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RESOURCES OF

NON-SALMONID PELAGIC FISHES OF THE GULF OF ALASKA AND EASTERN BERING SEA

PART 2

HISTORICAL DATA RECORD OF NON-SALMONID PELAGIC FISHES

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RU-064

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Seattle, Washington 98112

MAY 1978

This report does not constitute a publication and is for information only
All data herein are to be considered provisional

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Submitted as part of the Final Report
for Contracts #R7120811 and #R7120812
Task A-7, Research Unit 64/354
OUTER CONTINENTAL SHELF ENERGY ASSESSMENT PROGRAM
Sponsored by
U. S. Department of the Interior
Bureau of Land Management

May 1978

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FOREWORD

This review summarizes-both published literature and data obtained from exploratory fishing and research on selected non-salmonid pelagic fishes of the eastern Bering Sea and the Gulf of Alaska. It is subdivided into 5 sections which are presented in three parts:

Part 1

Section I : Introduction
Section II : General Fish Resources and Fisheries
Section 111 : Review of Literature on Non-salmonid Pelagic Fish Resources

Part 2

Section IV : Historical Data Record of Non-salmonid Pelagic Fishes

Part 3

Data Appendices

Section I presents background information for the project, scope of coverage, list of fishes selected for review, and descriptions of the areas covered. Section 11 discusses briefly the general fish resources and fisheries of the eastern Bering Sea and Gulf of Alaska. Section III contains synopses of knowledge from the published literature about the distribution, life history, biology, physiology, and fisheries of the 24 species or groups of fishes selected for coverage.

Section IV is a compilation of data records on the relative abundance and distribution of the species under study obtained from published and unpublished records of research by a number of academic and governmental sources. The section lists the data sources, the types of sampling gear used by various agencies, and a "brief review of survey targets and methods of the agencies. Actual data are summarized in Sections IV.A. and IV.B. Section IV.A. consists of 52 computer-produced charts showing the distribution of combined effort and catches by gear and by season in the eastern Bering Sea and the Gulf of Alaska. Section IV.B. contains .288 charts and graphs showing the relative abundance of each species or group of species by gear type and by season in each of the geographic areas considered.

The Data Appendices consist of (A) tables of coding format and coding used in the compilation and analysis of published and unpublished historical survey record data, (B) a computer listing of the station and haul data included in the historical data record, and (C) 190 computer-generated plots (with land masses overlayed) of the seasonal catch-per-unit-effort by gear of non-salmonid pelagic fish species.

In addition to the literature reviews in Section 111, a bibliography by Janet M. Wall and Paul T. Macy entitled, "An annotated bibliography on non-salmonid pelagic fishes of the Gulf of Alaska and eastern Bering Sea," was issued for the Outer Continental Shelf Environmental Assessment Program (OCSEAP) in September 1976 as a processed report of the Northwest and Alaska Fisheries Center, Seattle, Washington. Also, a 9-track data tape, NWF 023.PR760801, was submitted, along with a "Description of the Data Record Report", to OCSEAP in October 1976.

Our intention is to provide scientists and administrators with a review of knowledge about non-salmonid pelagic fish species in the eastern Bering Sea and Gulf of Alaska by bringing information and data together in a form not previously available.

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IV. HISTORICAL DATA RECORD OF NON-SALMONID PELAGIC FISHES

Data records used to supplement the review of scientific literature on the relative abundance and distribution of the species under study, within the confines of the present study area were obtained from a number of governmental and academic sources. Both published and unpublished information has been retrieved.

The status of historical information retrieved ranged from records that were fully analyzed, documented and published, to totally raw data taken from field logs and deck sampling forms.

As a first step, data were classified according to their content and quality as:

1. Primary data: Original, raw data individually assembled and analyzed. Fourteen sources of available data were included in this category;

   a. National Marine Fisheries Service (NMFS) -- Observer program on Japanese trawlers, 1963-69 (5 cruises)
   b. NMFs -- Observer program on Japanese trawlers and motherships, 1973-75 (23 cruises)
   c. NMFs -- Observer program on Soviet trawlers, ''1974-75 (5 cruises)
   d. NMFs -- High seas salmon surveys, 1955-71 (41 cruises)
   e. NMFs -- Exploratory fishing surveys, 1948-62 (13 cruises)
   f. NMFs -- Bristol Bay smelt surveys, 1966-70 (4 cruises)
   g. NMFs -- Marmap I surveys, 1971-72 ("2 cruises)
   h. Alaska Department of Fish and Game (ADFG) -- Offshore salmon monitoring surveys, 1967-68 (3 cruises)
   i. ADFG -- Kodiak shrimp, surveys, 1974-76 (9 cruises)
   j. University of Washington, Fisheries Research Institute (UW-FRI) -- Kodiak salmon monitoring, 1963-75 (13 cruises)
   k. UW-FRI -- High seas salmon surveys, 1956-69 (35 cruises)
   l. UW-Department of Oceanography -- International Geophysical Year (IGY) oceanographic surveys, 1957 (1 cruise)
   m. Hokkaido University, Japan -- Survey cruises, 1955-70 (12 cruises)
   n. Fisheries Research Board of Canada (FRBC) -- Pacific Biological Station surveys, 1970 (1 cruise)

2. Secondary data: Summaries prepared from original data records. Five sources, consisting mainly of commercial landings statistics, made up this category;

   a. ADFG records of commercial landings (fish ticket information).
   b. Japanese records of commercial catches (as provided to the International North Pacific Fisheries Commission (INPFC)).
   c. Soviet records of catches (as provided to the United States Government).
   d. NMFS groundfish surveys (other than those in 1 above).
   e. ADFG exploratory surveys.

3. Tertiary data: Included, but were not limited to, published or processed data summaries, tables, and lists of historical statistical information. Seven broad categories of information contained the majority of data;

a. International Pacific Halibut Commission (IPHC) groundfish surveys.
b. NMFS, Auke Bay Fisheries Laboratory (ABFL), Juneau, Alaska, inshore exploratory surveys.
c. U. S. Bureau of Commercial Fisheries (BCF) records of Alaskan landings.
d. ADFG records of landings (not found in 2 above).
e. U.S.S.R. exploratory fishing and biological survey records.
f. Japanese fishery survey records.
g. Canadian fishery survey records.

Primary data were individually analyzed and are being presented in this section of the report and in Appendices B and C. Secondary and tertiary data, in their processed forms, have been used, whenever possible and necessary, in various sections of this report dealing with the history of commercial fisheries as well as in the individual summaries of current knowledge concerning the principal species of non-salmonid pelagic fish in the study areas.

Primary Historical Data Record

The bulk of the historical data (surveys listed under primary data, 1 above) have not been previously analyzed for most species presently under study. The majority of usable, information originated with the NMFS, ADFG and the University of Washington. Sources of non-United States primary data were rather poor, with the exception of the Hokkaido University survey records which have been published in a quite detailed format.

Information inventoried was quite variable in quality because the majority of the data were obtained during limited sampling seasons (usually in the summer) on an incidental basis, routinely using sampling gear not designed to capture the subject species. The targets of the various cruises are shown in Table IV.1.

Some of the problems encountered included, but were not limited to, obvious misidentification and inadequate qualitative and quantitative measurements. Furthermore, the historical nature of the information has precluded any objective verification of the data and of the instruments and methods used in generating them.

During the assembly and evaluation of the data, no standard cutoff date was considered, and data were inventoried and accepted for use under the following criteria:

1. Surveys conducted within the geographical area of interest: Cruises would often contain only a number of hauls conducted in the area; in such cases, only those hauls-were included;

2. Surveys for which locations, times and methods of sampling were adequately documented;

3. Surveys in which incidental catches of the species of interest were fully documented;

Table IV.1.--Characteristics of sampling gear used by the various agencies during surveys in the eastern Bering Sea and the Gulf of Alaska.

Gear	Agency	Target(s)	Characteristics*
Townet	FRI	Juv. salmon	17 m long w/codend mesh less than 20mm
Townet	NMFS/ABFL	Juv. salmon	Information not available
Isaacs-Kidd trawl	Univ. Wash.	Ichthyoplankton	8m long w/end mesh less than 4mm
Isaacs-Kidd trawl	Hokkaido Univ.	Ichthyoplankton	Similar to that of University of Washington
Plankton net	Hokkaido Univ.	Zooplankton	5m long w/end mesh less than 1mm
Bongo net	NMFS	Zooplankton	Opening diam. 0.5m operated in arrays, end' mesh 0.303 and 0.505mm
Bottom trawl	NMFS	Bottomfish	400 mesh Eastern trawl
Bottom trawl	Hokkaido Univ.	Bottomfish	43m head rope, end mesh approximately 60mm
Bottom trawl"	Jap. commer.	Bottomfish	66-84m long w/59-80m footrope and 50-60m headrope; end mesh 80-100mm
Bottom trawl	FRBC	Bottomfish	Information not available
Bottom trawl	Jap. commer.	Shrimp	54-70m long w/54-69m footrope and 42-53m headrope: end mesh 30-50mm
Bottom trawl	ADFG	Shrimp	21m long w/19m footrope and 19m headrope; end mesh less than 45mm
Bottom trawl	NMFS	Shrimp	12m long w/13-21m footrope and 13-18m headrope
Pelagic trawl	NMFS	Herring	52m long modified Universal trawl; 28m foot and headrope; end mesh 45mm
Gillnet	NMFS	Salmon	8-40 shackles of 91x7m multifilament and monofilament w/mesh 60-160mm
Gillnet	Hokkaido Univ.	Salmon	62-143 tans of 49x5m, monofilament w/mesh 30-125mm
Gillnet	ADFG	Salmon	10 shackles 91x8m w/110mm mesh
Purse seine	FRI	Salmon	732m corkline; average 60mm body mesh and 35mm bunt mesh
Purse seine	NMFS/ABFL	Salmon	Various: 110, 366, 549m corkline
Lampara	NMFS/ABFL	Salmon	210m corkline

*Characteristics given are generalized into wide categories which serve only to give an approximate view of the gear types used. In many cases gear information is fragmentary or missing. All available gear information for each haul performed is archived with NOAA/EDS on computer data tape OCSEAP NWF023.PF760801.

4. Cruises in which incidental catches of any species of interest occurred and were reported for more than 10% of the hauls conducted in the geographical area of interest: Cruise records not satisfying this requirement included primarily those in which the sampling gear and stratum were totally inappropriate for the pelagic species of interest (e.g., most bottomfish sampling, king and snow (Tanner) crab surveys, as well as most shrimp surveys).

As a general rule, very few of the potentially available bottom trawling cruises were included in the primary data record. Those included were deemed marginally acceptable and have been used to demonstrate the degree of vulnerability and availability of pelagic species to such gear.

Because data from these various sources were in various formats, it was necessary to reprocess all data to a common format (see Appendix A). Following the conversion, the data were punched onto cards, listed, and verified against their original sources (see Introduction to the Data Appendix). Finally, data were transferred to computer tape files to facilitate further access, retrieval and analysis.

Survey Targets and Methods

The methods used and the areas and times covered in each of the surveys varied considerably with the objectives of the investigations.

Japanese trawlers participating in the 1963-69 observer program directed their operations toward the capture of groundfish and shrimp in the Gulf of Alaska. The primary goal of observations was to determine the amount of halibut caught incidentally. Later observer programs on Japanese and Soviet vessels in 1973-75 had as their main objective the evaluation of the impact of foreign fisheries on groundfish and shellfish stocks.

The NMFS high seas salmon surveys were conducted with gillnets in the North Pacific Ocean, the Gulf of Alaska, and the Bering Sea. Their primary objective was to investigate commercially important salmonid stocks, but catches of other species were also tabulated. NMFS exploratory fishing surveys, using a large variety of sampling gear (otter trawls, beam trawls, shrimp trawls, midwater herring trawls, dipnets, and troll gear) were conducted across the entire northeastern Pacific Ocean, the Bering Sea, and the Gulf of Alaska. These surveys had various objectives ranging from the investigation of the range and relative abundance of any commercially important fish and shellfish to the investigation of particular stocks and the evaluation of particular types of gear.

The NMFS Bristol Bay studies were conducted by the Auke Bay Biological Laboratory using townets, lampara nets and, in later surveys, purse seines. The survey objectives centered on the investigation of the early marine life history and distribution of Bristol Bay salmon stocks. The presence and abundance of other species caught were routinely recorded.

Marmap I surveys, using banks of bongo nets, focused on the investigation of mesopelagic species and ichthyoplankton in the northeastern Pacific Ocean.

The ADFG salmon surveys were conducted off southeastern Alaska for a number of years to estimate the abundance of commercially important salmon species. Other species caught in the gillnets were enumerated and recorded. Shrimp surveys around Kodiak Island by ADFG, using shrimp trawls, contained records of other fish caught (mainly smelt).

The FRI Kodiak surveys, using townets, had as their main objective the assessment of salmon smelts in the bays around Kodiak Island. Other species caught were noted but not measured nor, at times, enumerated. Surveys on the high seas by FRI using purse seines also focused on salmon, but all other species caught were rather accurately identified, enumerated, and recorded.

Of more than 100 oceanographic cruises by the University of Washington, a single cruise in which ichthyological specimens were both sampled (using Isaacs-Kidd trawls) and recorded as to species and numbers was included in the record. On the other hand, oceanographic cruises by the Hokkaido University vessel Oshoro Maru utilized a variety of gear (plankton nets, Isaacs-Kidd trawls, gillnets, and bottom trawls) to obtain samples of the fauna which were routinely enumerated, identified, and recorded.

Finally, although primary data from the FRBC Pacific Biological Station, Nanaimo, B. C., were not made available, published information furnished data on the single cruise included in our record. Trawls were used to investigate offshore herring stocks, but other species caught on the cruise were enumerated and recorded.

As a general comment, it may be stated that almost none of the surveys inventoried considered any' of the species under study in this report to be their main target of research. Length and weight measurements were almost never taken. Further, we found no data describing the age structure of the fish under study here. For a number of surveys, general comments on age such as "larvae", 'juveniles", or "adults" were entered along with the noting of the occurrence of fish species in the catches.

The emphasis of the sampling procedures in all surveys focused upon the various target species of fish and shellfish which were routinely the first to be sorted, measured, examined, and in some cases tagged. Non-target species were identified and enumerated as time permitted. In most cases, numbers of incidentally caught non-target species were projected from subsamples or their number was visually estimated. In samples taken from bottom trawl catches, weights rather than numbers were recorded. For the purposes of this analysis and for conformity with the majority of the records, however, we are presenting catch rates in numbers for all surveys.

Areas and Timing of Sampling

The majority of the surveys considered in this report were conducted within the period from April to August inclusive, but a number of surveys (see Appendix B) were conducted either wholly or partly in autumn and winter. The starting dates and duration of cruises were quite variable from year to year, ranging from a few days to a number of months" (Appendix B).

Station densities also were quite variable because the cruise tracks for the various surveys ranged from nearly straight transoceanic crossings to localized sampling within a confined area. For catch rate computations, we standardized stations to areas measuring 30′ of longitude by 15′ of latitude.

The duration of tows and gear "soak" times varied according to the gear used. We standardized hauls by seines, bottom trawls, Isaacs-Kidd trawls, bongo nets and pelagic midwater trawls to 0.5 hr duration which, in most cases, agreed with the observed duration. Gillnets were standardized to 12 hr "soak" time per kilometer of net, and plankton nets and townets were standardized to 0.2 hr tows. Trolling was standardized to 6 hr of trolling. In all cases, the prevailing duration was taken to be the target.

Estimates of distance and area fished were available in very few instances, and such estimates were often fragmentary. Because of the fragmentary nature and differences in the original data reported, we converted catch rates for all surveys to numbers caught/specific amount of time fished,

Vessels participating in these surveys ranged from small, inshore townet boats to large factory trawlers and motherships. Because of the great variety of vessels involved, the different types of gear, and the variation in operating techniques between surveys, cruises, and years, the results are not clearly comparable between. surveys or years. No attempt has been made to adjust catch rates to variables other than broad gear categories.

Within each survey, each type of gear used was fairly constant throughout the years of the survey. A number of surveys used a number of different types of gear. Sampling gears are described in a general form in Table IV.1.

Analysis and Presentation of the Data

With 160 surveys (179 if all different gear used in a survey were to be counted separately) spanning 28 years in both the Gulf of Alaska and the eastern Bering Sea, and with nearly two dozen species or groups of species of fish under study, a very large number of distributional data sets were available for further analysis.

In order to reduce this large volume to manageable levels from which relevant information could be derived, certain species were grouped within or across families. Data were grouped according to sampling gear used and not according to surveys or years of sampling. Because data" were not clearly comparable from year to year as the result of variability in sampling locations and techniques, the analysis focused primarily on seasonal distribution and relative abundance, as expressed through standardized catch-per-unit-effort (CPUE) for each sampling gear across all years of sampling. Distributional maps for some sampling operations which showed no significant catches of any species of interest were excluded from the text. Seasons, for purposes of this analysis, were defined as calendar quarters which were found to closely approximate the four seasons in the aquatic environment.

Data were presented in the following manner:

1. A table of station data is included in Appendix B. Catch and gear information are not entered; however, methods for retrieval of such information are presented in Appendix A.

2. Computer-generated charts showing the distribution of hauls by gear type, season, and area are included in section IV.A., "Distribution of Combined Effort and Catches by Gear and by Season" (Figures IV.A.1 - IV.A.52). "

3. Figures describing the mean geometric CPUE, with 90% confidence interval, of all pelagic species combined considered by each gear type, within each of two areas (Bering Sea and Gulf of Alaska) for each year of sampling are included with the above figures. The CPUE figures do not include information from the various NMFS observer surveys or the UW-FRI Kodiak salmon surveys because of the fragmentary nature and summary form of the data.

4. Figures describing the mean geometric CPUE, with 90% confidence interval, of each species and/or group of species under study, as shown by the various types of gear in the Bering Sea and the Gulf of Alaska, for each year of sampling are included in this section under IV.B., "Distribution and Relative Abundance of Individual Species and Groups of Fishes" (Figures IV.B.1 - IV.B.288).

5. Computer-printer generated distributional charts showing the standardized mean geometric CPUE for each species or group of species as shown by each sampling gear within standard areas of 15′ latitude x 30′ longitude in each calendar quarter sampled, across all years, are included in Appendix C.

6. Computer-generated charts showing the seasonal relative abundance of all species and groups of species under study, as shown by different types of sampling gear are included in section IV.B. as mentioned in (4) above. These charts were generated from the CPUE prints (5 above), but a selection process was used to establish the definitions of above average, average, and below average abundance for any given species.

The mean geometric standard CPUE of a given species caught by any given gear type across all years of sampling in an area within the same calendar quarter was arbitrarily taken as average, while CPUE rates falling in the upper or lower quarters of the calculated confidence interval were termed above average and below average, respectively.

As such, the abundance-distribution charts serve to show seasonal but not annual variations in distribution and abundance for each species in a number of areas and strata as inherently defined by the operational capabilities of the various gear types considered. Consequently, abundance is defined as a highly relative measure pertaining to variations in the occurrence of a species independent of all others. As such, different catch rates for the various species were taken as average and, additionally, different average values were assigned to catch rates of the same species when caught by different gear types.

Because no accurate information describing the age structure of the catches was found, no special plotting of juvenile and larval catches was possible. Consequently, the use of "numbers of fish caught" in the calculated CPUE of catches of larvae and juveniles could be very misleading, in spite of consideration for the sampling gear used (e.g., plankton nets).

In order to partly alleviate this problem, generalized plots describing the distribution of larvae and juveniles have been placed, whenever possible, at the beginning of the section on distribution and relative abundance of each

species. These plots have been prepared with the aid of the occasional information describing the catches as larvae or juveniles.

In order to provide some insight into possible seasonal, annual, and long-term variations in the distribution and relative abundance of the various species, to the extent information at hand allowed we are presenting information in the following sections:

IV.A. Distribution of Combined Effort and Catches by Gear and by Season (figs. IV.A.1 - IV.A.52) -- Sampling distribution charts are grouped by area according to sampling gear by season, each followed by graphs describing annual and long-term variations in overall catches.

IV.B. Distribution and Relative Abundance of Individual Species and Groups of Fishes (figs. IV.B.1 - IV.B.288) -- Distribution and relative abundance charts by area for each species are presented by appropriate sampling gear in each season sampled. Again, each set is followed by graphs showing any apparent annual variation in the abundance of the species.

In this manner, keeping in mind the limited amount of information available, it becomes possible to take advantage of the diversity of informational sets in order to get a more complete view of the species distribution and relative abundance and their possible areal, seasonal, annual, long-term, and stratal variations.

IV.A. DISTRIBUTION OF COMBINED EFFORT AND CATCHES BY GEAR AND BY SEASON

The maps included in Figures IV.A.1 - IV.A.52 have a legend inside a box referring to hauls of subject pelagic species with "no catch" and "catch". The upper figure indicates the number of hauls in which no catches were made and the lower figure indicates the number of hauls in which catches were made. Thus, [1/0] shows one haul with no catches and no hauls with catches.

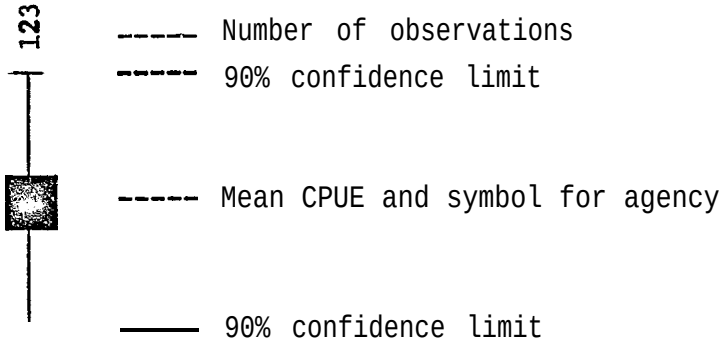
"Each group of charts by fishing gear is followed by CPUE graphs showing catches of all pelagic species by that gear by the various agencies.

The key to agencies shown on the CPUE graphs is as follows:

- NMFS, Northwest and Alaska Fisheries Center, Seattle, Washington
- NMFS, Auke Bay Biological Laboratory, Juneau, Alaska
- Observers on Japanese vessels
- Observers on Soviet vessels
- Alaska Department of Fish and Game
- Fisheries Research Institute, University of Washington, Seattle
- Hokkaido University, Sapporo, Japan
- Fisheries Research Board of Canada, Biological Station, Nanaimo, B.C.

Note: Where the calculation of the geometric mean was not feasible, arithmetic means, without confidence intervals, are shown.

Each entry on the CPUE graphs is accompanied by the number of observations (Arabic numerals). Also shown are the 90% confidence limits, the mean CPUE, and a symbol for the agency that did the sampling. Example:



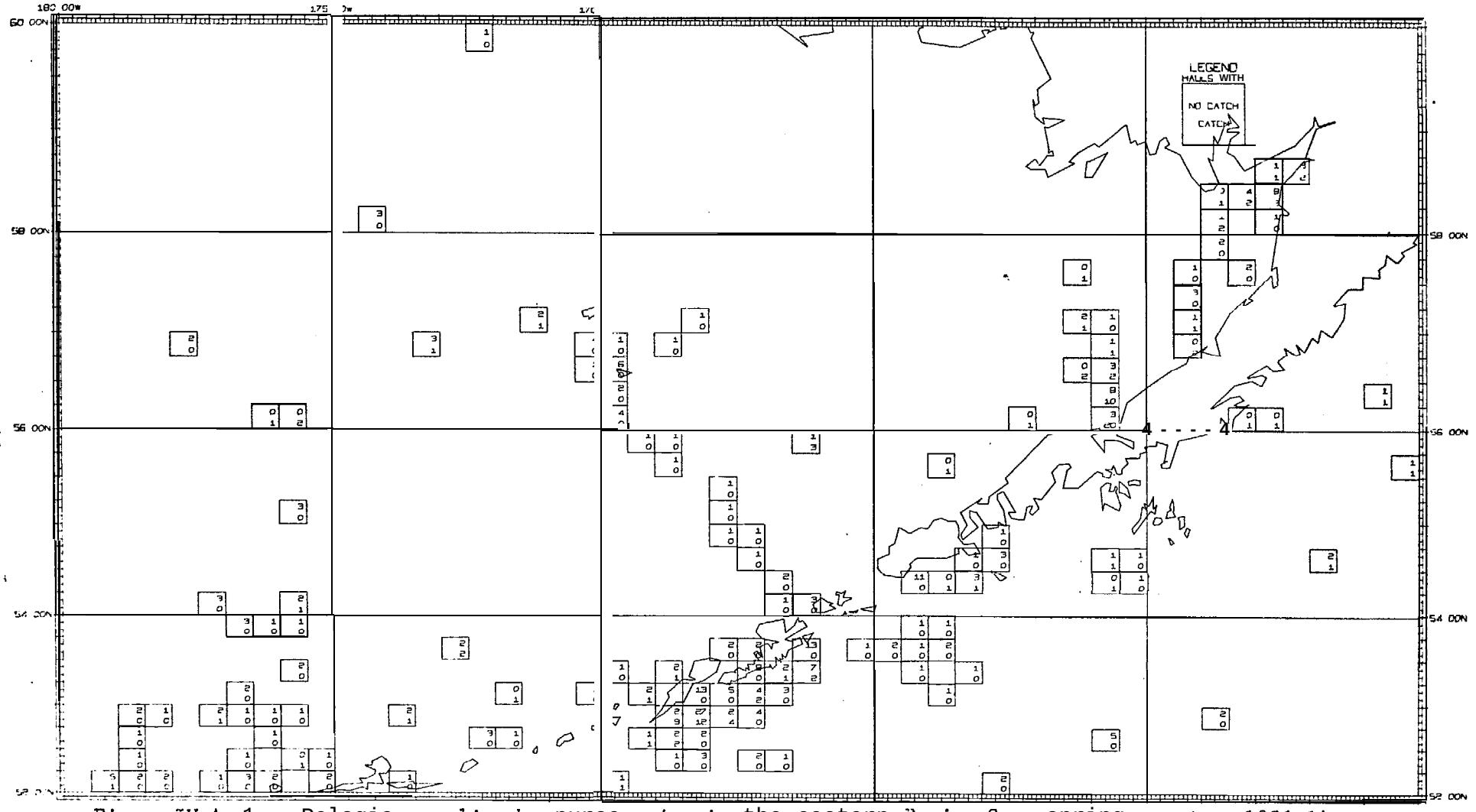


Figure IV.A. 1 .--Pelagic sampling by purse seine in the eastern Bering Sea, spring quarter, 1956-64, 1966-67, 1969-70.

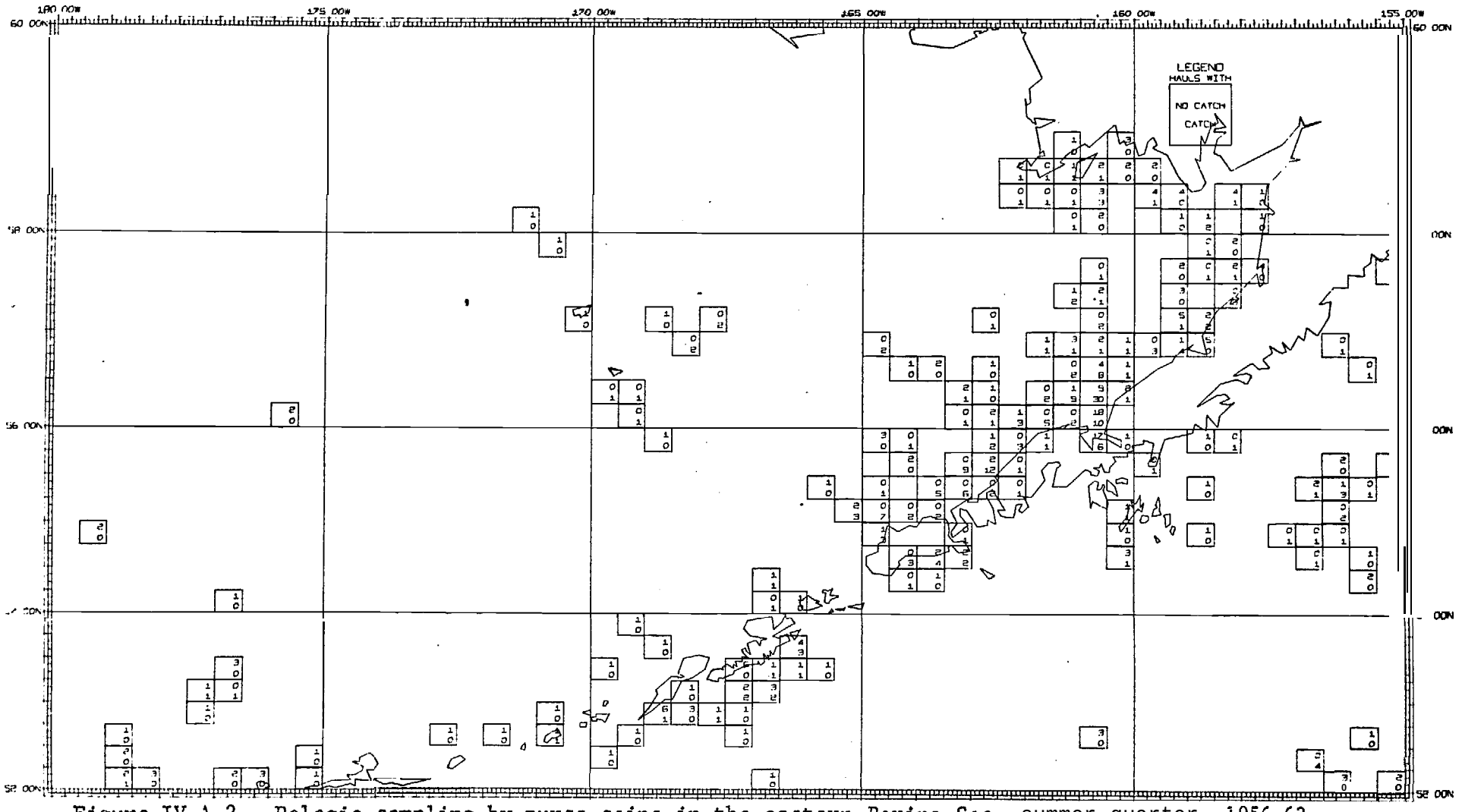
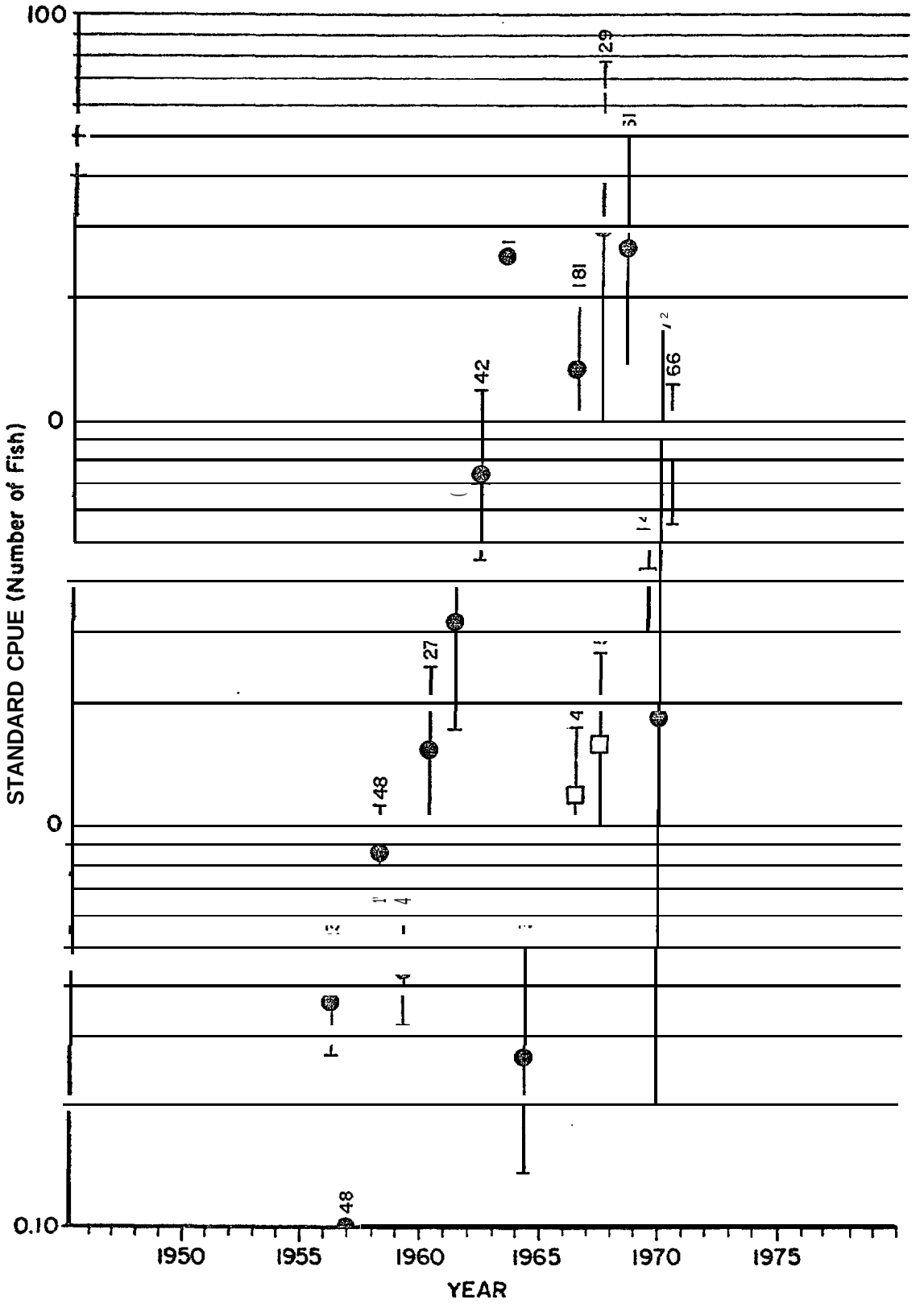


Figure IV.A.2.--Pelagic sampling by purse seine in the eastern Bering Sea, summer quarter, 1956-63, 1966-70.



'igure IV.A.3.--Standardized rate of catch (geometric mean: number/0.5 hr with 90% confidence interval and number of observations) of all pelagic species combined in the eastern Bering Sea by purse seines.

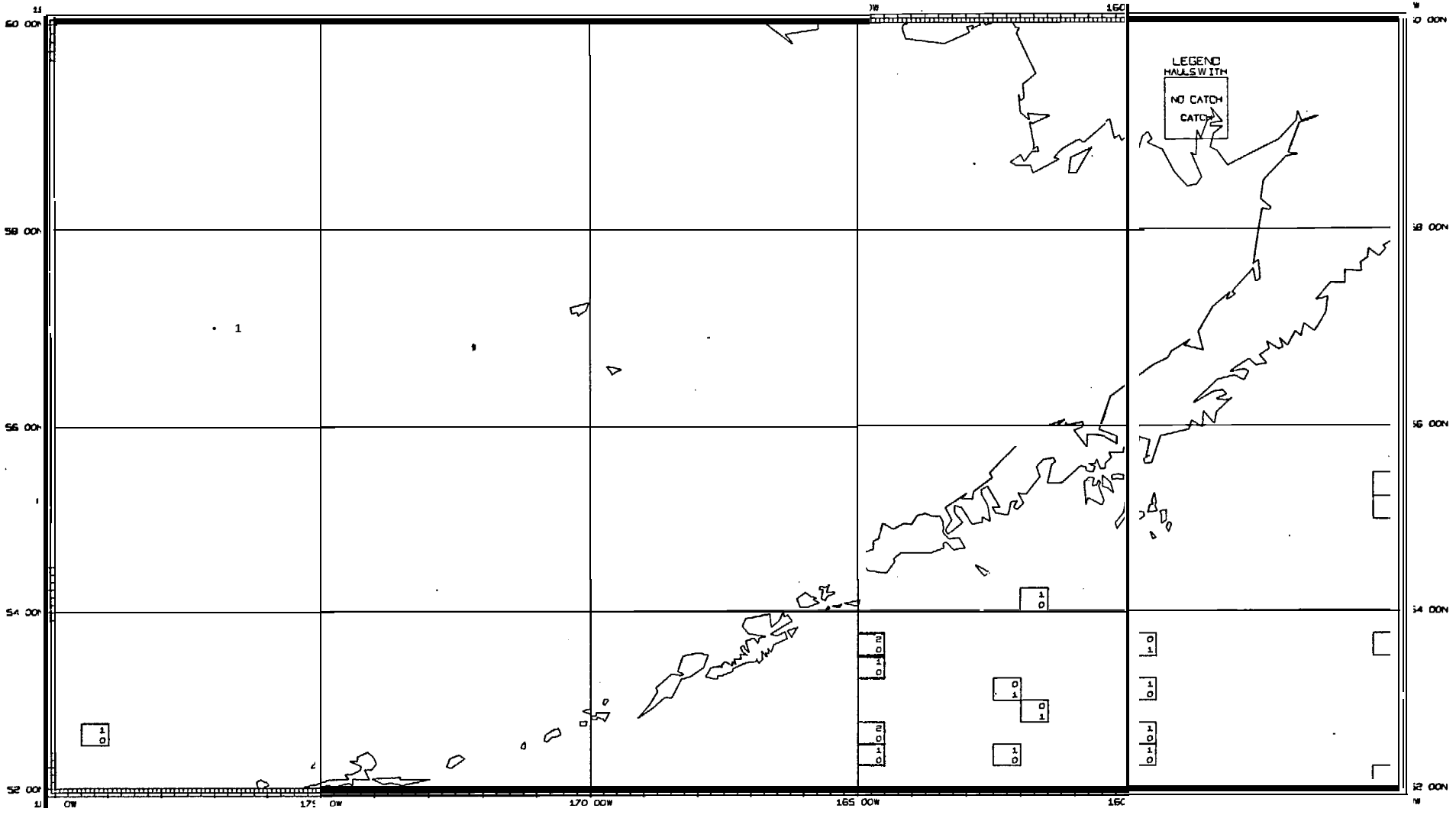


Figure IV.A.4.--Pelagic sampling by gillnet in the eastern Bering Sea, winter quarter, 1963-64, 1-96'?, 1969-71.

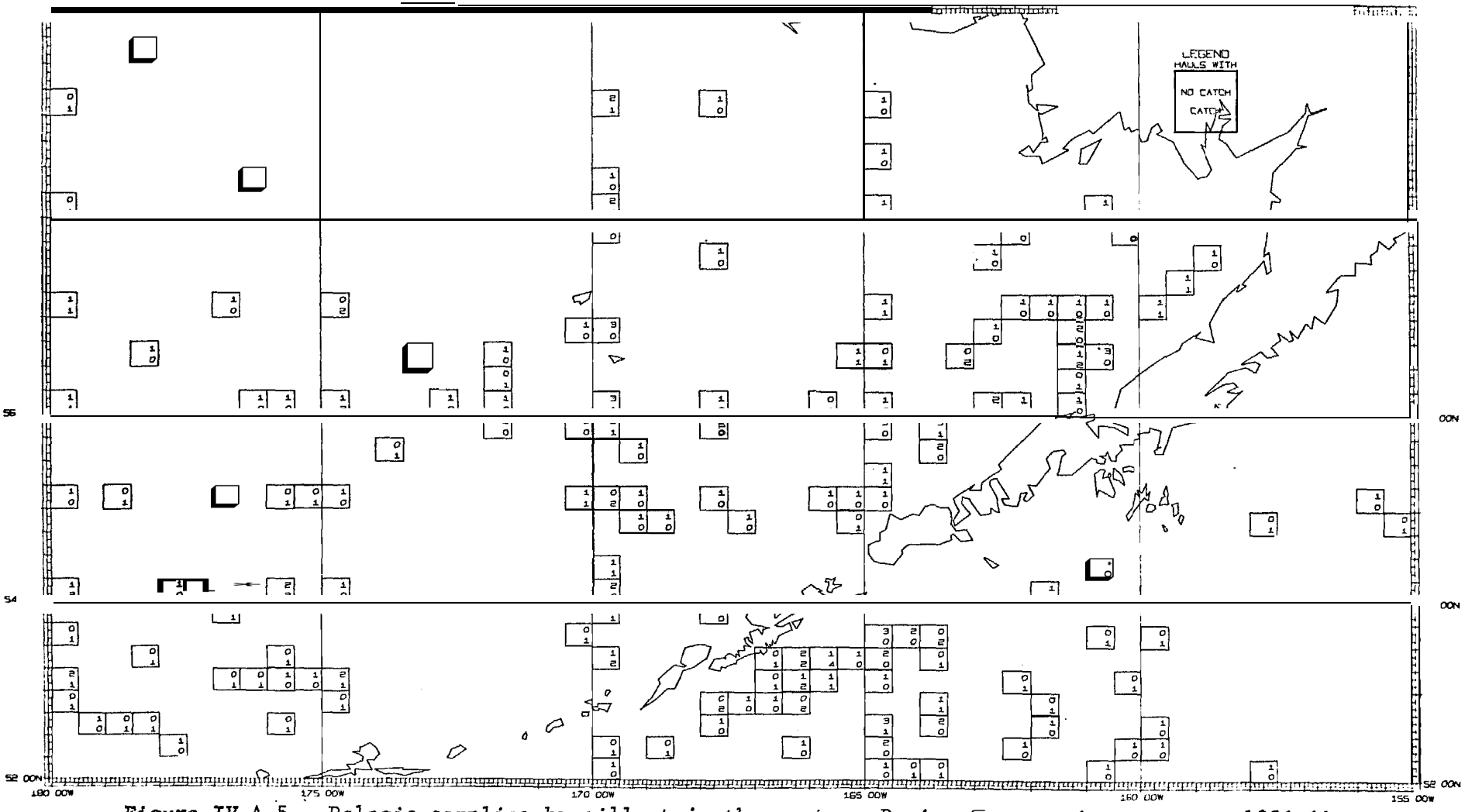


Figure IV.A.5.--Pelagic sampling by gillnet in the eastern Bering Sea, spring quarter, 1956-62, 1965-66, 1968-71.

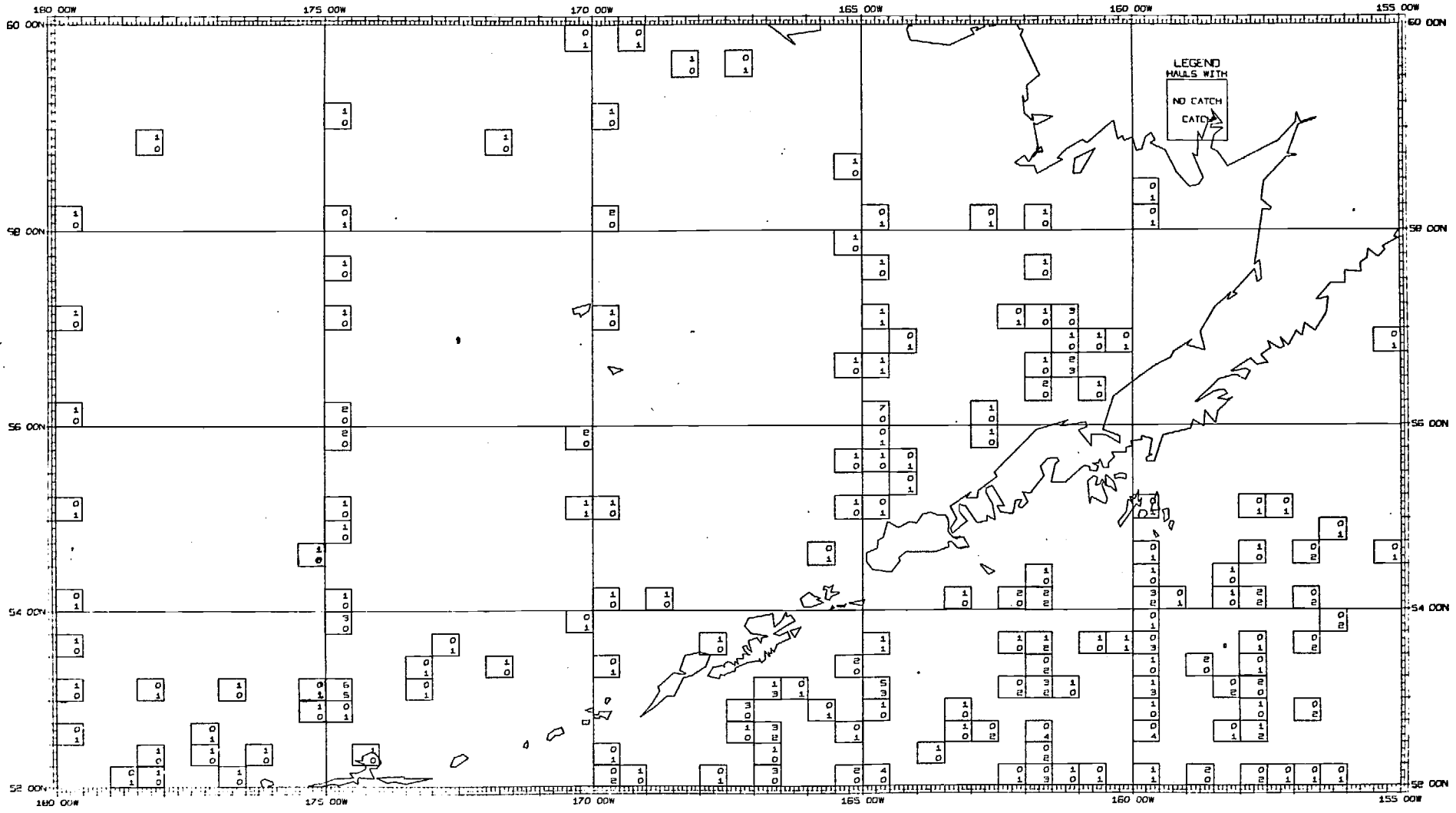


Figure IV.A.6.--Pelagic sampling by gillnet in the eastern Bering Sea, summer quarter, 1953, "1955-63, 1965-71.

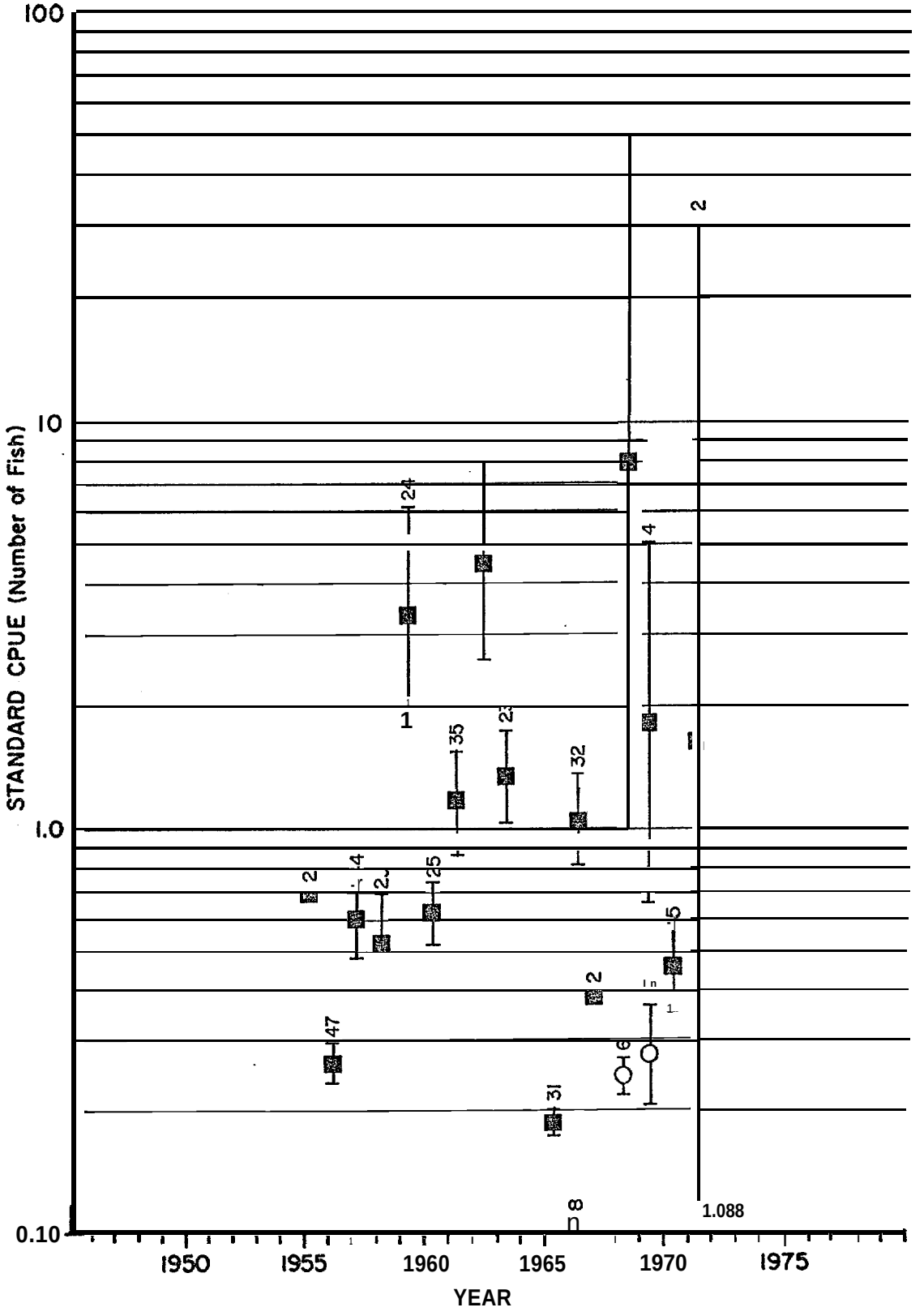


Figure IV.A.7.--Standardized rate of catch (geometric mean: number/12hr/1 km net with 90% confidence interval and number of observations) of all pelagic species combined in the eastern Bering Sea by gillnets.

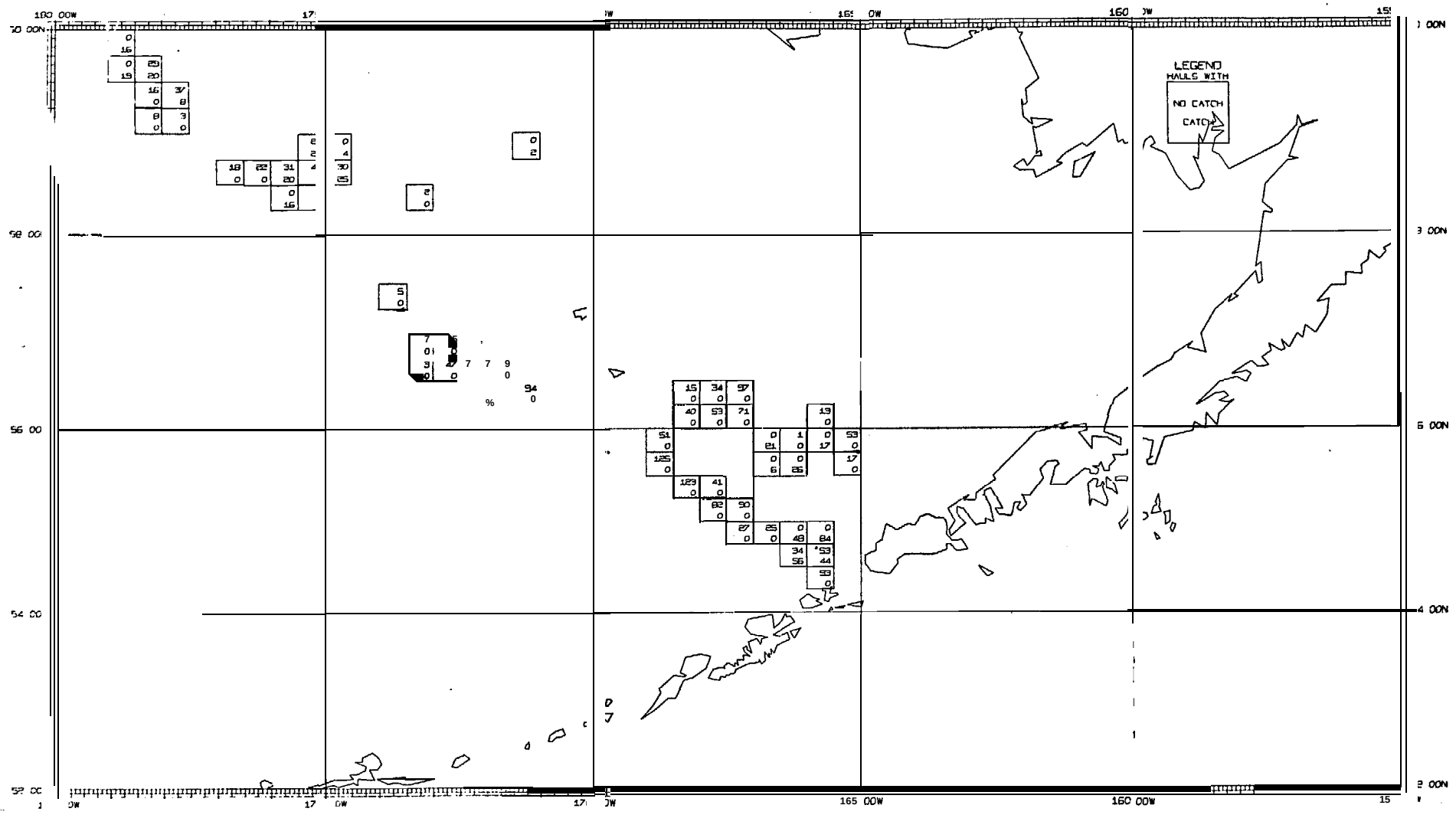


Figure IV.A.8. --Pelagic sampling by bottom trawl in the eastern Bering Sea, winter quarter, 1973-75.

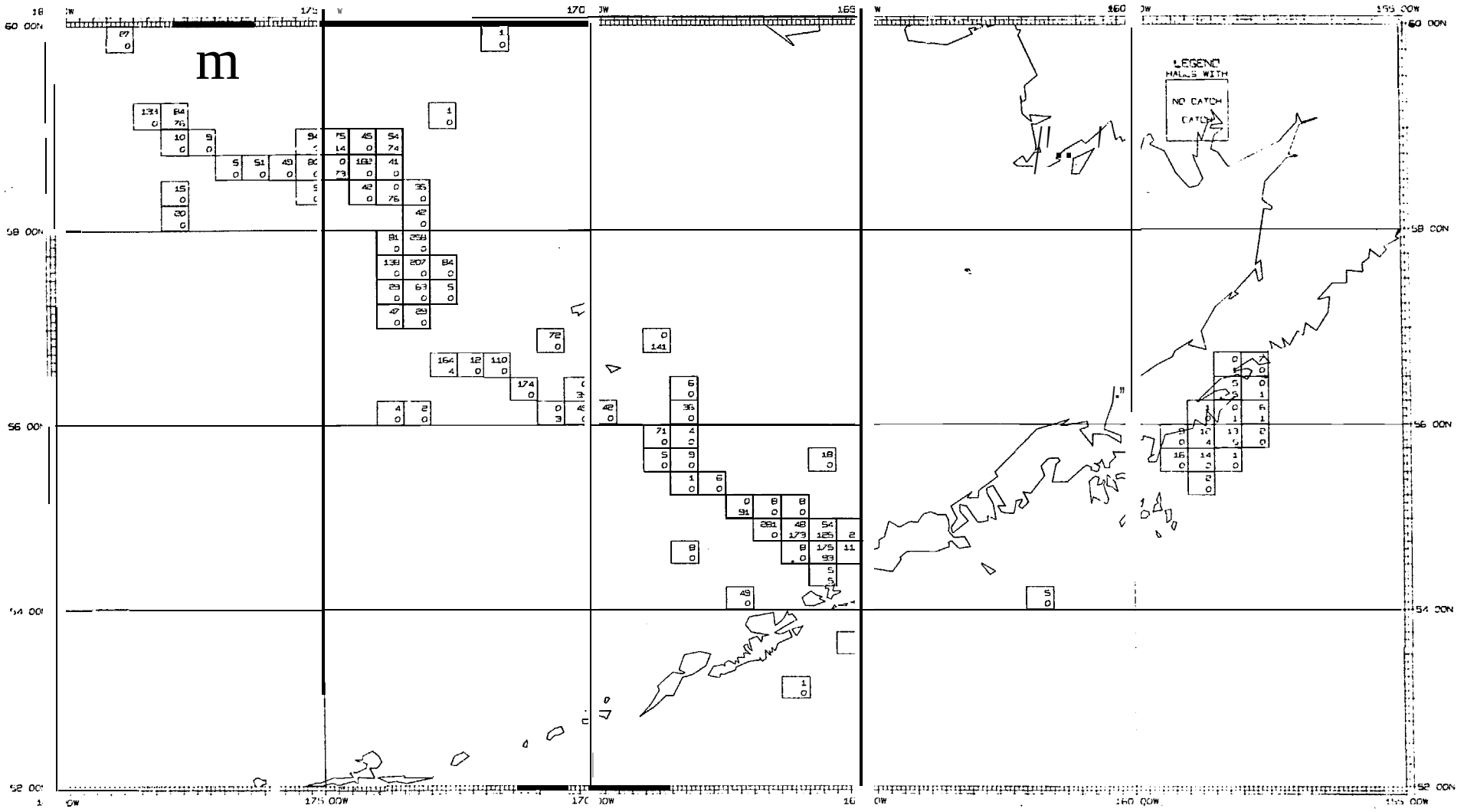


Figure IV.A.9.--Pelagic sampling by bottom trawl in the eastern Bering Sea, spring quarter, 1974-75.

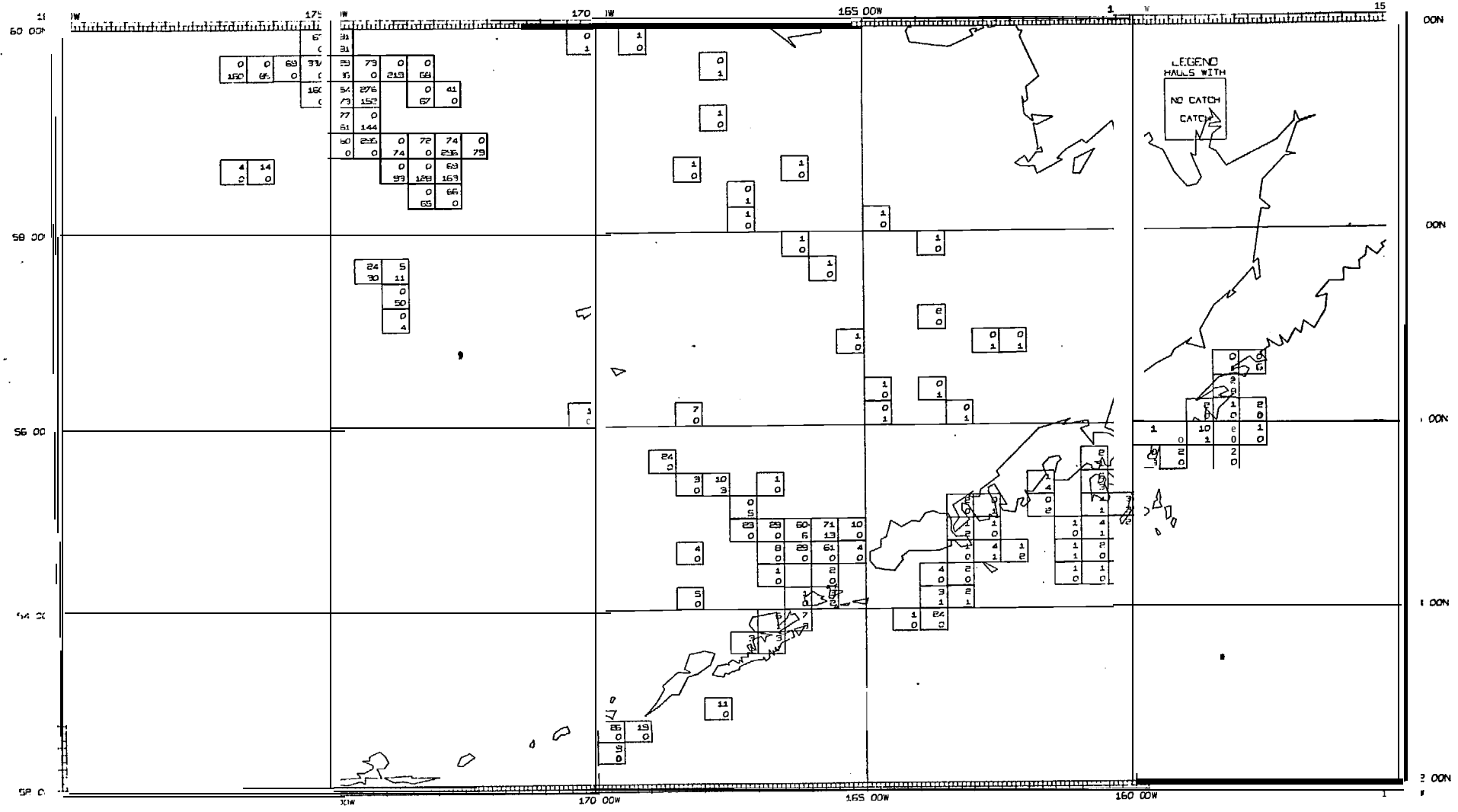


Figure IV. A .10.--Pelagic sampling by bottom trawl in the caster'n Bering Sea, summer quarter, 1948-49, 1957, 1969, 1974-75.

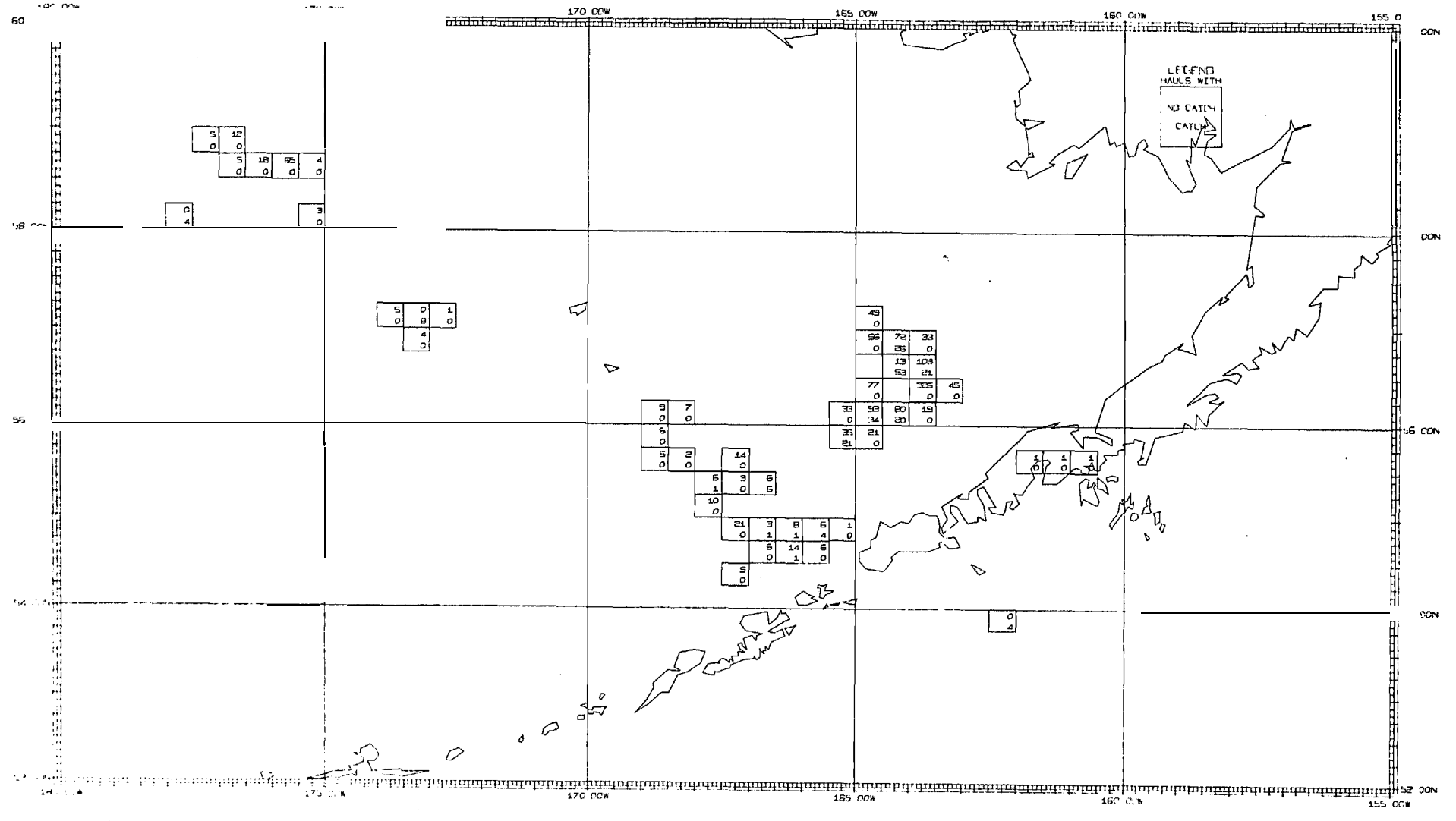


Figure IV.A.11.--Pelagic sampling by bottom trawl in the eastern Bering Sea, autumn quarter, 1948, 1964, 1973-74.

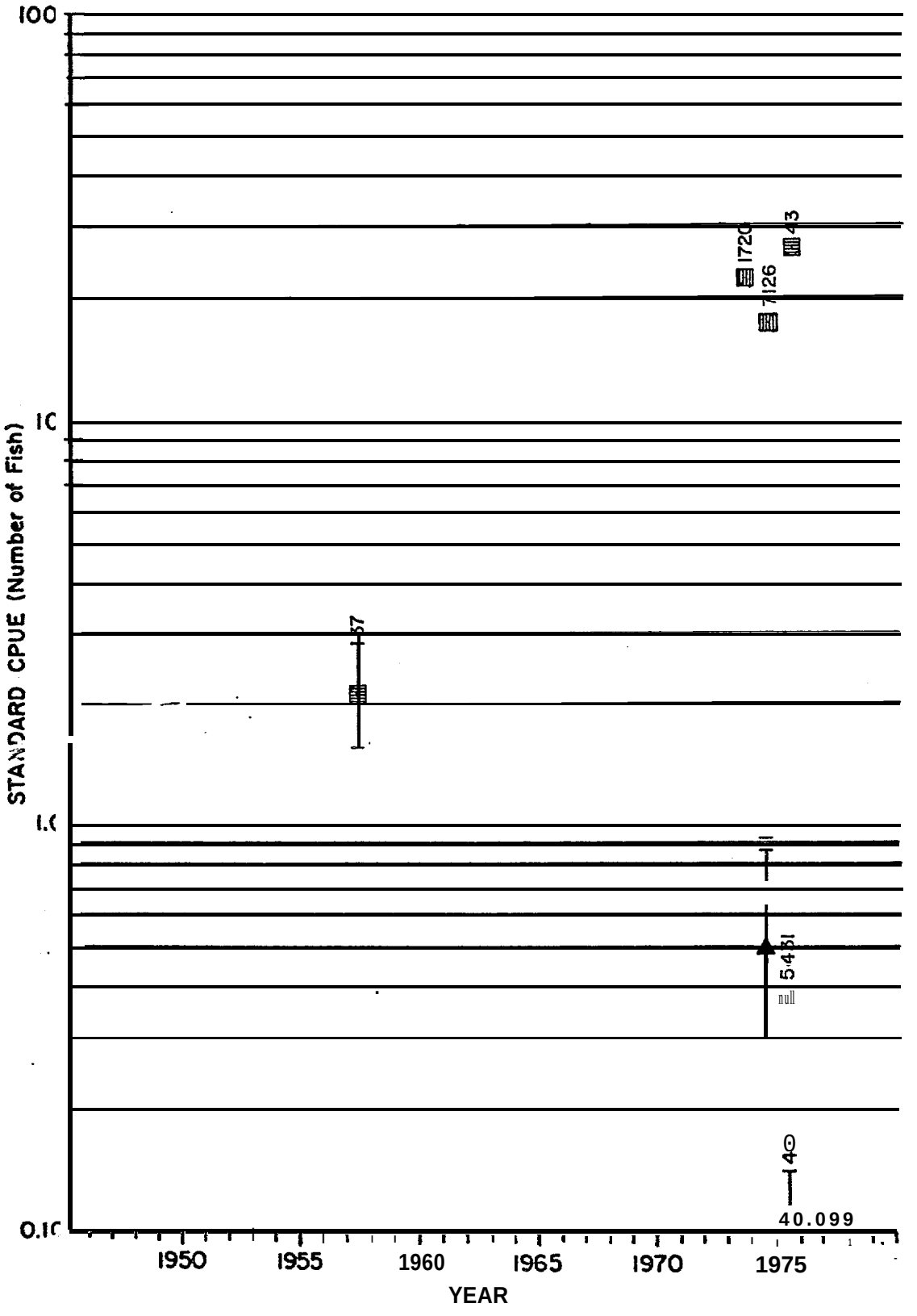


Figure IV. A. 12.--Standardized rate of catch (geometric mean: number/0.5 hr with 90% confidence interval and number of observations) of all pelagic species comb ined in the eastern Bering Sea by bottom trawl.

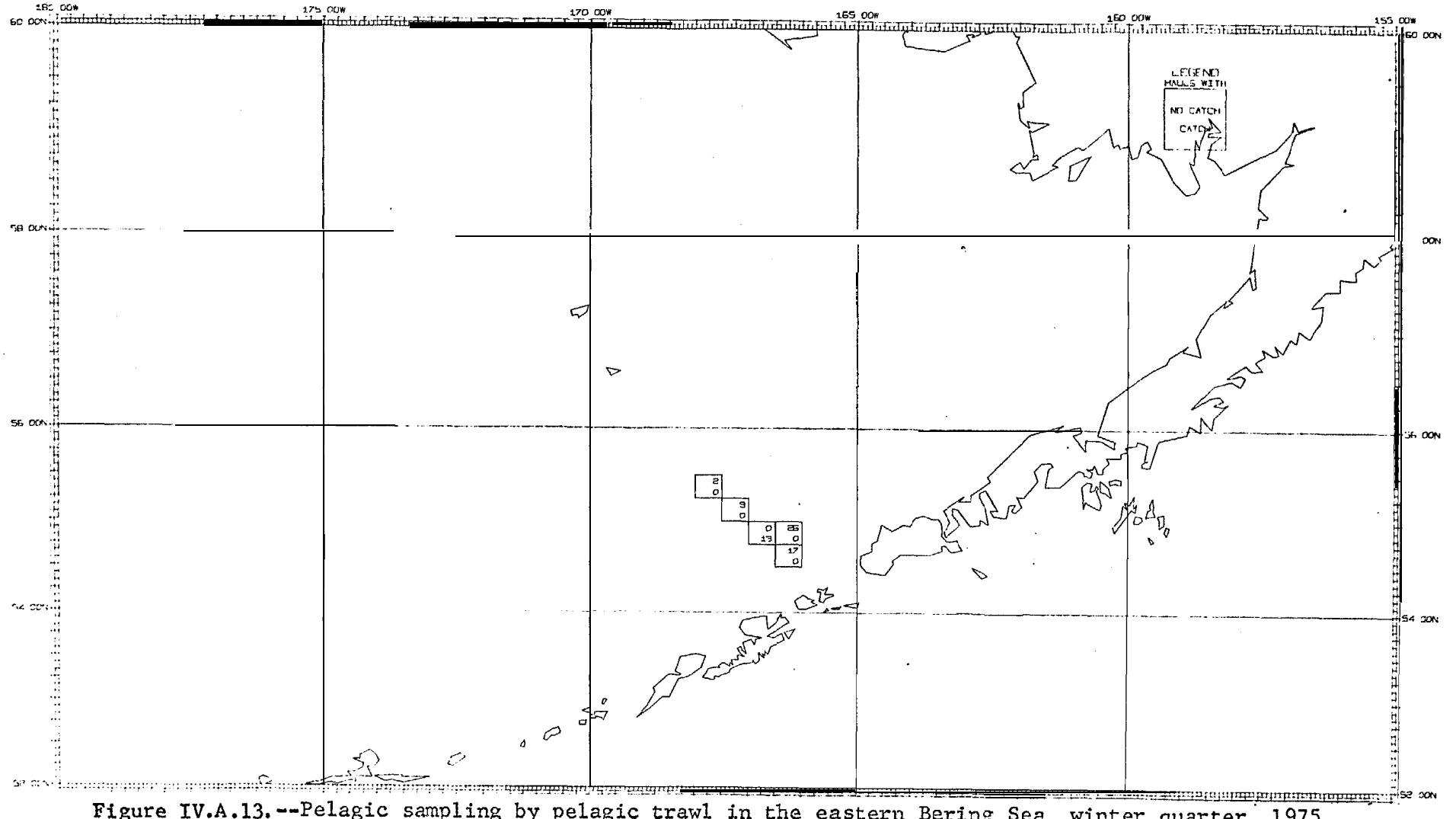


Figure IV.A.13.--Pelagic sampling by pelagic trawl in the eastern Bering Sea, winter quarter, 1975.

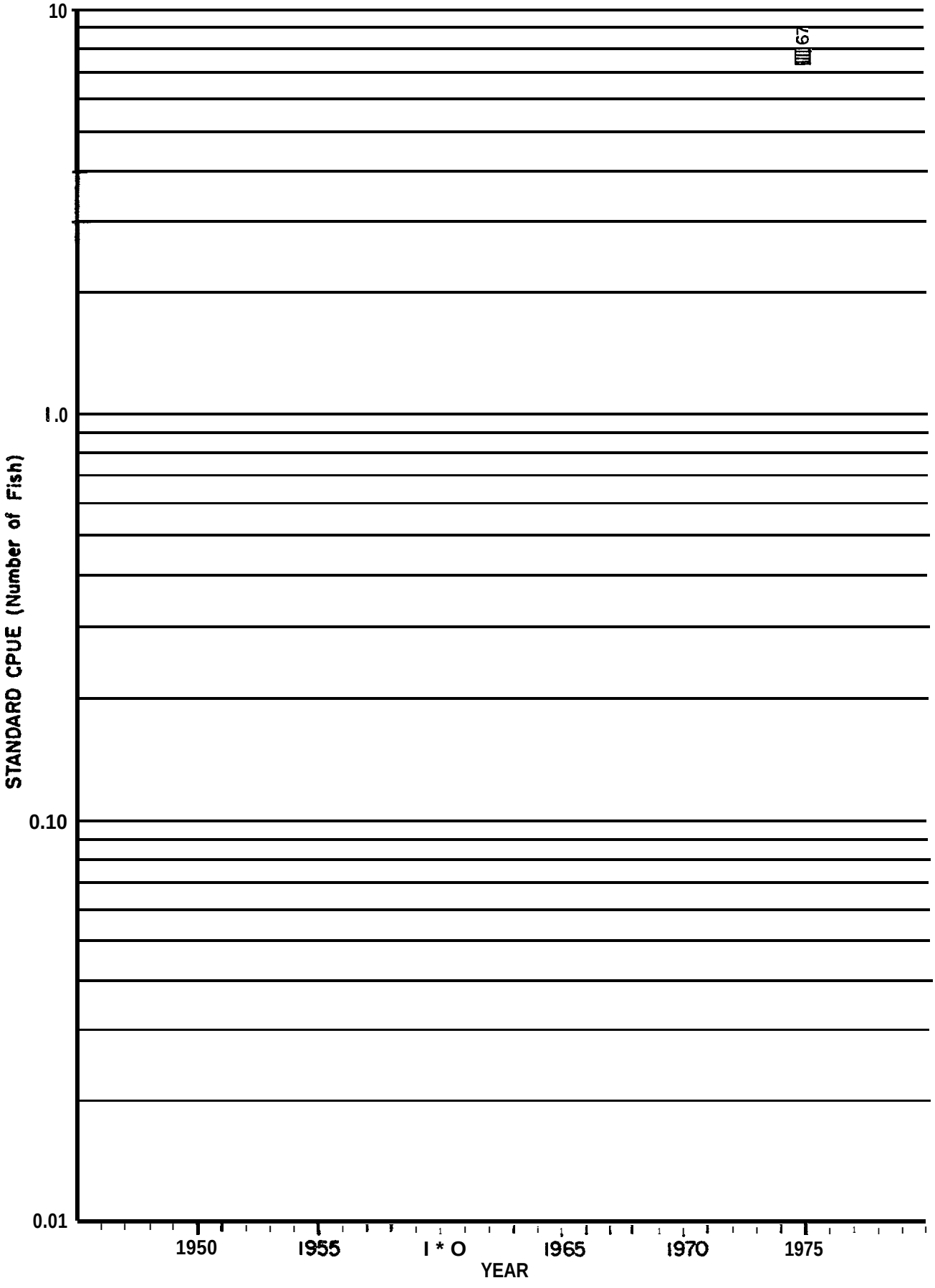


Figure IV. A.14.--Standardized rate of catch (geometric mean: number/0.5 hr with 90% confidence interval and number of observations) of all pelagic species combined in the eastern Bering Sea by pelagic trawl.

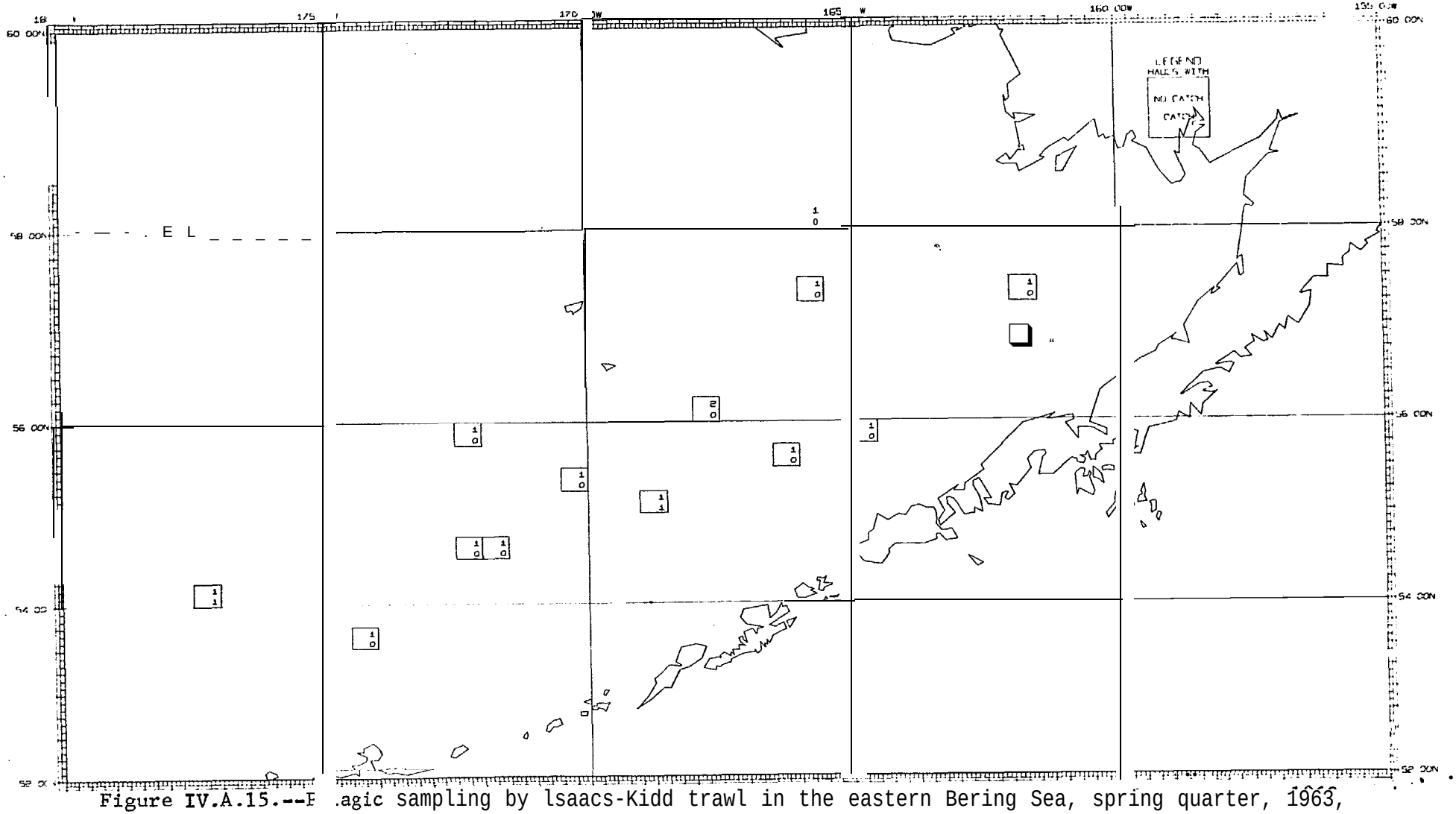


Figure IV.A.15.--P .agic sampling by lsaacs-Kidd trawl in the eastern Bering Sea, spring quarter, 1963, 1967.

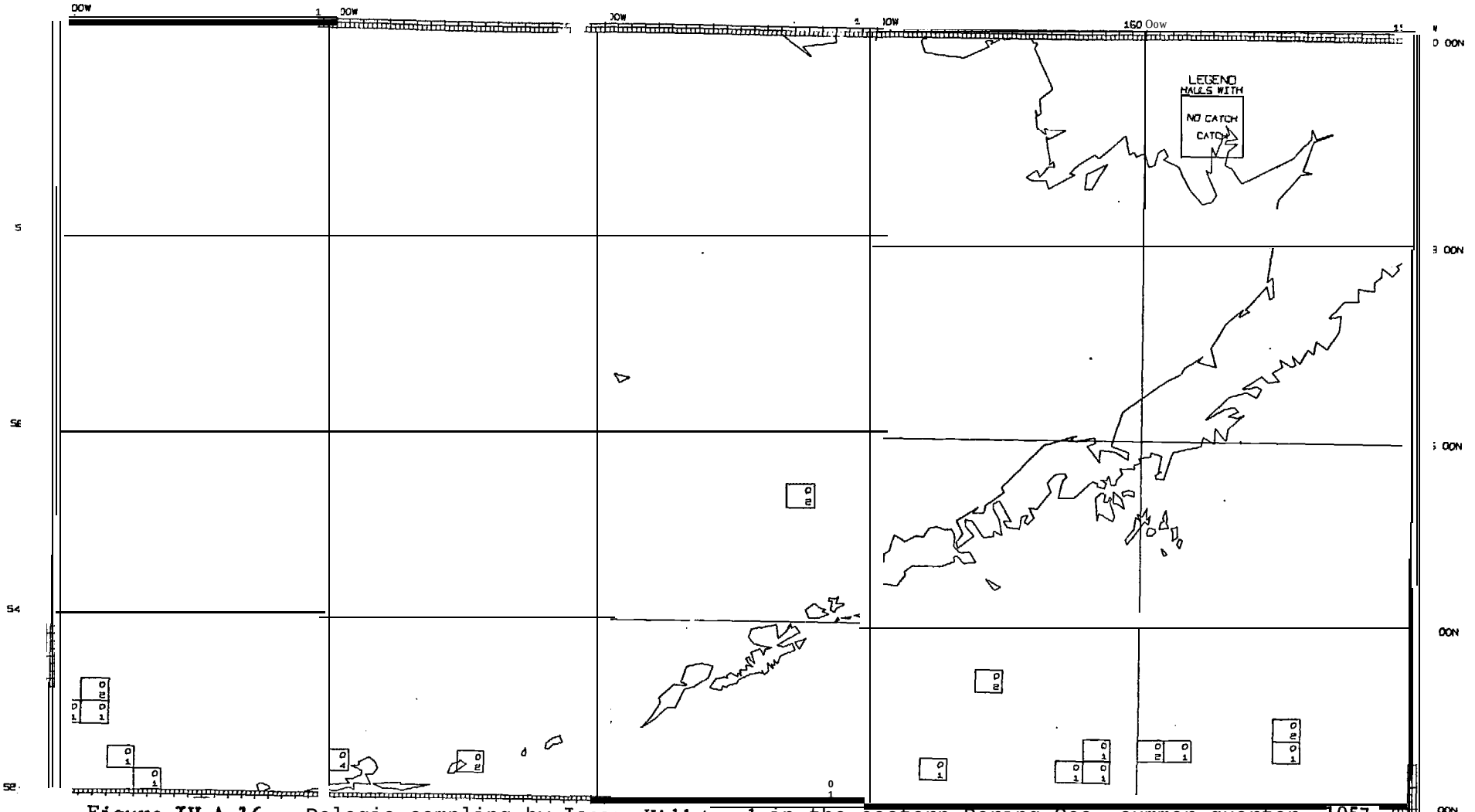


Figure IV.A.16.--Pelagic sampling by Isaacs-Kidd trawl in the eastern Bering Sea, summer quarter, 1957.

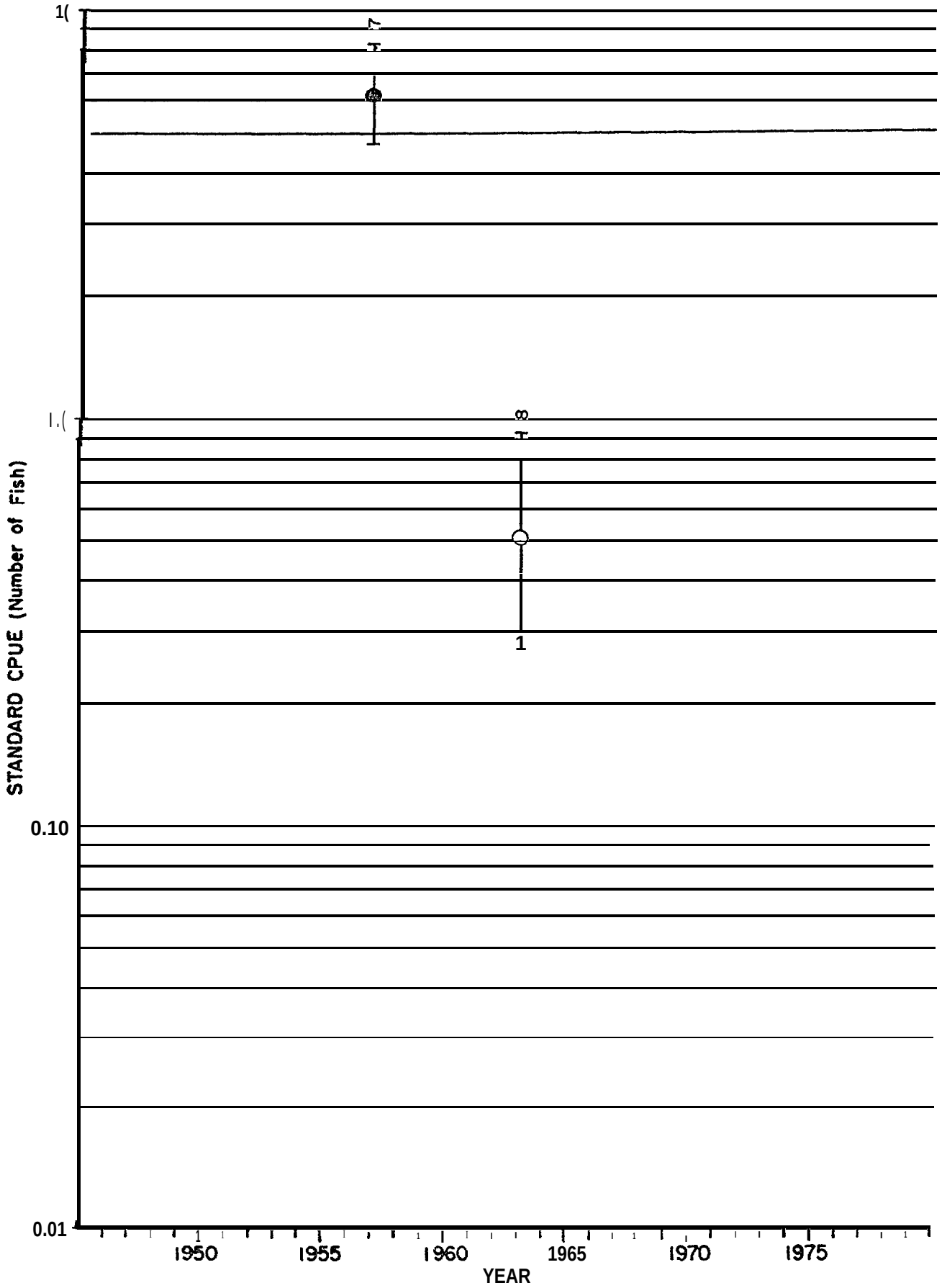


Figure IV.A.17.--Standardized rate of catch (geometric mean: number/0.5 hr with 90% confidence interval and number of observations) of all pelagic species combined in the eastern Bering Sea by Isaacs-Kidd trawl.

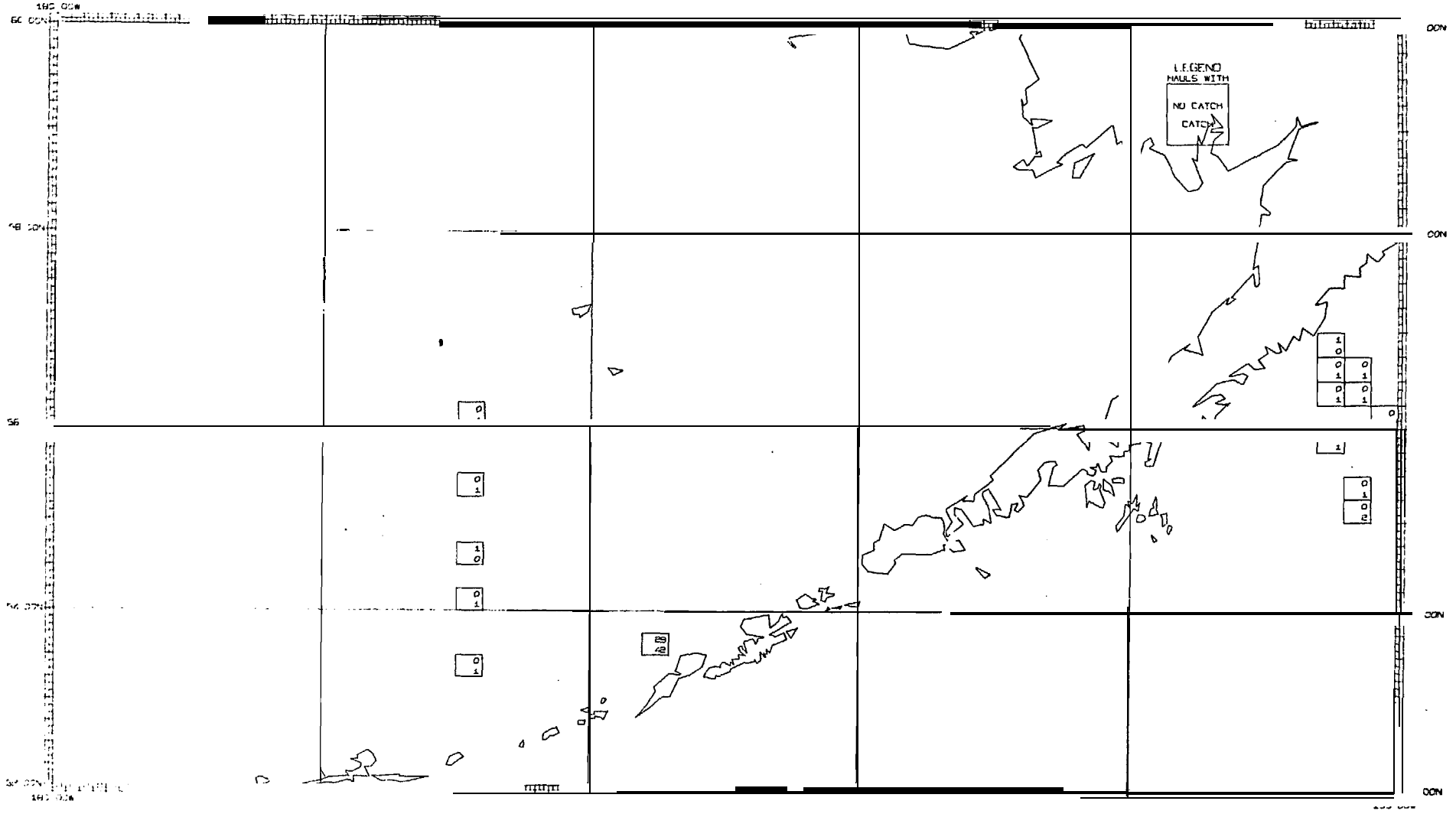


Figure IV.A.18.--Pelagic sampling by bongo net in the eastern Bering Sea, spring quarter, 1971-72.

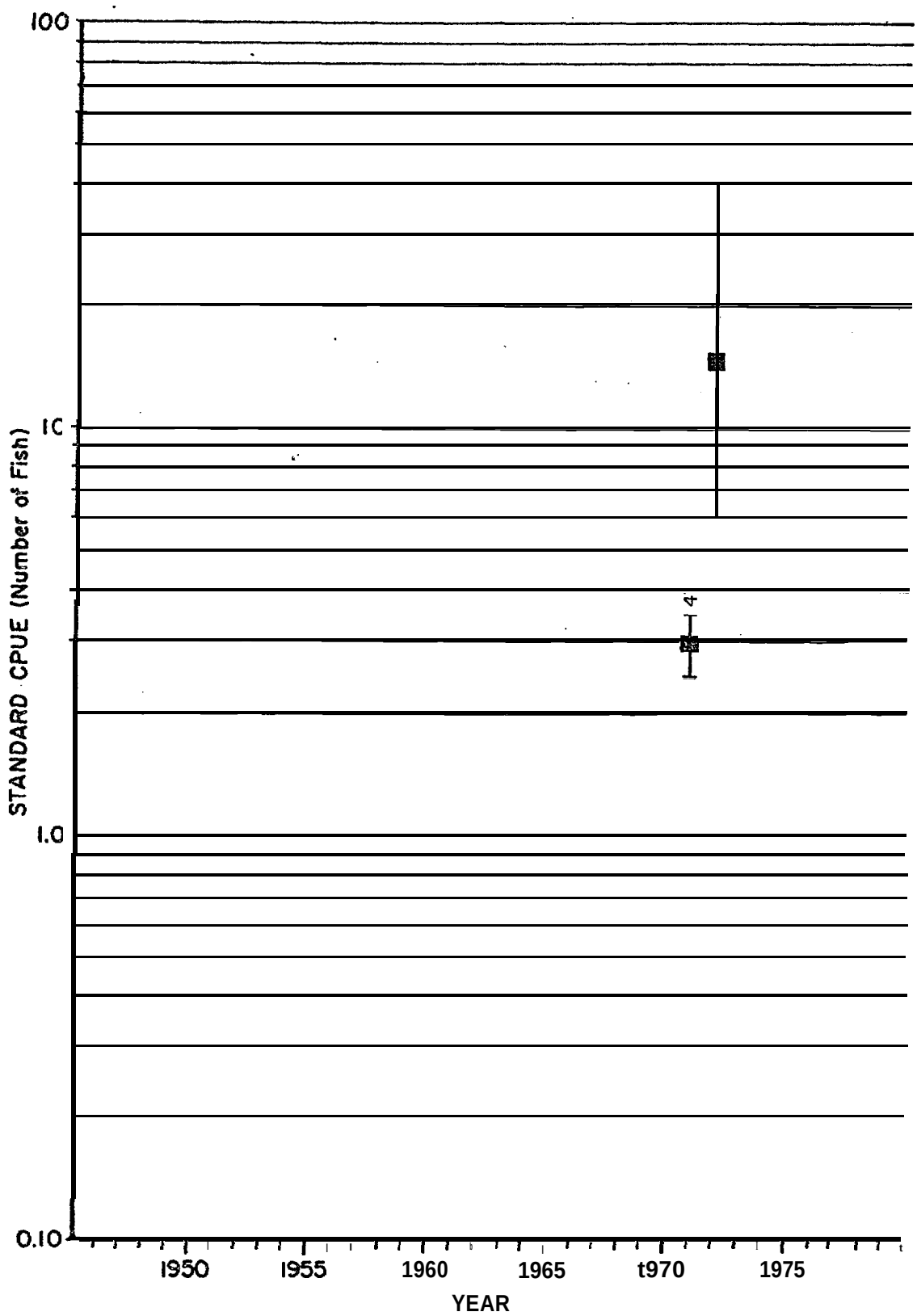


Figure IV.A.19.--Standardized rate of catch (geometric mean: number/0.5 hr with 90% confidence interval and number of observations) of all pelagic species combined in the eastern Bering Sea by bongo net.

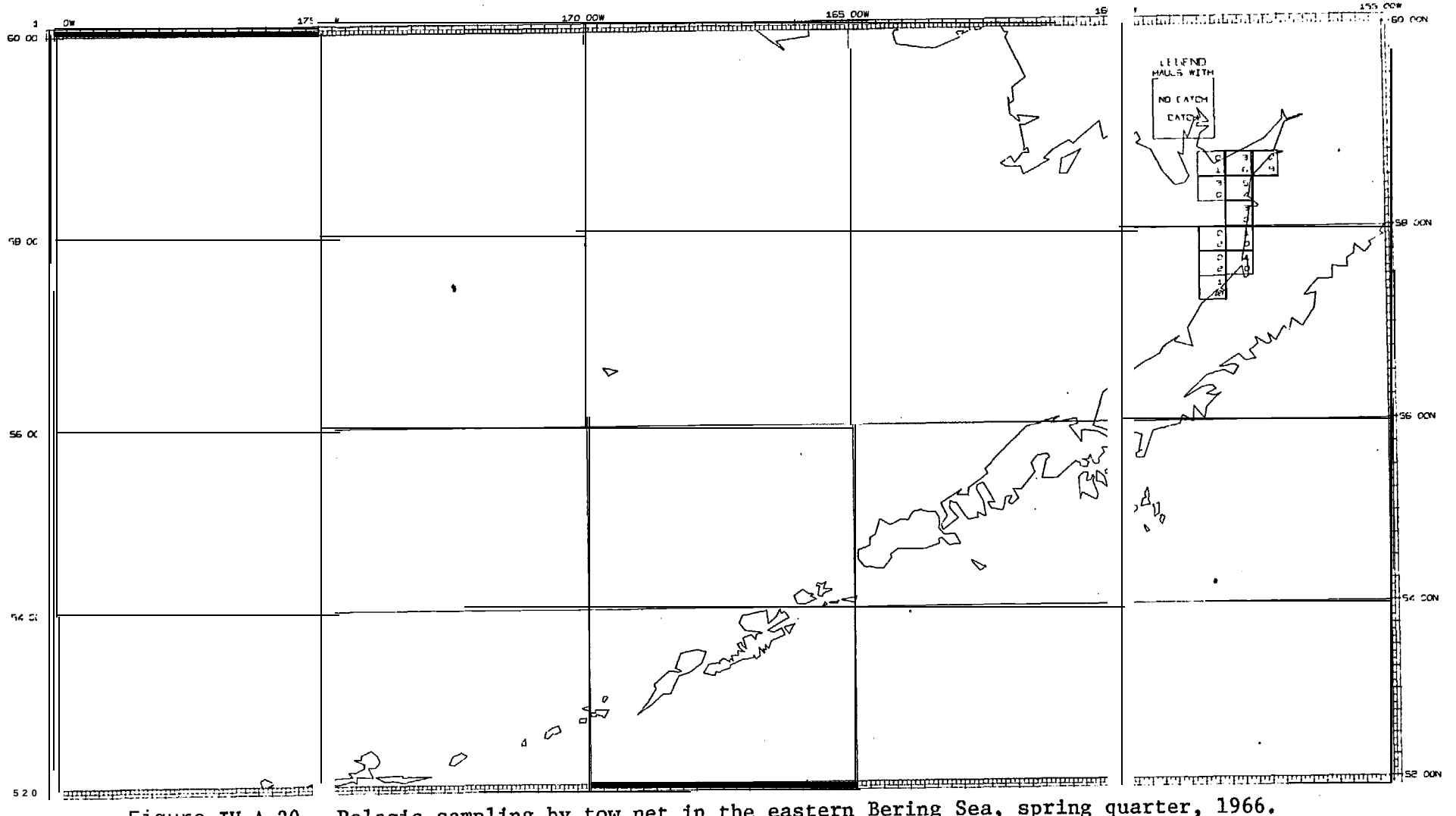


Figure IV.A.20.--Pelagic sampling by tow net in the eastern Bering Sea, spring quarter, 1966.

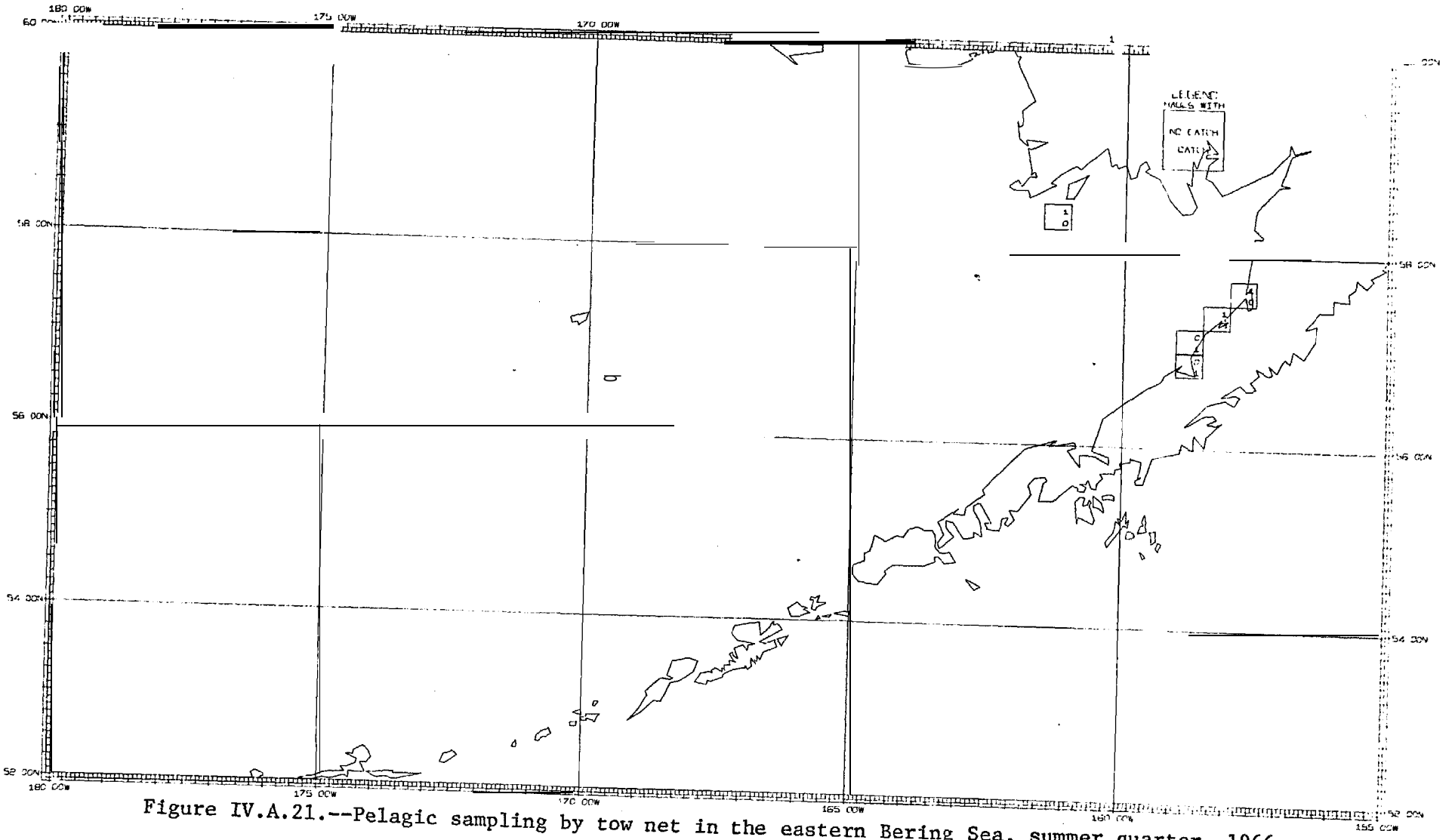


Figure IV.A.21.--Pelagic sampling by tow net in the eastern Bering Sea, summer quarter, 1966.

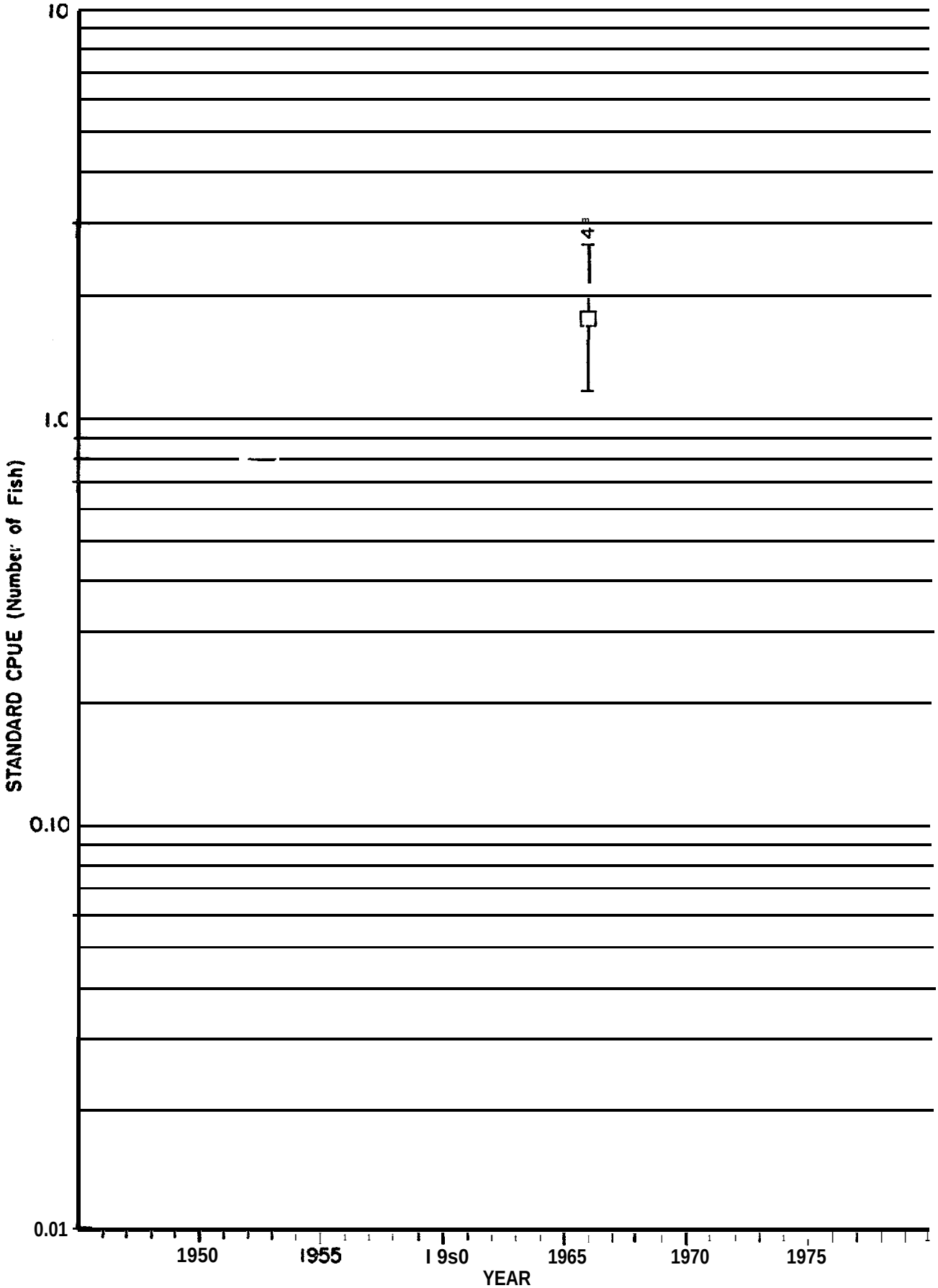


Figure IV.A.22.--Standardized rate of catch (geometric mean: number/0.2 hr with 90% confidence interval and number of observations) of all pelagic species combined in the eastern Bering Sea by townet.

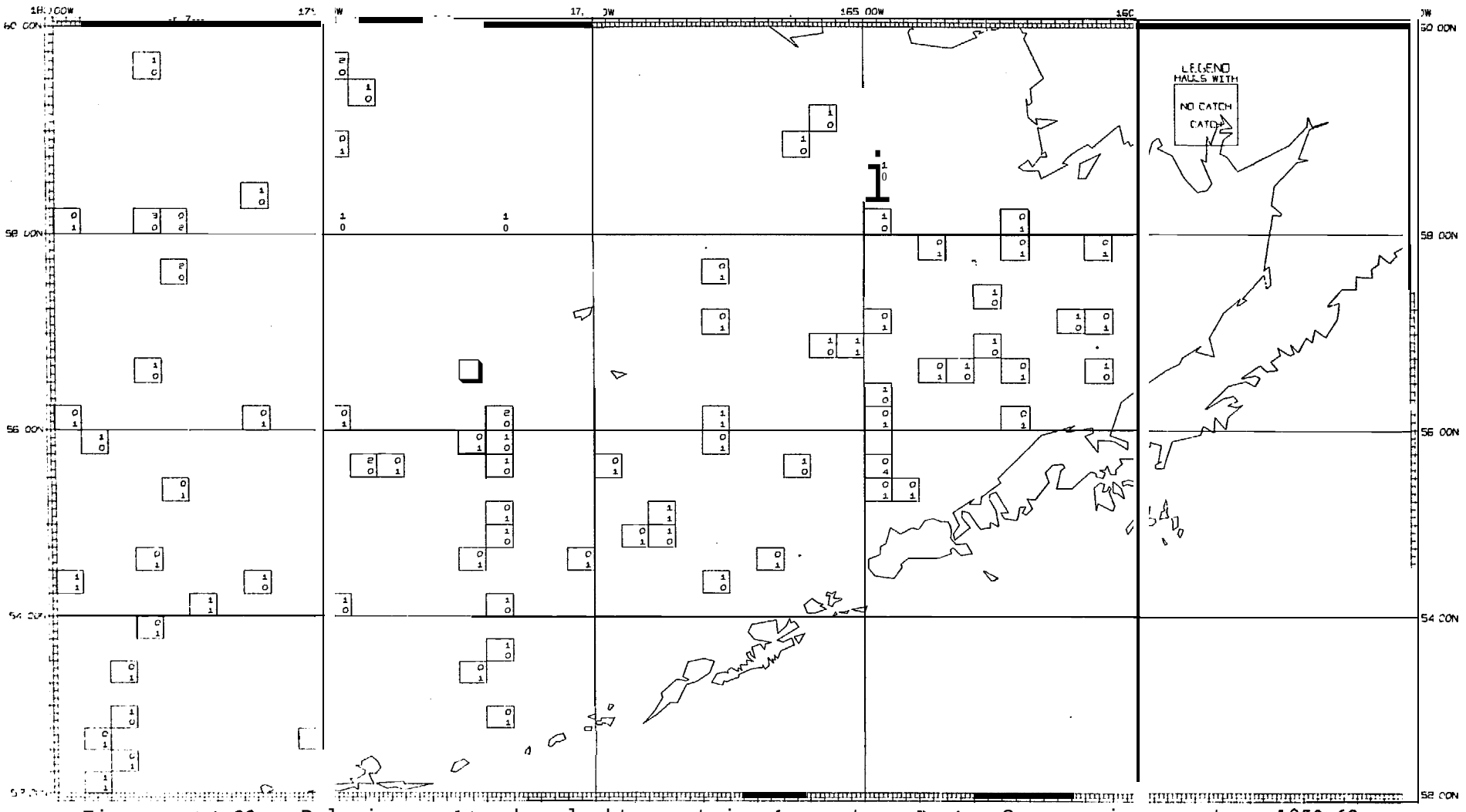


Figure IV.A.23.--Pelagic sampling by plankton net in the eastern Bering Sea, spring quarter, 1958-60, 1963, 1966-69.

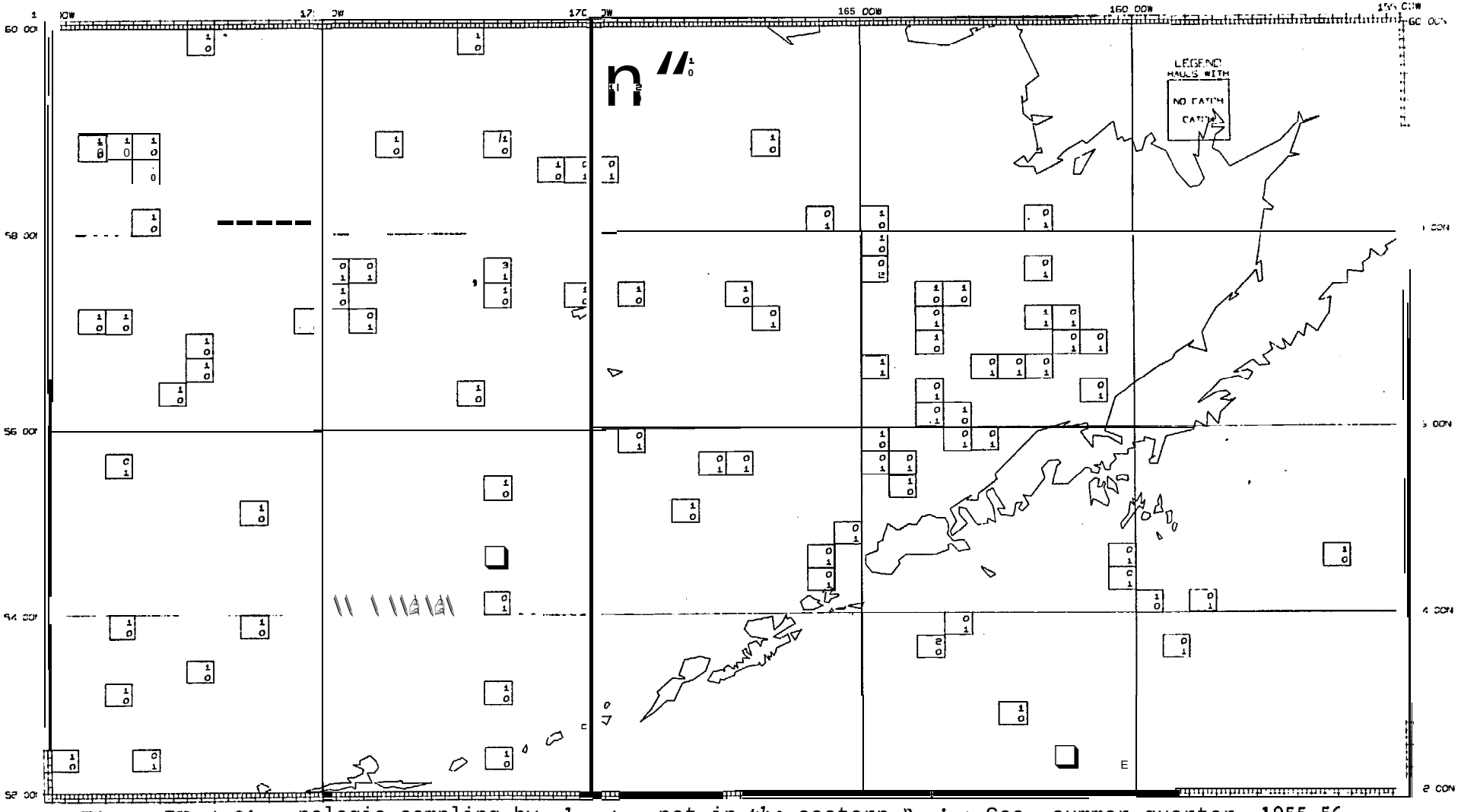


Figure IV. A.24.--pelagic sampling by plankton net in the eastern Bering Sea, summer quarter, 1955-56, 1959-60, 1966-69.

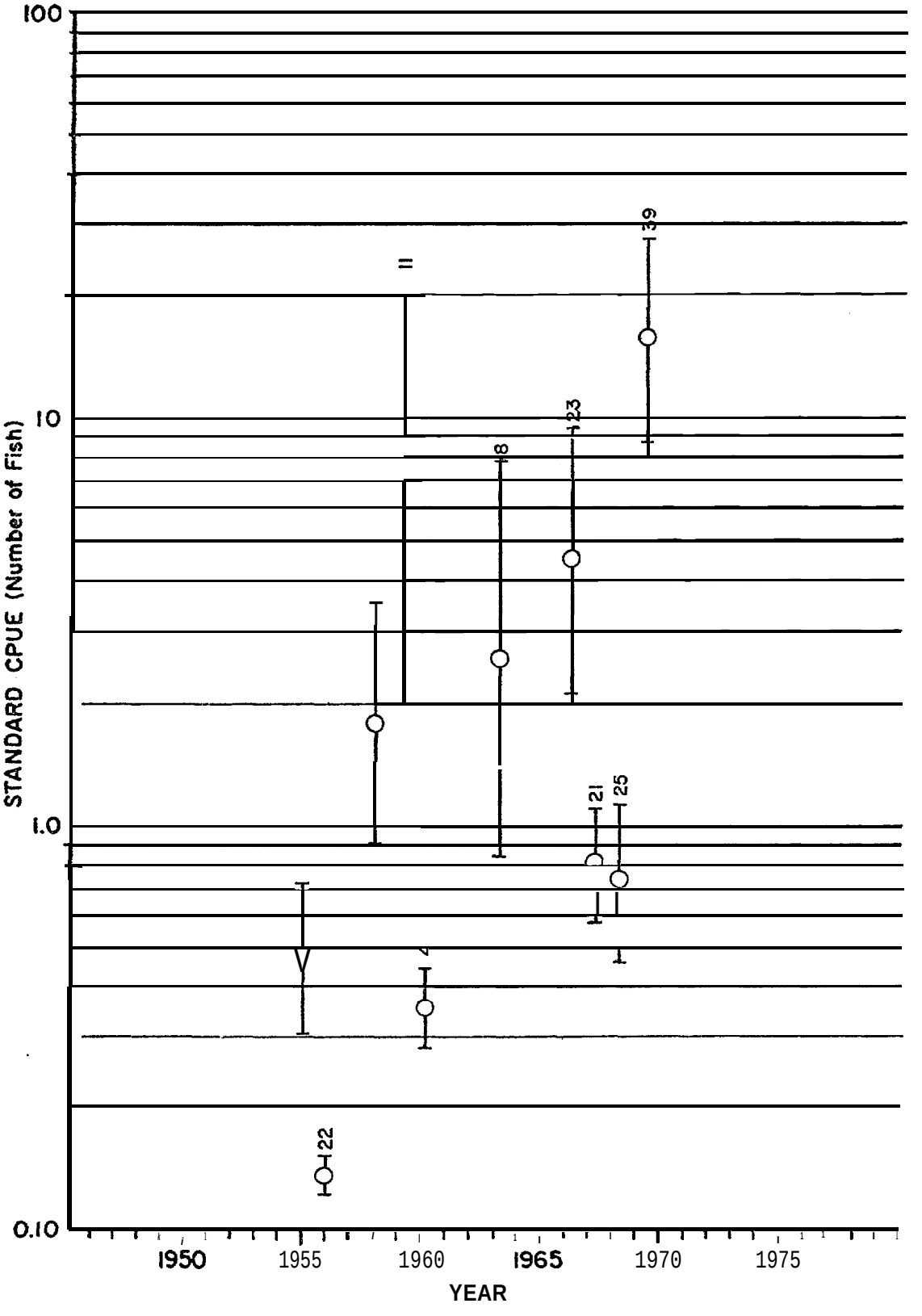


Figure IV.A.25.--Standardized rate of catch (geometric mean: number/0.2 hr with 90% confidence interval and number of observations) of all pelagic species combined in the eastern Bering Sea by plankton net.

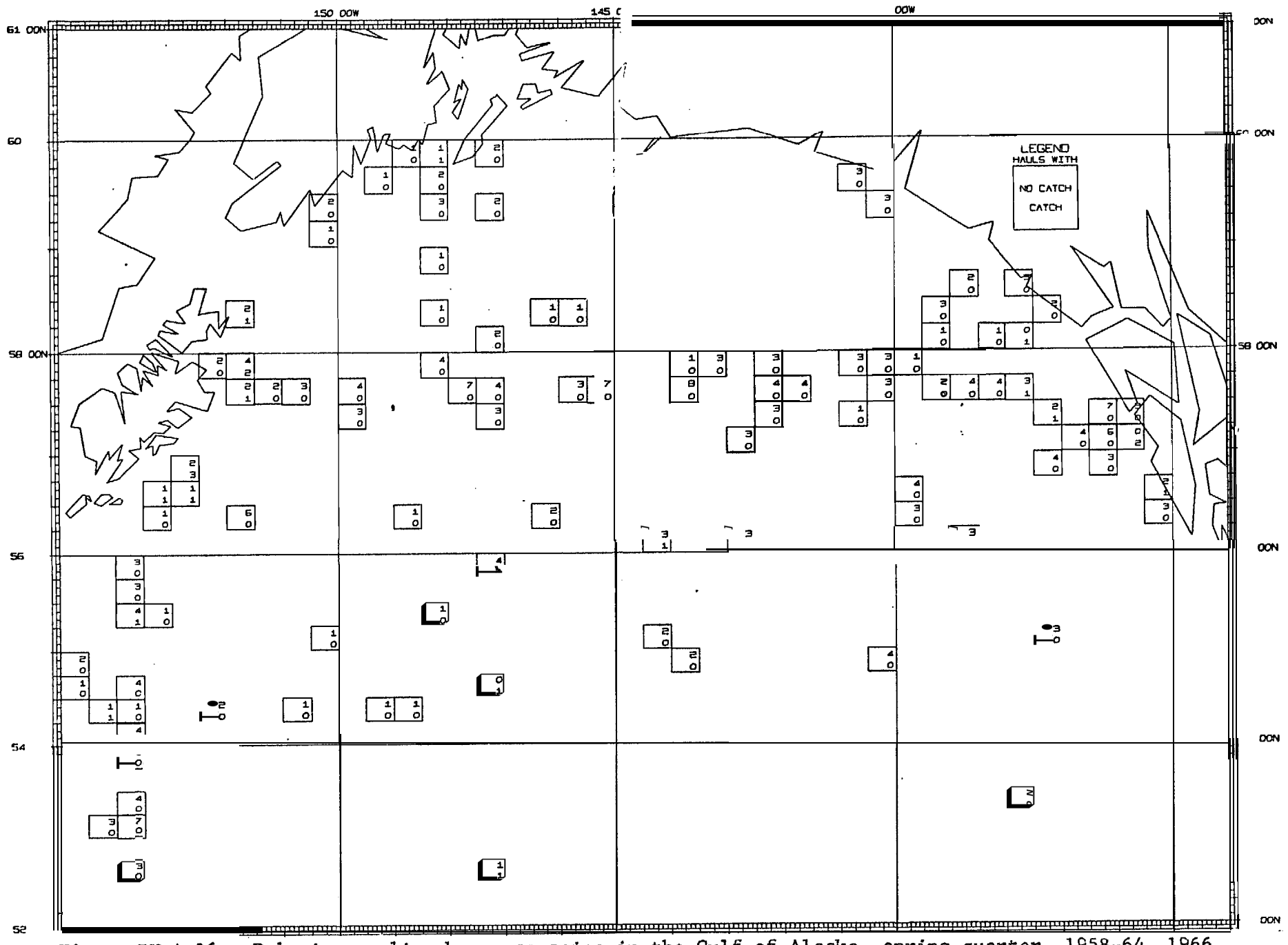


Figure IV.A.26.--Pelagic sampling by purse seine in the Gulf of Alaska, spring quarter, 1958-64, 1966.

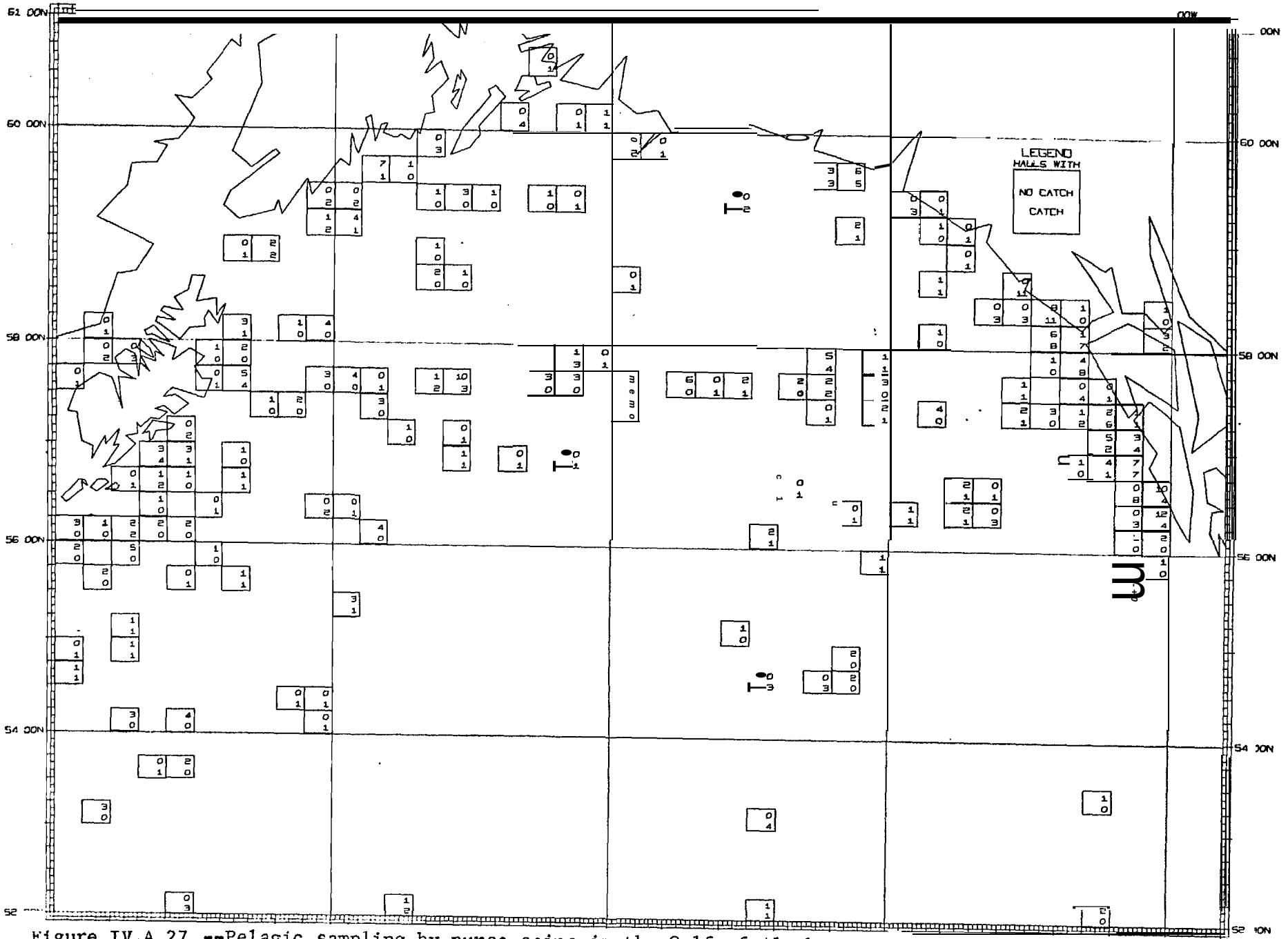


Figure IV.A.27.--Pelagic sampling by purse seine in the Gulf of Alaska, summer quarter, 1956-59, 1961-68.

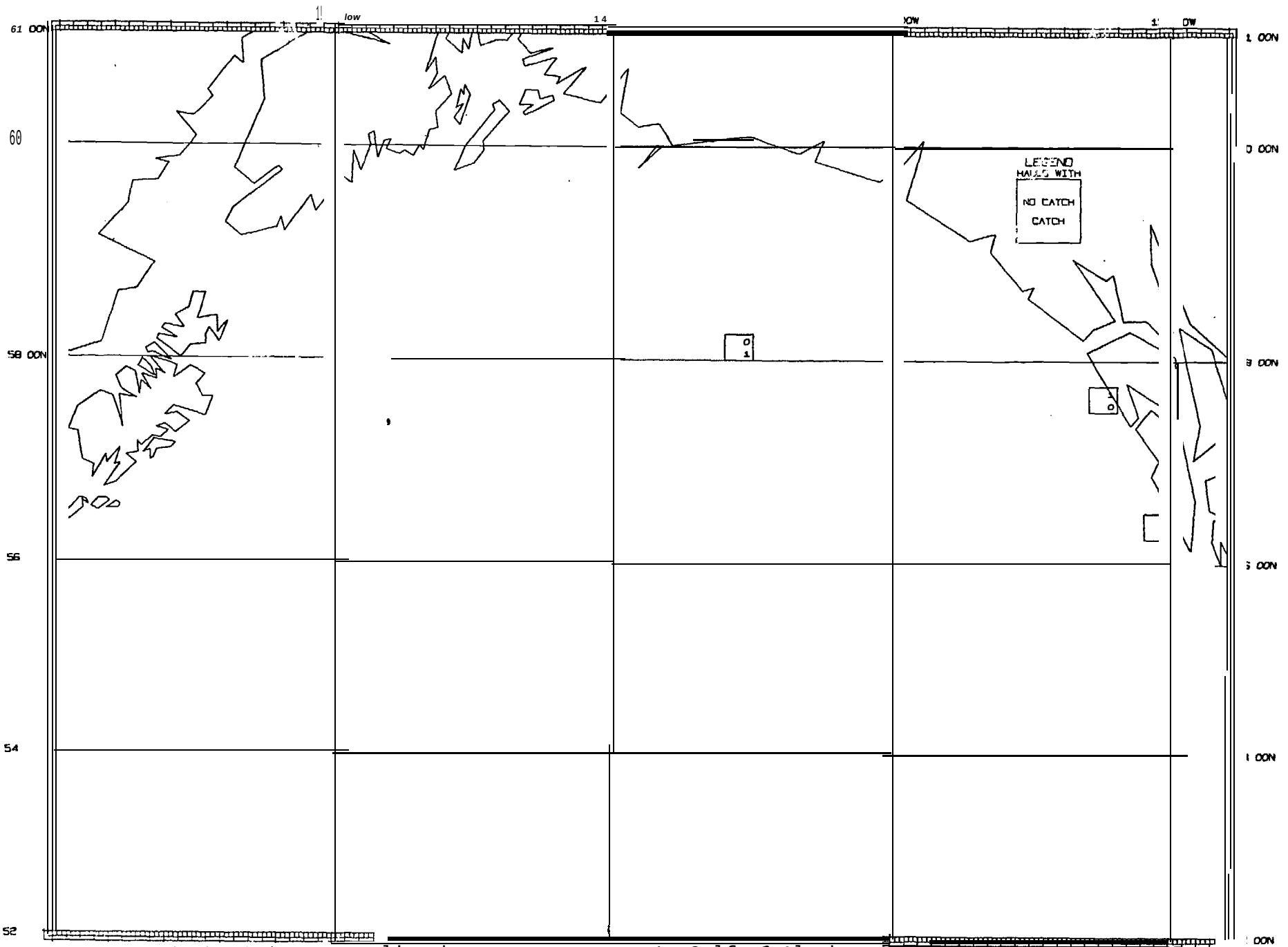


Figure IV.A.28.--Pelagic sampling by purse seine in the Gulf of Alaska, autumn quarter, 1959, 1967.

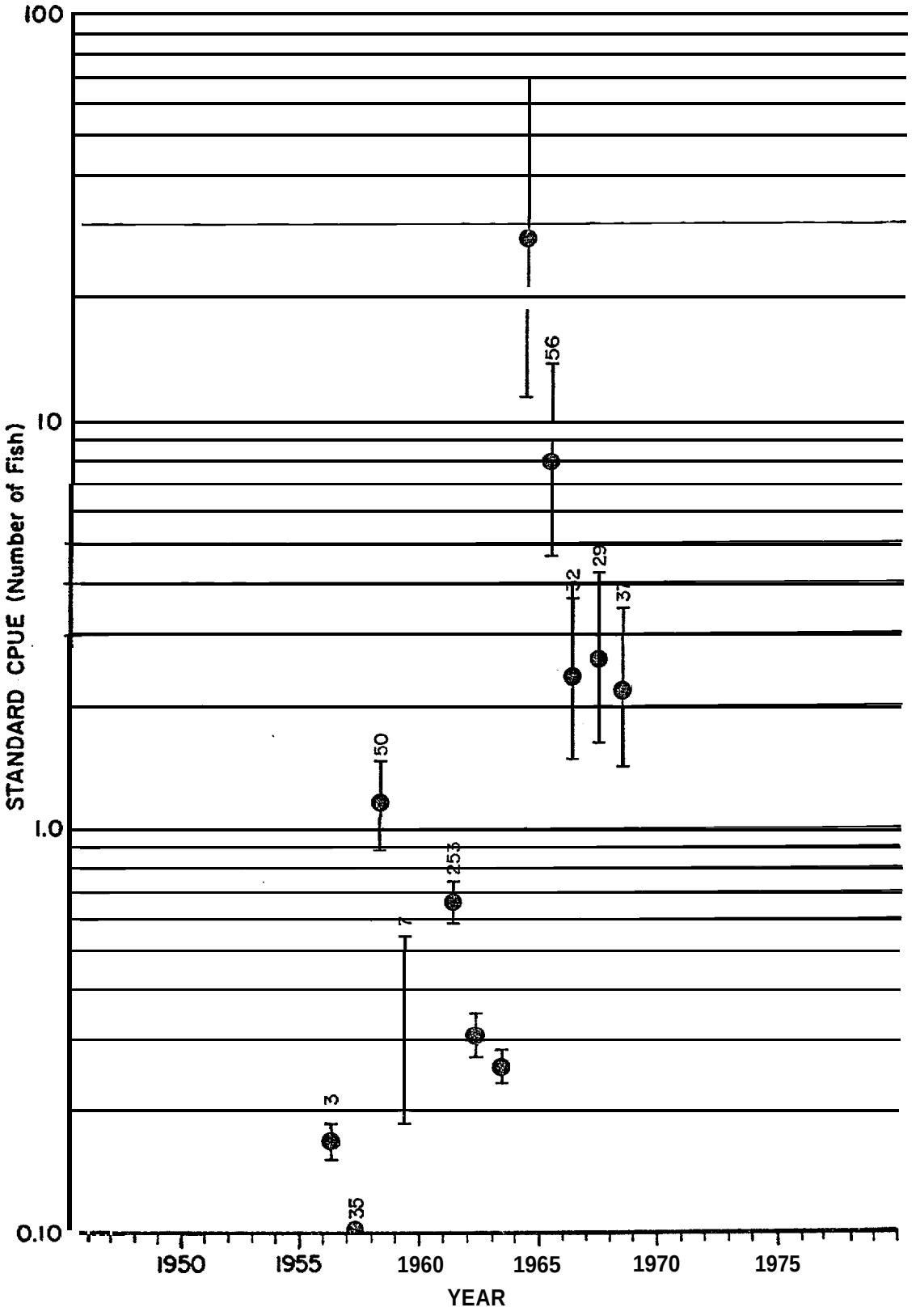


Figure IV.A.29.--Standardized rate of catch (geometric mean: number/0.5 hr with 90% confidence interval and number of observations) of all pelagic species combined in the Gulf of Alaska by purse seine.

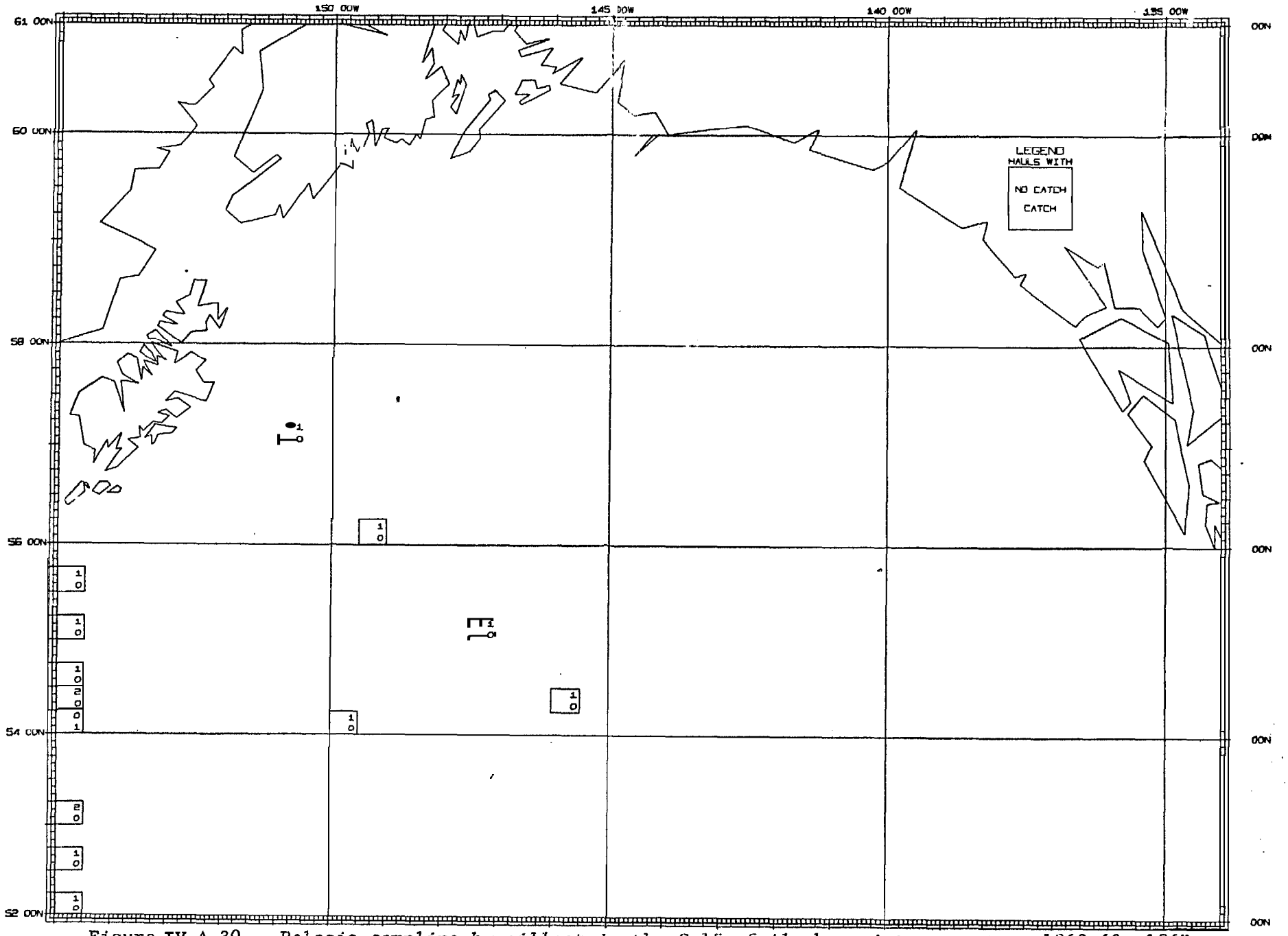


Figure IV.A.30.--Pelagic sampling by gillnet in the Gulf of Alaska, winter quarter, 1962-63, 1967, 1969-70.

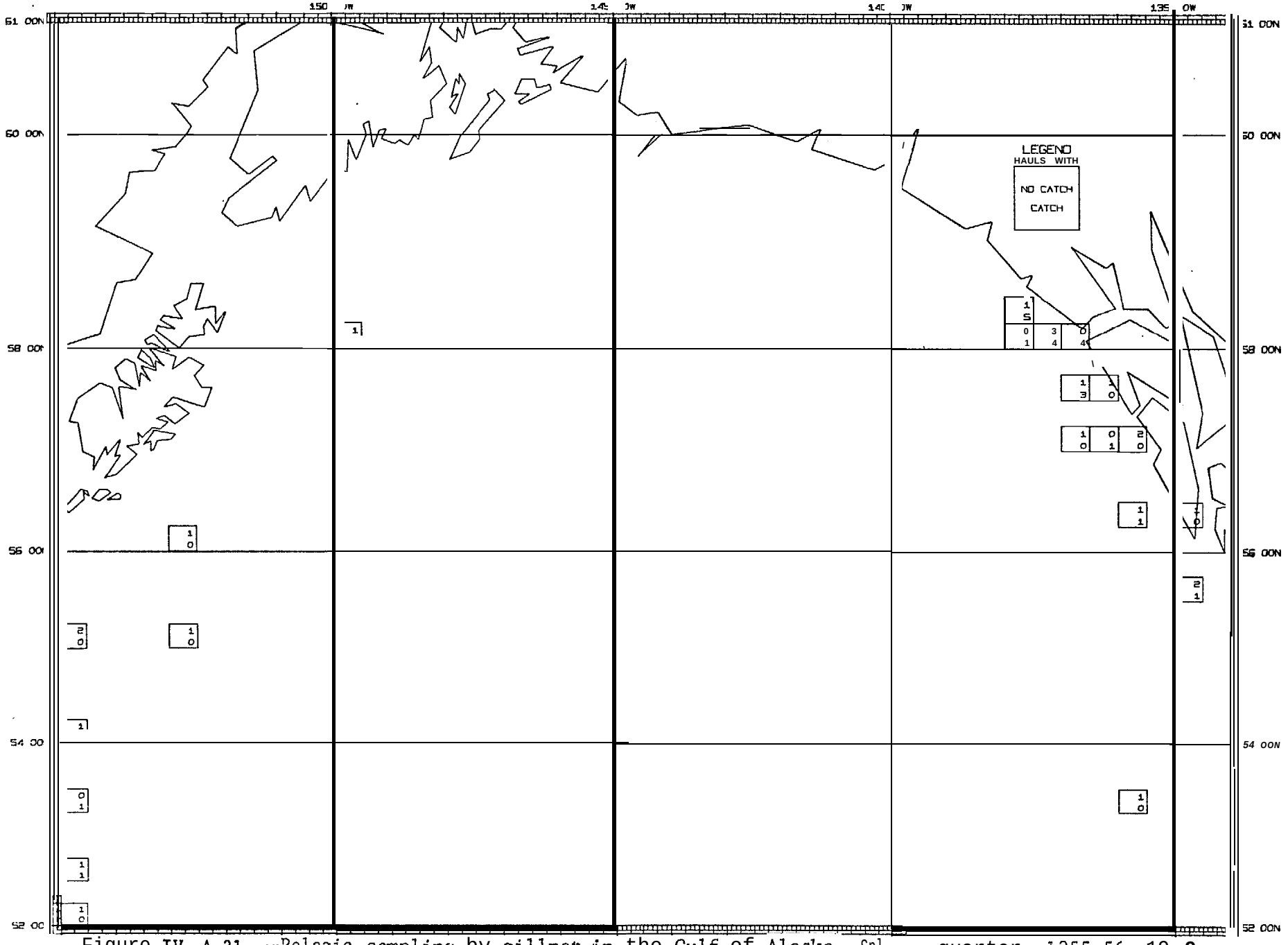


Figure IV. A.31. --Pelagic sampling by gillnet in the Gulf of Alaska, Spl ng quarter, 1955-56, 19 9, 1961, 1967-69, 1971.

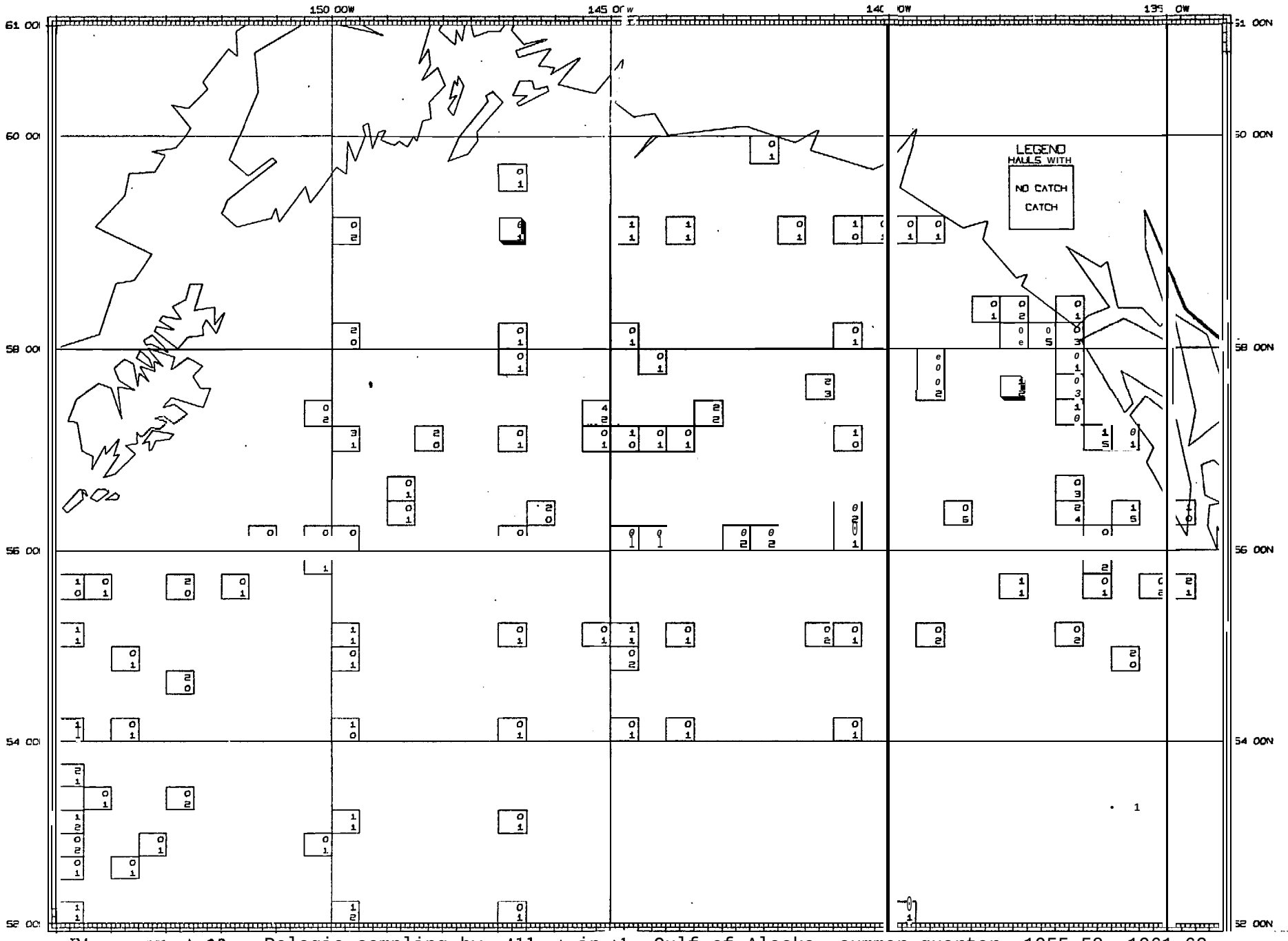


Figure IV. A.32.--Pelagic sampling by gillnet in the Gulf of Alaska, summer quarter, 1955-58, 1961-62, 1967-68, 1970-71,

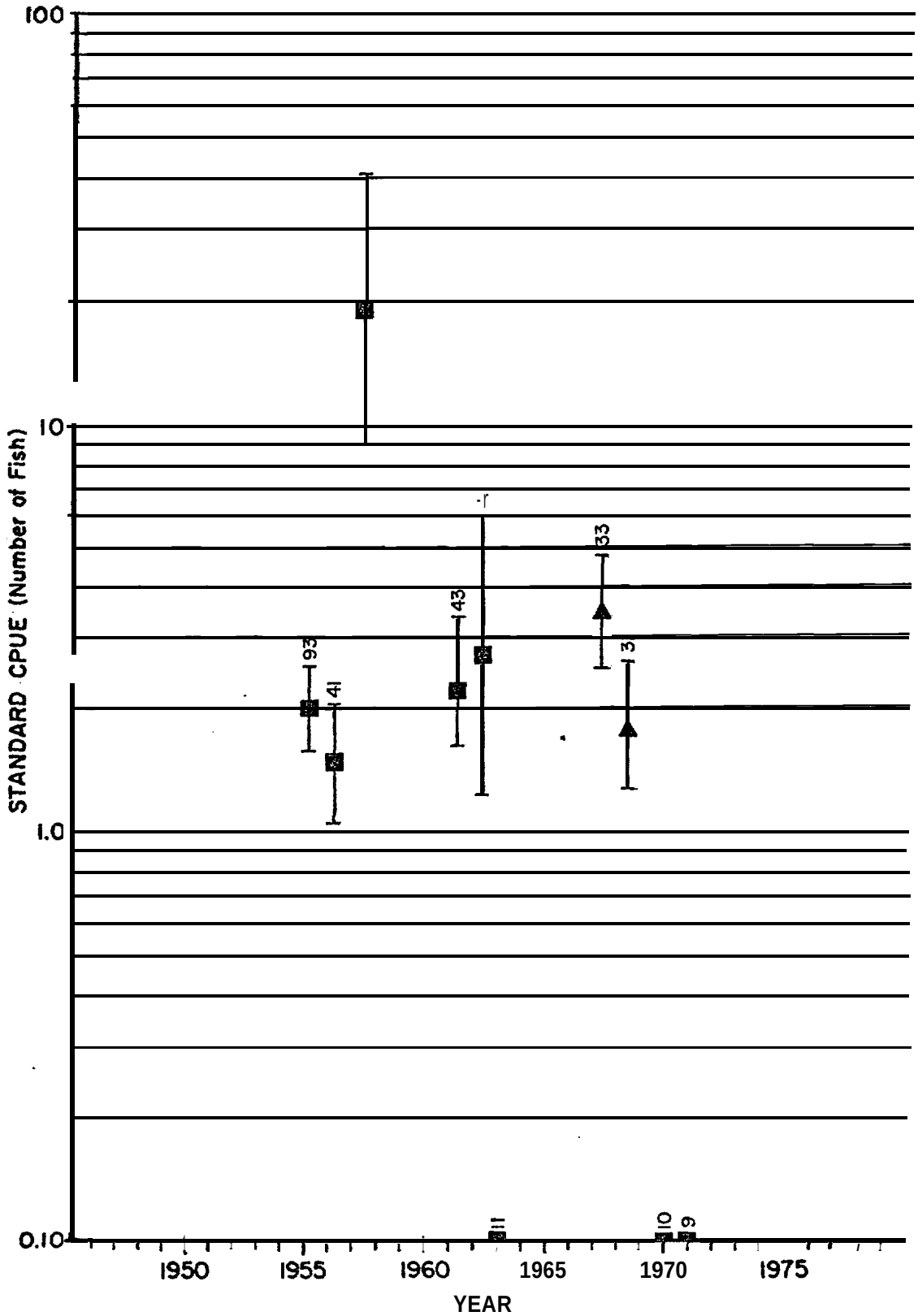


Figure IV.A.33.--Standardized rate of catch (geometric mean: number/12 hr/1 km net with 90% confidence interval and number of observations) of all pelagic species combined in the Gulf of Alaska by gillnets.

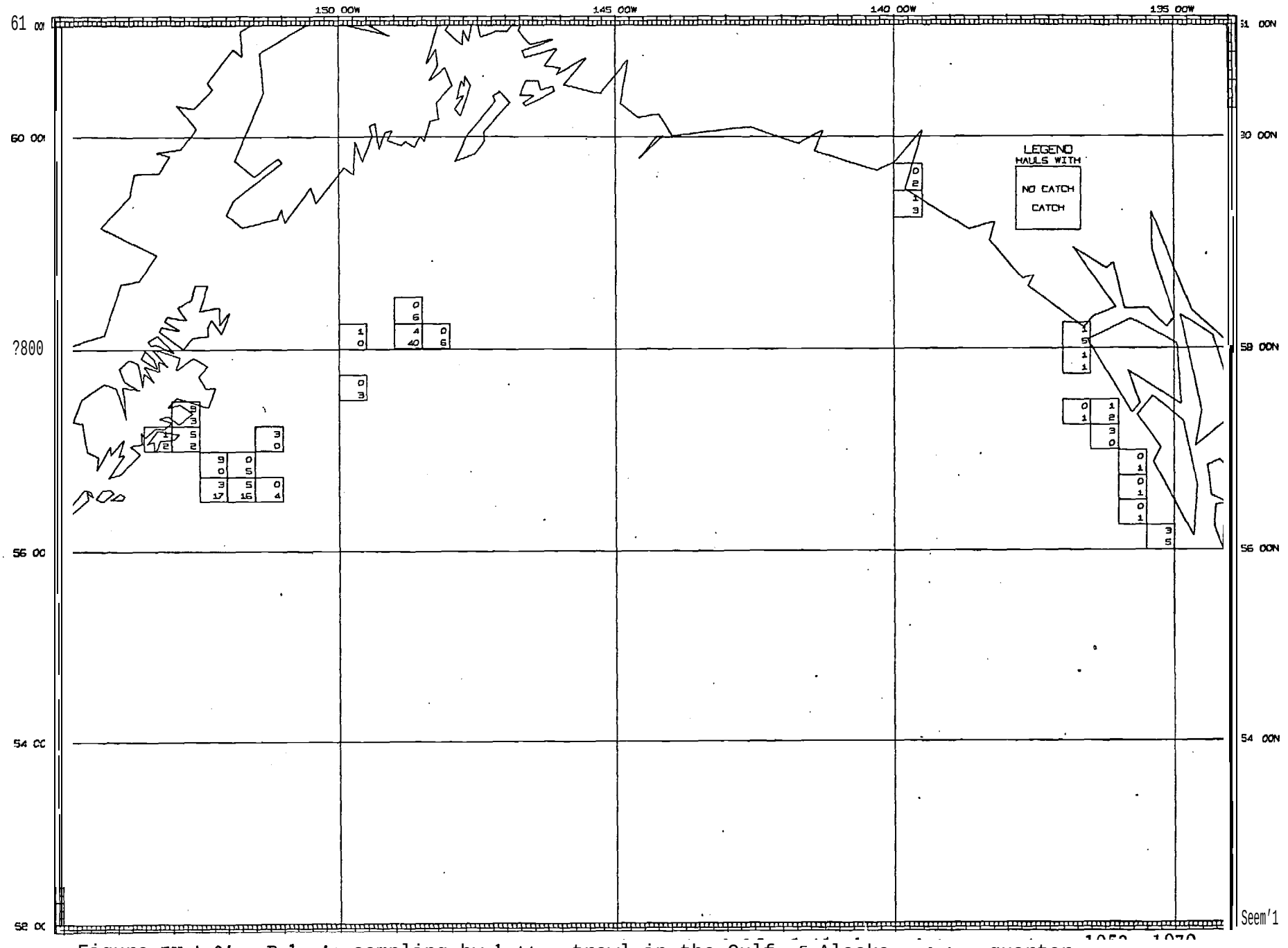
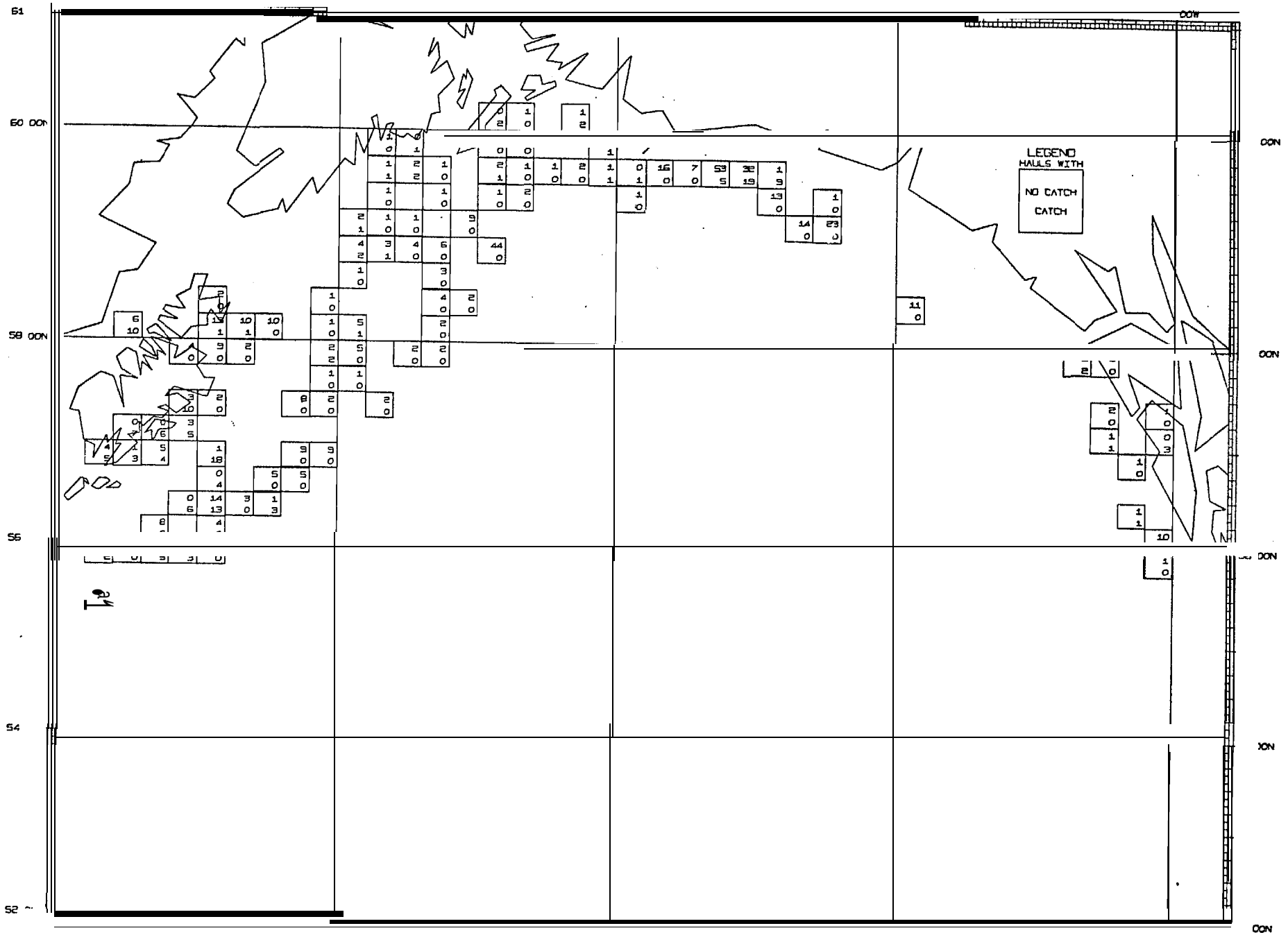


Figure IV.A.34.--Pelagic sampling by bottom trawl in the Gulf of Alaska, winter quarter, 1953, 1970, 1975-76.



1969-70, 1975.

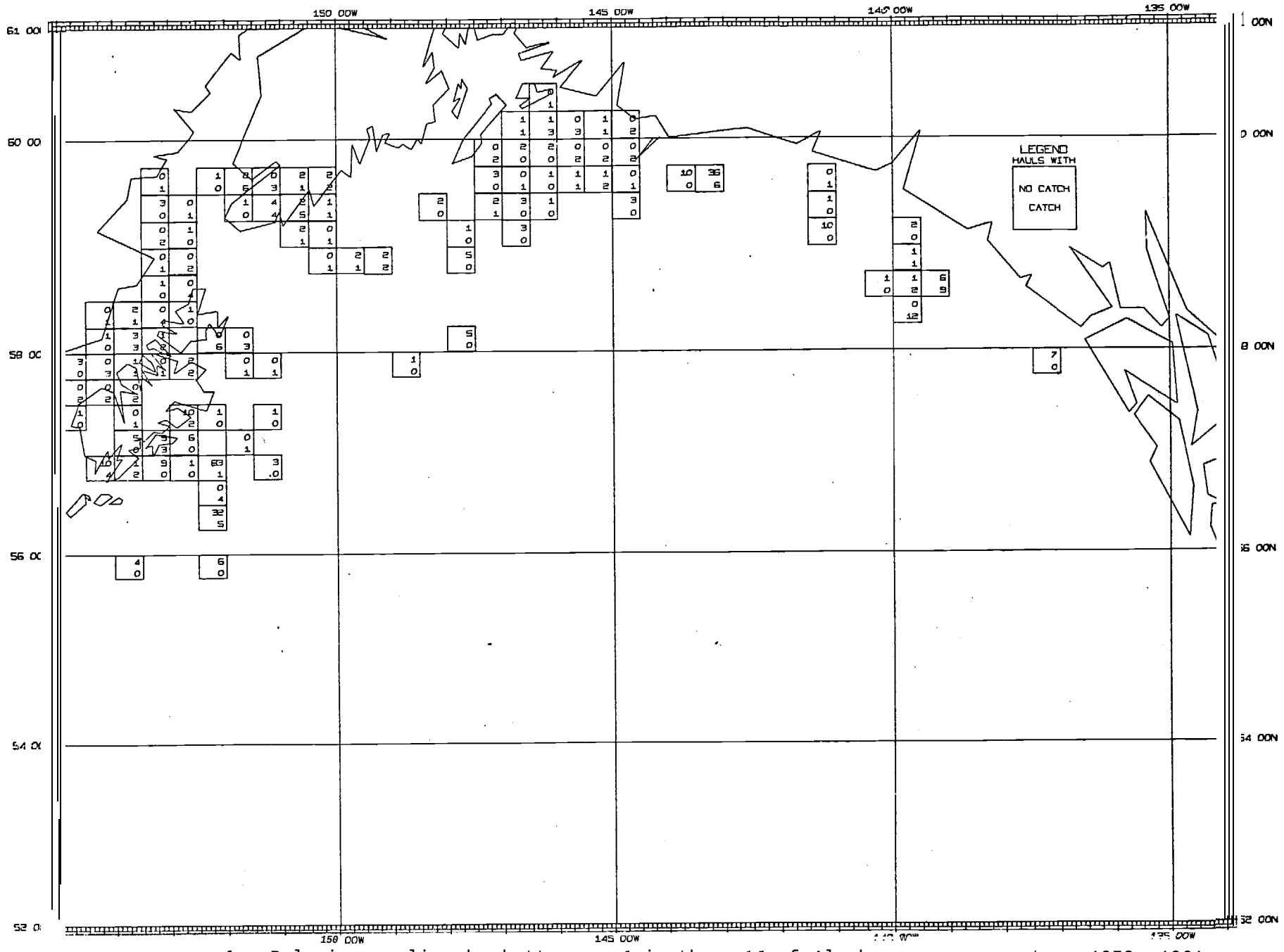


Figure IV.A.36.--Pelagic sampling by bottom trawl in the Gulf of Alaska, summer quarter, 1958, 1961, 1964, 1968, 1970, 1975.

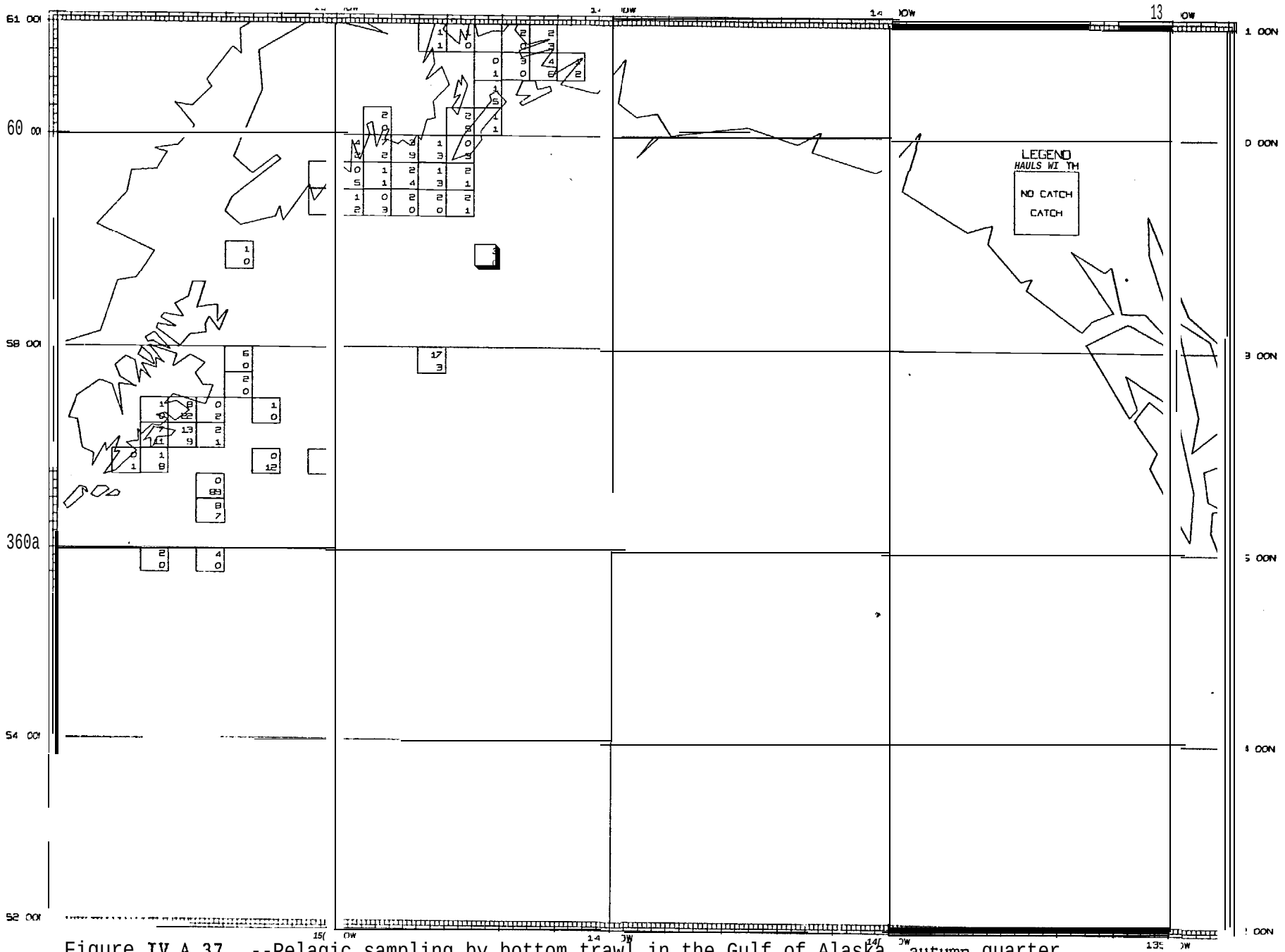


Figure IV.A.37. --Pelagic sampling by bottom trawl in the Gulf of Alaska, autumn quarter, 1948, 1959, 1961, 1964, 1974-75.

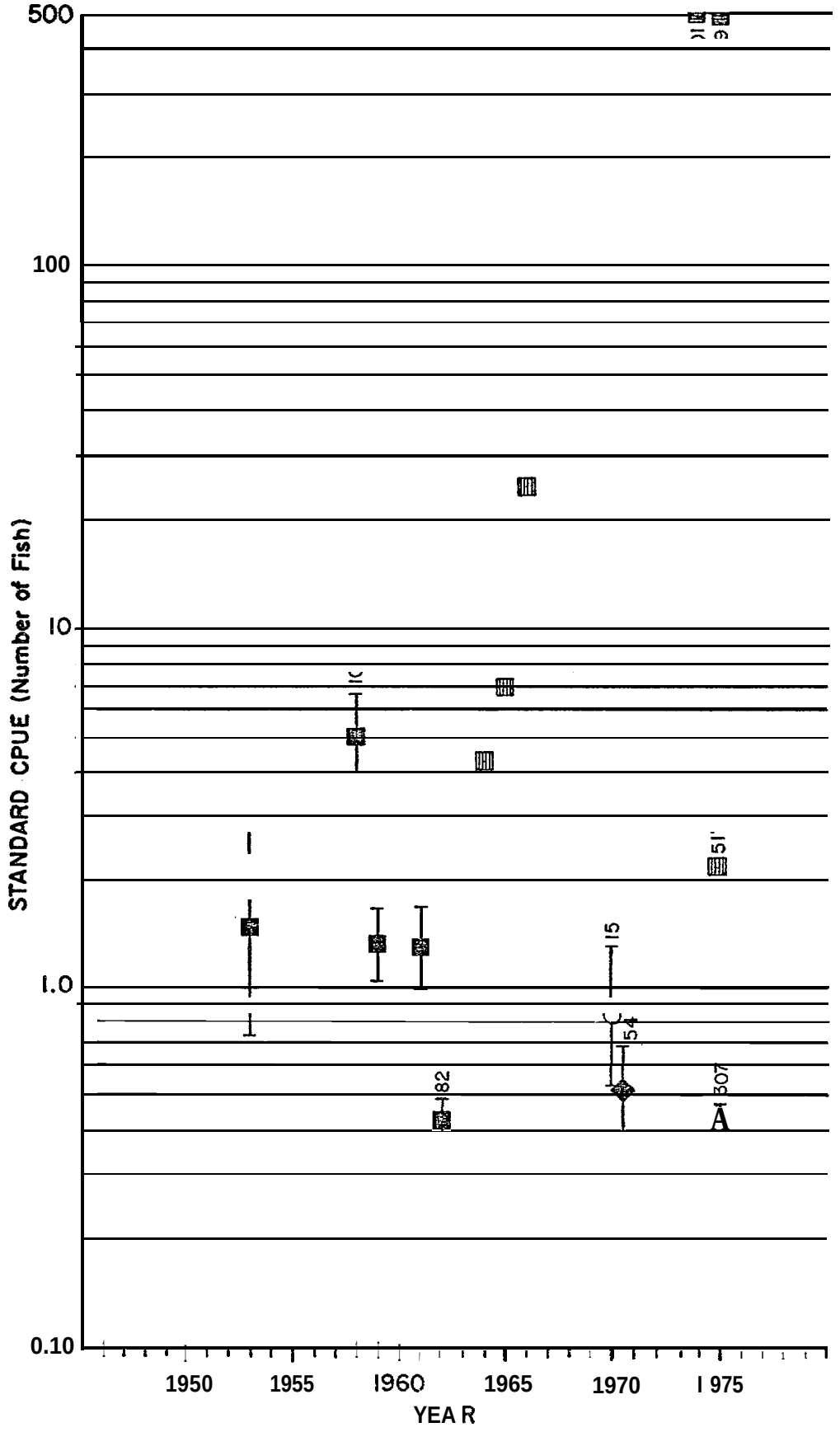


Figure IV. A.38.--Standardized rate of catch (geometric mean: number/0.5 hr with 90% confidence interval and number of observations) of all pelagic species combined in the Gulf of Alaska by bottom trawl.

