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Trawl Locations of Walleye Pollock and Atka Mackerel Fisheries in the Bering Sea, Aleutian Islands and Gulf of Alaska from 1977-92

August 1993

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TRAWL LOCATIONS OF WALLEYE POLLOCK AND ATKA MACKEREL FISHERIES IN THE BERING SEA, ALEUTIAN ISLANDS AND GULF OF ALASKA FROM 1977-92

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Abstract

This report contains plots of observed trawl locations of fisheries for walleye pollock and Atka mackerel by foreign, joint-venture, and domestic fisheries in the Bering Sea and Aleutian Islands (BSAI; INPFC areas 51-55) and Gulf of Alaska (GOA; INPFC areas 61-64). Data were collected by fishery observers from 1977-92 and fisheries were defined on the basis of catch composition of individual hauls in the observer database (NORPAC). Data were compiled as part of analysis of groundfish fishery activities within critical habitat of the Steller sea lion, designated on 1 April 1993 (58 FR 17181). Pollock and Atka mackerel are important prey species for Steller sea lions in Alaska.

Pollock fishery trawl locations in the BSAI were plotted: (1) by three, four-month periods for foreign (1977-88), joint-venture (1982-90) and domestic (1989) fisheries; and (2) by "A" (January-April) and "B" (May-December) seasons and processor type (catcher/processor (offshore), floating processor/mothership and catcher vessel (inshore)) for domestic fisheries (1990-92).

Pollock fishery trawl locations in the GOA were plotted by three, four-month periods for foreign and joint-venture (combined, 1977-87) and domestic fisheries (1989-92).

Atka mackerel fishery trawl locations in the BSAI were plotted by year for foreign and joint-venture (combined, 1977-88) and domestic fisheries (1989-92).

Atka mackerel fishery trawl locations in the GOA were plotted by year for foreign and joint-venture (combined, 1977-85) and domestic fisheries (1991-92).

Plots in this report contain only observed trawl locations of the pollock and Atka mackerel fisheries between 1977-92. Observers did not sample the catch of every haul or set of gear while they were onboard a vessel, nor were observers on each trip that a vessel fished. Therefore, plots in this report should be considered minimal estimates of the range of the fishery during the selected time period.

Introduction

Steller sea lions (*Eumetopias jubatus*) range throughout the North Pacific Ocean rim from Japan and Korea northward to the Bering Strait, throughout the Aleutian Islands and the Gulf of Alaska, and south to the Channel Islands of California (Hoover 1988). Sea lions eat primarily schooling fish, such as Pacific sand lance, salmon, capelin, Pacific herring, walleye pollock and Atka mackerel, some of which are also commercially exploited by fisheries off Alaska. The historical center of abundance has been in Alaskan waters from the Aleutian Islands eastward to the Kenai Peninsula. After a survey of sea lion abundance at key index sites in 1985, researchers at the National Marine Mammal Laboratory (NMML) and at the Alaska Department of Fish and Game (ADFG) observed that the sea lion population in the eastern Aleutian Islands had declined by almost 80% since the mid-1950s (Merrick et al. 1987). The range-wide survey in 1989 confirmed not only that the decline in the eastern Aleutian population had continued, but that populations in the GOA (54% decline between 1960 and 1989) and the former USSR (74% decline) had shrunk as well (Loughlin et al. 1992). Furthermore, studies in the central GOA suggested that the physical condition of sea lions had deteriorated, possibly due to nutritional deficiencies (Calkins and Goodwin 1988). Sea lions collected in 1985-86 in the central GOA (near Kodiak Island) were significantly smaller in weight, girth and standard length and had lower hemoglobin values than a similar group collected in the 1970s from the same area (Calkins and Goodwin 1988). Analyses of sea lion life tables (York 1993) and data on resightings of tagged pups (Merrick 1992) suggests that the decline in the sea lion population as a whole may be due to an increase in mortality of juveniles, particularly during the first year of life. Recently weaned sea lions tend to eat smaller fish than adults and forage in surface waters (usually less than 20 m depth; Merrick (1992).

Concern for the survival of the species led the NMFS to list the Steller sea lion as threatened throughout its range under the Endangered Species Act (ESA) on an emergency basis on 5 April 1990 (55 FR 12645) and on a final basis on 26 November 1990 (55 FR 49204). Section 7 of the ESA requires that each federal agency, in consultation with the Secretary (of Commerce, in the case of sea lions), insure that its actions are not likely to jeopardize the continued existence of a listed species. As part of the ESA Section 7 review of the 1991 GOA pollock fishery, the NMFS concluded that spatial and temporal concentration of trawl fishing for pollock in the 1980s could have contributed to the decline in the sea lion population. To protect sea lions, the NMFS (in 1992) implemented fishery management regulations (pursuant to Amendment 20 to the Bering Sea/Aleutian Islands (BSAI) and Amendment 25 to the GOA fishery management plans (FMP)) to spatially allocate the total allowable catch (TAC) of

pollock in the GOA and separate sea lions from trawlers in important sea lion habitats. The spatial separation took the form of annual 10 nm trawl exclusion zones around all 37 sea lion rookeries west of 150°W longitude in the GOA and BSAI. Furthermore, 20 nm trawl exclusion zones were created around six rookeries in the eastern and central Aleutians islands from January-April 15, during the BSAI pollock "A" or roe season.

A requirement of Section 4 of the ESA is the designation of critical habitat, which is rather broadly defined in Section 3(5)(A)(i) of the ESA as:

> **the specific areas** within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) **essential to the conservation of the species and** (II) **which may require special management consideration or protection** (author's emphasis).

On 1 April 1993, the Department of Commerce published a proposed rule designating critical habitat for the Steller sea lion (58 FR 17181). The proposed critical habitat is:

> (1) all Steller sea lion rookeries (where adult males actively defend territories and most females give birth and mate) and major haulouts (where greater than 200 sea lions have been counted, but where few pups are present and little breeding takes place), including:
>
> > (a) a zone 3000 feet landward and seaward from each site east of 144°W longitude (including those in Alaska, Washington, Oregon and California); and
> >
> > (b) a zone 3000 feet landward and 20 nautical miles (nm) seaward of each site west of 144°W longitude where the population had declined more precipitously and where the former center of abundance of the species had been; and
>
> (2) three aquatic foraging habitats within the core of the species' range (Figure Group 1):
>
> > (a) an area in the eastern Bering Sea surrounding Bogoslof Island from approximately 60 nm north of Unimak Island west to 60 nm north of the Islands of Four Mountains and south to the Aleutian Island chain;
> >
> > (b) Seguam Pass in the Aleutian Islands; and
> >
> > (c) Shelikof Strait in the GOA.

Portions of proposed critical habitat, specifically within 10 nm of all rookeries west of 150°W and 20 nm of six rookeries in the eastern and central Aleutians, were receiving "special management consideration or protection" prior to designation of critical habitat. However, designation of critical habitat for a species does not, in and of itself, prohibit or restrict any activity in that area. Designation of critical habitat, much like the Section 7 process, creates a mechanism whereby each federal agency insures that its actions within the area are not likely to destroy those features which make it "critical" nor adversely modify its usefulness to sea lions.

Methods

As a result of the Fishery Conservation and Management Act of 1977 which promoted "domestication" of fisheries in the exclusive economic zone (between 3-200 miles offshore) of the United States, the participants, and areas and seasons fished by the groundfish fisheries off Alaska changed dramatically during the 1980s. From the mid-1960s to 1982, Alaskan groundfish fisheries were dominated by distant-water fleets of foreign nations, particularly Japan, the former USSR, Korea and Poland. Beginning in about 1980, domestic catcher vessels formed joint-ventures with foreign processing ships to supply groundfish via cod-end transfer at sea. This practice continued through 1990 in the BSAI and 1988 in the GOA, after which groundfish fisheries were prosecuted solely by domestic enterprises.

The NORPAC database, maintained by the Alaska Fisheries Science Center, NMFS, contains all data collected by fishery observers aboard foreign, joint-venture and domestic vessels in the North Pacific. FETCH, the NORPAC query language, was used to plot trawl locations by foreign, joint-venture and domestic pollock and Atka mackerel fisheries in the BSAI and GOA for 1977-92. Pollock and Atka mackerel fisheries were chosen because of the importance of both the species as Steller sea lion prey and critical habitat to the fisheries. Pollock and Atka mackerel trawl fisheries were defined using hierarchical catch composition criteria for individual hauls, as defined below:

I. <u>Pollock and Atka mackerel fisheries in the BSAI:</u>

1) Midwater pollock	pollock ≥ 95% of total catch
2) Flatfish (other than yellowfin sole)	flatfish ≥ 35% of total catch
3) Pacific cod	Pacific cod ≥ 45% of total catch
4) Atka mackerel	Atka mackerel ≥ 20% of total catch
5) Bottom pollock	pollock ≥ 20% of total catch.

II. Pollock fisheries in the GOA:

1) Midwater pollock-pollock ≥ 95% of allocated groundfish catch
2) Pacific cod-Pacific cod ≥ 40% of allocated groundfish catch
3) Rockfish-rockfish ≥ 35% of allocated groundfish catch
4) Bottom pollock-pollock ≥ 20% of allocated groundfish catch

III. Atka mackerel fisheries in the GOA:

1) Pollock	pollock ≥ 30% of total catch
2) Pacific cod	Pacific cod ≥ 40% of total catch
3) Rockfish	rockfish ≥ 35% of total catch
4) Atka mackerel	Atka mackerel ≥ 20% of total catch

Results

Figure 1 contains pollock fishery trawl locations in the BSAI plotted:

(1) by three, four-month periods for foreign (1977-88), joint-venture (1982-90) and domestic (1989) fisheries; and

(2) by "A" (January-April) and "B" (May-December) seasons and processor type (catcher/processor (offshore), floating processor/mothership and catcher vessel (inshore)) for domestic fisheries (1990-92).

Figure 2 contains pollock fishery trawl locations in the GOA plotted by three, four-month periods for foreign and joint-venture (combined, 1977-87) and domestic fisheries (1989-92).

Atka mackerel fishery trawl locations in the BSAI were plotted by year for foreign and joint-venture (combined, 1977-88) and domestic fisheries (1989-92; Figure 3).

Atka mackerel fishery trawl locations in the GOA were plotted by year for foreign and joint-venture (combined, 1977-85) and domestic fisheries (1991-92; Figure 4).

Plots in Figures 1-4 contain only observed trawl locations of the pollock and Atka mackerel fisheries between 1977-92. Observers did not sample the catch of every haul or set of gear while they were onboard a vessel, nor were observers on each trip that a vessel fished. Therefore, plots in Figures 1-4 should be considered minimal estimates of the range of the fishery during the selected time period.

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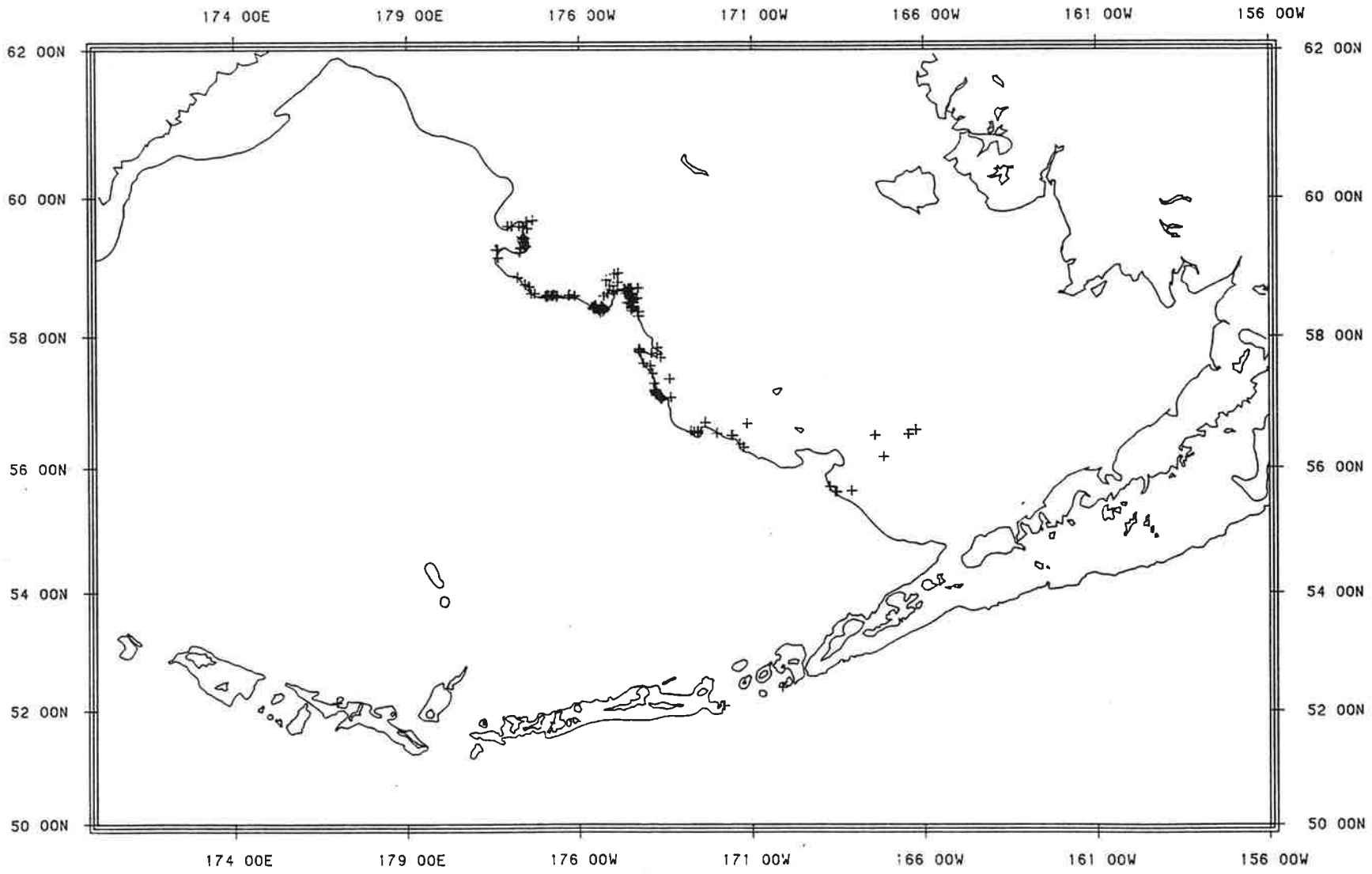
Figure 1. Pollock fishery trawl locations in the Bering Sea/Aleutian Islands plotted:

(1) by three, four-month periods for foreign (1977-88), joint-venture (1982-90) and domestic (1989) fisheries; and

(2) by season ["A" (January-April) and "B" (May-December)] and processor type [catcher/processor (offshore), floating processor/mothership and catcher vessel (inshore)] for domestic fisheries (1990-92).



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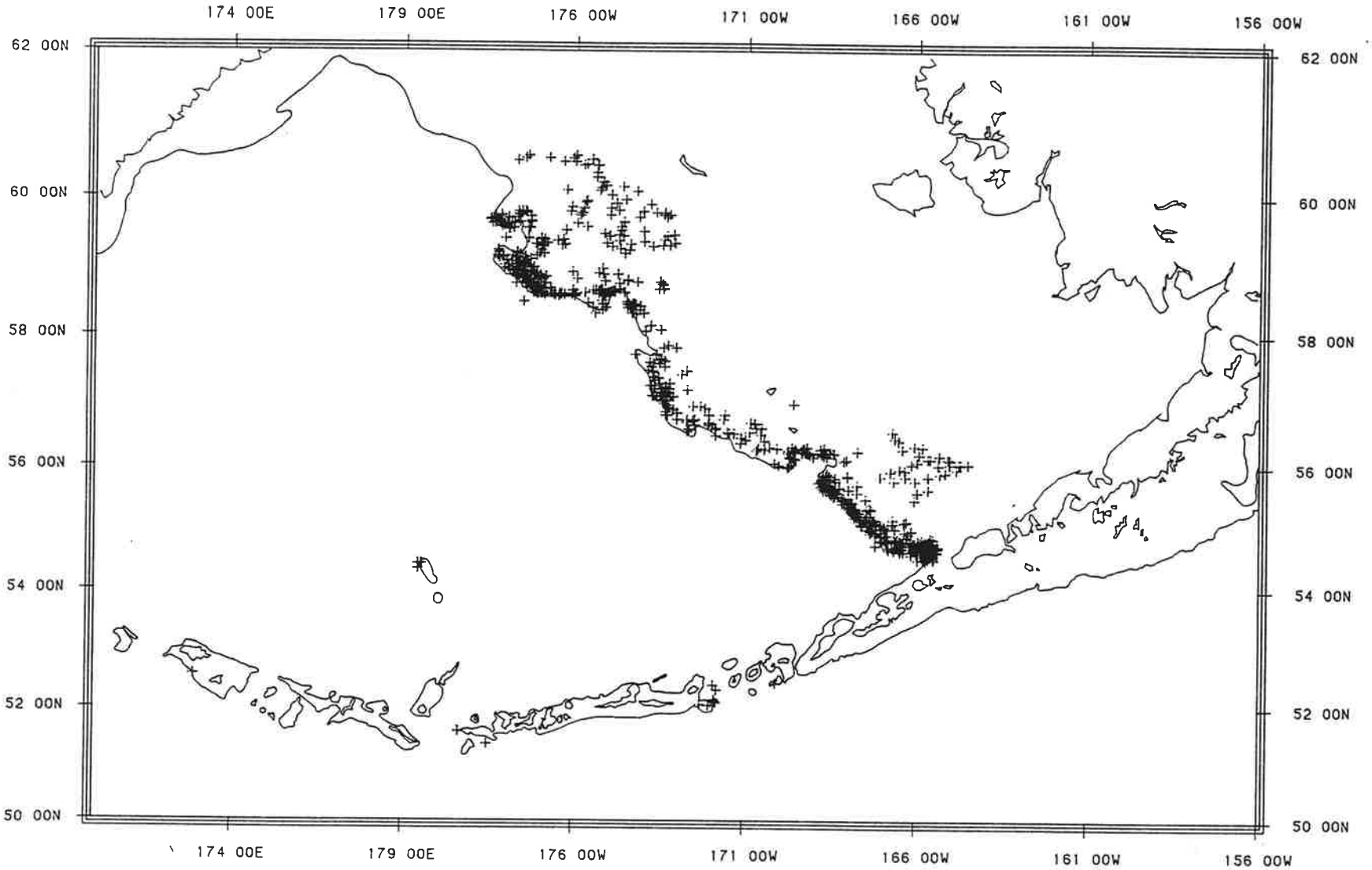

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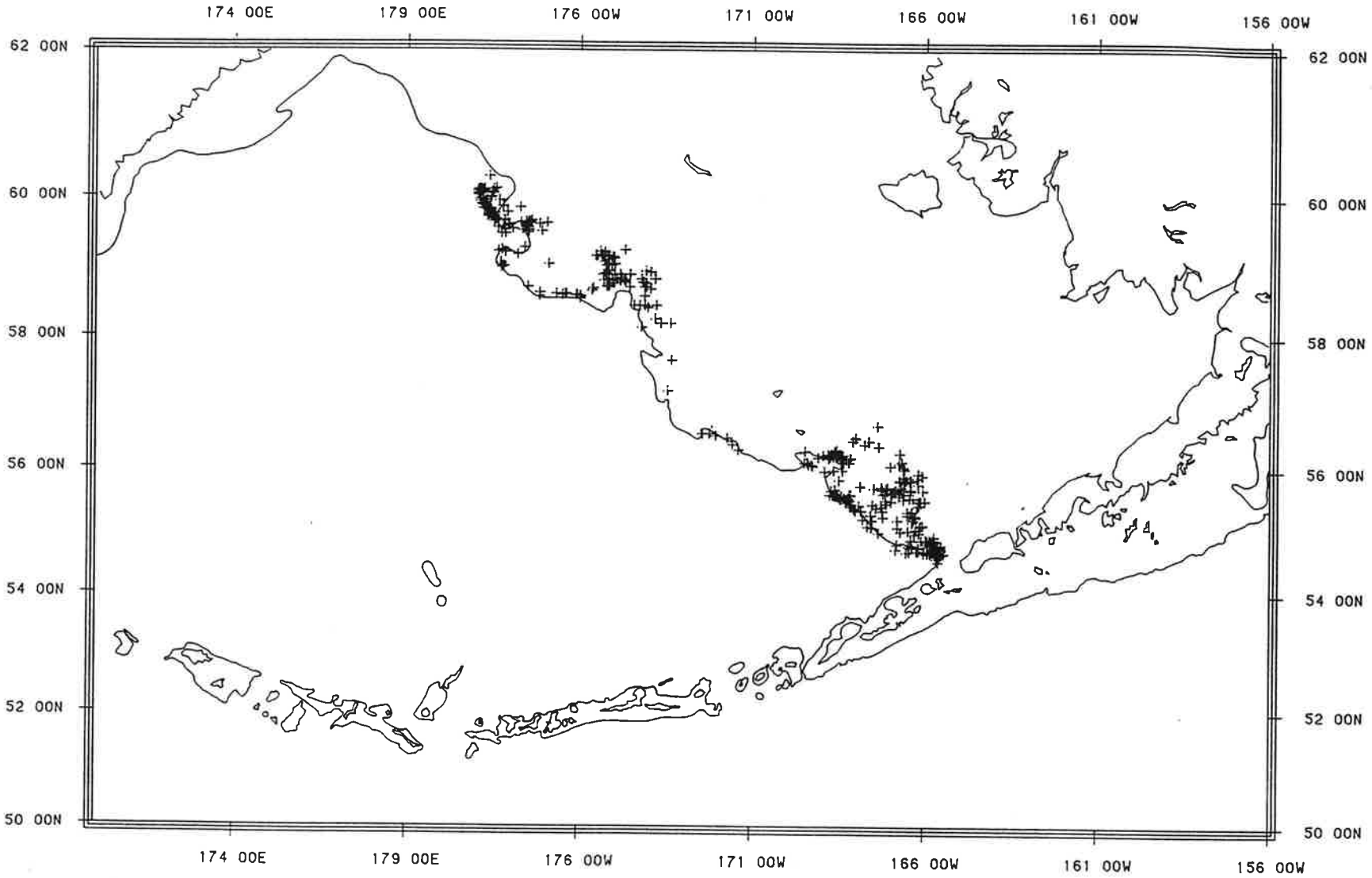

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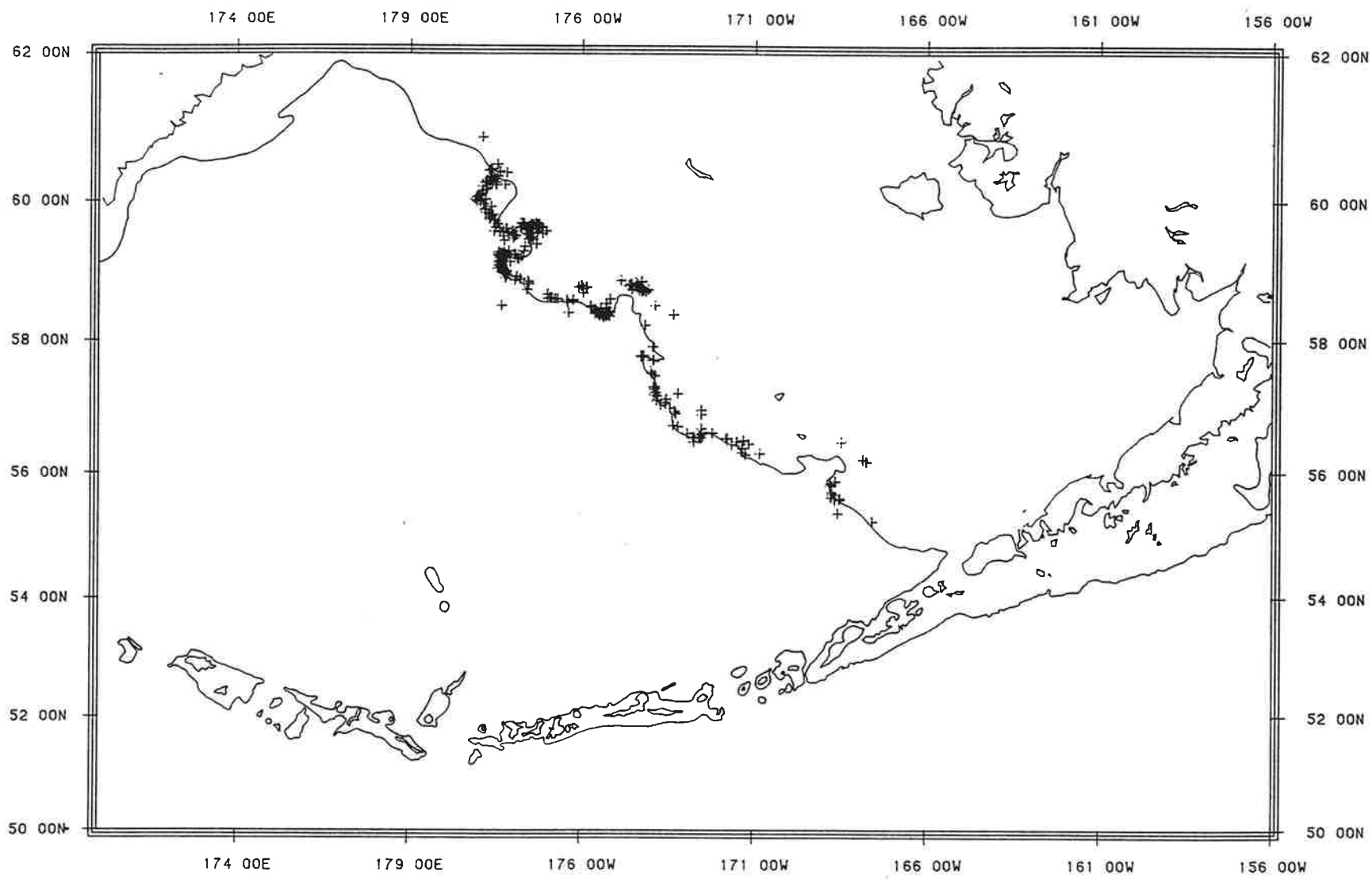

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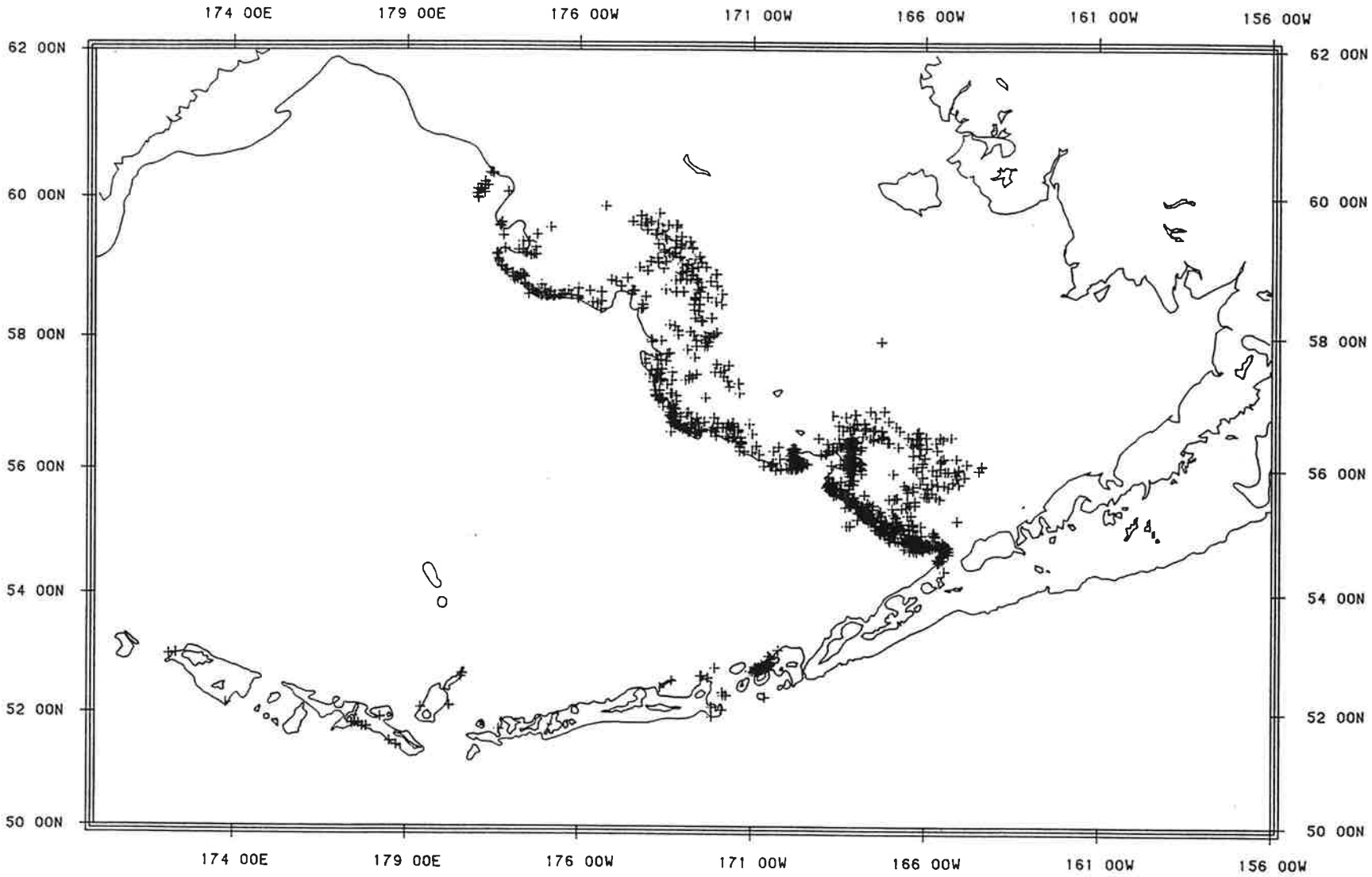

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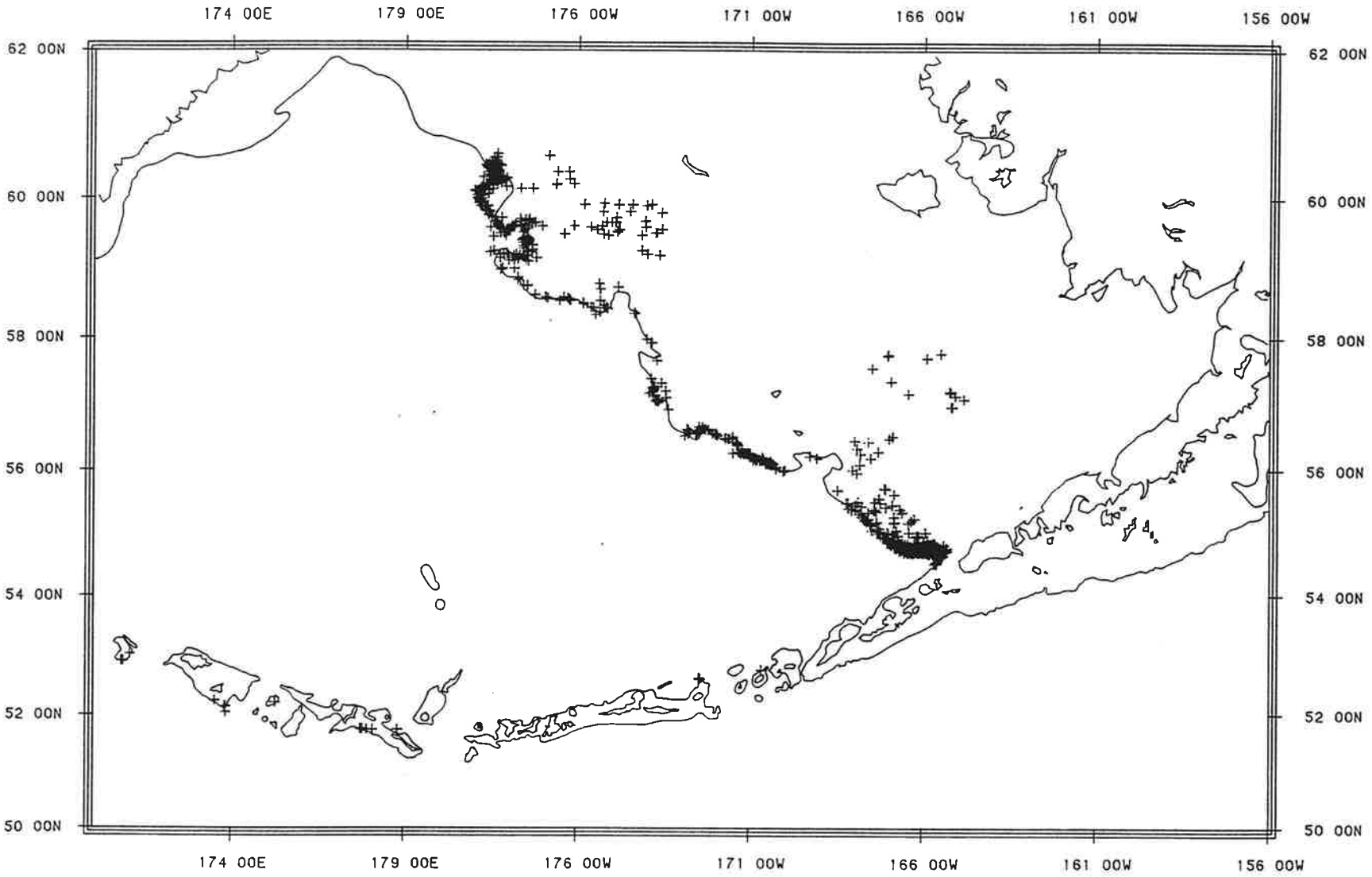

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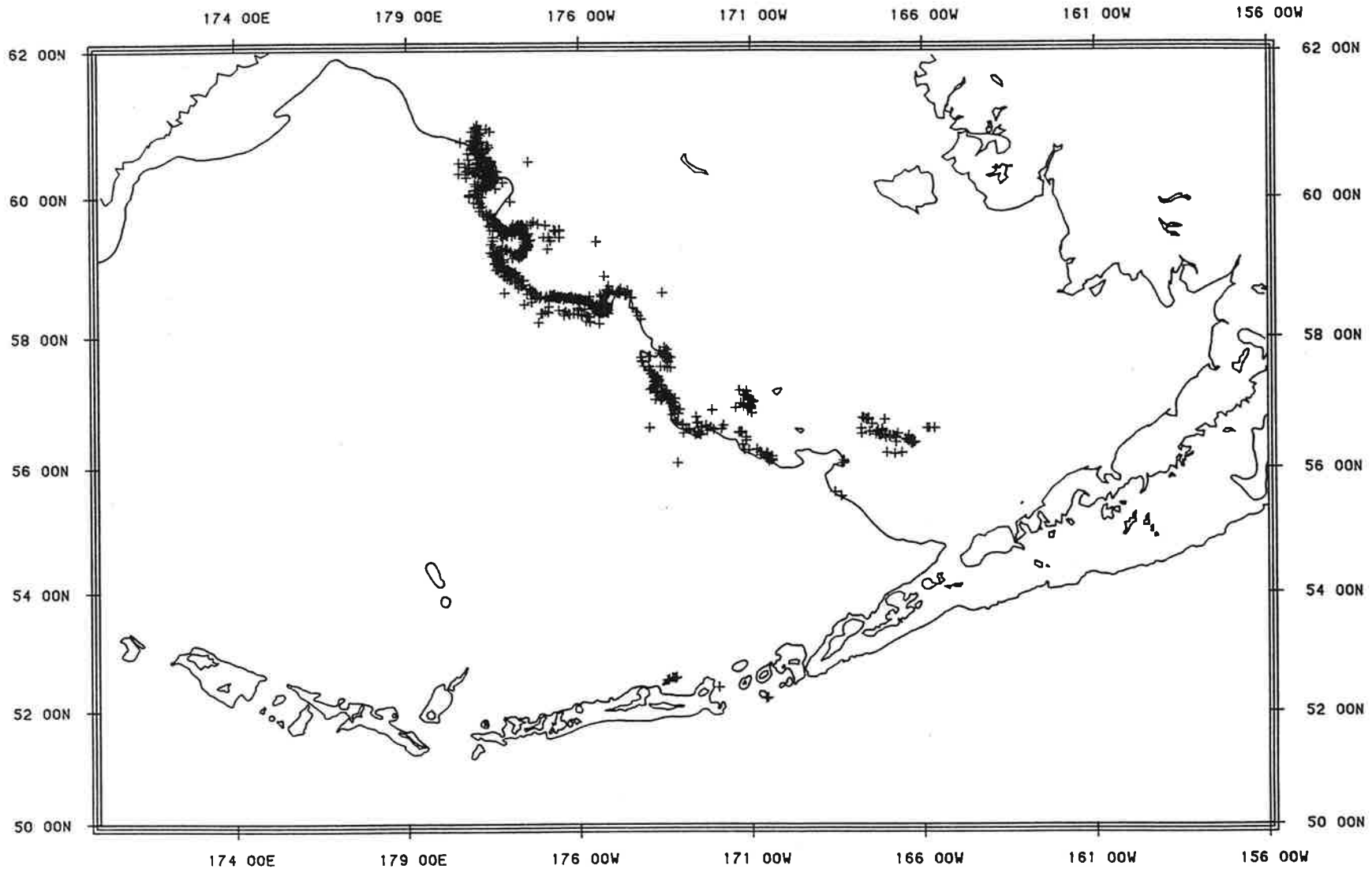

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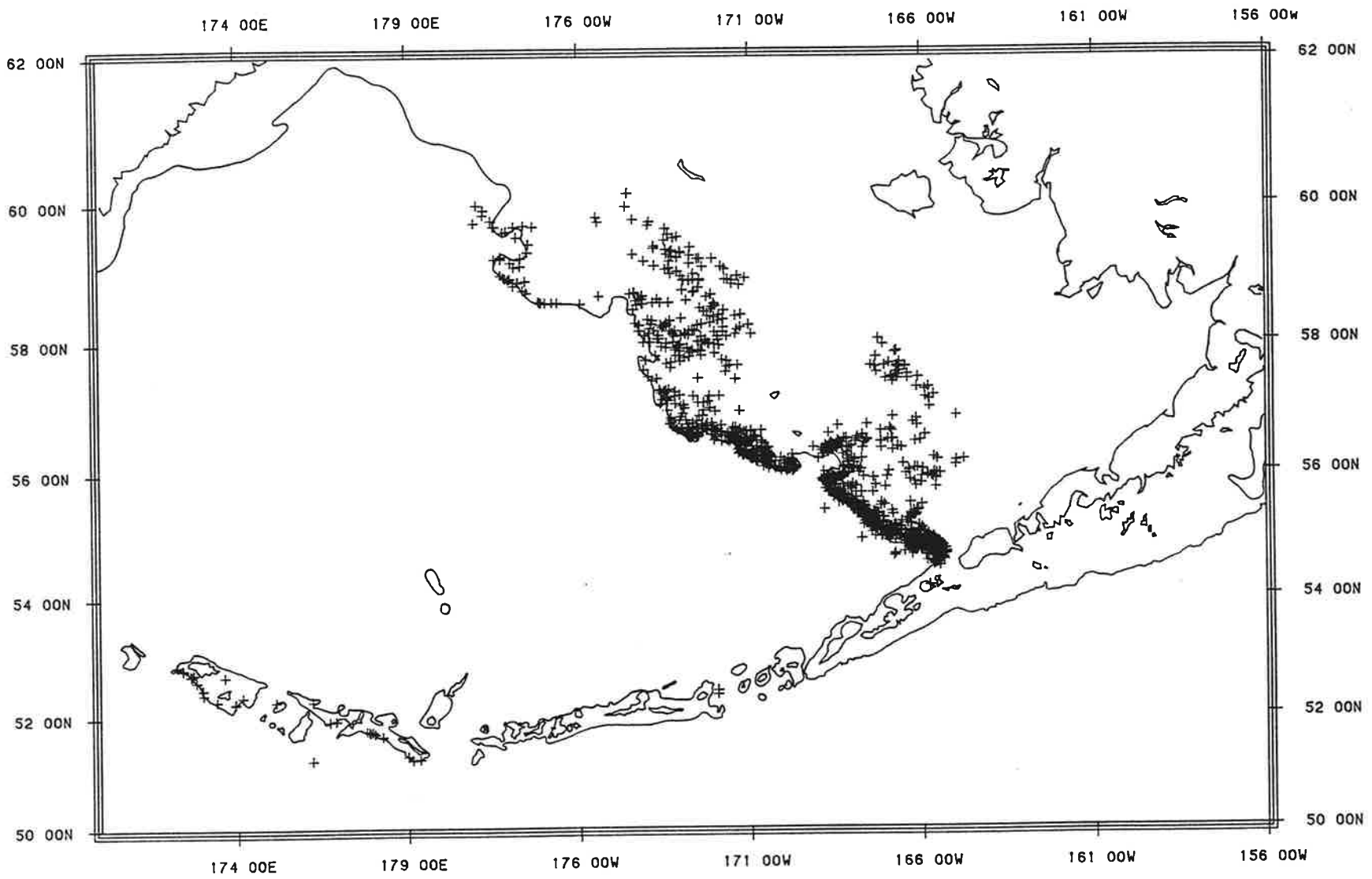

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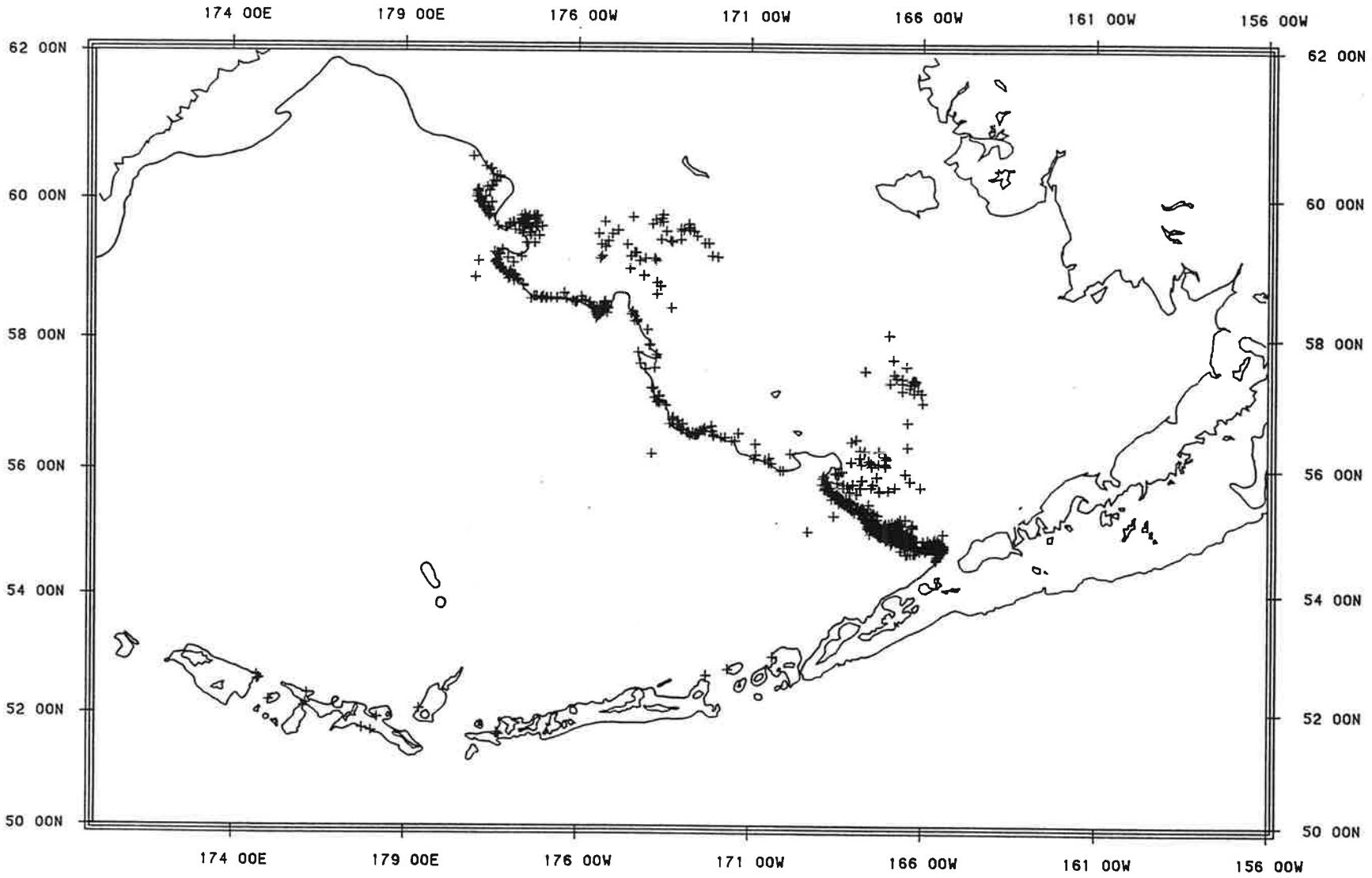

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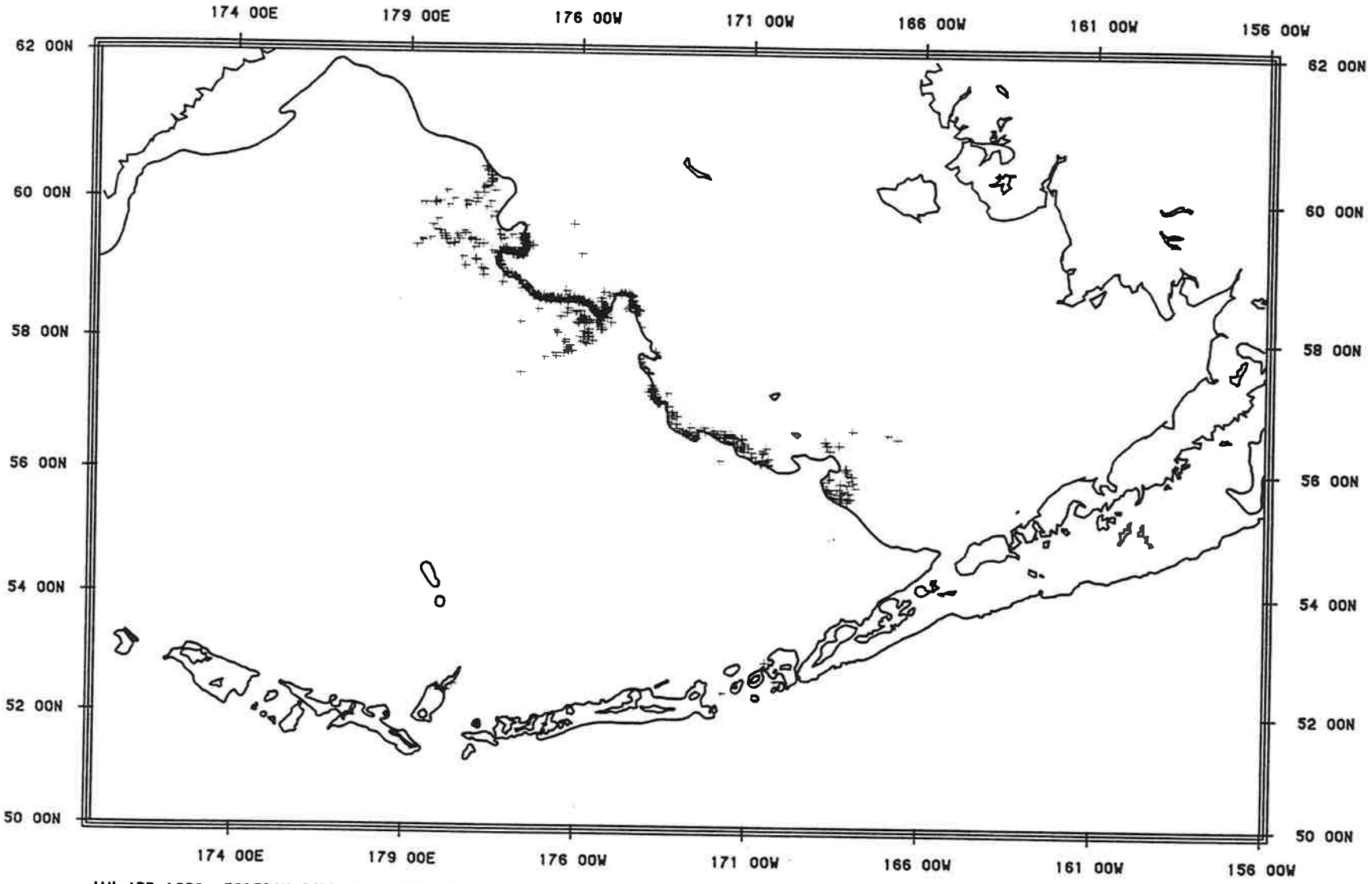

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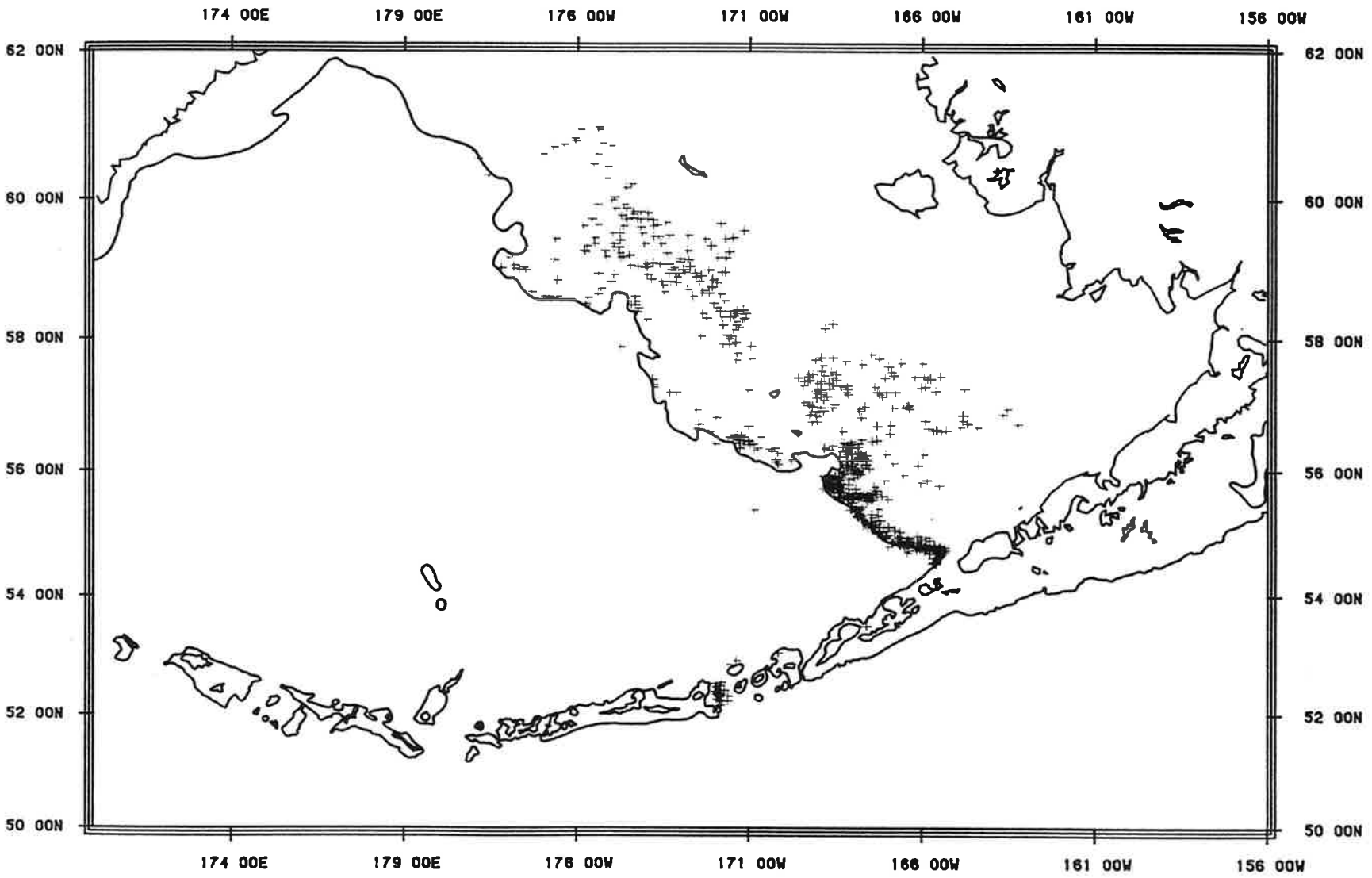

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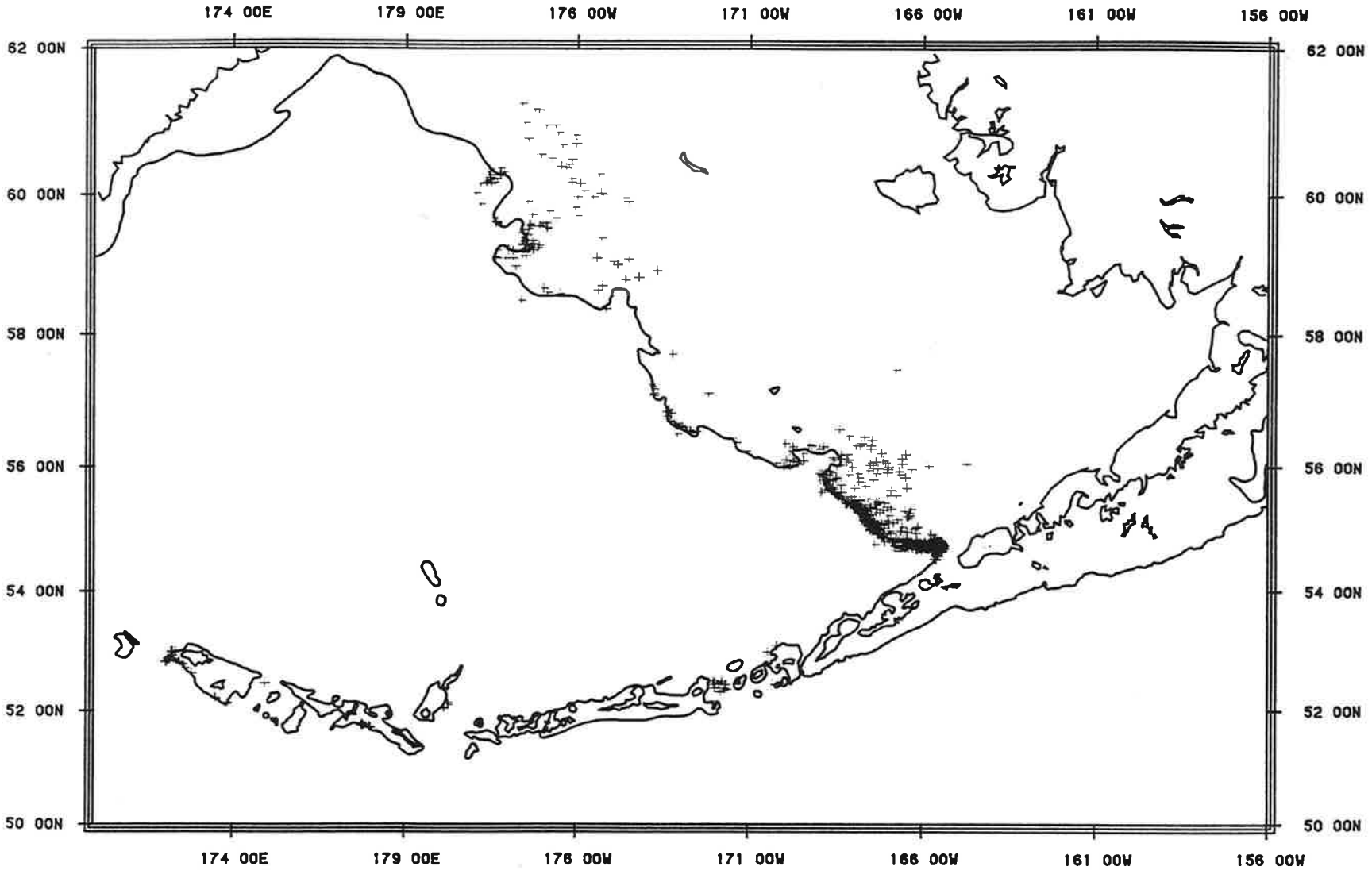

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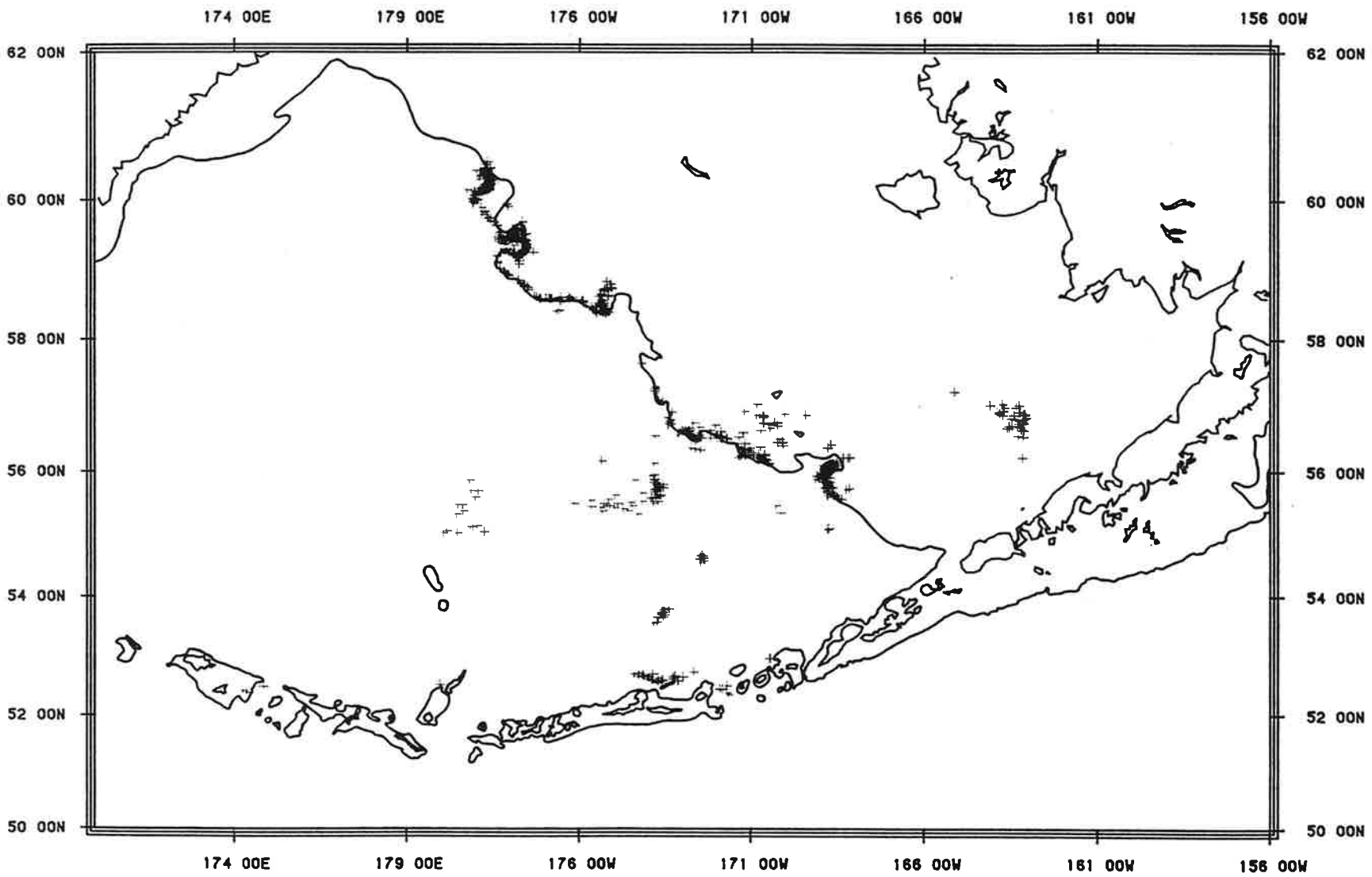

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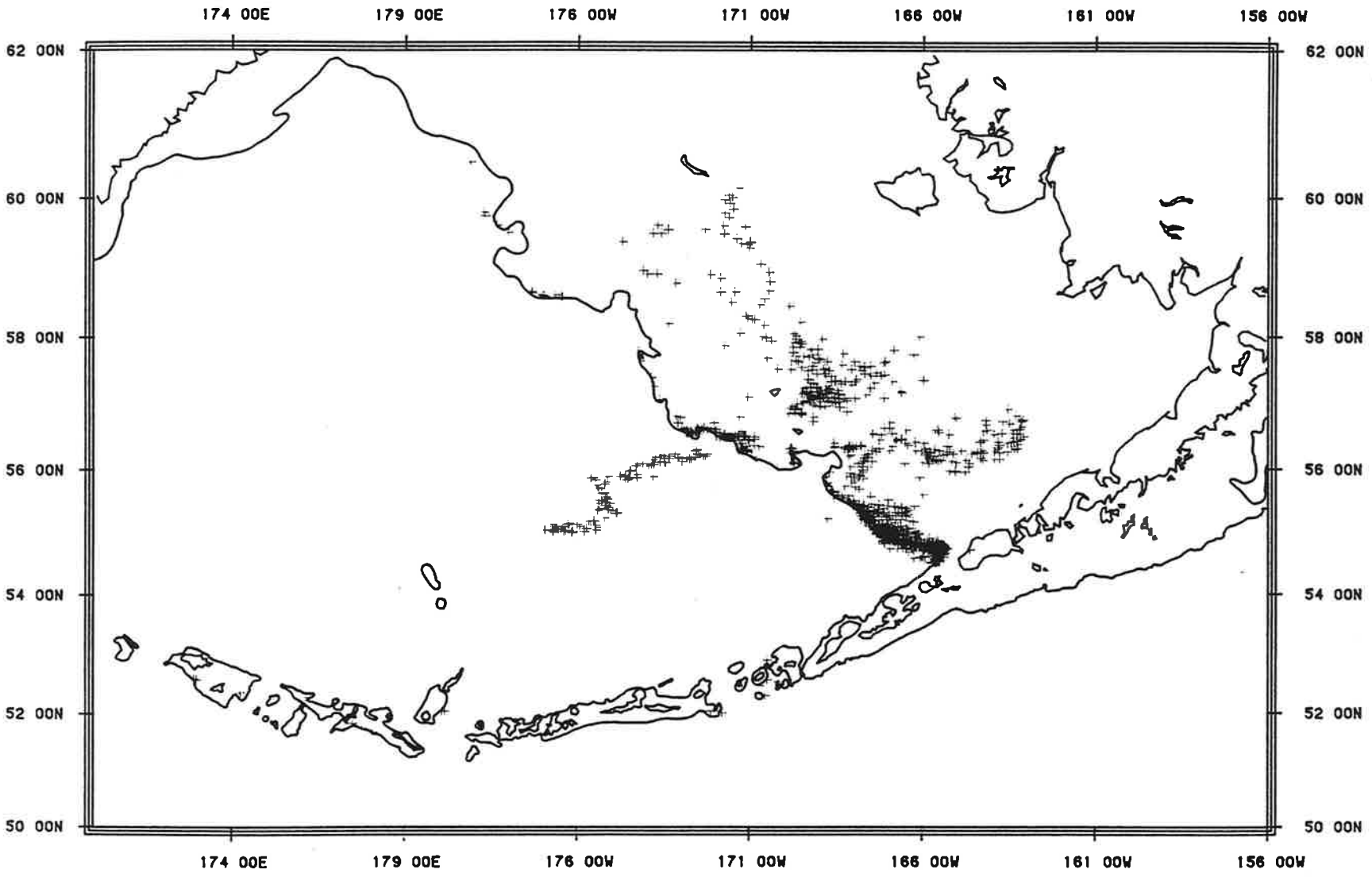

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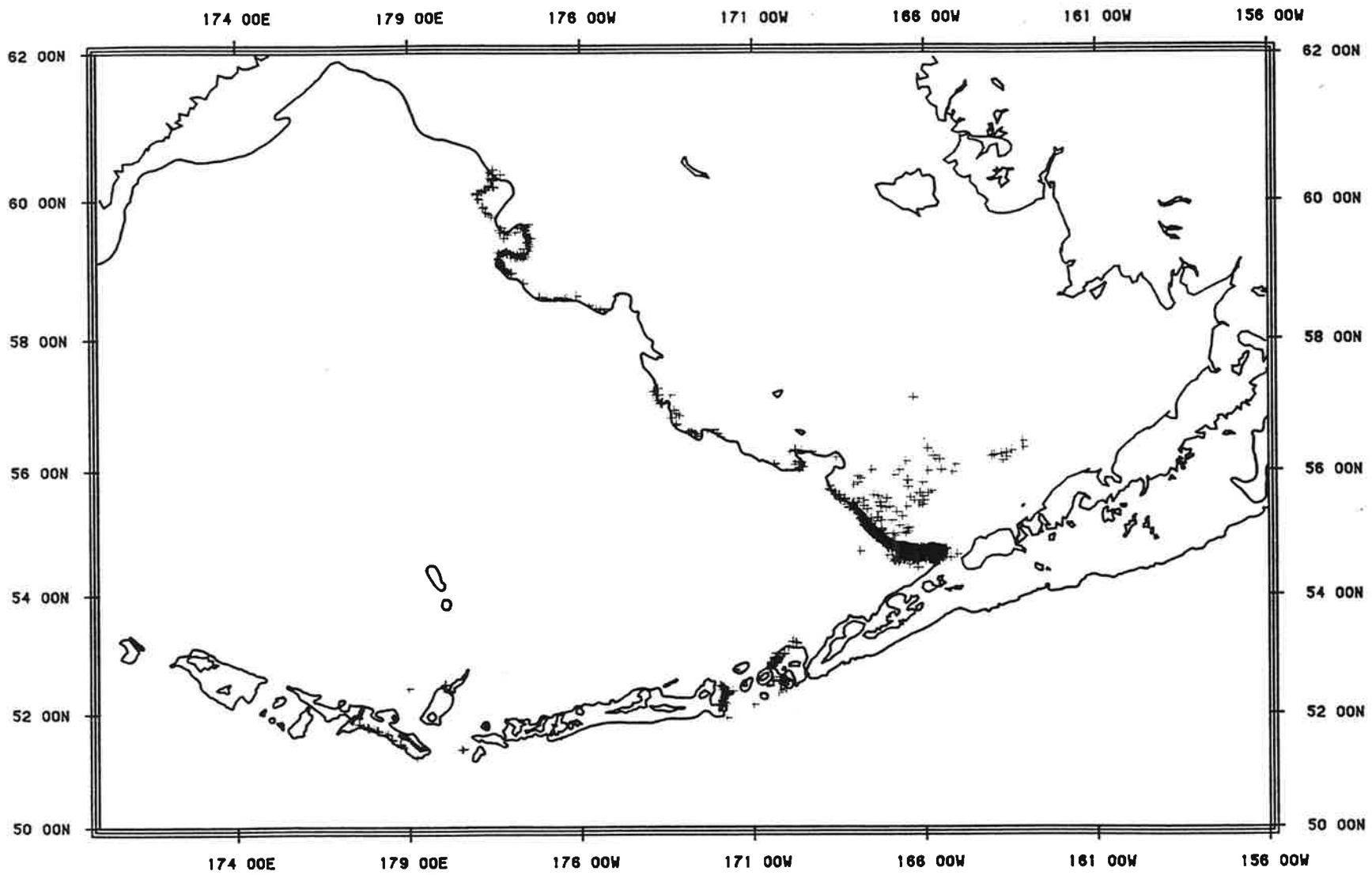

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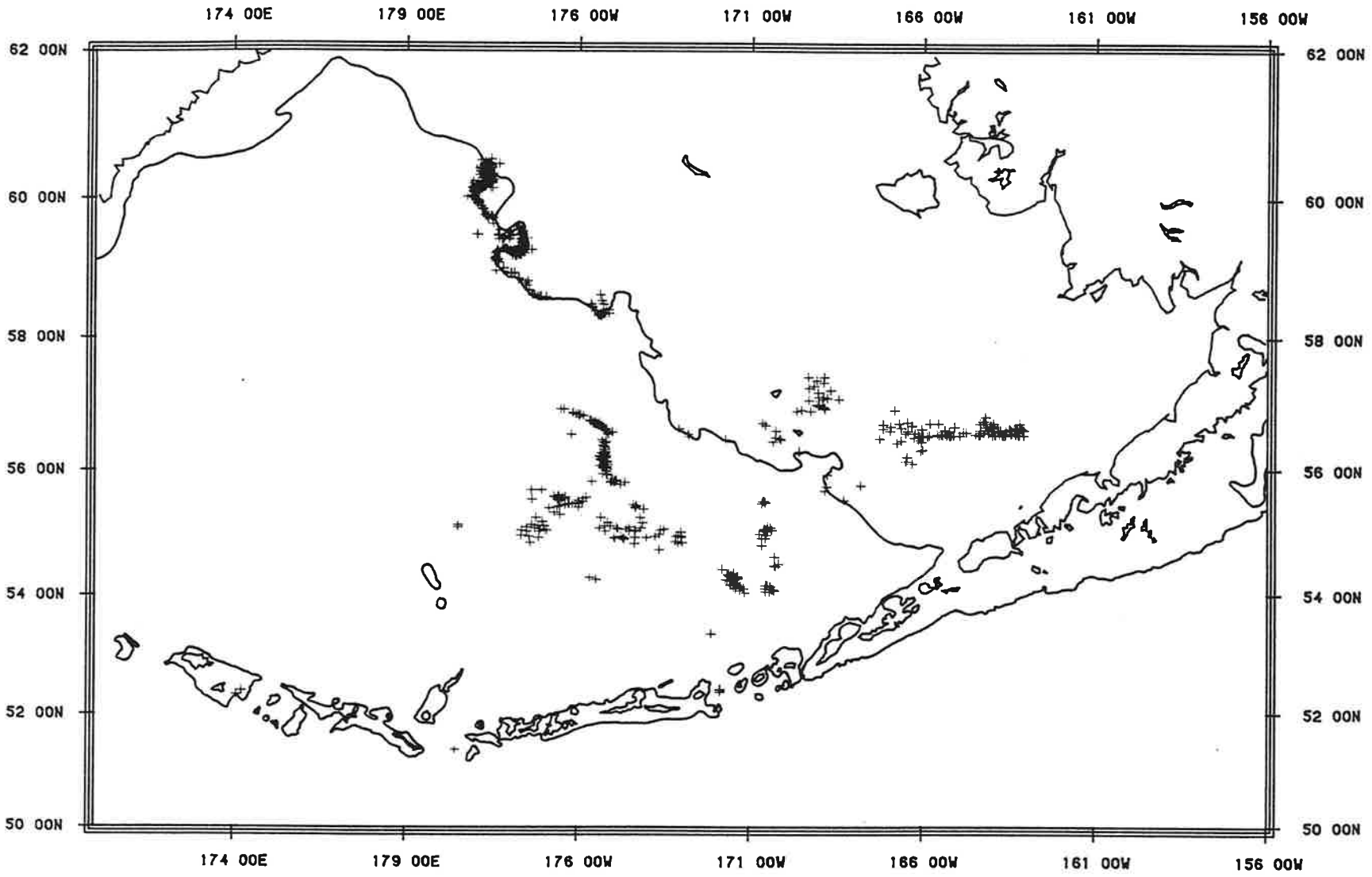

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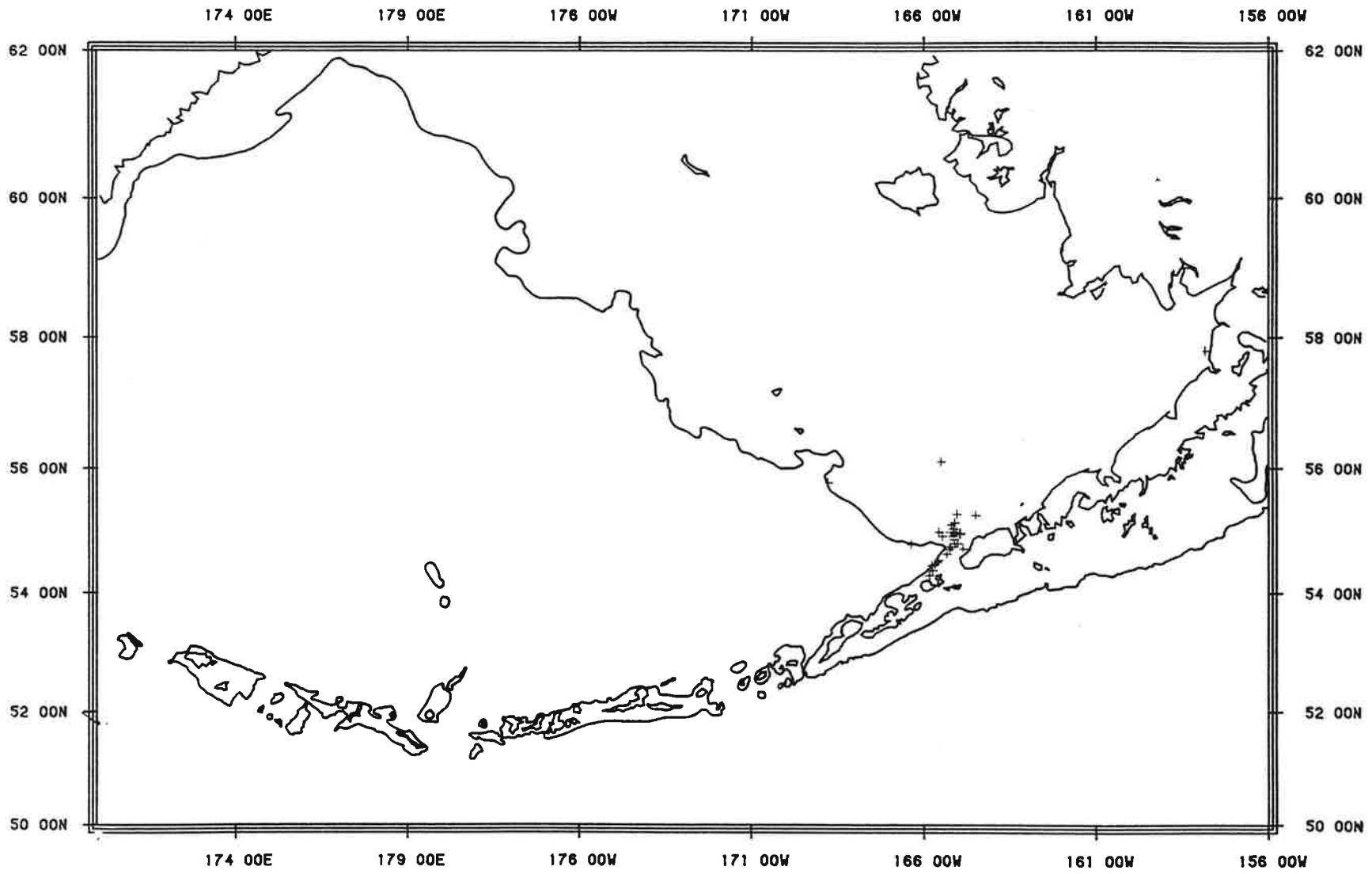

