



International Commission

for the

Northwest Atlantic Fisheries



1950

1970

RESTRICTED

Serial No.2415
(B.g.7)

ICNAF Res.Doc.70/70

ANNUAL MEETING - JUNE 1970

Cooperative Herring Egg Survey - Georges Bank, 1969

by

V. Anthony

Bureau of Commercial Fisheries Biological Laboratory
West Boothbay Harbor, Maine 04575

V. I. Sauskan and J. K. Sigaev
AtlantNIRO, Kaliningrad, U.S.S.R.

Procedure

Biologists from AtlantNIRO in Kaliningrad, U. S. S. R. and the Bureau of Commercial Fisheries Laboratories in Boothbay Harbor, Maine and Woods Hole, Mass. participated in a cooperative research cruise September 30 - October 4, 1969 on Georges Bank. The purpose of the joint effort was to evaluate the spawning success of Atlantic herring, Clupea harengus harengus, by defining areas of spawning and density of herring eggs on the spawning beds. Two research vessels from the U.S.S.R., the Aliot and Ekliptika and the Albatross IV from Woods Hole, Massachusetts conducted the research. Four Russian scientists participated in the research aboard the Albatross IV and 3 American scientists sailed aboard the Ekliptika. Five areas were investigated on Georges Bank (Figure 1). The Russian vessel Aliot, which had been conducting egg surveys prior to the cooperative efforts of the U.S. and U.S.S.R. had located eggs at the following 3 locations: 41°58'N, 67°15'W; 42°00'N, 67°30'W, and 41°38'N, 68°20'W. Area 3 was chosen for the initial survey because of the heavy spawning in this area and the proximity of two other spawning areas. The Ekliptika, Aliot, and Albatross IV surveyed 7 x 10 nautical mile areas as indicated in Figure 2, by dredging along the bottom for 15 minutes at each station. A Naturalist dredge was used by the Albatross IV. The Aliot used a non-standard rectangular dredge made on board the Aliot. Another Russian dredge with a triangular mouth opening, 1 meter on each side was used by the Ekliptika in addition to the Naturalist dredge. The Russian triangular dredge seemed to operate more efficiently than the Naturalist dredge, although the variability in the amounts of catch was too great to allow a satisfactory assessment of the catchability of the two gears.

A buoy was set out by the Albatross IV at 41°59.5'N by 67°32.5'W over the center of an egg patch. The Aliot also set out a buoy approximately 0.75 miles southwest from the U.S. buoy (Figure 3). A major difficulty associated with herring egg research is in locating the exact position of the egg patches. The U.S. buoy as shown in Figure 3 is the location determined by the Aliot. This is nearly 3 miles southeast of the location as determined by the Albatross IV. Grab sampling began around the buoys by the Aliot and Albatross IV, and samples of eggs were saved for counting purposes. Trawl tows to sample the spawning herring and predator populations were made each day at noon and midnight. Stomachs of all predators were saved for laboratory analysis. Bongo tows to sample drifting herring larvae were made to determine if hatching had begun or whether larvae had drifted in from nearby areas. If considerable drifting occurs, any study of larval dispersion away from a given egg patch would be difficult. Photographs were also taken of the sea bottom to determine egg variability and bottom conditions.

The Ekliptika moved to Area 4 (Figure 1) on October 2 and began a dredge survey as shown in Figure 4. Herring eggs had been found previously in this area by the Aliot. On October 4, the Ekliptika moved to Area 5 and began a survey as previously done in the first 2 areas. Only seven stations were completed because of inclement weather.

Results

No eggs were found in the dredge surveys in Areas 1, 2 and 3 even though at least two egg patches were known to be present. The dredge stations located at 2 mile intervals were apparently too far apart for effective detection of egg patches. A better means of locating spawning sites is by sampling the adult spawning population and noting the presense of newly spawned herring.

The grab stations occupied by the Aliot on September 28-29 and October 2-3, 1969 are shown in Figure 3. The egg patch inside the U.S. circle was found on September 28 and 29. On October 2 and 3 the egg patch on the southwest border of the circle was surveyed. Both were found by the Aliot. The location and grams of eggs found per square meter of bottom by the Aliot on October 2 and 3, 1969 are given in Table 1. The stations occupied by the Albatross IV on October 2 and 3 are also shown in Figure 3. Samples of the eggs taken by the Albatross IV, usually one tenth of the entire sample, were returned to the Boothbay Harbor Laboratory and counted. The location of the samples, depth and egg amounts are given in Table 2.

