

NATIONAL MARINE FISHERIES SERVICE

NORTHWEST FISHERIES CENTER

PROCESSED REPORT

No. 1

ATLAS OF JAPANESE FAR SEAS FISHERIES IN THE
BERING SEA, NOVEMBER 1970 TO OCTOBER 1972 :

THREE-DIMENSIONAL GRAPHS OF MONTHLY CATCH STATISTICS

By

LOH LEE LOW

APRIL 1974



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University of Washington
Center for Quantitative Science
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Resource Project

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Part I : Time series graphs (12 per page) showing geographical distribution of fish catch by species as follows :-

Figure No.	Species	Time	
1 - 2	Yellowfin sole	Nov. 1970 to Oct. 1972	.. 10-11
3 - 4	Pacific cod	Nov. 1970 to Oct. 1972	.. 12-13
5 - 6	Pacific Pollock	Nov. 1970 to Oct. 1972	.. 14-15
7 - 8	Pac. Ocean Perch	Nov. 1970 to Oct. 1972	.. 16-17
9 - 10	Black cod	Nov. 1970 to Oct. 1972	.. 18-19
11 - 12	Misc. Flatfish	Nov. 1970 to Oct. 1972	.. 20-21

Part II : Larger graphs (2 per page) showing finer details of graphs shown in Part I as follows:-

Figure No.	Species	Time	
13 - 24	Yellowfin sole	Nov. 1970 to Oct. 1972	.. 24-35
25 - 36	Pacific cod	Nov. 1970 to Oct. 1972	.. 36-47
37 - 48	Pacific Pollock	Nov. 1970 to Oct. 1972	.. 48-59
49 - 60	Pac. Ocean Perch	Nov. 1970 to Oct. 1972	.. 60-71
61 - 72	Black cod	Nov. 1970 to Oct. 1972	.. 72-83
73 - 84	Misc. Flatfish	Nov. 1970 to Oct. 1972	.. 84-95

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INTRODUCTION

This collection of monthly catch graphs conveys the latest information on the dynamic sequence of major groundfish species catch trends in the Bering Sea. The three-dimensional graphs enhance comprehension of the intricate spatial and temporal changes of catch trends taken place. These graphs are computer generated, demonstrating the relatively simple procedure for plotting such detailed pictures for effective display of massive information.

The entire collection of graphs contain information from the Japanese mothership, longline-gillnet and independent trawl fisheries only. However, these Japanese fisheries account for about 85% of the total groundfish catch from the Bering Sea. Thus, the trends depicted can be very useful in research on the performance of the fishery and the resources. Besides, one can learn a great deal from the very successful Japanese fisheries for making fishing decisions.

This paper is divided into two parts. Part I shows the time series of relative catch trends by geographical distribution of major groundfish species in the Bering Sea for 12 months per page. This format enables the casual reader the benefit of a quick visual inspection of within year catch trends. Larger pictures of monthly catch graphs are shown in Part II where one may pick up finer details than those shown in Part I.

A third part of this atlas, bounded separately, shows the exact magnitude of fish catch depicted in Parts I and II. The magnitudes are expressed in metric tons of fish landed over geographical locations in arrays of numbers superimposed with maps of the area. This part (Low, 1974) shall be limited to internal departmental use.

GENERAL DESCRIPTION OF THE BERING SEA

The Bering Sea is one of the largest seas in the world. It is bounded on the west by the Soviet Union, the east by Alaska, and the south partially by the Aleutian chain of islands (Fig. A). It opens up to the Arctic Ocean at the north. The continental shelf of less than 200 meter depth covers about 43% of the total area. The general northwesterly to southwesterly direction of the continental slope should be noted because it will become evident later that the area is the major fishing ground. The deep basin is as deep as 3,000 meters and virtually too deep for fishing activities.

DEVELOPMENT OF THE FISHERY

Pruter (1973) gives a comprehensive outline on the development of the bottomfish fishery since commercial exploitation. Major developments are post World War II. Japan started her groundfish operations again after the War in 1954, the Soviet Union in 1958, and South Korea for the first time in 1967. United States and Canadian fishermen participate in a limited longline fishery for halibut in the eastern Bering Sea and around the Aleutian Islands.

Harvest of groundfish by Japan increased to almost 600 thousand metric tons (M.T.) in 1961, mostly of yellowfin sole (Limanda aspera), and declined to 300 thousand M.T. in 1963. At about that time, the target species was switched from yellowfin sole to Alaska (walleye) pollock (Theragra chalcogramma) for processing into fish meal and surimi (a fish sausage). The modernization of the Japanese fishing vessels and the experience gained in years of fishing in the region resulted in an accelerated catch of pollock to about 1.5 million M.T. by 1972.

The primary species sought by the Soviet Union have been flatfishes, Pacific Ocean perch (Sebastes alutus), and herring. Her total harvest of groundfish was about 300 thousand M.T. in recent years. South Korea fishes mainly for pollock and her catch was estimated at 5 thousand M.T. in 1971, very small by comparison to catches by other nations.

The mothership, longline-gillnet and independent trawl fisheries account for most of Japan's catch. Japan also has another fishery, the land-based dragnet fishery that is licensed to fish as far east as 170°W longitude. This latter fishery is very small by comparison to that of the other Japanese far seas fisheries.

MAJOR SPECIES

The major species of groundfish harvested commercially in the Bering Sea are:

- | | |
|-------------------|------------------------------|
| 1. Yellowfin sole | <u>Limanda aspera</u> |
| 2. Pacific cod | <u>Gadus macrocephalus</u> |
| 3. Alaska pollock | <u>Theragra chalcogramma</u> |

4. Pacific Ocean perch	<u>Sebastes alutus</u>
5. Black cod	<u>Anoploma fimbria</u>
6. Rock sole	<u>Lepidopsetta bilineata</u>
7. Flathead sole	<u>Hippoglossoides elassodon</u>
8. Turbot	<u>Atheresthes stomias</u>
9. Pacific halibut	<u>Hippoglossus stenolepis</u>

The first four species combine for more than 94% of the total groundfish catch in the region. In this atlas, catch graphs for the first five species and a miscellaneous flatfish group are presented. The miscellaneous flatfish group includes species 6 to 8 and Alaska plaice.

DATA SOURCE

The source of information is the Fishery Agency of Japan. The Agency compiles the information on catch and fishing effort by time, location, species, gear type, and vessel size class. As a member of the International North Pacific Fisheries Commission (INPFC), Japan has provided member nations with such catch and effort statistics. Thus, the information used for plotting these graphs comes from the Northwest Fisheries Center, U.S. National Marine Fisheries Service which has access to the information supplied by Japan.

THE COMPUTER PROGRAM

A three-dimensional graphics program T3D is used. It is a version of an original software (PICTURE) developed at the Los Alamos Laboratory (Prueitt 1973).

In general, T3D processes an X, Y and Z array of numbers representing fish catch by longitude and latitude into graphic format. The proper array of numbers is generated from an extensive data file of the Japanese far seas fisheries on the University of Washington CDC 6400 computer.

The graph generated by T3D is controlled through certain key parameters. These parameters include the length of the X (longitude) and Y (latitude) axes, height of the Z (magnitude of the catch) axis, the viewing angle and distance referenced from the common point of origin of the 3 axes, hidden line removal flags, and others. A more detailed explanation on the use of the 3-D program may be inferred from the University of Washington, Computer Center Document W00072, written for PICTURE.

The graphs in this paper are plotted on the remote control Tektronix 4010 cathode-ray-tube terminal linked to the CDC 6400 computer by telephone. Each graph takes about 30 to 90 seconds to plot, depending upon the amount and complexity of information plotted. A hard copy of the graph on the CRT screen is obtained by activating a companion hard copy unit of the remote terminal.

GUIDE TO GRAPH READING

Each graph depicts fish catch for a certain species by time (month and year) as labelled. The black shaded areas denote land. The Soviet Union is located at the top left corner, Alaska at the top right corner, and the arc of islands is the Aleutian-Commander chain of islands. Major longitude and latitude lines are labelled. Lines running from left to right are spaced at 1° longitude intervals and those running from top to bottom are spaced at $1/2^{\circ}$ latitude intervals.

The height of peaks shown in the graphs denote relative magnitude of fish catch. The higher the peak, the larger is the catch. The largest catch (peak) in a 1° longitude and $1/2^{\circ}$ latitude area in each month is typed at the lower right corner. The total catch for that month is also shown.

It should be noted that the vertical scales showing the relative magnitudes of catch differ from species to species; reflecting large differences in catch levels. However, these scales are the same for each species from month to month. The ceiling for the vertical scales for the 6 major groups of groundfish are:

Species	Ceiling Scale (Tons)
Yellowfin sole	4500
Pacific cod	2000
Pacific pollock	90000
Pacific Ocean perch	700
Black cod	190
Miscellaneous flatfish	7200

LITERATURE CITED

- Low, L. L. 1974. Monthly catch statistics of Japanese far seas fisheries in the Bering Sea, November 1970 to October 1972. University of Washington, Center for Quantitative Science, NORFISH Report NL18. 147p.
- Prueitt, M. L. 1973. Fantastic computer pictures give us a new look at numbers. Popular Science 1973(2):102-105.
- Pruter, A. L. 1973. Development and present status of bottomfish resources in the Bering Sea. J. Fish. Res. Board Can. 30(12):2373-2385.

ACKNOWLEDGMENT

I wish to express sincere gratitude to my colleagues Dan Brown and Gary Morishima for introducing me into three-dimensional computer graphics. Many thanks are also conveyed to Dr. D.L. Alverson, L.J. Bledsoe and Mike Fredin for encouraging me to assemble this atlas. The entire undertaking is funded by the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service.

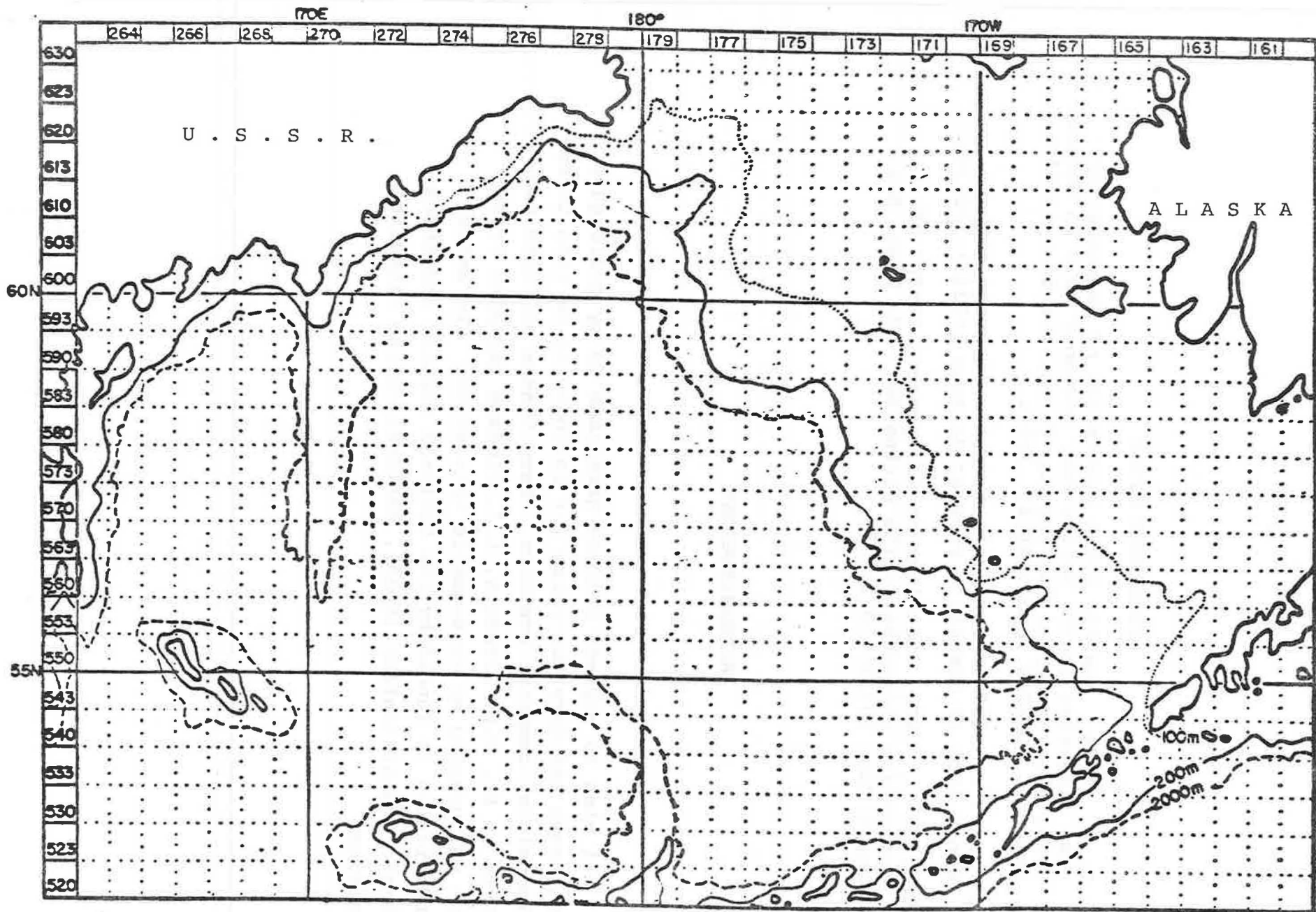


Fig. A. Map of the Bering Sea showing depth contour and geographical grids.

Part I

Time series graphs (12 per page) showing
geographical distribution of fish catch
by species as labelled

Figure No.	Species	Time	Page No.
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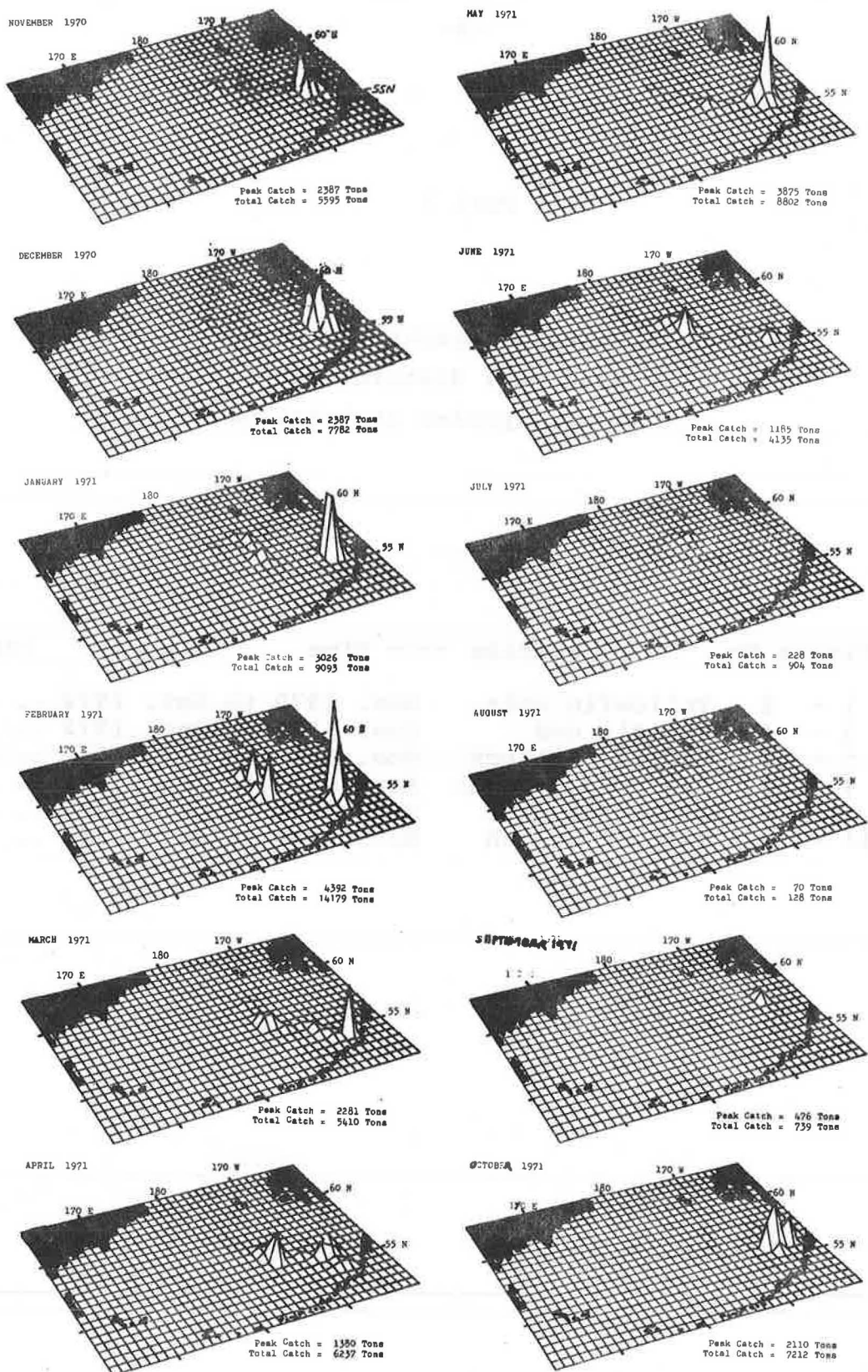


Figure 1. Geographical distribution of yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1970 to October 1971.

YELLOWFIN SOLE

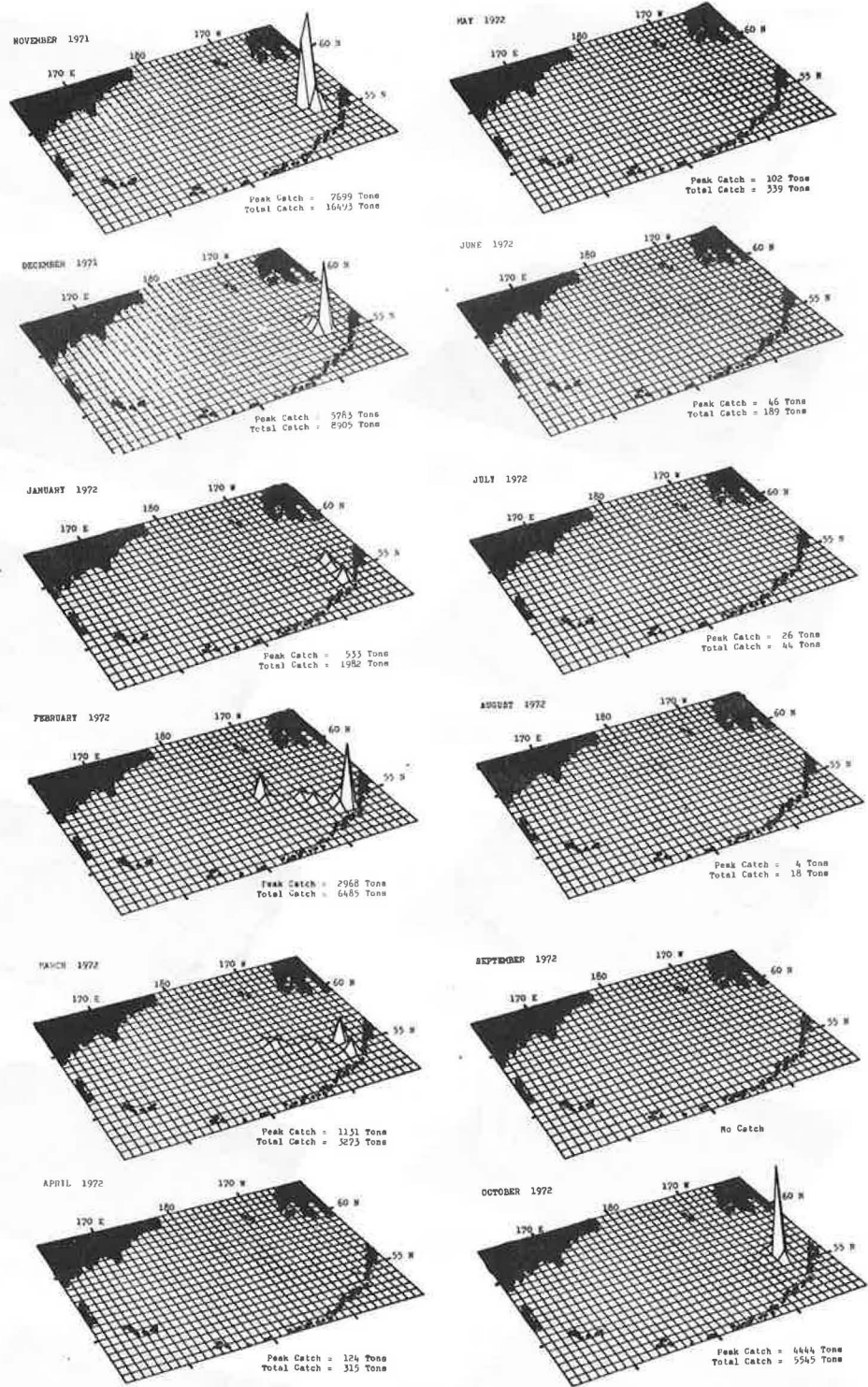


Figure 2. Geographical distribution of yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1971 to October 1972.

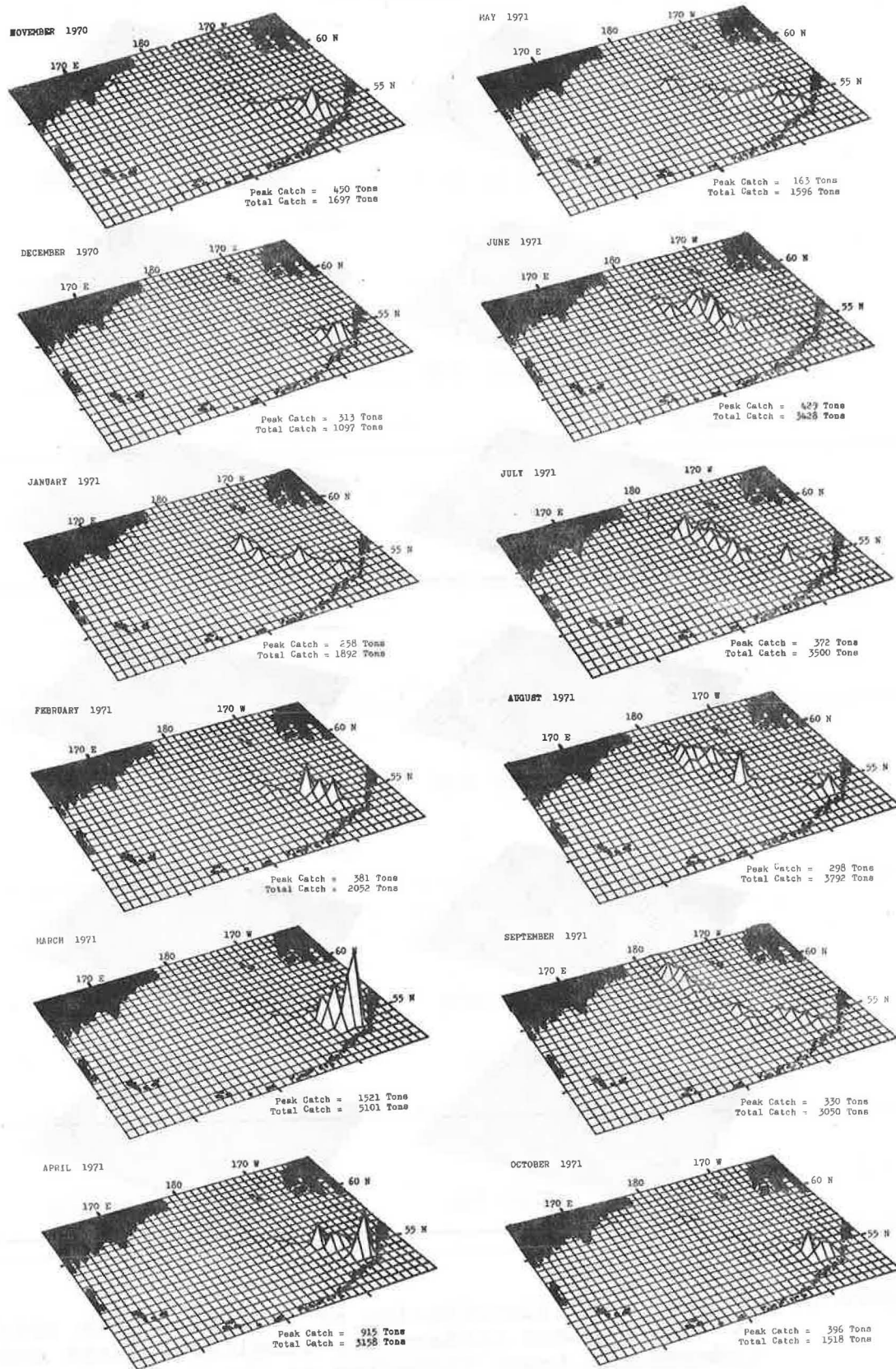


Figure 3. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1970 to October 1971.

PACIFIC COD

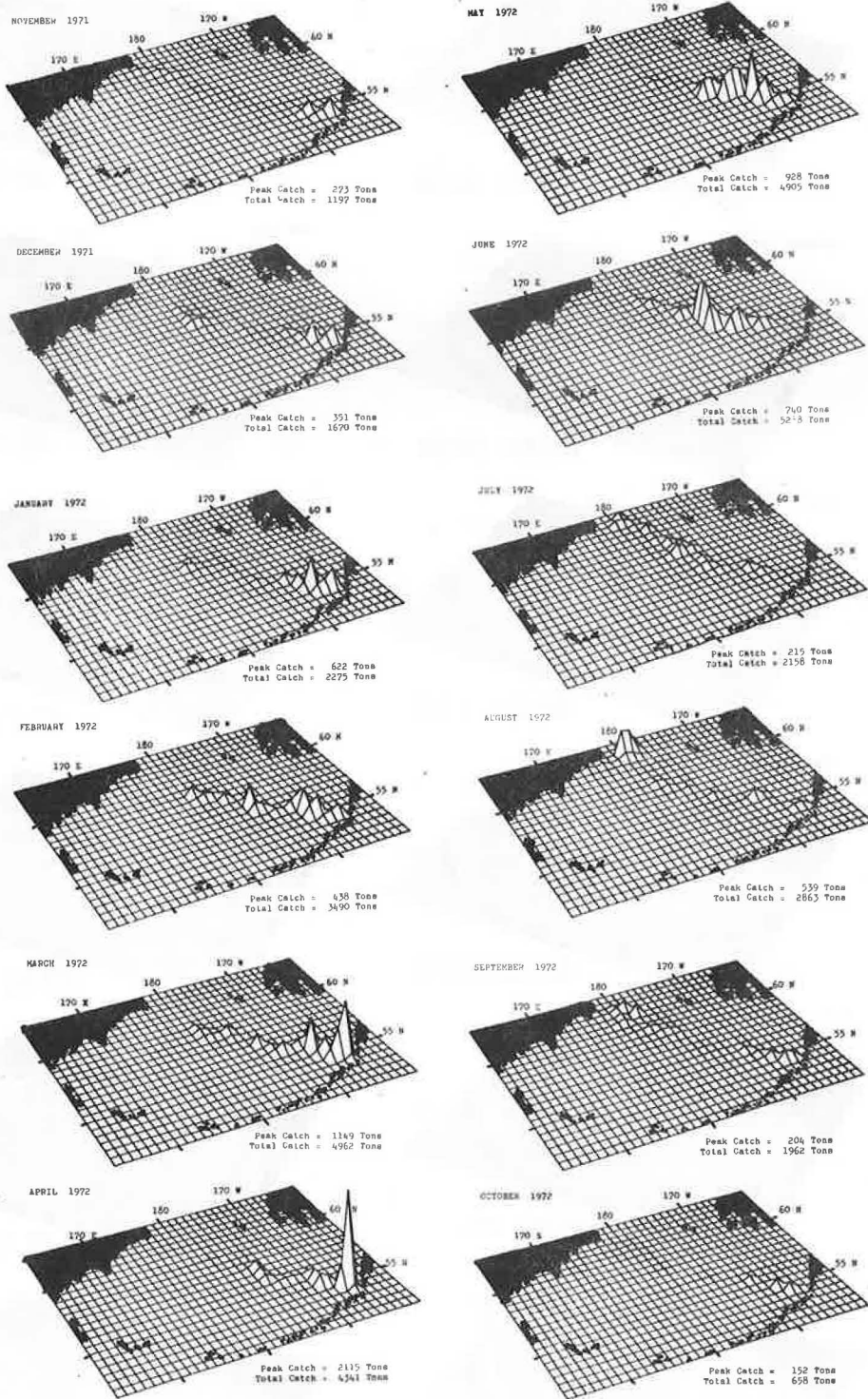


Figure 4. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1971 to October 1972.

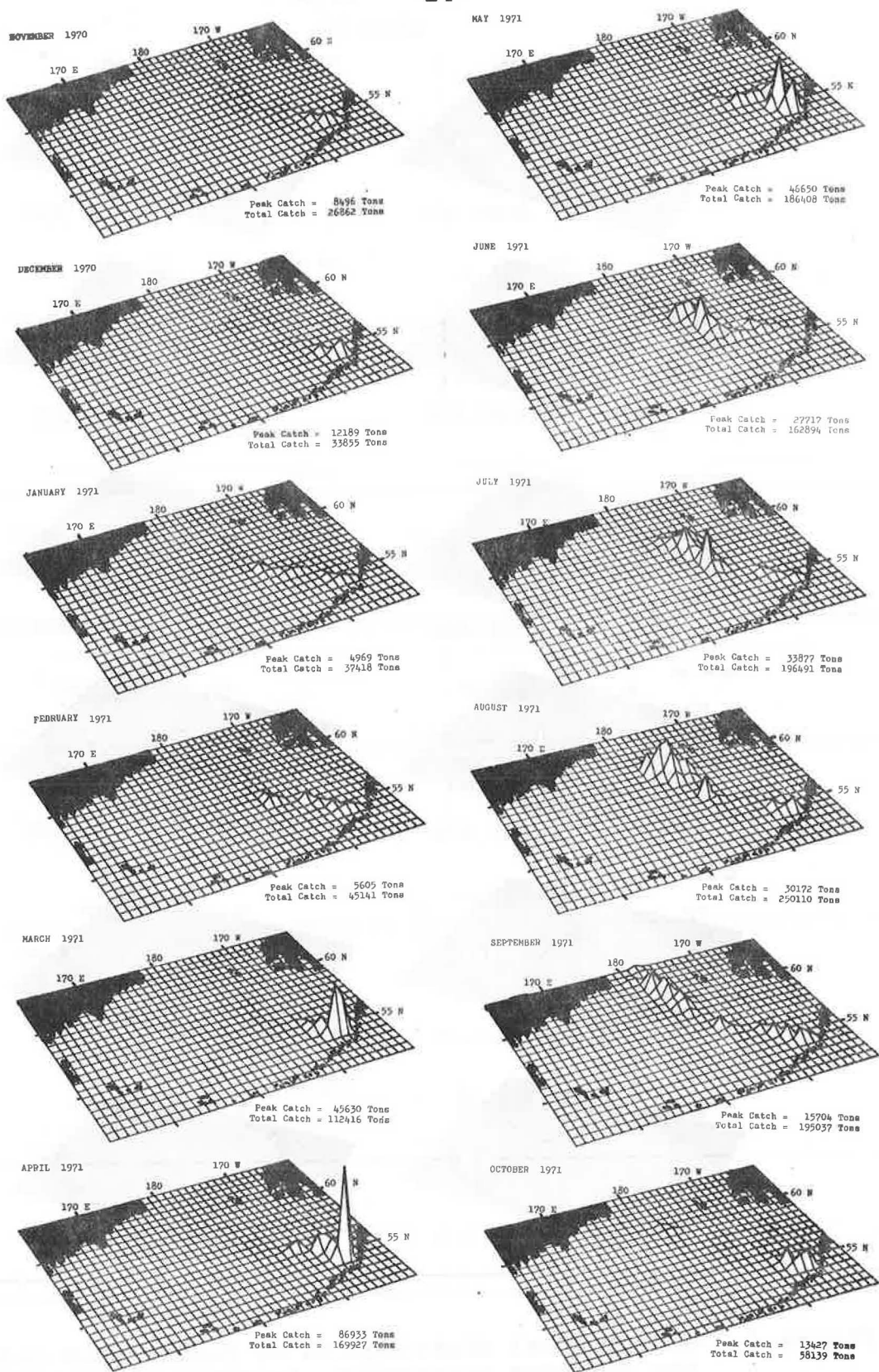


Figure 5. Geographical distribution of Alaska pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1970 to October 1971.

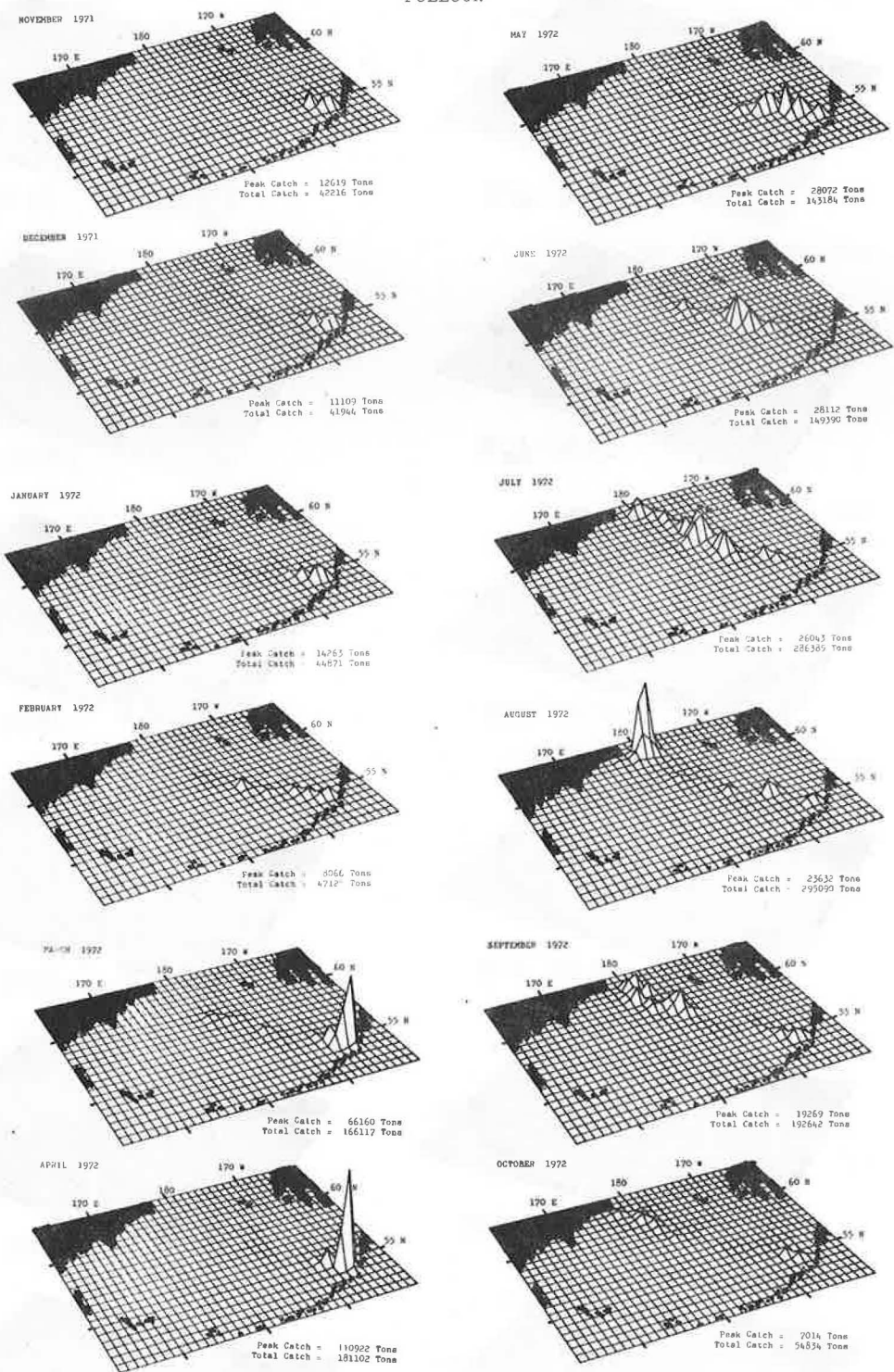


Figure 6. Geographical distribution of Alaska pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1971 to October 1972.

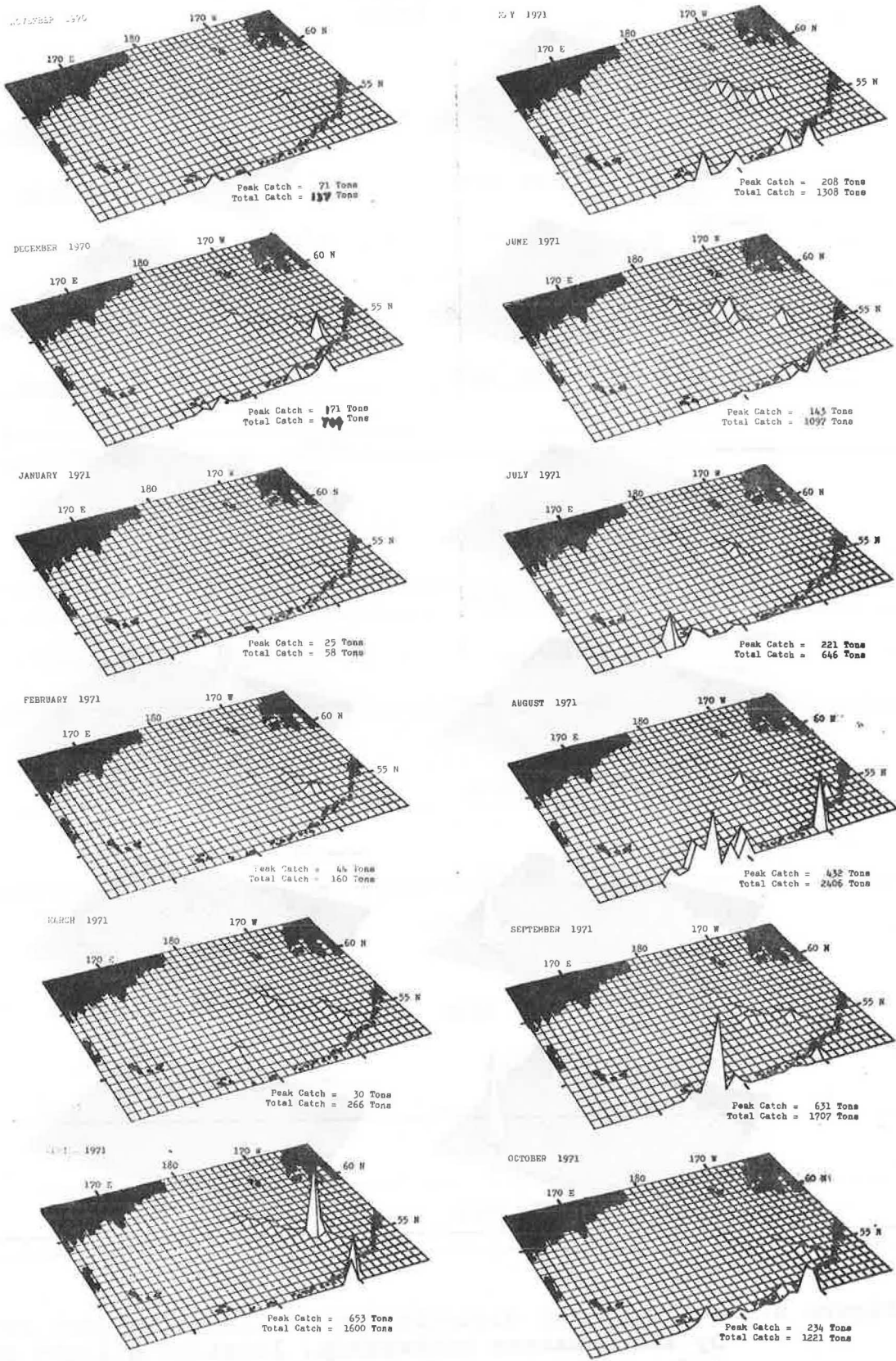


Figure 7. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea, November 1970 to October 1971.

-17-
PACIFIC OCEAN PERCH

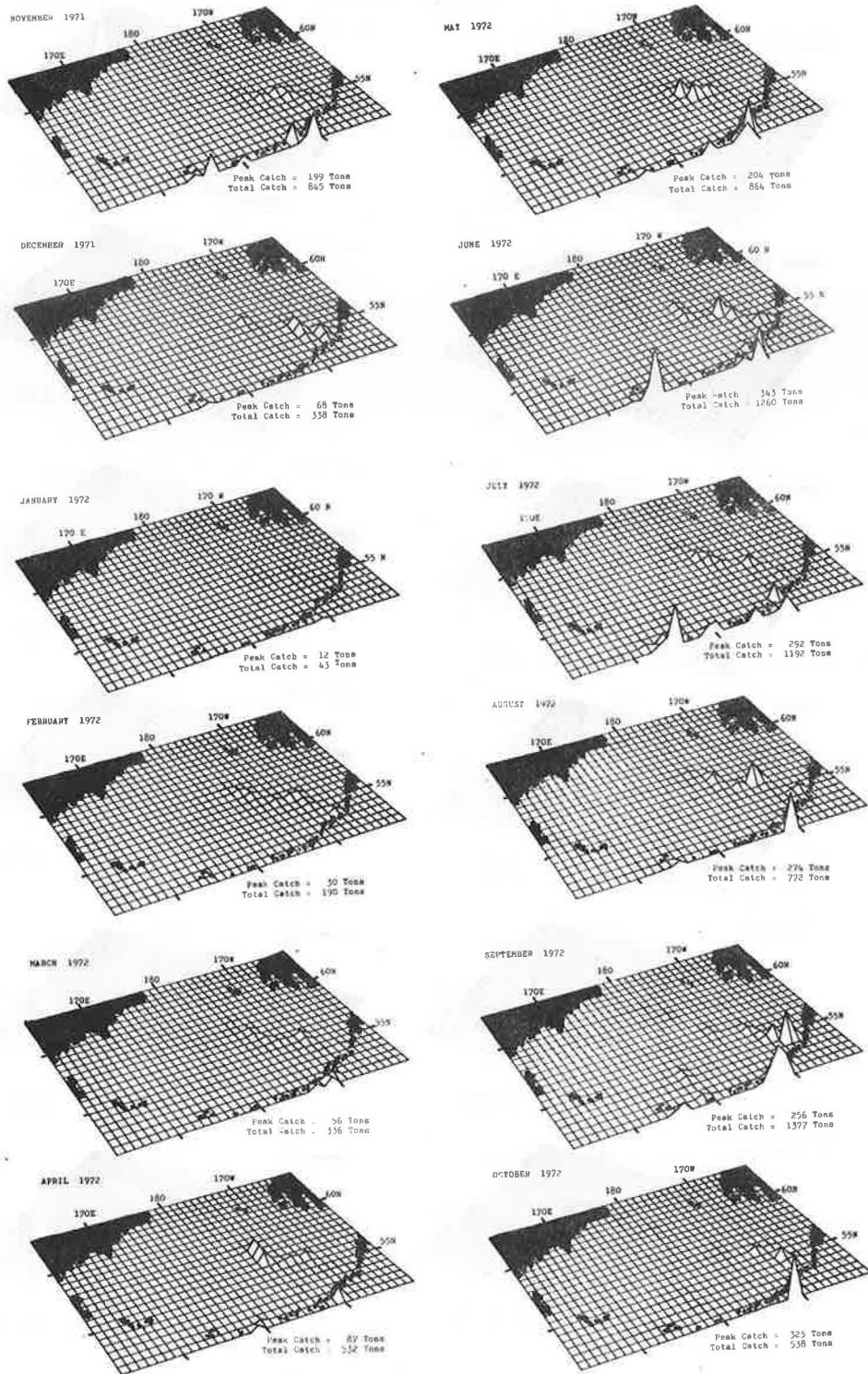


Figure 8. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea, November 1971 to October 1972.

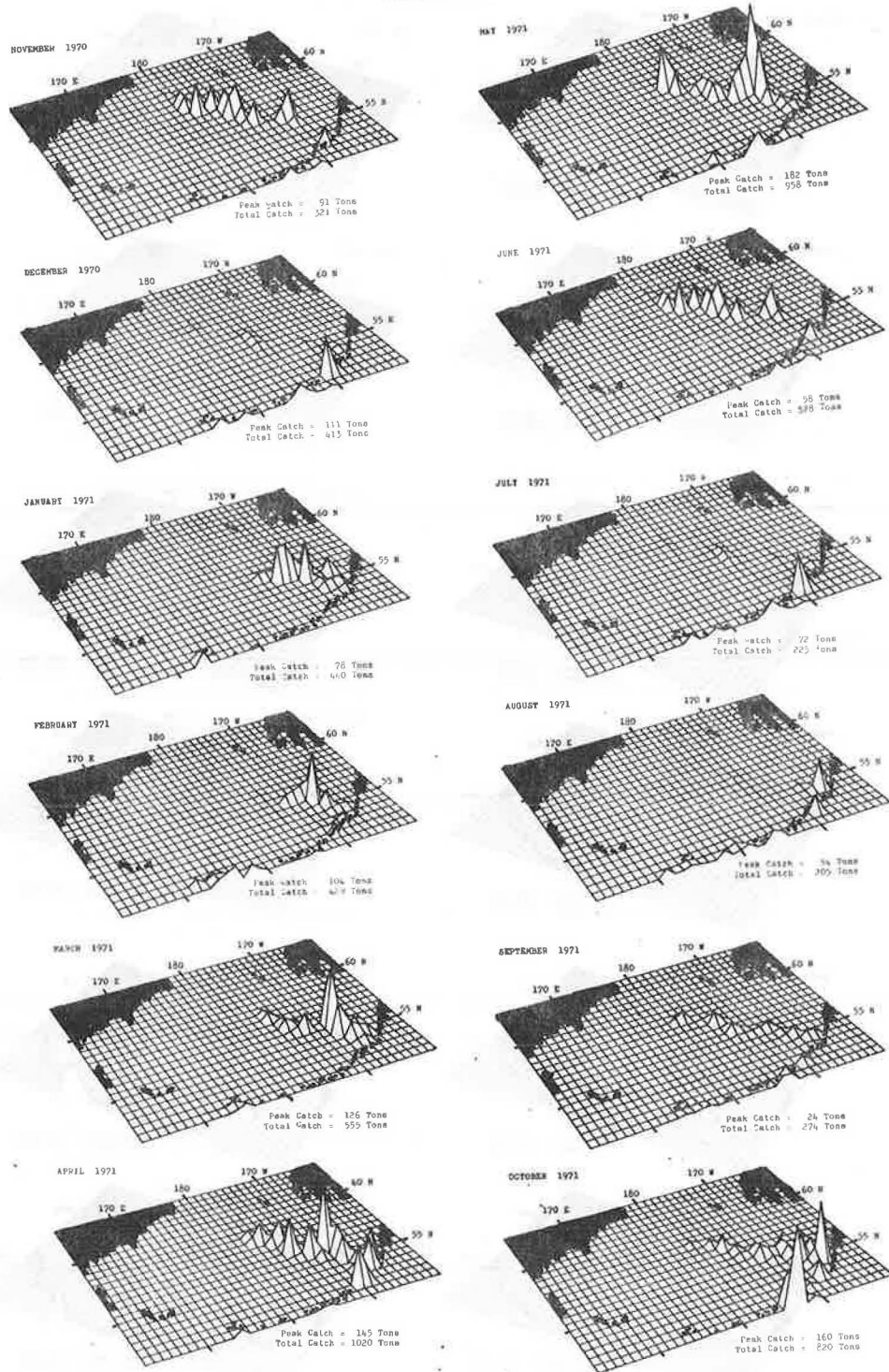


Figure 9. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1970 to October 1971.

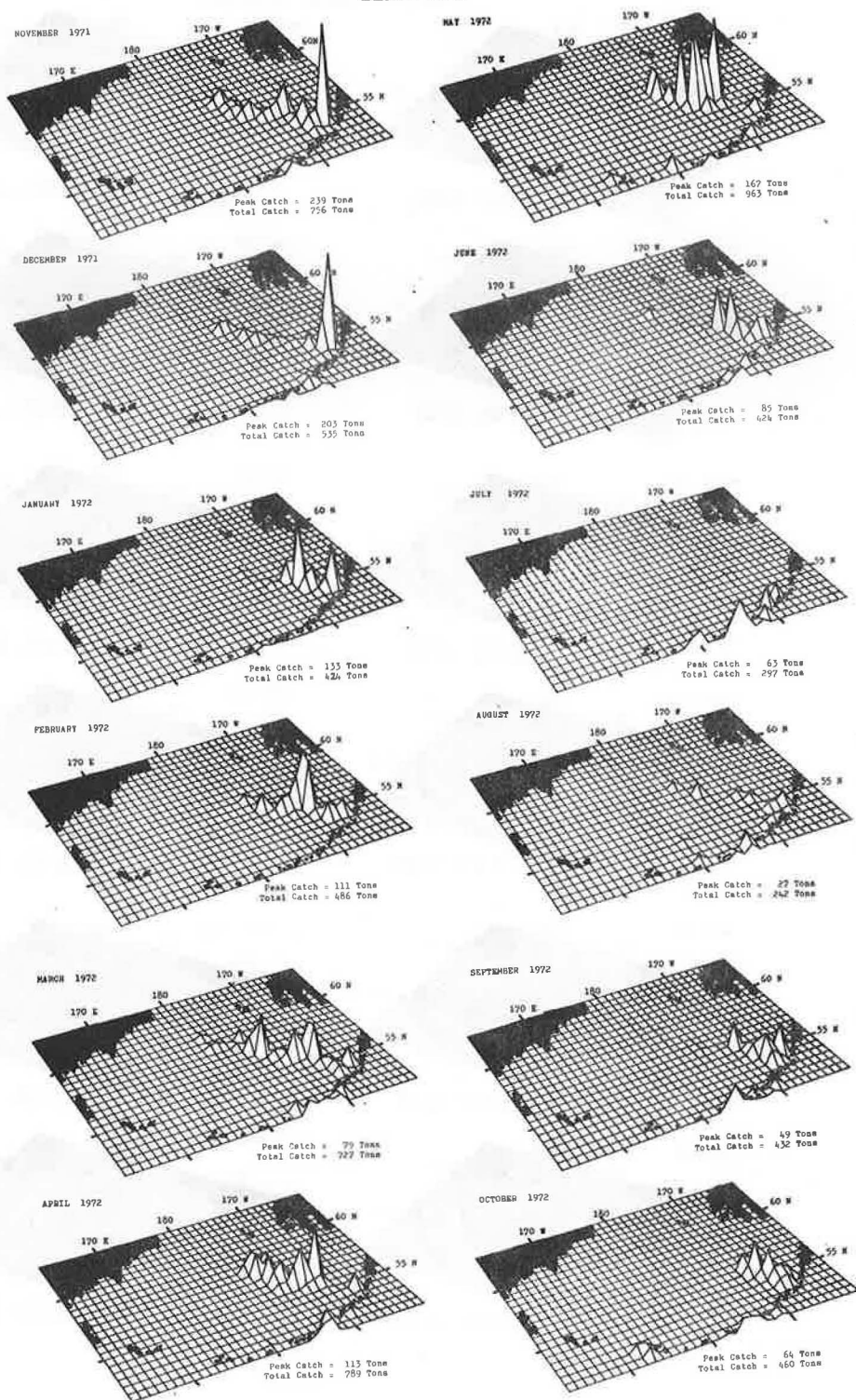


Figure 10. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1971 to October 1972.

MISCELLANEOUS FLATFISH

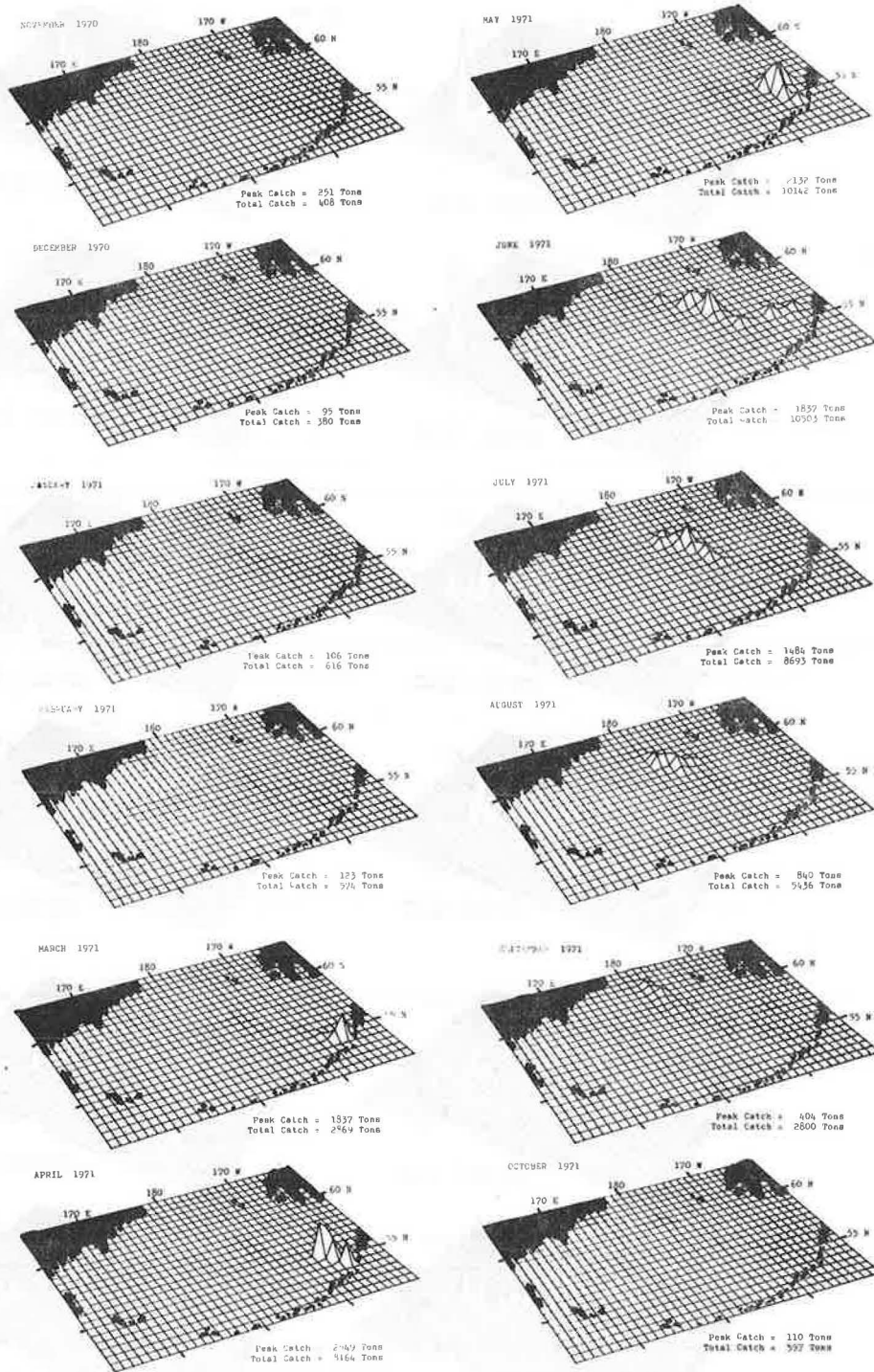


Figure 11. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1970 to October 1971.

MISCELLANEOUS FLATFISH

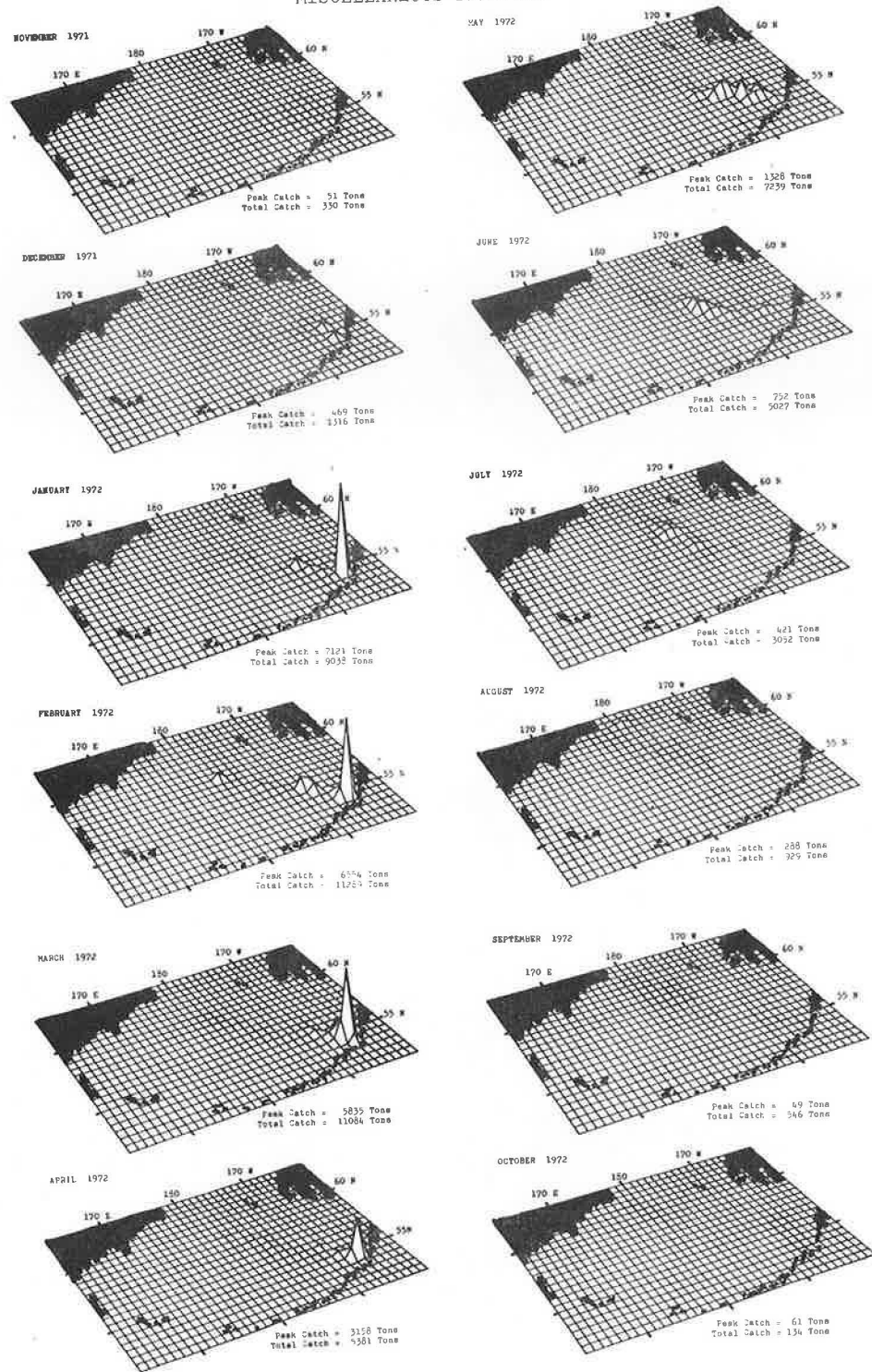


Figure 12. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea from November 1971 to October 1972.



