A-Y-K REGION

Herring Report # 2

BERING SEA HERRING FISHERIES

1959-1969

Prepared by

Ronald I. Regnart
Regional Supervisor

Carl M. Yanagawa
Area Management Biologist

Alaska Department of Fish and Game
Division of Commercial Fisheries
Anchorage, Alaska

BERING SEA HERRING FISHERIES

Table 1 shows Soviet herring catches made in the North Pacific north of 40°N for 1964-70. Unfortunately the Bering Sea portion of this harvest was not available.

Tables 2 and 3 show Bering Sea catches made by Japan for 1964-69 and by the U.S. for 1964-71 respectively. There is no record of any recent U.S. Bering Sea fishery located west of Bristol Bay.

Table 4 shows annual Japanese Bering Sea catches by type of gear.

Figures 1-6 present annual Japanese Bering Sea catches by 1/2 x 1 degree areas.

Figures 7-9 show the Japanese Bering Sea catch for 1969 by calendar year quarters which was very similar to that for 1968.

Figures 10-11 show the major herring concentrations in the eastern Bering Sea based on Soviet studies made during 1959-61.

Finally, a copy of the Soviet report regarding these 1959-61 studies is enclosed.

Major conclusions drawn from this material are:

1. U.S. commercial catches in the Bering Sea are insignificant compared to catches made by foreign nations.

2. Recent Japanese catches and earlier Soviet studies indicate that a large winter concentration of herring exists in the Bering Sea, just northwest of the Pribilof Islands. The Soviet study concluded that these stocks spawned adjacent to the western Alaska shoreline (Alaska Peninsula, Kuskokwim Bay and Nunivak were specifically mentioned).

3. Beginning in 1968, the vast majority of the Japanese Bering Sea catch has been made east of 175°W, especially in the Pribilof area. Prior to 1968 the greatest catches were made in the western Bering Sea near the Kamchatka Peninsula.

4. Reasons for the sudden change in the Japanese catch-effort pattern is not clear but may involve: (a) decline in abundance of Kamchatka stocks (b) catch restrictions imposed by the Soviets.

Also, important information regarding herring utilization throughout the North Pacific (including Bering Sea) is still lacking. Further information should be obtained re delineation of harvest by specific catch areas for the entire Soviet fishery and the Japanese fishery south of the Bering Sea. It is especially important to obtain Soviet Bering Sea catch information to determine implications of foreign fisheries upon western Alaska herring stocks.

1/ Catch for North Pacific Ocean North of 20°N. and West of 175°W

2/ Catch for North Pacific Ocean North of 40°N and East of 175°W

Table 1. Soviet North Pacific and Bering Sea Herring Catch in Metric Tons, 1964-1970.1/

Year	~~West of 175°W~~ 2/	~~East of 175°W~~ 1/	Total
1964	47,200	413,300	460,500
1965	11,200	320,900	332,100
1966	2,400	320,900	323,300
1967	3,200	339,000	342,200
1968	~~29,200~~ 22,255	416,300	445,500
1969	~~73,700~~ 94,491	433,300	507,000
1970	117,200	350,500	467,700
1971	23,000		
1972	54,000		

1/ From Murray Hayes, NMFS, Kodiak.
The majority of the catches are from the Bering Sea. The Soviet reporting system encompassed the area north of 40°N.

Table 2. Japanese Bering Sea Herring Catch in Metric Tons, 1964-1969.[1/]

Year	West of 175°W (Near Kamchatka Peninsula)	East of 175°W (Pribilof Island, Alaska)	Total	ICNAFC Stat. Yearbook 1970
1964	41,637	822	42,459	42600
1965	34,784	771	35,555	35,556
1966	24,118	3,385	27,503	27,500
1967	30,170	2,711	32,881	33,276
1968	1,708	38,367	40,075	44,357
1969	856 1,528	24,275 34,840	25,131	36,371
1970				28,340
			15,000	
1970 Prowler				13,377
1971				6,019
1972				

Prowler: Combined Japan-USSR catch: 110,000
132,000 (1970)

1/ Original data from Japan Fisheries Agency. Received from NOAA, North Pacific Fisheries Research Center, Seattle.

Table 3. Alaskan Herring Catches from Coastal Bering Sea Waters, 1964-1971.

Year	Togiak (Bristol Bay) Round wt. in lbs. (females only)	Roe on Kelp in lbs.
1967	268,902 1/	
1968	181,765 2/	54,600
1969	94,481 2/	10,1~~00~~ 25
1970	55,195 2/	38,855
1971		51,795
Totals	600,343 (300.2 tons) 3/	155,350 (77.7 tons)

	Arctic-Yukon-Kuskokwim Round wt. in lbs. (males and females)
1964-1965	66,000
1969	4,000
1970	40,000
1971	40,000
Totals	150,000 (75.0 tons)

1/ Gill net.
2/ Gill net and purse seine.
3/ Estimate about 600 tons caught, males included.

Table 4. Japanese Bering Sea Herring Catches by Gear, in Metric Tons, 1964-1969.

	Number (Percent)							
Year	Stern Trawl Shrimp Nets	Stern Trawl Fish Nets	Gillnets	Side Trawl Fish Nets	Side Trawl Shrimp Nets	Danish Seine Fish Nets	Pair Trawl Fish Nets	Total
1964			41,597 (98.0)	822 (1.9)		40 (0.1)		42,459 (100.0)
1965			34,659 (97.5)	624 (1.7)	272 (0.8)			35,555 (100.0)
1966			24,118 (87.7)	2,974 (10.8)	411 (1.5)			27,503 (100.0)
1967		175 (0.5)	30,170 (91.8)	2,492 (7.6)	23 (+)	2 (+)	19 (+)	32,881 (100.0)
1968	607 (1.5)	32,345 (80.7)	2,526 (6.3)	4,384 (10.9)		63 (0.2)	150 (0.4)	40,075 (100.0)
1969	545 (2.2)	21,220 (84.4)	2,603 (10.4)	740 (2.9)		23 (0.1)		25,131 (100.0)
								203,604 tons

Figure 1. Japanese Bering Sea Herring Catch, 1964.
(metric tons)

