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Distribution of Principal Groundfish and Prohibited Species in the Eastern Bering Sea Based on Research Trawl Samples, 1979–1983

March 1984

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Distribution of Principal Groundfish and Prohibited Species in the Eastern Bering Sea Based on Research Trawl Samples, 1979-1983.

by

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INTRODUCTION

This report describes the distribution and abundance of three target species of the foreign and domestic trawl fisheries, walleye pollock (*Theragra chalcogramma*), Pacific cod (*Gadus macrocephalus*) and yellowfin sole (*Limanda aspera*) and five species prohibited to trawl fishing, king crab (*Paralithodes camtschatica* and *P. platypus*), snow (Tanner crab) (*Chionoectes bairdi* and *C. opilio*) and Pacific halibut (*Hippoglossus stenolepis*) in the eastern Bering Sea from 1979 through 1983. Data were obtained from research bottom trawl surveys conducted from June through September in each year by the National Marine Fisheries Service.

Prohibited species are incidentally caught by bottom trawl fisheries while fishing for target species. Regulations require that prohibited species must be returned to the sea but handling mortality may cause a reduction in these species which are the targets of other fisheries. Reducing the catch of prohibited species saves the additional handling time of removal from the catch and benefits the prohibited species by reducing mortality. Therefore, it is important to know the distribution and abundance of both target and prohibited species so as to increase the benefit of the catch to all fisheries concerned.

DESCRIPTION OF METHODS

Catch data were obtained from the Northwest and Alaska Fisheries Center's eastern Bering Sea (EBS) stock assessment surveys conducted each summer since 1975. These surveys sample crab and groundfish using a bottom trawl towed for 1/2 hour at the centers of 38x38 km (20x20 nautical mile) grids covering the EBS from the Alaska Peninsula north. The catch from each trawl sample was sorted by species and then weighed and counted. Commerical species were separated by sex and measured (total length for

fish, carapace length for king crab and carapace width for Tanner crab). For a complete description of the processing of survey catches see Pereyra et al. (1976).

Catches were standarized (catch per unit of effort (CPUE) in catch per hectare, or 10,000 m^2 trawled) and when more than a single sample was taken in a grid catches were averaged. Mean length of fish and mean carapace size of crab were weighted by the number of individuals caught in the sample. Pacific halibut population length frequency distributions were based on length and population estimates summarized for 2 degree latitude by 4 degree longitude areas and for the entire survey area in each year. Catches of prohibited species per unit of total fish catch were standardized to number of individuals per metric ton of total fish caught. The two species of king crab were grouped together for all analyses.

No attempt was made to standarize catches for differences between vessels or gear within or between years. Research catches were not compared or standardized to commerical catch data. The characteristics of the vessel and trawl gear used in each year is presented in Table 1.

Table 1.--Characteristics of the vessels and gear used in each survey 1979-1983.

Year / Vessel	Overall length (m)	Gross tonnnage	HP	Number stations	Trawl gear	Mean effective net opening width (m)	Mean effective net opening height (m)
1979							
Oregon	30.4	219	600	104	400 eastern	12.19	1.7
Paragon II	33.5	196	1,125	312	400 eastern	12.19	1.7
Discovery Bay	32.9	196	850	93	400 eastern	12.19	1.7
				57	Nor'eastern	18.30	6.1
1980							
Oregon	30.4	219	600	101	400 eastern	12.19	1.7
Ocean Harvester	32.9	199	1,125	228	400 eastern	12.19	1.7
1981							
Chapman	38.7	427	1,165	149	83-112 eastern	17.98	2.3
Alaska	30.5	193	600	131	400 eastern	13.41	1.7
1982							
Chapman	38.7	427	1,165	143	83-112 eastern	16.65	2.3
Pat San Marie	30.0	200	756	204	83-112 eastern	16.26	2.3
Miller Freeman	65.5	1,500	2,200	17	83-112 eastern	17.00	2.3
1983							
Chapman	38.7	427	1,165	176	83-112 eastern	16.54	2.3
Alaska	30.5	193	600	178	83-112 eastern	16.41	2.3

RESULTS

Total fish CPUE (in kg/ha) for each year are presented in Figures 1-5. The CPUE (in kg/ha) for individual target and prohibited species by year are found in Figures 6-40. Figures 41-60 give the CPUE of prohibited species (numbers of individuals/ha). Figures 61-80 show the catch of prohibited species in relation to total fish catch (numbers of prohibited individuals per metric ton of total fish caught) by year. Figures 81-100 describe the mean size of each prohibited species by year. Figures 101-105 illustrate the length frequency distribution of Pacific halibut in 2 degree latitude by 4 degree longitude areas and for the total survey area in each year.

LITERATURE CITED

Pereyra, W.T., J.E. Reeves, and R.G. Bakkala.
1976. Demersal fish and shellfish resources of the eastern Bering Sea in the baseline year 1975. Northwest and Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, 2725 Montlake Blvd. E., Seattle, WA 98112. Processed Rep., 619 p.

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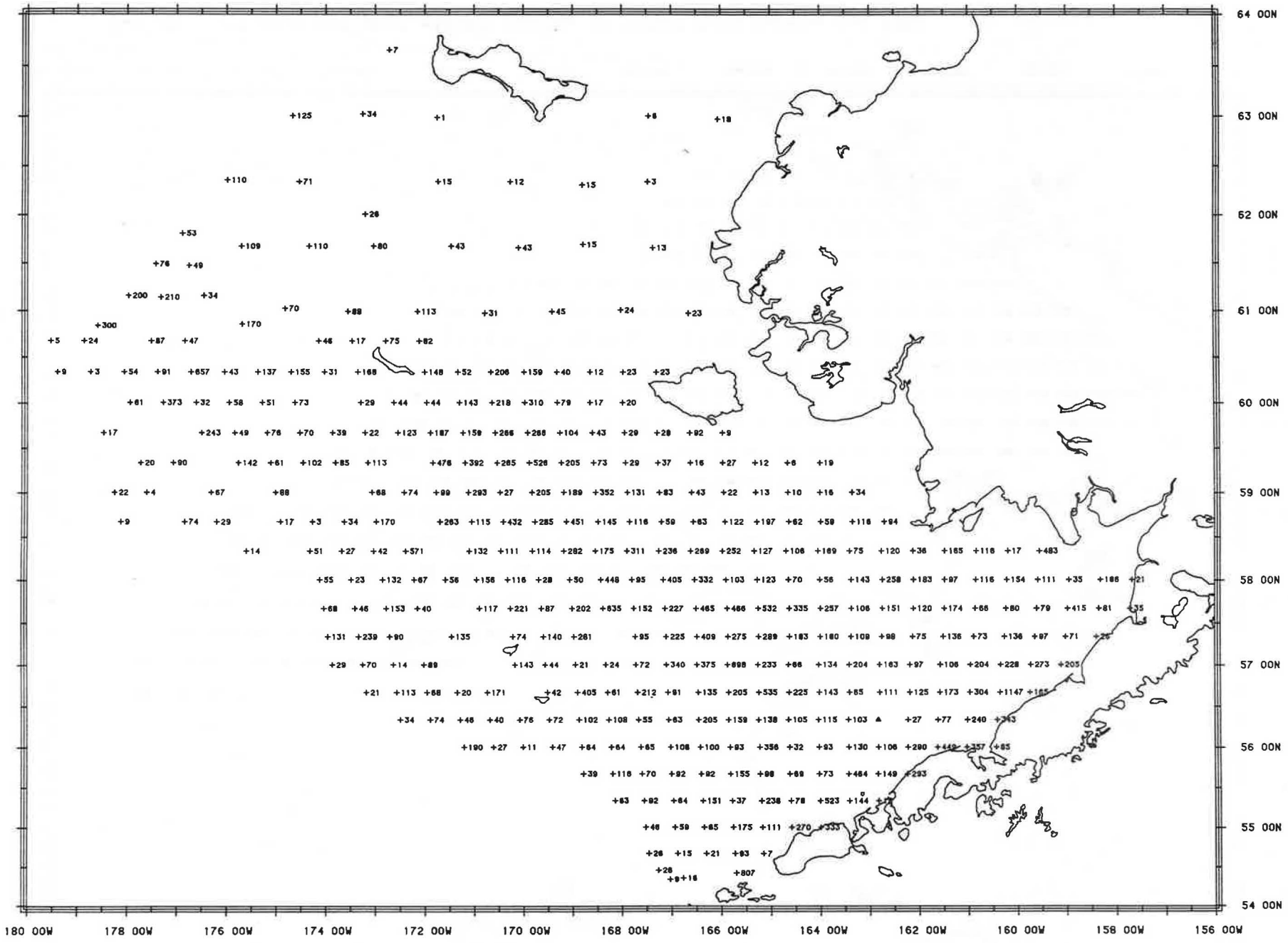


Figure 1.--Catch per unit effort (kg/ha) of total fish during the 1979 survey.

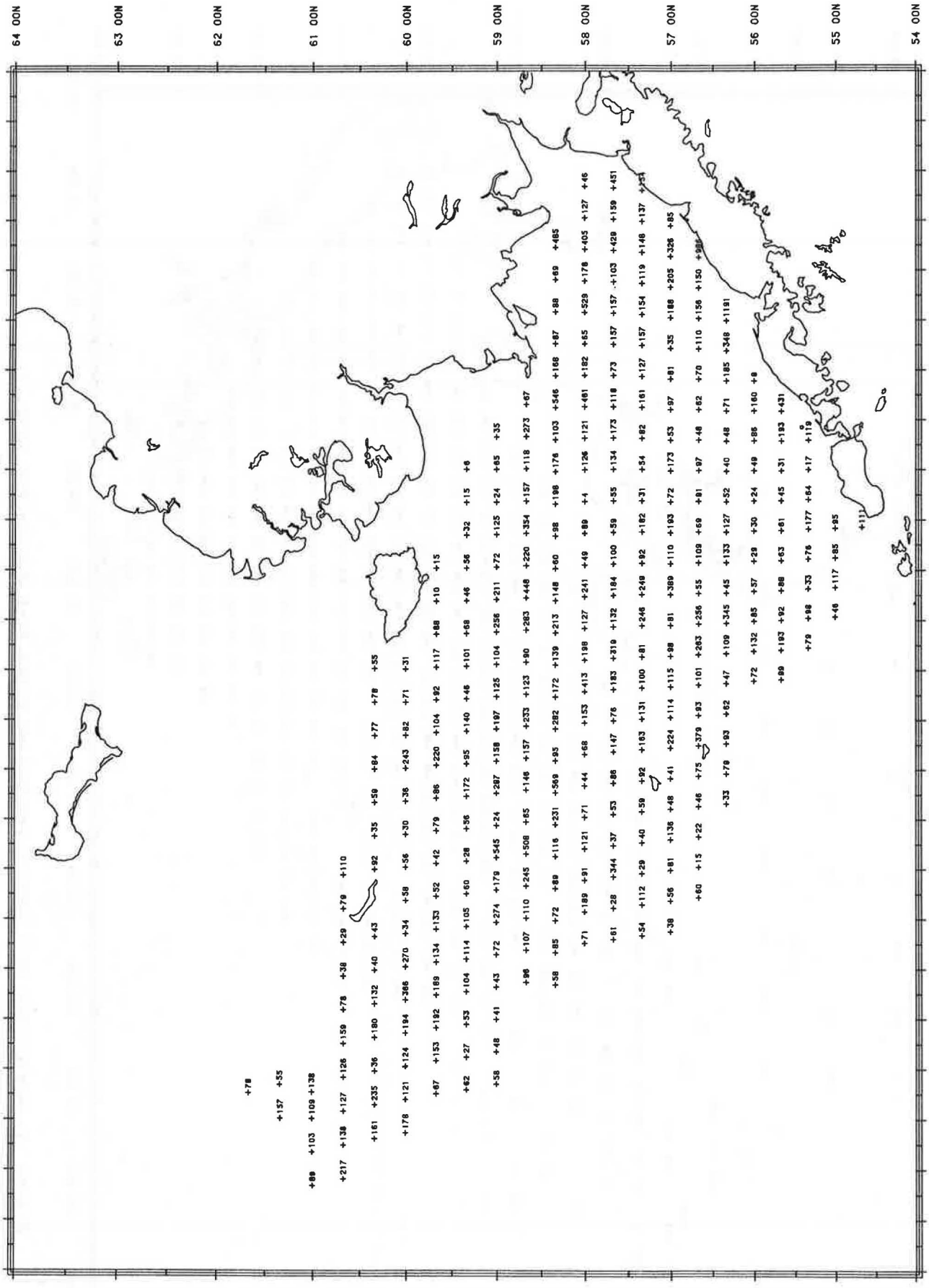


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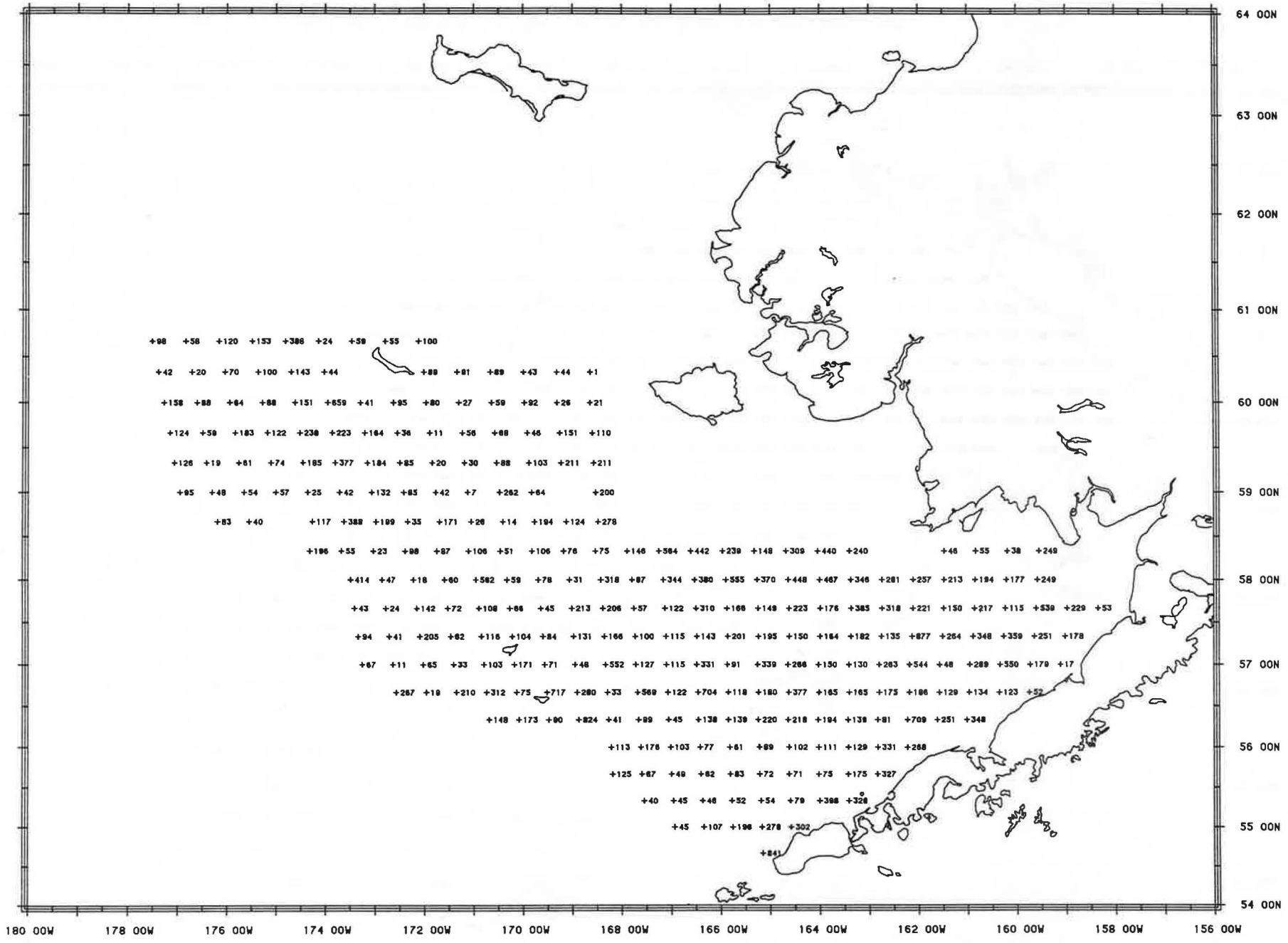


Figure 3.--Catch per unit effort (kg/ha) of total fish during the 1981 survey.

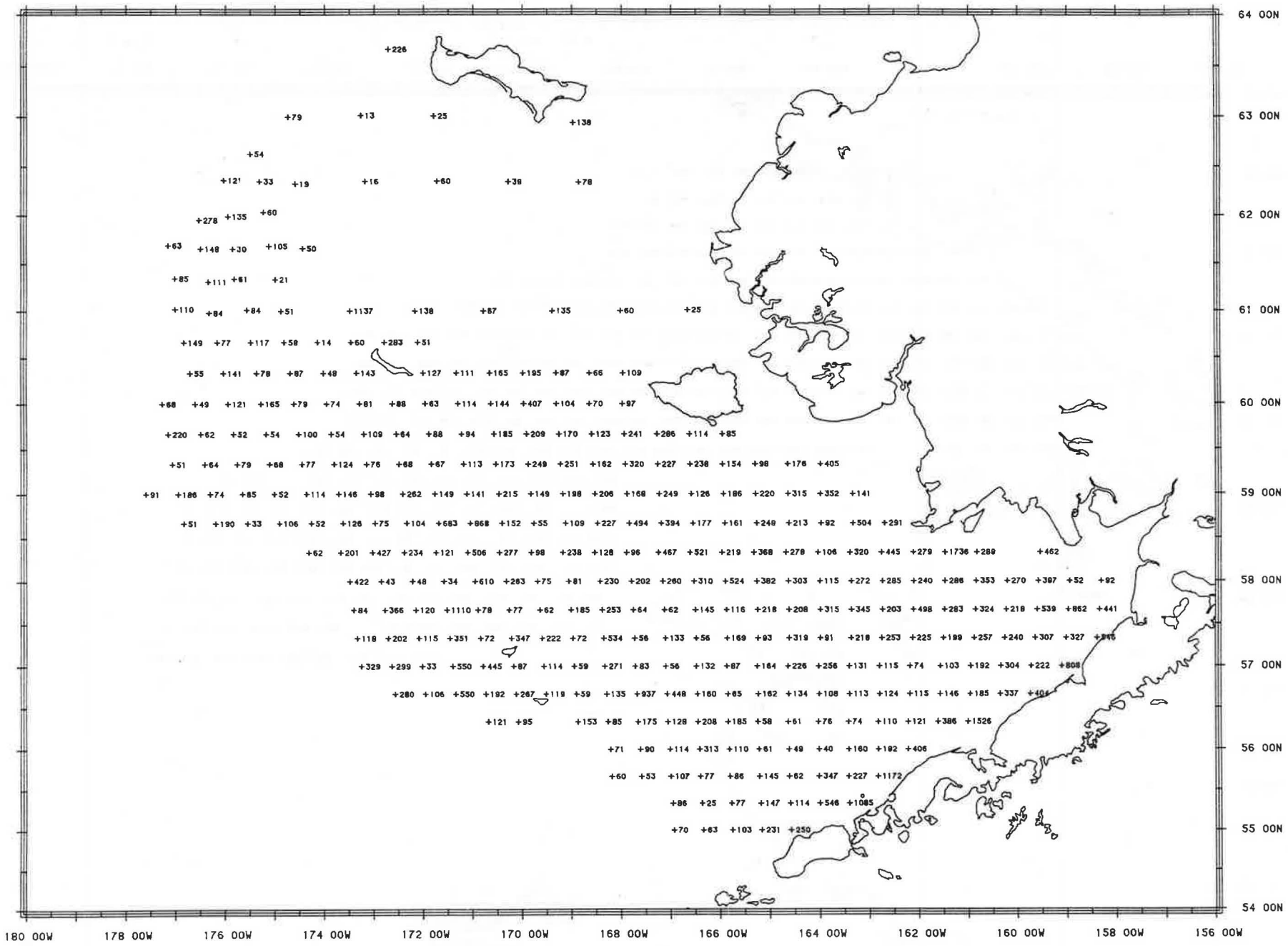


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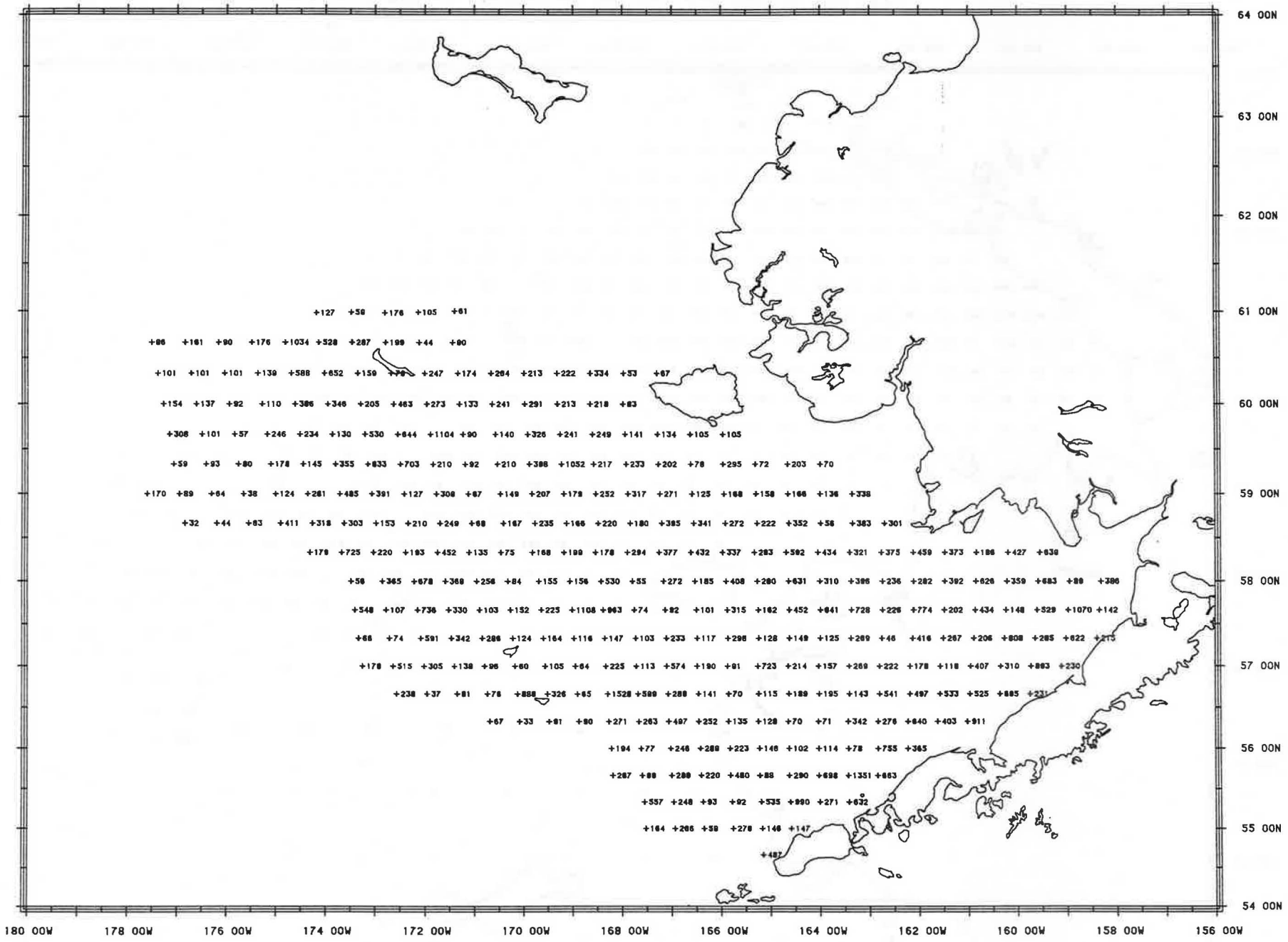


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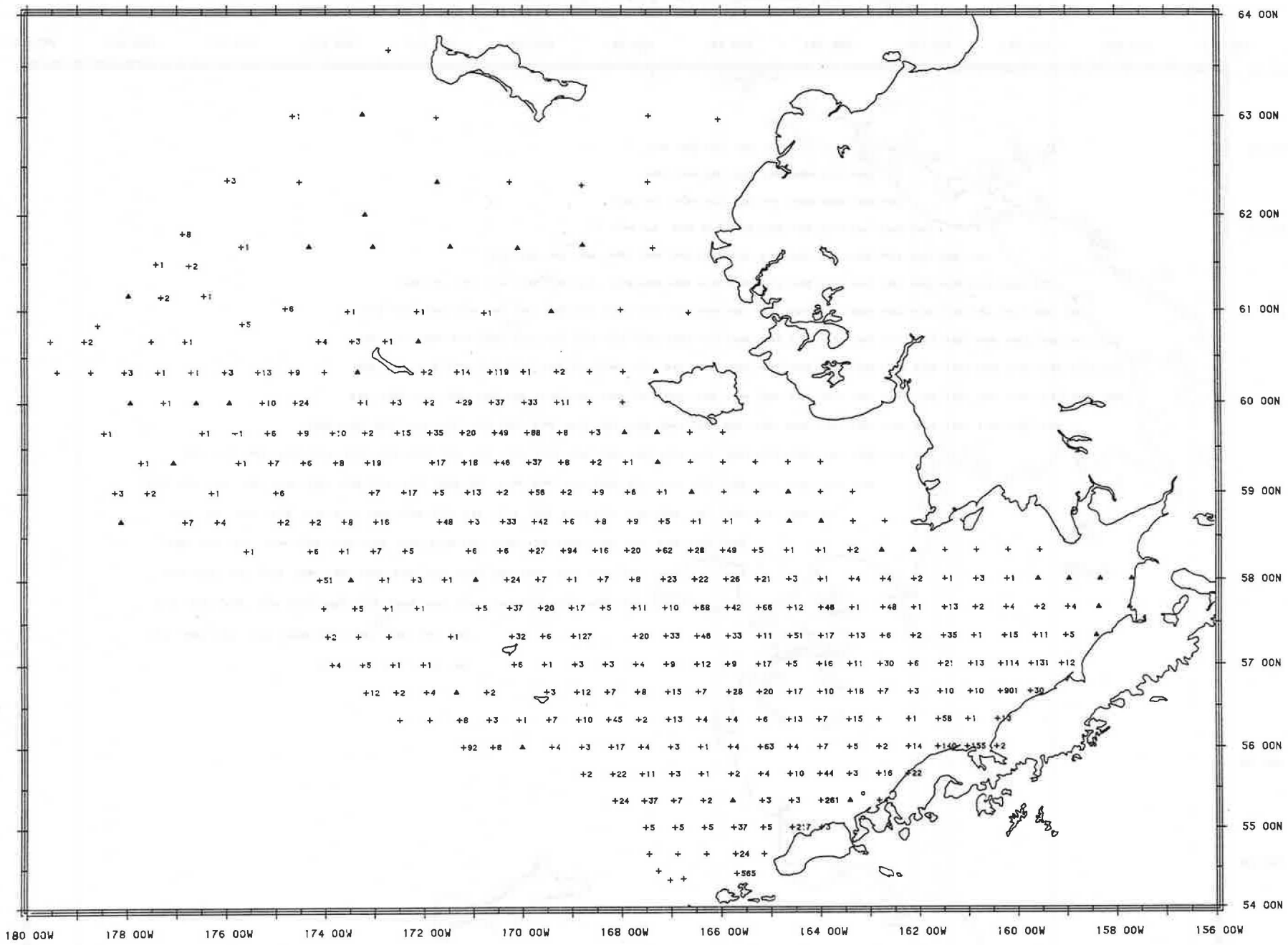


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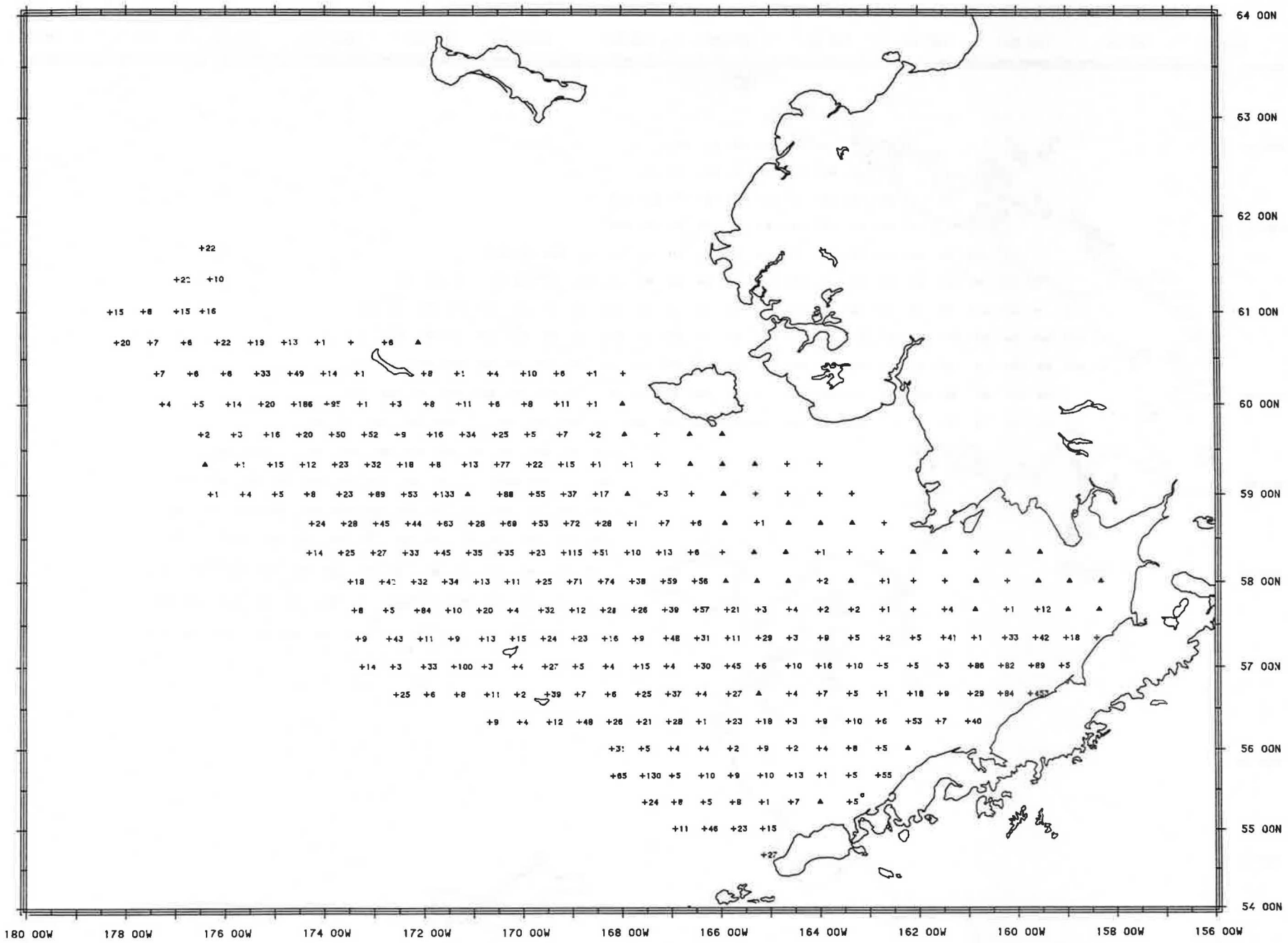


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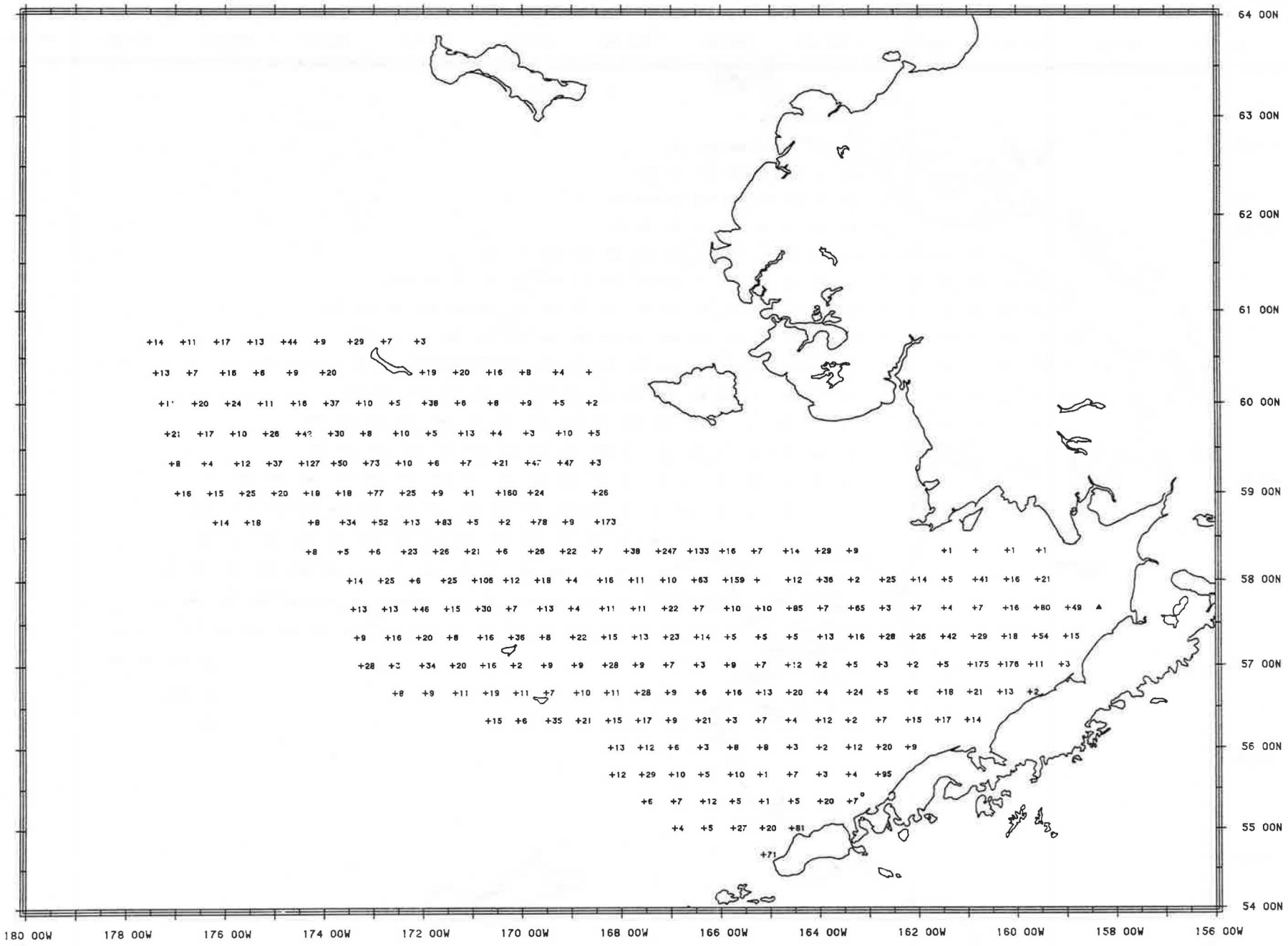


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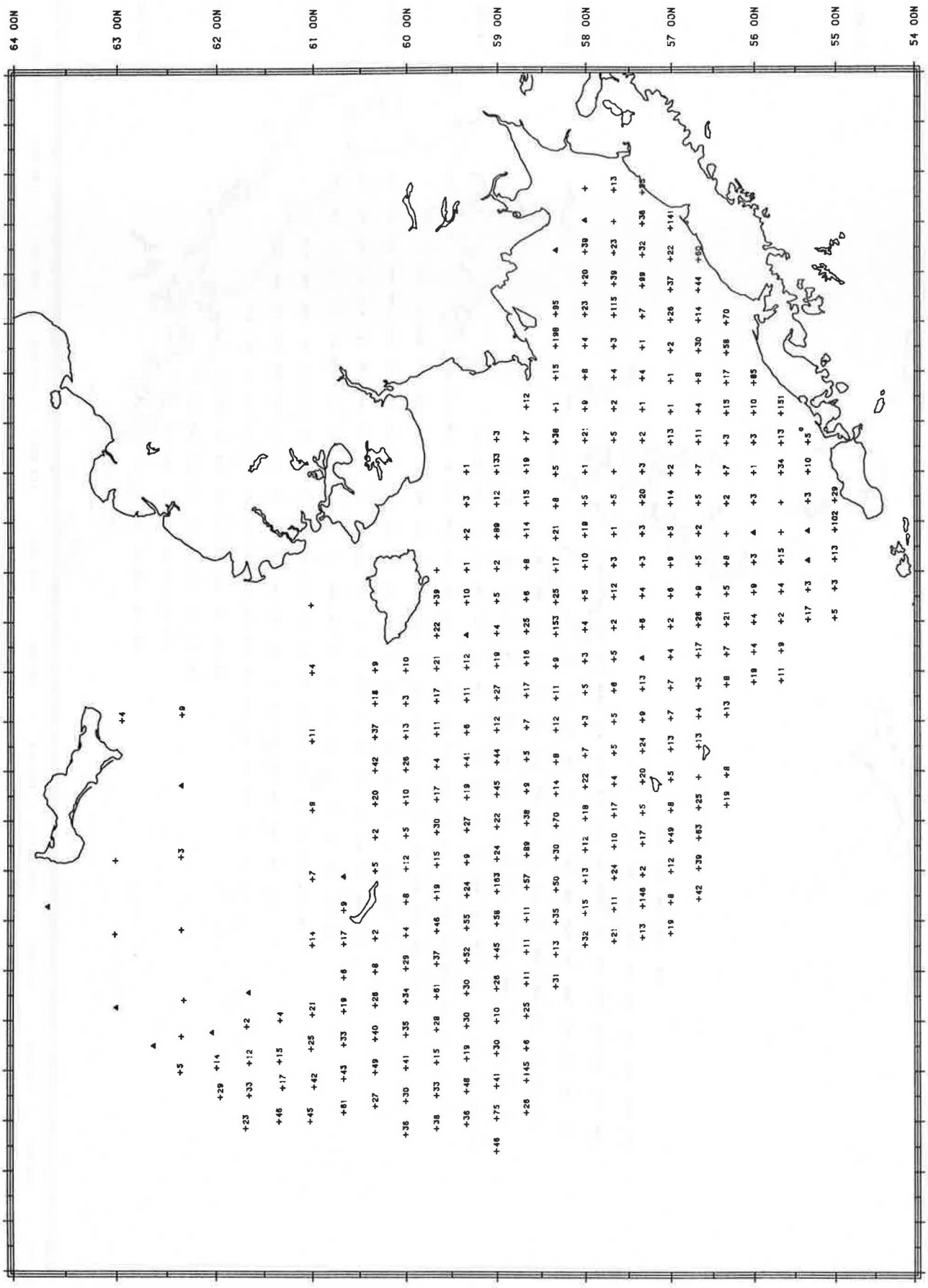


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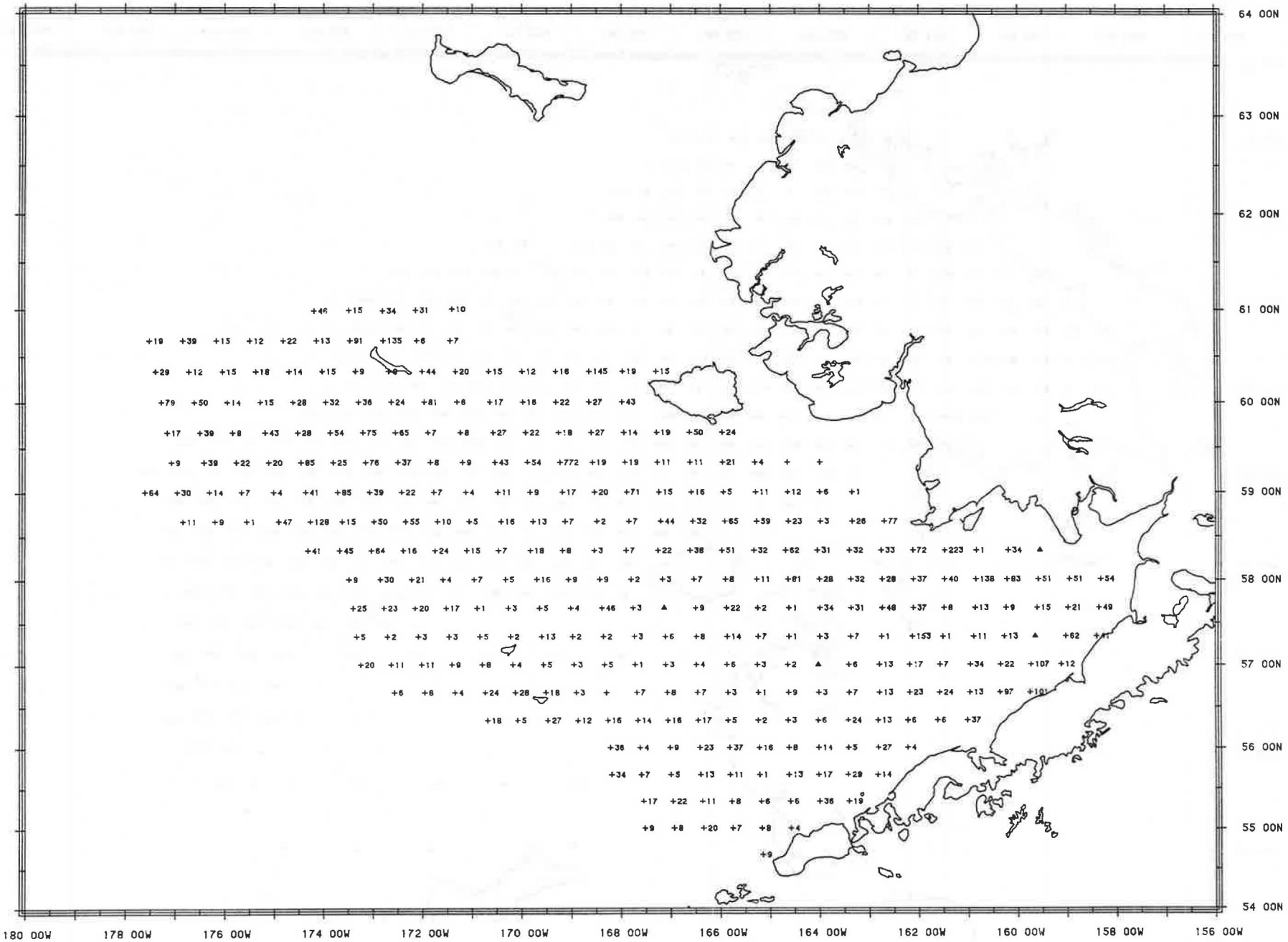


Figure 10.--Catch per unit effort (kg/ha) of Pacific cod during the 1983 survey.

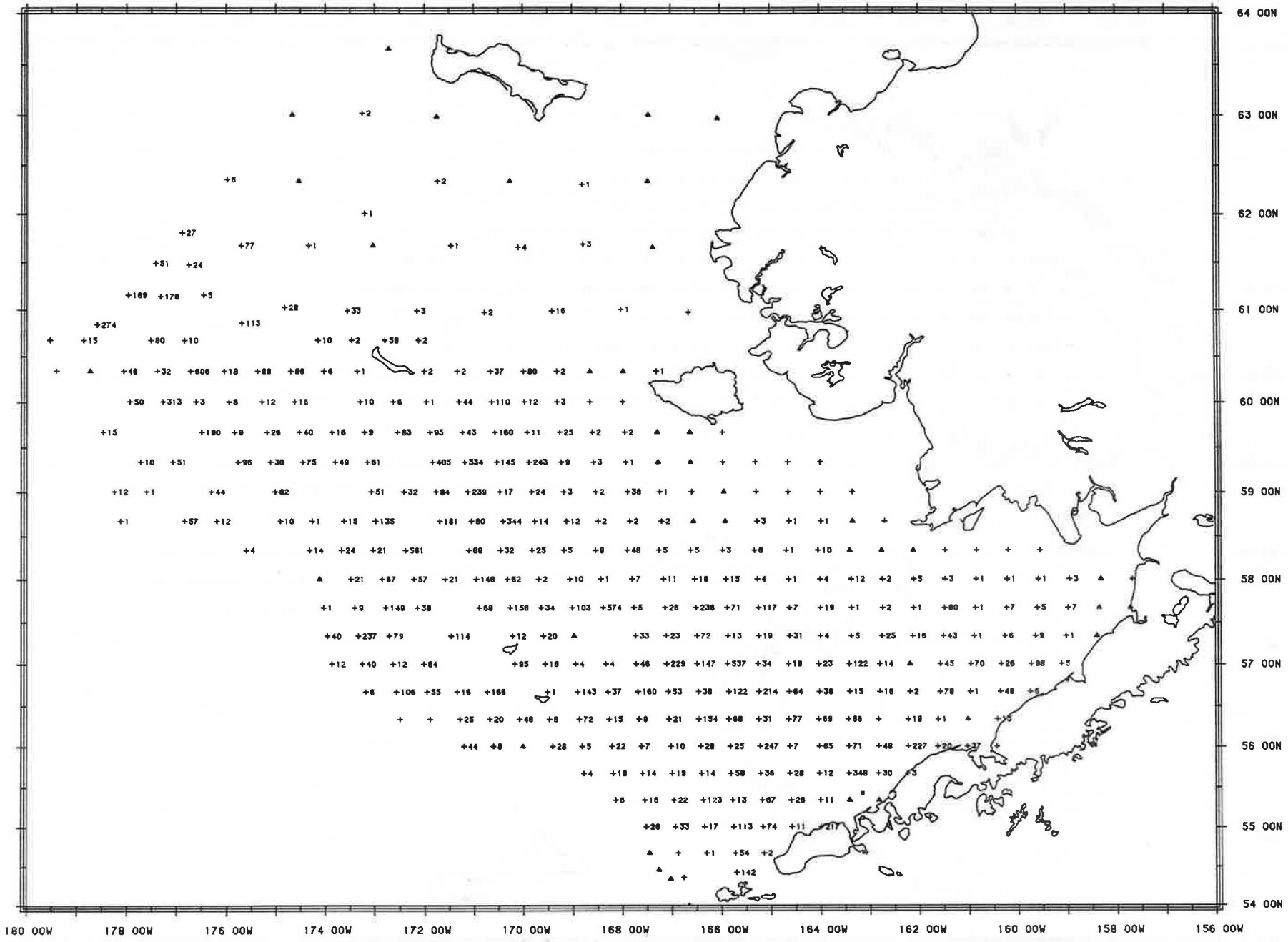


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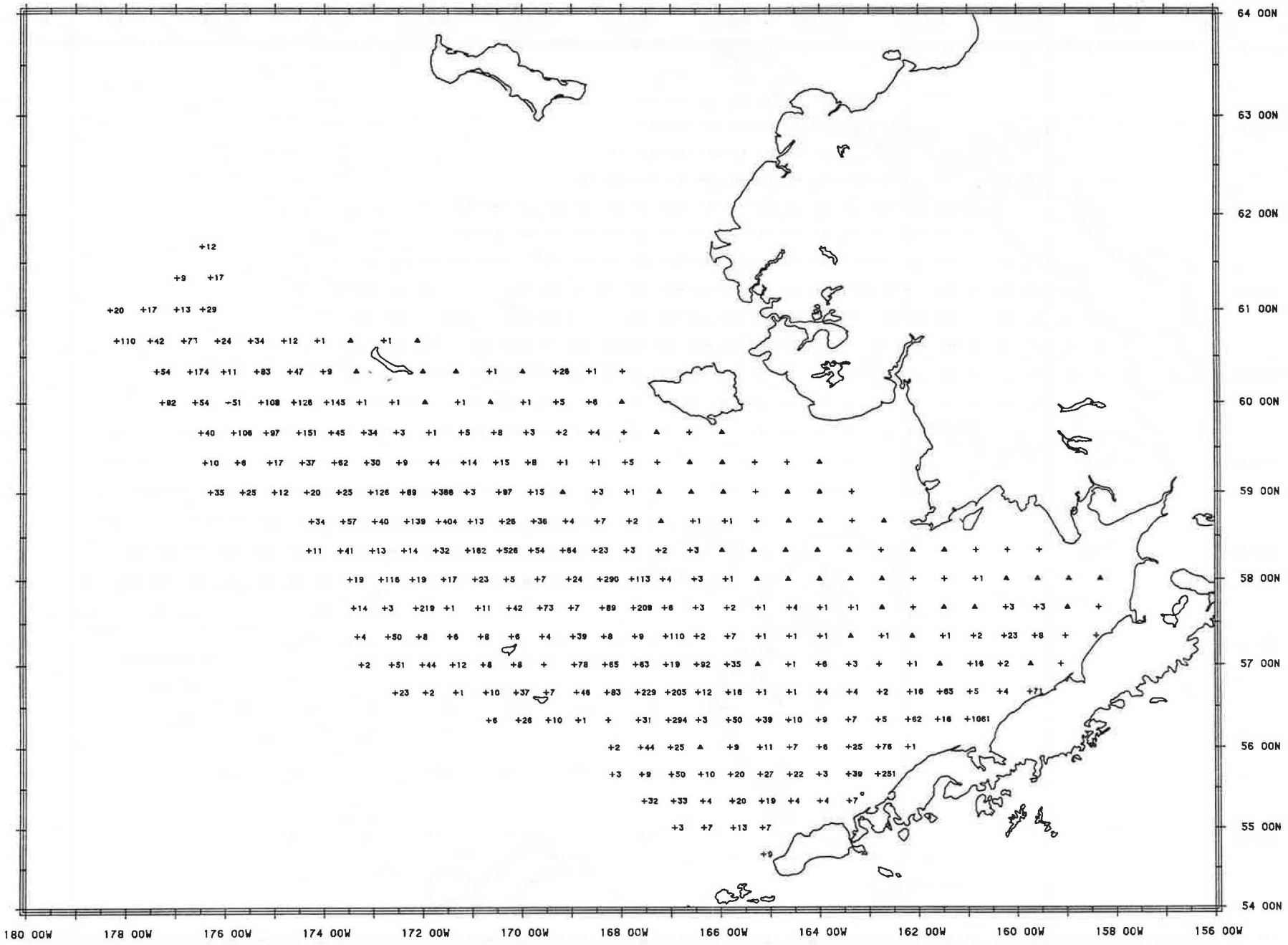


