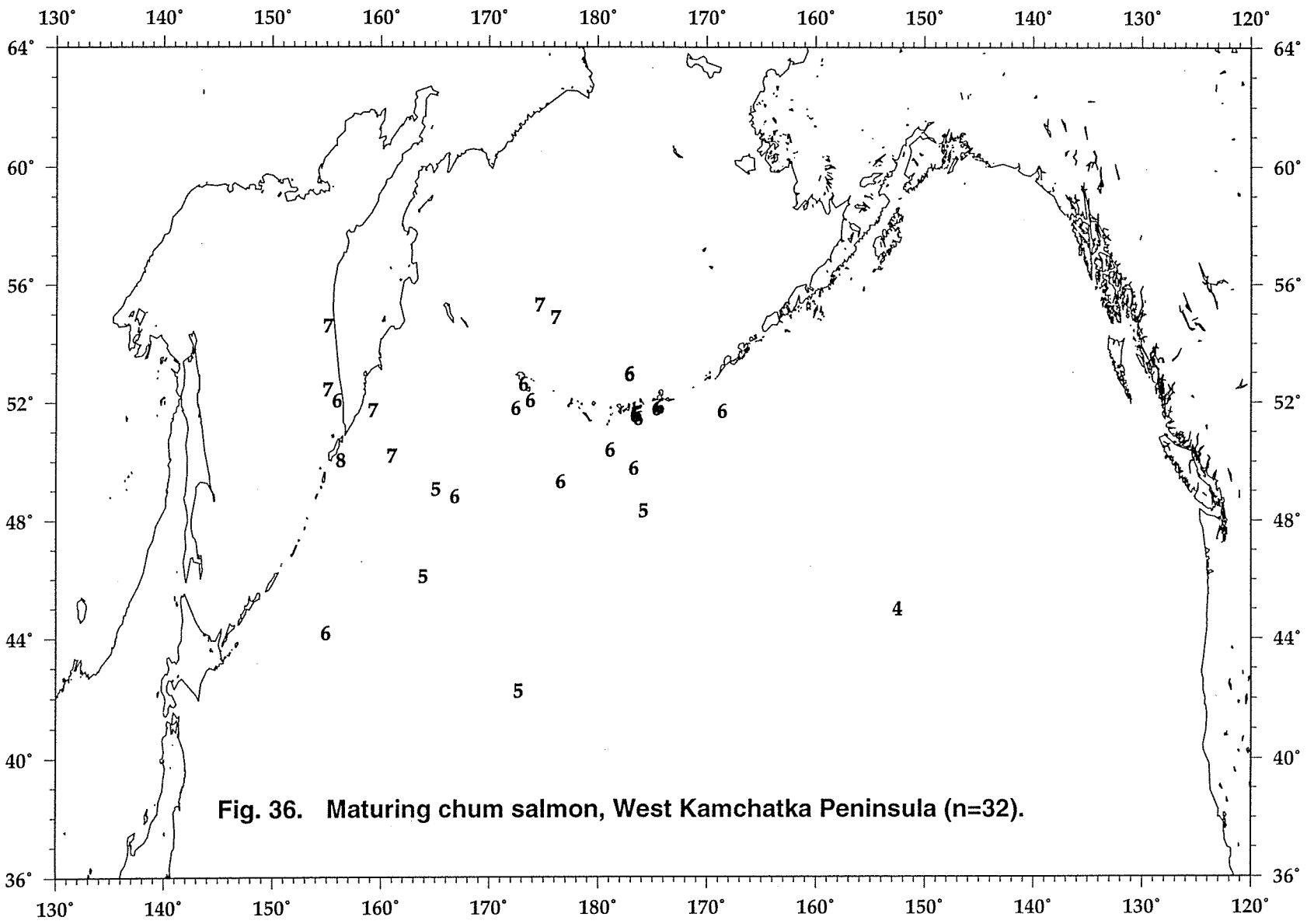


Fig. 36. Maturing chum salmon, West Kamchatka Peninsula (n=32).

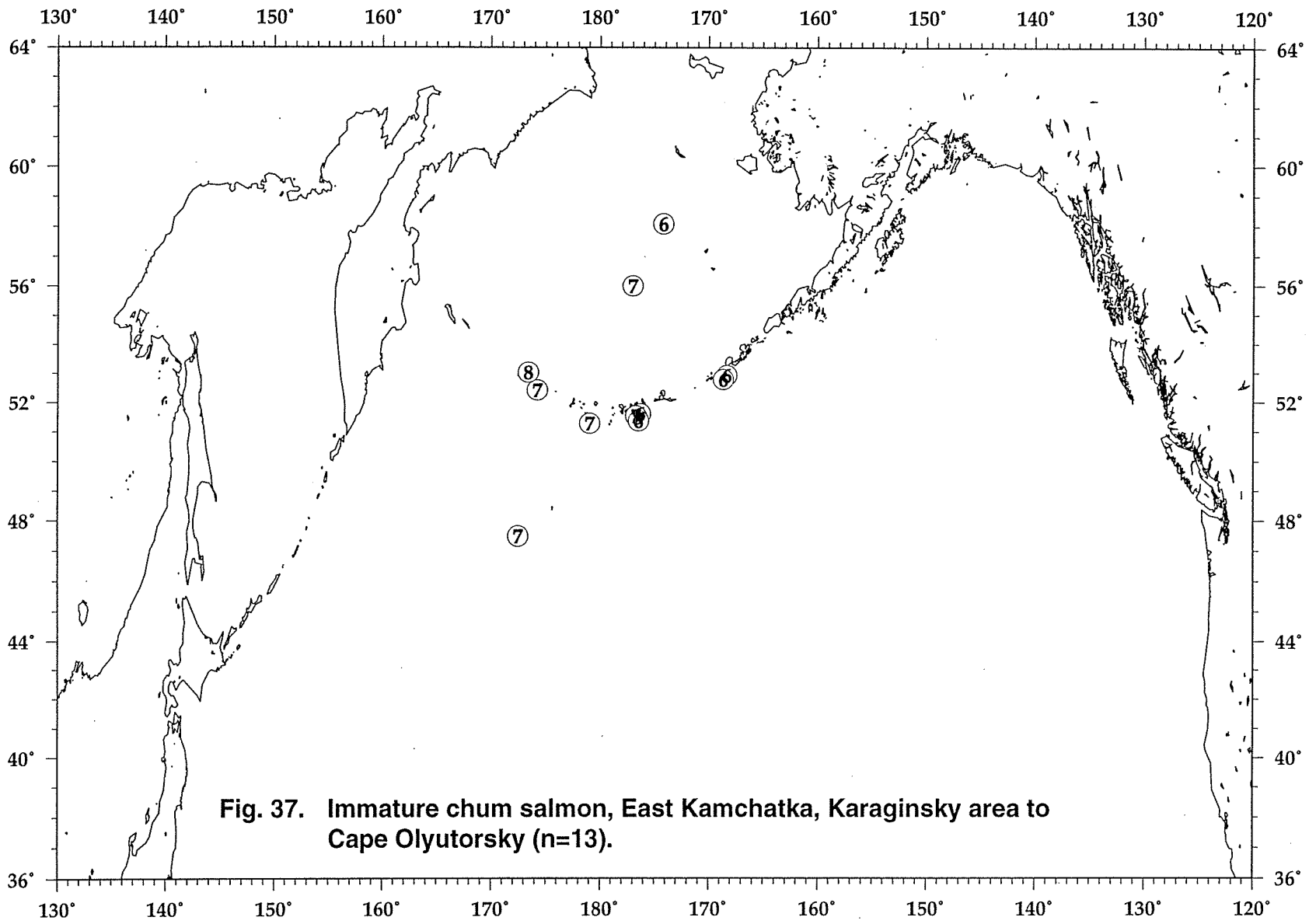


Fig. 37. Immature chum salmon, East Kamchatka, Karaginsky area to Cape Olyutorsky (n=13).

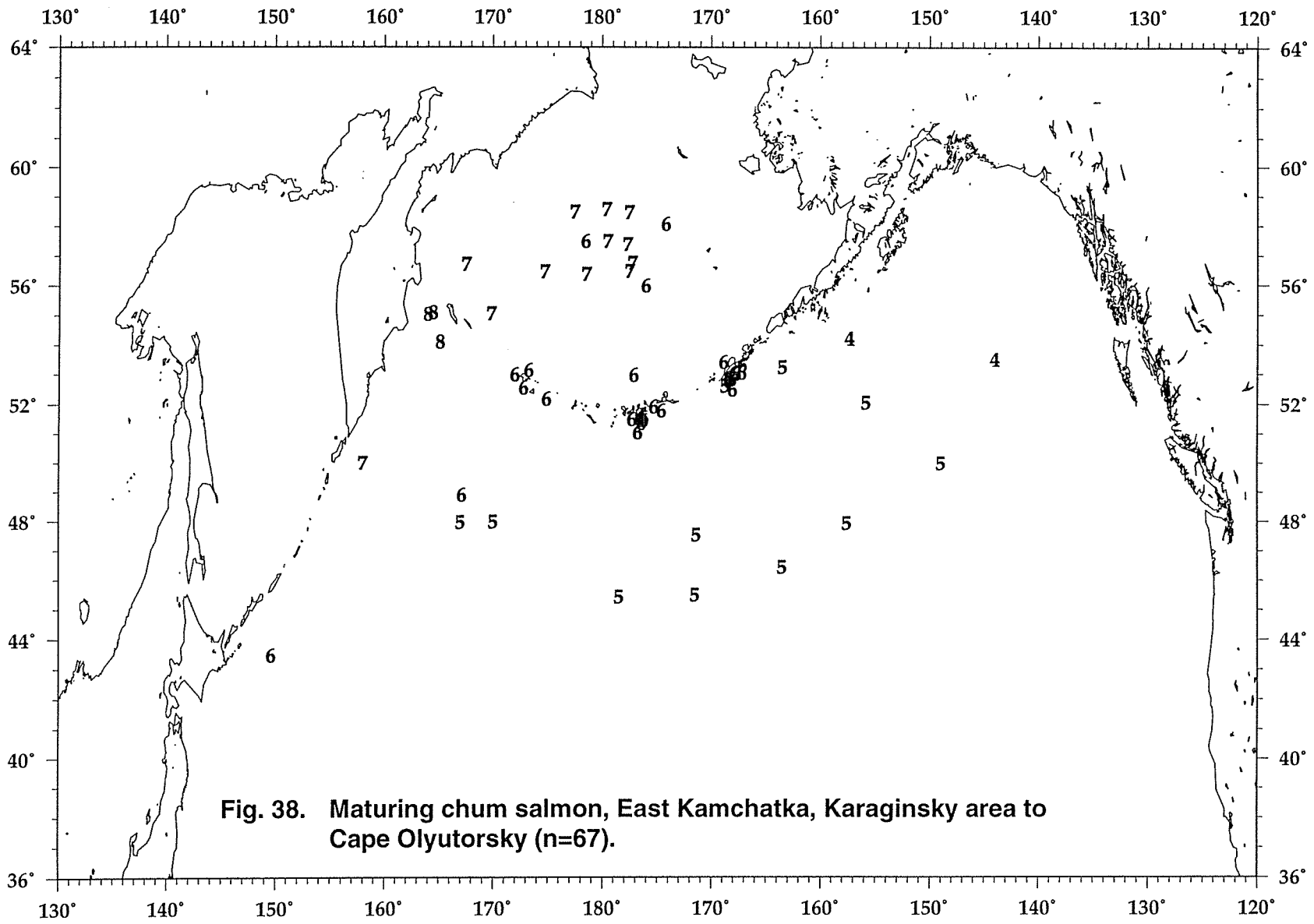


Fig. 38. Maturing chum salmon, East Kamchatka, Karaginsky area to Cape Olyutorsky (n=67).

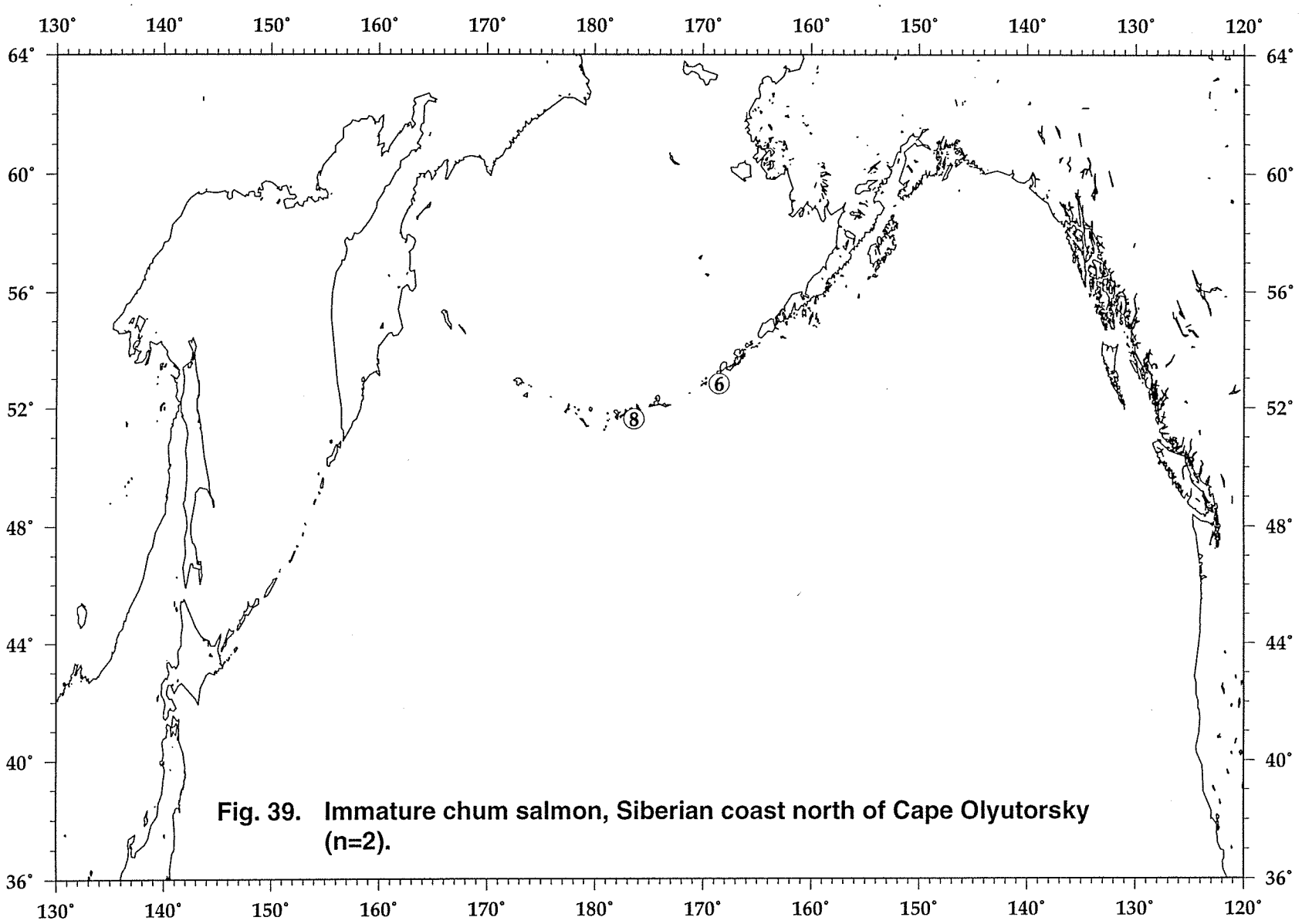


Fig. 39. Immature chum salmon, Siberian coast north of Cape Olyutorsky (n=2).

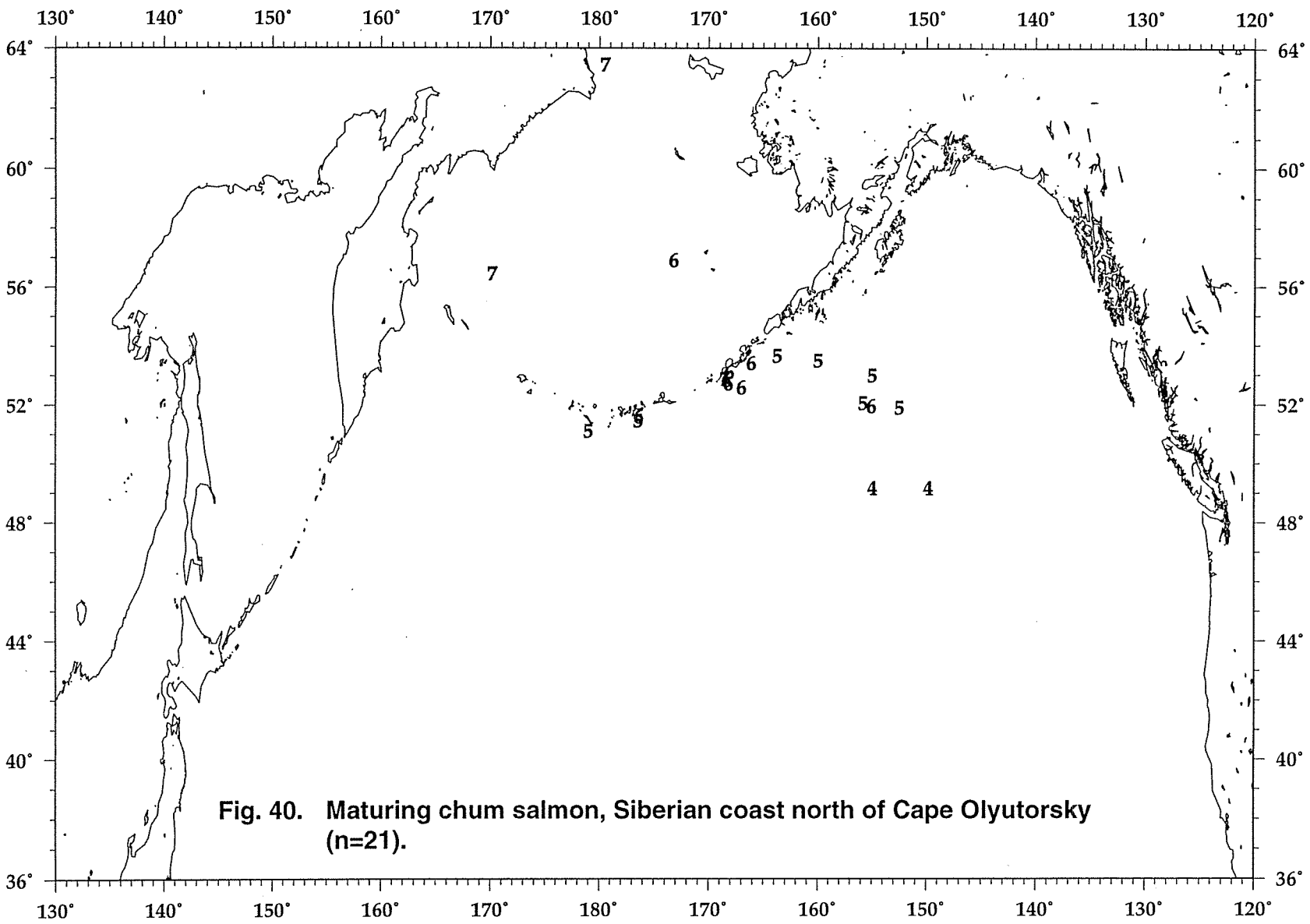


Fig. 40. Maturing chum salmon, Siberian coast north of Cape Olyutorsky (n=21).

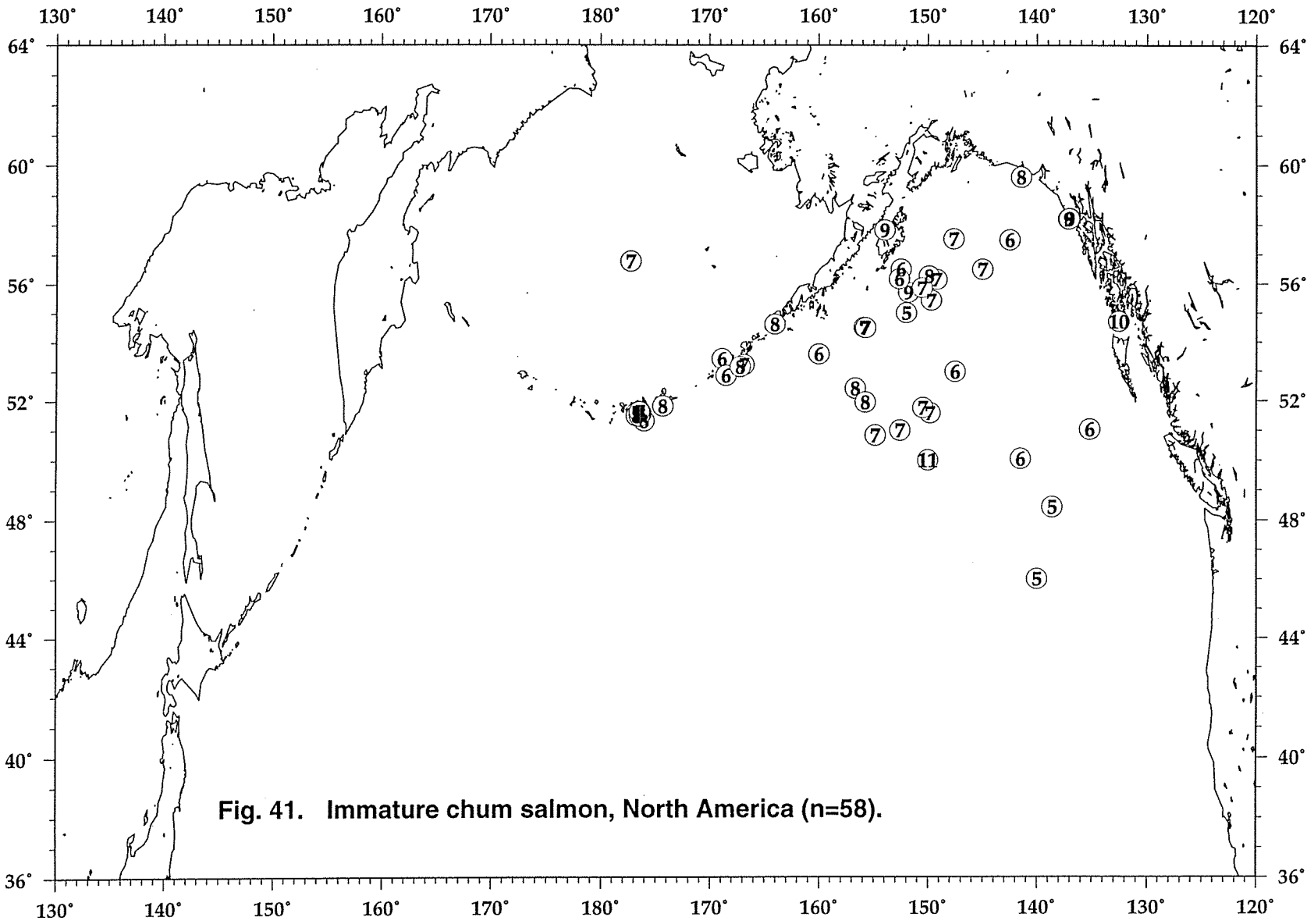


Fig. 41. Immature chum salmon, North America (n=58).

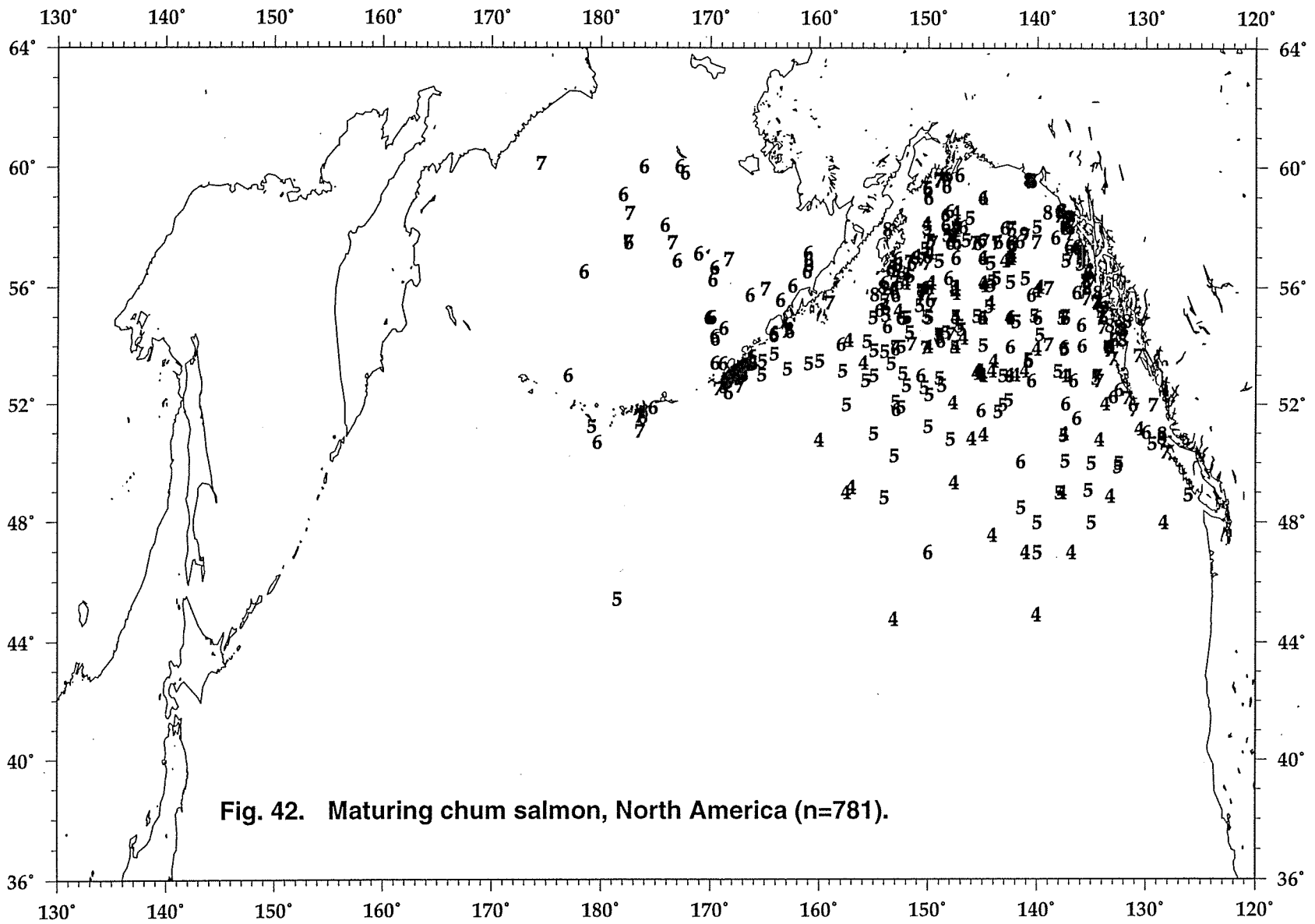


Fig. 42. Maturing chum salmon, North America (n=781).

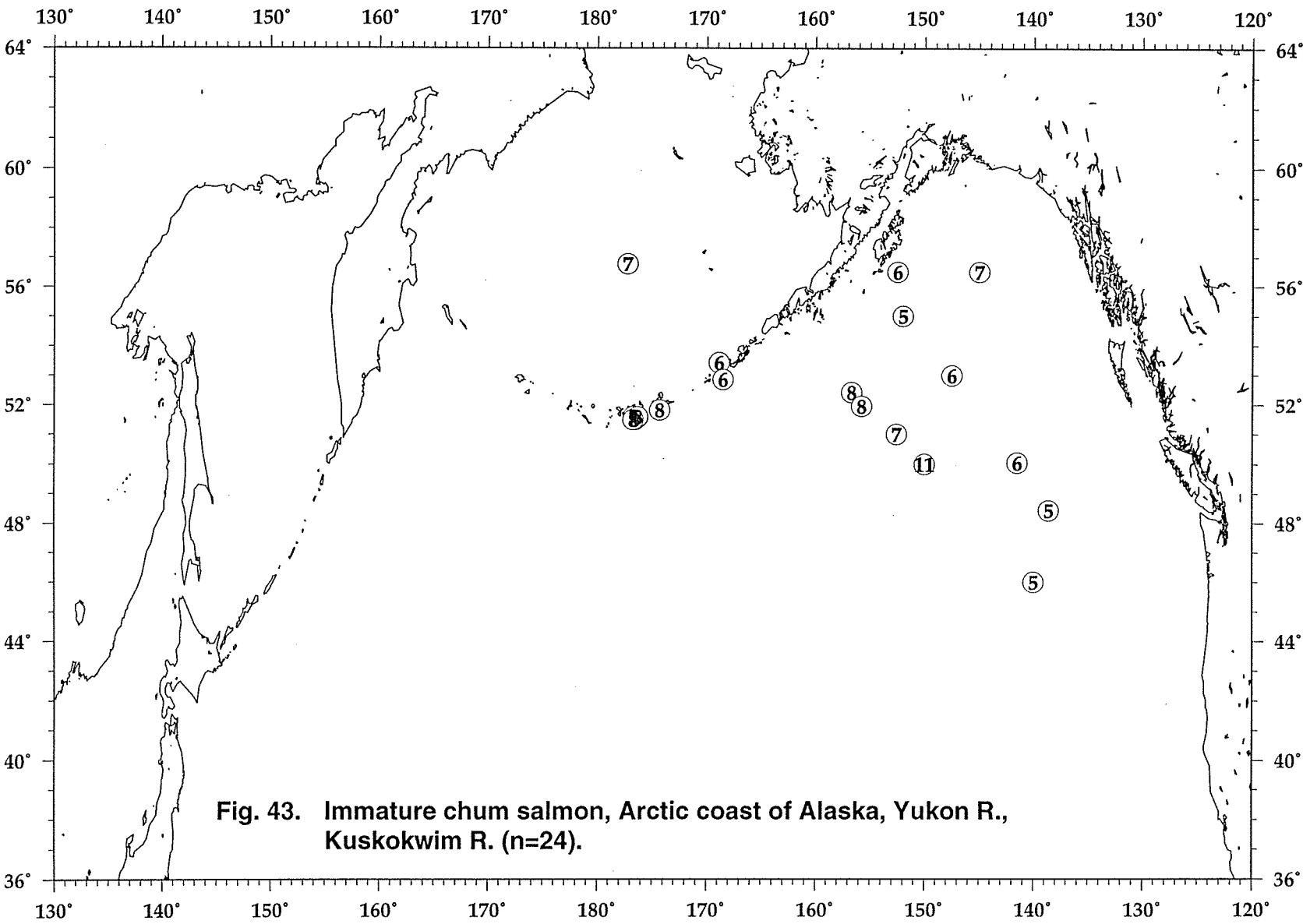


Fig. 43. Immature chum salmon, Arctic coast of Alaska, Yukon R., Kuskokwim R. (n=24).

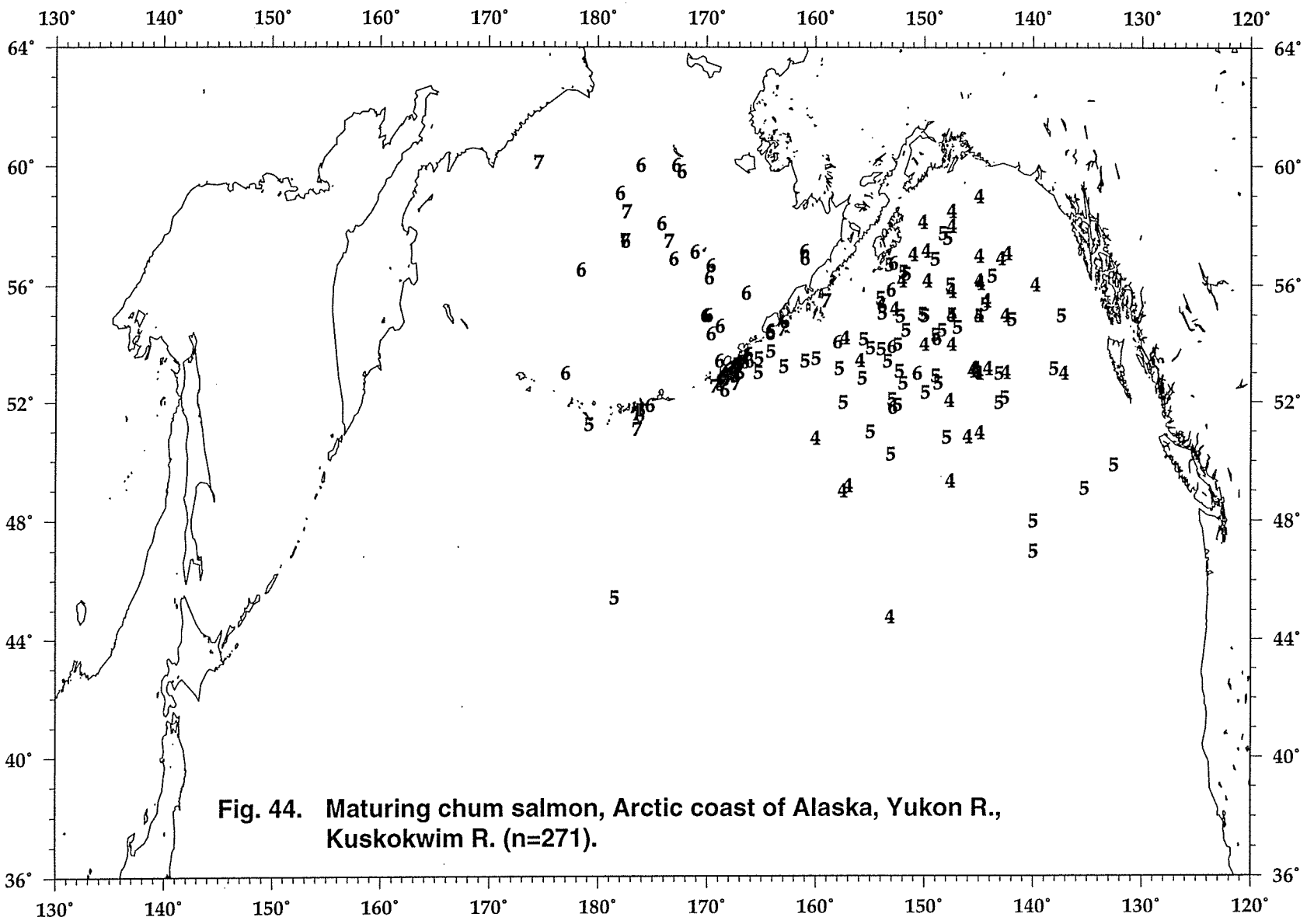


Fig. 44. Maturing chum salmon, Arctic coast of Alaska, Yukon R., Kuskokwim R. (n=271).

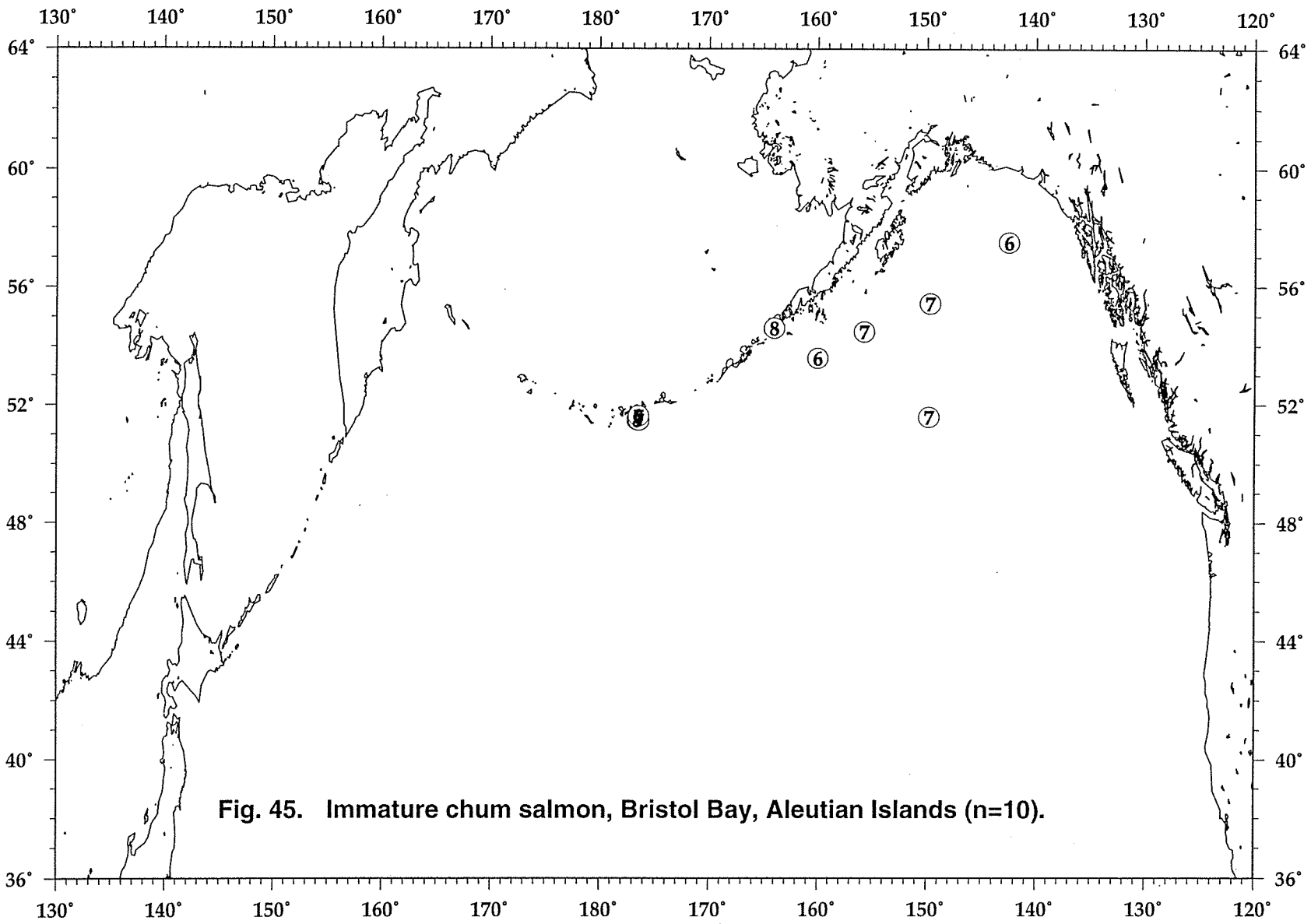


Fig. 45. Immature chum salmon, Bristol Bay, Aleutian Islands (n=10).

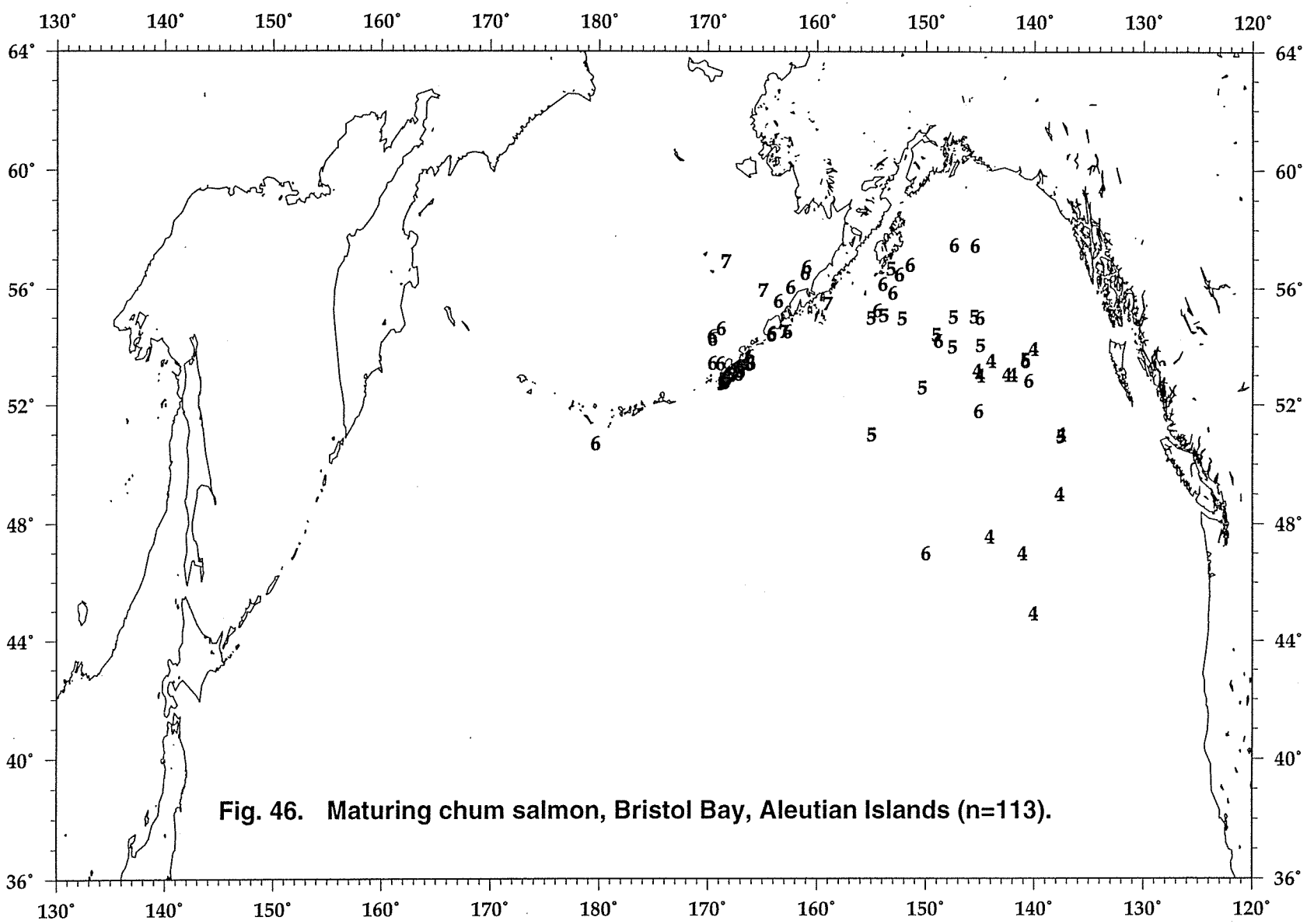


Fig. 46. Maturing chum salmon, Bristol Bay, Aleutian Islands (n=113).

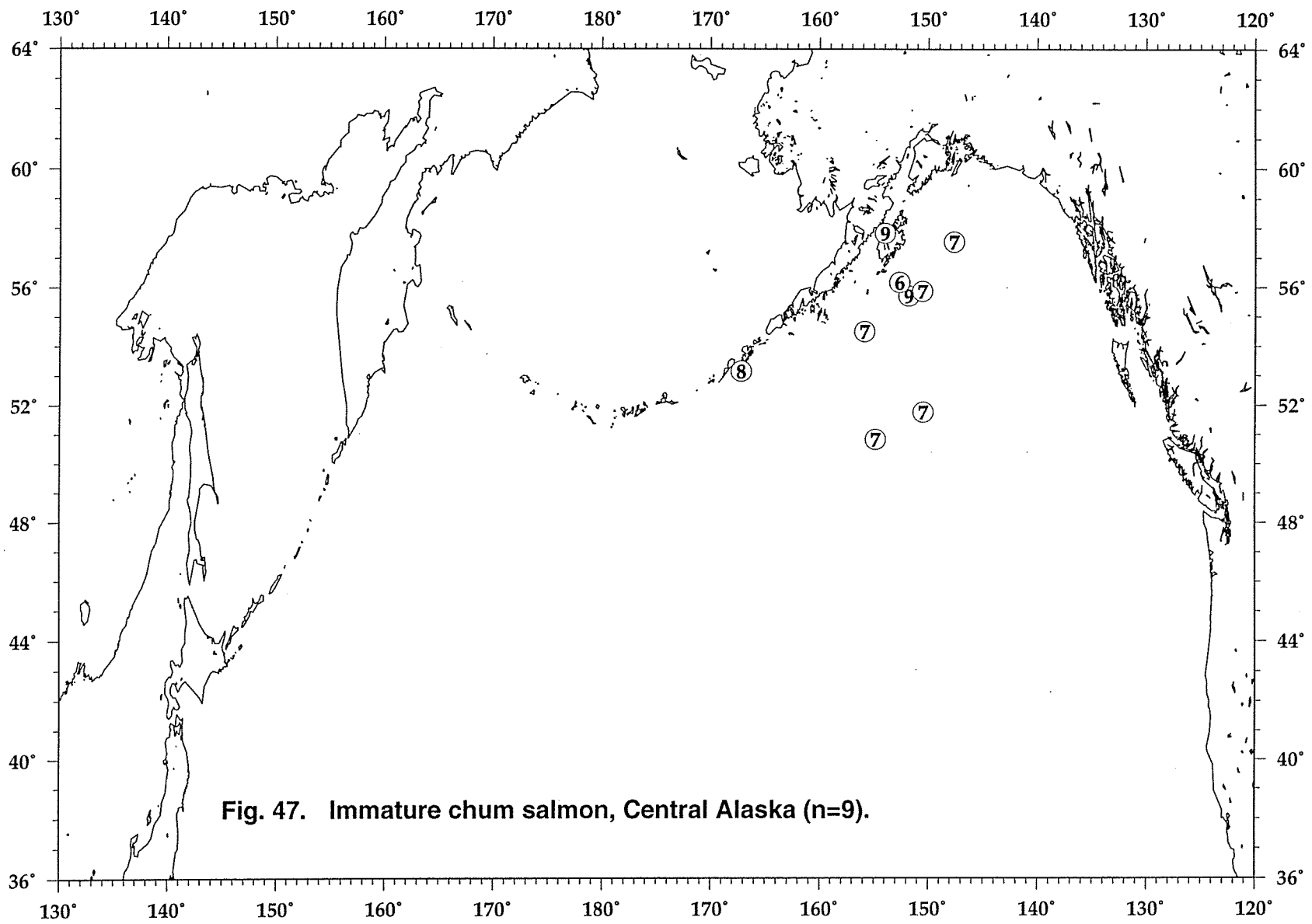


Fig. 47. Immature chum salmon, Central Alaska (n=9).

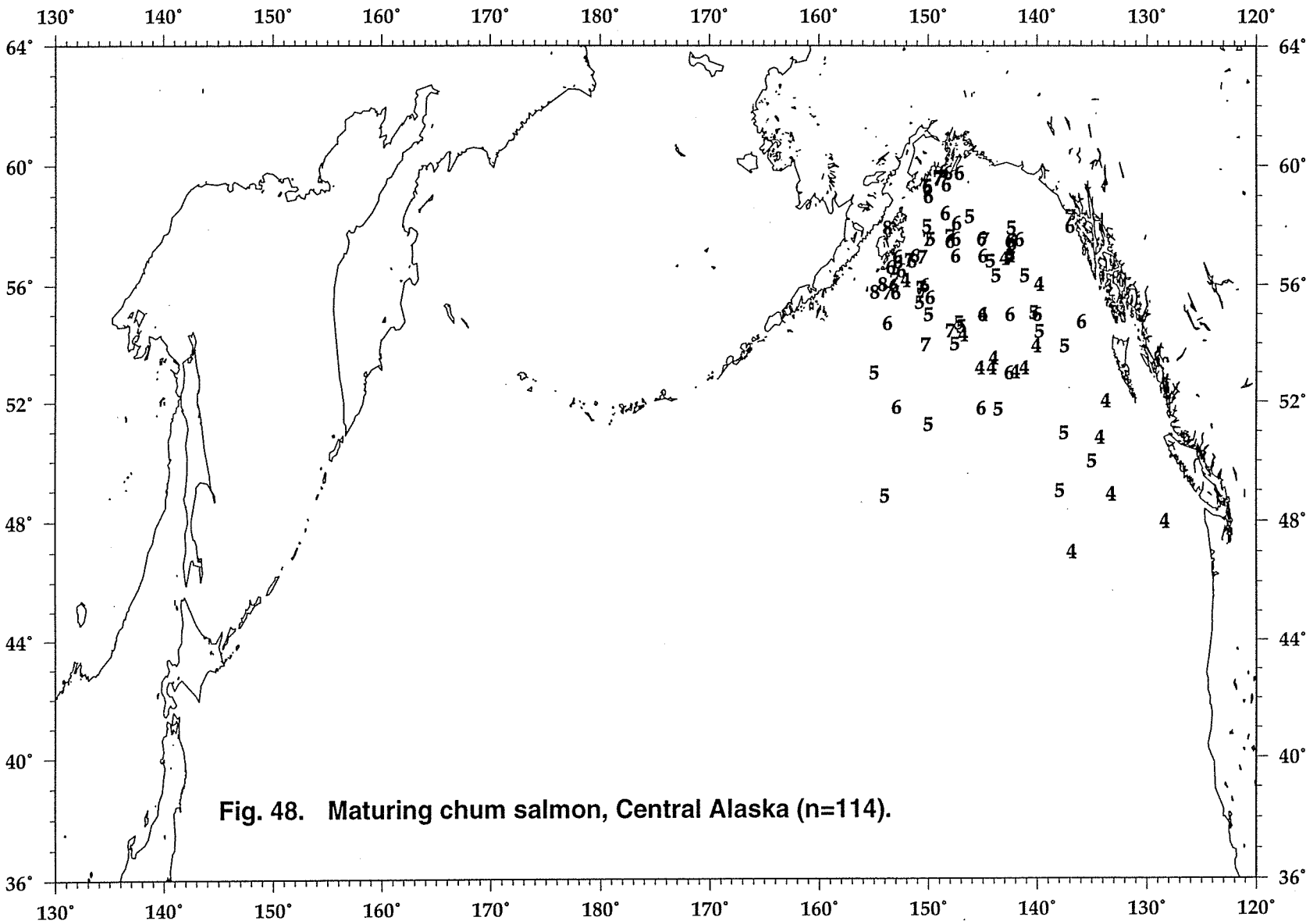


Fig. 48. Maturing chum salmon, Central Alaska (n=114).

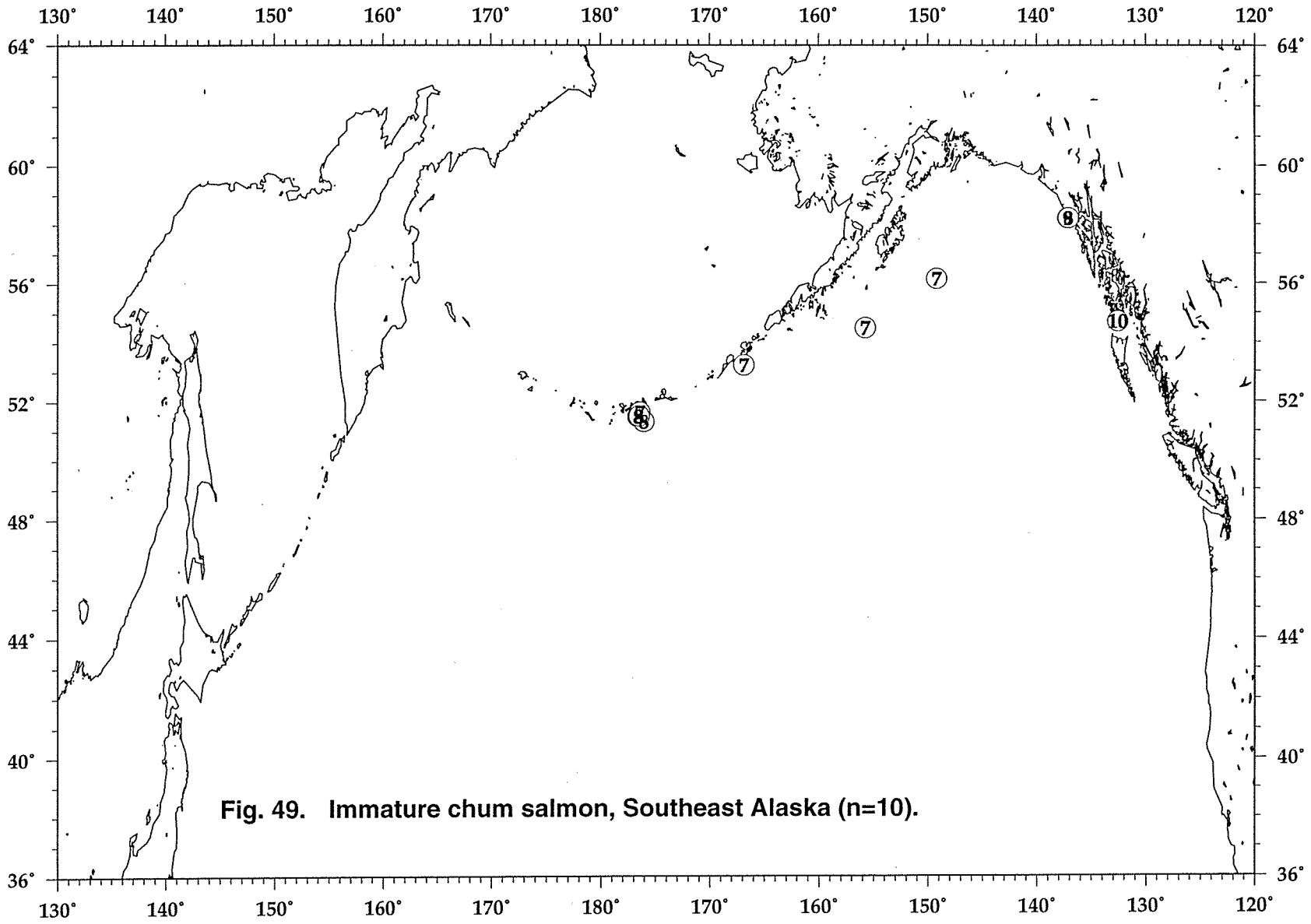


Fig. 49. Immature chum salmon, Southeast Alaska (n=10).

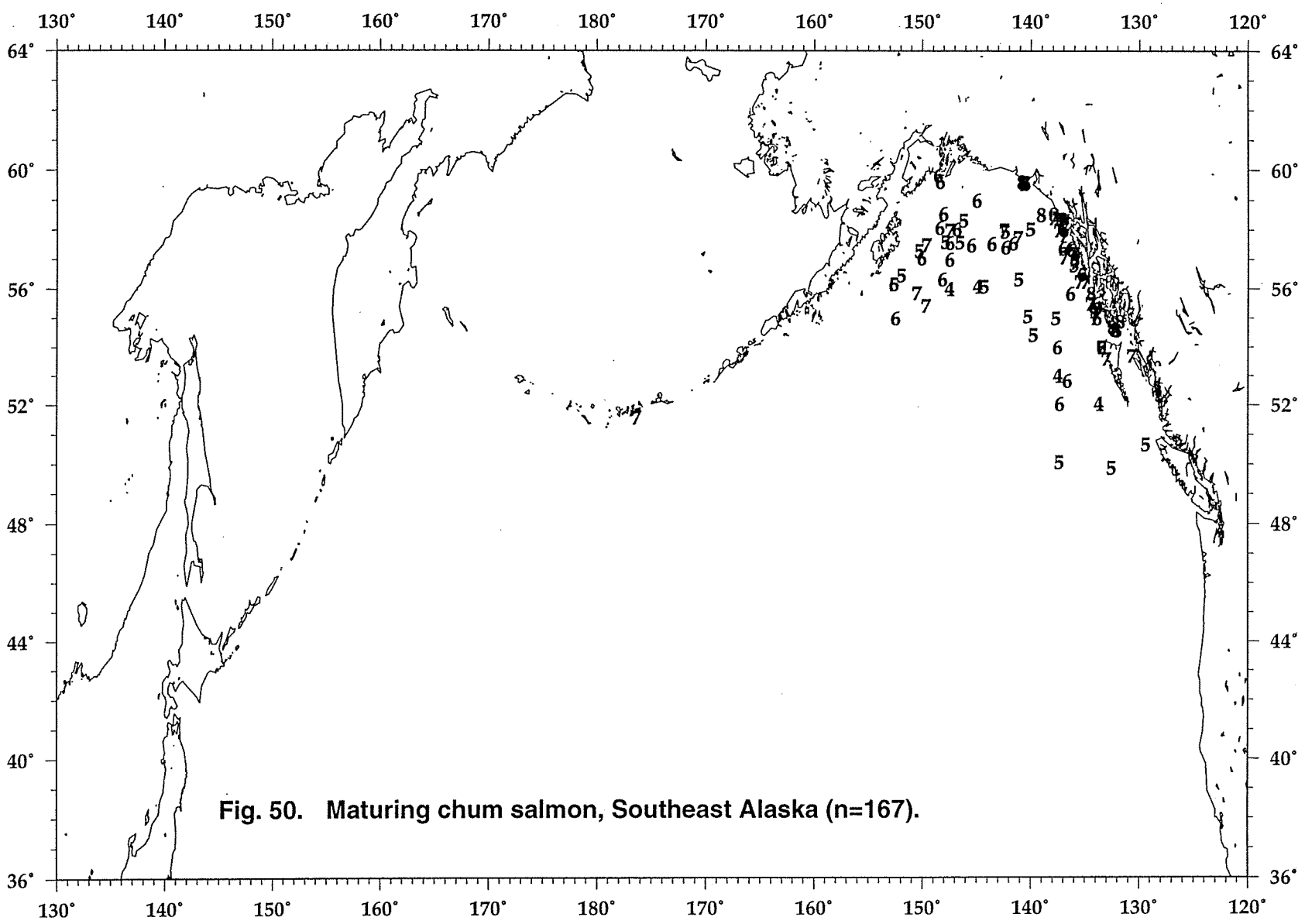


Fig. 50. Maturing chum salmon, Southeast Alaska (n=167).

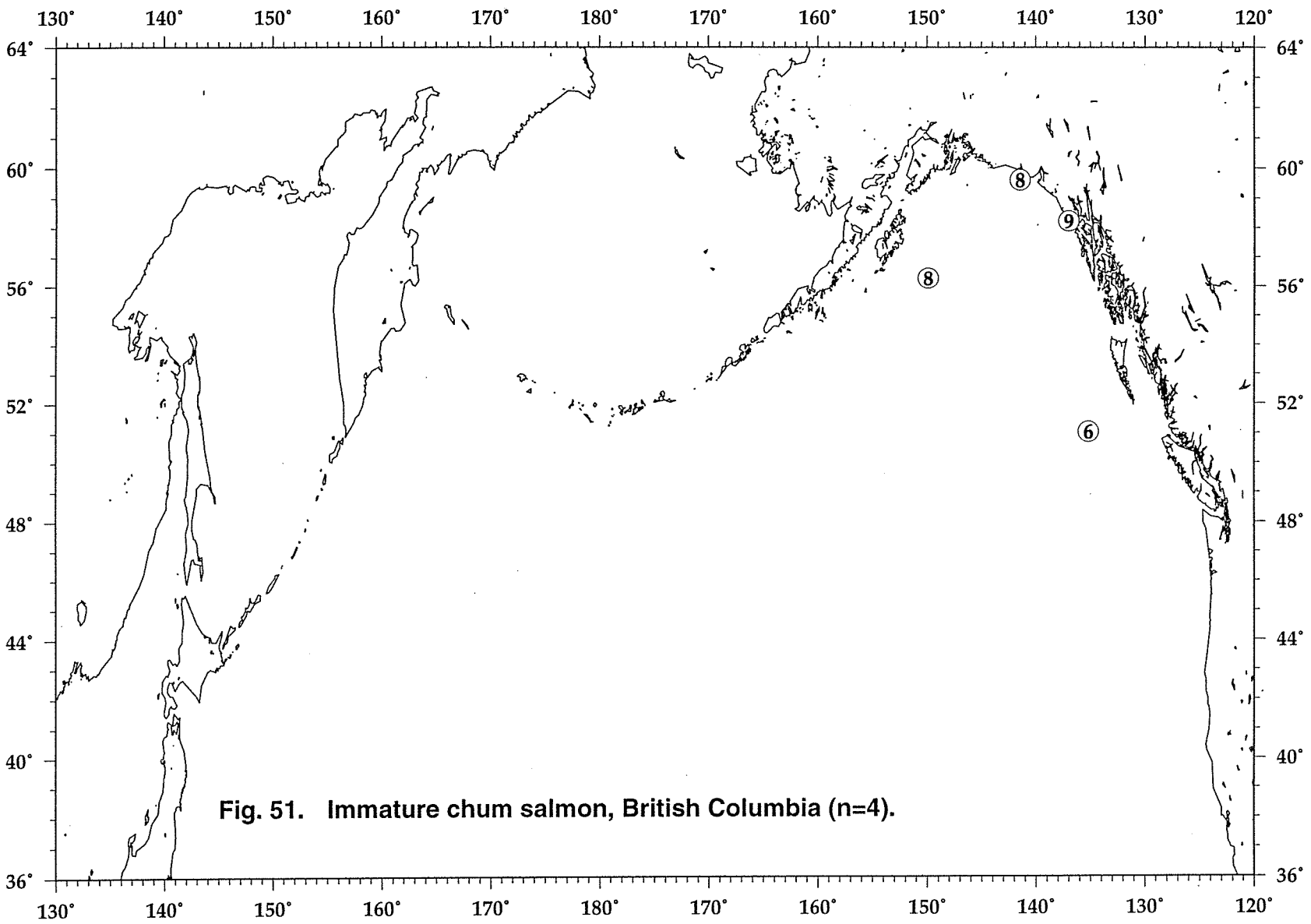


Fig. 51. Immature chum salmon, British Columbia (n=4).

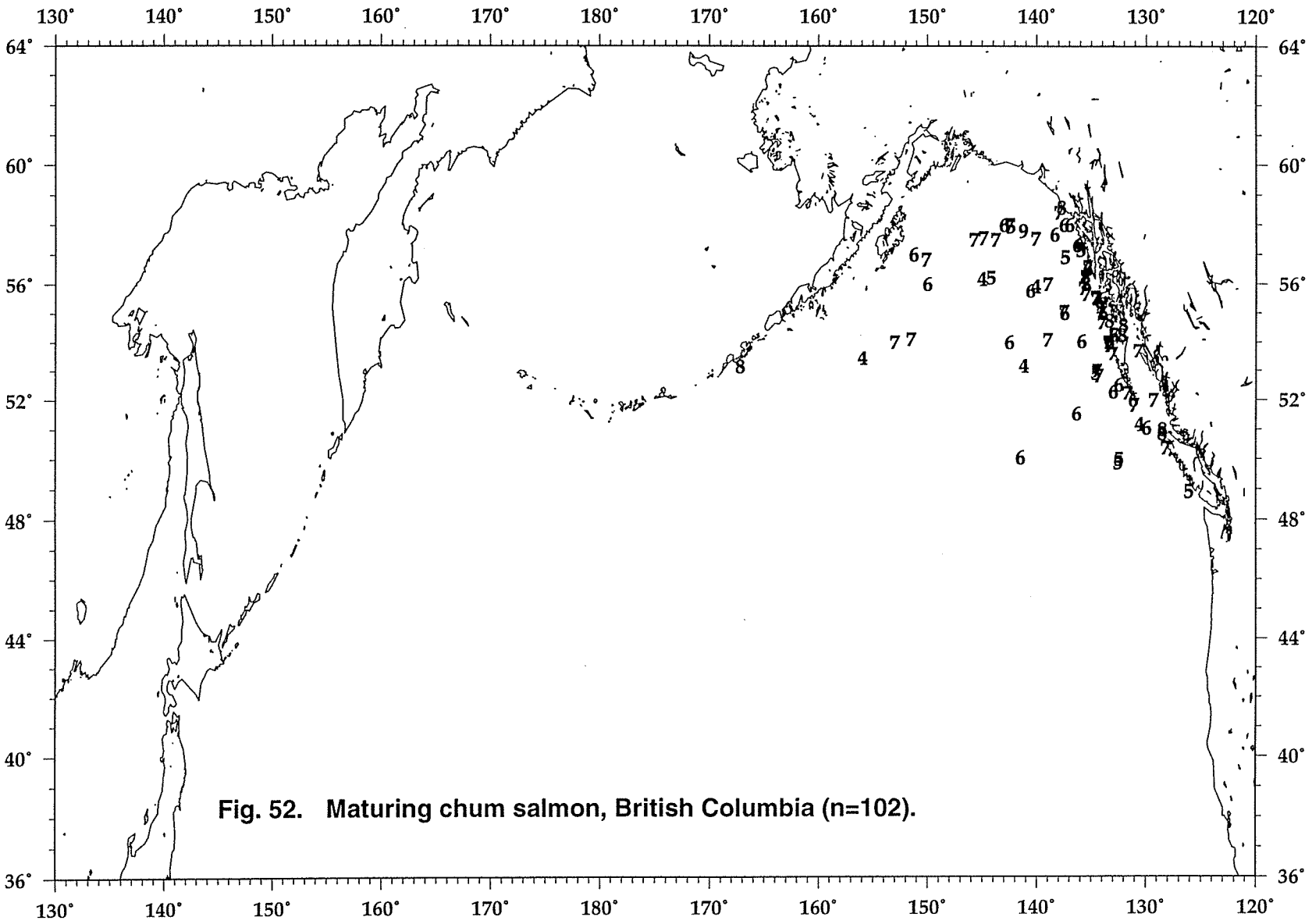


Fig. 52. Maturing chum salmon, British Columbia (n=102).

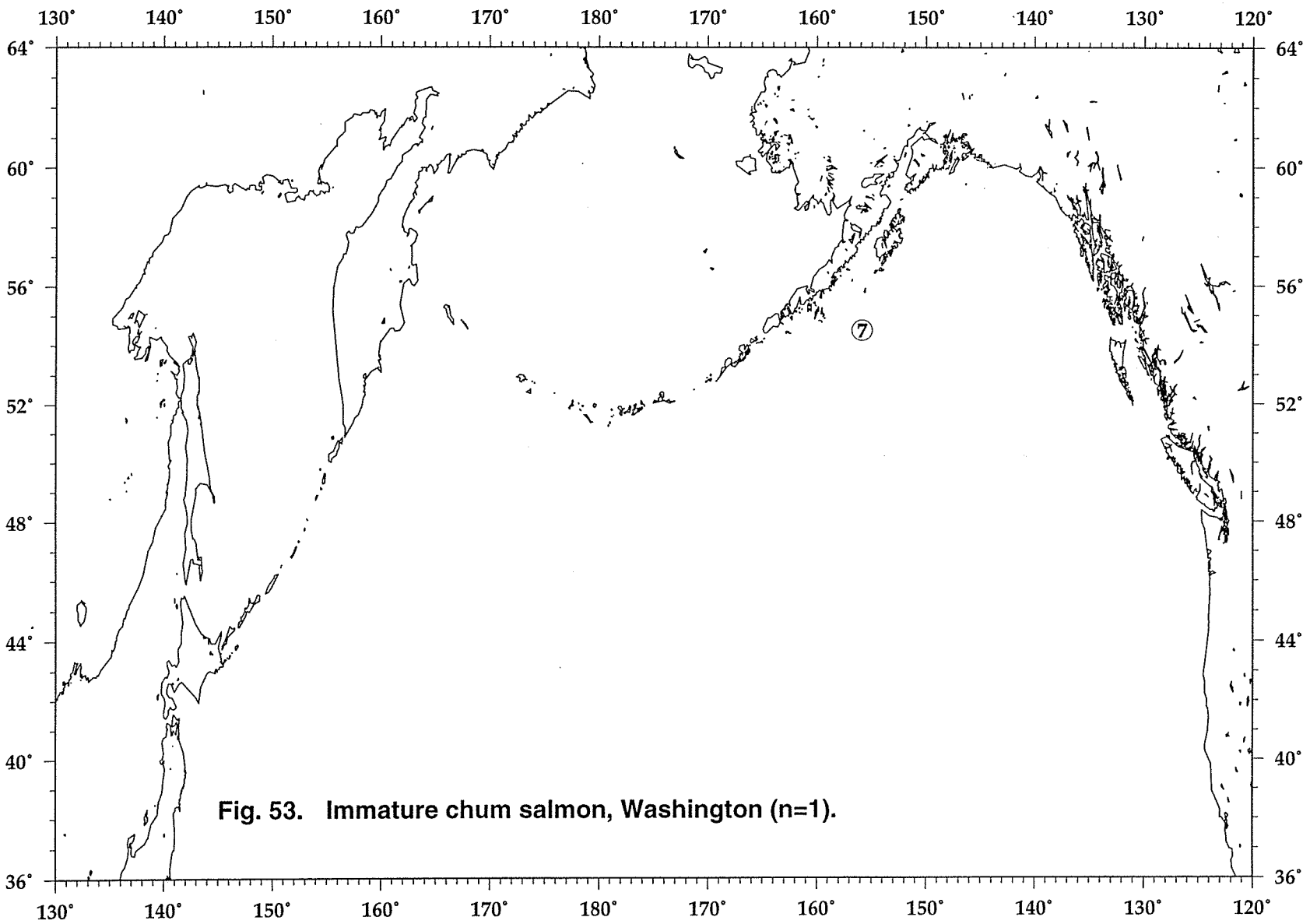


Fig. 53. Immature chum salmon, Washington (n=1).

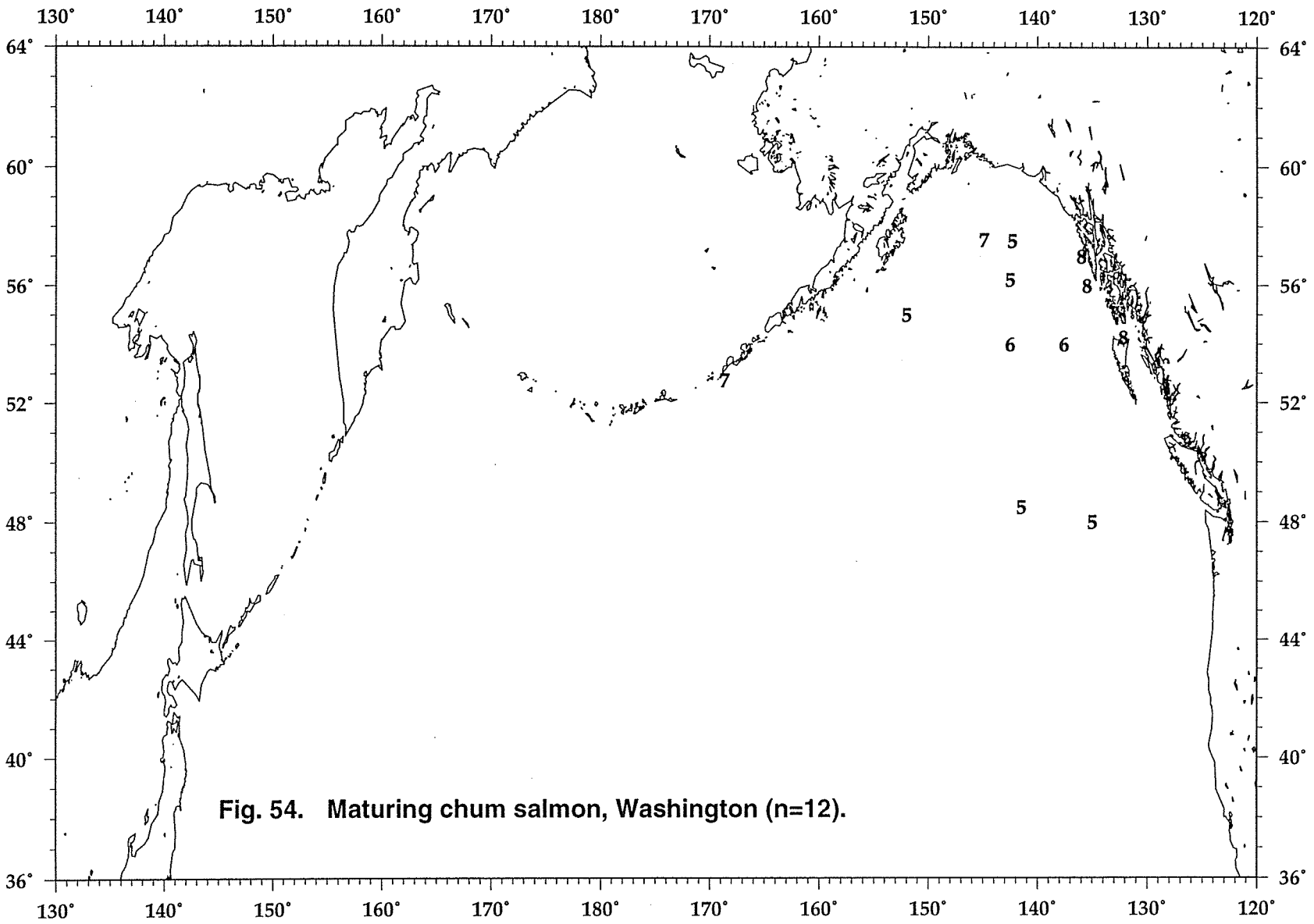


Fig. 54. Maturing chum salmon, Washington (n=12).

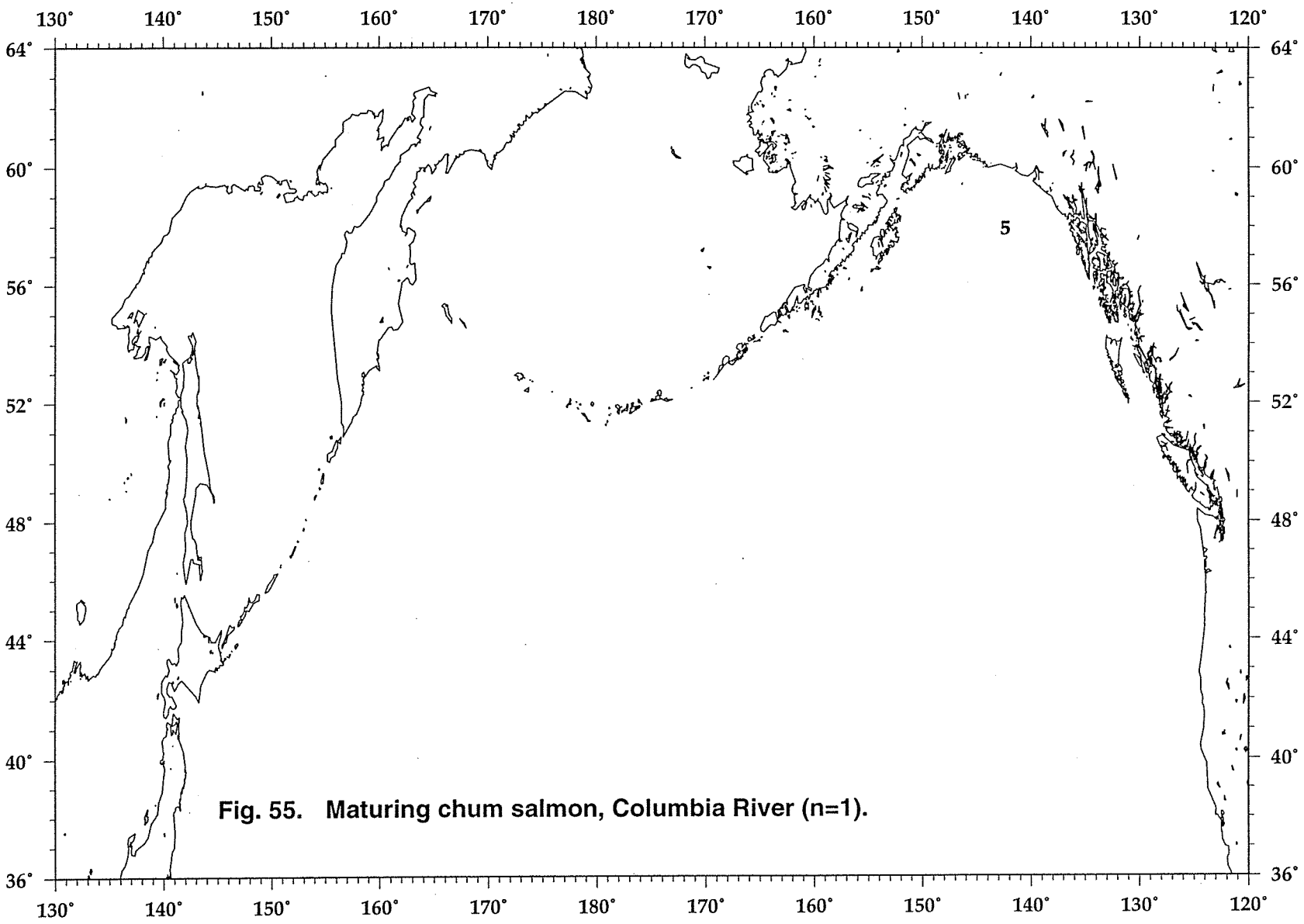


Fig. 55. Maturing chum salmon, Columbia River (n=1).