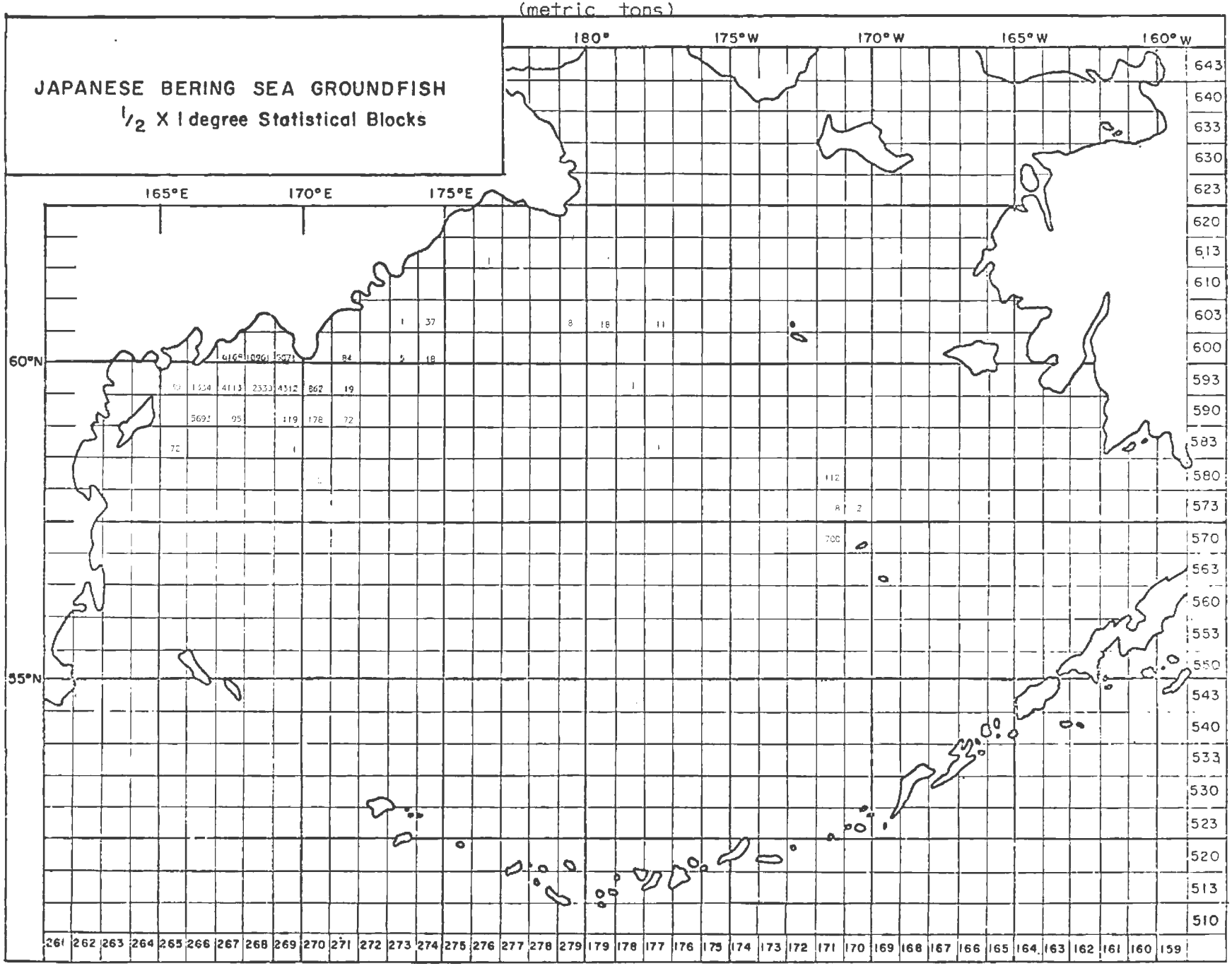


Figure 2. Japanese Bering Sea Herring Catch, 1965.
(metric tons)

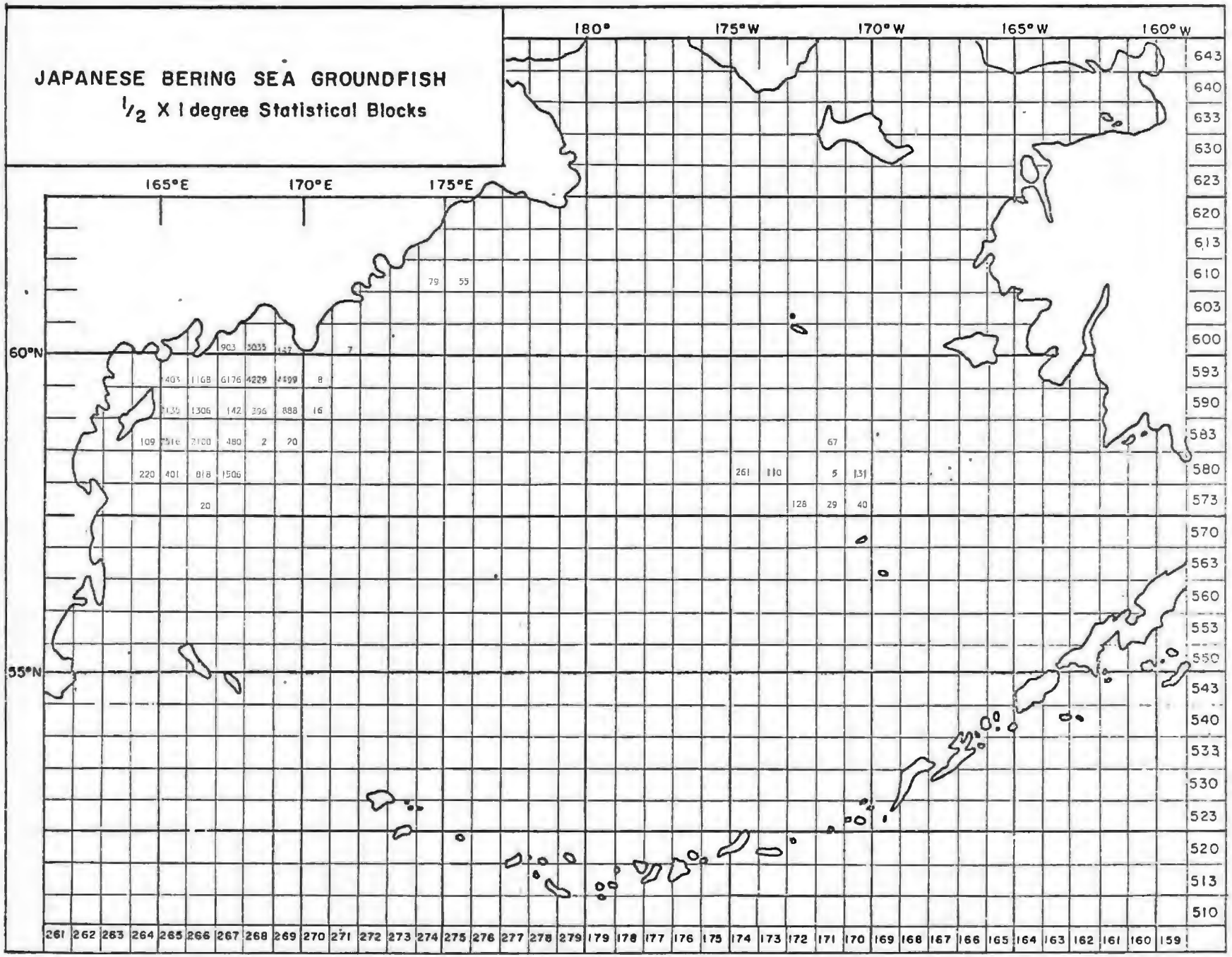


Figure 3. Japanese Bering Sea Herring Catch, 1966.
(metric tons)