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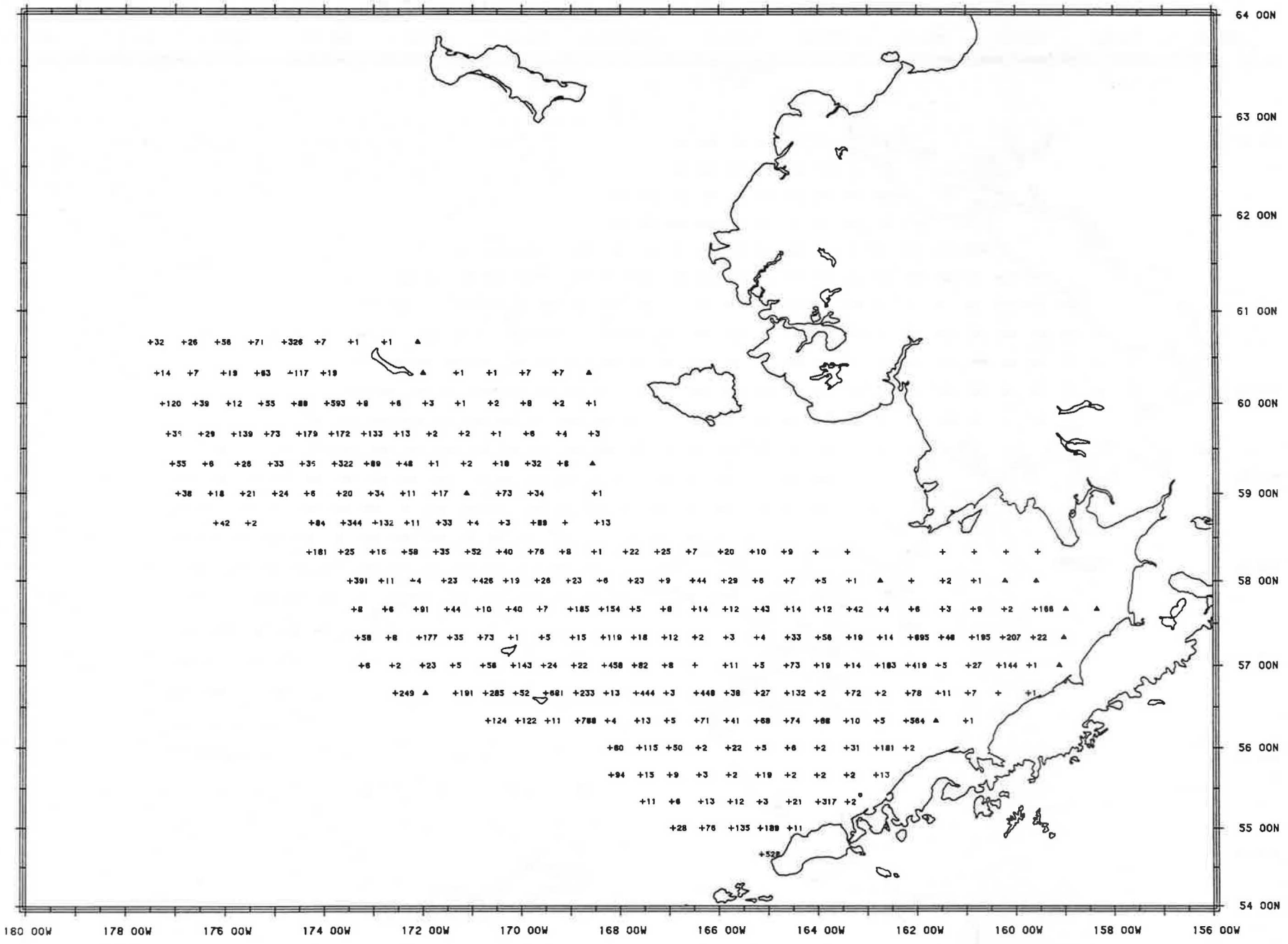


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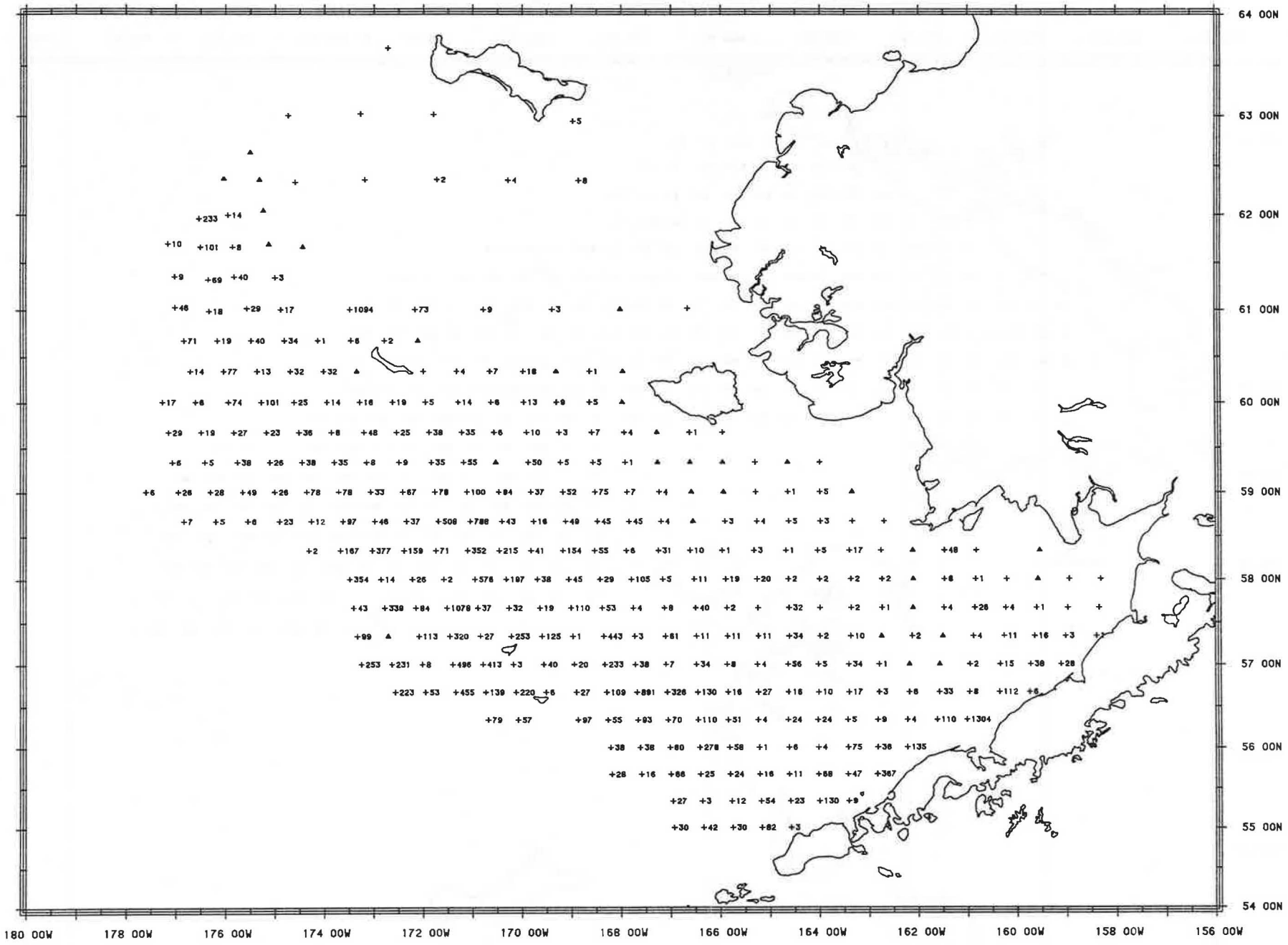


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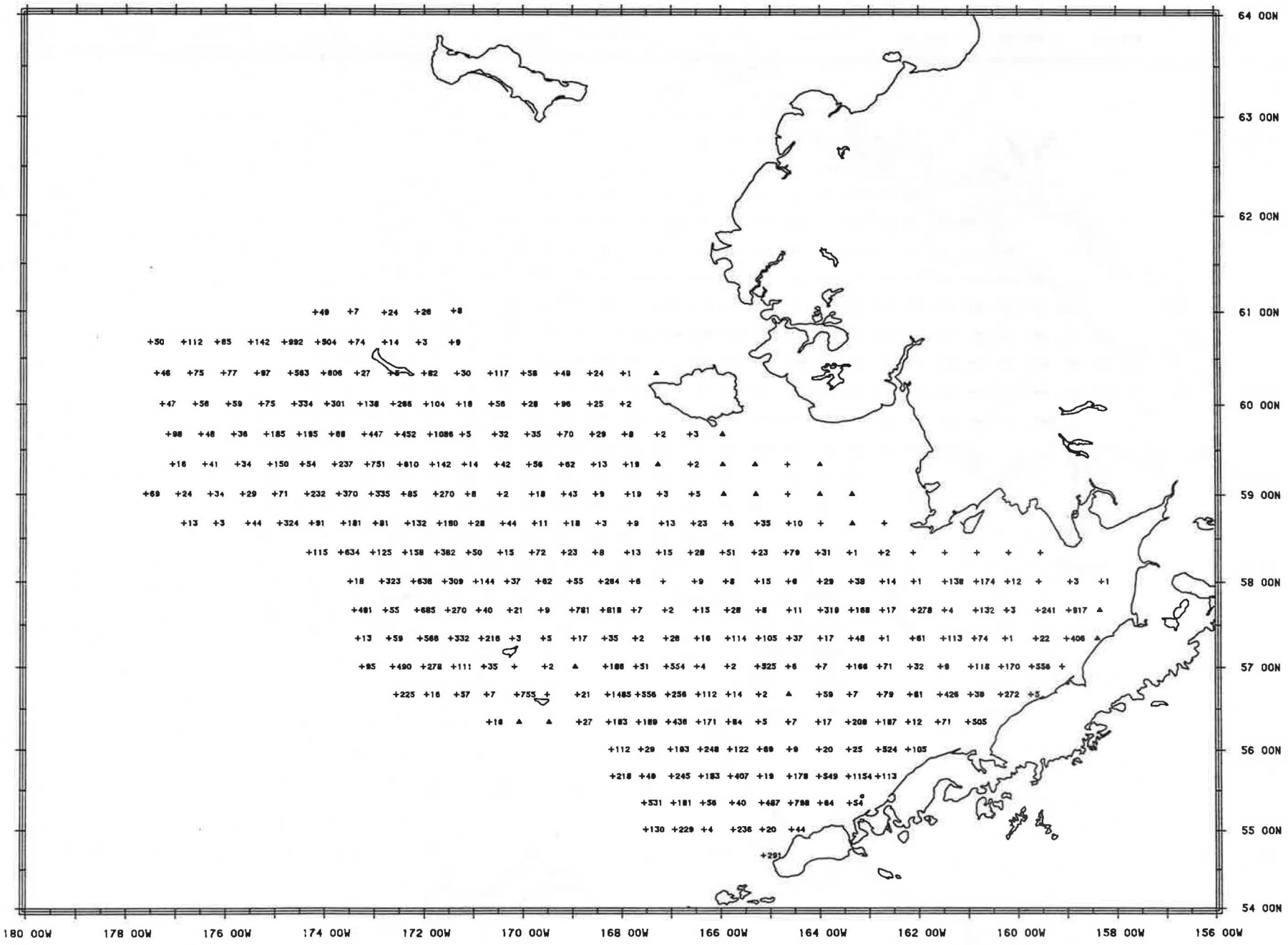


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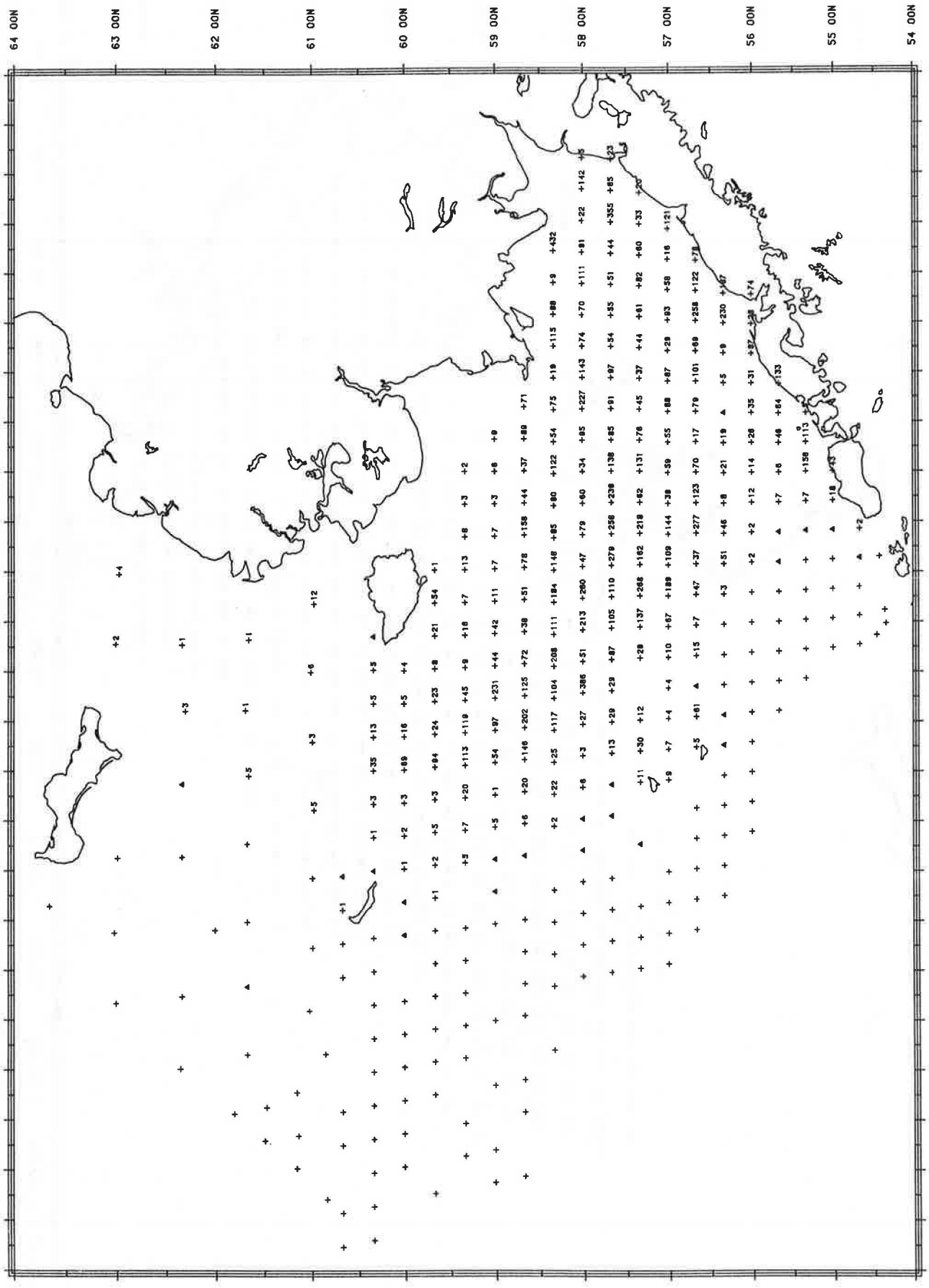


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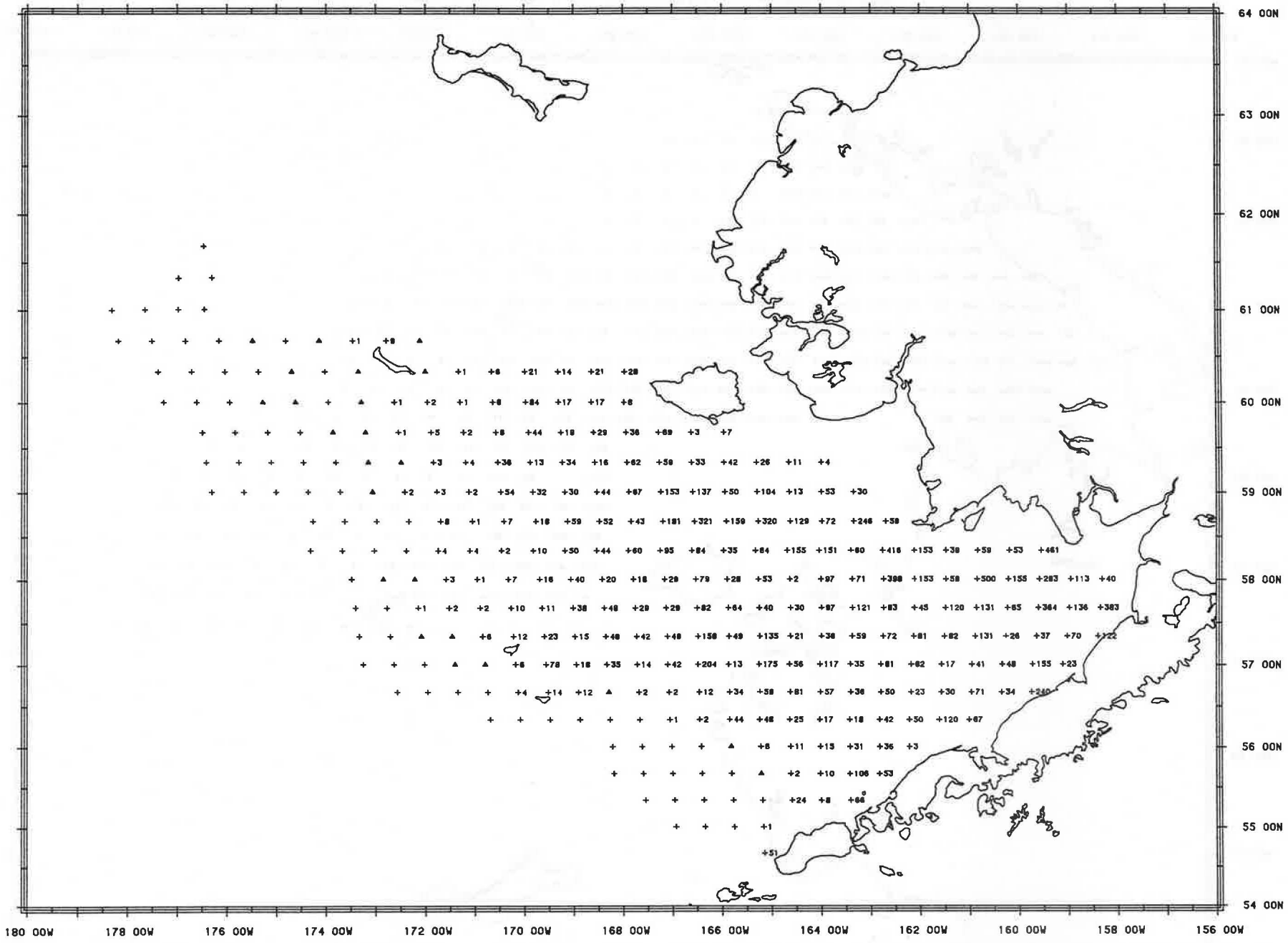


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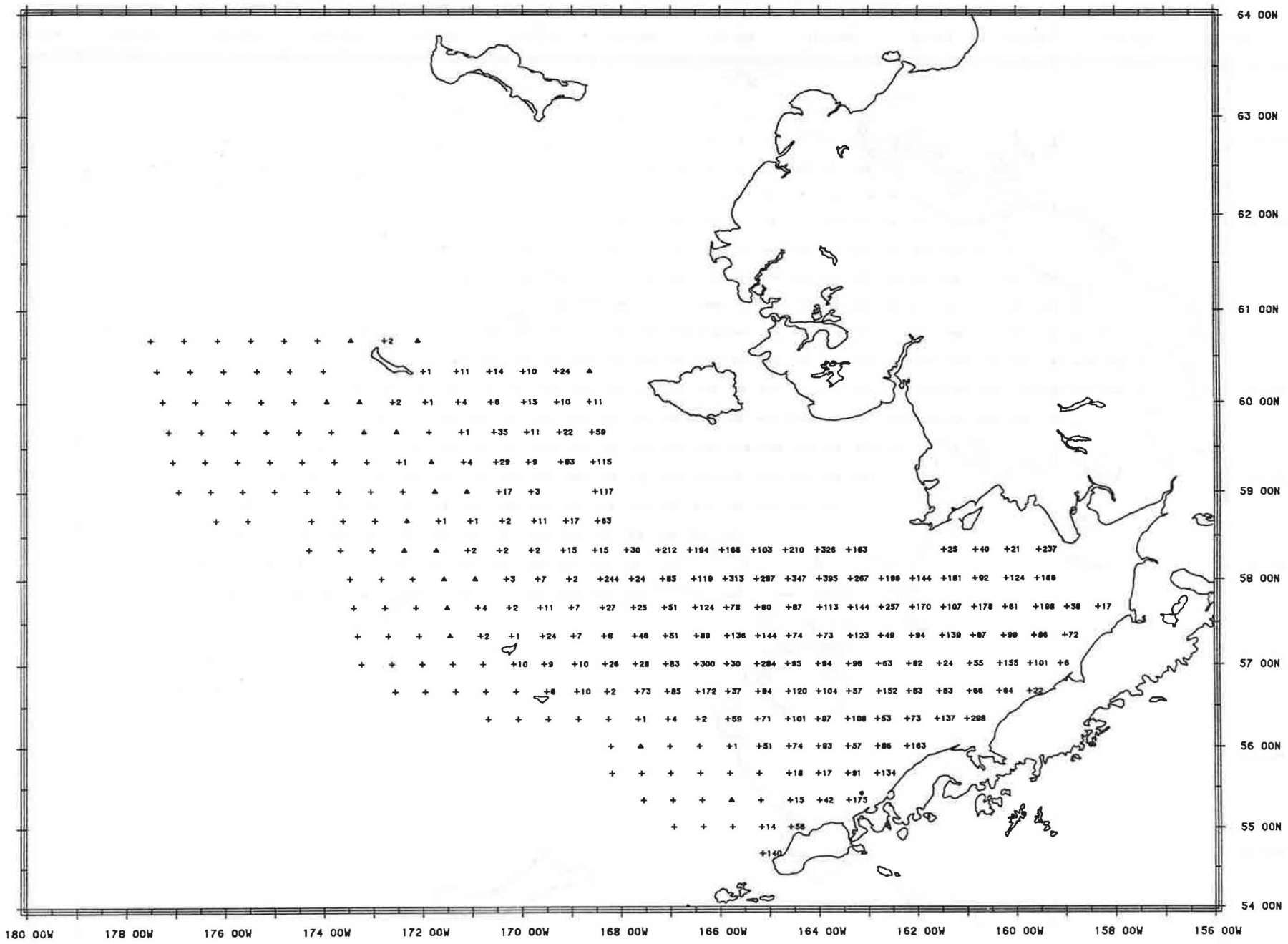


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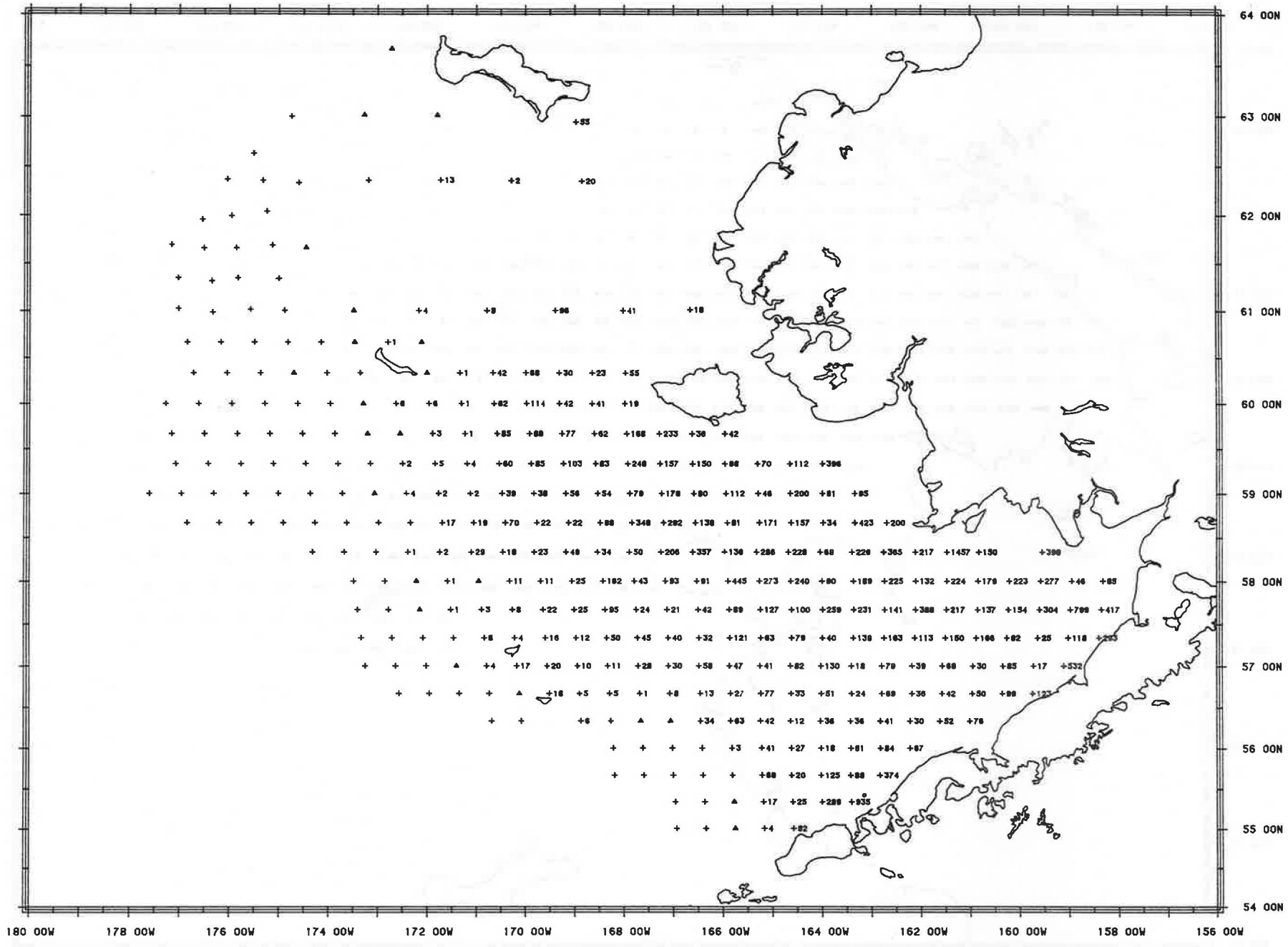


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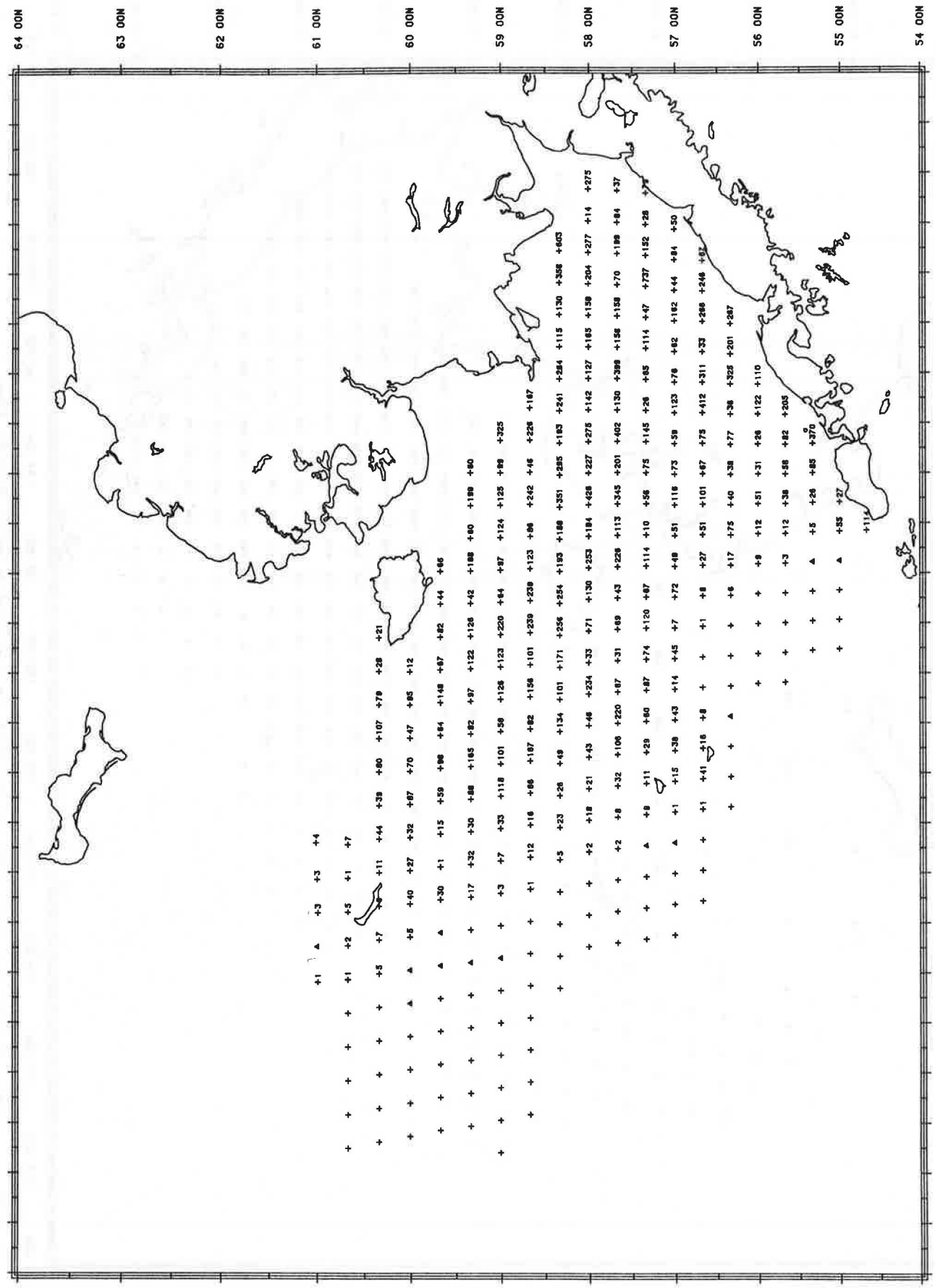


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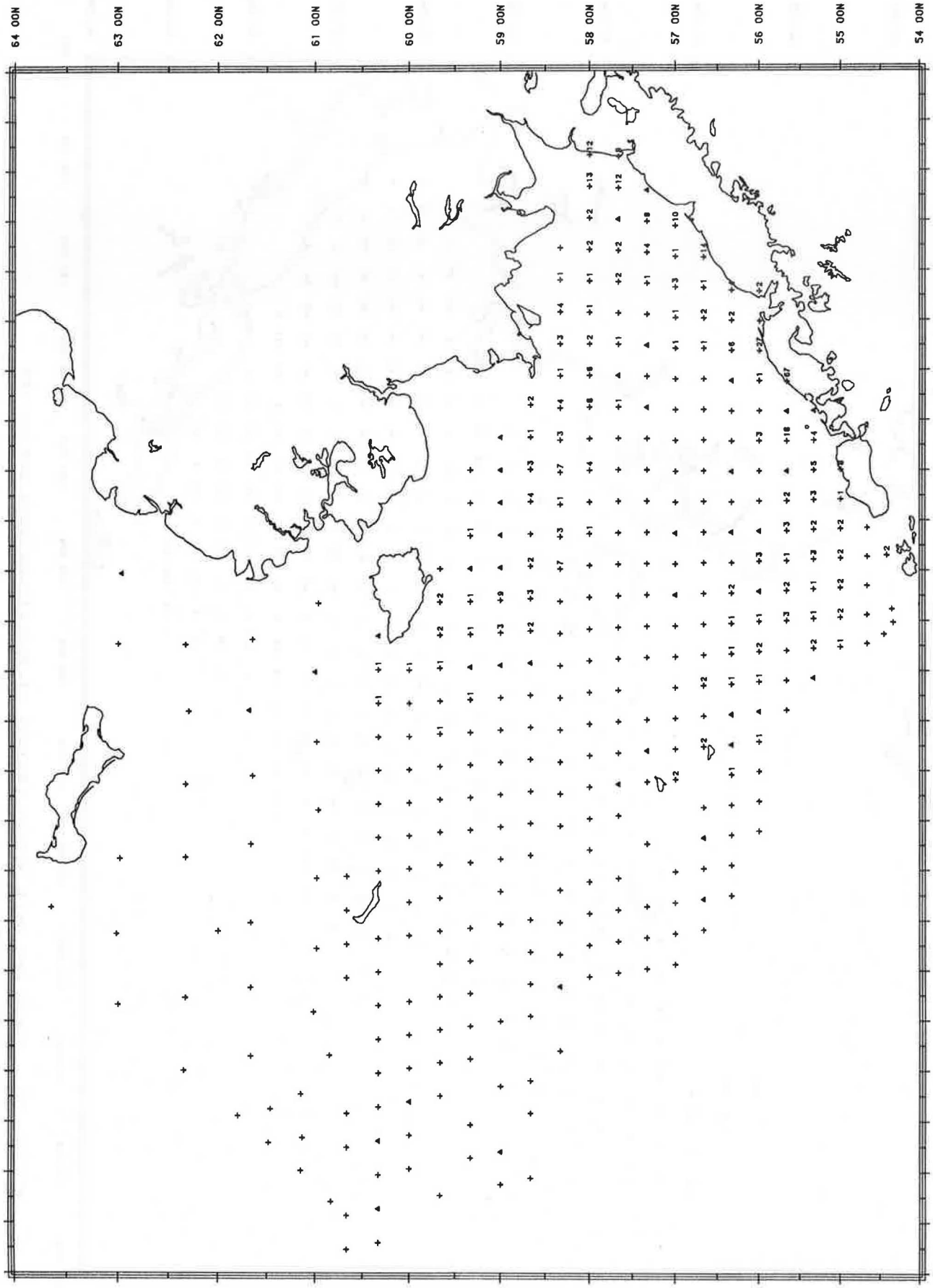


Figure 21.--Catch per unit effort (kg/ha) of Pacific halibut during the 1979 survey.

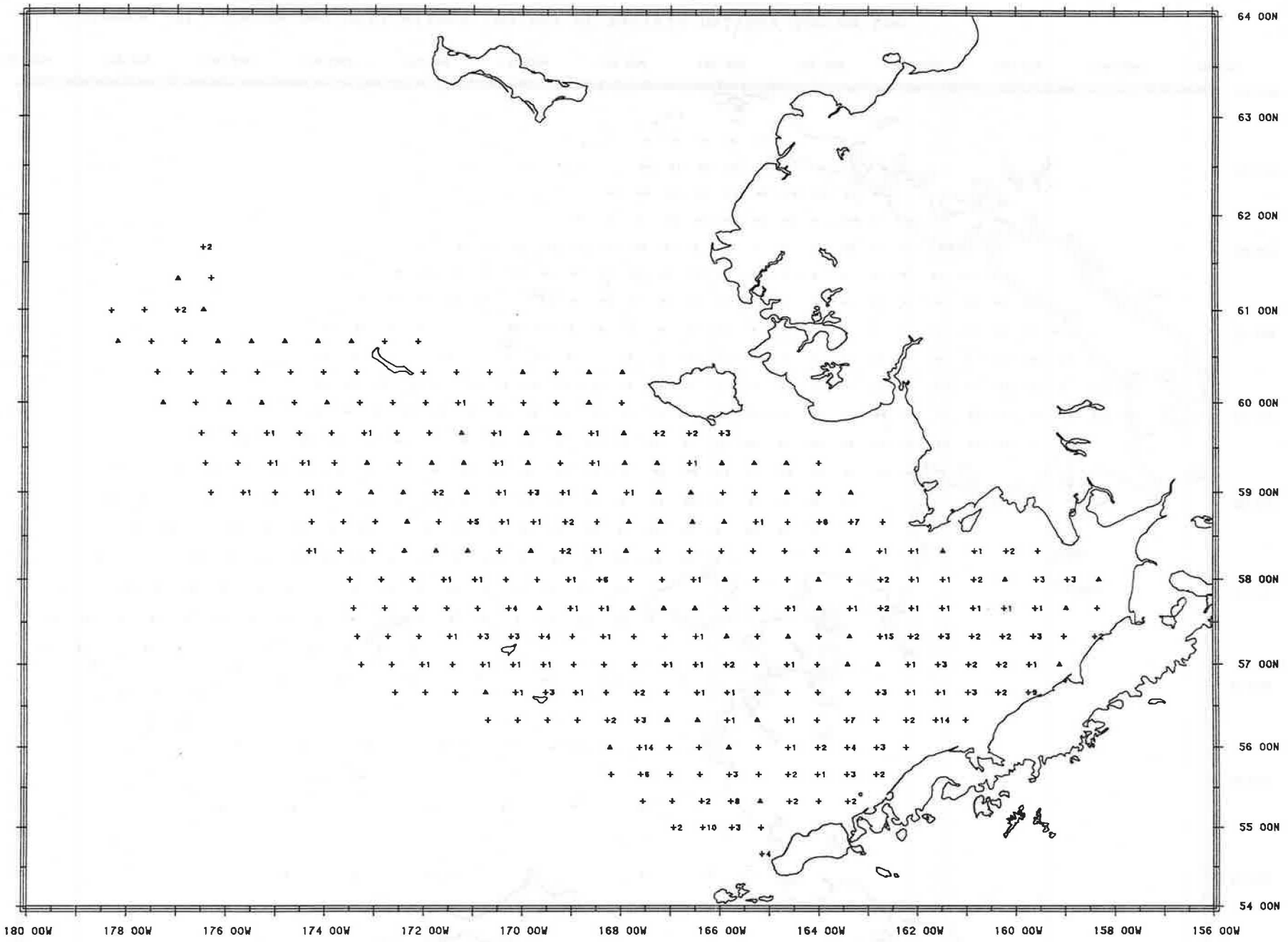


Figure 22.--Catch per unit effort (kg/ha) of Pacific halibut during the 1980 survey.

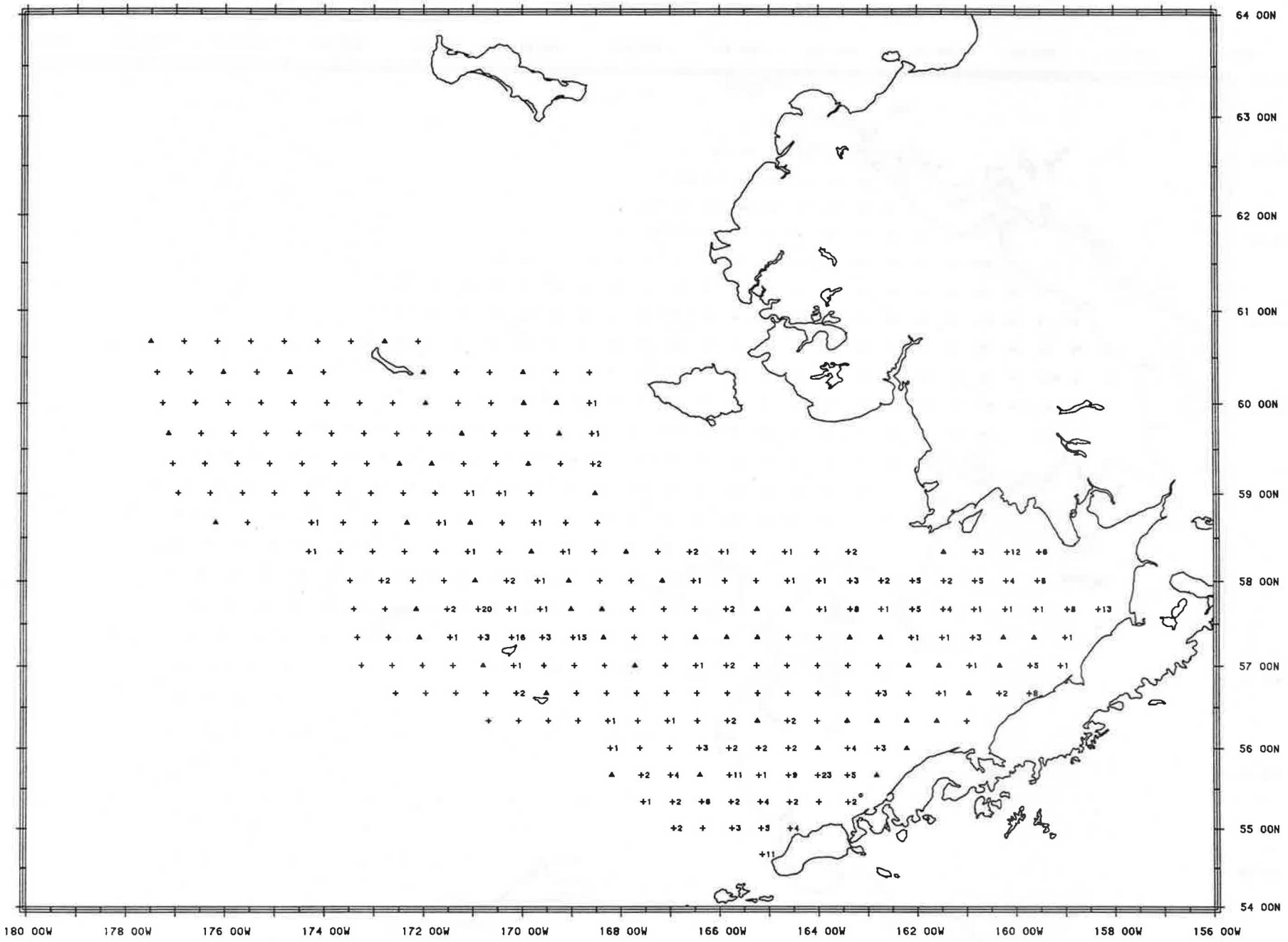


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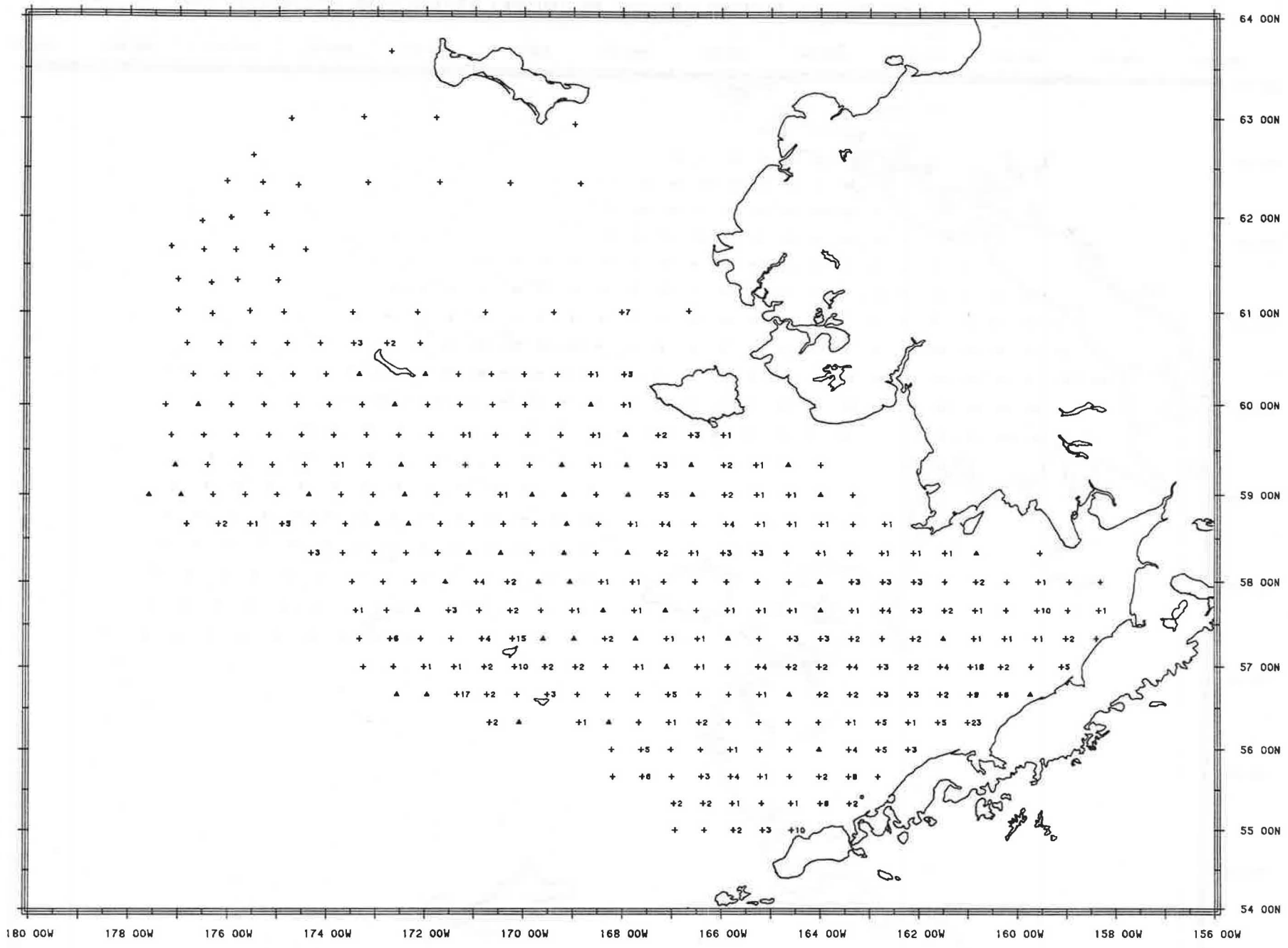


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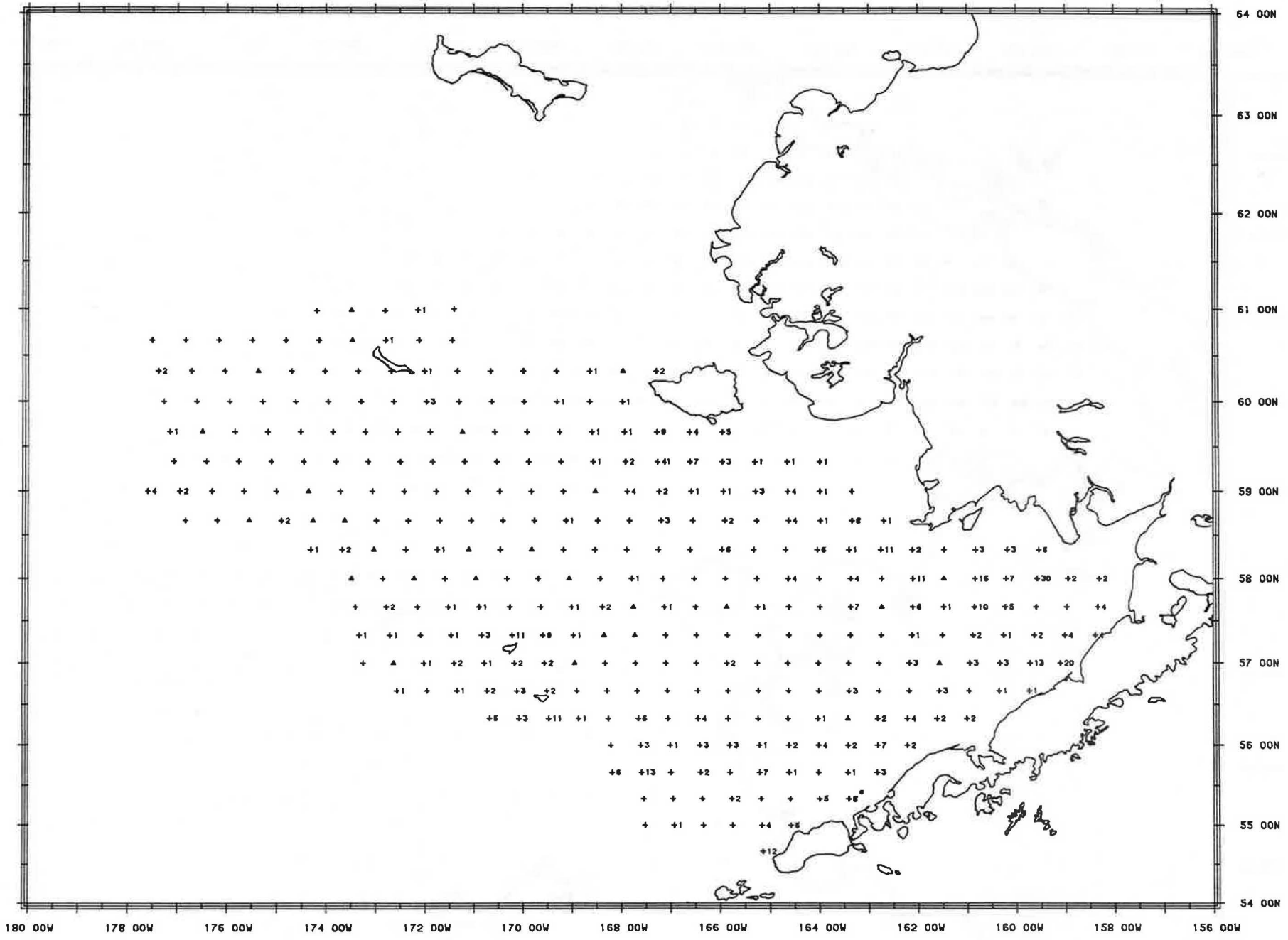


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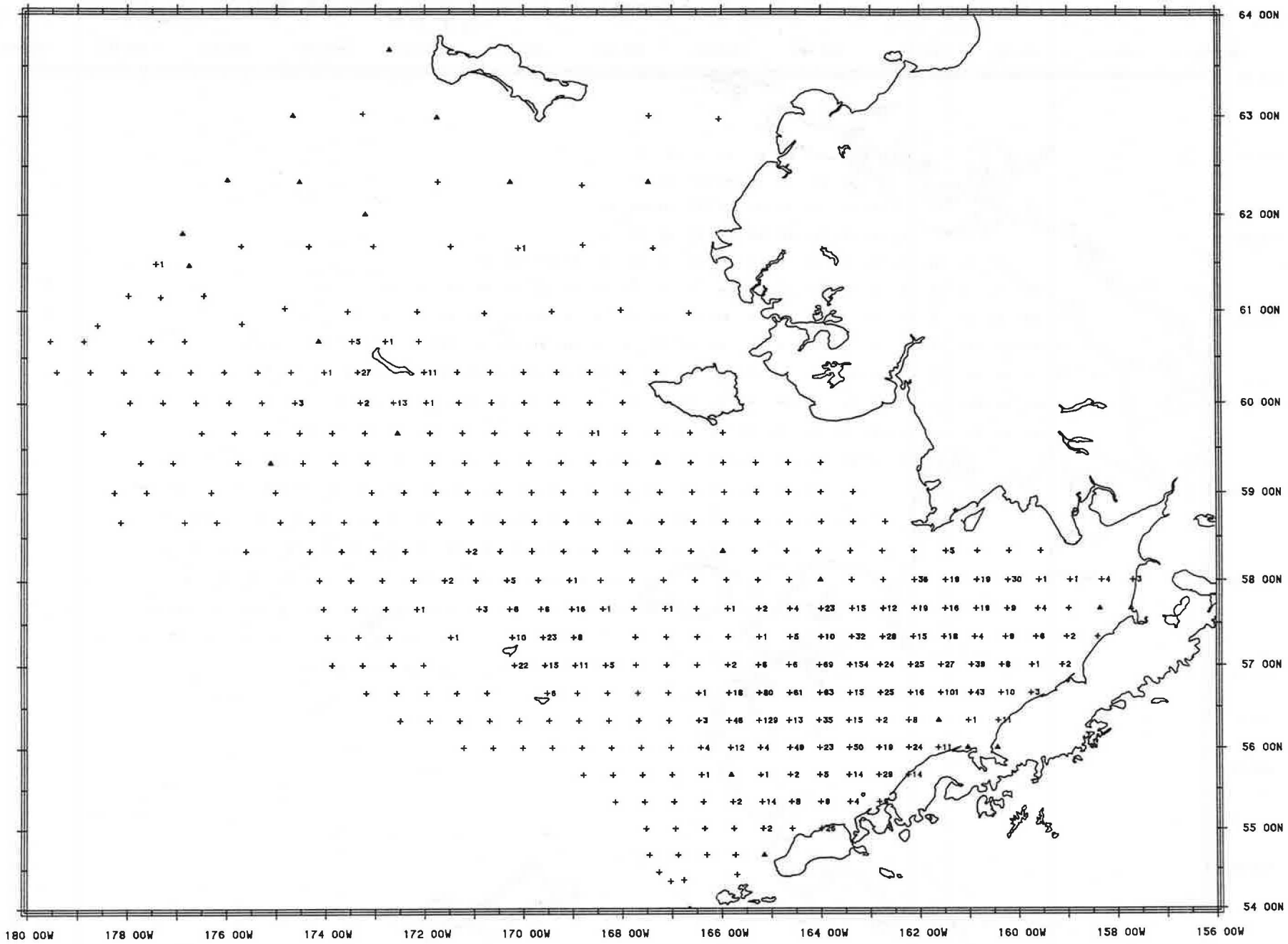


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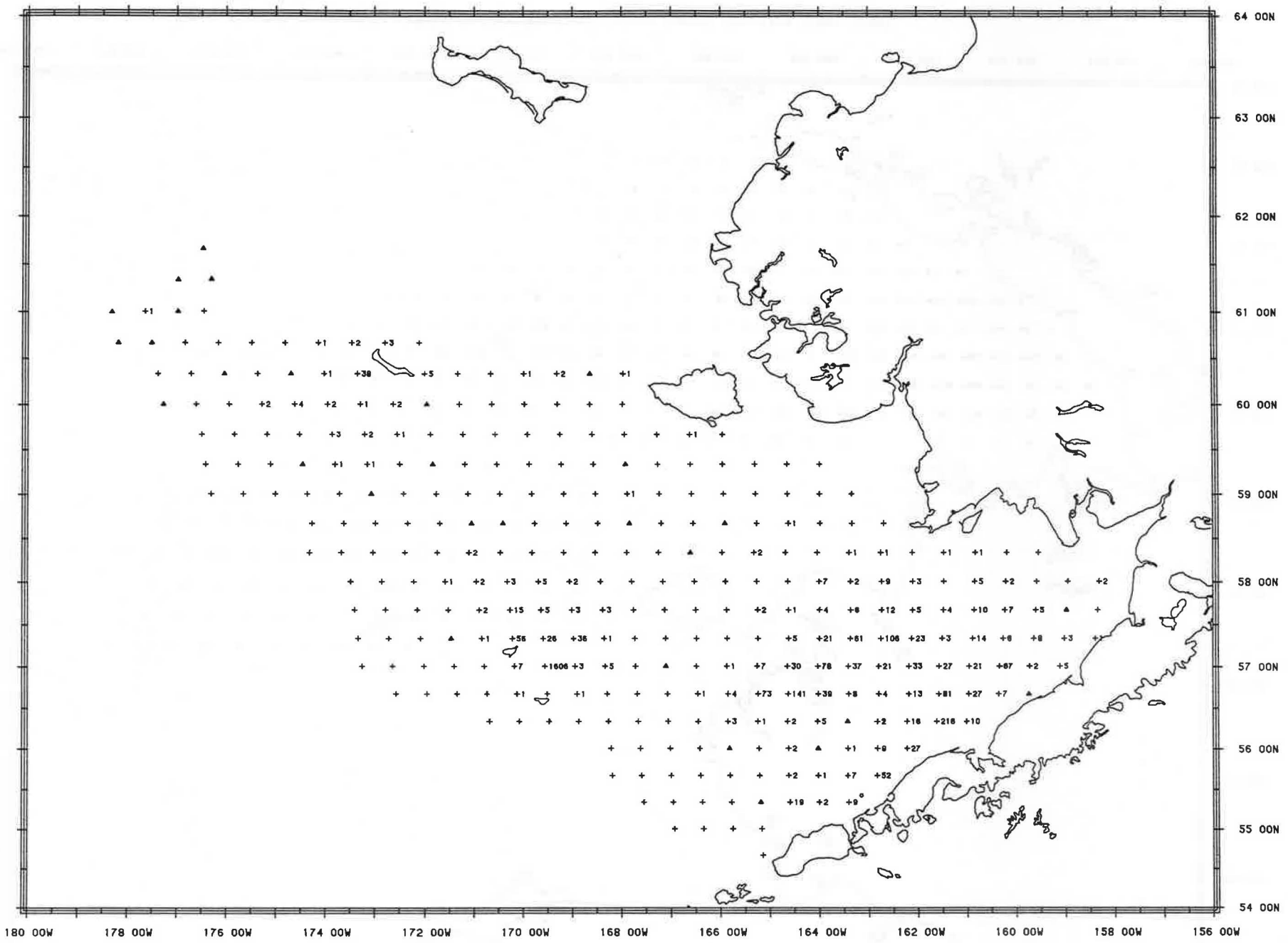


Figure 27.--Catch per unit effort (kg/ha) of king crab during the 1980 survey.