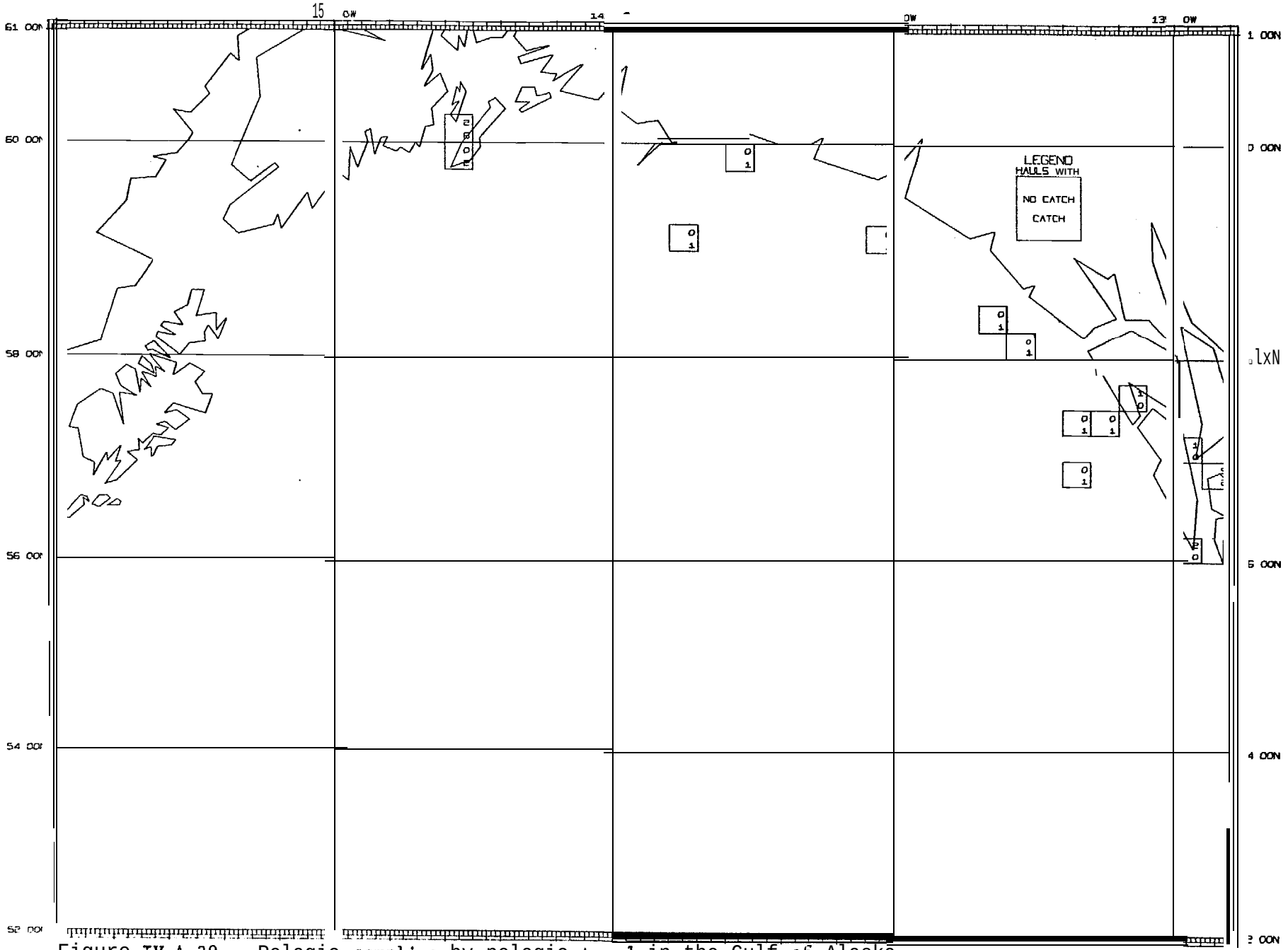


Figure IV.A.39.--Pelagic sampling by pelagic trawl in the Gulf of Alaska, summer quarter, 1957, 1961.

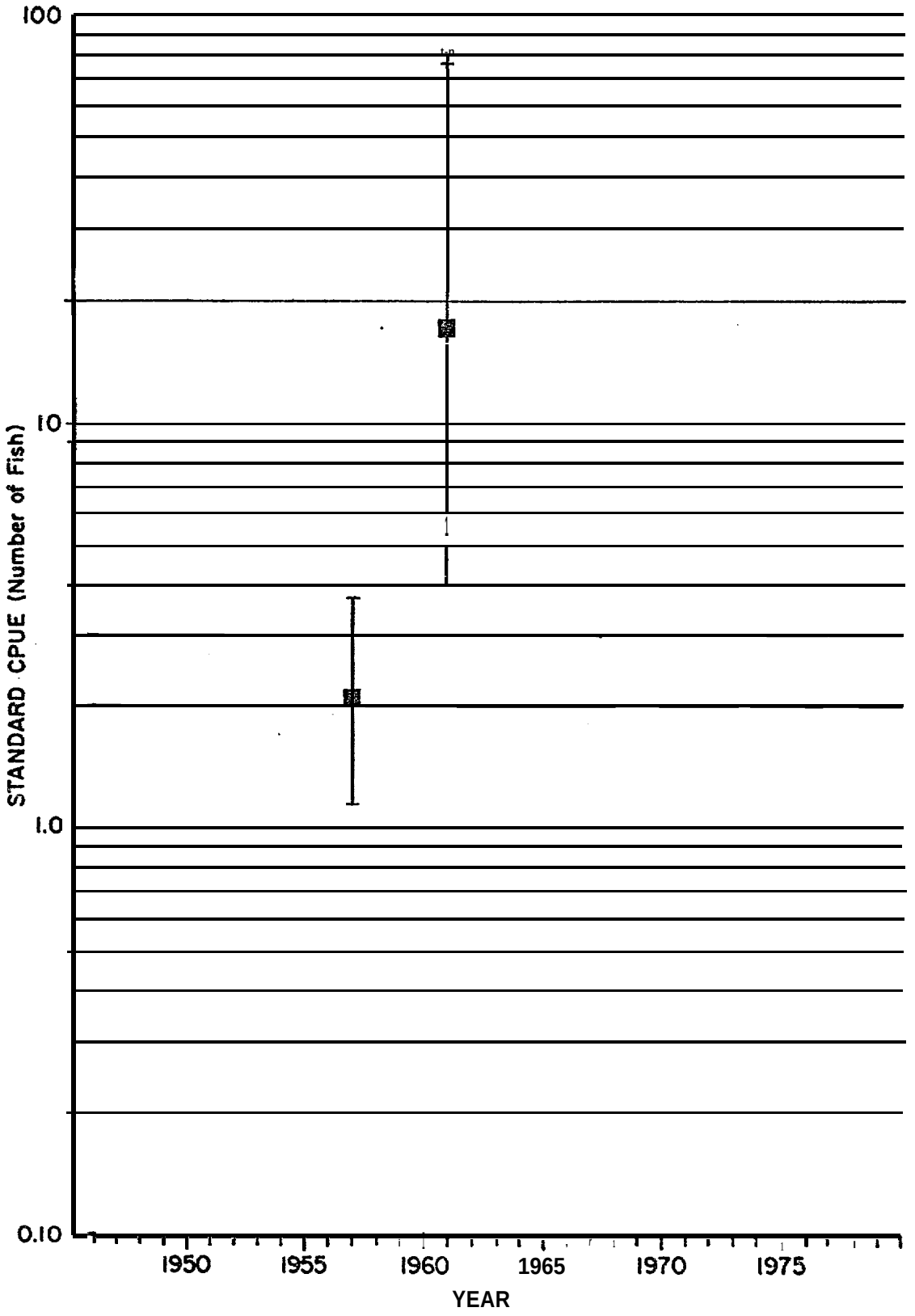


Figure IV. A.40.--Standardized rate of catch (geometric mean: number/0.5 hr with confidence interval and number of observations) of all pelagic species combined in the Gulf of Alaska by pelagic trawl.

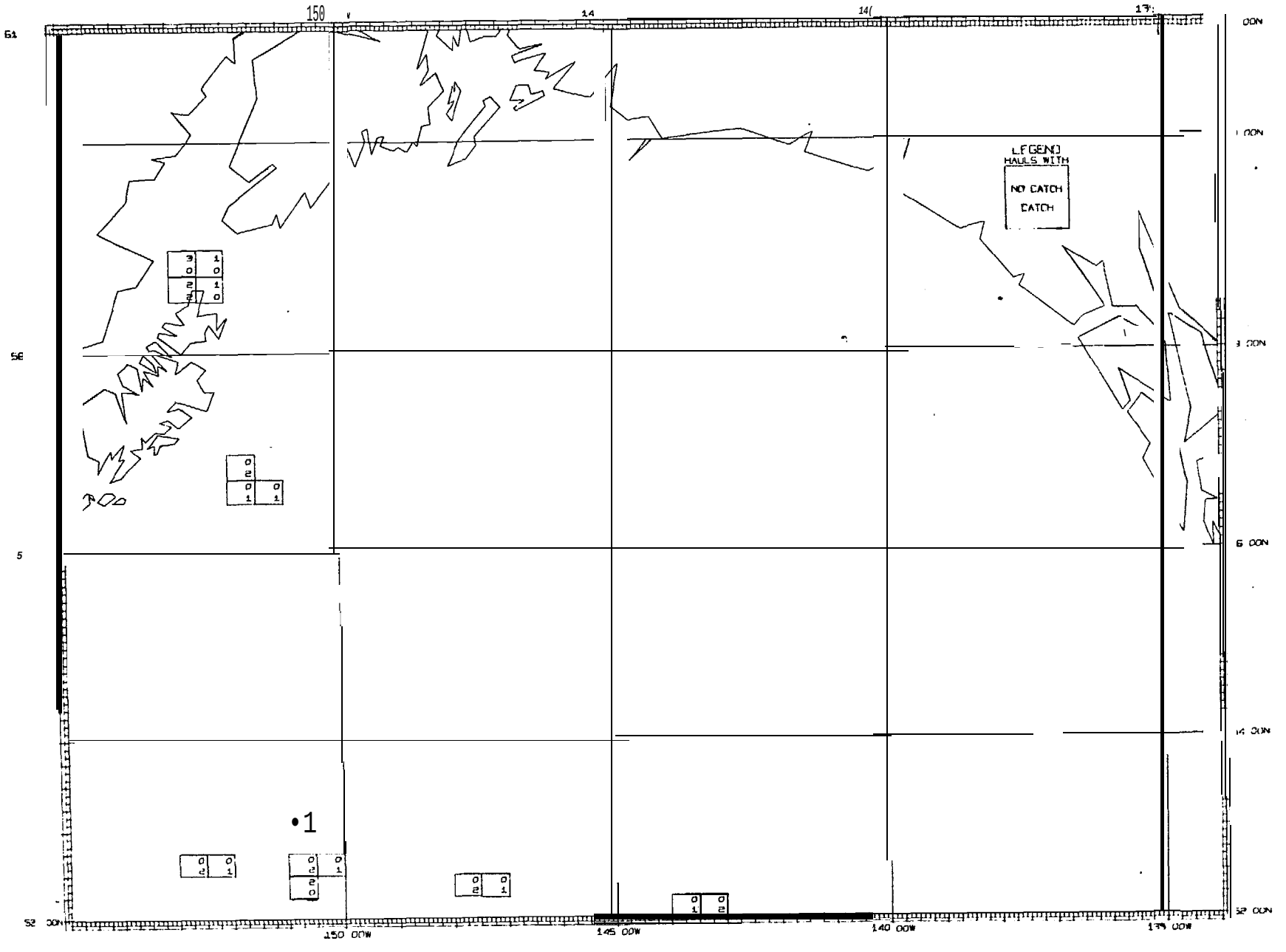


Figure IV.A.41. -pelagic sampling by Isaacs-Kidd trawl in the Gulf of Alaska, summer quarter, 1957.

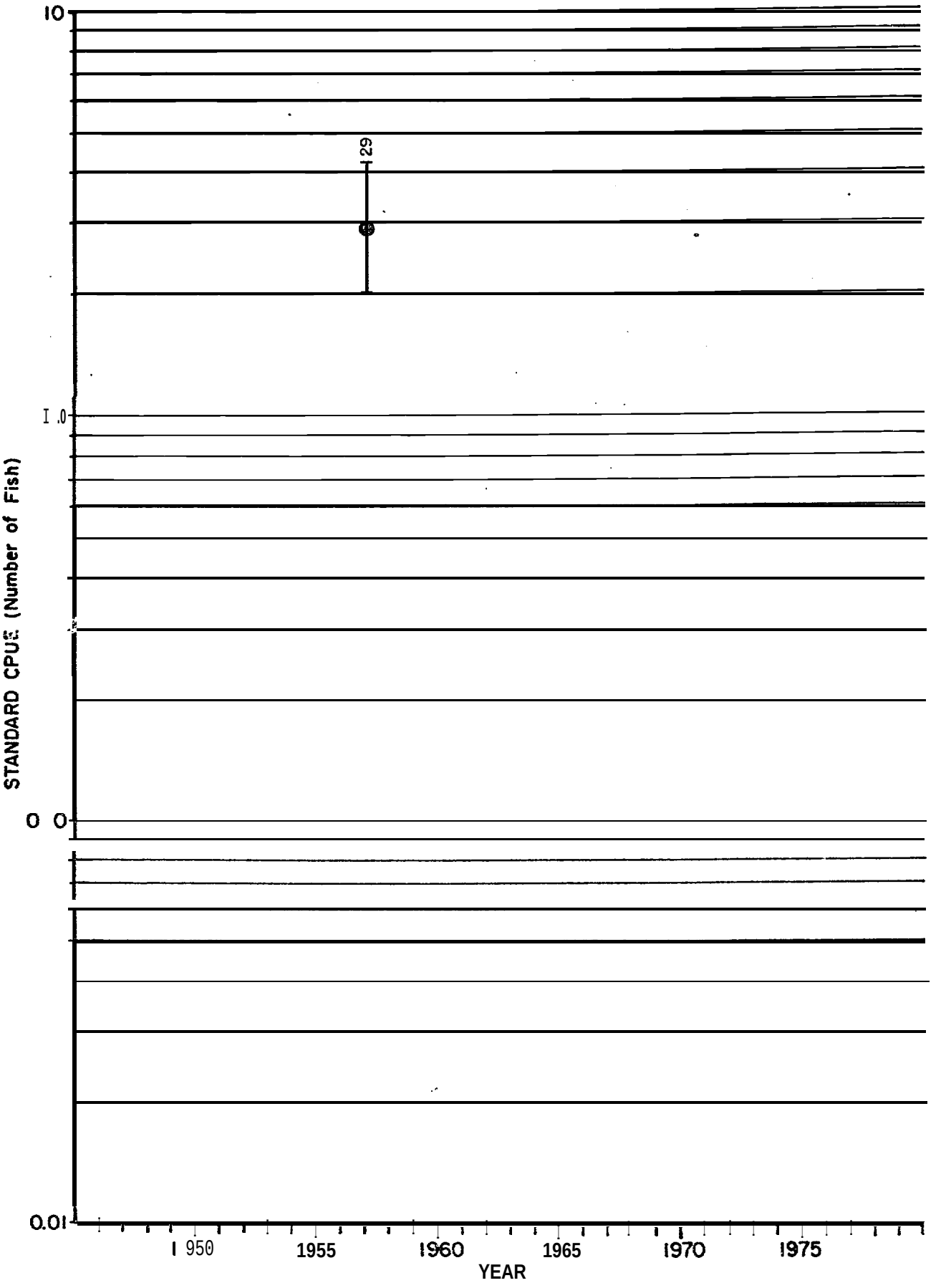


Figure IV.A.42.--Standardized rate of catch (geometric mean: number/0.5 hr with 90% confidence interval and number of observations) of all pelagic species combined in the Gulf of Alaska by Isaacs-Kidd trawl.

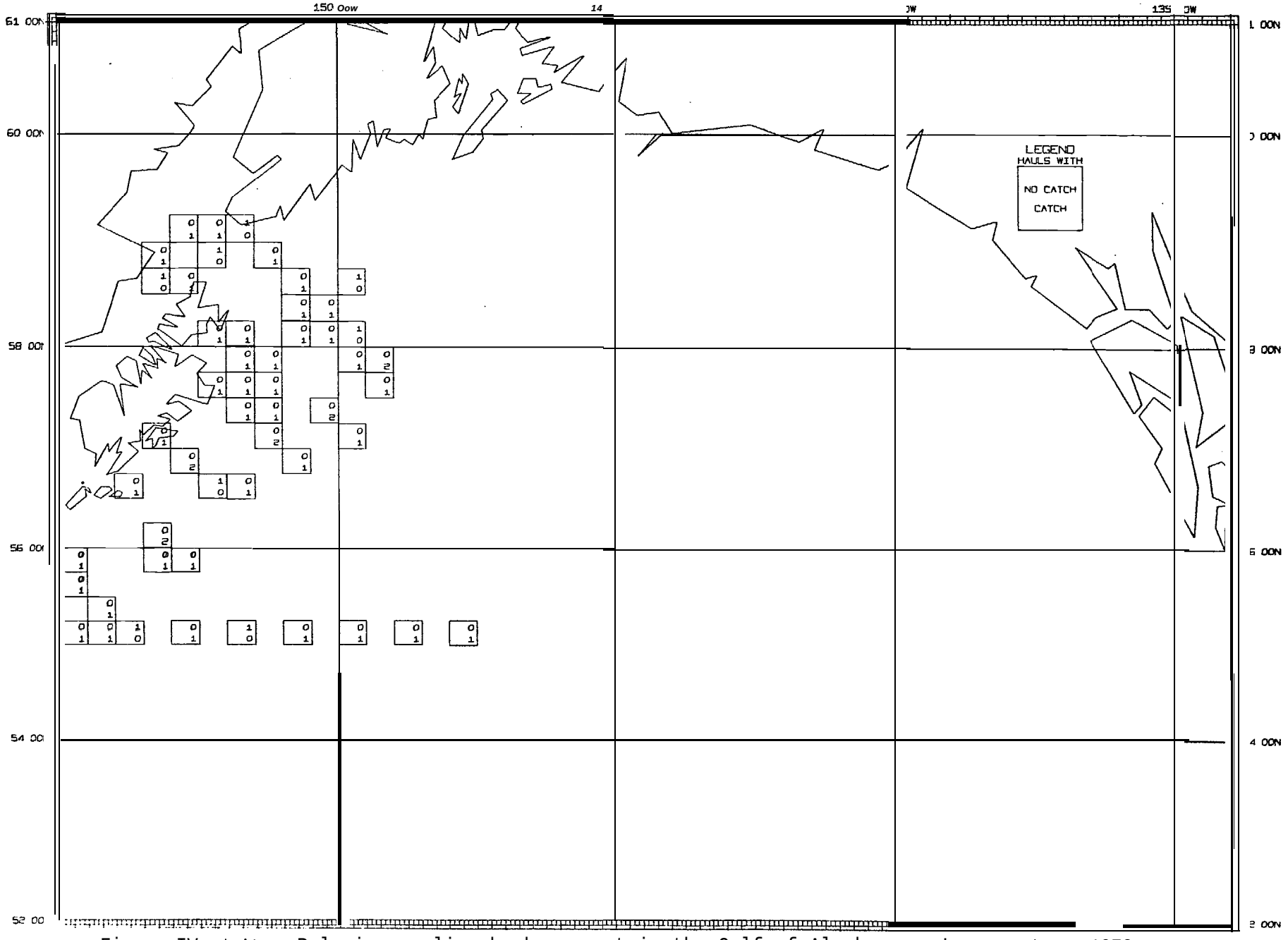


Figure IV. A.43.--Pelagic sampling by bongo net in the Gulf of Alaska, spring quarter, 1972.

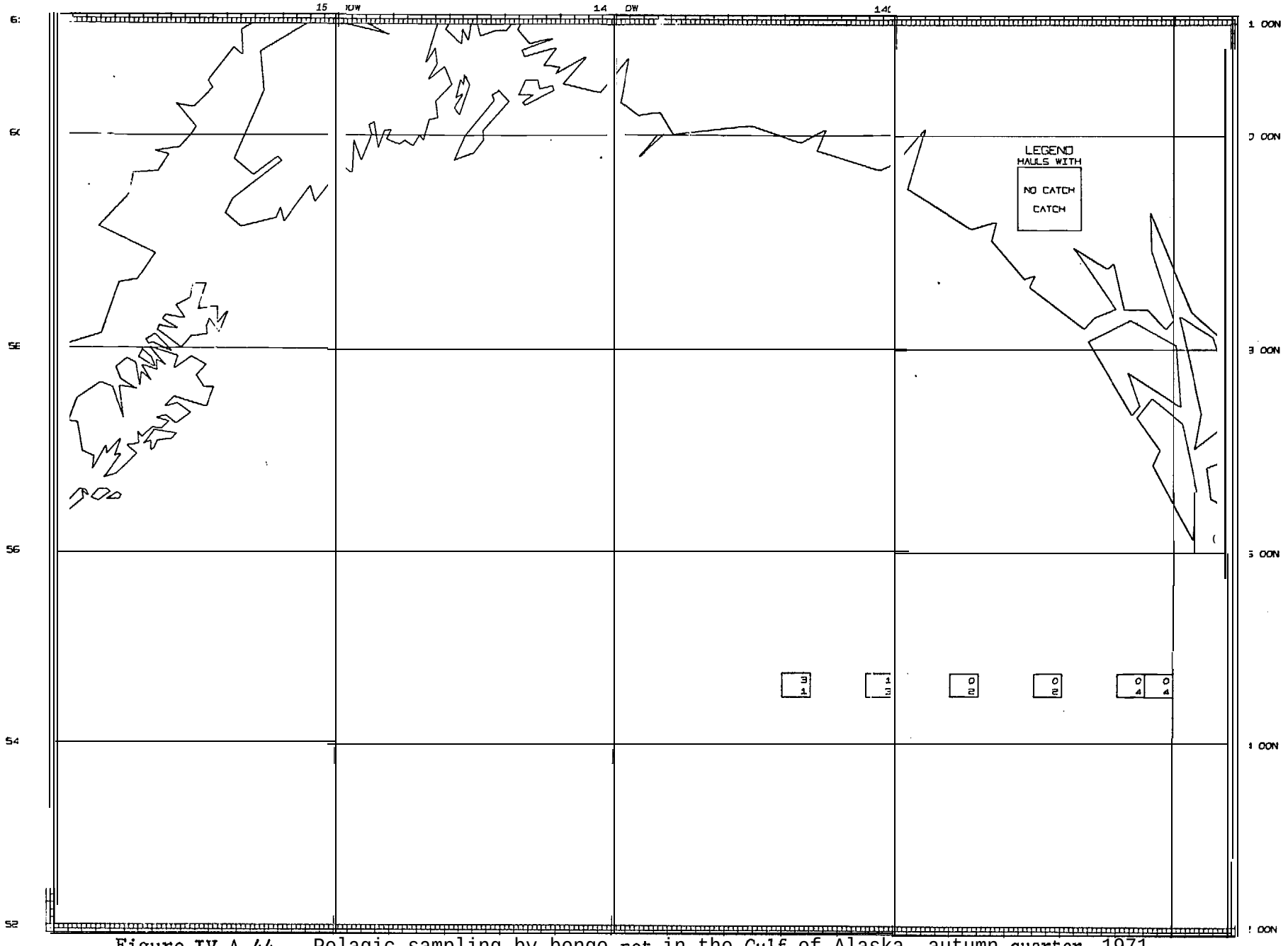


Figure IV.A.44.--Pelagic sampling by bongo net in the Gulf of Alaska, autumn quarter, 1971,

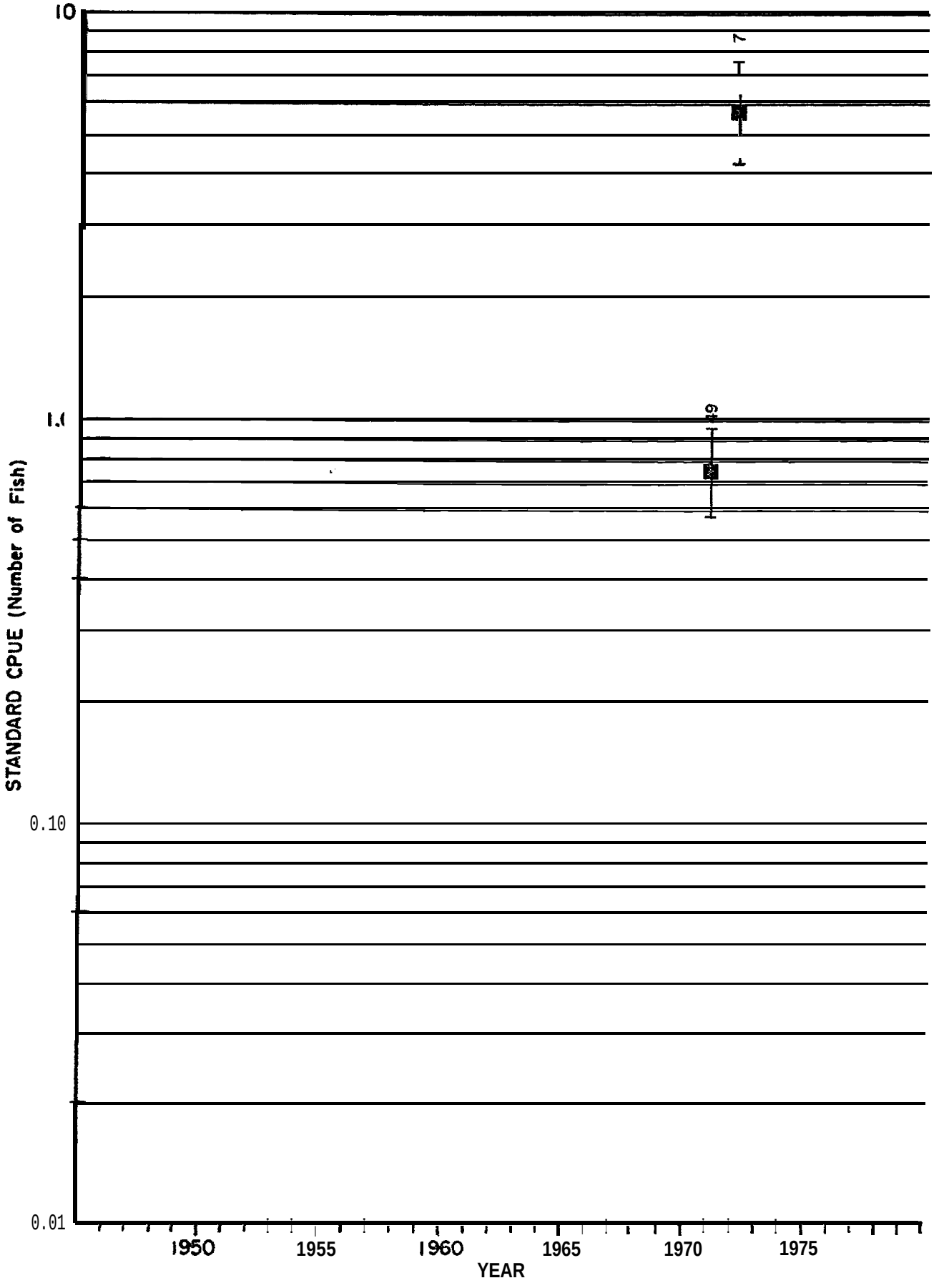


Figure IV. A.45 .--Standardized rate of catch (geometric mean: number/0.5 hr with 90% confidence interval and number of observations) of all pelagic species combined in the Gulf of Alaska by bongo net.

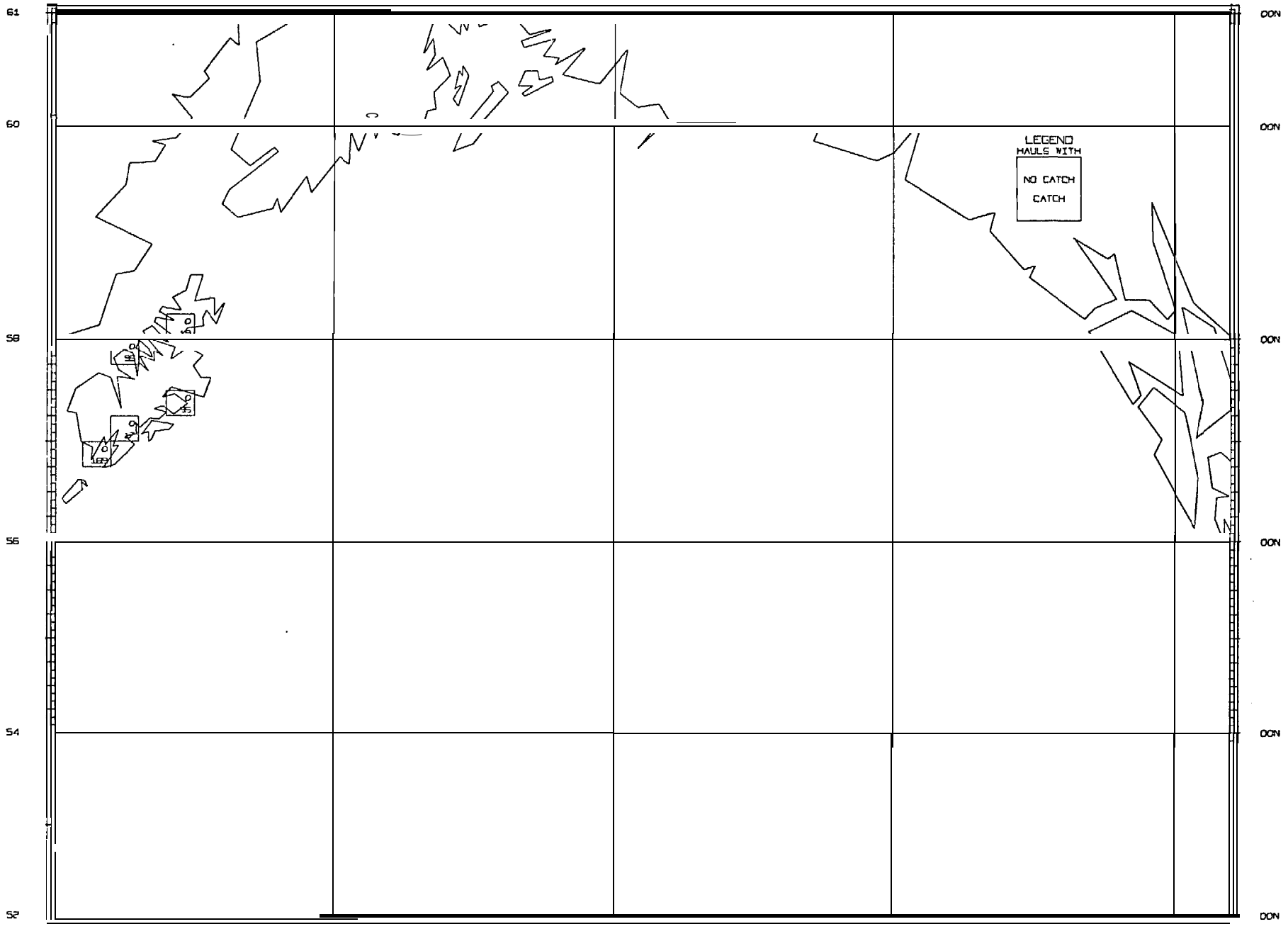


Figure IV.A.46.--Pelagic sampling by townet in the Gulf of Alaska, spring quarter, 1964, 1966-67, 1969-71.

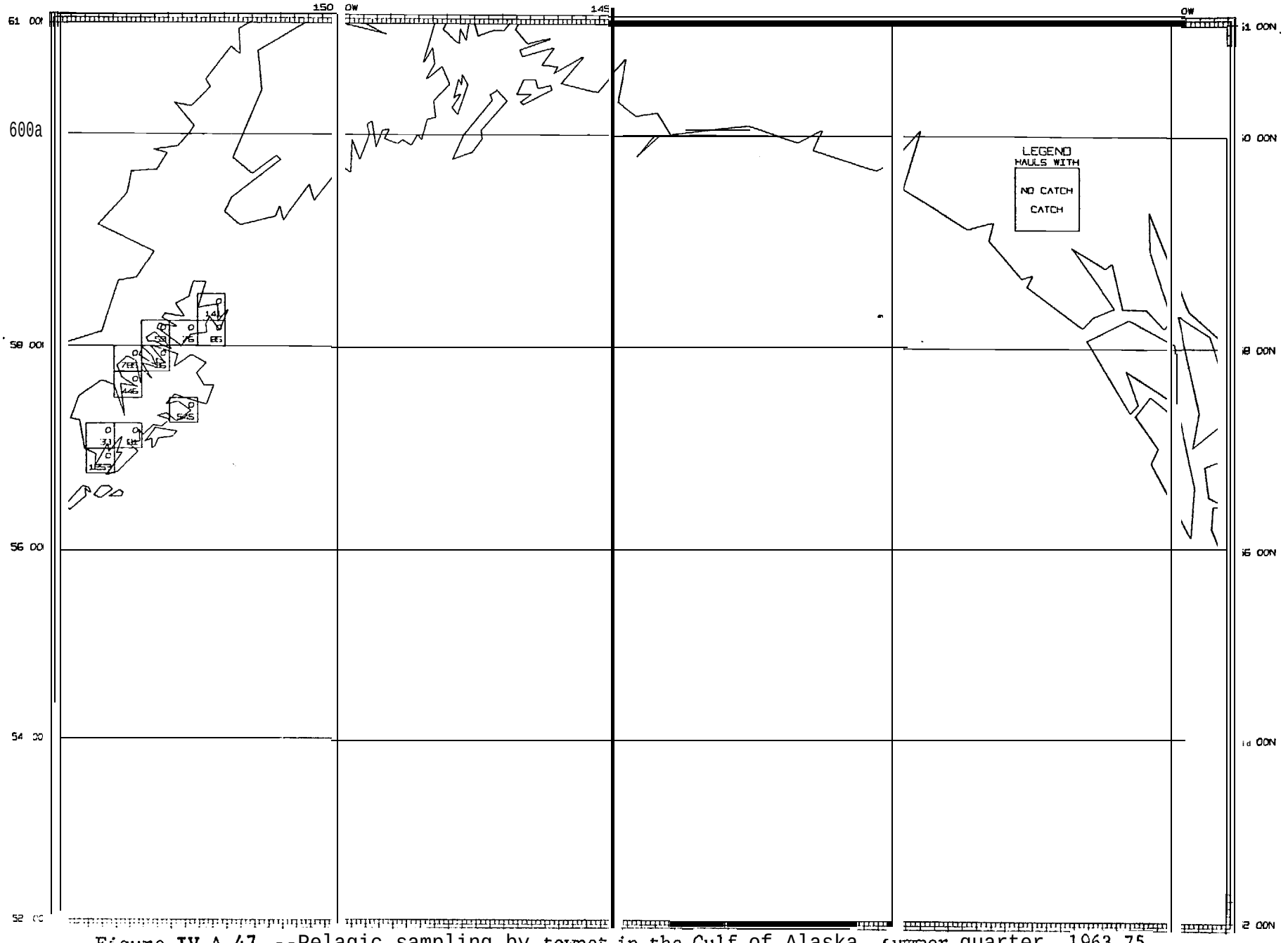


Figure IV.A.47.--Pelagic sampling by townet in the Gulf of Alaska, summer quarter, 1963-75.

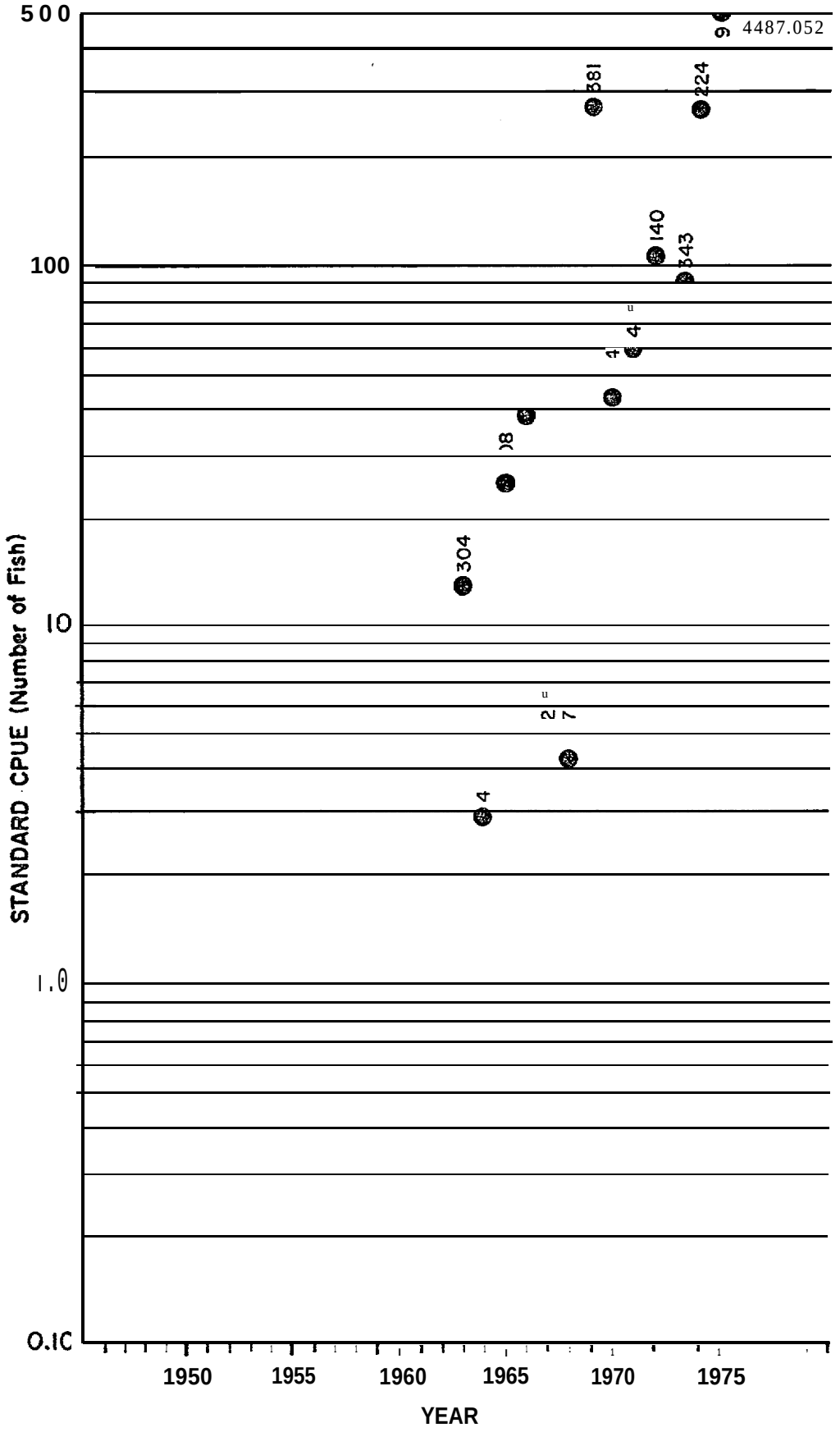


Figure IV. A.48.--Standardized rate of catch (geometric mean: number/0.2 hr with 90% confidence interval and number of observations) of all pelagic species combined in the Gulf of Alaska by townet.

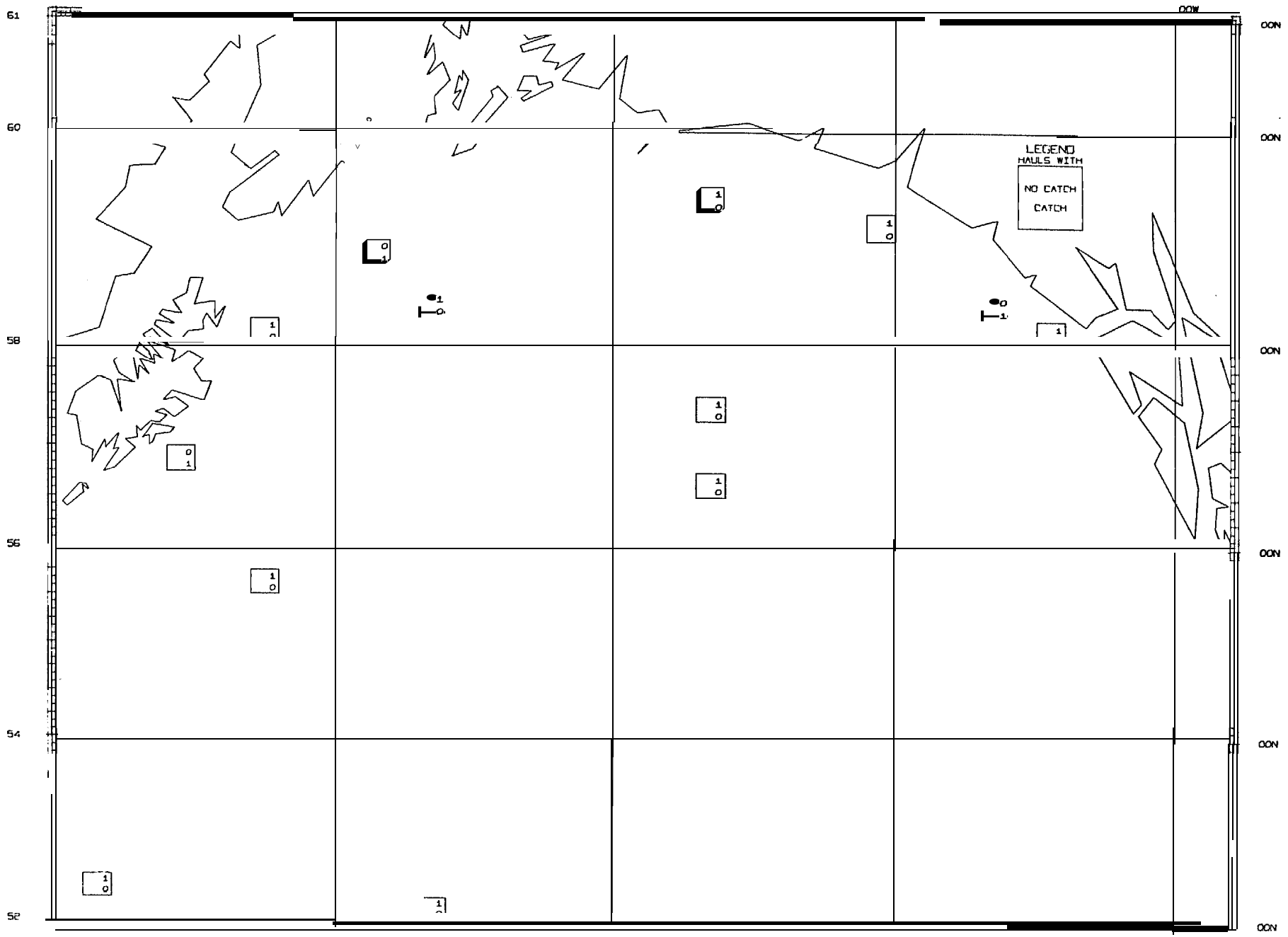


Figure IV.A.49. Ichthyoplankton sampling by plankton net in the Gulf of Alaska, summer quarter, 1955, 1960, 1967-68.

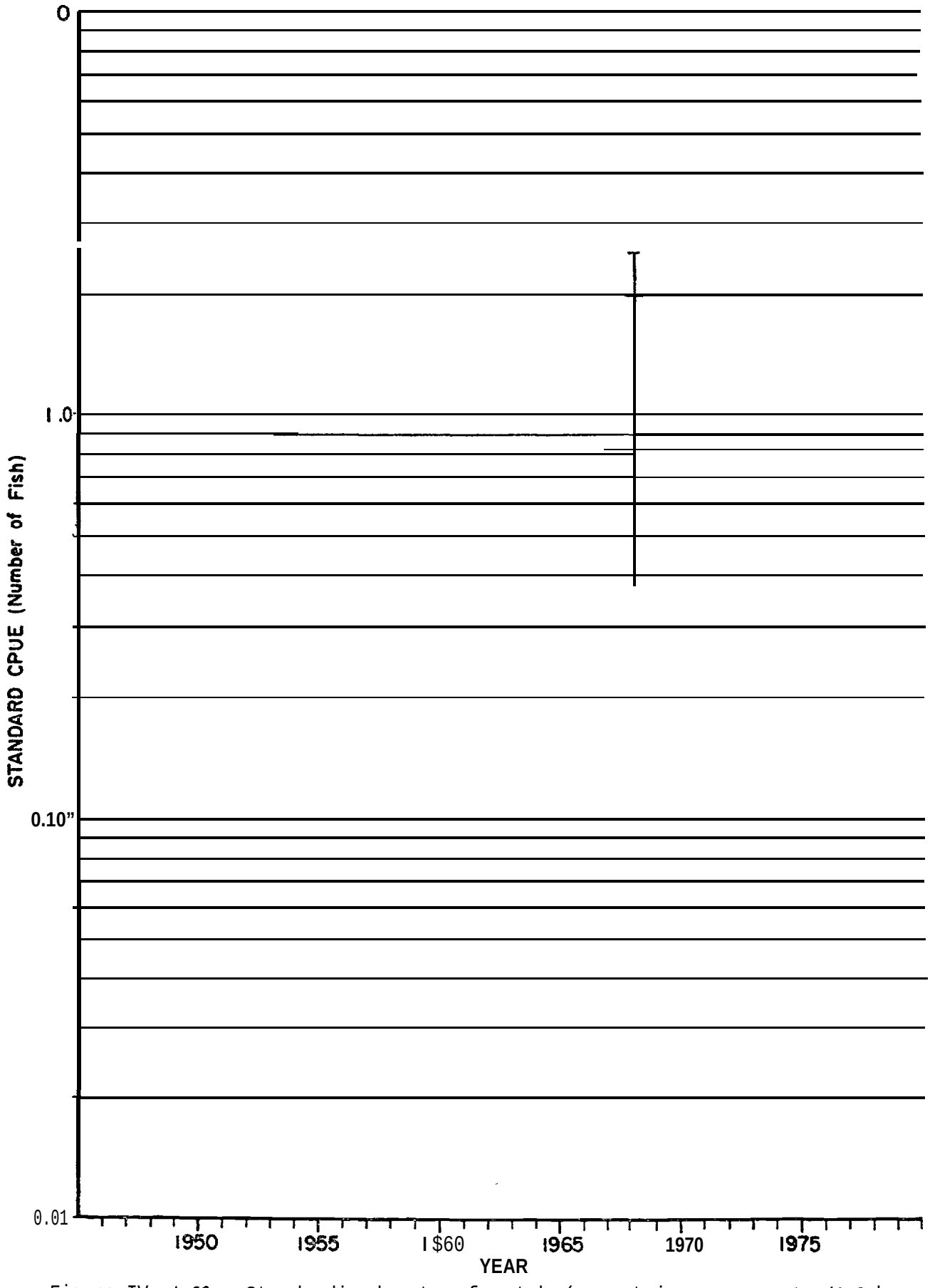


Figure IV. A.50.--Standardized rate of catch (geometric mean: number/0.2 hr with 90% confidence interval and number of observations) of all pelagic species combined in the Gulf of Alaska by plankton net.

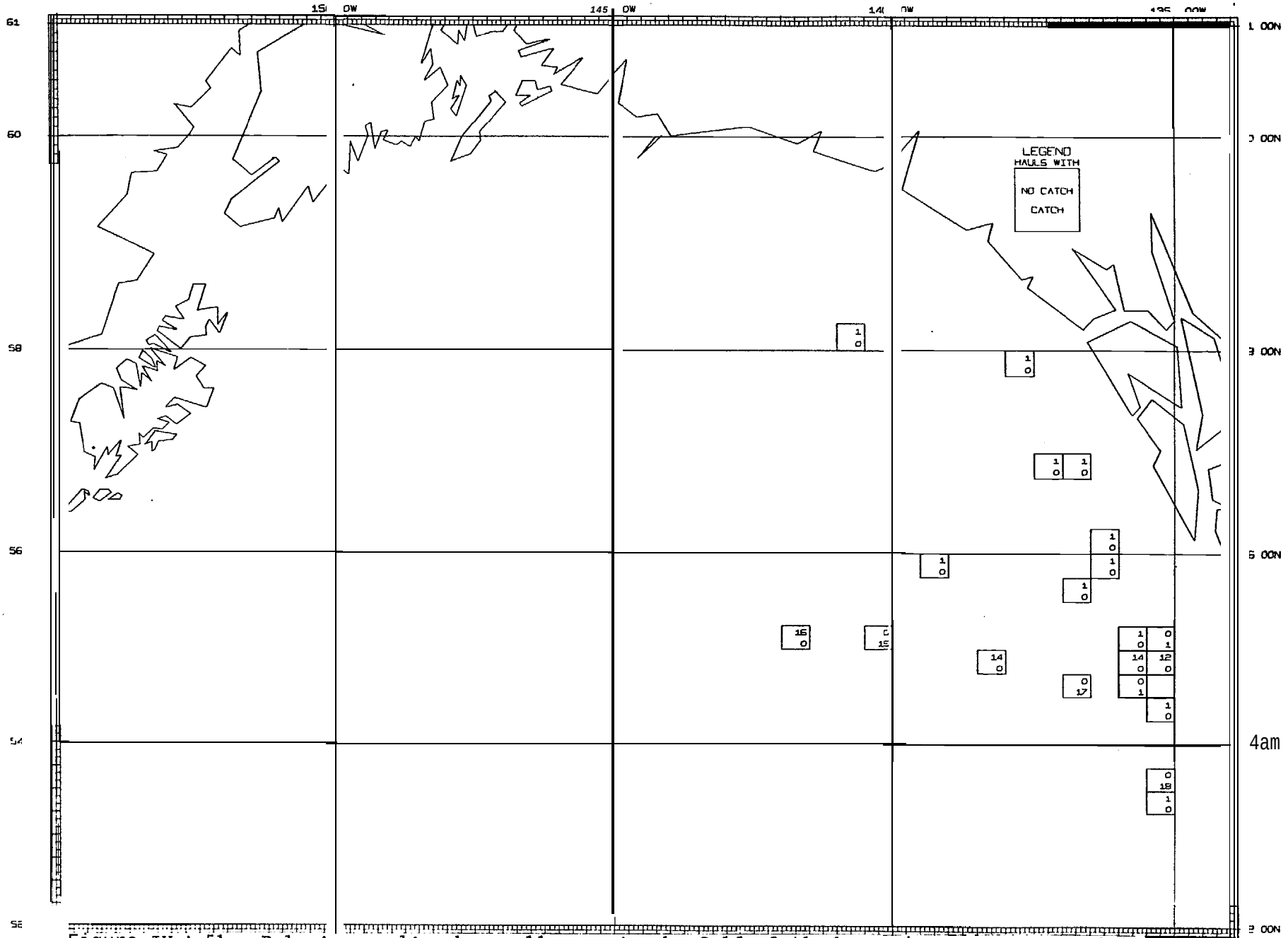


Figure IV.A.51.--Pelagic sampling by troll gear in the Gulf of Alaska, inner quarter, 1949-50, 1955.

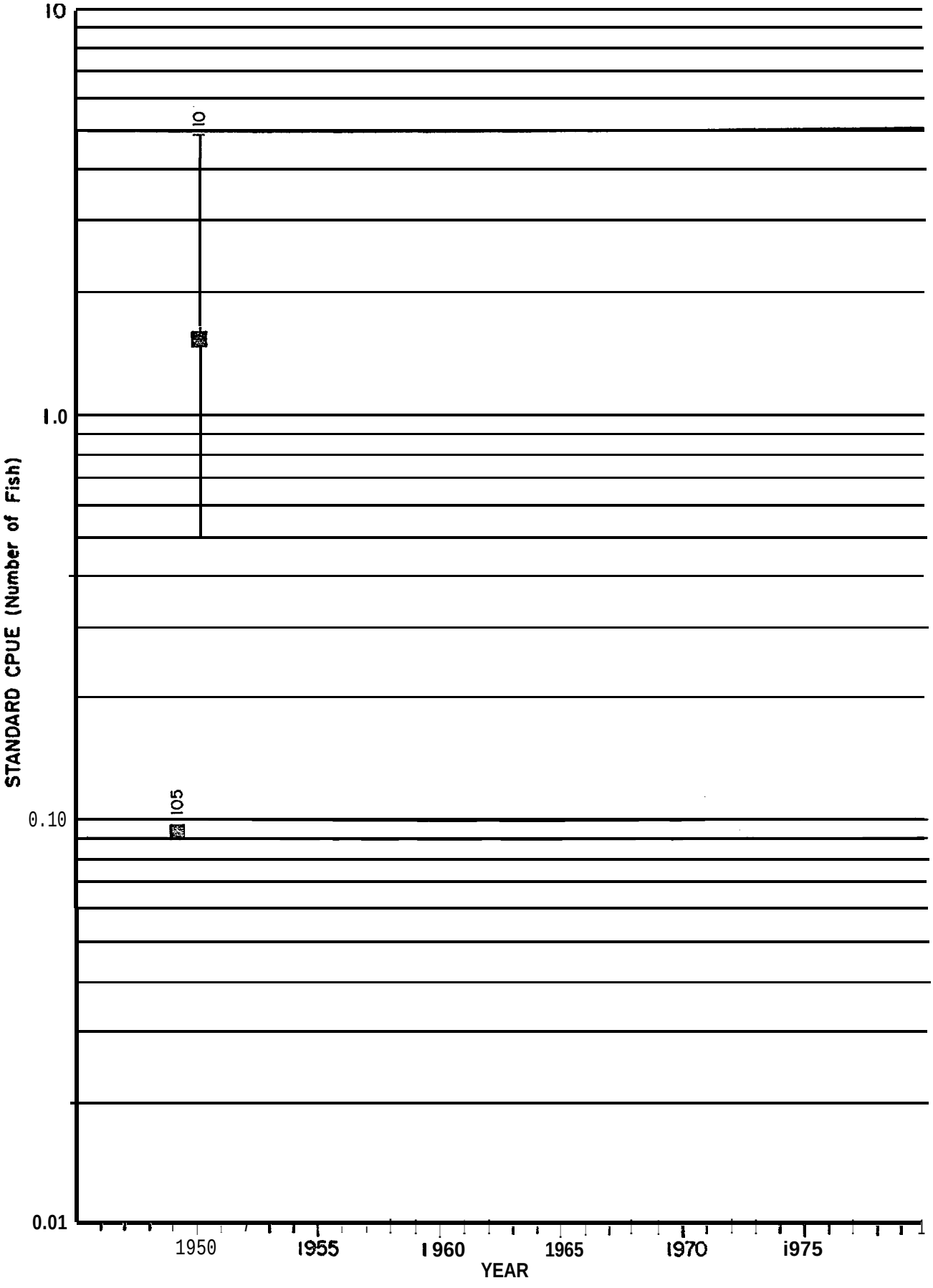


Figure IV.A.52.--Standardized rate of catch (geometric mean: number/6 hr with 90% confidence interval and number of observations) of all pelagic species combined in the Gulf of Alaska by troll gear.

IV. B. DISTRIBUTION AND RELATIVE ABUNDANCE OF INDIVIDUAL SPECIES AND GROUPS OF FISHES.

The maps included in Figures IV.B.1 - IV.B.288 show graphically the relative abundance (see p. 363 , introduction to section IV) of each species or group of species by gear and by season. The boxes on the maps indicate where sampling was done, and the shading, where it appears, designates the relative abundance of the species or group of species in that sampling area. Some maps include more than one species, in which instance the boxes are divided diagonally, the top triangle referring to one species and the bottom referring to the other species. Three types of shading indicate below average, average*, or above average abundance found in sampling.

Key to Shading:

Below average abundance

Average abundance

Above average abundance .

*Average: Mean CPUE ± Standard Deviation

Each group of charts showing the relative abundance for each species sampled by a given type of gear is followed by a CPUE graph for that species and 'gear. Each entry on these graphs is accompanied by the number of observations (Arabic numerals) and the calendar quarter in which observations were made (Roman numerals). Also shown are the 90% confidence limits, the mean CPUE, and a symbol for the agency that did the sampling. An example is as follows:

----- Quarter of year (summer)

----- Number of observations

------ 90% confidence limit

----- Mean CPUE and symbol for agency

----- 90% confidence limit

EASTERN BERING SEA

(FIGURES IV B.1 - IV B.138)

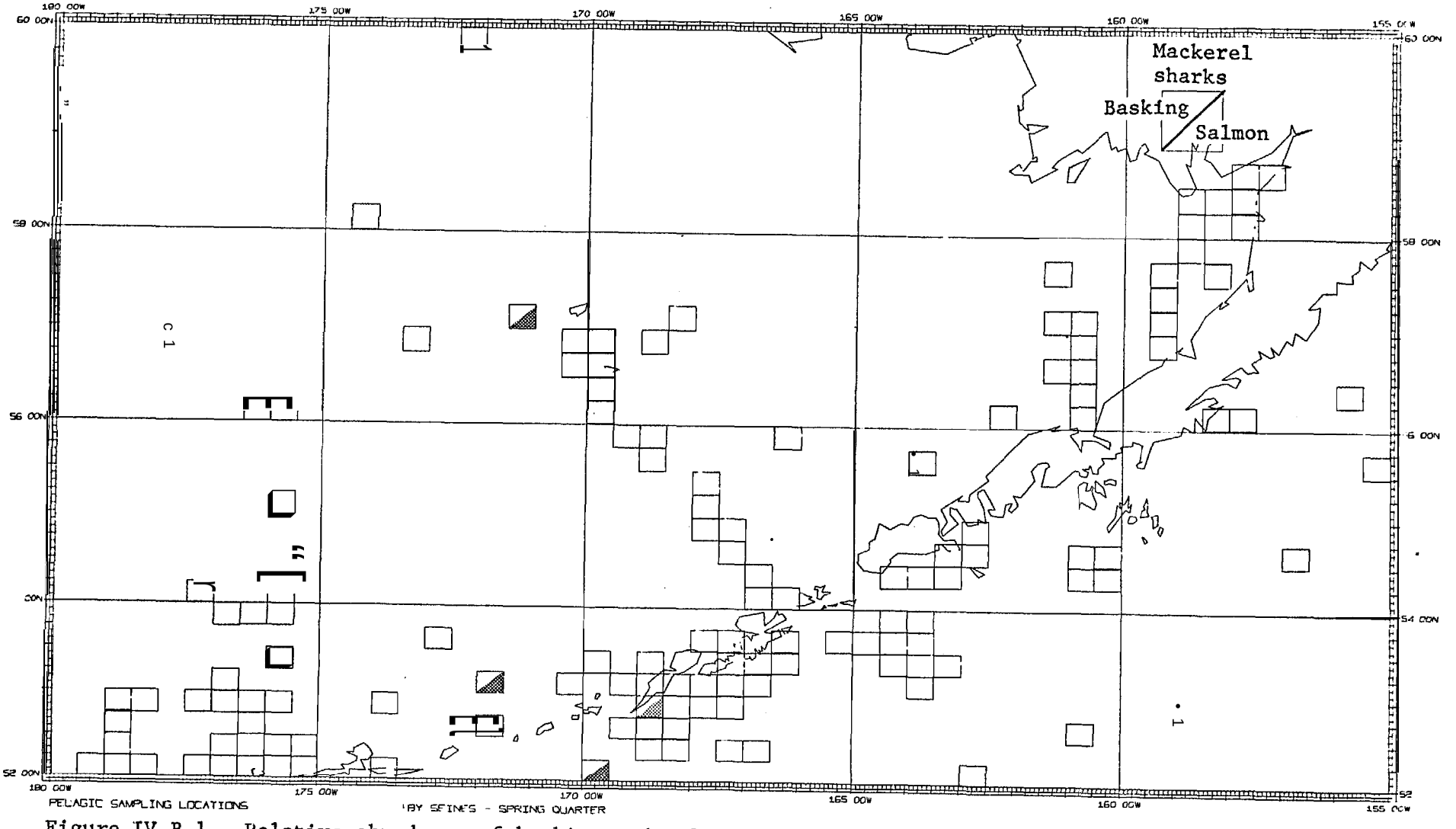


Figure IV.B.1.--Relative abundance of basking and salmon sharks in purse seines in spring, eastern Bering Sea.

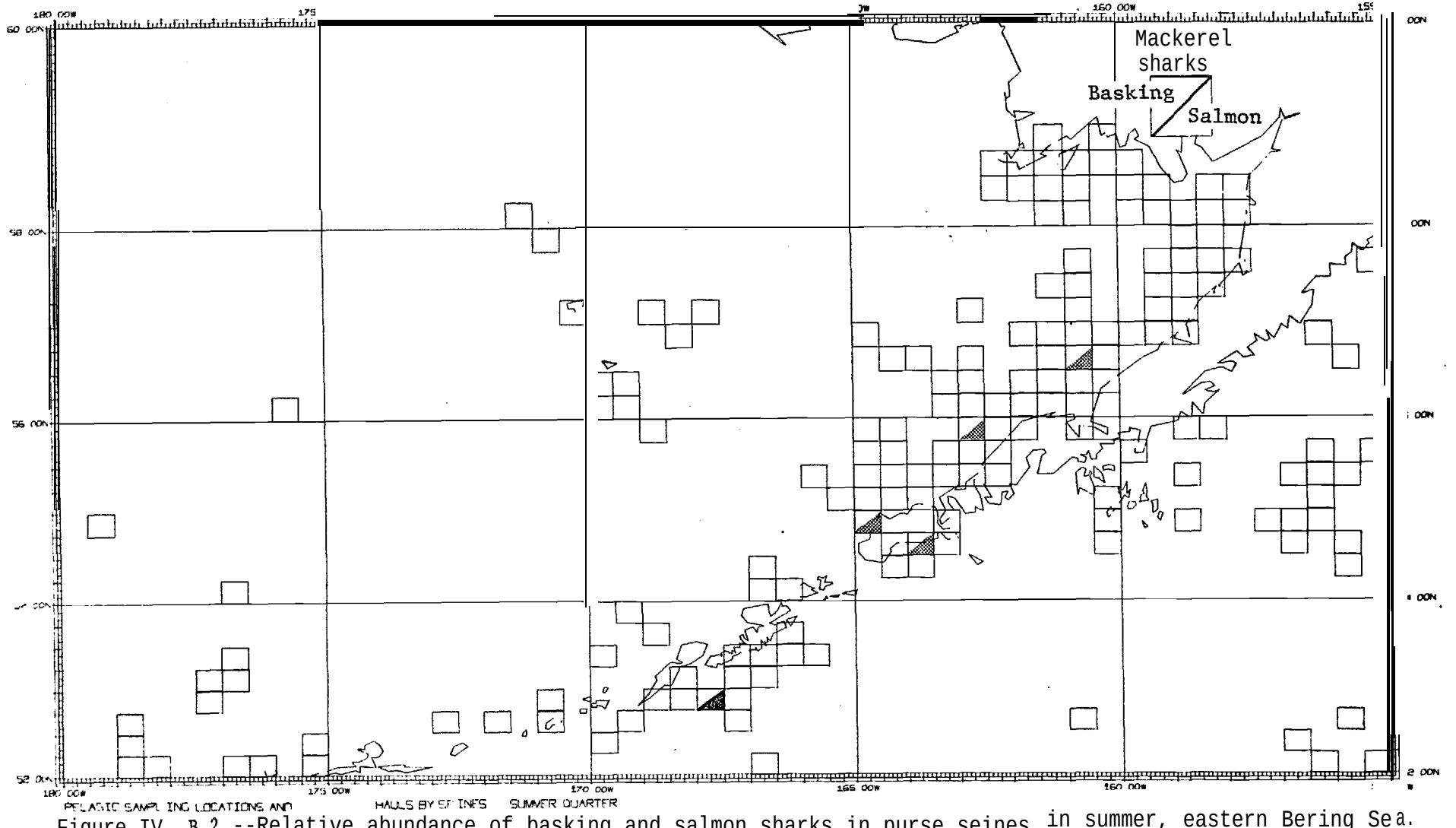


Figure IV. B.2.--Relative abundance of basking and salmon sharks in purse seines in summer, eastern Bering Sea.

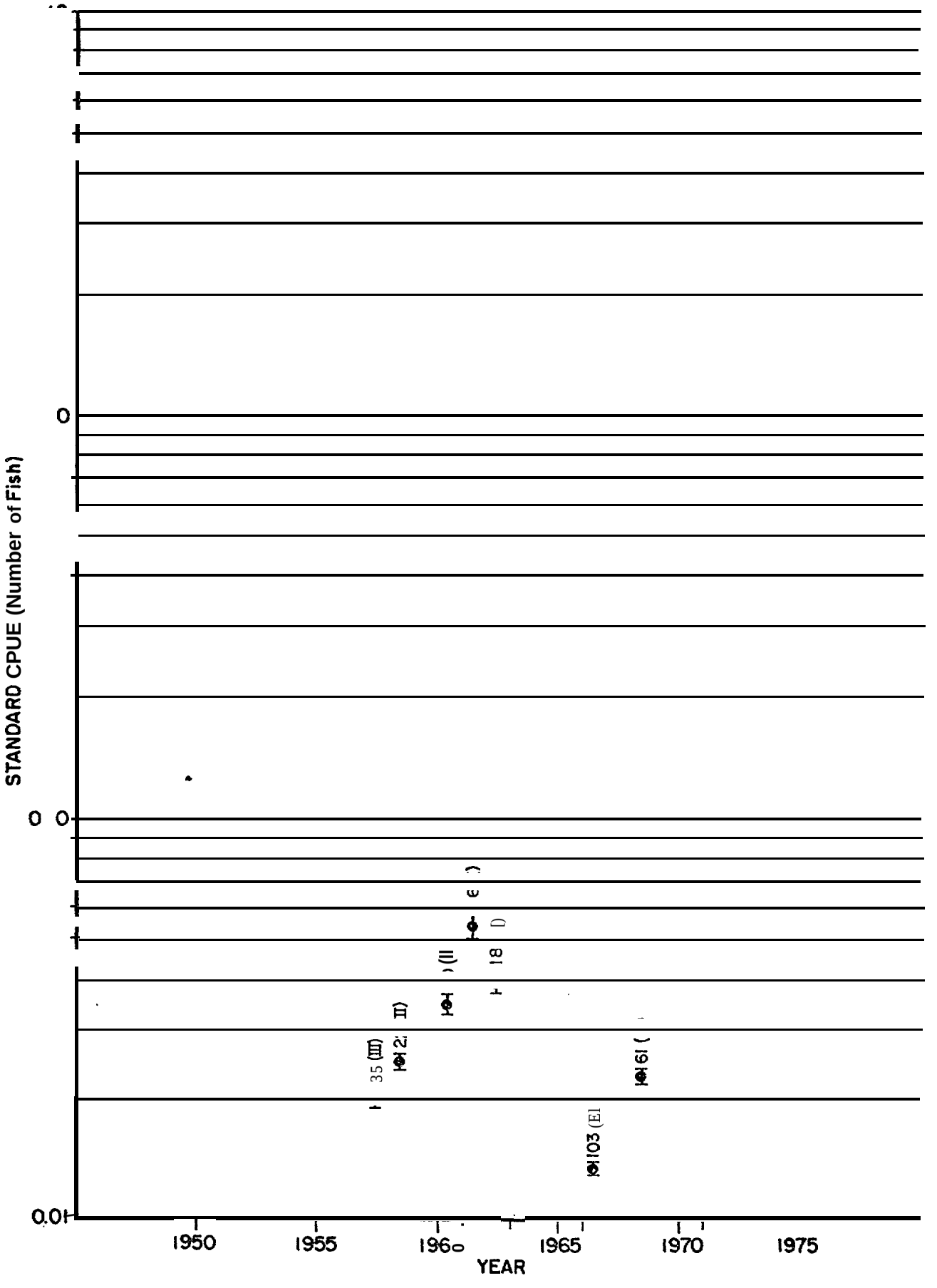


Figure IV.B.3.--Standardized rate of catch of salmon shark by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

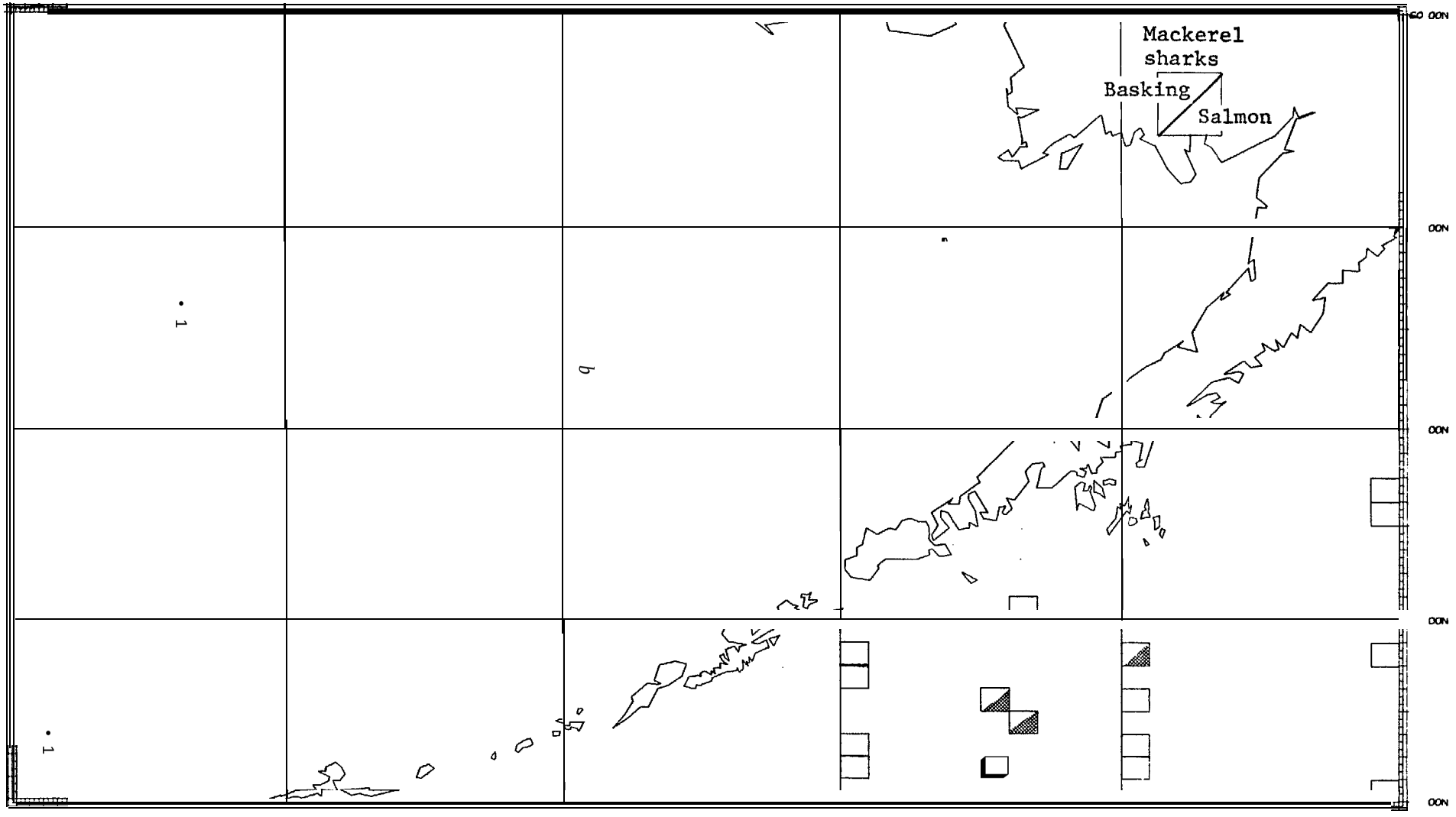


Figure IV.B.4.--Relative abundance of basking and salmon sharks in gillnets in winter, eastern Bering Sea.

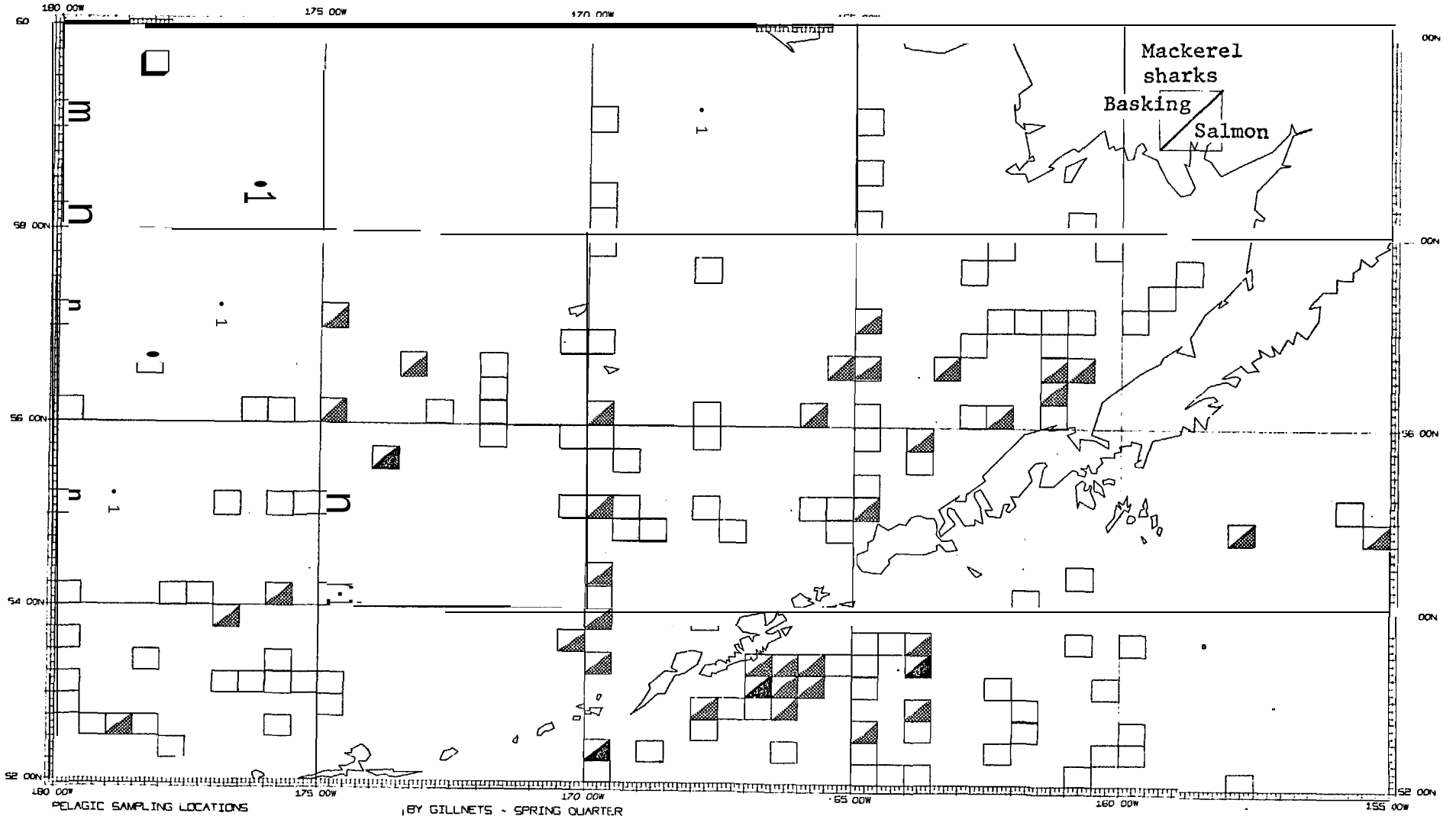


Figure IV.B.5.--Relative abundance of basking and salmon sharks in gillnets in spring, eastern Bering Sea.

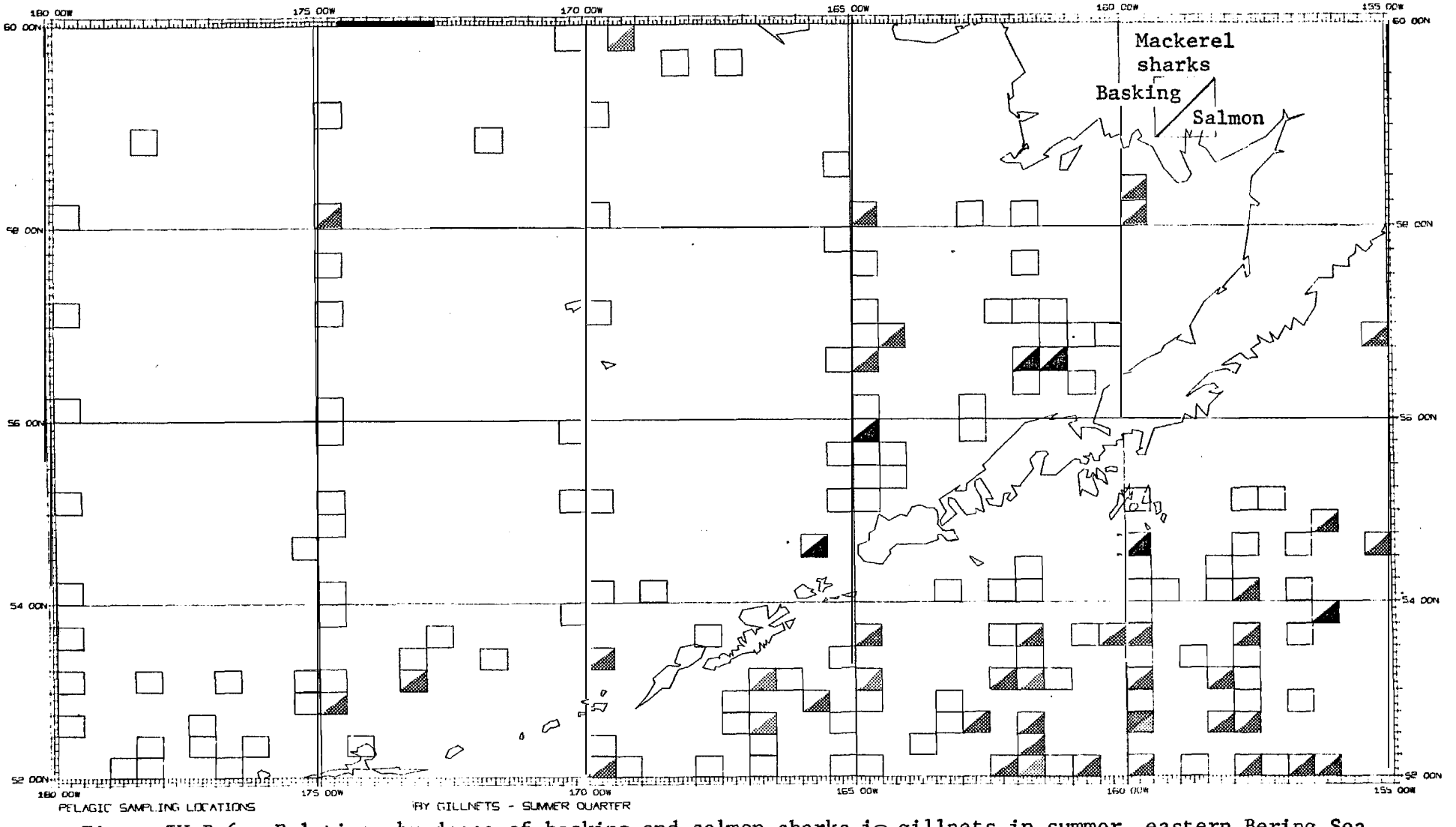


Figure IV.B.6.--Relative abundance of basking and salmon sharks in gillnets in summer, eastern Bering Sea.

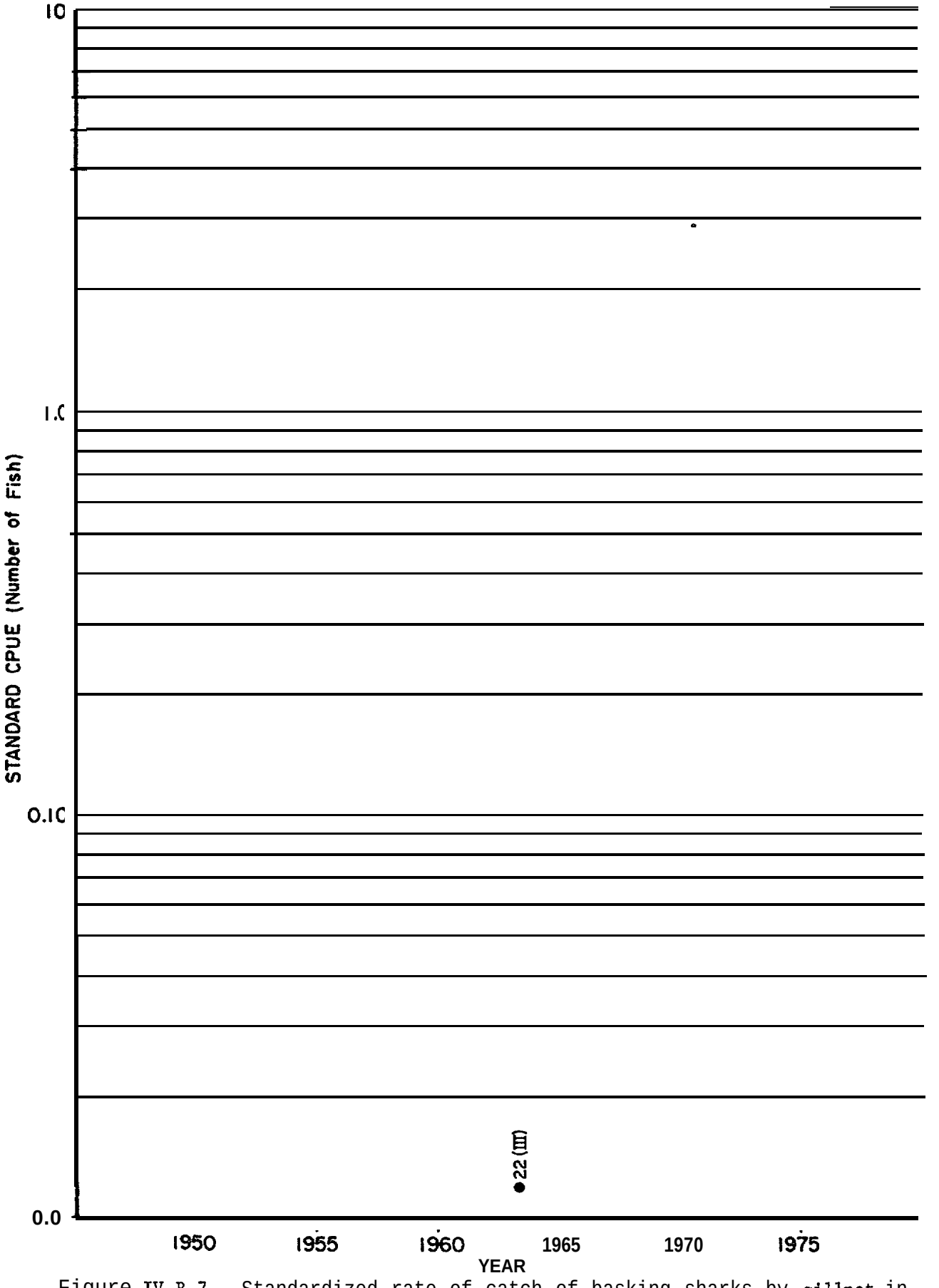


Figure IV.B.7.--Standardized rate of catch of basking sharks by gillnet in the eastern Bering Sea (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

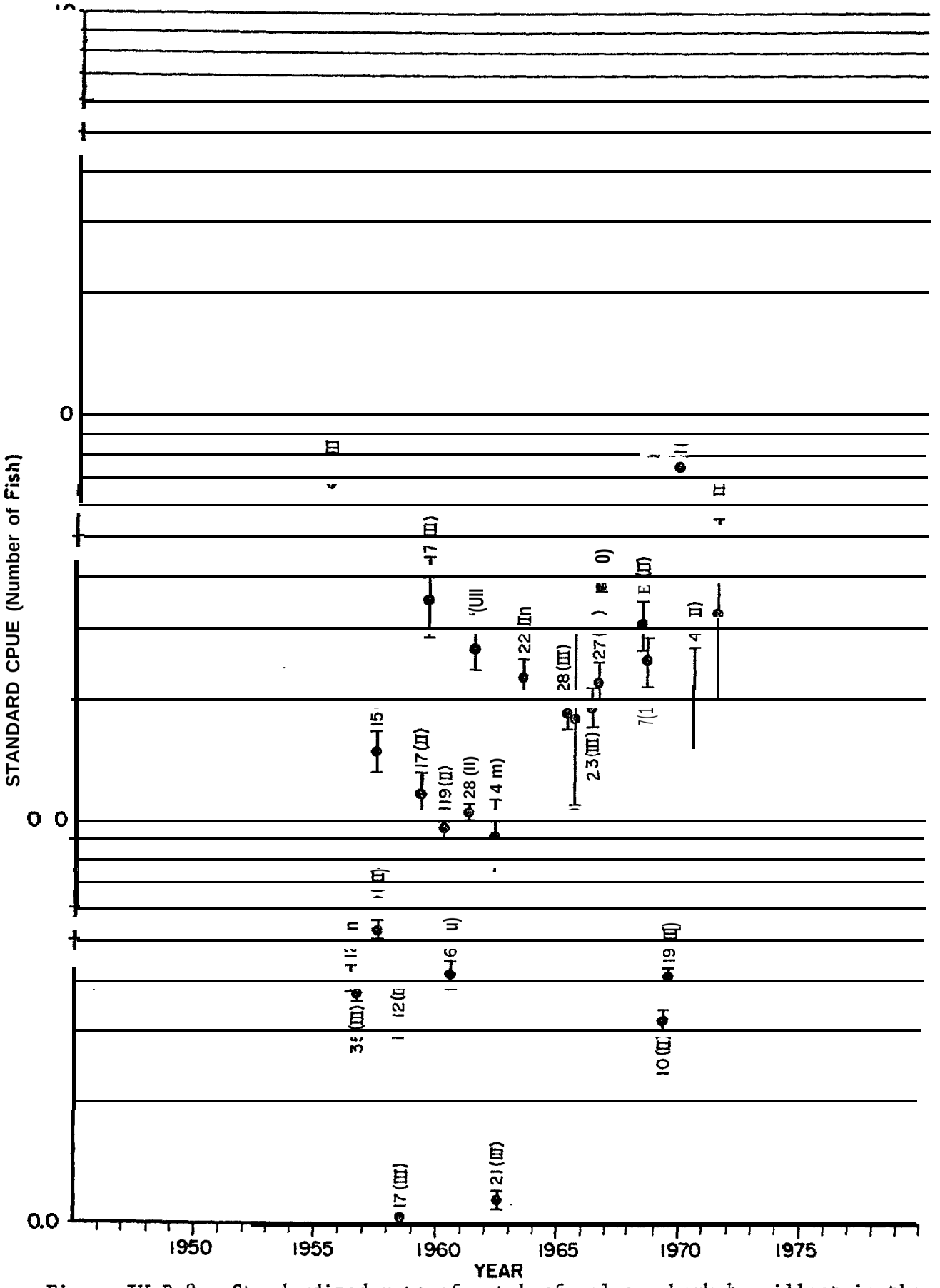


Figure IV.B.8.--Standardized rate of catch of salmon shark by gillnet in the eastern Bering Sea (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

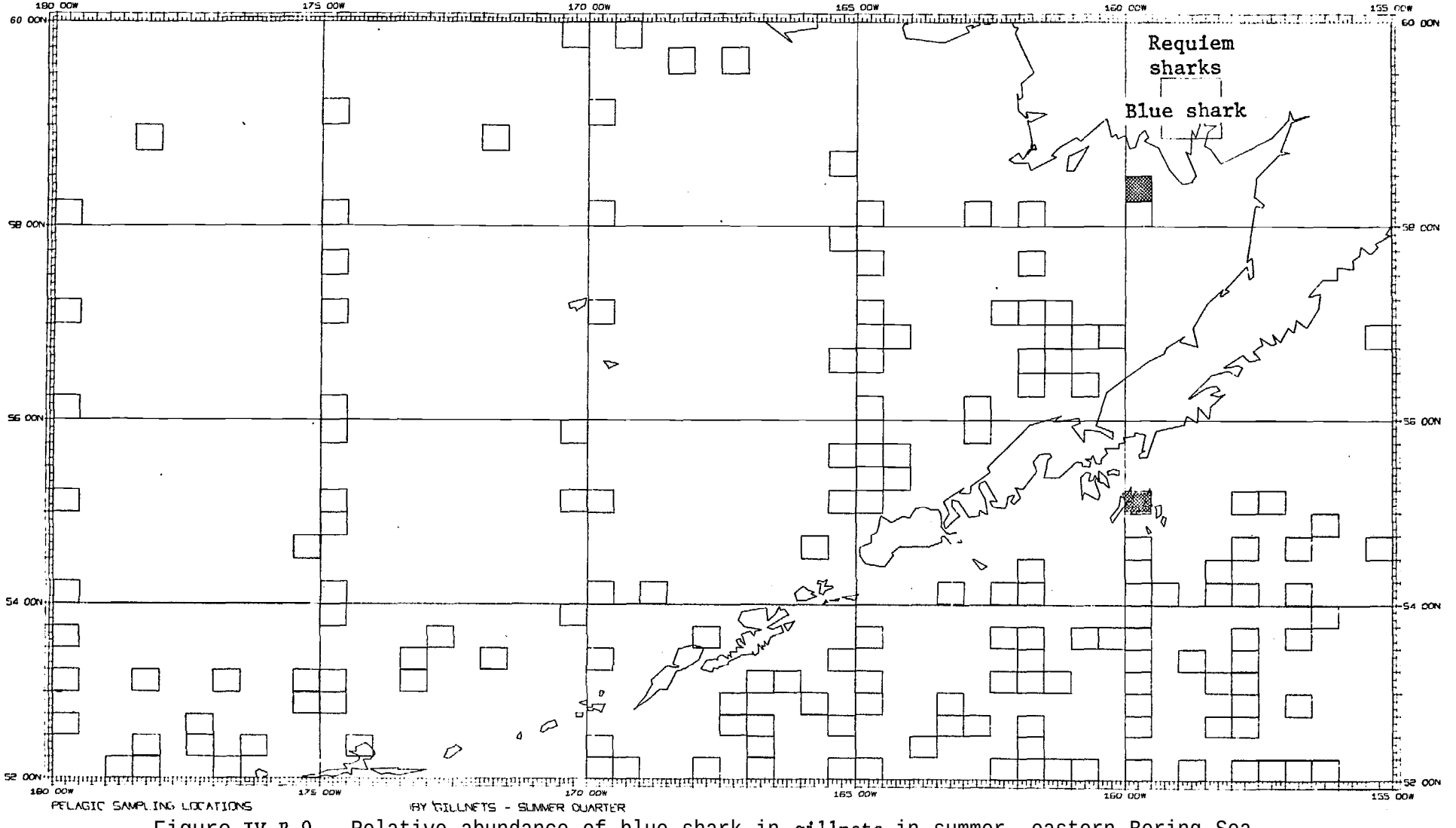


Figure IV.B.9.--Relative abundance of blue shark in gillnets in summer, eastern Bering Sea.

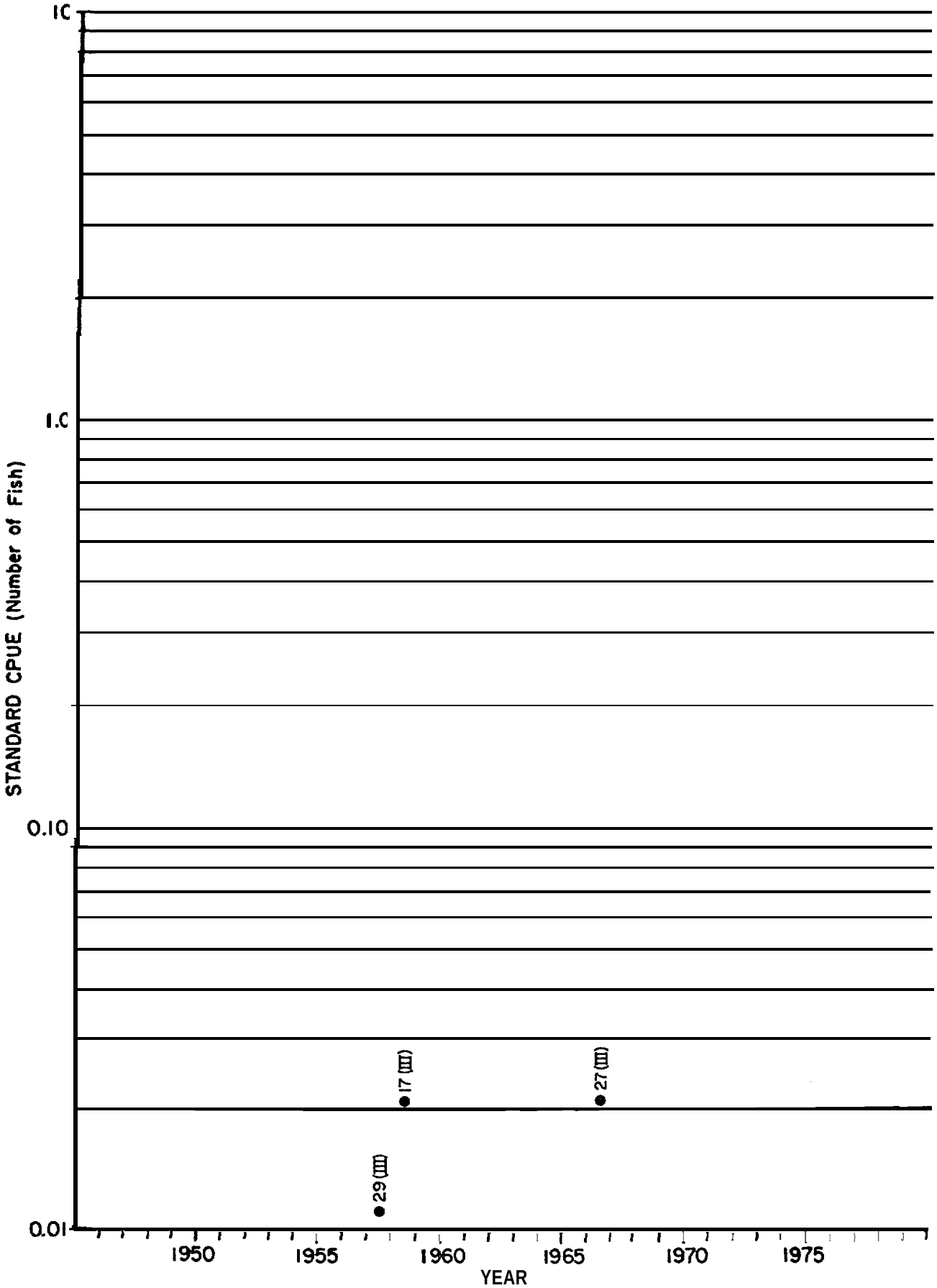


Figure IV.B.10.--Standardized rate of catch of blue shark by gillnet in the eastern Bering Sea (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

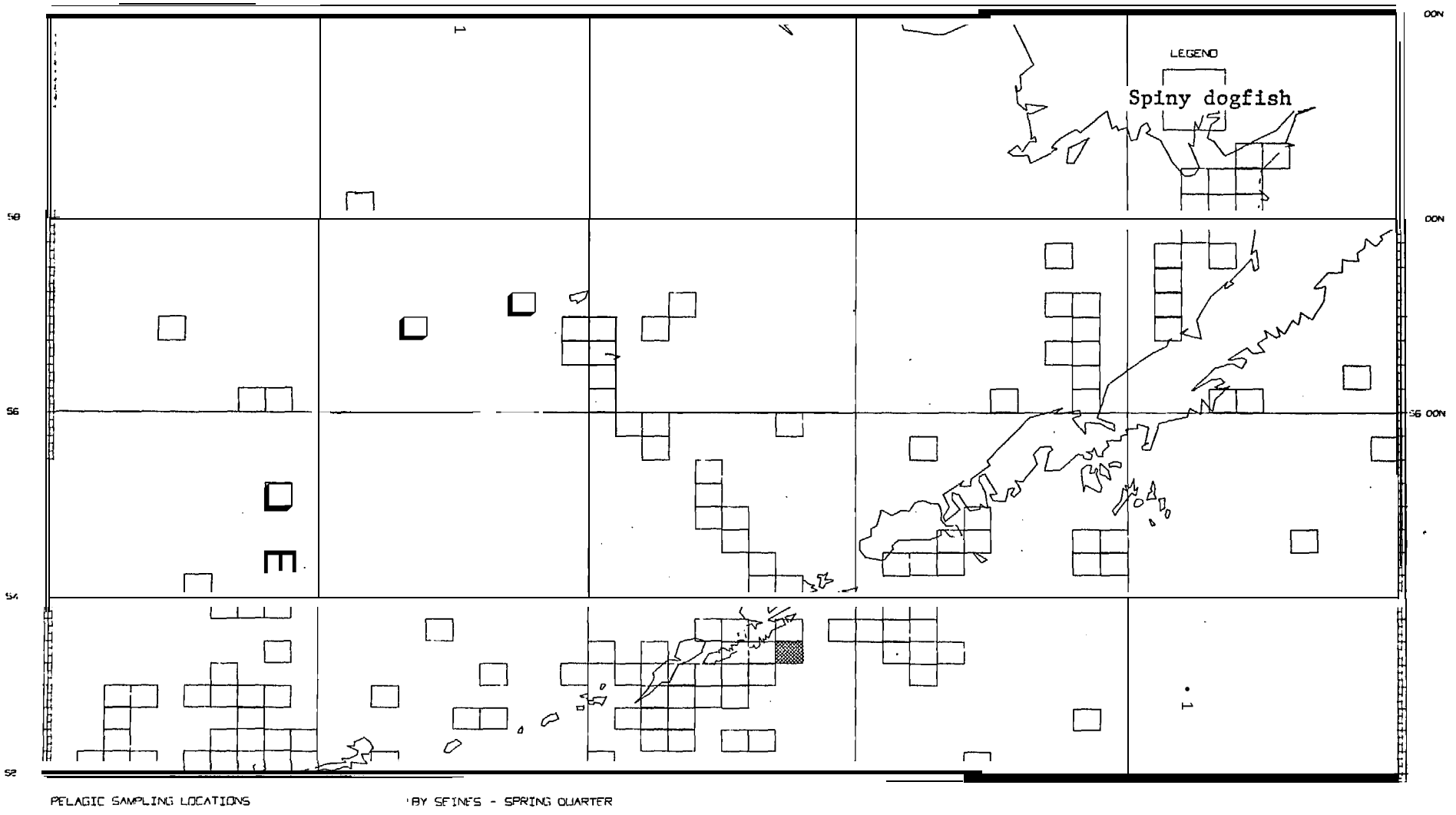


Figure IV.B.11.—Relative abundance of spiny dogfish in purse seines in spring, eastern Bering Sea.

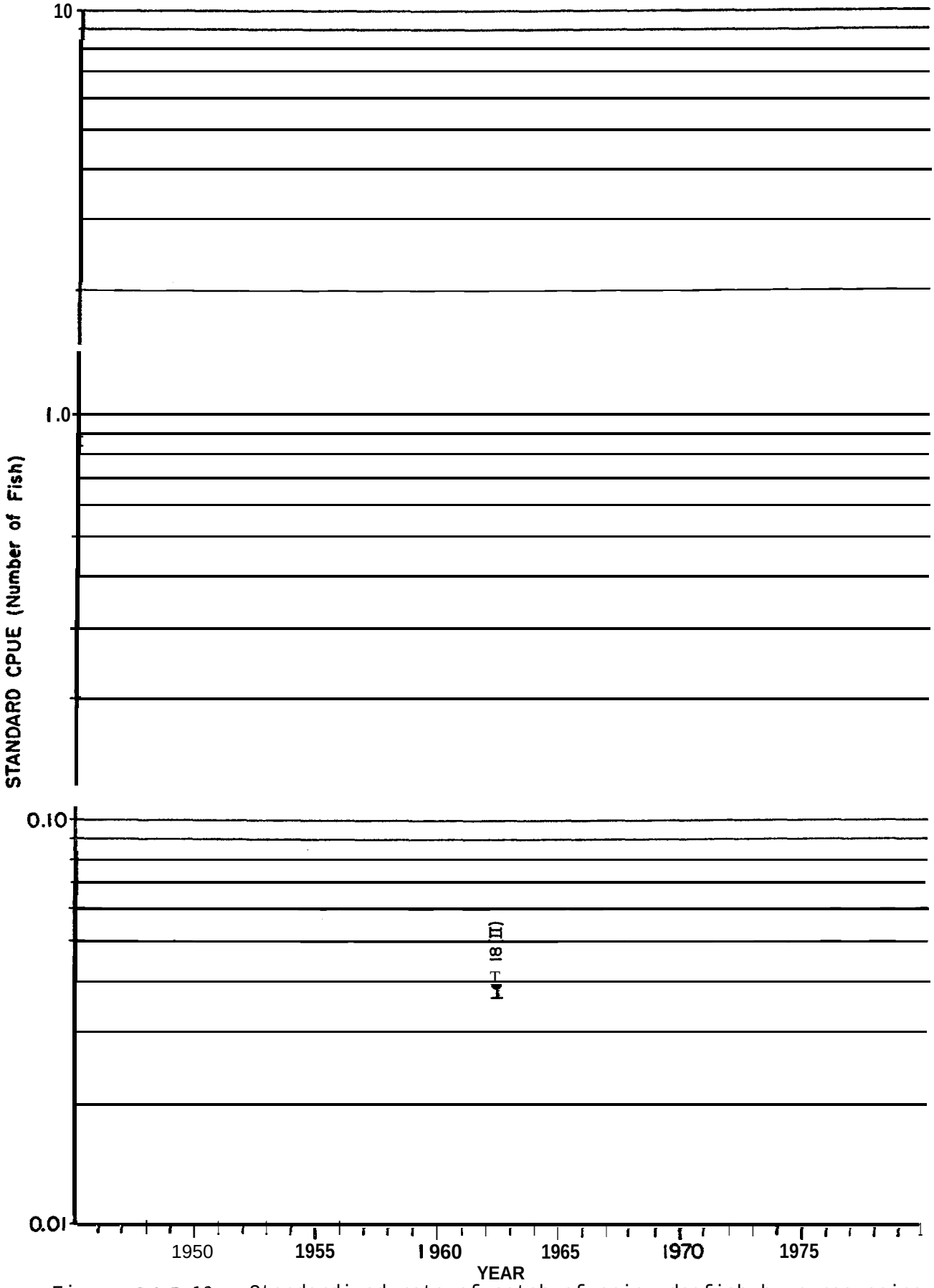


Figure IV.B.12.--Standardized rate of catch of spiny dogfish by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

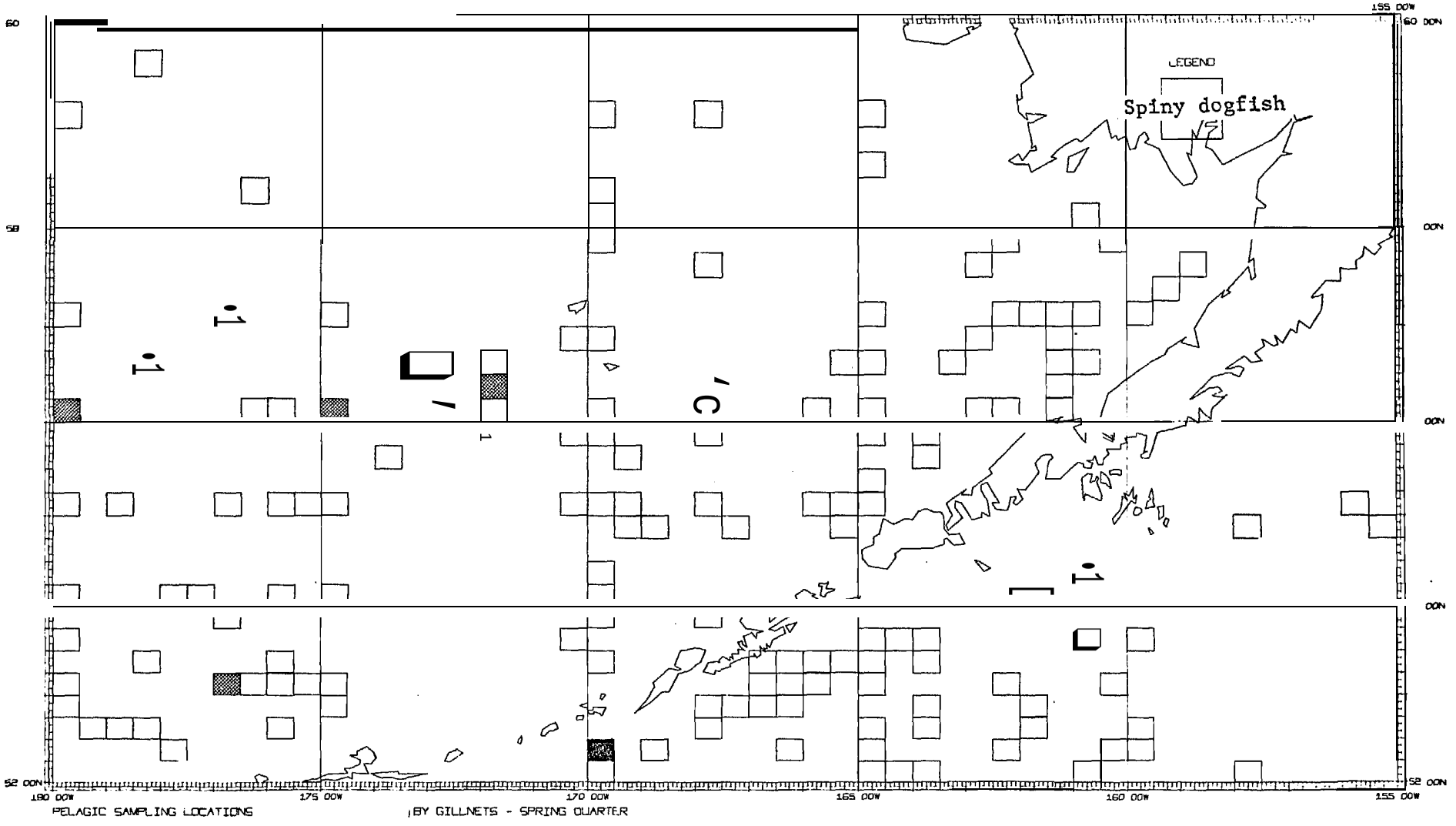


Figure IV.B.13.--Relative abundance of spiny dogfish in gillnets in spring, eastern Bering Sea.

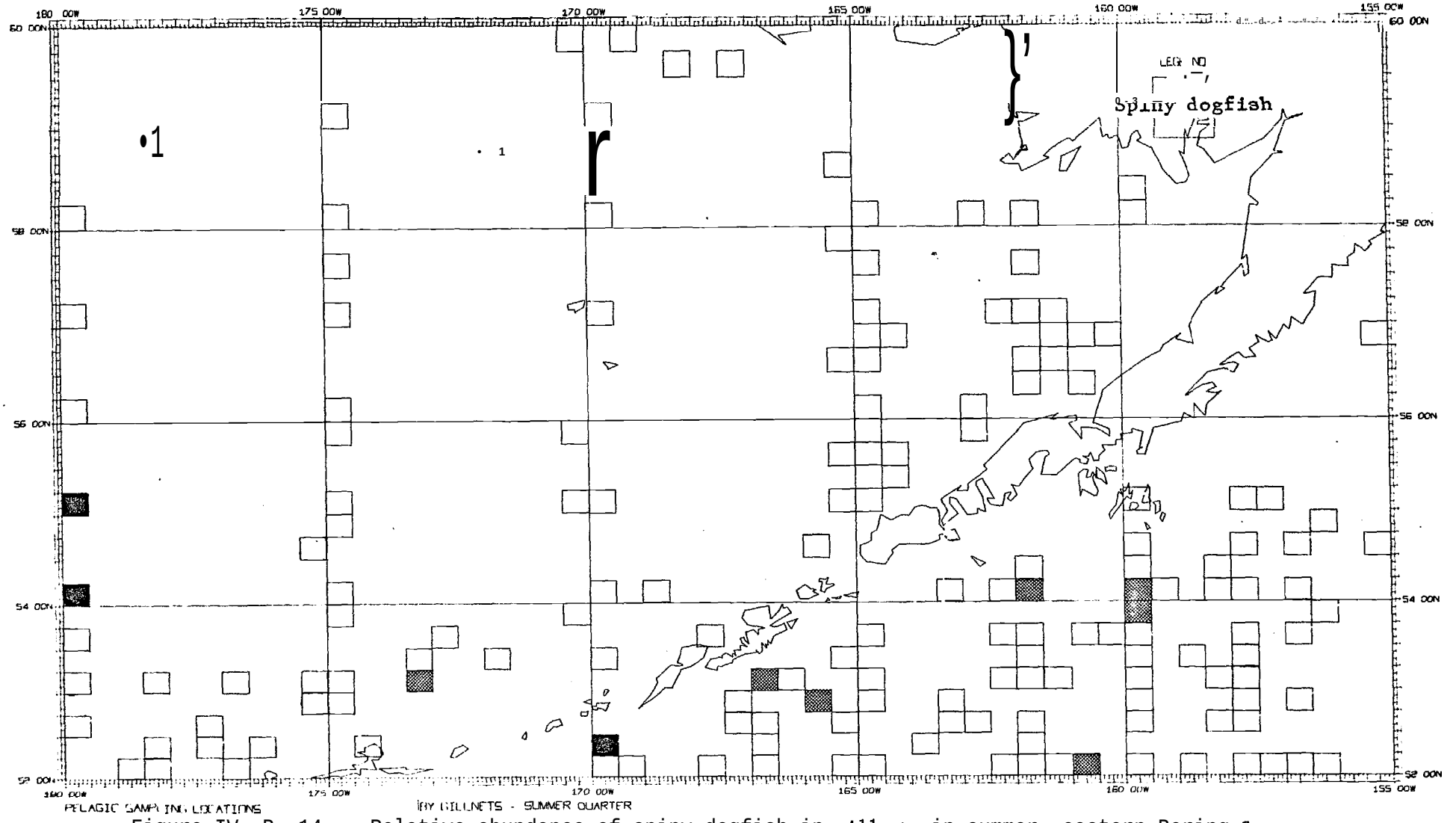


Figure IV. B. 14. --Relative abundance of spiny dogfish in gillnets in summer, eastern Bering Sea.

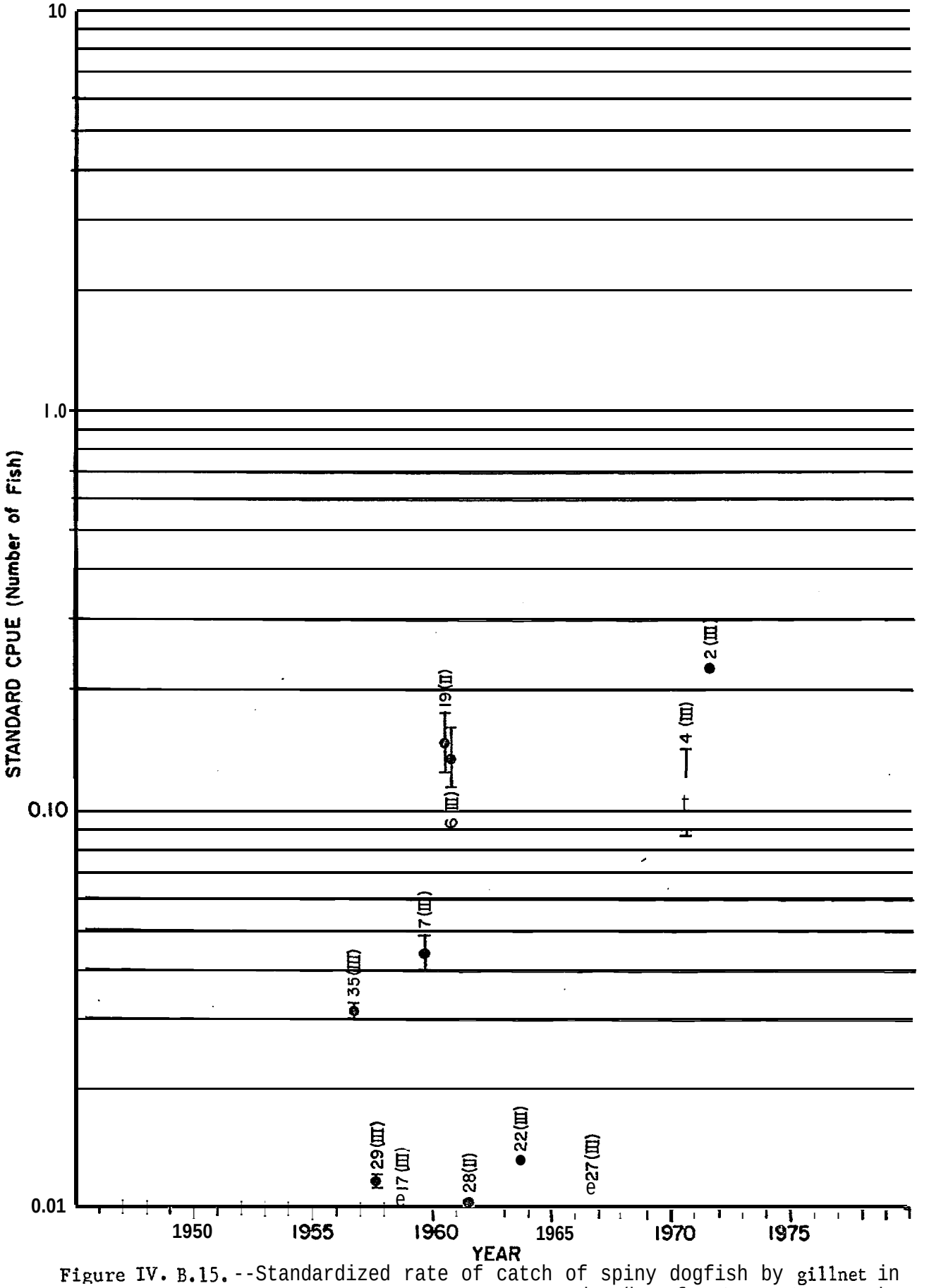


Figure IV. B.15.--Standardized rate of catch of spiny dogfish by gillnet in the eastern Bering Sea (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

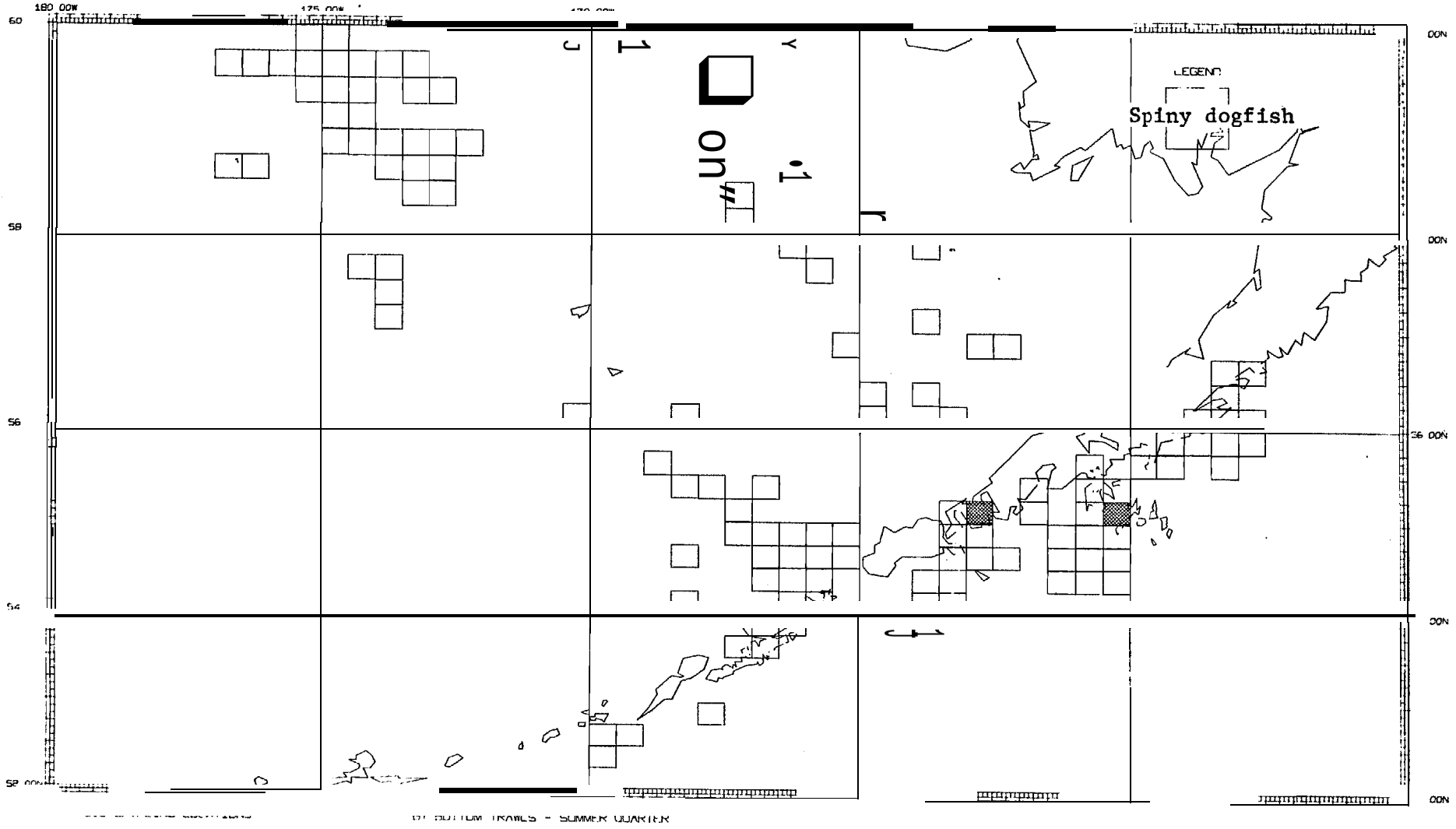


Figure IV.B.16.--Relative abundance of spiny dogfish in bottom trawls in summer, eastern Bering Sea.

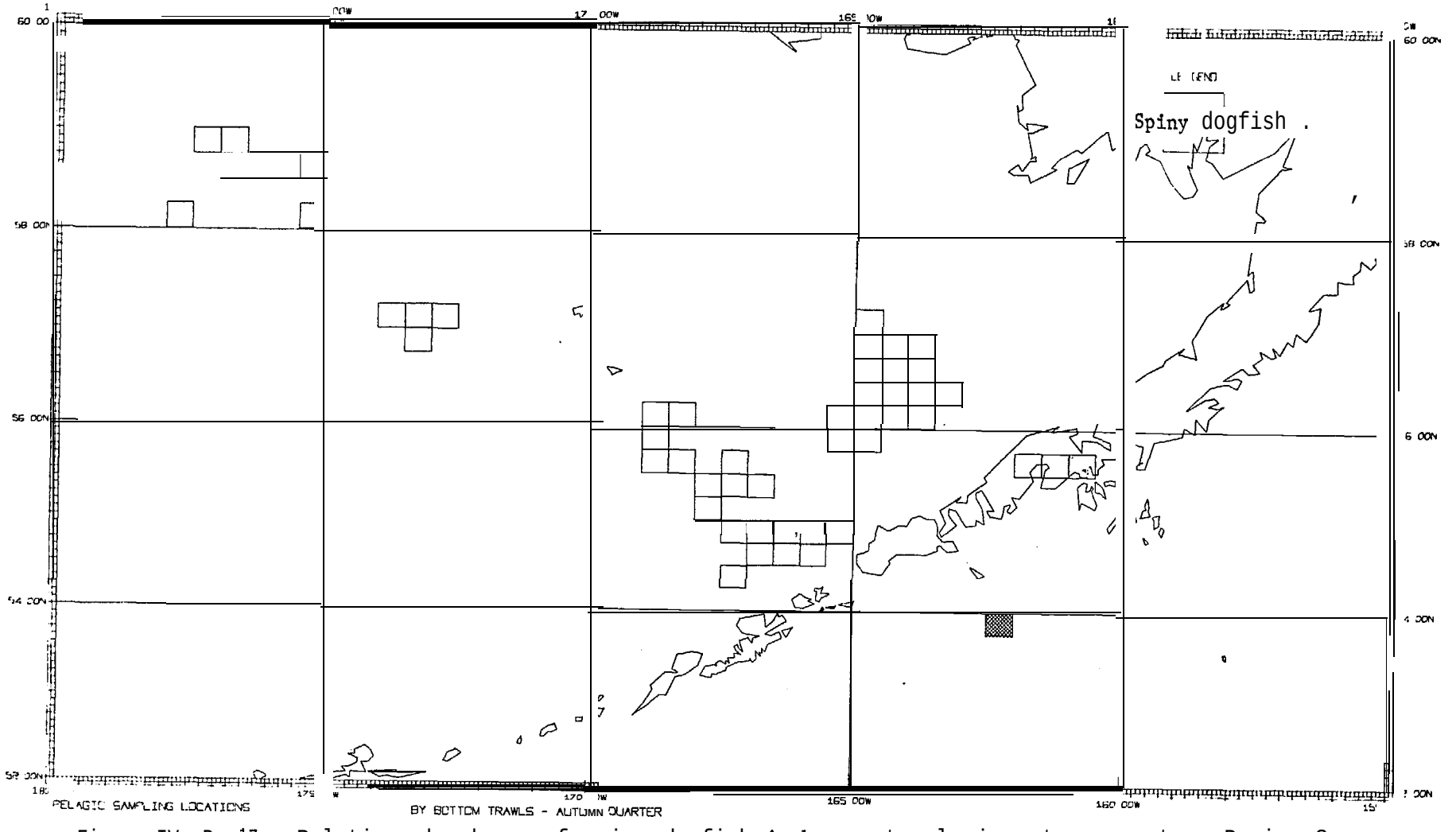


Figure IV. B. 17.--Relative abundance of spiny dogfish in bottom trawls in autumn, eastern Bering Sea.

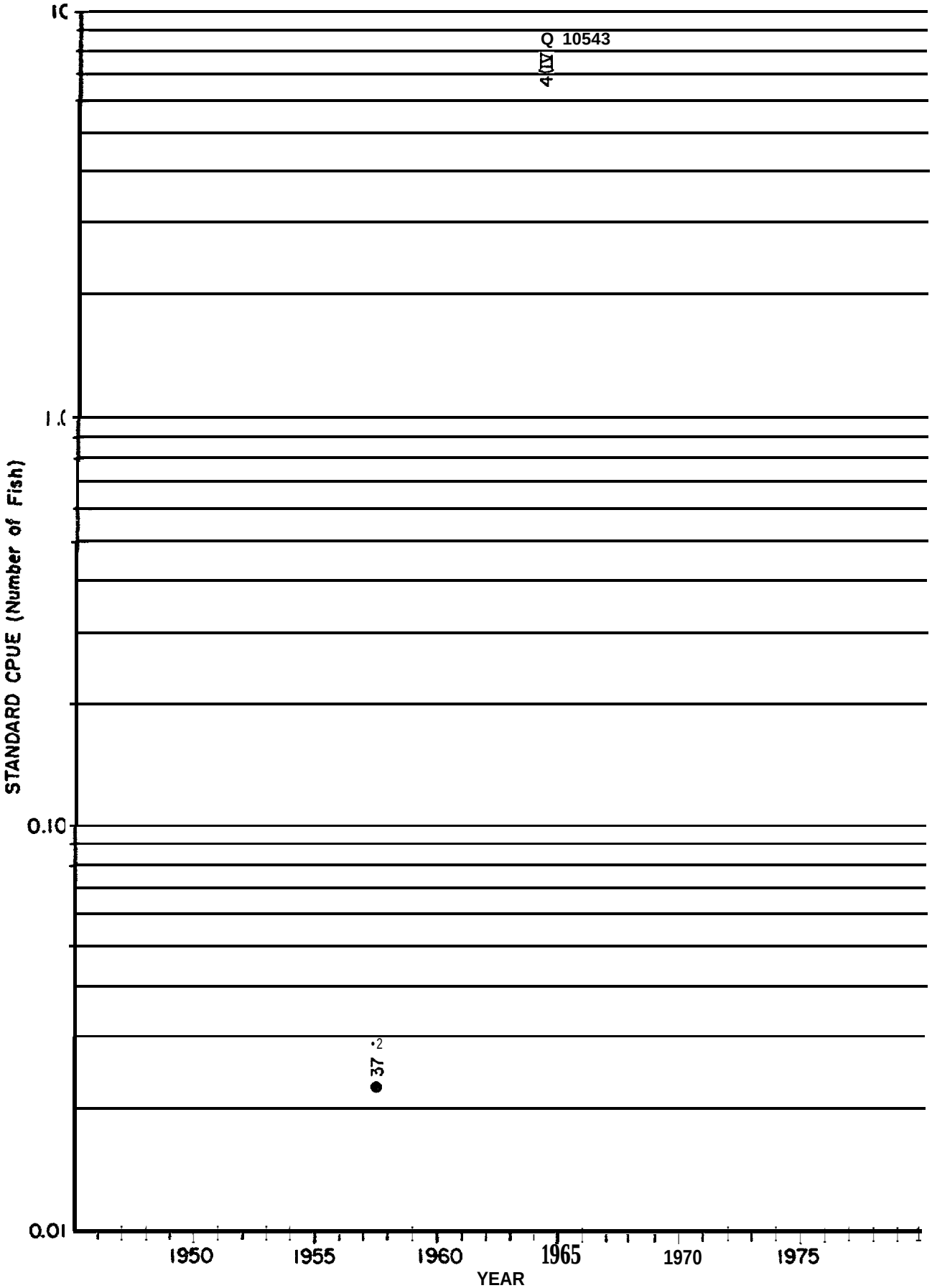


Figure IV.B.18.--Standardized rate of catch of spiny dogfish by bottom trawl in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

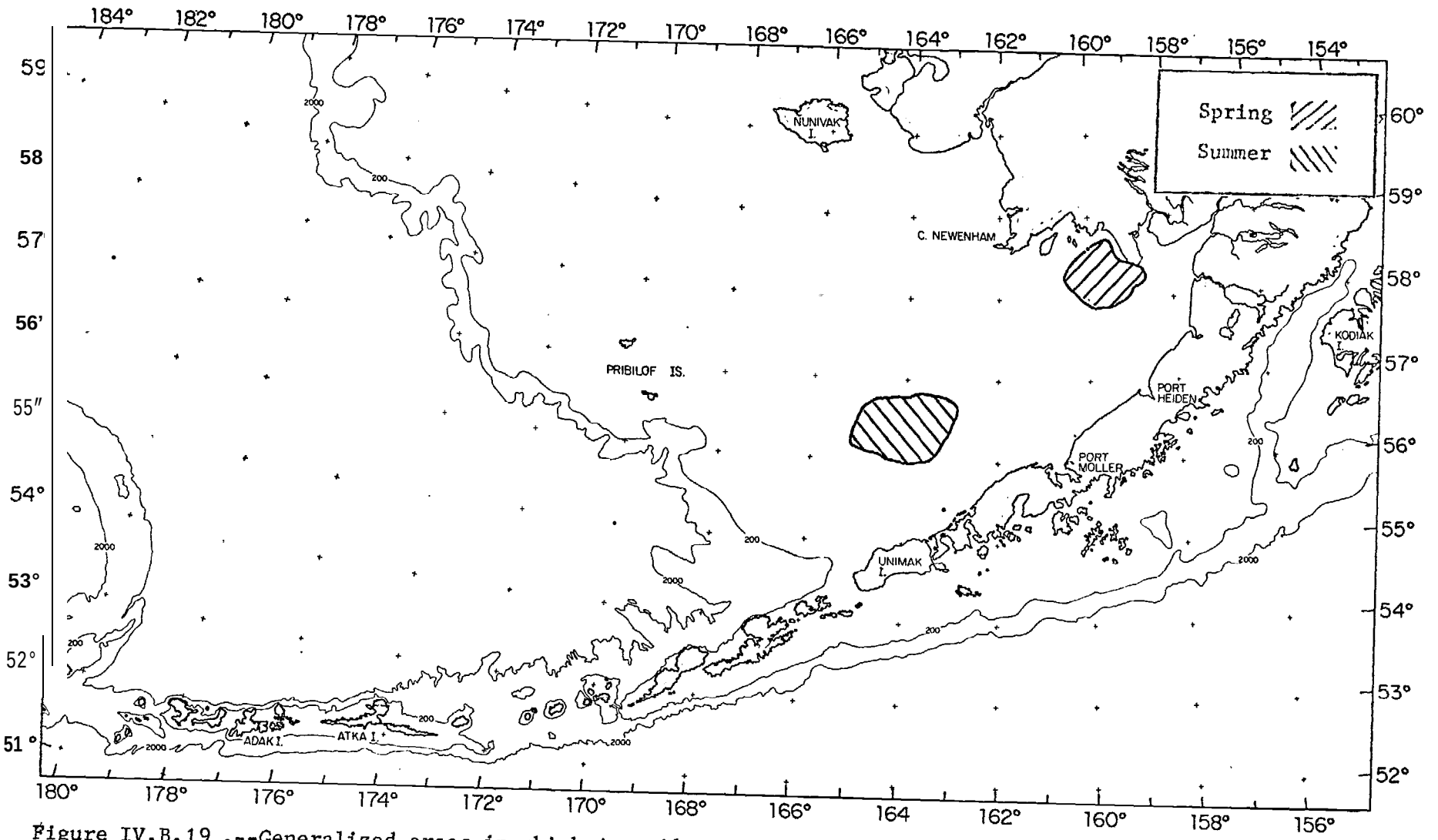


Figure IV.B.19 .--Generalized areas in which juvenile Pacific herring were caught by seines in spring and summer, eastern Bering Sea.

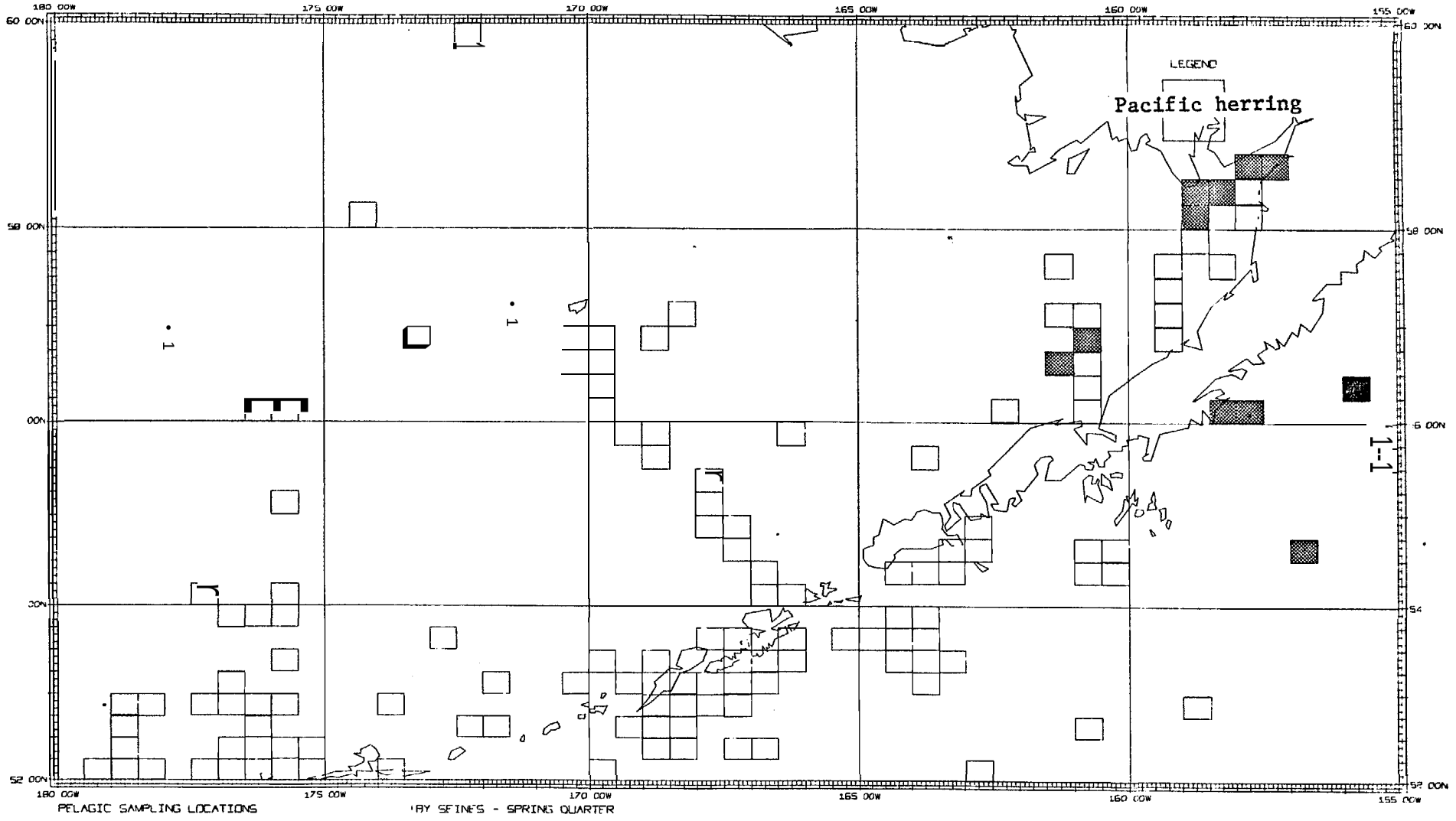


Figure IV.B.20.--Relative abundance of Pacific herring in purse seines in spring, eastern Bering Sea.

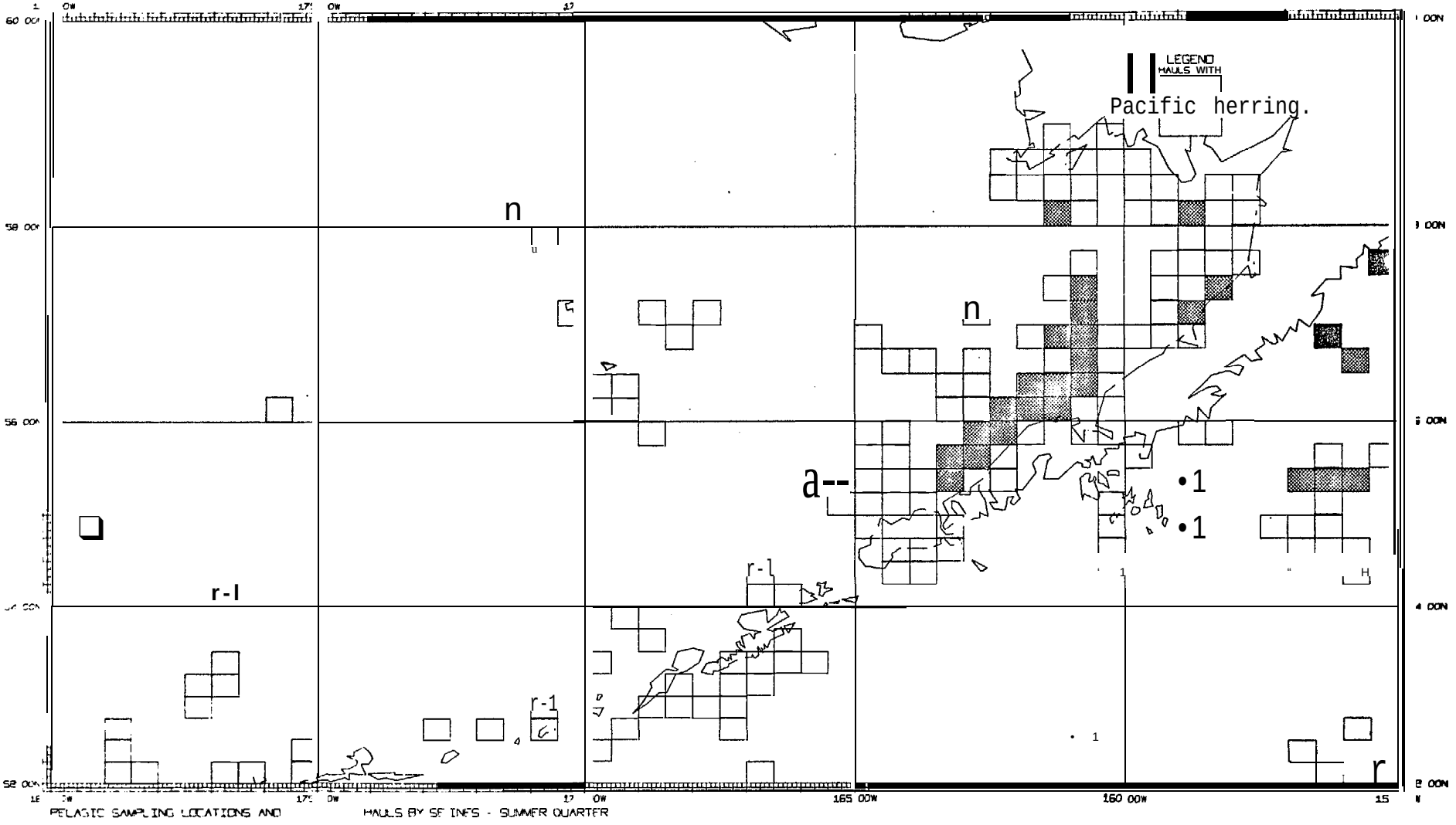


Figure IV. B.21.--Relative abundance of Pacific herring in purse seines in summer, eastern Bering Sea.

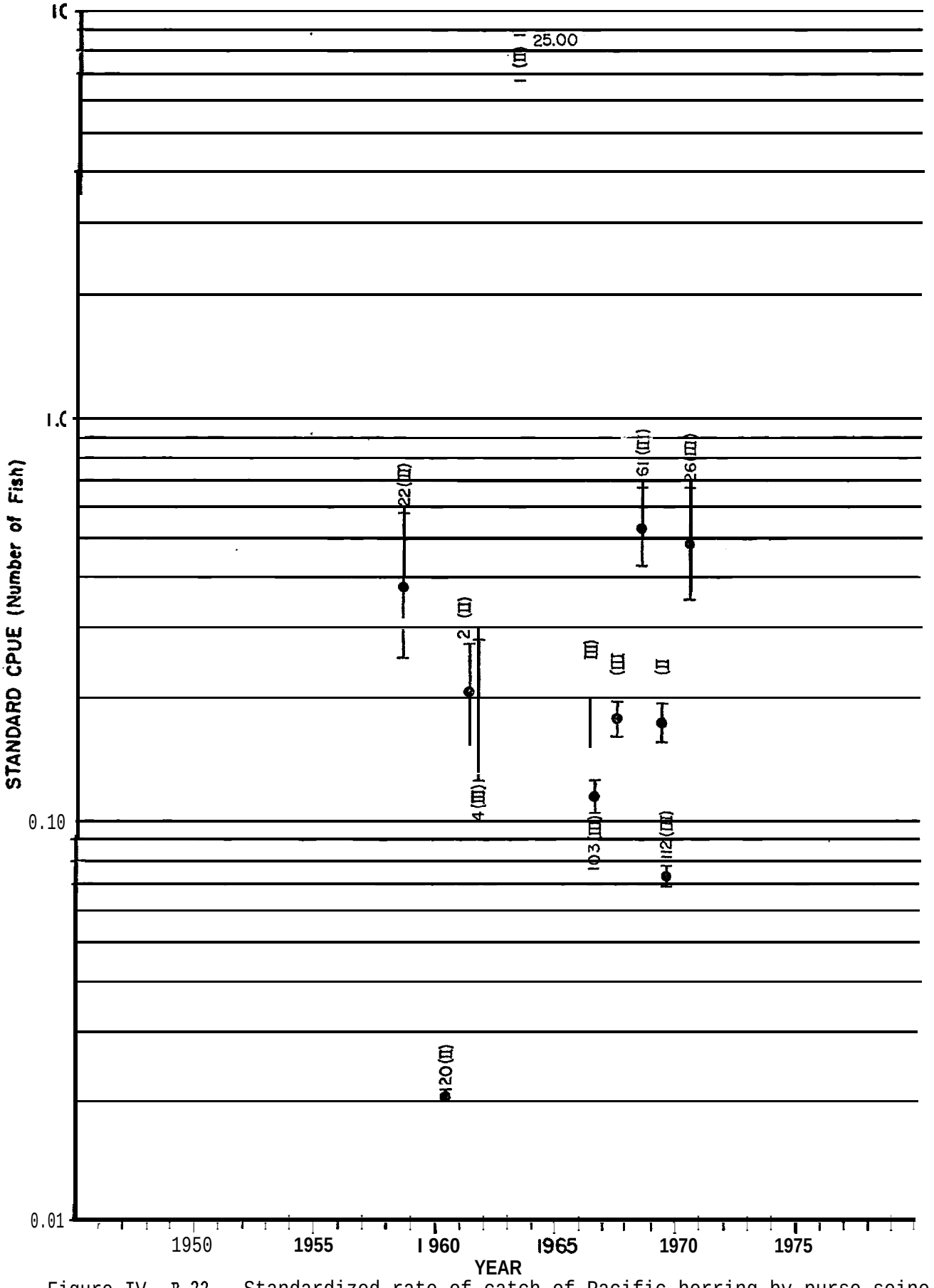


Figure IV. B.22.--Standardized rate of catch of Pacific herring by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

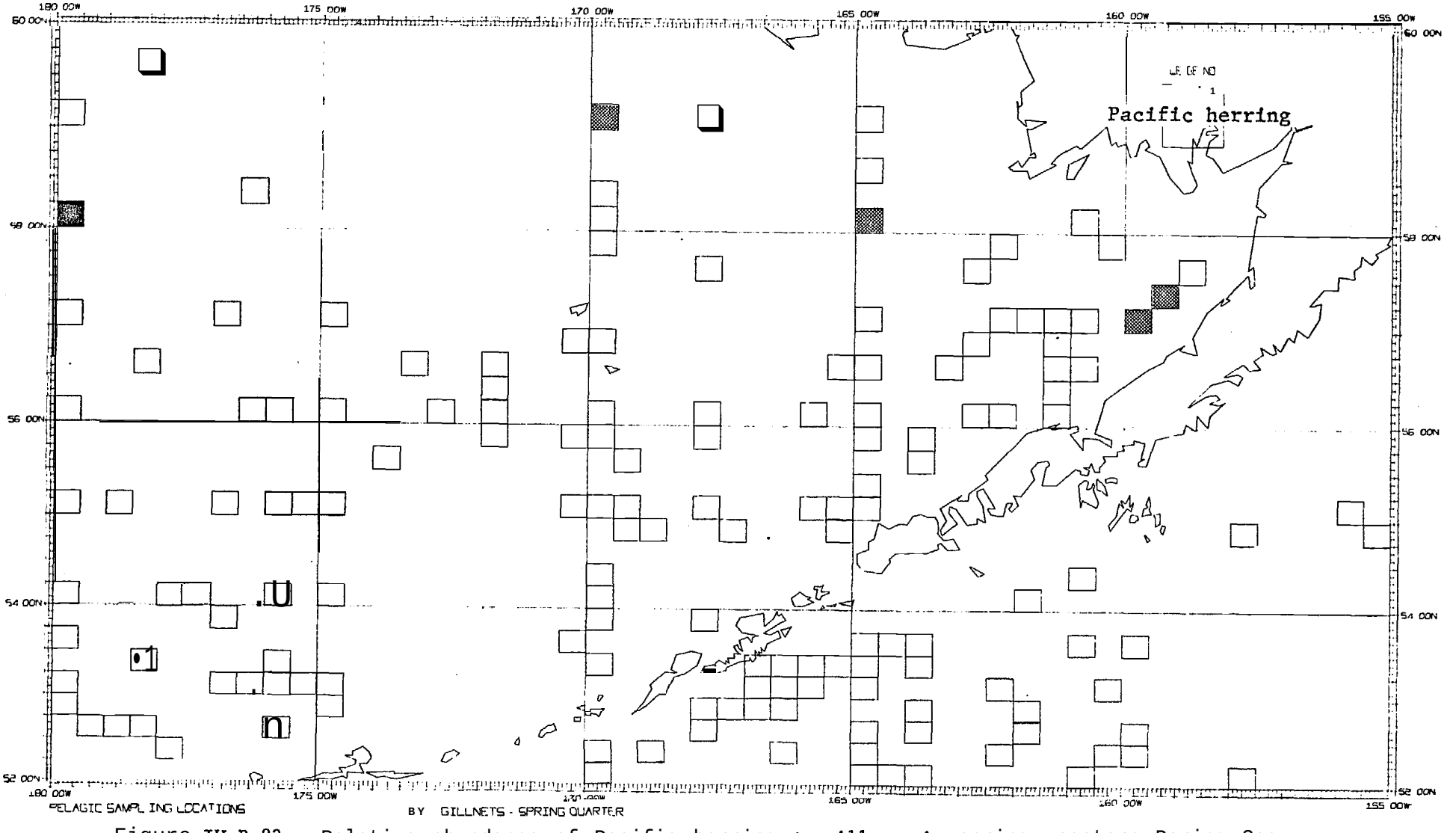


Figure IV.B.23.--Relative abundance of Pacific herring in gillnets in spring, eastern Bering Sea.

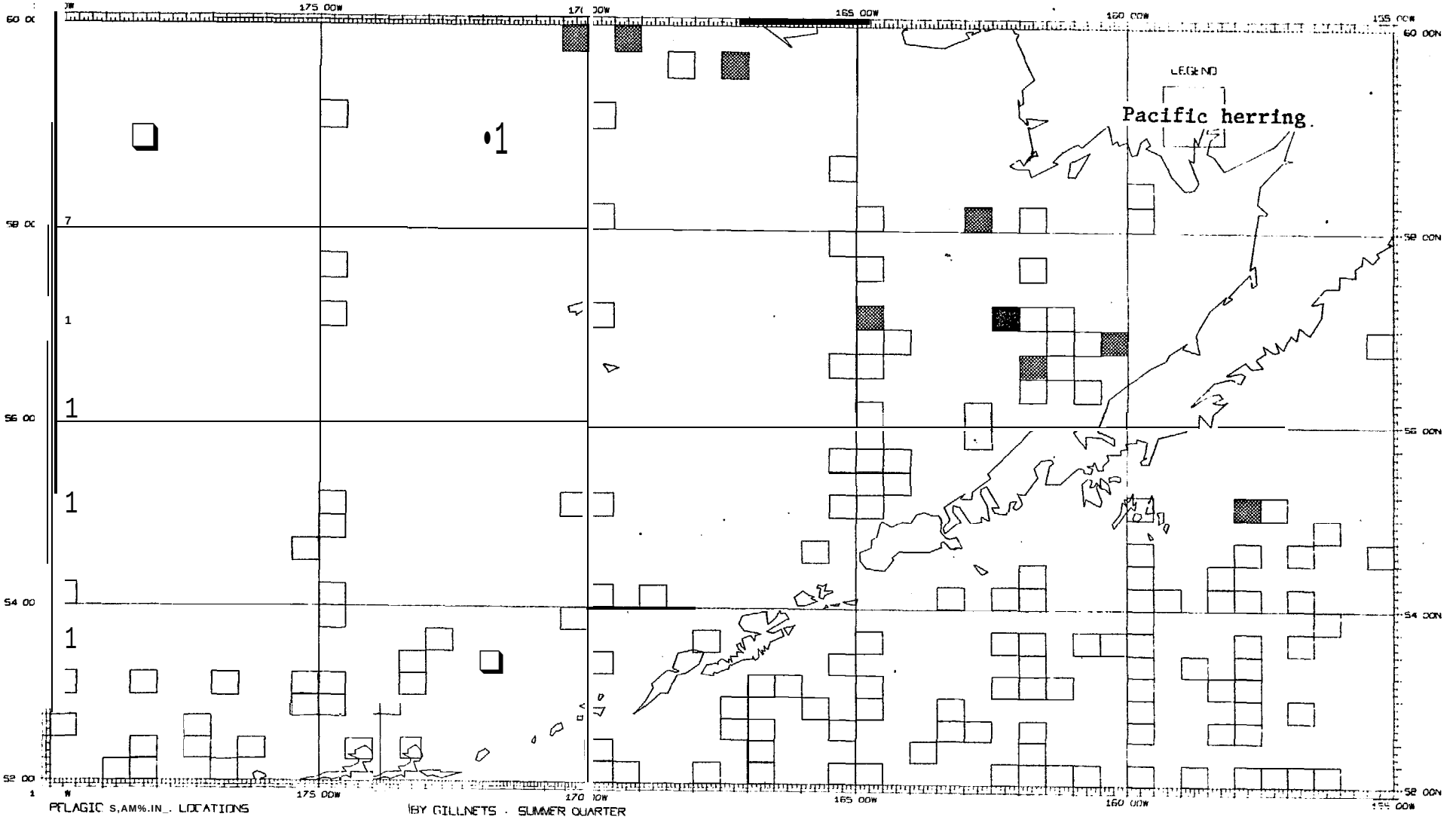


Figure IV. B.24.--Relative abundance of Pacific herring in gillnets in summer, eastern Bering Sea.

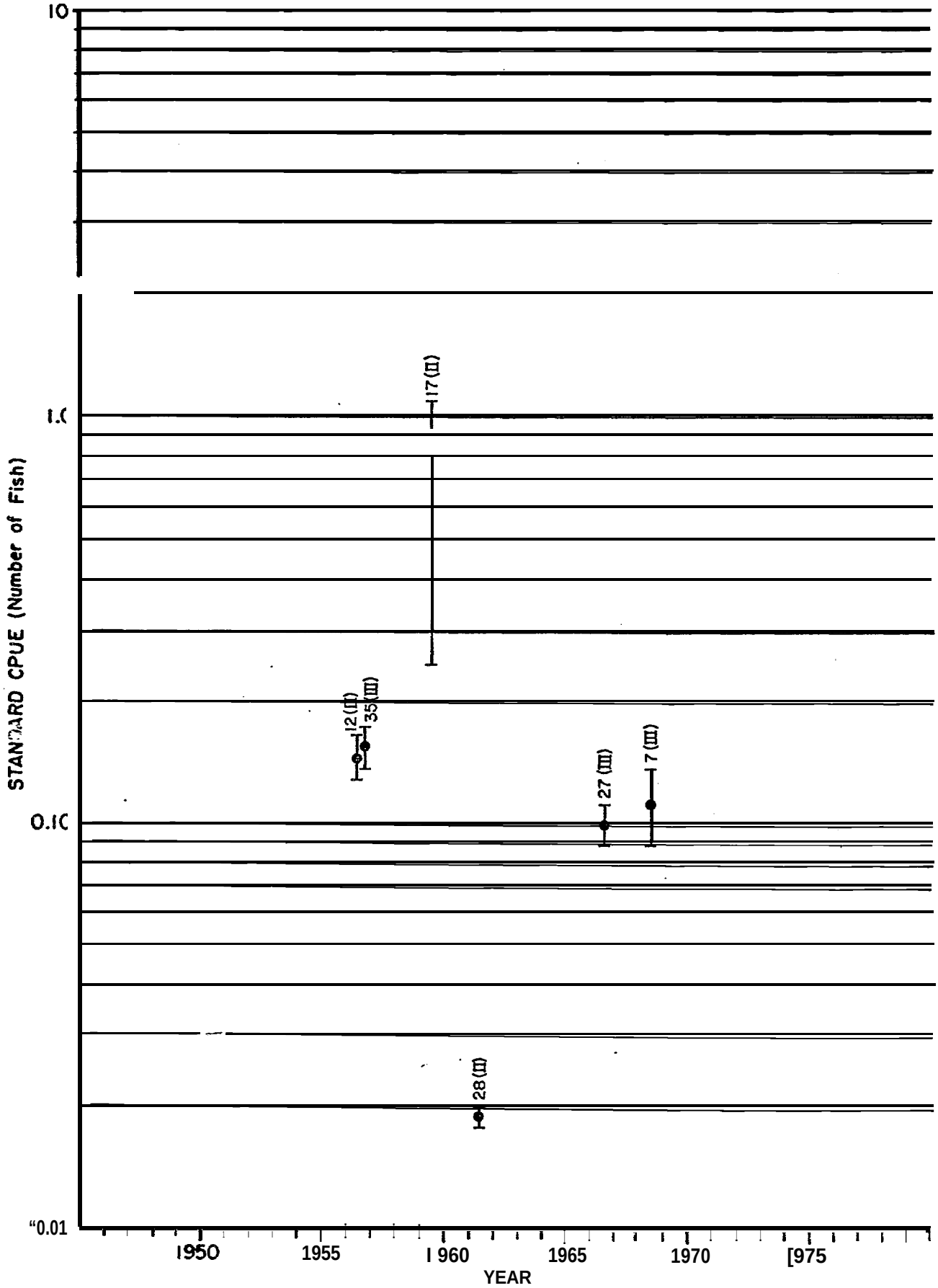


Figure IV.B.25.--Standardized rate of catch of Pacific herring by gillnet in the eastern Bering Sea (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

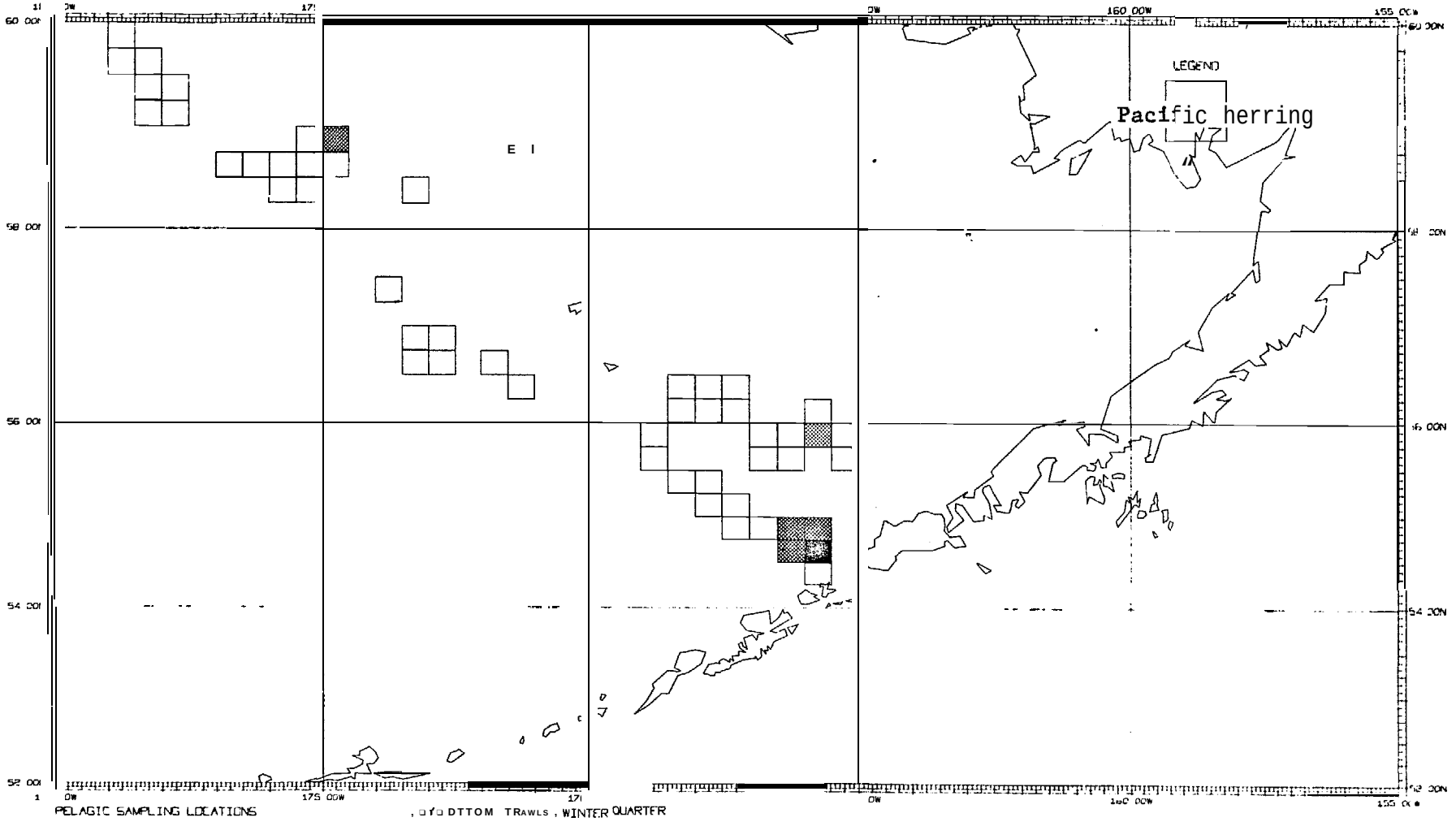


Figure IV. B.26.--Relative abundance of Pacific herring in bottom trawls in winter, eastern Bering Sea.

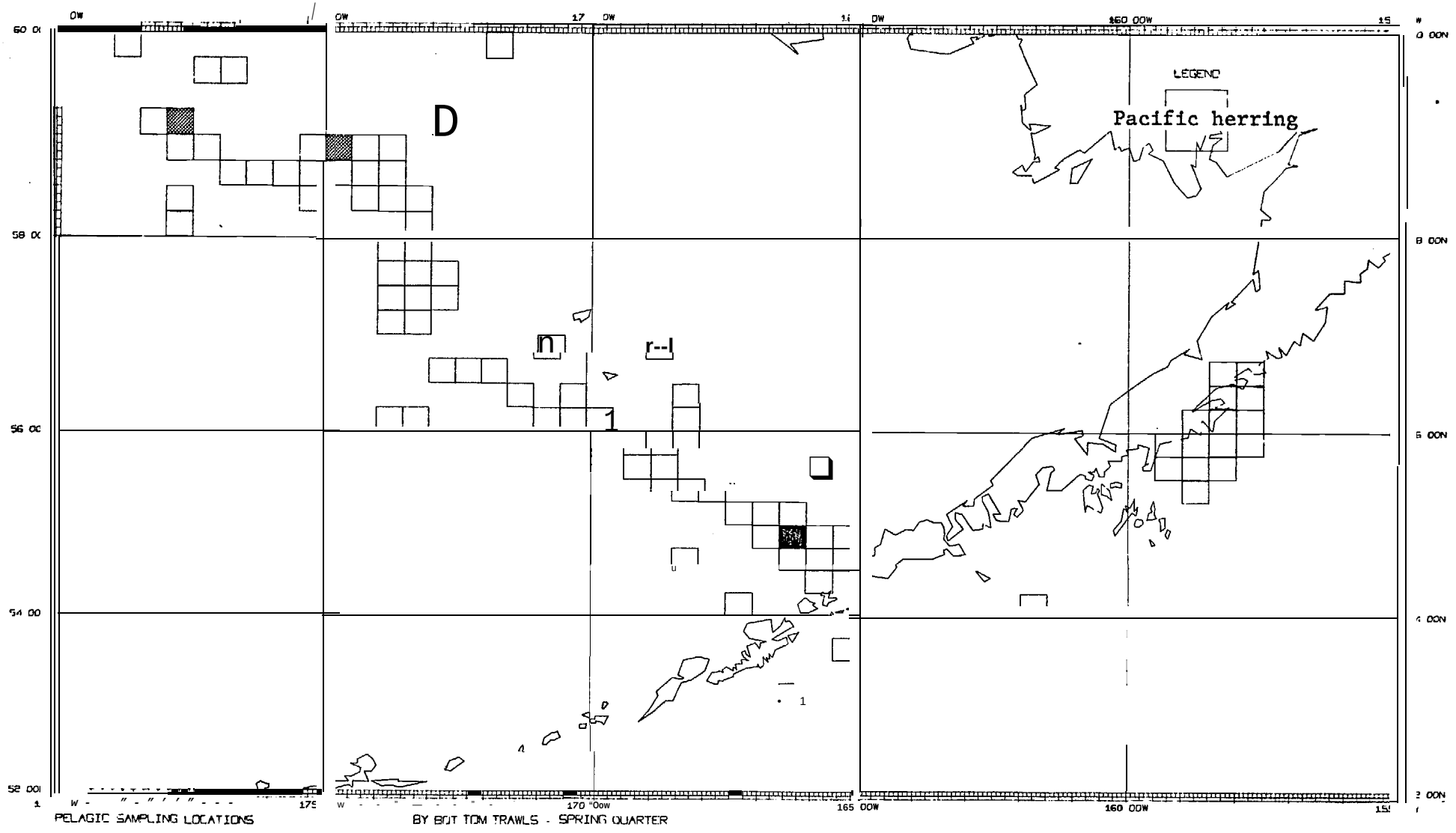


Figure IV. B.27.-. Relative abundance of Pacific herring in bottom trawls in spring, eastern Bering Sea.

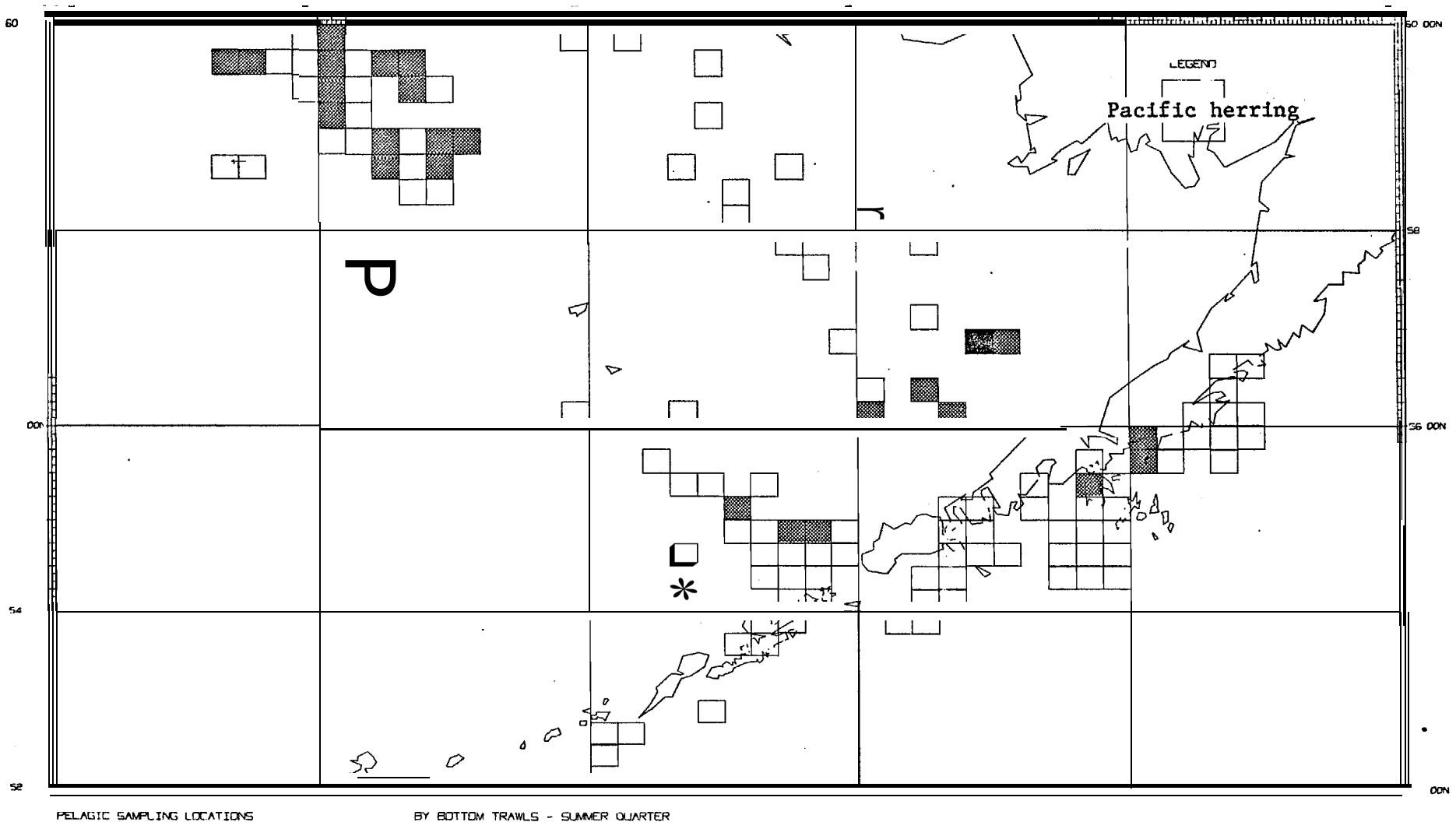


Figure IV.B.28.--Relative abundance of Pacific herring in bottom trawls in summer, eastern Bering Sea.

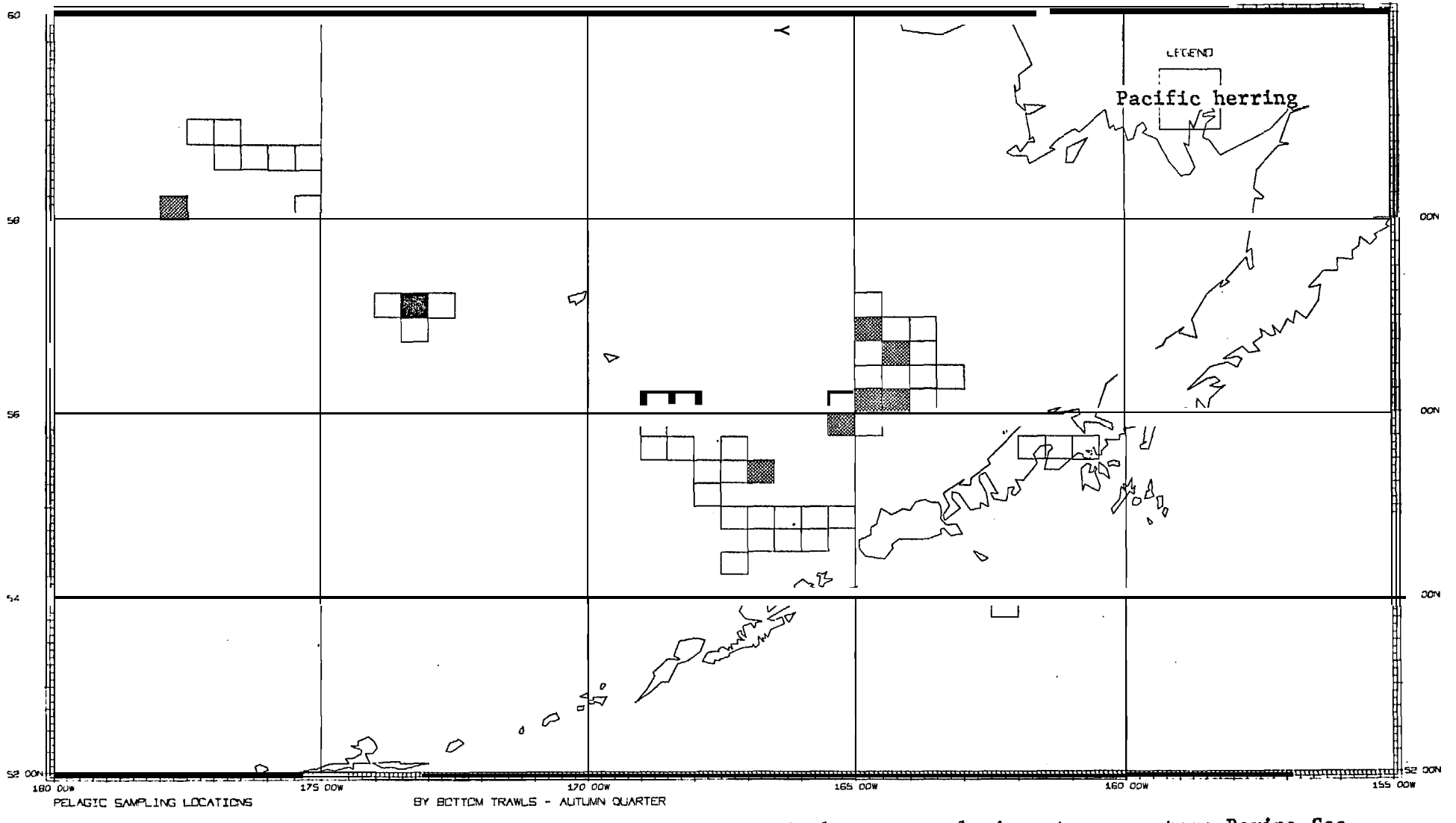


Figure IV.B.29.--Relative abundance of Pacific herring in bottom trawls in autumn, eastern Bering Sea.