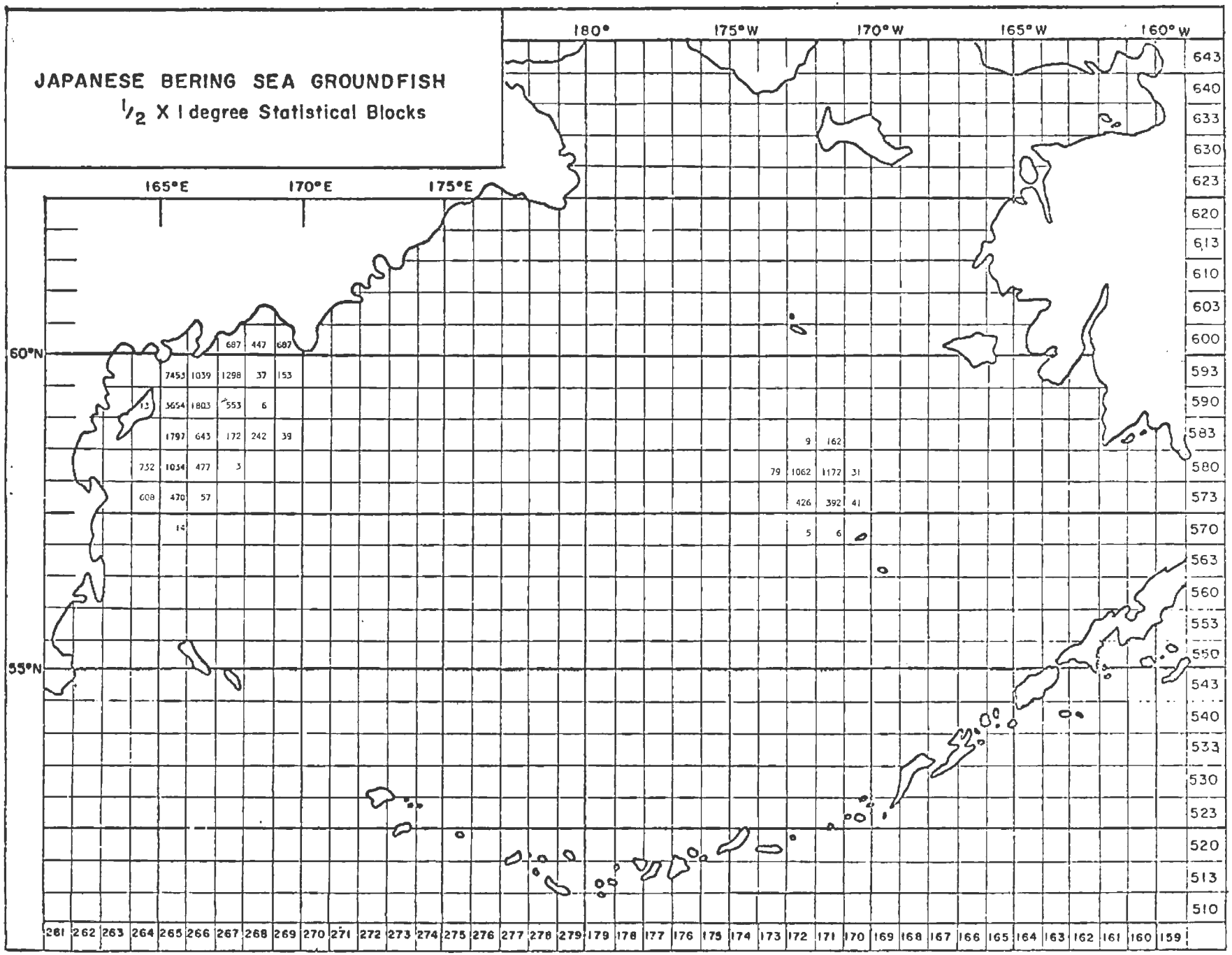


Figure 4. Japanese Bering Sea ! -ing Catch, 1967
(metric tons)

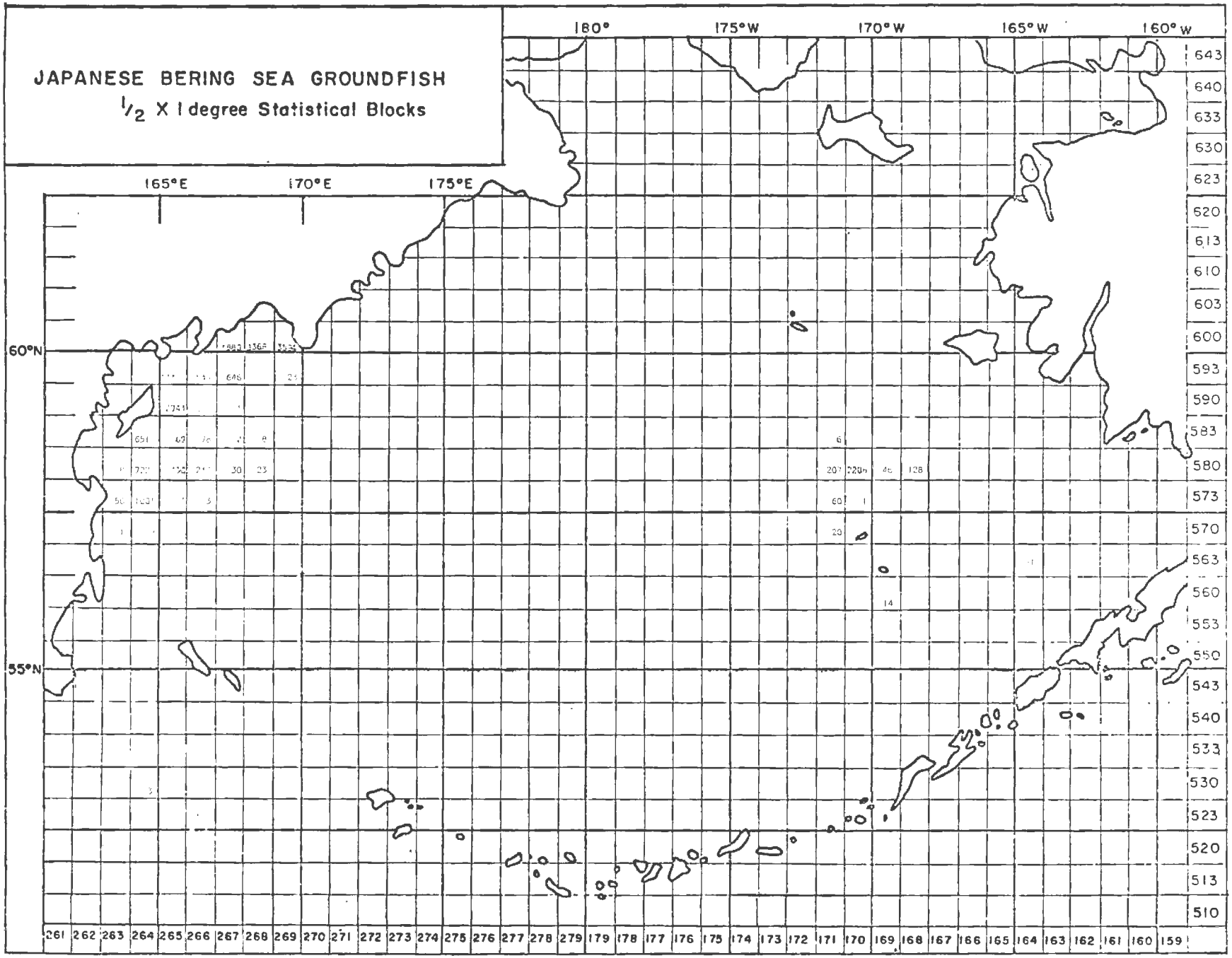


Figure 5. Japanese Bering Sea F ing Catch, 1968.
(metric tons)