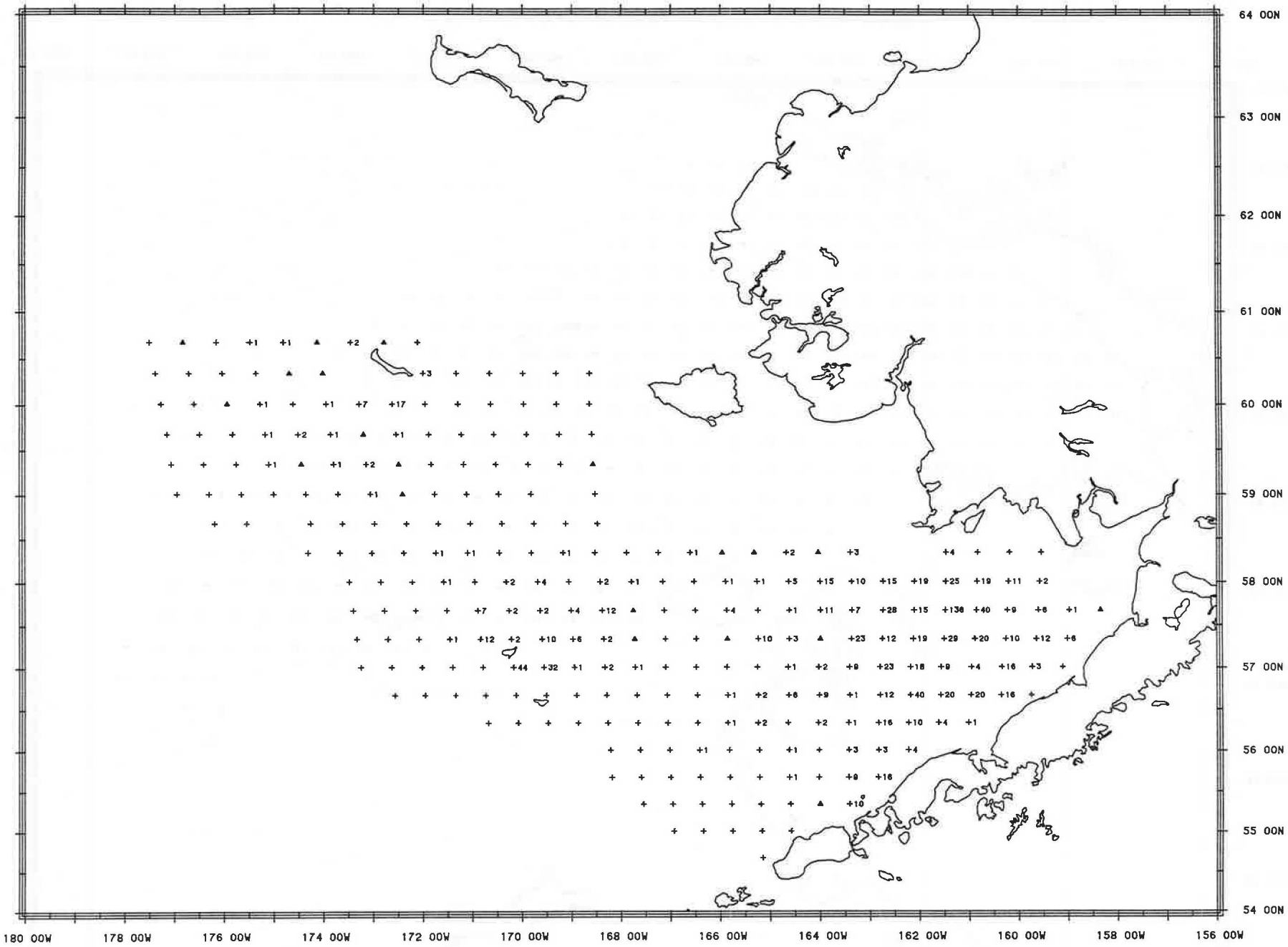


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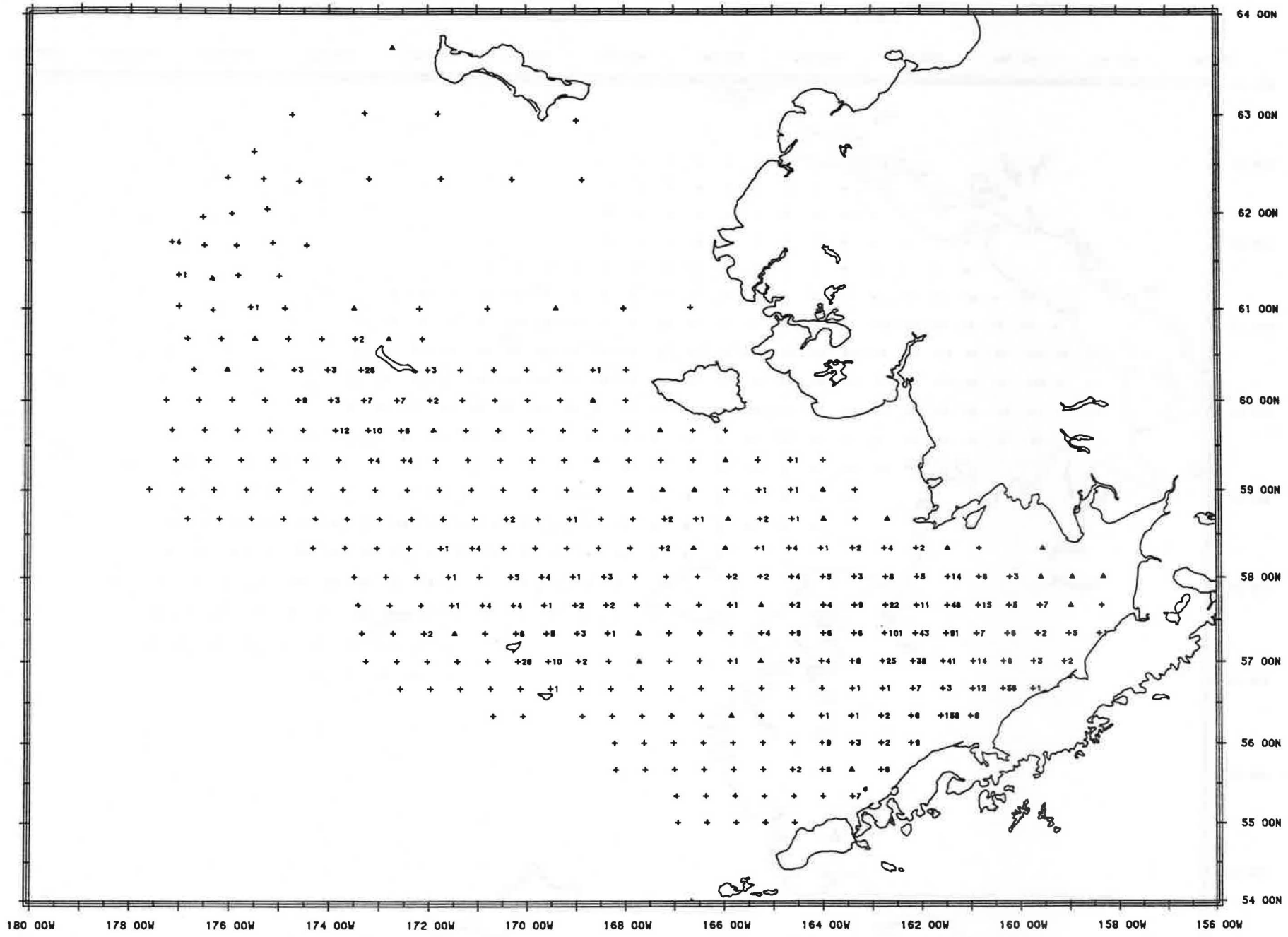


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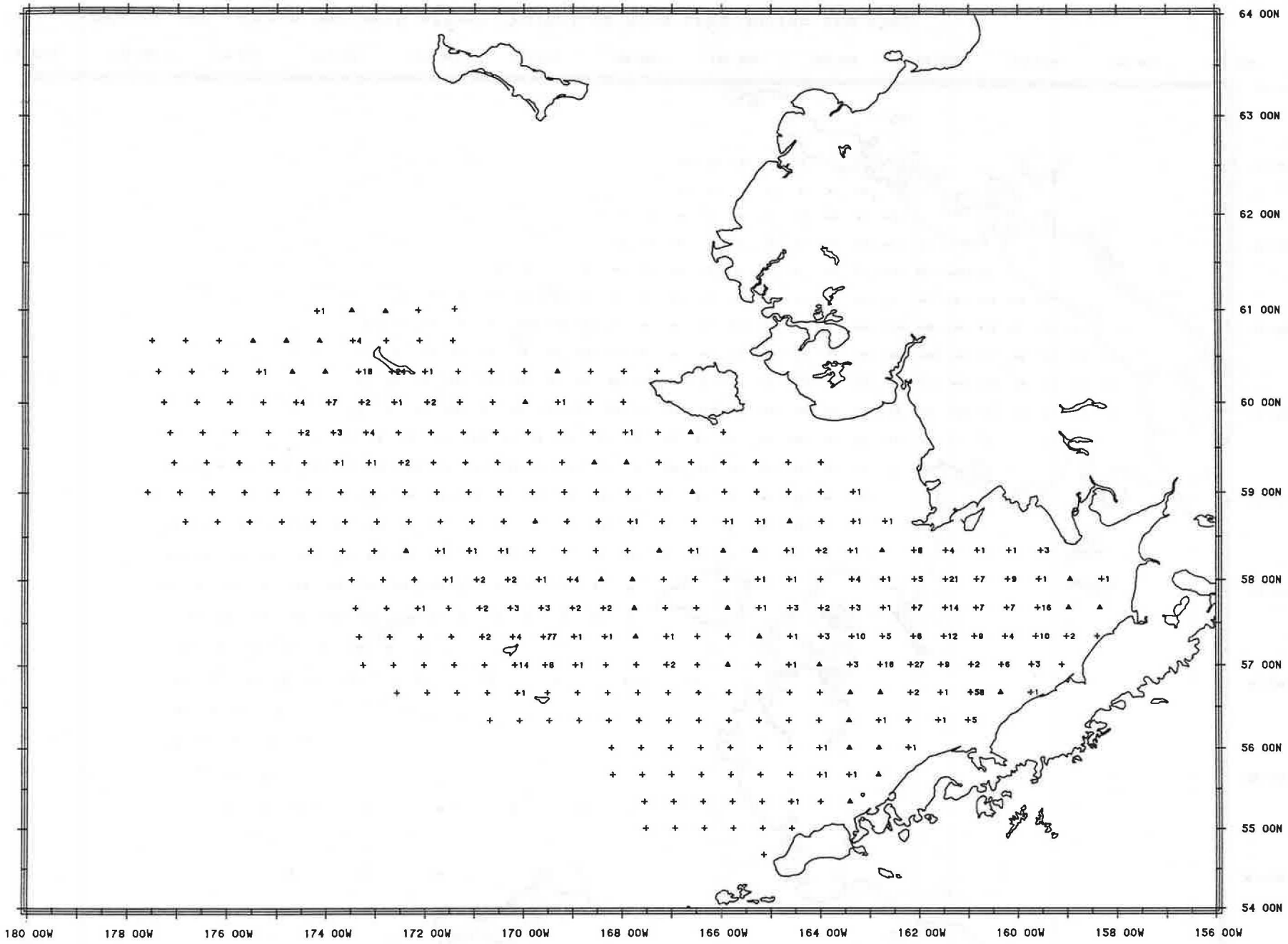


Figure 30.--Catch per unit effort (kg/ha) of king crab during the 1983 survey.

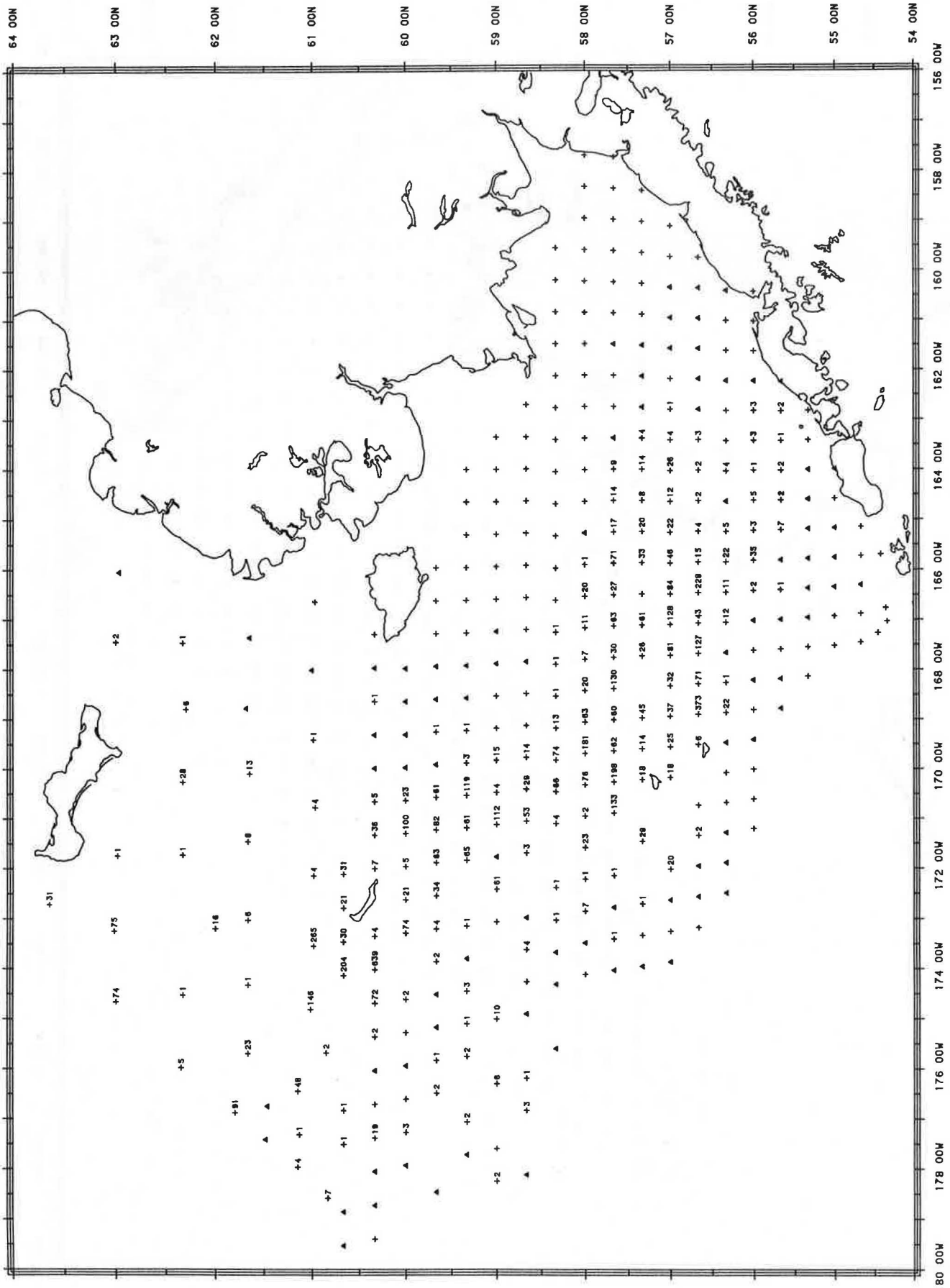


Figure 31.--Catch per unit effort (kg/ha) of C. opilio during the 1979 survey.

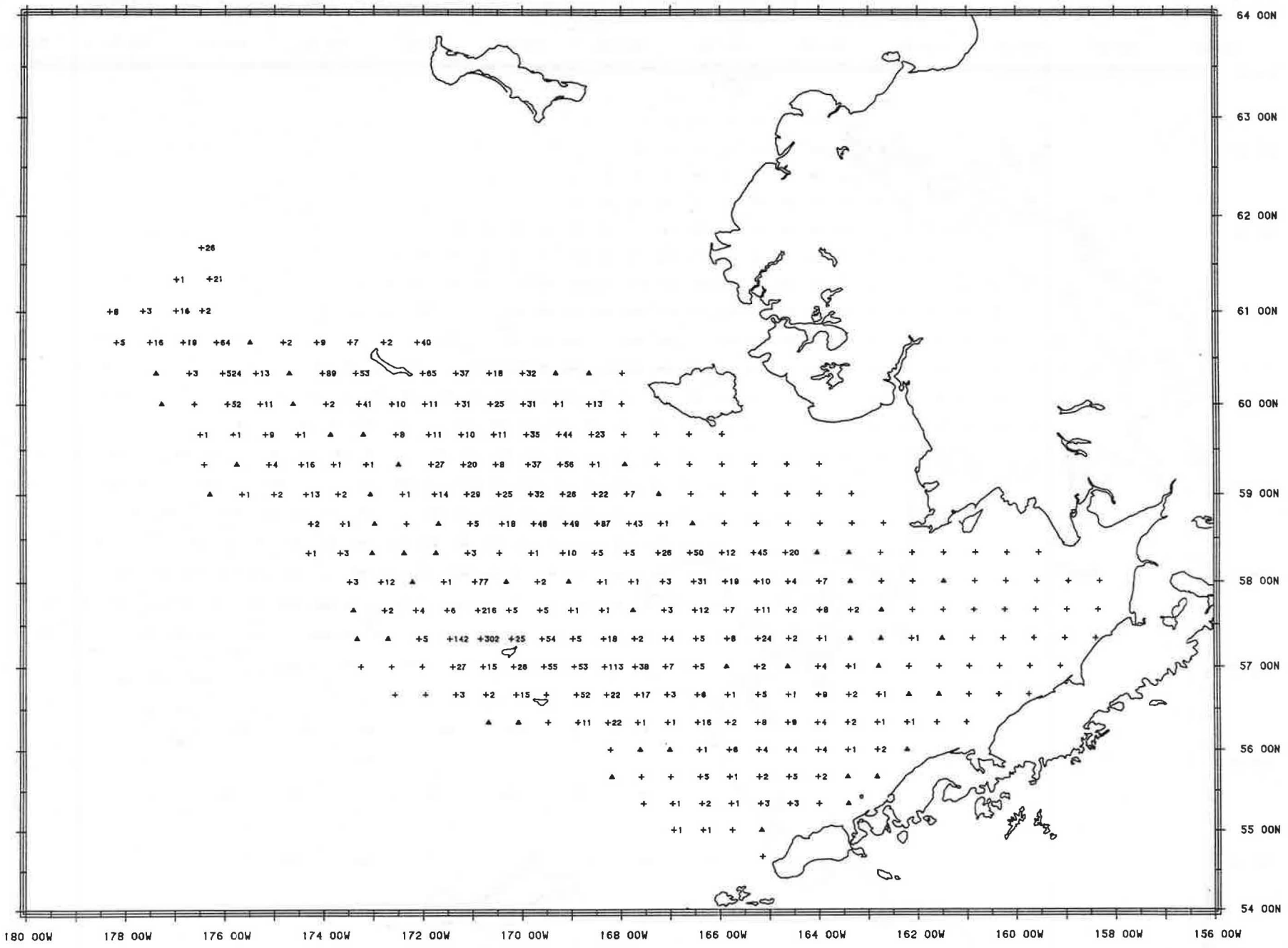


Figure 32.--Catch per unit effort (kg/ha) of C. opilio during the 1980 survey.

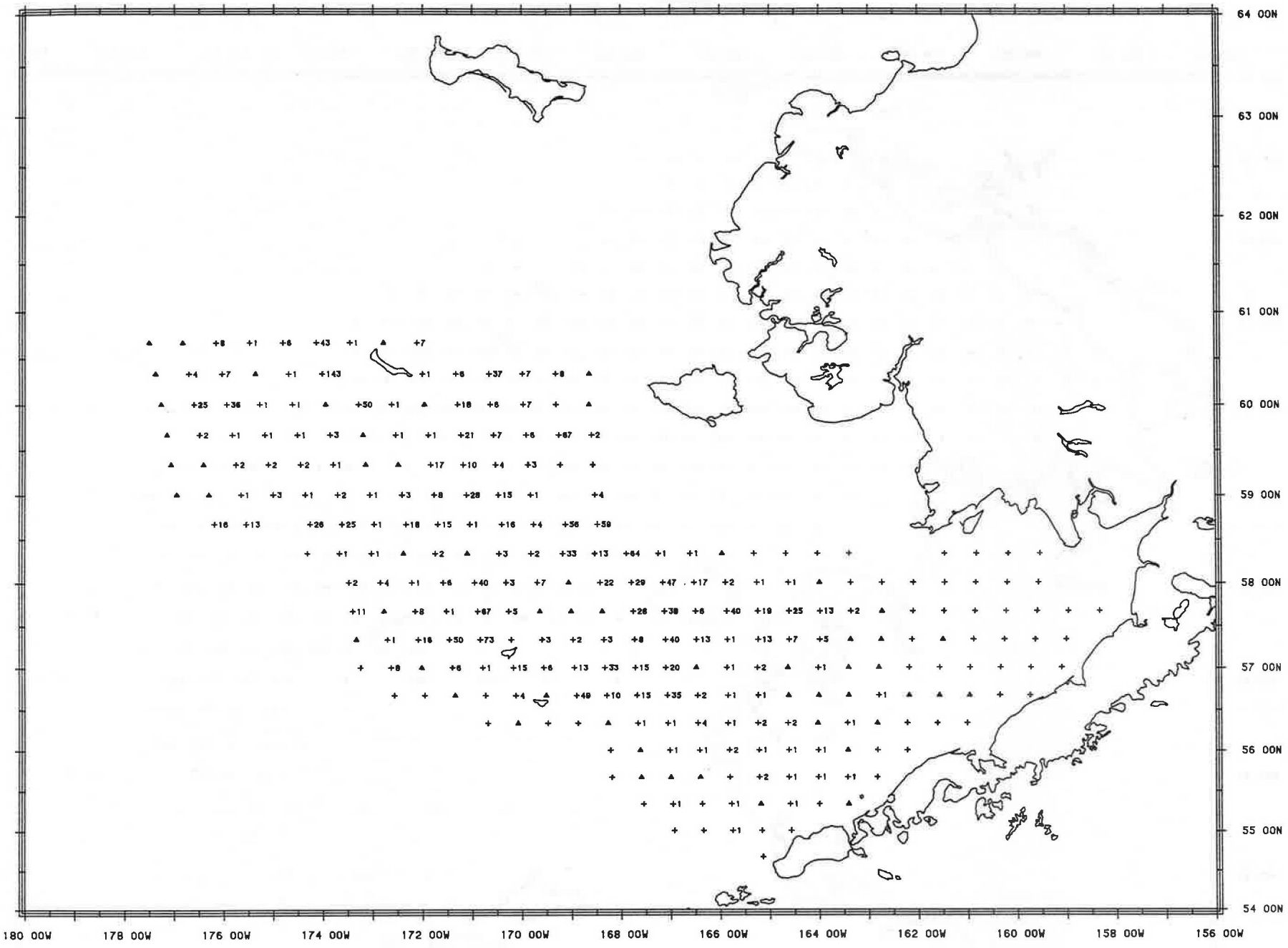


Figure 33.--Catch per unit effort (kg/ha) of C. opilio during the 1981 survey.

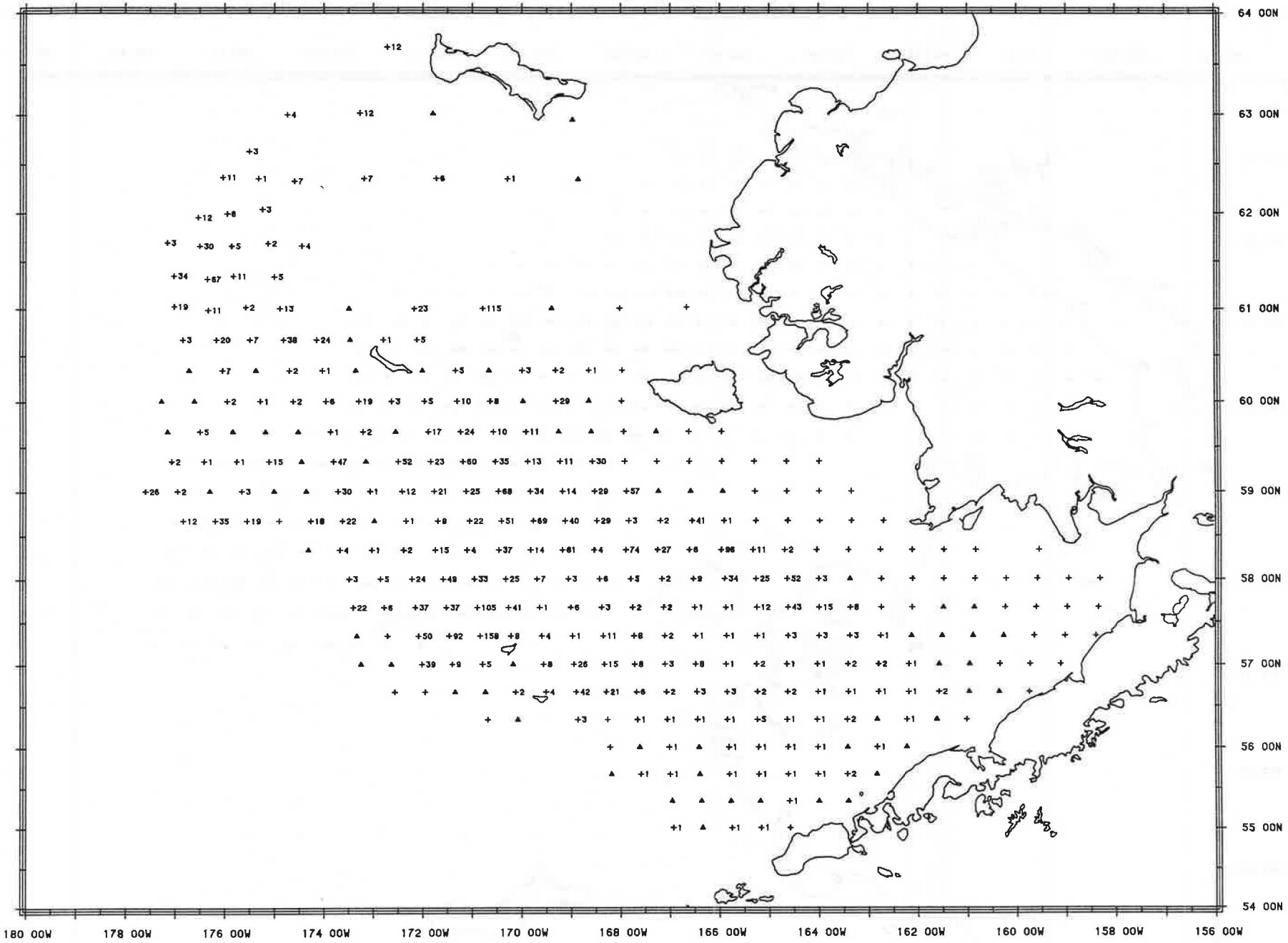


Figure 34.--Catch per unit effort (kg/ha) of C. opilio during the 1982 survey.

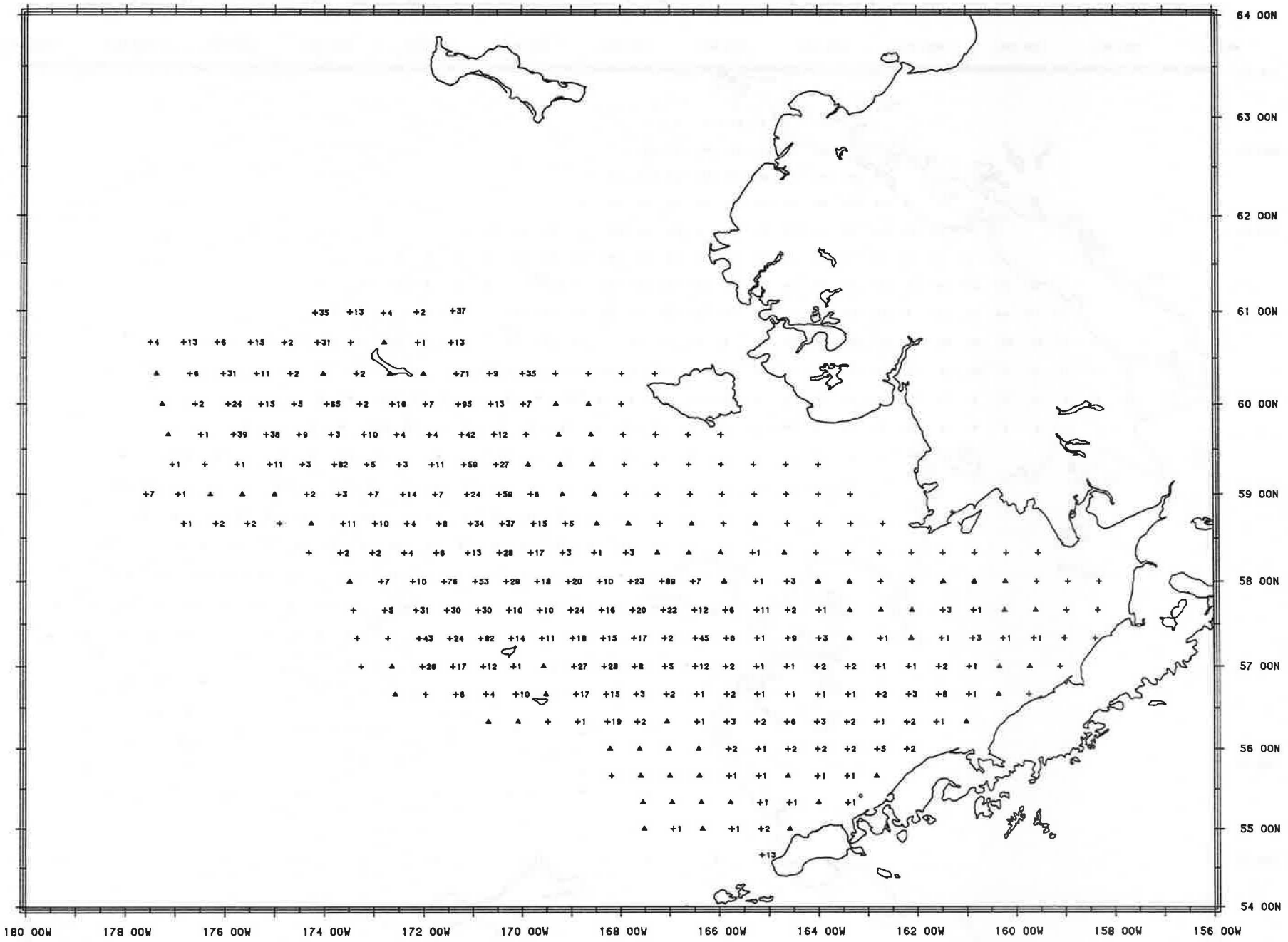


Figure 35.--Catch per unit effort (kg/ha) of C. opilio during the 1983 survey.

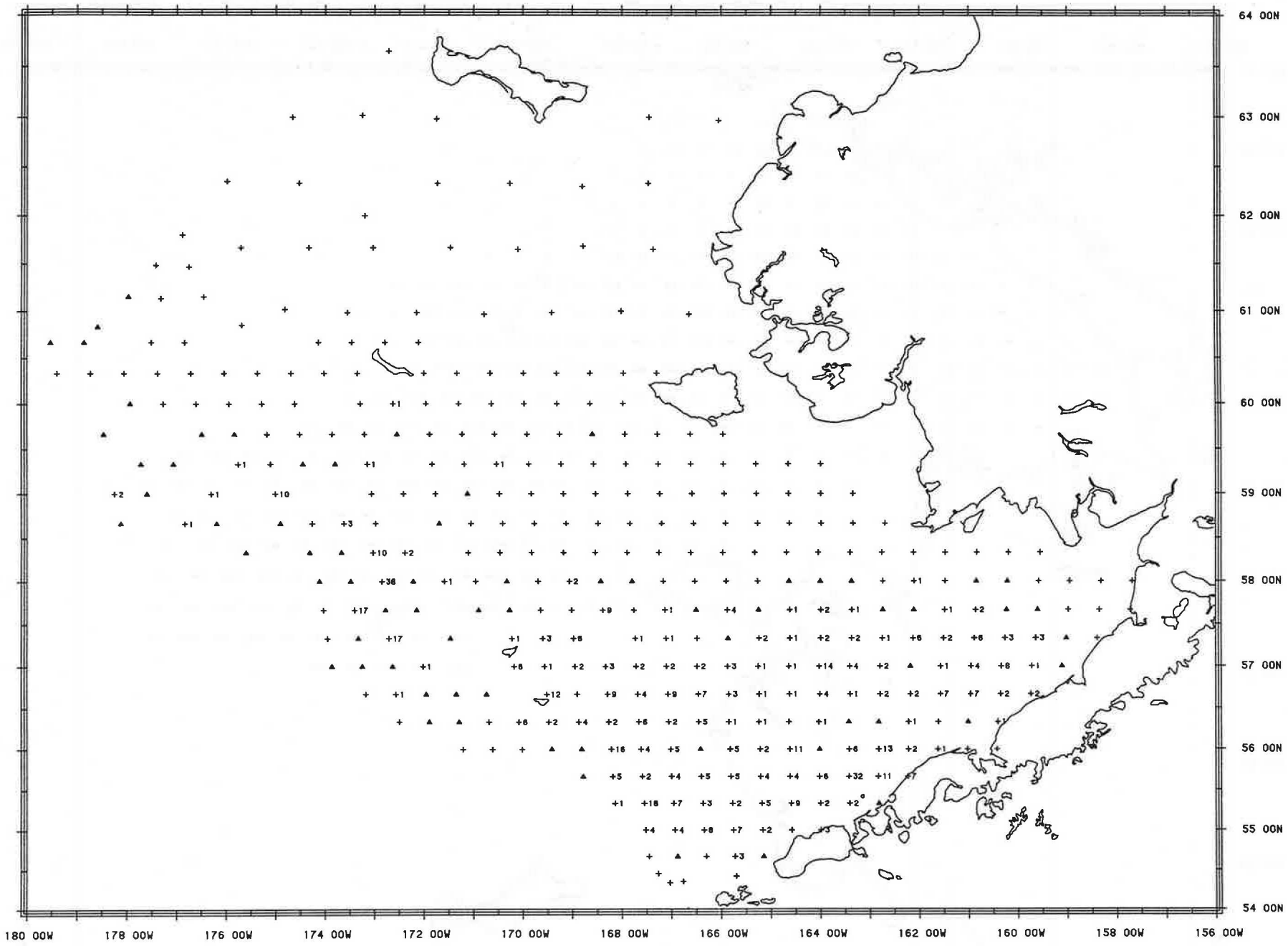


Figure 36.--Catch per unit effort (kg/ha) of C. bairdi during the 1979 survey.

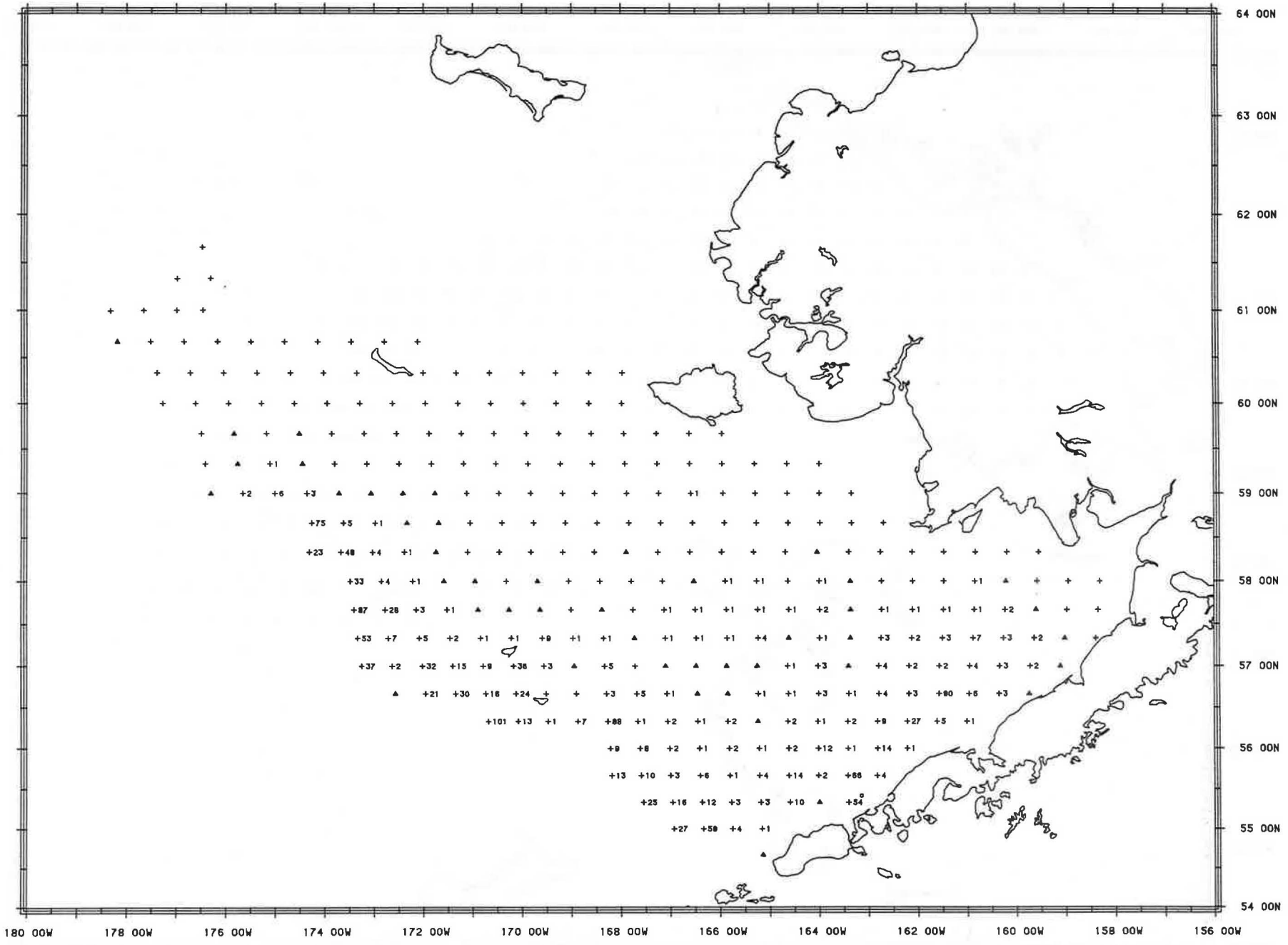


Figure 37.--Catch per unit effort (kg/ha) of C. bairdi during the 1980 survey.

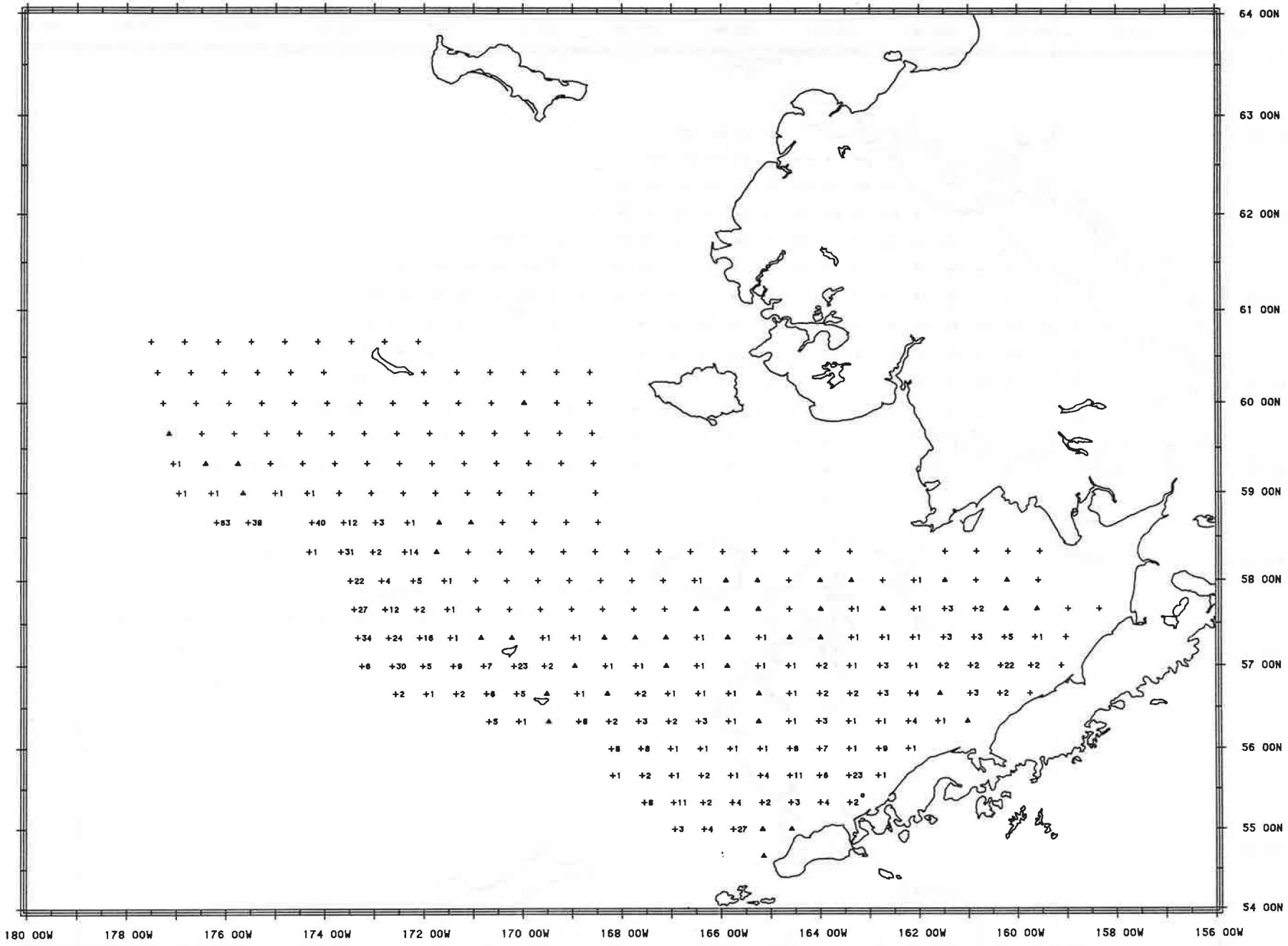


Figure 38.--Catch per unit effort (kg/ha) of C. bairdi during the 1981 survey.

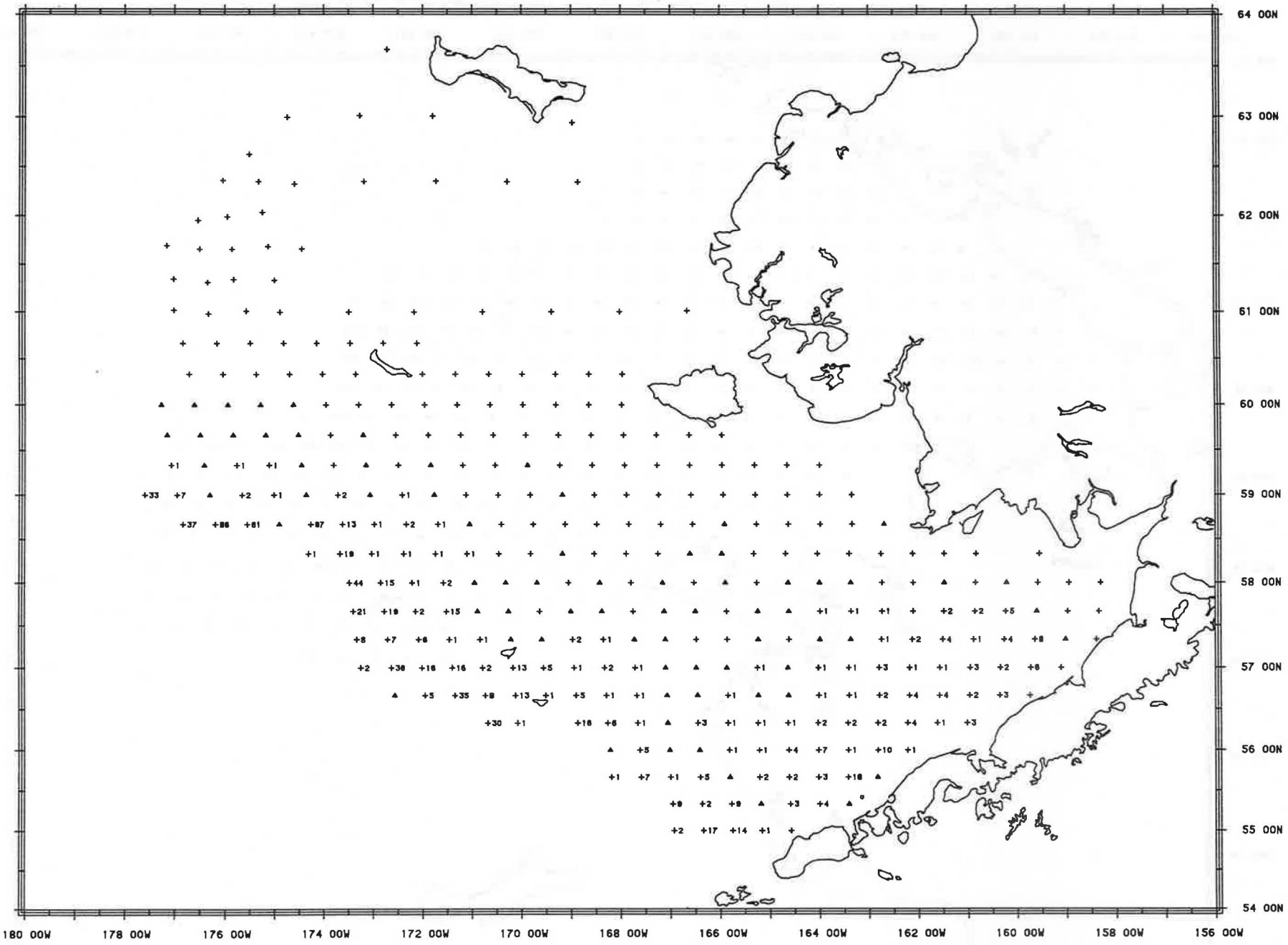


Figure 39.--Catch per unit effort (kg/ha) of C. bairdi during the 1982 survey.