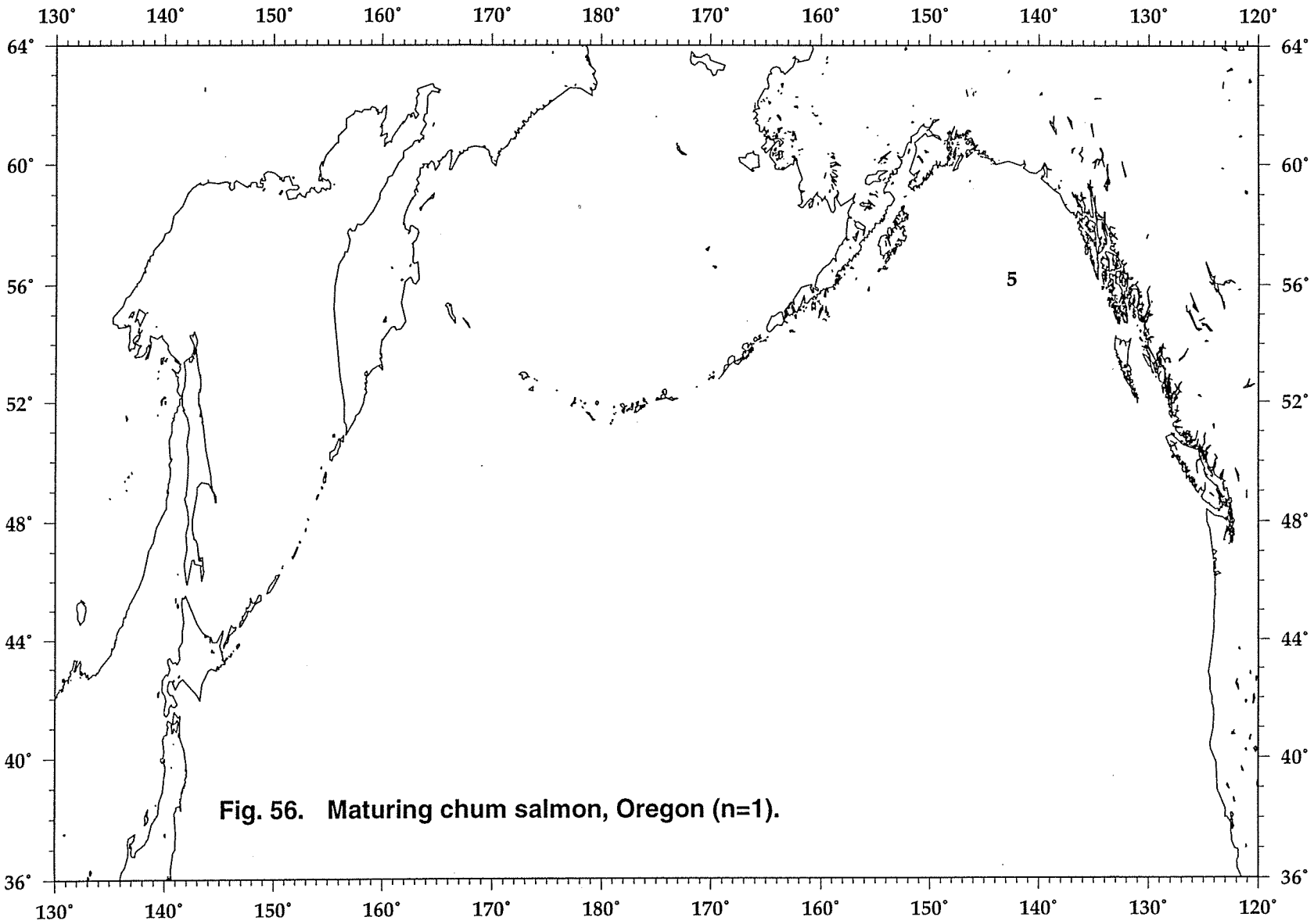


Fig. 56. Maturing chum salmon, Oregon (n=1).

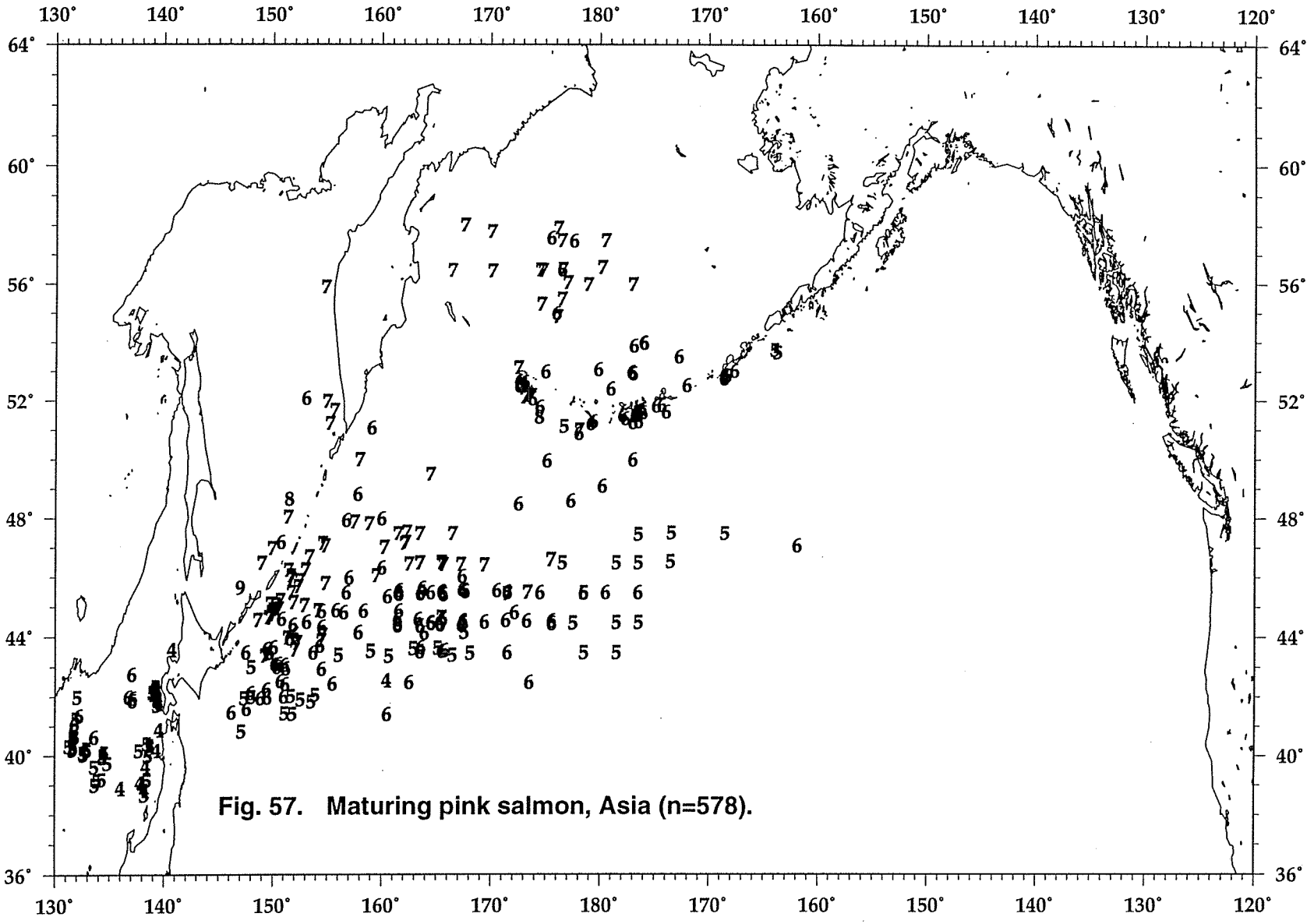


Fig. 57. Maturing pink salmon, Asia (n=578).

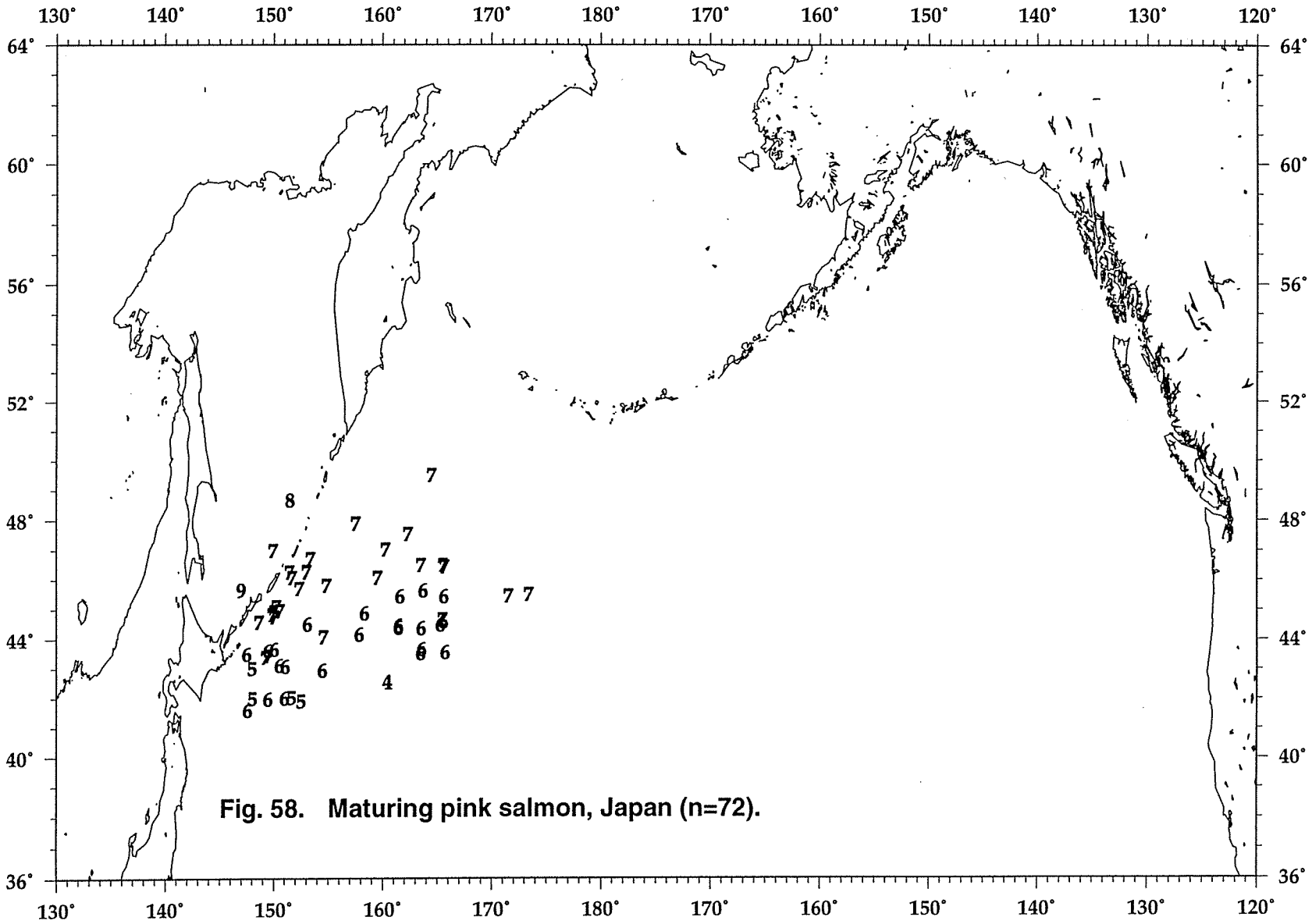


Fig. 58. Maturing pink salmon, Japan (n=72).

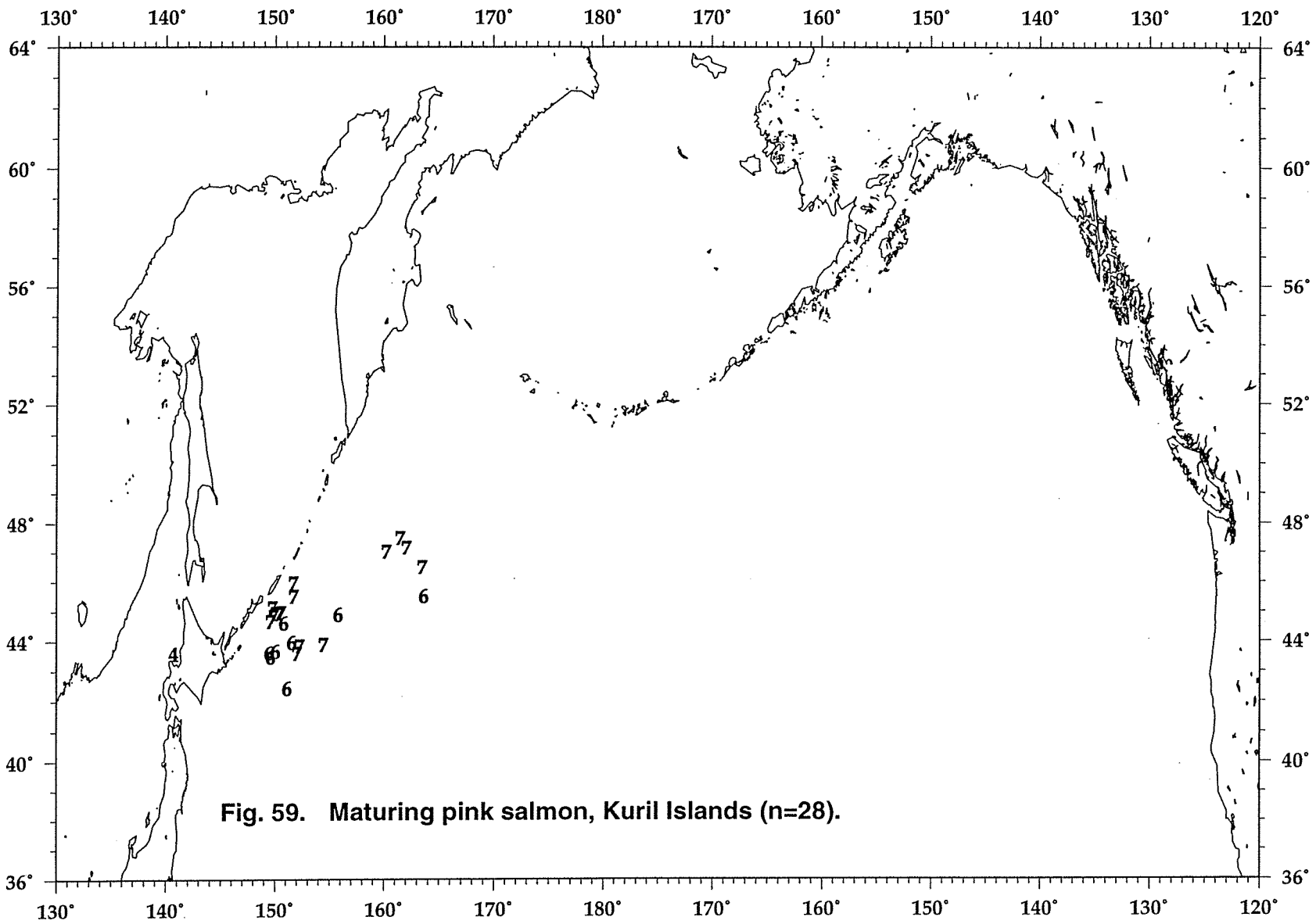


Fig. 59. Maturing pink salmon, Kuril Islands (n=28).

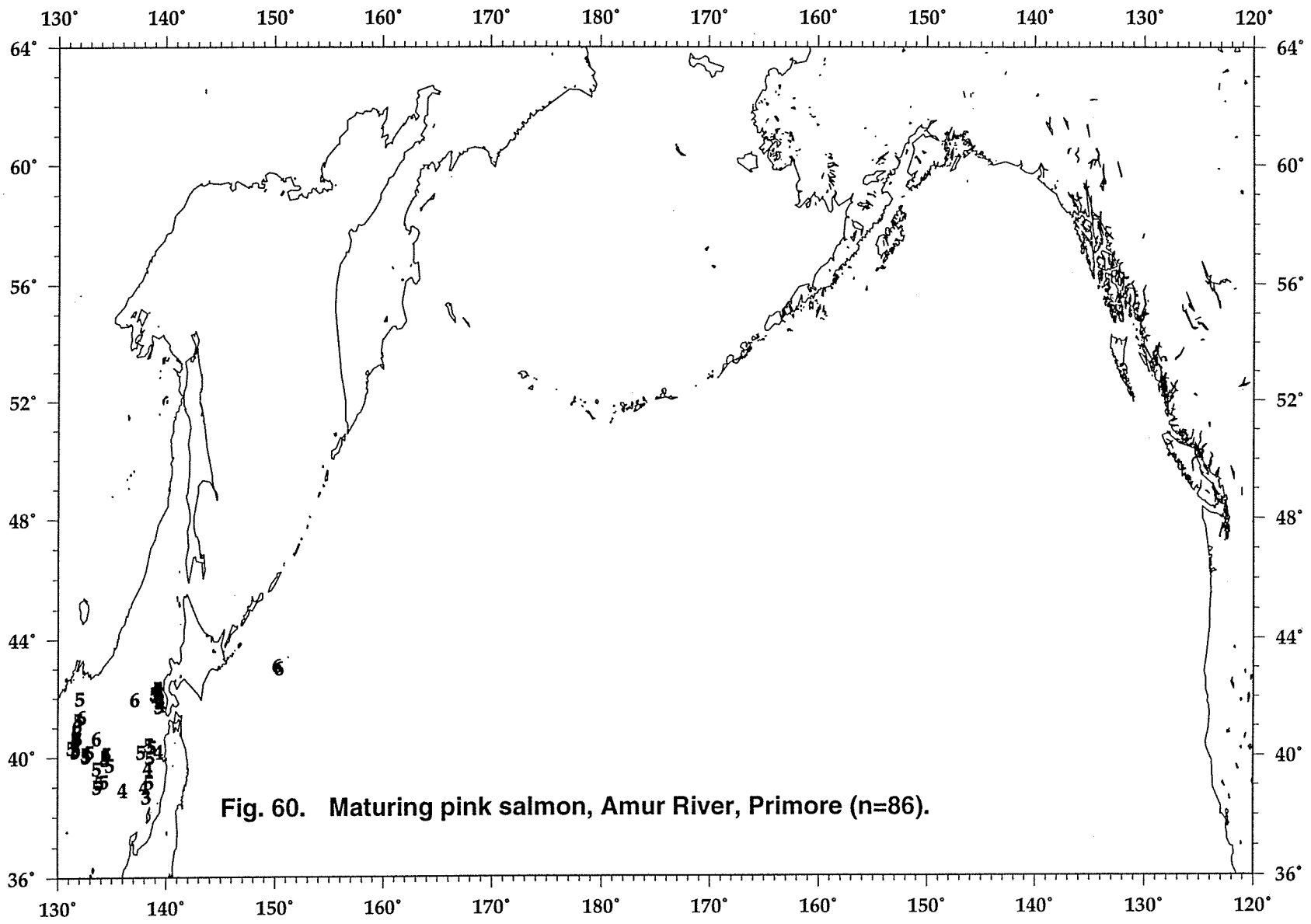


Fig. 60. Maturing pink salmon, Amur River, Primore (n=86).

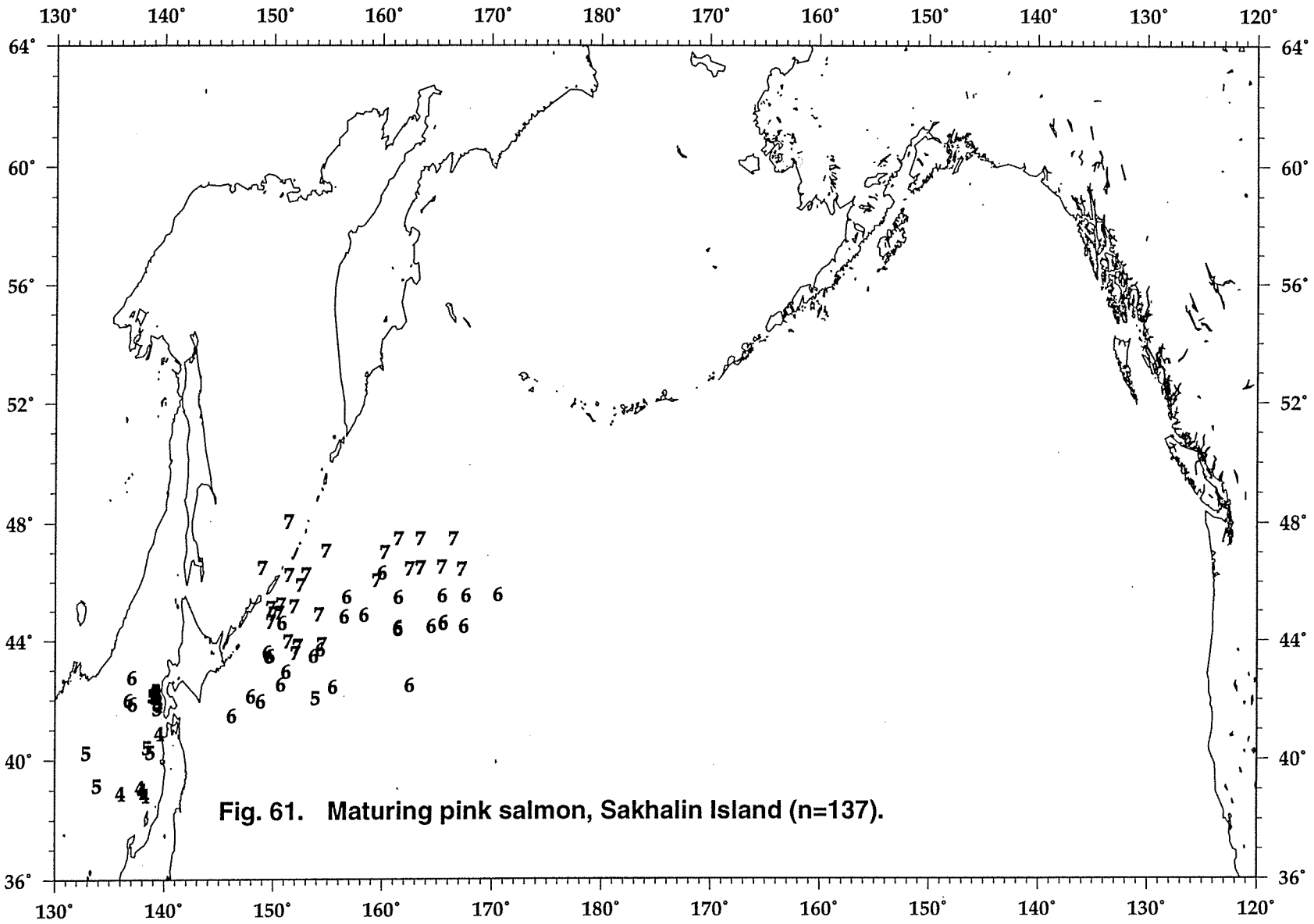


Fig. 61. Maturing pink salmon, Sakhalin Island (n=137).

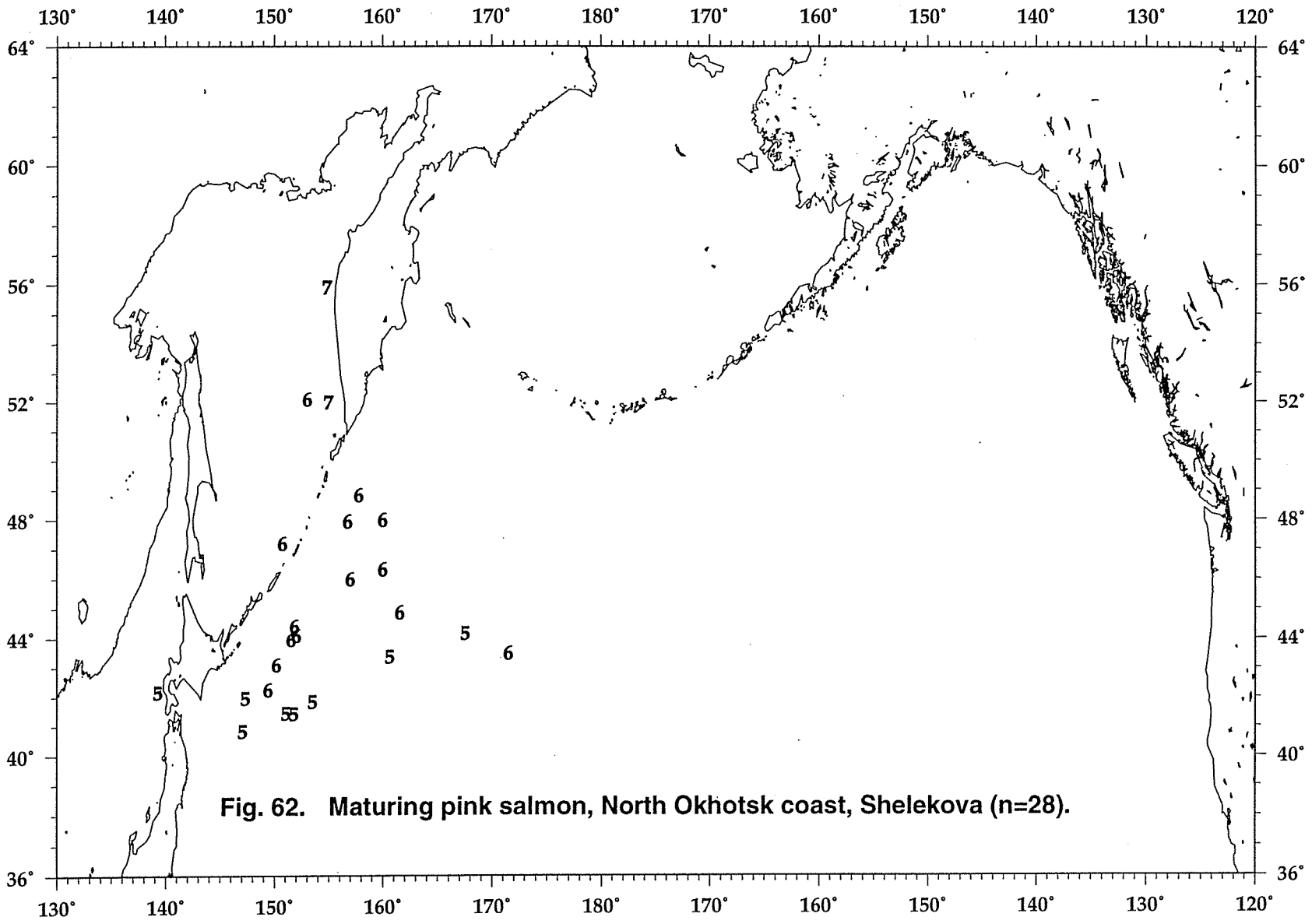


Fig. 62. Maturing pink salmon, North Okhotsk coast, Shelekova (n=28).

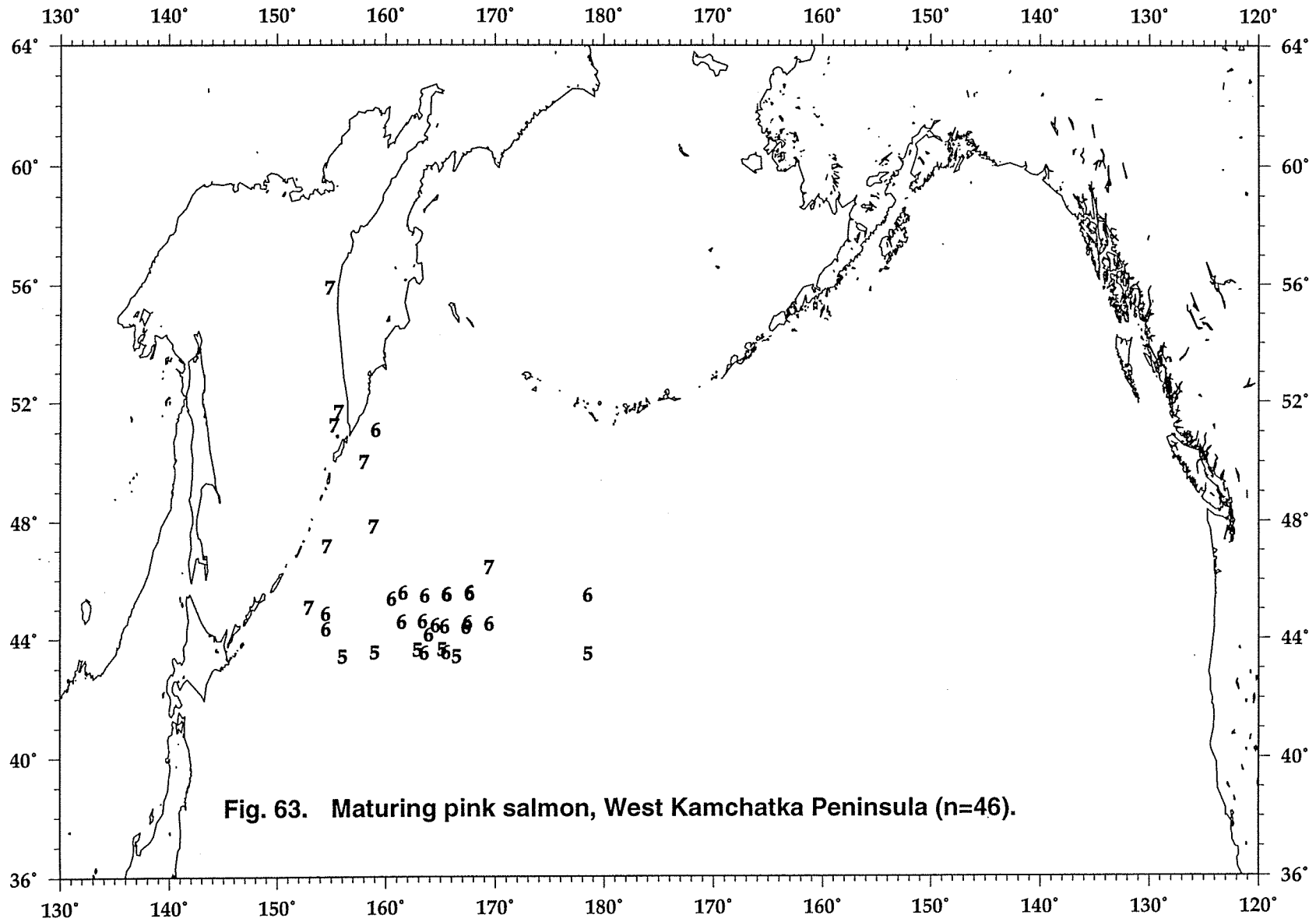


Fig. 63. Maturing pink salmon, West Kamchatka Peninsula (n=46).

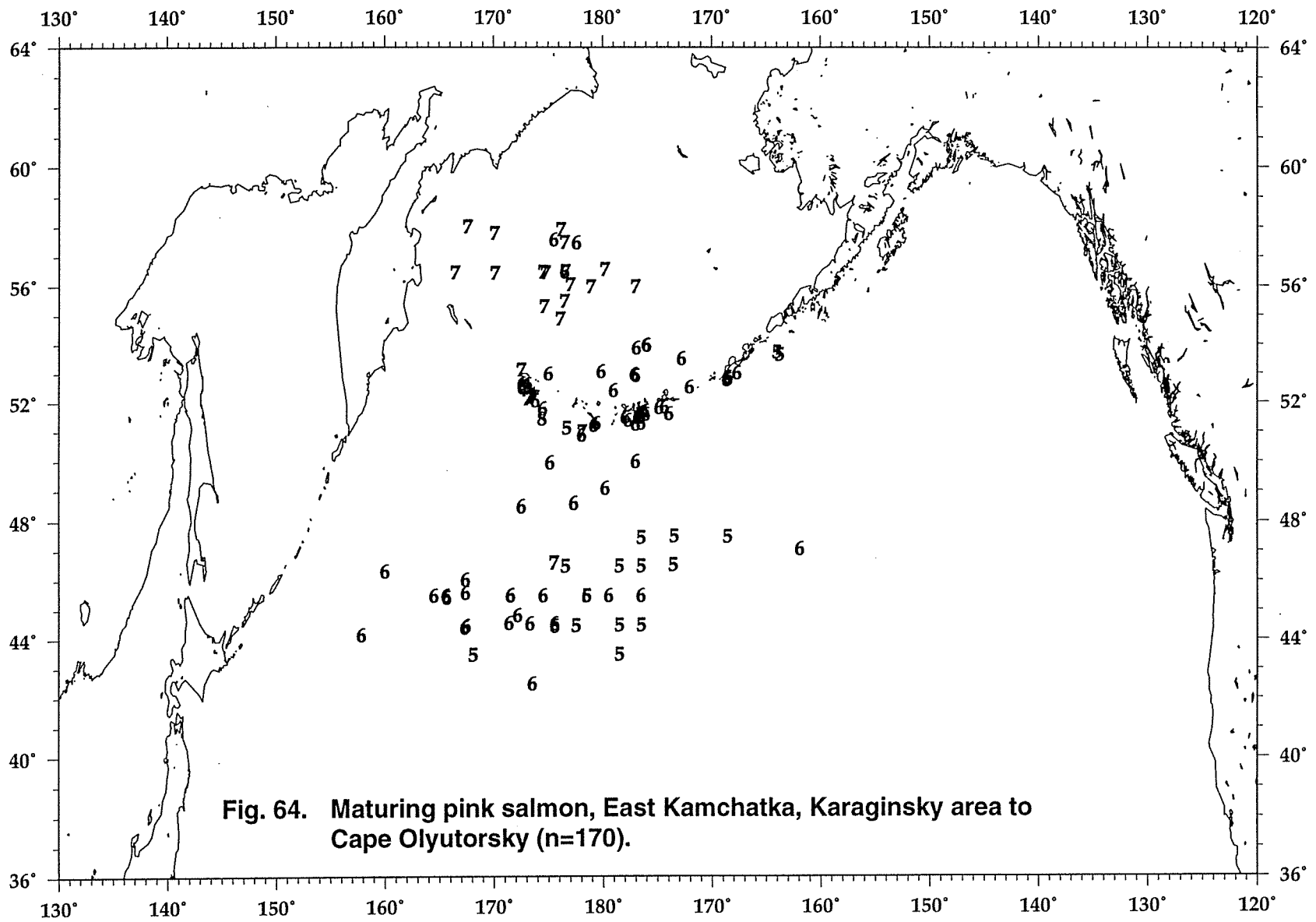


Fig. 64. Maturing pink salmon, East Kamchatka, Karaginsky area to Cape Olyutorsky (n=170).

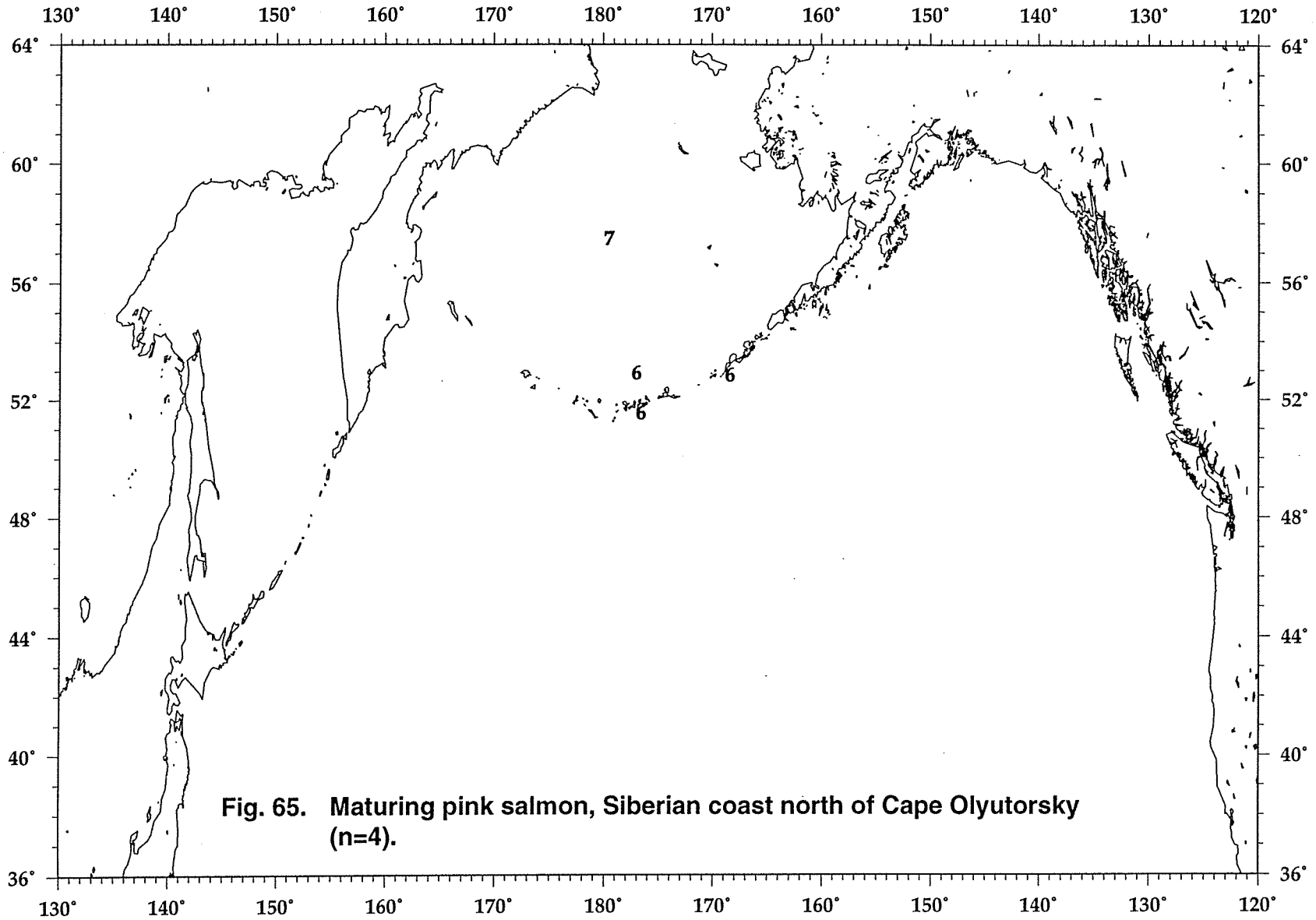


Fig. 65. Maturing pink salmon, Siberian coast north of Cape Olyutorsky (n=4).

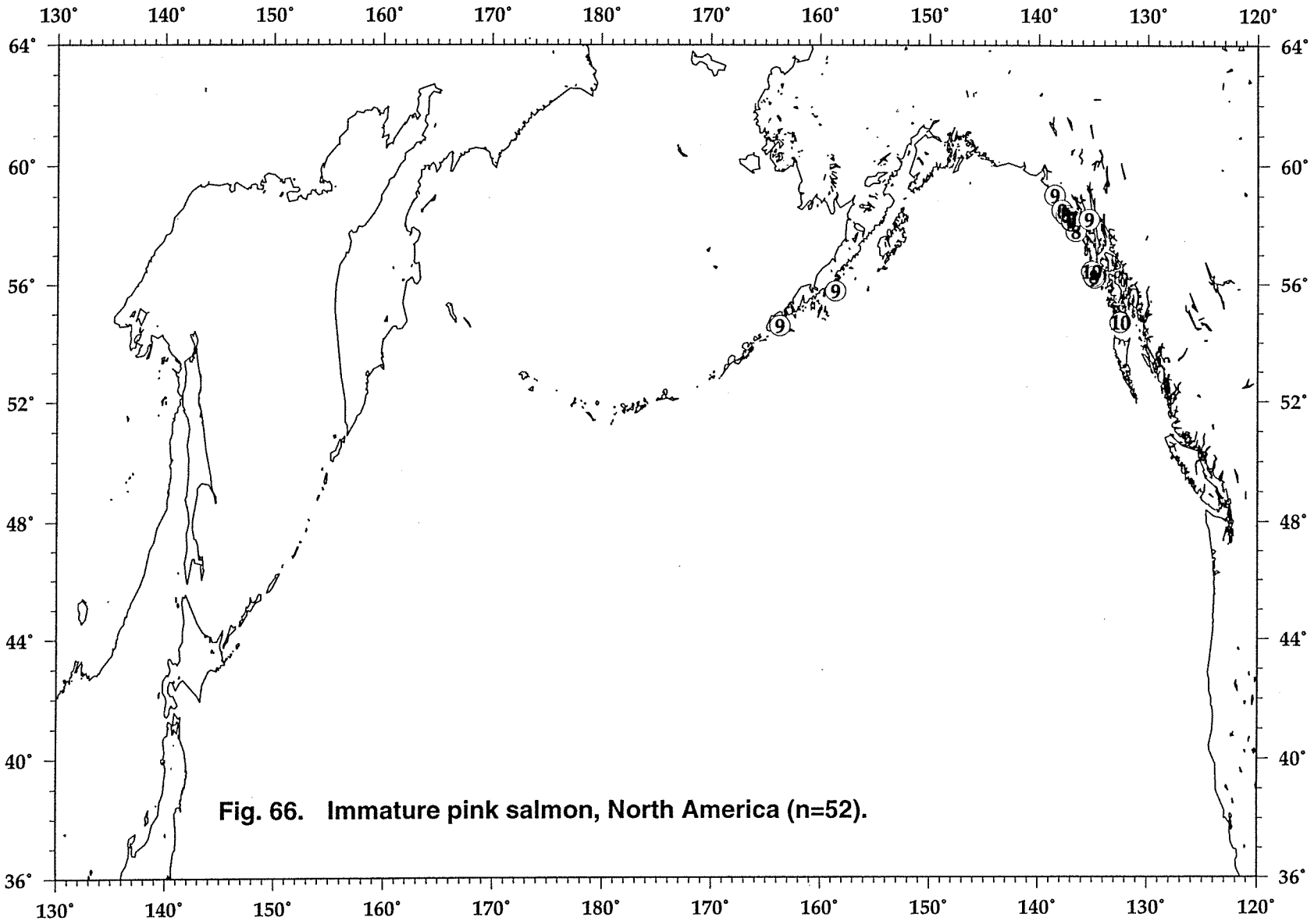


Fig. 66. Immature pink salmon, North America (n=52).

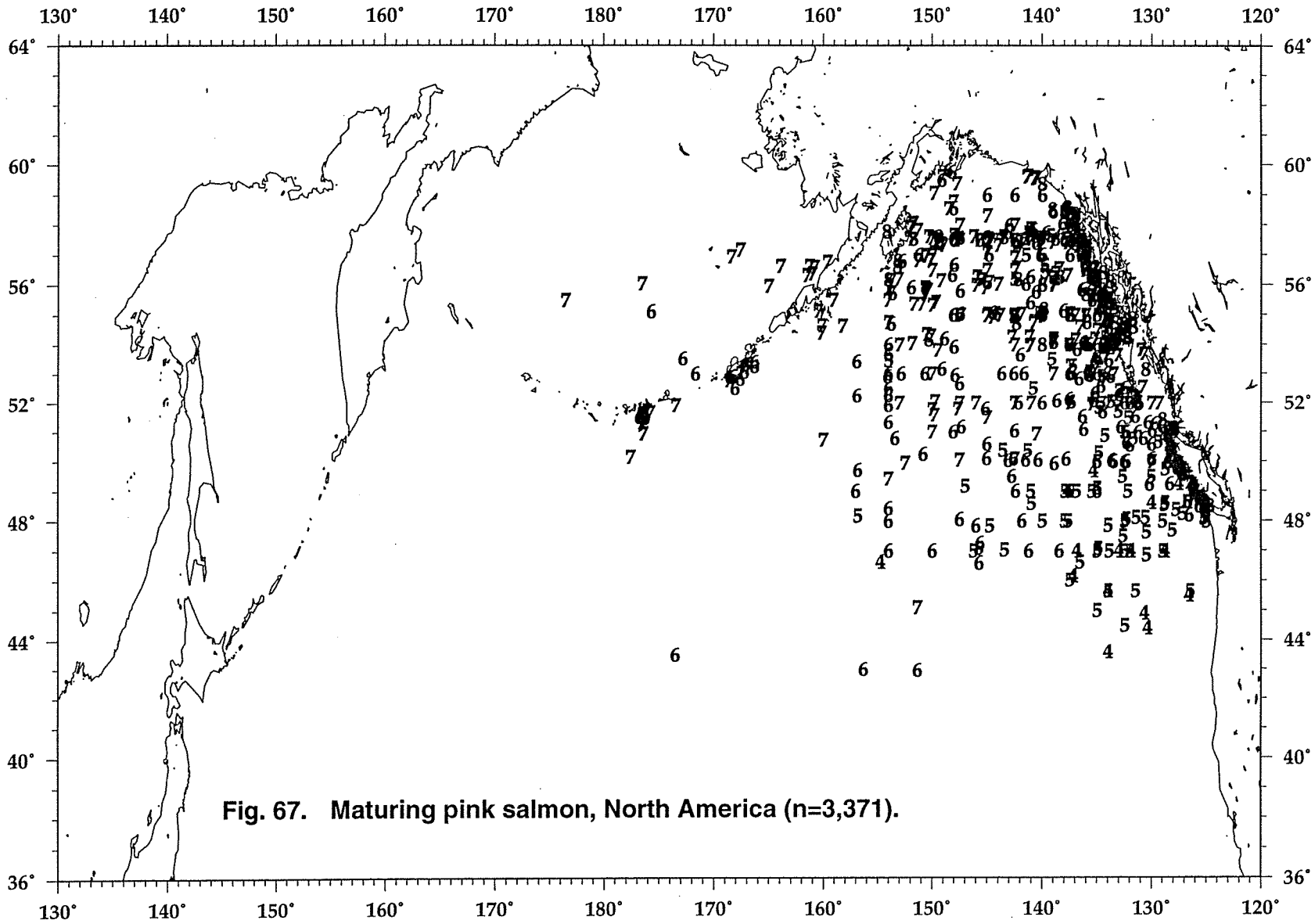


Fig. 67. Maturing pink salmon, North America (n=3,371).

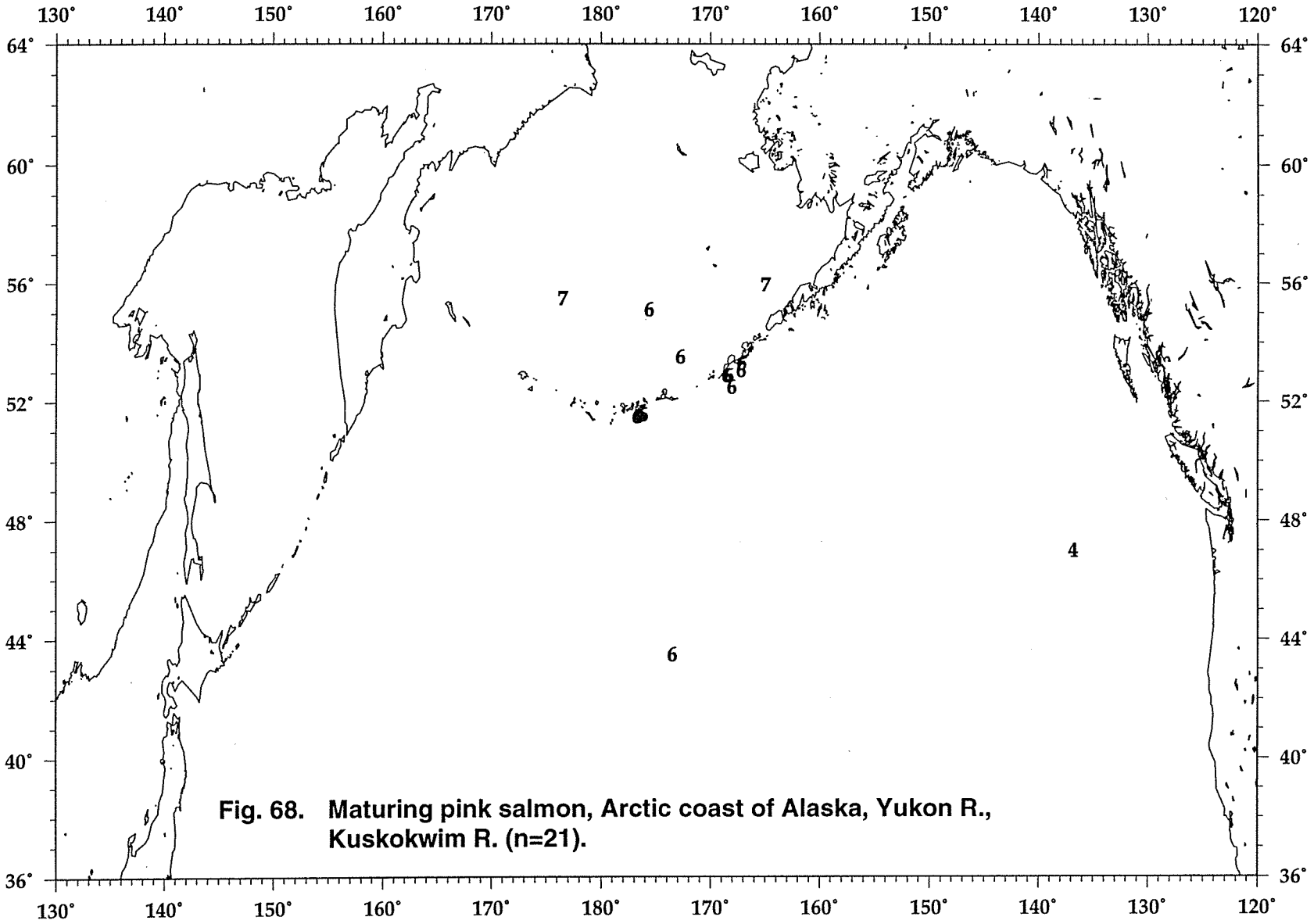


Fig. 68. Maturing pink salmon, Arctic coast of Alaska, Yukon R., Kuskokwim R. (n=21).

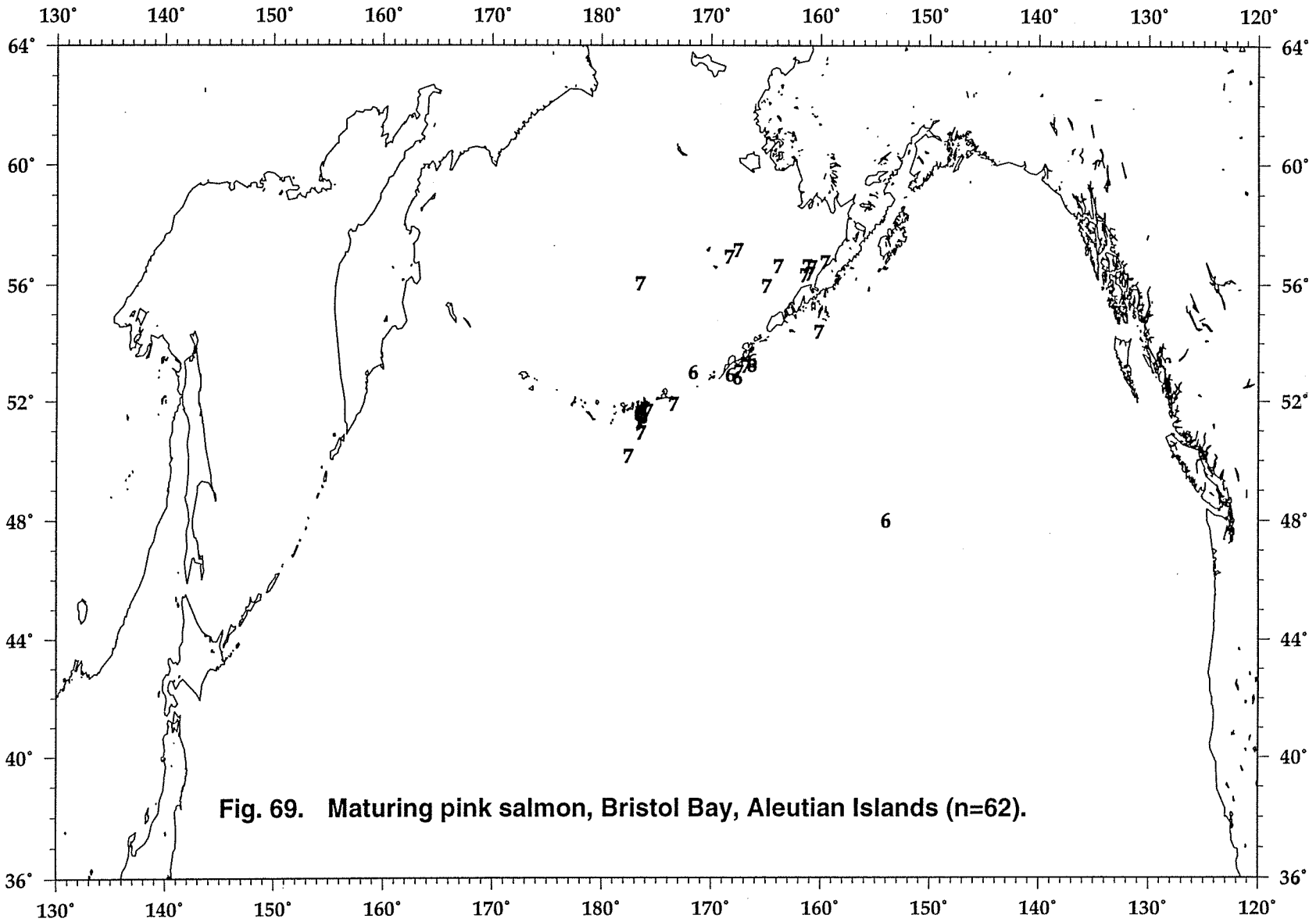


Fig. 69. Maturing pink salmon, Bristol Bay, Aleutian Islands (n=62).

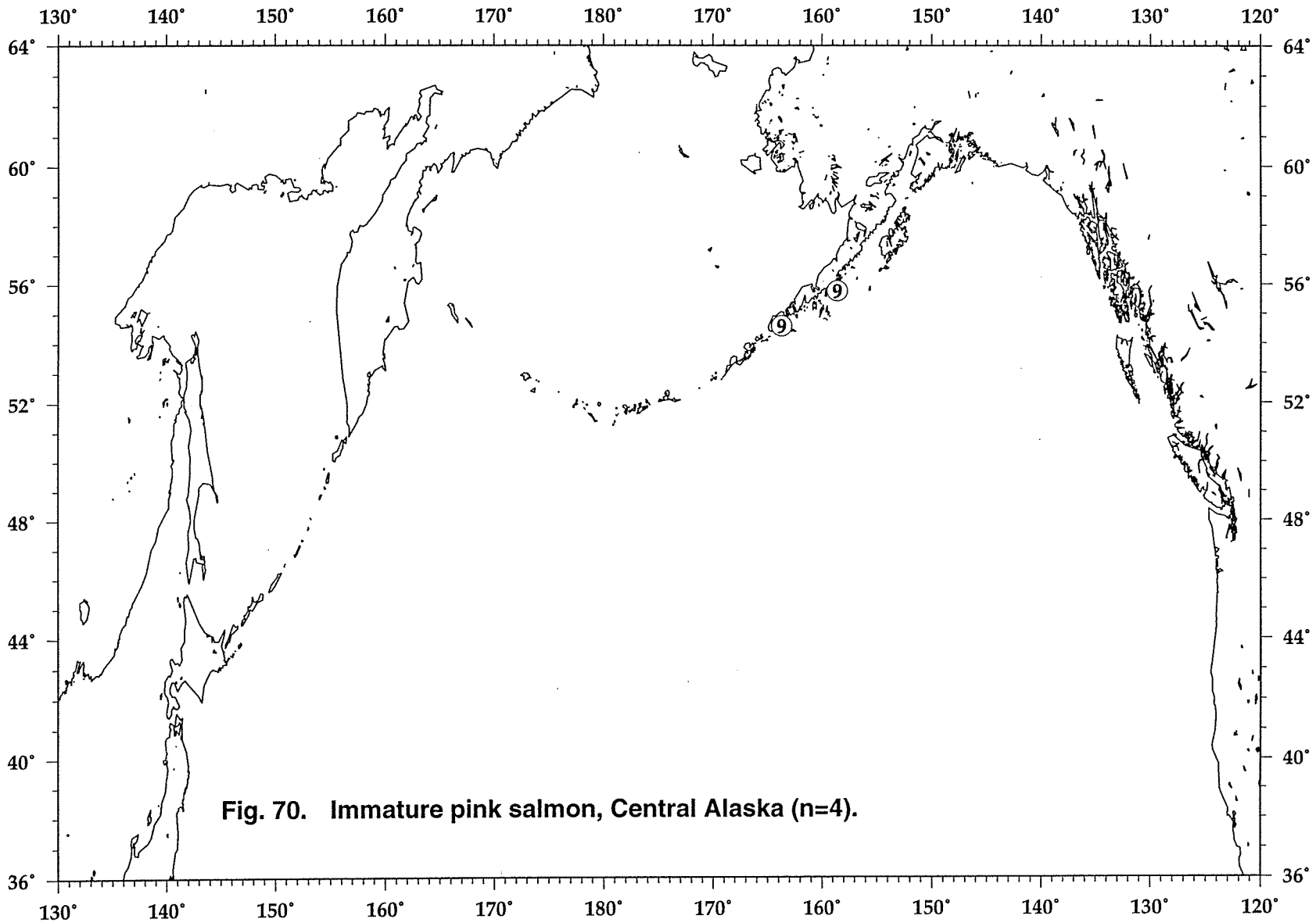


Fig. 70. Immature pink salmon, Central Alaska (n=4).

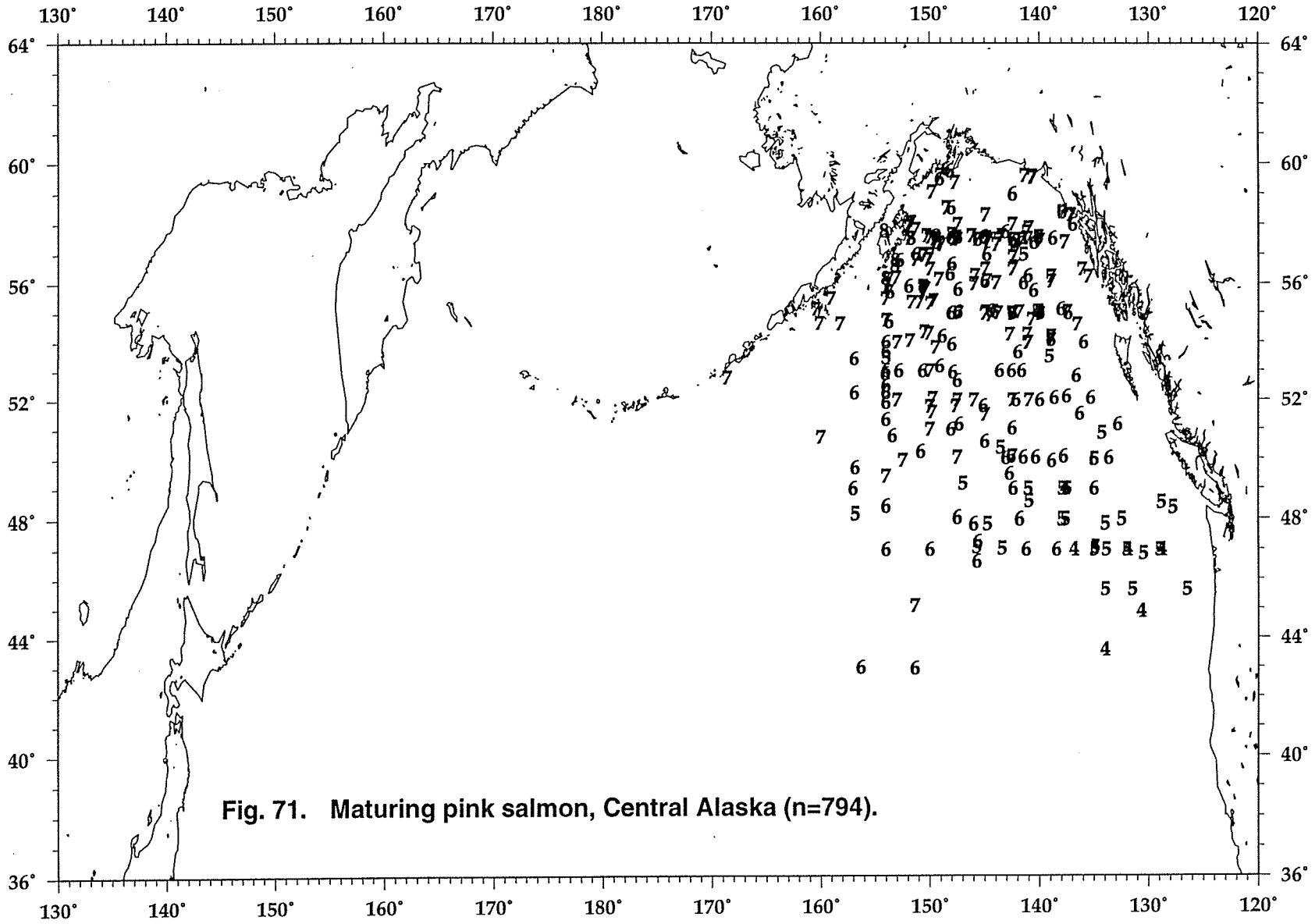


Fig. 71. Maturing pink salmon, Central Alaska (n=794).

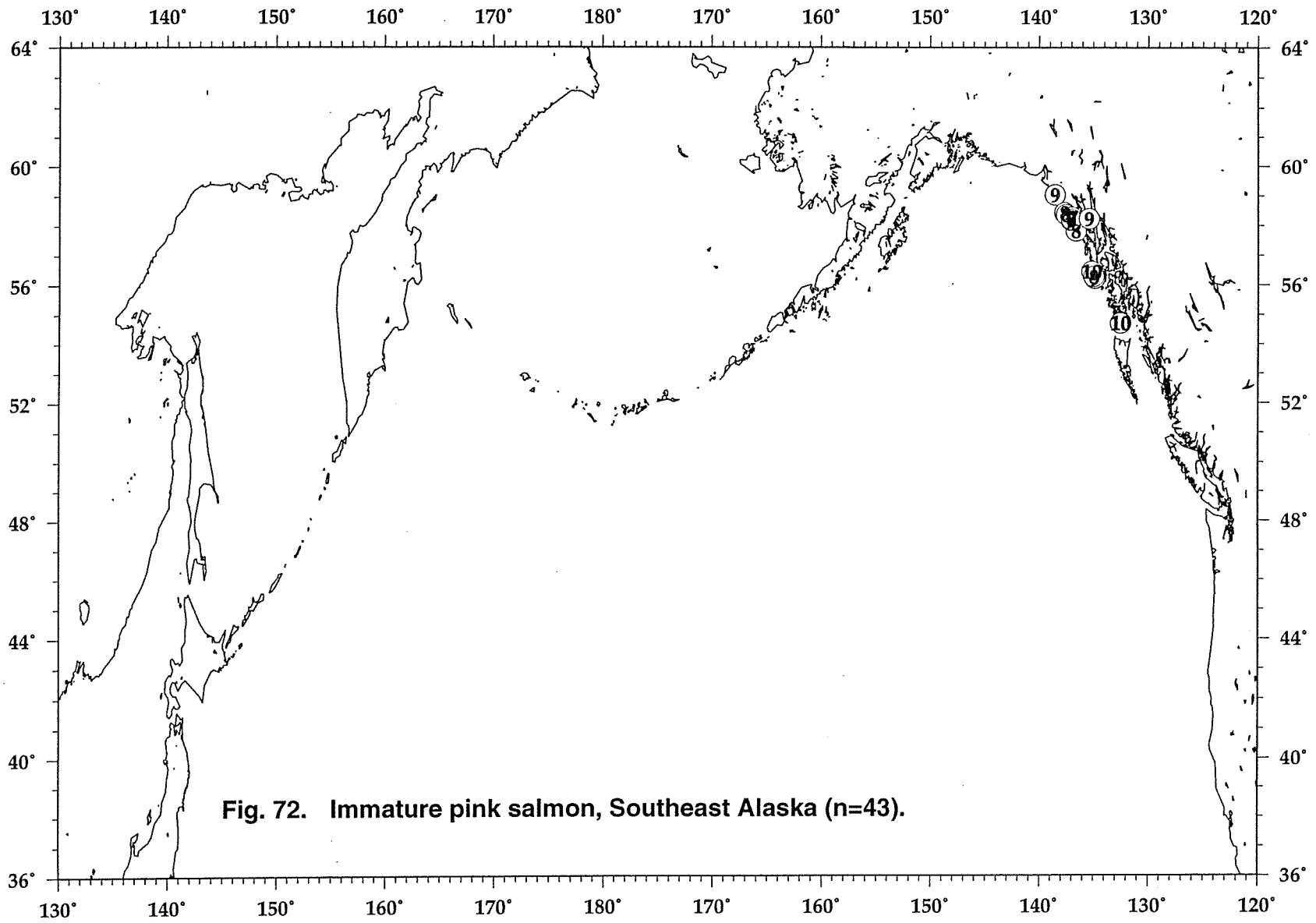


Fig. 72. Immature pink salmon, Southeast Alaska (n=43).

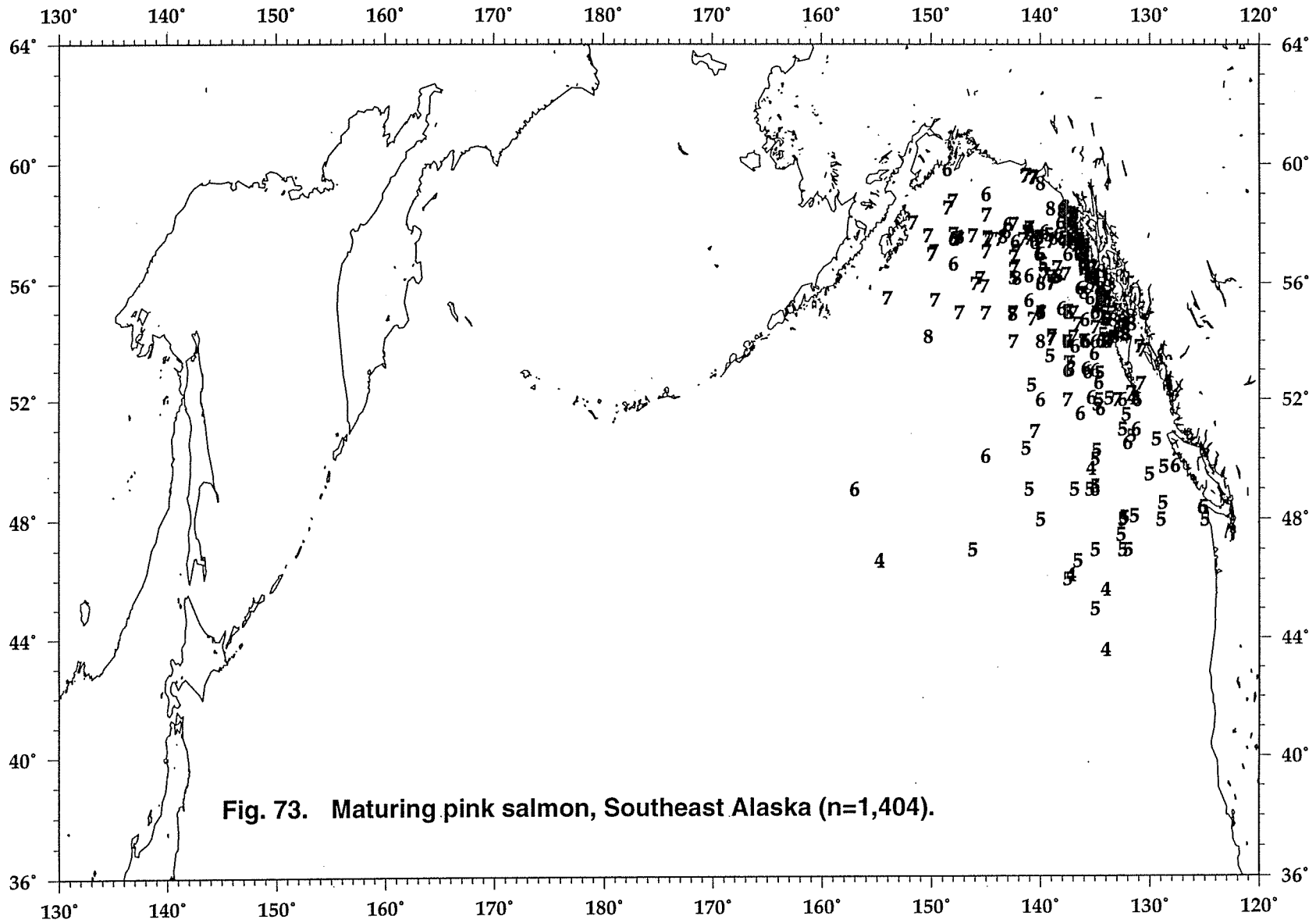


Fig. 73. Maturing pink salmon, Southeast Alaska (n=1,404).

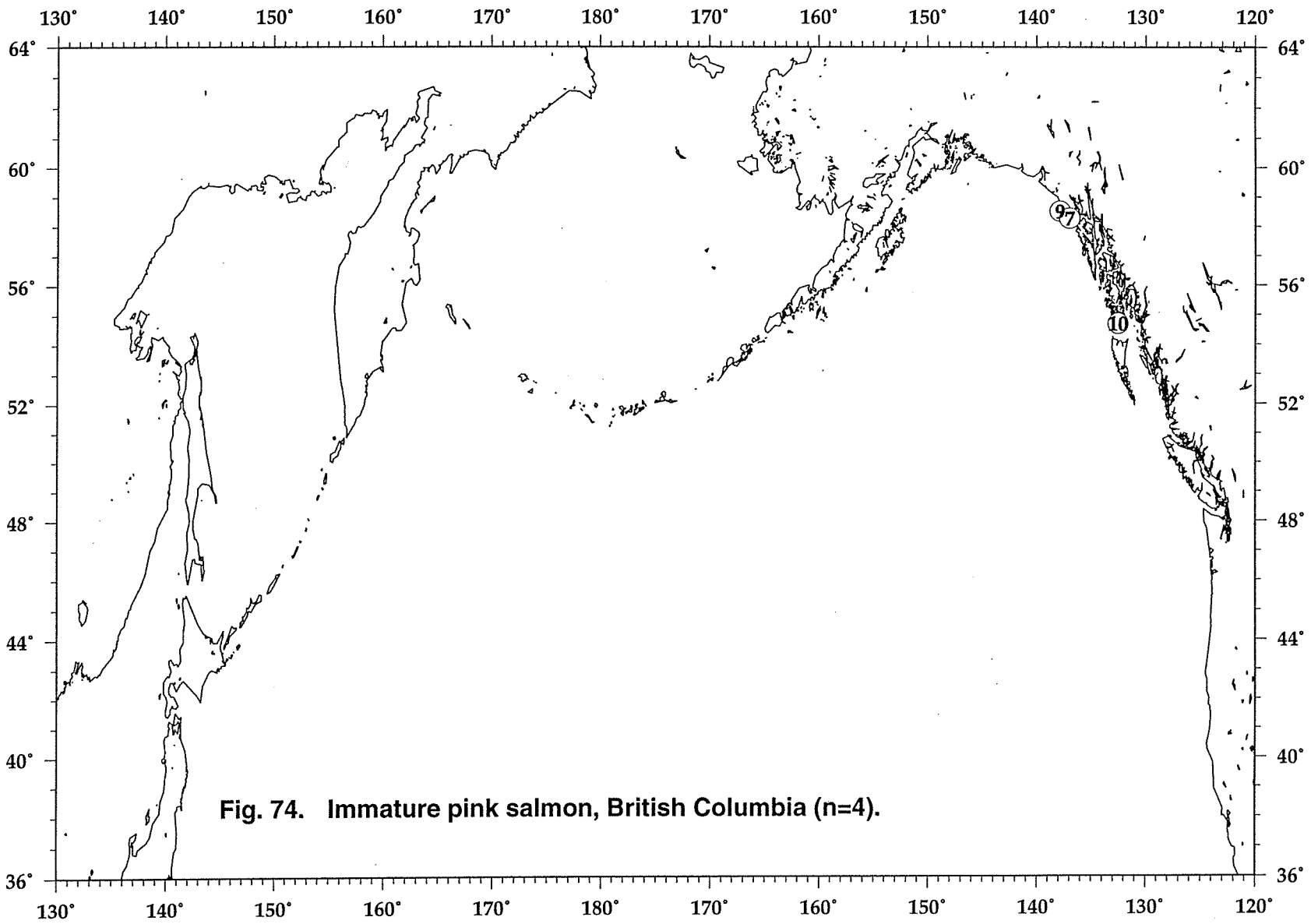


Fig. 74. Immature pink salmon, British Columbia (n=4).

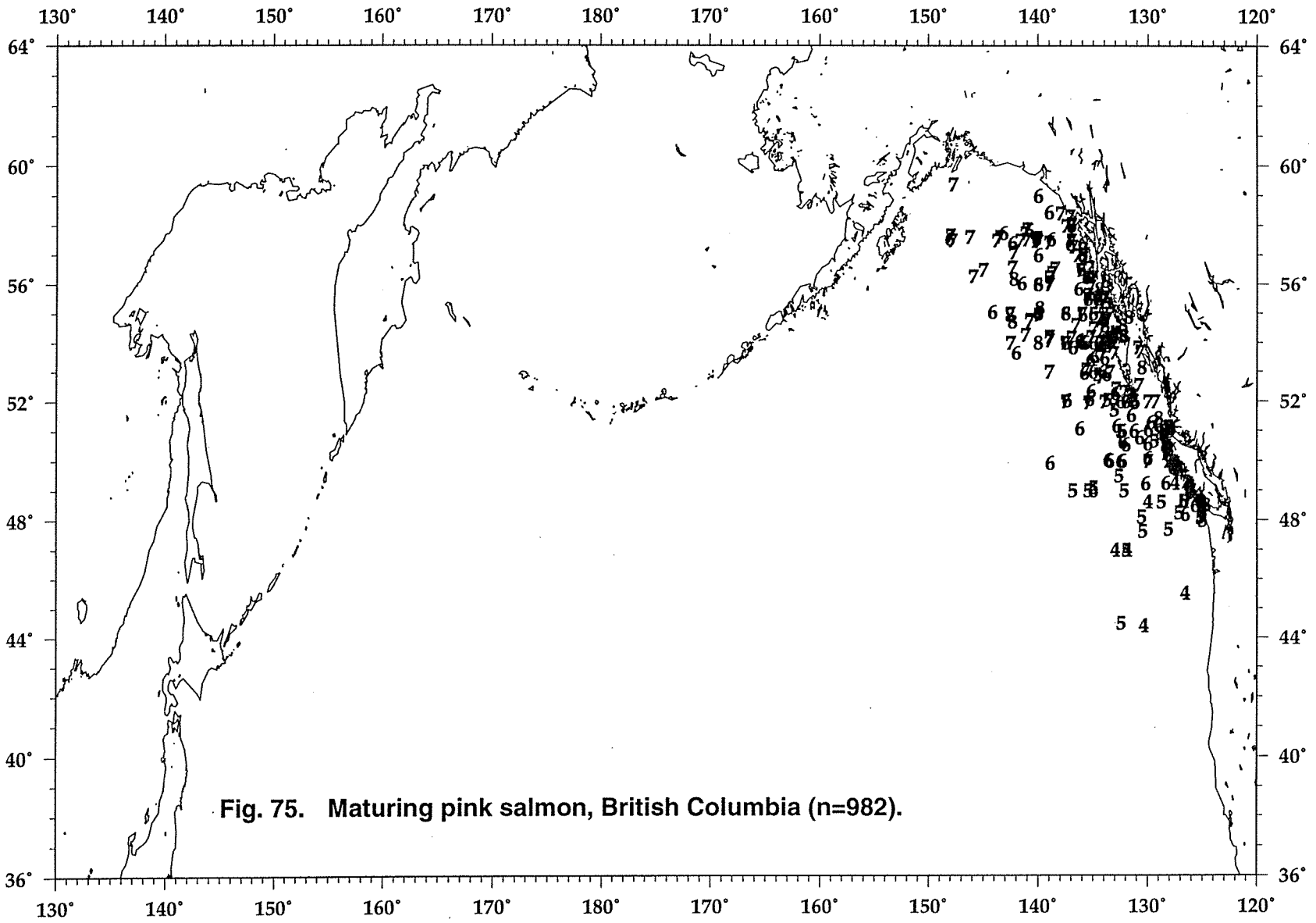


Fig. 75. Maturing pink salmon, British Columbia (n=982).