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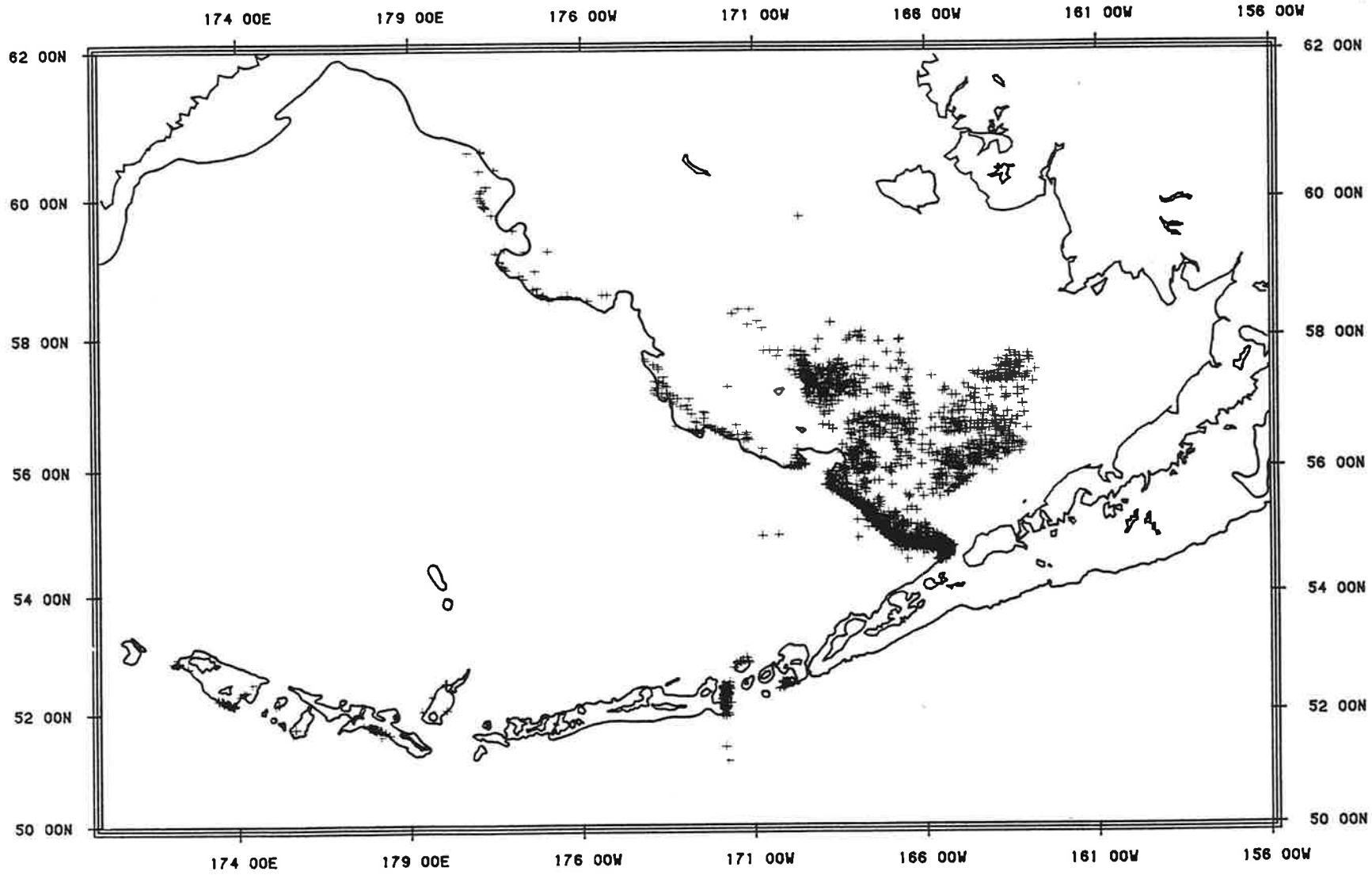

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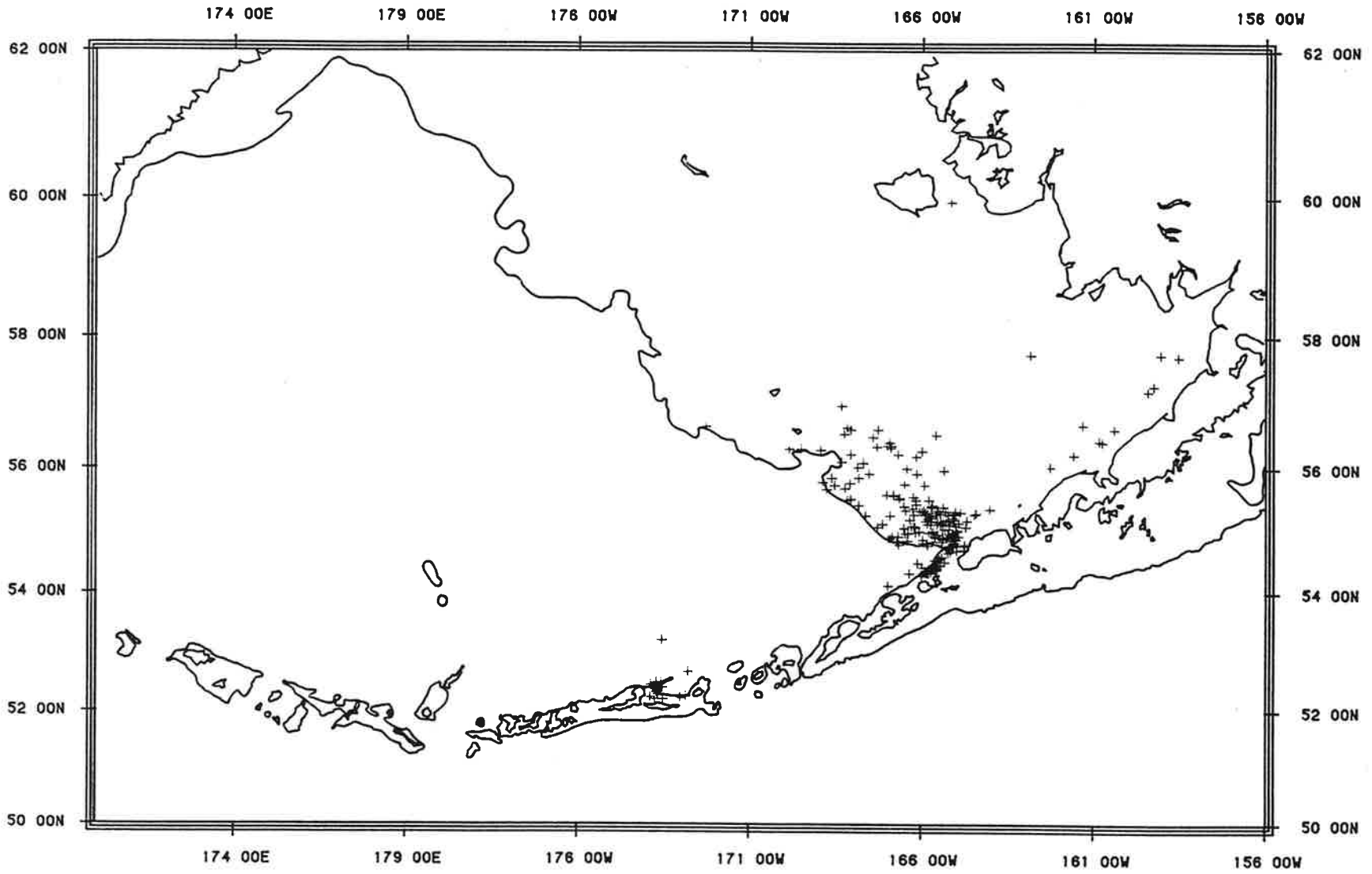

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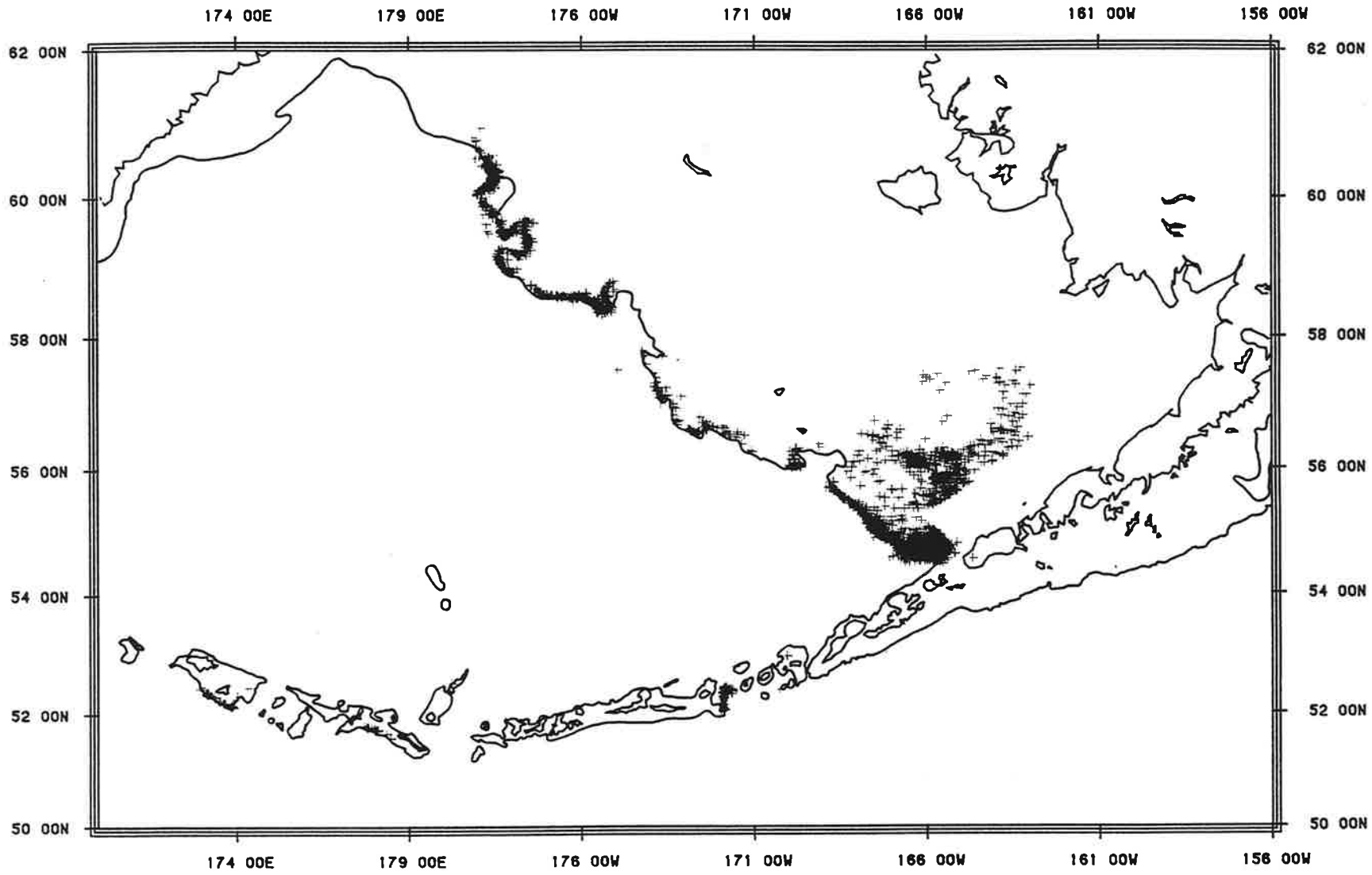

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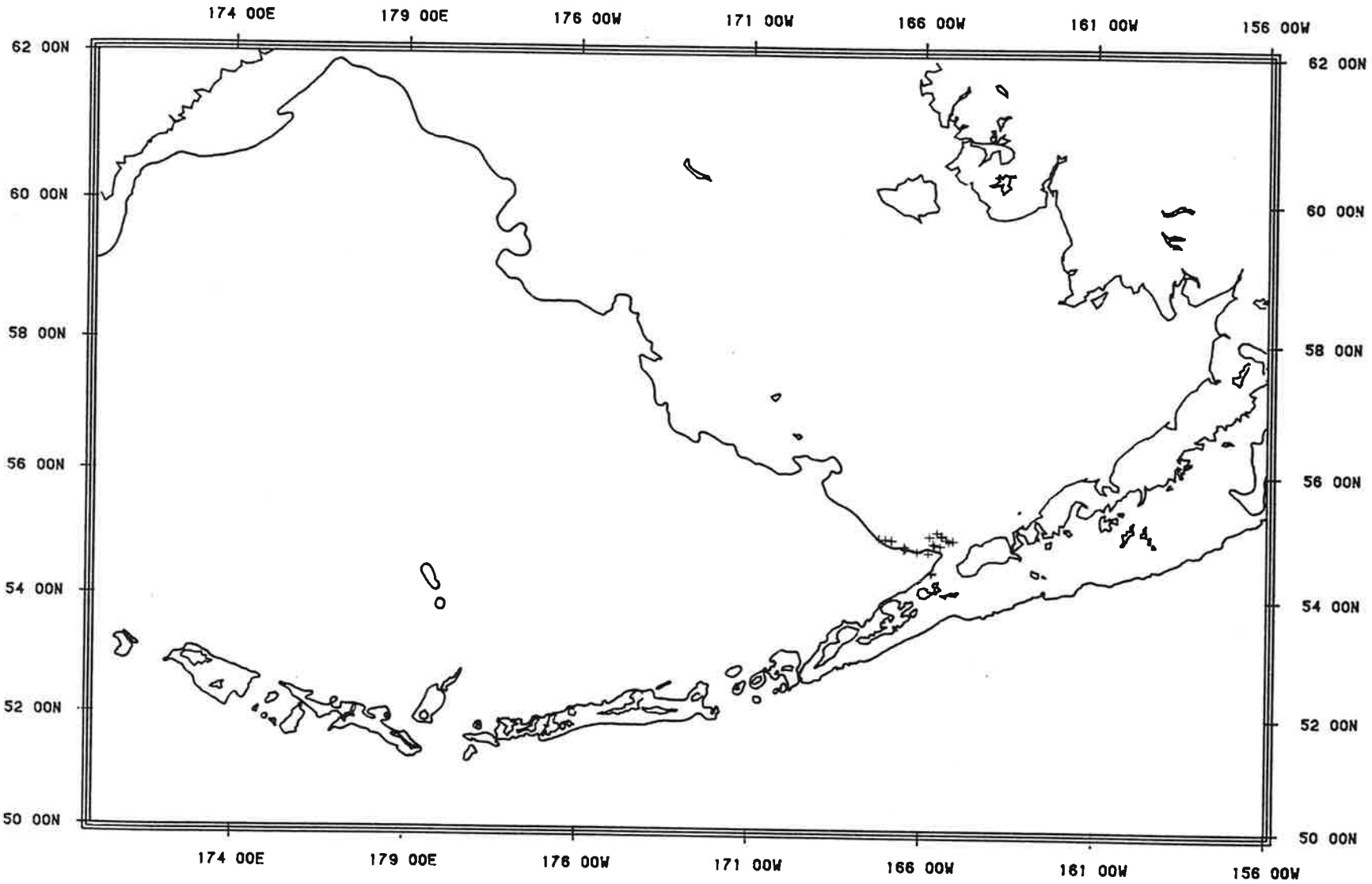

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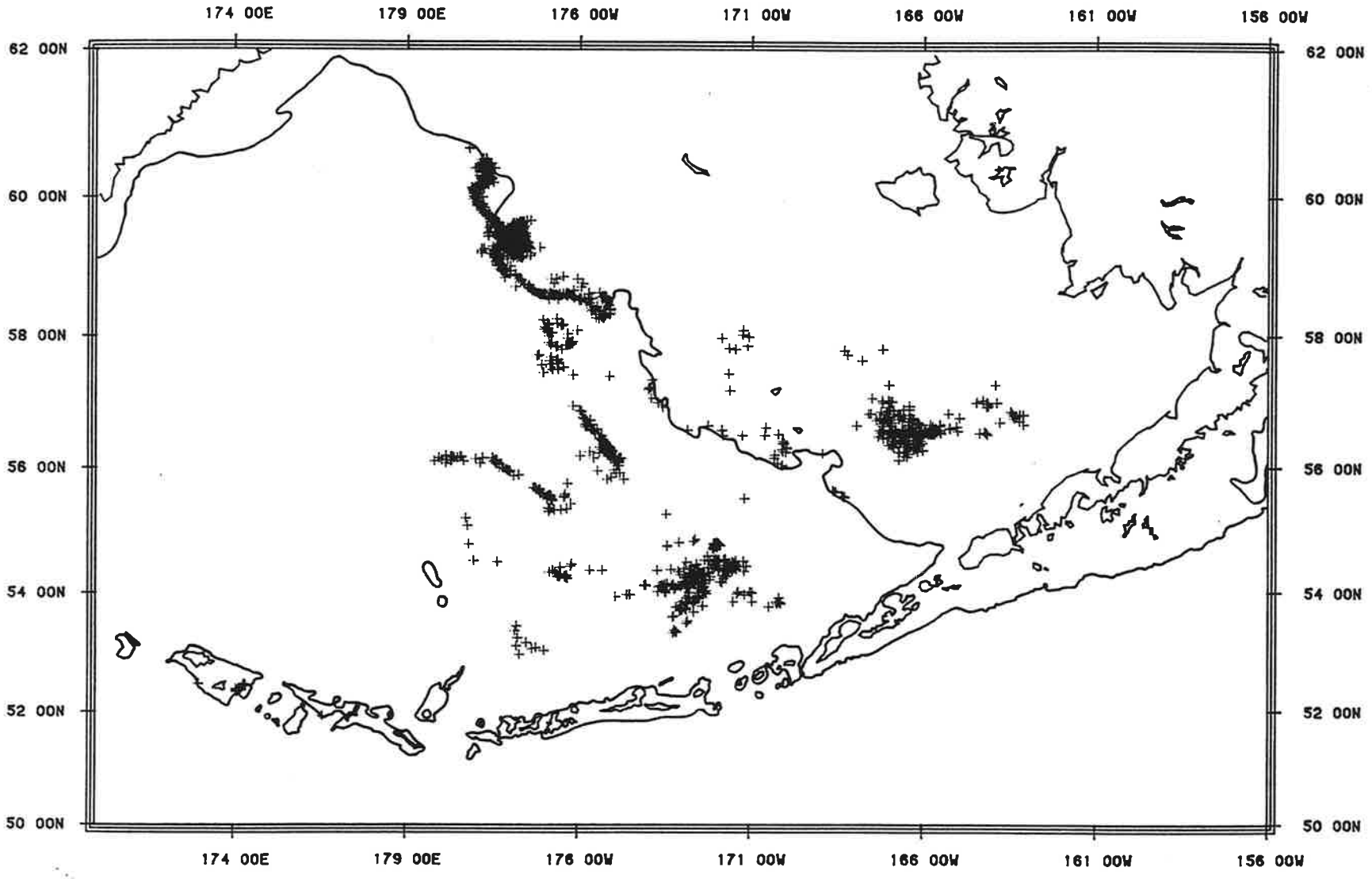

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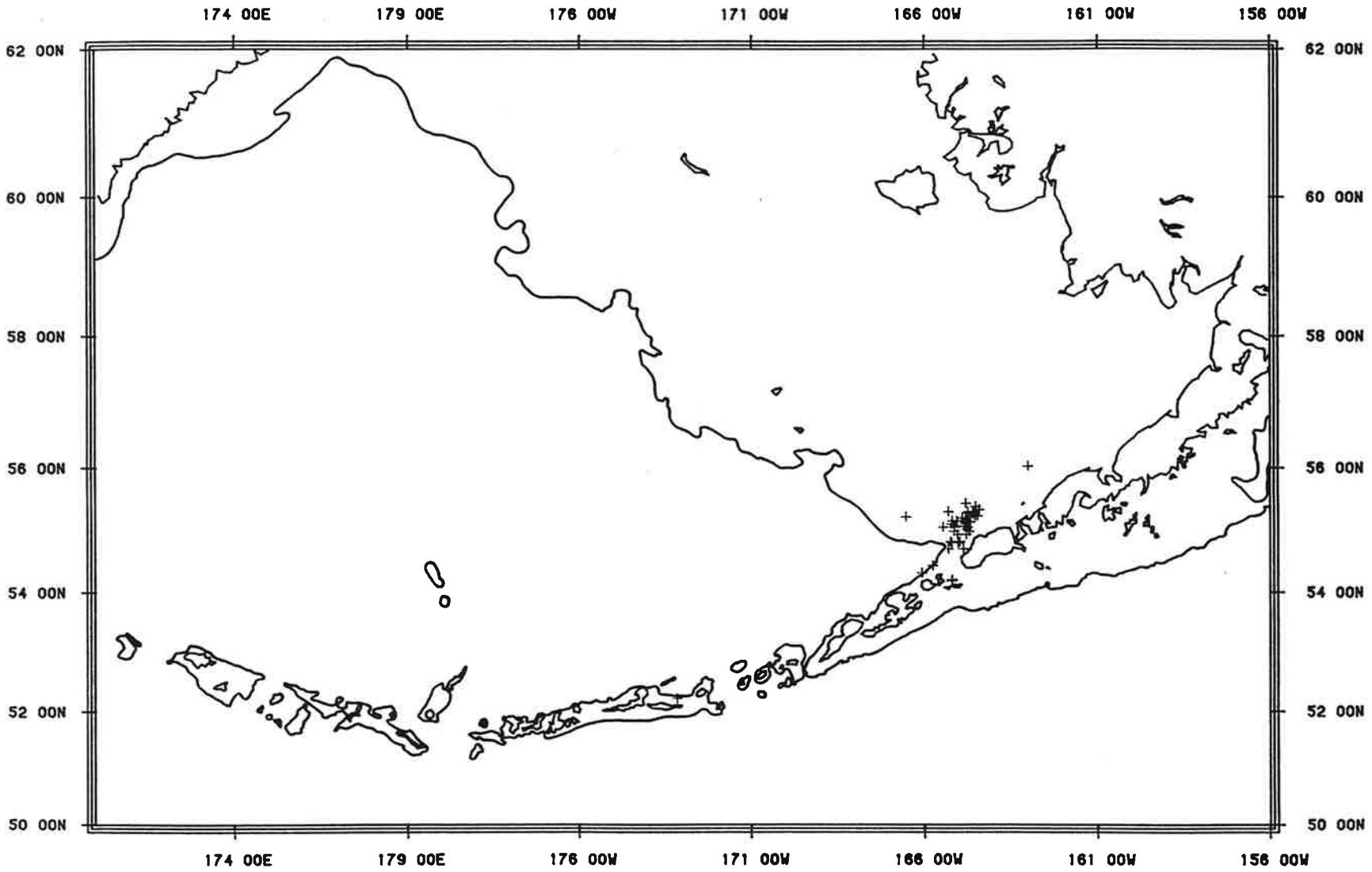

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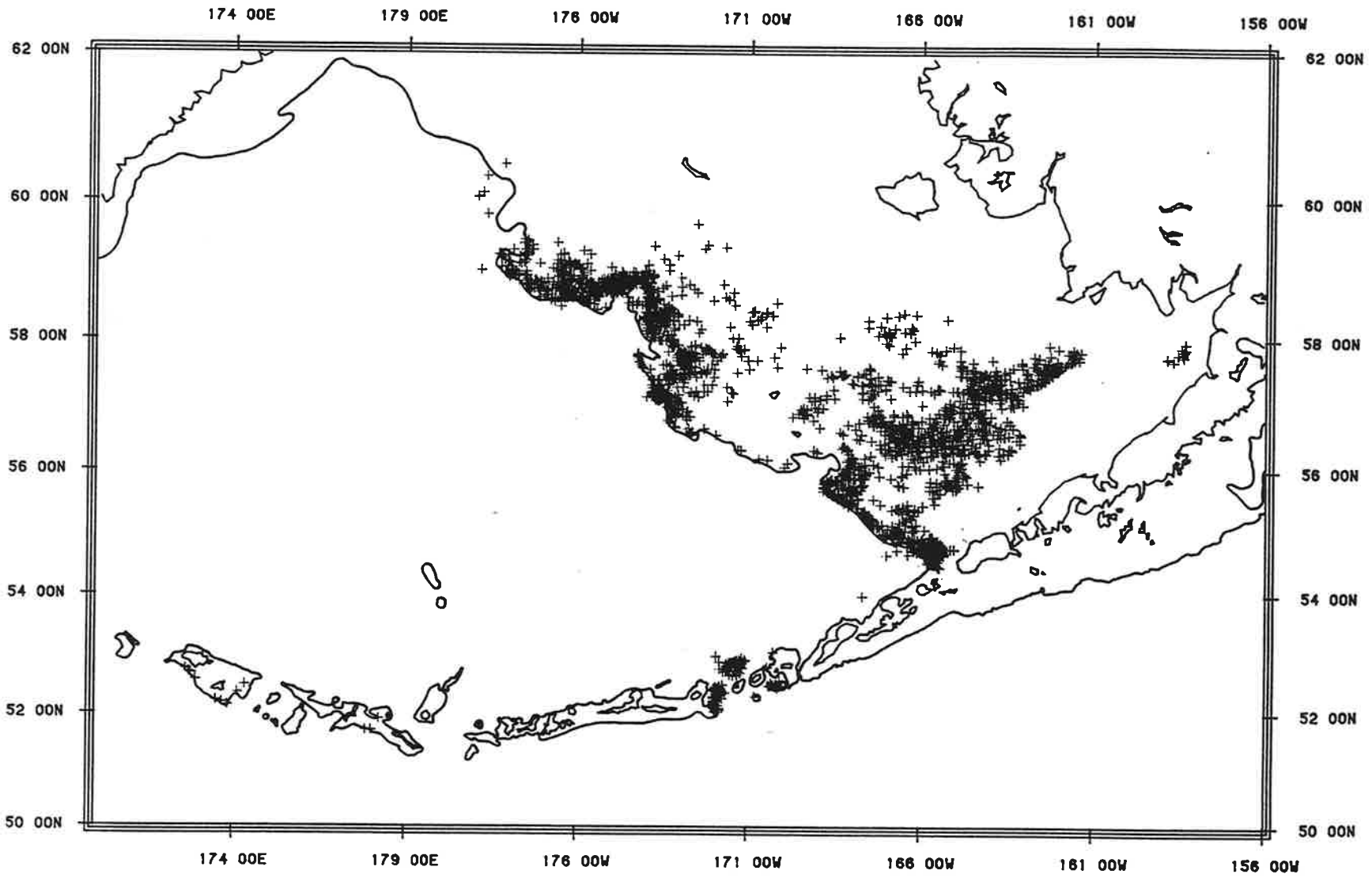

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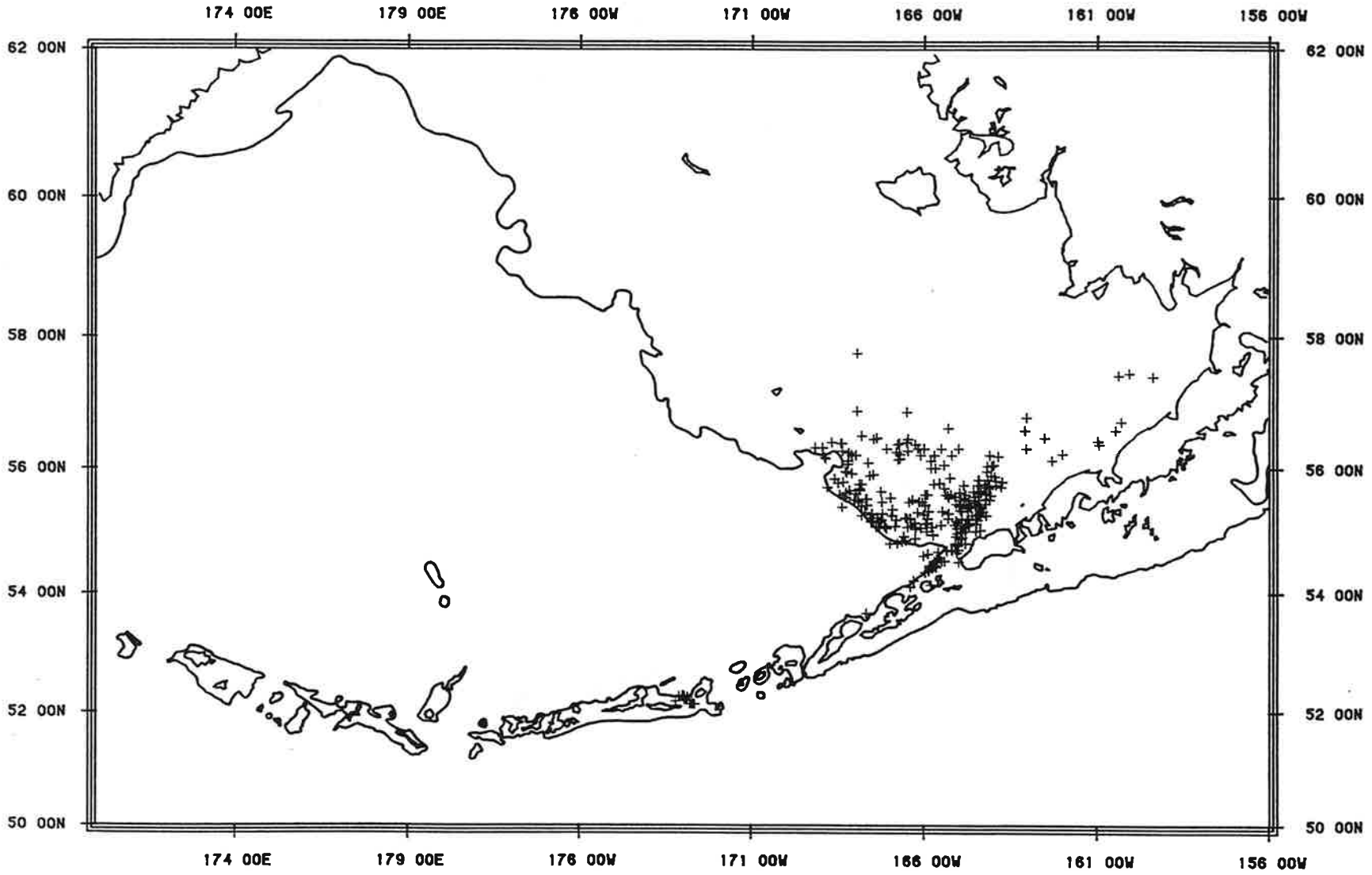

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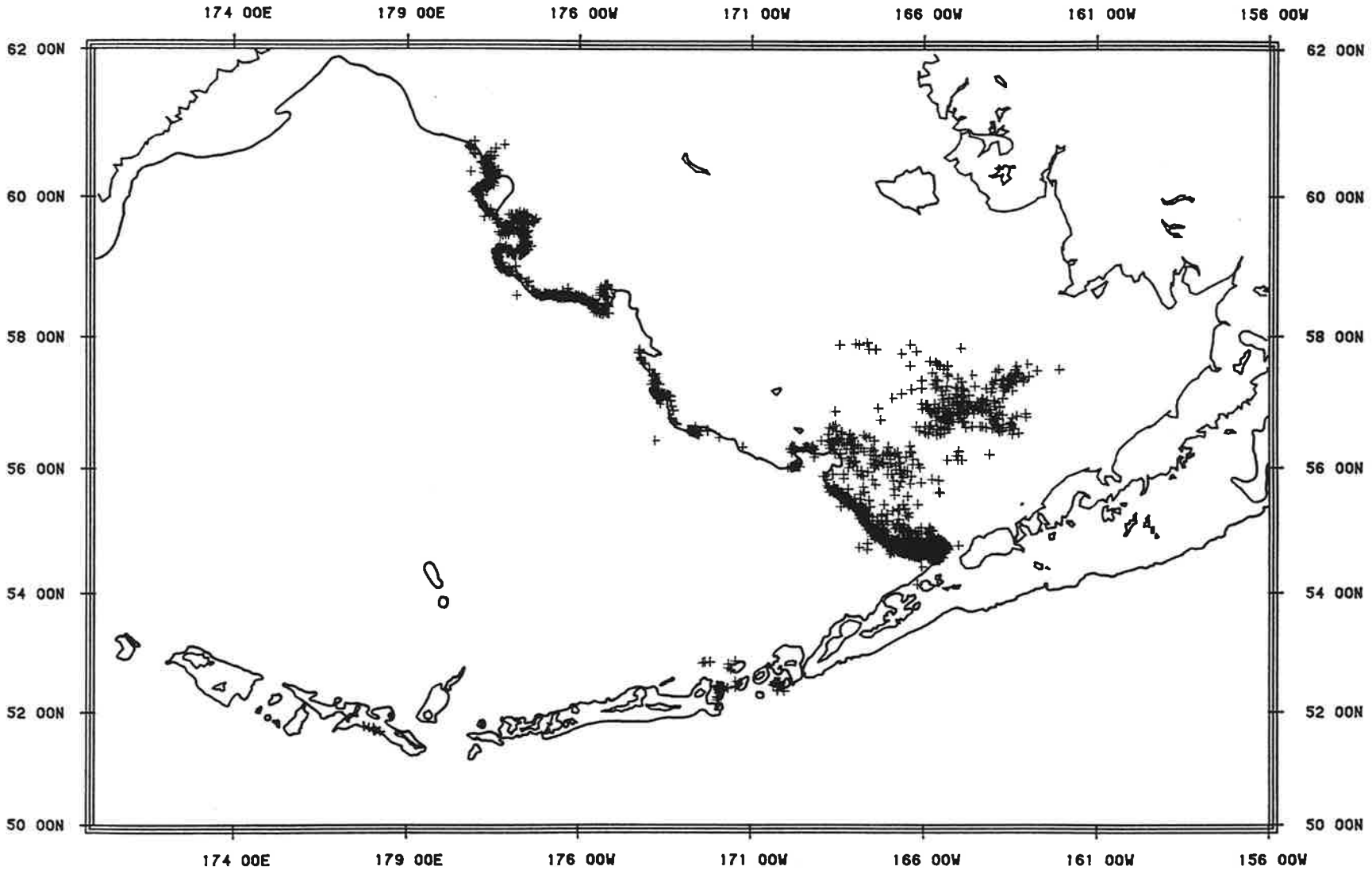

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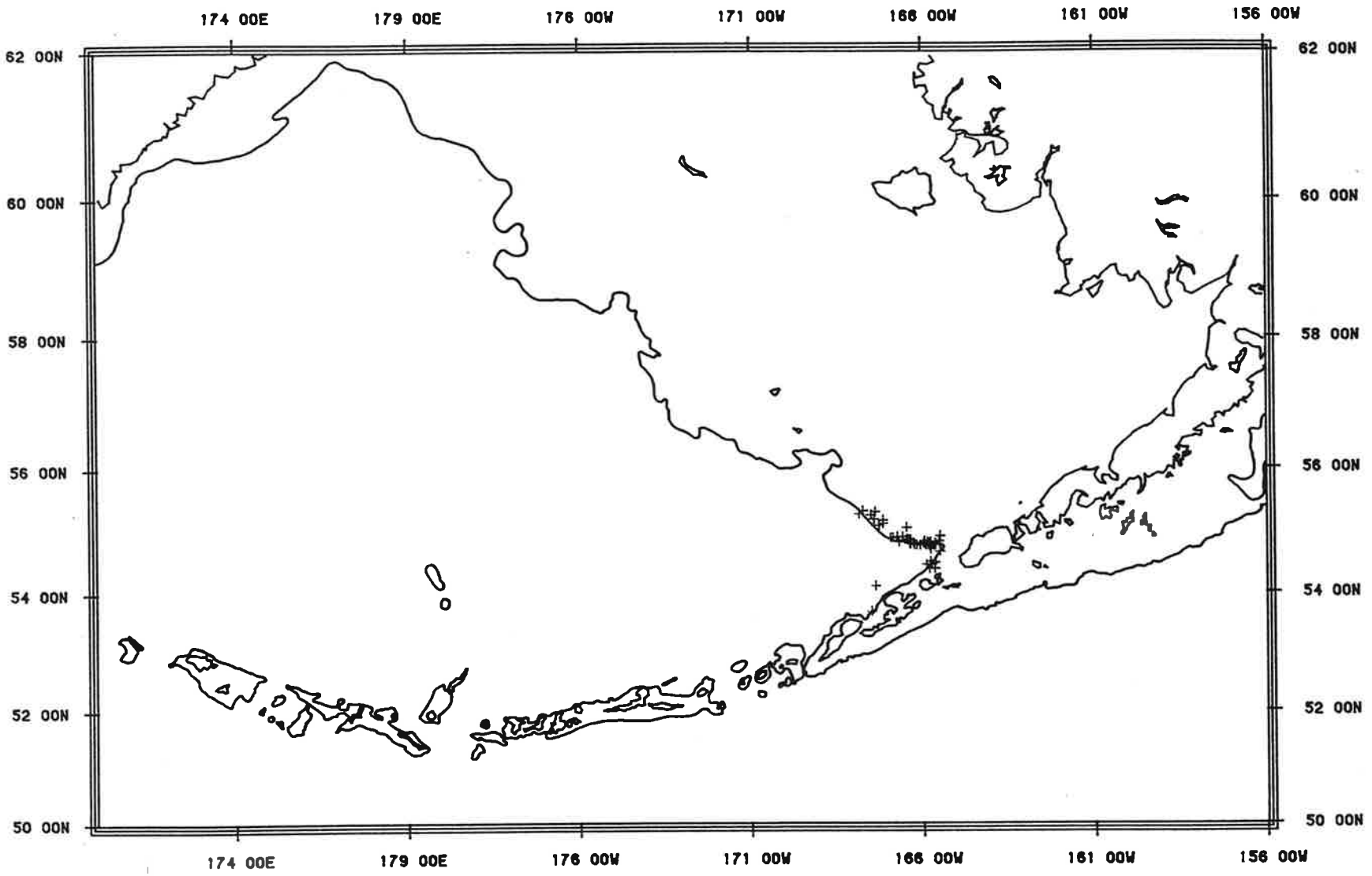

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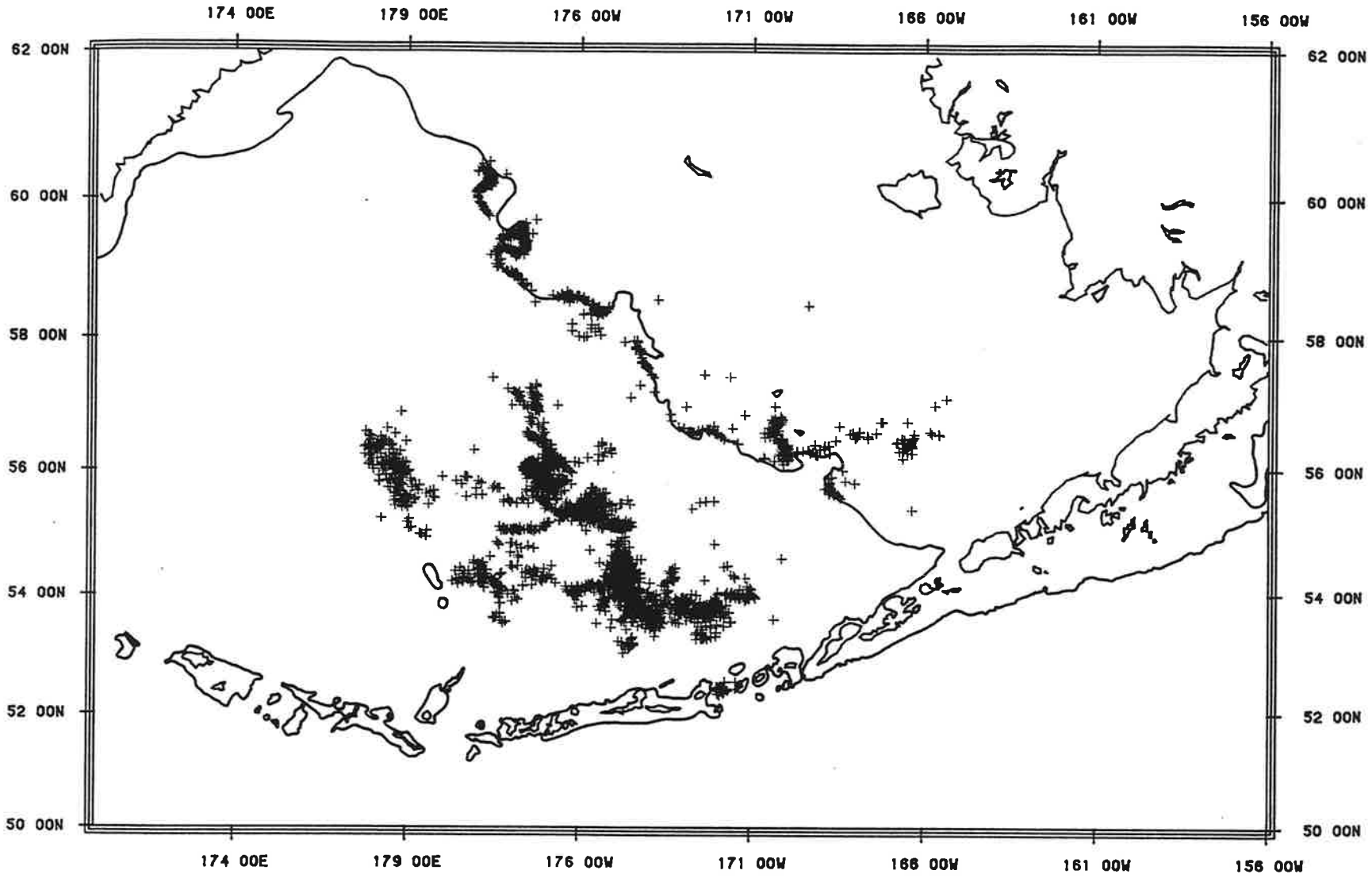

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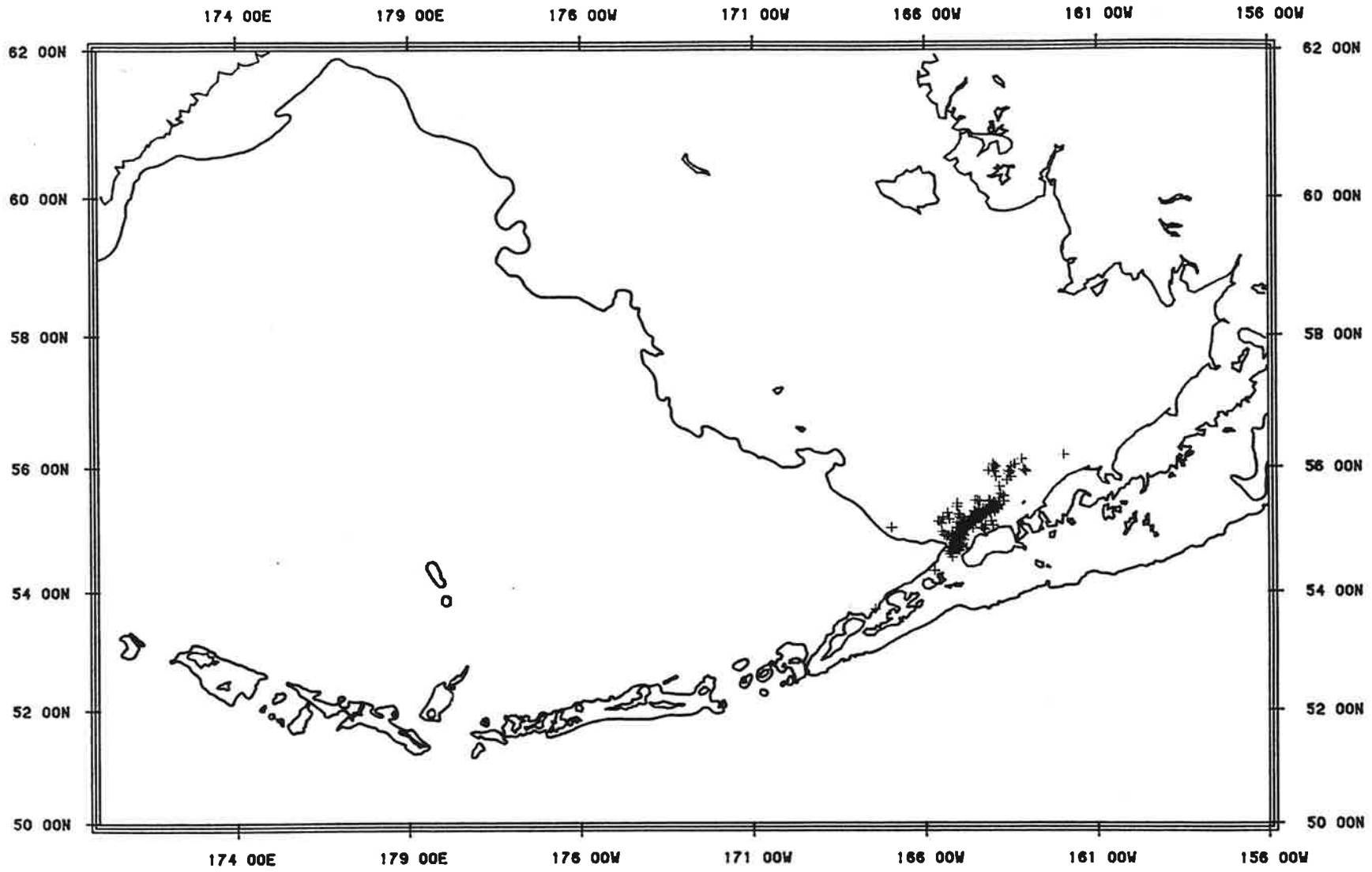

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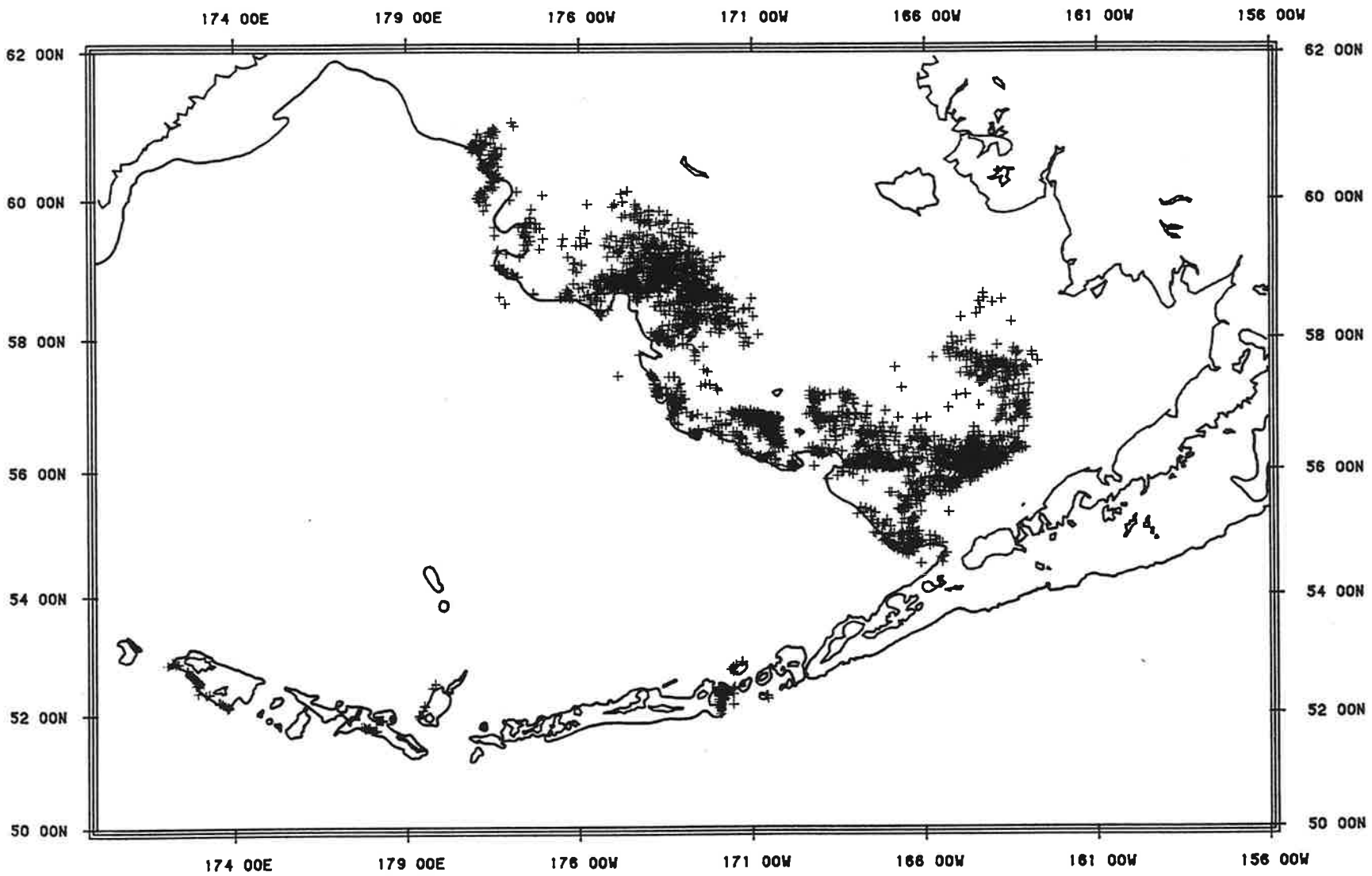

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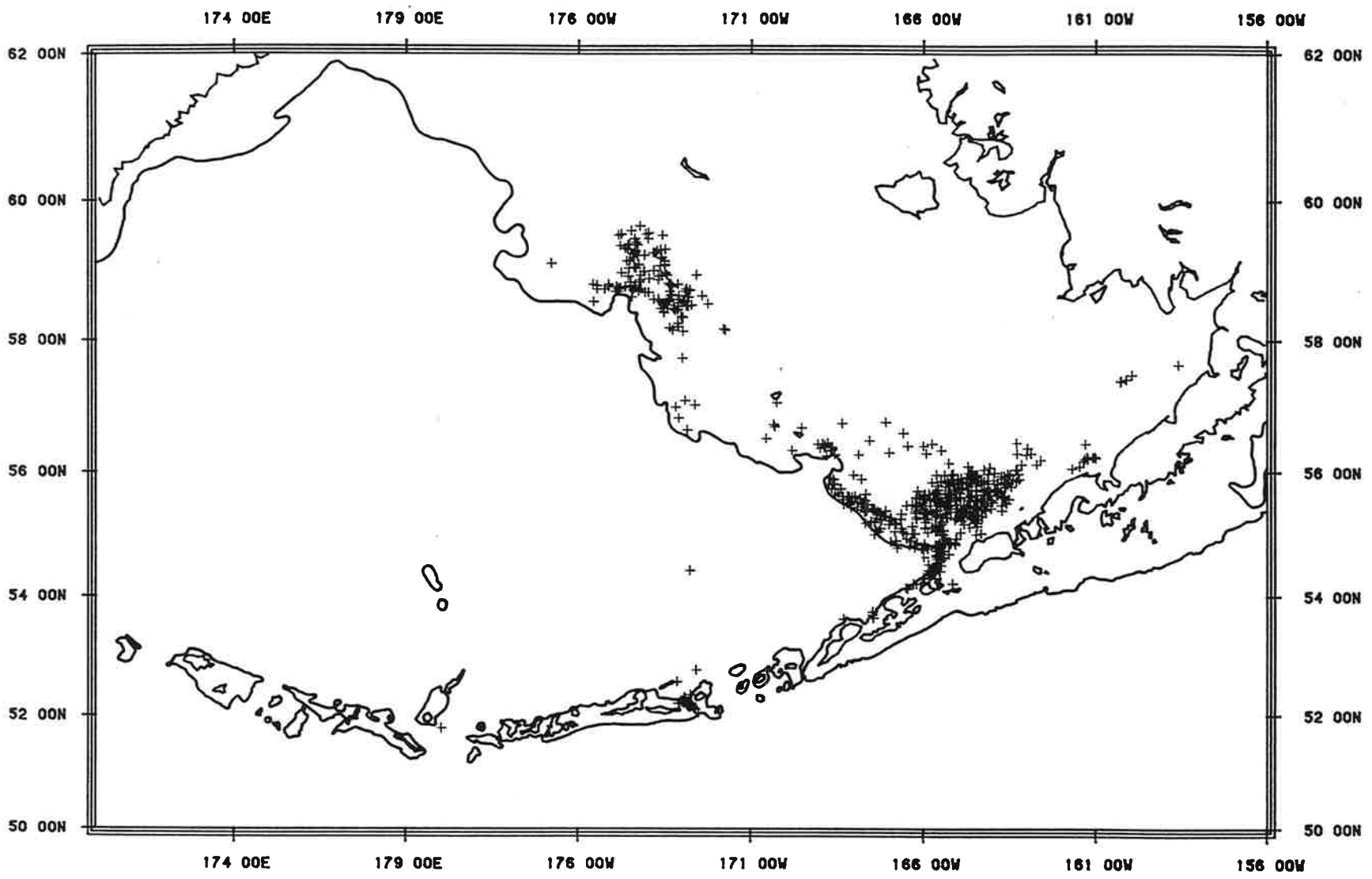

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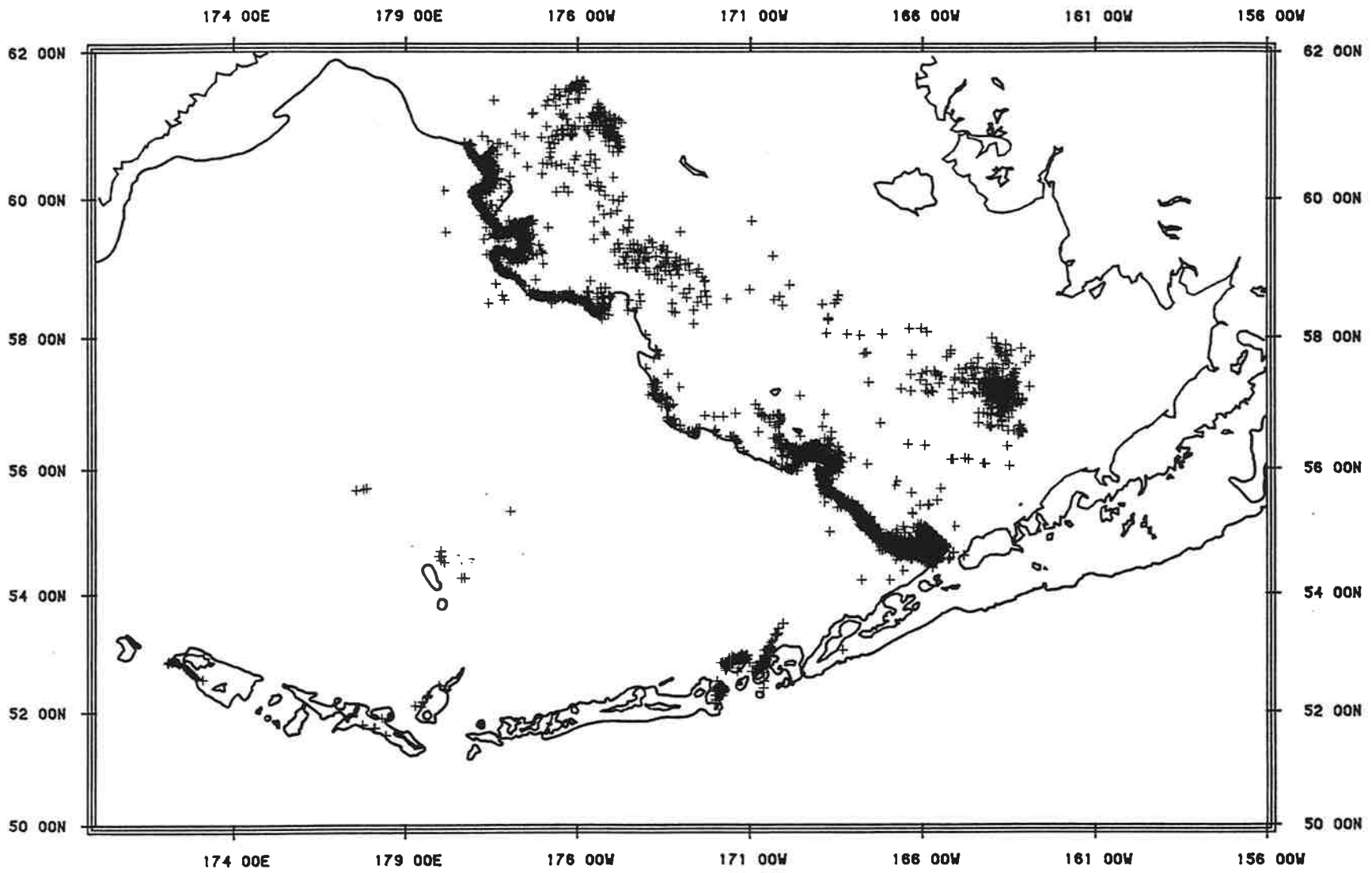
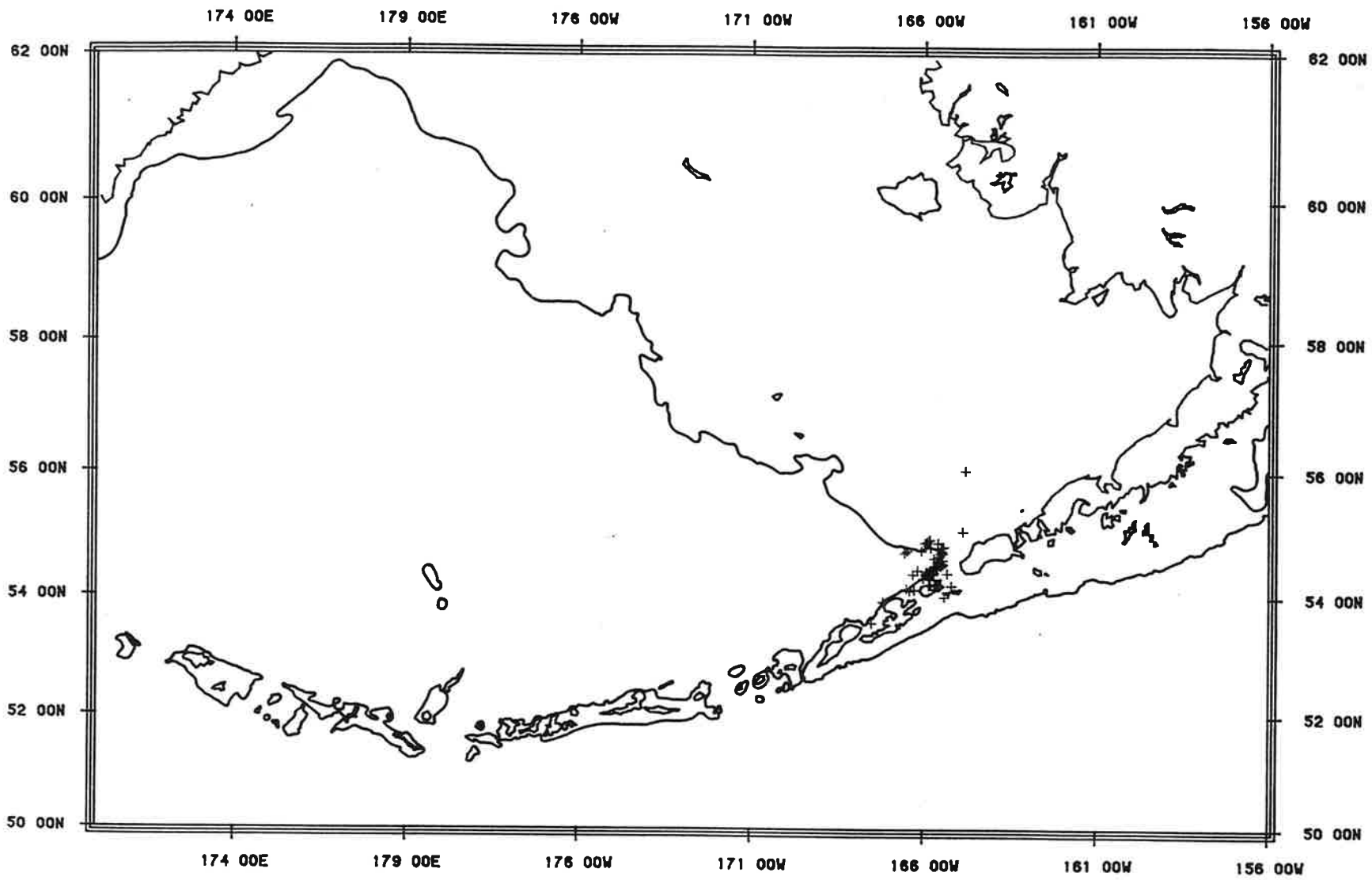
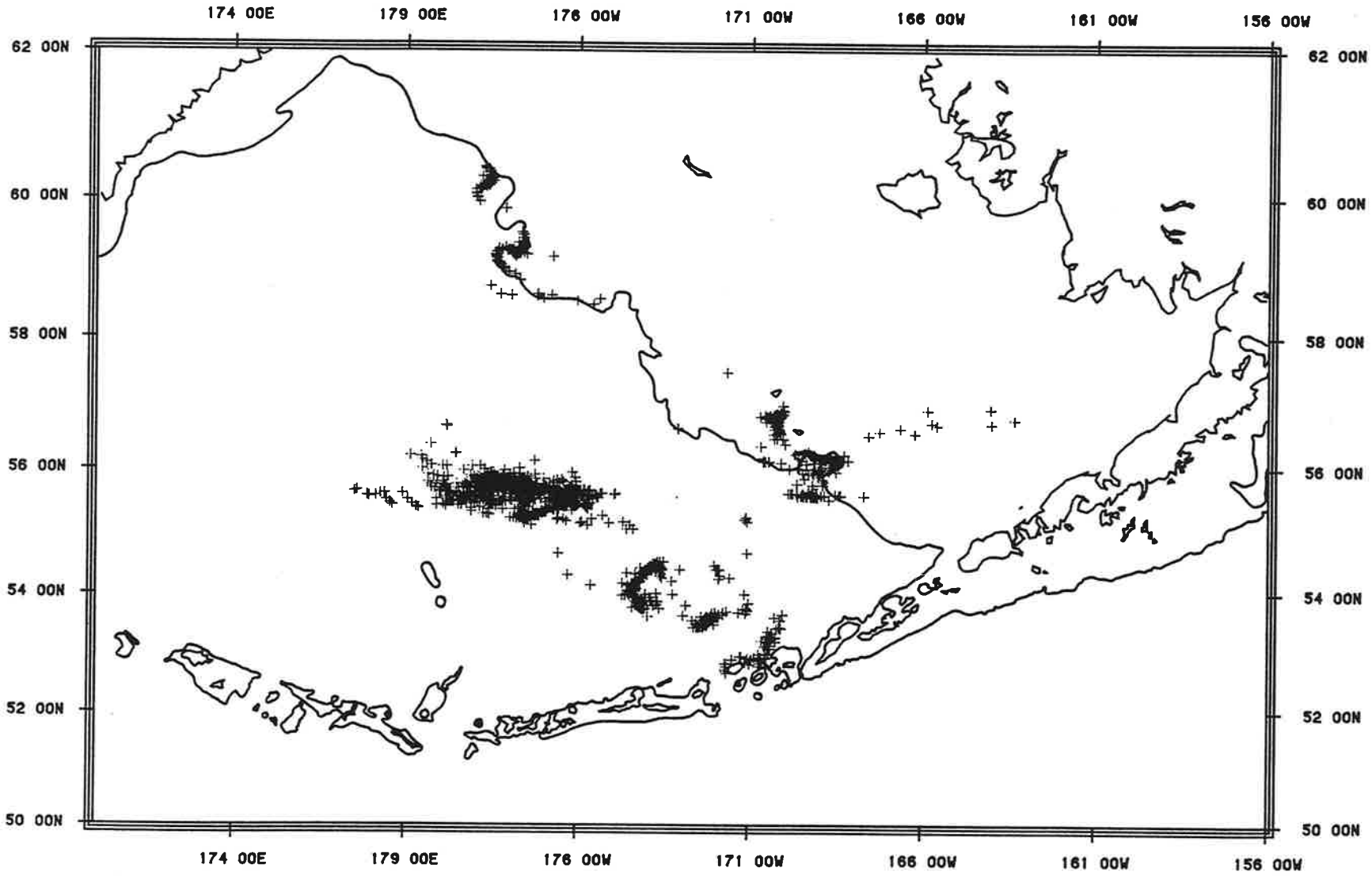


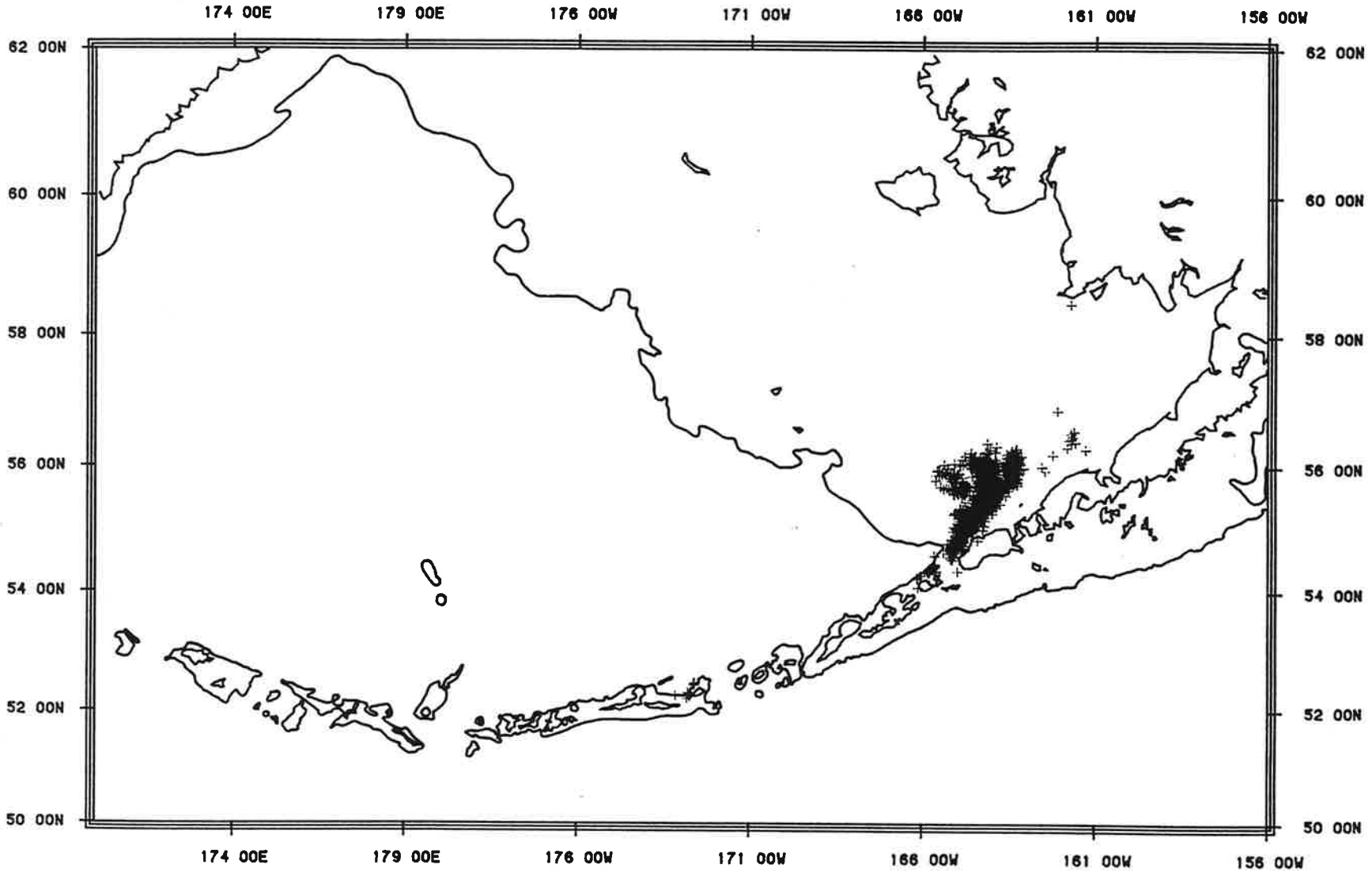
SEP-DEC 1984. FOREIGN POLLOCK TRAWL LOCATIONS



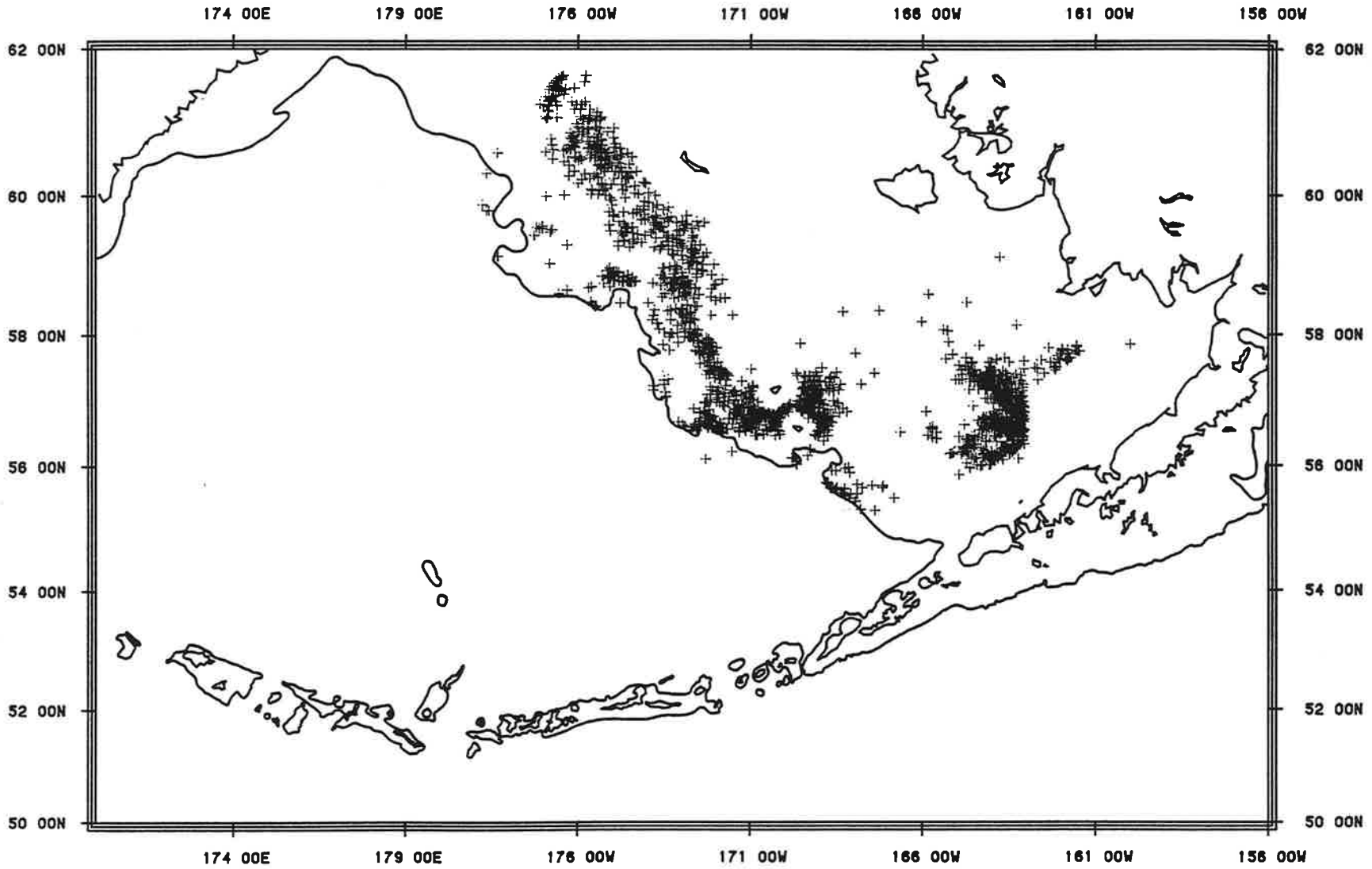
SEP-DEC 1984. JOINT VENTURE POLLOCK TRAWL LOCATIONS