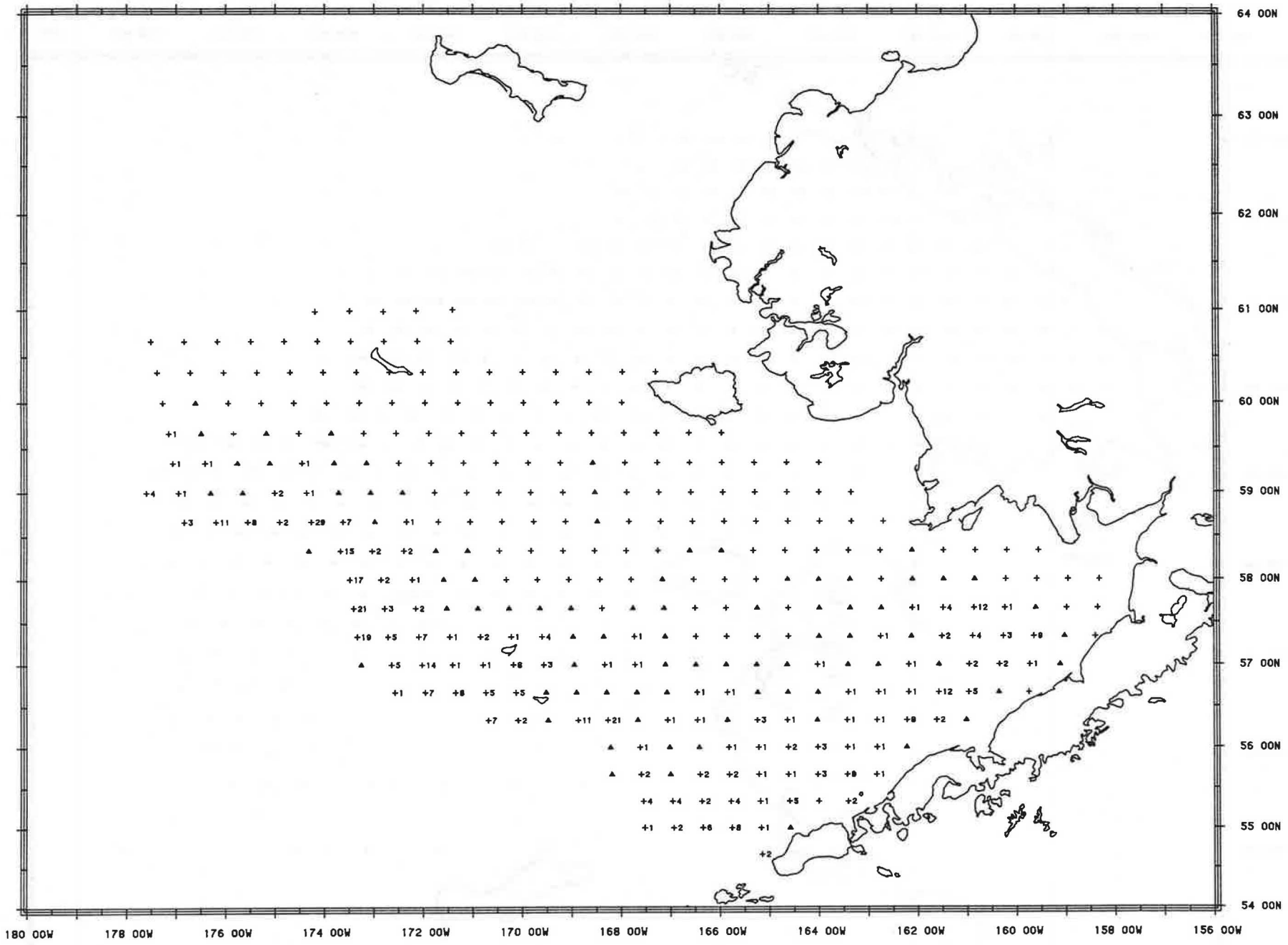


Figure 40.--Catch per unit effort (kg/ha) of C. bairdi during the 1983 survey.

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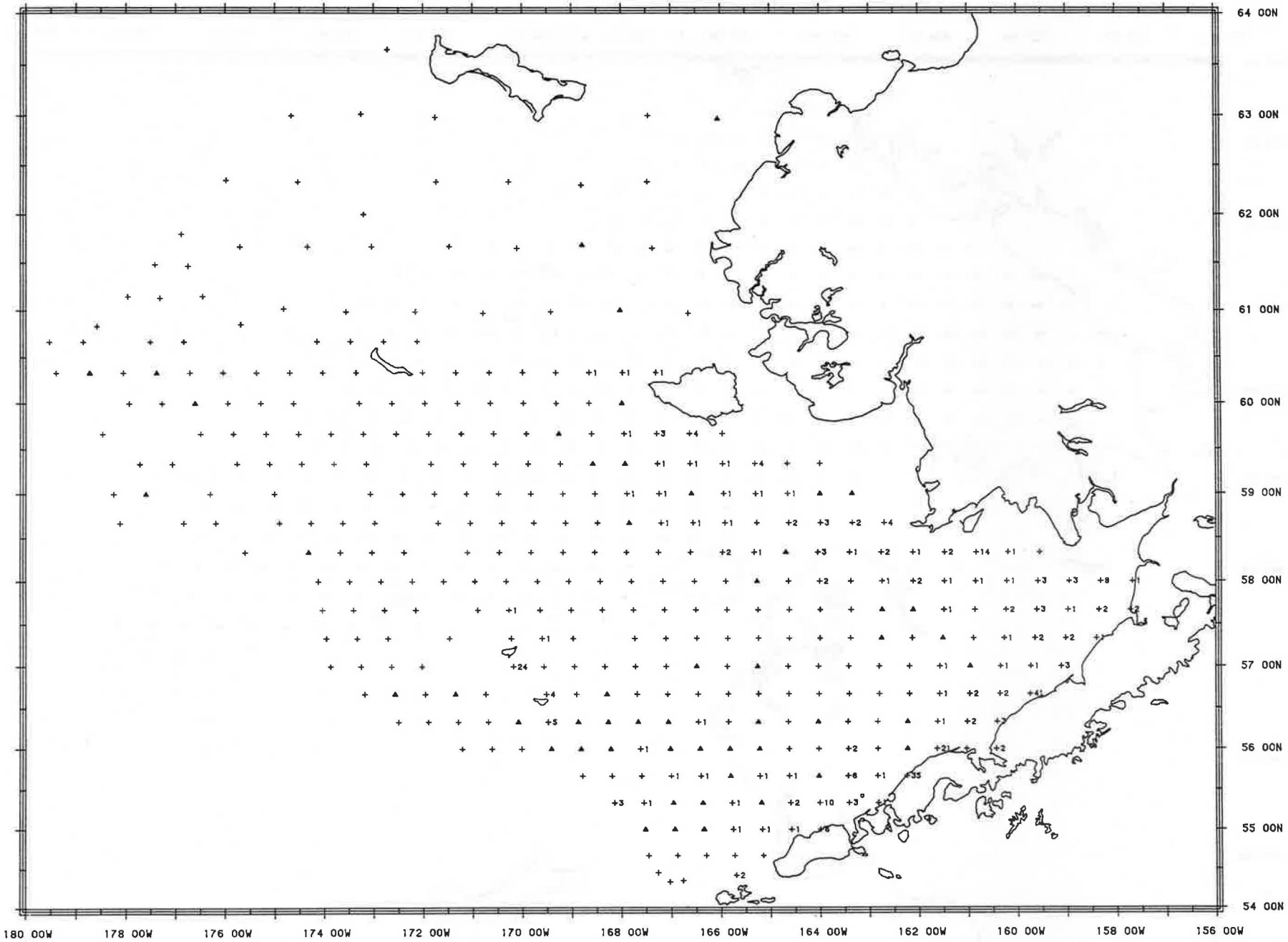


Figure 41.--Catch per unit effort (number/ha) of Pacific halibut during the 1979 survey.

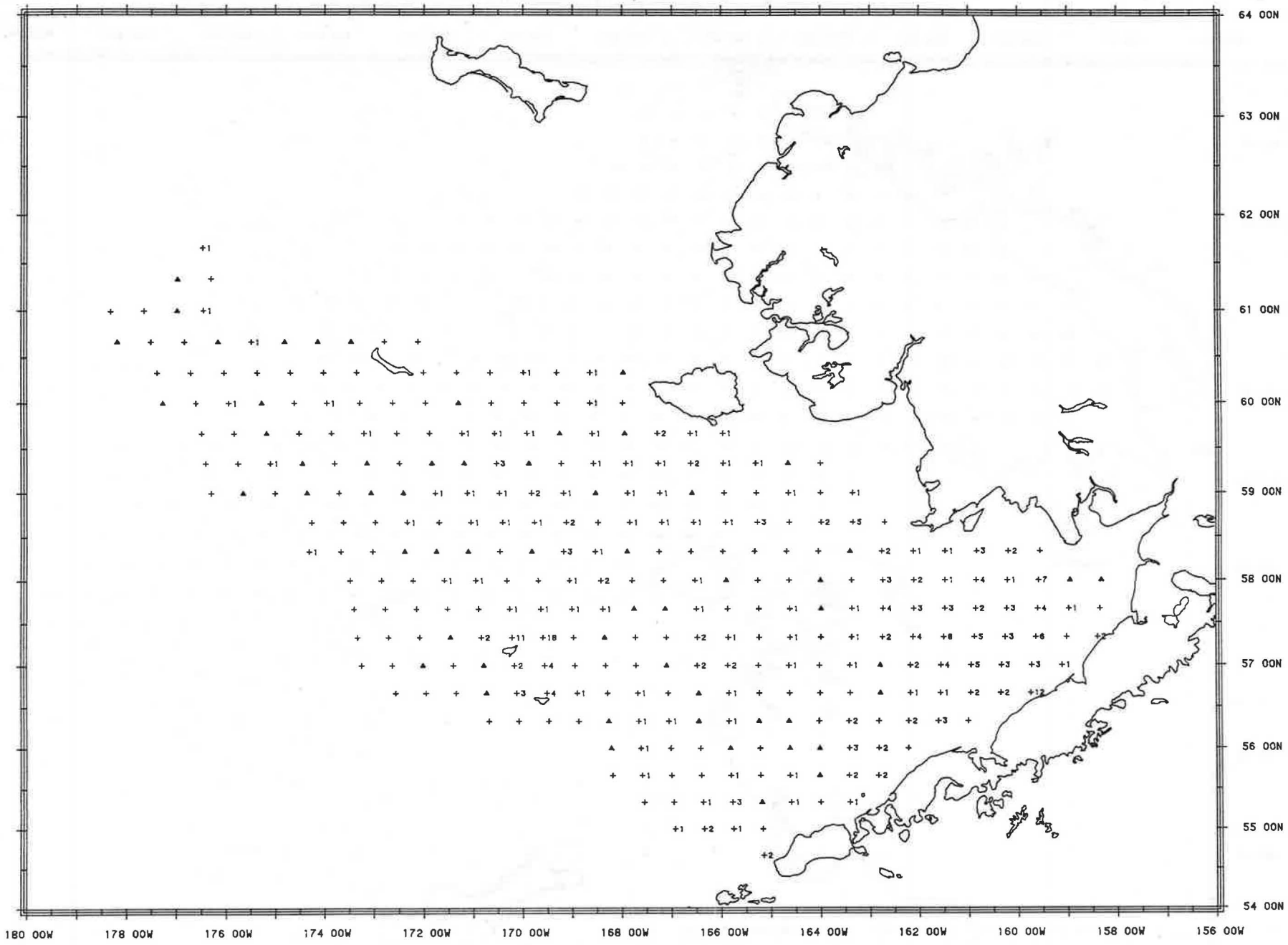


Figure 42.--Catch per unit effort (number/ha) of Pacific halibut during the 1980 survey.

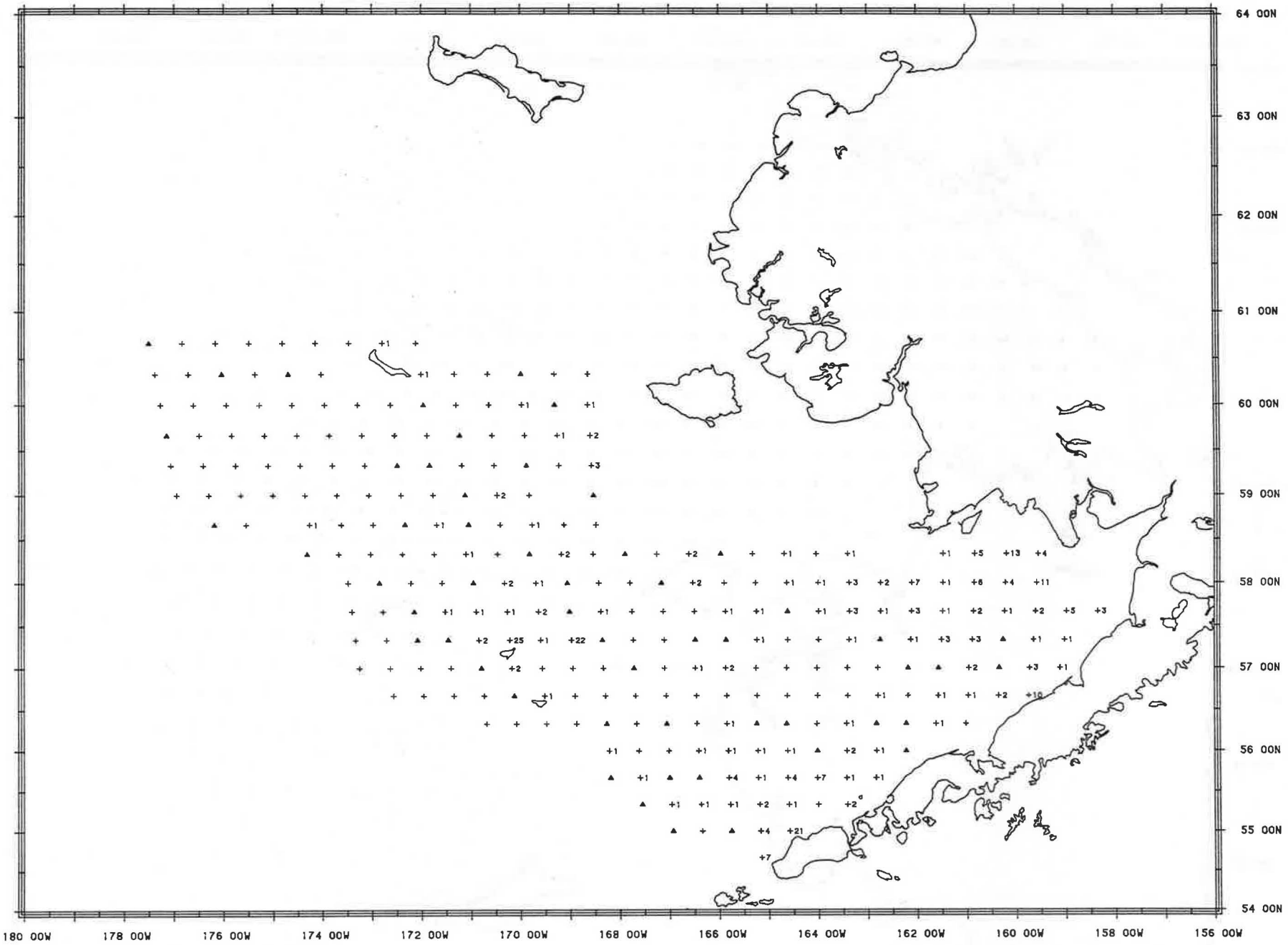


Figure 43.--Catch per unit effort (number/ha) of Pacific halibut during the 1981 survey.

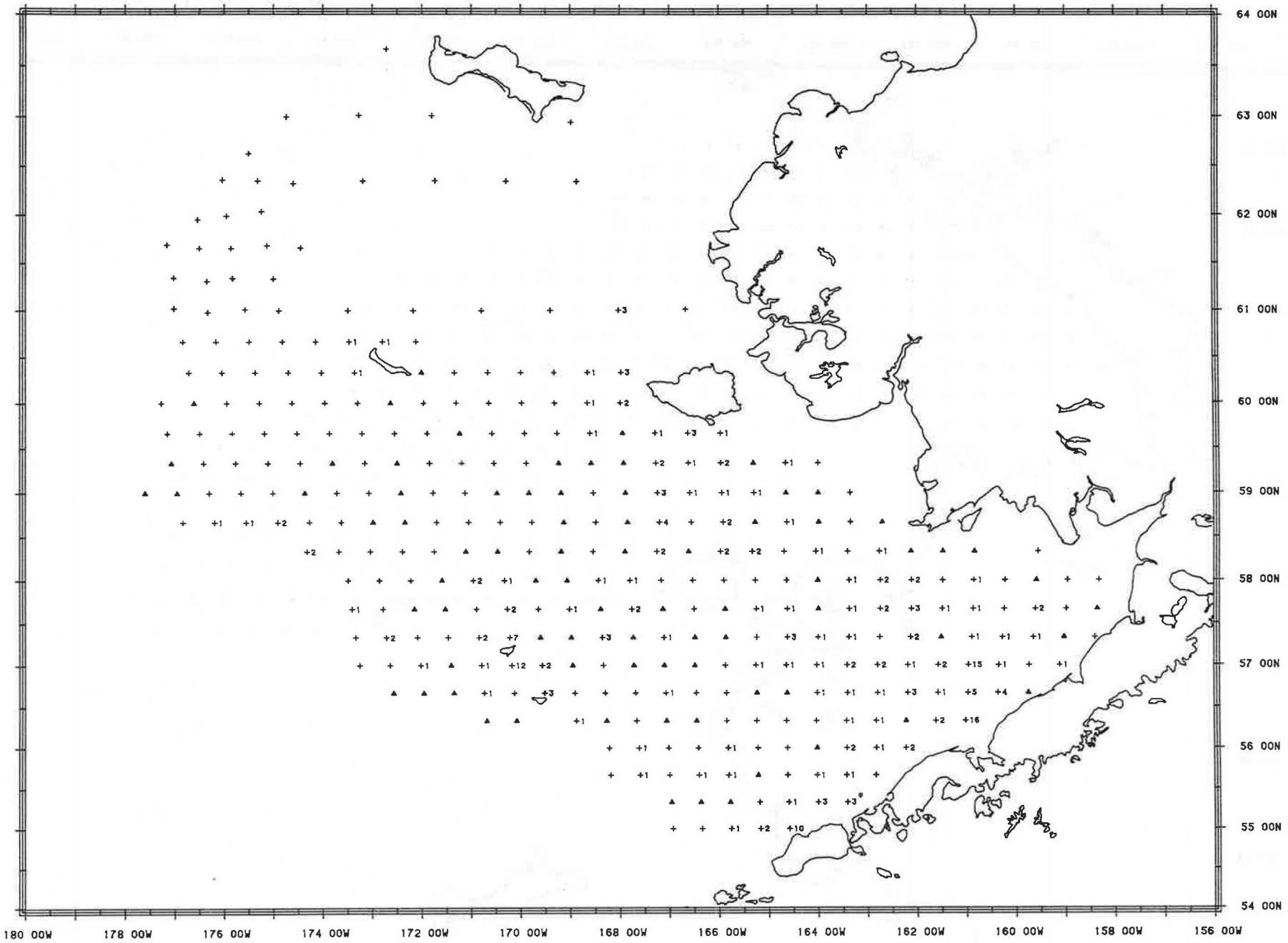


Figure 44.--Catch per unit effort (number/ha) of Pacific halibut during the 1982 survey.

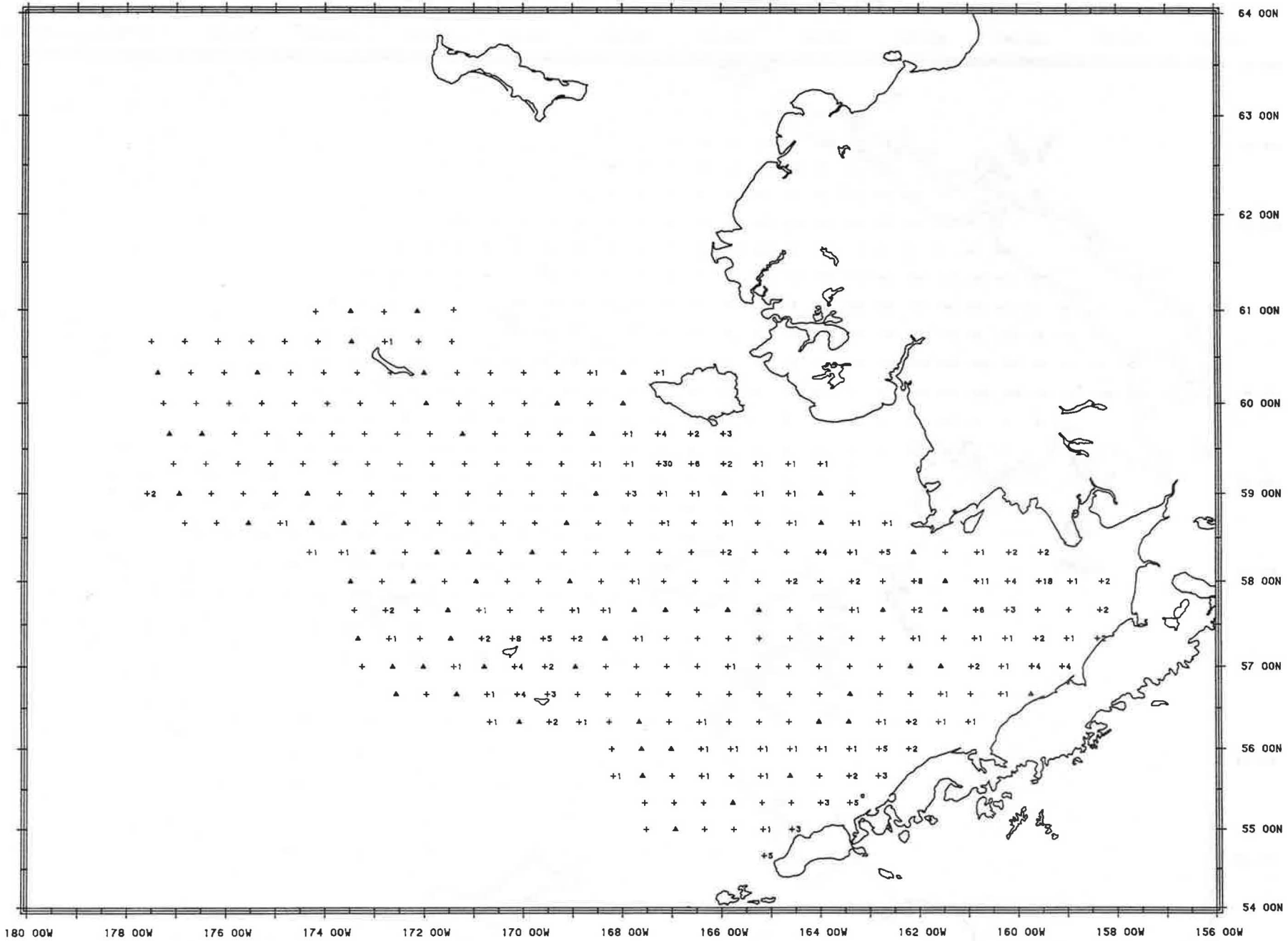


Figure 45.--Catch per unit effort (number/ha) of Pacific halibut during the 1983 survey.

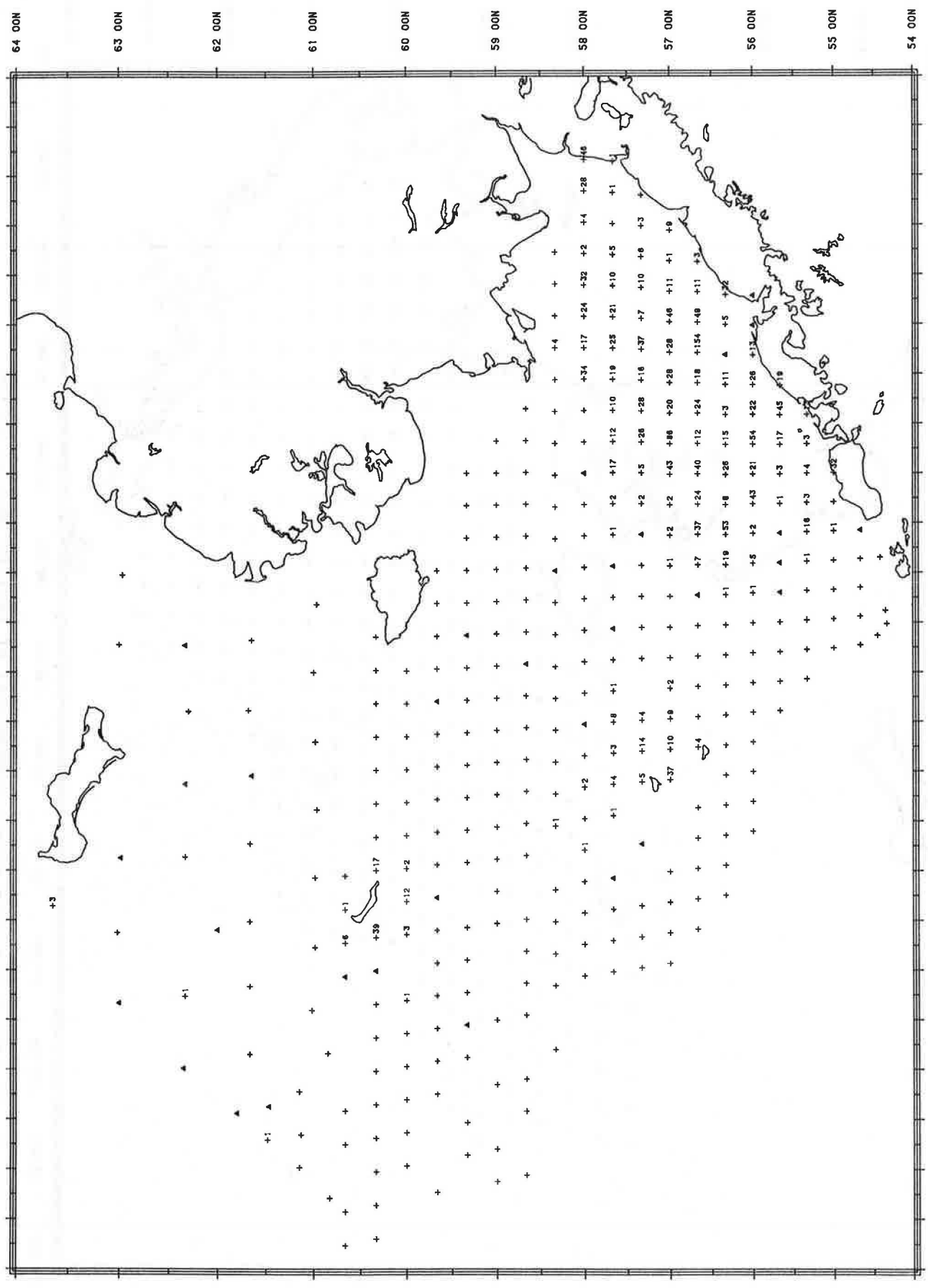


Figure 46.--Catch per unit effort (number/ha) of king crab during the 1979 survey.

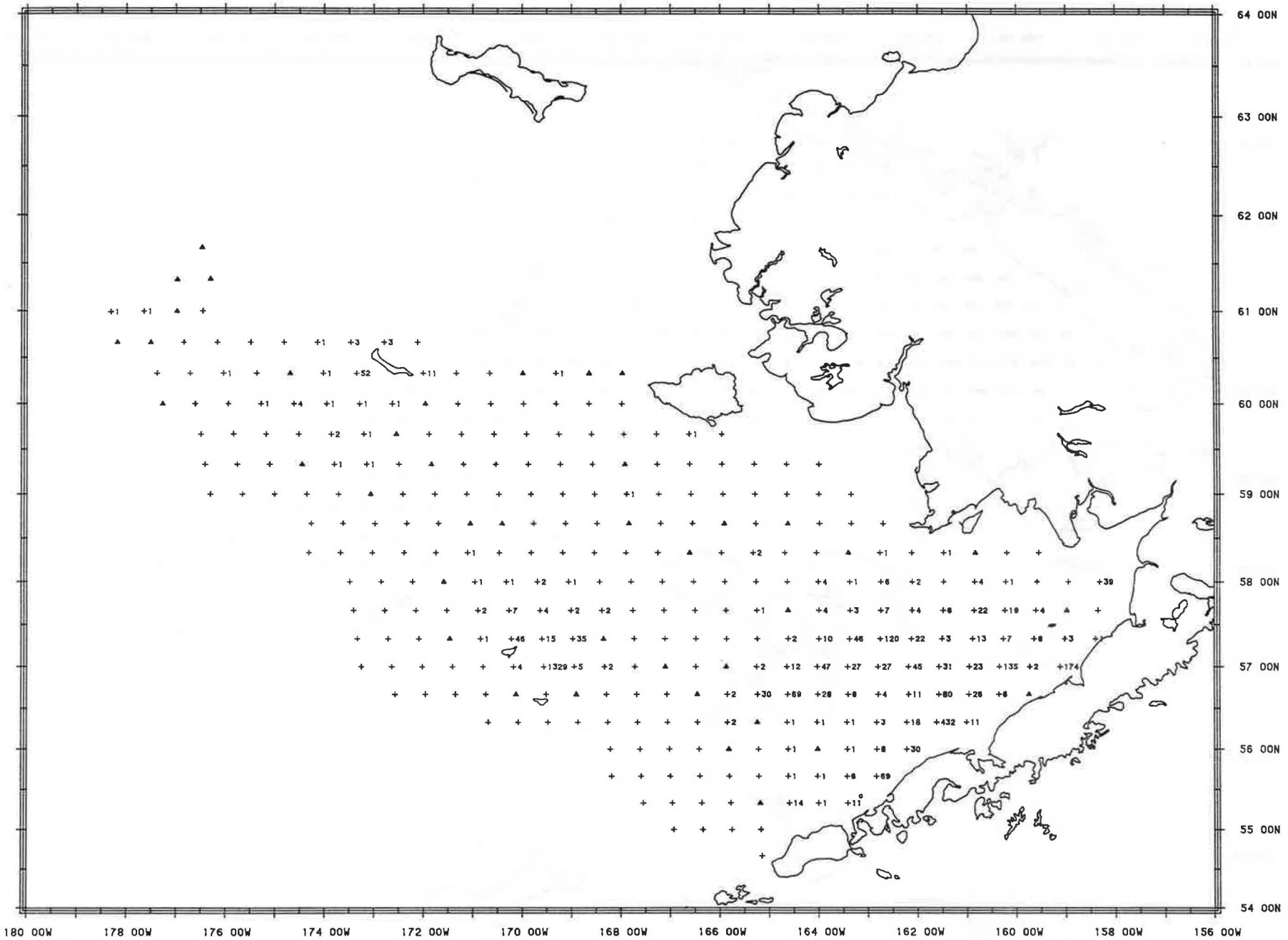


Figure 47.--Catch per unit effort (number/ha) of king crab during the 1980 survey.

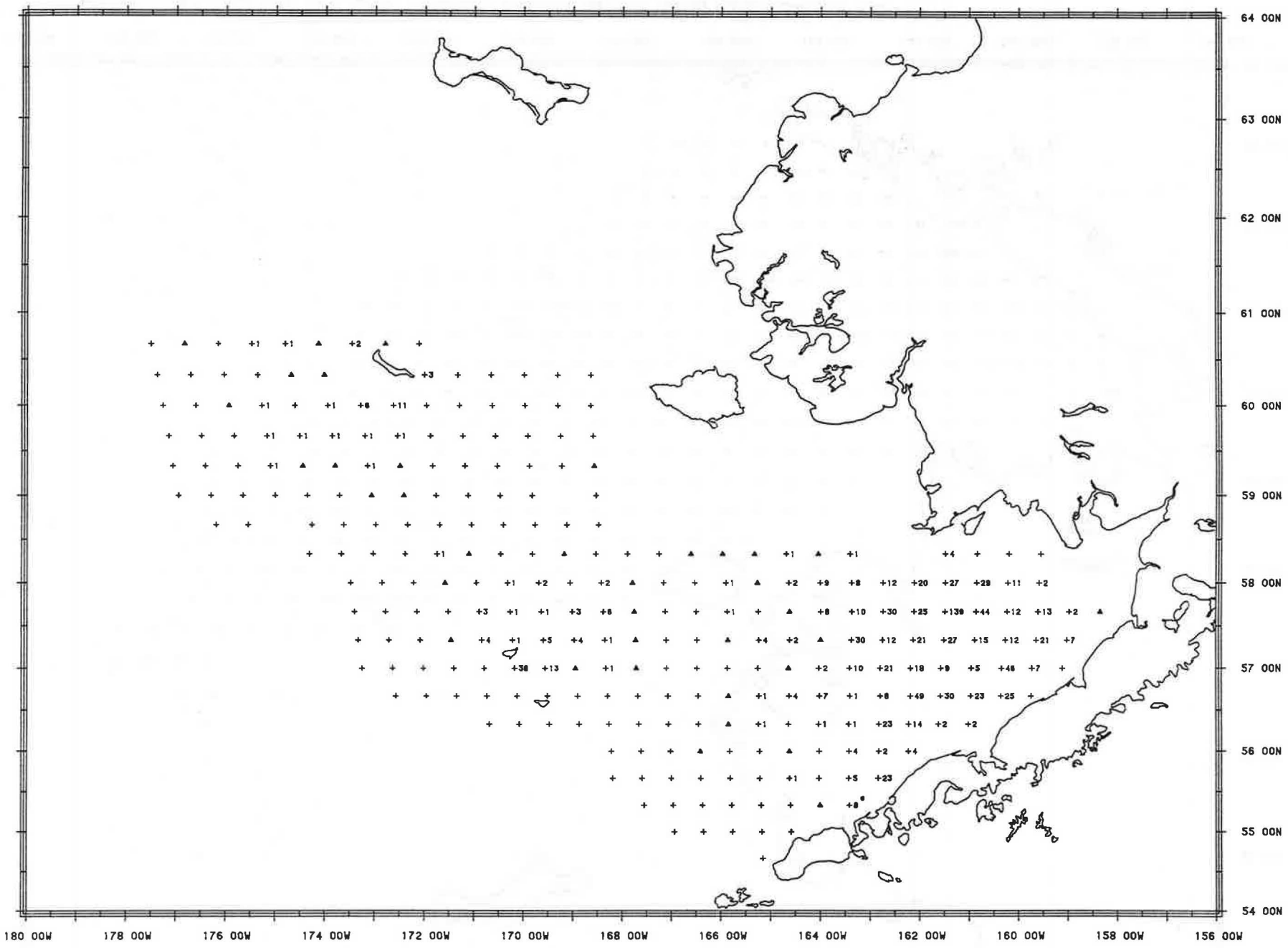


Figure 48.--Catch per unit effort (number/ha) of king crab during the 1981 survey.

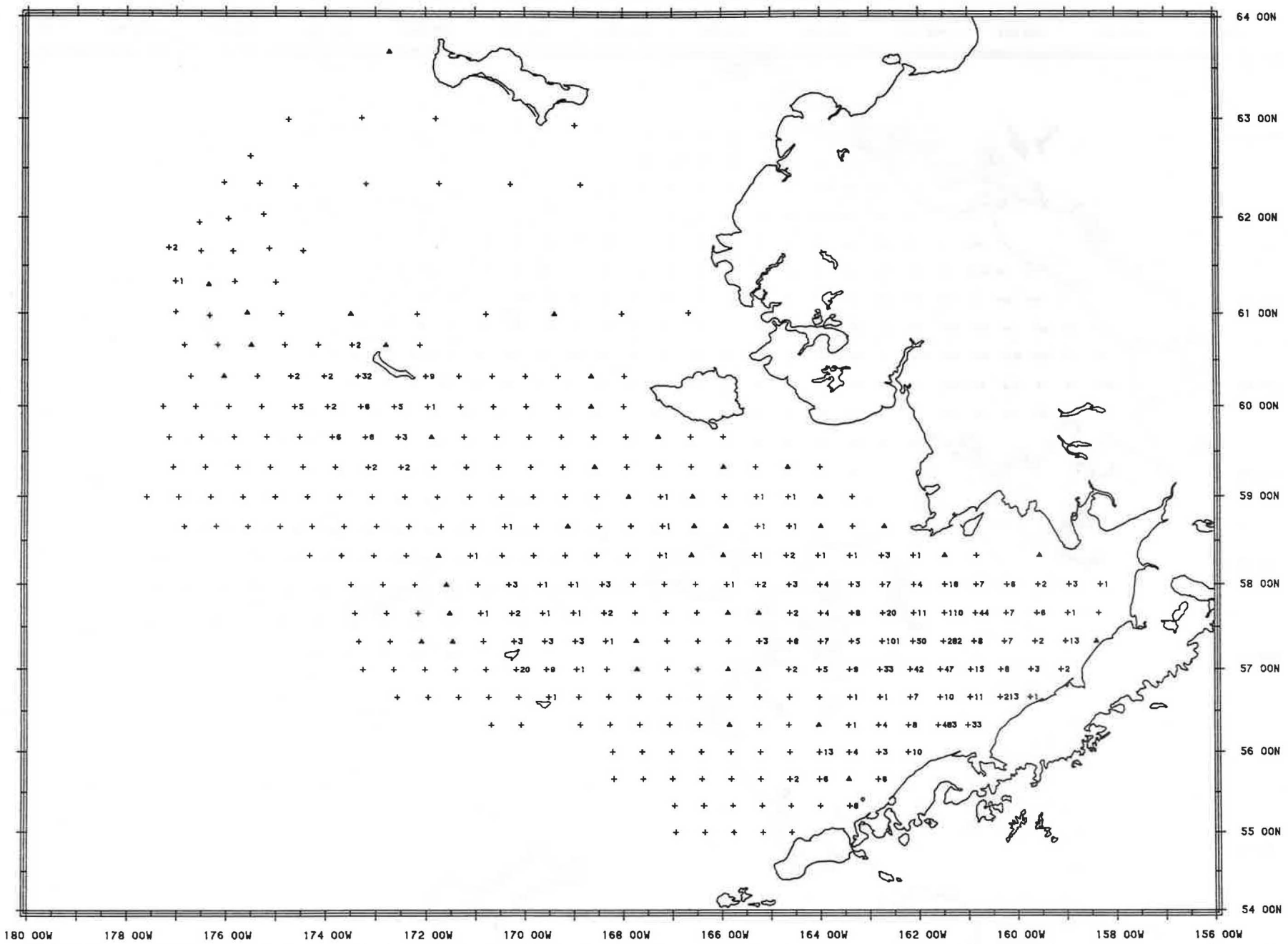


Figure 49.--Catch per unit effort (number/ha) of king crab during the 1982 survey.

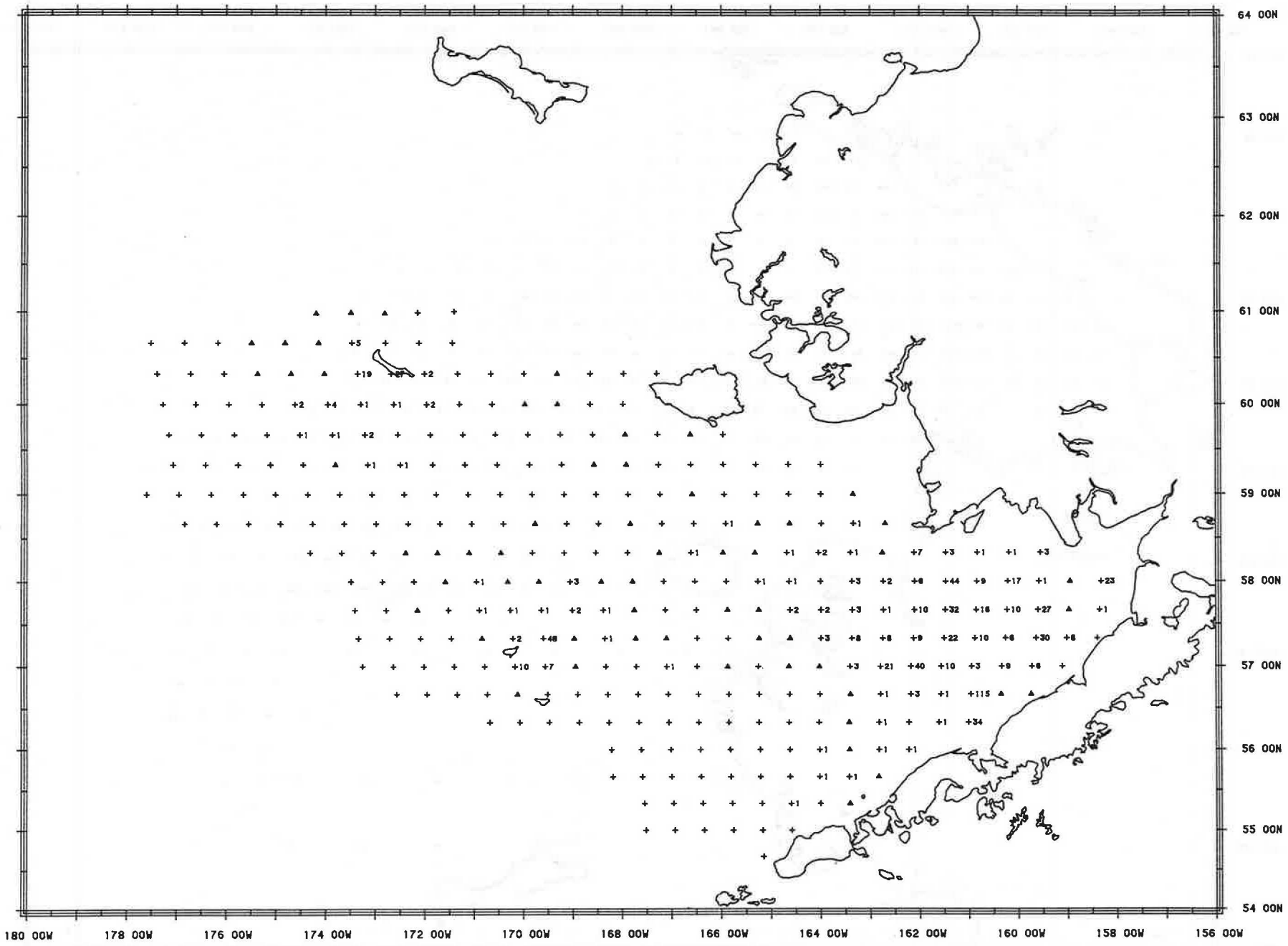


Figure 50.--Catch per unit effort (number/ha) of king crab during the 1983 survey.

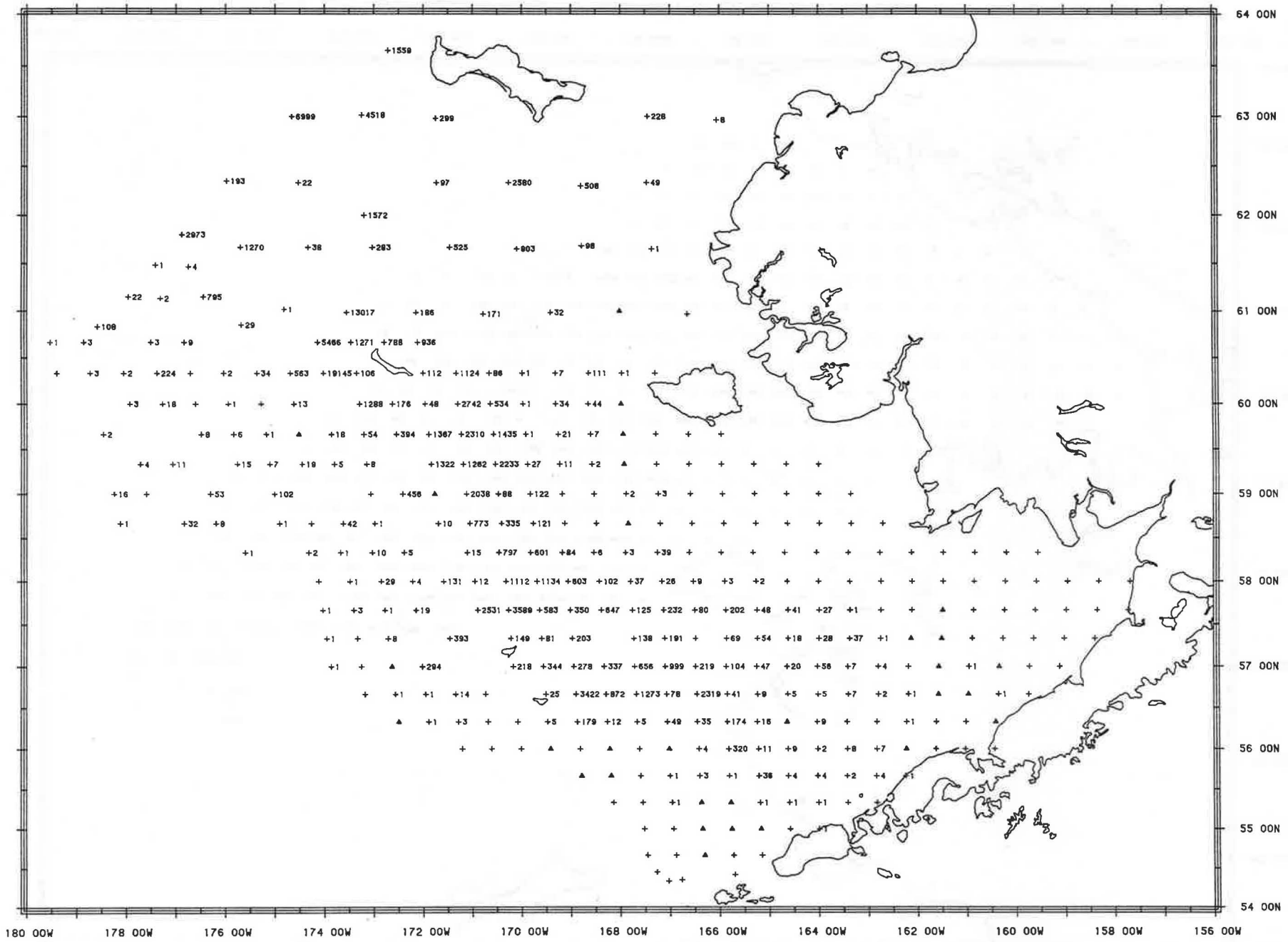


Figure 51.--Catch per unit effort (number/ha) of C. opilio during the 1979 survey.

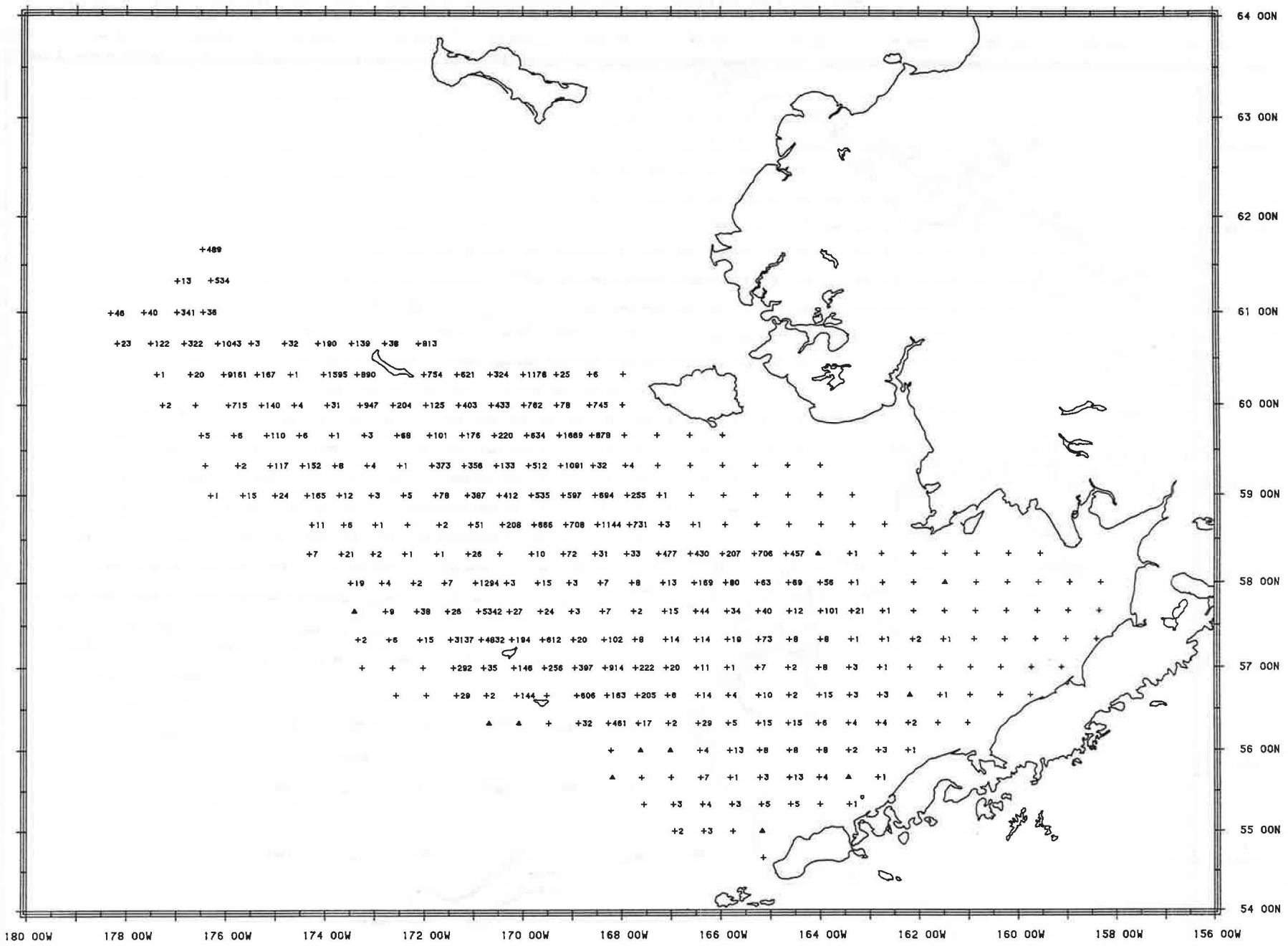


Figure 52.--Catch per unit effort (number/ha) of C. opilio during the 1980 survey.