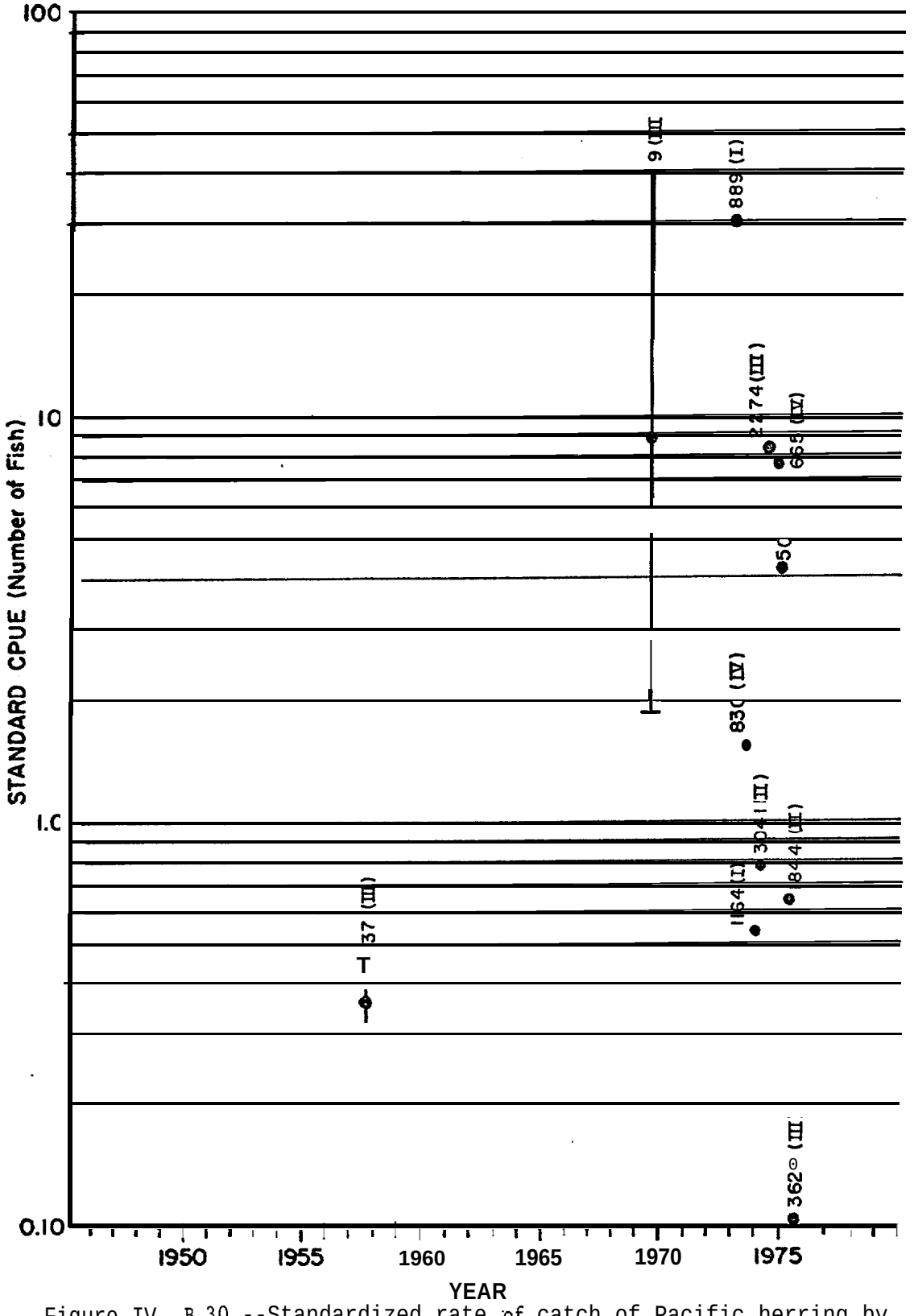


Figure IV. B.30.--Standardized rate of catch of Pacific herring by bottom trawl in the eastern Bering Sea (geometric mean: number/ 30min tow with 90% confidence interval, number of observations, and quarter of the year).

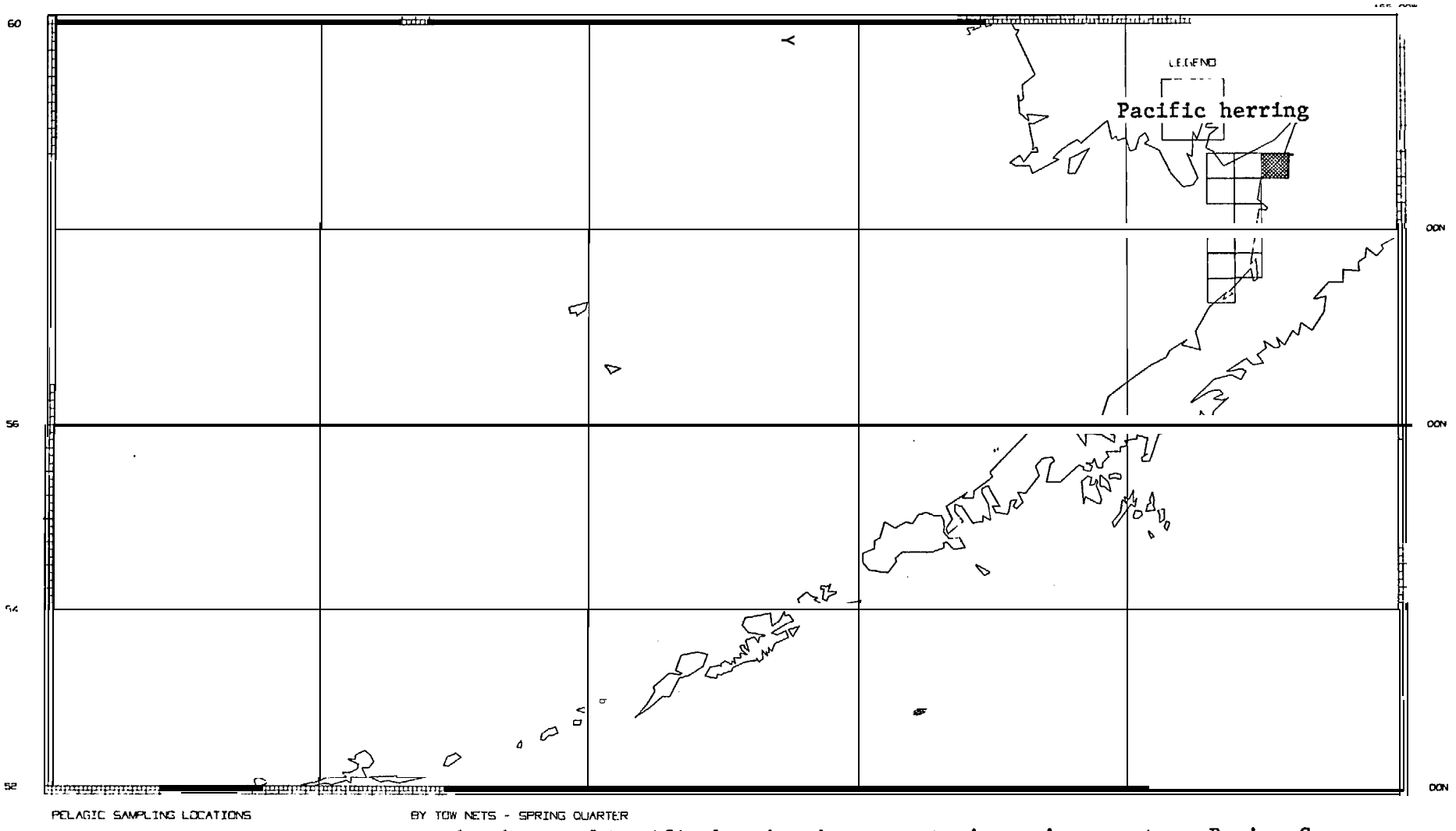


Figure IV.B.31.--Relative abundance of Pacific herring in tow nets in spring, eastern Bering Sea.

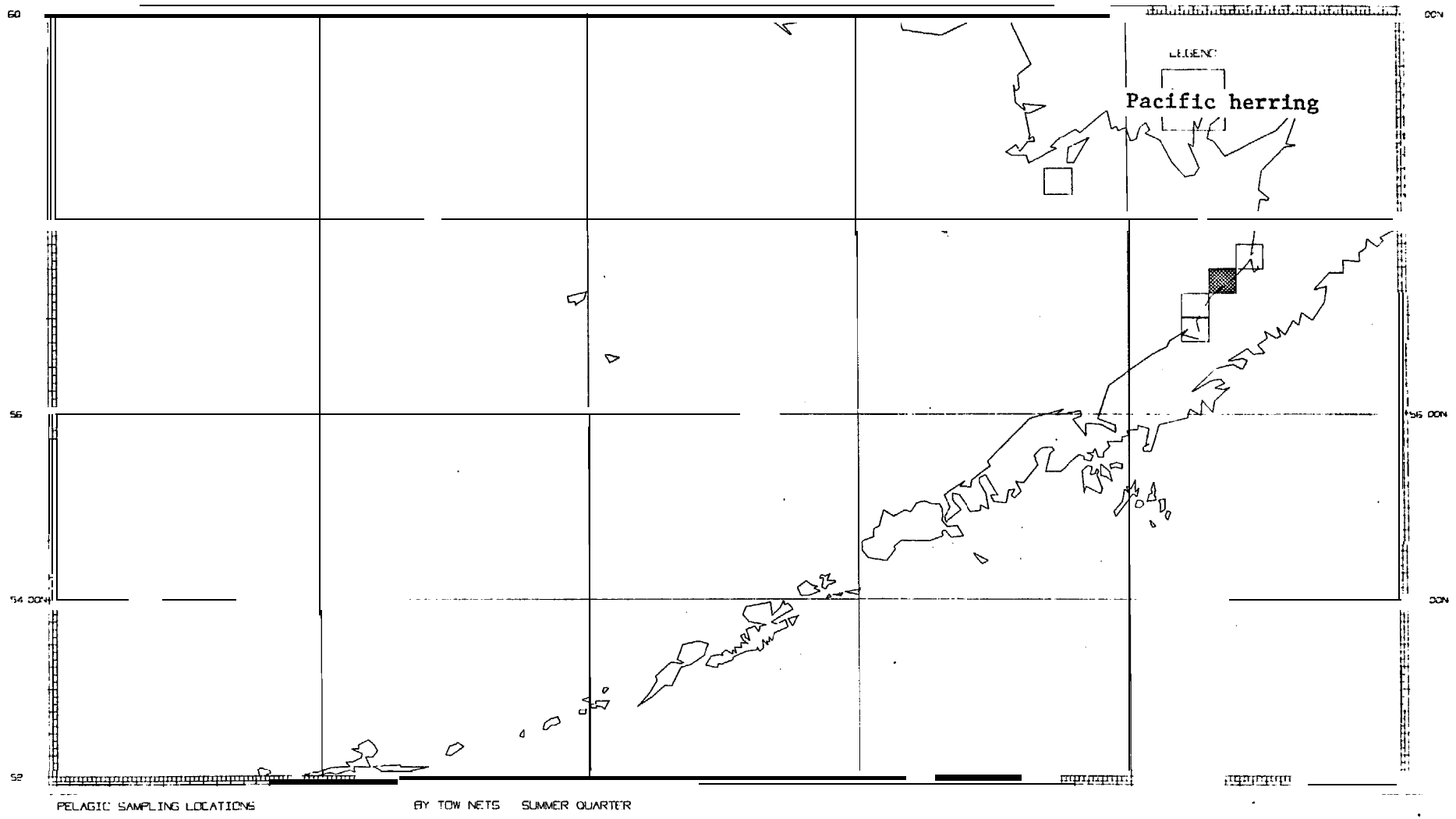


Figure IV.B.32.--Relative abundance of Pacific herring in tow nets in summer, eastern Bering Sea.

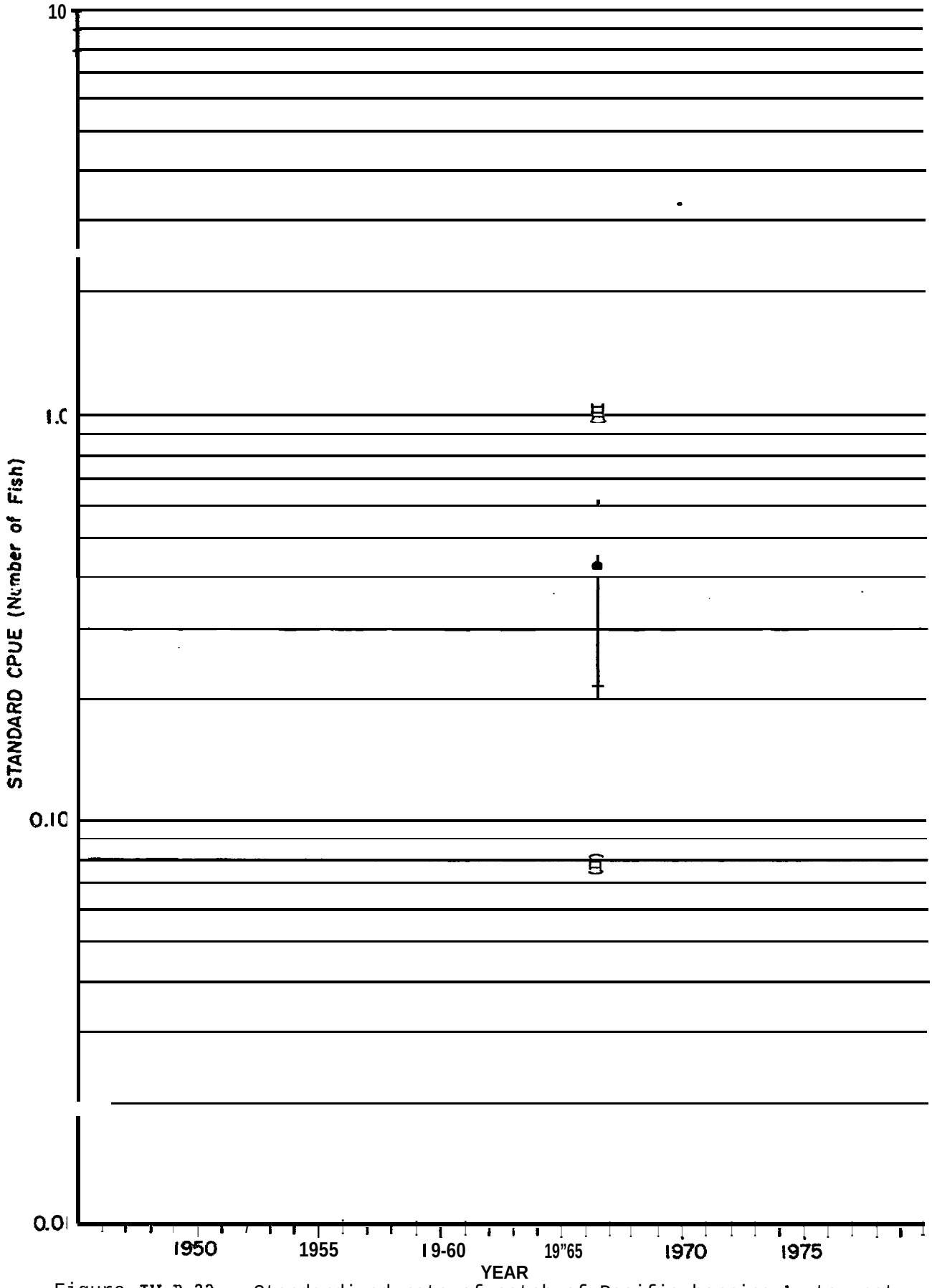


Figure IV.B.33.--Standardized rate of catch of Pacific herring by tow net in the eastern Bering Sea (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

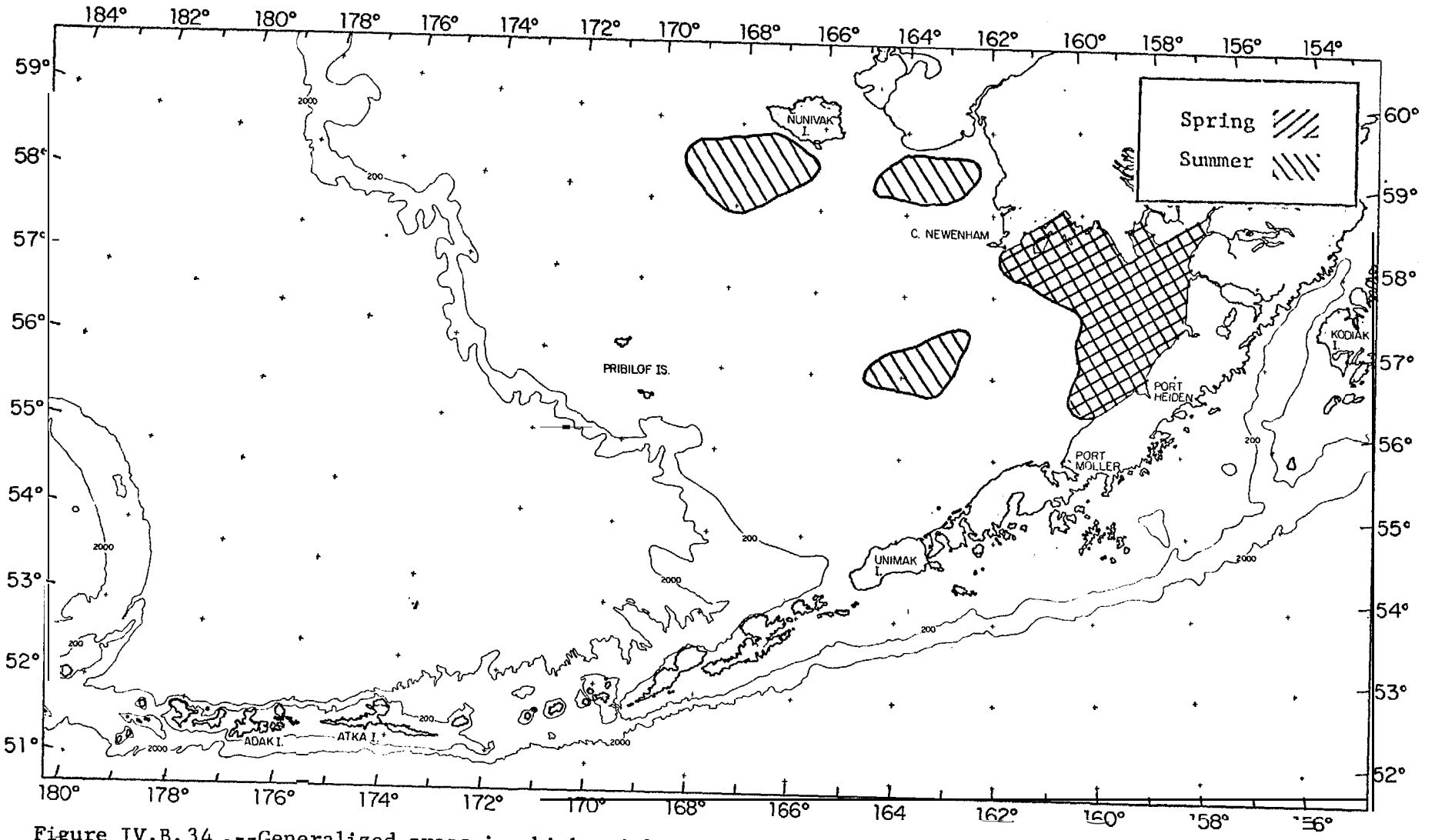


Figure IV.B.34 .--Generalized areas in which rainbow smelt larvae and juveniles were caught by seines, cow nets, and plankton nets, in spring and summer, eastern Bering Sea.

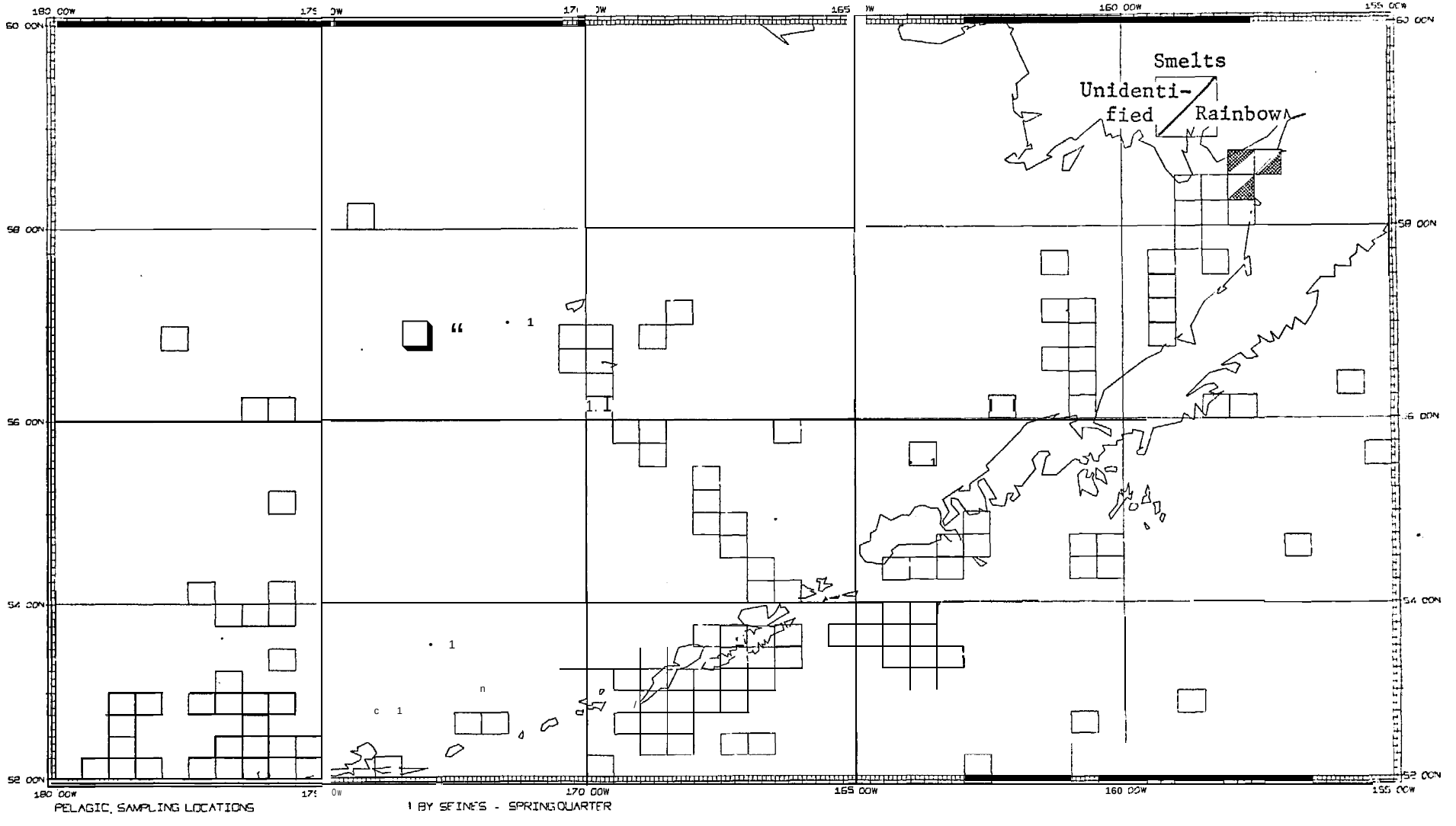


Figure IV.B.35.--Relative abundance of unidentified and rainbow smelts in purse seines in spring, eastern Bering Sea.

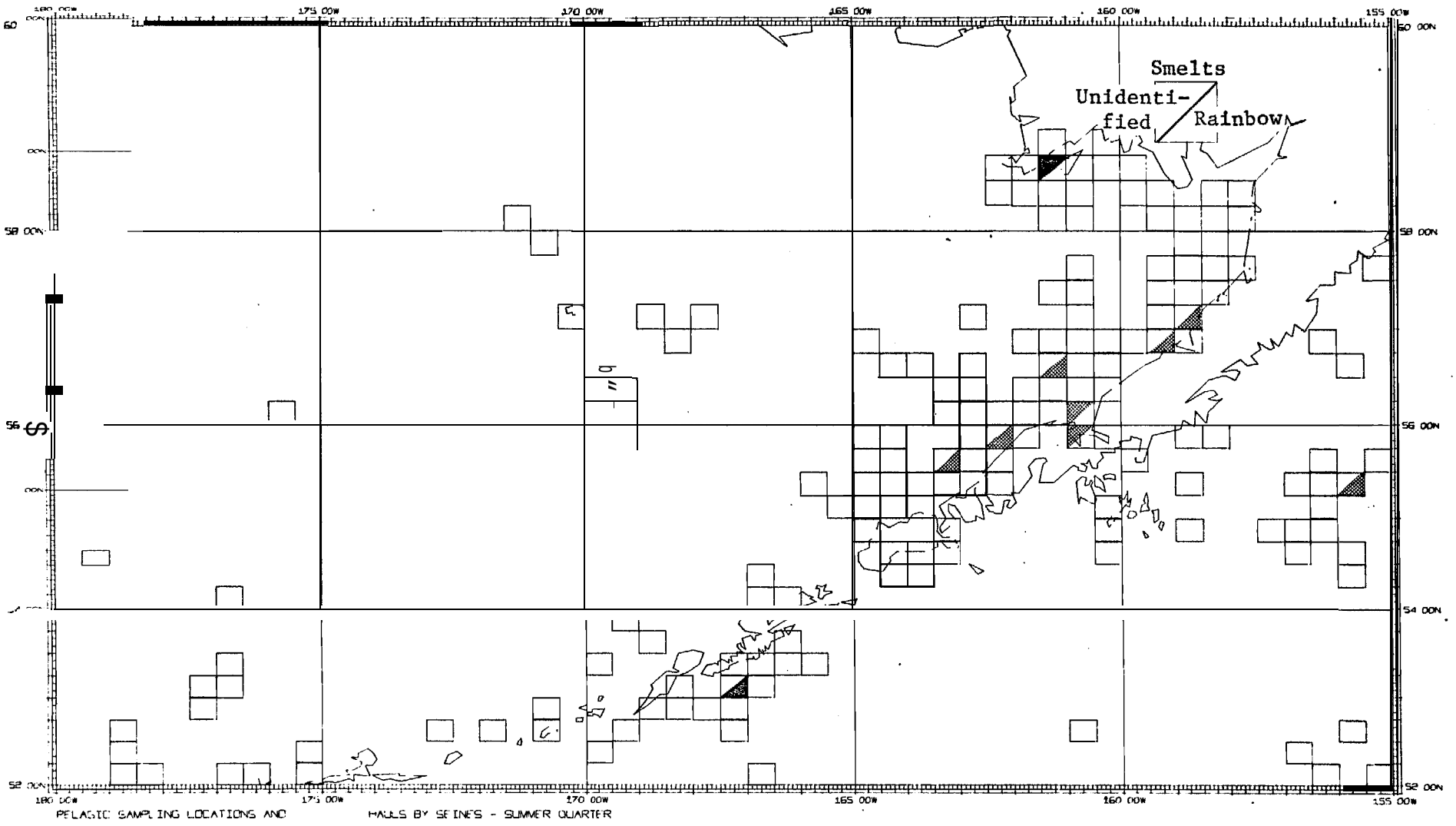


Figure IV.B.36.--Relative abundance of unidentified and rainbow smelts in purse seines in summer, eastern Bering Sea.

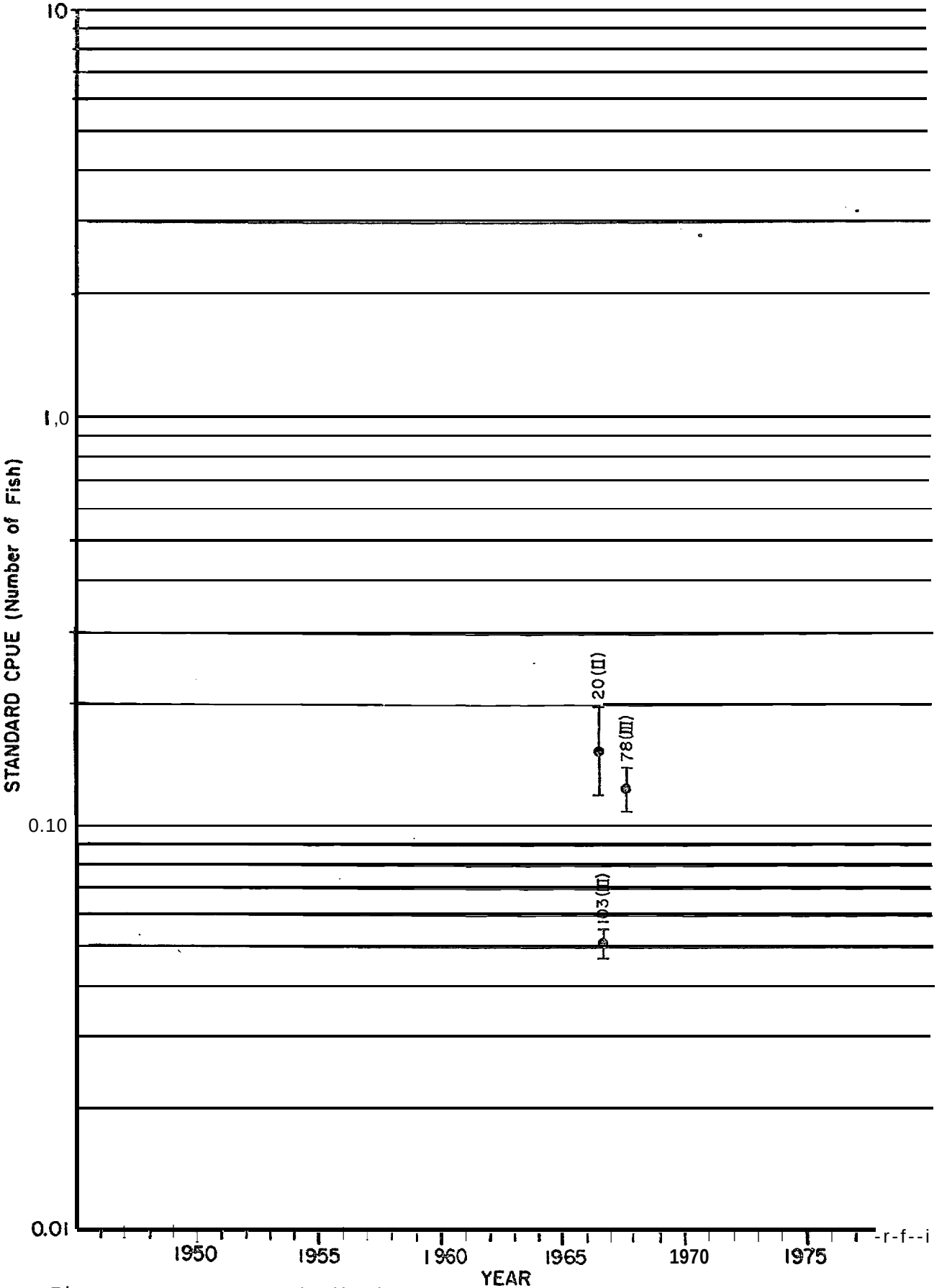


Figure IV. B.37 .--Standardized rate of catch of unidentified smelts by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

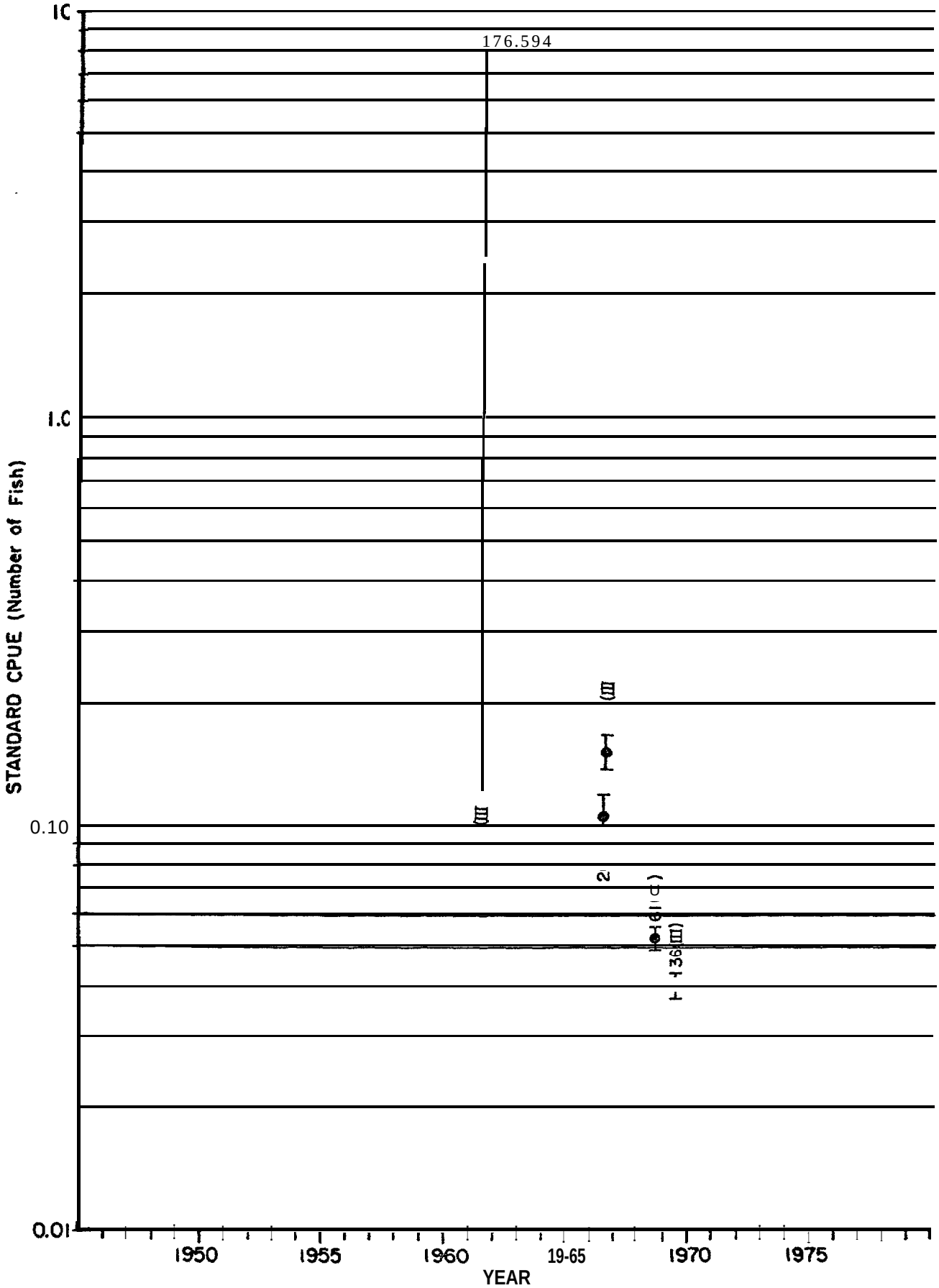


Figure IV. B.38.--Standardized rate of catch of rainbow smelt by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

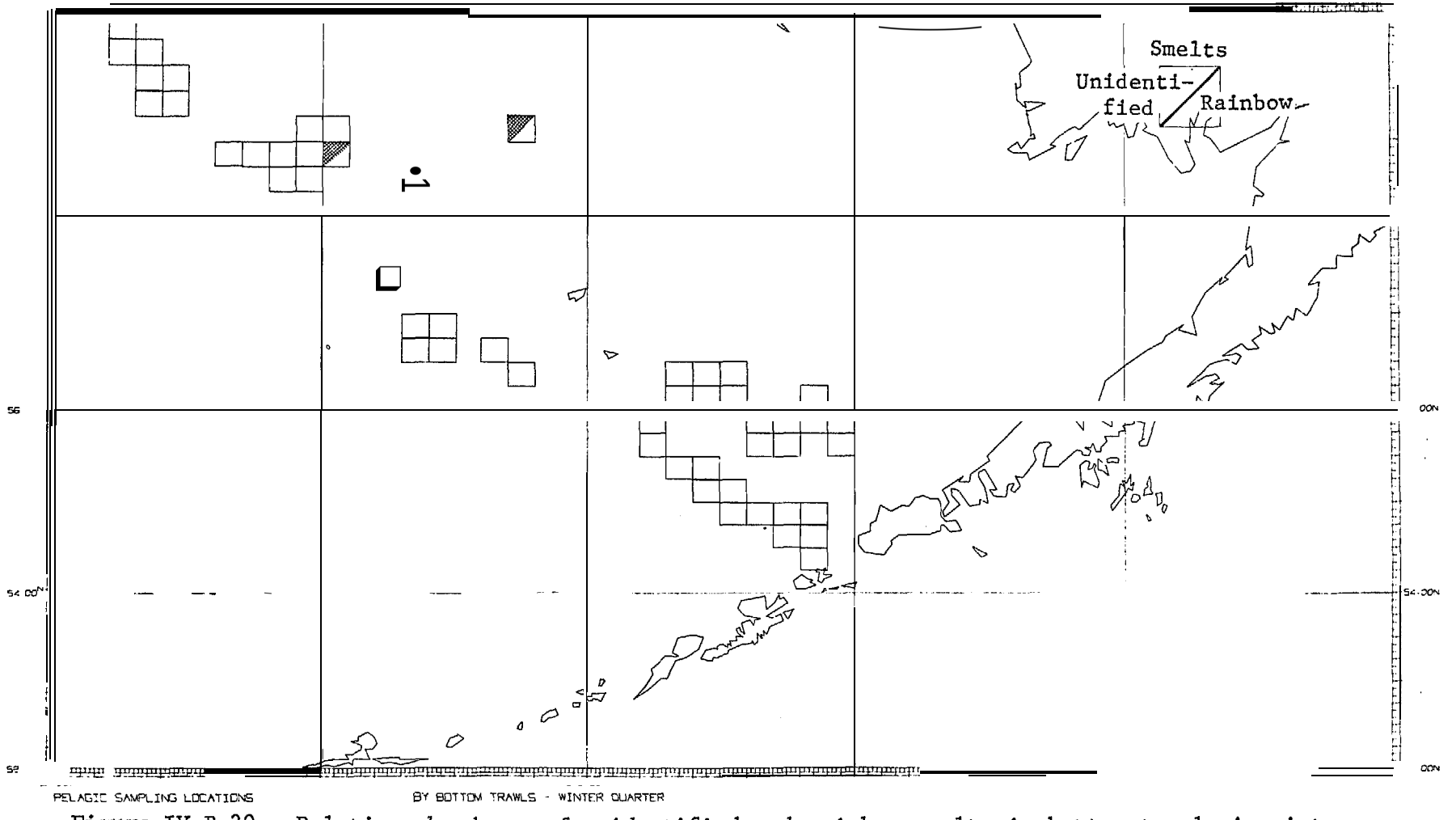


Figure IV.B.39.--Relative abundance of unidentified and rainbow smelts in bottom trawls in winter, eastern Bering Sea.

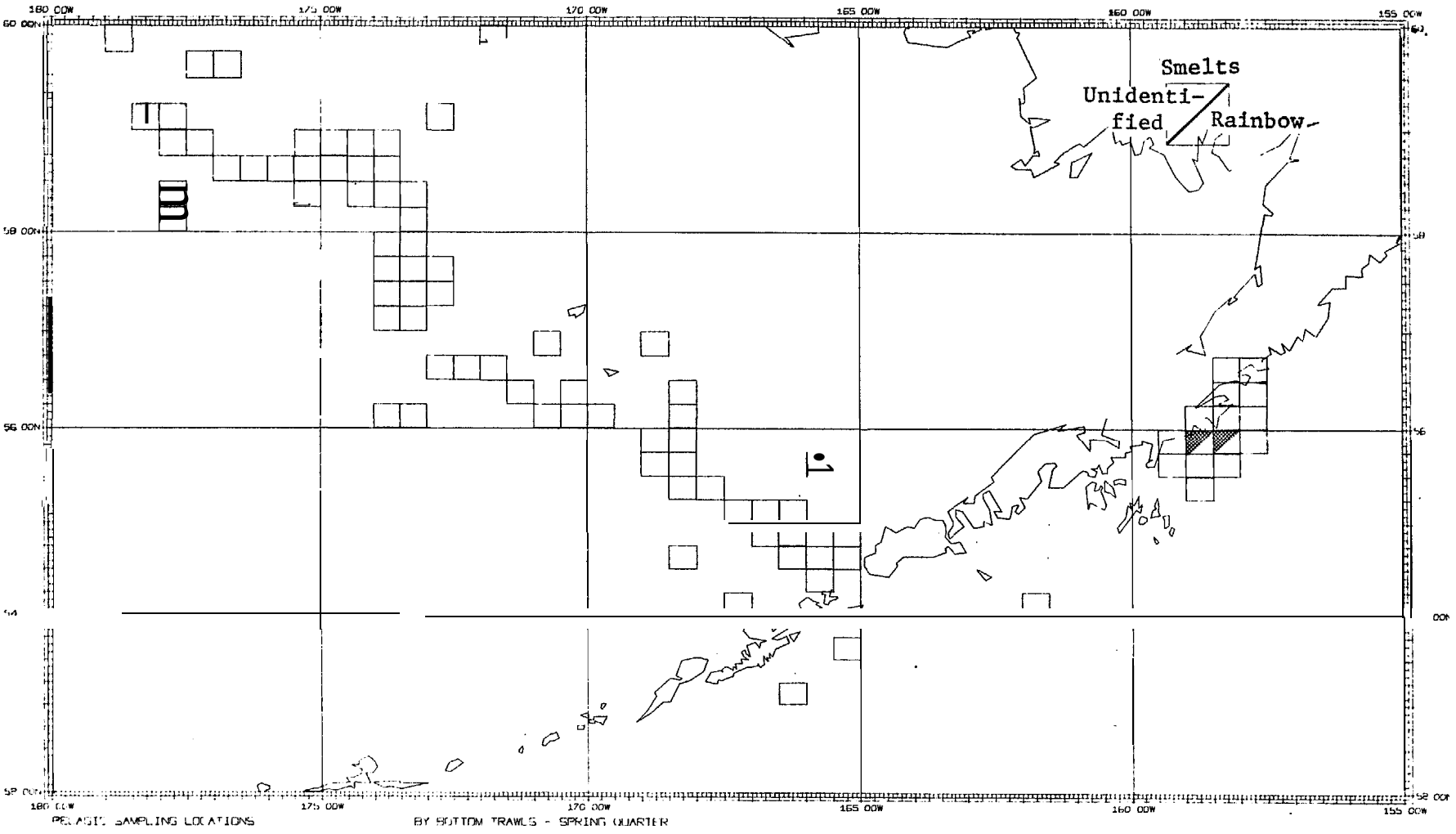


Figure IV.B.40.--Relative abundance of unidentified and rainbow smelts in bottom trawls in spring, eastern Bering Sea.

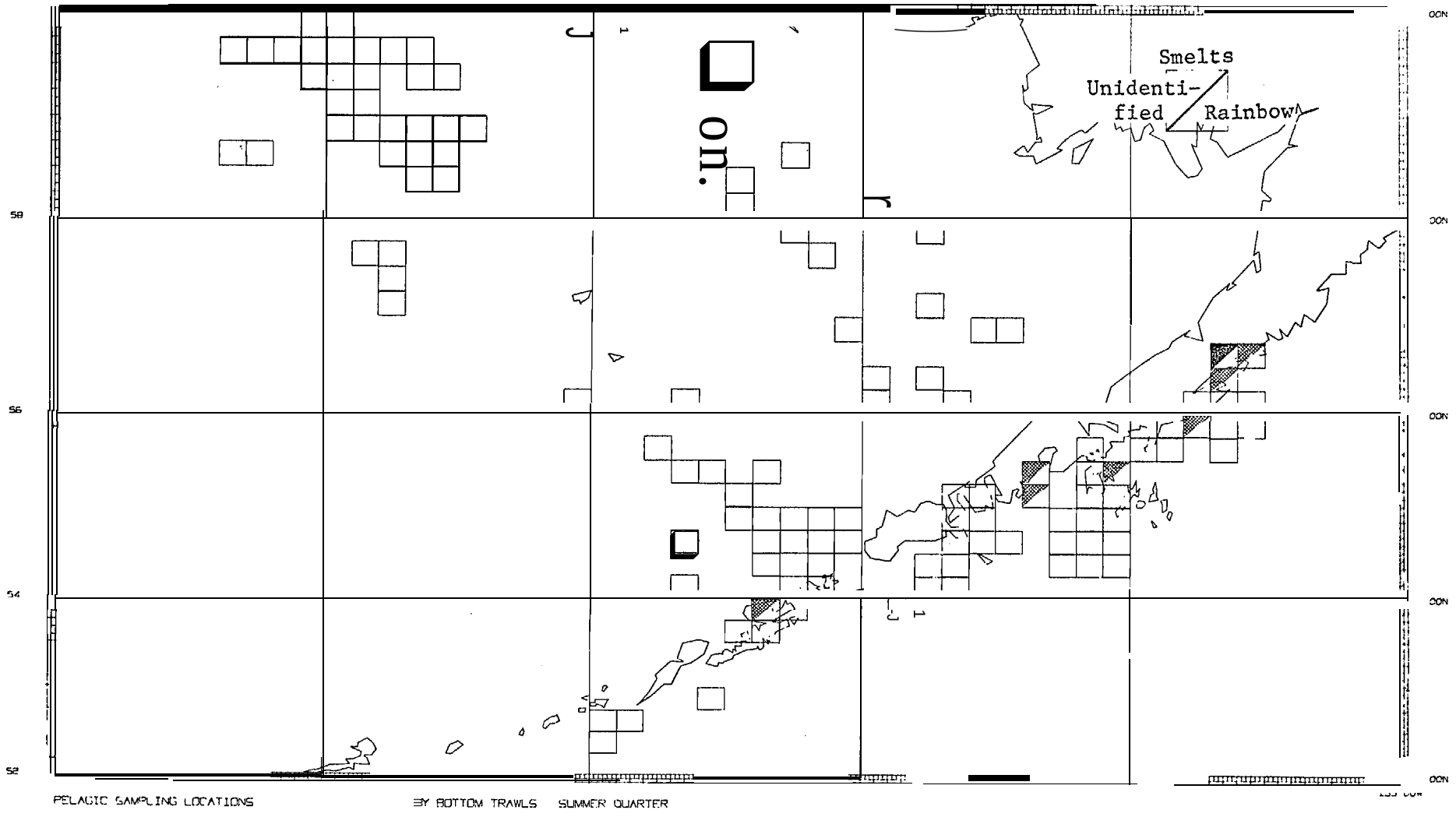


Figure IV.B.41.--Relative abundance of unidentified and rainbow smelts in bottom trawls in summer, eastern Bering Sea.

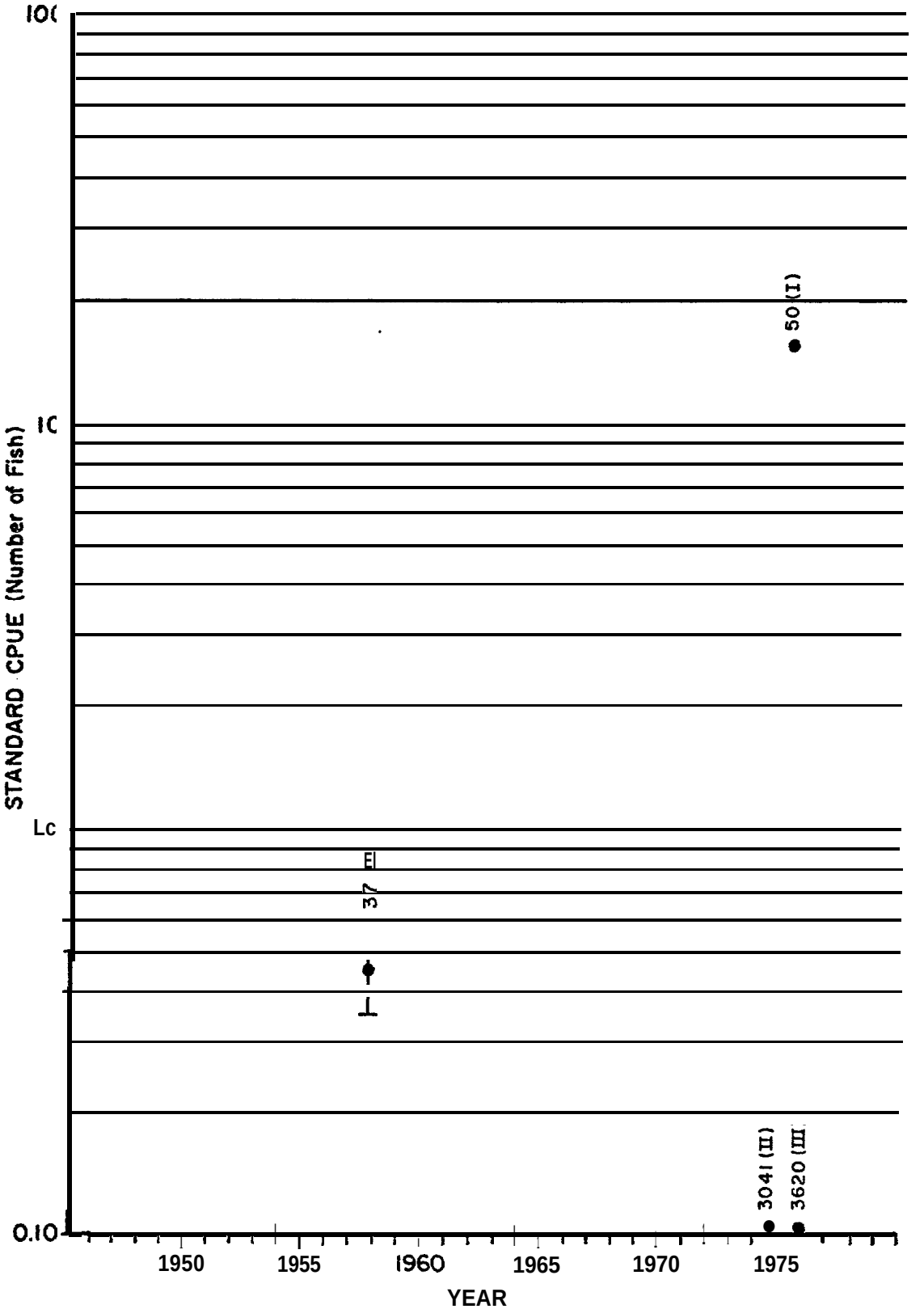


Figure IV. B.42.--Standardized rate of catch of unidentified smelts by bottom trawl in the eastern Bering Sea (geometric mean: number/ 30 min tow with 90% confidence interval, number of observations, and quarter of the year).

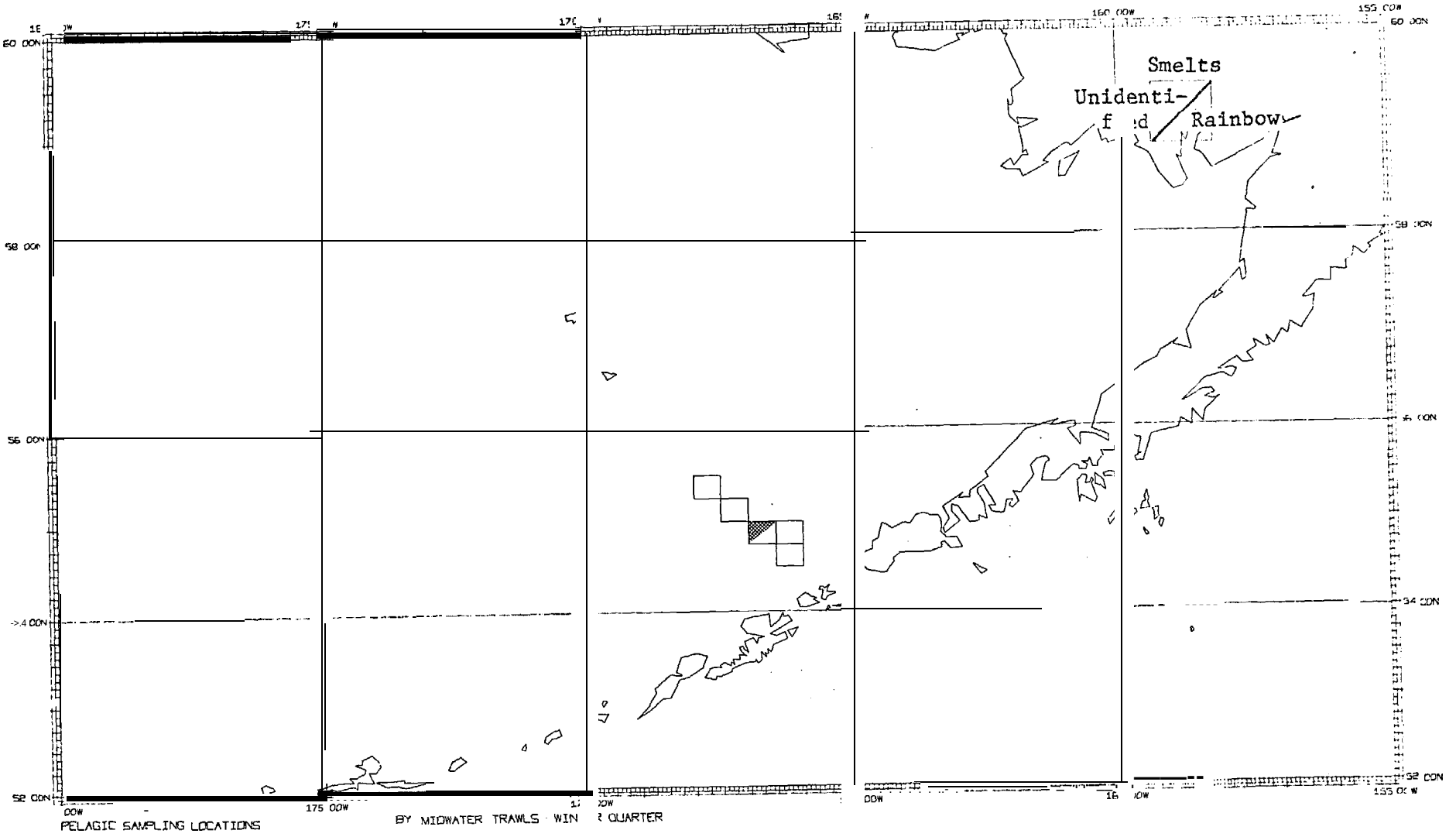


Figure IV. B.43.--Relative abundance of unidentified and rainbow smelts in midwater trawls in winter, eastern Bering Sea.

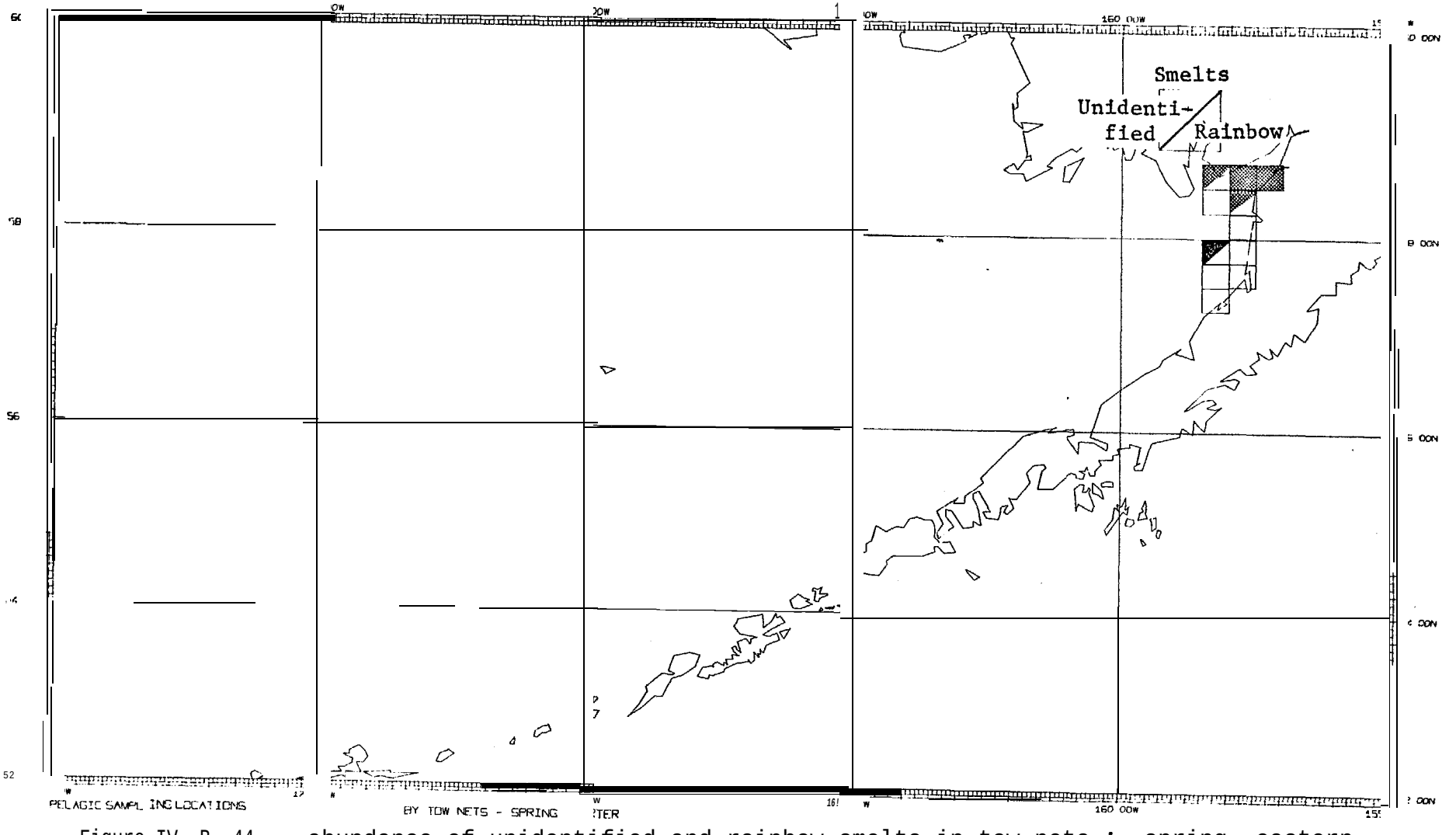


Figure IV. B. 44 --Relative abundance of unidentified and rainbow smelts in tow nets in spring, eastern Bering Sea.

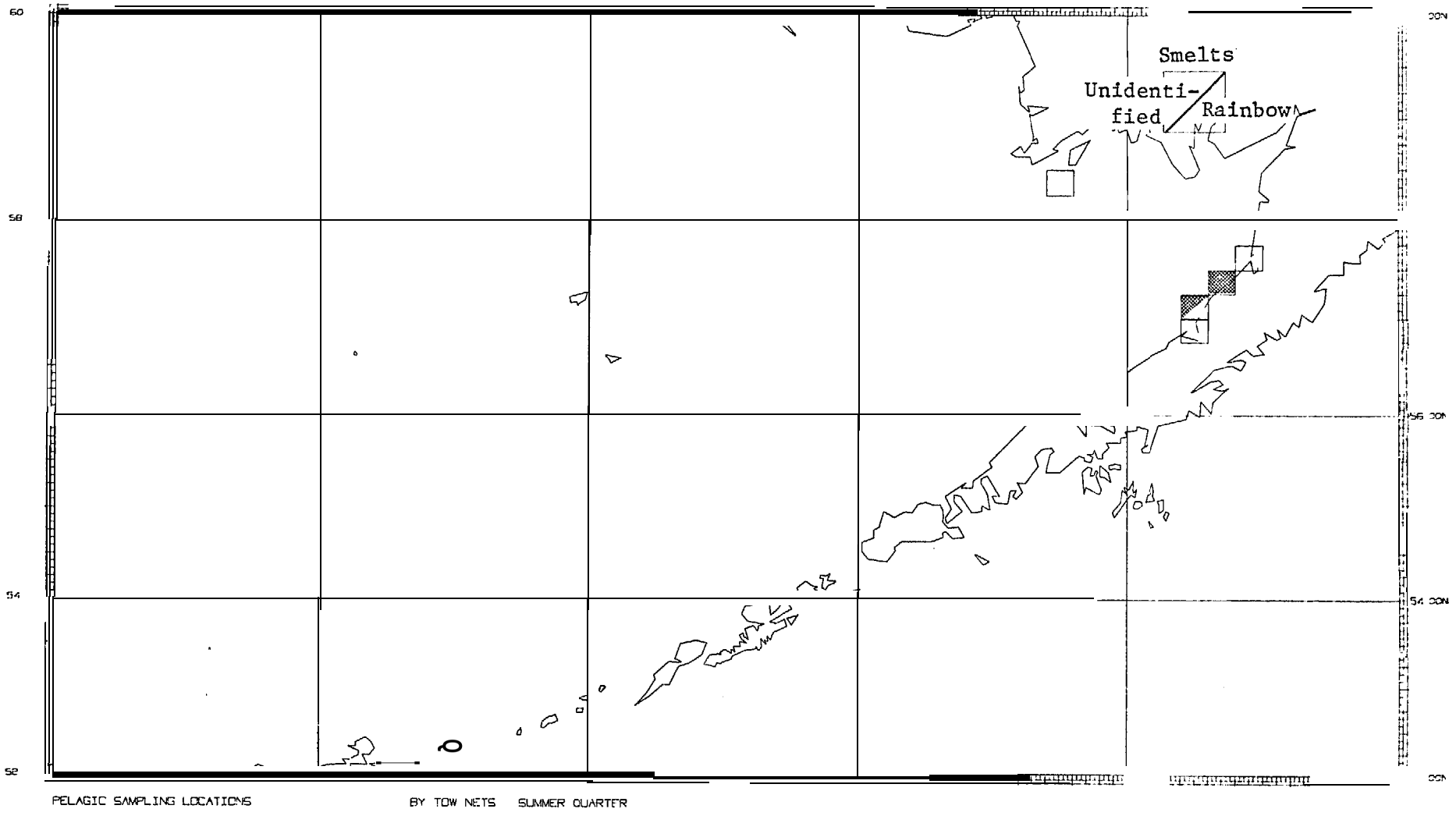


Figure IV.B.45.--Relative abundance of unidentified and rainbow smelts in tow nets in summer, eastern Bering Sea.

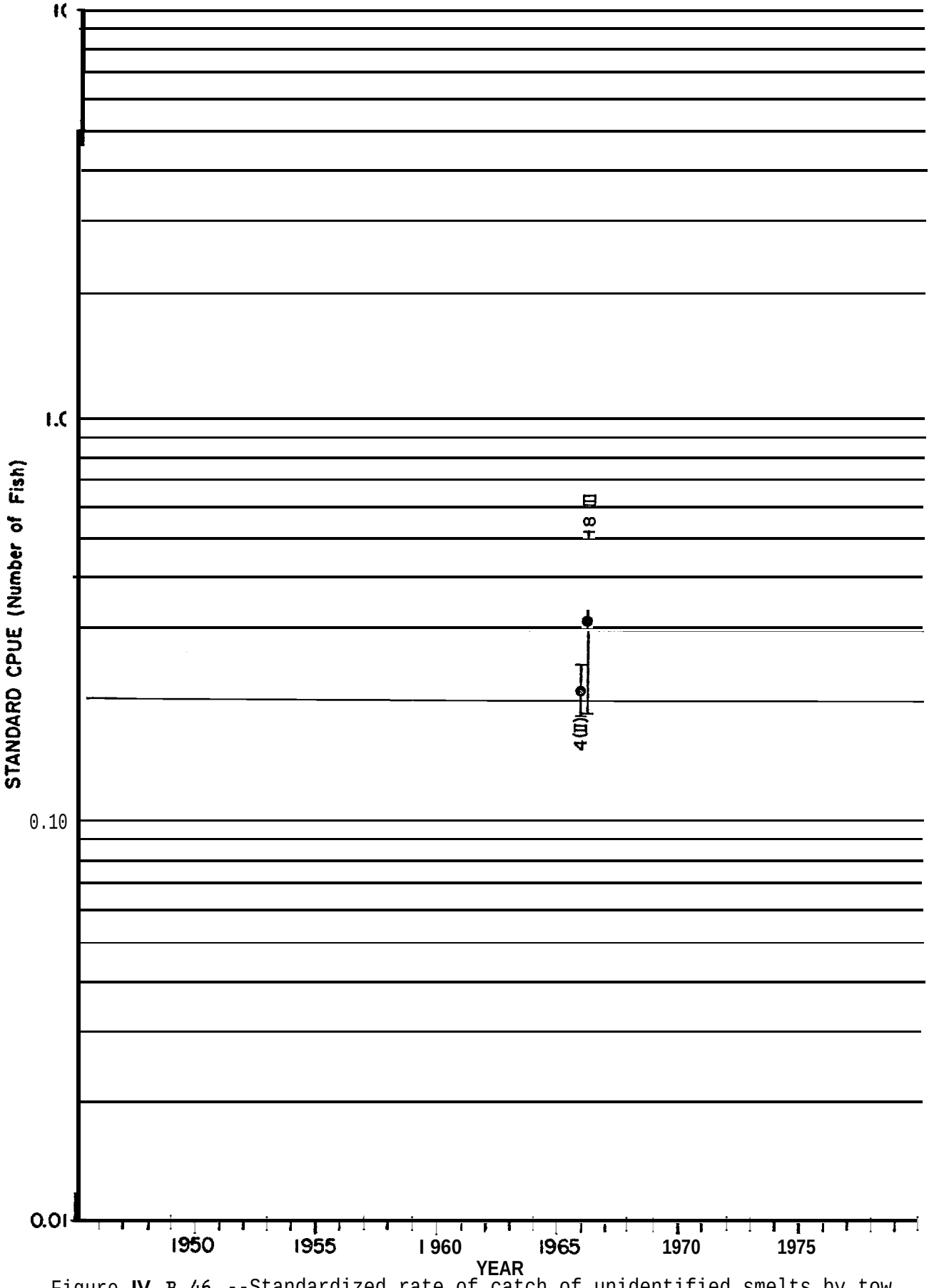


Figure IV. B.46.--Standardized rate of catch of unidentified smelts by tow net in the eastern Bering Sea (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

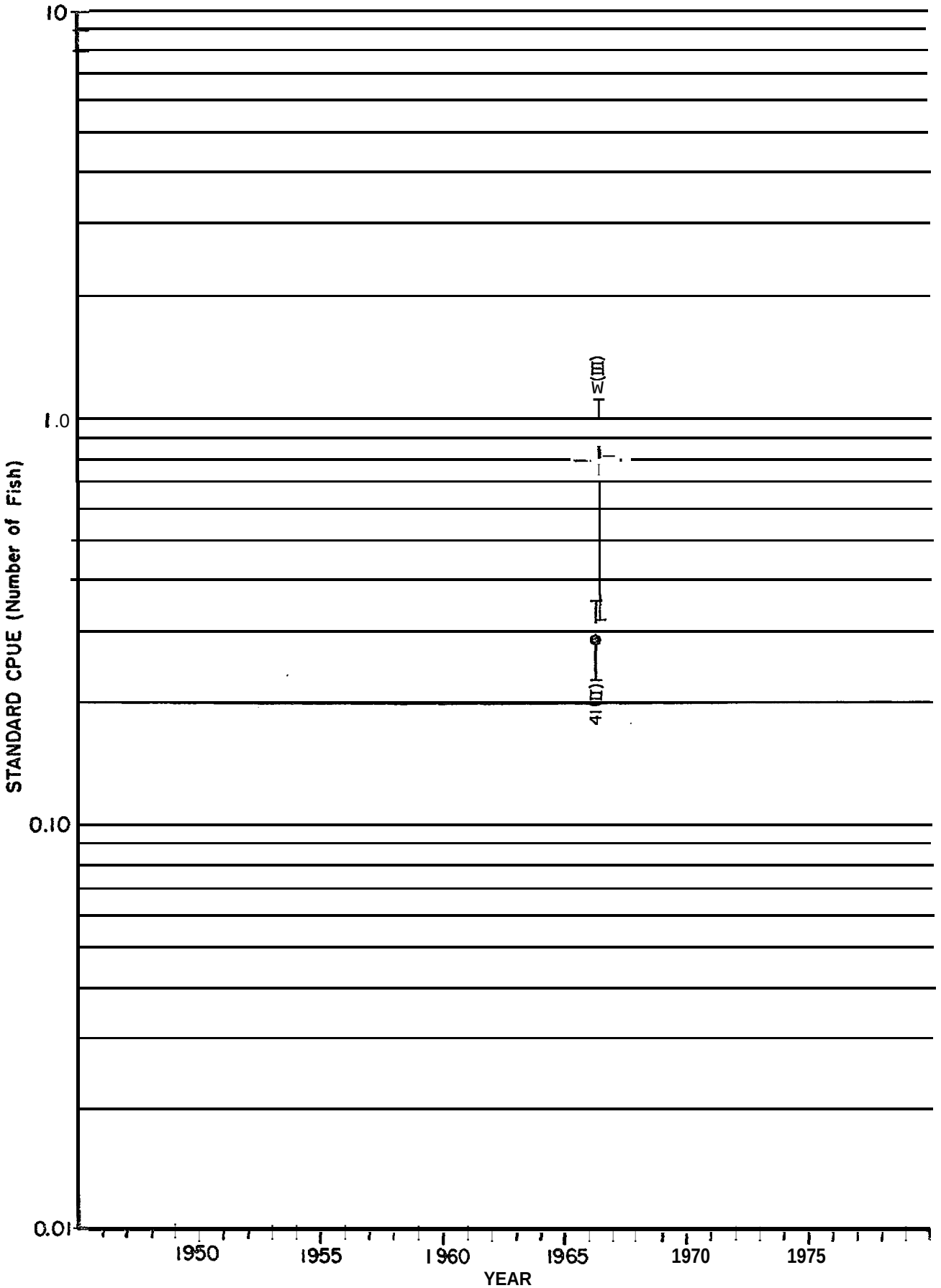


Figure IV.B.47.--Standardized rate of catch of rainbow smelt by tow net in the eastern Bering Sea (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

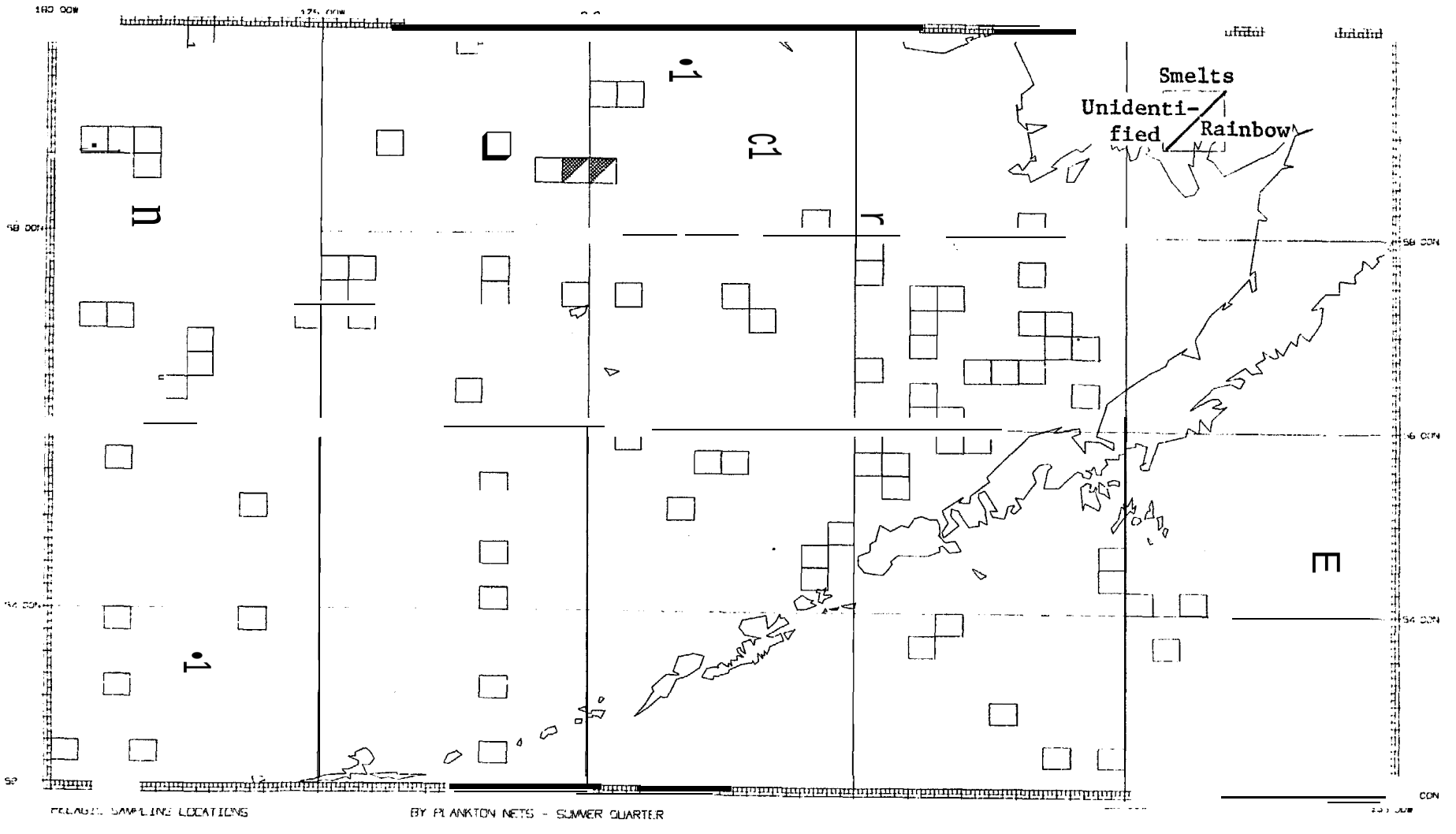


Figure IV.B.48.--Relative abundance of unidentified and rainbow smelts in plankton nets in summer, eastern Bering Sea.

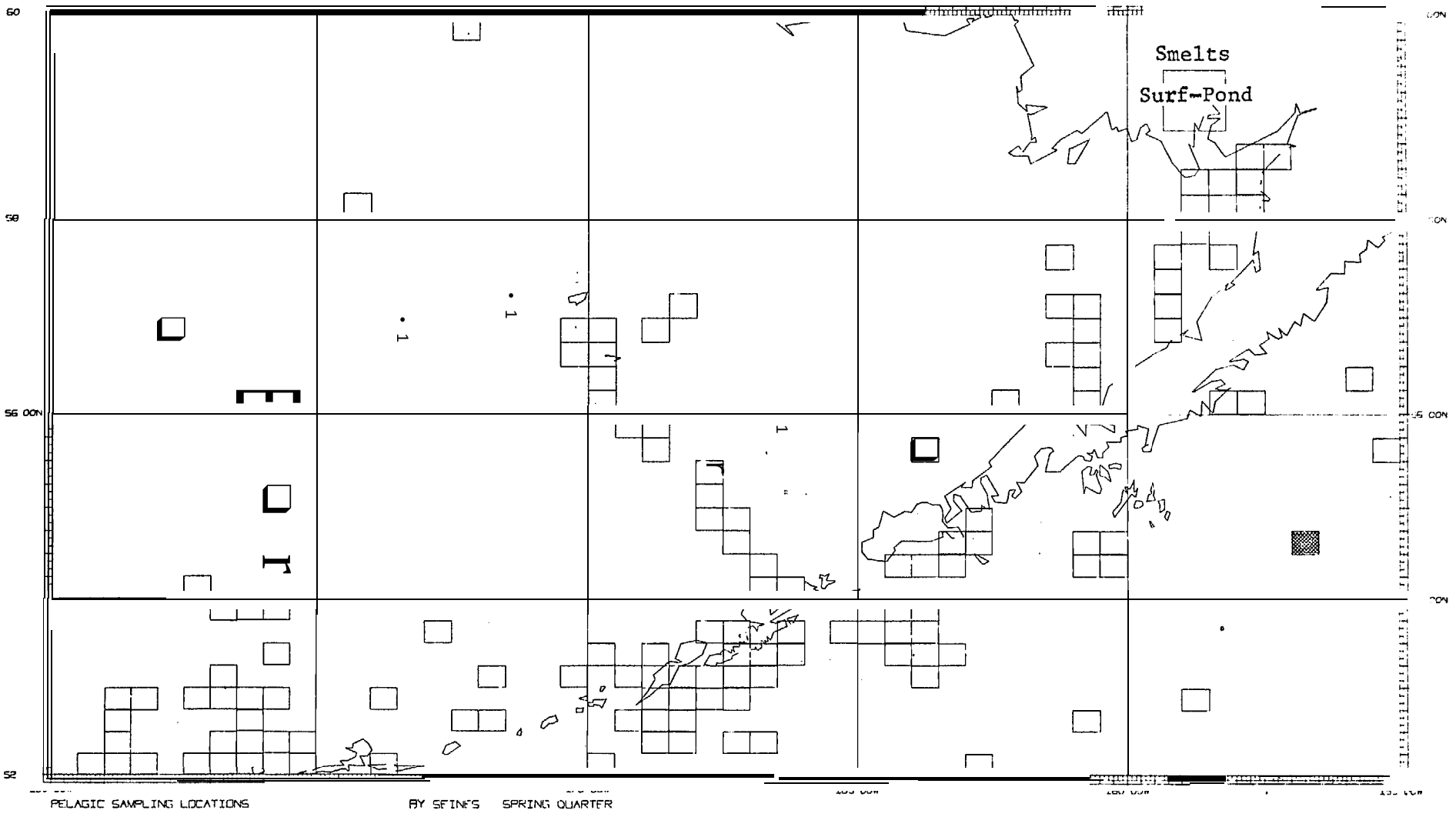


Figure IV.B.49.--Relative abundance of surf and pond smelts (combined) in purse seines in spring, eastern Bering Sea.

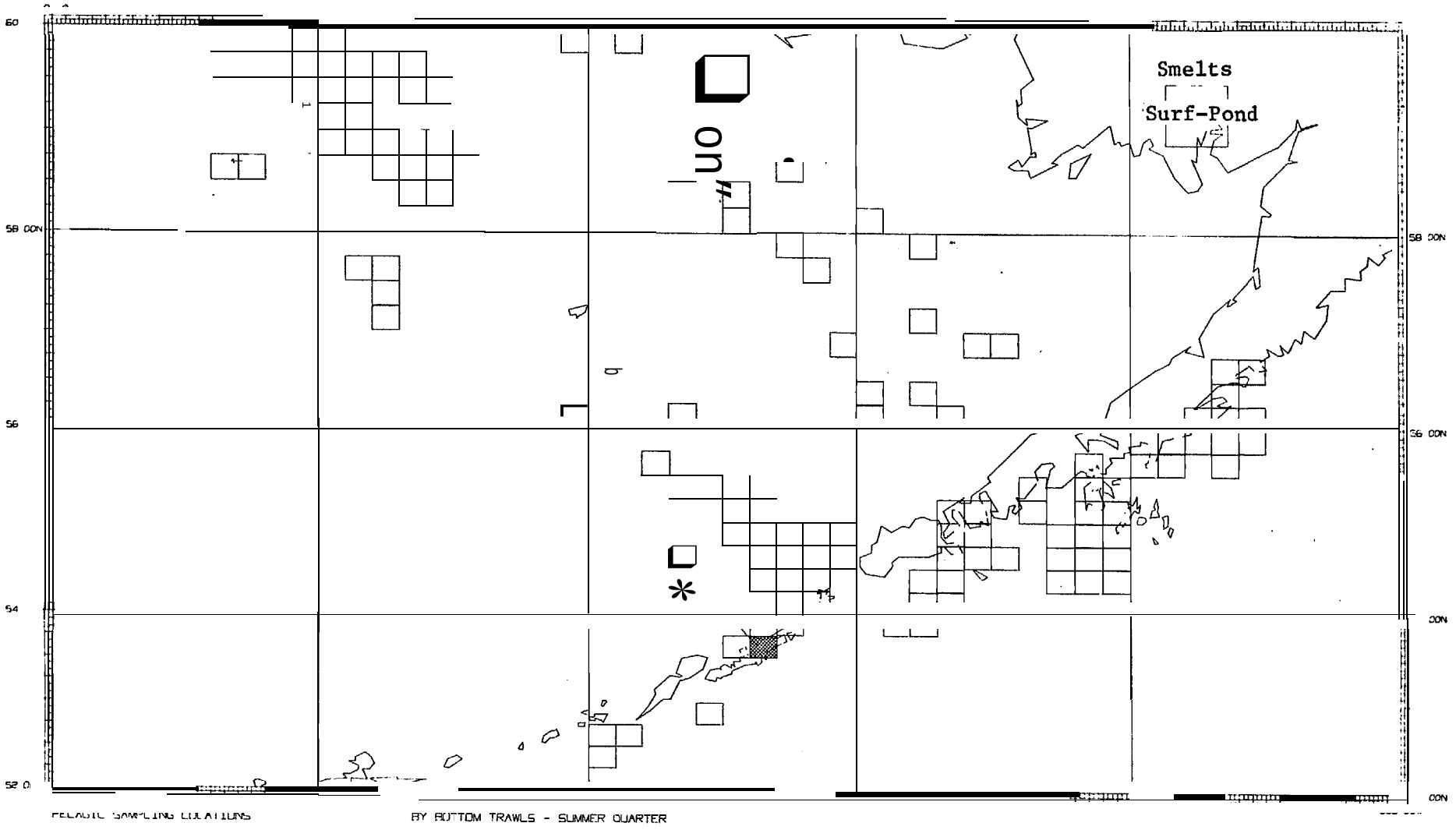


Figure IV.B.50.--Relative abundance of surf and pond smelts (combined) in bottom trawls in summer, eastern Bering Sea.

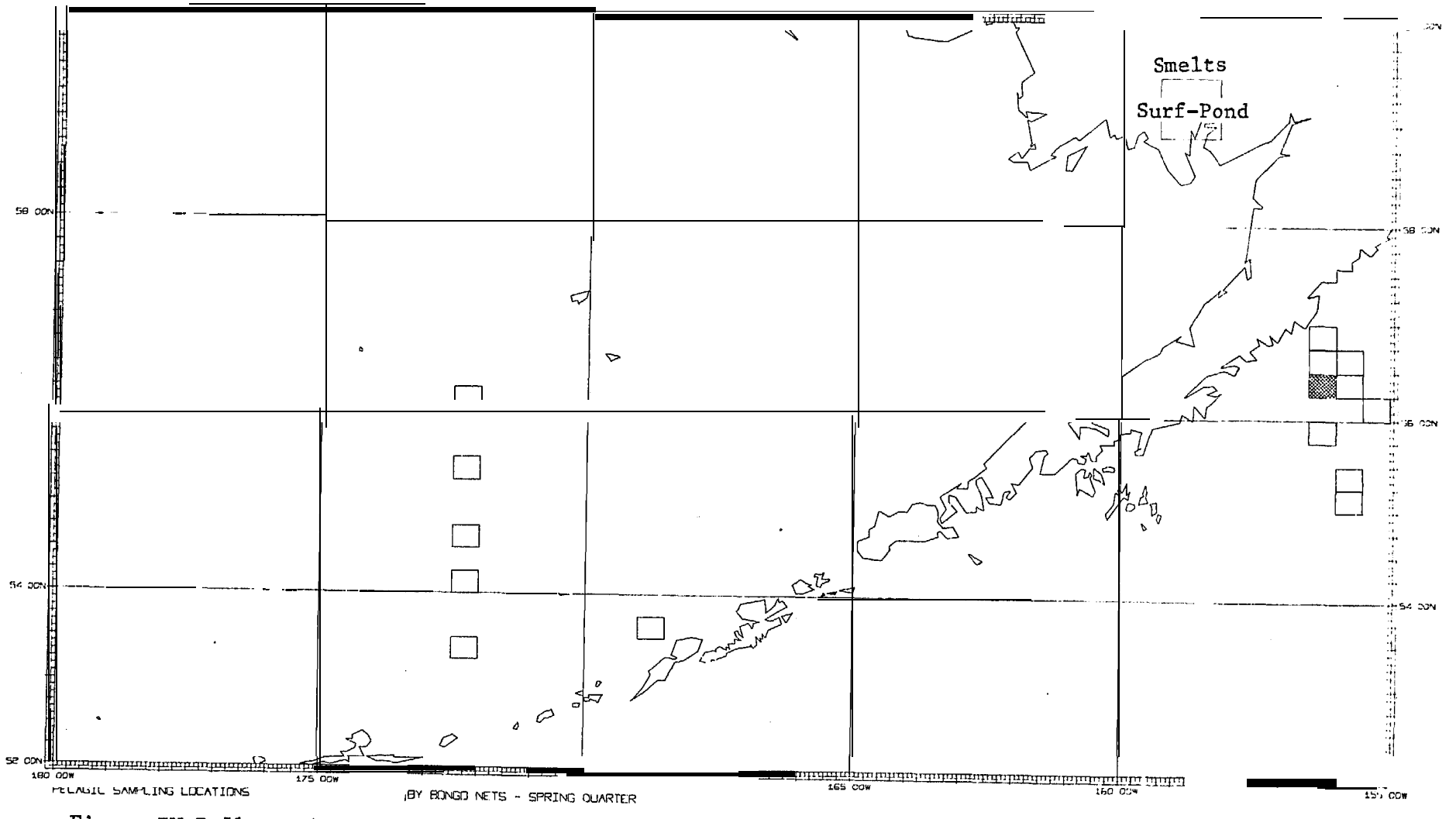


Figure IV.B.51.--Relative abundance of surf and pond smelts (combined) in bongo nets in spring, eastern Bering Sea.

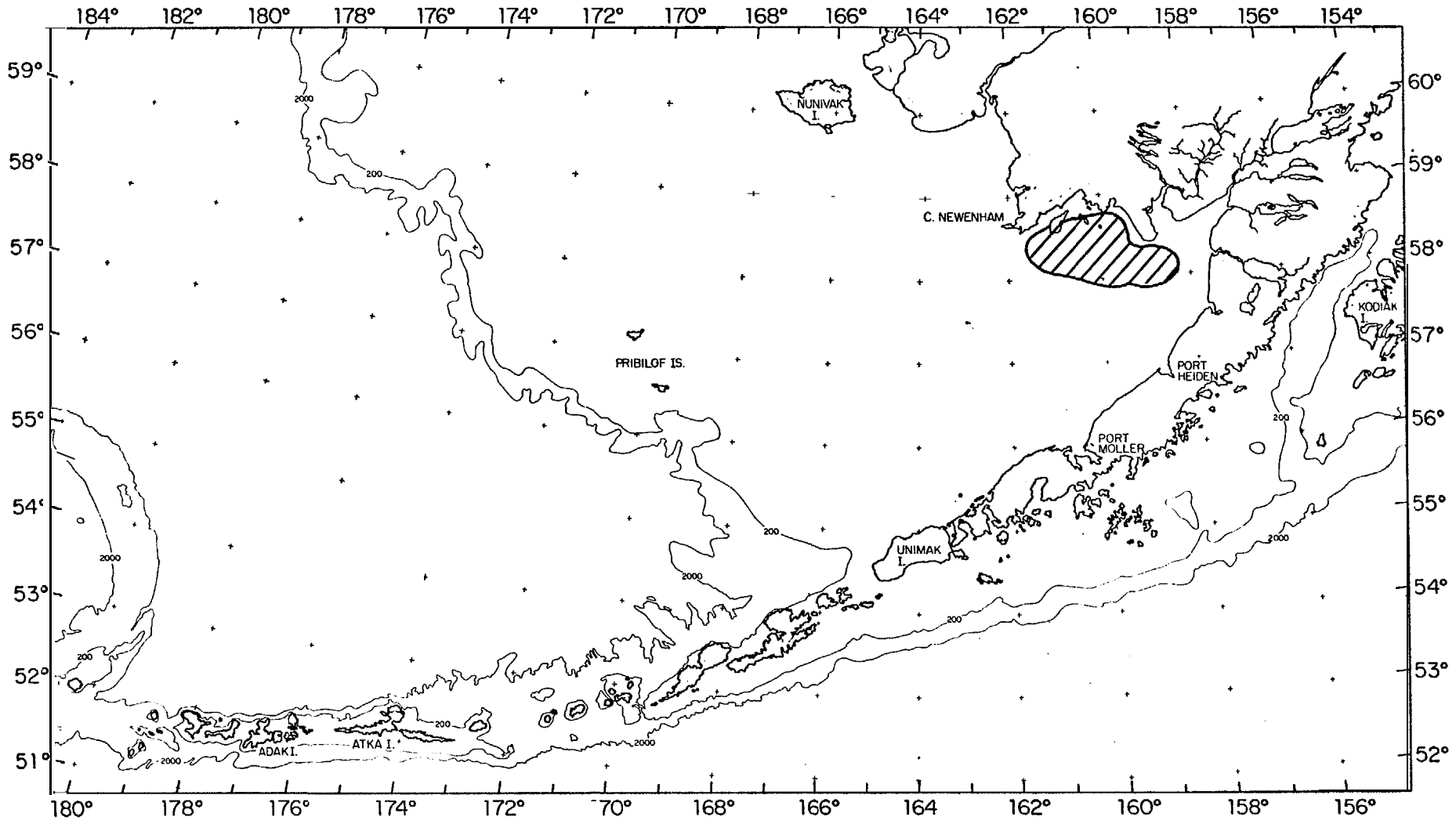


Figure IV.B.52.--Generalized area in which juvenile pond smelt were caught by tow net in spring, eastern Bering Sea.

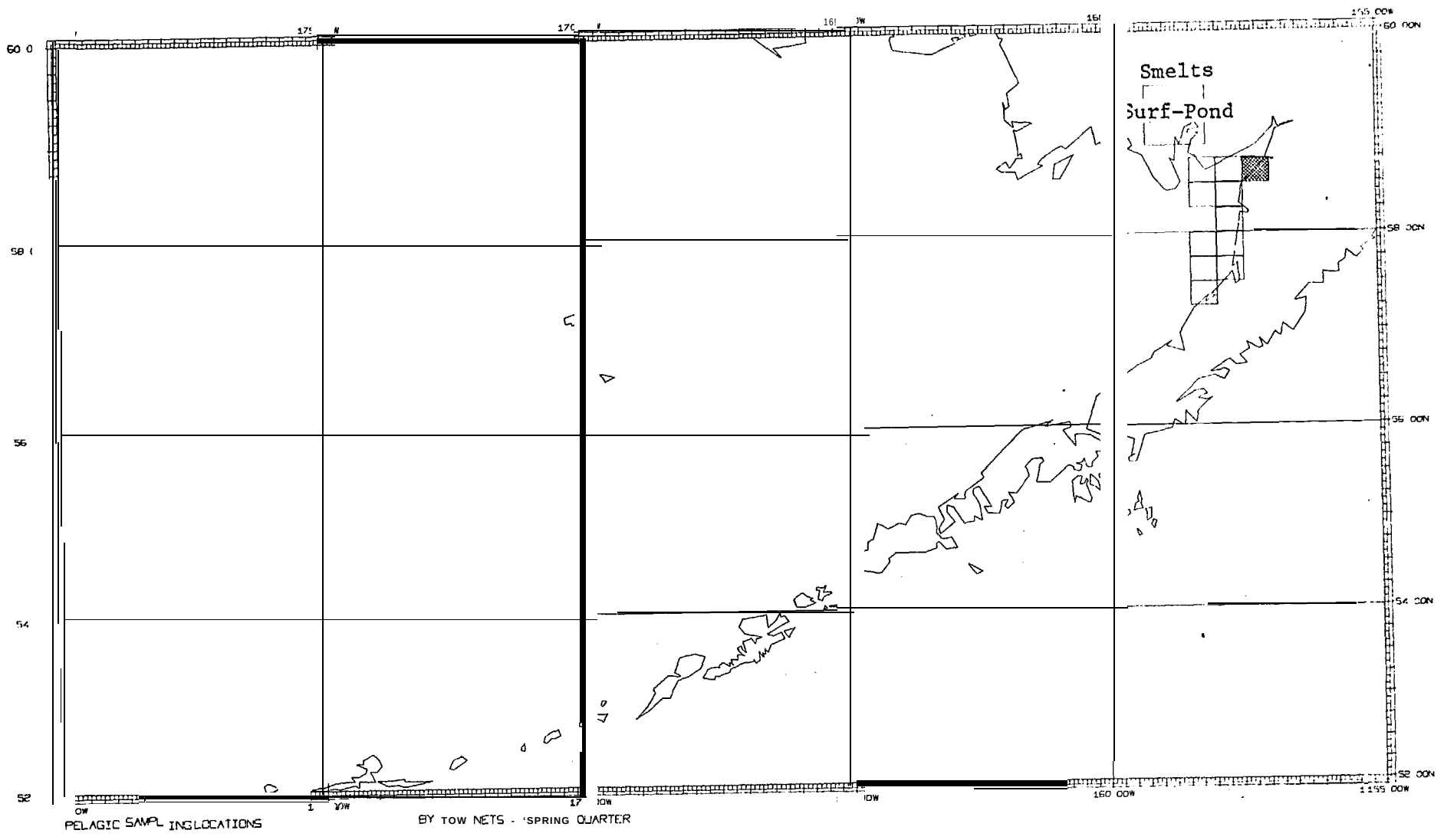


Figure XV. B.53.--Relative abundance of surf and pond smelts '(combined) in tow nets in spring, eastern Bering Sea.

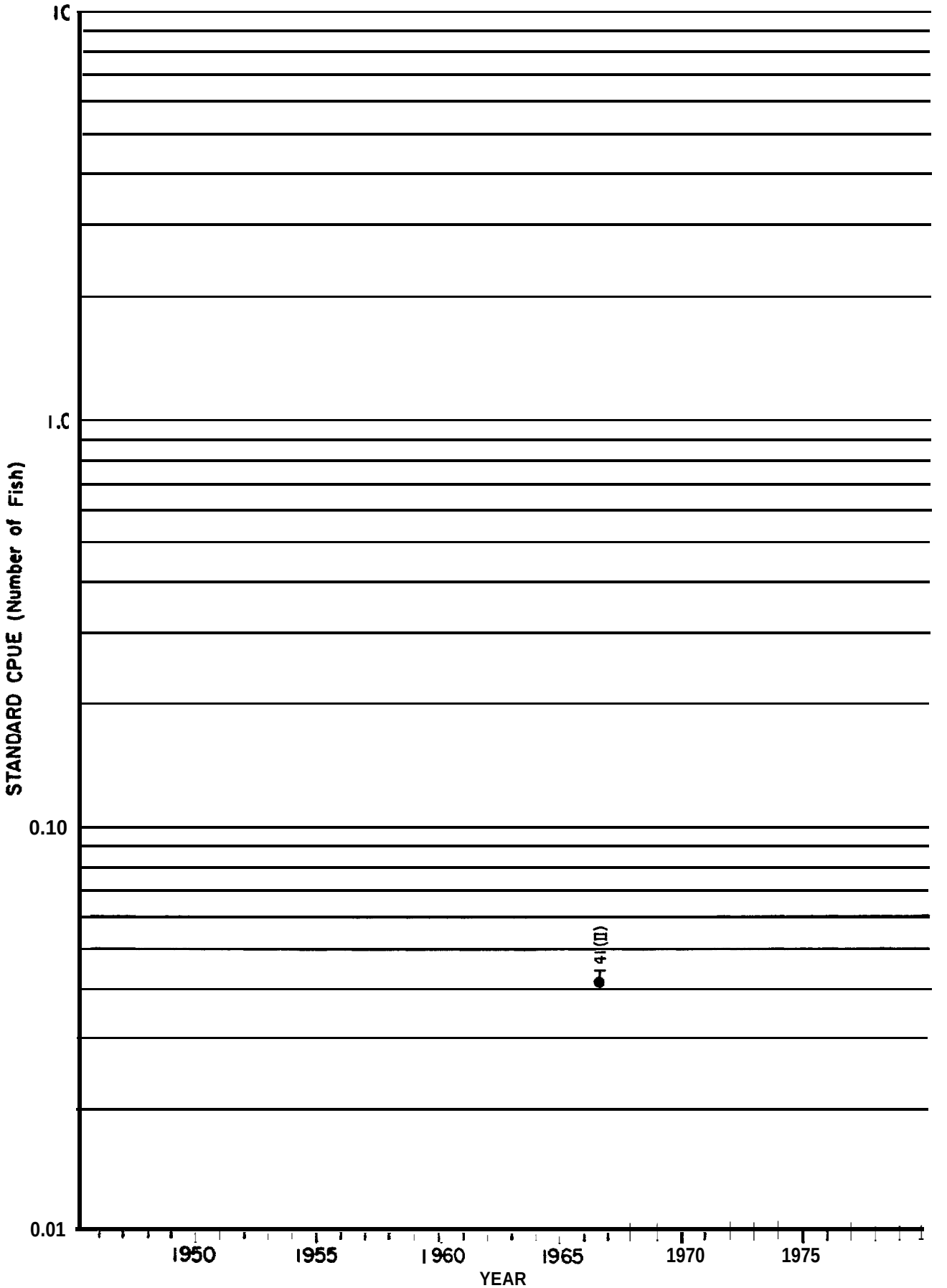


Figure IV. B.54.--Standardized rate of catch of surf and pond smelts (combined) by tow net in the eastern Bering Sea (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year) .

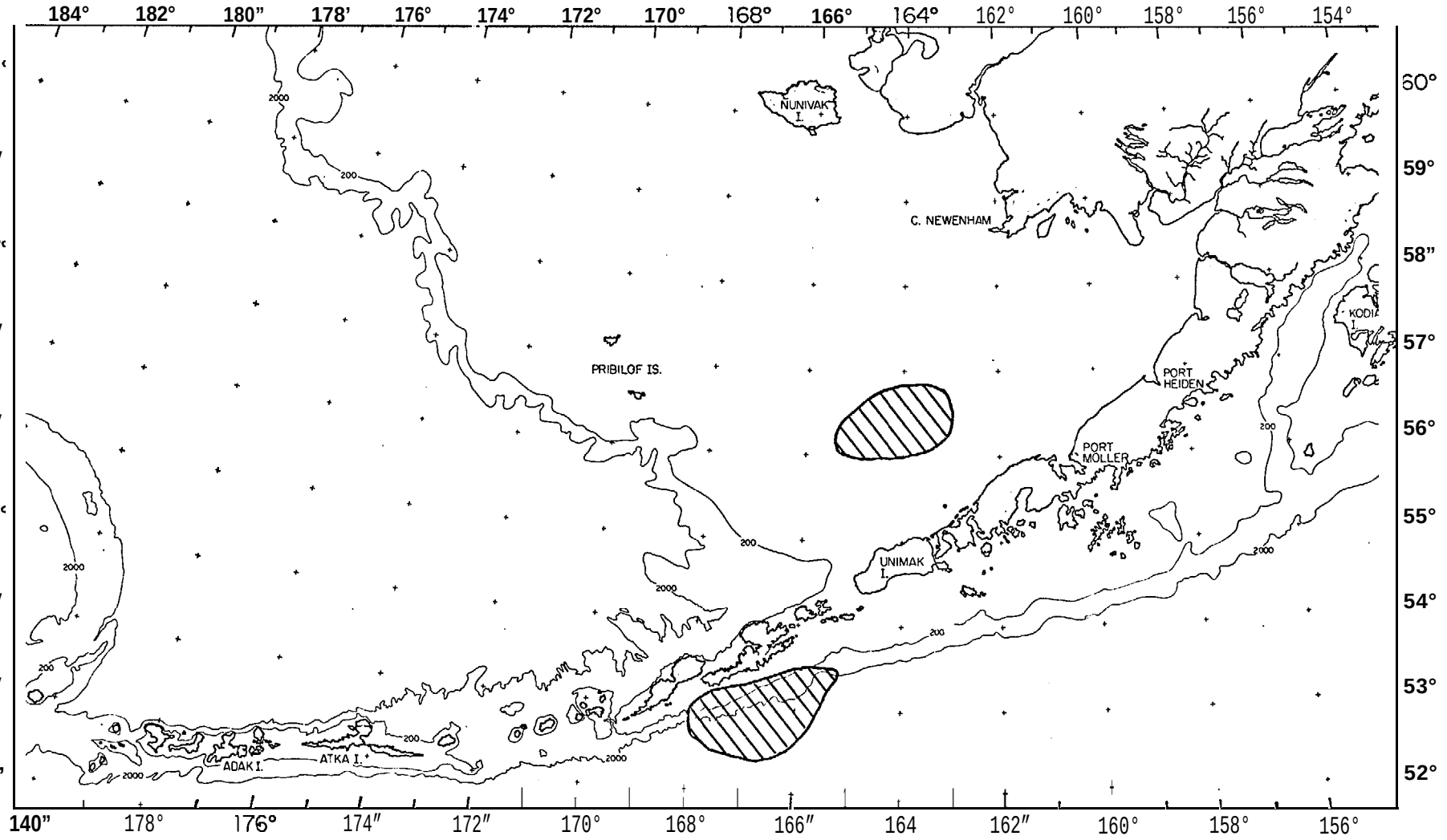


Figure IV.B.55 .--Generalized areas in which capelin larvae were caught by seines in summer, eastern Bering Sea and western Gulf of Alaska.

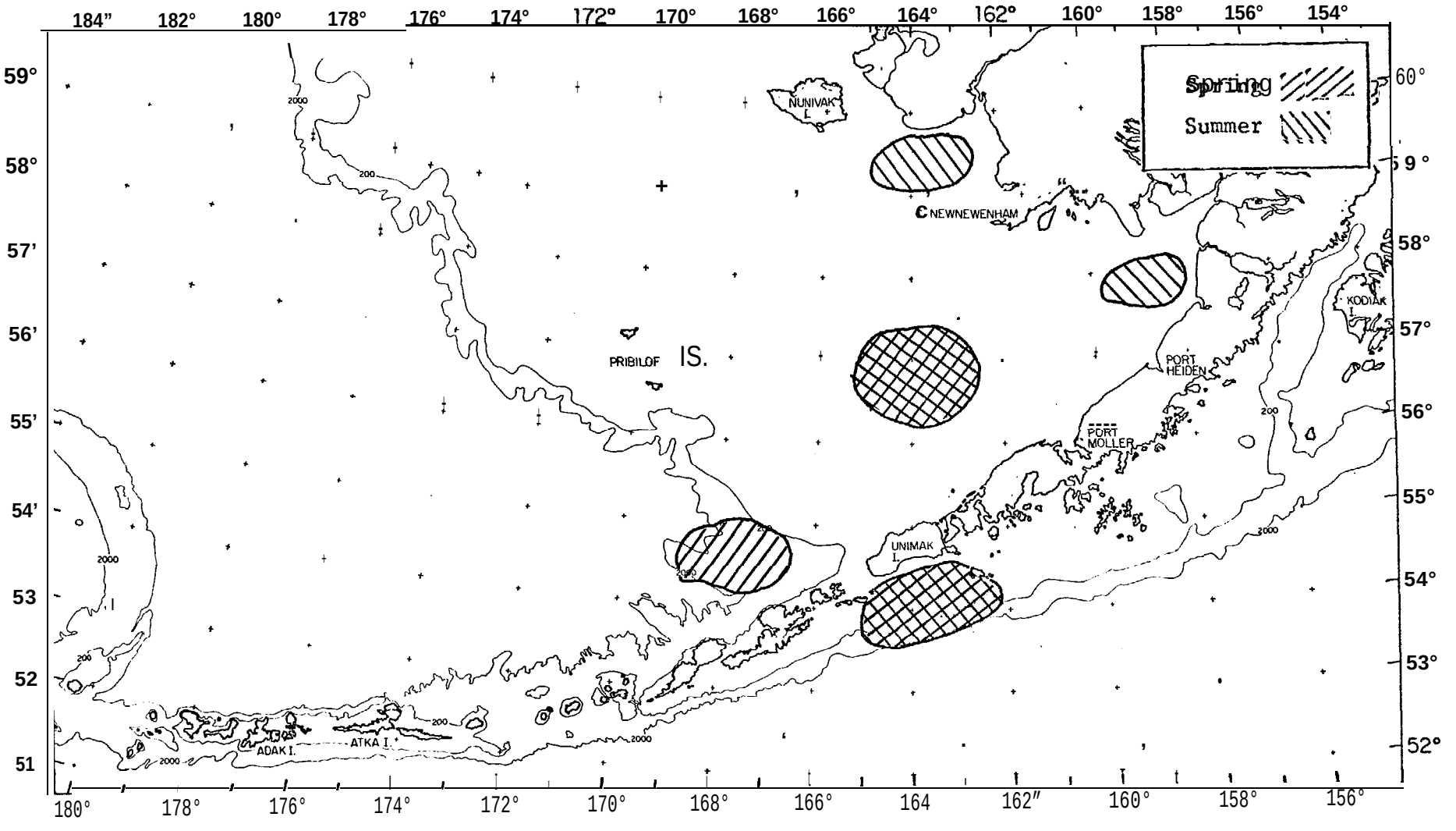


Figure IV. B. 56.--Generalized areas in which capelin juveniles were caught by seines in spring and summer, eastern Bering Sea and western Gulf of Alaska.

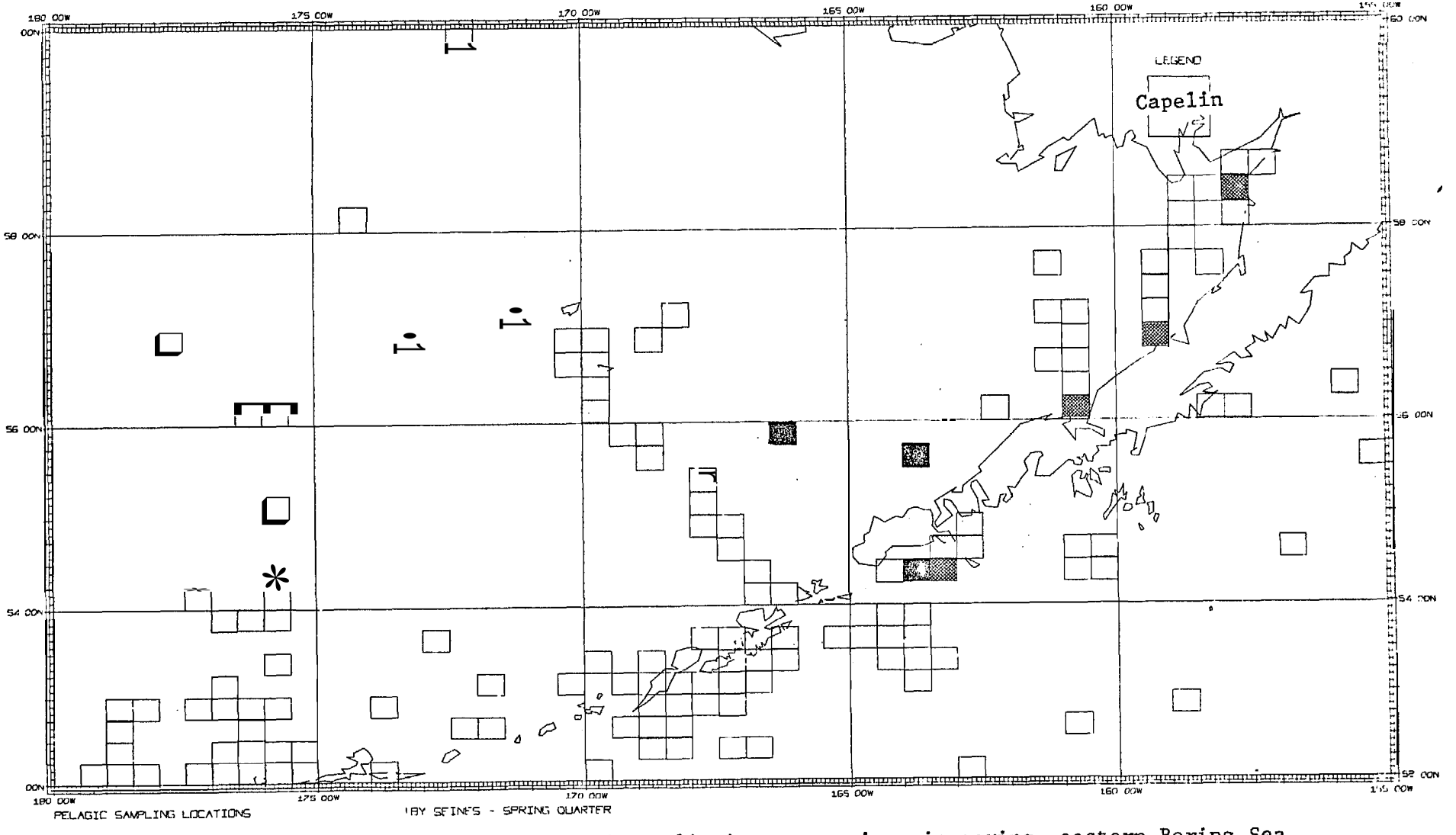


Figure IV.B.57.--Relative abundance of capelin in purse seines in spring, eastern Bering Sea.

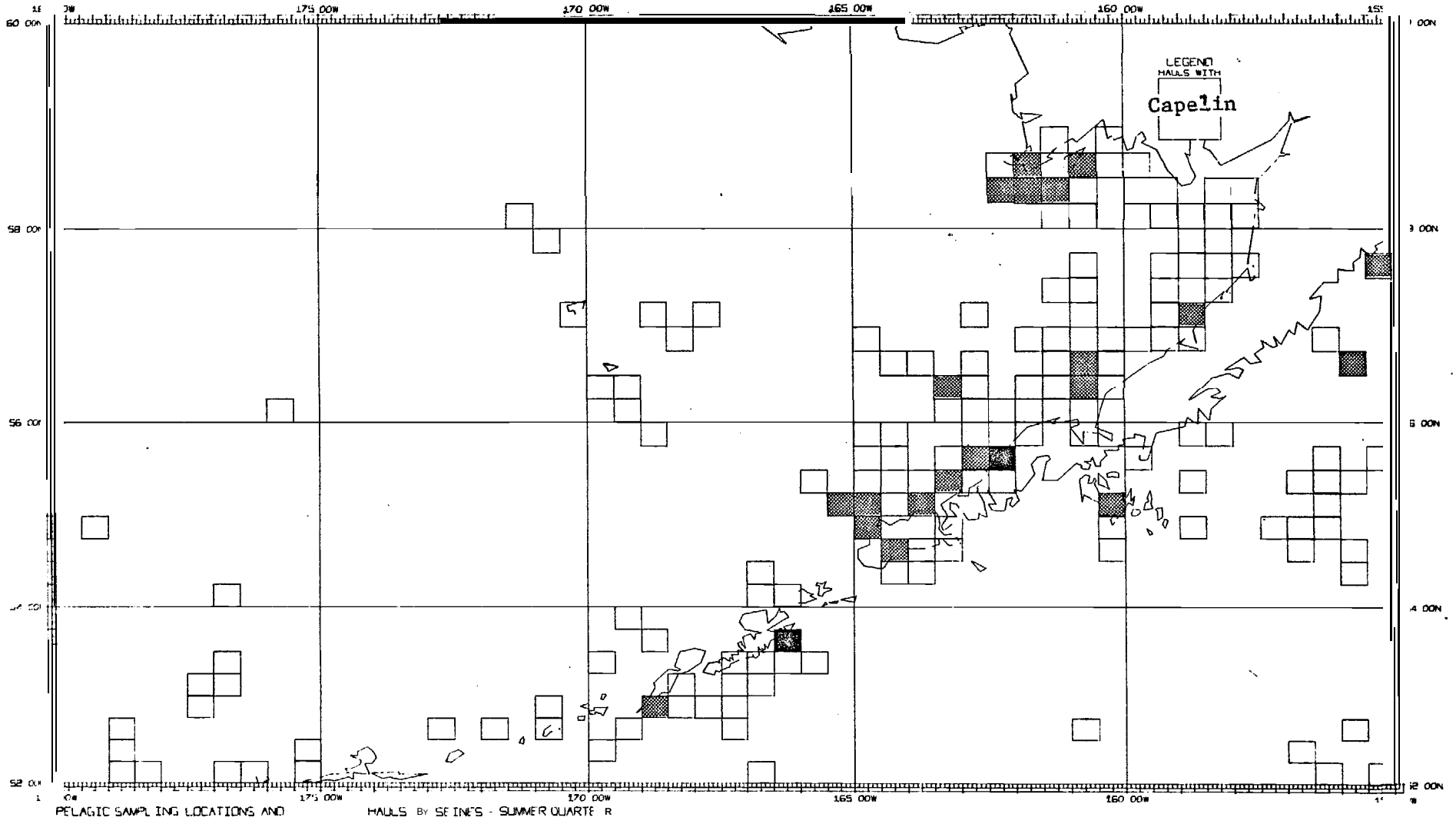


Figure IV. B.58.--Relative abundance of capelin in purse seines in summer, eastern Bering Sea.

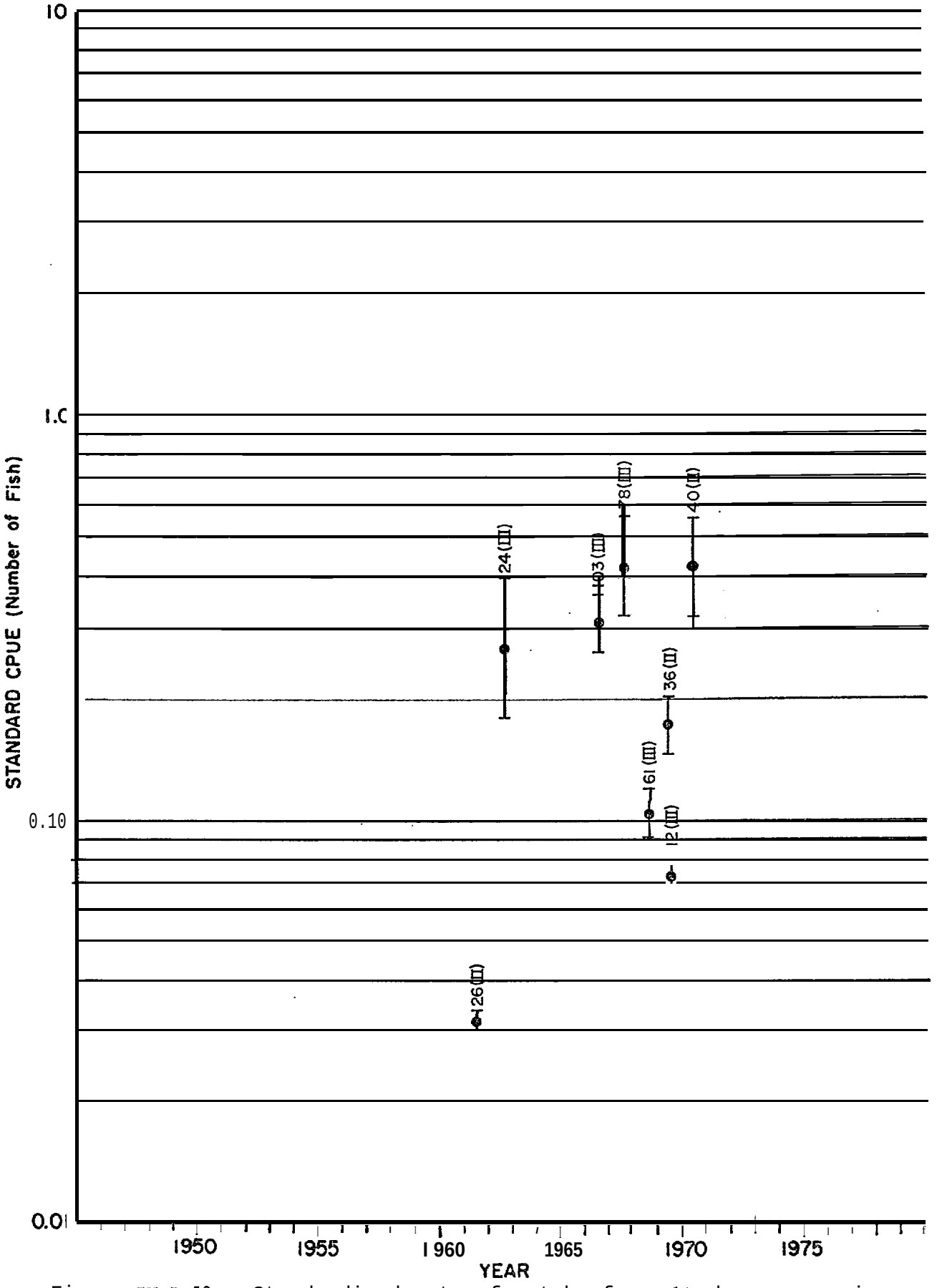


Figure IV.B.59.--Standardized rate of catch of capelin by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

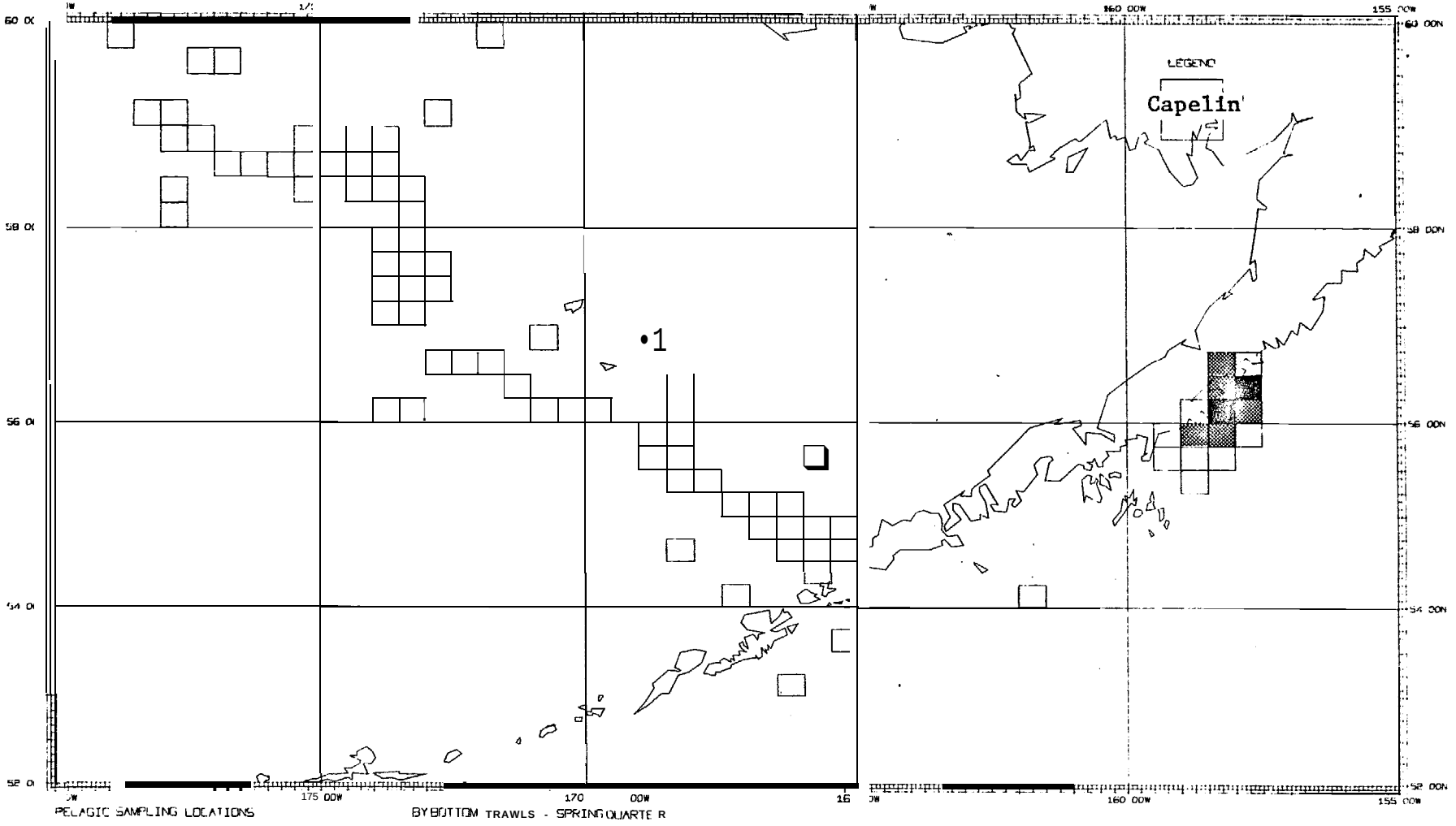


Figure IV. B.60.--Relative abundance of capelin in bottom trawls in spring, eastern Bering Sea.

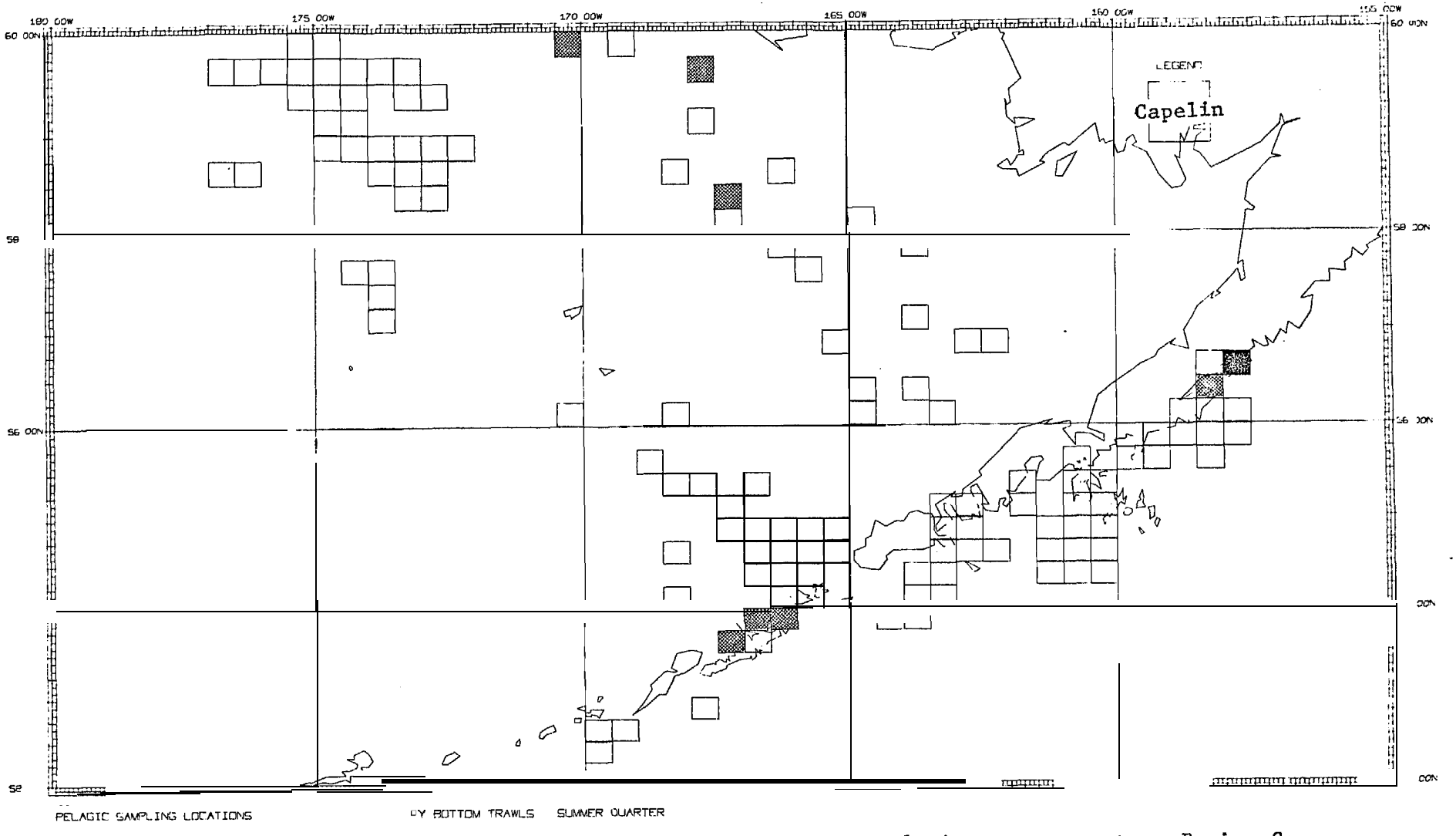


Figure IV.B.61.--Relative abundance of capelin in bottom trawls in summer, eastern Bering Sea.

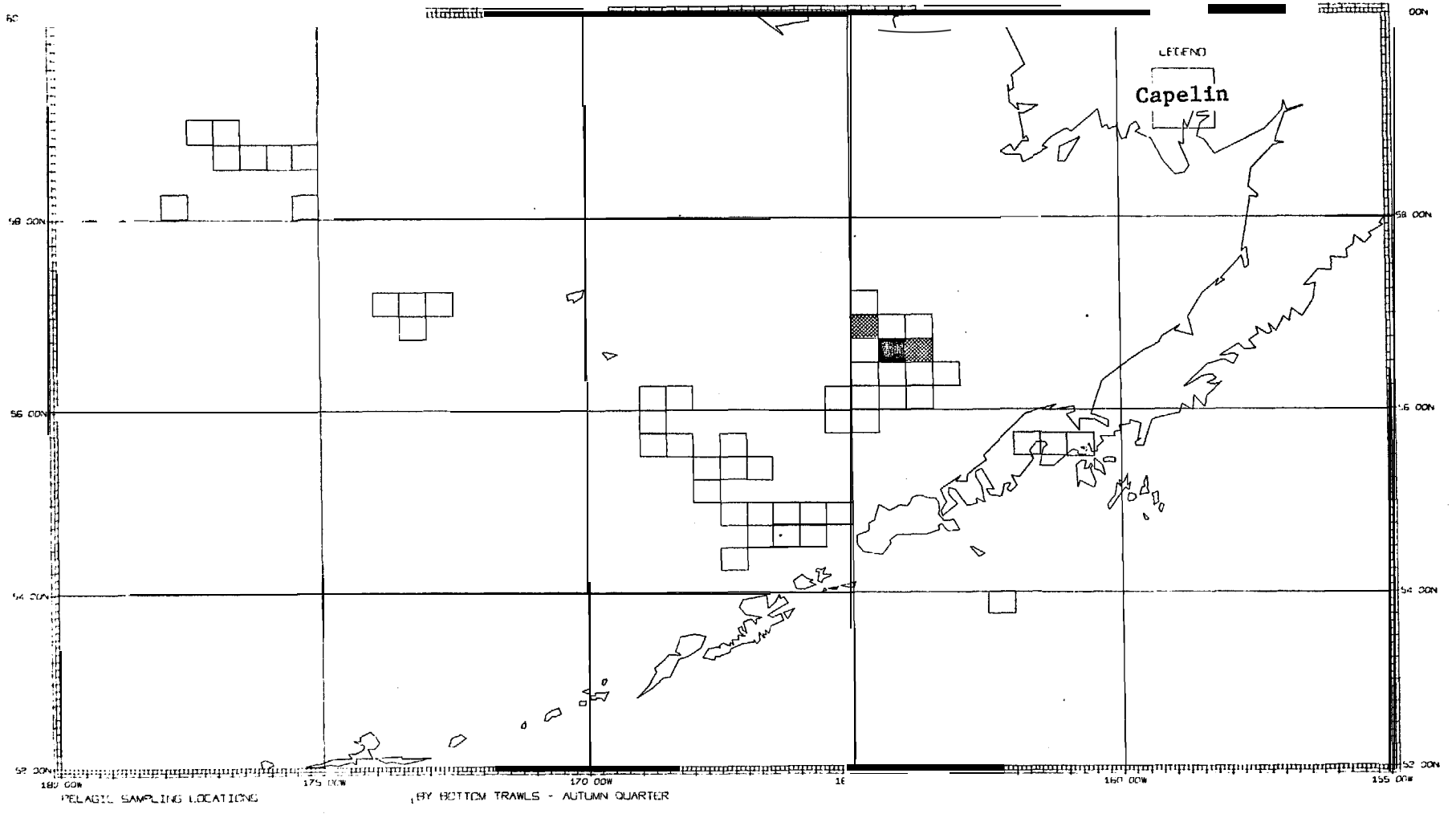


Figure IV.B.62.--Relative abundance of capelin in bottom trawls in autumn, eastern Bering Sea.

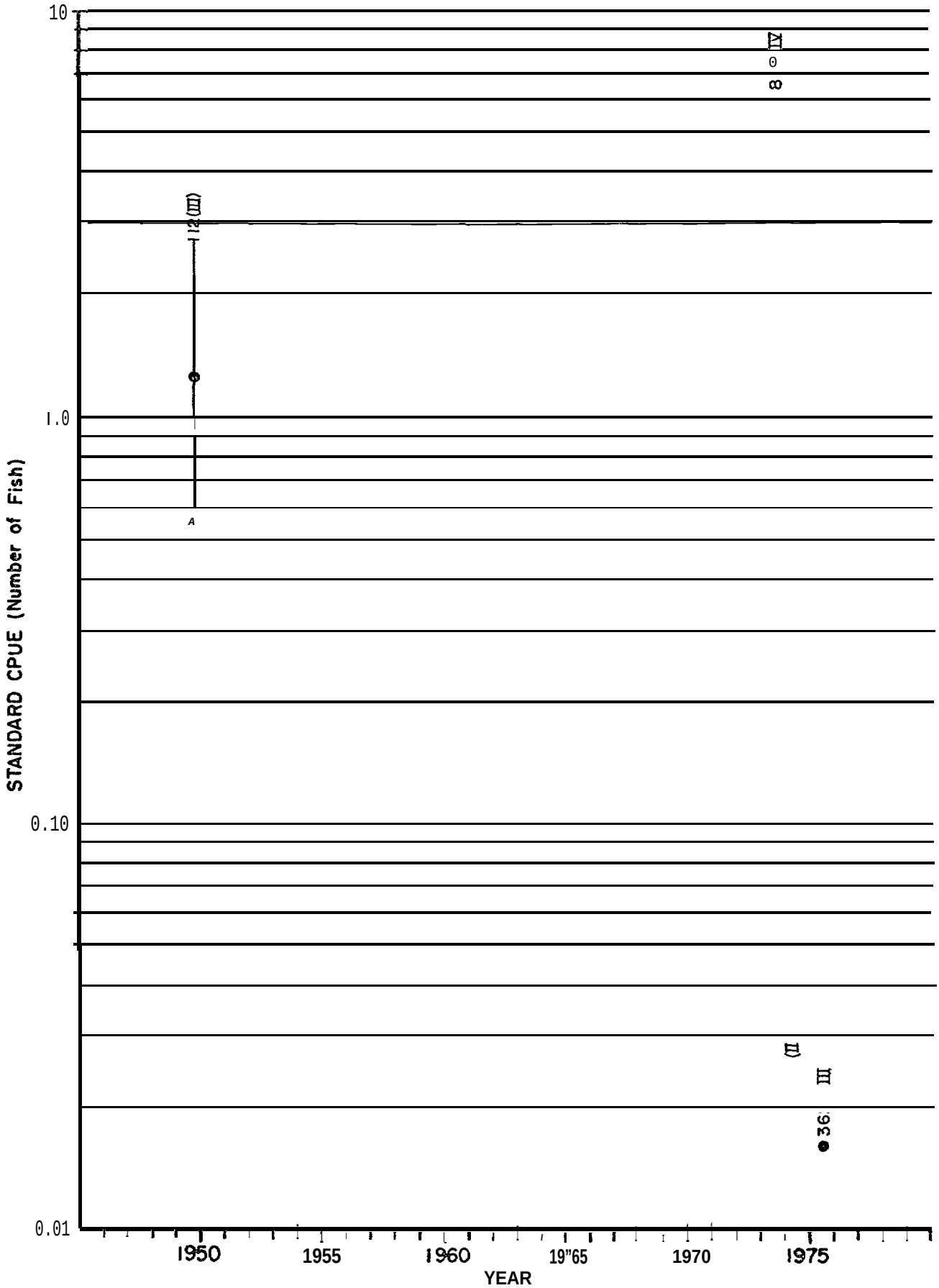


Figure IV. B.63.--Standardized rate of catch of capelin by bottom trawl in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, "and quarter of the year).

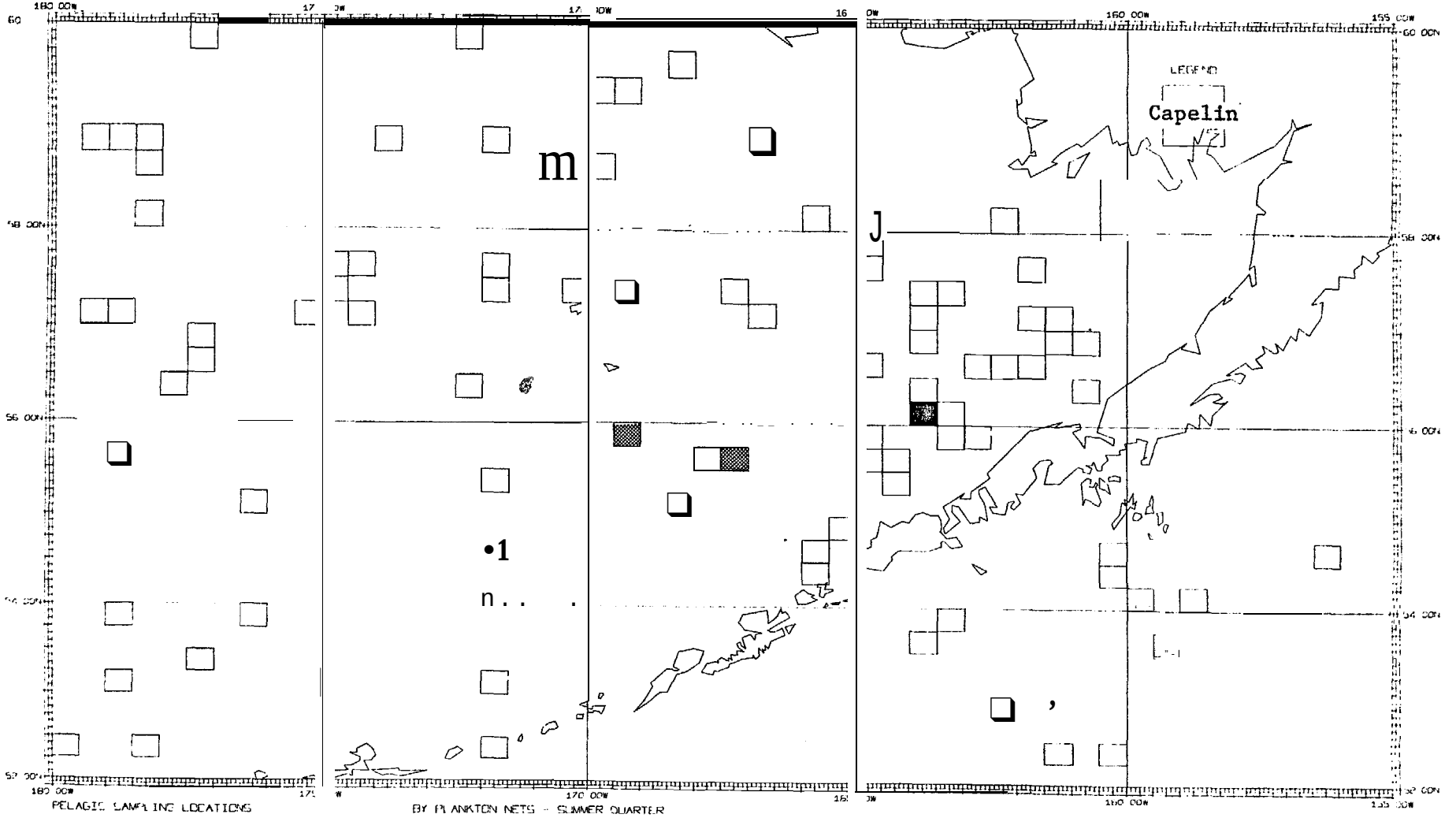


Figure IV. B.64.--Relative abundance of capelin in plankton nets in summer, eastern Bering Sea.

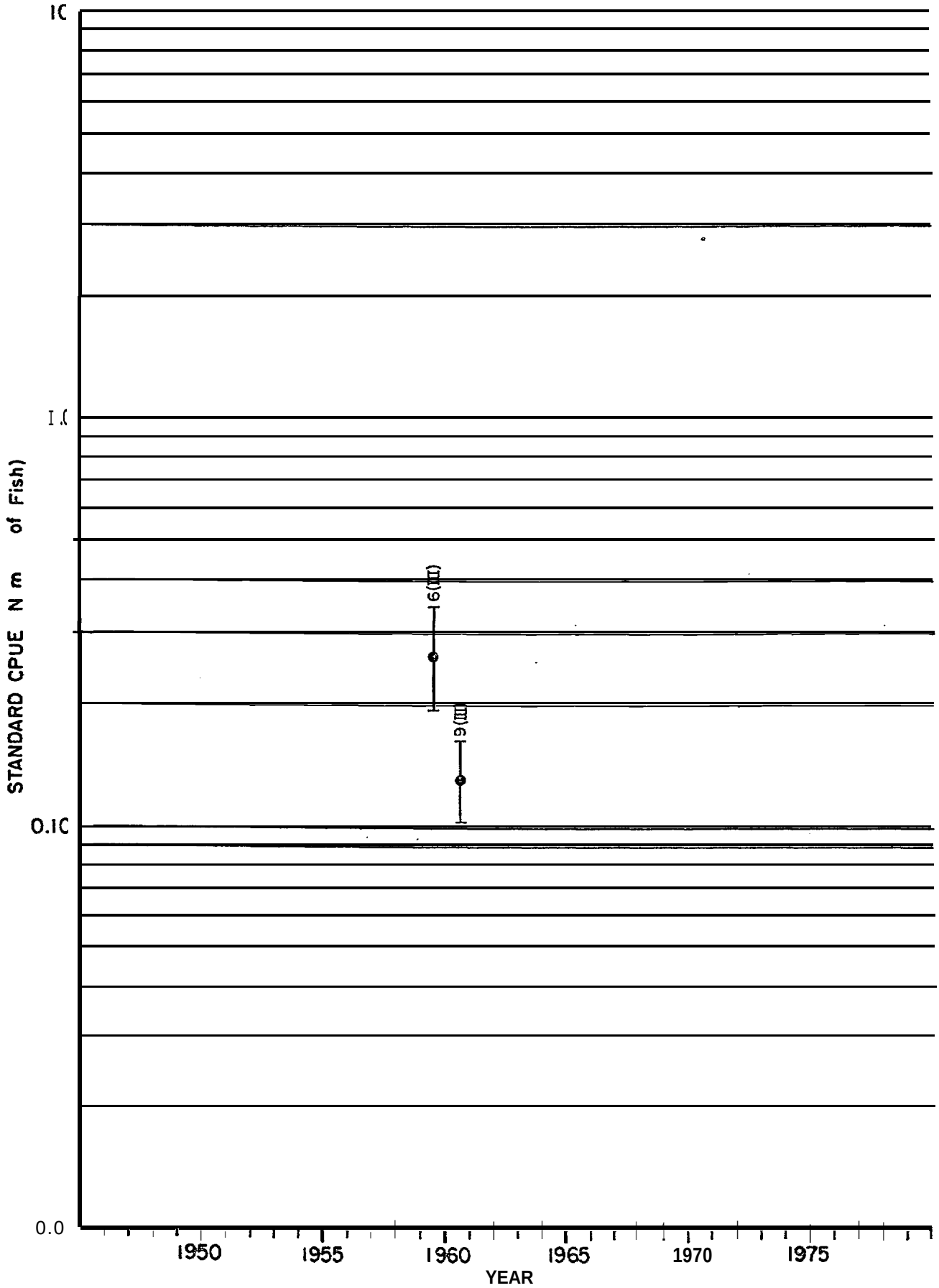


Figure IV.B.65.--Standardized rate of catch of capelin by plankton net in the eastern Bering Sea (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

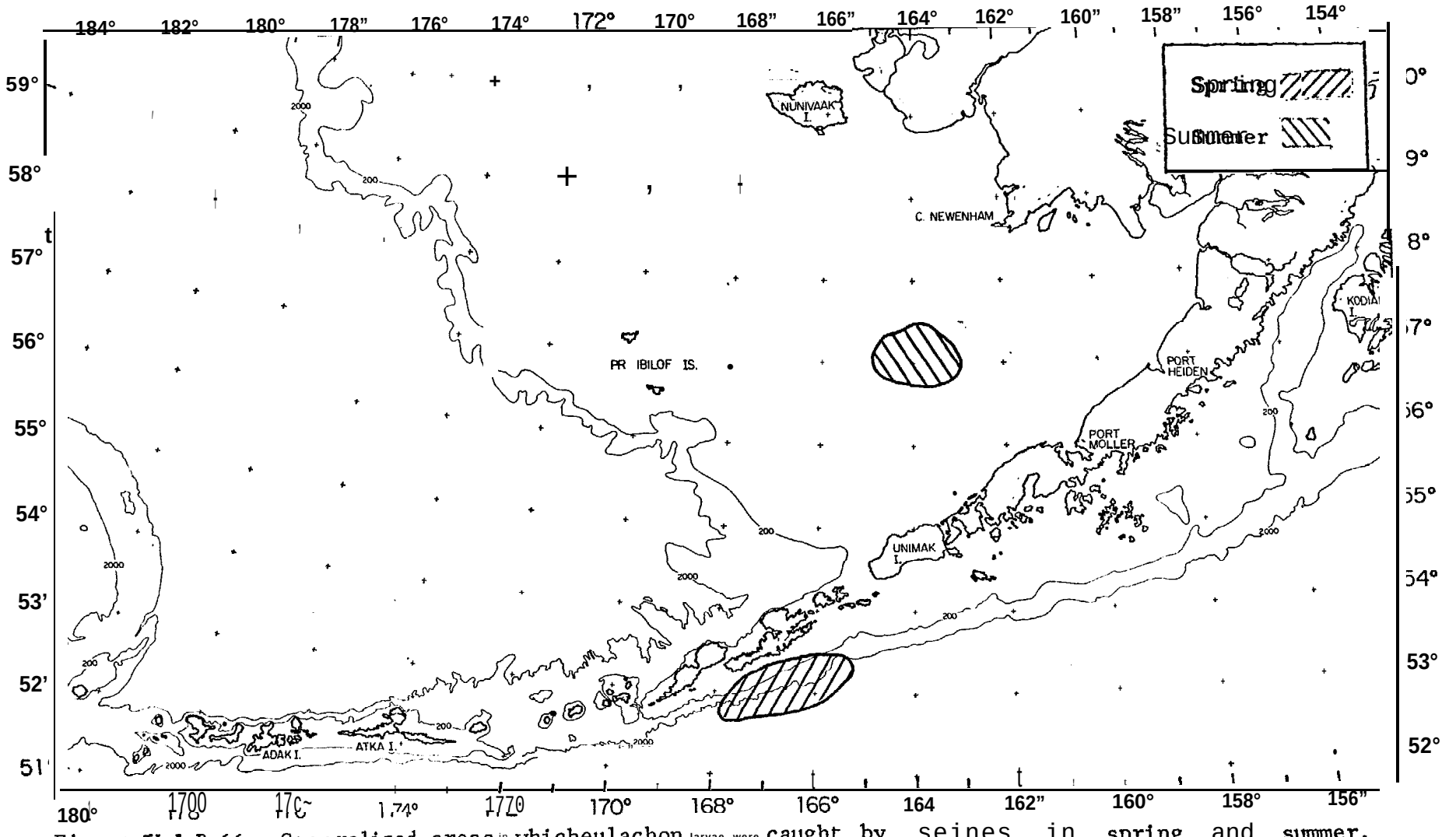


Figure IV.D.66.--Generalized areas in which euphausiid larvae were caught by seines in spring and summer, eastern Bering Sea and western Gulf of Alaska.

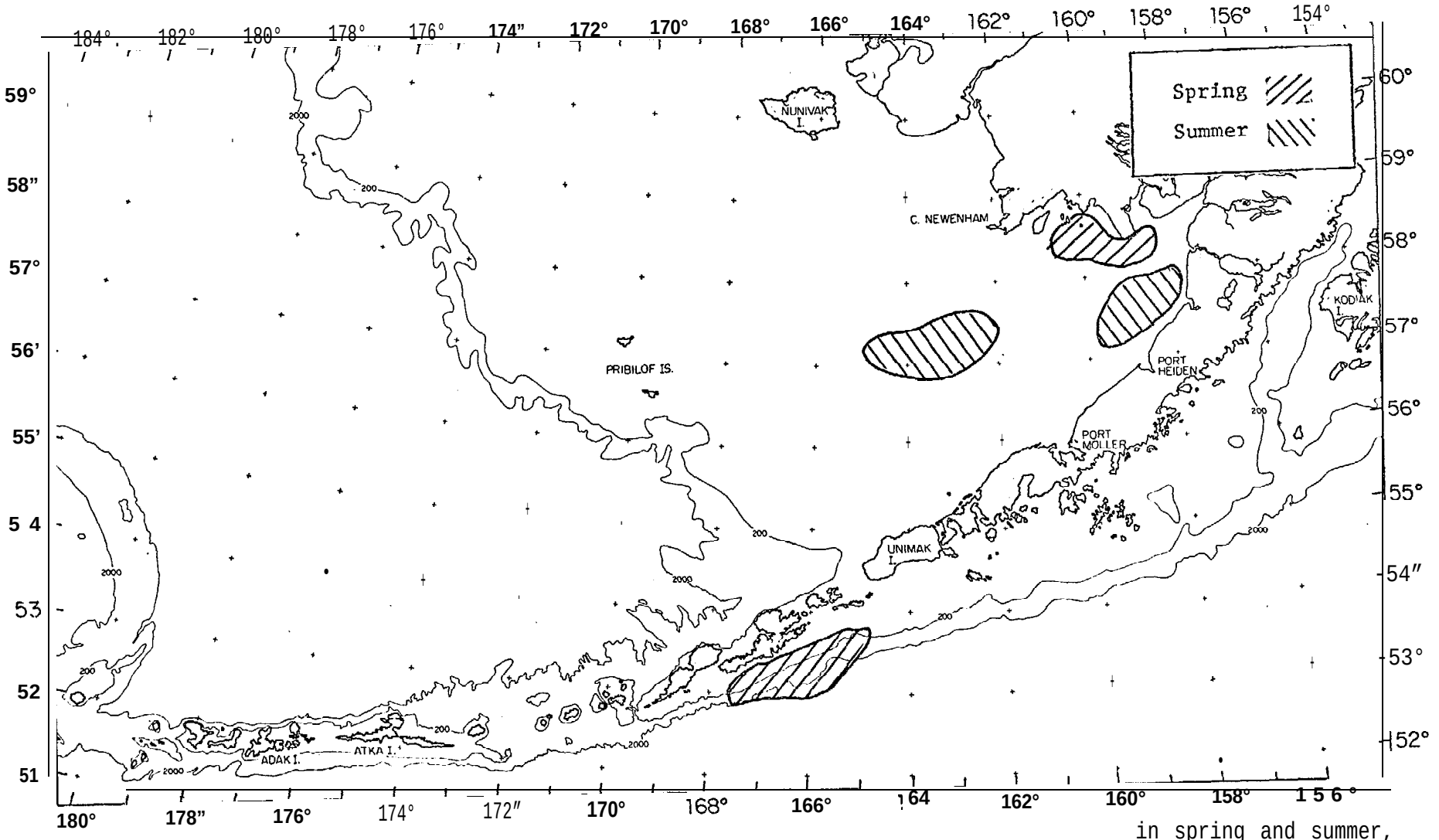


Figure IV. B. 67 .--Generalized areas in which eulachon juveniles were caught by seines in spring and summer, eastern Bering Sea and western Gulf of Alaska.

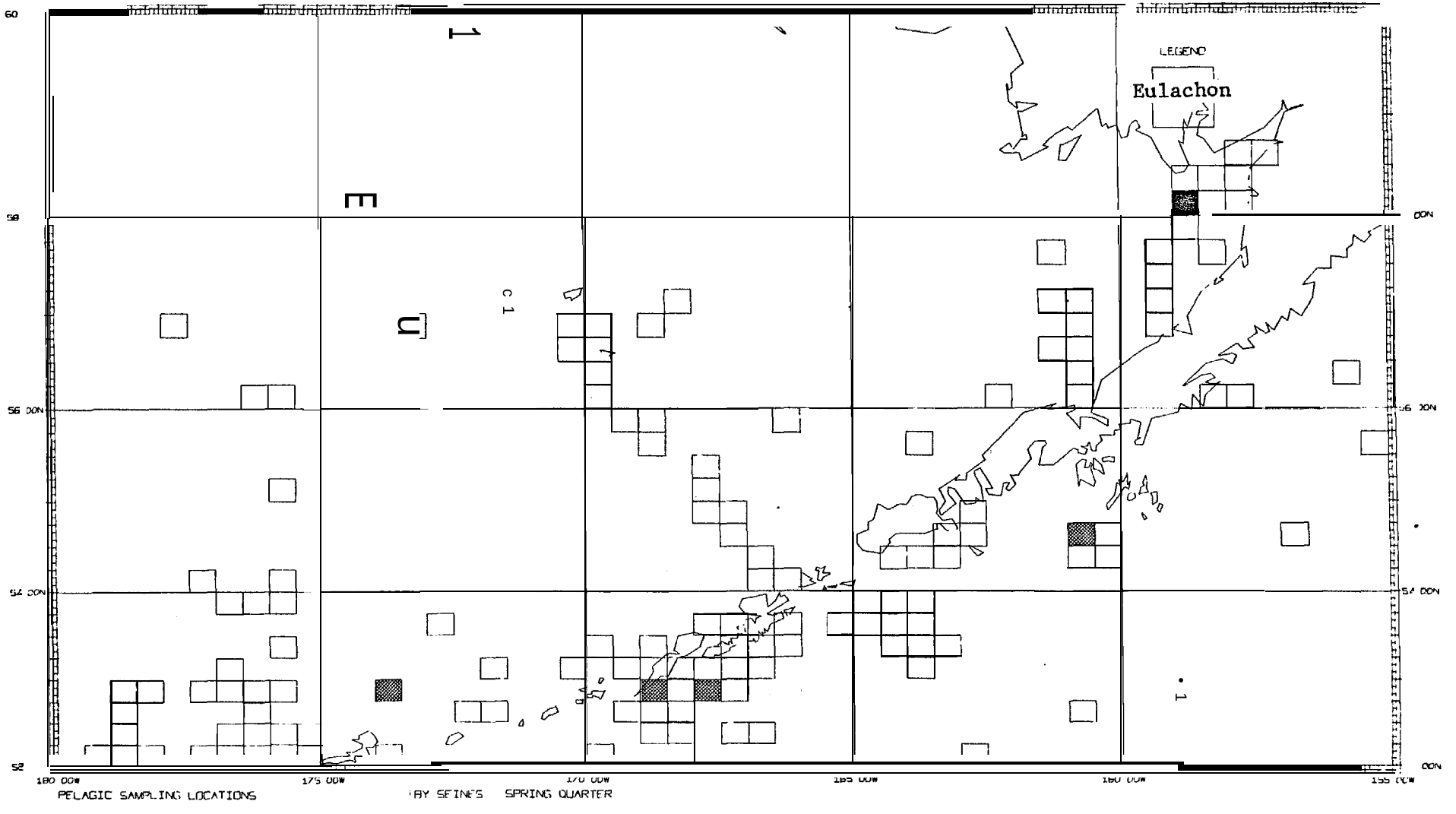


Figure IV.B.68.--Relative abundance of eulachon in purse seines in spring, eastern Bering Sea.

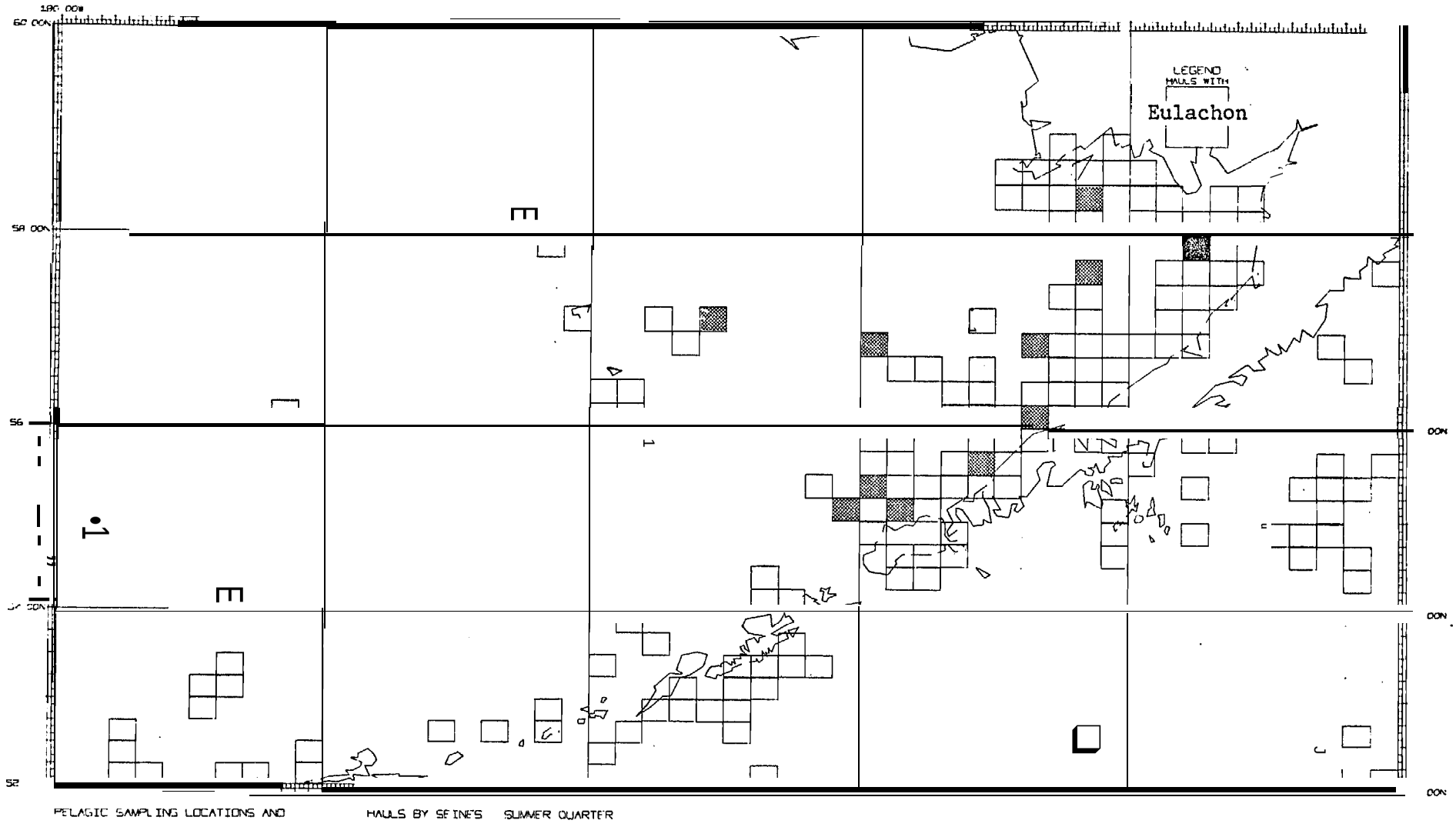


Figure IV.B.69.--Relative abundance of eulachon in purse seines in summer, eastern Bering Sea.

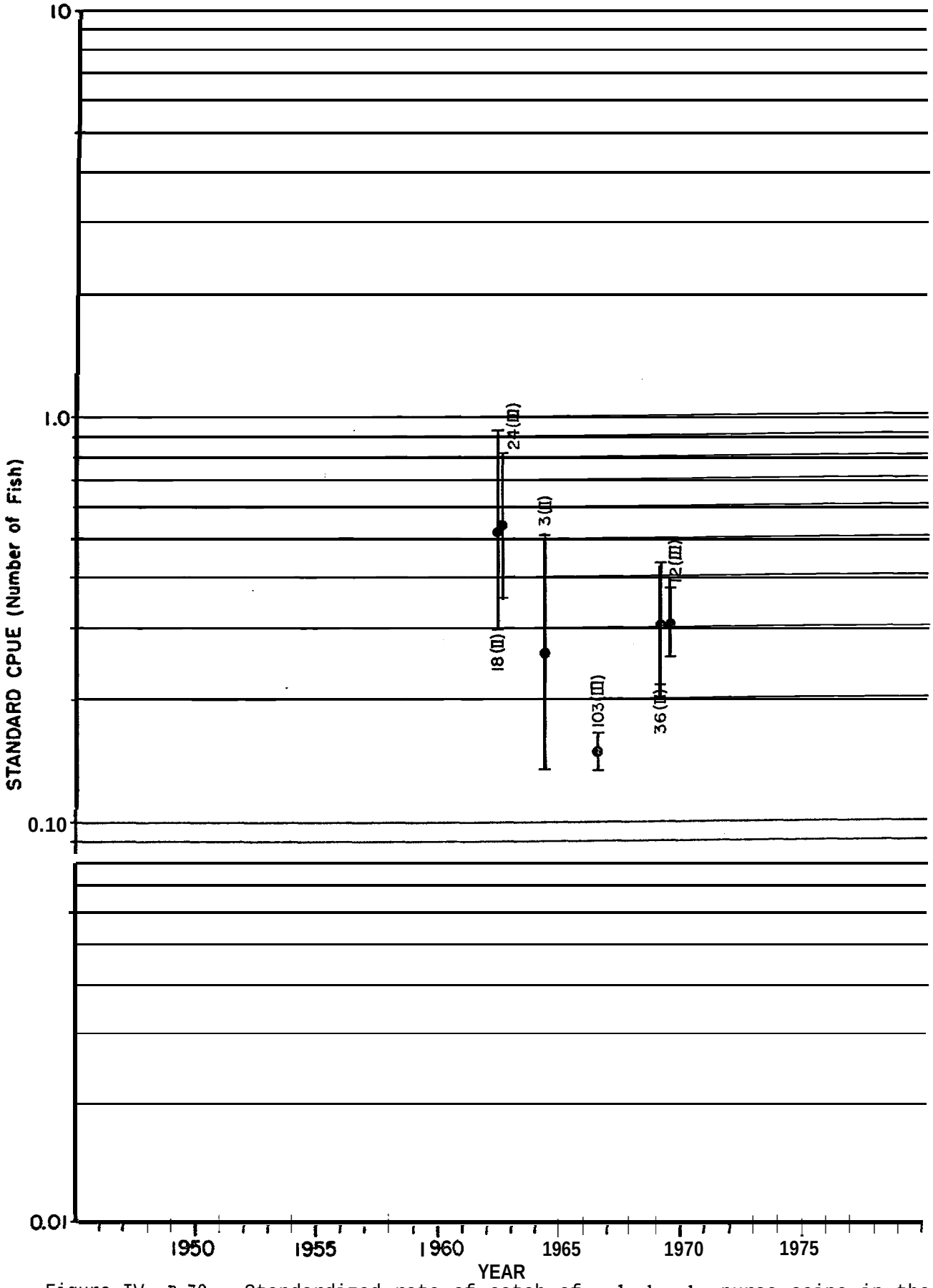


Figure IV. B.70.--Standardized rate of catch of eulachon by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

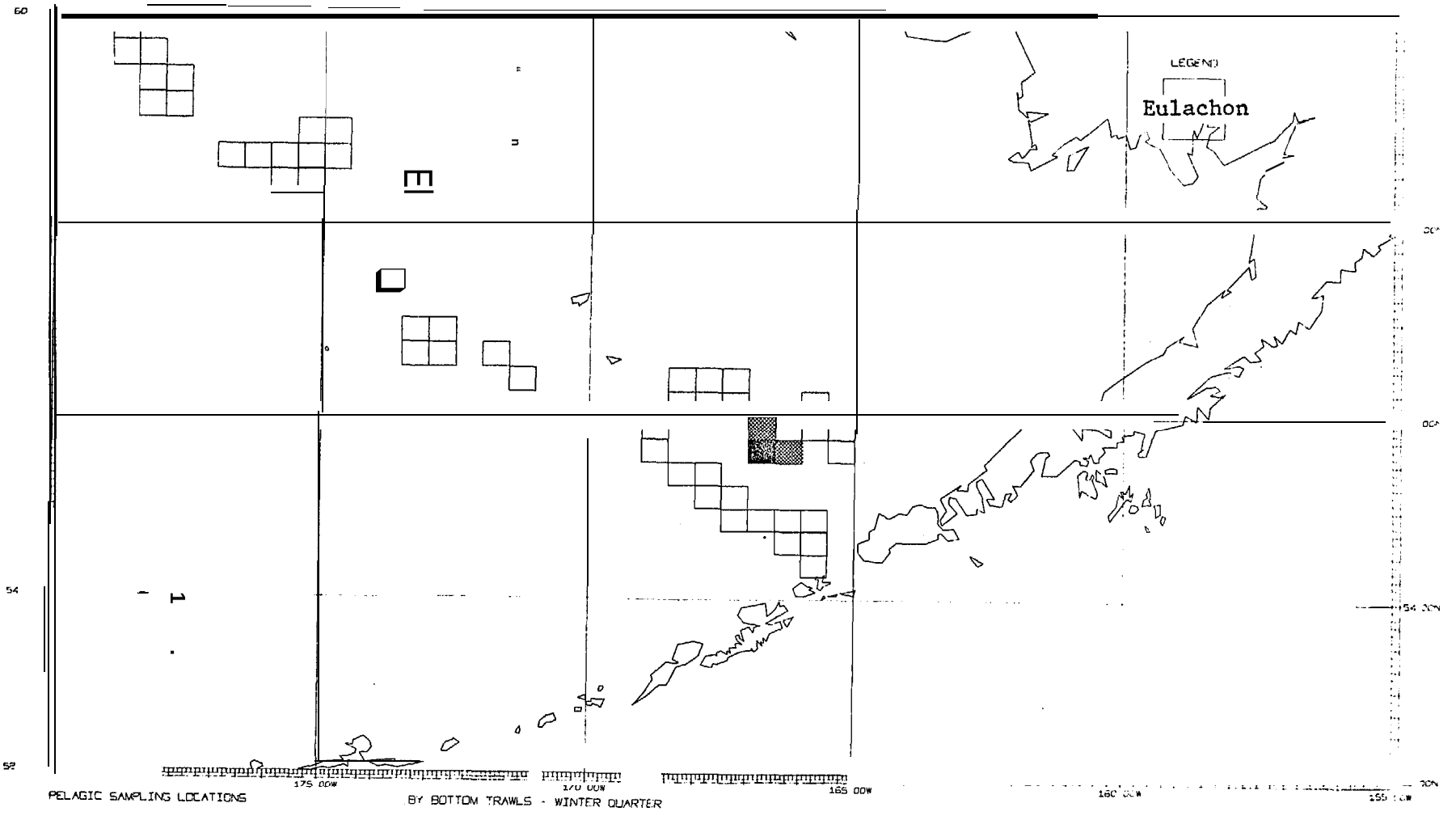


Figure IV.B.71.--Relative abundance of eulachon in bottom trawls in winter, eastern Bering Sea.

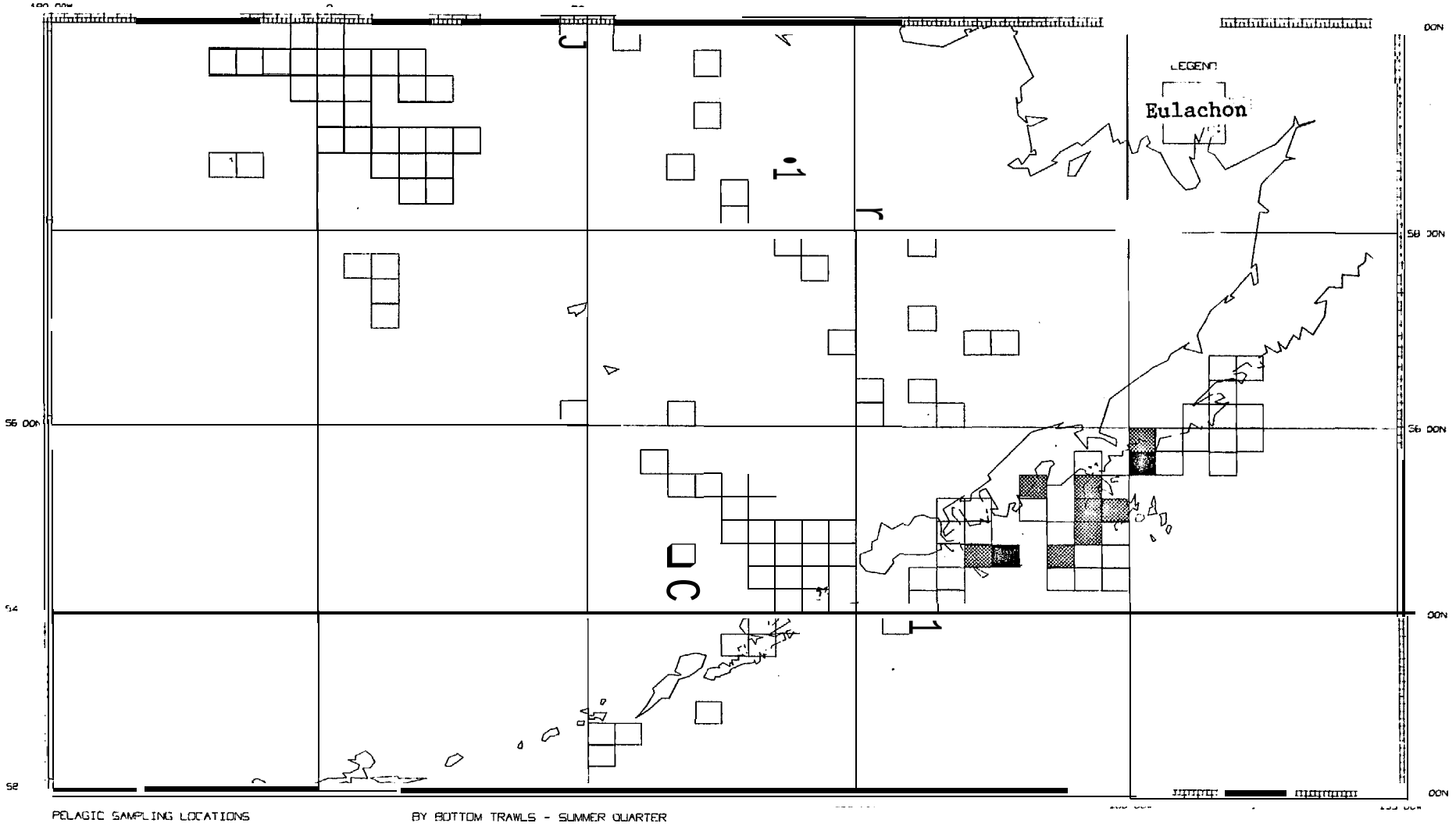


Figure IV.B.72.--Relative abundance of eulachon in bottom trawls in summer, eastern Bering Sea.