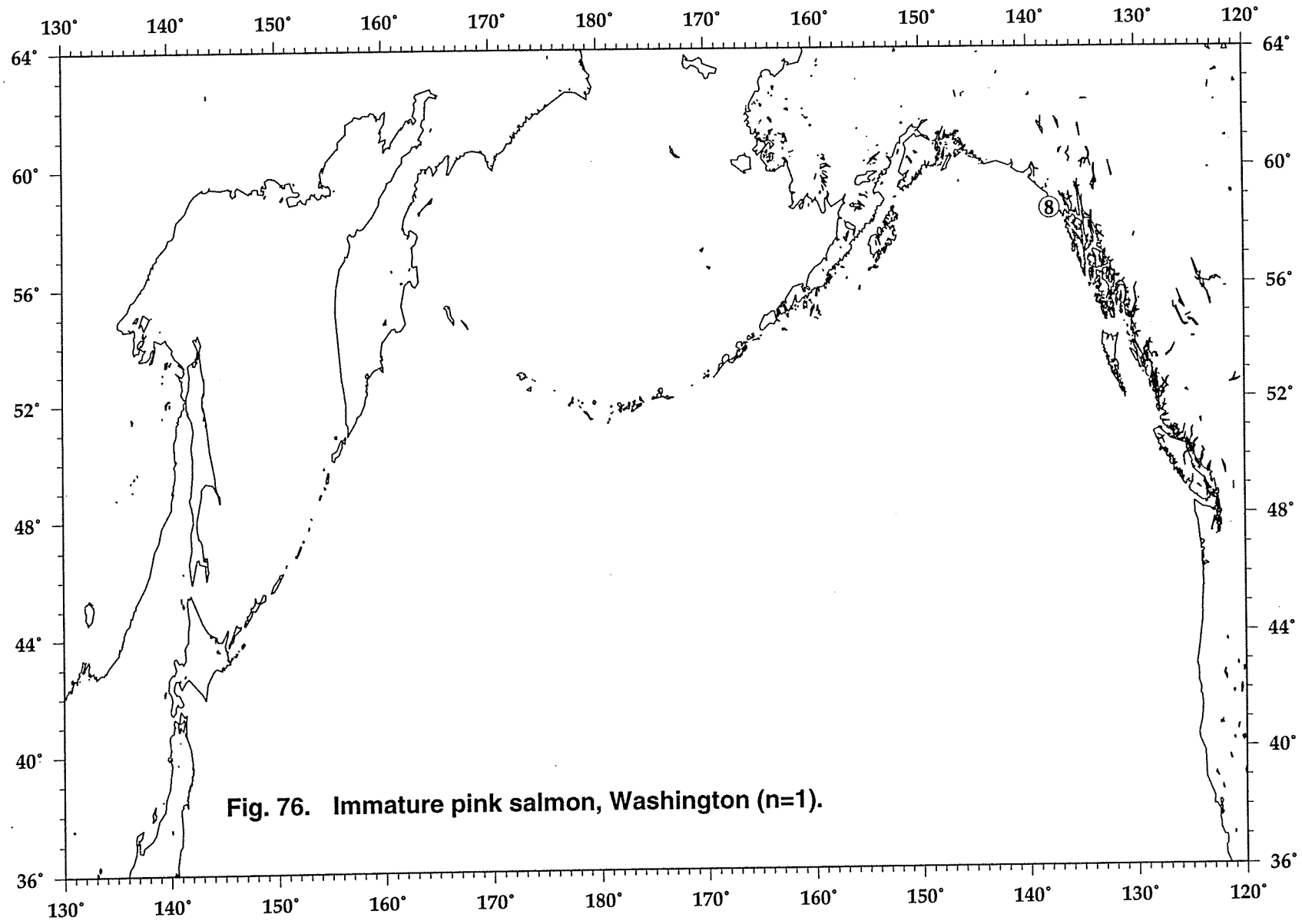


Fig. 76. Immature pink salmon, Washington (n=1).

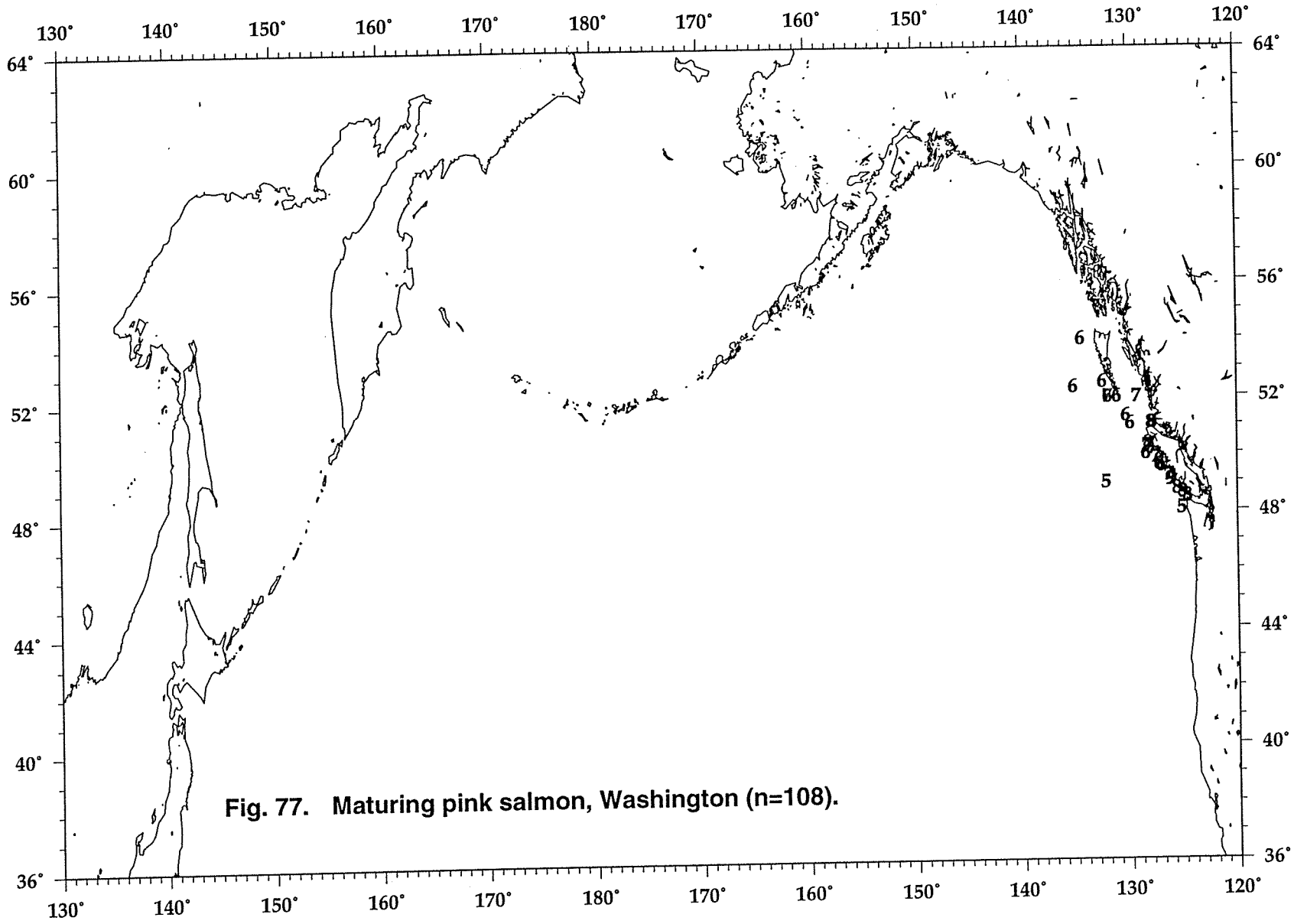


Fig. 77. Maturing pink salmon, Washington (n=108).

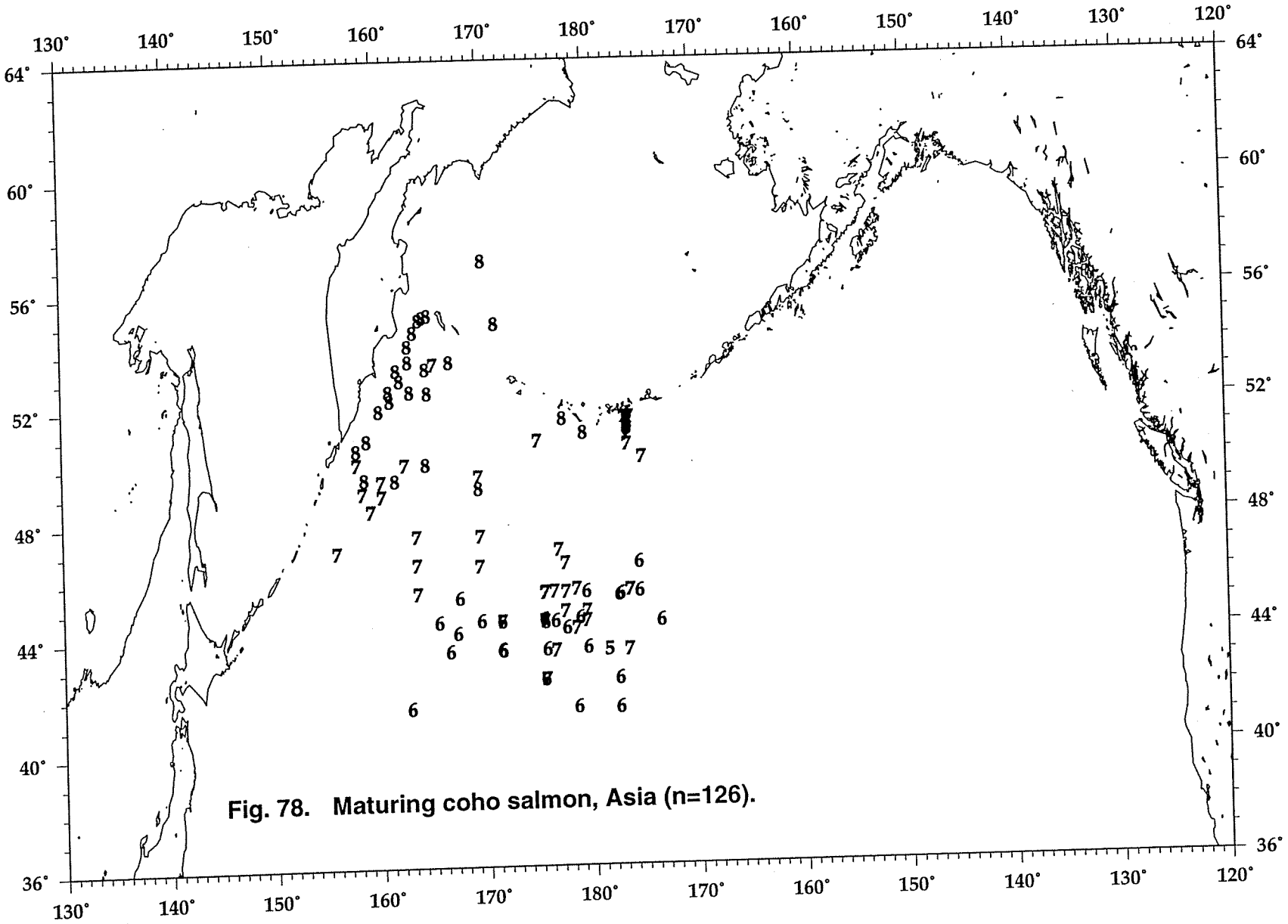


Fig. 78. Maturing coho salmon, Asia (n=126).

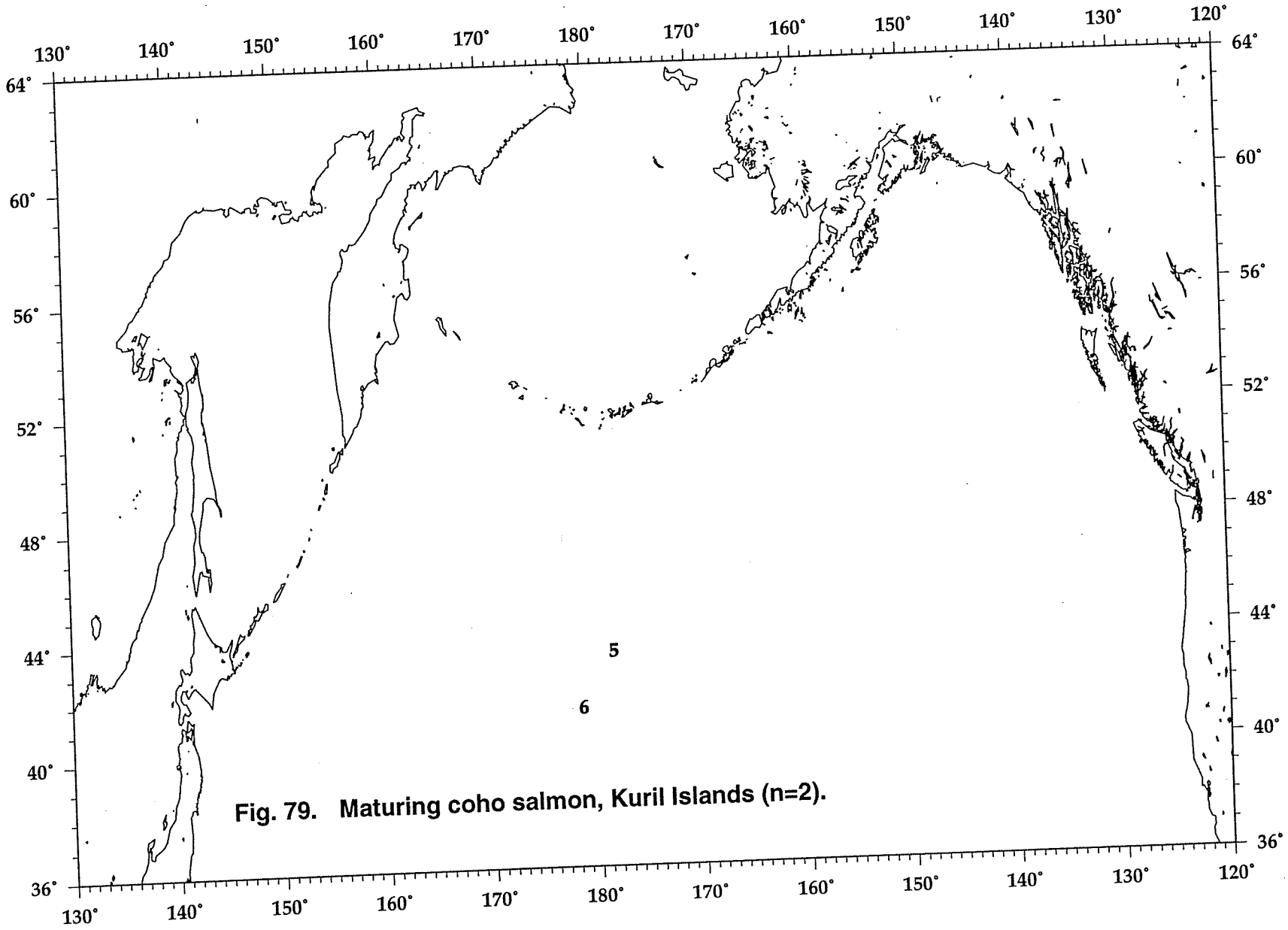


Fig. 79. Maturing coho salmon, Kuril Islands (n=2).

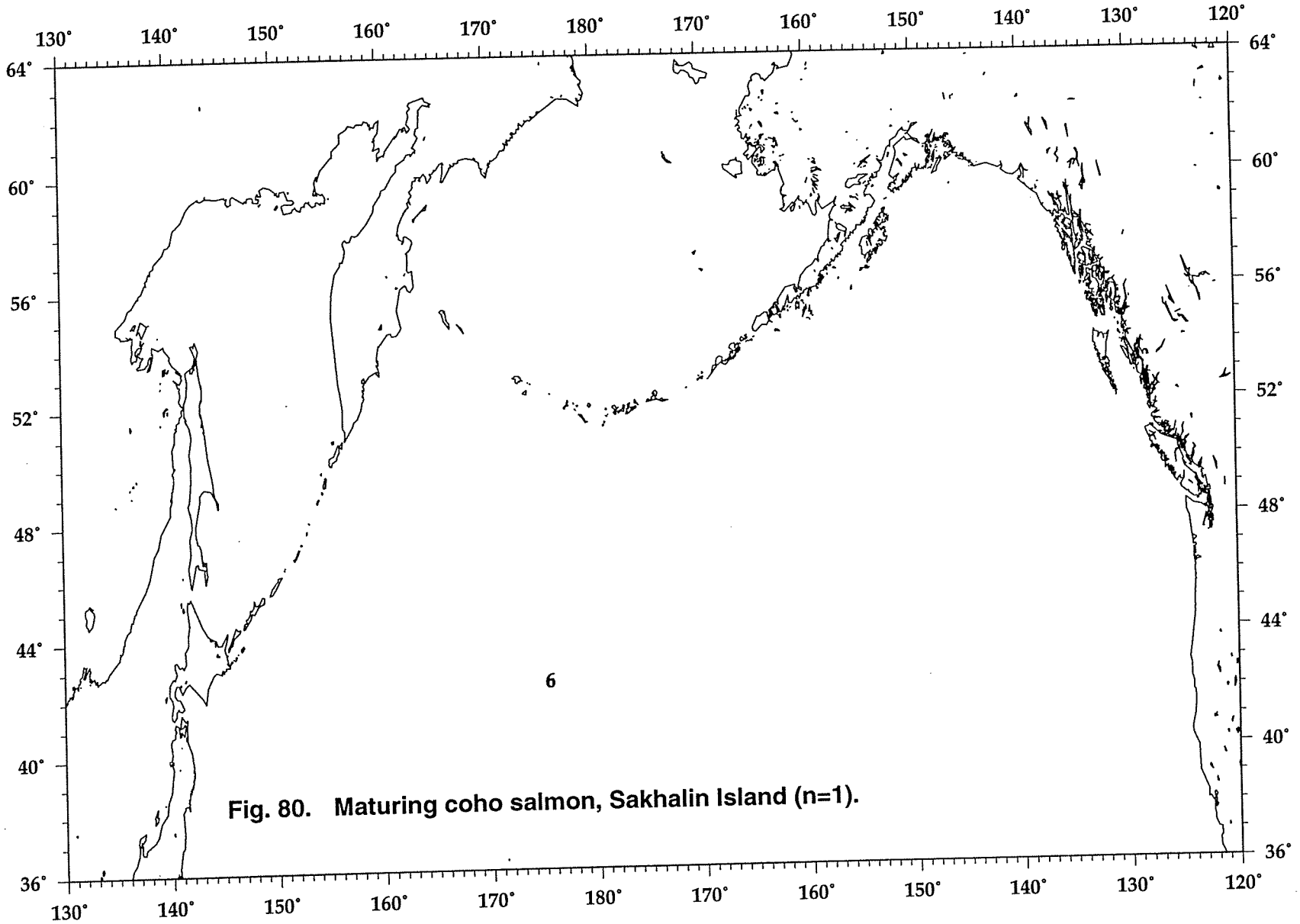


Fig. 80. Maturing coho salmon, Sakhalin Island (n=1).

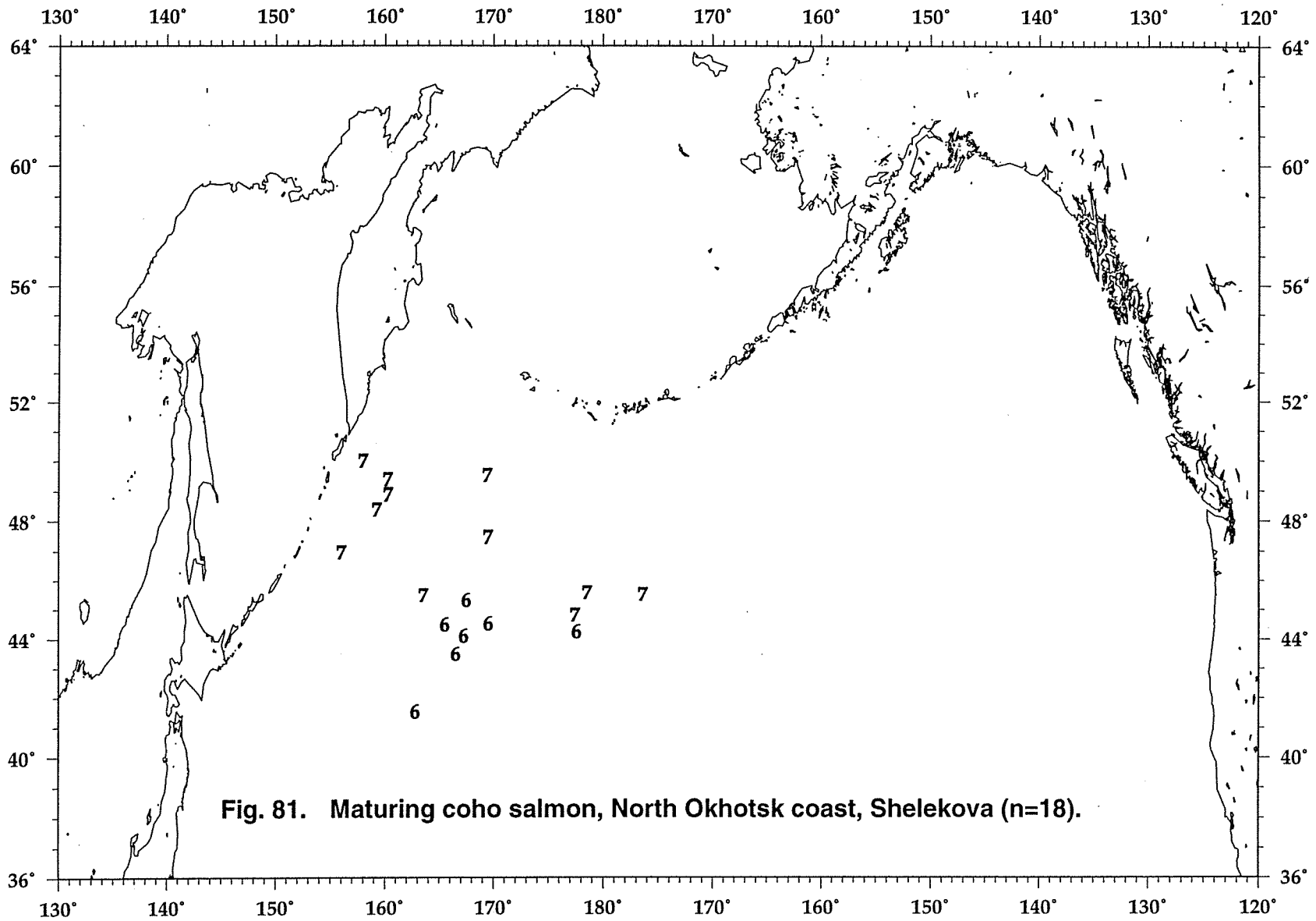


Fig. 81. Maturing coho salmon, North Okhotsk coast, Shelekova (n=18).

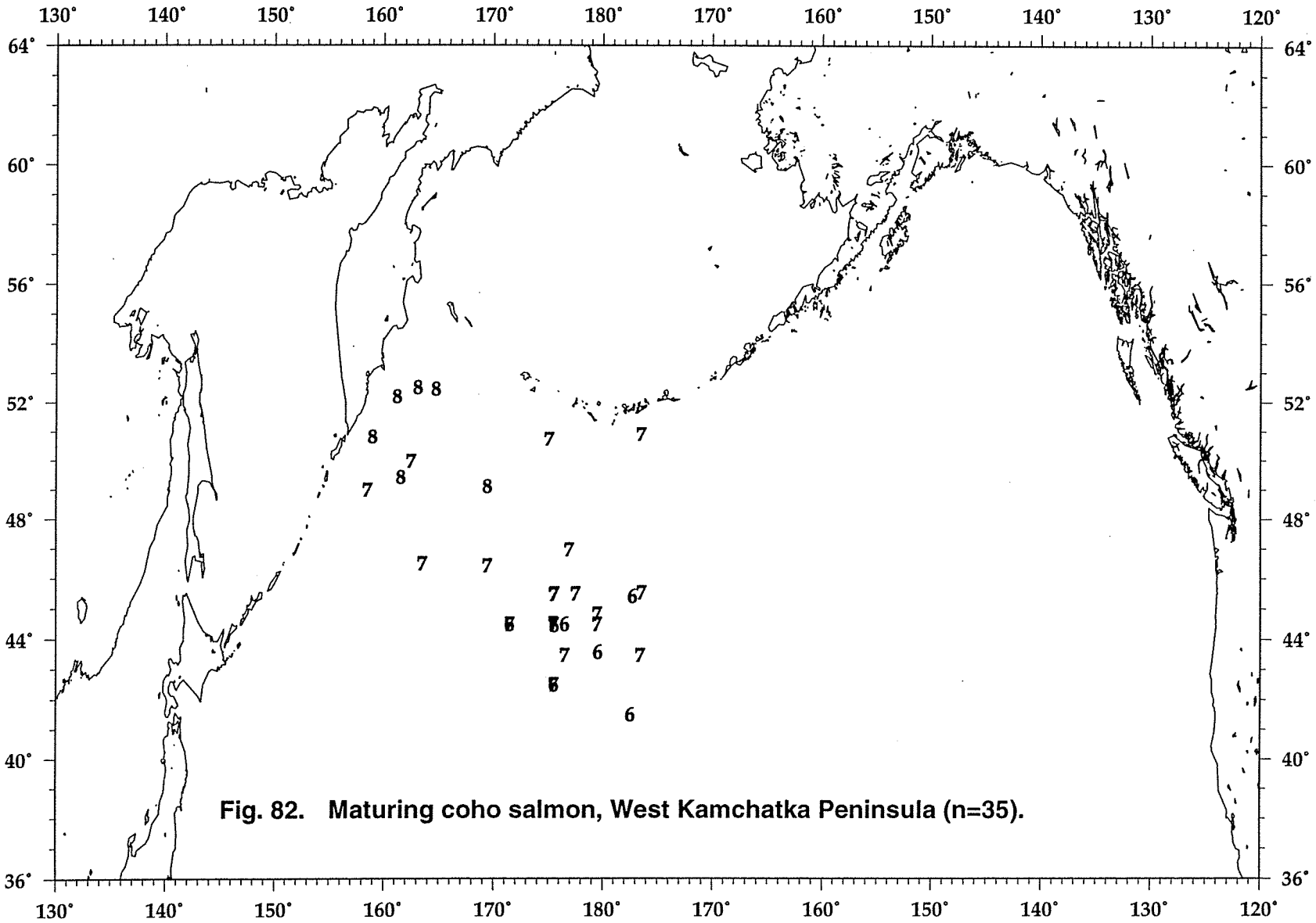


Fig. 82. Maturing coho salmon, West Kamchatka Peninsula (n=35).

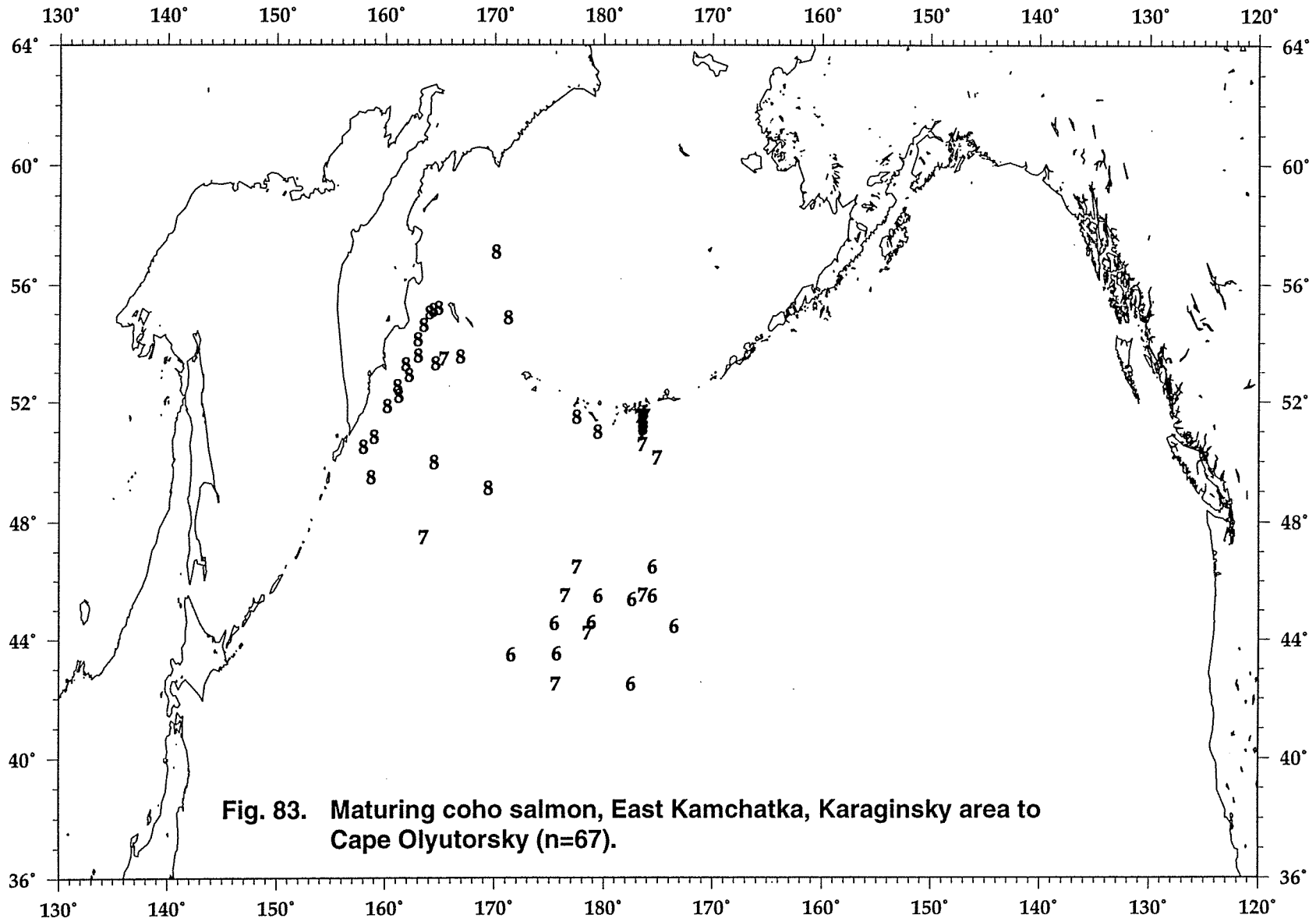


Fig. 83. Maturing coho salmon, East Kamchatka, Karaginsky area to Cape Olyutorsky (n=67).

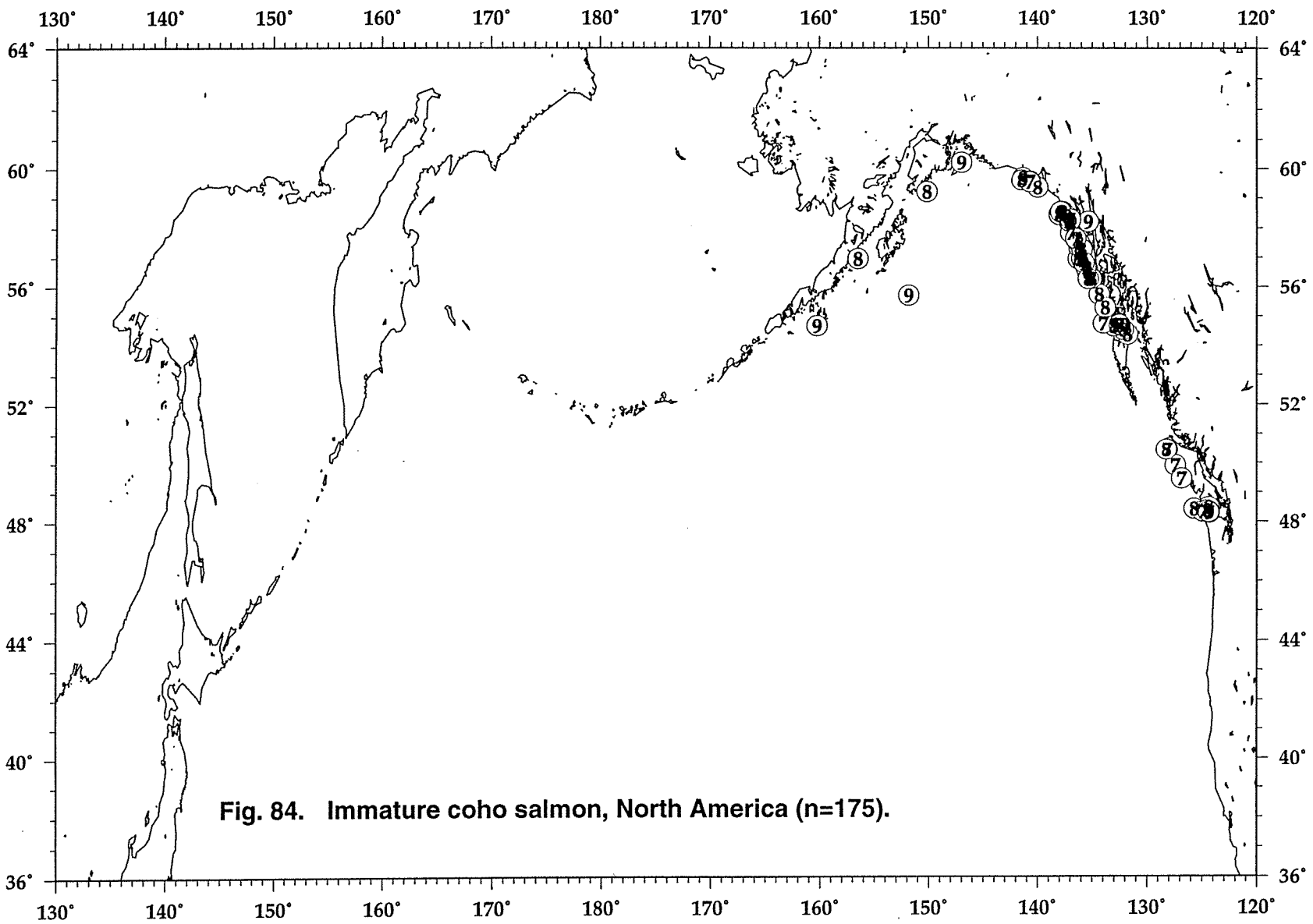


Fig. 84. Immature coho salmon, North America (n=175).

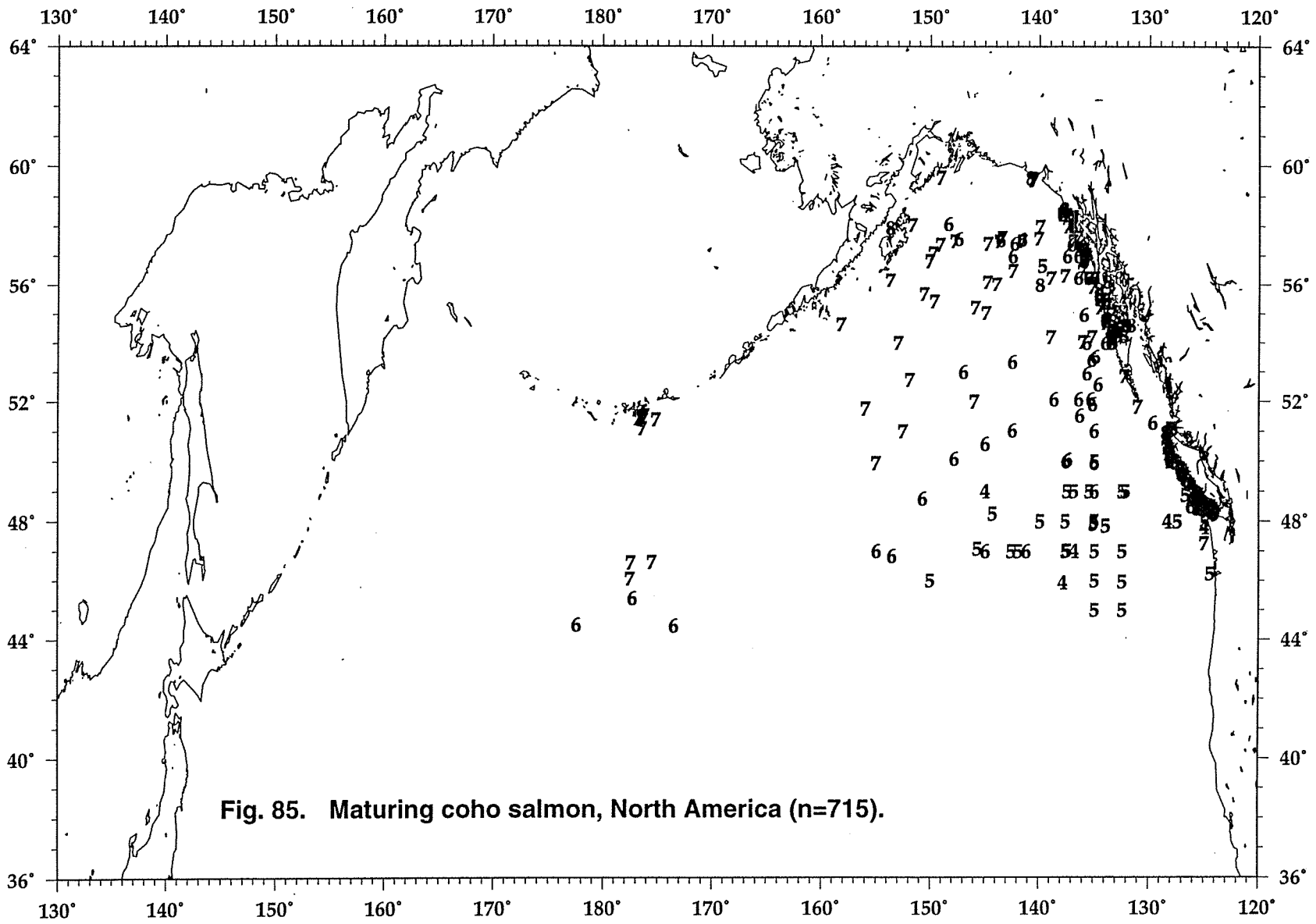


Fig. 85. Maturing coho salmon, North America (n=715).

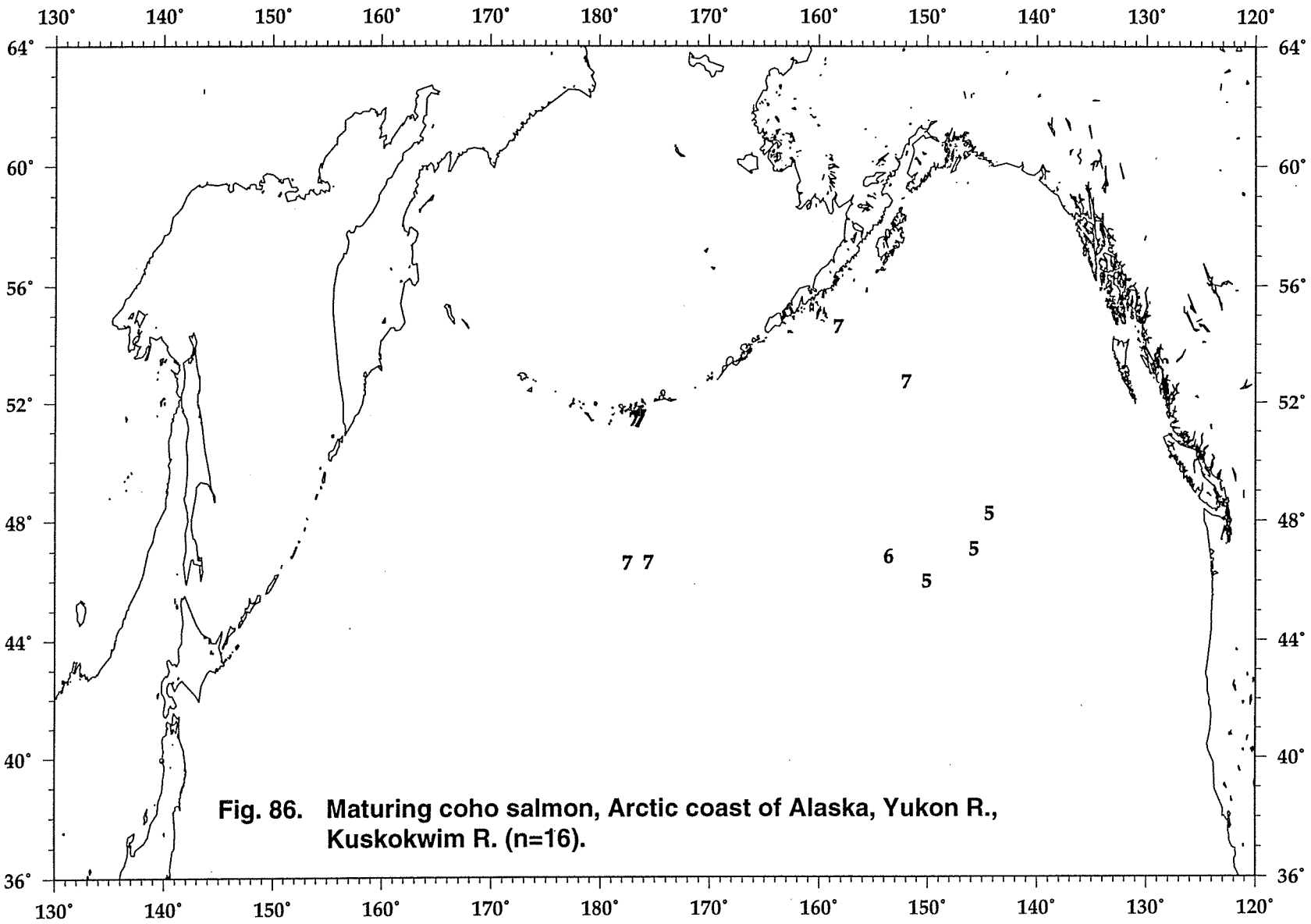


Fig. 86. Maturing coho salmon, Arctic coast of Alaska, Yukon R., Kuskokwim R. (n=16).

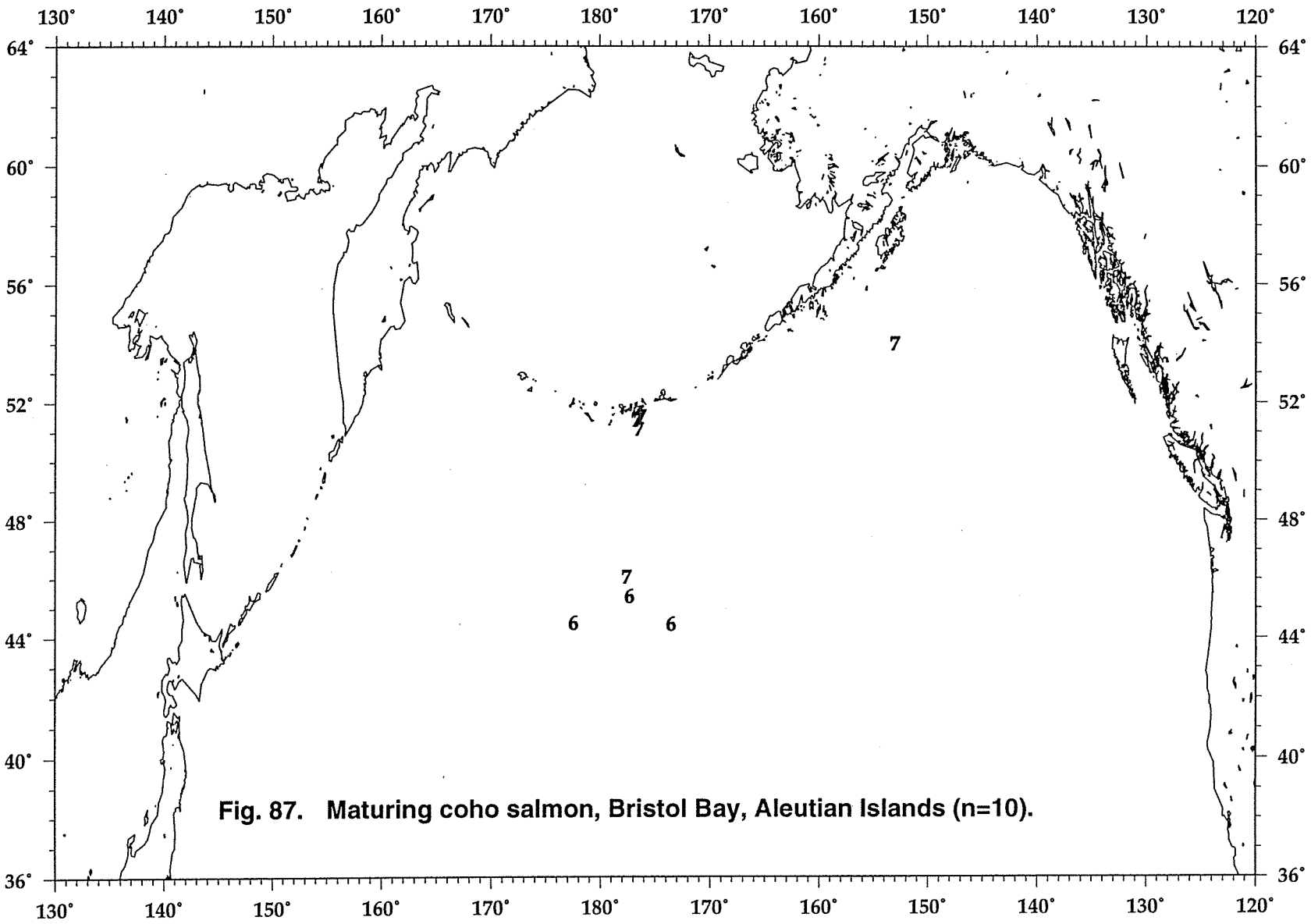


Fig. 87. Maturing coho salmon, Bristol Bay, Aleutian Islands (n=10).

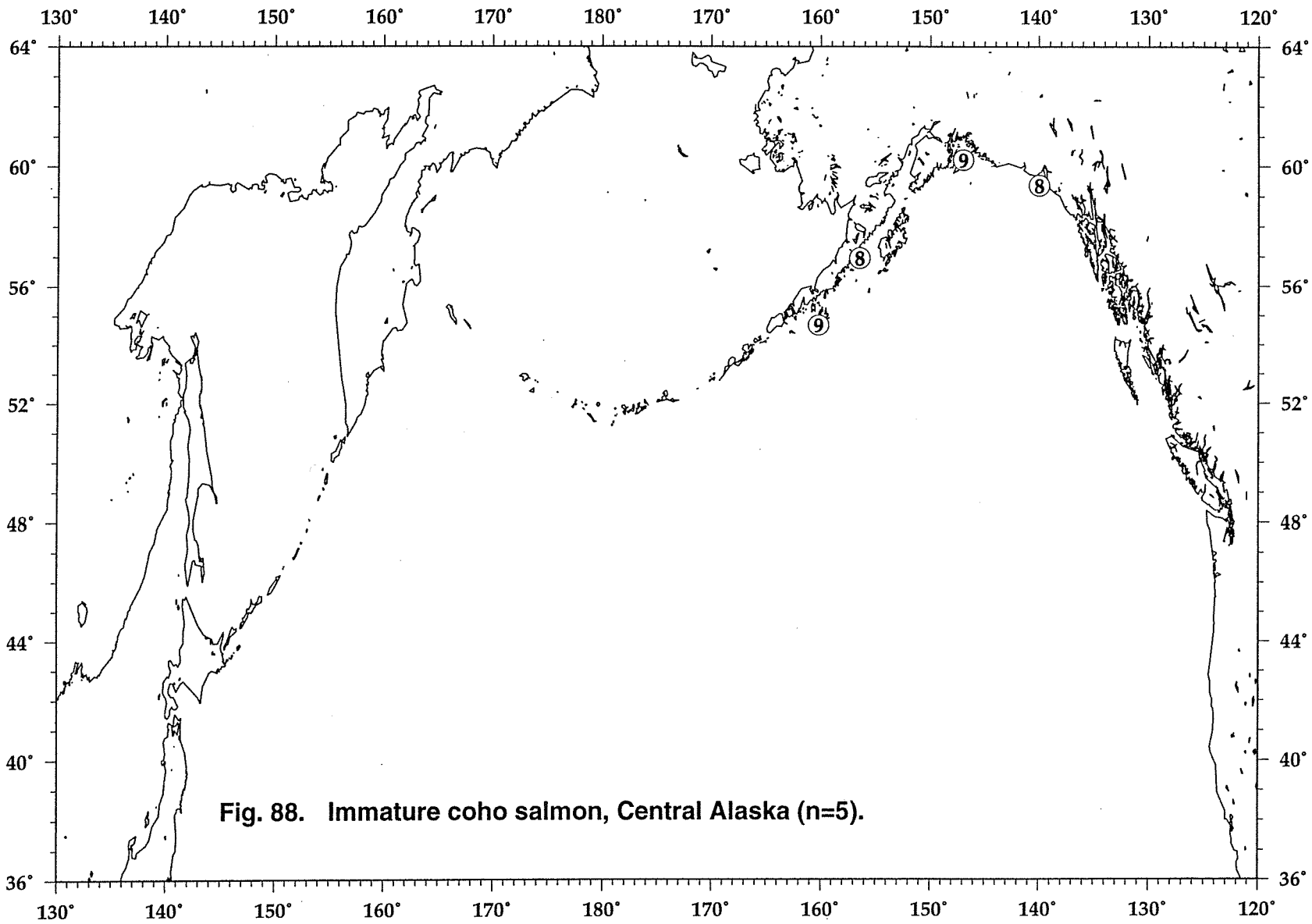


Fig. 88. Immature coho salmon, Central Alaska (n=5).

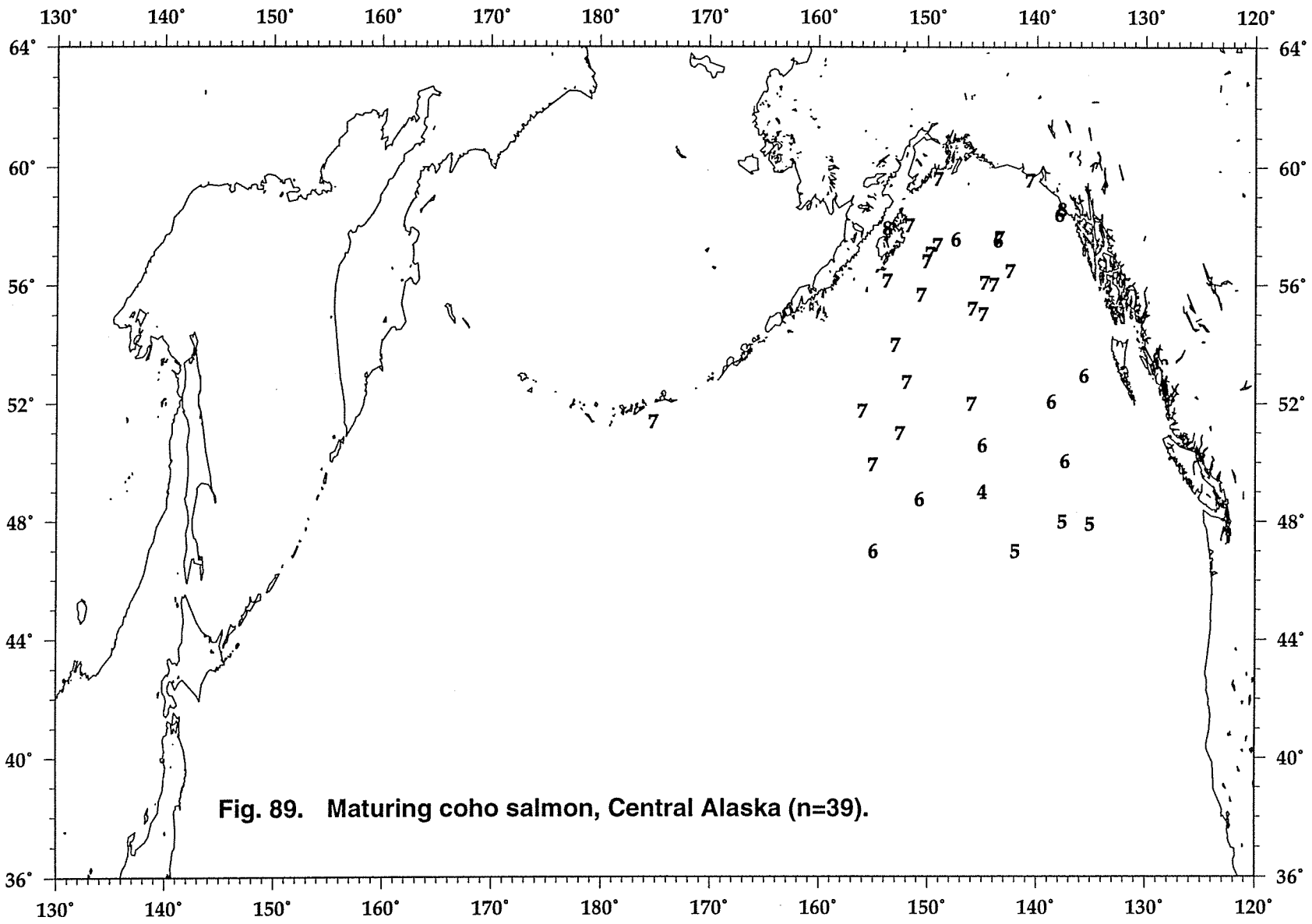


Fig. 89. Maturing coho salmon, Central Alaska (n=39).

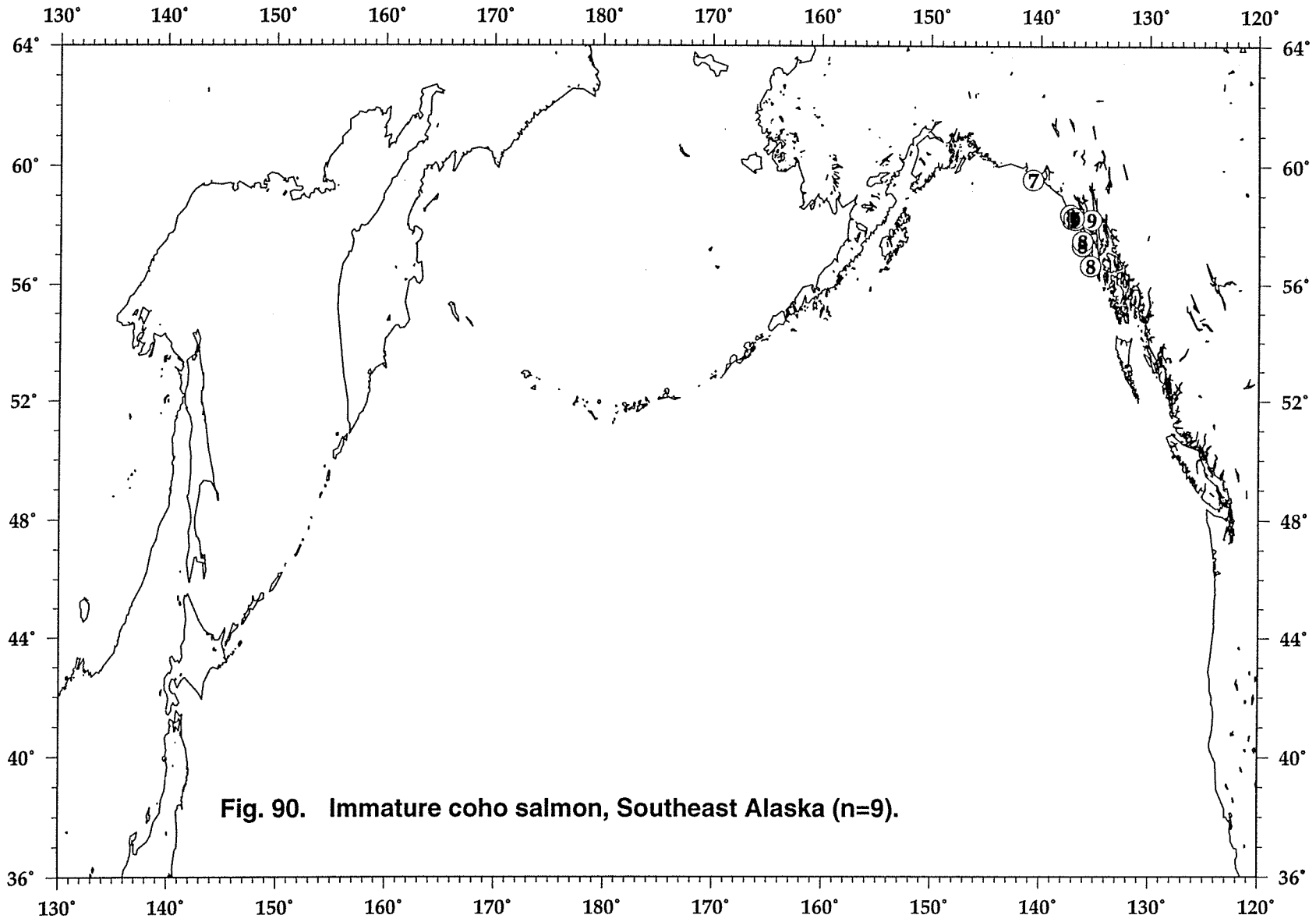


Fig. 90. Immature coho salmon, Southeast Alaska (n=9).

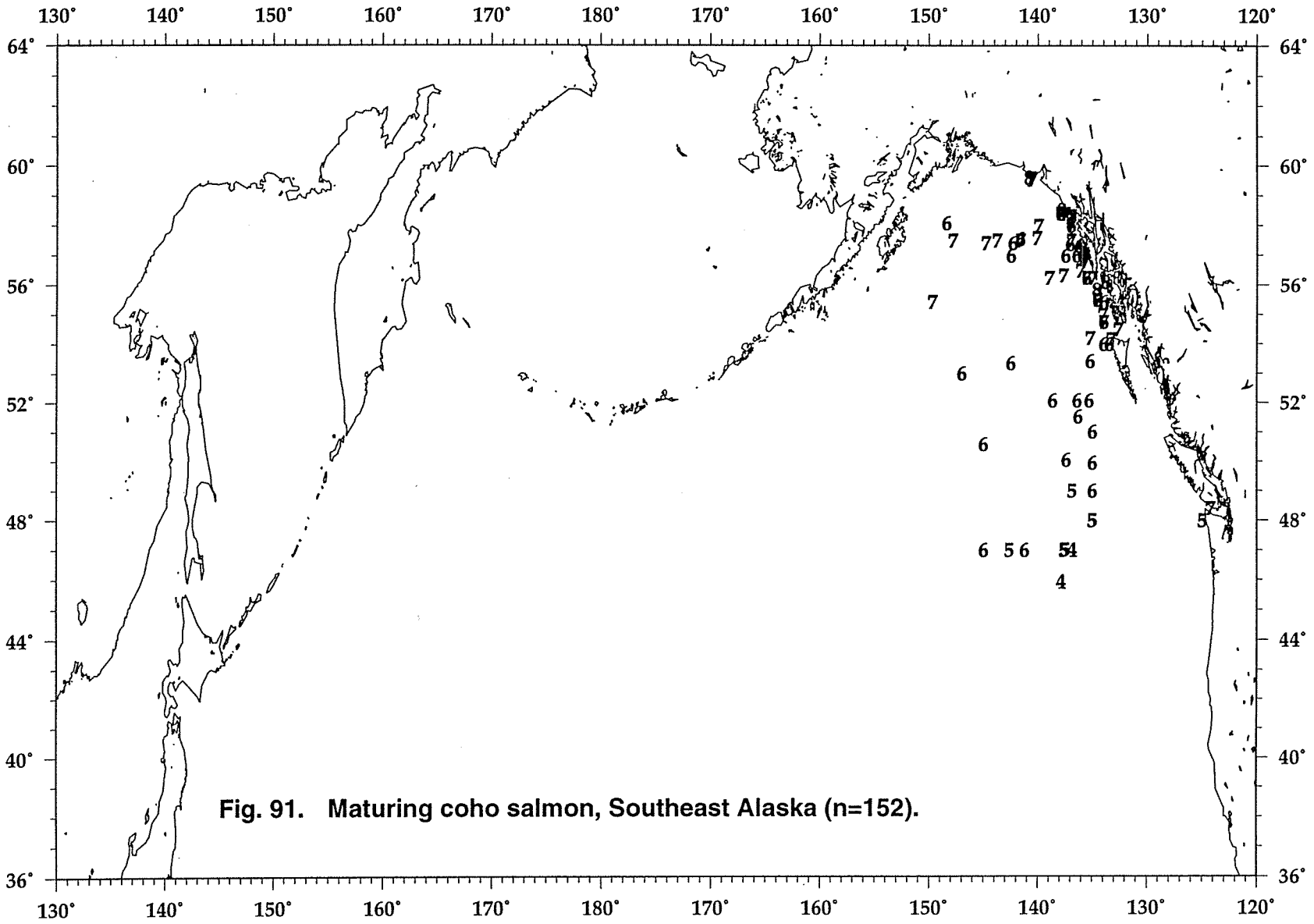


Fig. 91. Maturing coho salmon, Southeast Alaska (n=152).

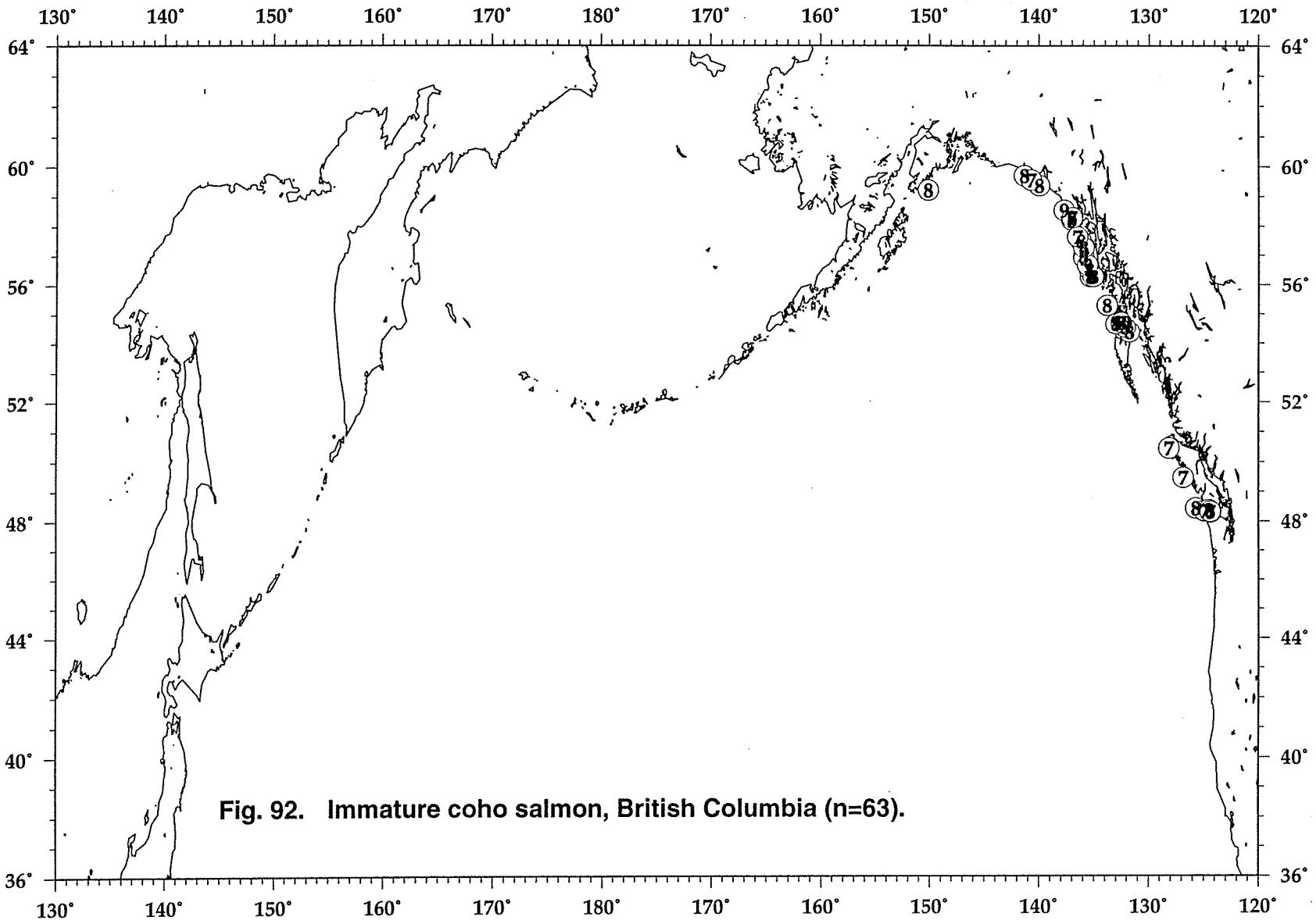


Fig. 92. Immature coho salmon, British Columbia (n=63).

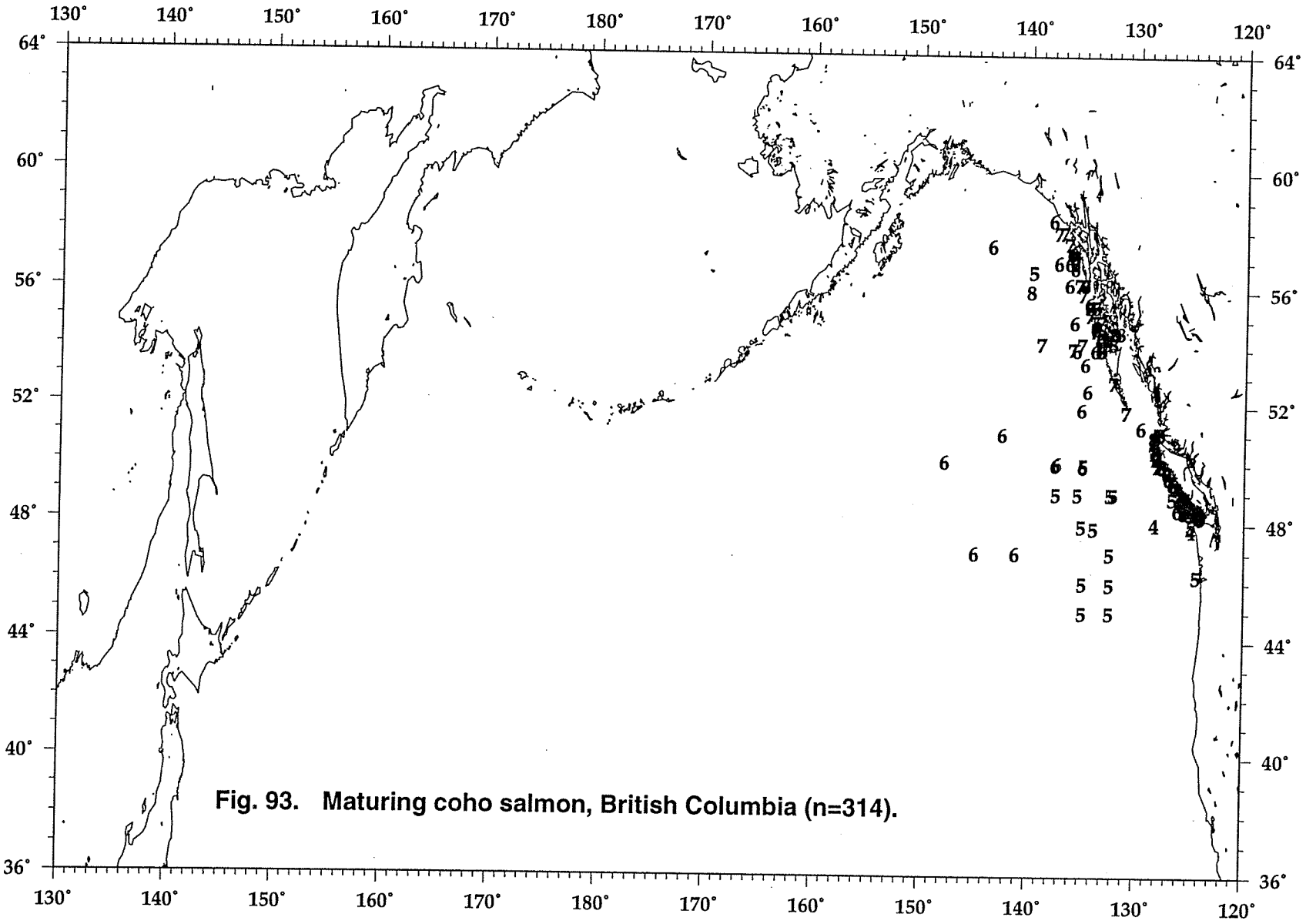


Fig. 93. Maturing coho salmon, British Columbia (n=314).

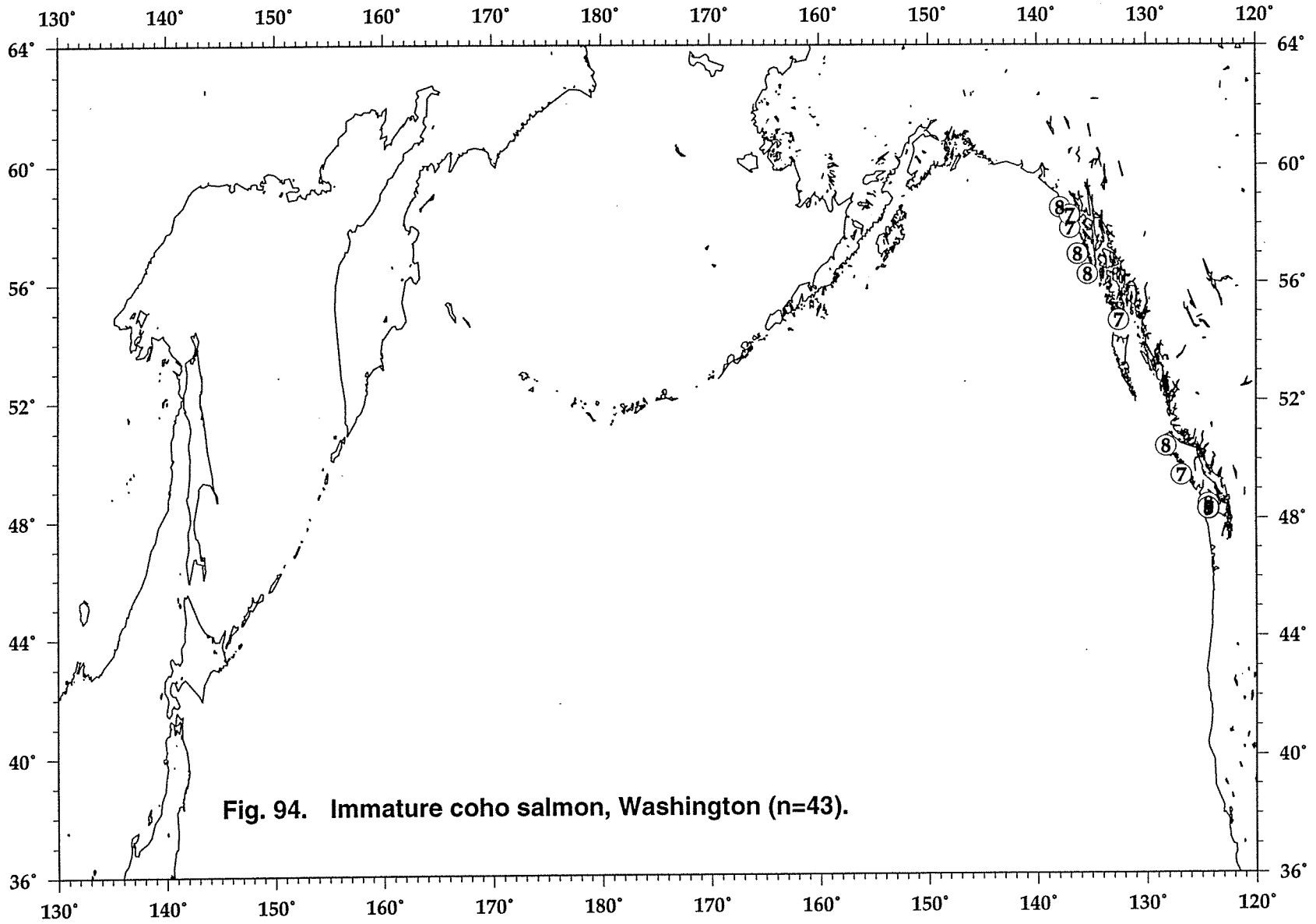


Fig. 94. Immature coho salmon, Washington (n=43).

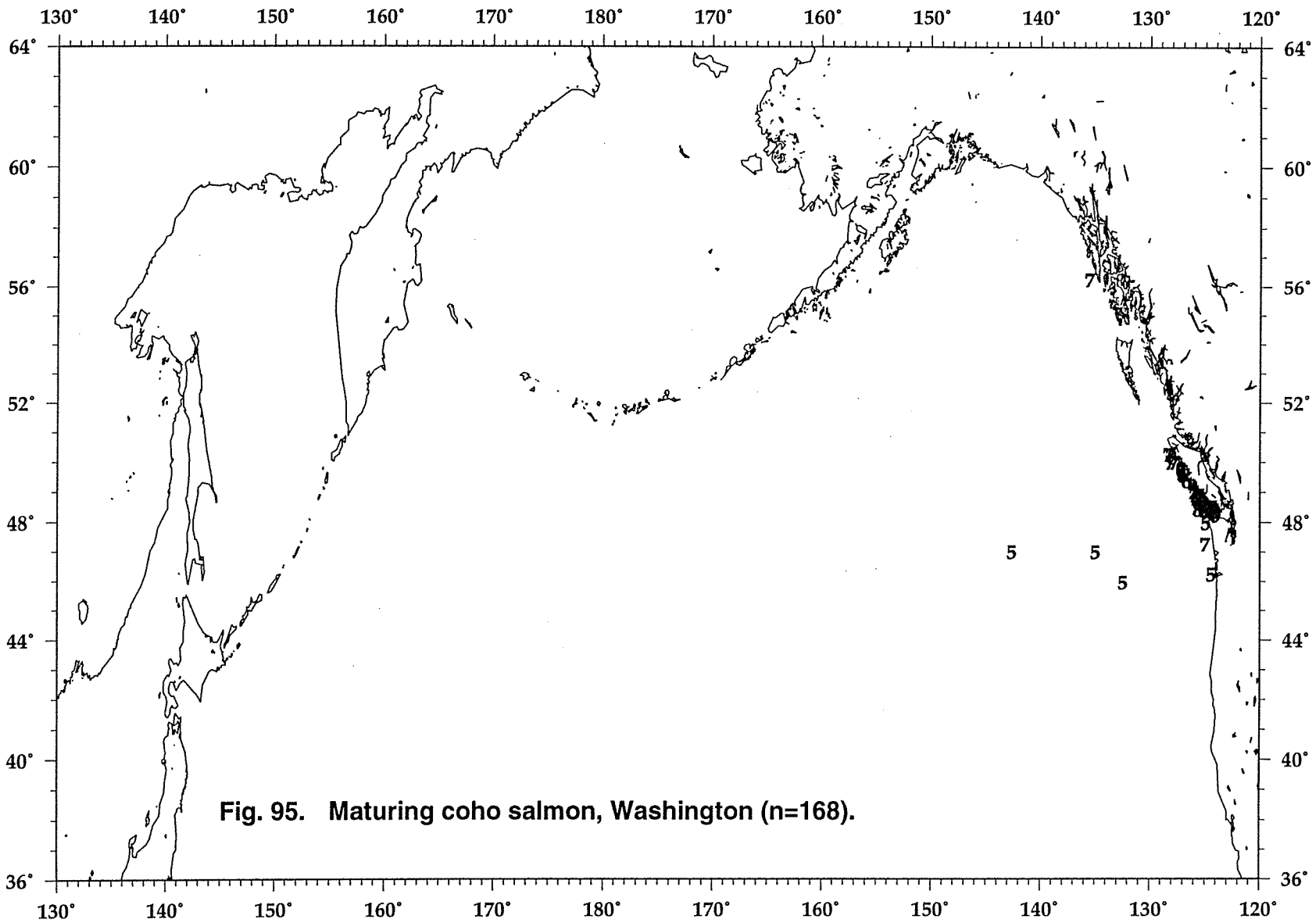


Fig. 95. Maturing coho salmon, Washington (n=168).

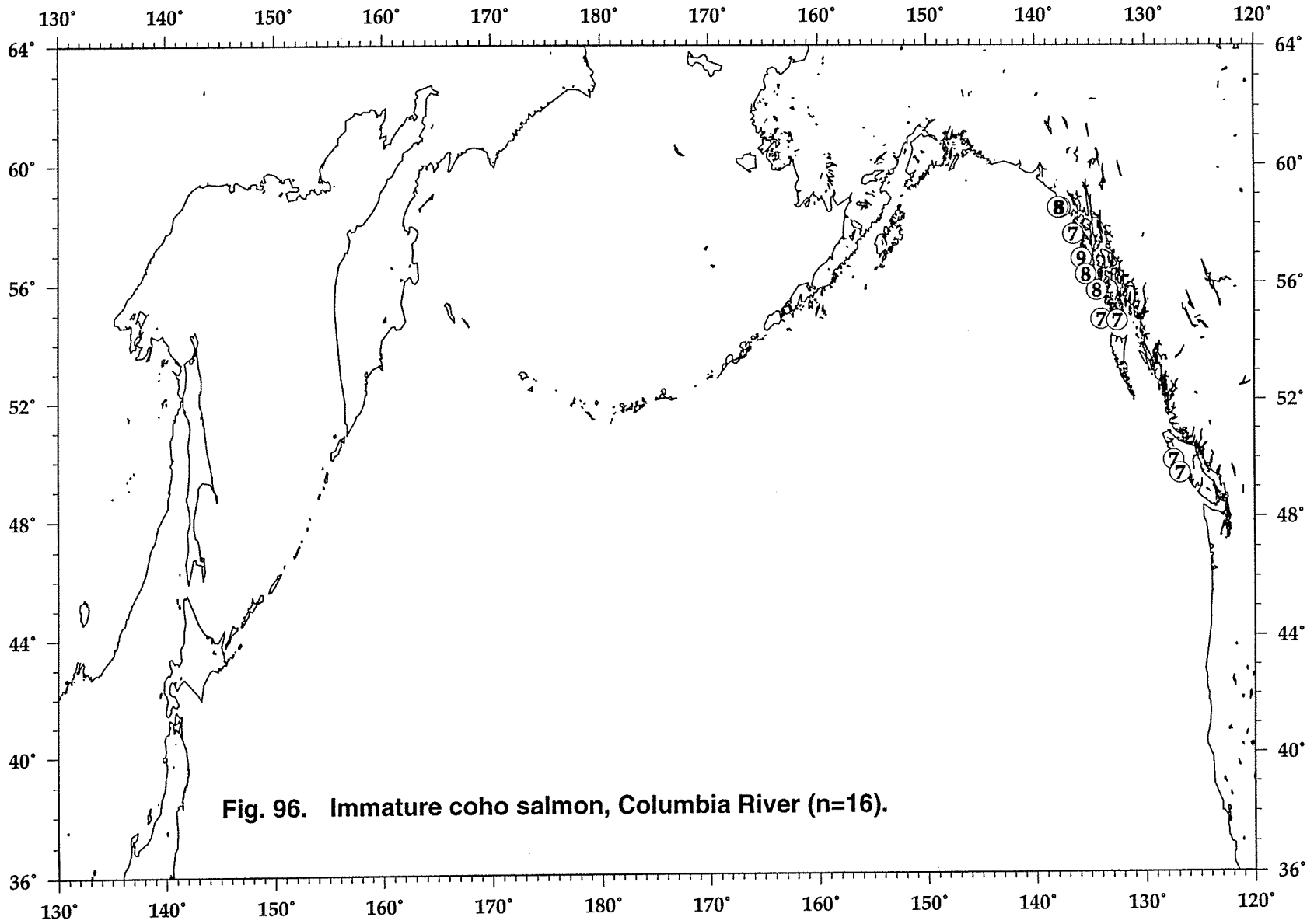


Fig. 96. Immature coho salmon, Columbia River (n=16).