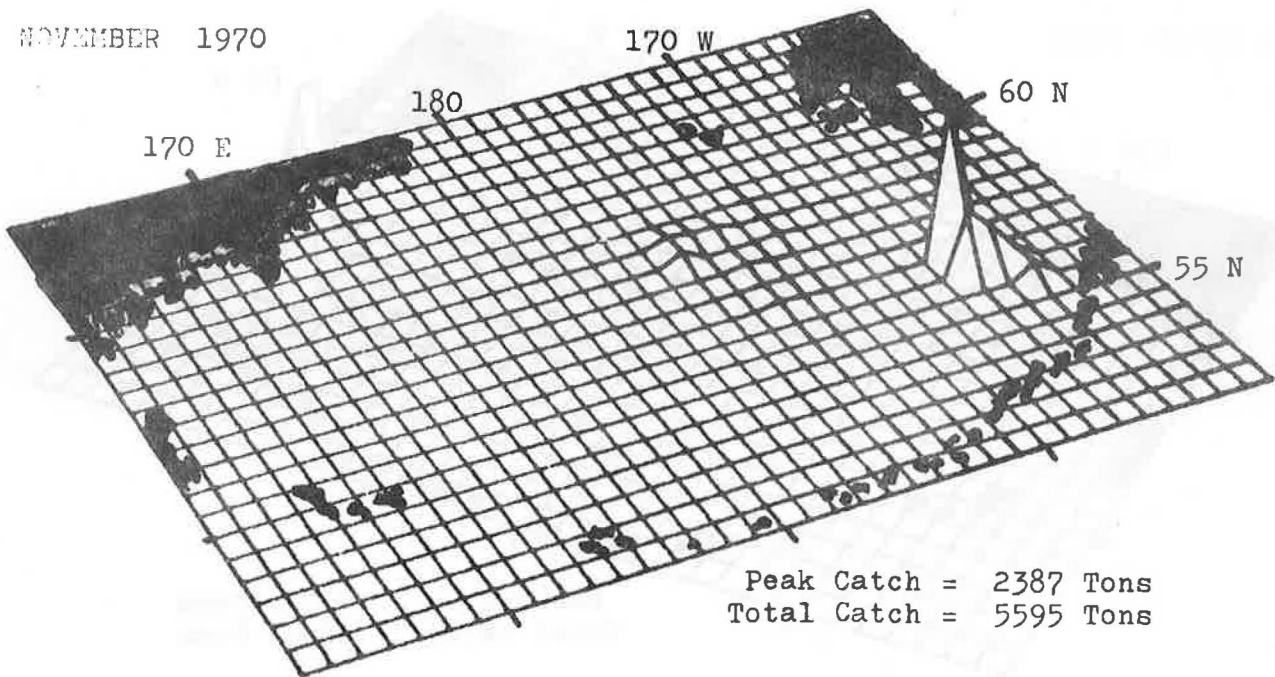
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Part II

Time series graphs (2 per page) showing finer details of geographical distribution graphs of fish catch shown in Part I by species as labelled

Figure No.	Species	Time	Page No.
13 - 24	Yellowfin sole	Nov. 1970 to Oct. 1972	.. 24-35
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61 - 72	Black cod	Nov. 1970 to Oct. 1972	.. 72-83
73 - 84	Misc. Flatfish	Nov. 1970 to Oct. 1972	.. 84-95

NOVEMBER 1970



DECEMBER 1970

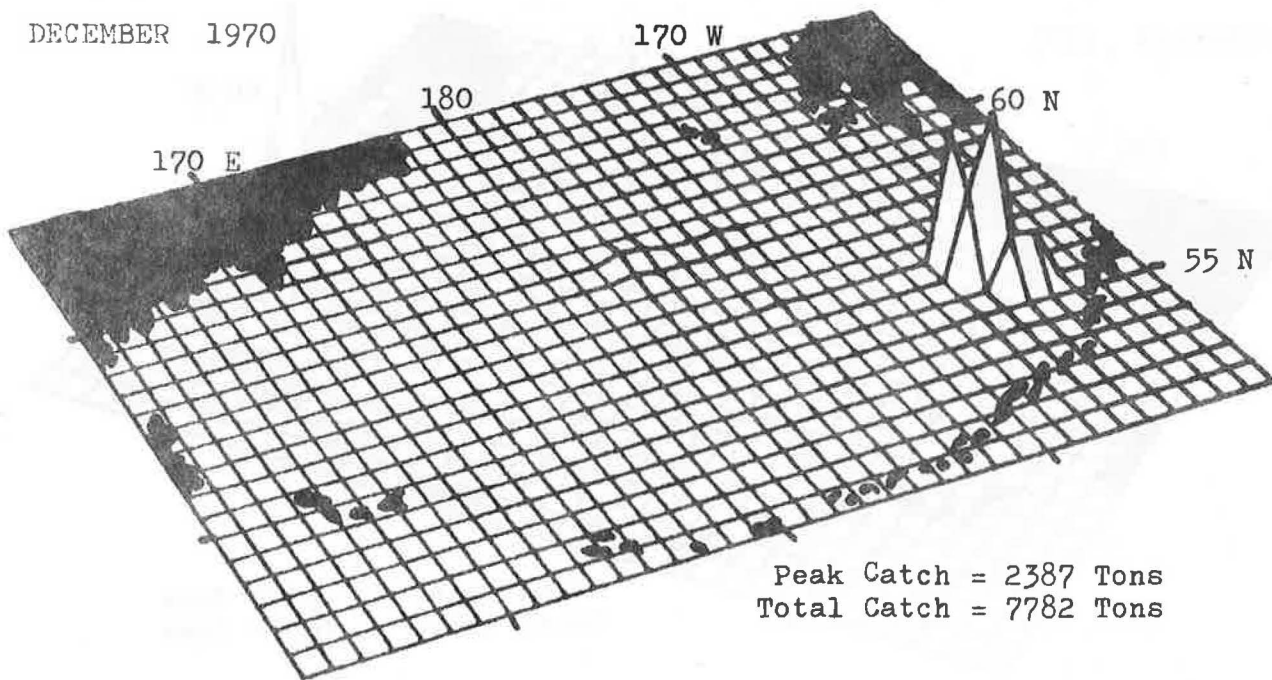


Figure 13. Geographical distribution of Yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in November and December, 1970.

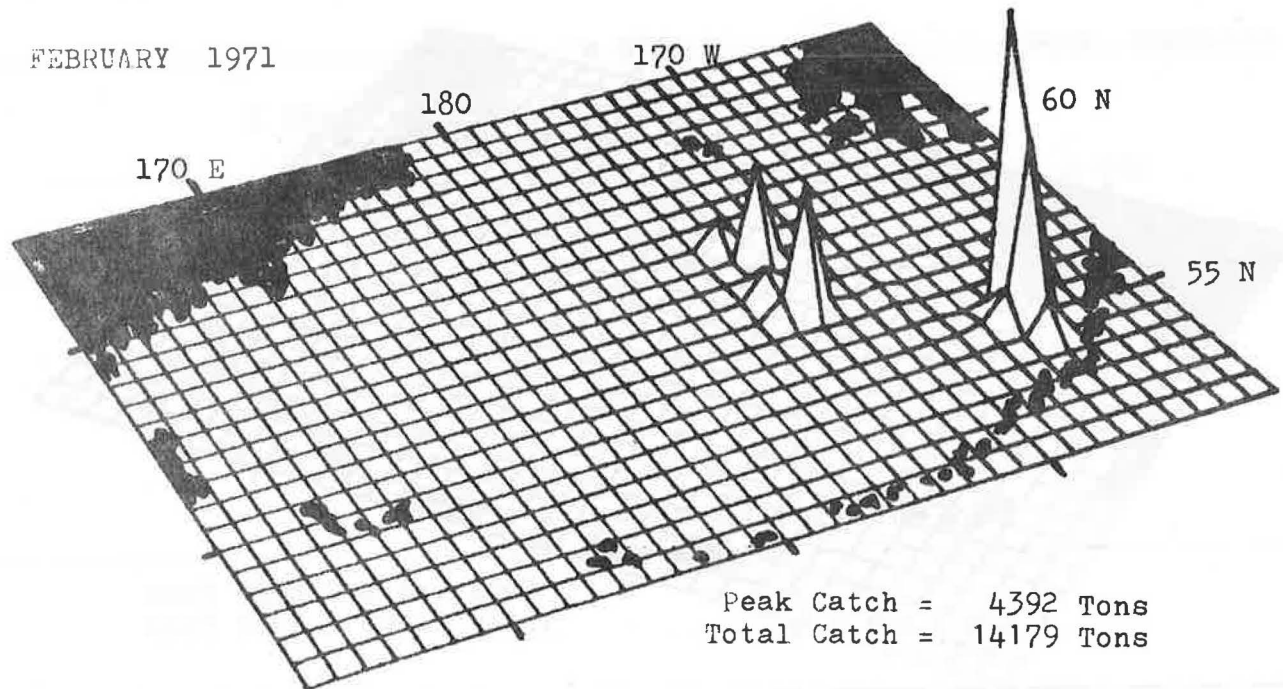
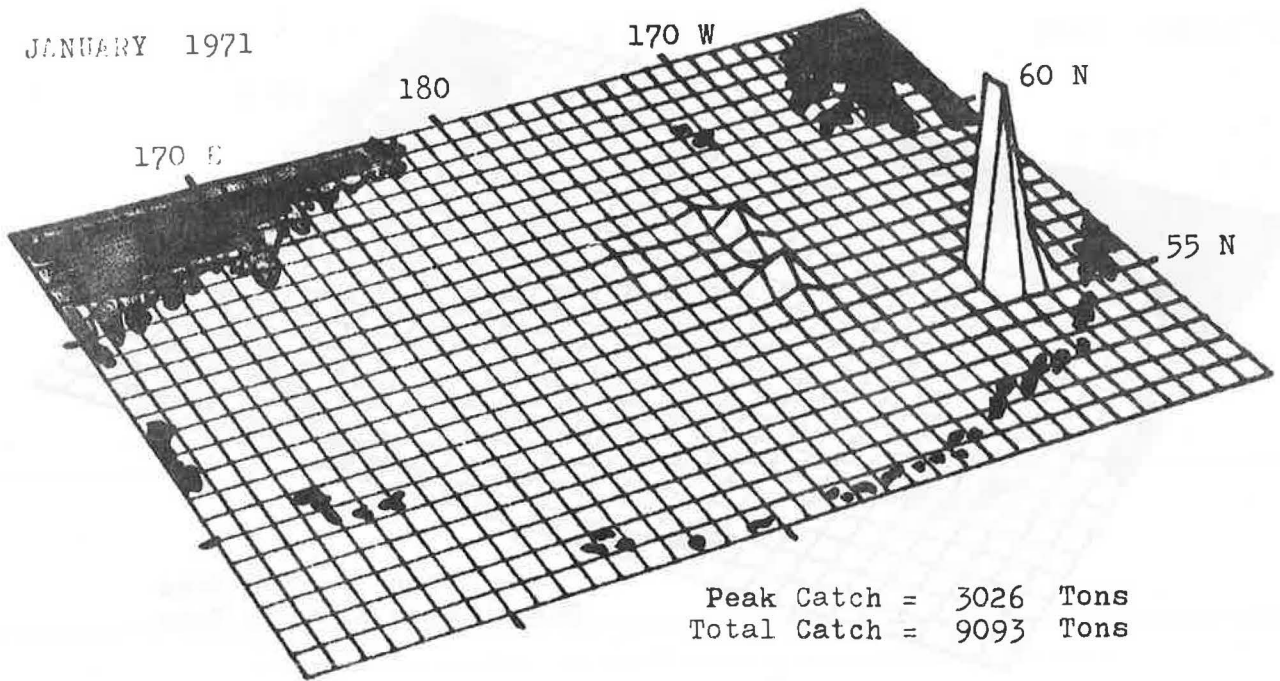


Figure 14. Geographical distribution of Yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in January and February, 1971.

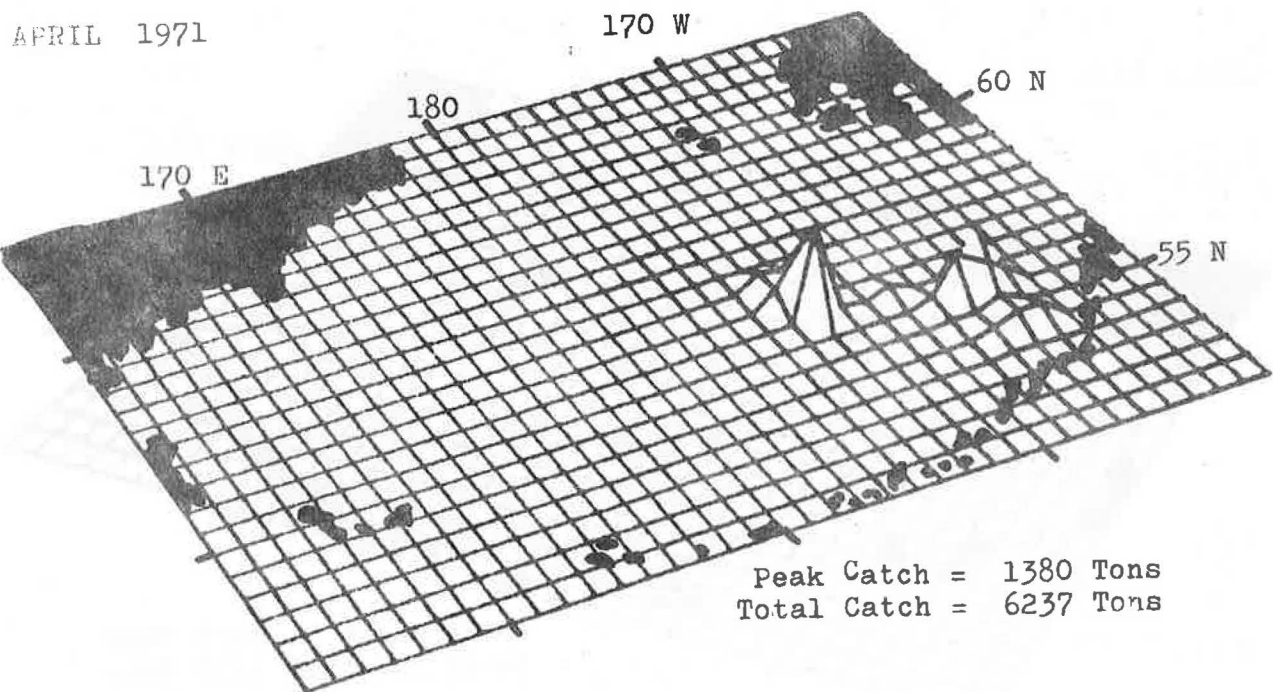
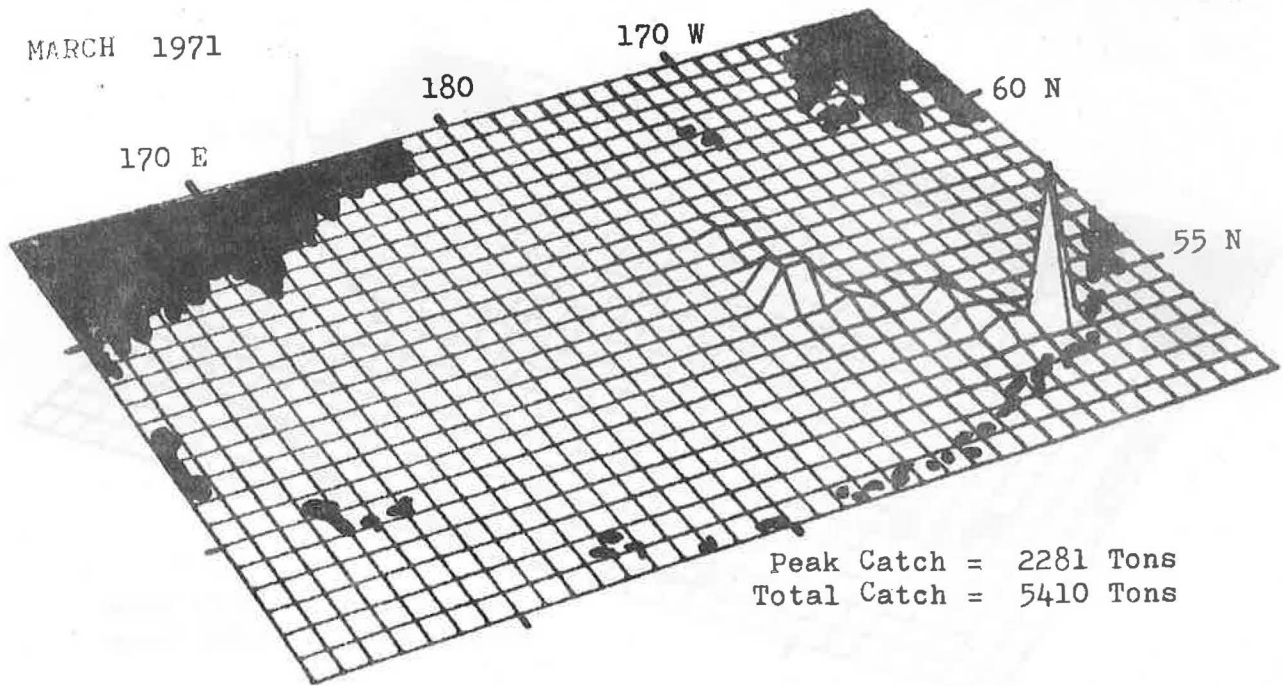


Figure 15. Geographical distribution of Yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in March and April, 1971.

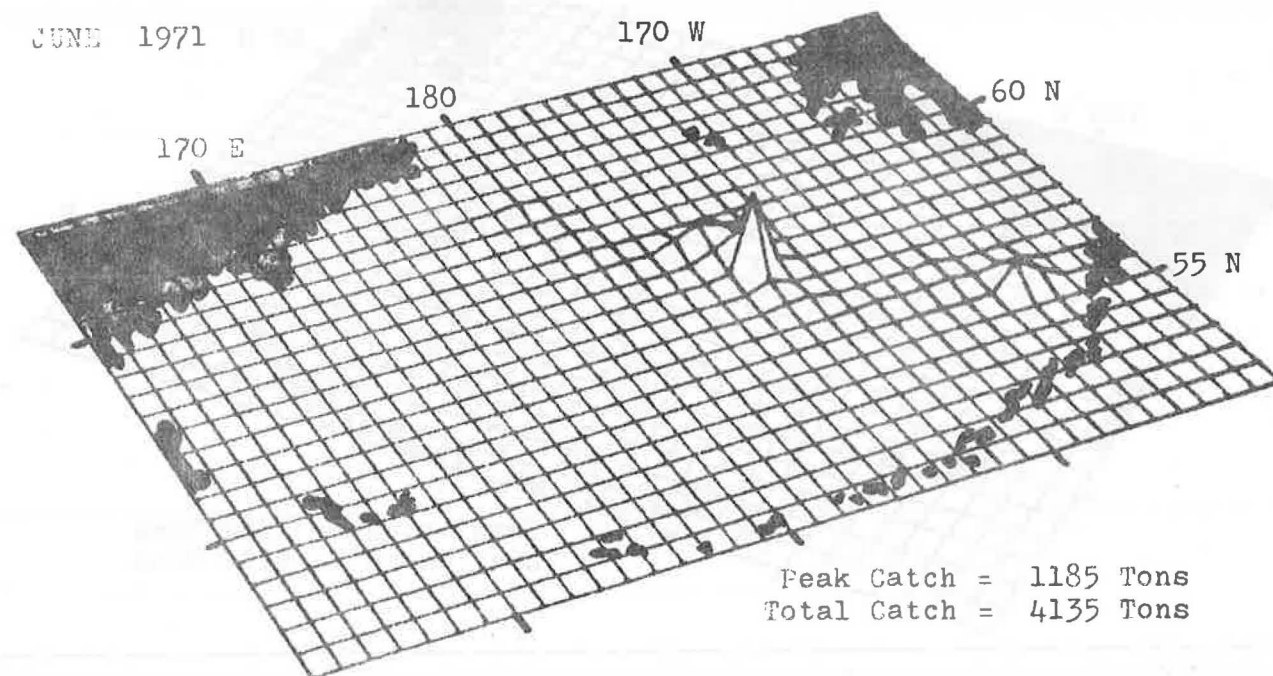
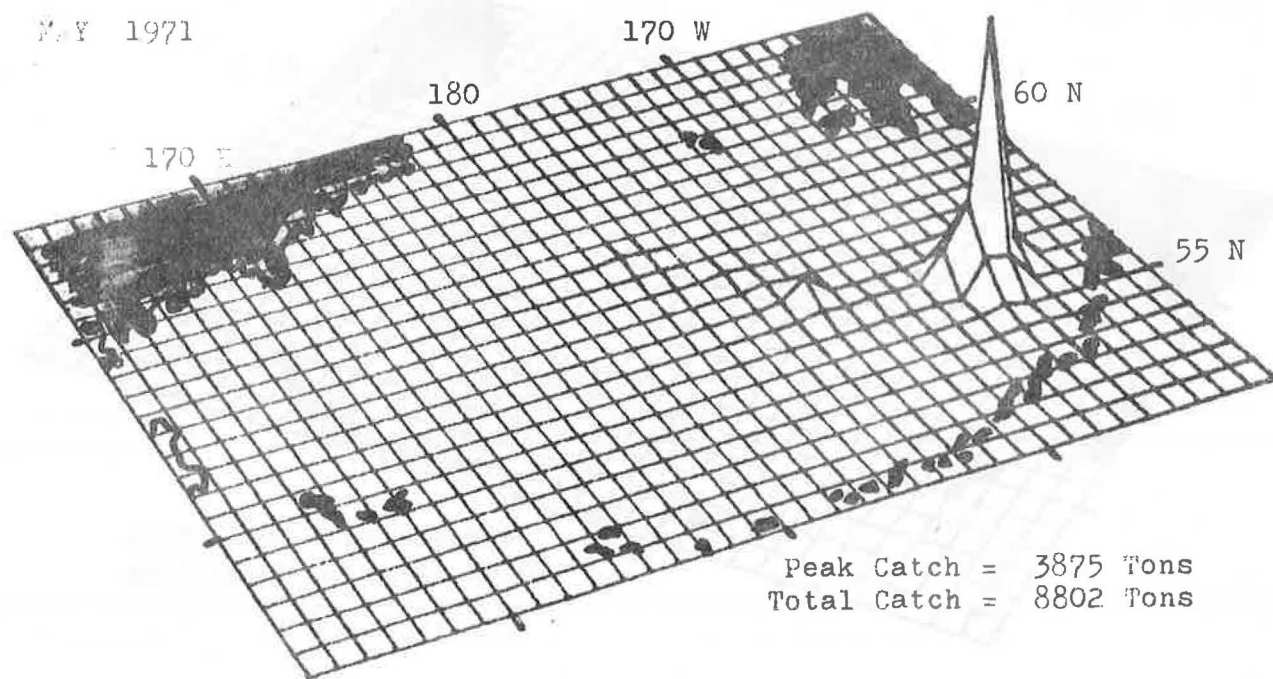


Figure 16. Geographical distribution of Yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in May and June, 1971.

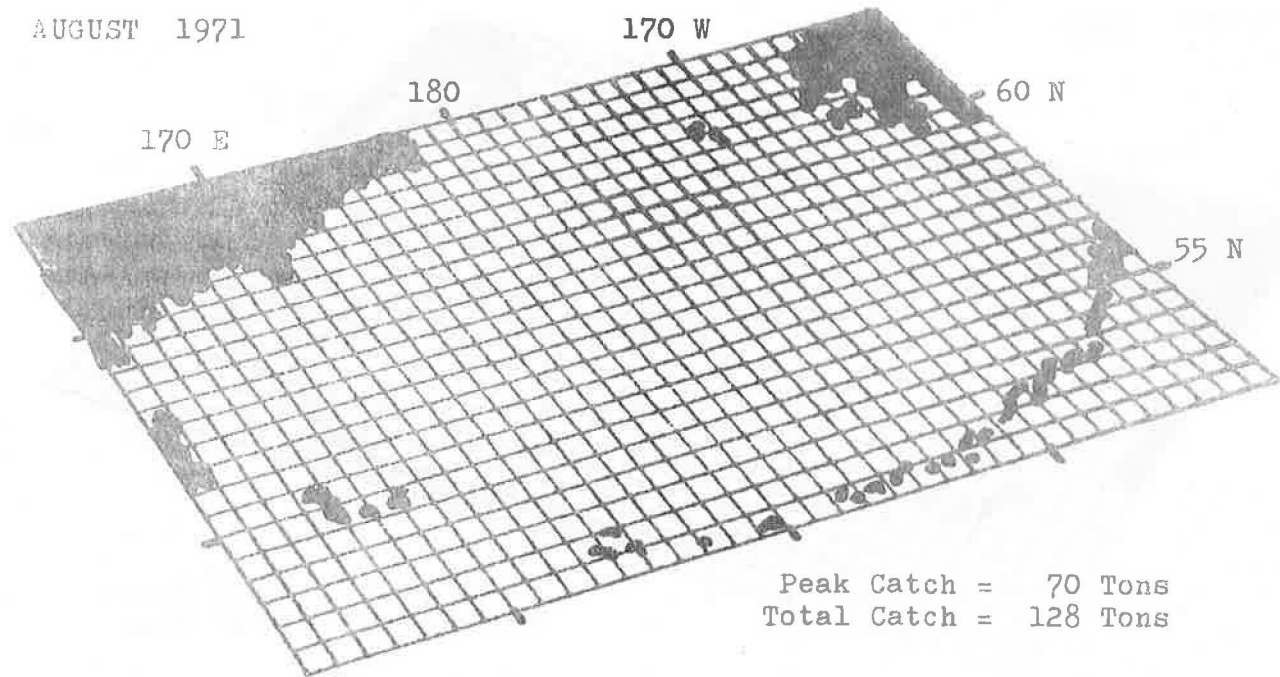
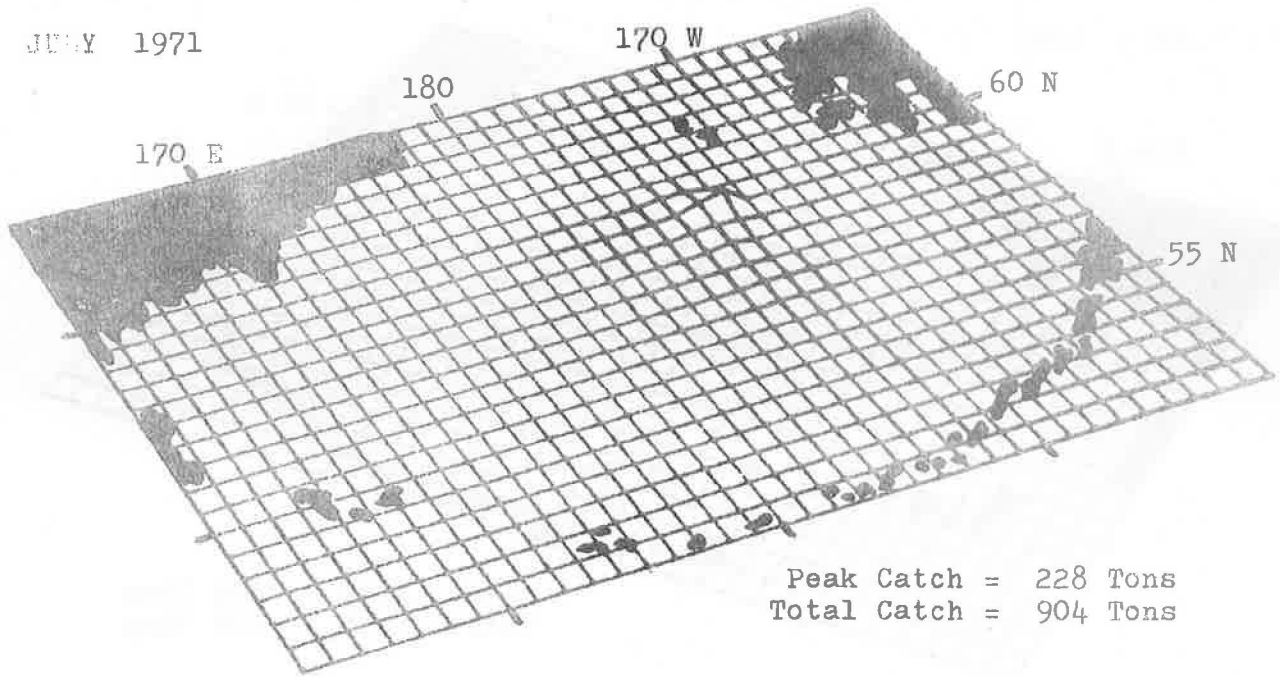
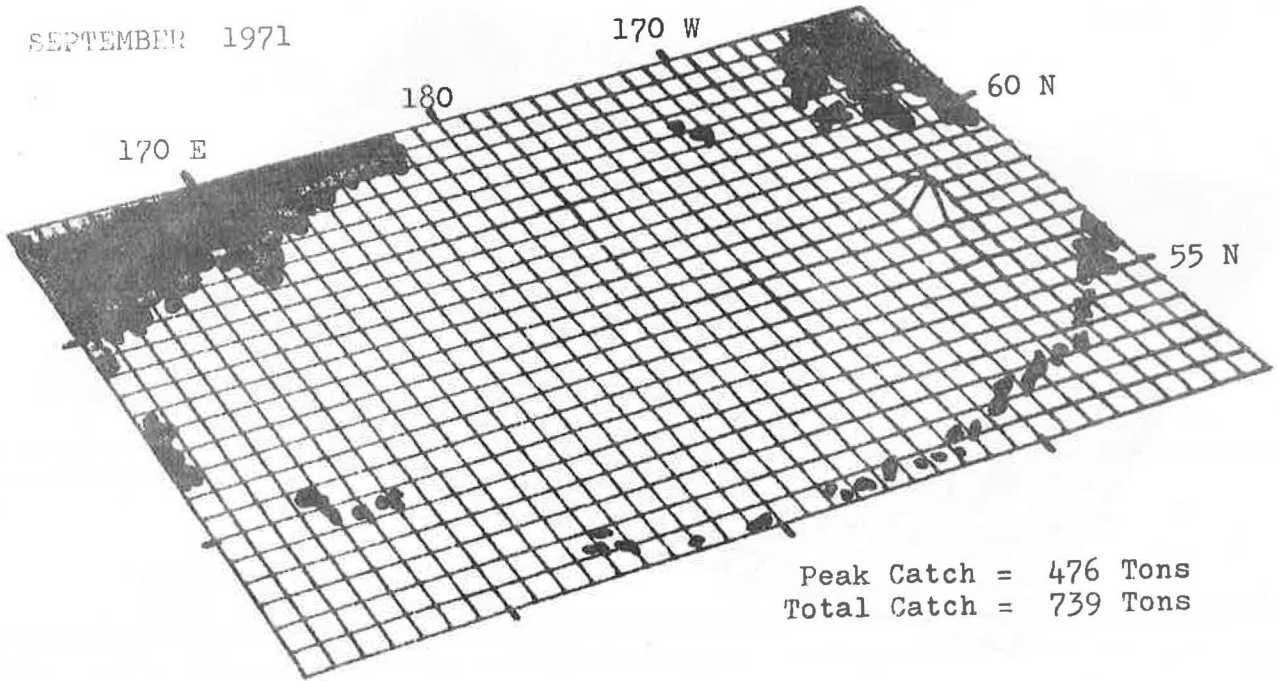
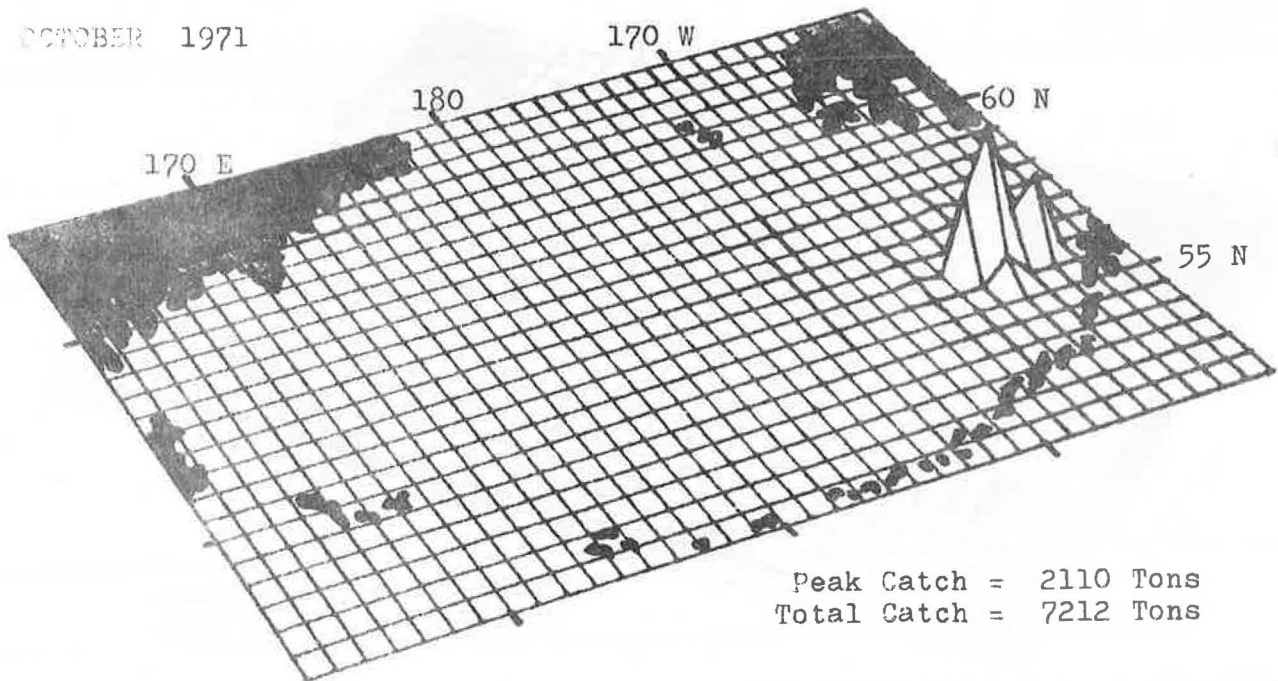


Figure 17. Geographical distribution of Yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in July and August, 1971.

SEPTEMBER 1971

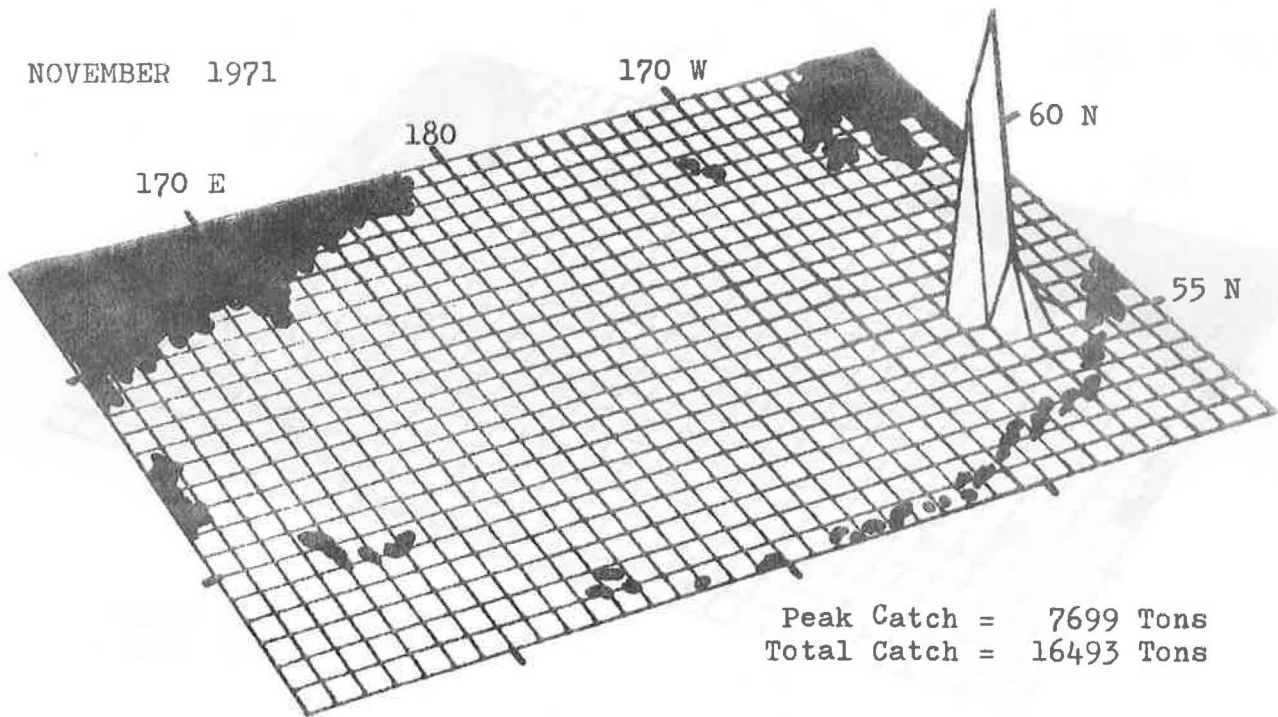


OCTOBER 1971



18 Geographical distribution of Yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in September and October, 1971.

NOVEMBER 1971



DECEMBER 1971

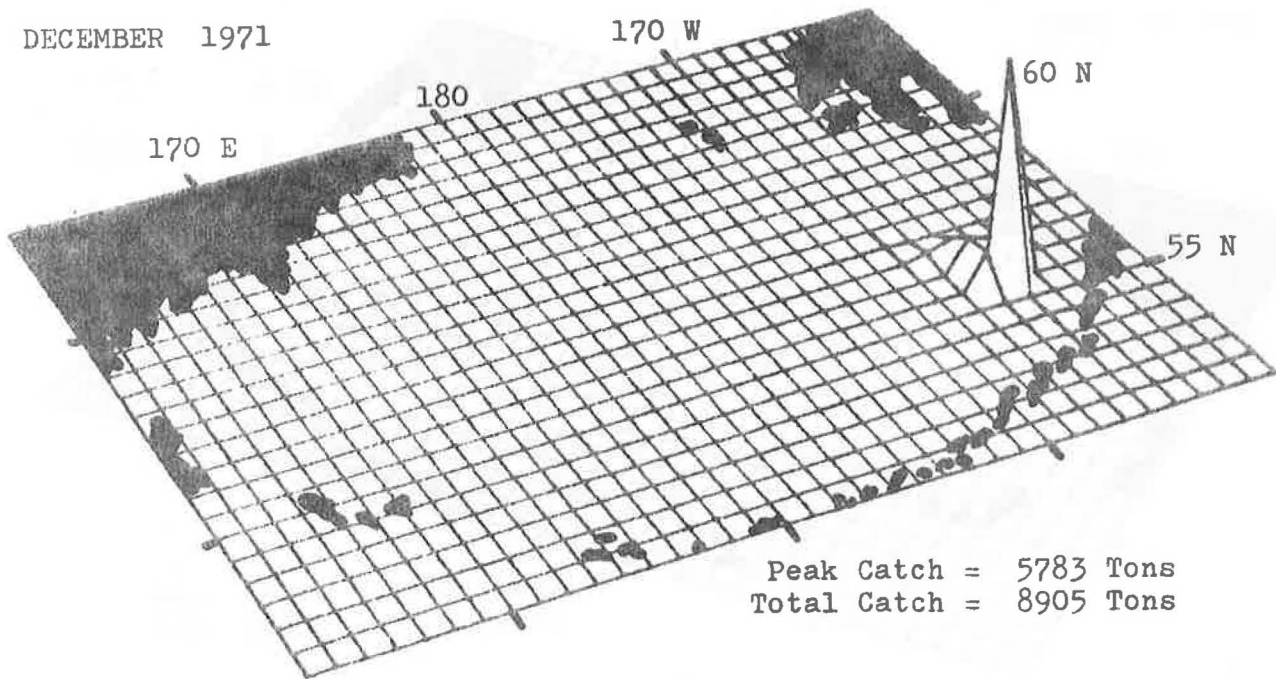
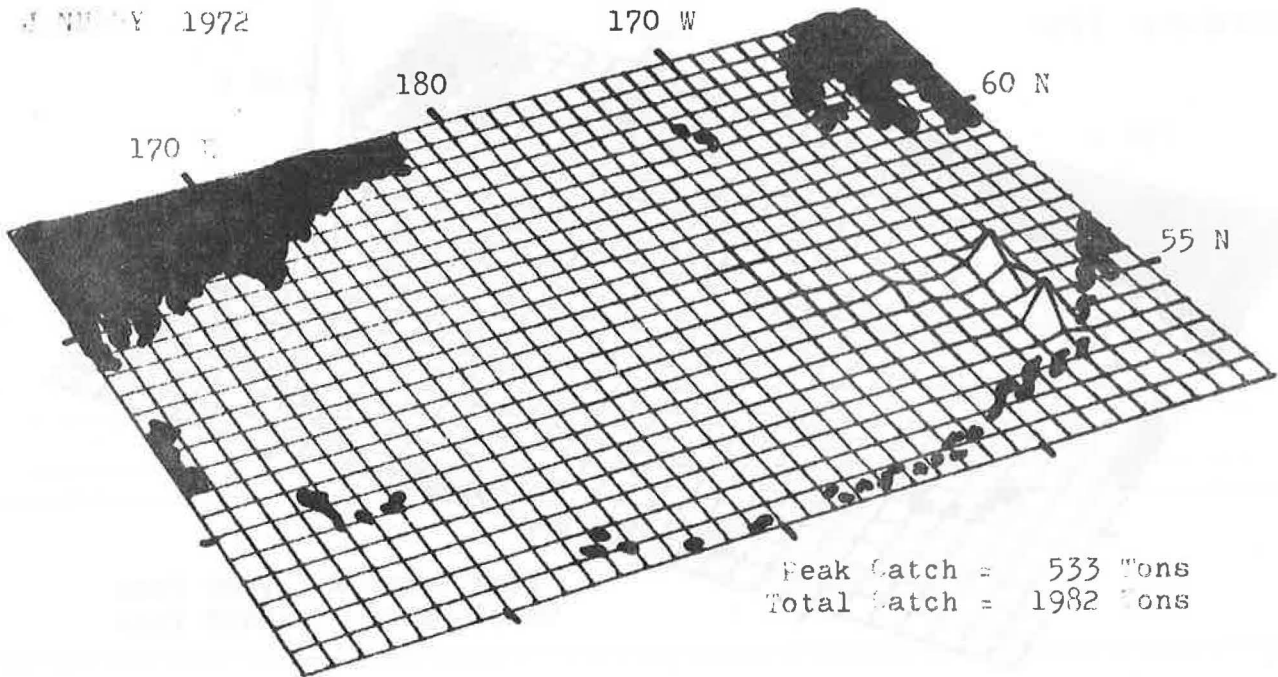


Figure 19 Geographical distribution of yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea November and December, 1971.

JANUARY 1972



FEBRUARY 1972

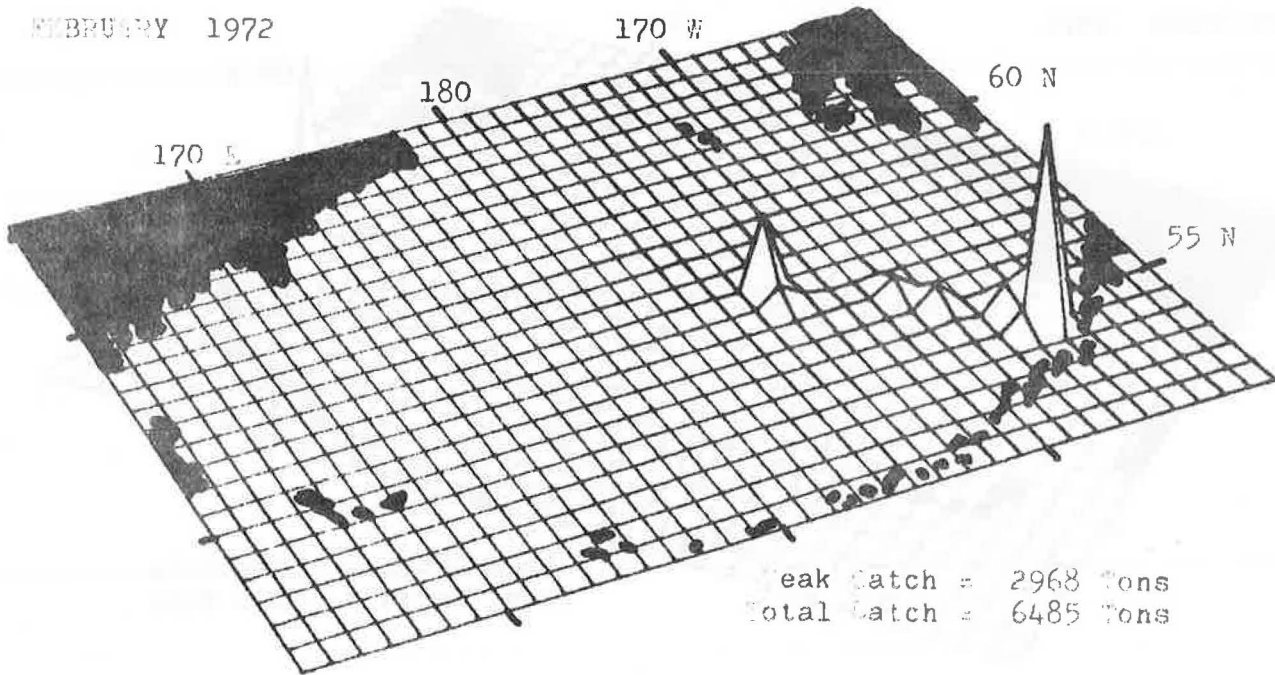


Figure 20. Geographical distribution of yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea January and February, 1972.

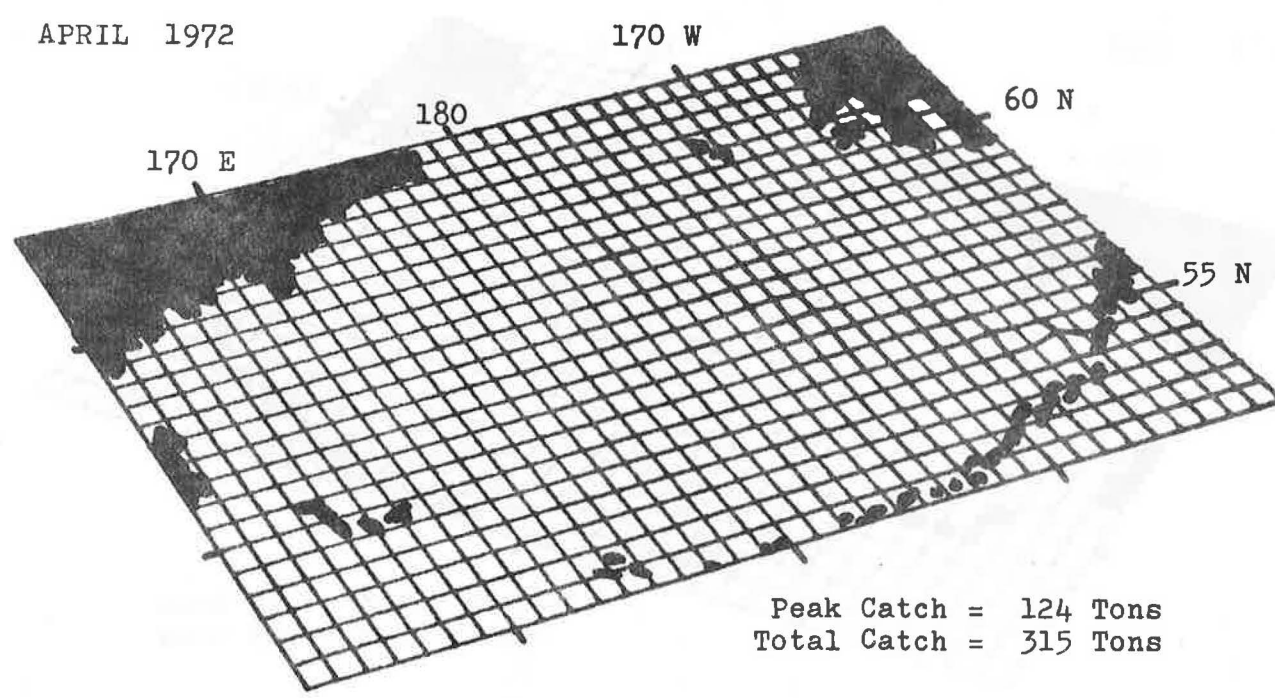
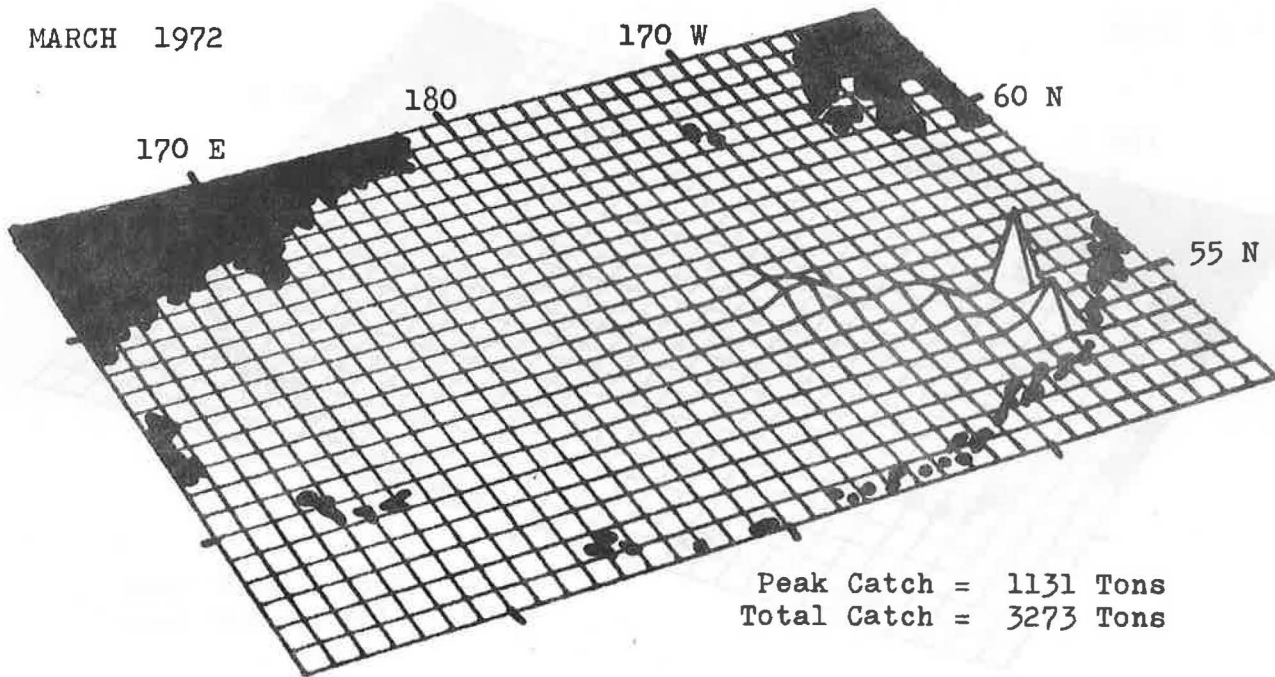


Figure 21. Geographical distribution of yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea March and April, 1972.

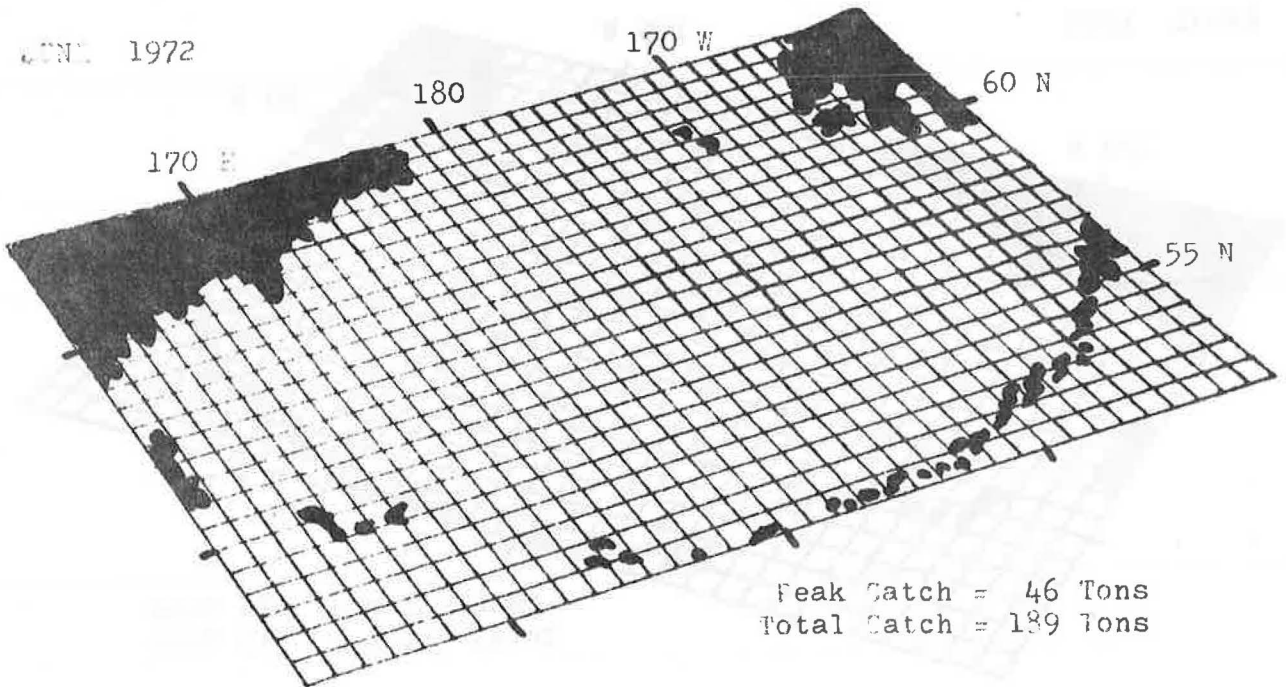
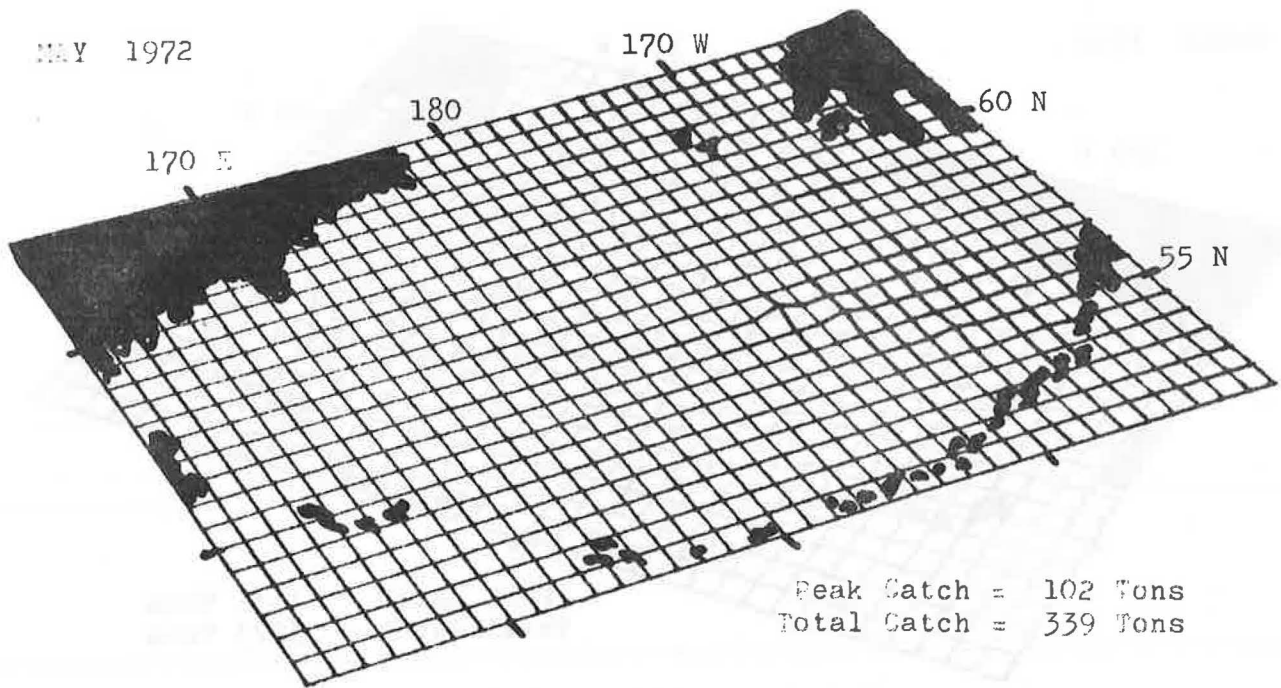


Figure 22. Geographical distribution of yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea May and June, 1972.