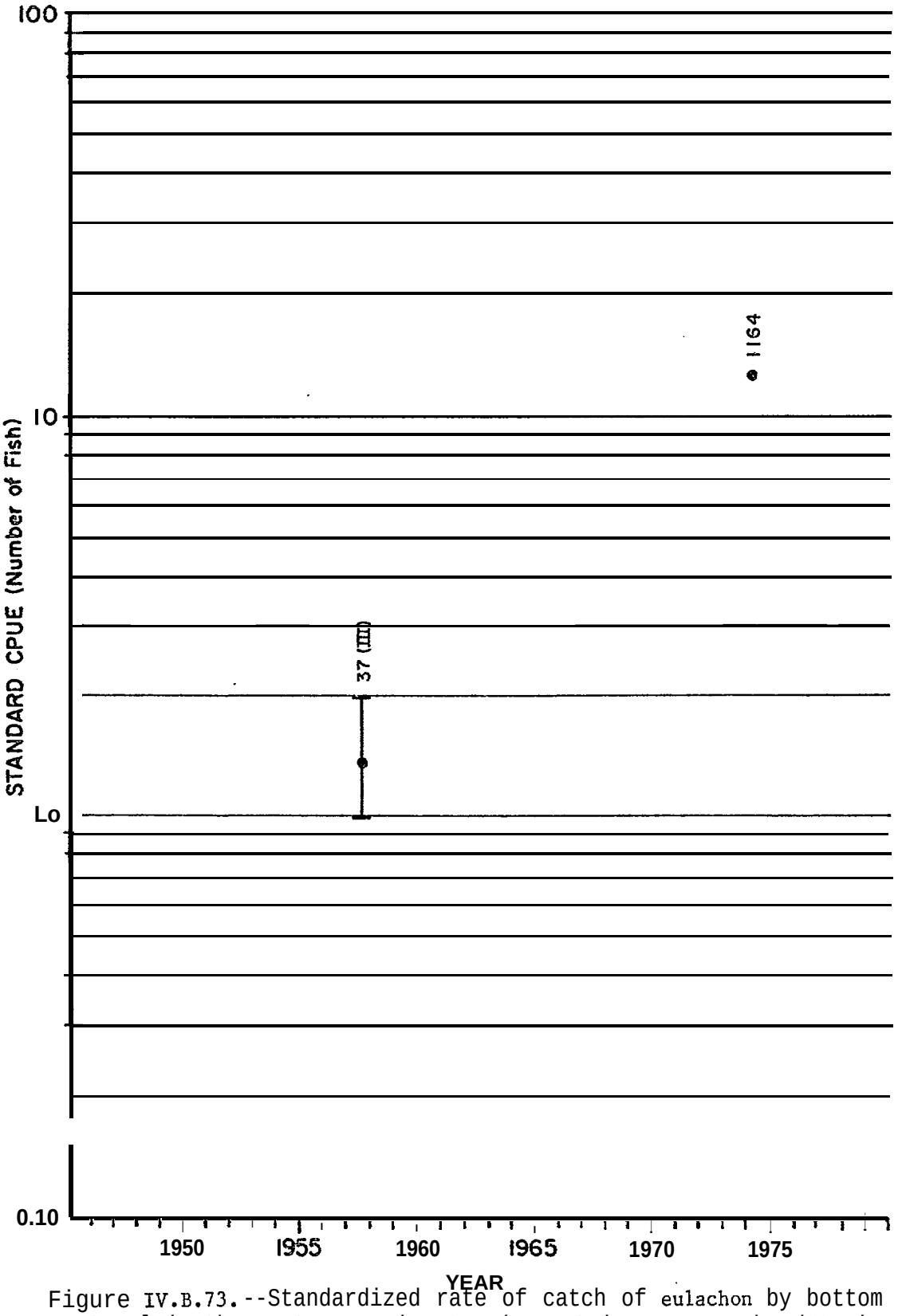


Figure IV.B.73.--Standardized rate of catch of eulachon by bottom trawl in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

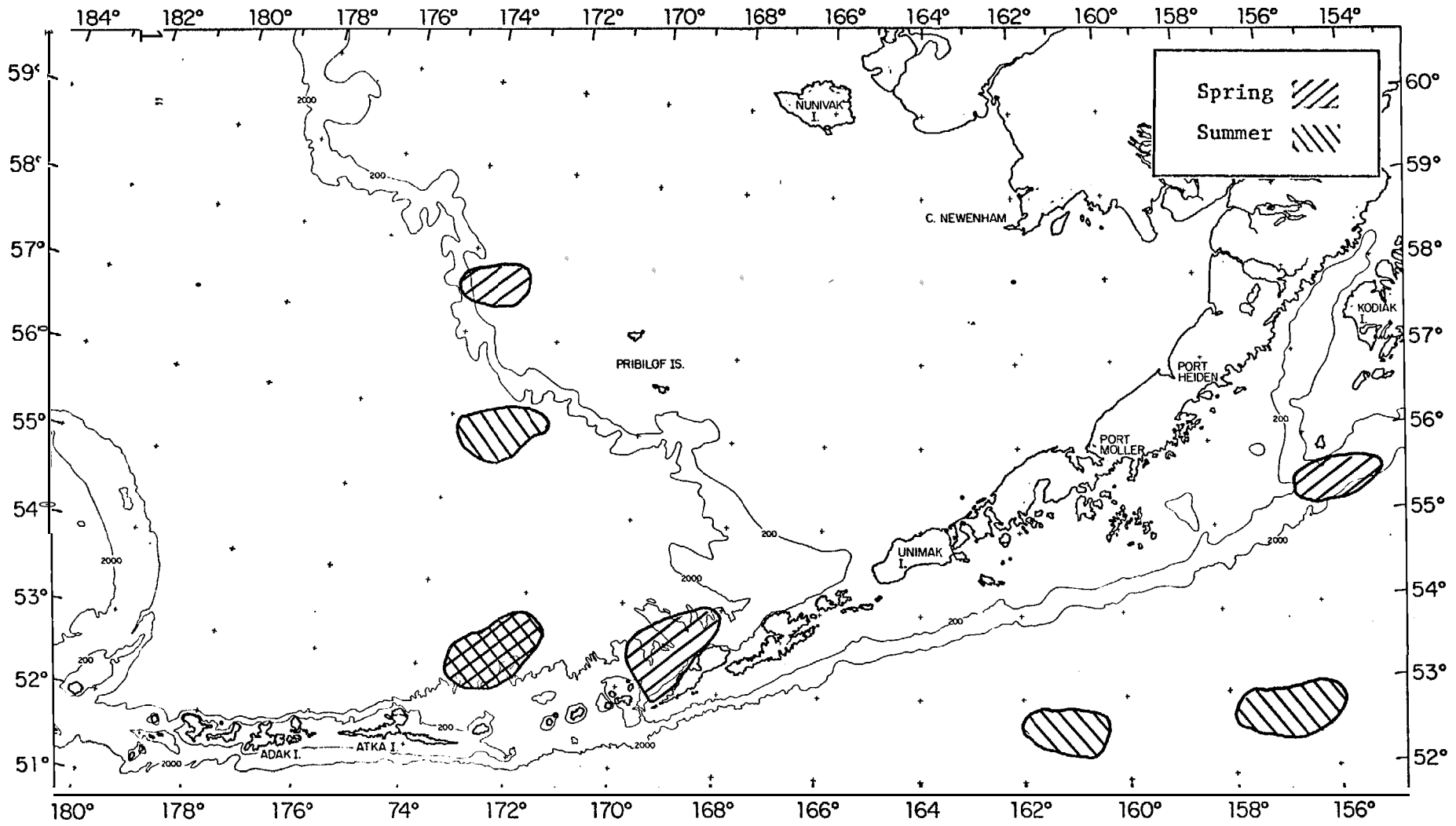


Figure IV.B. 74.--Generalized areas in which deep-sea smelt (Bathylagidae) larvae and juveniles were caught by bongo nets and Isaacs-Kidd trawls in spring and summer, eastern Bering Sea and western Gulf of Alaska.

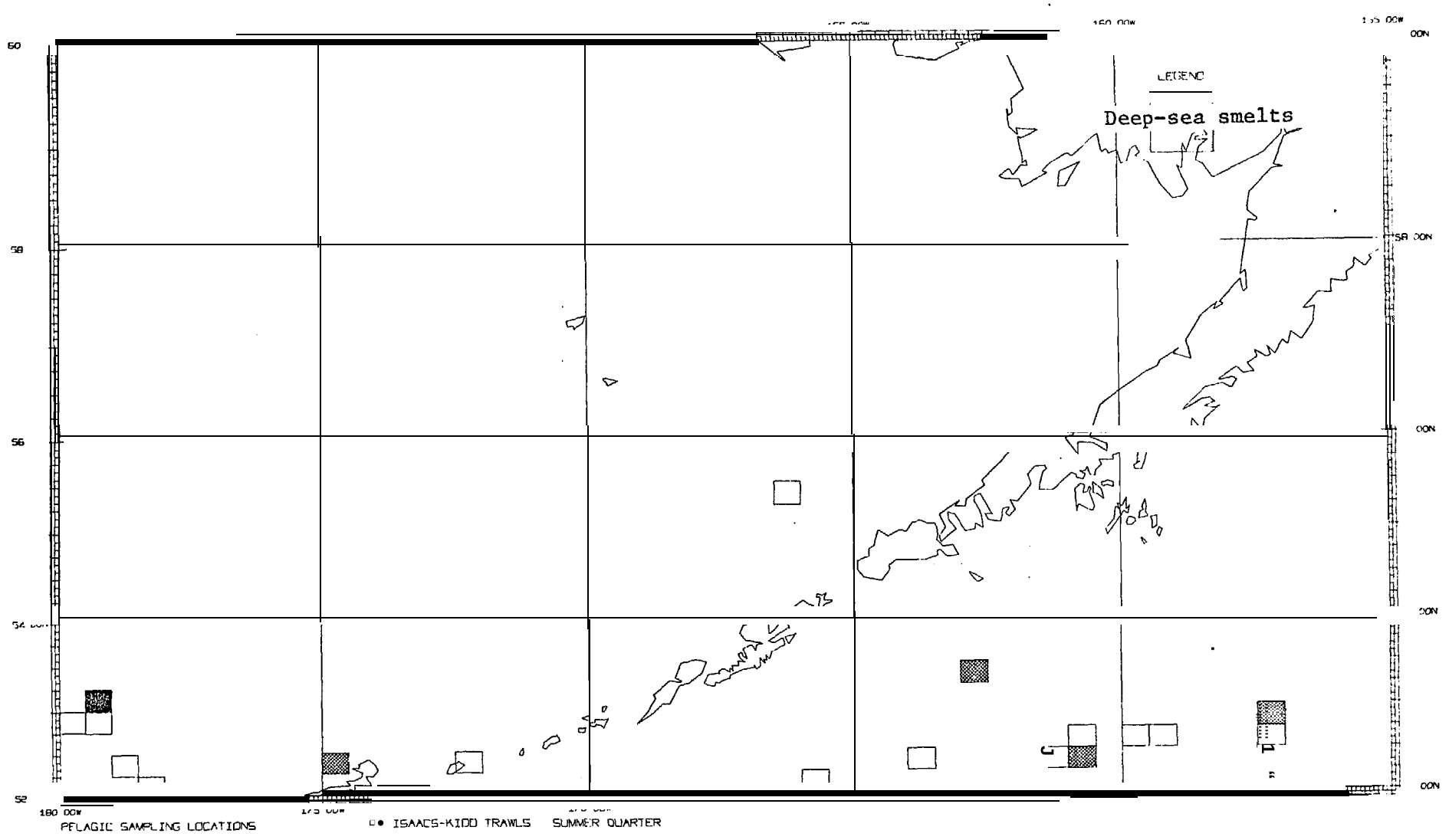


Figure IV.B.75.--Relative abundance of deep-sea smelts in Isaacs-Kidd trawls in summer, eastern Bering Sea.

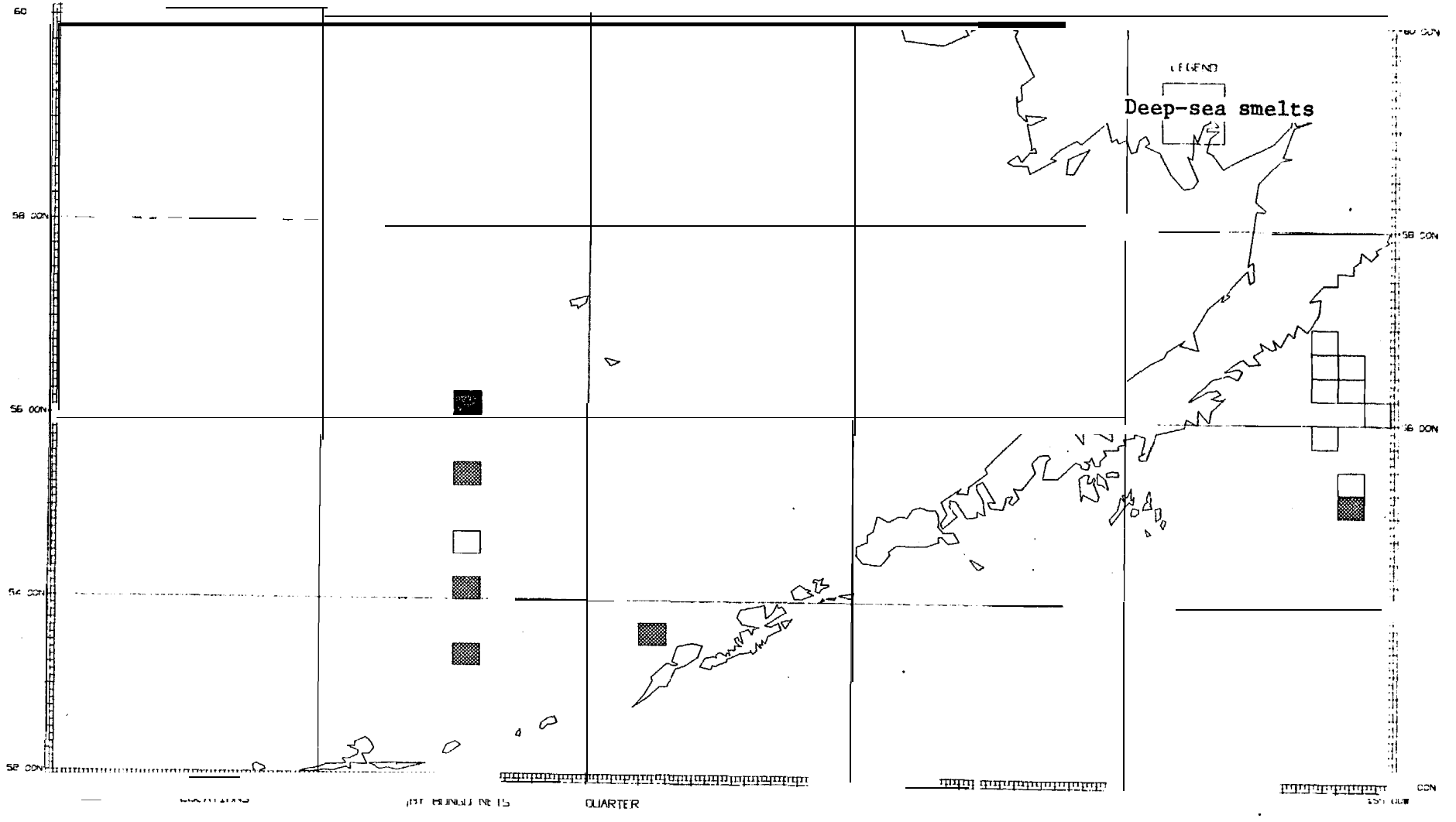


Figure IV.B.76.--Relative abundance of deep-sea smelts in bongo nets in spring, eastern Bering Sea.

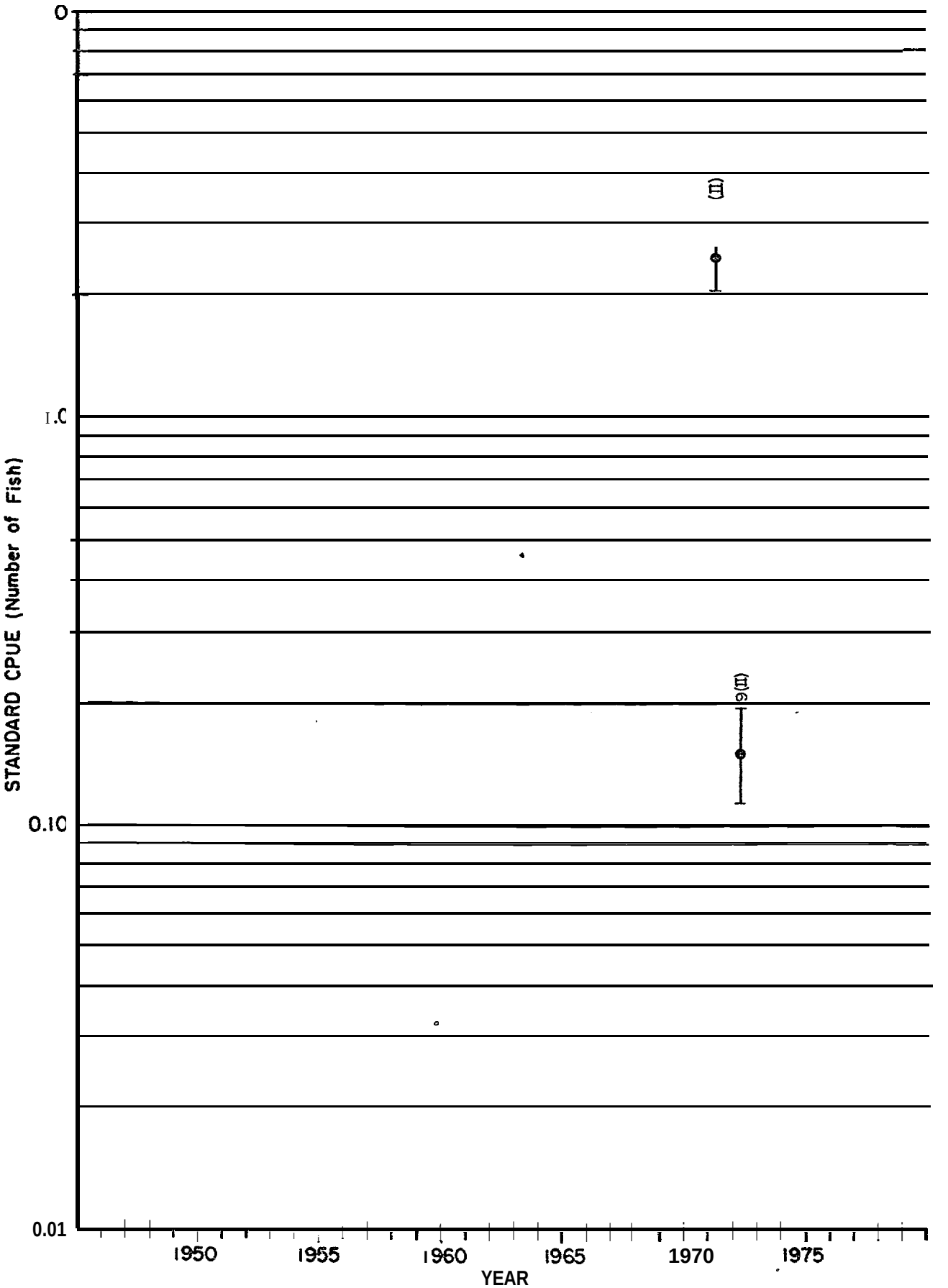


Figure IV.B.77.--Standardized rate of catch of deep-sea smelts by bongo net in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

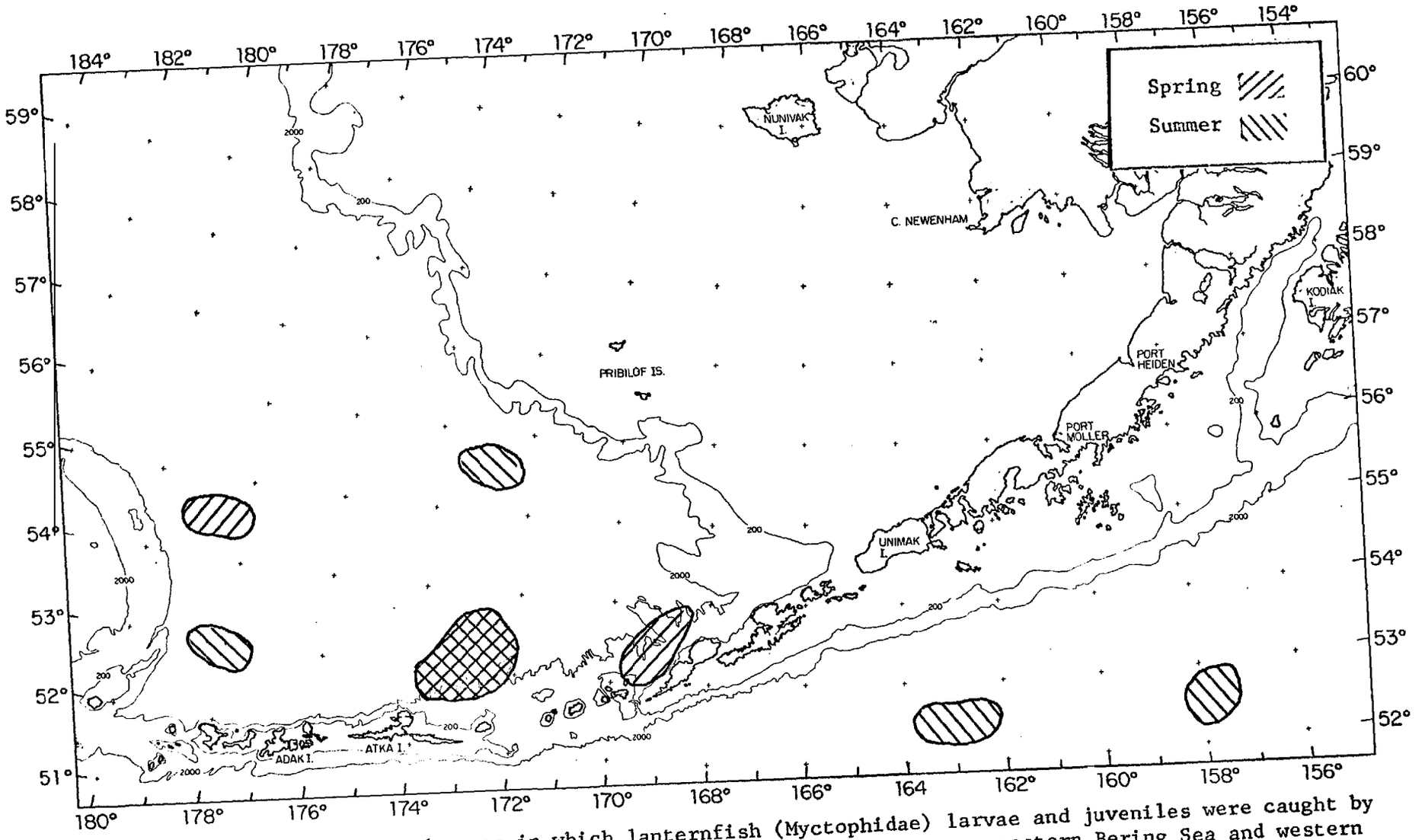


Figure IV.B. 78.--Generalized areas in which lanternfish (Myctophidae) larvae and juveniles were caught by Isaacs-Kidd trawls, bongo nets, and plankton nets in spring and summer, eastern Bering Sea and western Gulf of Alaska.

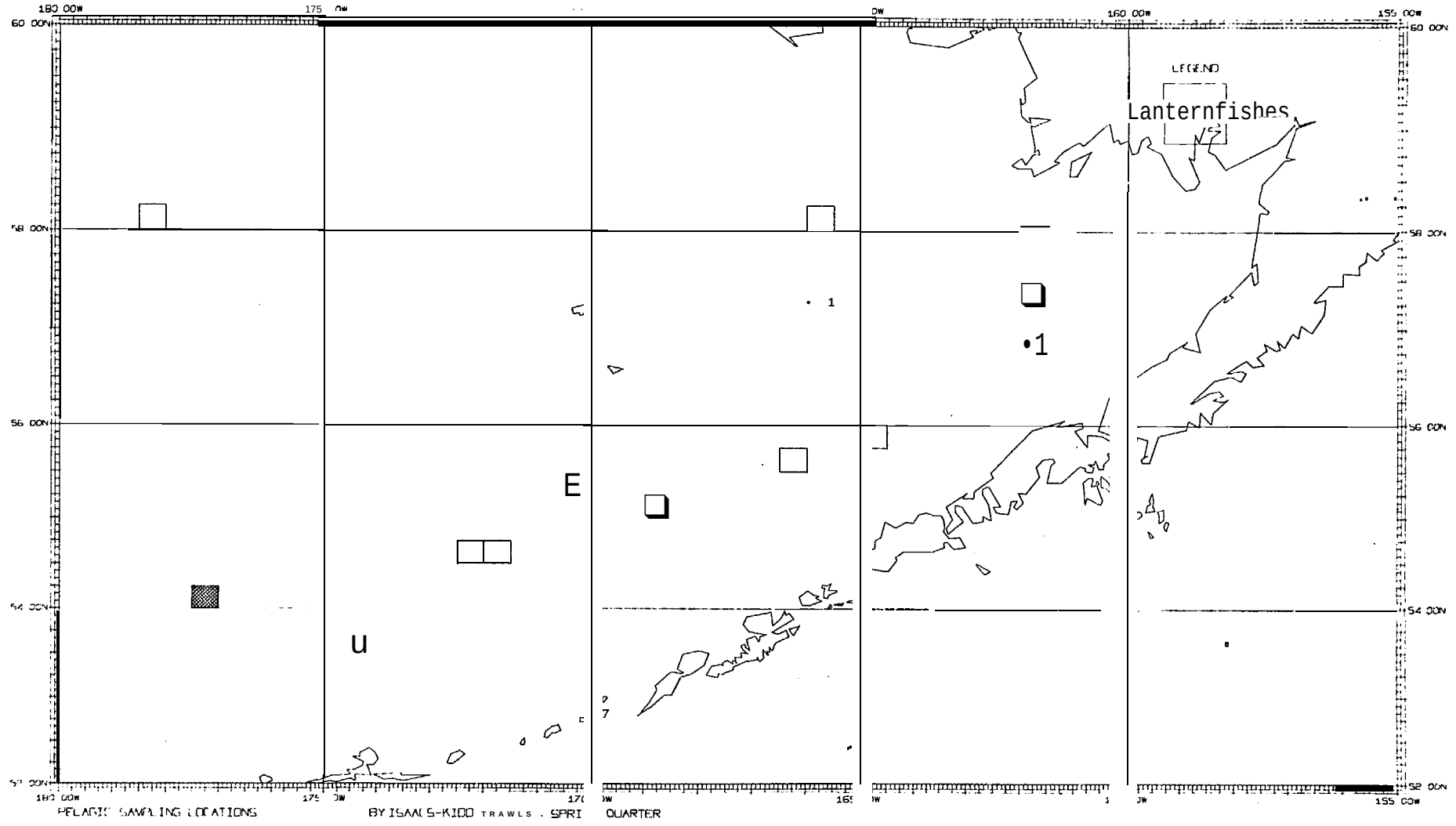


Figure IV.B.79.--Relative abundance of lanternfishes in Isaacs-Kidd trawls in spring, eastern Bering Sea.

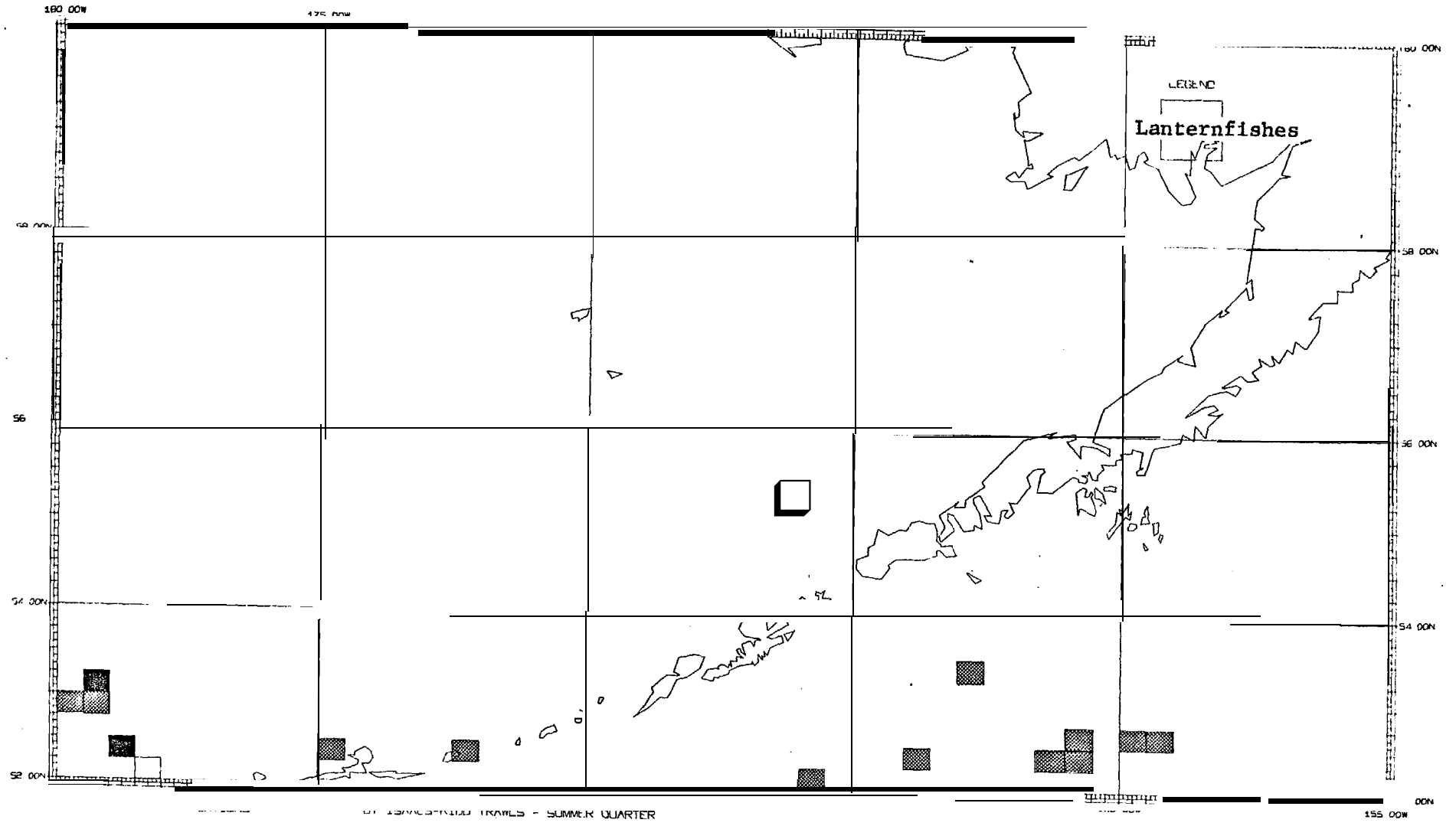


Figure IV.B.80.--Relative abundance of lanternfishes in Isaacs-Kidd trawls in summer, eastern Bering Sea.

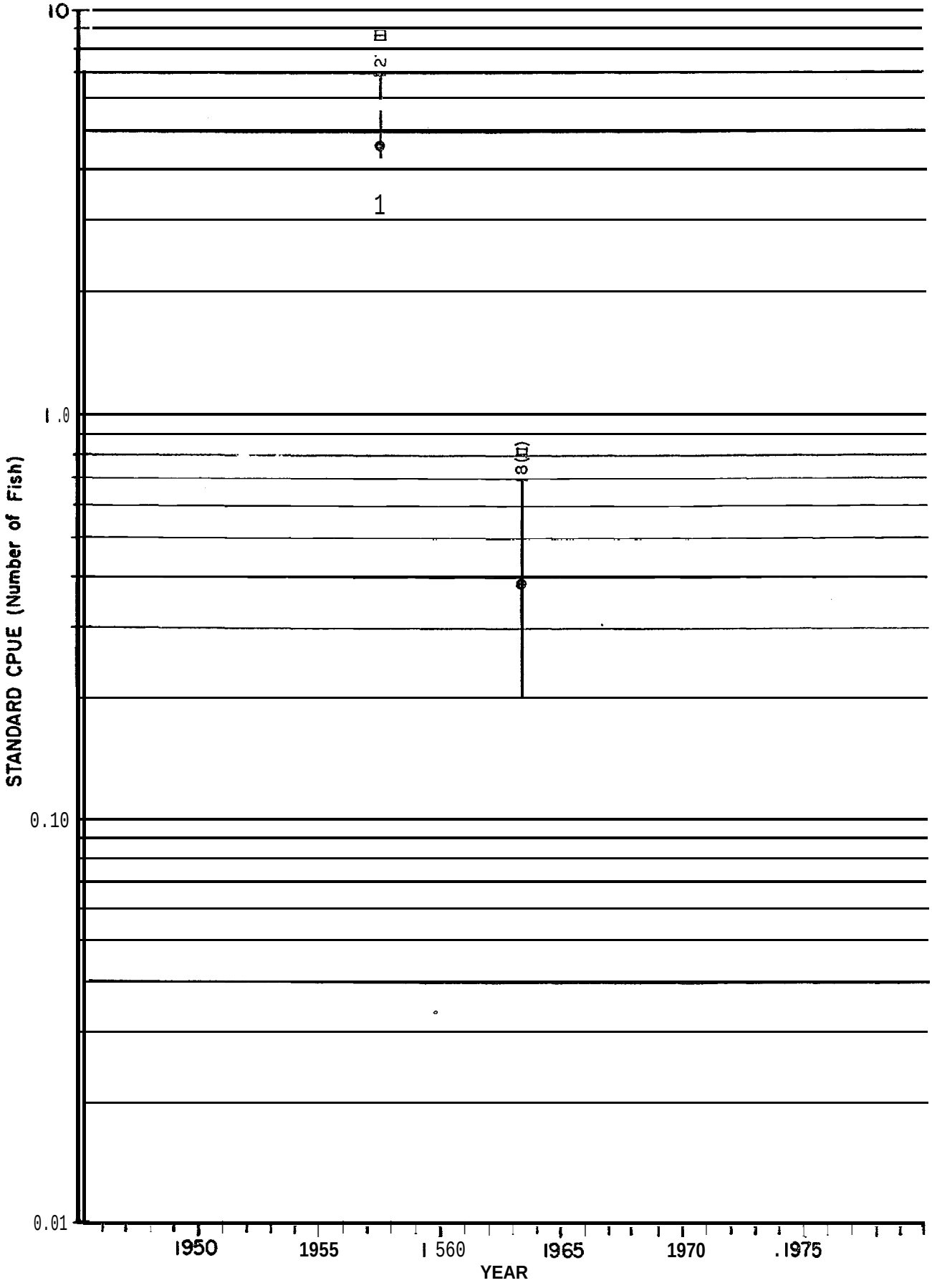


Figure IV.B.81.--Standardized rate of catch of lanternfishes by Isaacs-Kidd trawl in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

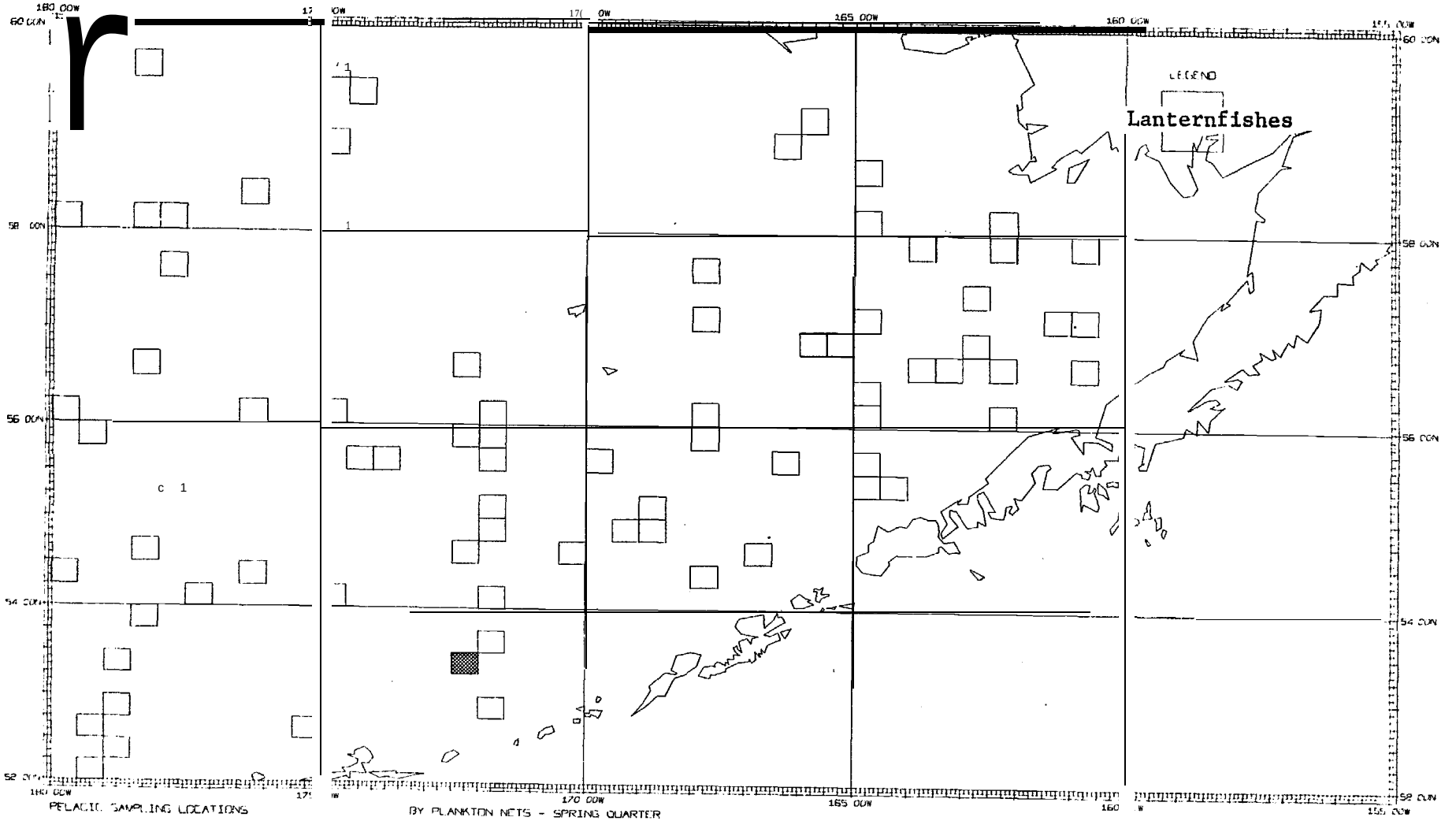


Figure IV.B.82..-Relative abundance of lanternfishes in plankton nets in spring, eastern Bering Sea.

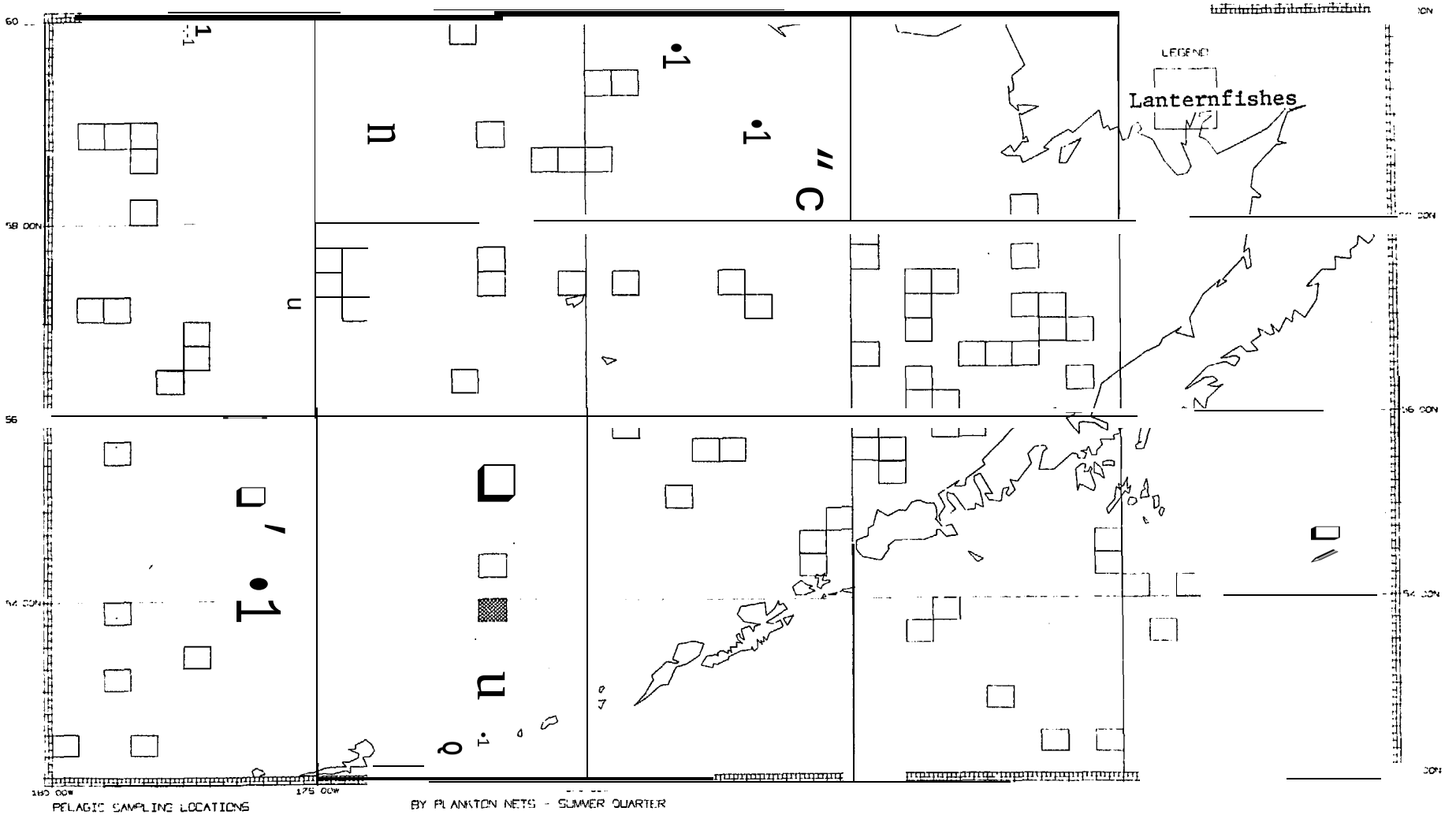


Figure IV.B.83.--Relative abundance of lanternfishes in plankton nets in summer, eastern Bering Sea.

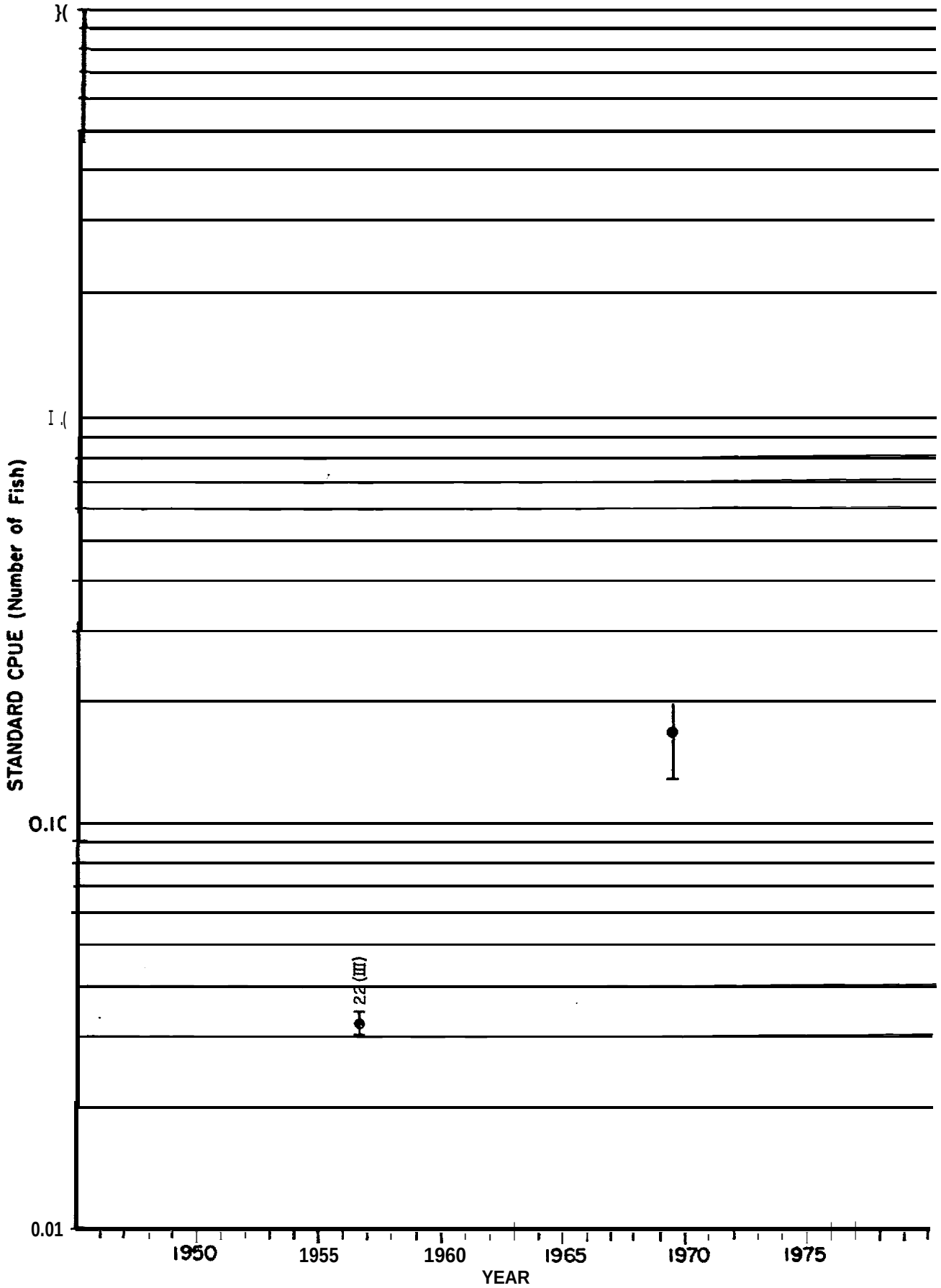


Figure IV.B.84.--Standardized rate of catch of lanternfishes by plankton net in the eastern Bering Sea (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

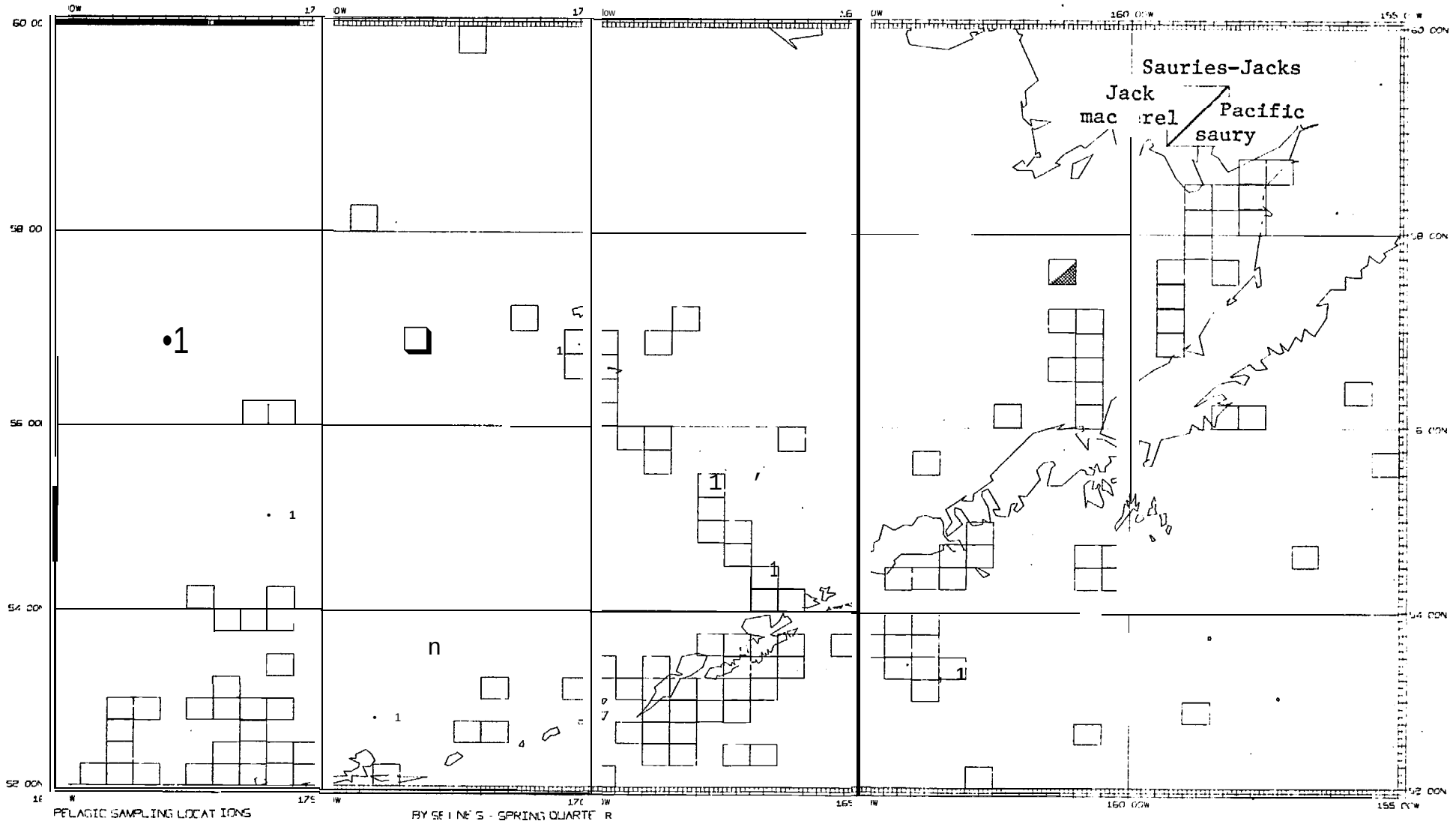


Figure IV. B.85.--Relative abundance of jack mackerel and Pacific saury in purse seines in spring, eastern Bering Sea.

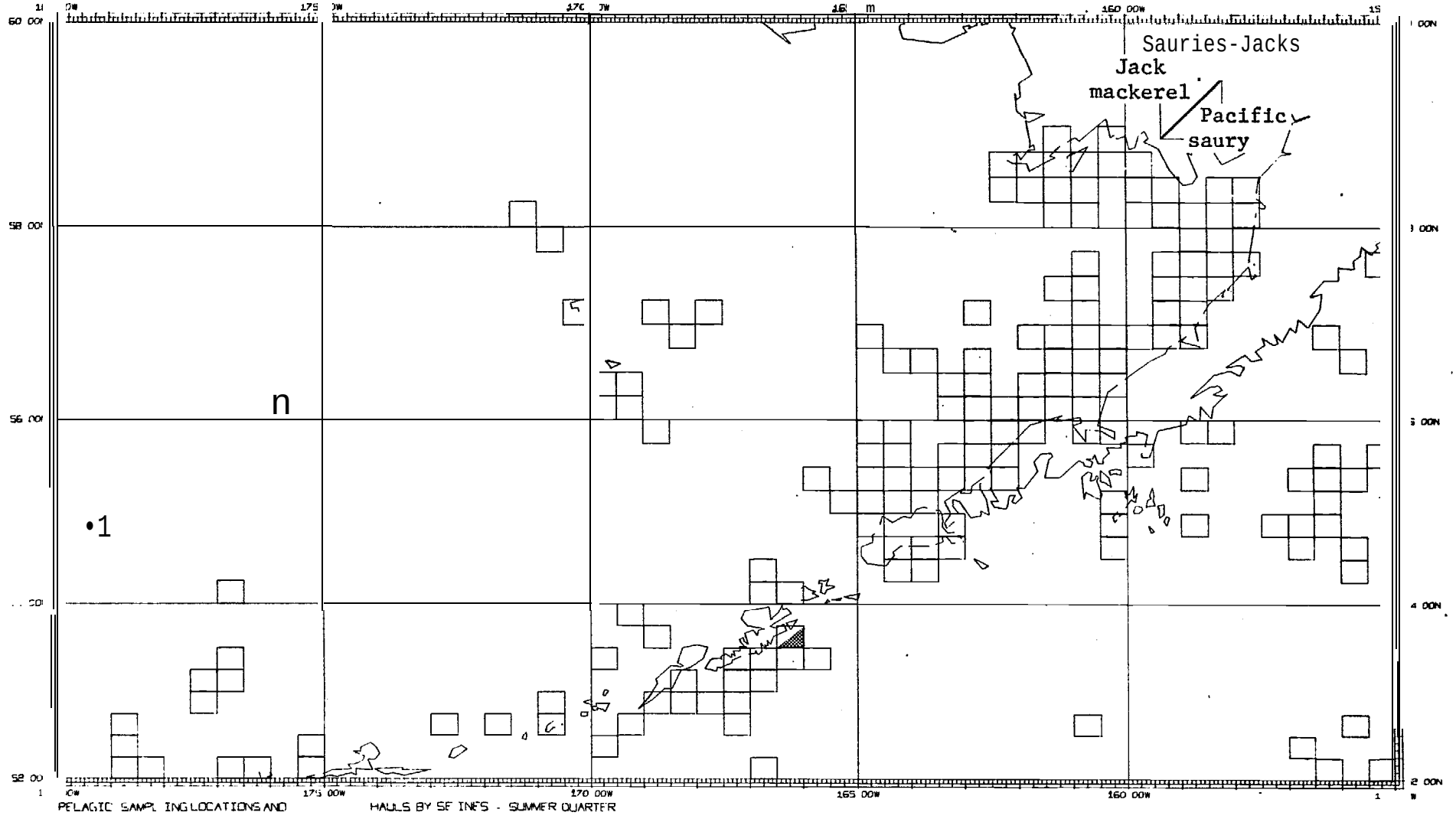


Figure IV.B.86..-Relative abundance of jack mackerel and Pacific saury in purse seines in summer, eastern Bering Sea.

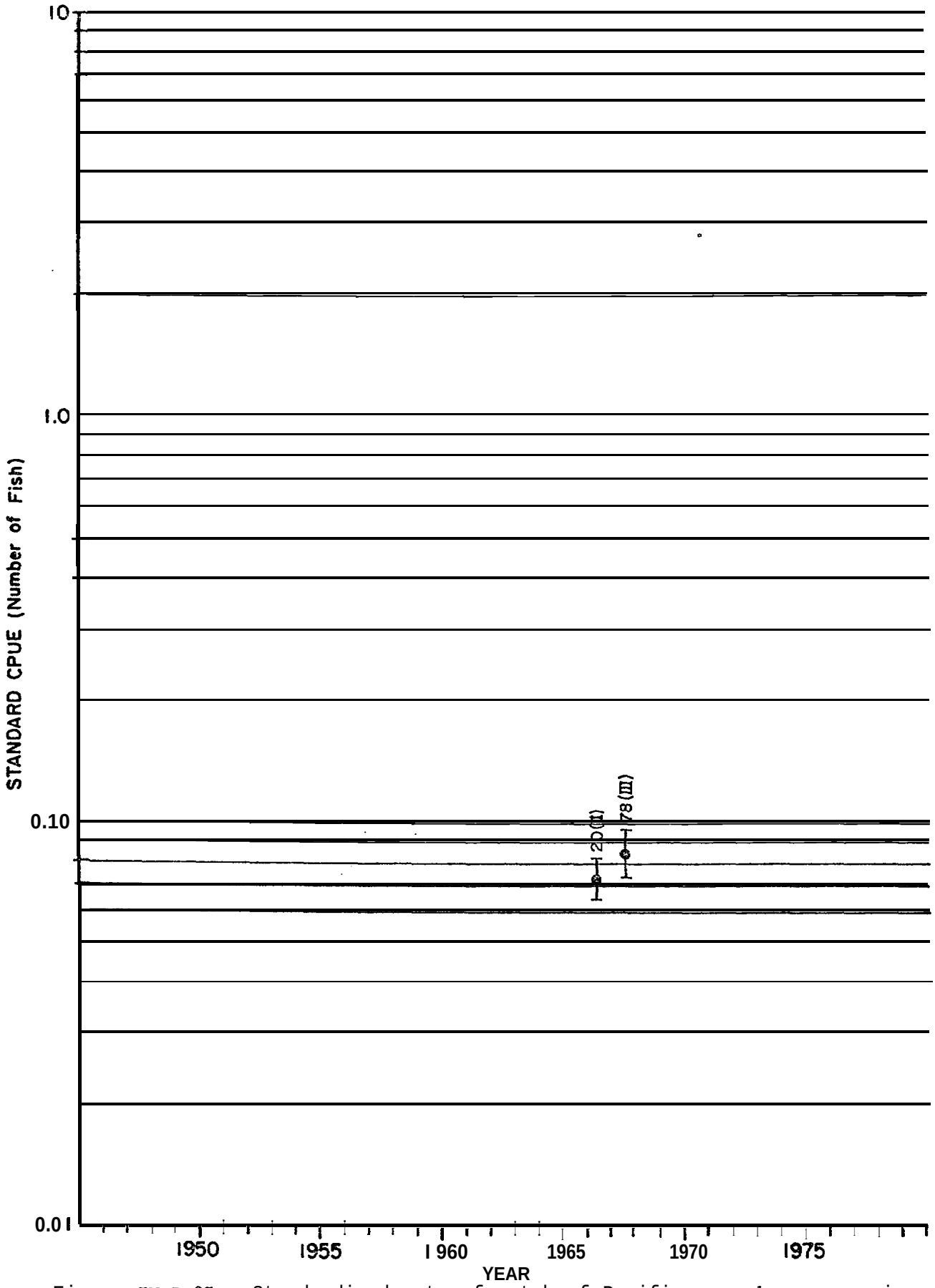


Figure IV.B.87.--Standardized rate of catch of Pacific saury by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

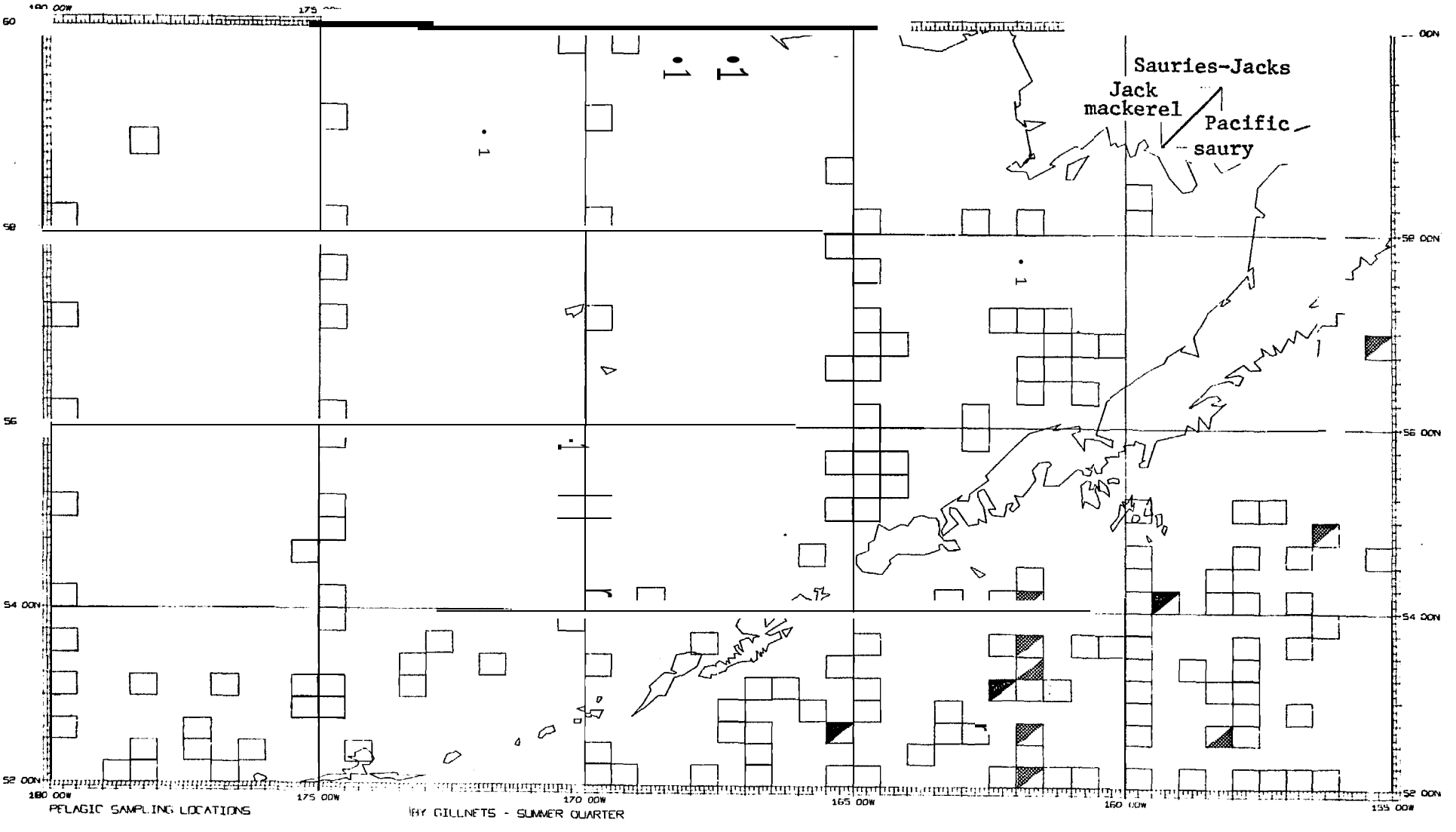


Figure IV.B.88.--Relative abundance of jack mackerel and Pacific saury in gillnets in summer, eastern Bering Sea.

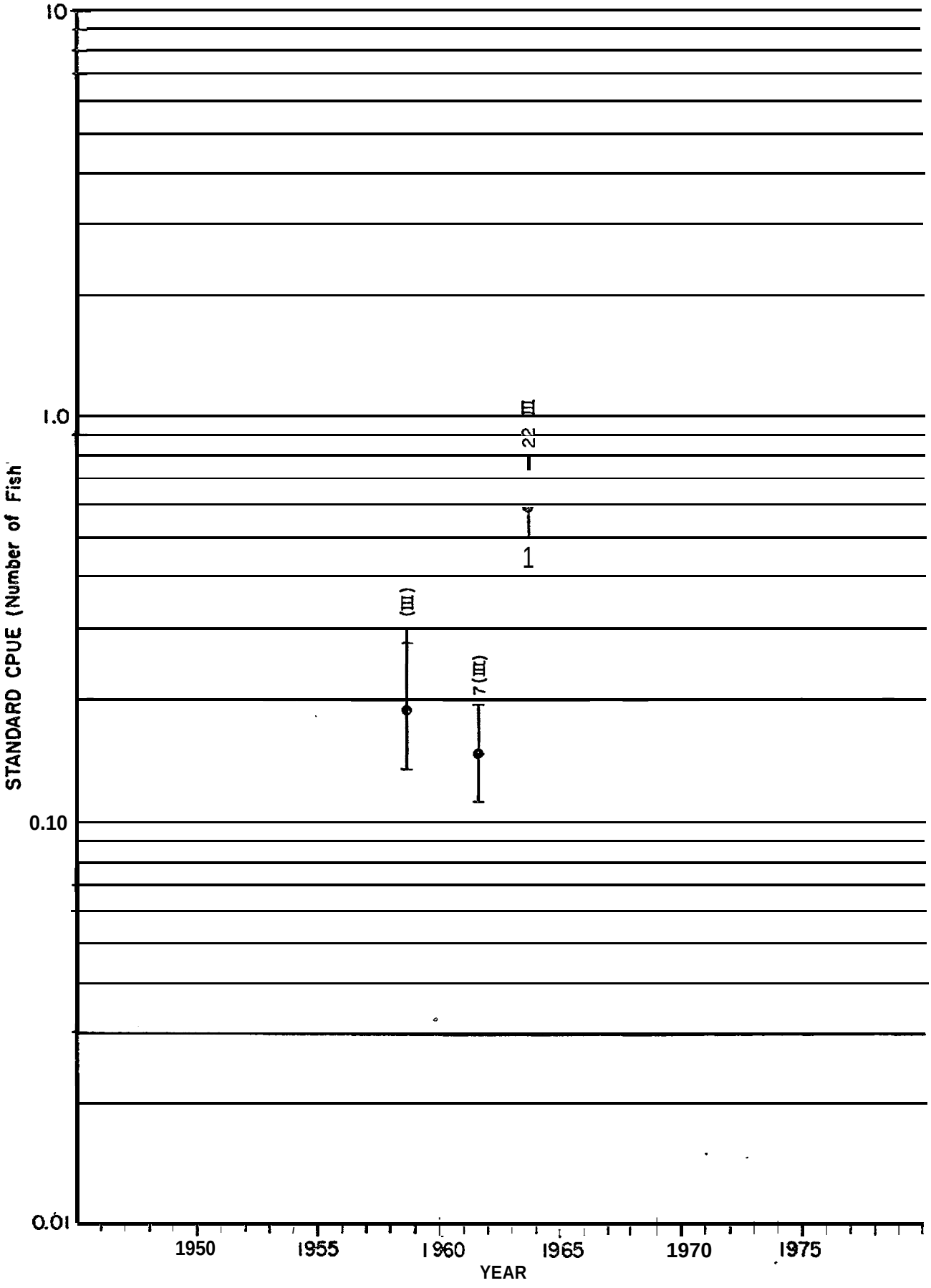


Figure IV. B.89.--Standardized rate of catch of jack mackerel by gillnet in the eastern Bering Sea (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

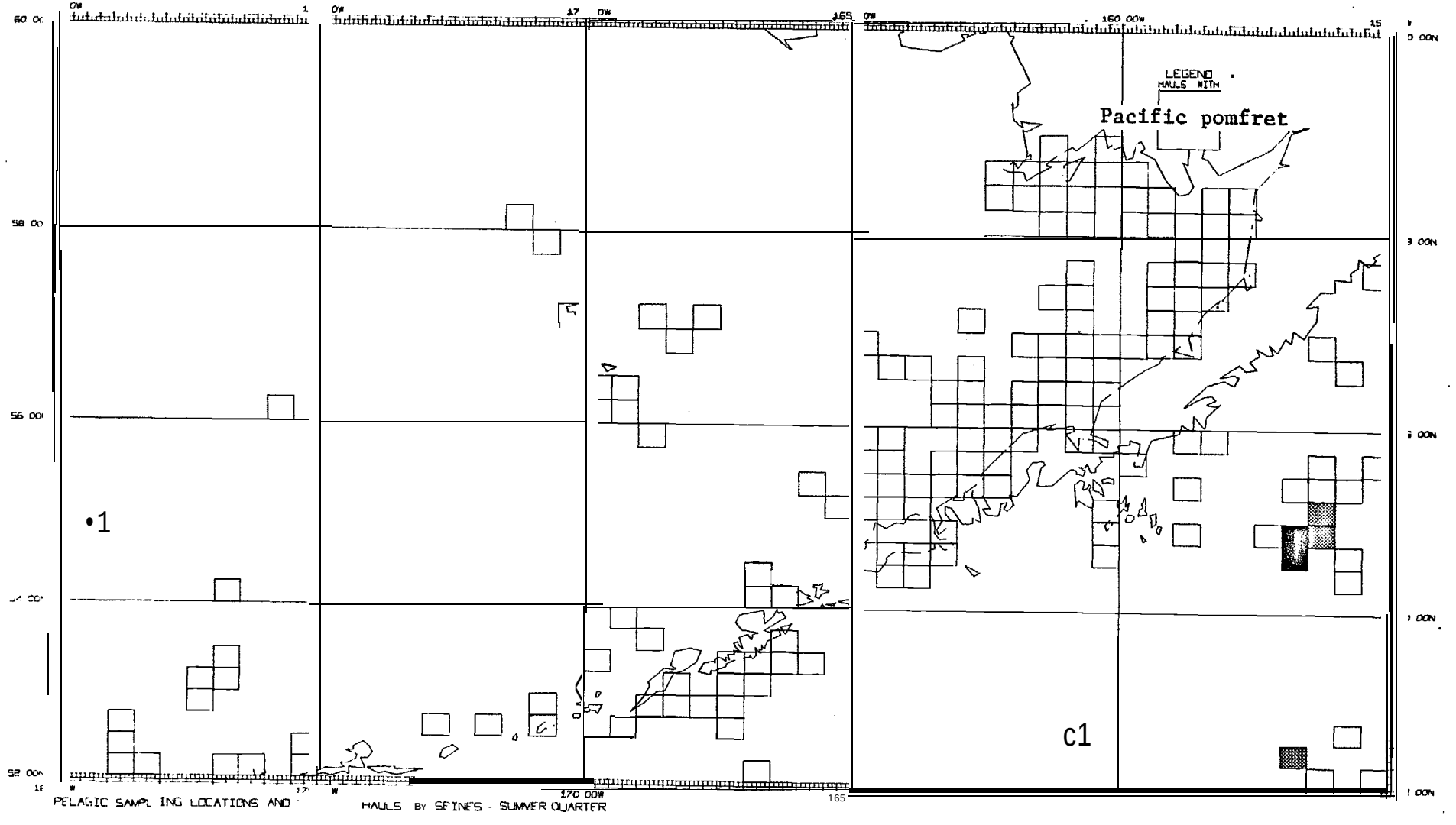


Figure IV.B. 90.--Relative abundance of Pacific pomfret in purse seines in summer, eastern Bering Sea.

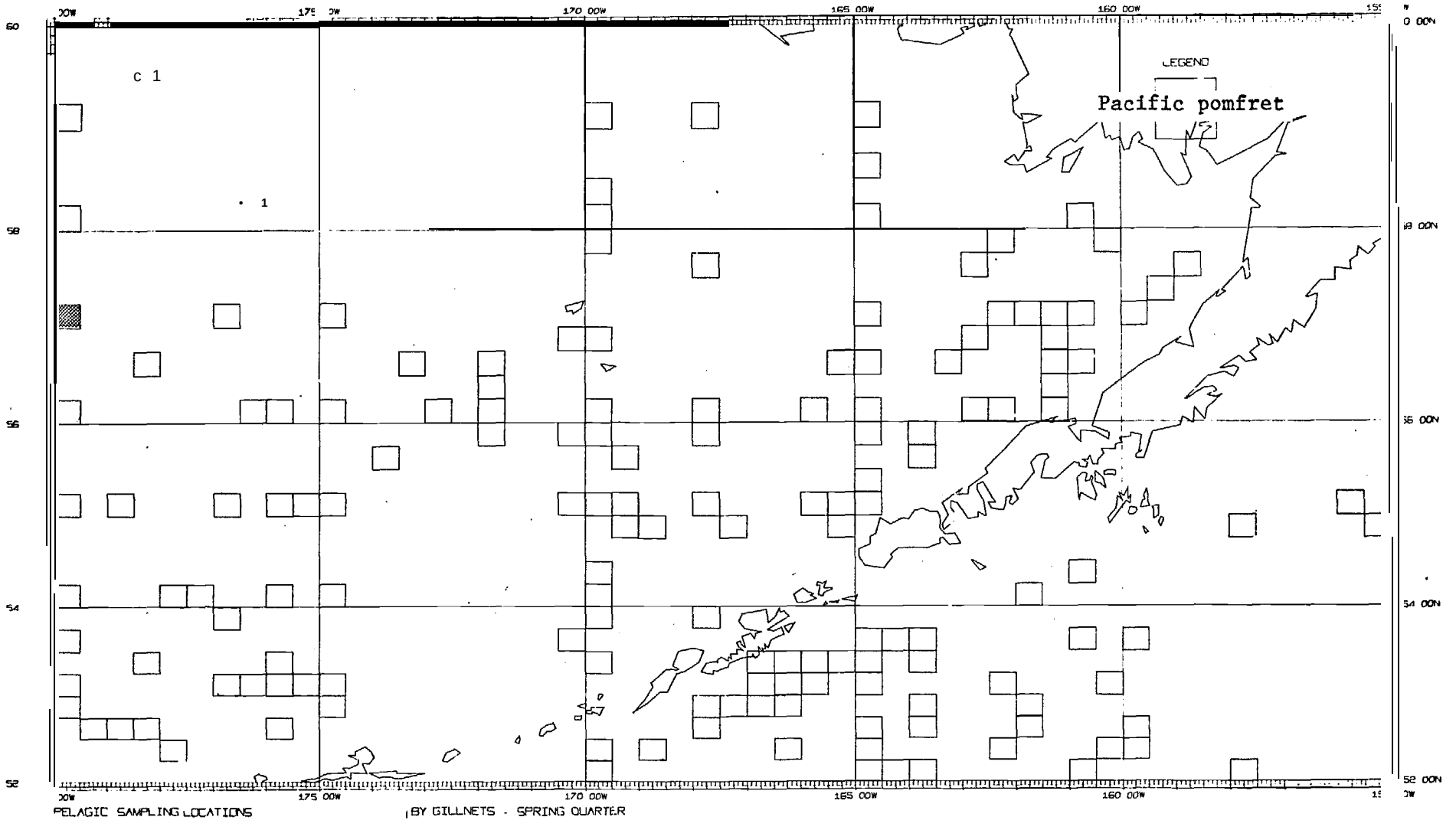


Figure IV. B.91.--Relative abundance of Pacific pomfret in gillnets in spring, eastern Bering Sea.

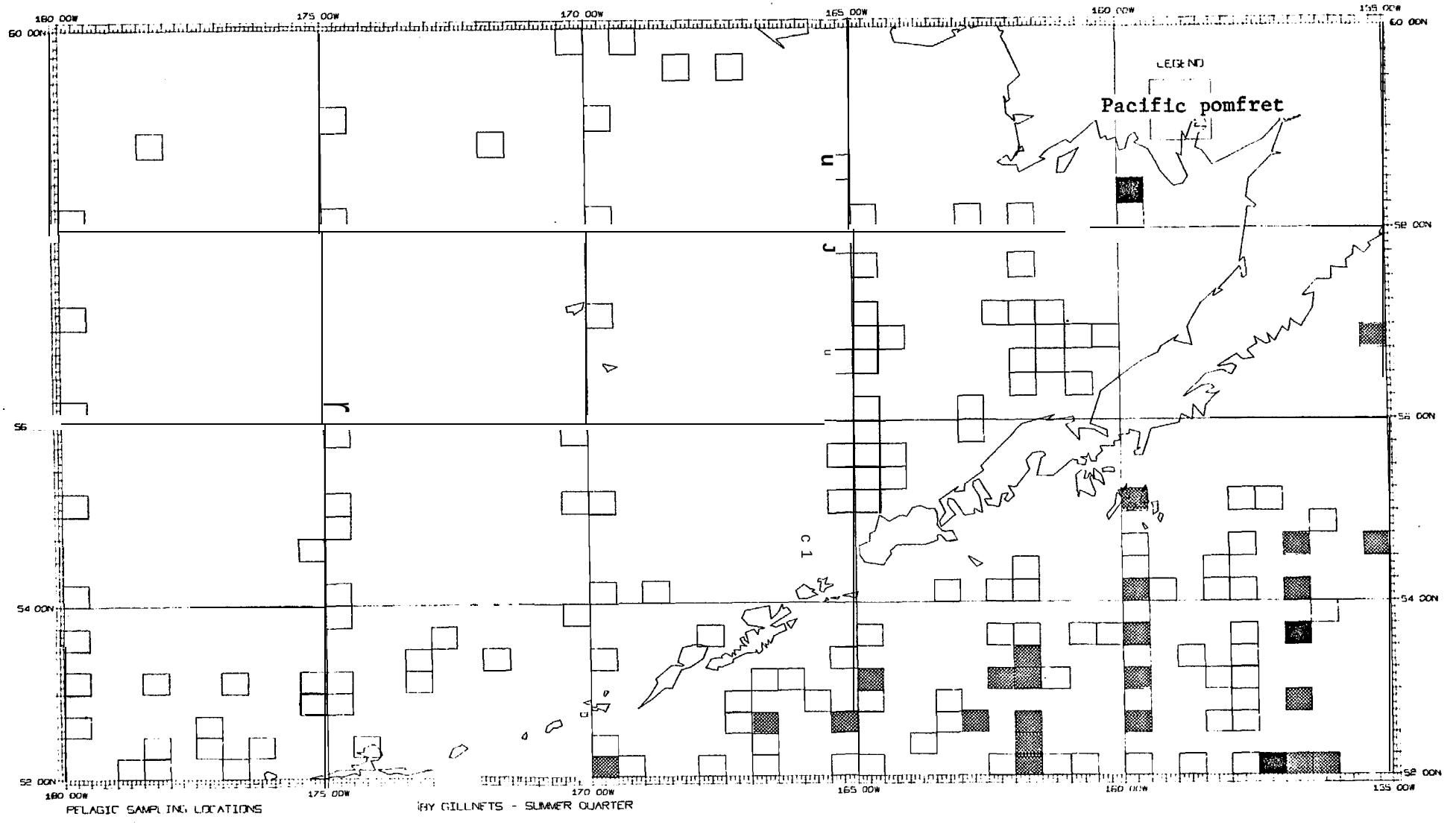


Figure IV.B.92.--Relative abundance of Pacific pomfret in gillnets in summer, eastern Bering Sea.

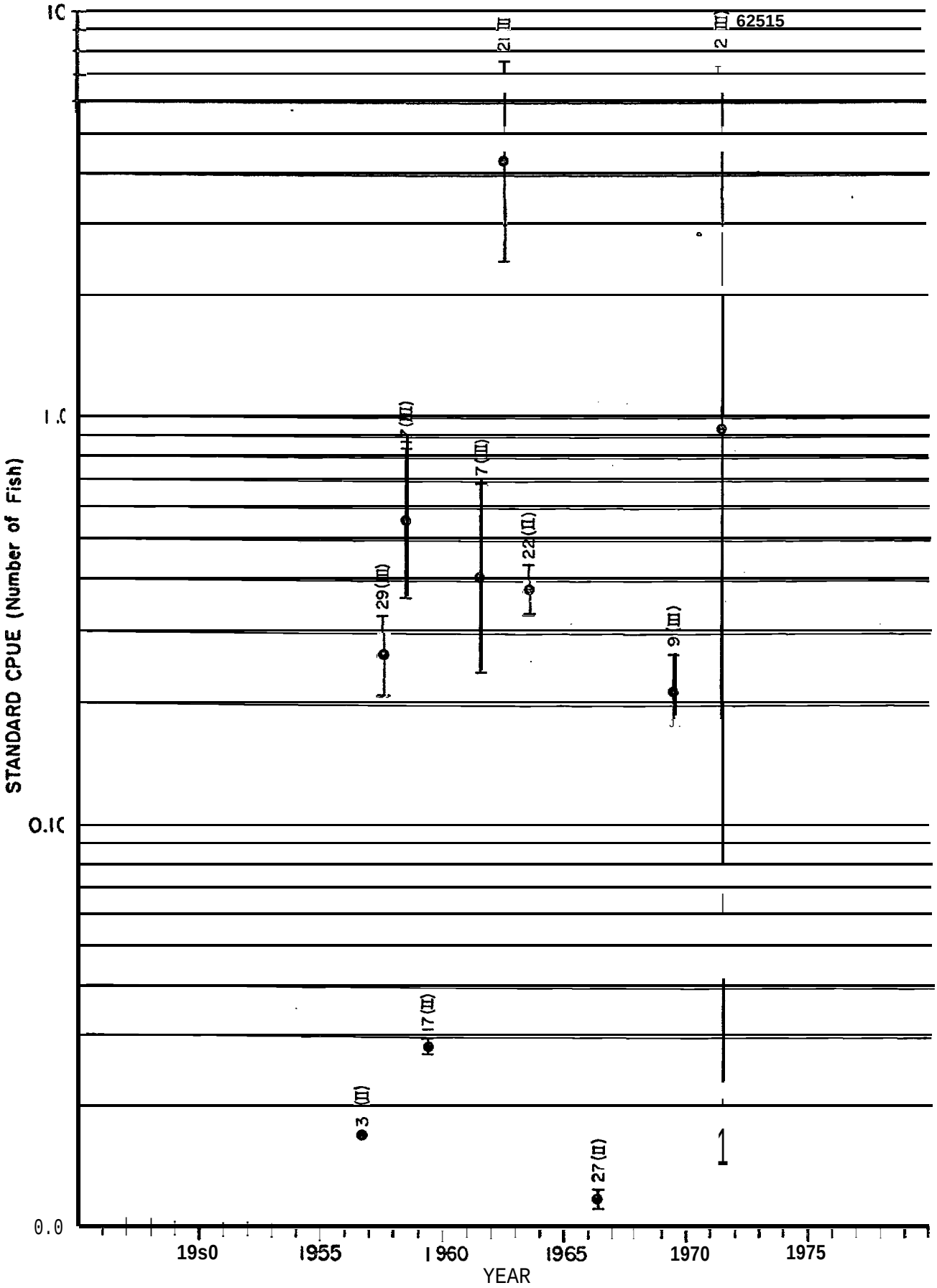


Figure IV. B.93.--Standardized rate of catch of Pacific pomfret by gillnet in the eastern Bering Sea (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

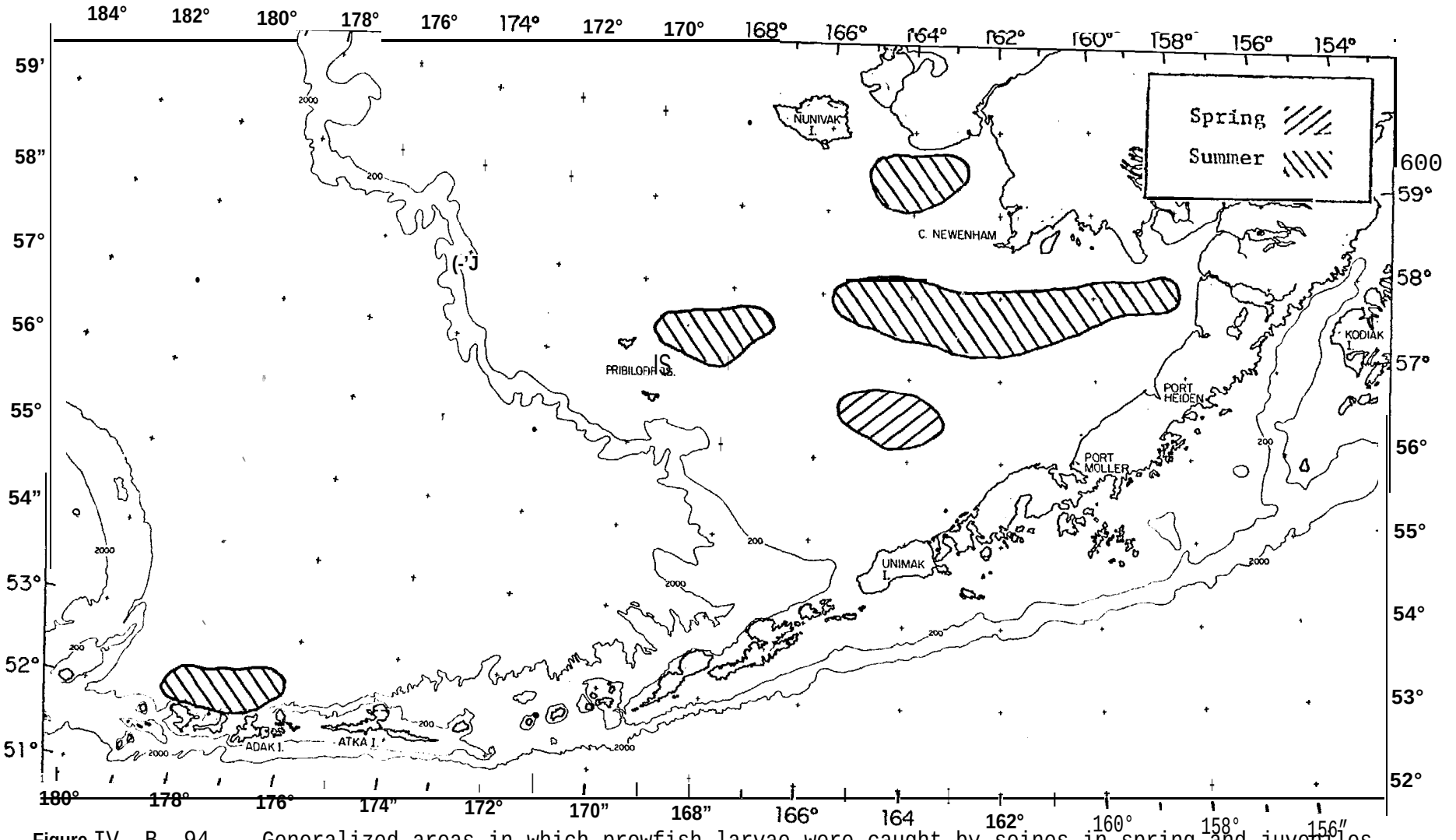


Figure IV. B. 94 .--Generalized areas in which prowfish larvae were caught by seines in spring and juveniles were caught in summer, eastern Bering Sea.

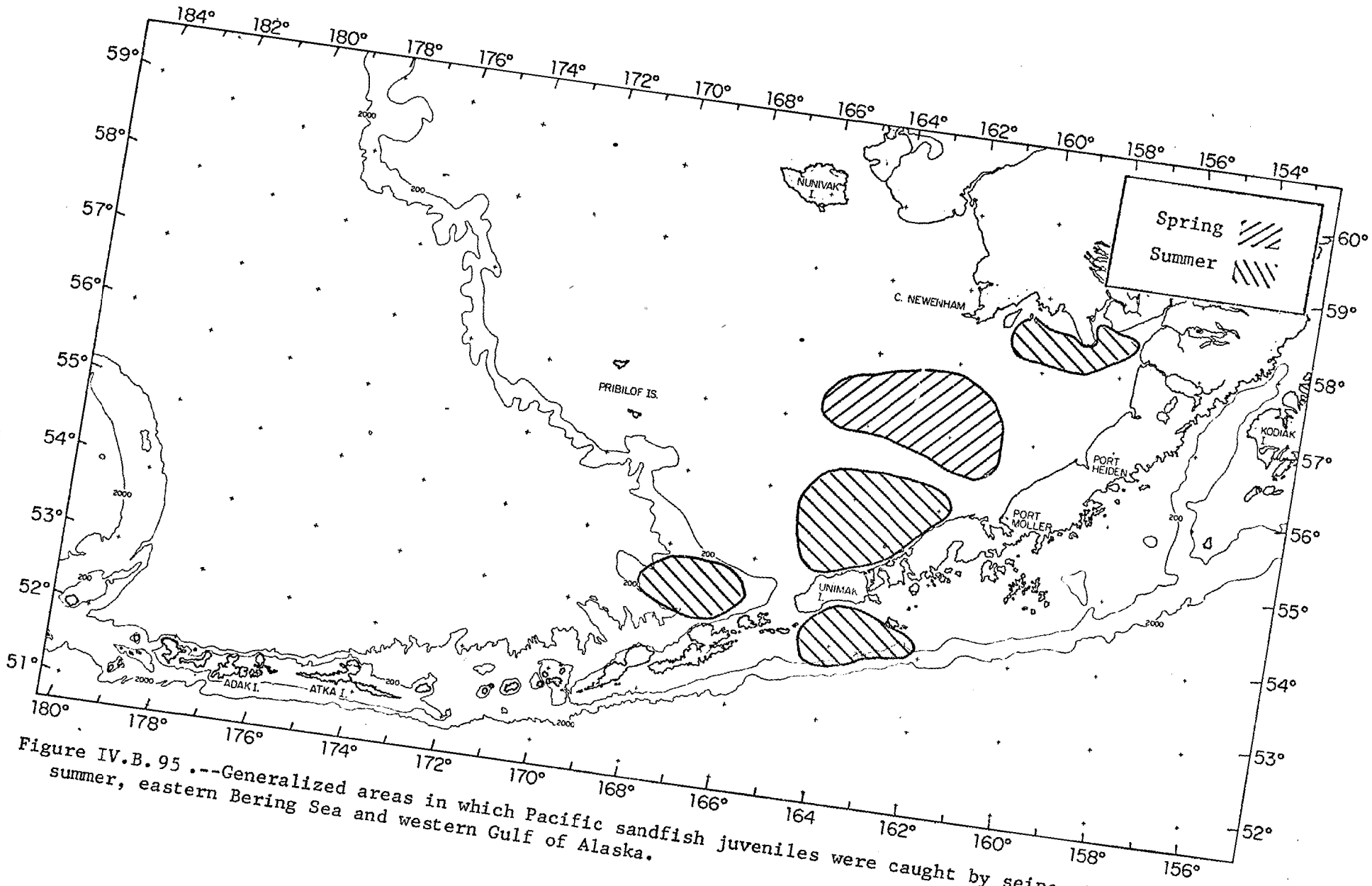


Figure IV.B.95 ---Generalized areas in which Pacific sandfish juveniles were caught by seines in spring and summer, eastern Bering Sea and western Gulf of Alaska.

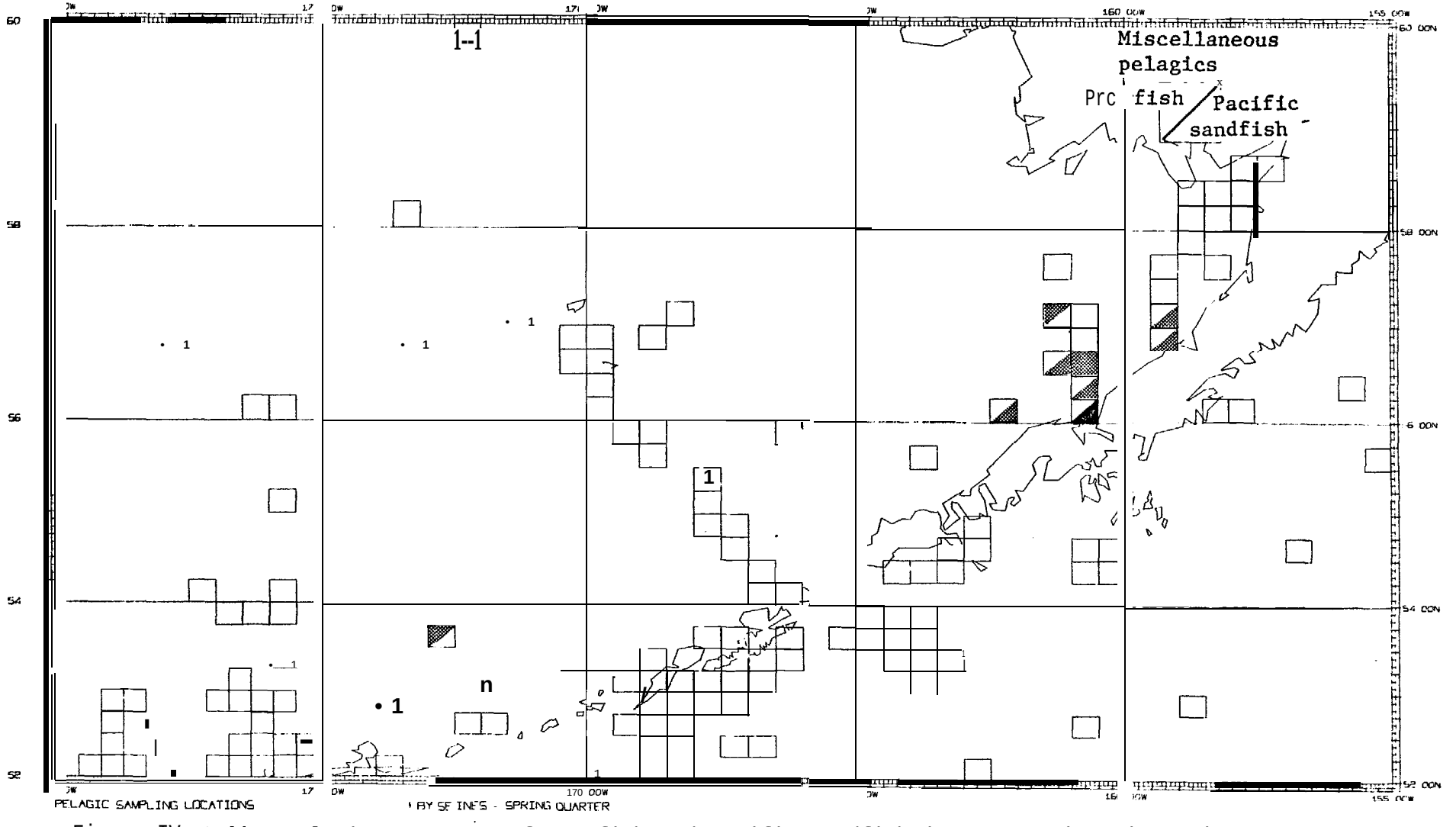


Figure IV. B.96.--Relative abundance of prowfish and Pacific sandfish in purse seines in spring, eastern Bering Sea.

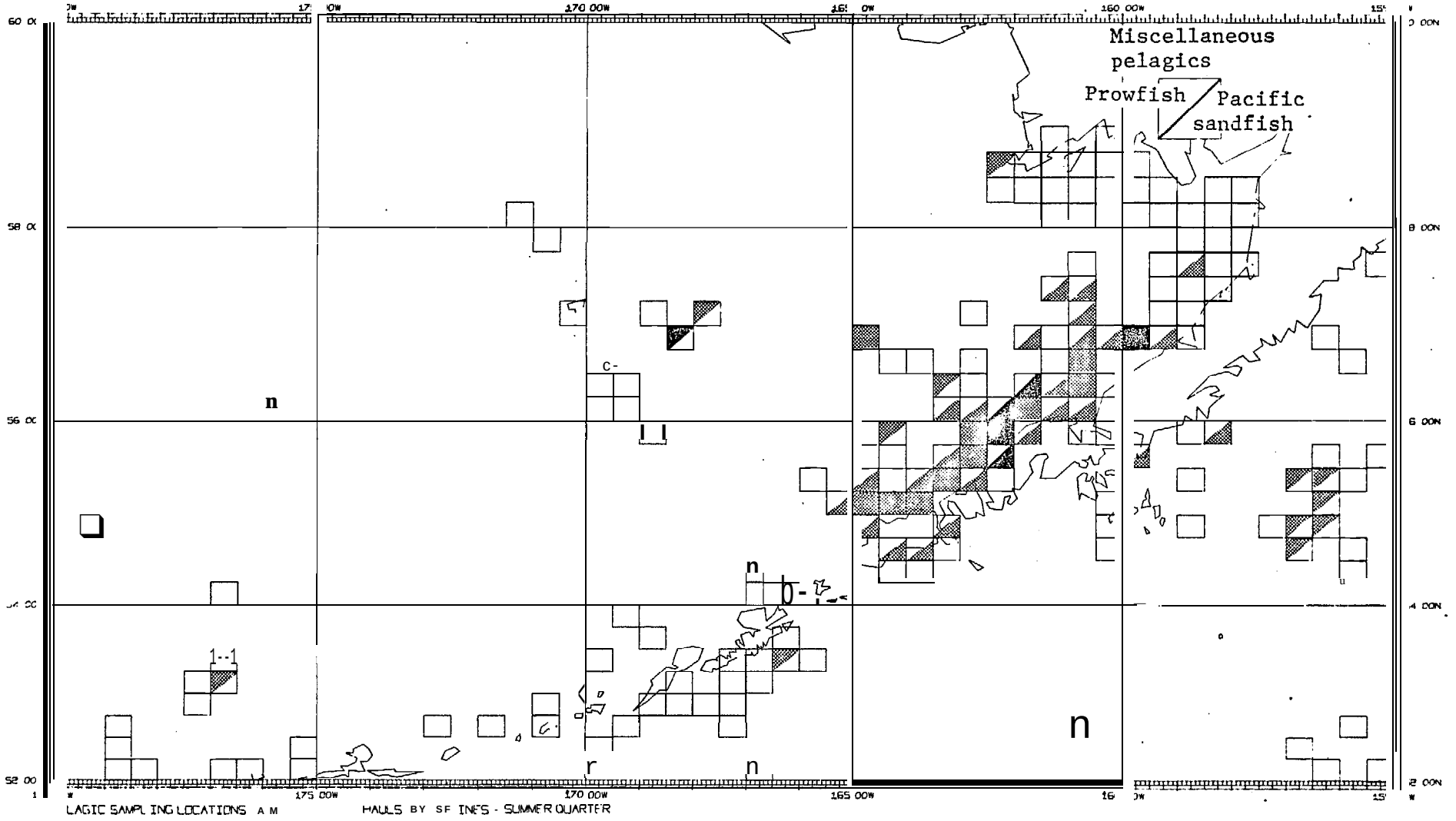


Figure IV. B.97.--Relative abundance of prowfish and Pacific sandfish in purse seines in summer, eastern Bering Sea.

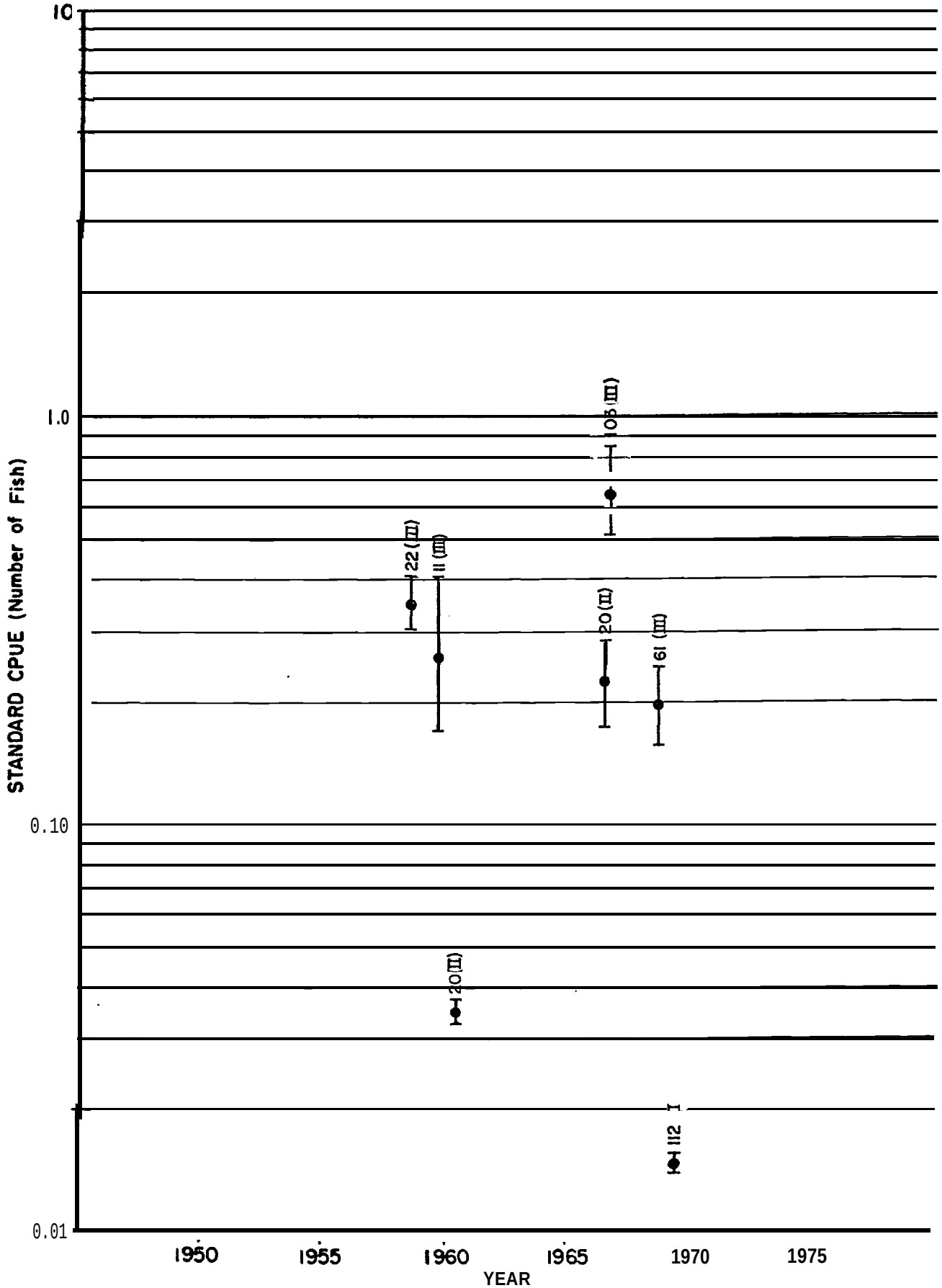


Figure IV.B.98.--Standardized rate of catch of prowfish by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

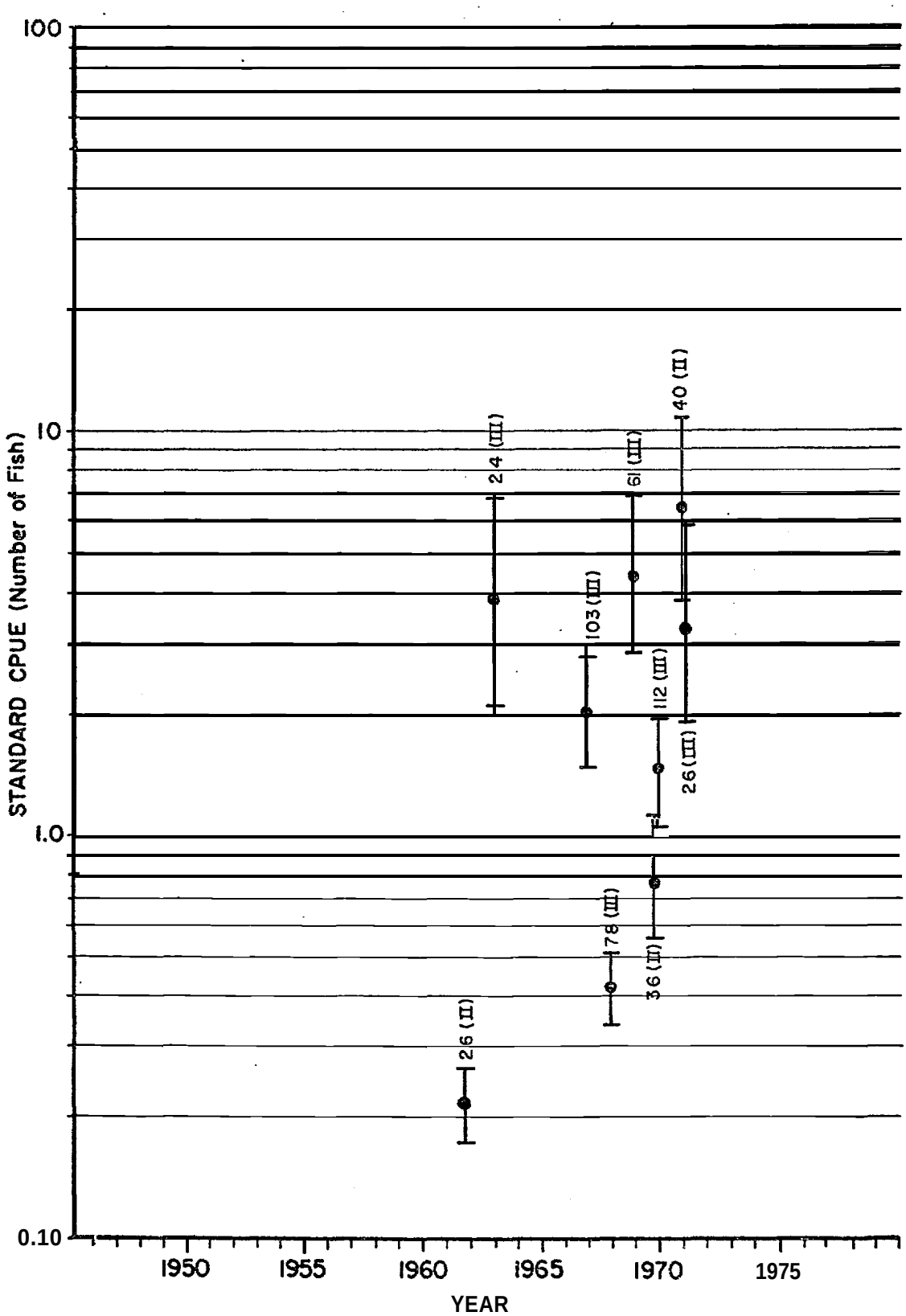


Figure IV.B.99.--Standardized rate of catch of Pacific sandfish by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

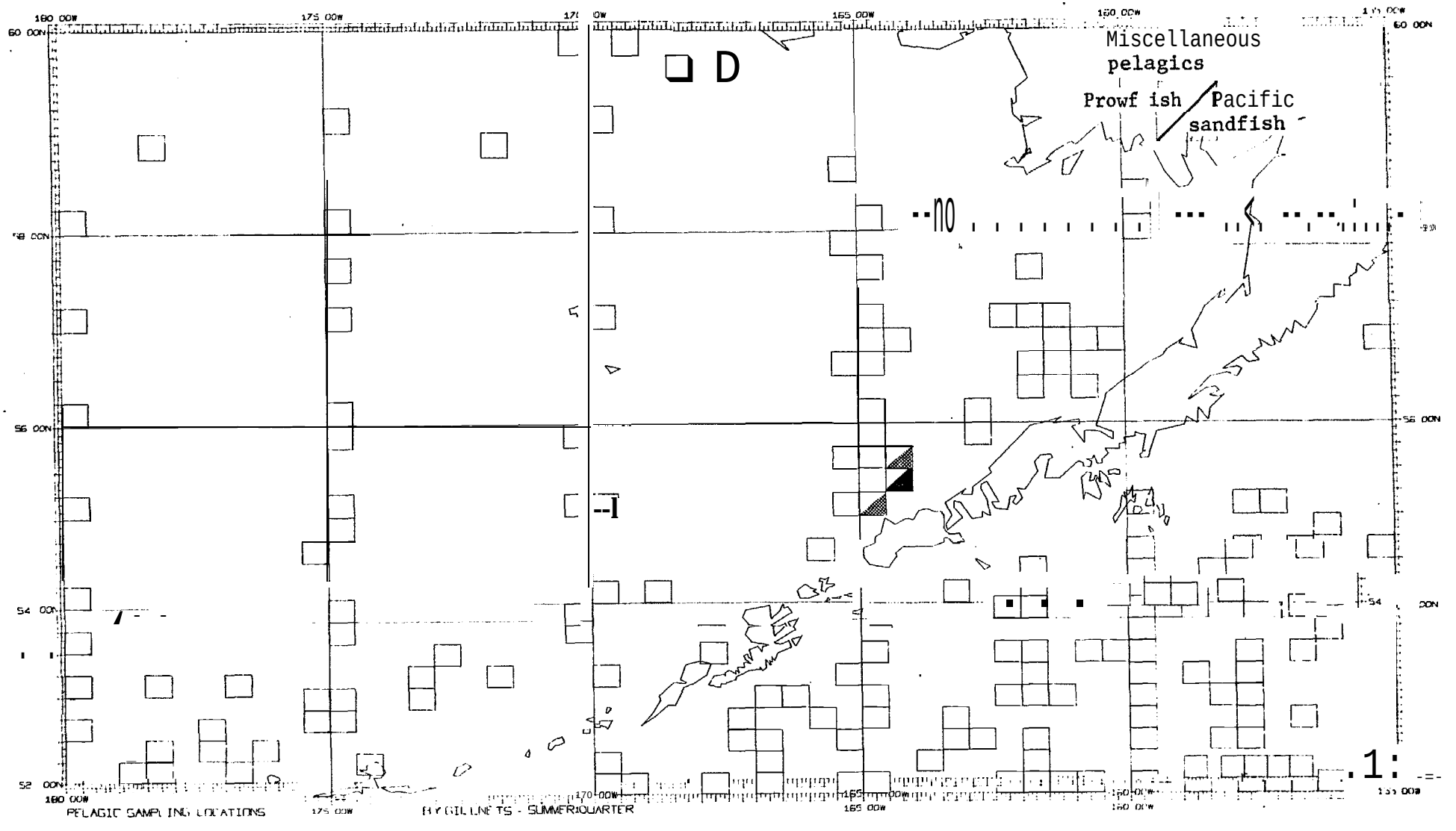


Figure IV. B.100. --Relative abundance of prowfish and Pacific sandfish in gillnets in summer, eastern Bering Sea.

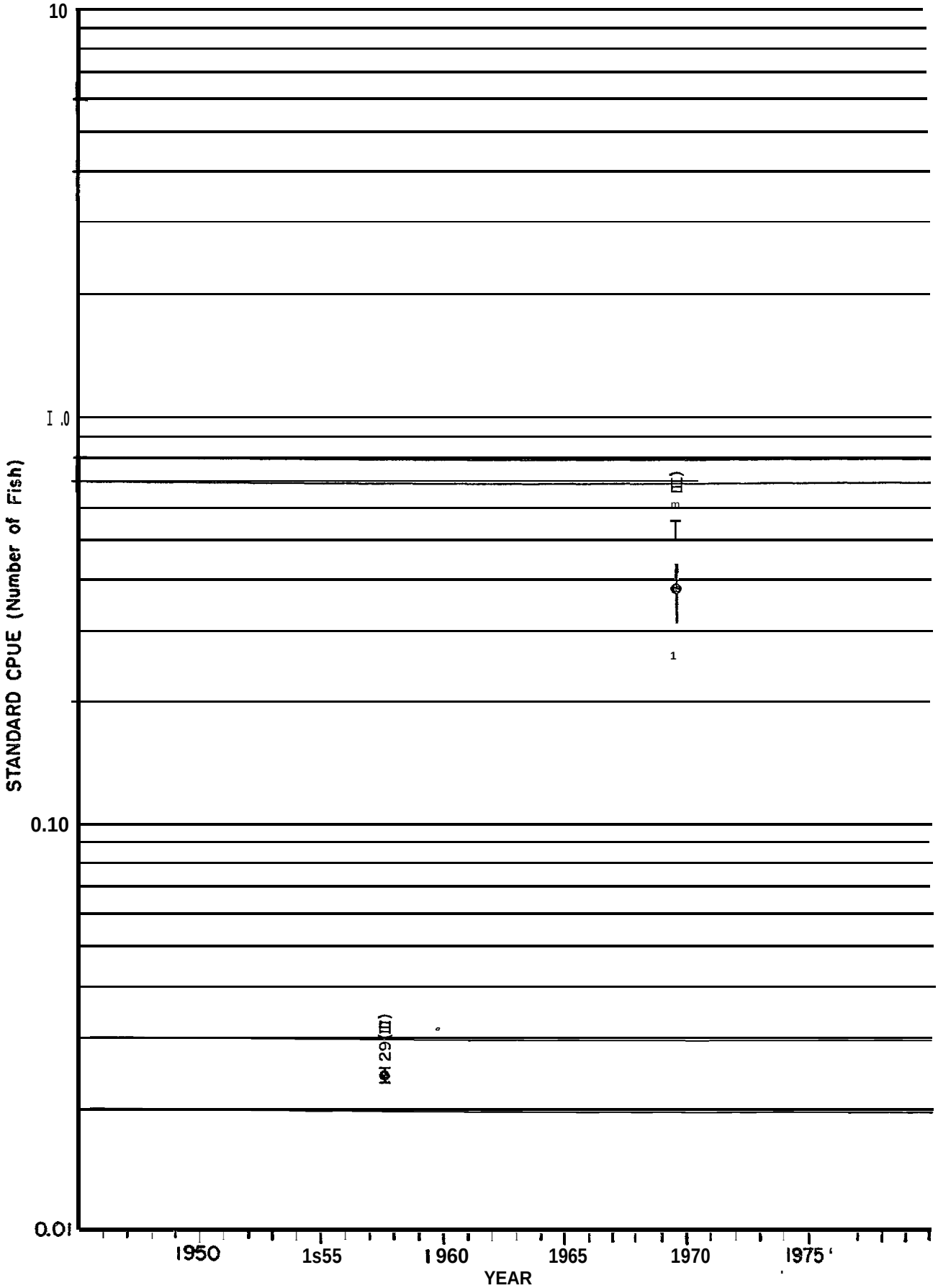


Figure IV.B.101.--Standardized rate of catch of Pacific sandfish by gillnet in the eastern Bering Sea (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

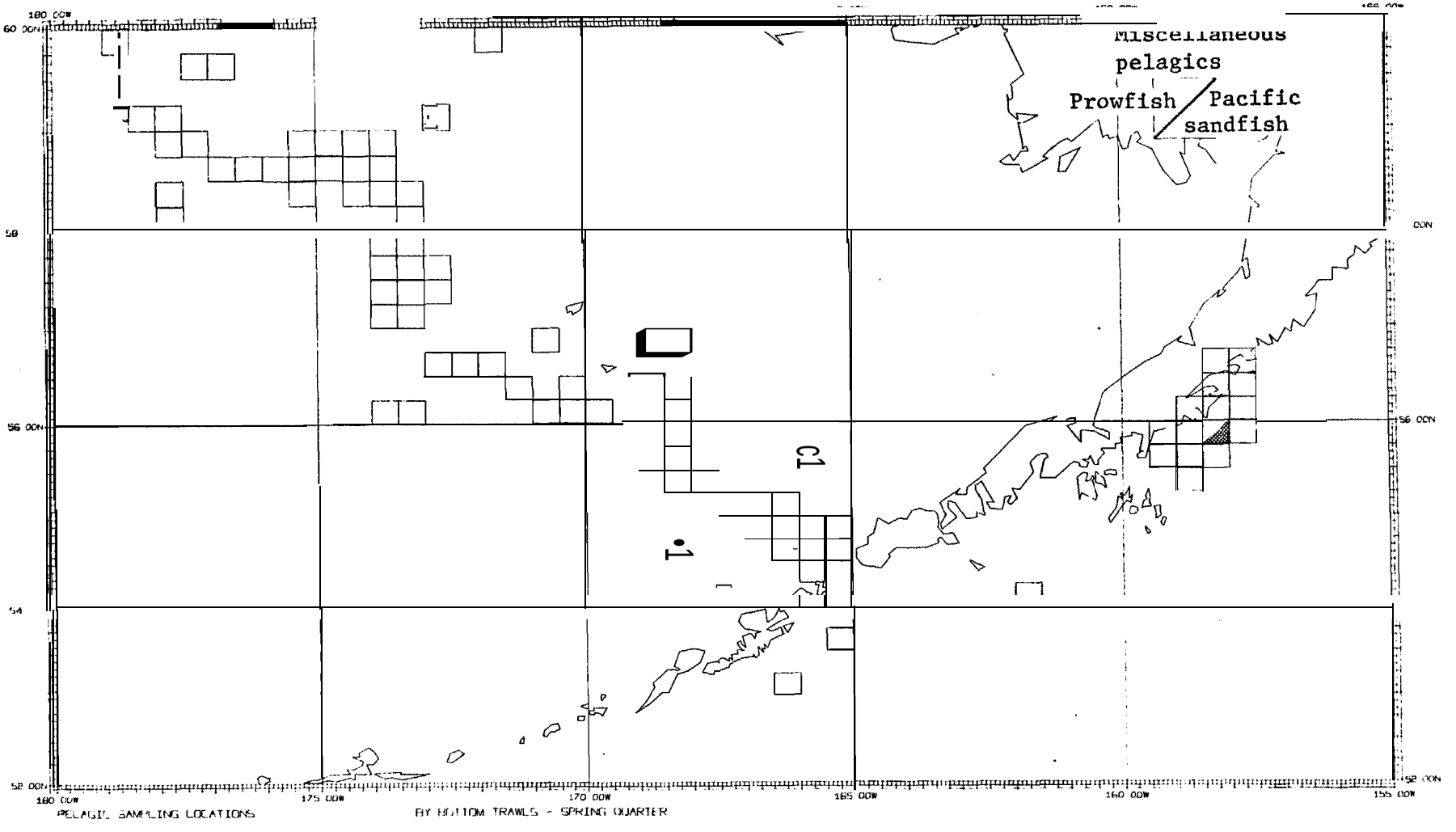


Figure IV.B.102.--Relative abundance of prowfish and Pacific sandfish in bottom trawls in spring, eastern Bering Sea.

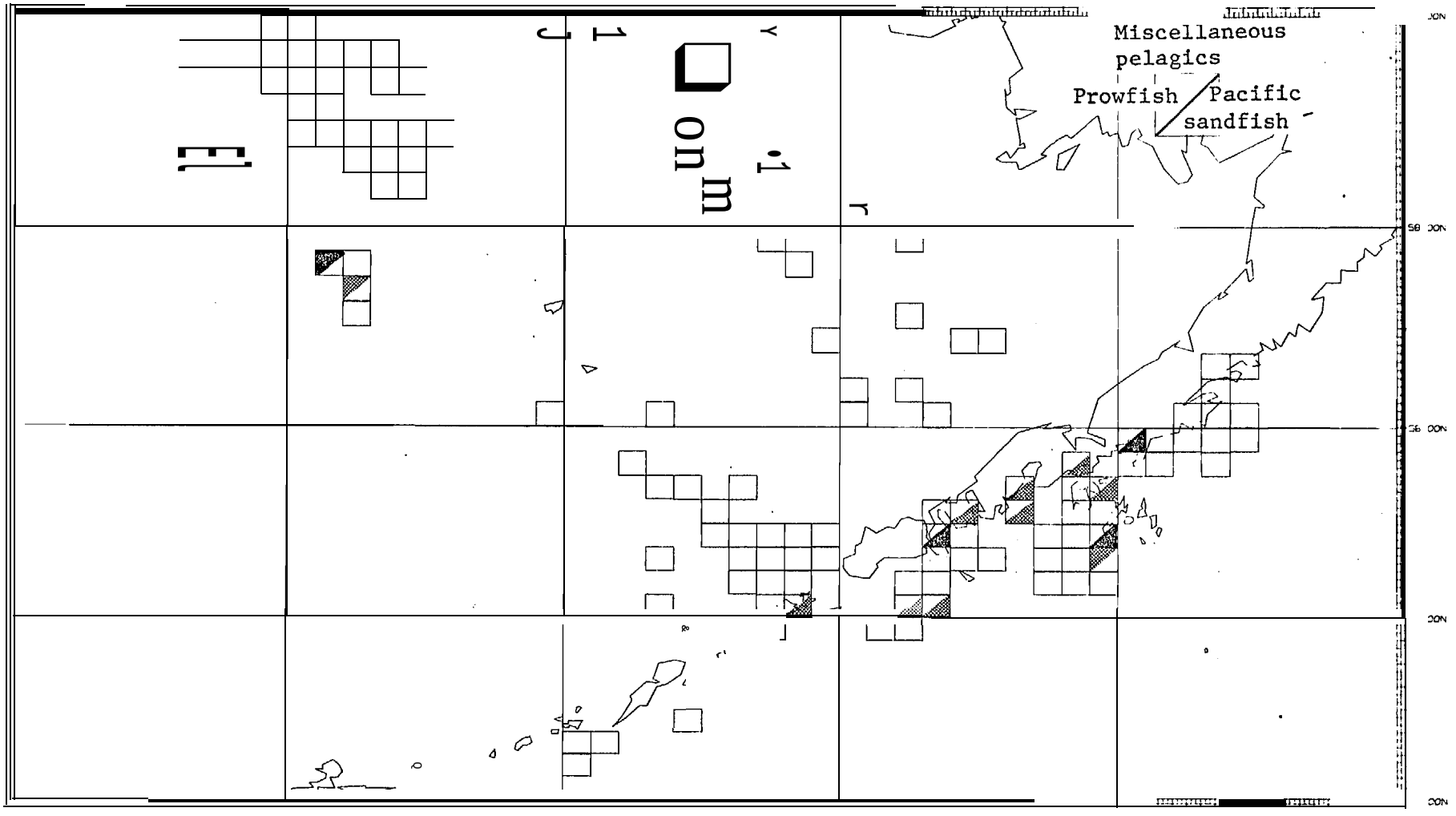


Figure IV.B.103 --Relative abundance of prowfish and Pacific sandfish in bottom trawls in summer, eastern Bering Sea.

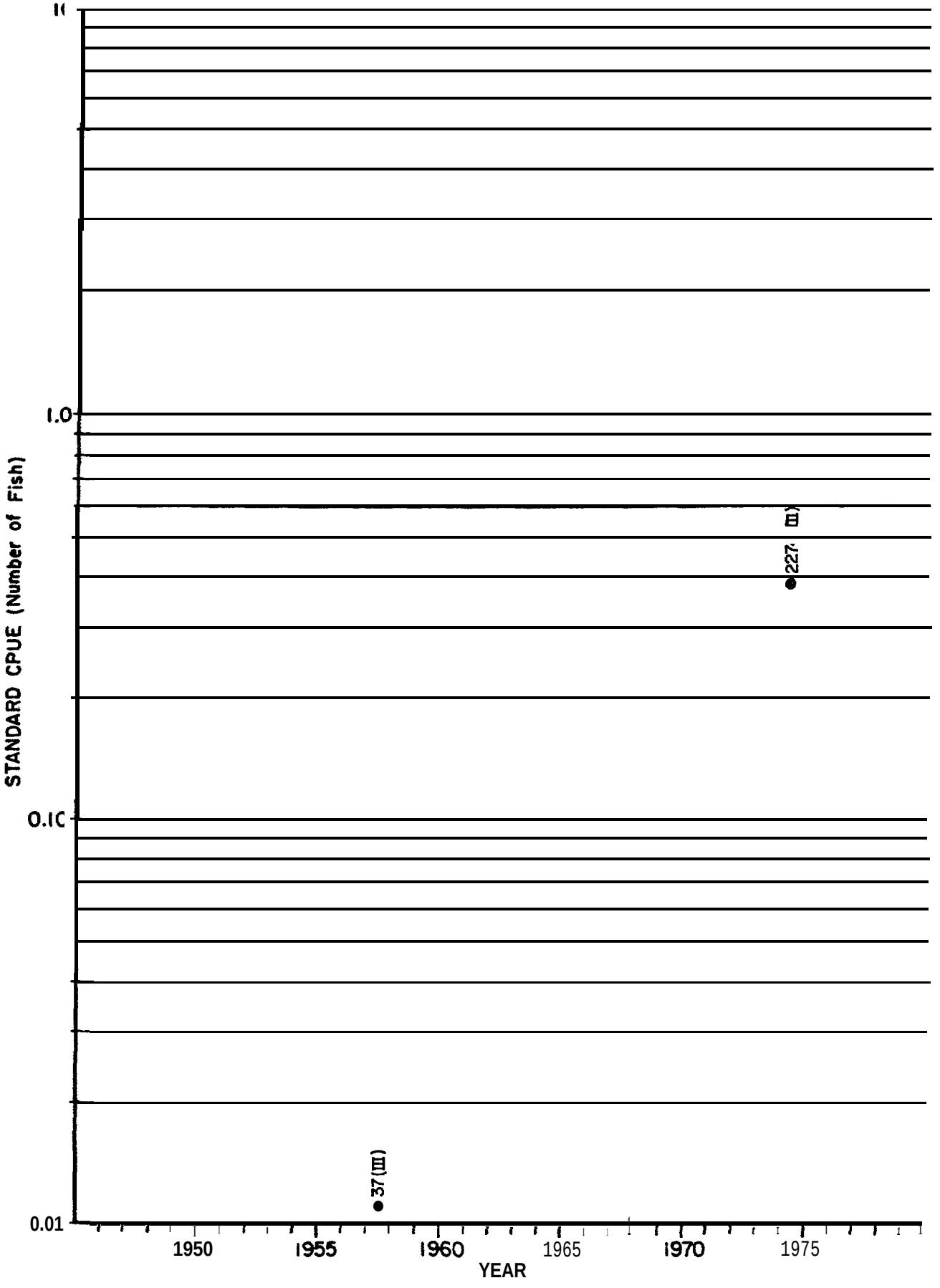


Figure IV. B.104.-- Standardized rate of catch of prowfish by bottom trawl in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

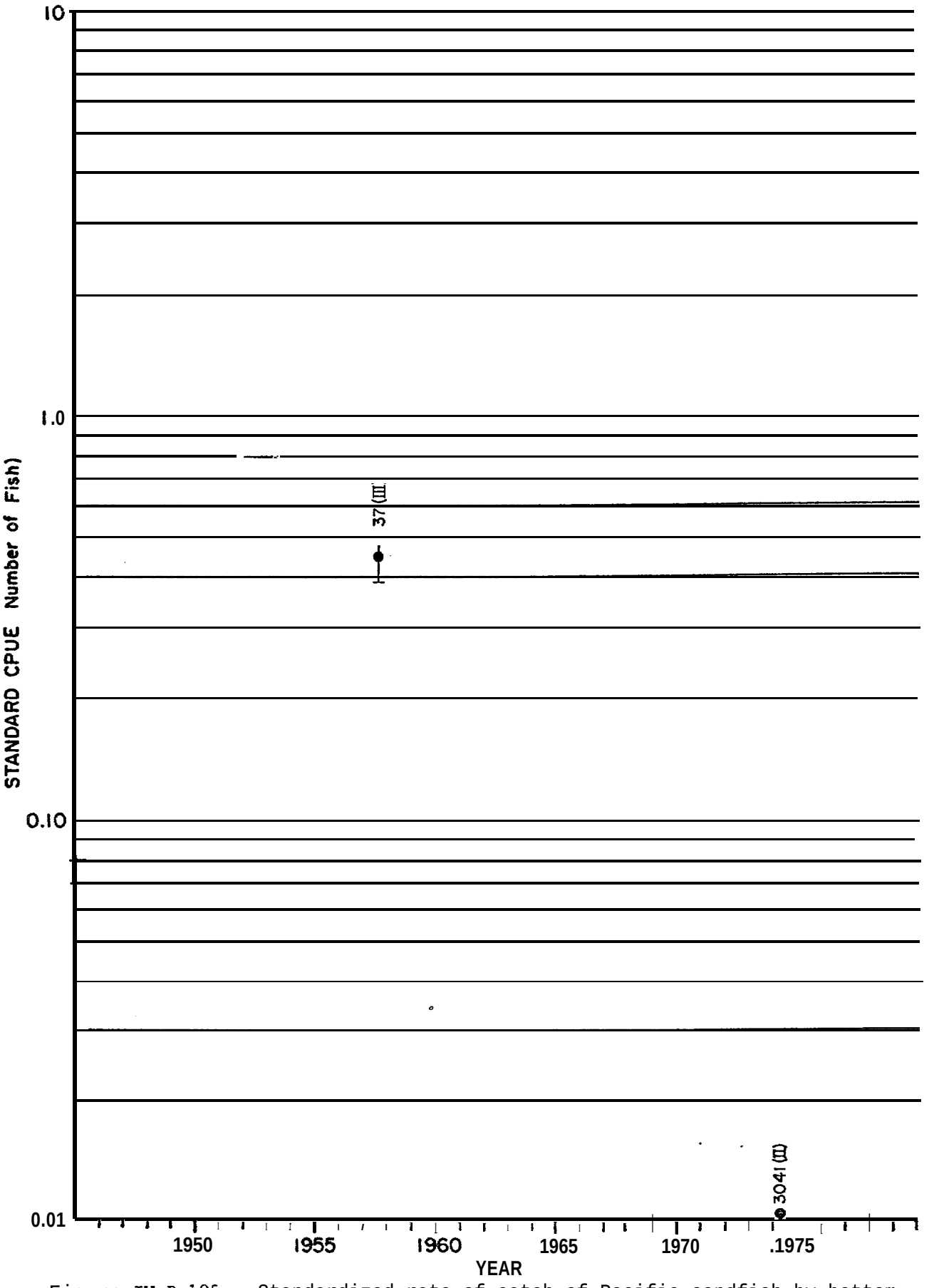


Figure IV.B.105.--Standardized rate of catch of Pacific sandfish by bottom trawl in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

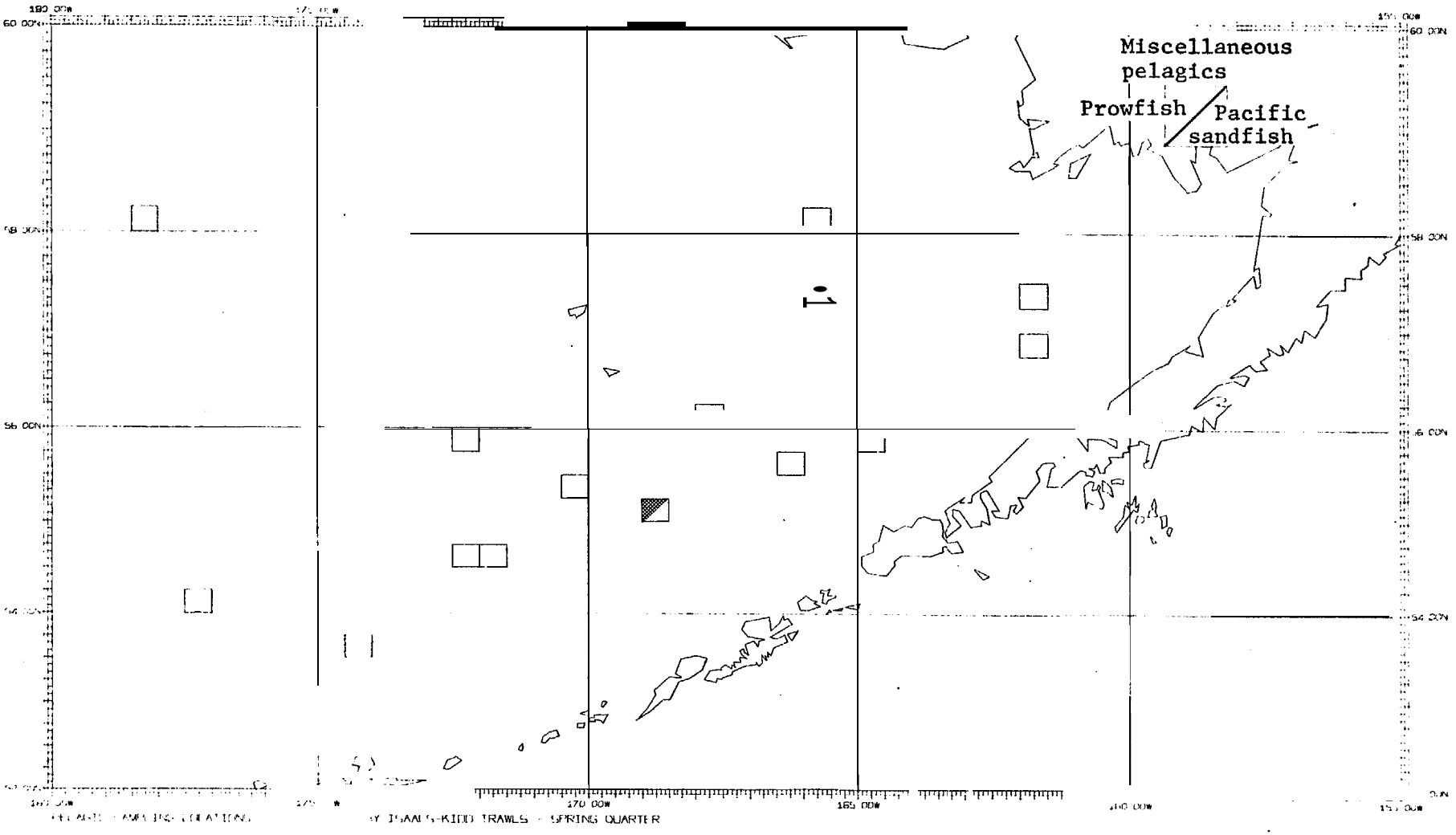


Figure IV.B.106.--Relative abundance of prowfish and Pacific sandfish in Isaacs-Kidd trawls in spring, eastern Bering Sea.

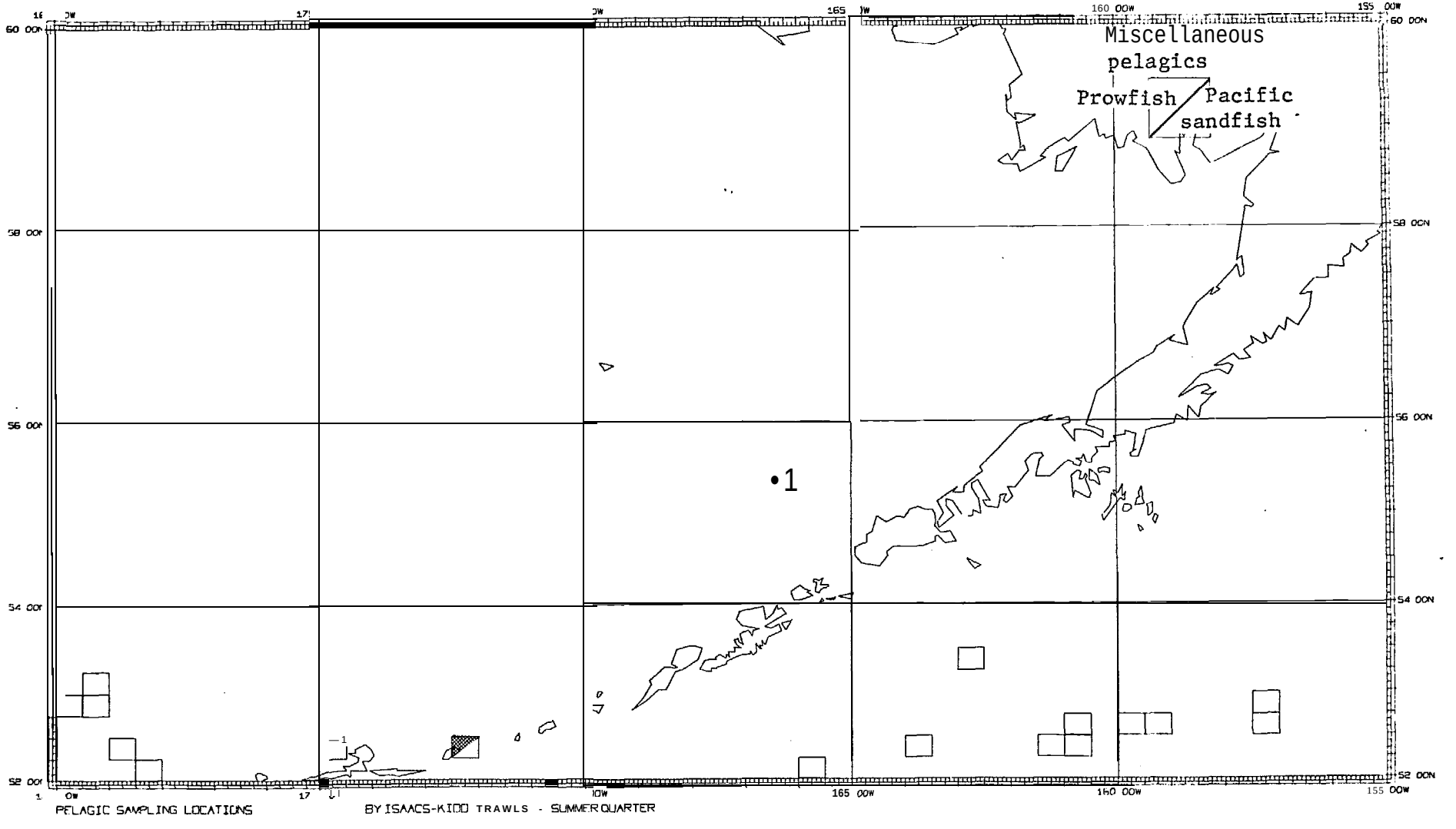


Figure IV.B.107.--Relative abundance of prowfish and Pacific sandfish in Isaacs-Kidd trawls in summer, eastern Bering Sea.

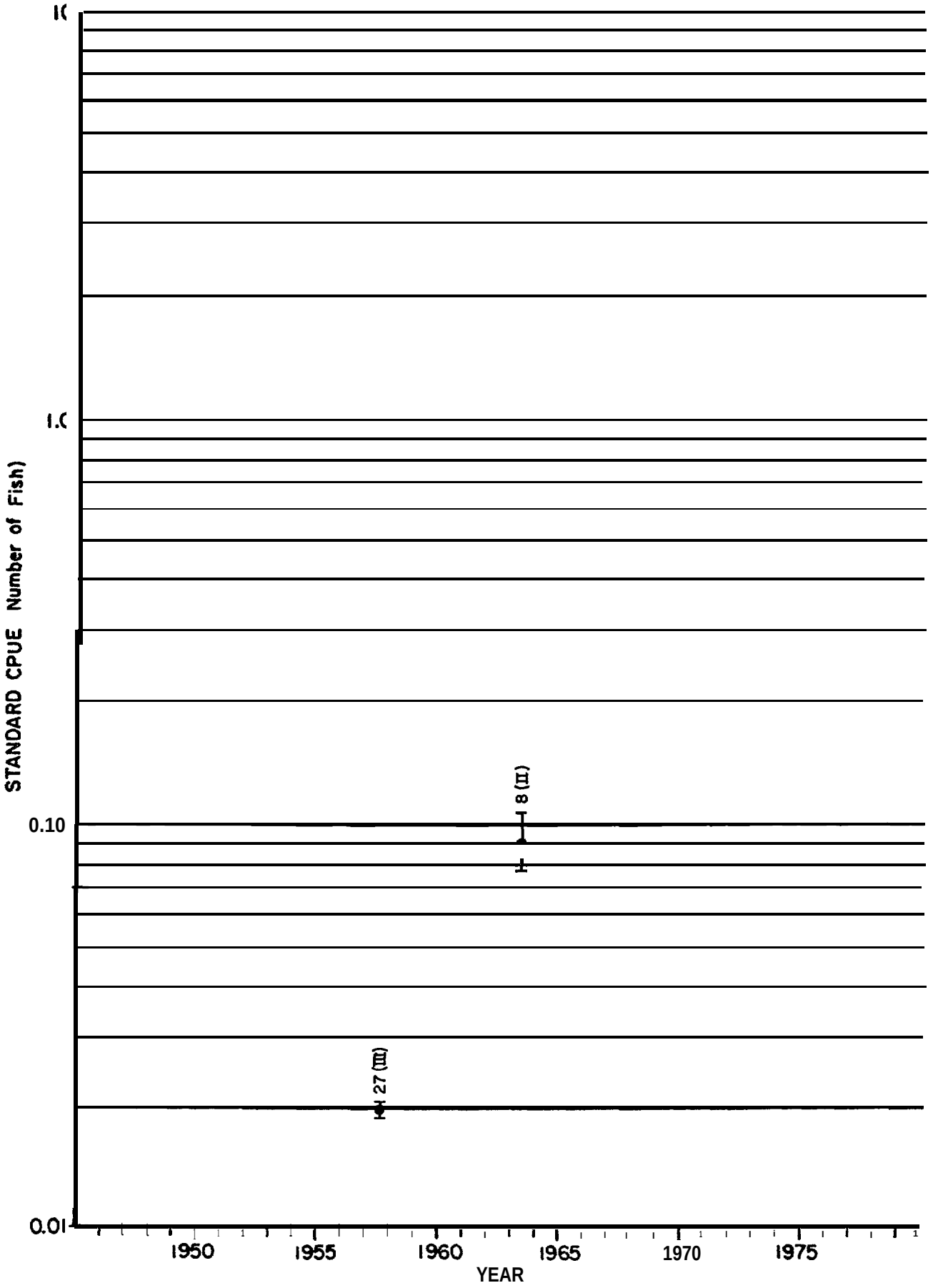


Figure IV.B.108.--Standardized rate of catch of prowfish by Isaacs-Kidd trawl in the eastern Bering Sea (geometric mean; number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

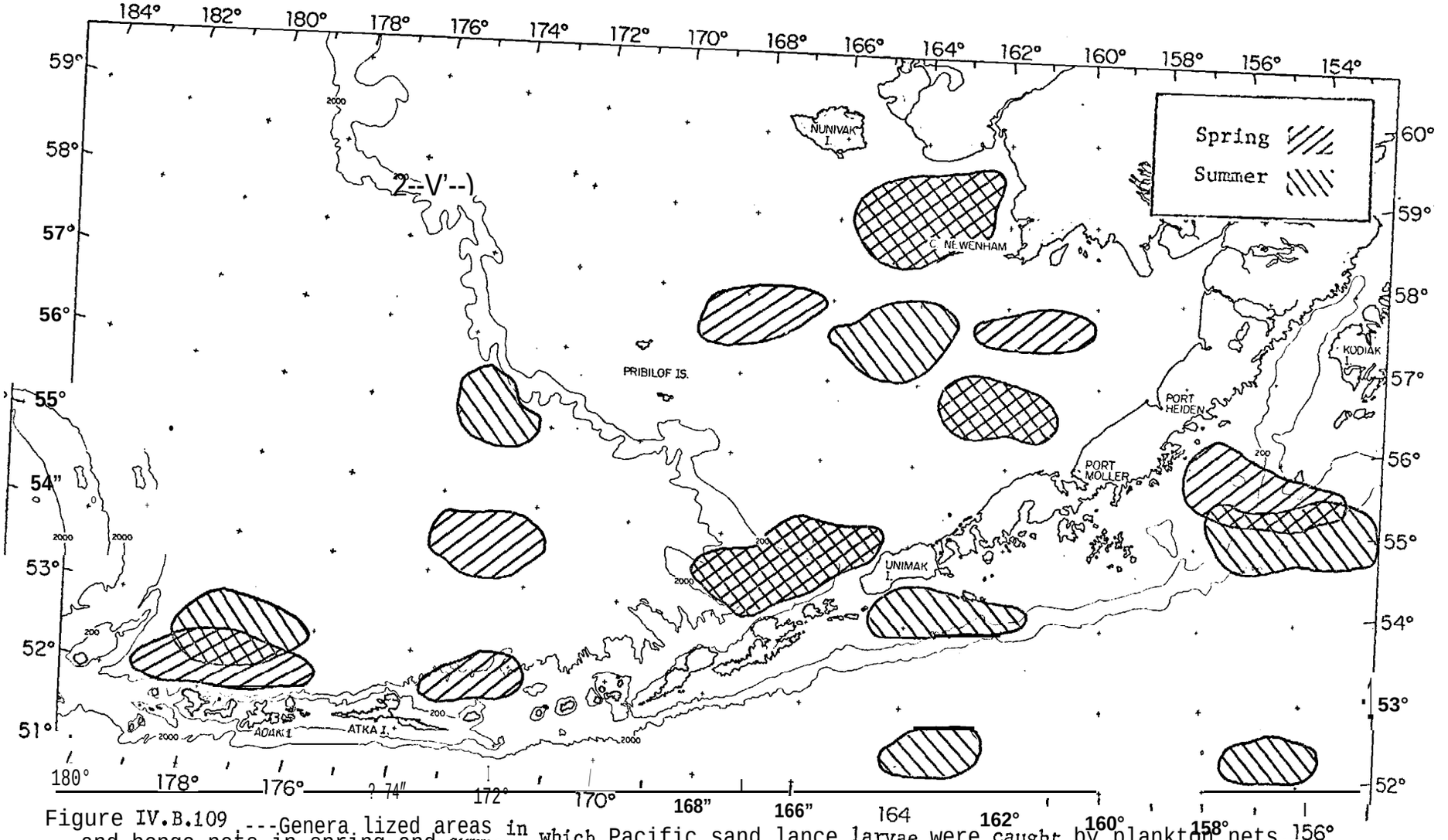


Figure IV.B.109 ---Genera lized areas in which Pacific sand lance larvae were caught by plankton nets, and bongo nets in spring and summer, eastern Bering Sea and western Gulf of Alaska.

seines,

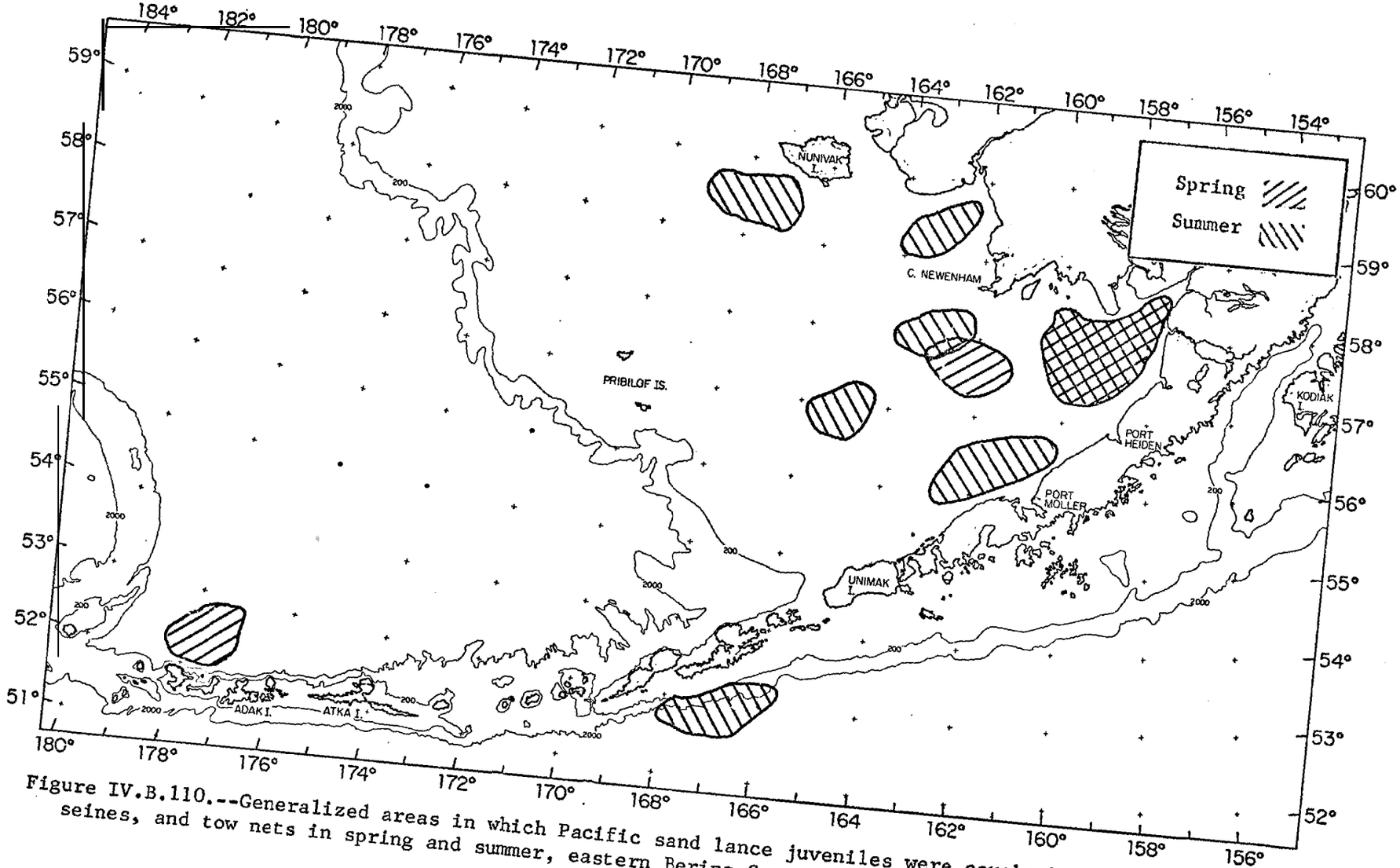


Figure IV.B.110.--Generalized areas in which Pacific sand lance juveniles were caught by plankton nets, seines, and tow nets in spring and summer, eastern Bering Sea and western Gulf of Alaska.

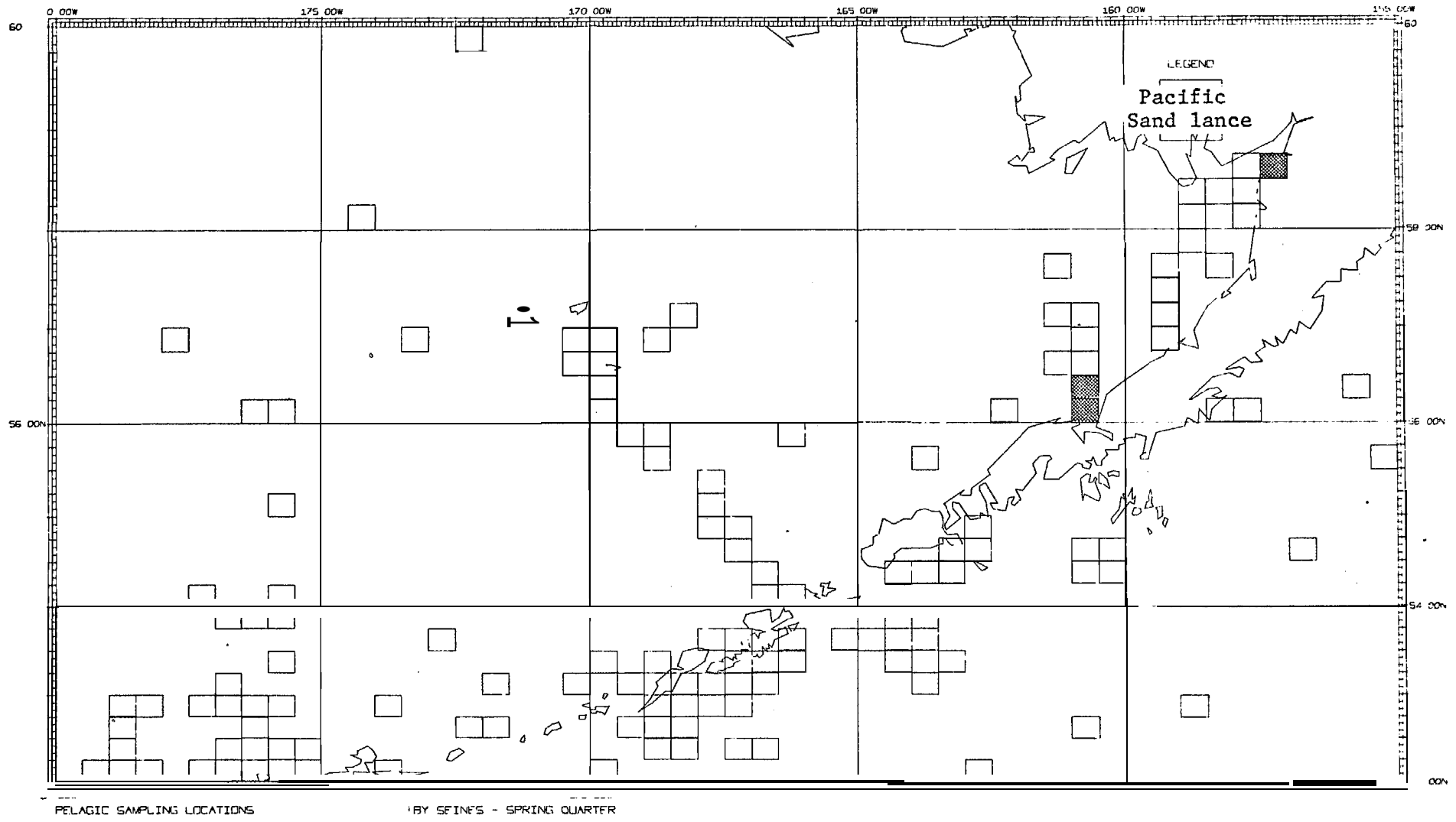


Figure IV.B.111.--Relative abundance of Pacific sand lance in purse seines in spring, eastern Bering Sea.

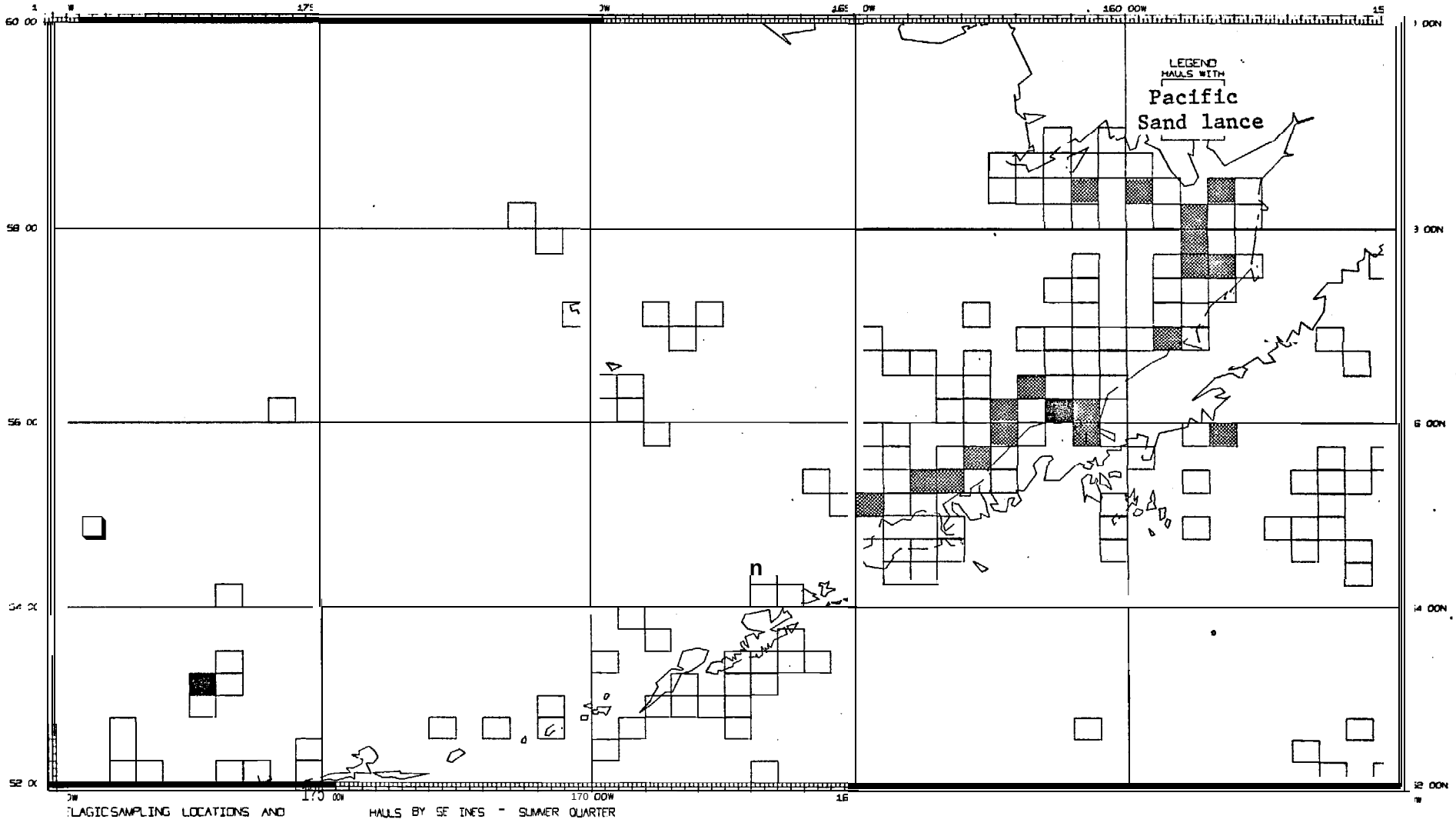


Figure IV. B.112.--Relative abundance of Pacific sand lance in purse seines in summer, eastern Bering Sea.

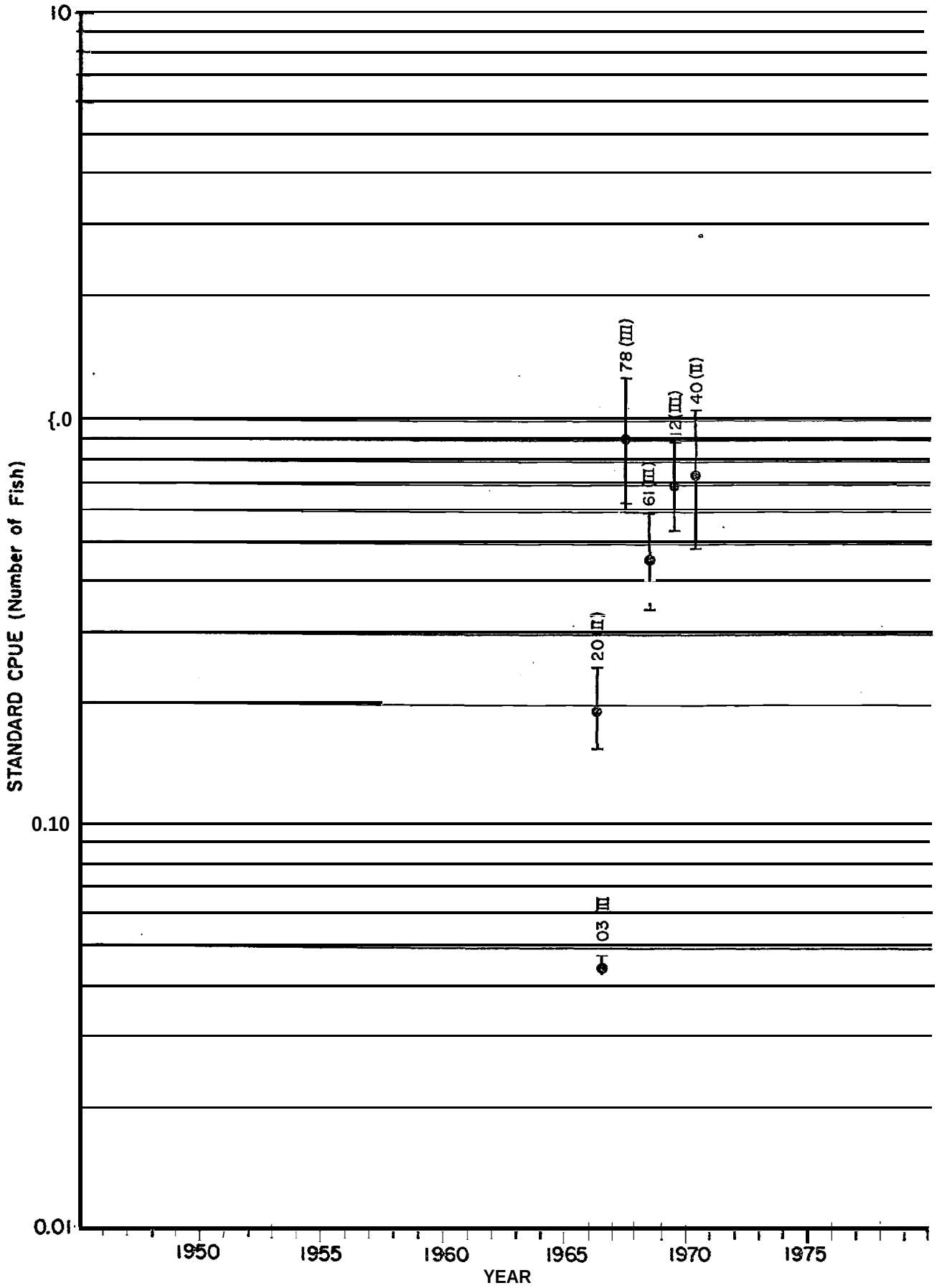


Figure IV. B.113.--Standardized rate of catch of Pacific sand lance by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

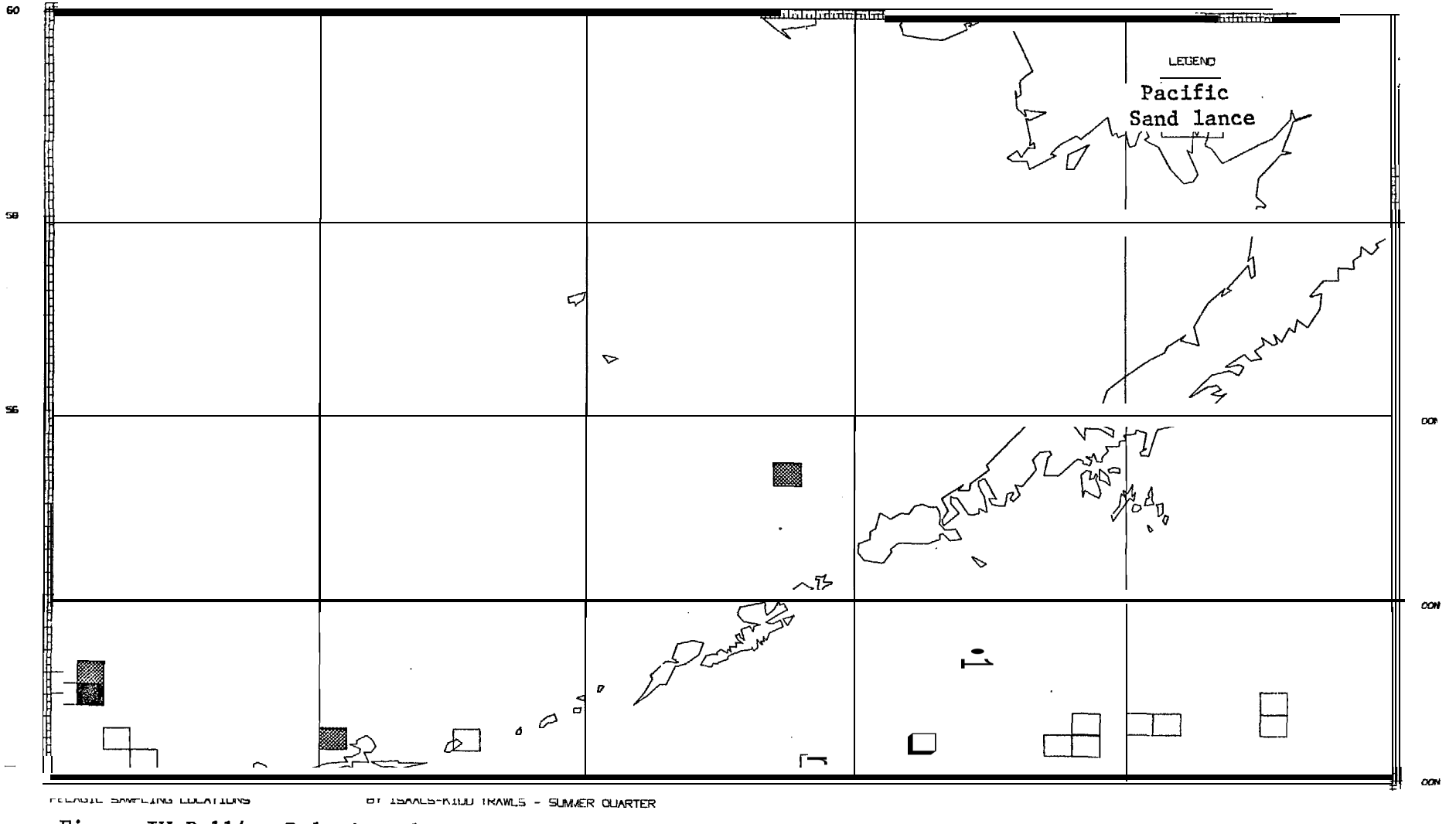


Figure IV.B.114.--Relative abundance of Pacific sand lance in Isaacs-Kidd trawls in summer, eastern Bering Sea.

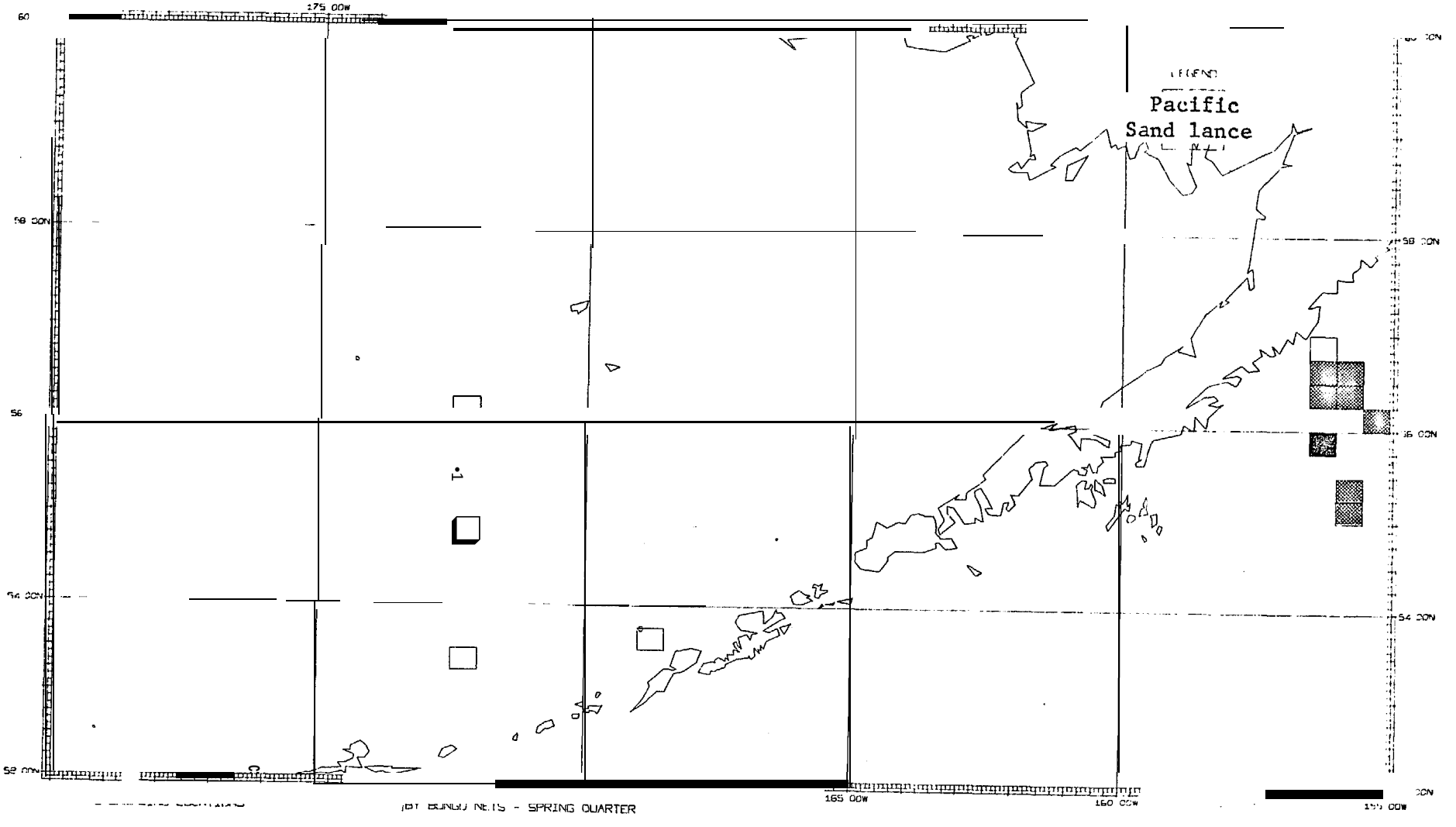


Figure IV.B.115.--Relative abundance of Pacific sand lance in bongo nets in spring, eastern Bering Sea.

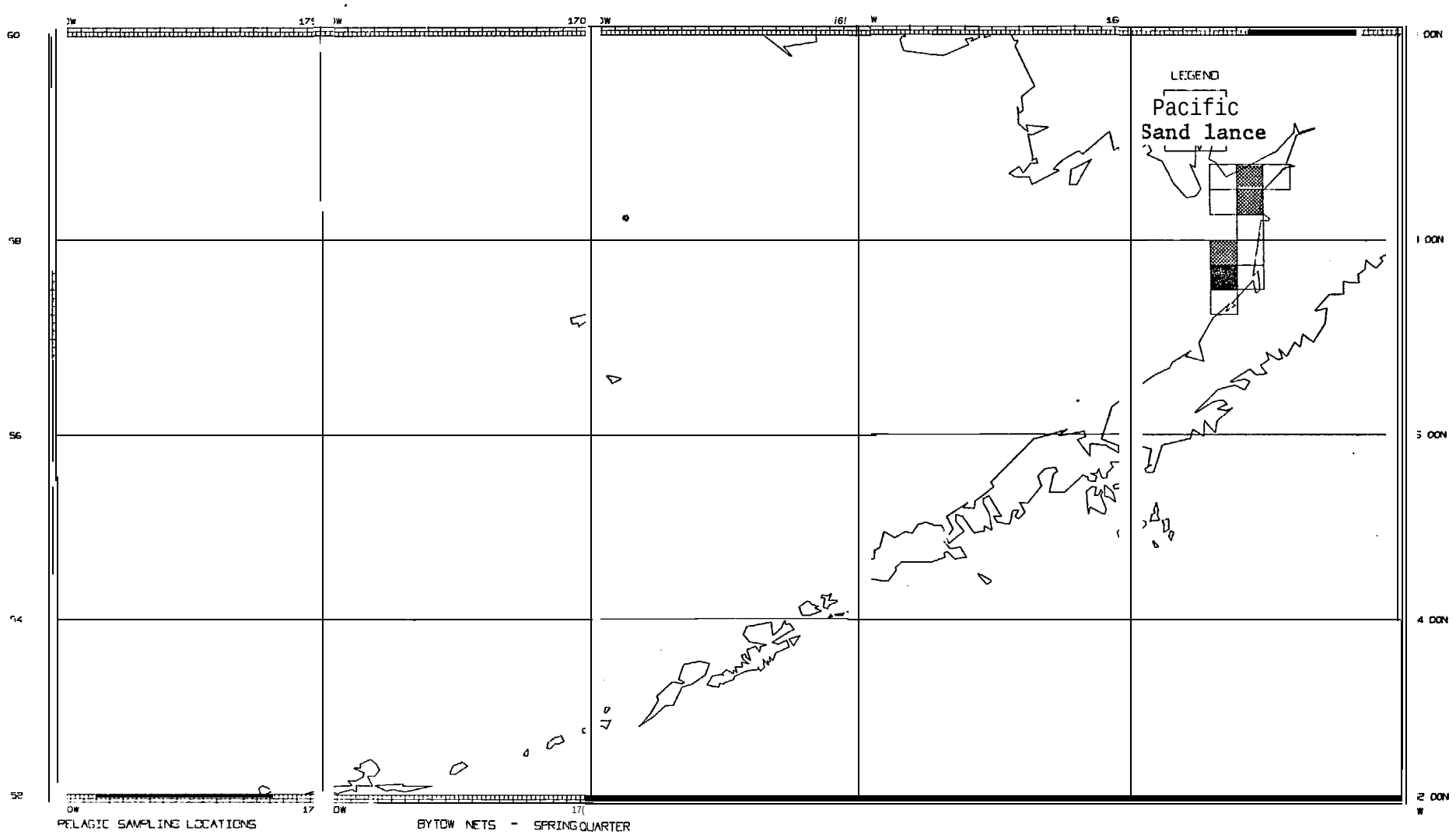


Figure IV.B.116.--Relative abundance of Pacific sand lance in tow nets in spring, eastern Bering Sea.