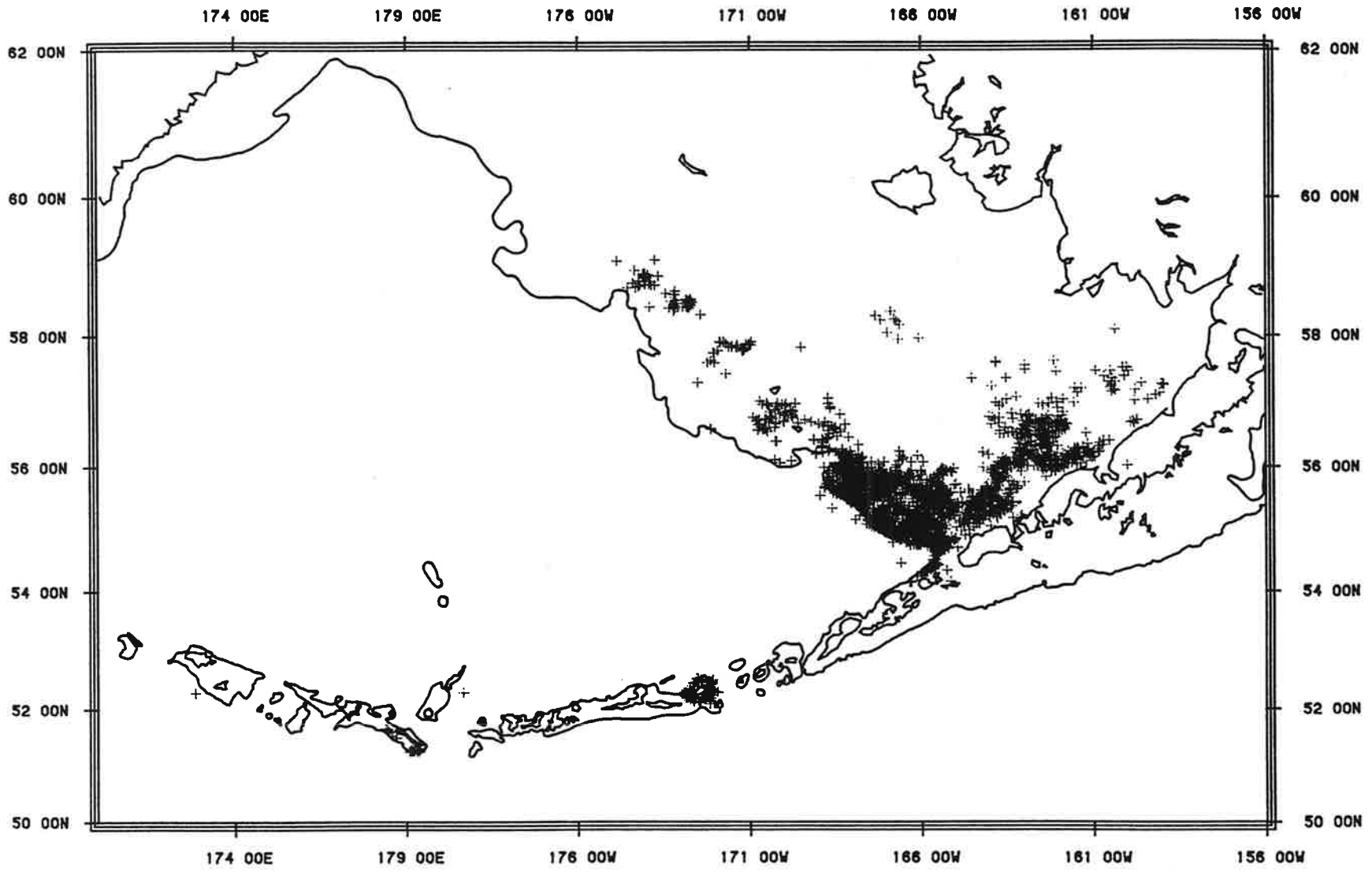
J&APR 1985. FOREIGN POLLOCK TRAWL LOCATIONS



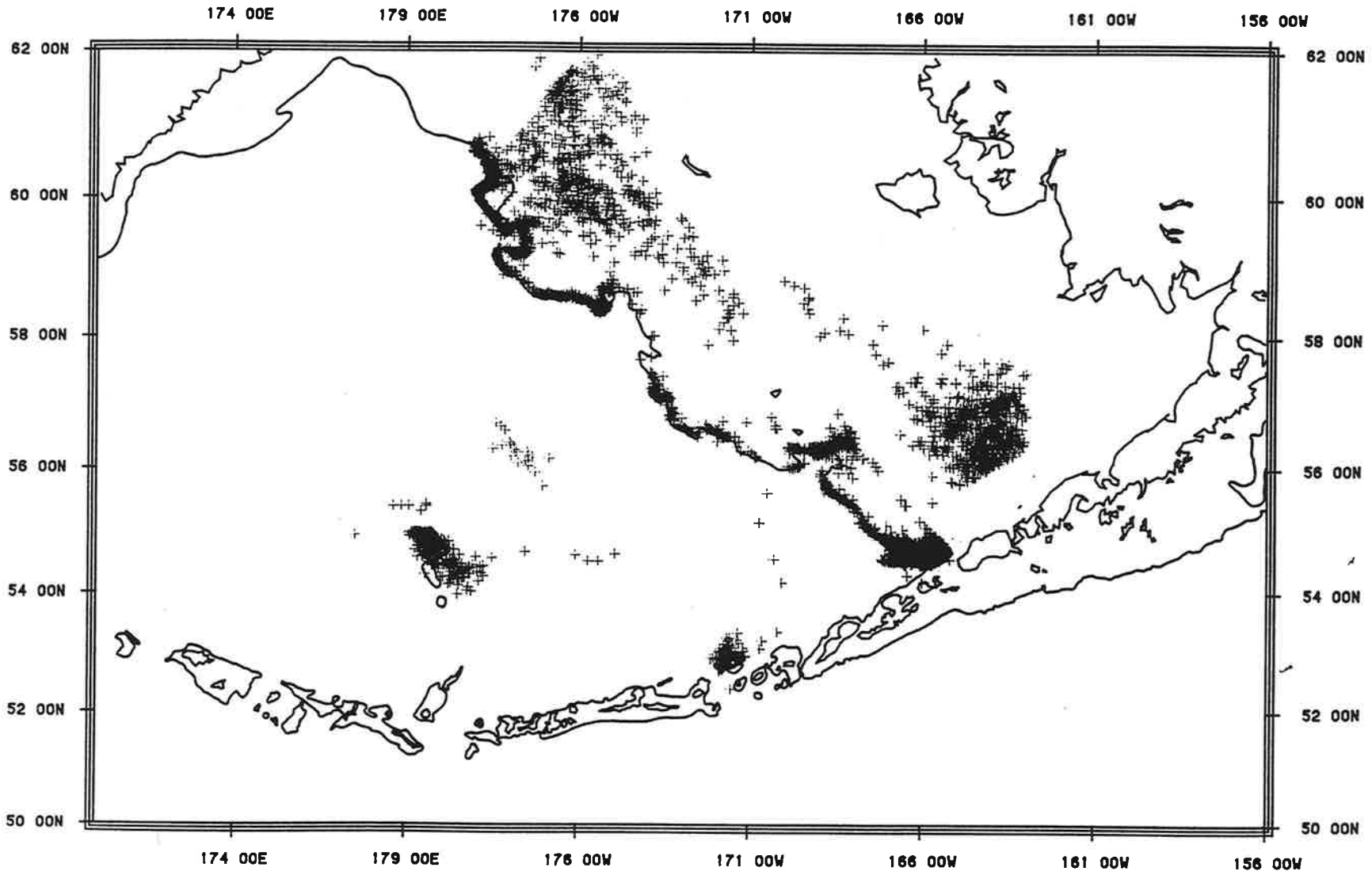
JAN-APR 1985. JOINT VENTURE POLLOCK TRAWL LOCATIONS



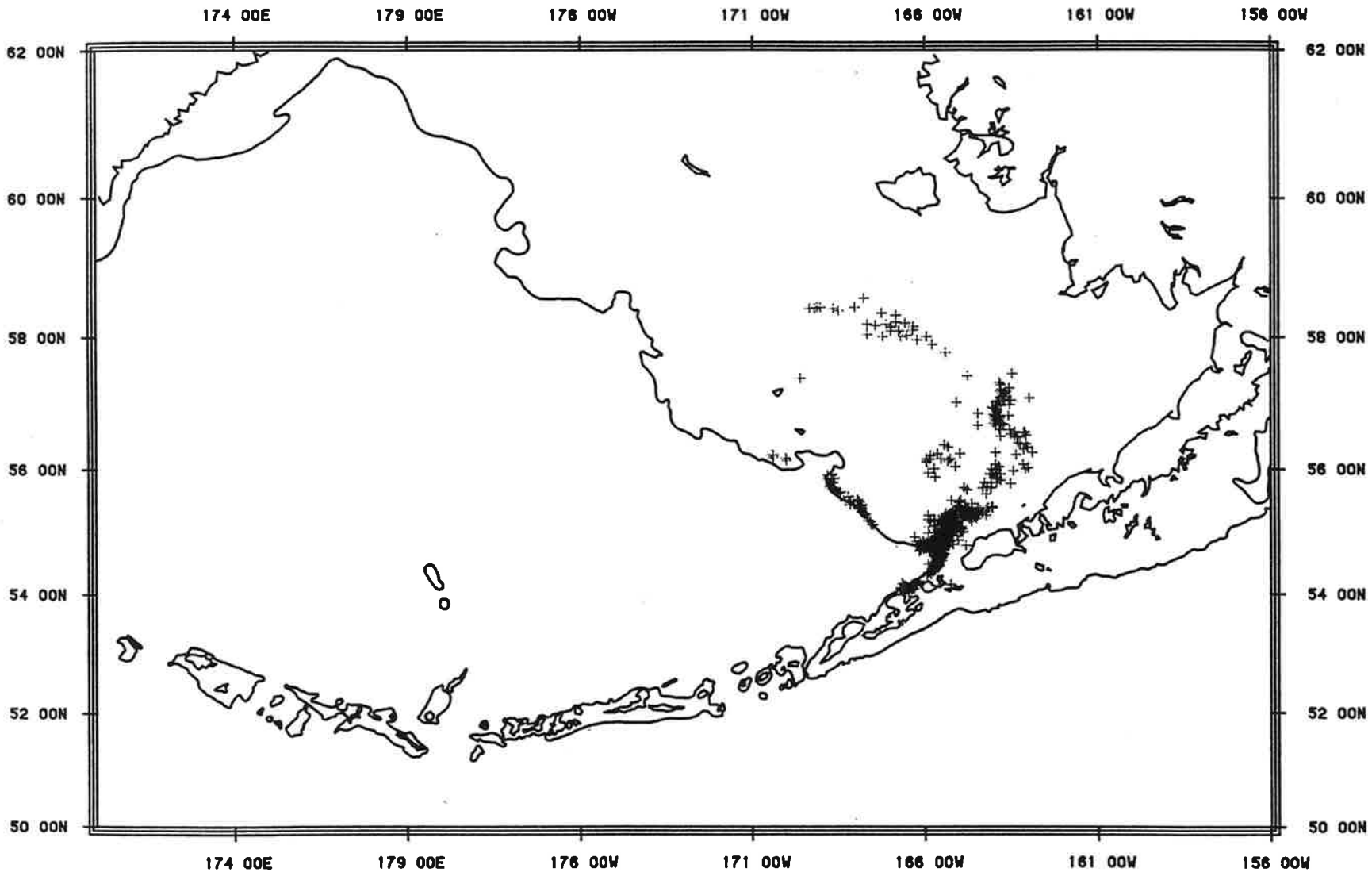
MAY-AUG 1985. FOREIGN POLLOCK TRAWL LOCATIONS



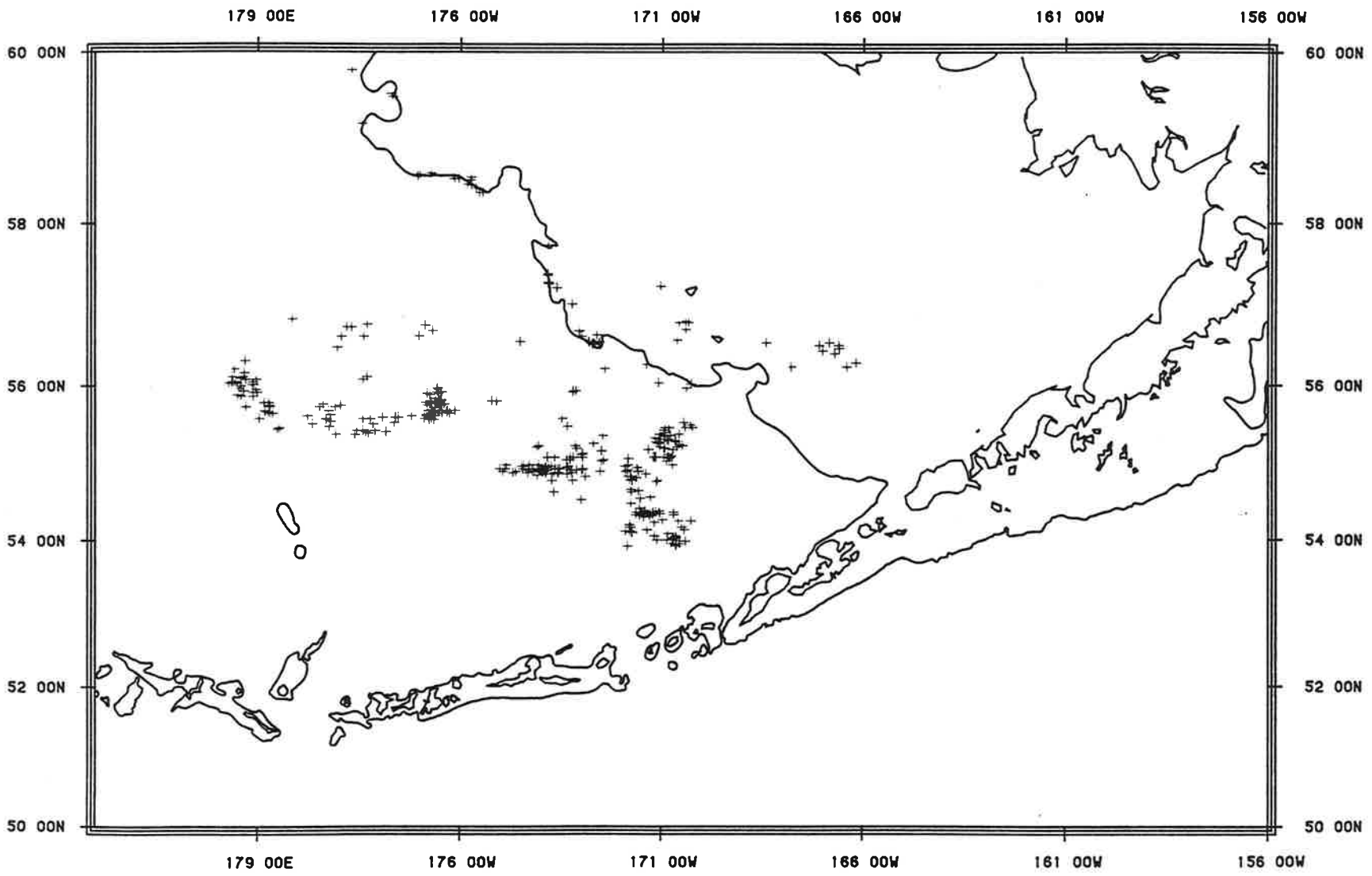
MAY-AUG 1985. JOINT VENTURE POLLOCK TRAWL LOCATIONS



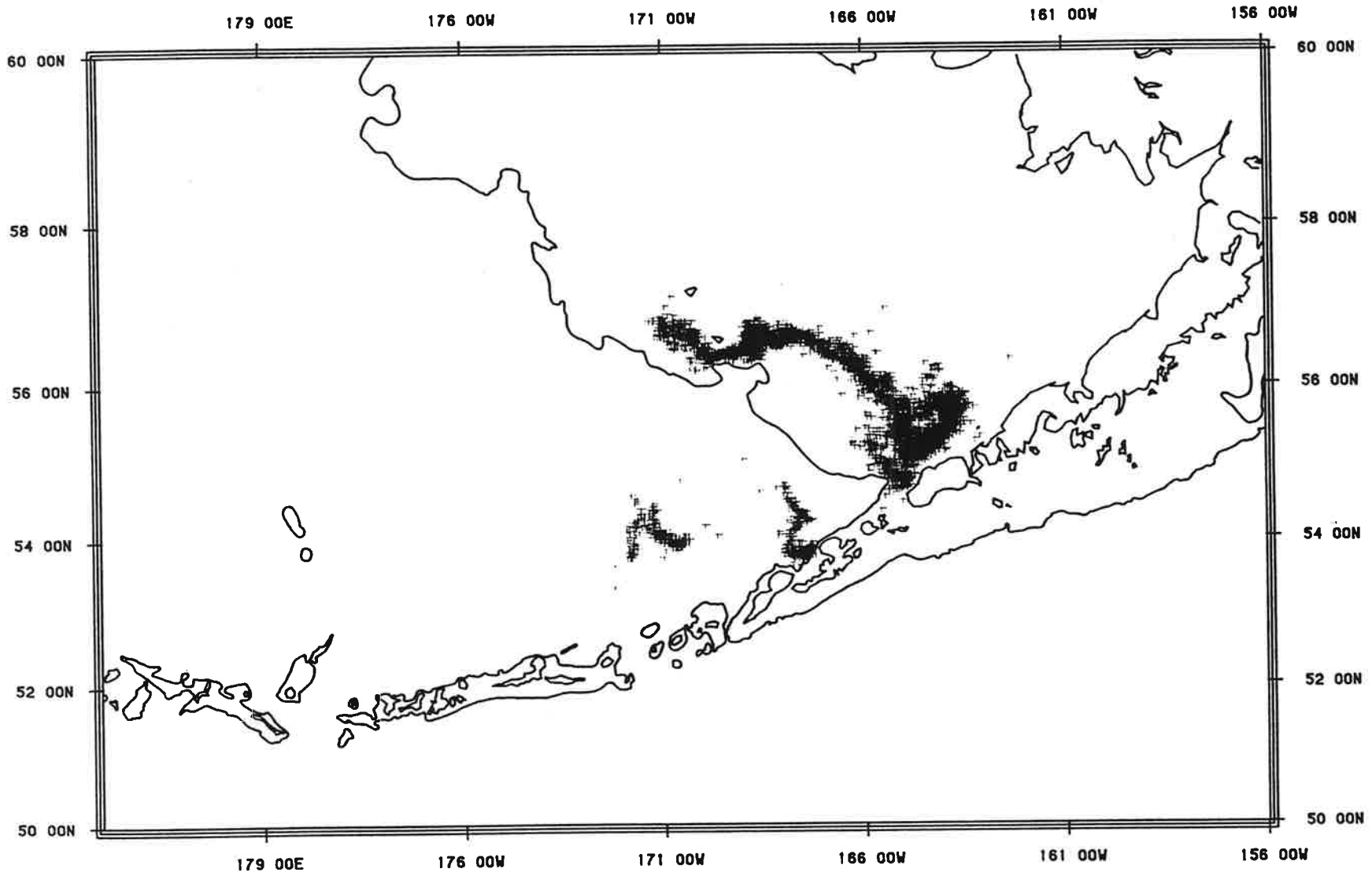
SEP-DEC 1985. FOREIGN POLLOCK TRAWL LOCATIONS



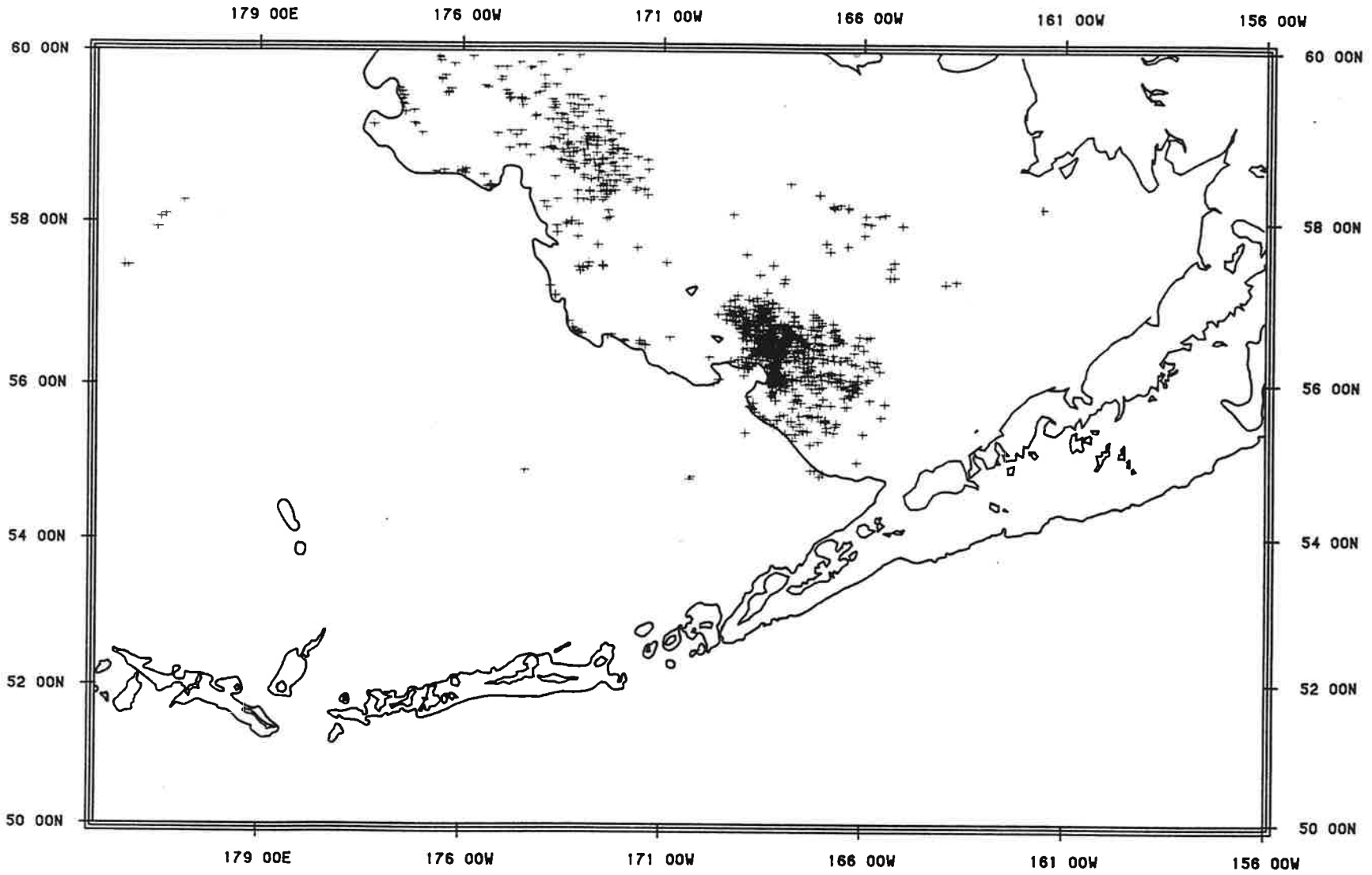
SEP-DEC 1985. JOINT VENTURE POLLOCK TRAWL LOCATIONS



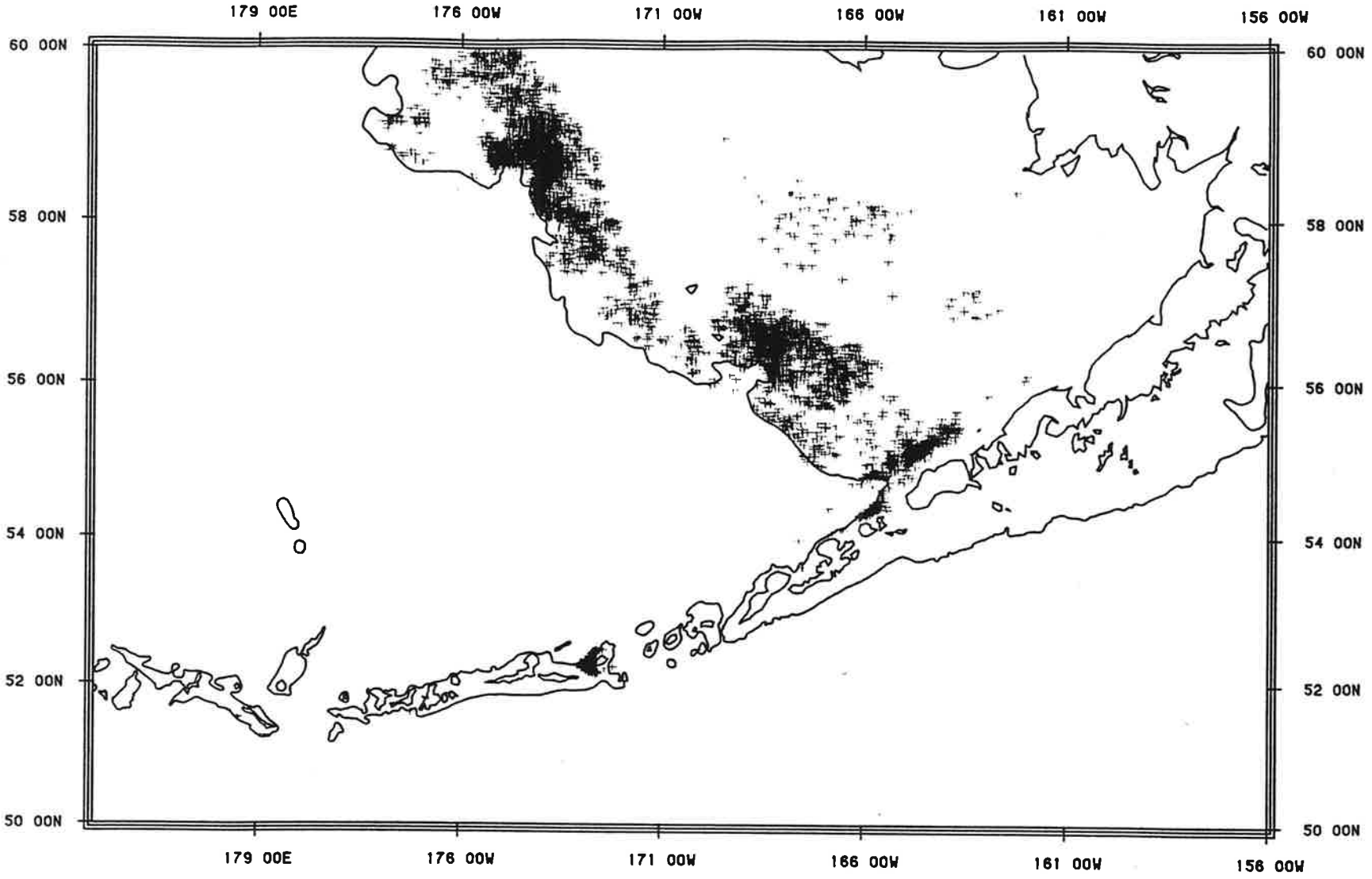
JAN-APR 1986. FOREIGN POLLOCK TRAWL LOCATIONS



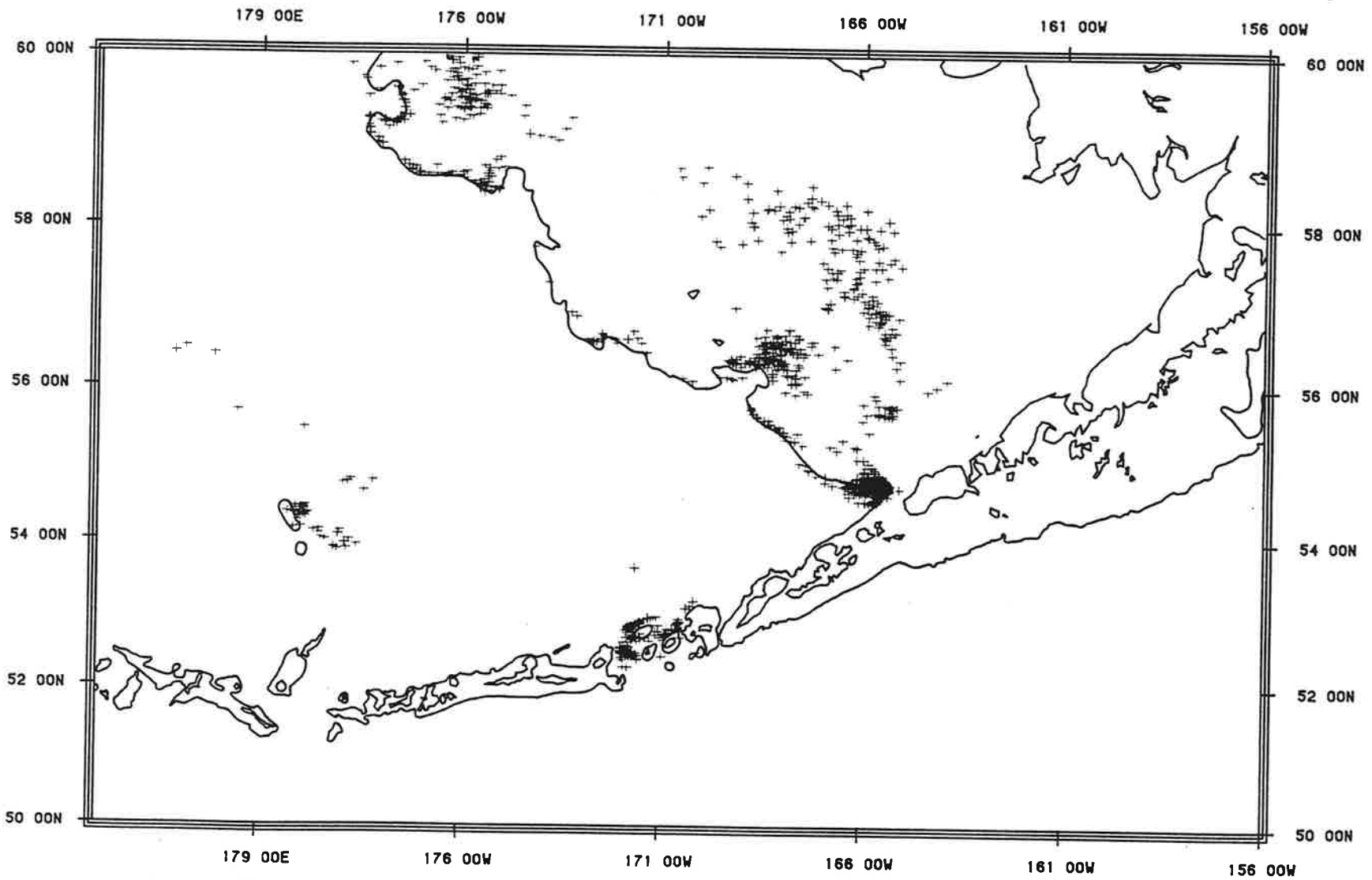
JAN-APR 1986. JOINT VENTURE POLLOCK TRAWL LOCATIONS



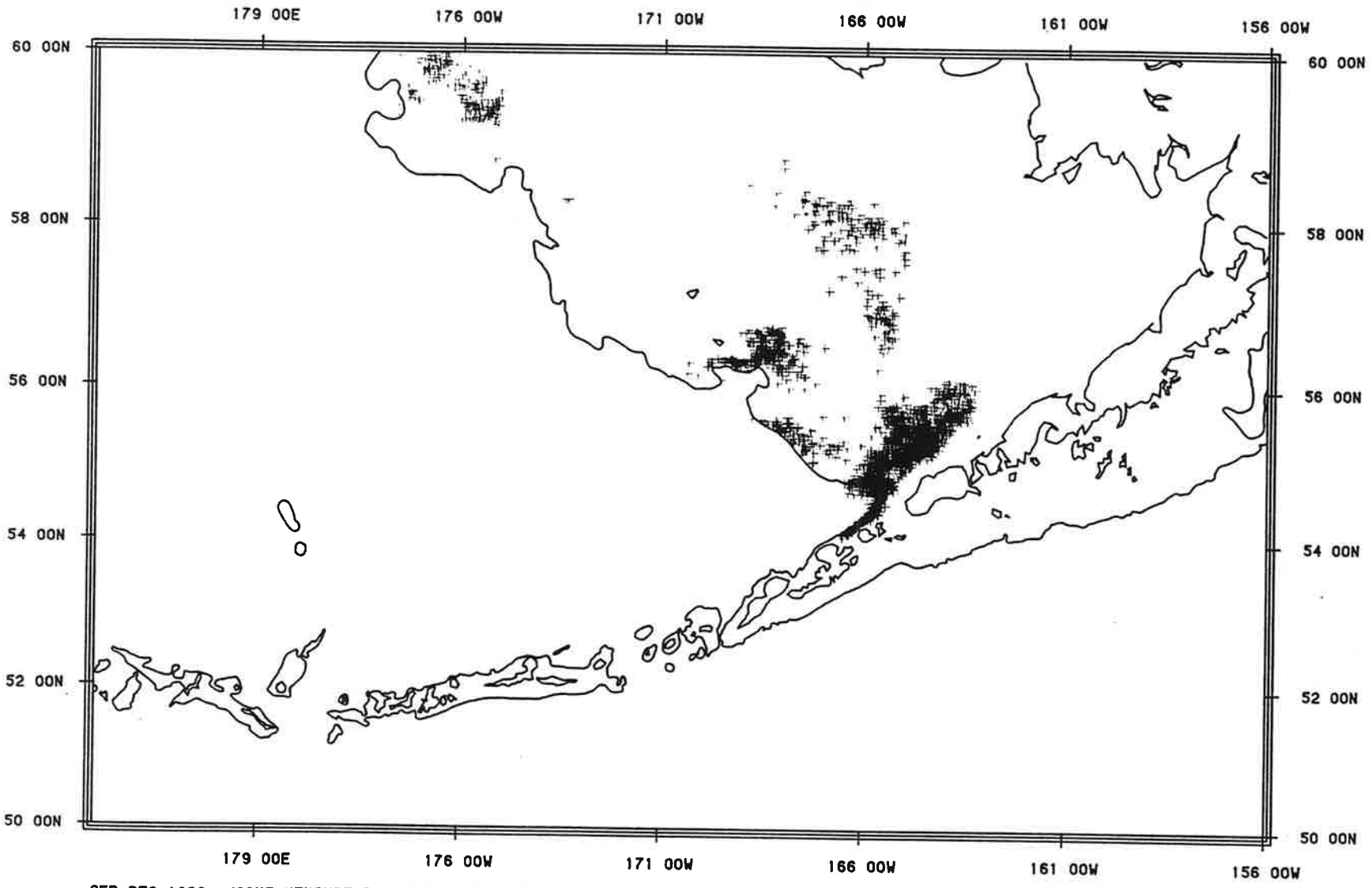
MAY-AUG 1986. FOREIGN POLLOCK TRAWL LOCATIONS



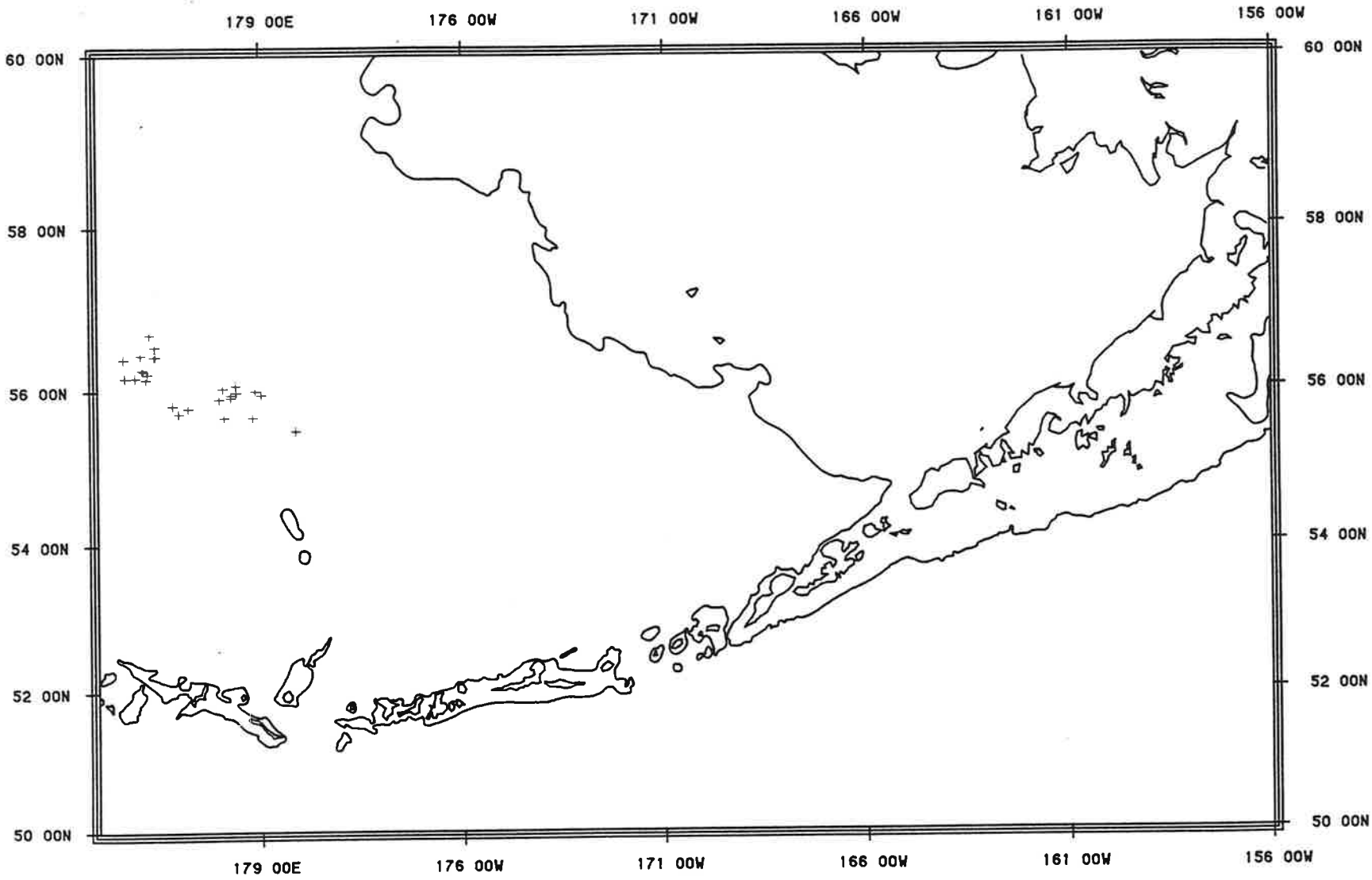
MAY-AUG 1986. JOINT VENTURE POLLOCK TRAWL LOCATIONS



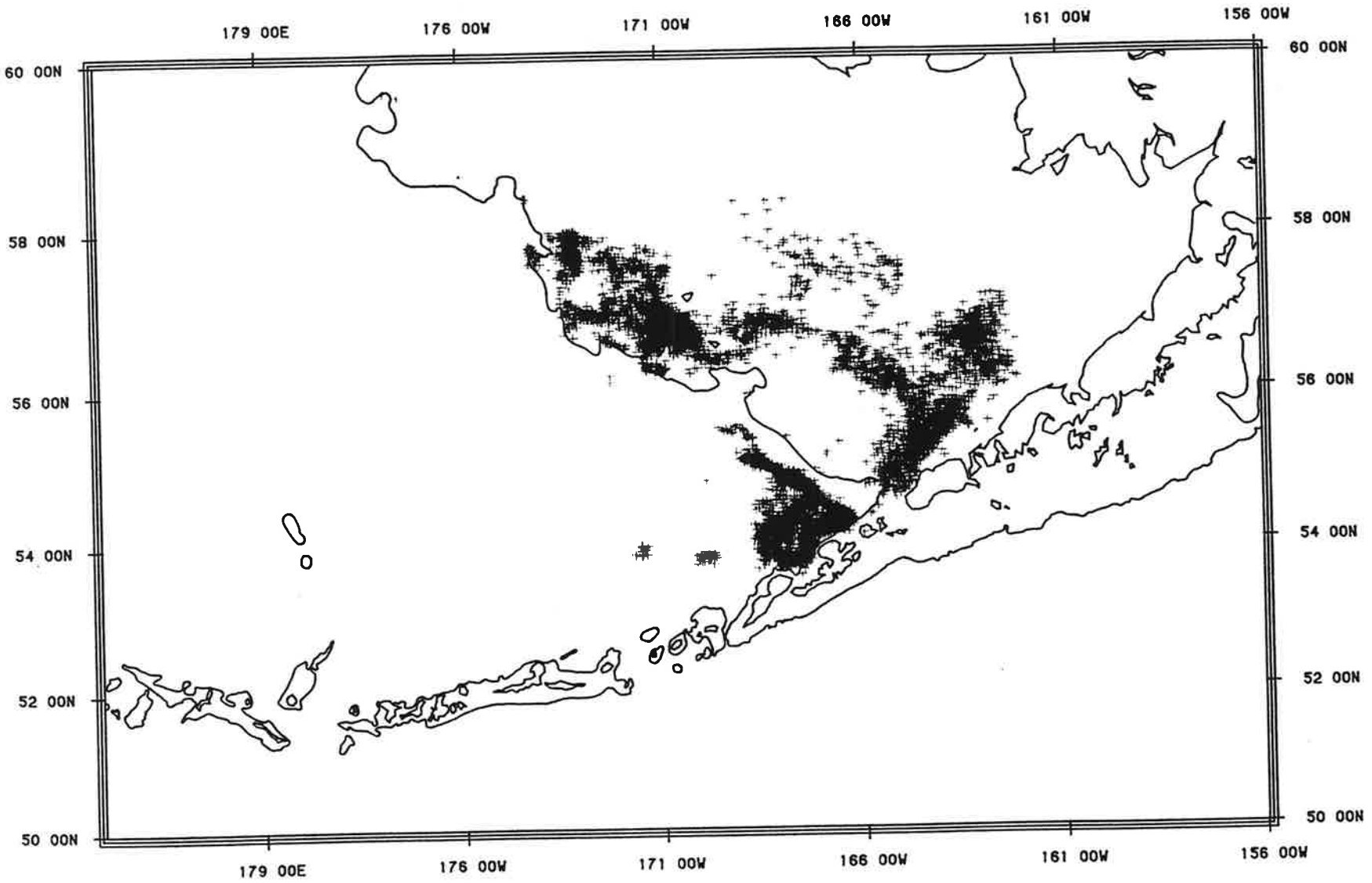
SEP-DEC 1986. FOREIGN POLLOCK TRAWL LOCATIONS



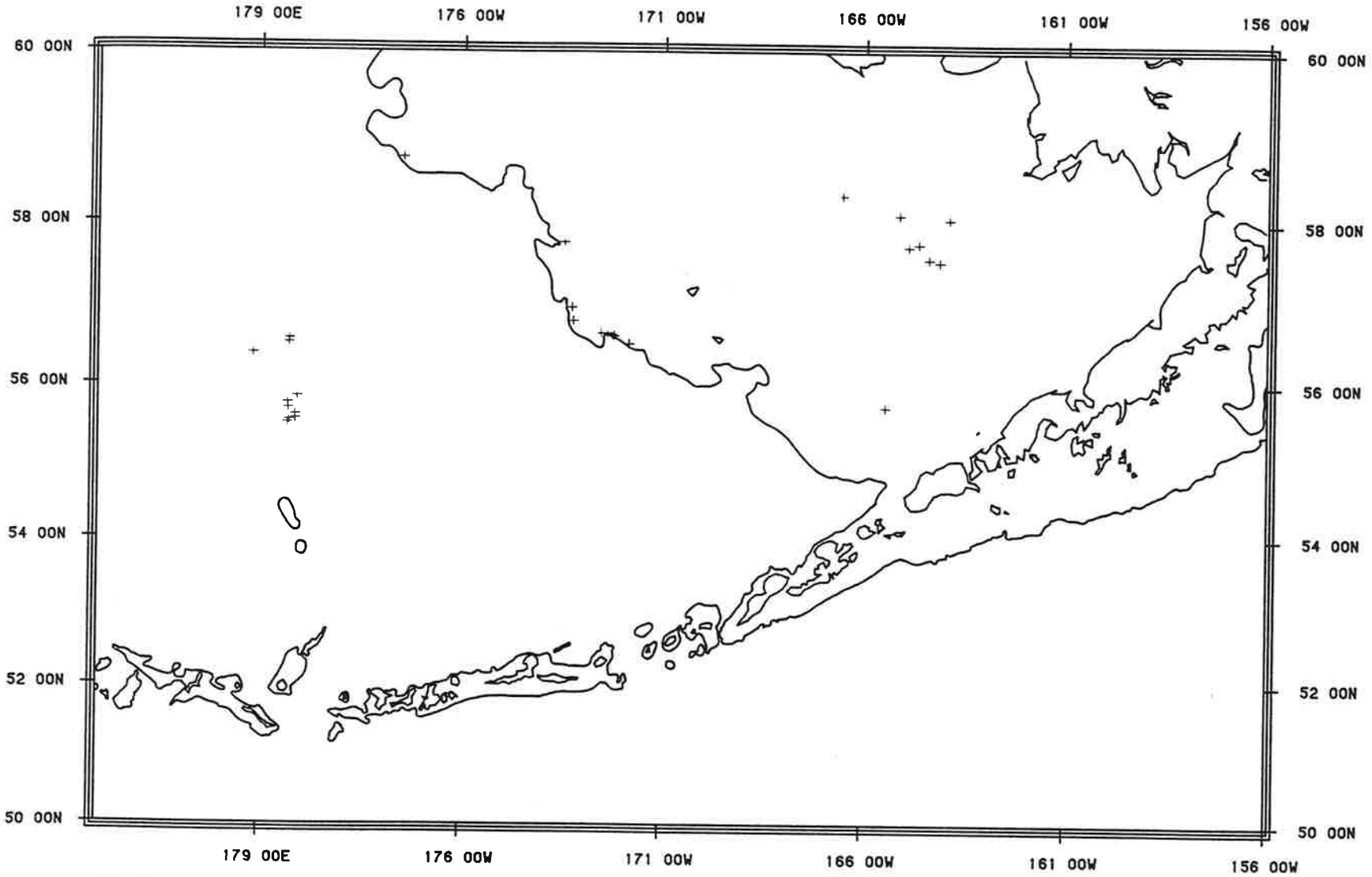
SEP-DEC 1986. JOINT VENTURE POLLOCK TRAWL LOCATIONS



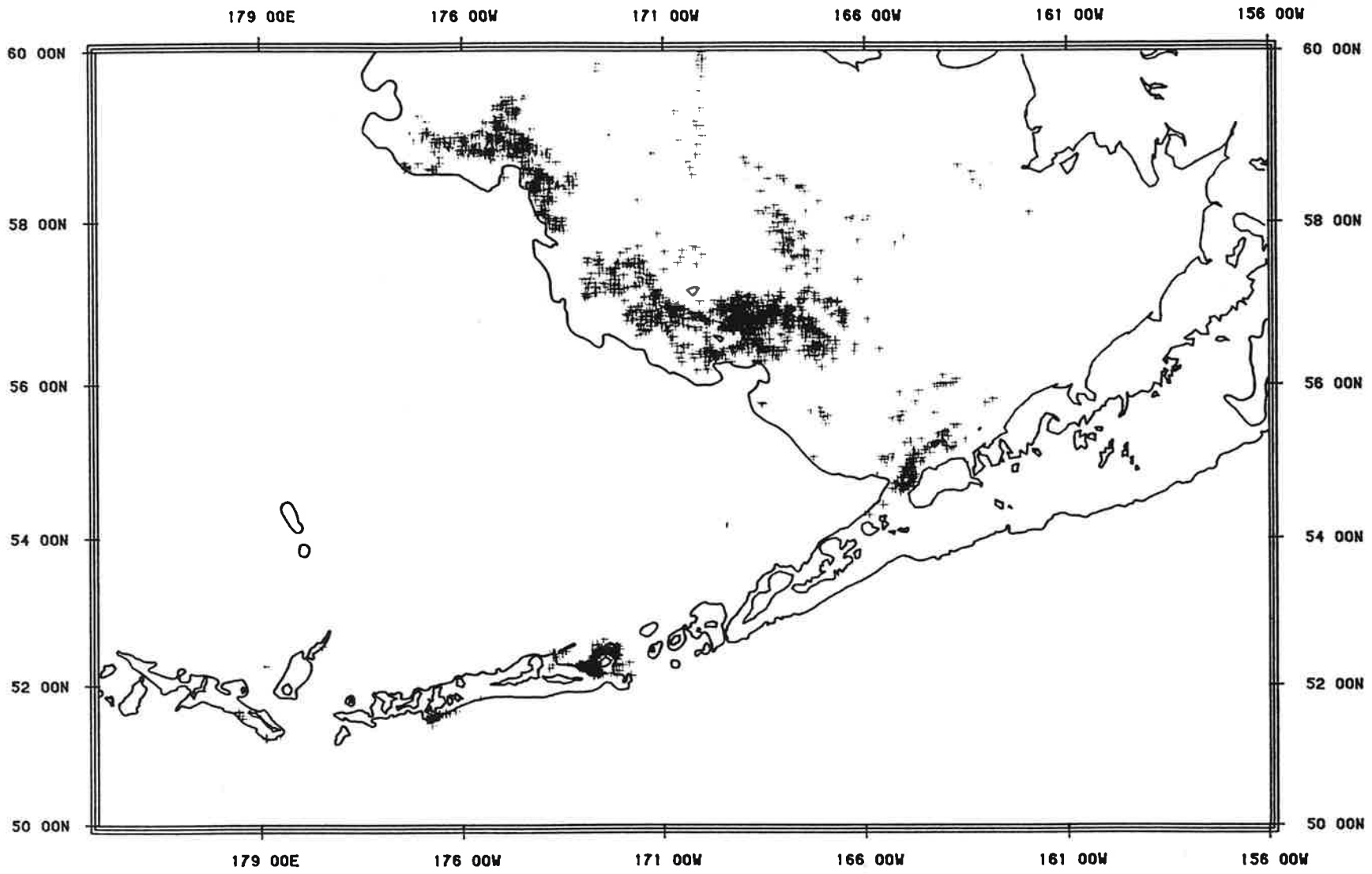
JAN-APR 1987. FOREIGN POLLOCK TRAWL LOCATIONS



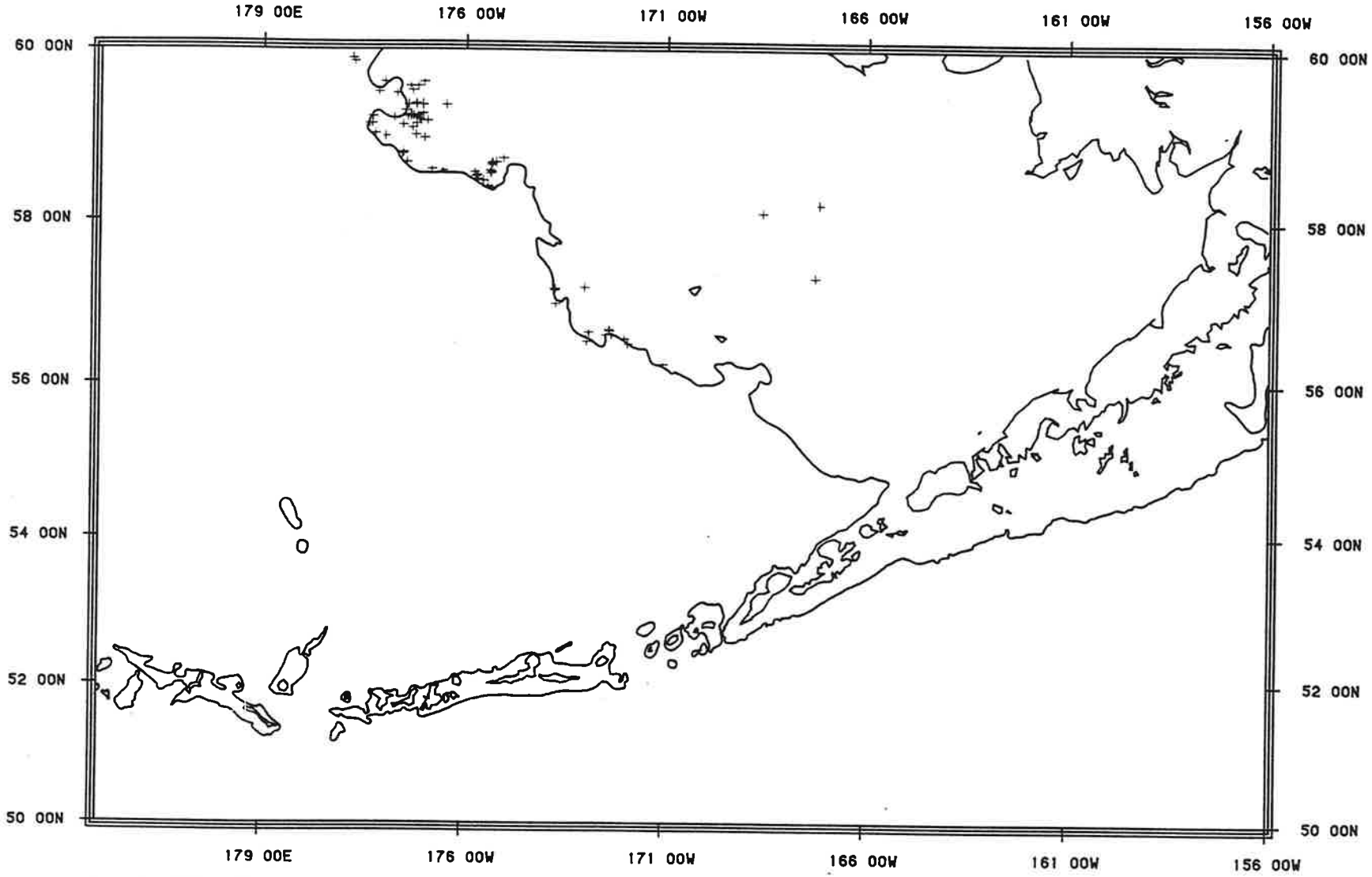
JAN-APR 1987. JOINT VENTURE POLLOCK TRAWL LOCATIONS



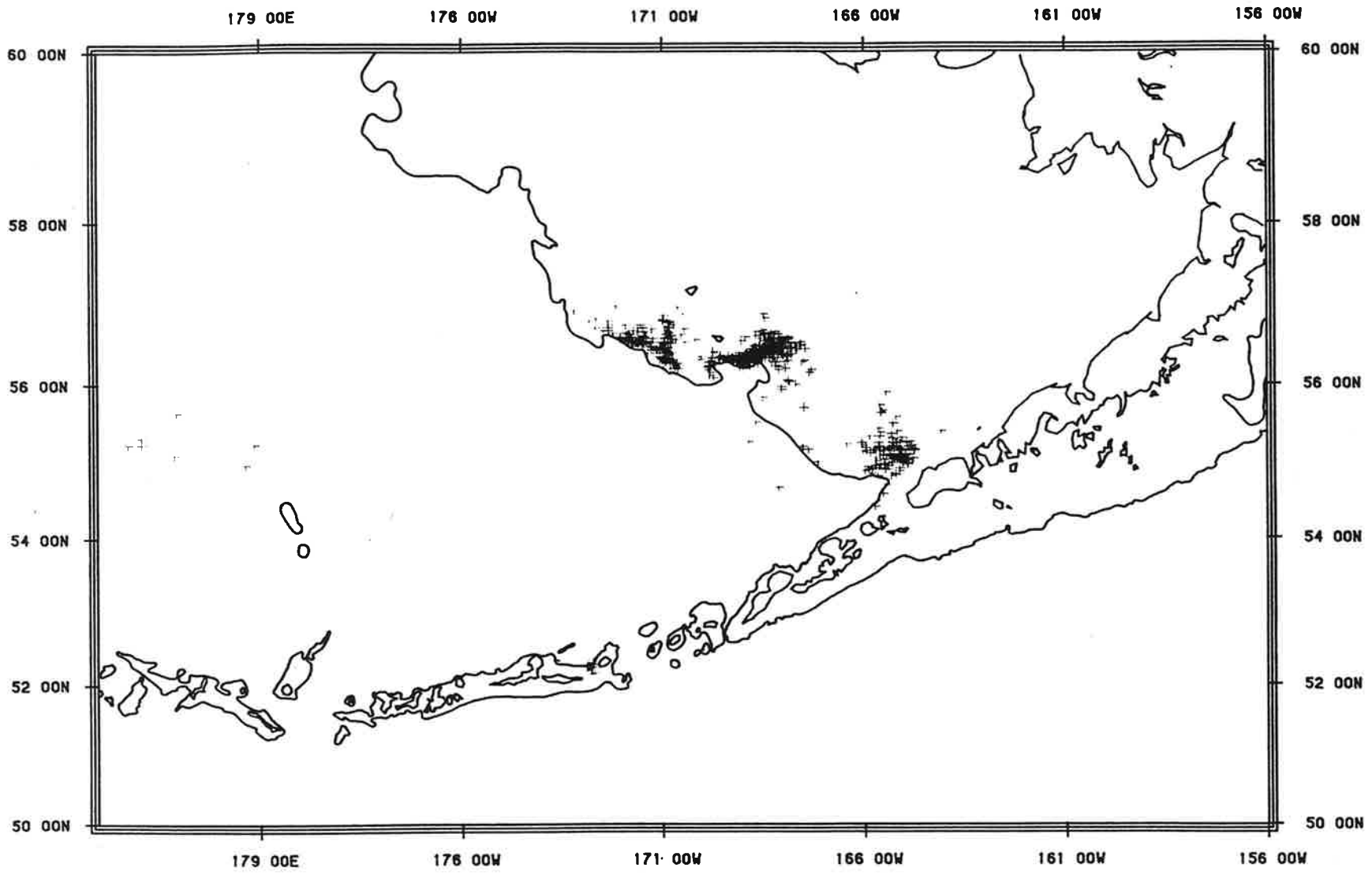
MAY-AUG 1987. FOREIGN POLLOCK TRAWL LOCATIONS



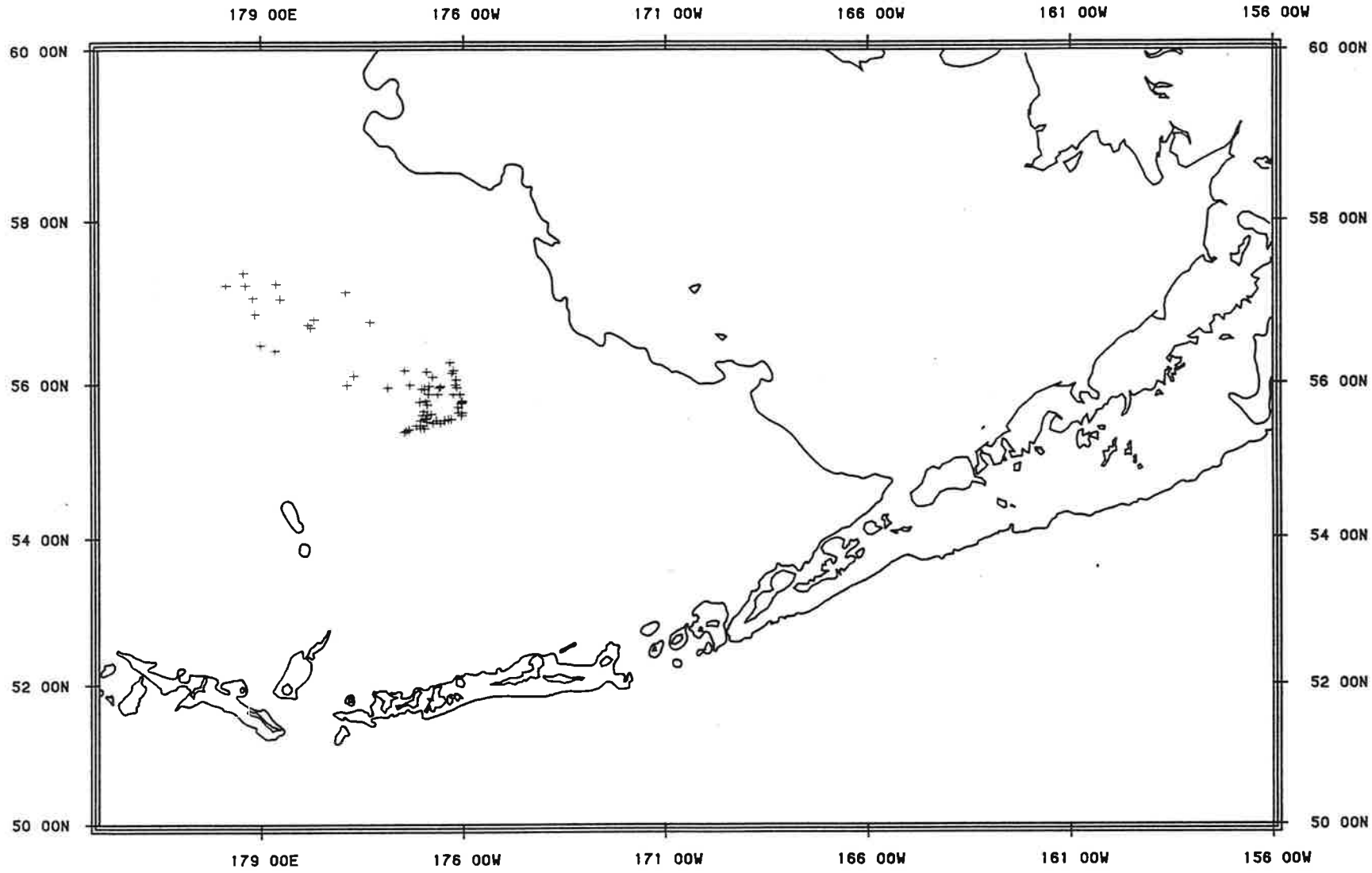
MAY-AUG 1987, JOINT VENTURE POLLOCK TRAWL LOCATIONS



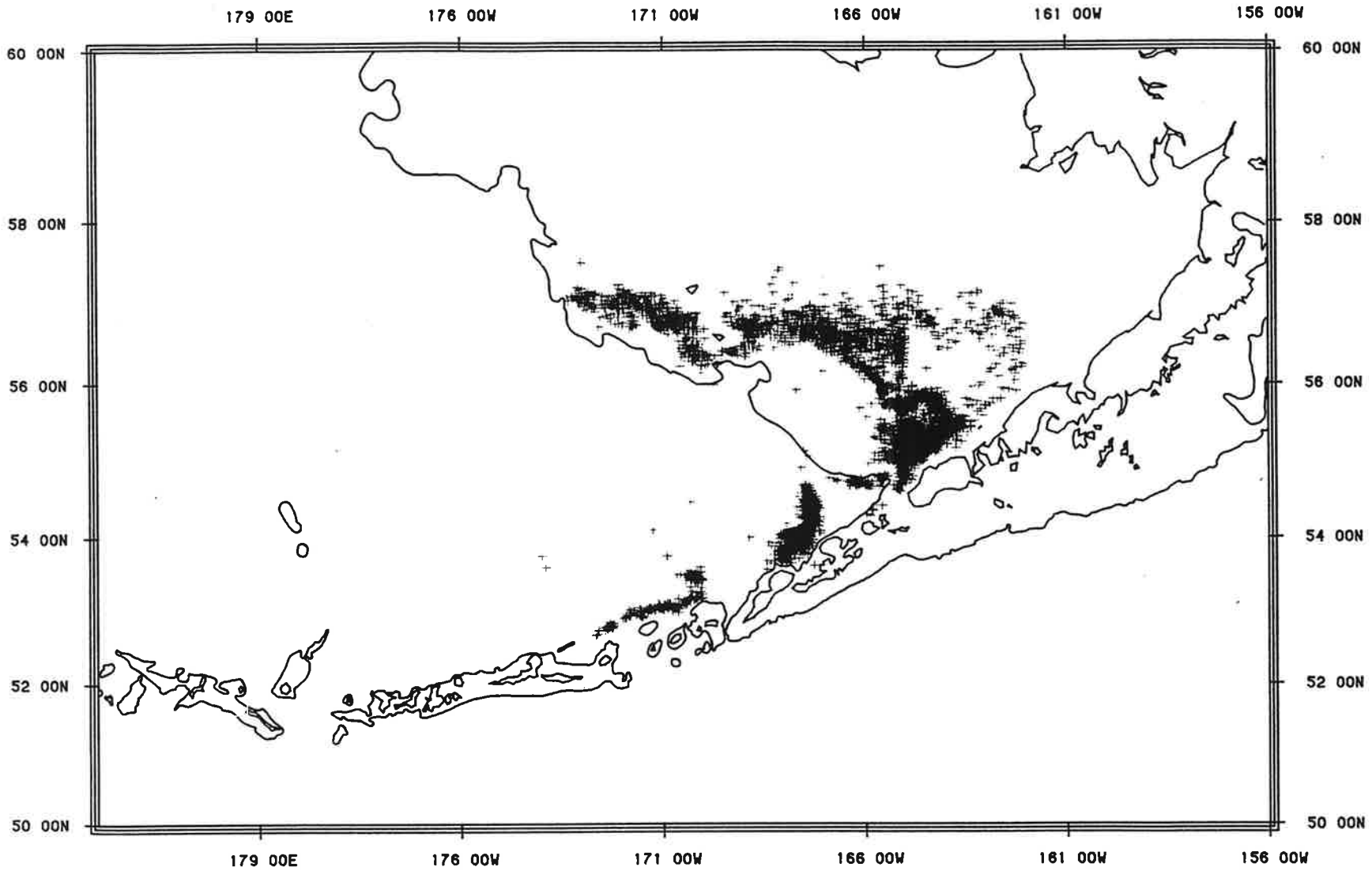
SEP-DEC 1987. FOREIGN POLLOCK TRAWL LOCATIONS



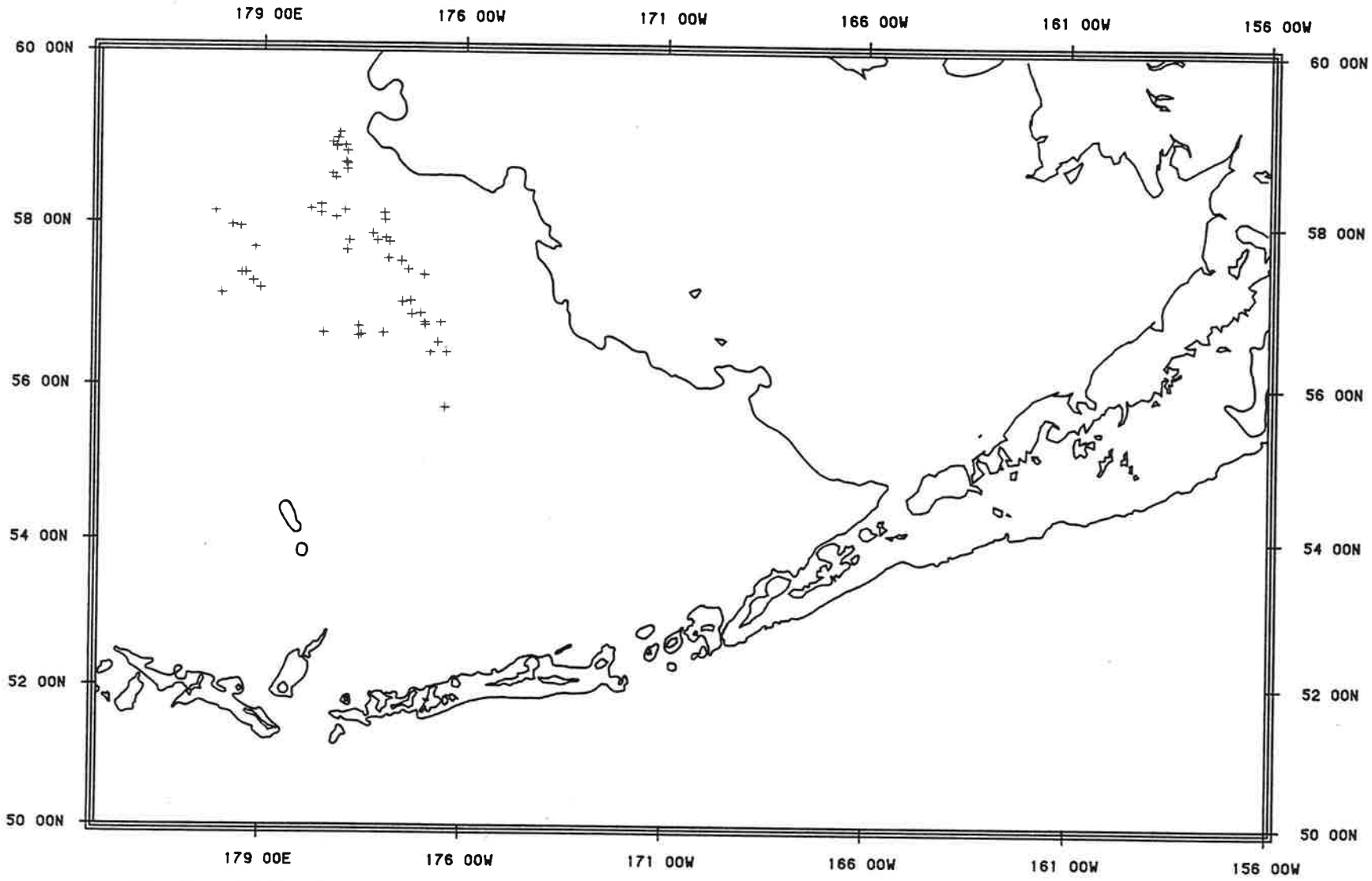
SEP-DEC 1987. JOINT VENTURE POLLOCK TRAWL LOCATIONS



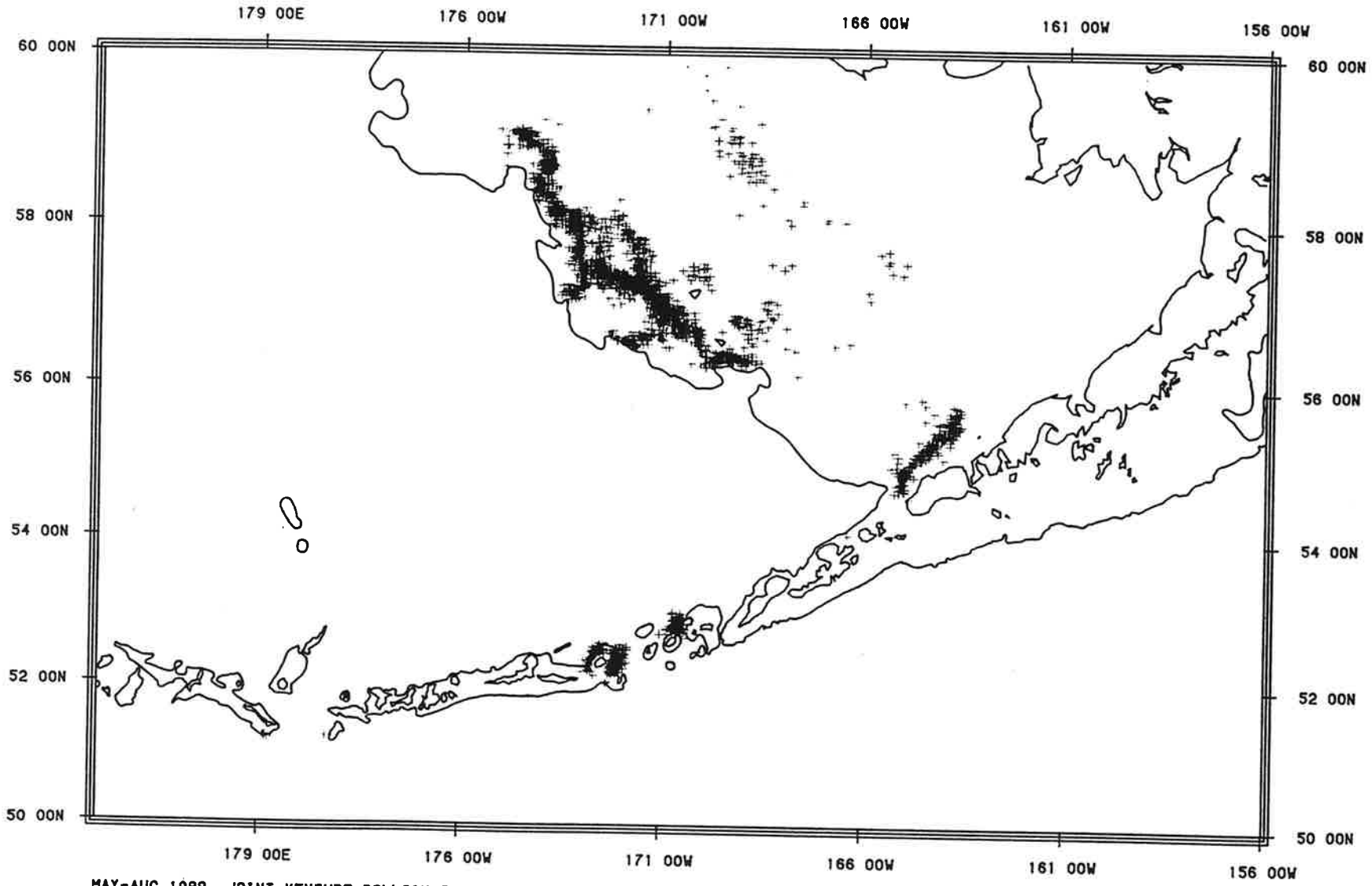
JAN-APR 1988. FOREIGN POLLOCK TRAWL LOCATIONS