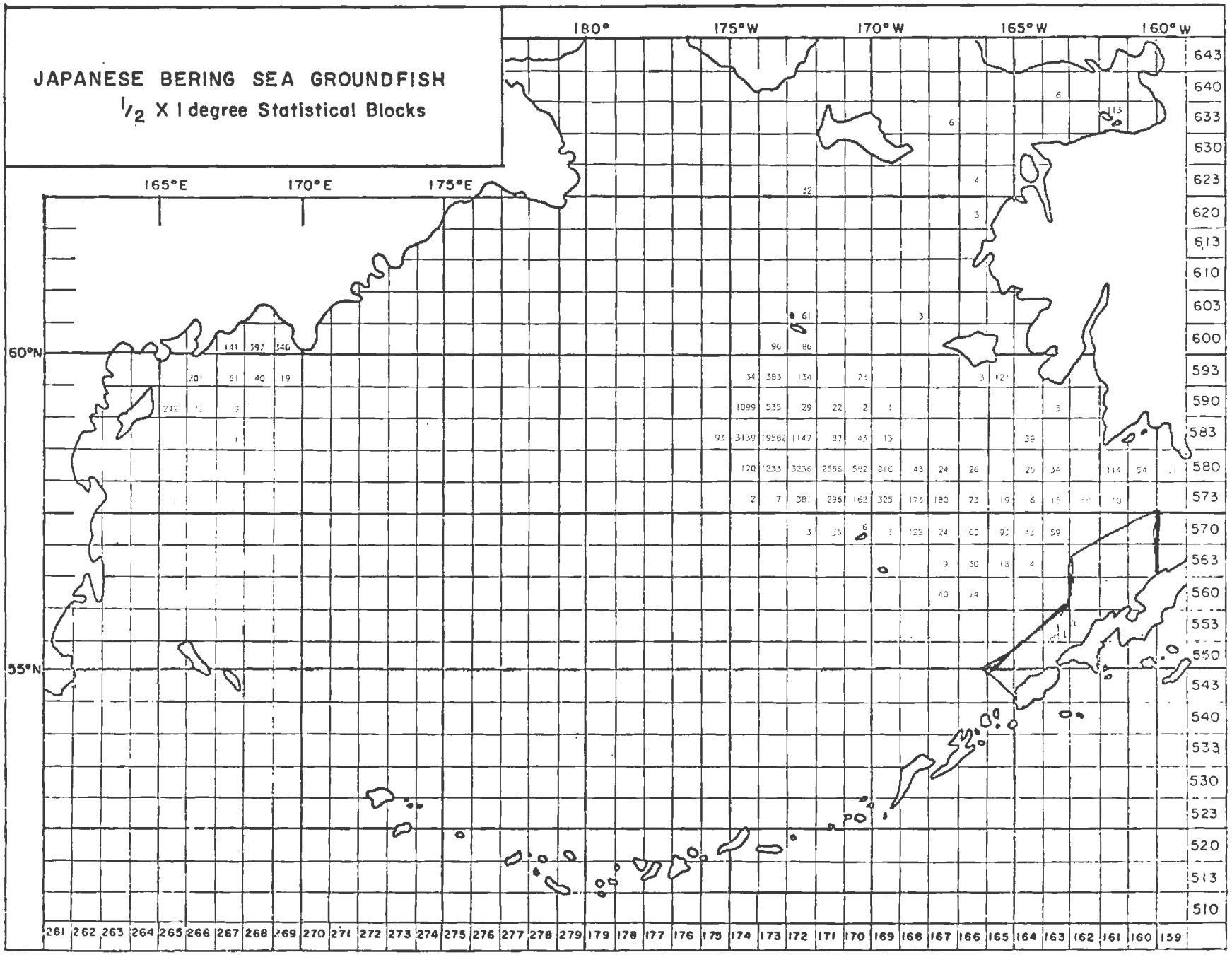


Figure 6. Japanese Bering Sea I .ing Catch, 1969.
(metric tons)

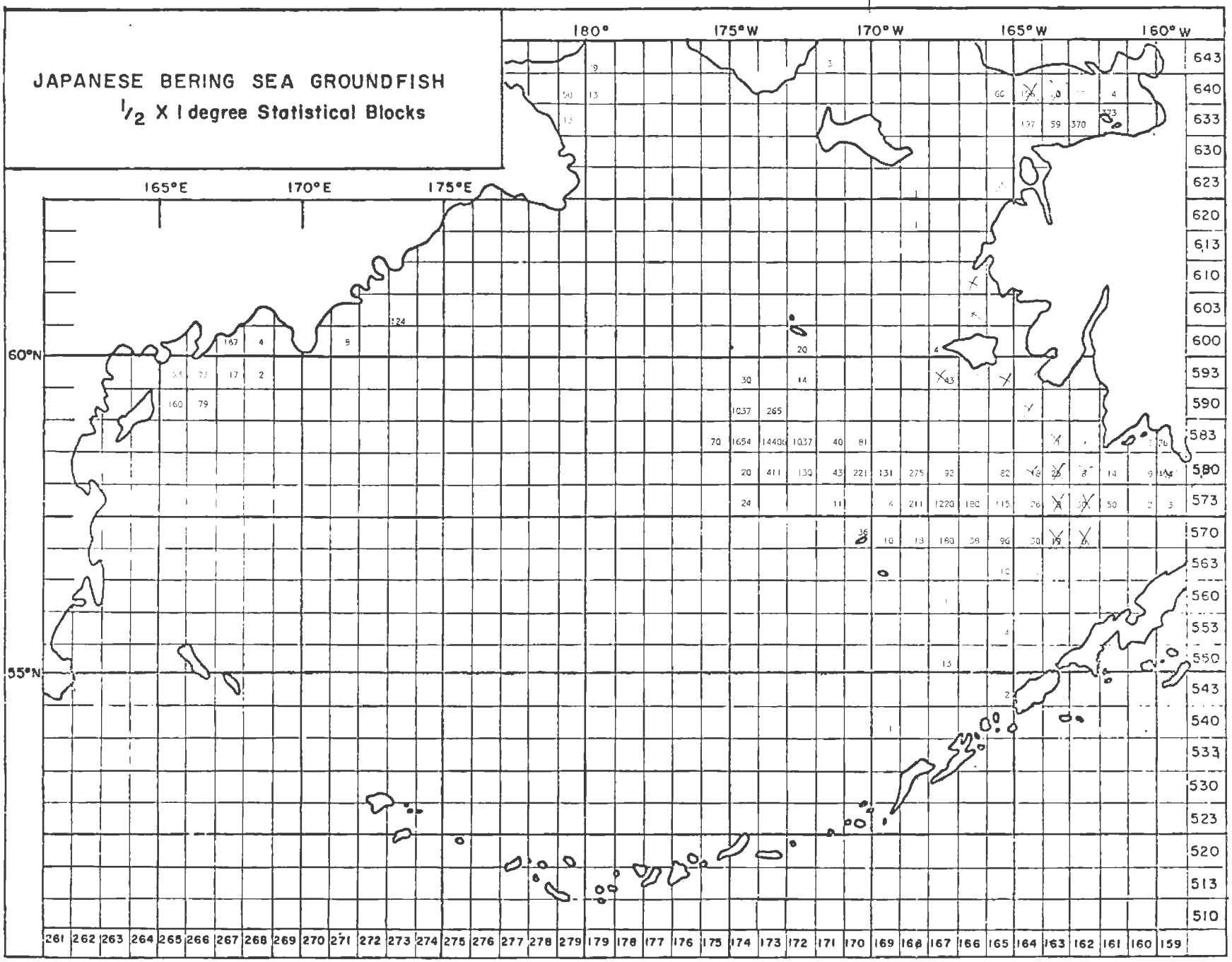


Figure 7. Japanese Bering Sea Herring Catch, January-March 1969. Quarter I in metric tons.

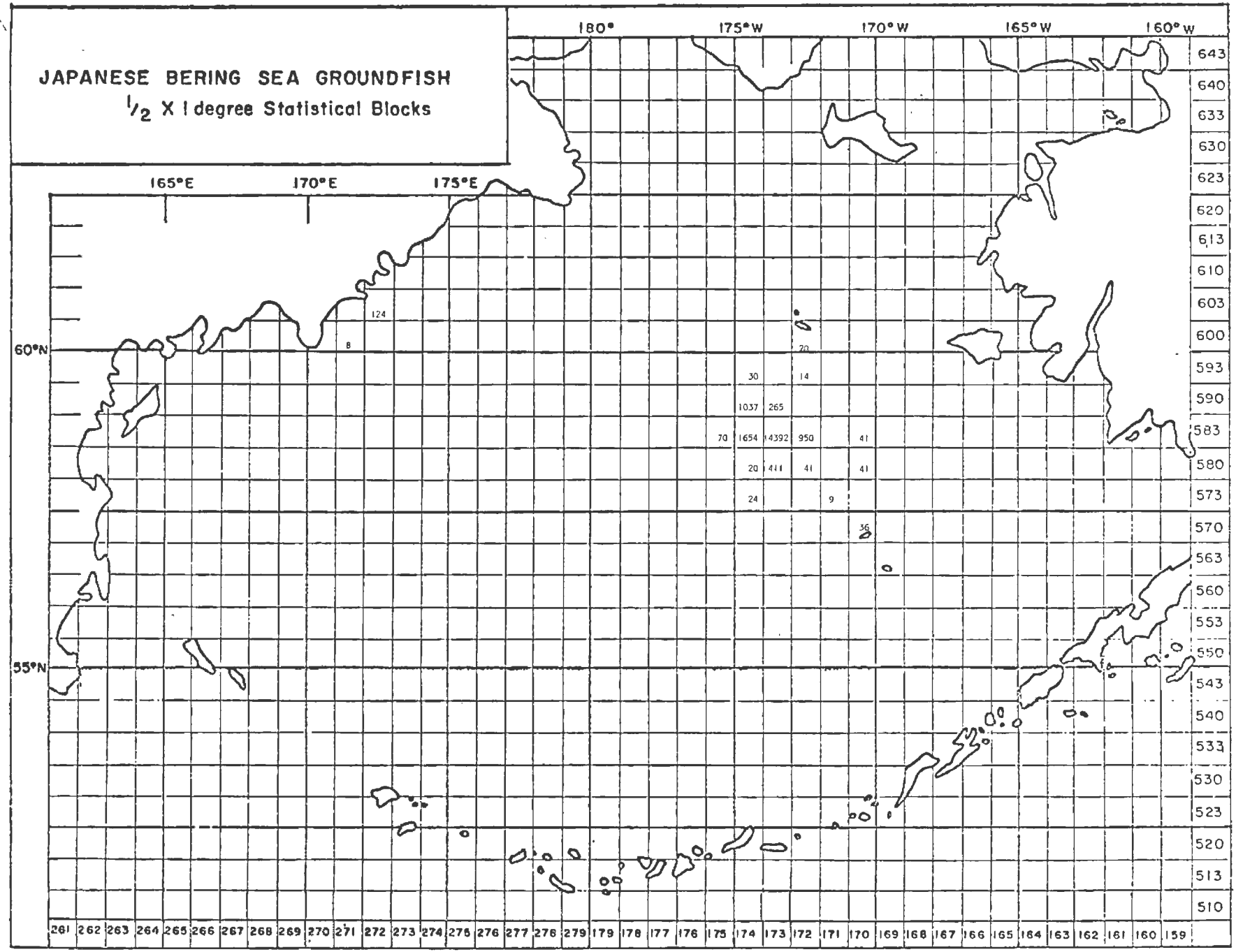


Figure 8. Japanese Bering Sea Herring Catch, April--June 1969.
Quarter 2 in metric tons