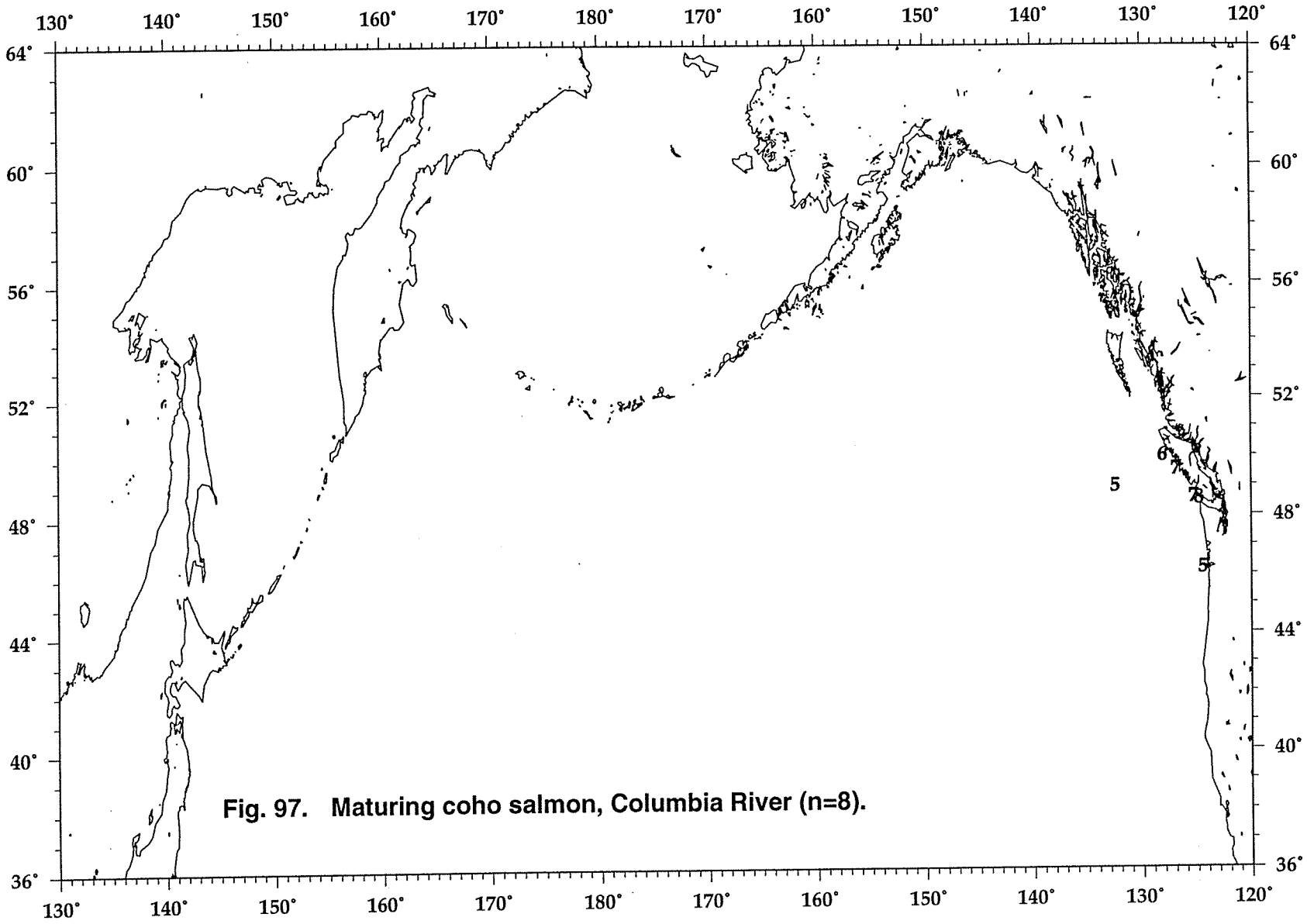


Fig. 97. Maturing coho salmon, Columbia River (n=8).

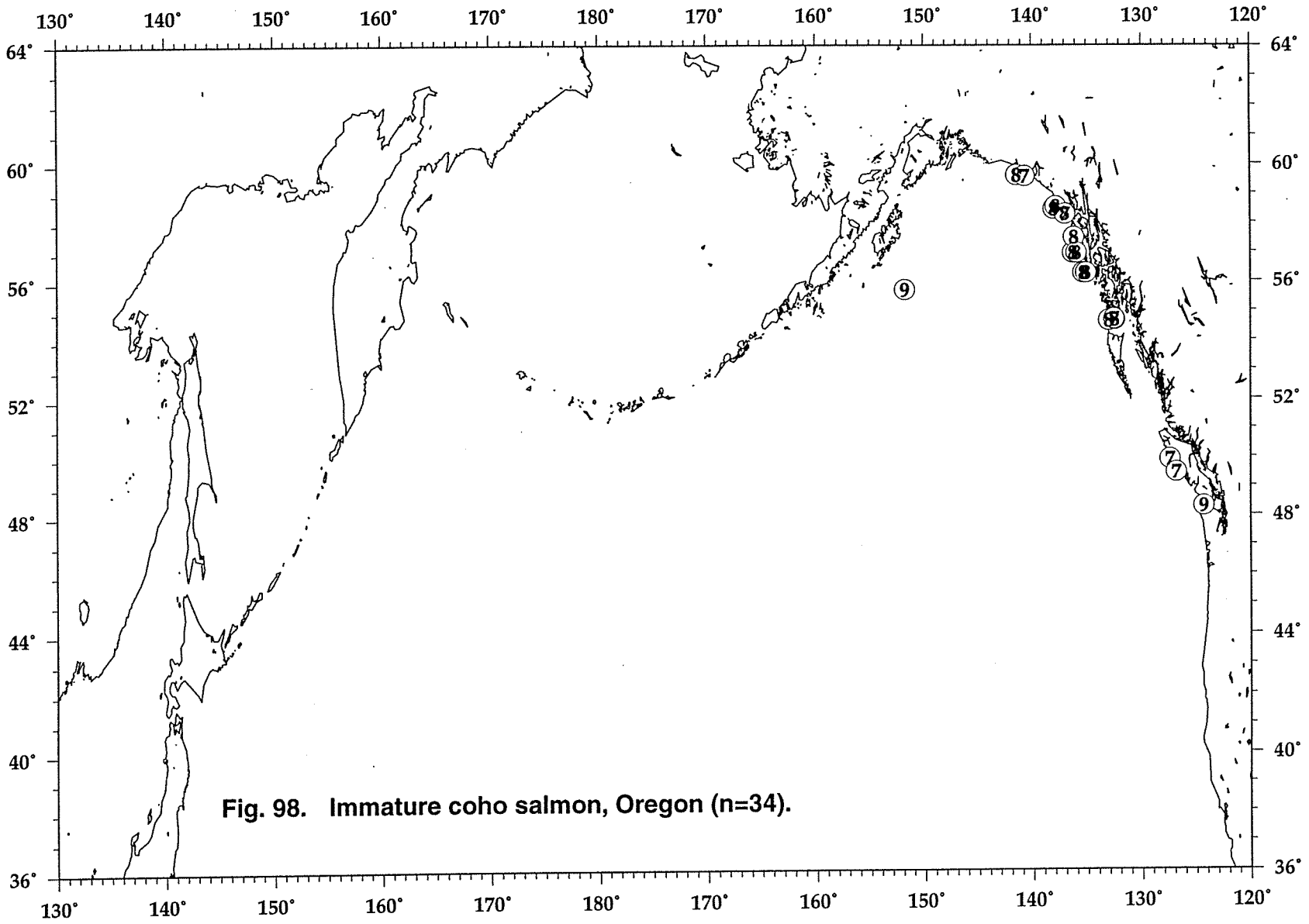


Fig. 98. Immature coho salmon, Oregon (n=34).

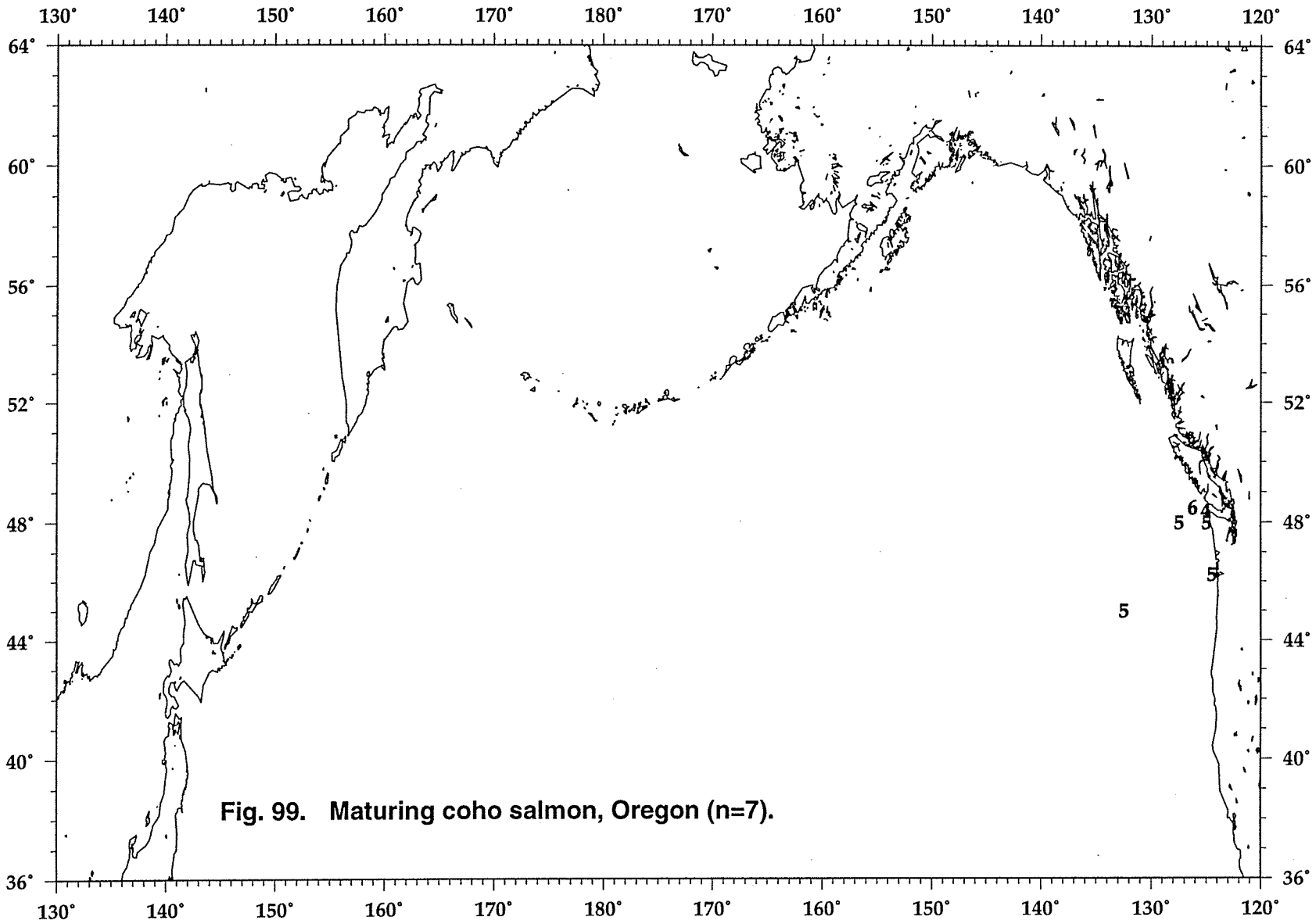


Fig. 99. Maturing coho salmon, Oregon (n=7).

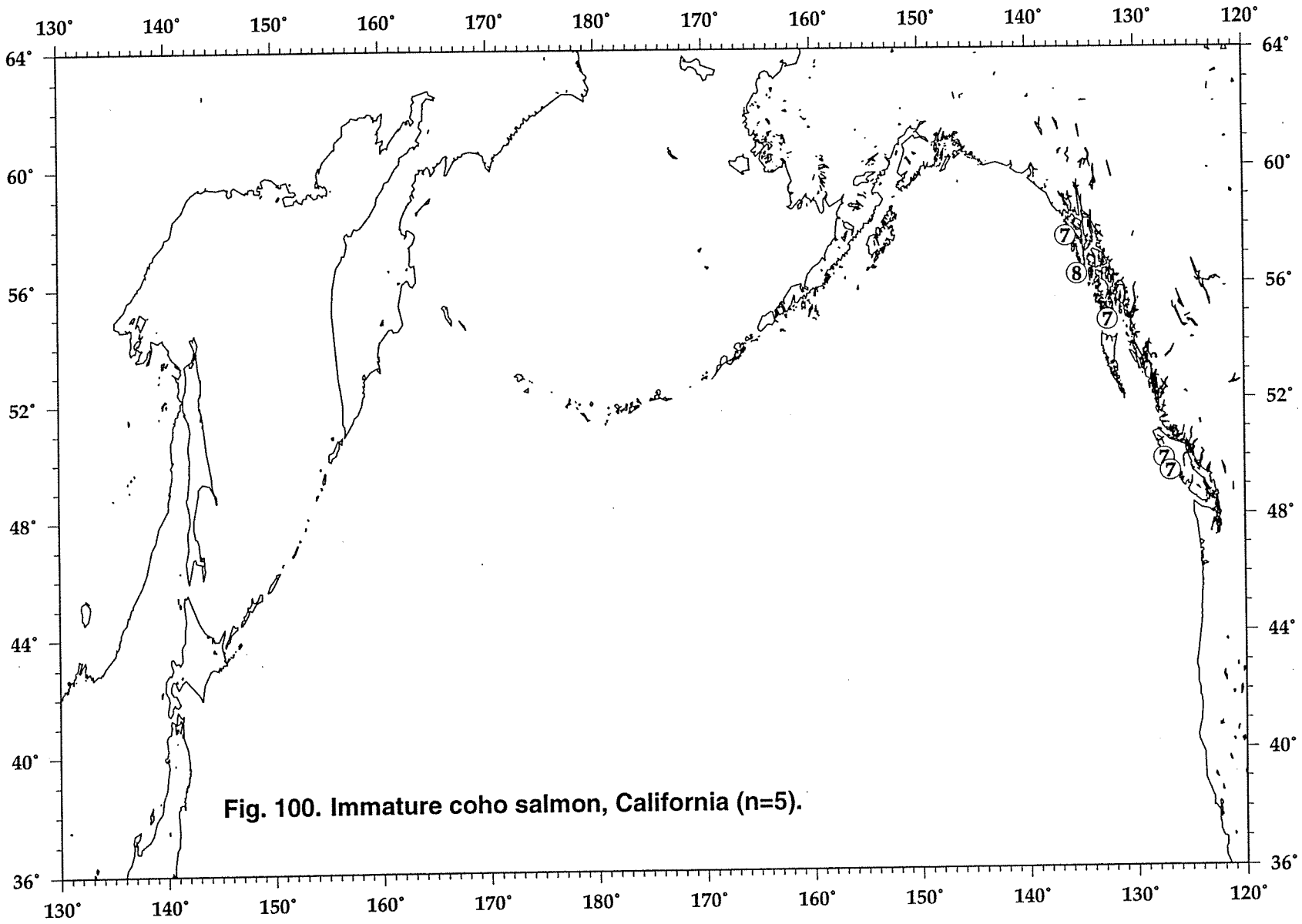


Fig. 100. Immature coho salmon, California (n=5).

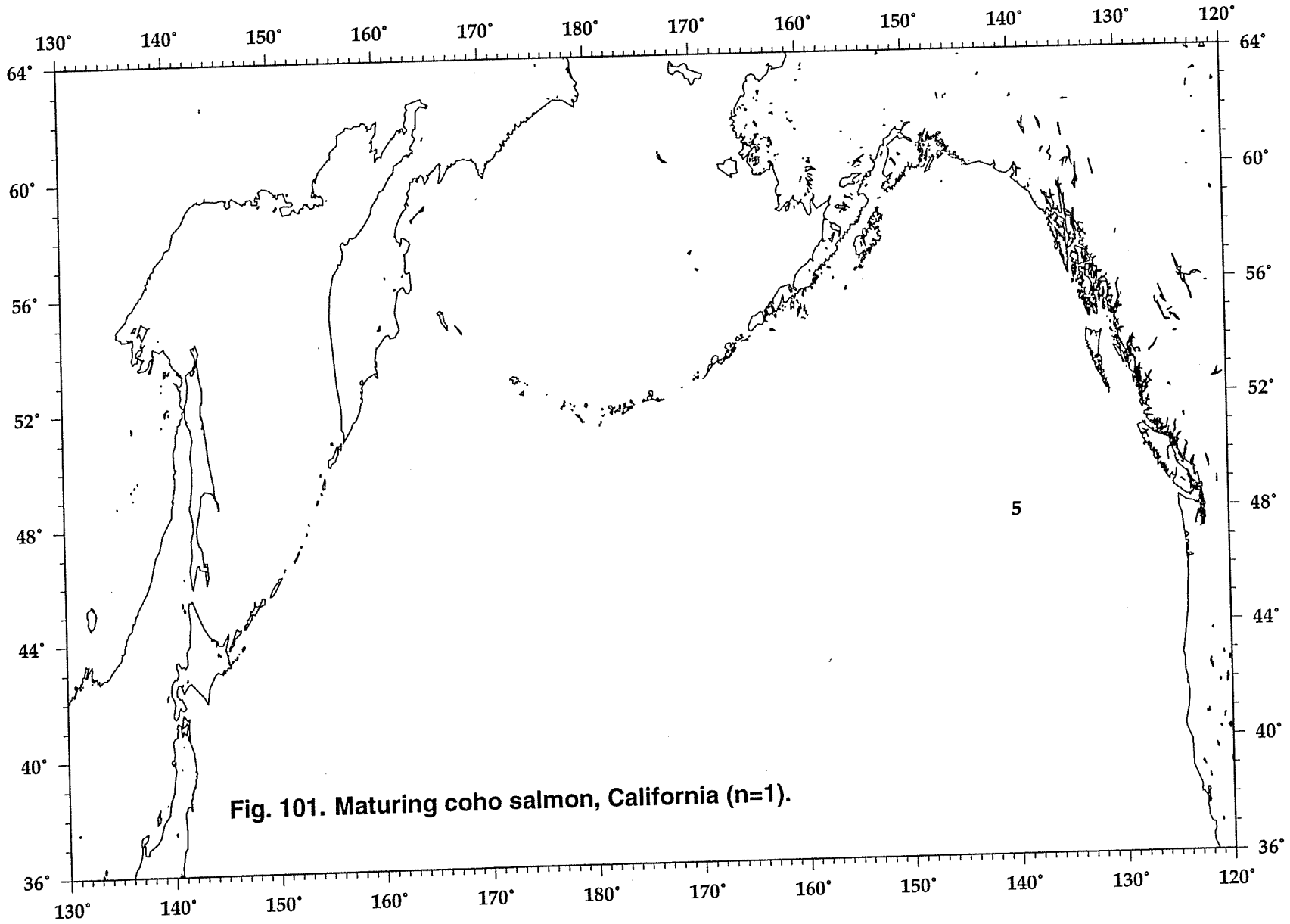


Fig. 101. Maturing coho salmon, California (n=1).

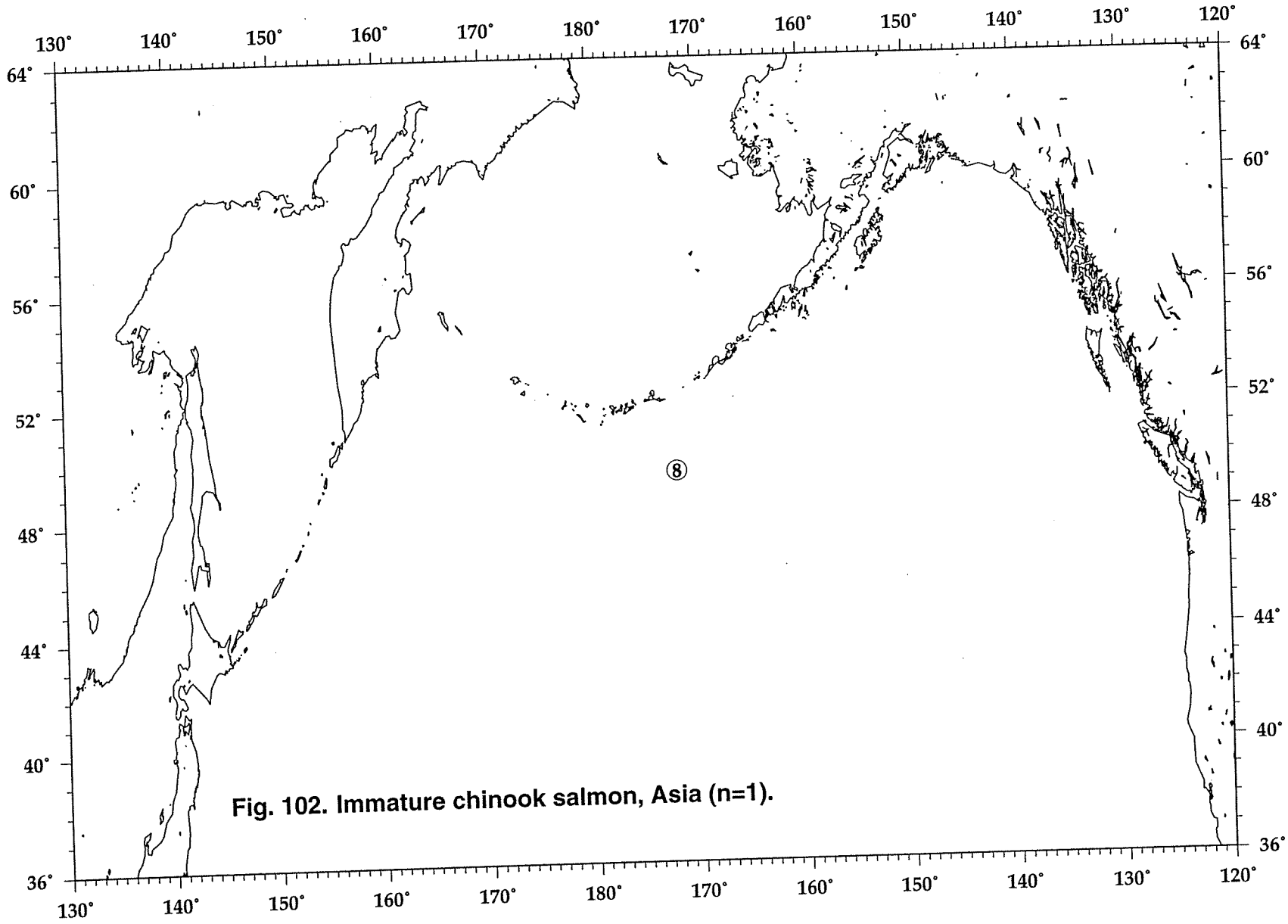


Fig. 102. Immature chinook salmon, Asia (n=1).

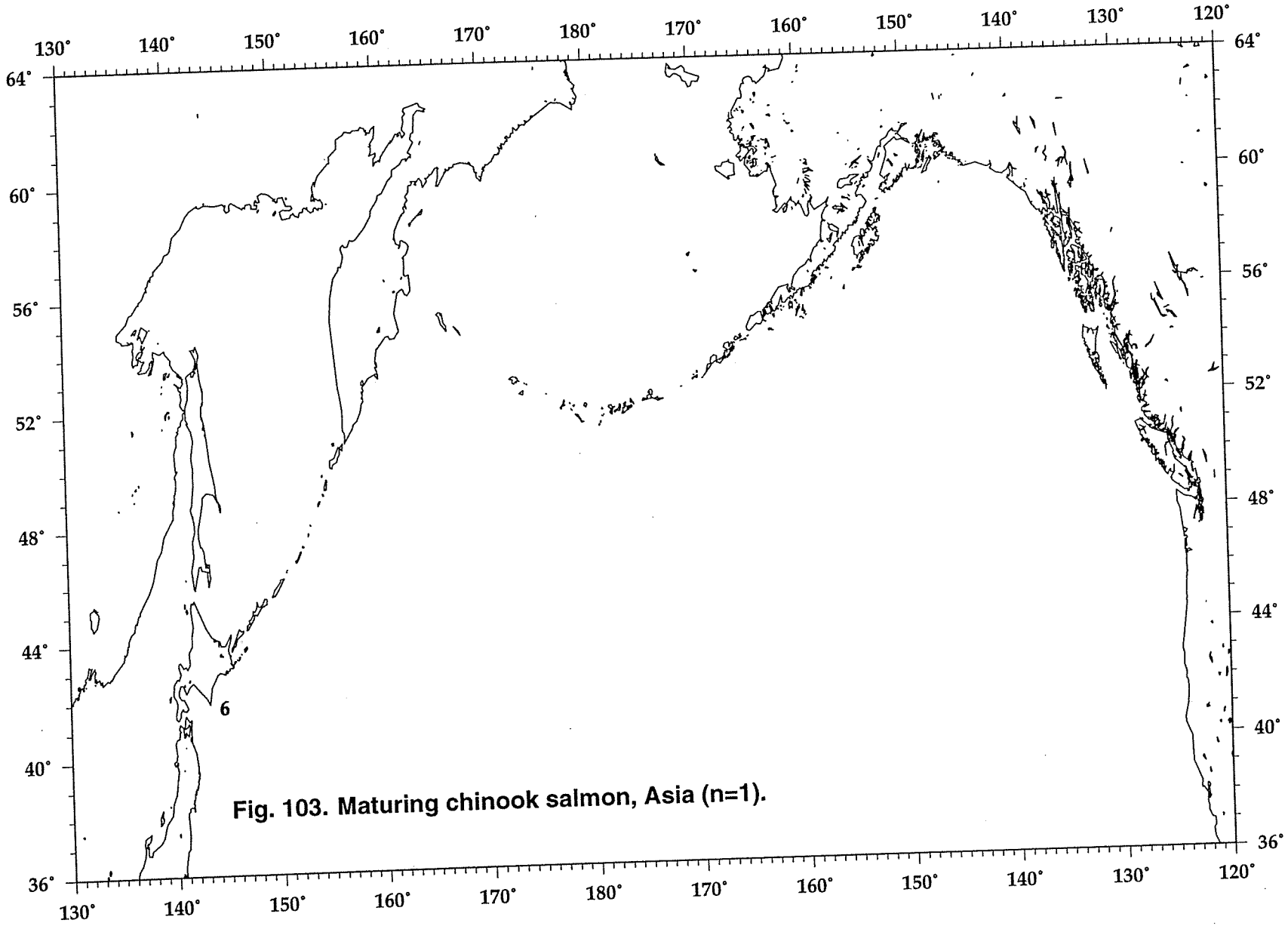


Fig. 103. Maturing chinook salmon, Asia (n=1).

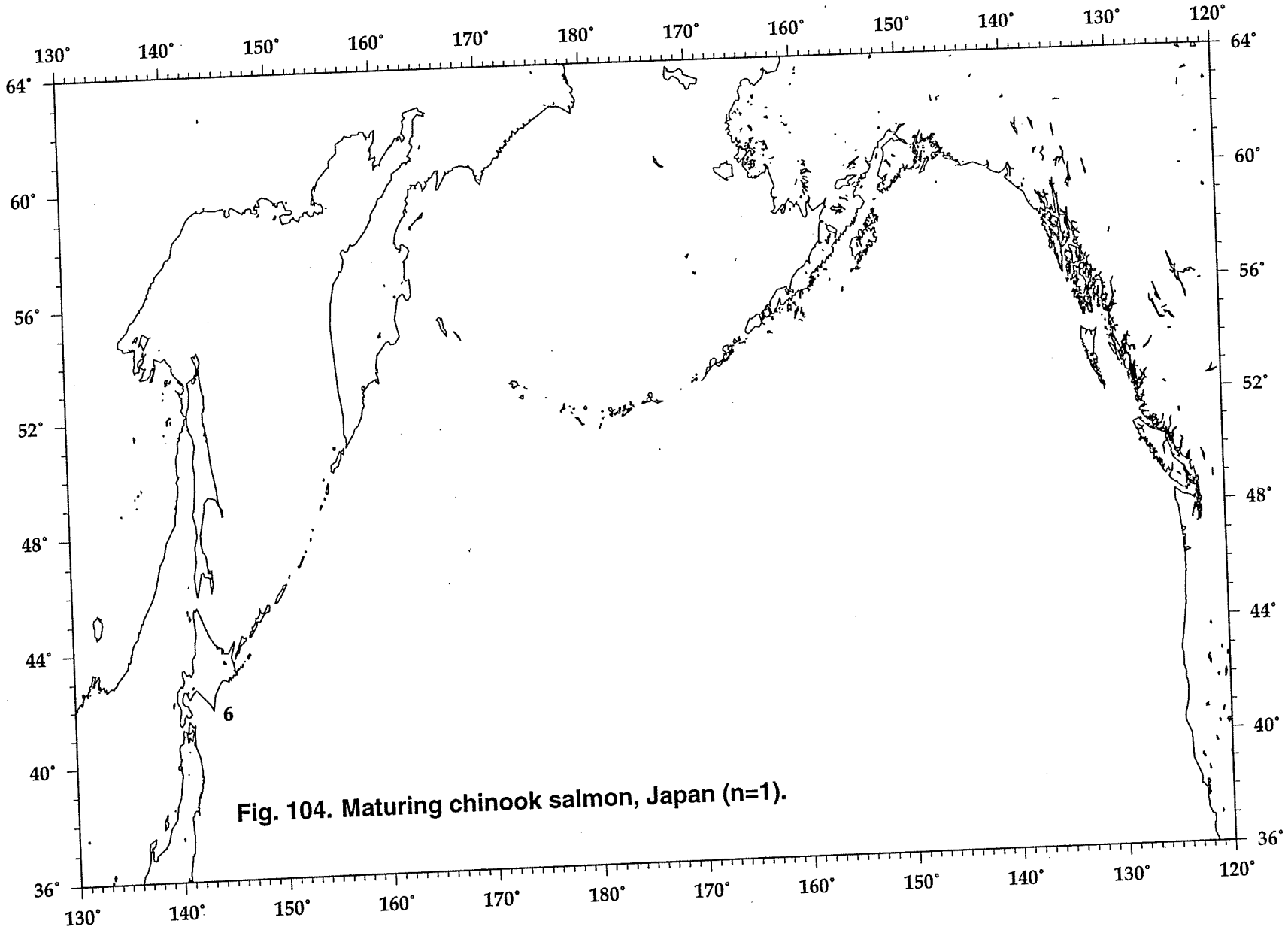


Fig. 104. Maturing chinook salmon, Japan (n=1).

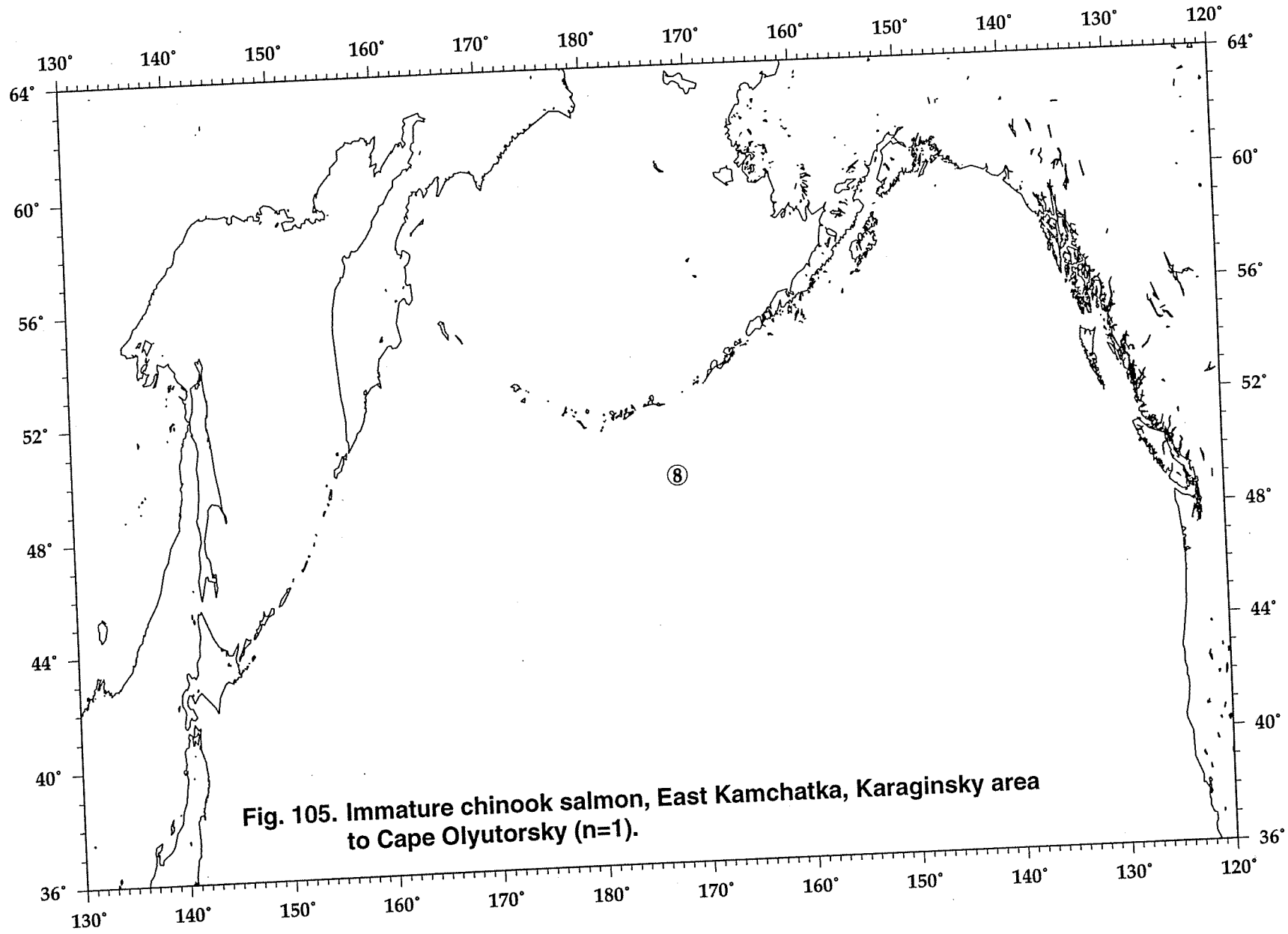


Fig. 105. Immature chinook salmon, East Kamchatka, Karaginsky area to Cape Olyutorsky (n=1).

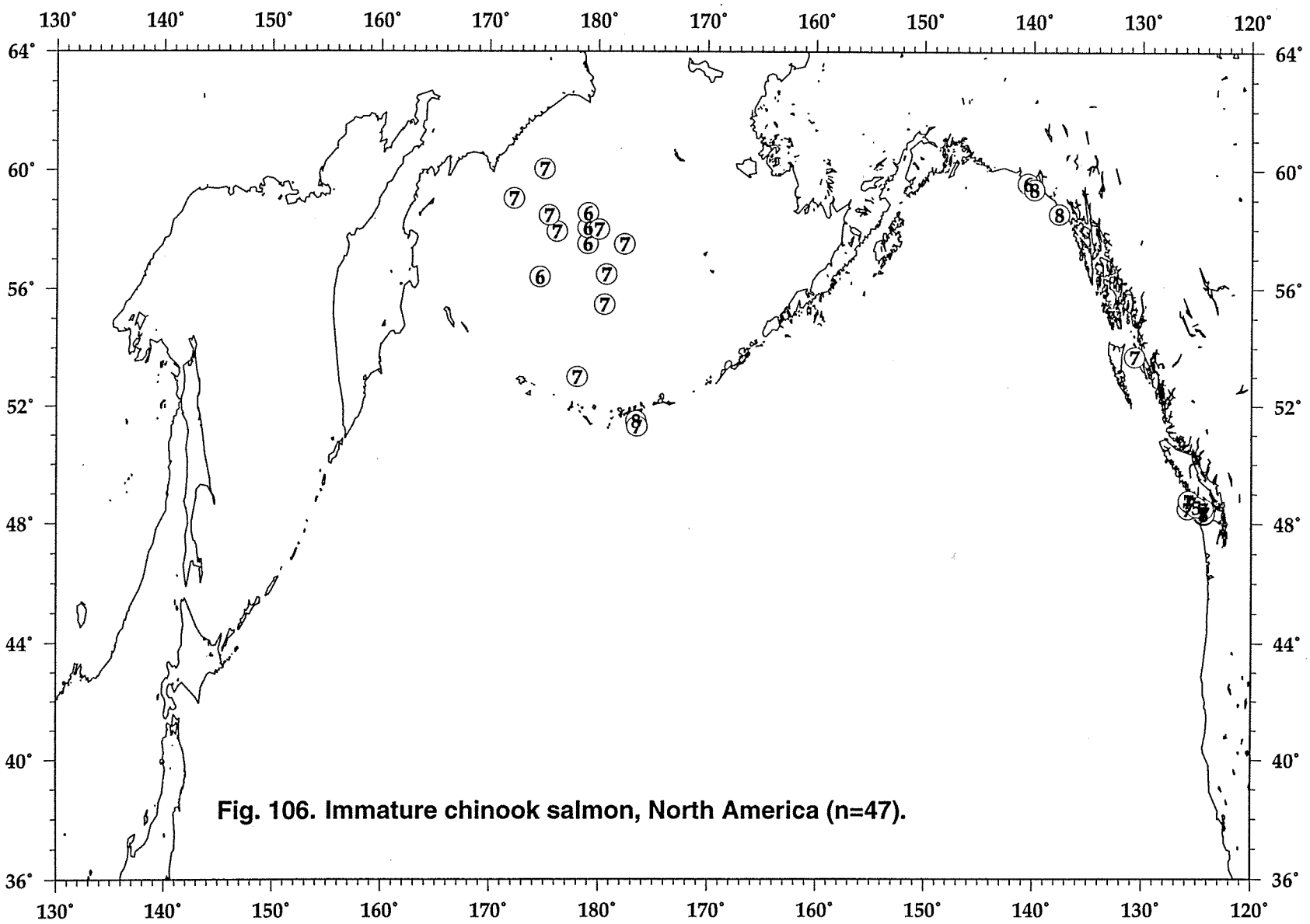


Fig. 106. Immature chinook salmon, North America (n=47).

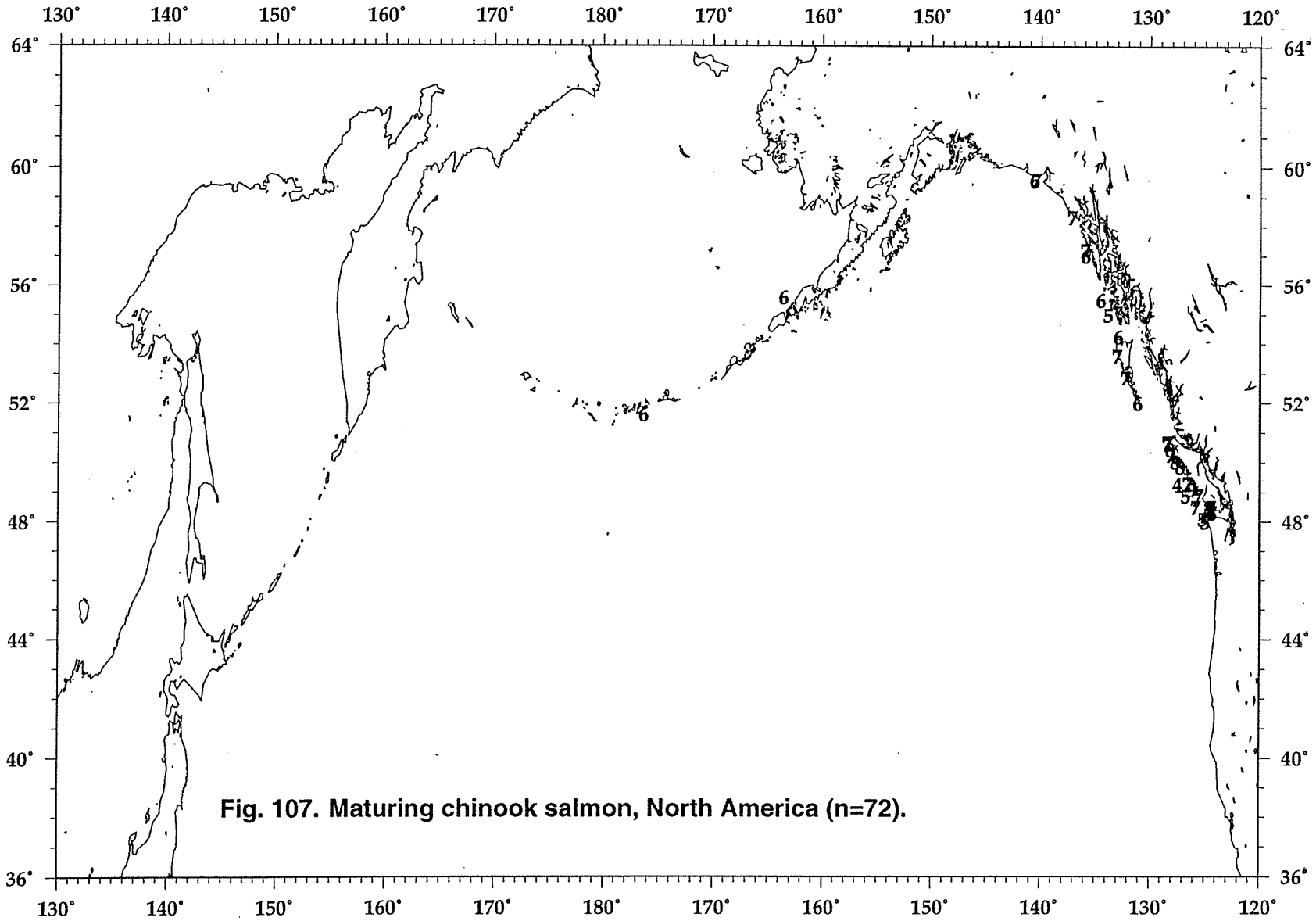


Fig. 107. Maturing chinook salmon, North America (n=72).

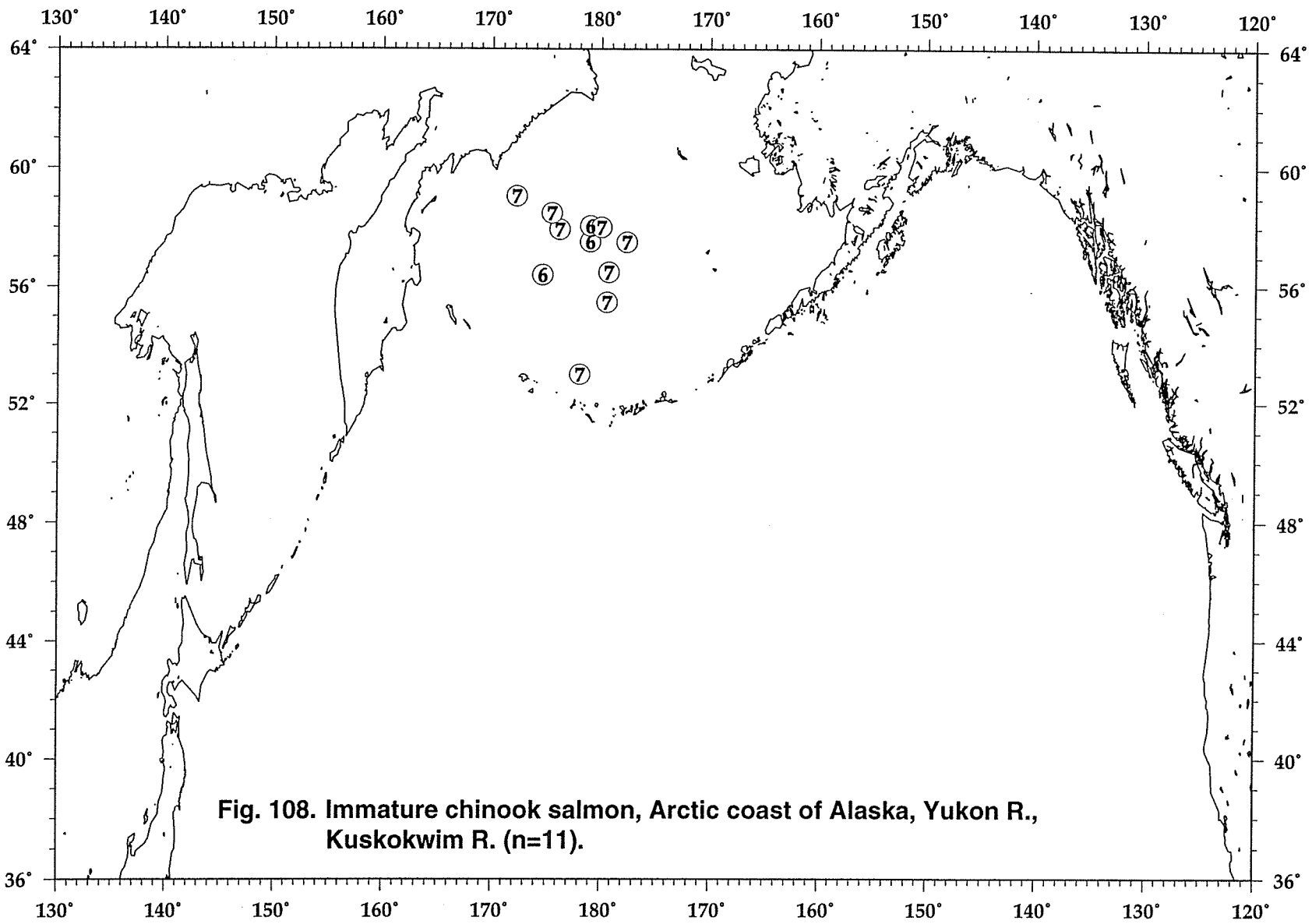


Fig. 108. Immature chinook salmon, Arctic coast of Alaska, Yukon R., Kuskokwim R. (n=11).

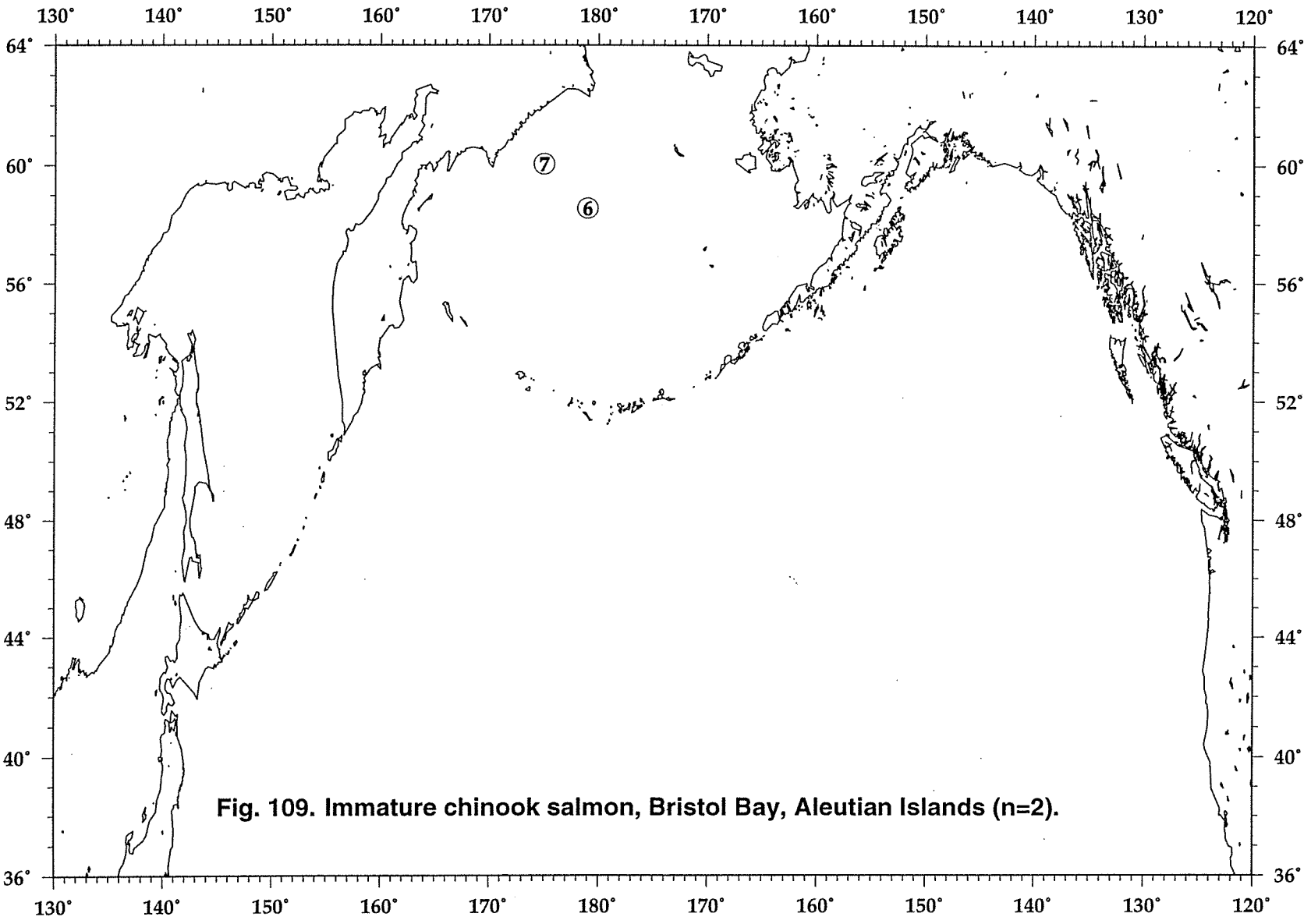


Fig. 109. Immature chinook salmon, Bristol Bay, Aleutian Islands (n=2).

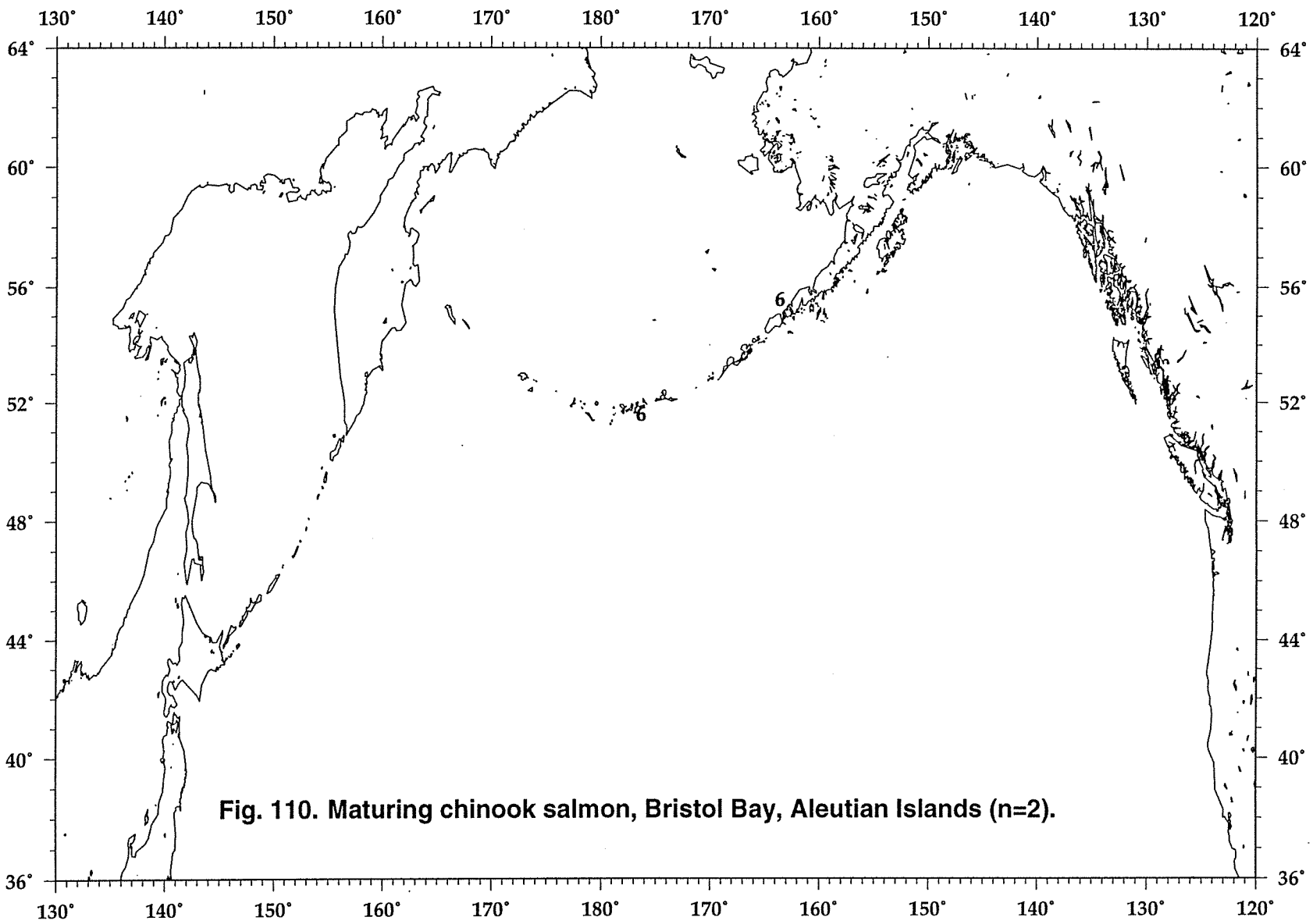


Fig. 110. Maturing chinook salmon, Bristol Bay, Aleutian Islands (n=2).

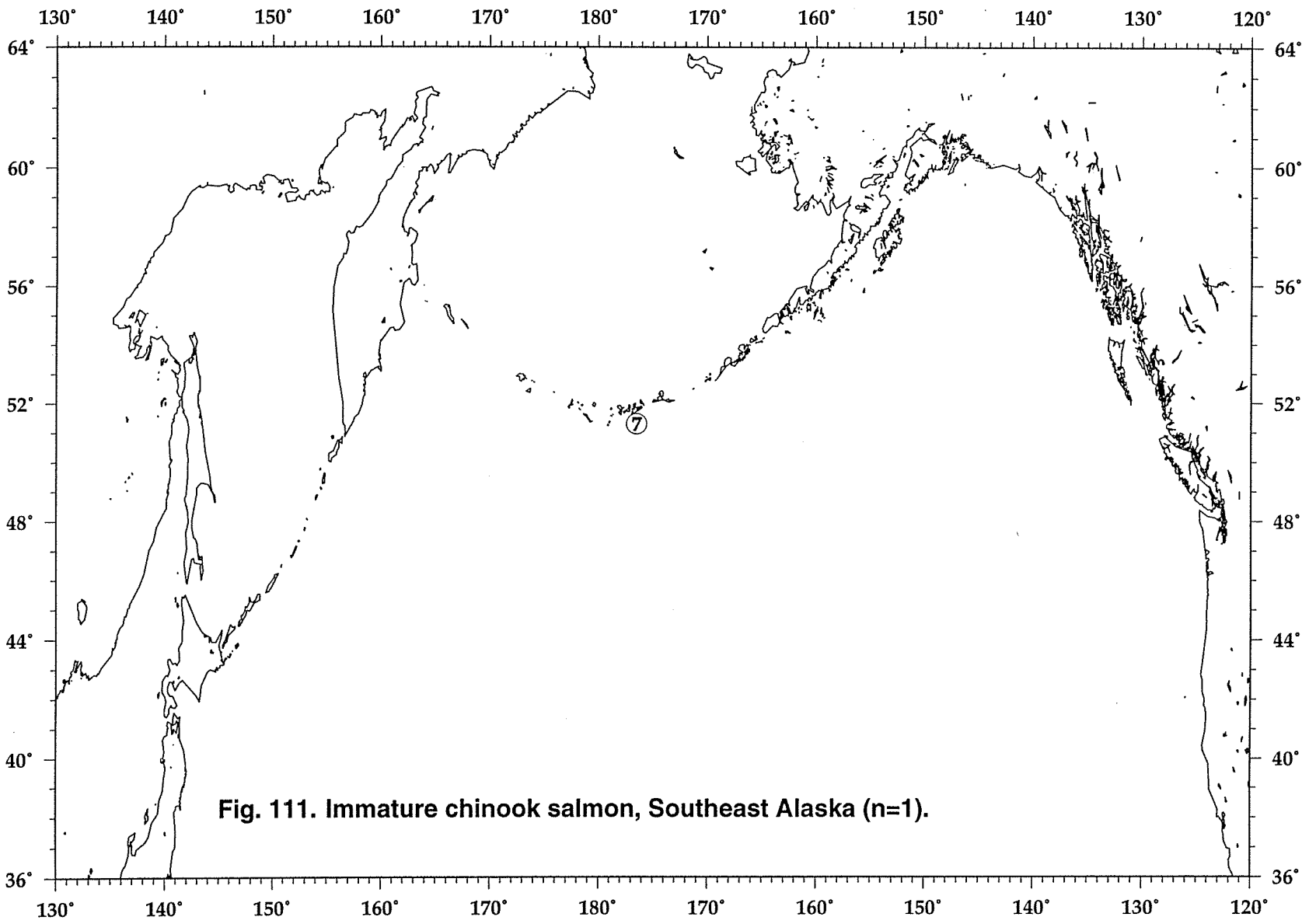


Fig. 111. Immature chinook salmon, Southeast Alaska (n=1).

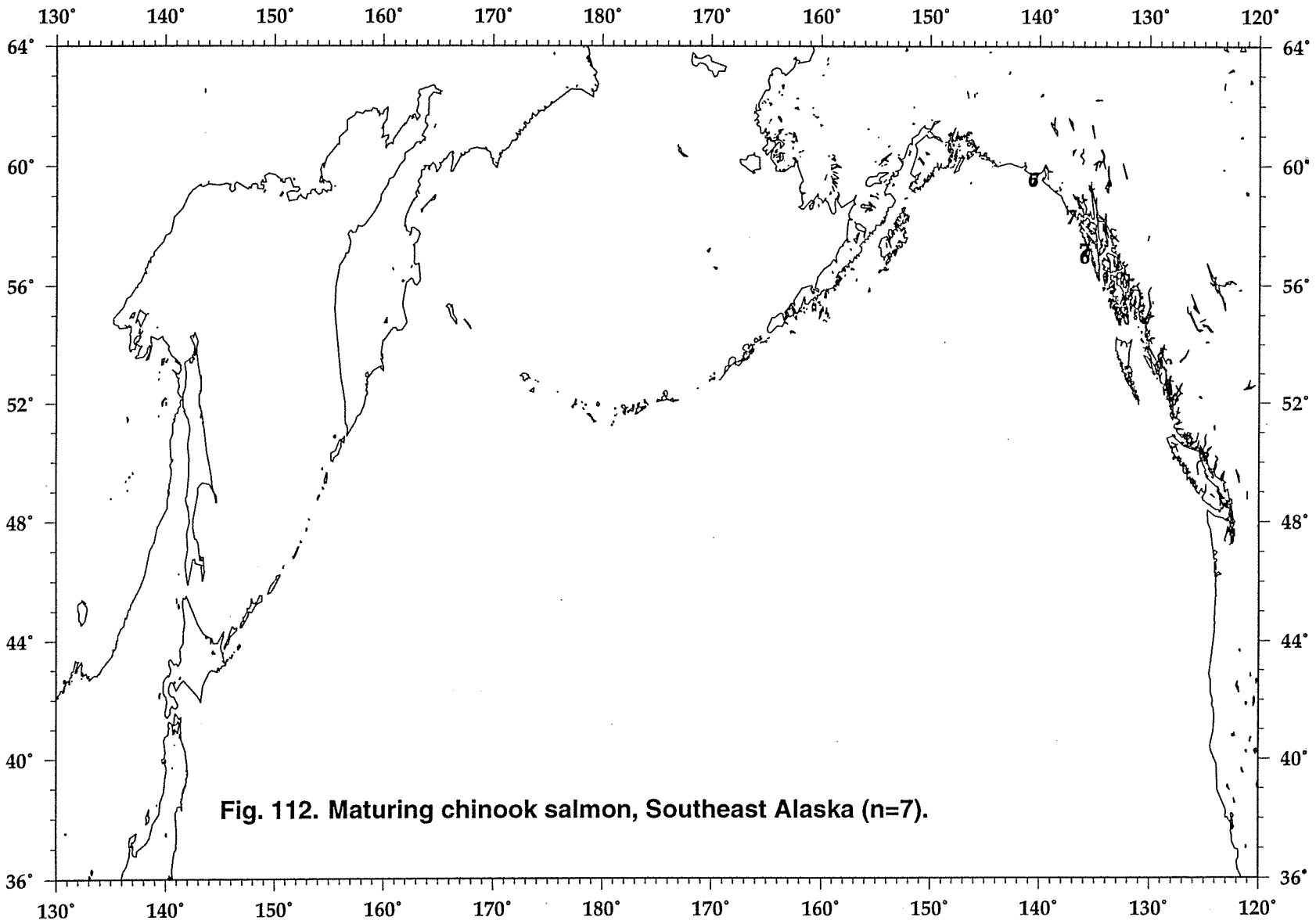


Fig. 112. Maturing chinook salmon, Southeast Alaska (n=7).

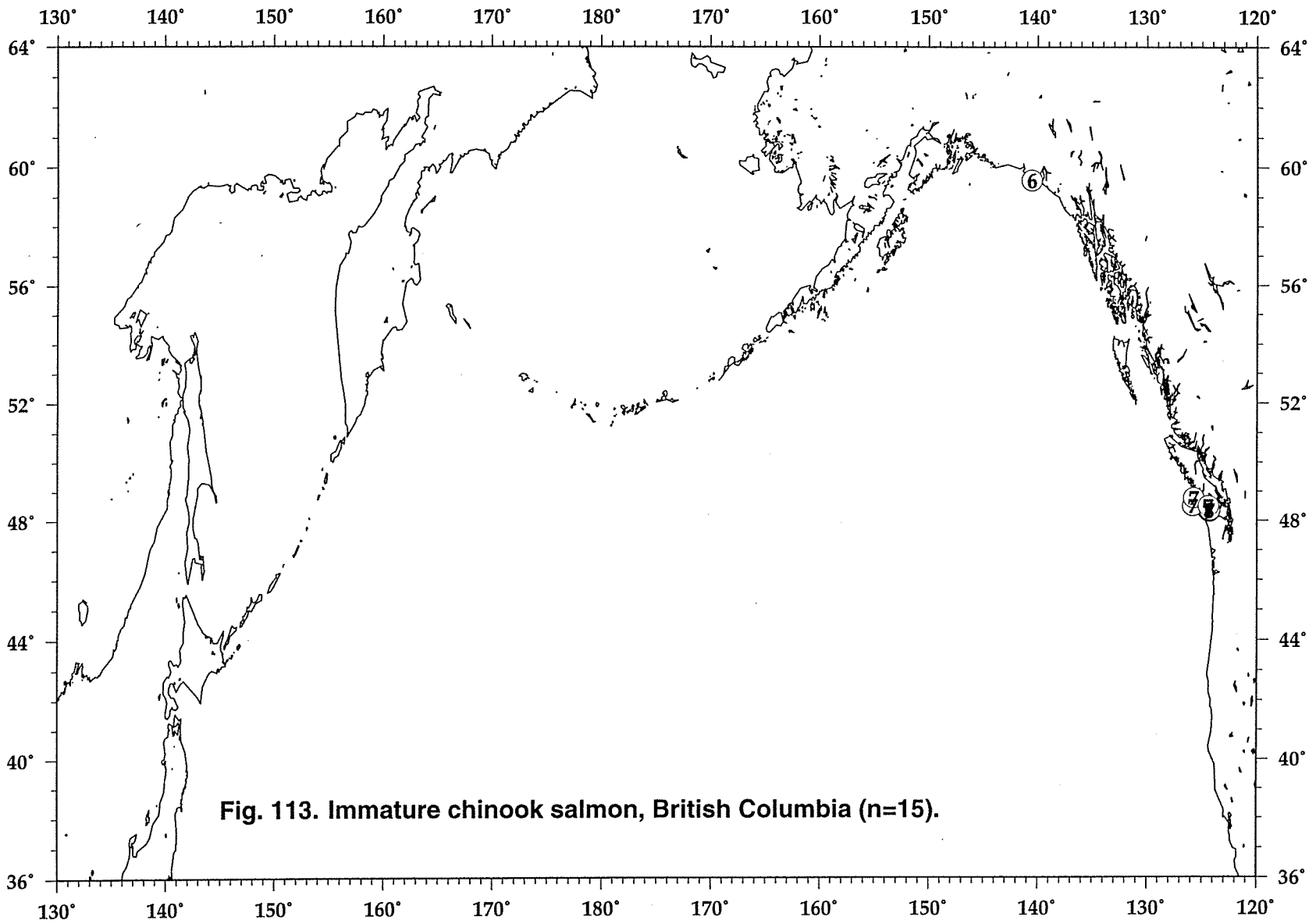


Fig. 113. Immature chinook salmon, British Columbia (n=15).

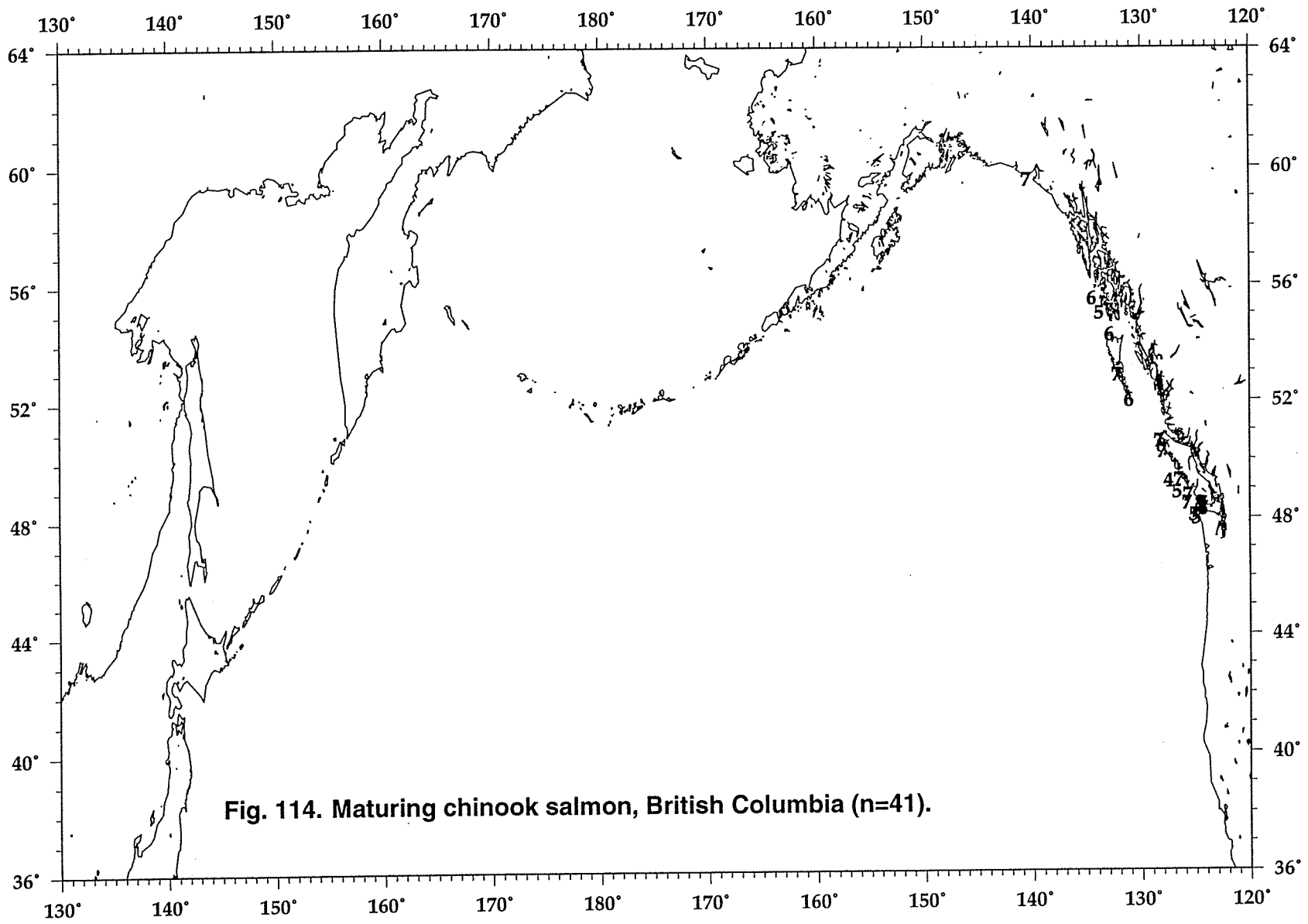


Fig. 114. Maturing chinook salmon, British Columbia (n=41).

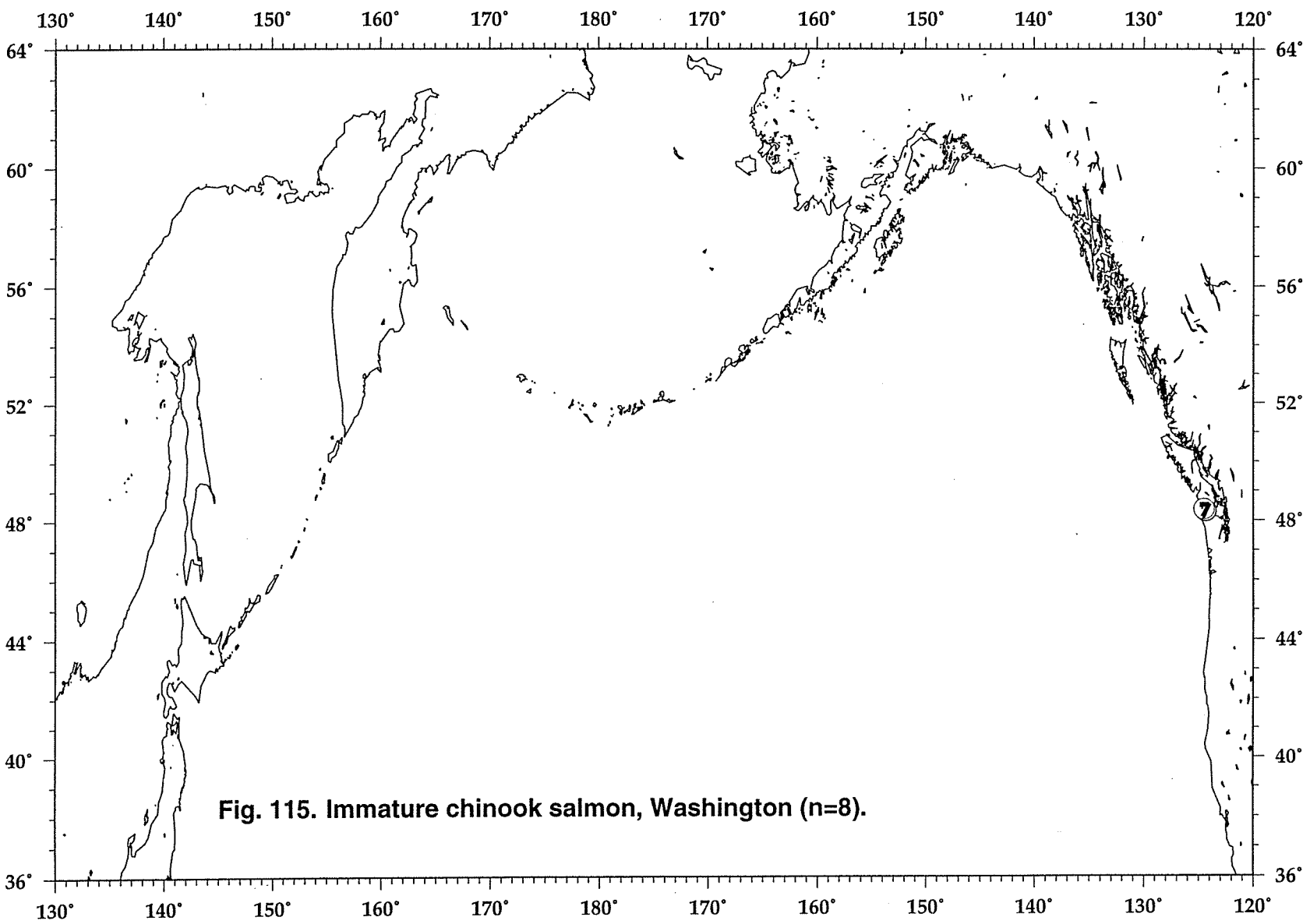


Fig. 115. Immature chinook salmon, Washington (n=8).

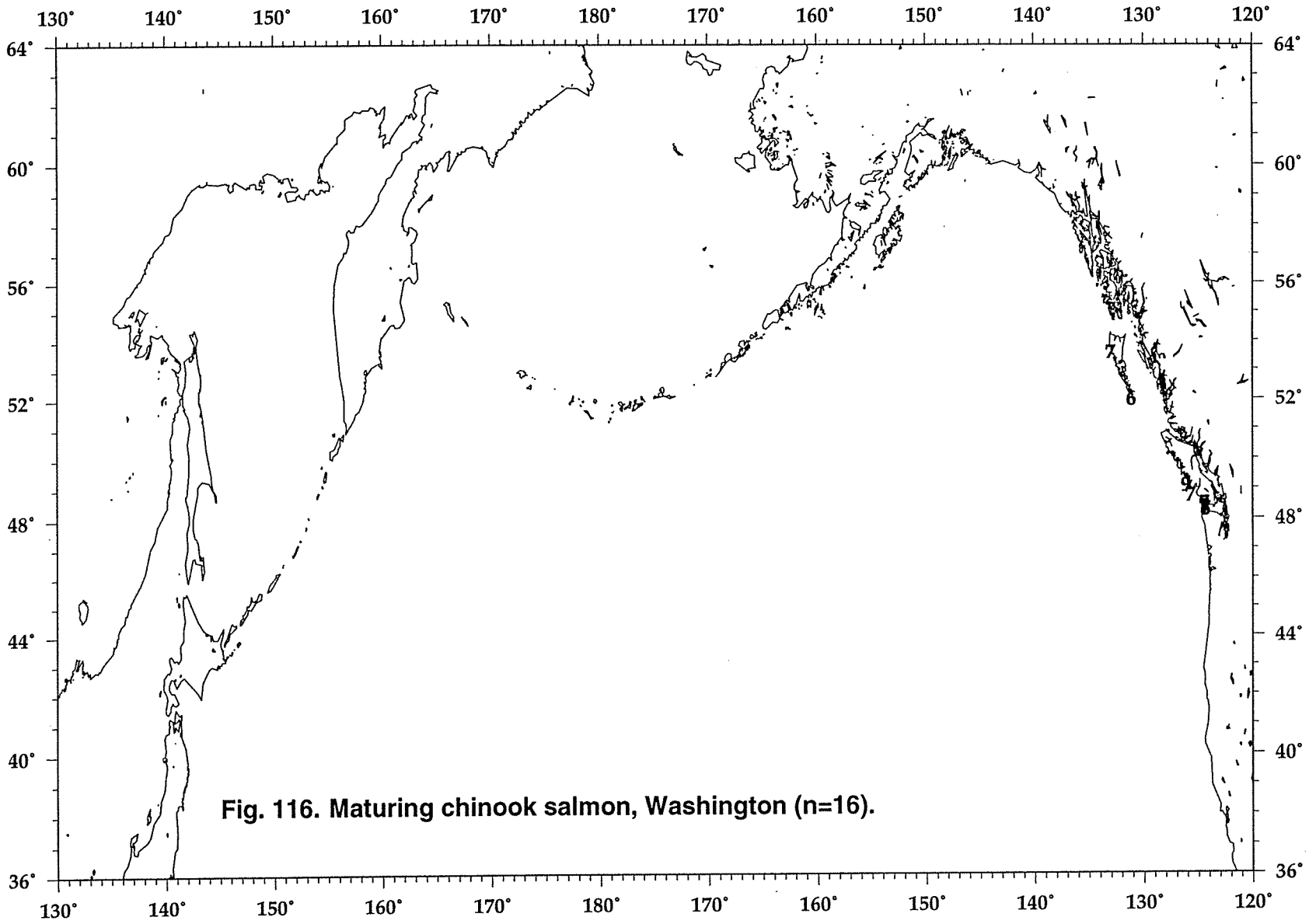


Fig. 116. Maturing chinook salmon, Washington (n=16).

