ANNUAL MEETING - JUNE 1972

USA-USSR Cooperative Fishery Research in 1971

by

B. L. Griswold
National Marine Fisheries Service
Woods Hole, Massachusetts, U.S.A.

and

V. Efanov
AtlantNIRO
Kaliningrad, U.S.S.R.

Introduction

The 1971 USA-USSR cooperative fishery research program was the fifth in the series begun in 1967. The primary objective was to continue development of groundfish survey techniques to provide more accurate abundance indices for groundfish. A standard survey was conducted from Cape Hatteras to the Laurentian Channel, employing the U. S. research stern trawler, Albatross IV from Woods Hole, and the Soviet scouting vessel Blesk, a side trawler, from Kaliningrad.

In addition to the standard groundfish survey, the 1971 operations included an extensive trawl comparison experiment involving both vessels. There was also a joint cruise involving not only the USSR and USA, but Canada, France, and West Germany as well, which was aimed at assessing larval herring abundance and distribution on and around Georges Bank. (See report of the Larval Herring Workshop, Doc. 72/?).

In this document we present a brief summary of the 1971 joint USA-USSR groundfish survey operations and fishing power comparison experiments. Included are further observations of relative fishing power of the vessel-gear combinations used

A 2

for surveys, as well as stratified mean catch per tow figures

for a few selected species in various survey areas.

Part I - Gear Trials

Methods and Operations

Gear trials in 1971 consisted of measuring trawl wingspread

and headrope height by the method and experimental design

described by Griswold et. al. (1971). Nets included in the

tests were: (1) Standard Yankee 36 with and without ground

cables (20 fm). (2) Modified Yankee 36 utilizing 10 fm bridles,

20 fm ground cables, and an 80 mesh extension piece which was

42 meshes around (114 mm stretch measure) forward of the

cod end. The remainder of the net conformed to Standard Yankee

36 specifications. (3) Atlantic Western Models II and IV.

(4) Soviet 27.1.

Specifications for all nets were as given by Griswold et. al.

(1971) with the following exception. The Soviet 27.1 net used

in the 1971 joint work was constructed of polyethylene netting

rather than kapron (nylon). There were 35 headrope floats

rather than 42, and the oval doors were hollow and filled with

water when immersed. Each door weighed 260 kg in air and had

a surface area of 3.0 m^2. These light hollow doors were used

with all nets tested on Blesk. The solid oval doors used with

the 27.1 in 1970 had the same area but weighed 670 kg. A

diagram of the 27.1 used in 1971 is given in Figure 1.

Ground cables and door size were variables in rigging

which were tested for the various nets as follows:

A 3

	Blesk		Albatross IV	
	Doors	Ground Cables	Doors	Ground Cables
Std. 36	260 kg	none	545 kg	none
Modified 36	260 kg	20 fm	545 kg	20 fm
			635 kg	
27.1	260 kg	20 m	-	-
Atlantic Western II	-	-	545 kg	10 fm
			635 kg	
Atlantic Western IV	-	-	545 kg	10 fm
				20 fm

Operational parameters which were controlled in the tests included scope (ratio of wire out to depth) and towing speed. Scopes used were 3:1, 4:1, and 5:1. Speeds were 3.0, 3.5, 4.0, and 4.5 knots. Speed logs aboard both vessels were checked periodically by chip log. An experiment on an individual net was considered complete when the net had been towed with, against, and across the tidal current in every combination of speed, scope, and rigging. By averaging the readings with respect to current, its effect on trawl opening was minimized.

The cod end was tied on all tows but catches were minimal and would not have affected the trawl performance.

The Standard 36, Modified 36, and Atlantic Western Models II and IV were tested aboard Albatross IV from 31 August to 4 September 1971. The Atlantic Western nets were used because previous attempts to measure them had been unsuccessful. The Soviet 27.1 trawl was not measured aboard Albatross IV because the Blesk had not yet arrived in Woods Hole and the net was not available. The Blesk reached Woods Hole on 6 September and measurement of the Standard 36, Modified 36, and Soviet 27.1 trawl were made aboard this vessel from 8-11 September.