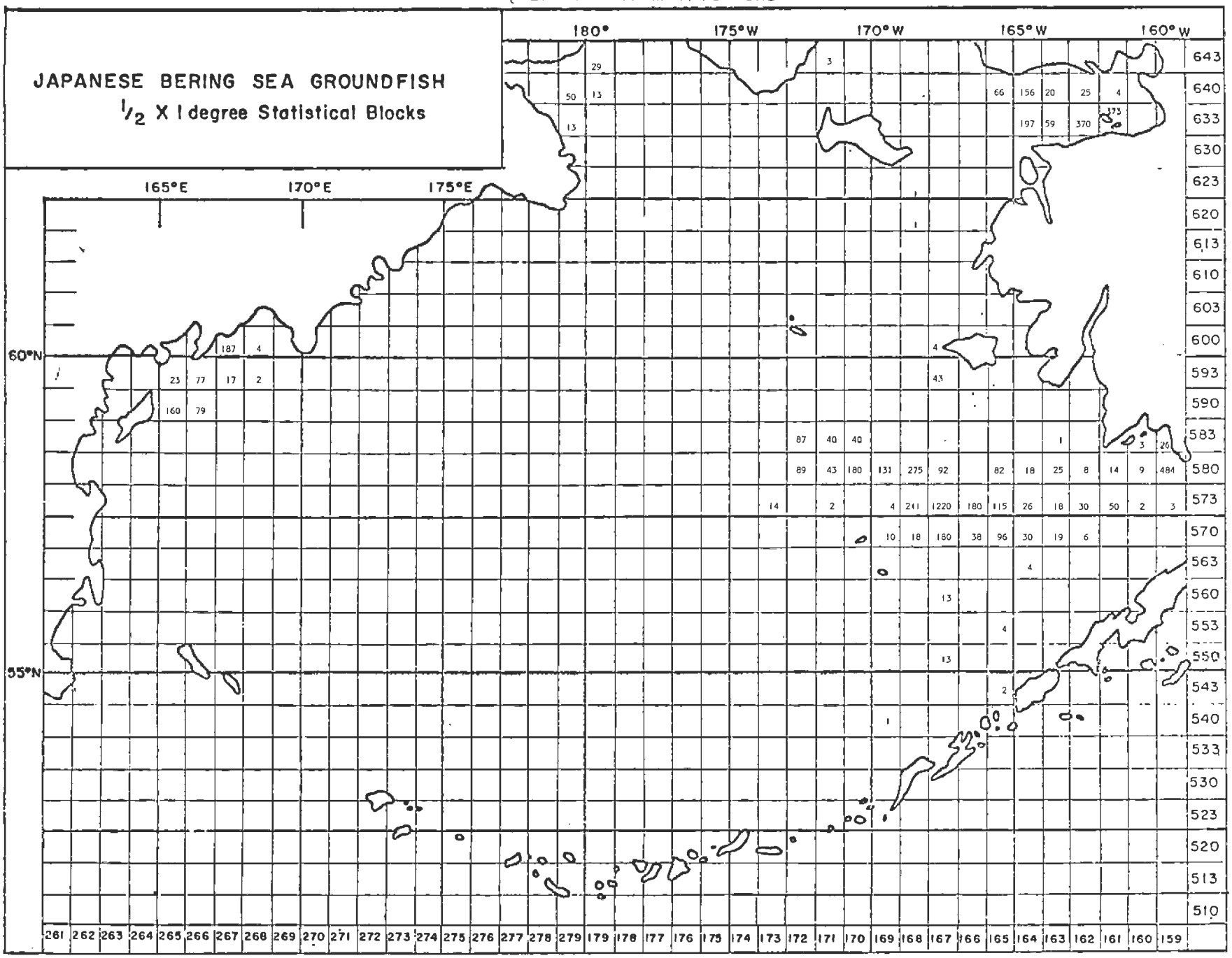


Figure 9. Japanese Bering Sea Herri Catch, July-September 1969.
Quarter 3 in metric tons.

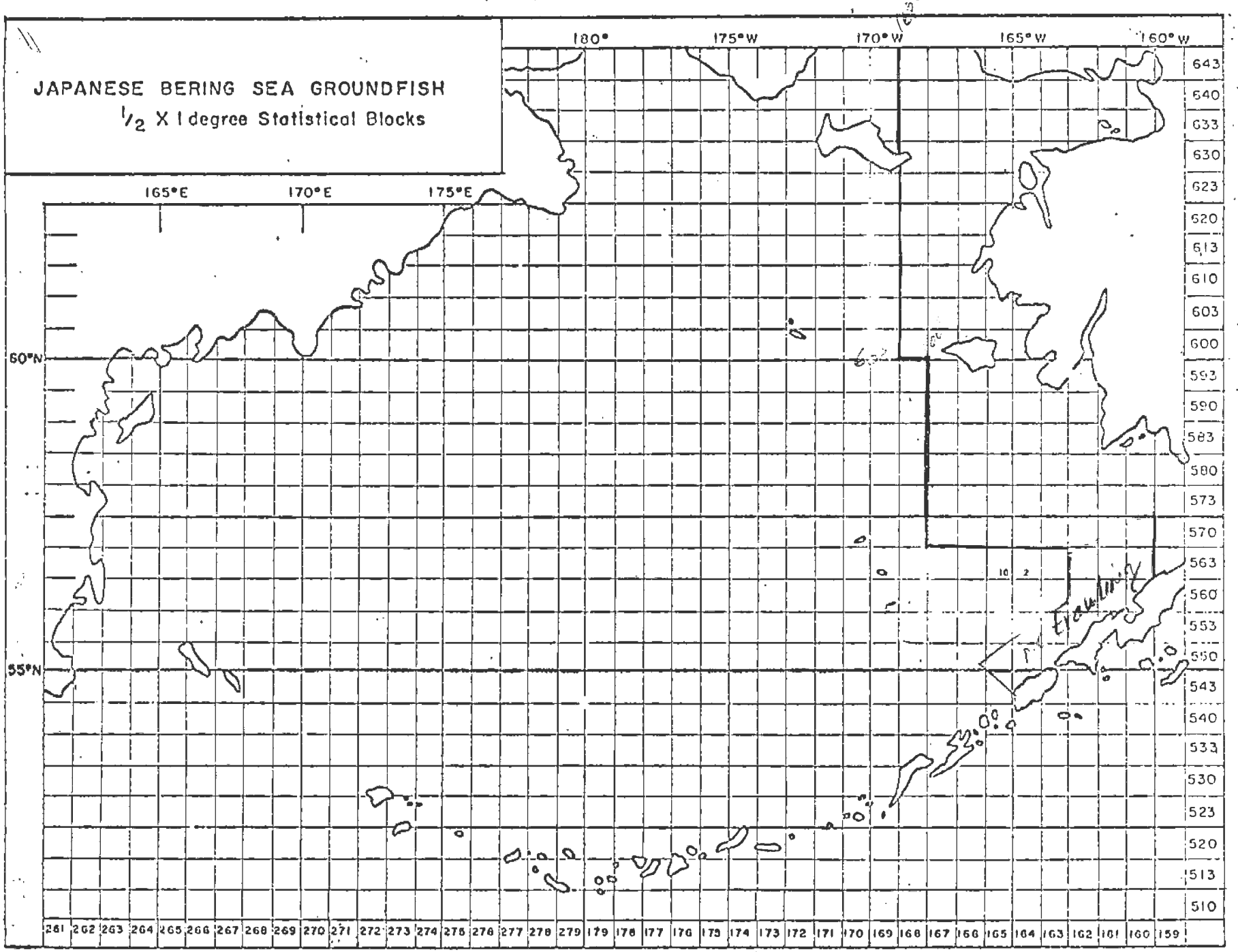


Figure 10. Soviet Bering Sea Herring Studies, 1959-1961.