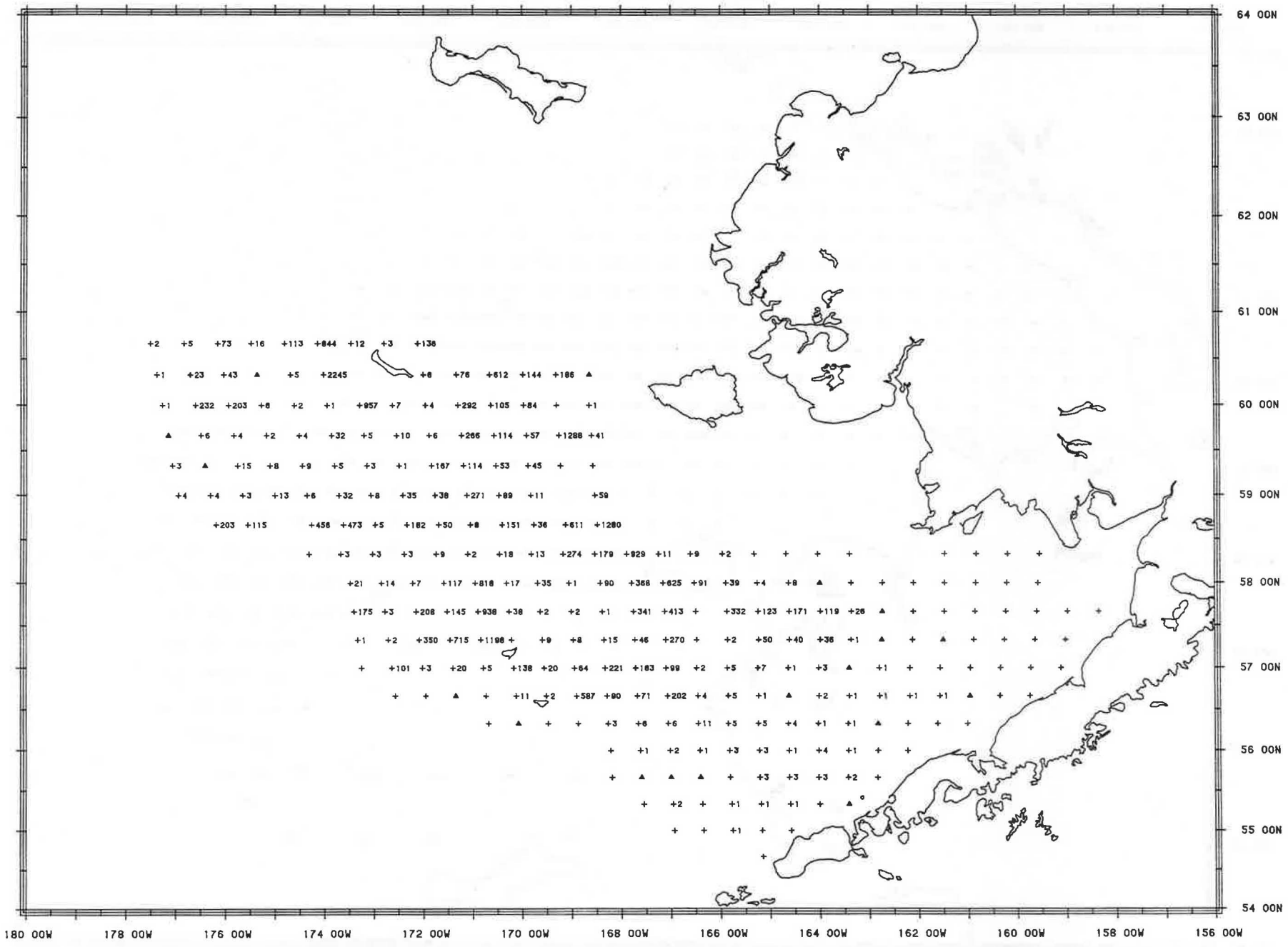


Figure 53.--Catch per unit effort (number/ha) of C. opilio during the 1981 survey.

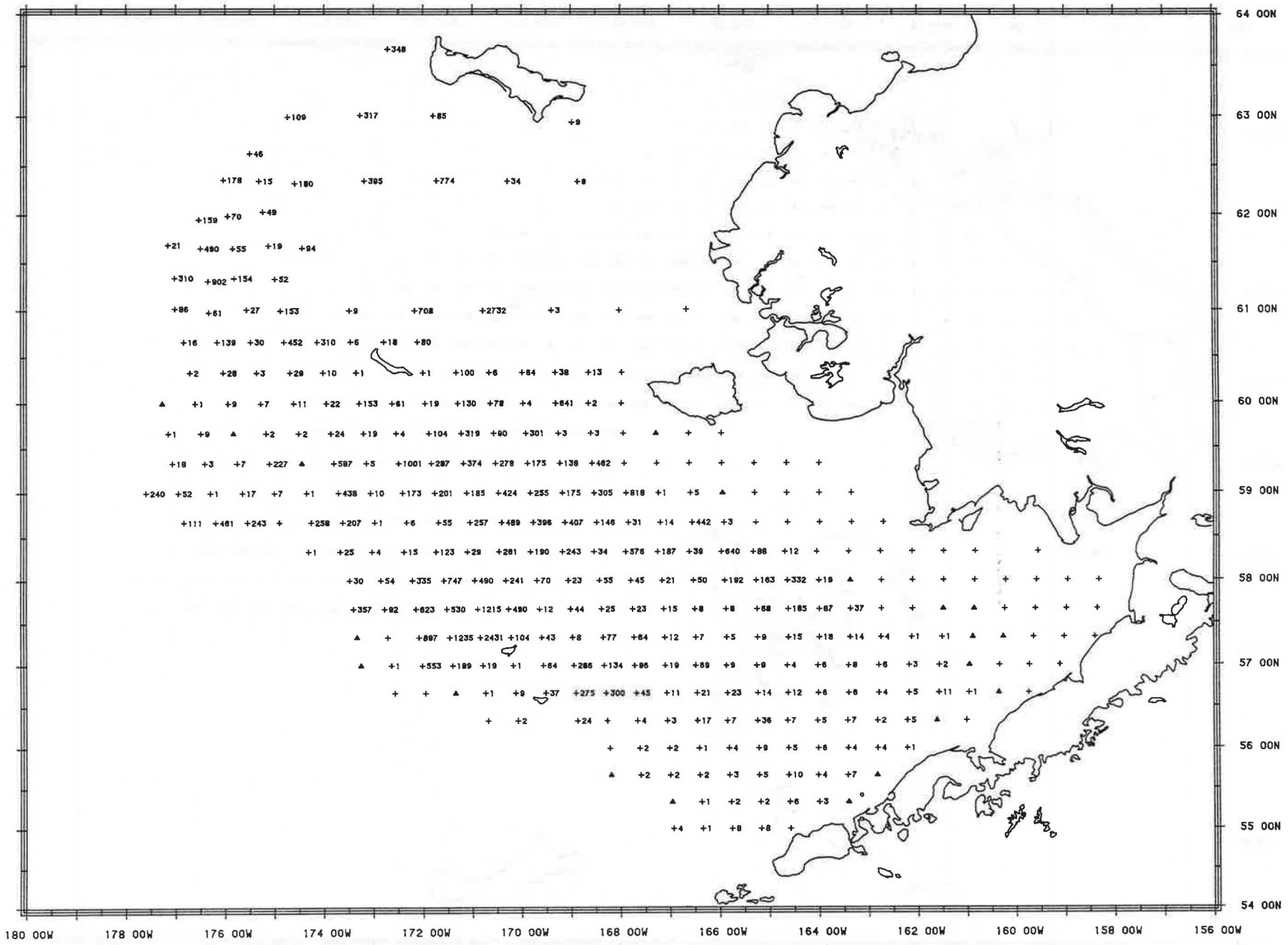


Figure 54.--Catch per unit effort (number/ha) of C. opilio during the 1982 survey.

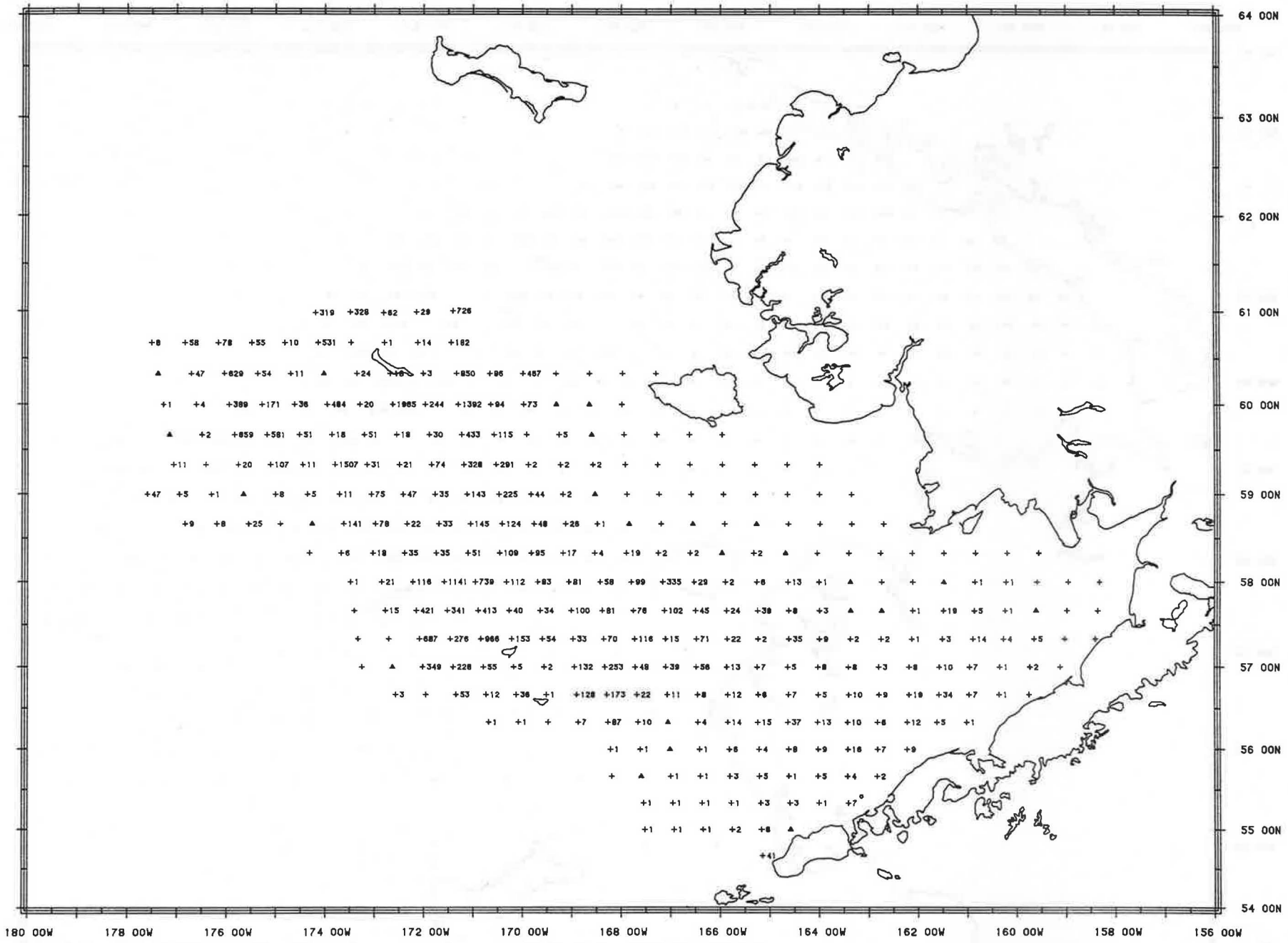


Figure 55.--Catch per unit effort (number/ha) of C. opilio during the 1983 survey.

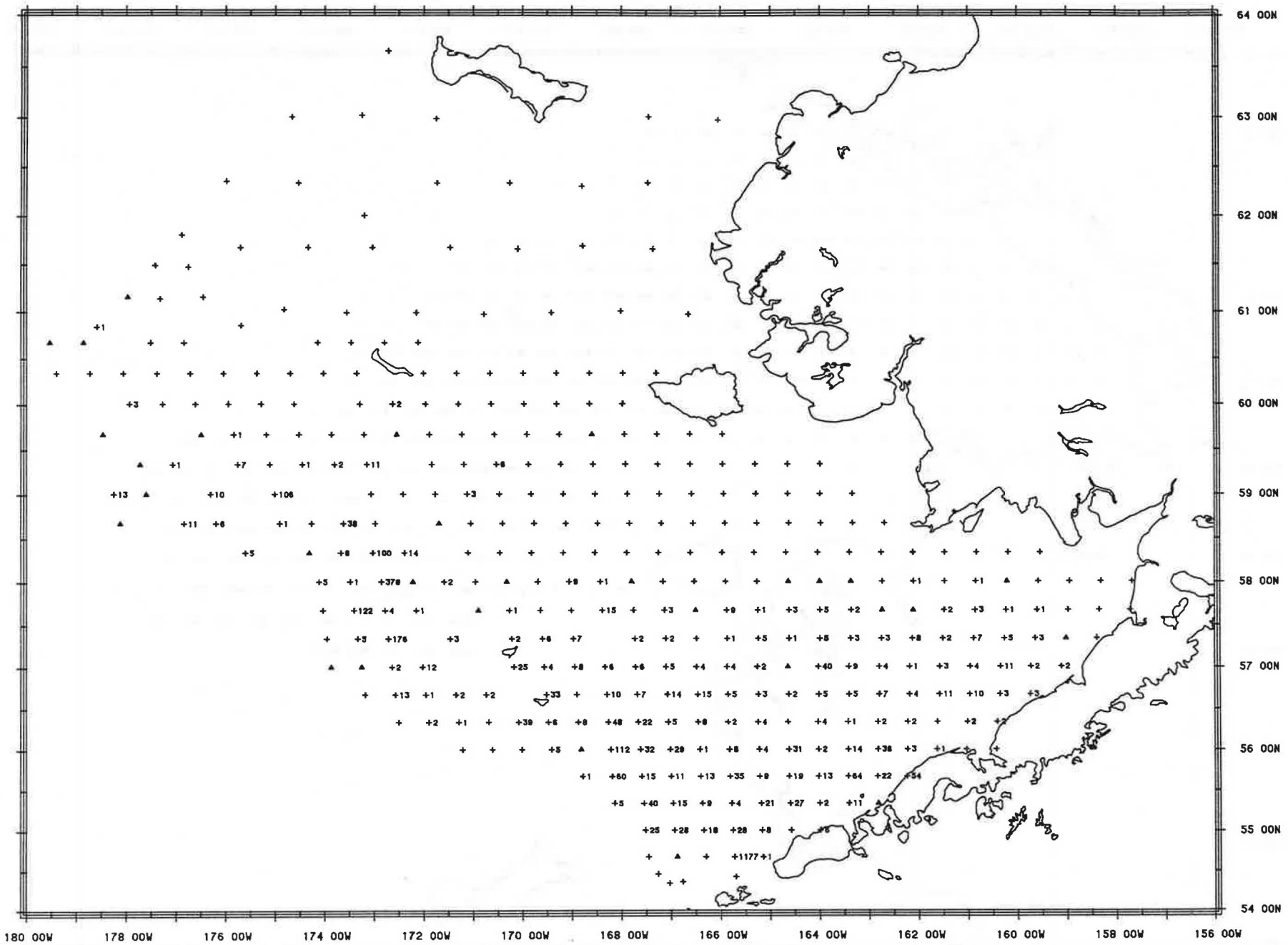


Figure 56.--Catch per unit effort (number/ha) of C. bairdi during the 1979 survey.

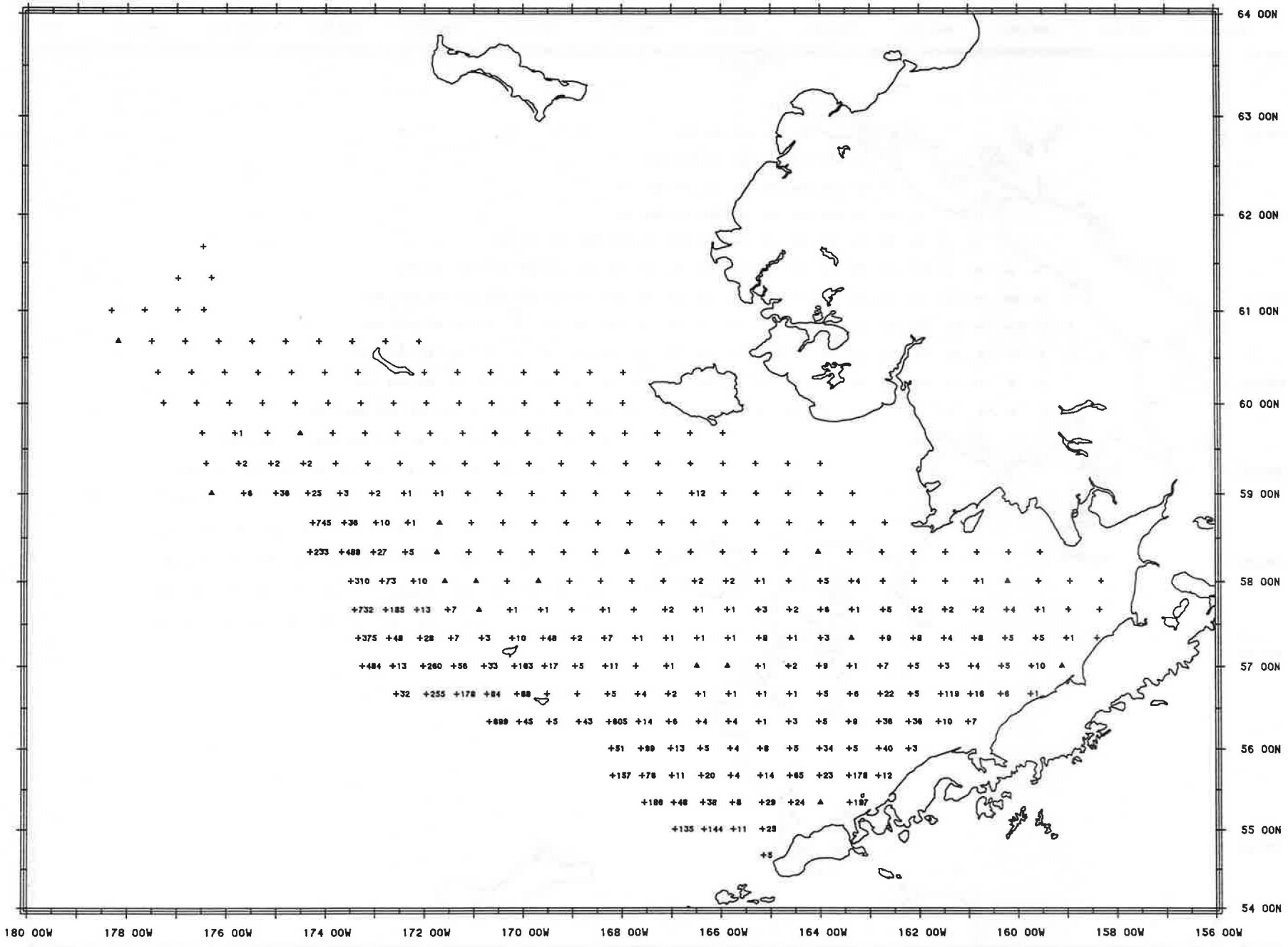


Figure 57.--Catch per unit effort (number/ha) of C. bairdi during the 1980 survey.

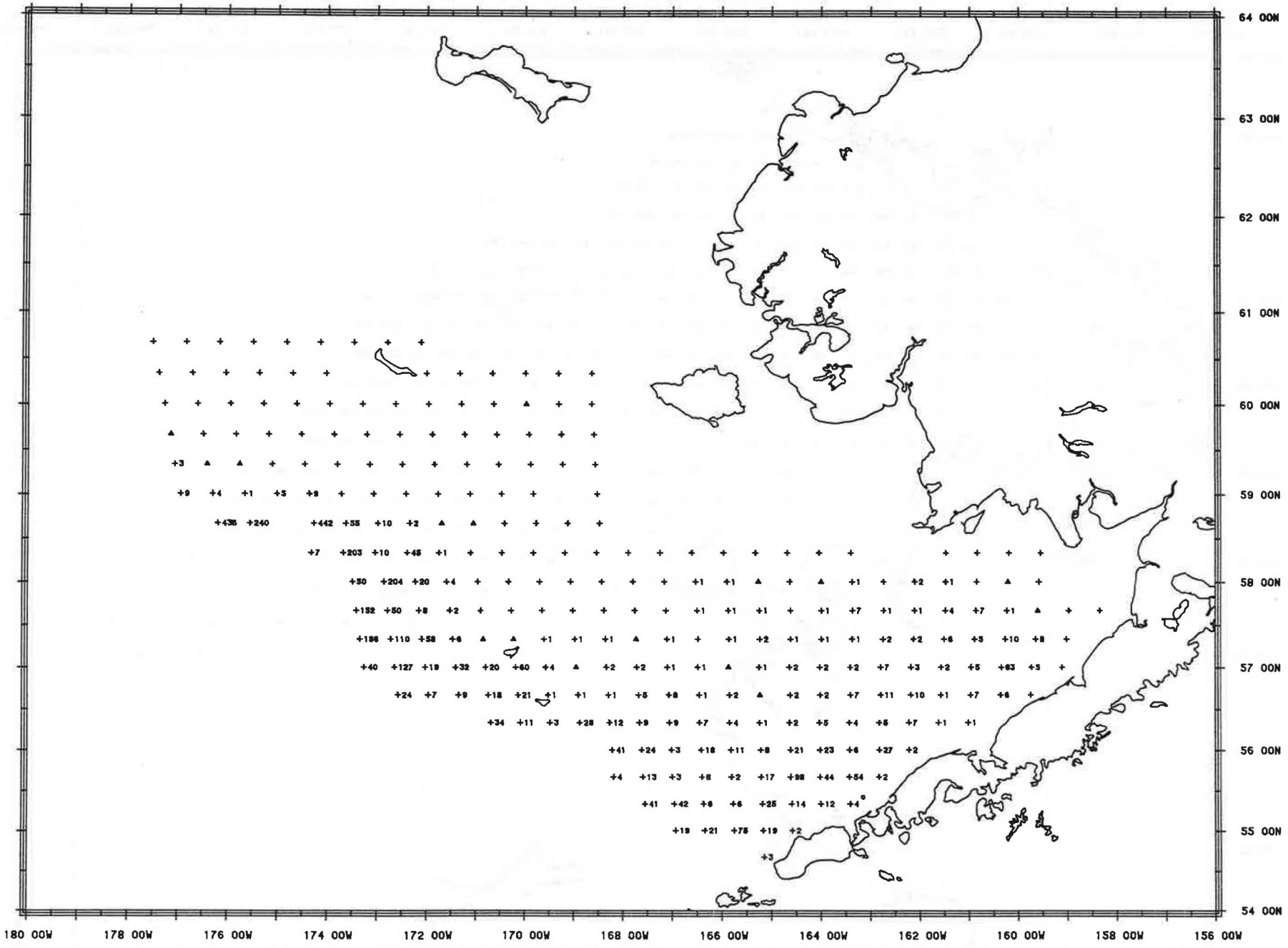


Figure 58.--Catch per unit effort (number/ha) of C. bairdi during the 1981 survey.

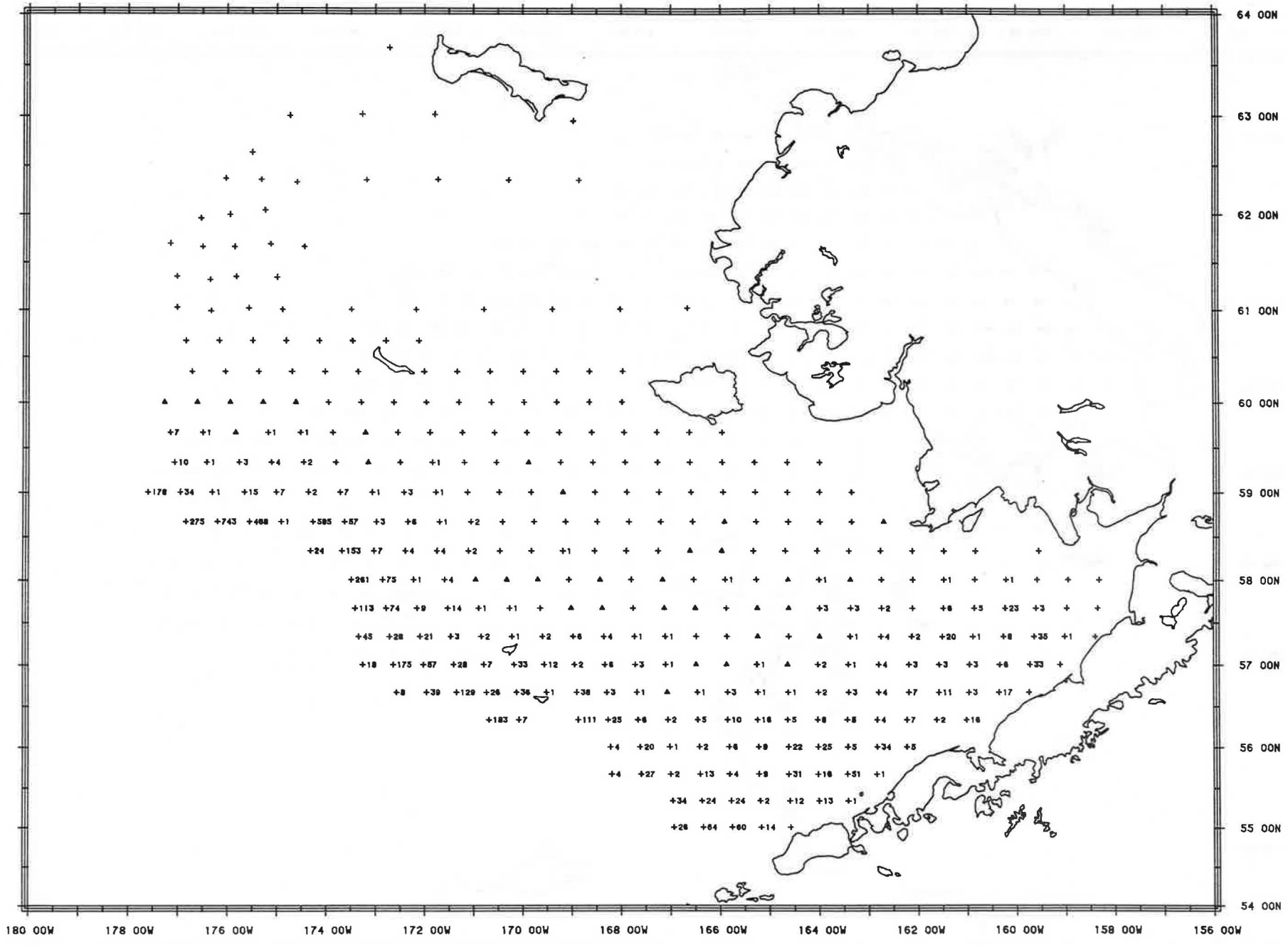


Figure 59.--Catch per unit effort (number/ha) of C. bairdi during the 1982 survey.

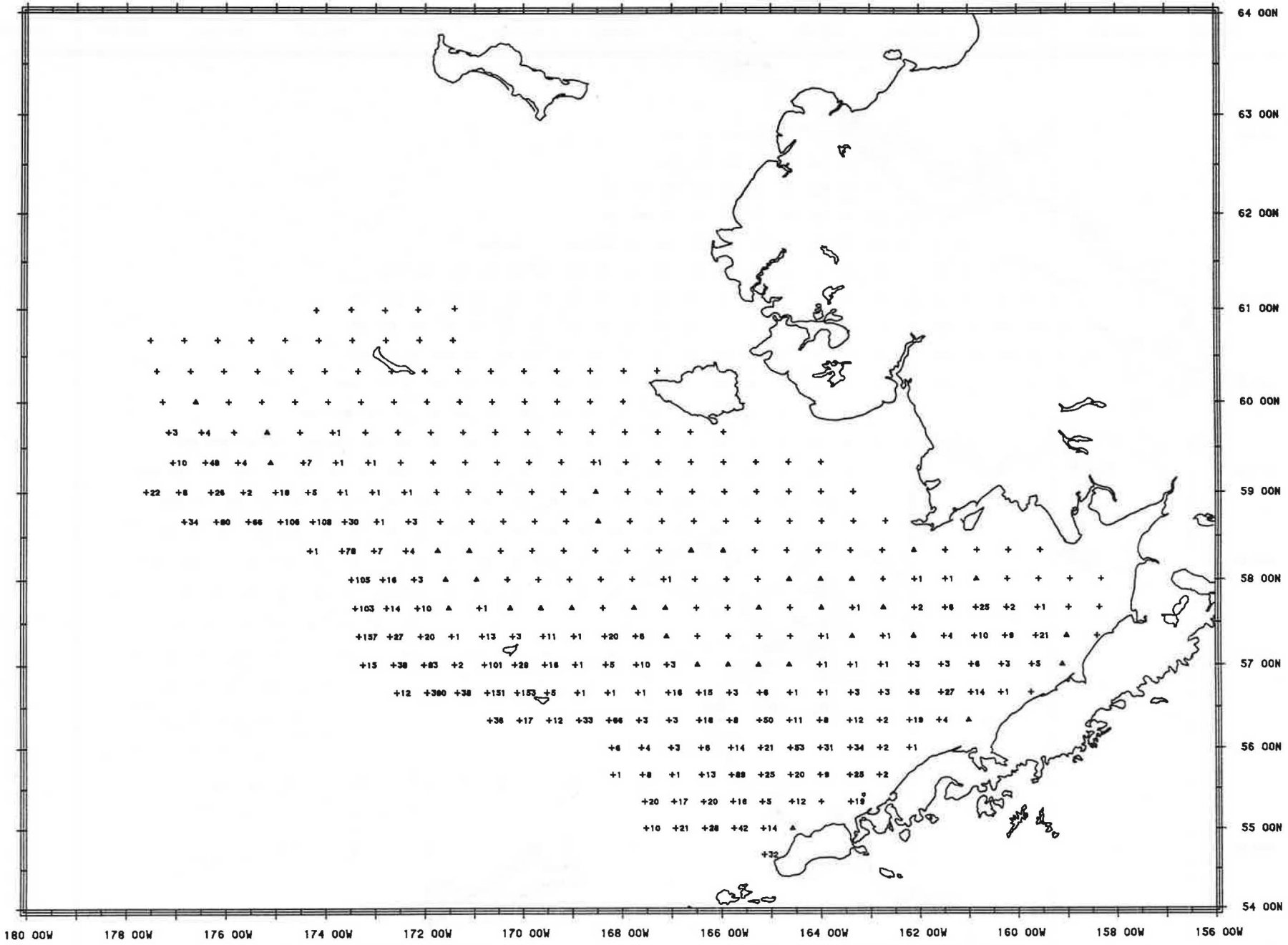


Figure 60.--Catch per unit effort (number/ha) of C. bairdi during the 1983 survey.

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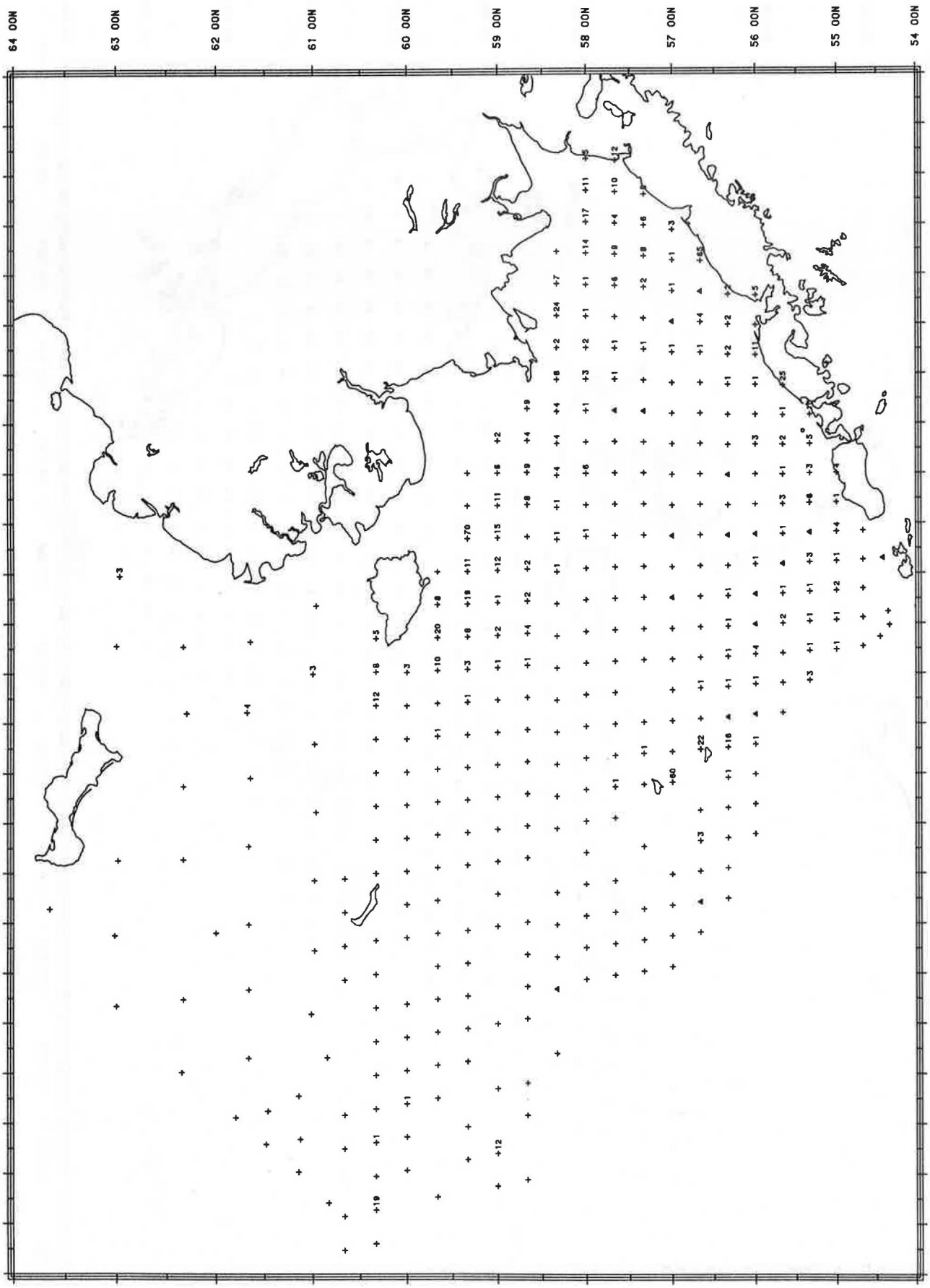


Figure 61.--Catch in numbers of Pacific halibut per metric ton of total fish caught during the 1979 survey.

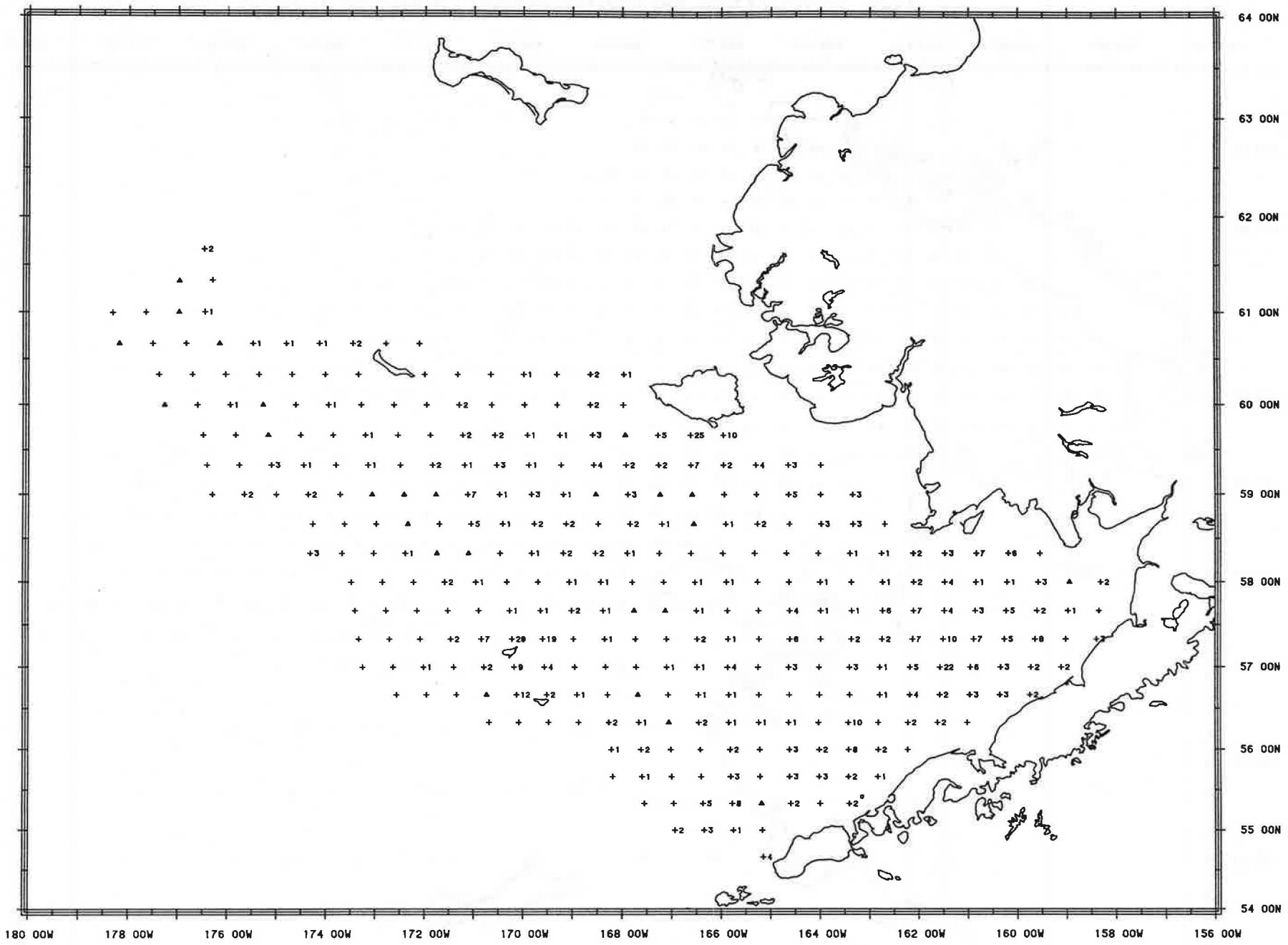


Figure 62.--Catch in numbers of Pacific halibut per metric ton of total fish caught during the 1980 survey.

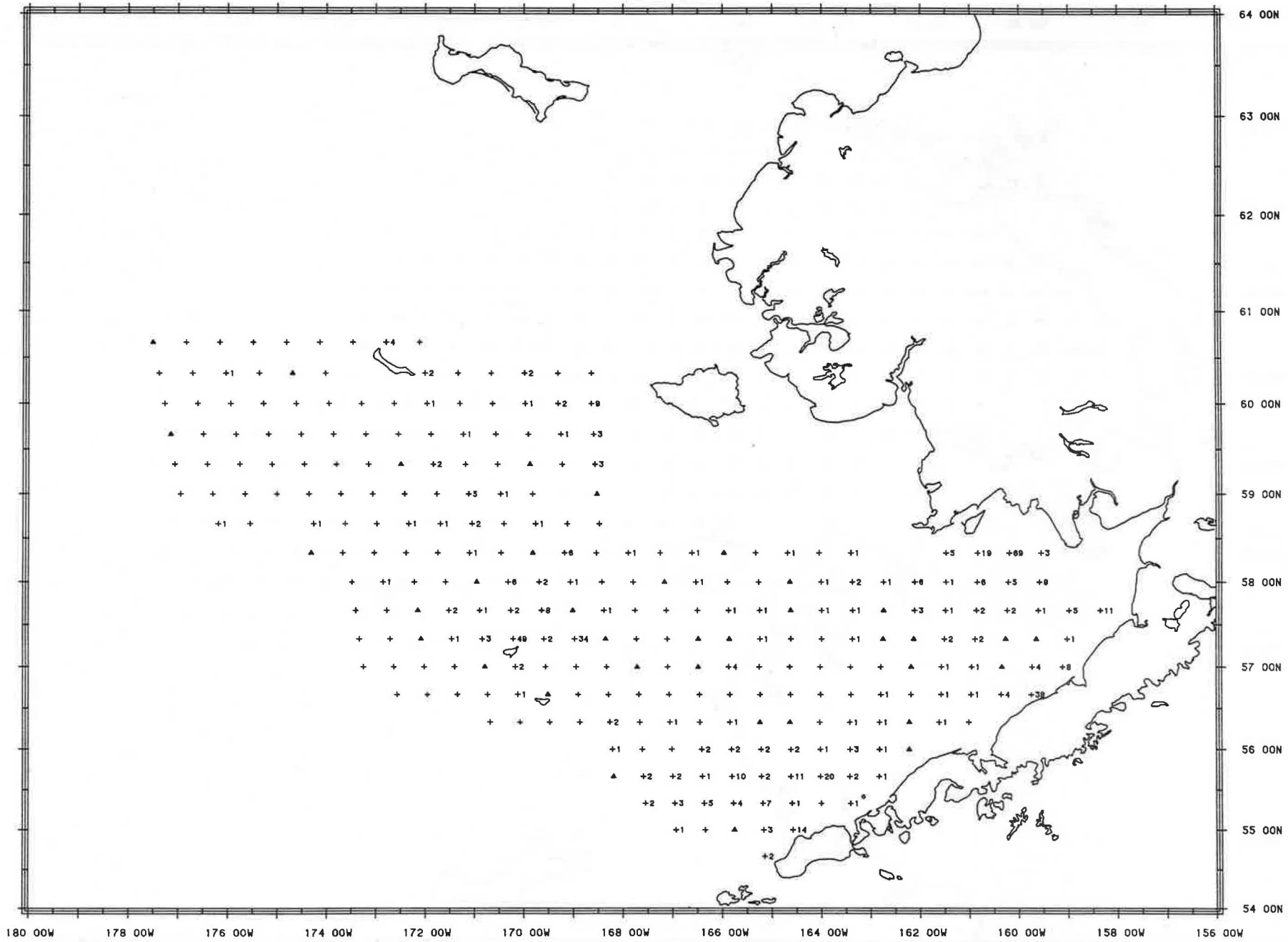


Figure 63.--Catch in numbers of Pacific halibut per metric ton of total fish caught during the 1981 survey.

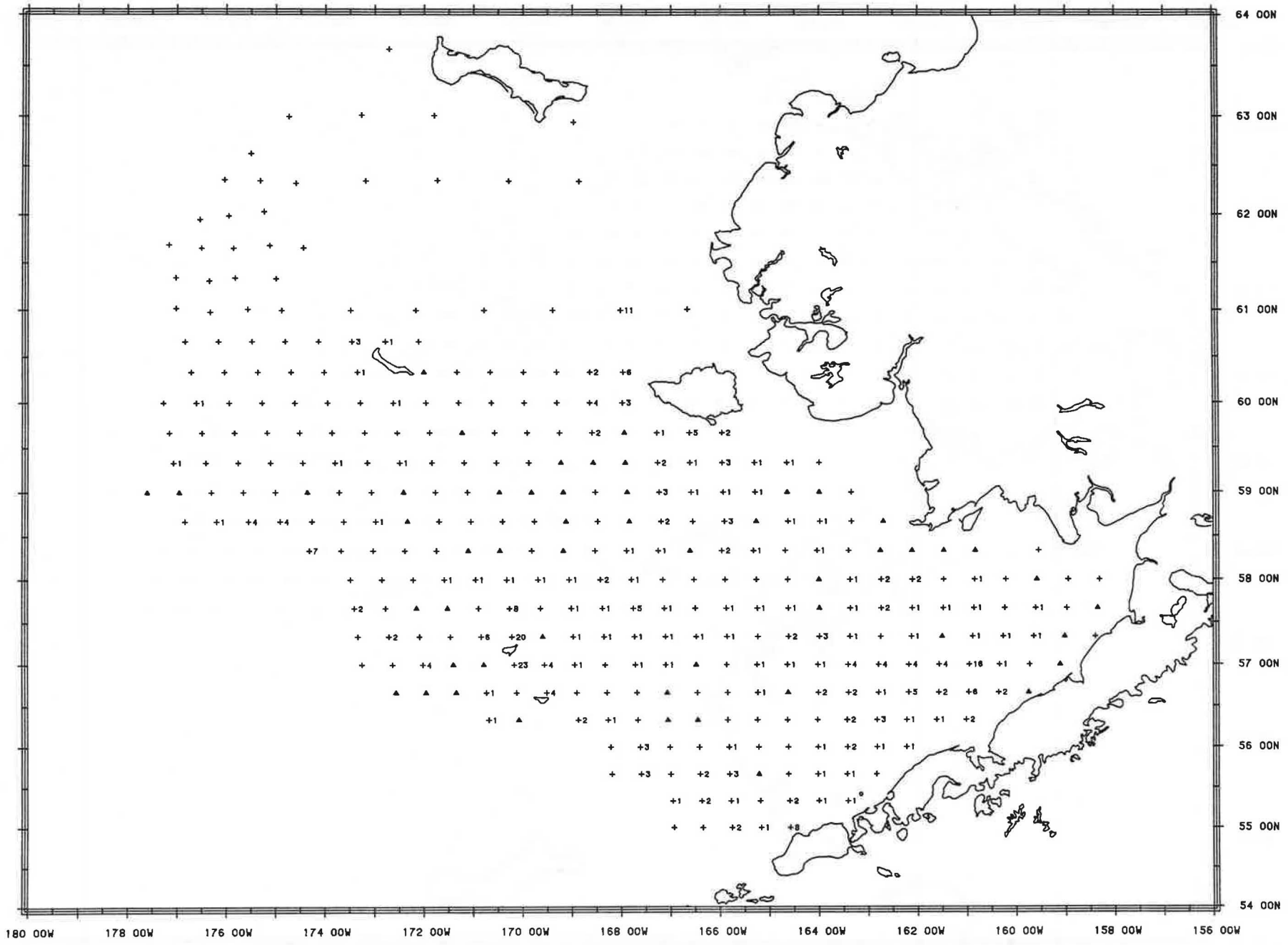


Figure 64.--Catch in numbers of Pacific halibut per metric ton of total fish caught during the 1982 survey.

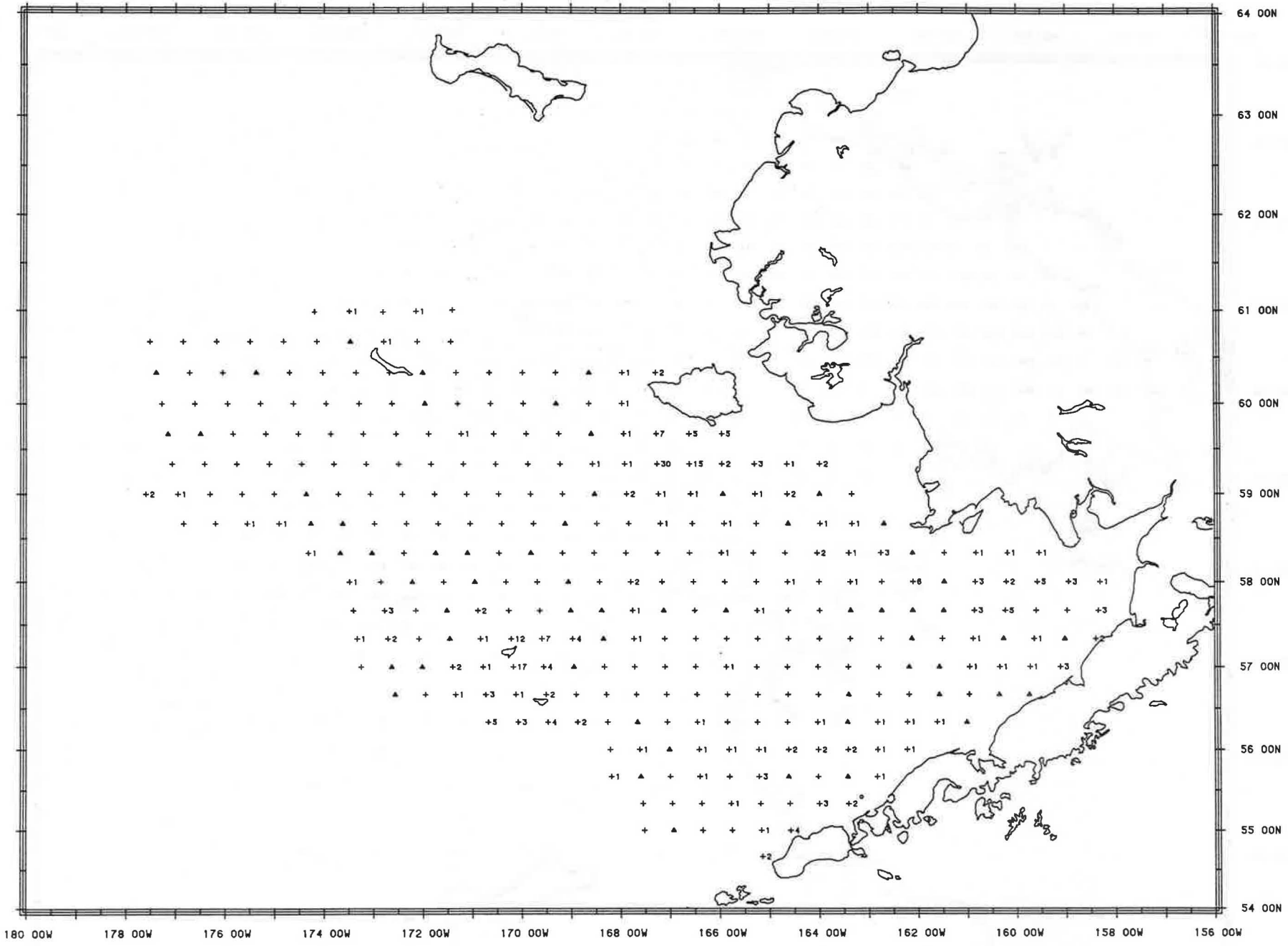


Figure 65.--Catch in numbers of Pacific halibut per metric ton of total fish caught during the 1983 survey.