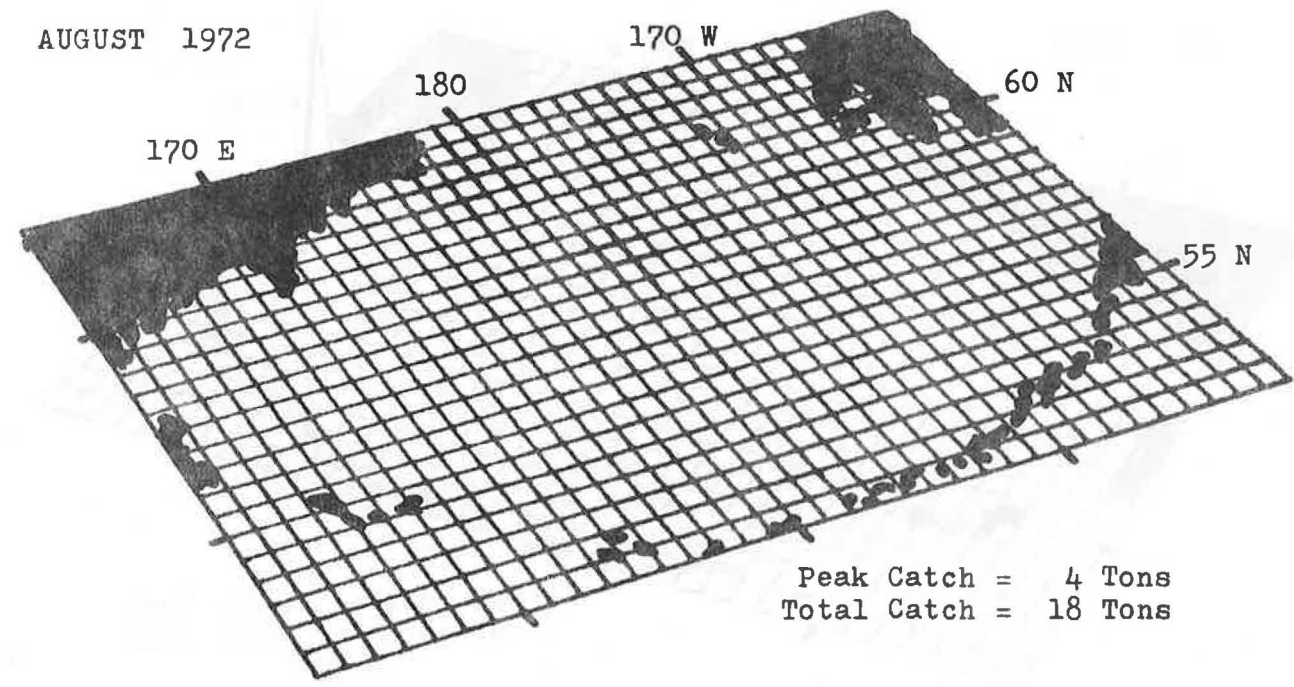
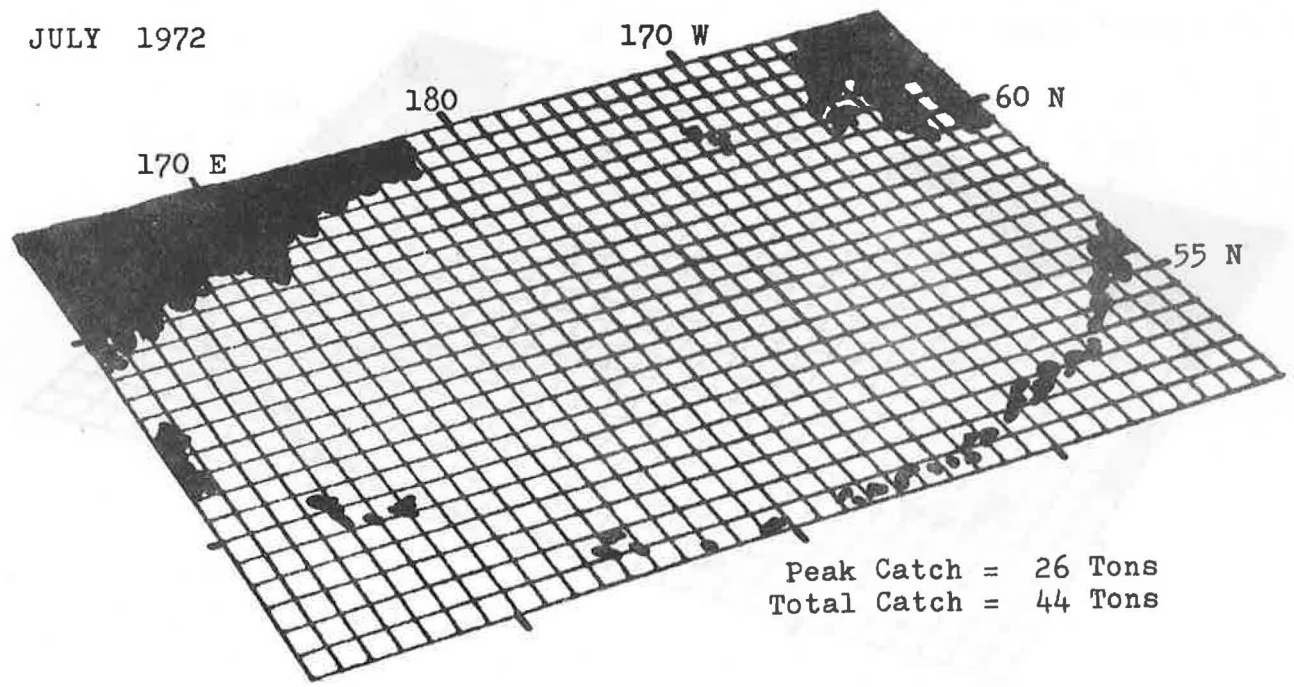


Figure 27. Geographical distribution of yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea July and August, 1972.

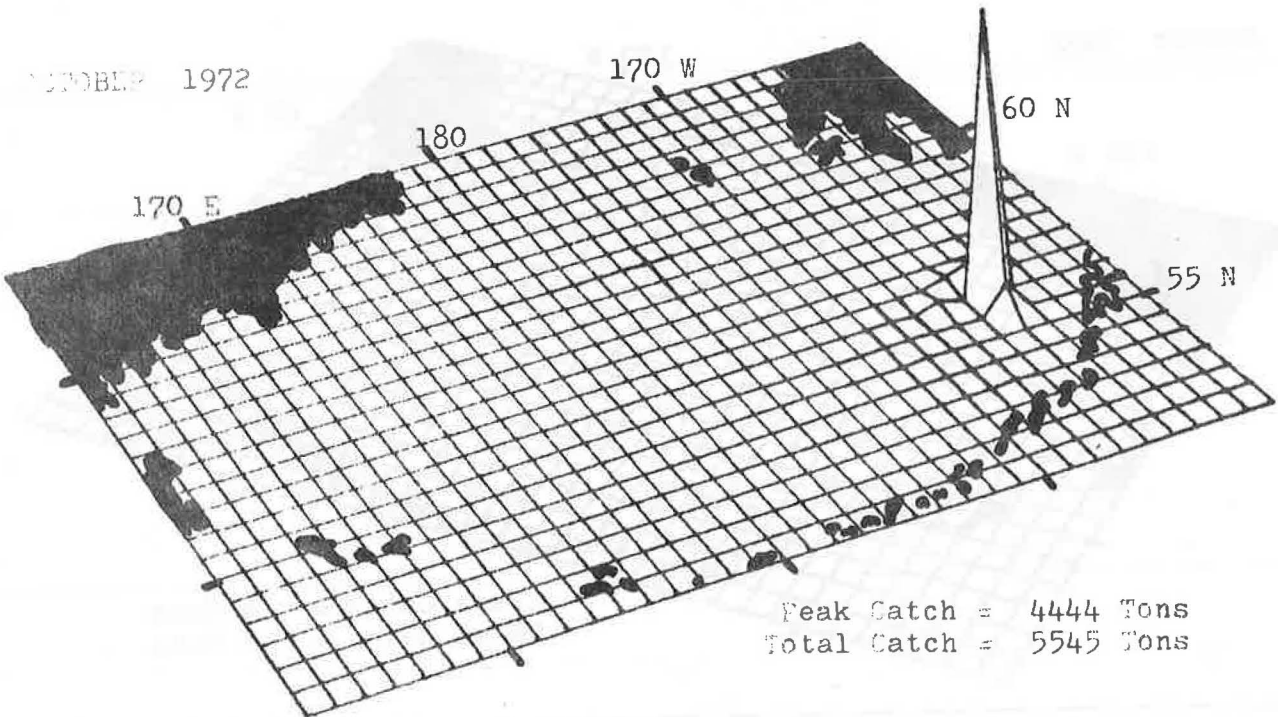
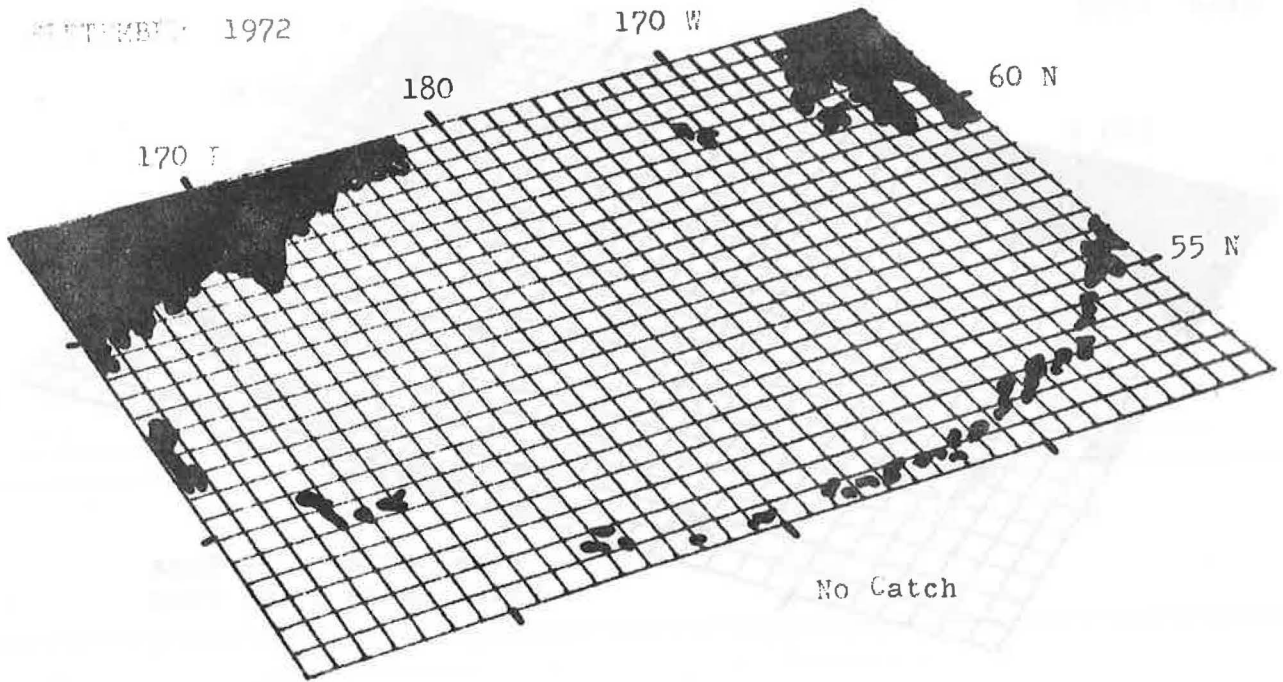


Figure 24. Geographical distribution of yellowfin sole catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea September and October, 1972.

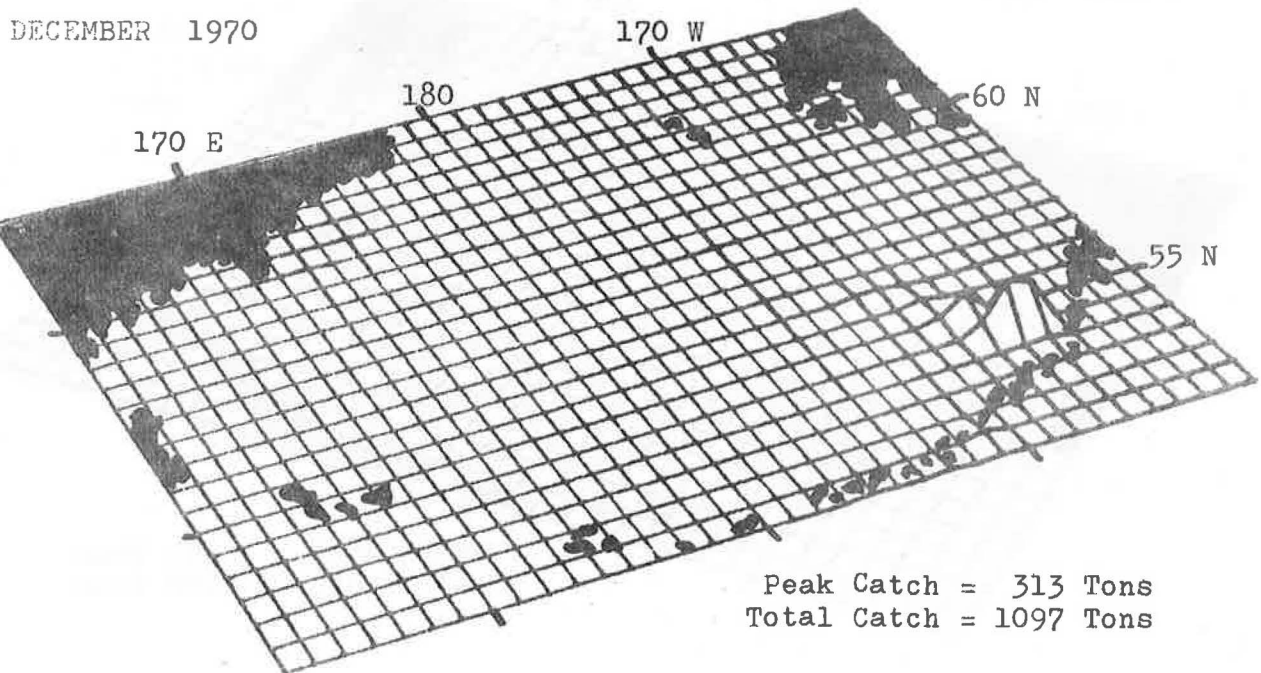
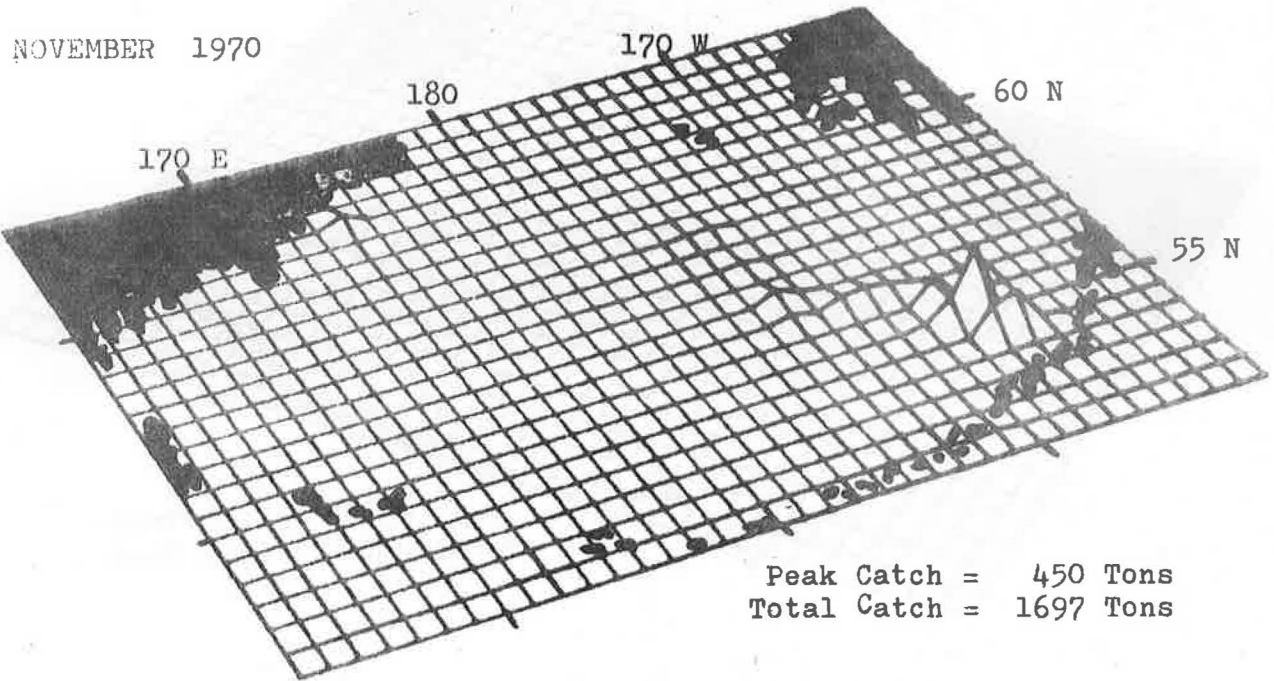


Figure 25. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in November and December, 1970.

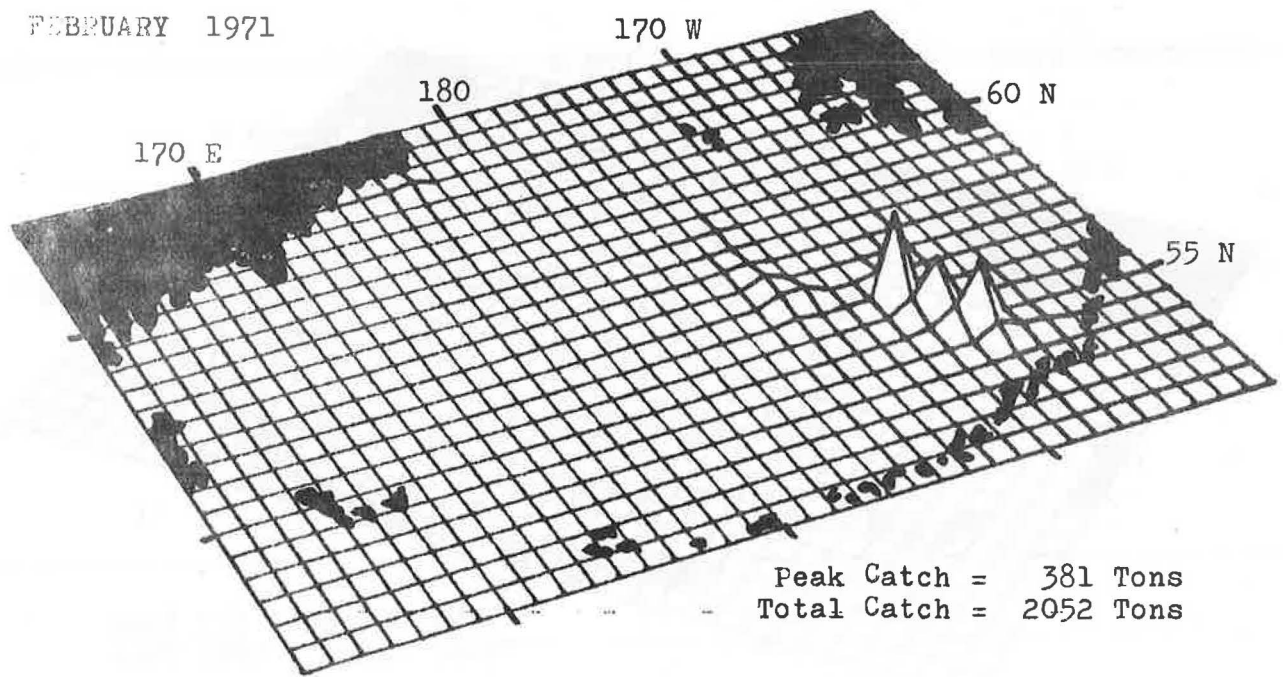
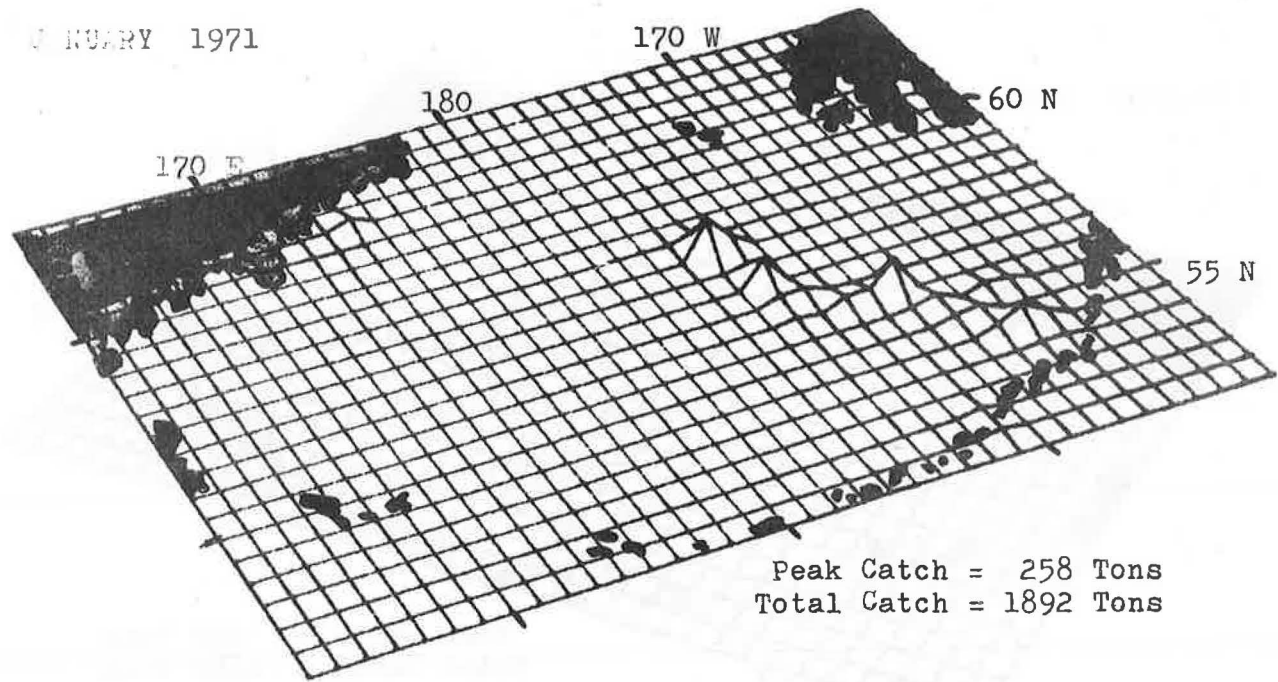
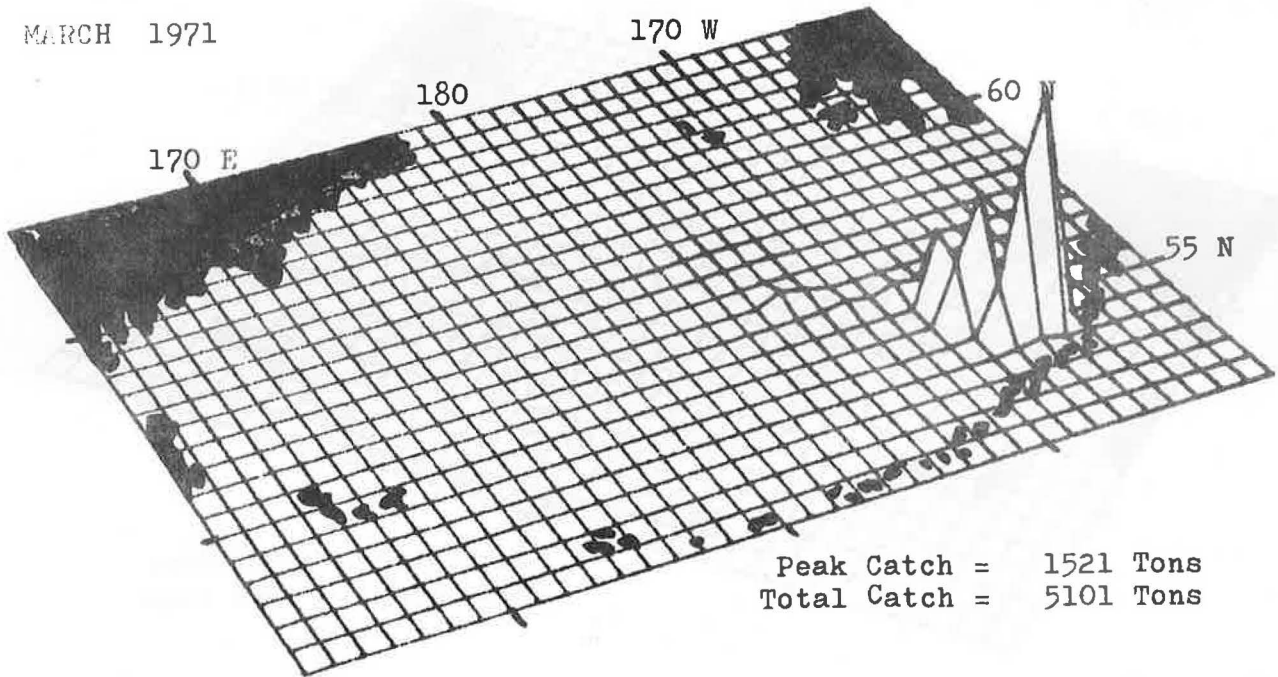


Figure 26. Geographical distribution of Pacific cod catch by Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in January and February, 1971.

MARCH 1971



APRIL 1971

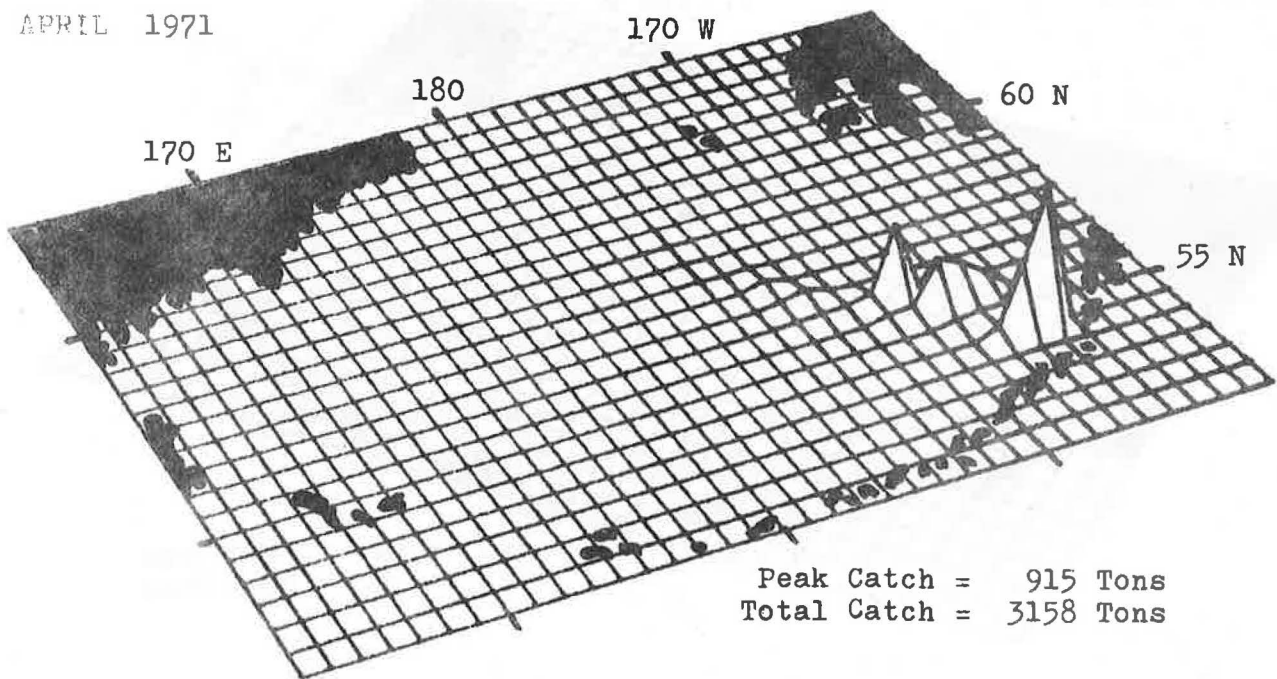


Figure 27. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in March and April, 1971.

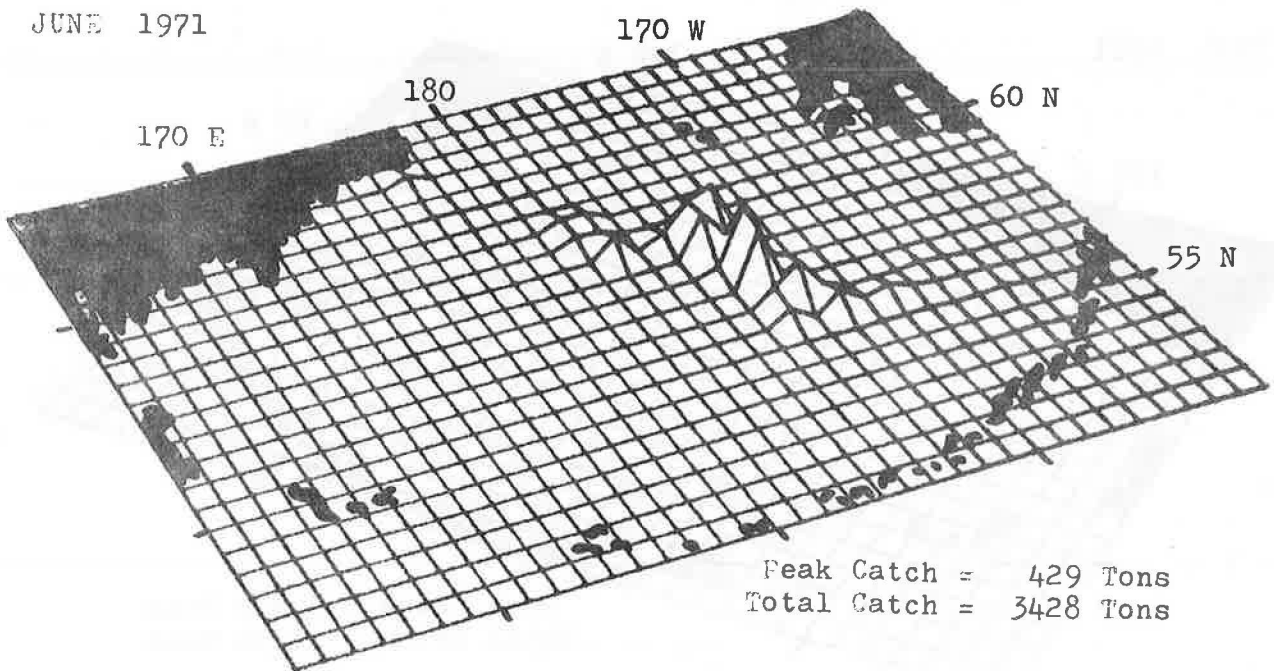
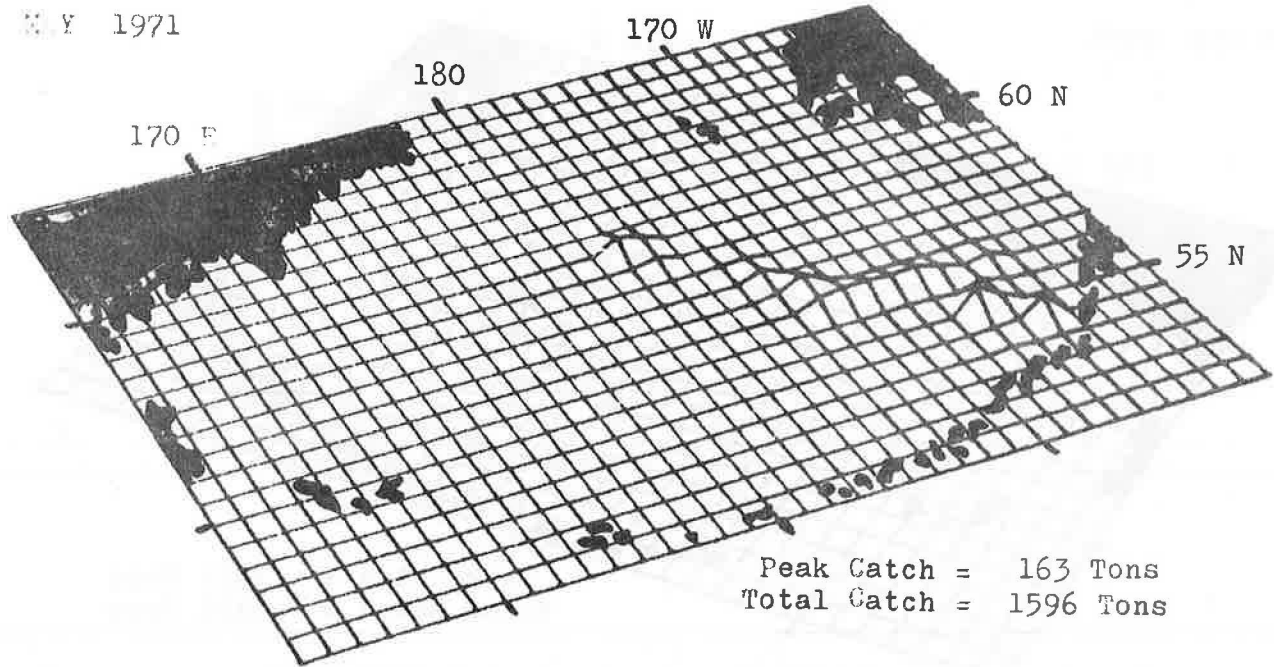


Figure 28. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in May and June, 1971.

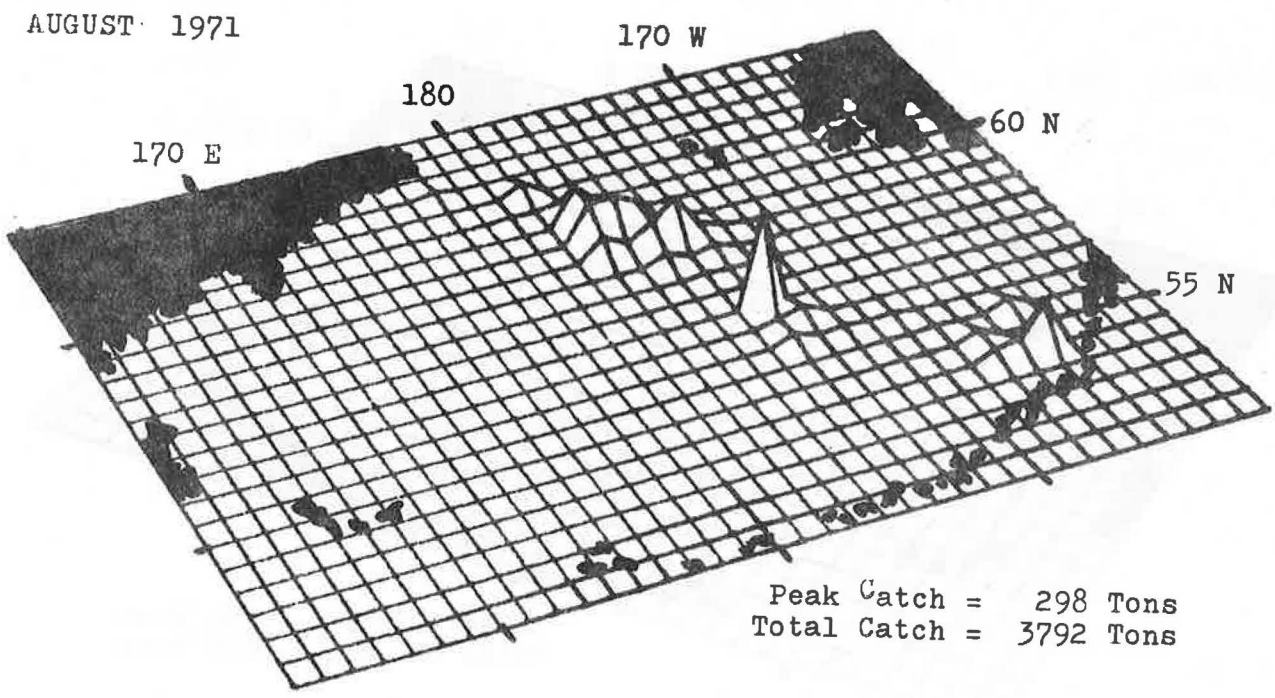
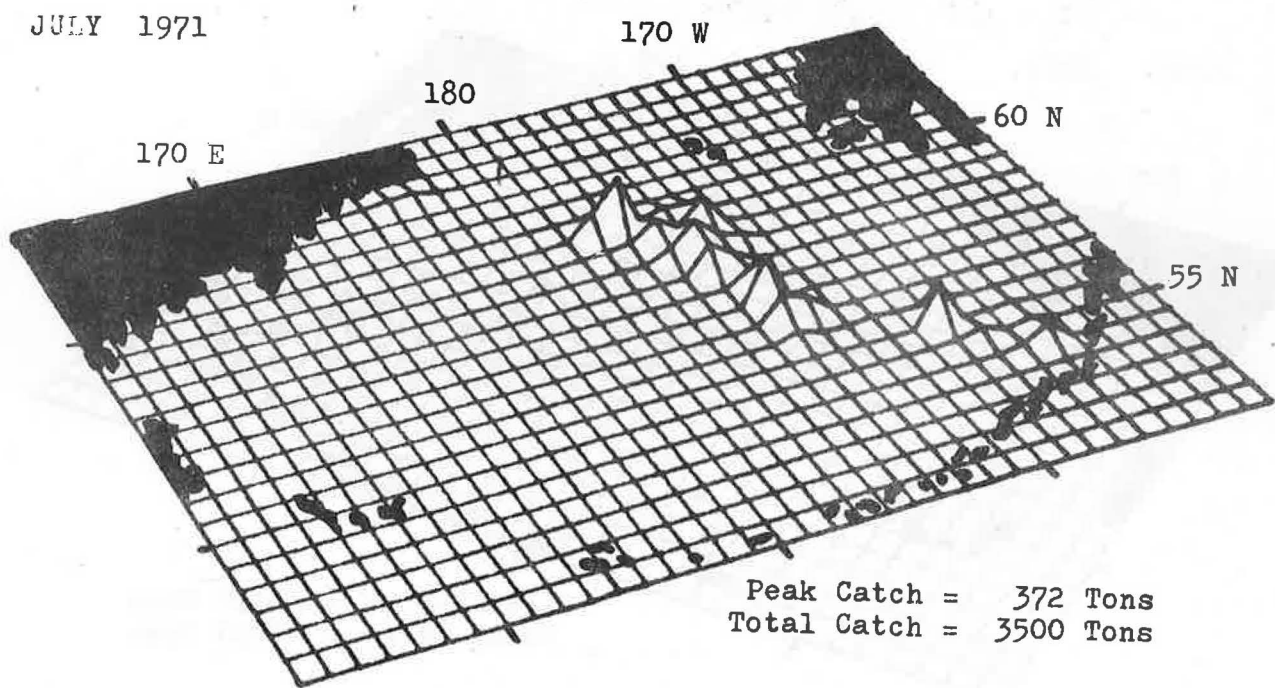


Figure 29. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in July and August, 1971.

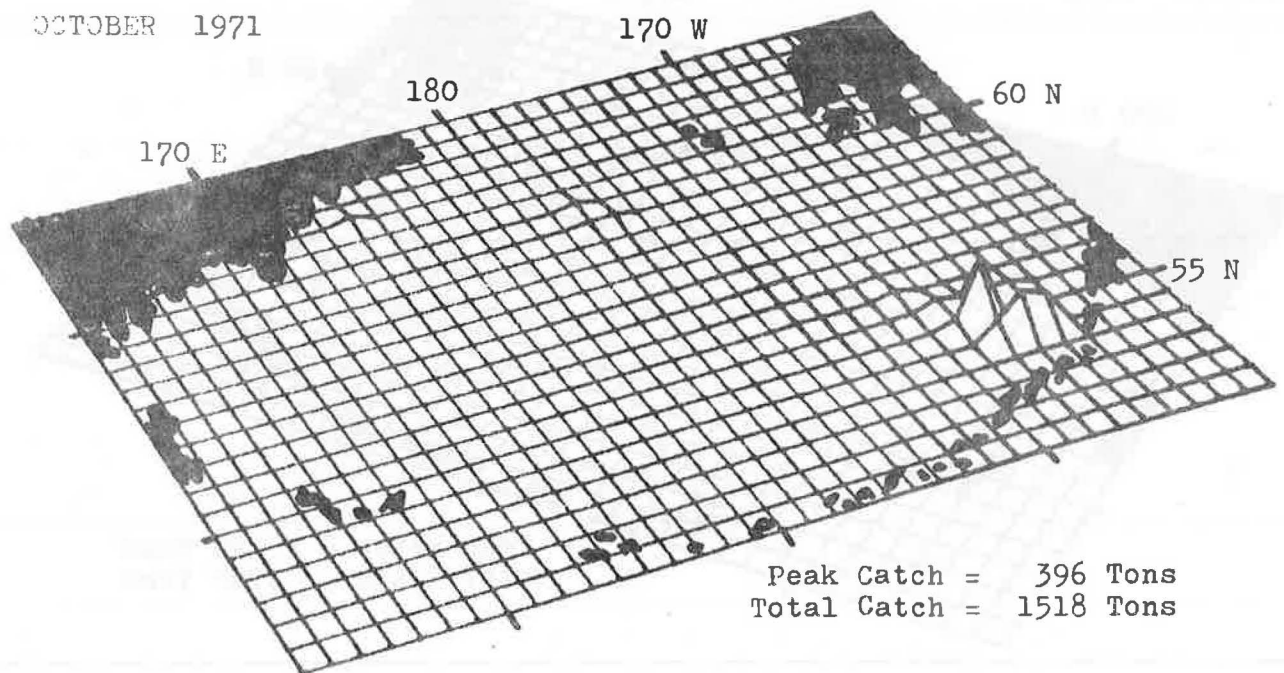
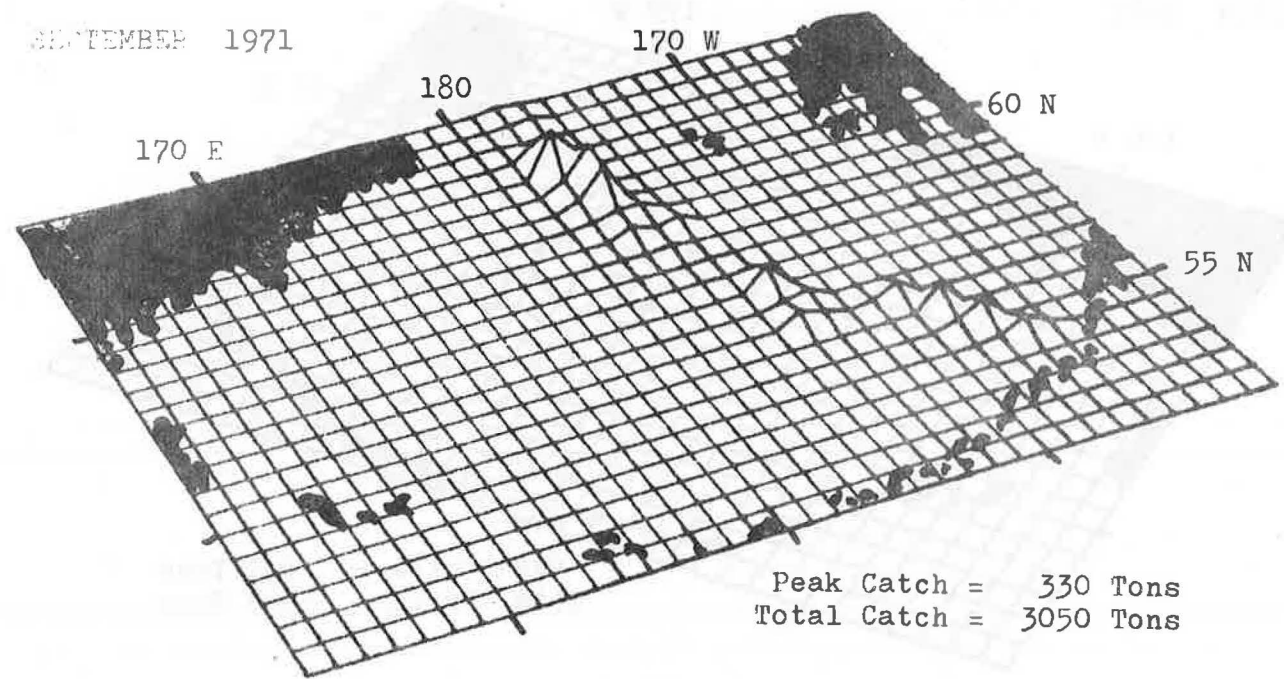
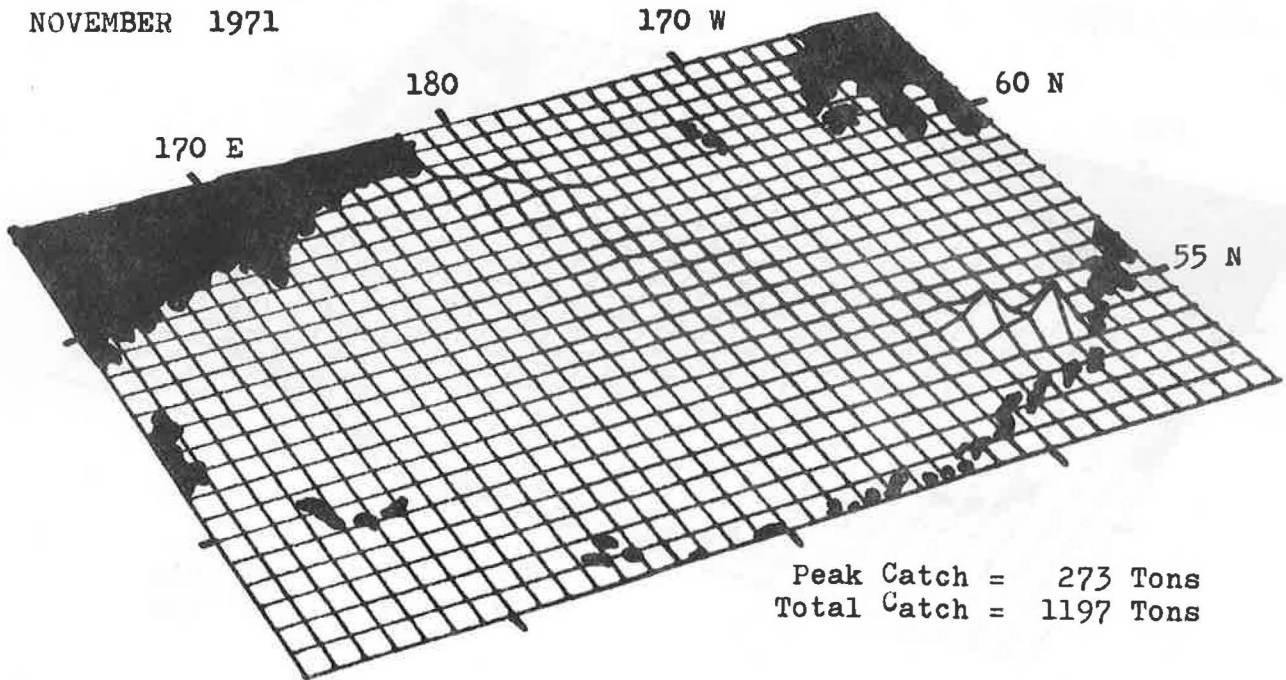


Figure 30. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in September and October, 1971.

NOVEMBER 1971



DECEMBER 1971

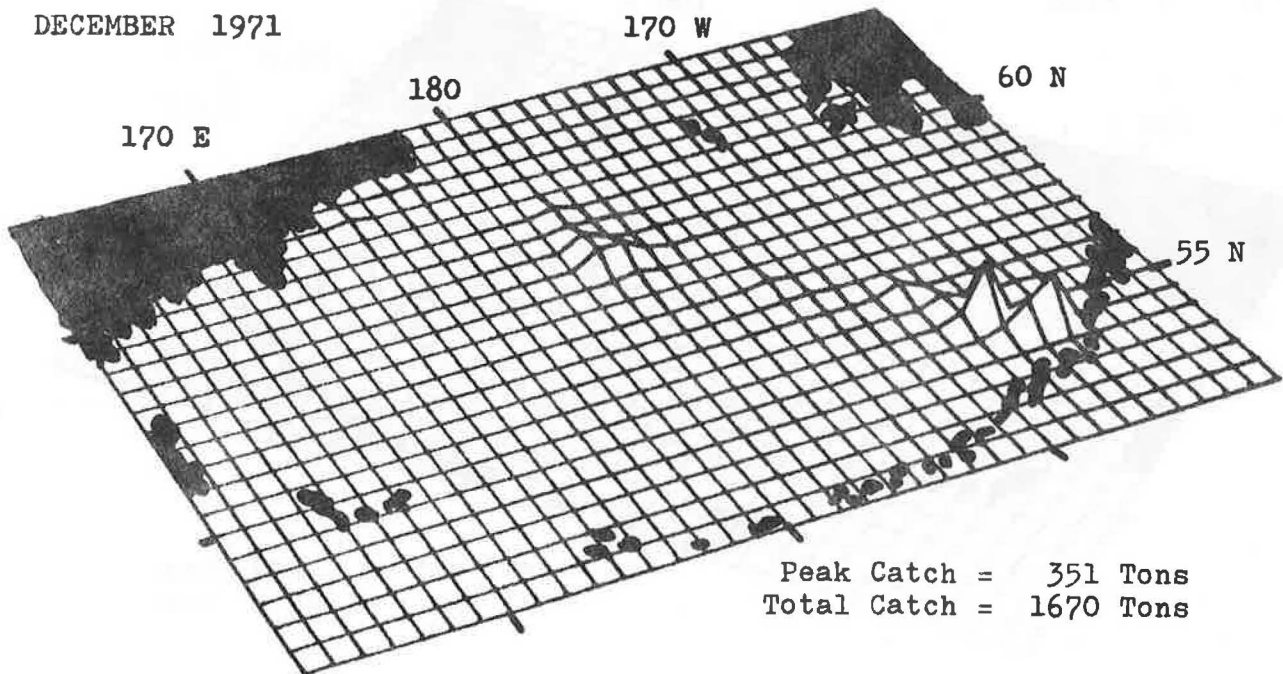


Figure 31. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea November and December, 1971.

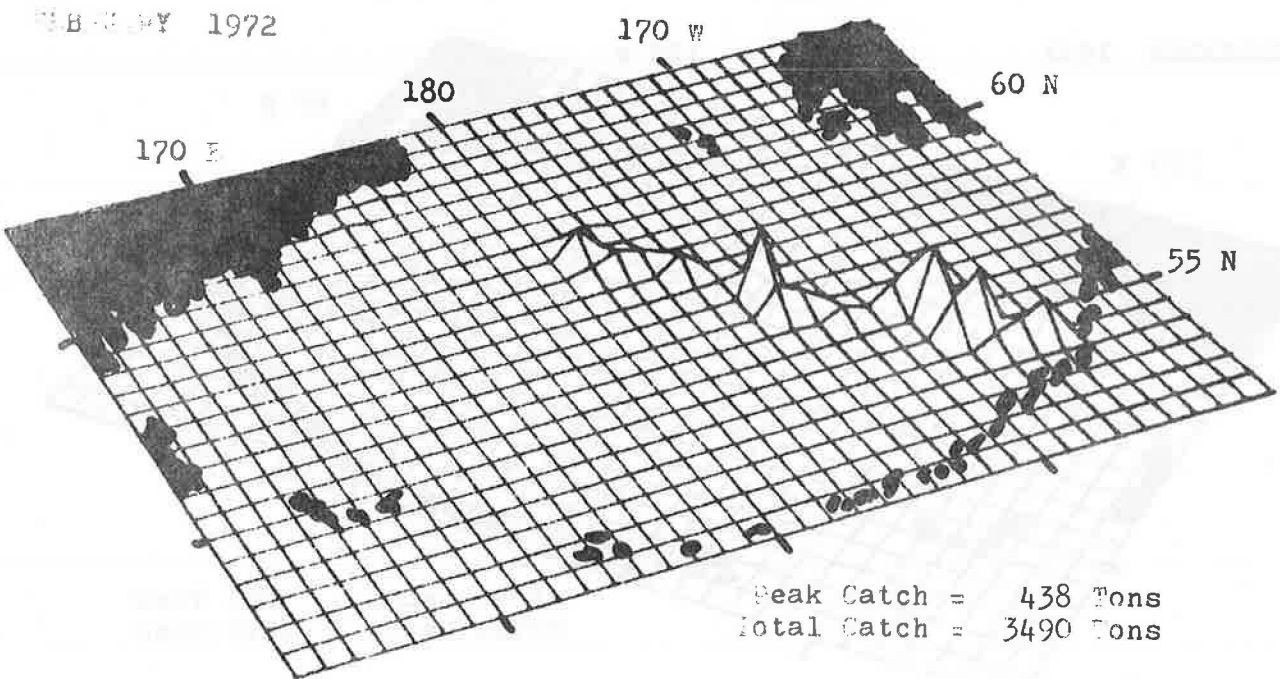
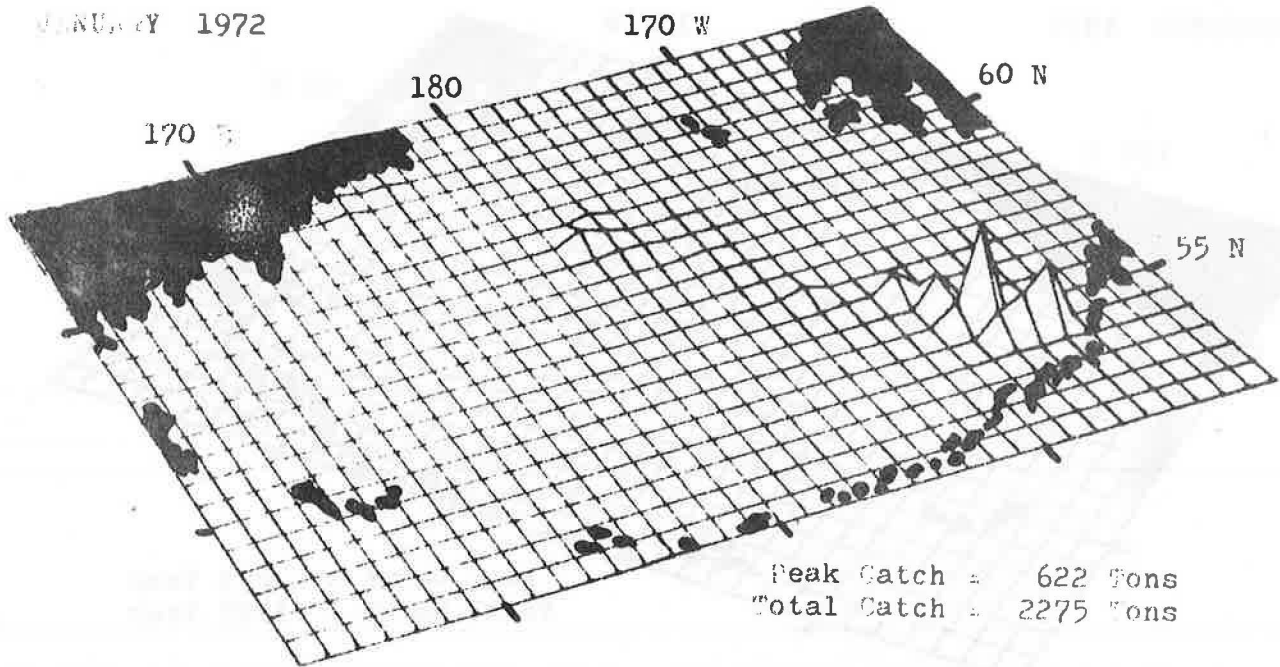
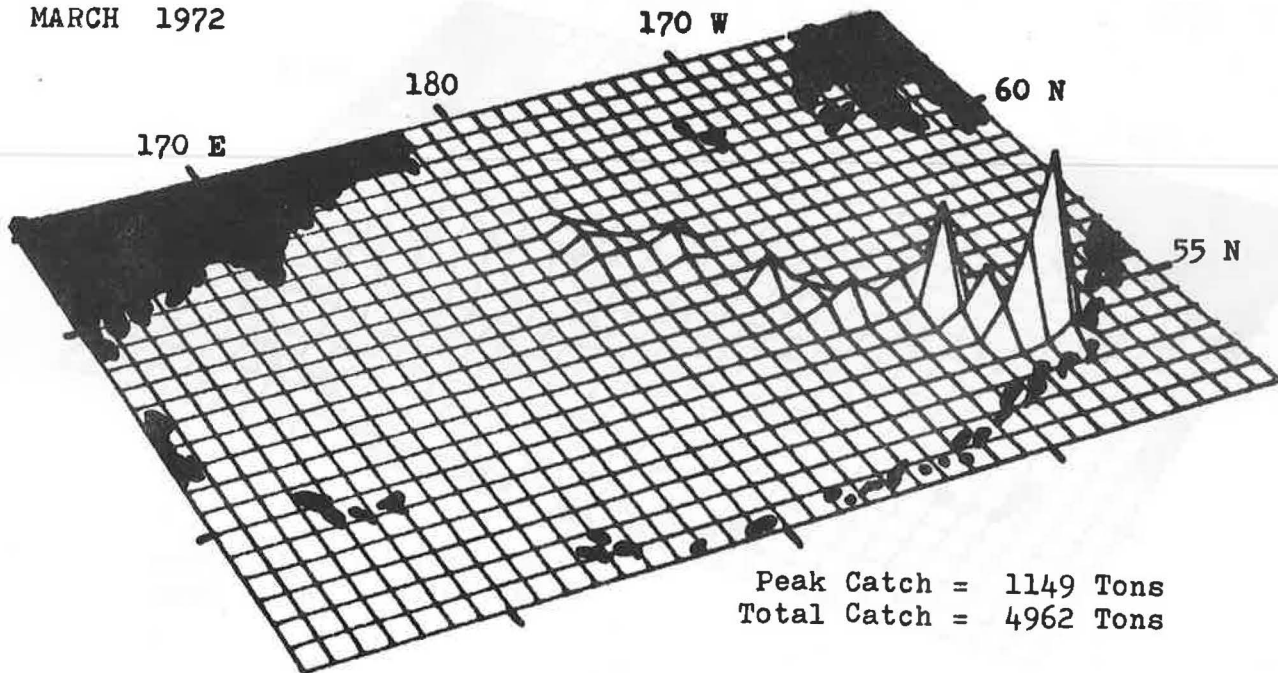


Figure 32. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea January and February, 1972.