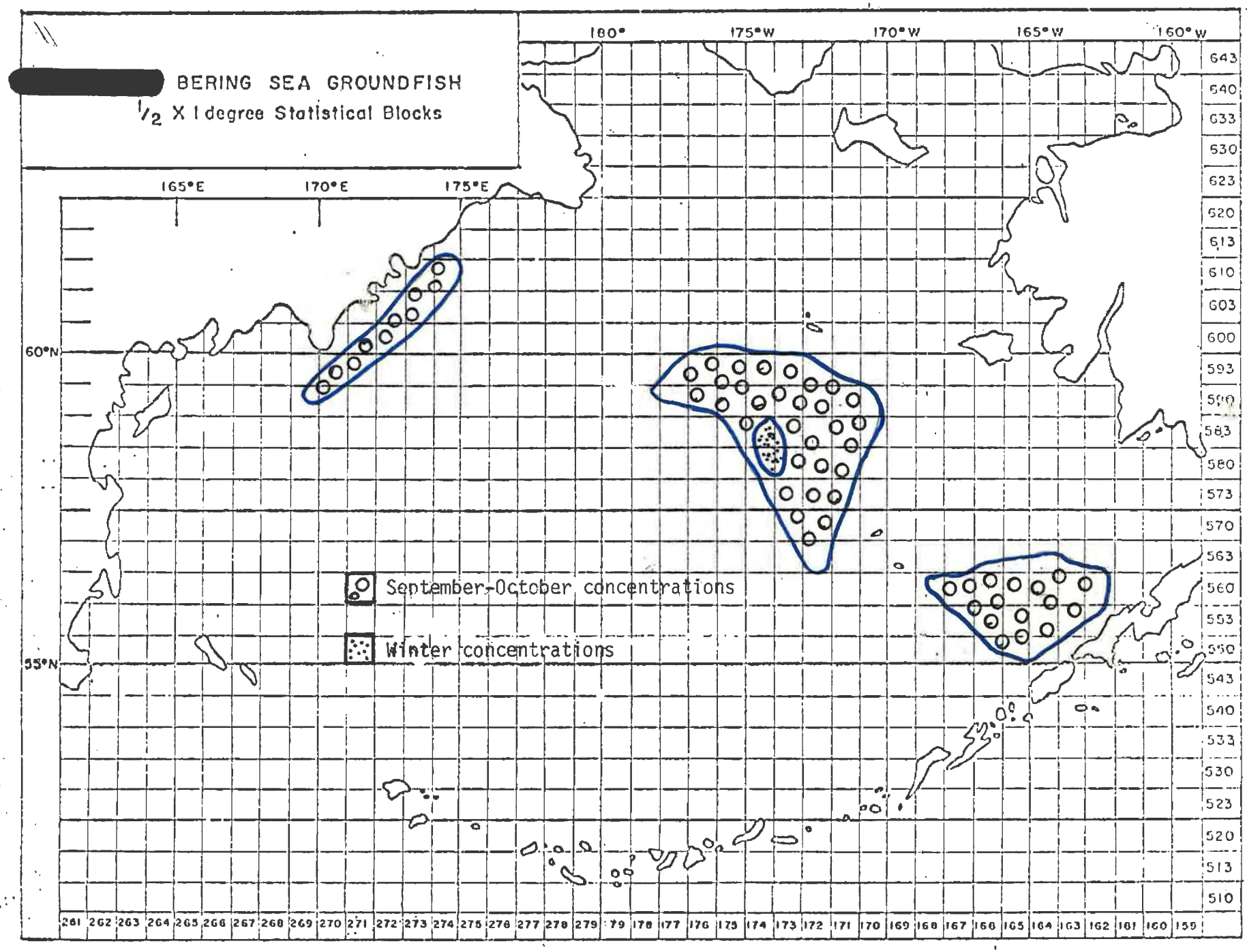
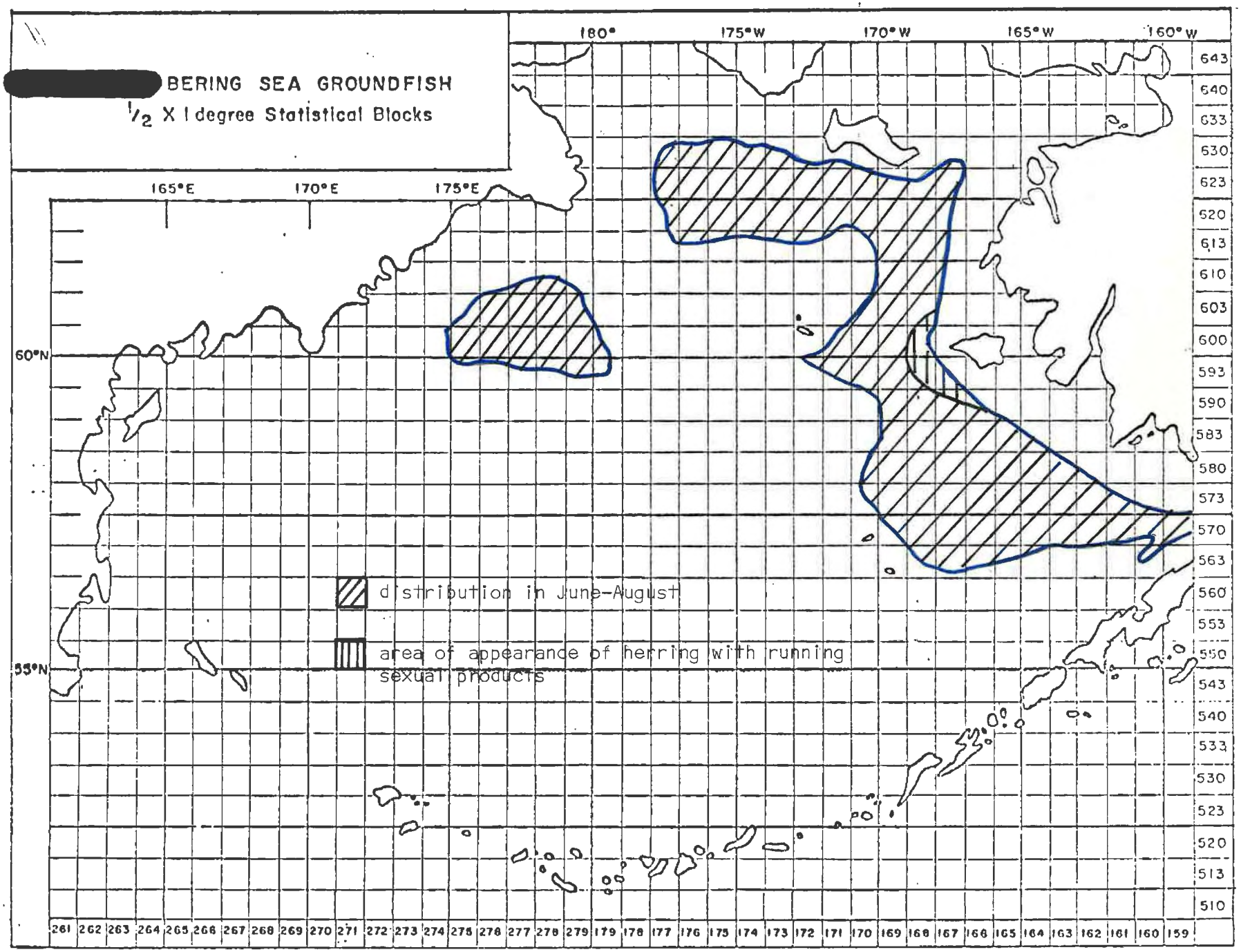


Figure 11. Soviet Bering Sea Herring Studies, 1959-1961.