Results

Some important aspects of the results of these tests include
the following:

(1) The average wingspread of the Soviet 27.1 trawl was
11.9 meters (37.2 ft.) and the average headrope height 4.0
meters (13.0 ft.) when totaled over all experiments. This
represents reductions of 2.9 and 0.5 meters, respectively,
compared to 1970 measurements (Griswold et. al., 1971). This
was not unexpected when the difference in material, structure,
and doors used in the two years is considered.

(2) All nets tested on Blesk did not tend bottom well at
3:1 scope at speeds greater than 3.0 knots.

(3) The Standard and Modified 36 nets had less wingspread
when towed from Blesk than when towed from Albatross IV,
presumable because of the lighter doors on Blesk. Trawl
measurements obtained in the tests are given in Tables 1 and 2.

(4) The principal criterion for evaluating trawl
performance in the past has been the ratio of wingspread to
headrope length, with an optimum ratio being about 50-60
percent (Griswold, et. al., 1971). This ratio is acceptable
for most all nets tested in 1971, when summed over speed at
each scope (Table 3). Speed seemed to have minimal effect on
the mouth opening within any one scope. Wingspread was a
little narrow for the 27.1 net at 3:1 scope, but improved
when scopes increased to 5:1, the scope used by the Soviets on
all but the deepest survey stations. On Albatross IV the
545 kg doors seemed to give slightly better ratios for the
Modified 36 and Atlantic Western II than the 635 kg doors.
The Atlantic Western IV was tested with 10 and 20 fathom ground
cables. The longer ground cables reduced the wingspread and
provided the most acceptable wingspread-headrope length ratios.   **A 5**

Part II - Fishing Power Comparisons

Methods and Operations

On 14 September, Albatross IV and Blesk commenced a 10-day experiment designed to compare fishing power of Albatross IV using the Standard Yankee 36 (both with and without ground cables) and the Modified 36, in relation to Blesk using the Soviet 27.1 trawl. The experiment took place in one block, 10 miles on a side and 25-30 fm deep, centered at 40° 50' N, 70° 20' W.

The experiment was designed so that both vessels fished 10 pre-selected stations per 24 hour period, 5 during daylight and 5 during darkness with no fishing during dawn or dusk. The stations were randomly pre-selected within the 100-square-mile block by dividing the block into 100 one mile square areas, each being assigned a number from 1 to 100. Then for each 24 hour period, 10 of these 1 mile square areas were assigned by using a table of random numbers, the stations being at the center of the areas and direction of tow toward the next station in the sequence. Both vessels fished at 3.5 knots with a scope identical to that used in 25-30 fm for regular survey operations (3:1 for Albatross IV and 5:1 for Blesk).

Results

Results of a preliminary analysis of catch in weight for the three comparisons are given in Table 4. In terms of total weight, catches of the three U.S. nets caught from 27 to 43 percent of the catch with the 27.1 net. The Standard Yankee 36 with ground cables had the best fishing power among the U.S. nets when compared with the Soviet net.

This net also had the best fishing power among the U.S. nets,
when compared to the Soviet 27.1, for most individual species.
One exception was yellowtail which was much better represented
in the catch of the Standard 36 without ground cables. This
inconsistency in the data cannot be explained at present, but
behavioral response to the trawl by this species may be
involved. The ratio of the catch of the Standard 36 net with
ground cables to the catch of the Soviet net was better than
other USA-USSR net ratios for all other species, especially
those which tend to be distributed up in the water column.
This indicates ground cables may be quite important in sampling
pelagic fish.

The Modified 36 ranked second in fishing power for total
catch among the U.S.A. nets compared to the 27.1. However,
over 60 percent of the total catch of this U.S.A. net was
spiny dogfish and about 75 percent of the dogfish were taken
on three tows. The Modified 36 had relatively poor fishing
power for certain important species such as silver hake,
butterfish, and round herring. It was noted at sea that very
few small fish were being captured with this net and that a
large proportion of the bigger fish were gilled in the meshes
of the extension piece. This may have been caused by back-
pressure from the small mesh cod end which forced water to flow
out the meshes of the extension piece, also explaining the
absence of small fish. With this unsatisfactory performance,
the experiment with the Modified 36 was terminated at sea
after 17 tows of each vessel.