The number of herring eggs laid on Georges Bank in a given year is given by the egg patch size and number of eggs laid per square meter of bottom. The extent of each egg patch was difficult to determine. In Figure 3, eggs were found at 4 locations where egg patches were not thought to exist. Area 4 may also be a significant egg producing area. The outlined egg patches in Figure 3 must provide a minimum estimate of spawning area. Apparently a great number of egg grabs are needed to detect the presense of the smaller egg patches. The counts of eggs per square meter of 20 stations varied from 1,970 to 6,821, 400 eggs per square meter with the greatest count being found on an isolated station at 41°58.2'N and 67°29.1'W. (Figure 5). The mean number of eggs counted per station was 1,395,000 per square meter with a 95 percent confidence interval of + 852,900 eggs per square meter. It is obvious that not only can many small egg patches be undetected but the size and shape of the patch and the mean number of eggs per square meter are sources of error. In the center of both egg patches of Figure 5 are found stations with very low egg counts indicating the great unevenness of the quantities of eggs. Another area sampled by the Aliot prior to the cooperative work is shown in Figure 6. This egg patch is Area 2 in Figure 1 and represents a new spawning location. Spawning in previous years had been found north of this area but not at this location (Figure 7). The research by the U.S.S.R. since 1964 indicates that the size of the spawning stock has been declining resulting in fewer and fewer eggs. Figure 7 shows the sizes of the egg patches in 1964-1966 and in 1969. Spawning was scattered in 1969 producing smaller, diffuse patches of eggs suggesting that the spawning population was continuing to decline. Research should be continued to substantiate this conclusion.

No counts were made of the layers of eggs making up the egg patch and no estimates of differential mortality were made by egg layers because the quantity of eggs laid was so small in 1969. If the egg mass had been reasonably thick as reported in past years, samples would have been taken from both the top and bottom layers to assess mortality differences between the eggs laid first and those laid last.

By placing the eggs in 3% formalin the dead, opaque eggs are readily visible. The number and age of the layers and the ages of the adults spawning each layer are very important in assessing egg mortality and stock-recruitment.

Most of the eggs caught in the grabs were mixed with sand and gravel so no thickness of the egg mass could be measured. Table 3 gives the limited data obtained on thickness from the grabs of the Albatross.

Bongo tows for larvae were made by the Albatross IV around the buoy. Table 4 gives the number and size of larvae caught. The 20 mm larva found in tow number 4 indicates that larvae found over an egg patch may be from a neighboring spawning area. Photographs were made of the ocean bottom around the buoy to further determine the variability of eggs in the egg patch. As the camera was lowered to the bottom a picture was taken as the camera supports struck bottom. The clarity of the photographs was poor and the equipment needs to be improved for further work.

Progress was made in the cooperative work in 1969 toward determining the variability associated with estimating the number of eggs in a given egg patch and the problems of dredge sampling. The cooperative egg research conducted in 1969 was the first such cooperative herring research and it is intended that this cooperative research will continue.

Table 1. Egg grabs of Allot around buoy located at
41°57.7'N, 67°29.9'W, October 2-3, 1969.

Station number	Latitude	Longitude	Grams of eggs per square meter	Eggs per square meter
2	41°57.7'N	67°30.5'W	5,800	2,644,800
5	41°59.2'N	67°30.5'W	1,010	460,560
9	41°57.6'N	67°29.8'W	440	200,640
14	41°58.7'N	67°29.1'W	460	209,760
36	41°57.6'N	67°30.0'W	370	168,720
39	41°57.9'N	67°30.0'W	1,200	547,200
40	41°58.0'N	67°30.2'W	6,350	2,748,915
41	41°57.7'N	67°29.4'W	3,890	1,773,840
43	41°58.3'N	67°30.2'W	-----	-----
45	41°57.8'N	67°30.2'W	7,000	2,749,600
61	41°58.2'N	67°29.1'W	14,030	6,821,386
90	41°57.8'N	67°31.8'W	-----	1,967
91	41°57.7'N	67°29.9'W	-----	2,644
92	41°57.8'N	67°29.8'W	9,350	4,802,160