MARCH 1972



APRIL 1972

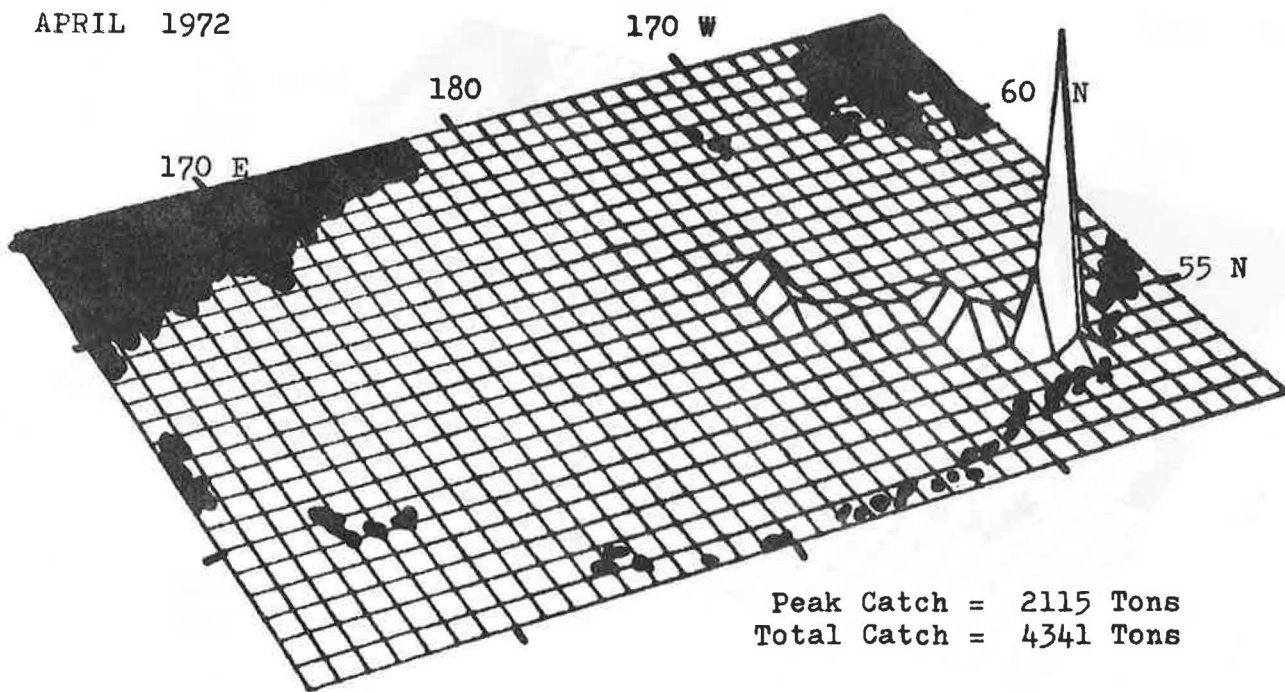
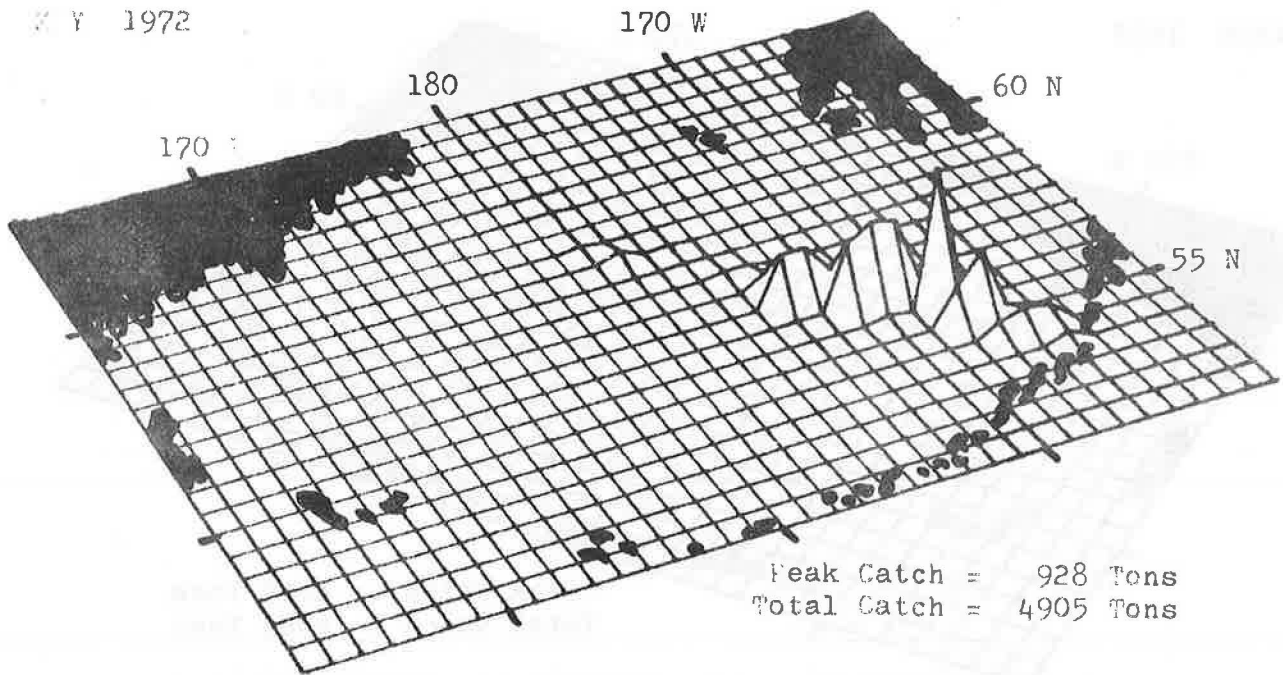


Figure 33. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea March and April, 1972.

MAY 1972



JUNE 1972

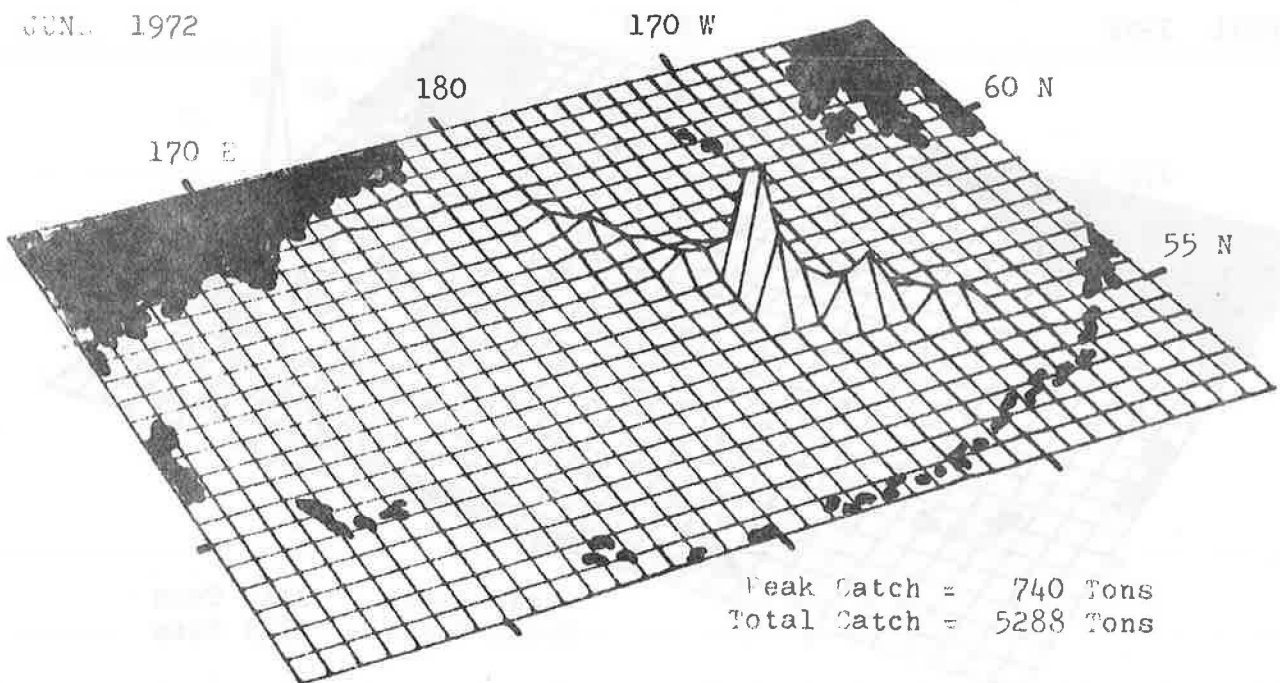


Figure 34. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea May and June, 1972.

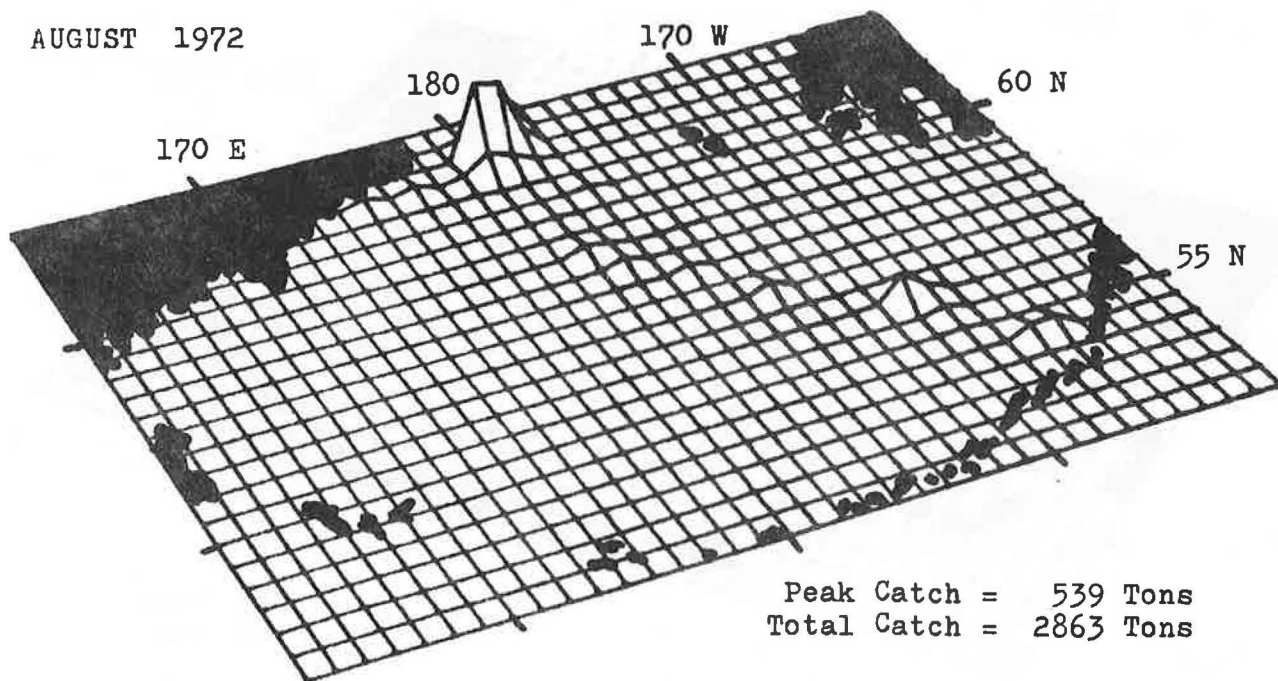
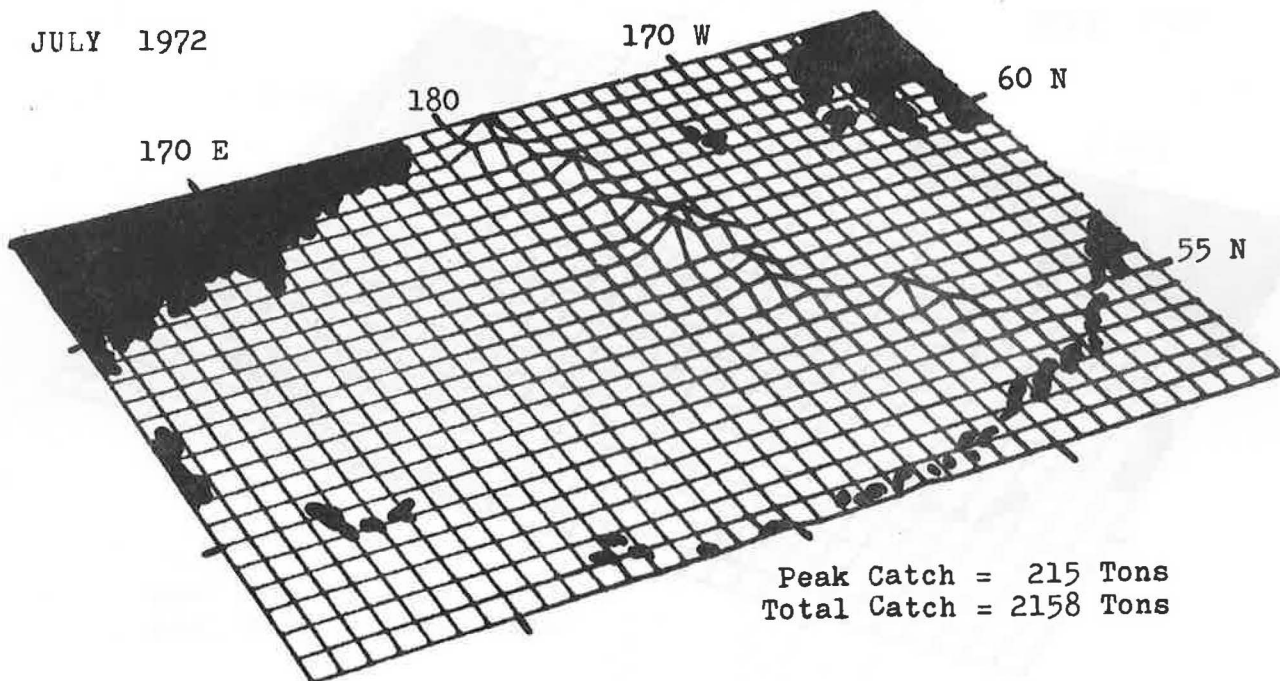


Figure 35. Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea July and August, 1972.

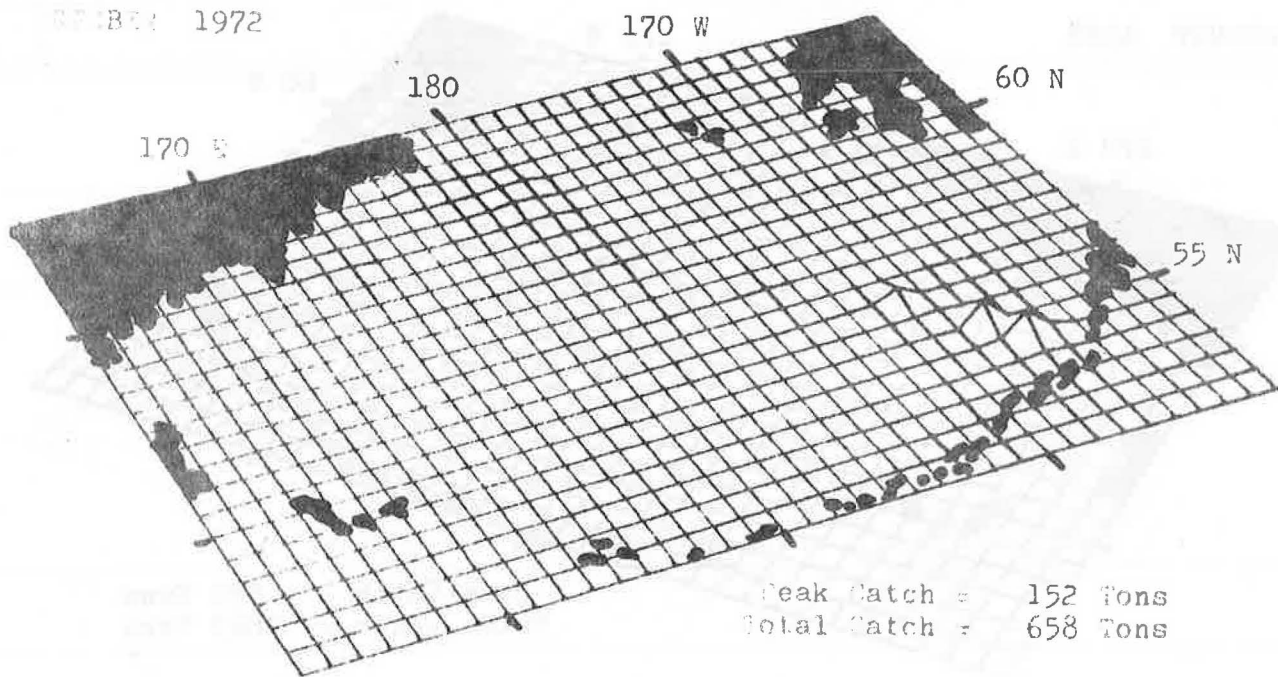
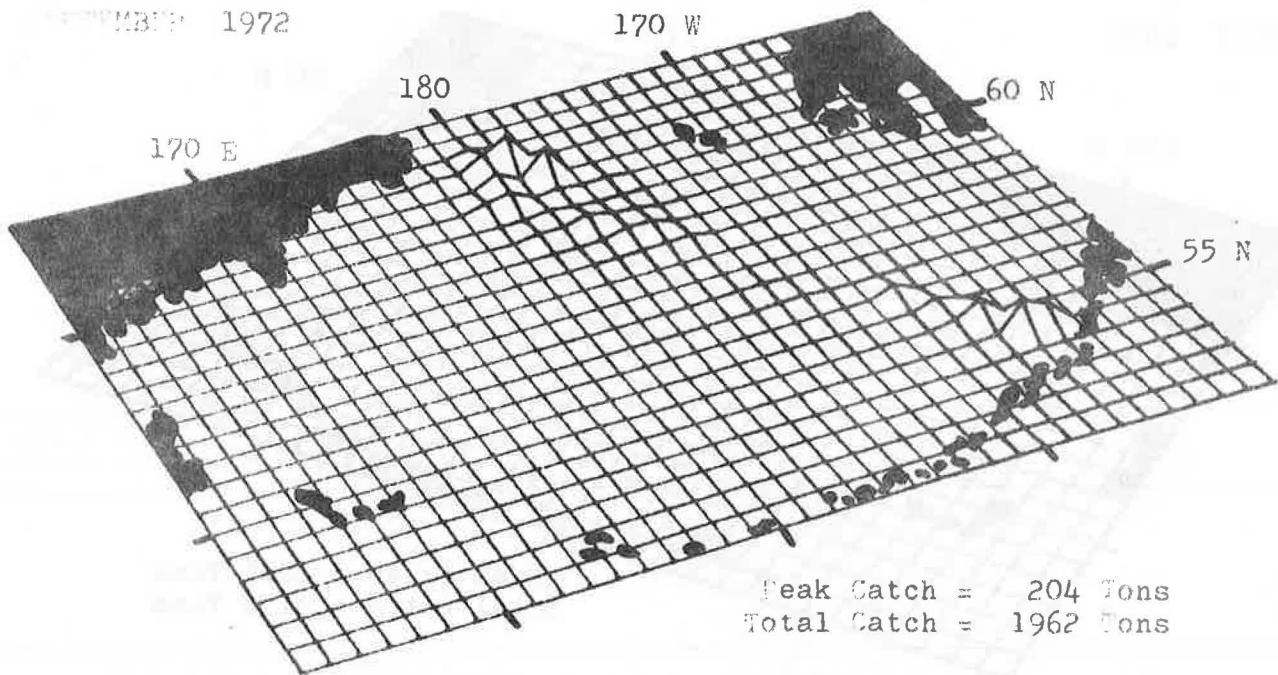


Figure 3 Geographical distribution of Pacific cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea September and October, 1972.

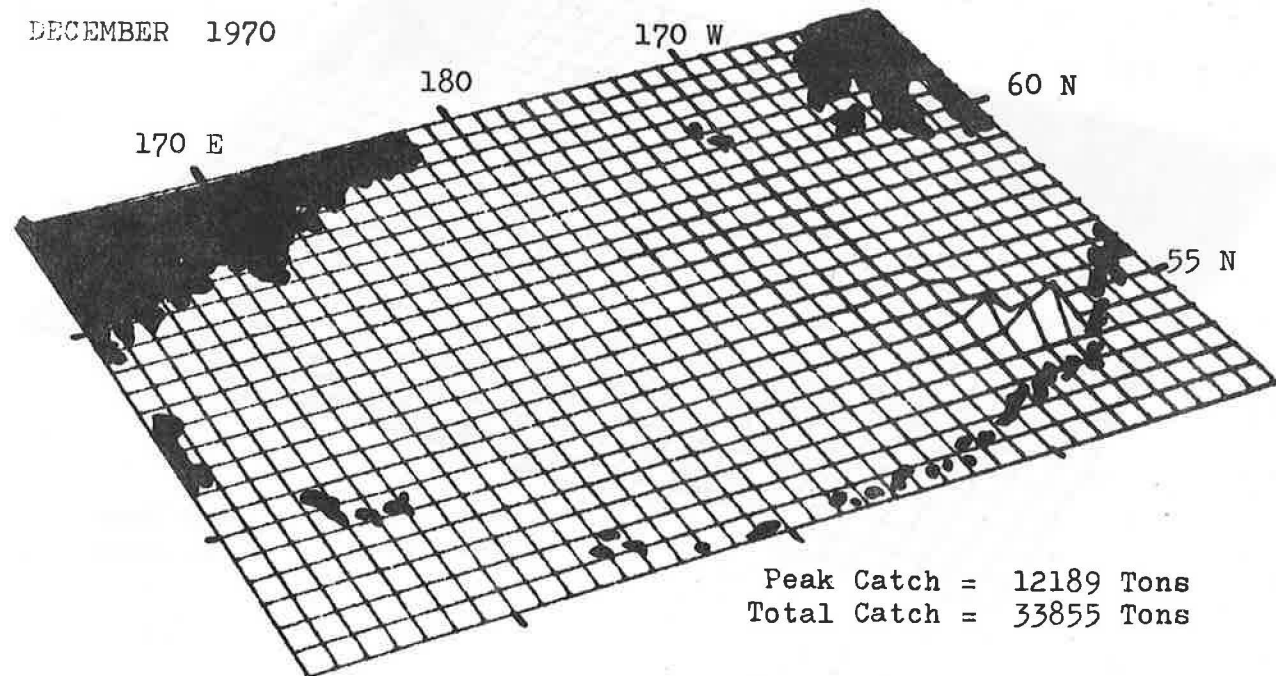
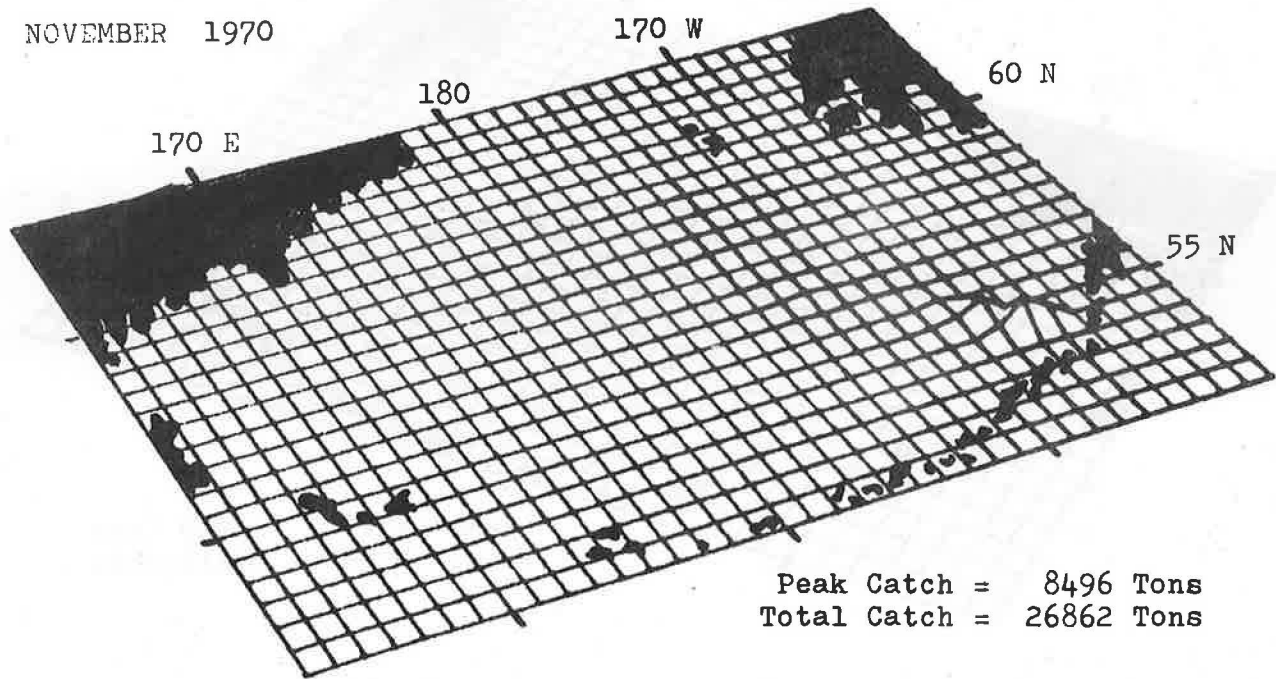


Figure 37. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in November and December, 1970.

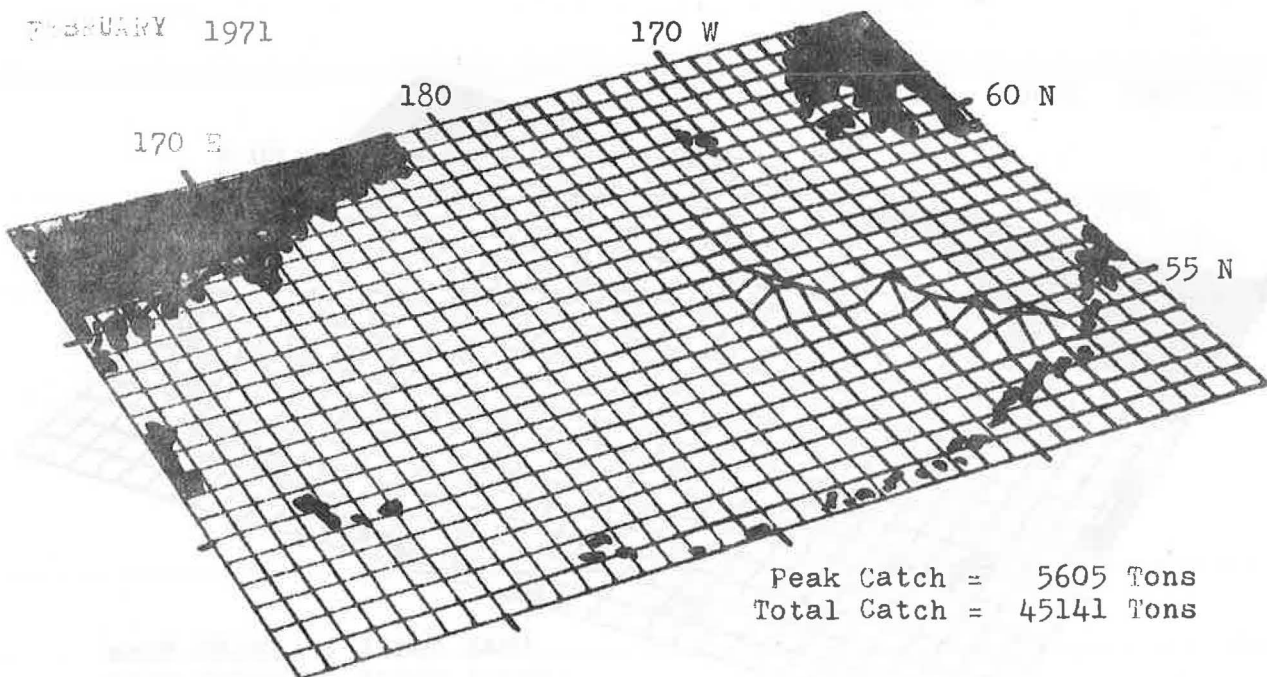
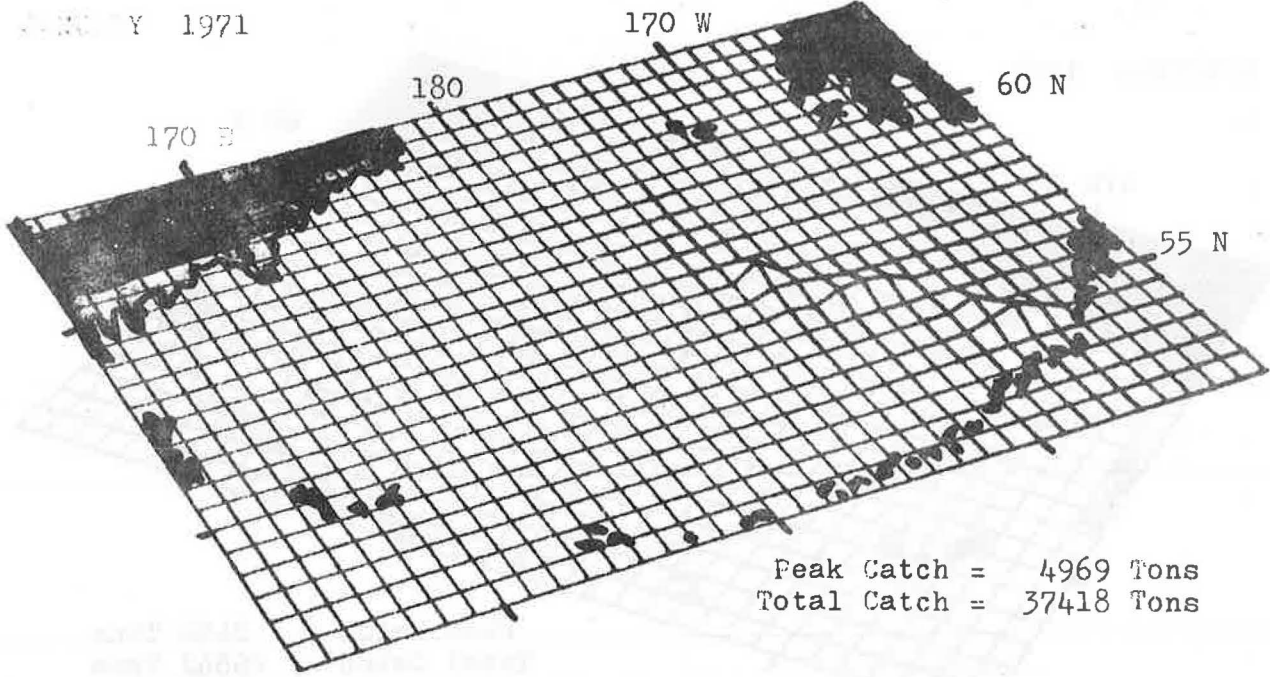


Figure 38. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in January and February, 1971.

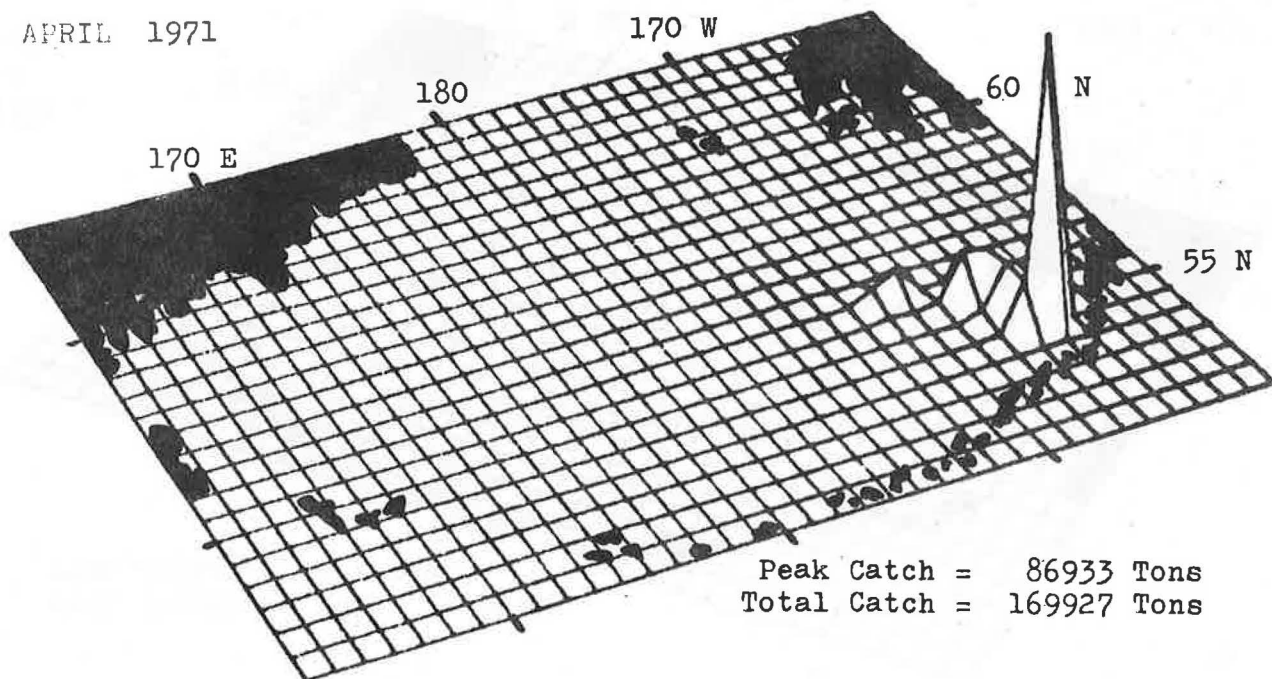
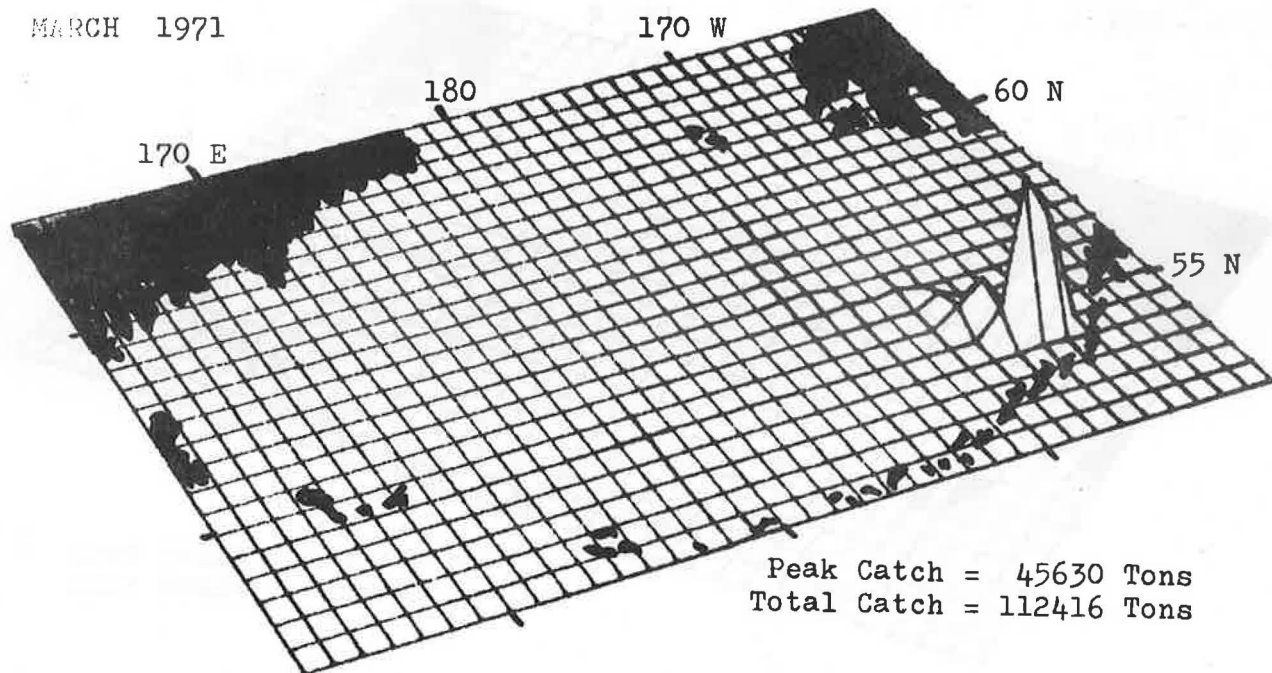
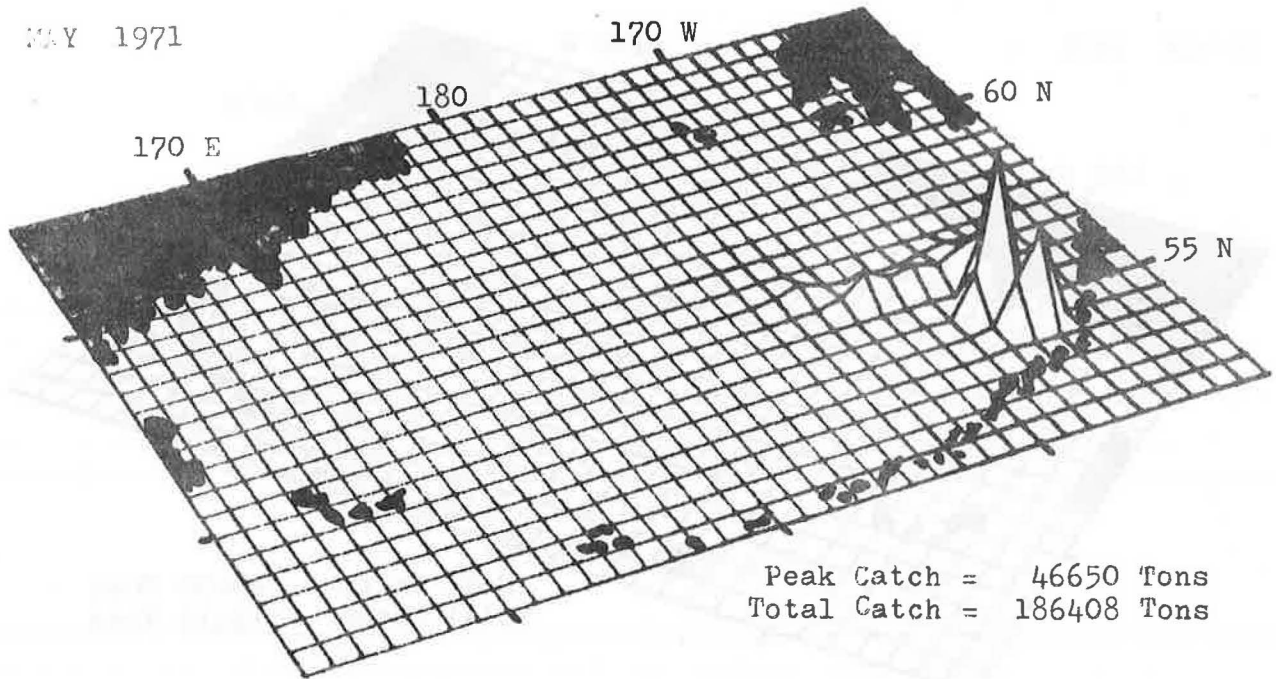


Figure 39. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in March and April, 1971.

MAY 1971



JUNE 1971

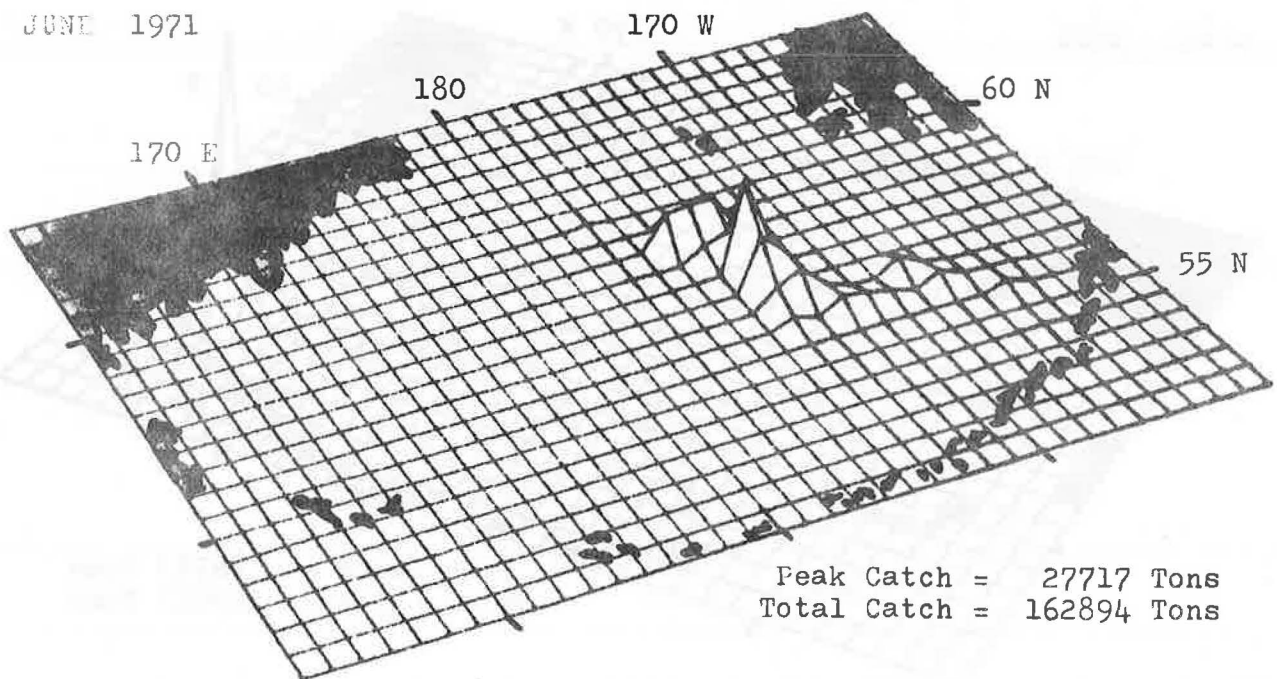


Figure 40. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in May and June, 1971

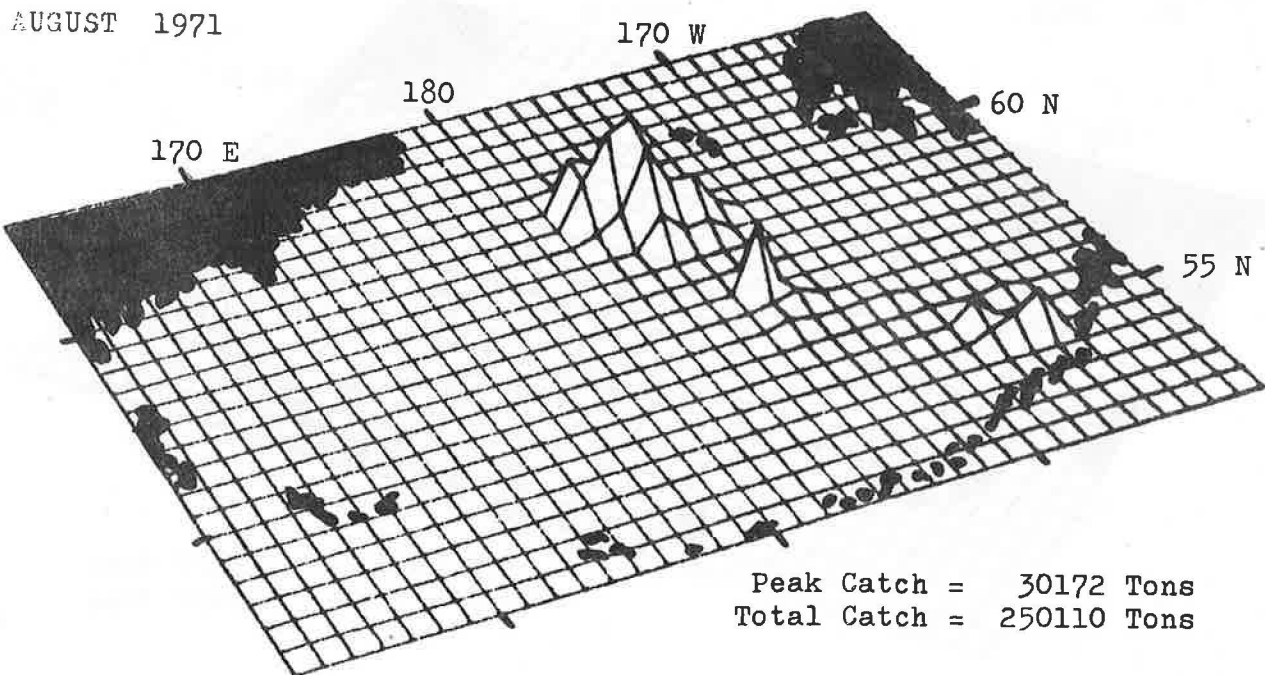
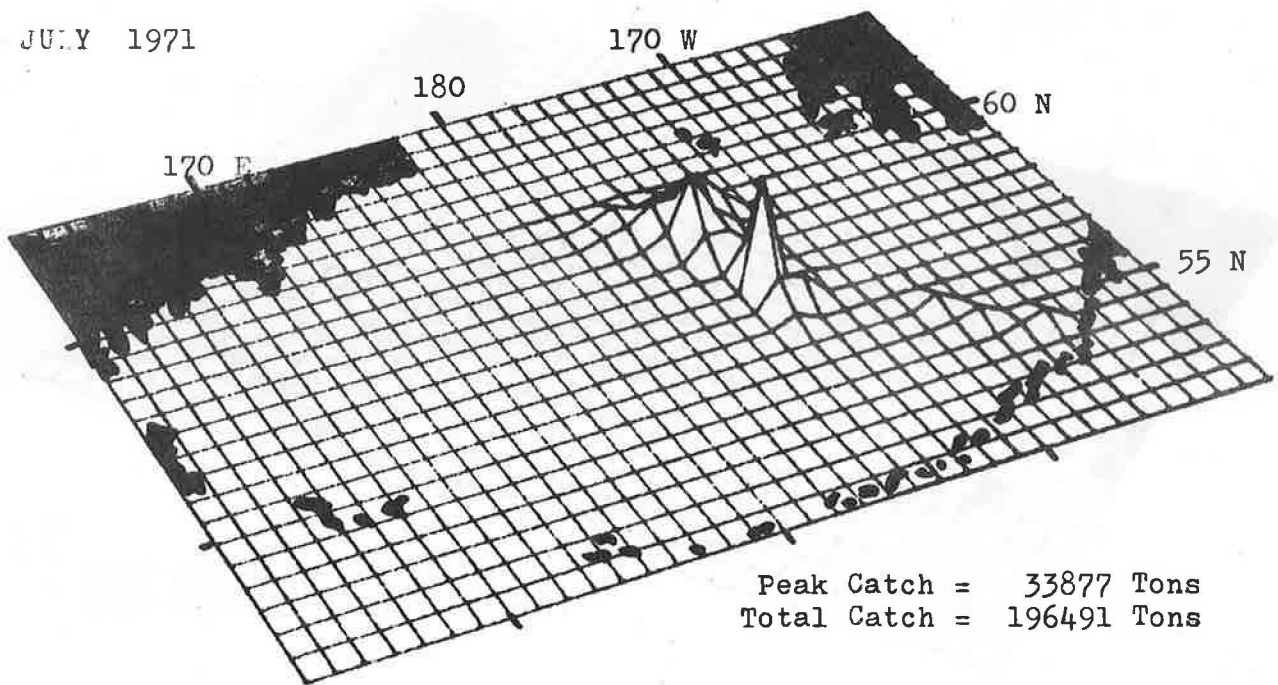


Figure 41. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in July and August, 1971.

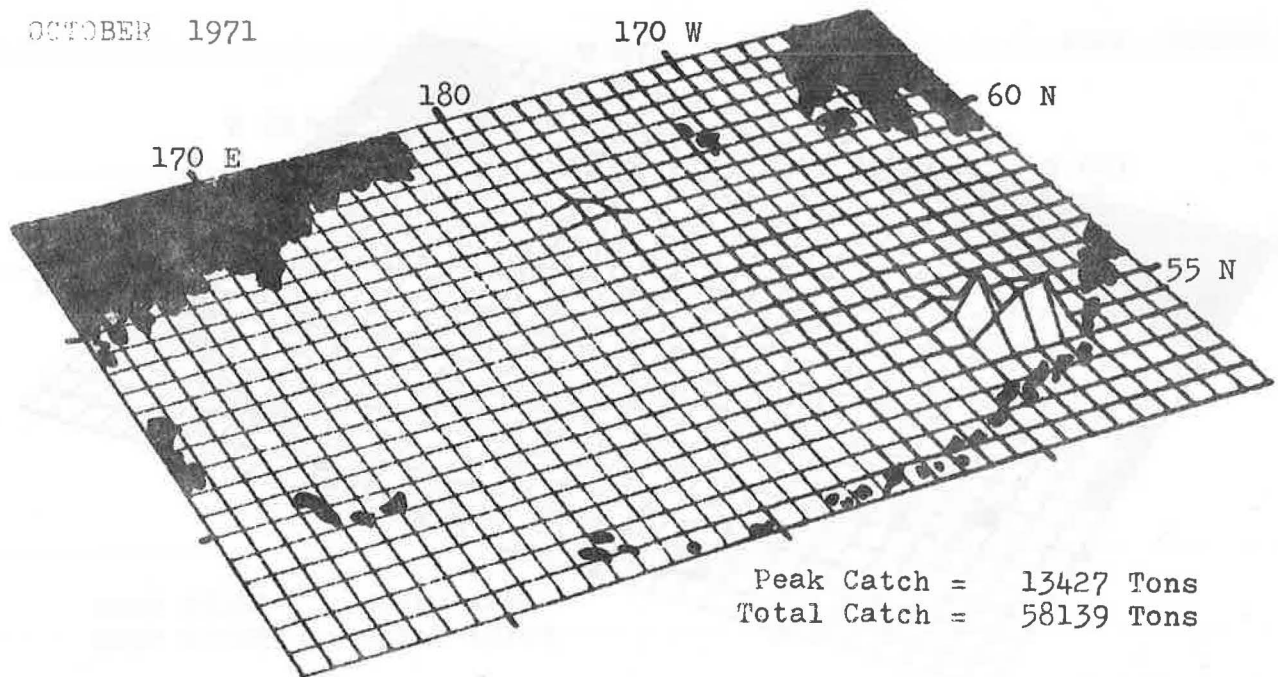
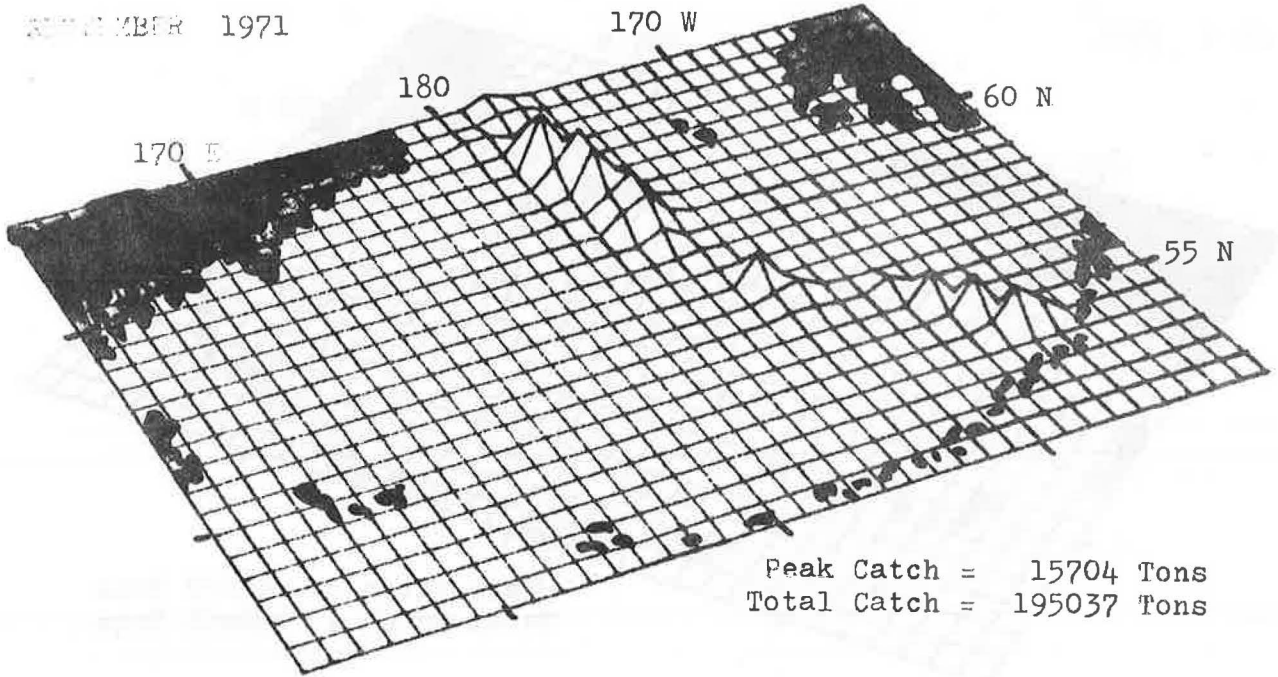
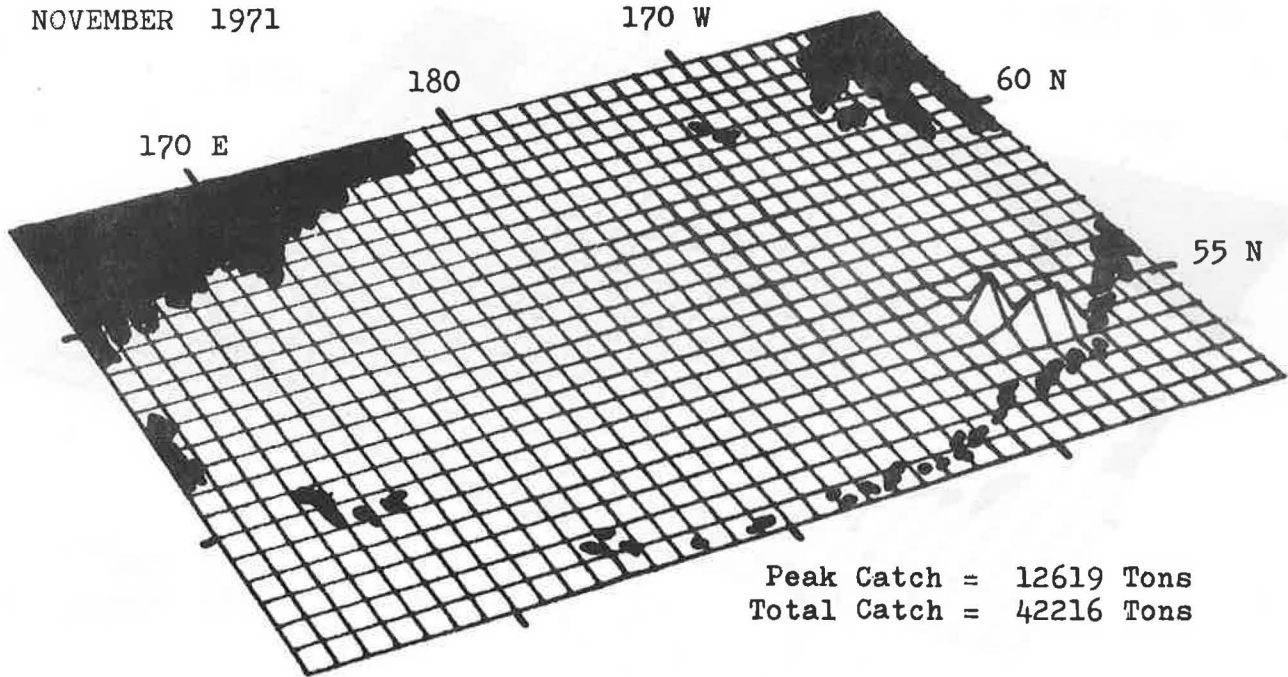


Figure 42. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in September and October, 1971.