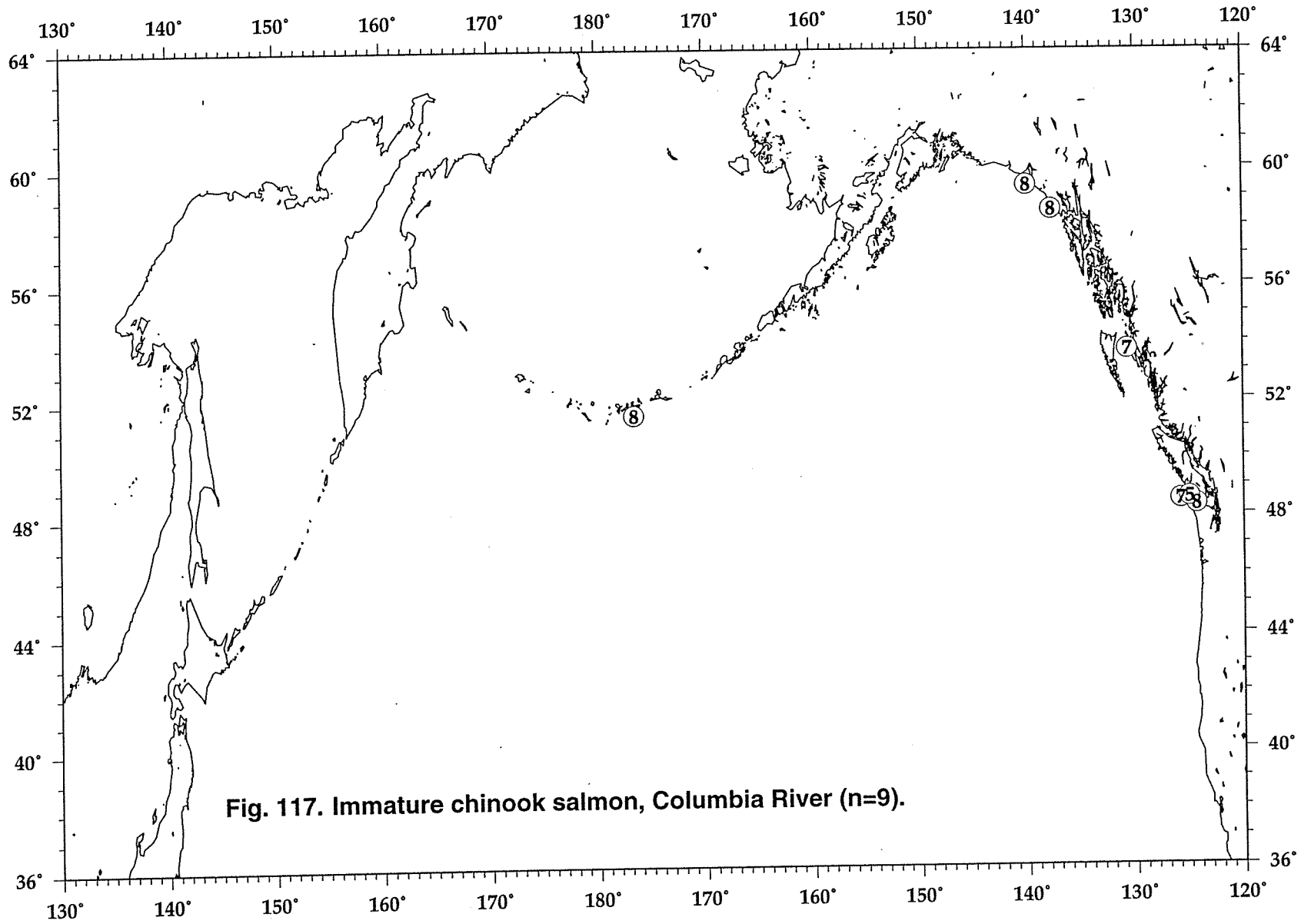


Fig. 117. Immature chinook salmon, Columbia River (n=9).

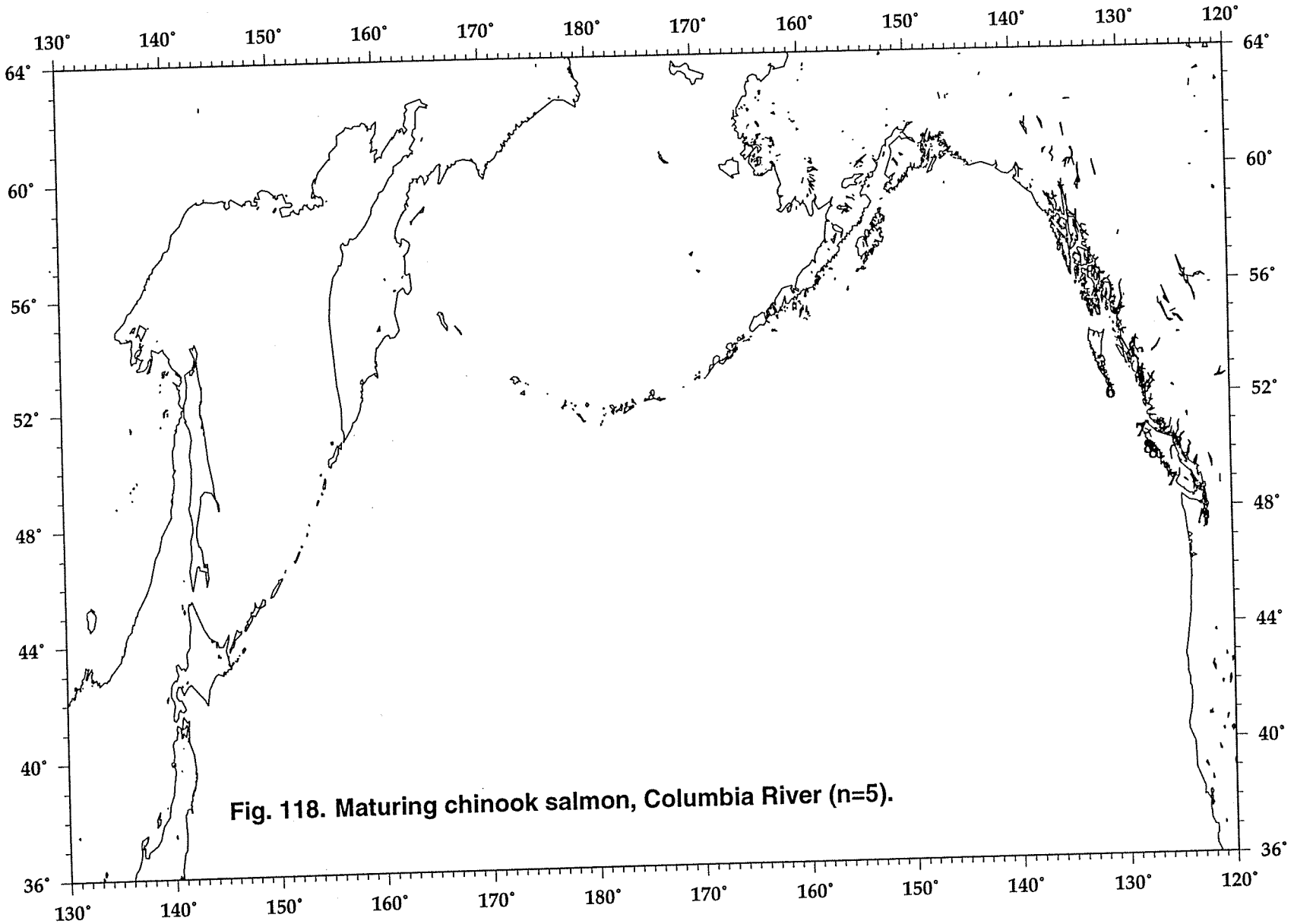


Fig. 118. Maturing chinook salmon, Columbia River (n=5).

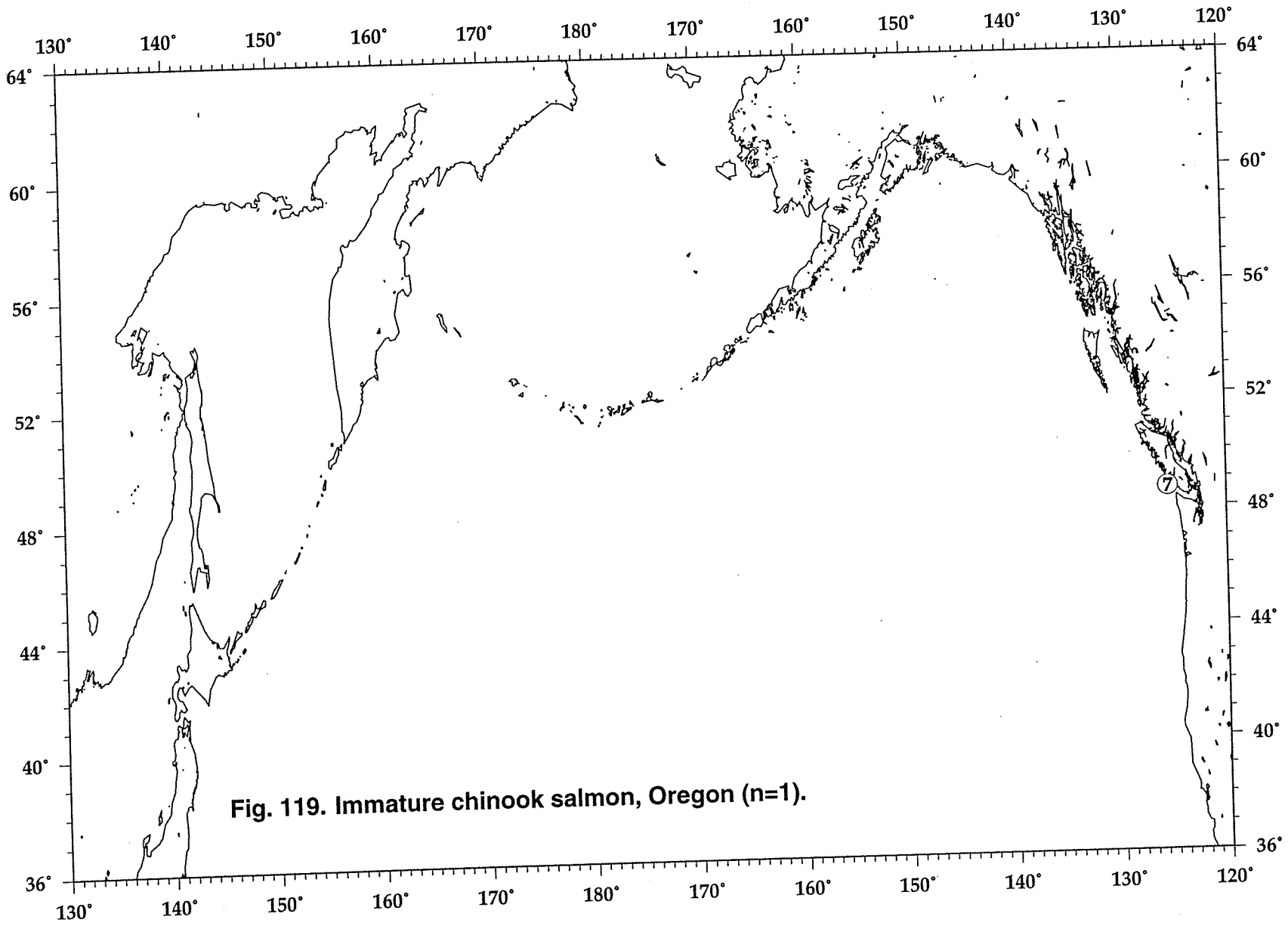


Fig. 119. Immature chinook salmon, Oregon (n=1).

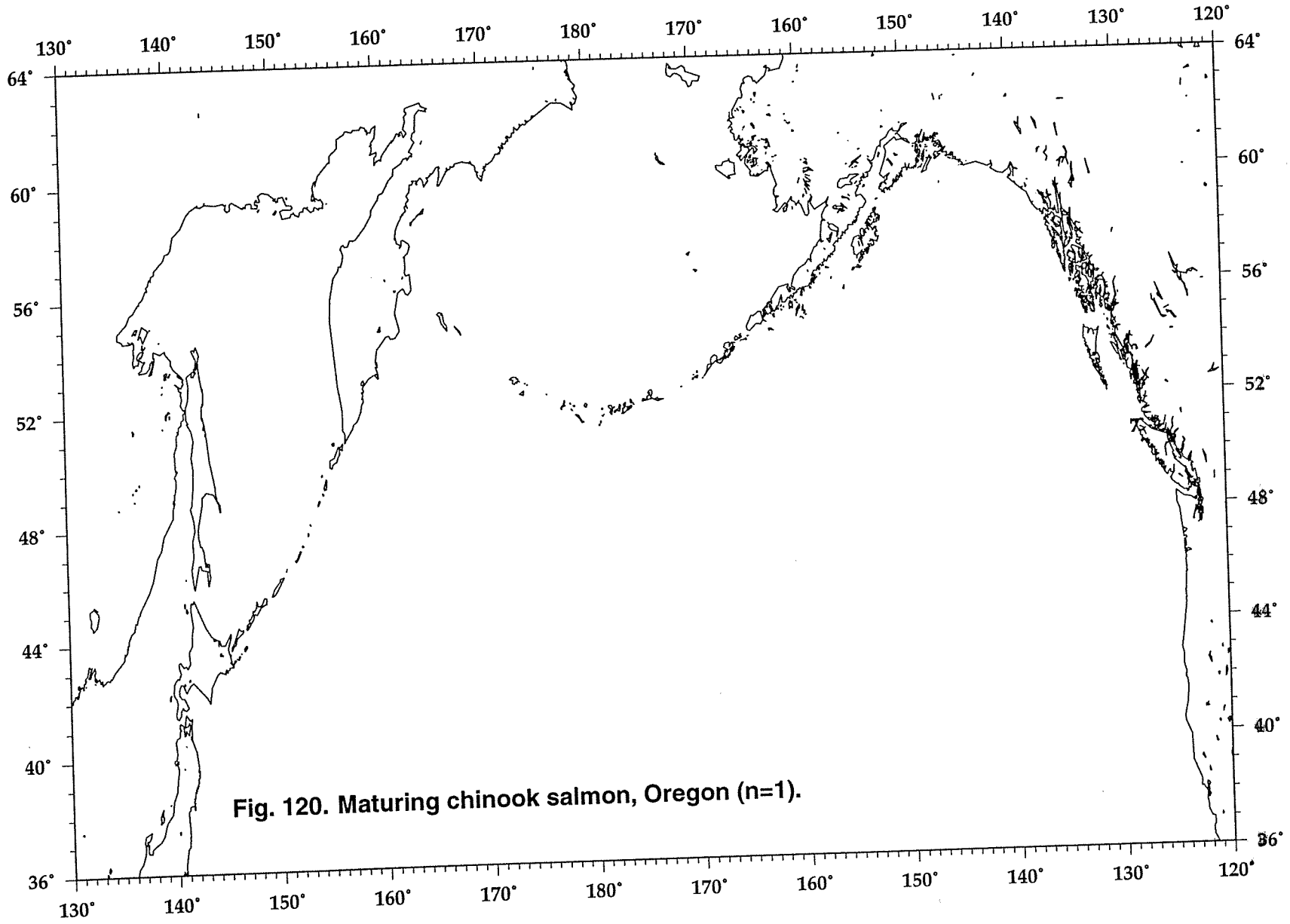


Fig. 120. Maturing chinook salmon, Oregon (n=1).

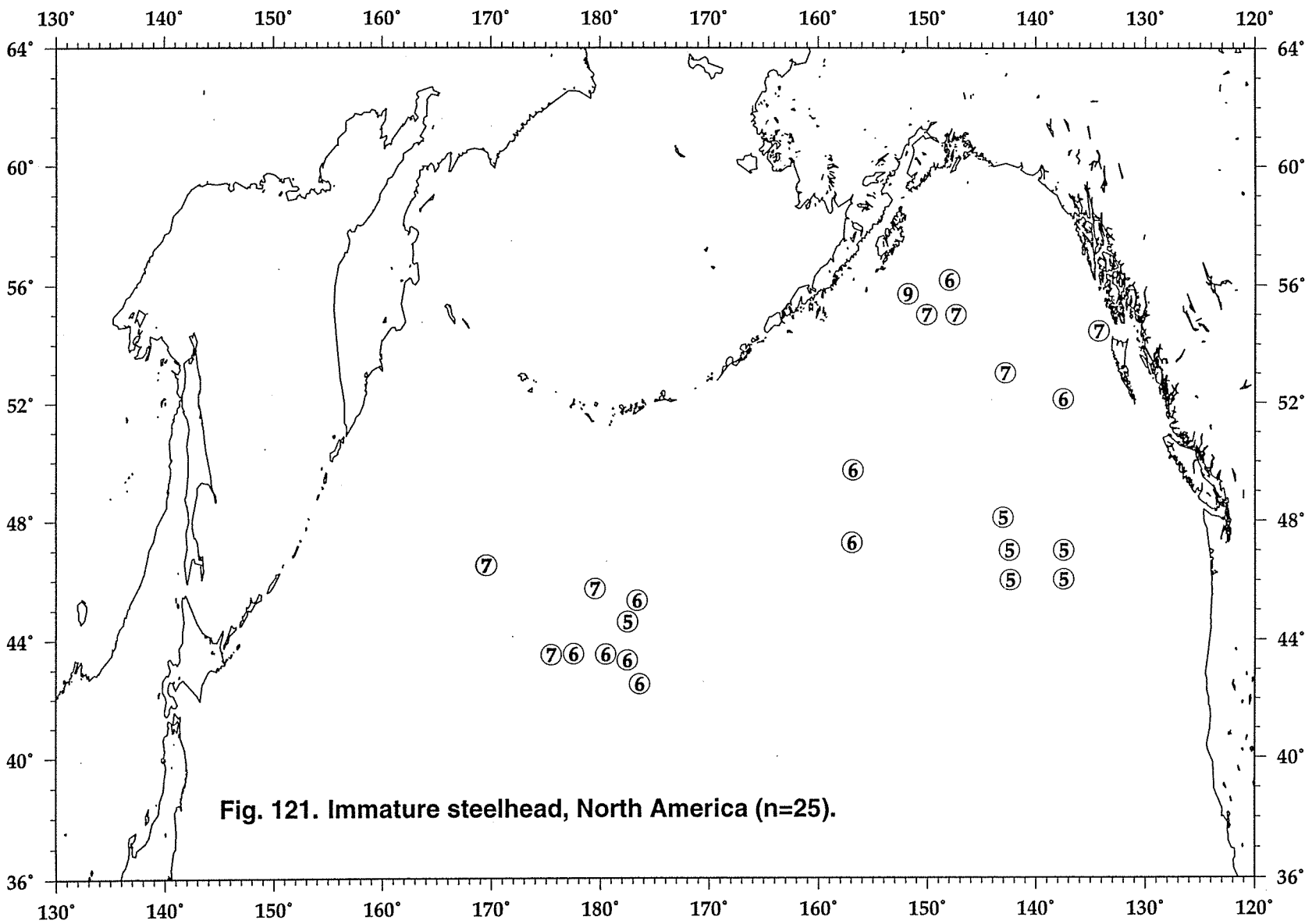


Fig. 121. Immature steelhead, North America (n=25).

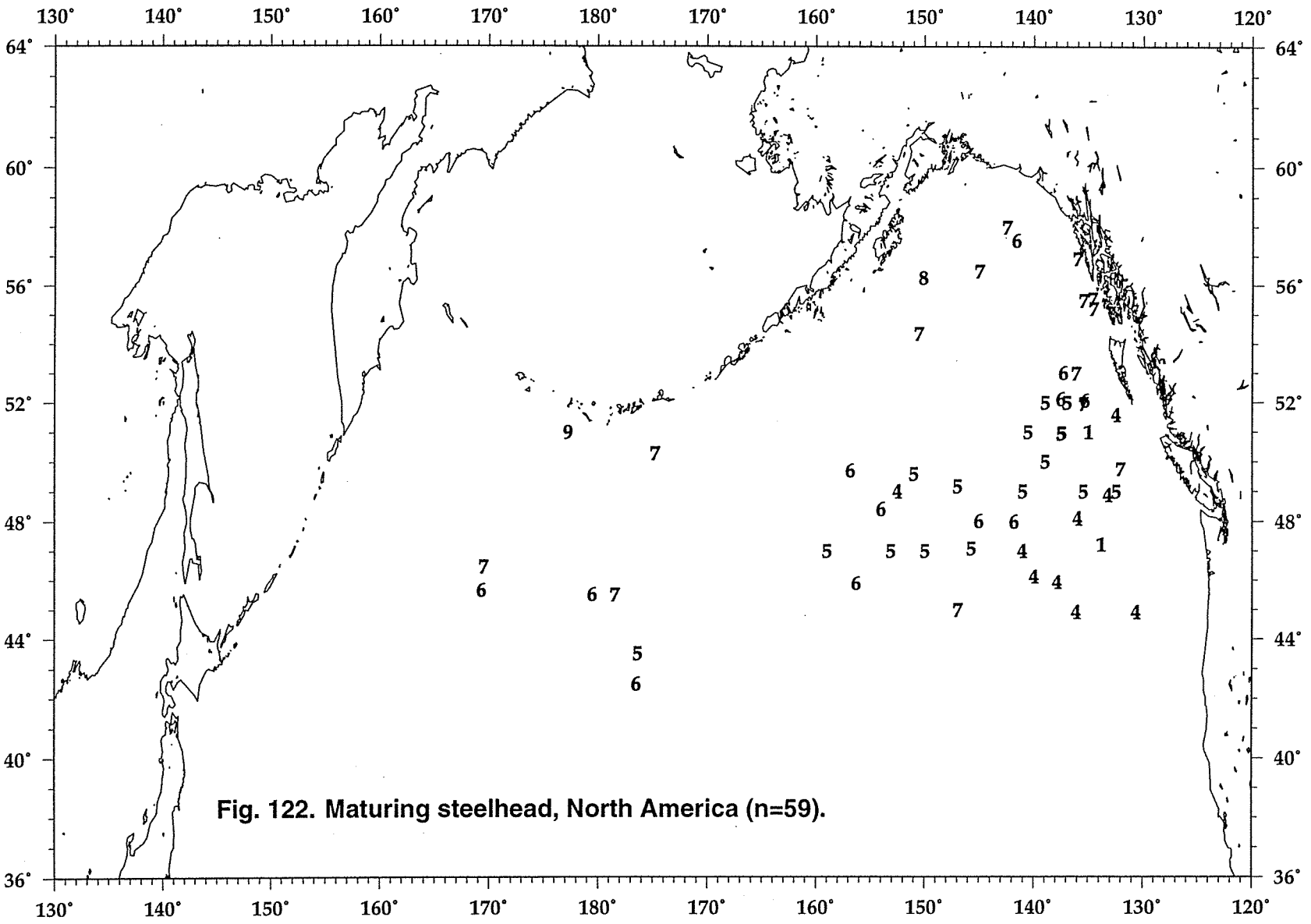


Fig. 122. Maturing steelhead, North America (n=59).

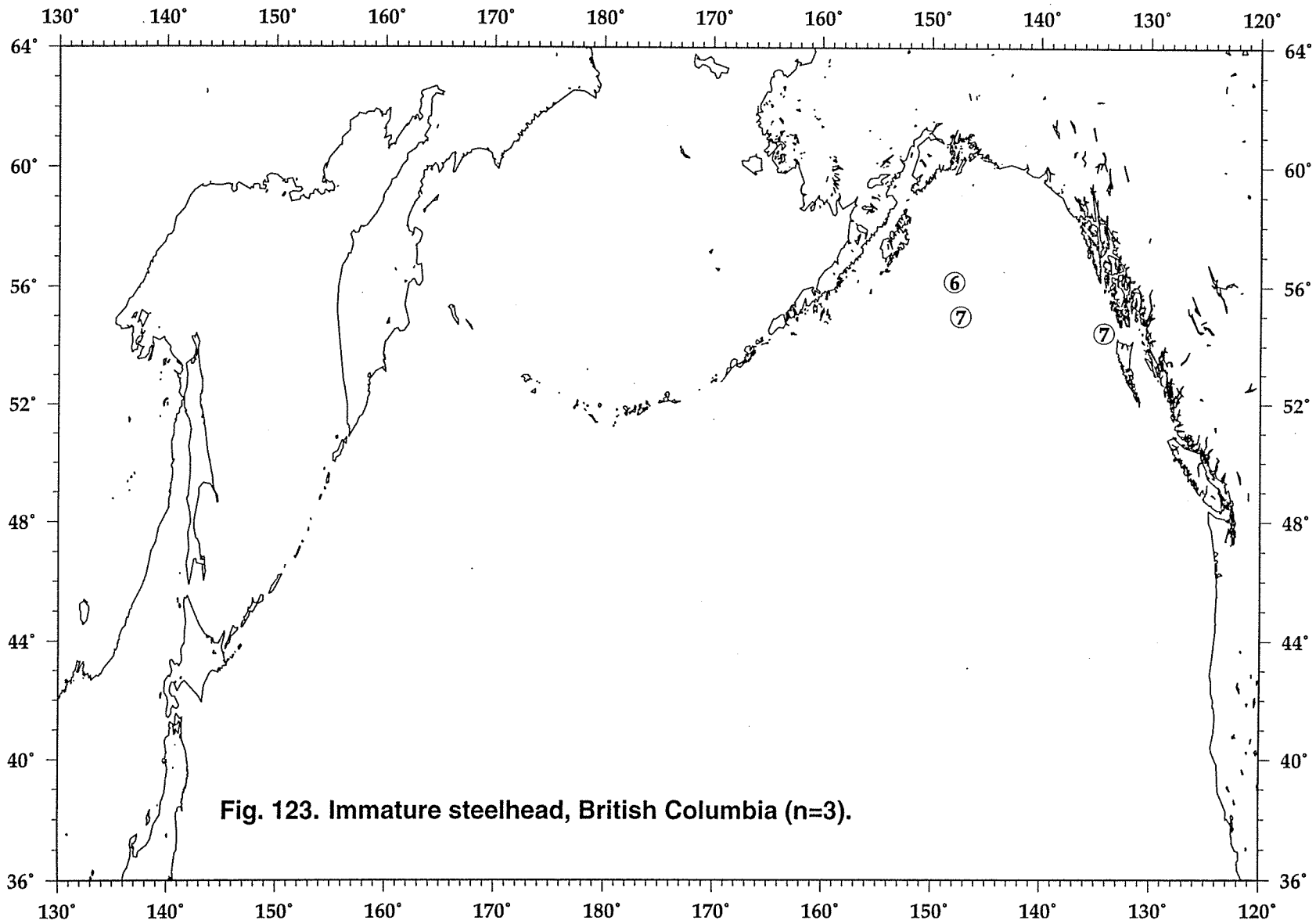


Fig. 123. Immature steelhead, British Columbia (n=3).

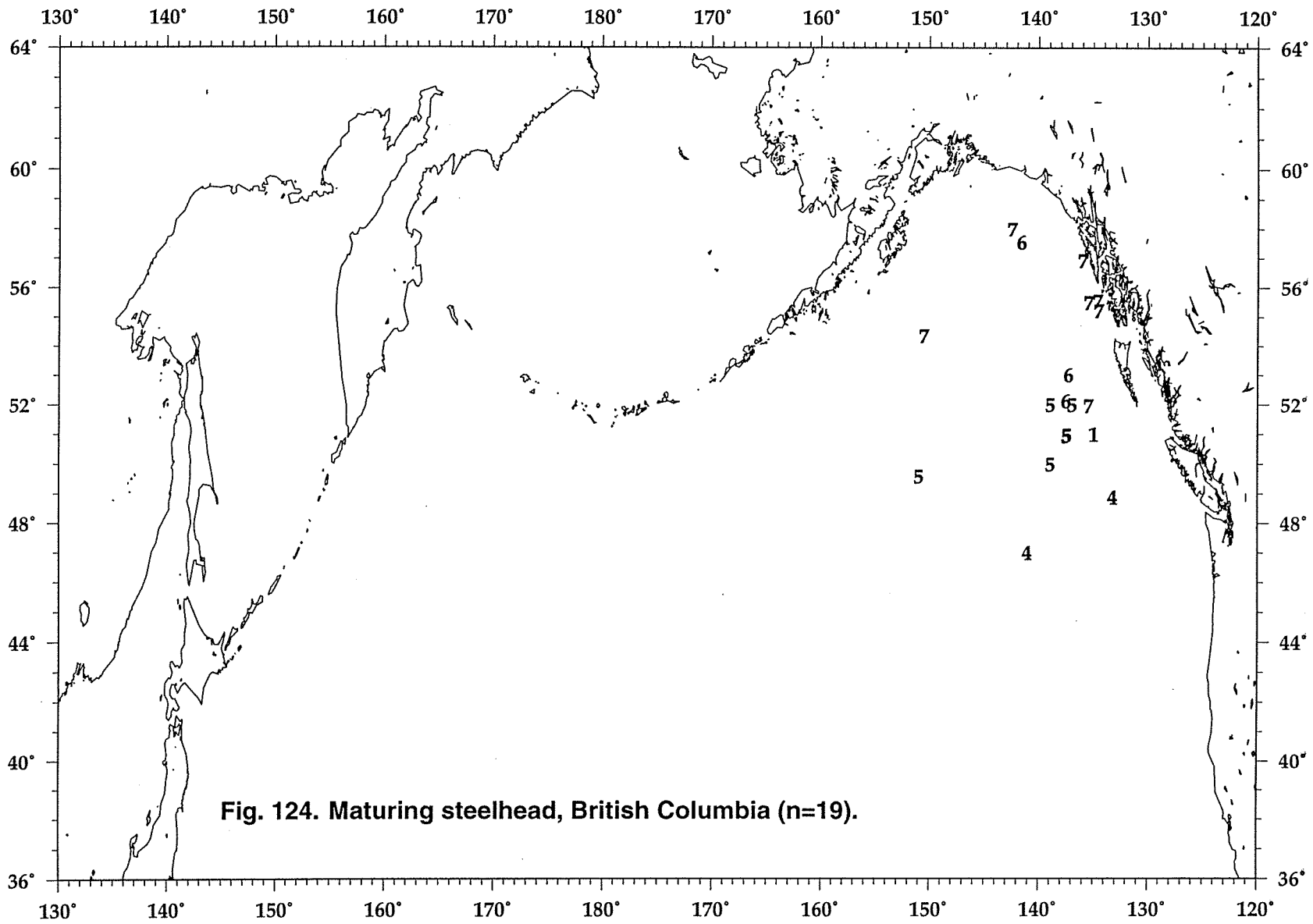


Fig. 124. Maturing steelhead, British Columbia (n=19).

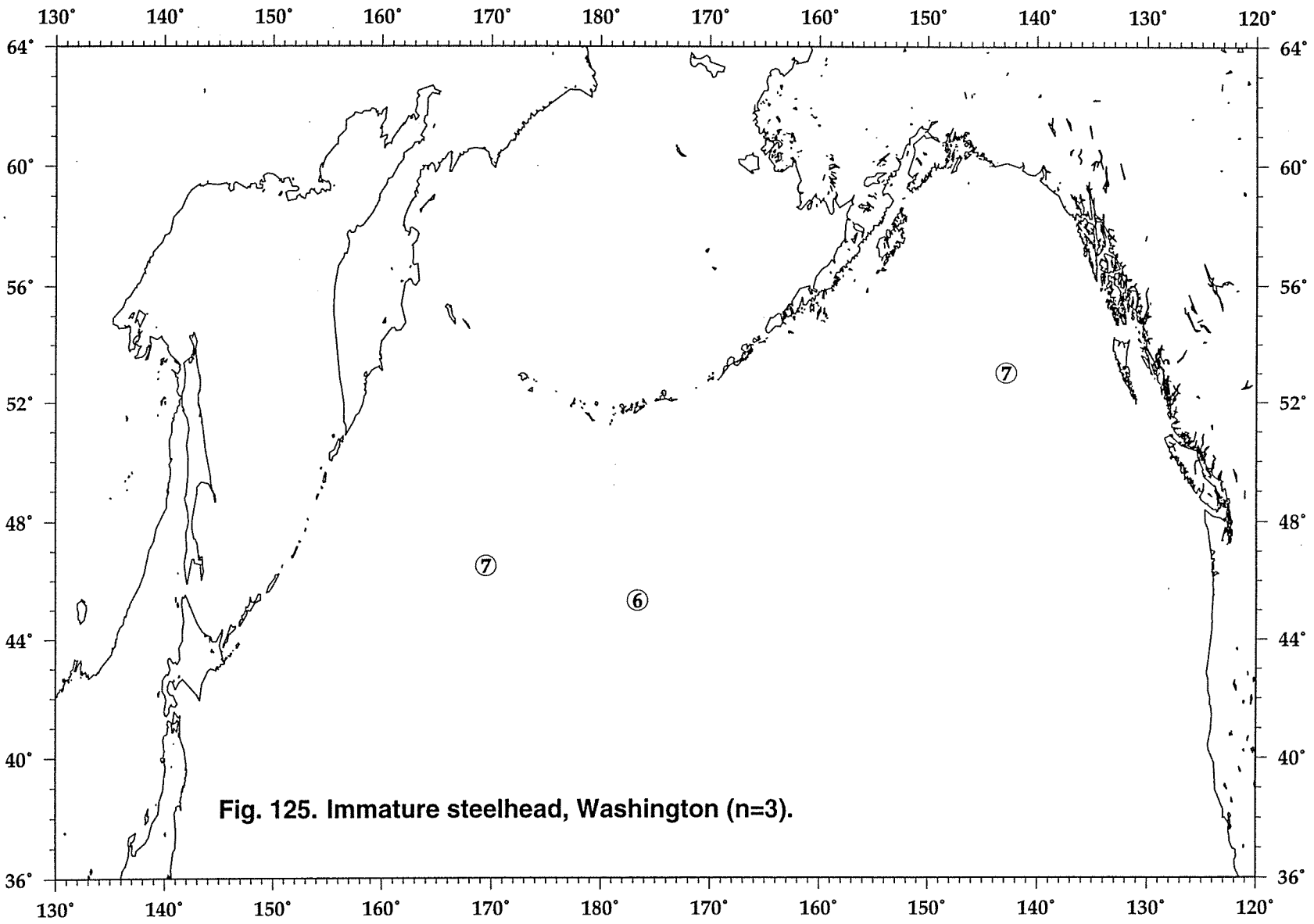


Fig. 125. Immature steelhead, Washington (n=3).

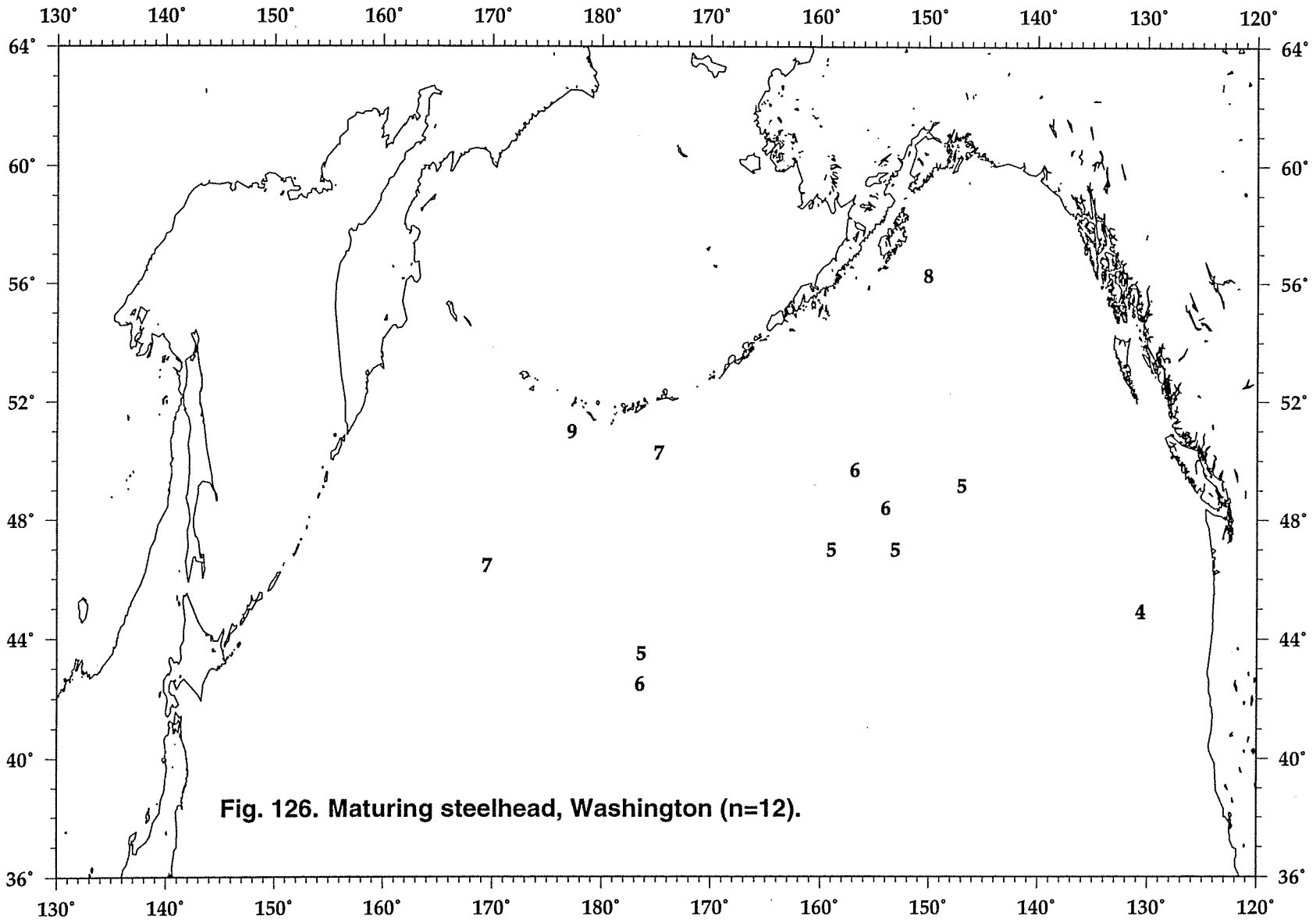


Fig. 126. Maturing steelhead, Washington (n=12).

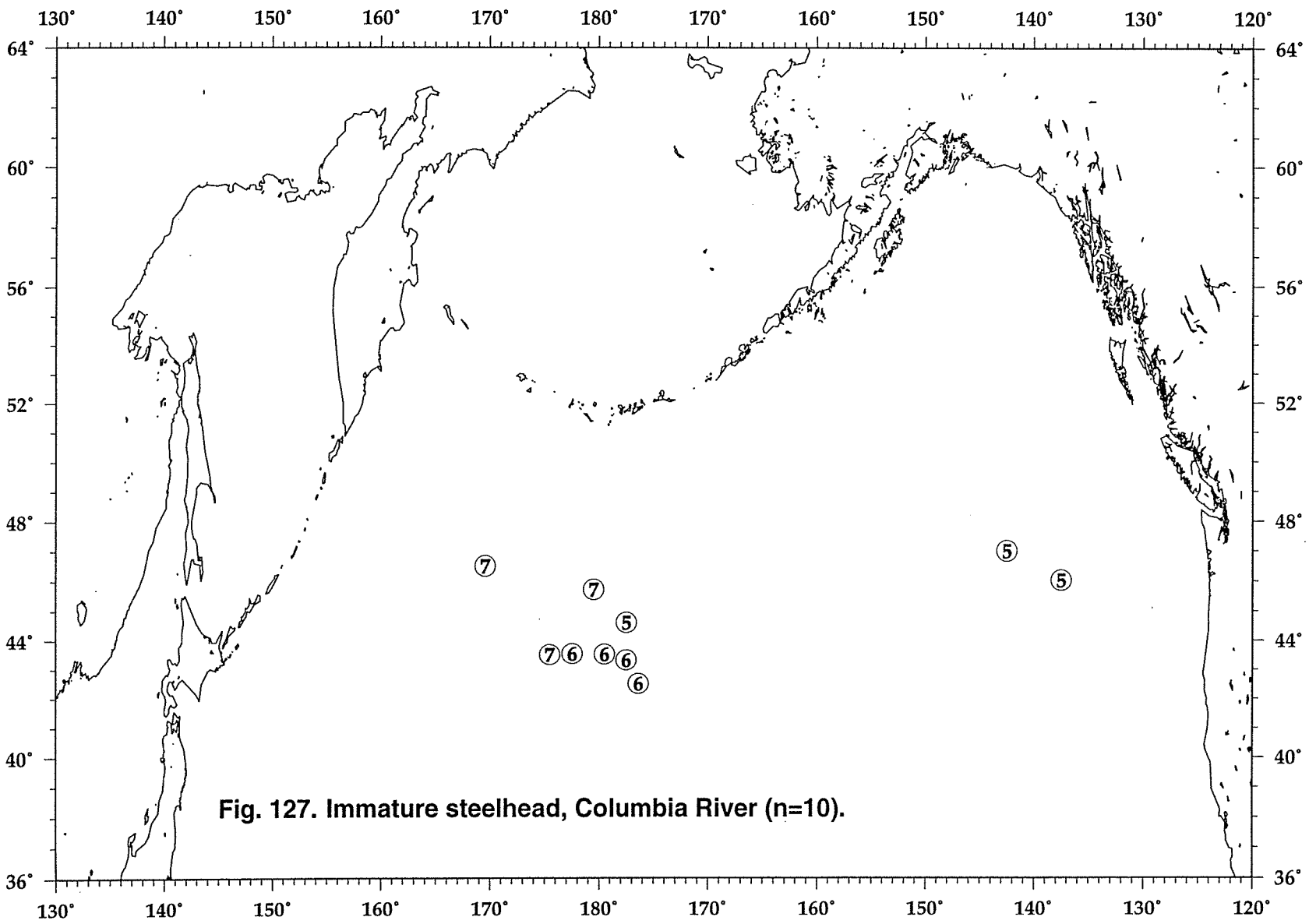


Fig. 127. Immature steelhead, Columbia River (n=10).

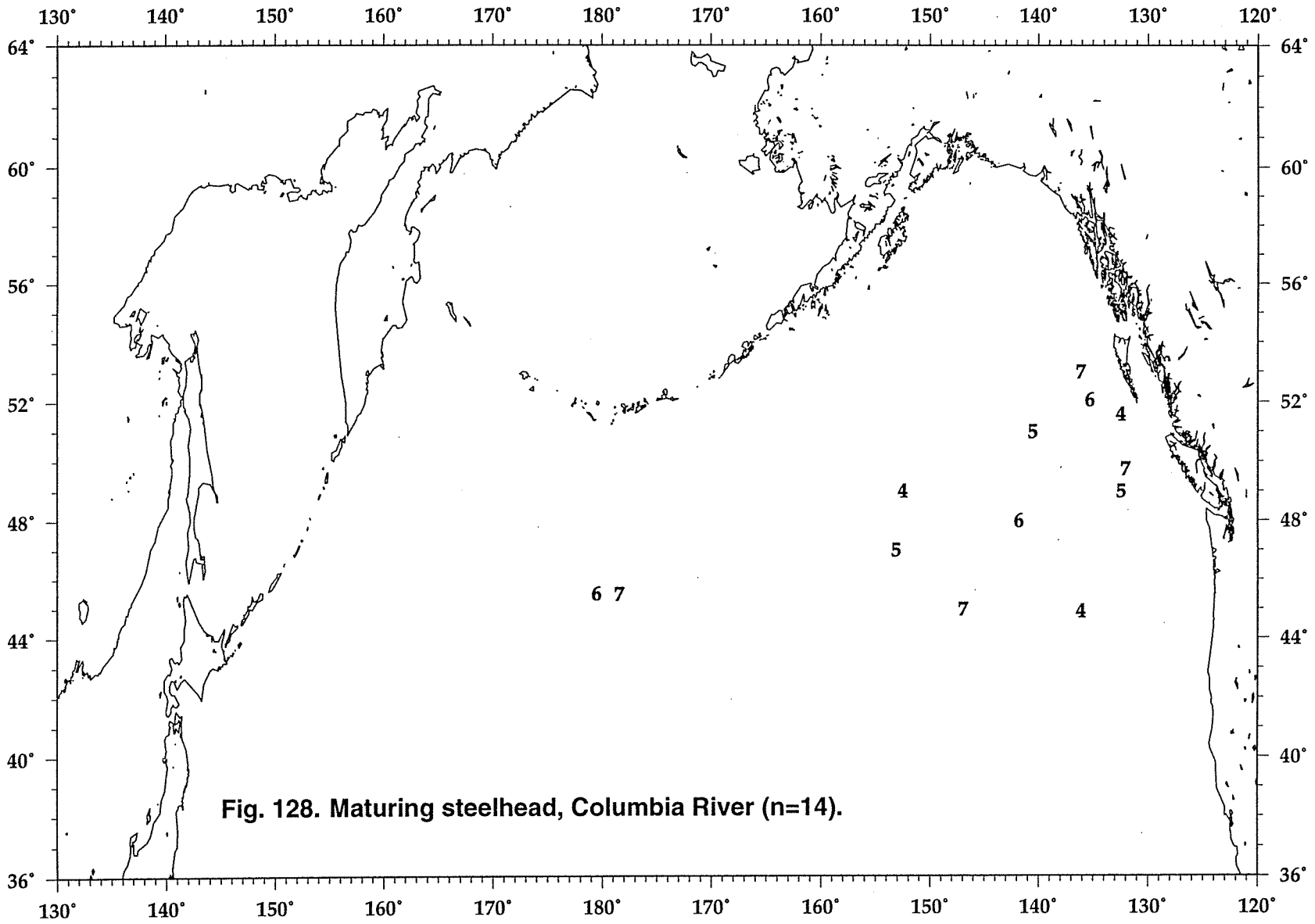


Fig. 128. Maturing steelhead, Columbia River (n=14).

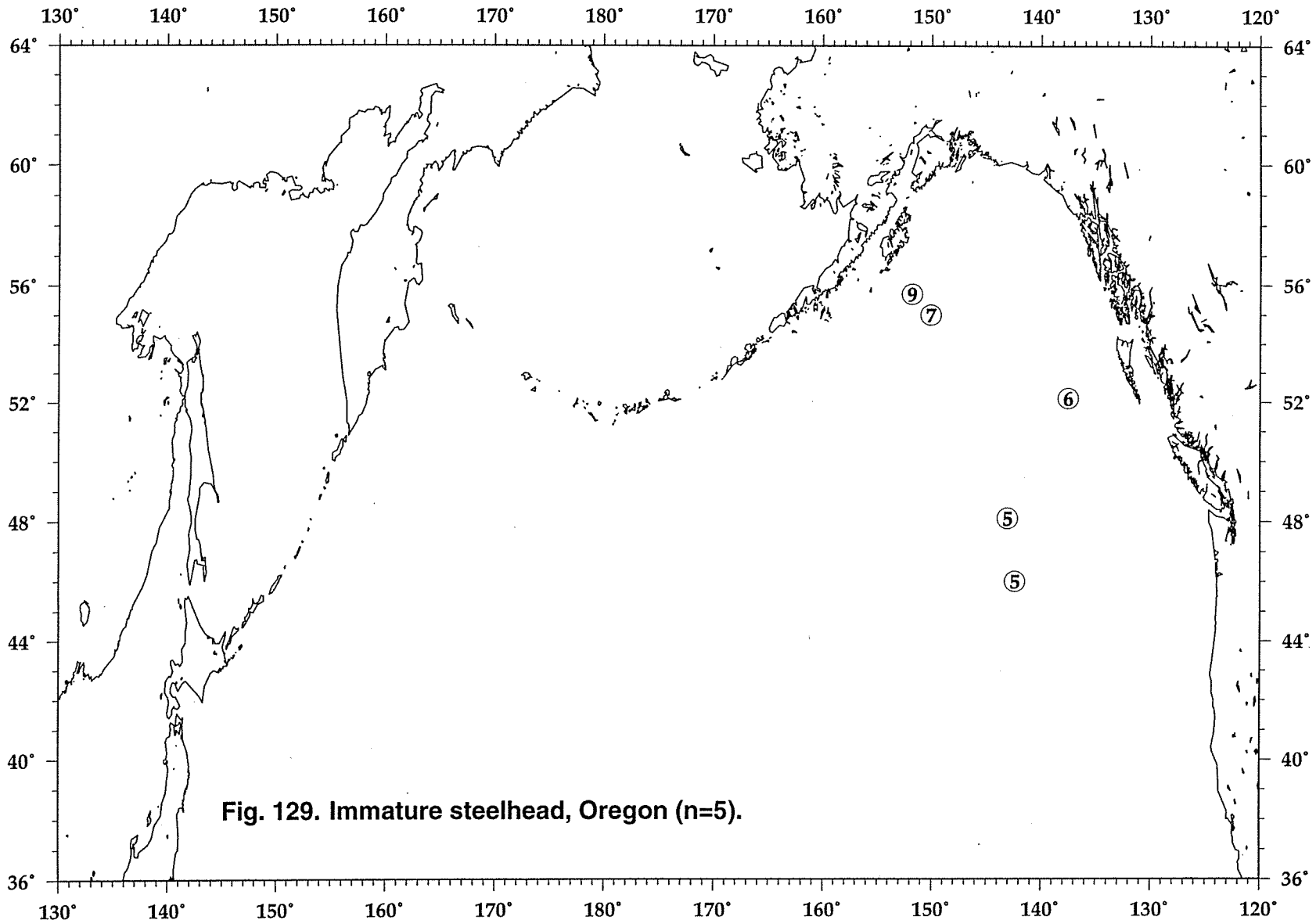


Fig. 129. Immature steelhead, Oregon (n=5).

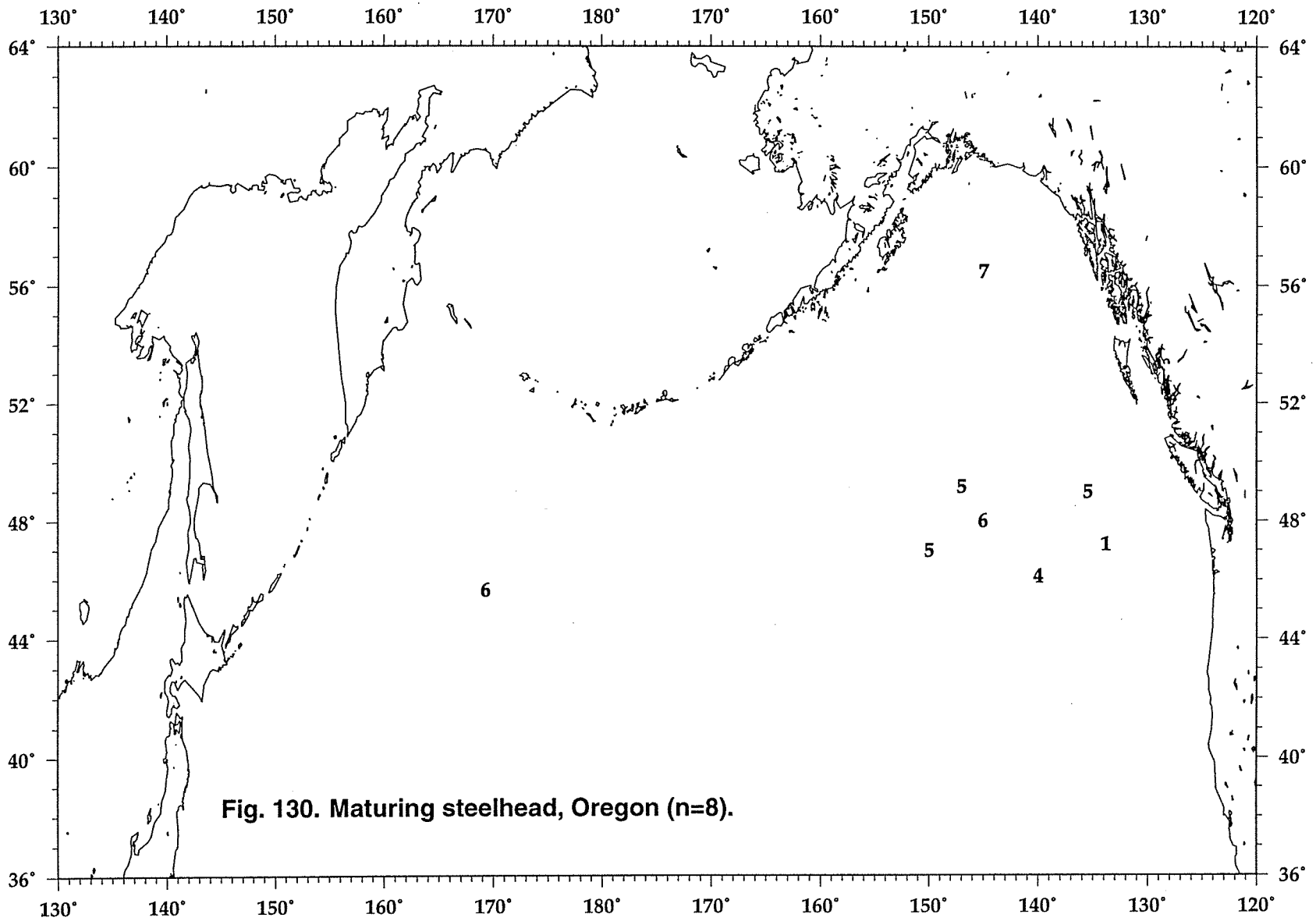


Fig. 130. Maturing steelhead, Oregon (n=8).

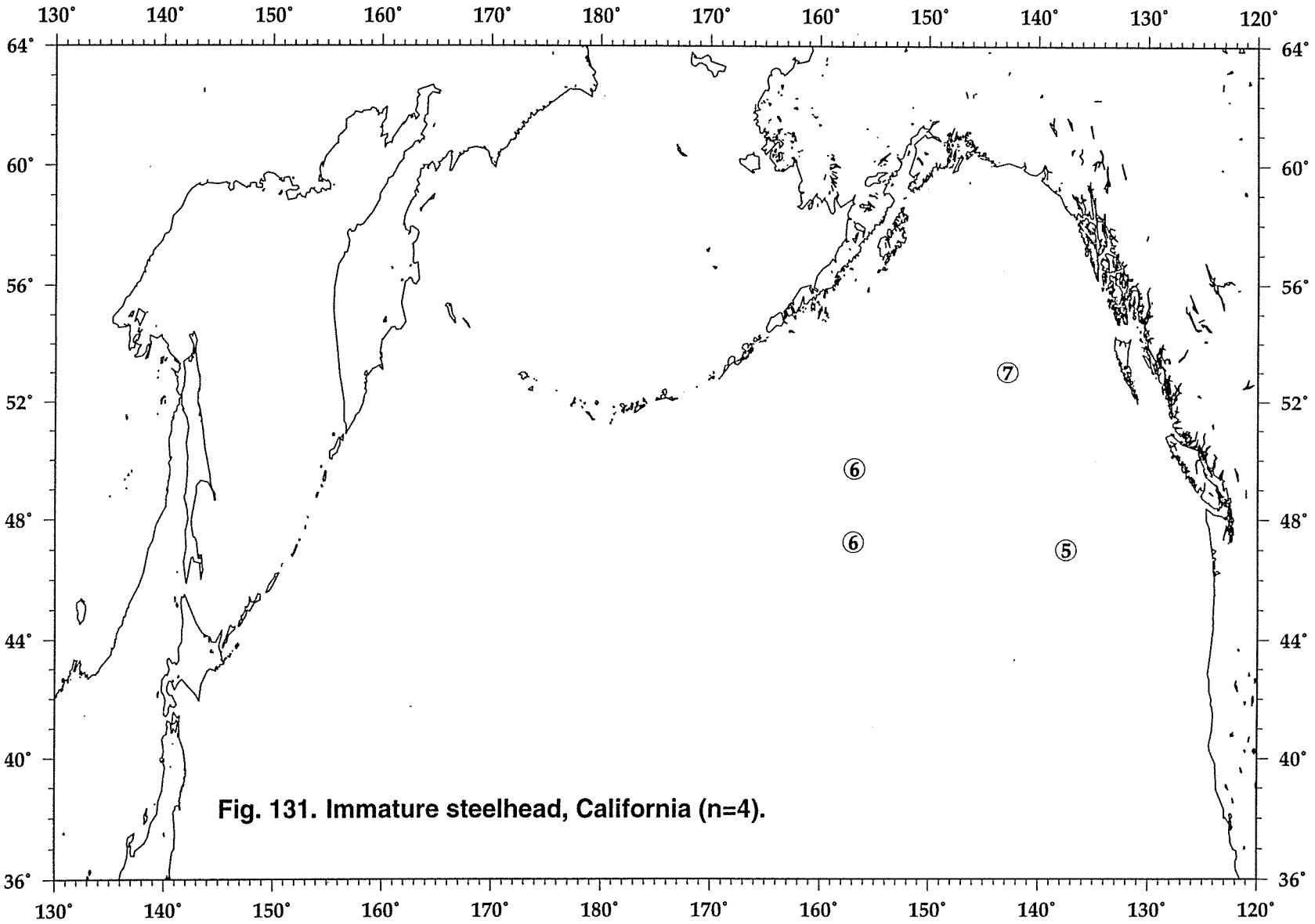


Fig. 131. Immature steelhead, California (n=4).

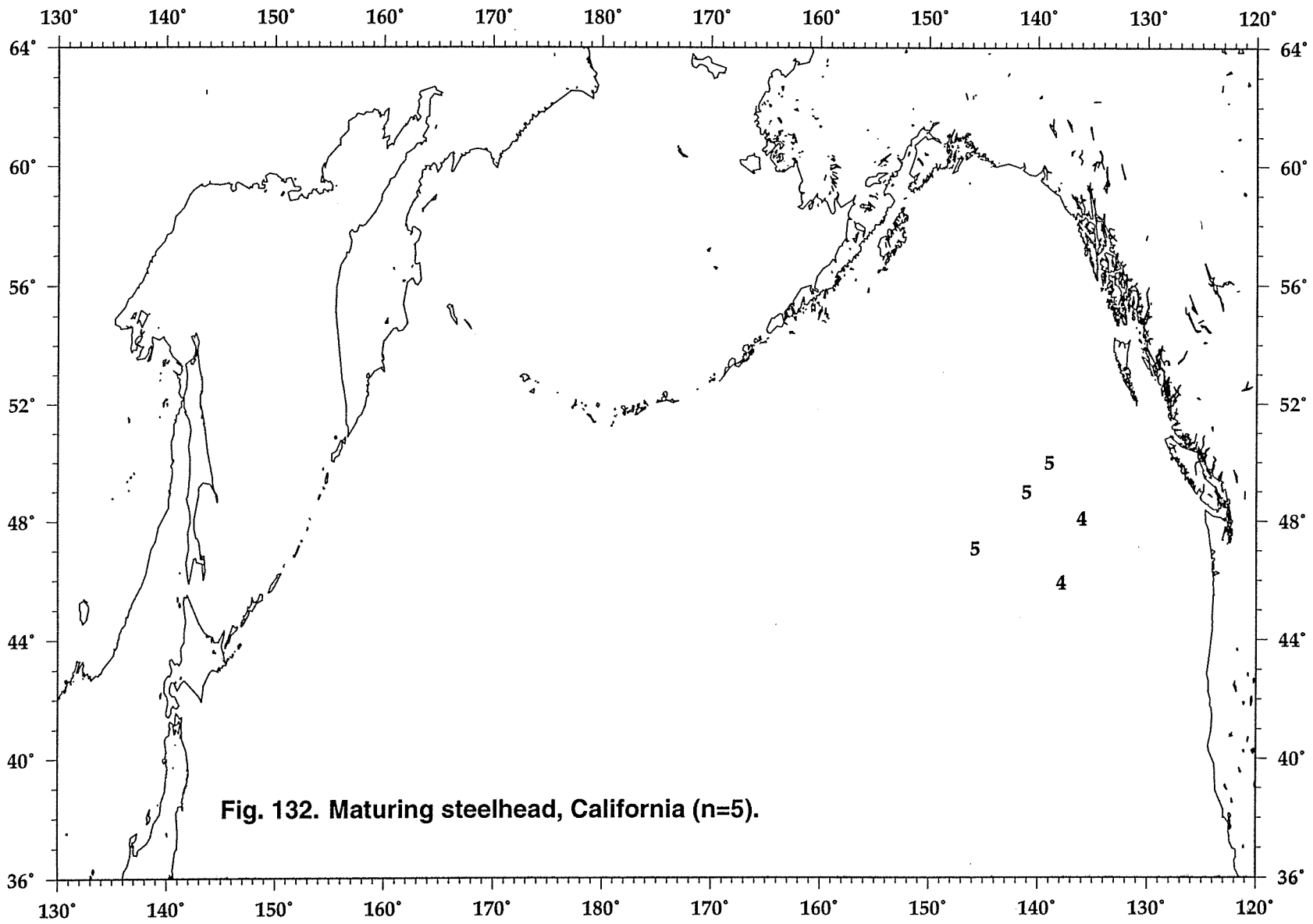


Fig. 132. Maturing steelhead, California (n=5).

Figures 133-155.

Maps showing high-seas recovery locations of coded-wire tagged salmonids by species and region of origin. The numbers indicate the month of recovery from 1 (January) through 12 (December). n = sample size.

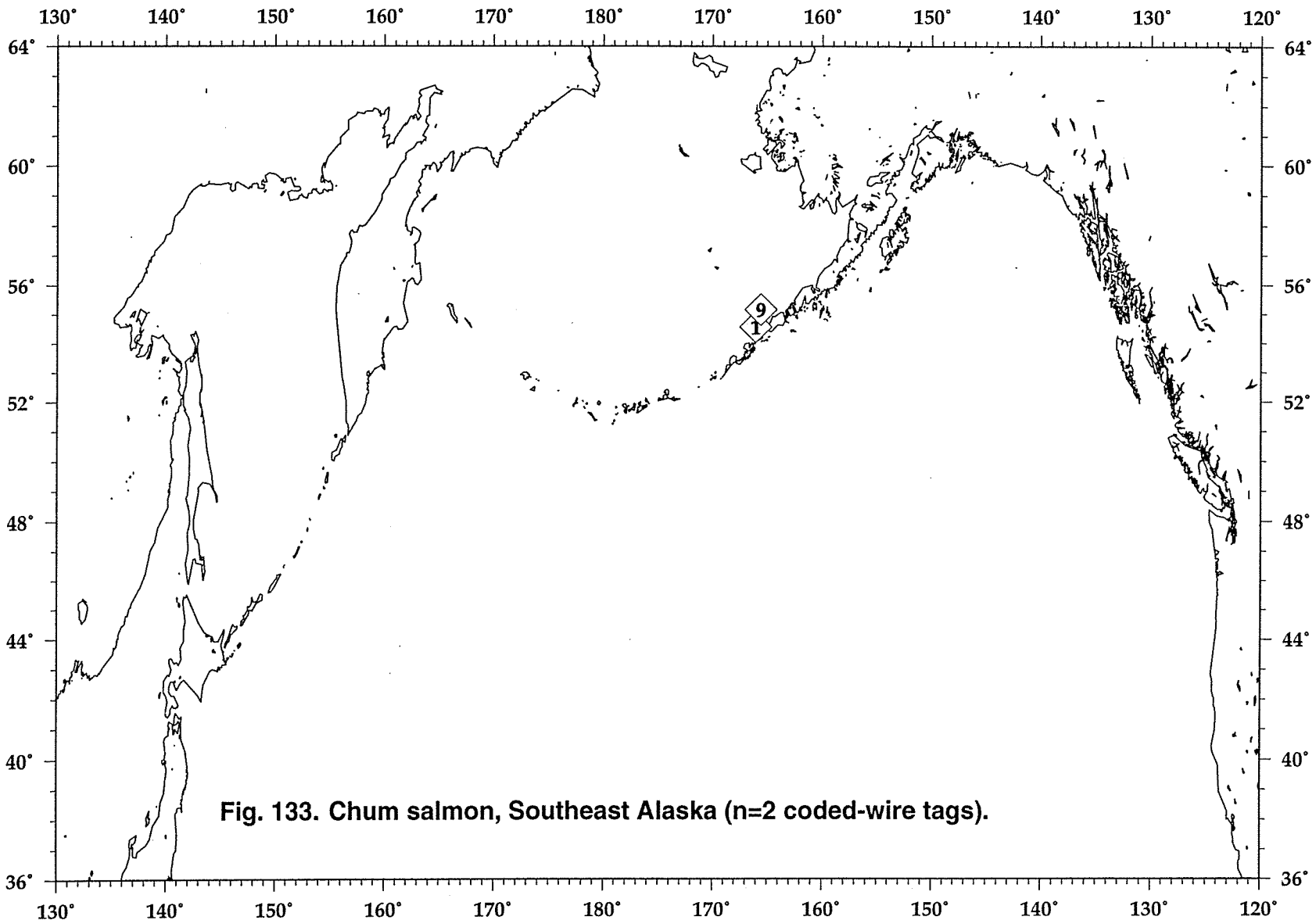


Fig. 133. Chum salmon, Southeast Alaska (n=2 coded-wire tags).

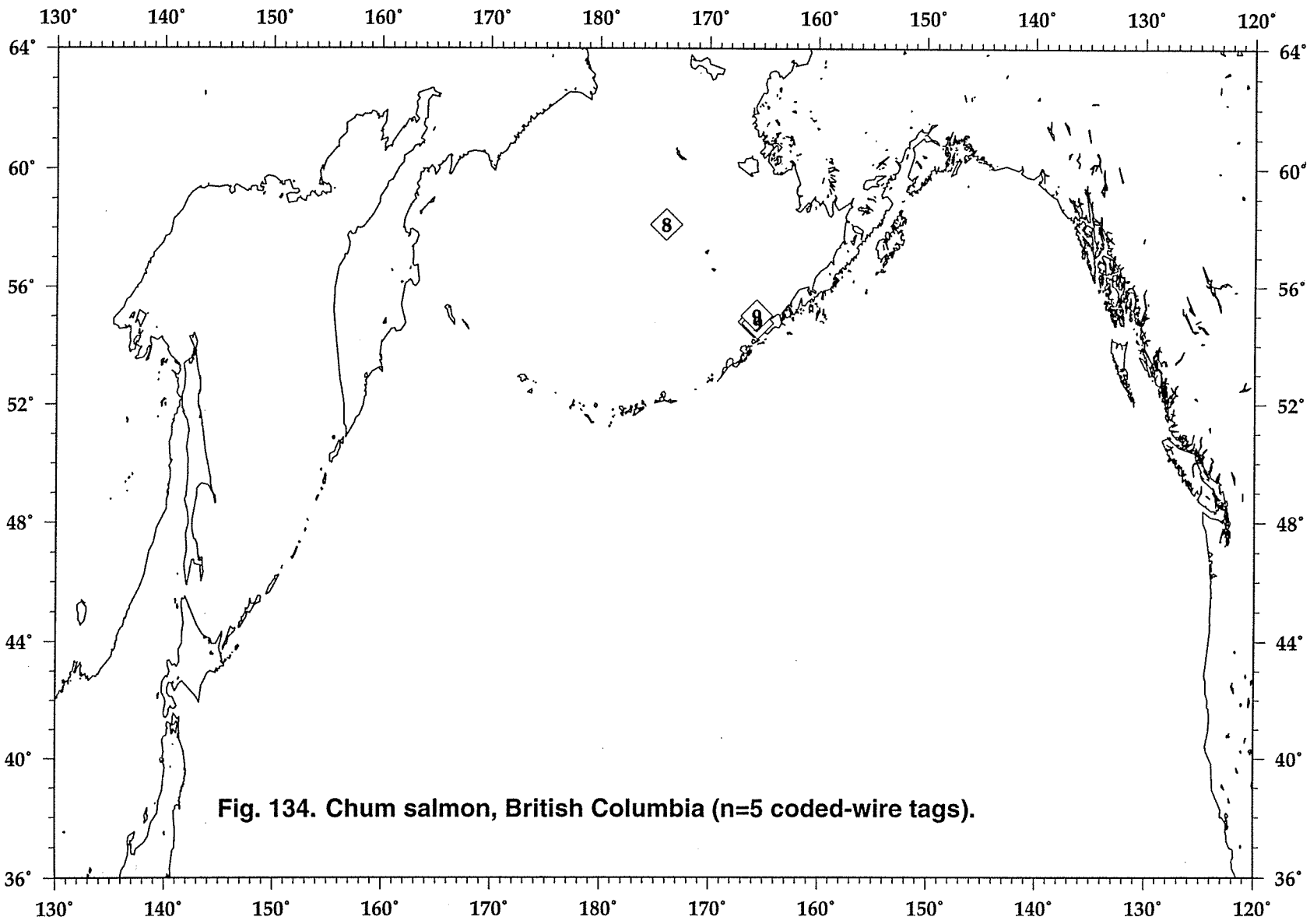


Fig. 134. Chum salmon, British Columbia (n=5 coded-wire tags).

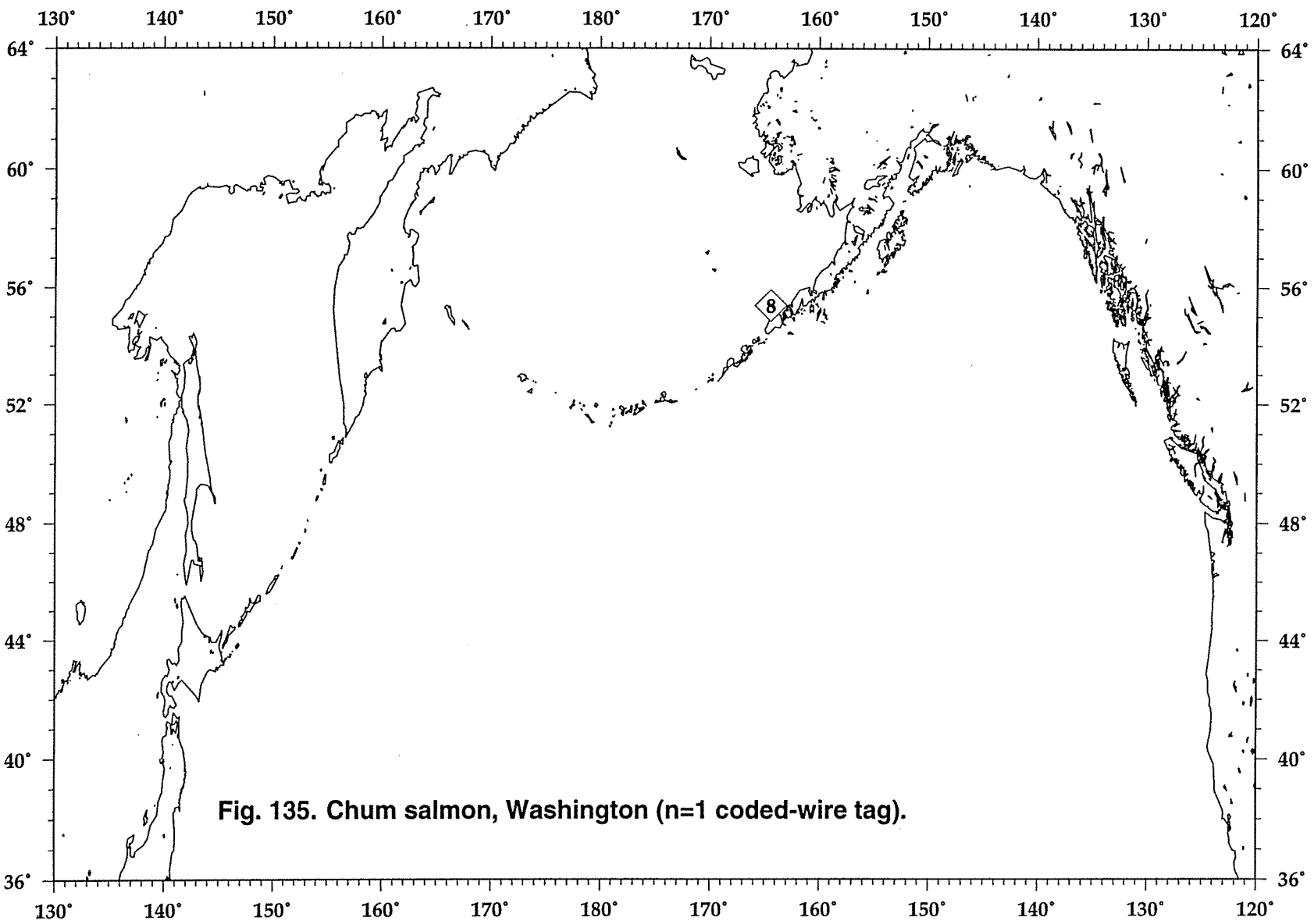


Fig. 135. Chum salmon, Washington (n=1 coded-wire tag).

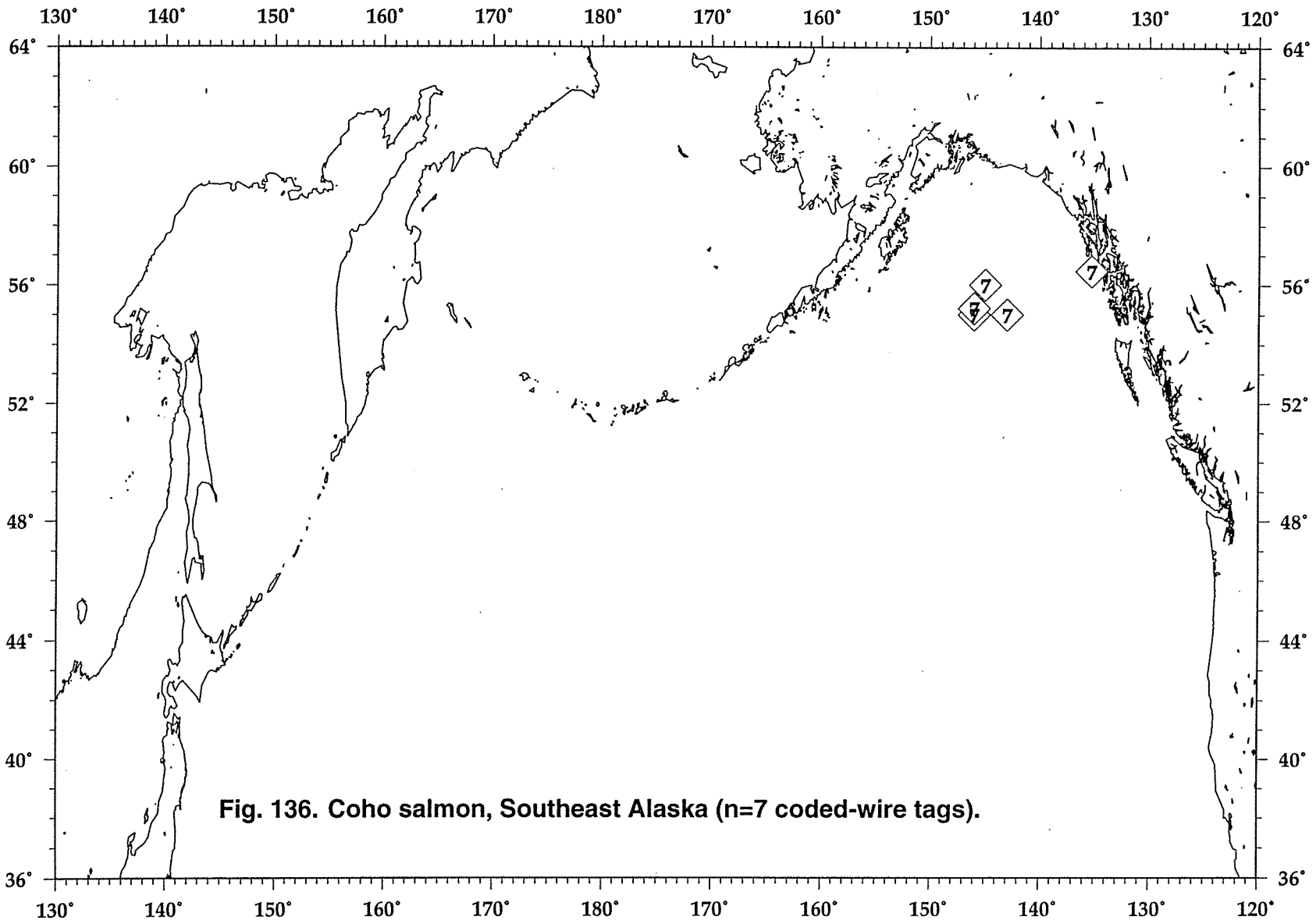


Fig. 136. Coho salmon, Southeast Alaska (n=7 coded-wire tags).