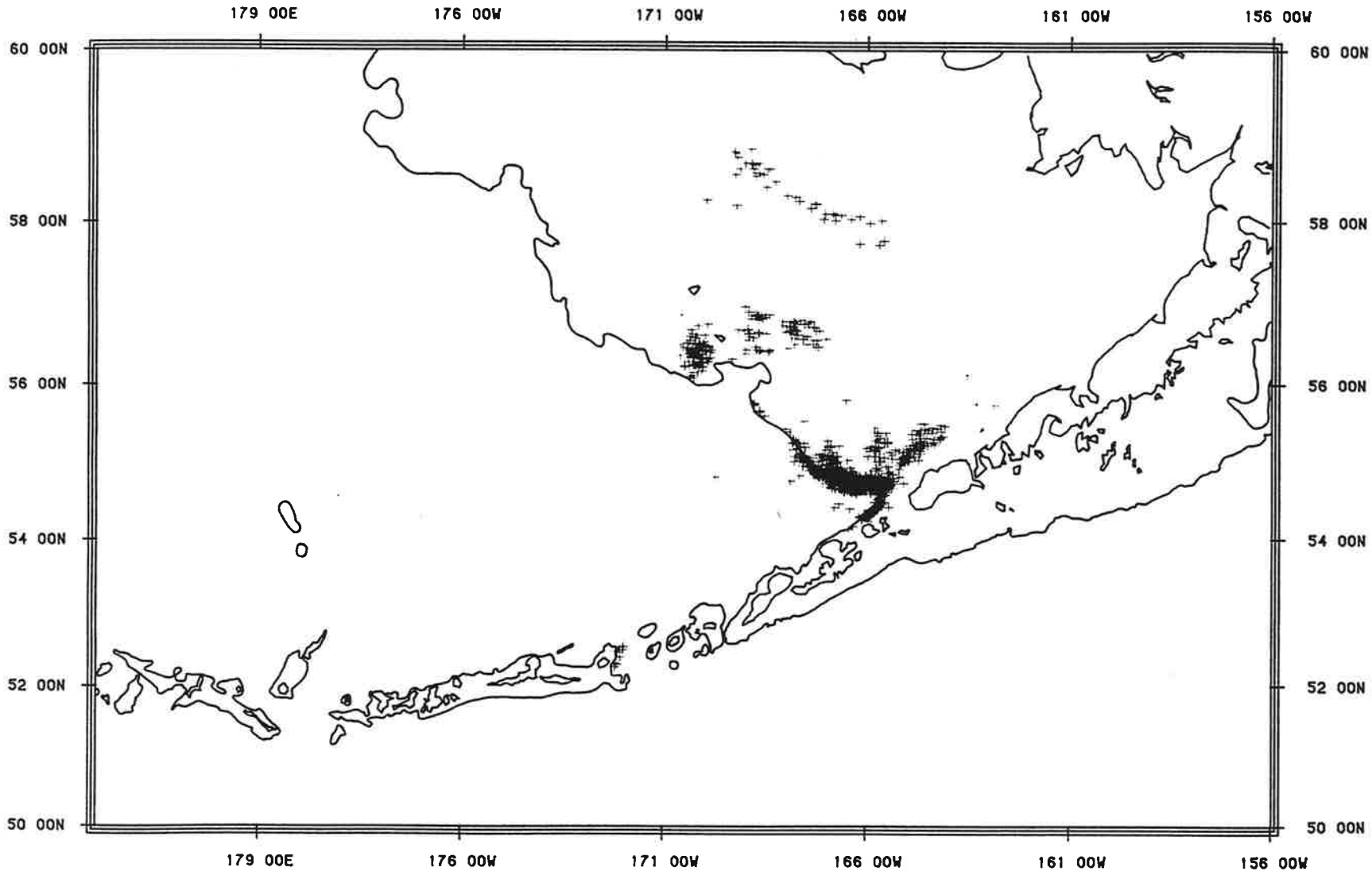
JAN-APR 1988, JOINT VENTURE POLLOCK TRAWL LOCATIONS



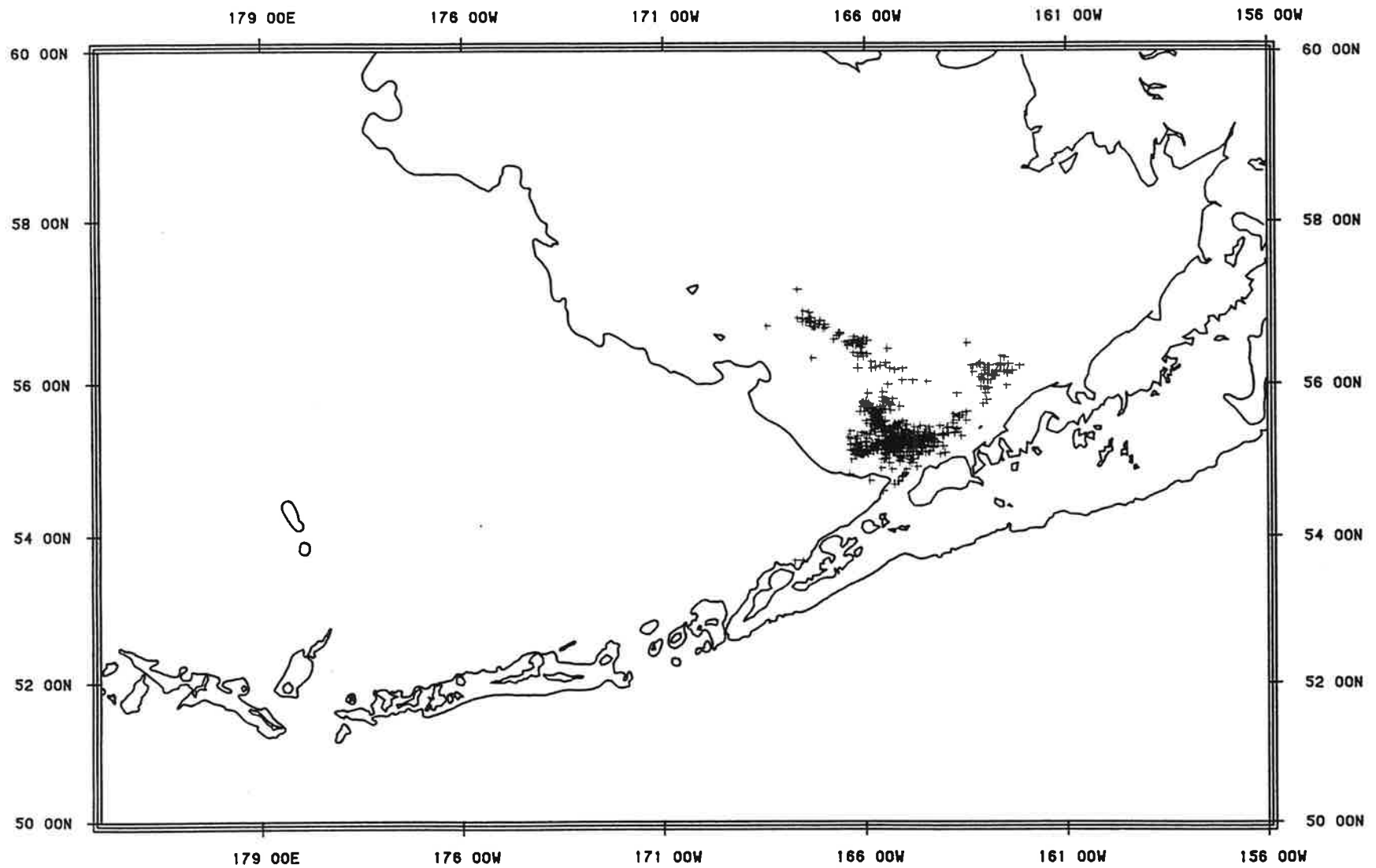
MAY-AUG 1988. FOREIGN POLLOCK TRAWL LOCATIONS



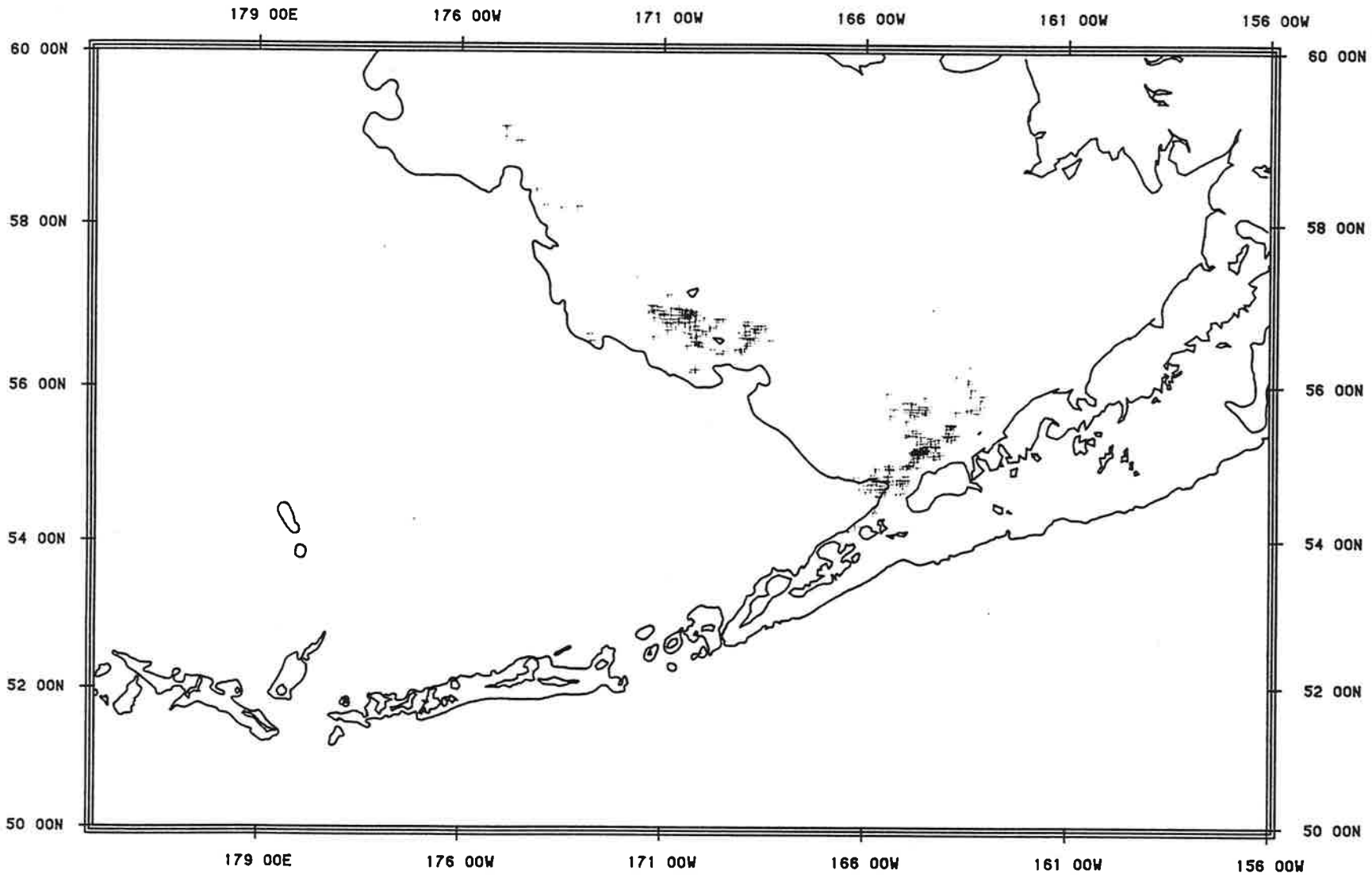
MAY-AUG 1988. JOINT VENTURE POLLOCK TRAWL LOCATIONS



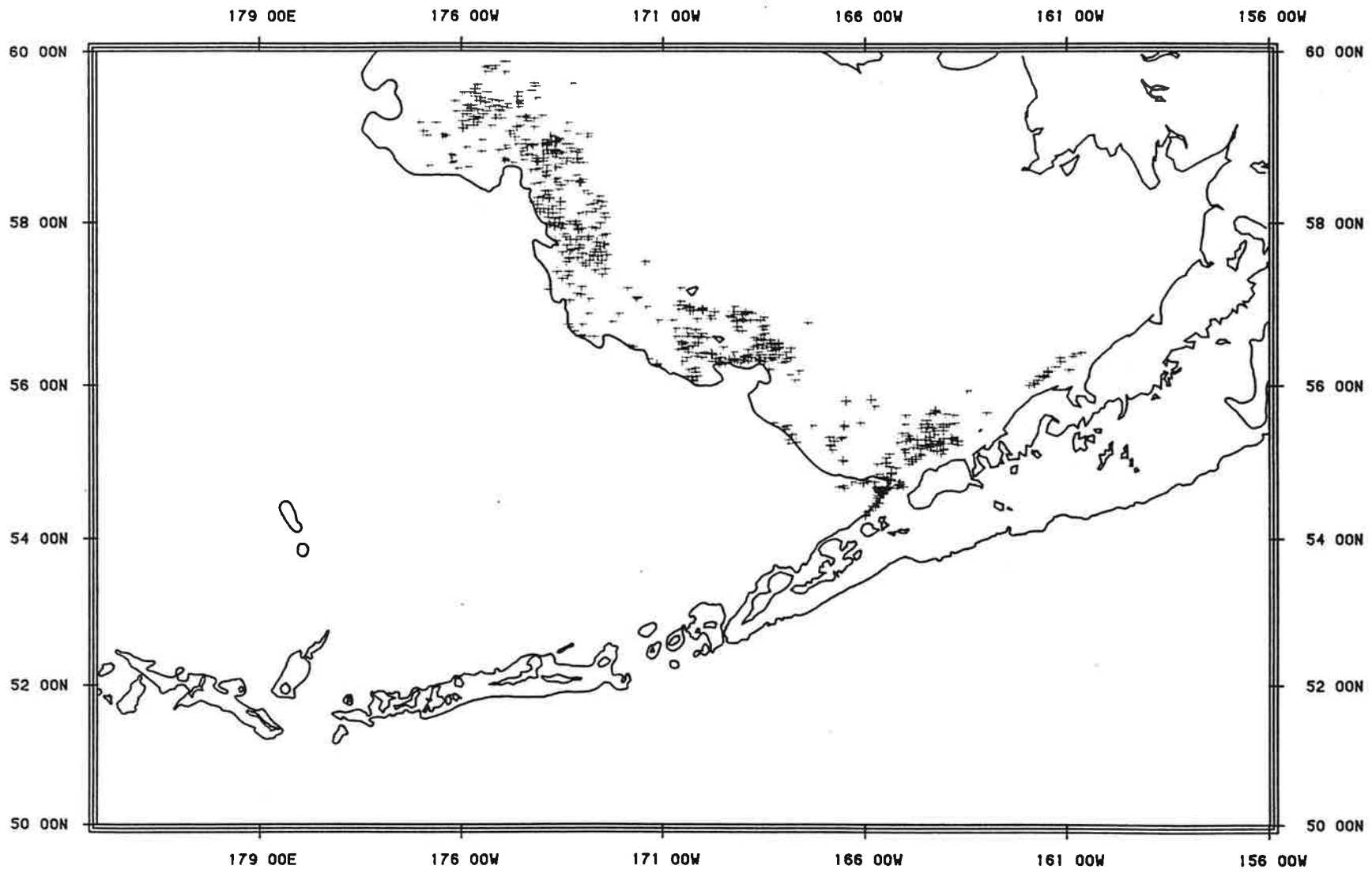
SEP-DEC 1988. JOINT VENTURE POLLOCK TRAWL LOCATIONS



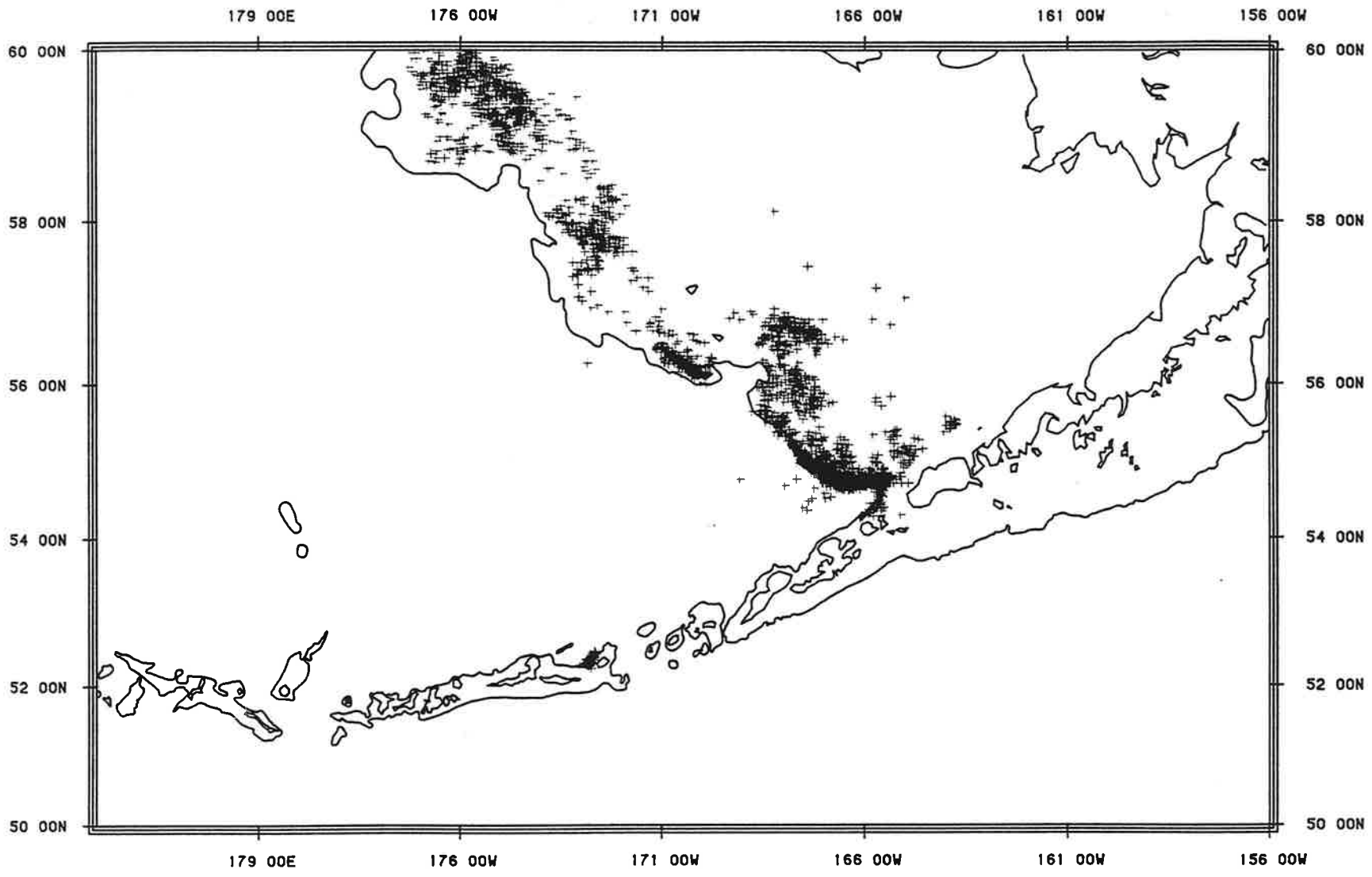
JAN-APR 1989. JOINT VENTURE POLLOCK TRAWL LOCATIONS



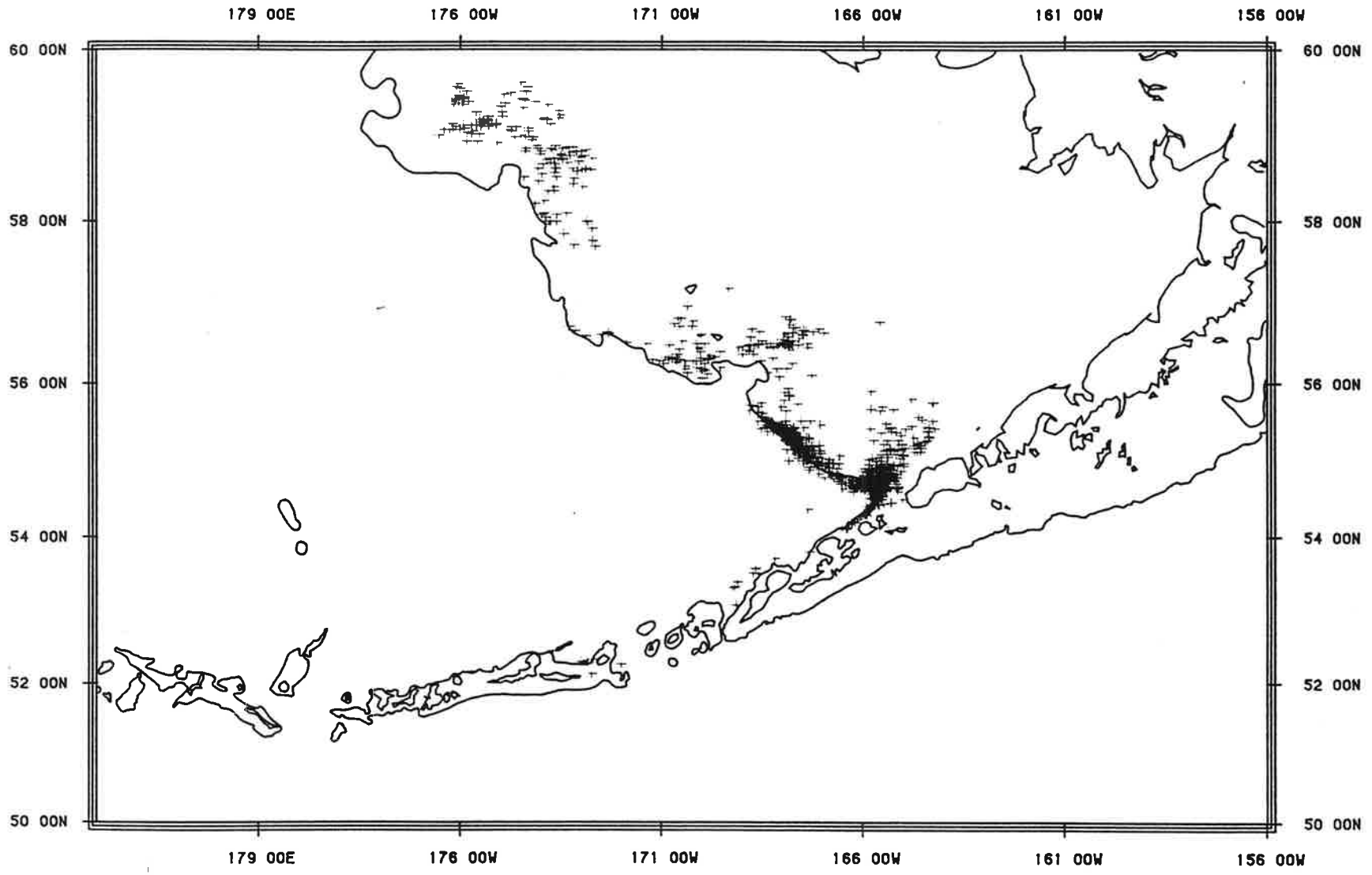
JAN-APR 1989. DOMESTIC POLLOCK TRAWL LOCATIONS



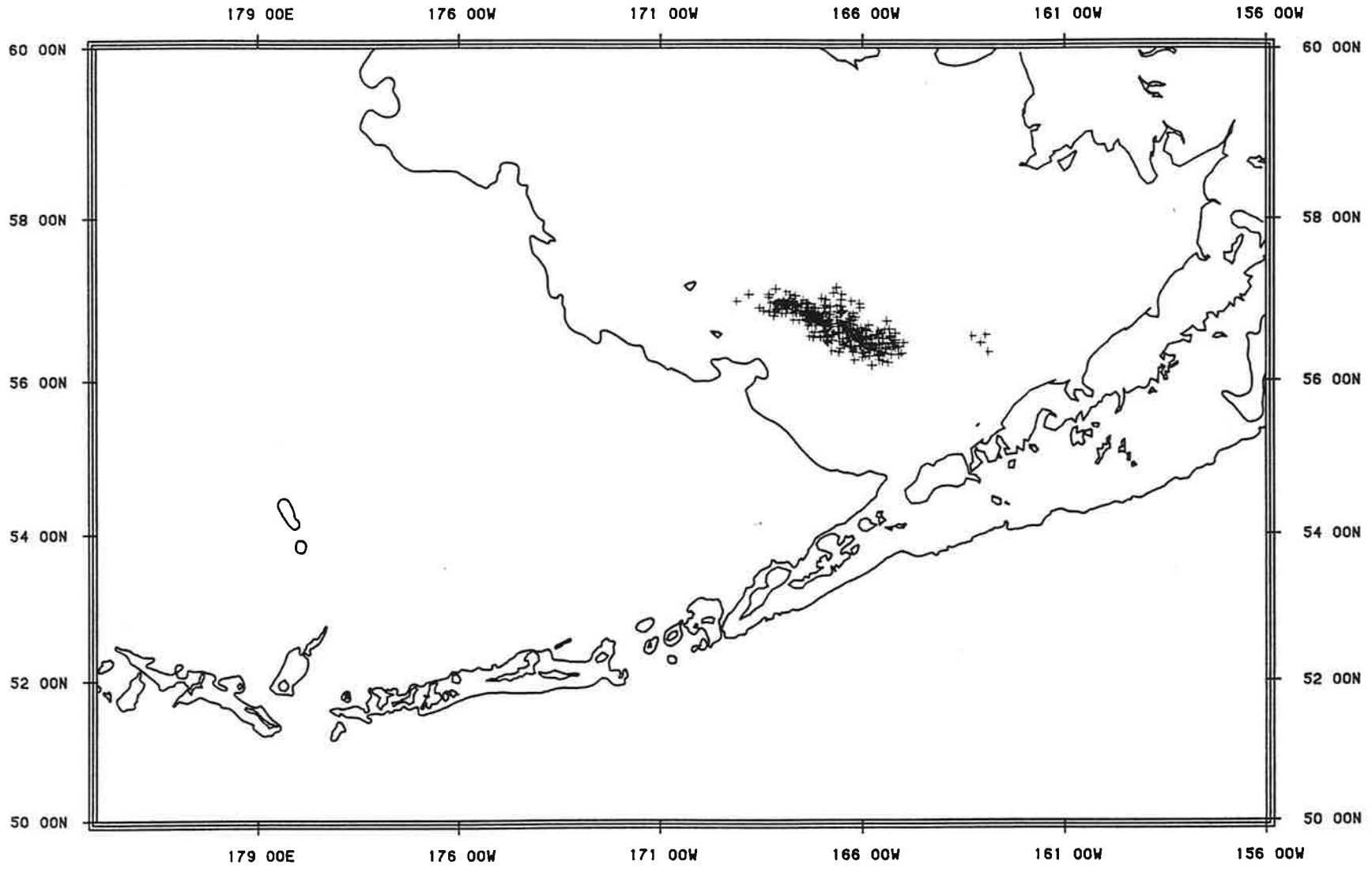
MAY-AUG 1989. DOMESTIC POLLOCK TRAWL LOCATIONS



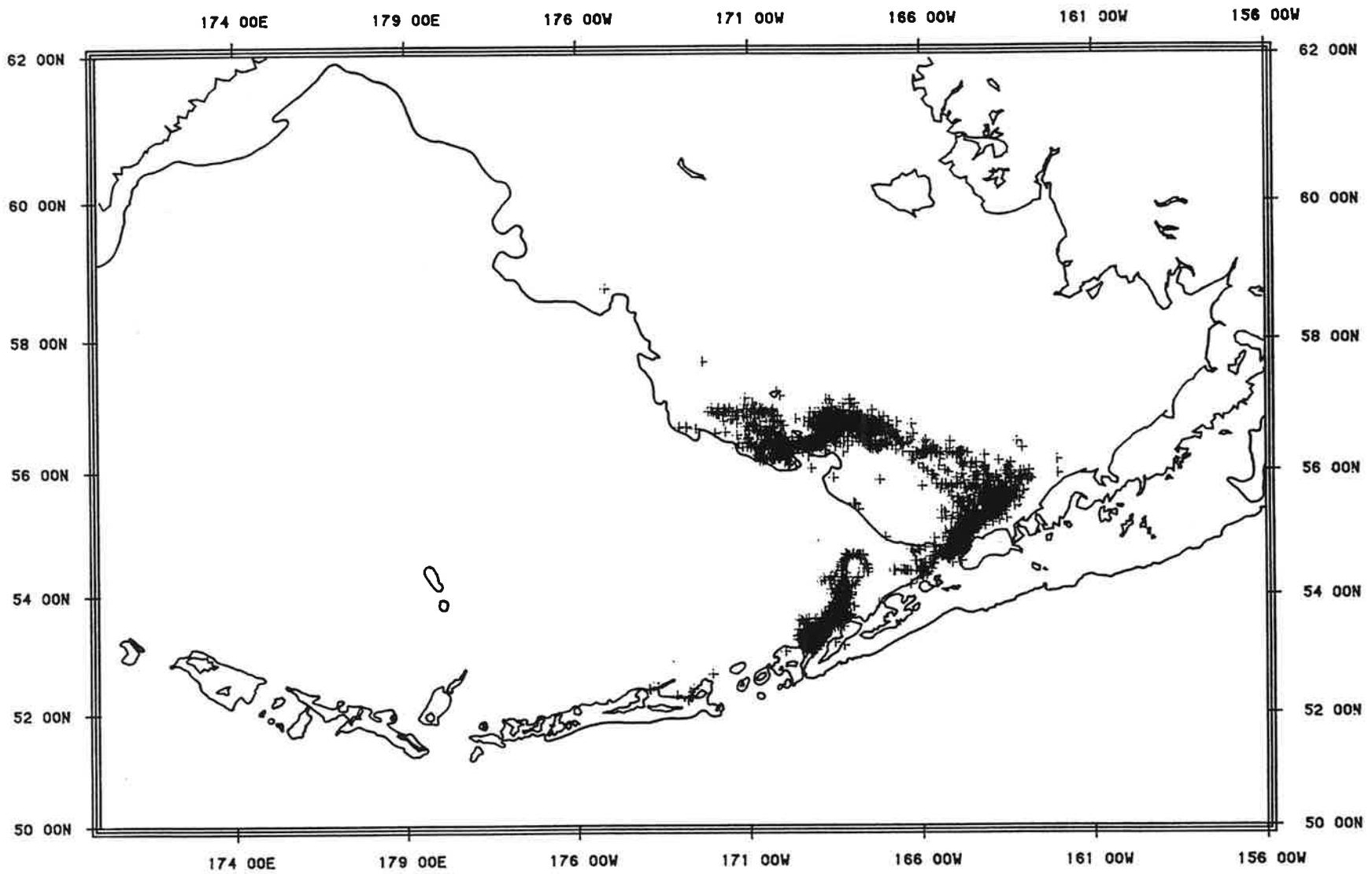
SEP-DEC 1989. JOINT VENTURE POLLOCK TRAWL LOCATIONS



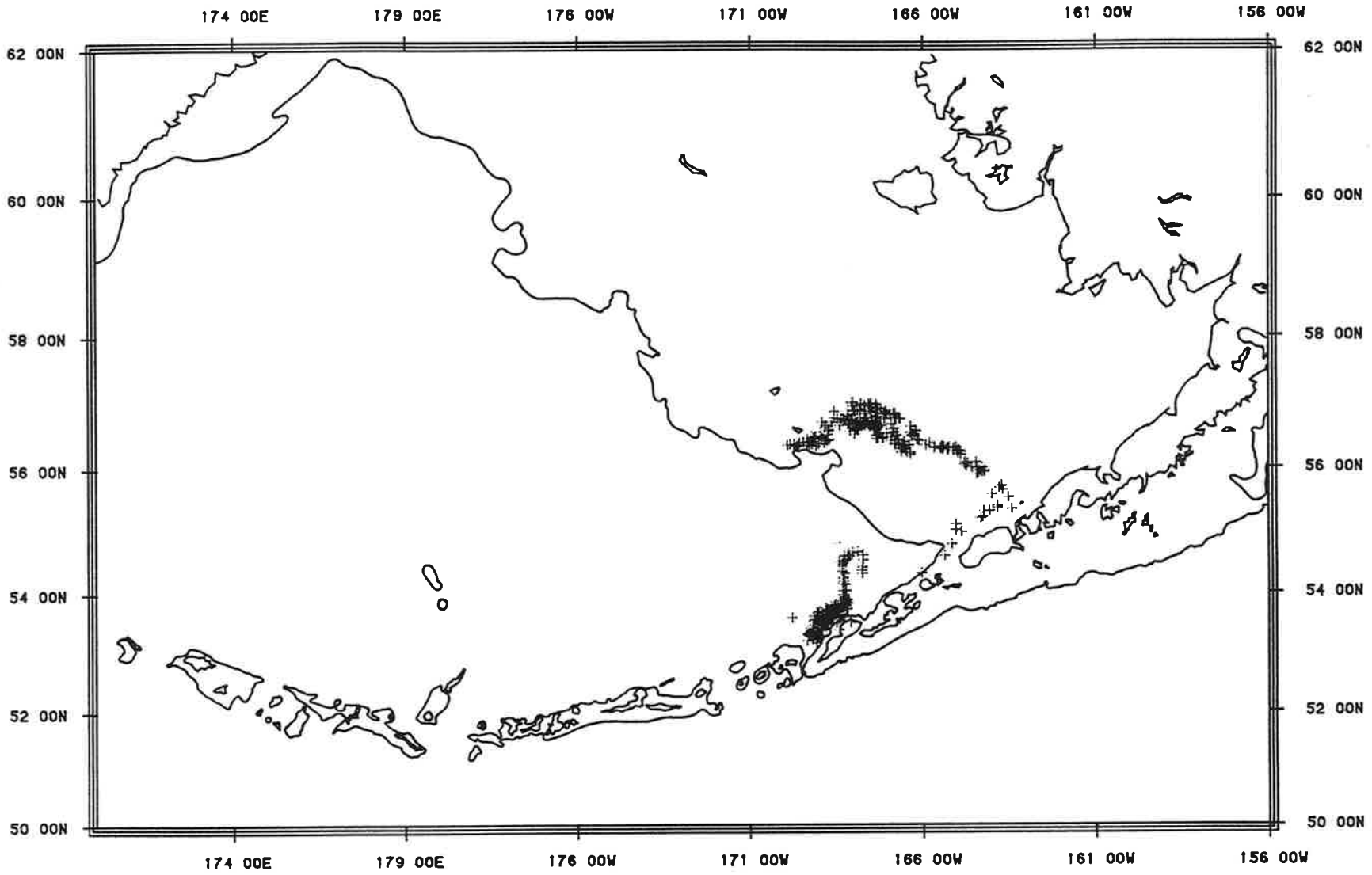
SEP-DEC 1989. DOMESTIC POLLOCK TRAWL LOCATIONS



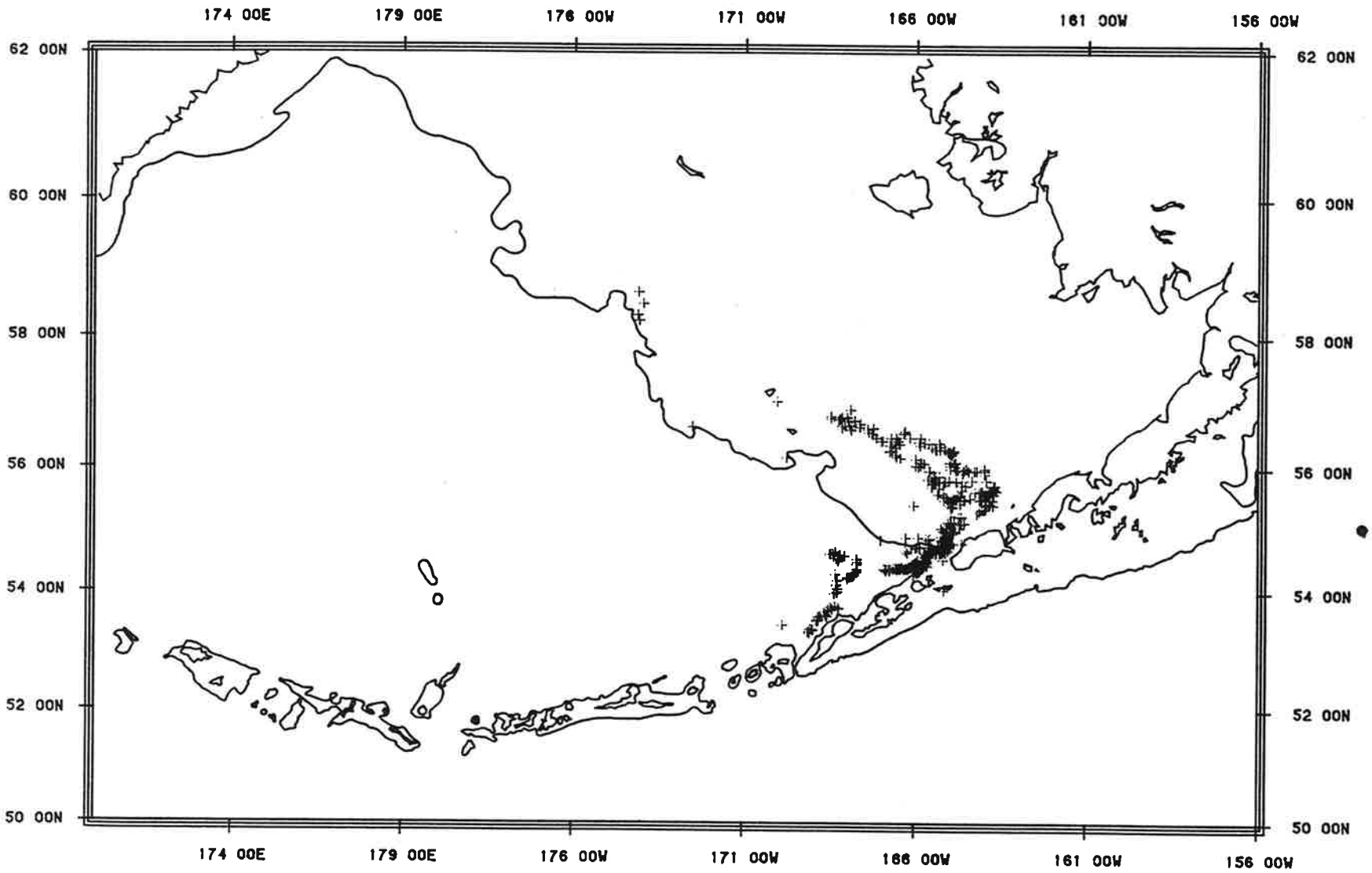
JAN-APR 1990. JOINT VENTURE POLLOCK TRAWL LOCATIONS



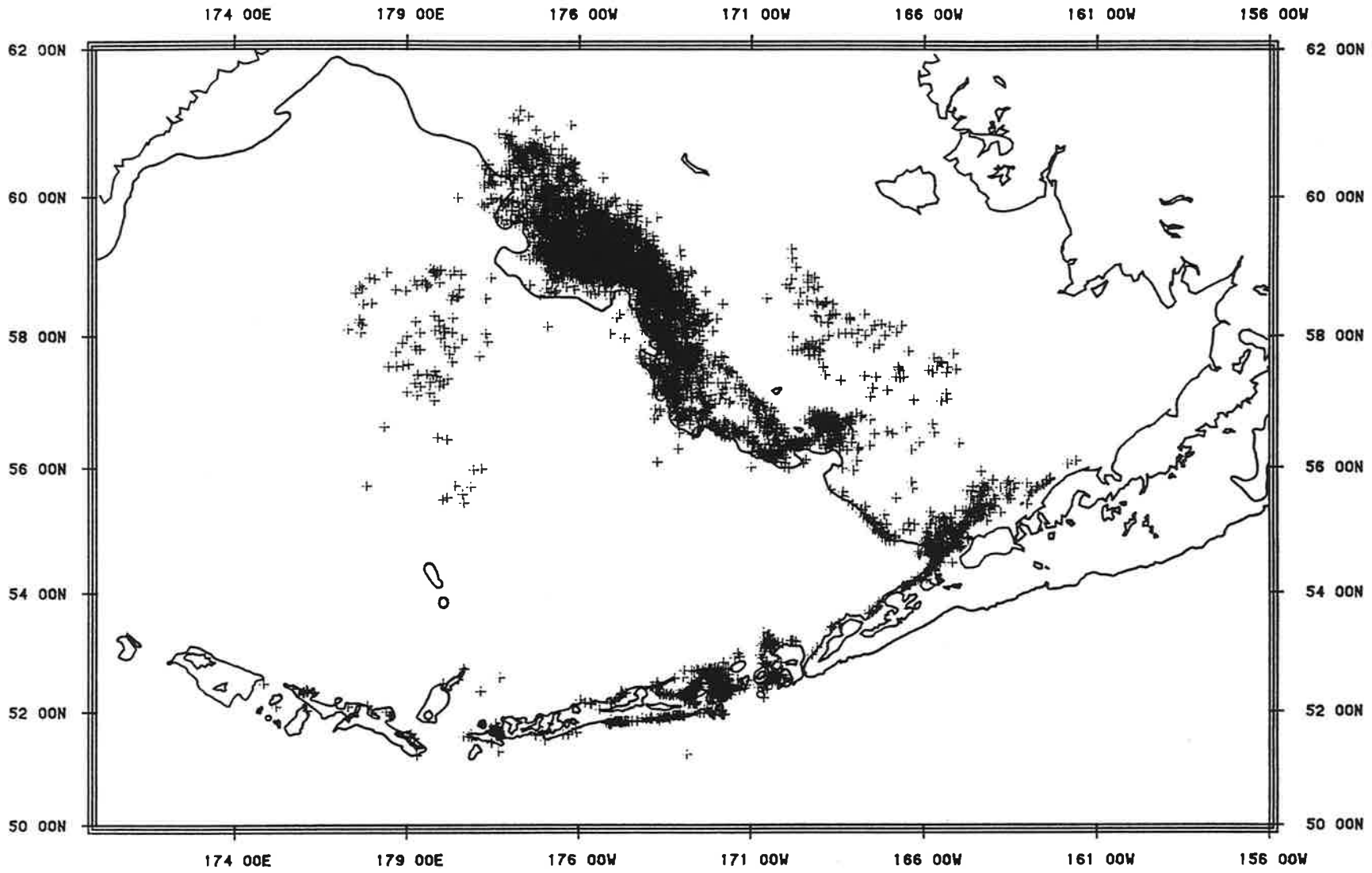
90 A SEASON. CATCHER/PROCESSOR POLLOCK TRAWL LOCATIONS



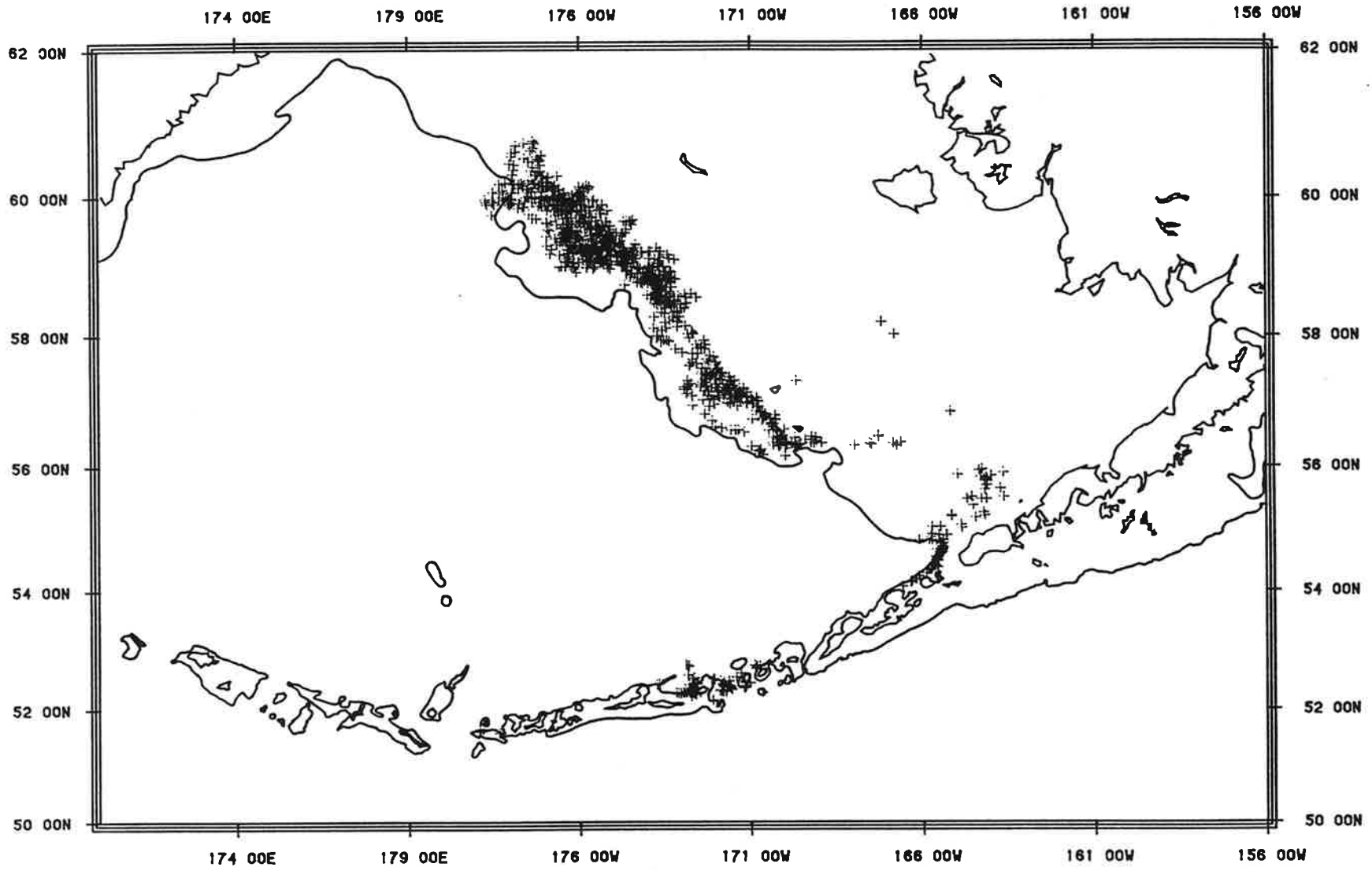
90 A SEASON. FL PROCESS/MOTHERSHIP POLLOCK TRAWL LOCATIONS



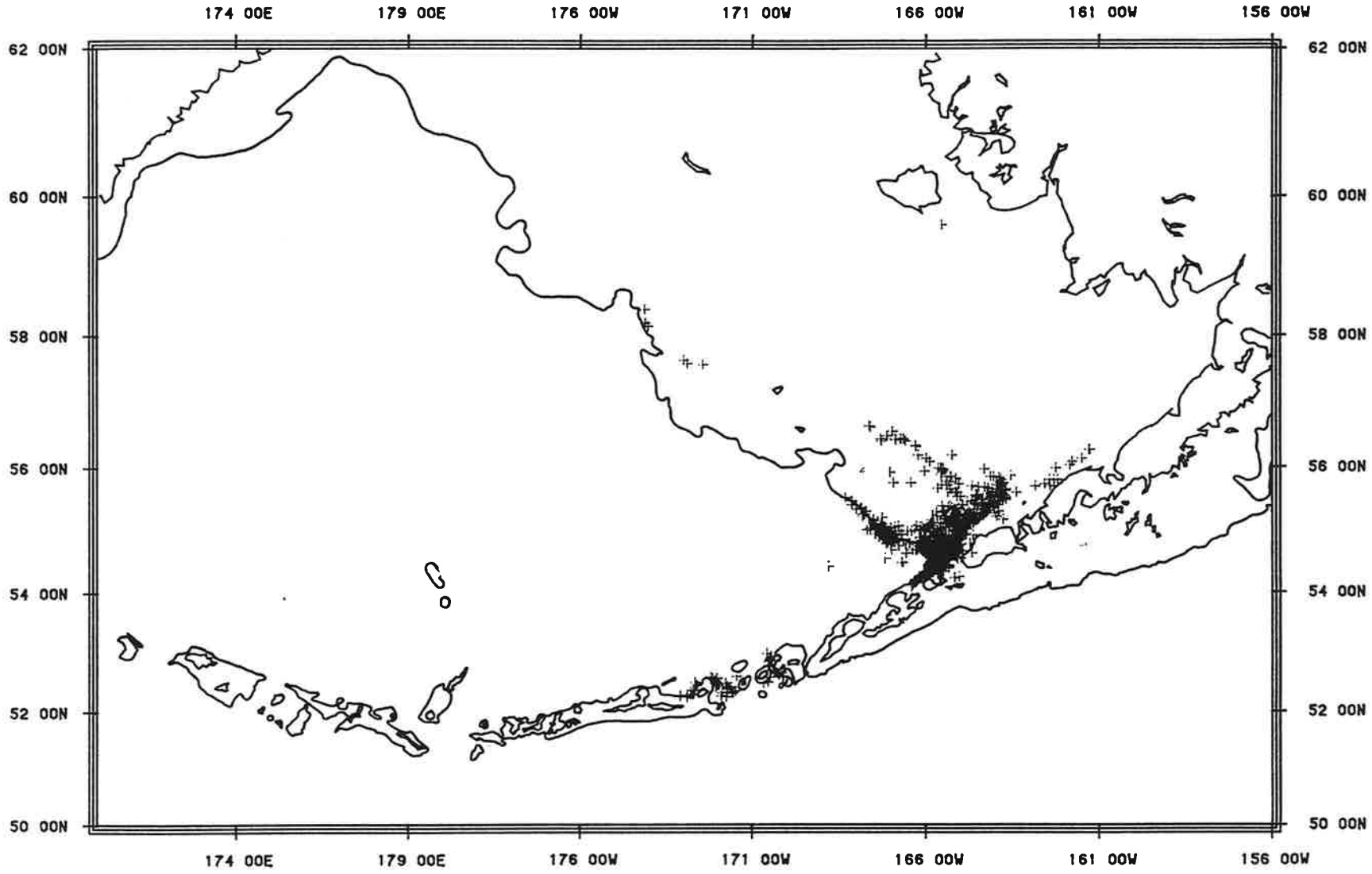
90 A SEASON, SMALL TRAWLERS POLLOCK TRAWL LOCATIONS



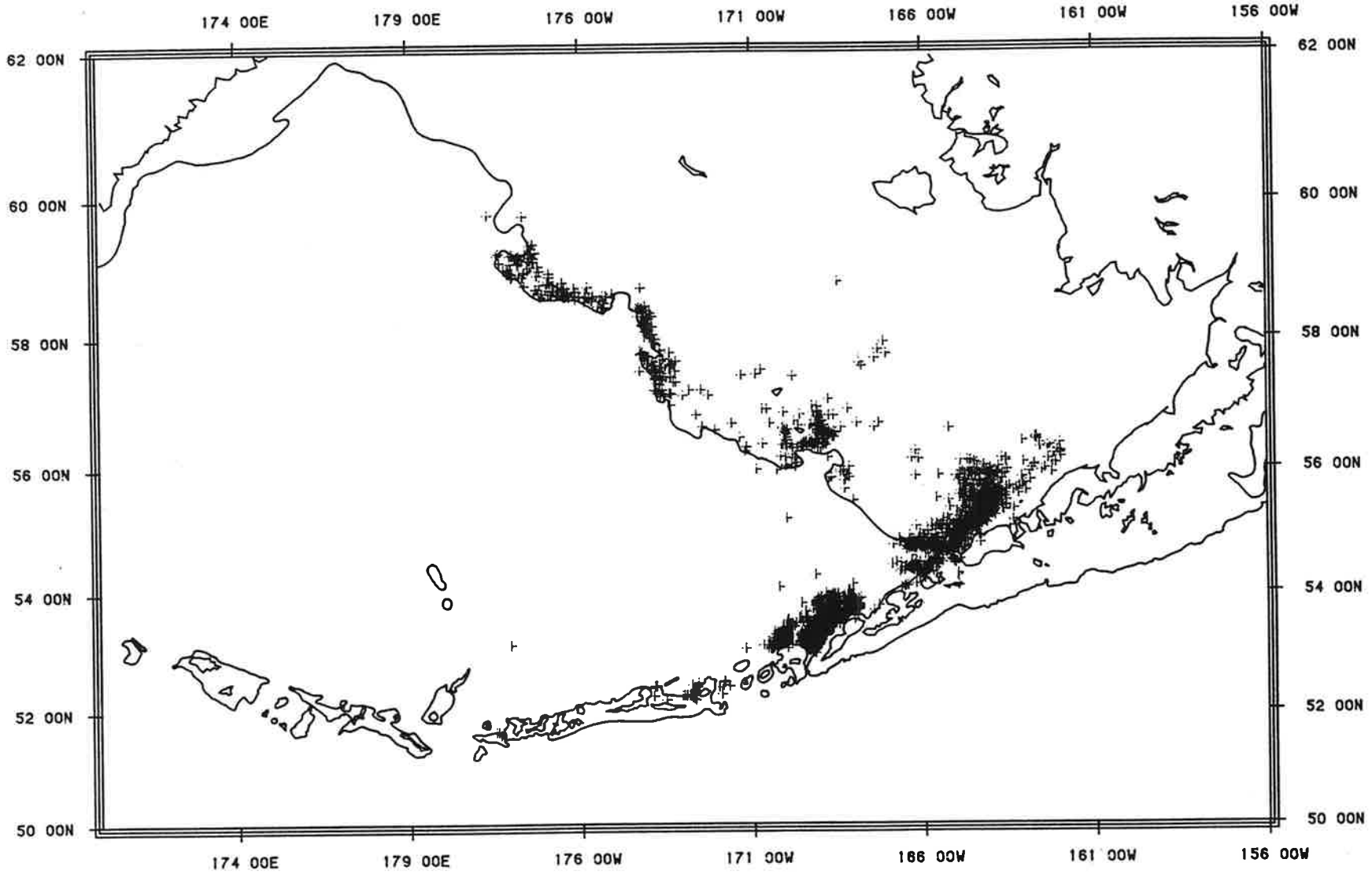
90 B SEASON. CATCHER/PROCESSOR POLLOCK TRAWL LOCATIONS



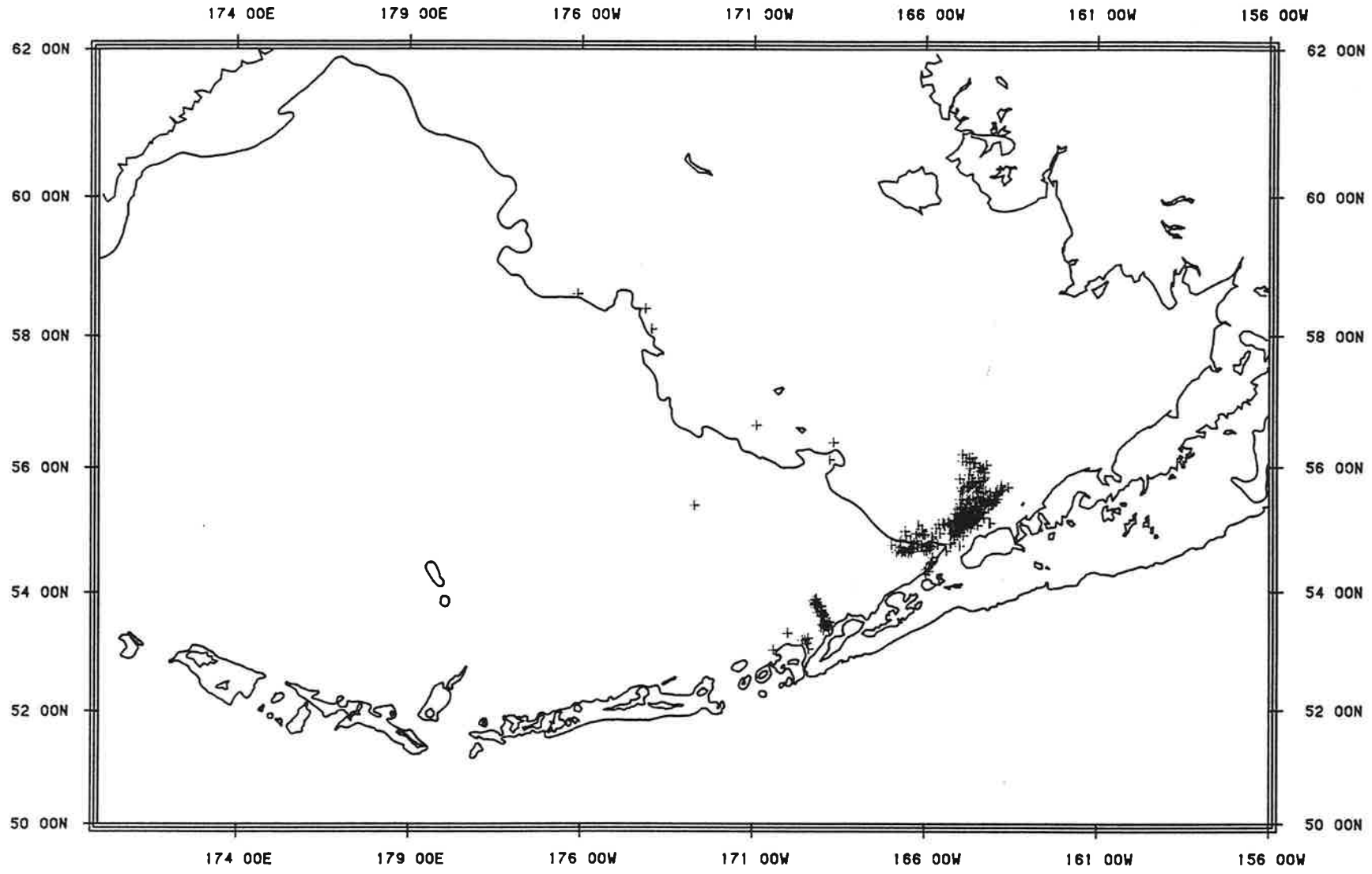
90 B SEASON. SMALL TRAWLERS POLLOCK TRAWL LOCATIONS



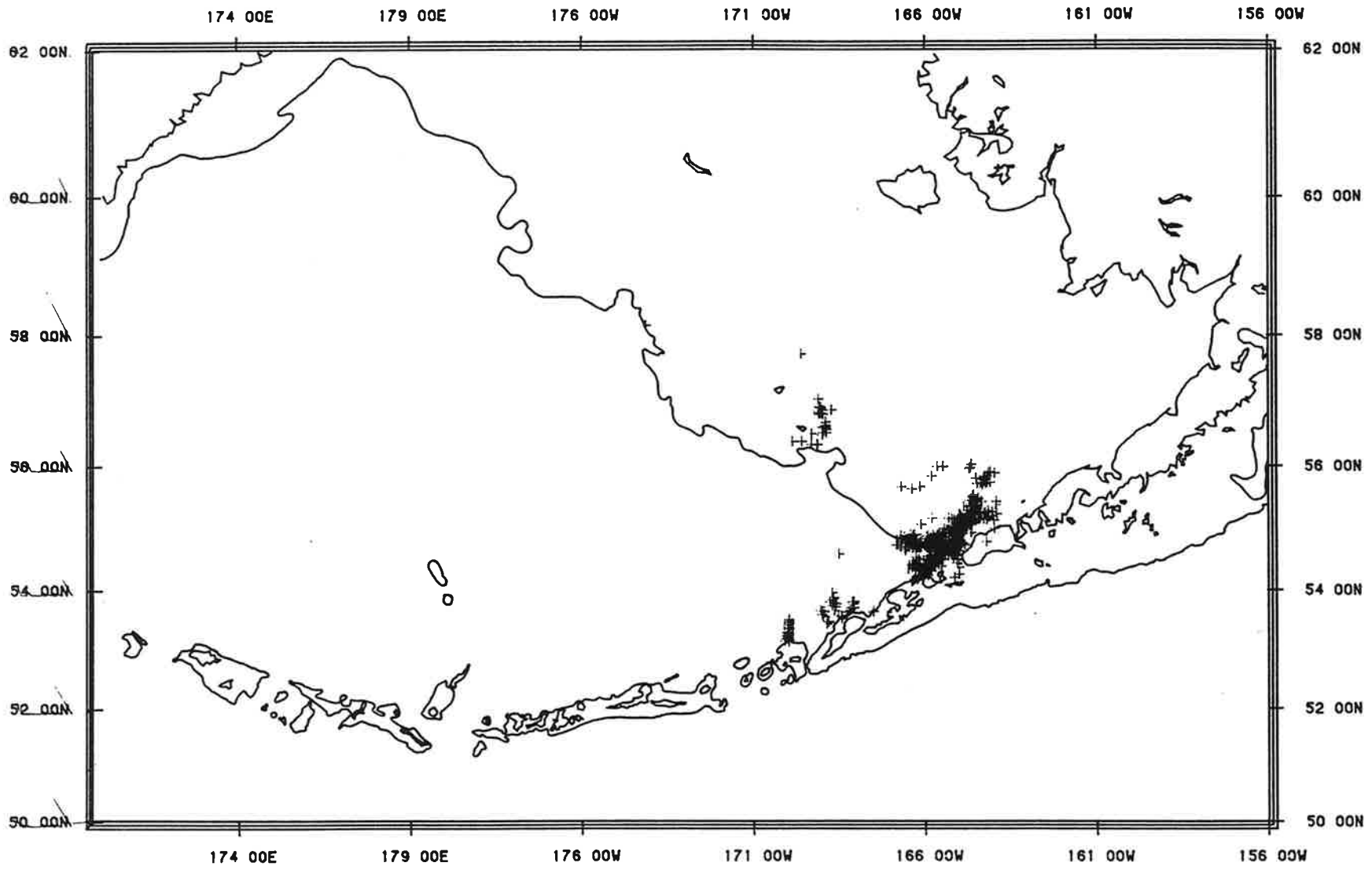
90 B SEASON. FL PROCESS/MOTHERSHIP POLLOCK TRAWL LOCATIONS



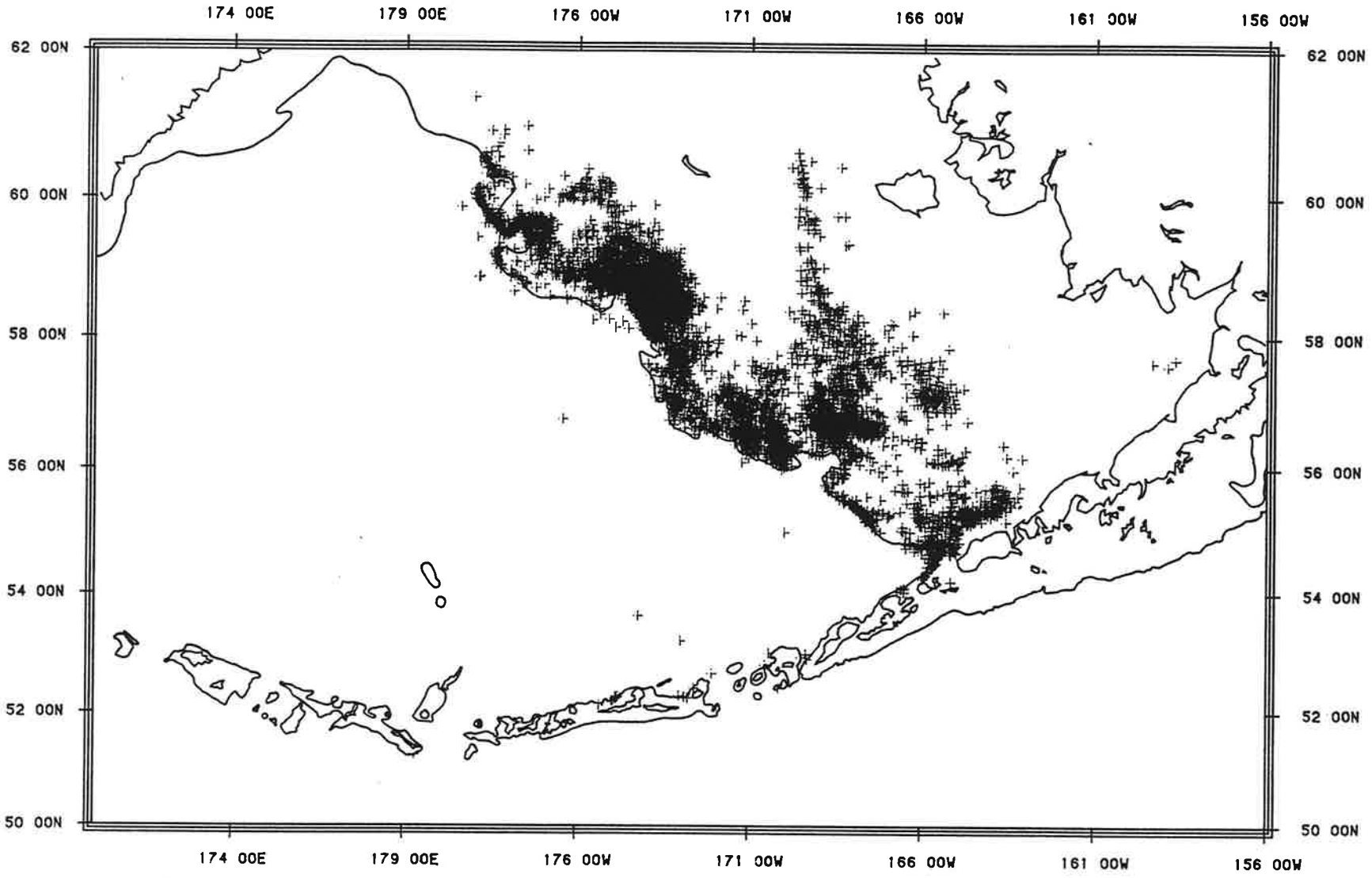
91 A SEASON. CATCHER/PROCESSOR POLLOCK TRAWL LOCATIONS



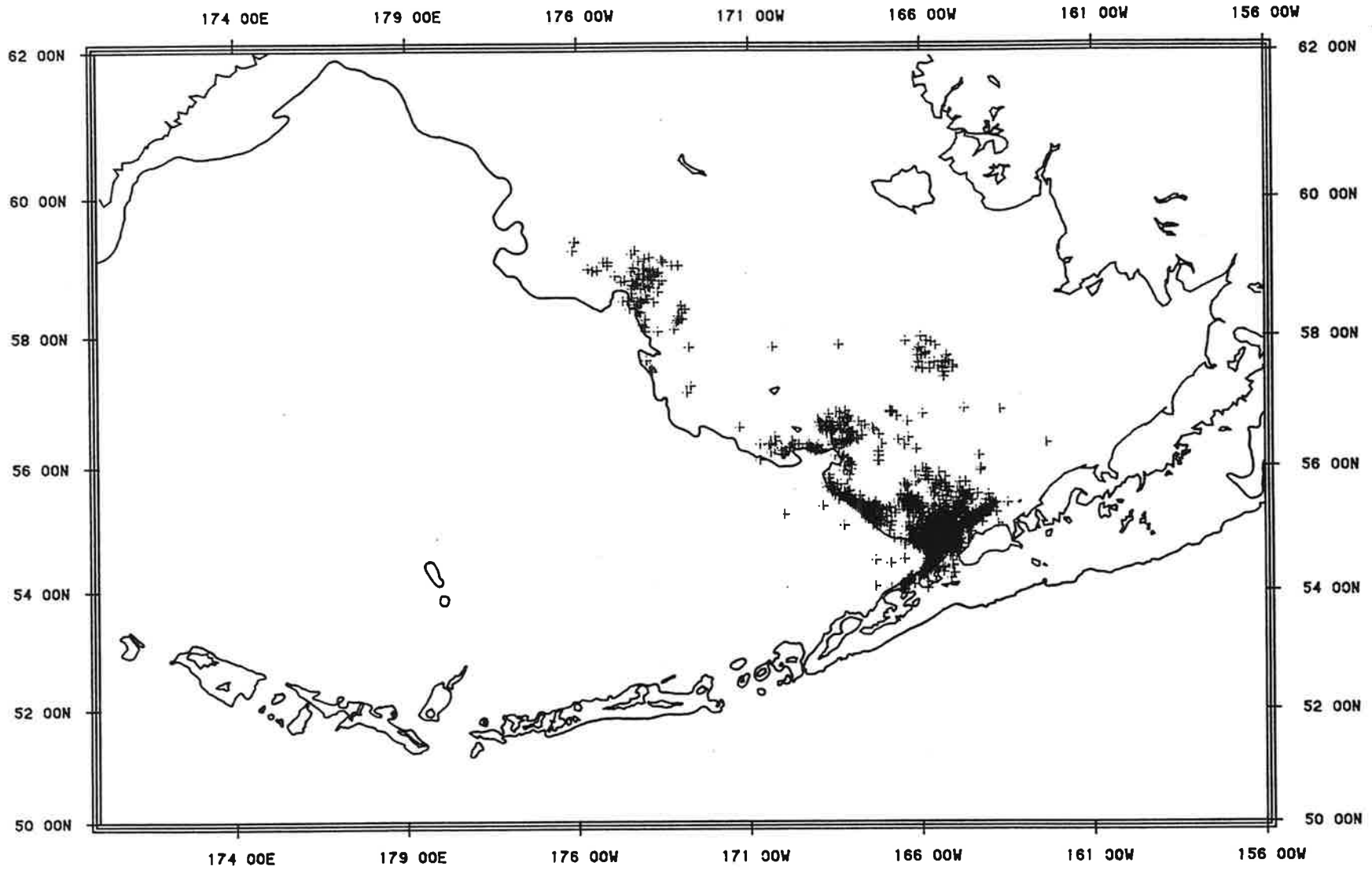
91 A SEASON. FL PROCESS/MOTHERSHIP POLLOCK TRAWL LOCATIONS



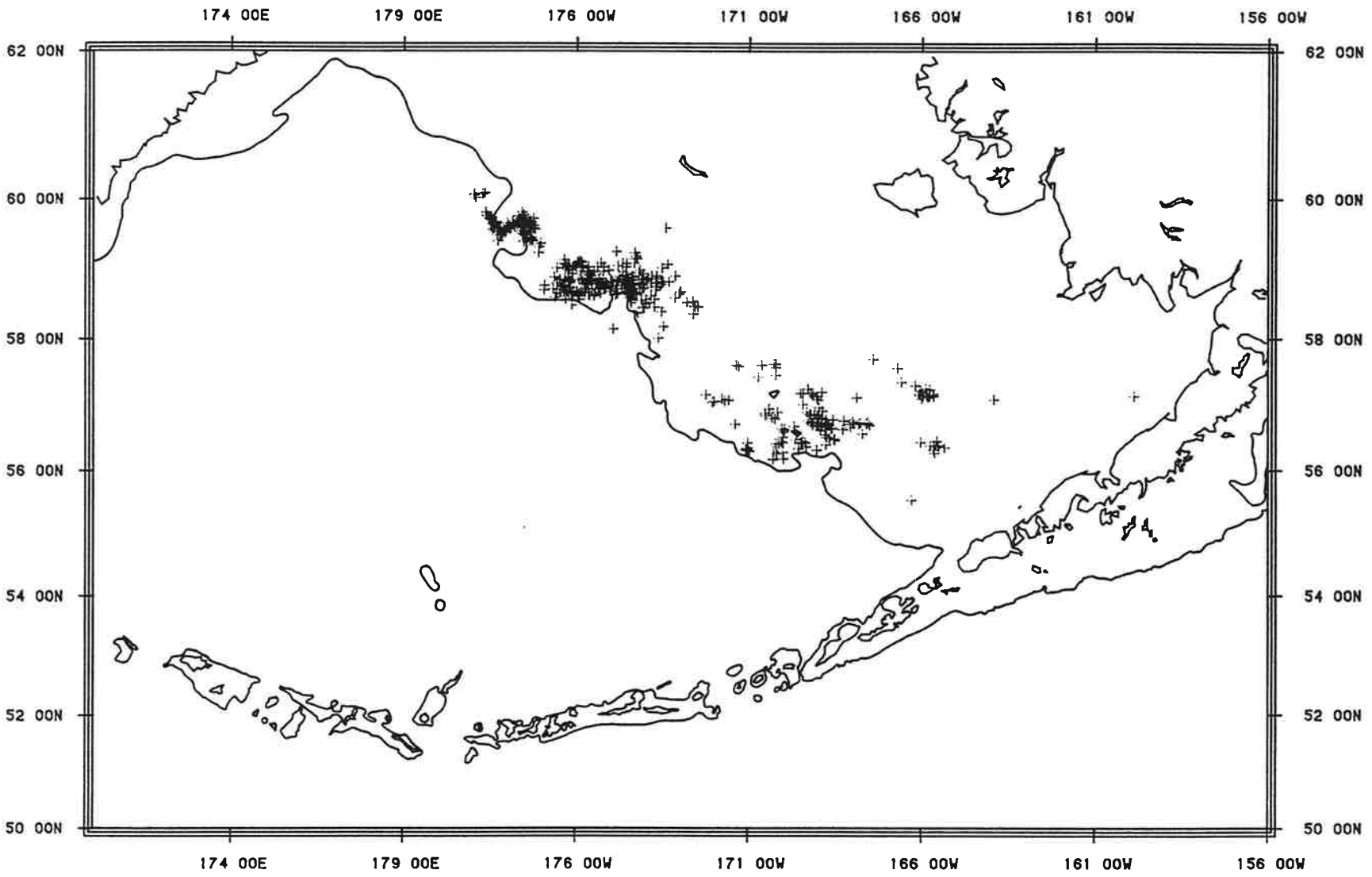
91 A SEASON. SMALL TRAWLERS POLLOCK TRAWL LOCATIONS