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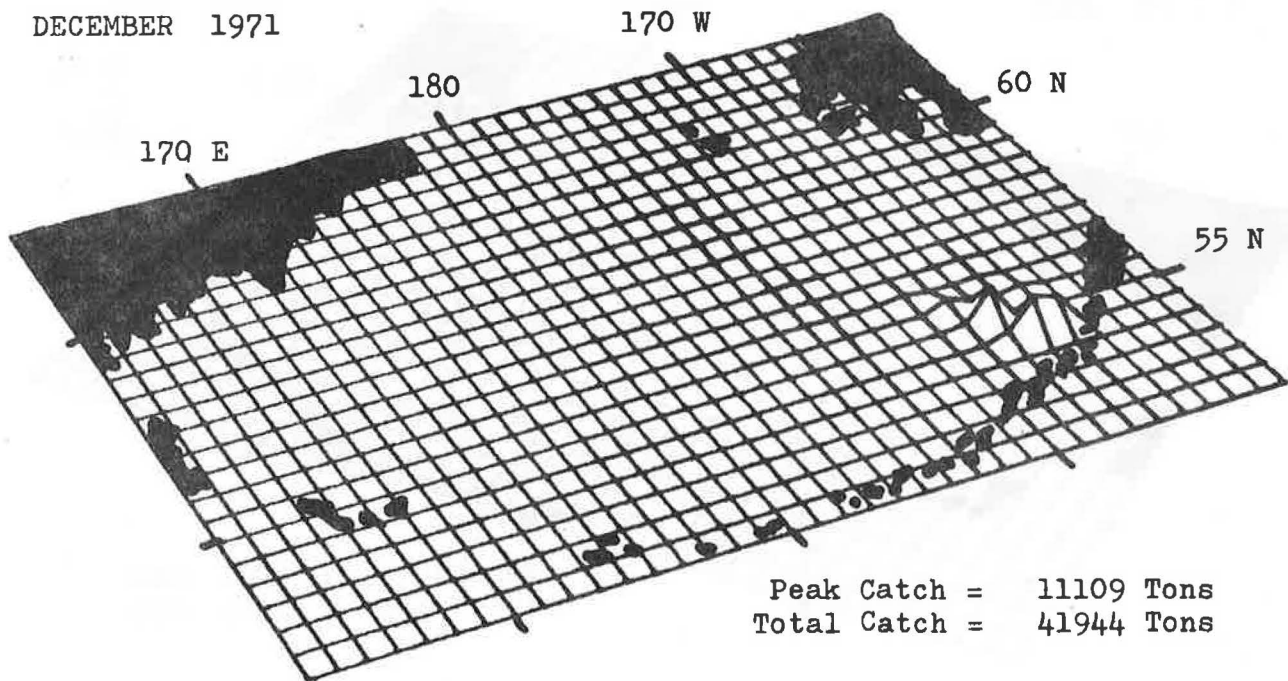


Figure 43. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea November and December, 1971.

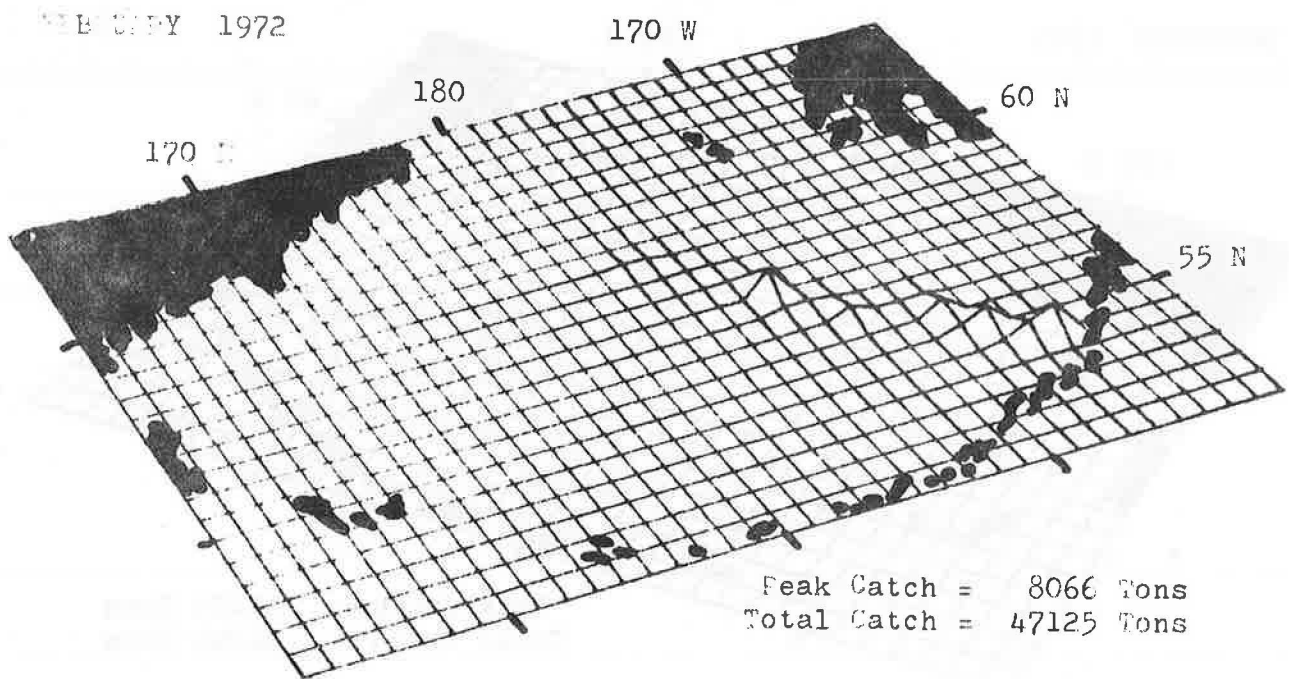
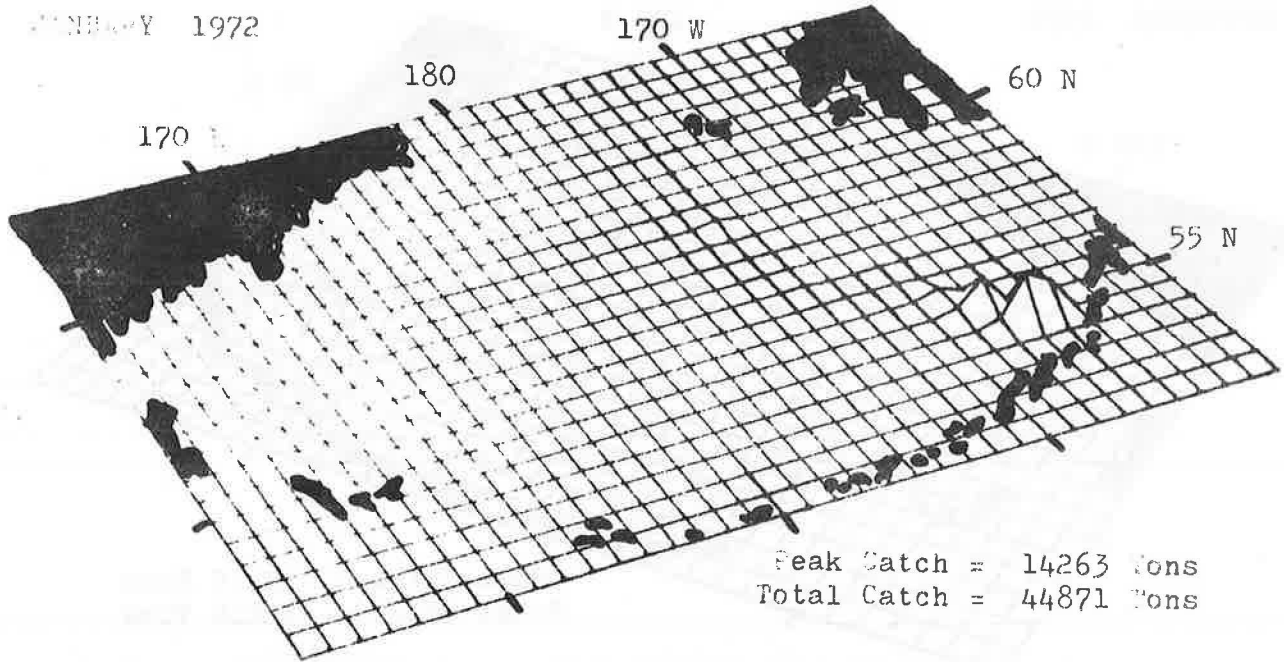


Figure 44. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea January and February, 1972.

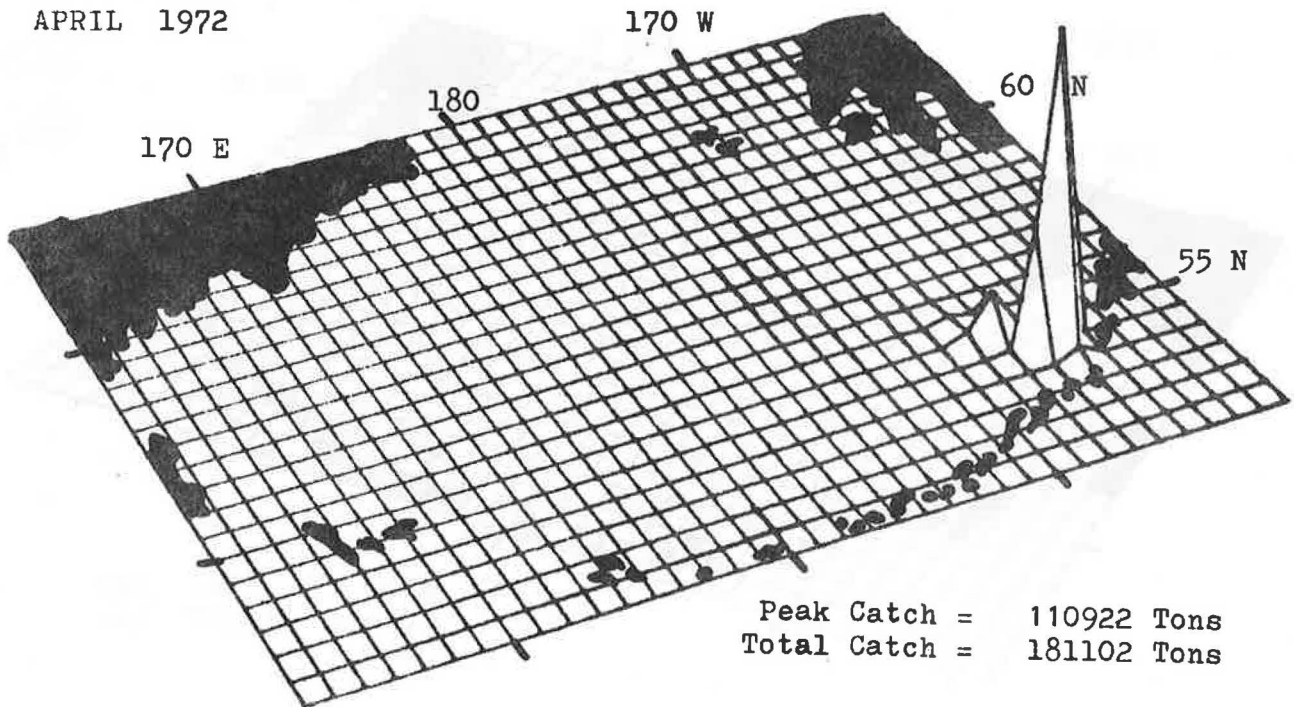
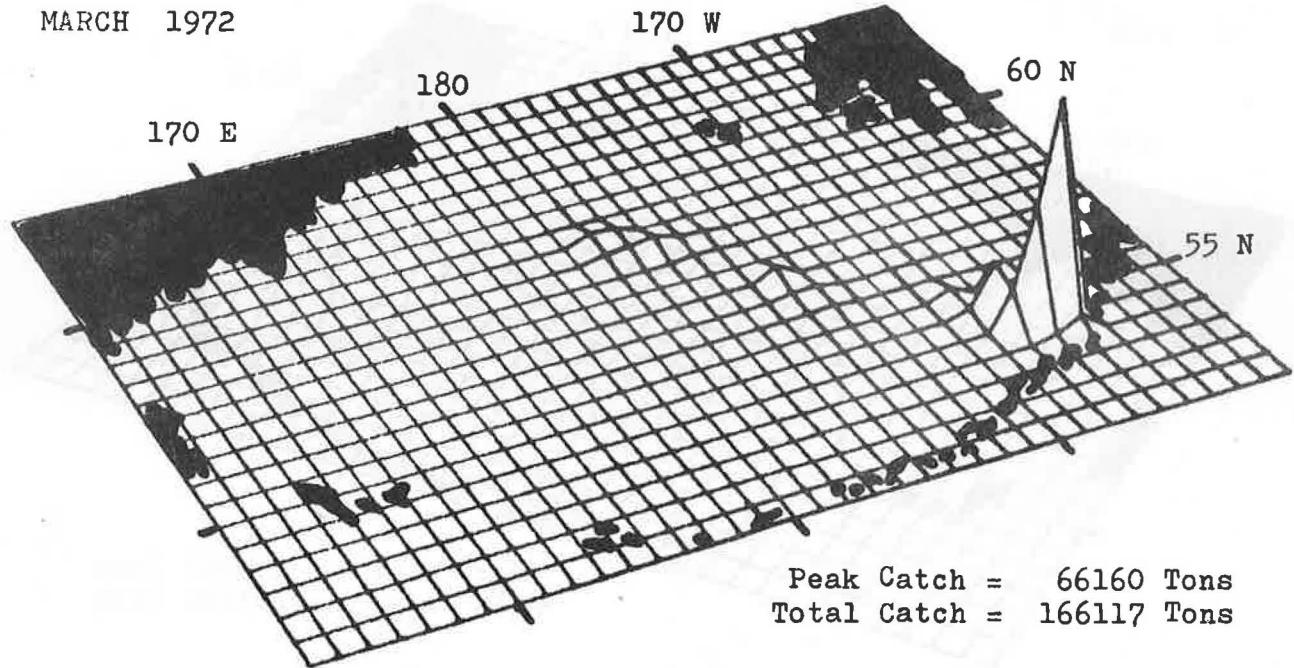


Figure 45. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea March and April, 1972.

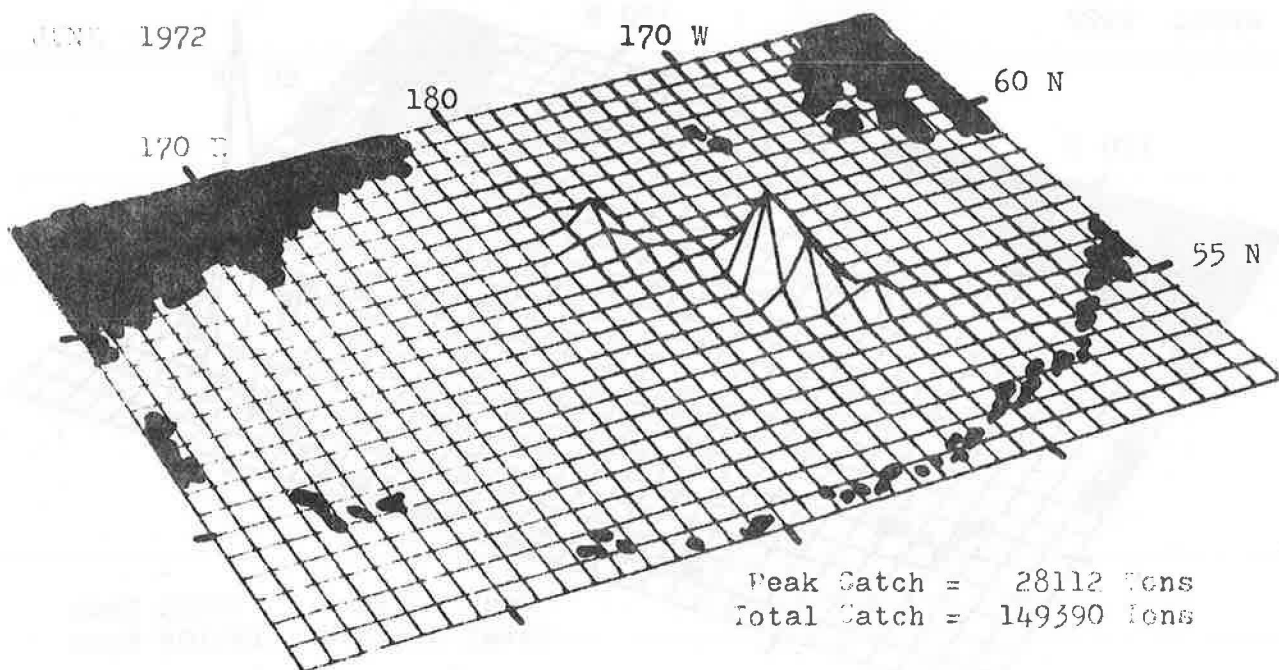
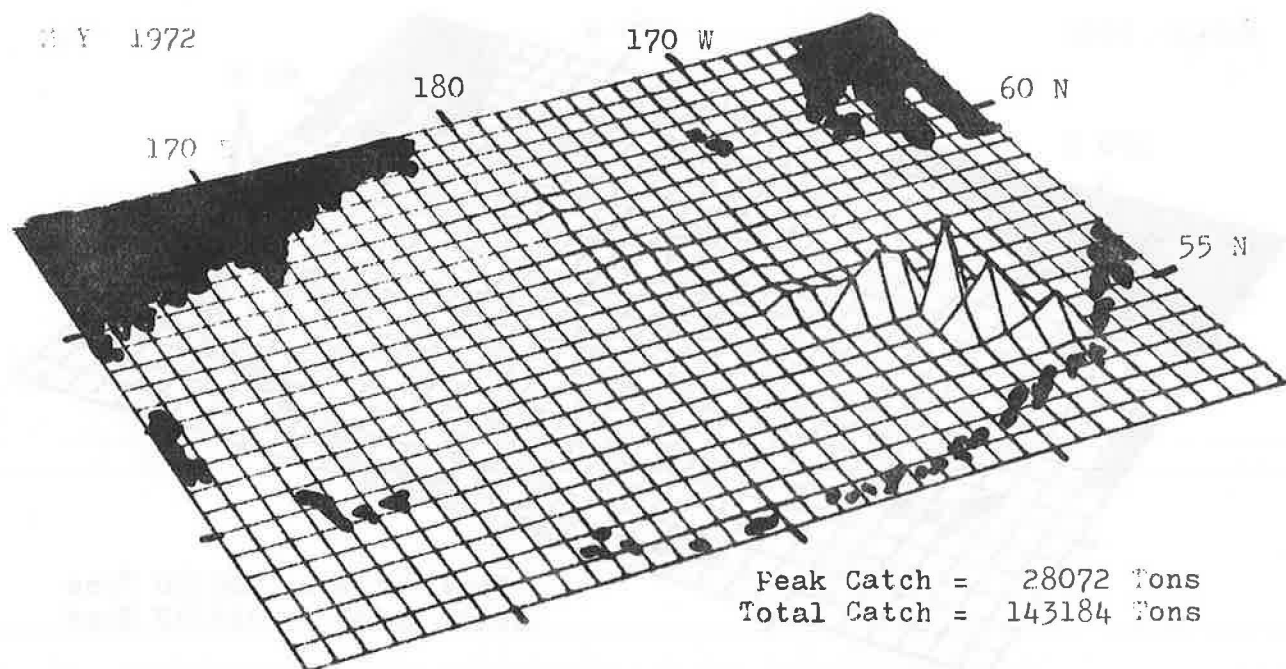
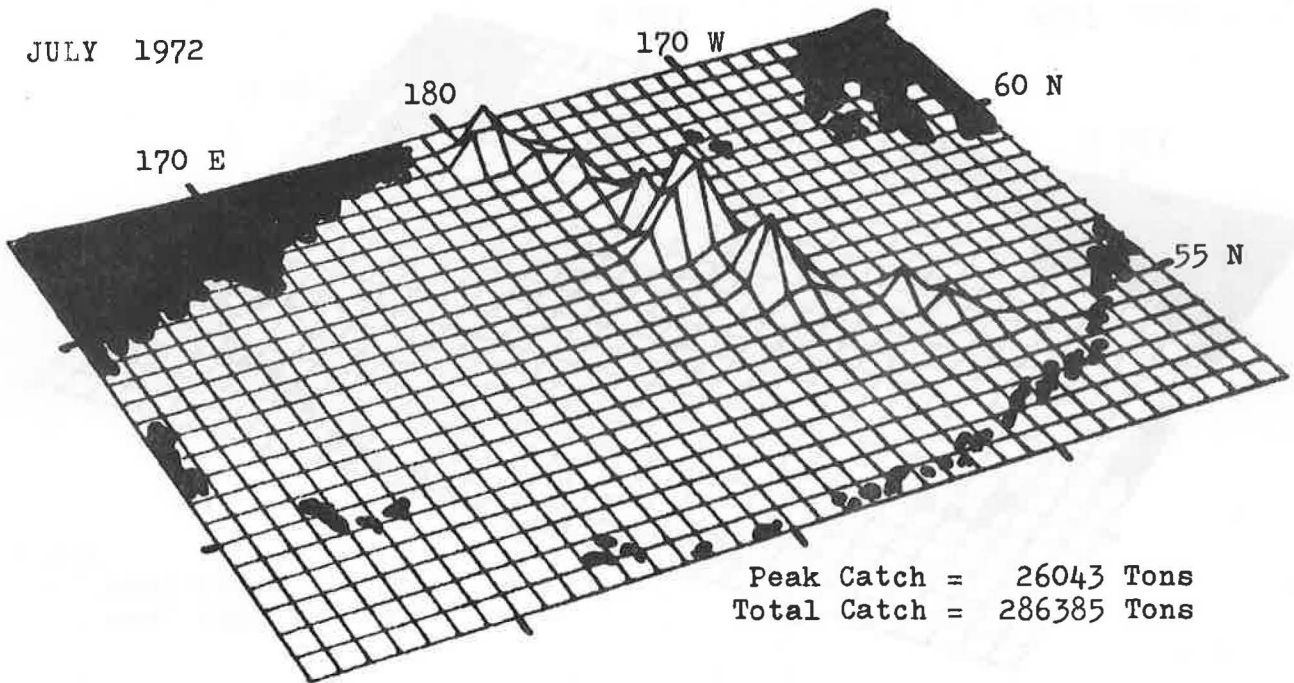


Figure 46. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea May and June, 1972.

JULY 1972



AUGUST 1972

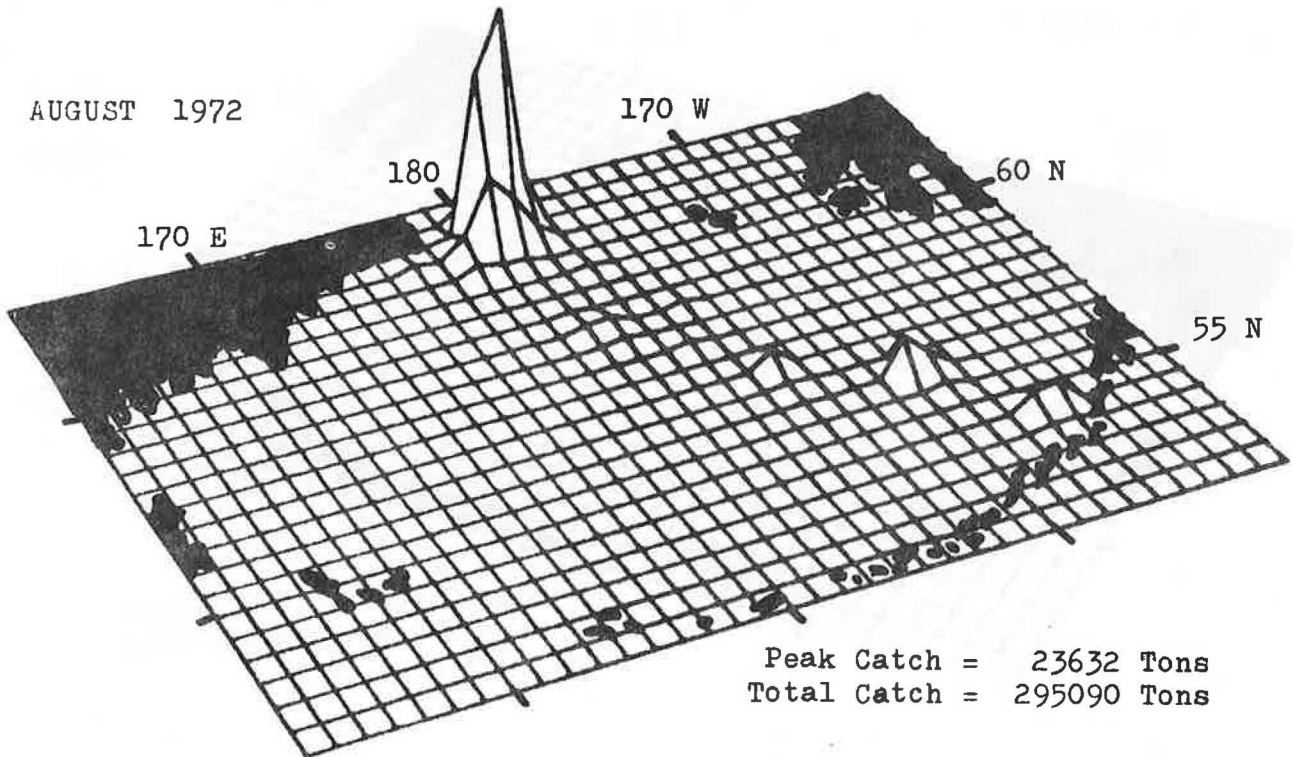


Figure 47. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea July and August, 1972.

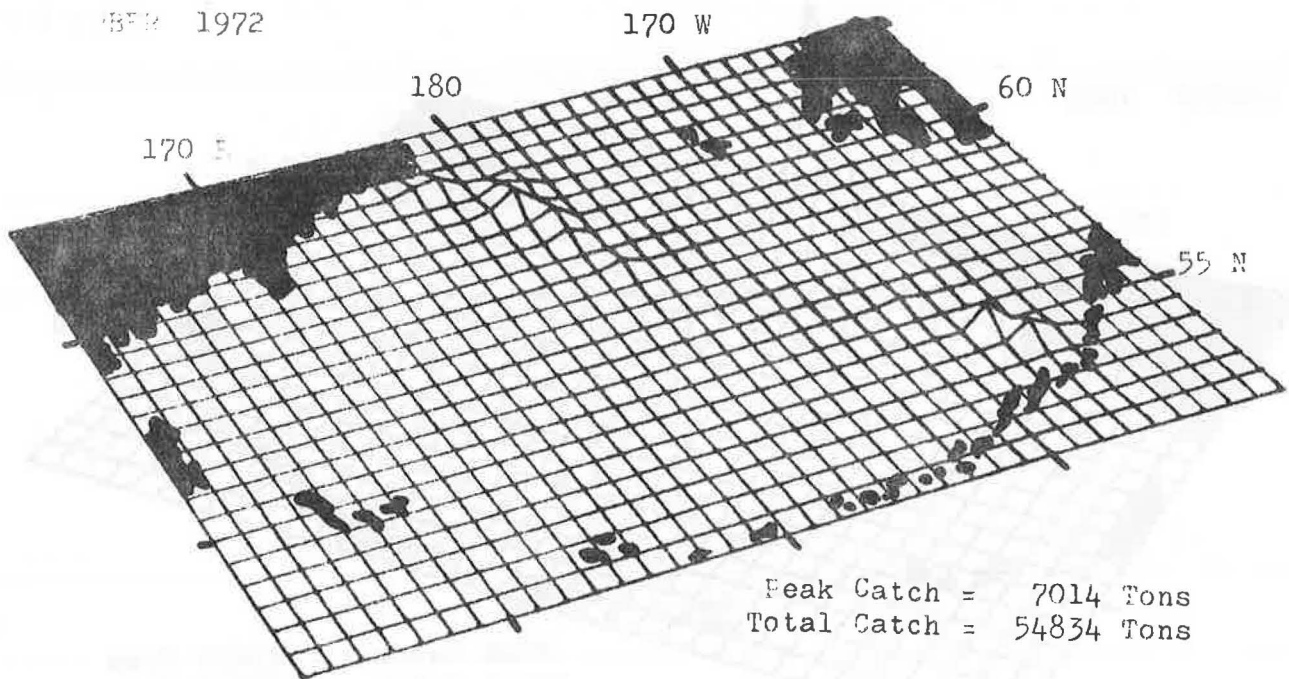
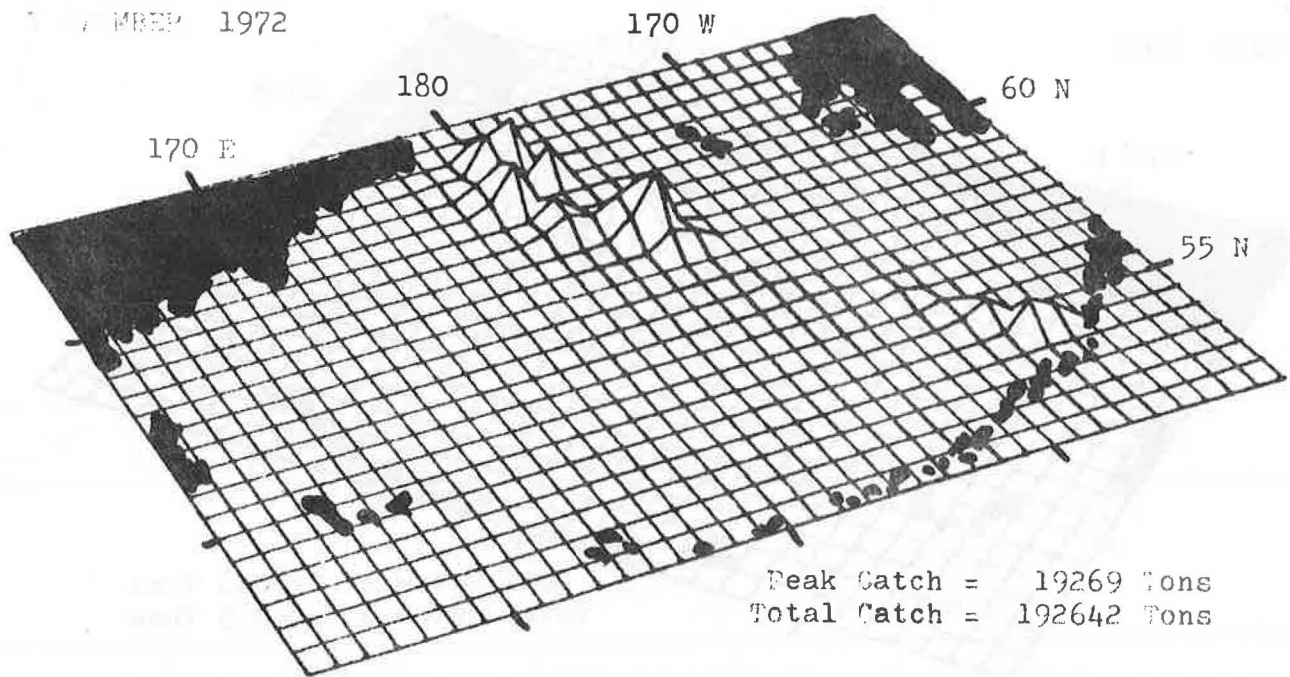


Figure 48. Geographical distribution of Pacific pollock catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea September and October, 1972.

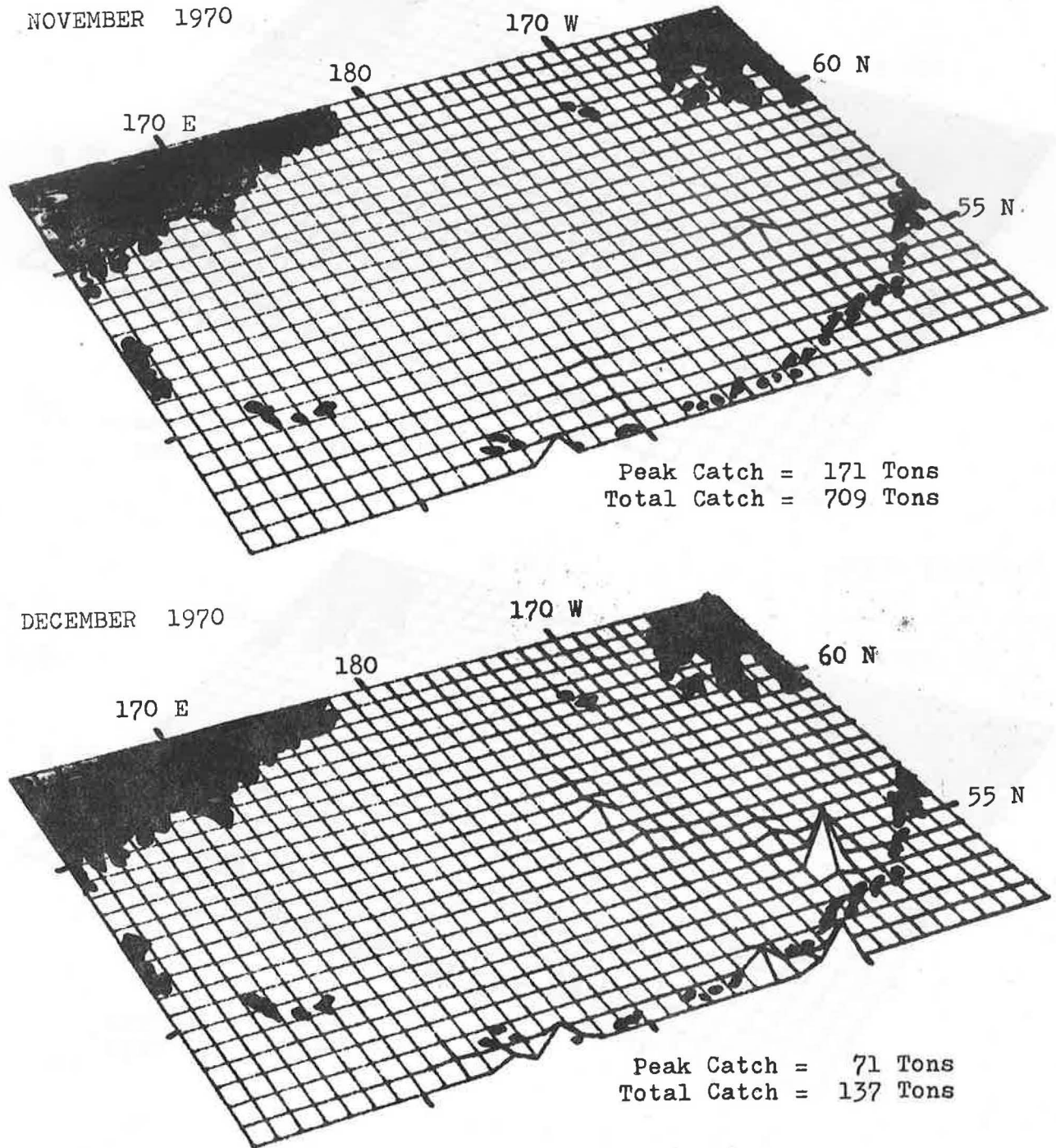


Figure 49. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in November and December, 1970.

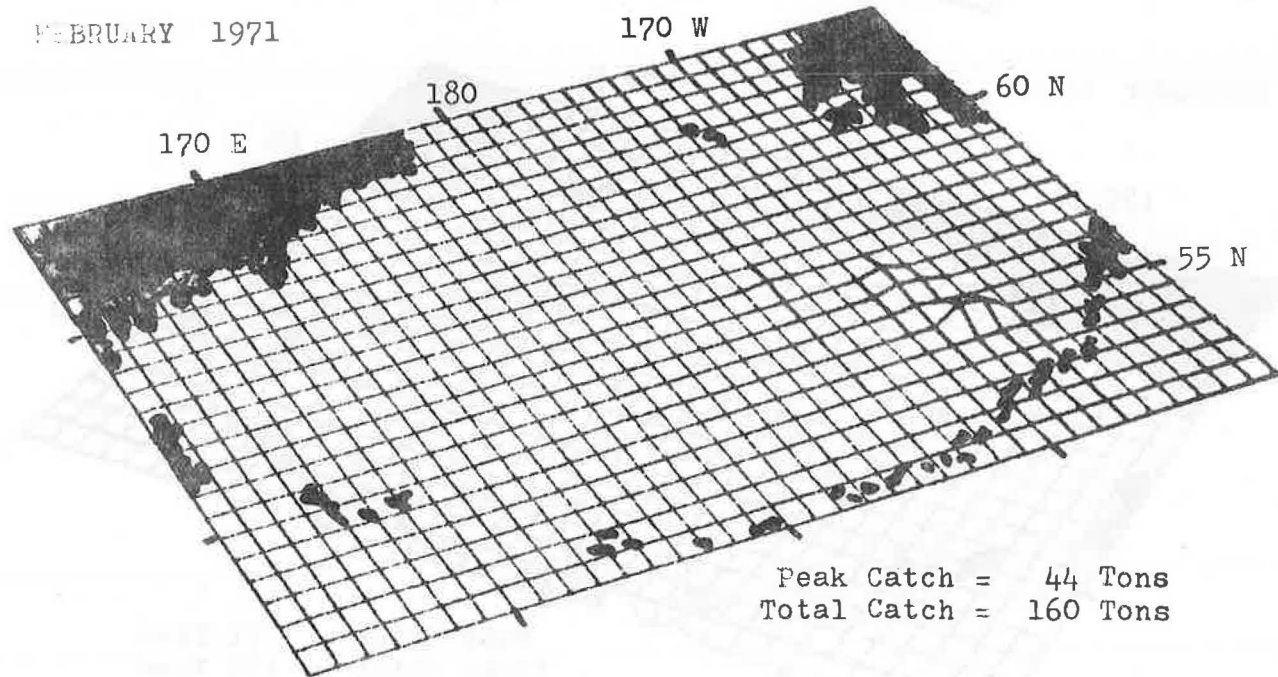
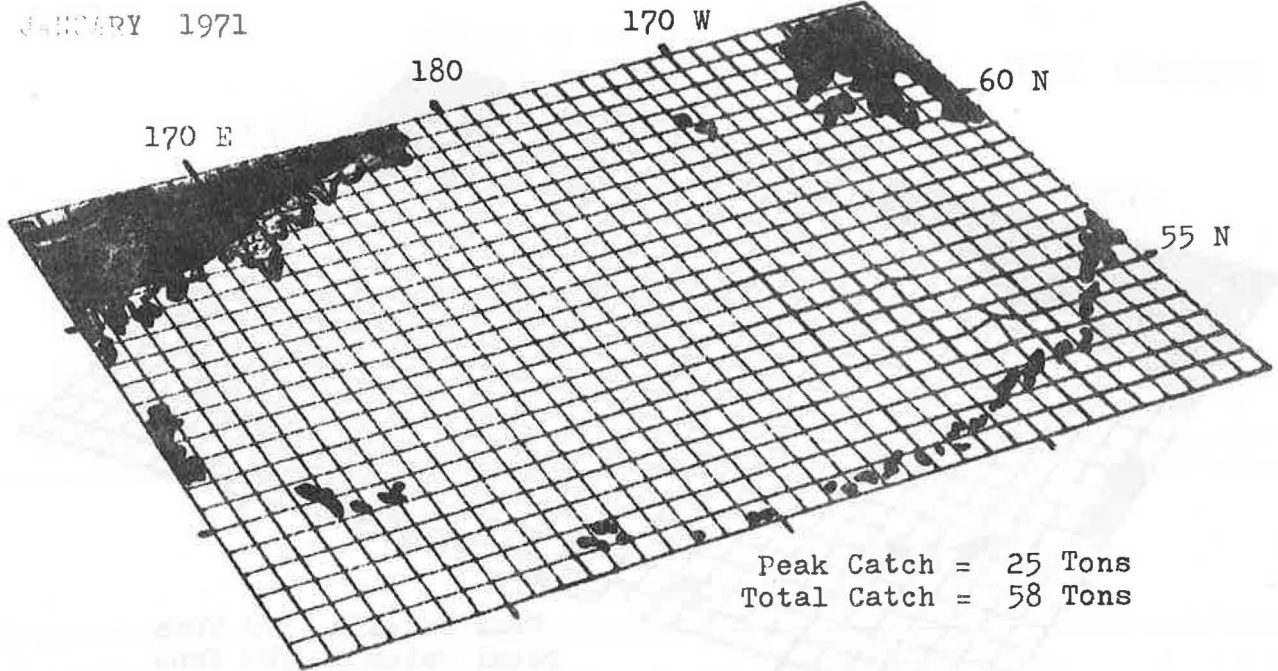
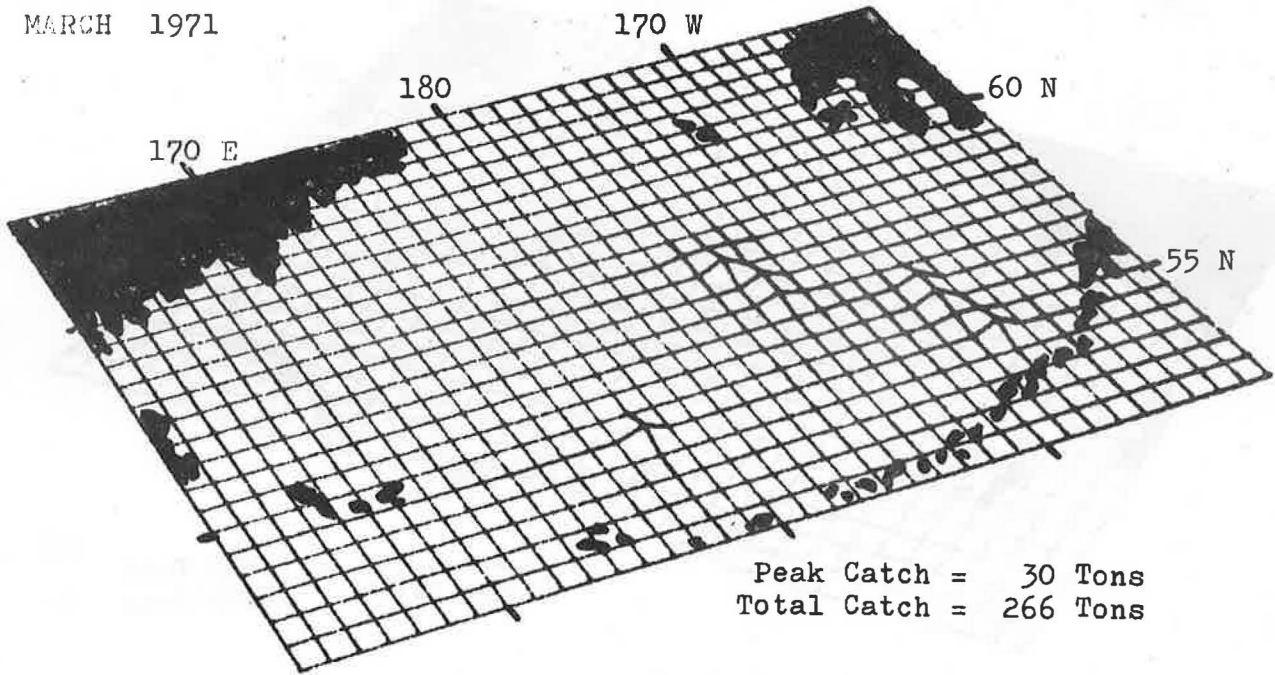


Figure 50. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in January and February, 1971.

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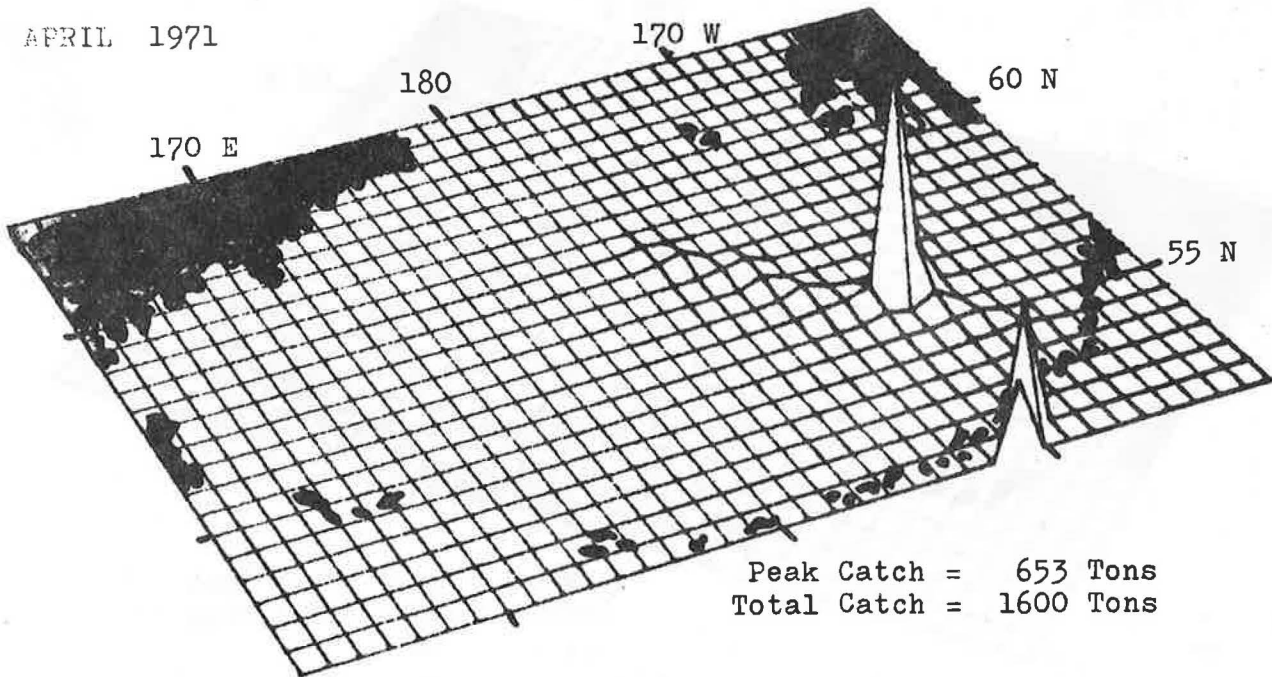
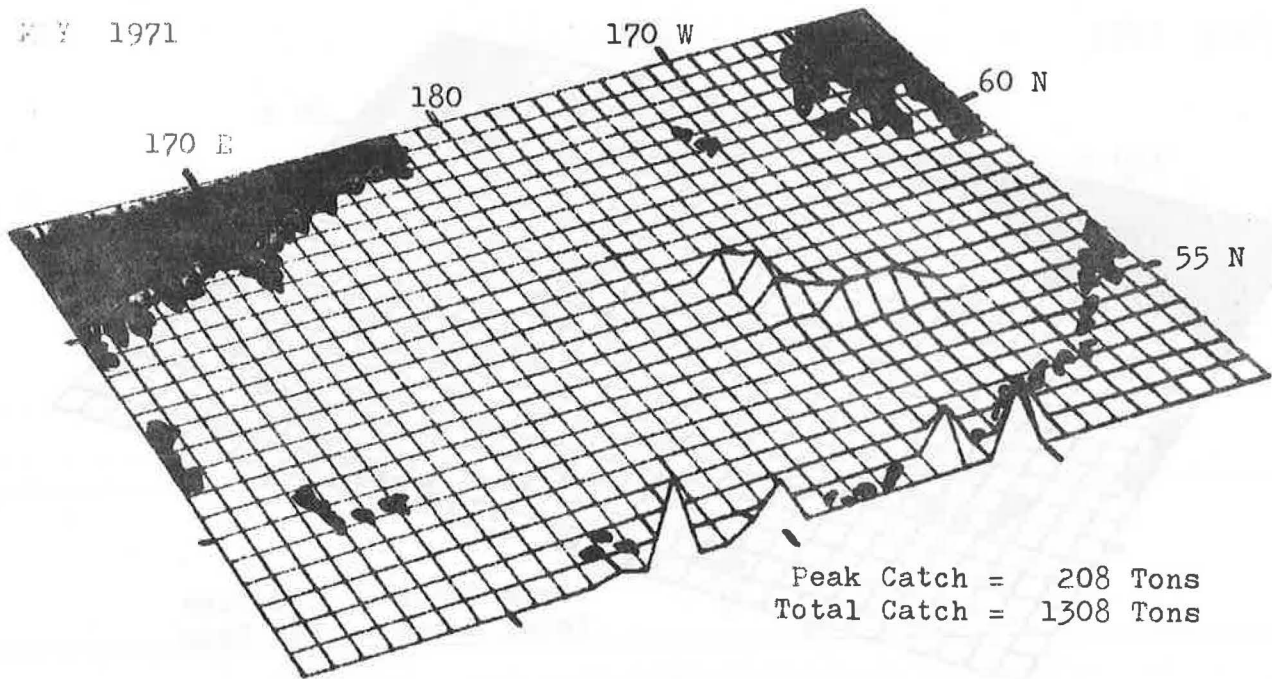


Figure 51. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in March and April, 1971.

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JUNE 1971

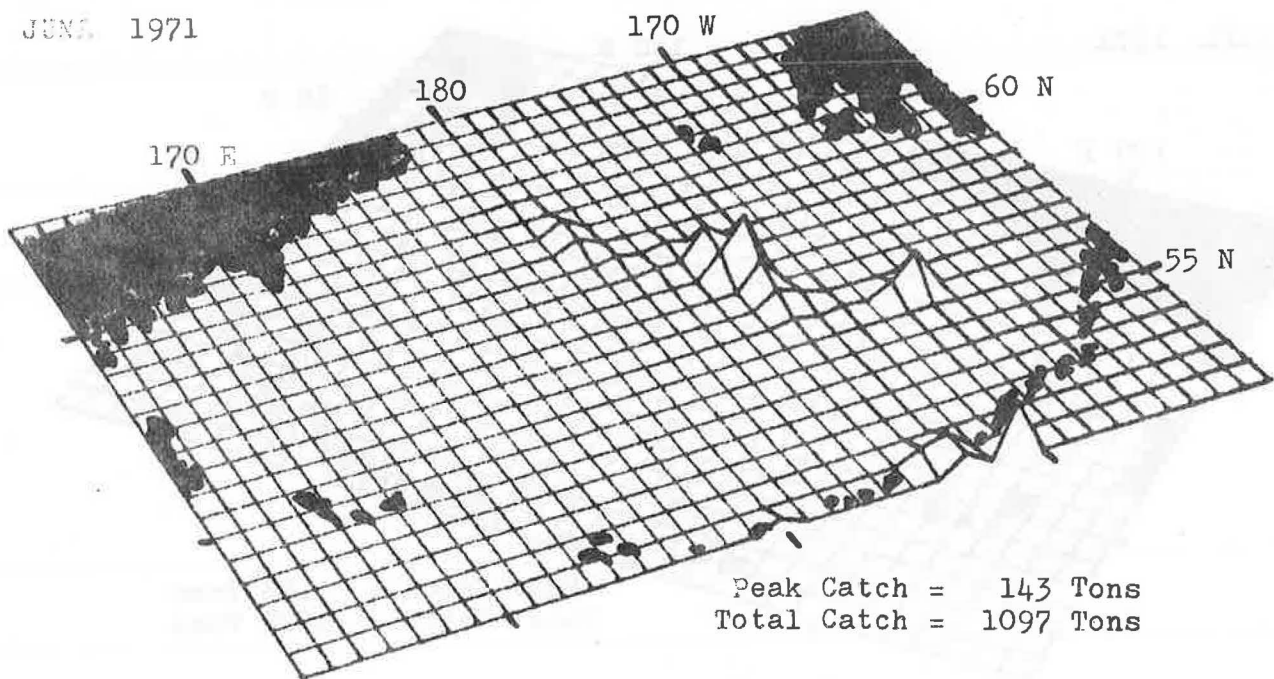


Figure 52. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in May and June, 1971.

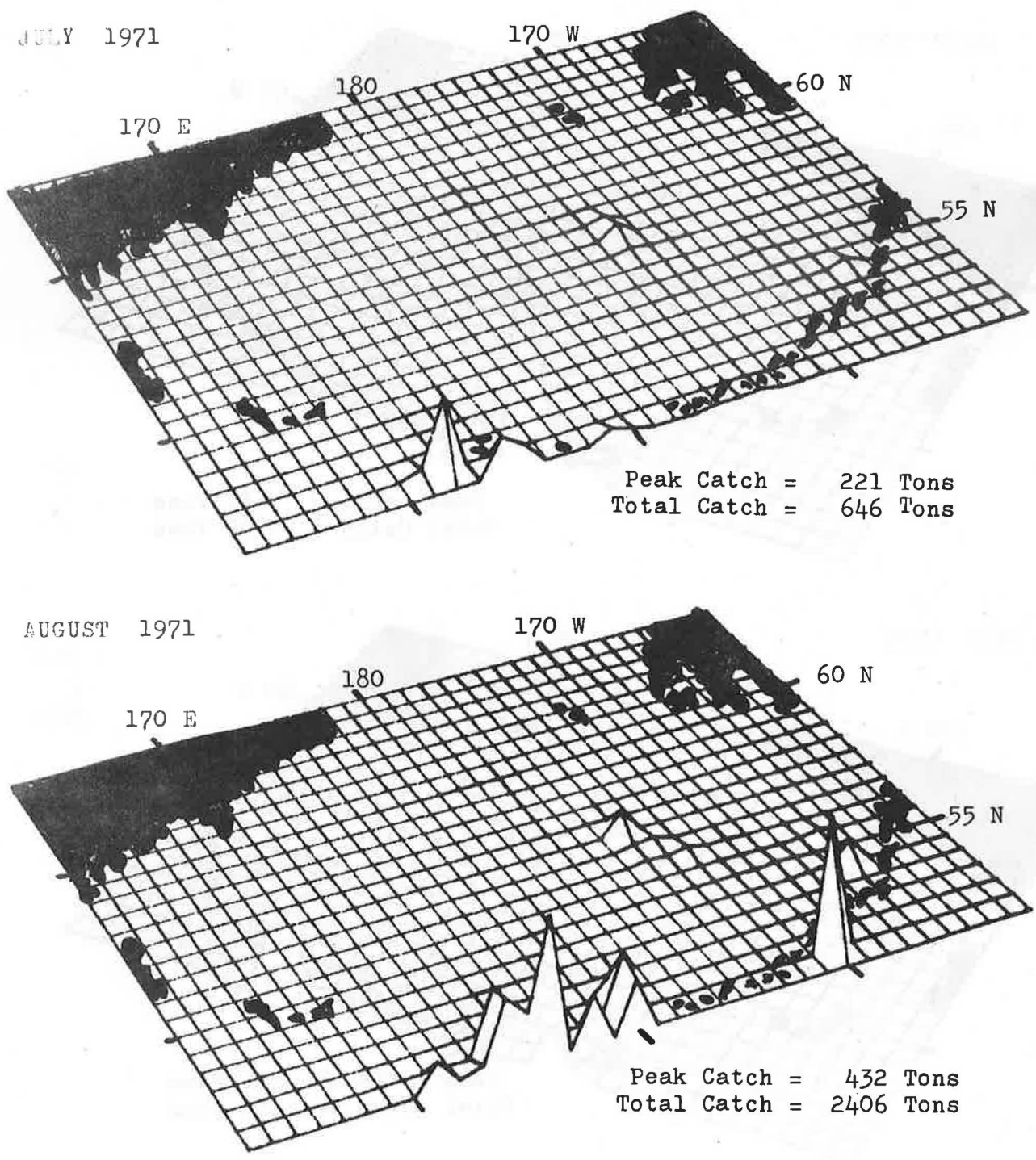
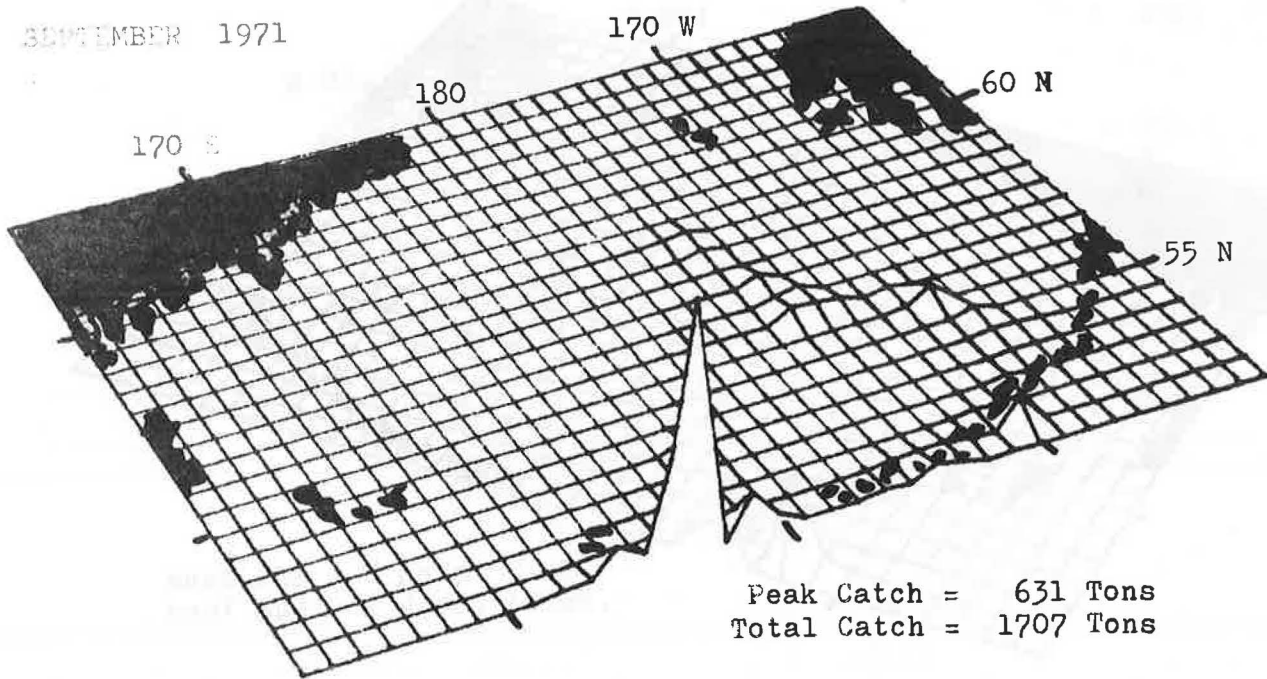


Figure 53. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in July and August, 1971.