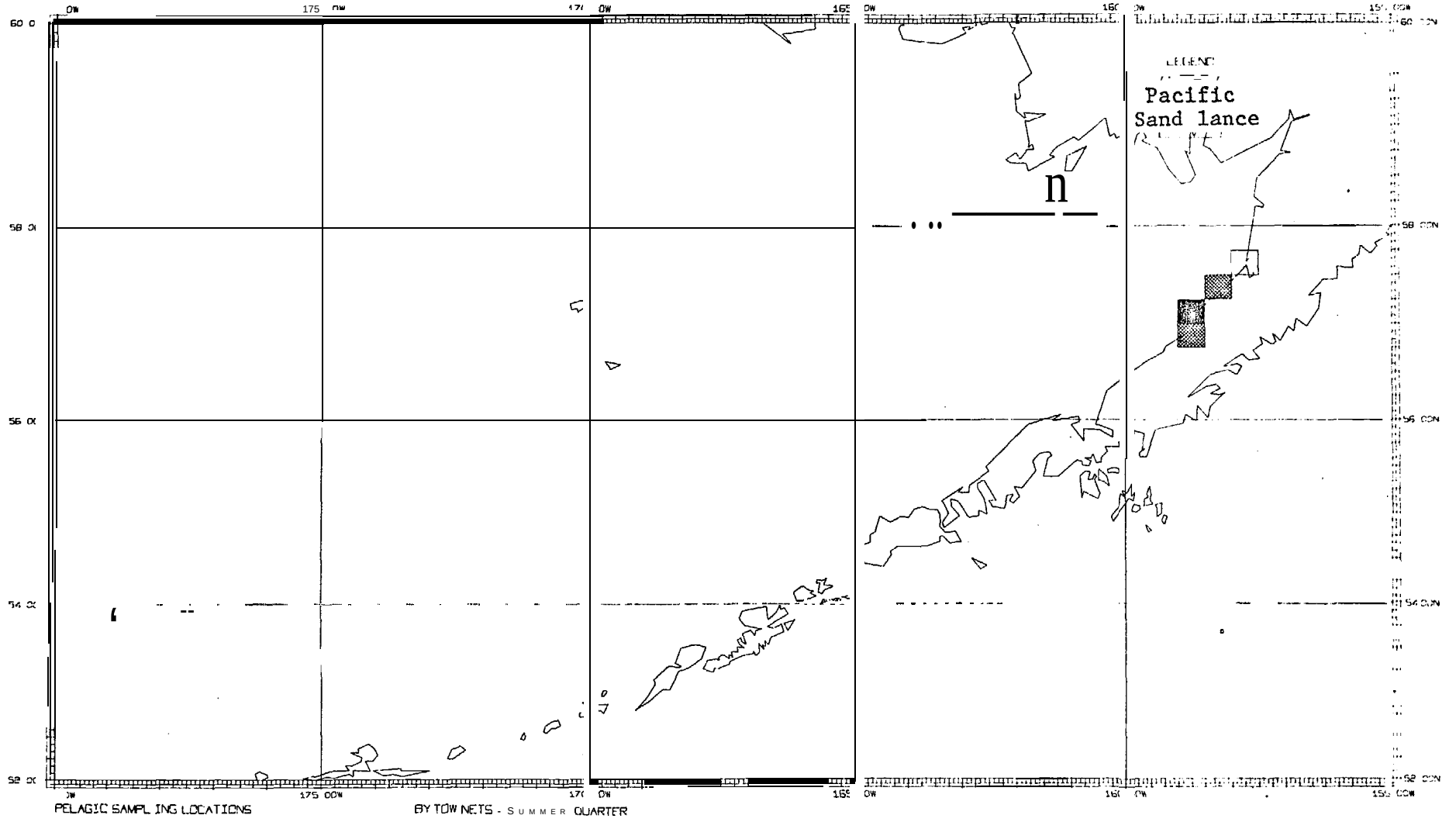


Figure IV.B. 117. -.Relative abundance of Pacific sand lance in tow nets in summer, eastern Bering Sea.

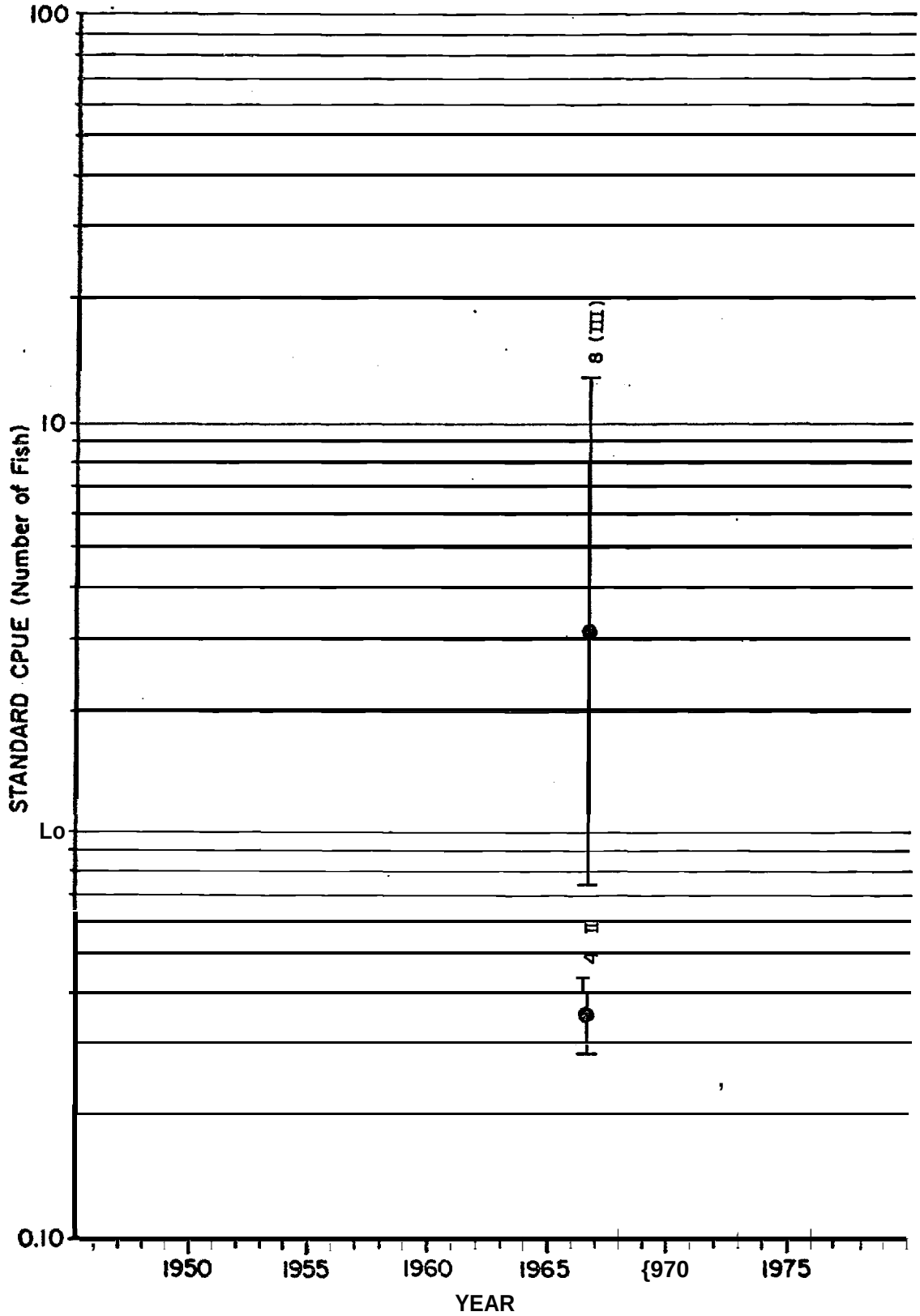


Figure IV.B.118.--Standardized rate of catch of Pacific sand lance by tow net in the eastern Bering Sea (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

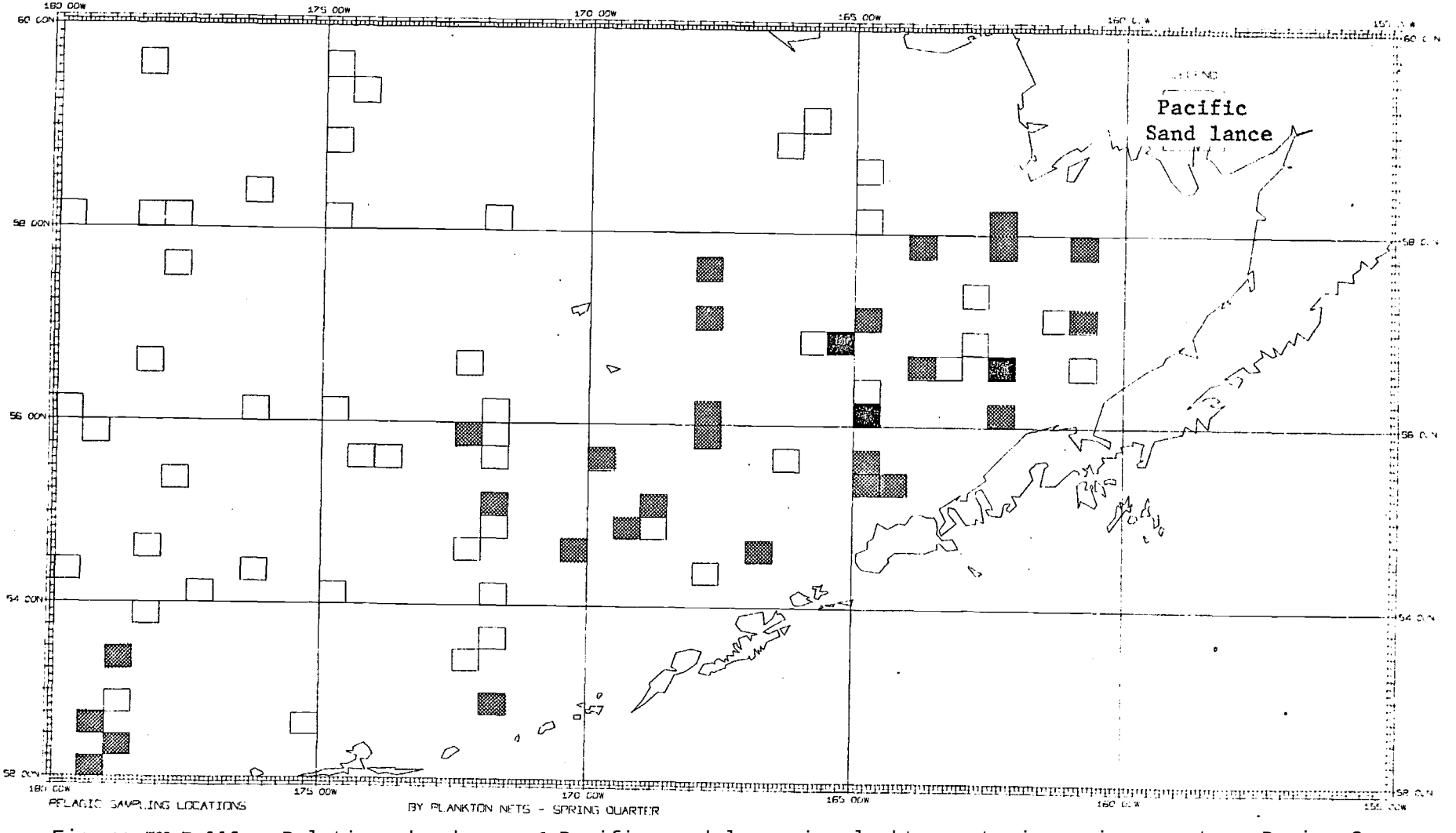


Figure IV.B.119.--Relative abundance of Pacific sand lance in plankton nets in spring, eastern Bering Sea.

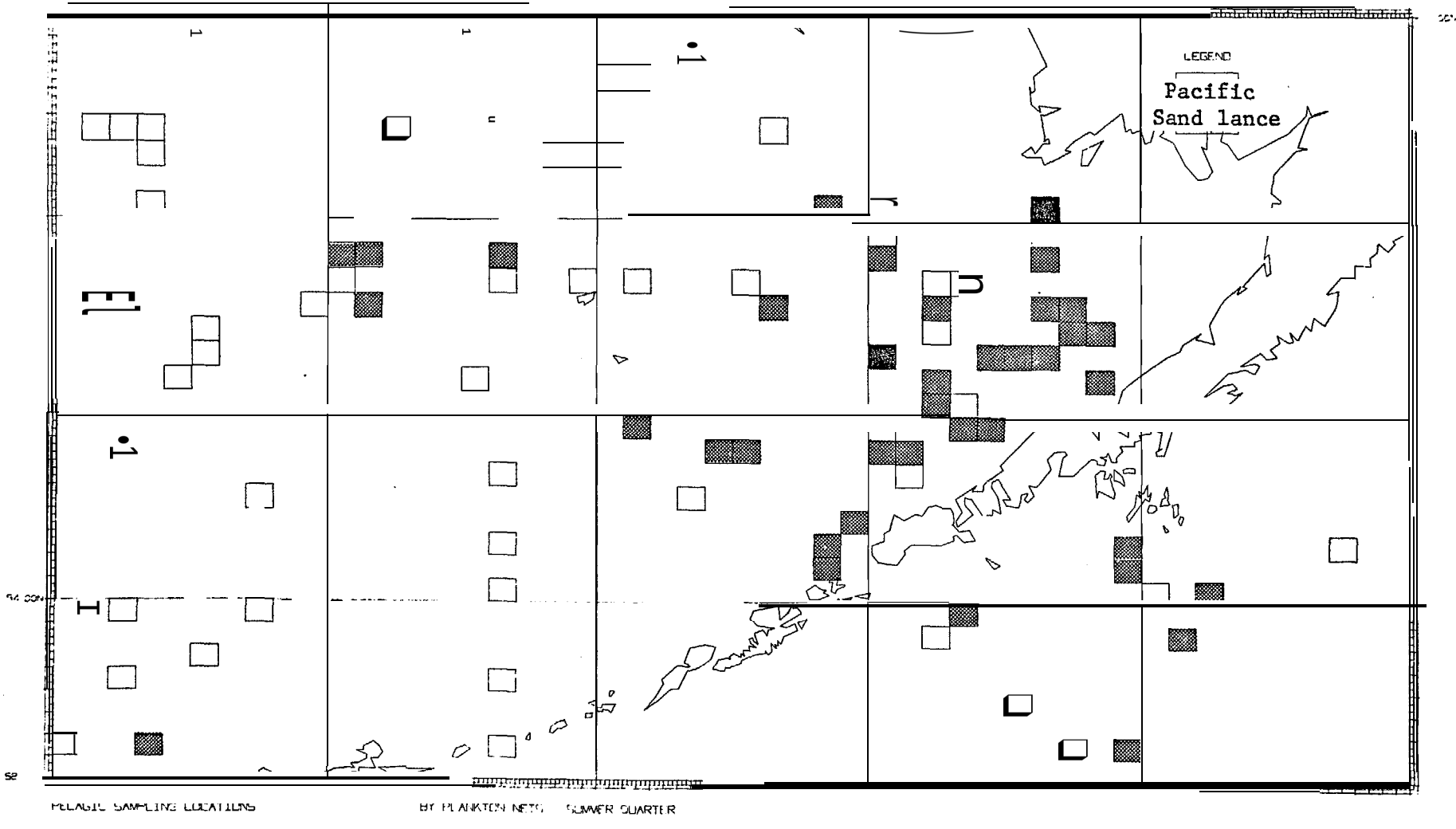


Figure IV.B.12--Relative abundance of Pacific sand lance in plankton nets in summer, eastern Bering Sea.

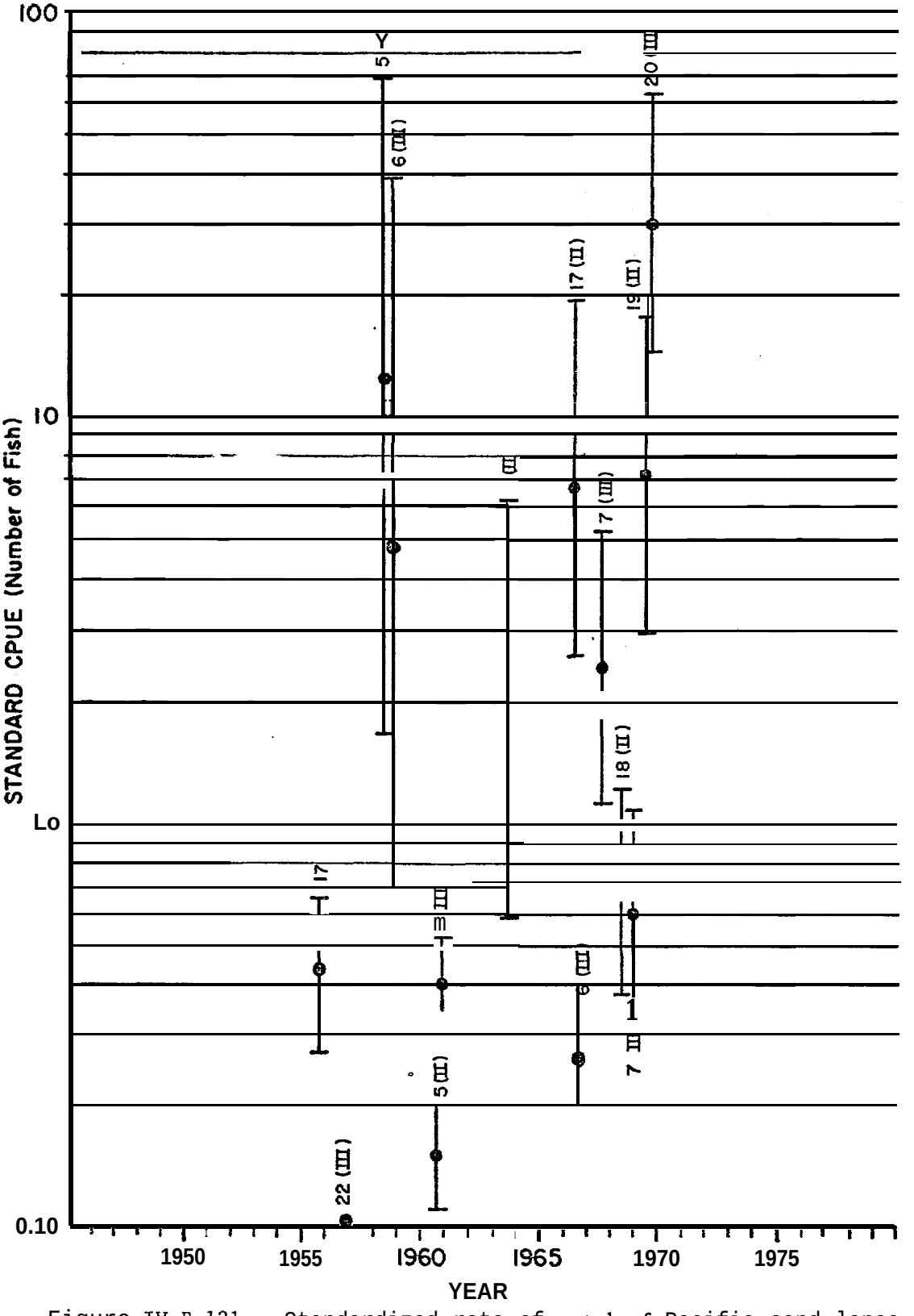


Figure IV.B.121.--Standardized rate of catch of Pacific sand lance by plankton net in the eastern Bering Sea (geometric mean: number/ 12 min tow with 90% confidence interval, number of observations, and quarter of the year).

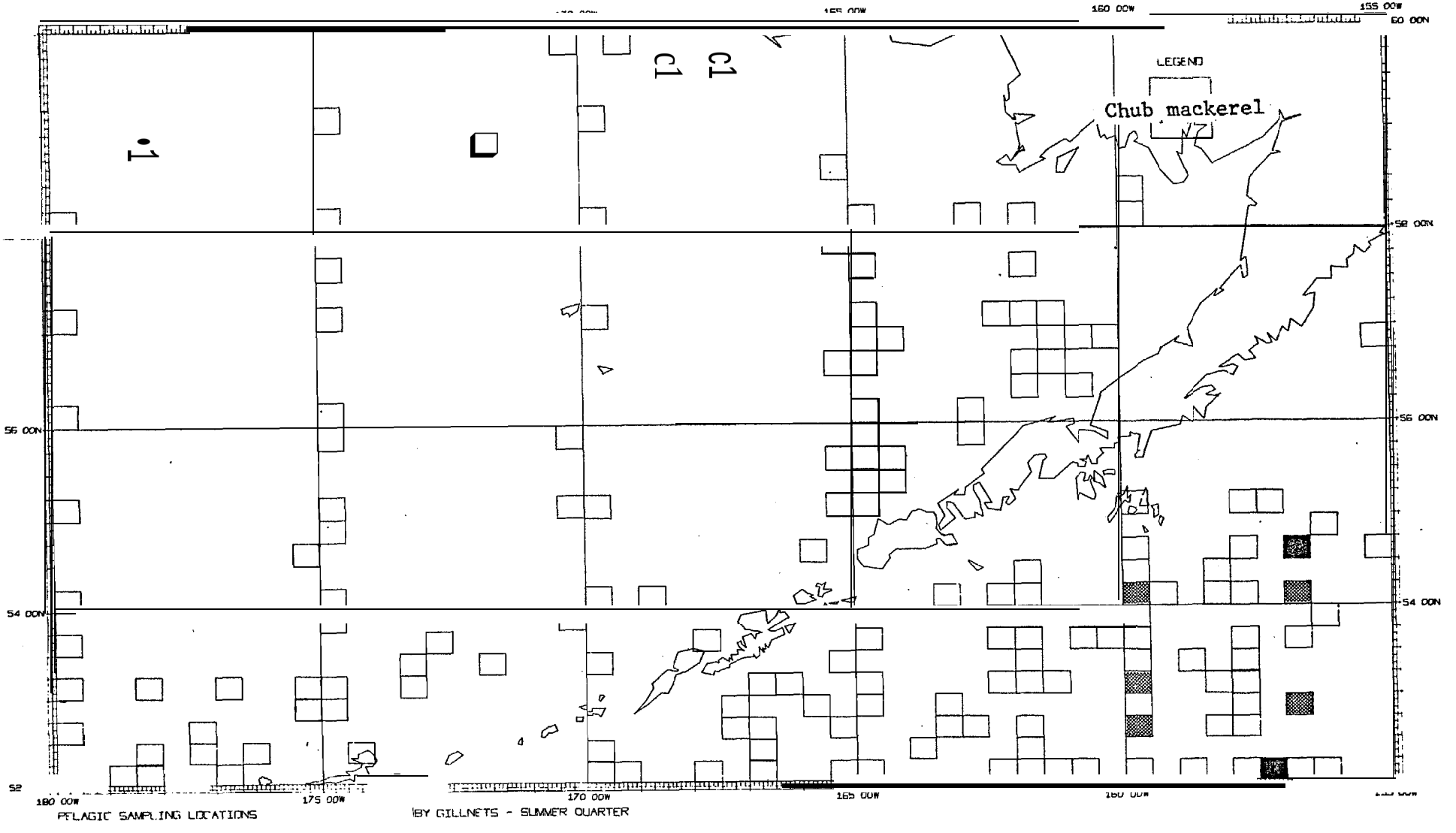


Figure IV.122.--Relative abundance of chub mackerel in gillnets in summer, eastern Bering Sea.

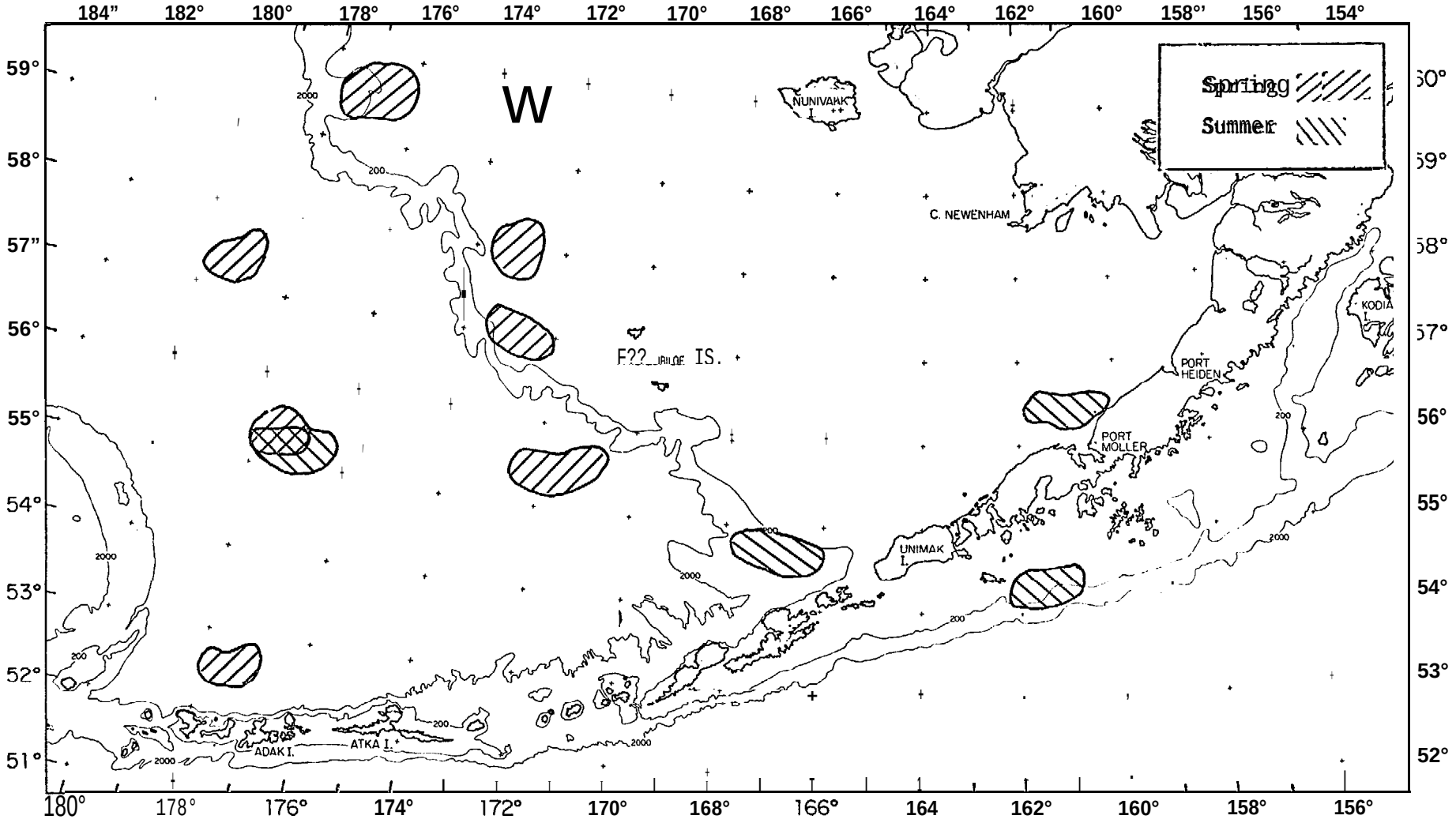


Figure IV. B. 123. --Generalized areas in which Atka mackerel larvae were caught by plankton nets, seines, and Isaacs-Kidd trawls in spring and summer, eastern Bering Sea and western Gulf of Alaska.

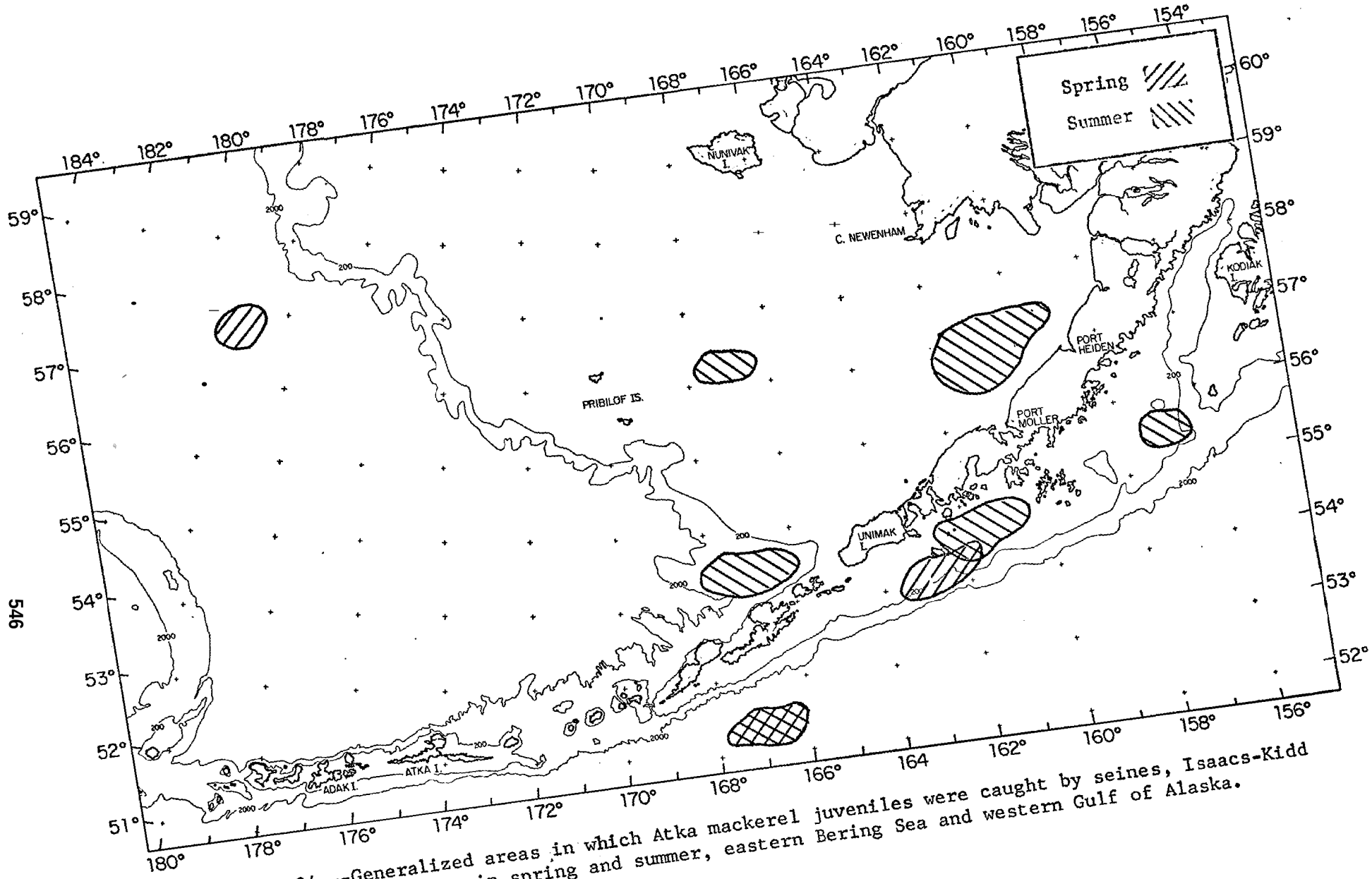


Figure IV.B.124.--Generalized areas in which Atka mackerel juveniles were caught by seines, Isaacs-Kidd trawls, and plankton nets in spring and summer, eastern Bering Sea and western Gulf of Alaska.

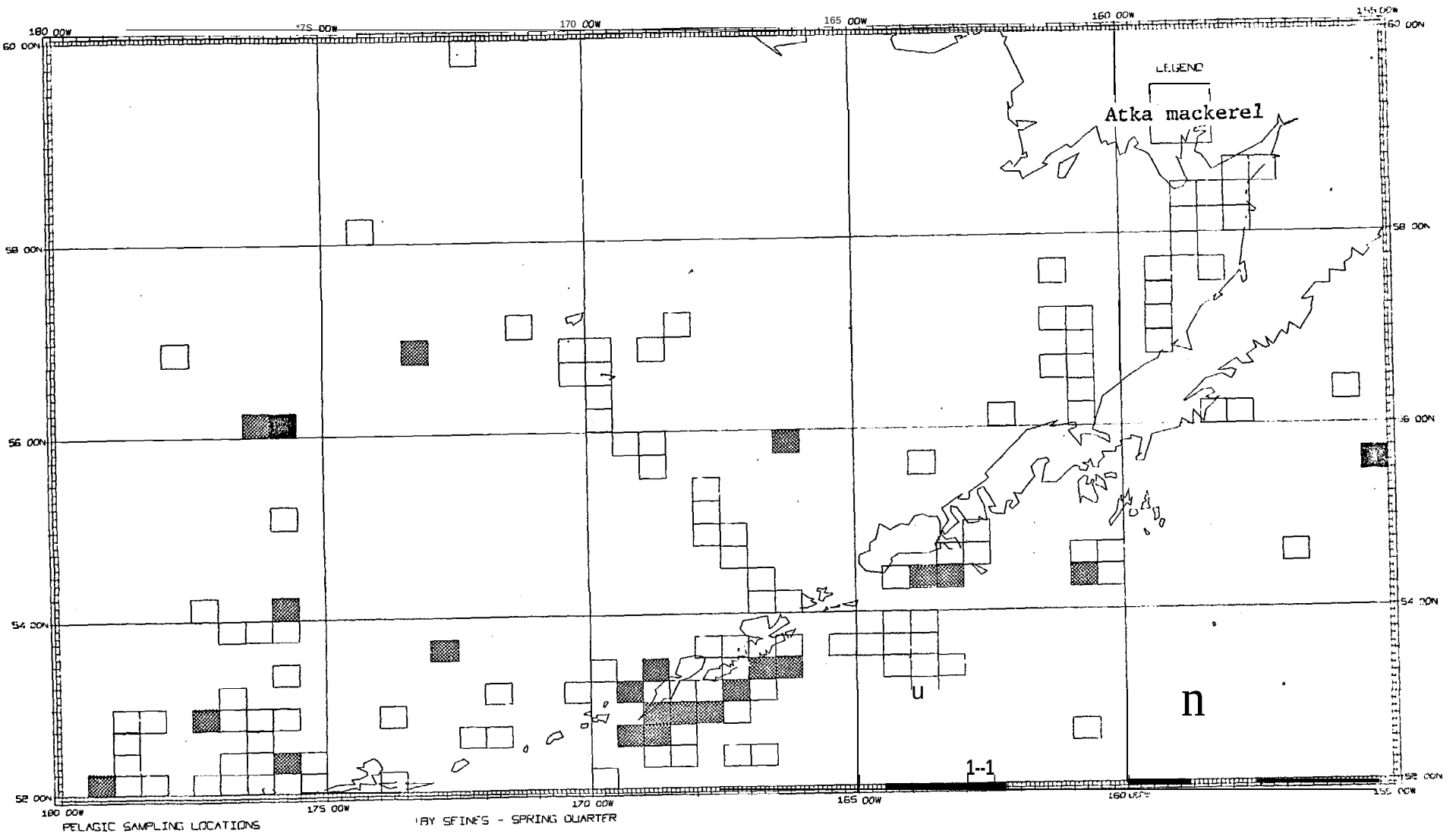


Figure IV. B.125. --Relative abundance of Atka mackerel in purse seines in spring, eastern Bering Sea.

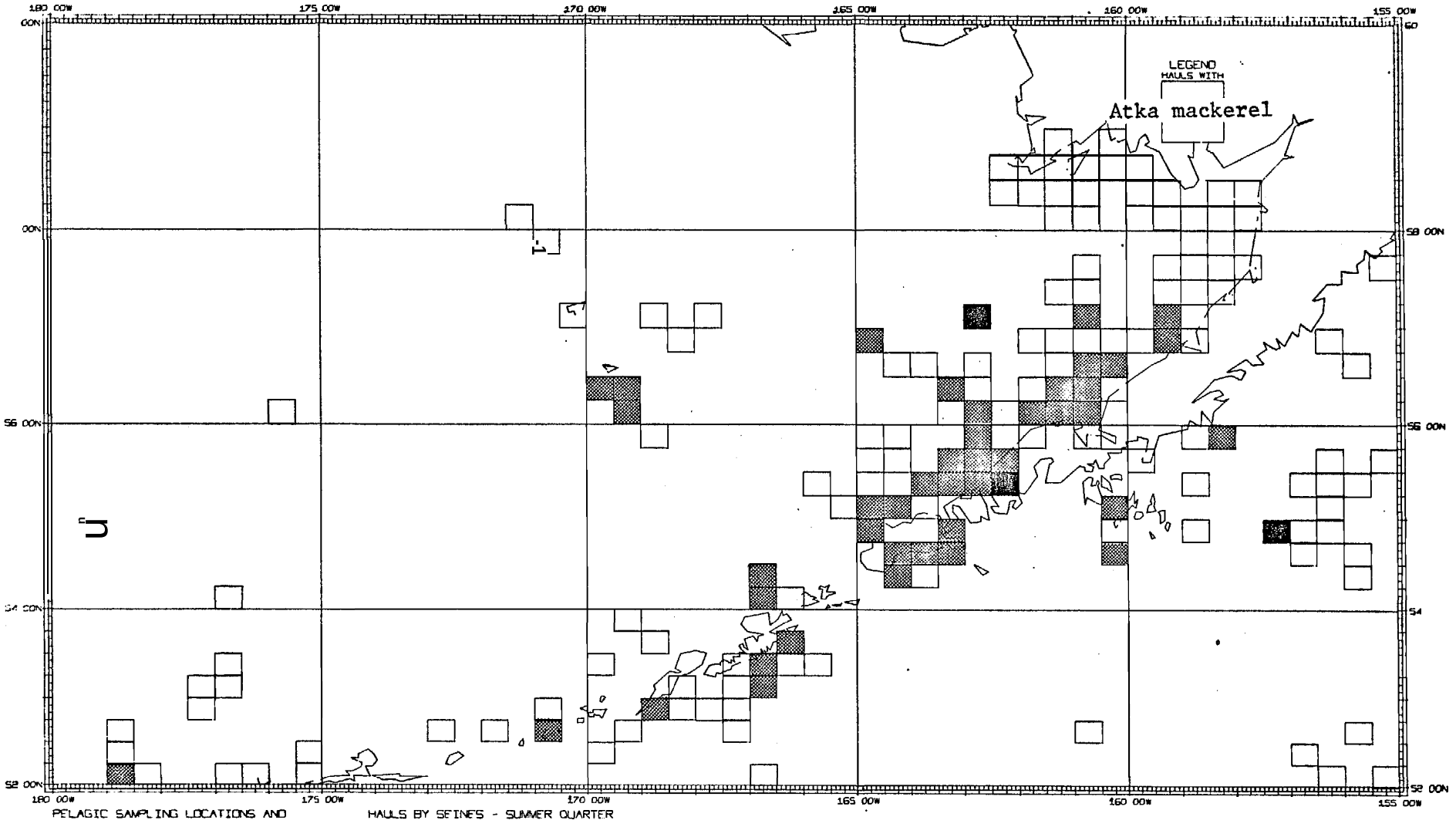


Figure IV.B.126.--Relative abundance of Atka mackerel in purse seines in summer, eastern Bering Sea.

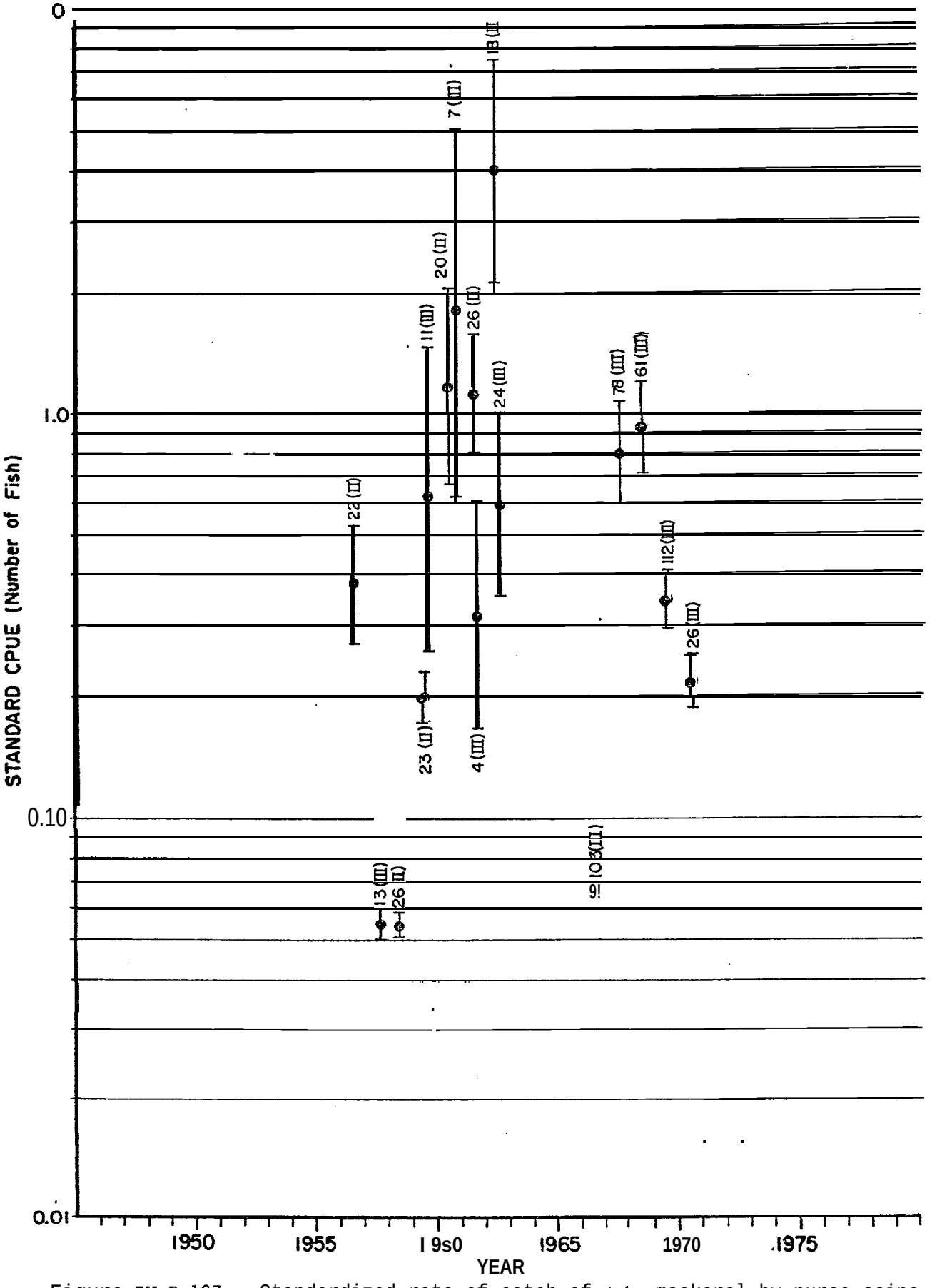


Figure IV.B.127.--Standardized rate of catch of Atka mackerel by purse seine in the eastern Bering Sea (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

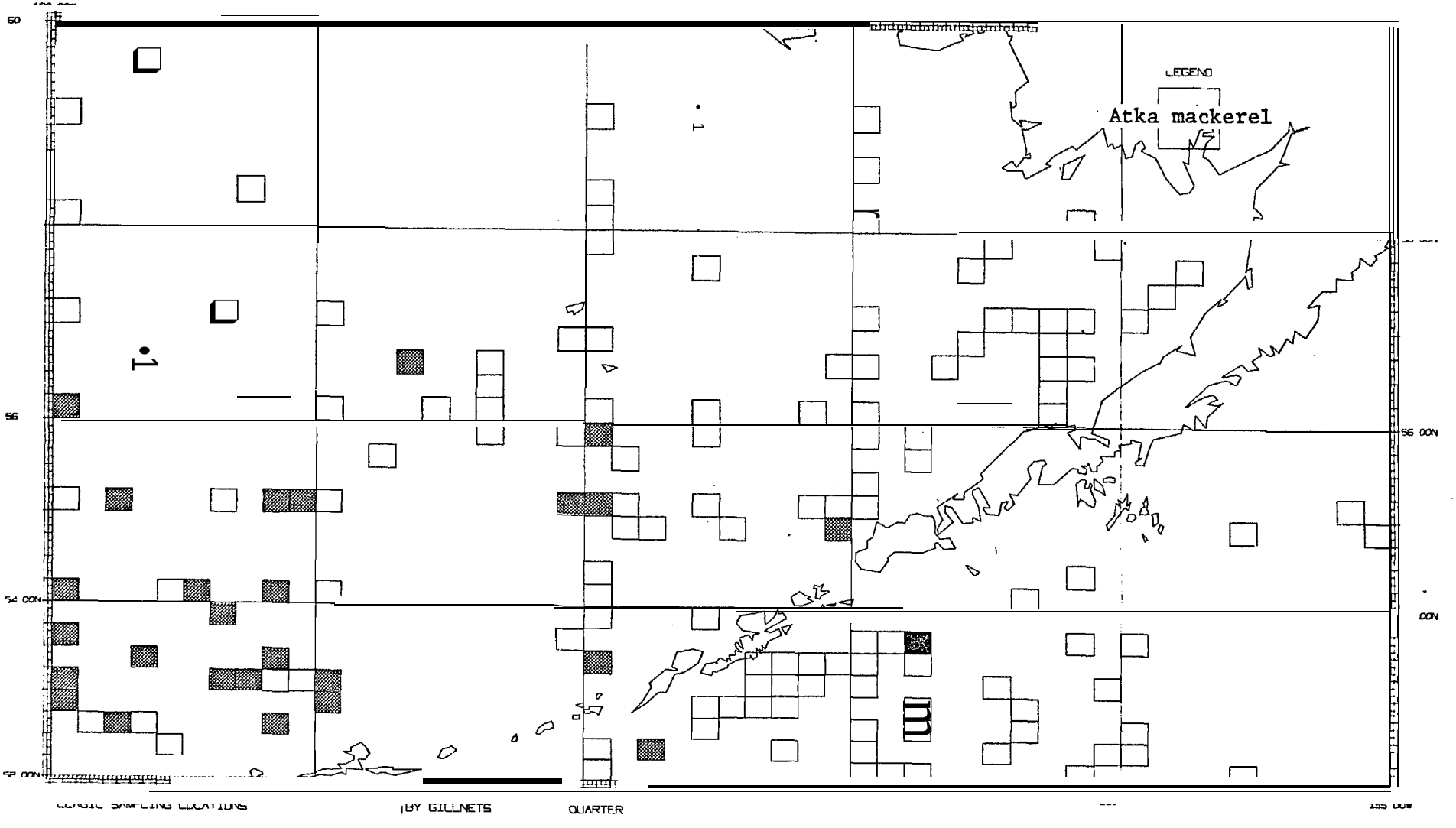


Figure IV.B.128.--Relative abundance of Atka mackerel in gillnets in spring, eastern Bering Sea.

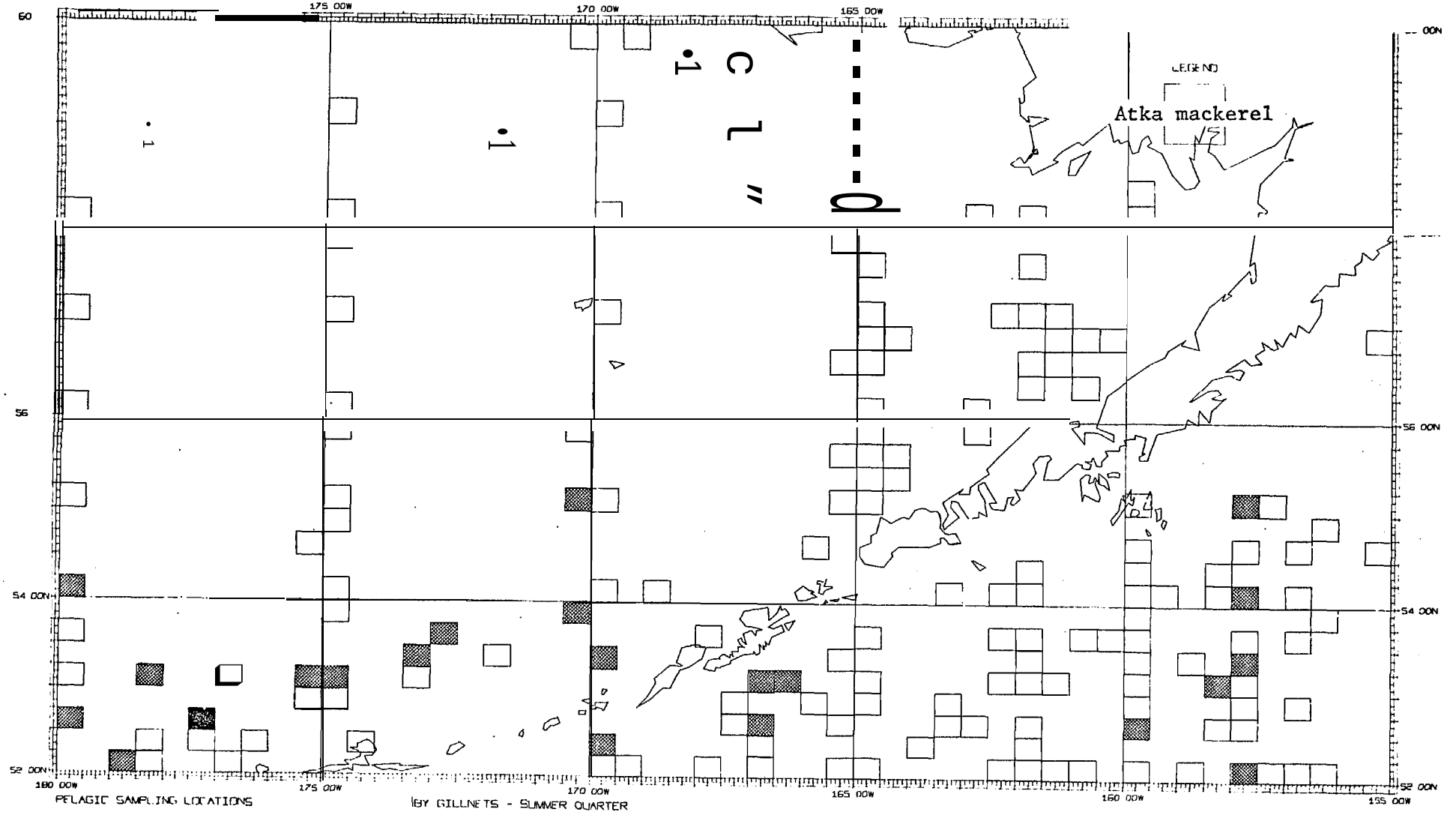


Figure IV.B.129.—Relative abundance of Atka mackerel in gillnets in summer, eastern Bering Sea.

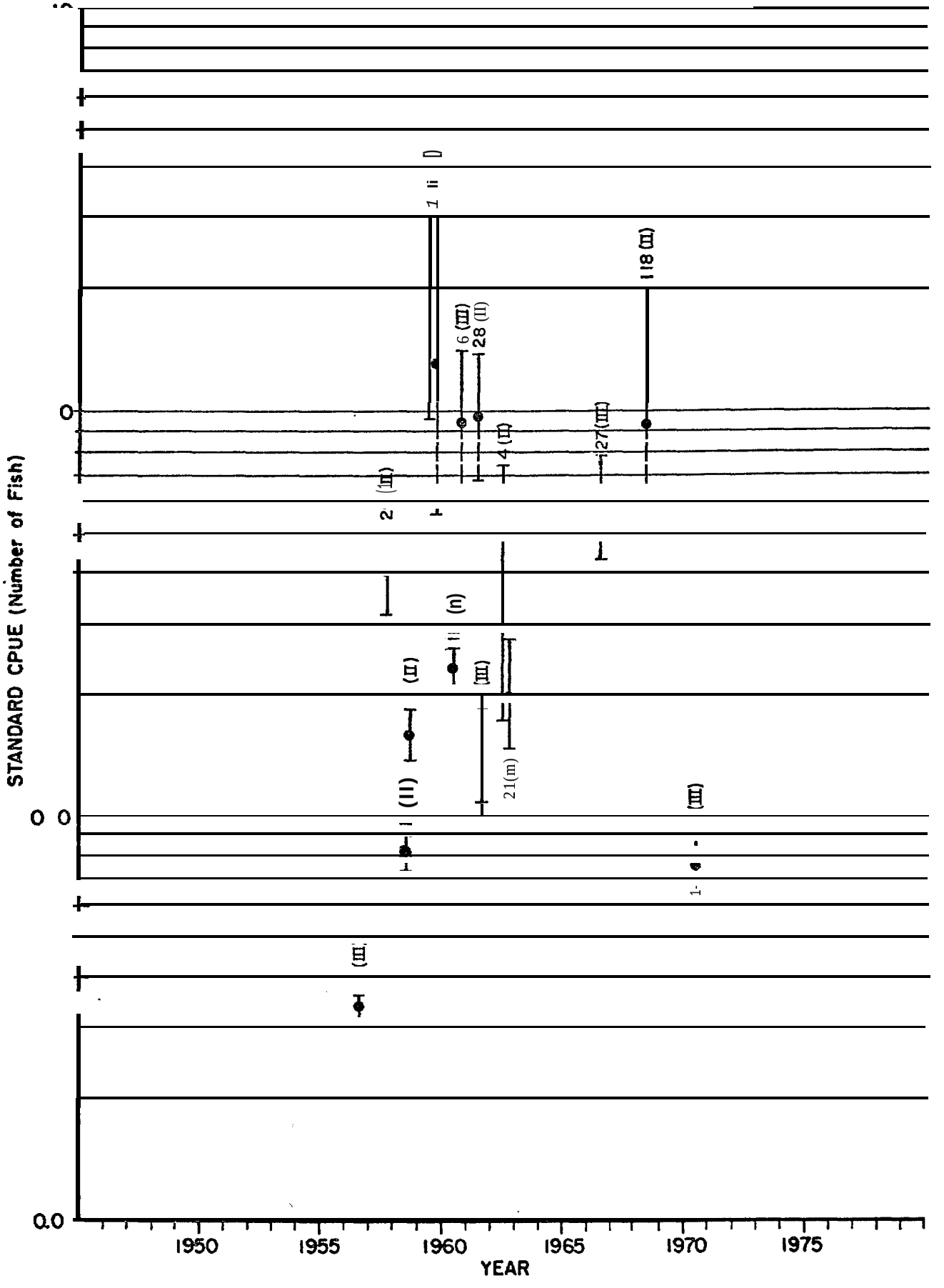


Figure IV.B.130.--Standardized rate of catch of Atka mackerel by gillnet in the eastern Bering Sea (geometric mean: number/km of net in the 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

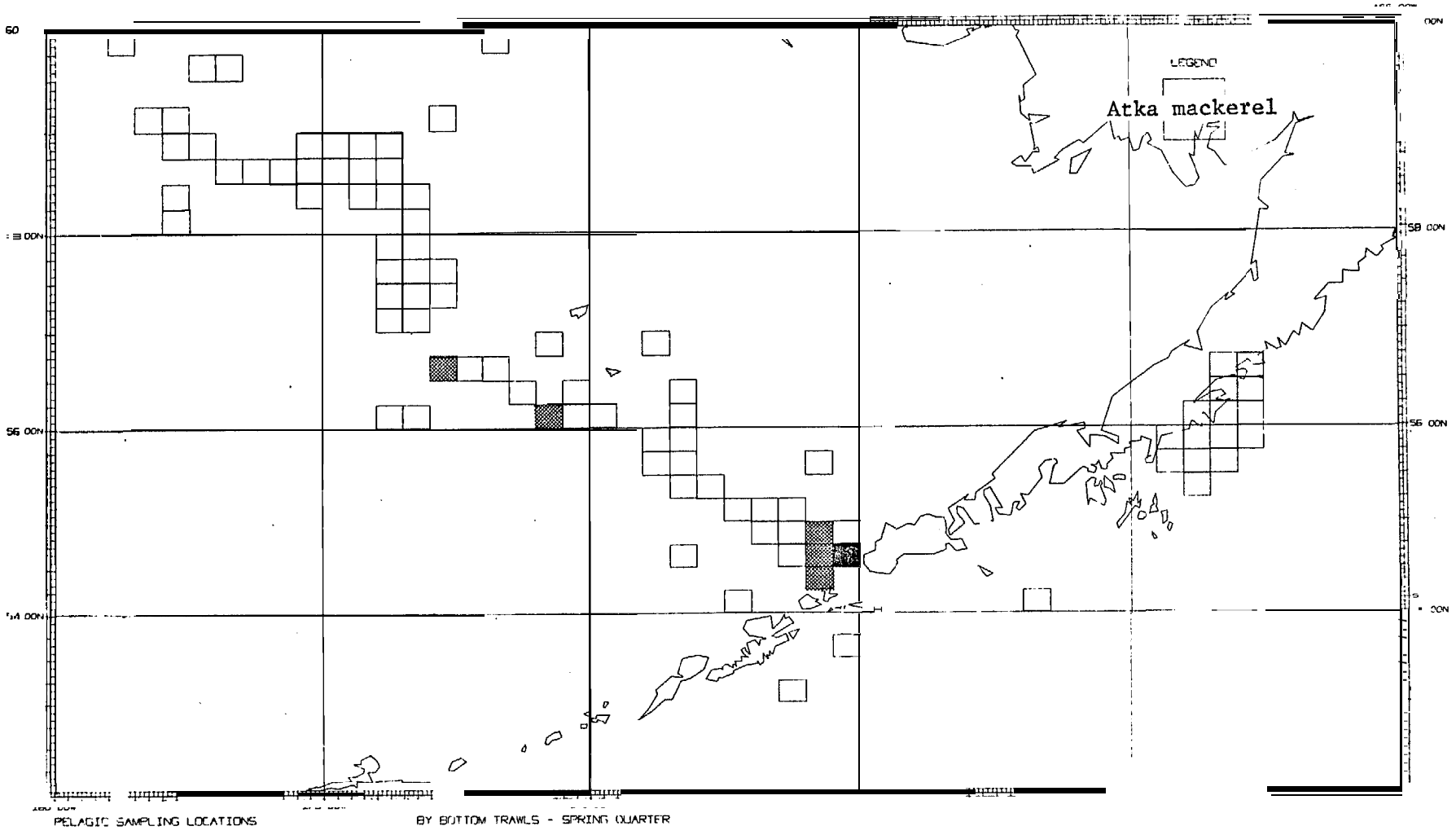


Figure IV.B.131.--Relative abundance of Atka mackerel in bottom trawls in spring, eastern Bering Sea.

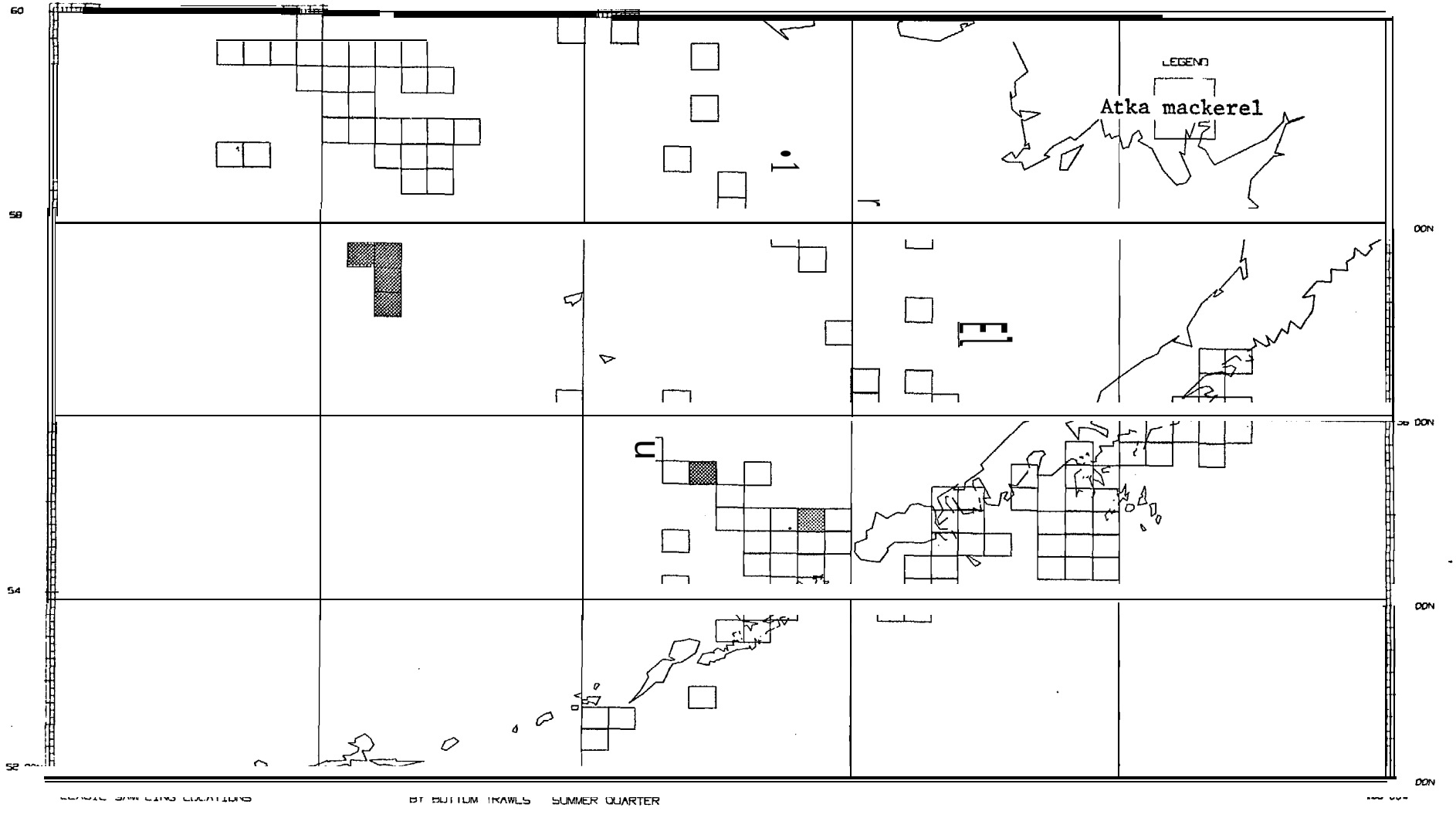


Figure IV.B.132.--Relative abundance of Atka mackerel in bottom trawls in summer, eastern Bering Sea.

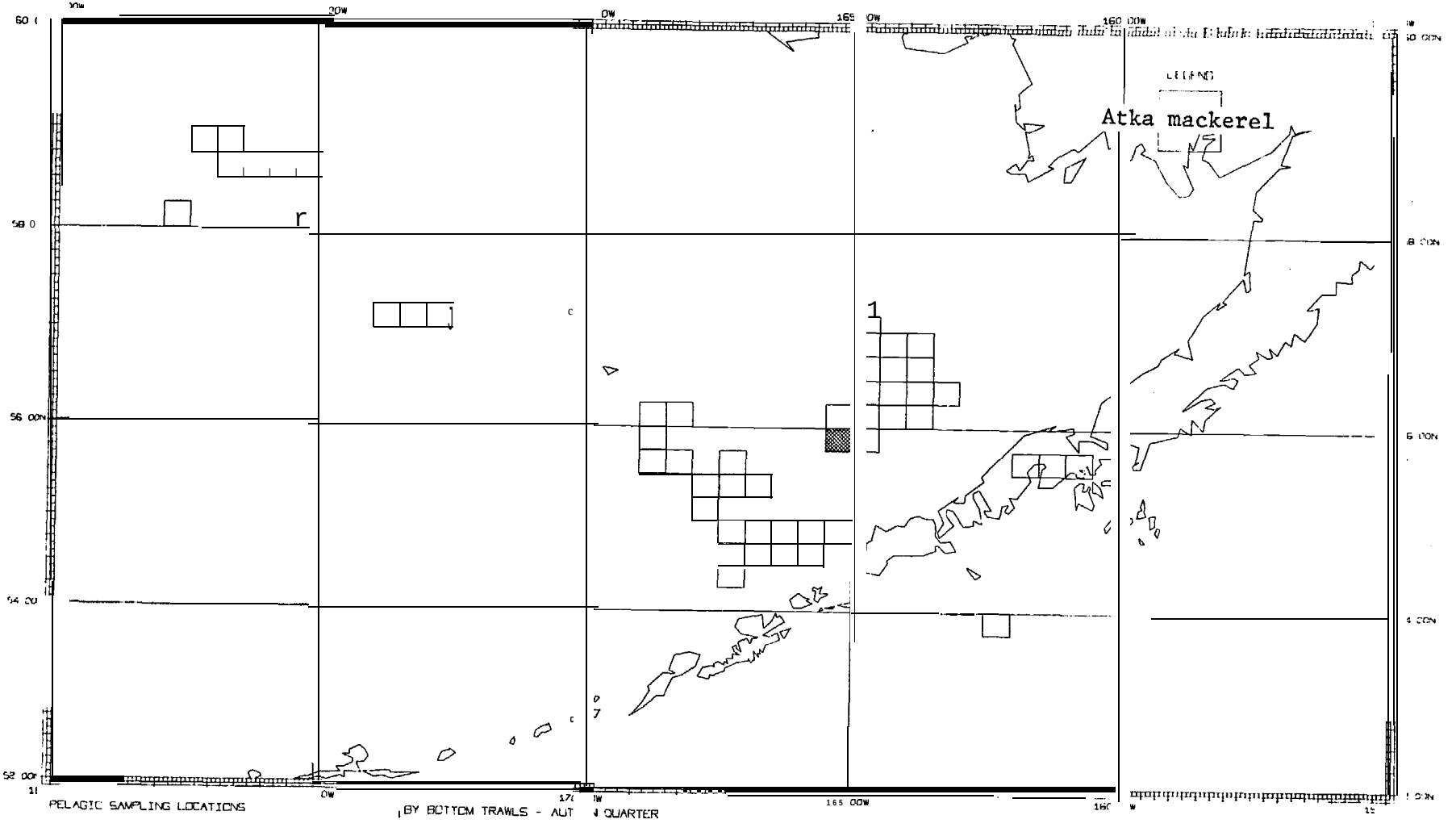


Figure IV. B.133.--Relative abundance of Atka mackerel in bottom trawls in autumn, eastern Bering Sea.

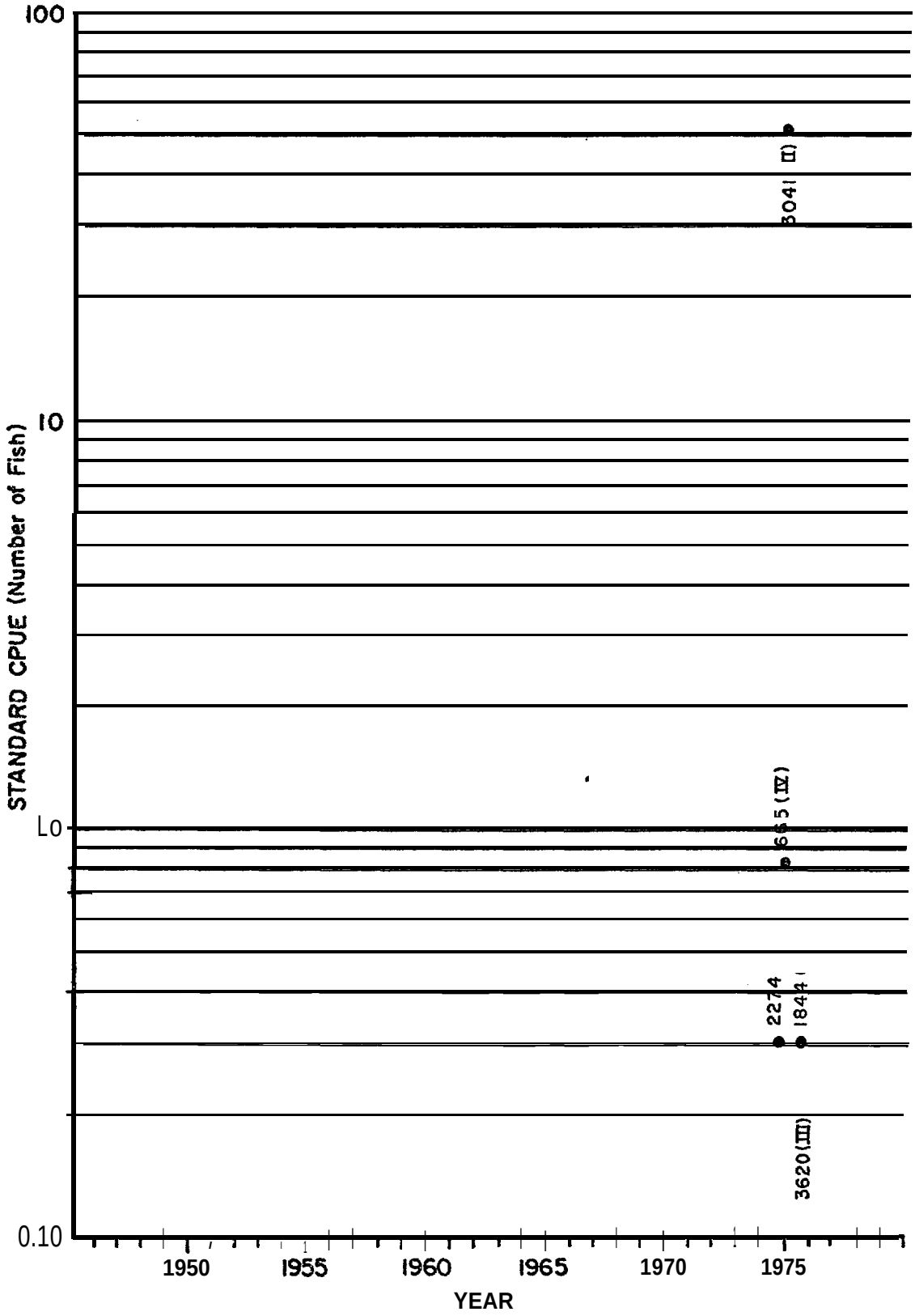


Figure IV. B.134.--Standardized rate' of catch of Atka mackerel by bottom trawl in the eastern Bering Sea (geometric mean: number/ 30 min tow with 90% confidence interval, number of observations, and quarter of the year).

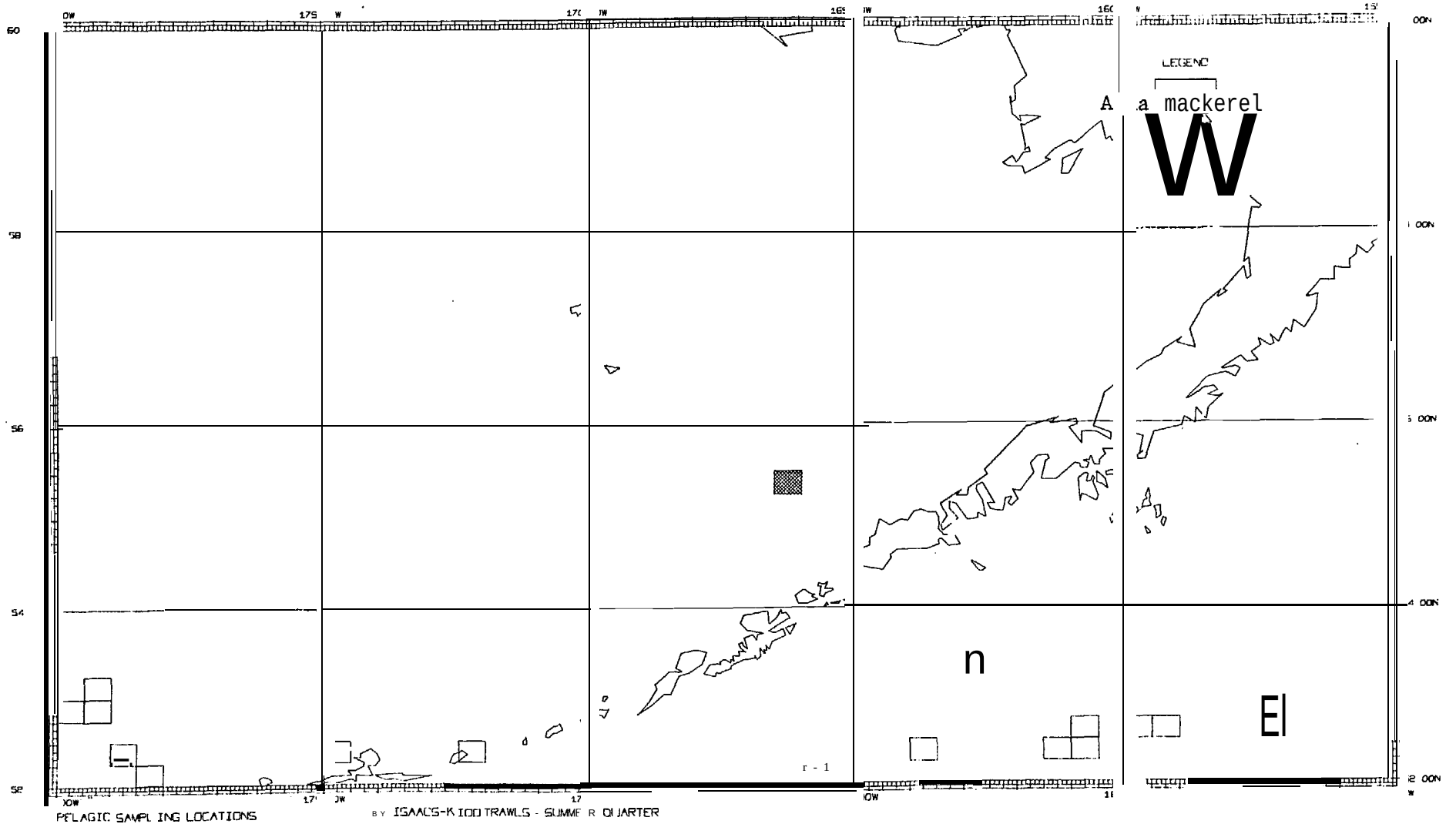


Figure IV. B.135.--Relative abundance of Atka mackerel in Isaacs-Kidd trawls in summer, eastern Bering Sea.

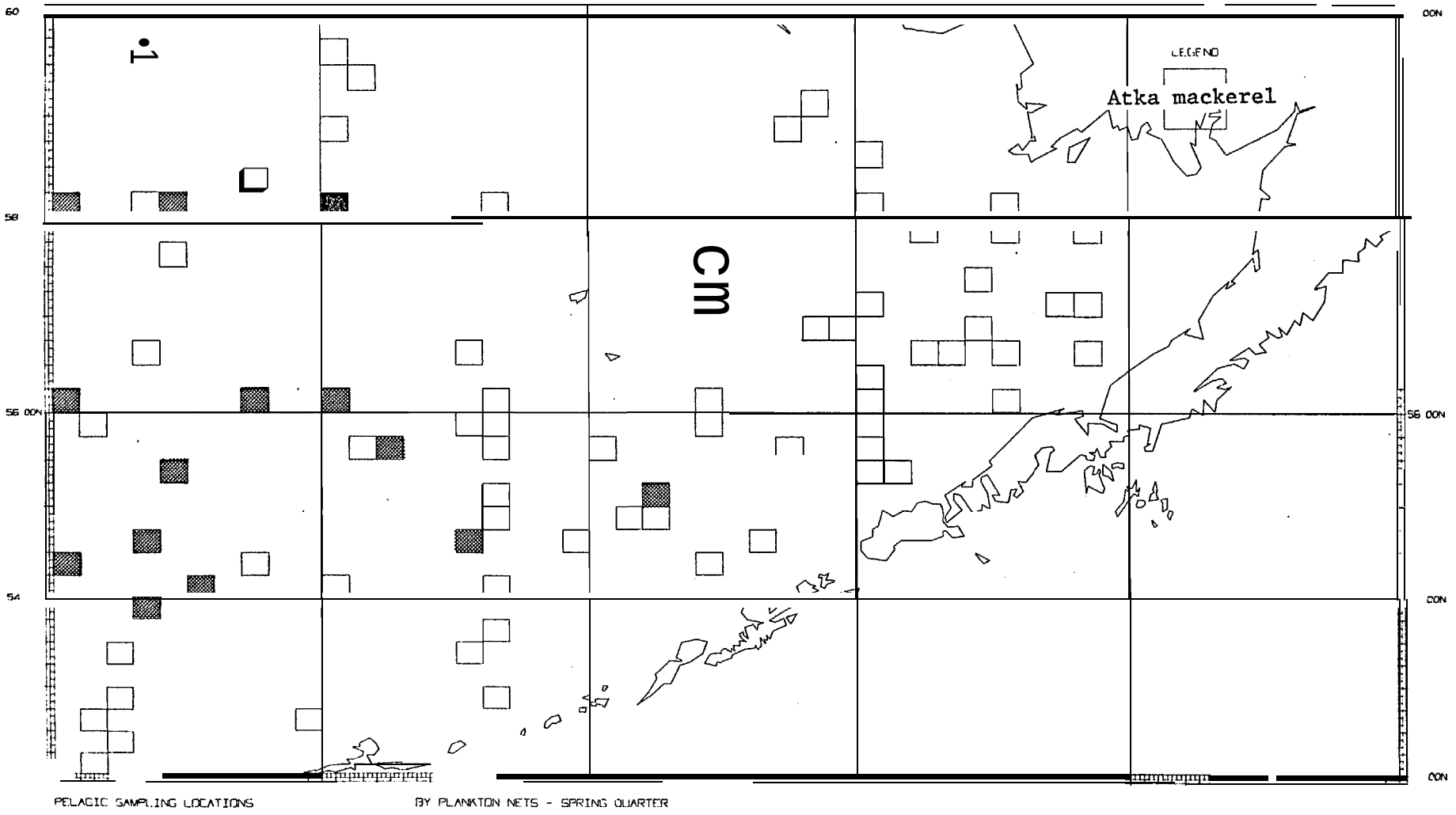


Figure IV.B.136.--Relative abundance of Atka mackerel in plankton nets in spring, eastern Bering Sea.

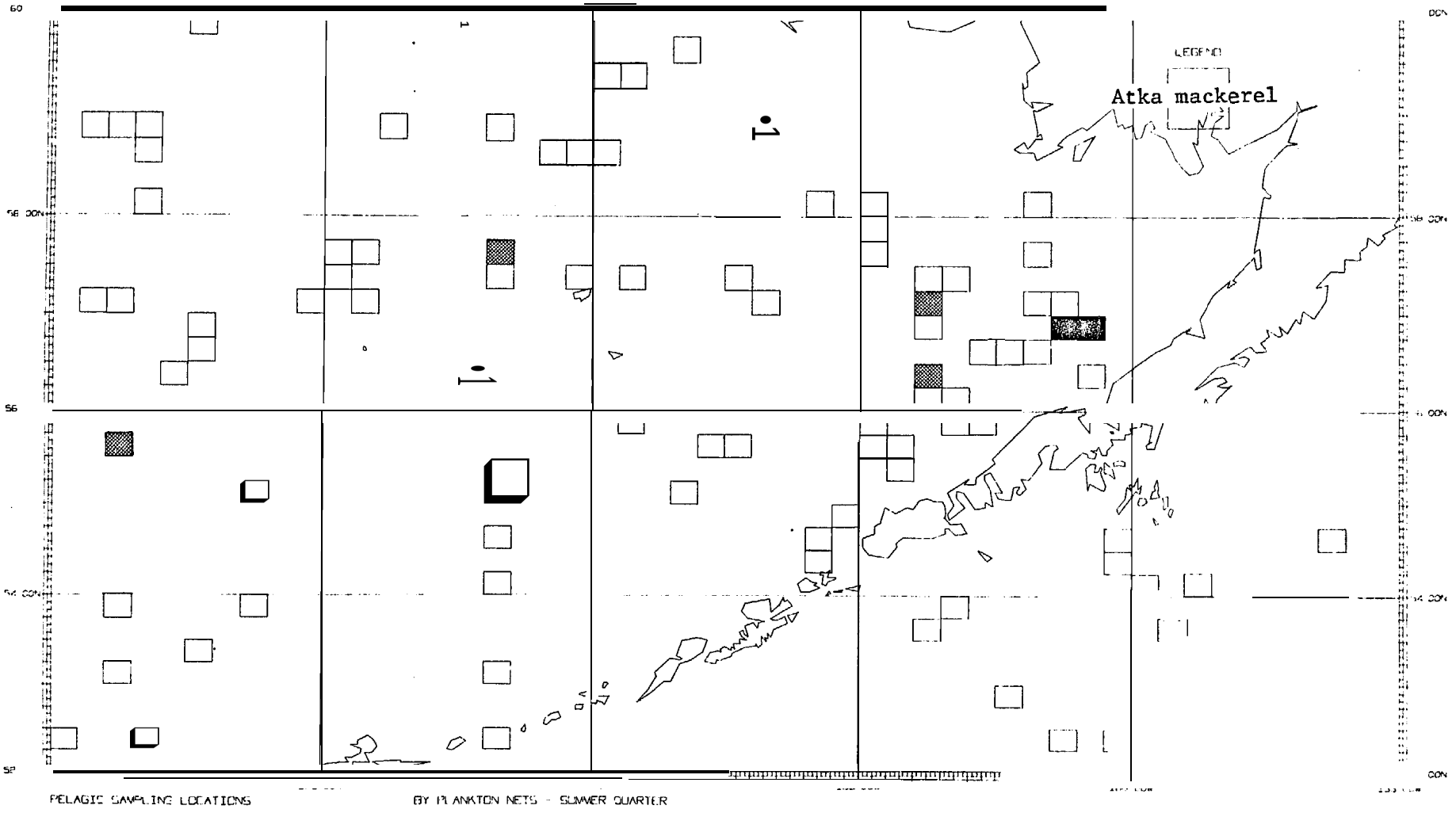


Figure IV.B.137.--Relative abundance of Atka mackerel in plankton nets in summer, eastern Bering Sea.

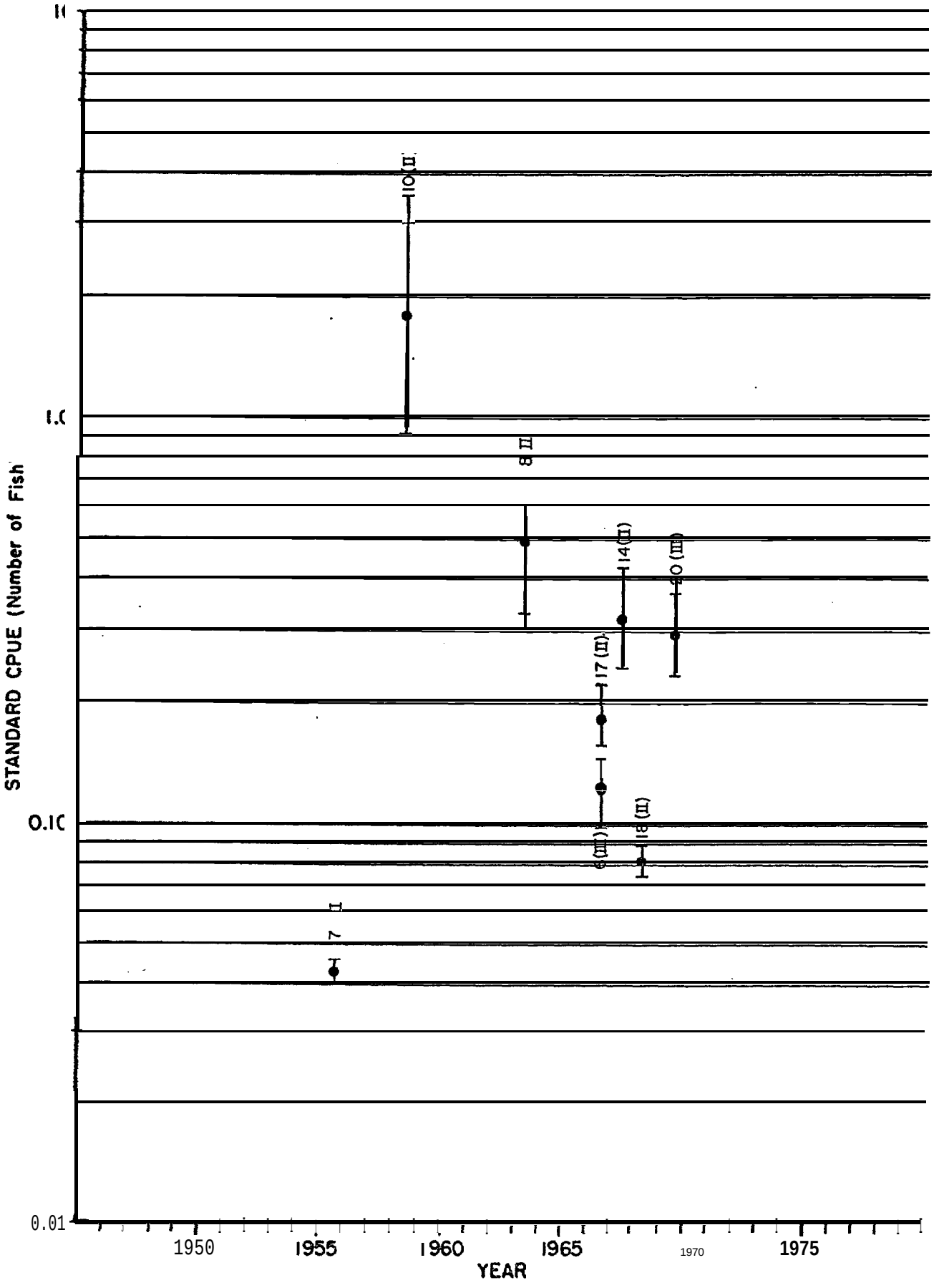


Figure IV. B.138.--Standardized rate of catch of Atka mackerel by plankton net in the eastern Bering Sea (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

GULF OF ALASKA

(FIGURES IV B.139 – IV B.288)

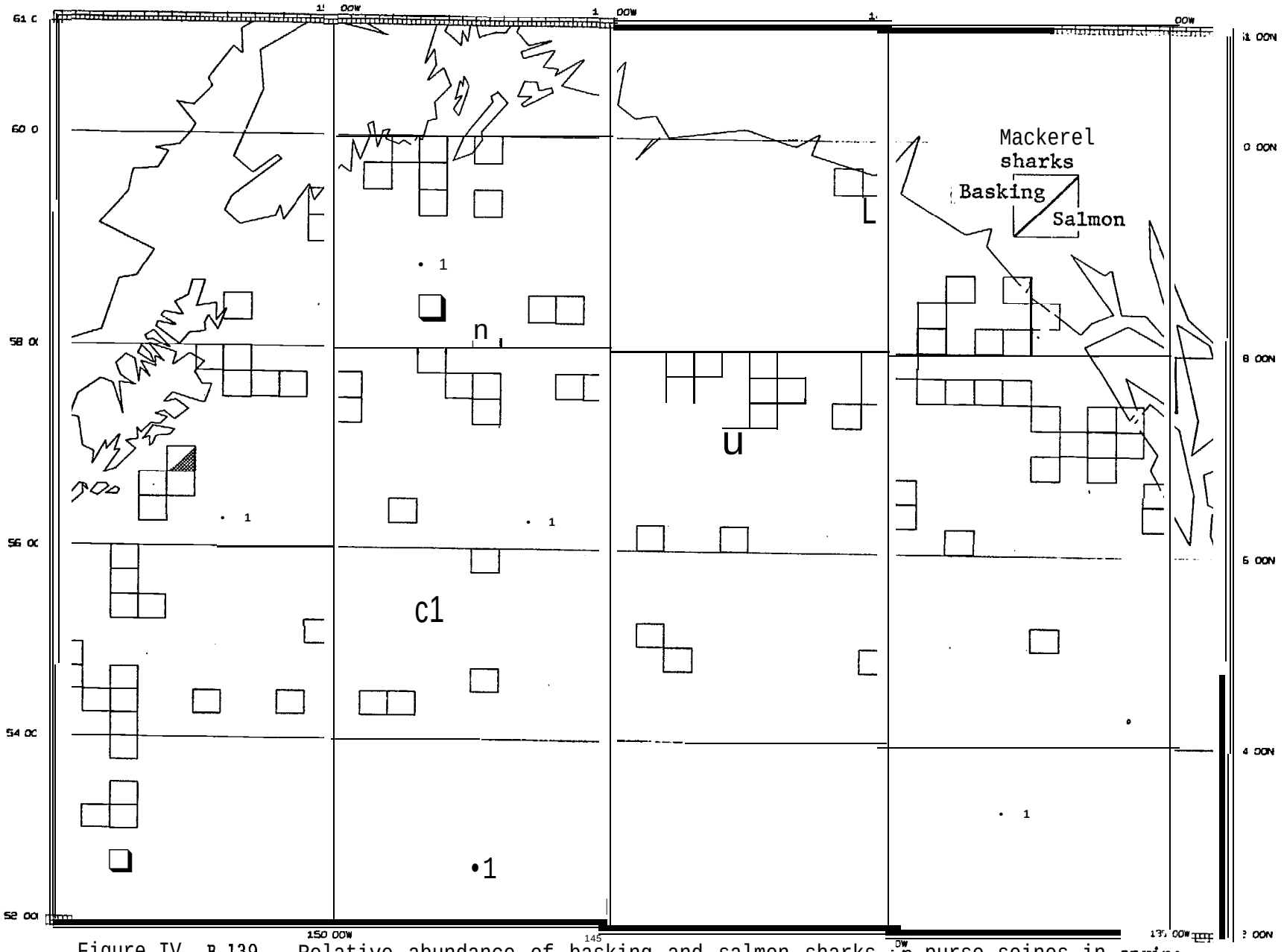


Figure IV. B.139.--Relative abundance of basking and salmon sharks in purse seines in spring, Gulf of Alaska.

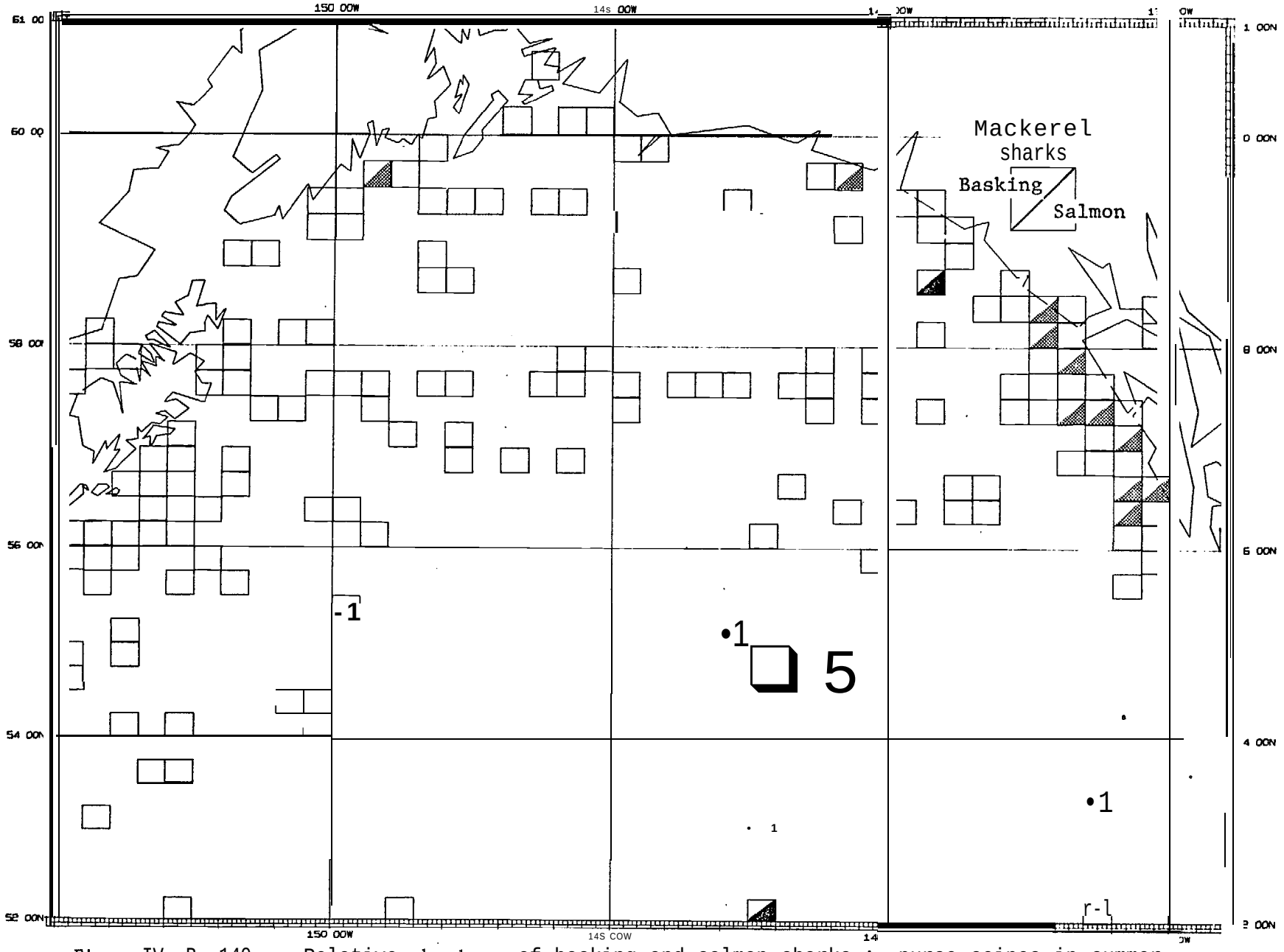


Figure IV. B. 140 . --Relative abundance of basking and salmon sharks in purse seines in summer, Gulf of Alaska.

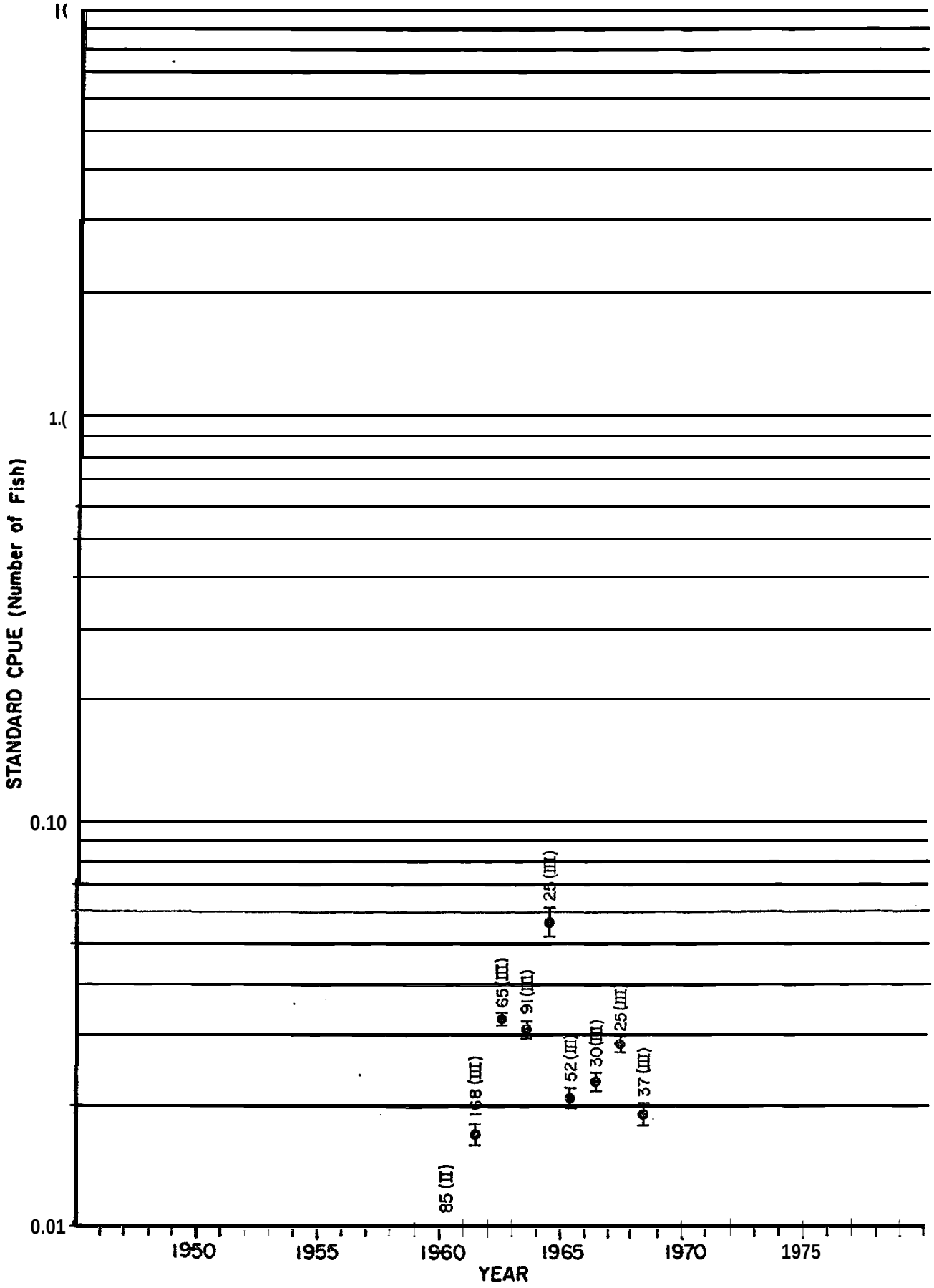


Figure IV.B.141.--Standardized rate of catch of salmon sharks by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

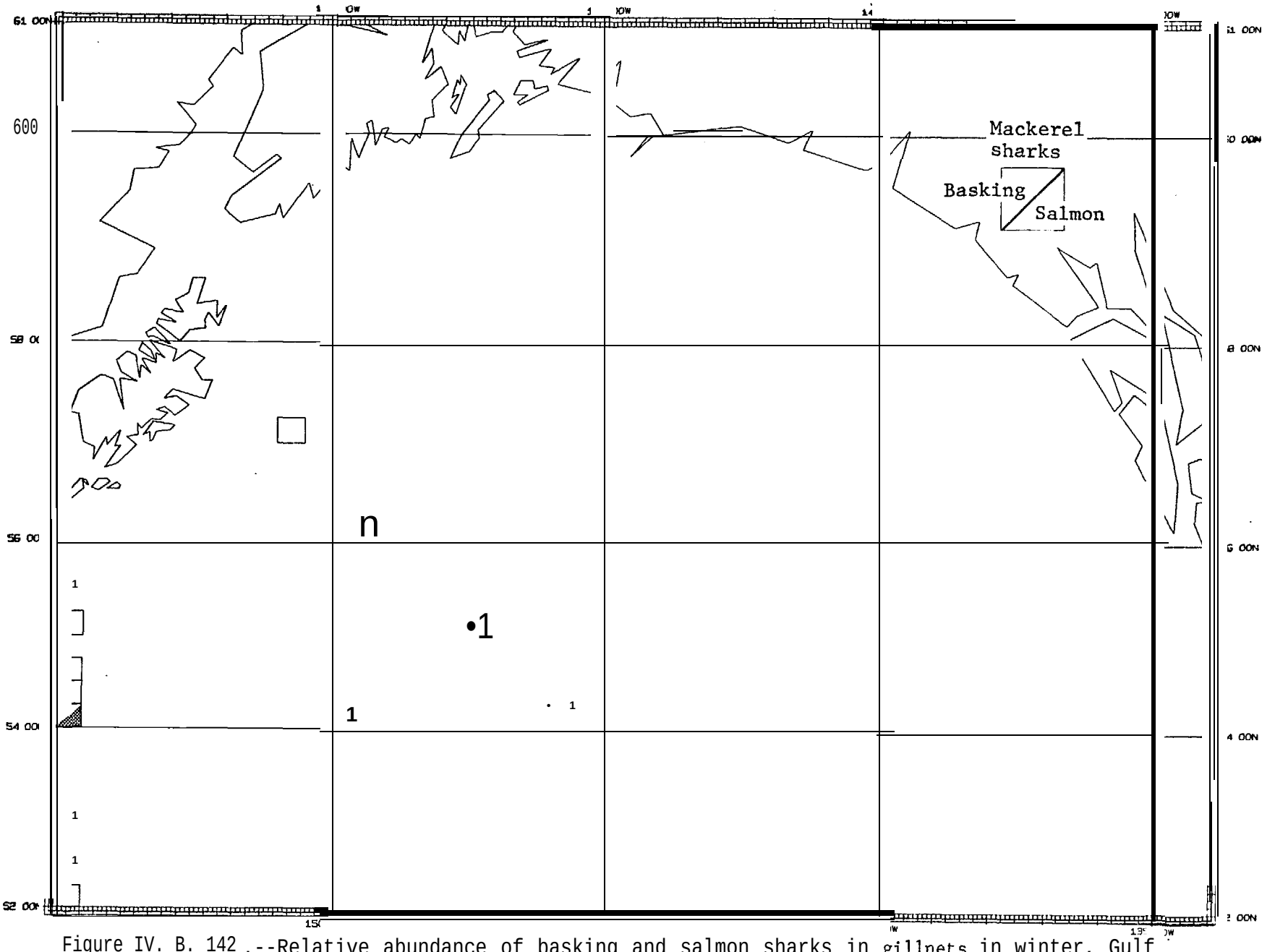


Figure IV. B. 142 .--Relative abundance of basking and salmon sharks in gillnets in winter, Gulf of Alaska.

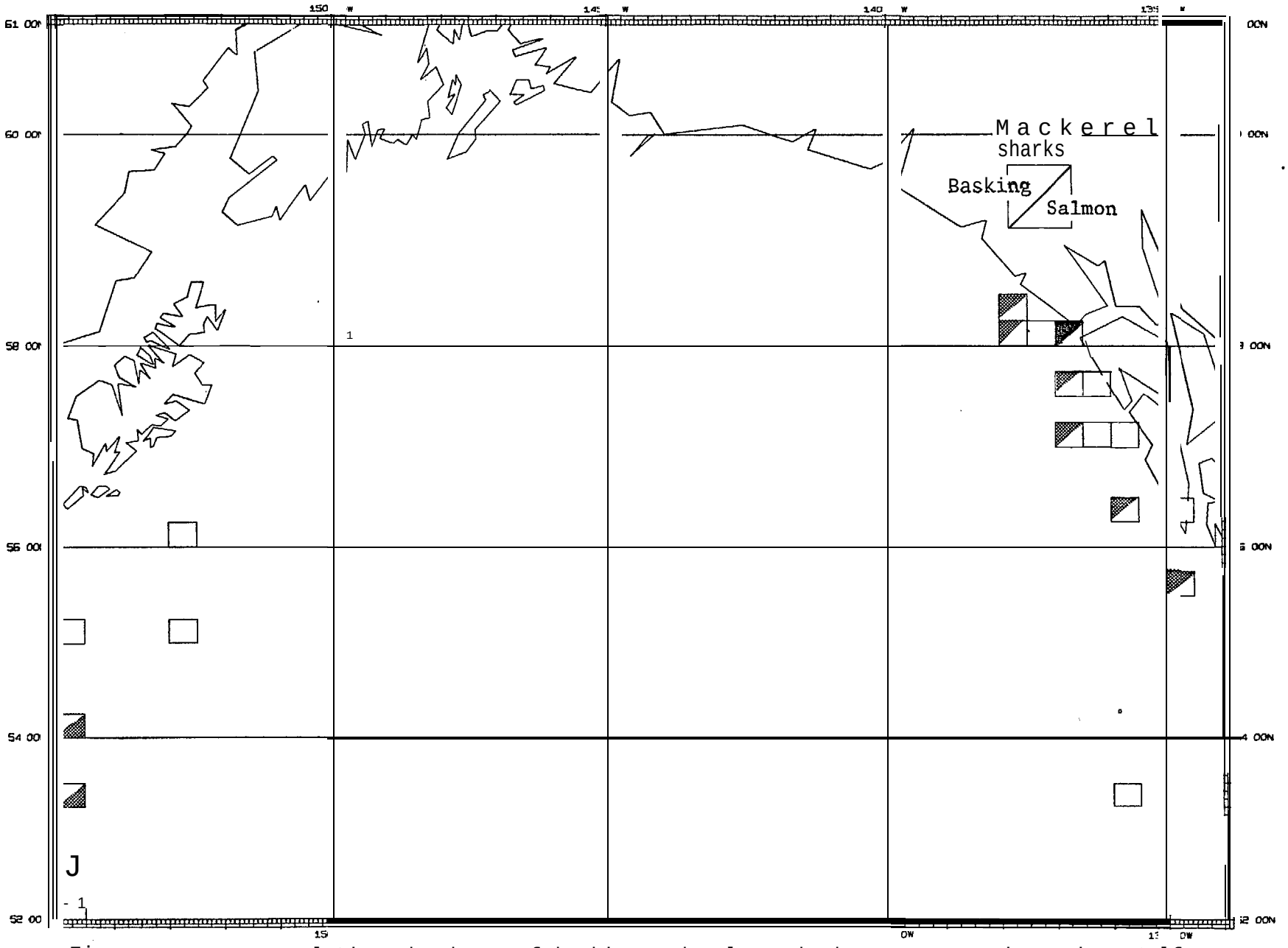


Figure IV.B.143.--Relative abundance of basking and salmon sharks in gillnets in spring, Gulf of Alaska.

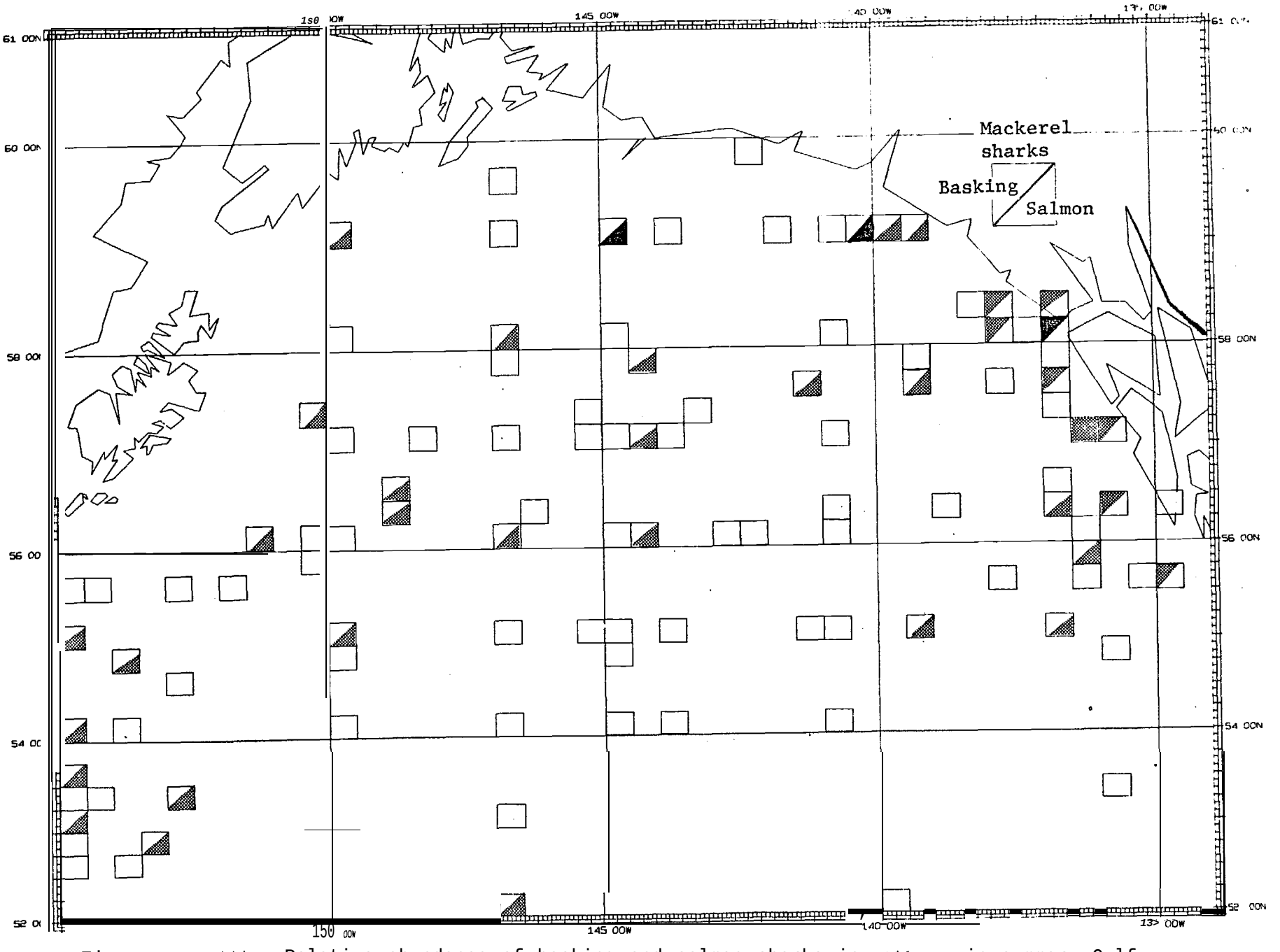


Figure IV.B.144.--Relative abundance of basking and salmon sharks in gillnets in summer, Gulf of Alaska.

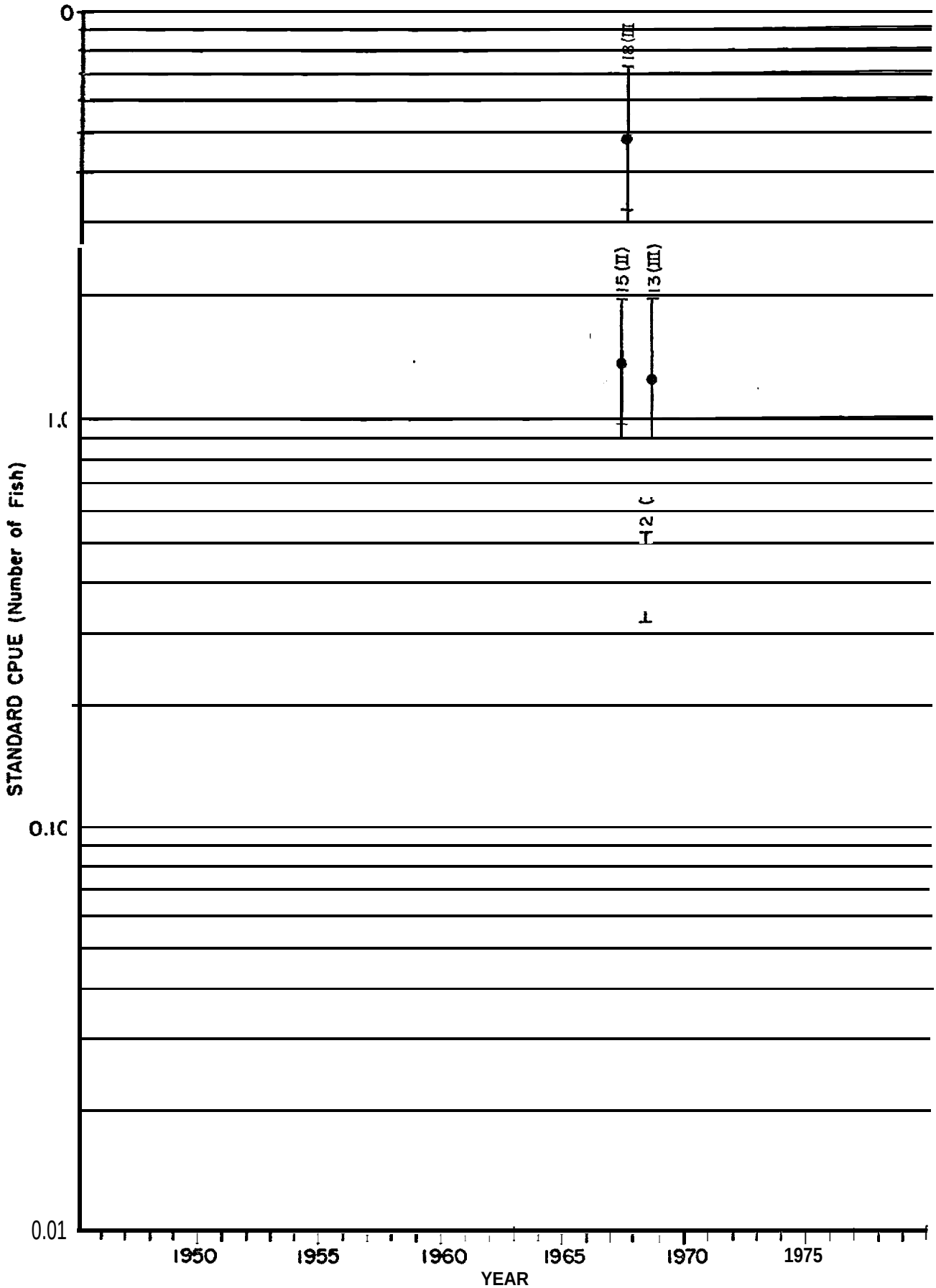


Figure IV.B.145.--Standardized rate of catch of basking shark by gillnet in the Gulf of Alaska (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

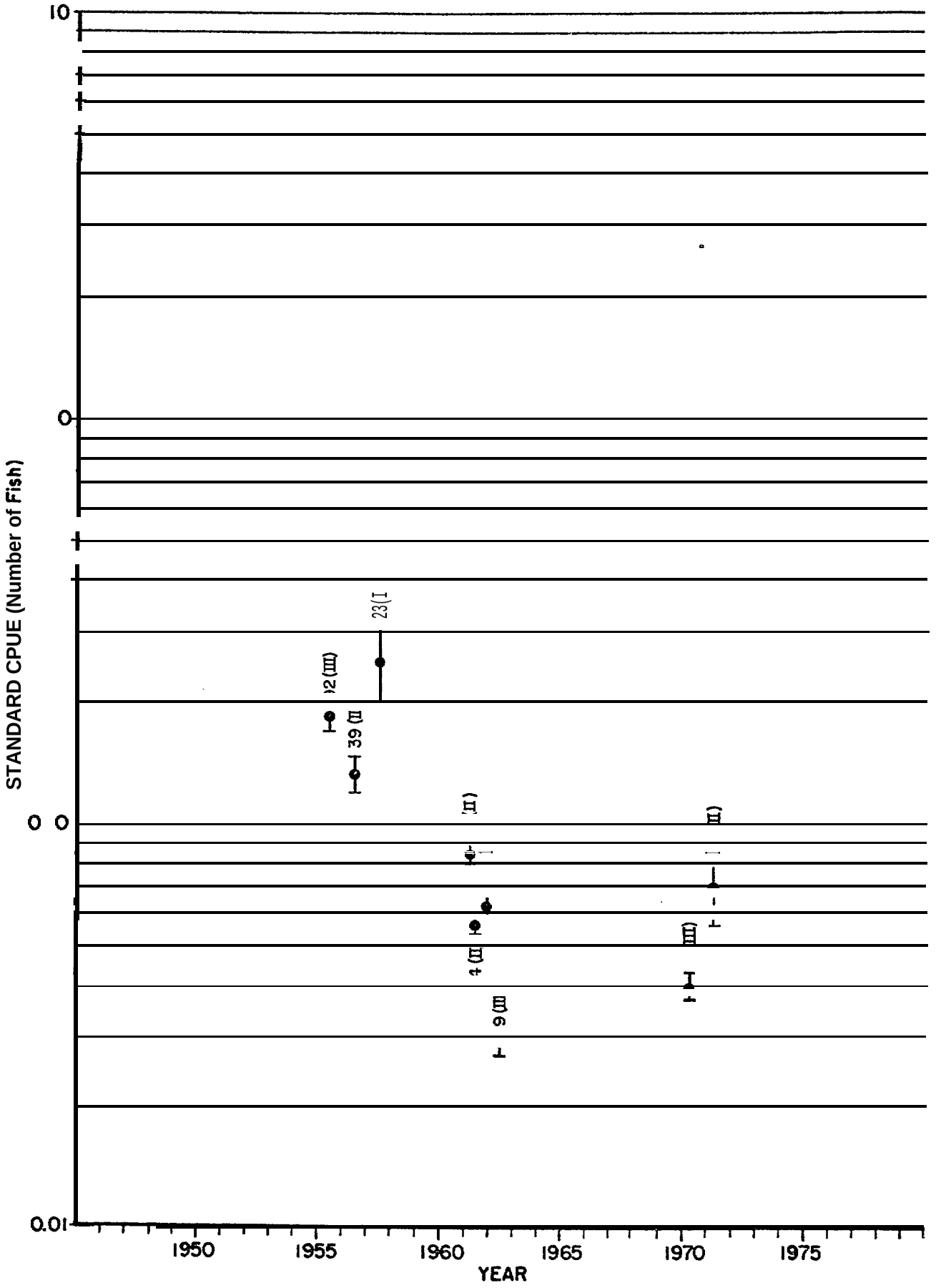


Figure IV.B.146.--Standardized rate of catch of salmon sharks by gillnet in the Gulf of Alaska (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

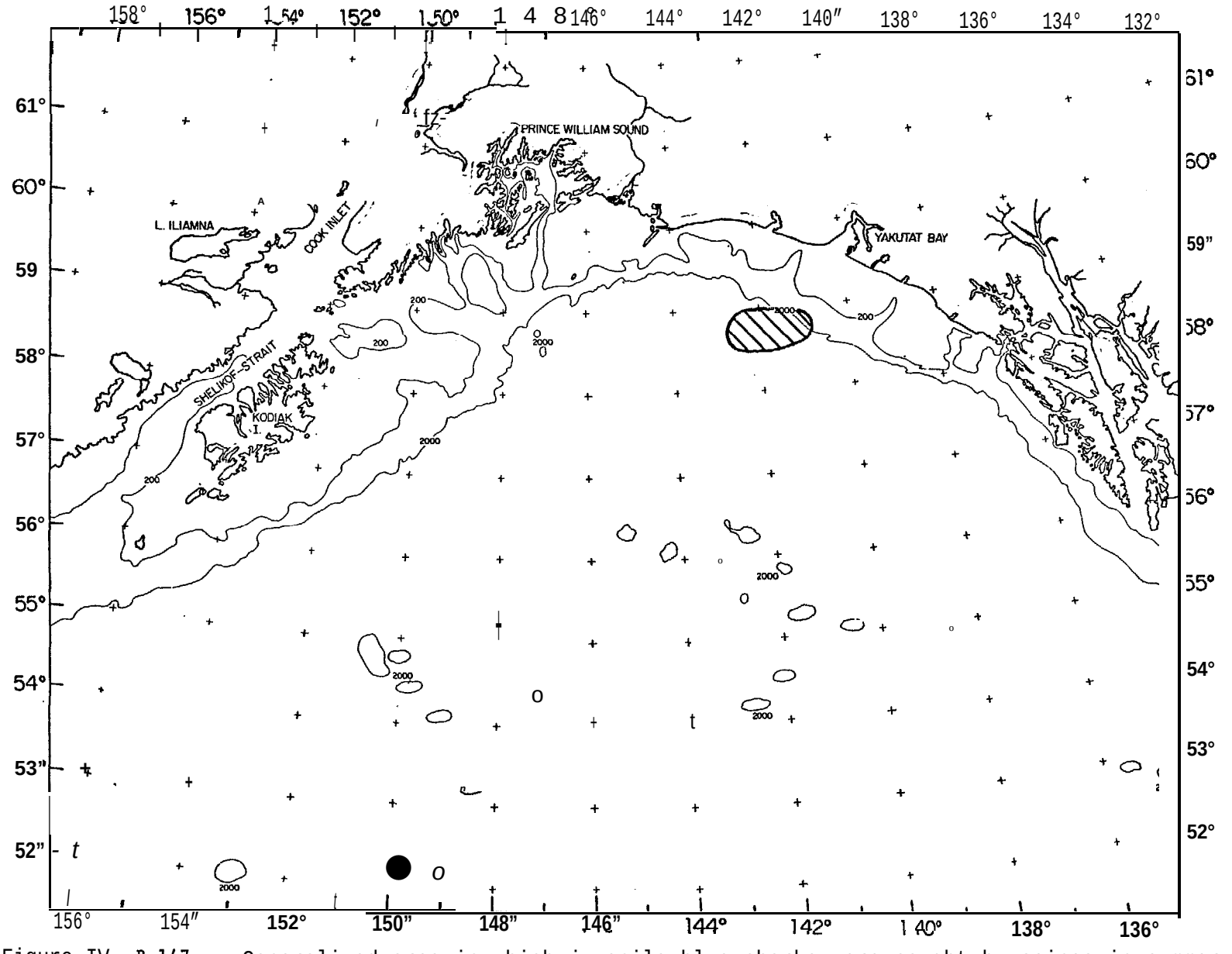


Figure IV. B.147a.--Generalized area in which juvenile blue sharks were caught by seines in summer, Gulf of Alaska.

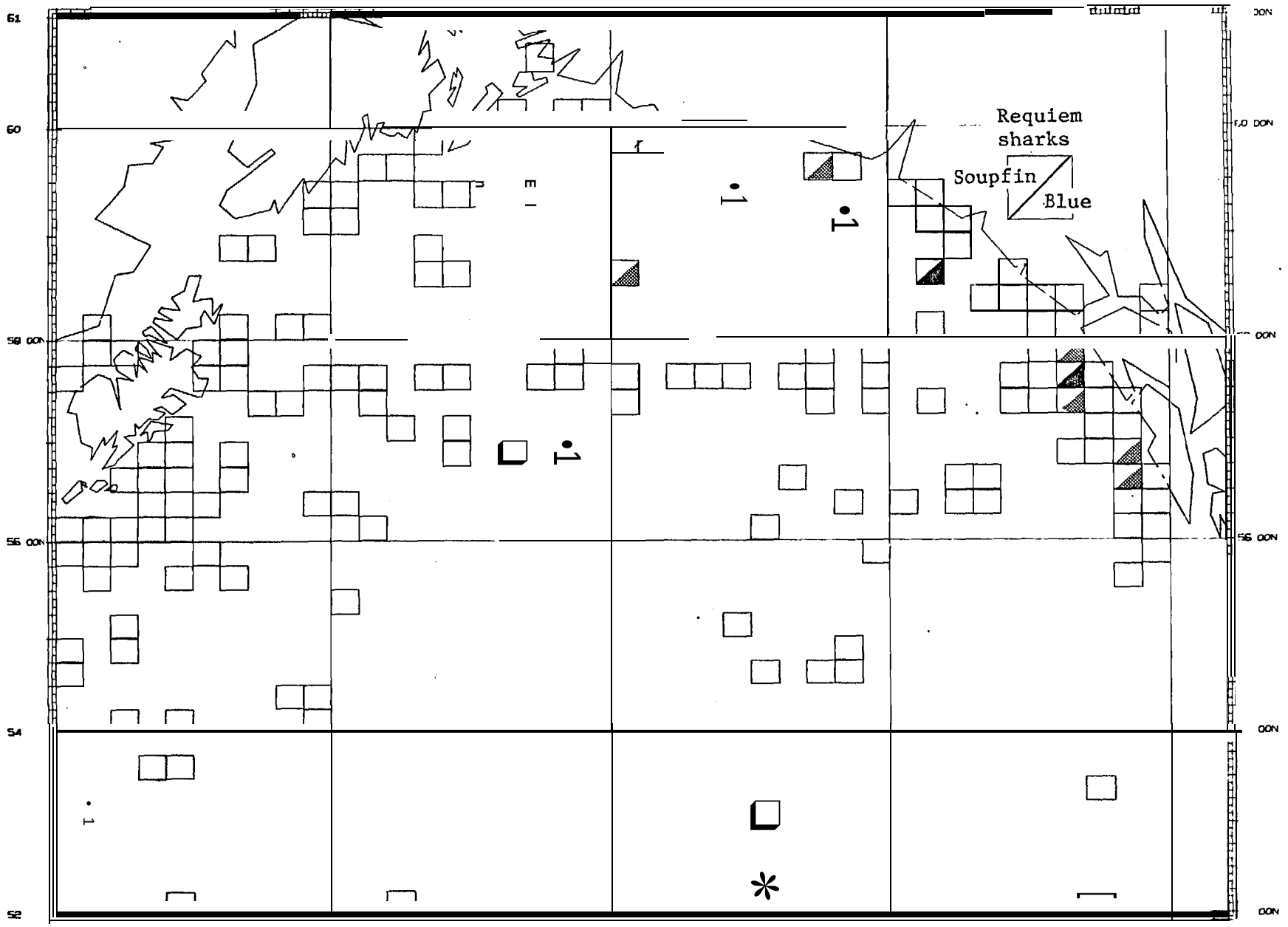


Figure IV.B.147b.--Relative abundance of soupfin and blue sharks in purse seines in summer, Gulf of Alaska.

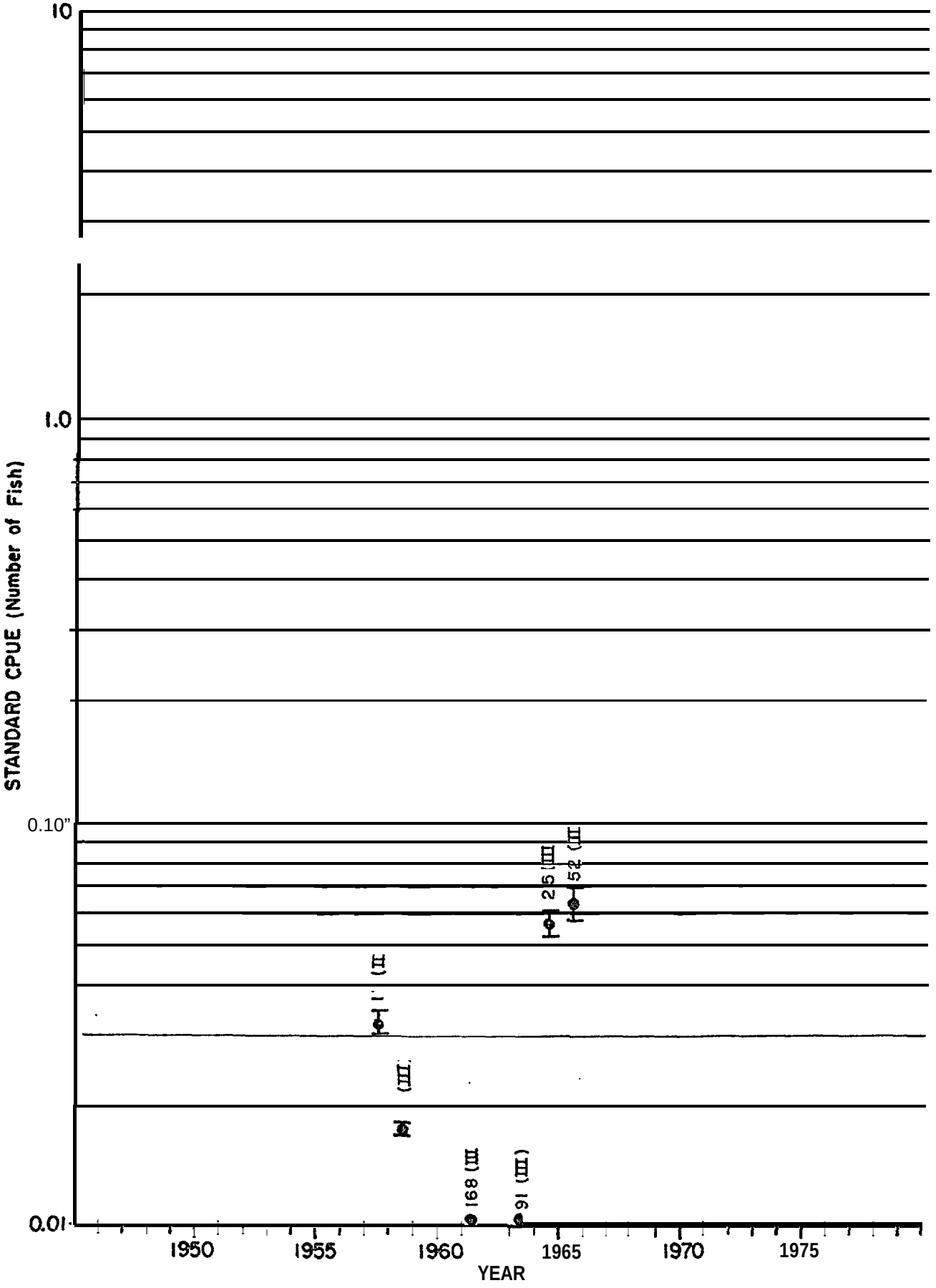


Figure IV.B.148.--Standardized rate of catch of blue shark by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

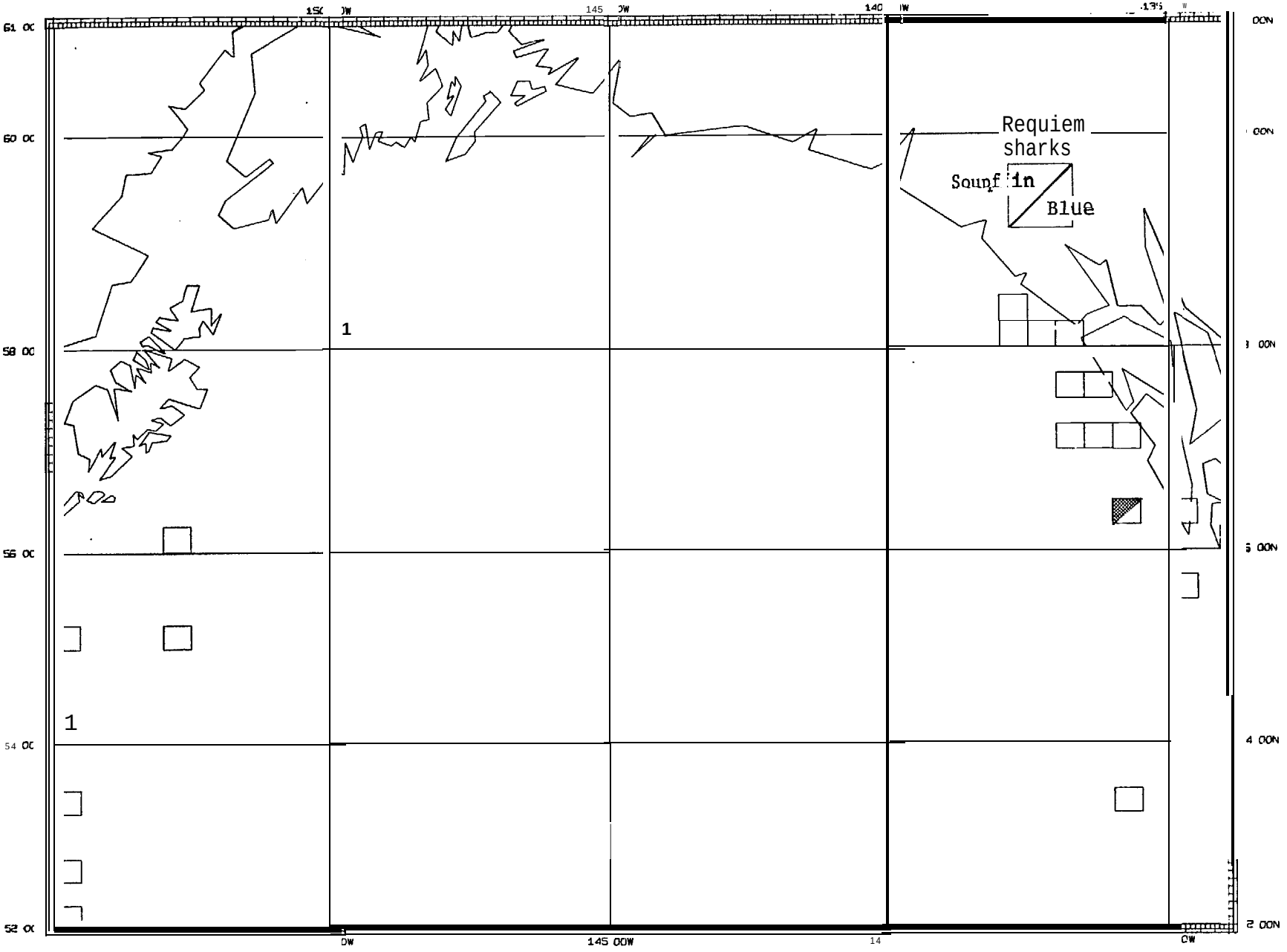


Figure IV. B.149.--Relative abundance of soupfin and blue sharks in gillnets in spring, Gulf of Alaska.

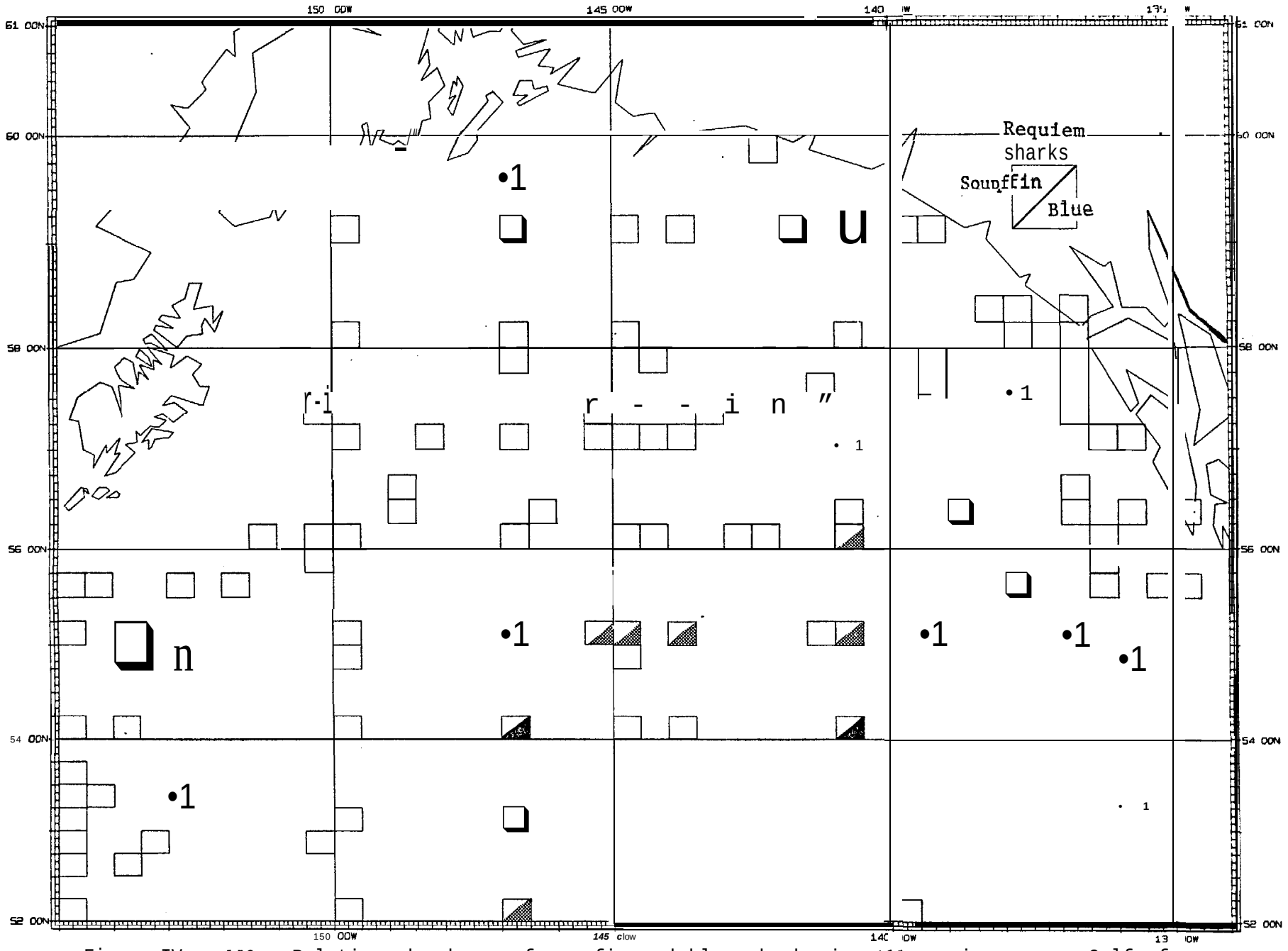


Figure IV. B.150.--Relative abundance of soupfin and blue sharks in gillnets in summer, Gulf of Alaska.

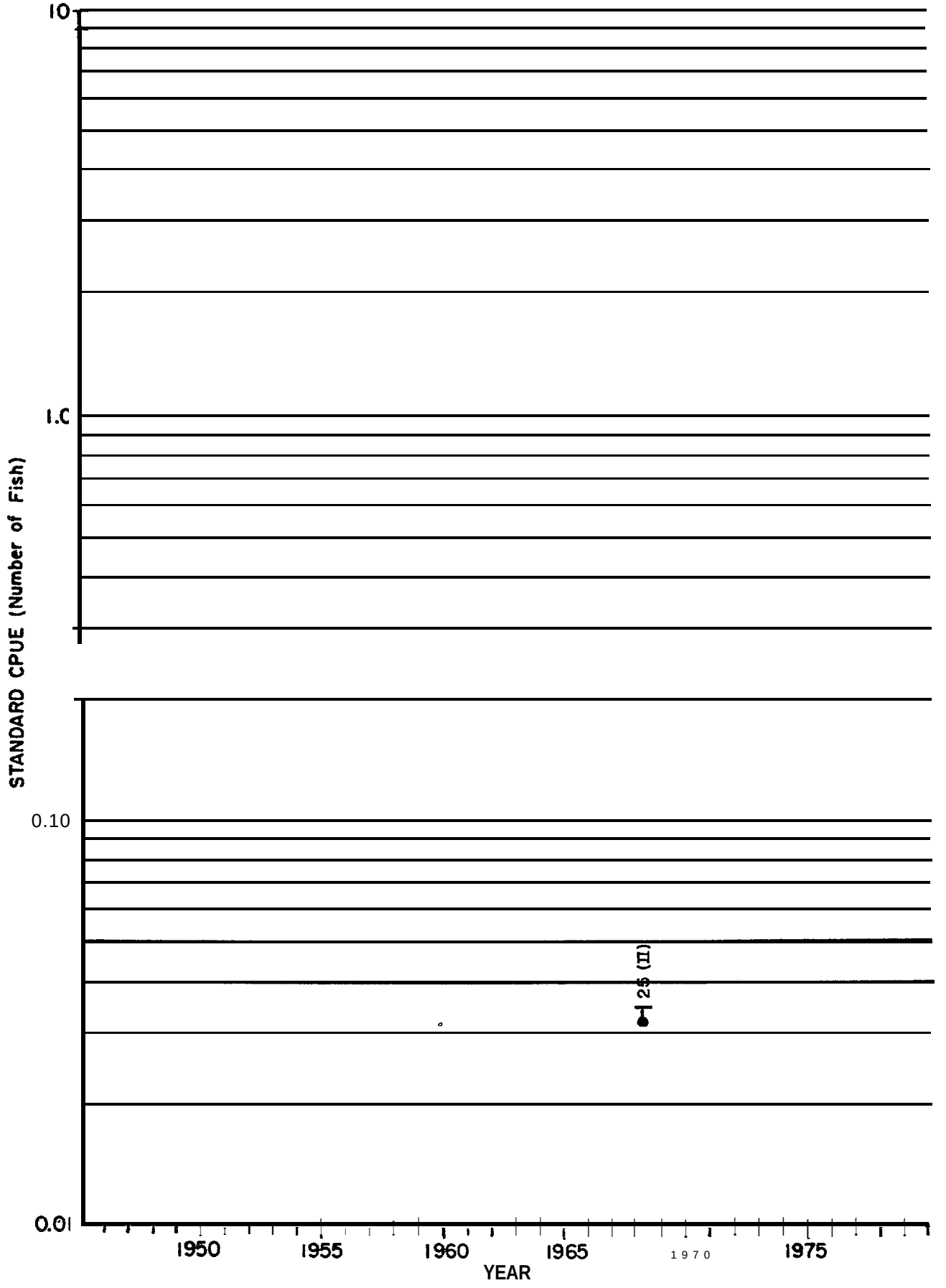


Figure IV.B.151.--Standardized rate of catch of soupfin shark by gillnet in the Gulf of Alaska (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

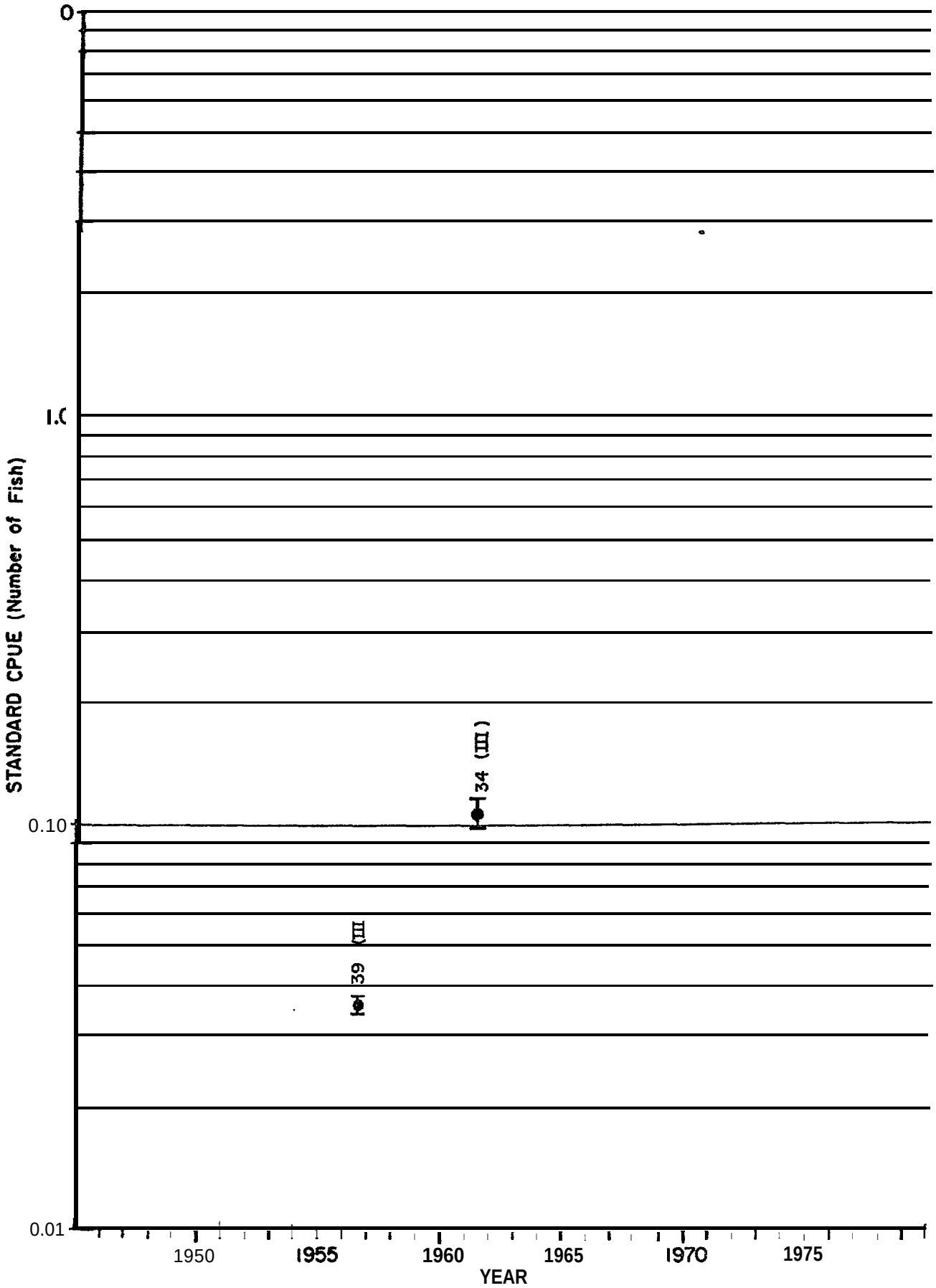


Figure IV.B.152.--Standardized rate of catch of blue shark by gillnet in the Gulf of Alaska (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

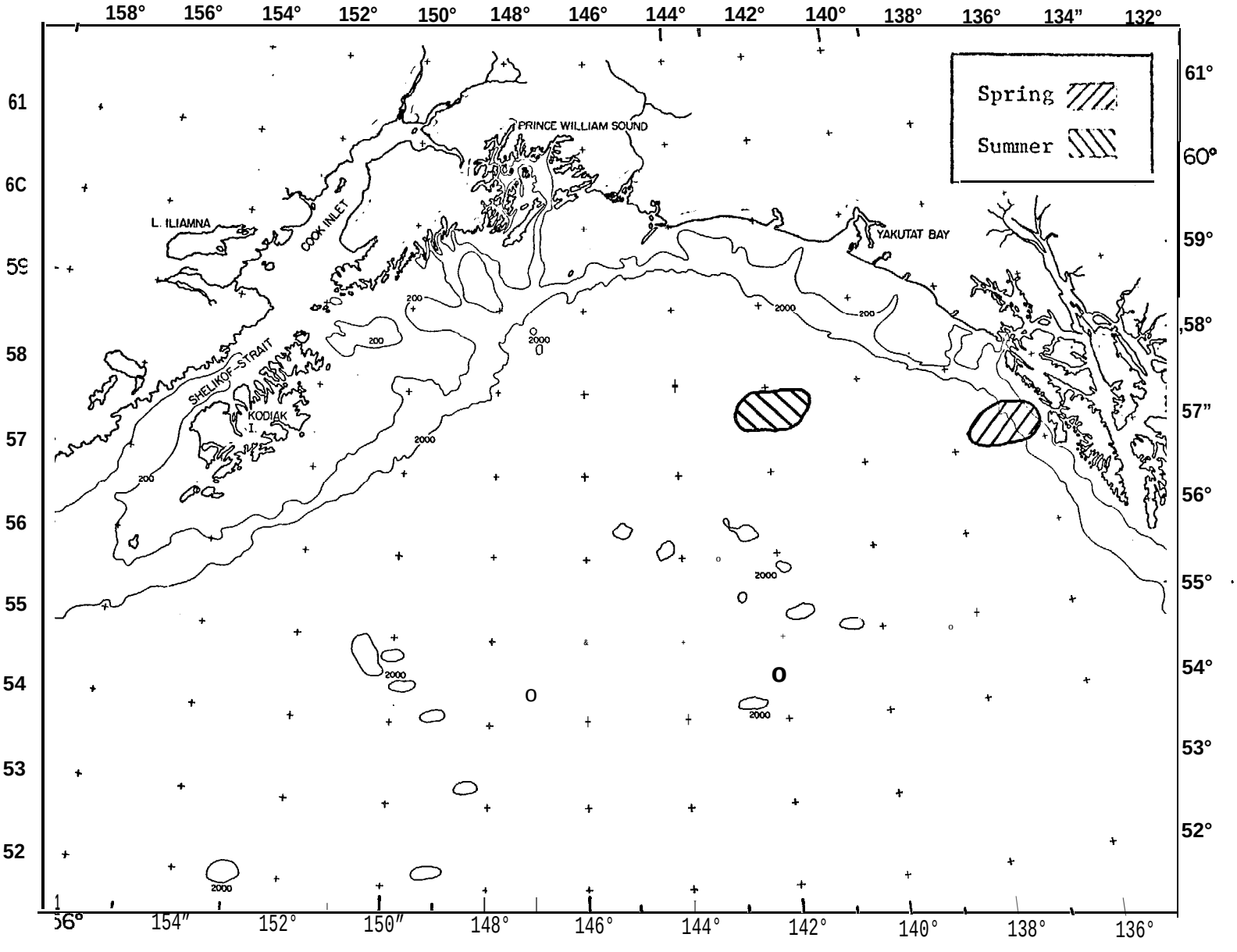


Figure IV. B.153 .--Genera lized areas in which juvenile spiny dogfish were caught by seines in spring and summer, Gulf of Alaska.

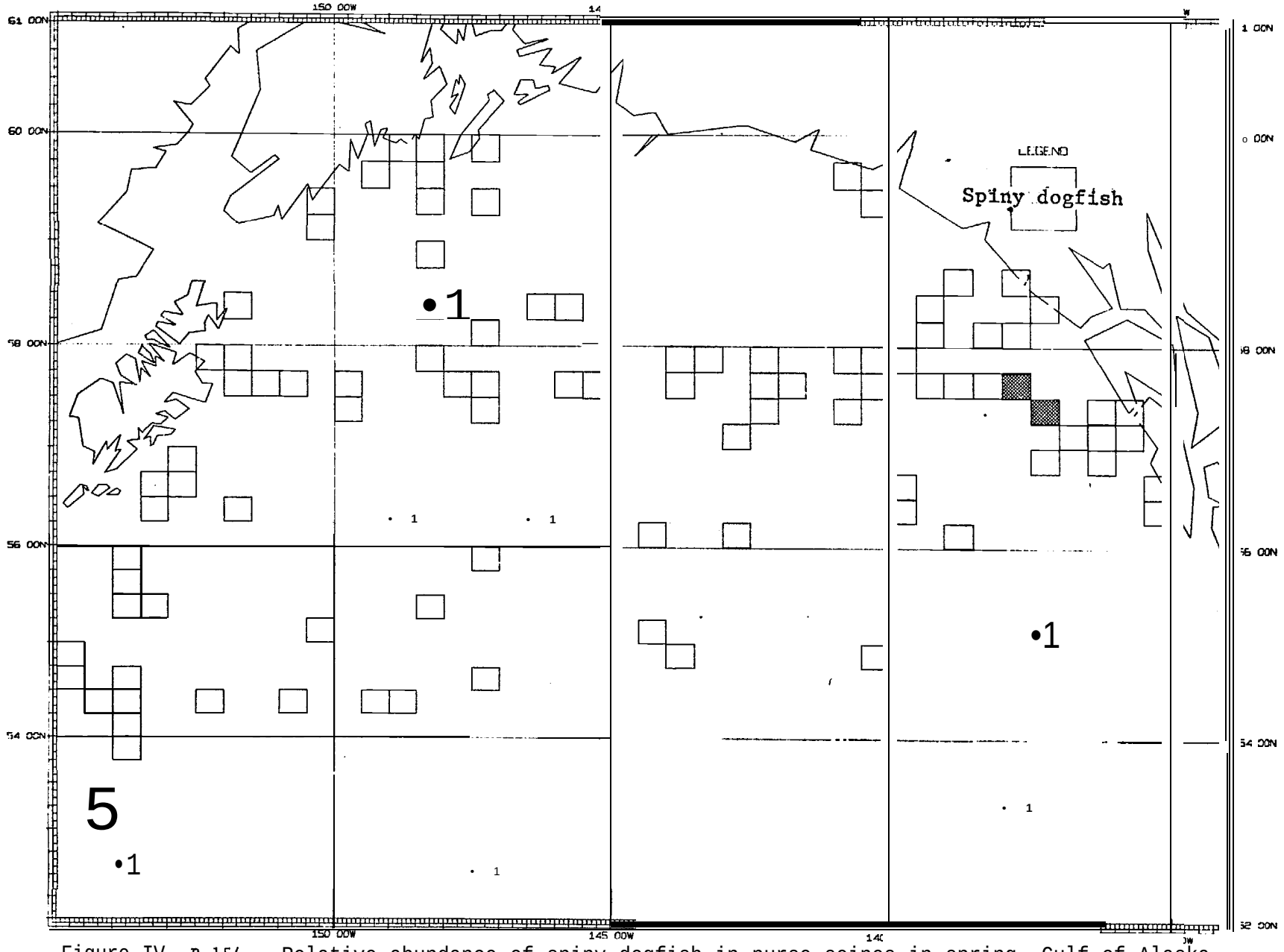


Figure IV. B.154.--Relative abundance of spiny dogfish in purse seines in spring, Gulf of Alaska.

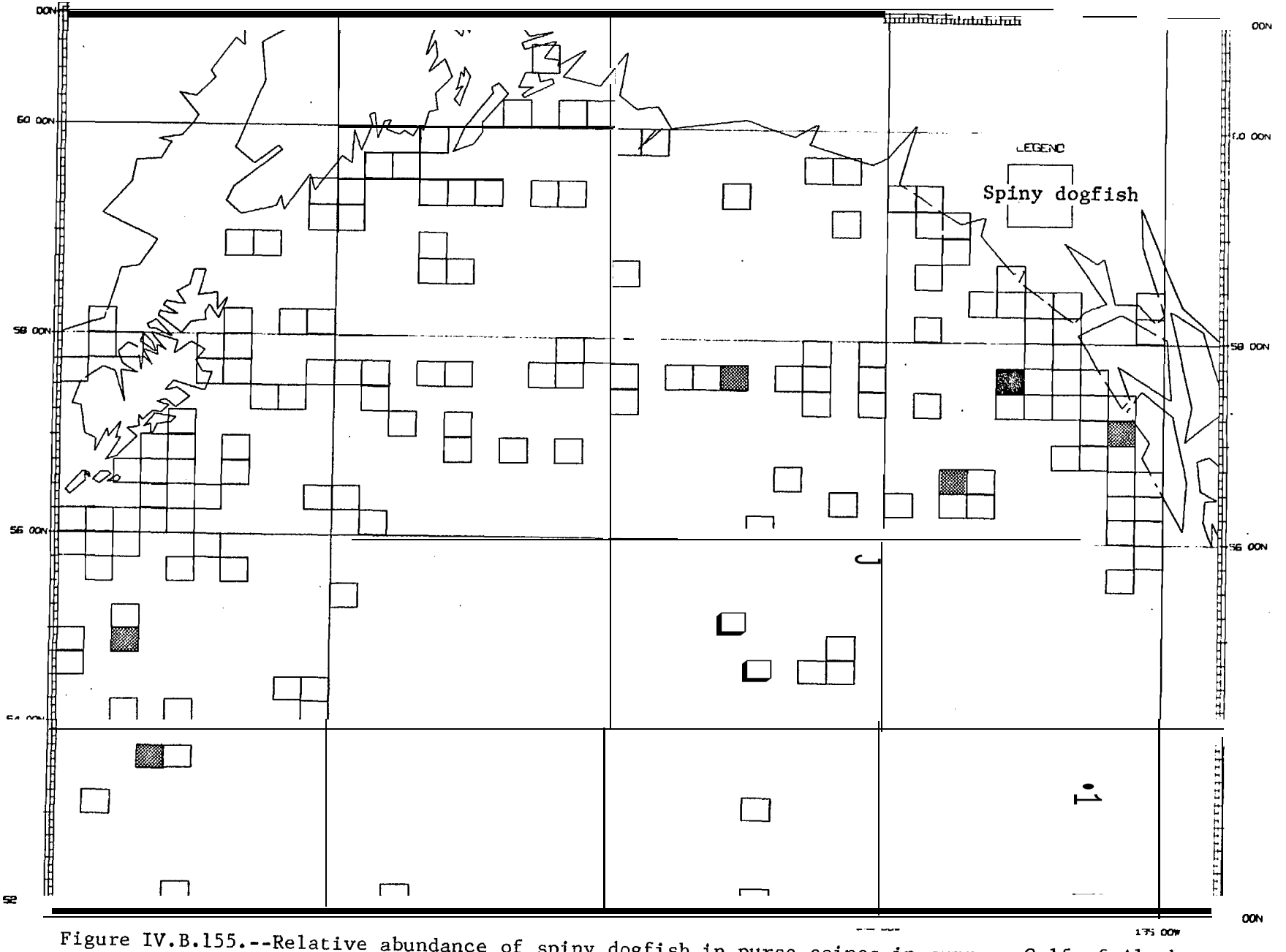


Figure IV.B.155.--Relative abundance of spiny dogfish in purse seines in summer, Gulf of Alaska.

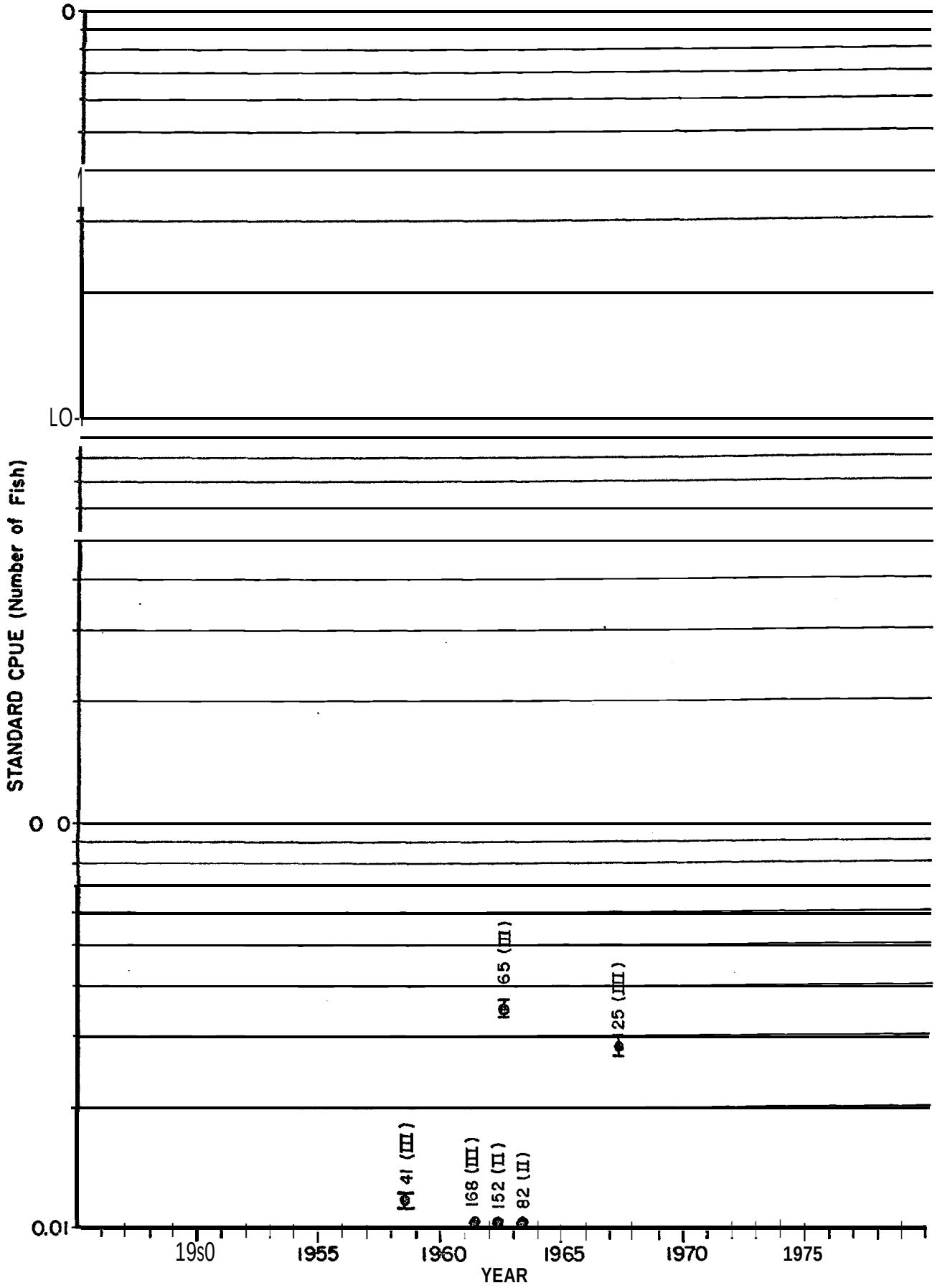


Figure IV.B.156.--Standardized rate of catch of spiny dogfish by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

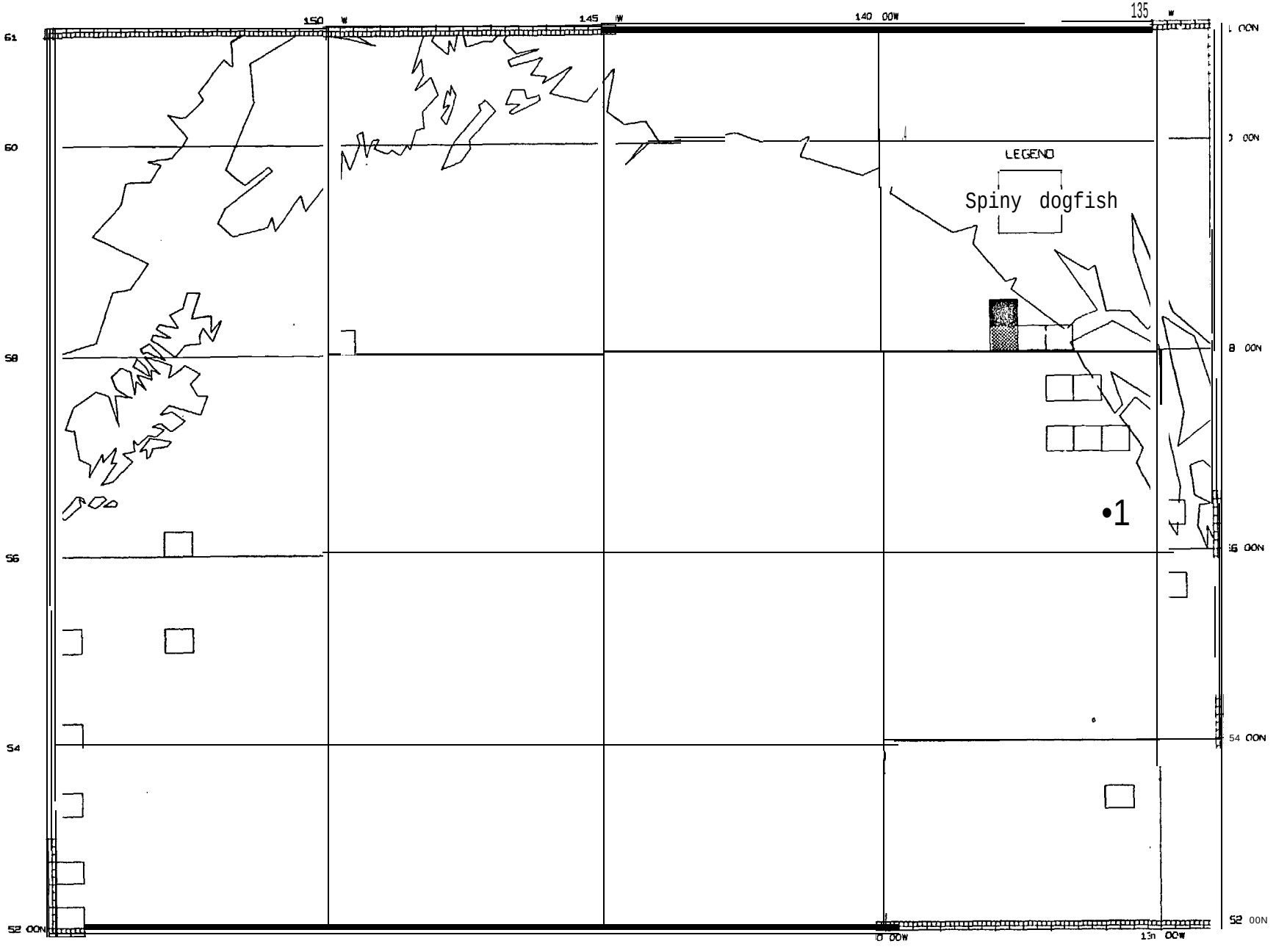


Figure IV.B.157.--Relative abundance of spiny dogfish in gillnets in spring, Gulf of Alaska.

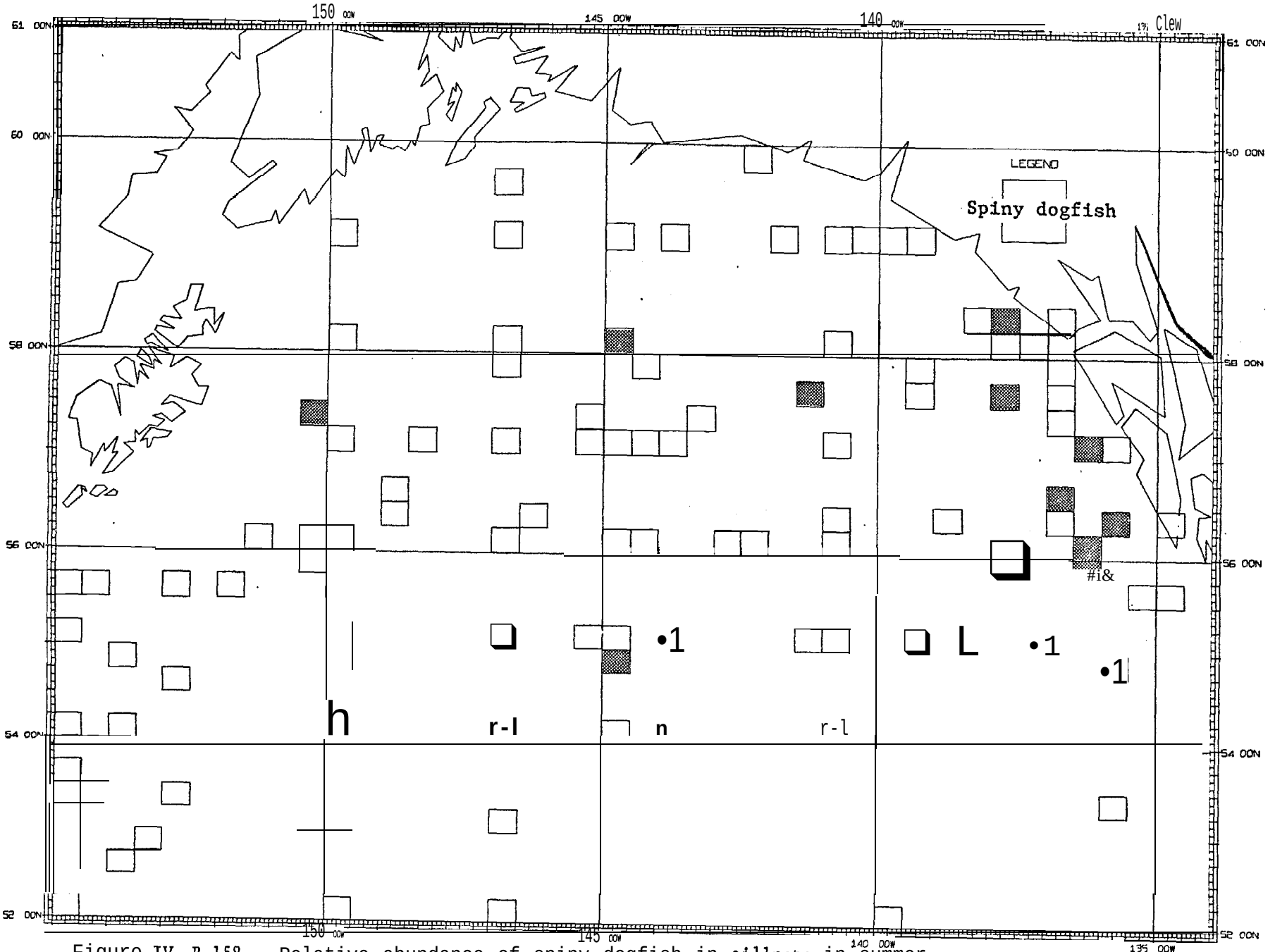


Figure IV. B.158.--Relative abundance of spiny dogfish in gillnets in summer, Gulf of Alaska.