The Standard Yankee 36 caught about 1/4 the total weight
of fish that the Soviet 27.1 caught. This is somewhat less
than the ratio found in 1967 when a similar experiment was

performed in the same general area (Hennemuth,1968). In that
year, the Yankee 36 caught about 40 percent of the 27.1 catch.
Similarly, this 1971 net ratio is reduced for most species and
species groups compared to 1967 (Table 5). It may be that
after final statistical analysis using log transformations for
the 1971 data, these differences will not be significant.
However, preliminary indication is that real differences
between years do exist, at least for some species or species
groups.

The explanation for the relative improvement of the catch
in the 27.1 over the Yankee 36 in 1971 may be the difference in
construction of the 27.1. The 1971 polyethylene trawl was a
higher rise trawl that the kapron trawl used in 1967. This
may allow increased catches of pelagic and semi-pelagic species.
The effect of the reduced wingspread of the 1971 trawl on the
catch of groundfish may be minimized by the herding effect of
the ground cables. The largest discrepancies in the net ratios
for the two years were in the pelagic and semi-pelagic groups
(i.e., silver hake, butterfish, and spiny dogfish). Differences
in the ratios for comparable groundfish species in the two
years were minimal (Table 5).

The two pair tows, one with the wind and one against,
indicated practically no difference in speed of the two ships
while towing. It is assumed the vessels covered equal
distances for their half-hour 3.5 knot tows during the
experiment. The total catch for the Albatross IV and Blesk
for these two pair hauls was 590 and 2,766 pounds, respectively,
giving a ratio of .21.

A 8

Part III - Joint Groundfish Survey

Methods and Operations

The Scotian Shelf encompassing the strata set, 31-32; 51-56;
60-70, described by Grosslein and Sauskan (1970) was surveyed
by Blesk from 9-30 August before proceeding to Woods Hole.
Blesk made 108 stations on the Scotian Shelf. After the fishing
power comparisons, Albatross IV and Blesk surveyed the area
from Cape Hatteras to Georges Bank concurrently from 29
September to 26 October. Blesk made 160 stations in this
area and Albatross IV 199 stations. Albatross IV then completed
her survey of the Gulf of Maine and Scotian Shelf after Blesk
had departed from Woods Hole on 28 October.

Station allocation, sampling techniques, and cooperation
between scientific groups were identical to previous years
(Grosslein, 1968; Grosslein and Sauskan, 1970; Lux, et. al.,
1969).

Results

The USSR catch per haul for all species combined increased
dramatically in 1971 compared to 1970 in both southern New
England and Georges Bank surveys, whereas the standard USA gear
showed a continued downward trend which is consistent with our
knowledge of recruitment and removal (Figures 2, 3). This
indicates a substantial increase in relative fishing power of
the Soviet gear in 1971. The largest increases in relative
fishing power of the USSR gear were for red and silver hake
and the miscellaneous category (primarily round herring and
butterfish) in both areas. There was also a moderate increase
in flounder and skate catch per haul in southern New England
and flounder catch per haul on Georges Bank. In contrast,

USA catch per haul figures indicate a decrease in flounder
relative abundance while the hakes and miscellaneous species
remained about the same in both areas; on Georges Bank, catch
per haul of cod remained steady but haddock continued to
decline despite the appearance of the 1971 year class in the
catch (see Doc. 72/21).

The relative fishing power of the Soviet 27.1 compared to
the USA gear during the 1971 survey (Table 6) corresponded
in a general way to the results of the fishing power experiment
described in Part II of this document. The relative fishing
power of the Soviet gear as compared to the Yankee 36 was much
greater for pelagics and semi-pelagics than for groundfish,
and the range of fishing power differentials for the different
groups corresponds with those found in the experiment.