Table 2. Egg Grabs of Albatross IV around buoy located at
41°59.5'N, 67°32.5'W, October 2-3, 1969.

ab Direction	Distance from buoy	Depth (fm)	Egg Amounts	Size of sample(ml)	Eggs per square meter
348°	75 yards	22	1070 ml (21,299 eggs)	105	2,129,900
128°	200 "	22	0	---	-----
235°	200 "	22.5	Trace	---	-----
240°	.50 mile	22.5	"	---	-----
270°	25 yards	22.5	fair amount	---	-----
55°	75 "	22.5	470 ml (28,933 eggs)	120	1,133,219
155°	300 "	22	0	---	-----
125°	75 "	22.5	4 ml (507 eggs)	4	5,070
60°	80 "	22.5	0	---	-----
35°	80 "	22	270 ml (2,587 eggs)	27	258,700
340°	.50 mile	22	0	---	-----
320°	.25 "	22.5	0	---	-----
0°	.25 "	22.5	0	---	-----
295°	.25 "	22.5	180 ml (7,193 eggs)	18	719,300
215°	.13 "	22.5	Trace	---	-----
180°	50 yards	22.5	Trace	---	-----
210°	100 "	22.5	0	---	-----
180°	.25 mile	22.5	0	---	-----
140°	.30 "	22.5	0	---	-----
320°	.25 "	22.5	120 ml (3,193 eggs)	12	319,300
85°	100 yards	22	60 ml (9,988 eggs)	20	199,760
220°	200 "	22	0	---	-----
40°	.75 mile	22.5	0	---	-----
10°	.25 "	22	0	---	-----
170°	150 yards	22	0	---	-----
200°	200 "	22.5	0	---	-----
270°	50 "	22	0	---	-----
345°	100 "	23	0	---	-----
320°	.25 mile	22	Trace	---	-----
10°	75 yards	22.5	0	---	-----
30°	.25 mile	22	0	---	-----
70°	200 yards	22	Trace	---	-----
45°	250 "	22	0	---	-----
10°	.25 mile	22	0	---	-----
320°	.25 mile	22	0	---	-----
350°	.25 "	22	0	---	-----

Table 3. The average thickness of the egg mass as measured by the Albatross IV.

Grab No.	Average thickness (mm)
1	22
5	1 egg layer (1 mm)
6	1 egg layer (1 mm)
14	5
20	2 or 3 egg layers (2-3 mm)
21	2 or 3 egg layers (2-3 mm)

Table 4. Results of Bongo tows (15 minutes) of Albatross IV on Cruise 69-10 (Oct. 3-4, 1969).

Tow No.	Tow Location	Number of larvae	Mean total length(mm)	Range in length(mm)
1	41°-59.5'N 67°-32.5'W	21	9.7	5.0-16.5
2	41°-59.5'N 67°-32.5'W	11	5.2	5.0-6.0
3	41°-57.5'N) (41°-56.6'N 67°-51'W) (67°-52.5'W	0	---	---
4	41°-45.8'N 68°-12.4'W	1	20.0	---
5	41°32'N) (41°31'N 68°34.5'W) (68°35.5'W	2	9.0	8.5-9.5
6	41°14'N) (41°12.5'N 68°50'W) (68°51'W	0	---	---
7	40°55.5'N) (40°57.2'N 69°05.5'W) (69°05.5'W	0	---	---