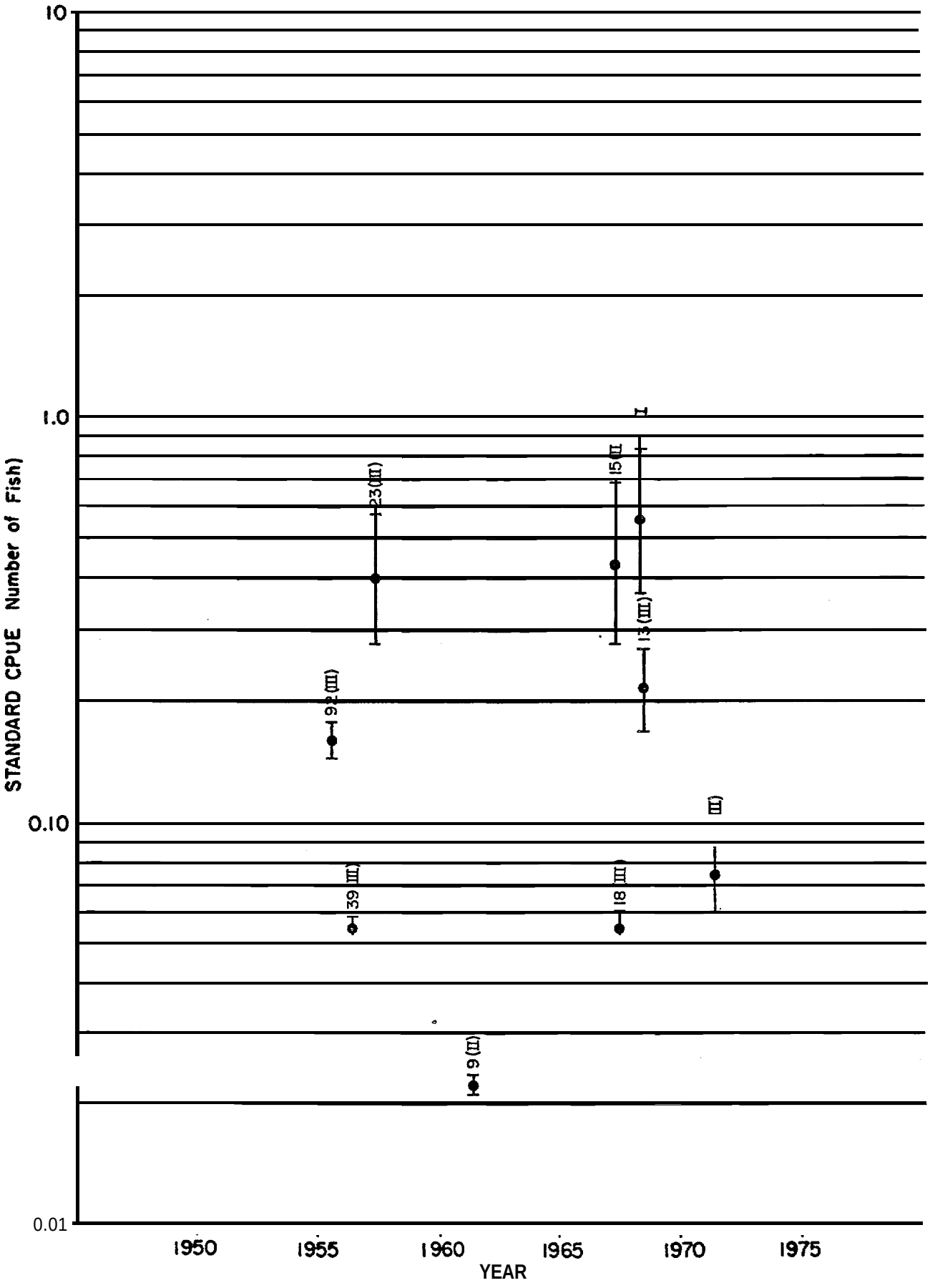


Figure IV.B.159.--Standardized rate of catch of spiny dogfish by gillnet in the Gulf of Alaska (geometric mean: number/km of net in 12 hr soak with 90% confidence internal, number of observations, and quarter of the year).

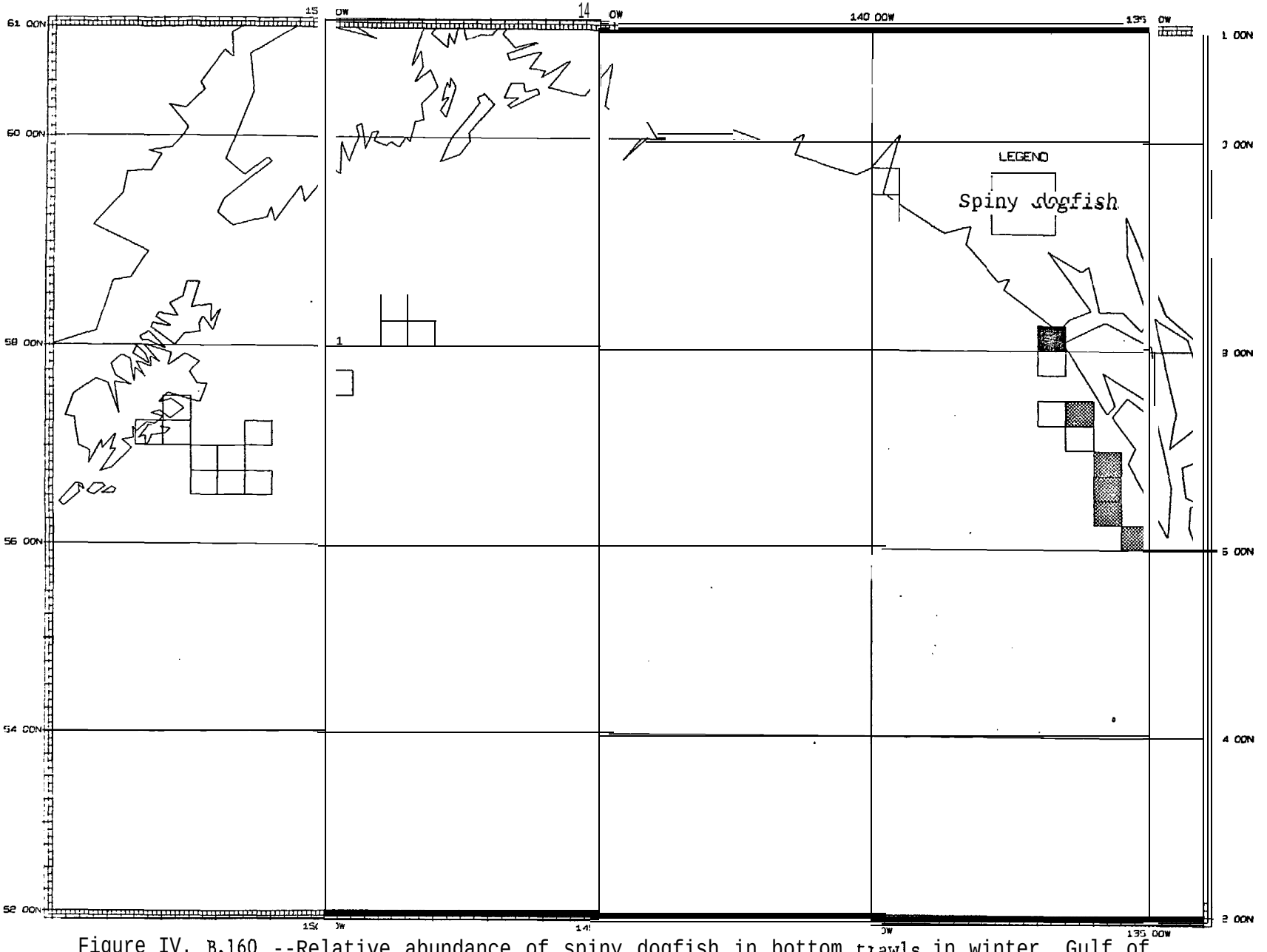


Figure IV. B.160.--Relative abundance of spiny dogfish in bottom trawls in winter, Gulf of Alaska.

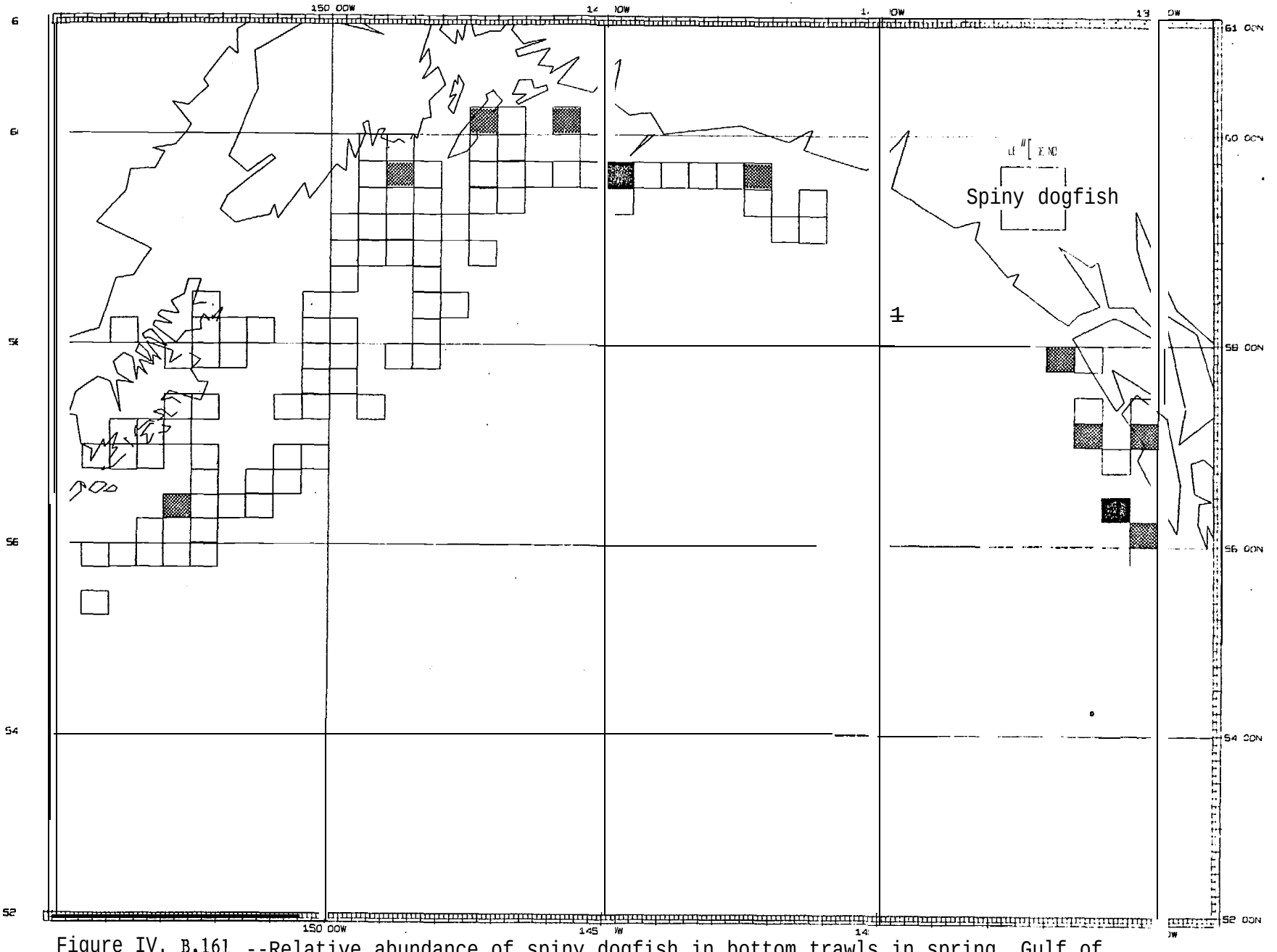


Figure IV. B.161.--Relative abundance of spiny dogfish in bottom trawls in spring, Gulf of Alaska.

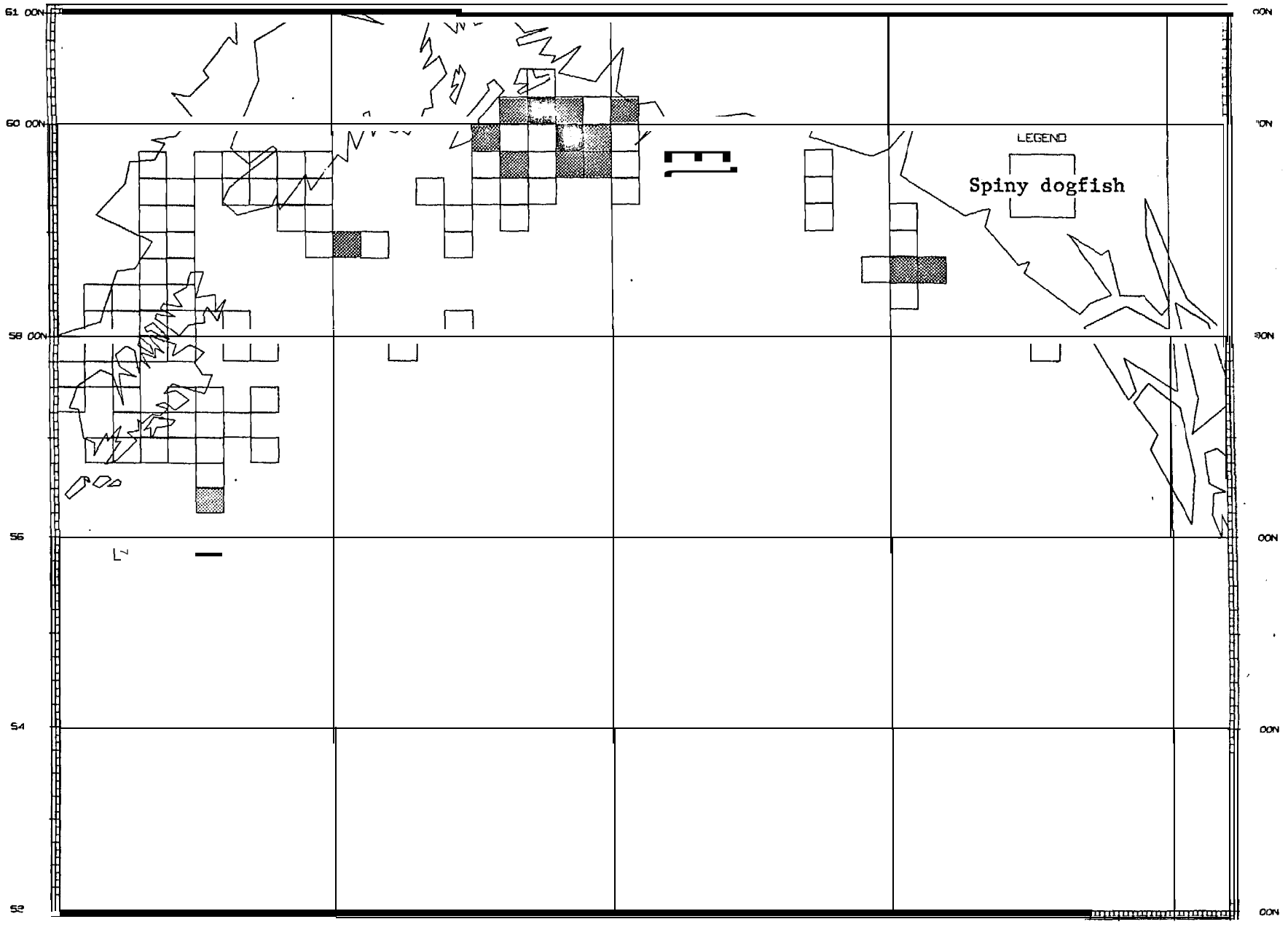


Figure IV.B.162.--Relative abundance of spiny dogfish in bottom trawls in summer, Gulf of Alaska.

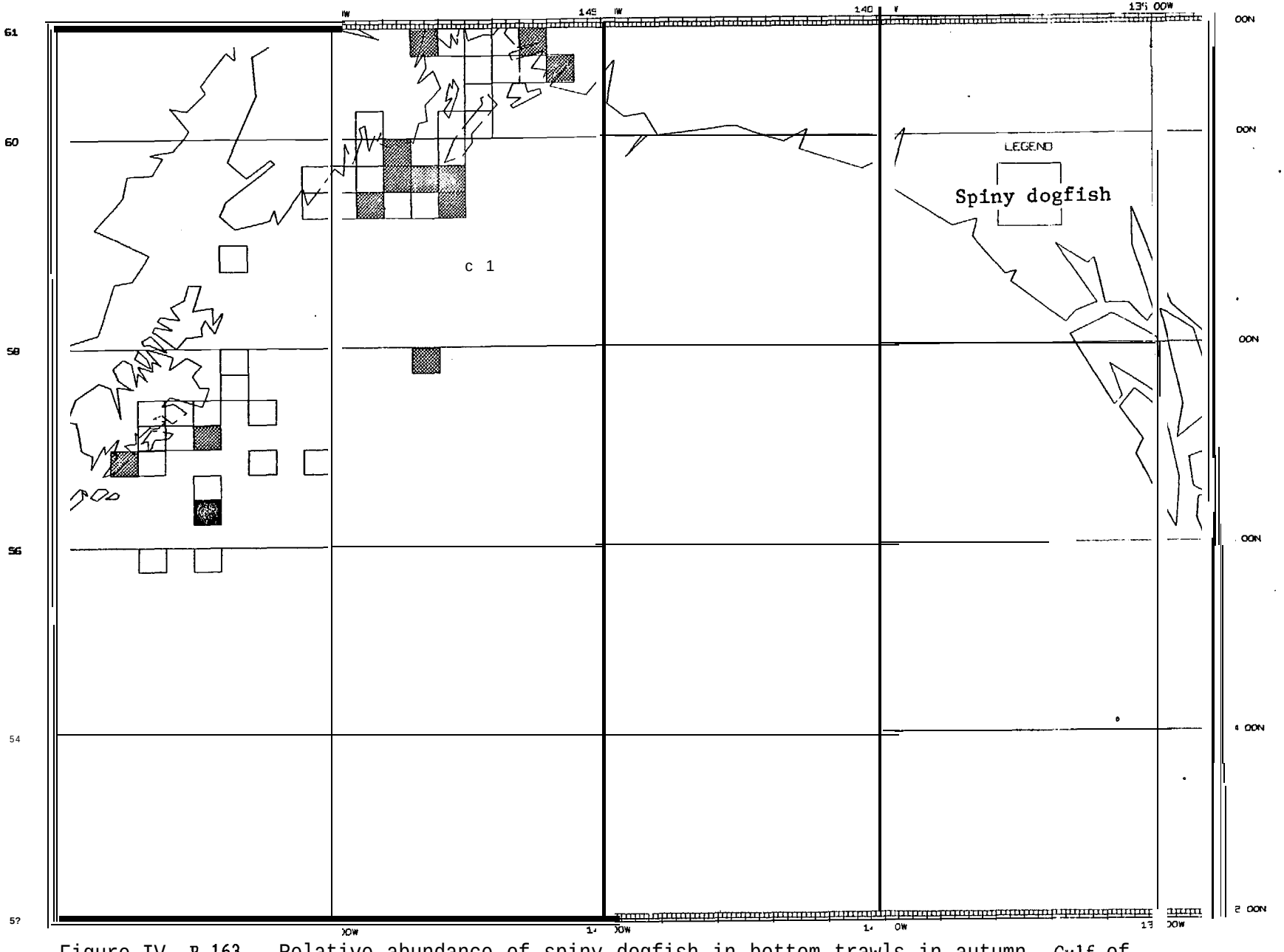


Figure IV. B.163.--Relative abundance of spiny dogfish in bottom trawls in autumn, Gulf of Alaska.

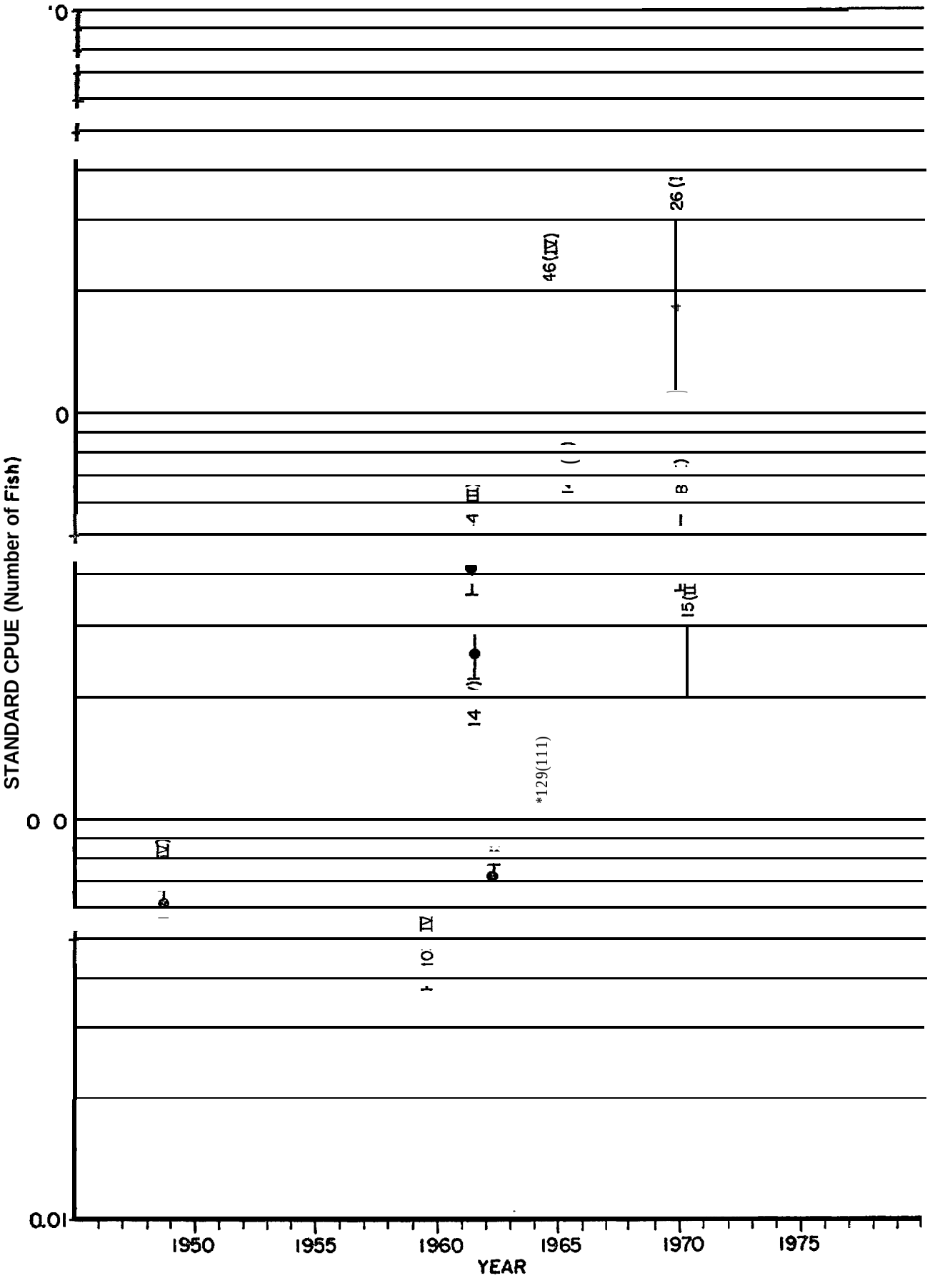


Figure IV.B.164.--Standardized rate of catch of spiny dogfish by bottom trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

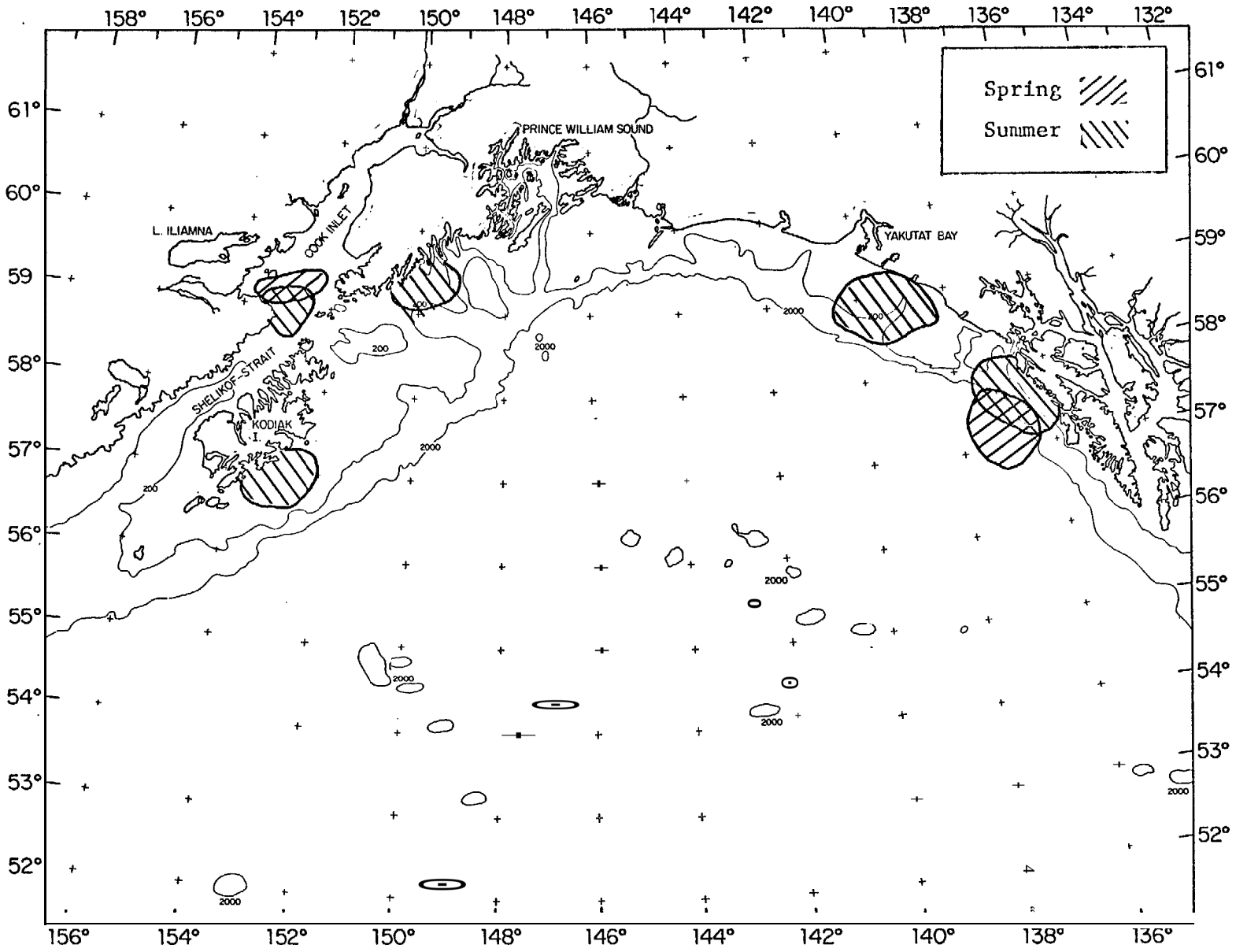


Figure IV.B.165.--Generalized areas in which juvenile Pacific herring were caught by seines in spring and summer, Gulf of Alaska.

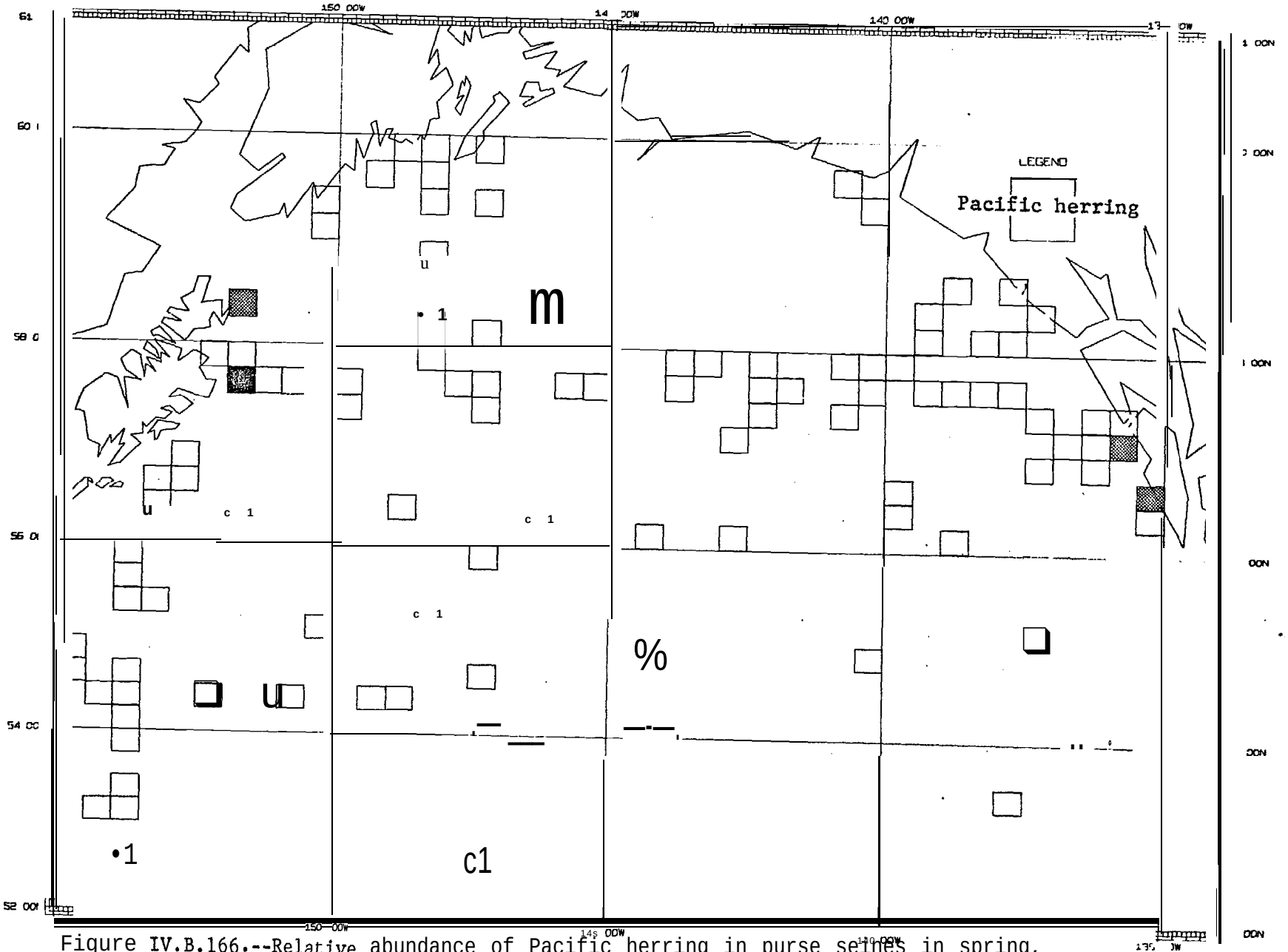


Figure IV.B.166.--Relative abundance of Pacific herring in purse seines in spring, Gulf of Alaska.

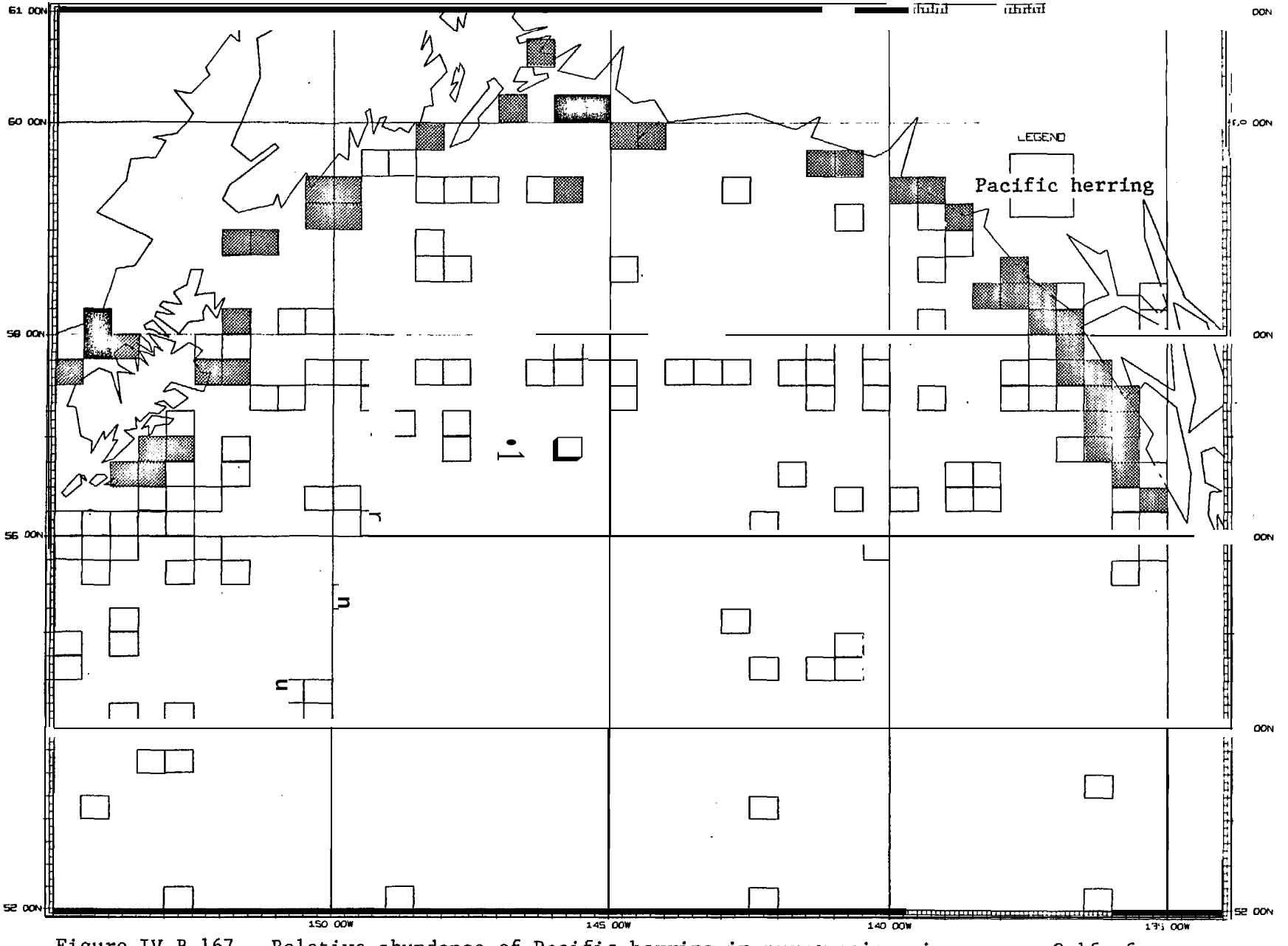


Figure IV.B.167.--Relative abundance of Pacific herring in purse seines in summer, Gulf of Alaska.

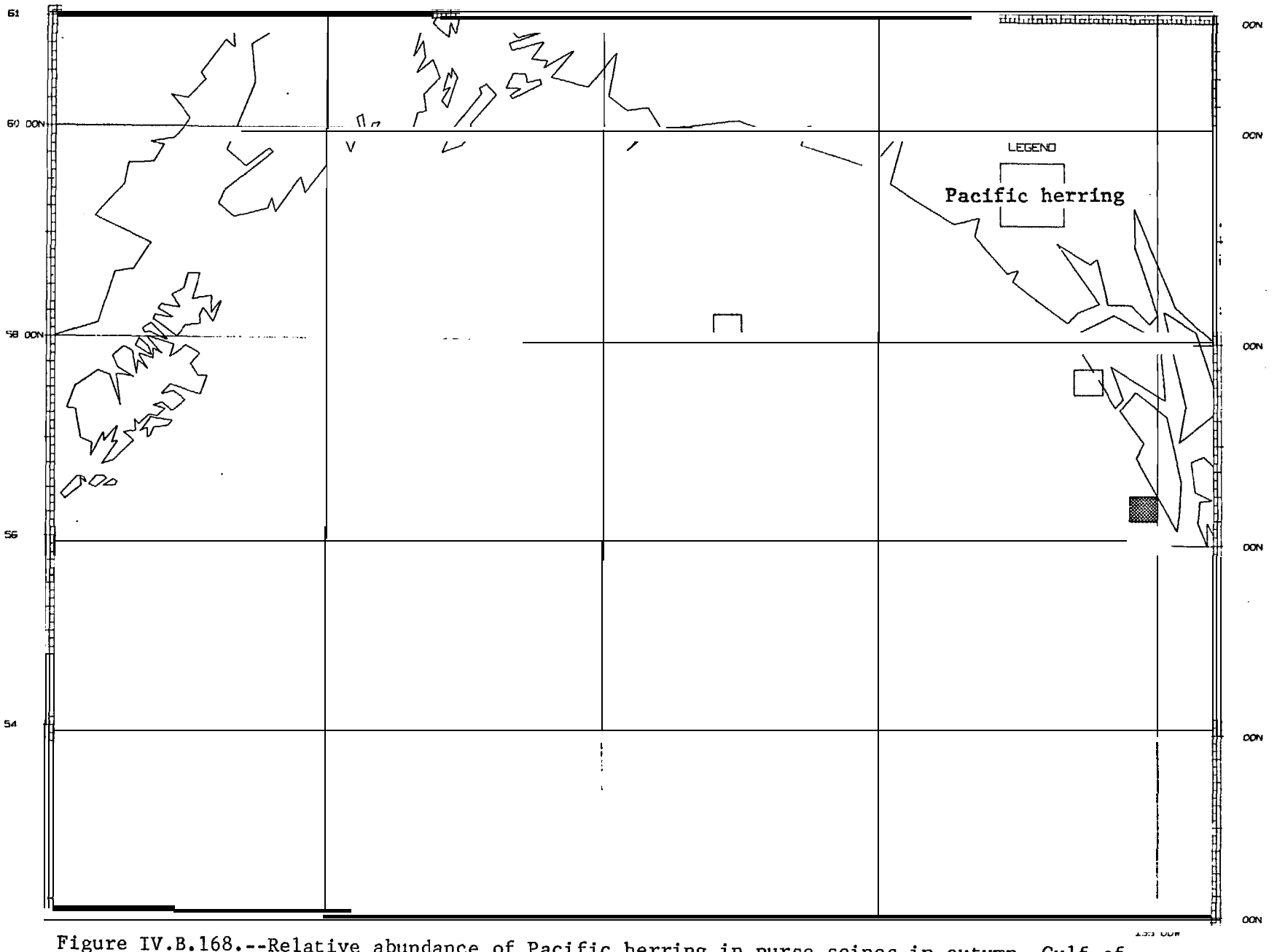


Figure IV.B.168.--Relative abundance of Pacific herring in purse seines in autumn, Gulf of Alaska.

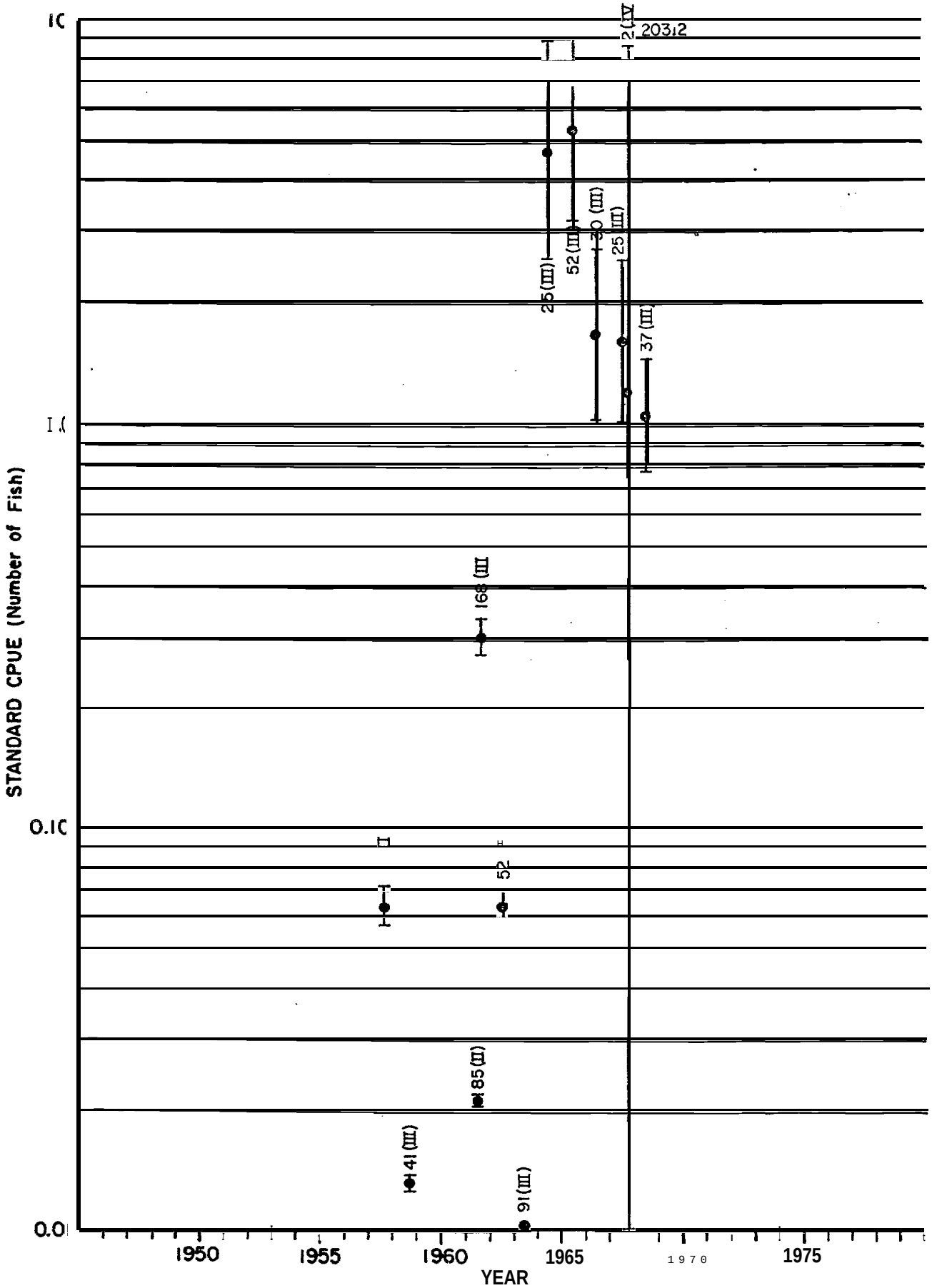


Figure IV.B.169.--Standardized rate of catch of Pacific herring by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

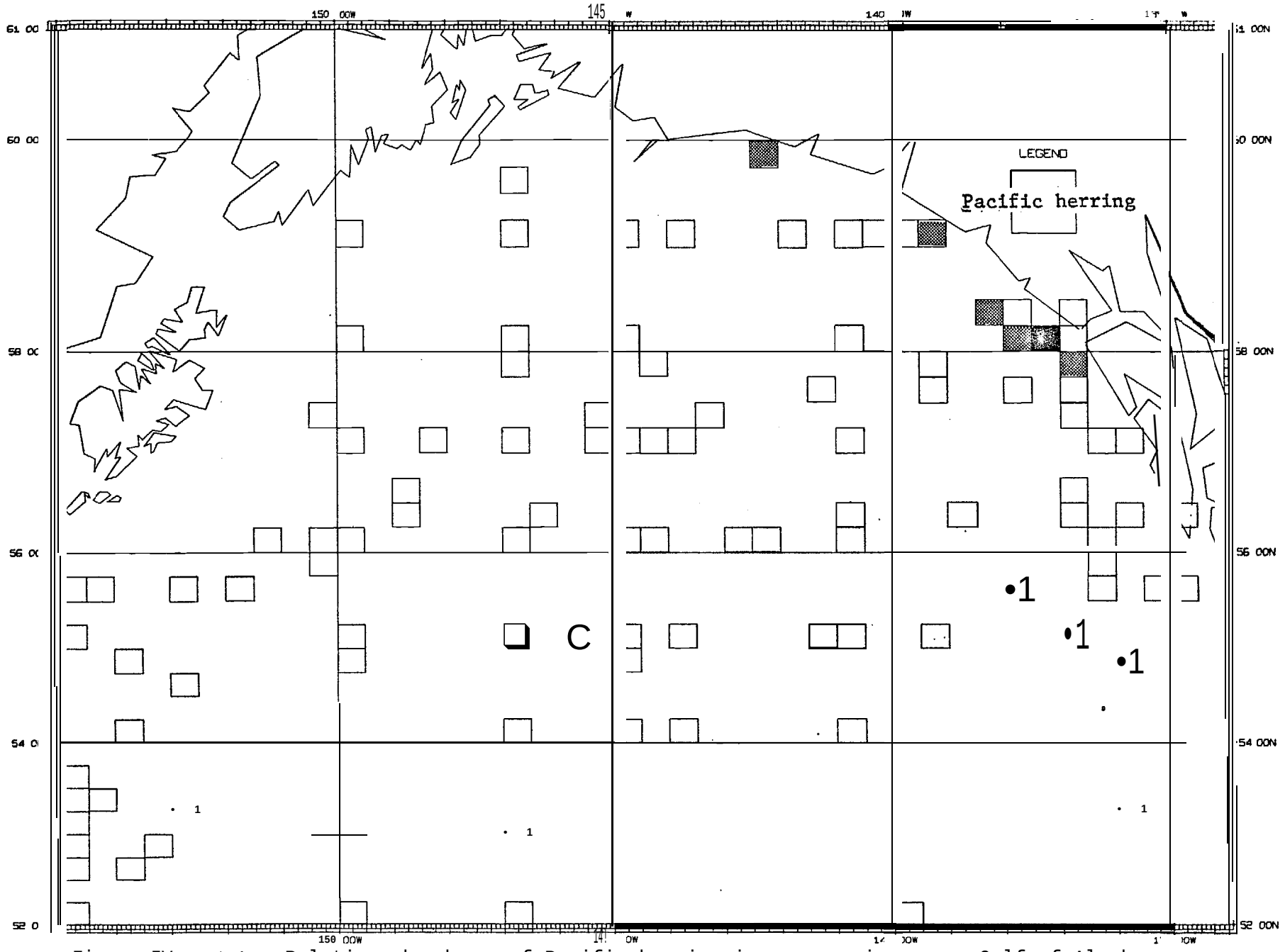


Figure IV. B.170.--Relative abundance of Pacific herring in gillnets in summer, Gulf of Alaska.

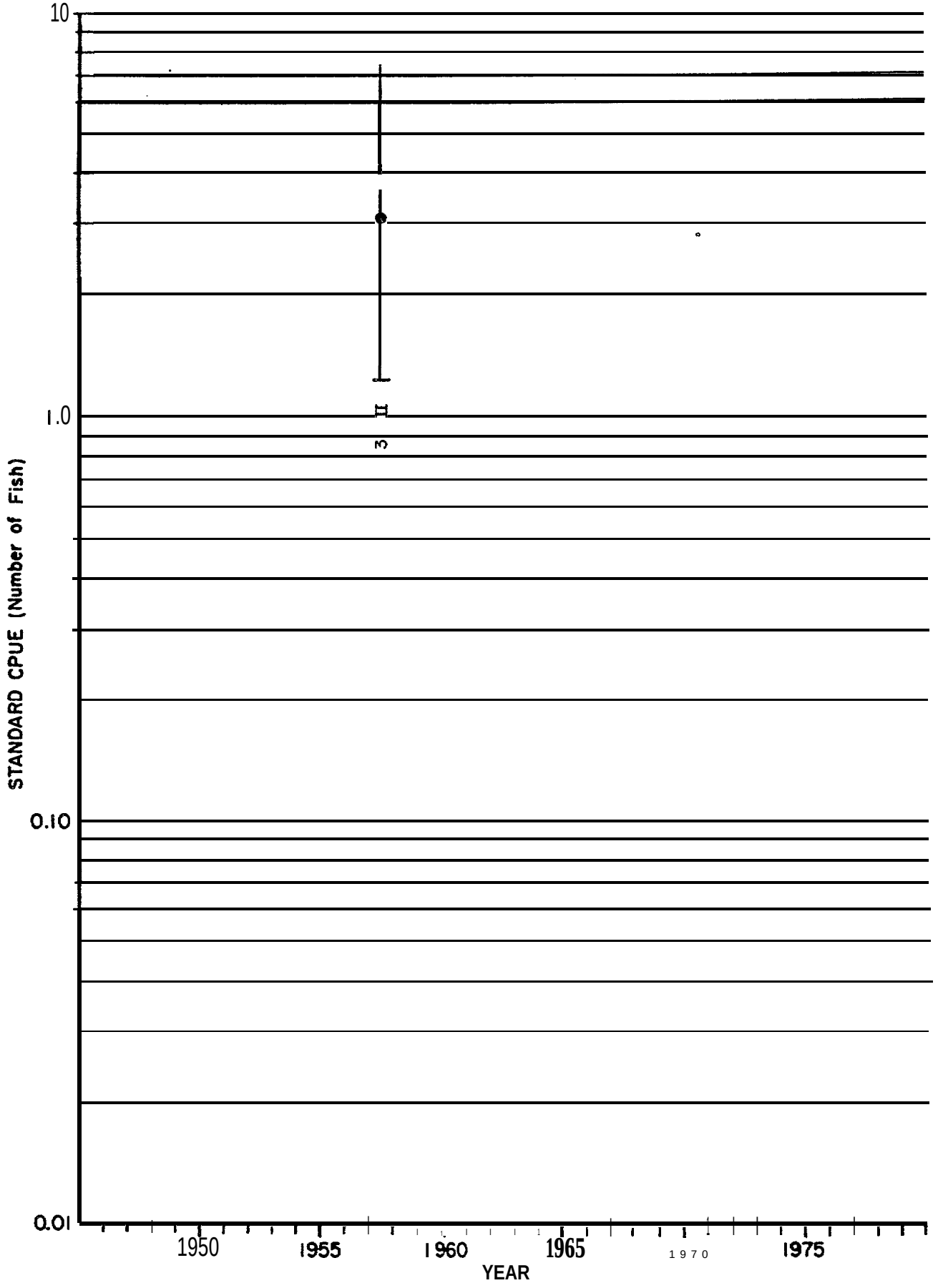


Figure IV.B.171.--Standardized rate of catch of Pacific herring by gillnet in the Gulf of Alaska (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

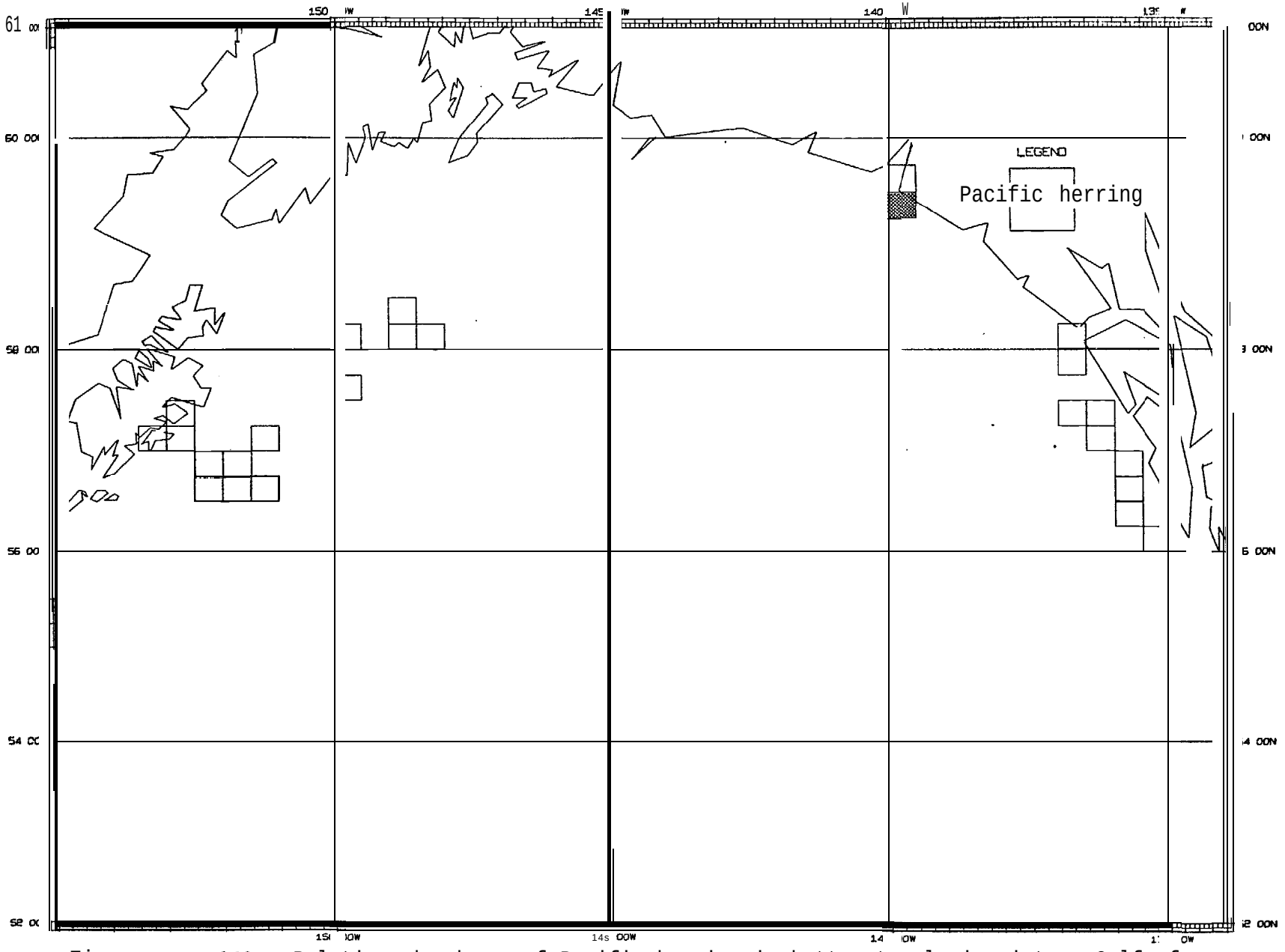


Figure IV.B.172.--Relative abundance of Pacific herring in bottom trawls in winter, Gulf of Alaska.

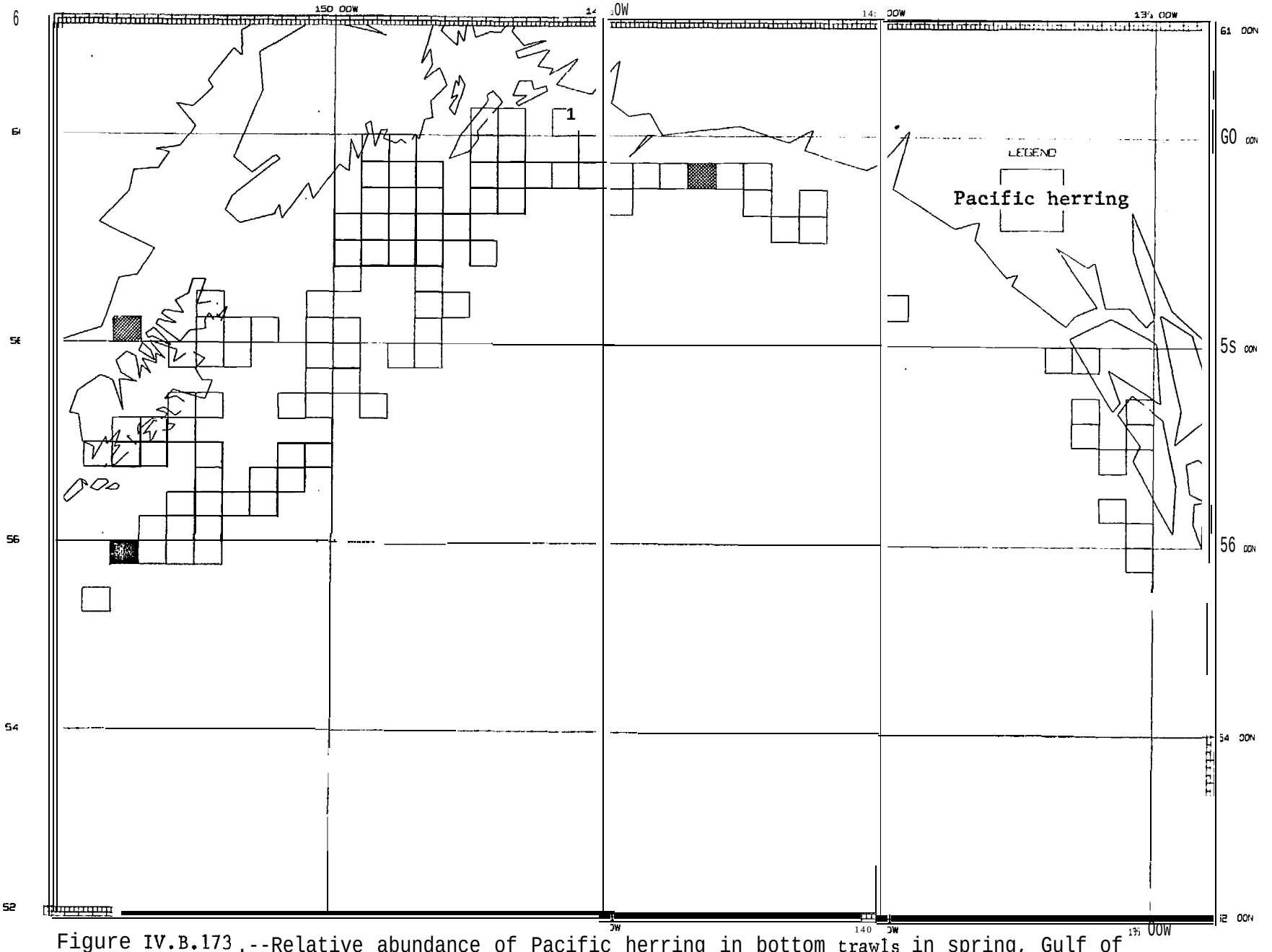


Figure IV.B.173.--Relative abundance of Pacific herring in bottom trawls in spring, Gulf of Alaska.

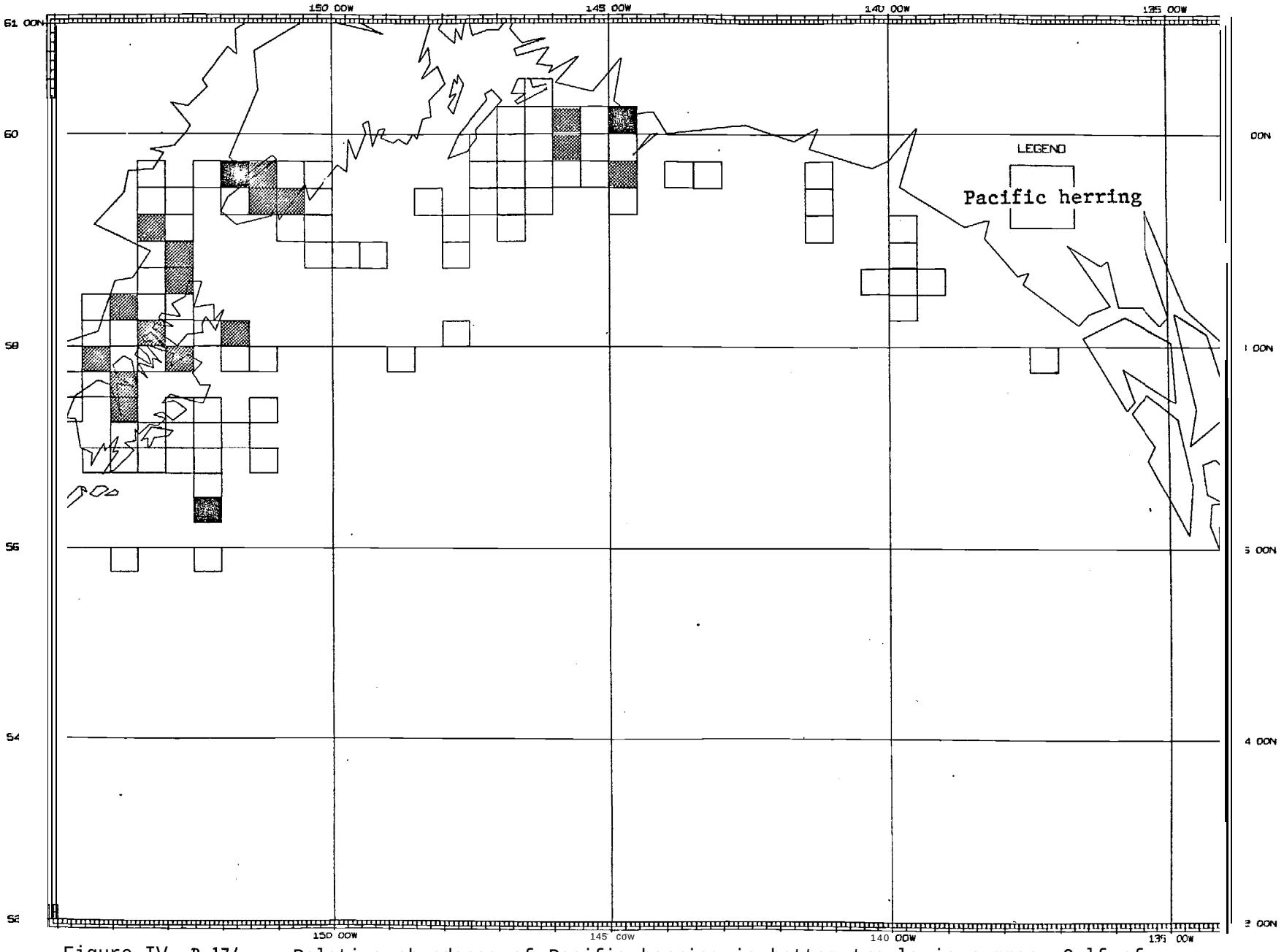


Figure IV. B.174. --Relative abundance of Pacific herring in bottom trawls in summer, Gulf of Alaska.

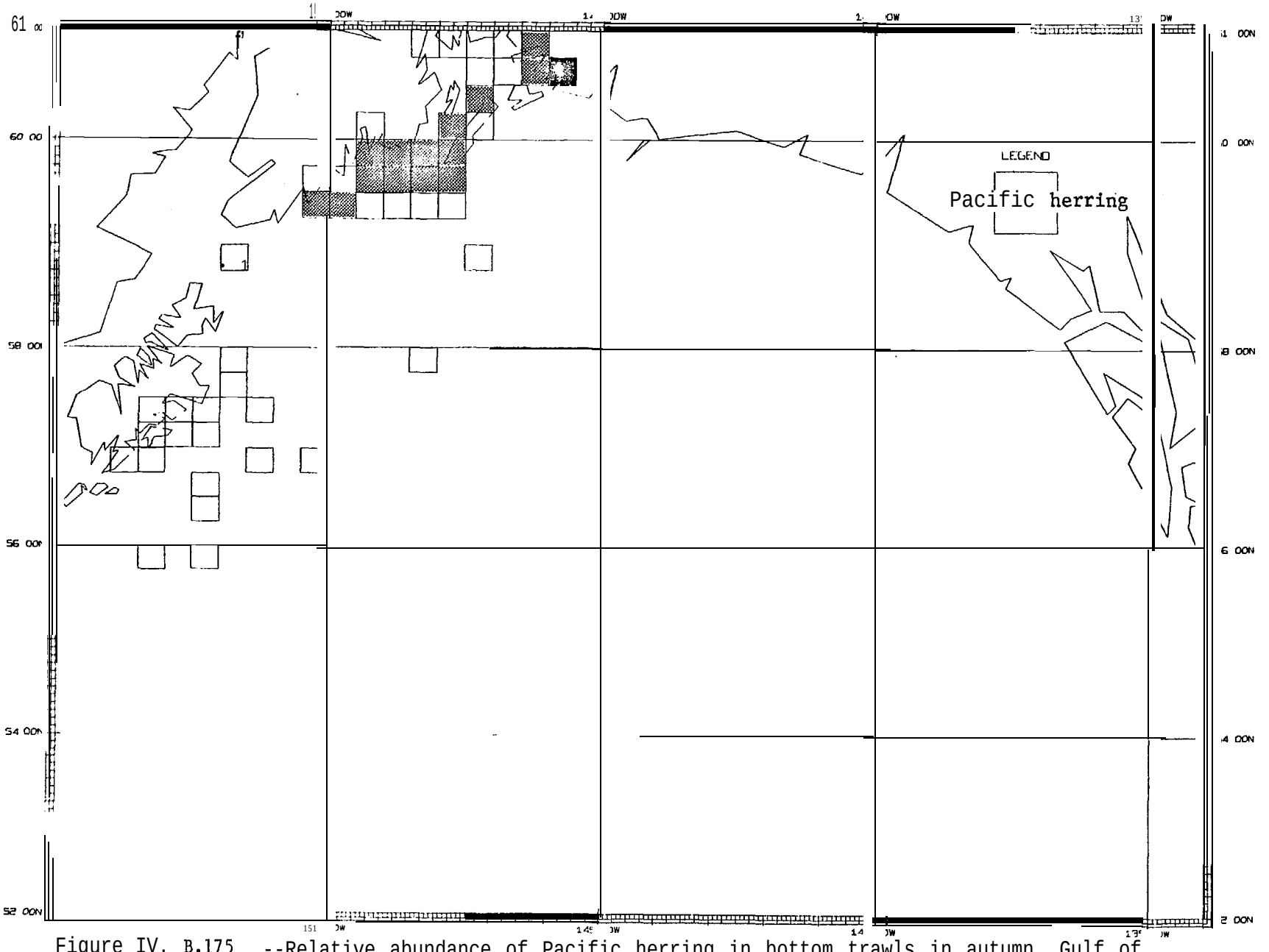


Figure IV. B.175. --Relative abundance of Pacific herring in bottom trawls in autumn, Gulf of Alaska.

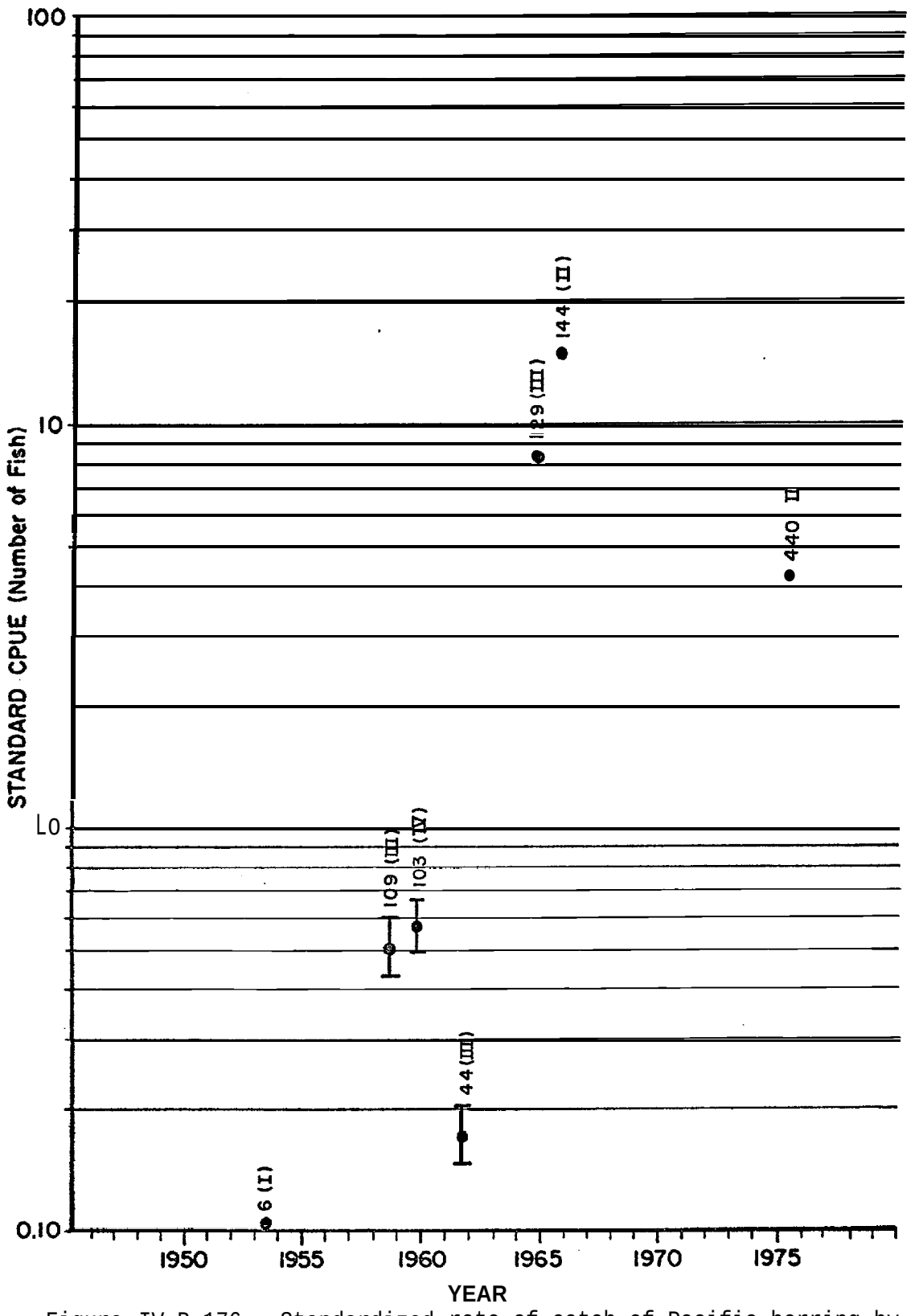


Figure IV.B.176.--Standardized rate of catch of Pacific herring by bottom trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

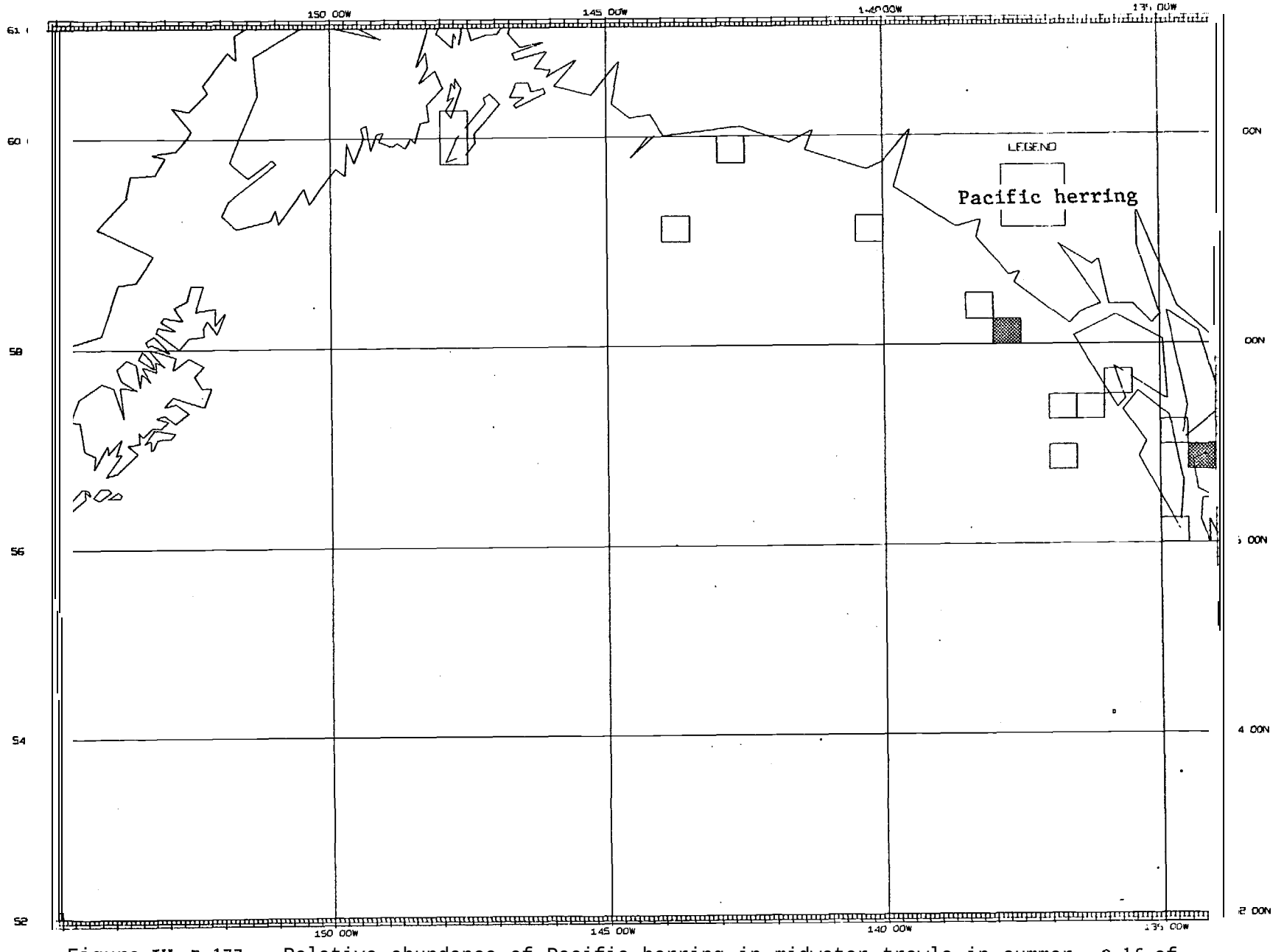


Figure IV. B.177.--Relative abundance of Pacific herring in midwater trawls in summer, Gulf of Alaska.

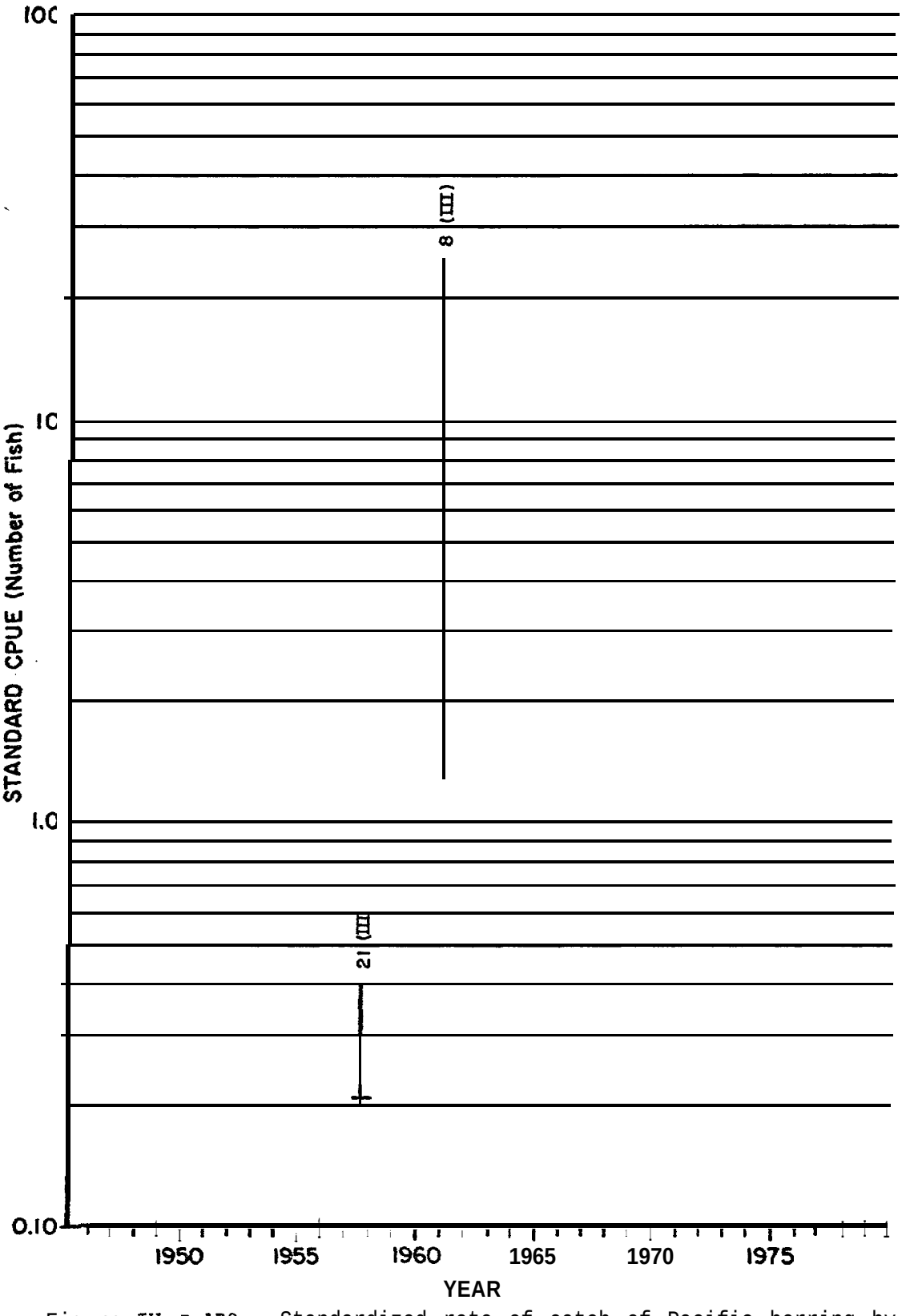


Figure IV. B.178.--Standardized rate of catch of Pacific herring by midwater trawl in the Gulf of Alaska (geometric mean: number/ 30 min tow with 90% confidence interval, number of observations, and quarter of the year).

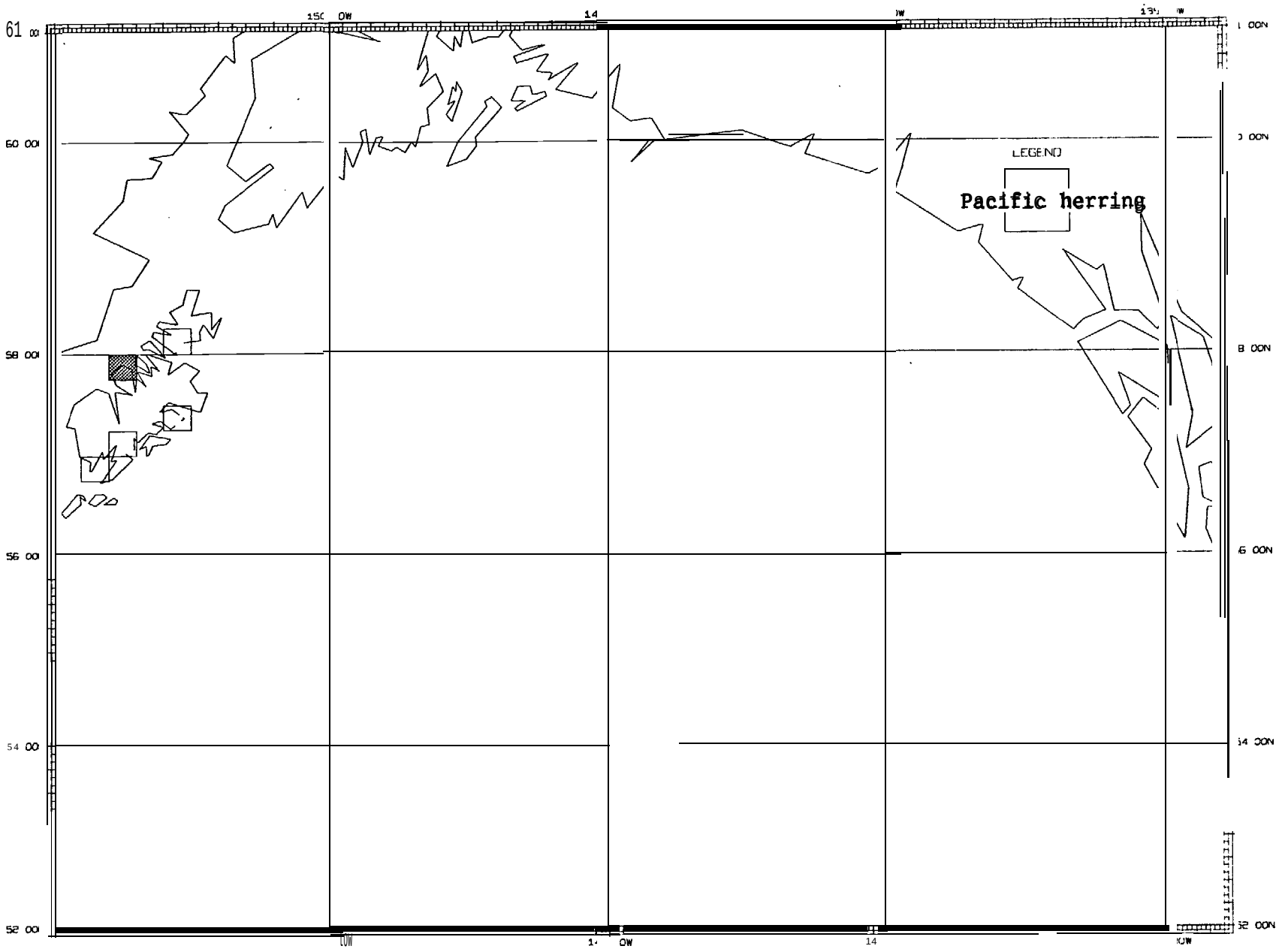


Figure IV.B.179.--Relative abundance of Pacific herring in tow nets in spring, Gulf of Alaska.

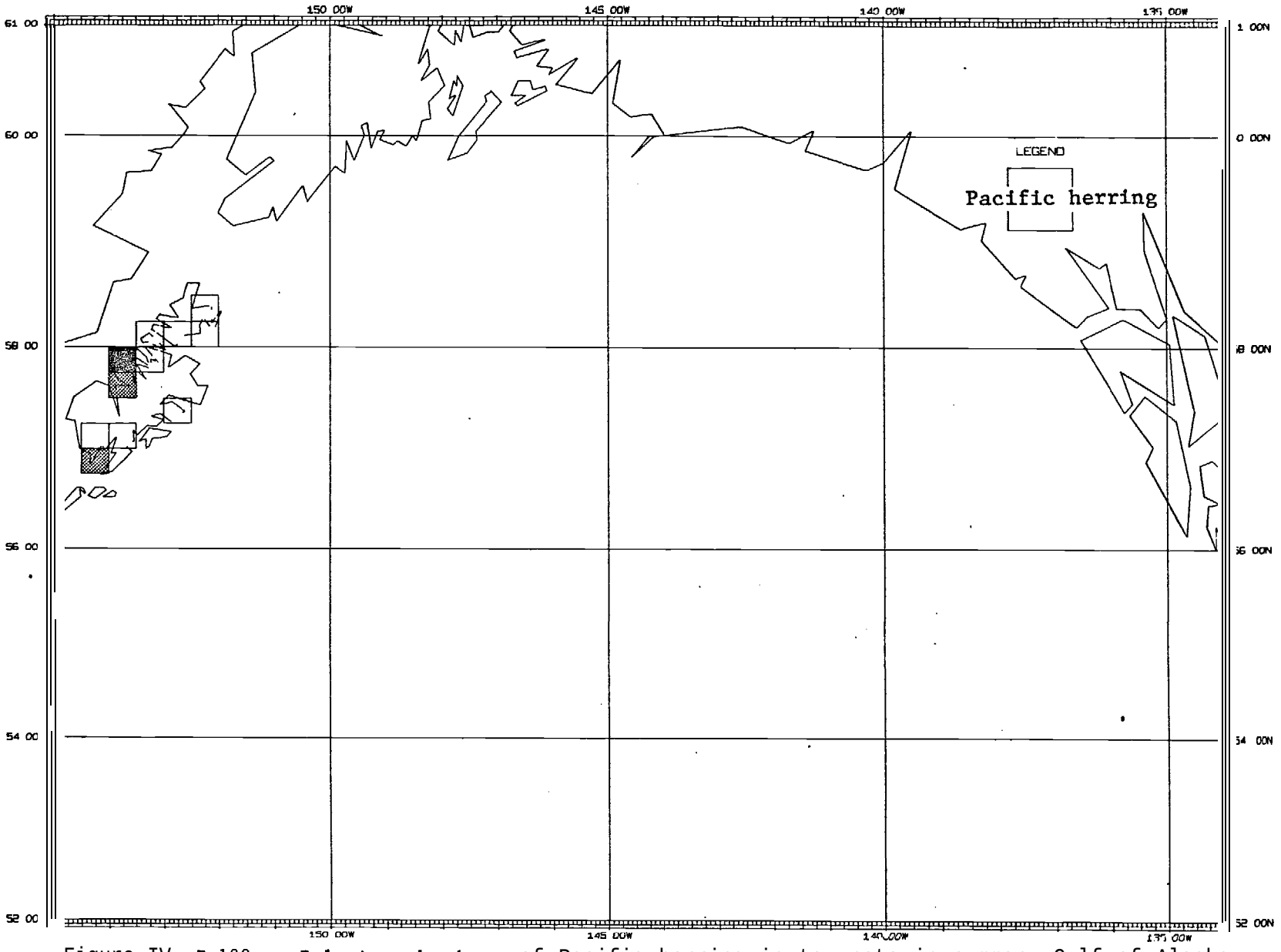


Figure IV. B.180. --Relative abundance of Pacific herring in tow nets in summer, Gulf of Alaska.

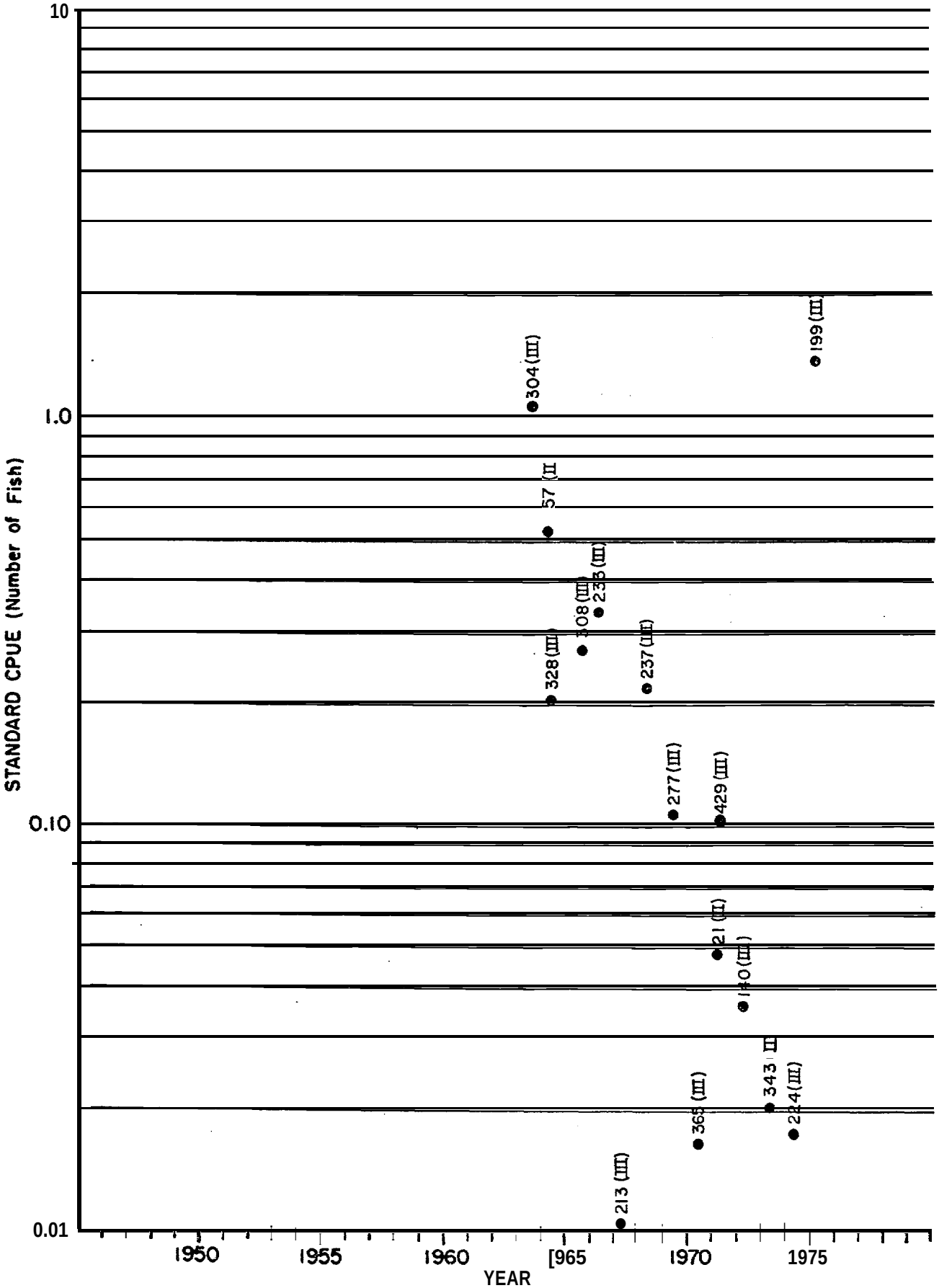


Figure IV. B.181.--Standardized rate of catch of Pacific herring by tow net in the Gulf of Alaska (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

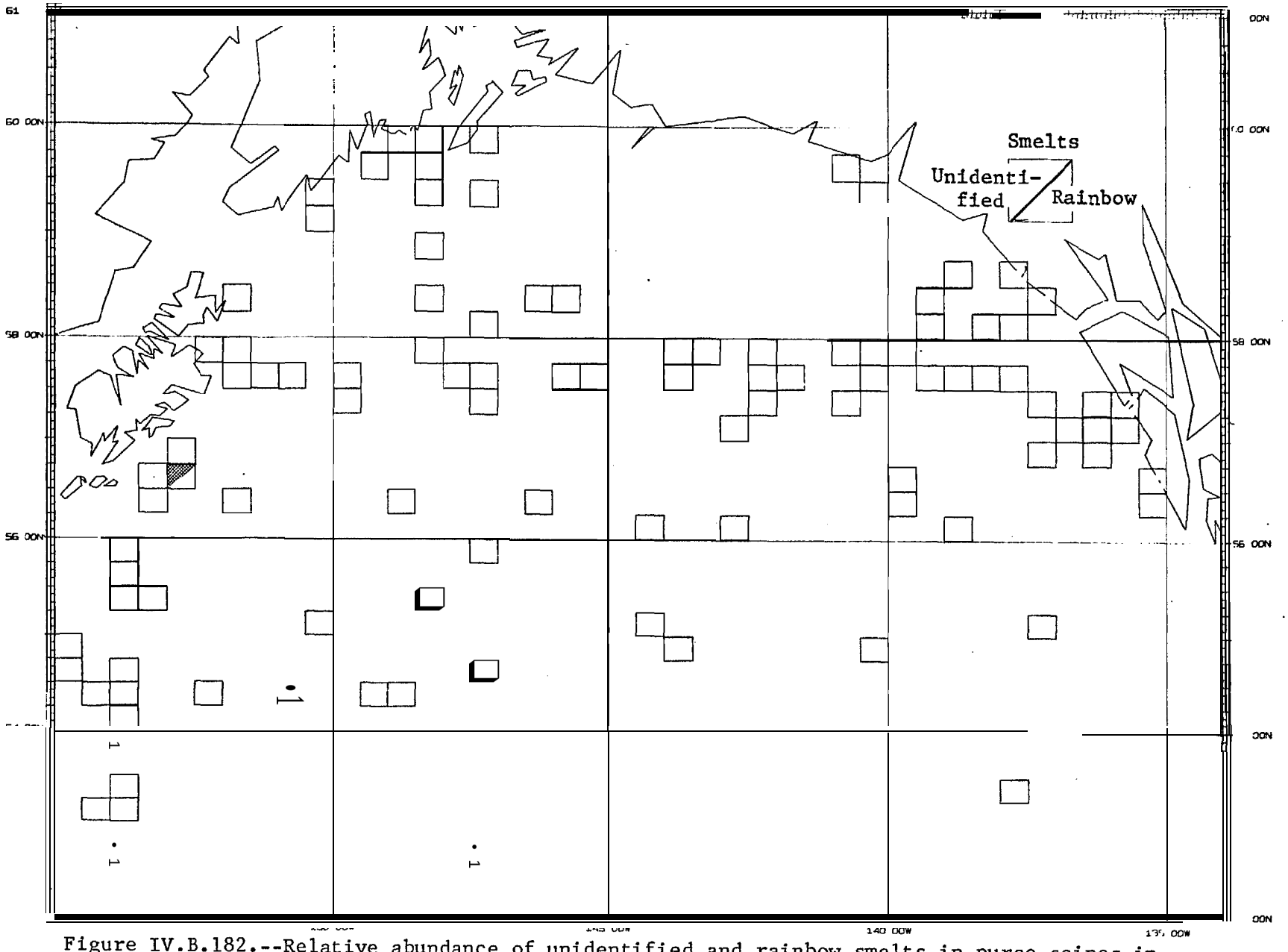


Figure IV.B.182.--Relative abundance of unidentified and rainbow smelts in purse seines in spring, Gulf of Alaska.

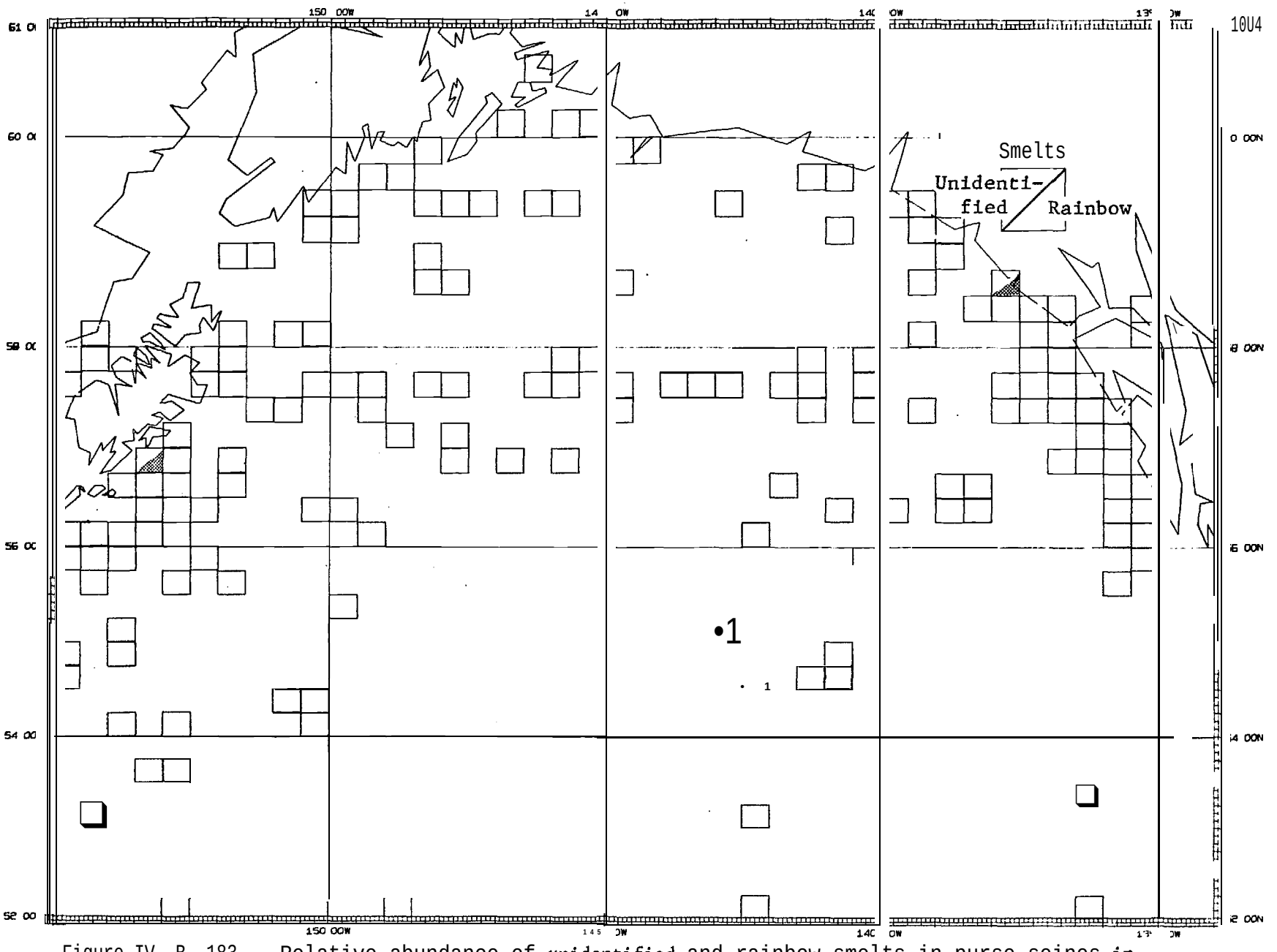


Figure IV. B. 183 .--Relative abundance of unidentified and rainbow smelts in purse seines in summer, Gulf of Alaska.

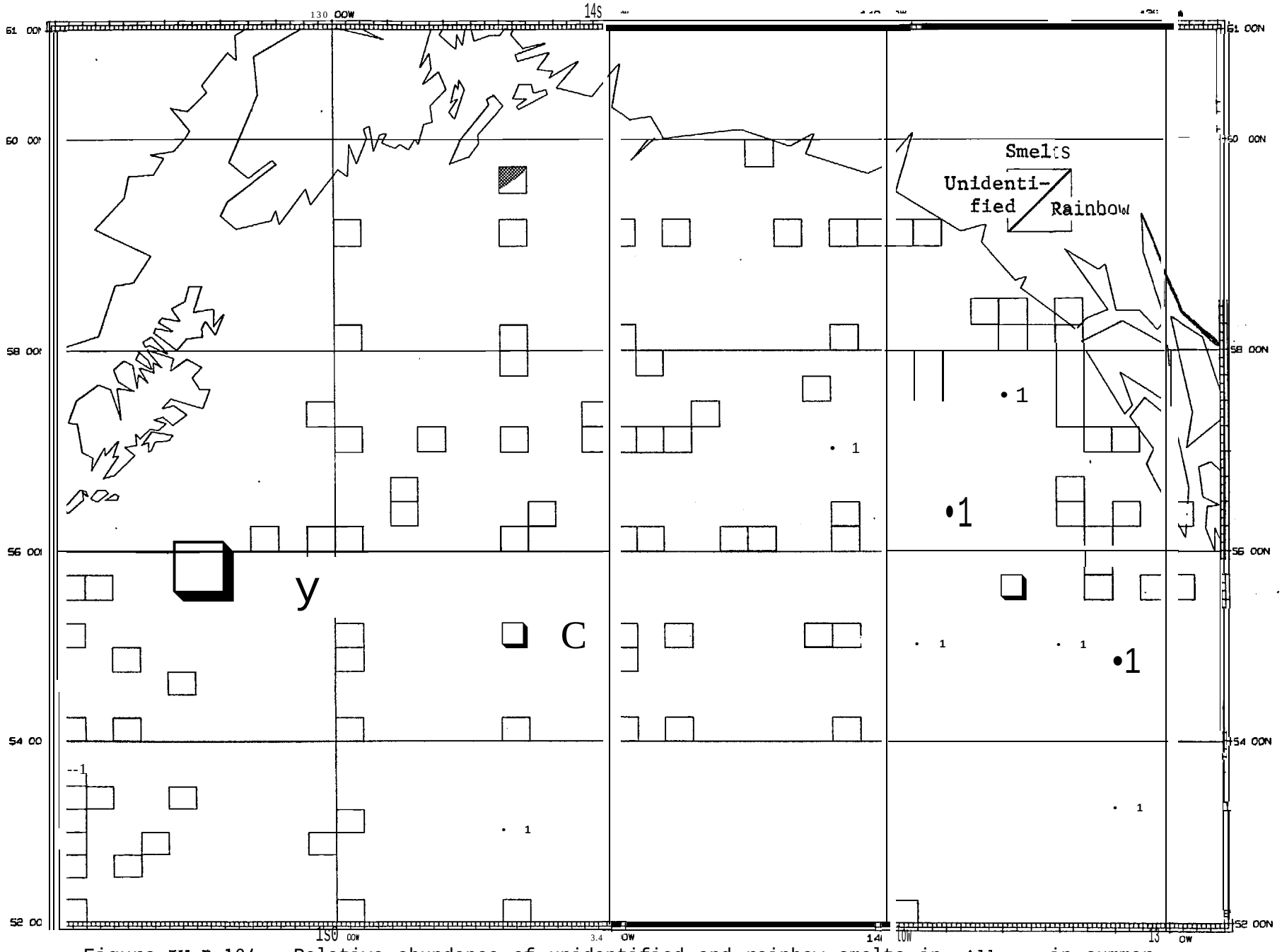


Figure IV.B.184.--Relative abundance of unidentified and rainbow smelts in gillnets in summer, Gulf of Alaska.

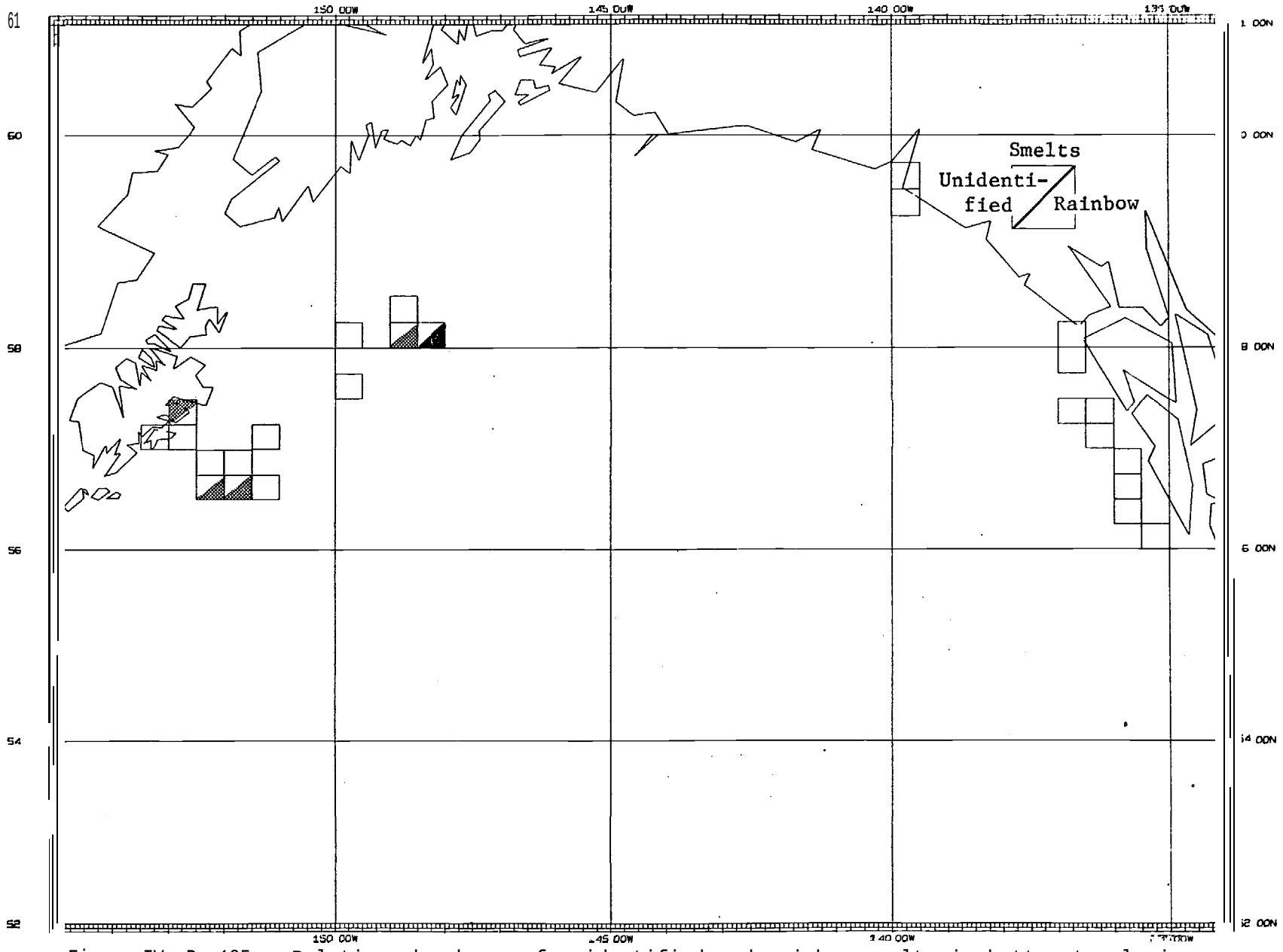


Figure IV. B. 185.--Relative abundance of unidentified and rainbow smelts in bottom trawls in winter, Gulf of Alaska.

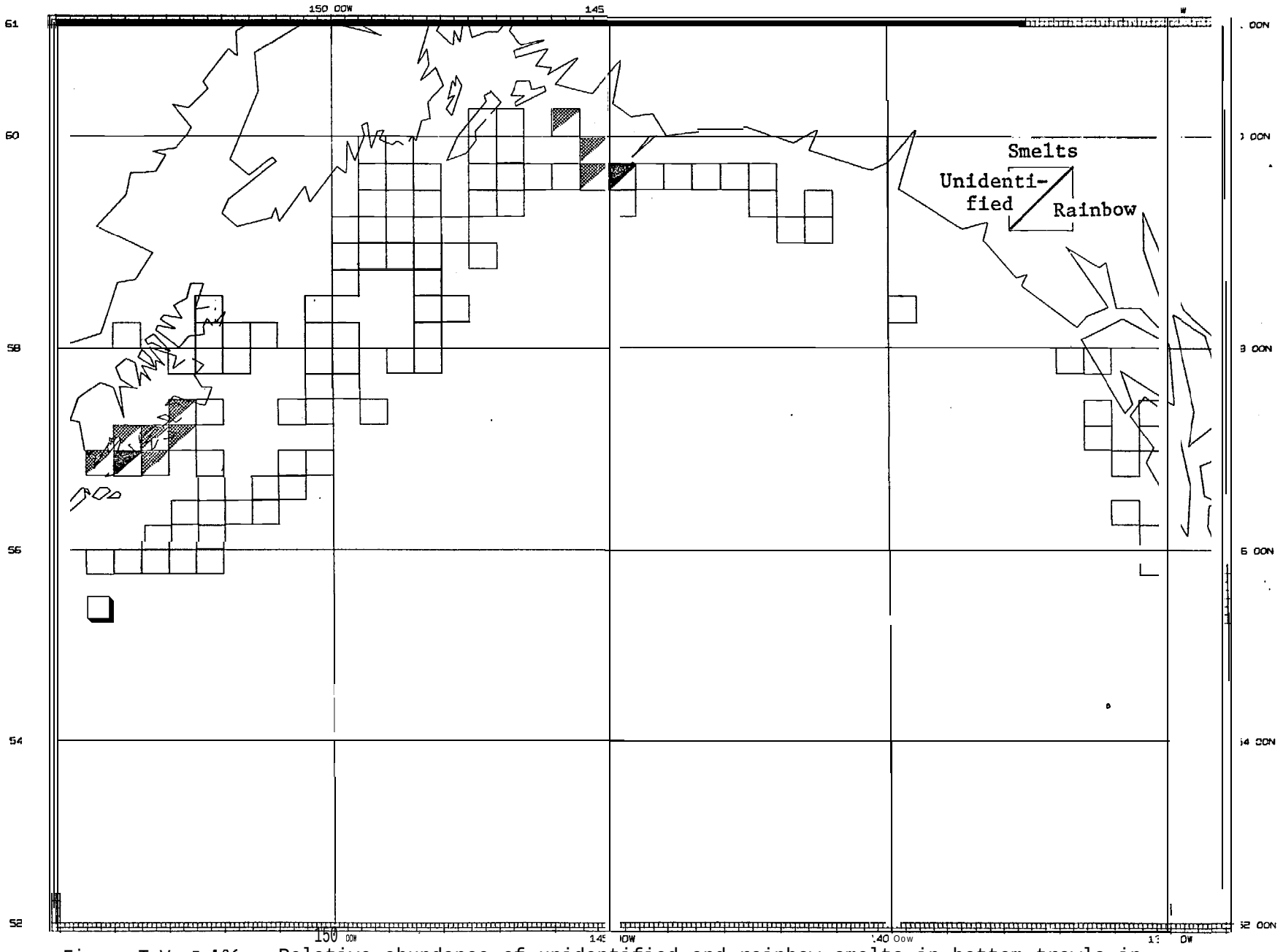


Figure T.V. B.186.--Relative abundance of unidentified and rainbow smelts in bottom trawls in spring, Gulf of Alaska.

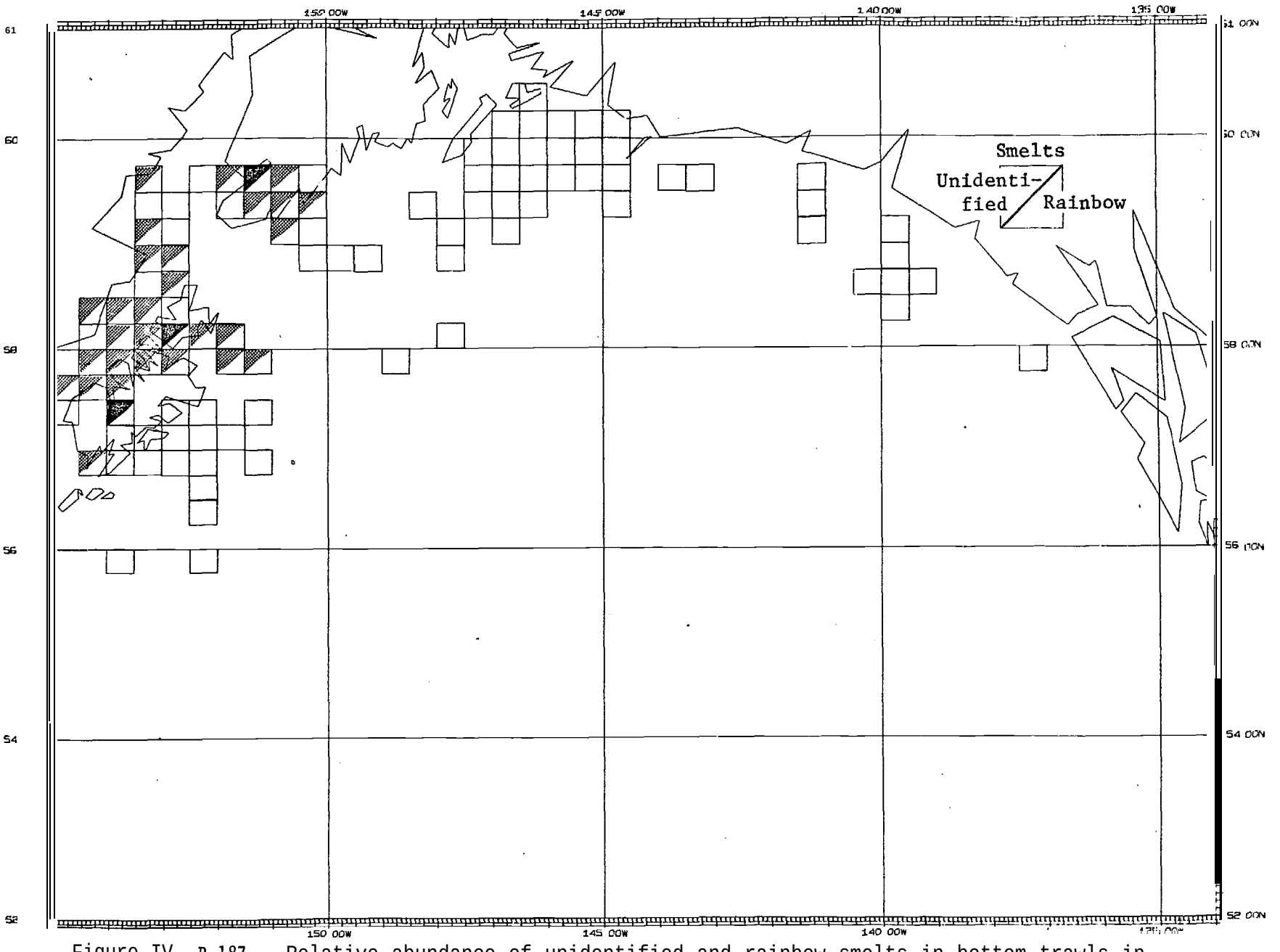


Figure IV. B.187,--Relative abundance of unidentified and rainbow smelts in bottom trawls in summer, Gulf of Alaska.

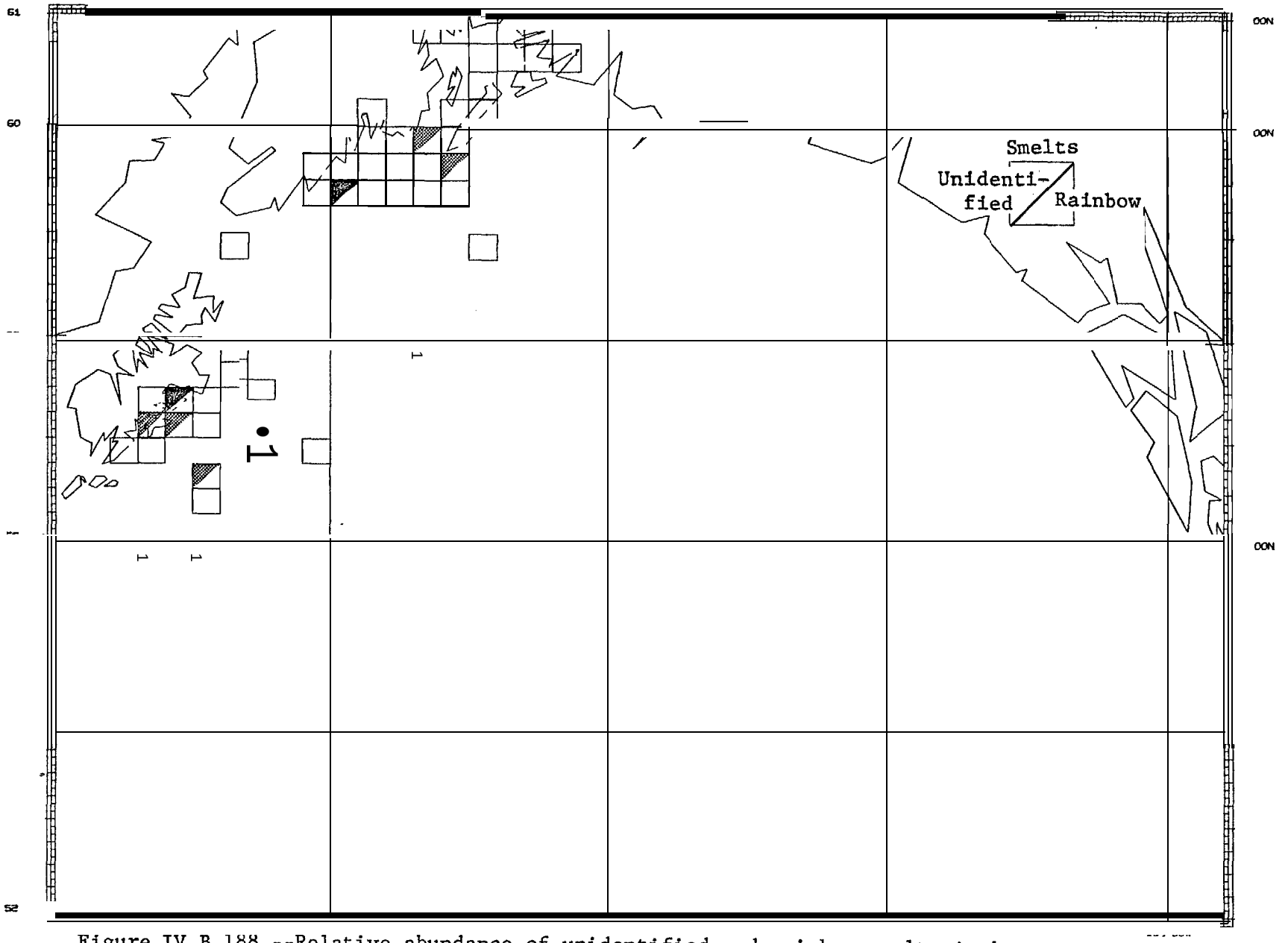


Figure IV.B.188.--Relative abundance of unidentified and rainbow smelts in bottom trawls in autumn, Gulf of Alaska.

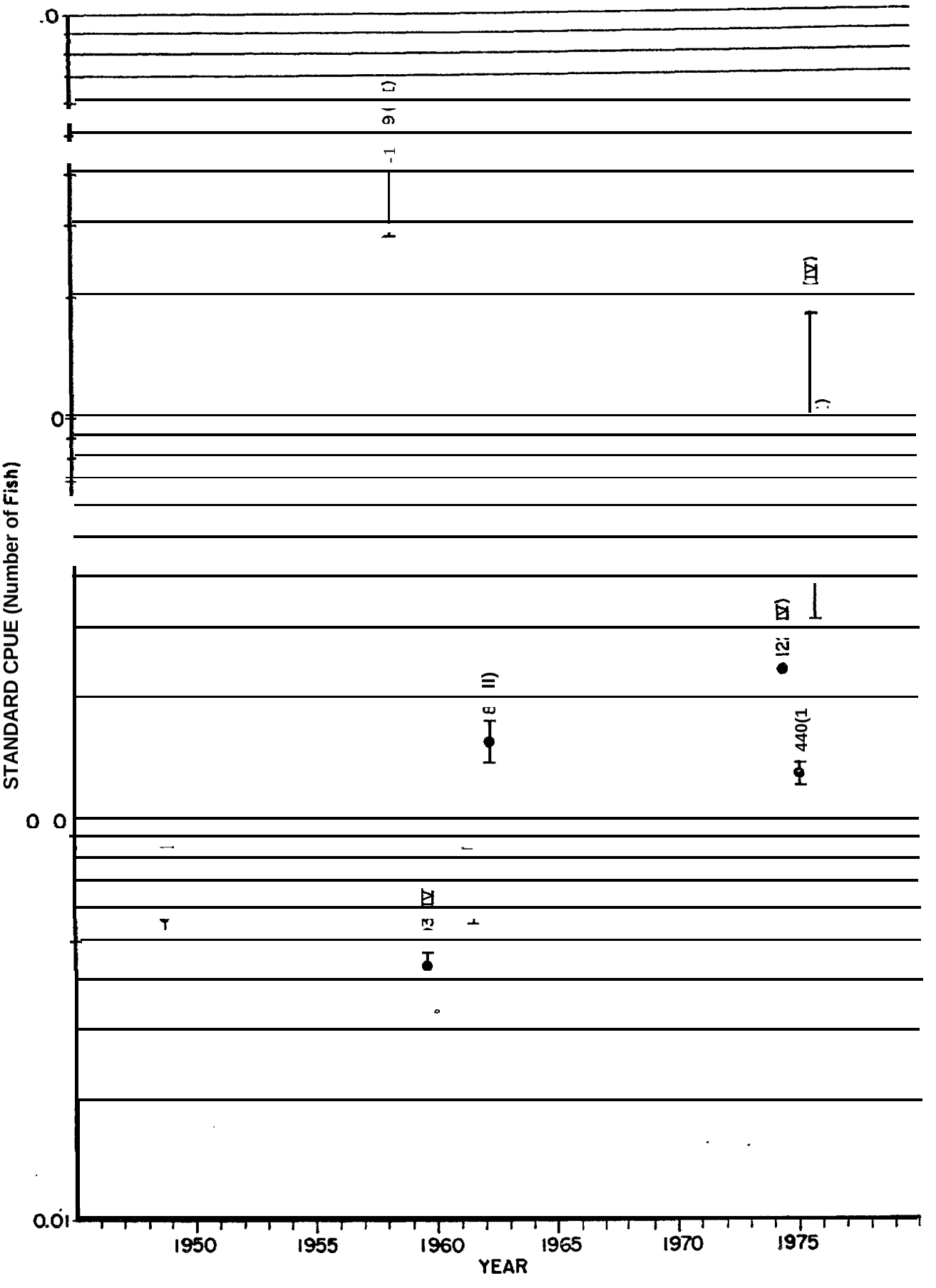


Figure IV.B.189.--Standardized rate of catch of unidentified smelts by bottom trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

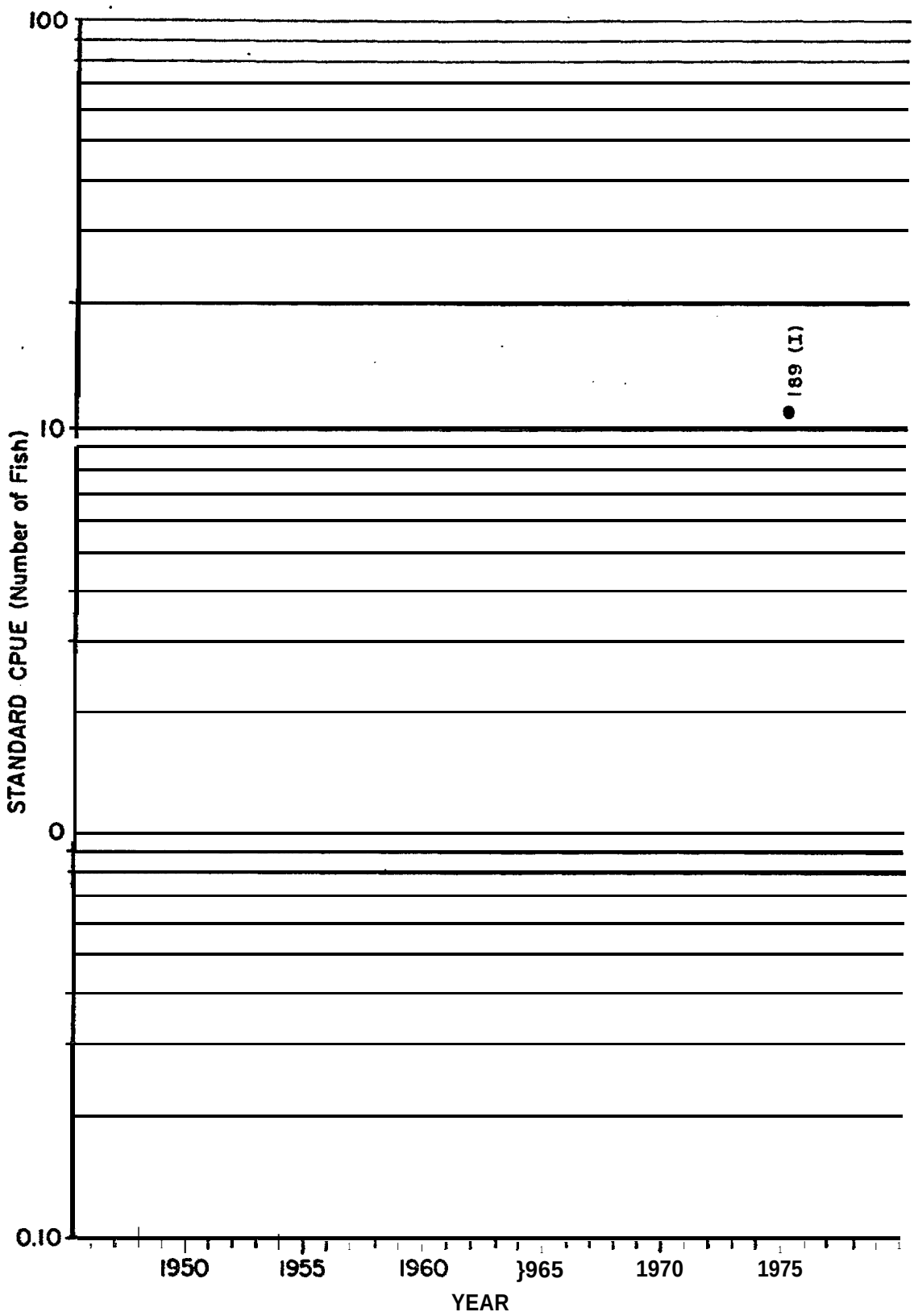


Figure IV.B.190.--Standardized rate of catch of rainbow smelt by bottom trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

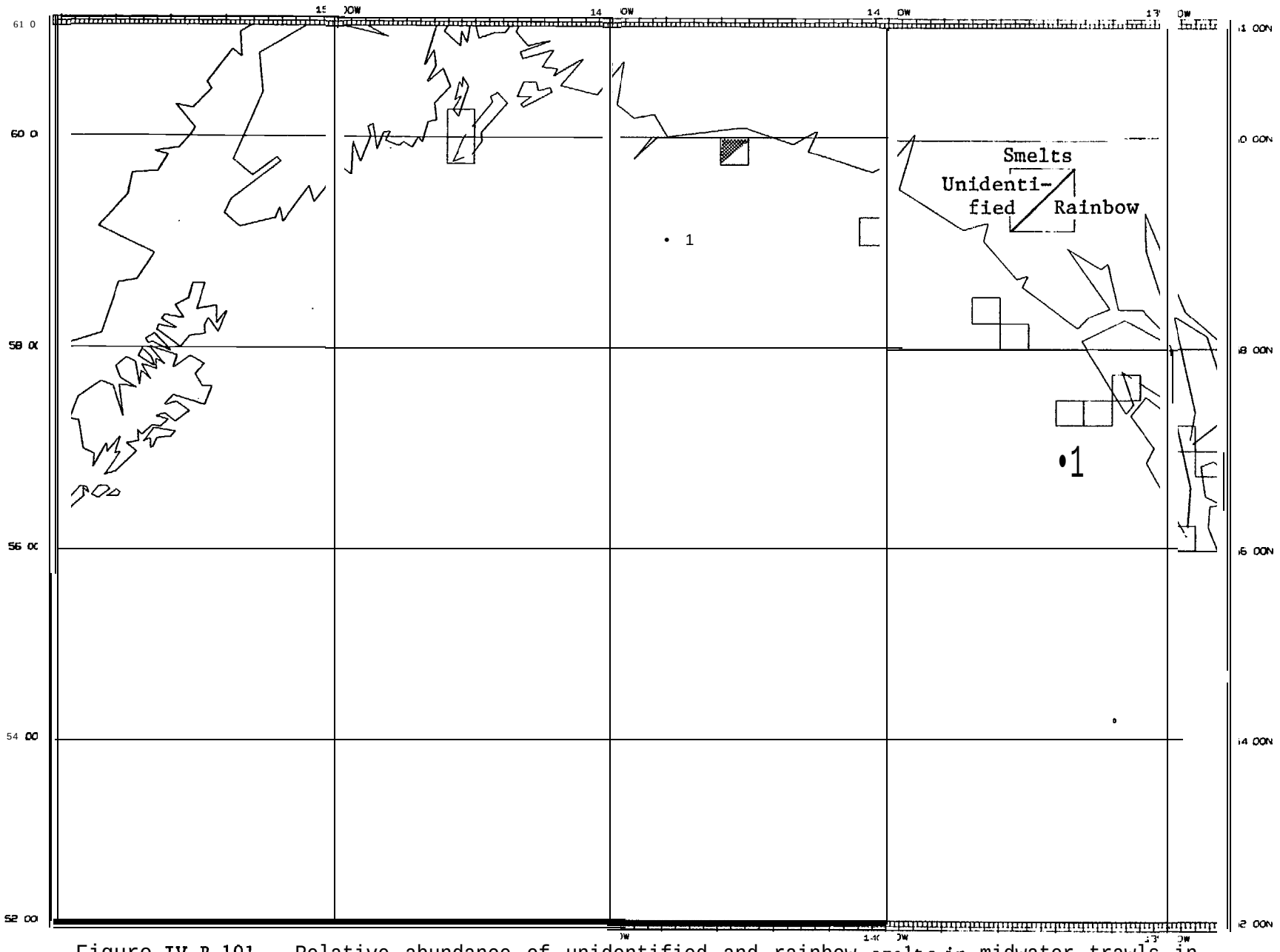


Figure IV.B.191.--Relative abundance of unidentified and rainbow smelts in midwater trawls in summer, Gulf of Alaska.

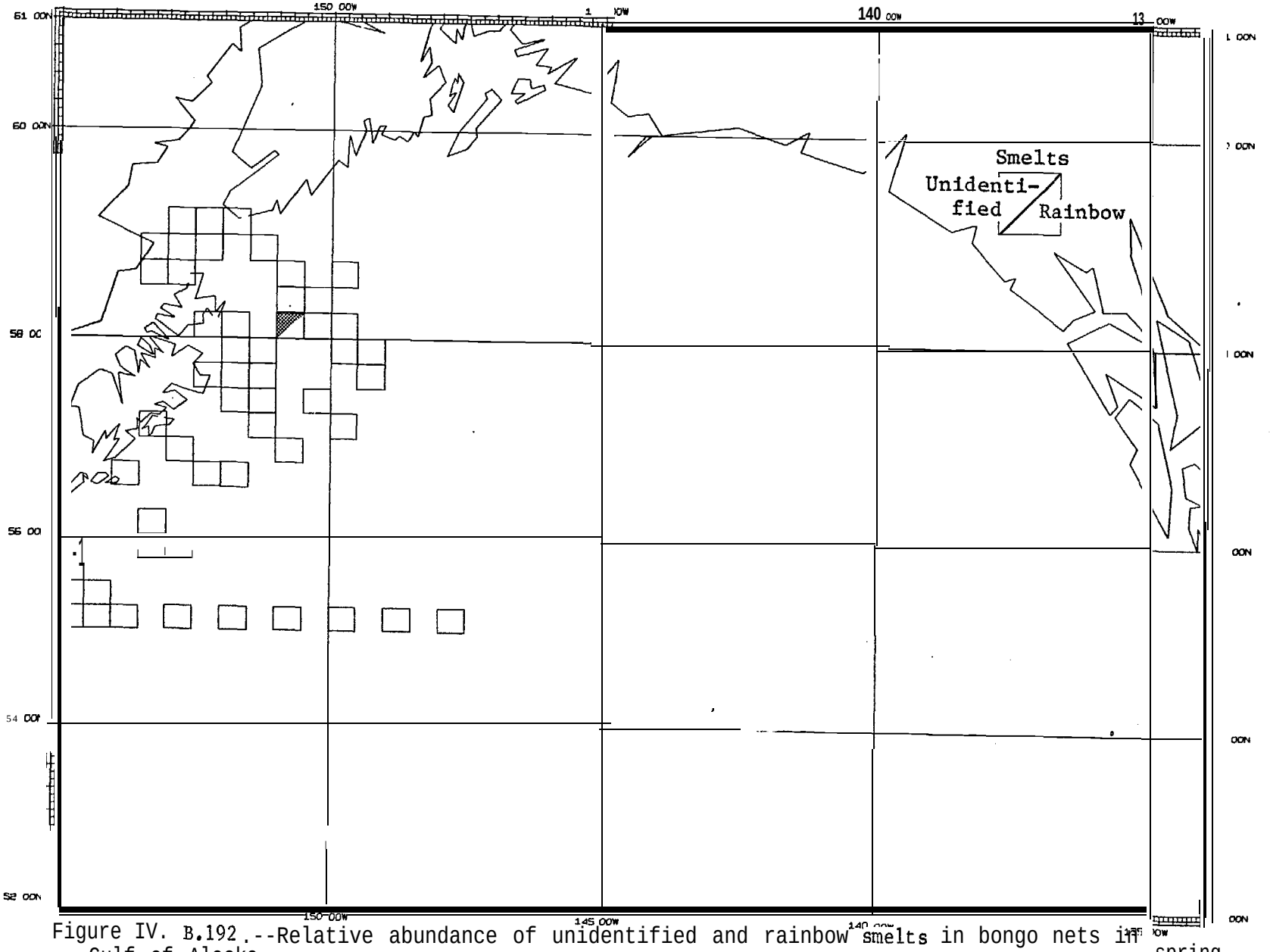


Figure IV. B.192.--Relative abundance of unidentified and rainbow smelts in bongo nets in spring, Gulf of Alaska.

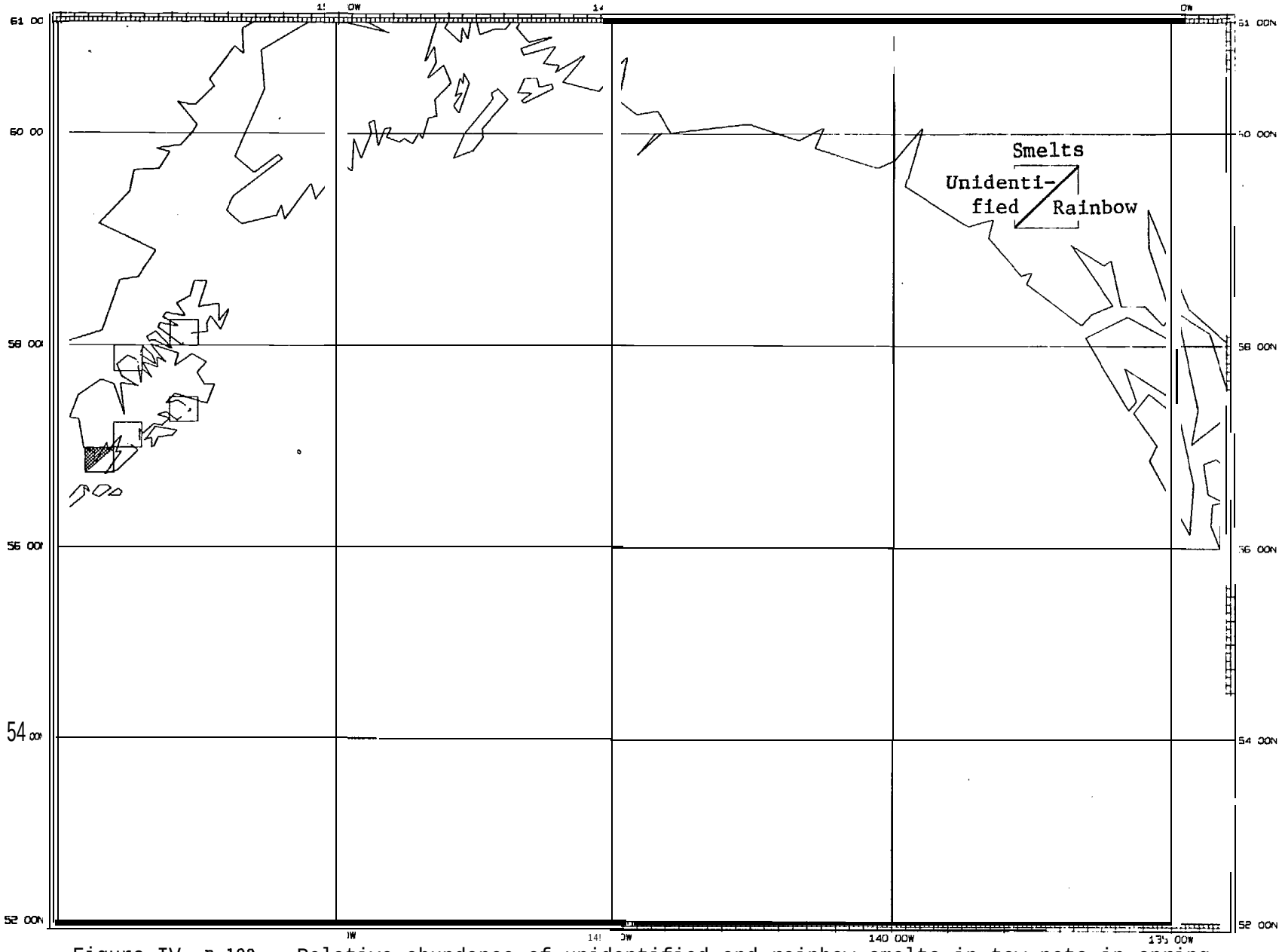


Figure IV. B.193.--Relative abundance of unidentified and rainbow smelts in tow nets in spring, Gulf of Alaska.

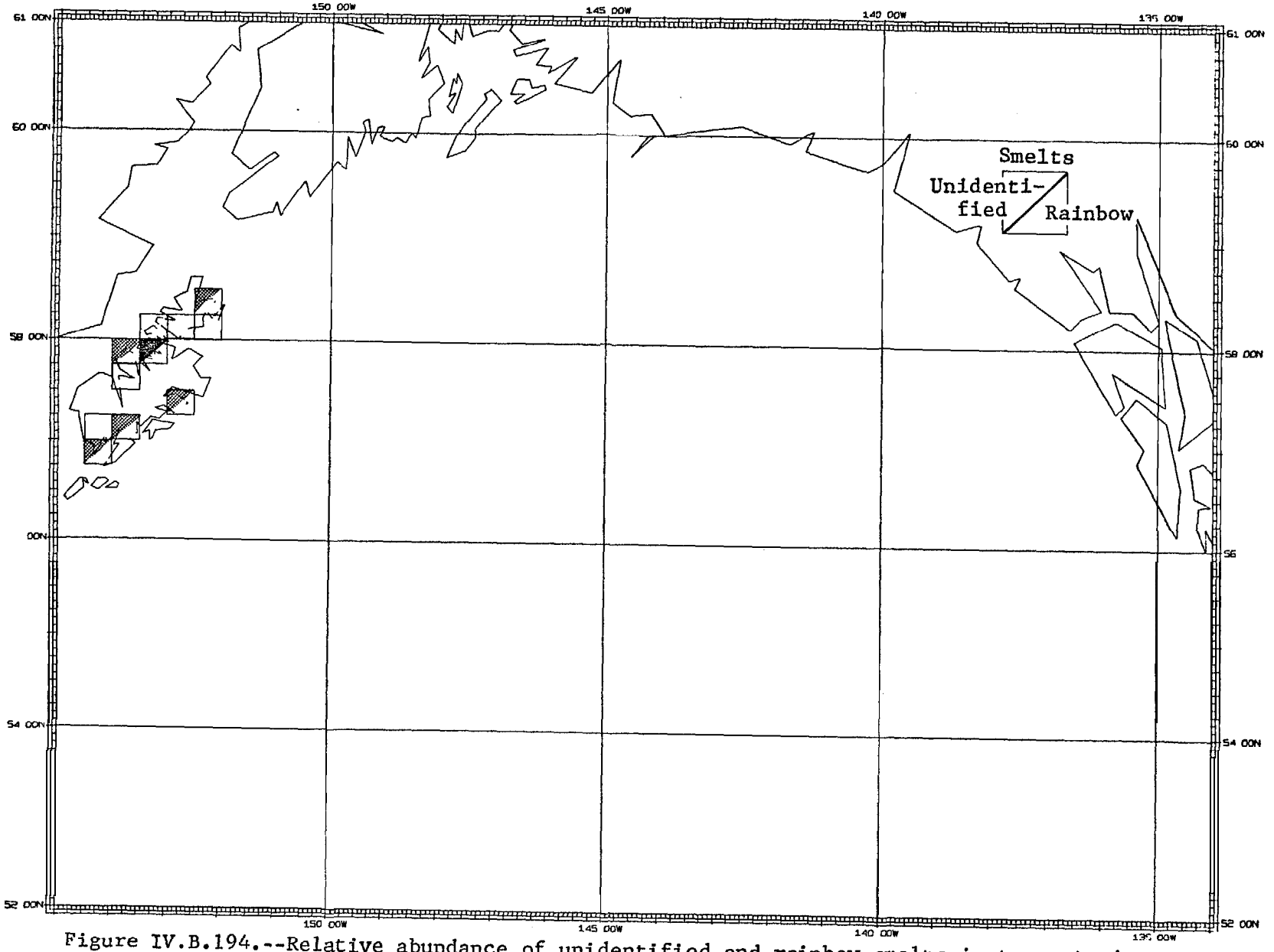


Figure IV.B.194.--Relative abundance of unidentified and rainbow smelts in tow nets in summer, Gulf of Alaska.

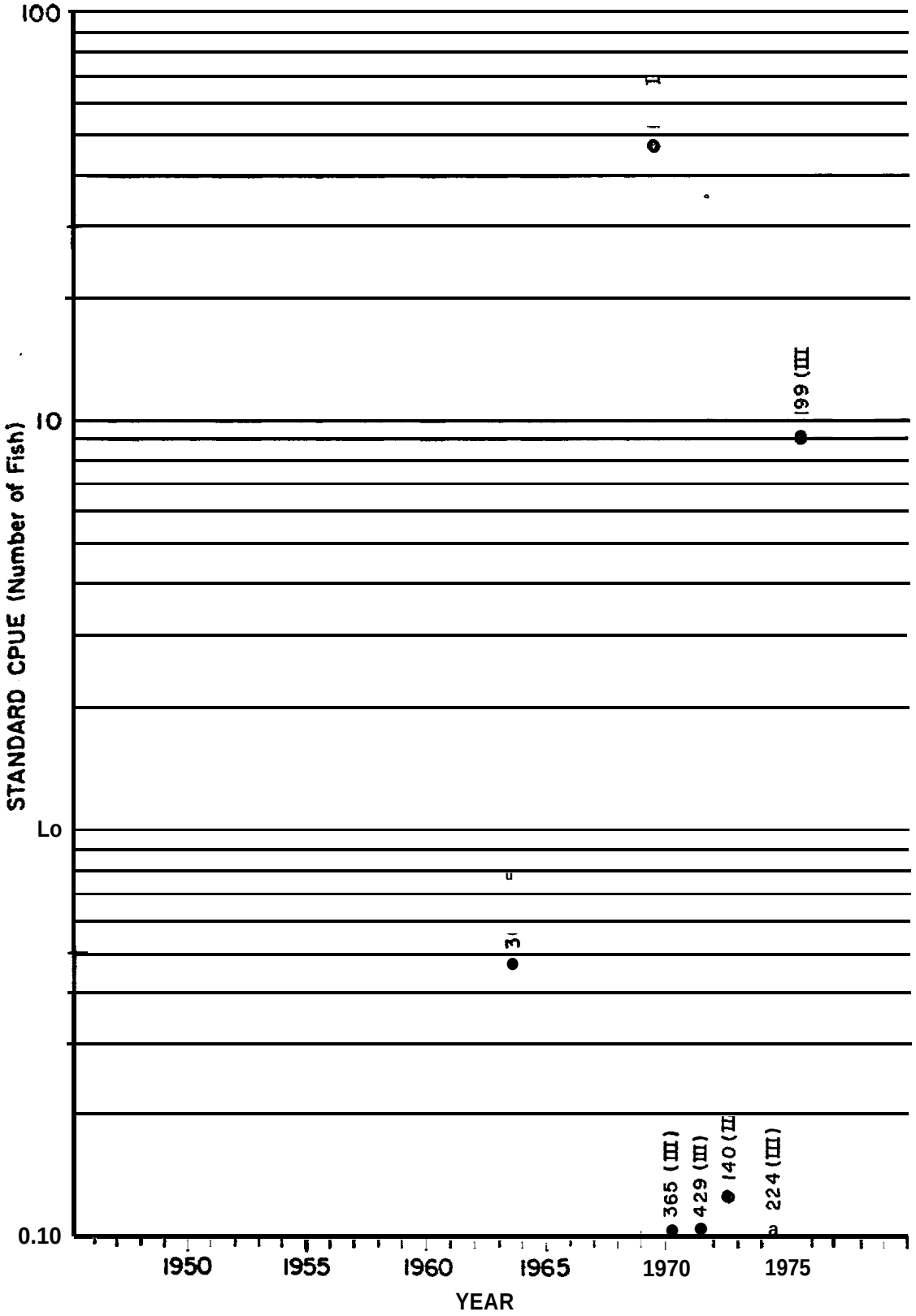


Figure IV.B.195.--Standardized rate of catch of unidentified smelts by tow net in the Gulf of Alaska (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

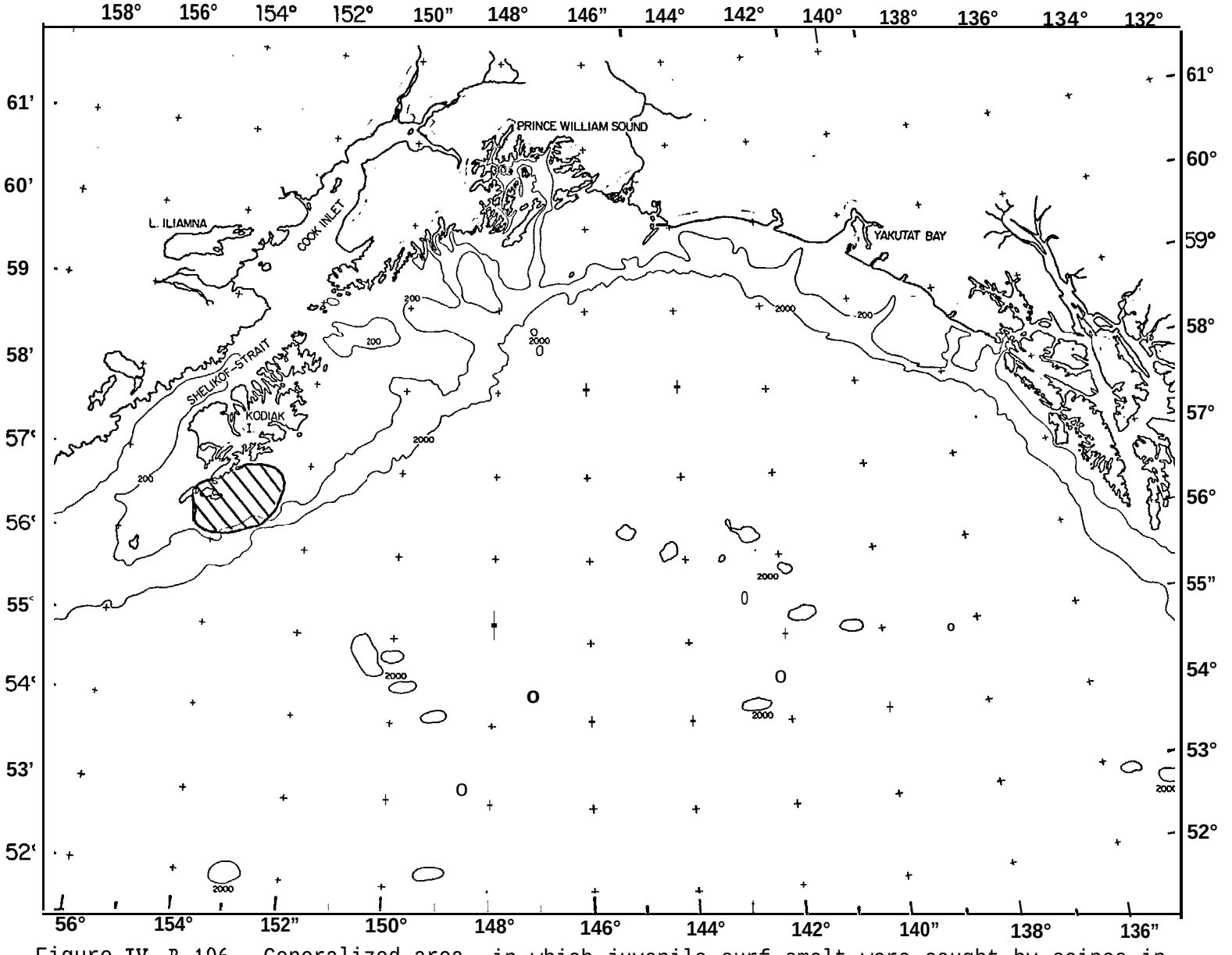


Figure IV. B. 196.--Generalized area in which juvenile surf smelt were caught by seines in summer, Gulf of Alaska.

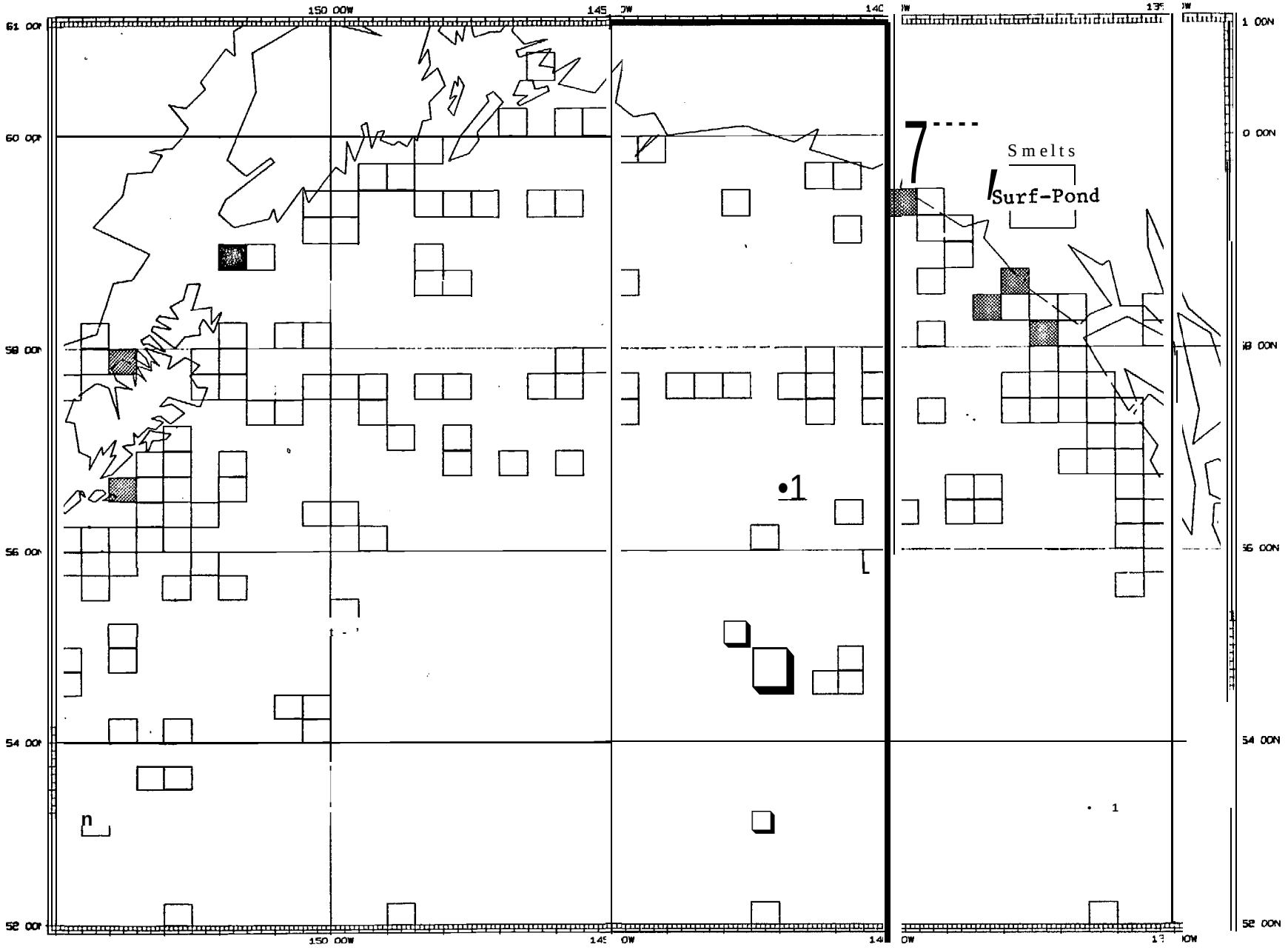


Figure IV. B. 197.-- Relative abundance of surf and pond smelts (combined) in purse seines in summer, Gulf of Alaska.

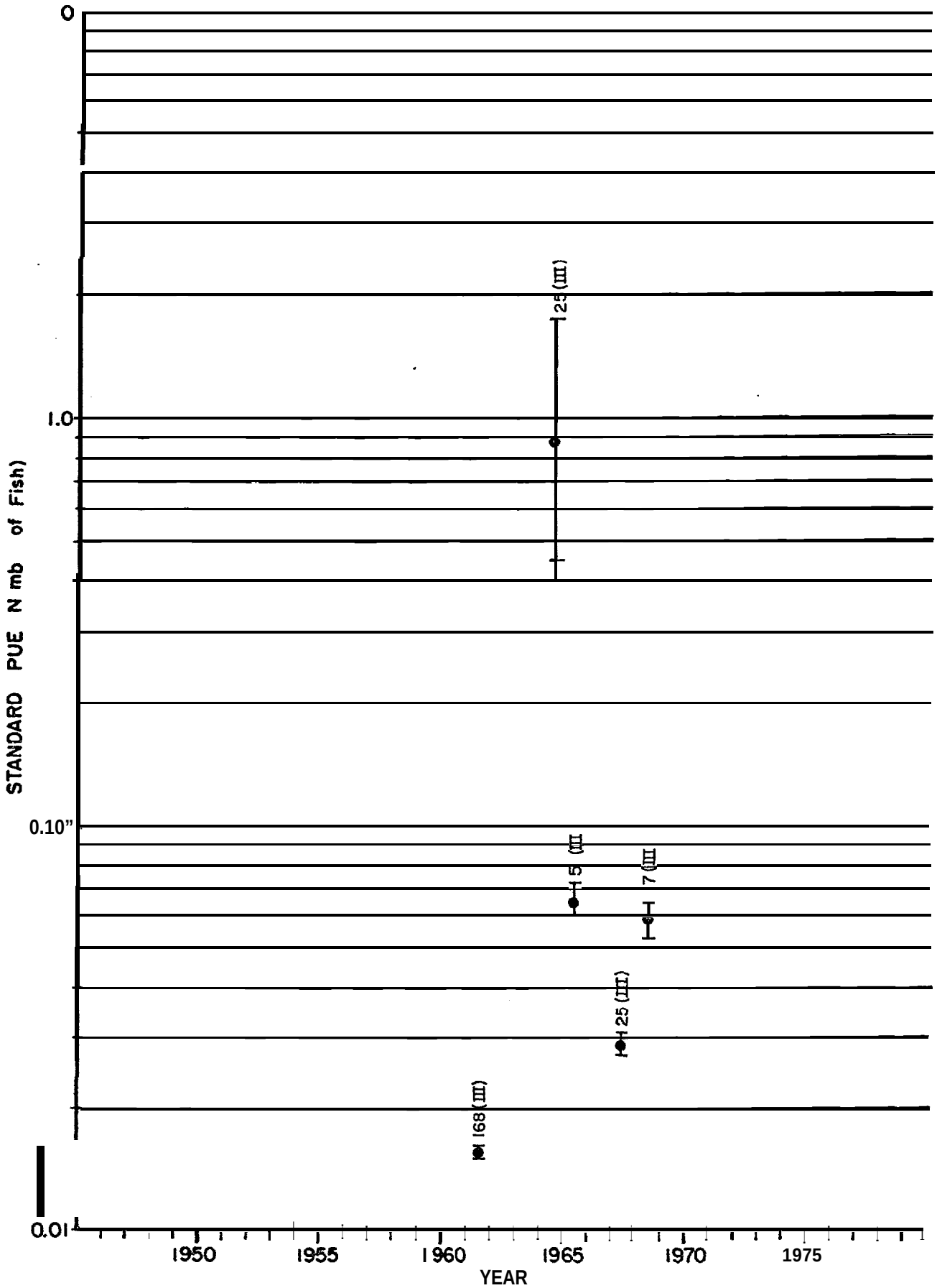


Figure Iv. B.198.--Standardized rate of catch of surf and pond smelts (combined) by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

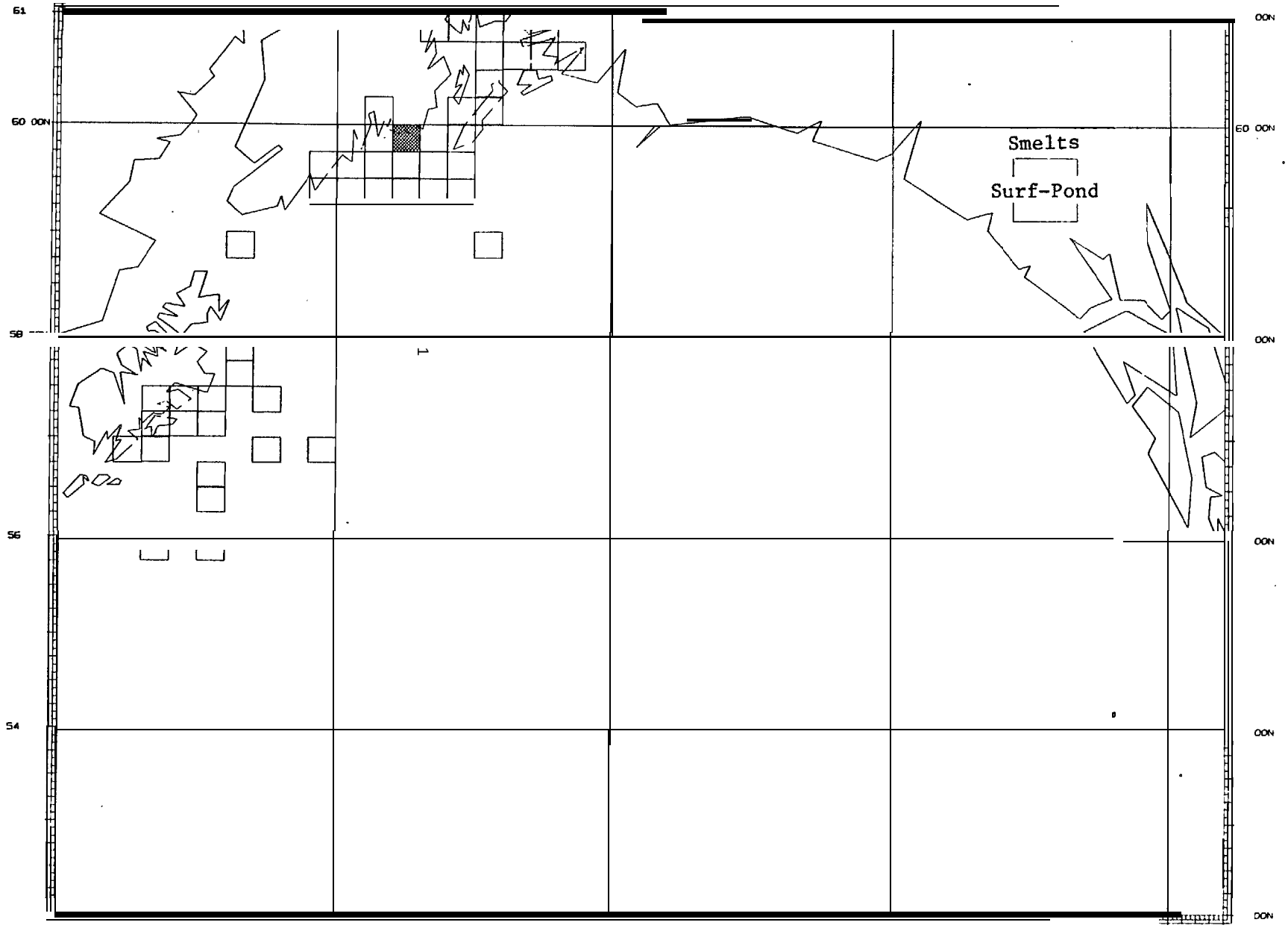


Figure IV.B.199.--Relative abundance of surf and pond smelts (combined) in bottom trawls in autumn Gulf of Alaska.

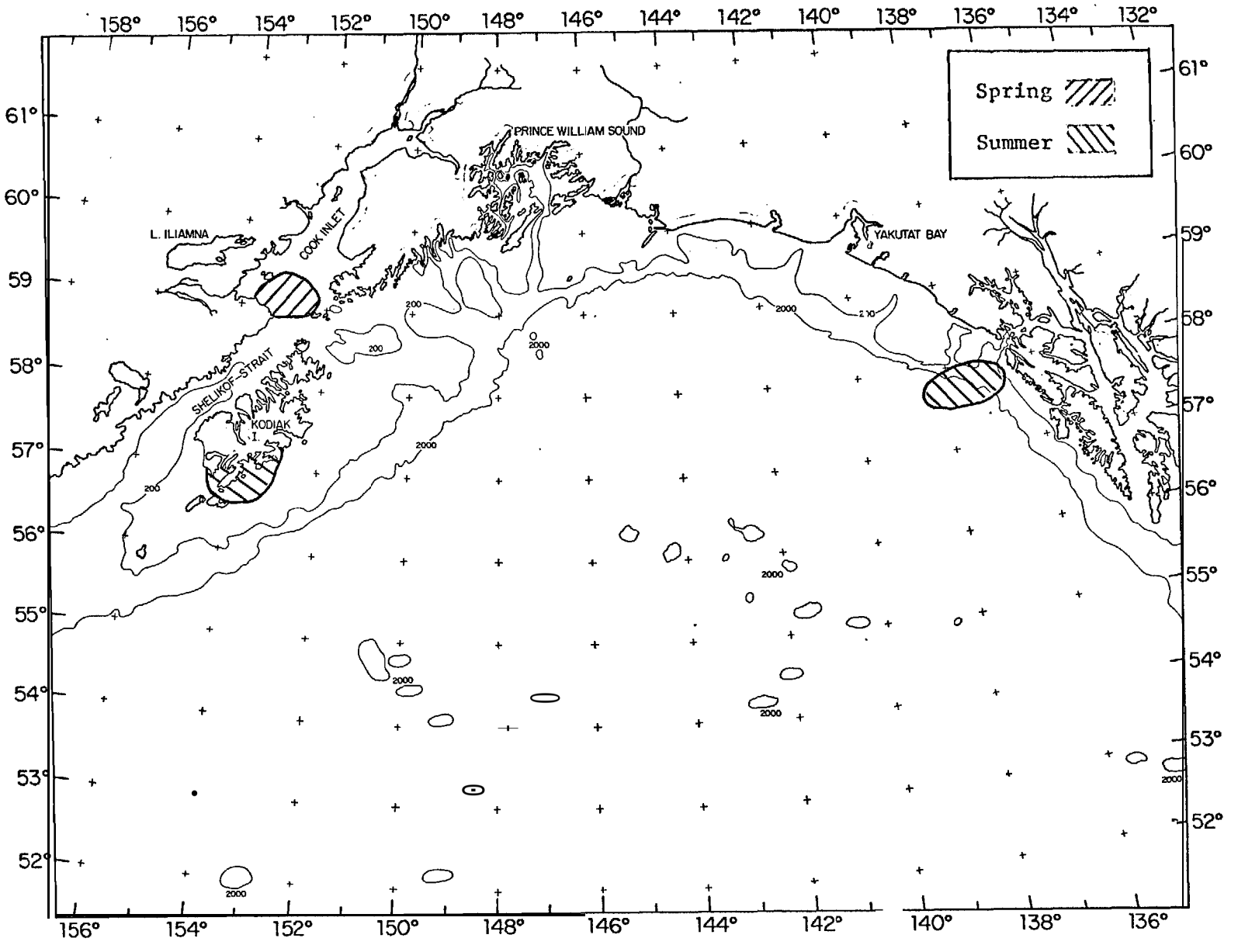


Figure IV.B.200.--Generalized areas in which juvenile capelin were caught by Isaacs-Kidd trawls in spring and by tow nets and seines in summer, Gulf of Alaska.

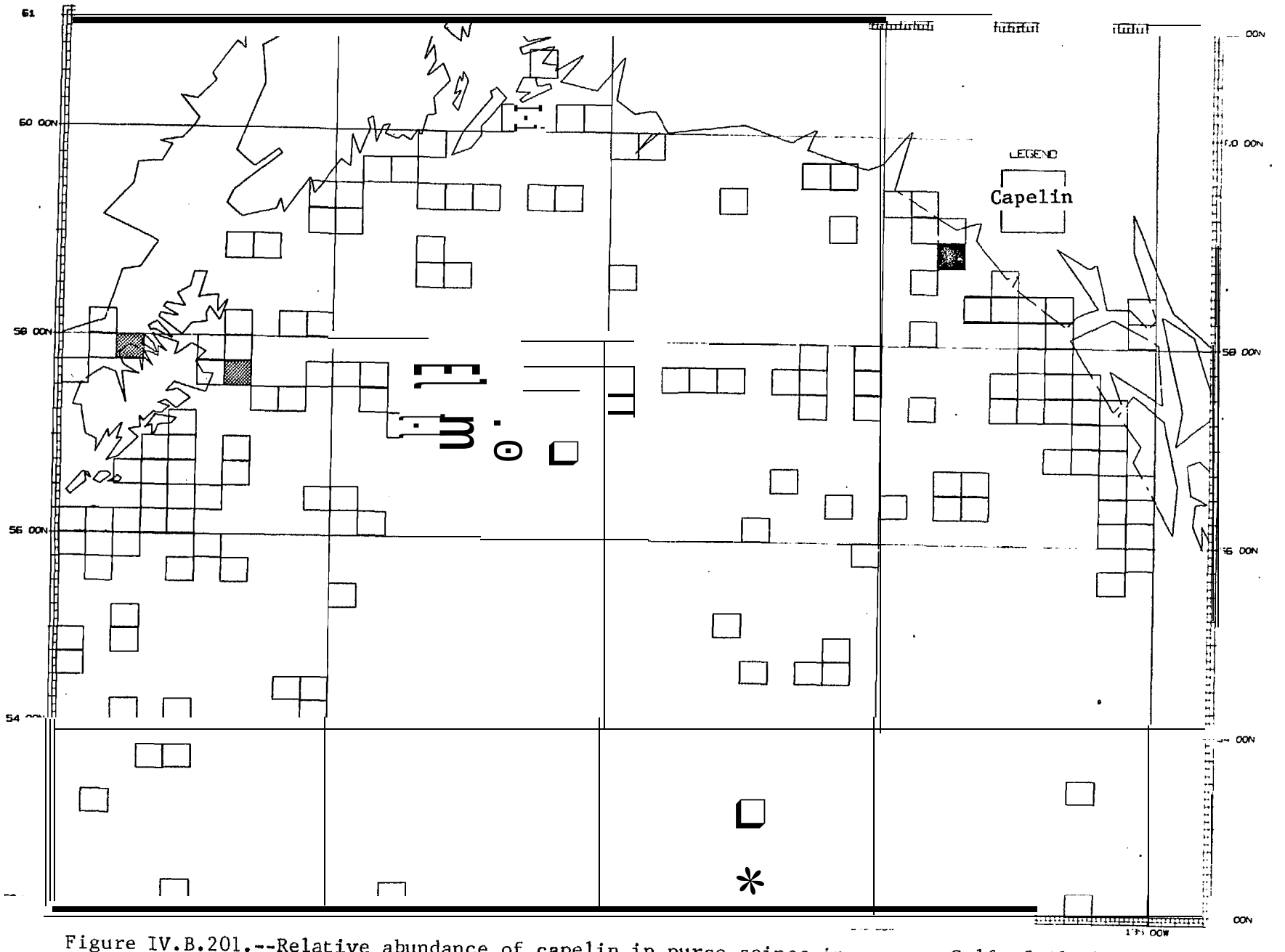


Figure IV.B.201.--Relative abundance of capelin in purse seines in summer, Gulf of Alaska.