These data clearly show that the fishing power of the
Soviet 27.1 trawl used in 1971 was considerably greater than
those used in previous joint surveys, especially for pelagic
and semi-pelagic species. The known factors which were
different include the lighter hollow doors, the polyethylene
twine, and the resultant 1.5 meter increase in headrope height.
It is possible there is a critical distance from the bottom
which must be reached in order to greatly increase the catch
of pelagic species, however, it is doubtful that an increase
in headrope height of 1.5 meters is enough to solely account
for the increased catch. The possibility exists that the
changes in the net have been accompanied by changes in the
behavioral response of the fish to the net making them more
available. In any case, the observed change in fishing power
suggests the need for further gear testing and evaluation
before decisions are made concerning a standard ICNAF survey
trawl.

The original objective of the USSR-USA joint surveys was
to establish a time series with the large 27.1 net against the
smaller Yankee 36. Analysis of this time series would allow
an evaluation of the Yankee 36 as a sampling tool to measure
relative changes in stock size, given its desirable features
of durability and relatively small catches. An effective
analysis of this question has not been possible due to the
year to year changes in fishing power of the Soviet trawls.

Table 1. -- Mean headrope and wingspread of trawls measured aboard _Blesk_ in 1971 for various combinations of scope and speed.

Net	Scope	3:1				4:1				5:1			
	Speed	3.0	3.5	4.0	4.5	3.0	3.5	4.0	4.5	3.0	3.5	4.0	4.5
27.1	HR	13.5	Net	Off	Bottom	12.5	13.7	14.7	15.5	9.5	11.1	12.2	13.3
	WS	35.8	"	"	"	40.7	38.2	37.2	37.0	45.7	43.7	43.0	41.3
Std. 36	HR	9.0	Net	Off	Bottom	7.8	7.4	Off	Off	7.7	7.4	7.5	Off
	WS	31.0	"	"	"	33.0	34.7	Bottom	Bottom	35.4	36.1	37.0	Bottom
Mod. 36	HR	10.7	9.3	Net	Off	9.0	8.5	7.7	Off	9.2	8.2	7.6	7.3
	WS	31.3	32.8	Bottom	Bottom	34.0	34.7	35.3	Bottom	34.3	35.3	36.8	38.7

Table 2. -- Mean headrope and wingspread of trawls measured aboard Albatross IV in 1971 for various combinations of scope and speed.

Net	Scope Speed	3:1 3.0	3.5	4.0	4.5	4:1 3.0	3.5	4.0	4.5	5:1 3.0	3.5	4.0	4.5
Std. 36	HR	8.7	8.6	8.1	7.5	8.0	8.5	8.9	8.7	8.7	8.4	8.5	8.8
	WS	36.3	34.3	32.7	36.5	37.3	35.8	35.3	37.0	36.1	37.4	38.0	39.7
Mod. 36 Small Doors	HR	8.0	8.8	9.2	8.9	7.4	8.0	9.4	8.9	8.1	8.1	8.6	8.6
	WS	34.0	31.9	31.0	33.0	36.5	35.5	33.0	35.3	38.0	37.0	37.2	38.3
Large Doors	HR	8.5	9.2	9.5	7.7	8.2	8.8	9.3	8.6	7.6	7.7	8.0	8.8
	WS	35.0	34.7	33.9	37.2	35.2	35.0	36.2	38.0	36.2	36.7	37.0	38.0
Atl. West. II Large Doors	HR	11.5	12.7	Off	Bottom	11.6	12.0	Off	Bottom	10.8	11.2	12.0	12.2
	WS	38.0	36.8	"	"	40.0	37.0	"	"	41.0	40.0	39.5	41.0
Small Doors	HR	10.2	11.7	11.4	11.2	9.3	10.2	10.8	11.0	9.4	10.7	11.2	10.6
	WS	35.7	34.7	34.0	35.8	37.7	36.7	37.7	38.0	38.5	38.3	39.5	39.0
Atl. West IV 10 fm ground cable	HR	9.5	9.8	9.8	9.7	9.3	10.0	Off	Bottom	9.3	9.2	9.7	Off
	WS	32.8	31.3	33.3	35.0	34.8	33.8	"	"	35.8	35.5	36.8	Bottom
20 fm ground cable	HR	8.8	9.7	10.2	9.6	8.7	9.2	9.6	9.7	8.8	8.5	9.0	9.6
	WS	32.1	30.7	29.8	30.3	33.6	32.5	32.0	32.7	33.5	34.2	33.7	34.8

Table 3. -- Wingspread to headrope length ratios calculated for

nets tested in the 1971 USA-USSR joint gear trials.