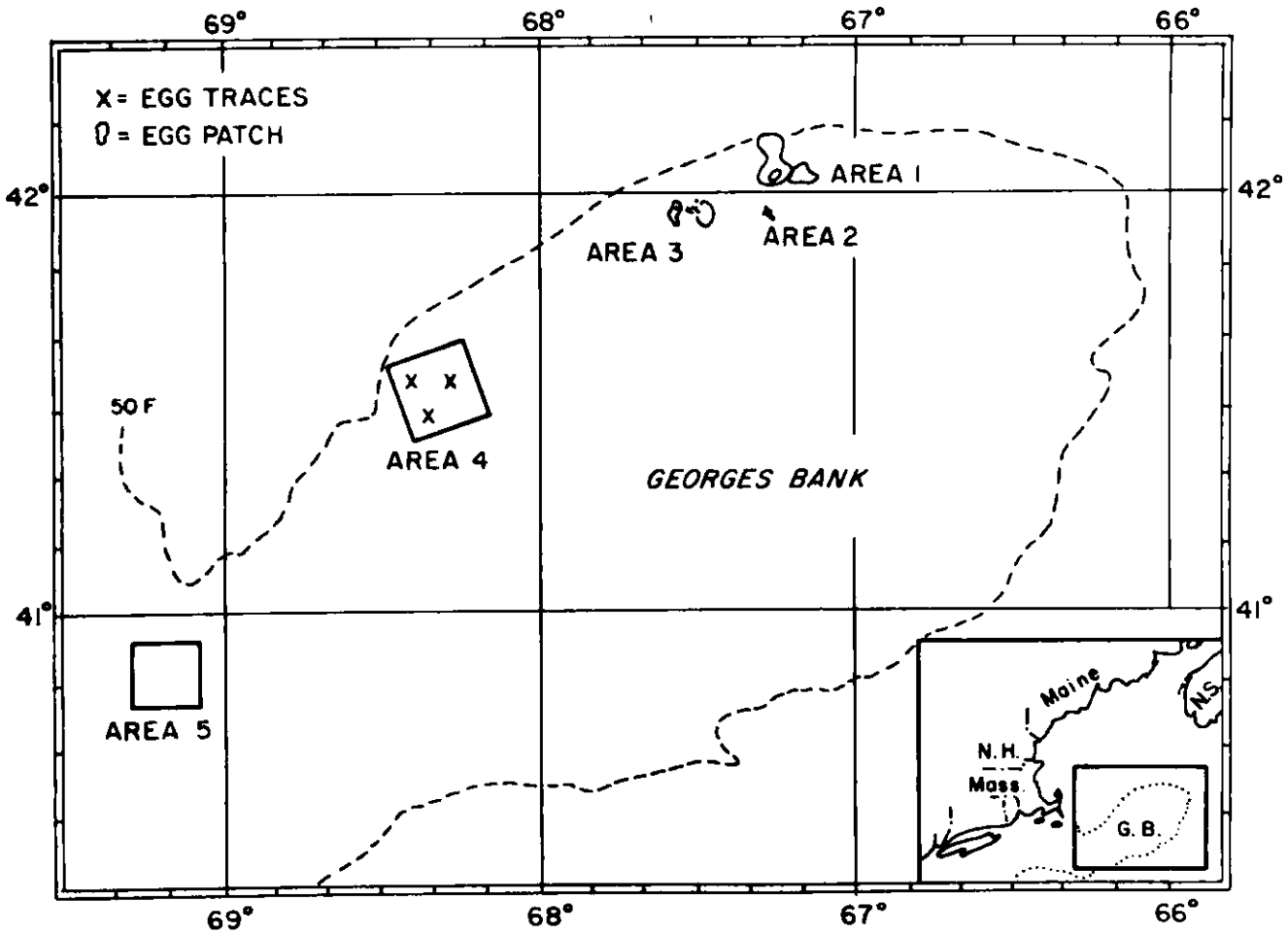


Figure 1 The areas of investigation during the 1969 cooperative egg research on Georges Bank by the U.S.S.R. and the U.S.