SEPTEMBER 1971



OCTOBER 1971

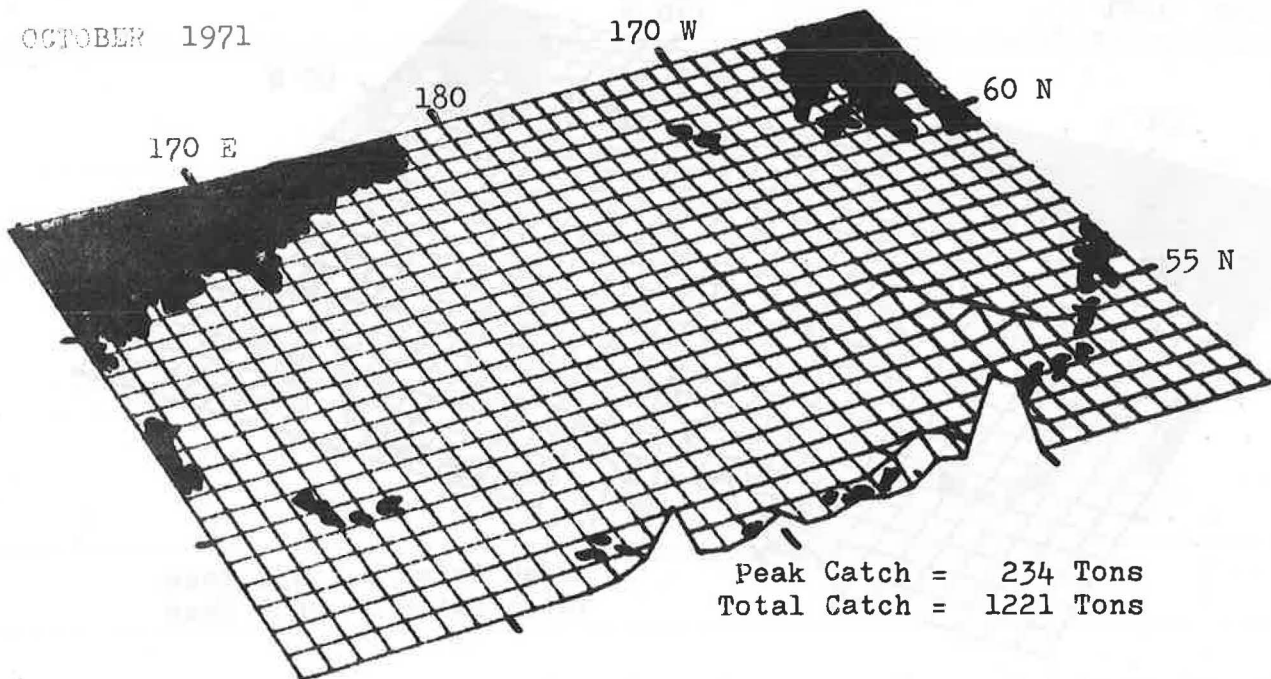


Figure 54. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in September and October, 1971.

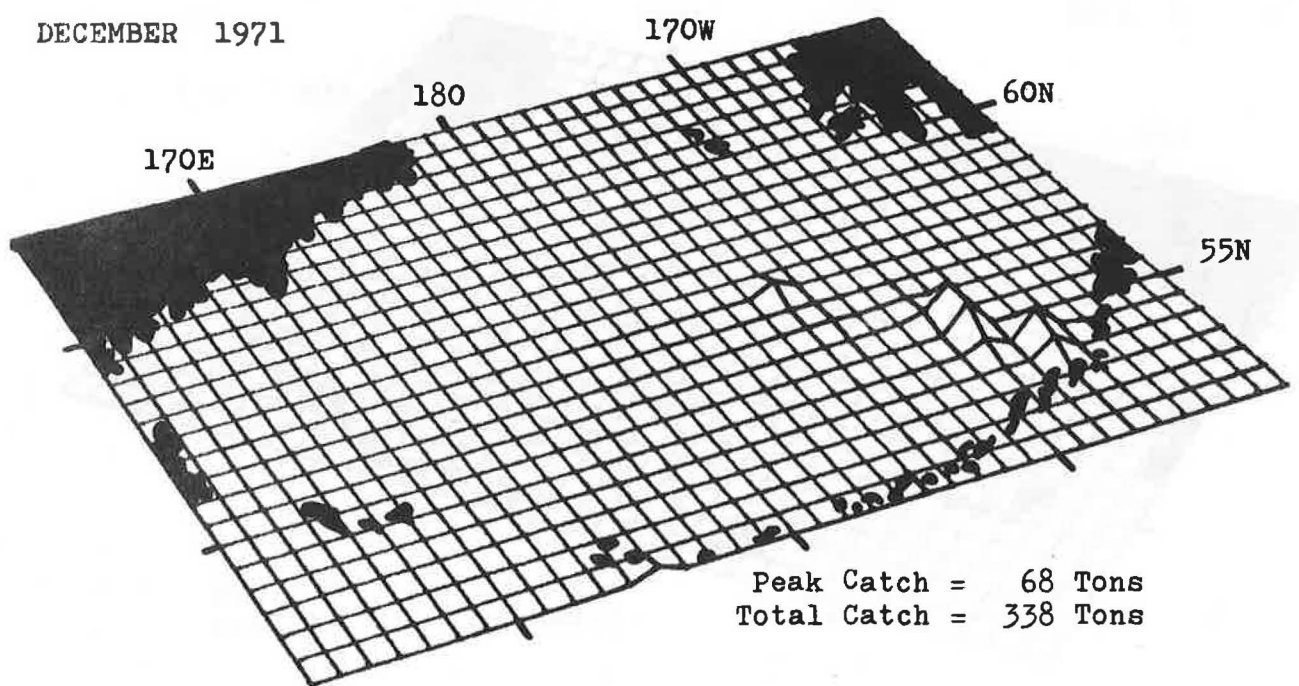
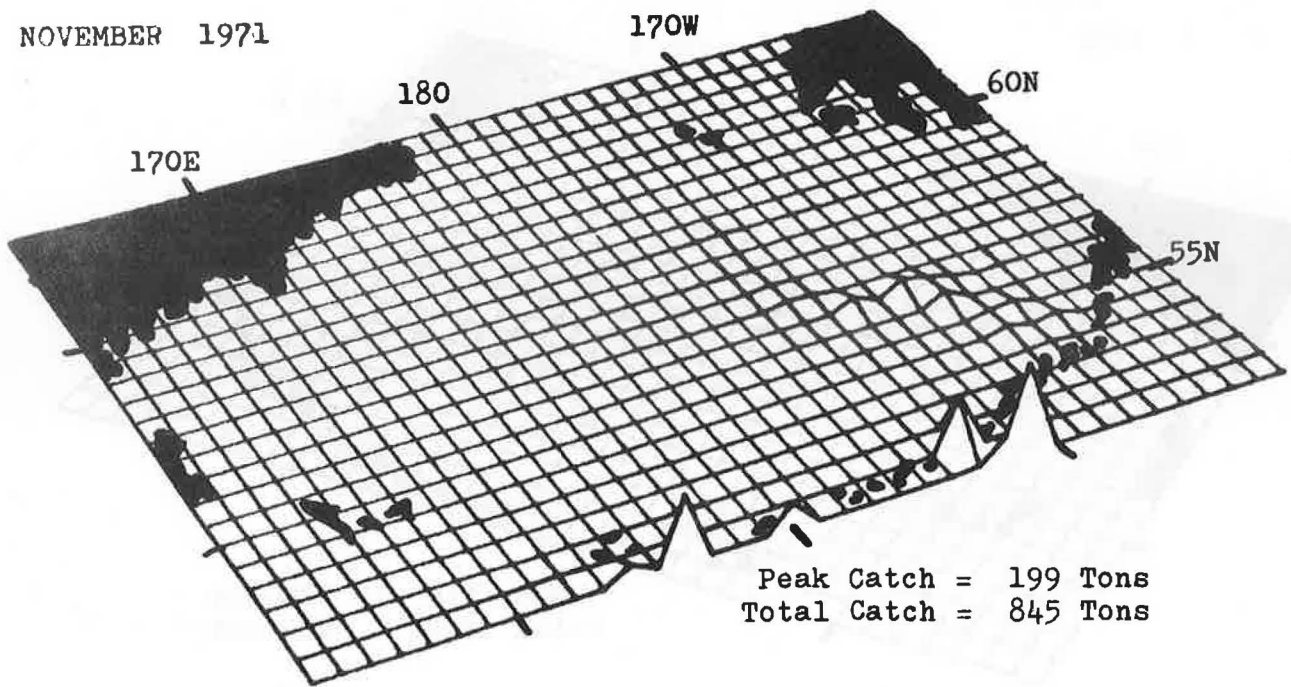


Figure 55. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea November and December, 1971.

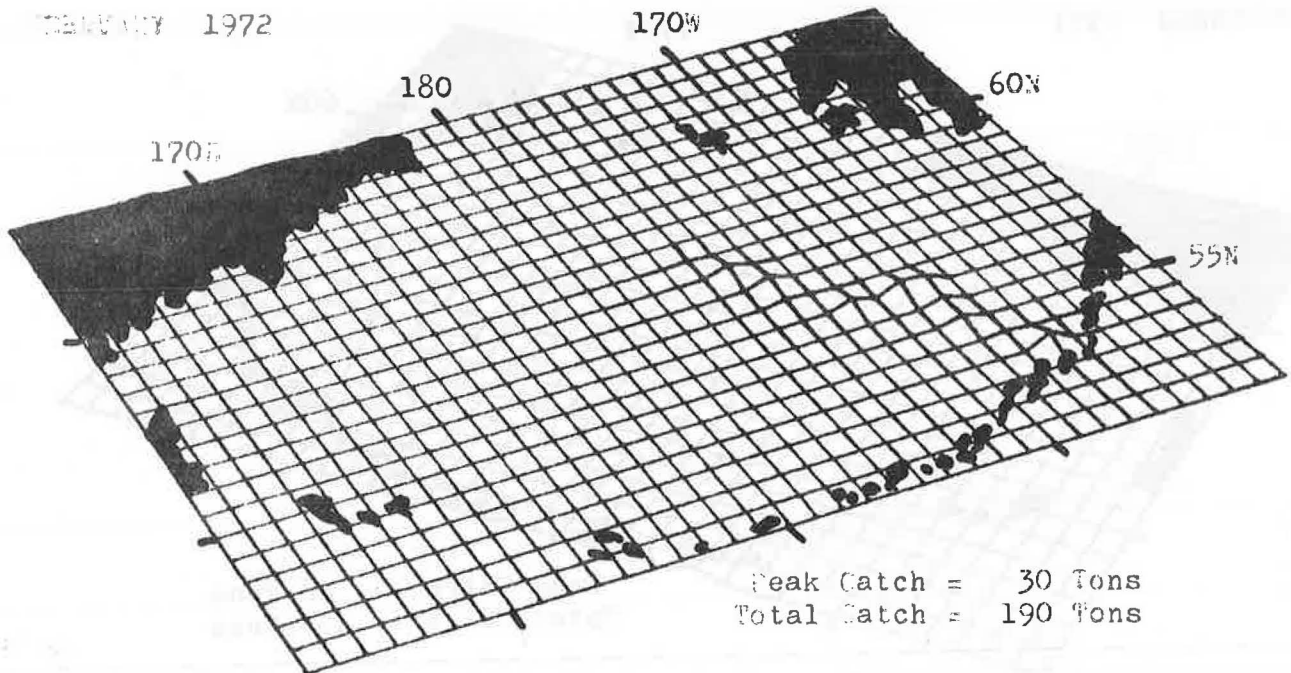
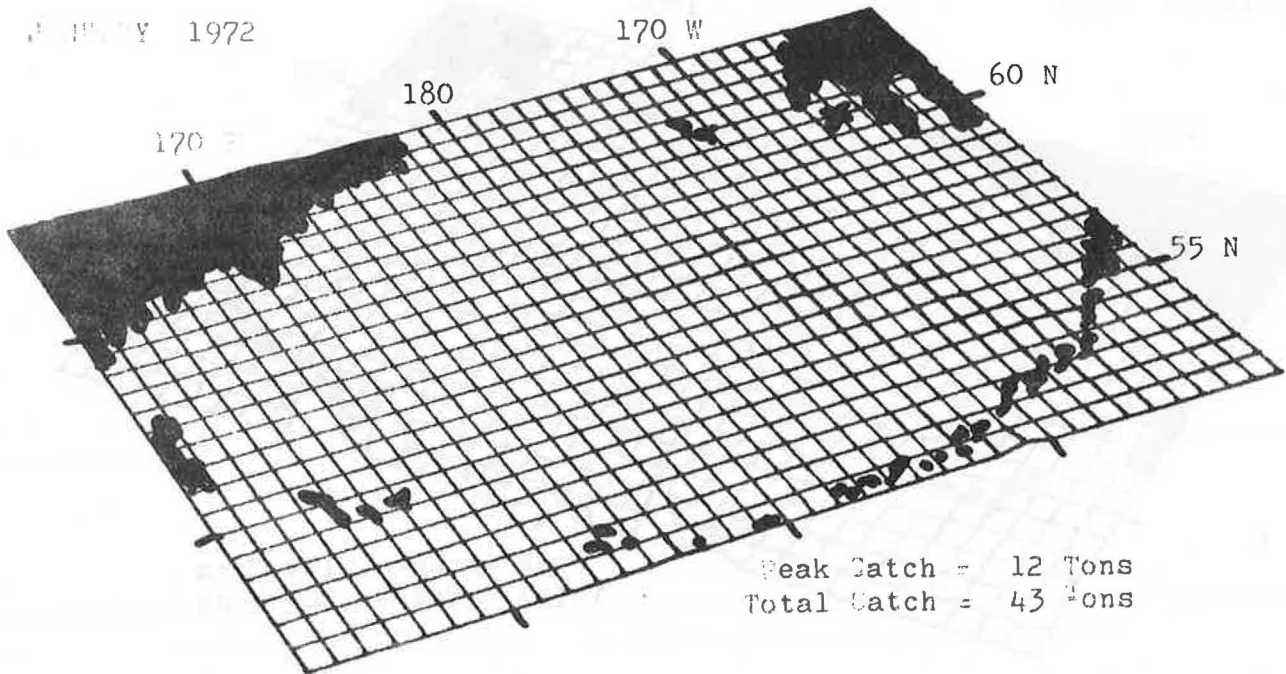
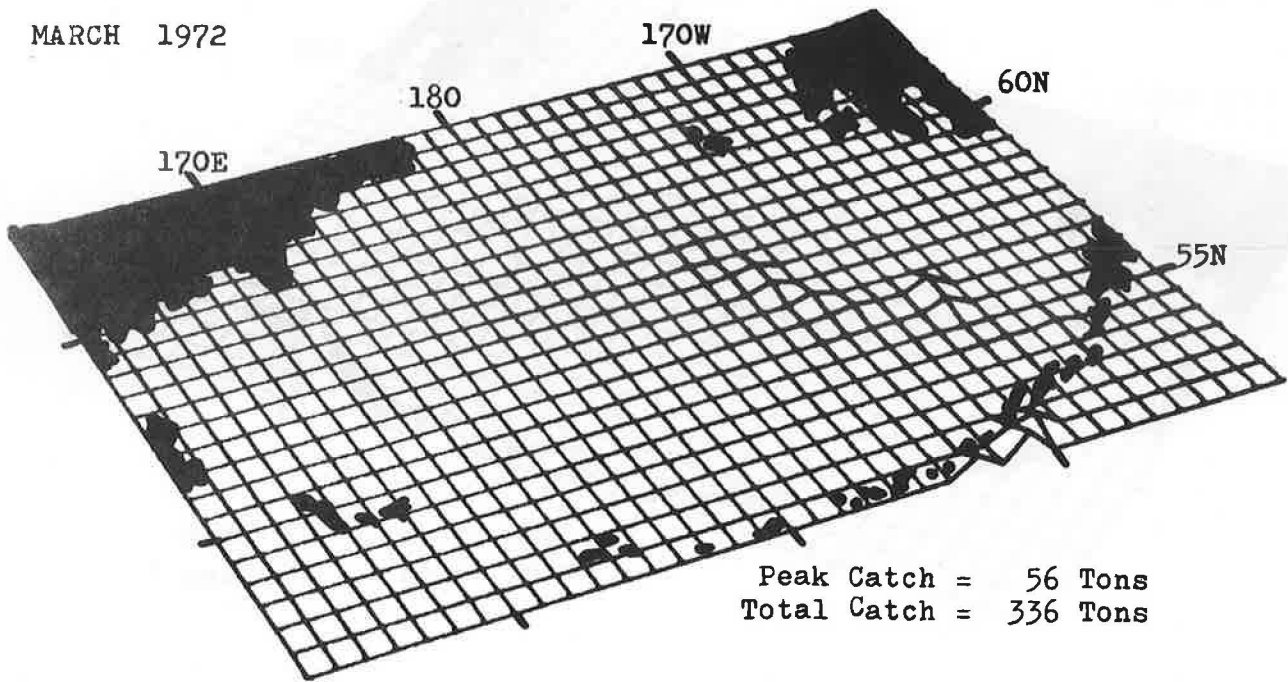


Figure 56. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea January and February, 1972.

MARCH 1972



APRIL 1972

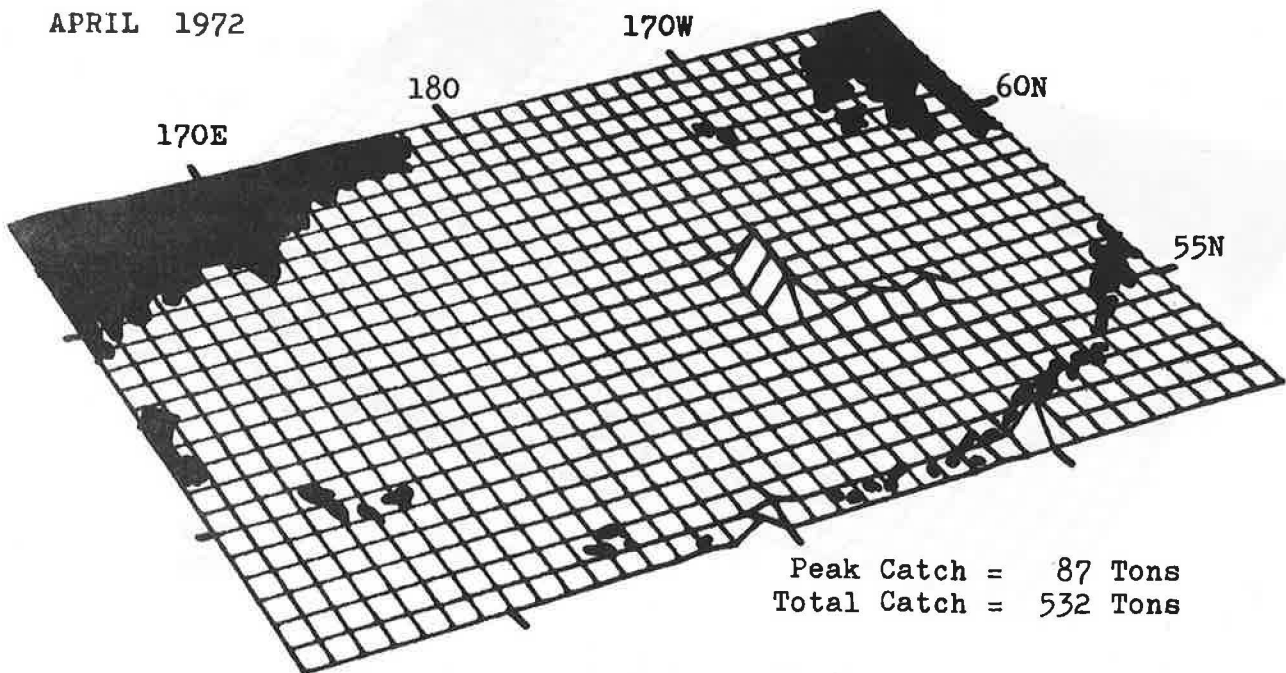


Figure 57. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea March and April, 1972.

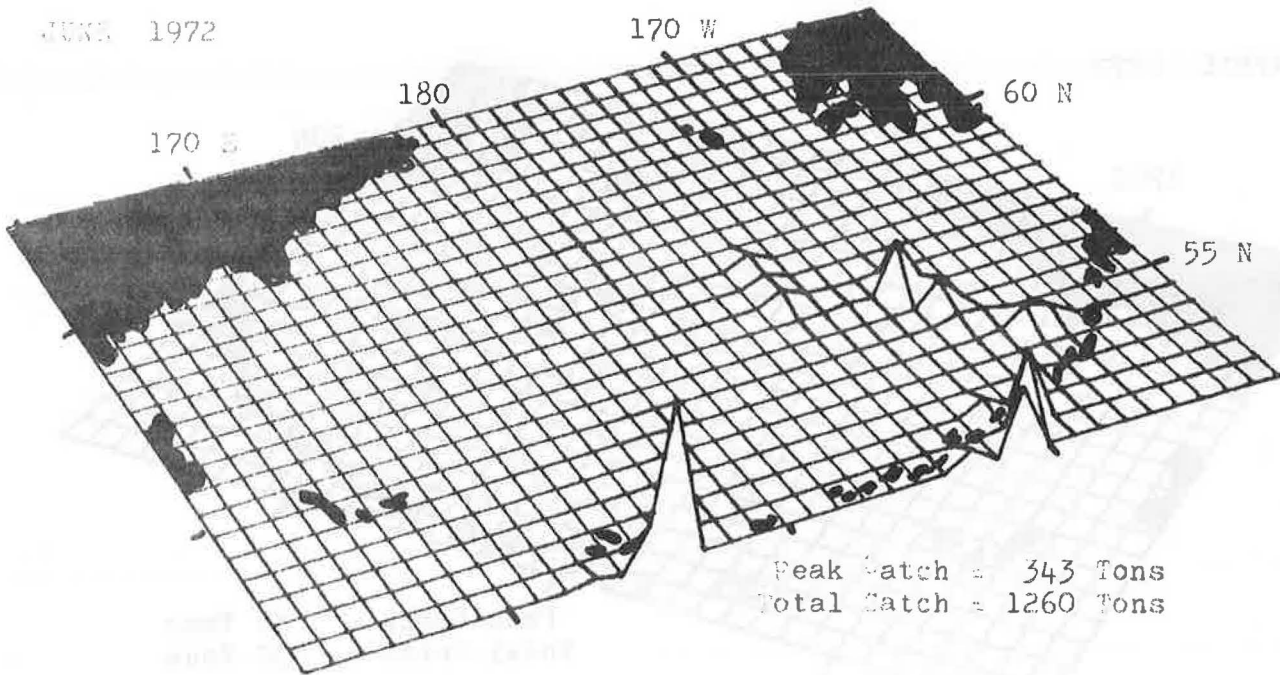
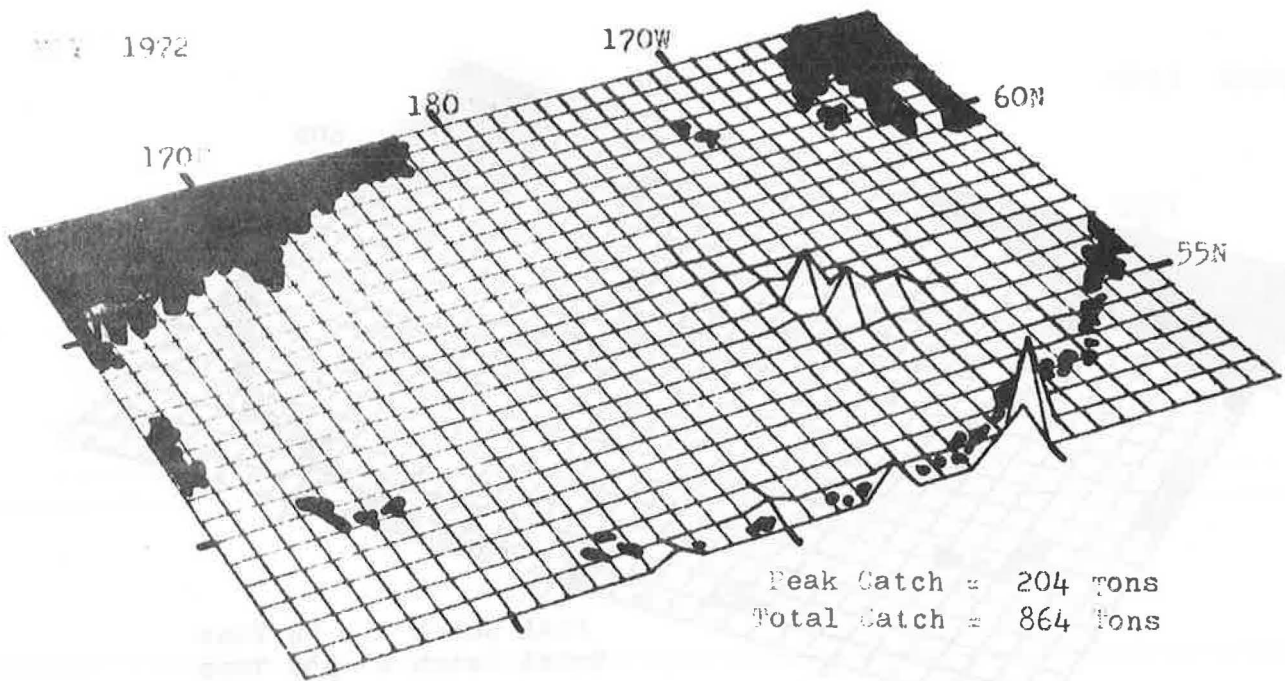


Figure 58. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea May and June, 1972.

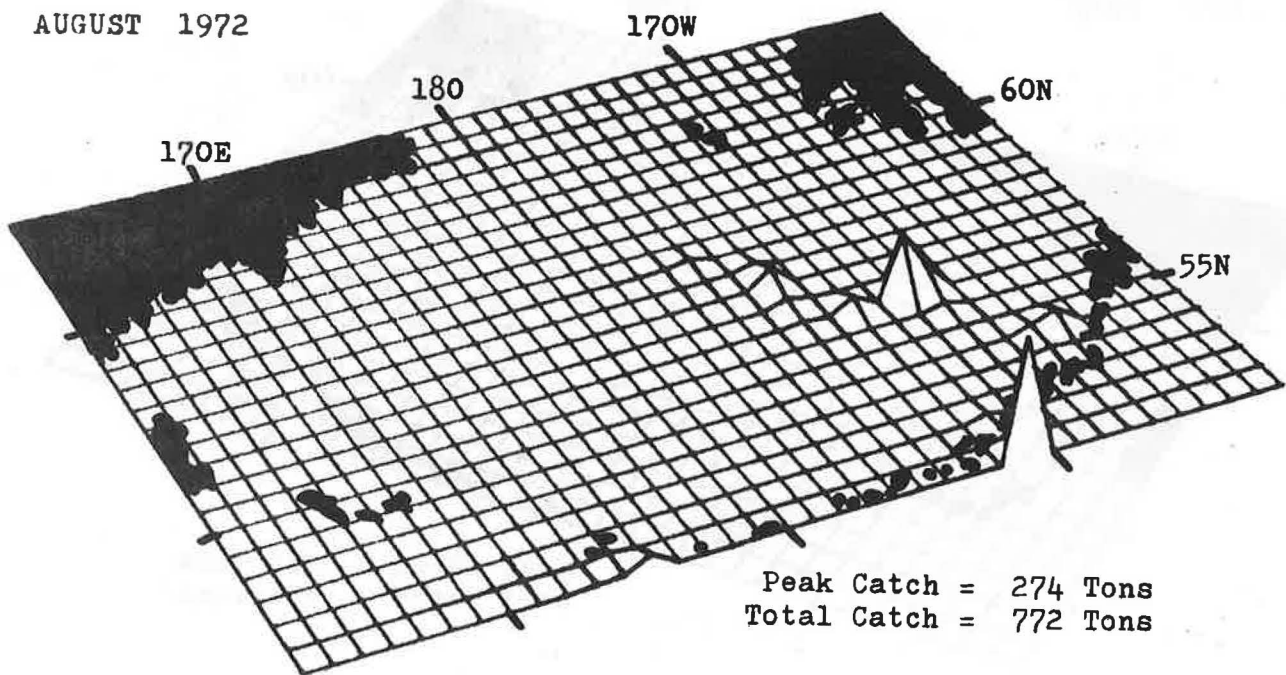
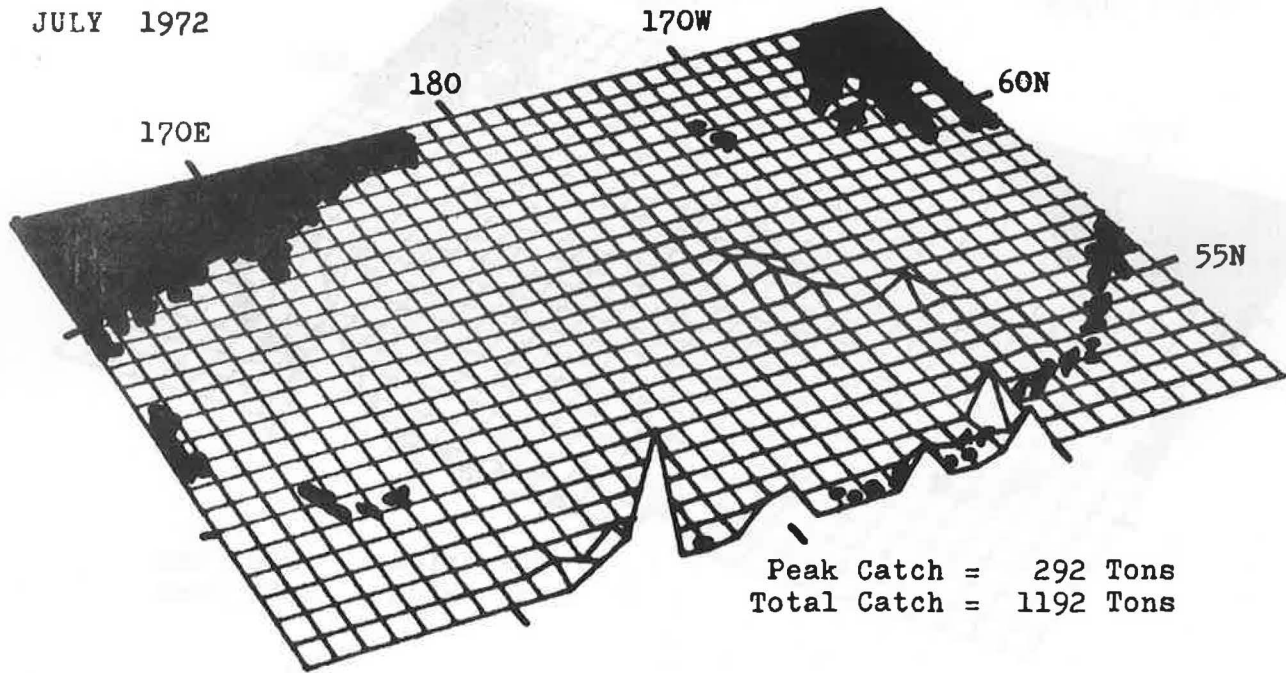


Figure 59. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea July and August, 1972.

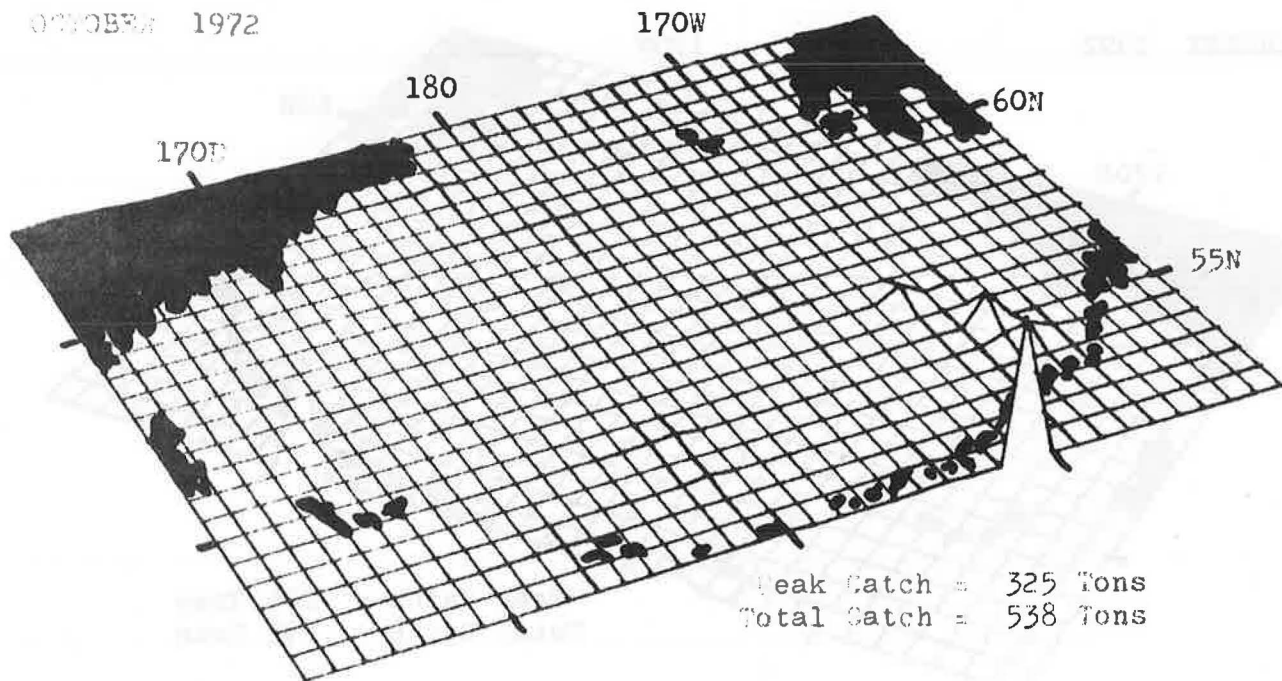
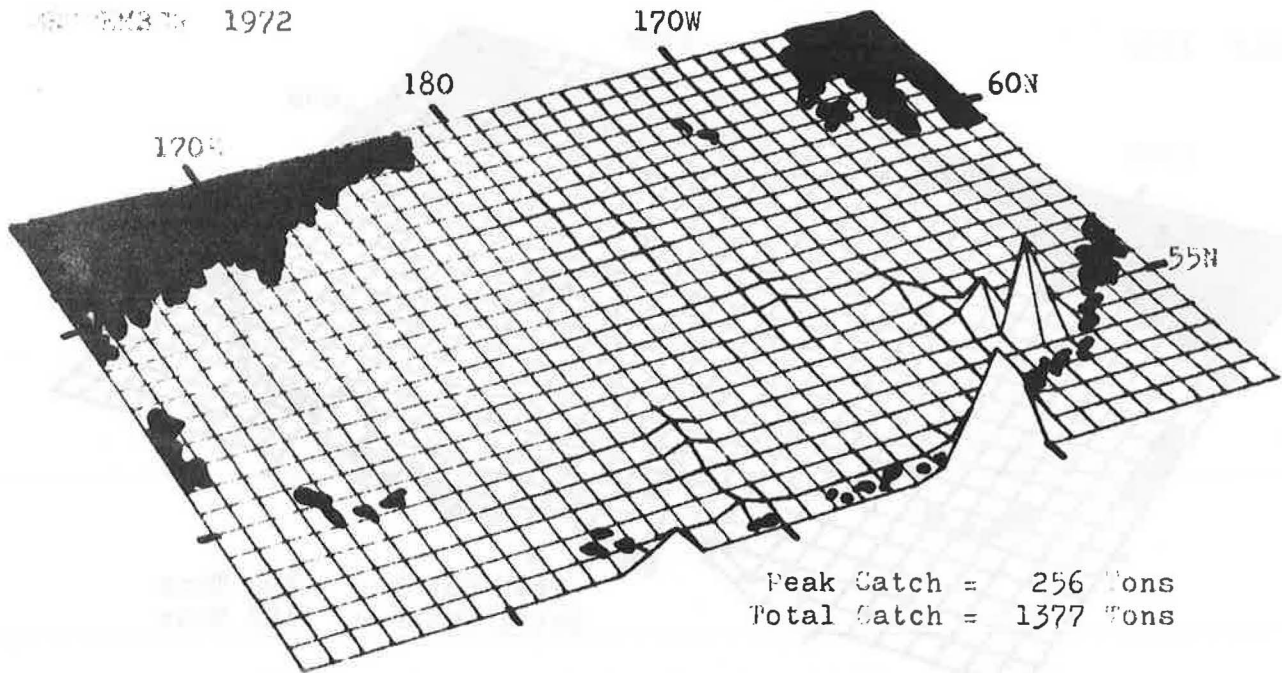


Figure 60. Geographical distribution of Pacific Ocean perch catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea September and October, 1972.

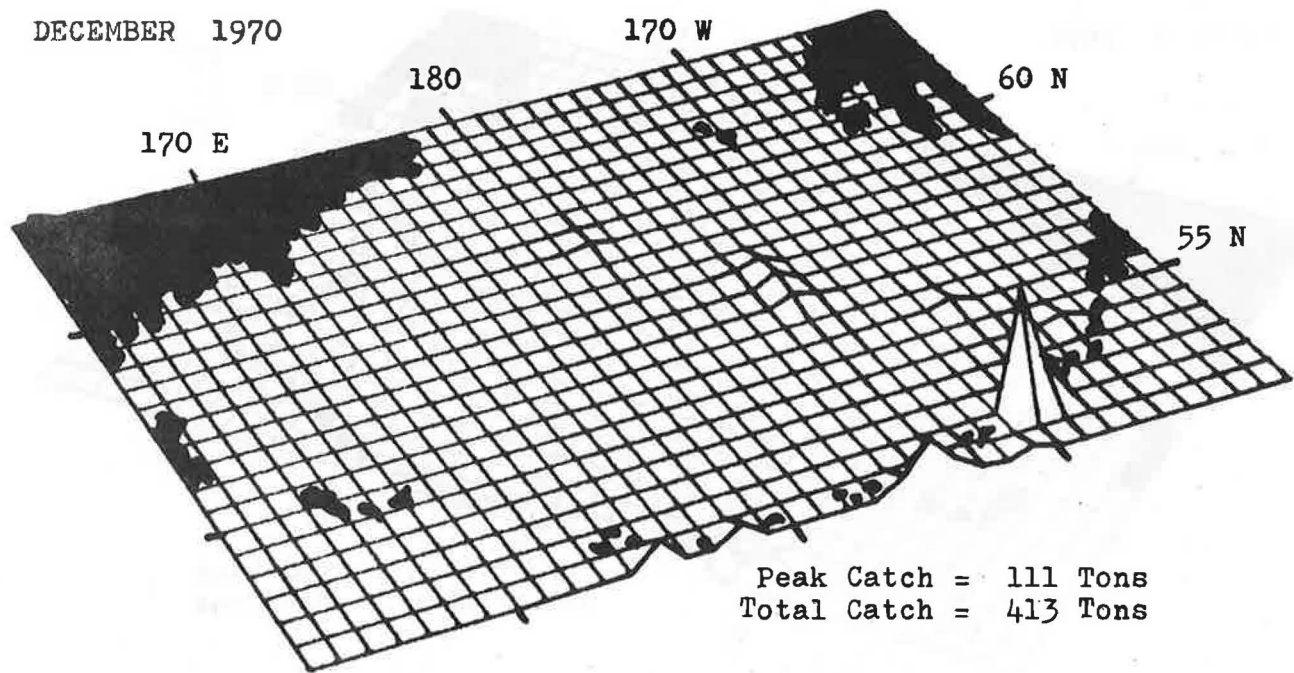
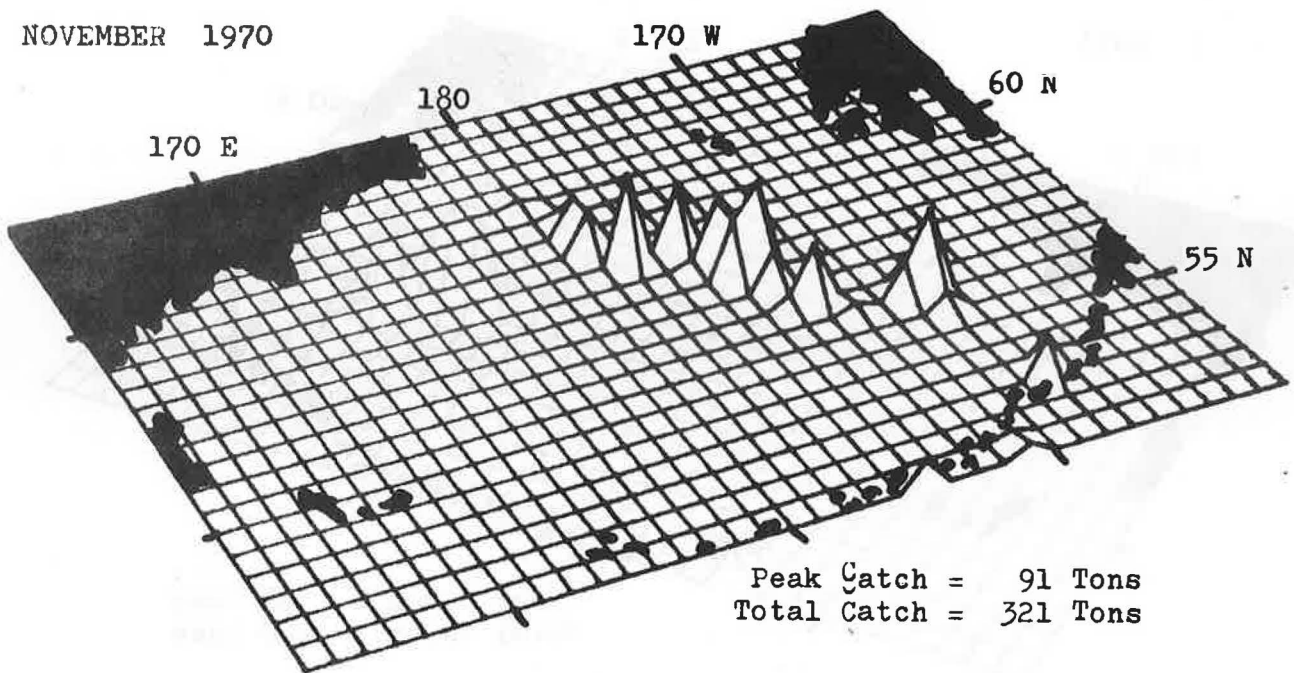


Figure 61. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in November and December, 1970.

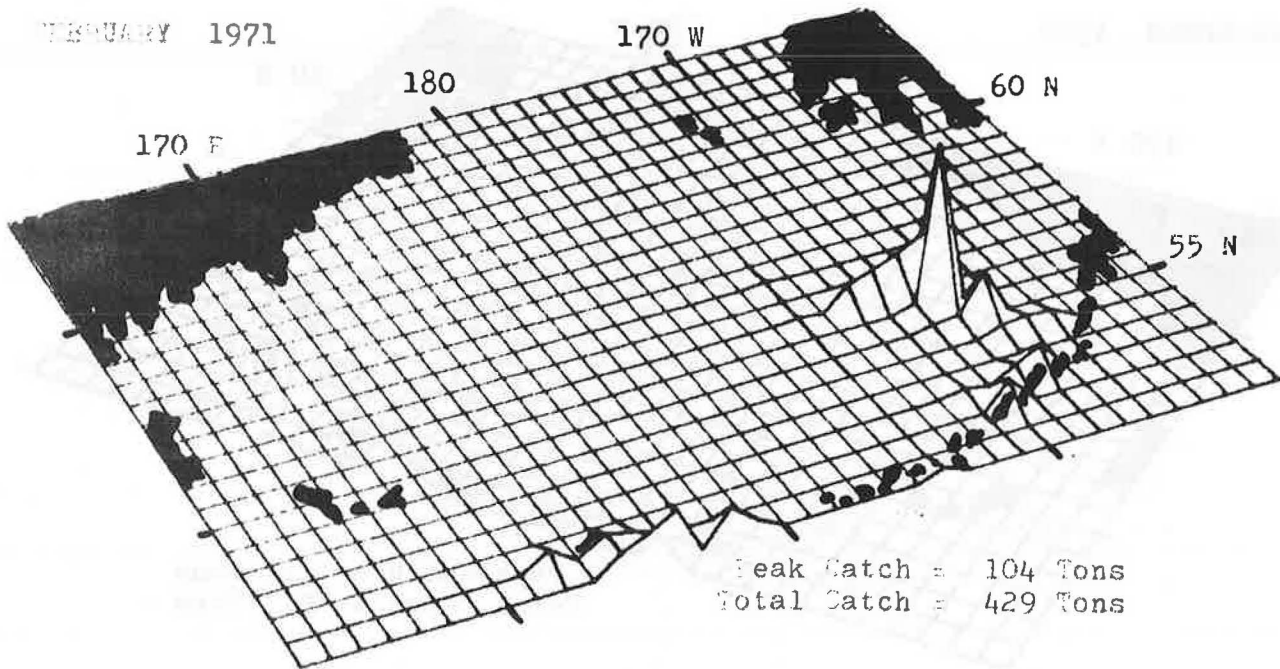
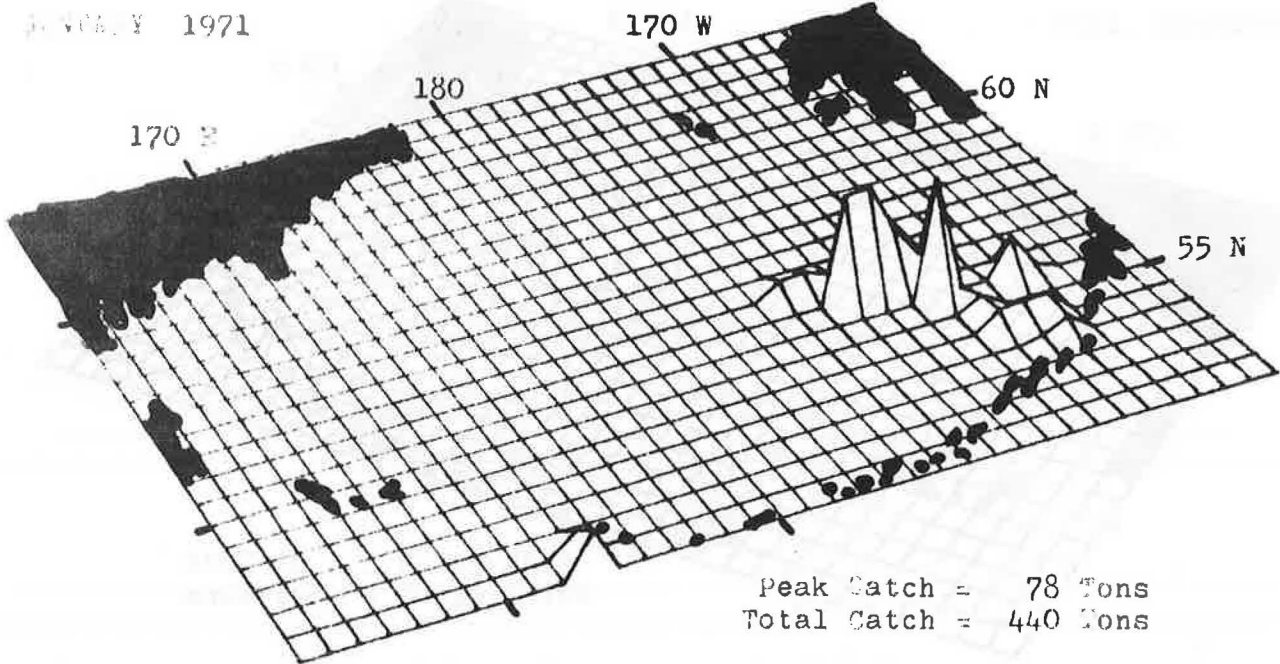
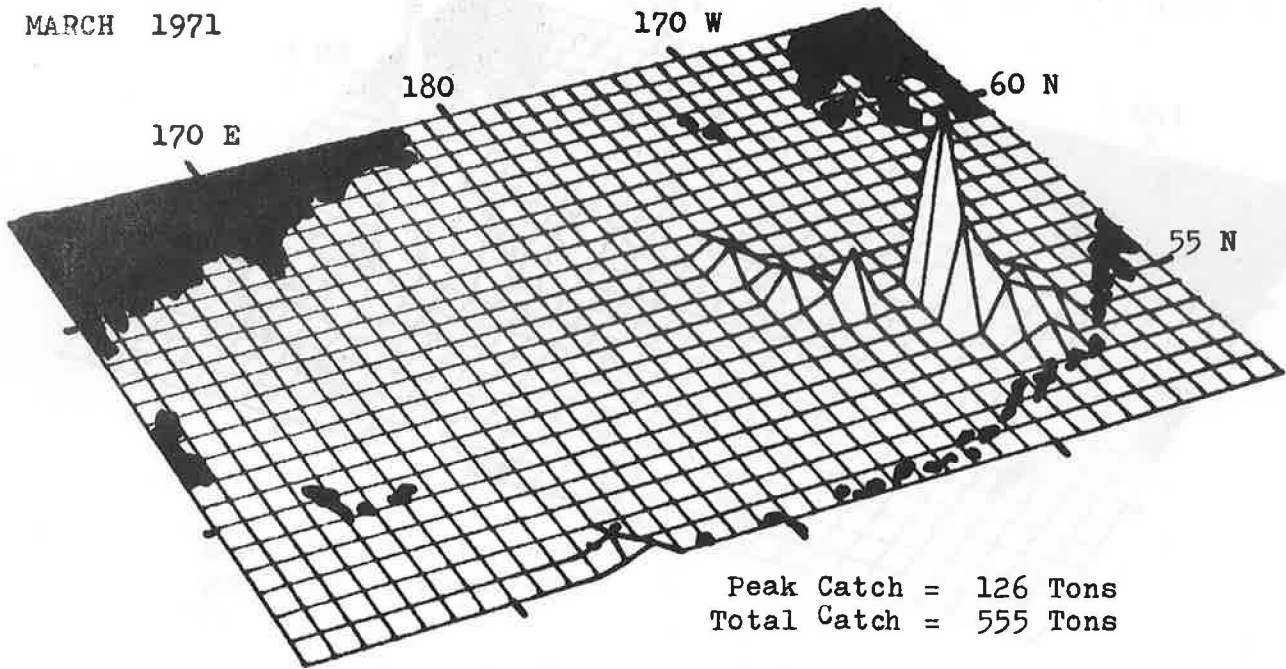


Figure 62. Geographical distribution of black cod catch by Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in January and February, 1971.

MARCH 1971



APRIL 1971

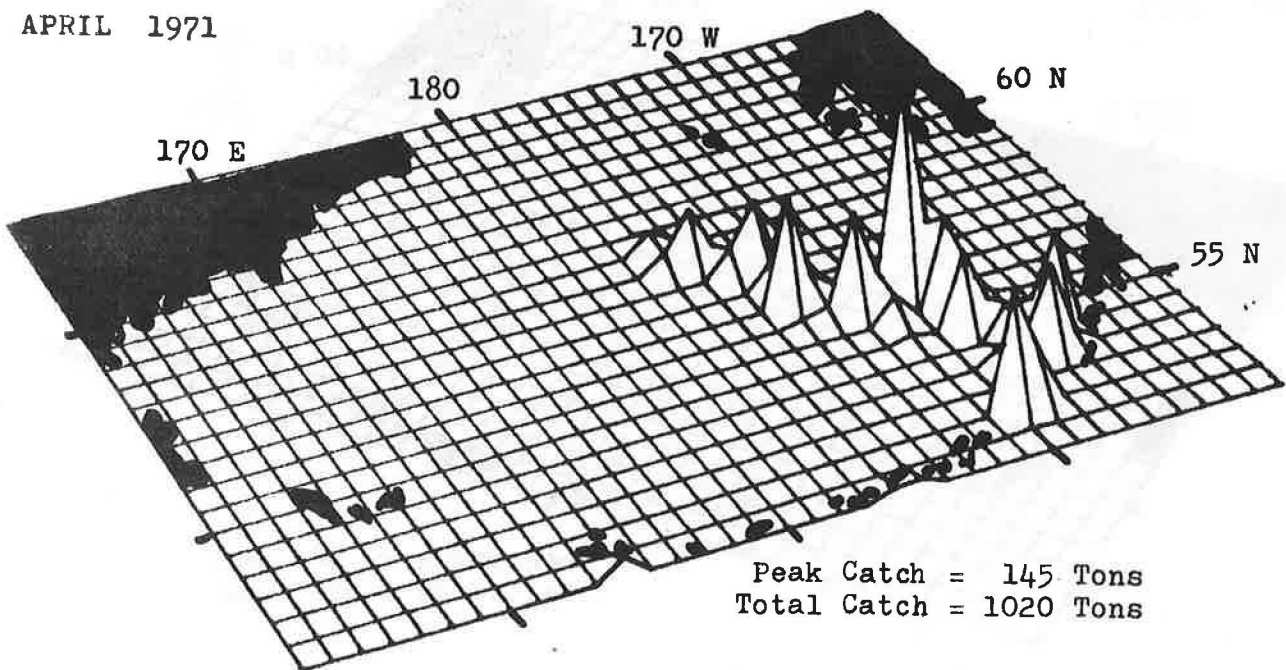


Figure 63. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in March and April, 1971.