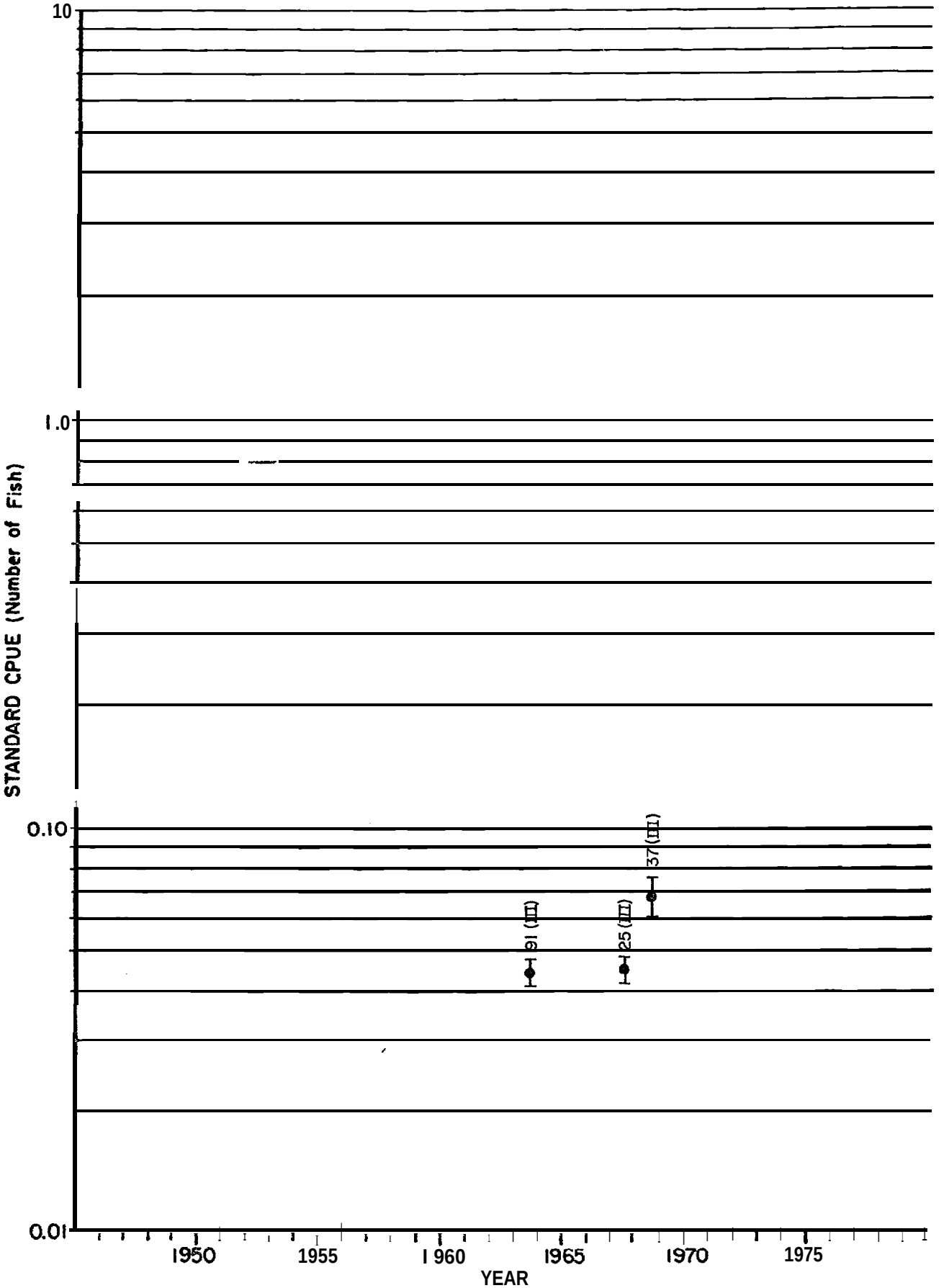


Figure IV.B.202.--Standardized rate of catch of capelin by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

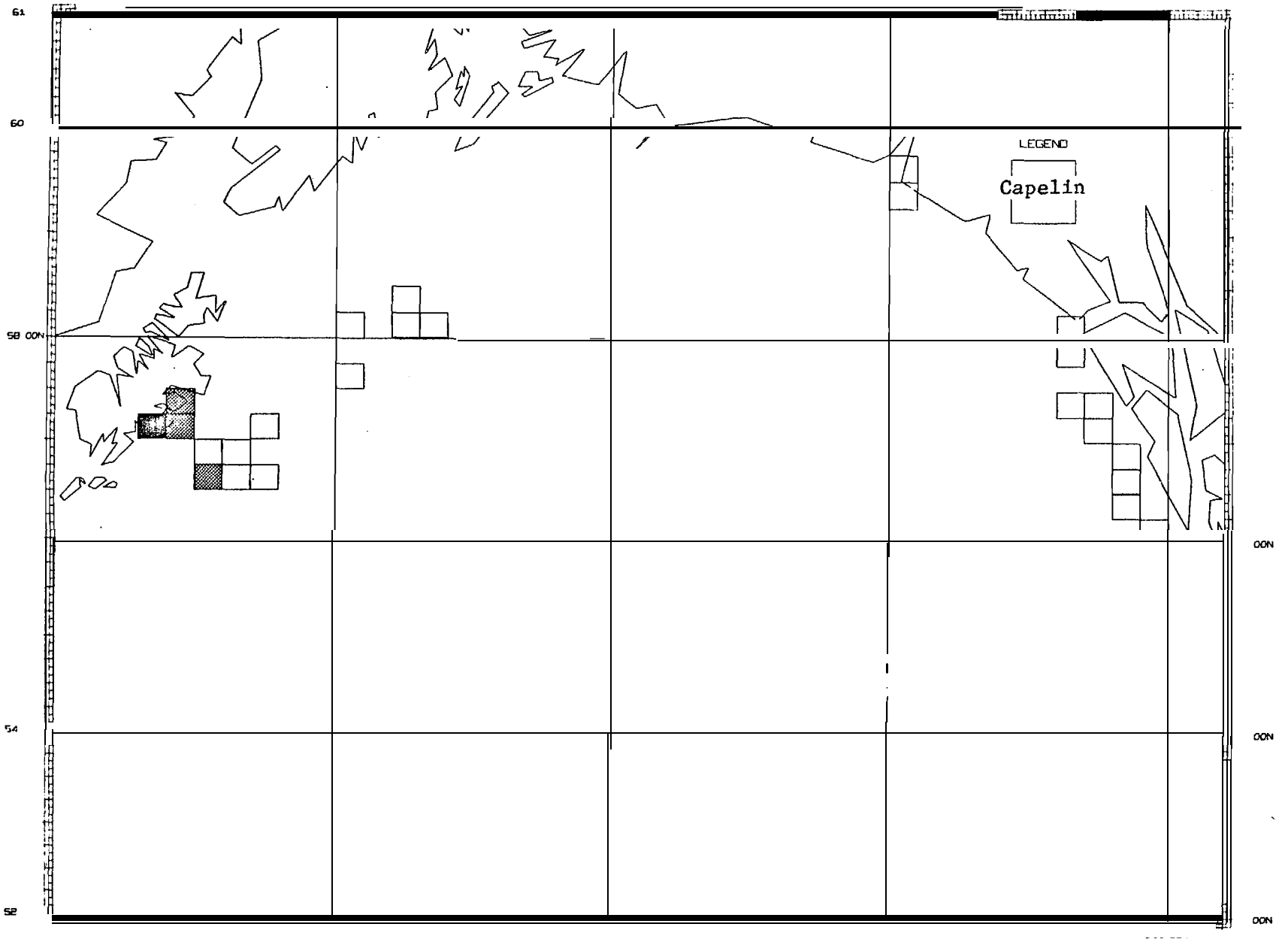


Figure IV.B.203.--Relative abundance of capelin in bottom trawls in winter, Gulf of Alaska.

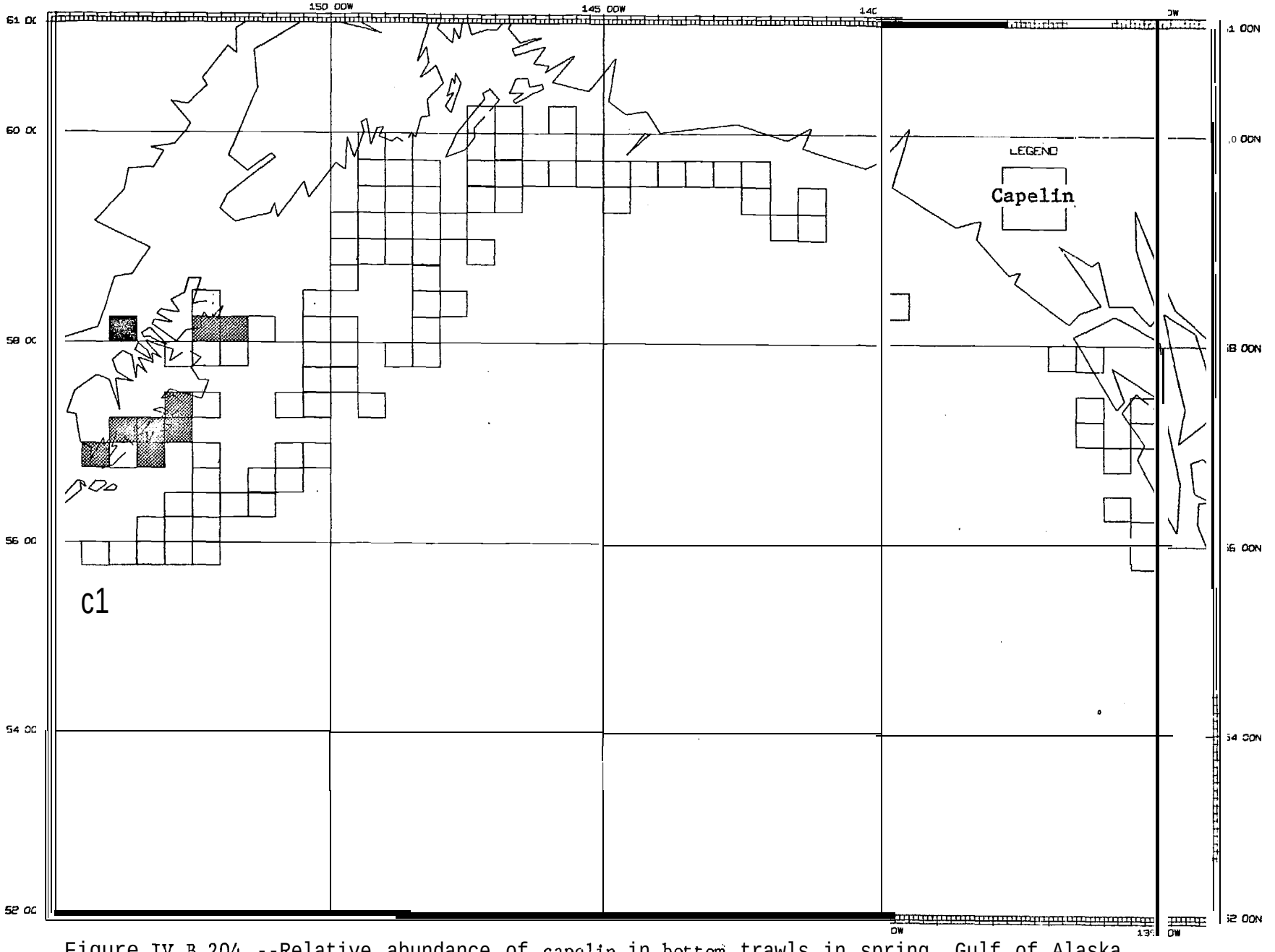


Figure IV.B.204.--Relative abundance of capelin in bottom trawls in spring, Gulf of Alaska.

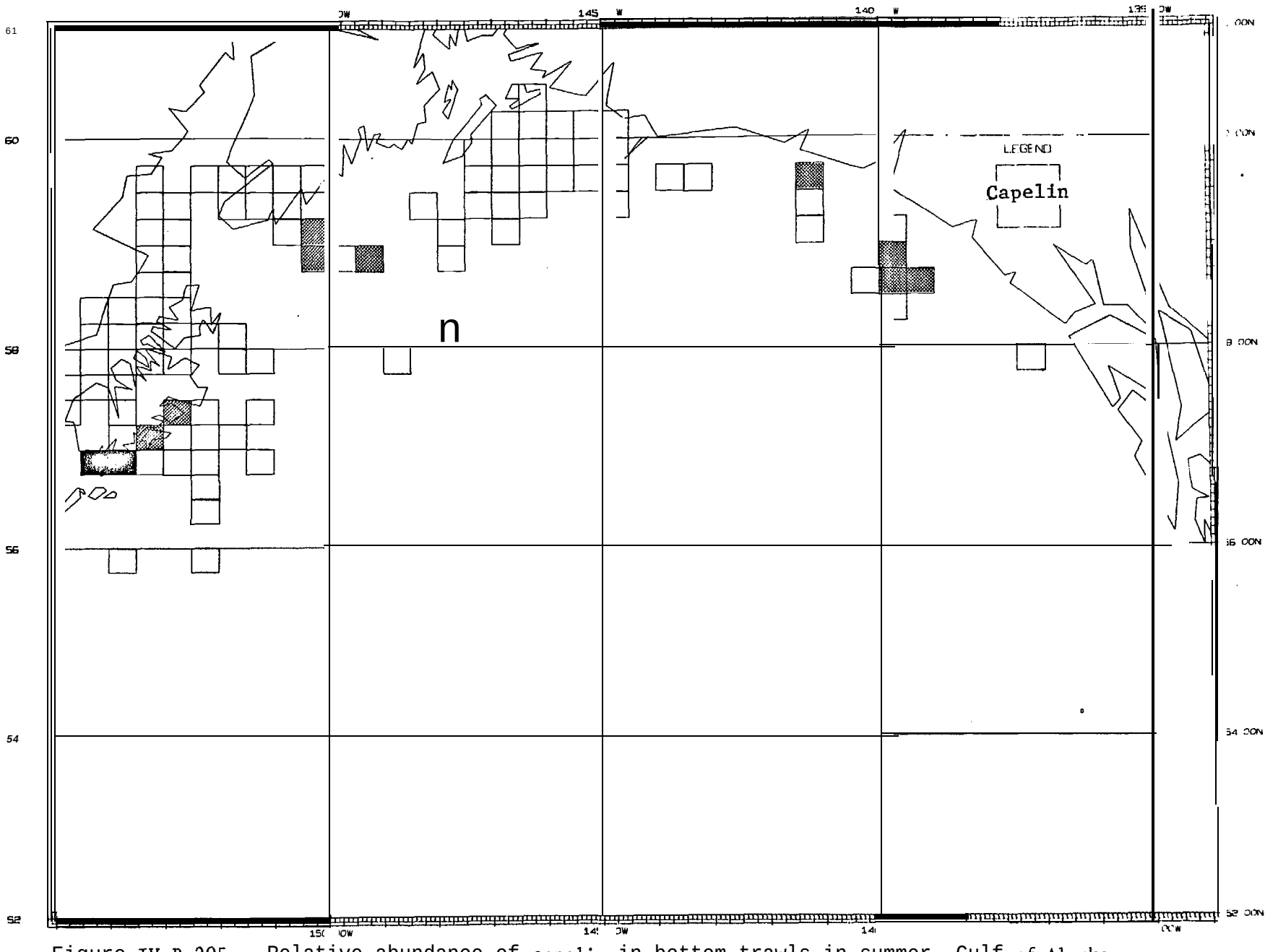


Figure IV.B.205.--Relative abundance of capelin in bottom trawls in summer, Gulf of Alaska.

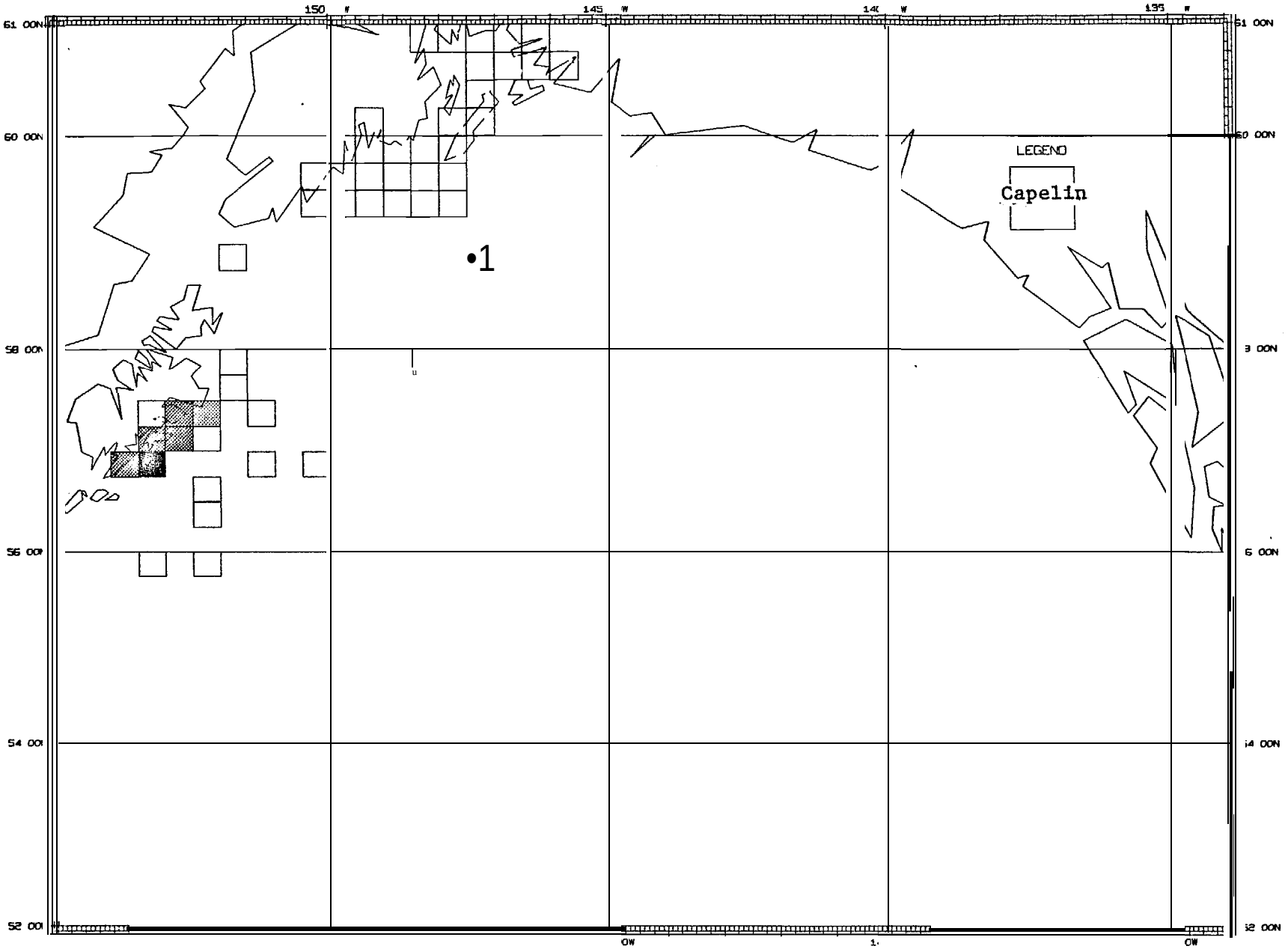


Figure IV. B.206.--Relative abundance of capelin in bottom trawls in autumn, Gulf of Alaska.

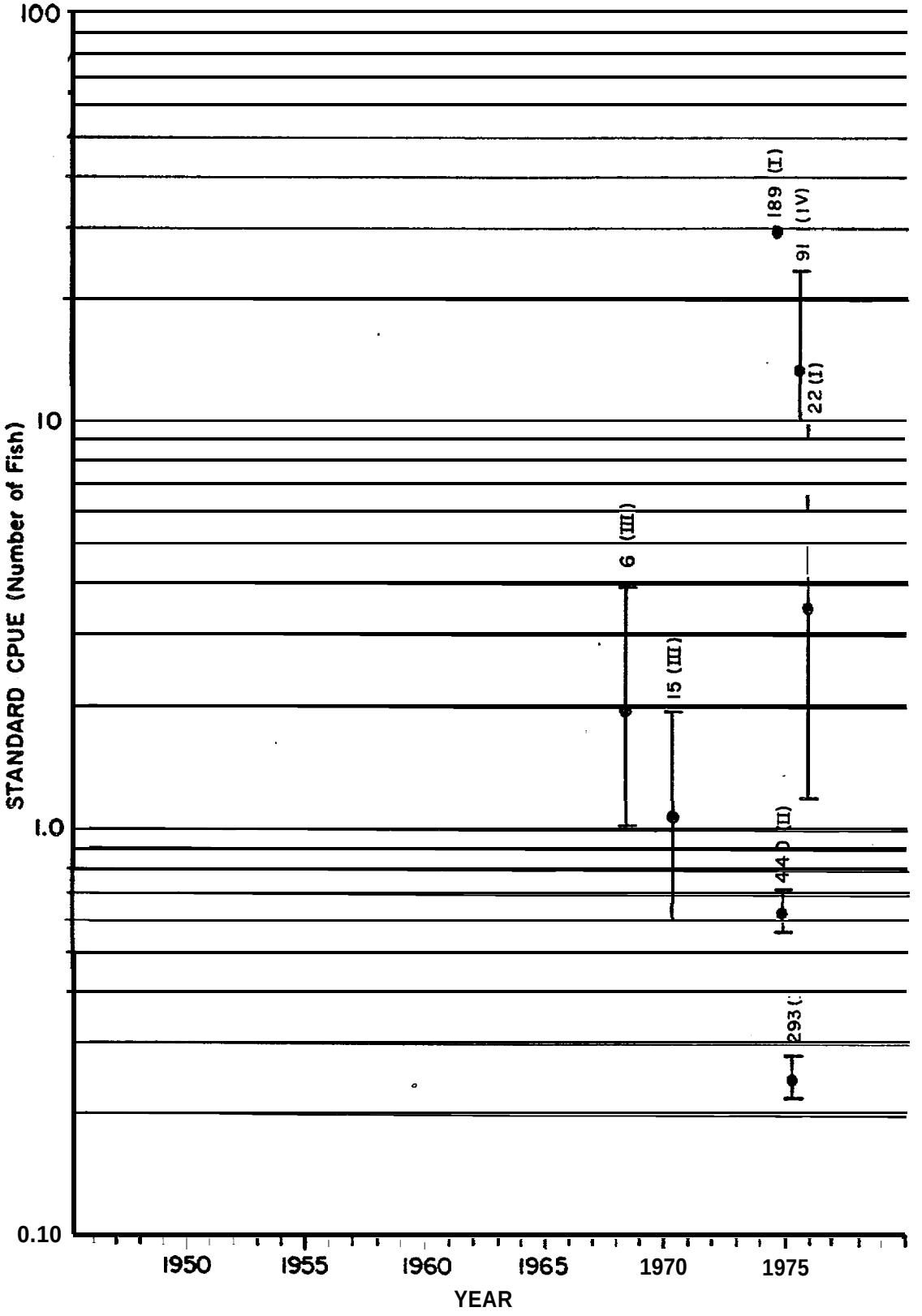


Figure IV. B.207.--Standardized rate of catch of capelin by bottom trawl in the Gulf of Alaska (geometric mean: number/30 "rein tow with 90% confidence interval, number of observations, and quarter of the year).

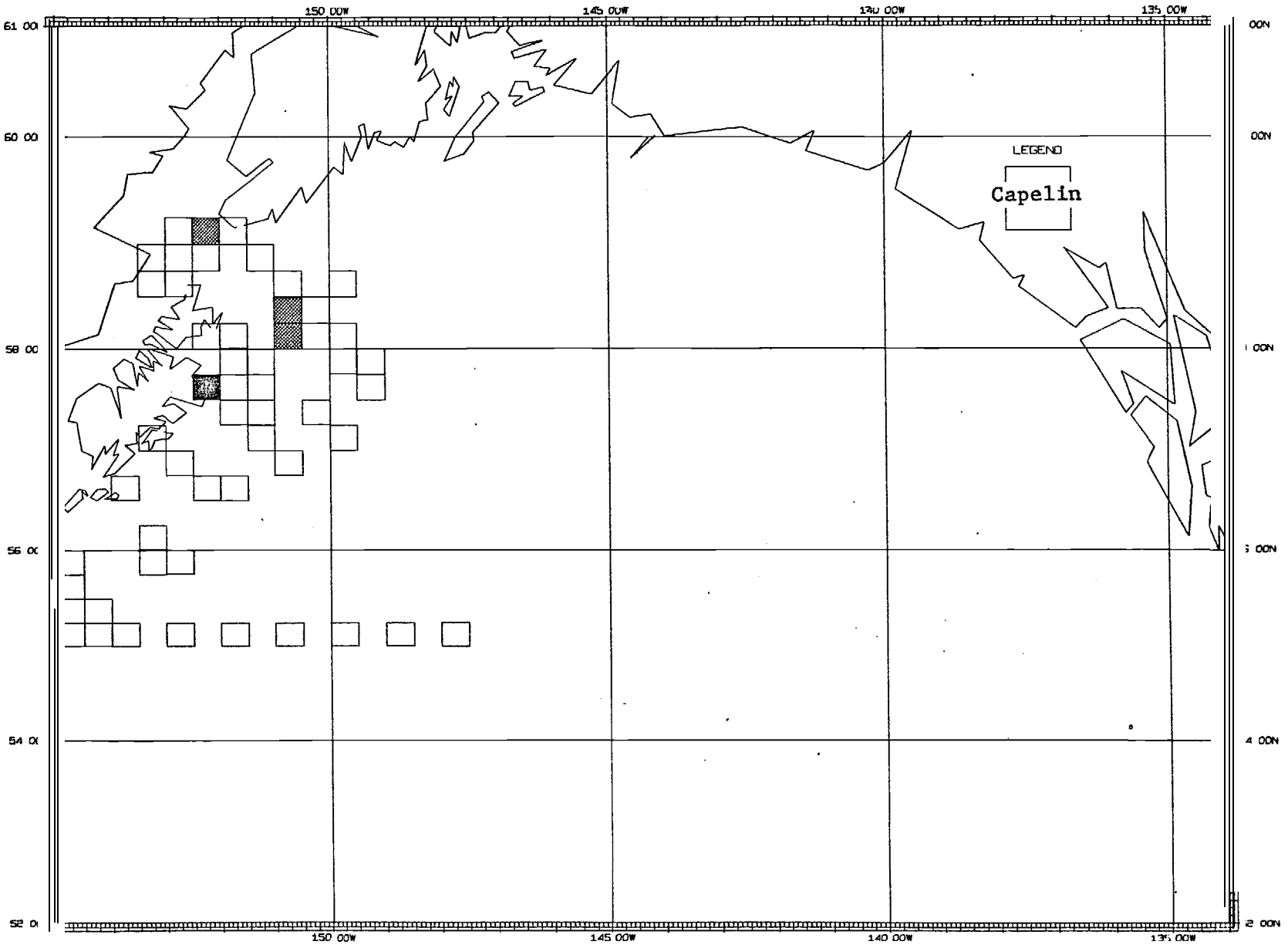


Figure IV.B.208.--Relative abundance of capelin in bongo nets in spring, Gulf of Alaska.

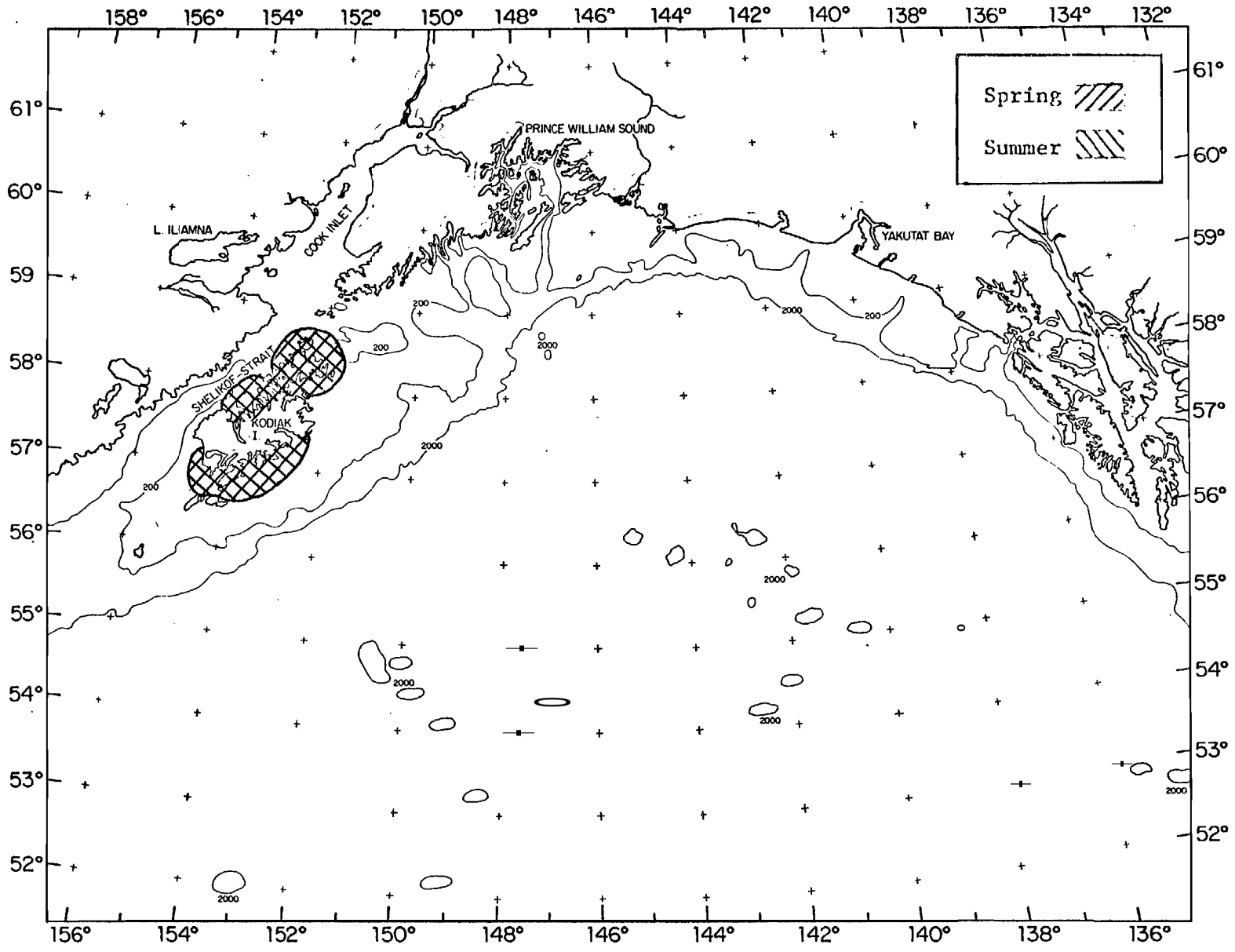


Figure IV.B.209.--Generalized areas in which capelin larvae were caught by tow net in spring and summer, Gulf of Alaska.

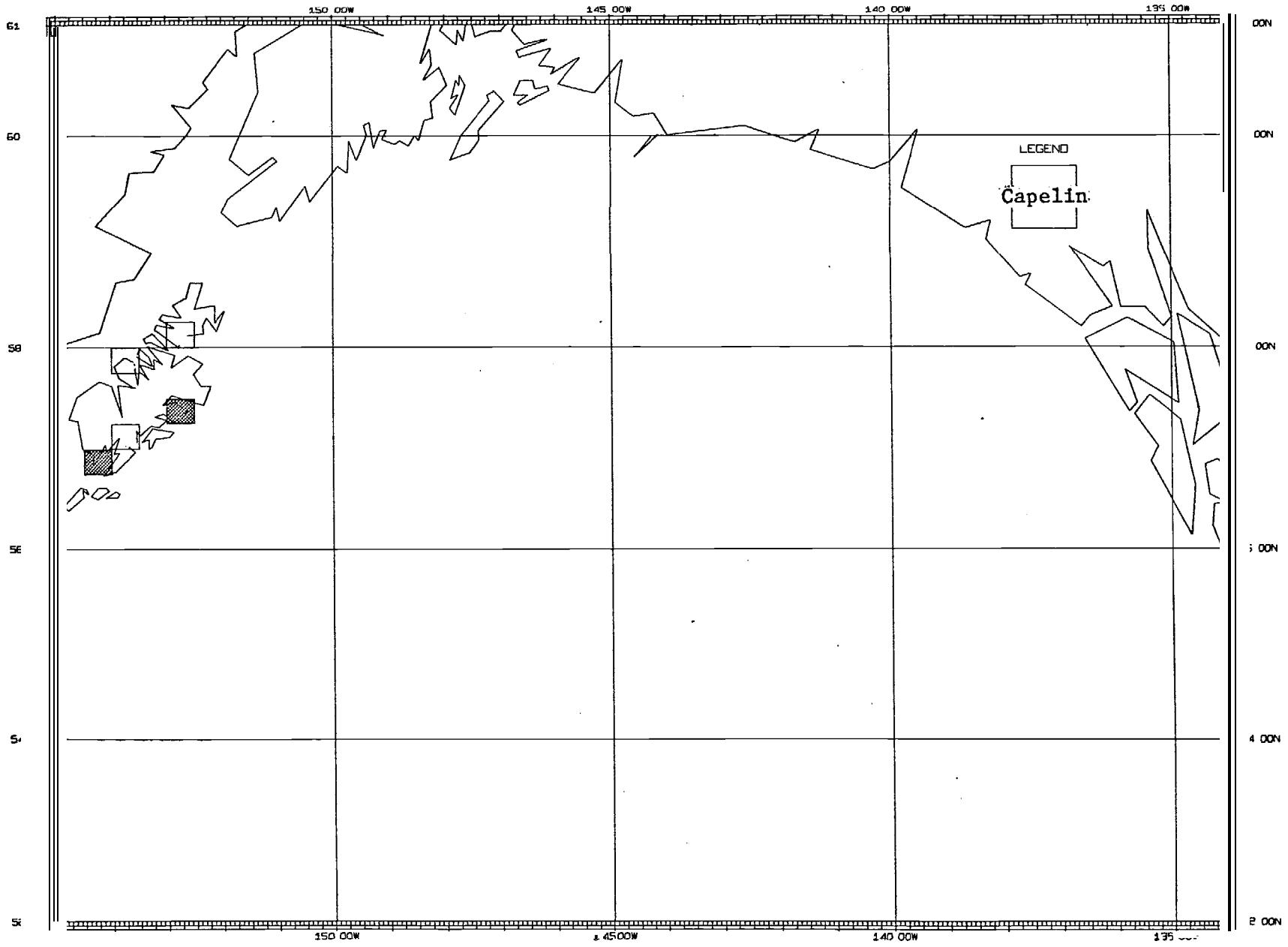


Figure IV.B.210.--Relative abundance of capelin in tow nets in spring, Gulf of Alaska.

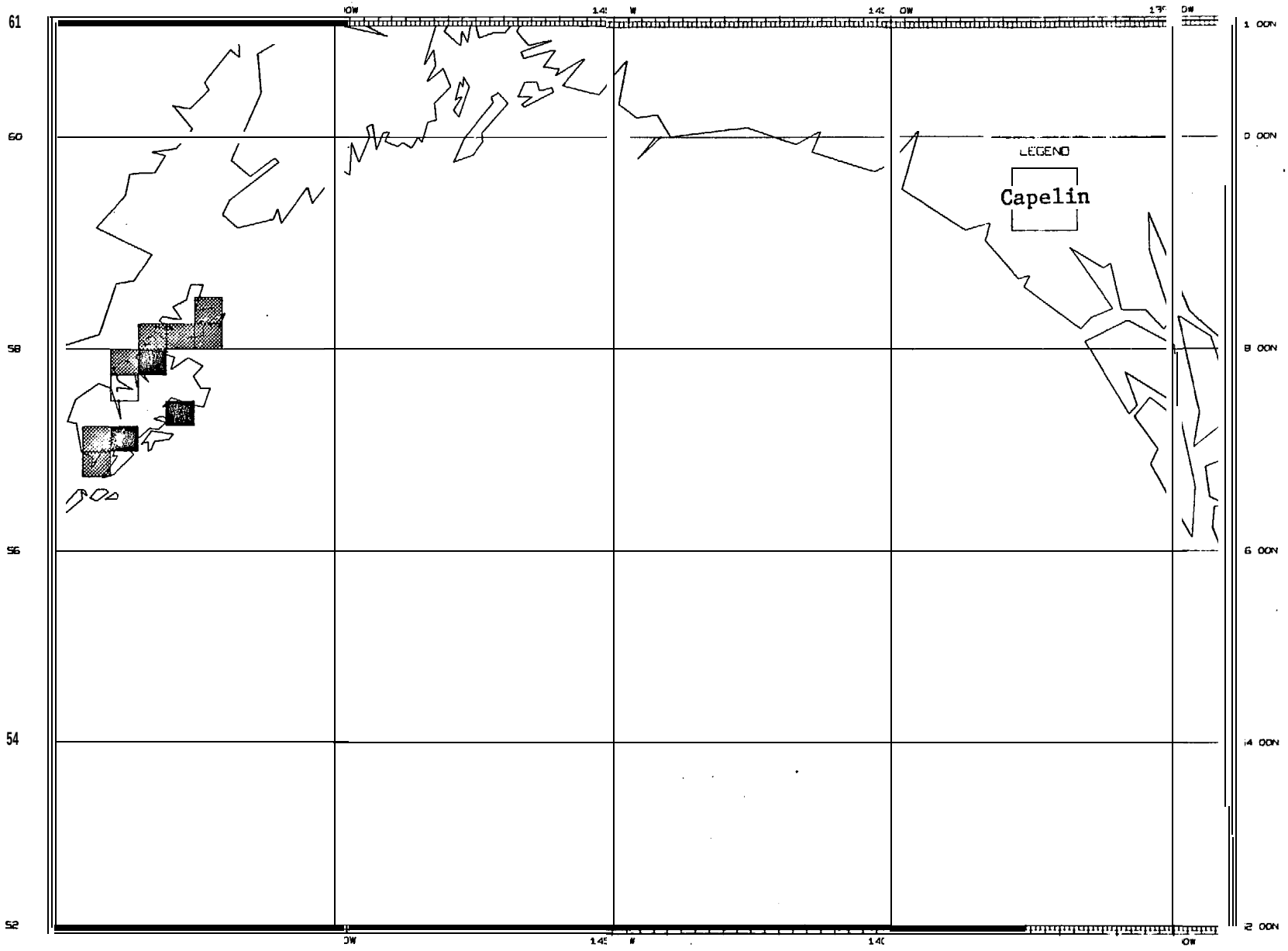


Figure IV. B.211.--Relative abundance of capelin in tow nets in summer, Gulf of Alaska.

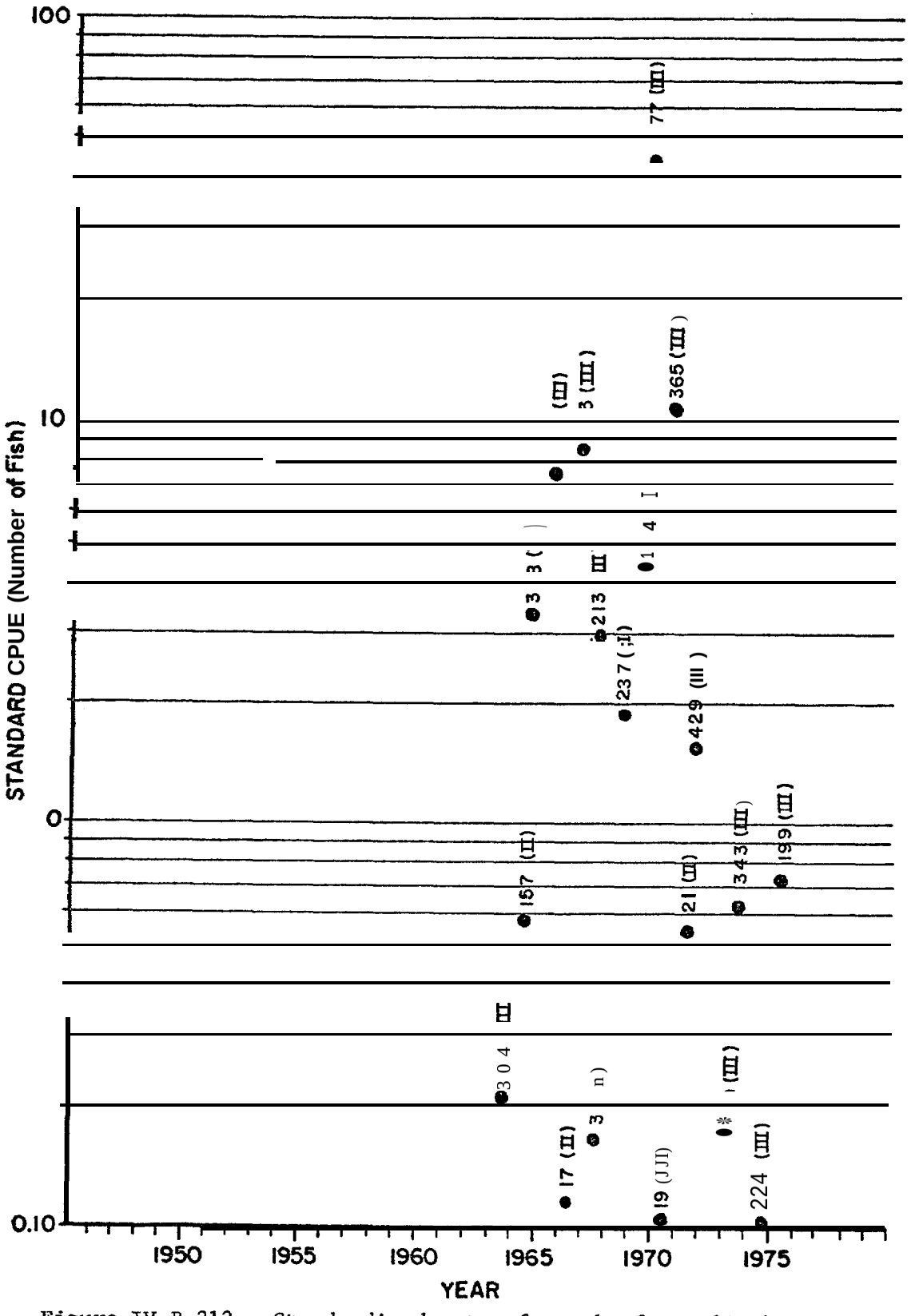


Figure IV.B.212.--Standardized rate of catch of capelin by tow net in the Gulf of Alaska (geometric mean: number/12 min tow net 90% confidence interval, number of observations, and quarter of the year).

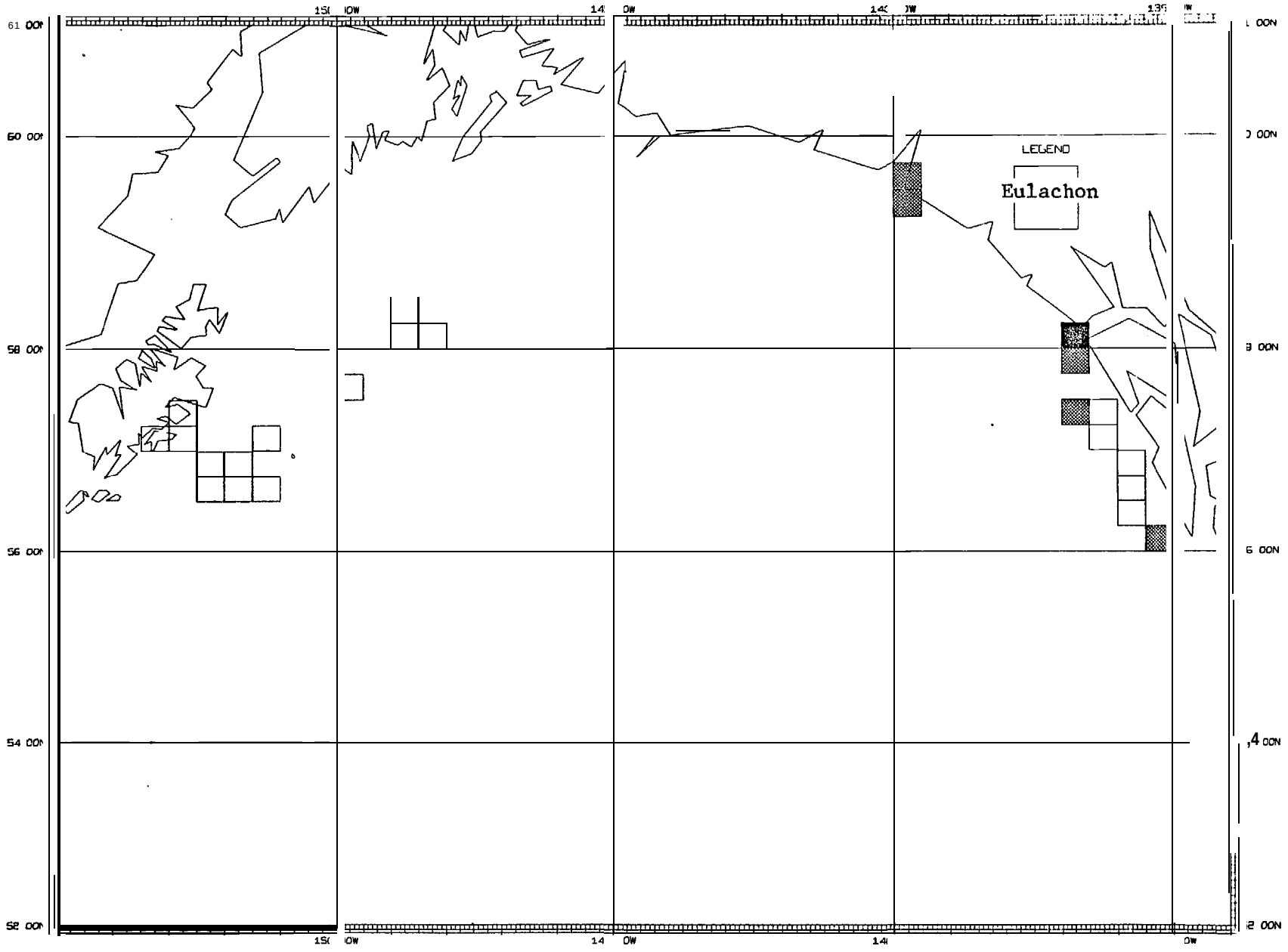


Figure IV. B.213 .--Relative abundance of eulachon in bottom trawls in winter, Gulf of Alaska.

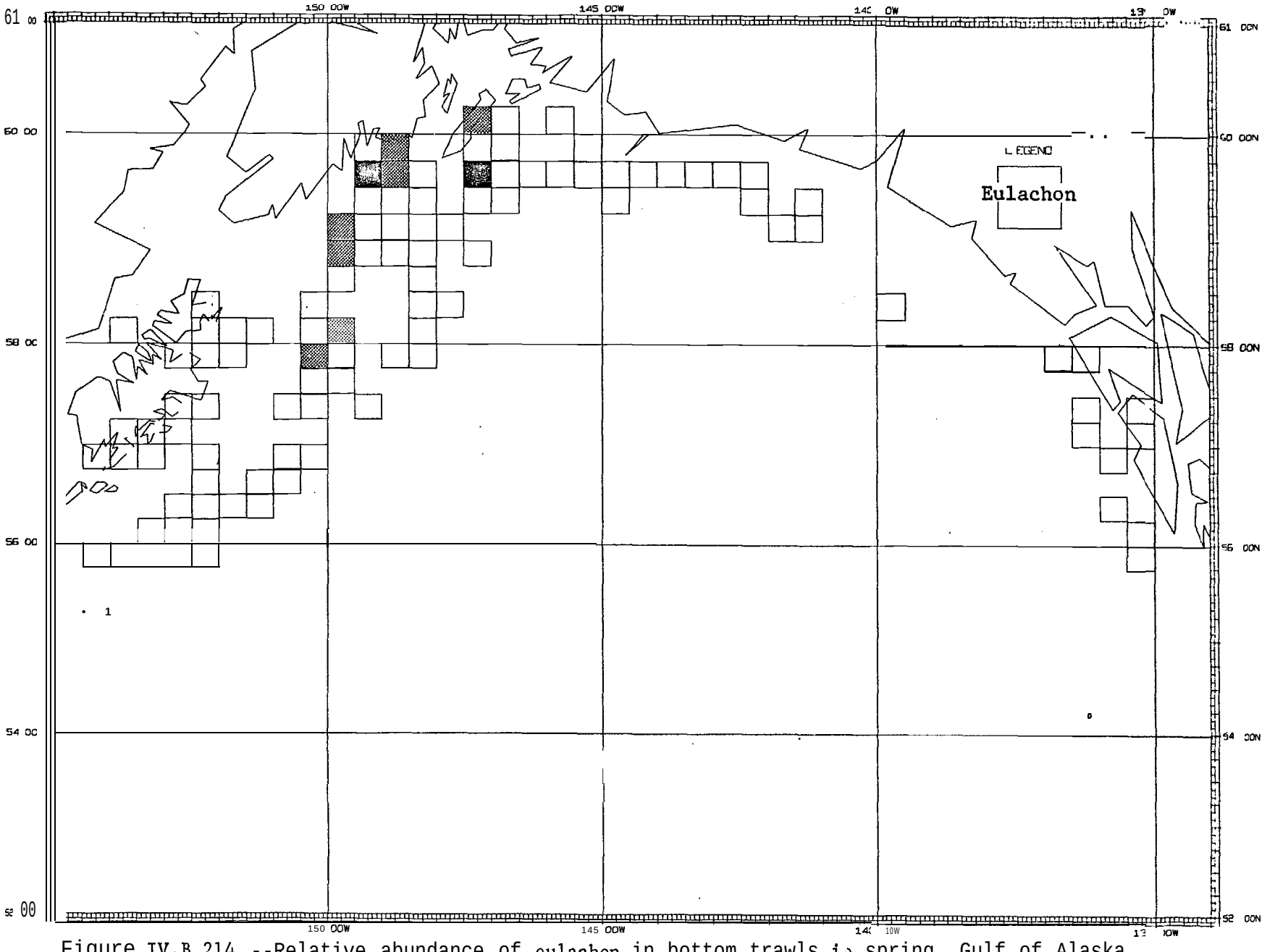


Figure IV.B.214.--Relative abundance of eulachon in bottom trawls in spring, Gulf of Alaska.

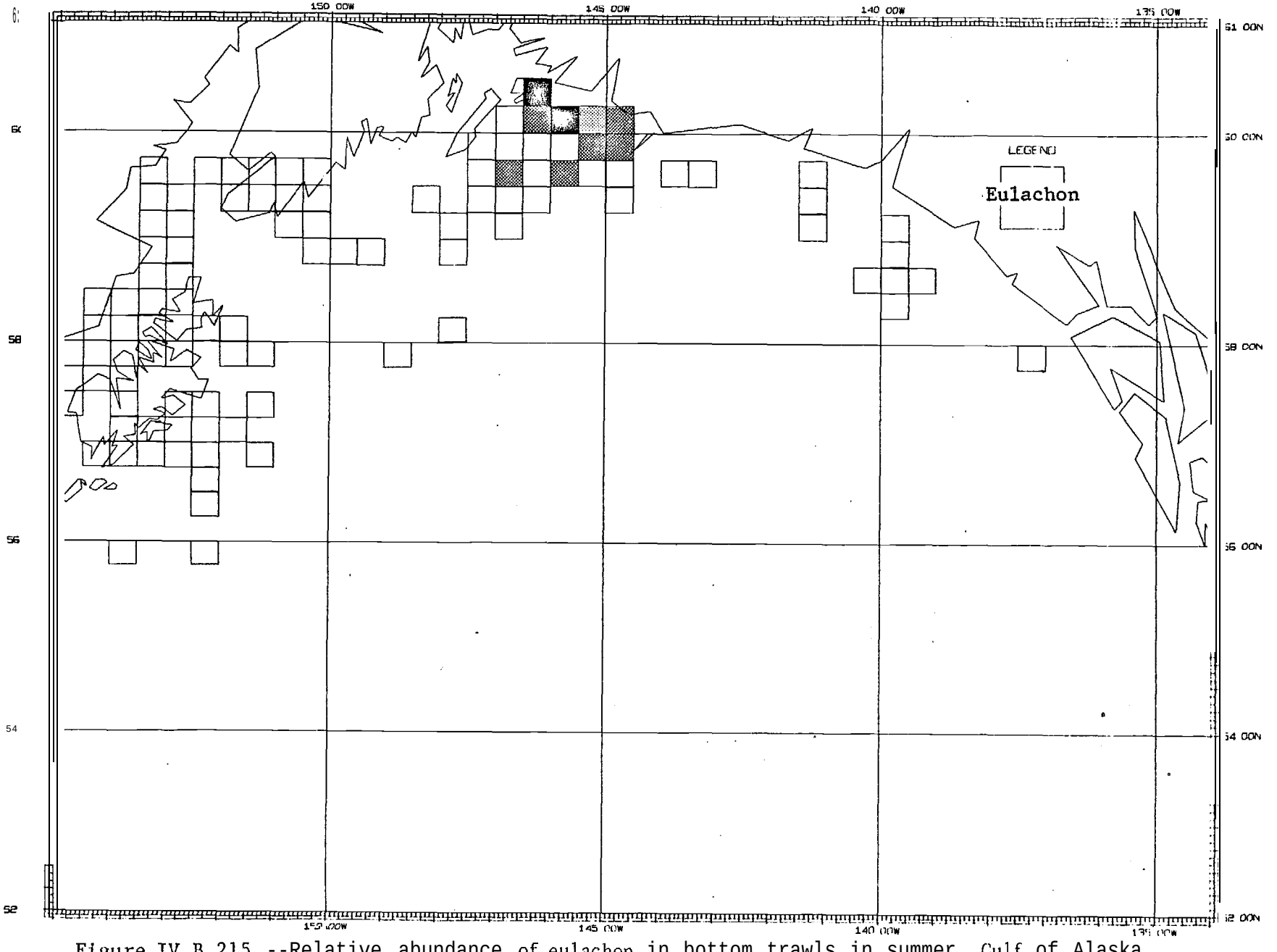


Figure IV.B.215.--Relative abundance of eulachon in bottom trawls in summer, Gulf of Alaska.

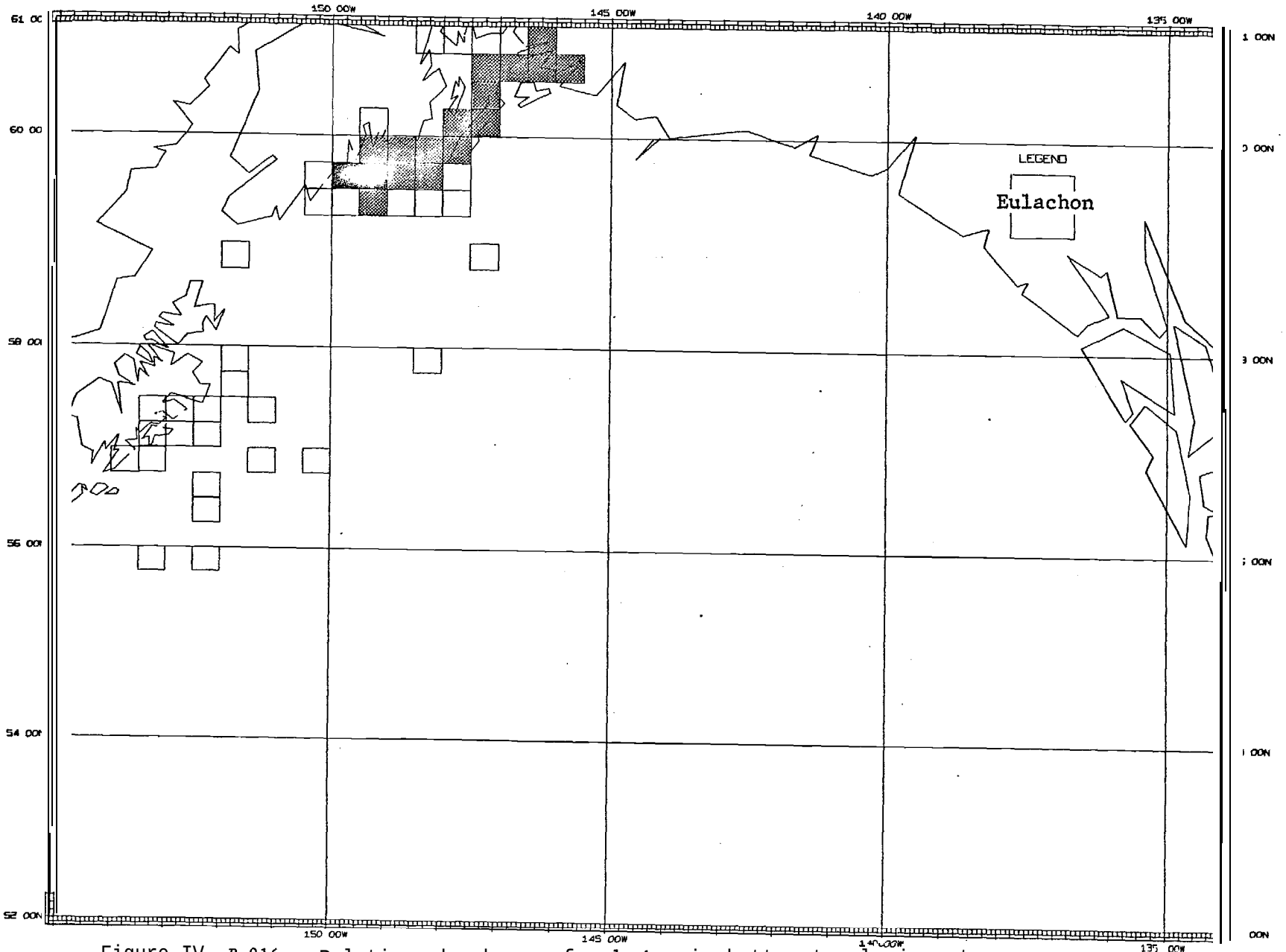


Figure IV, B.216.--Relative abundance of eulachon in bottom trawls in autumn, Gulf of Alaska.

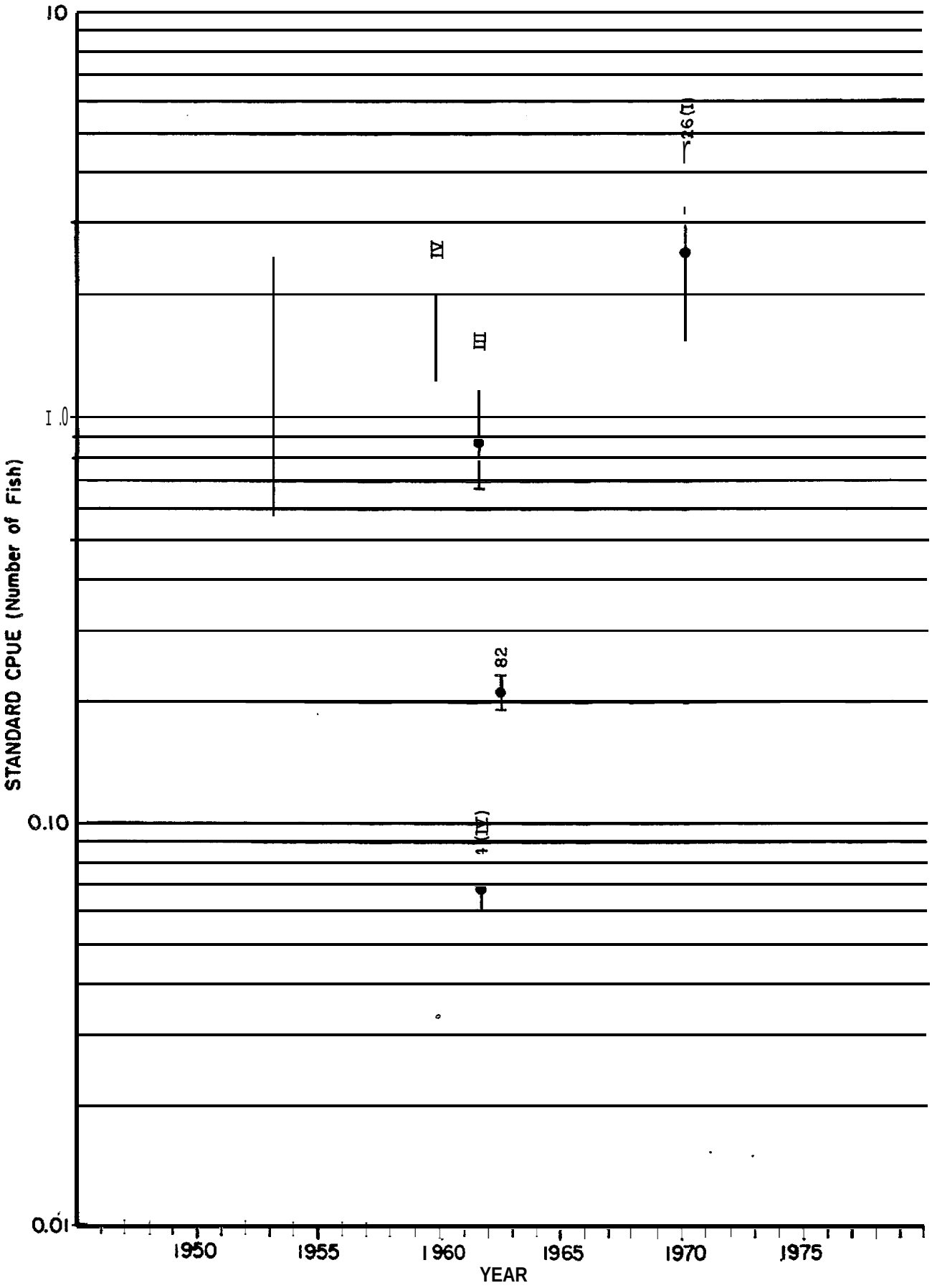


Figure IV.B.217.--Standardized rate of catch of eulachon by bottom trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

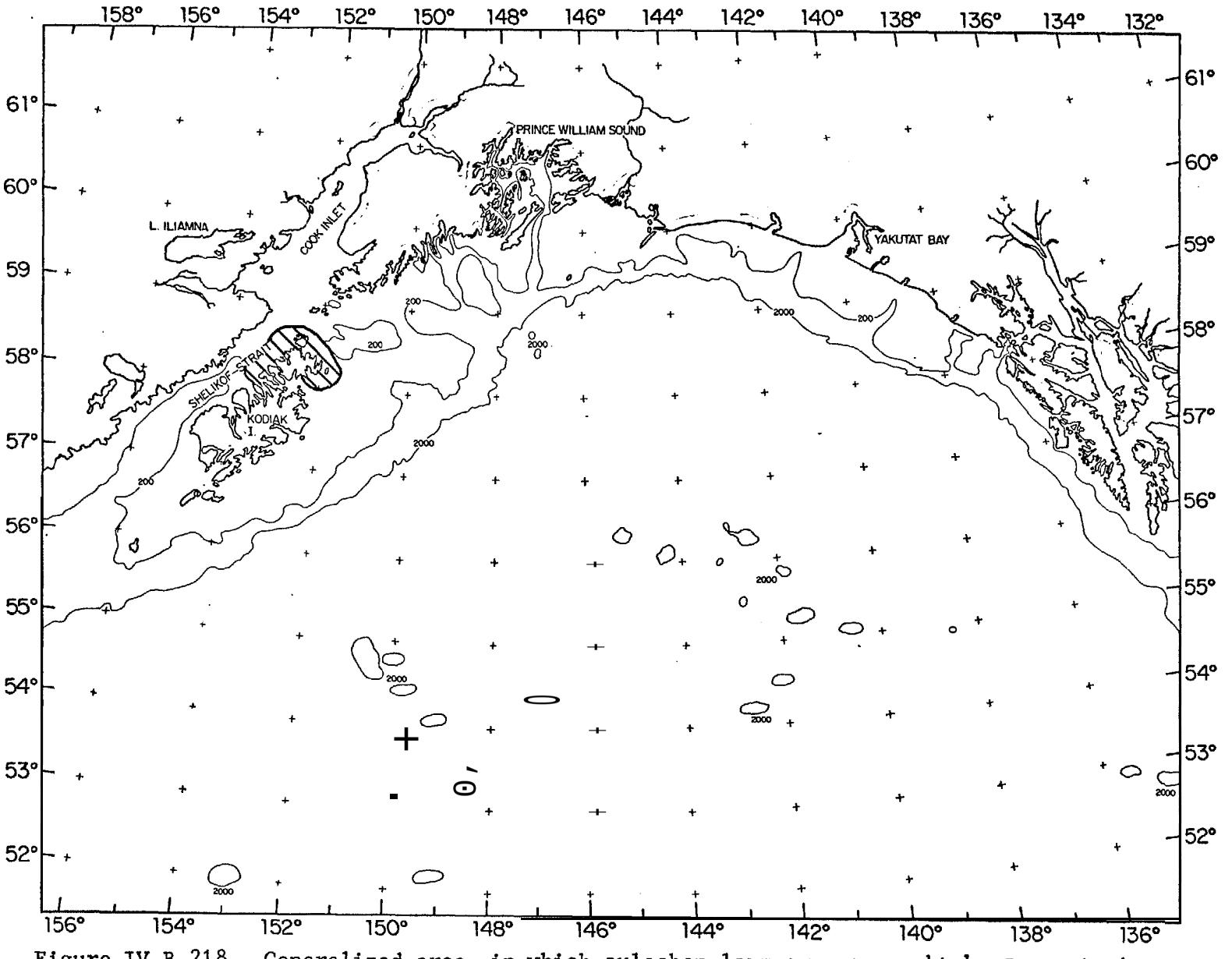


Figure IV.B.218.--Generalized area in which eulachon larvae were caught by =ow nets in summer, Gulf of Alaska.

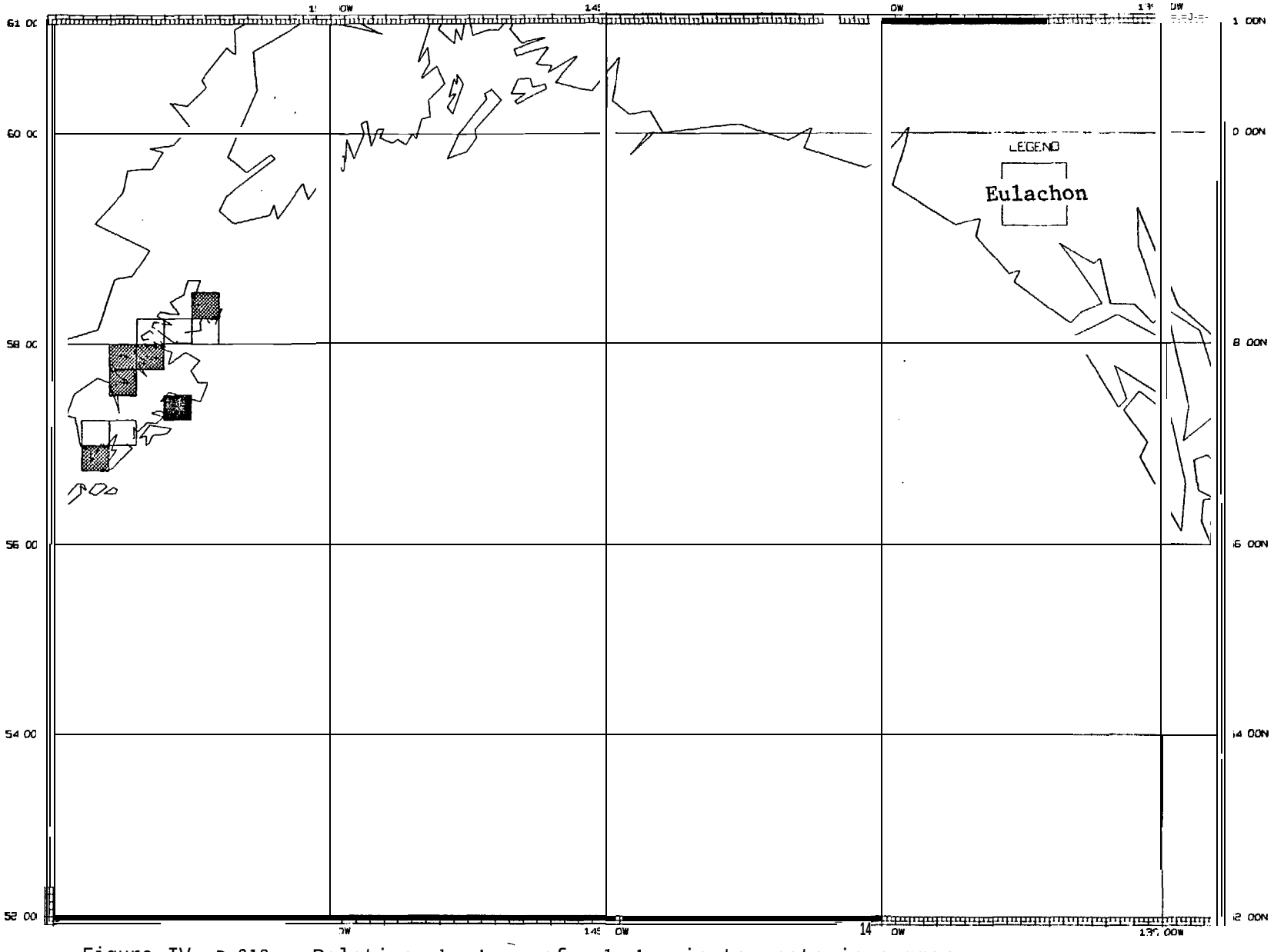


Figure IV. B.219.--Relative abundance of eulachon in tow nets in summer, Gulf of Alaska.

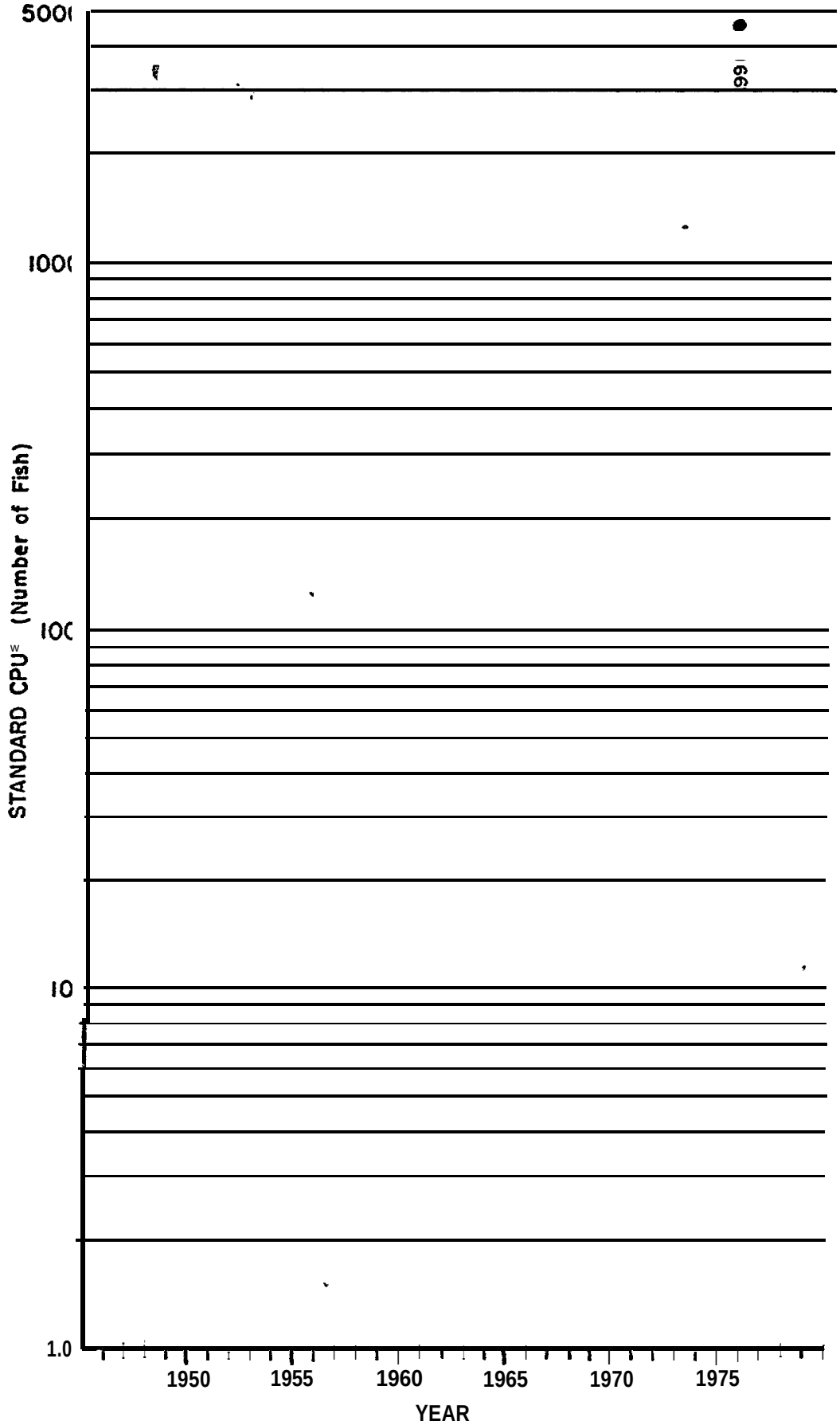


Figure IV.B.220.--Standardized rate of catch of eulachon by tow net in the Gulf of Alaska (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

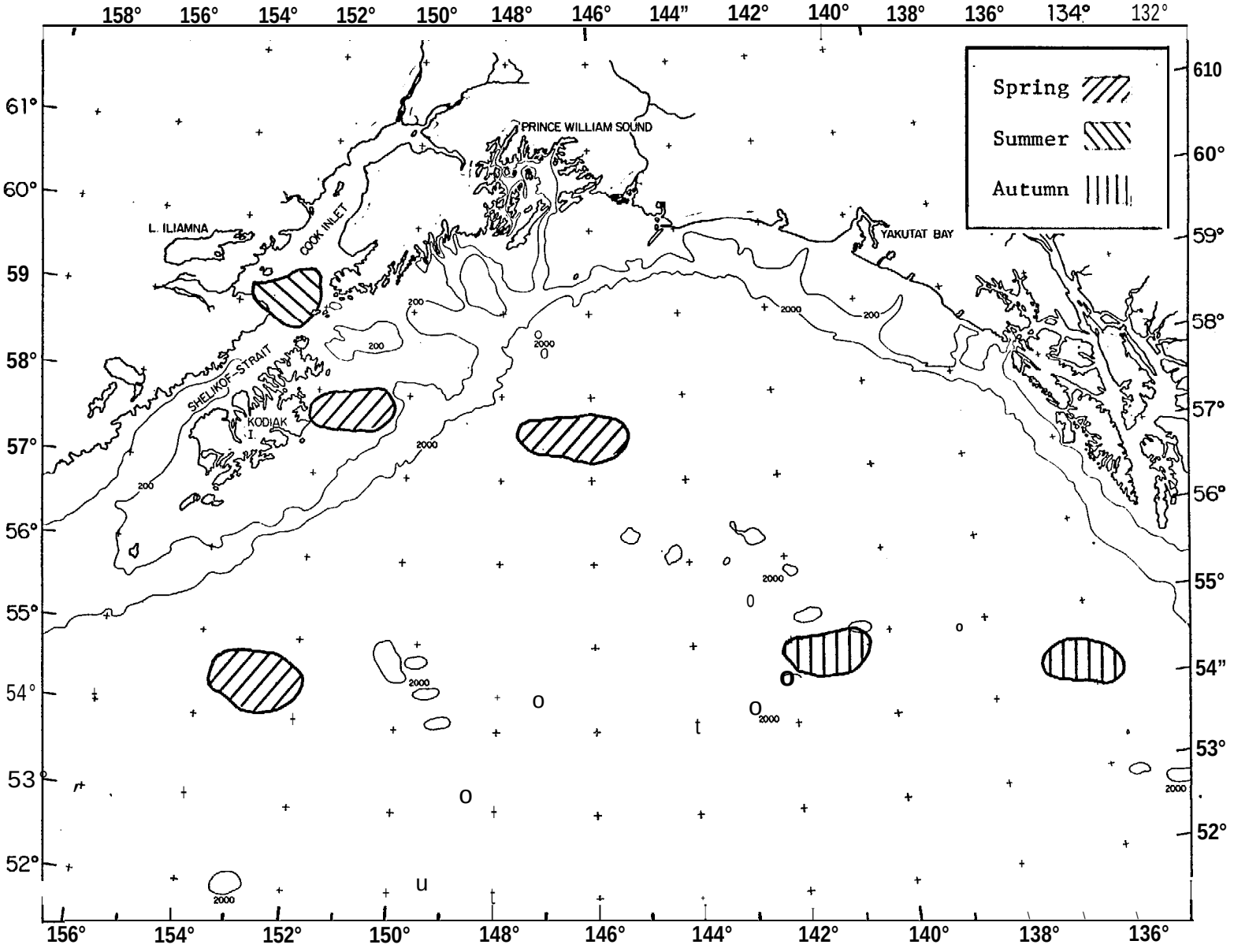


Figure IV. B.221 . --Generalized areas in which deep-sea smelt (Bathylagidae) larvae were caught by bongo nets in spring and autumn and juveniles were caught by Isaacs-Kidd trawl in summer, Gulf of Alaska.

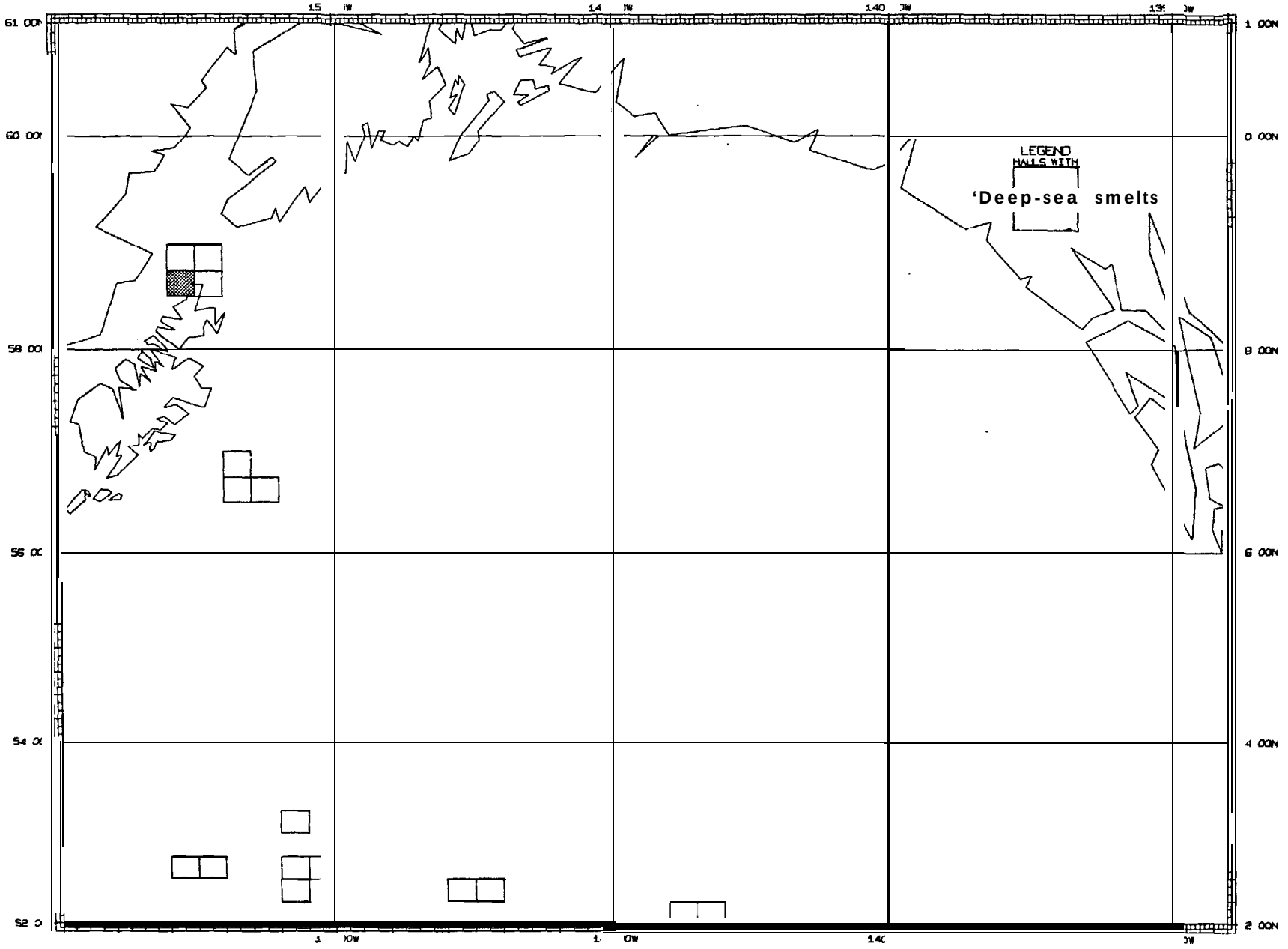


Figure IV.B.222.--Relative abundance of deep-sea smelts (Bathylagidae) in Isaacs-Kidd trawls in summer, Gulf of Alaska.

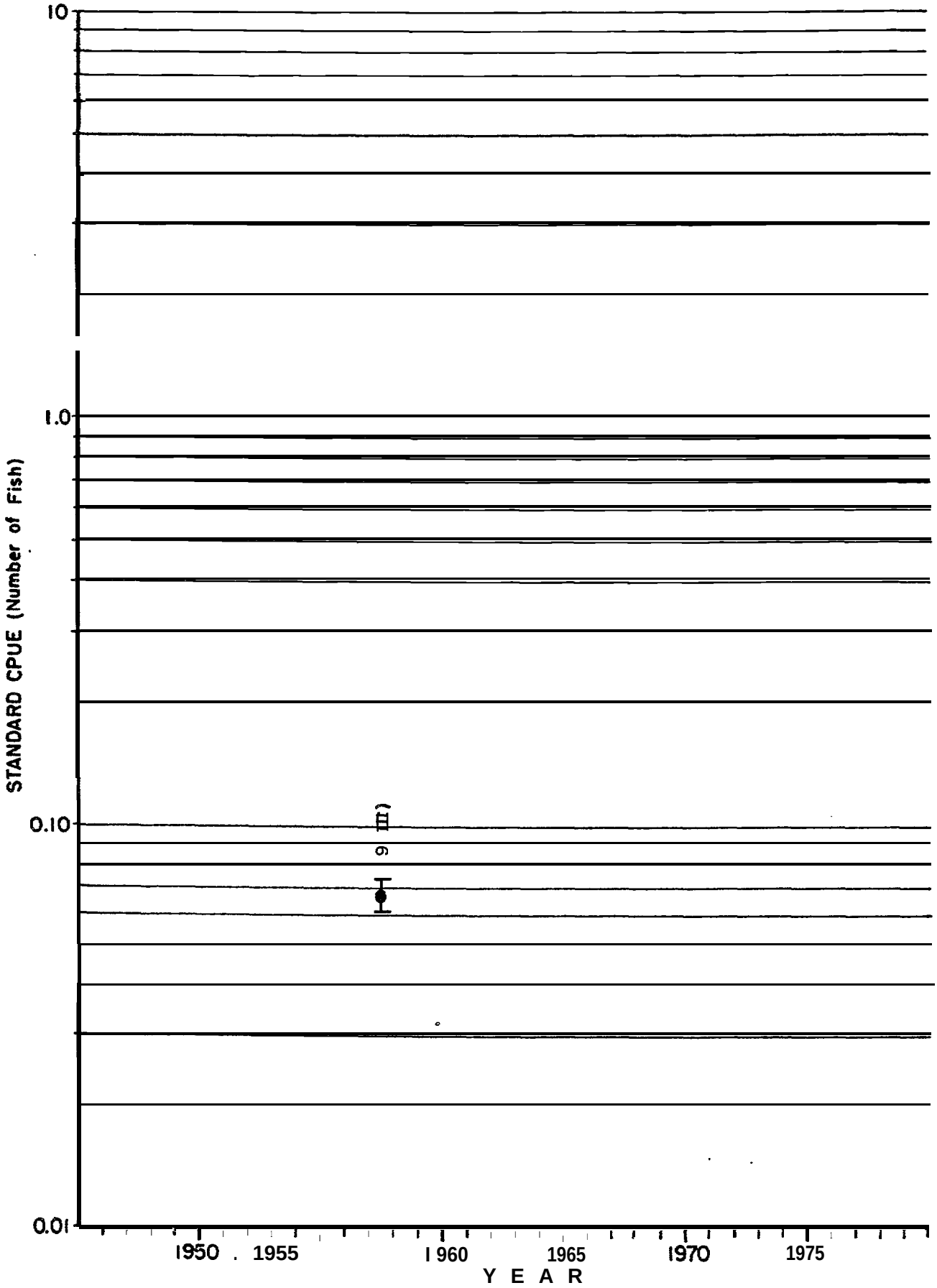


Figure IV.B.223.--Standardized rate of catch of deep-sea smelts (Bathylagidae) by Isaacs-Kidd trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

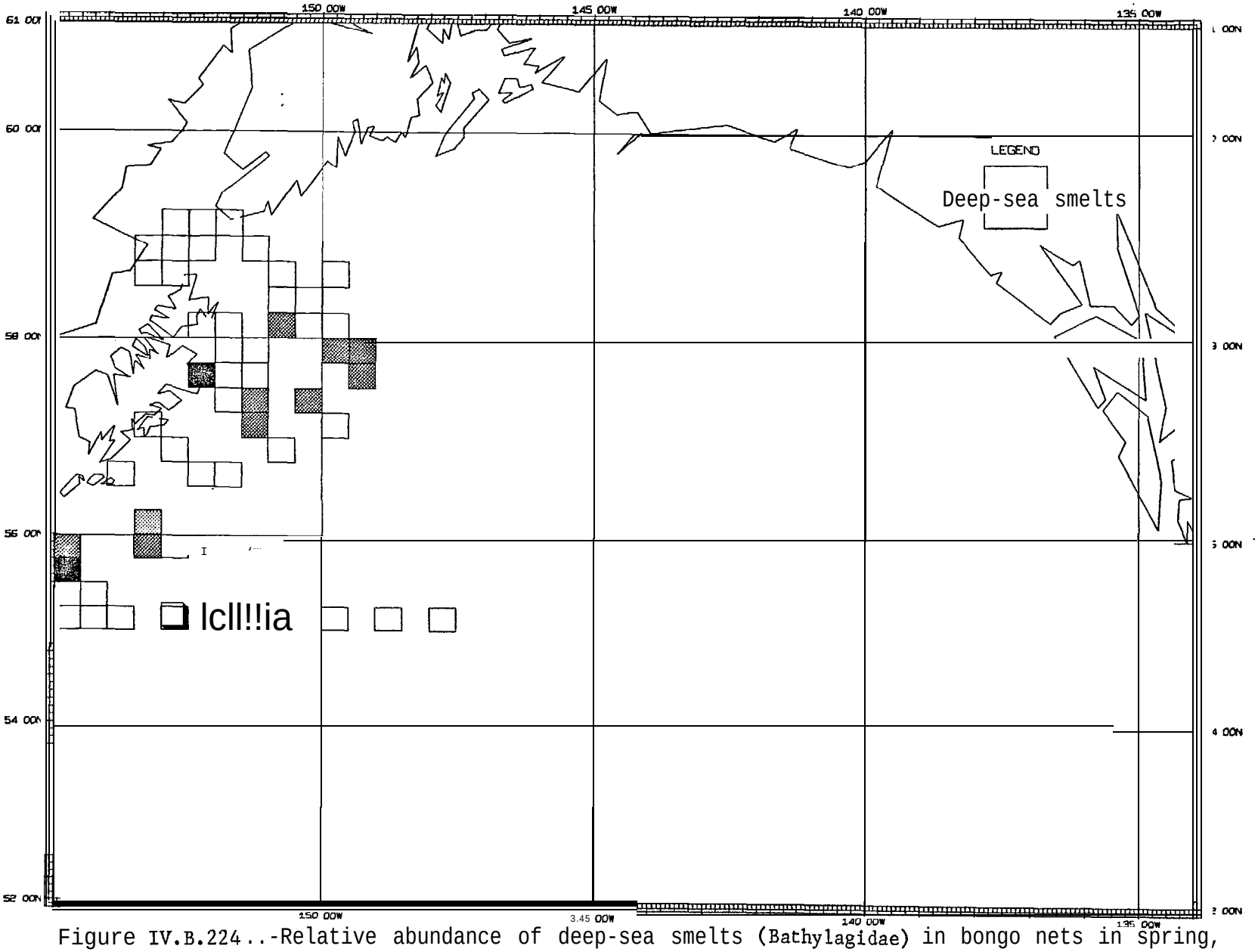


Figure IV.B.224..-Relative abundance of deep-sea smelts (Bathylagidae) in bongo nets in spring, Gulf of Alaska.

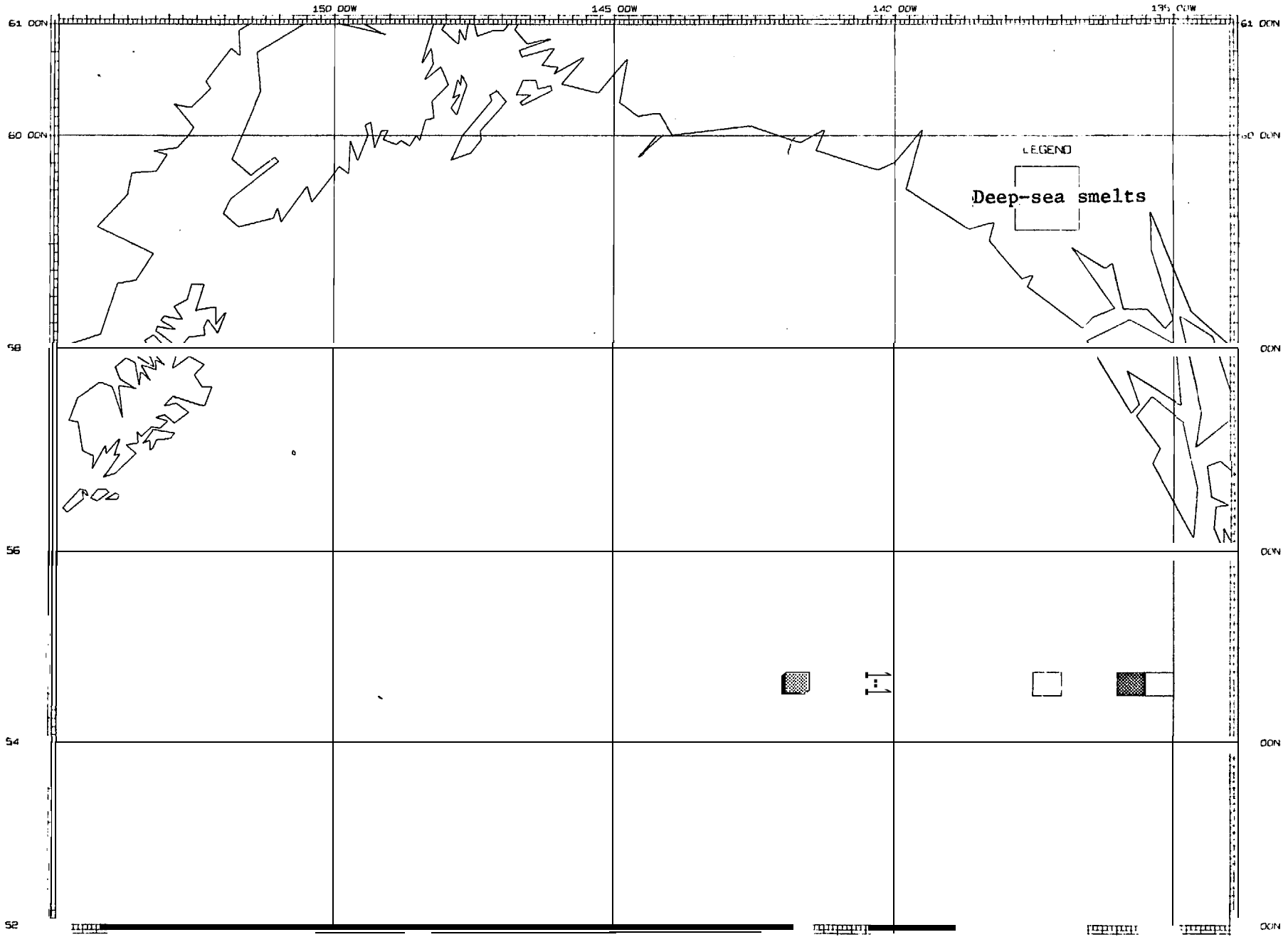


Figure IV.B.225.--Relative abundance of deep-sea smelts Bathylagidae) in bongo nets in autumn, Gulf of Alaska.

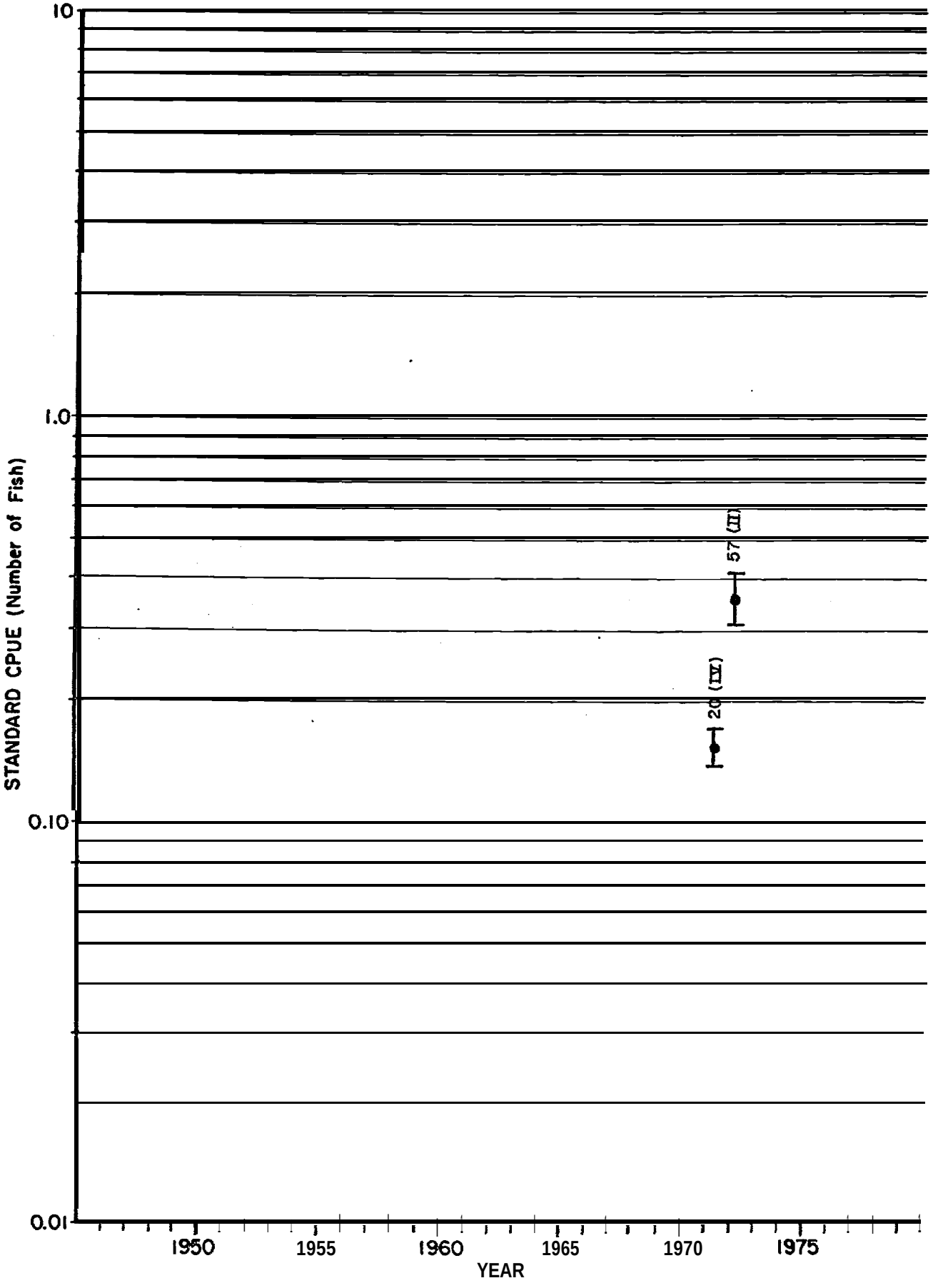


Figure IV. B.226.--Standardized rate of catch of deep-sea smelts (Bathylagidae) by bongo net in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

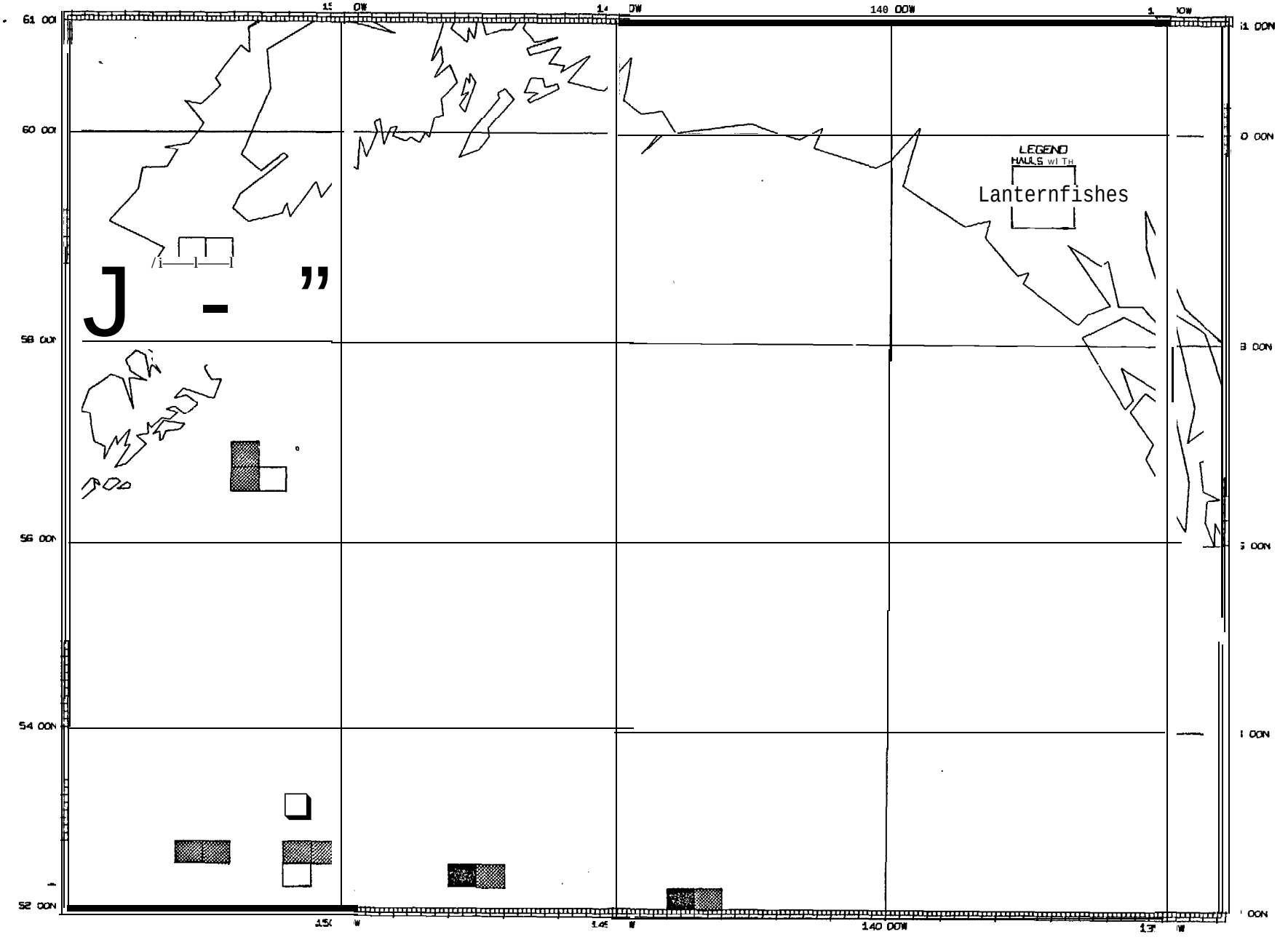


Figure IV.B.227.--Relative abundance of lanternfishes (Myctophidae) in Isaacs-Kidd trawls in summer, Gulf of Alaska.

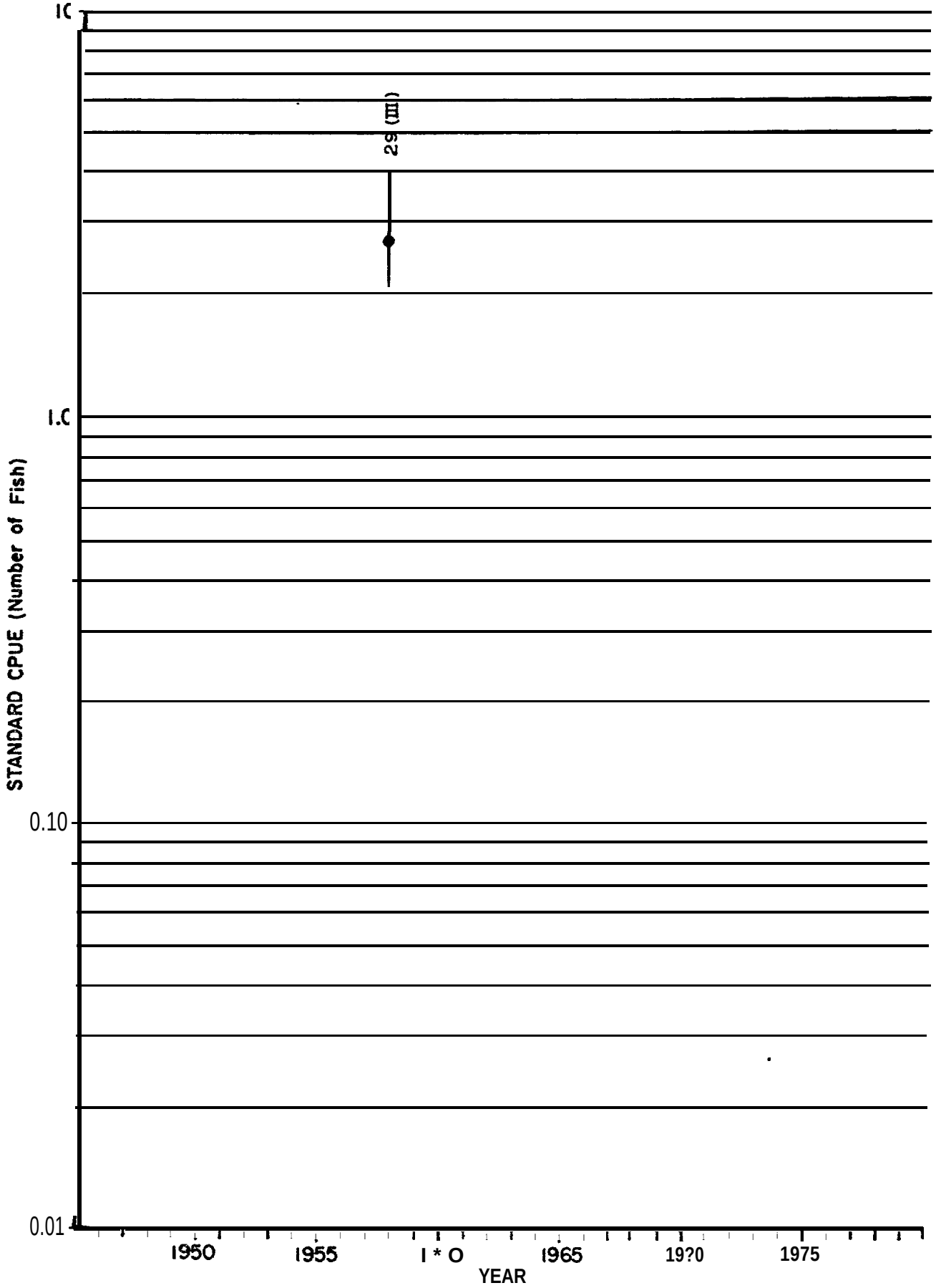


Figure IV.B.228.--Standardized rate of catch of lanternfishes (Myctophidae) by Isaacs-Kidd trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

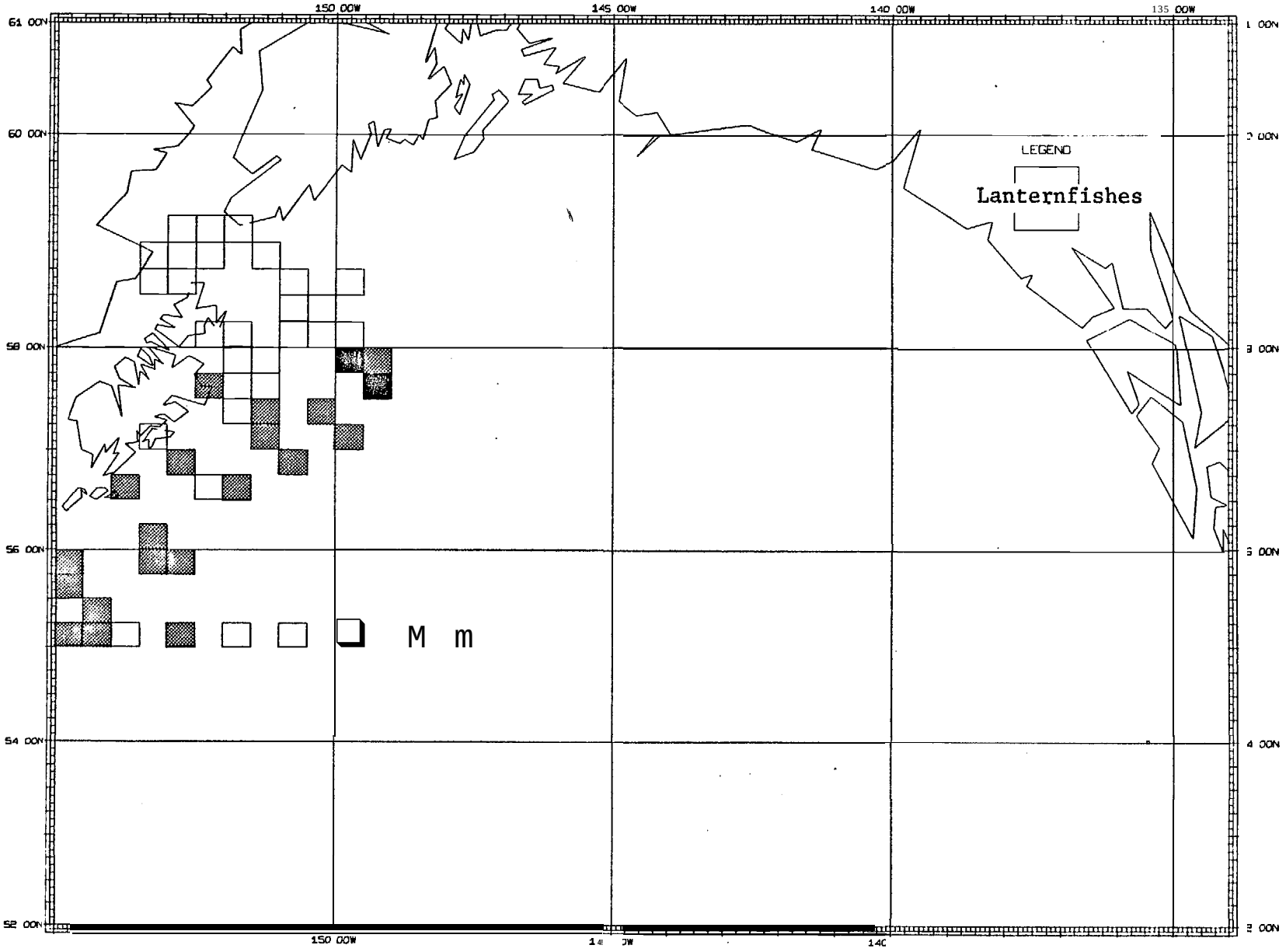


Figure IV.B.229.--Relative abundance of lanternfishes (Myctophidae) in bongo nets in spring, Gulf of Alaska.

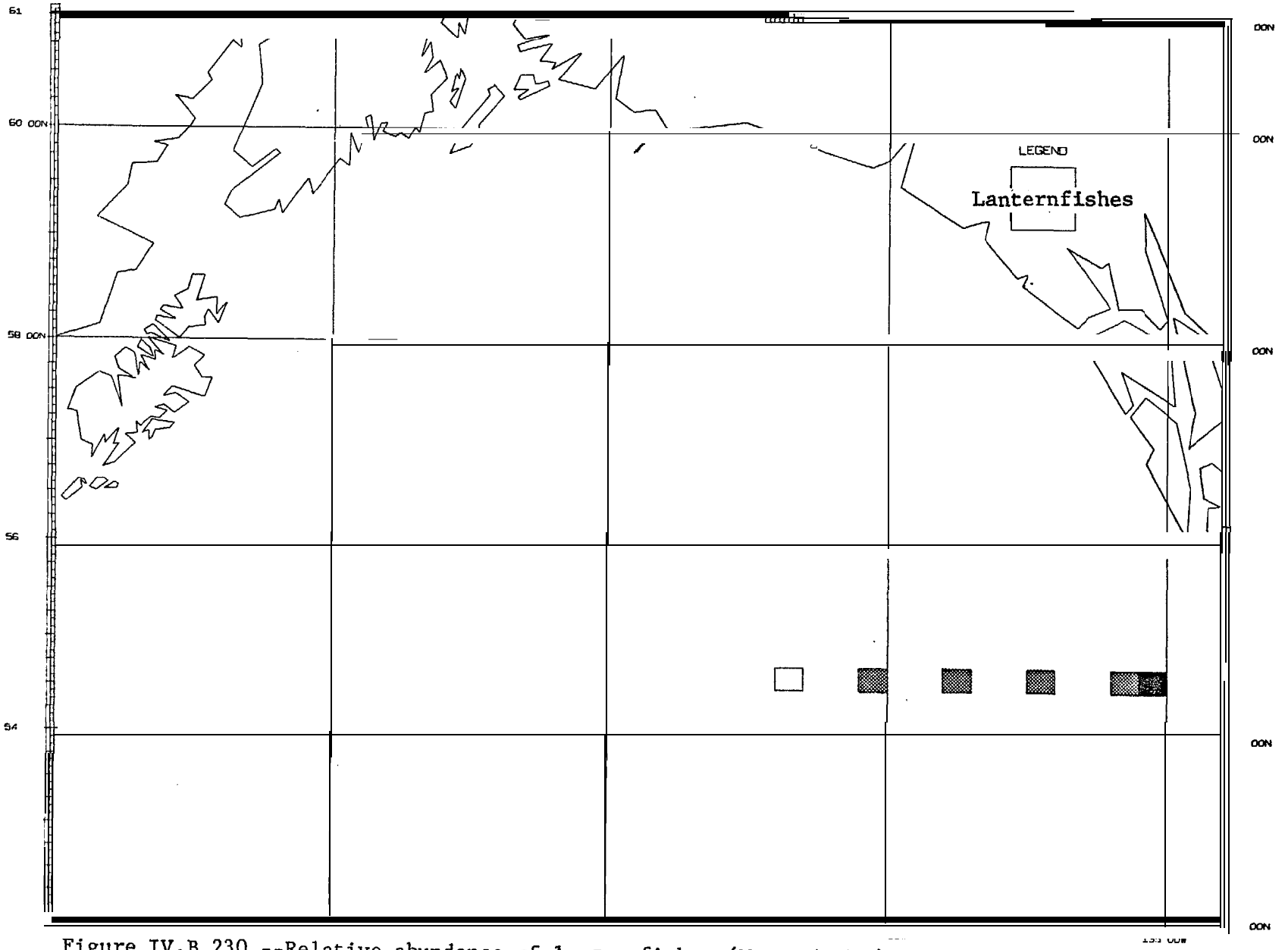


Figure IV.B.230.--Relative abundance of lanternfishes (Myctophidae) in bongo nets in autumn, Gulf of Alaska.

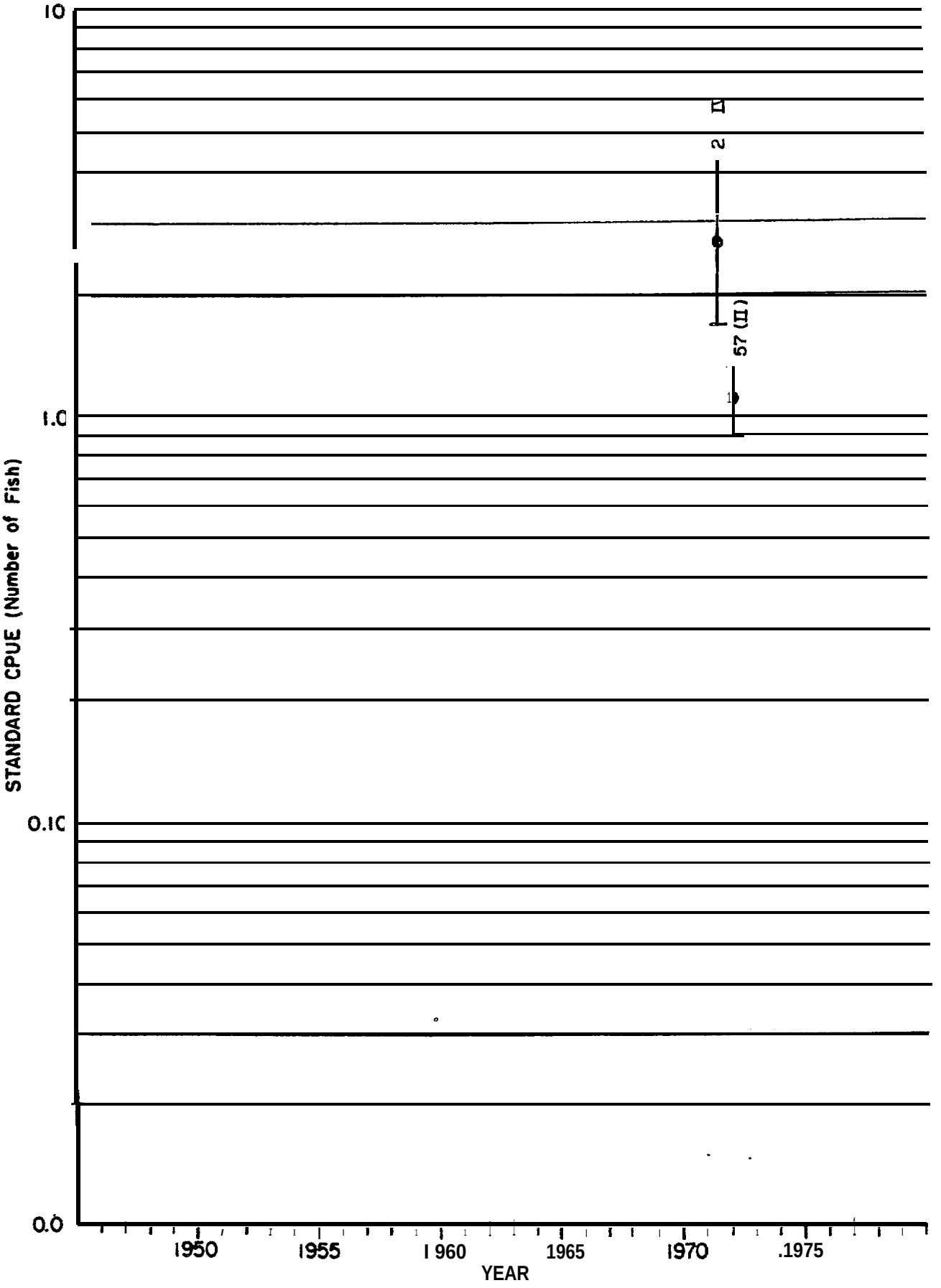


Figure IV.B.231.--Standardized rate of catch of lanternfishes (Myctophidae) by bongo net in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

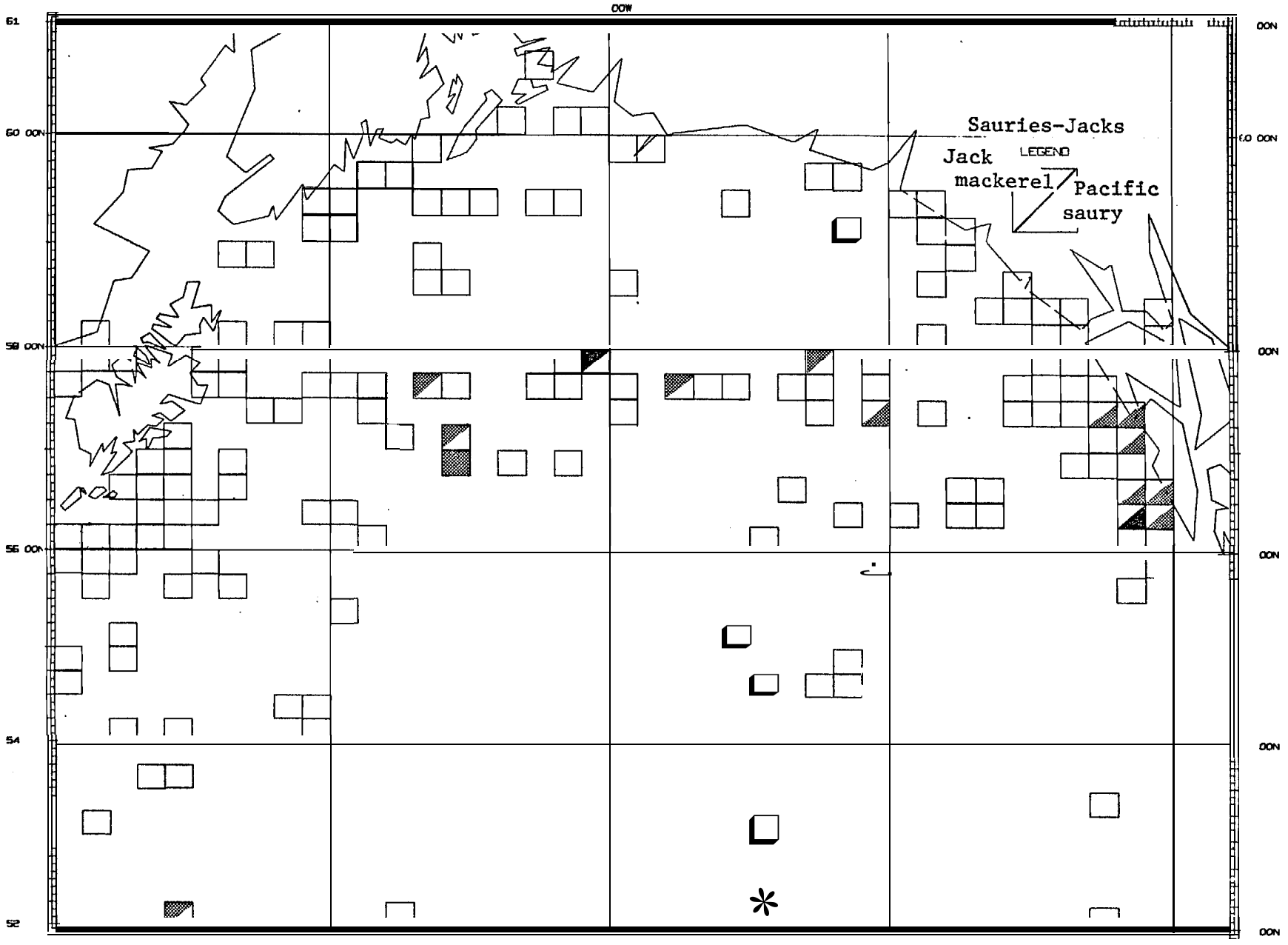


Figure IV.B.232.--Relative abundance of jack mackerel and Pacific saury in purse seines in summer, Gulf of Alaska.

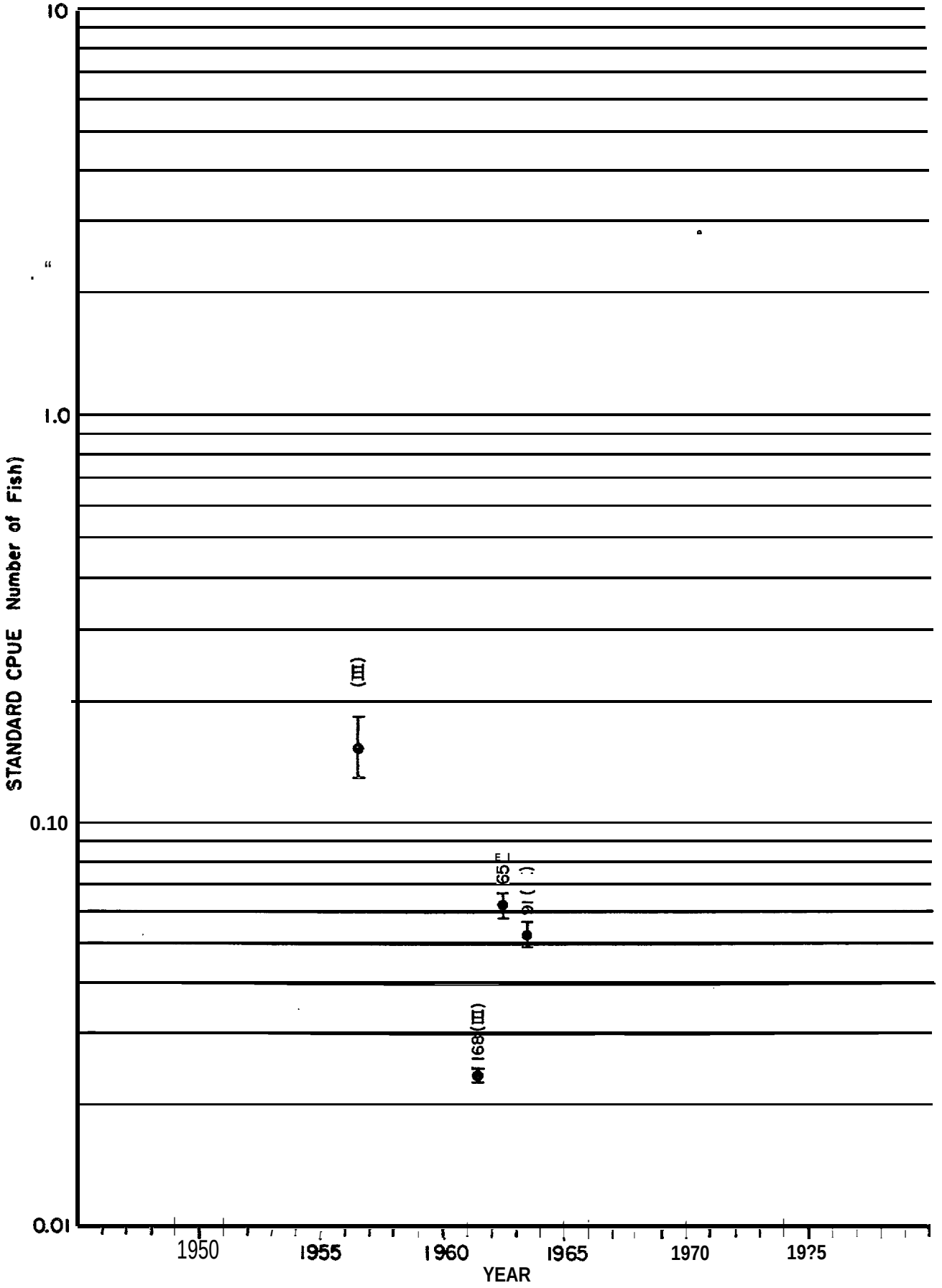


Figure IV. B.233.--Standardized rate of catch of jack mackerel by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

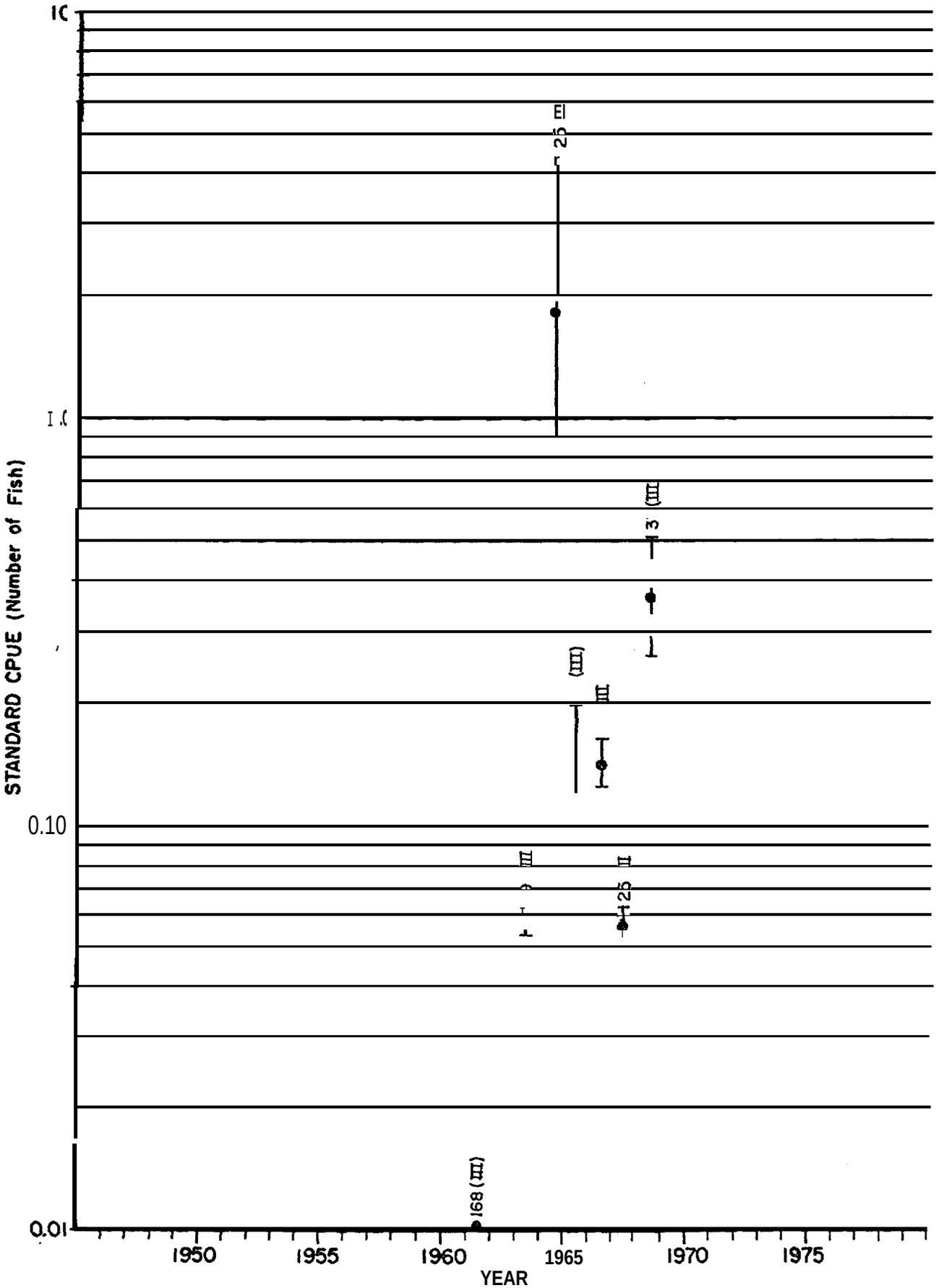


Figure IV. B.234.--Standardized rate of catch of Pacific saury by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year}.

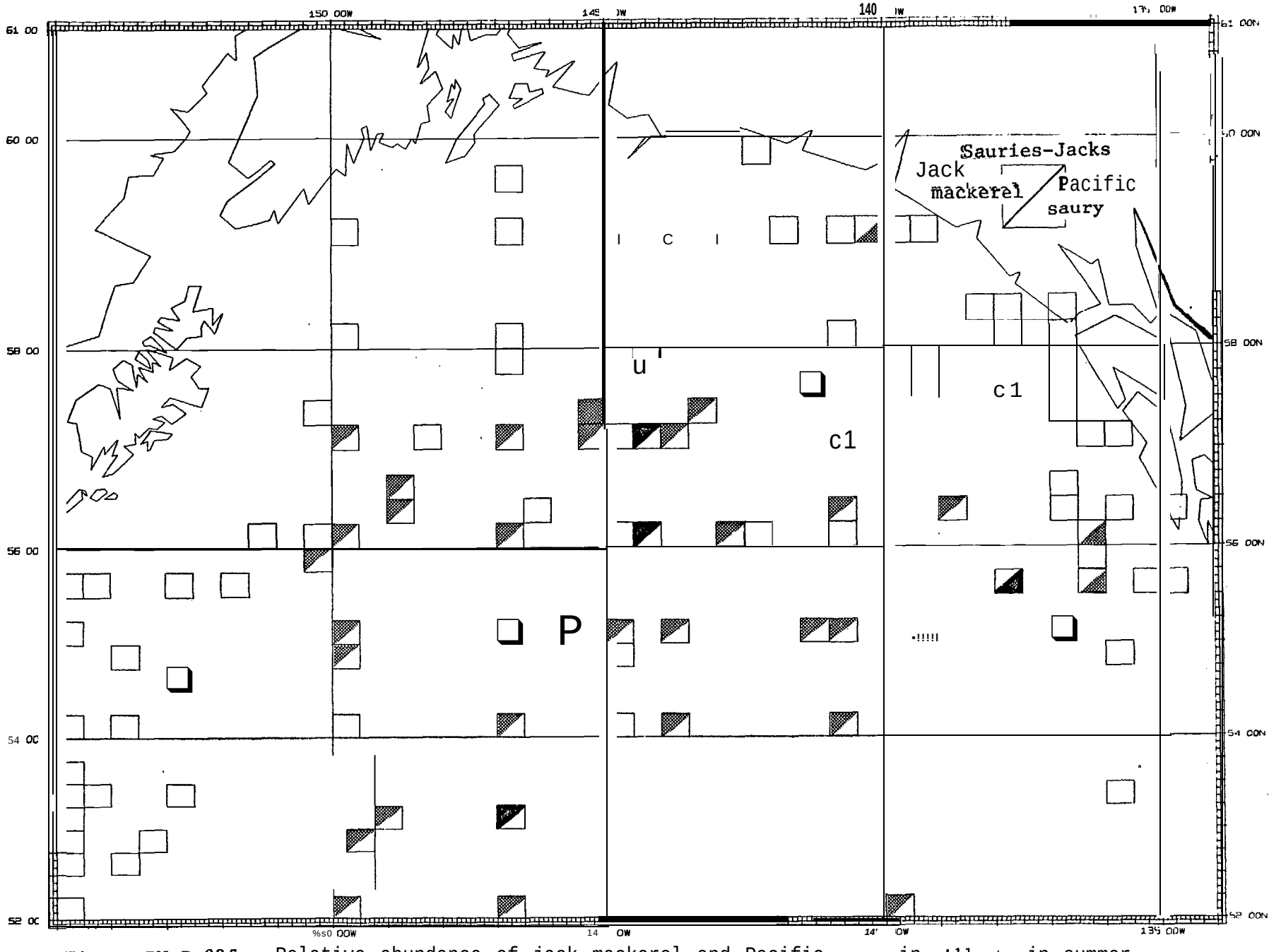


Figure IV.B.235.--Relative abundance of jack mackerel and Pacific saury in gillnets in summer, 'Gulf of Alaska.

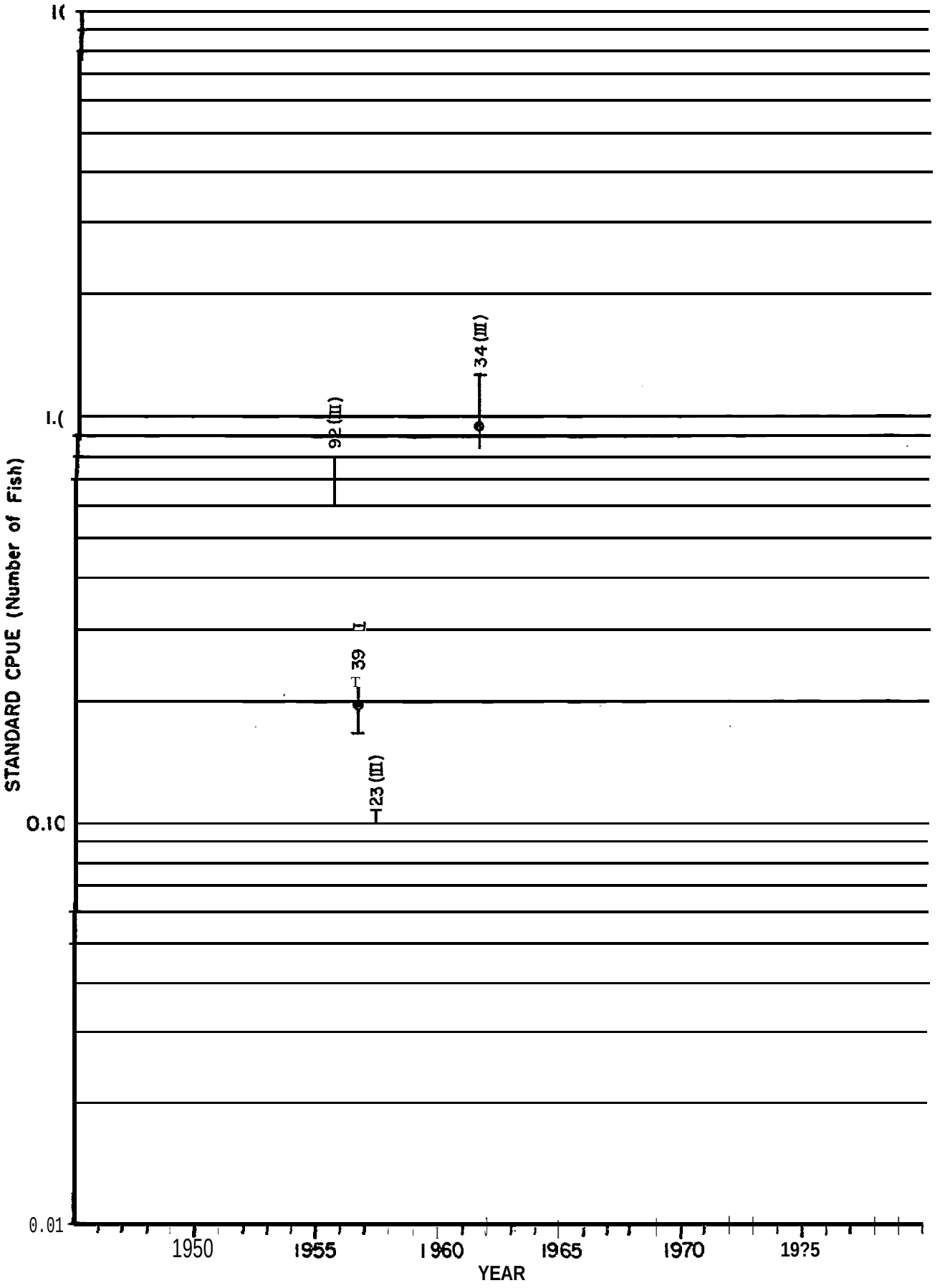


Figure IV.B.236.--Standardized rate of catch of jack mackerel by gillnet in the Gulf of Alaska (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

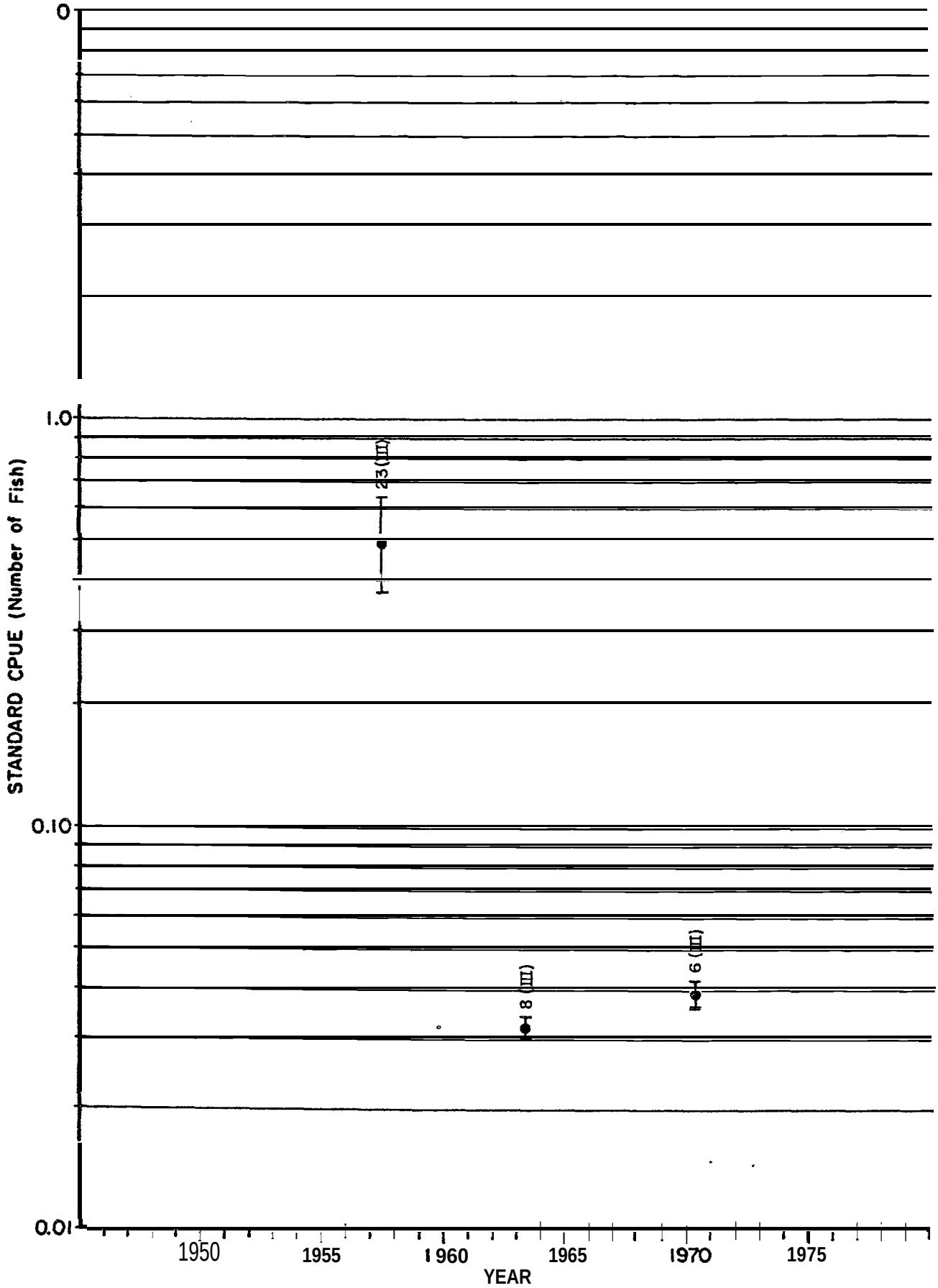


Figure IV.B.237. .-Standardized rate of catch of Pacific saury by gillnet in the Gulf of Alaska (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

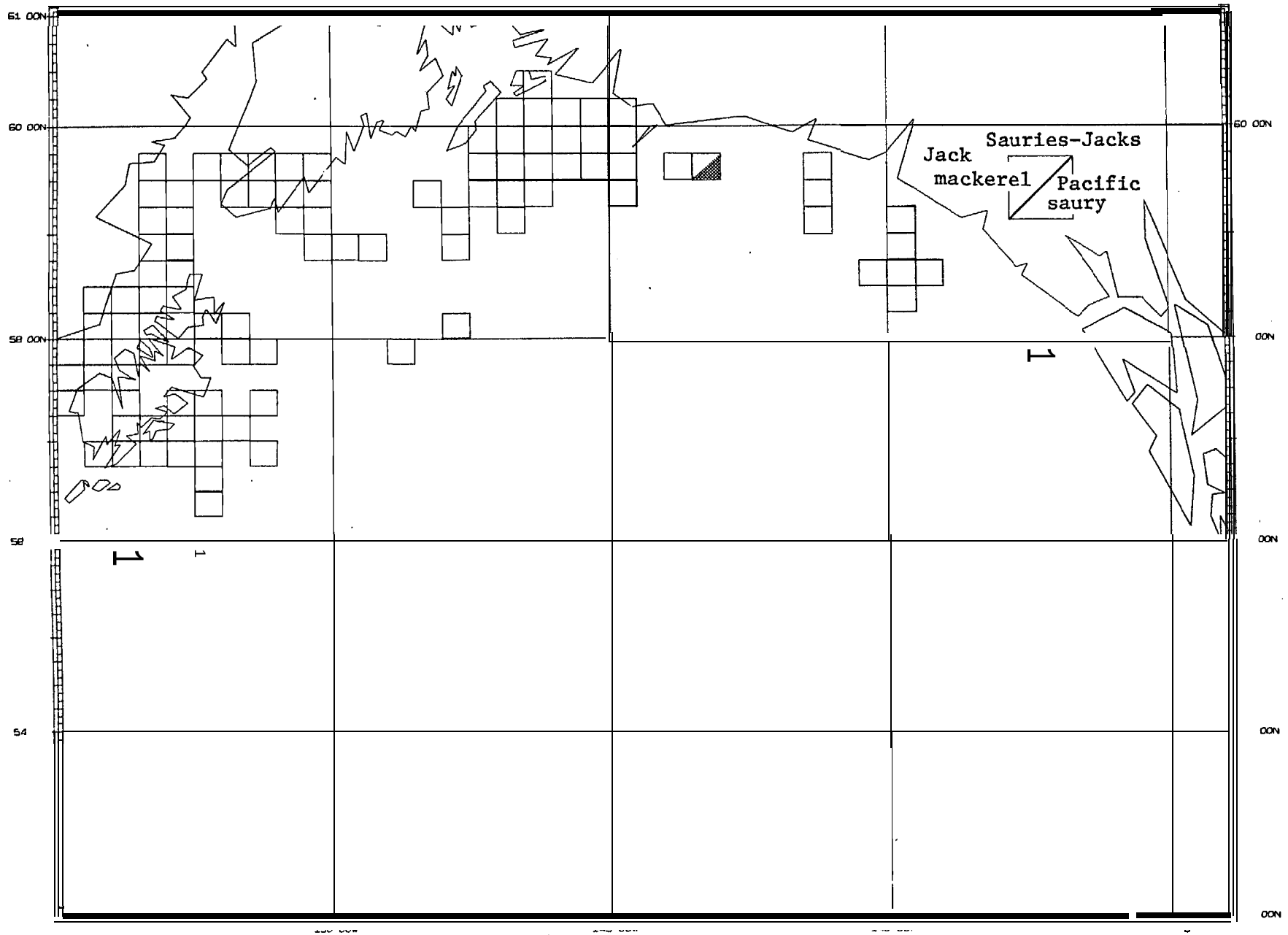


Figure IV.B.238.--Relative abundance of jack mackerel and Pacific saury in bottom trawls in summer, Gulf of Alaska.

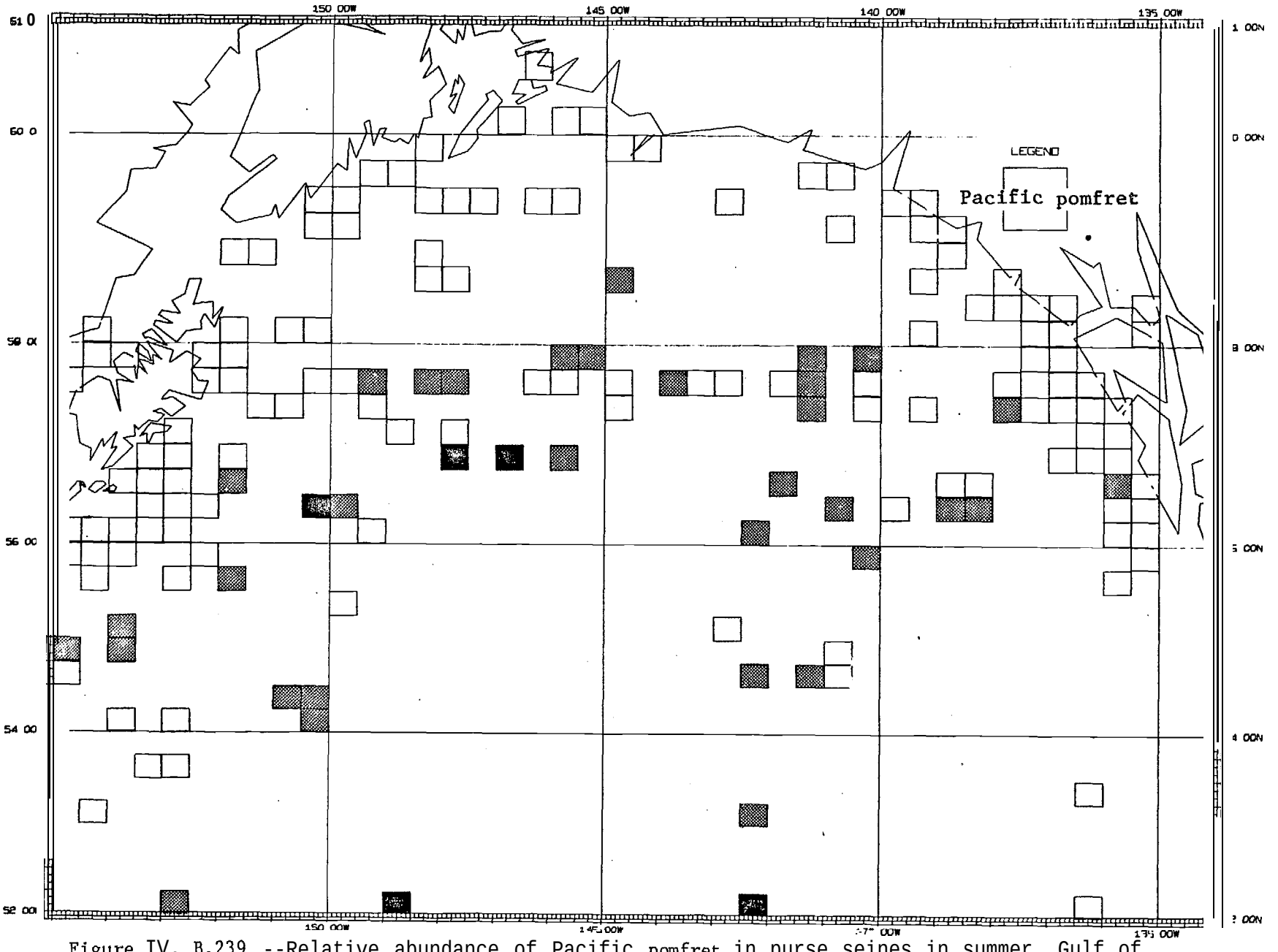


Figure IV. B.239.--Relative abundance of Pacific pomfret in purse seines in summer, Gulf of Alaska.

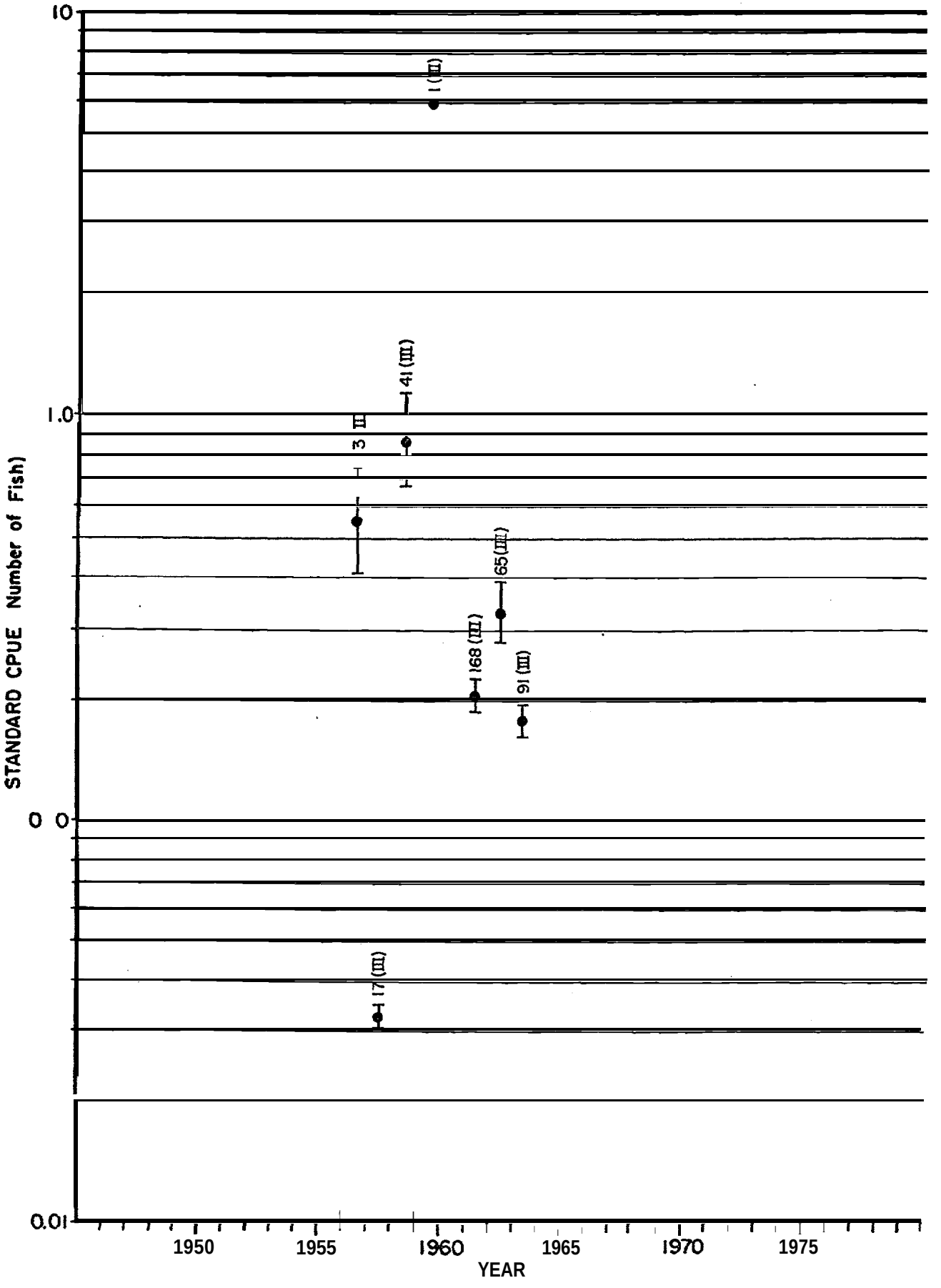


Figure IV. B.240. --Standardized rate of catch of Pacific pomfret by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

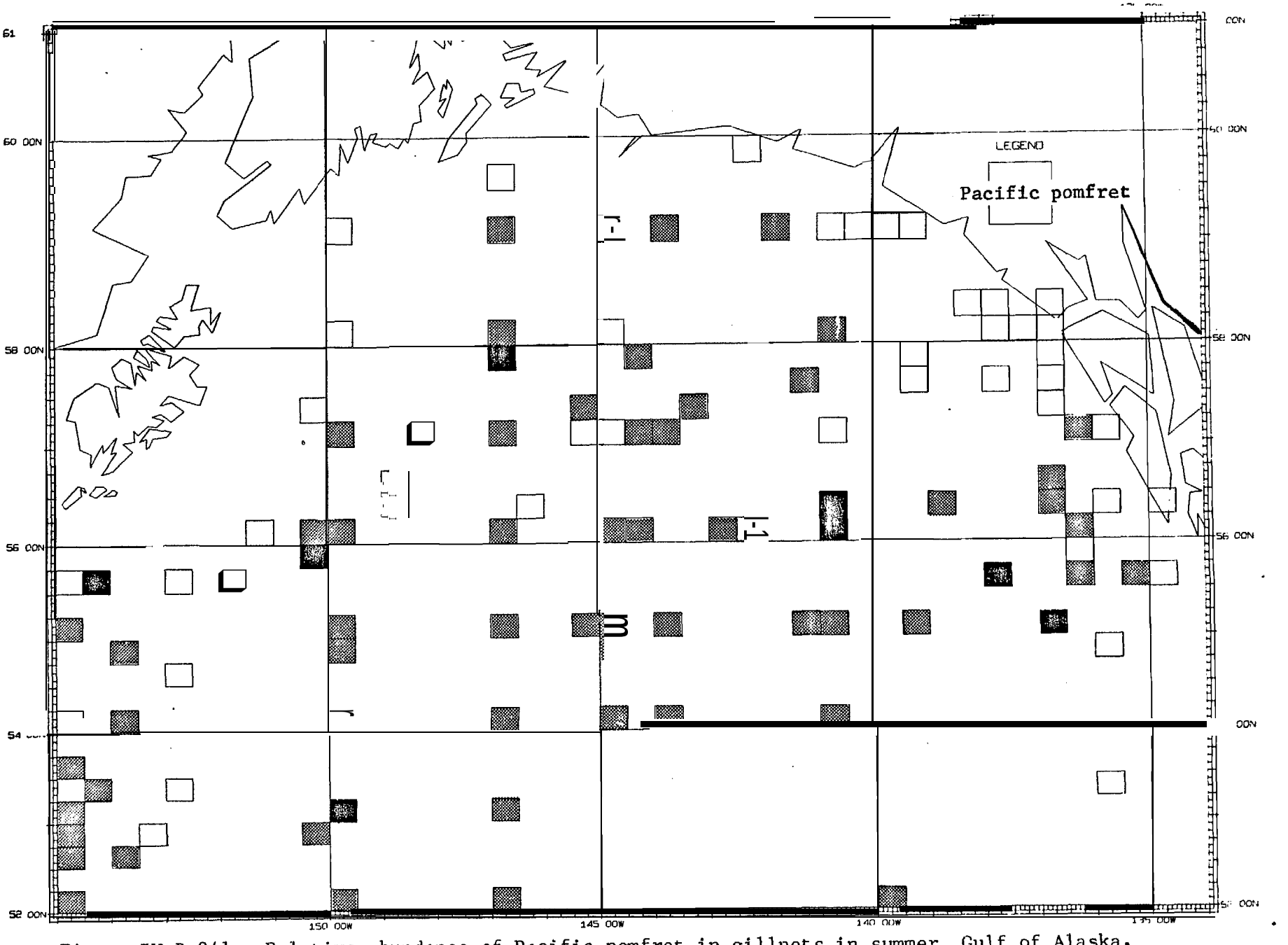


Figure IV.B.241.--Relative abundance of Pacific pomfret in gillnets in summer, Gulf of Alaska.

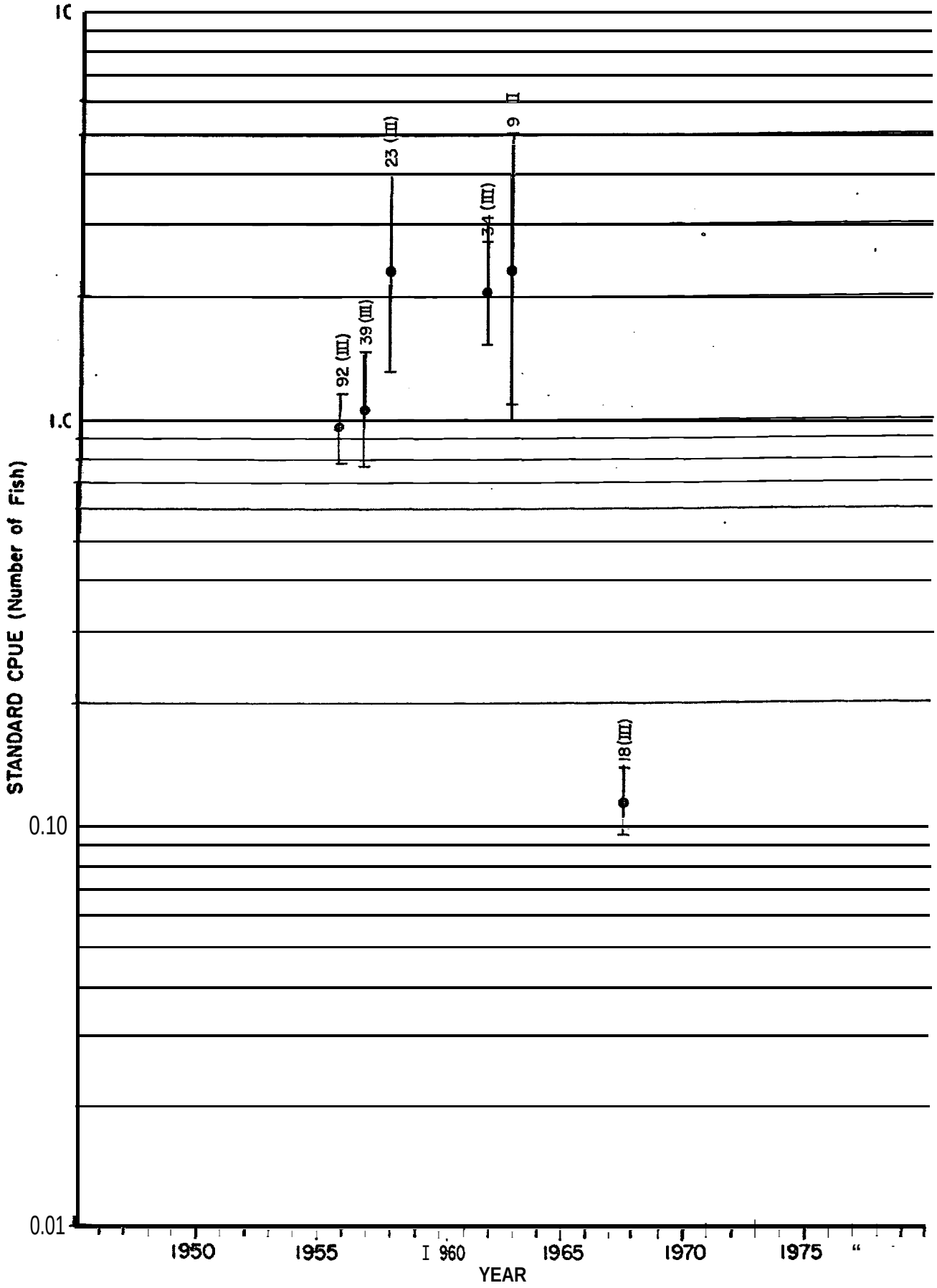


Figure IV. B.242.--Standardized rate of catch of Pacific pomfret by gillnet in the Gulf of Alaska (geometric mean: number/km of net in 12 hr soak with 90% confidence interval, number of observations, and quarter of the year).

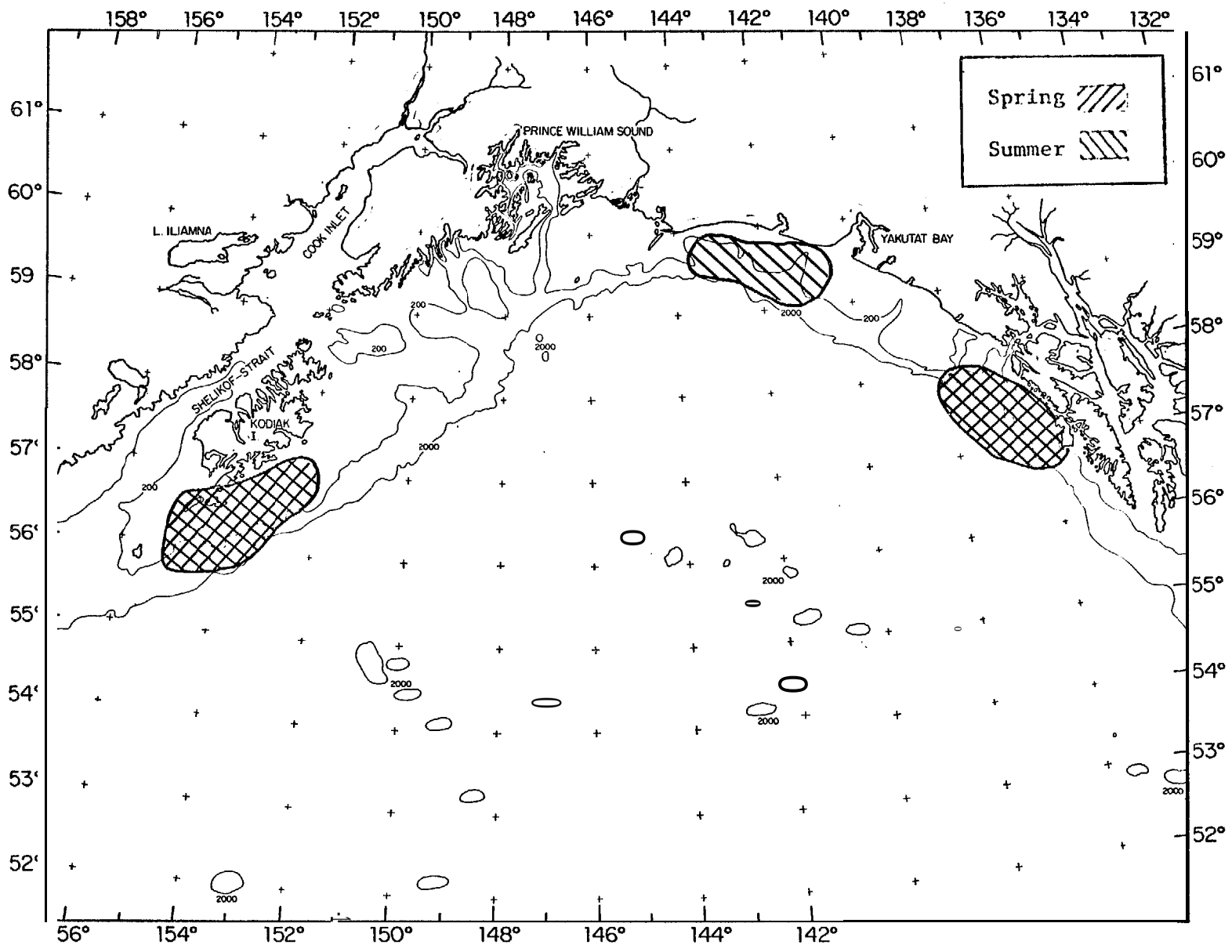


Figure IV.B.243.--Generalized areas in which prowfish juveniles were caught by seines in spring and summer, Gulf of Alaska.

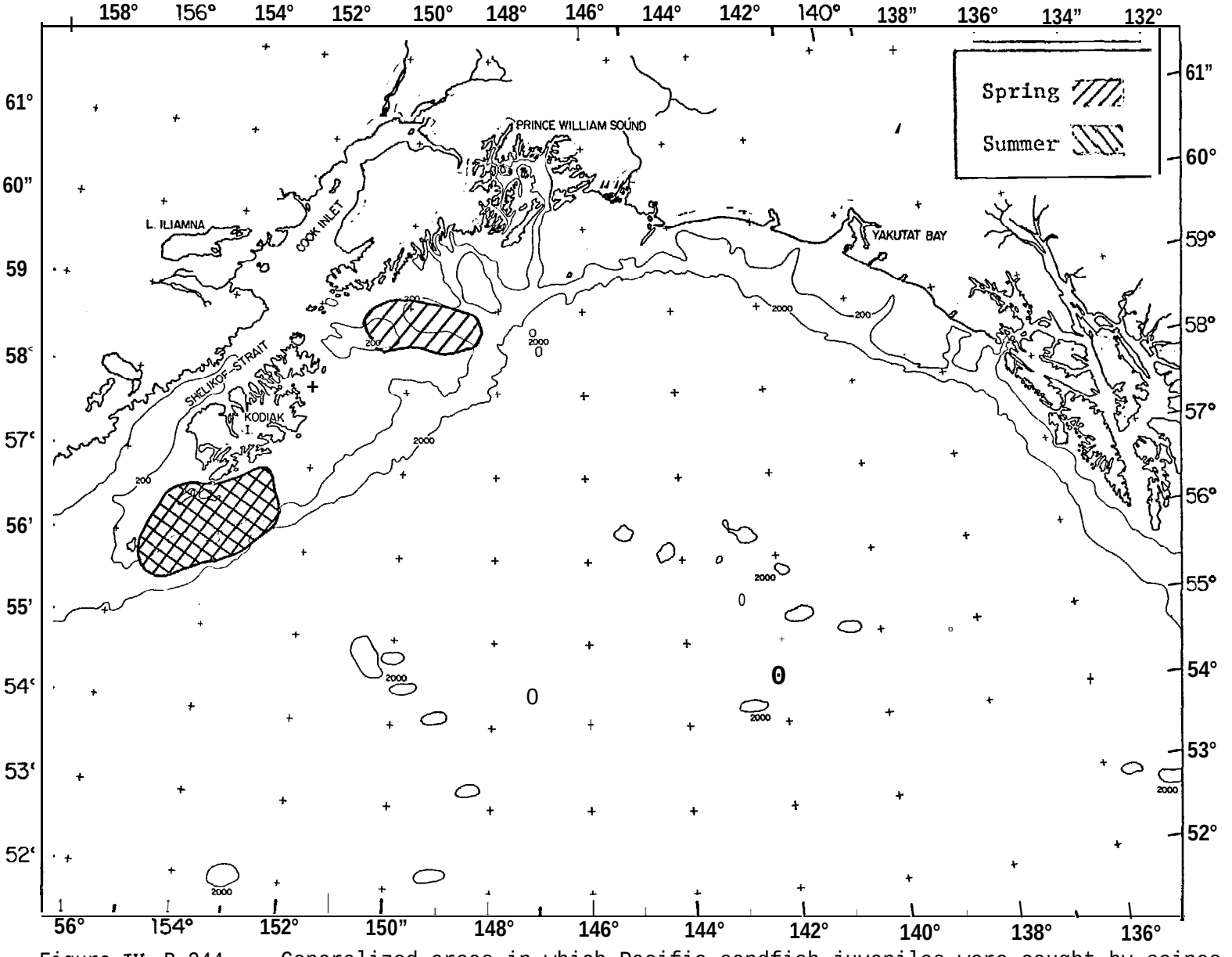


Figure IV. B.244 . --Generalized areas in which Pacific sandfish juveniles were caught by seines in spring and summer, Gulf of Alaska.

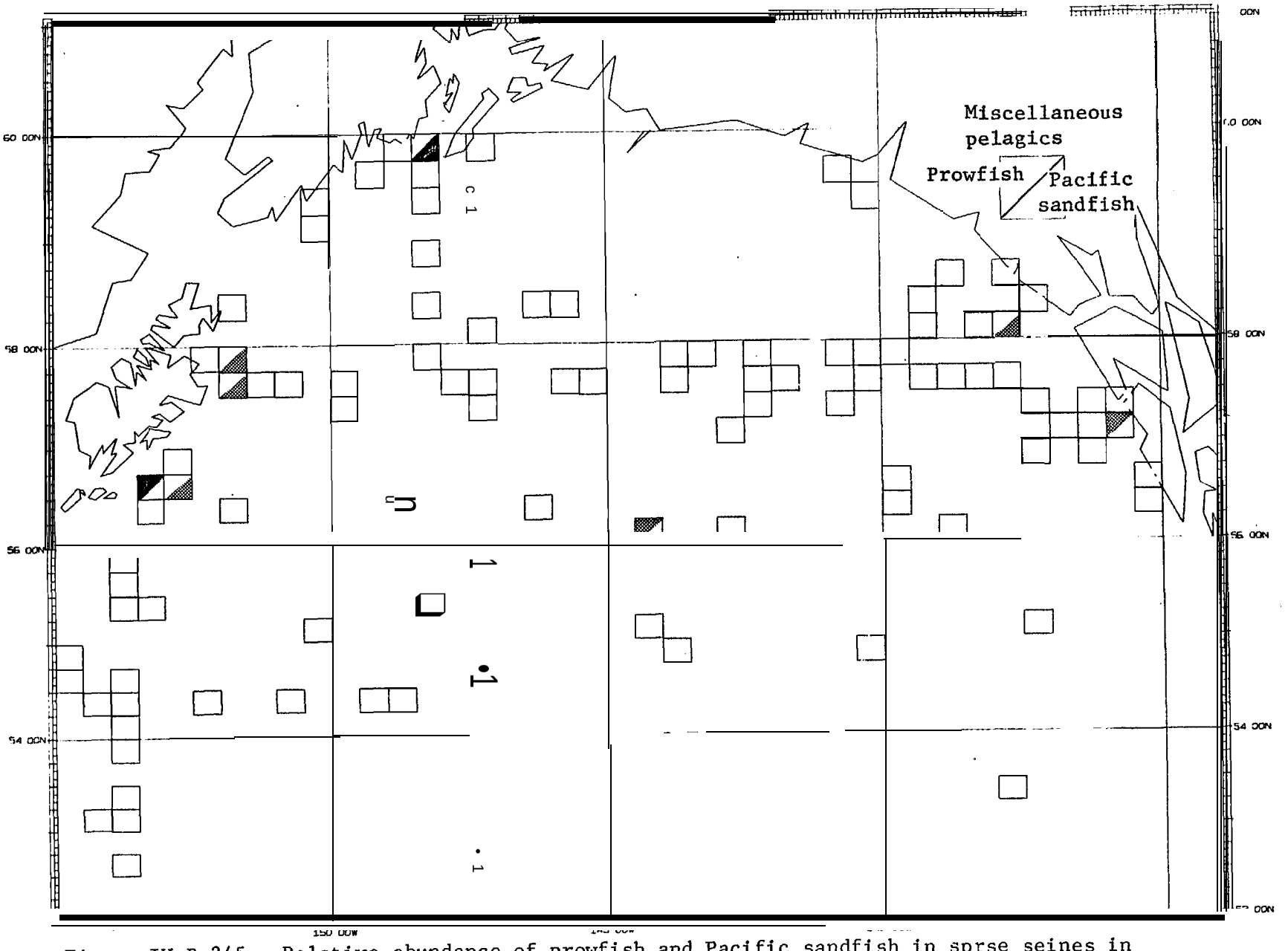


Figure IV.B.245.--Relative abundance of prowfish and Pacific sandfish in sprse seines in spring, Gulf of Alaska.