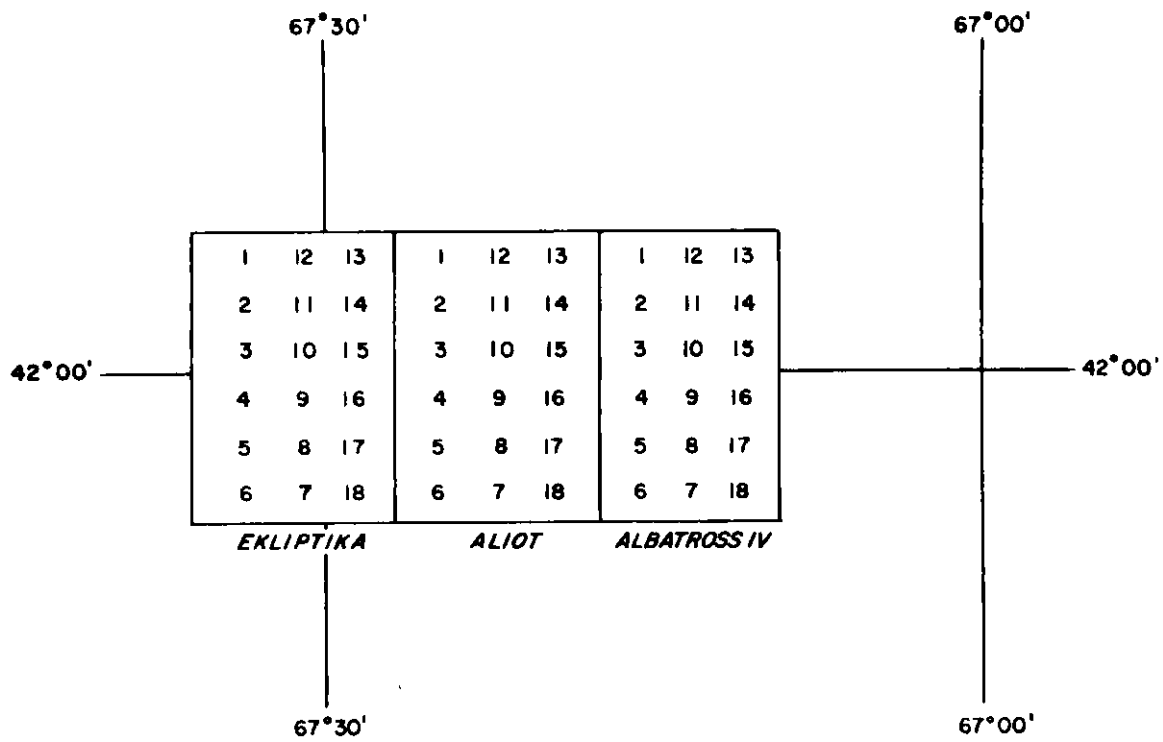


Figure 2. The stations of the herring egg survey by the Ekliptika, Aliot, and the Albatross IV on October 1, 1969.