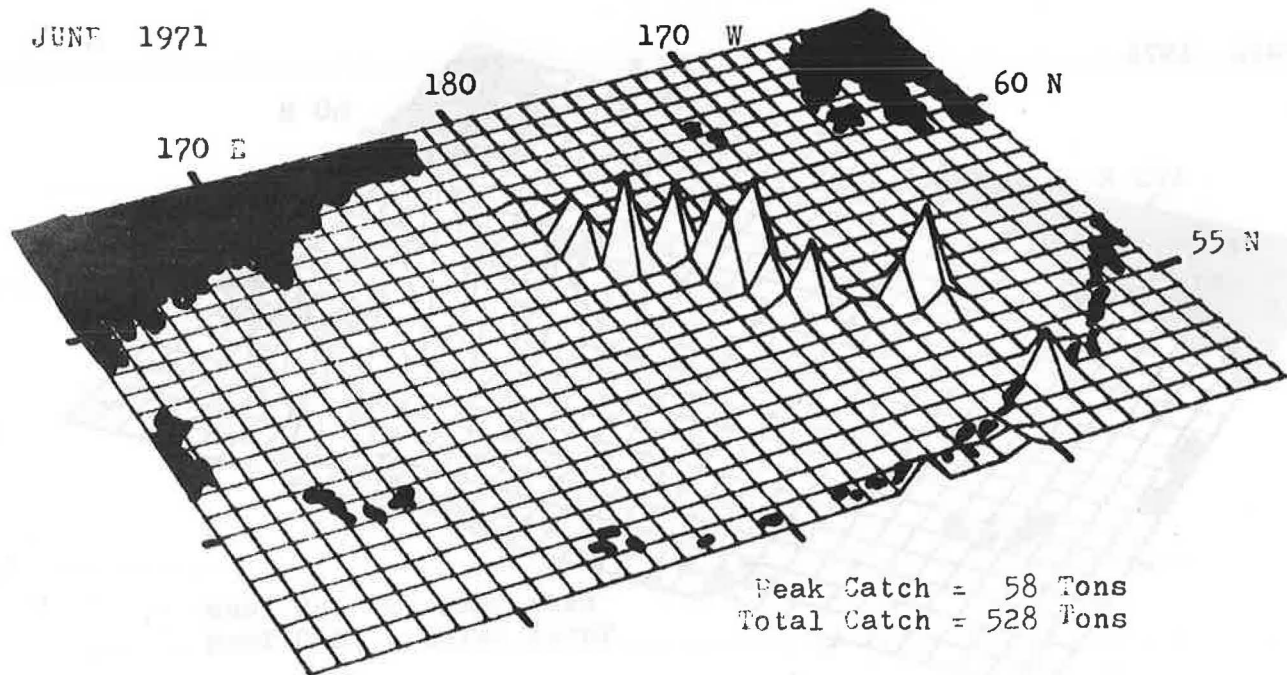
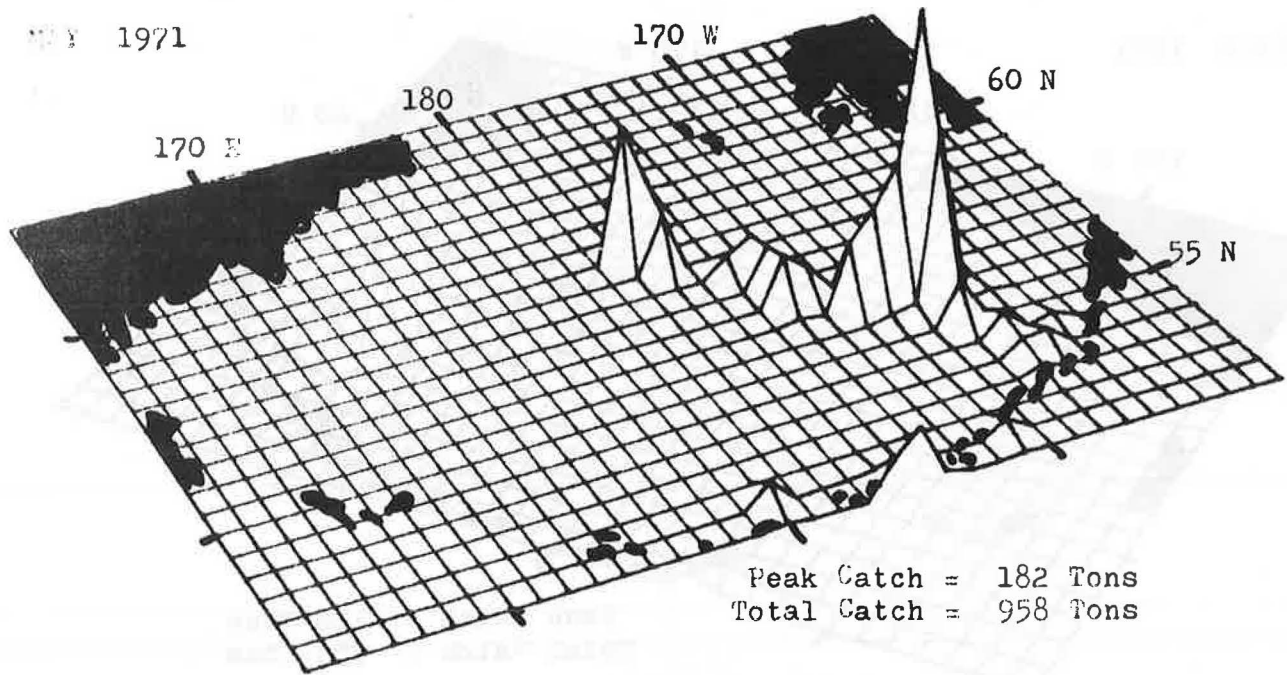


Figure 64. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in May and June, 1971.

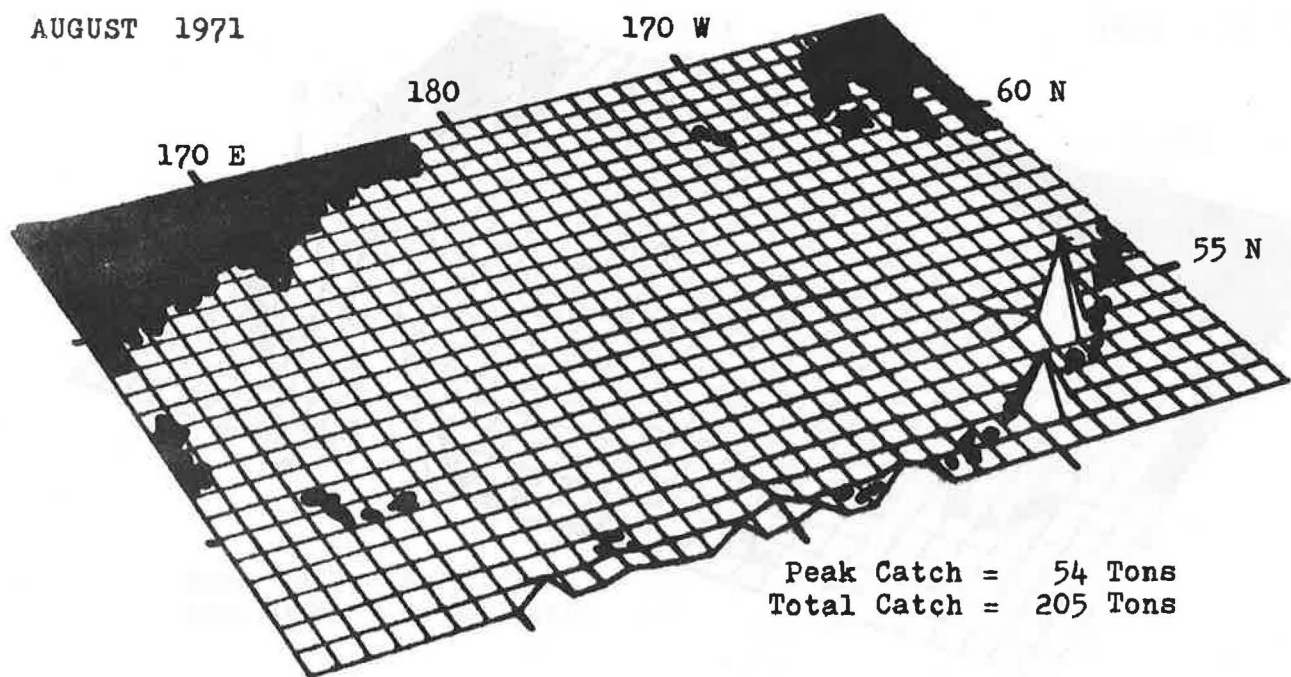
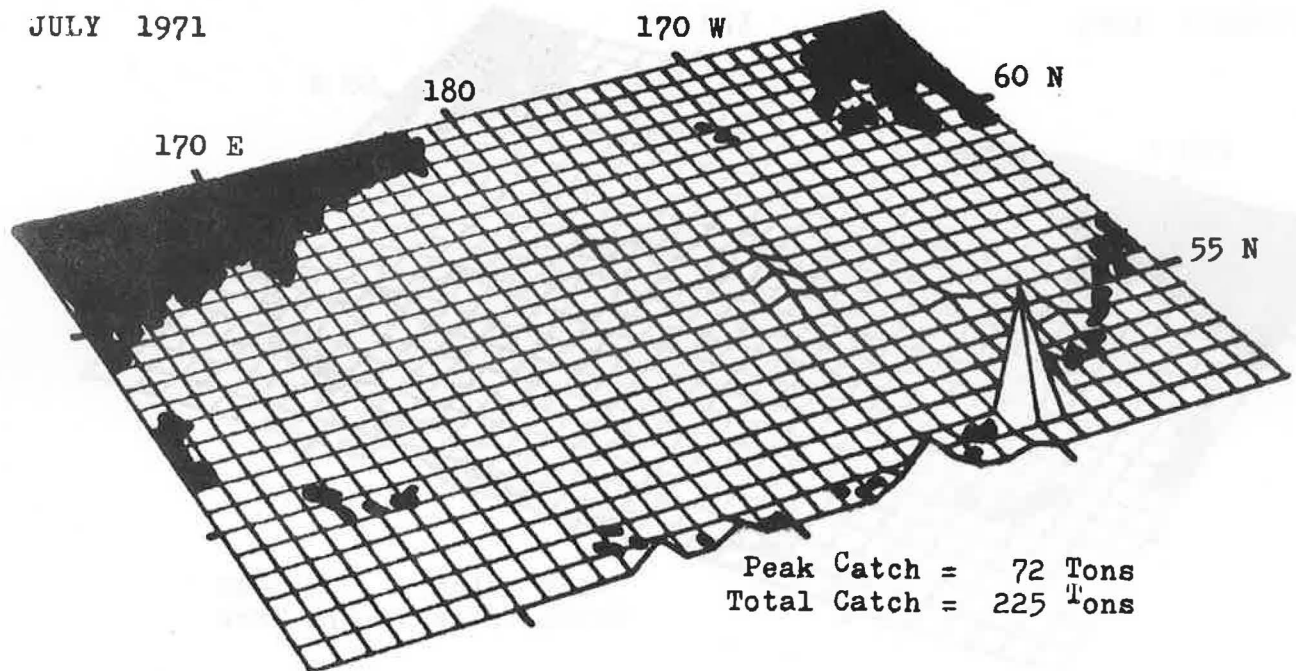


Figure 65. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in July and August, 1971.

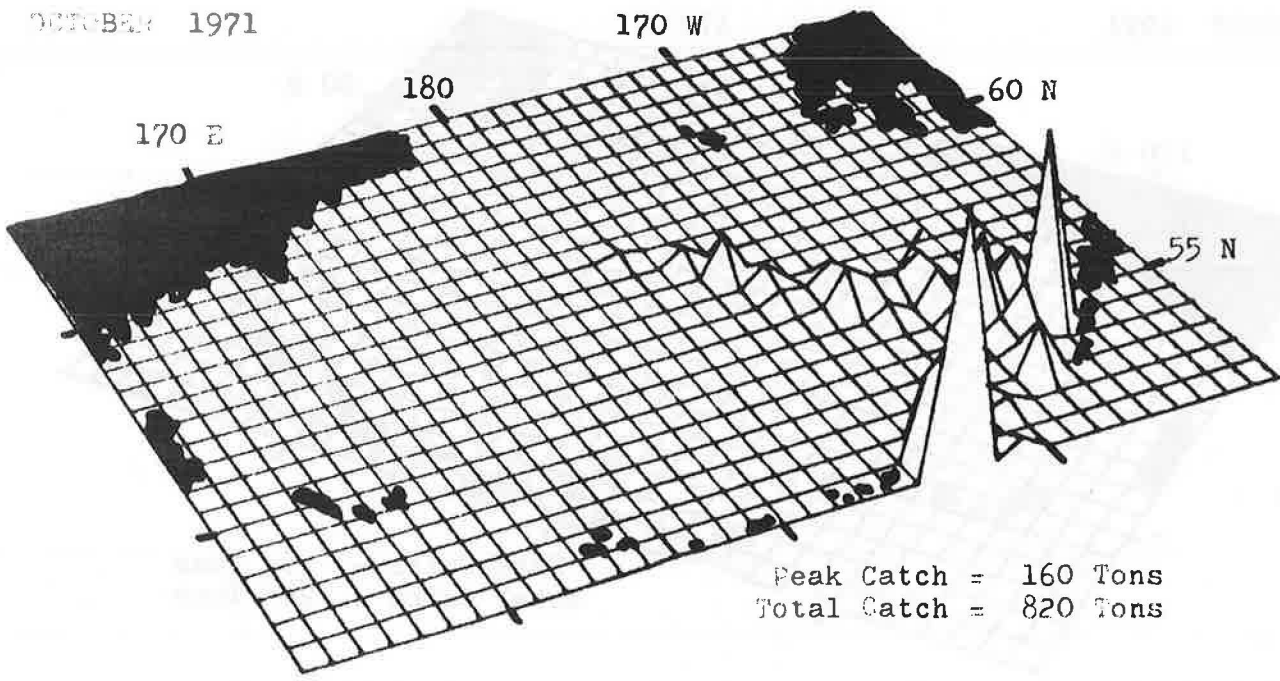
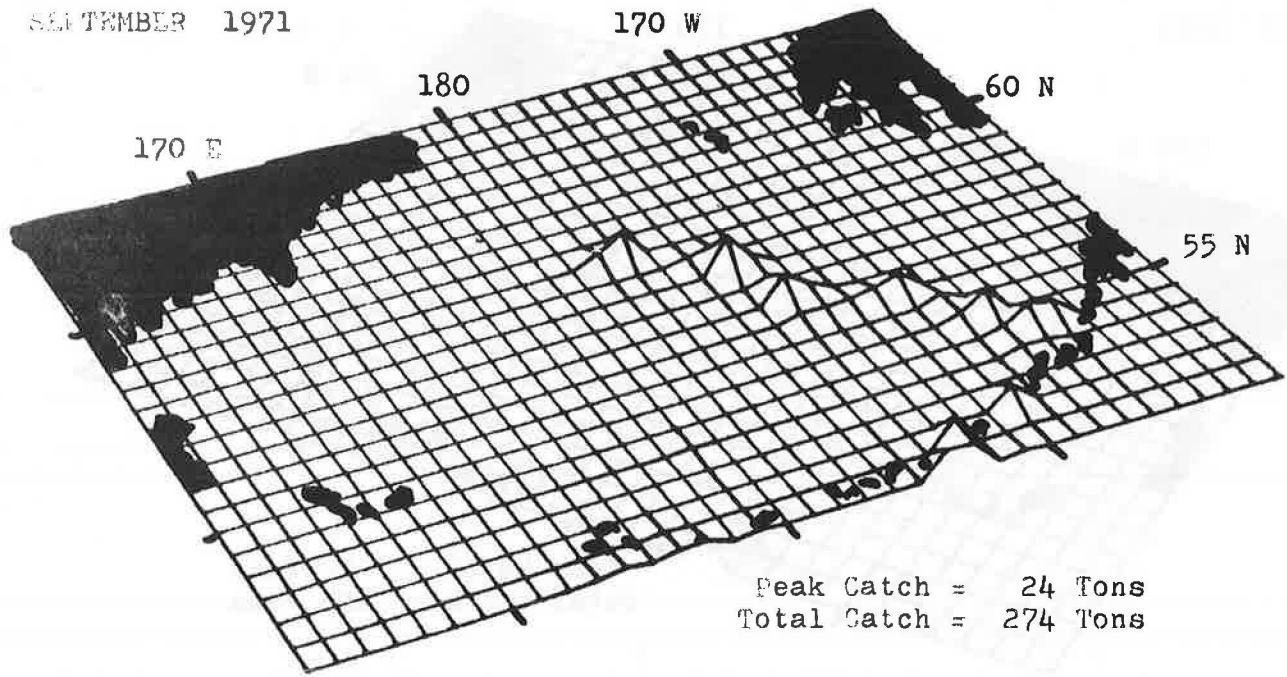


Figure 66. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in September and October, 1971.

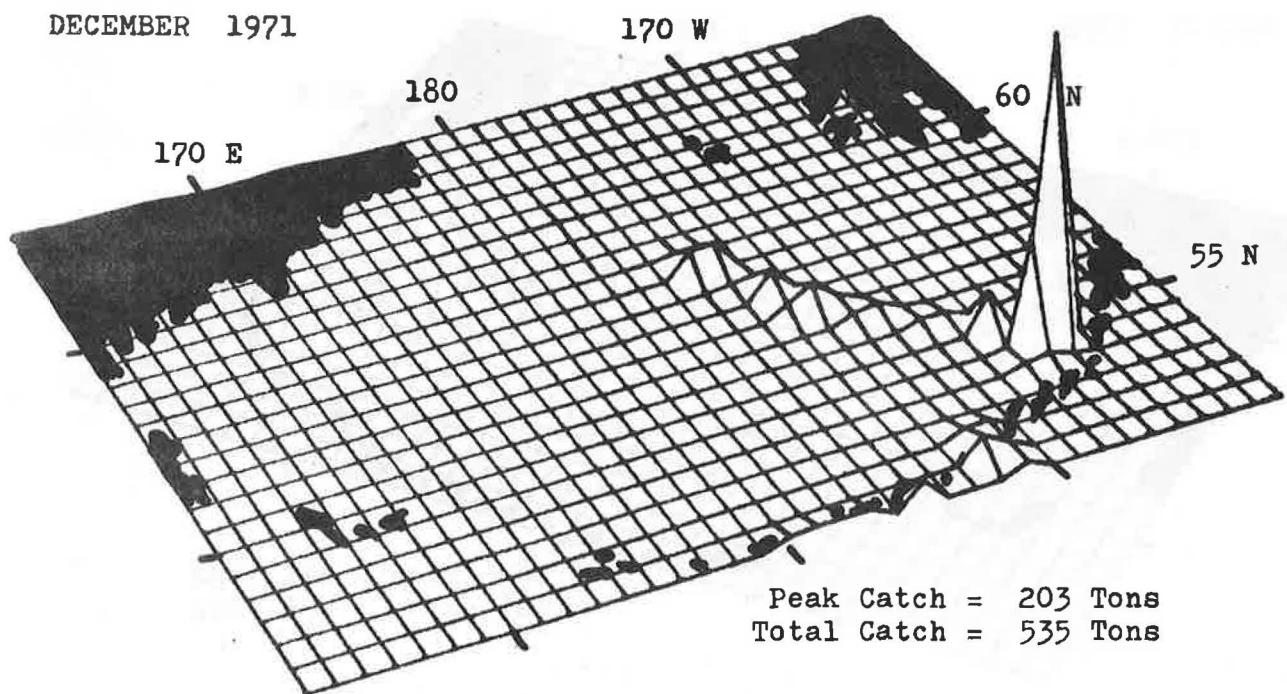
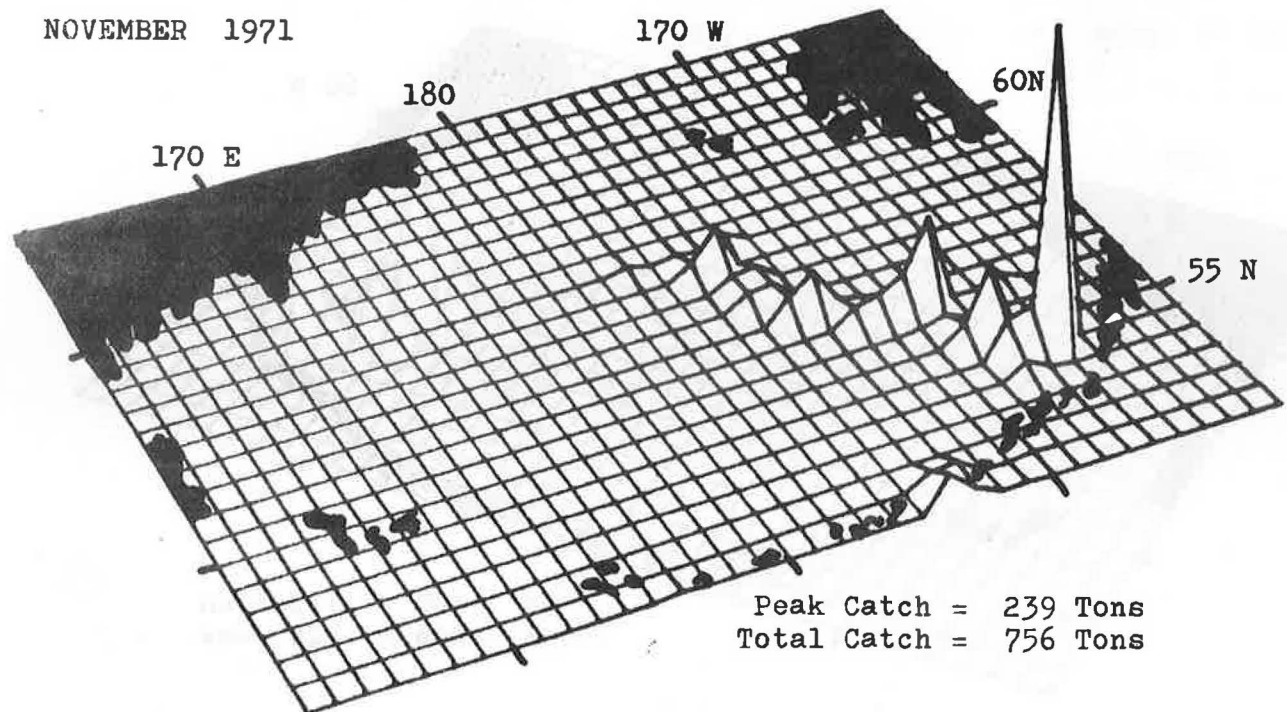


Figure 67. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea November and December, 1971.

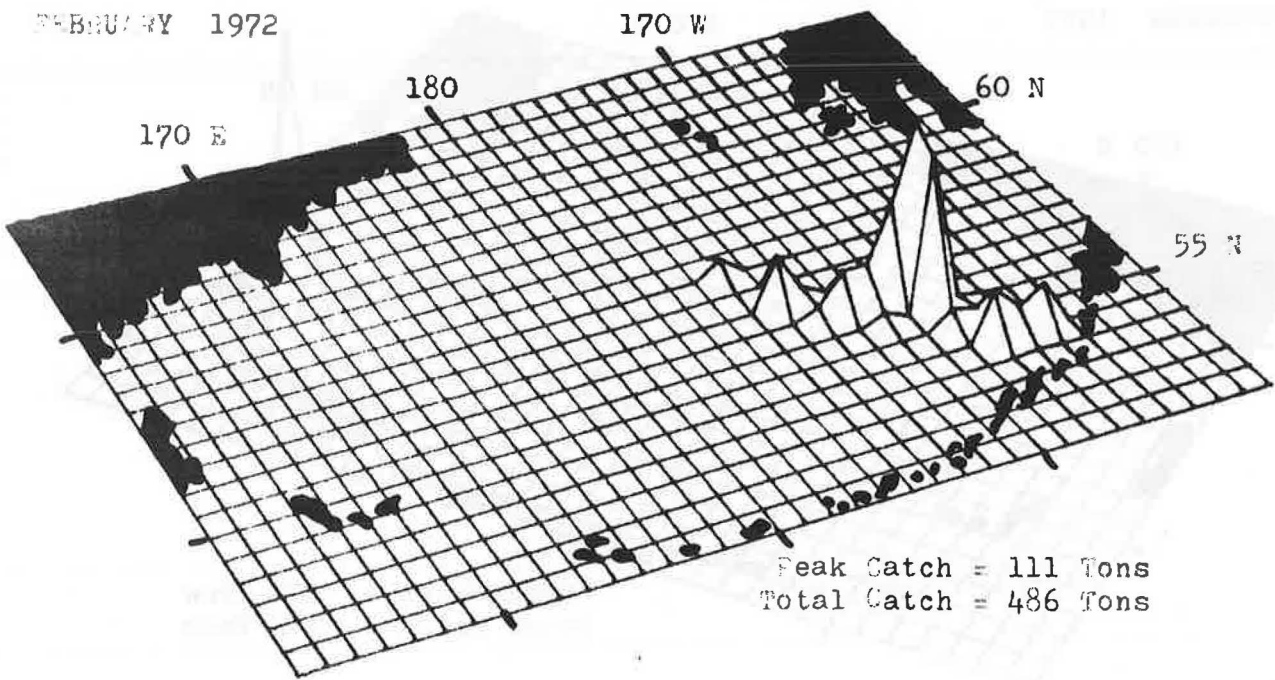
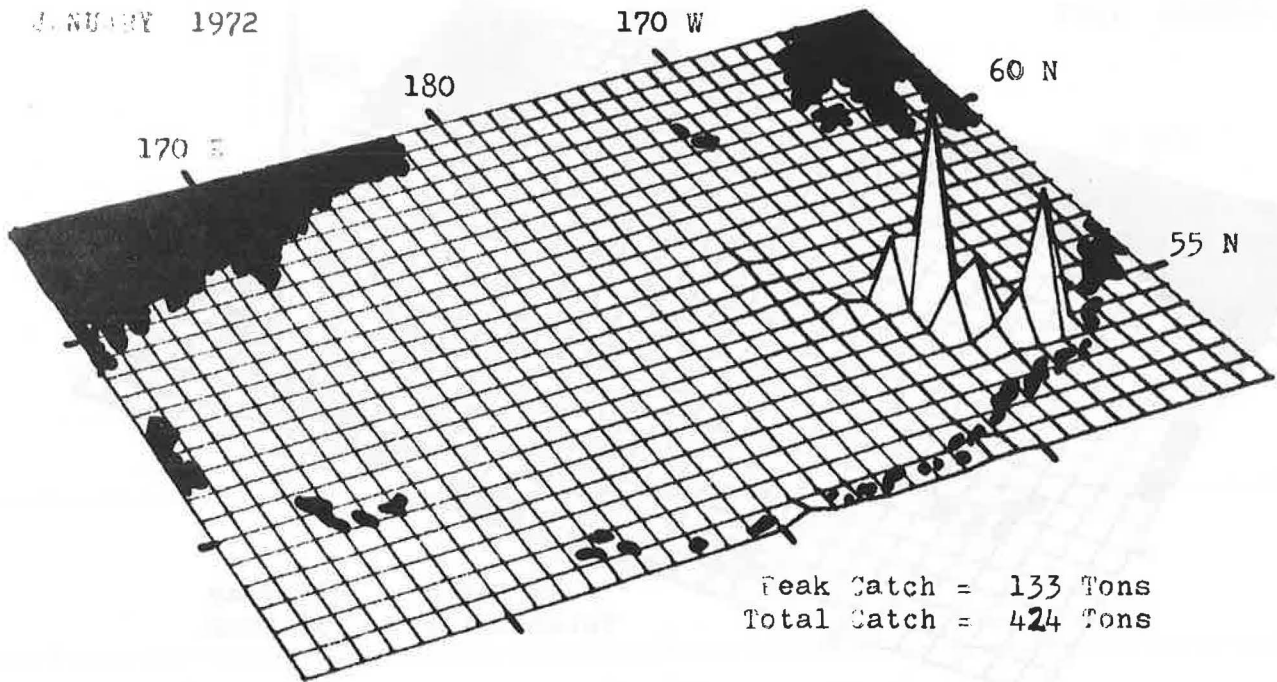


Figure 68. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea January and February, 1972.

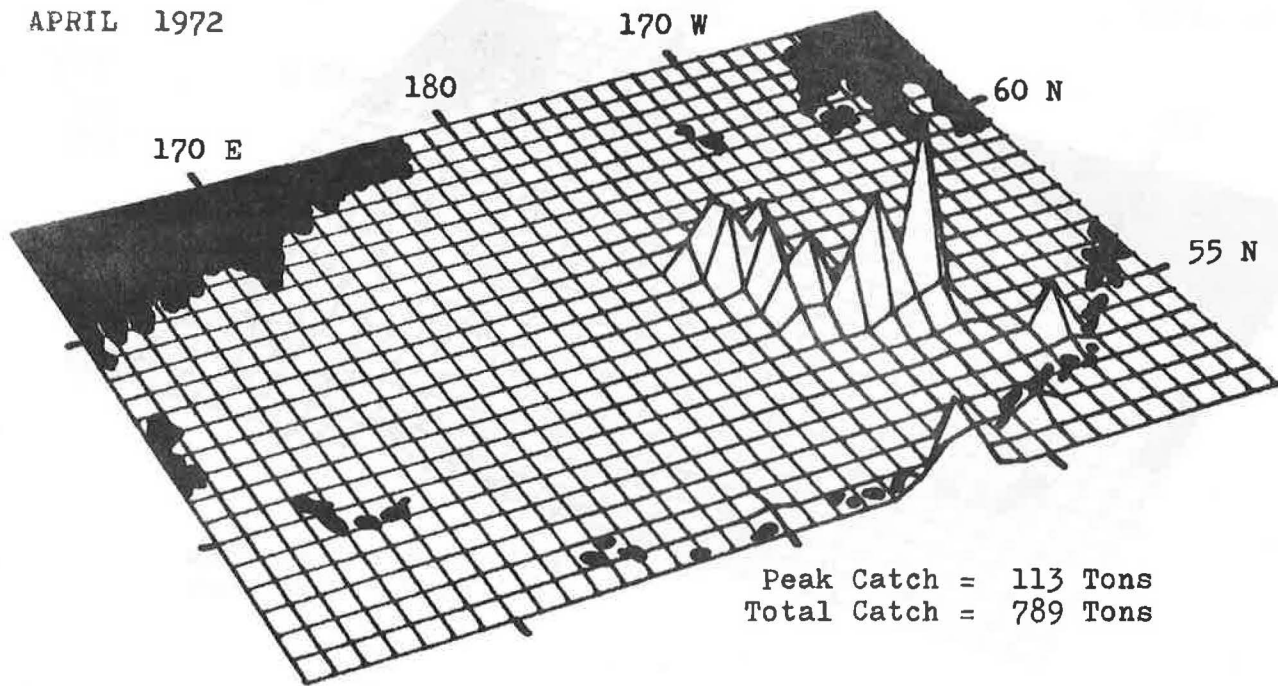
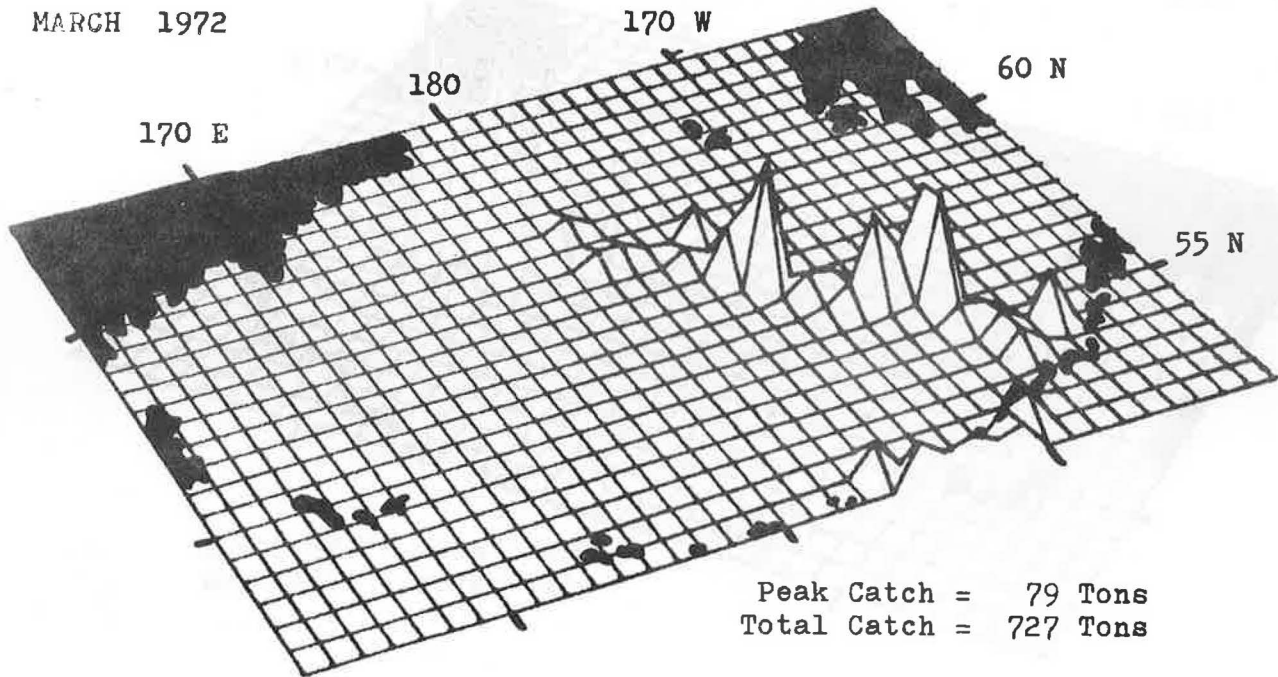
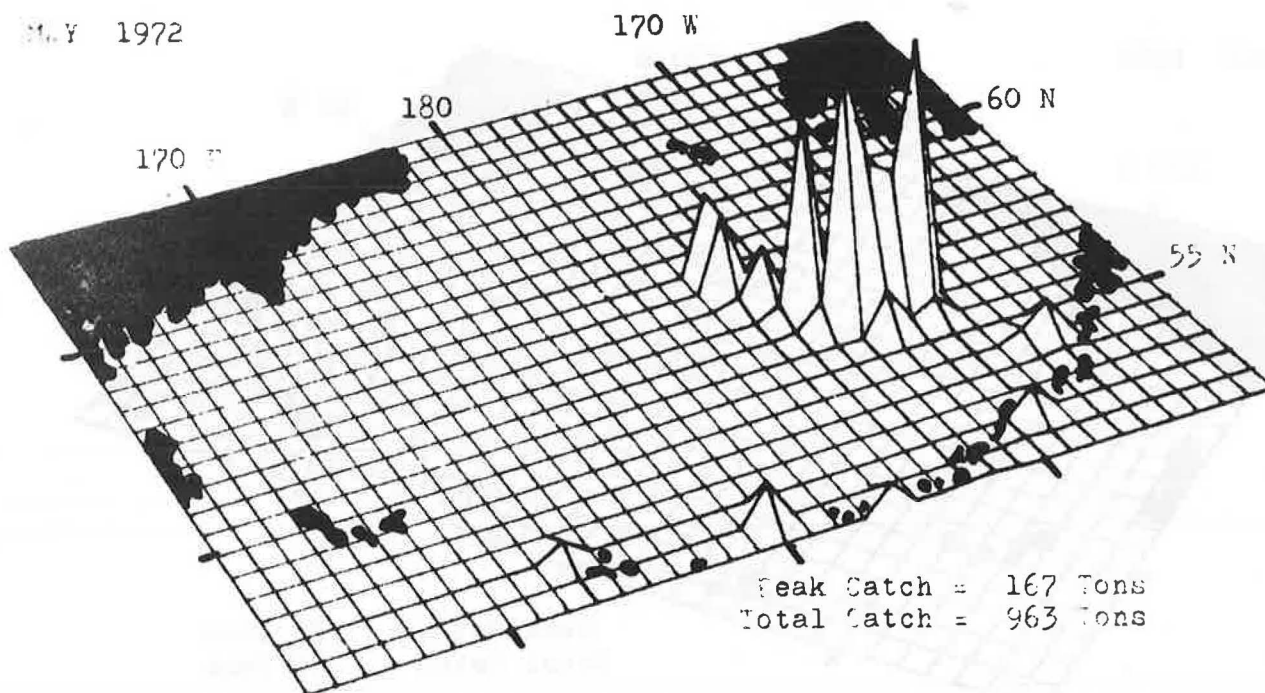


Figure 69. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea March and April, 1972.

MAY 1972



JUNE 1972

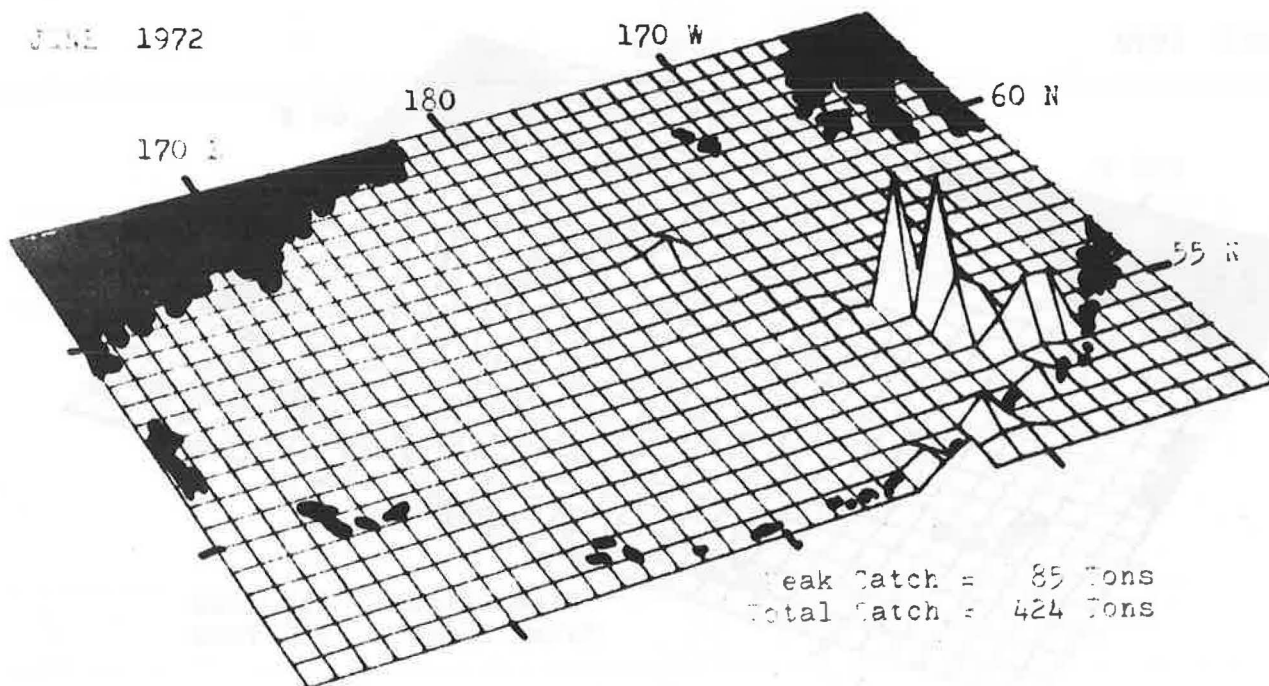
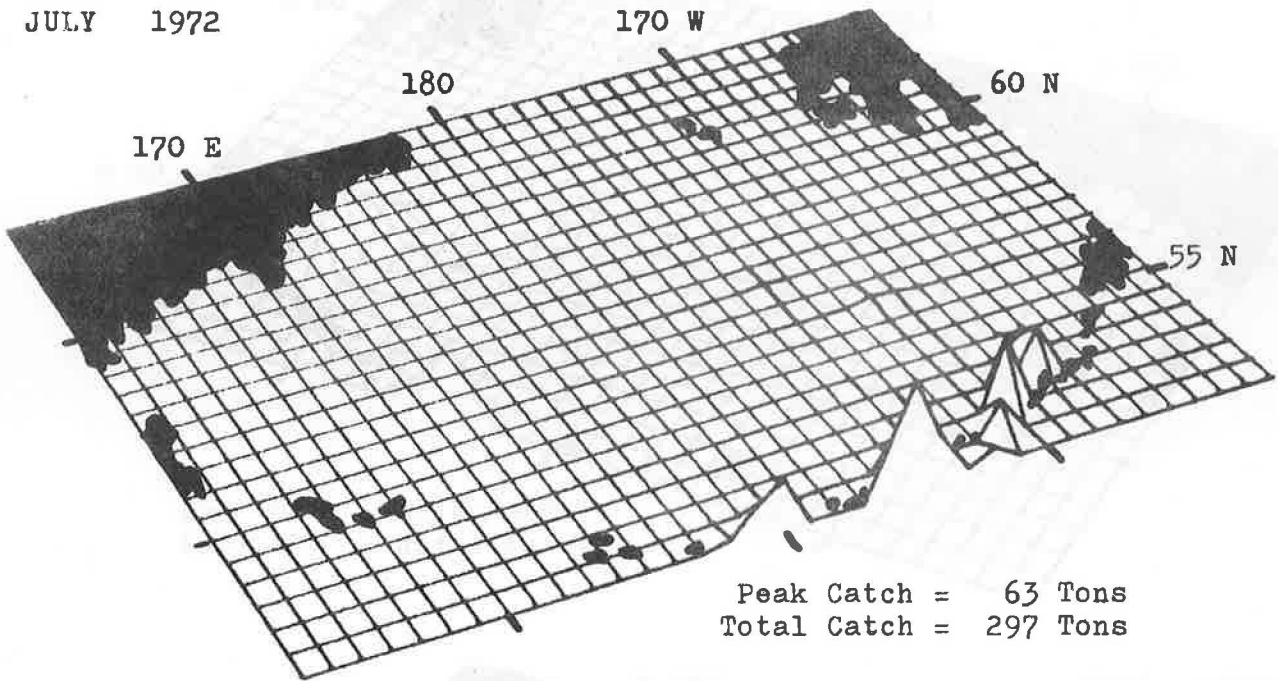


Figure 70. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea May and June, 1972.

JULY 1972



AUGUST 1972

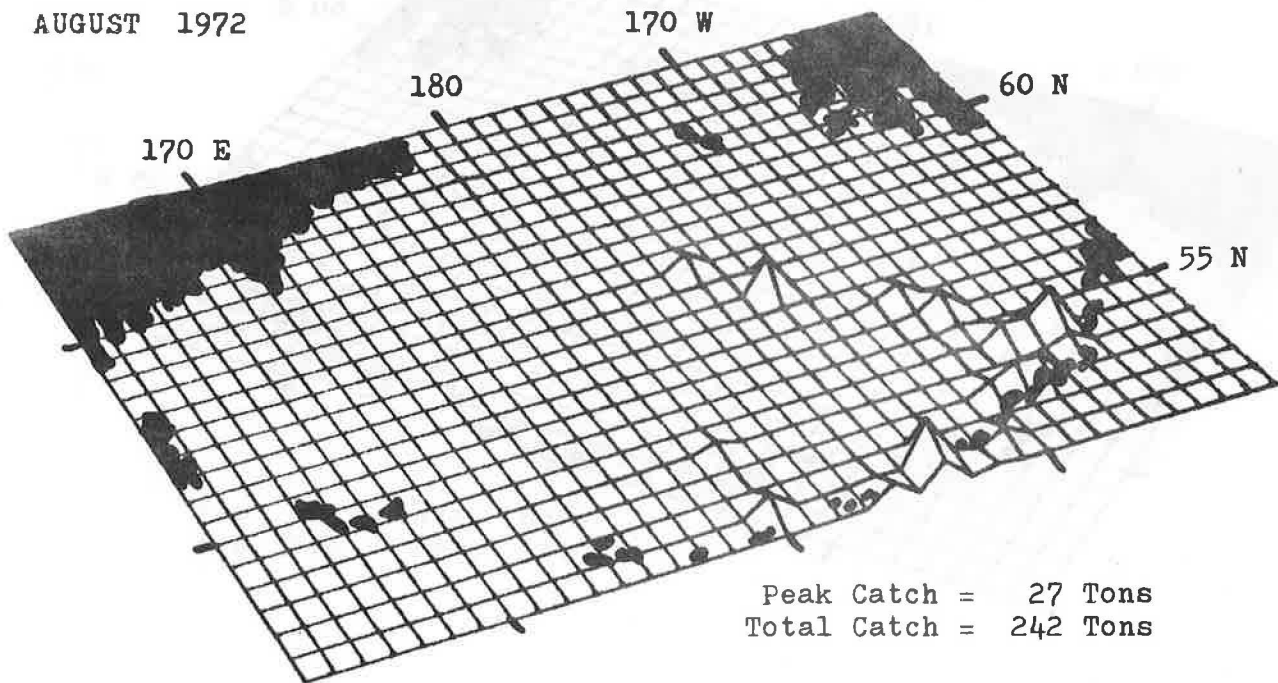
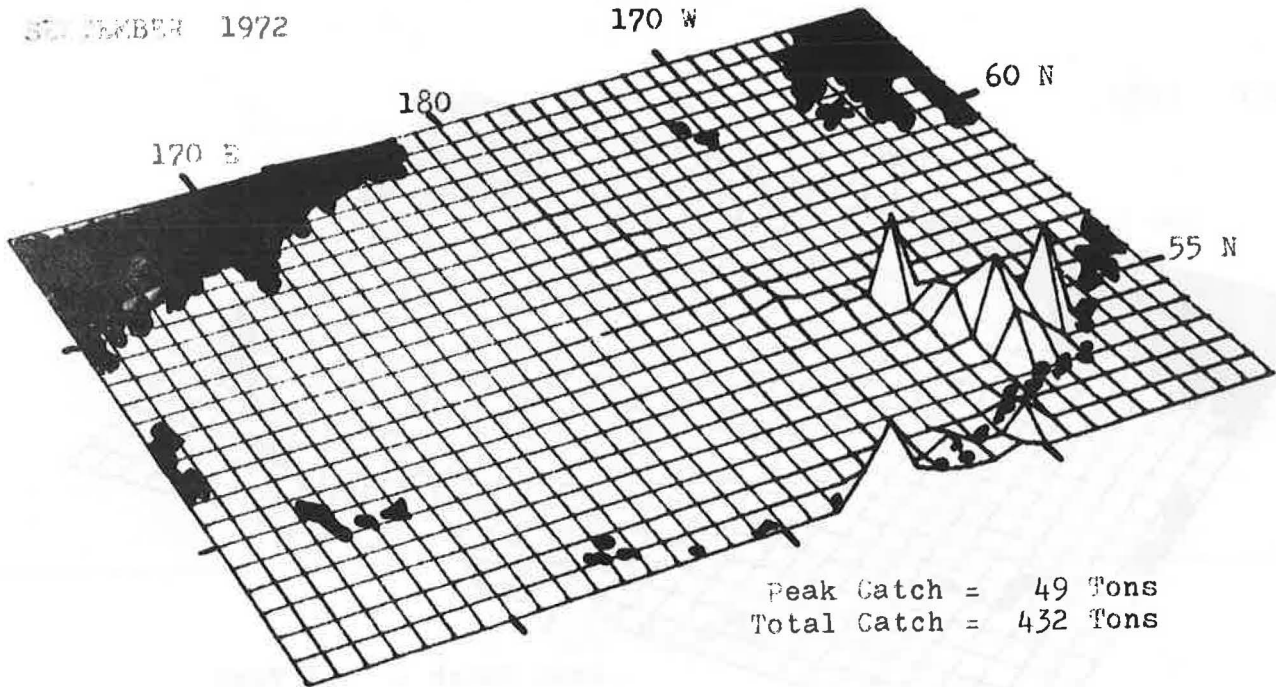


Figure 71. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea July and August, 1972.

SEPTEMBER 1972



OCTOBER 1972

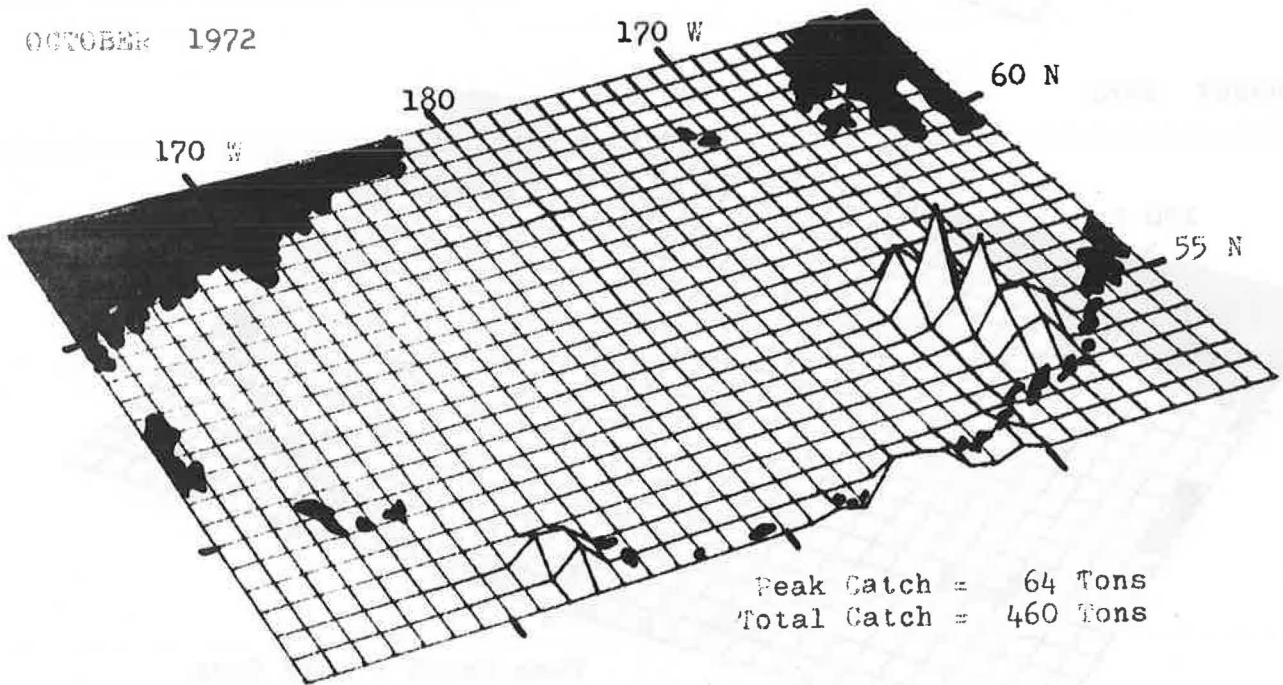
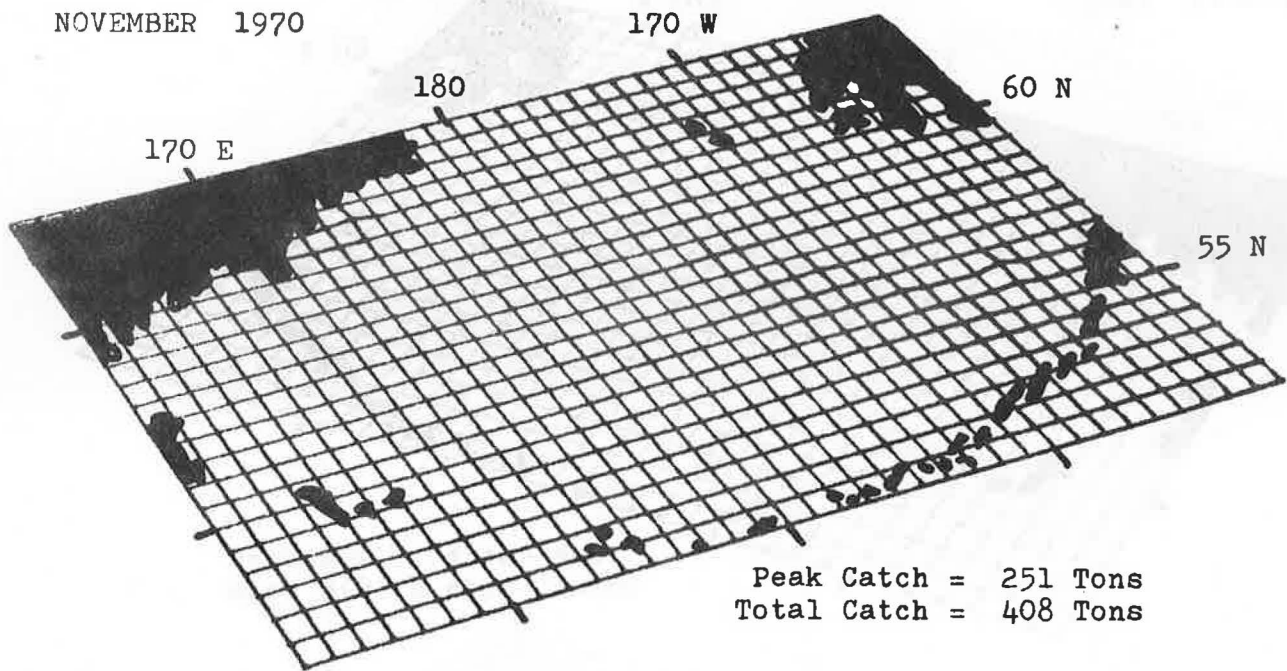


Figure 72. Geographical distribution of black cod catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea September and October, 1972.

NOVEMBER 1970



DECEMBER 1970

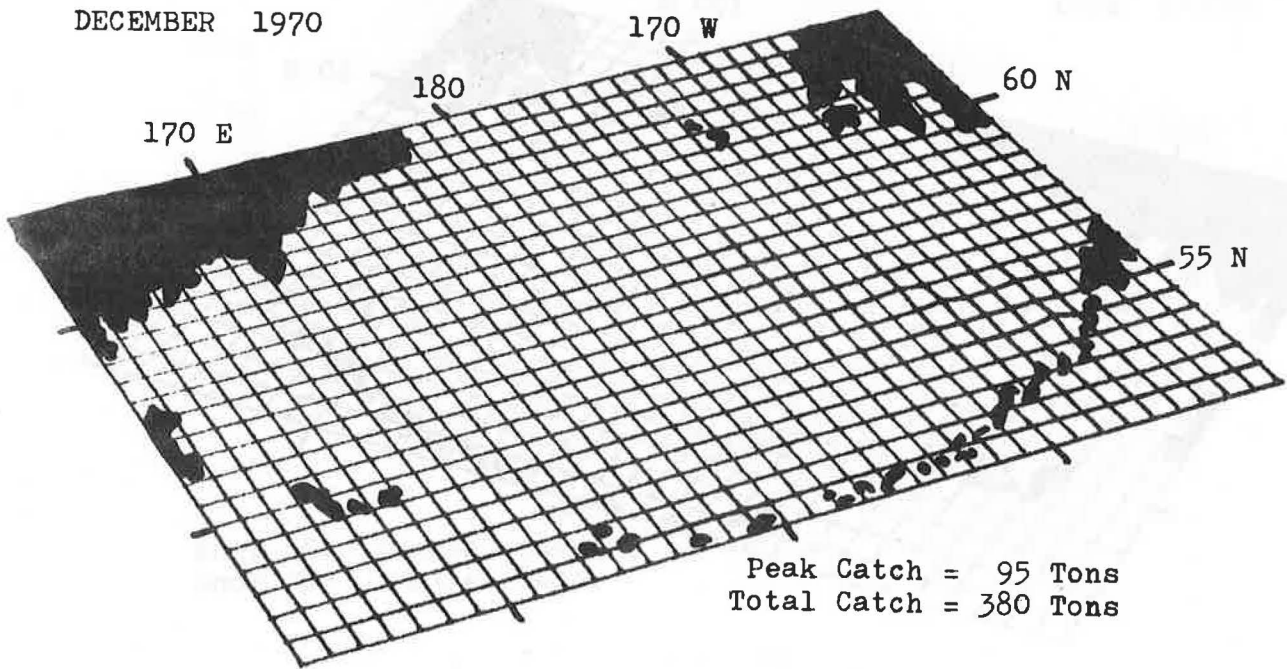


Figure 73. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in November and December, 1970.

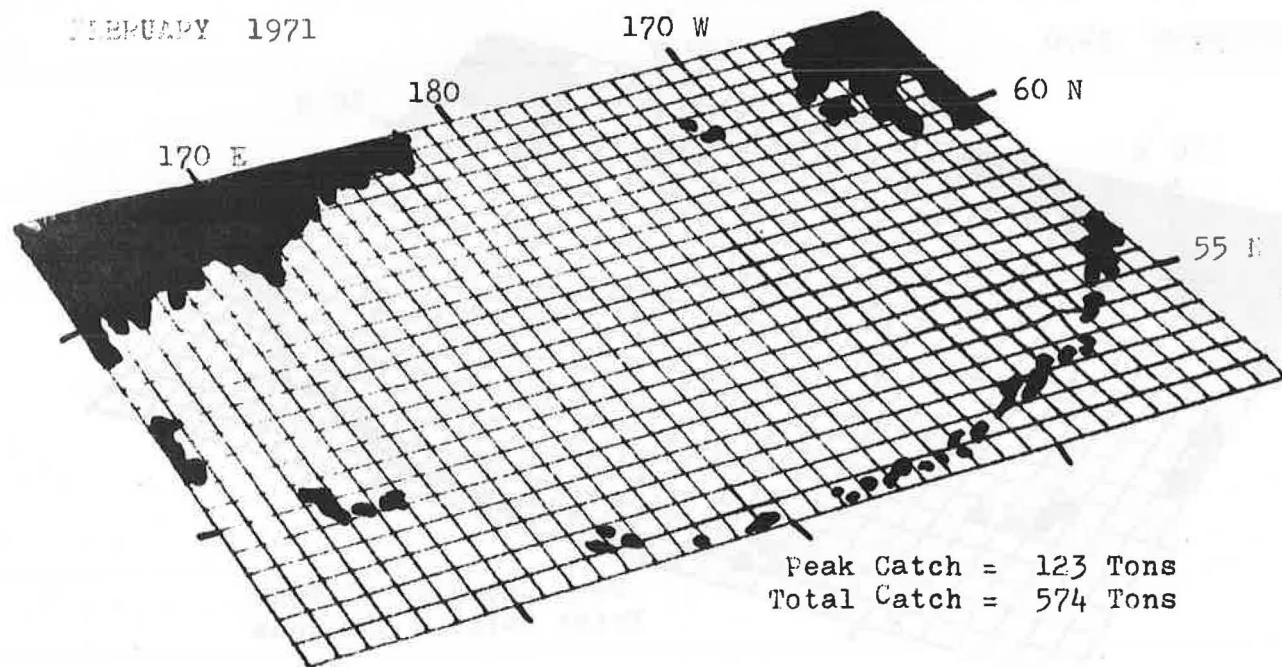
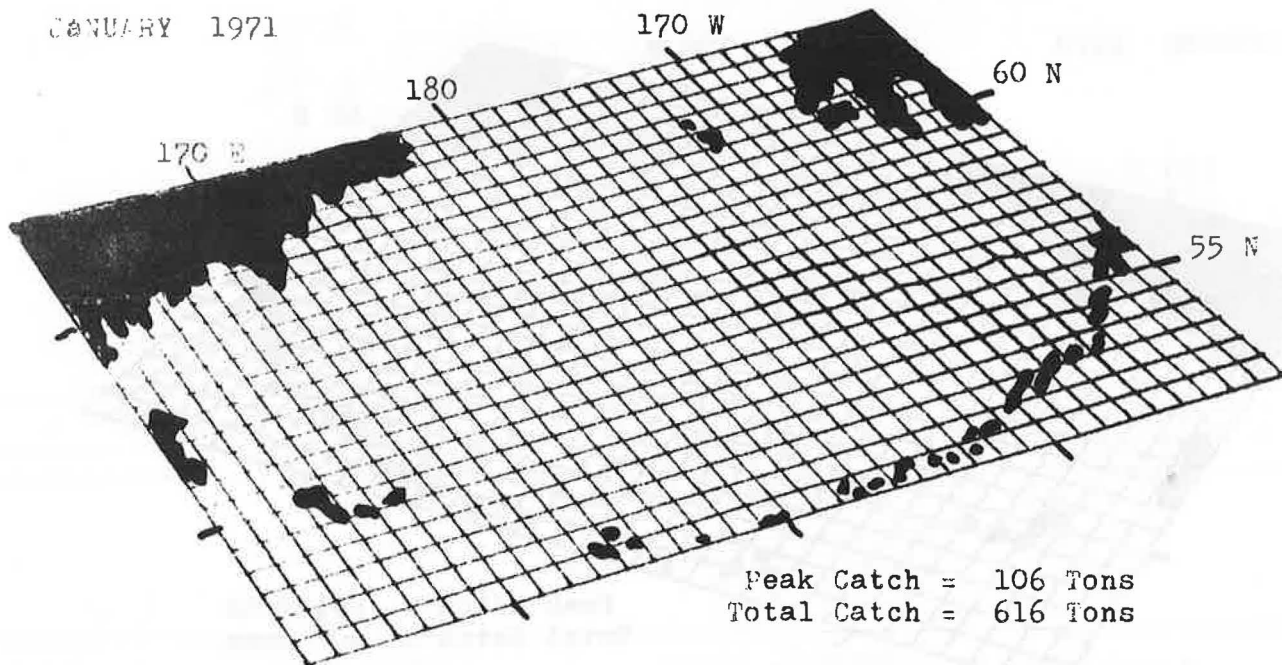


Figure 74. Geographical distribution of miscellaneous flatfish catch by Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in January and February, 1971.