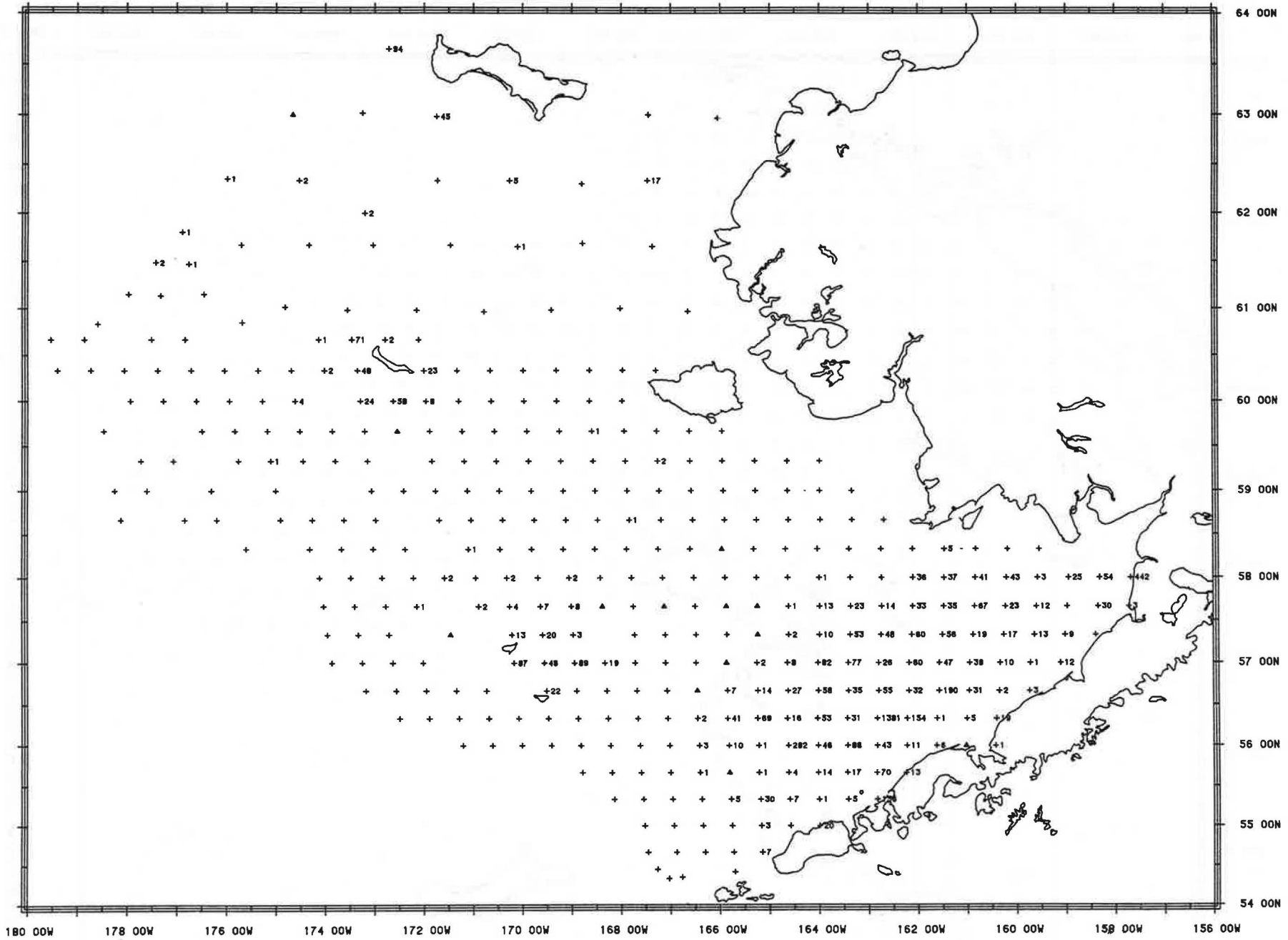


Figure 66.--Catch in numbers of king crab per metric ton of total fish caught during the 1979 survey.

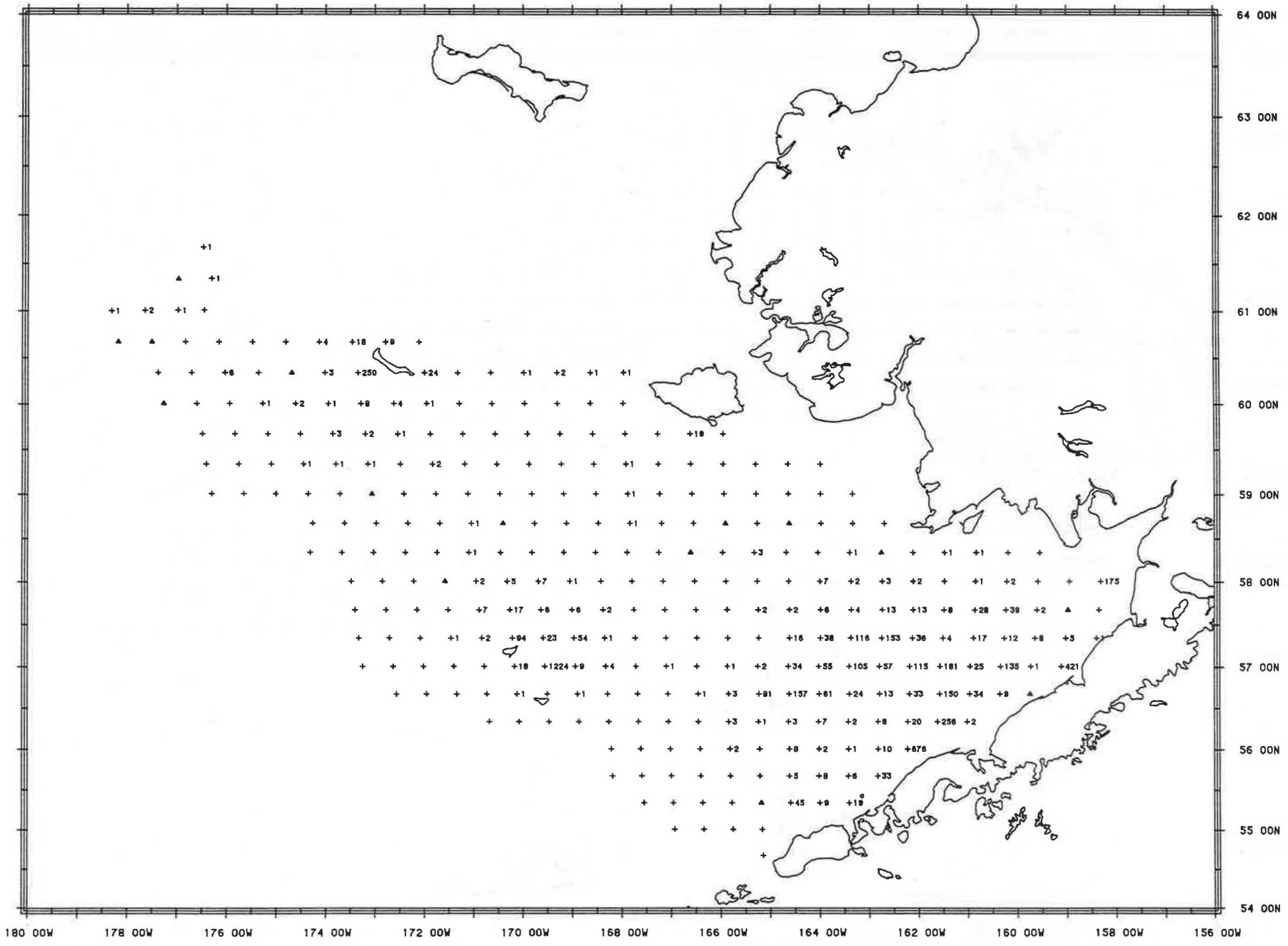


Figure 67.--Catch in numbers of king crab per metric ton of total fish caught during the 1980 survey.

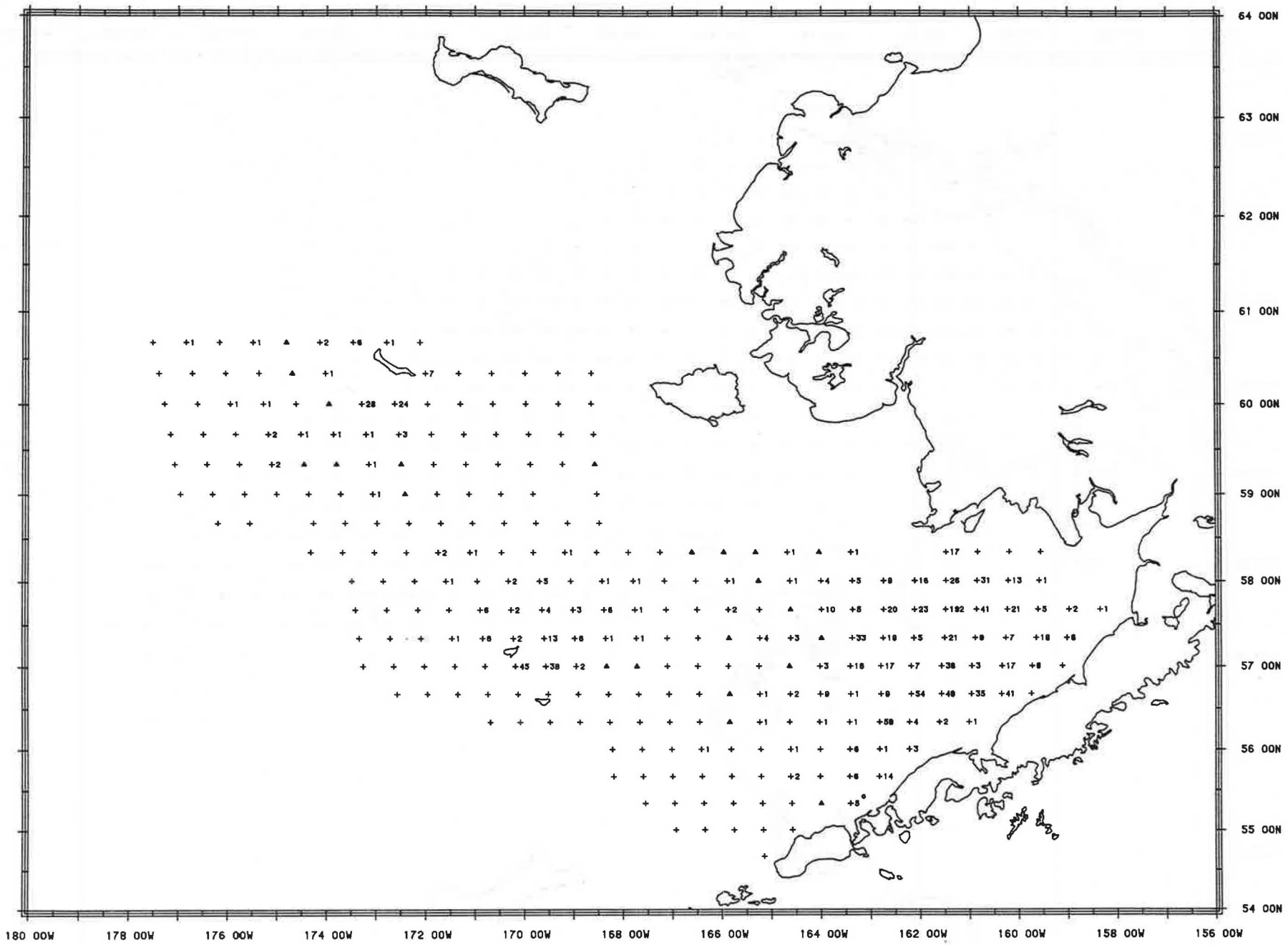


Figure 68.--Catch in numbers of king crab per metric ton of total fish caught during the 1981 survey.

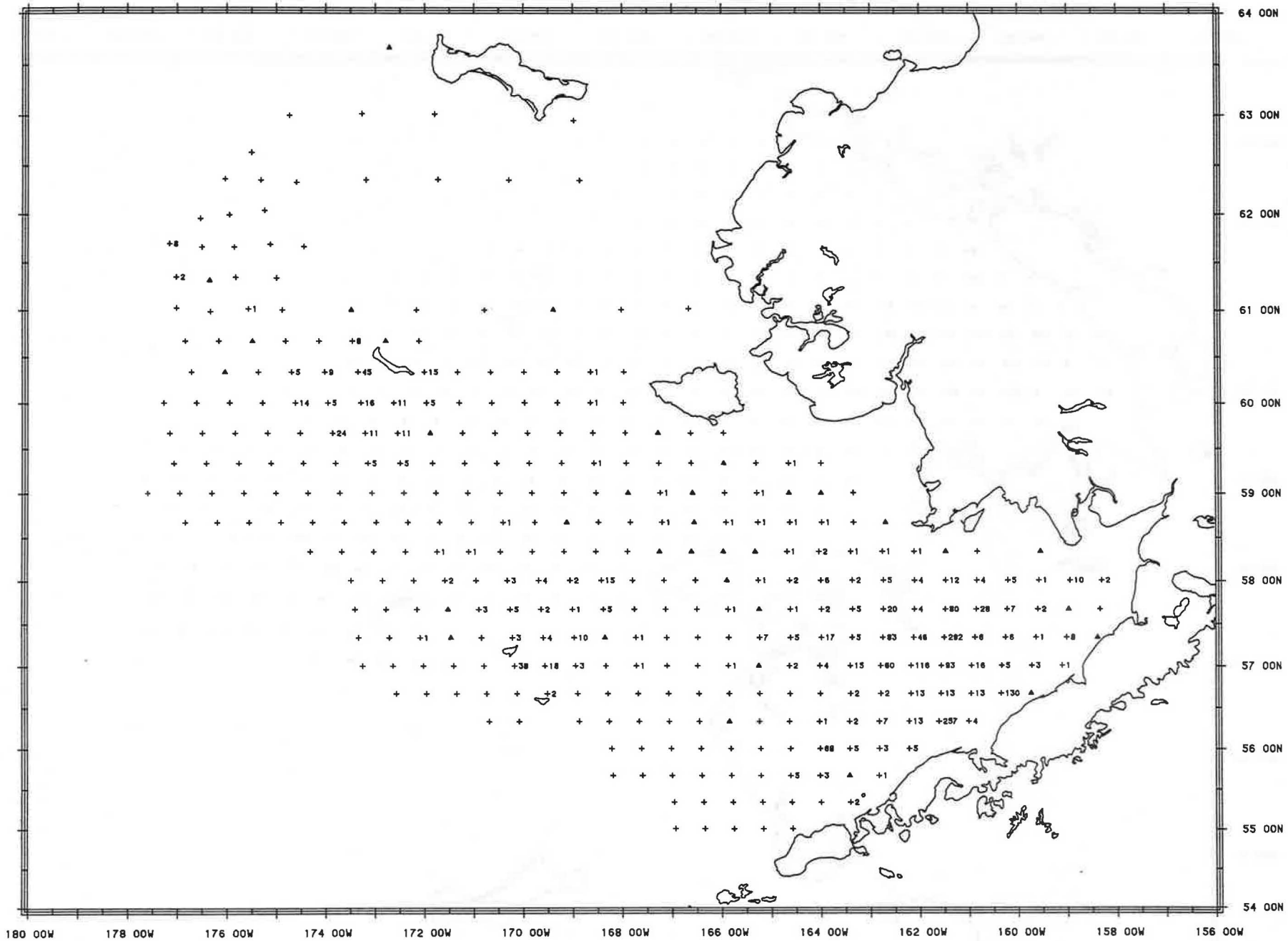


Figure 69.--Catch in numbers of king crab per metric ton of total fish caught during the 1982 survey.

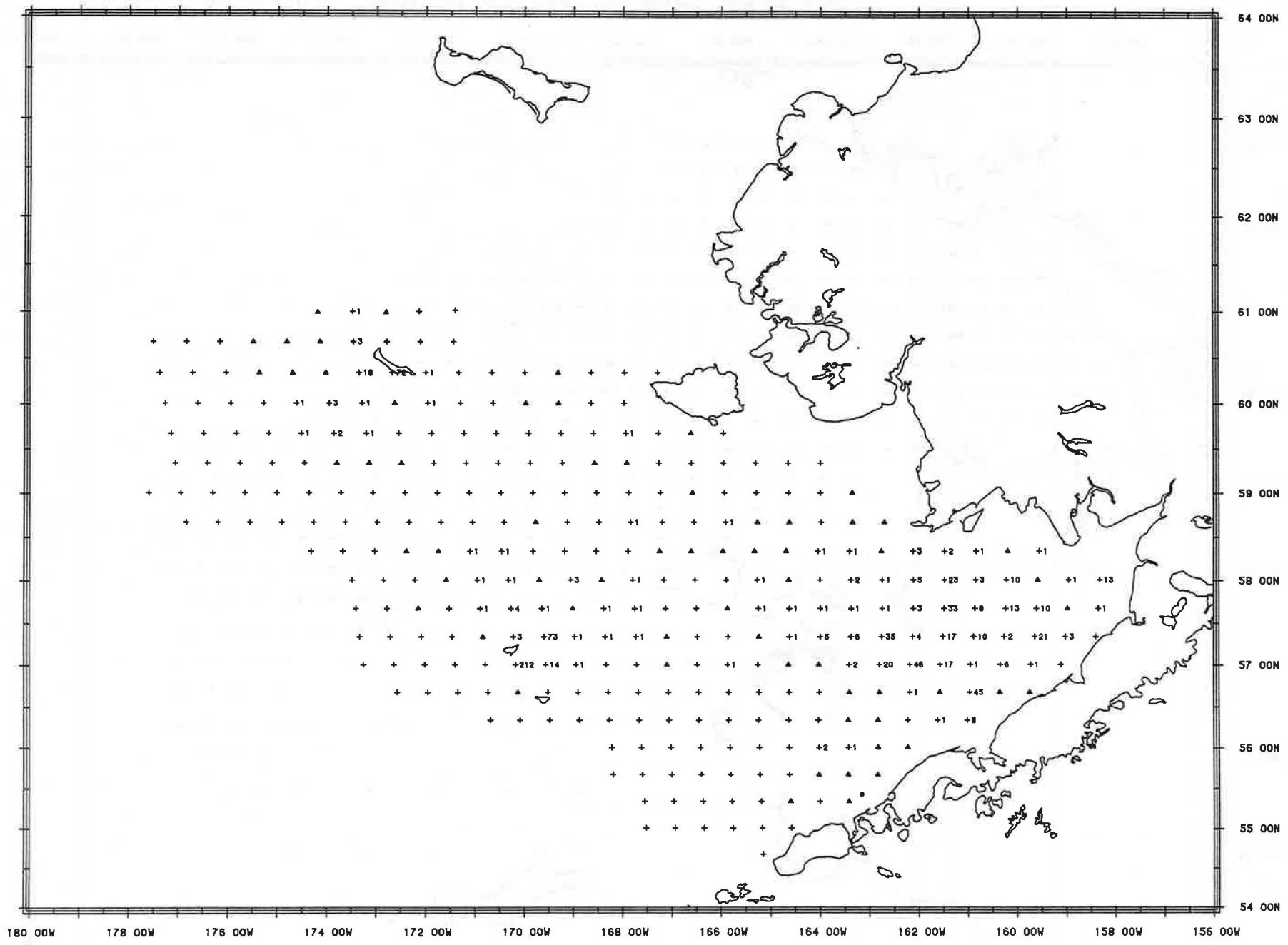


Figure 70.--Catch in numbers of king crab per metric ton of total fish caught during the 1983 survey.

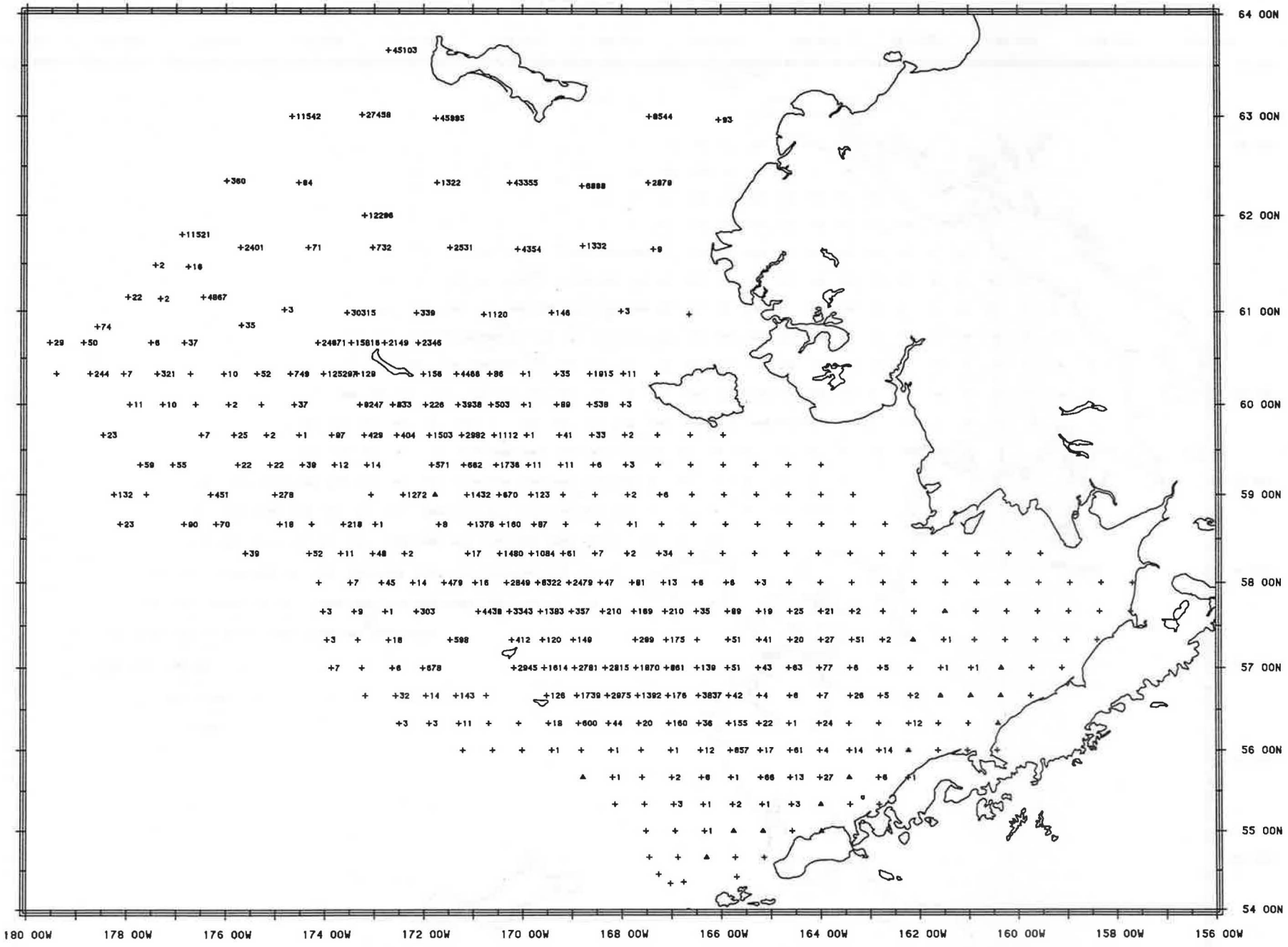


Figure 71.--Catch in numbers of C. opilio per metric ton of total fish caught during the 1979 survey.

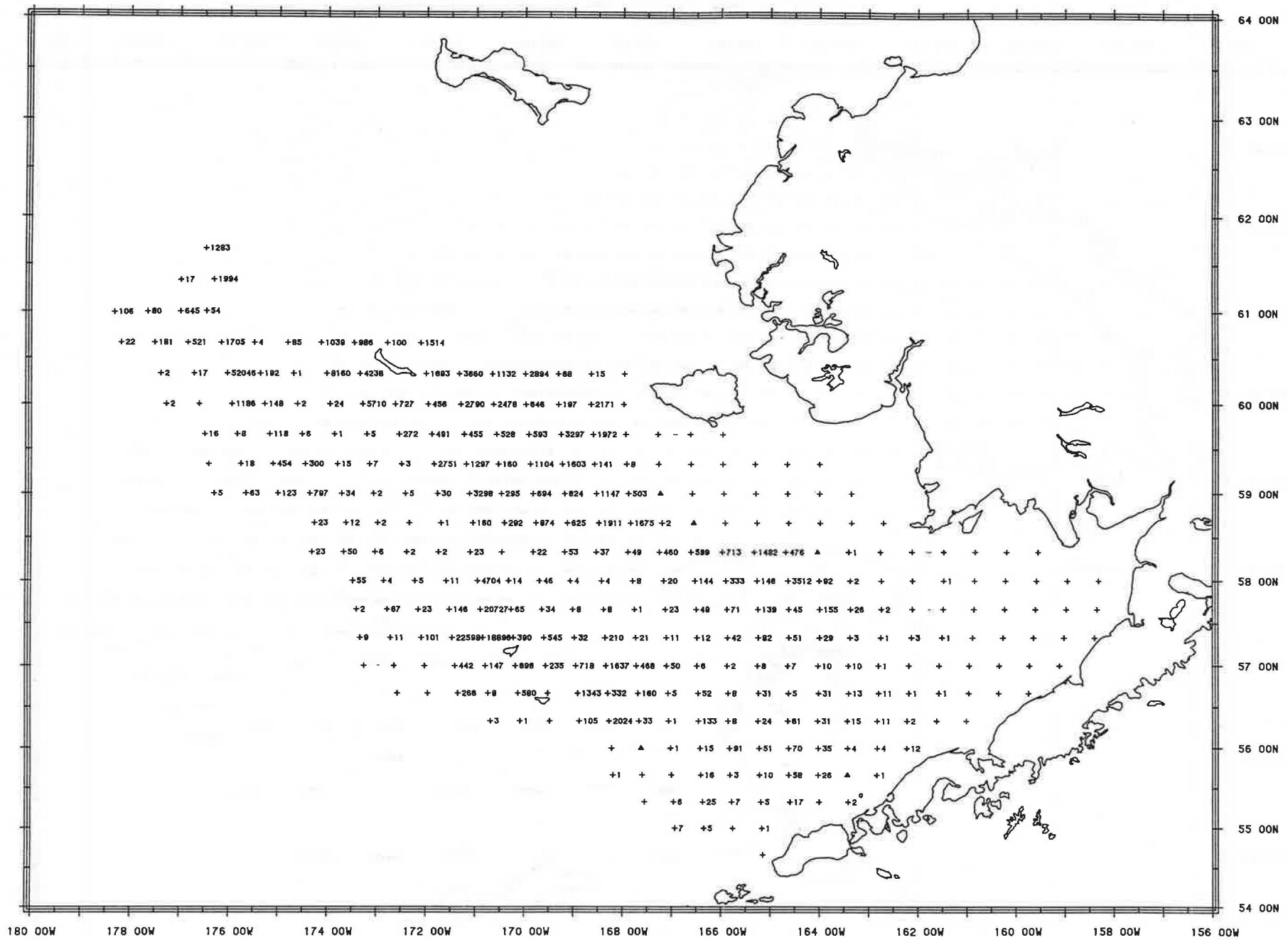


Figure 72.--Catch in numbers of C. opilio per metric ton of total fish caught during the 1980 survey.

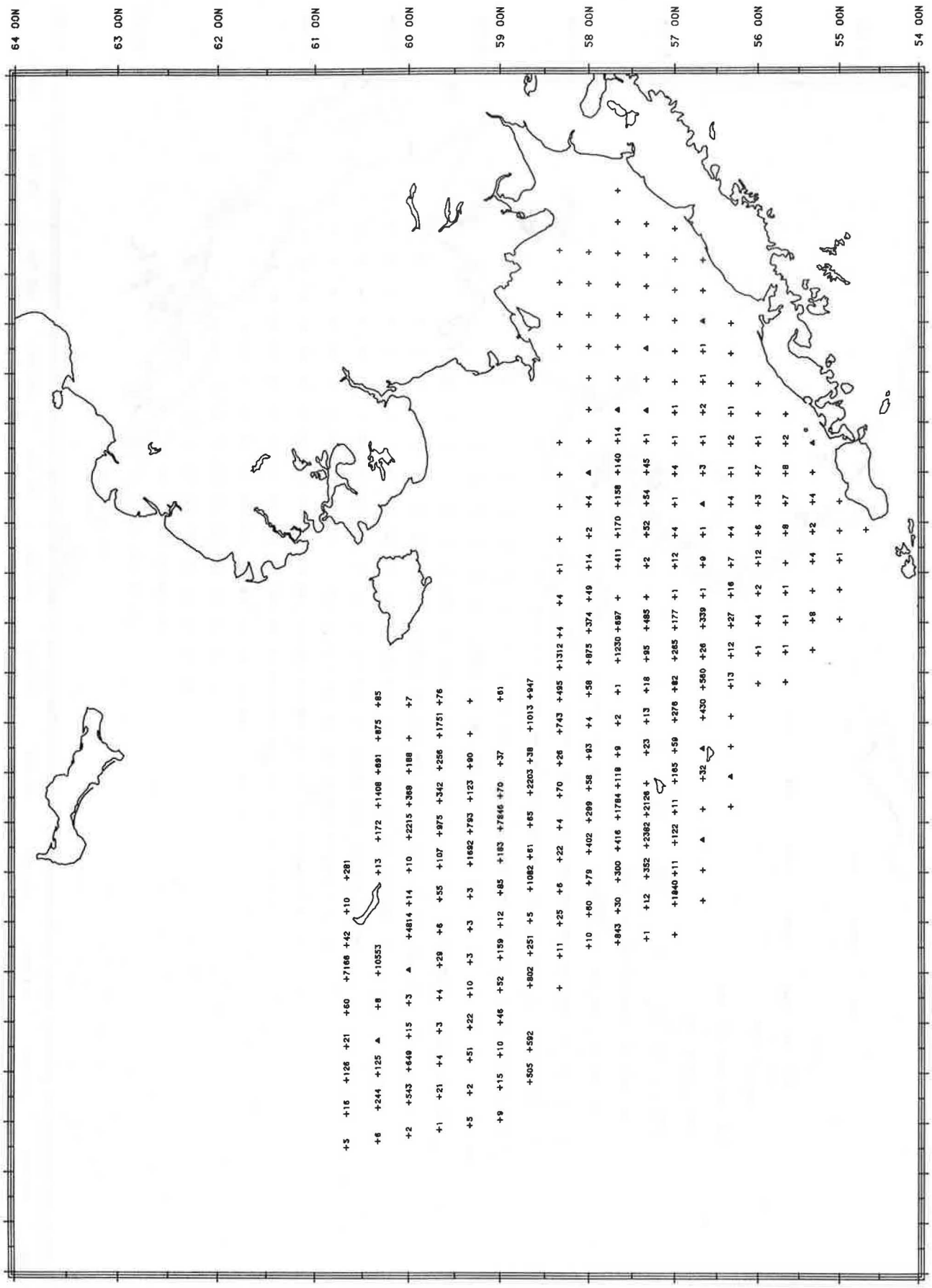


Figure 73.--Catch in numbers of C. opilio per metric ton of total fish caught during the 1981 survey.

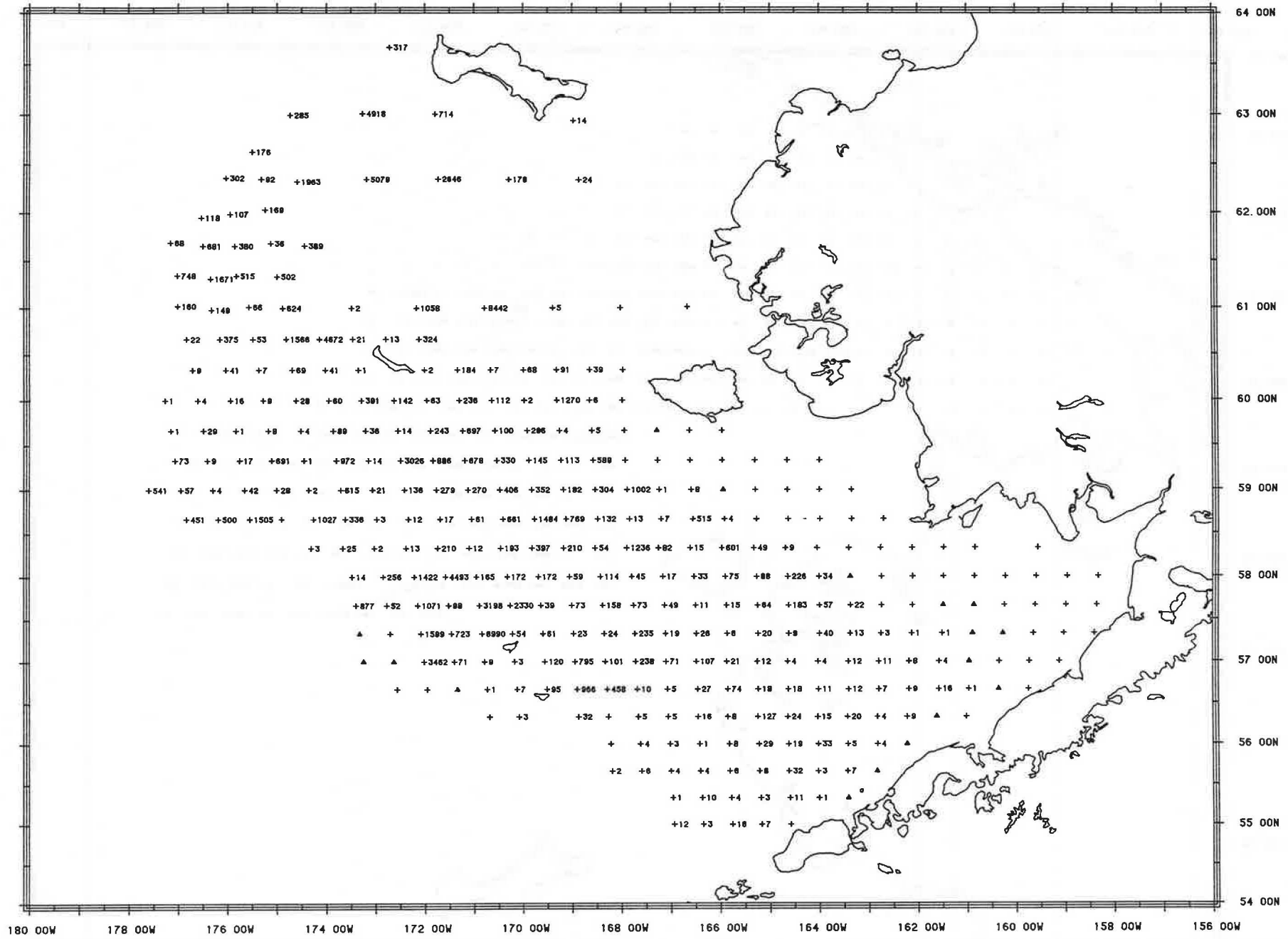


Figure 74.--Catch in numbers of C. opilio per metric ton of total fish caught during the 1982 survey.

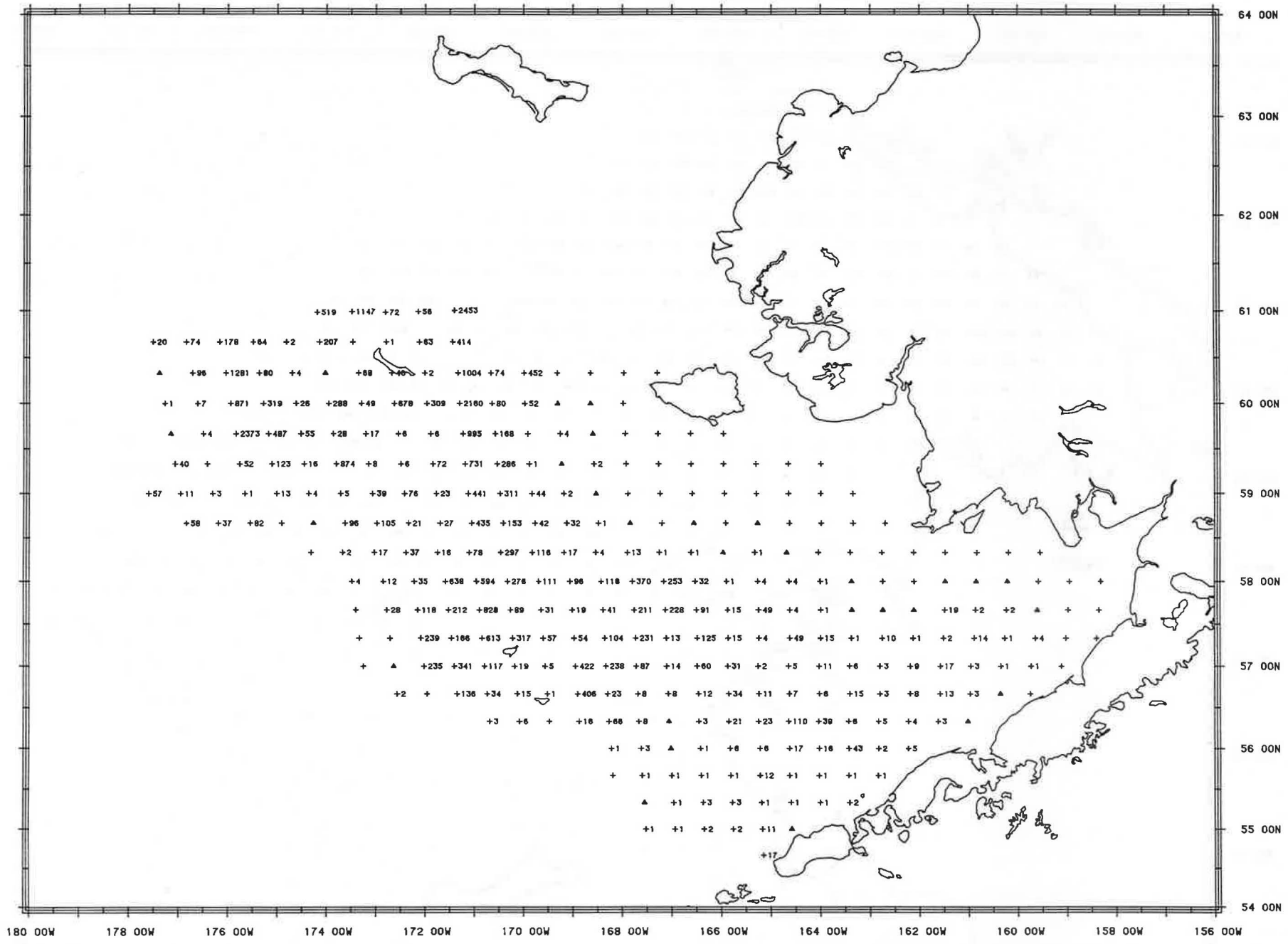


Figure 75.--Catch in numbers of C. opilio per metric ton of total fish caught during the 1983 survey.

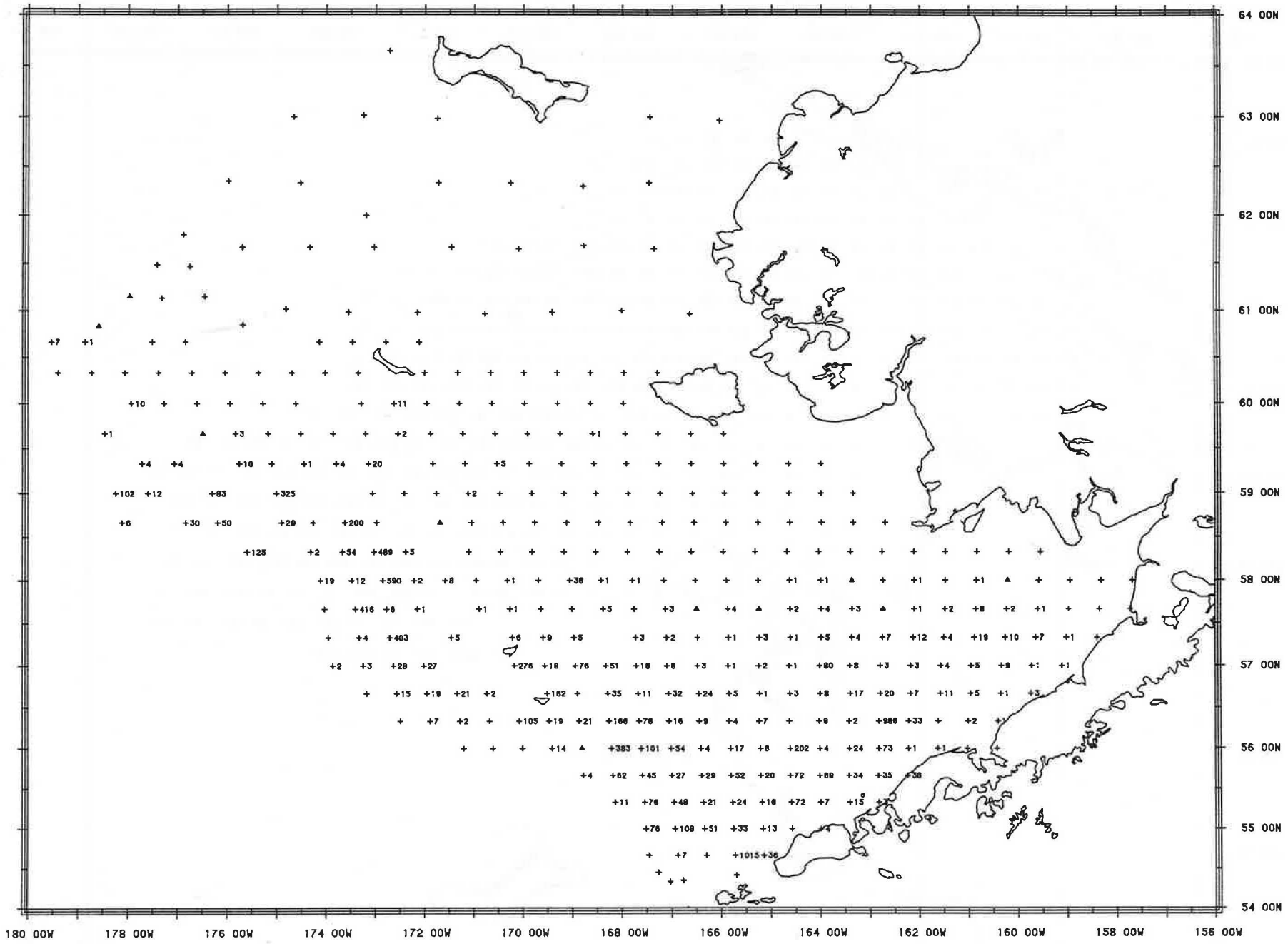


Figure 76.--Catch in numbers of C. bairdi per metric ton of total fish caught during the 1979 survey.

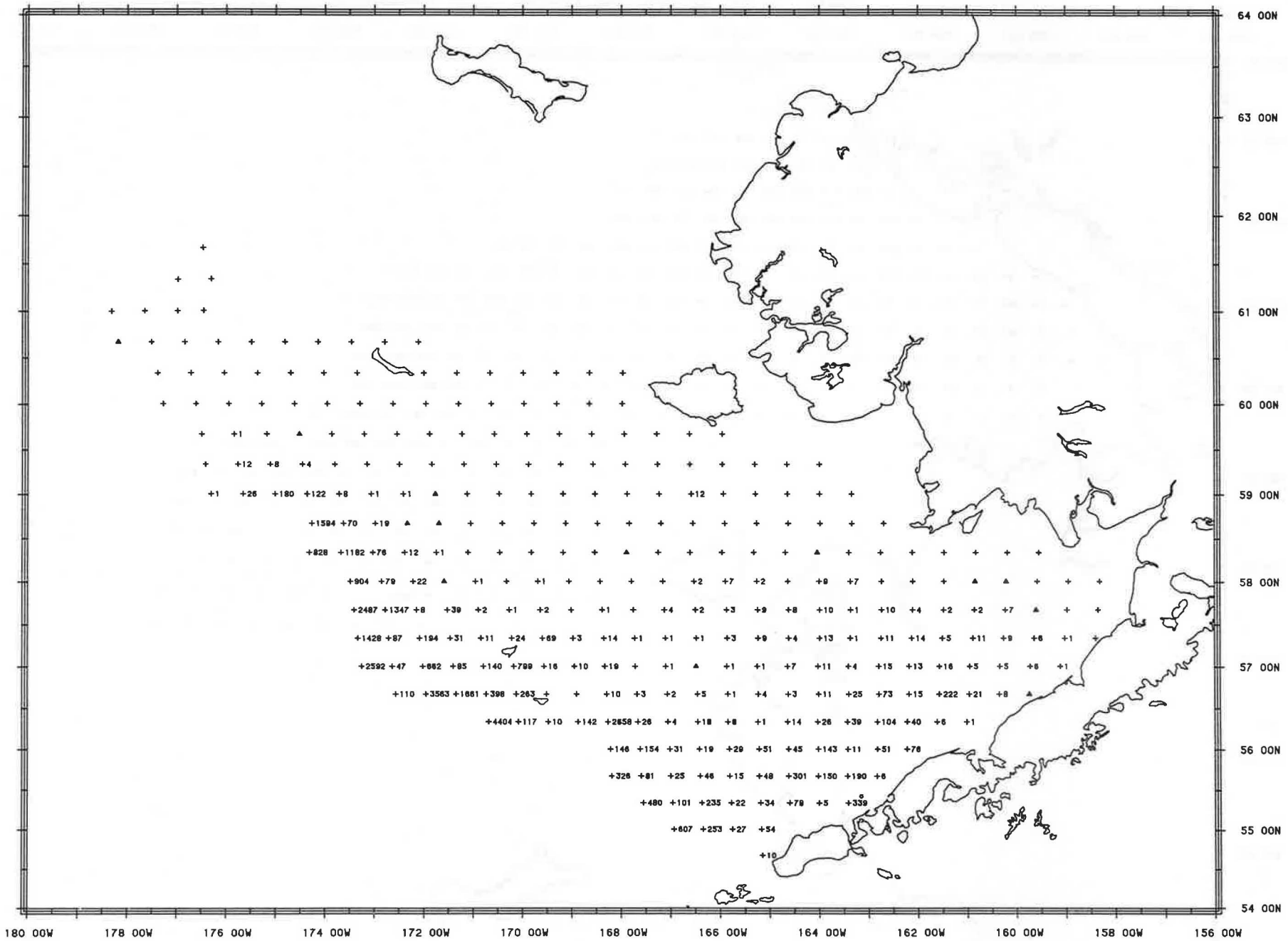


Figure 77.--Catch in numbers of C. bairdi per metric ton of total fish caught during the 1980 survey.

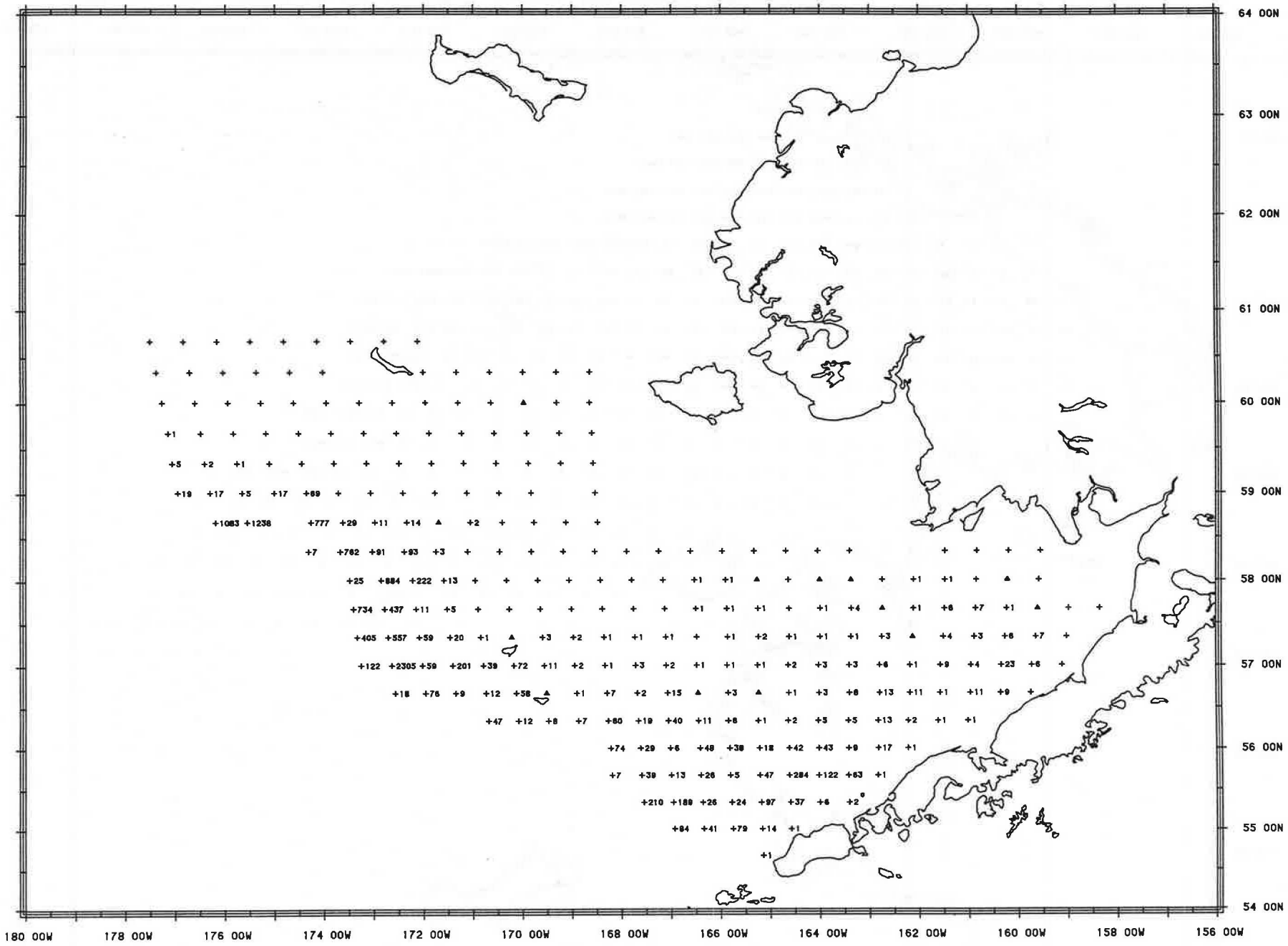


Figure 78.--Catch in numbers of C. bairdi per metric ton of total fish caught during the 1981 survey.

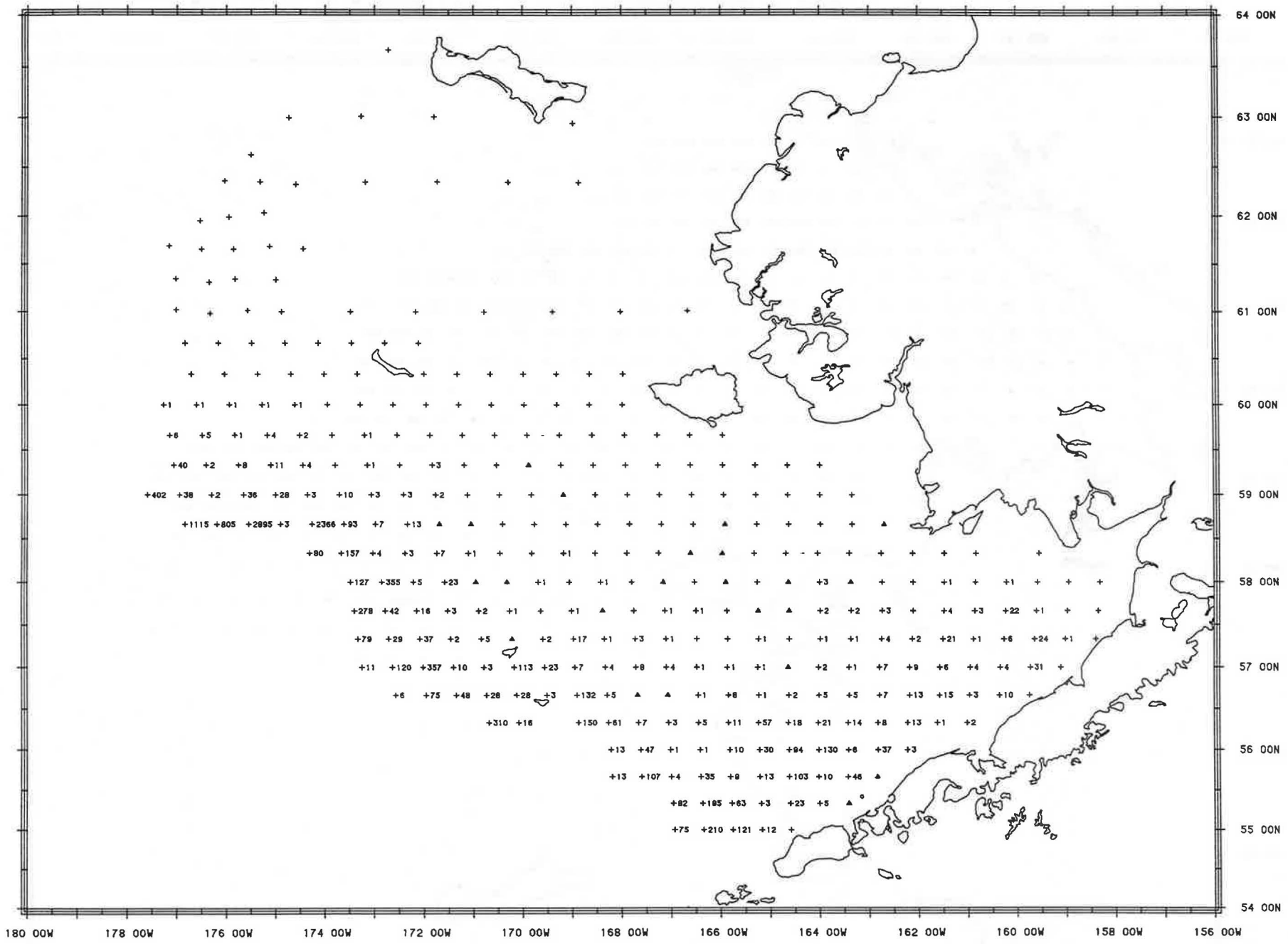


Figure 79.--Catch in numbers of C. bairdi per metric ton of total fish caught during the 1982 survey.