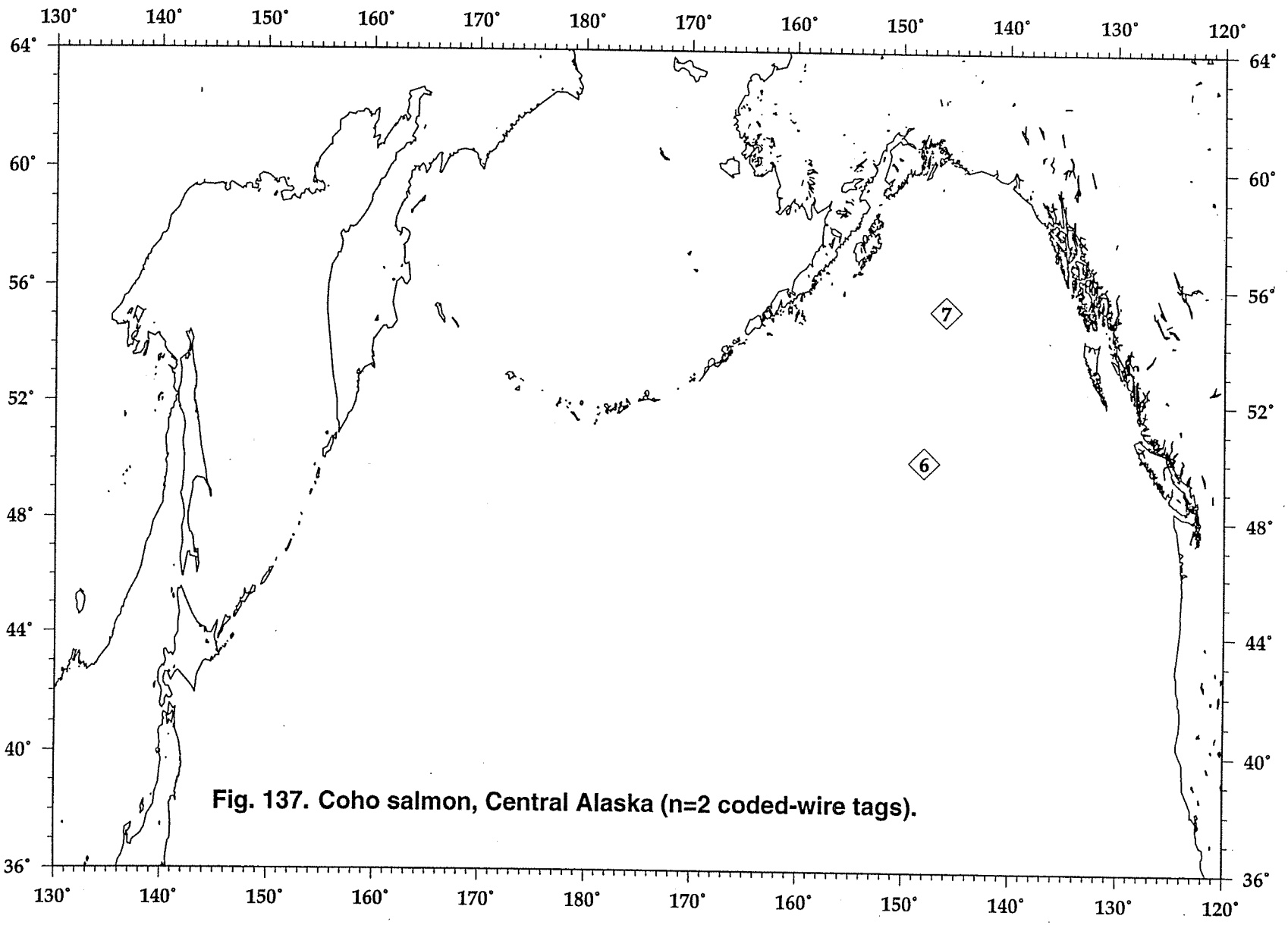


Fig. 137. Coho salmon, Central Alaska (n=2 coded-wire tags).

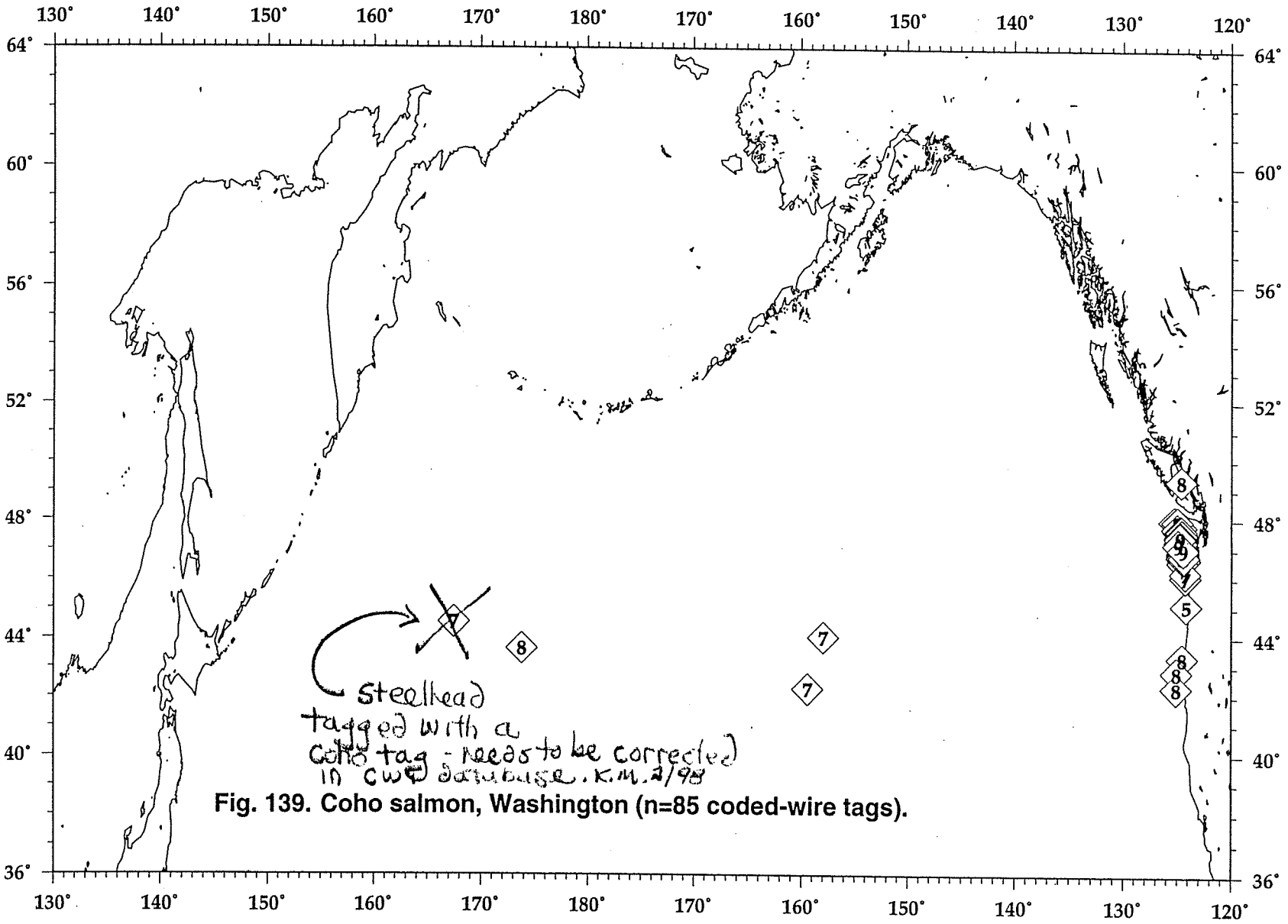


Fig. 139. Coho salmon, Washington (n=85 coded-wire tags).

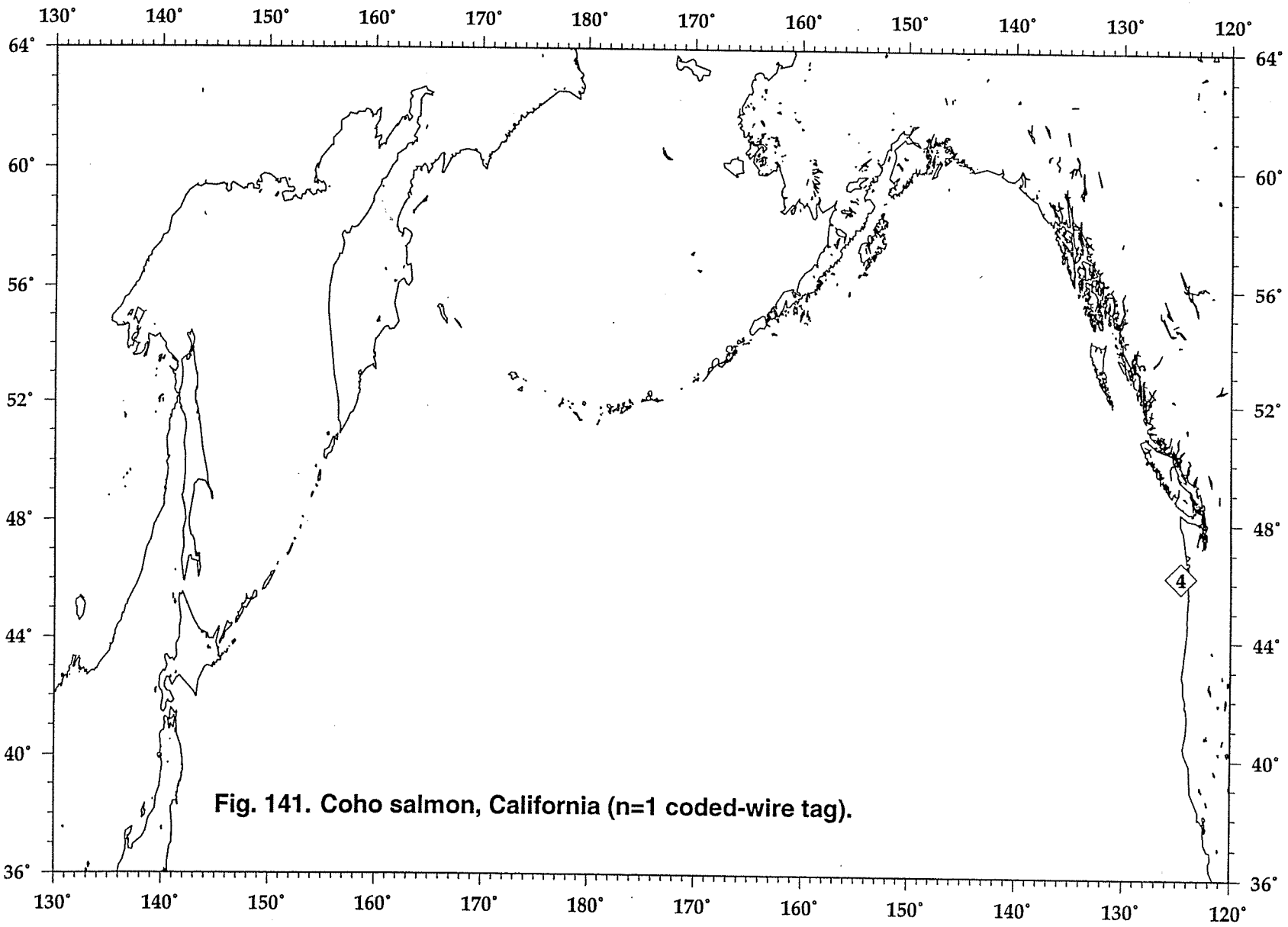


Fig. 141. Coho salmon, California (n=1 coded-wire tag).

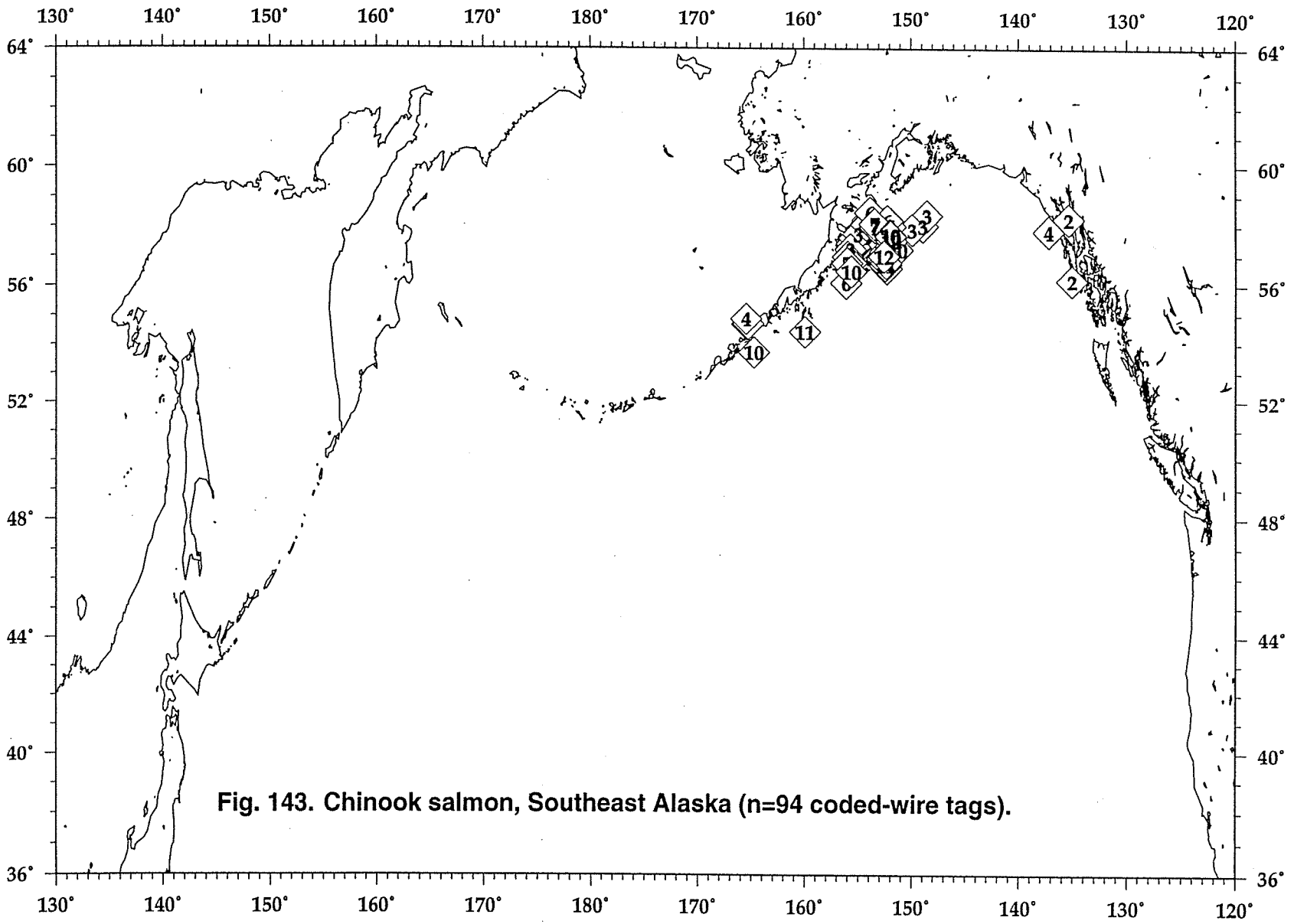


Fig. 143. Chinook salmon, Southeast Alaska (n=94 coded-wire tags).

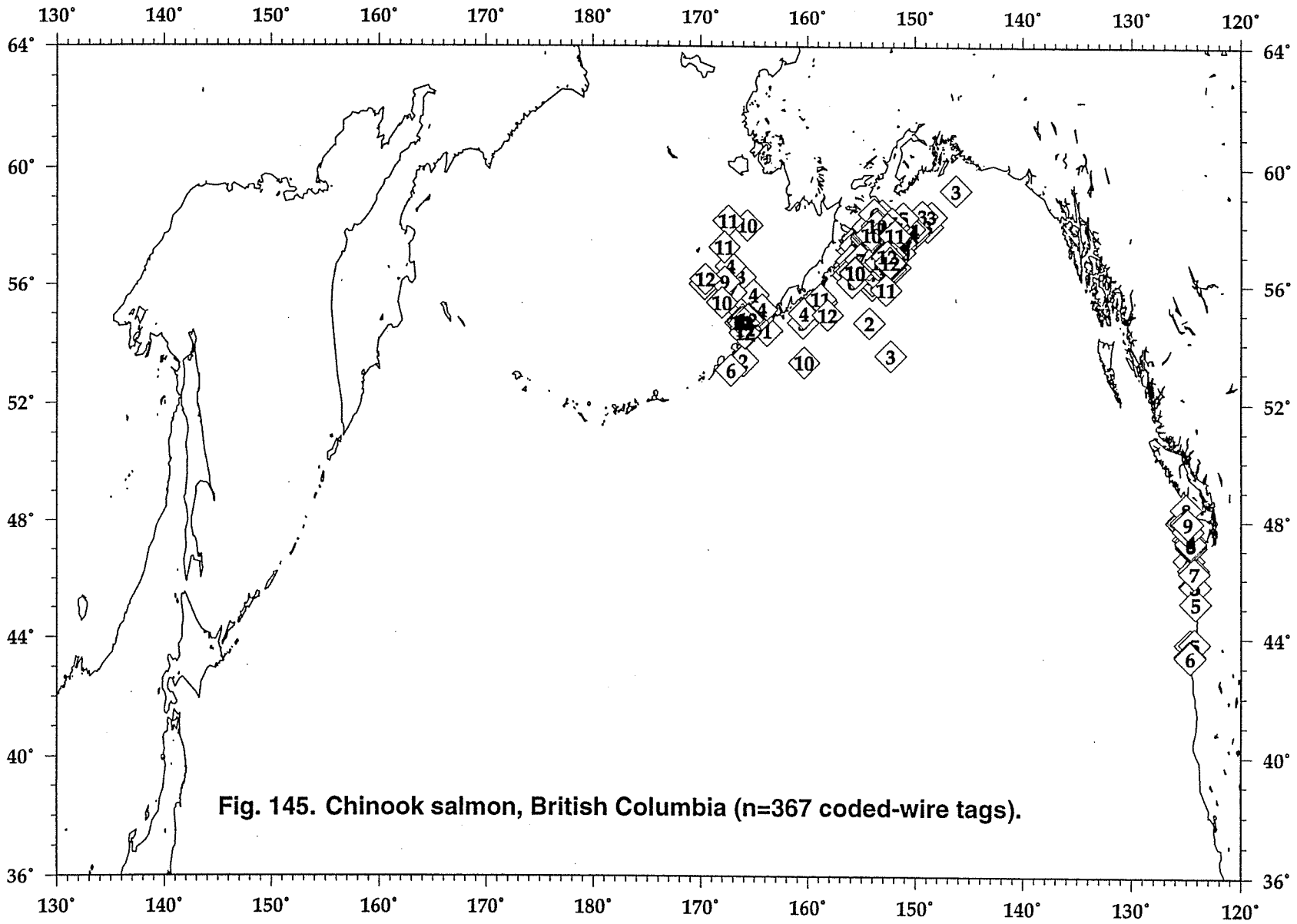


Fig. 145. Chinook salmon, British Columbia (n=367 coded-wire tags).

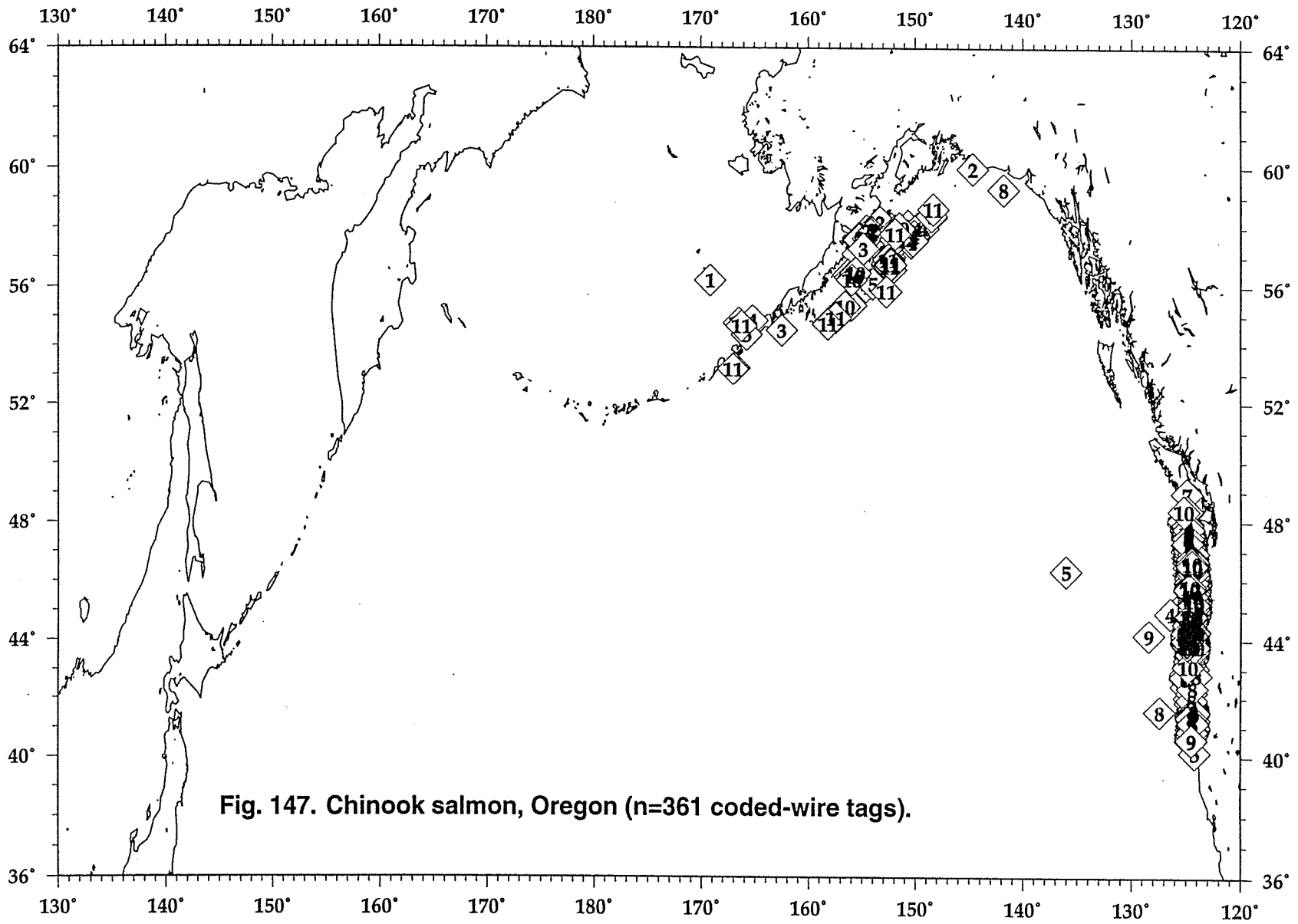


Fig. 147. Chinook salmon, Oregon (n=361 coded-wire tags).

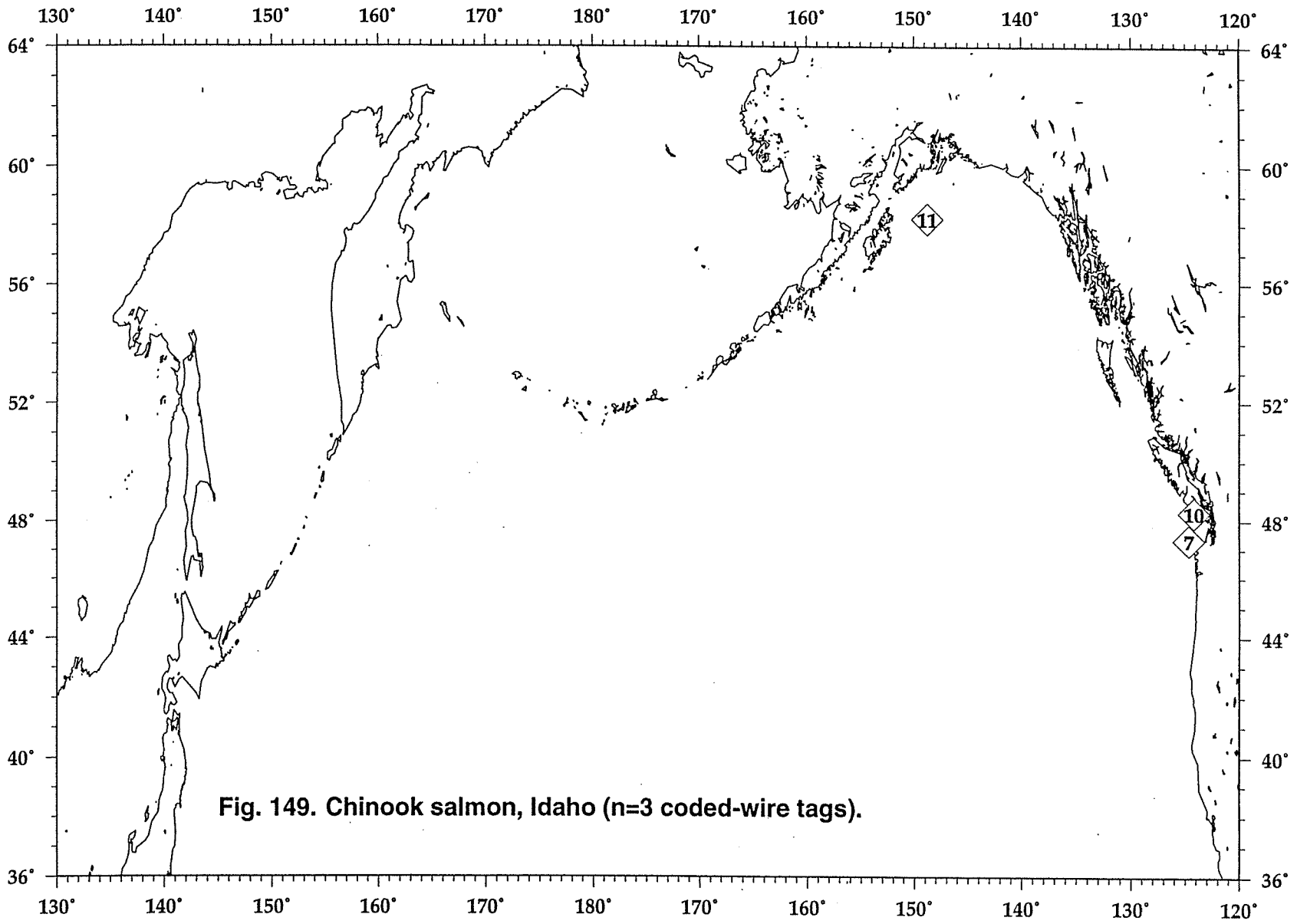


Fig. 149. Chinook salmon, Idaho (n=3 coded-wire tags).

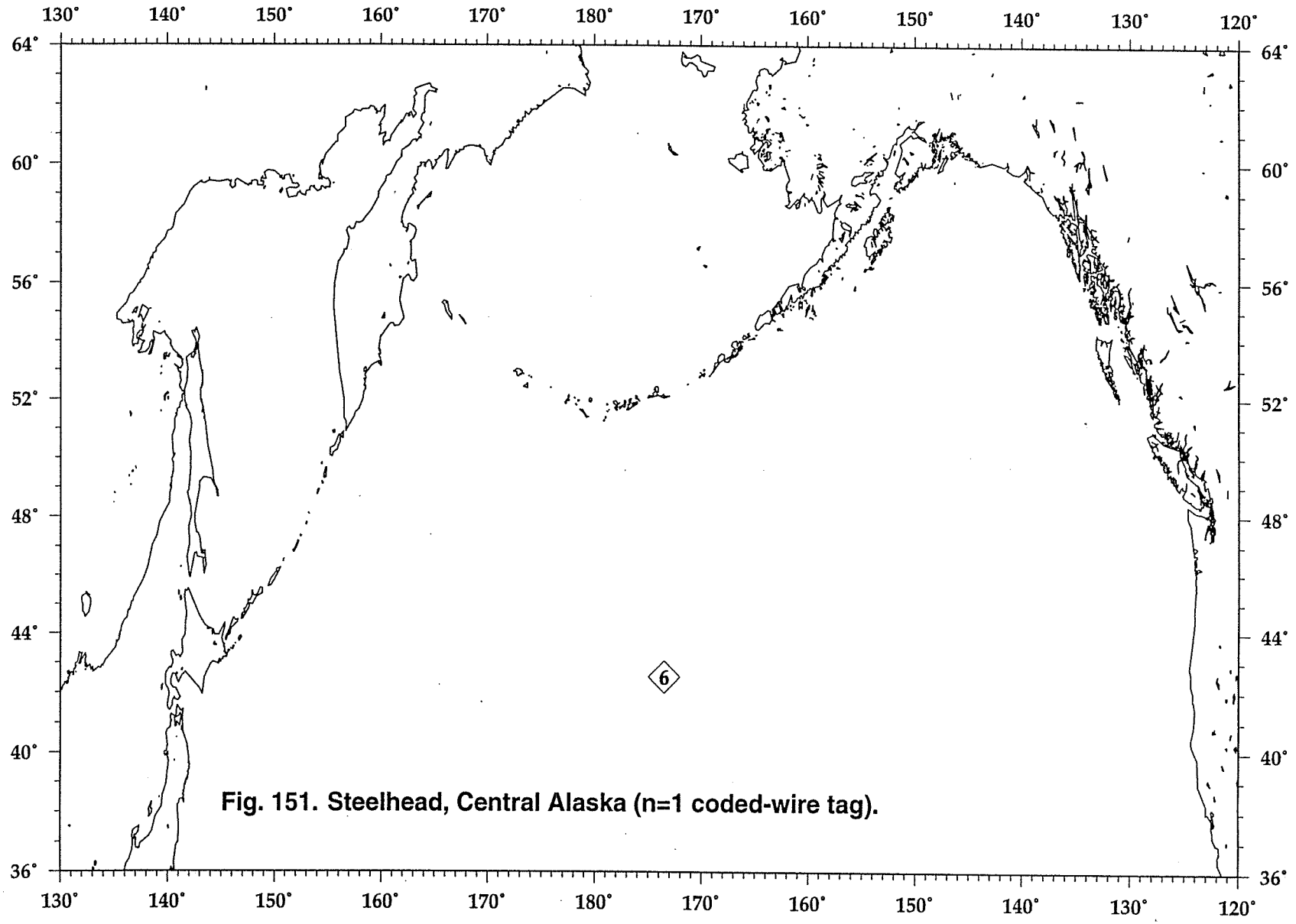


Fig. 151. Steelhead, Central Alaska (n=1 coded-wire tag).

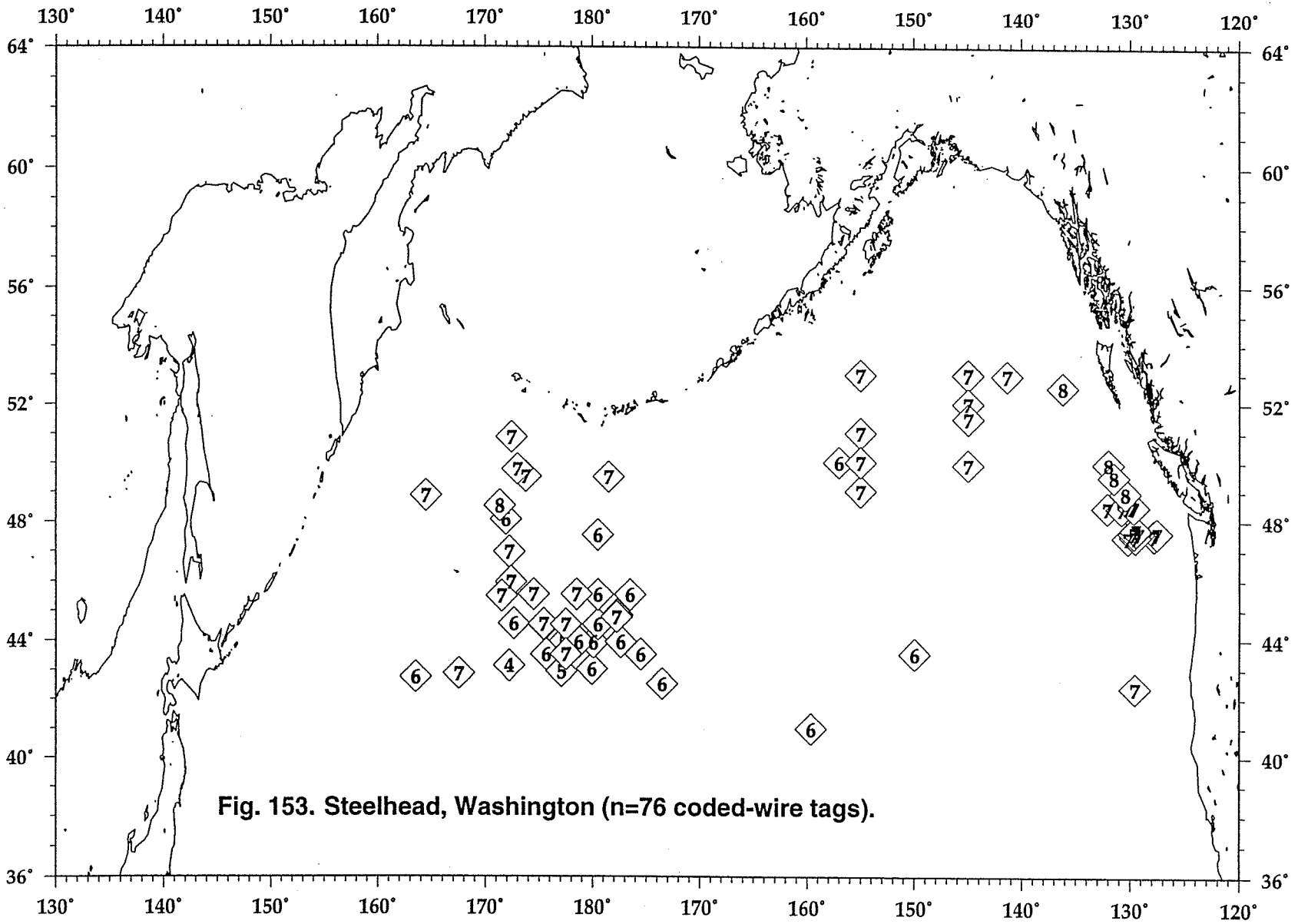


Fig. 153. Steelhead, Washington (n=76 coded-wire tags).

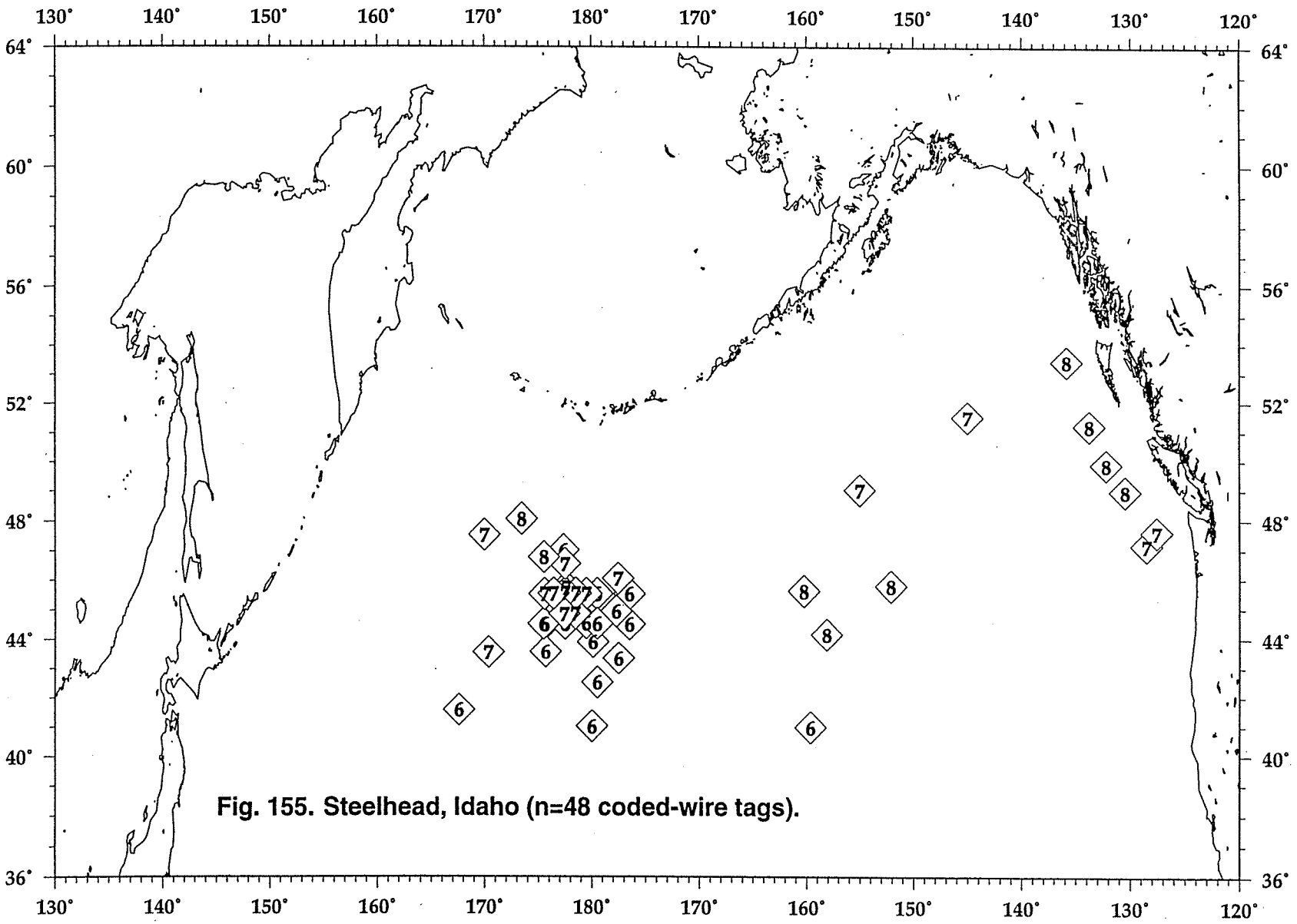


Fig. 155. Steelhead, Idaho (n=48 coded-wire tags).

APPENDIX A

Release locations of high-seas tagged salmonids (1954-1995) by species, month, and 2°-latitude X 5°-longitude statistical area. A black column with a white top indicates that the number of releases in a particular area was greater than 500 fish.

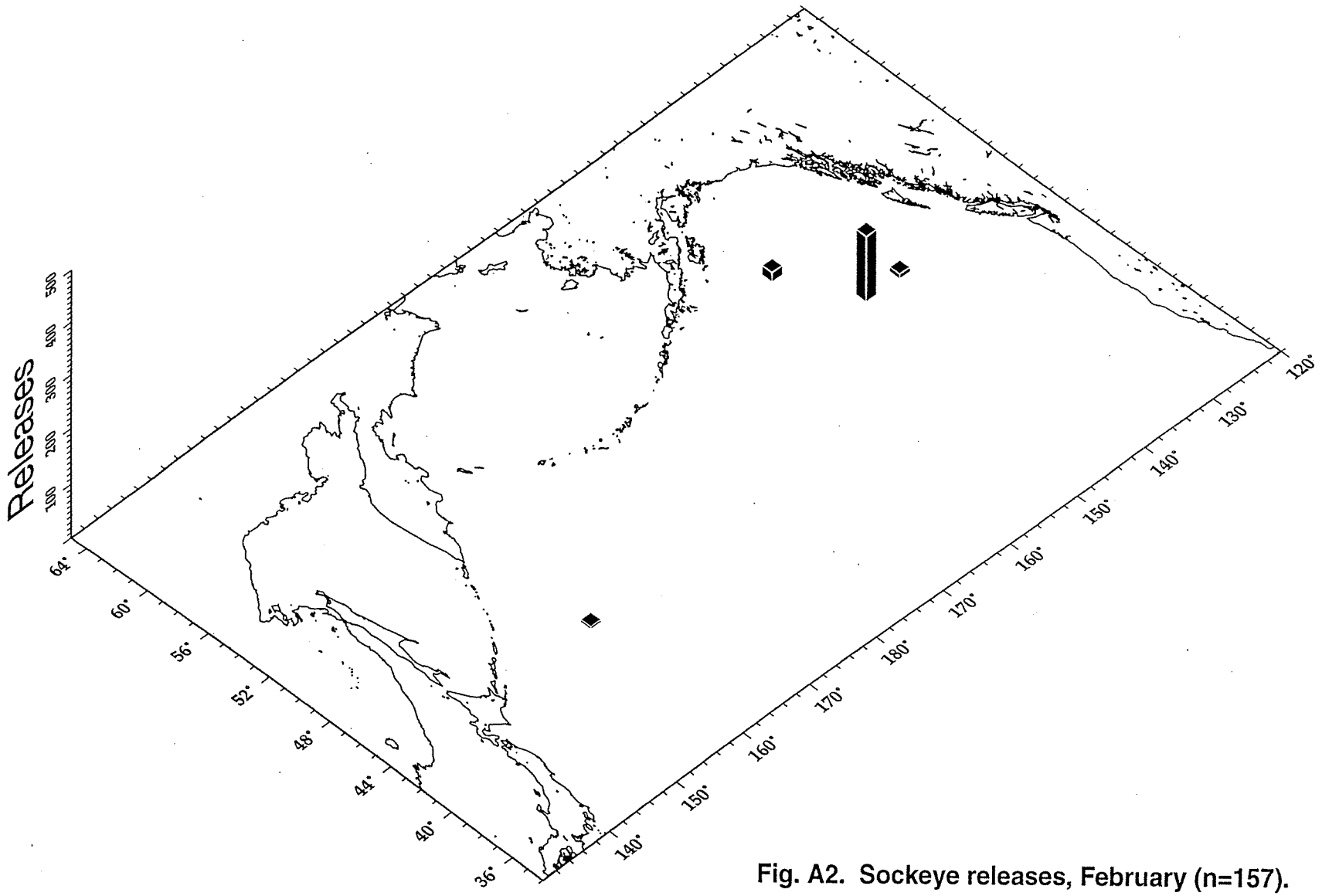


Fig. A2. Sockeye releases, February (n=157).

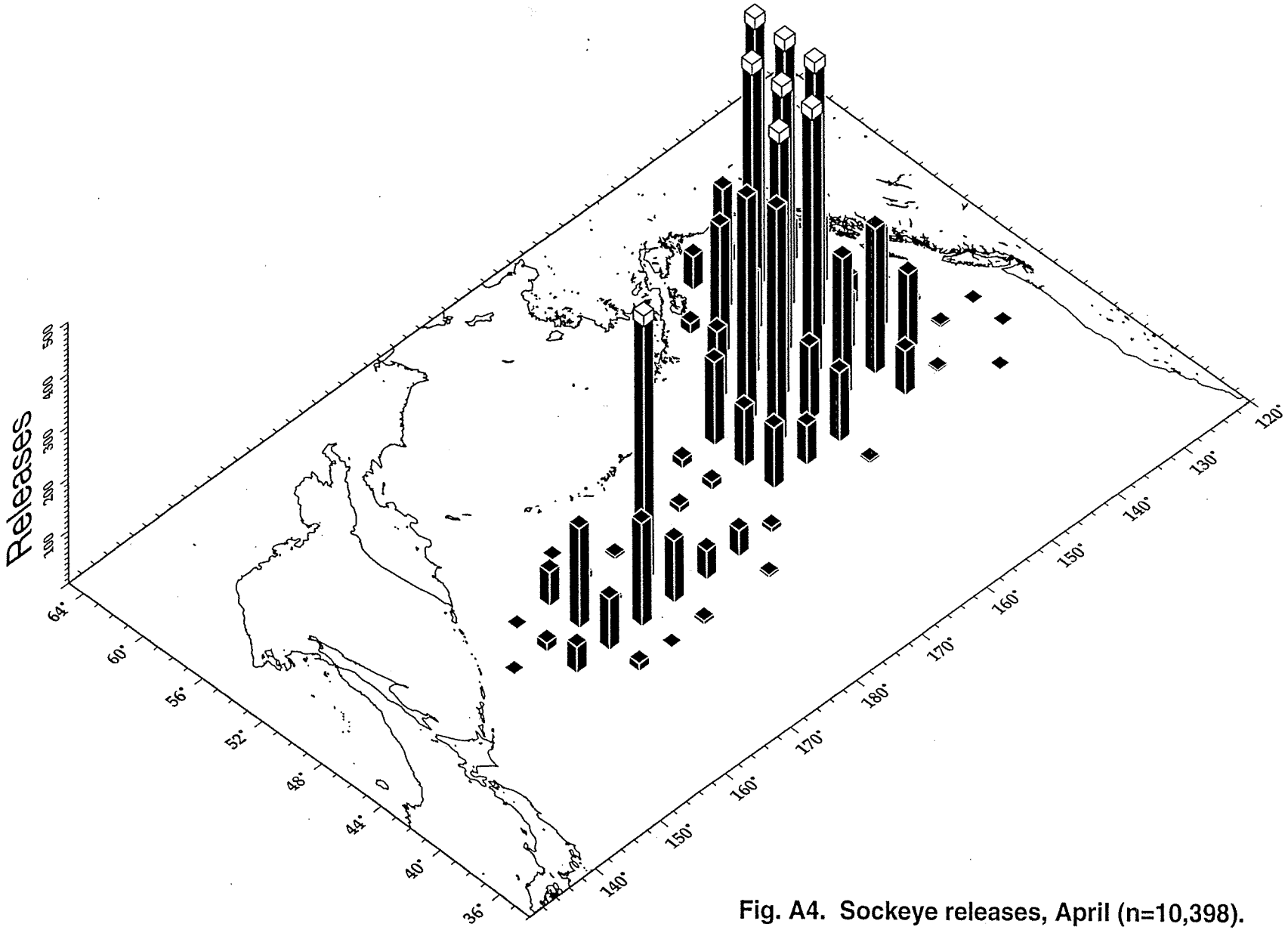


Fig. A4. Sockeye releases, April (n=10,398).

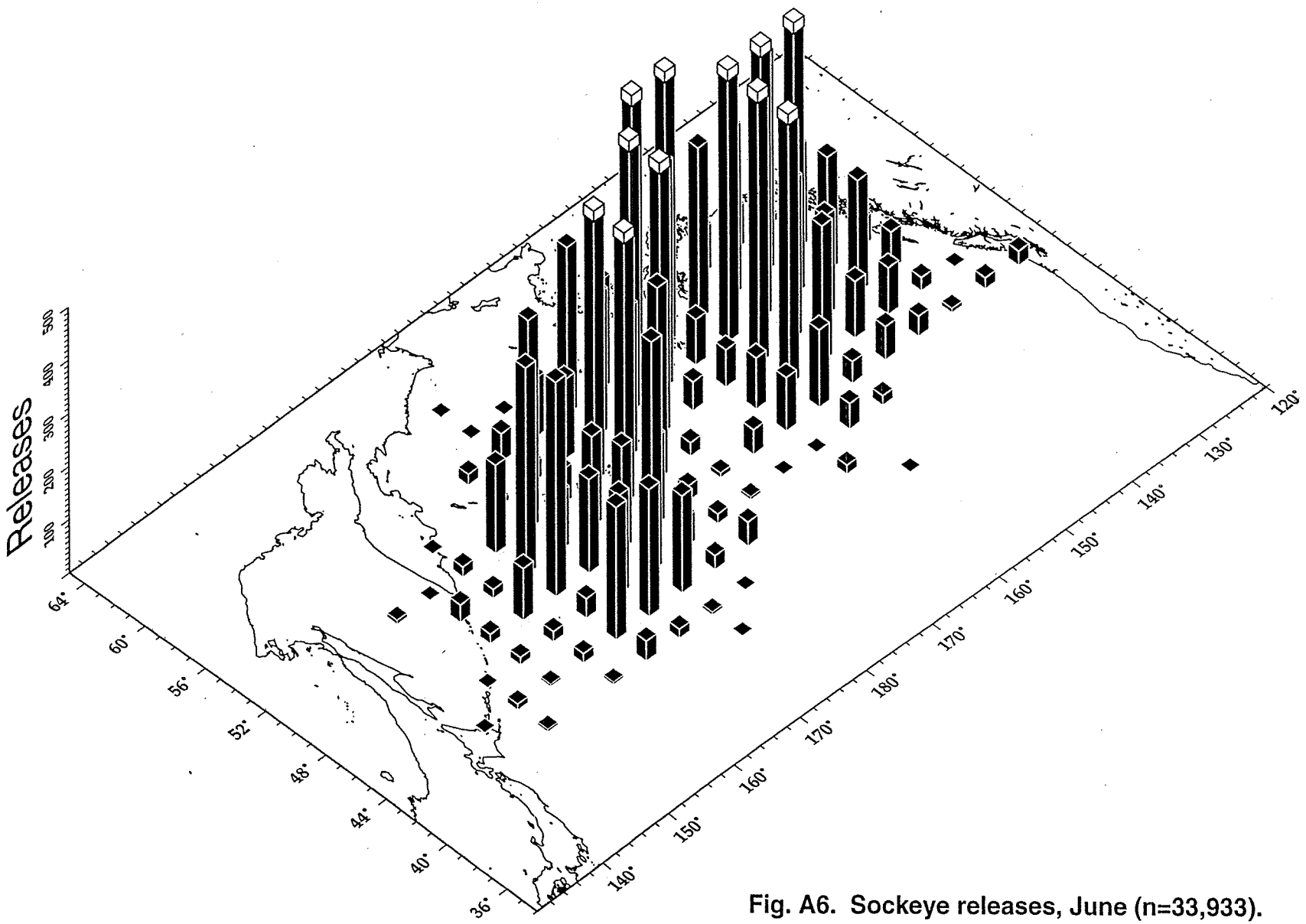


Fig. A6. Sockeye releases, June (n=33,933).

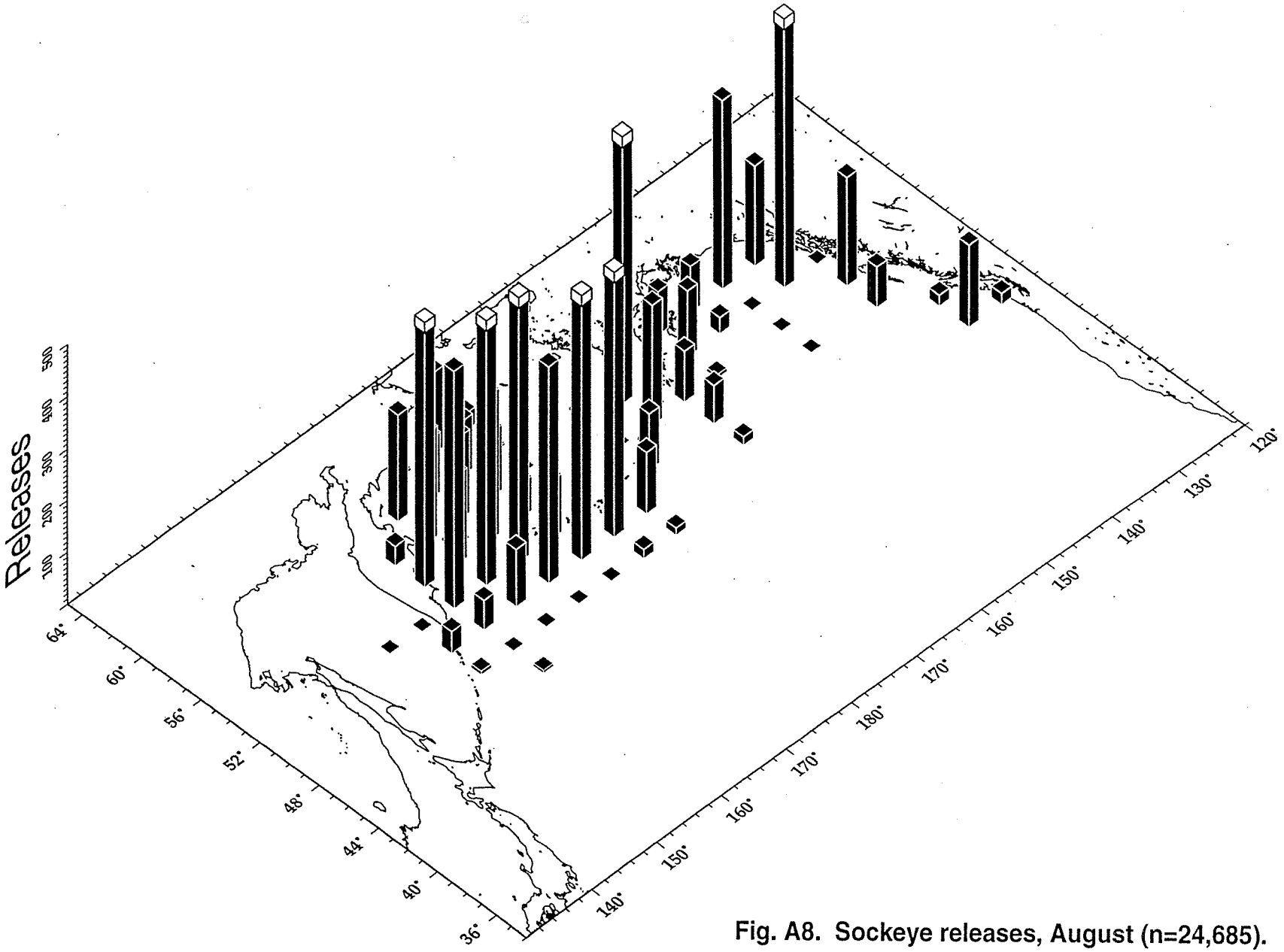


Fig. A8. Sockeye releases, August (n=24,685).

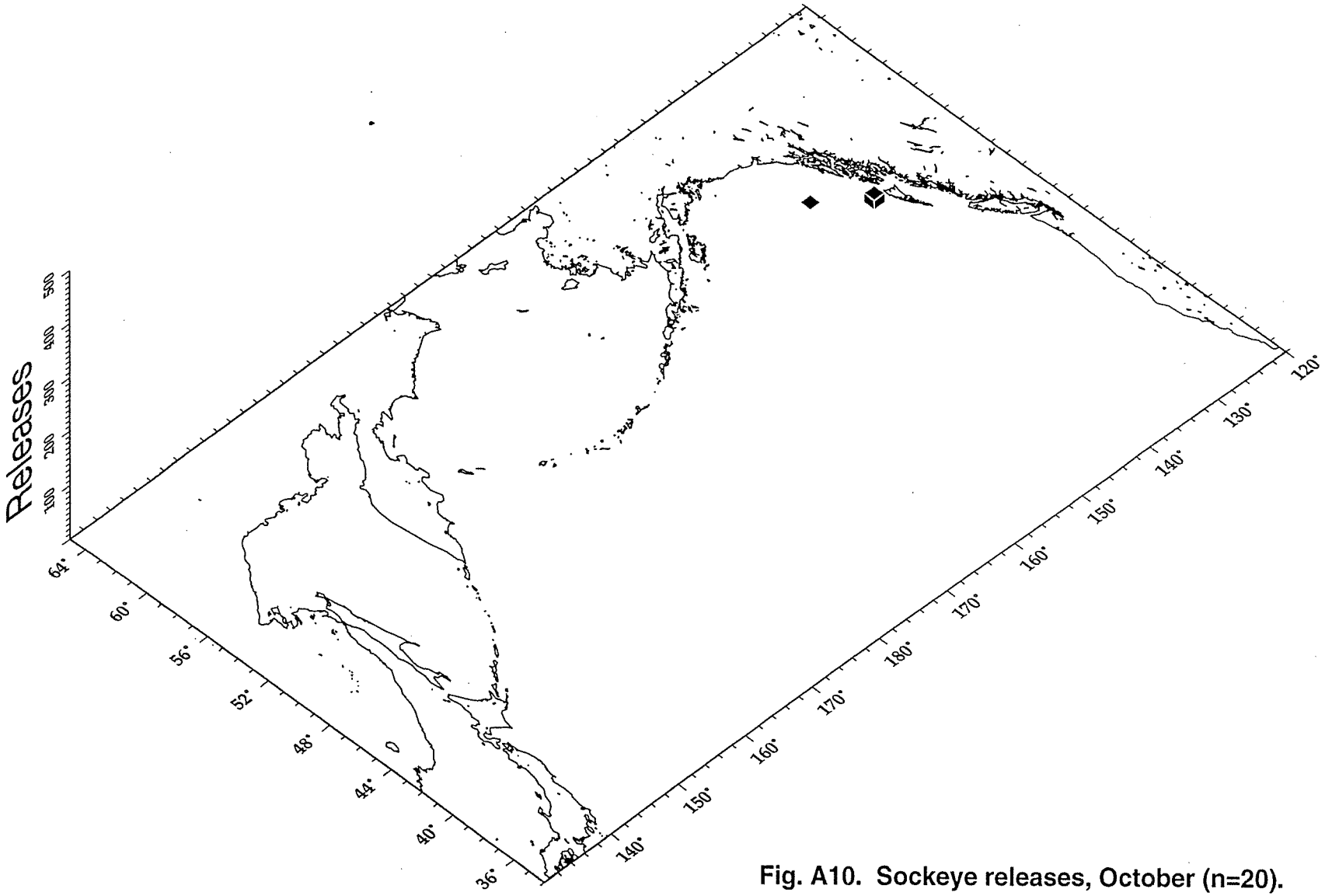


Fig. A10. Sockeye releases, October (n=20).

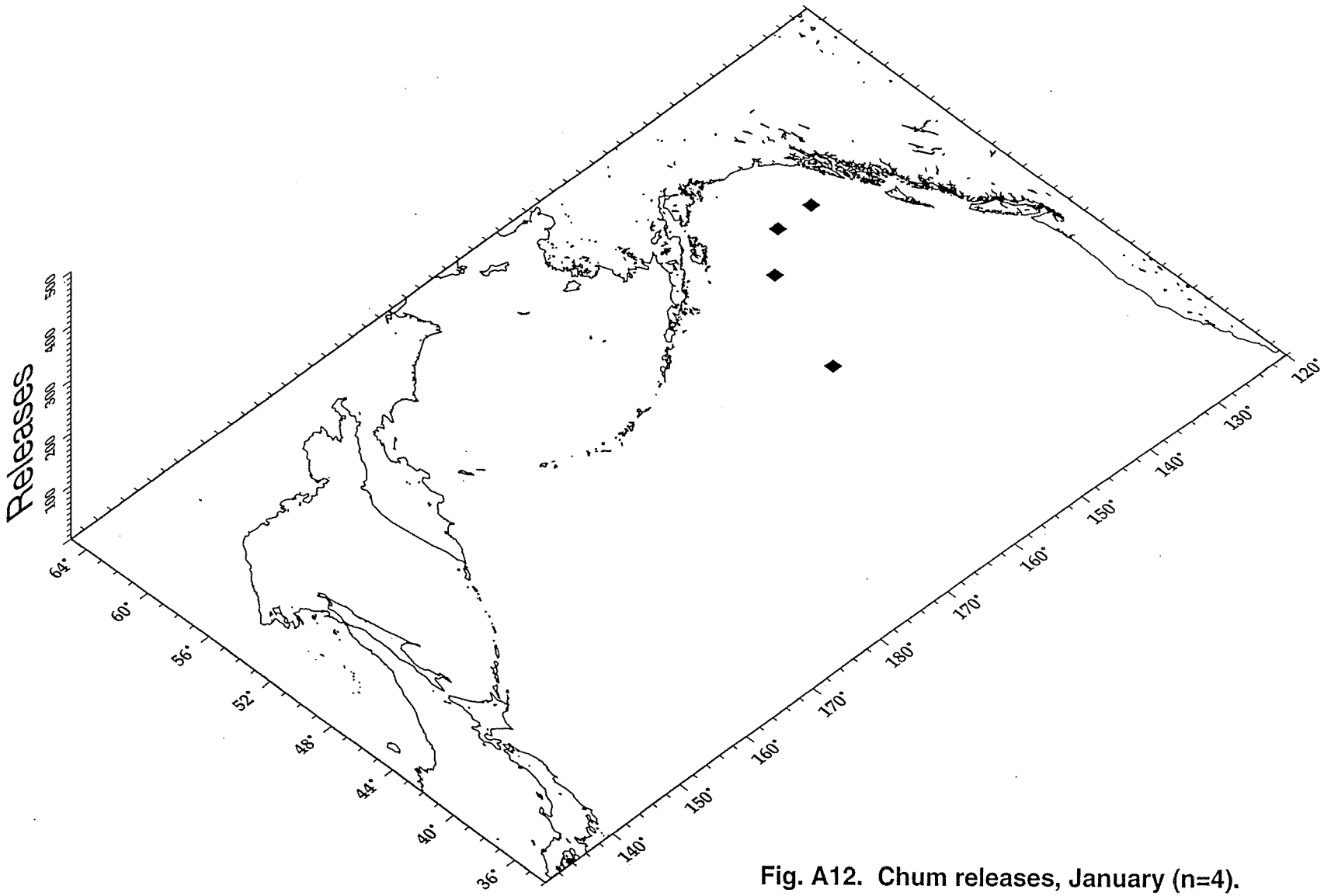


Fig. A12. Chum releases, January (n=4).

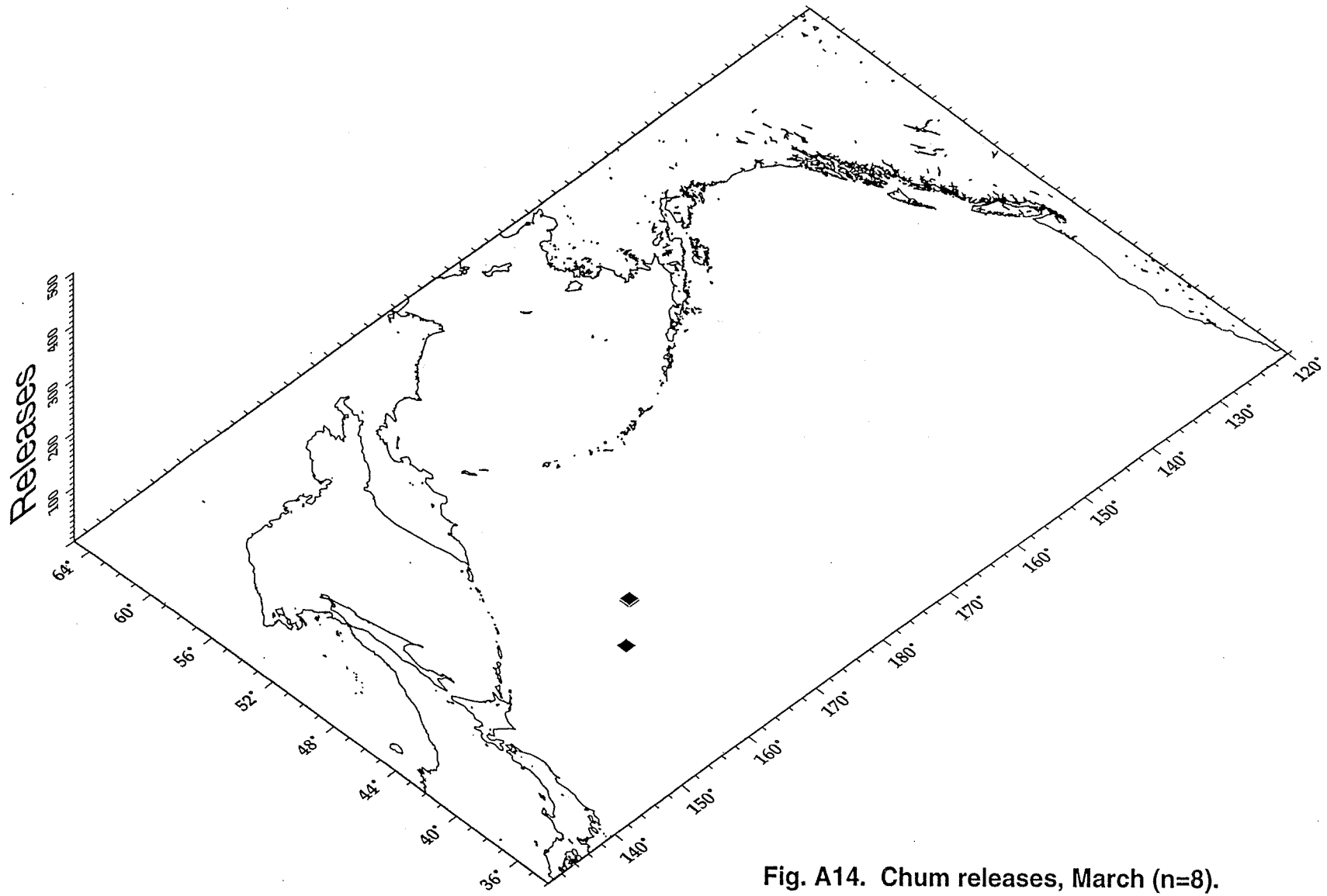


Fig. A14. Chum releases, March (n=8).

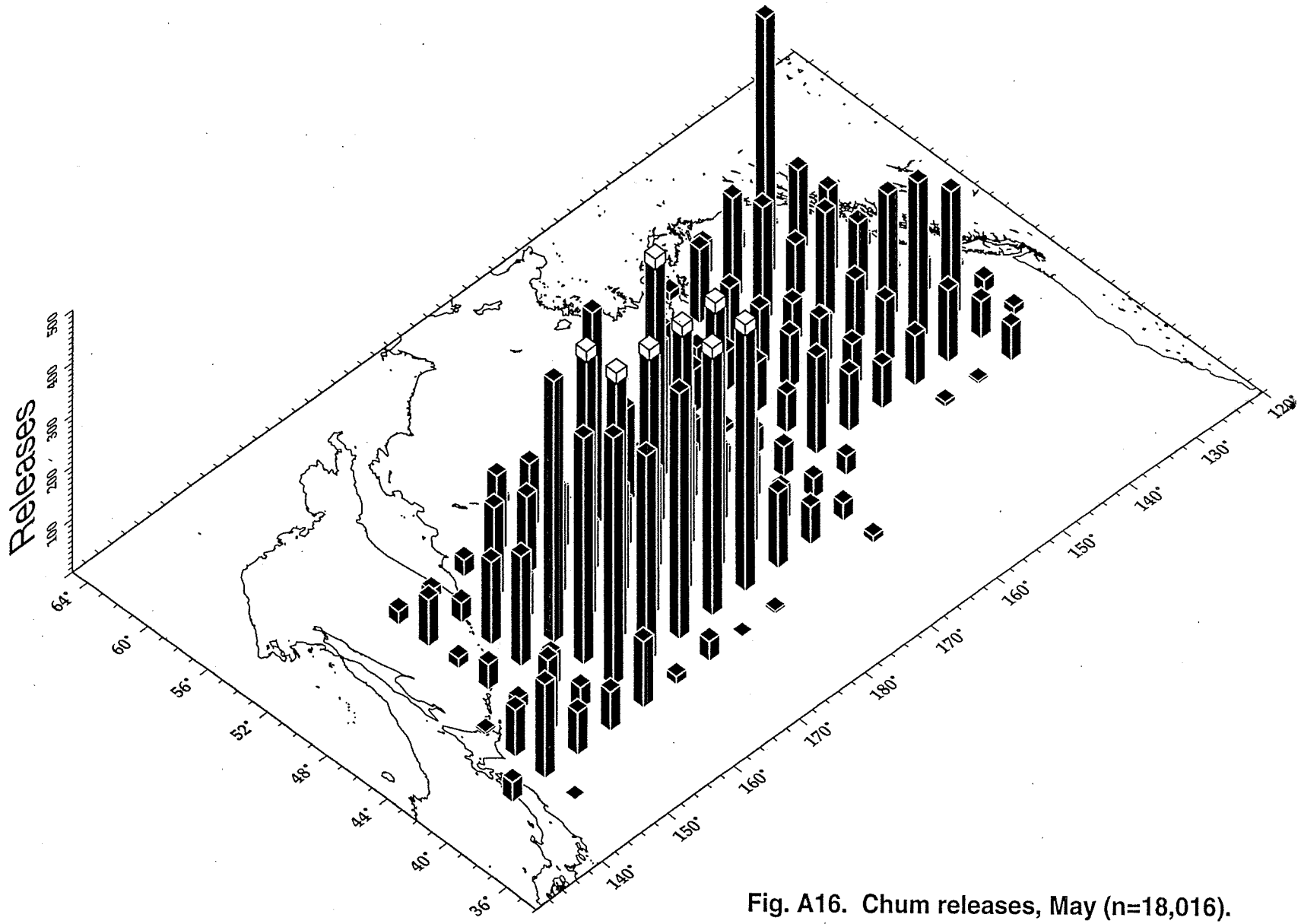


Fig. A16. Chum releases, May (n=18,016).

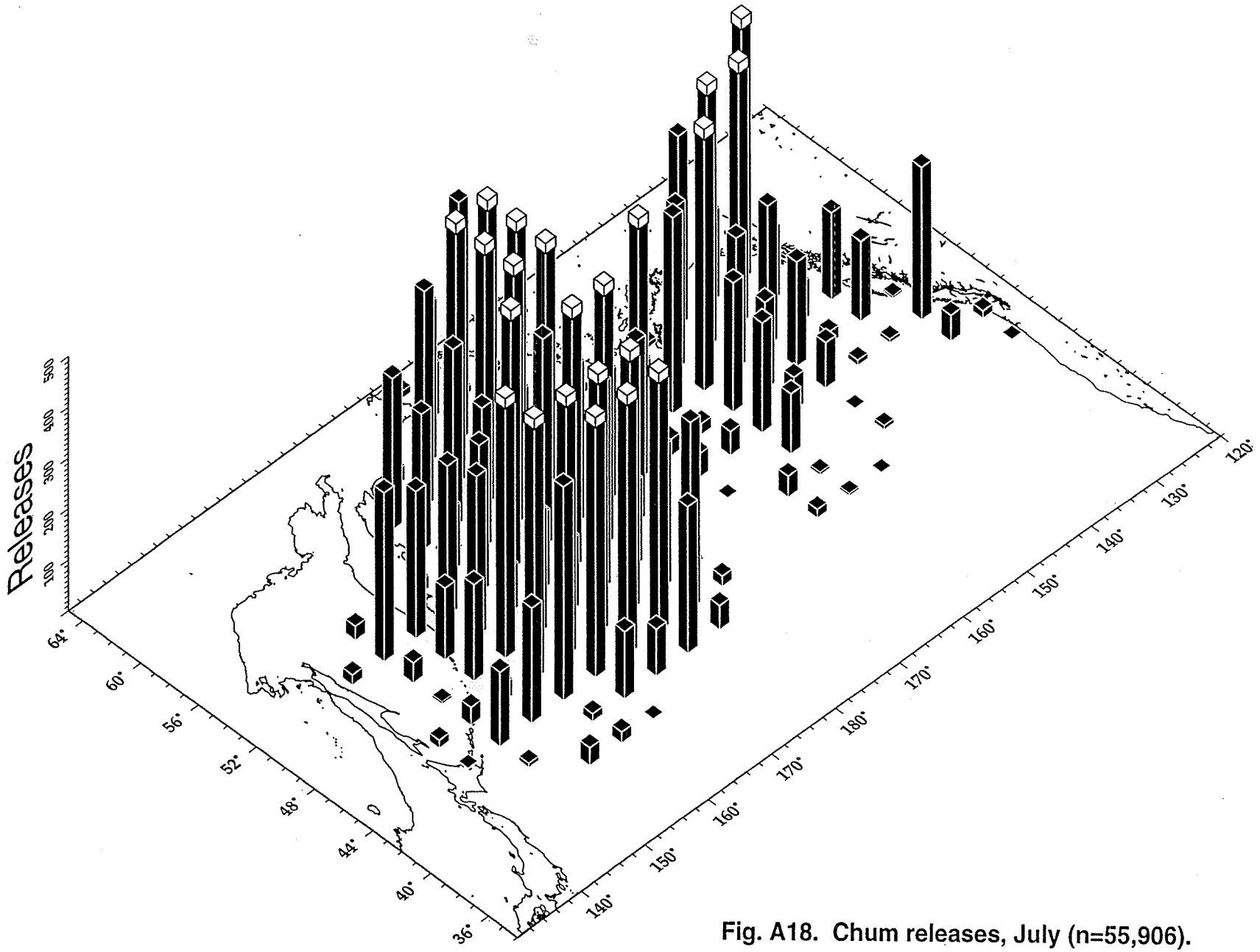


Fig. A18. Chum releases, July (n=55,906).

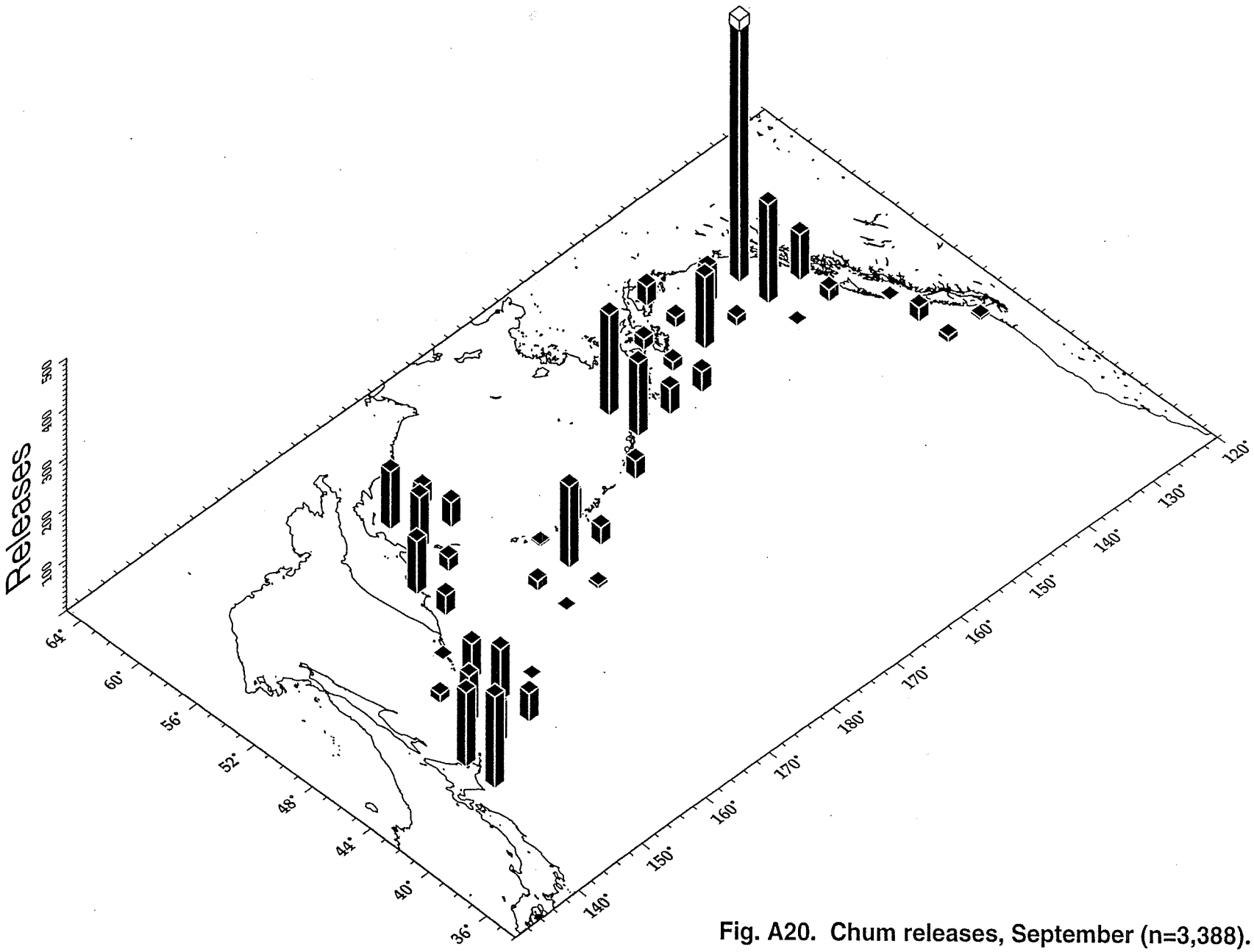


Fig. A20. Chum releases, September (n=3,388).