BLESK

	3:1	4:1	5:1
Yankee	50	56	60
27.1	40	43	49
Mod. 36	53	58	60

ALBATROSS IV

	3:1	4:1	5:1
Yankee (Mod)			
Small Doors	54	58	63
Large Doors	59	60	64
Std. 36	58	60	63
AW II			
Large Doors	61	64	65
Small Doors	57	61	64
AW IV			
10 fm ground cable	62	63	67
20 fm ground cable	57	60	62

Table 4. -- Catch (lbs.) for selected species during the 1971 USA-USSR fishing power comparison experiments.

	Total Catch	Silver Hake	Butter-fish	Spiny Dogfish	Blackback Flounder	Yellow-tail	Round Herring	All Skates
A. Standard Yankee 36	7,318	277	191	1,015	291	648	2,453	201
B. Soviet 27.1	27,064	5,424	845	3,484	690	1,362	6,313	2,576
A/B	.27	.05	.23	.29	.42	.48	.39	.08
C. Standard Yankee 36 with ground cable	14,958	975	643	4,754	305	344	4,966	790
D. Soviet 27.1	34,768	4,233	1,200	9,118	704	1,490	7,539	6,113
C/D	.43	.23	.54	.52	.43	.23	.66	.13
E. Modified Yankee 36	3,996	45	23	2,550	144	216	6	318
F. Soviet 27.1	10,777	1,377	167	1,160	317	1,144	2,758	1,709
E/F	.37	.03	.14	2.20	.45	.19	.002	.19

Table 5. -- Ratio of catch (pounds) of Yankee 36 to
Soviet 27.1 for selected species in the
1967 and 1971 experiments.

	1967*	1971
Total	.40	.27
Silver Hake	.18	.05
Spiny Dogfish	.53	.29
Butterfish	.41	.23
Flounder	.40	.46
Skates	.10	.08
Red Hake	.20	.21

*Based on log retransformations.

Table 6. -- Stratified mean catch per haul of selected species
and species group (lbs.) for 1971 joint USA-USSR
groundfish survey for Southern New England (Strata
1-12) and Georges Bank (Strata 13-25).

	Southern New England			Georges Bank		
	USSR	USA	USA/USSR	USSR	USA	USA/USSR
Skates	68.71	14.57	.21	51.99	19.56	.38
Flounder	64.42	21.76	.43	35.41	14.44	.40
Cod	-	-	-	21.43	13.38	.62
Haddock	-	-	-	10.17	8.05	.79
Red Hake	80.08	7.44	.09	32.72	4.09	.12
Silver Hake	86.08	10.14	.12	19.57	2.75	.14
All other exclusive of invertebrates and dogfish	151.73	30.53	.20	58.05	27.37	.47

LITERATURE CITED

Griswold, B. L., Y. Kurlyandsky, and P. Twohig. 1971. Performance of trawls used in joint USA-USSR groundfish studies. ICNAF Res. Doc. 71/117.

Grosslein, M. D. 1968. Results of the joint USA-USSR groundfish studies. Part II. Groundfish survey from Cape Hatteras to Cape Cod. ICNAF Res. Doc. 68/87.

Grosslein, M. D., and V. I. Sauskan. 1970. USA-USSR cooperative groundfish survey, Fall, 1969. ICNAF Res. Doc. 70/80.

Hennemuth, R. C. 1968. Results of the joint USA-USSR groundfish studies. Part I. Comparative fishing experiments. ICNAF Res. Doc. 68/86.