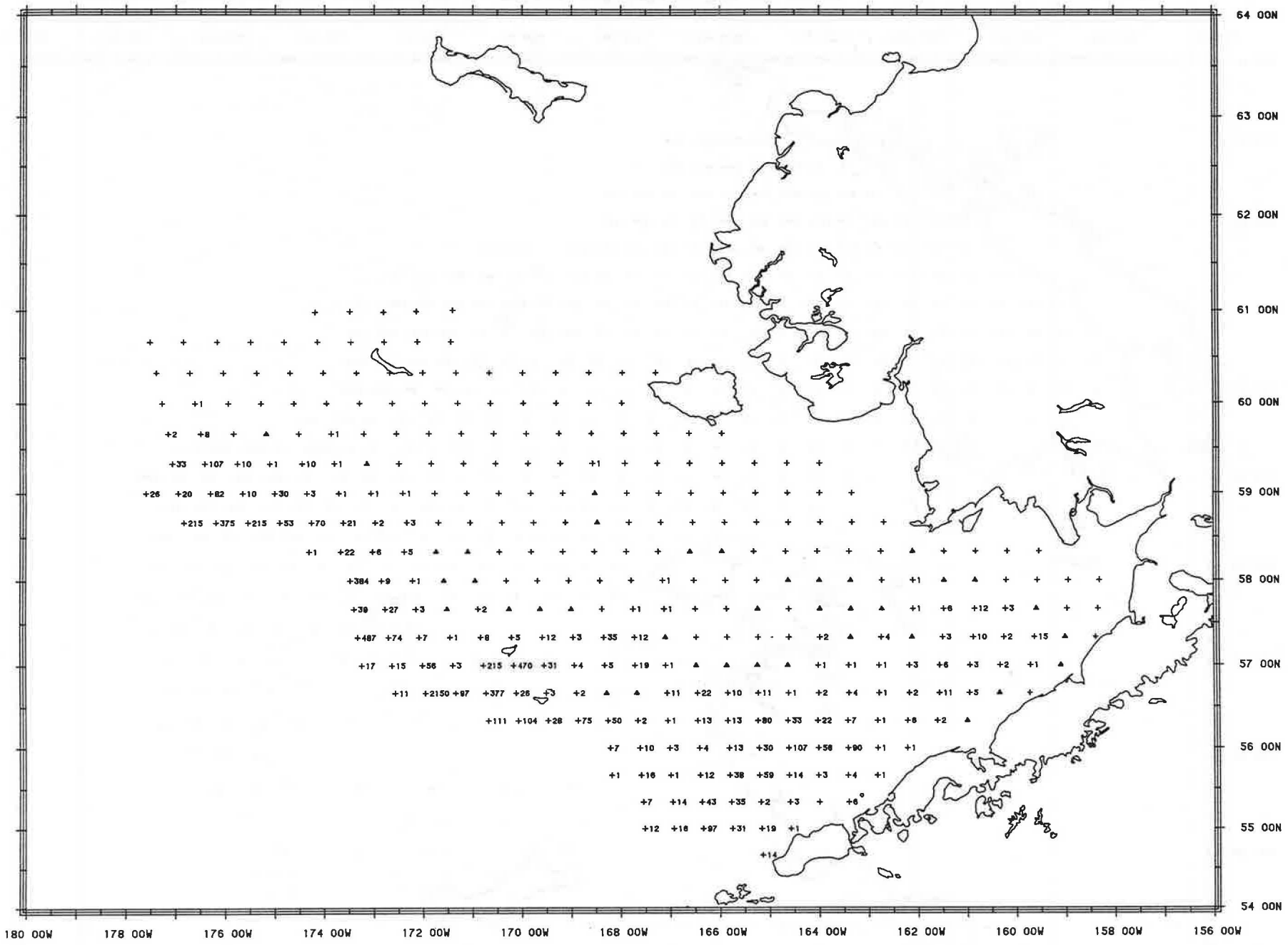


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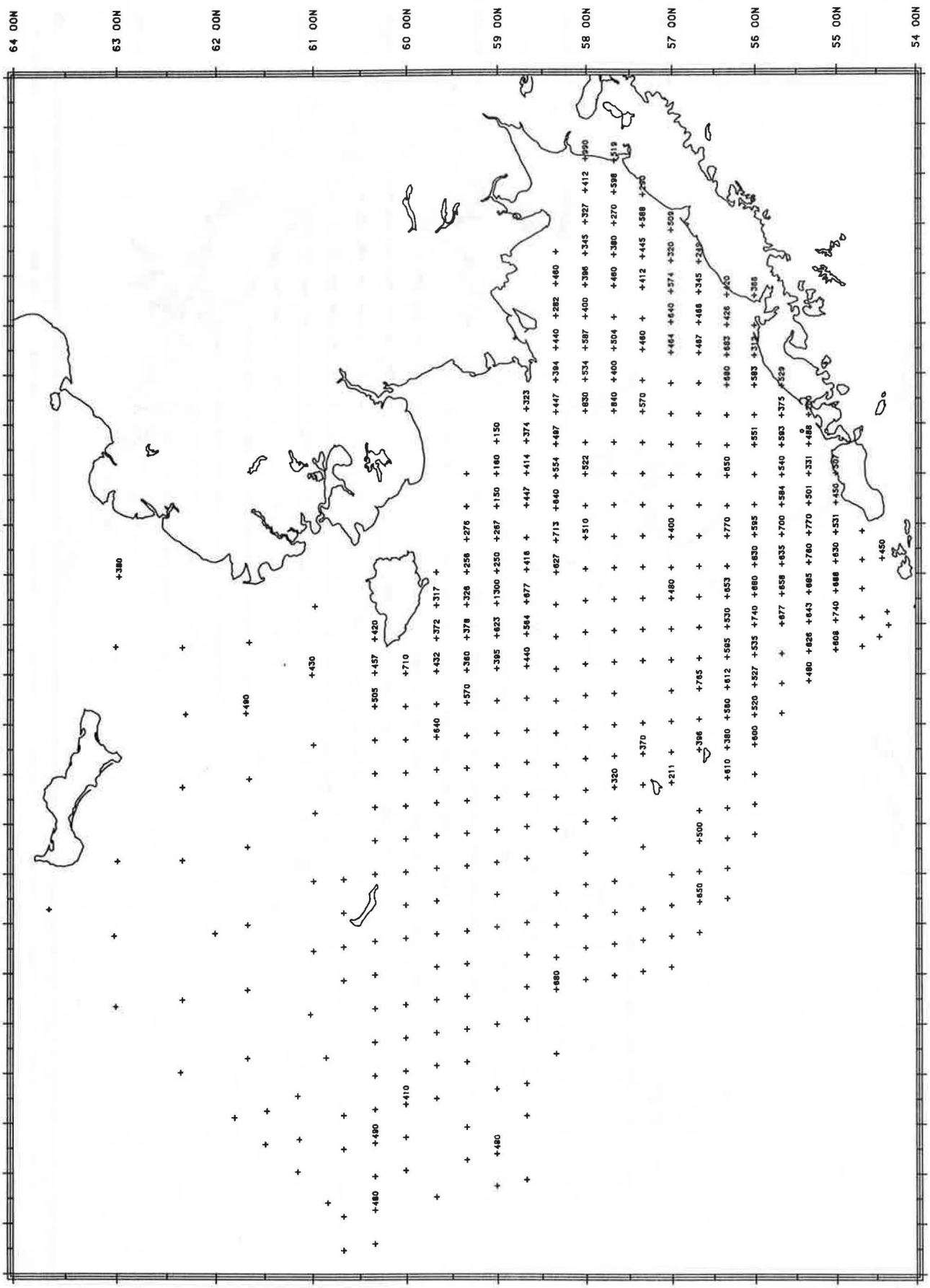


Figure 81.--Mean total length (cm) of Pacific halibut from the 1979 survey.

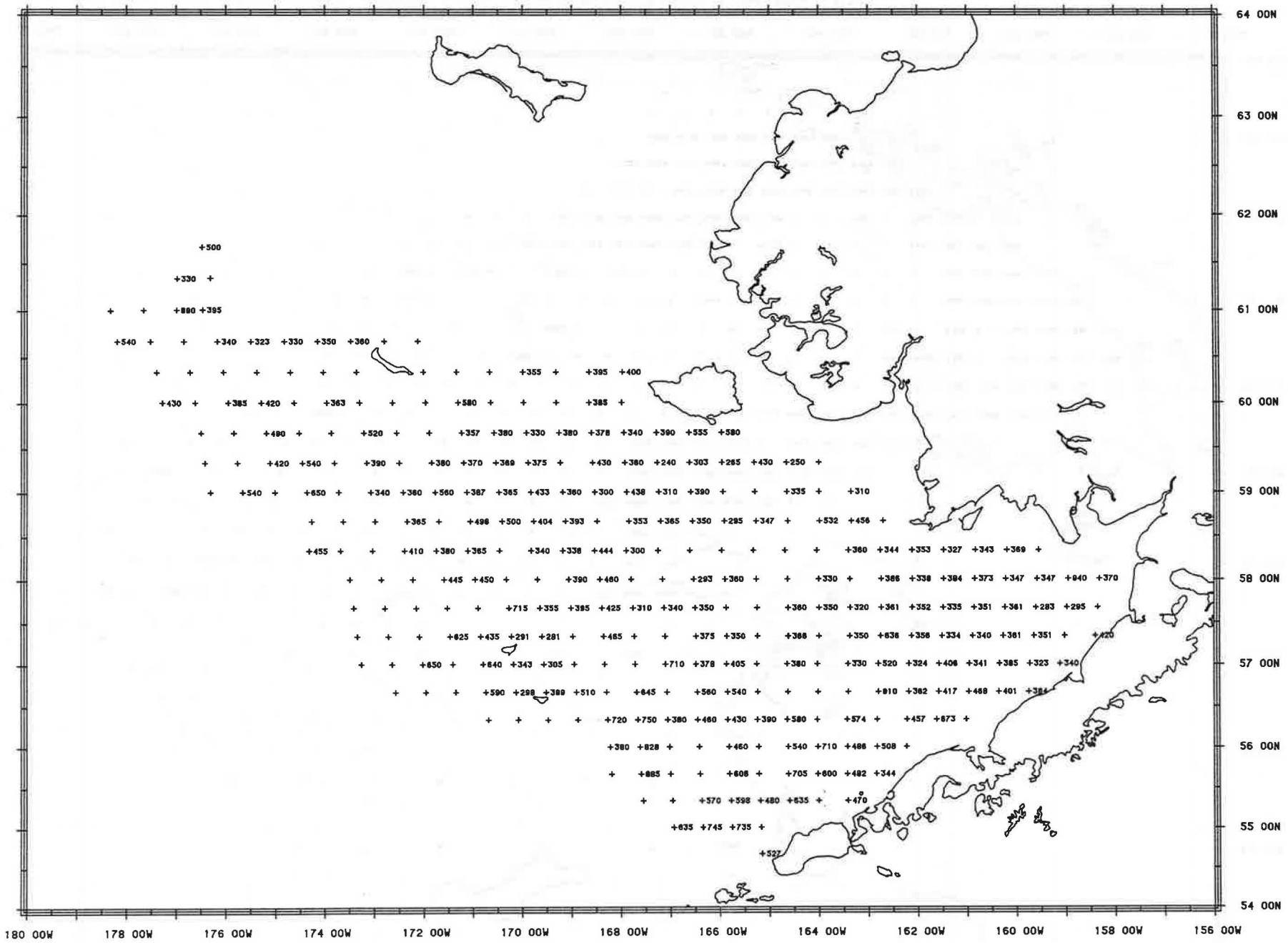


Figure 82.--Mean total length (cm) of Pacific halibut from the 1980 survey.

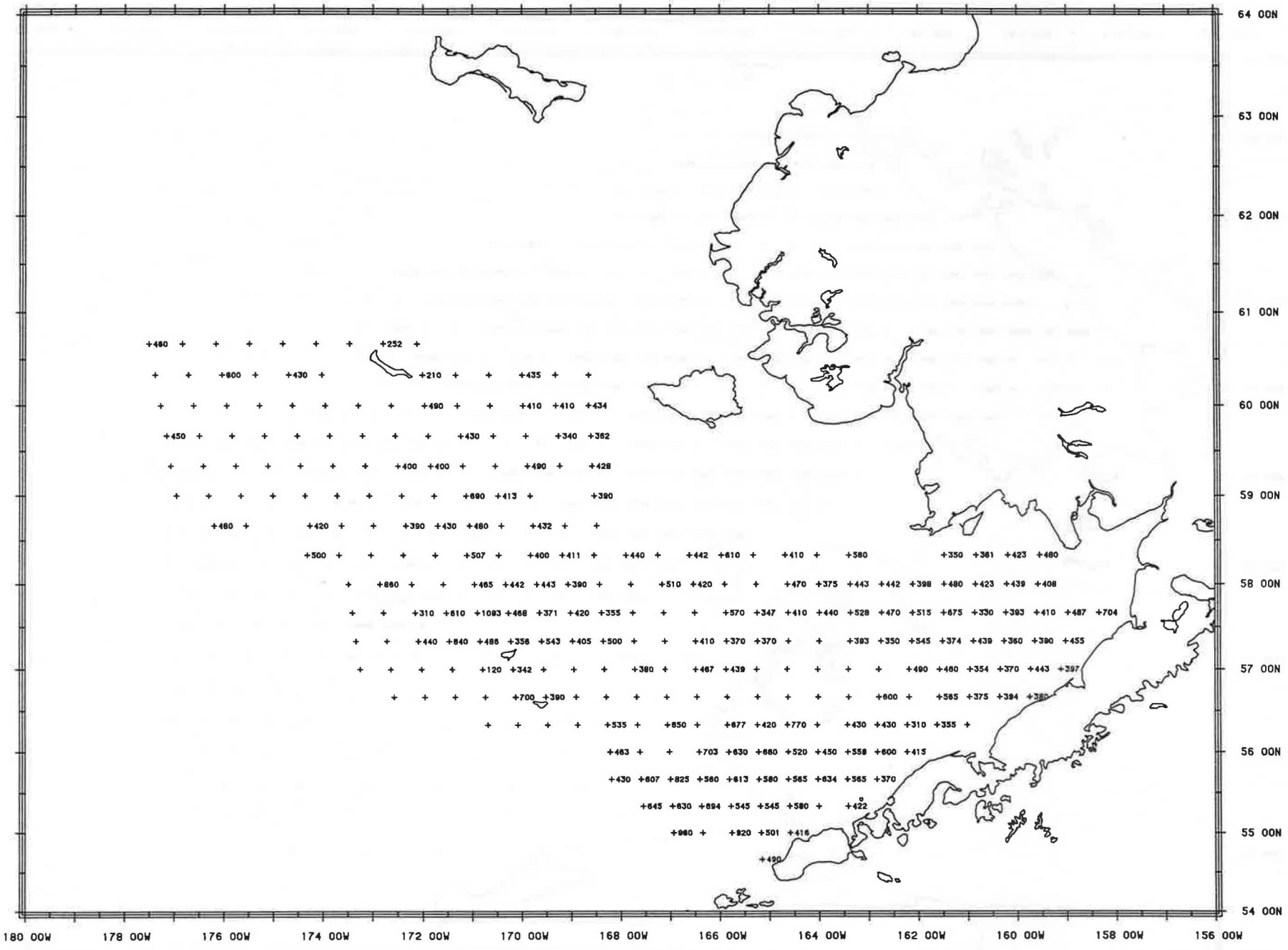


Figure 83.--Mean total length (cm) of Pacific halibut from the 1981 survey.

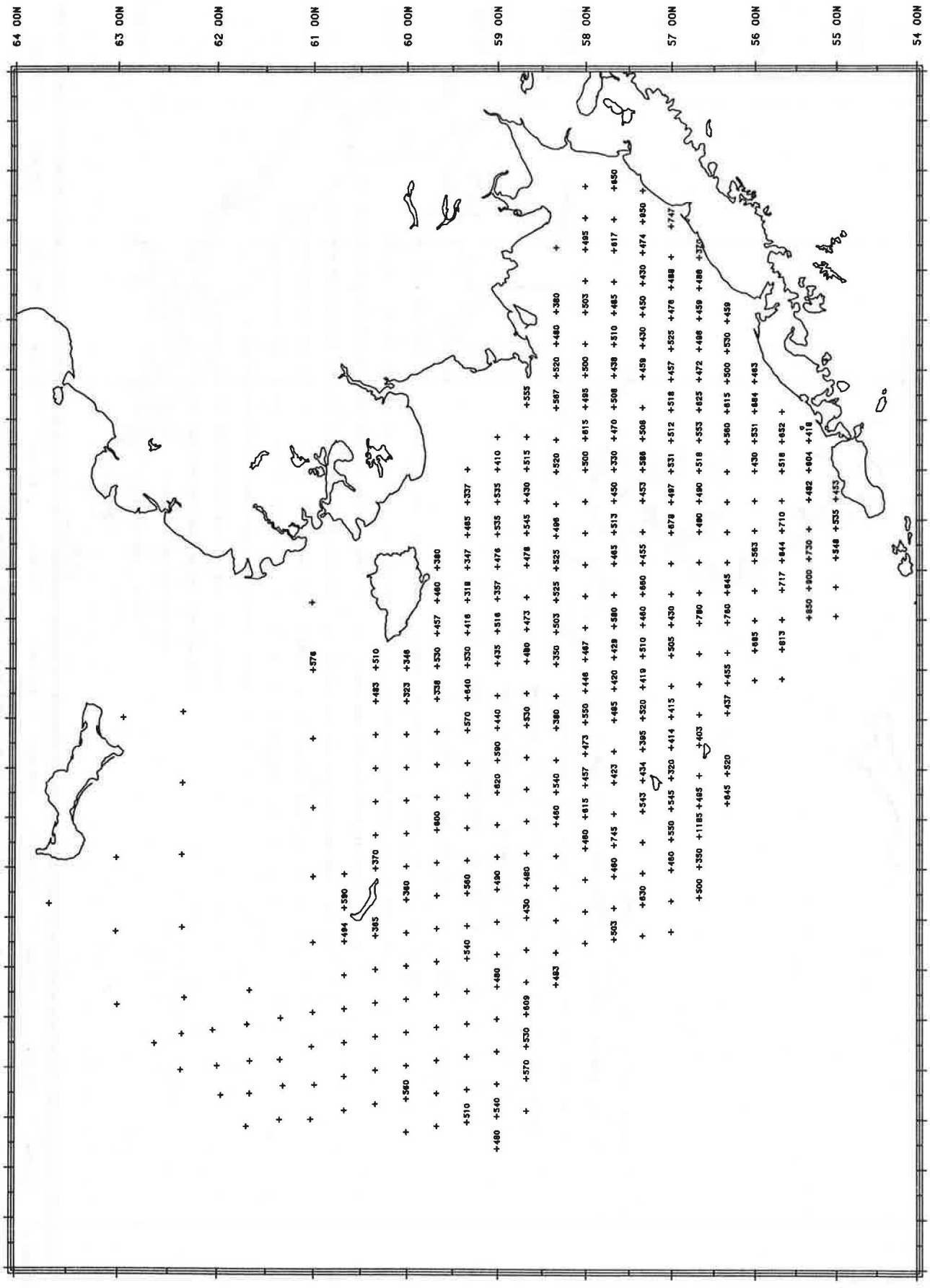


Figure 84.--Mean total length (cm) of Pacific halibut from the 1982 survey.

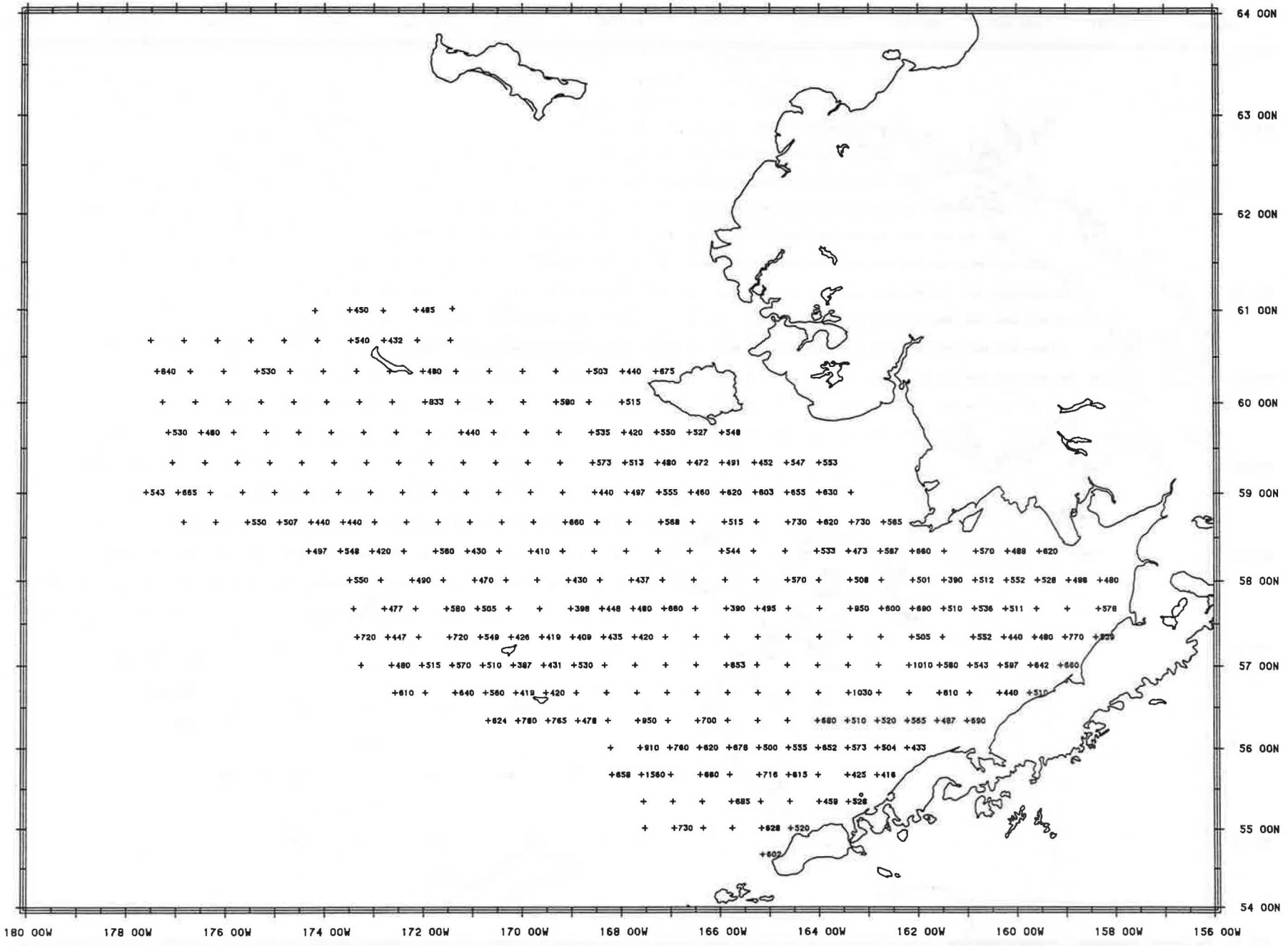


Figure 85.--Mean total length (cm) of Pacific halibut from the 1983 survey.

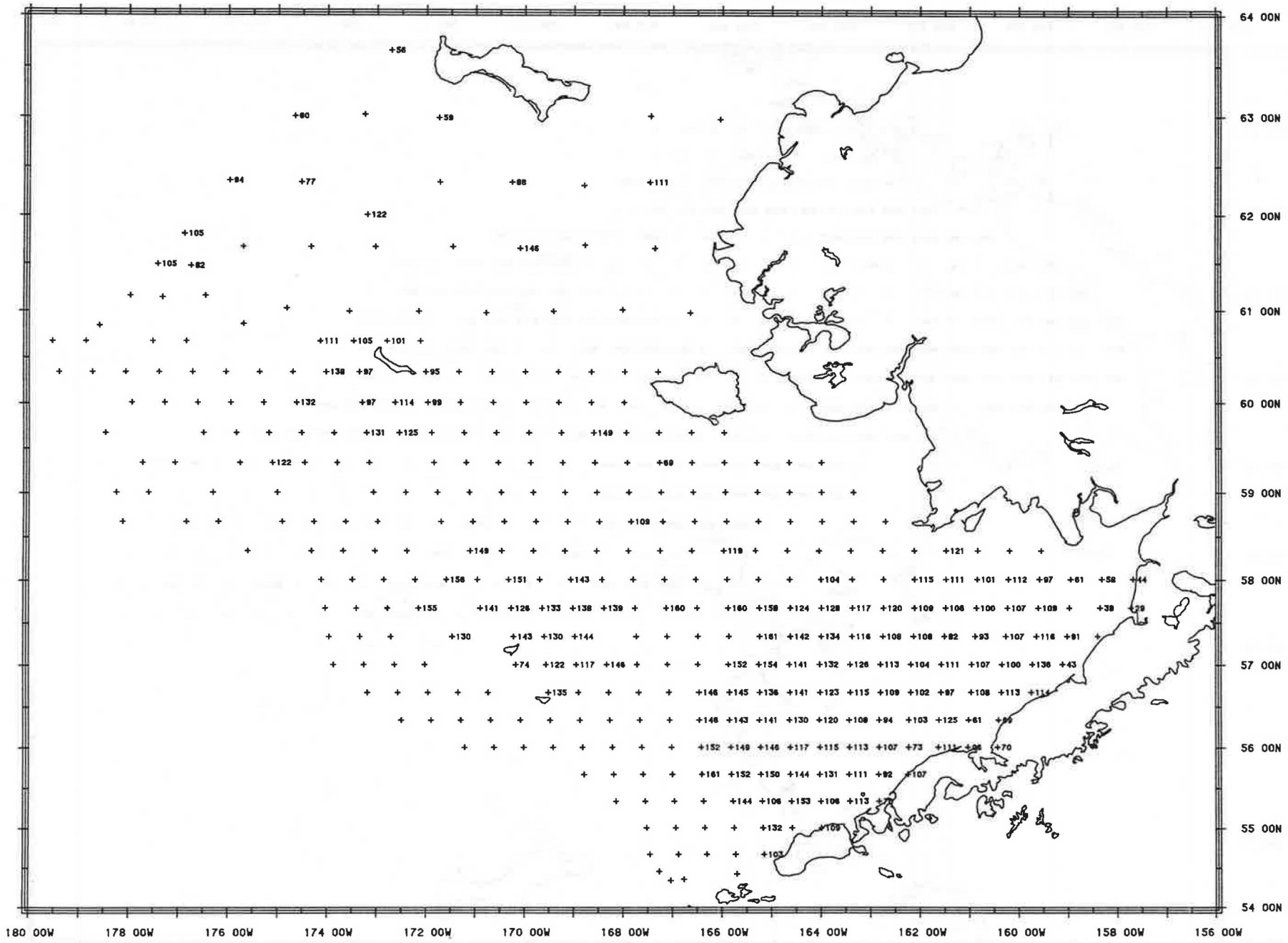


Figure 86.--Mean carapace length (mm) of king crab from the 1979 survey.

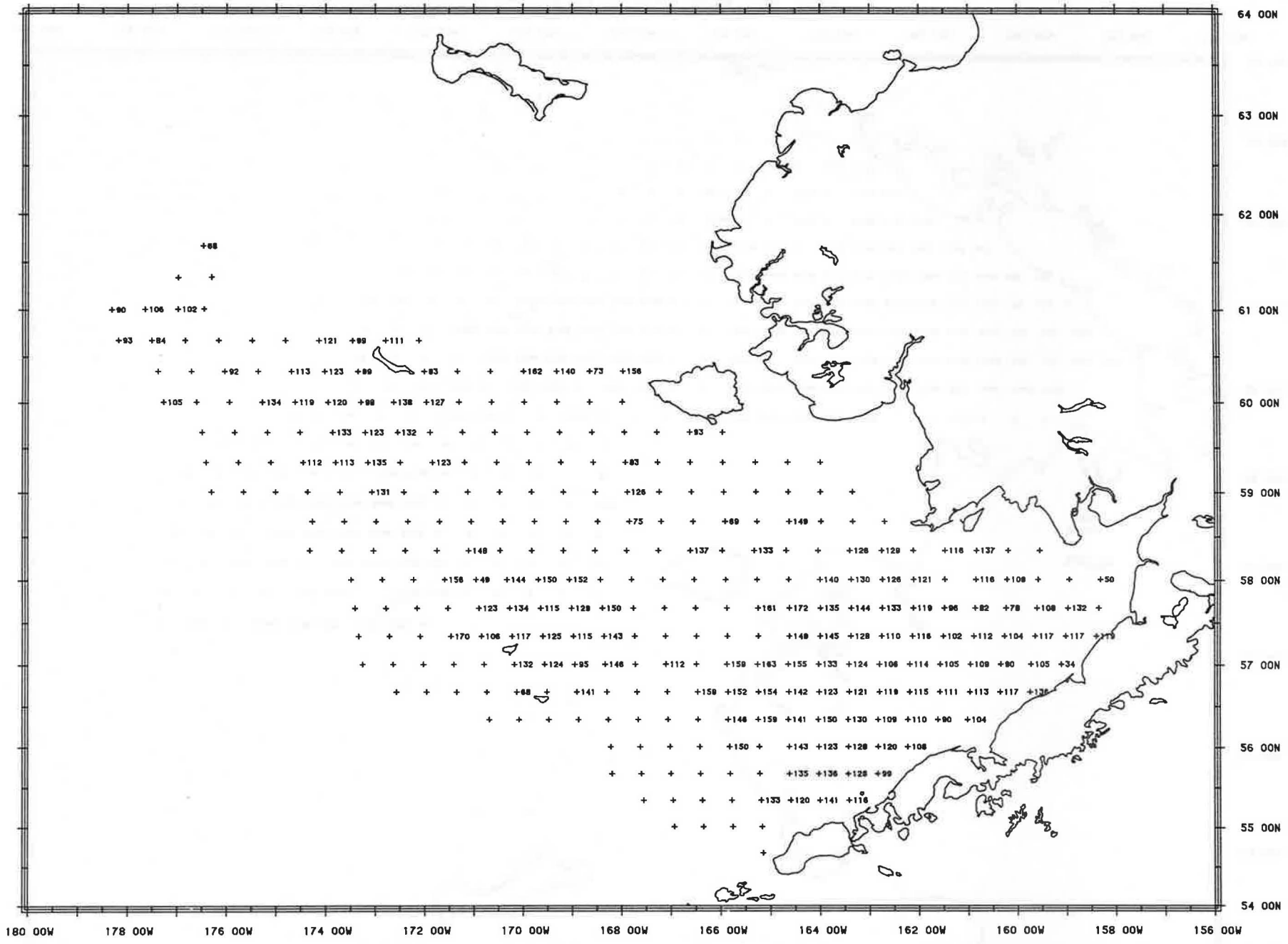


Figure 87.--Mean carapace length (mm) of king crab from the 1980 survey.

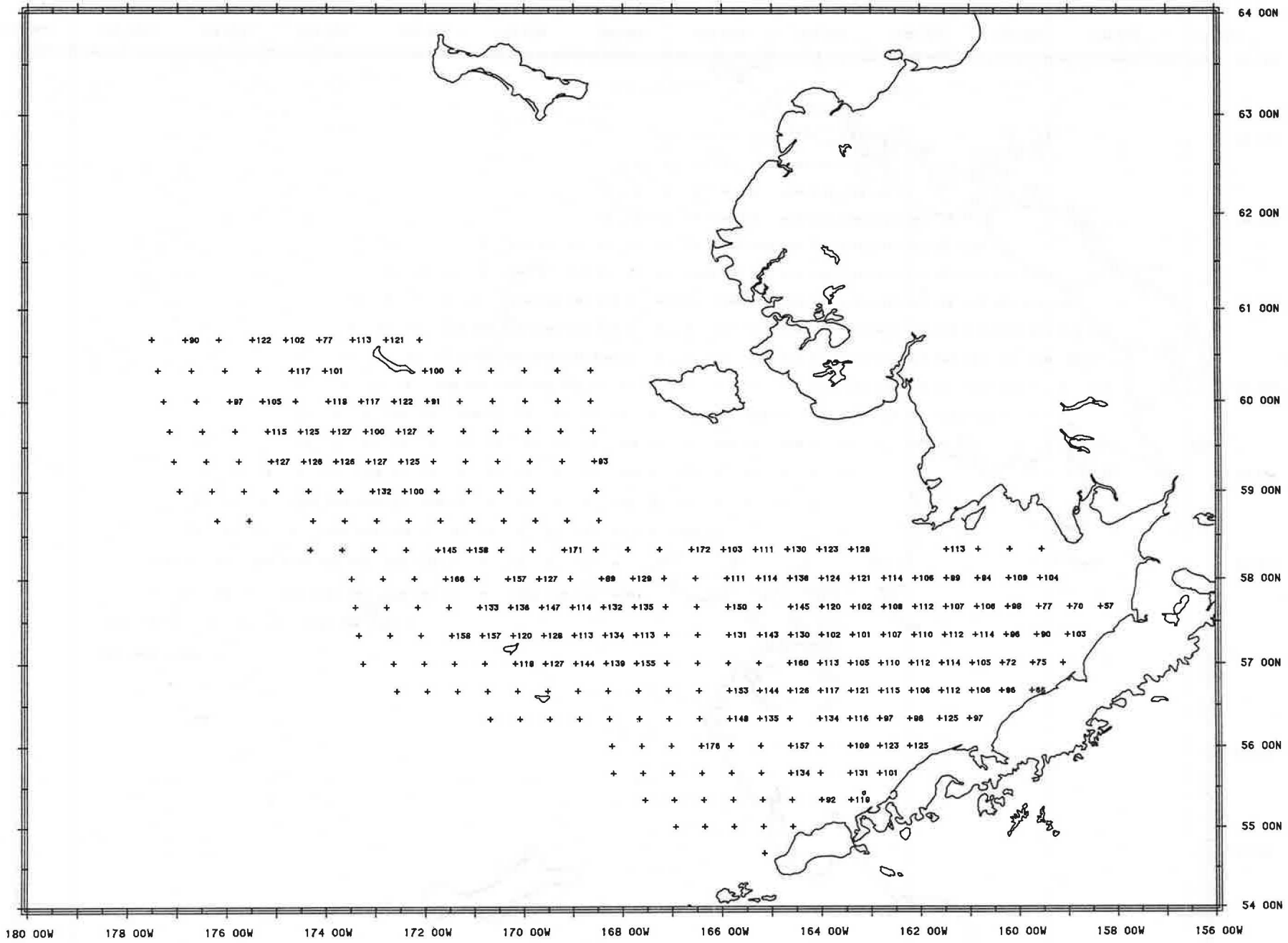


Figure 88.--Mean carapace length (mm) of king crab from the 1981 survey.

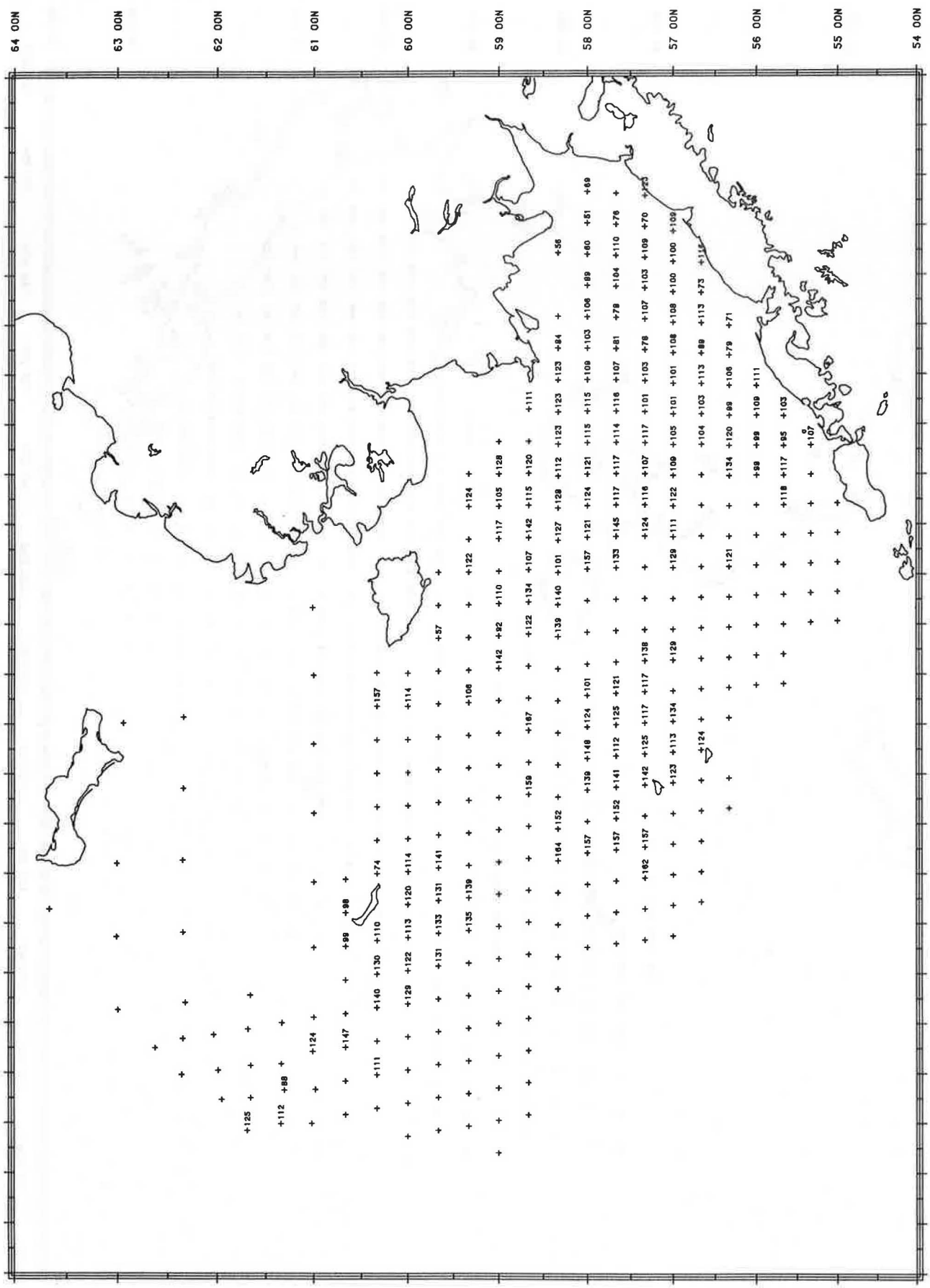


Figure 89.--Mean carapace length (mm) of king crab from the 1982 survey.

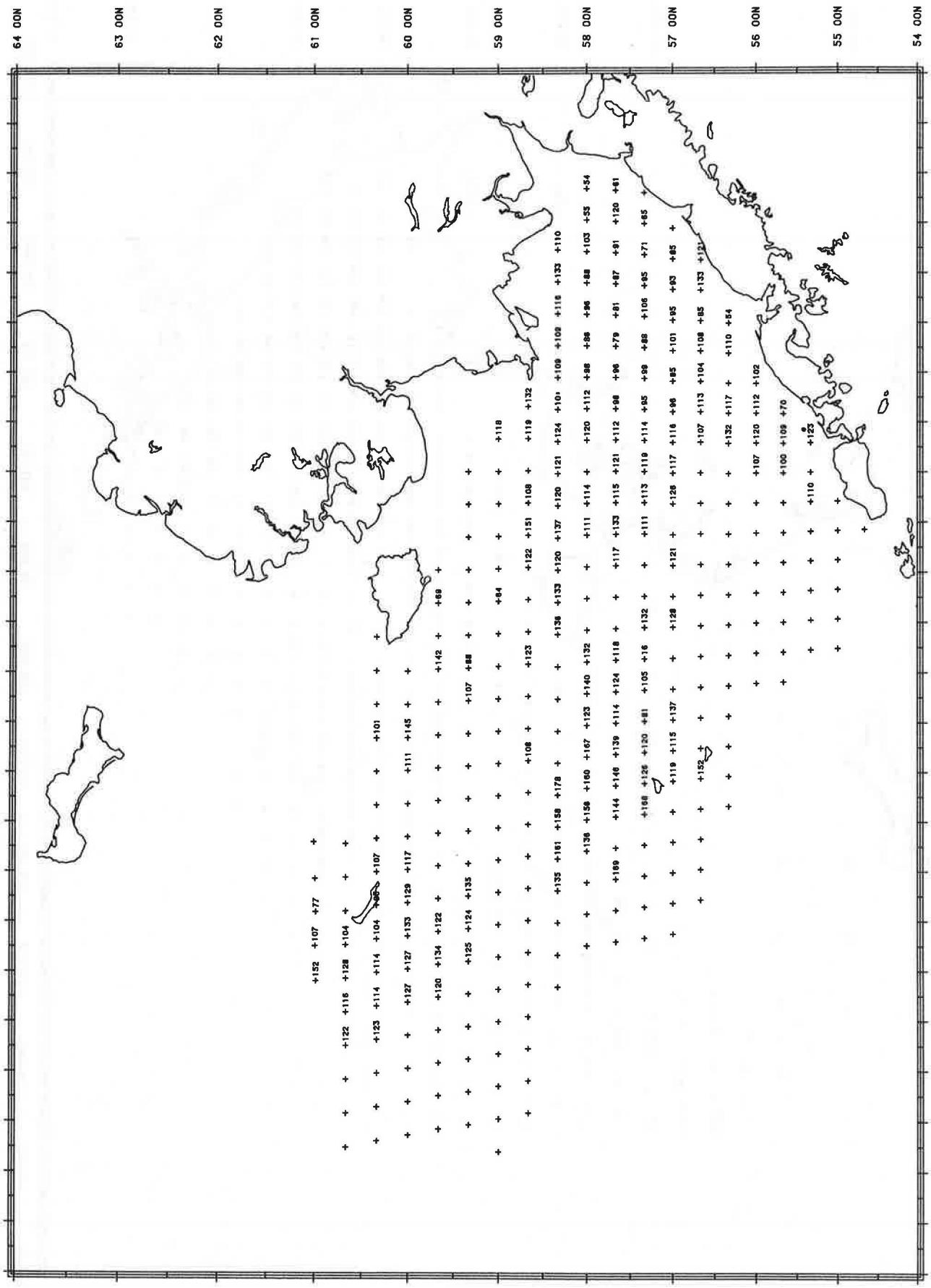


Figure 90.--Mean carapace width (mm) of king crab from the 1983 survey.

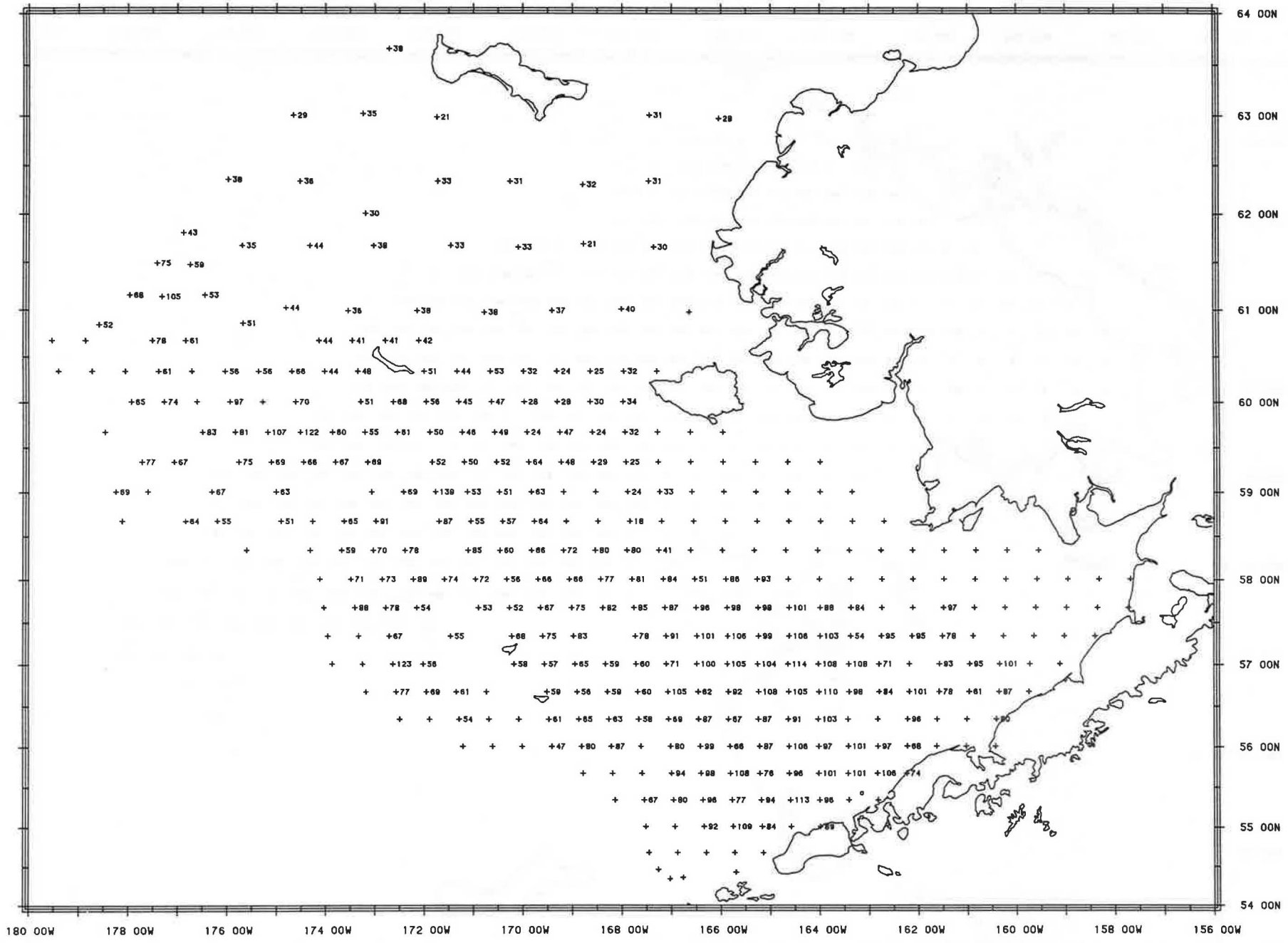


Figure 91.--Mean carapace width (mm) of C. opilio from the 1979 survey.

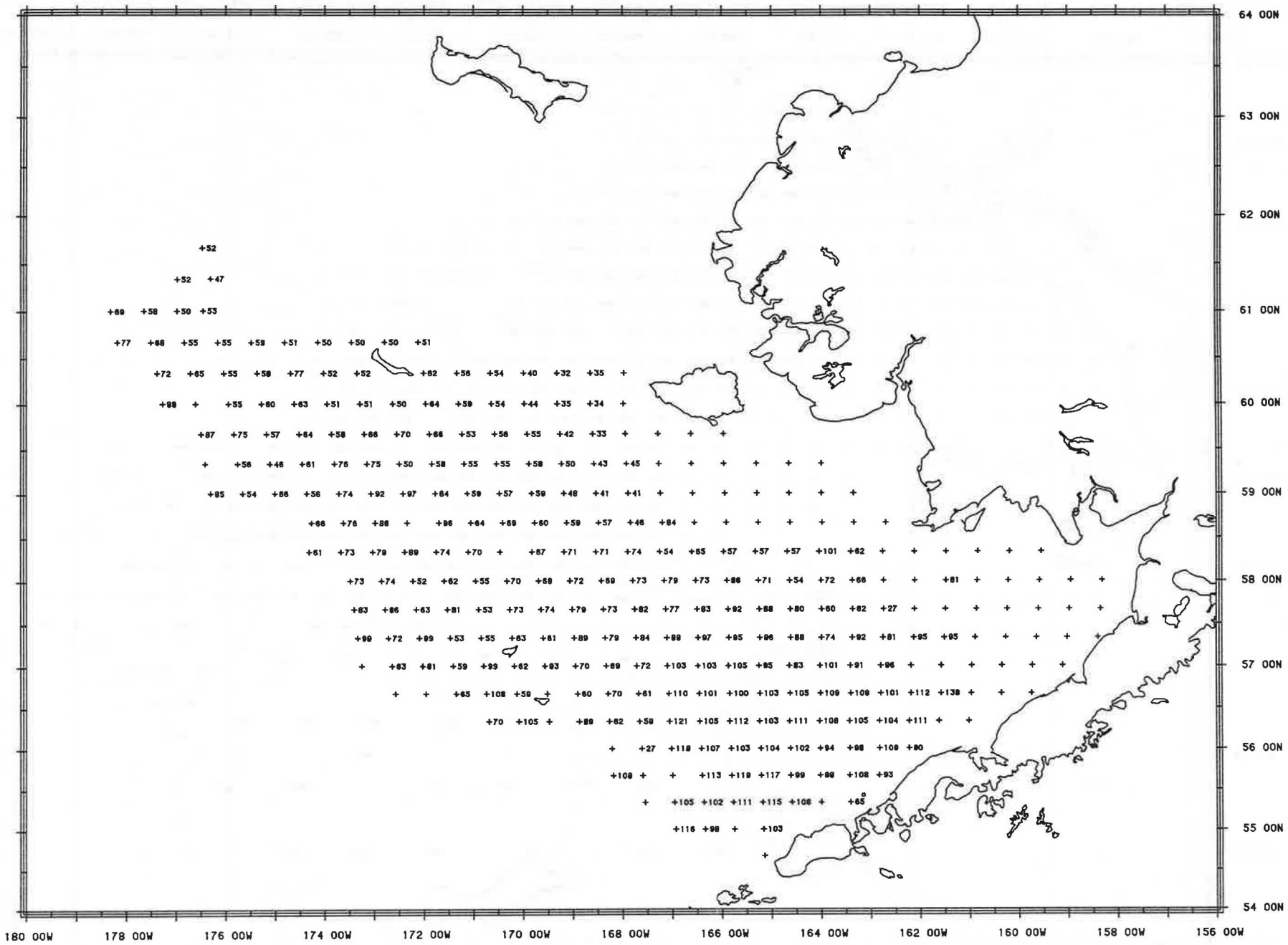


Figure 92.--Mean carapace width (mm) of C. opilio from the 1980 survey.