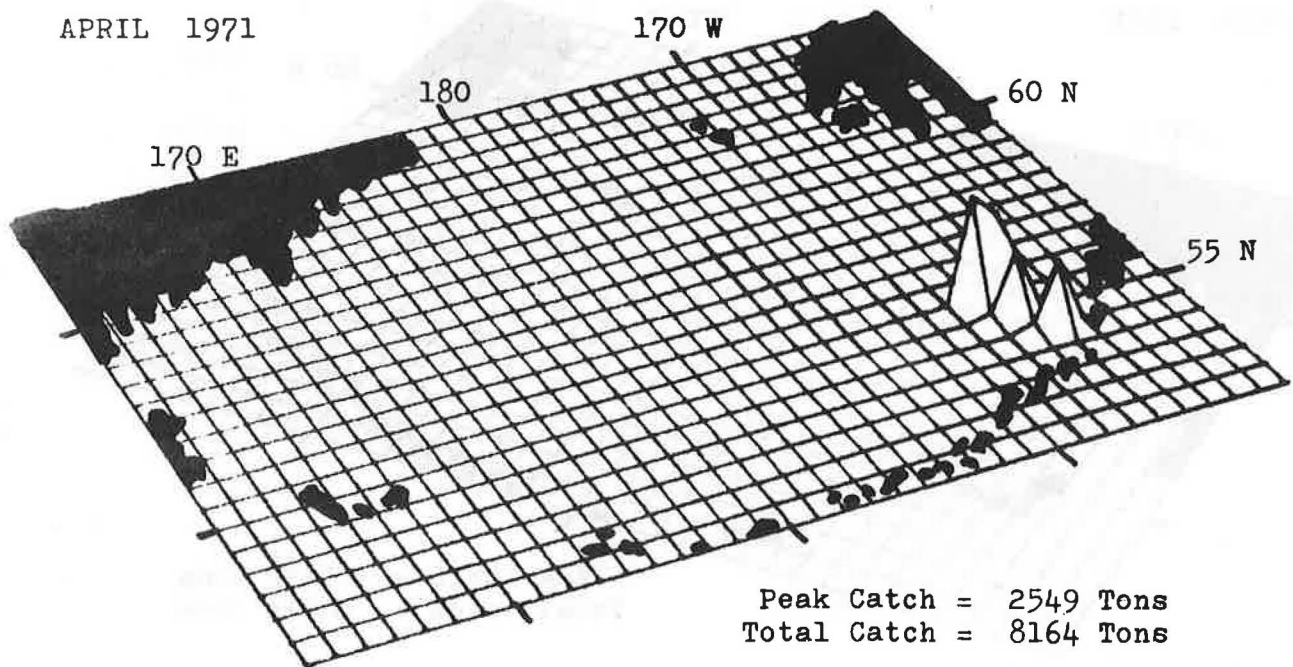
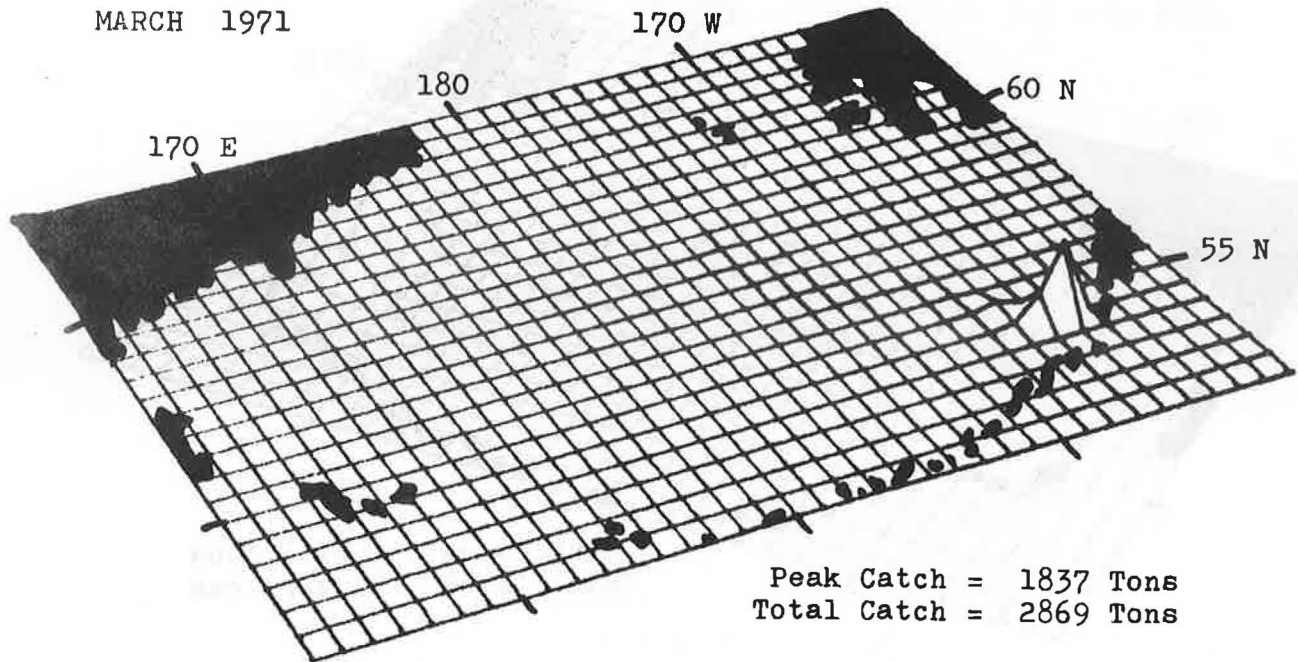


Figure 75. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in March and April, 1971.

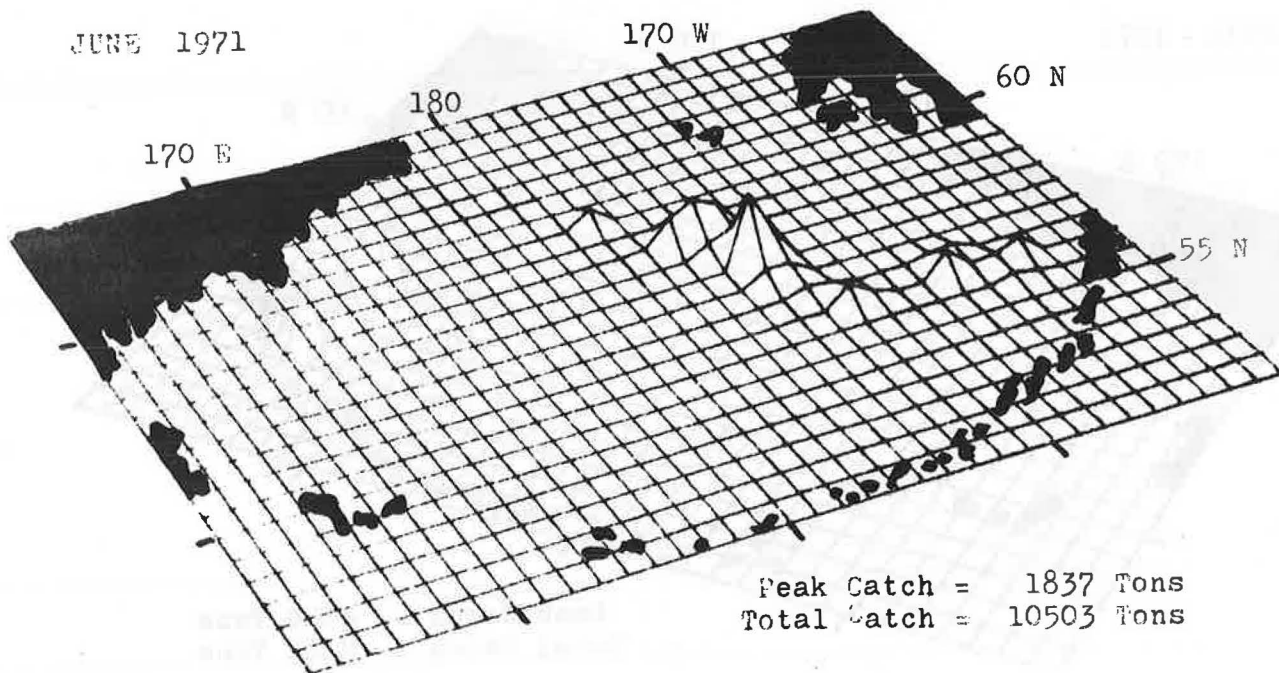
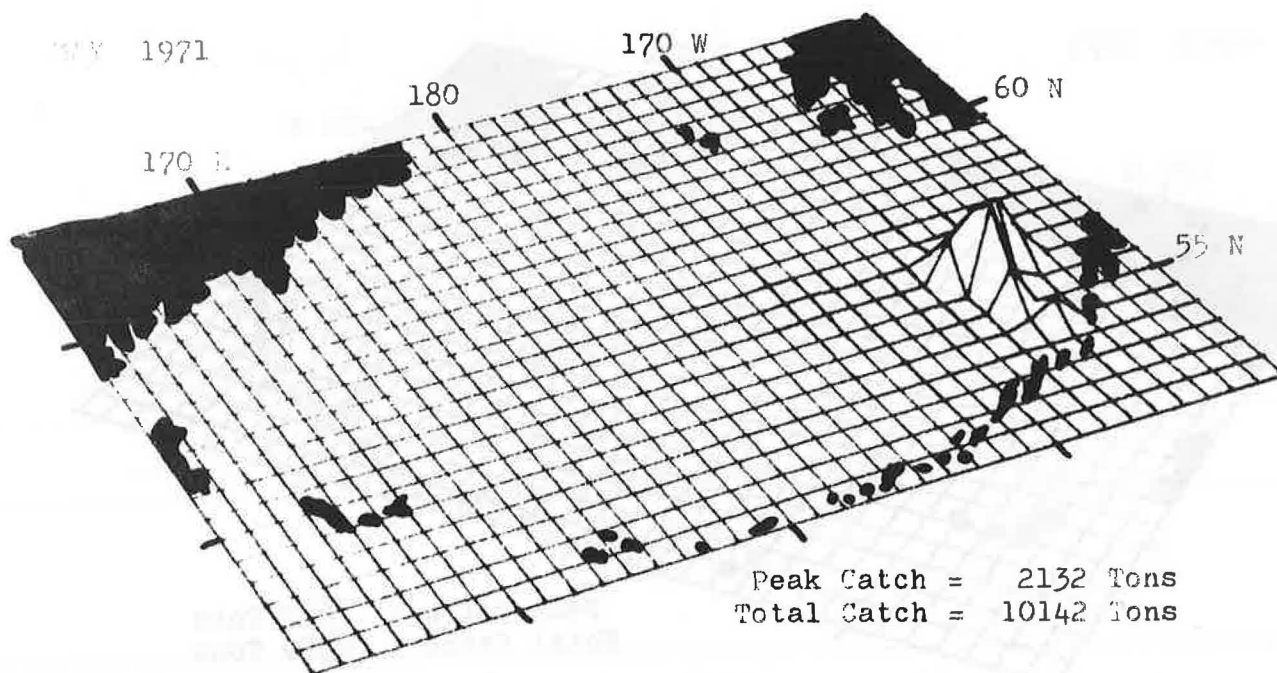


Figure 76. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in May and June, 1971.

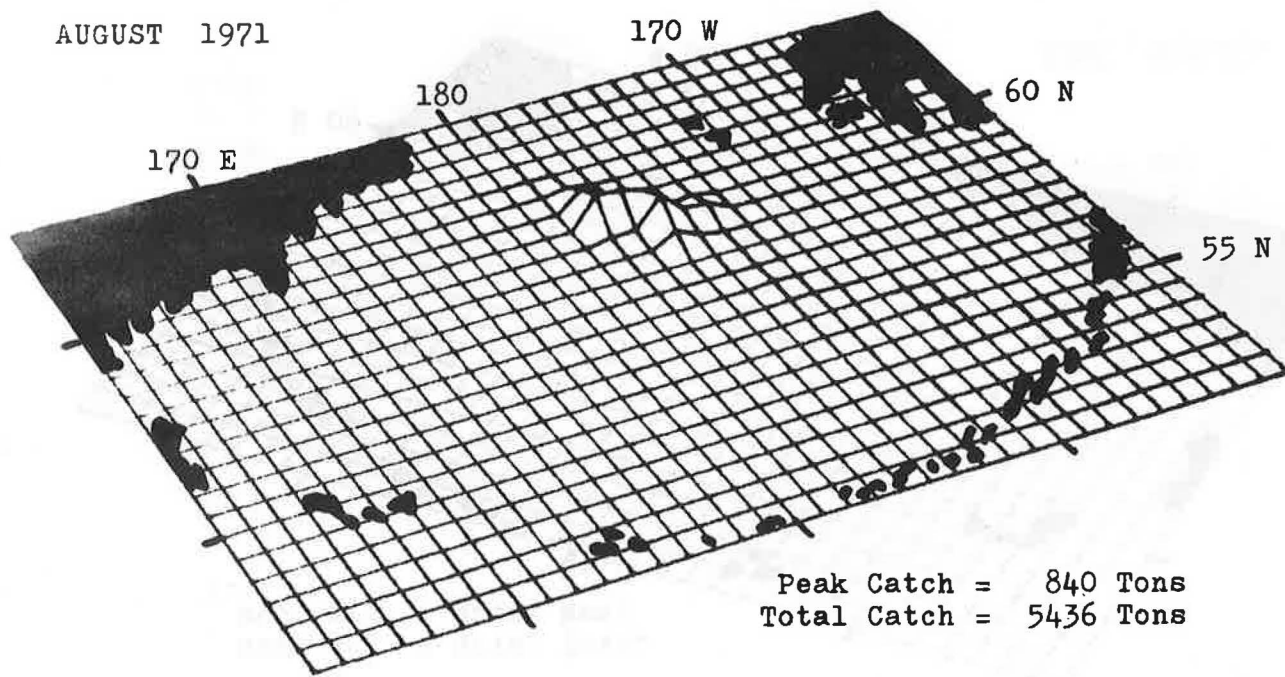
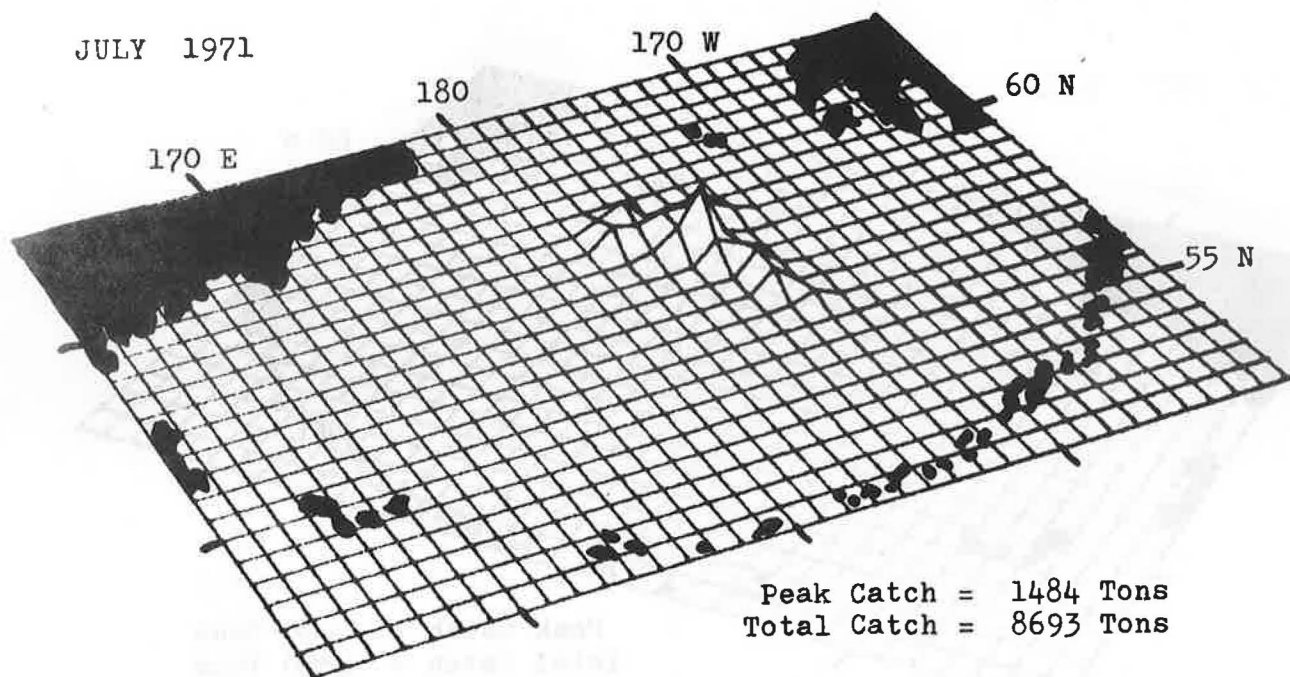


Figure 77. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in July and August, 1971.

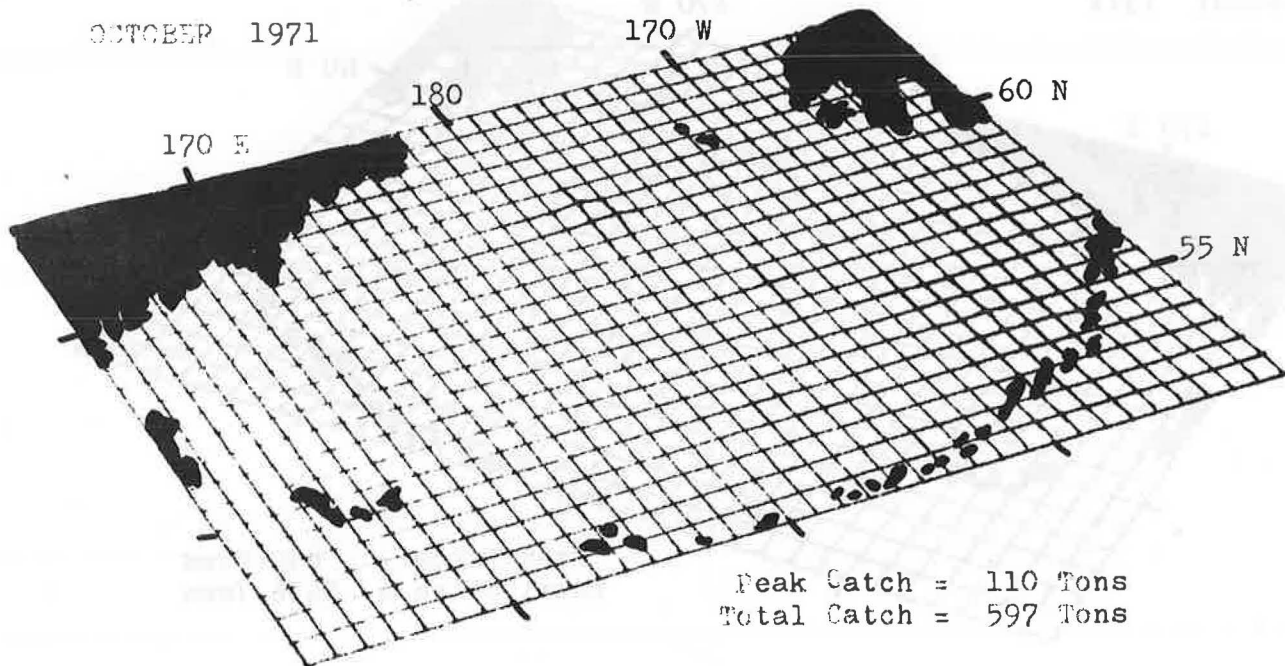
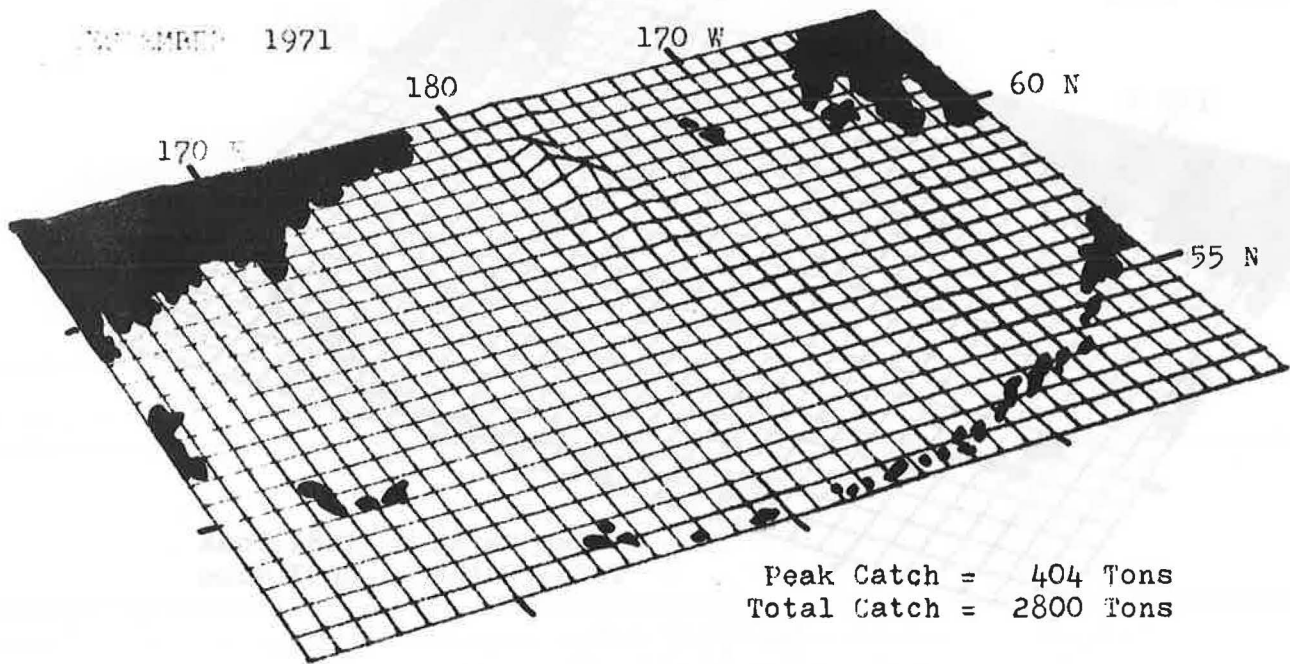
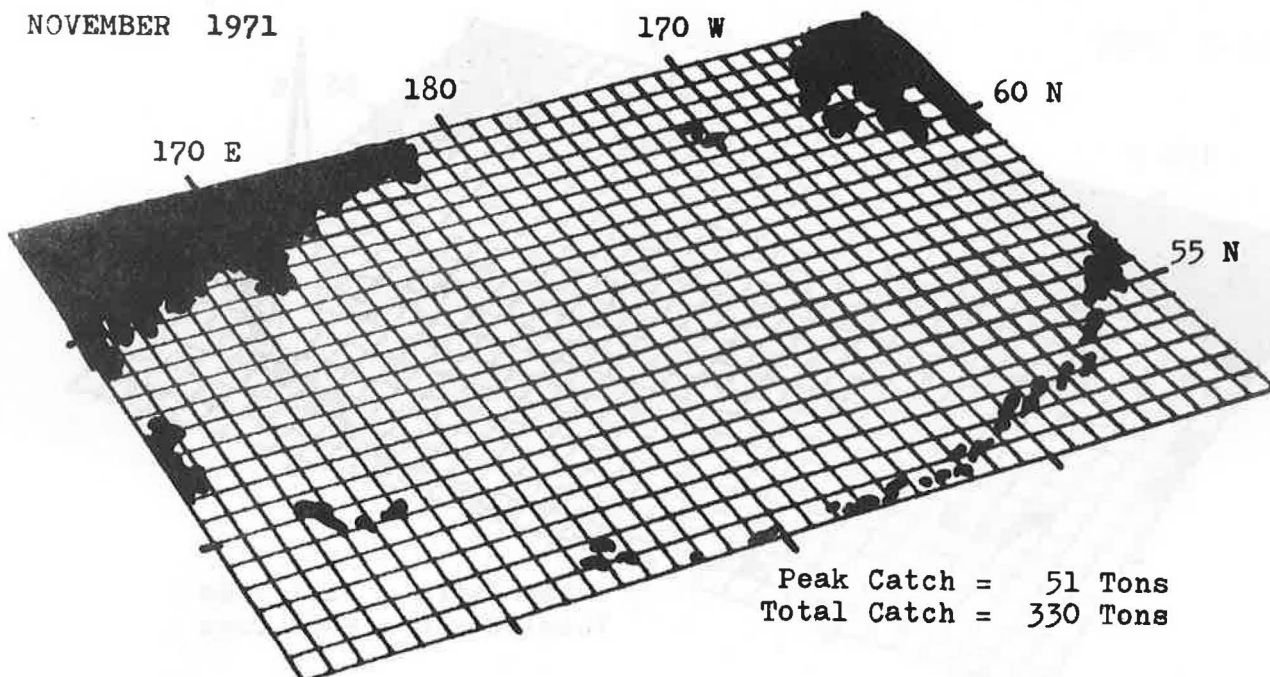


Figure 78. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea in September and October 1971.

NOVEMBER 1971



DECEMBER 1971

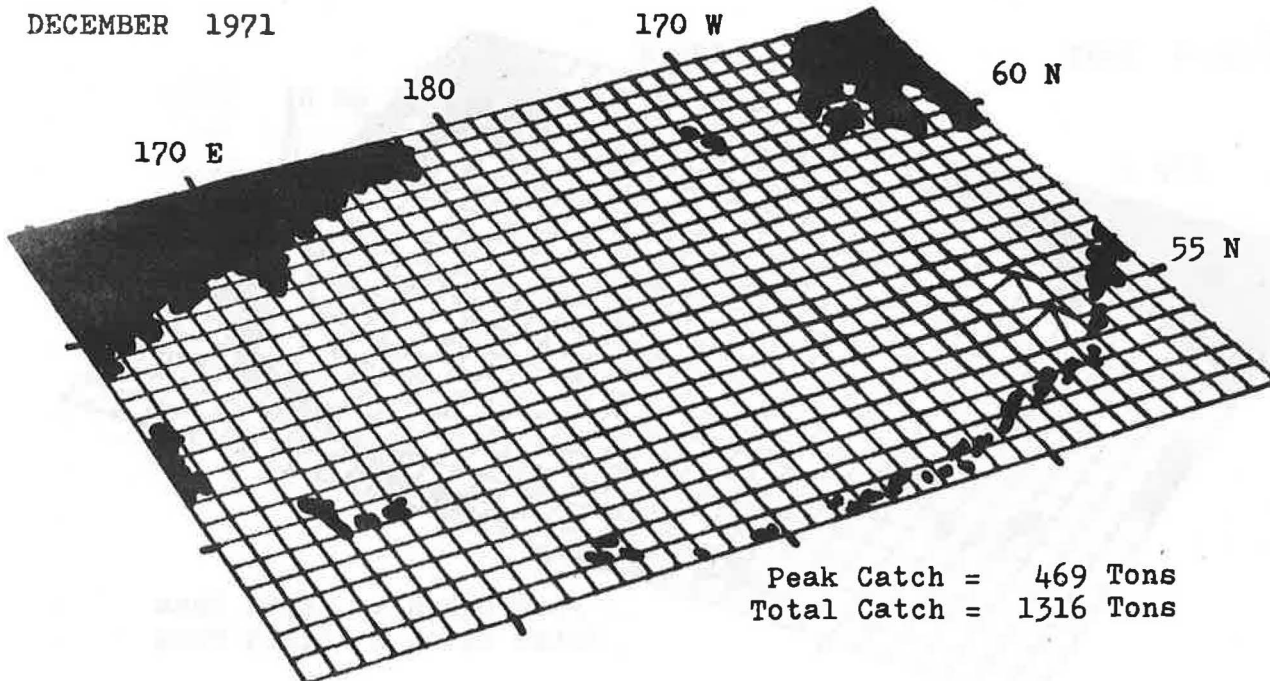


Figure 79 . Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea November and December, 1971.

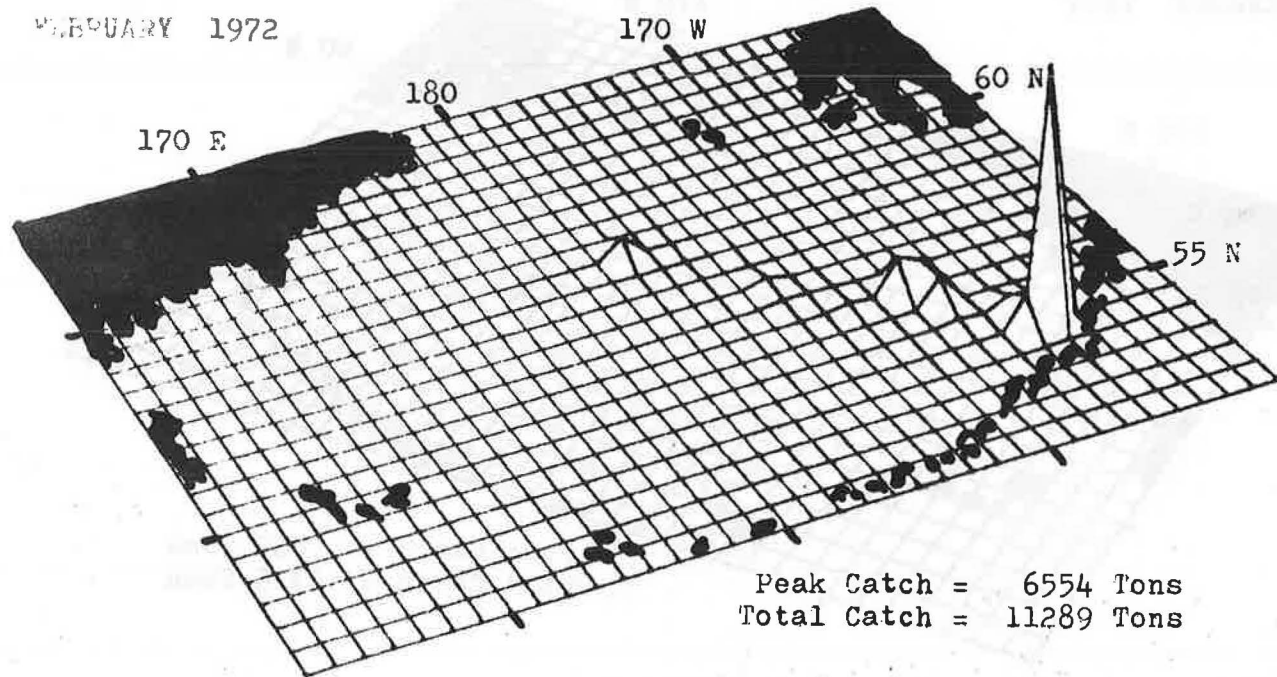
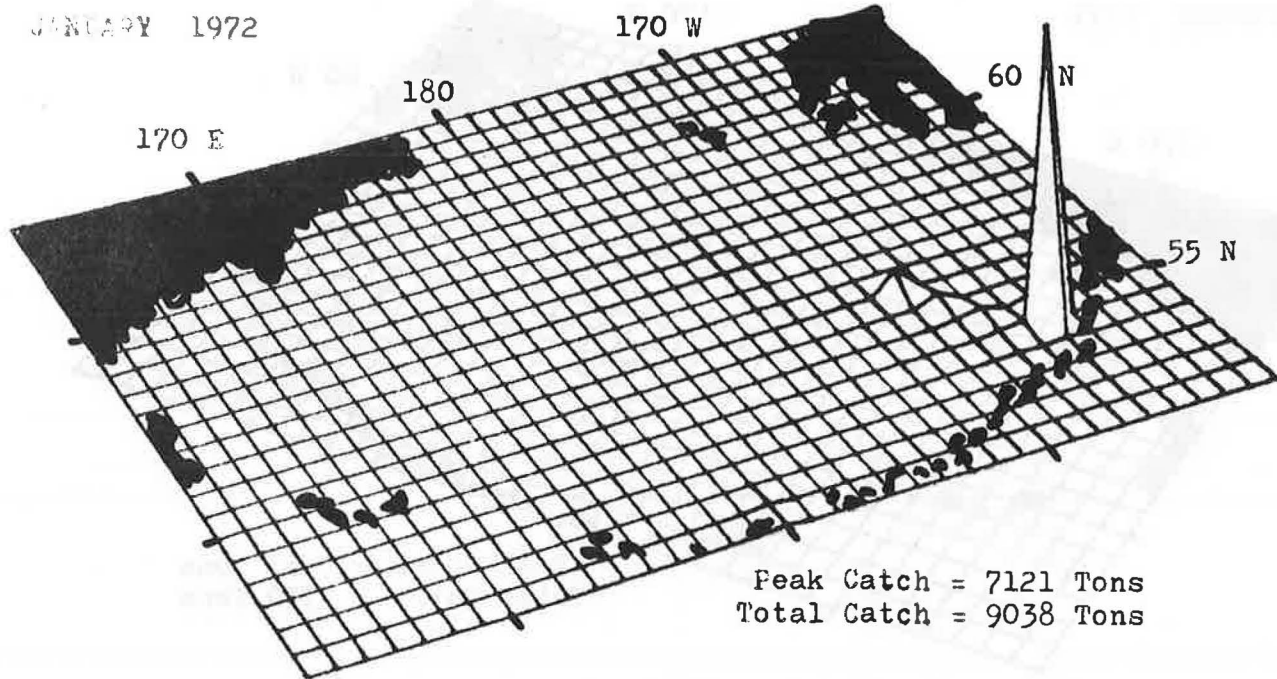
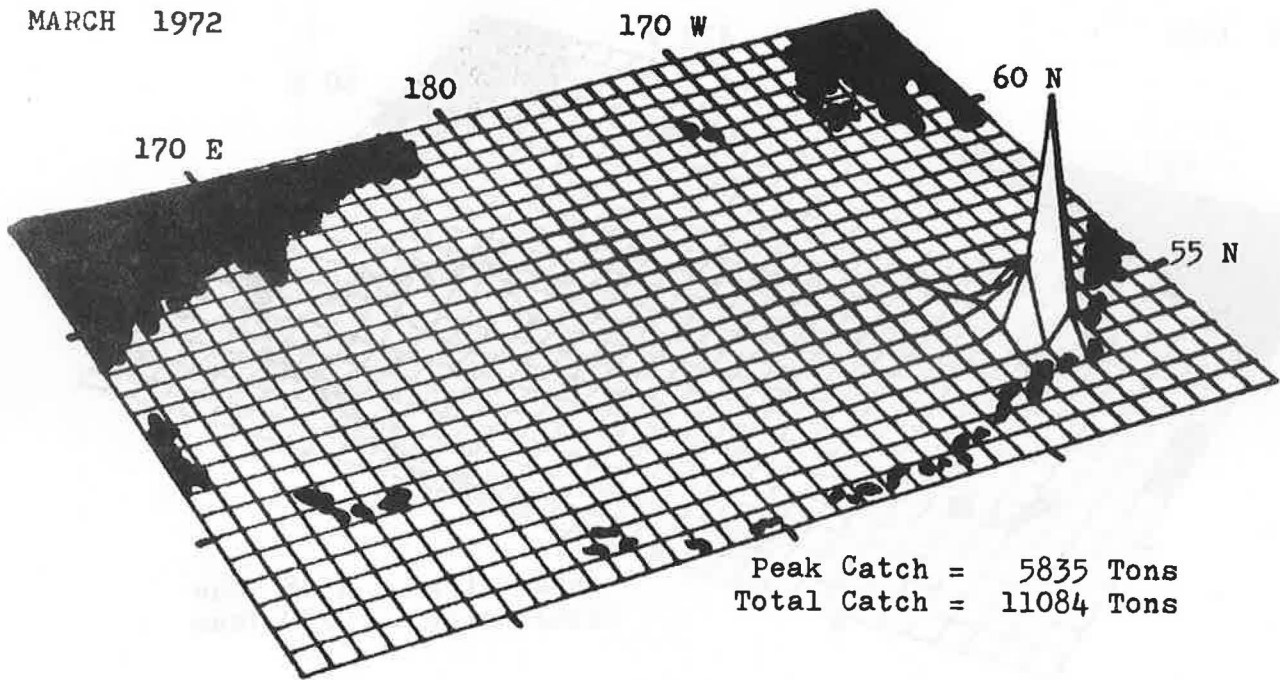


Figure 80. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea January and February, 1972.

MARCH 1972



APRIL 1972

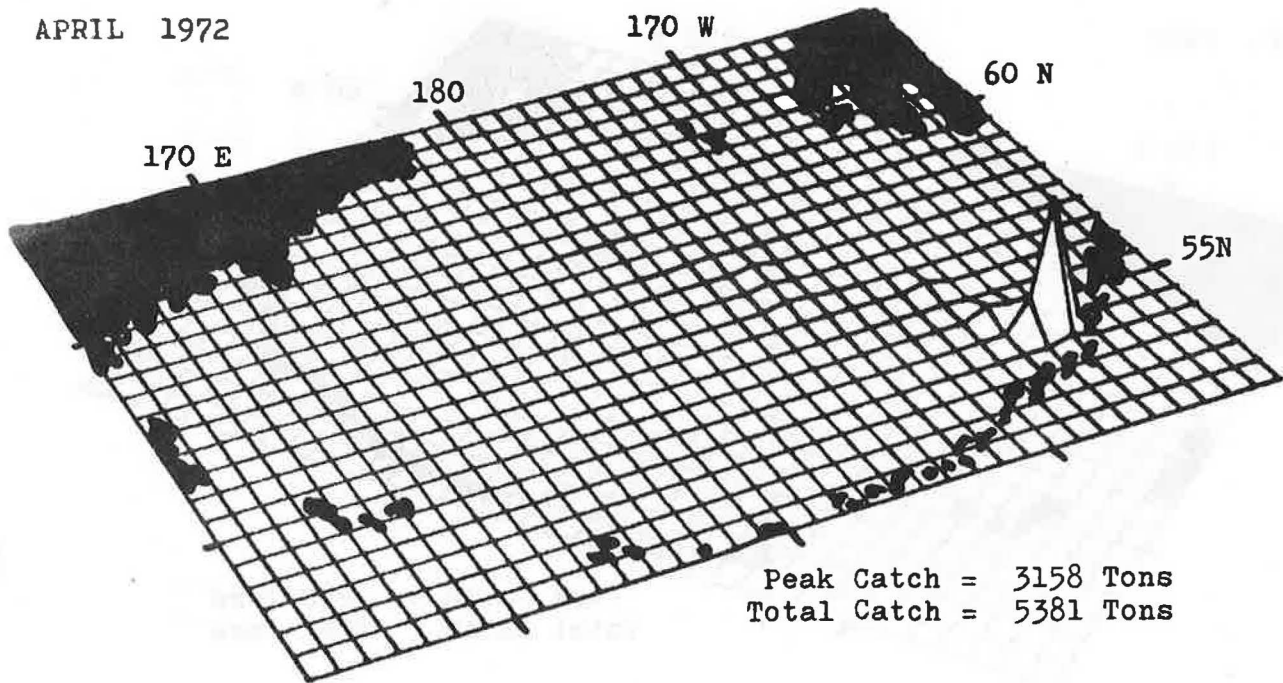


Figure 81. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, loneline-gillnet and independent trawl fisheries in the Bering Sea March and April, 1972.

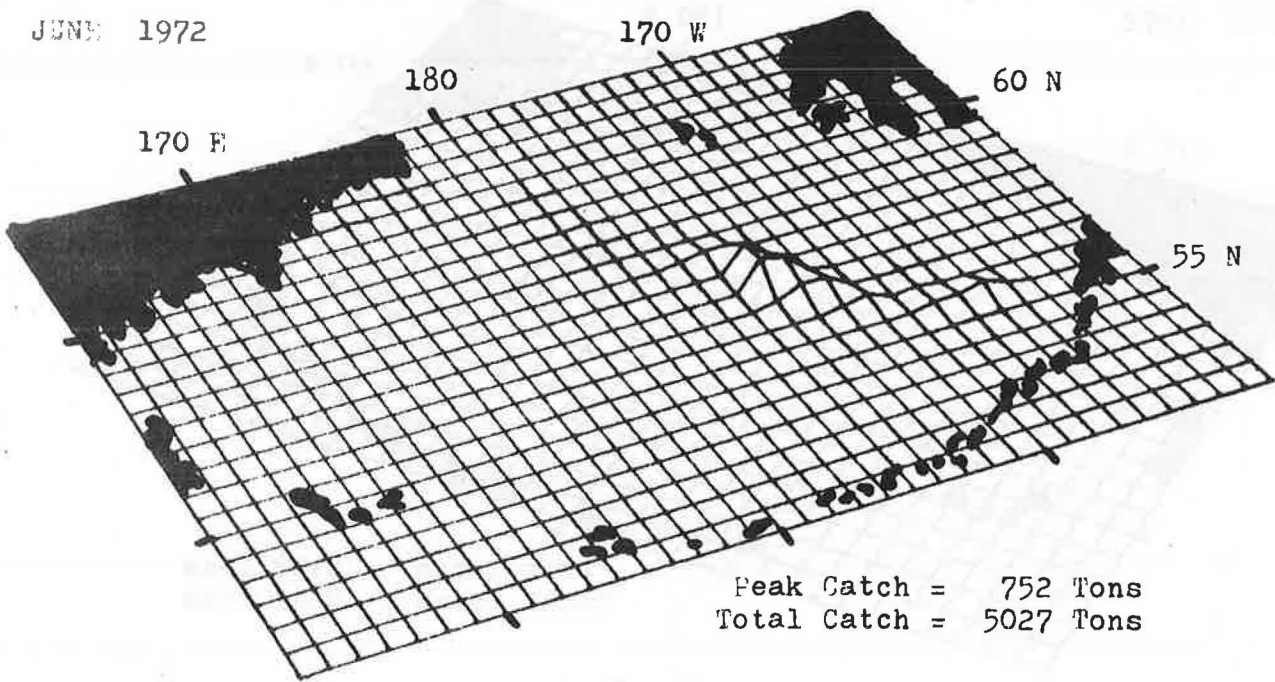
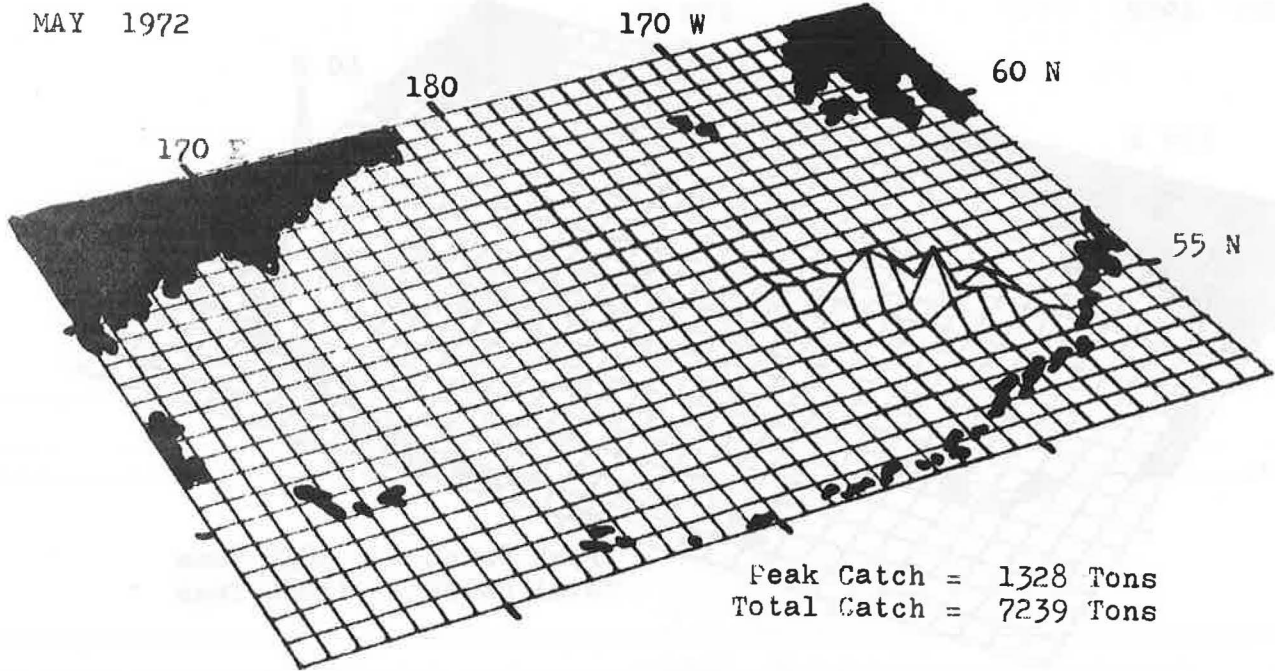


Figure 82. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea May and June, 1972.

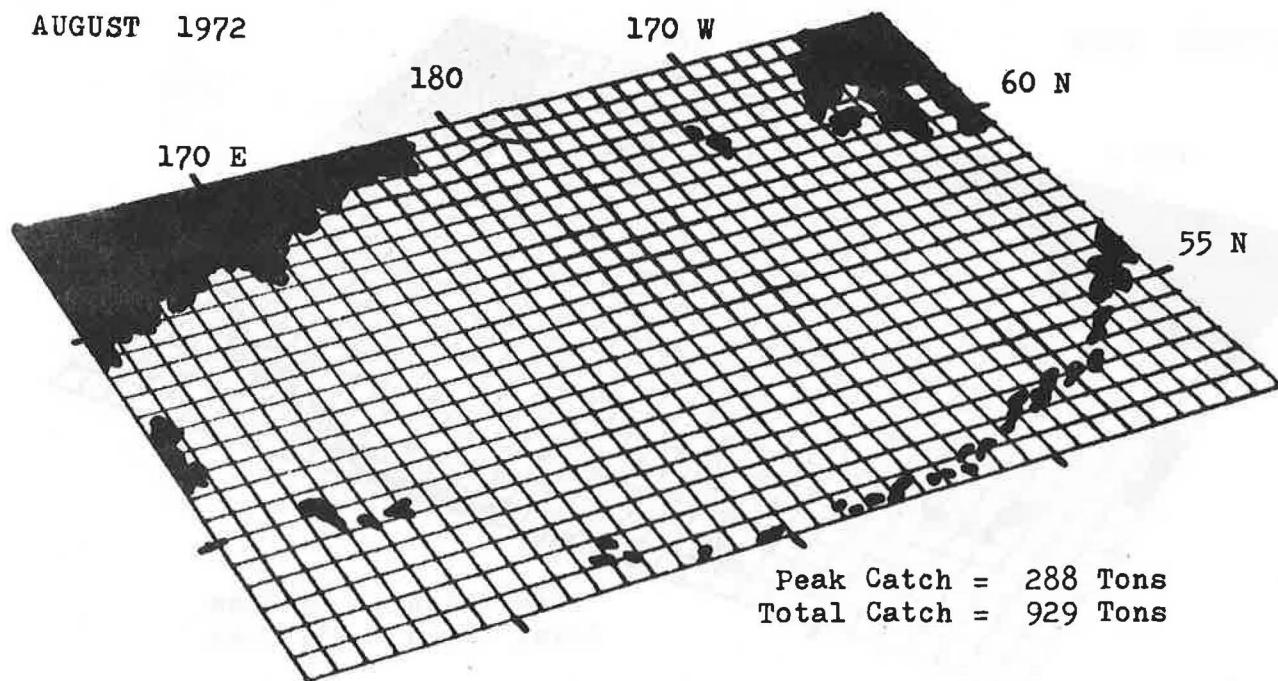
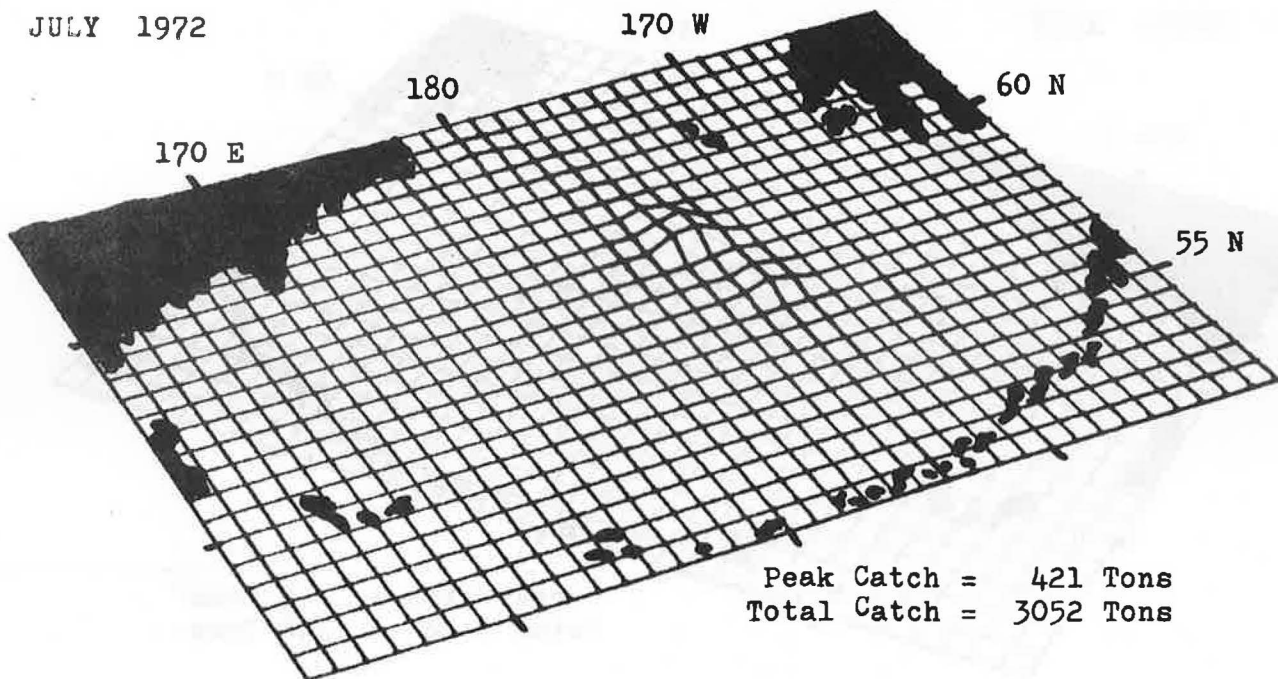
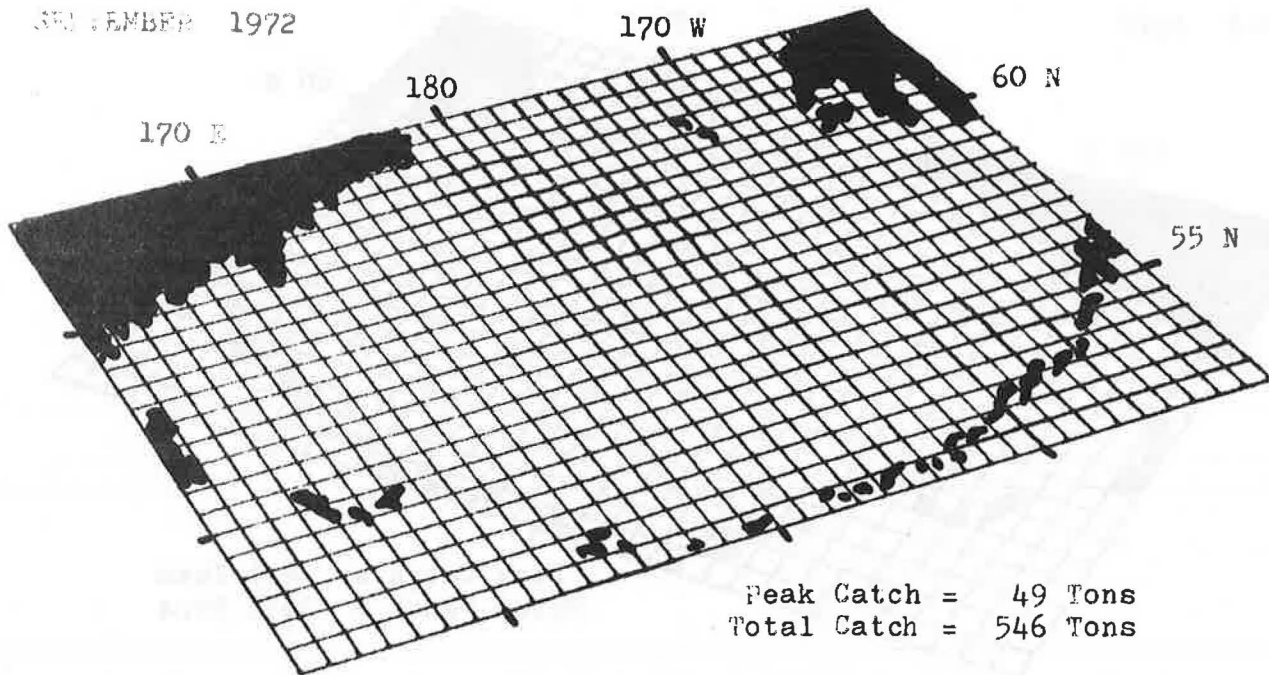


Figure 83. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea July and August, 1972.

SEPTEMBER 1972



OCTOBER 1972

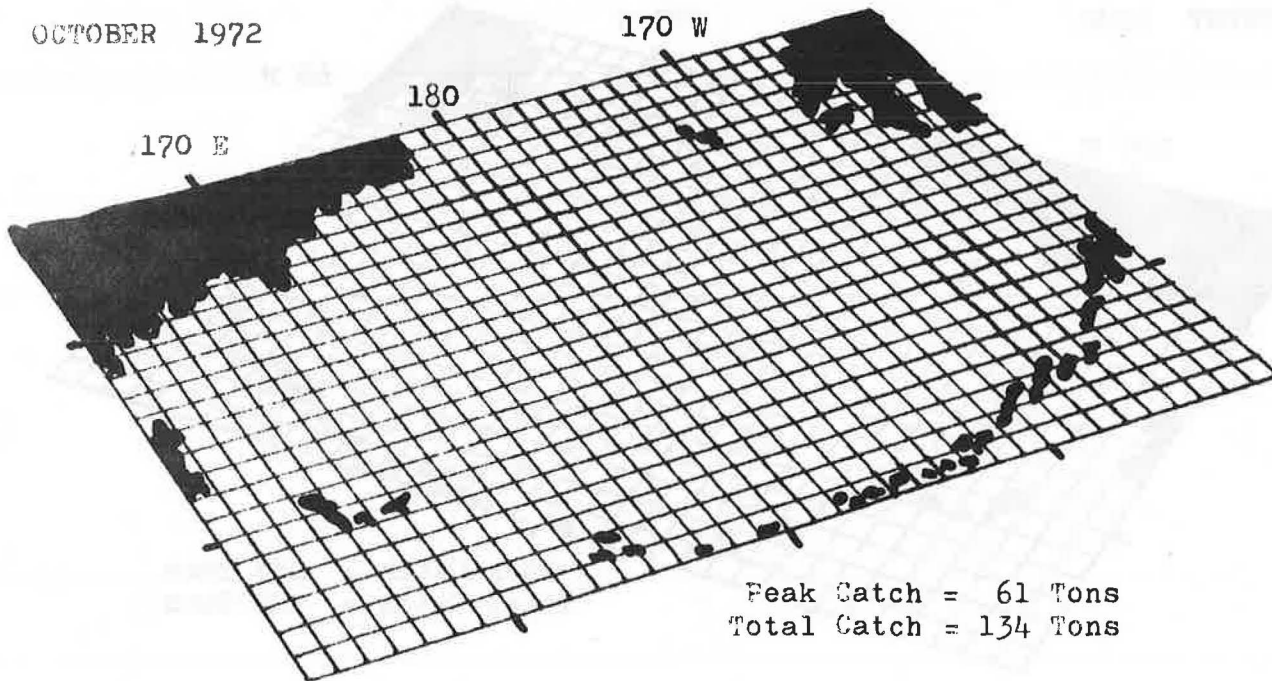


Figure 84. Geographical distribution of miscellaneous flatfish catch by the Japanese mothership, longline-gillnet and independent trawl fisheries in the Bering Sea September and October, 1972.