From: Soviet Fisheries Investigation in the N.E. Pacific
Part II
Translated from Russian
IPST Translation 1968

597.553 (265.2)

THE HERRINGS OF THE EASTERN PART OF THE BERING SEA

Yu. I. Dudnik and E. A. Usol'tsev
TINRO

The Soviet herring fleet in the Bering Sea was, until recent years, active only in the western area with the Korf-Karaginskii stock of herrings.

However, even in its first year of activity, the Bering Sea Expedition showed that in the eastern Bering Sea there were herring, in addition to flatfish, rockfish, and other benthic and demersal fish, possibly in commercial concentrations.

Special investigations, organized in 1959, lasted three years and were conducted on the vessels SRT-4347, SRT-4454, "Ametist" and "Alatyr'," by V. G. Prokhorova, I. E. Shaboneeva, and the authors.

An extensive area from the Alaska Peninsula to St. Lawrence Island was surveyed. Together with the trawling with the bottom herring trawl, background hydrological and plankton studies were made with control catches in surface waters with drift nets, and with echo sounding gear in midwater.

The information gained on the seasonal distribution, migration routes, and behavior of herring is of course not complete, but nevertheless has considerable scientific and commercial value. Subsequent works of the expedition will no doubt supplement and improve available data.

The winter period of the annual cycle in herring has been relatively well studied, and already in 1961 winter fishing was organized. Between January and May 1961 about 10,000 tons of herring were taken by the fishing vessels, and between January and April 1962, more than 21,000 tons.

Maximum catches by SRT-type vessels exceeded 20 tons, and trawl hauls of 5—10 tons were common.

The wintering area of the herrings is northwest of the Pribilof Islands (Figure 1) and the southern margin of the ice fields. Other areas of wintering possibly exist; several findings collected in the spring indicate that there may be considerable numbers of herring under the ice fields further north.

The Pribilof area wintering ground is near the slope; the bottom relief is gentle, and the bottom temperatures are relatively stable throughout the winter.

Herring concentrations began to form in the area in October—November, fairly dense schools being observed in the second half of November at depths of 110 — 130 m; smaller quantities were found at greater and lesser depths.

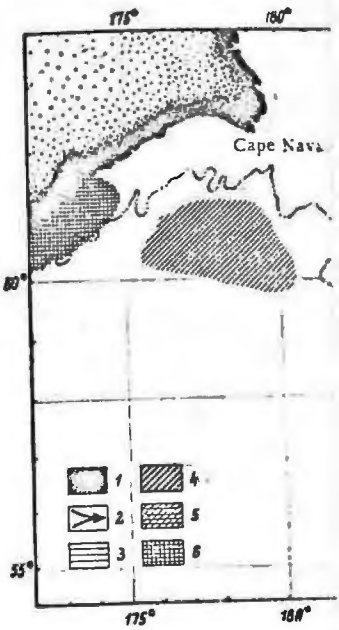


FIGURE 1. Distribution of herring in

1— winter concentrations; 2— depar
runny sexual products; 4— distributio
grounds for Korf-Karaginskii herring

The water temperature
December to March vari
lower, 0.9—2°C, in the s

Herrings were found d
an area of more than 900
vertical migrations. By
densely on the bottom, a
hauls with bottom trawls
this period was 5 — 10 m

At dusk the herrings
density was much smalle
500 kg per trawl. The he
and extended over 7 — 9

The size composition
in catches were from 12
corresponded to the yea
3).

However, the year
comprising 57.5% in 196
1953 to 1955 played a m
(8.6%), mainly due to th
1957.

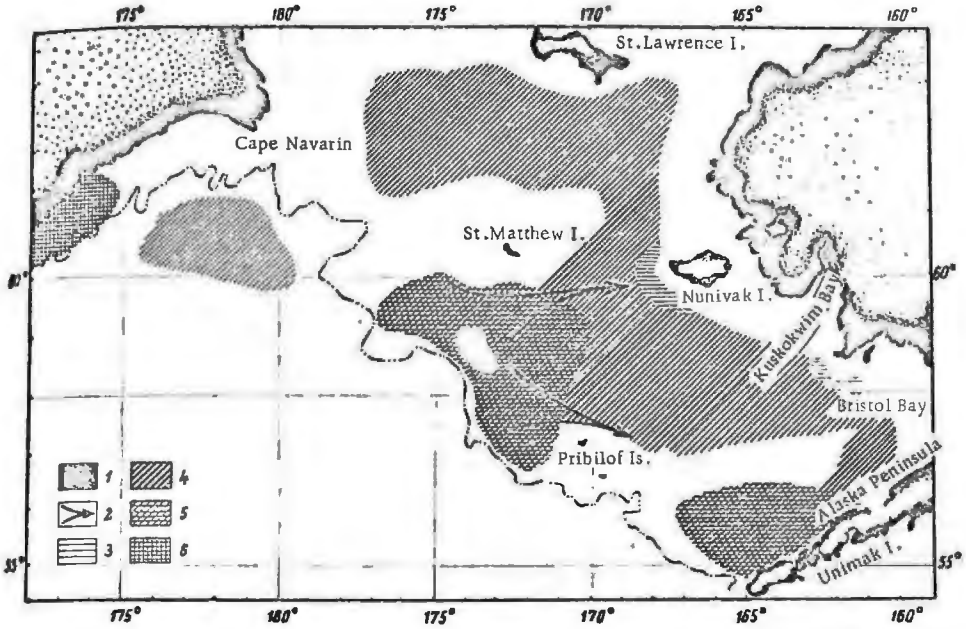


FIGURE 1. Distribution of herring in the eastern Bering Sea:

1– winter concentrations; 2– departure on spawning migration; 3– area of appearance of herring with runny sexual products; 4– distribution in June – August; 5– distribution in September – October; 6– fishing grounds for Korf-Karaginskii herring in July – August

The water temperature of the layers inhabited by herrings from December to March varied between 2 — 3.5°C, though temperatures were lower, 0.9 — 2°C, in the second half of March at the end of wintering.

Herrings were found during the period of most stable concentration in an area of more than 900 square miles. There were distinct diurnal vertical migrations. By day, especially on sunny days, herrings lay densely on the bottom, as was shown both by echo sounders and increased hauls with bottom trawls. The height of the schools above the bottom in this period was 5 — 10 m, and catches reached the maximum rate.

At dusk the herrings left the bottom for the midwater layers. School density was much smaller, and haul size was sharply reduced, to 200 — 500 kg per trawl. The height of the schools was 20 — 50 m from the bottom, and extended over 7 — 9 km.

The size composition in the wintering area was very variable. Herrings in catches were from 12 — 36 cm long, and from 2 — 12 years old, which corresponded to the year classes spawned in 1949— 1960 (Figures 2 and 3).

However, the year classes of 1956 and 1957 predominated, comprising 57.5% in 1961, and 72.9% in 1962. The older year classes of 1953 to 1955 played a more important role in 1961 (33.7%) than in 1962 (8.6%), mainly due to the entry into fishing of the abundant year class of 1957.

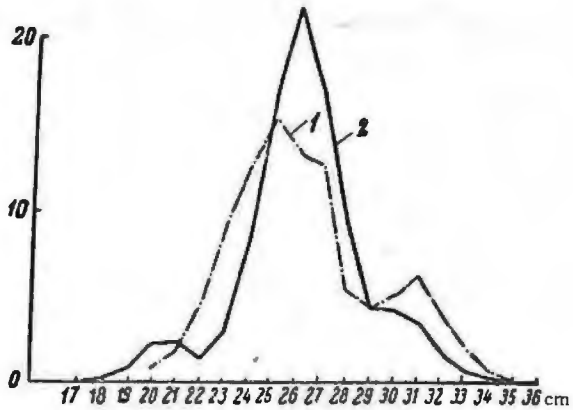


FIGURE 2. Size composition of herrings (in %) in winter fishing grounds:

1– 1960–61, 4,721 specimens, 2– 1961–62, 4,310 specimens

The maximum rate of growth of the east Bering Sea herring is up to the age of three years.