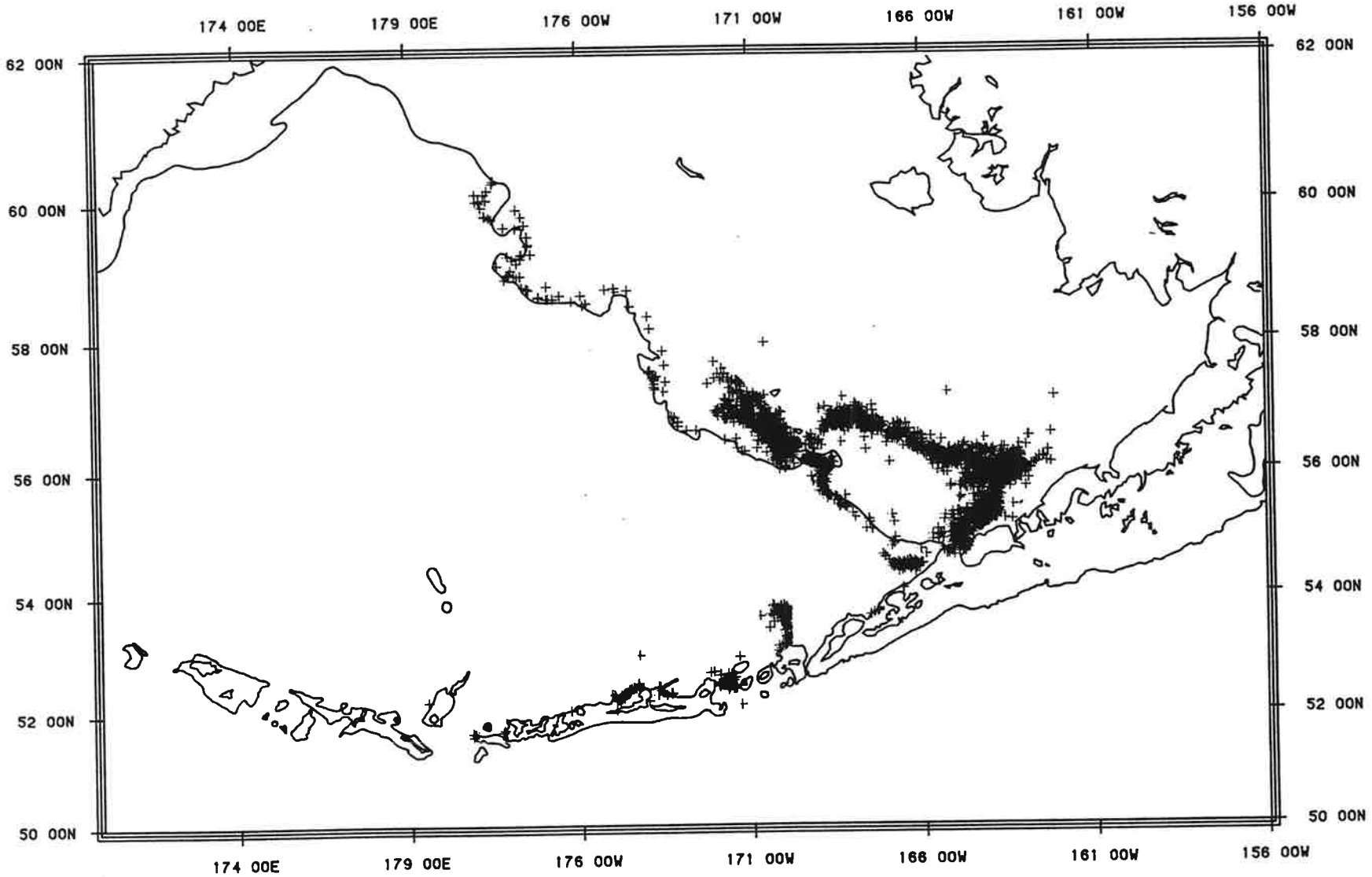
91 B SEASON. CATCHER/PROCESSOR POLLOCK TRAWL LOCATIONS



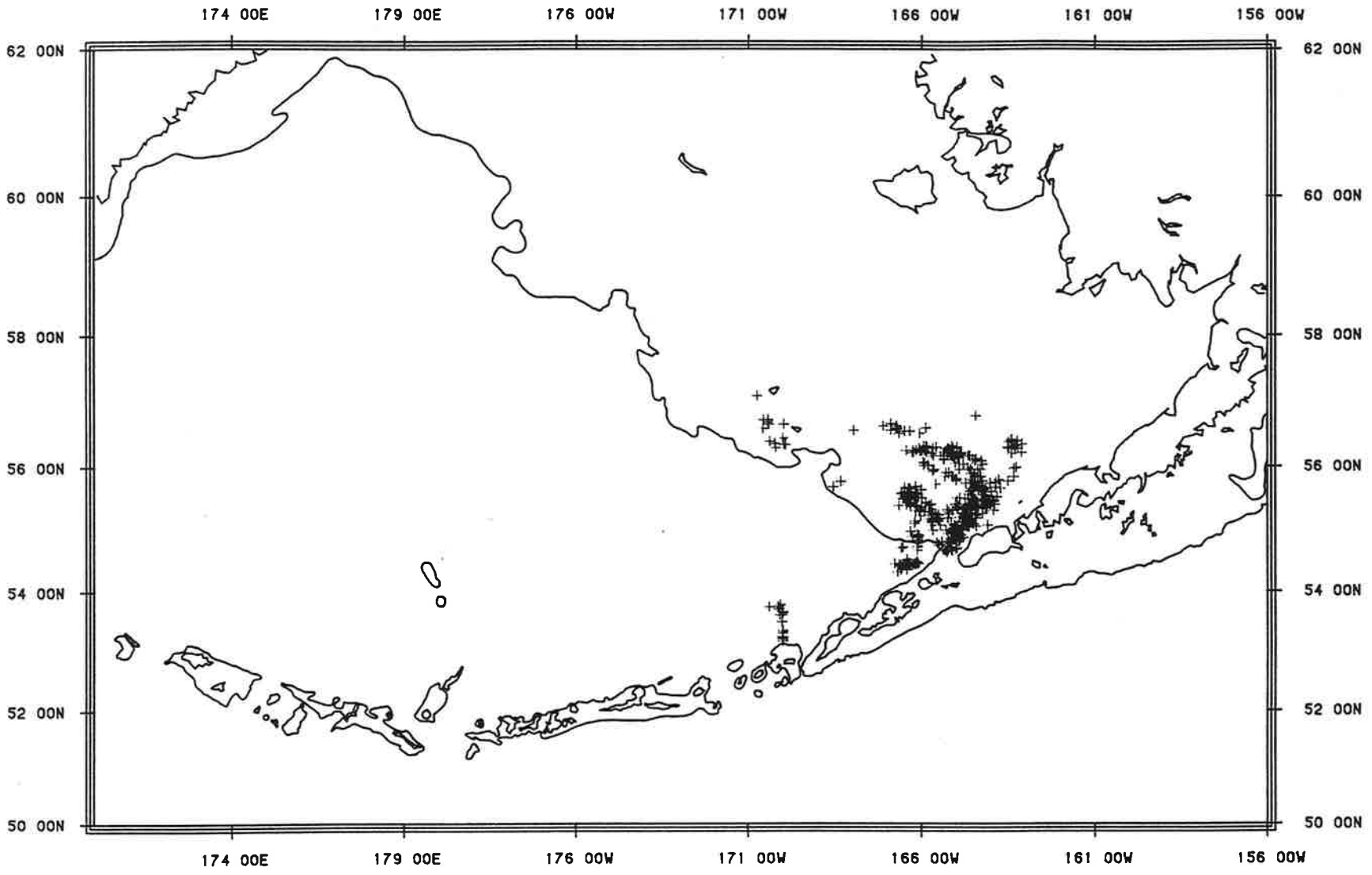
91 B SEASON. FL PROCESS/MOTHERSHIP POLLOCK TRAWL LOCATIONS



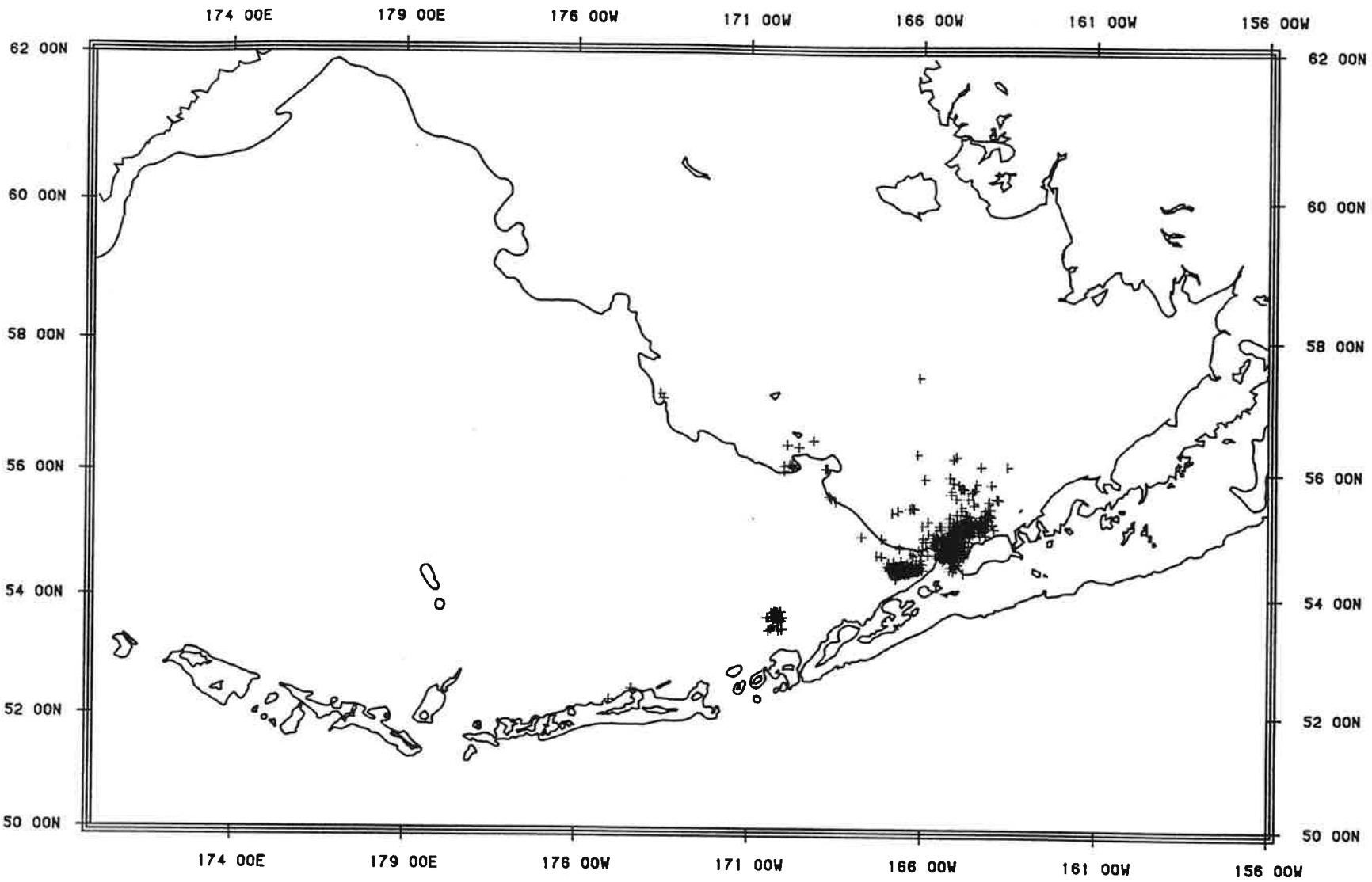
91 B SEASON. SMALL TRAWLERS POLLOCK TRAWL LOCATIONS



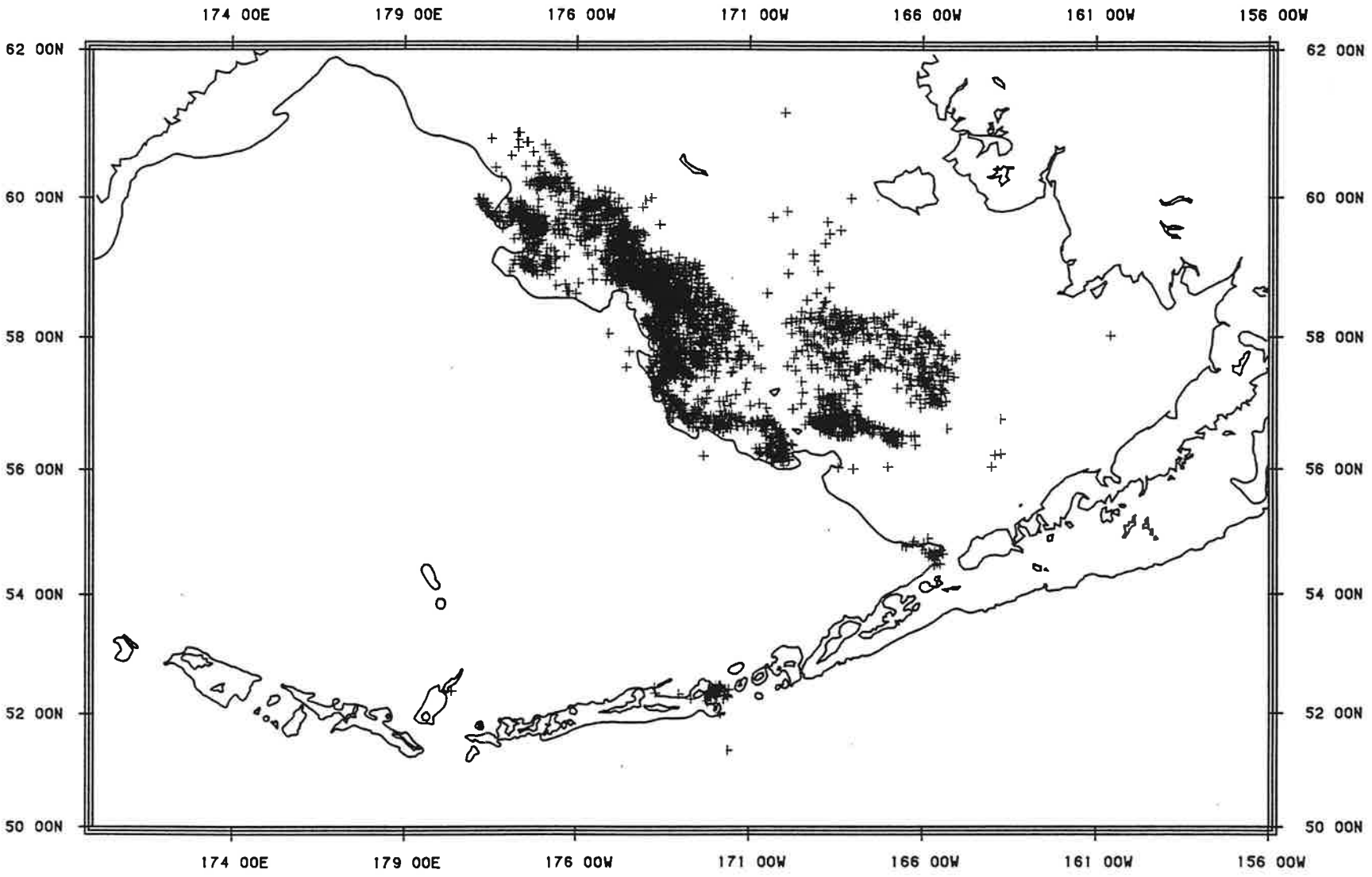
92 A SEASON. CATCHER/PROCESSOR POLLOCK TRAWL LOCATIONS



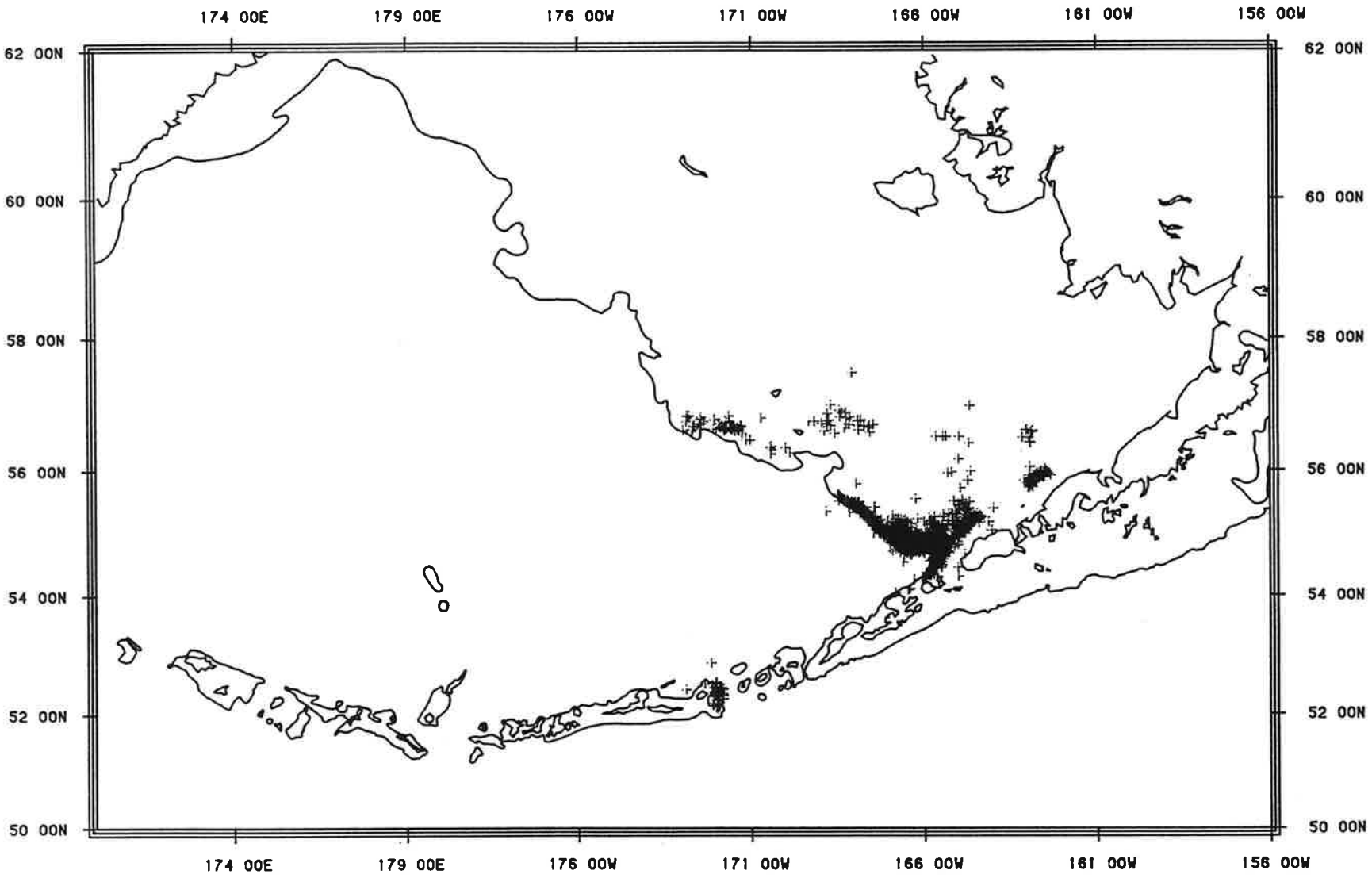
92 A SEASON, FL PROCESS/MOTHERSHIP POLLOCK TRAWL LOCATIONS



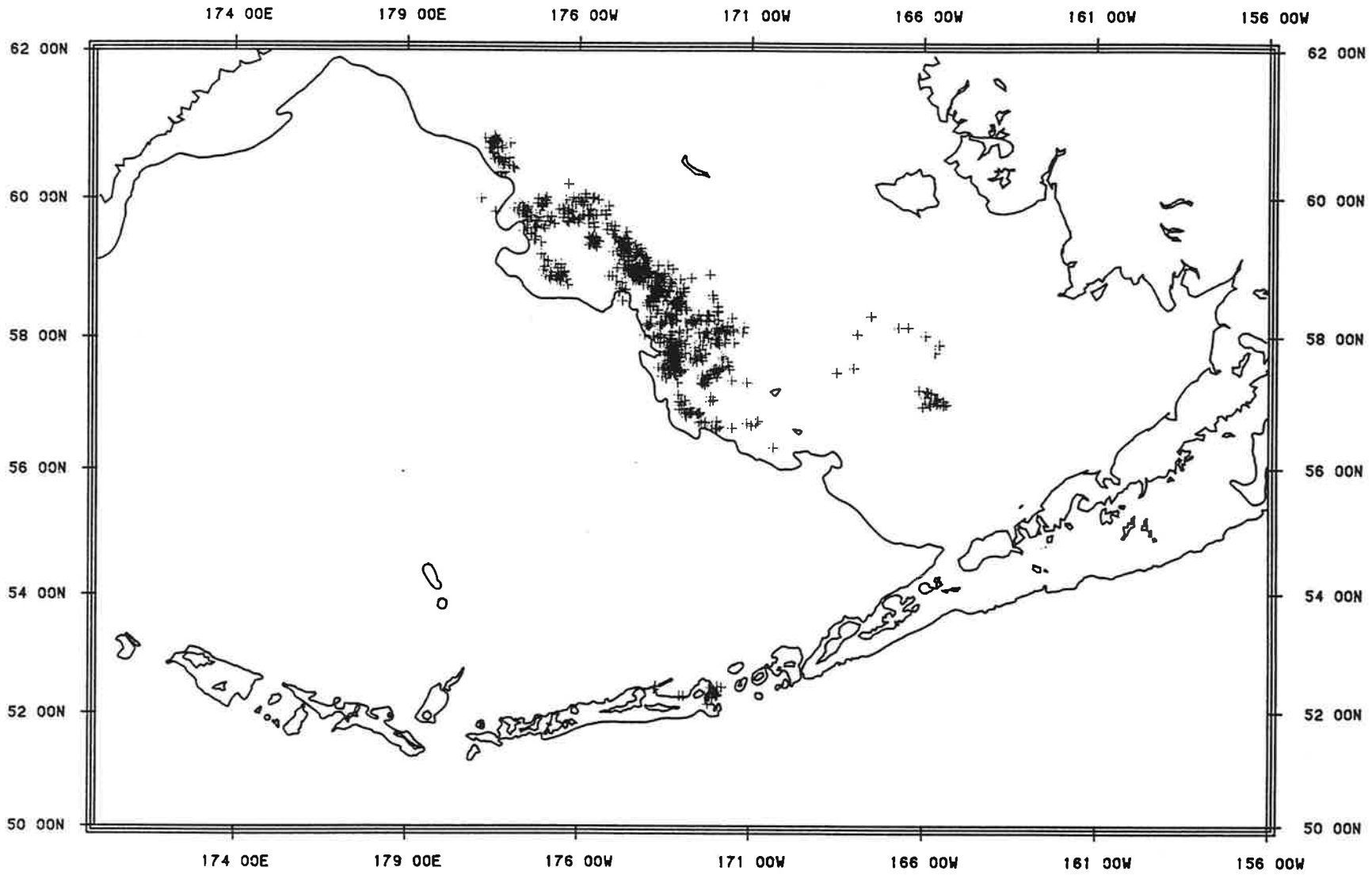
92 A SEASON. SMALL TRAWLERS POLLOCK TRAWL LOCATIONS



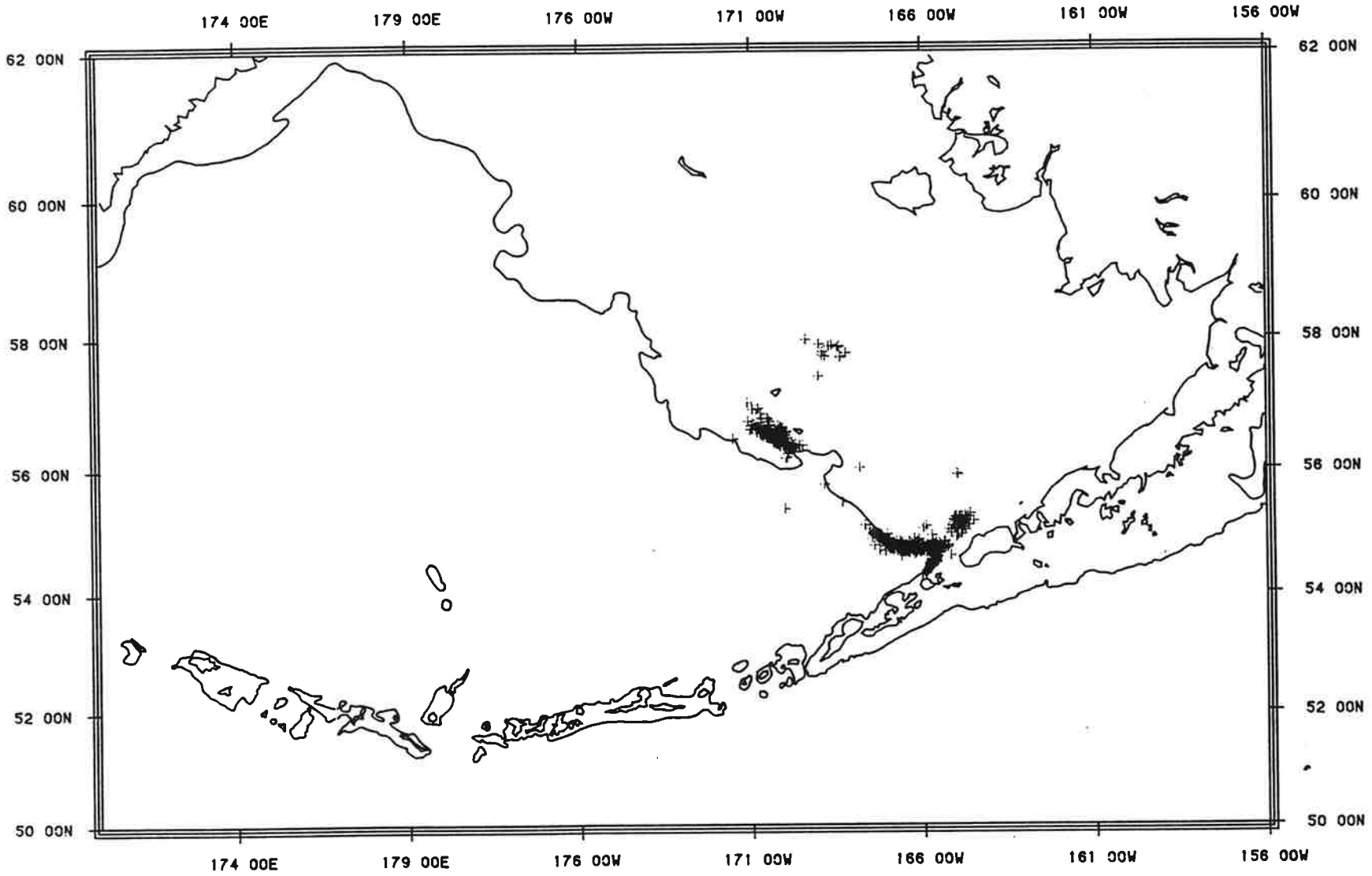
92 B SEASON, CATCHER/PROCESSOR POLLOCK TRAWL LOCATIONS



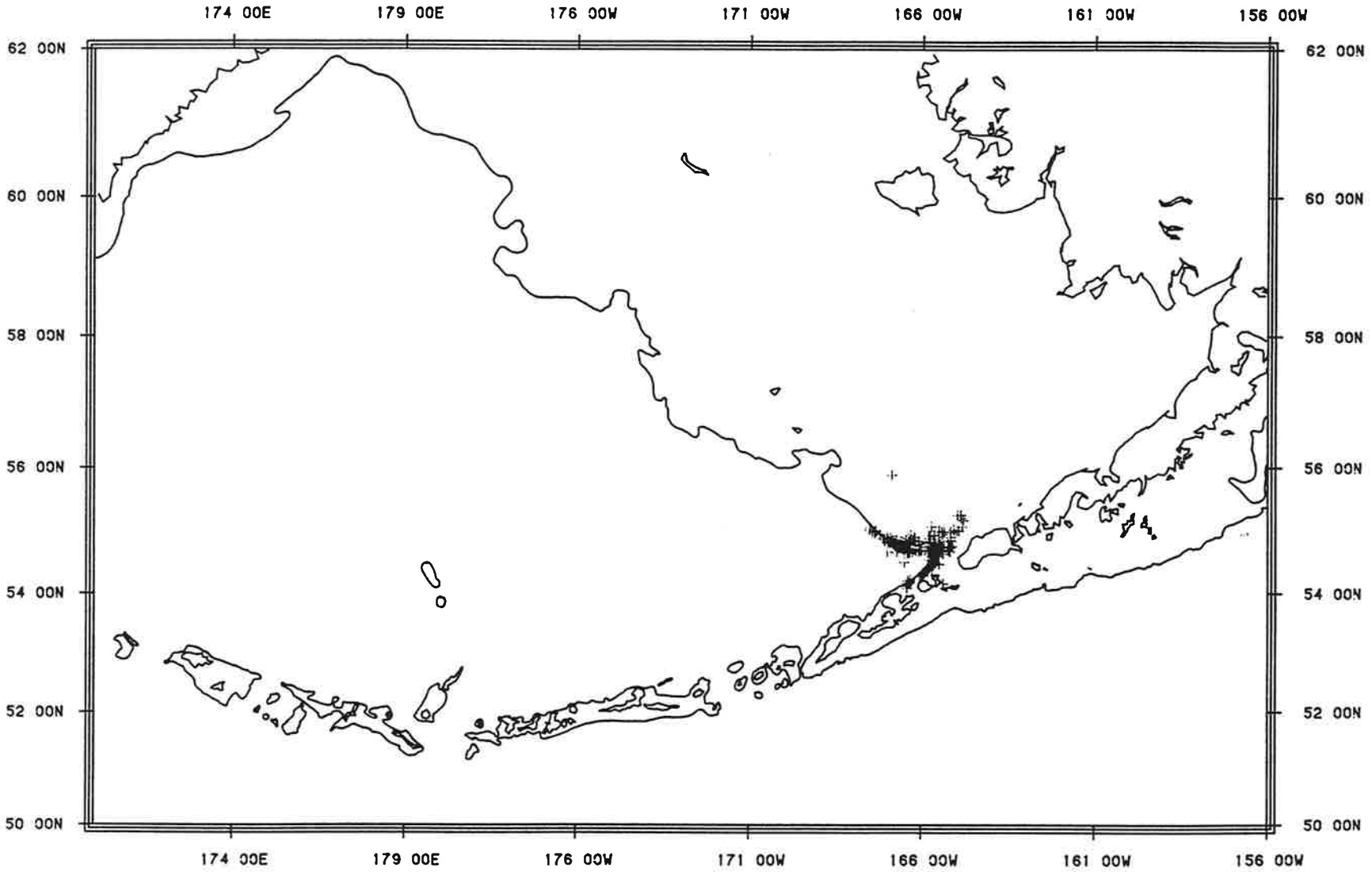
92 B SEASON. FL PROCESS/MOTHERSHIP POLLOCK TRAWL LOCATIONS



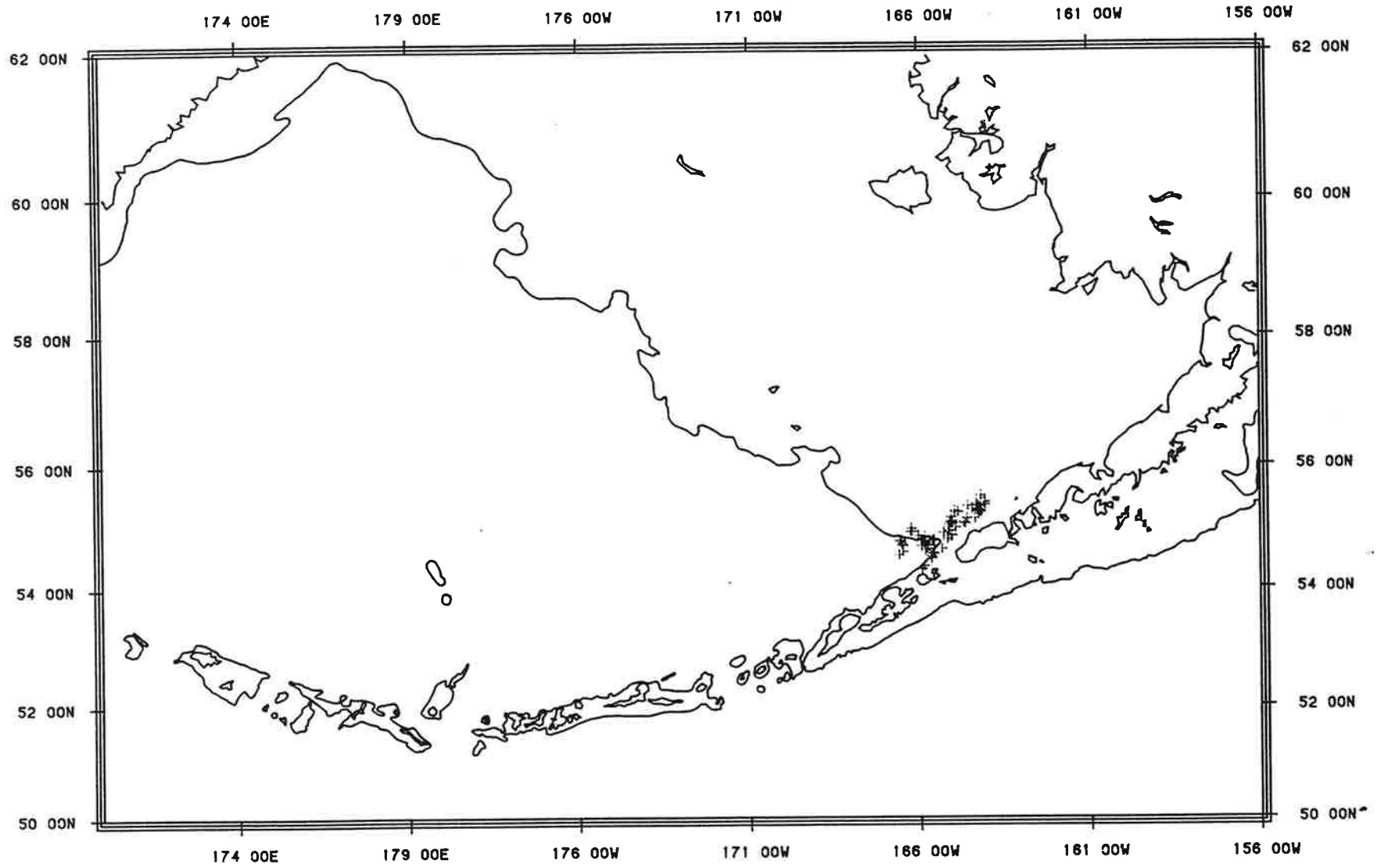
92 B SEASON. SMALL TRAWLERS POLLOCK TRAWL LOCATIONS



DEC 92-CDQ. CATCHER/PROCESSOR POLLOCK TRAWL LOCATIONS

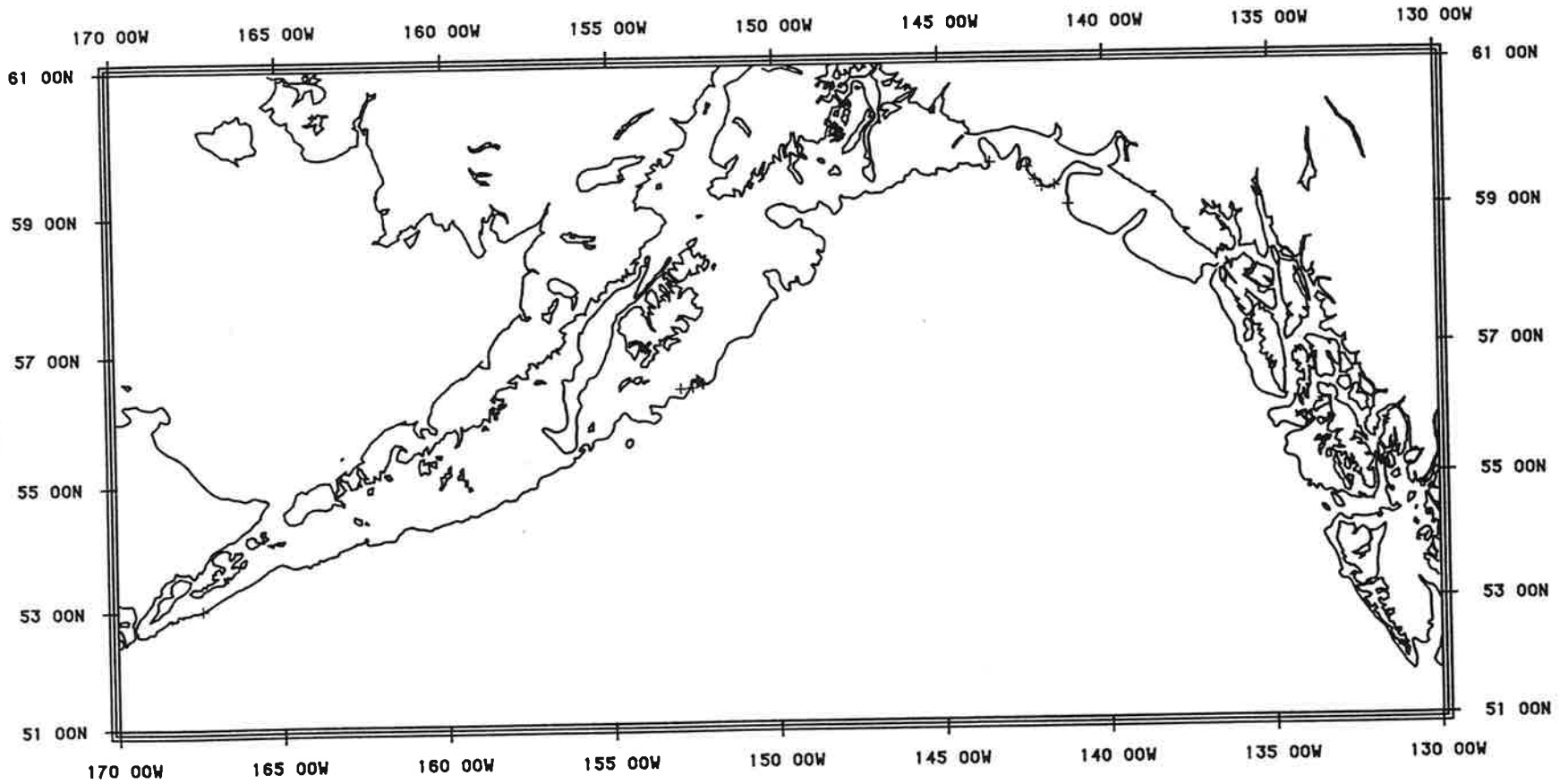


DEC 92-CDQ. FL PROCESS/MOTHERSHIP POLLOCK TRAWL LOCATIONS

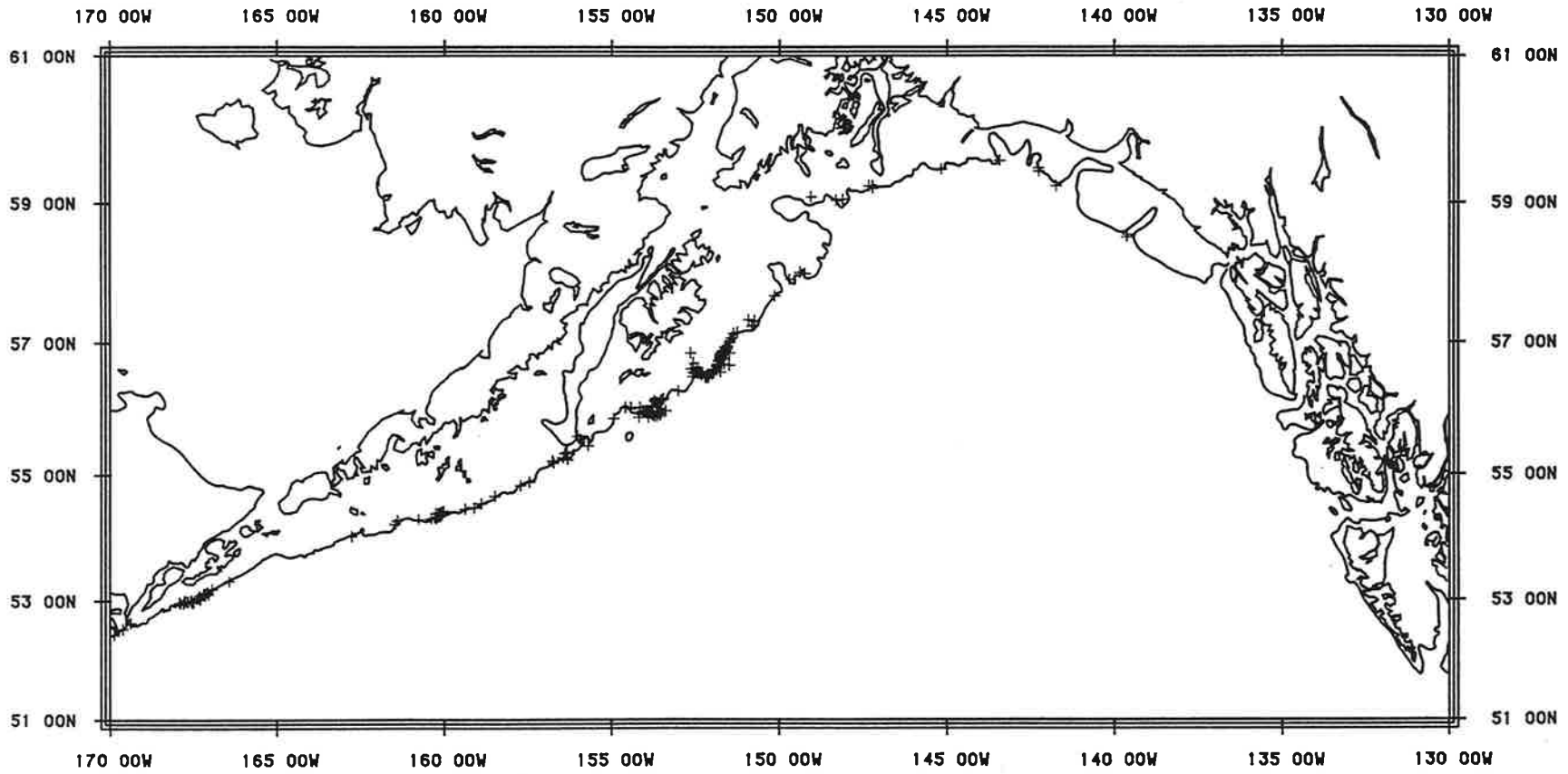


DEC 92-CDQ. SMALL TRAWLERS POLLOCK TRAWL LOCATIONS

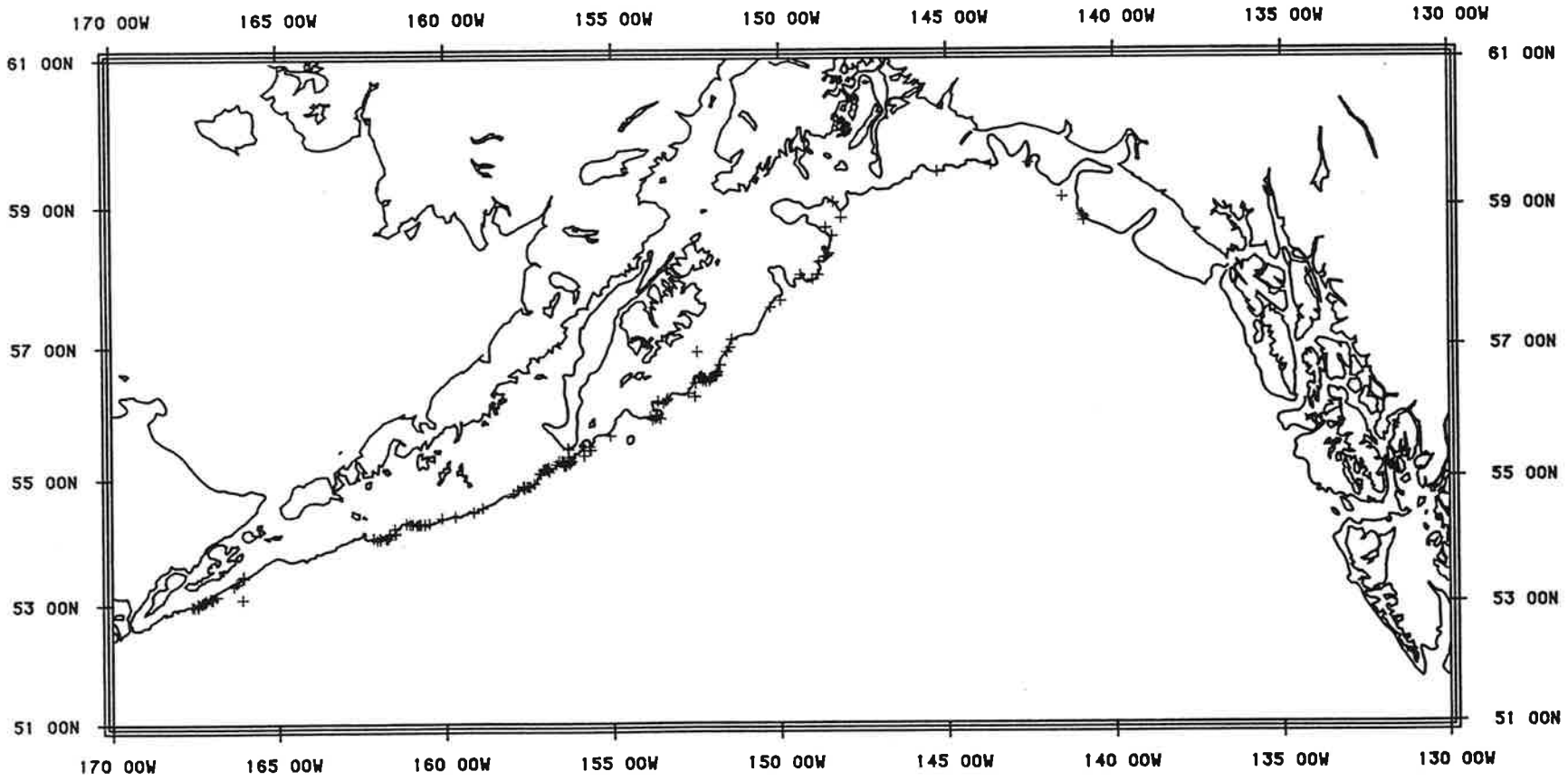
Figure 2. Pollock fishery trawl locations in the Gulf of Alaska plotted by three, four-month periods for foreign and joint-venture (combined, 1977-87) and domestic fisheries (1989-92).



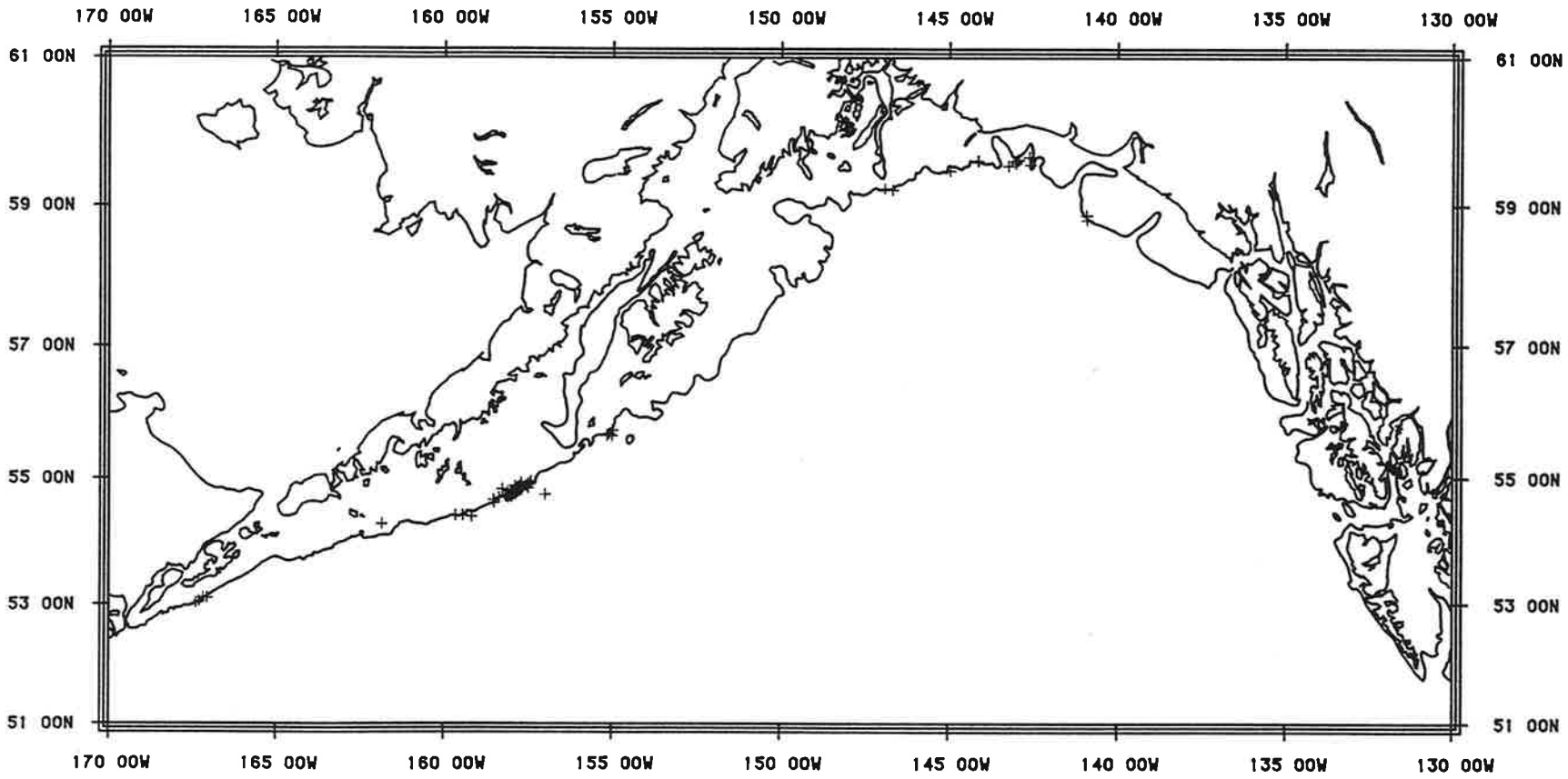
JAN-APR 1977. FOREIGN & JV POLLOCK TRAWL LOCATIONS



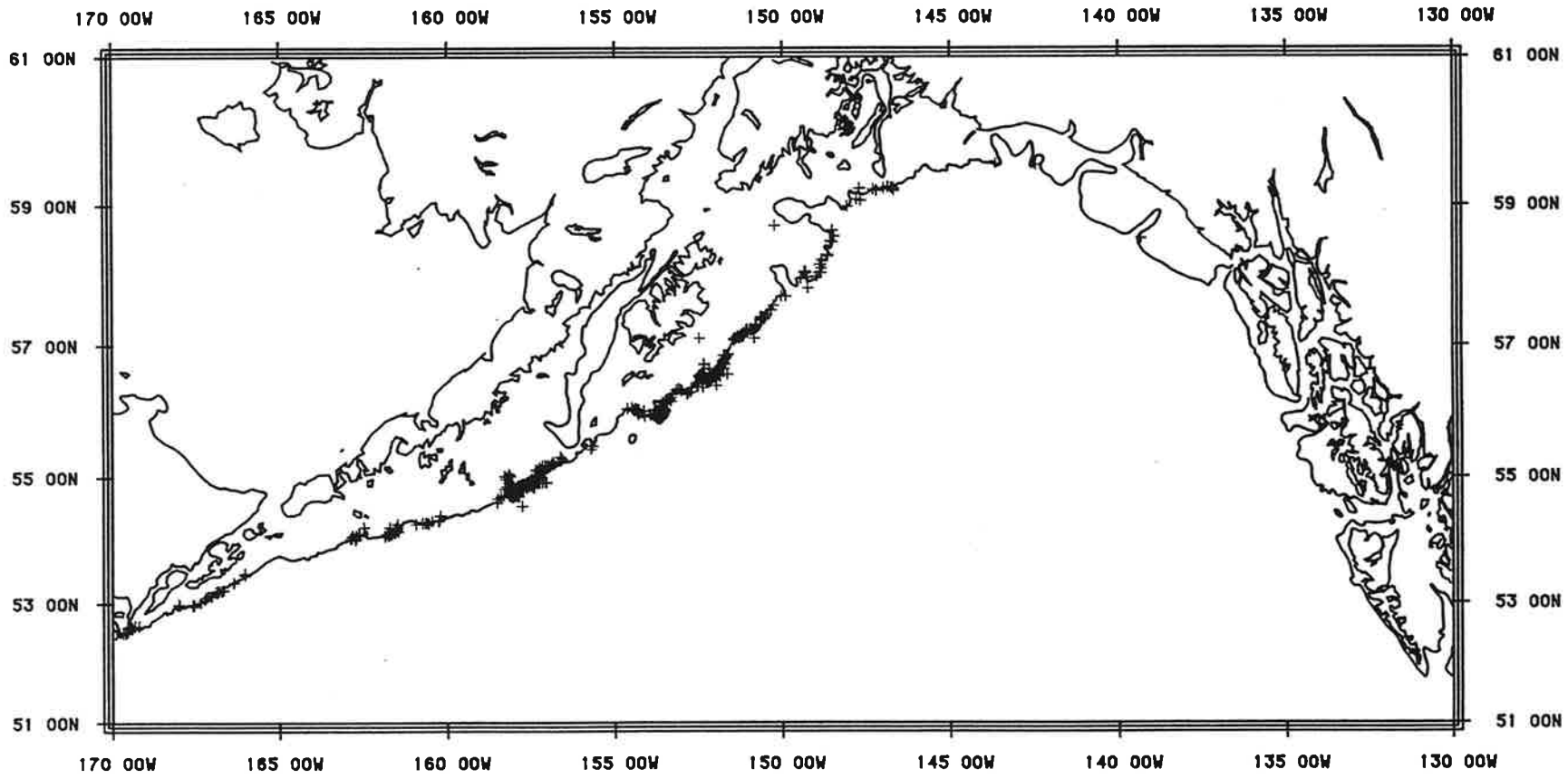
MAY-AUG 1977. FOREIGN & JV POLLOCK TRAWL LOCATIONS



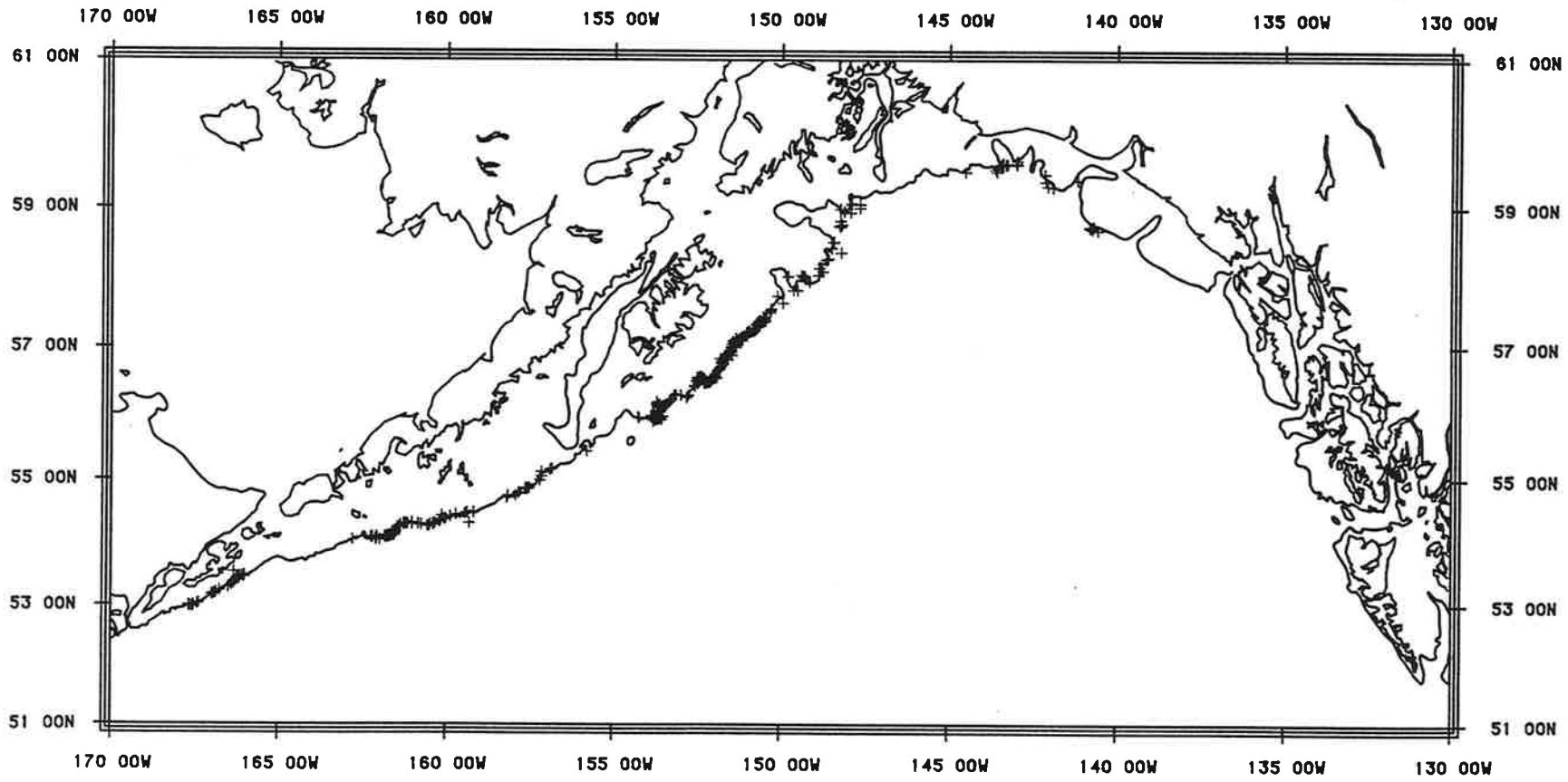
SEP-DEC 1977. FOREIGN & JV POLLOCK TRAWL LOCATIONS



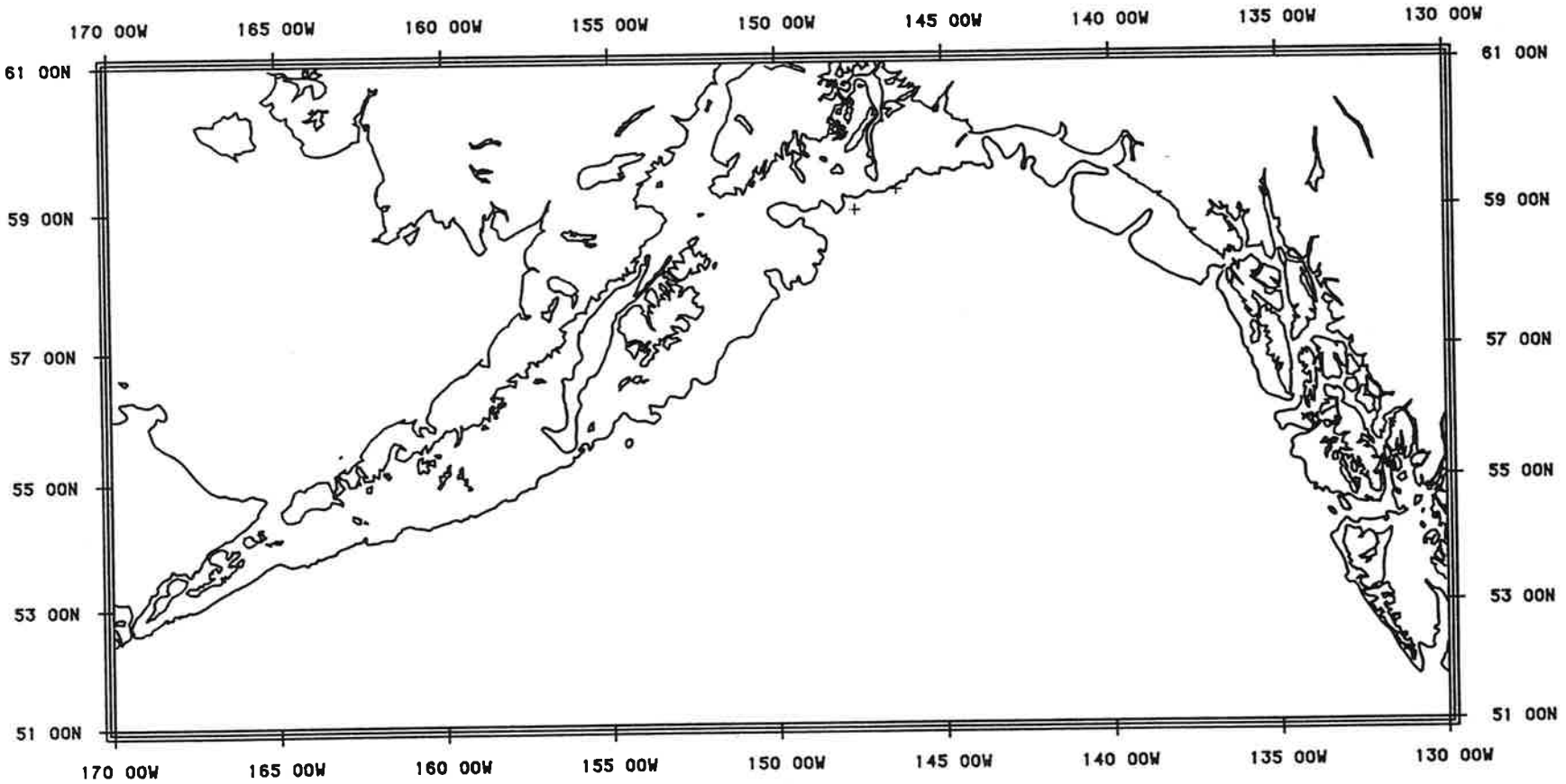
JAN-APR 1978. FOREIGN & JV POLLOCK TRAWL LOCATIONS



MAY-AUG 1978. FOREIGN & JV POLLOCK TRAWL LOCATIONS



SEP-DEC 1978. FOREIGN & JV POLLOCK TRAWL LOCATIONS



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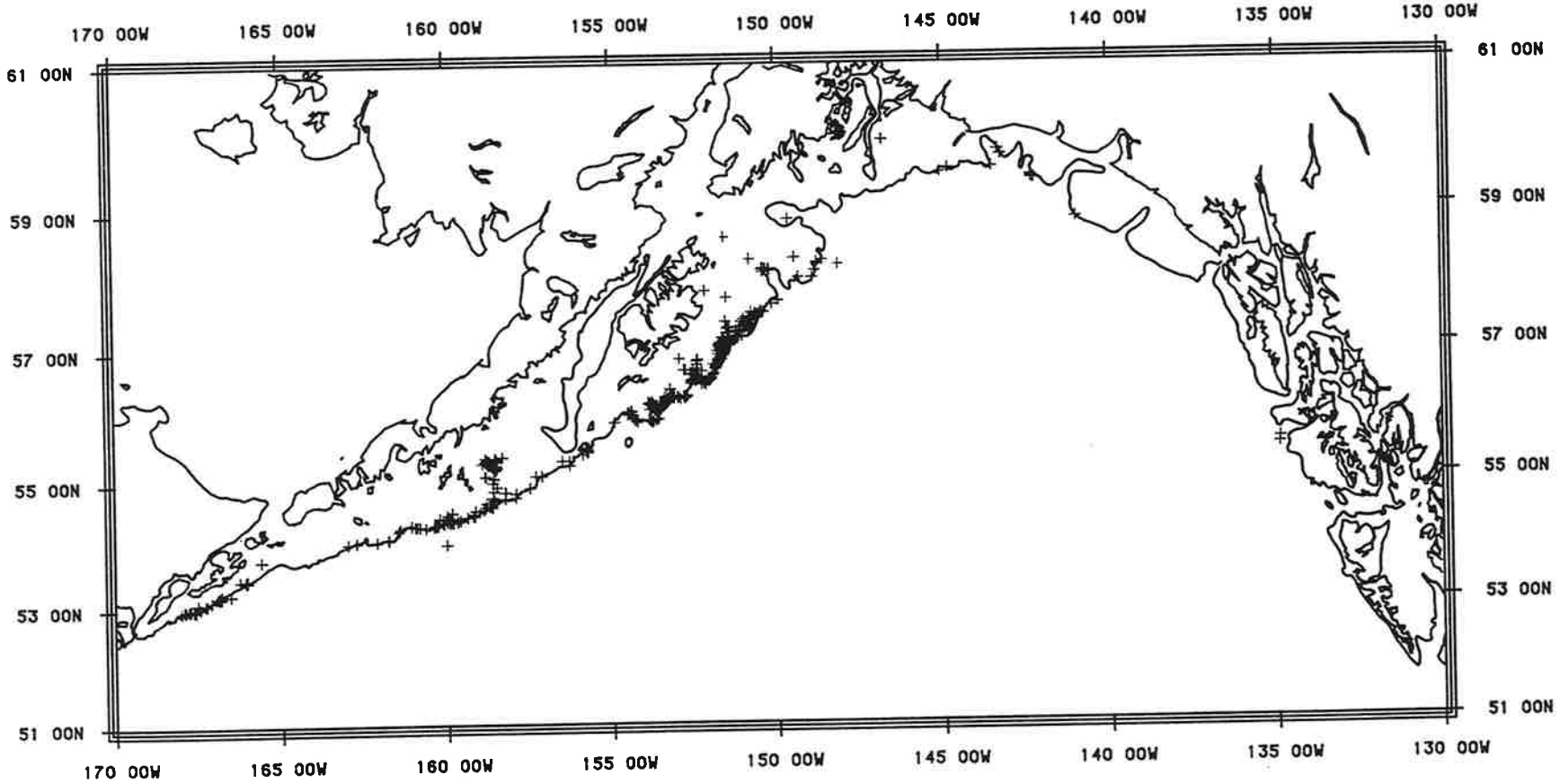

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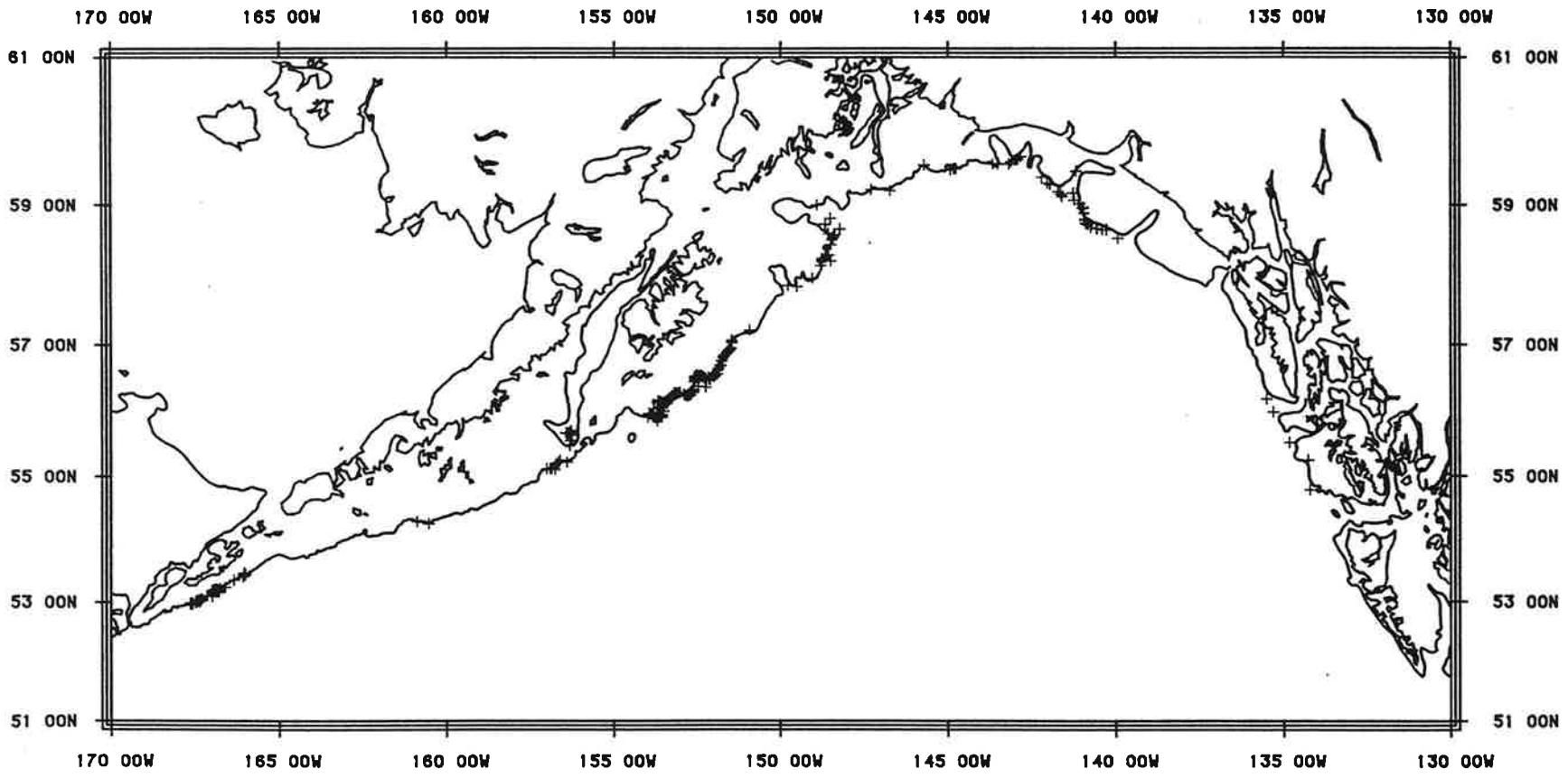
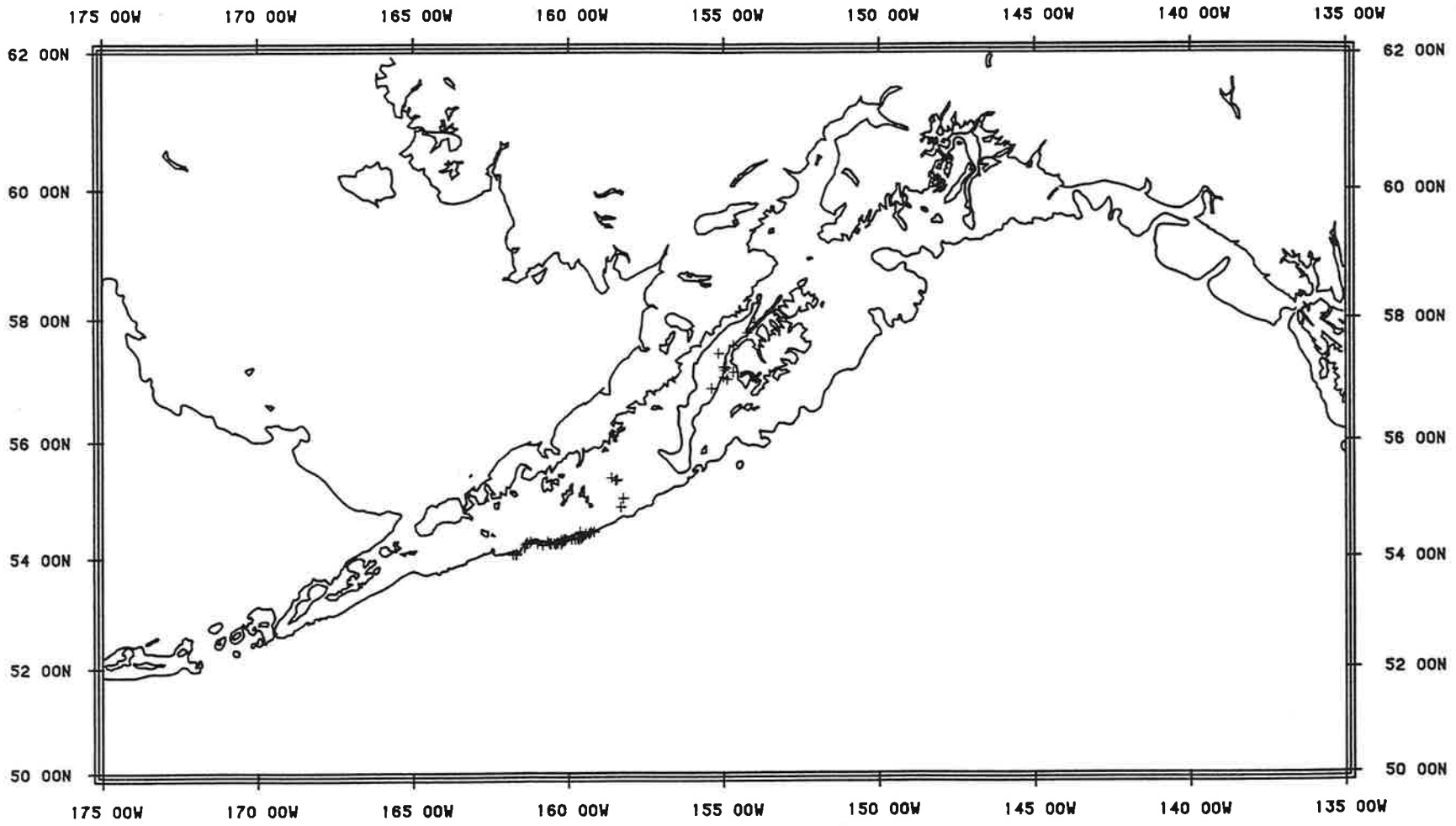
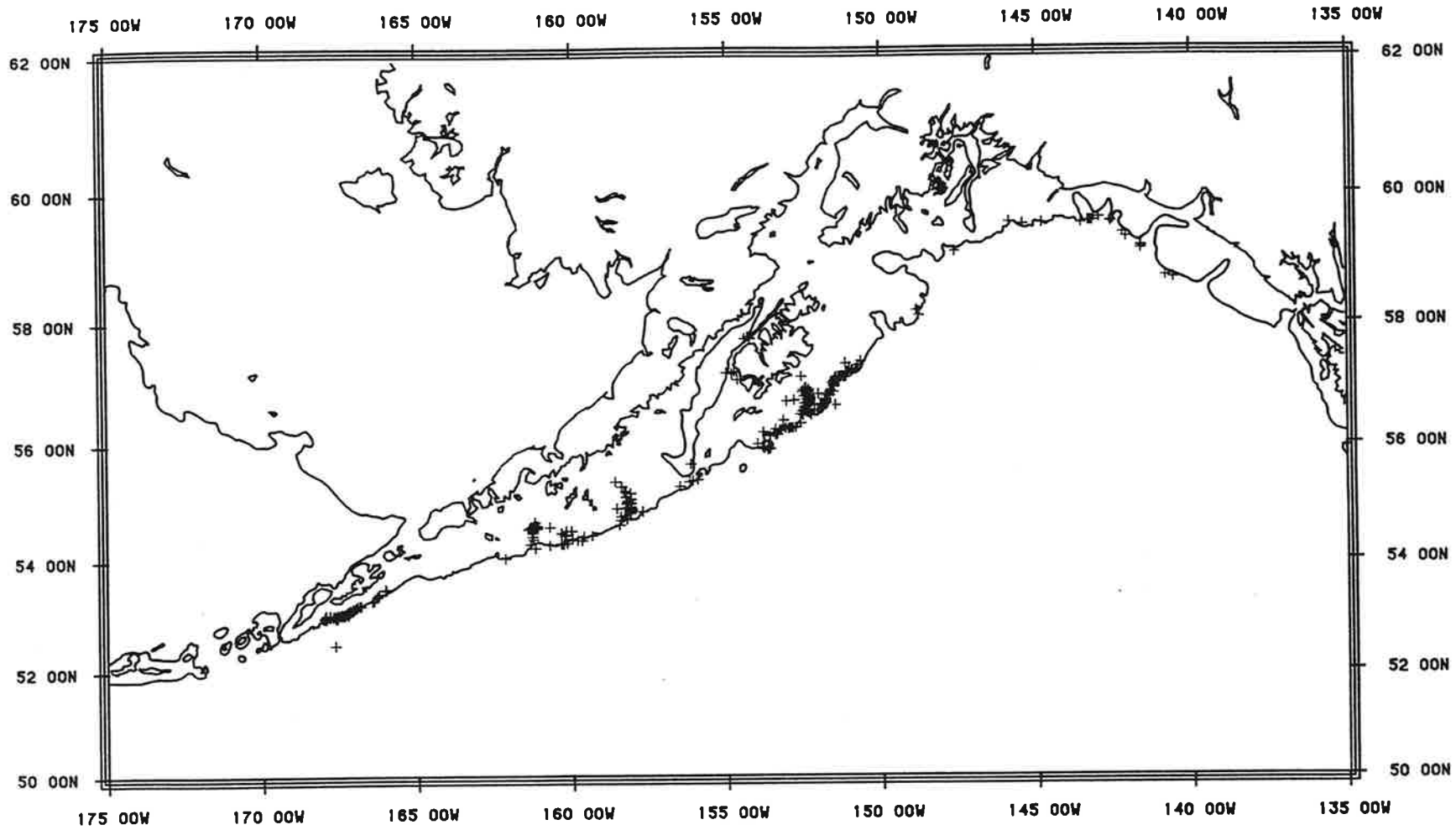