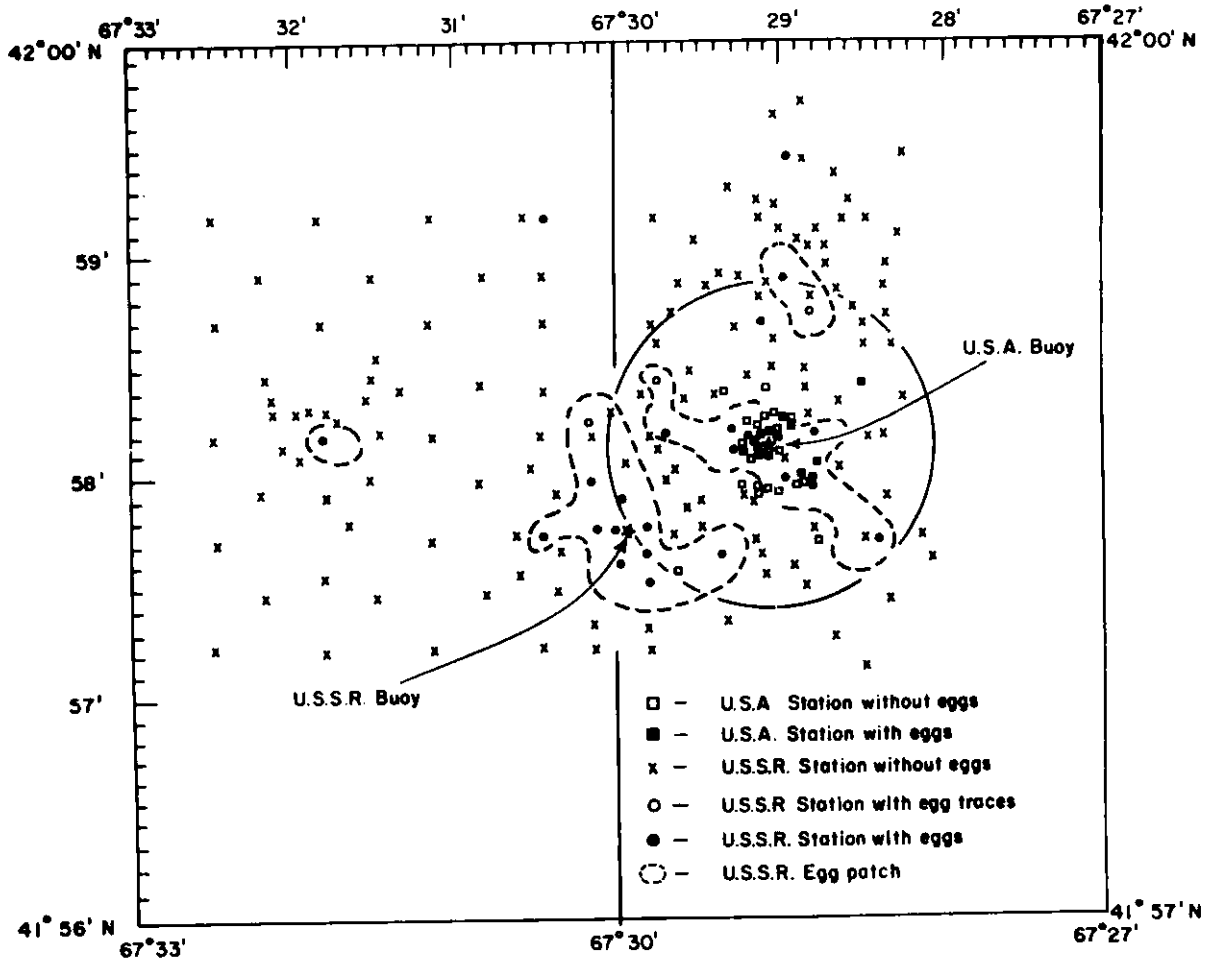


Figure 3. The herring egg survey by the Aliot on September 28-29, and October 2-3, 1969 with the area of sampling of the Albatross IV shown by the circle.

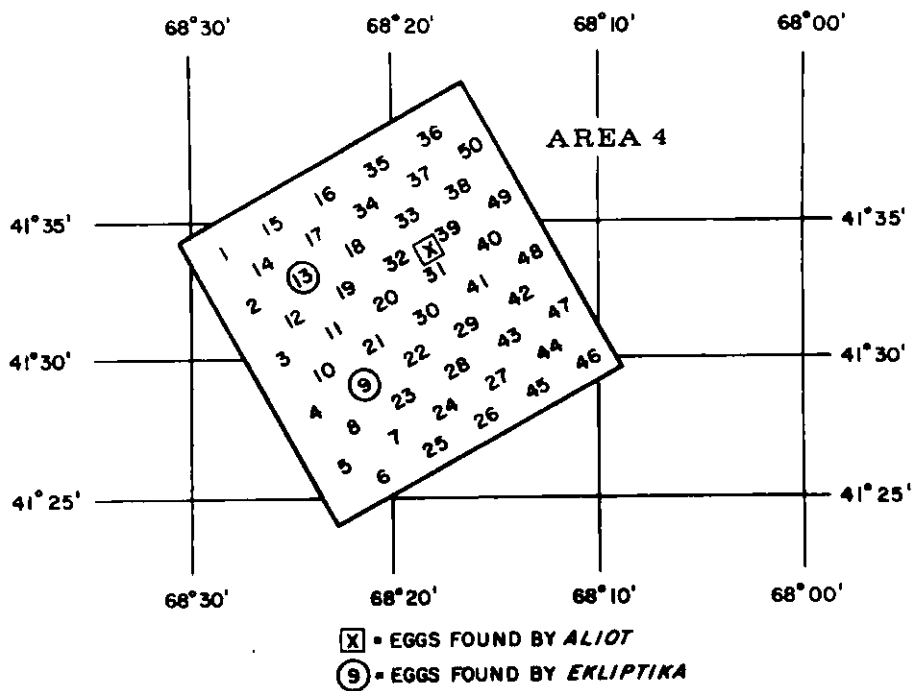


Figure 4. The stations of the herring egg survey at Area 4 by the Eklptika on October 2-3, 1969.