Lux, F. E., V. A. Richter, and M. D. Grosslein. 1969. USA-USSR otter trawl survey, Fall, 1968. ICNAF Res. Doc. 69/75.
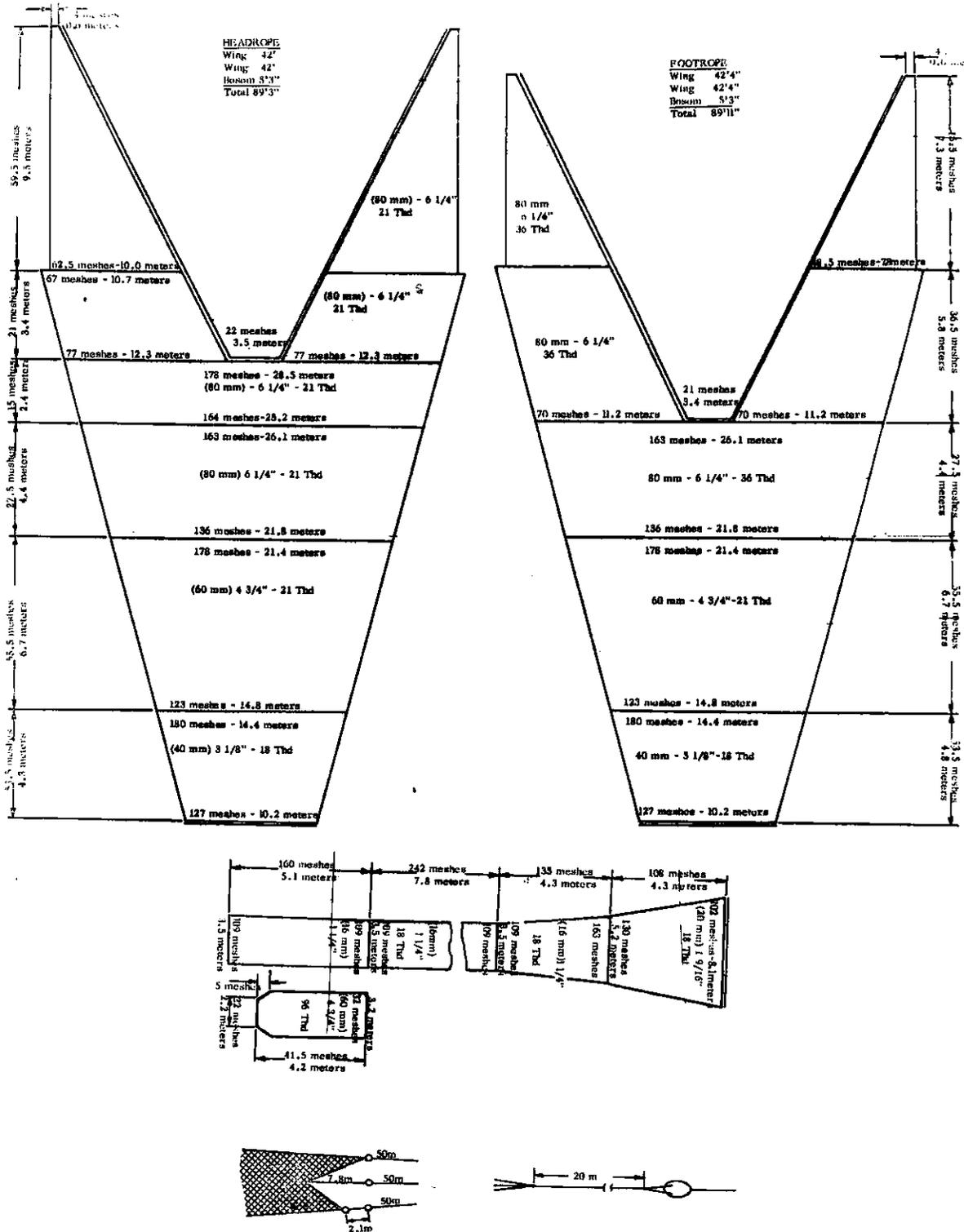