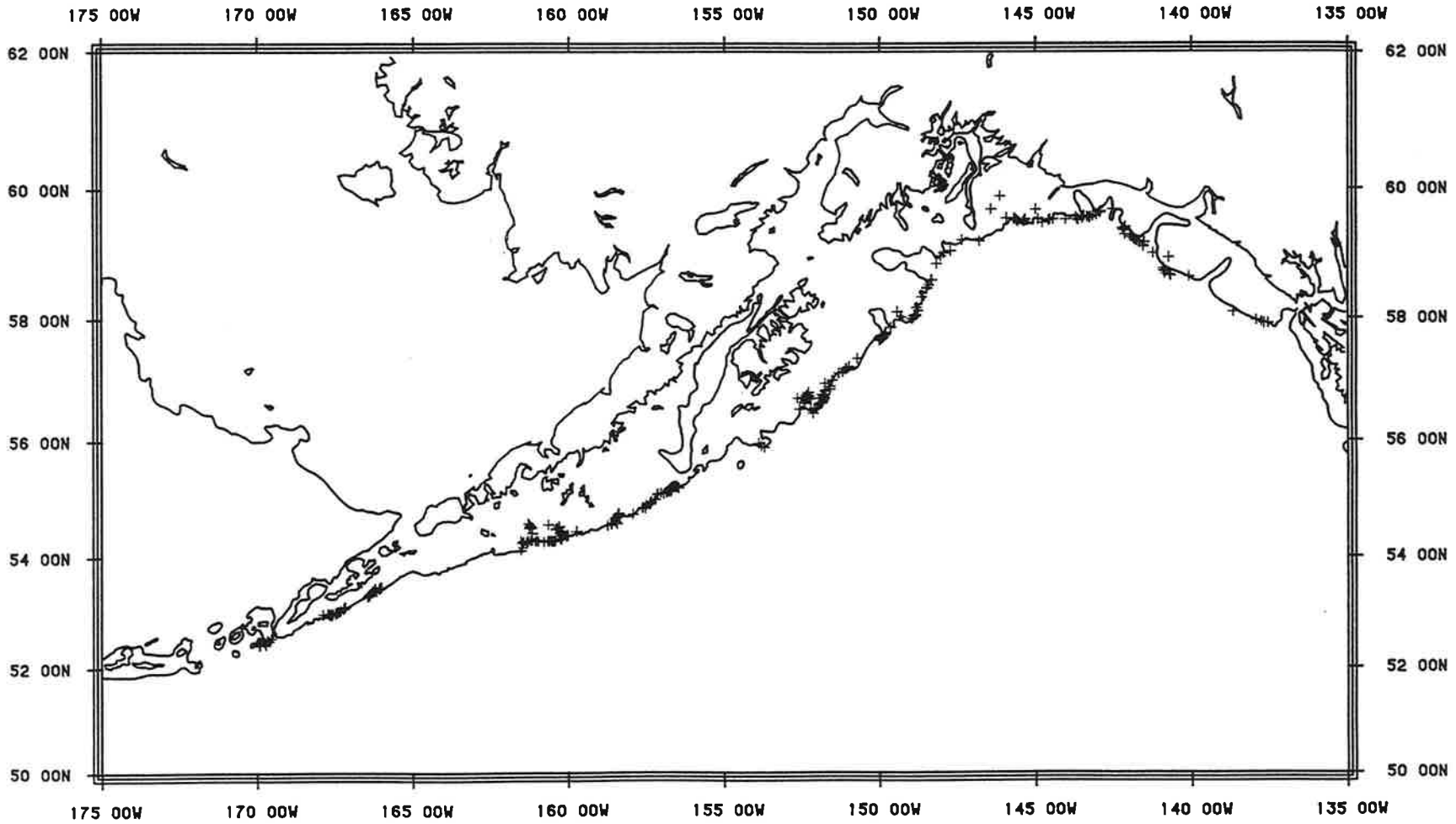
SEP-DEC 1979. FOREIGN & JV POLLOCK TRAWL LOCATIONS



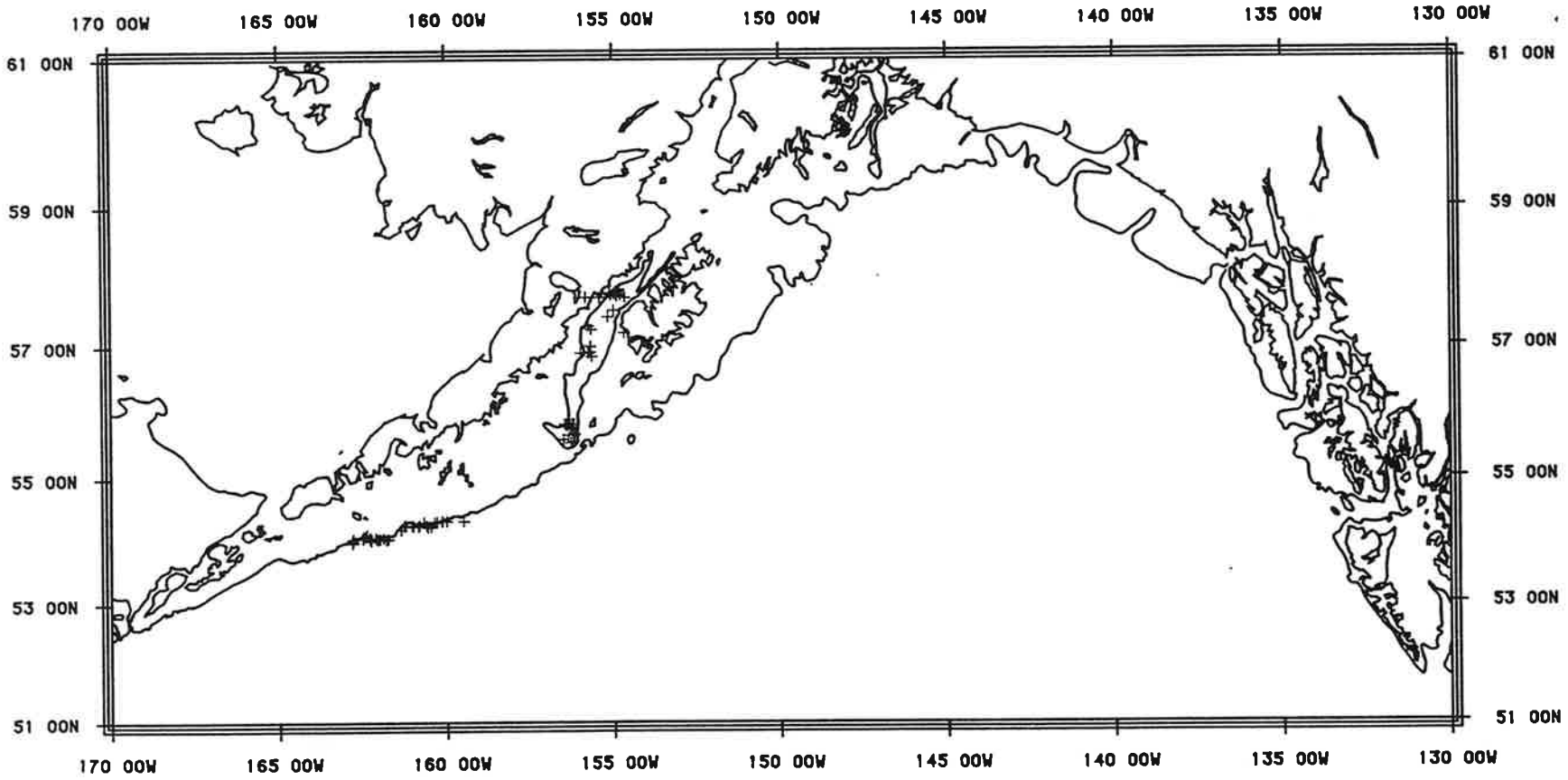
JAN-APR 1980. GOA POLLOCK TRAWL LOCATIONS



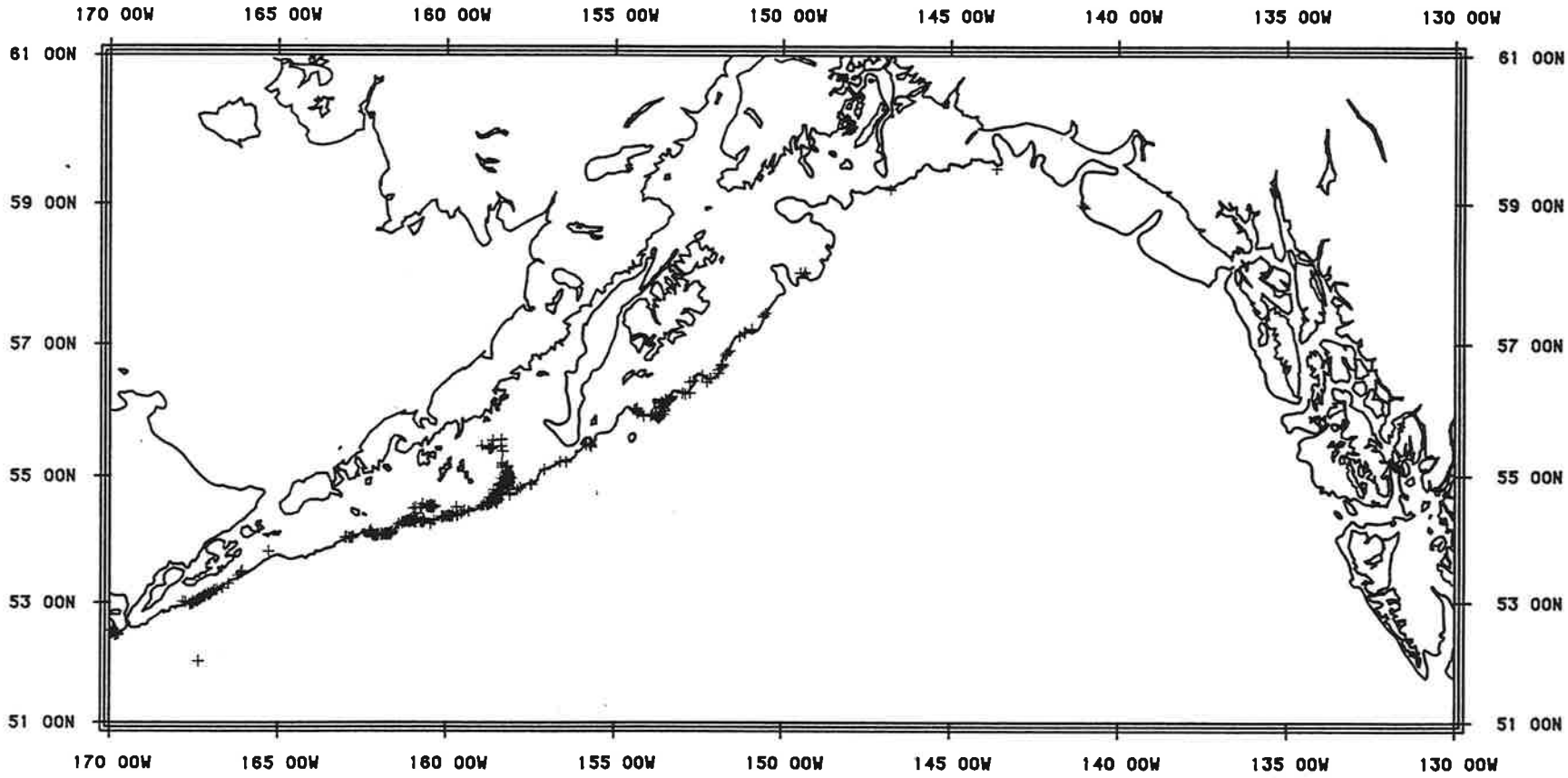
MAY-AUG 1980. GOA POLLOCK TRAWL LOCATIONS



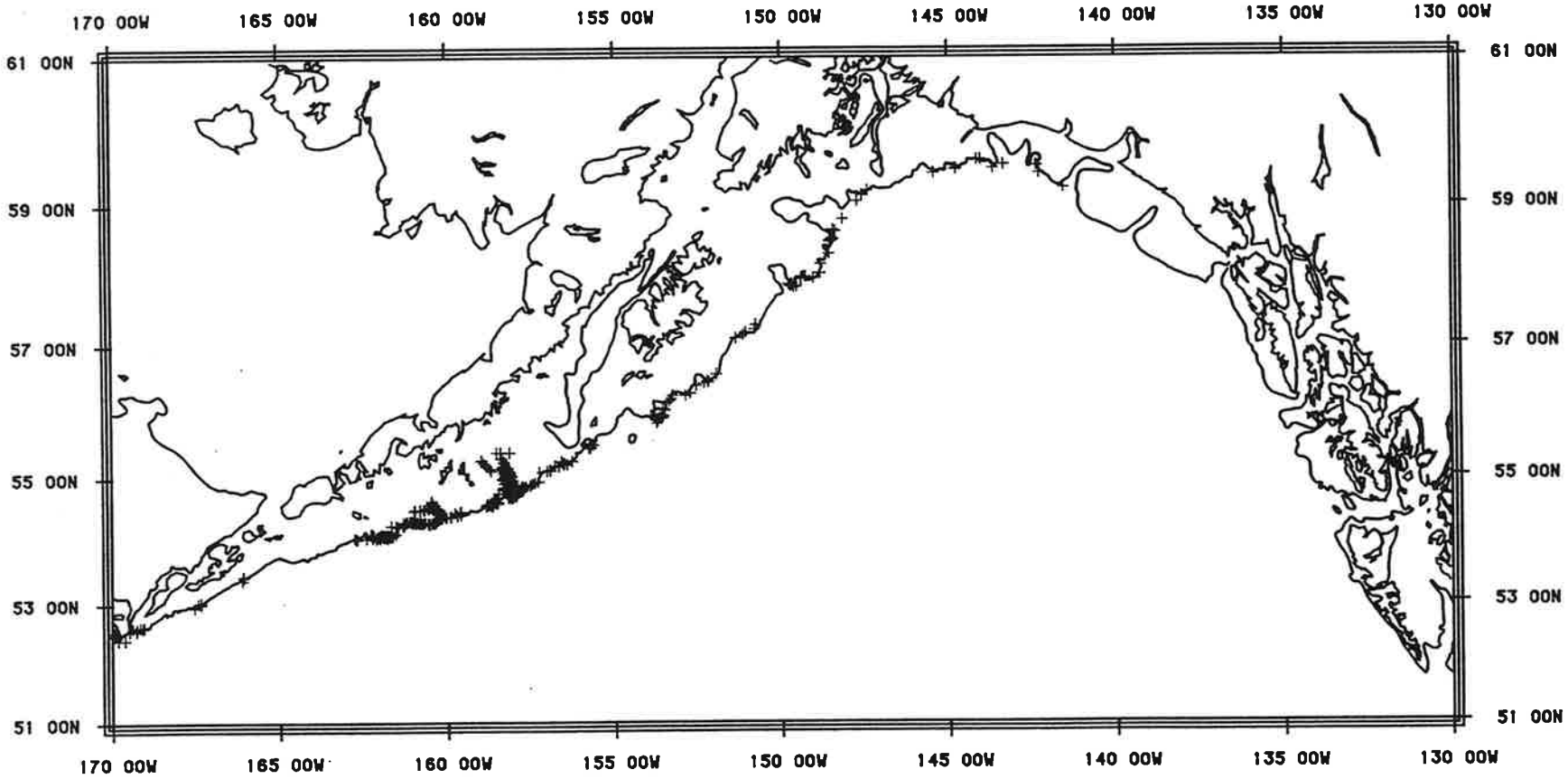
SEP-DEC 1980. GOA POLLOCK TRAWL LOCATIONS



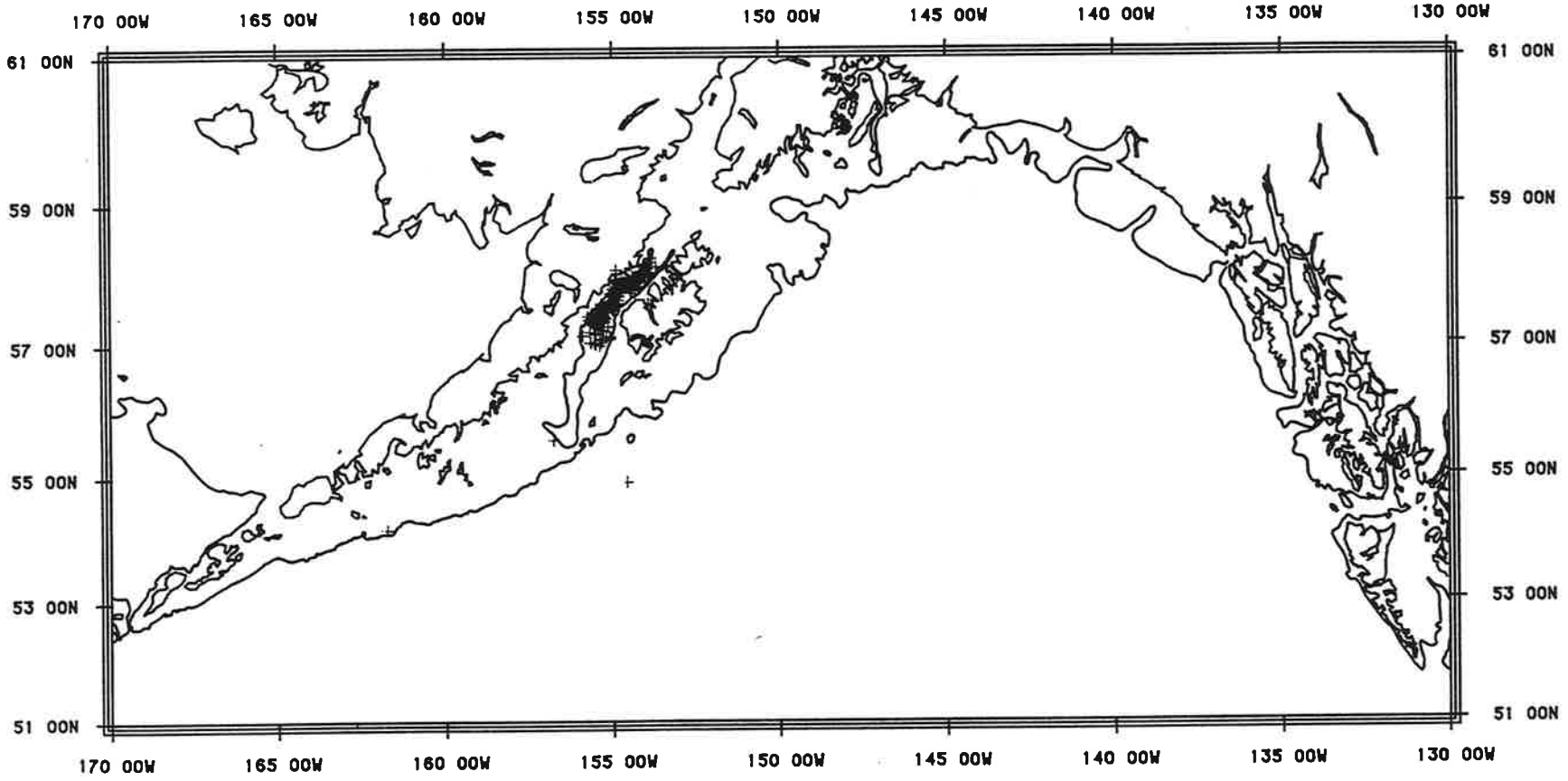
JAN-APR 1981. FOREIGN & JV POLLOCK TRAWL LOCATIONS



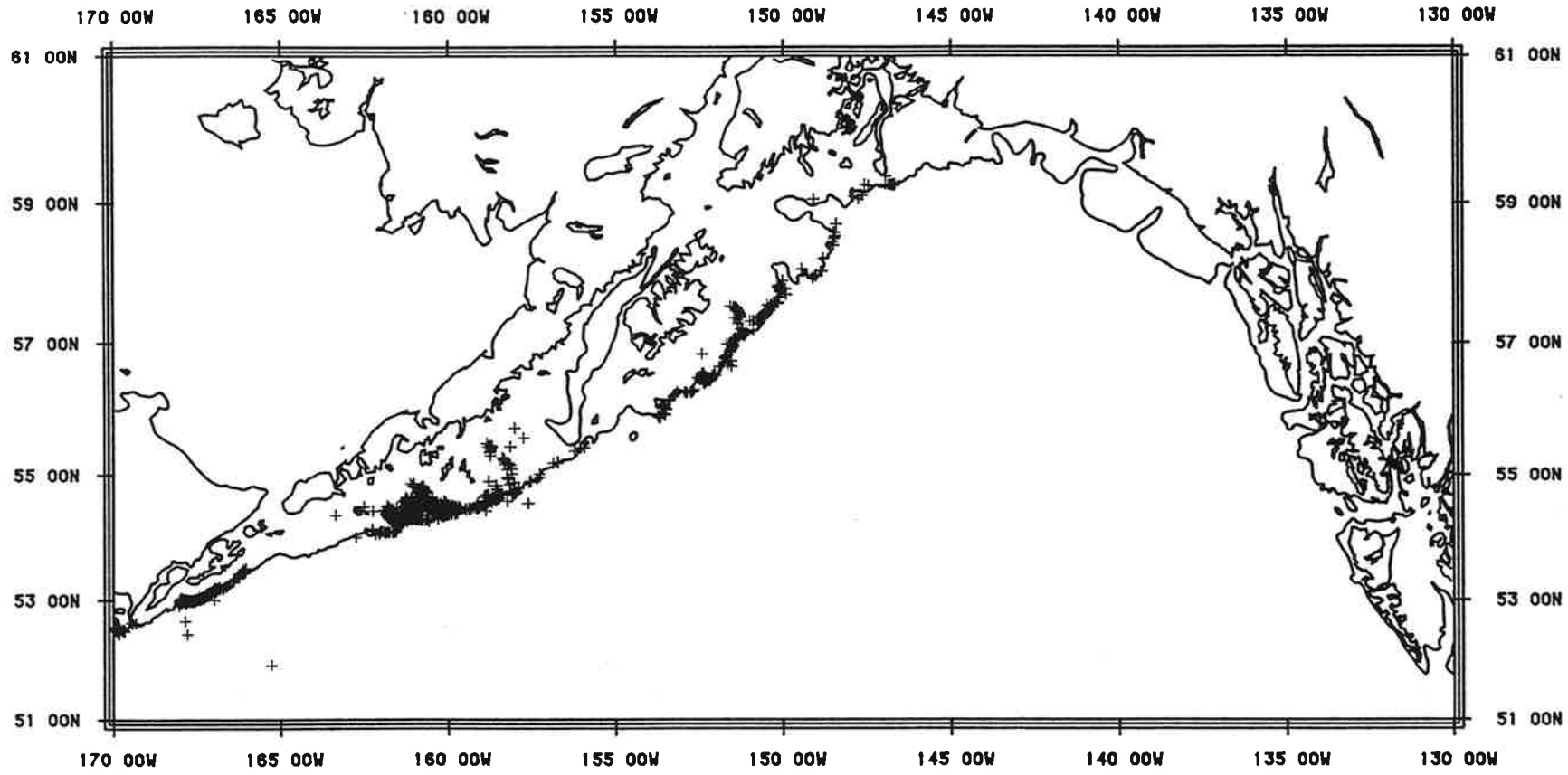
MAY-AUG 1981. FOREIGN & JV POLLOCK TRAWL LOCATIONS



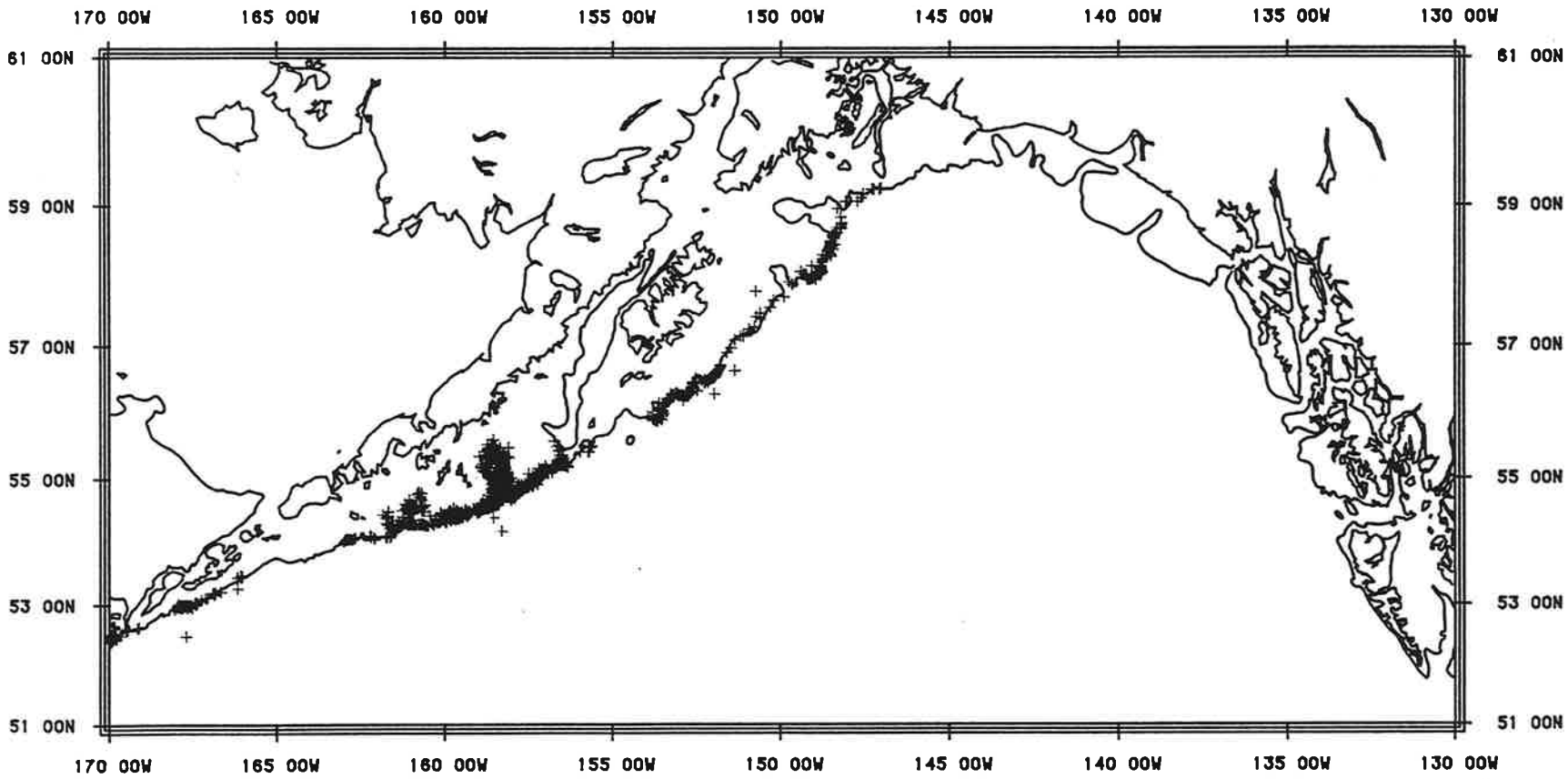
SEP-DEC 1981. FOREIGN & JV POLLOCK TRAWL LOCATIONS



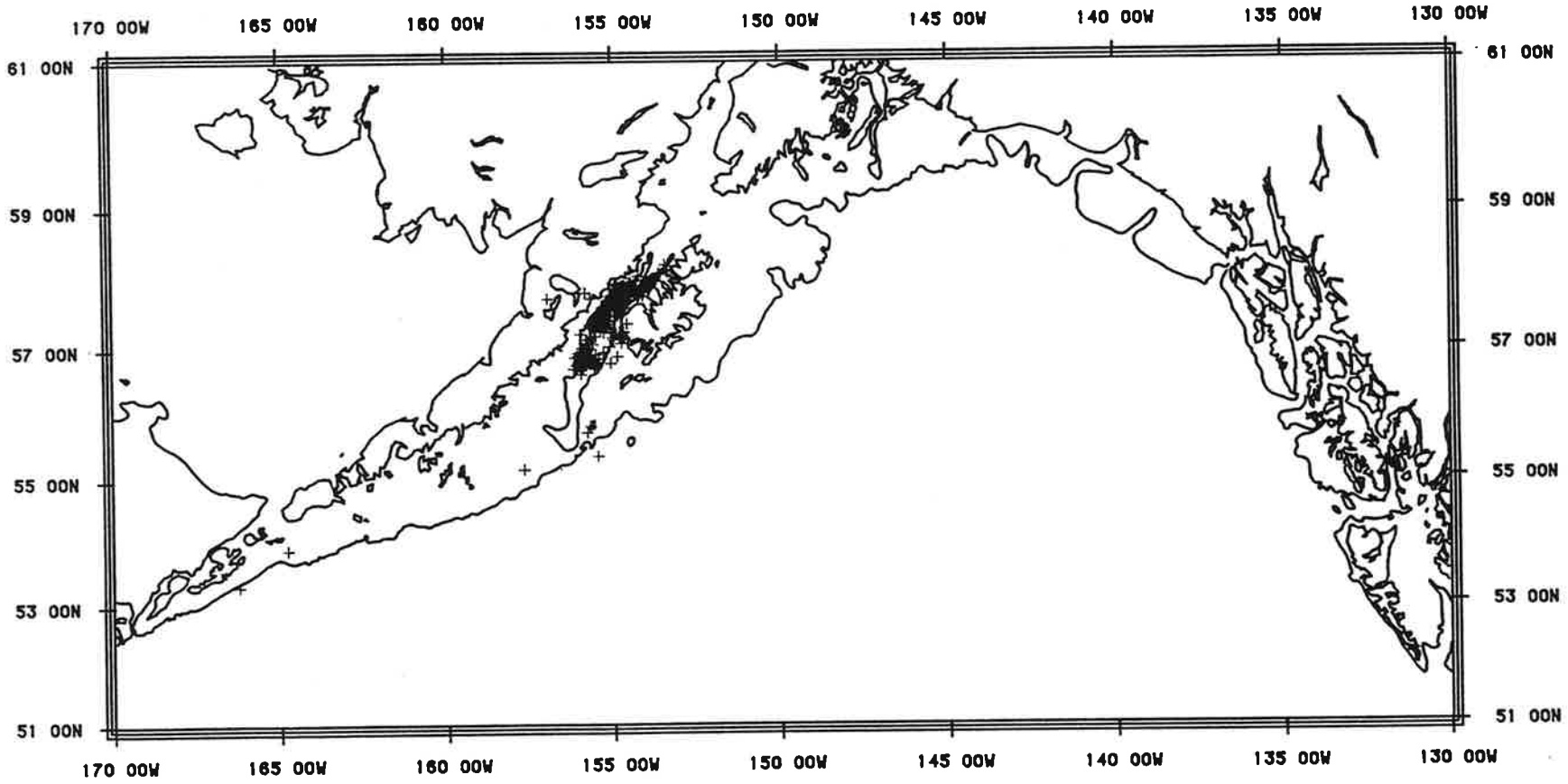
JAN-APR 1982. FOREIGN & JV POLLOCK TRAWL LOCATIONS



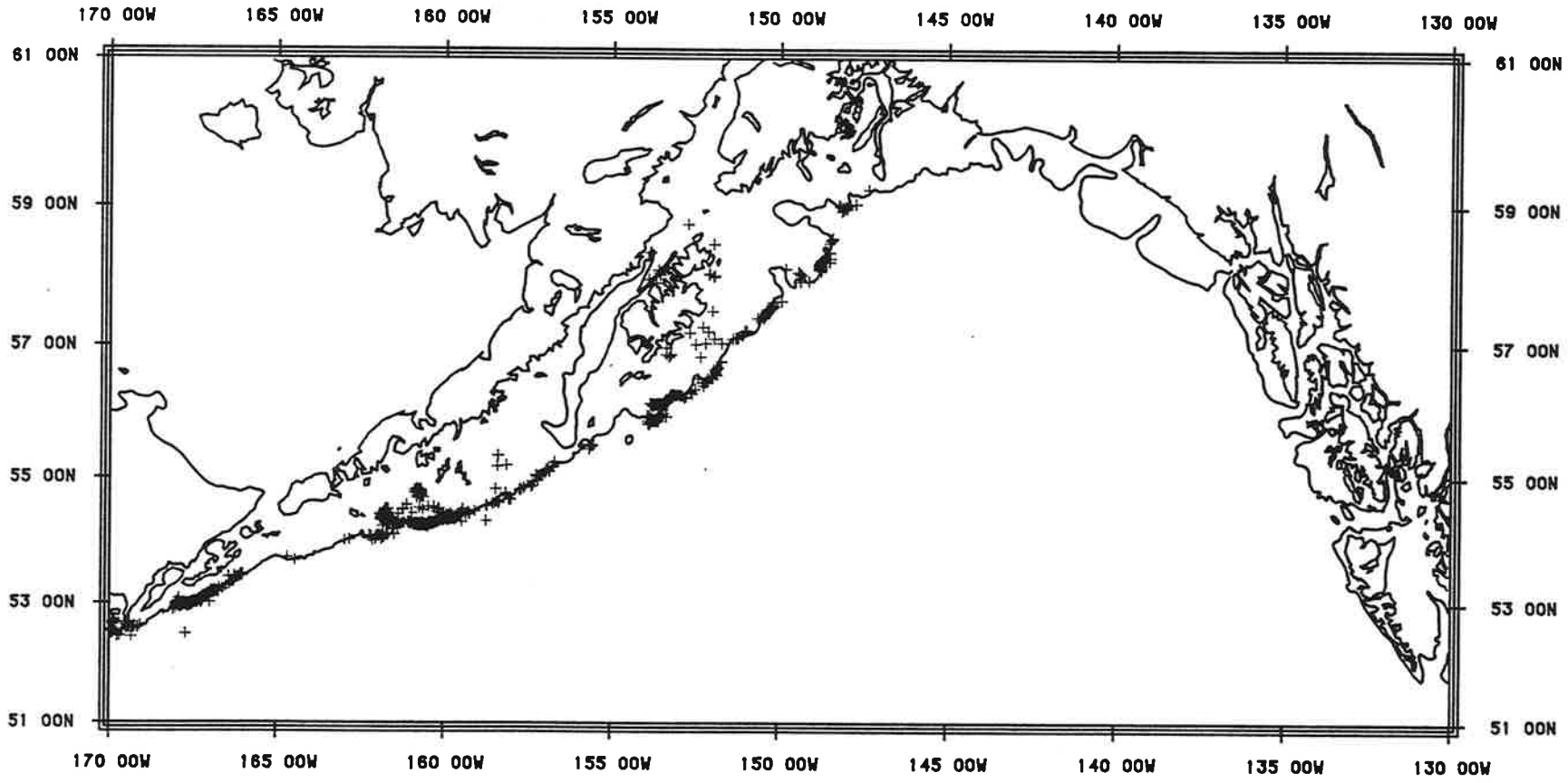
MAY-AUG 1982. FOREIGN & JV POLLOCK TRAWL LOCATIONS



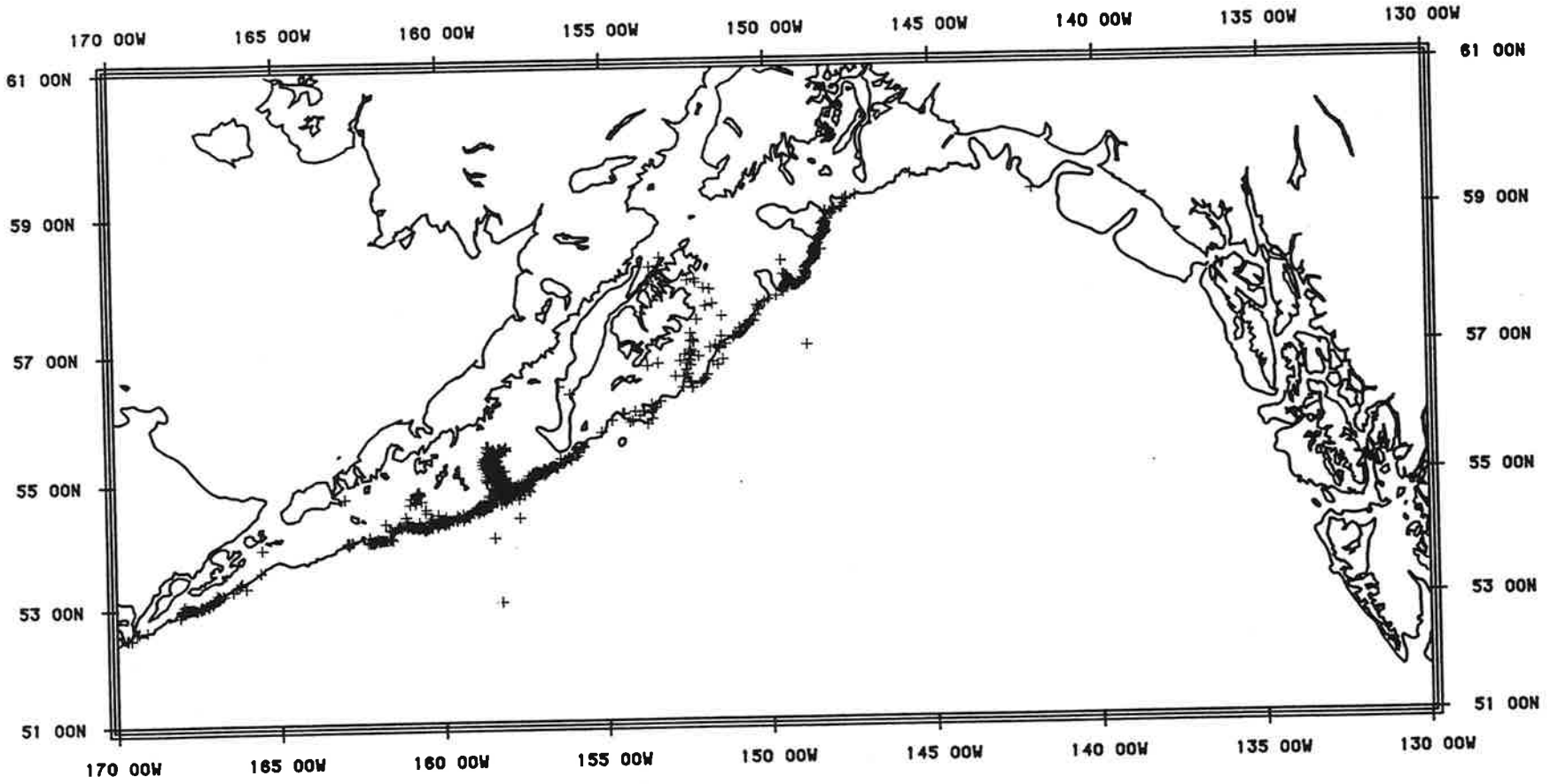
SEP-DEC 1982. FOREIGN & JV POLLOCK TRAWL LOCATIONS



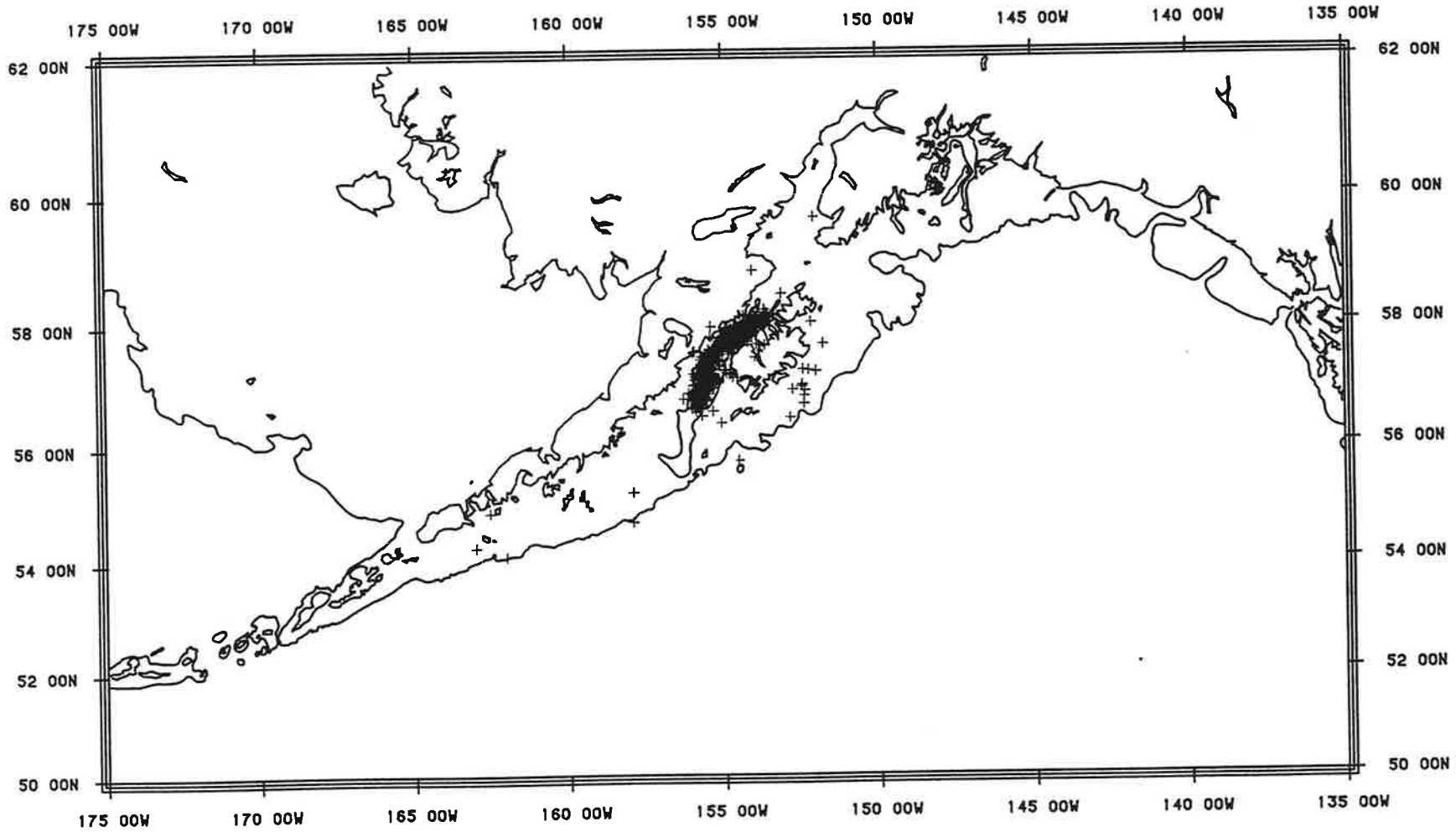
JAN-APR 1983. FOREIGN & JV POLLOCK TRAWL LOCATIONS



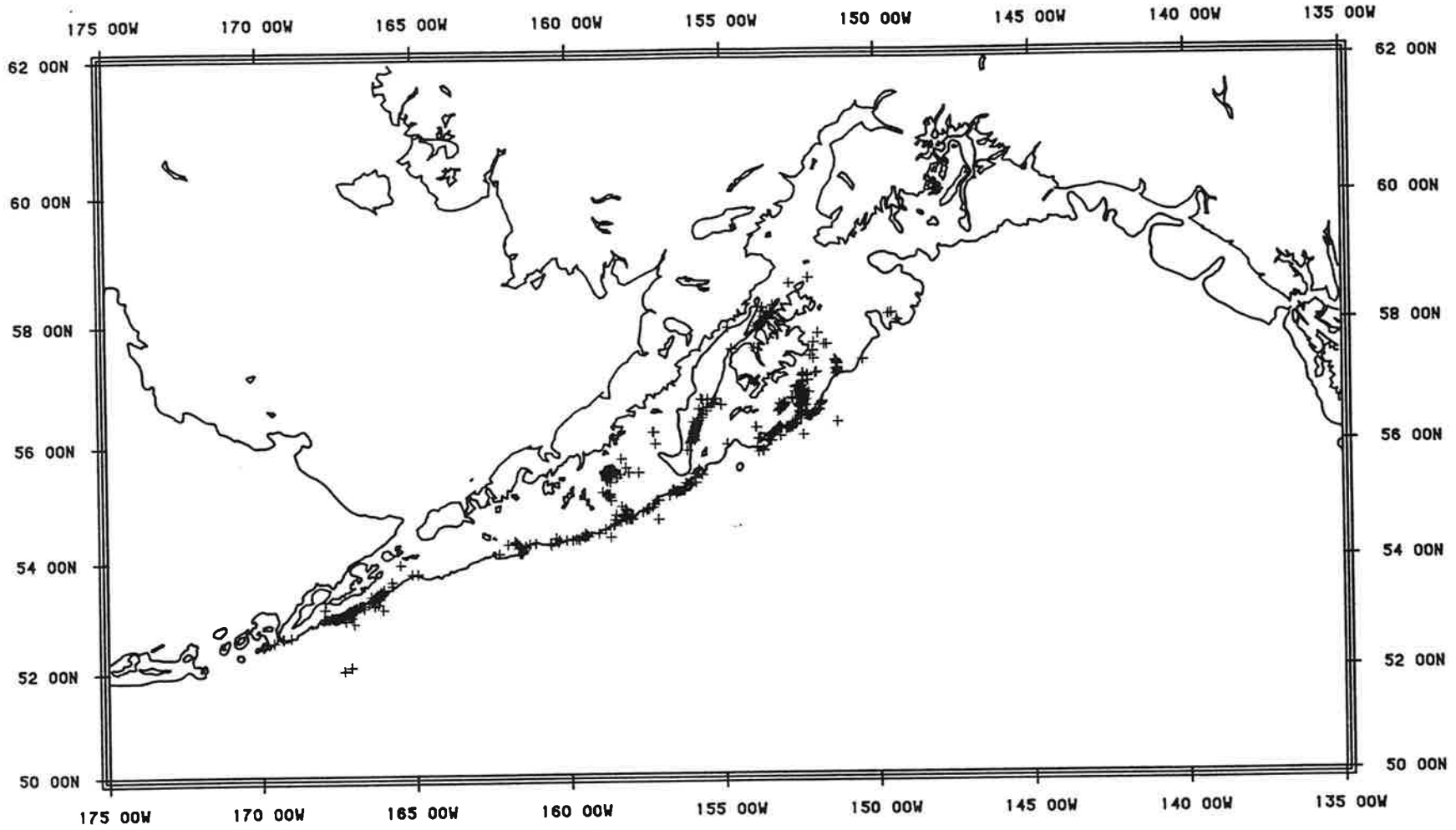
MAY-AUG 1983. FOREIGN & JV POLLOCK TRAWL LOCATIONS



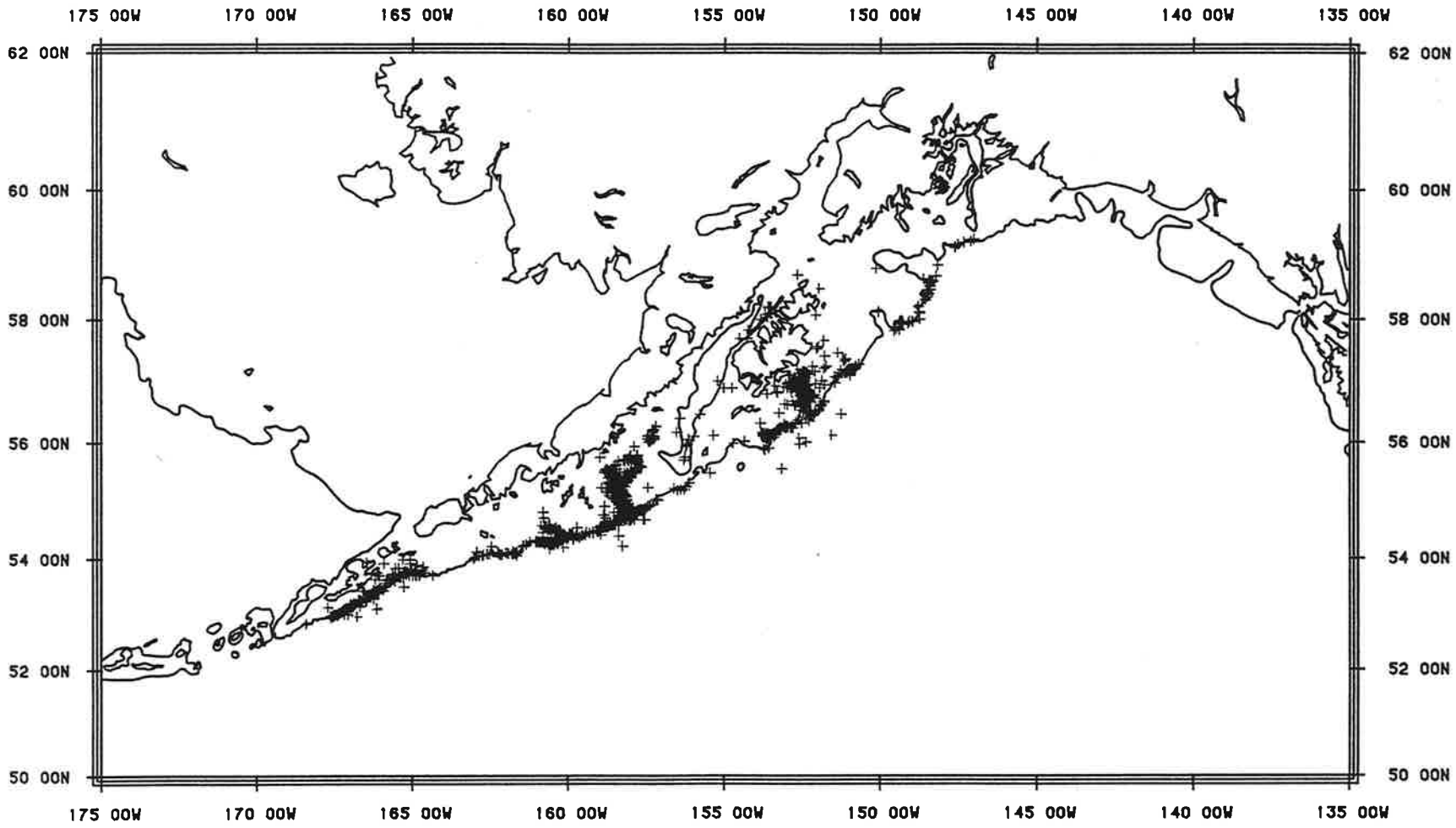
SEP-DEC 1983. FOREIGN & JV POLLOCK TRAWL LOCATIONS



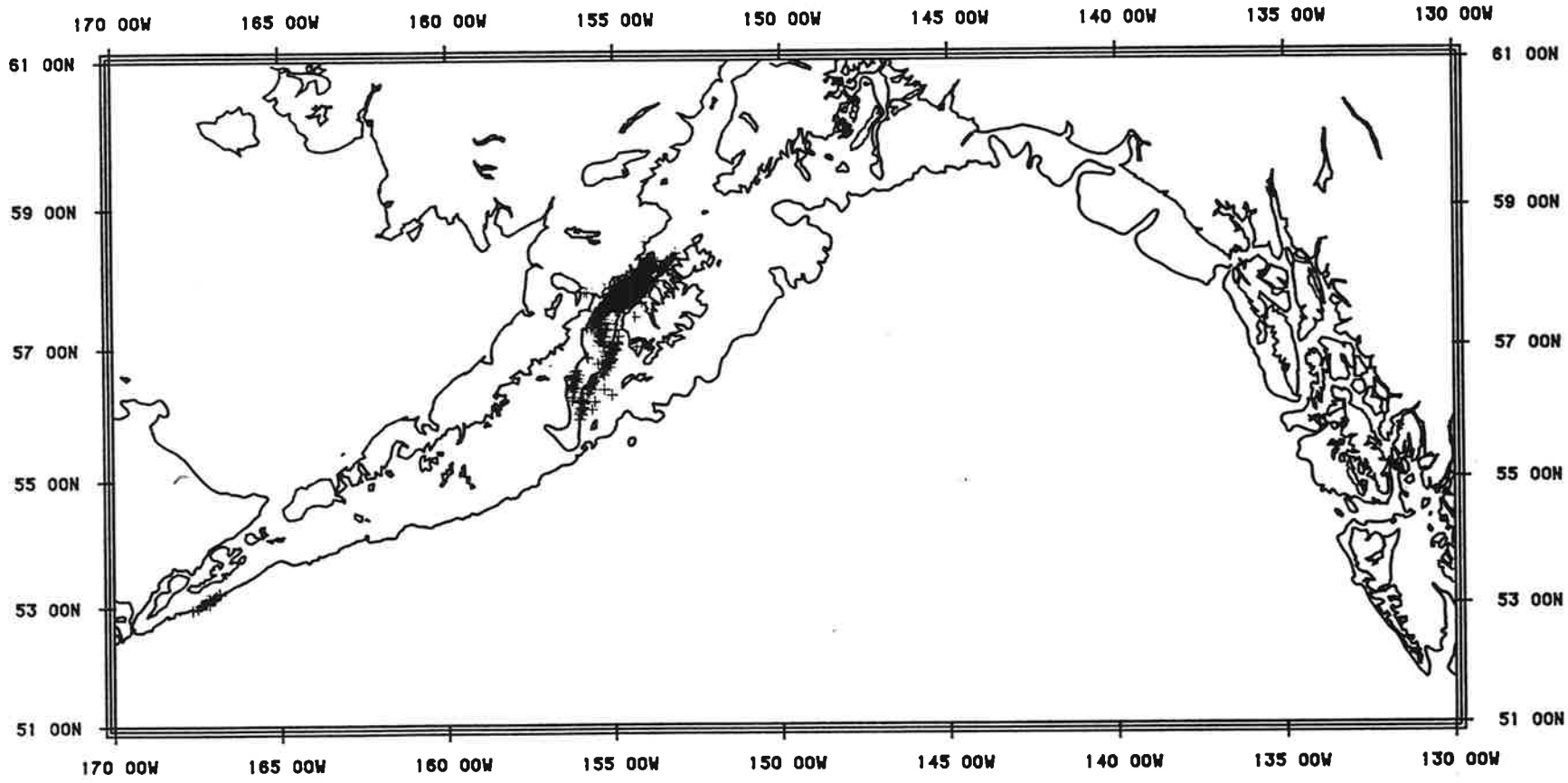
JAN-APR 1984. GOA POLLOCK TRAWL LOCATIONS



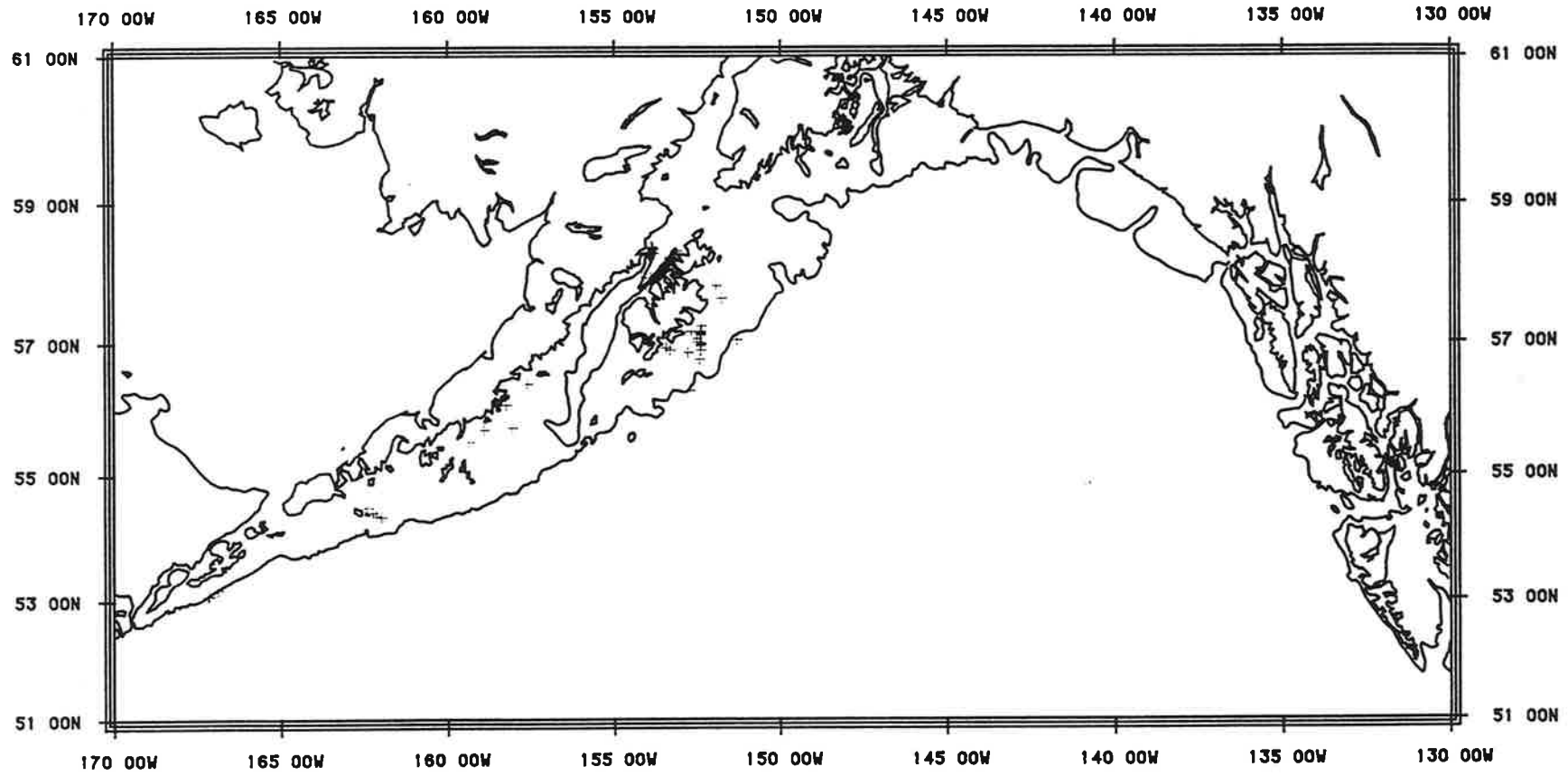
MAY-AUG 1984. GOA POLLOCK TRAWL LOCATIONS



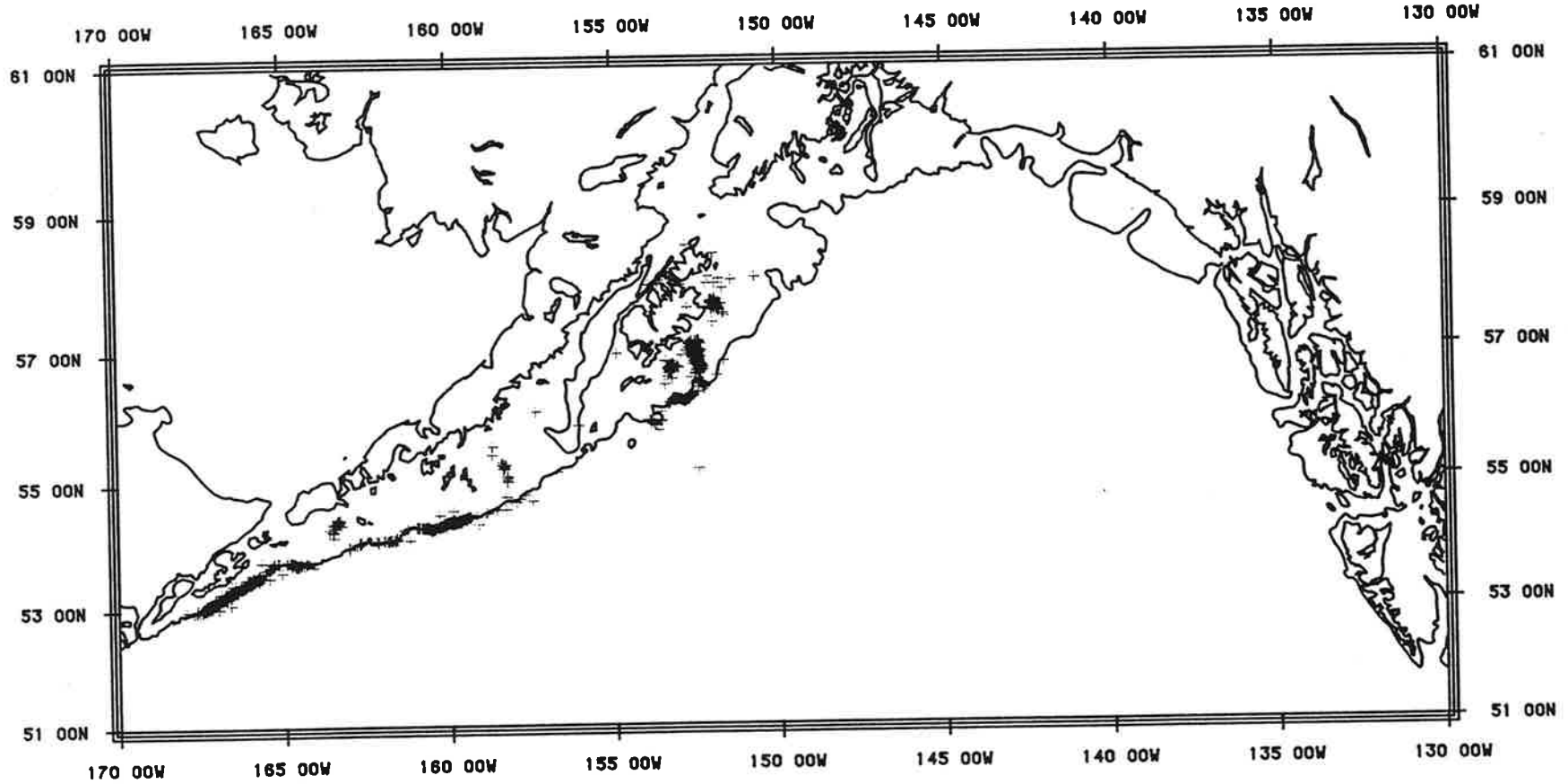
SEP-DEC 1984. GOA POLLOCK TRAWL LOCATIONS



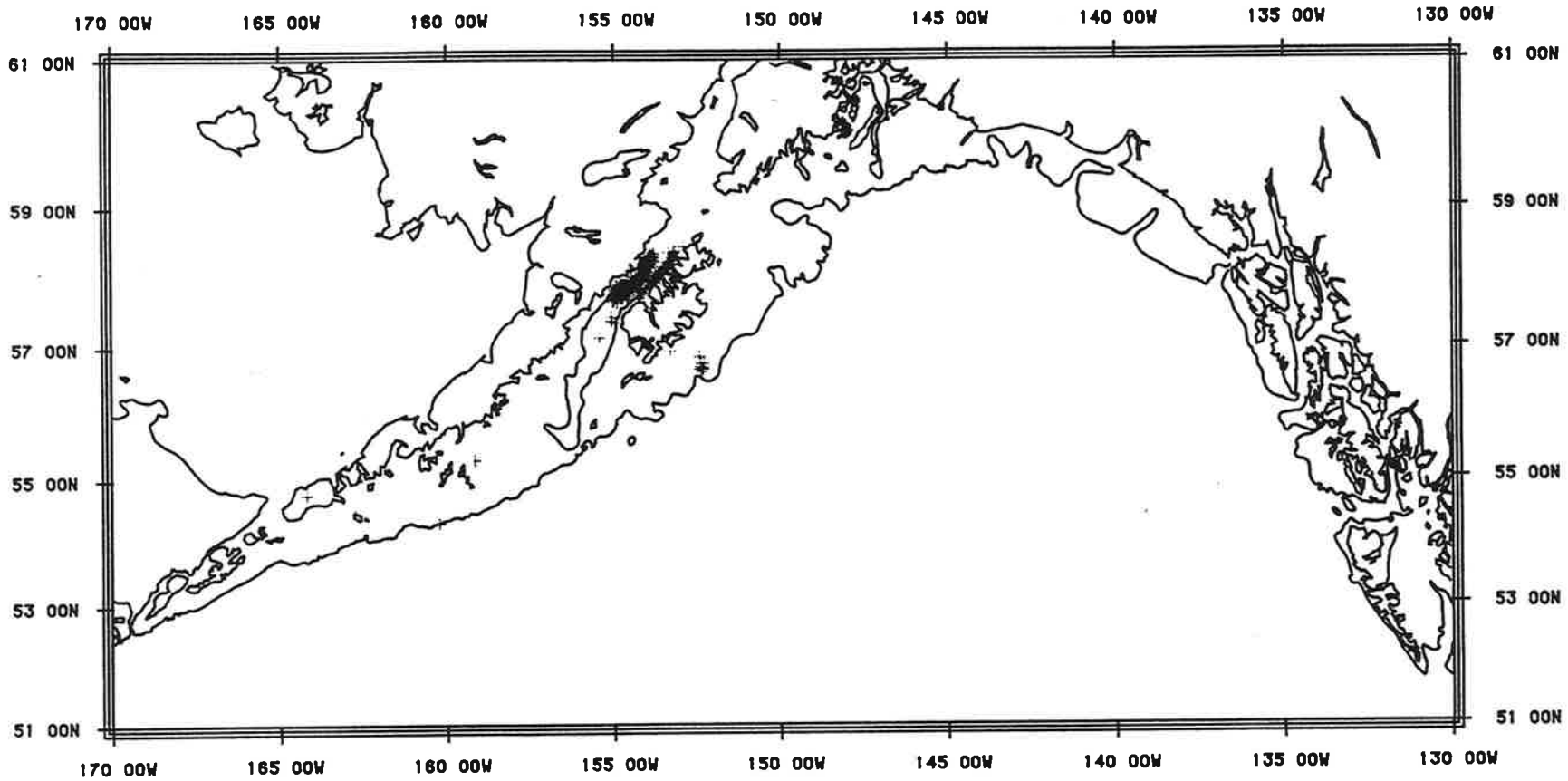
JAN-APR 1985. FOREIGN & JV POLLOCK TRAWL LOCATIONS



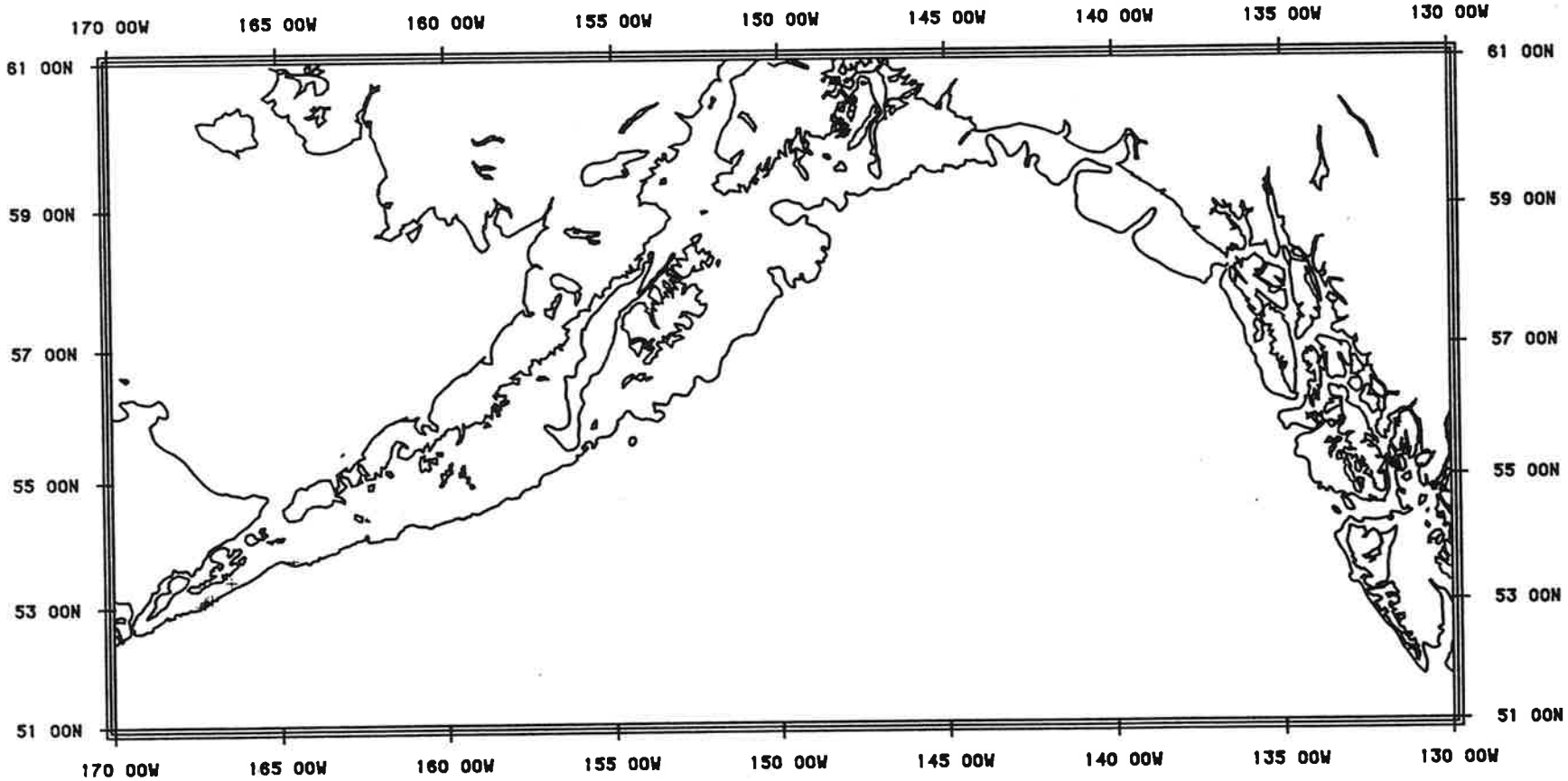
MAY-AUG 1985. FOREIGN & JV POLLOCK TRAWL LOCATIONS