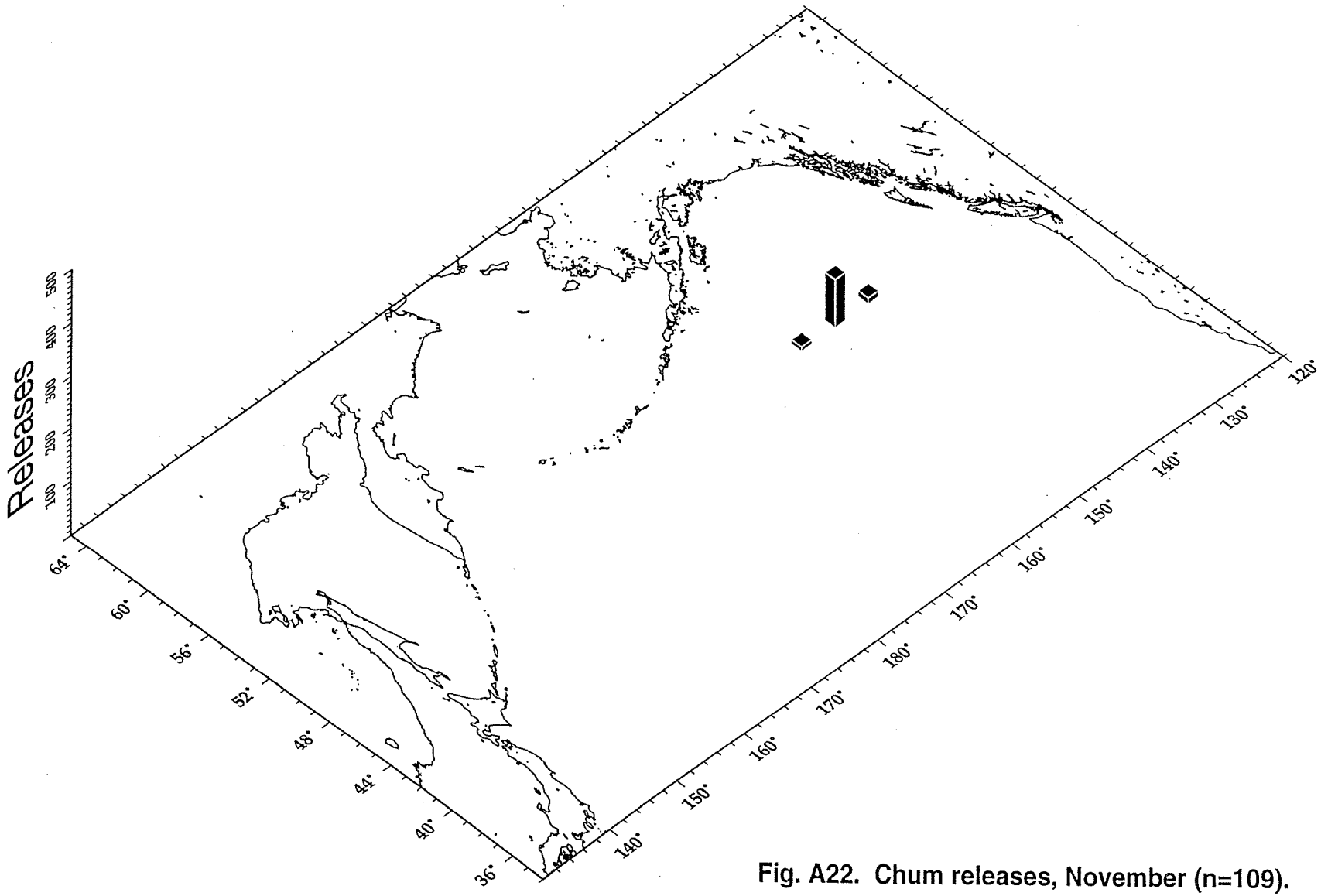


Fig. A22. Chum releases, November (n=109).

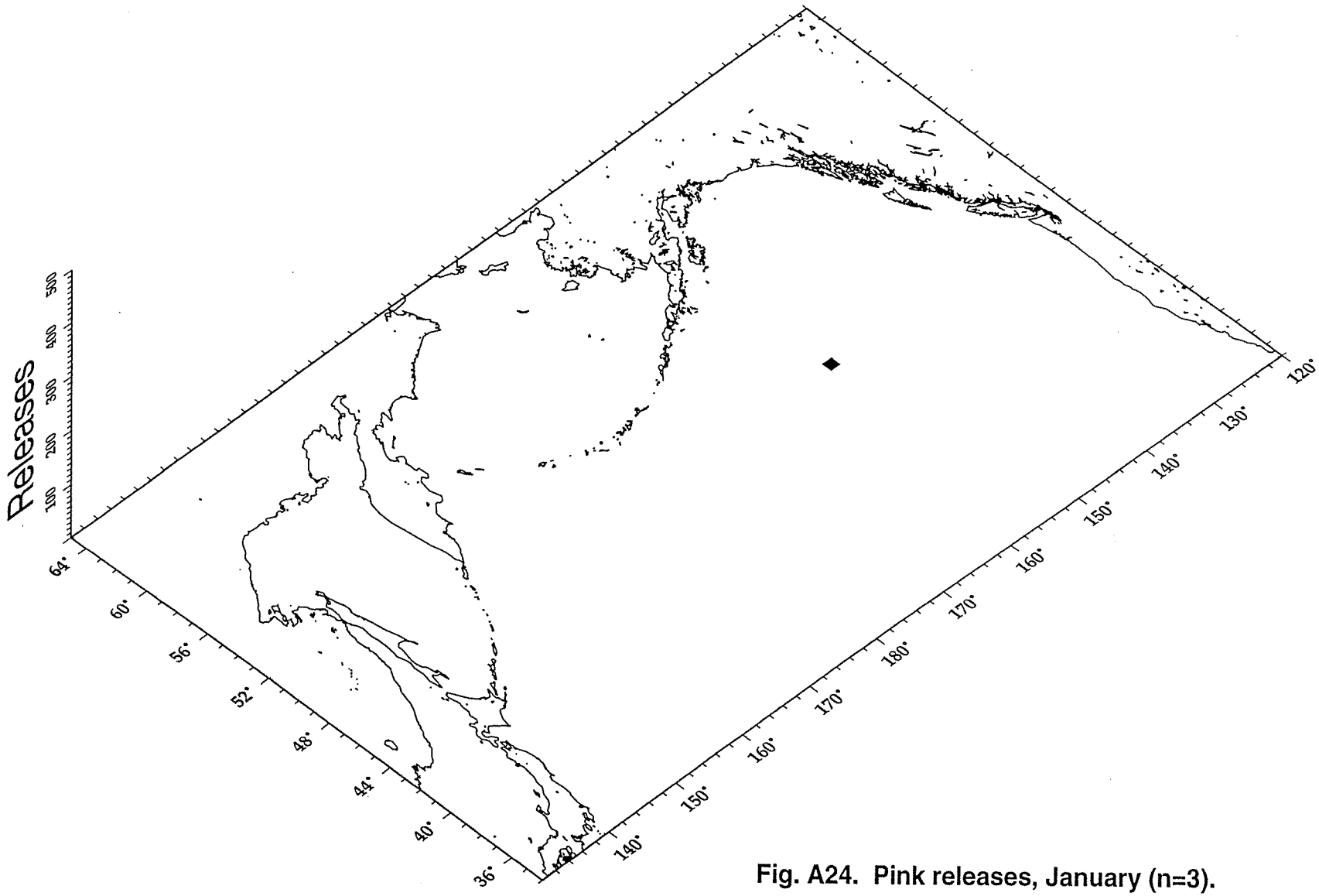


Fig. A24. Pink releases, January (n=3).

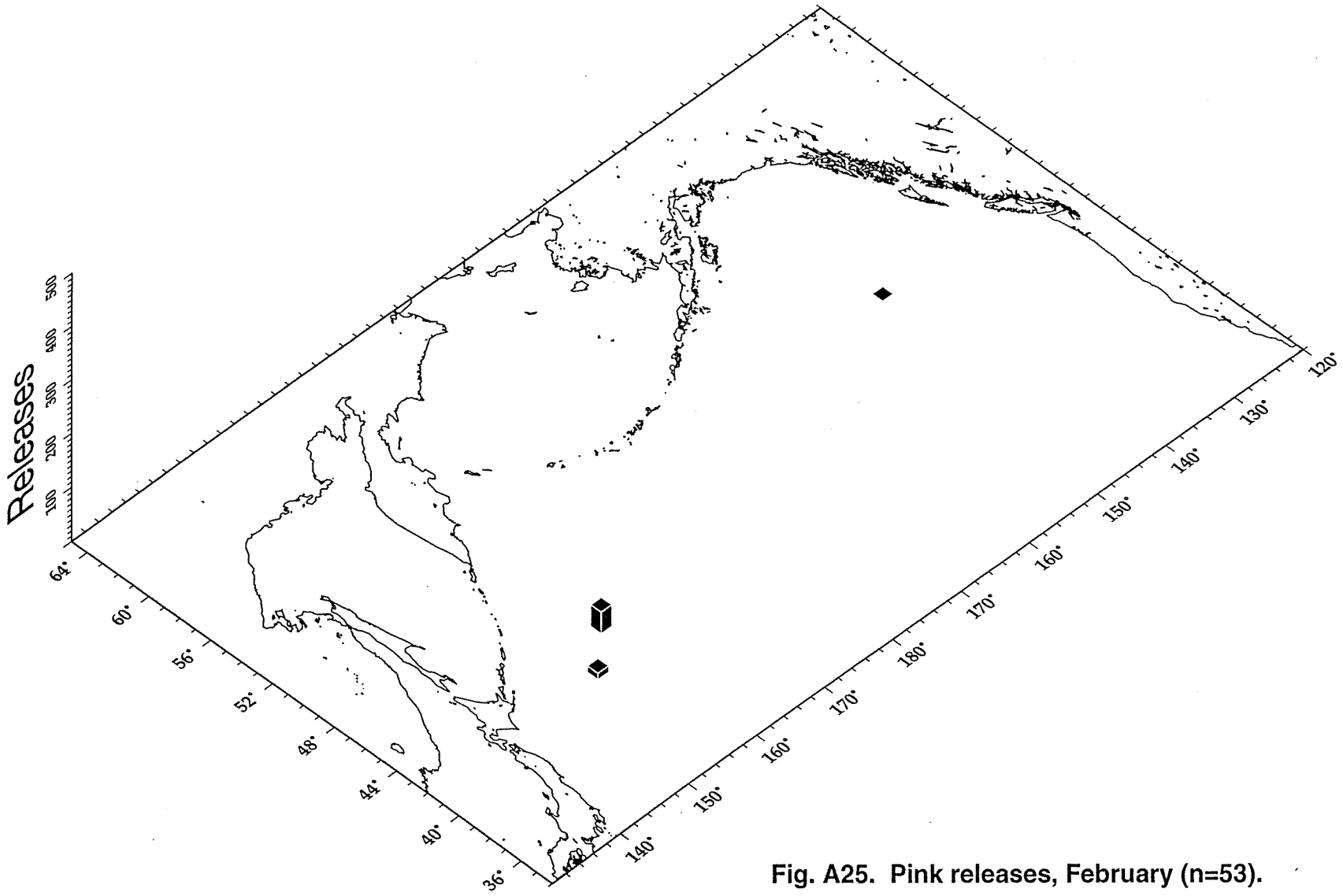


Fig. A25. Pink releases, February (n=53).

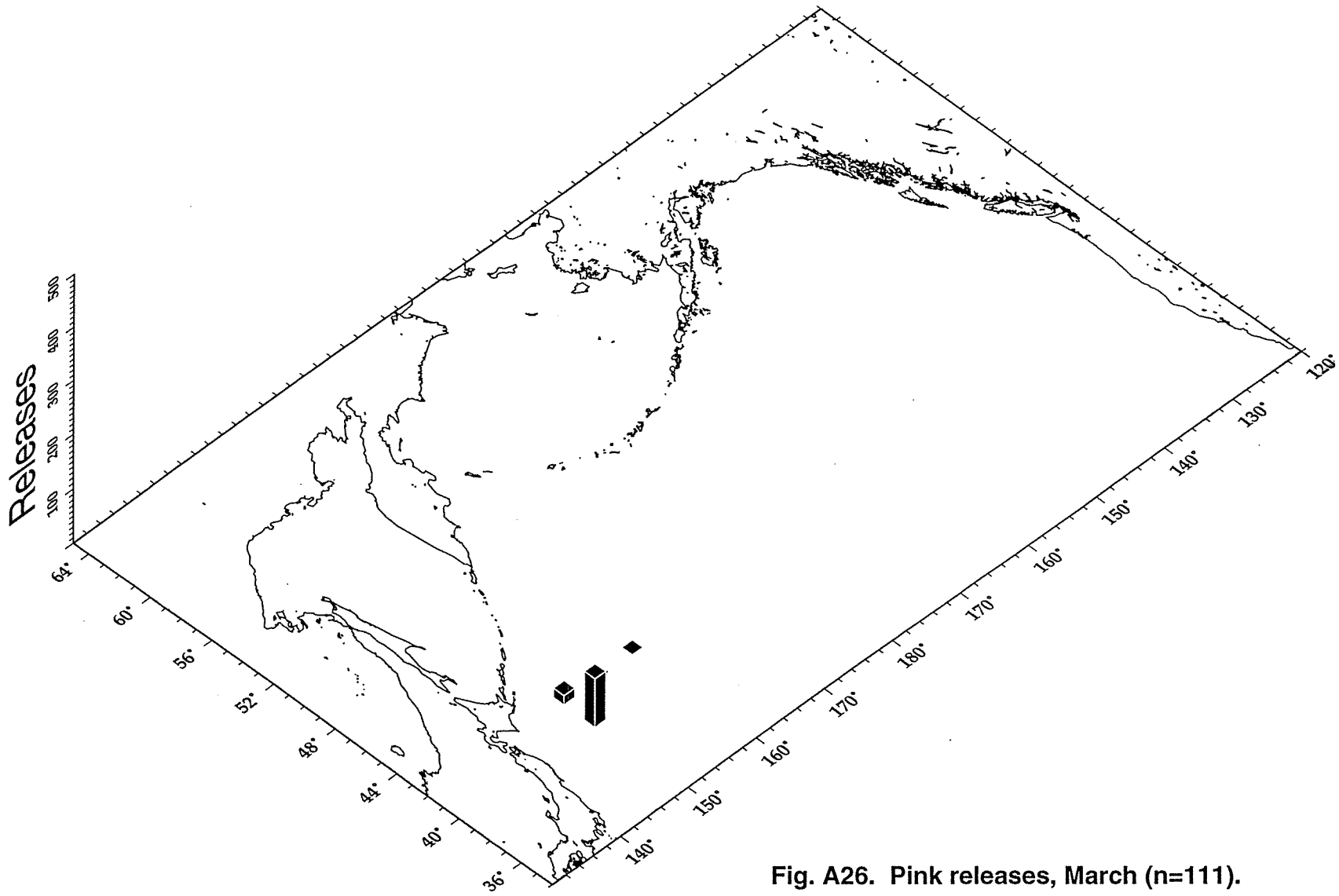


Fig. A26. Pink releases, March (n=111).

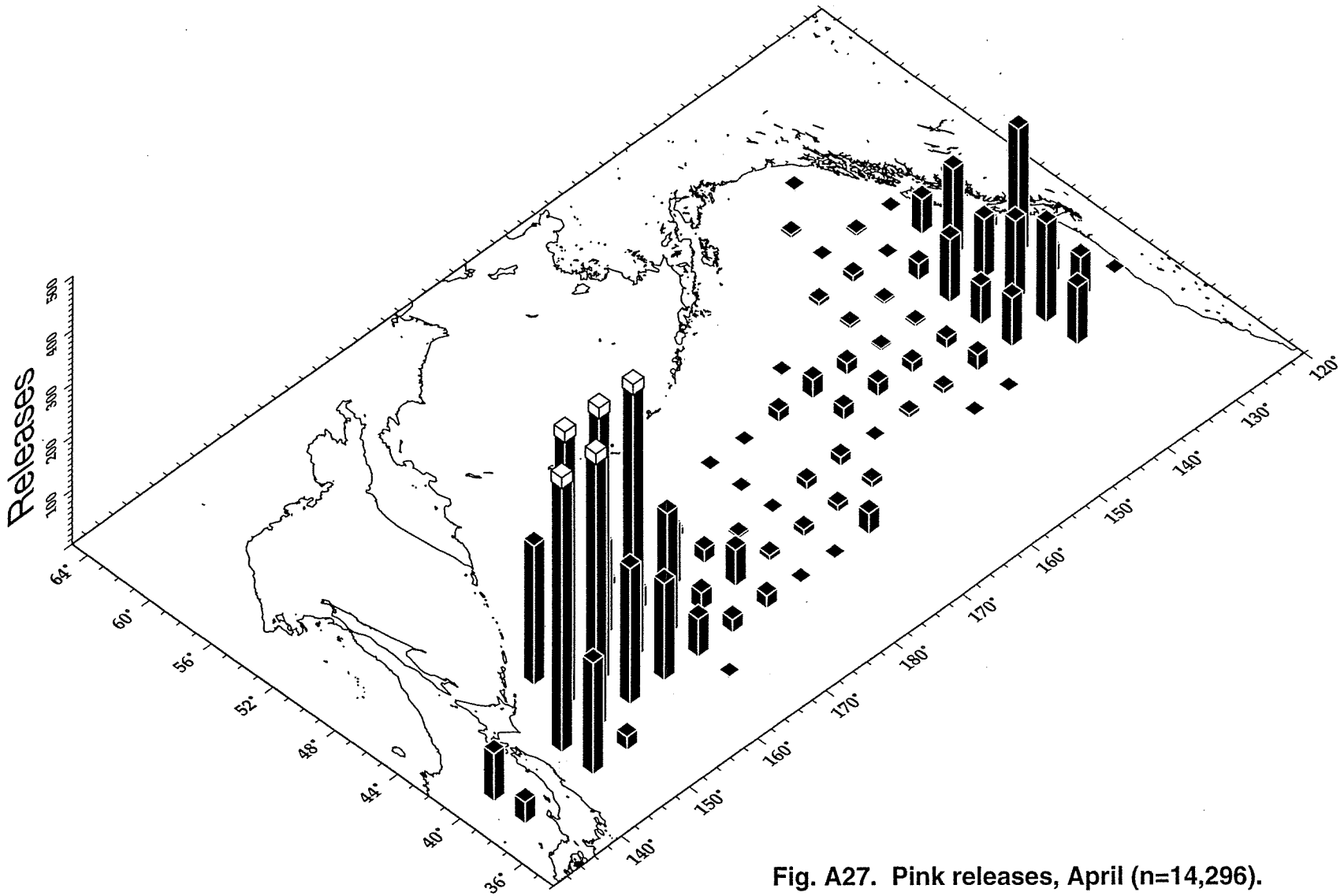


Fig. A27. Pink releases, April (n=14,296).

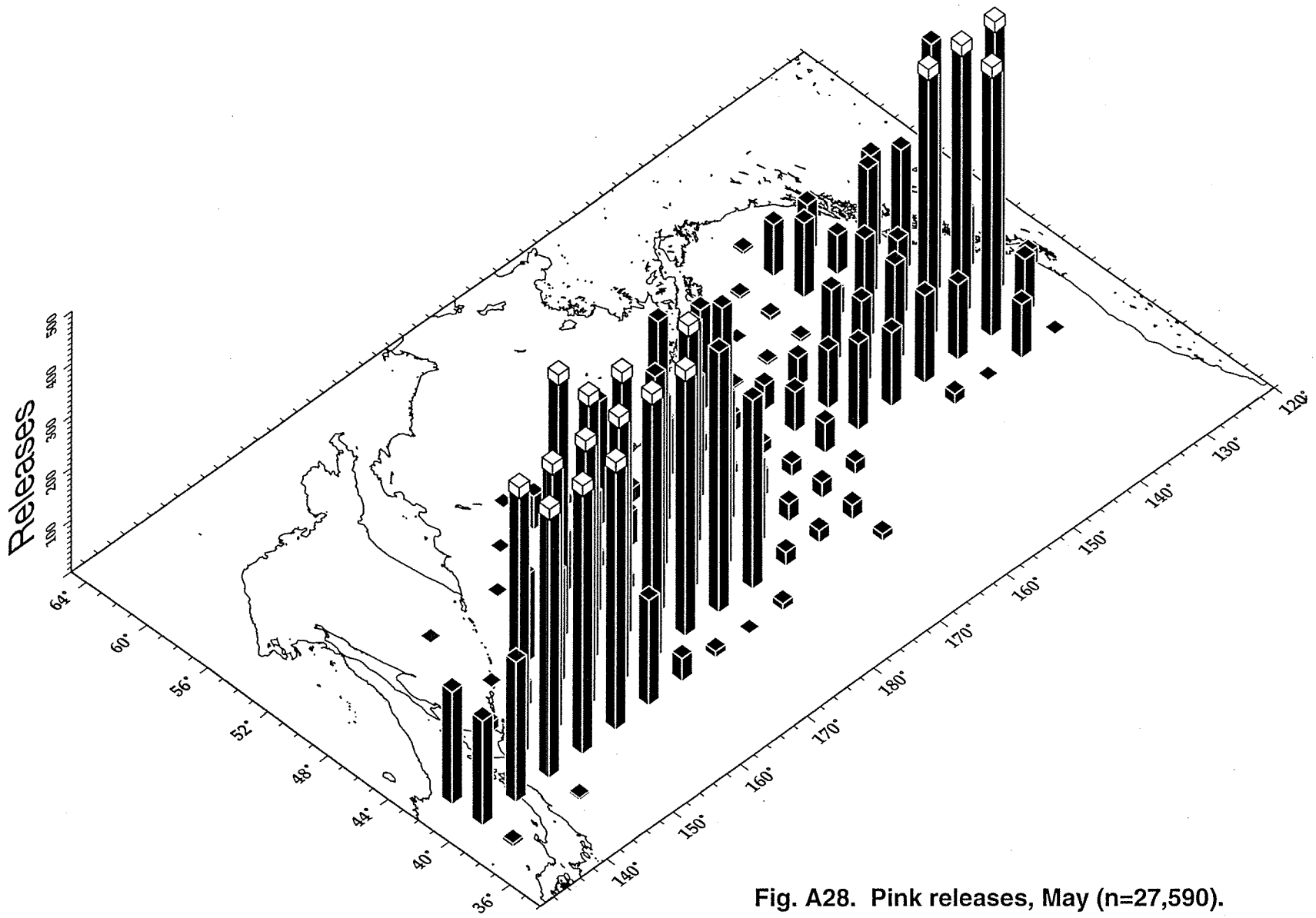


Fig. A28. Pink releases, May (n=27,590).

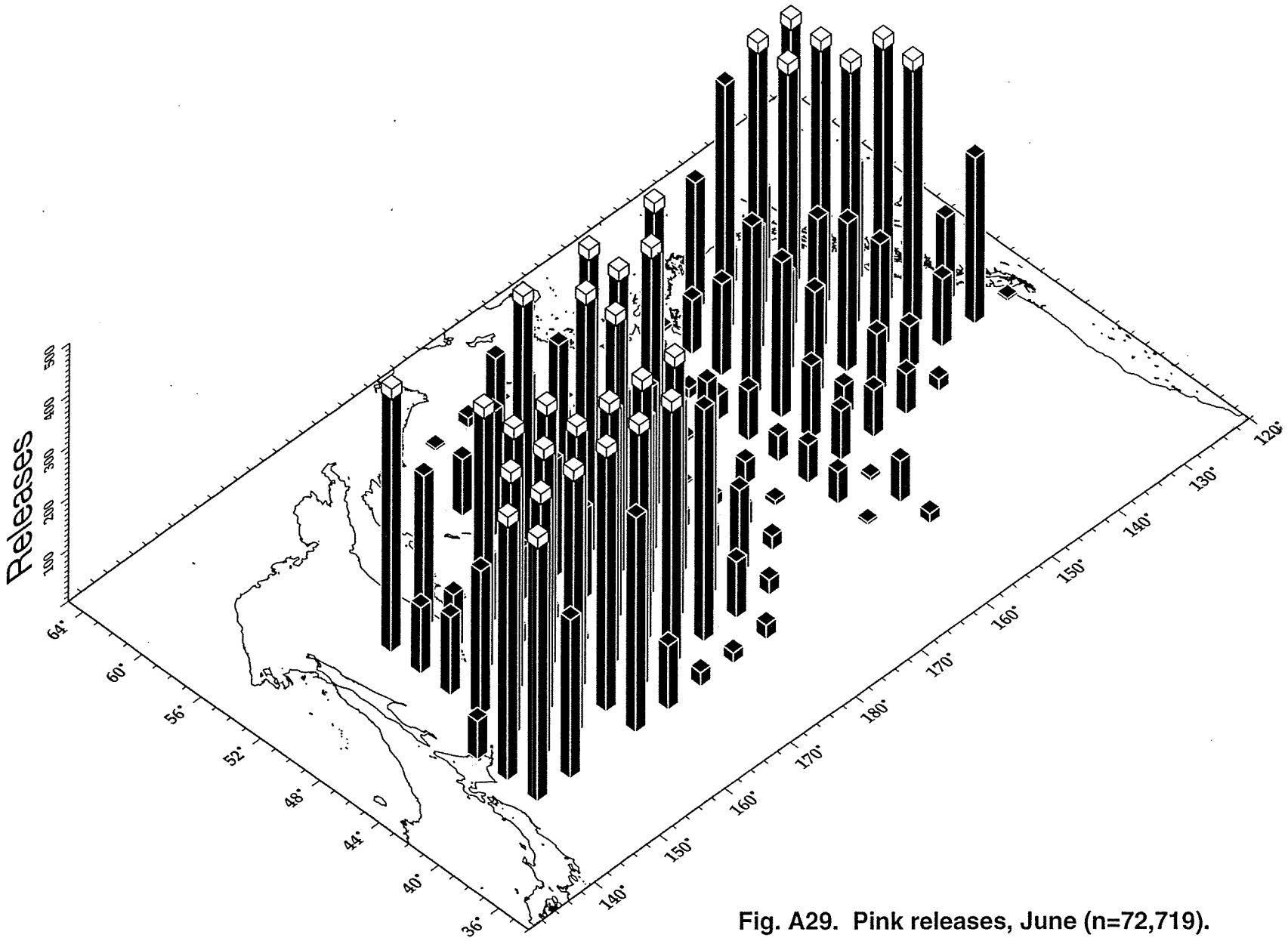


Fig. A29. Pink releases, June (n=72,719).

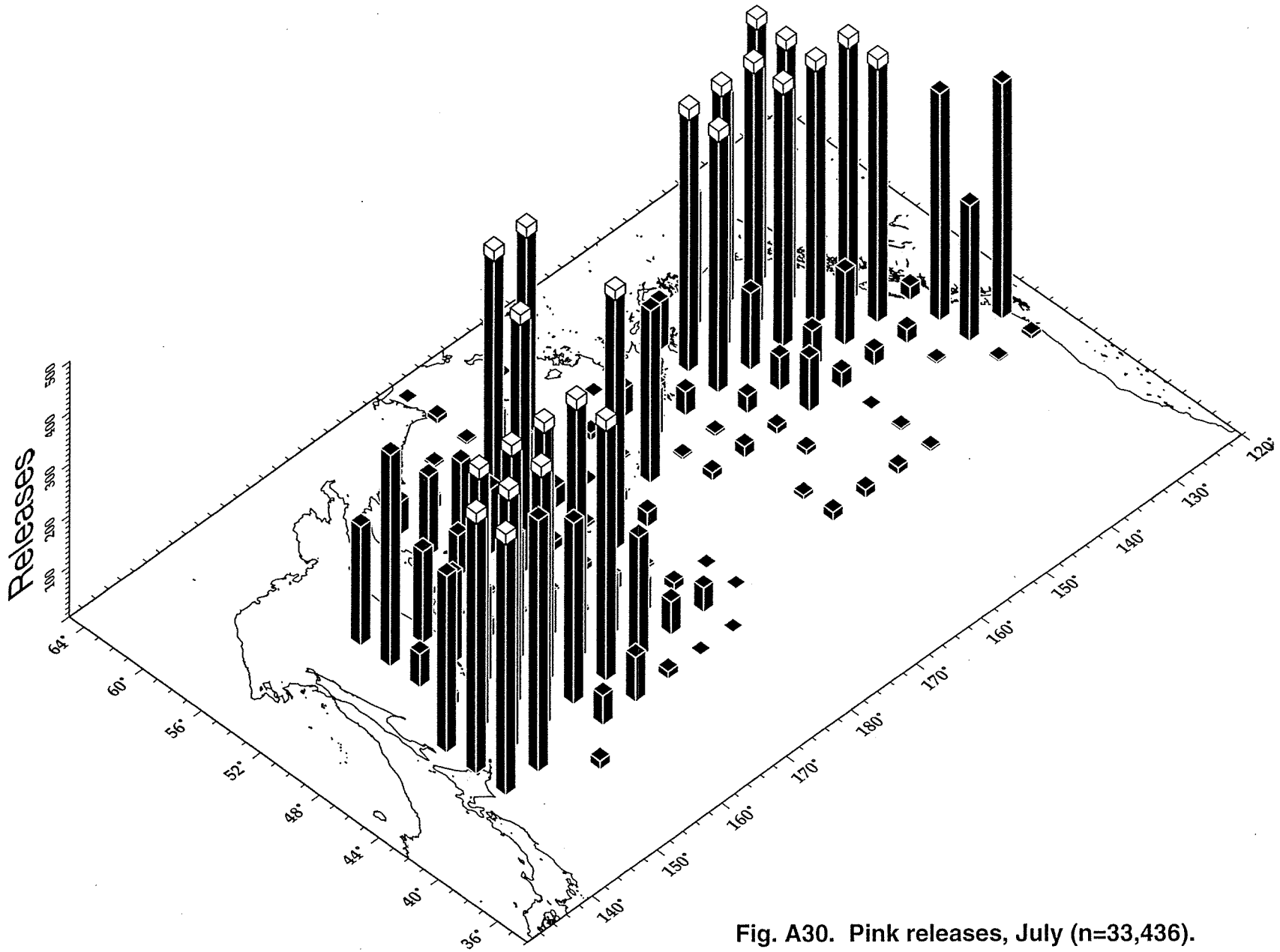


Fig. A30. Pink releases, July (n=33,436).

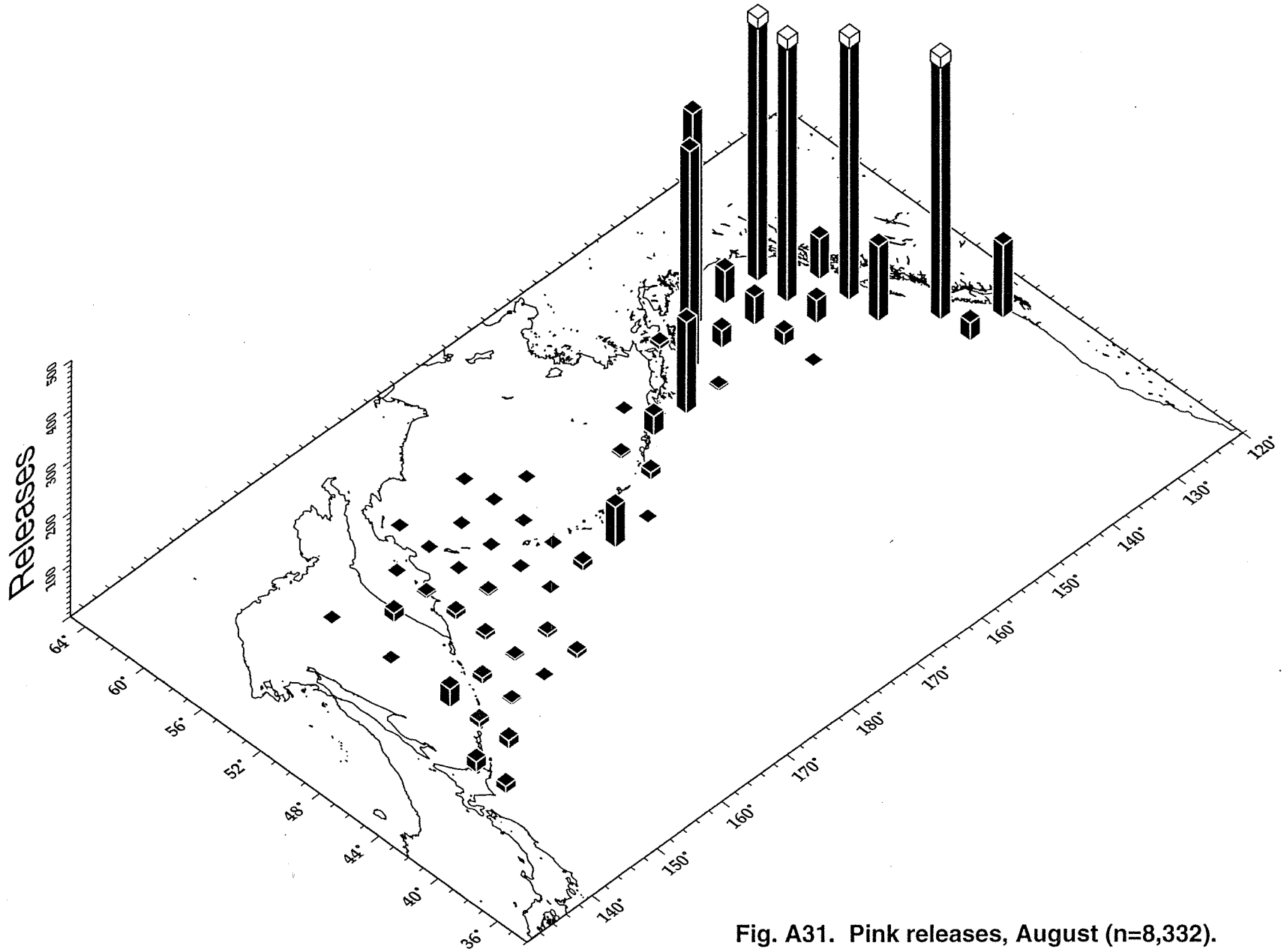


Fig. A31. Pink releases, August (n=8,332).

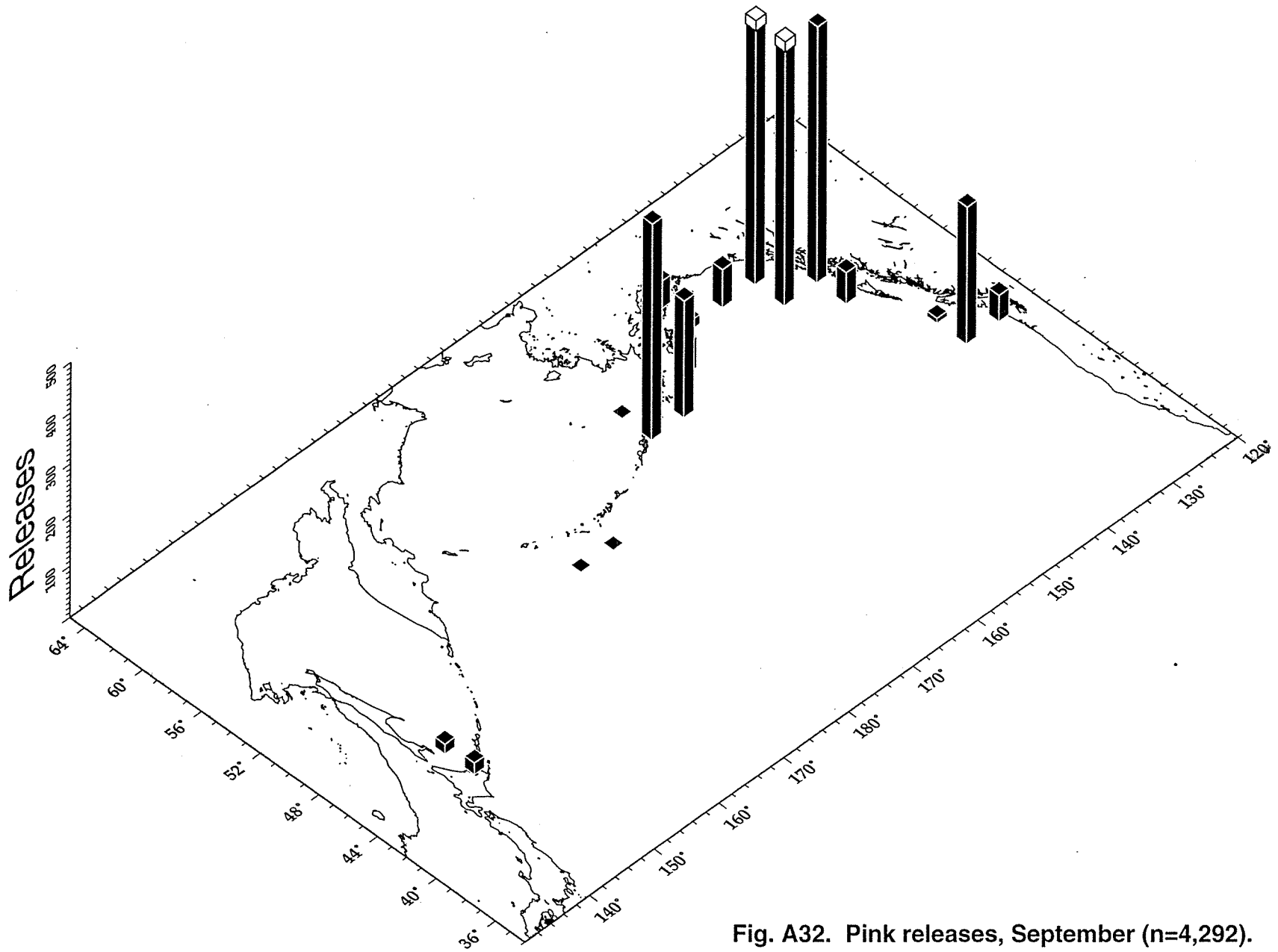


Fig. A32. Pink releases, September (n=4,292).

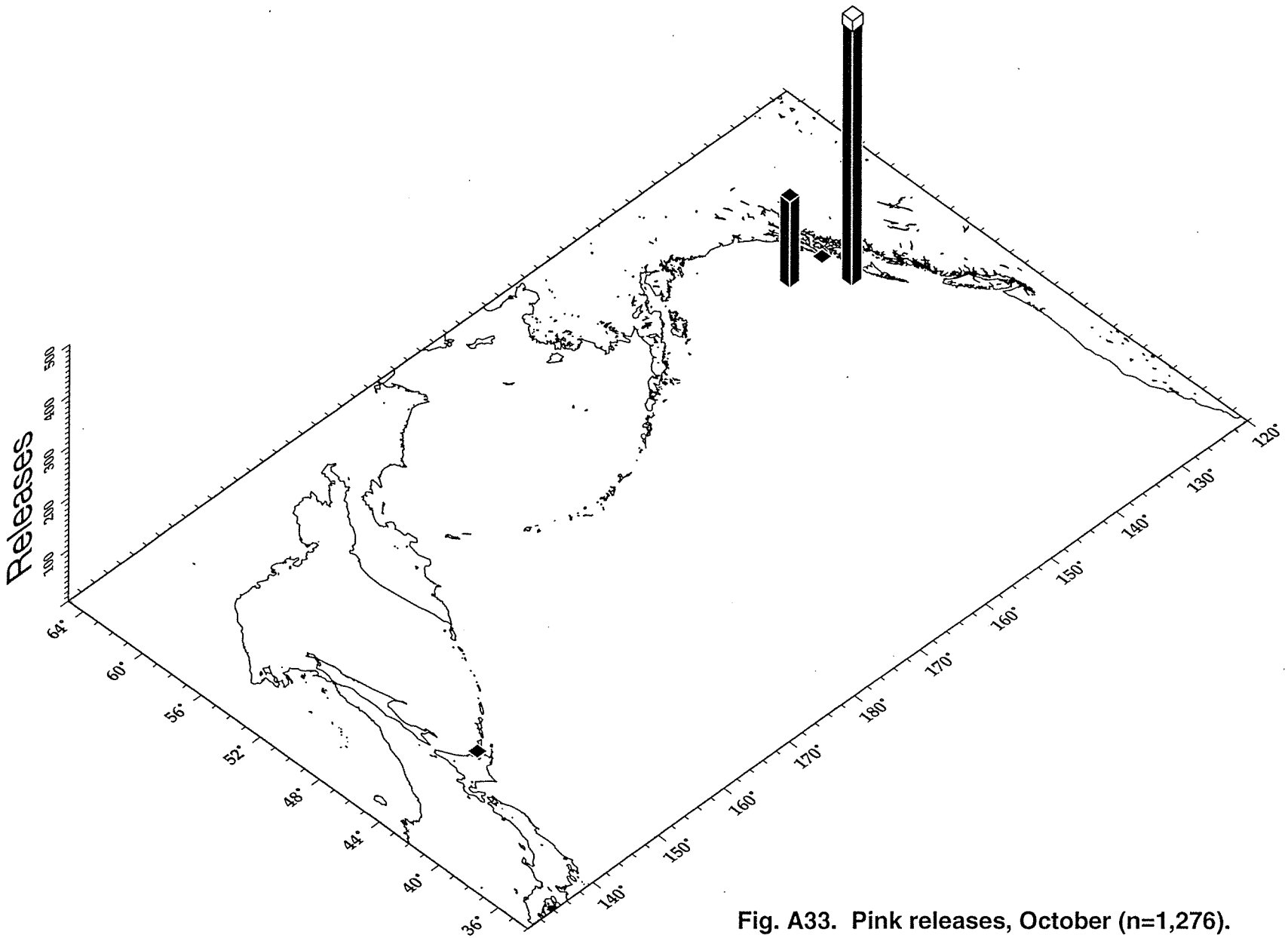


Fig. A33. Pink releases, October (n=1,276).

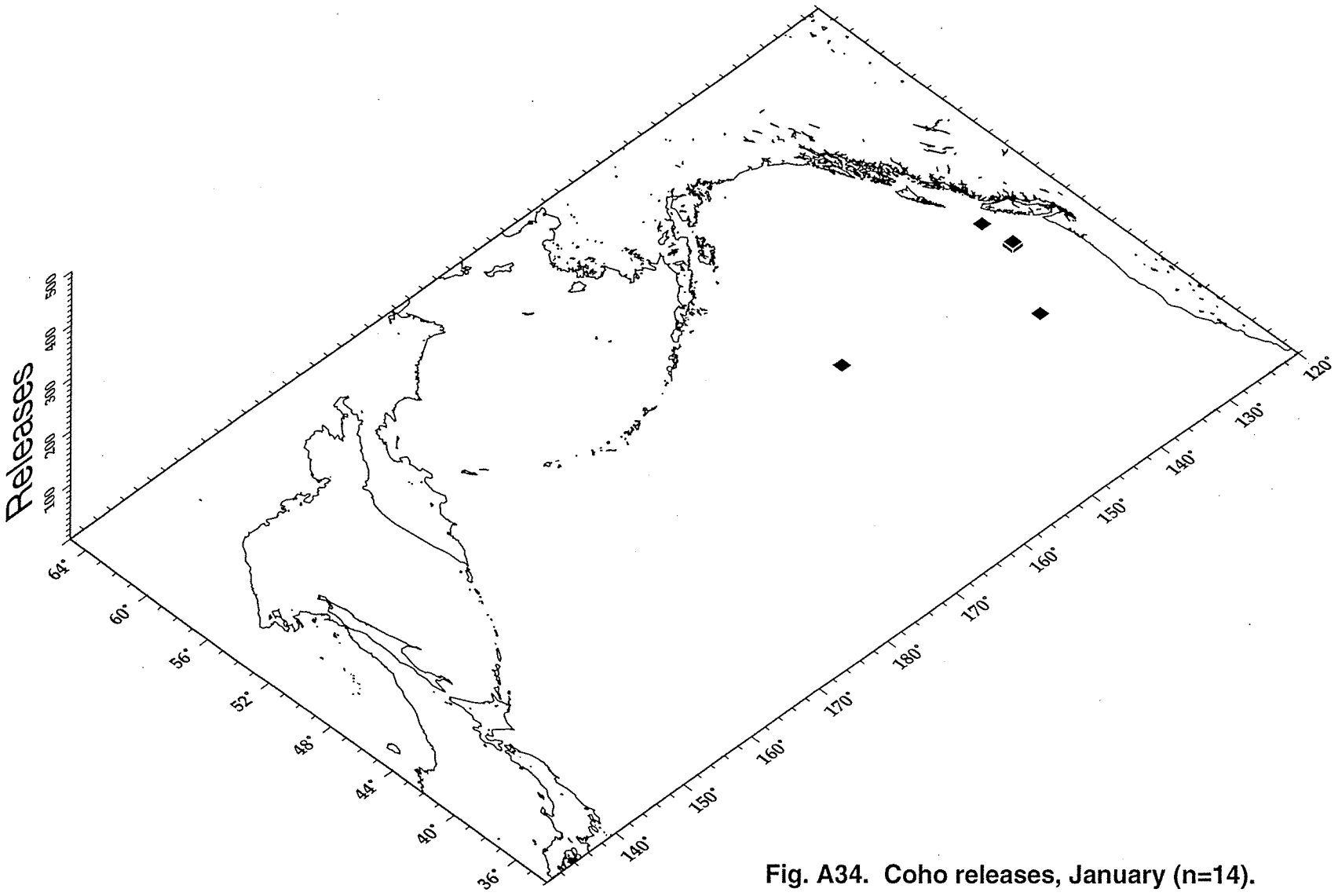


Fig. A34. Coho releases, January (n=14).

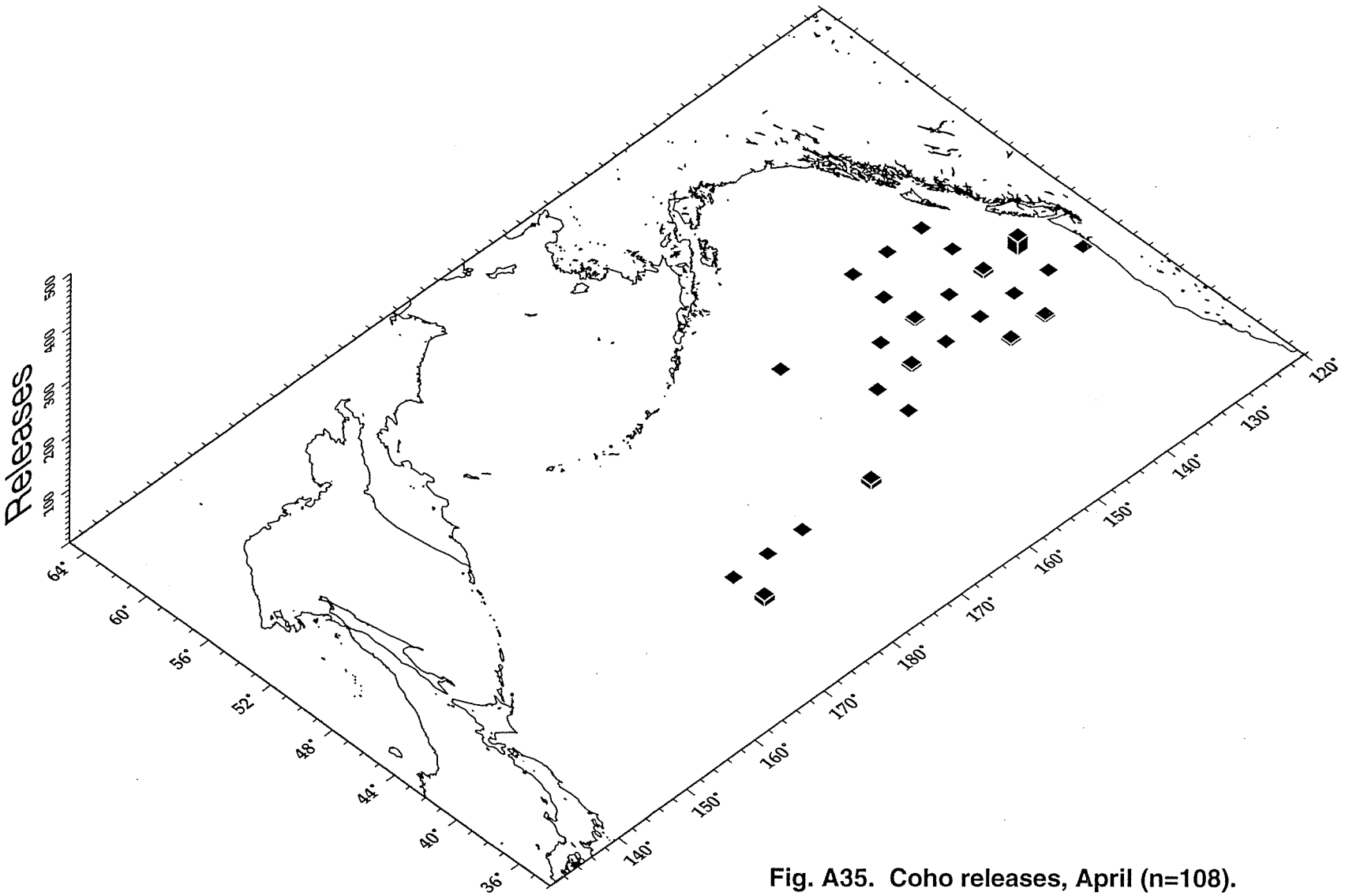


Fig. A35. Coho releases, April (n=108).

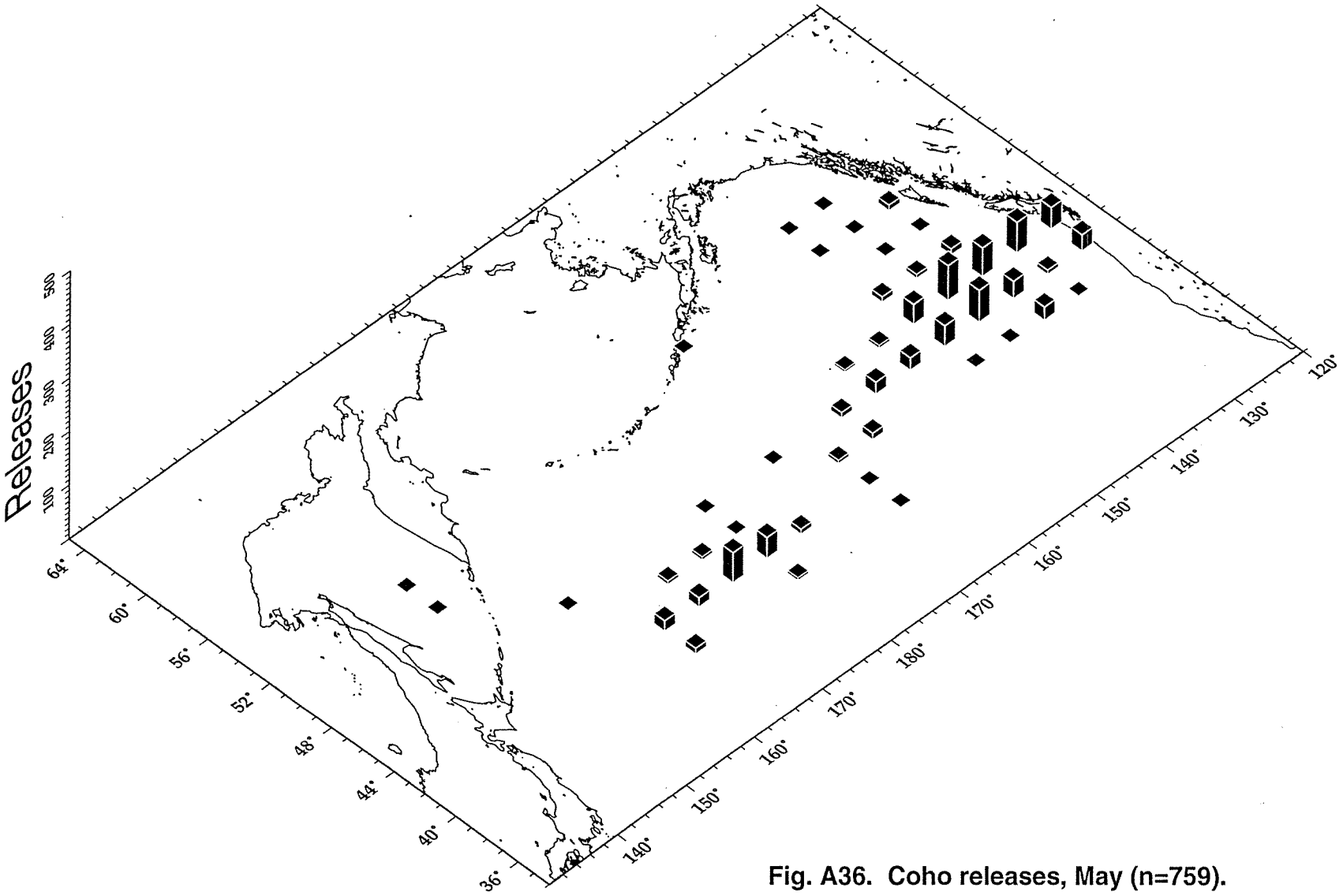


Fig. A36. Coho releases, May (n=759).

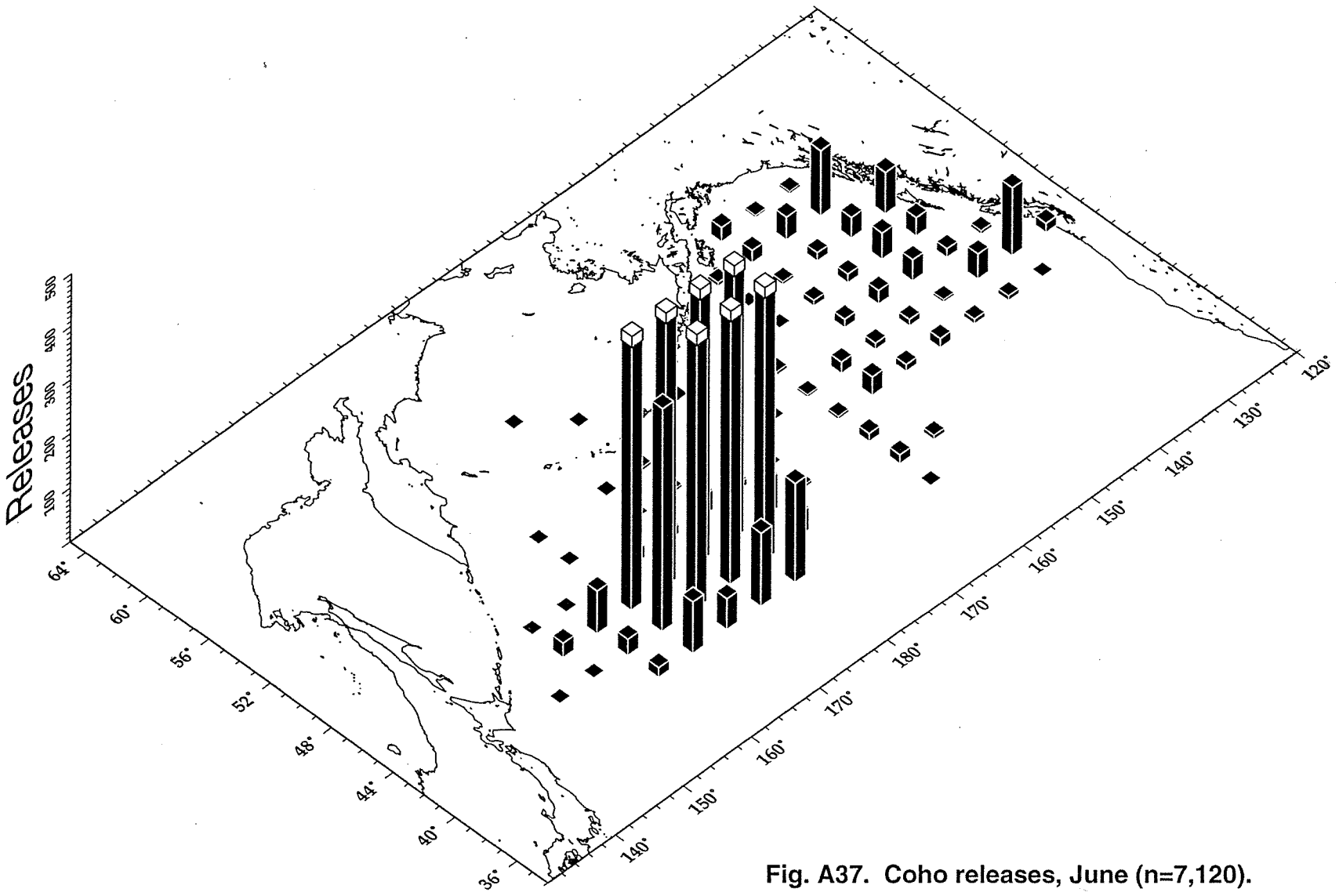


Fig. A37. Coho releases, June (n=7,120).

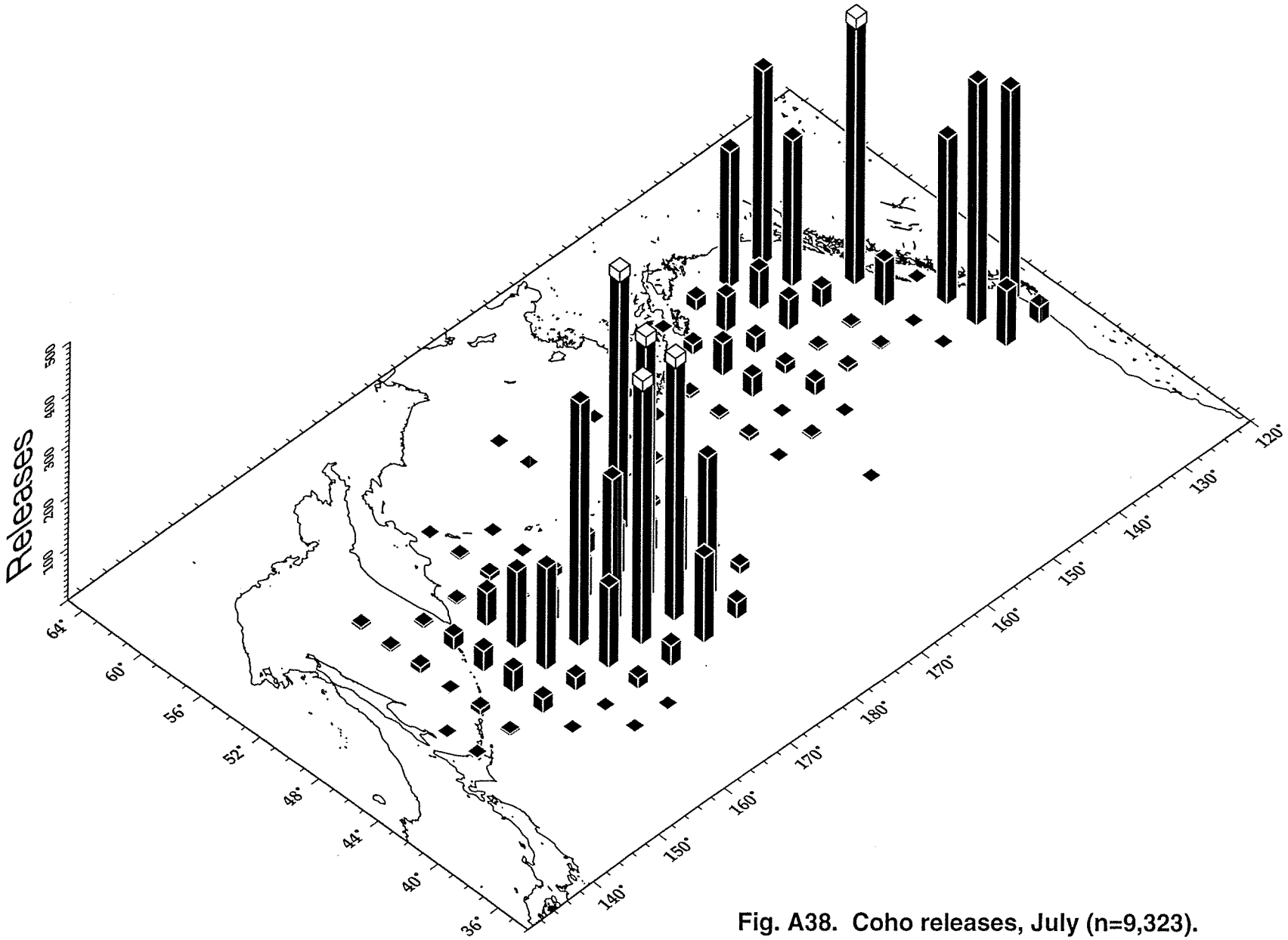


Fig. A38. Coho releases, July (n=9,323).

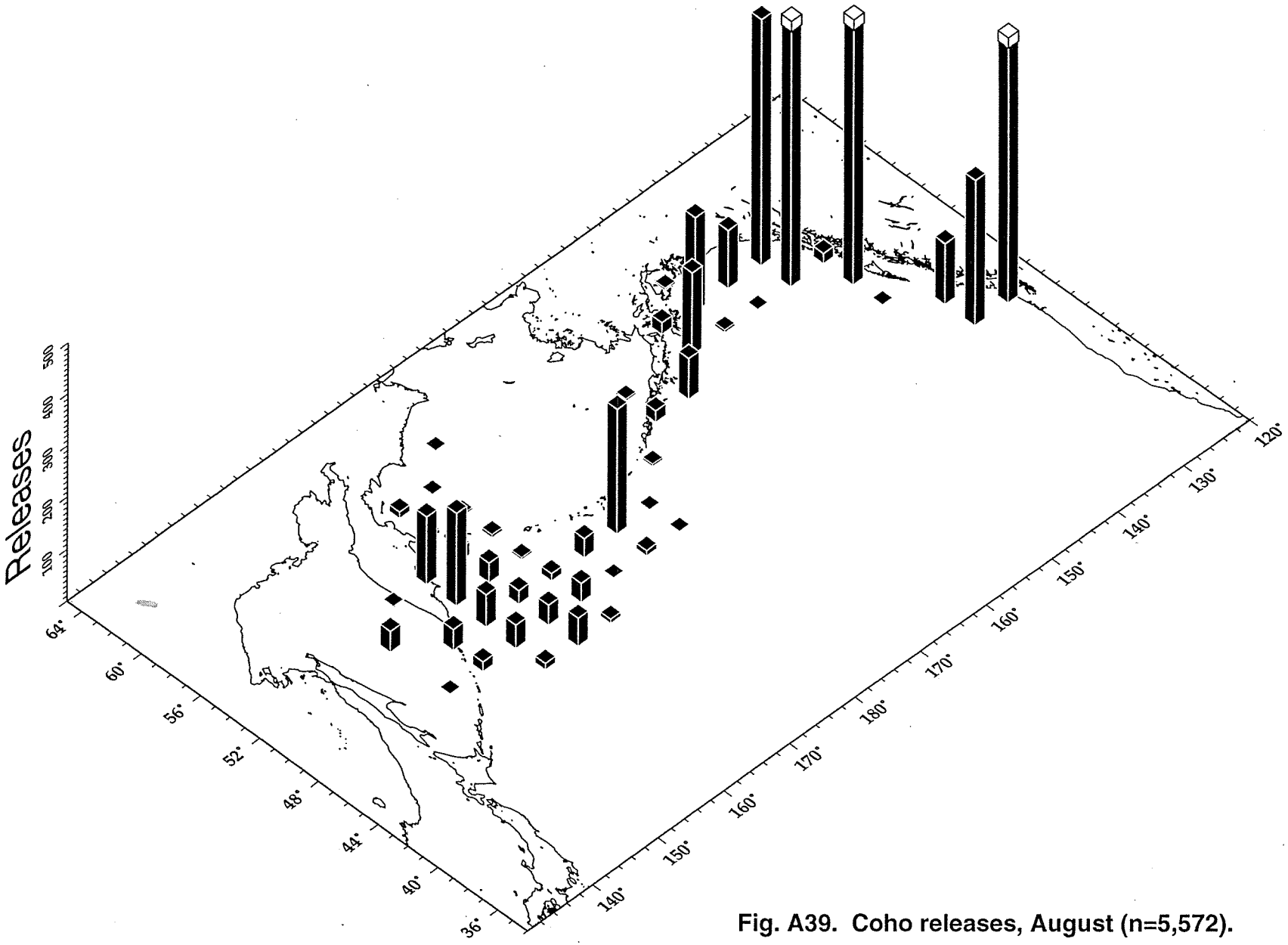


Fig. A39. Coho releases, August (n=5,572).

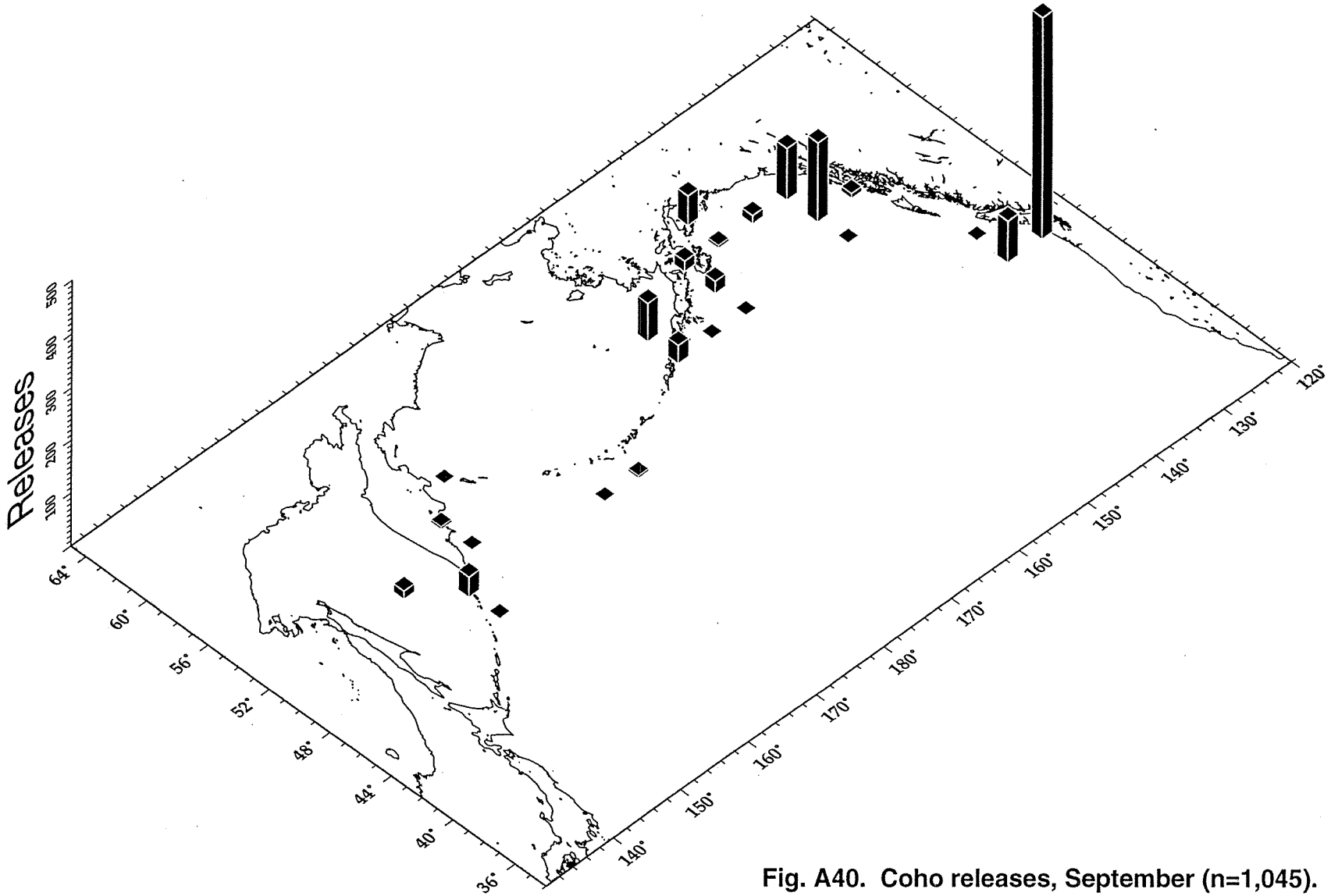


Fig. A40. Coho releases, September (n=1,045).

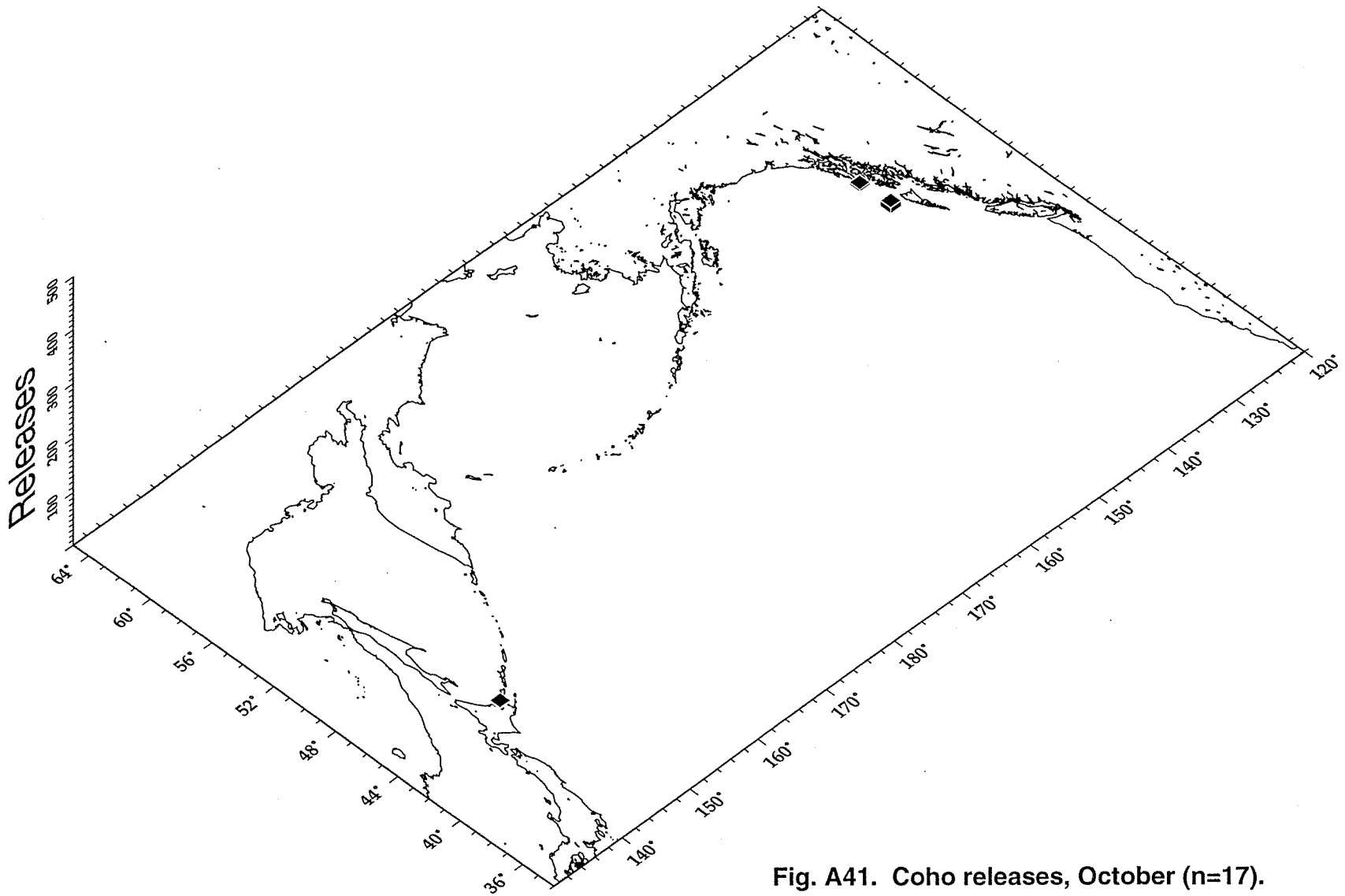


Fig. A41. Coho releases, October (n=17).

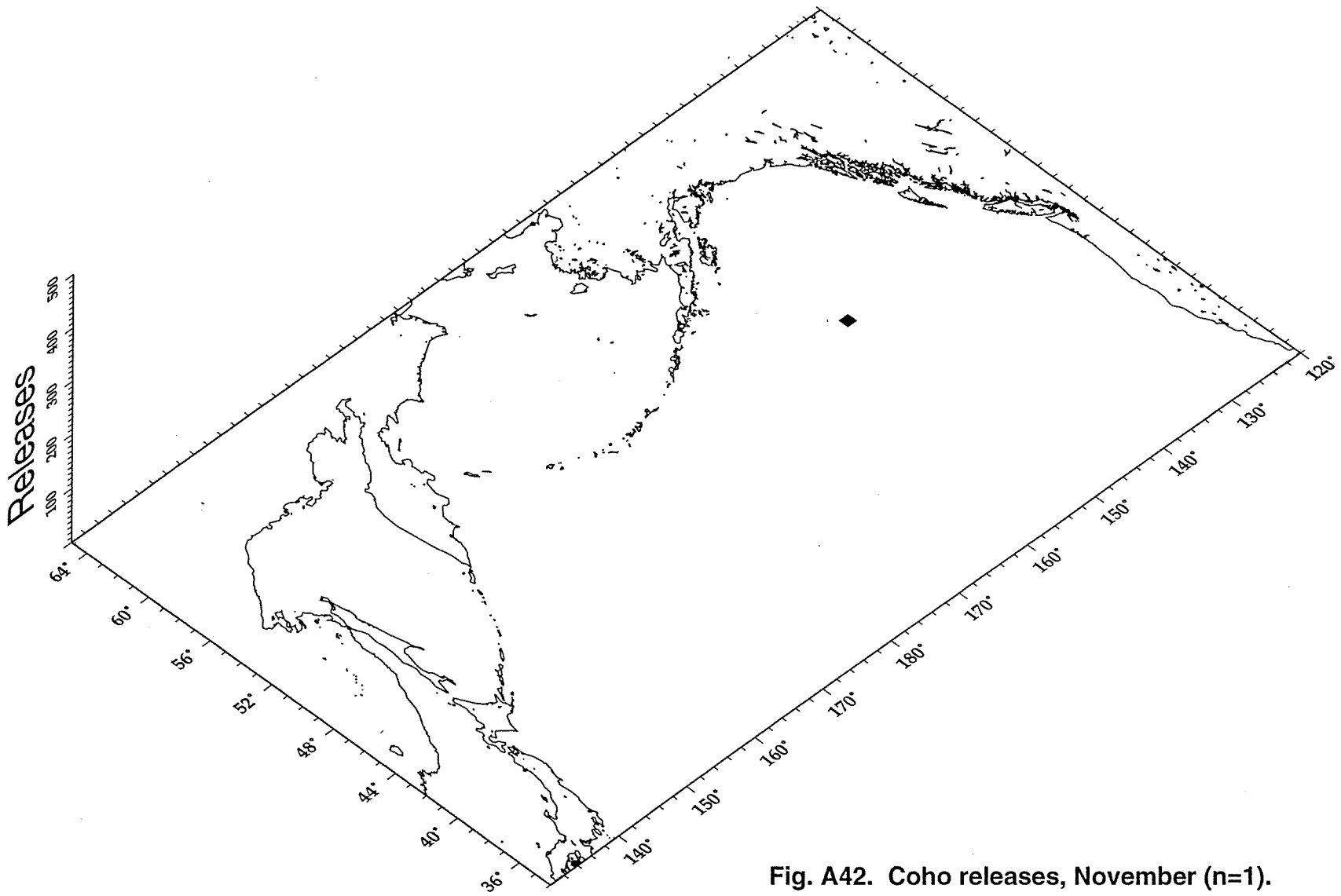


Fig. A42. Coho releases, November (n=1).

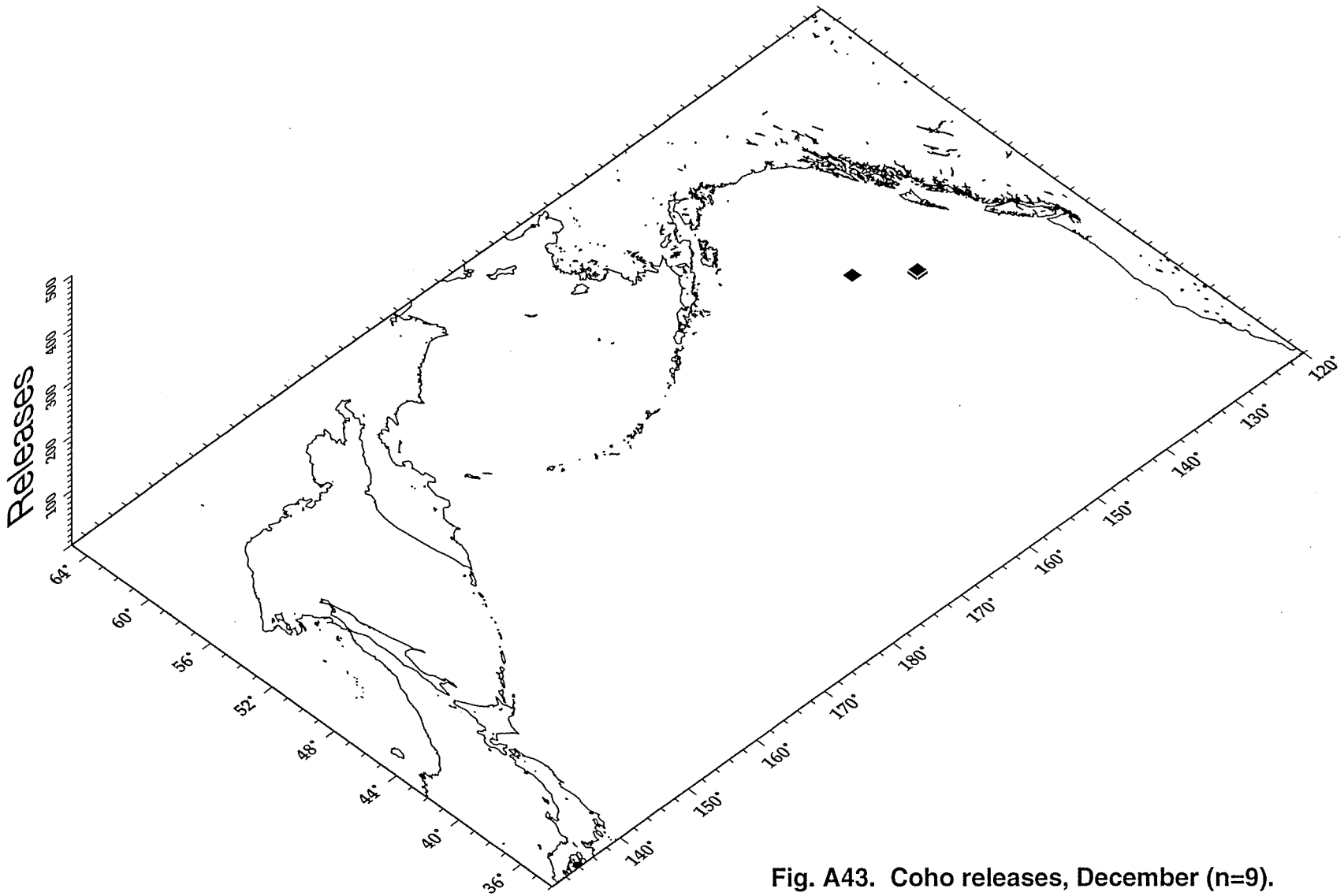


Fig. A43. Coho releases, December (n=9).