Figure 1.   Diagram of the Soviet 27.1 meter net used in the
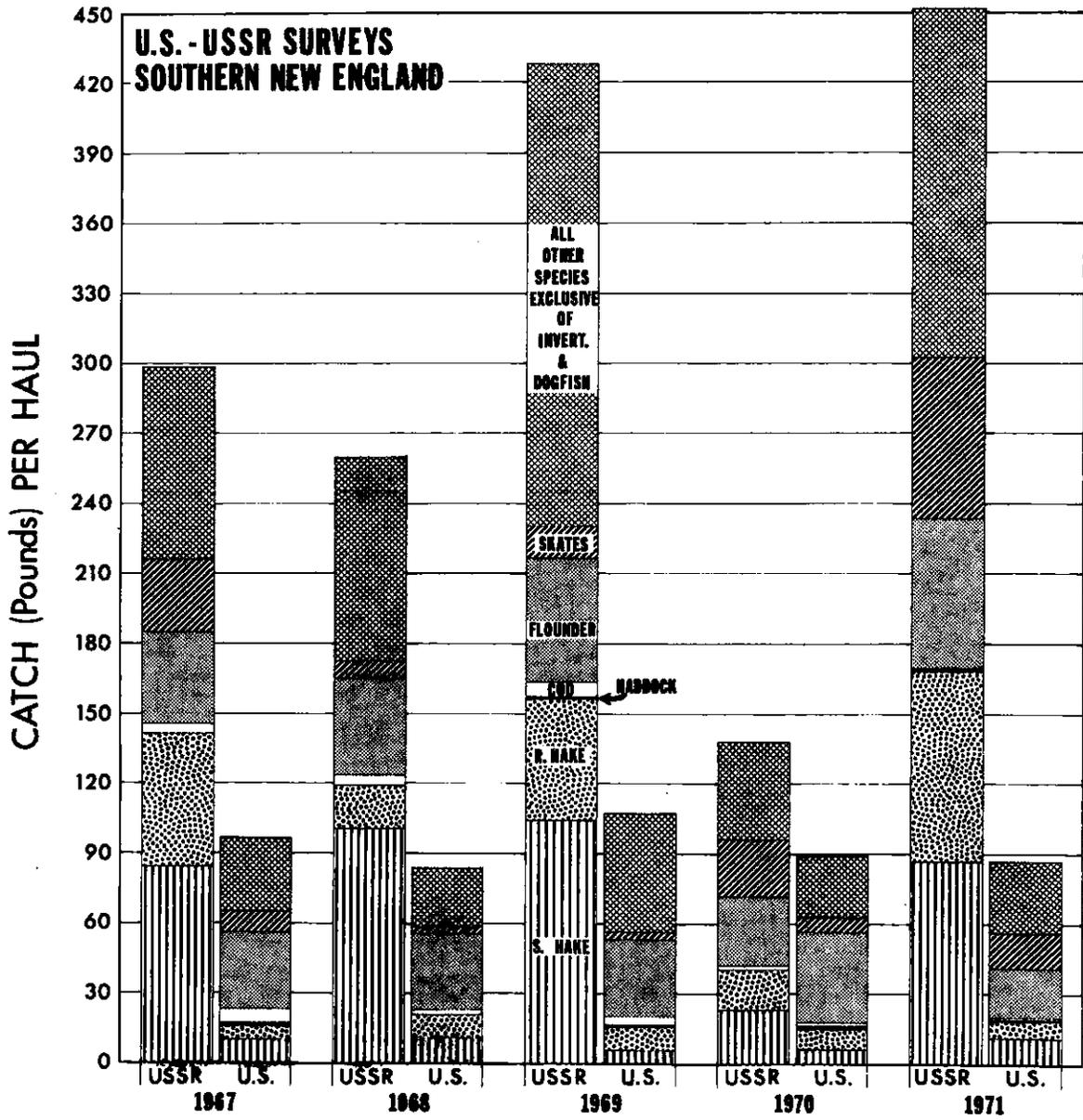1971 USA-USSR joint groundfish survey work.