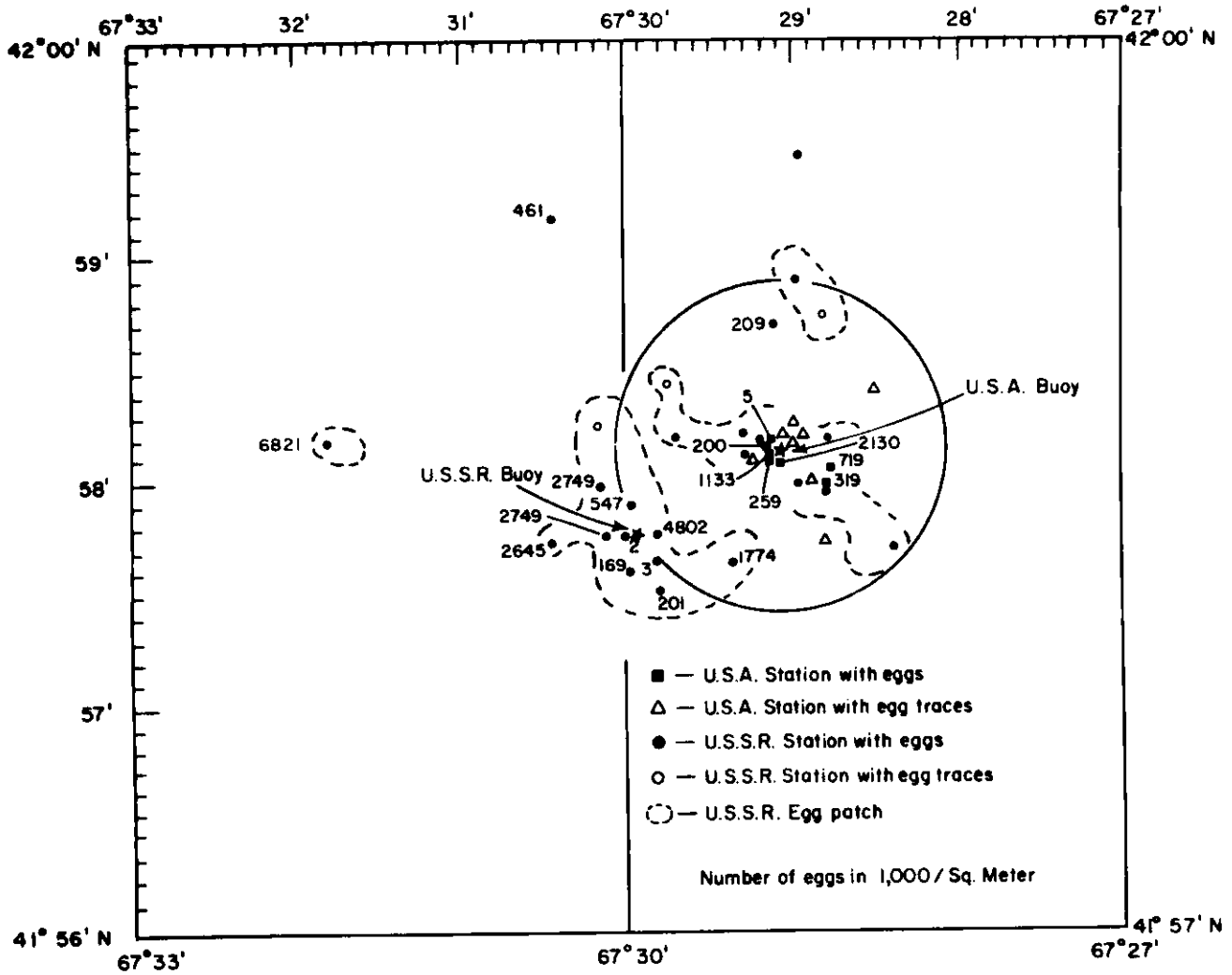


Figure 5. The stations of the Aliot and Albatross IV where eggs were found with the number of eggs per square meter.