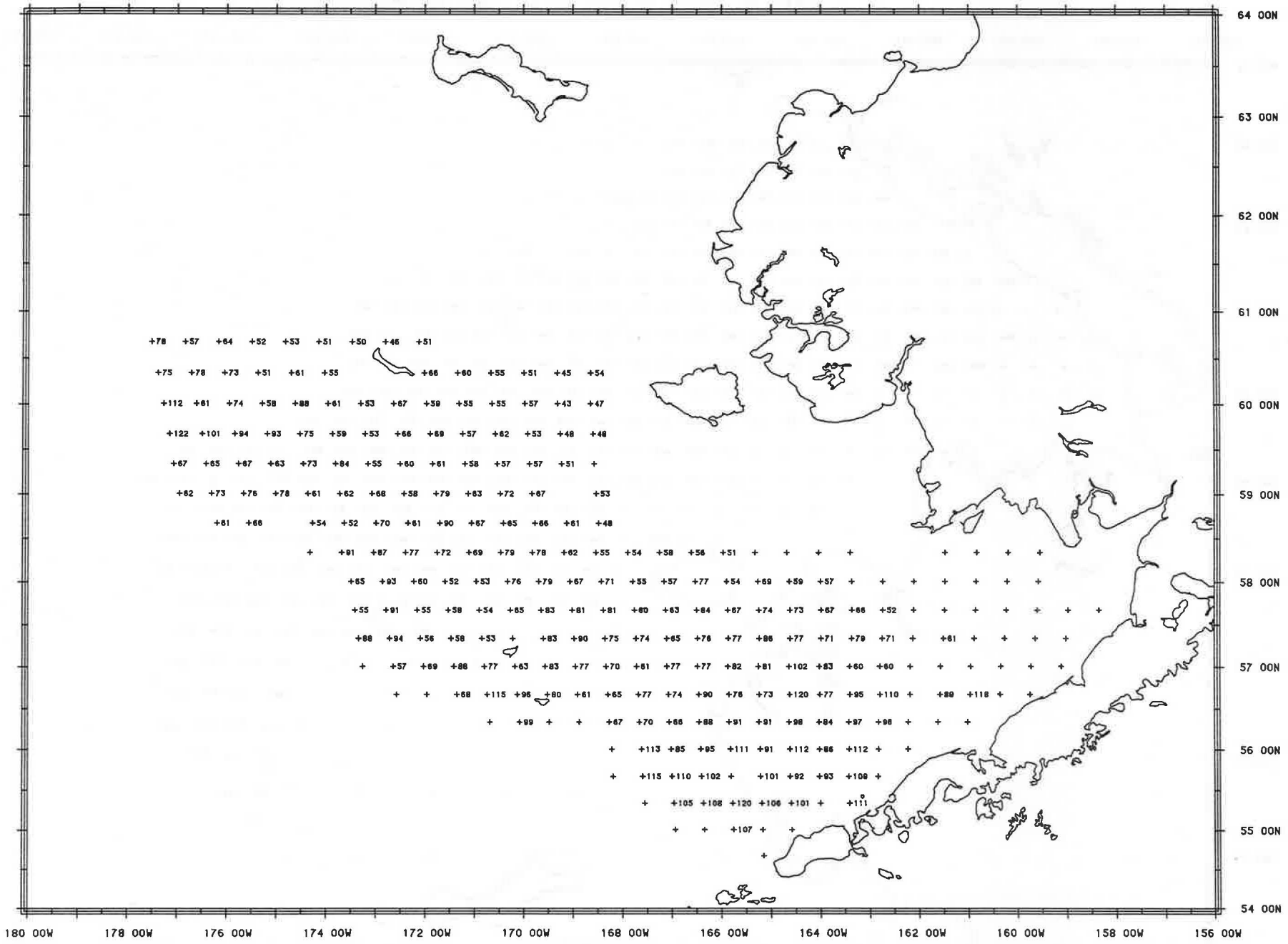


Figure 93.--Mean carapace width (mm) of C. opilio from the 1981 survey.

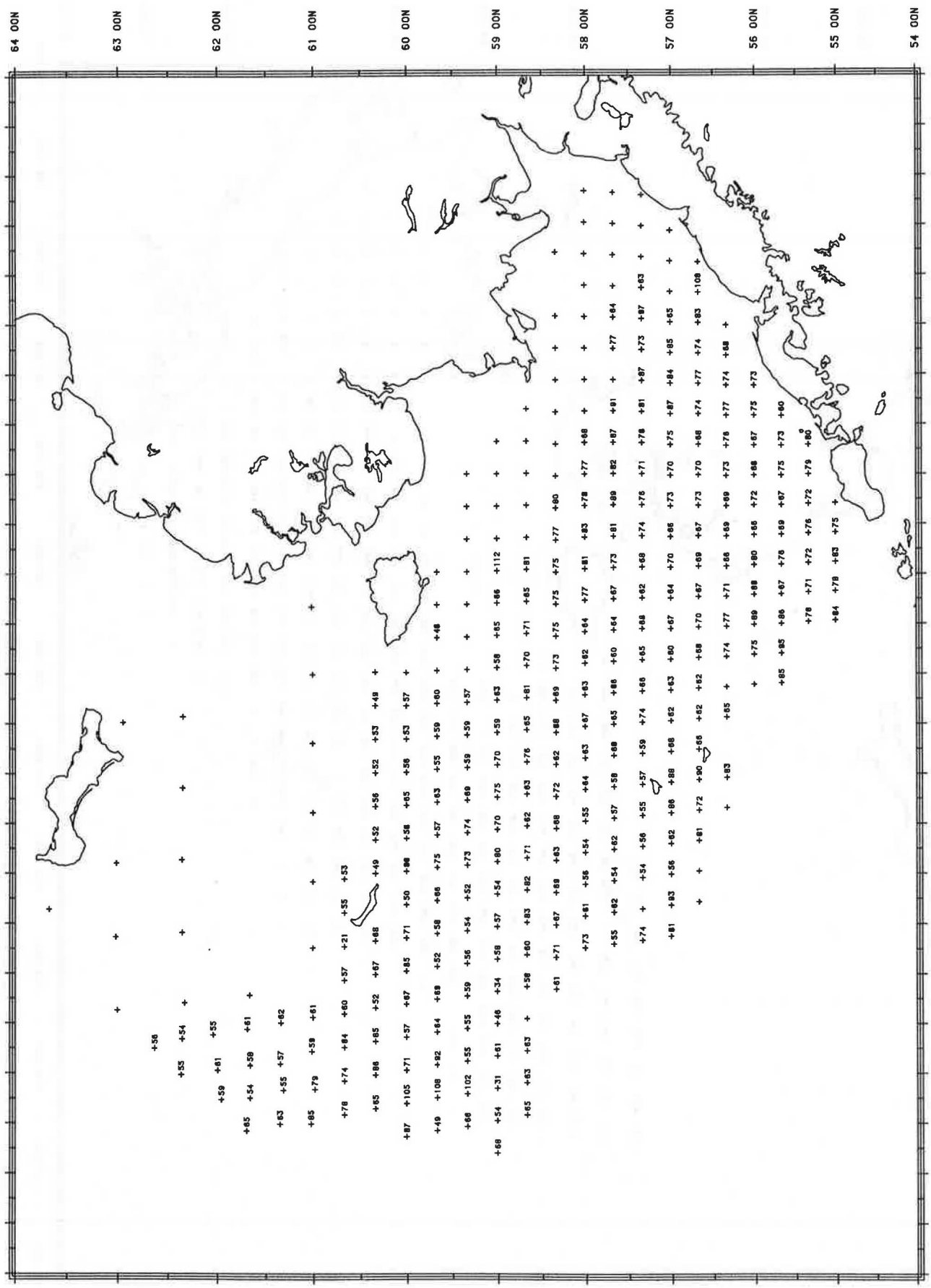


Figure 94.--Mean carapace width (mm) of C. opilio from the 1982 survey.

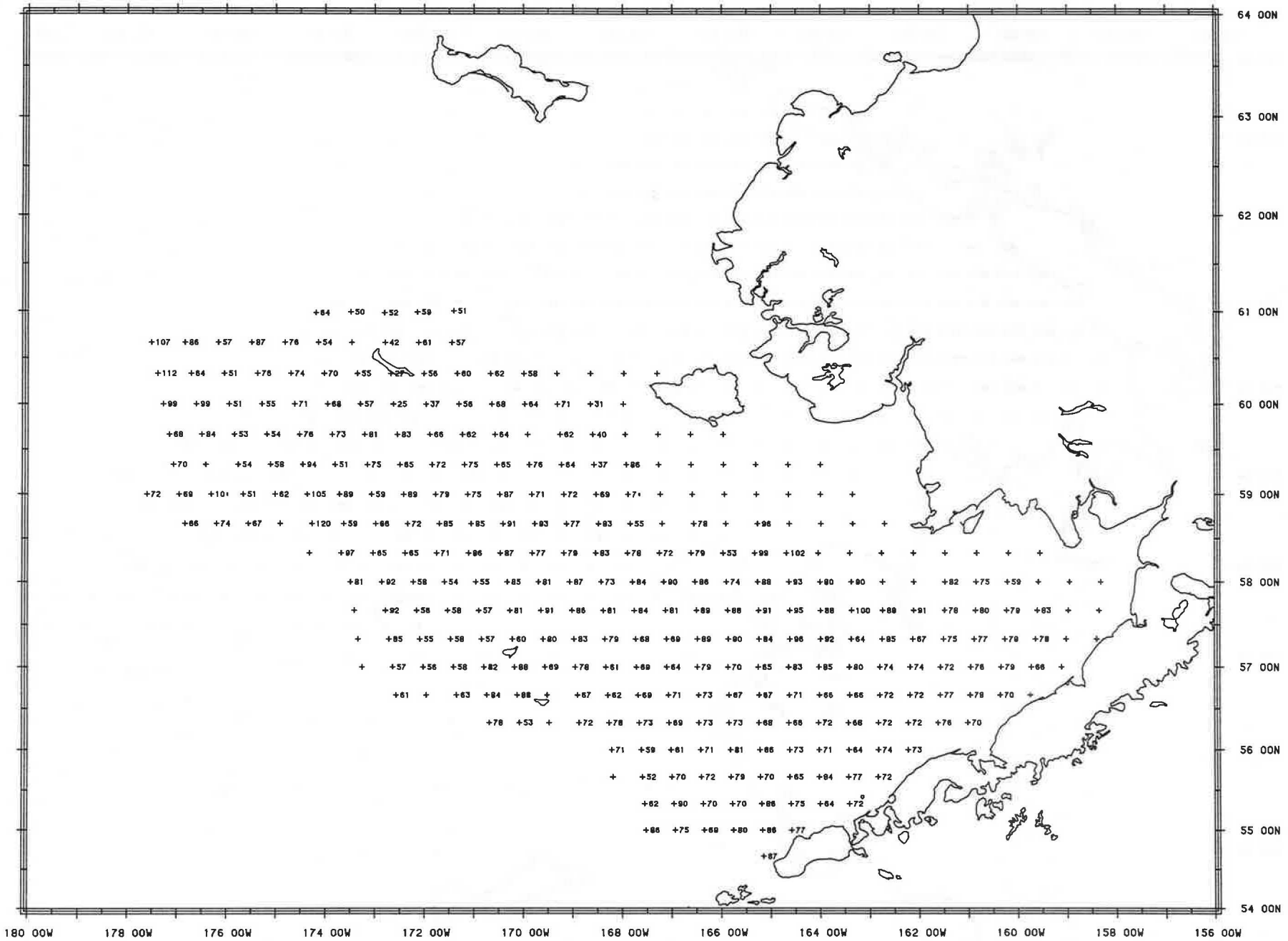


Figure 95.--Mean carapace width (mm) of C. opilio from the 1983 survey.

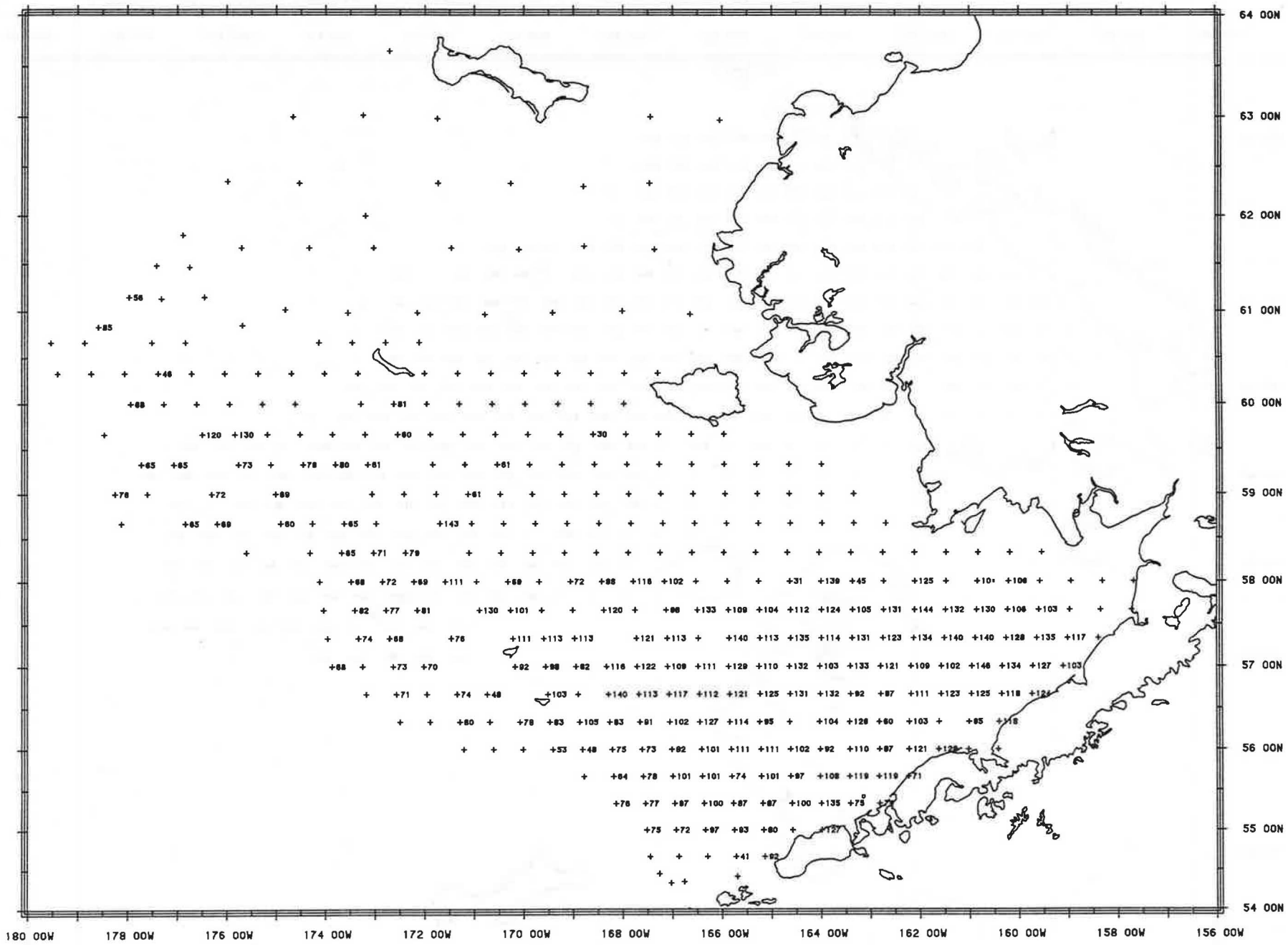


Figure 96.--Mean carapace width (mm) of C. bairdi from the 1979 survey.

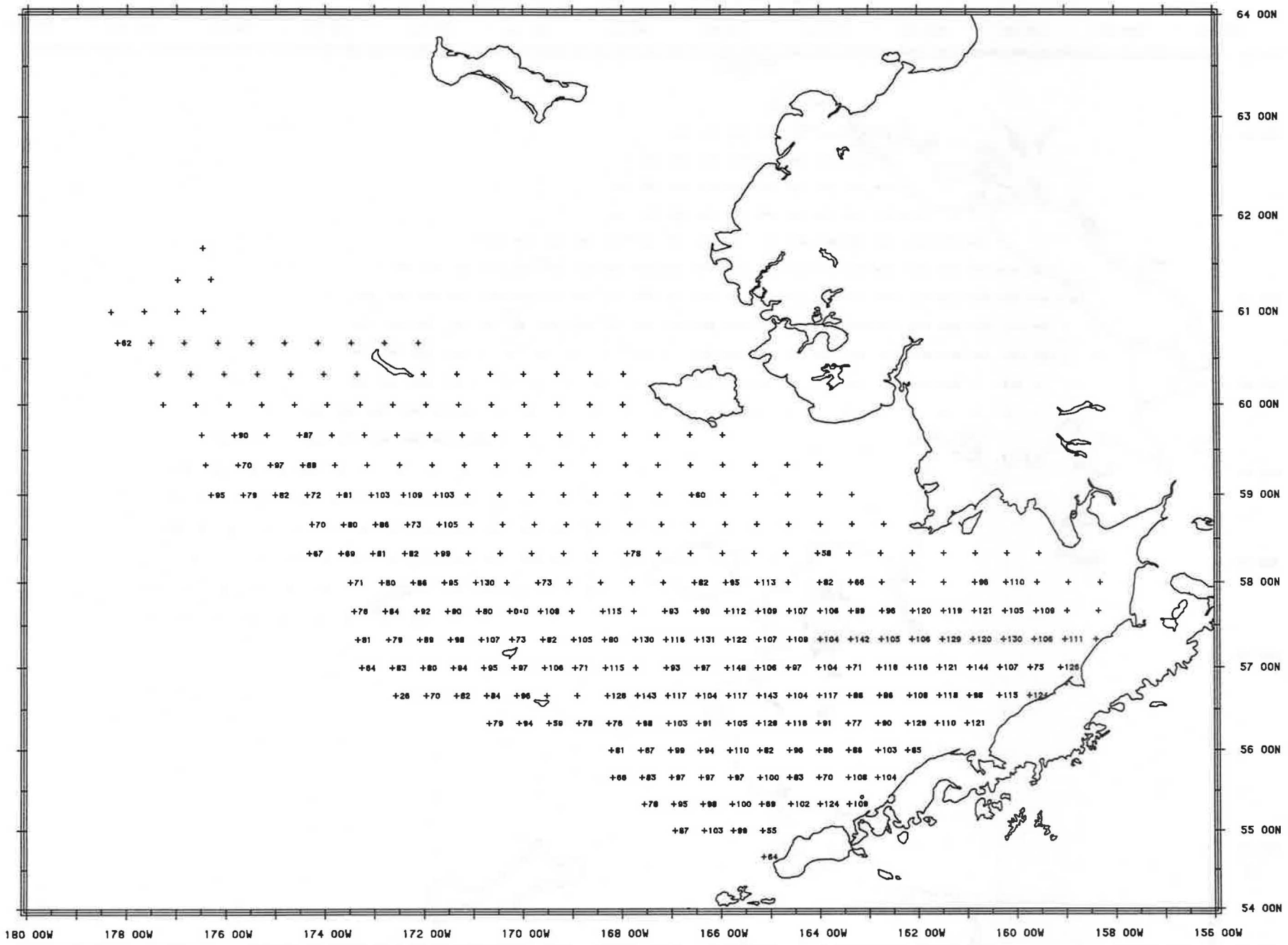


Figure 97.--Mean carapace width (mm) of C. bairdi from the 1980 survey.

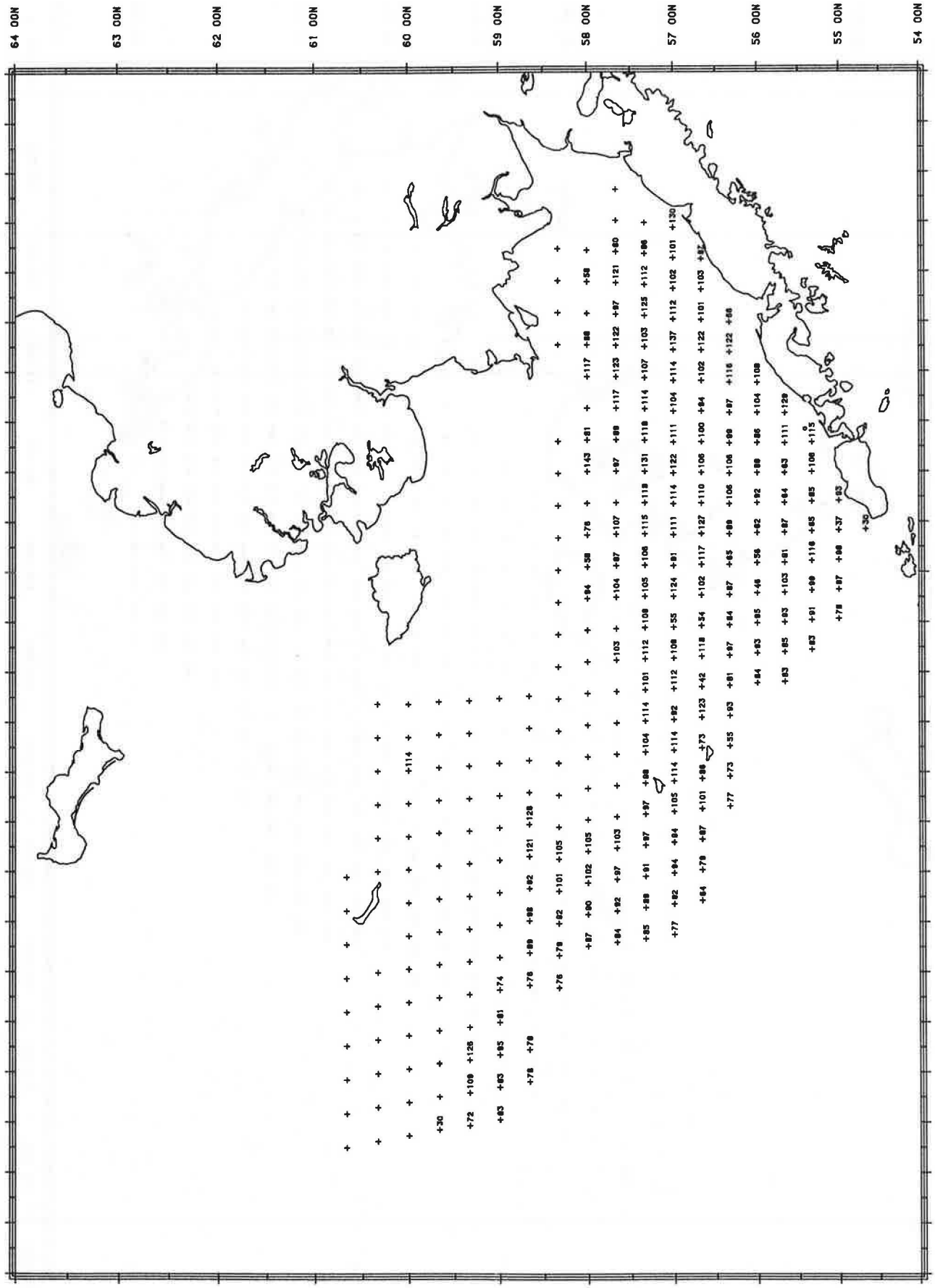


Figure 98.--Mean carapace width (mm) of C. bairdi from the 1981 survey.

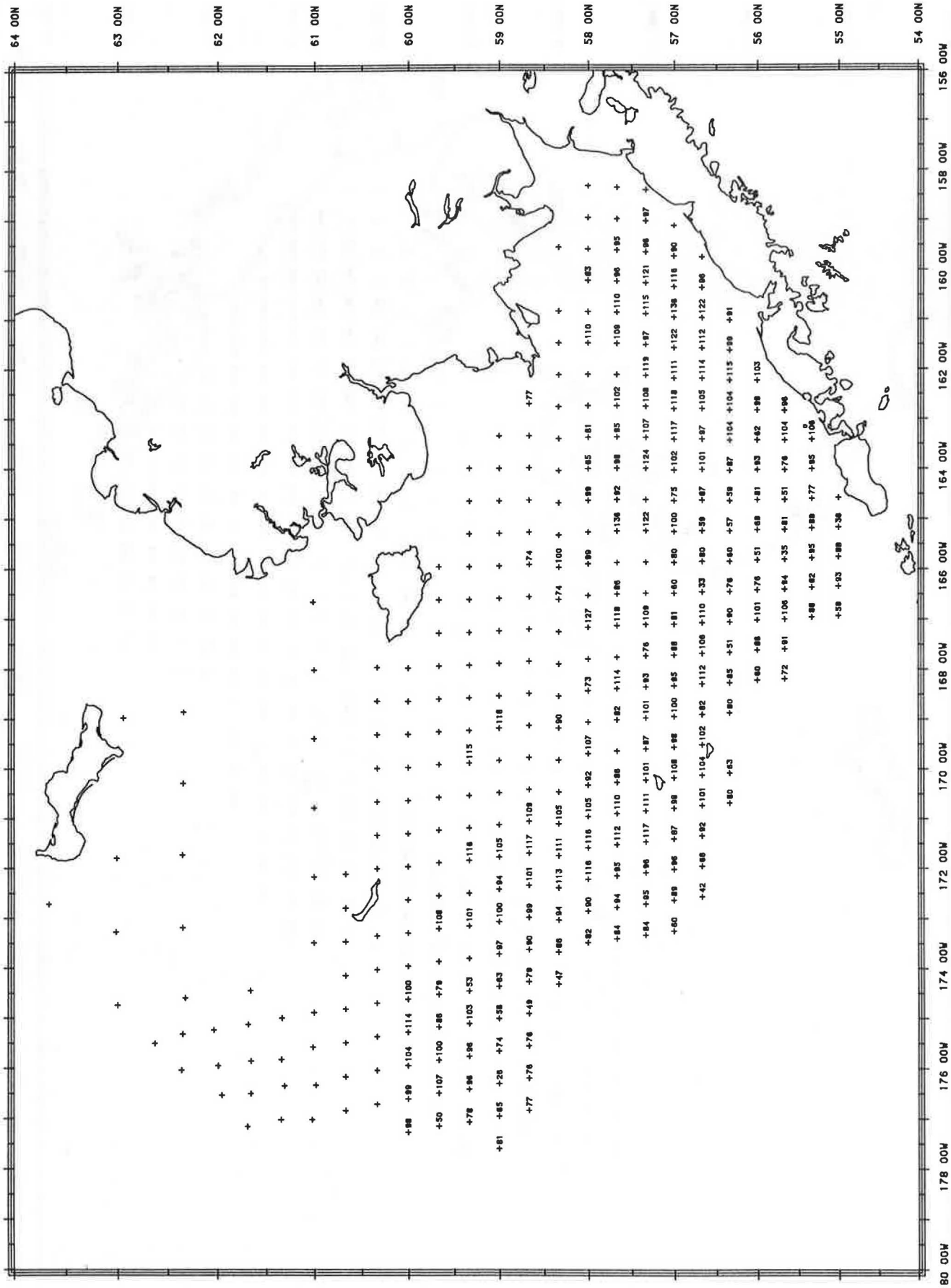


Figure 99.--Mean carapace width (mm) of C. bairdi from the 1982 survey.

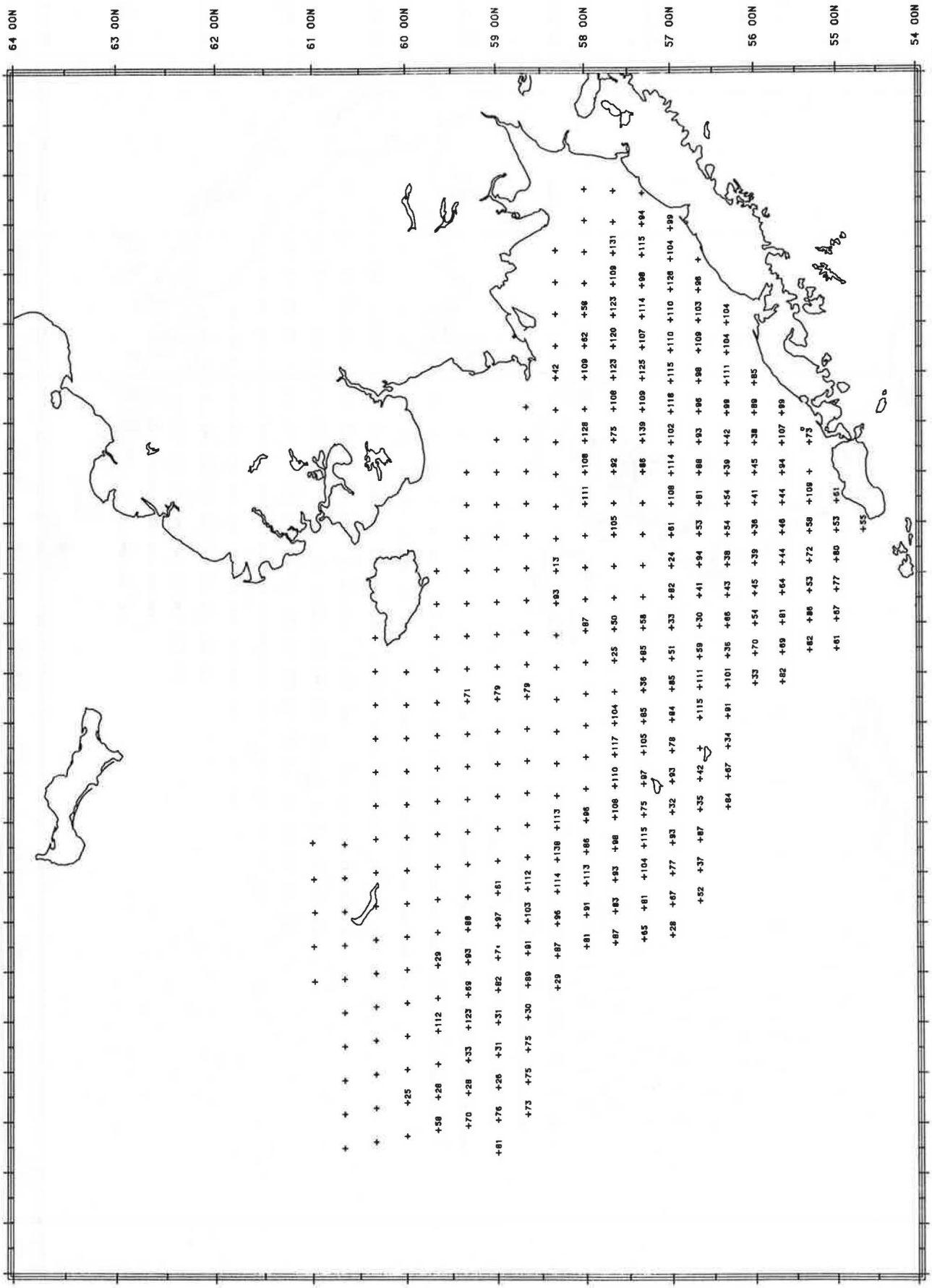


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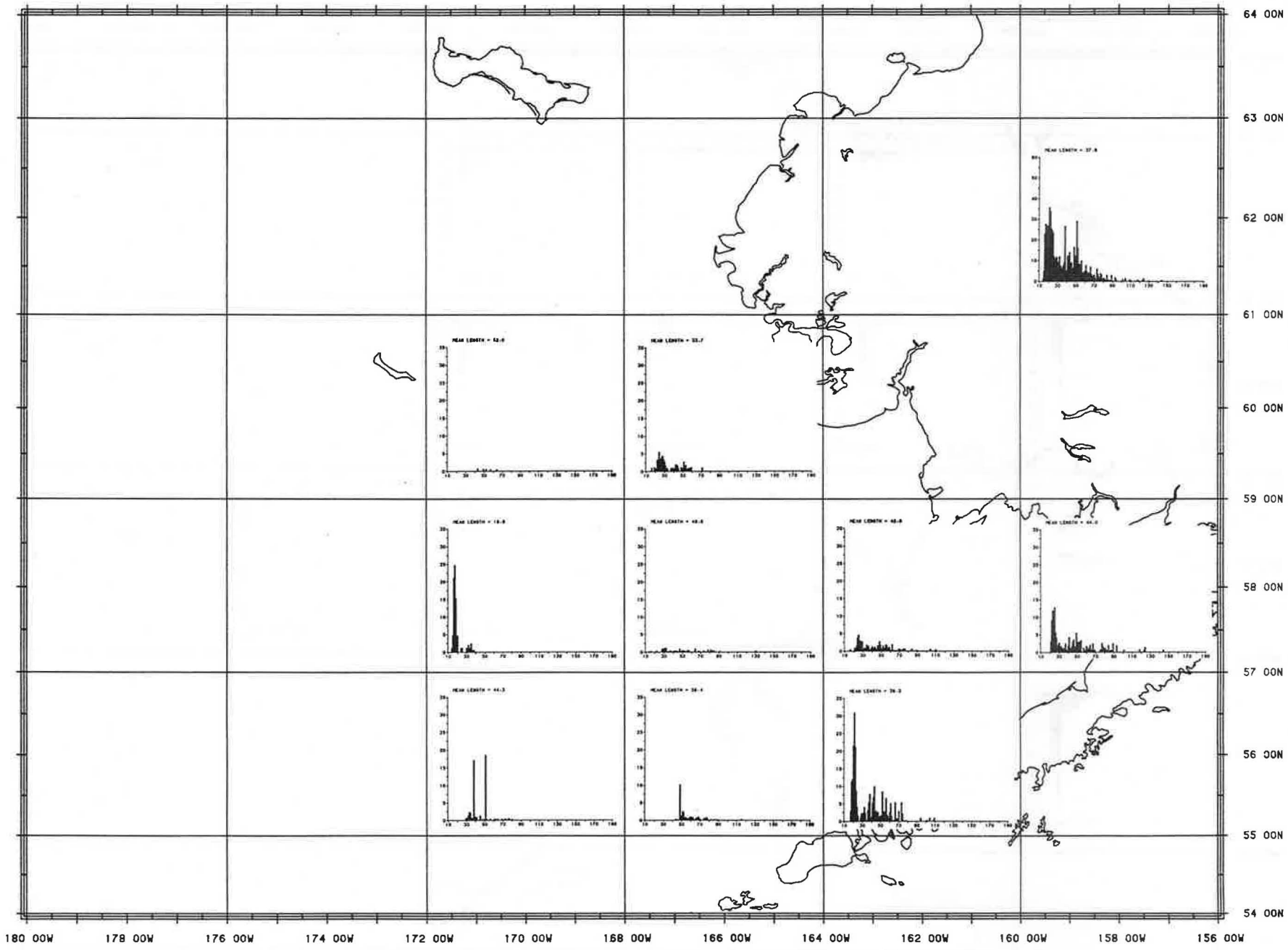


Figure 101.--Length frequency distributions for Pacific halibut from the 1979 survey (length in cm and individuals x 100,000)

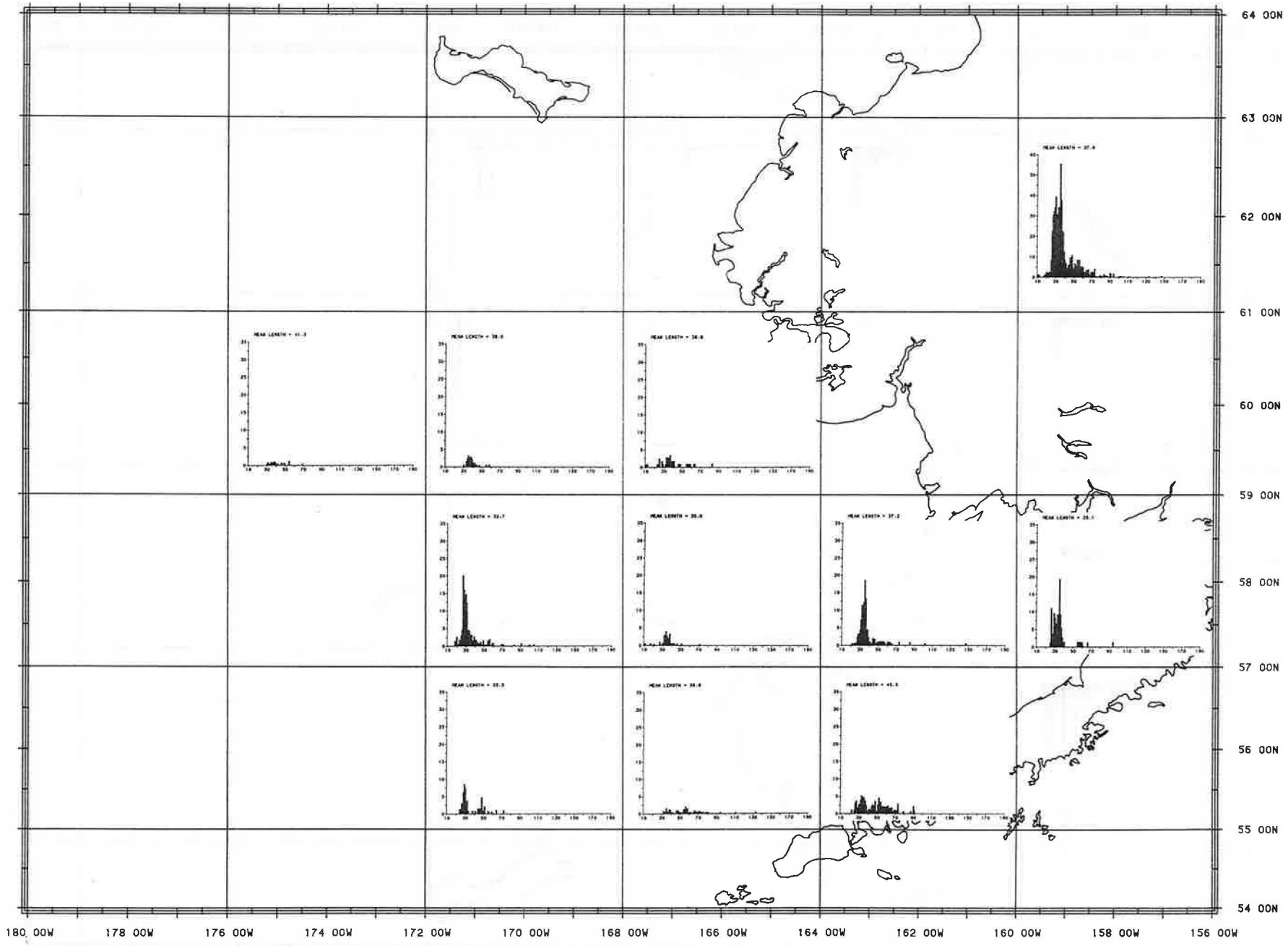


Figure 102.--Length frequency distributions for Pacific halibut from the 1980 survey (length in cm and individuals x 100,000)

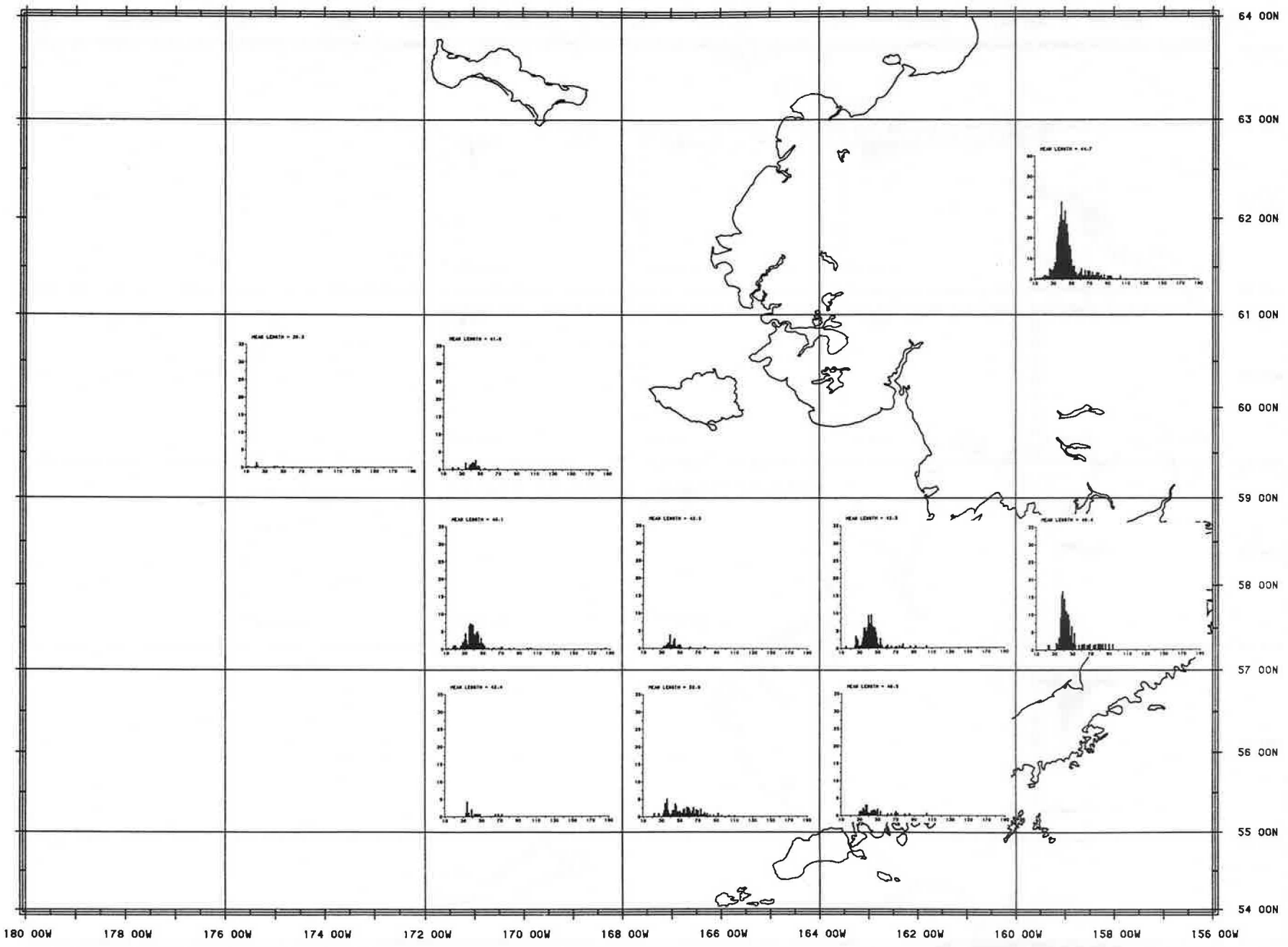


Figure 103.--Length frequency distributions for Pacific halibut from the 1981 survey (length in cm and individuals x 100,000)

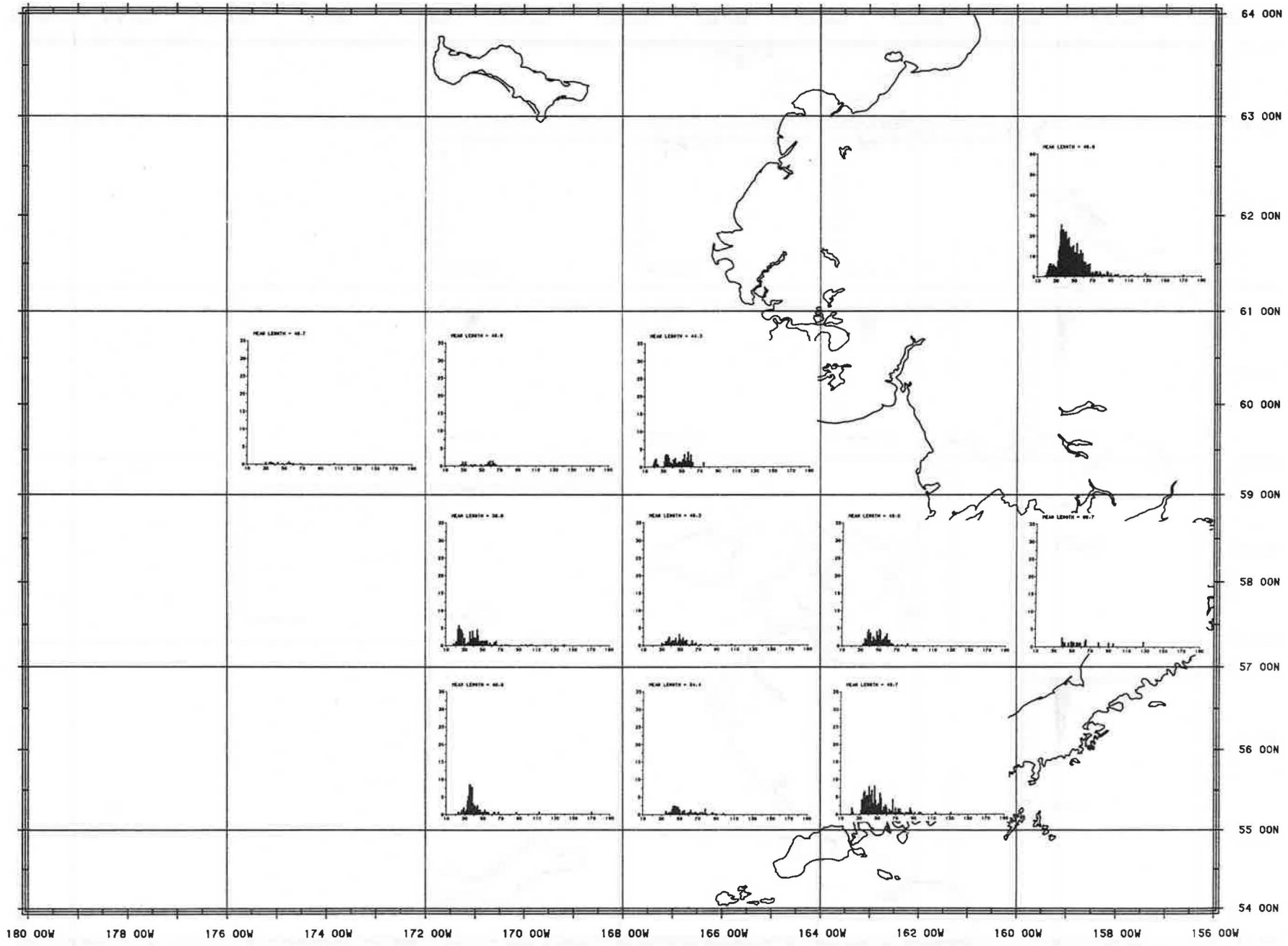


Figure 104.--Length frequency distributions for Pacific halibut from the 1982 survey (length in cm and individuals x 100,000)

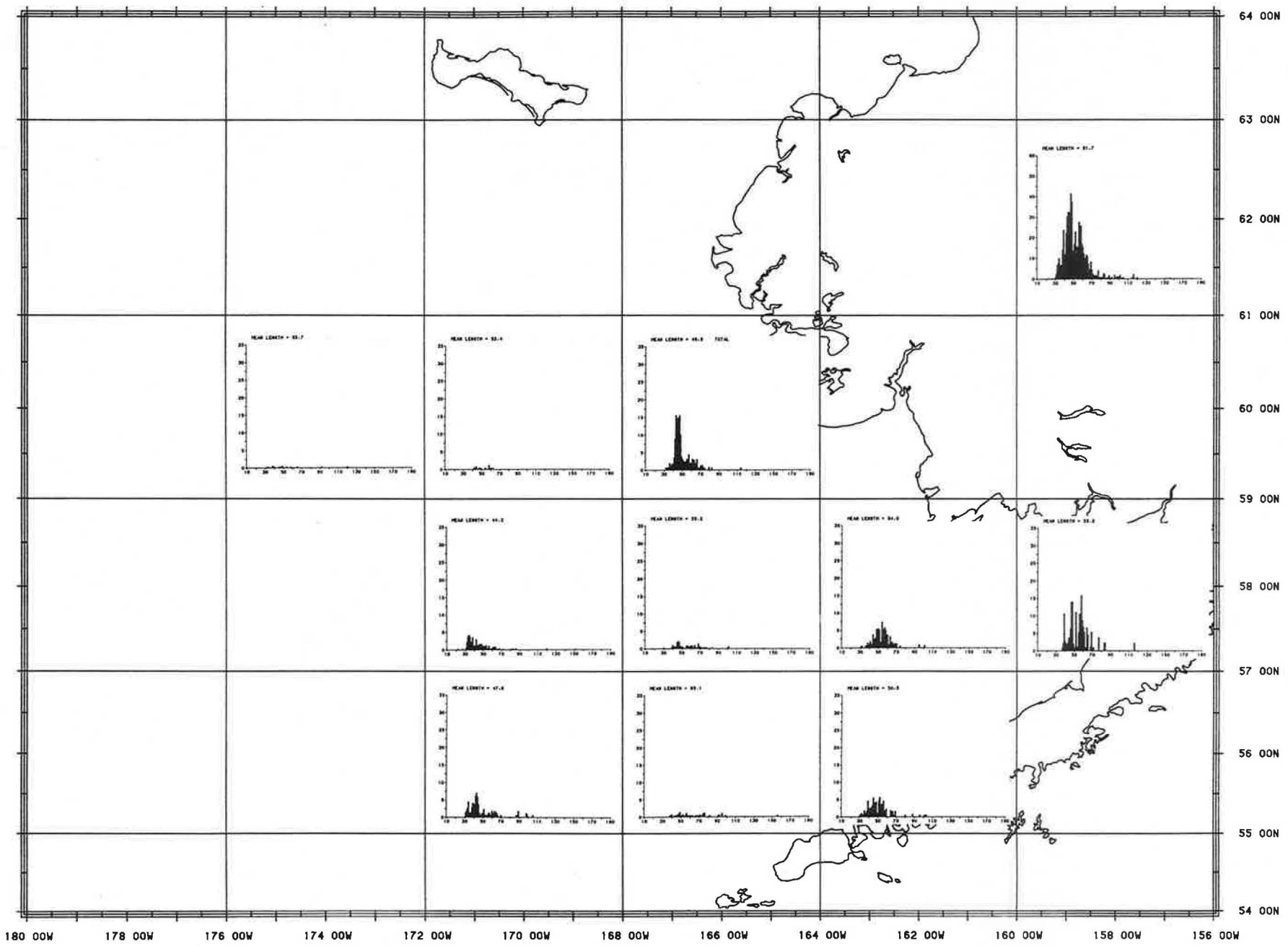


Figure 105.--Length frequency distributions for Pacific halibut from the 1983 survey (length in cm and individuals x 100,000)