Average yearly increment of herrings (in cm)

t_1	7.0	t_6	2.1
t_2	6.8	t_7	1.7
t_3	4.8	t_8	0.9
t_4	2.9	t_9	0.9
t_5	2.3	t_{10}	1.0
t_{11}	0.7		

Sexual maturity begins in the third and fourth year, rarely in the fifth (Table 1). These figures do not permit any conclusions about the onset of mass maturation at the age of 3+, since they only refer to herrings in one particular wintering ground. A large part of immature fish of a particular age may winter elsewhere.

In September–October in the period of formation of prewintering schools, the sexual products of mature herrings in the Pribilof area were at stages II and III of maturity. At the end of the wintering period, they were at stages III–IV and IV, precisely the stages which predominate when herrings leave the wintering grounds at the end of March–April.

The area occupied by the herrings increased somewhat at the time of departure from the wintering grounds, and migrations were in two directions: northeast and southeast (see Figure 1).

The mobility of schools increased, and in catches fish with filled stomachs were often encountered, the food items being mainly Themisto and Sagitta; wintering herring hardly eat, and then only rarely are young "chernoglazki" [blackeye] found in stomachs. The extent of vertical migrations also increased, the herrings rising from the bottom to the surface waters by night.

A relationship between wa
herrings could not be establi

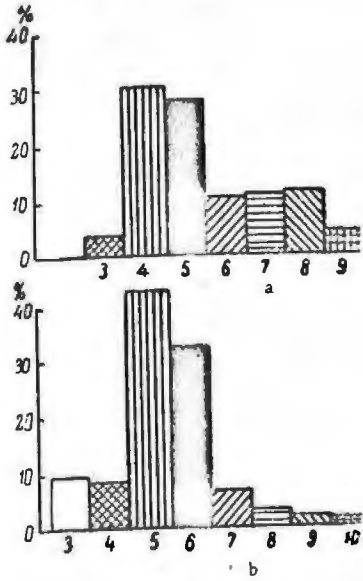


FIGURE 3. Age composition of herrings
fishing area:

a– 1960–61, 745 specimens; b– 1961
specimens

expanses between the Alask
water temperatures were 6

TABLE 1. Ratio of mature and immatur

Age, years	Mature, %
3	32.6
4	87.4
5	99.0

In the eastern Bering S
were noted only in Bristol
the littoral areas off the A
even smaller.

In June–July 1959 and
waters was noted south an

A relationship between water temperature and the distribution of herrings could not be established. Herrings on spawning migrations were frequently encountered at below zero temperatures (to −1.7°C).

From data of locations in littoral waters where herrings with runny sexual products, and later spent herrings, were found, spawning appears to take place in the bays of the Alaska Peninsula and the mainland, including Kuskokwim Bay and the Nunivak area.

In the area of the Alaska Peninsula, prespawning herrings were encountered in the second half of April and May, in Kuskokwim Bay at the beginning of June, and in the Nunivak area in the second half of June.

The foraging period begins after spawning; in most herrings the degree of stomach fullness is three to four units, and the main items of diet continue to be "chernoglazki," Calanus, and Sagitta.

In June—August herrings were encountered over the shelf in small, separate schools in the surface-warmed water. Occasional herrings were taken in drift nets in the expanses between the Alaska Peninsula and St. Lawrence Island where water temperatures were 6—9.8°C.

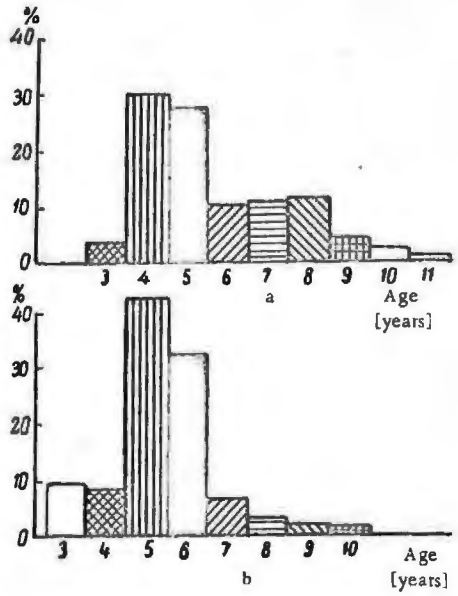


FIGURE 3. Age composition of herrings in winter in fishing area:

a— 1960—61, 745 specimens; b— 1961—62, 1,773 specimens

TABLE 1. Ratio of mature and immature herrings in fishing area in winters of 1960—61 and 1961—62

Age, years	Mature, %	Immature, %	Length, cm	Number of specimens
3	32.6	67.4	16.5—24.5	92
4	87.4	12.6	19.0—25.5	189
5	99.0	1.0	22.0—28.0	380

In the eastern Bering Sea, commercial drift net hauls (of 50—500 kg) were noted only in Bristol Bay; such quantities were encountered only in the littoral areas off the Alaska Peninsula; further offshore hauls were even smaller.

In June—July 1959 and 1960, the presence of herrings in surface waters was noted south and southeast of Cape Navarin over depths of

150 — 1,200 m. It was subsequently shown that herrings encountered over the extensive area from 179°W. to the Asian coast (see Figure 1) belonged to the Korf-Karaginskii stock.

At the end of August herrings in the eastern part of the sea begin to migrate toward the slope, and from the surface to the bottom. In September, they are encountered only in trawls, and their range of distribution constantly narrows. At the end of September—October north of the Pribilof Islands, they were between the 75 and 125 m isobaths at bottom temperatures of 2 — 3.5°C. Greatest concentrations were at depths of 90 — 95 m (50 to 500 kg).

Till November the herrings foraged fairly intensively, stomach fullness index being between 1 and 4 "fatness" reaching 2 or 3. The sexual products were at stages II—III and III of maturity. Males had more advanced stages of sexual products.

Large commercial concentrations of herrings were found in the second half of November; scientific scouting vessels hauled up to 10 tons per trawl hour. Obviously, this new fishing area of the east Bering Sea stock of herring is of major commercial importance.

INTRASPECIFIC VARIABI
ROCKFISH (SEBASTOD

V. V. Barsukov
Zoological Institute, AN SS

The commercial signifi
has increased greatly in th
Oceans in recent years. A
more precise systematic d
a simple task, especially f
Sebastodes is marked b
morphological differences
among Atlantic species of S
a matter of disagreement i
Because of the enormous ra
studies are possible for se
individual specimens from
species are rarely encount
difficulty. Under these con
descriptions of the intraspe
number of individuals of va

Sebastodes alutus,
and other American investi
synonymy, and is the most
Bering Sea and adjacent wa
intraspecific variability of
include those characters ut
species, and may serve as
in this genus. Attention has
size variabilities, and seco
variability, except in the st
considered, since it is muc
and, especially, size varia

* [Translated in the U.S.A.]

** Some investigations/26, and other
from the Atlantic Sebastes; addi

LITERATURE CITED

Biwer, D.A., Jr. 1969. Herring fishery in the Togiak district of Bristol Bay, Alaska Dept. of Fish and Game, Bristol Bay Data Report No. 17, 18 p.

Biwer, D.A., Jr. 1970. 1969 Togiak herring fishery, Alaska Dept. of Fish and Game, unpublished, 10 p.

Hayes, Murray L., Director, Kodiak Fisheries, Laboratory NOAA (Personal communication).

Japanese Bering Sea Groundfish Catch and Effort Data 1964-1969. Vol. I-III (Original data from Japan Fisheries Agency) obtained from: NOAA, North Pacific Fisheries Research Center, Seattle,

Y.I. Dudrik and E.A. Usol'tsev. The herrings of the eastern part of the Bering Sea. Soviet Fisheries Investigation in the N.E. Pacific, Part II. Translated from Russian, 1 PST Translation 1968, pp. 236-240.