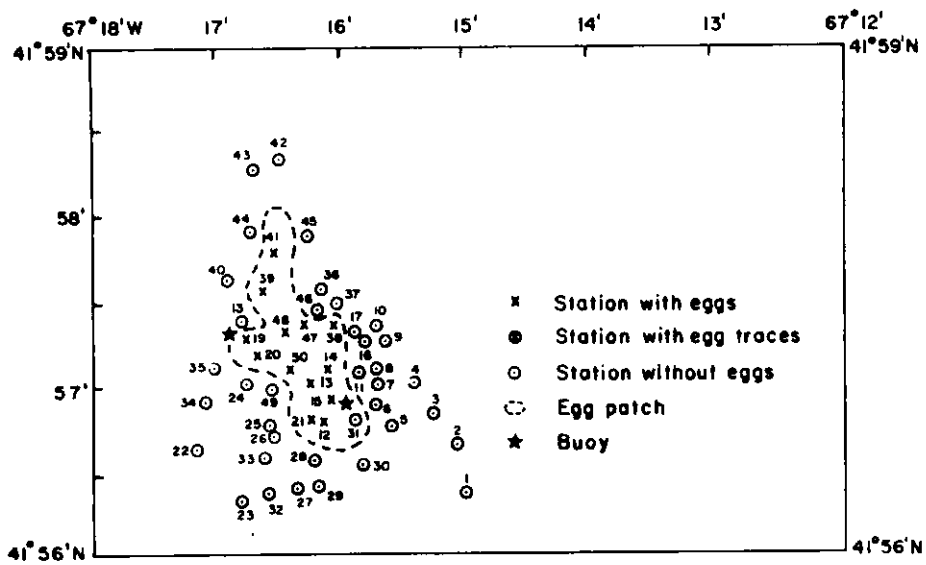


Figure 6. The herring egg survey of the Aliot on September 21, 1969 in Area 2.

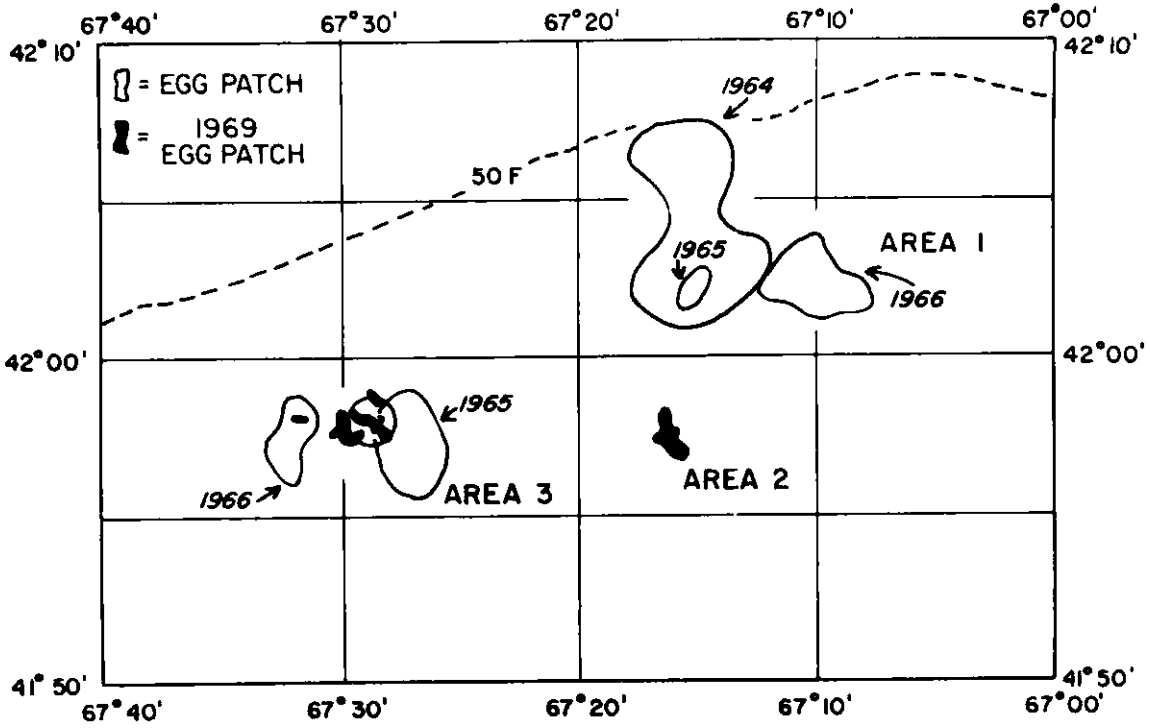


Figure 7. A comparison of egg patch location and size in 1964-1966 and 1969.