Figure 2. Stratified mean catch per tow during the autumn
Soviet and USA groundfish surveys, 1967-1971,
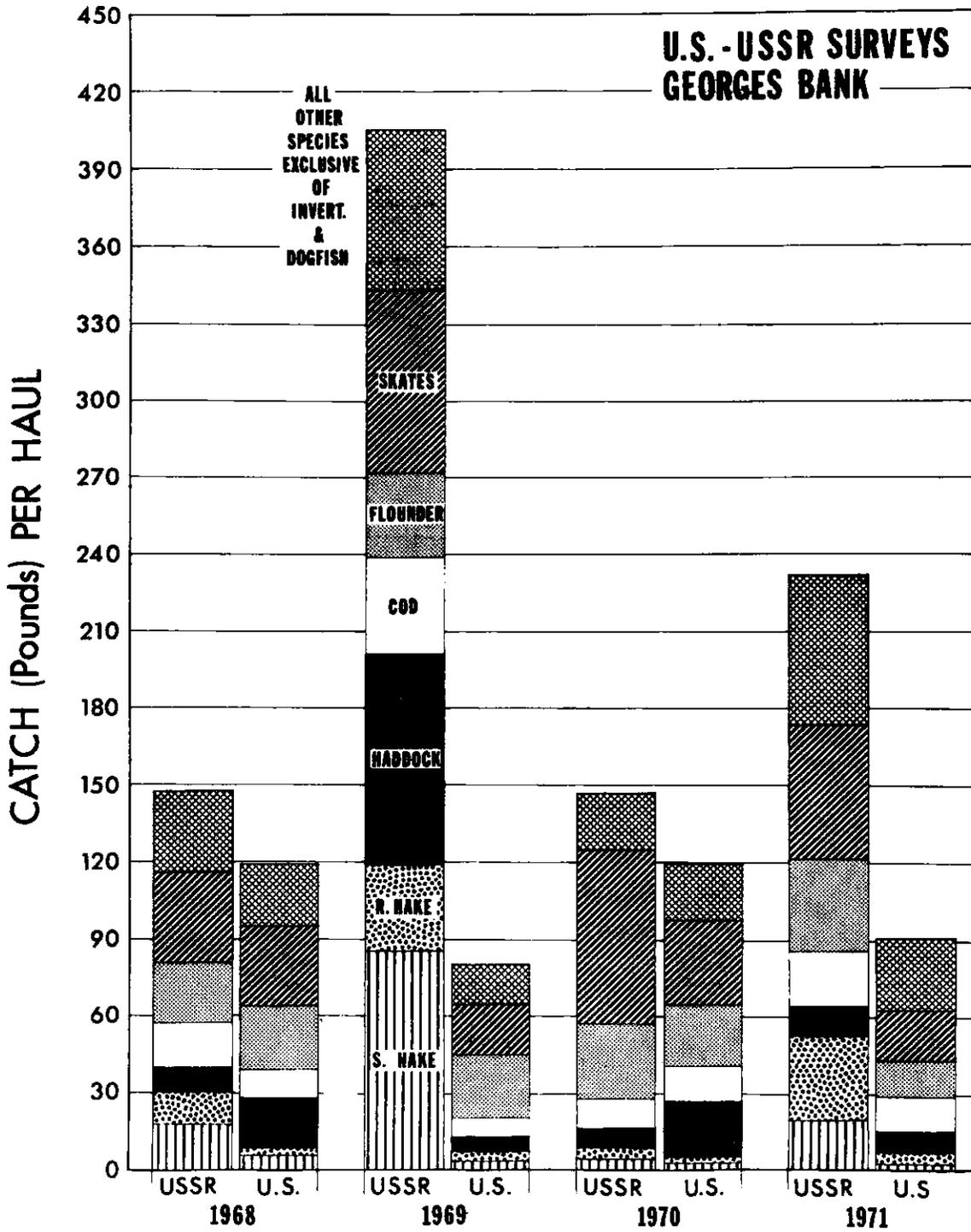for Southern New England.

Figure 3. Stratified mean catch per tow during the autumn
         Soviet and USA groundfish surveys, 1968-1971,
         for Georges Bank.