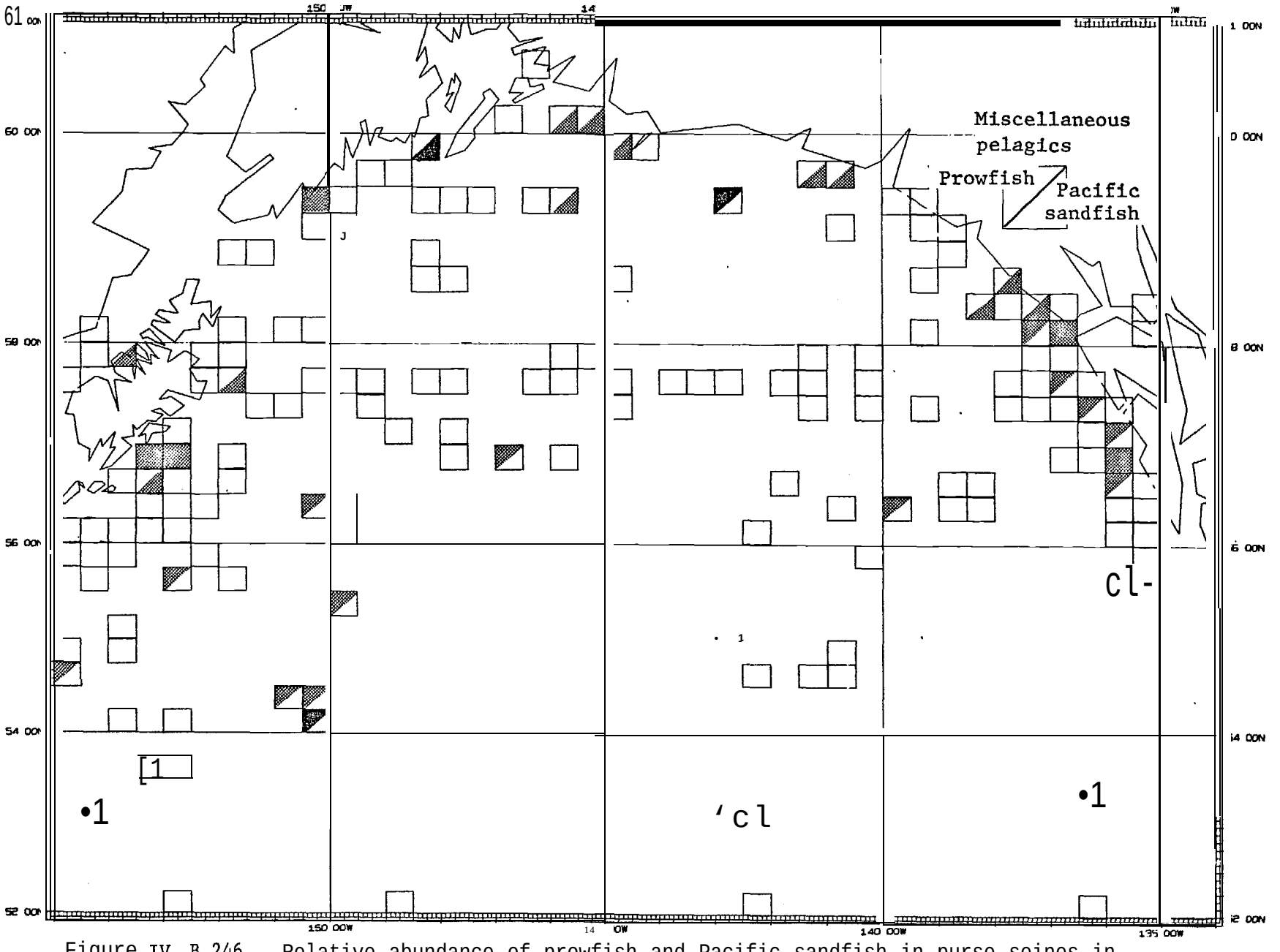


Figure IV. B.246.--Relative abundance of prowfish and Pacific sandfish in purse seines in summer, Gulf of Alaska.

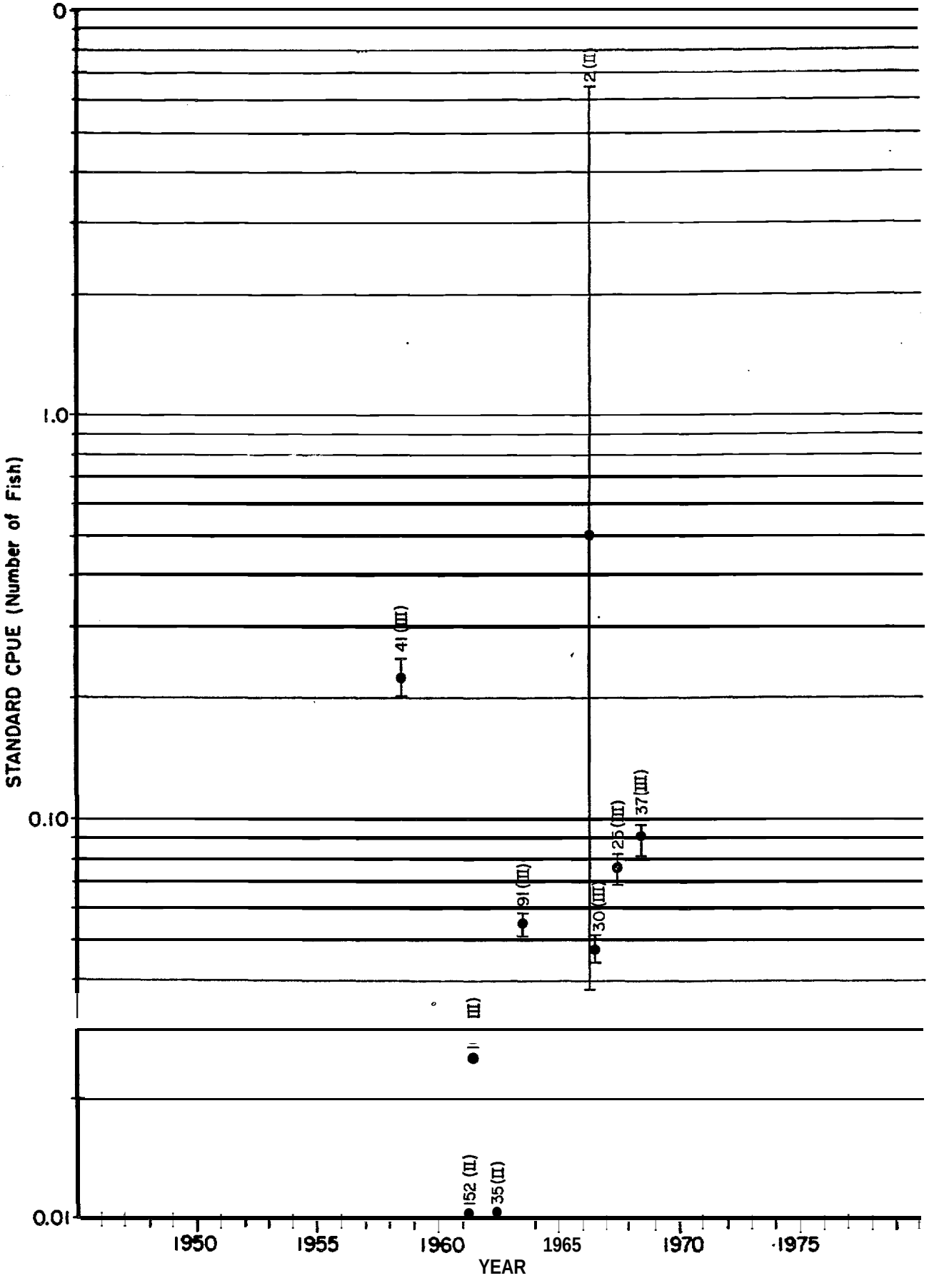


Figure IV. B.247.--Standardized rate of catch of prowfish by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

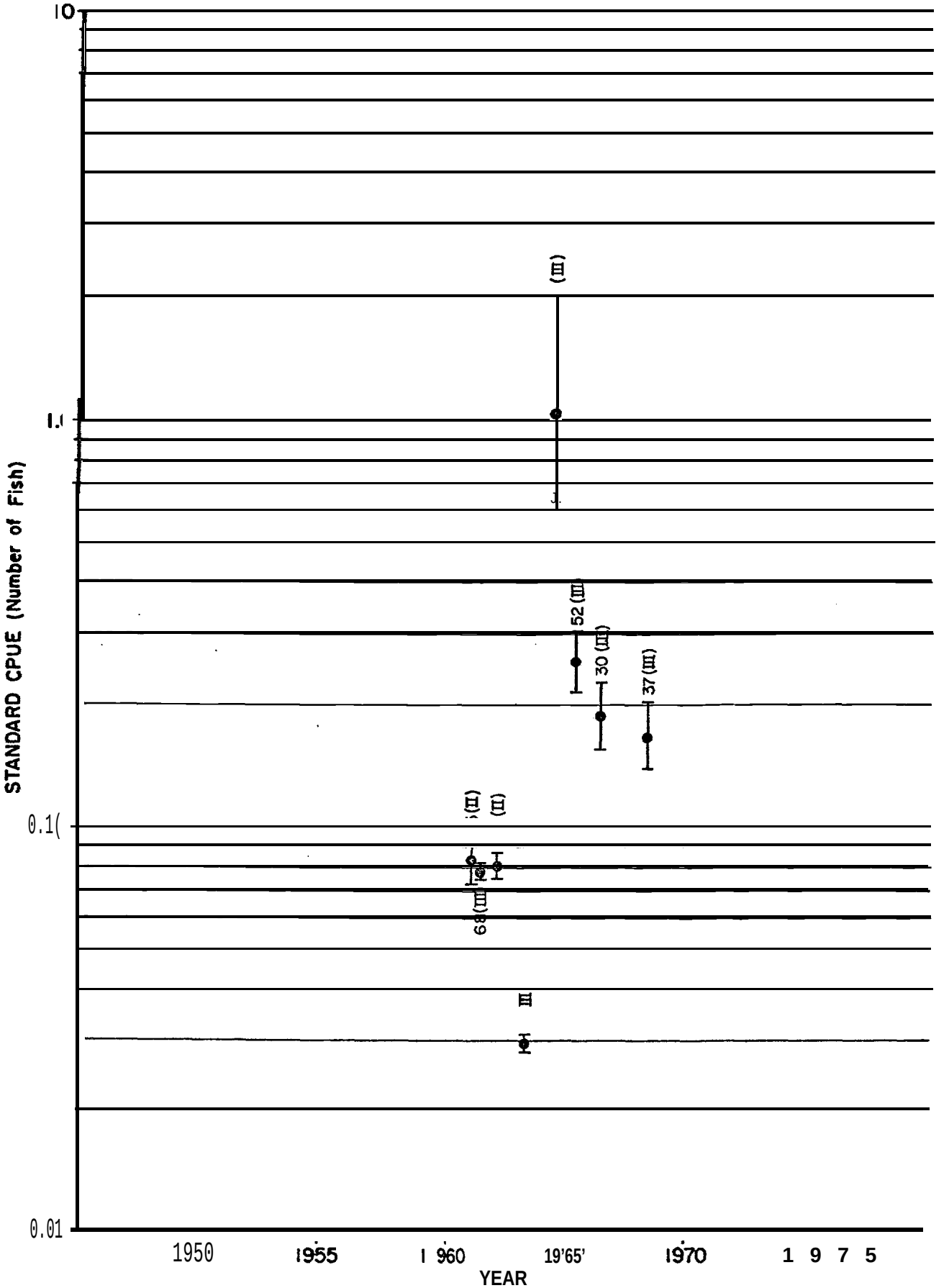


Figure IV.B.248.--Standardized rate of catch of Pacific sandfish by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

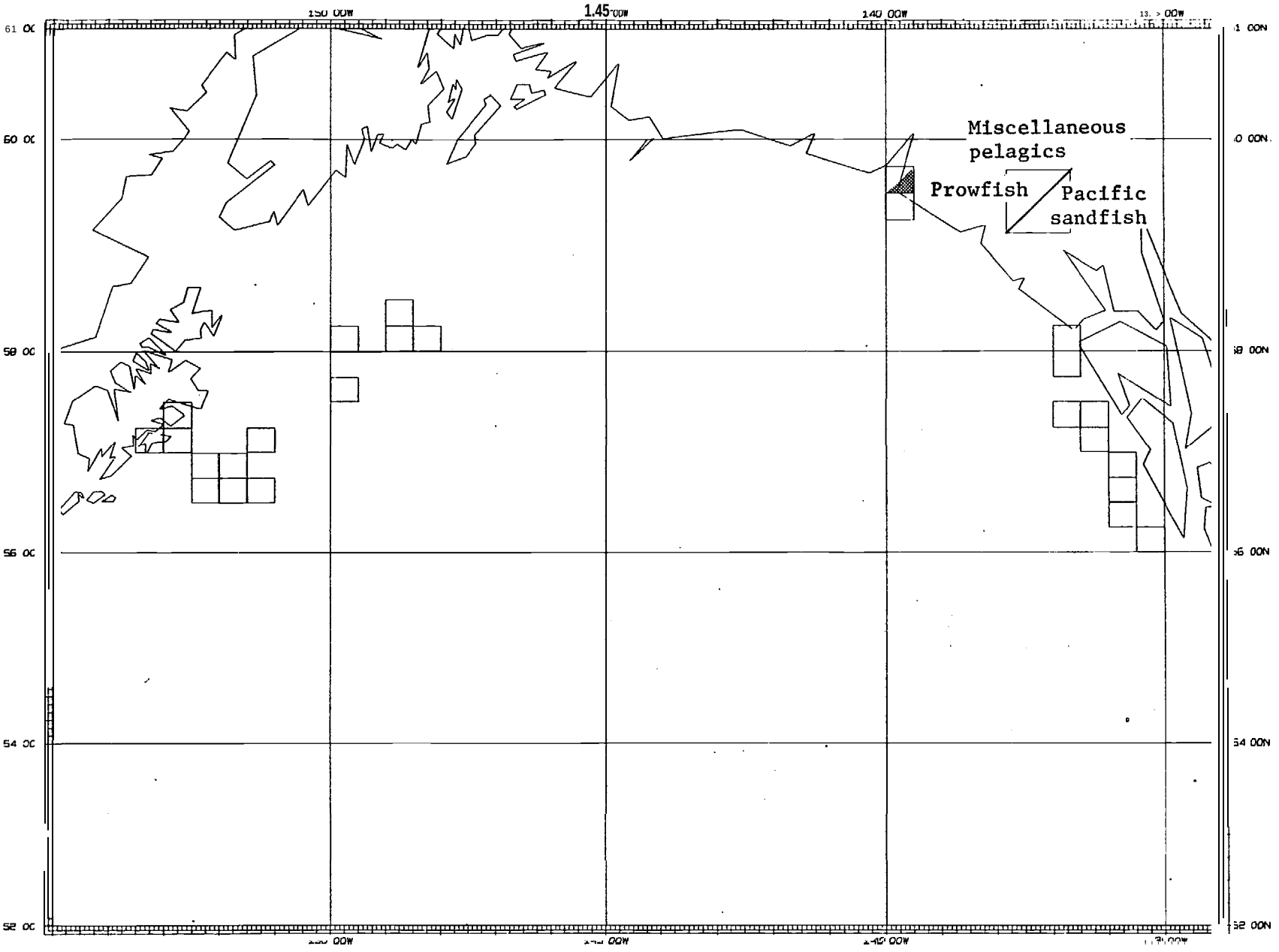


Figure IV. B.249.--Relative abundance of prowfish and Pacific sandfish in bottom trawls in winter, Gulf of Alaska.

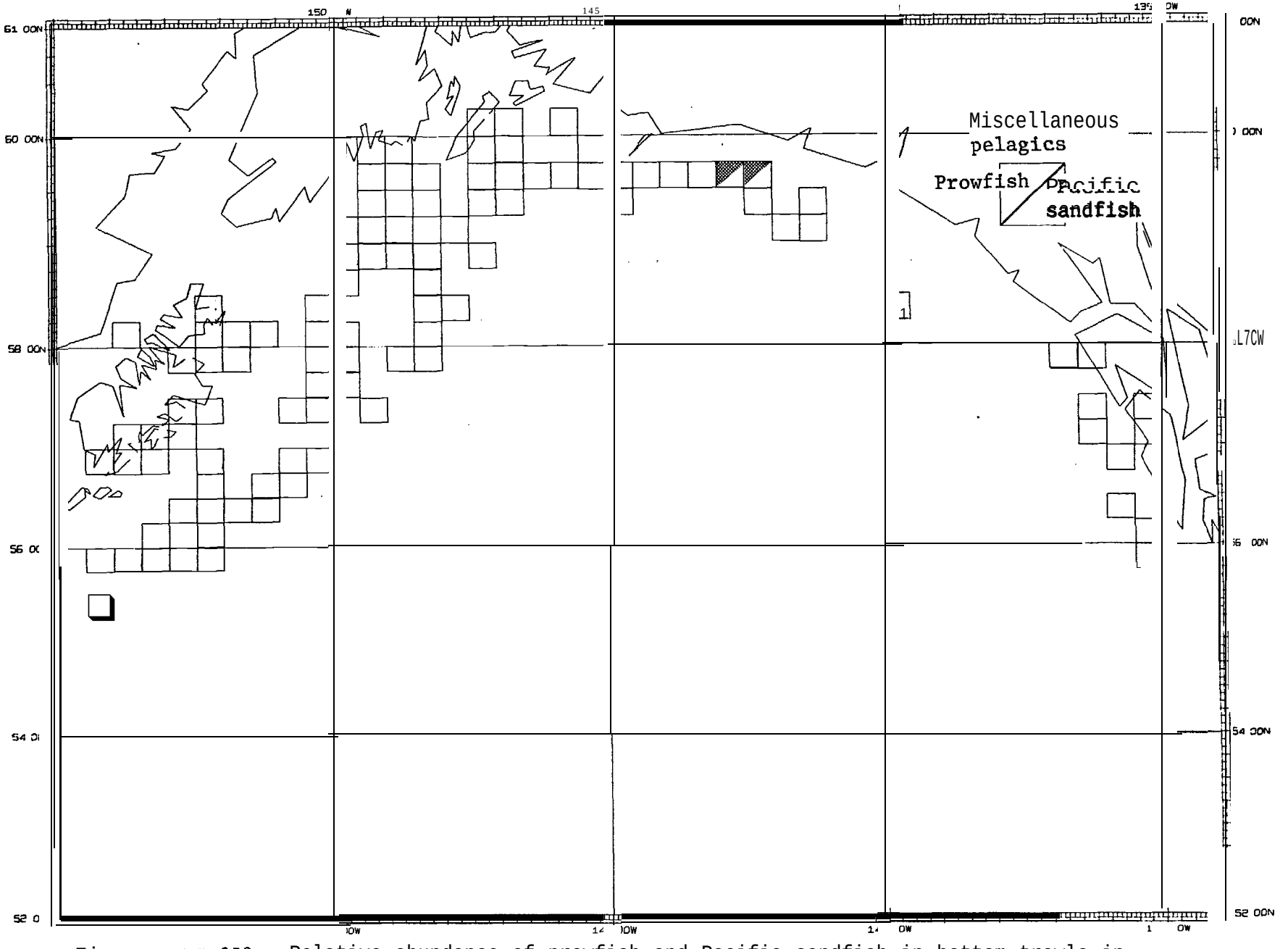


Figure IV.B.250..-Relative abundance of prowfish and Pacific sandfish in bottom trawls in spring, Gulf of Alaska.

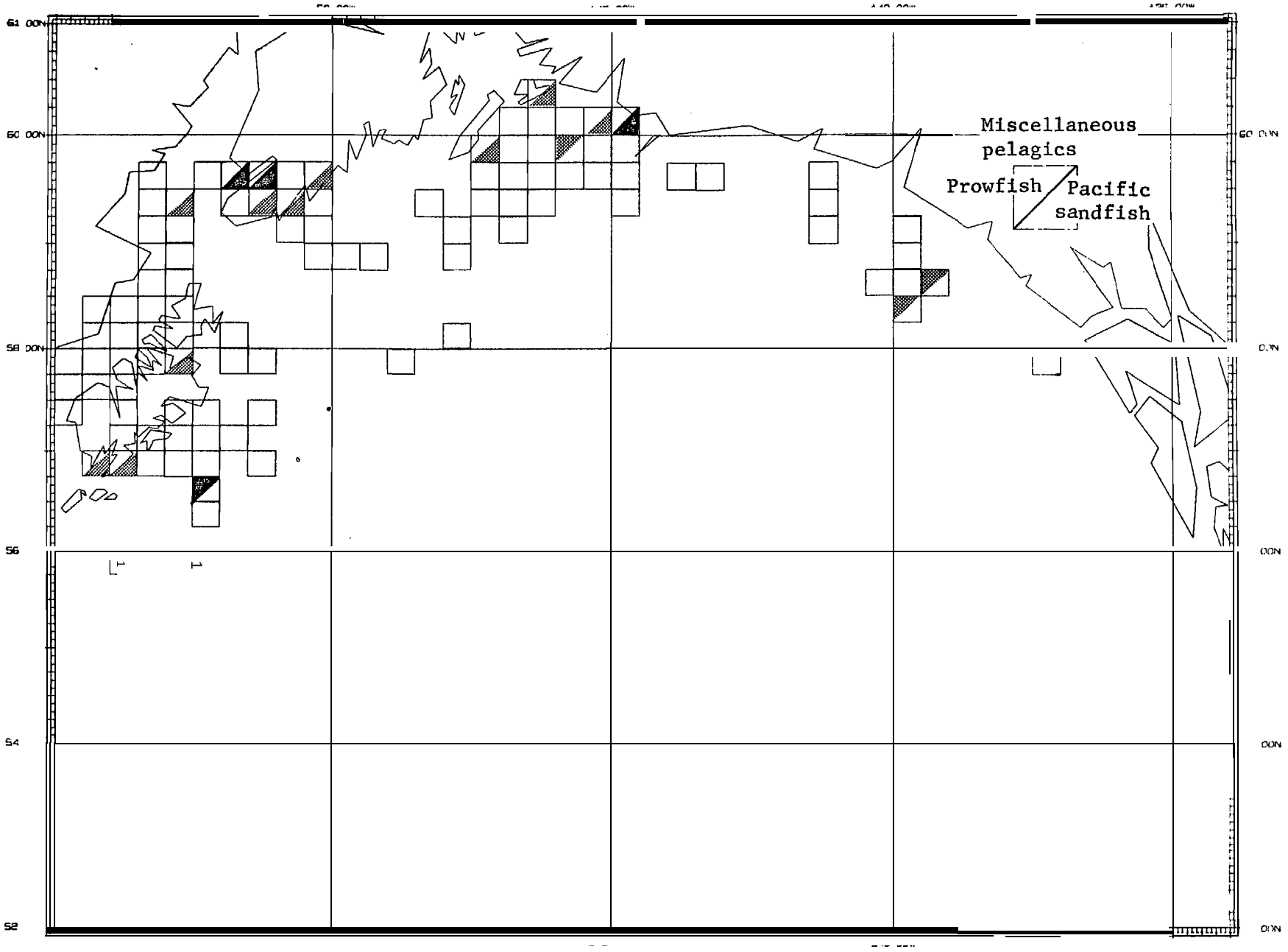


Figure IV.B.251.--Relative abundance of prowfish and Pacific sandfish in bottom trawls in summer, Gulf of Alaska.

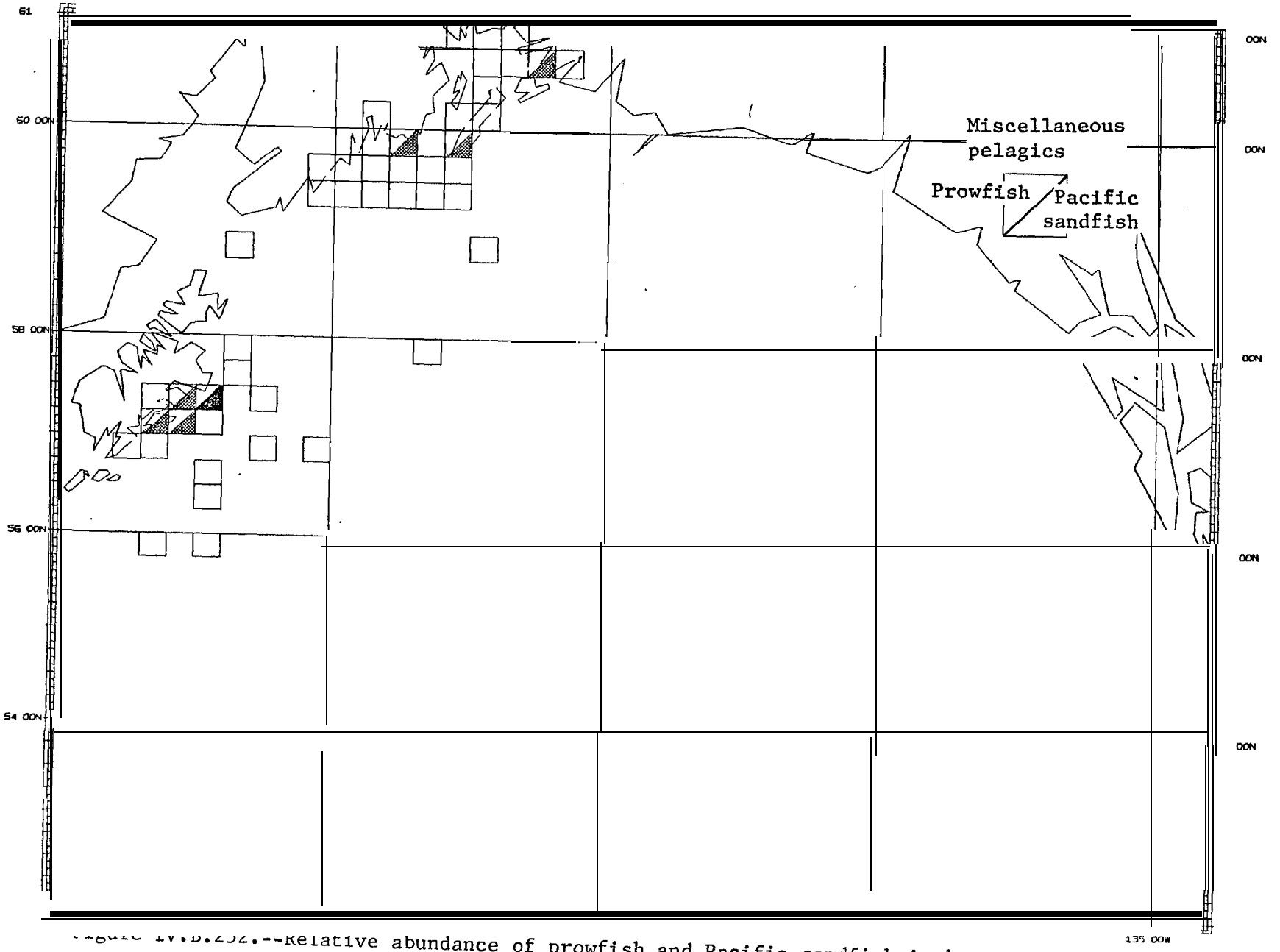


Figure IV.B.252.--Relative abundance of prowfish and Pacific sandfish in bottom trawls in autumn, Gulf of Alaska.

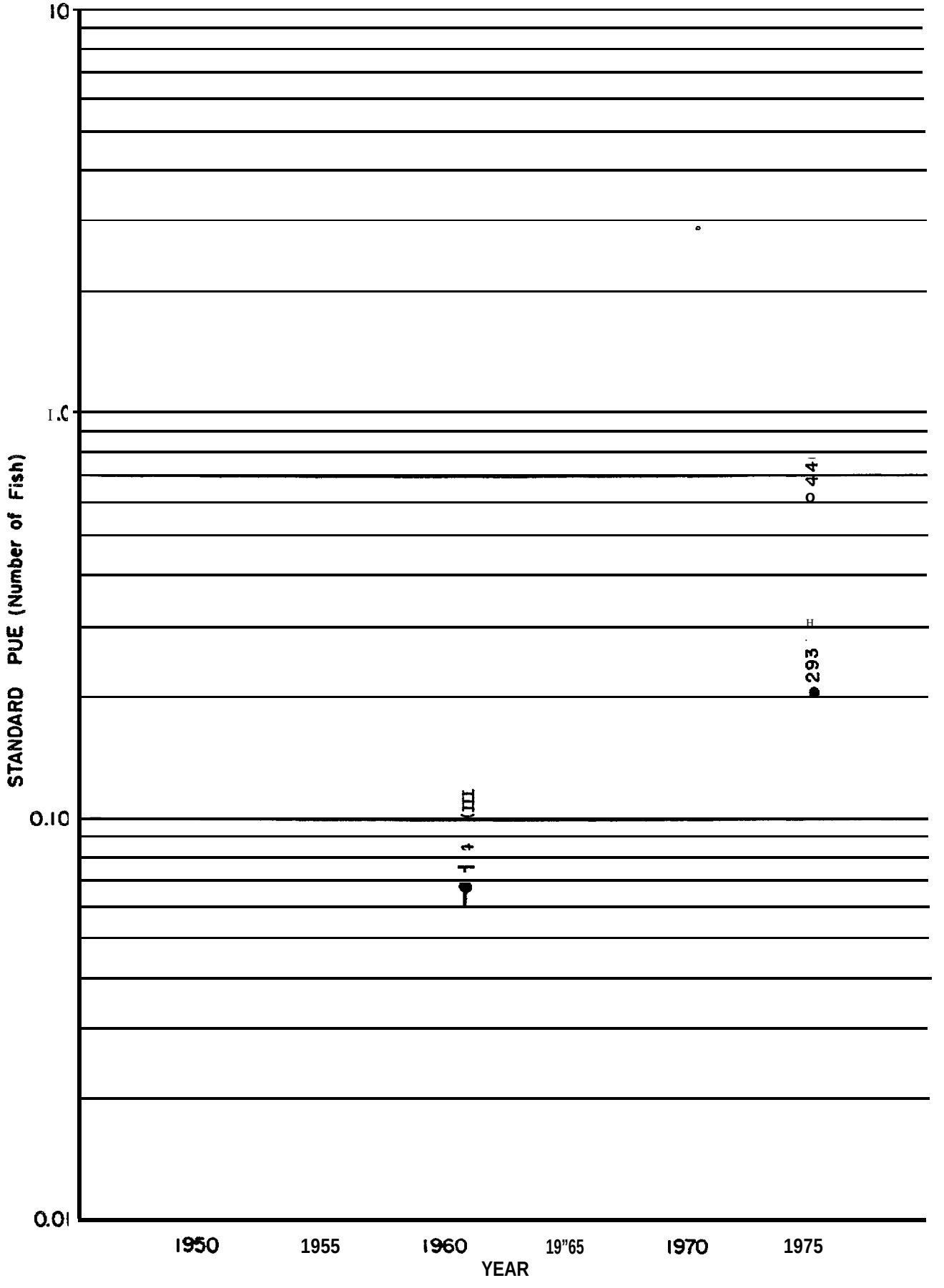


Figure IV. B. 253 .--Standardized rate of catch of prowfish by bottom trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90'/. confidence interval number of observations, and quarter of the year).

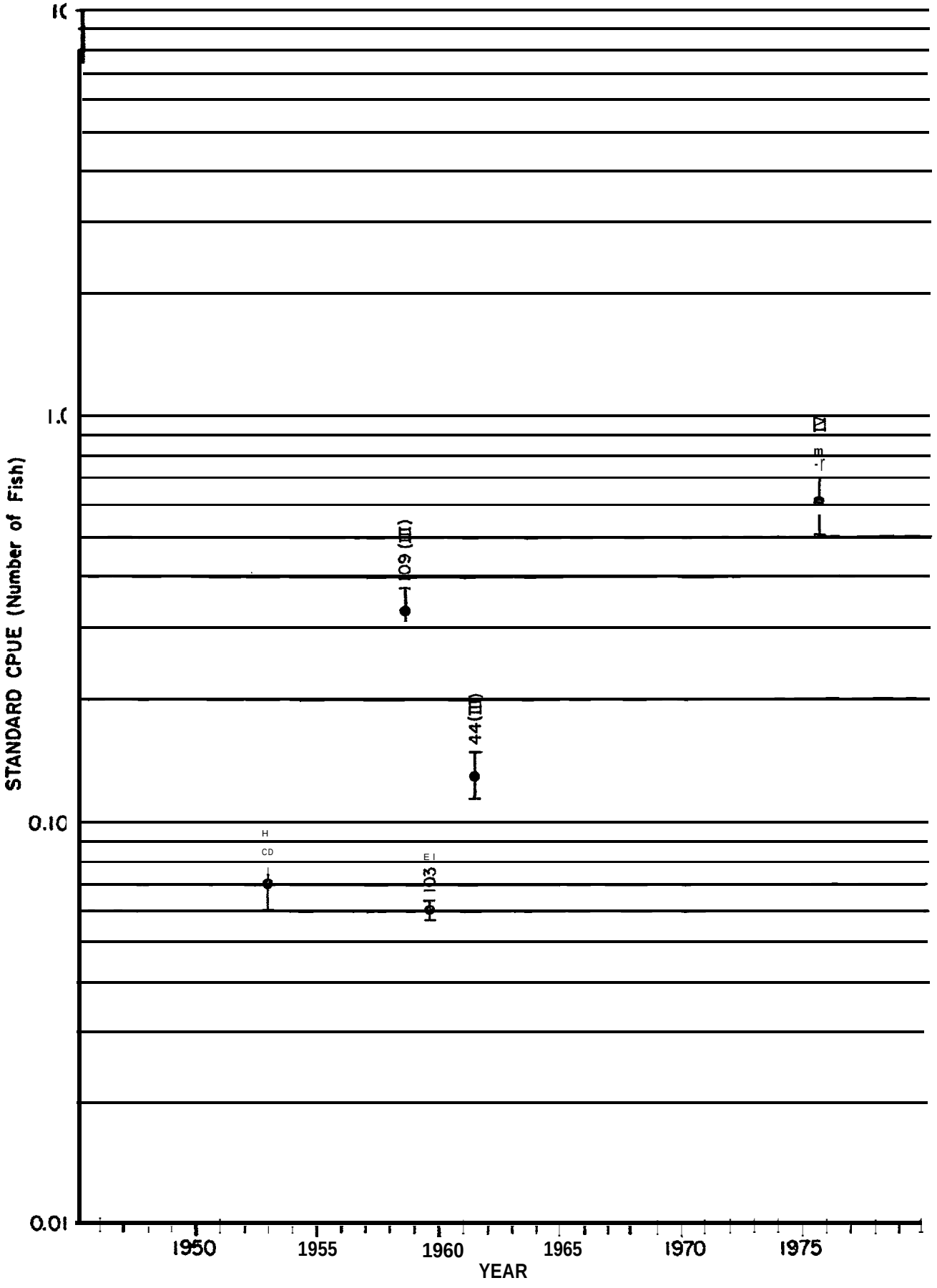


Figure IV.B.254.--Standardized rate of catch of Pacific sandfish by bottom trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

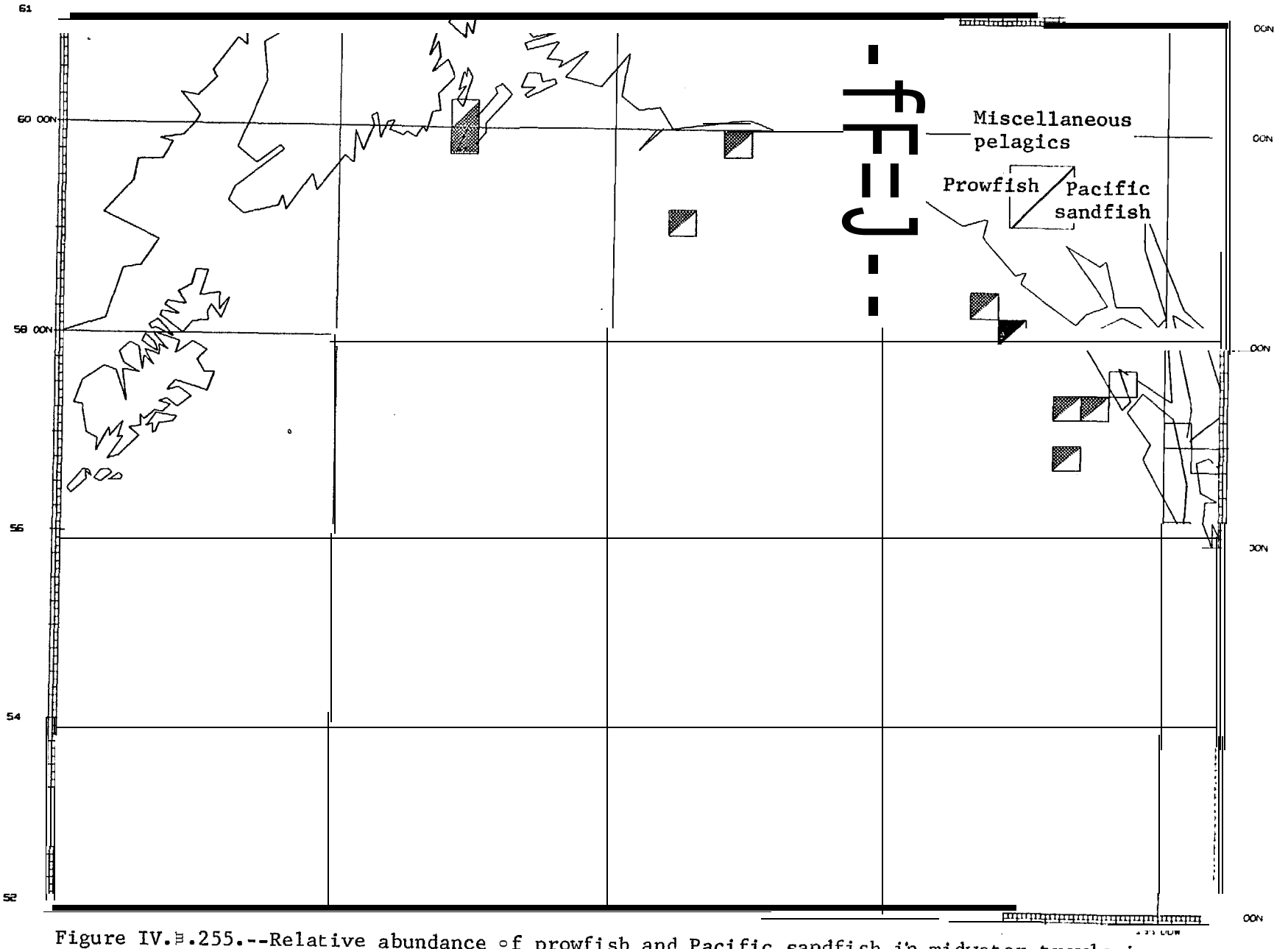


Figure IV.3.255.--Relative abundance of prowfish and Pacific sandfish in midwater trawls in summer, Gulf of Alaska.

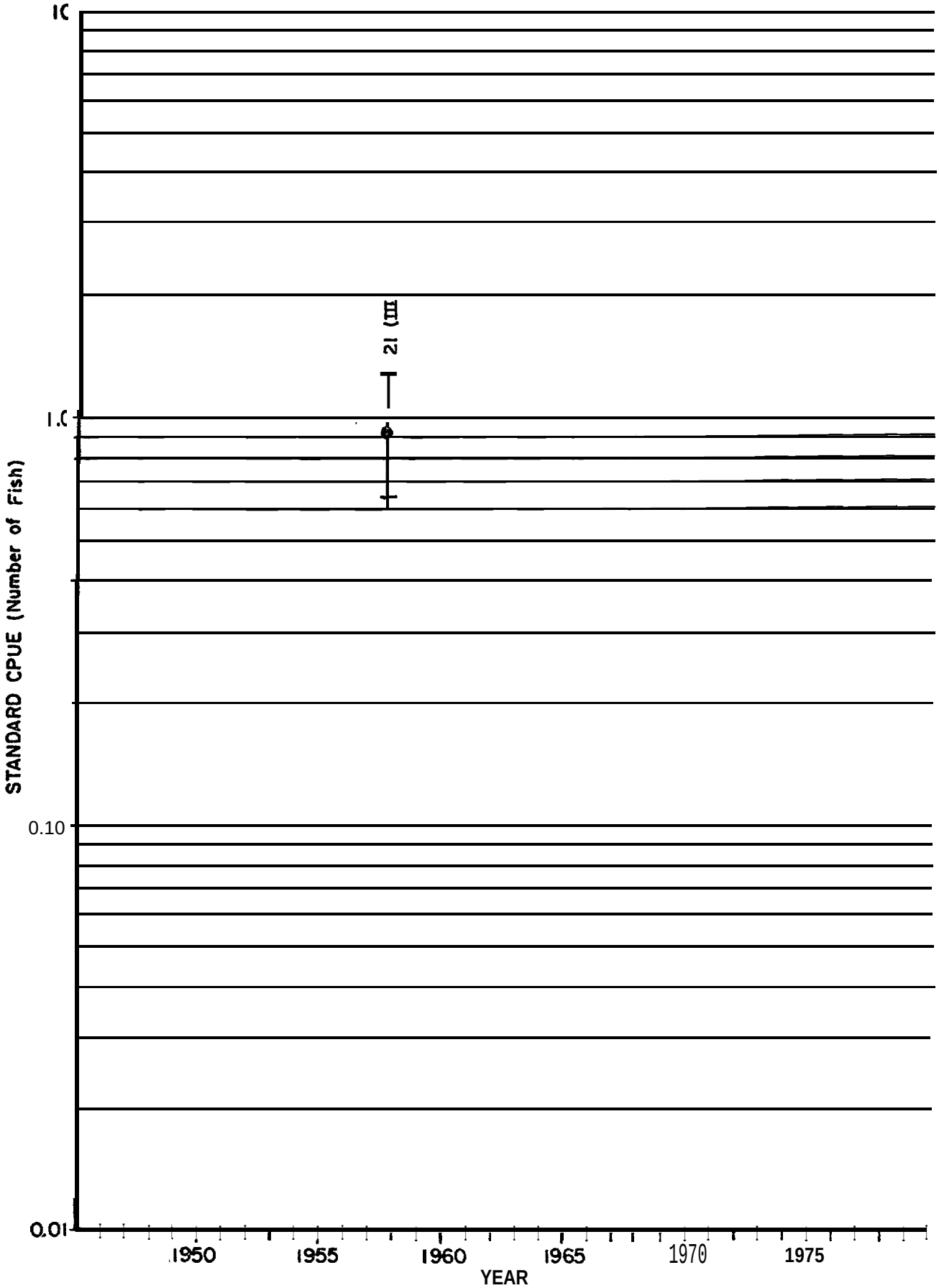


Figure IV.B.256.--Standardized rate of catch of prowfish by midwater trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

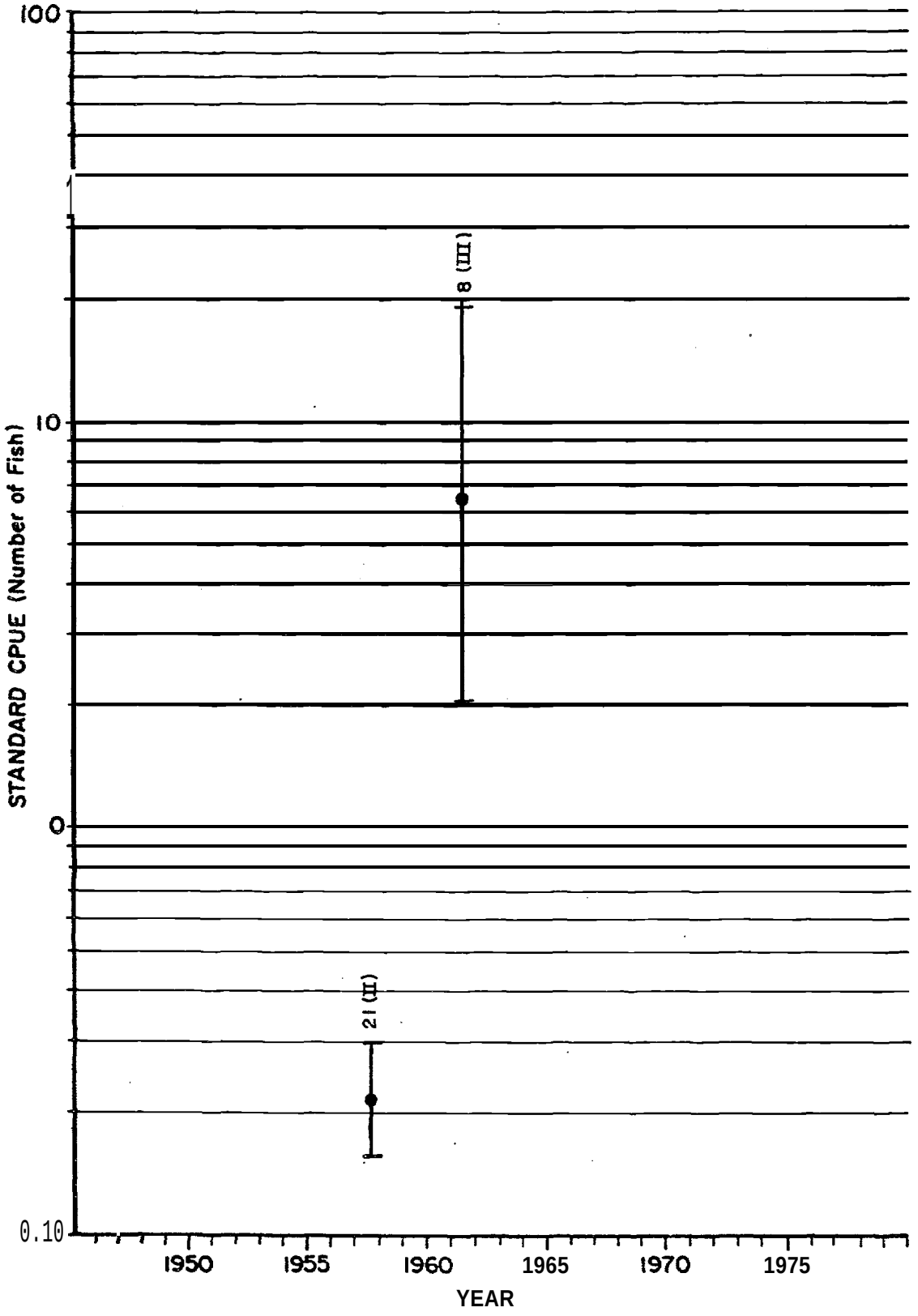


Figure IV.B.257.--Standardized rate of catch of Pacific sandfish by midwater trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

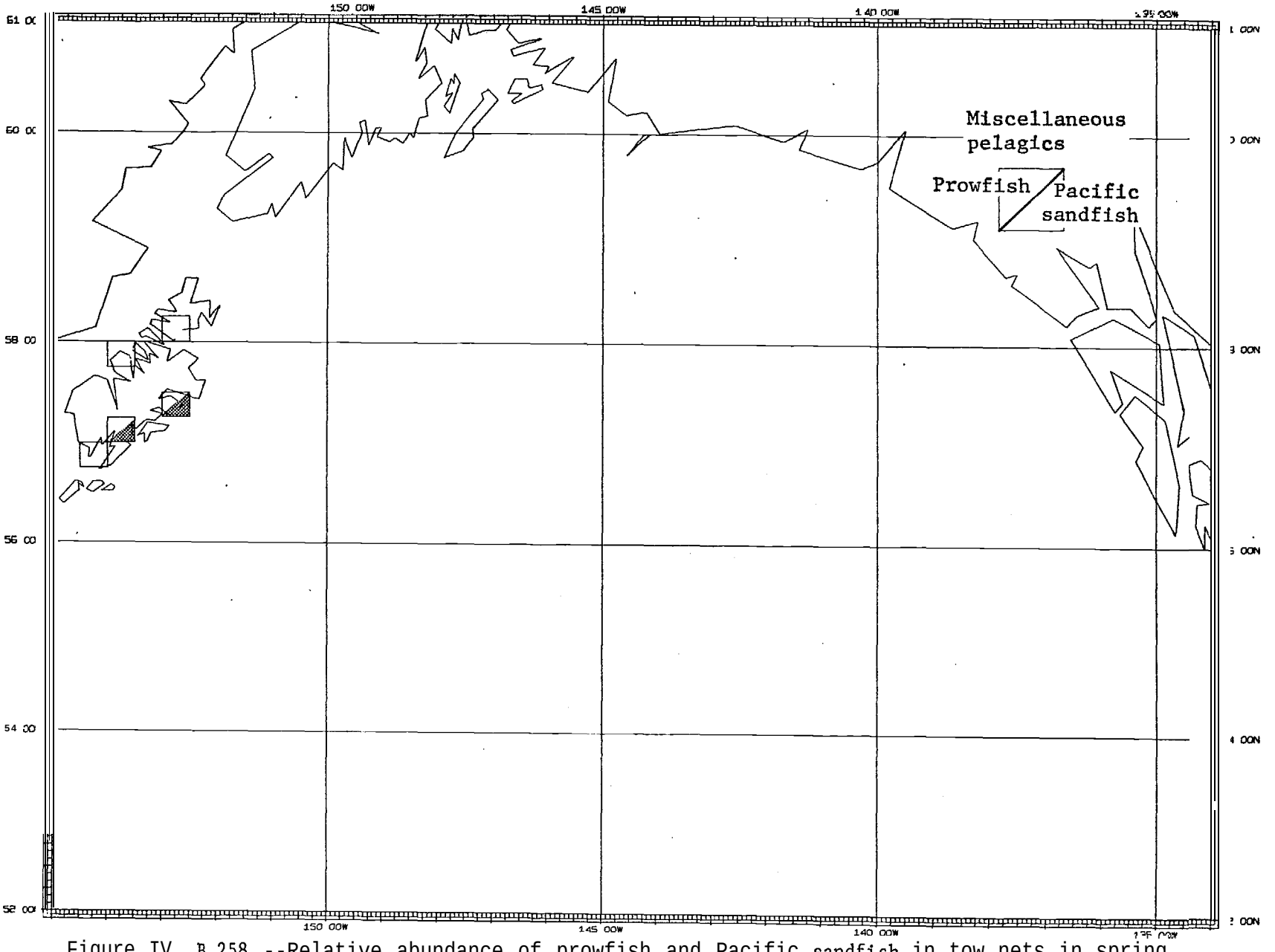


Figure IV. B.258.--Relative abundance of prowfish and Pacific sandfish in tow nets in spring, Gulf of Alaska.

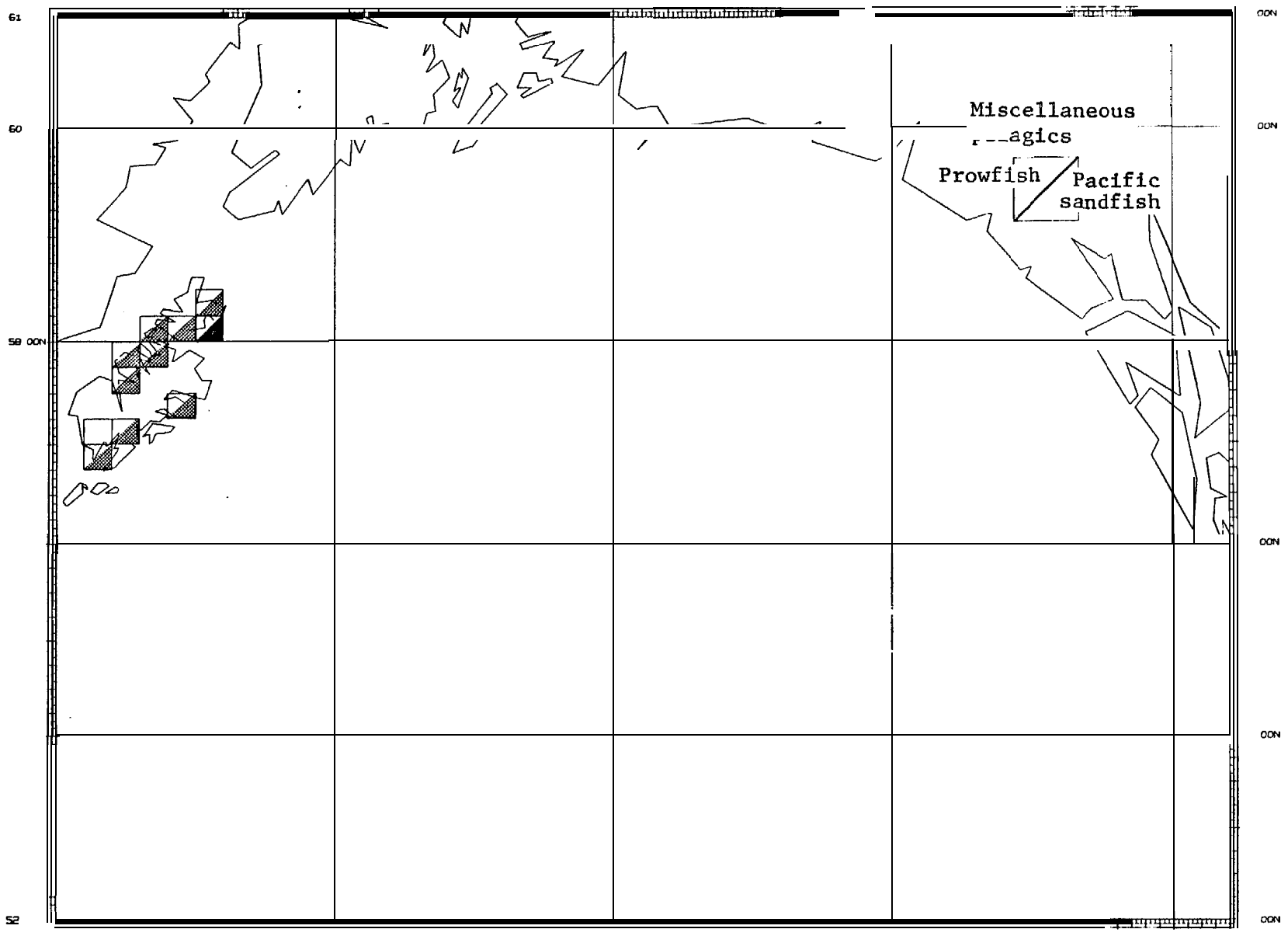


Figure IV.B.259.--Relative abundance of prowfish and Pacific sandfish in tow nets in summer, Gulf of Alaska.

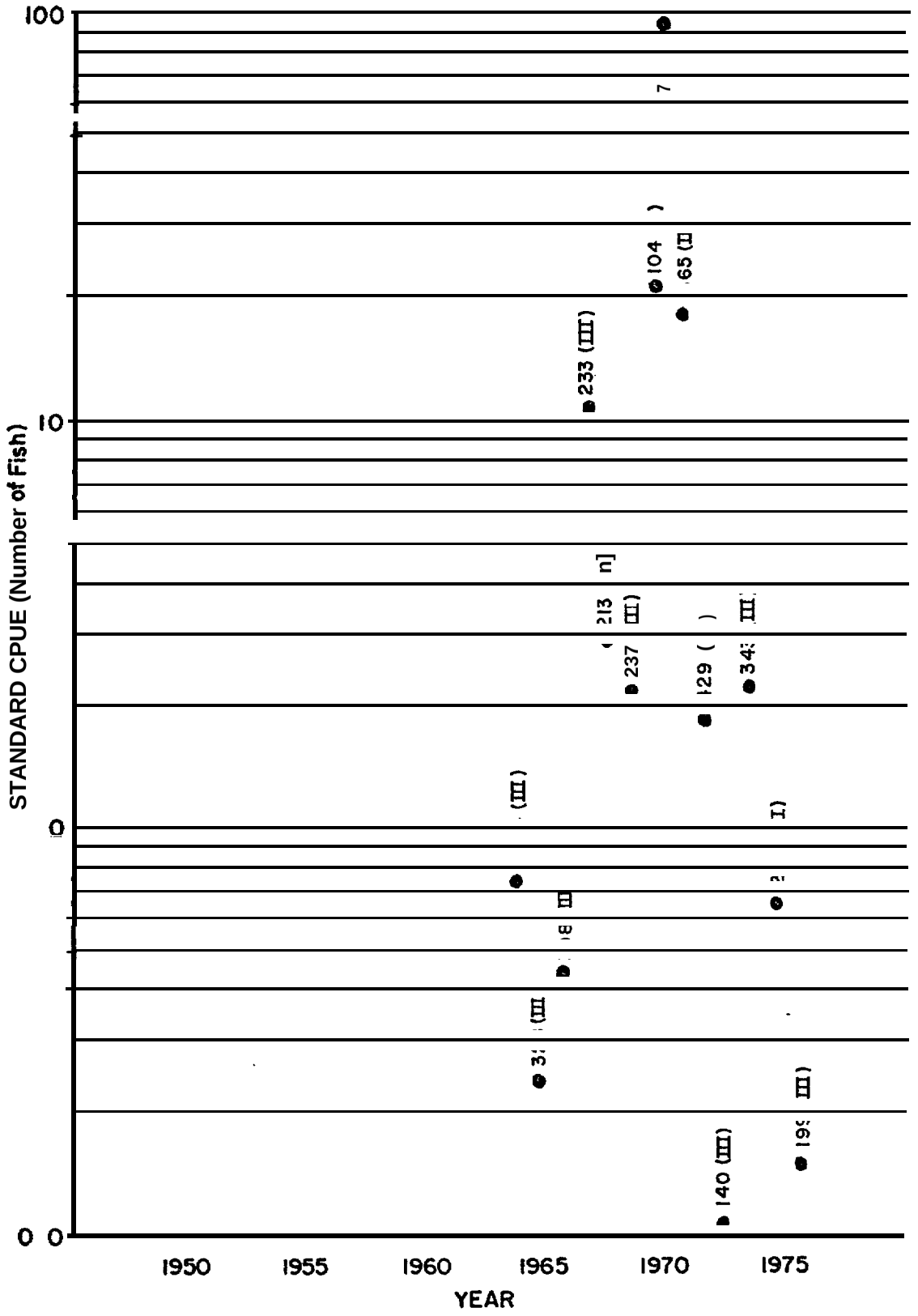


Figure IV.B.260.--Standardized rate of catch of Pacific sandfish by tow net in the Gulf of Alaska (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

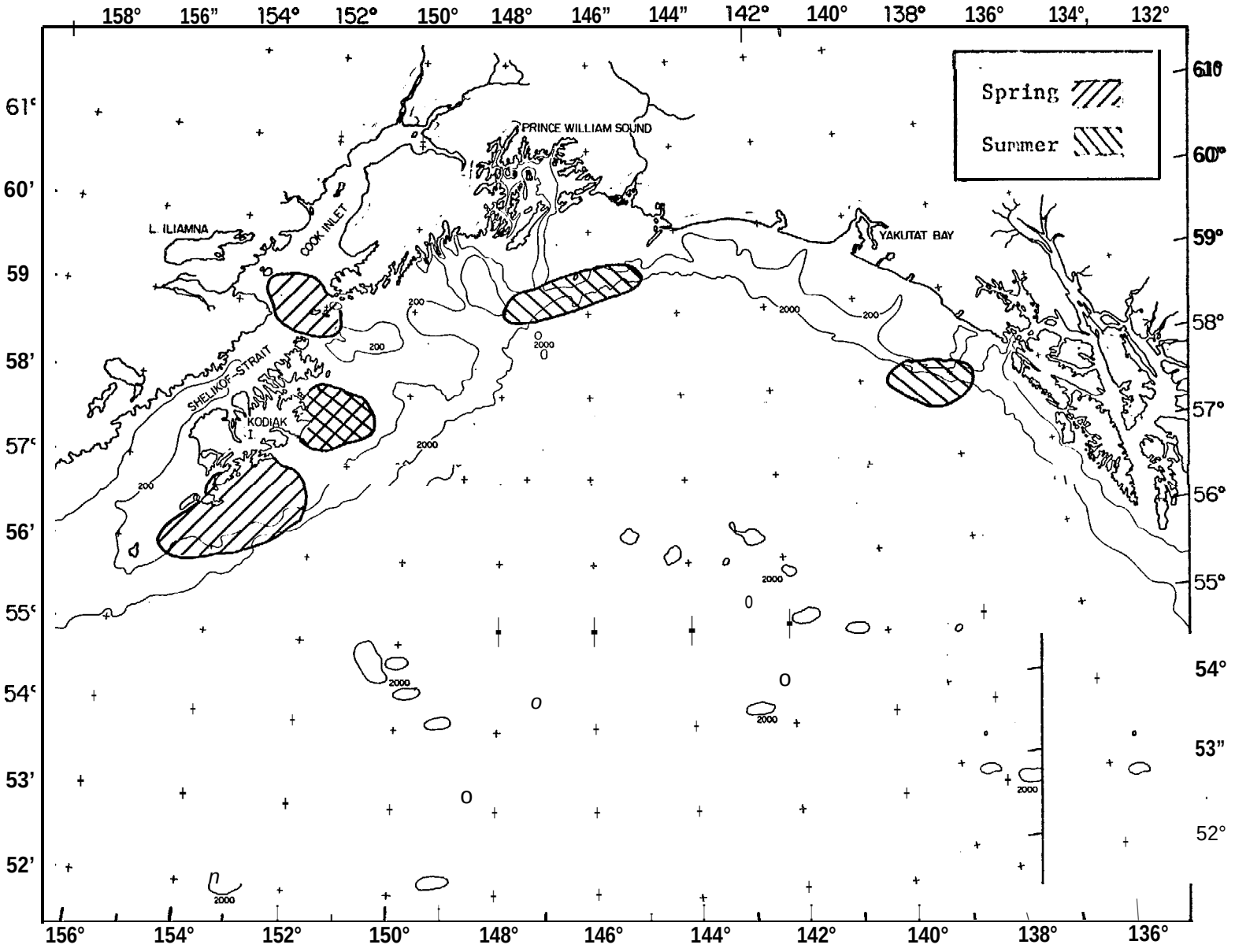


Figure IV. B.261 . --Generalized areas in which Pacific sand lance larvae were caught by tow nets, plankton nets, and bongo nets in spring and summer, Gulf of Alaska.

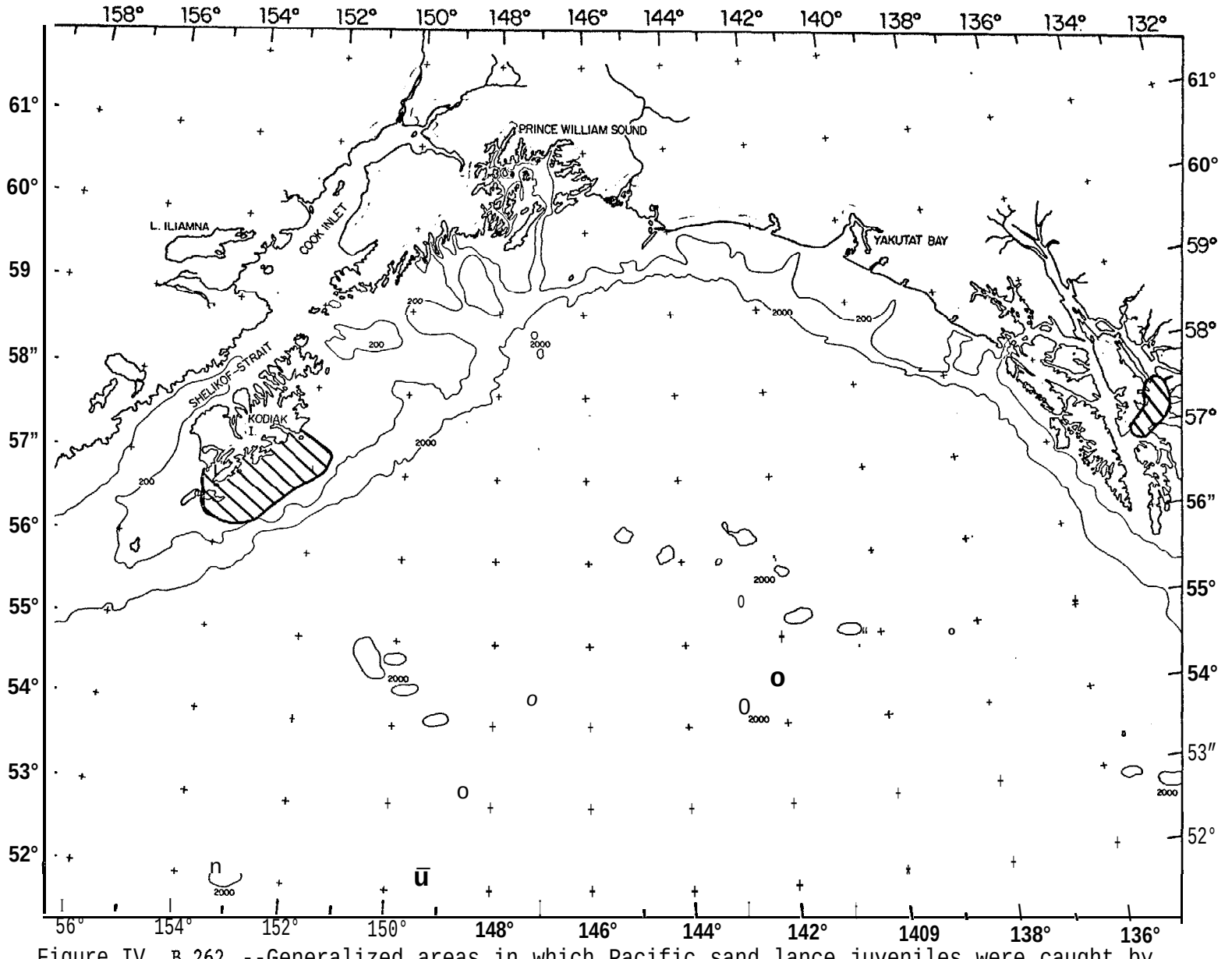


Figure IV. B.262.--Generalized areas in which Pacific sand lance juveniles were caught by seines, plankton nets, and pelagic trawls in summer, Gulf of Alaska.

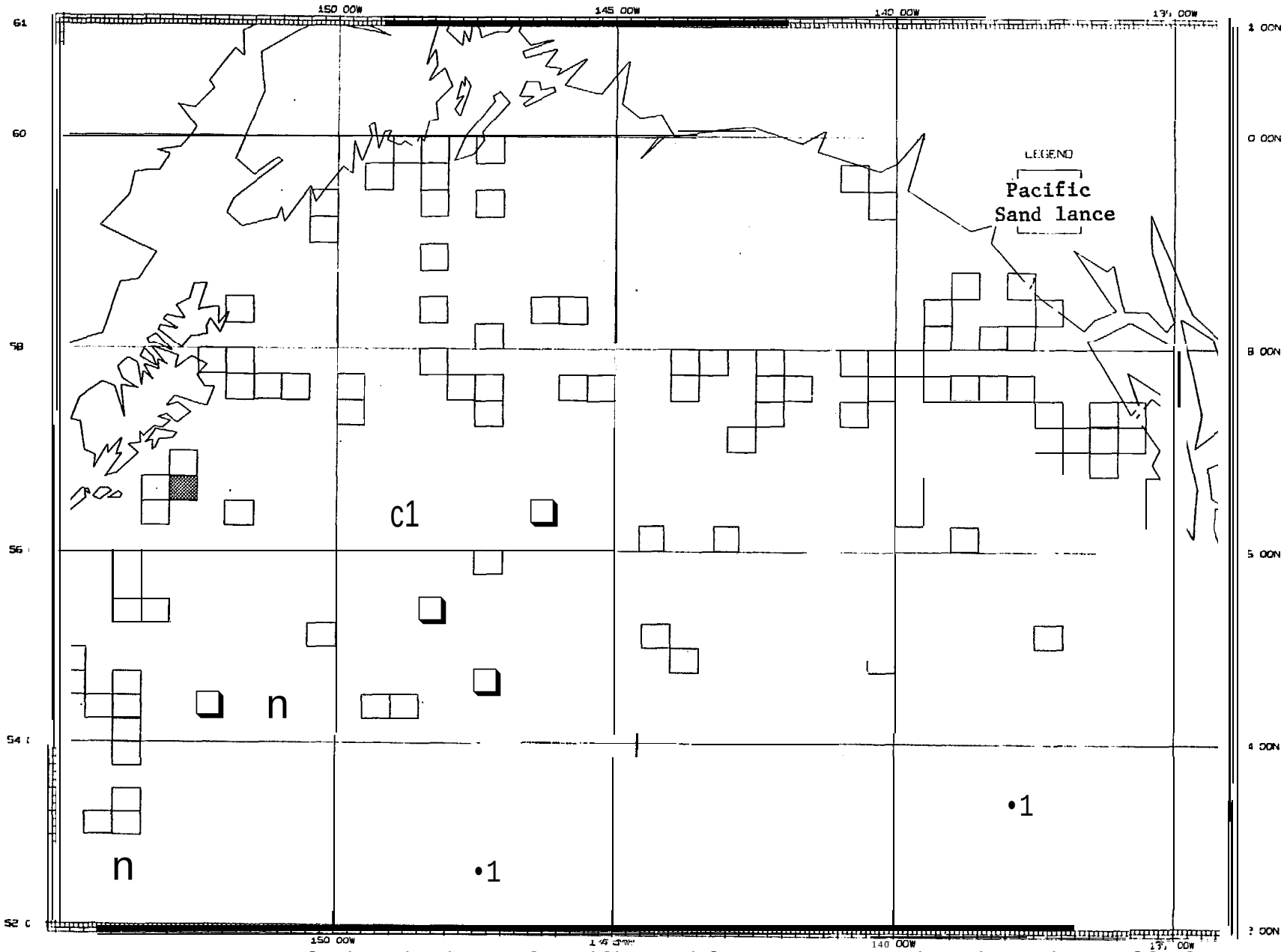


Figure IV. B.263.--Relative abundance of Pacific sand lance in purse seines in spring, Gulf of Alaska.

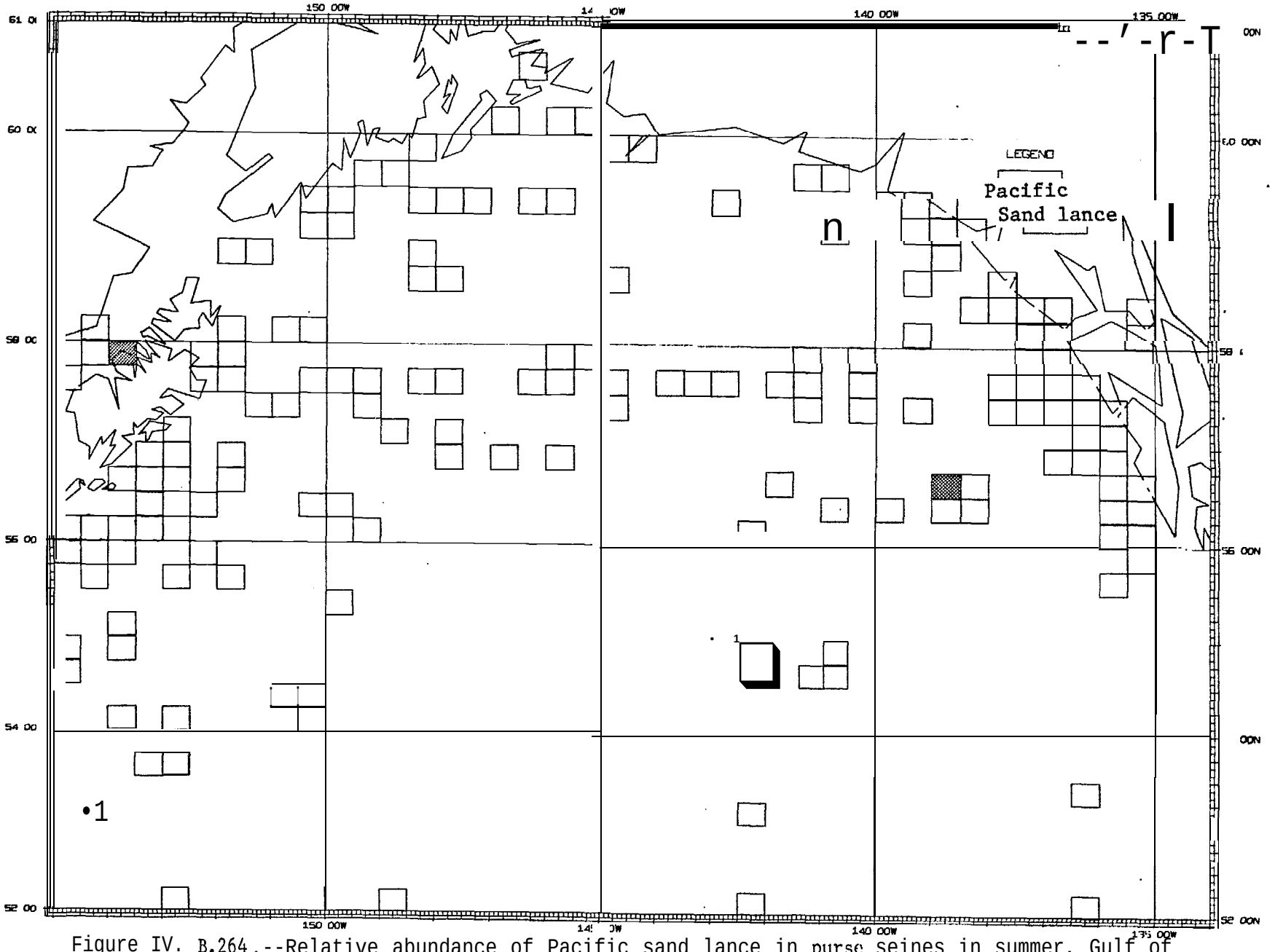


Figure IV. B.264.--Relative abundance of Pacific sand lance in purse seines in summer, Gulf of Alaska.

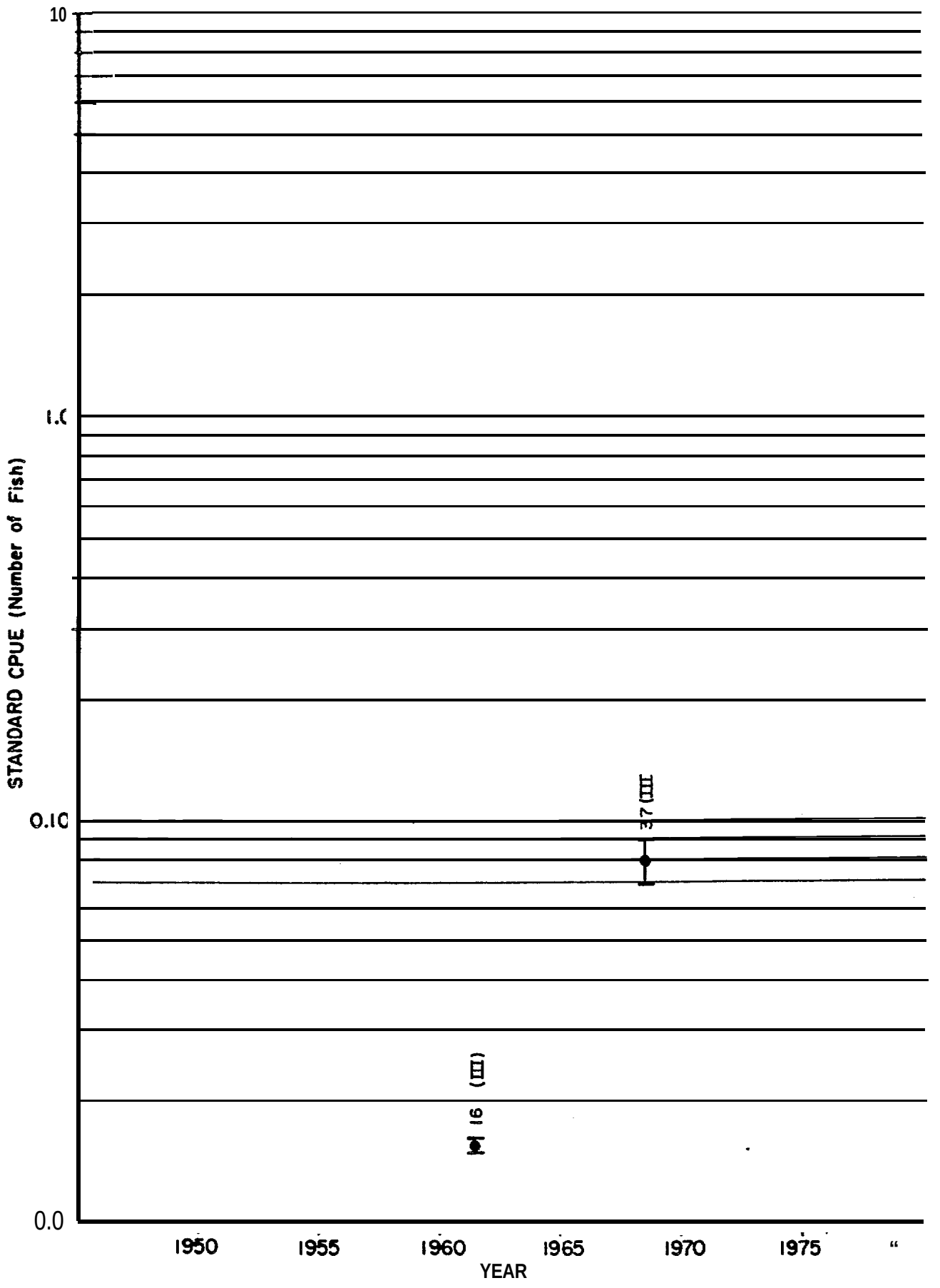


Figure IV.B.265.--Standardized rate of catch of Pacific sand lance by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

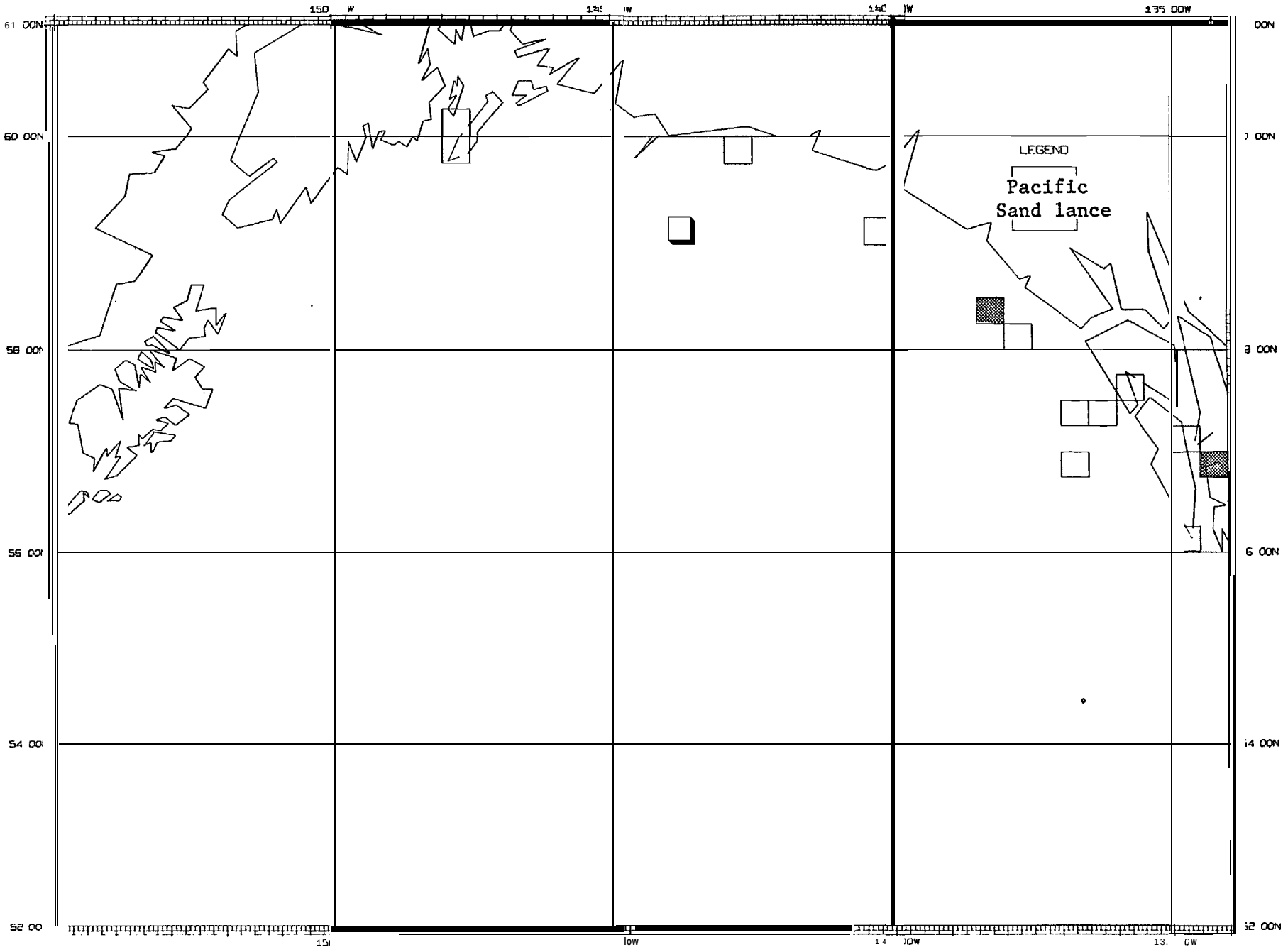


Figure IV. B.266.--Relative abundance of Pacific sand lance in midwater trawls in summer, Gulf of Alaska.

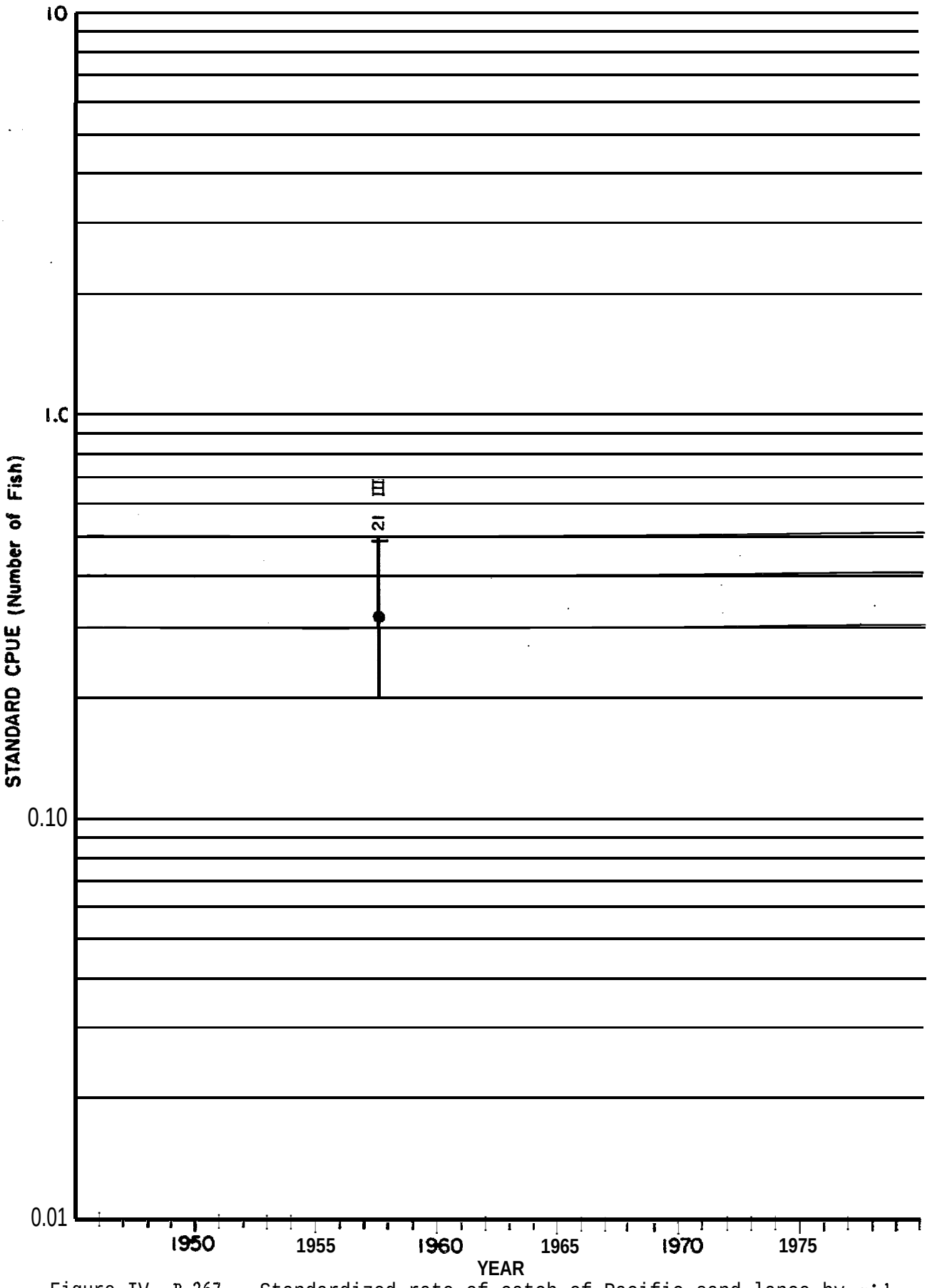


Figure IV. B.267.--Standardized rate of catch of Pacific sand lance by mid-water trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

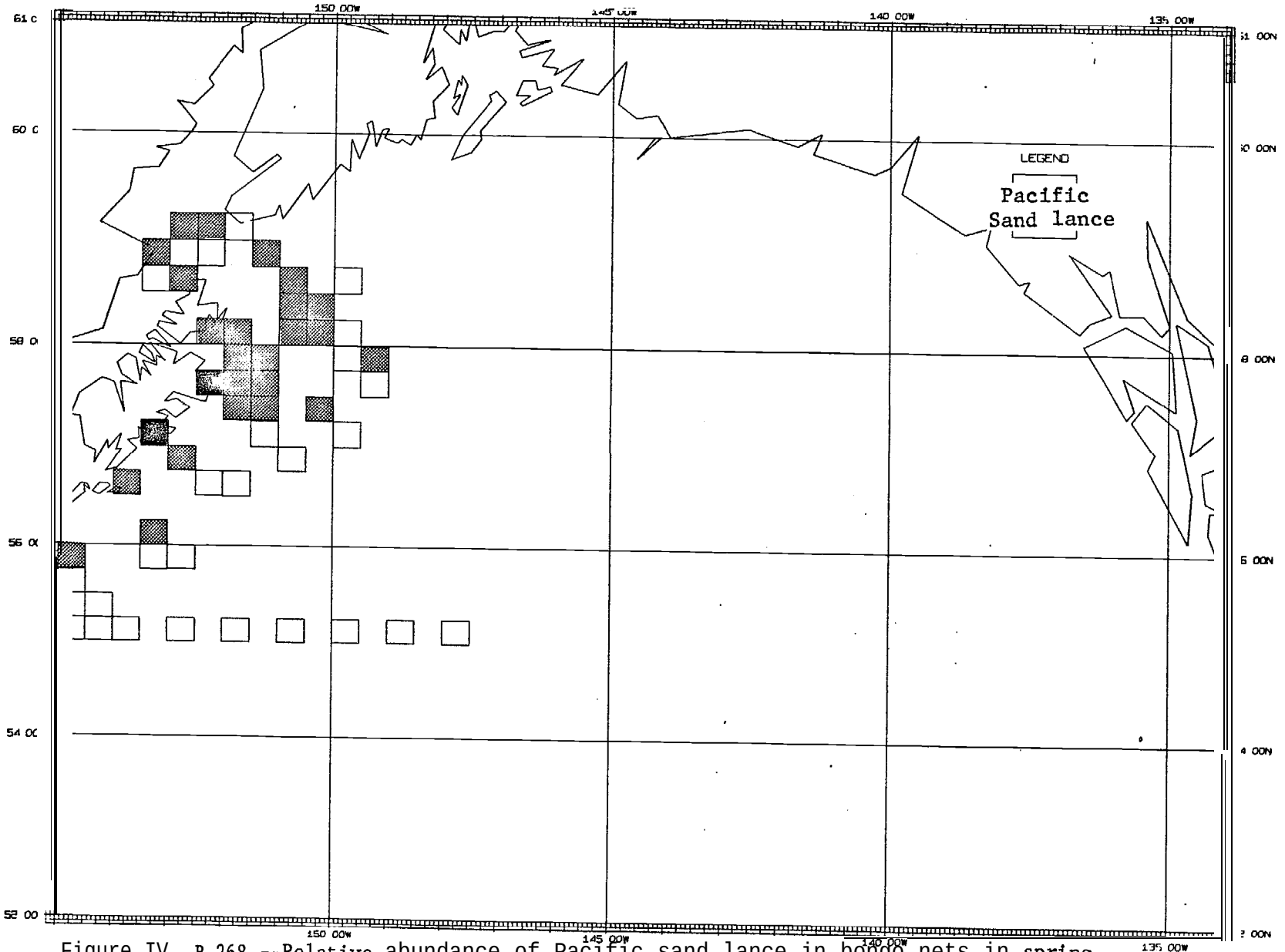


Figure IV. B.268.--Relative abundance of Pacific sand lance in bongo nets in spring, Gulf of Alaska.

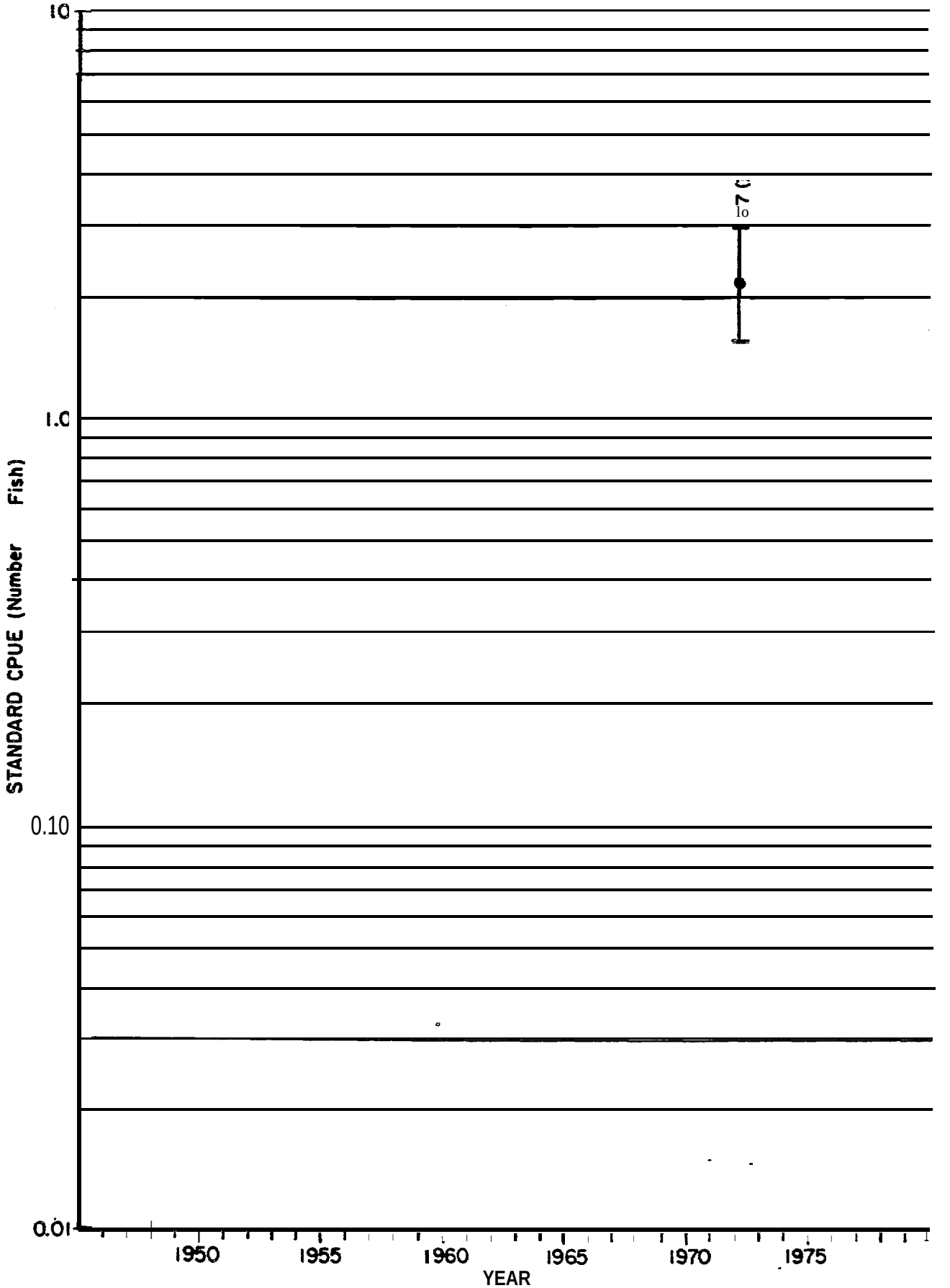


Figure IV.B.269.--Standardized rate of catch of Pacific sand lance by bongo net in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

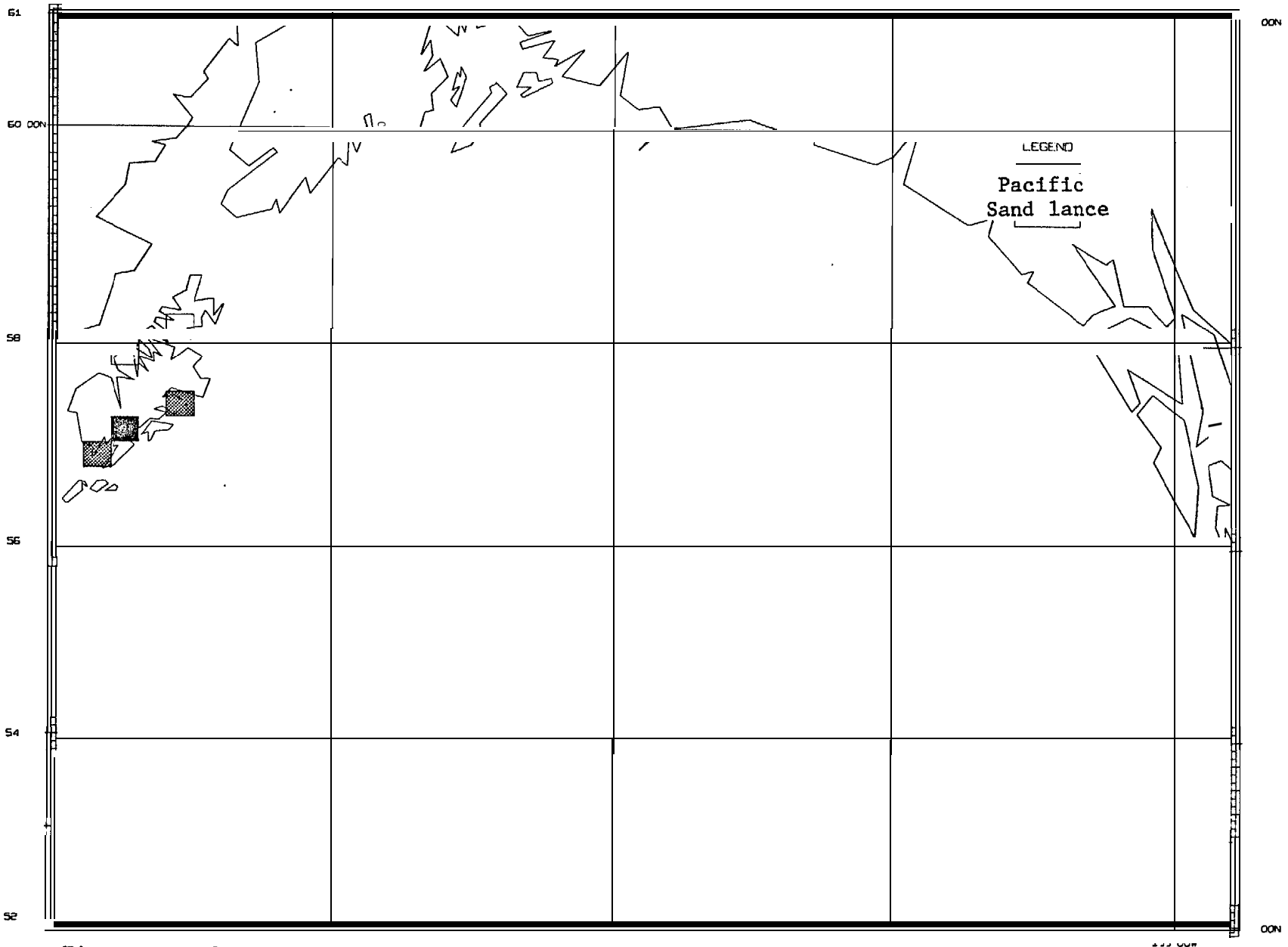


Figure IV.B.270.--Relative abundance of Pacific sand lance in bow nets in spring, Gulf of Alaska.

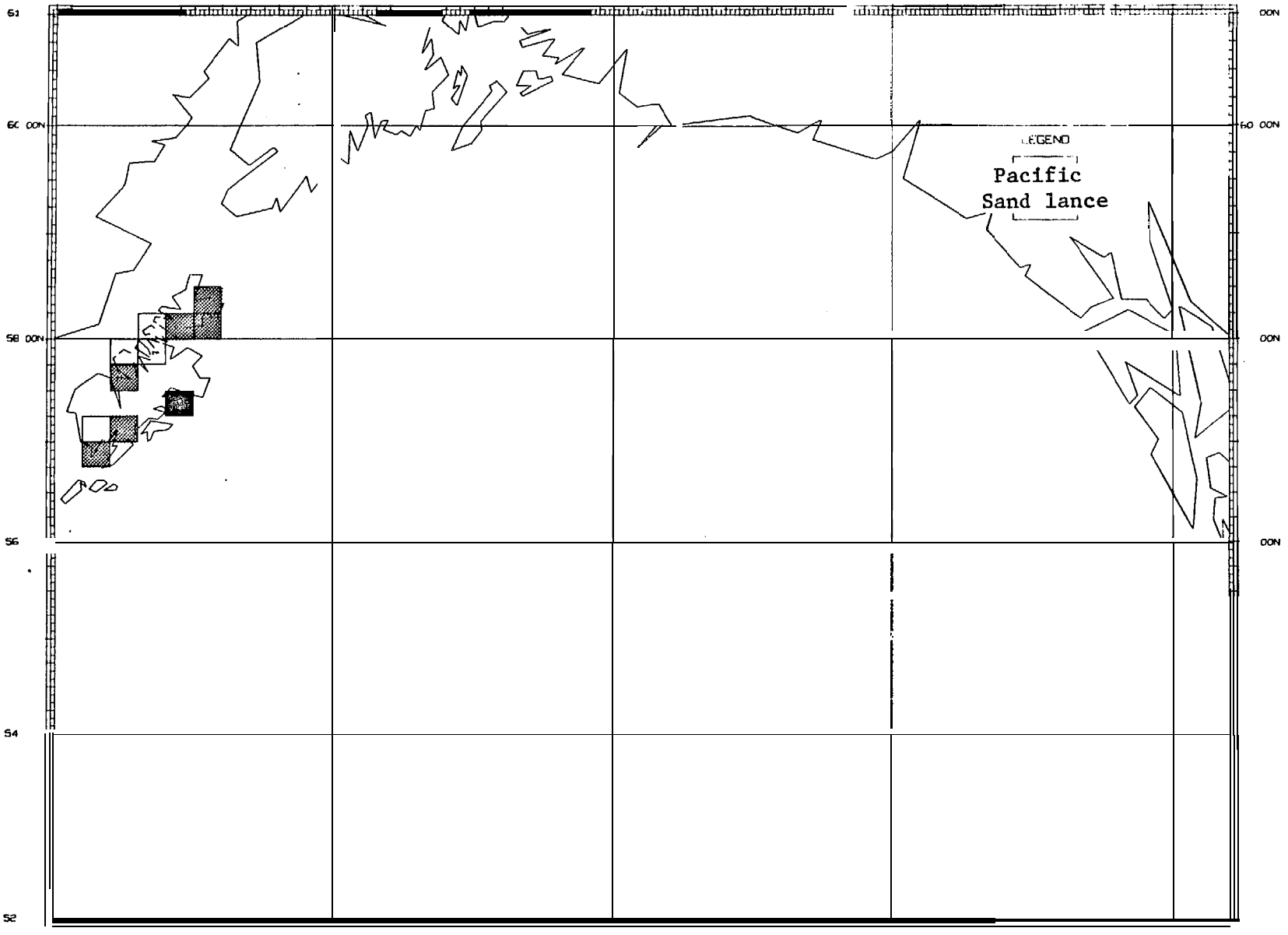


Figure IV.B.271.--Relative abundance of Pacific sand lance in tow nets in summer, Gulf of Alaska.

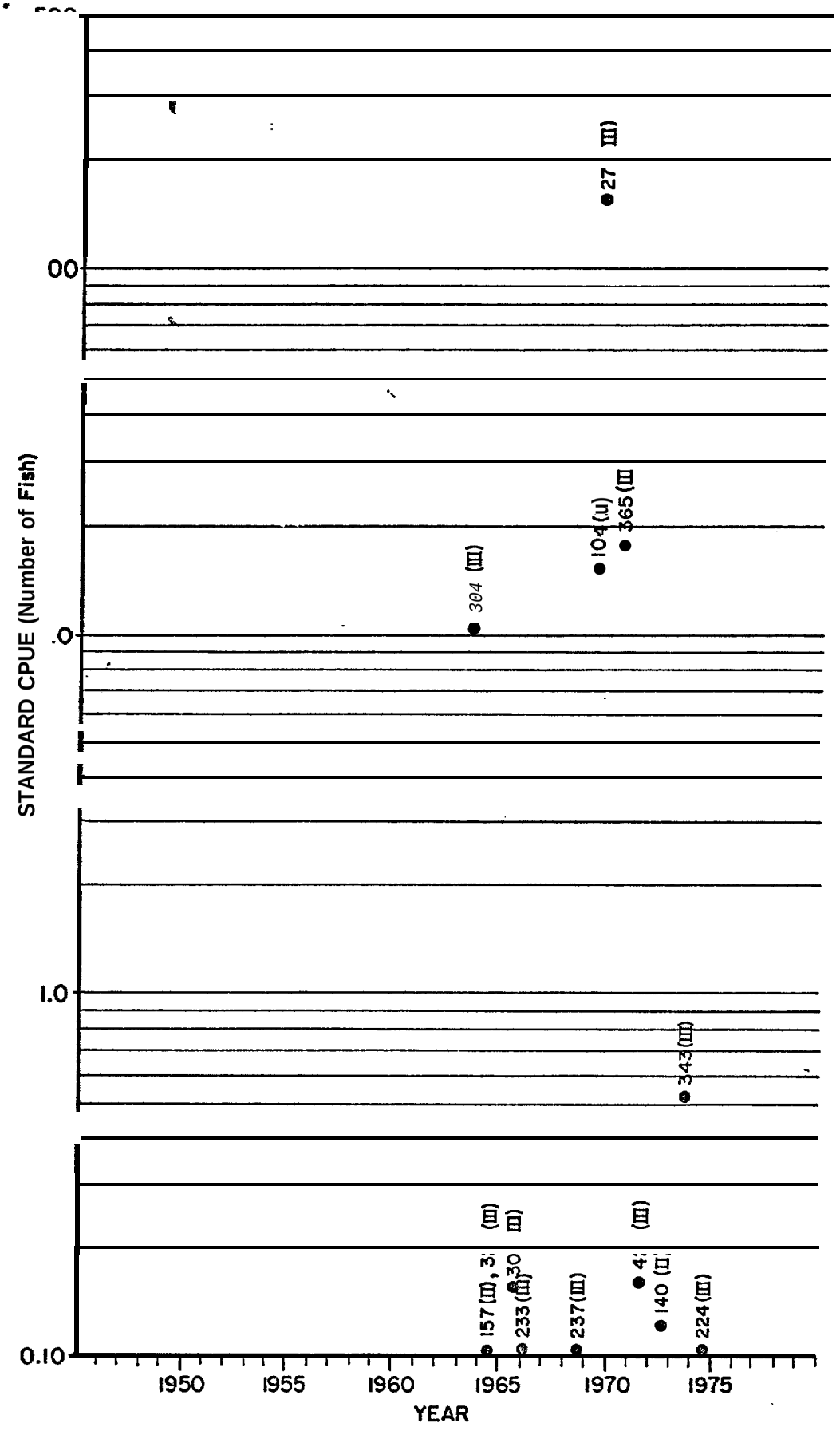


Figure IV.B.272.--Standardized rate of catch of Pacific sand lance by tow net in the Gulf of Alaska (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

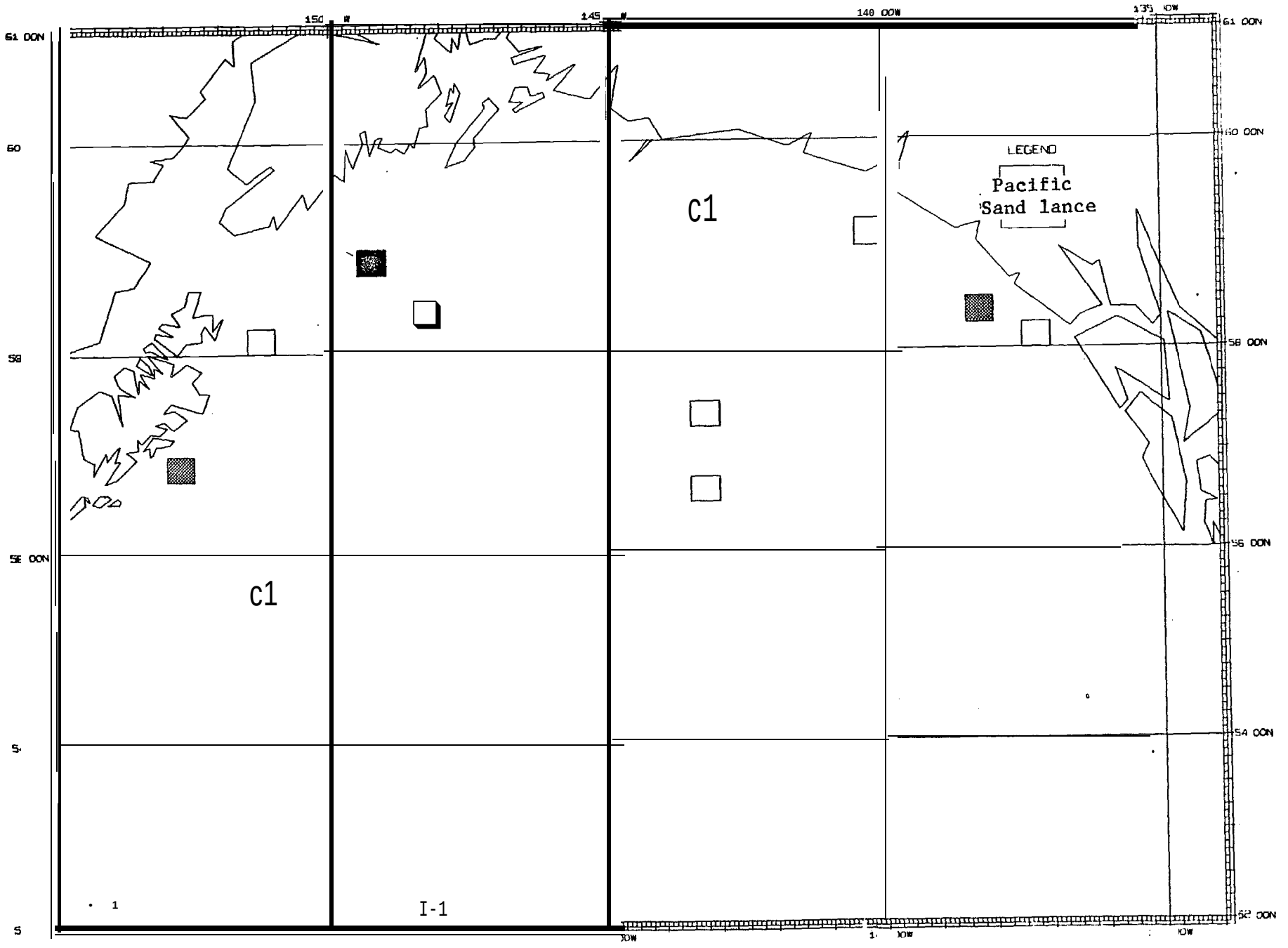


Figure IV.B.273.--Relative abundance of pacific sand lance in plankton nets in summer, Gulf of Alaska.

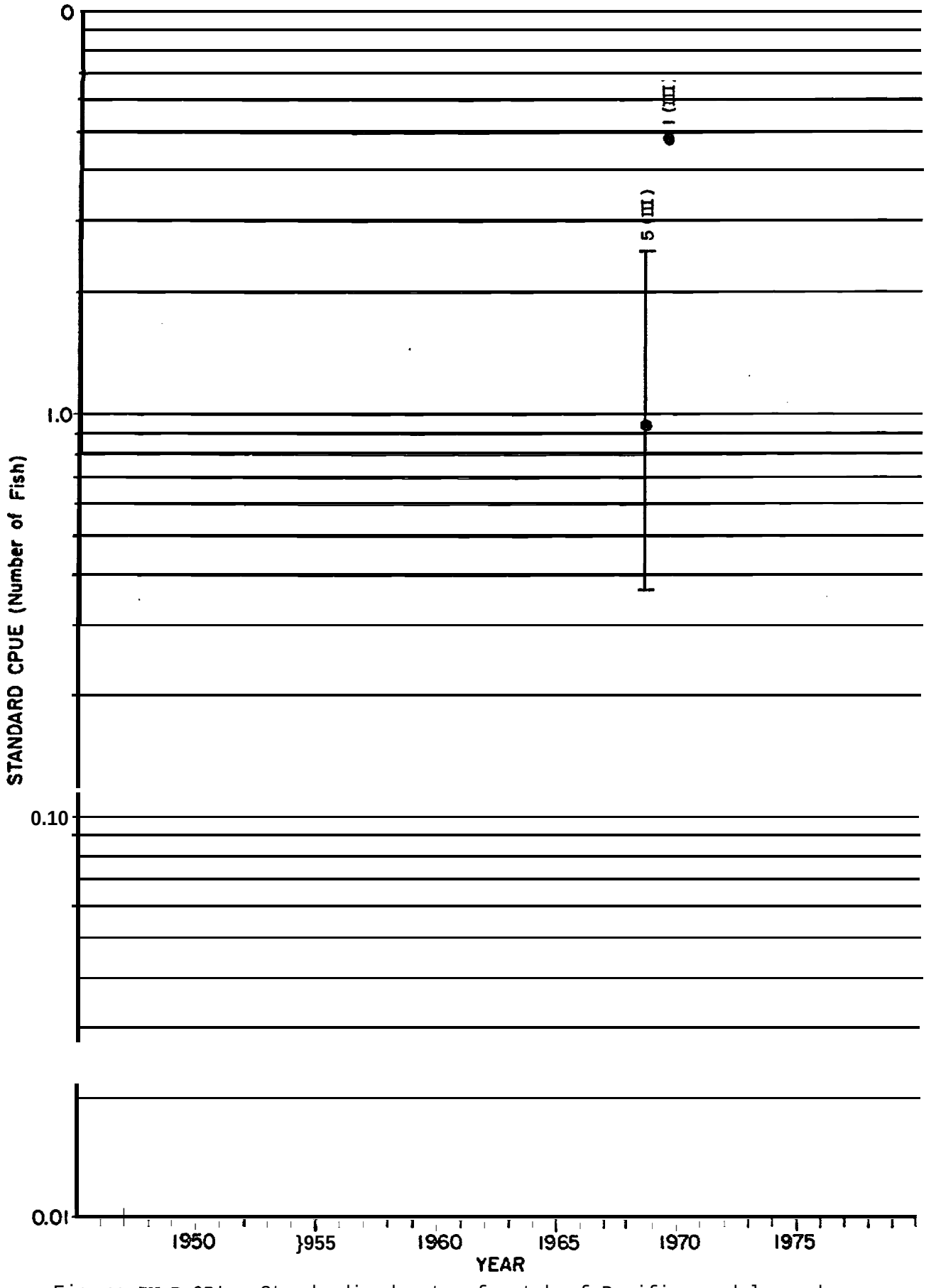


Figure IV.B.274.--Standardized rate of catch of Pacific sand lance by plankton net in the Gulf of Alaska (geometric mean: number/12 min tow with 90% confidence interval, number of observations, and quarter of the year).

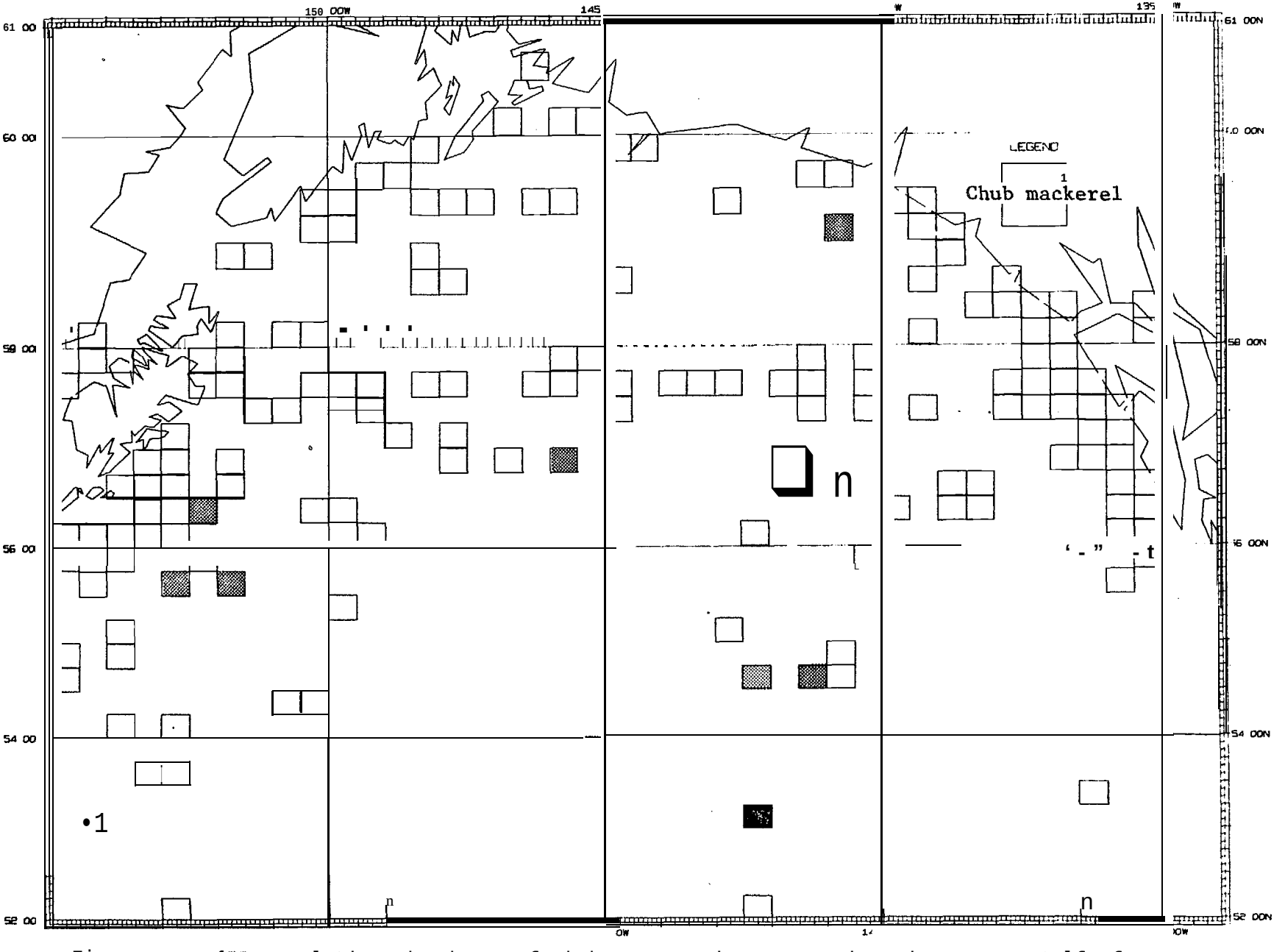


Figure IV. B.275.--Relative abundance of chub mackerel in purse seines in summer, Gulf of Alaska.

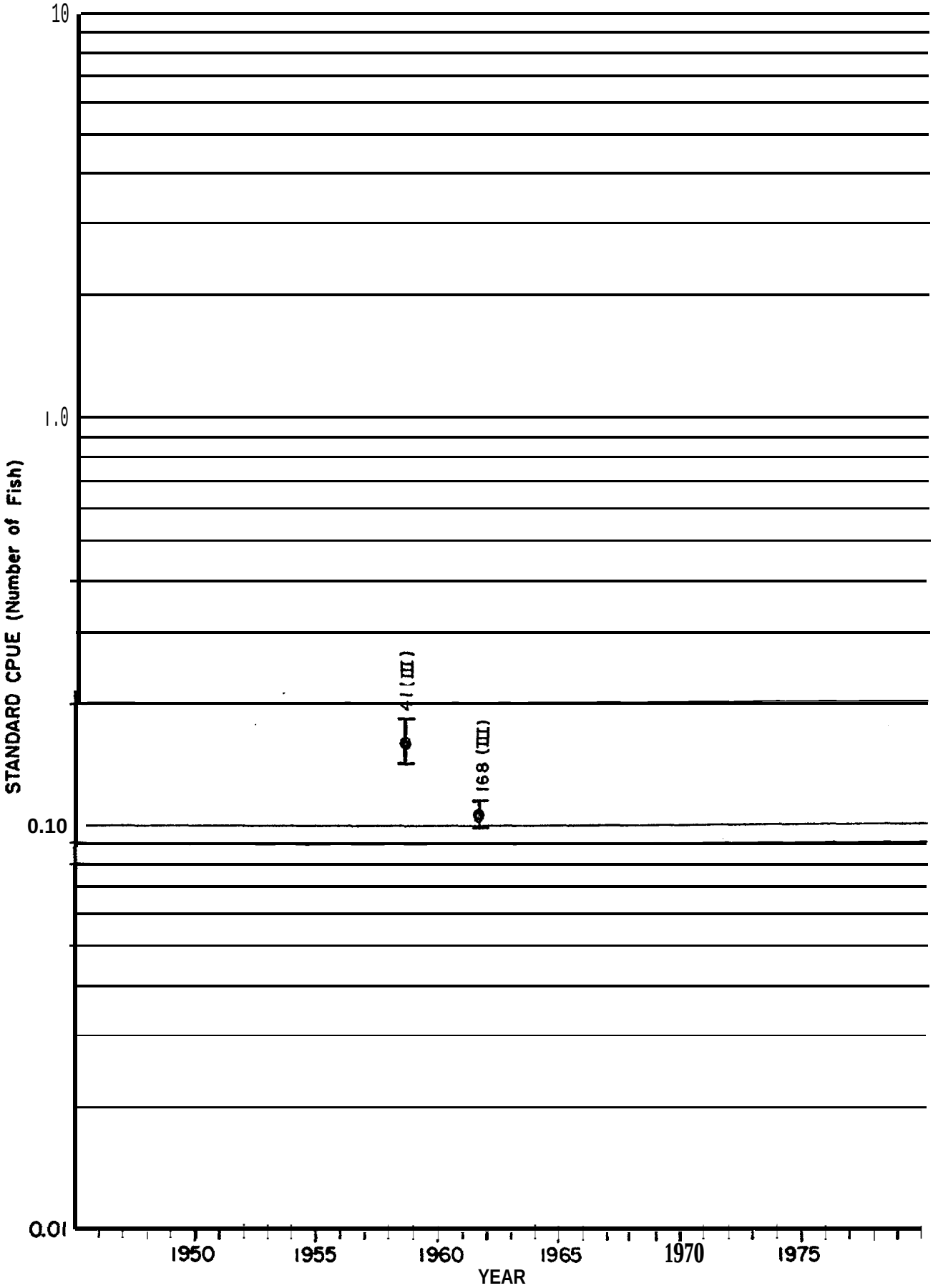


Figure IV.B.276.--Standardized rate of catch of chub mackerel by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

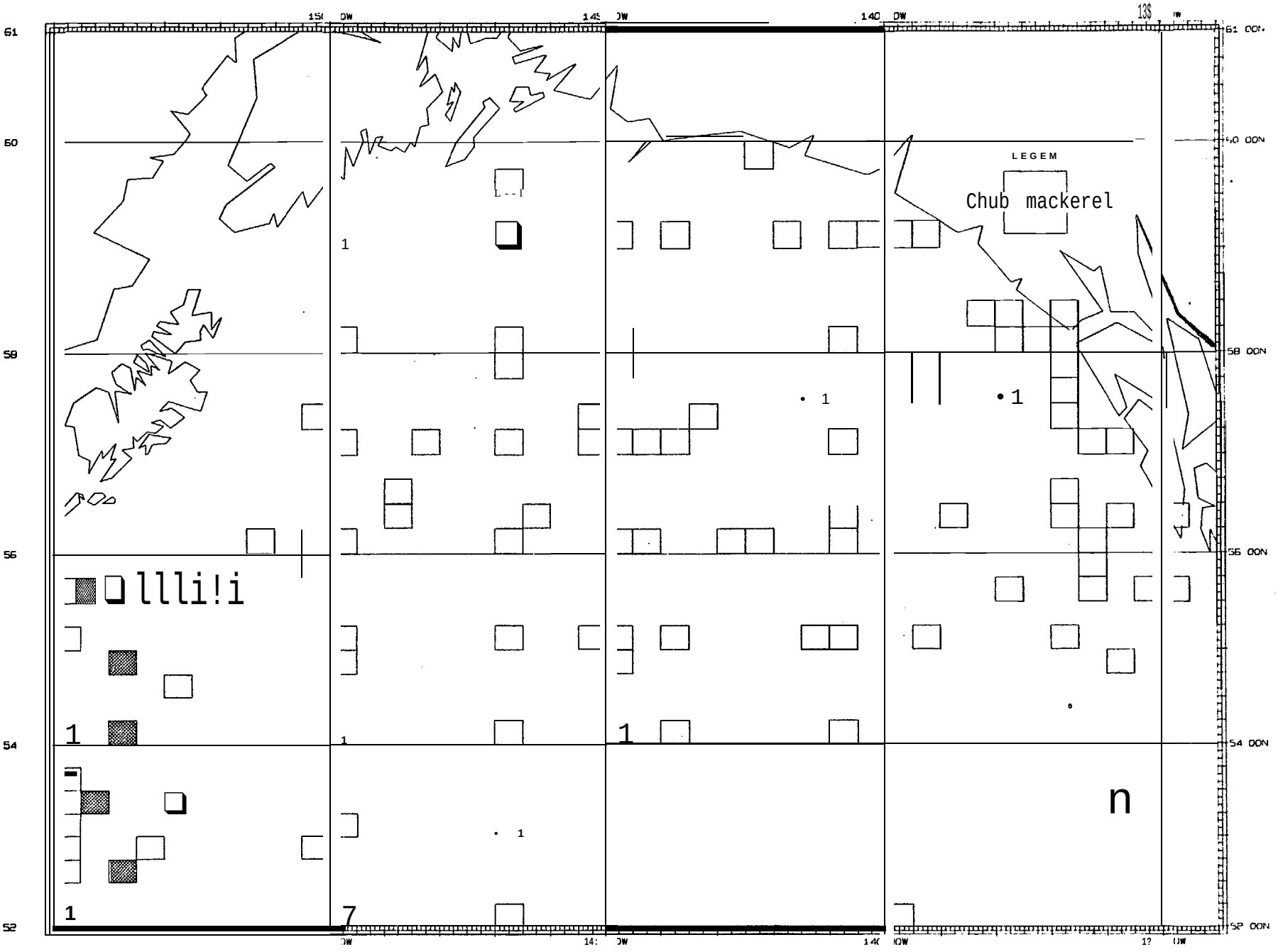


Figure IV.B.277.--Relative abundance of chub mackerel in gillnets in summer, Gulf of Alaska.

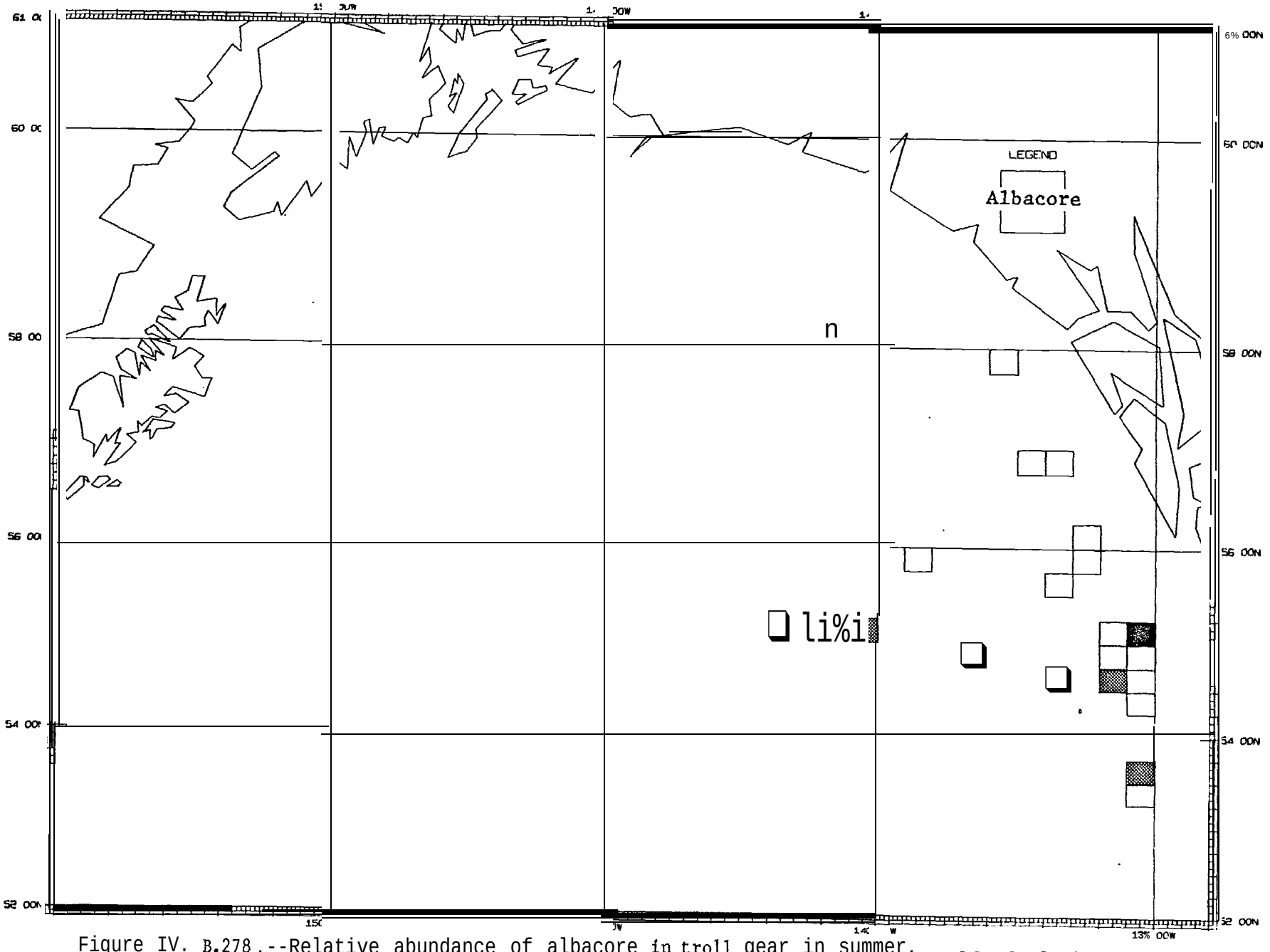


Figure IV. B.278.--Relative abundance of albacore in troll gear in summer, Gulf of Alaska.

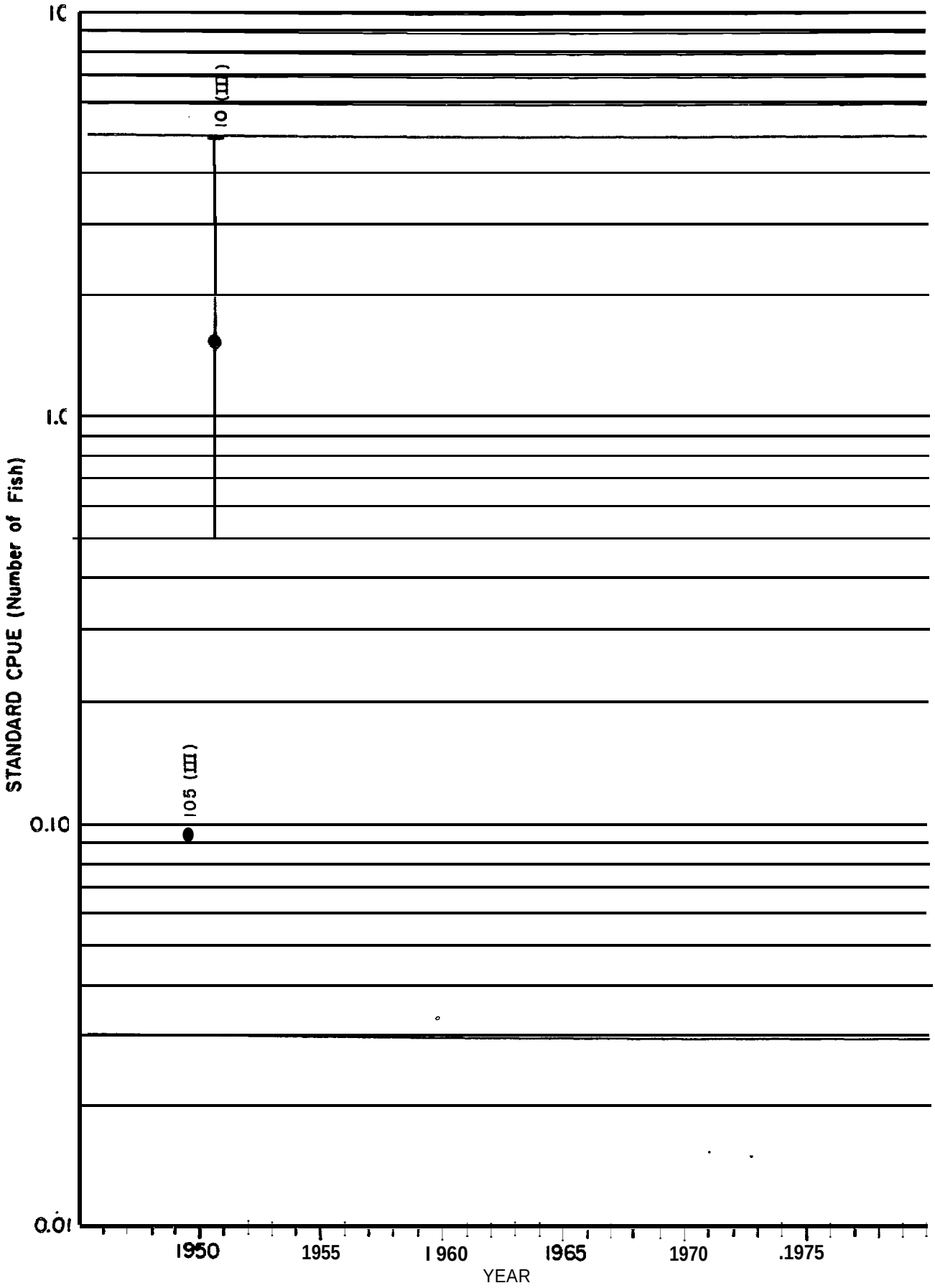


Figure IV.B.279.--Standardized rate of catch of albacore by trolling in the Gulf of Alaska (geometric mean: number/6 hr of trolling with 90% confidence interval, number of observations, and quarter of the year).

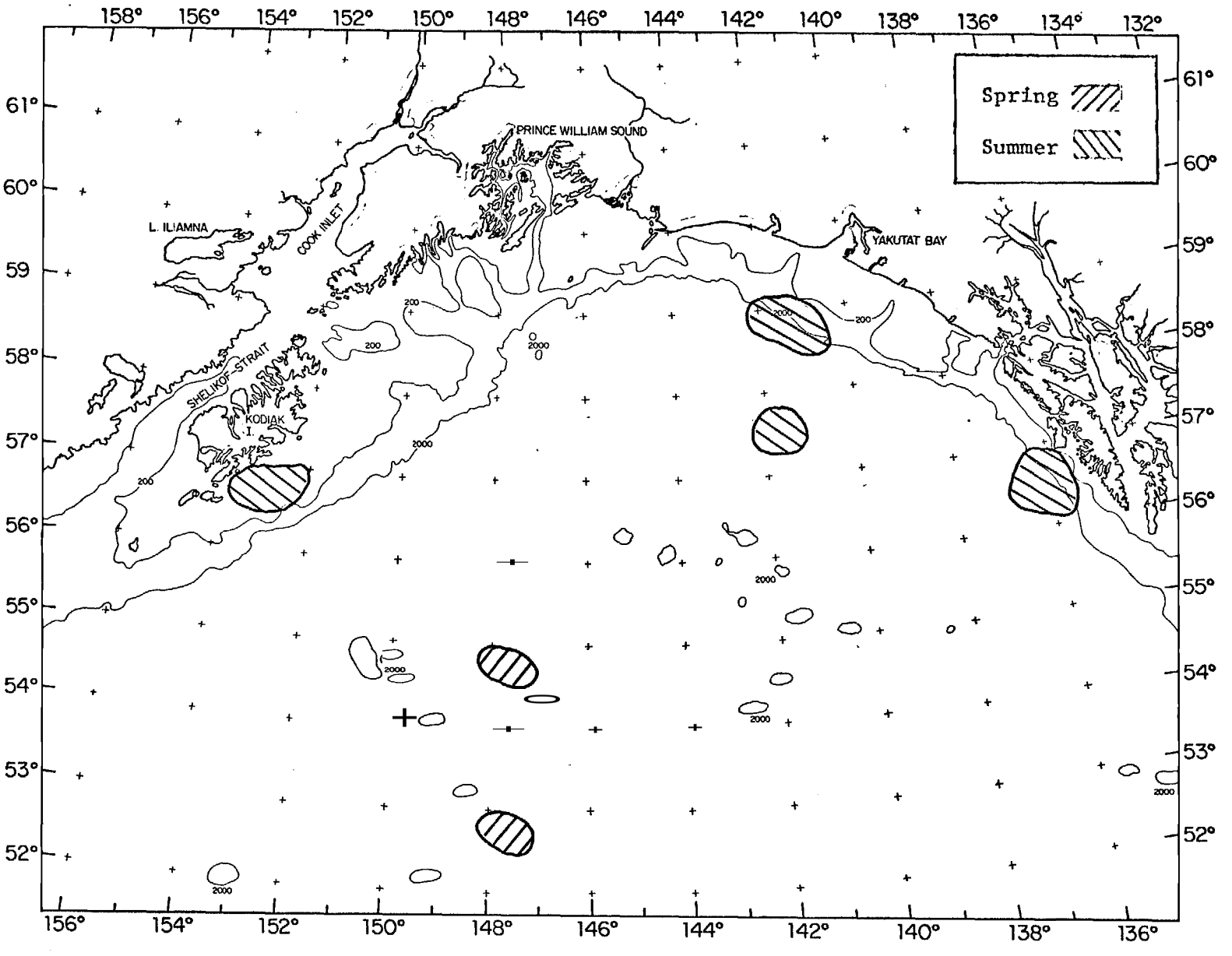


Figure IV.B.280.--Generalized areas in which Atka mackerel larvae were caught by seines in spring and juveniles were caught in summer, Gulf of Alaska.

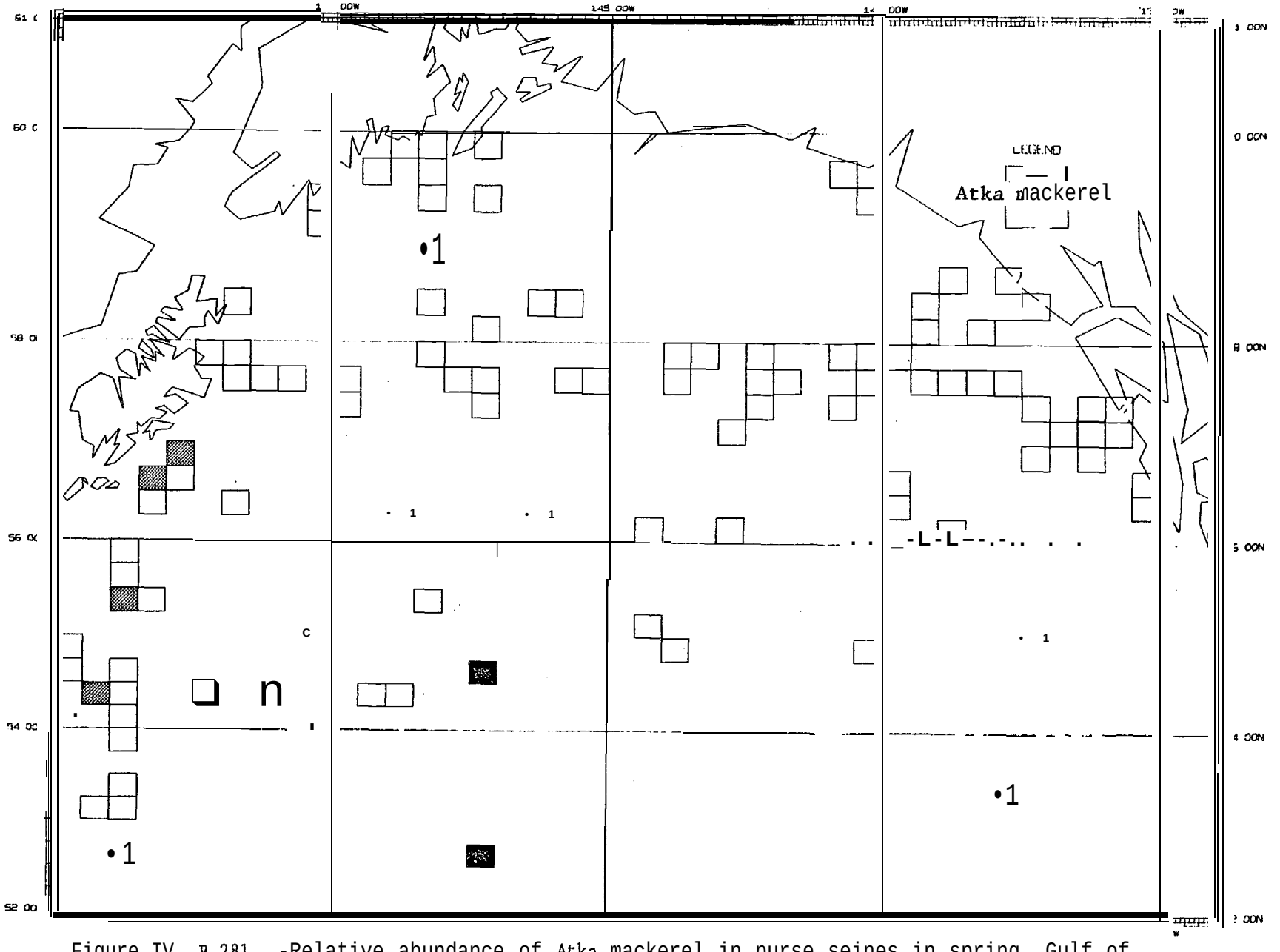


Figure IV. B.281 ..-Relative abundance of Atka mackerel in purse seines in spring, Gulf of Alaska.

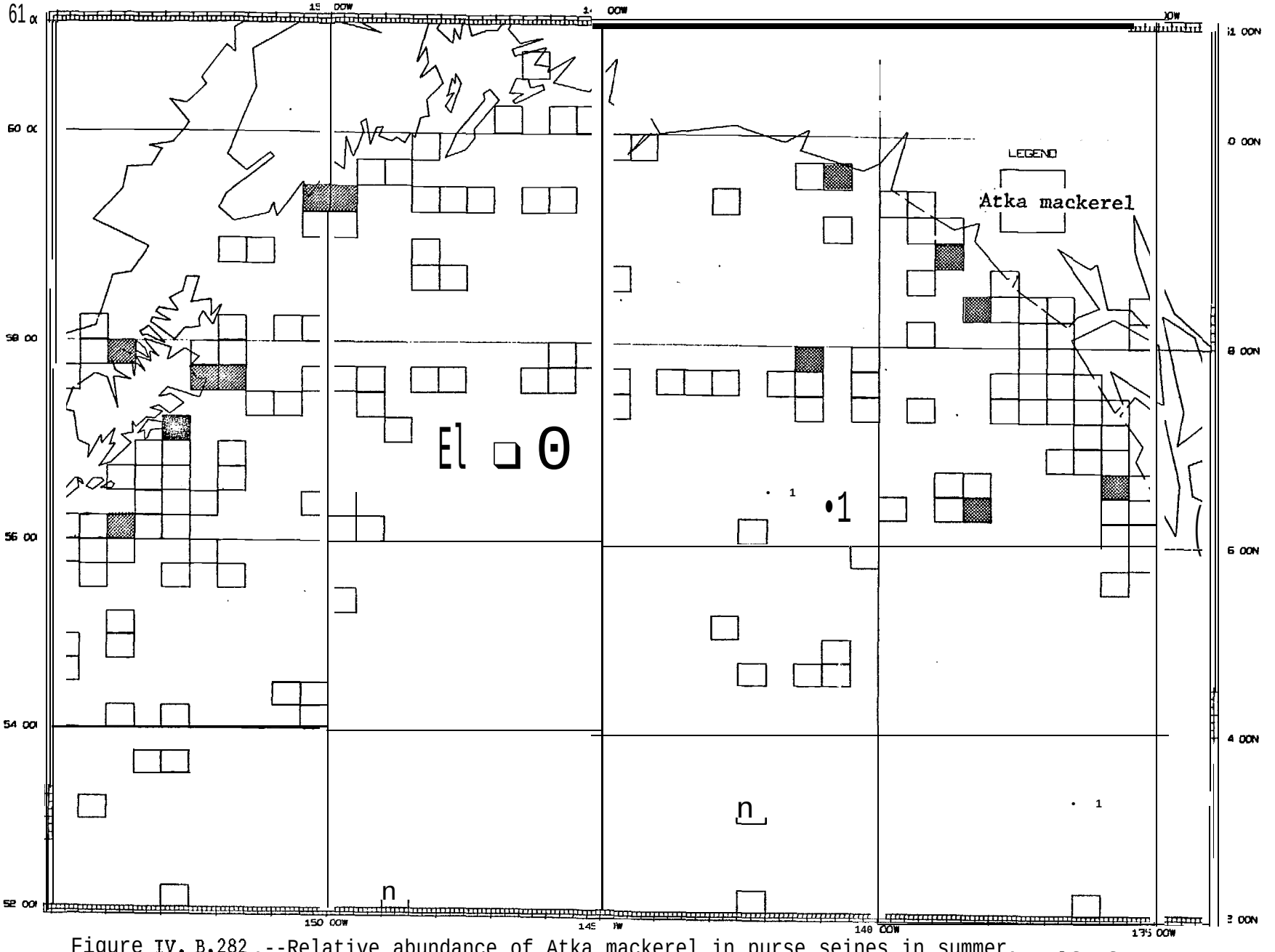


Figure IV. B.282 .--Relative abundance of Atka mackerel in purse seines in summer, Gulf of Alaska.

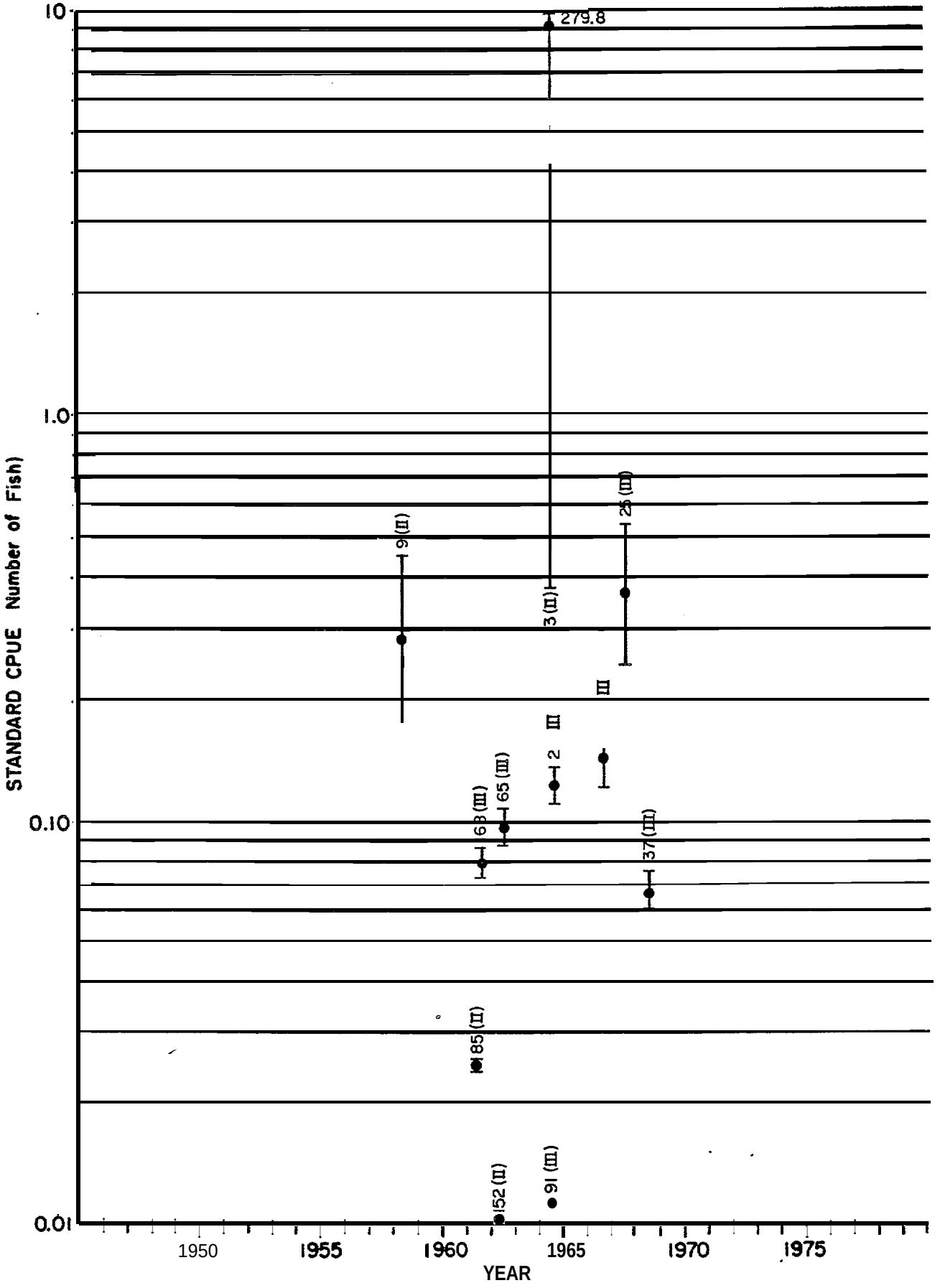


Figure IV. B.283.--Standardized rate of catch of Atka mackerel by purse seine in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

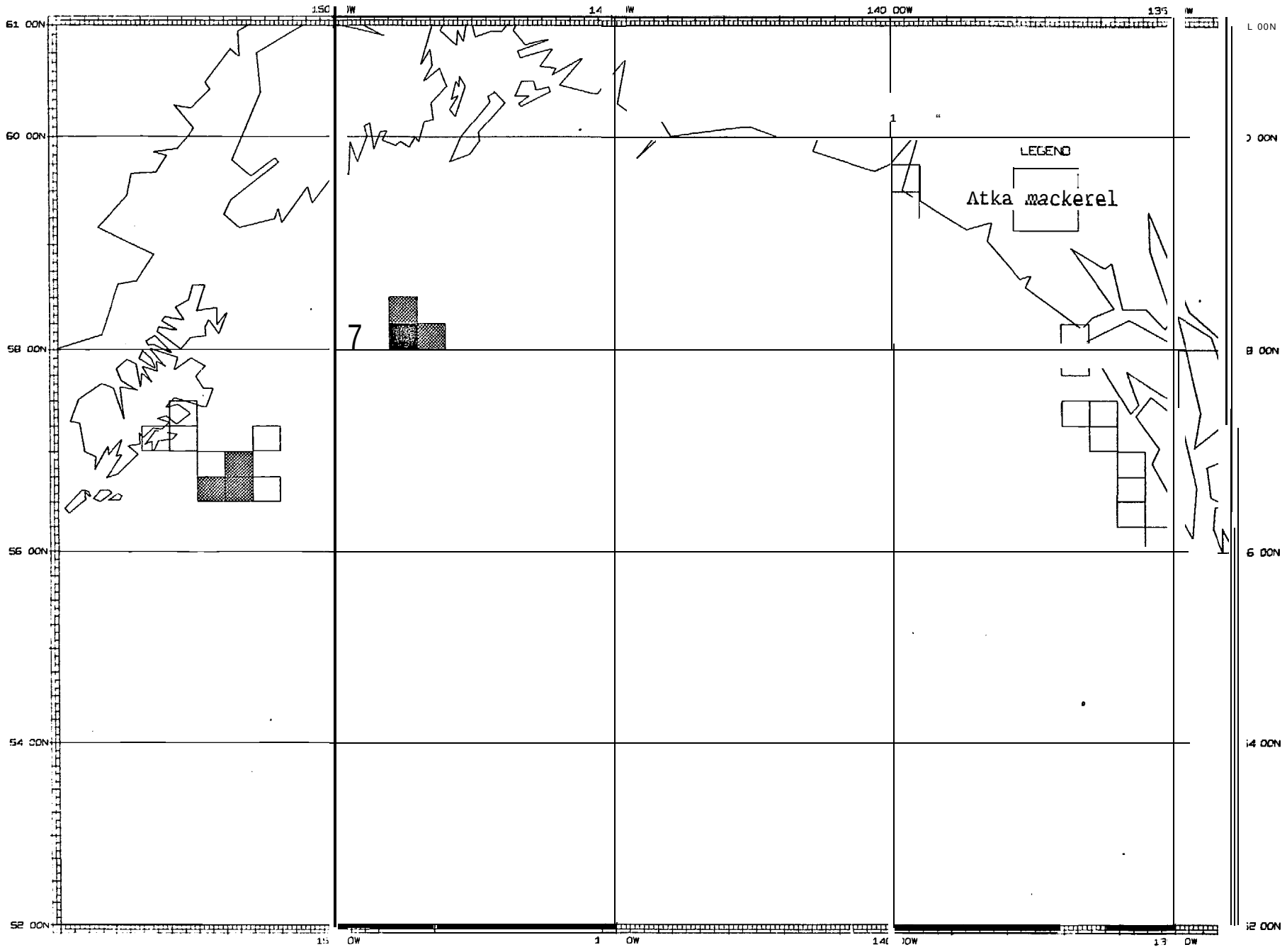


Figure IV.B.284.--Relative abundance of Atka mackerel in bottom trawls in winter, Gulf of Alaska.

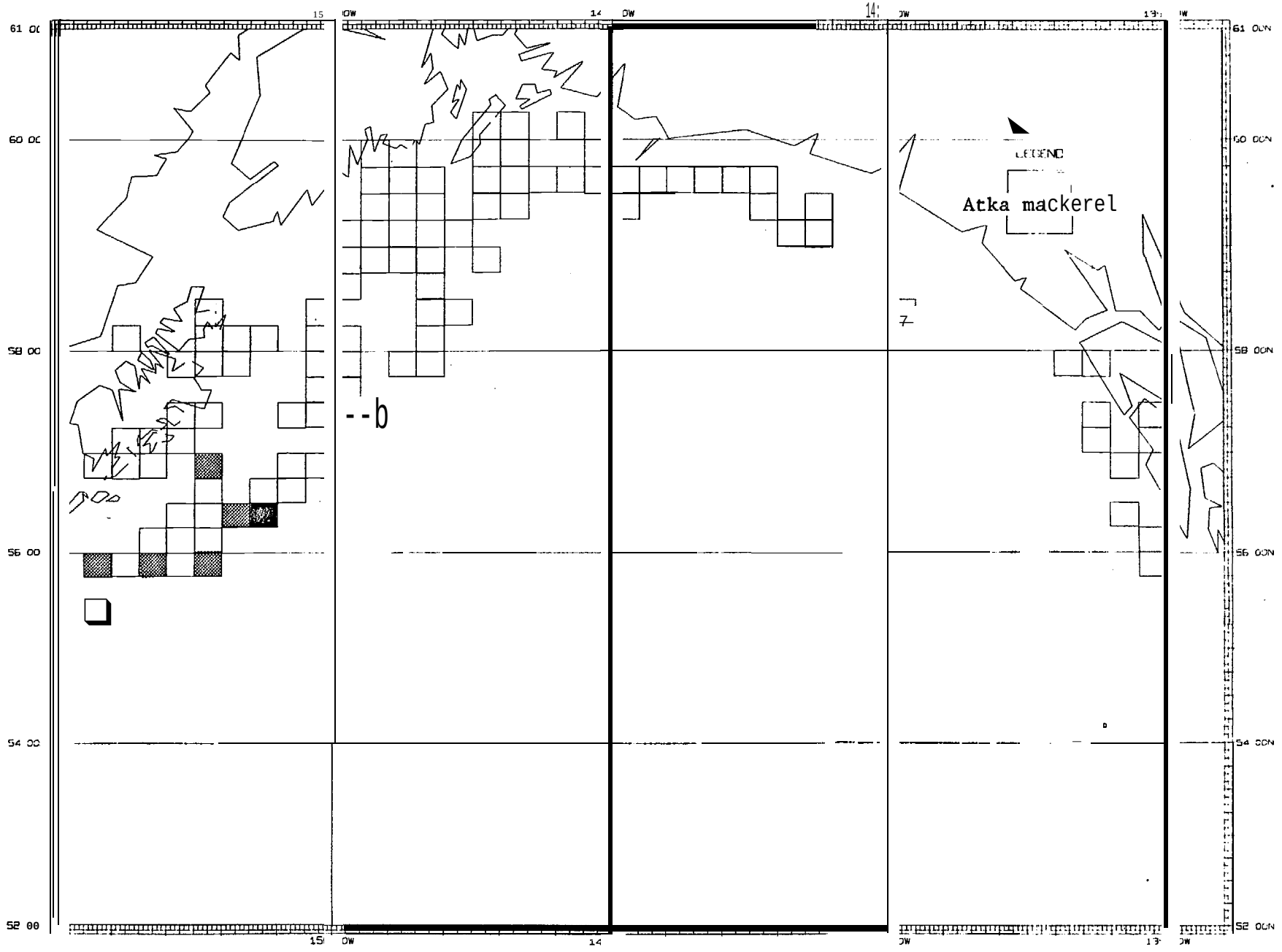


Figure IV. B.285.--Relative abundance of Atka mackerel in bottom trawls in spring, Gulf of Alaska.

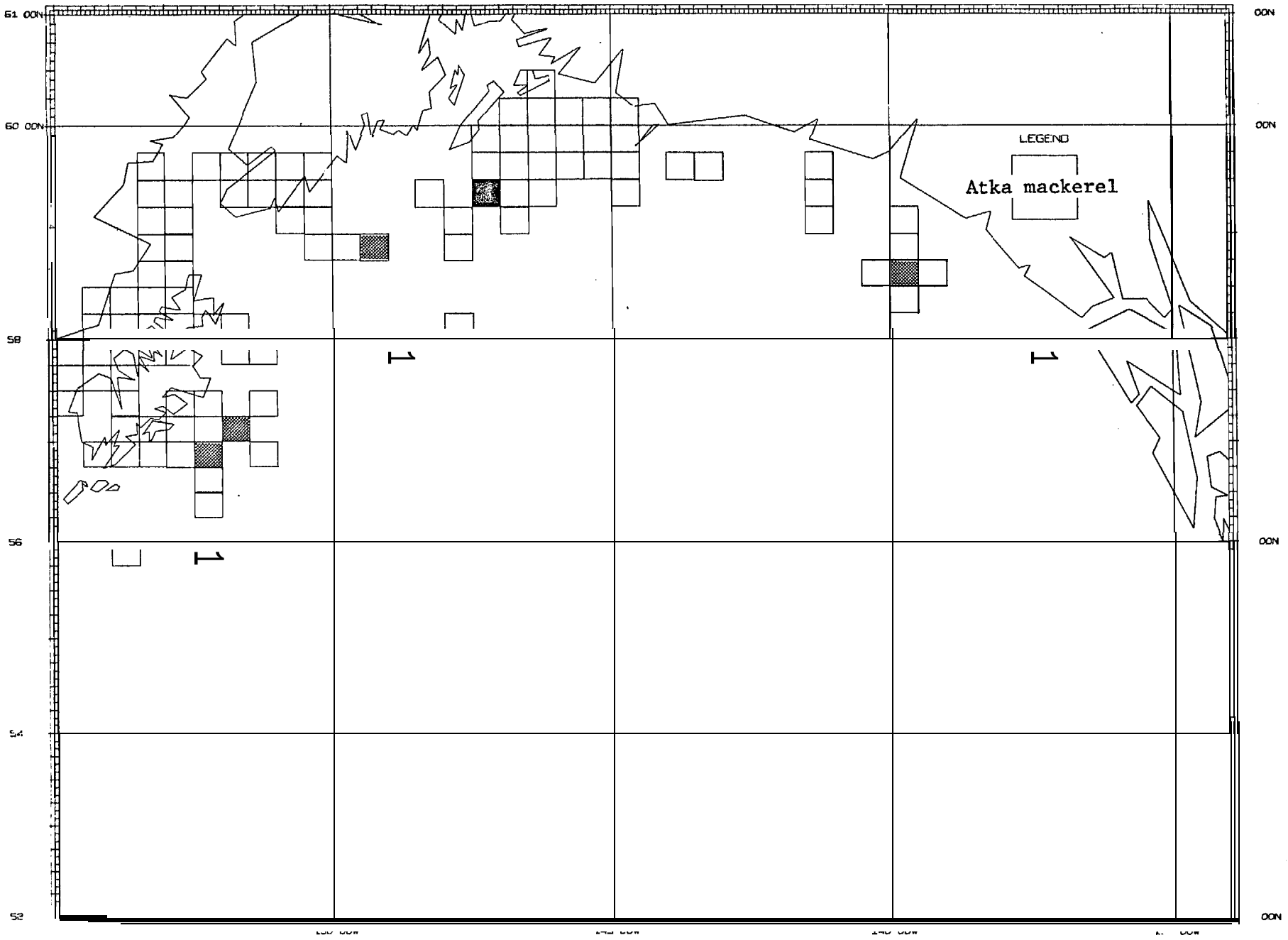


Figure IV.B.286.--Relative abundance of Atka mackerel in bottom trawls in summer, Gulf of Alaska.

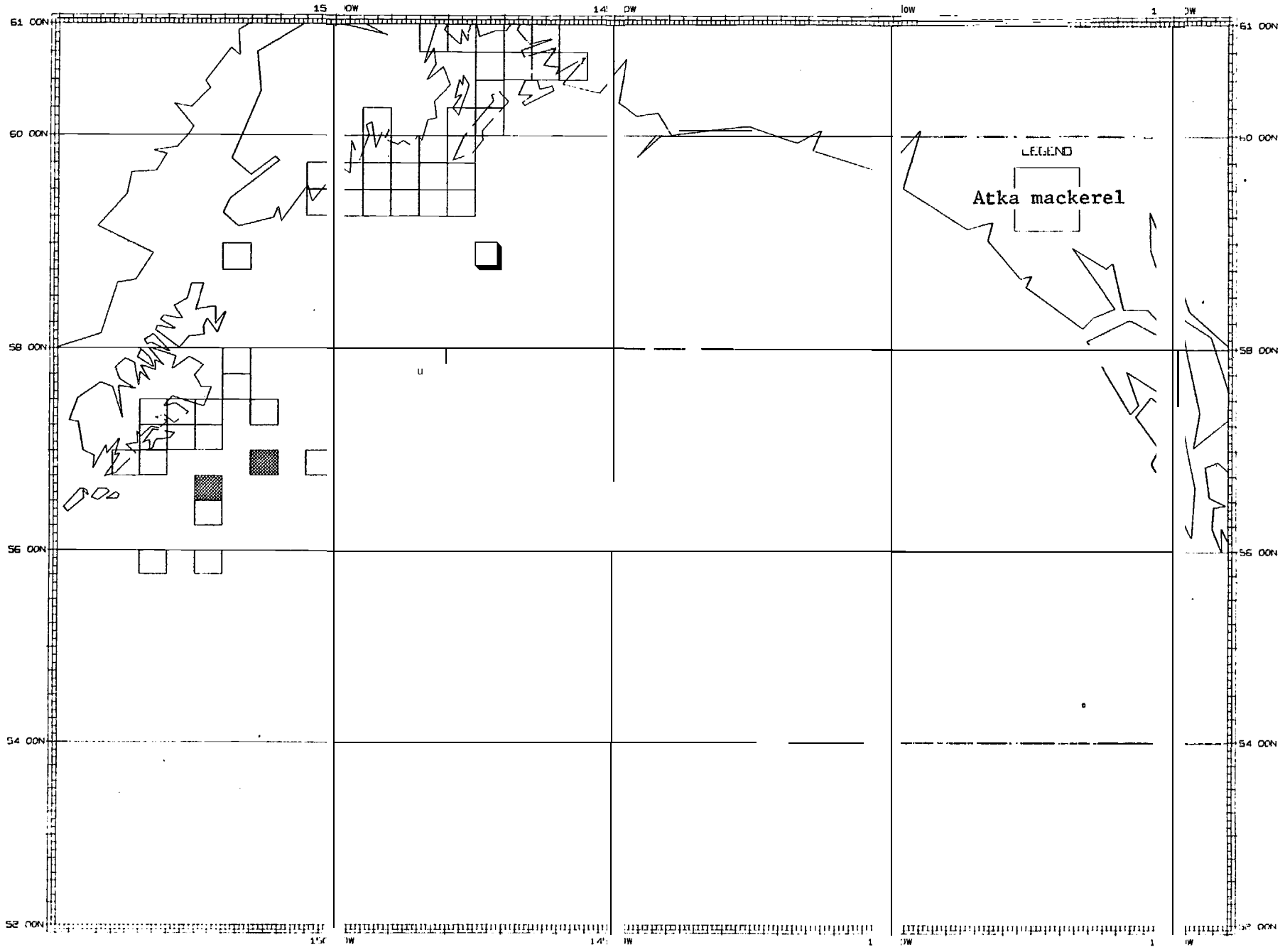


Figure IV. B.287 .--Relative abundance of Atka mackerel in bottom trawls in autumn. Gulf of Alaska.

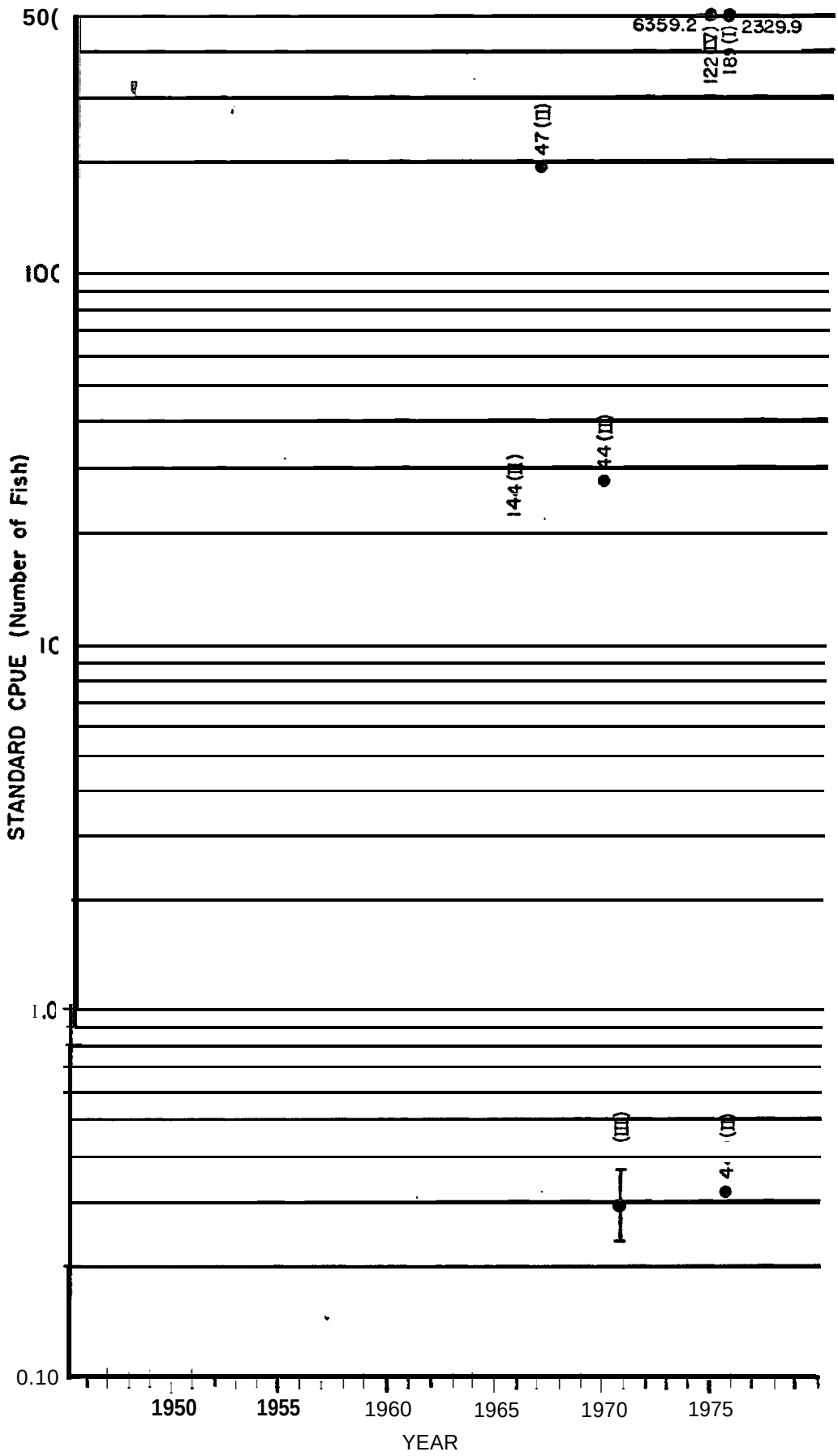


Figure IV.B.288.--Standardized rate of catch of Atka mackerel by bottom trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).

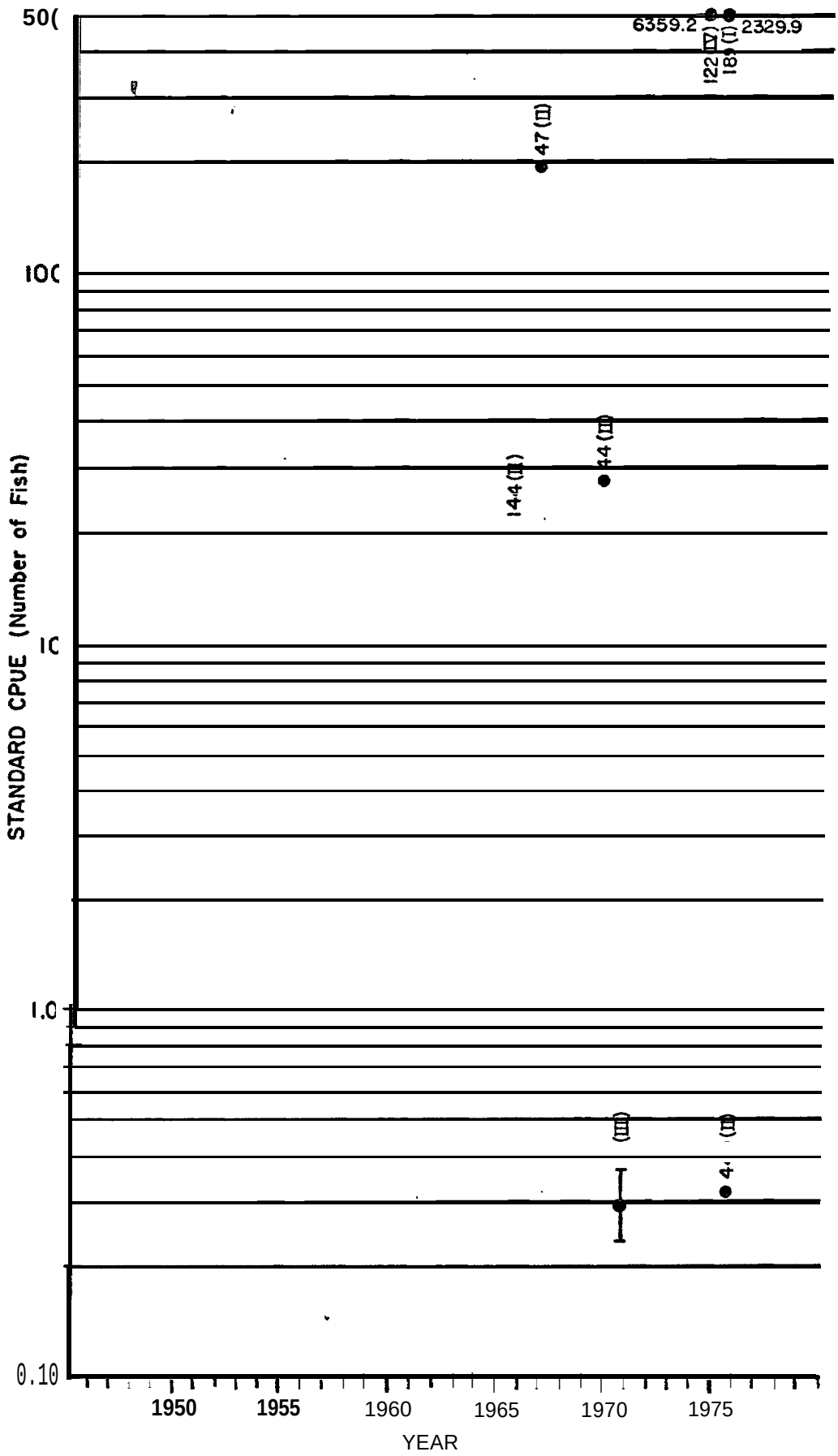


Figure IV.B.288.--Standardized rate of catch of Atka mackerel by bottom trawl in the Gulf of Alaska (geometric mean: number/30 min tow with 90% confidence interval, number of observations, and quarter of the year).