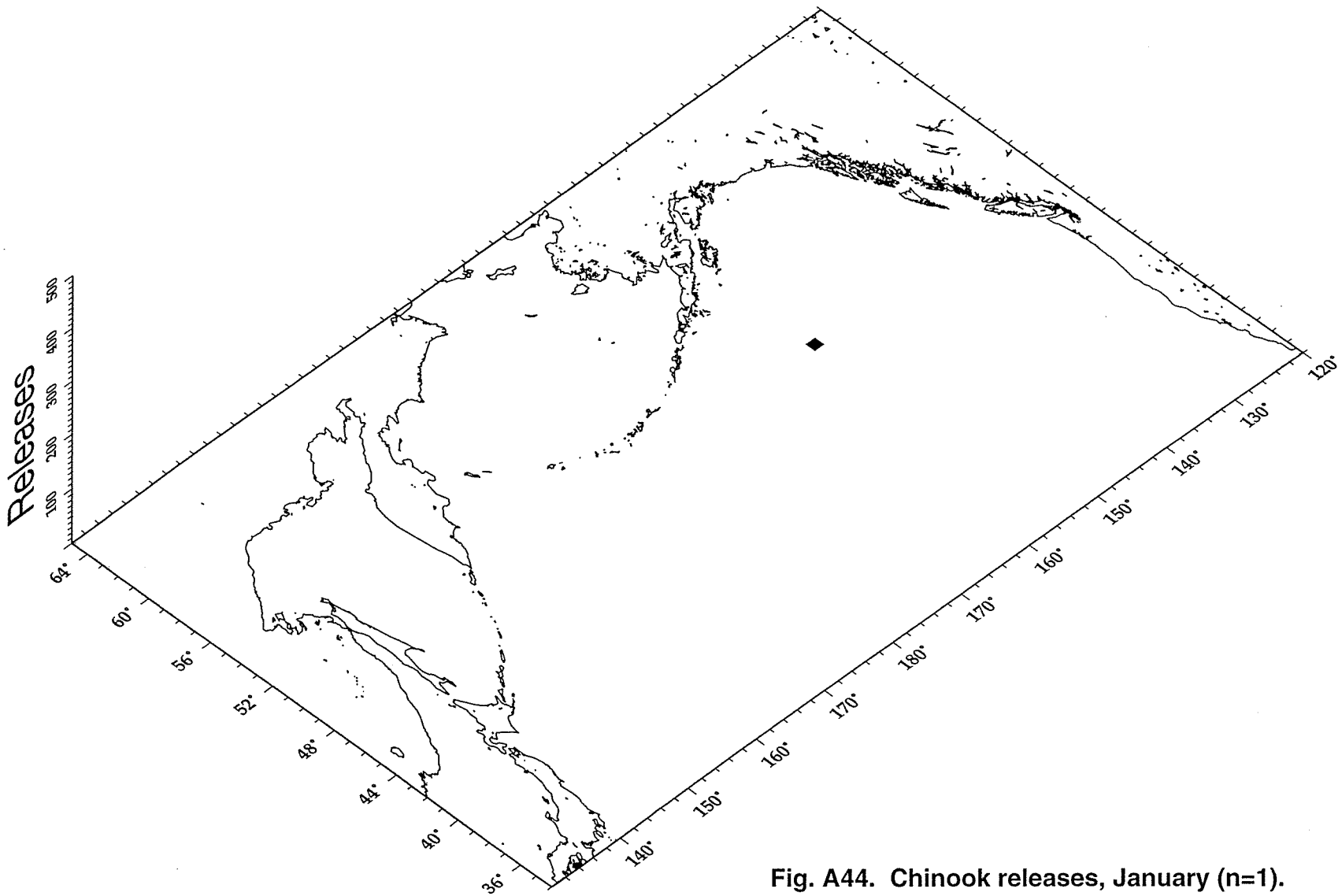


Fig. A44. Chinook releases, January (n=1).

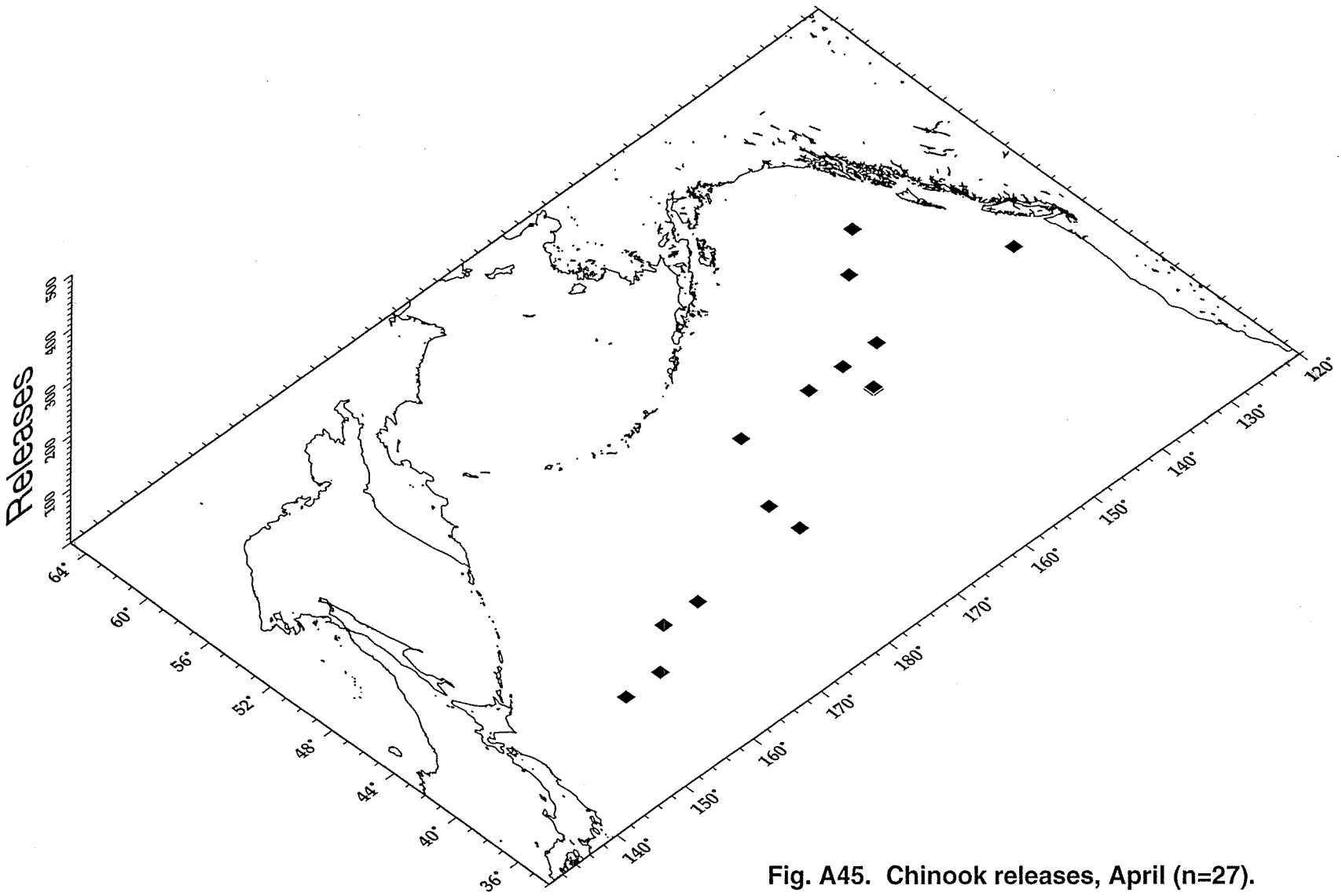


Fig. A45. Chinook releases, April (n=27).

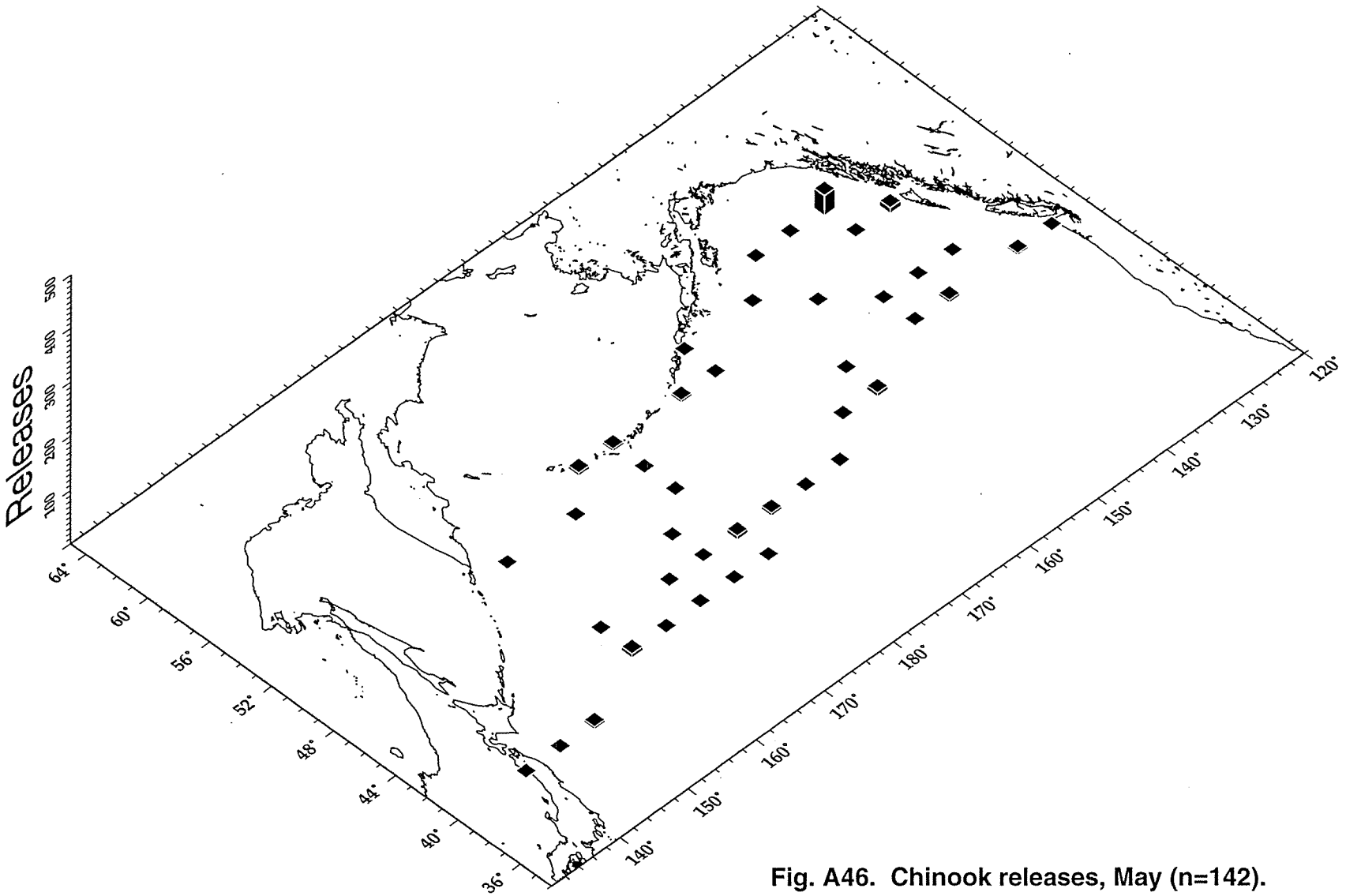


Fig. A46. Chinook releases, May (n=142).

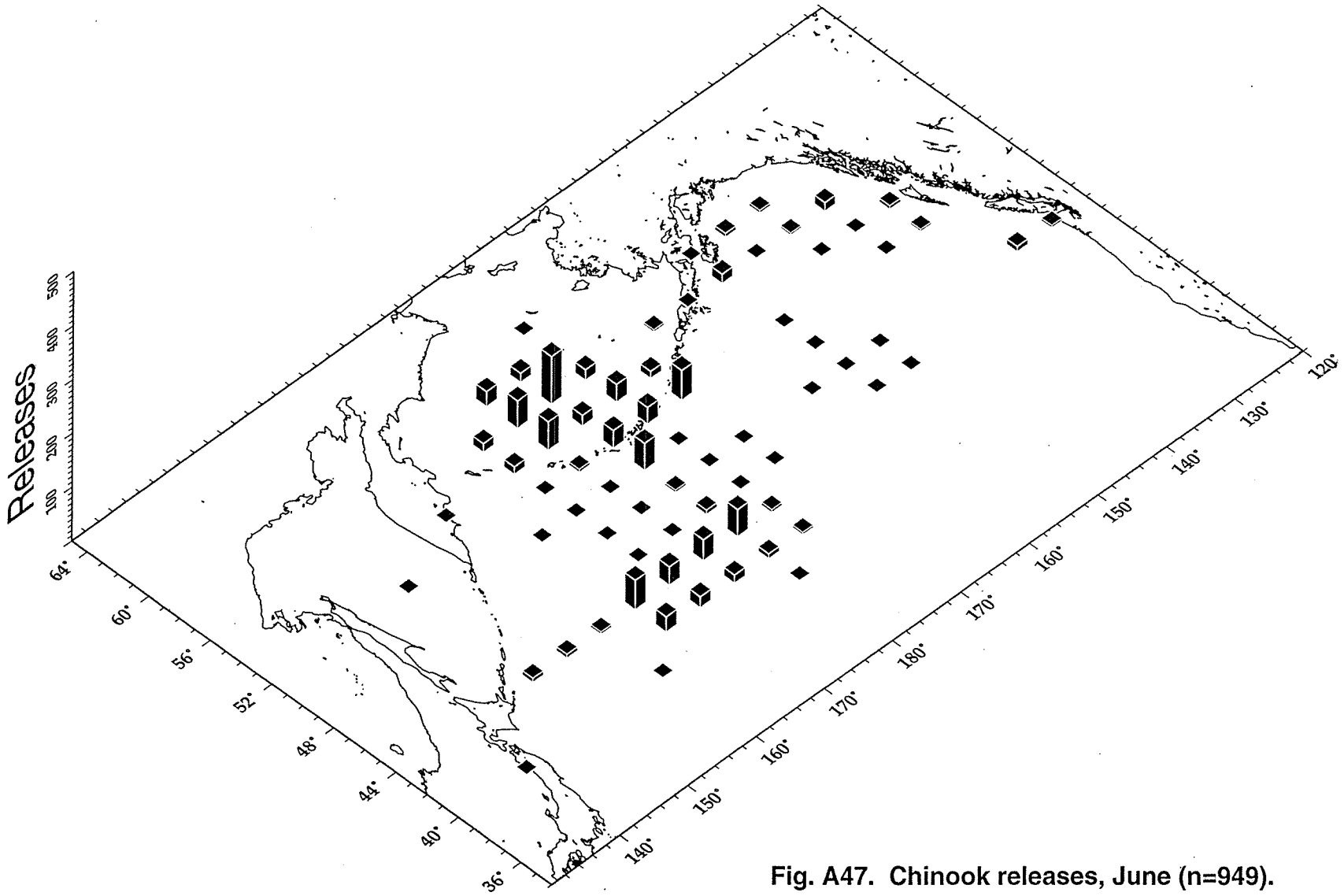


Fig. A47. Chinook releases, June (n=949).

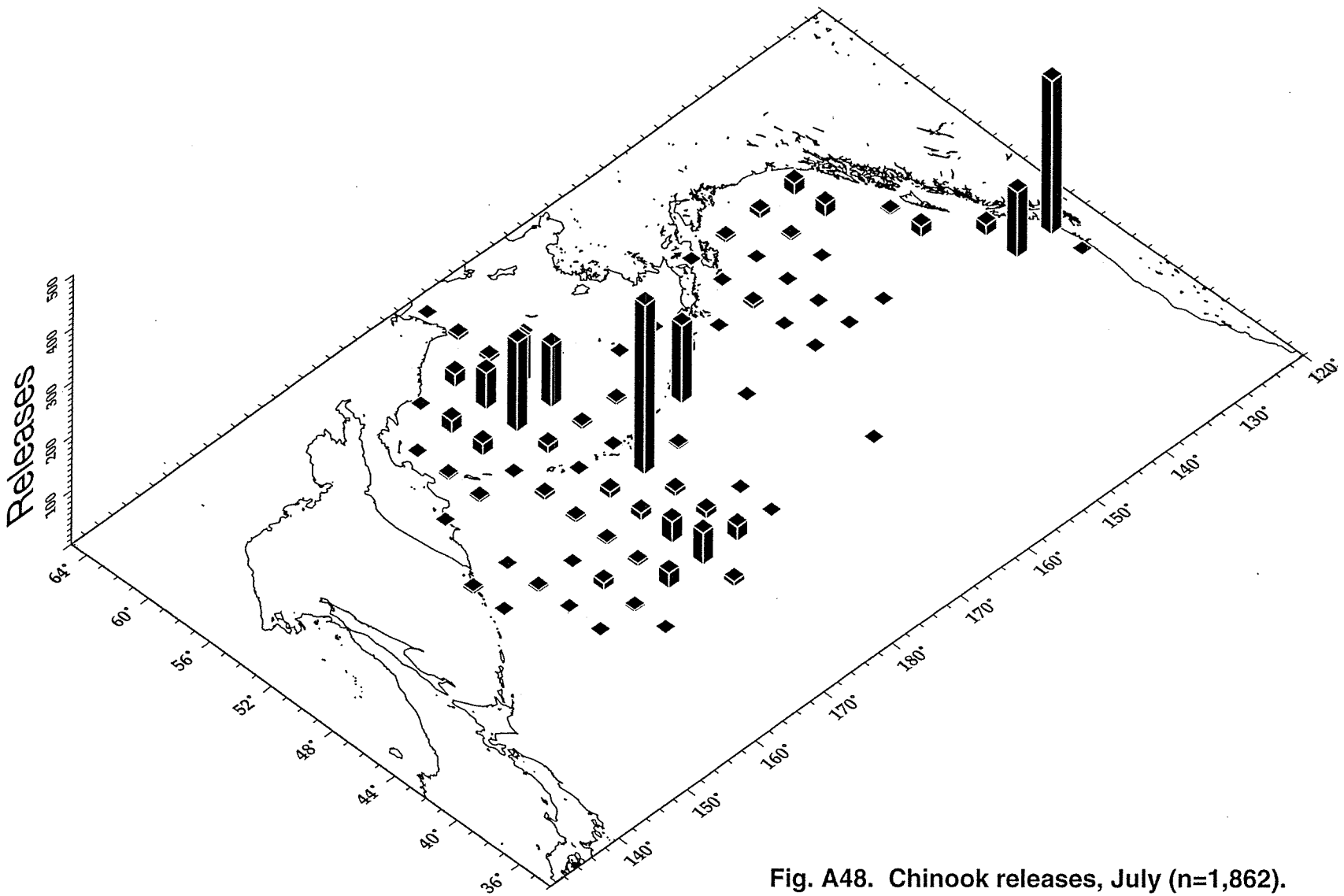


Fig. A48. Chinook releases, July (n=1,862).

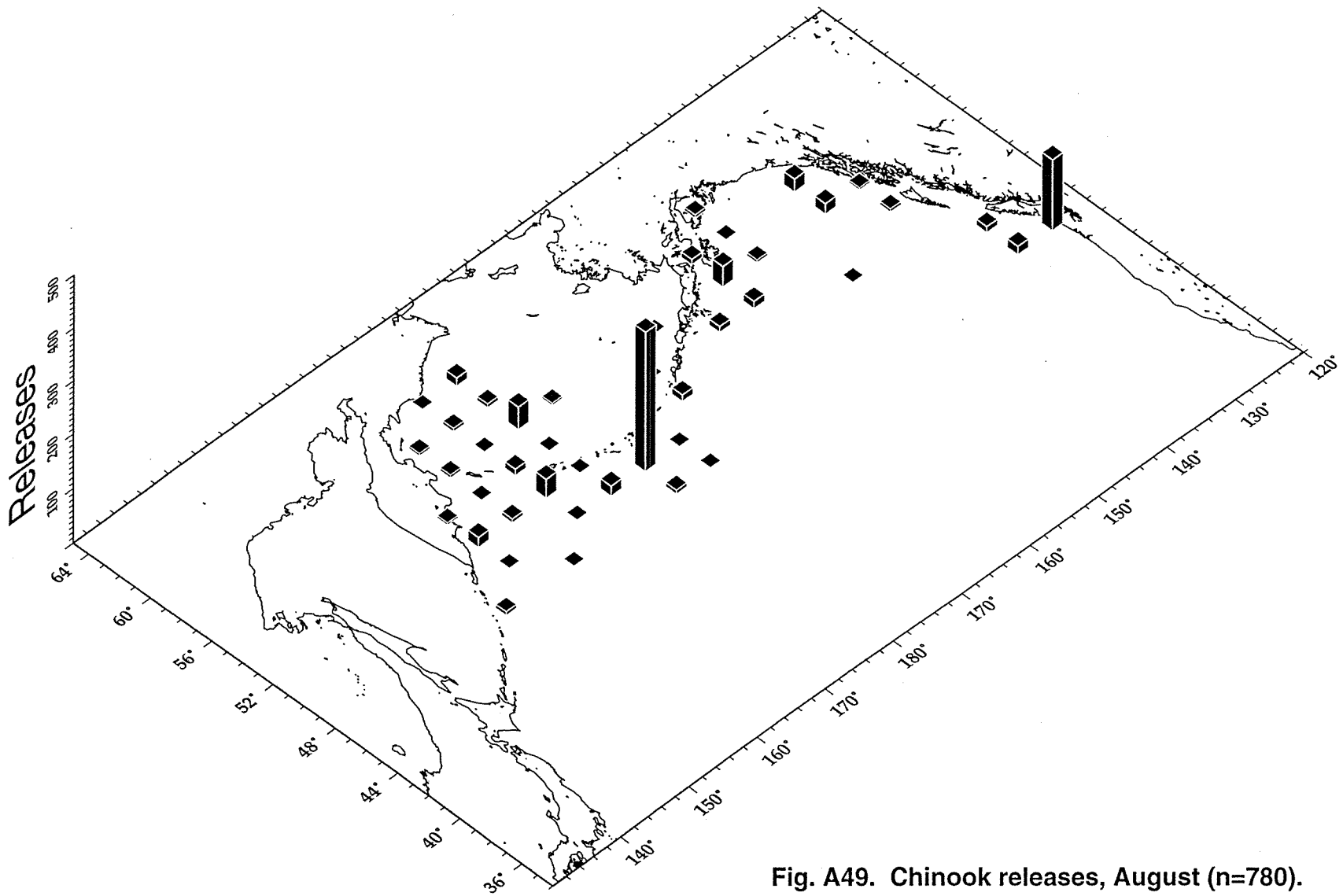


Fig. A49. Chinook releases, August (n=780).

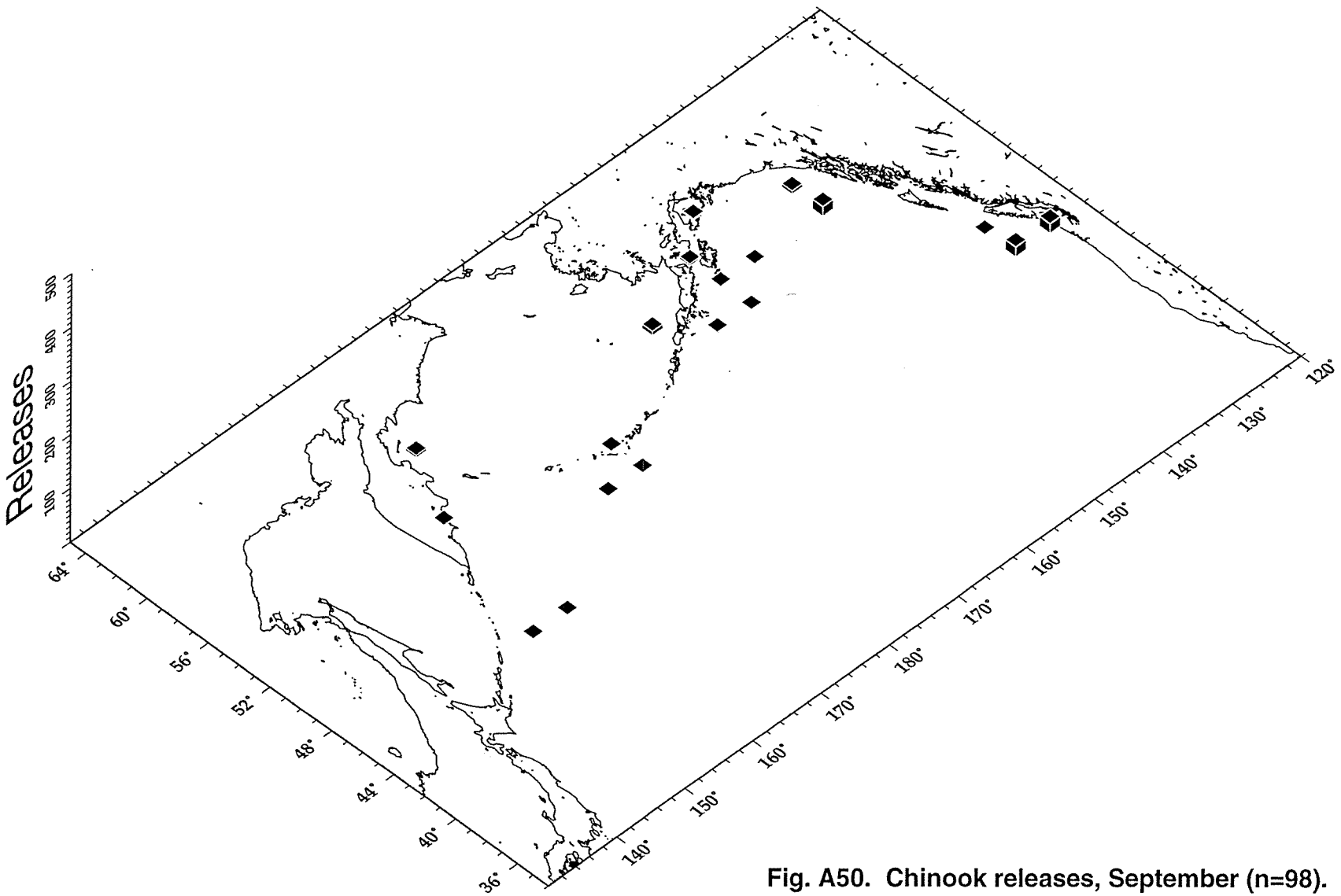


Fig. A50. Chinook releases, September (n=98).

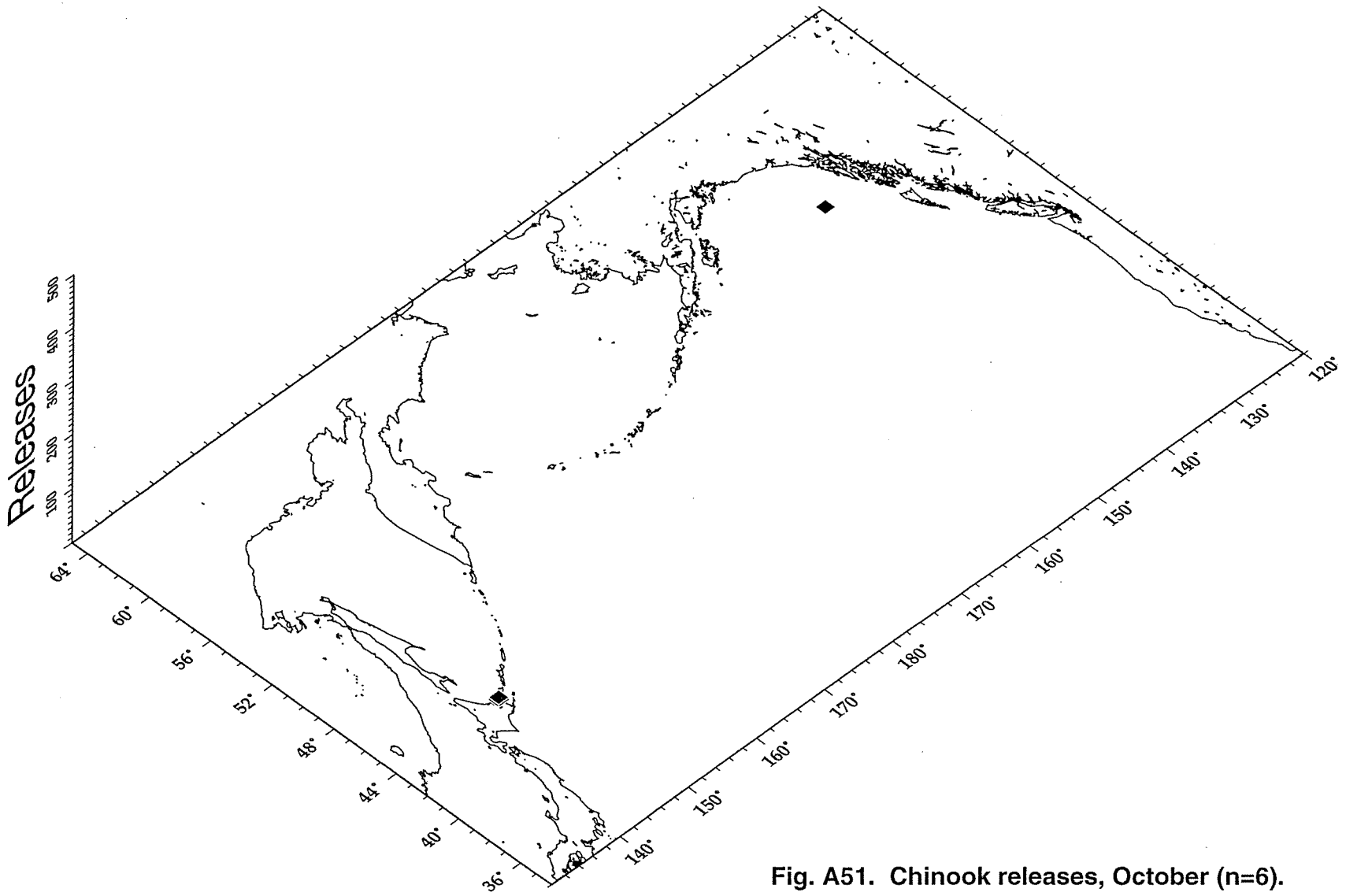


Fig. A51. Chinook releases, October (n=6).

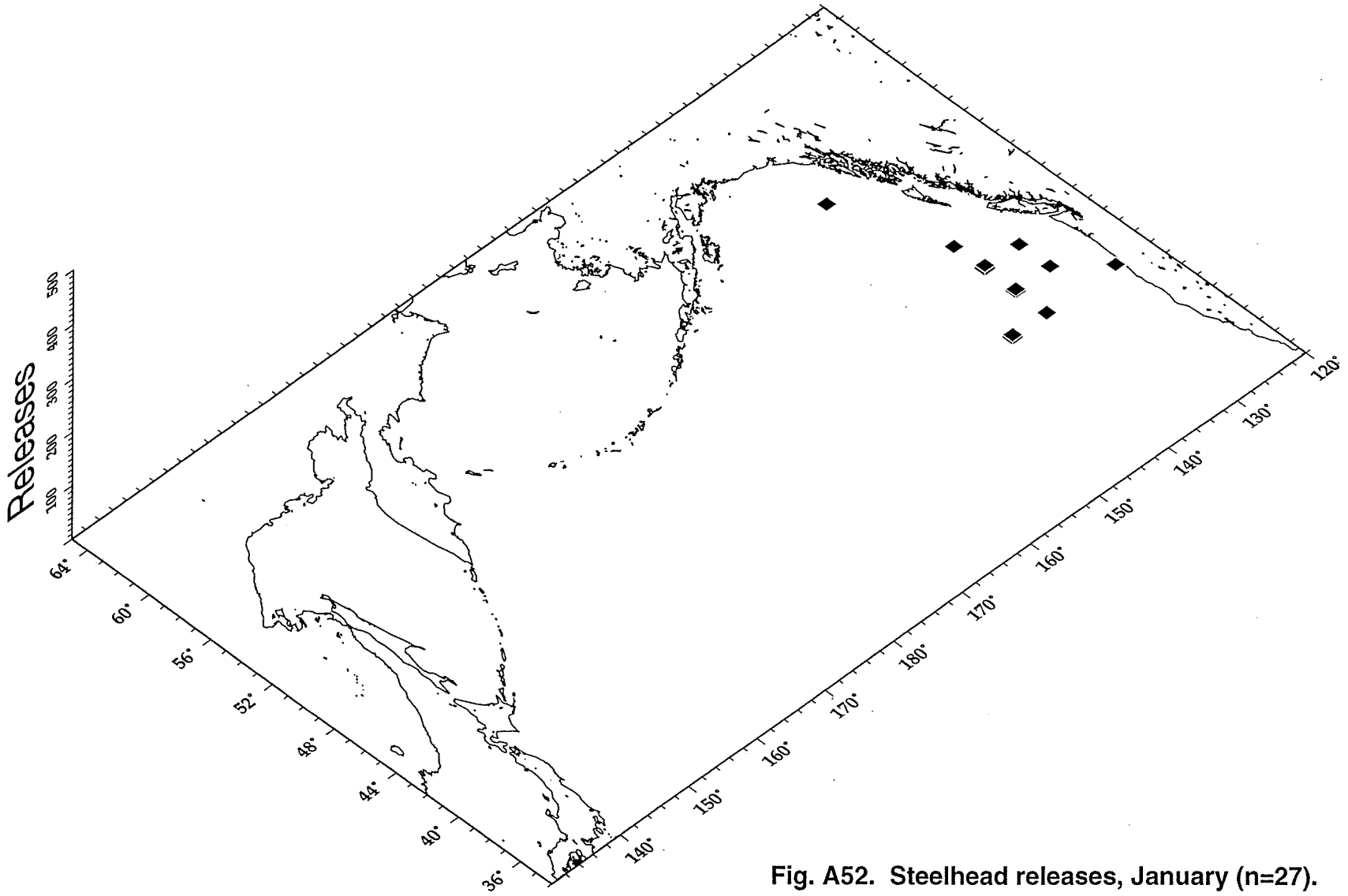


Fig. A52. Steelhead releases, January (n=27).

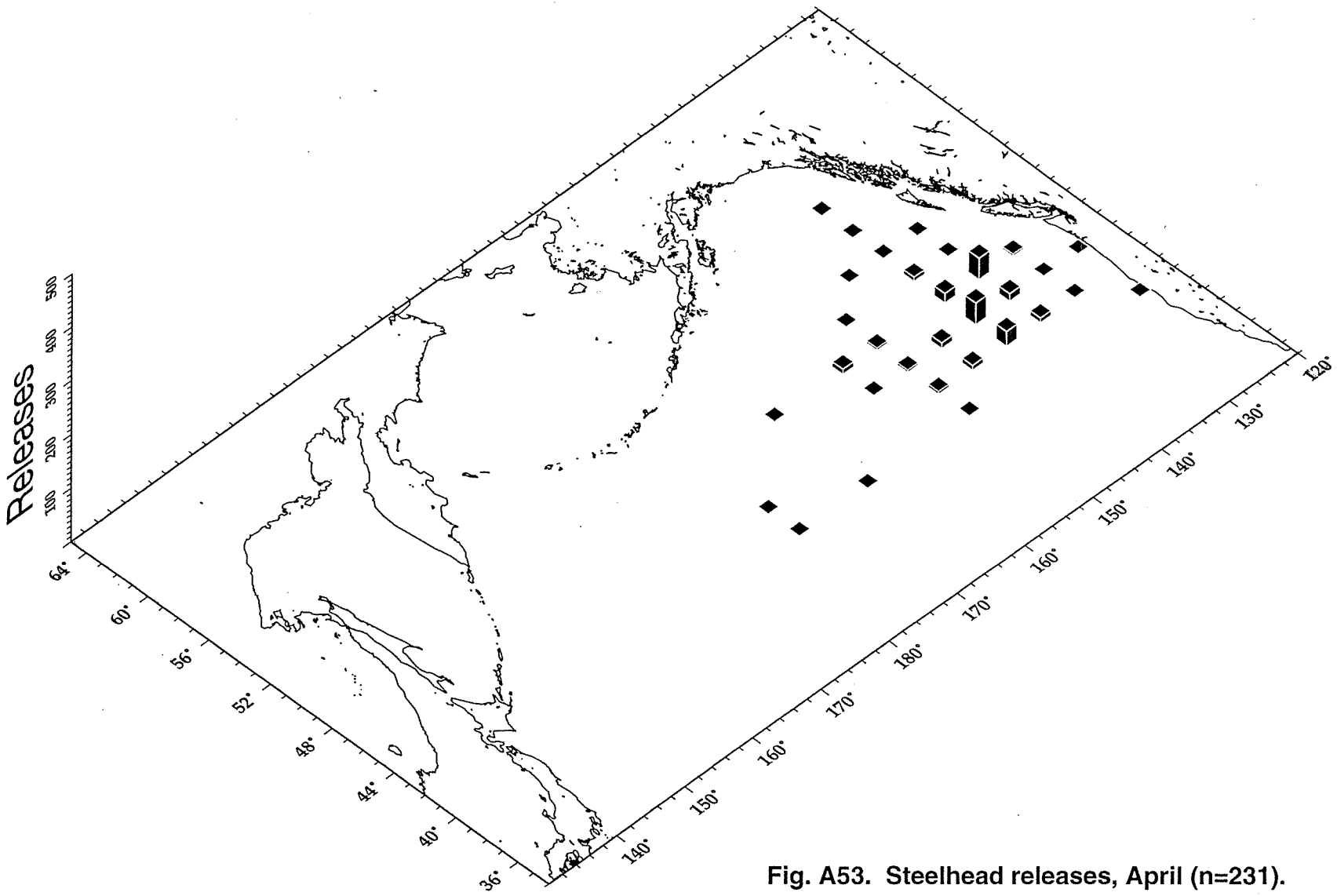


Fig. A53. Steelhead releases, April (n=231).

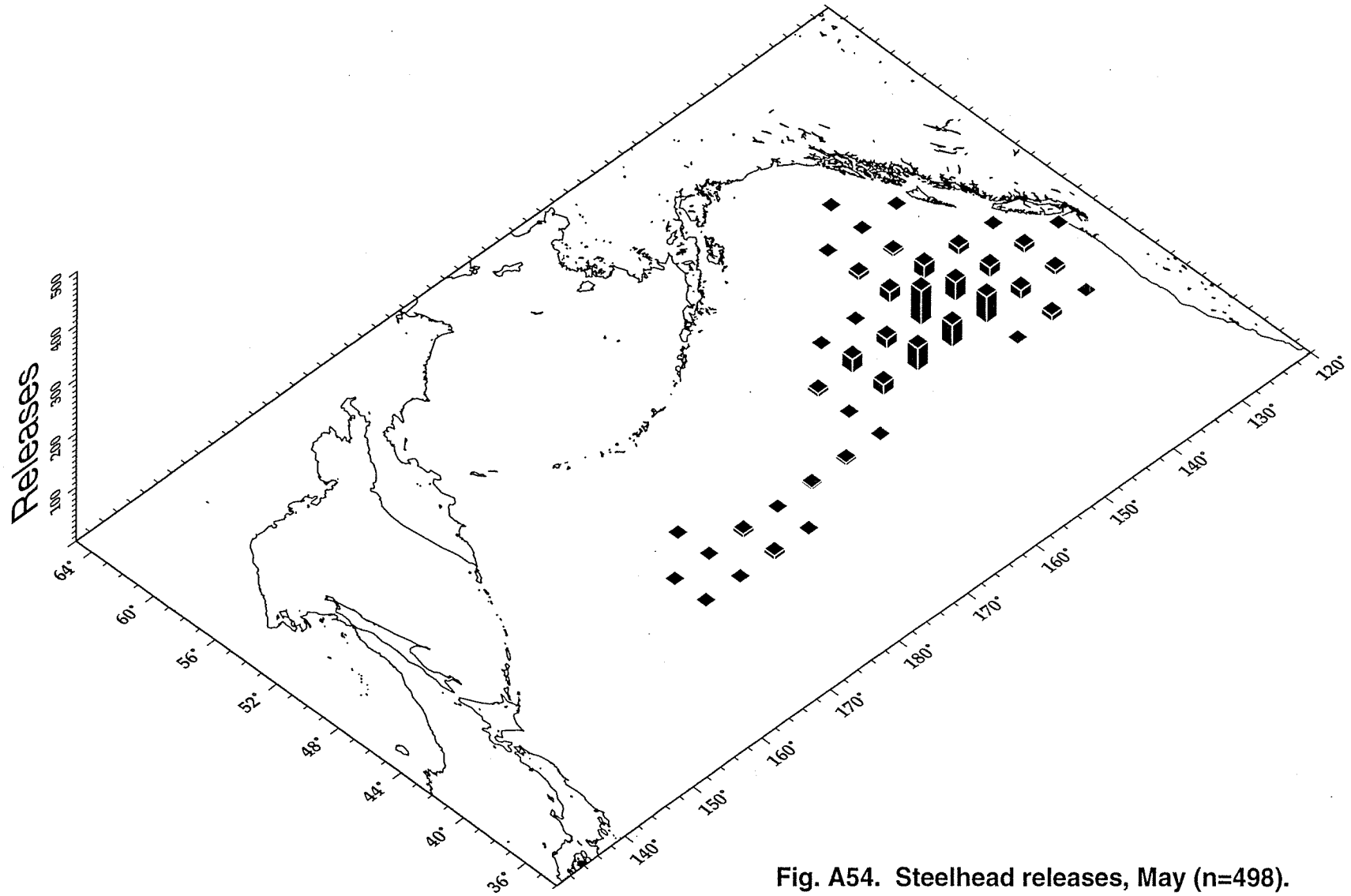


Fig. A54. Steelhead releases, May (n=498).

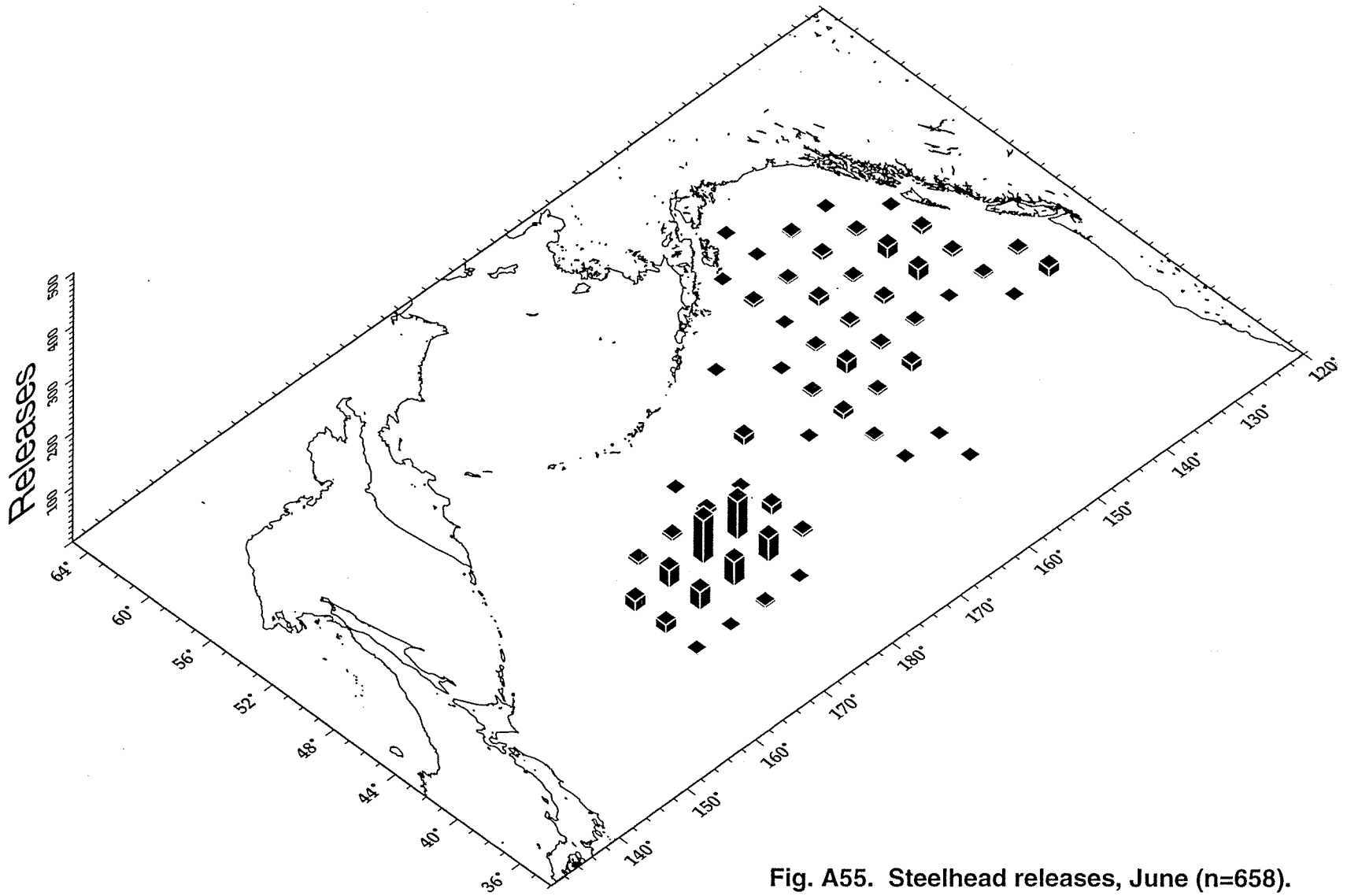


Fig. A55. Steelhead releases, June (n=658).

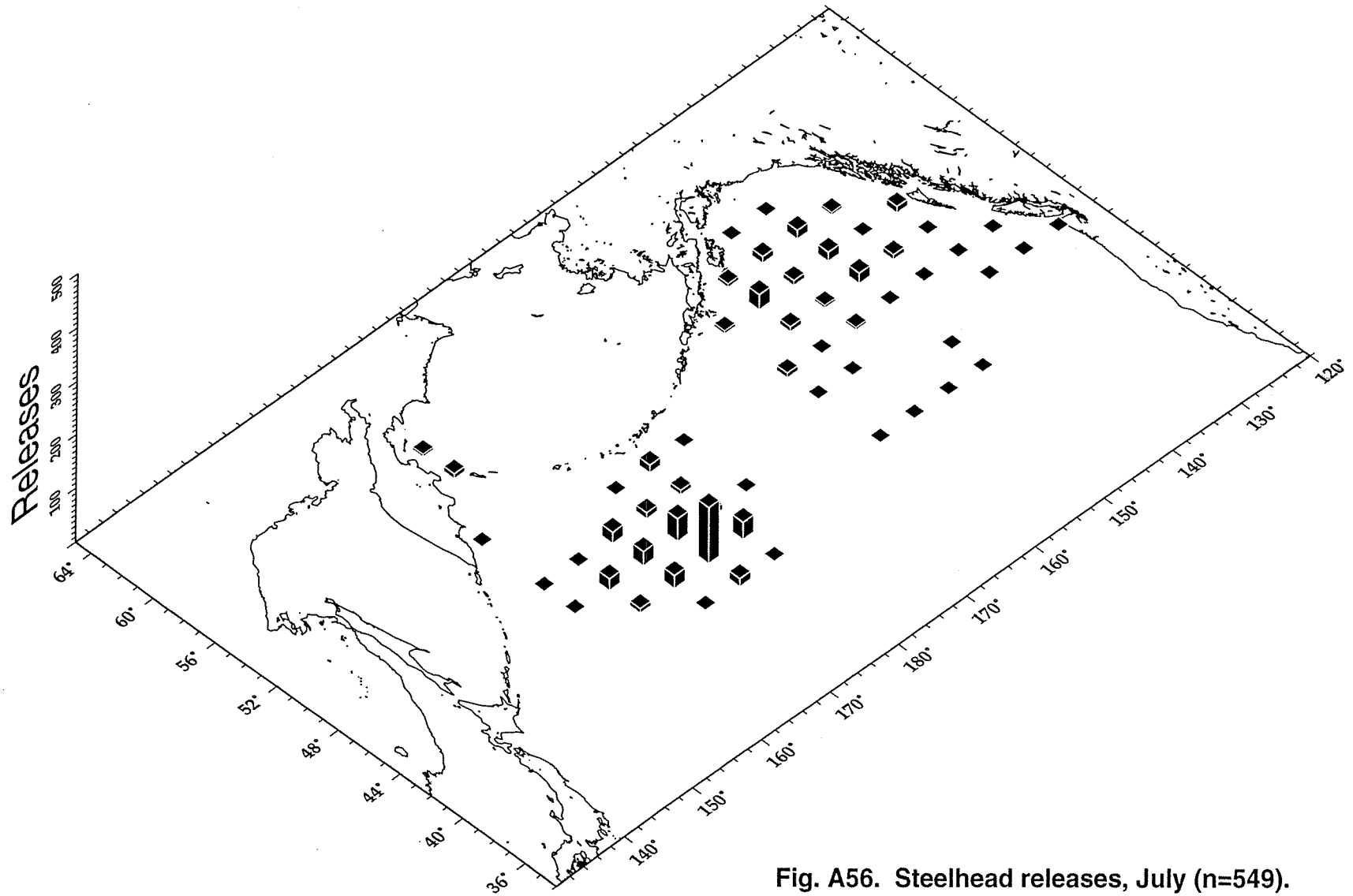


Fig. A56. Steelhead releases, July (n=549).

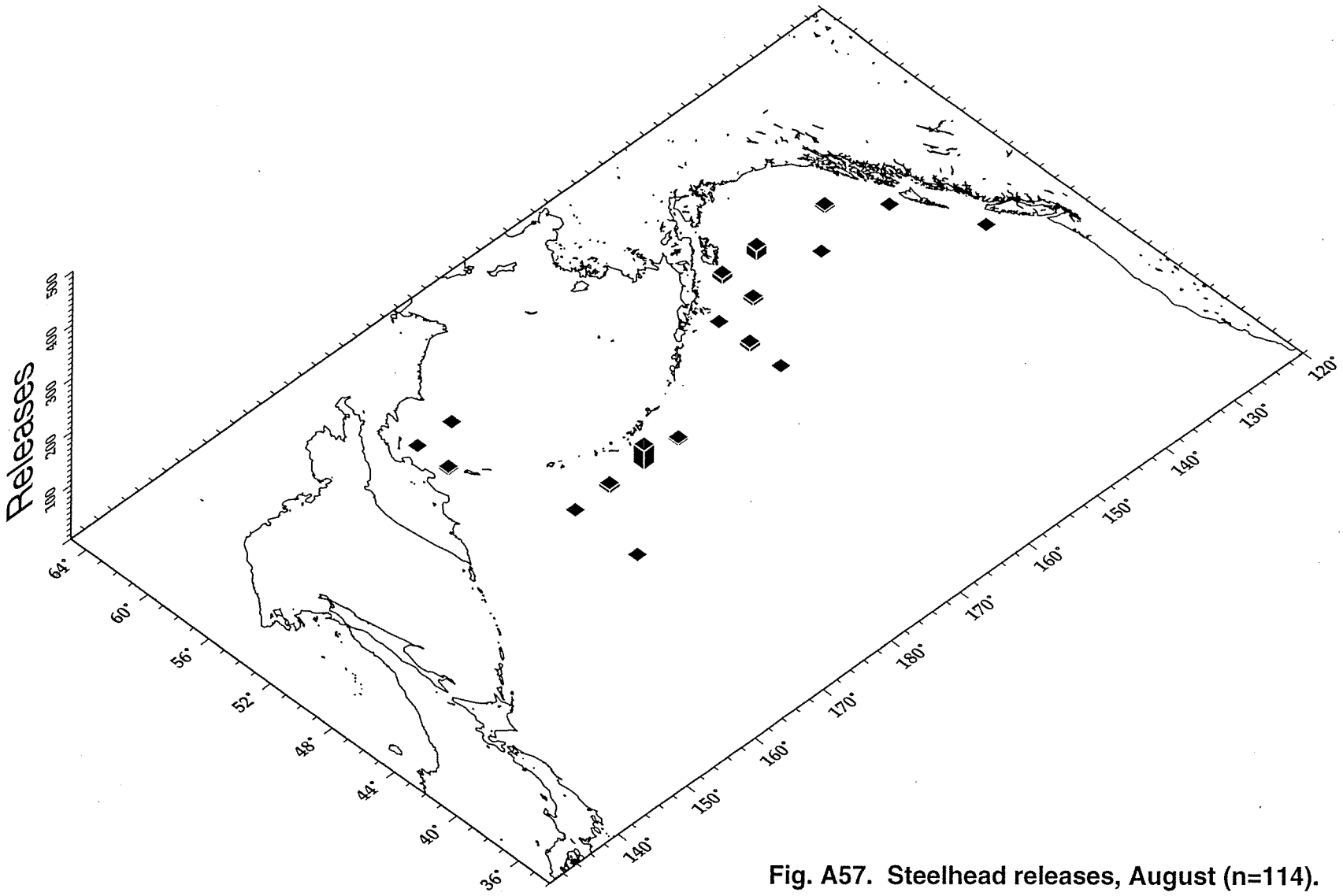


Fig. A57. Steelhead releases, August (n=114).

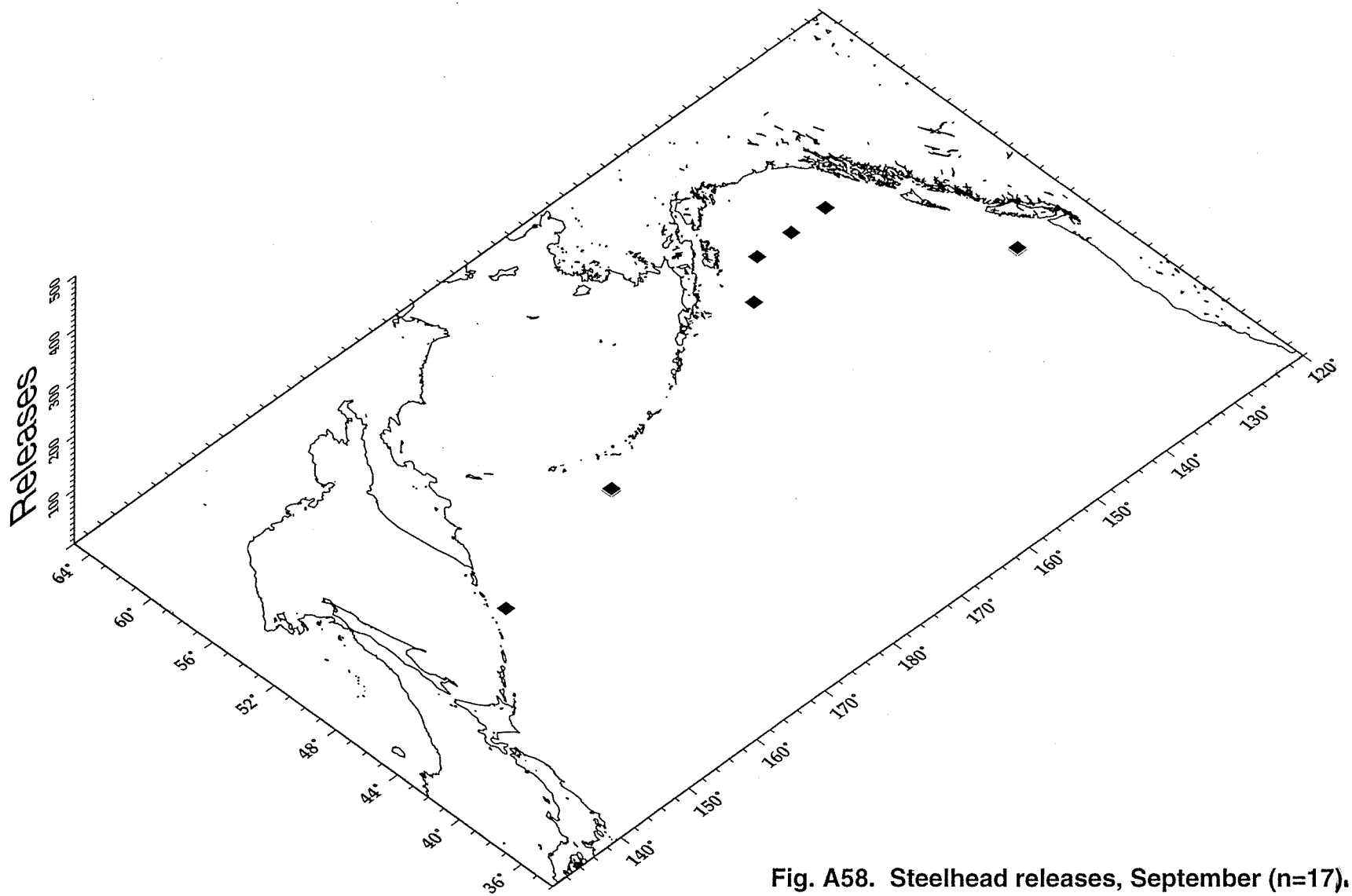


Fig. A58. Steelhead releases, September (n=17).

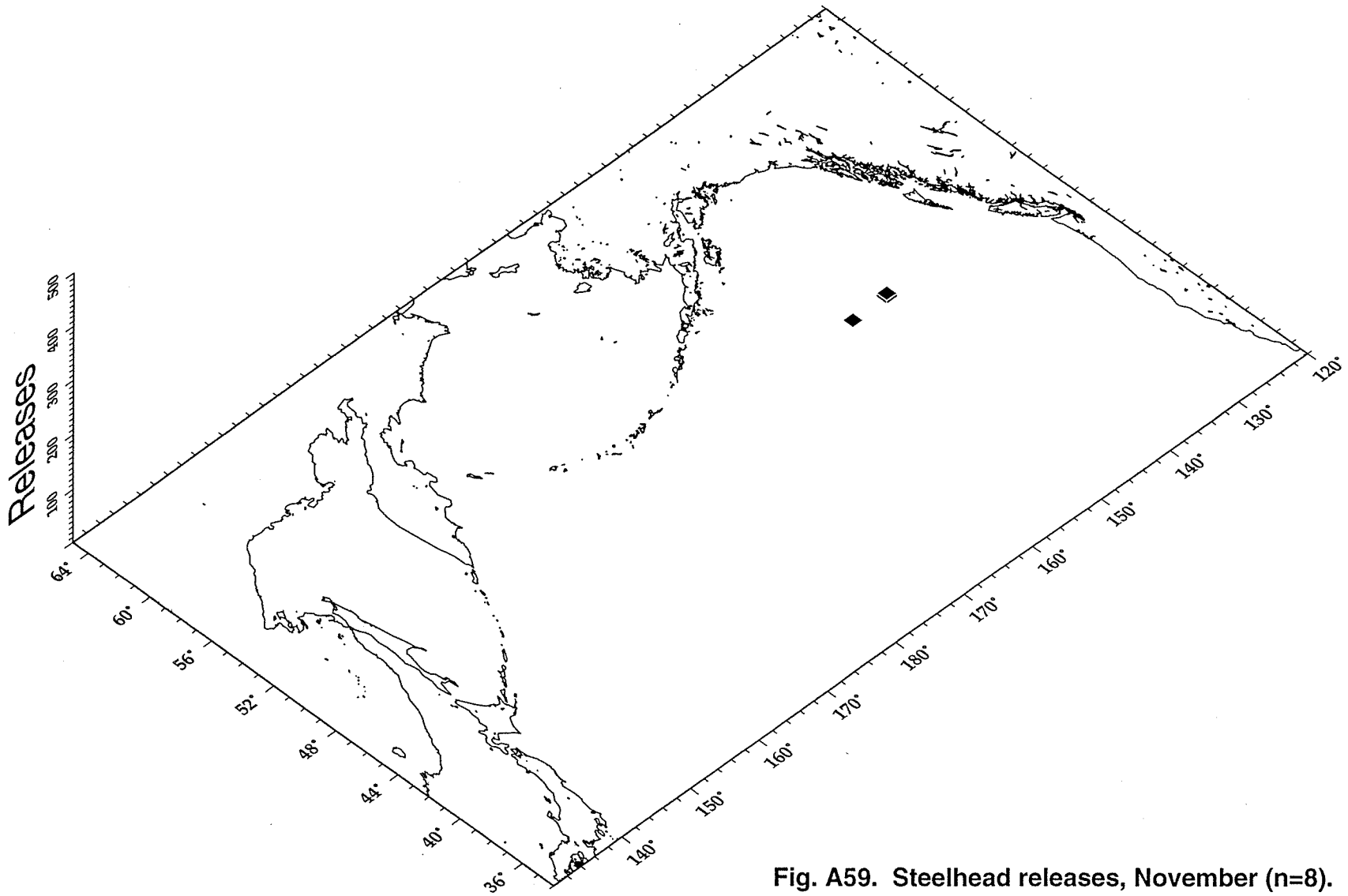


Fig. A59. Steelhead releases, November (n=8).

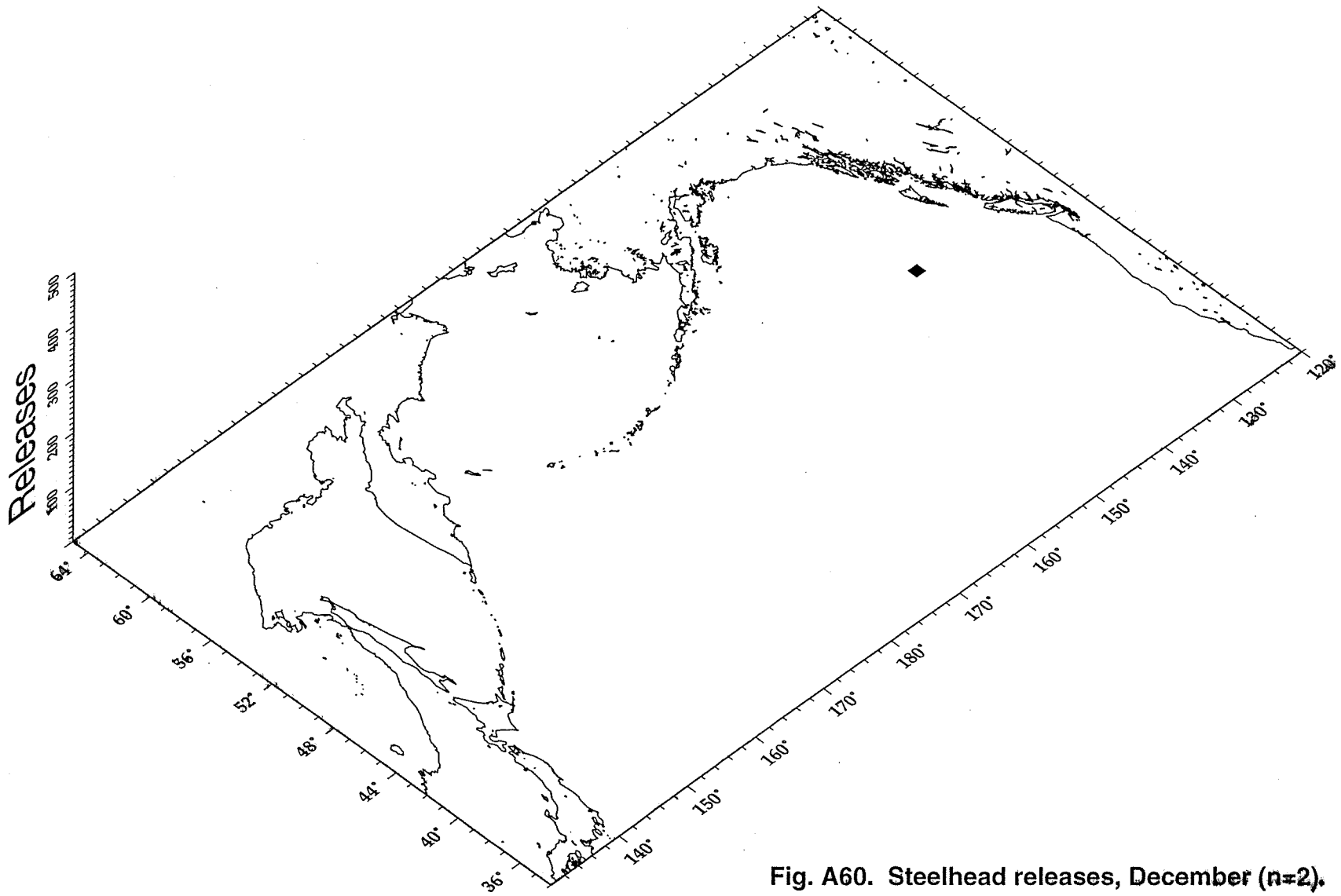
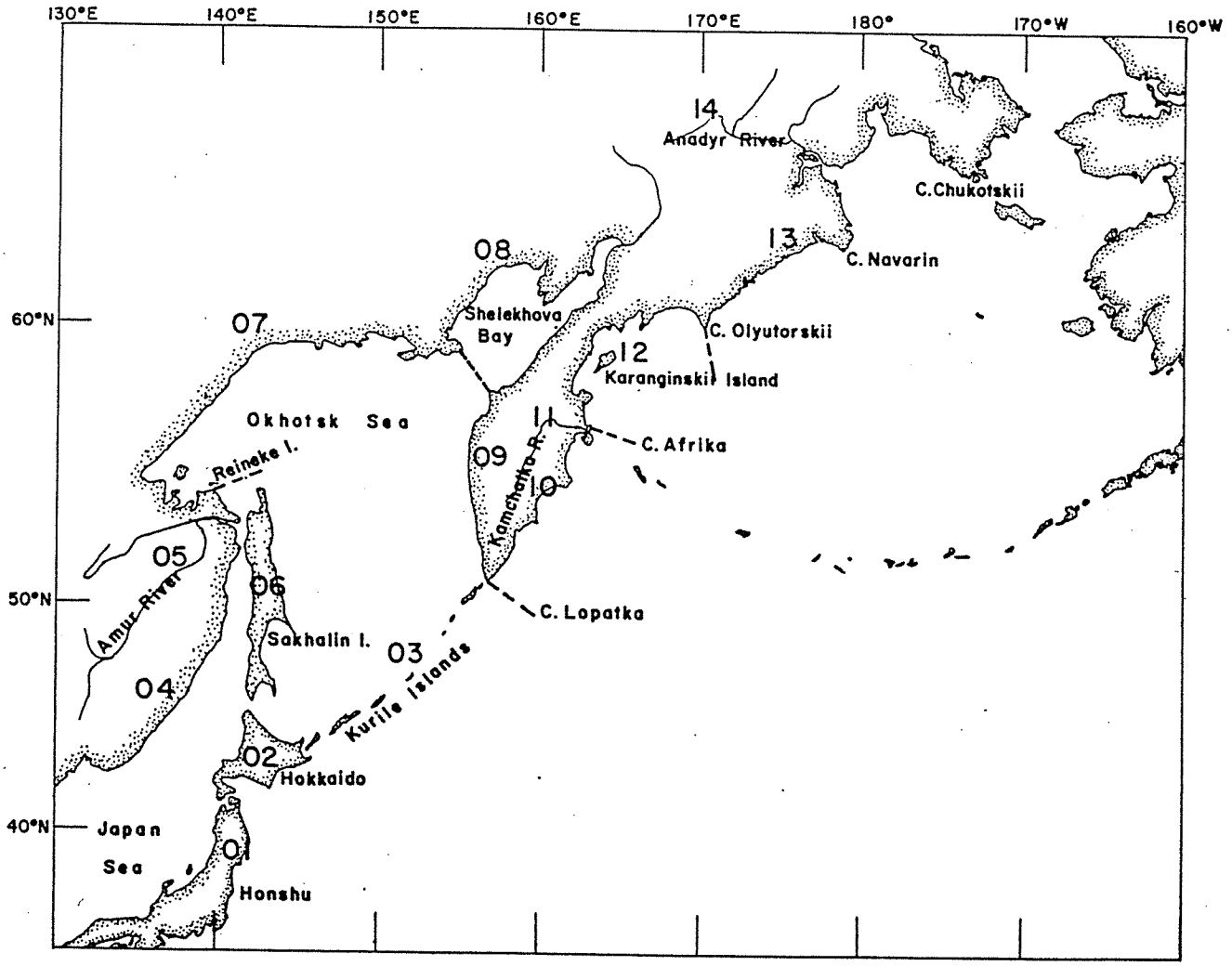


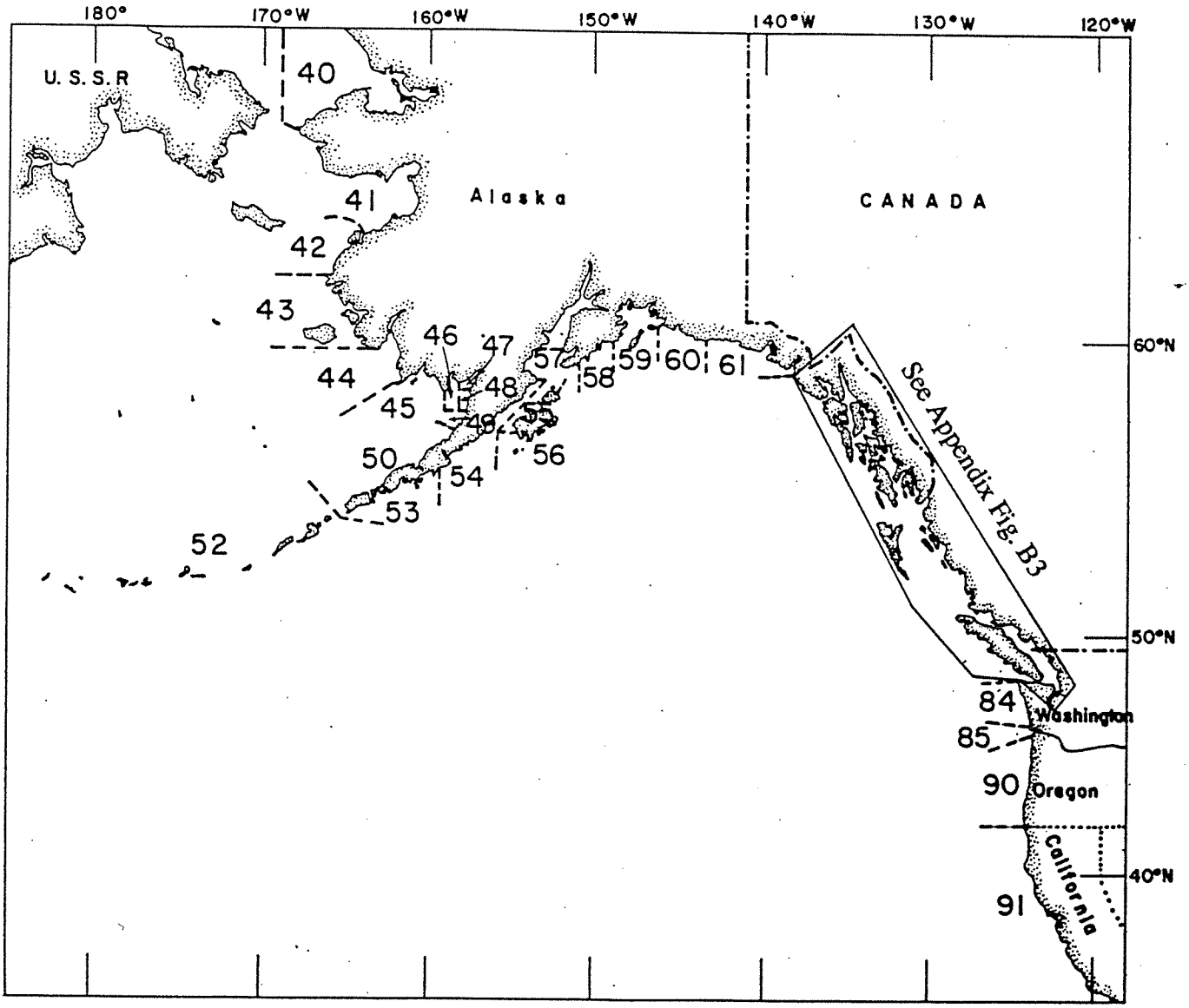
Fig. A60. Steelhead releases, December (n=2).

APPENDIX B

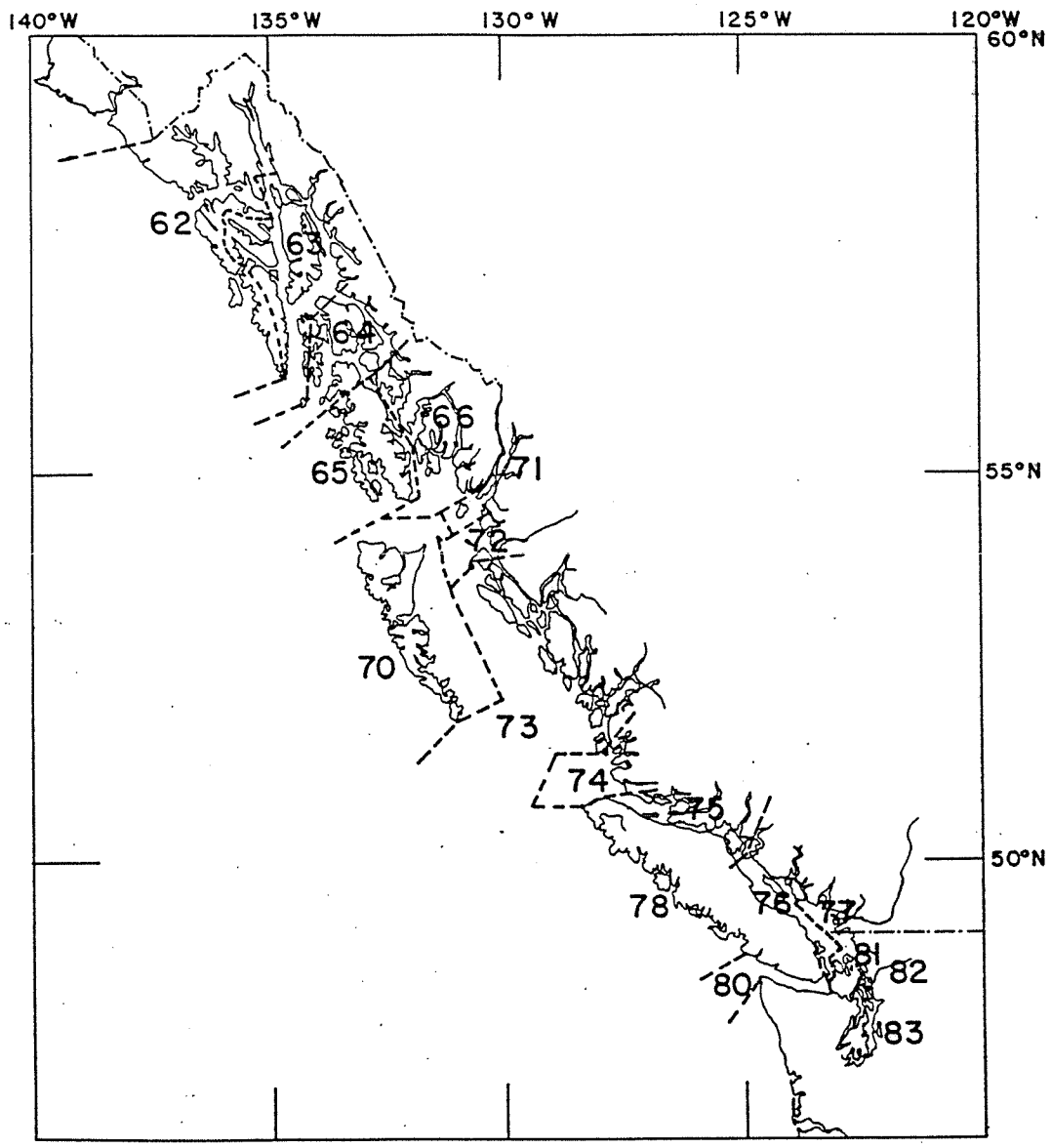
Maps showing locations and codes for major Asian and North American stocks.



Appendix Fig. B1. General areas and INPFC codes for Asia (from French et al. 1975).



Appendix Fig. B2. General areas and INPFC codes for North America (inset enlarged in Appendix Fig. B3) (from French et al. 1975).



Appendix Fig. B3. General areas and INPFC codes for southeast Alaska, British Columbia, and Puget Sound (from French et al. 1975).