SEP-DEC 1985. FOREIGN & JV POLLOCK TRAWL LOCATIONS



JAN-APR 1986. FOREIGN & JV POLLOCK TRAWL LOCATIONS



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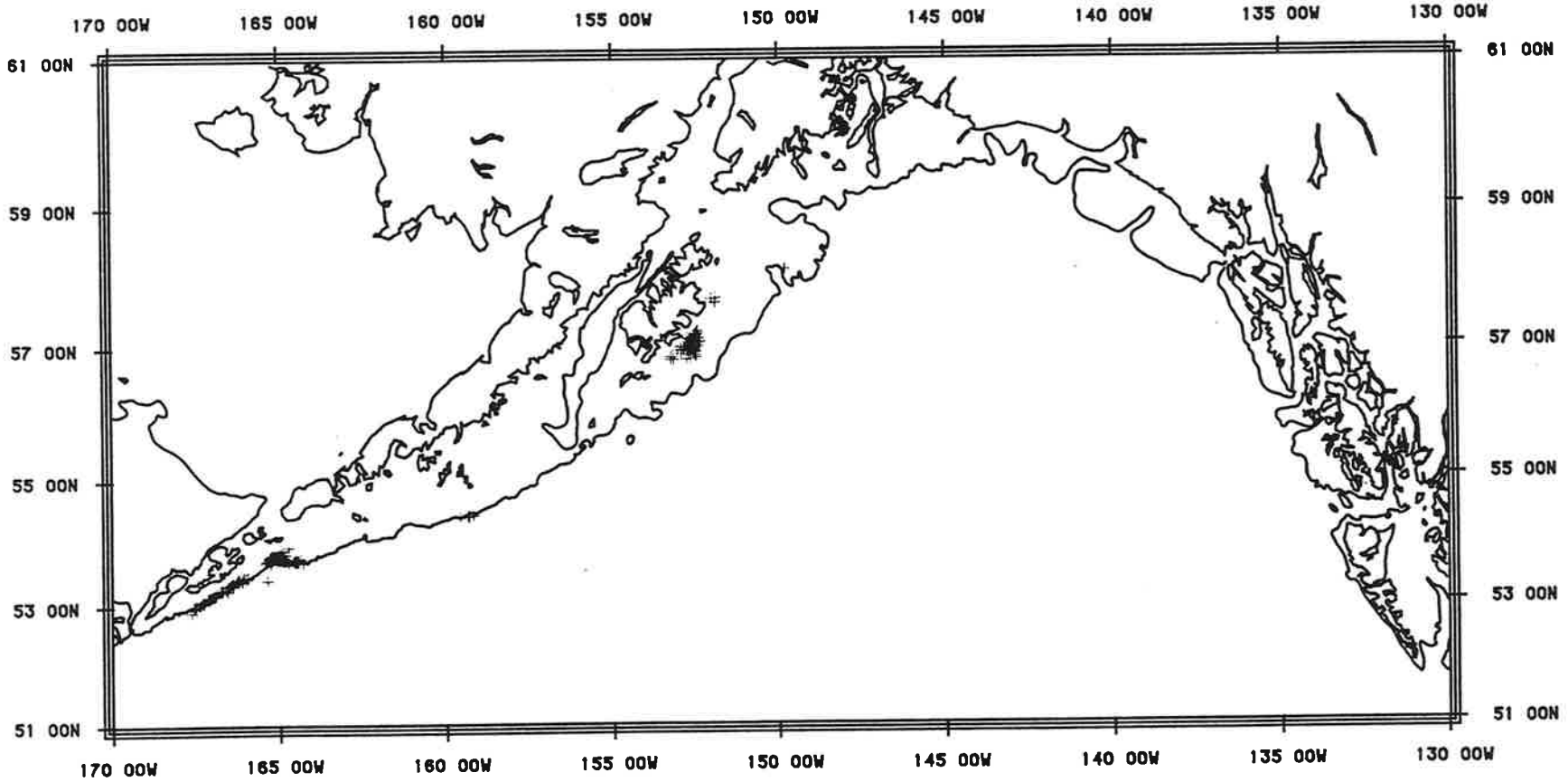
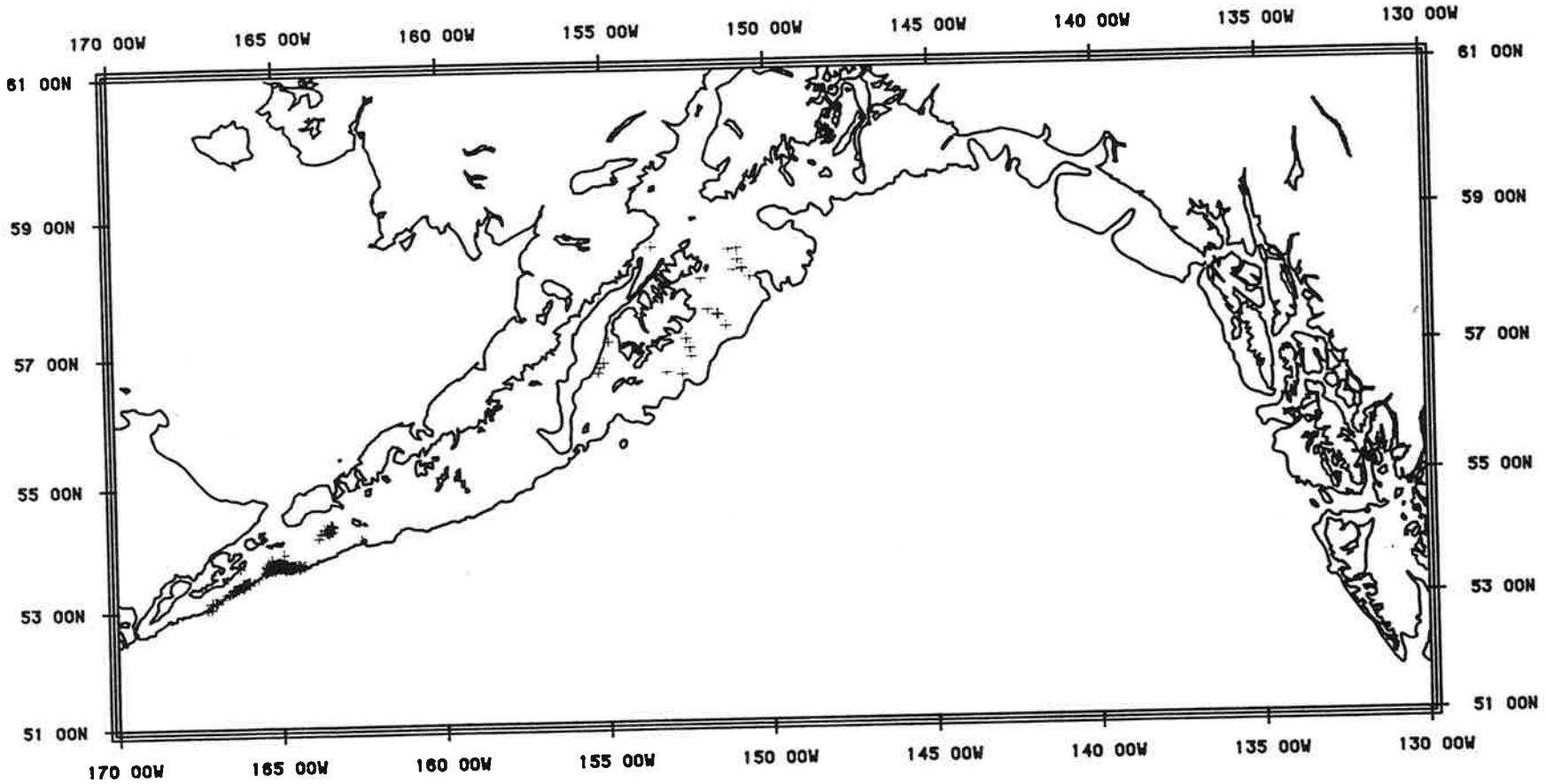
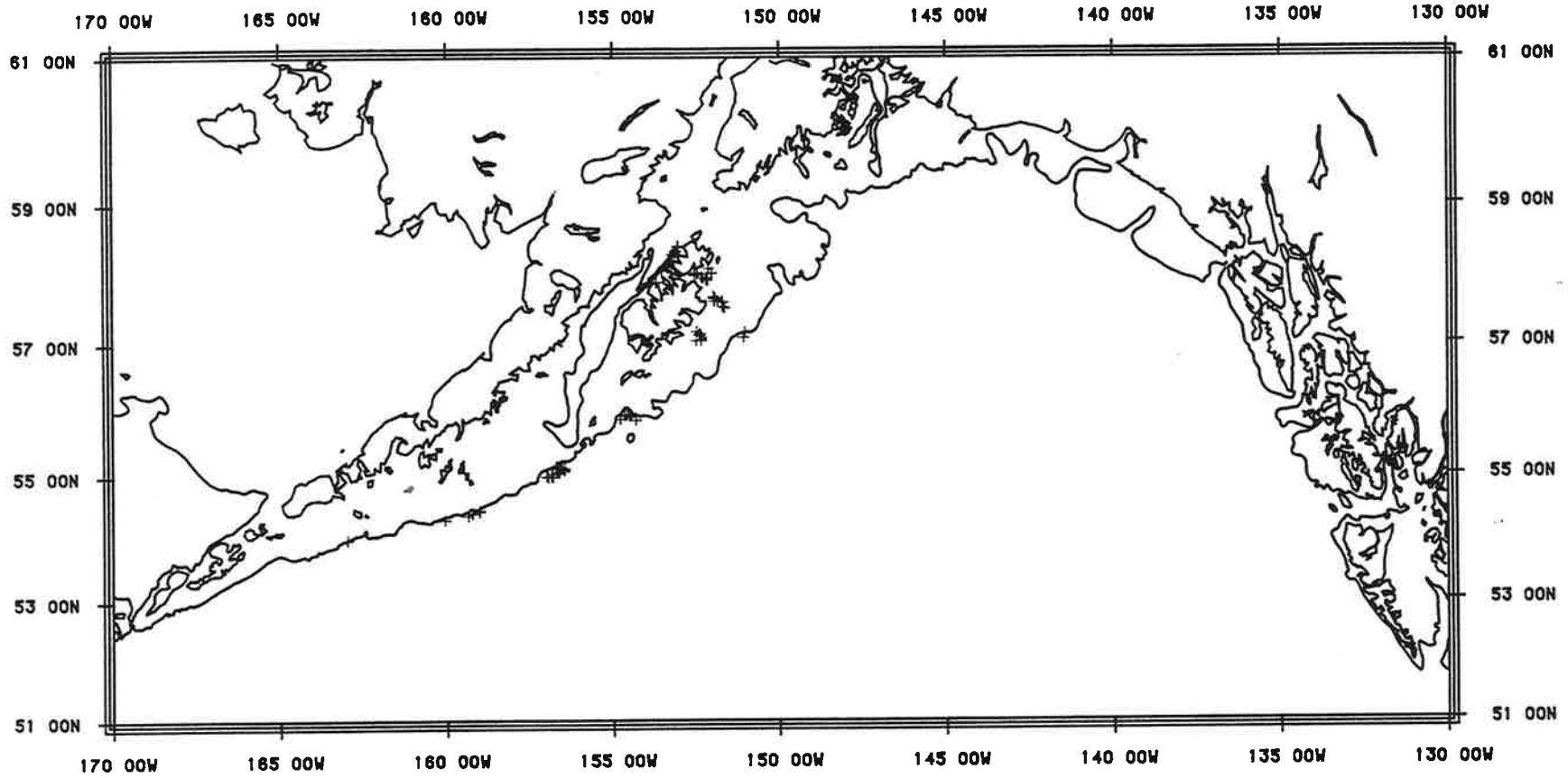


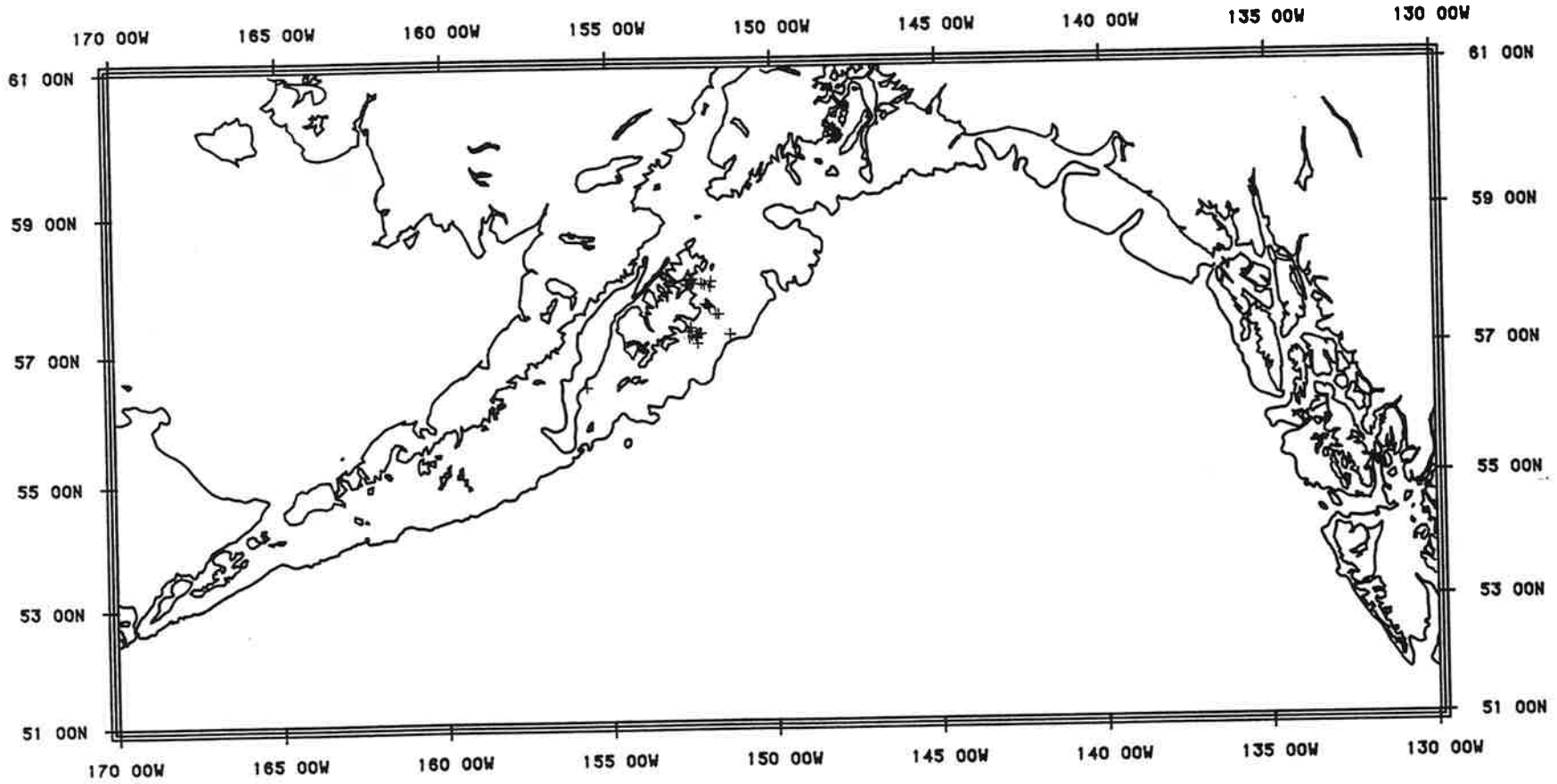
SEP-DEC 1986. FOREIGN & JV POLLOCK TRAWL LOCATIONS



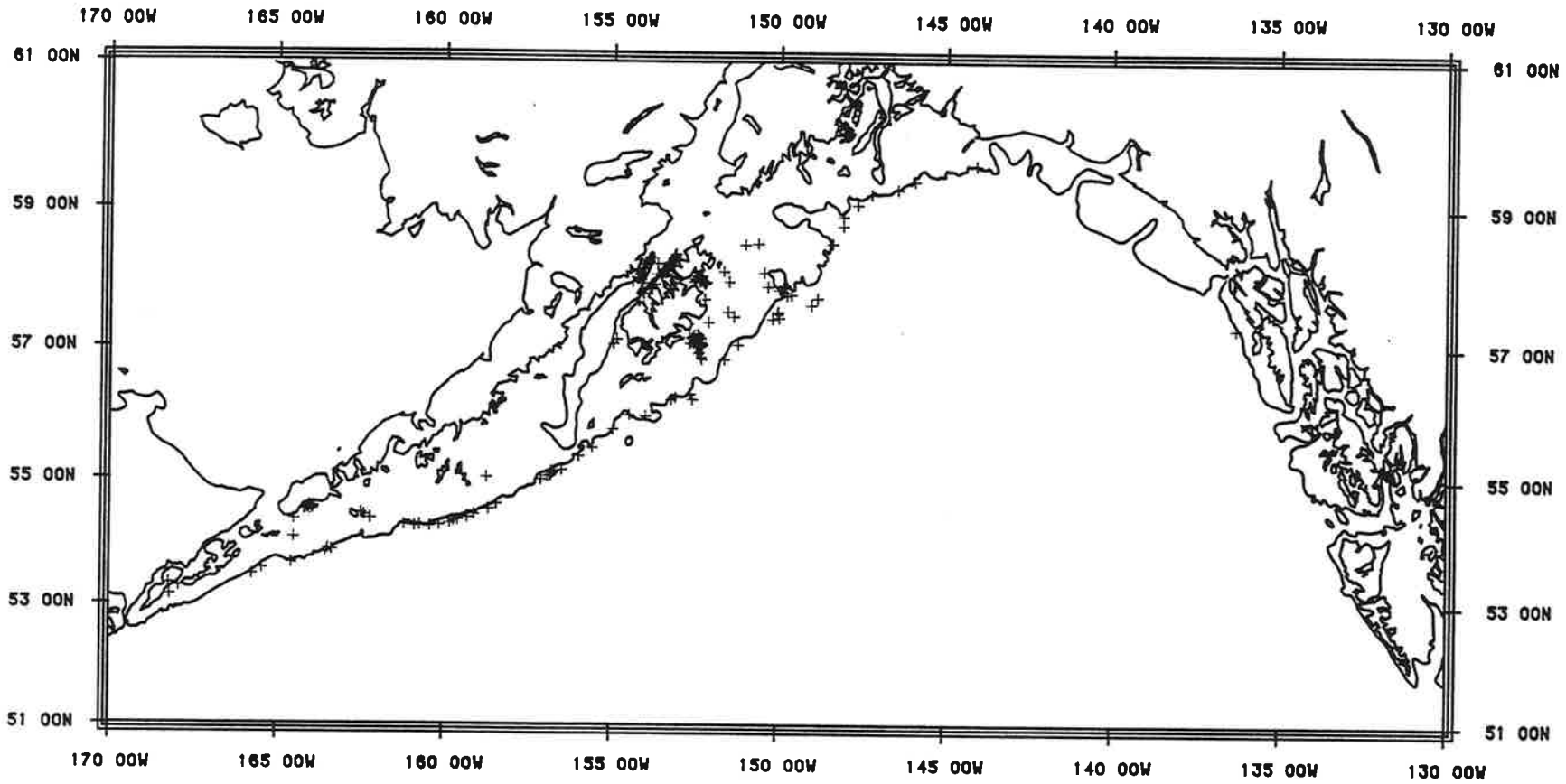
SEP-DEC 1987. FOREIGN & JV POLLOCK TRAWL LOCATIONS



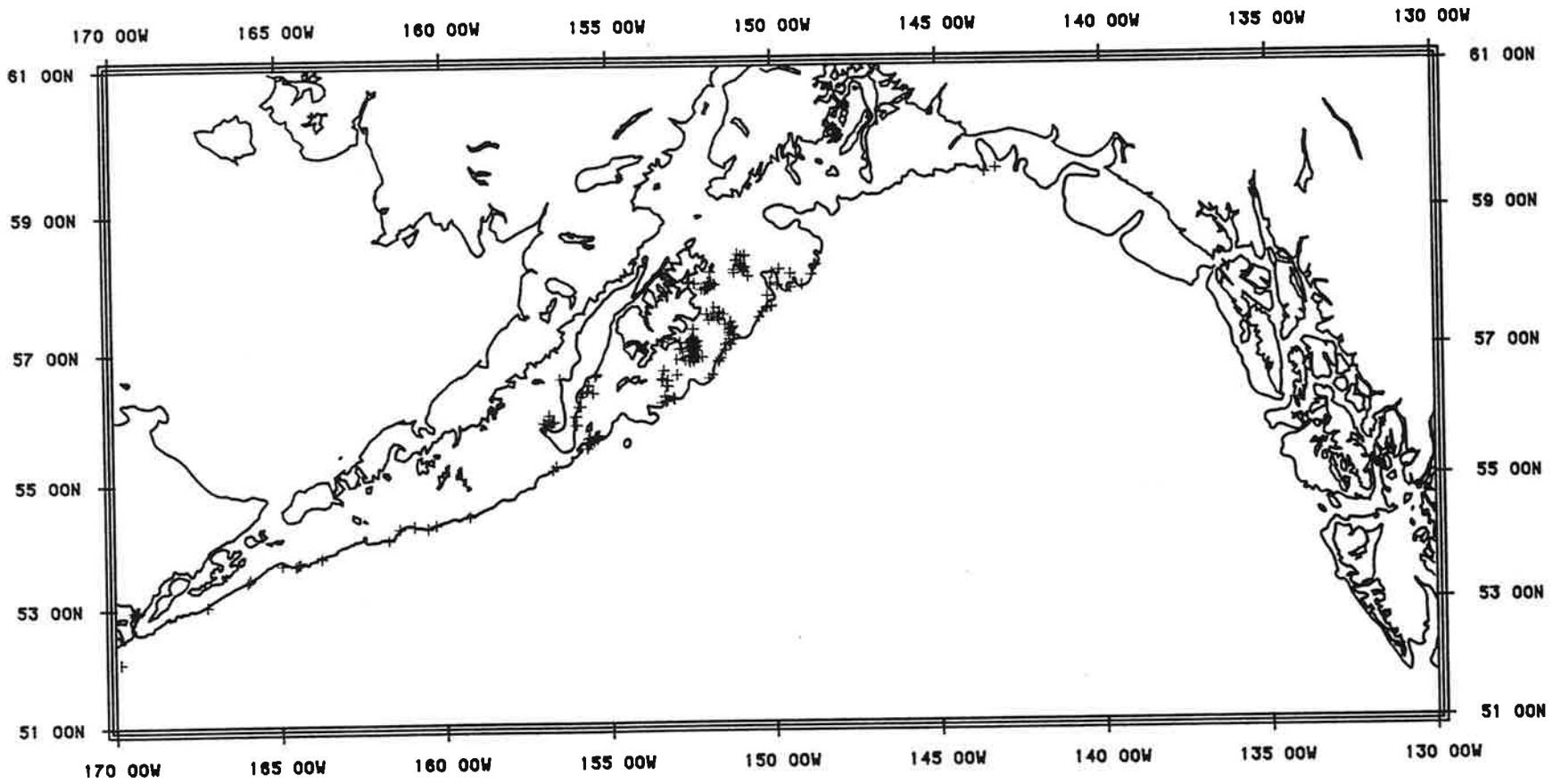
JAN-APR 1989. DOMESTIC POLLOCK TRAWL LOCATIONS



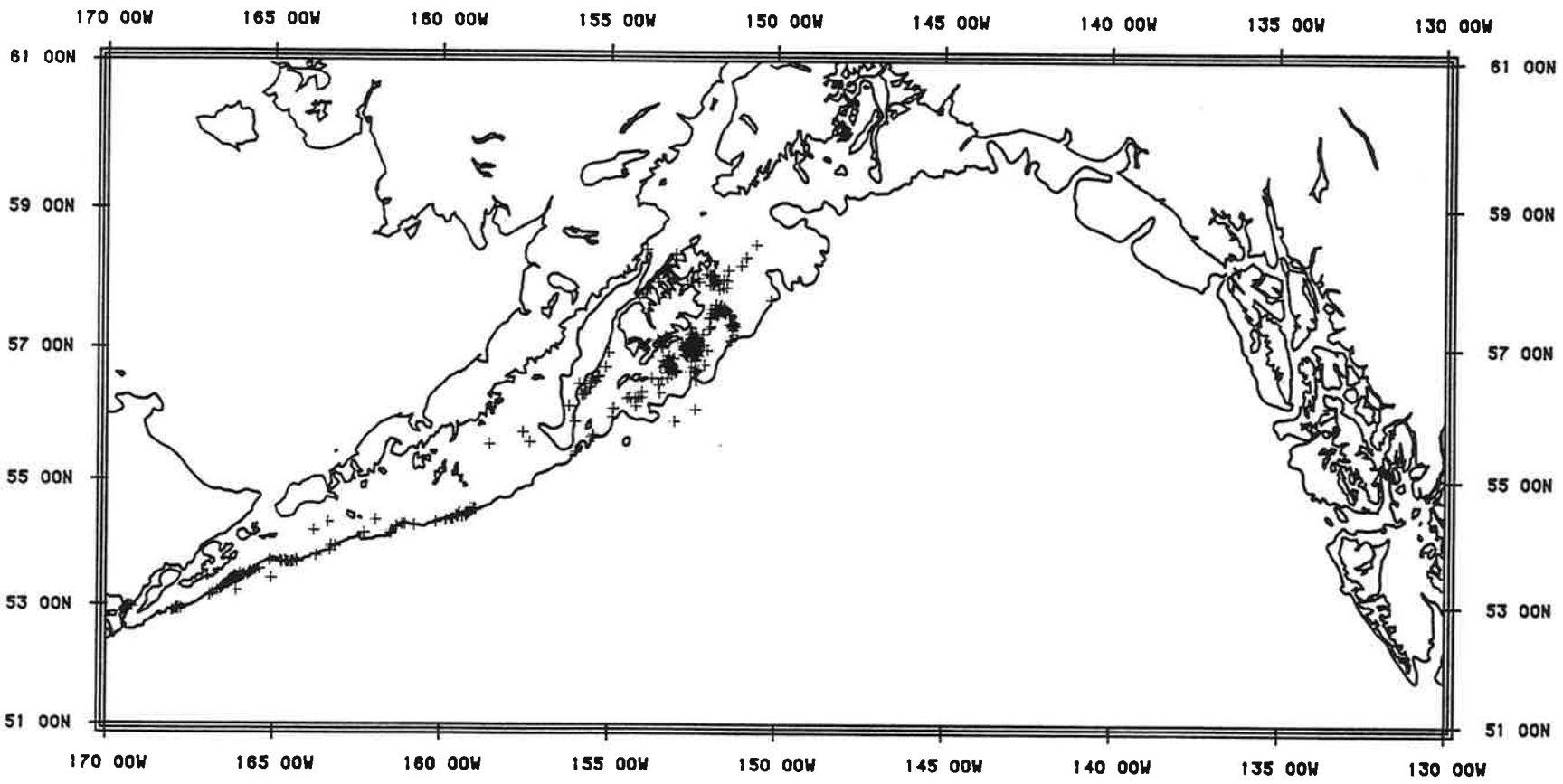
SEP-DEC 1989. DOMESTIC POLLOCK TRAWL LOCATIONS



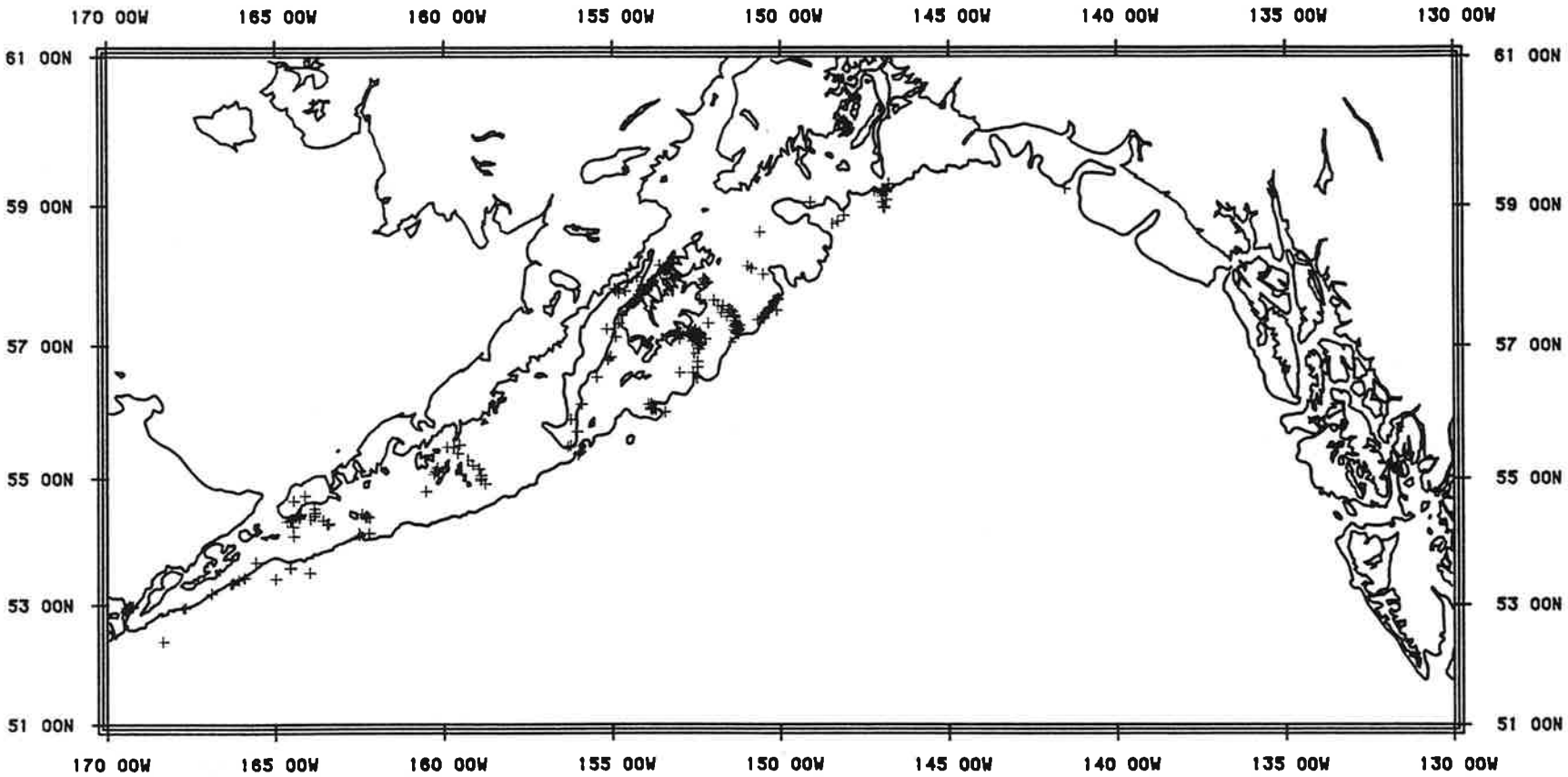
JAN-APR 1990. DOMESTIC POLLOCK TRAWL LOCATIONS



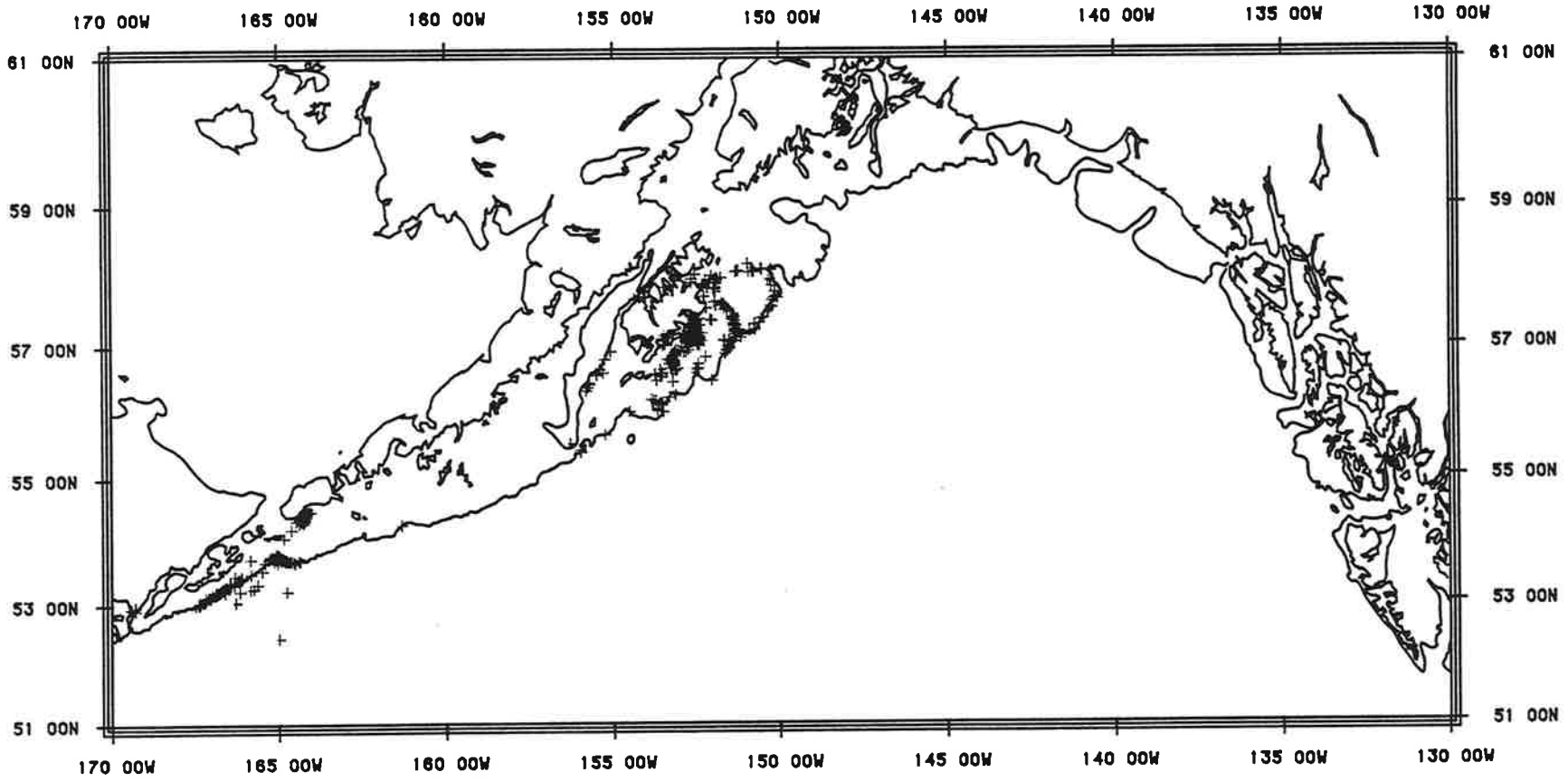
MAY-AUG 1990. DOMESTIC POLLOCK TRAWL LOCATIONS



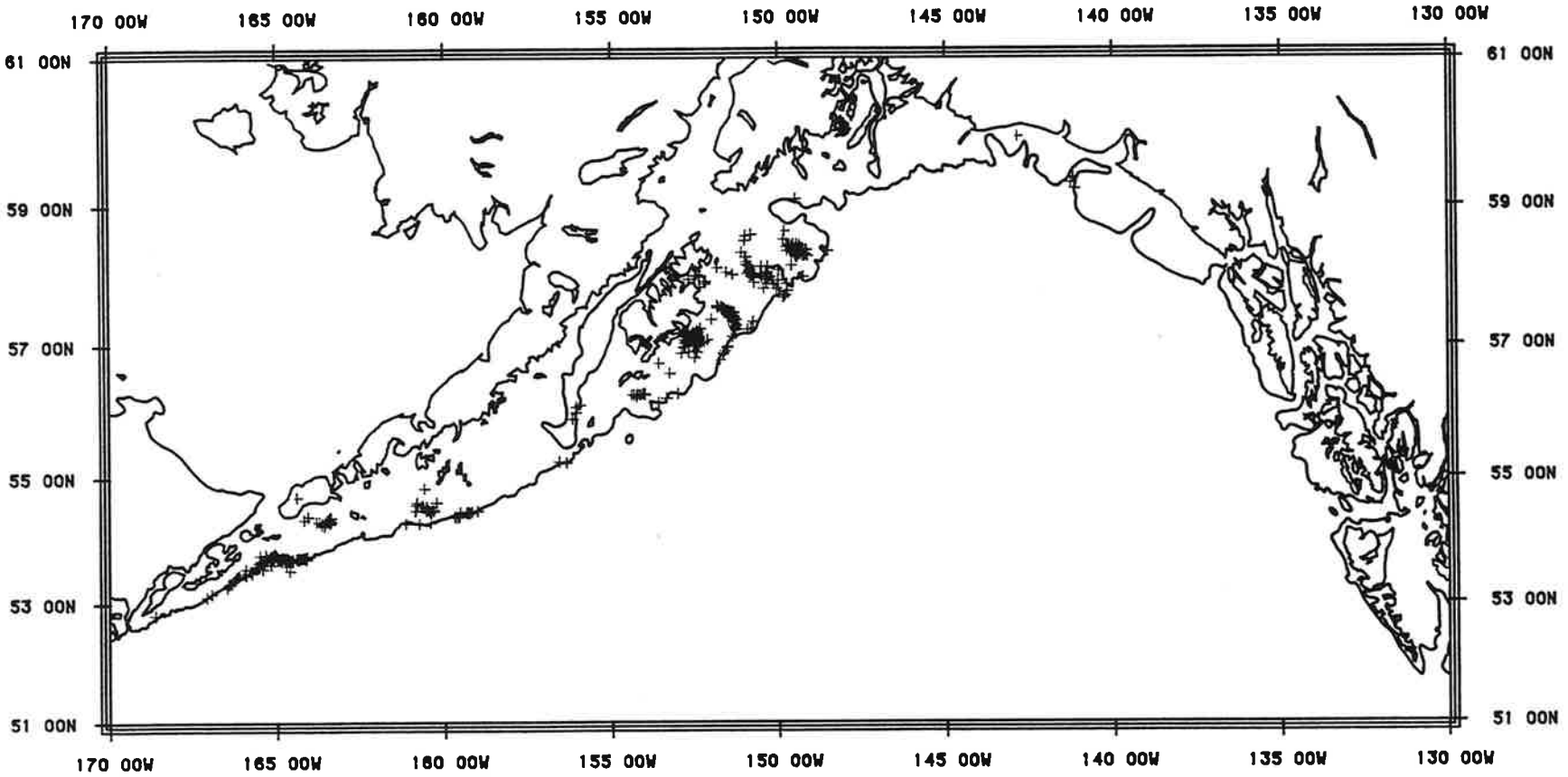
SEP-DEC 1990. DOMESTIC POLLOCK TRAWL LOCATIONS



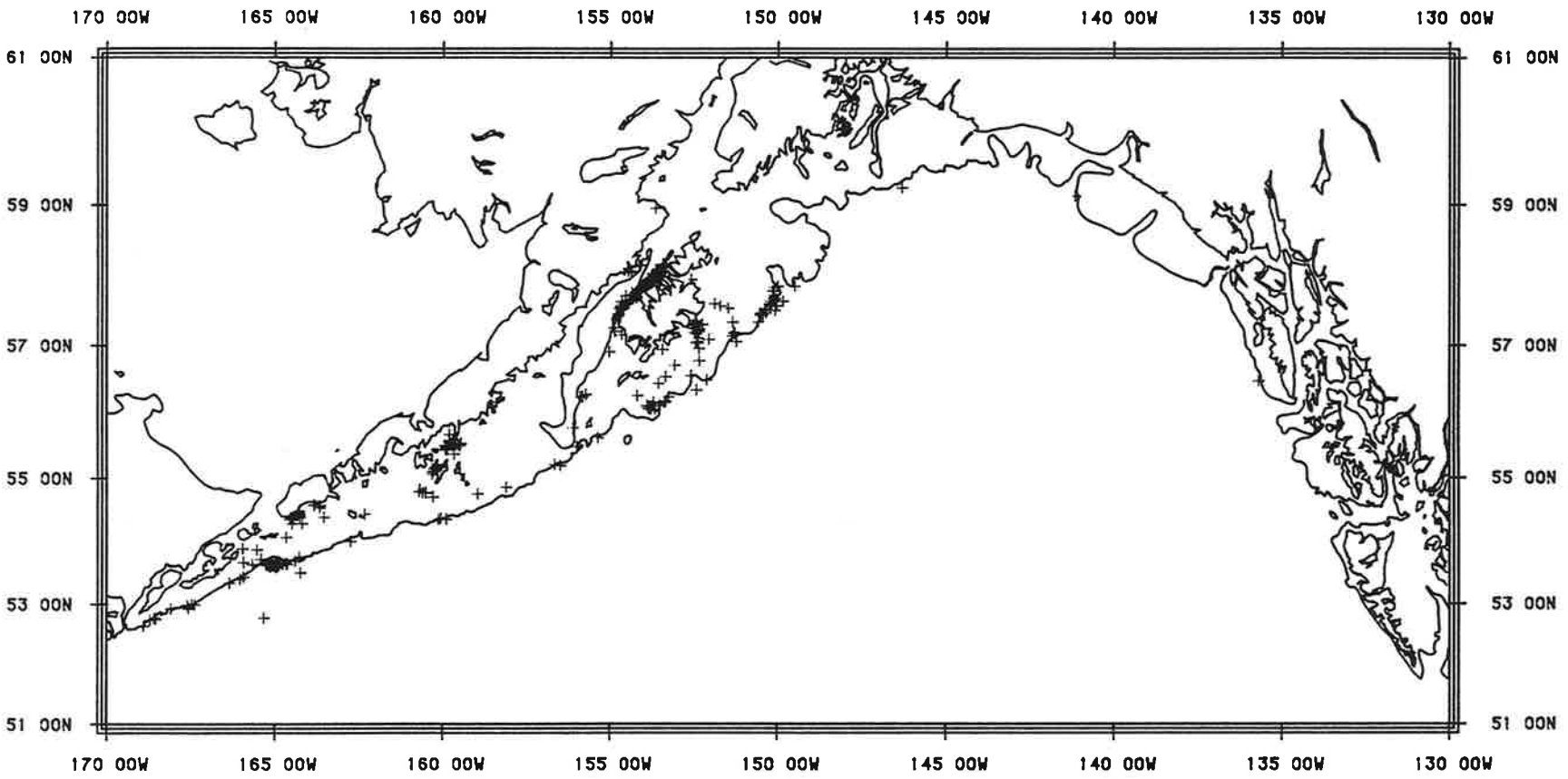
JAN-APR 1991. DOMESTIC POLLOCK TRAWL LOCATIONS



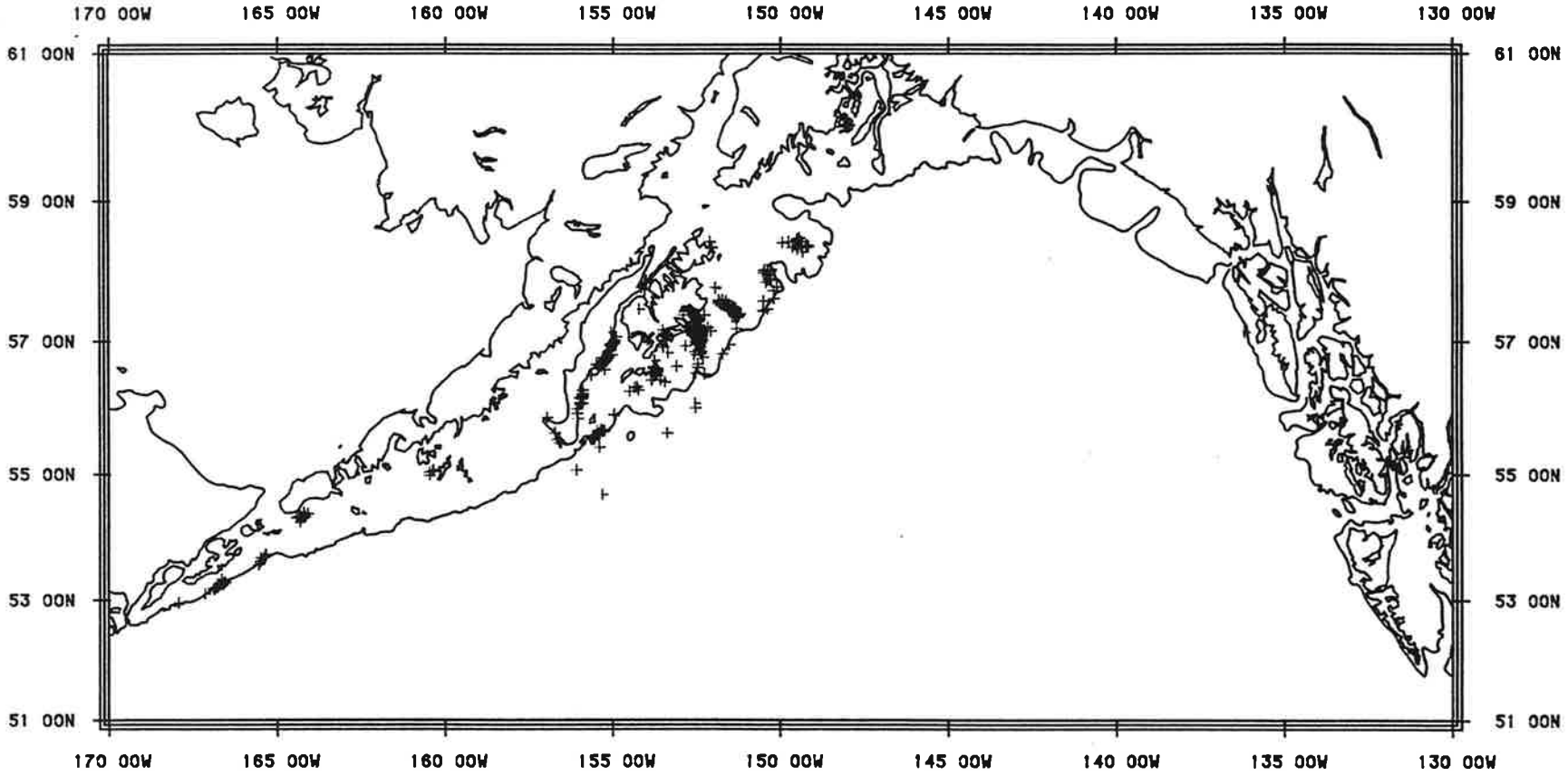
MAY-AUG 1991. DOMESTIC POLLOCK TRAWL LOCATIONS



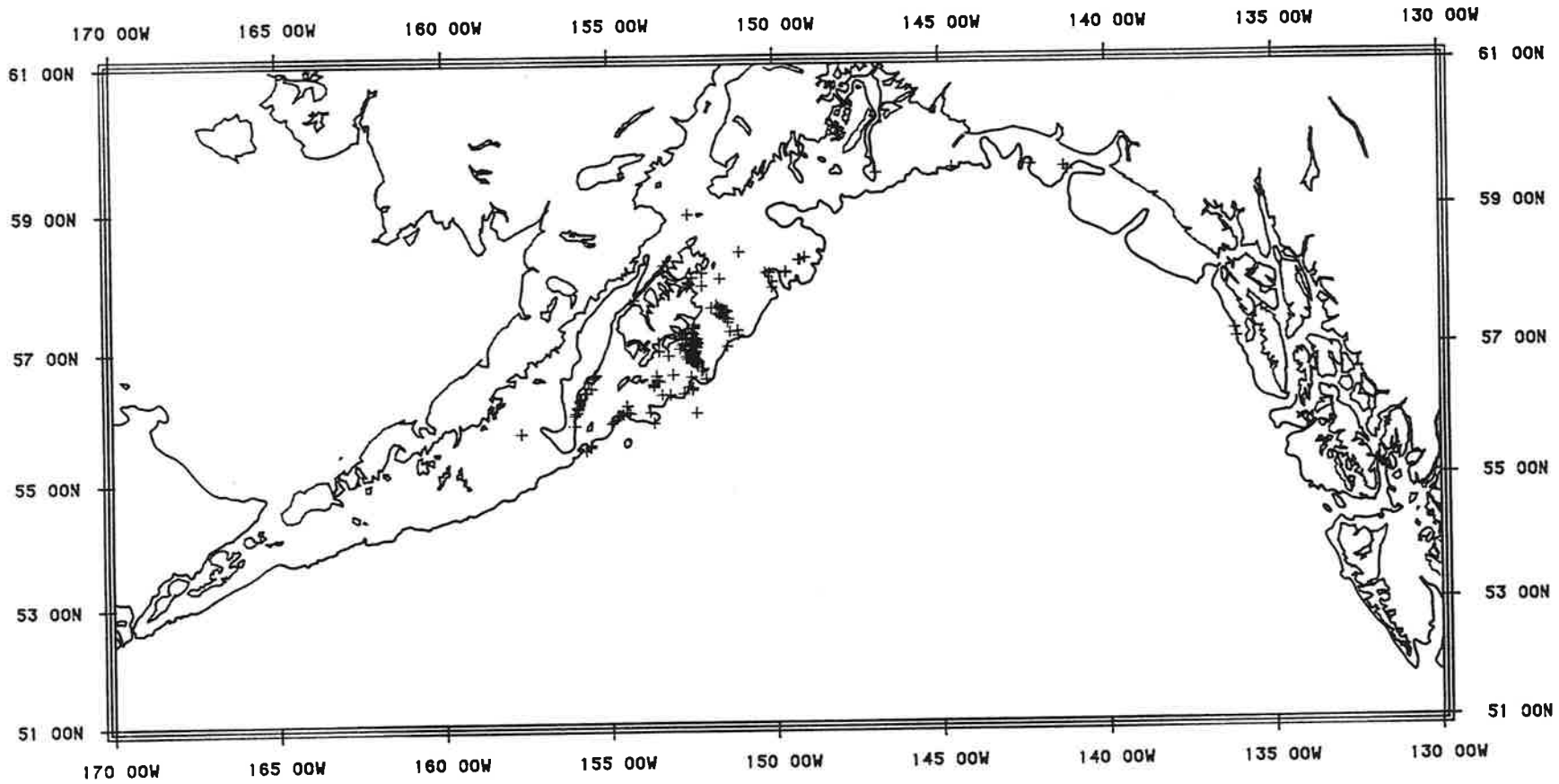
SEP-DEC 1991. DOMESTIC POLLOCK TRAWL LOCATIONS



JAN-APR 1992, DOMESTIC POLLOCK TRAWL LOCATIONS

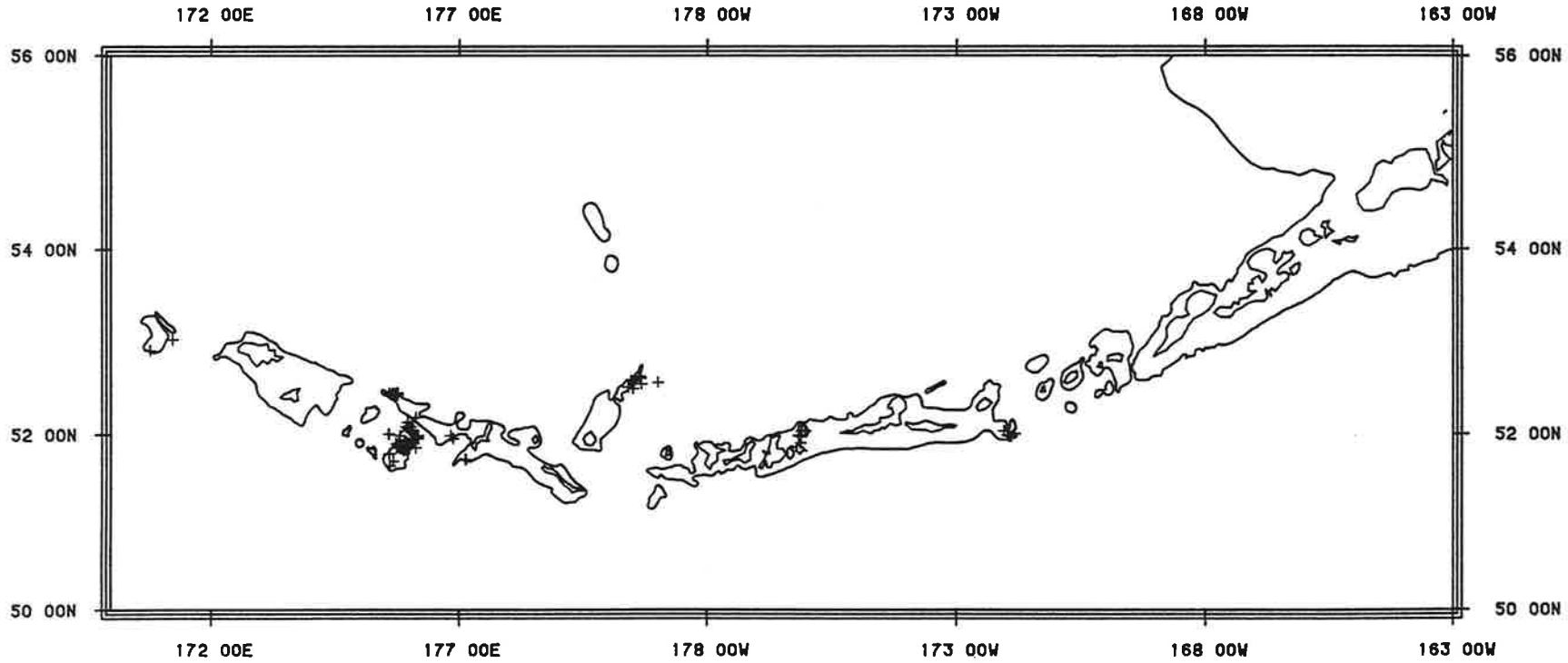


MAY-AUG 1992. DOMESTIC POLLOCK TRAWL LOCATIONS

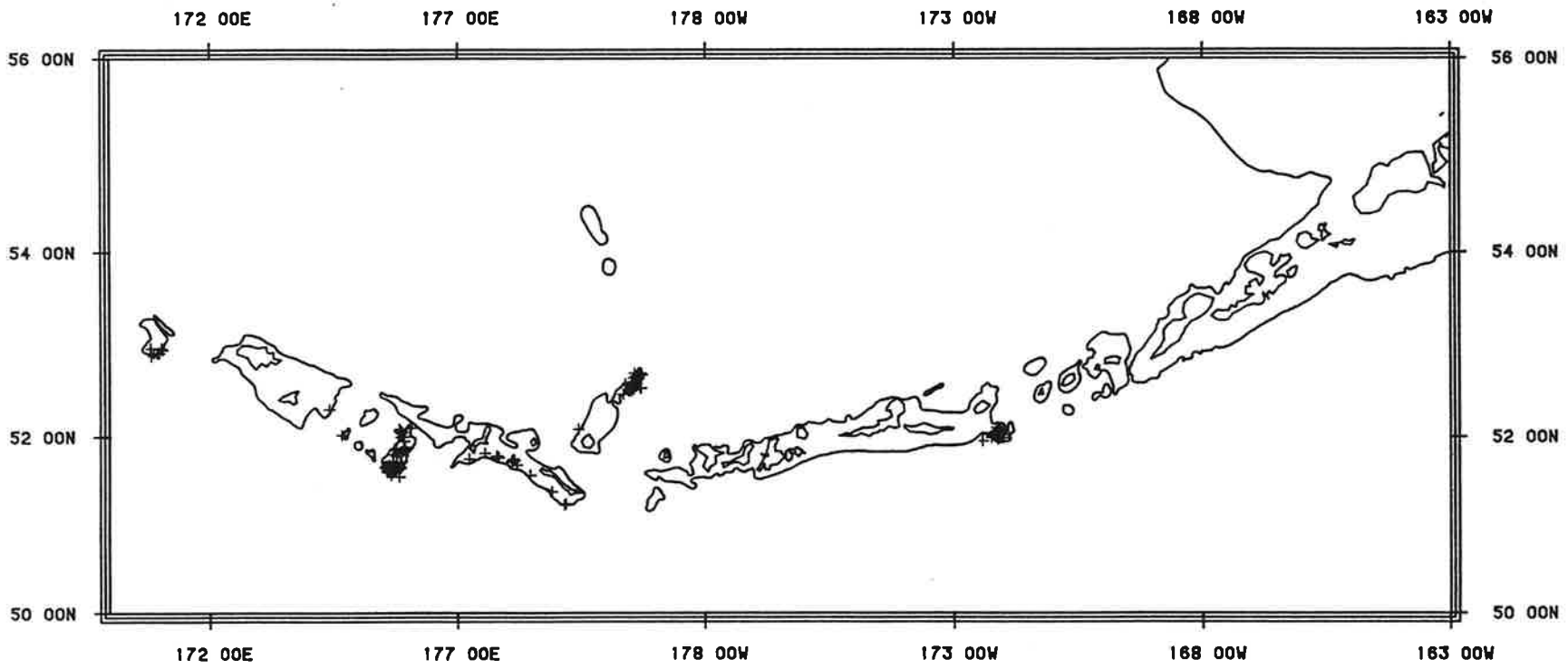


SEP-DEC 1992. DOMESTIC POLLOCK TRAWL LOCATIONS

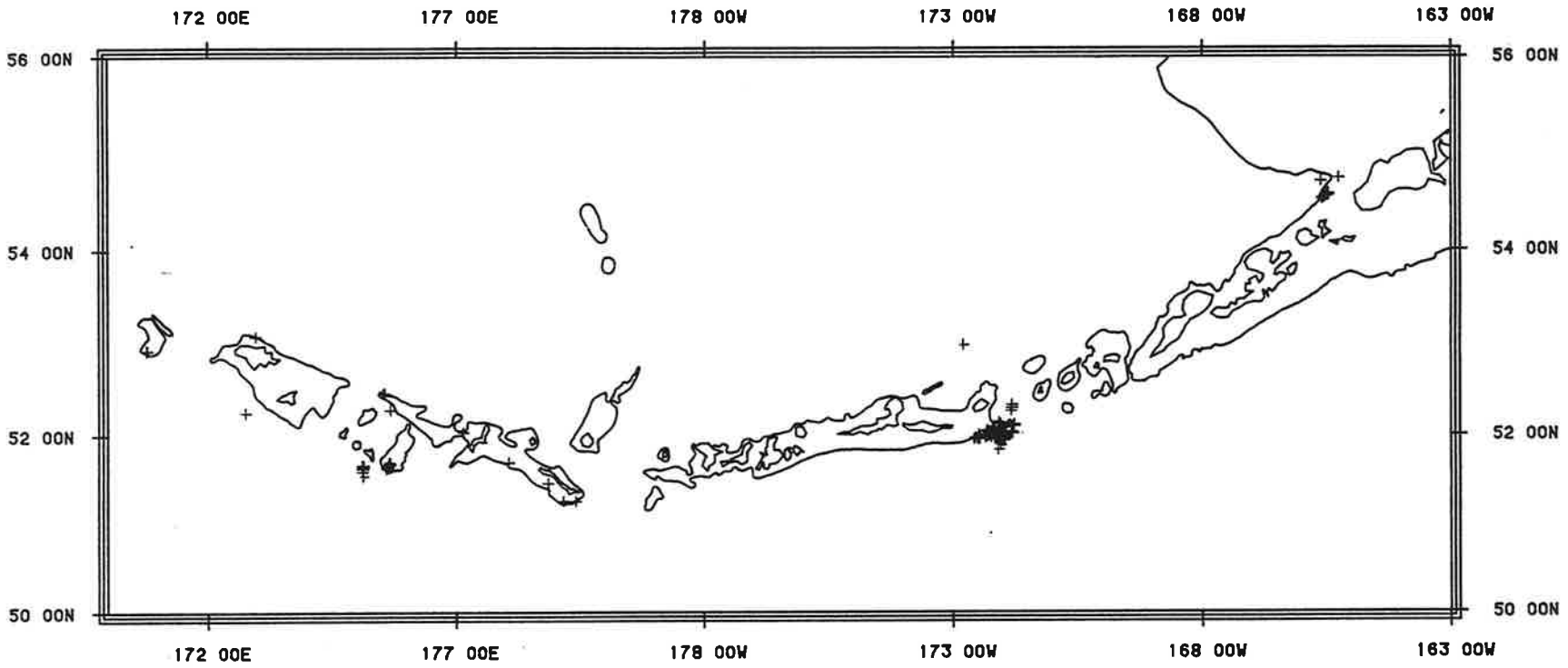
Figure 3. Atka mackerel fishery trawl locations in the Bering Sea/Aleutian Islands plotted by year for foreign and joint-venture (combined, 1977-88) and domestic fisheries (1989-92).



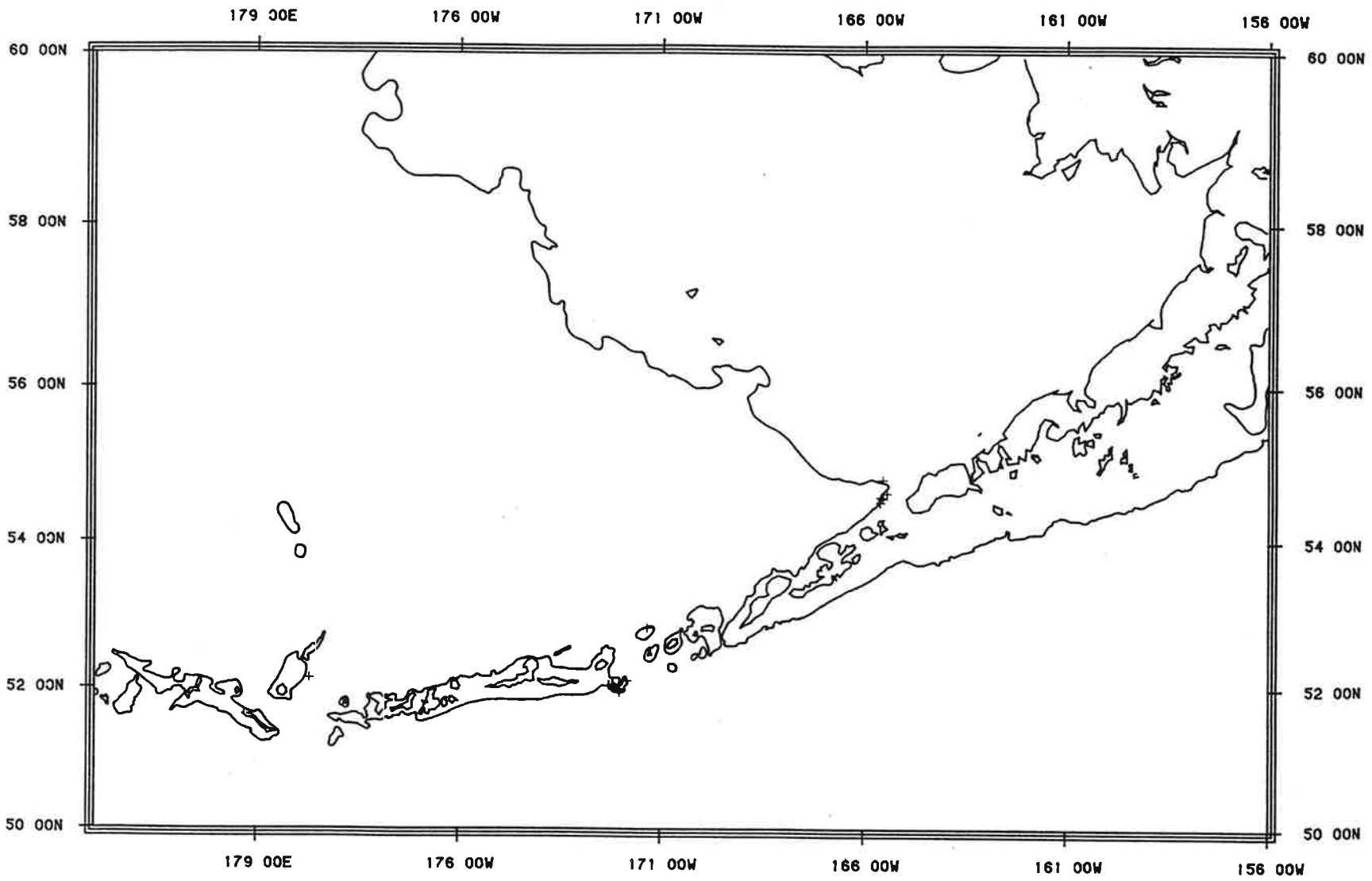
1977 ATKA MACKEREL TRAWL LOCATIONS



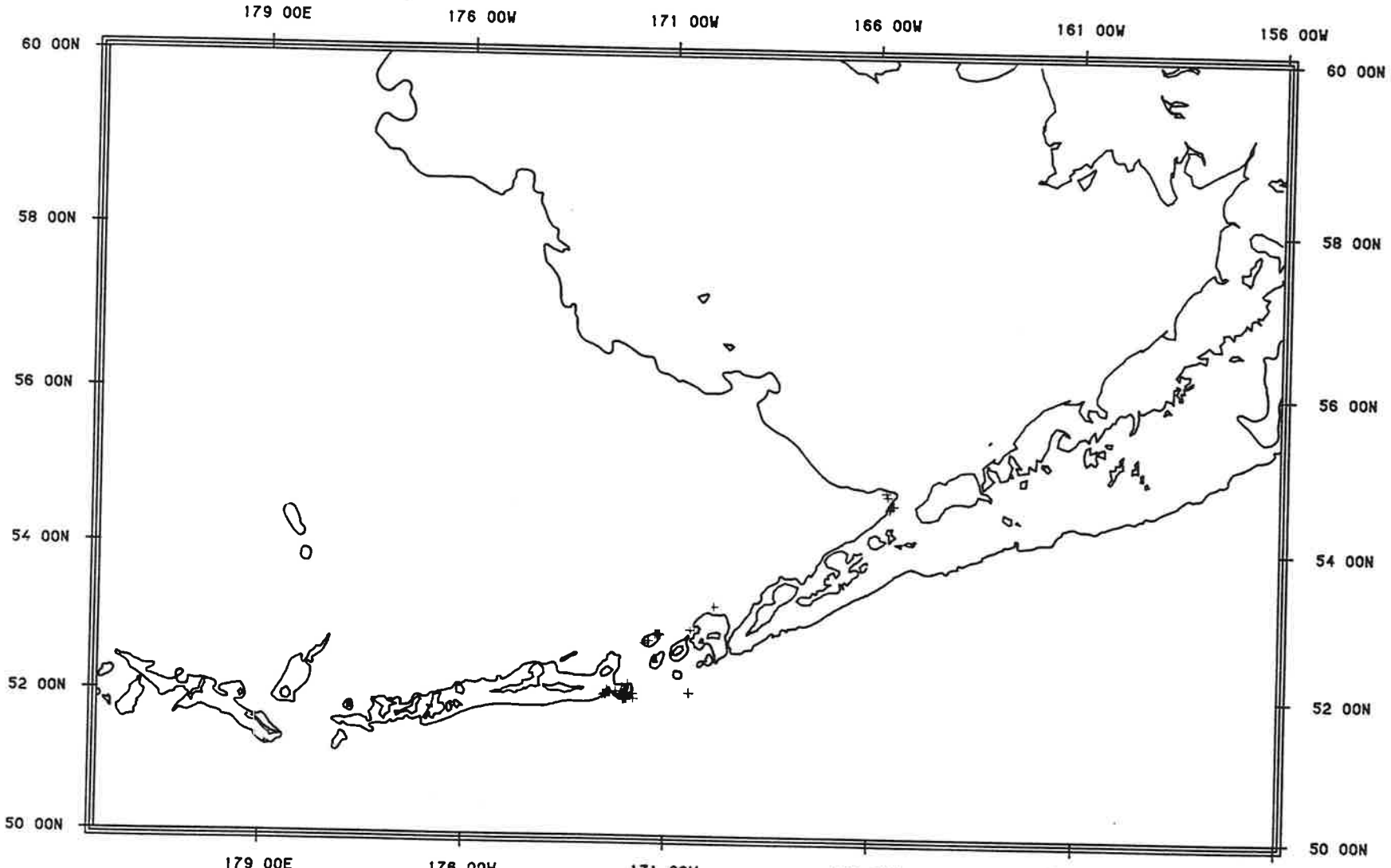
1978 ATKA MACKEREL TRAWL LOCATIONS



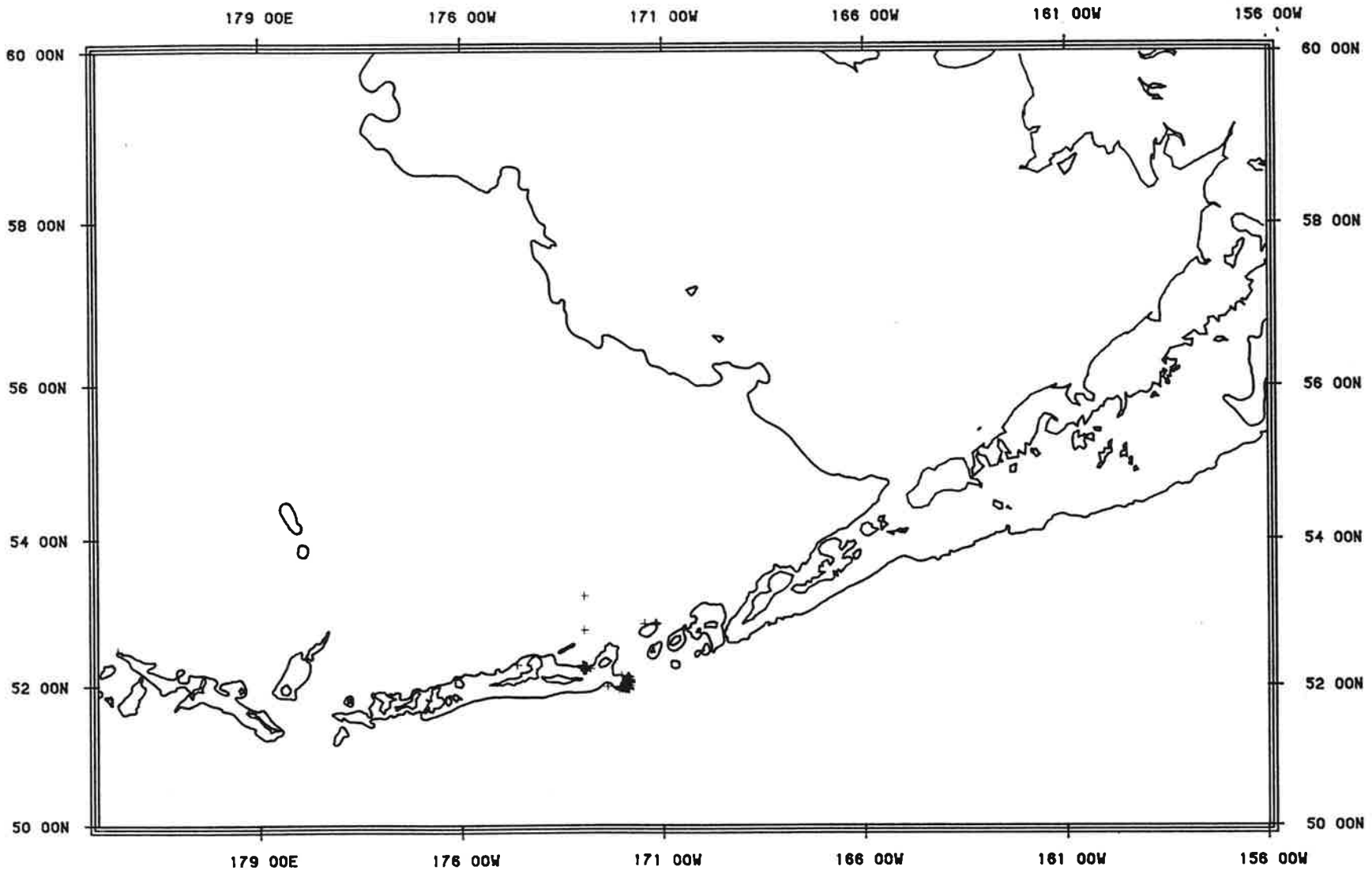
1979 ATKA MACKEREL TRAWL LOCATIONS



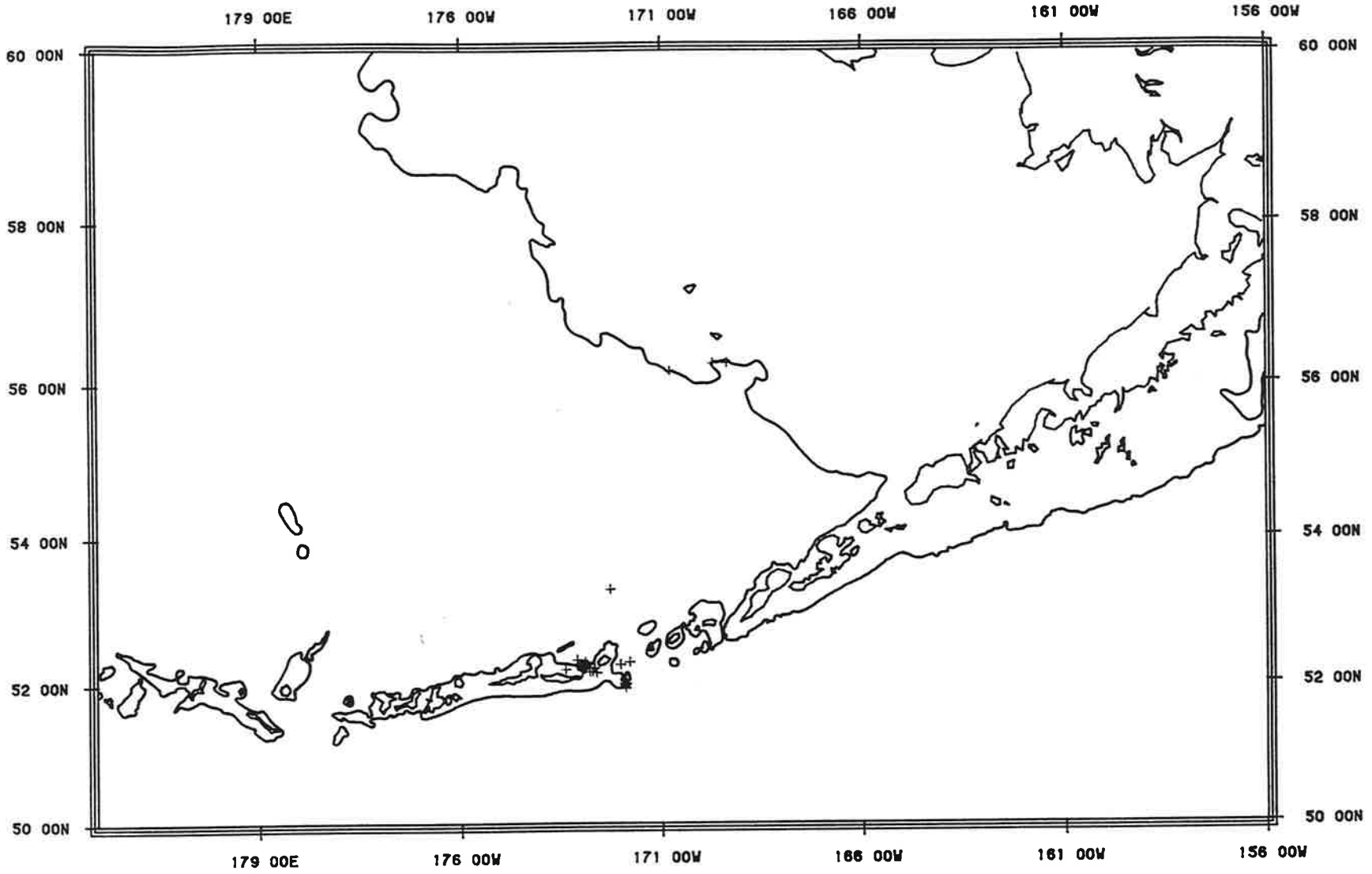
1980 FOREIGN ATKA MACKEREL TRAWL LOCATIONS



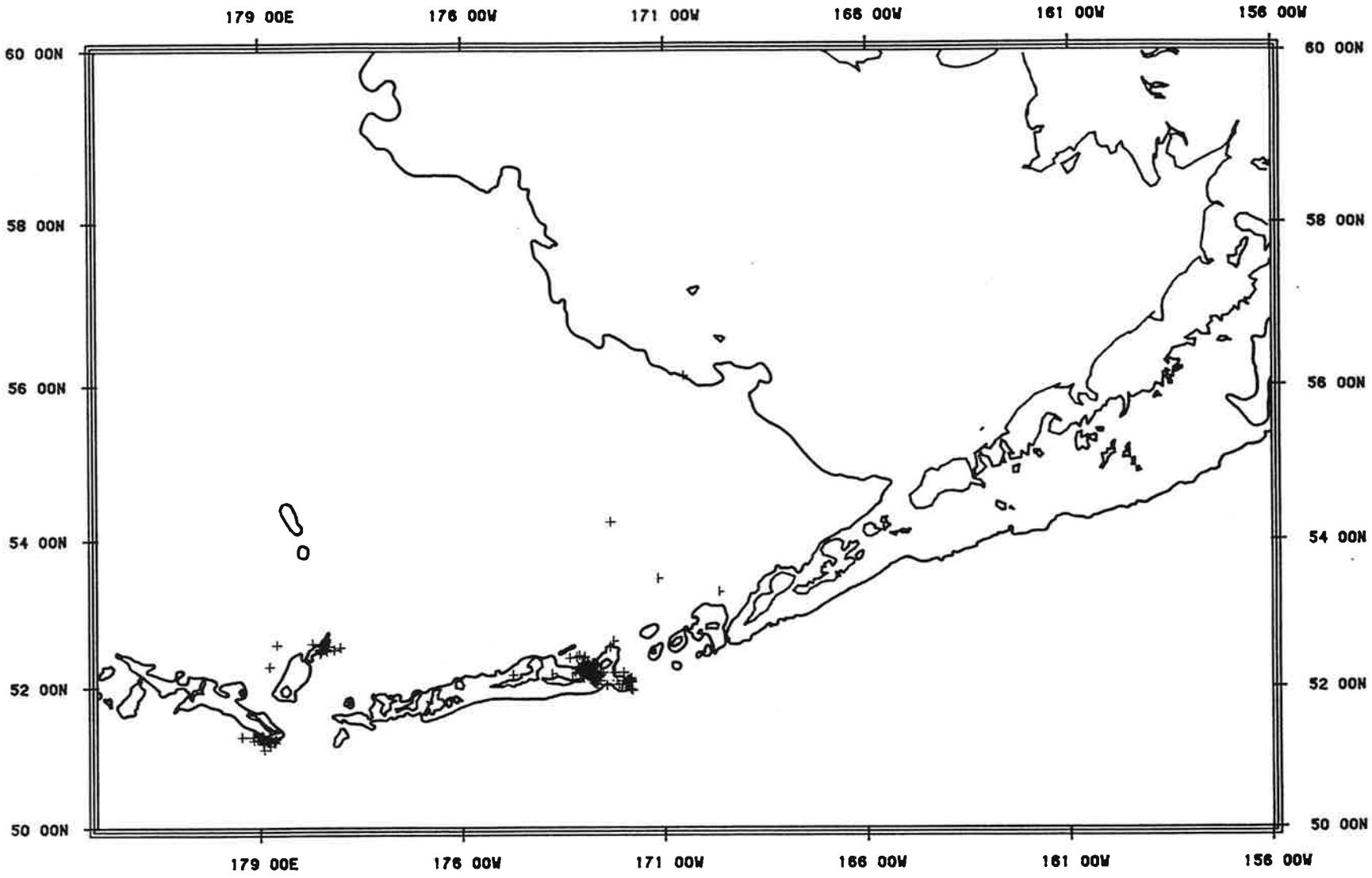
1981 FOREIGN ATKA MACKEREL TRAWL LOCATIONS



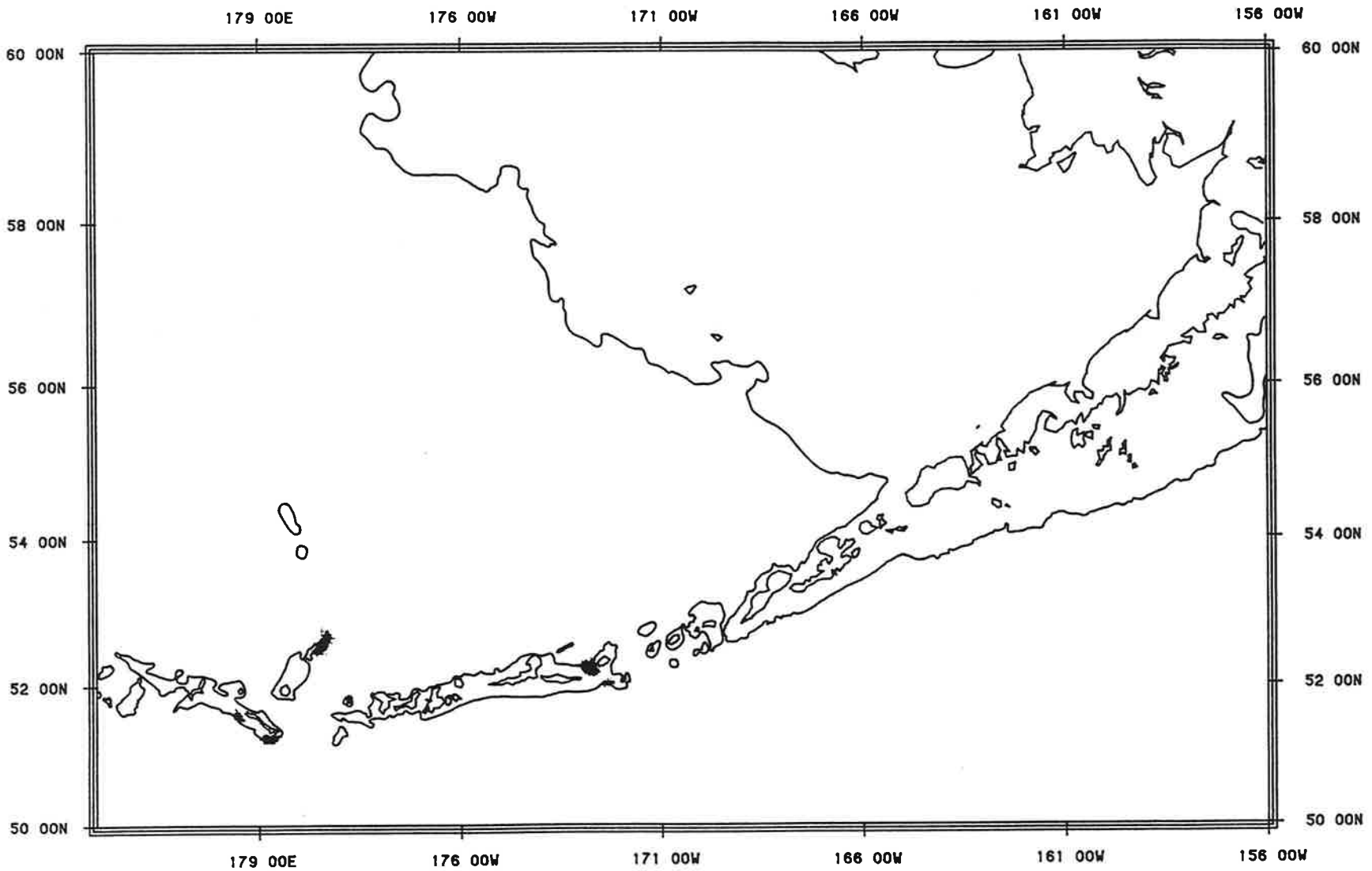
1982 FOREIGN ATKA MACKEREL TRAWL LOCATIONS



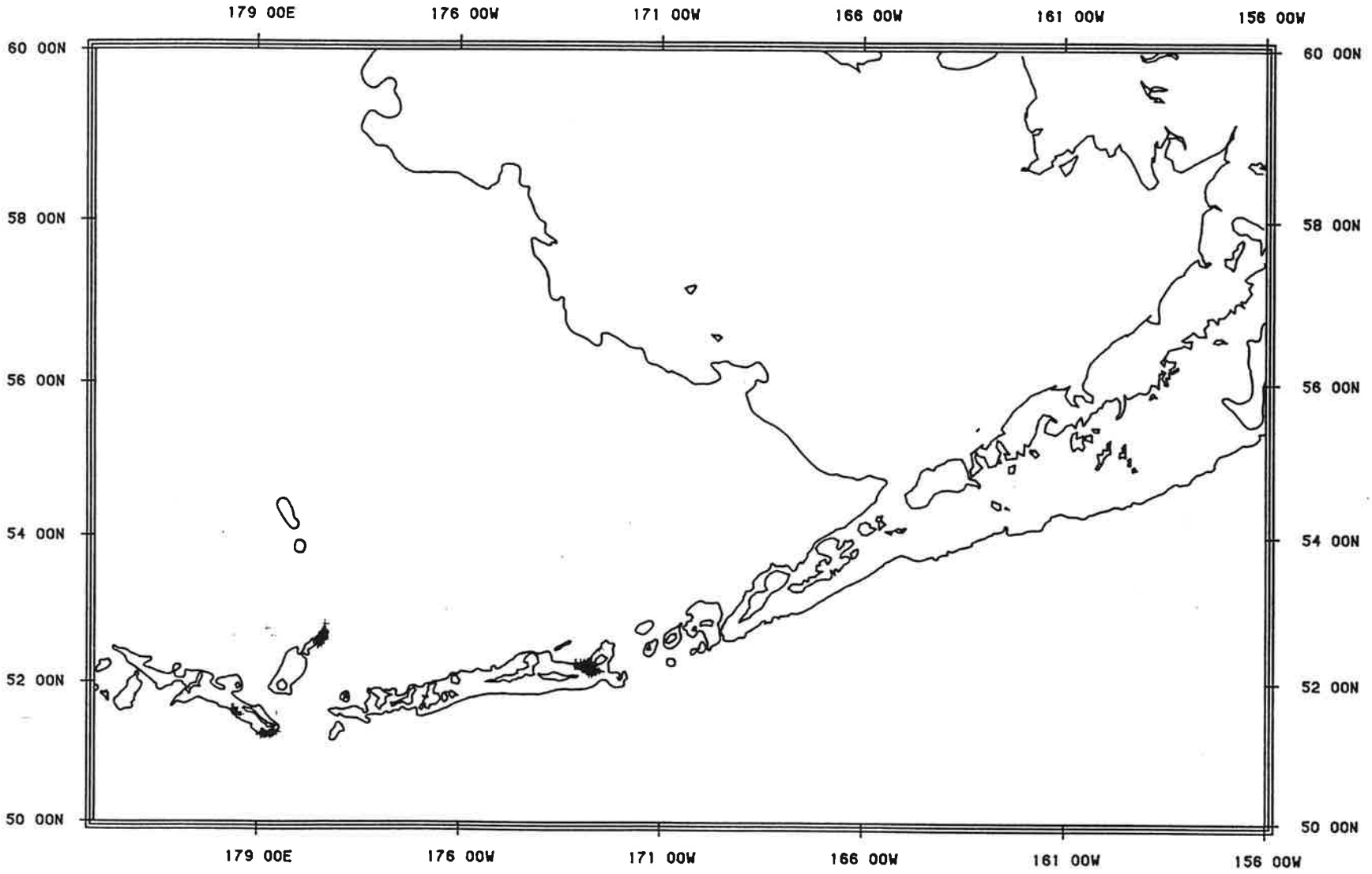
1983 FOREIGN ATKA MACKEREL TRAWL LOCATIONS



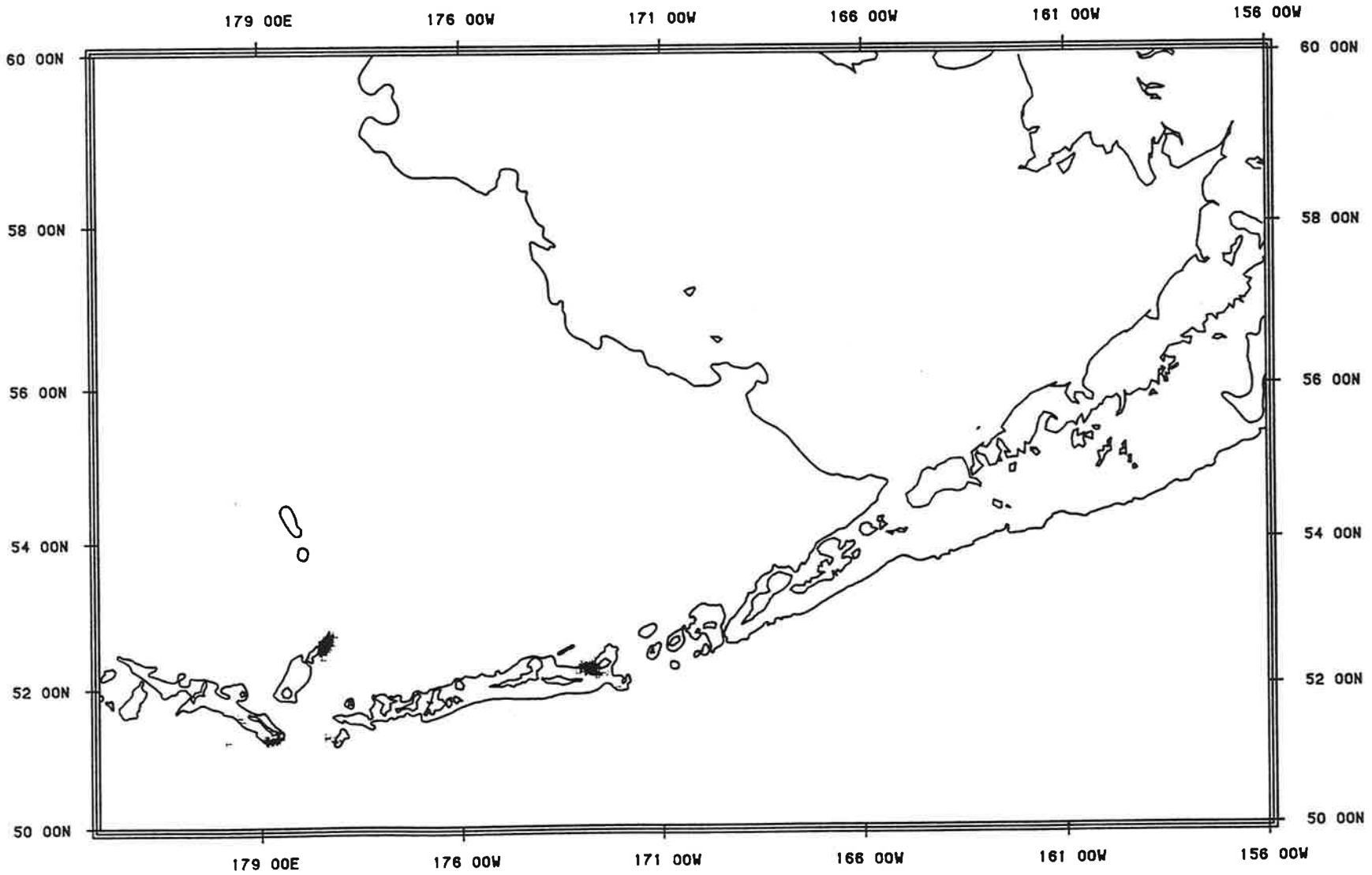
1984 FOREIGN ATKA MACKEREL TRAWL LOCATIONS



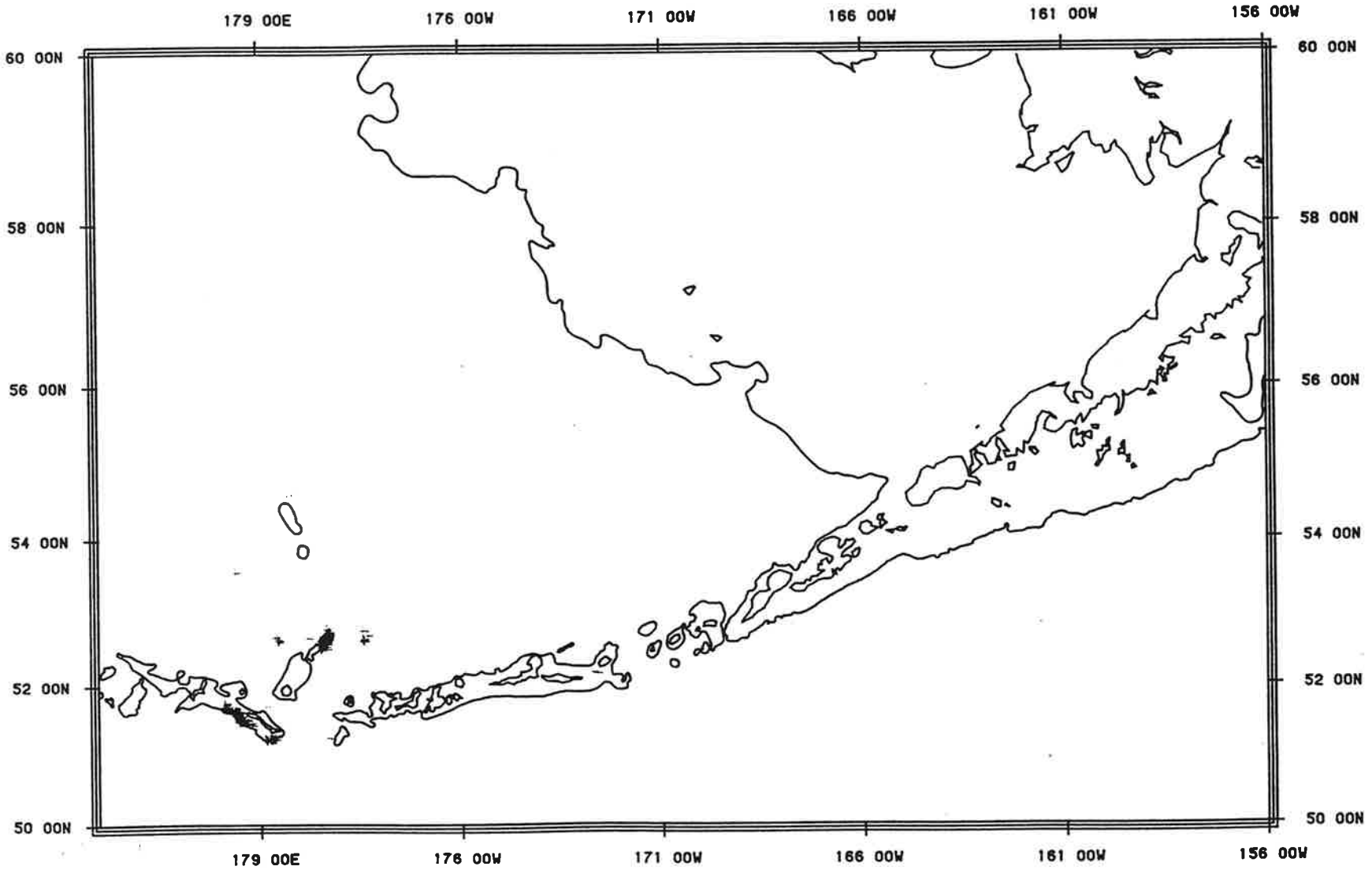
1985 FOREIGN ATKA MACKEREL TRAWL LOCATIONS



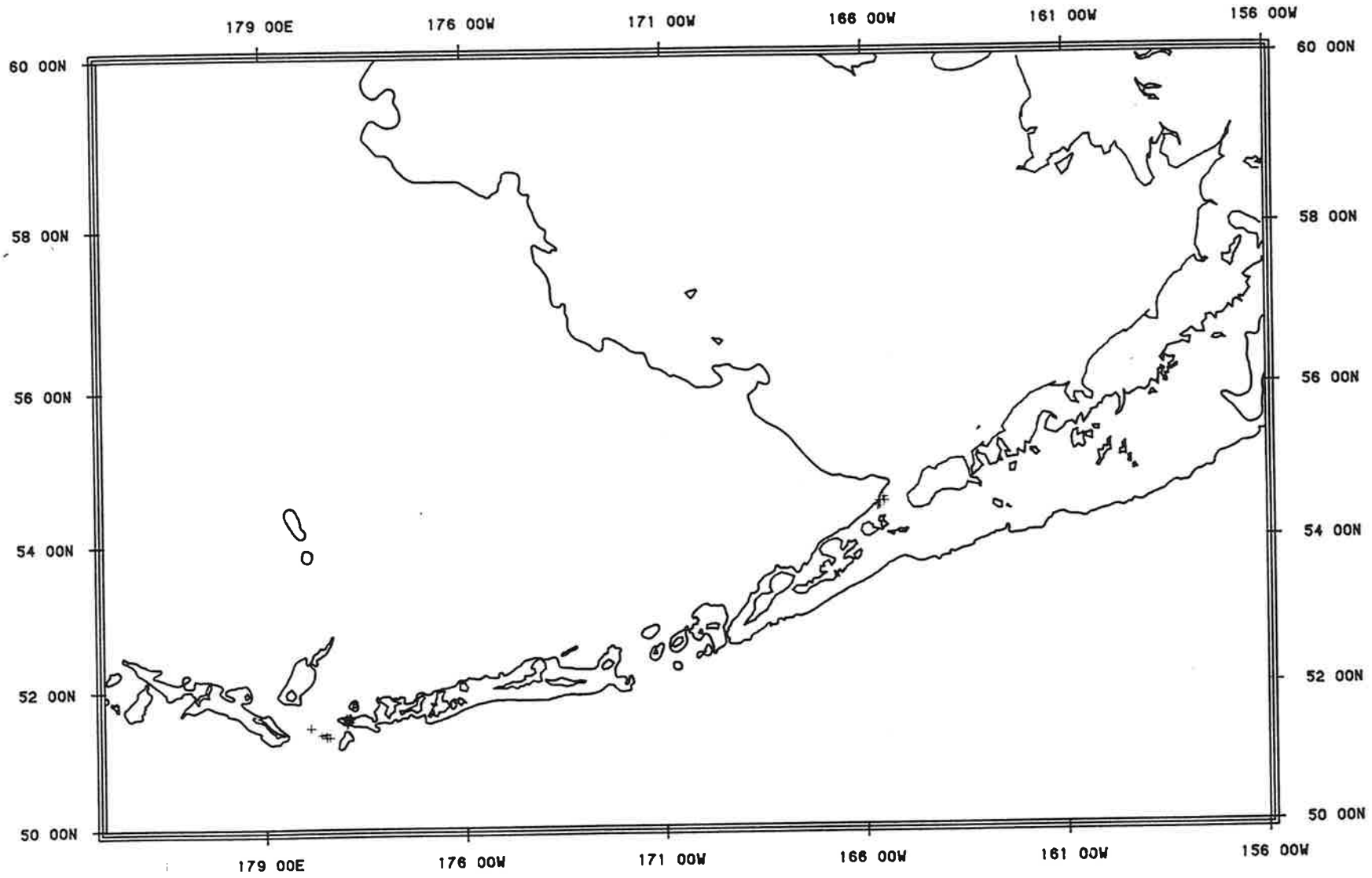
1986 FOREIGN ATKA MACKEREL TRAWL LOCATIONS



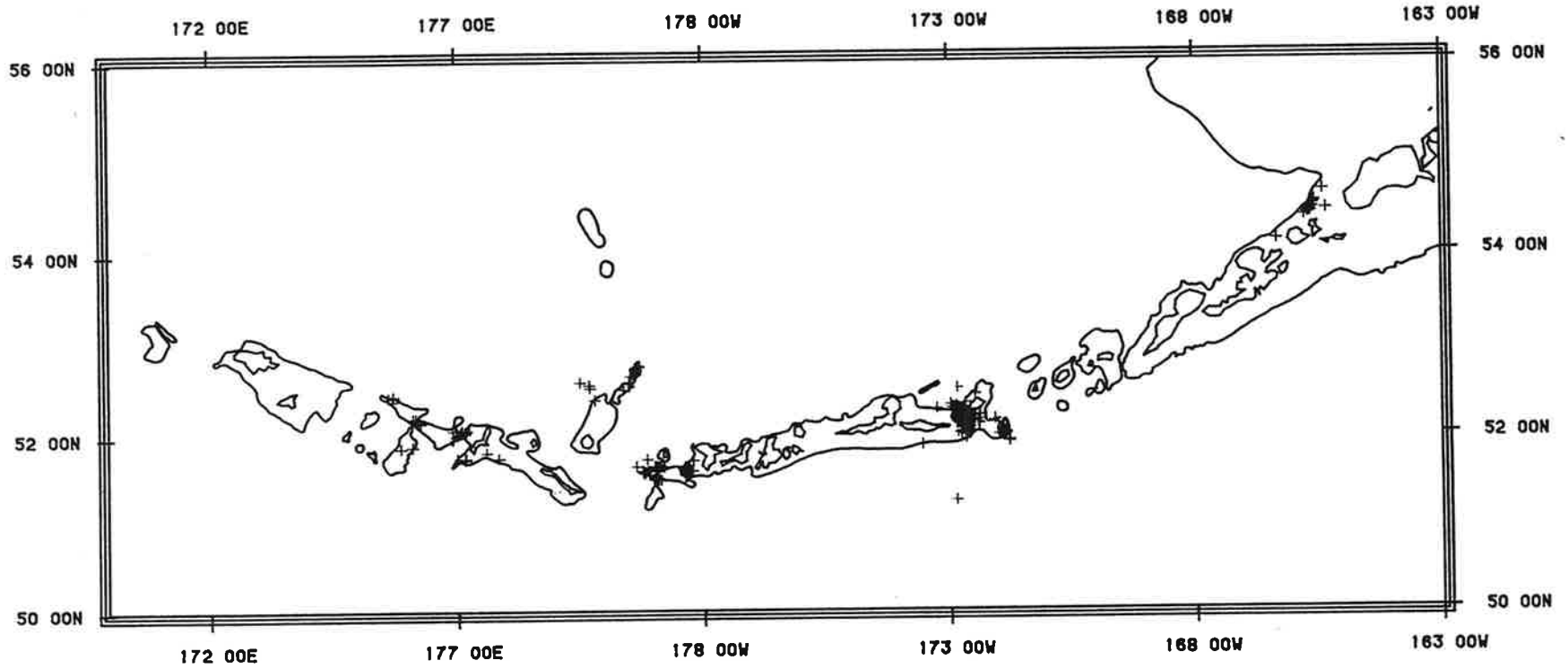
1987 FOREIGN ATKA MACKEREL TRAWL LOCATIONS



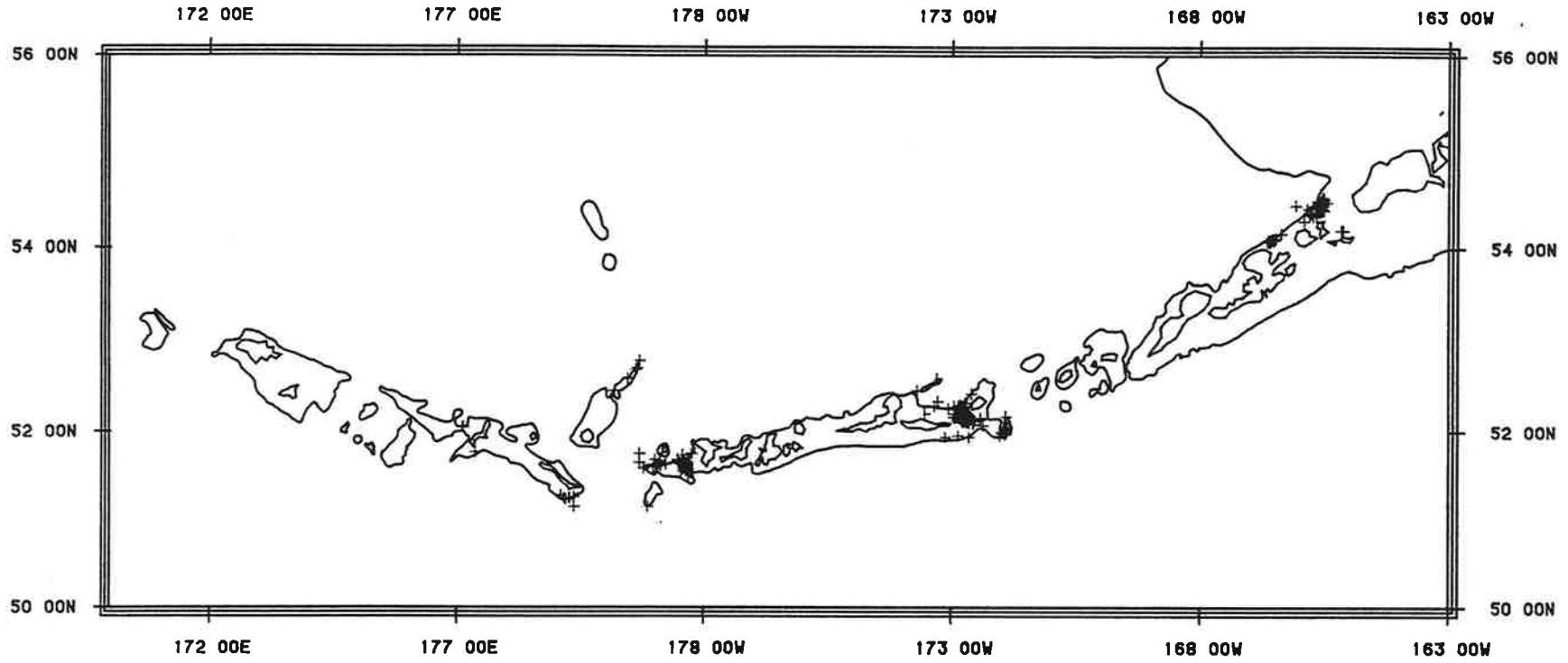
1988 FOREIGN ATKA MACKEREL TRAWL LOCATIONS



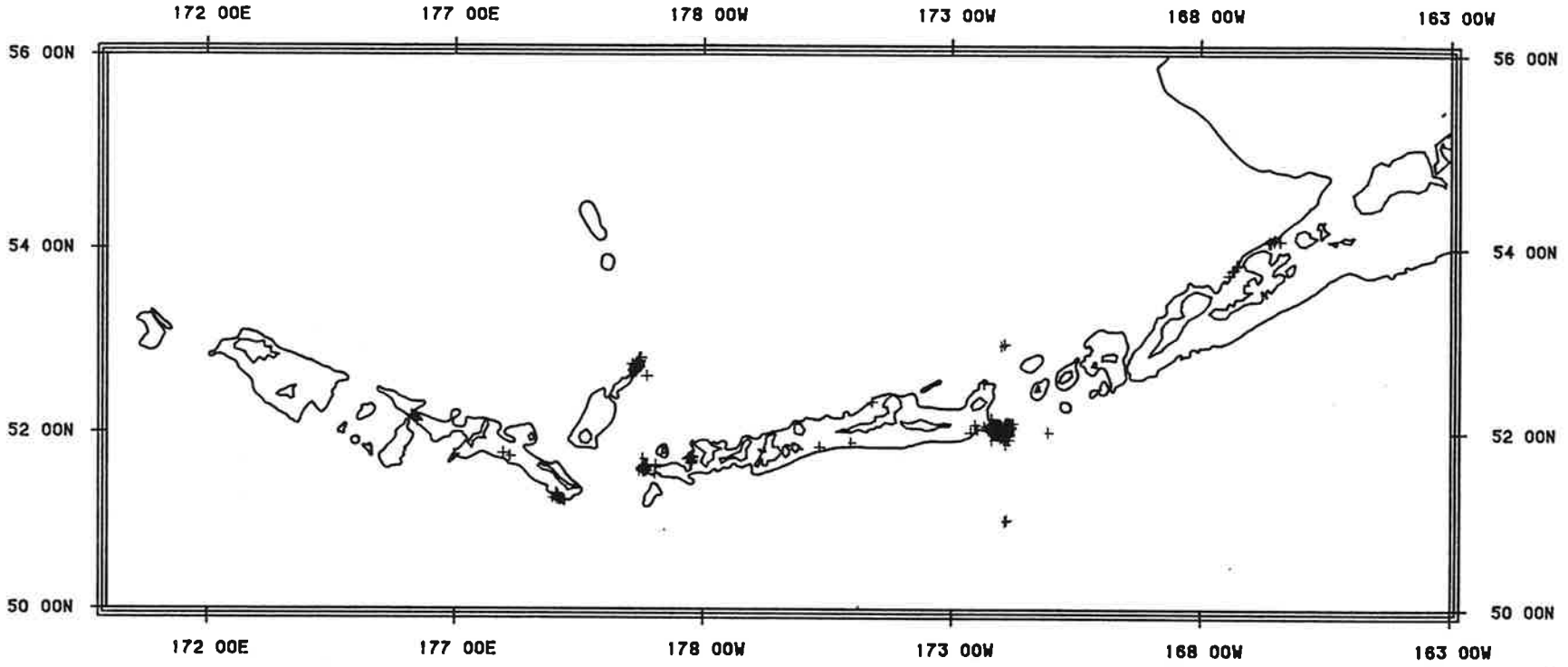
1989 DOMESTIC ATKA MACKEREL TRAWL LOCATIONS



1990 ATKA MACKEREL TRAWL LOCATIONS

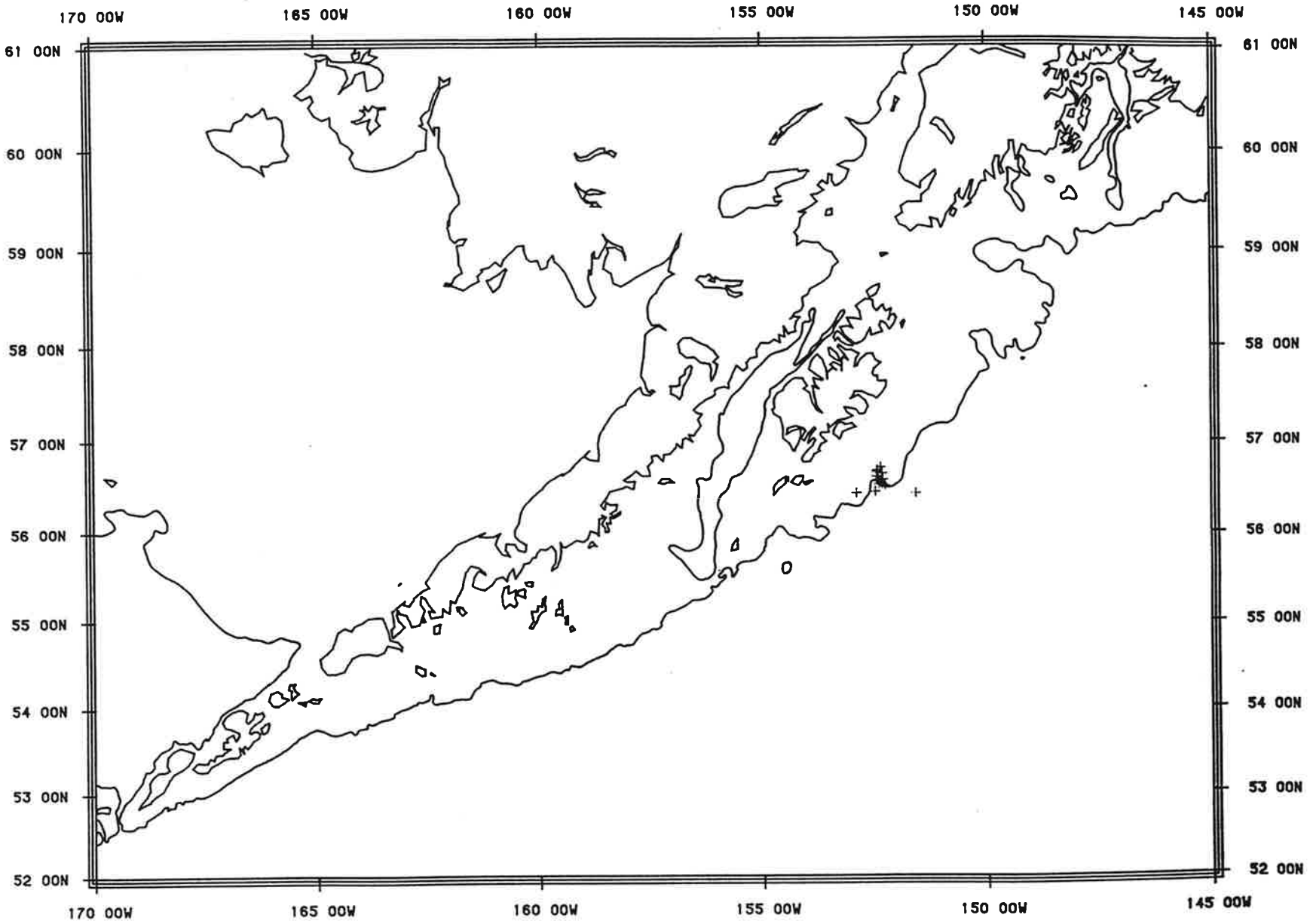


1991 ATKA MACKEREL TRAWL LOCATIONS

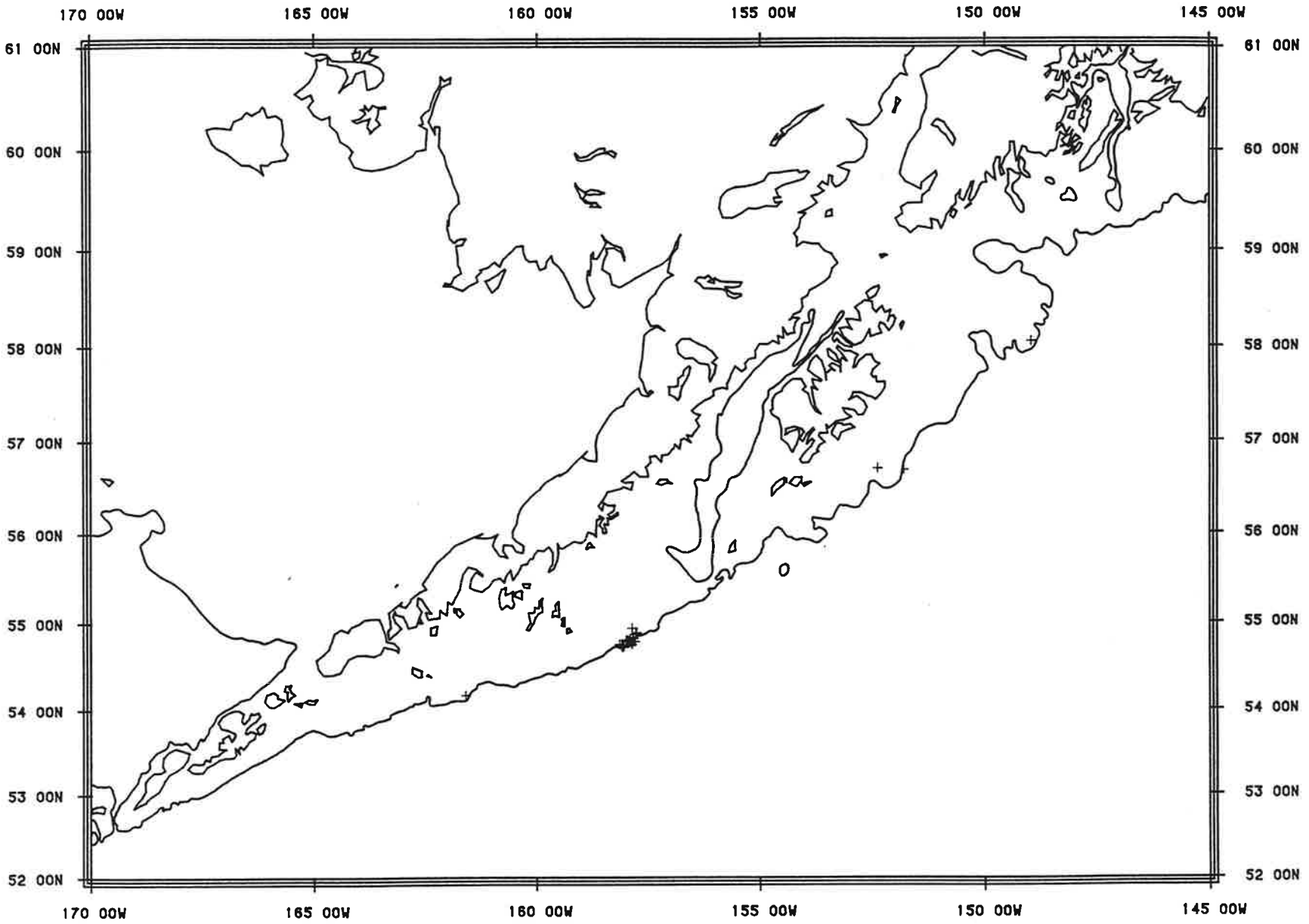


1992 ATKA MACKEREL TRAWL LOCATIONS

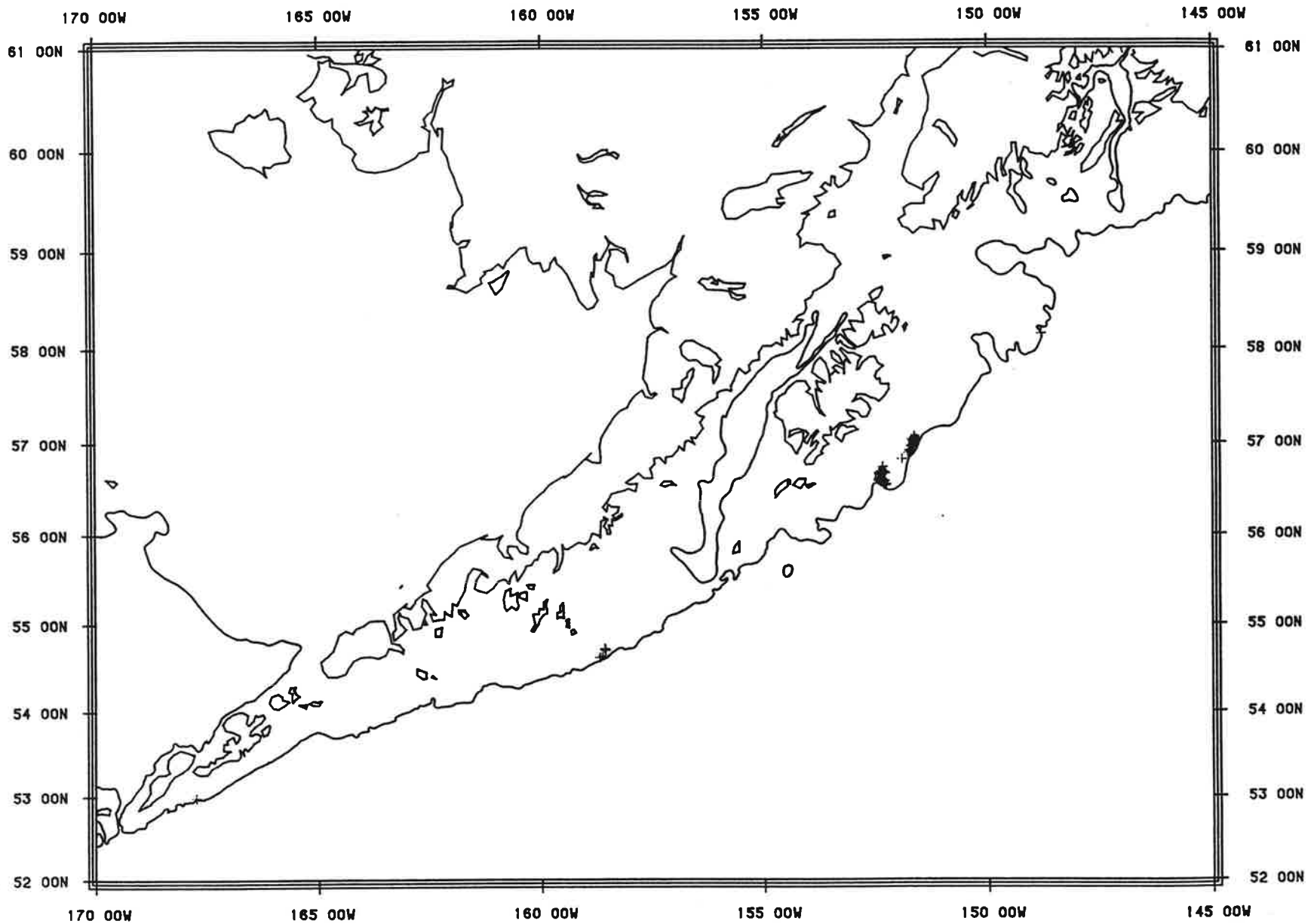
Figure 4. Atka mackerel fishery trawl locations in the Gulf of Alaska plotted by year for foreign and joint-venture (combined, 1977-85) and domestic fisheries (1991-92).



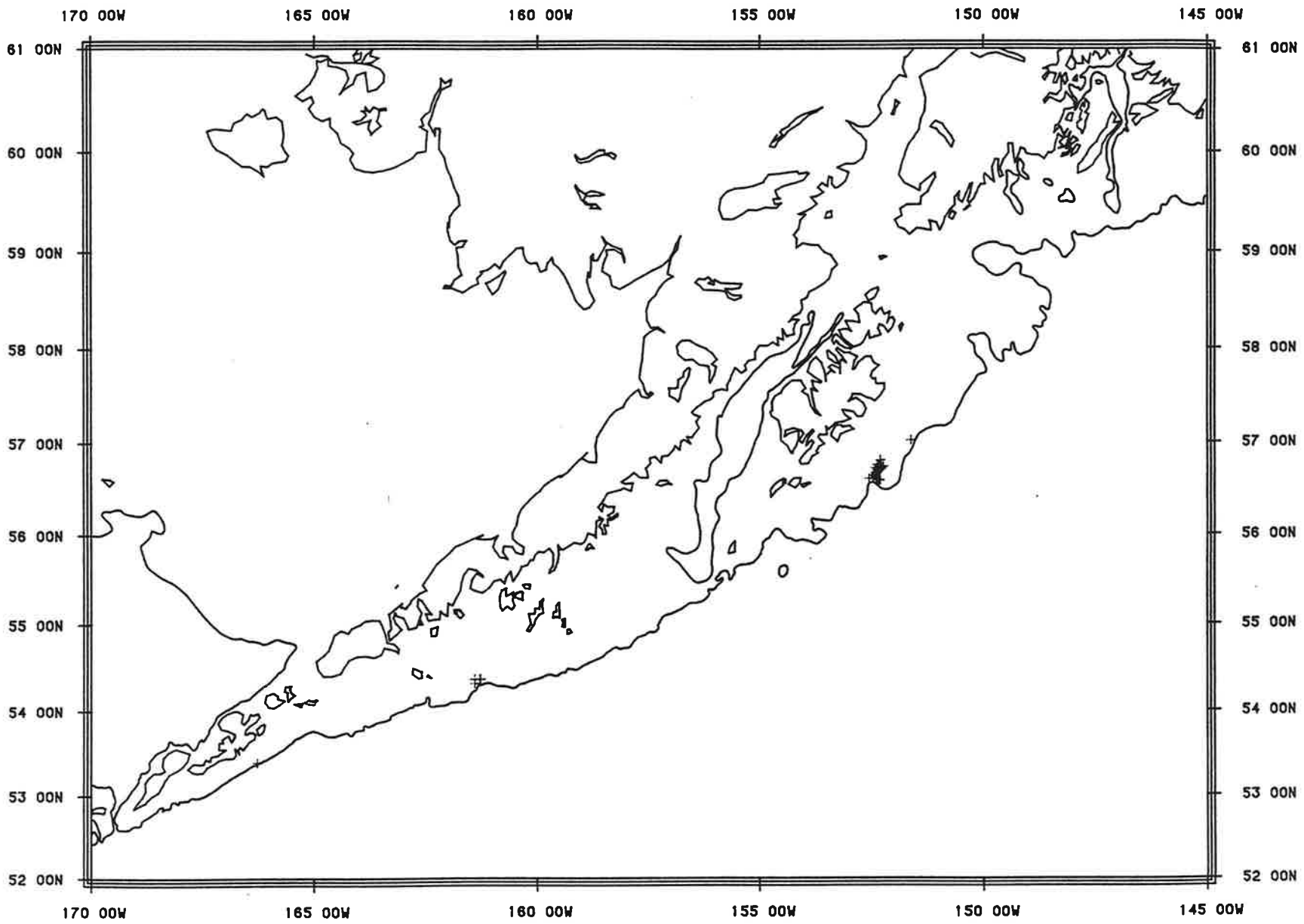
1977 GOA ATKA MACKEREL TRAWL LOCATIONS



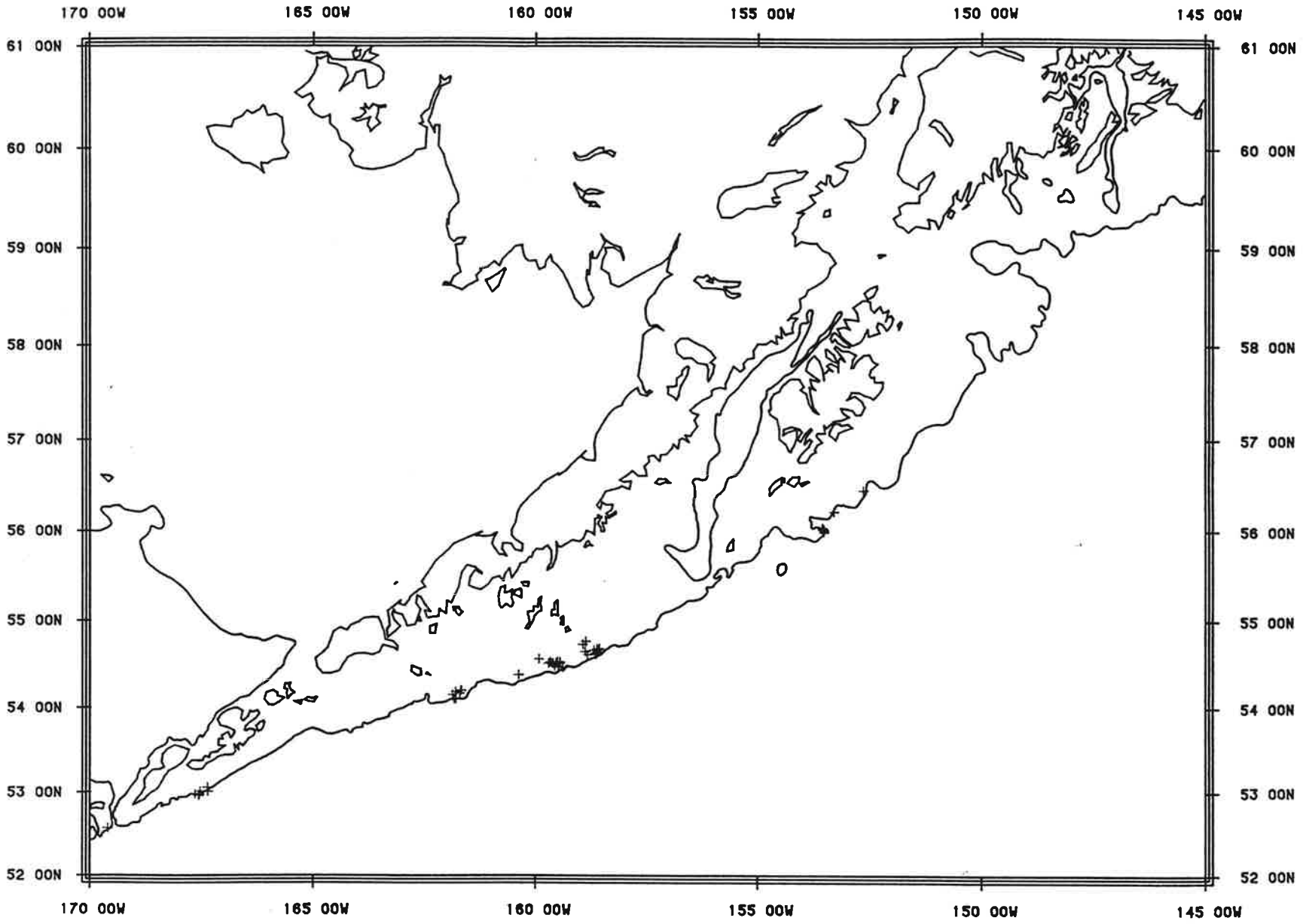
1978 GOA ATKA MACKEREL TRAWL LOCATIONS



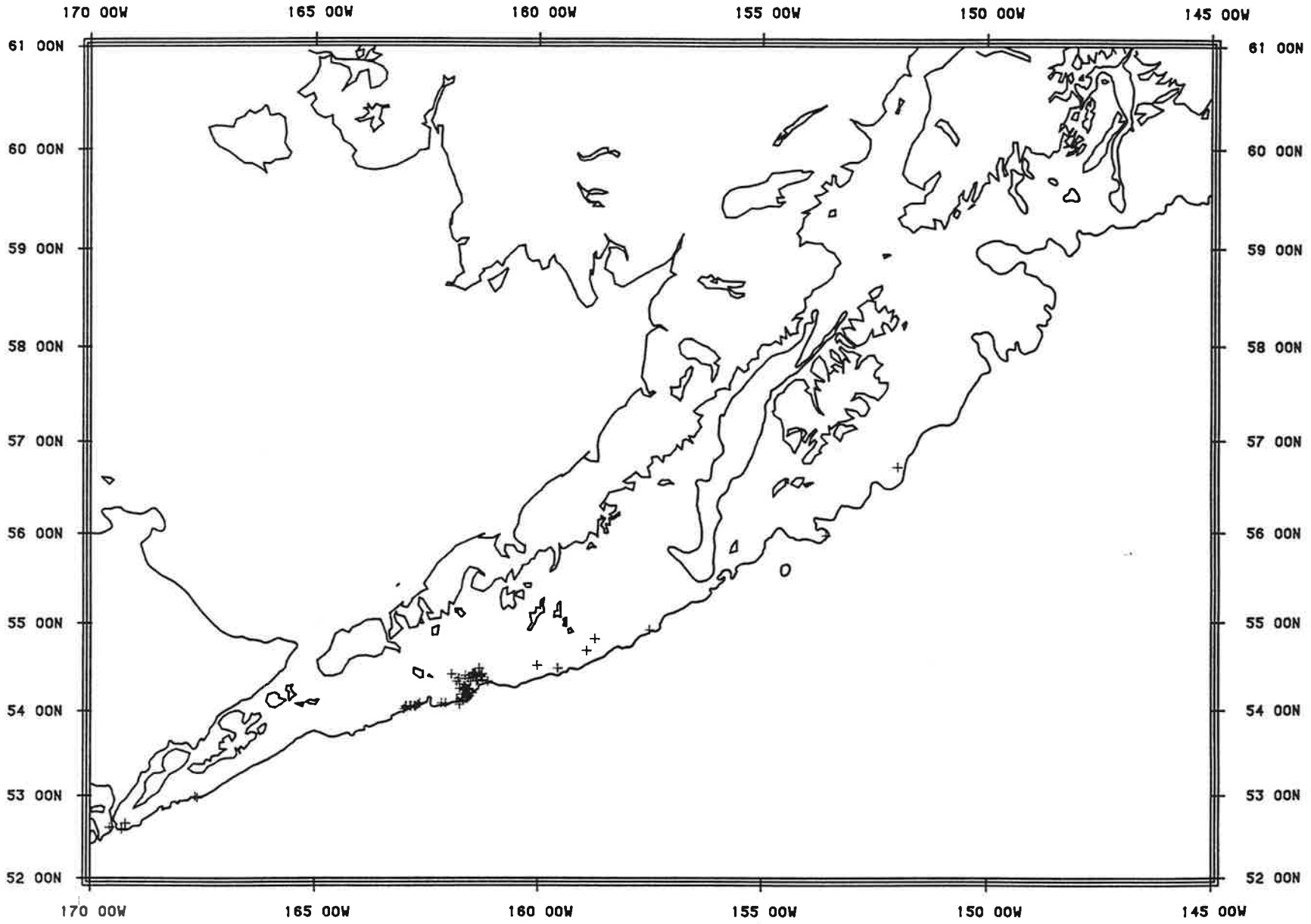
1979 GOA ATKA MACKEREL TRAWL LOCATIONS



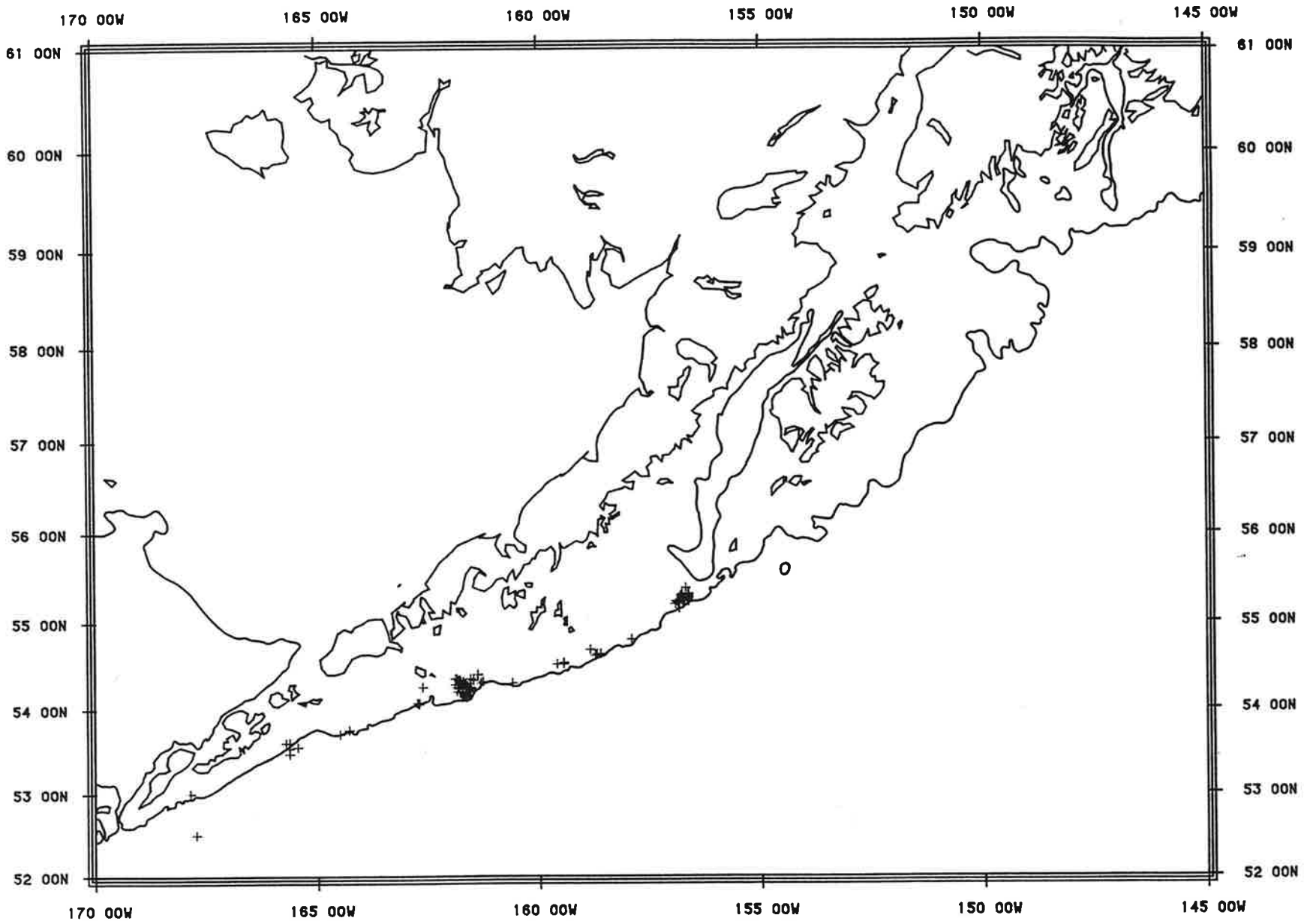
1980 GOA ATKA MACKEREL TRAWL LOCATIONS



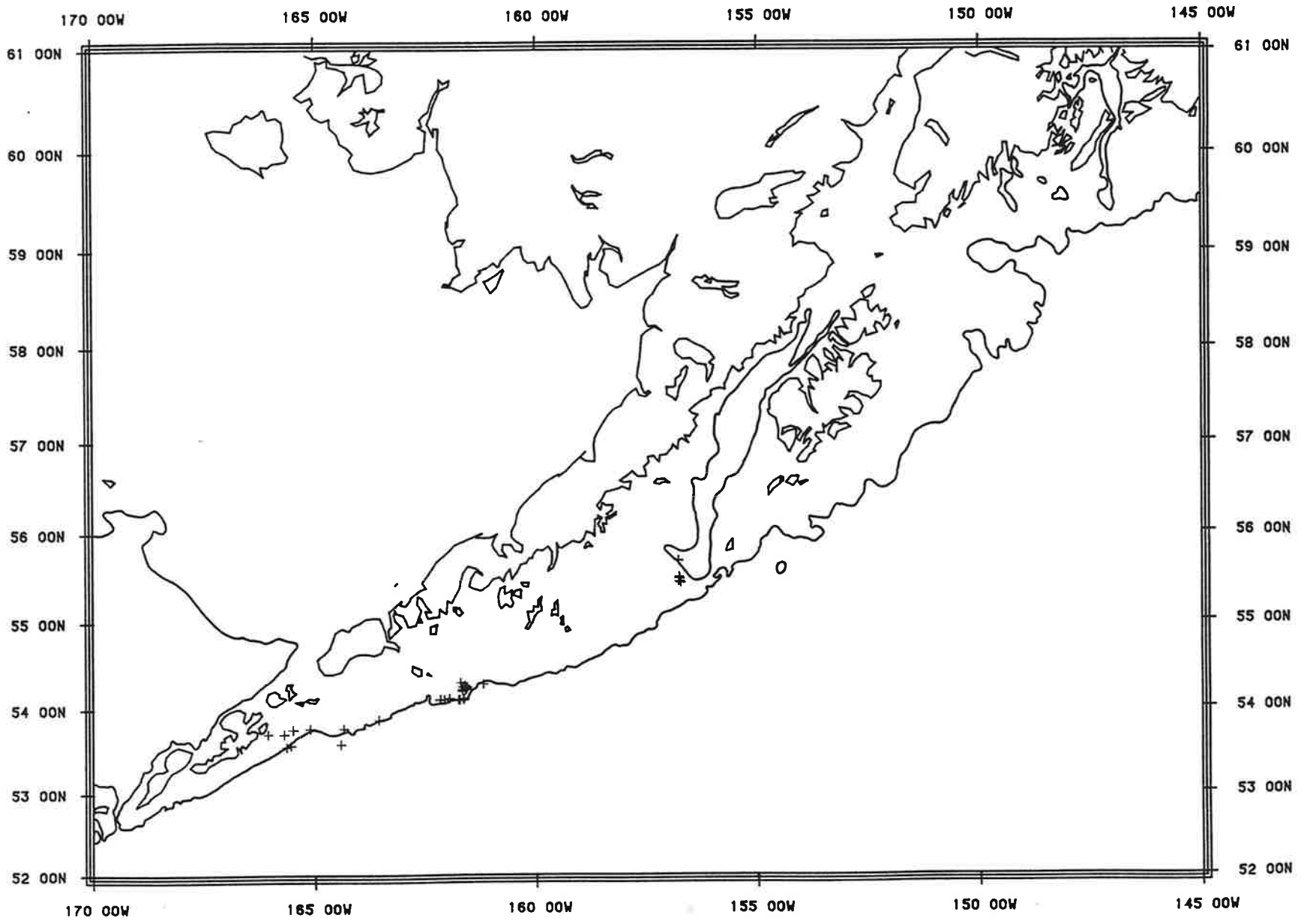
1981 GOA ATKA MACKEREL TRAWL LOCATIONS



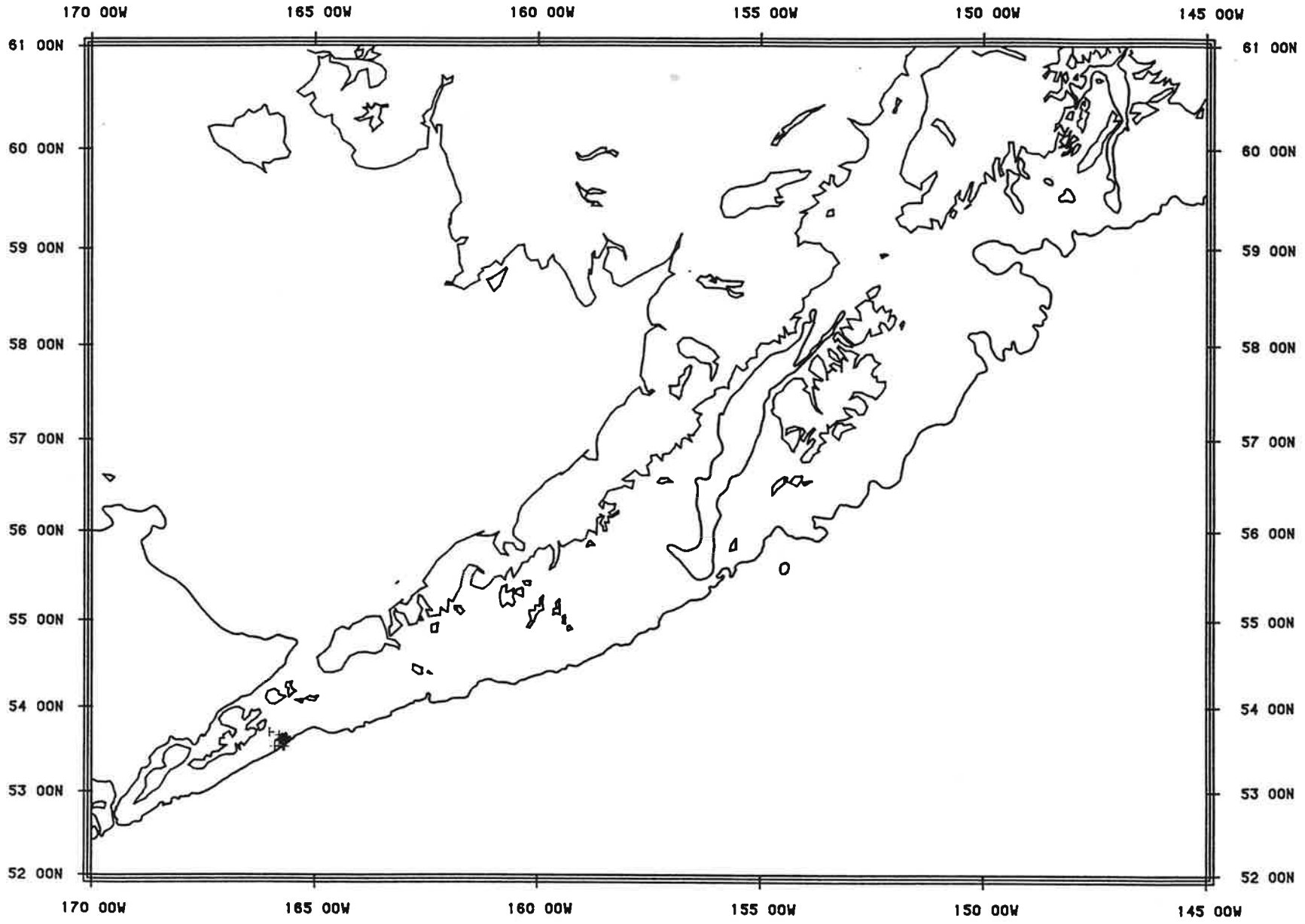
1982 GOA ATKA MACKEREL TRAWL LOCATIONS



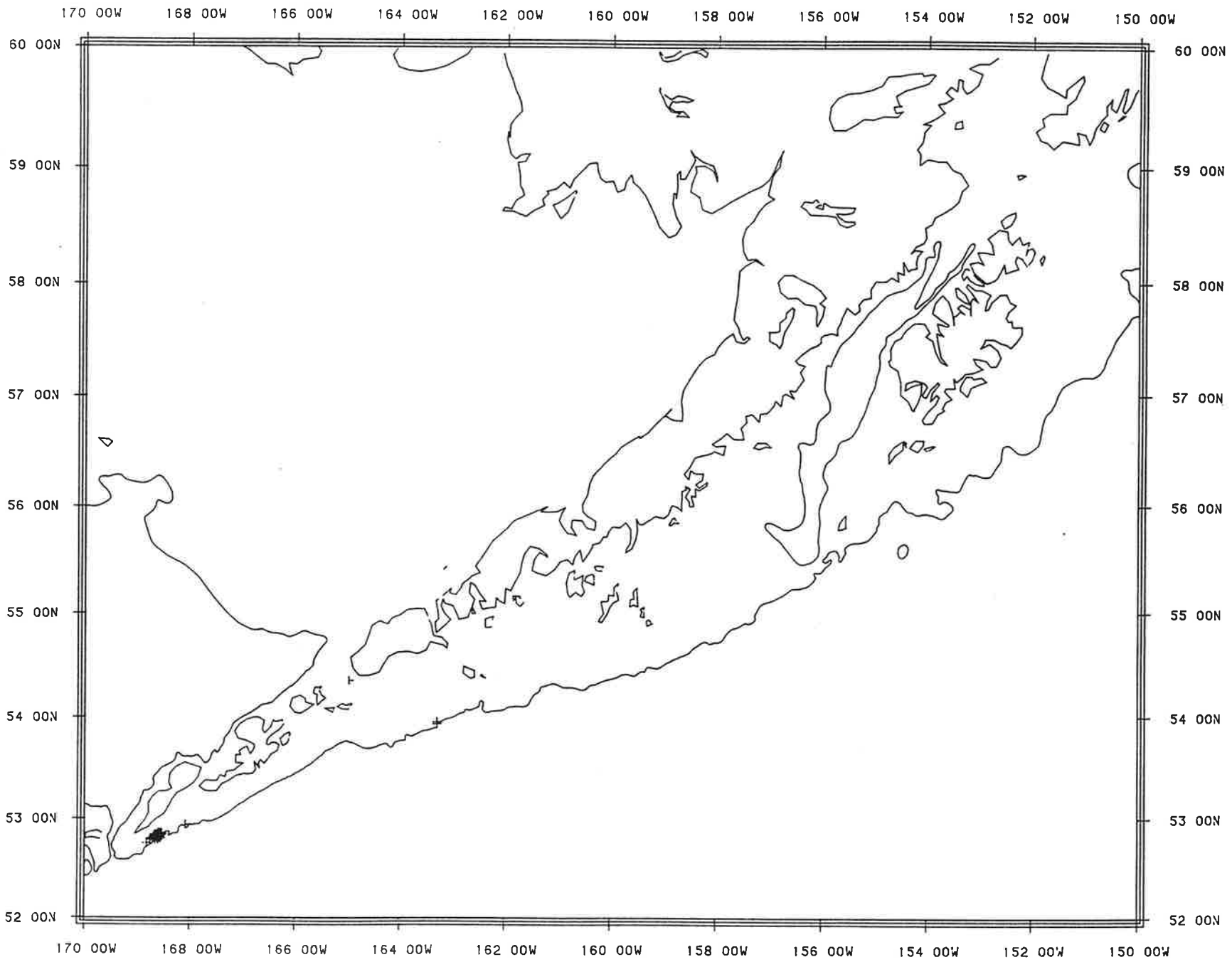
1983 GOA ATKA MACKEREL TRAWL LOCATIONS



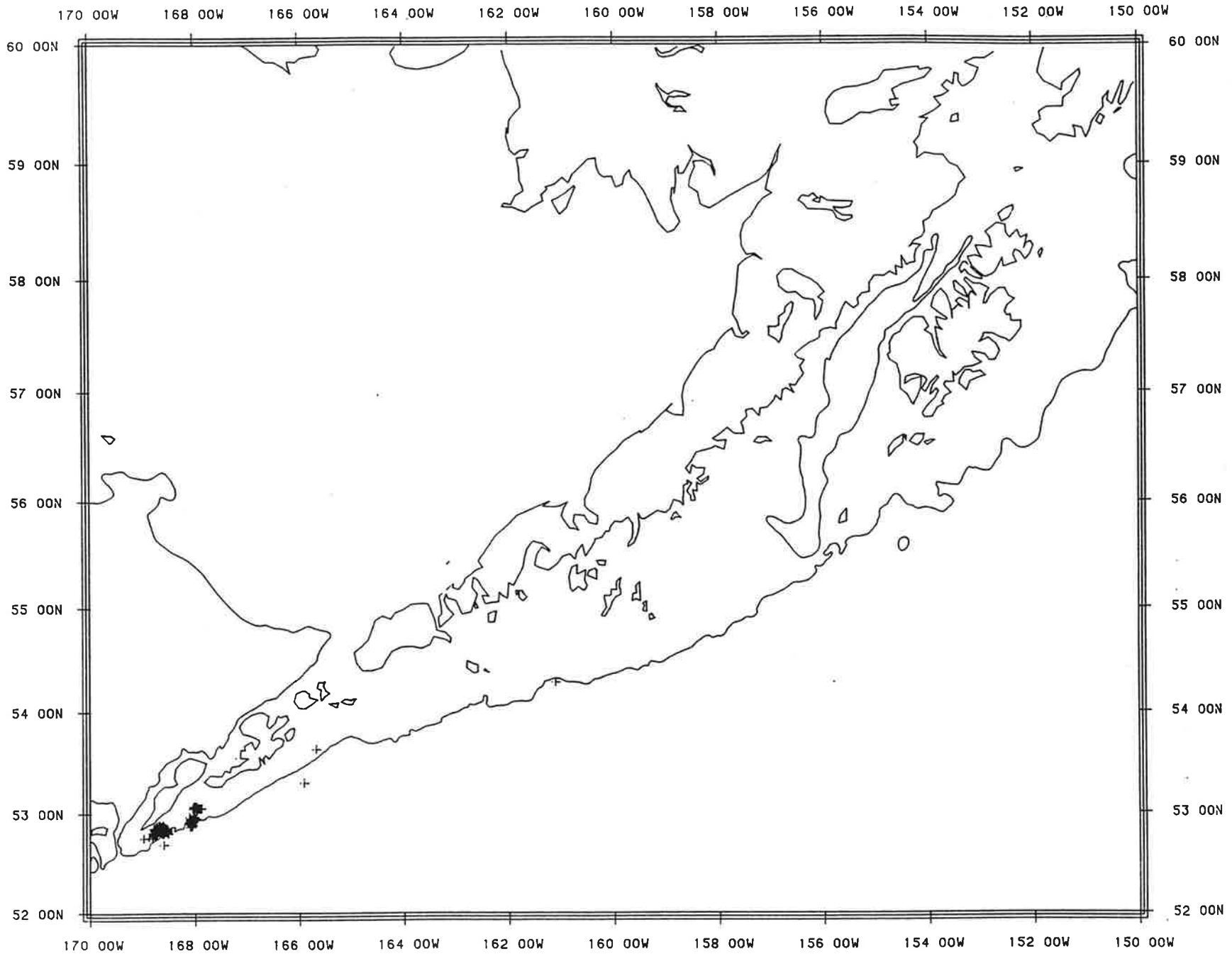
1984 GOA ATKA MACKEREL TRAWL LOCATIONS



1985 GOA ATKA MACKEREL TRAWL LOCATIONS



1991 GOA ATKA MACKEREL TRAWL LOCATIONS



1992 GOA ATKA MACKEREL TRAWL LOCATIONS